Fourth Five-Year Review Report

for

FMC Corporation Yakima

Superfund Site

Yakima, Washington

SEPTEMBER 2013

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9/18/13

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
CFR	Code of Federal Regulations
ESD	Explanation of Significant Difference(s)
FY	Fiscal Year
IRIS	Integrated Risk Information System
MCL	Maximum Contaminant Level
MTCA	Model Toxics Control Act (Washington State)
NCP	National Contingency Plan
ng	nanograms
NPL	National Priorities List
O&M	Operation and Maintenance
PQL	Practical Quantitation Level
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RfD	Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
µg	micrograms
WDOE	Washington Department of Ecology

Executive Summary

In December 1992, FMC completed remedial action at the FMC Corporation Yakima Superfund Site. FMC had operated a pesticide formulation plant at the site from 1951 to 1986. The cleanup was conducted pursuant to a Consent Decree and in conformance with the 1990 Record of Decision (ROD).

A 1993 Explanation of Significant Differences (ESD) addressed the impracticability of cleaning up contaminated soil below the low water table and provided for the removal of contaminated concrete surfaces, among other changes to the initial on-site incineration remedy.

A 2011 ROD Amendment selected institutional controls in the form of enforceable land use covenants under the Washington Uniform Environmental Covenants Act (UECA). The institutional controls were implemented in 2012 through enforceable land use restrictions in environmental covenants pursuant to the UECA. These institutional controls prevent the use of the shallow groundwater aquifer as a drinking water source and prevent unauthorized intrusion into subsurface contamination over the land use control area identified in the ROD Amendment. The ROD Amendment also clarified that aldrin and dieldrin are soil and groundwater contaminants of concern (COCs) and provided the cleanup levels for them, added two groundwater remedial action objectives (RAOs), and updated the applicable and relevant and appropriate requirements (ARARs) to include Model Toxics Control Act (MTCA) industrial cleanup standards for soil and MTCA standards that allow for unrestricted use of groundwater (once the standards are met) which, along with previously selected Maximum Contaminant Levels (MCLs), determine the threshold for restoration of all beneficial uses of groundwater.

As part of the cleanup, 5,600 cubic yards of contaminated material were excavated and treated through incineration. An additional 1,000 cubic yards of contaminated soil were disposed off site at an approved hazardous waste landfill. The concrete floor of the warehouse was scarified to remove contamination and then restored so that the warehouse was made ready for reuse.

Hazardous substances were left on site at depths generally below 7 feet from grade (following soil removal and treatment) at concentration levels high enough to seasonally impact groundwater quality. The groundwater has been regularly monitored by an EPA-approved network of wells and remains contaminated, mainly by dieldrin. Dieldrin was included in the ROD as a contaminant of concern (COC) for soils but not for groundwater, because it was rarely detected during the Remedial Investigation. It is listed as a probable carcinogen in EPA's toxicological database known as Integrated Risk Information System (IRIS). Levels of dieldrin and its breakdown product aldrin (a closely related chemical with nearly identical risk levels) rose dramatically during the soil removal, and then dropped and stabilized, but at concentrations about an order of magnitude higher than before the excavation. The ROD listed two primary contaminant groups: endosulfans and the DDT series. Like aldrin and dieldrin, endosulfans rose dramatically following remedy implementation, but the endosulfan Reference Dose (RfD) was changed in IRIS so that even the elevated levels were no longer considered a risk. Endosulfan levels have since dropped and stabilized. Groundwater concentrations of the DDT series dropped dramatically following the soil excavation, and they are no longer detected.

The remedy is currently protective despite the continued presence of dieldrin for two primary reasons. First, this contaminant is at low levels and does not travel very far in groundwater before being re-adsorbed onto soil particles. As a result, the plume extent is self-limiting. The plume expands and shrinks seasonally, with the largest plume existing in the late summer/early fall. Even at that time, the plume does not extend beyond the site boundary. Second, no one currently uses (or is likely to use) this

shallow groundwater under the former FMC property for drinking water purposes. Consequently, there is only a very low probability of a complete exposure pathway for groundwater. The site is zoned industrial, the area is served by a municipal water supply, and the current owner is fully aware of the groundwater impairment.

To ensure that the exposure pathway cannot lawfully be completed, now or in the future, the UECA covenants selected in the 2011 ROD Amendment were negotiated with the current landowners by FMC, and duly recorded following EPA approval. They also include measures to prevent intrusion into subsurface contamination.

The implemented soil remedy reduced the risks from direct contact with the soil to acceptable levels down to about 7-10 feet (a little below the seasonally low water table). Excavation below the water table was ruled out (by the ESD) based on impracticability, and the remedy, constructed as documented in the Remedial Action Report, was certified complete by EPA in December 1993. Contaminants were also removed from the interior of the site warehouse building, making it safe for reuse.

The remedy at this site currently protects human health and the environment because surface and near-surface soils have been remediated to below the cleanup goals and the groundwater plume is stable beneath the site and is not a source of drinking water. In order for the remedy to remain protective in the long term, enforceable institutional controls were added to prevent unacceptable exposure to contaminants in groundwater and subsurface soils. Also, modified sampling and analysis procedures were developed and employed to lower detection limits for aldrin and dieldrin to help ensure that future monitoring can determine if the site meets cleanup goals allowing for unlimited use and unrestricted exposure.

The Superfund Sitewide Human Exposure Environmental Indicator Status for the site remains "Under Control" because soil exposures do not pose an unacceptable risk and no one currently uses (or is likely to use) the shallow groundwater under the former FMC property for drinking water purposes. Also, enforceable institutional controls are in place to help limit exposure.

The Groundwater Migration Environmental Indicator for the site remains “Under Control" because the only contamination ever detected in groundwater is in shallow groundwater at low levels and does not travel very far in groundwater before being re-adsorbed onto soil particles. As a result, the plume extent is self-limiting.

The Cross Program Revitalization Measure Status for the site is “Ready for Anticipated Use” due to the success of the remedial action for soils and the implementation of enforceable institutional controls. The site is being fully reused for light industrial purposes.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: FMC Corporation Yakima		
EPA ID: WAD000643577		
Region: 10	**State:** WA	**City/County:** Yakima/Yakima

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Craig Cameron
Author affiliation: Project Manager, EPA, Region 10
Review period: 4/5/2013 – 9/18/2013
Date of site inspection: 4/5/2013 (spring groundwater sampling); 6/21/2013 (official site inspection)
Type of review: Statutory
Review number: 4
Triggering action date: 9/19/2008
Due date *(five years after triggering action date)*: 9/18/2013

Five-Year Review Summary Form (continued)

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
Entire Site (includes OU 1)

Sitewide and OU 1 Protectiveness Statement	
For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.	
Protectiveness Determination:	*Addendum Due Date (if applicable): NA*
Protectiveness Statement: The remedy is protective of human health and the environment because surface and near-surface soils have been remediated to below the cleanup goals and the groundwater plume is stable beneath the site and is not a source of drinking water. To ensure that the remedy remains protective, institutional controls were added to prevent unacceptable exposure to residual soil and groundwater contamination. Finally, lower groundwater detection limits for aldrin and dieldrin were achieved through implementation of modified sampling and analysis procedures. The lower detection limits are necessary to ensure that monitoring information can be correctly used to determine (in the future) if the site meets cleanup goals allowing for unlimited use and unrestricted exposure.	

Fourth Five-Year Review Report
FMC Corporation Yakima
Superfund Site
Yakima, Washington

I. INTRODUCTION

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review Reports. In addition, Five-Year Review Reports identify issues found during the review, if any, and identify recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this Five-Year Review Report pursuant to CERCLA §121(c) and the National Contingency Plan (NCP). CERCLA §121(c) states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) which states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

Region 10 of the EPA conducted the Five-Year Review of the remedy implemented at the FMC Corporation Yakima Superfund Site, located in Yakima, Washington. This Fourth Five-Year Review for the FMC Corporation Yakima Superfund Site was conducted by the EPA Remedial Project Manager (RPM) from June 2013 through September 2013. This report documents the results of the review.

The triggering action for this statutory review was the completion of the Third Five-Year Review Report, dated September 19, 2008. The five-year review is required because hazardous substances, pollutants, or contaminants remain in the soil and groundwater above levels that allow for unlimited use and unrestricted exposure.

II. SITE CHRONOLOGY

Table 1. Chronology of Site Events
FMC Corporation Yakima

Event	Date
FMC operations	1951 thru 1986
Preliminary Investigations	1982
NPL Listing	September 8, 1983
Pre-MTCA State Water Program Discharge or Spill Response Order (State)	June 10, 1983
Administrative Order on Consent (EPA) – RI/FS	July 31, 1987
Administrative Order on Consent (EPA) – Removal	May 31, 1988
Removal Completion	April 1990
ROD Issuance	September 14, 1990
RD/RA Consent Decree Entry	December 6, 1991
Incineration Began	November 1992
ESD Issuance	April 21, 1993
Incineration and Construction Completed	August 1993
Groundwater Monitoring Plan Approval	November 1993
Certification of Completion Issuance	December 1993
Final RA Report	July 1, 1994
Property sold to current owners	1995
First Five-Year Review	September 1998
Second Five-Year Review	September 2003
Third Five-Year Review	September 2008
ROD Amendment Issuance	September 2011
Land Use Covenants Implemented	September 2012

III. BACKGROUND

Site Location and Description

The FMC Superfund Site was placed on the National Priorities List (NPL) [also known as Superfund Site List] on September 8, 1983.

The FMC Corporation Yakima Superfund Site (site) is located at 4 West Washington Avenue, approximately 1 mile east of the Yakima Municipal Airport in Yakima, Washington (see Figure 1 in Appendix). The site is located in the lower Ahtanum Valley, an area of about 100 square miles in central Yakima County, Washington. The site is a 58,000-square-foot fenced area that was leased by Farm Machinery Corporation (FMC) from Union Pacific Railroad and is bounded to the east by Union Pacific Railroad tracks. Most of the surrounding area is zoned light-industrial. There are a few parcels bordering the western side of the property (across Longfibre Road) that are zoned residential (see Figure 6 in Appendix). However, these parcels are up-gradient from the direction of groundwater flow. There are no homes nearby.

FMC formulated pesticide dusts at the site from 1951 until 1986. Pesticide liquids were formulated there in the 1970s. Between 1952 and 1969, FMC disposed of wastes containing pesticides in an on-site pit. An estimated 2,000 pounds of waste consisting of raw material containers, soil contaminated by leaks or

spills, and process wastes was dumped into the excavated pit and covered with soil. After 1969, waste materials were disposed of at Yakima Valley Disposal in Yakima and at Chemical Waste Management's Arlington, Oregon, facility.

The site slopes to the southeast with a grade of less than 1 percent. The site is 1.5 miles west of the Yakima River (outside of the 500-year flood plain) and 1 mile north of Wide Hollow Creek (also outside of the creek's flood plain). No surface water bodies exist on site. Vegetation within the fenced site and over the residual groundwater plume consists of tall weeds and grasses. The groundwater beneath the plume occurs in alluvial silty sands and gravels and flows southeastward toward the Yakima River. Groundwater levels fluctuate seasonally with the high in the fall (average of 2 feet below ground surface (bgs)) corresponding to the agricultural growing season (regional irrigation), and a low in the winter (approximately 7 feet bgs). Groundwater flows in a southeasterly direction with a seepage velocity of about 7 feet/day. There are currently no wells used for drinking water in the shallow aquifer within a 1-mile radius.

The site currently contains an active metal fabrication facility, parking lot, and equipment storage yard owned by Stephens Metal Products. The ownership of this parcel was confirmed in 2008 with a title search. Ownership was most recently reconfirmed during an interview with company president Chester Stephens in 2013. Two businesses have purchased parts of the original FMC leased property west of Stephens Metal Products and have erected buildings, a Country Farm & Garden True Value Hardware store (including a garden nursery) and Butlers Welding and RV Accessories. Most current operations are on paved ground. Figure 2 in the Appendix shows the structures at Stephens Metal Products, the location of the former disposal pit, and the groundwater monitoring wells.

Site History

A. Early Investigations

Waste materials and an estimated 2,000 pounds of various chemicals were dumped into an on-site disposal pit between 1952 and 1969. A preliminary investigation was conducted for EPA in 1982, and the site was placed on the NPL later that year based on high levels of pesticides in site soils and surrounding groundwater. An Administrative Consent Order issued by the State of Washington Department of Ecology (WDOE) in 1983 required a study of the former disposal pit area. In 1986, after operations at the facility ceased, FMC claimed it removed all contents of the main warehouse and surface tanks and washed the warehouse floor and walls without EPA or WDOE oversight. EPA issued two Administrative Orders on Consent in 1987 and 1988 requiring a Remedial Investigation/Feasibility Study (RI/FS) and a removal and disposal of the pit contents, respectively. FMC's removal of the pit contents occurred in two phases in 1988 and 1989 while the RI/FS was being completed. A Record of Decision (ROD) was issued on September 14, 1990, to address all post-removal residual site contamination. Subsequent remedial action included removal and incineration of contaminated soil and concrete as well as groundwater monitoring. Structures remaining on site included an office building, a warehouse with loading dock, and a parking lot.

B. Phase 1

A Phase I removal of the contents of the disposal pit (containing pesticide concentrations up to 25,000 mg/kg) was performed in June 1988 following a Phase I investigation of the pit. The pit was excavated to a depth of 4 feet (the depth of the groundwater table at the time), and 500 tons of contaminated soil were removed. In March 1989, an additional 350 tons of soils were removed, which increased the depth of the excavation to approximately 8 feet. All waste was disposed of at Chemical Waste Management's Arlington, Oregon, permitted hazardous waste disposal facility.

C. Phase II

A Phase II investigation, or completion of the RI/FS for the remainder of the site, was completed in April 1990. A Record of Decision (ROD) selecting final remedial action was issued on September 14, 1990. FMC entered into a Consent Decree to perform the remedial action which was entered in Federal District Court for the Eastern District of Washington on December 6, 1991.

D. Basis for Action

The basis for action was the release and presence of hazardous substances at the site at levels that could pose an unacceptable risk to human health and to the environment if left unaddressed. At the time of the ROD the contaminated media of concern were the contaminated soils and structures at the FMC site. Concentrations of contaminants in groundwater were below health-based levels at the time; however, continued groundwater monitoring was called for to confirm the effectiveness of source removal in protecting groundwater.

The contaminants of concern for human health at the site were DDD (l,l-dichloro-2,2-bis(p-chlorophenol) ethane), DDE (1,1,dichloro-2,2-bis(p-chlorophenol) ethylene), DDT(l,l,l-trichloro2,2-bis(p-chlorophenol) ethane), dieldrin, endosulfans, malathion, ethion, ethyl parathion, parathion, DNOC (4,6-dinitroo-cresol), cadmium, and chromium VI. All of these compounds are considered toxic to humans; cadmium, chromium VI, DDD, DDE, DDT, and dieldrin are also carcinogenic. The contaminants of concern for potential ecological effects were DDD, DDE, DDT, endosulfans, ethion, malathion, and zinc.

Groundwater contamination had been found at low concentrations, most notably the organo-chlorines (DDT, DDD and DDE), dieldrin and endosulfans.

IV. REMEDIAL ACTION

A Record of Decision for remedial action was issued on September 14, 1990. After initiation of Remedial Action in 1992, THE EPA modified the selected remedy and cleanup goals on April 21, 1993, in an Explanation of Significant Differences (ESD). THE EPA deemed that changes were necessary due to difficulties encountered during implementation of the Selected Remedy, in particular the discovery that the depth of the contamination in some areas was greater than expected and below the water table. Both the ROD and ESD are discussed below, along with the remedial action objectives, cleanup goals, and implementation of the remedy. The last part of this section (subsection D) describes the 2011 ROD Amendment which added institutional controls and updated the Remedial Action Objectives (RAOs) and Applicable or Relevant and Appropriate Requirements (ARARs).

A. Record of Decision

The remedial action objectives for the site included:

- Preventing human exposure to contaminated soil, structures, and debris that exceed health-based cleanup levels;

- Reducing the potential for the contaminated soil to act as a source for groundwater contamination; and

- Further defining the extent of groundwater contamination and confirming that contamination does not exceed health-based levels, or if the quality of the groundwater exceeds these levels during monitoring, evaluating the need to take appropriate measures as further response action.

The selected remedy in the ROD addressed the remaining contaminated soils and structures at the site. The selected remedy called for the following:

- Sampling of soils and concrete structures to refine the RI/FS estimate of the lateral and vertical extent of material requiring treatment,

- Excavation of contaminated soils exceeding cleanup levels,

- On-site incineration of contaminated soils,

- Dismantling of contaminated slabs and portions of the buildings that are determined to exceed cleanup goals,

- On-site incineration of contaminated concrete and debris or disposal at a RCRA Subtitle C permitted hazardous waste disposal facility, depending on volume,

- Analysis of incinerator ash to determine the degree of contaminant destruction and leachability, and delisting of the ash if health-based cleanup goals are met,

- Groundwater monitoring for 5 years to confirm source removal. Groundwater monitoring to continue quarterly for 2 years following completion of the remedial action, and then for 3 more years on an annual basis. If contamination was detected above the cleanup goals and groundwater remediation proved to be necessary, it would be addressed in a subsequent ROD. These goals were 0.1 µg/L for DDT (the 10^{-6} excess cancer risk level) and 2 µg/L for endosulfans (the 1.0 Hazard Index level at that time).

The ROD estimated the amount of contaminated soil at the site to be 900 to 4,000 cubic yards.

ROD Cleanup Goals (prior to ESD and ROD Amendment)

HEALTH - BASED CLEANUP LEVELS FOR CONTAMINATED CONCRETE AND SURFACES

Compound	Concentration (µg/100 cm^2)
DDD	6.5
DDE	4.6
DDT	4.6
Dieldrin	0.1
Endosulfans	10.0
Ethion	270.0
Malathion	8,200.0
Ethyl Parathion	2,400.0

Cleanup goals will be adjusted where multiple contaminants are found.

HEALTH - BASED CLEANUP LEVELS FOR CONTAMINATED SOIL

Compound	Concentration (mg/kg)
DDD	5.1
DDE	3.6
DDT	3.6
Dieldrin	0.076
Cadmium	8.0
Chromium VI	1.0
Endosulfans	4.2
Ethion	42.4
Malathion	1,695.0
Ethyl Parathion	11.0
DNOC	8.5
Zinc	500.0

B. Explanation of Significant Differences – Changes to the Remedy

1) Change in Site Cleanup Goals:
Two changes in the site cleanup goals became necessary as a result of the mechanical difficulties associated with excavation below the water table and the discovery that the depth of the contamination in some areas was greater than expected.

a) Change in cleanup goal from a risk of $1x10^{-6}$ to a risk of $5x10^{-6}$ for excavation at depths greater than 2 feet, but less than 7 feet bgs; and

b) Determination that the extent of the excavation would not exceed 7 feet bgs. The EPA determined that excavation below 7 feet was technically impracticable, and that the material did not pose an exposure risk or a threat to the groundwater.

2) Change in Volume of Soil to Be Excavated:
The ROD estimated that there would be from 900 to 4,000 cubic yards of contaminated material. As a result of contamination extending deeper than expected, approximately 5,600 cubic yards of material was excavated.

3) Determination that Cobble Did Not Require Incineration:
Approximately one third of the material excavated was cobble, approximately 2 to 6 inches in diameter. It was crushed and sampled, and found to meet health-based and RCRA-based cleanup requirements. Therefore, the EPA determined the cobble did not require incineration prior to use as backfill.

4) Modification to the Cleanup Criteria for the Warehouse Floor:
At the time the remedy was selected, there were no promulgated cleanup standards applicable to buildings. Subsequent to the beginning of site excavation, RCRA developed technology-based criteria for decontamination of concrete debris (57 Fed. Reg. 371904), which The EPA determined appropriate to apply to the warehouse floor.

The RCRA decontamination criteria call for scarification to a depth of 0.6 cm (approximately 1/4 inch) and removal of any additional visual staining. As part of the remedial action, the warehouse floors were scarified to a depth of 1/4 inch or more, and no visible contamination remained. It was therefore determined that the warehouse floors were clean. The floors were restored to allow the building to return to functional use.

C. Remedial Action Implementation

The remedial design began on August 23, 1991. The design was performed in two phases to expedite the start of the remedial action. The excavation phase was approved April 23, 1992, and the remedial action started on that date. The design for the incineration phase was approved on May 30, 1992. Incineration began in November of 1992. On August 12, 1993, FMC notified the EPA that construction activities were completed.

For cleanup purposes, the site was divided into several different areas based on historical usage or function. The excavation phase consisted of excavating contaminated material, followed by sampling the bottom and sides of the excavations to determine if the cleanup standards were met. If the remaining material was still above cleanup standards, excavation and sampling of an area continued until the cleanup standards were met. Contaminated material was stockpiled in a lined area on the west side of the property prior to incineration. At the conclusion of the excavation phase, the material was incinerated. Incinerator ash was stored in bags until sampling determined that it met the required standards. The ash was then used as a soil cover over the cobble backfill.

During the excavation phase, it was determined that contamination depth was greater than estimated in the RI/FS. In addition, excavation unearthed a second pesticide disposal pit located directly west of the first pit. These factors resulted in a significant increase in the amount of soil excavated and incinerated. During the remedial action, 5,600 cubic yards of contaminated material were excavated and treated.

A number of changes in the site cleanup goals became necessary as a result of the mechanical difficulties associated with excavation below the water table and the discovery that the depth of the contamination in some areas was greater than expected.

1) The cleanup goals were changed from an excess cancer risk of $1x10^{-6}$ to a risk of $5x10^{-6}$ for excavation at depths greater than 2 feet, but less than 7 feet bgs. These levels were set for industrial use. The cleanup goals in the ROD were the attainment of an overall site hazard index of less than or equal to 1, and the attainment of an overall site excess cancer risk of $1x10^{-6}$, both based on residential use exposure. When site excavation began, the water table was at its seasonal low of approximately 7 feet bgs. Over the course of the excavation the water table rose to its seasonal high of 2 feet bgs. (The water table is at 7 feet bgs during the winter and early spring, and at 2 feet bgs the rest of the year.) The majority of the site excavation was of material below the seasonal high water table. Excavation below the water table resulted in sloughing of the trenches and spillage of small quantities of excavated material back into the holes as the material was removed. Thus, minimal recontamination occurred as excavation progressed. Continued excavation was not able to alleviate the recontamination problem. In addition, some previously excavated areas became submerged and out of reach of the construction equipment, making re-excavation impossible.

The contaminant concentrations resulting from recontamination were calculated to equate to risk levels well within the EPA acceptable risk range of $1x10^{-6}$ to $1x10^{-4}$. To account for the technical impracticability of reaching the original $1x10^{-6}$ cleanup goal, EPA adjusted the cleanup goal (and the contaminant levels associated with it) to a risk of $5x10^{-6}$ for areas below 2 feet (which is below the high water table) to avoid ineffective attempts at excavation of residual contamination. For most of the site, the material with concentrations above the adjusted cleanup goal was removed by excavations ranging from 2 feet to 7 feet bgs. The areas where contaminant depth exceeded 7 feet bgs are discussed below.

2) Samples from 7 feet bgs taken during soil excavation of the drum washing area and the tank farm (two adjacent areas on the southern end of the site), contained contaminant concentrations equating to risk levels above the cleanup goals. The EPA determined that excavation below 7 feet was technically impracticable, and that the material did not pose an exposure risk or a threat to the groundwater based on the following:

> a) The water table in the area fluctuates from 7 to 2 feet bgs. There is no chance of incidental direct exposure to soil 7 feet bgs which is always below the water table. In addition, because the high water table is within 2 feet of the ground surface, there is no potential for future subsurface construction leading to exposure of the remaining contaminated soil. Because there is no probable current or future exposure to this material, it does not present a direct exposure risk.
>
> b) Prior to excavation, the contaminant levels in the groundwater were below the health-based levels. The bulk of the contamination was removed, reducing the impact on the groundwater. The groundwater was required to be monitored for 5 years following the completion of the remedial action.

3) As a result of contamination extending deeper than expected, approximately 5,600 cubic yards of material were excavated.

4) It was determined that the cobble met the soil remediation requirements and so did not require incineration. Approximately one third of the material excavated were cobbles, approximately 2 to 6 inches in diameter. They were crushed, sampled, and found to meet the health-based and RCRA-based requirements of the Consent Decree Performance Standard. Therefore, the cobbles did not require incineration prior to use as backfill.

5) The EPA developed site-specific criteria for the warehouse. The exposure assumptions for determining the cleanup criteria were based on contact with the walls. A wipe test using a filter to swab walls and floors was to be analyzed and the results compared to the cleanup standards.

Subsequent to the beginning of site excavation, RCRA developed technology-based criteria for decontamination of concrete debris (57 Fed. Reg. 371904). The new RCRA criteria were developed to allow concrete to be disposed of, after the applicable treatment, without further testing. In the case of the warehouse, the cleanup criteria in the ROD were based on decontamination of the building for reuse. However, EPA determined that it was appropriate to apply the new RCRA criteria to the warehouse floor.

As part of the remedial action, the warehouse floors were scarified to a depth of 1/4 inch or more and no visible contamination remained. It was therefore determined that the warehouse floors were clean.

At the conclusion of the remedial action after demobilization of the incinerator, FMC determined that 1,000 cubic yards of additional soil under the stockpile liner were contaminated due to breaches in the liner. Equipment operation on the stockpile area had punctured the line in a number of places, and precipitation leached contaminants from the stockpile to the ground below. This additional contaminated soil was sent off site to Chemical Waste Management's Arlington, Oregon, facility for disposal.

Close-out and Monitoring Activities

A letter dated August 12, 1993, from FMC notified the EPA that the physical activities at the site were completed. The EPA conducted an inspection of the site on August 19, 1993, and found that no additional work was required.

The groundwater monitoring program was conducted by FMC from December 1993 until May 1996 on a quarterly basis, and later, on a semiannual basis. The frequency of the monitoring program was reduced after the first five-year review to every other year in the early fall, the worst-case season, and then further reduced to where it is now performed only in the fall prior to preparation of the five-year review (once every 5 years). Currently, the monitoring frequency is in once in the fall and once in the spring prior to each Five-Year review.

D. Record of Decision Amendment

The first three Five-Year Review reports highlighted the need for institutional controls to prevent unacceptable risk to receptors if land use activities change from the exposure assumptions used in the risk assessment. The risk assessment assumed that the reasonably anticipated future land use was industrial. Since the construction of the former FMC pesticide formulation facility the land use has remained light commercial and industrial. However, to help ensure that unacceptable risk to human health and the environment does not occur at the site, institutional controls have been selected and implemented to prevent unlimited use and unrestricted exposure to residual contamination in the subsurface and groundwater on the site.

In 2011, a supplemental feasibility study was performed and reported in ERM 2011. Later that year a Proposed Plan for additional remedial action was developed and provided for public comment. The supplemental feasibility study examined three alternatives in depth and also a No Action alternative for comparative purposes. The three active alternatives included an institutional controls alternative, a soil excavation and landfilling alternative with institutional controls, and a more active groundwater

extraction alternative; with the institutional controls alternative as the preferred alternative. Only one public comment was received and it supported the preferred alternative.

A September 2011 ROD Amendment selected the institutional controls alternative since it provided control of all residual risks (in the form of enforceable land use controls), caused the least disturbance to onsite businesses, and was the most cost effective alternative. Along with adding institutional controls, the ROD Amendment clarified that aldrin and dieldrin are soil and groundwater COCs and provided the cleanup levels for them, and updated the ARARs to include the Model Toxics Control Act (MTCA) industrial cleanup standards for soil and the MTCA standards that allow for unrestricted use of groundwater (once the standards are met) which, along with previously selected Maximum Contaminant Levels, determine the threshold for restoration of all beneficial uses of groundwater.

The MTCA cleanup standards selected for aldrin and dieldrin (the two remaining primary groundwater contaminants) were based on the MTCA soil-to-protect-groundwater levels. The cleanup standard for aldrin in unsaturated soil is 0.0025 mg/kg and 0.00013 mg/kg in soil saturated with water (e.g., below the water table). The cleanup standard for dieldrin in unsaturated soil is 0.0028 mg/kg and 0.00014 mg/kg for soil saturated with water.

The ROD Amendment included a new RAO to reduce the potential for contaminated soil to act as a source for groundwater contamination. By preventing unauthorized excavation into subsurface contamination, the likelihood of remobilizing residual contamination is reduced. The site originally did not have groundwater contaminant issues until the active remediation mobilized the contaminants. By meeting the soil-to-protect-groundwater cleanup levels for aldrin and dieldrin, the site has a significant chance of groundwater restoration to beneficial uses. This supports a second new RAO to restore groundwater to allow for its beneficial use as a source of drinking water within a reasonable restoration time frame (30 years from the date of the ROD Amendment).

V. PROGRESS SINCE LAST FIVE-YEAR REVIEW

Since the third Five-Year Review, institutional controls were added to the remedy through an Amended Record of Decision and were implemented through the recording of environmental covenants for the parcels that contain the designated land use control area. This satisfied the requirement to implement institutional controls. A revised sampling and analysis procedure was used during the fall 2012 and spring 2013 sampling campaigns to lower the detection limits for aldrin and dieldrin to below the lower excess cancer risk range endpoint ($1x10^{-6}$). This change satisfied the requirement to lower the detection limits for aldrin and dieldrin to help ensure that monitoring information can be correctly used to determine (in the future) if the site meets cleanup goals allowing for unlimited use and unrestricted exposure.

Since the removal of material from the disposal pit in 1988 and 1989, pesticide contamination in the groundwater has been below established Maximum Contaminant Level (MCL) drinking water standards. However, MCLs have not been established for aldrin and dieldrin. Also, the practical quantitation limit (PQL) for both aldrin and dieldrin had been 0.05 µg/L (for all but this latest Five-Year Review) which is above the $1x10^{-6}$ cancer risk level established as the groundwater cleanup goal in the ROD.

The pesticides Tedion, alachlor and DDT (and DDT derivatives) have not been detected in site groundwater since 2002. Aldrin was not detected in either 2002 or 2007; however, the PQL for aldrin was not sufficient at those times to determine whether the concentrations were below the value

corresponding to the $1x10^{-6}$ excess cancer risk range endpoint. This endpoint for aldrin equates to a concentration of 2.6 ng/L (nanograms/liter) in groundwater.

The EPA project manager witnessed FMC's April 5, 2013 groundwater sampling effort. Results of the sampling and analysis from fall 2012 and spring 2013 were reported in the groundwater monitoring report in June 2013 (ERM 2013) and are summarized below.

Aldrin was detected in the fall 2012 sampling campaign using modified sampling and analysis procedures in monitoring well W-18 with a qualified observation that was well below the groundwater cleanup level of 2.6 ng/L. It was not detected in any wells in the spring 2013 campaign.

Dieldrin exceeded the groundwater cleanup level of 5.5 ng/L in all eight monitoring wells in the fall of 2012. Dieldrin was not detected in monitoring well W-16 in the spring 2013 sampling campaign, but was detected in the other monitoring wells. Dieldrin exceeded the cleanup level (which corresponds to the $1x10^{-6}$ excess cancer risk range endpoint) in two wells in the spring 2013 sampling campaign (W-8C and W-7).

In the fall 2012 sampling, endosulfans (endosulfan I, endosulfan II, and endosulfan sulfate) were detected at all monitoring wells at concentrations below the site cleanup level of 96 µg/L (micrograms/liter). During the fall 2013 sampling, only endosulfan I was detected in site wells and at lower concentrations than were measured in fall 2012.

Groundwater monitoring results over the years have supported FMC's and EPA's evaluations that demonstrate the extent of the organochlorine compound plume is stable (i.e., not expanding or changing position). Seasonal fluctuations have been observed as the regional recharge of irrigation water raises the shallow groundwater table. Groundwater contamination at the site is believed to be the result of the gradual mobilization of residual soil contamination at the former disposal pit location and from other nearby areas.

Many years ago during active cleanup of the site, the EPA agreed to allow FMC to halt removal excavations at a depth of approximately 7 feet below grade where groundwater was encountered. As anticipated, analytical results from post-excavation samples indicated soil concentrations of organochlorine compounds greater than ROD cleanup levels (but not greater than were allowed after the 1993 Explanation of Significant Differences) were present in soils beneath the bottom of the excavation. Residual soil contamination at the base of the excavation is in direct contact with groundwater during periods of average and seasonally high groundwater levels.

The screened cobble backfill is much more permeable since the fines (silt and sand) were removed. As a result, groundwater flows through this area more easily than before the excavation and at a faster rate than the surrounding areas, especially when the groundwater levels are elevated during the summer and fall irrigation season. Since the cobbles are more permeable than the surrounding soils, groundwater elevations are slightly lower within this area immediately adjacent to and above soil with residual organochlorine compound contamination. Excess groundwater is pulled through those residually contaminated soils into the cobble backfill and drawn in a cross-gradient direction toward the former disposal pit area. As a result, maximum concentrations of organochlorine compounds are typically detected in monitoring wells immediately down gradient after the seasonal high water table occurs. Figures 3 and 4 in the Appendix show the groundwater table elevations across the site for the fall 2012 and spring 2013 sampling campaigns (respectively). Figures 5 and 6 in the Appendix show the 2012 and 2013 contaminant concentrations (respectively) by well.

When the ROD was issued, pesticide contaminants of concern in groundwater were endosulfans and DDT-series compounds (DDD, DDE, and DDT). The non-carcinogenic hazard index for endosulfans is equal to 1, at a concentration of 200 µg/L – 100 times greater than when the ROD was issued in 1990. The concentration of endosulfans in site groundwater is significantly less than 200 µg/L.

The long-term trends for aldrin plus dieldrin and for total endosulfans are provided in figures 7 and 8 in the Appendix. Generally, the trends for these contaminants have decreased over the life of the monitoring program and are at low levels compared with peak concentrations detected immediately following active remediation.

Groundwater at the site and immediate vicinity is not currently used for domestic, industrial, or agricultural purposes. Two private wells were sampled during the RI, one up-gradient and one down-gradient of the site. The area is served by City of Yakima water, and the wells were used only for sampling and possibly for yard irrigation. No site contaminants were detected in either well. A well canvass was conducted in October 1988 and found that no known down-gradient wells were used for drinking water within a 1-mile radius. Prior to the first five-year review, water well records were obtained from WDOE and reviewed for wells located within a 1-mile radius. Those record searches did not identify any wells used for domestic, industrial, or agricultural purposes down-gradient of the site.

No new drinking water wells in the vicinity of the site were identified during the June site visit, and a July 9, 2013, search of the WDOE well database showed no evidence for any recently installed drinking water wells in the area. The search did turn up a few older logs for water wells in the general area, but all of them were at least 1/4 mile away from the stable site plume. Based on these surveys, the EPA concludes there currently are no nearby domestic wells, all contemporaneous wells in the vicinity were evaluated during the RI/FS, and no one is currently using groundwater contaminated at the site for drinking or other purposes. Also, there are institutional controls restricting the use of groundwater and preventing intrusion into residual contamination at depth. Monitoring wells associated with the site are locked to prevent access by unauthorized personnel.

Besides the Stephens Metal Products owned parcel (containing the monitoring well network), two other businesses are located just west of the site, Country Farm & Garden True Value Hardware, including an outdoor nursery area with planters on asphalt, and Butlers Welding and RV Accessories. (See photographs of the three business locations in Appendix). Interviews were conducted on site as part of the June 21 site inspection (and two additional interviews were conducted by telephone on June 24 and 25, respectively – see the Appendix for interview records). In all cases, slab foundations and shallow footings were used in the construction of the buildings. Large portions of these properties are also paved. No problems or issues were encountered during or since the construction. No issues were reported related to site environmental conditions by those interviewed.

VI. FIVE-YEAR REVIEW PROCESS

This Five-Year Review was conducted according to procedures in OSWER Directive 9355.7- 03B-P, Comprehensive Five-Year Review Guidance. Activities in this review consisted of:

1) Review of site-related documents,
2) Review of monitoring data,
3) Discussions with current on-site businesses,
4) Site visit and inspection,

5) Well survey,
6) Community relations activities, and
7) Preparation of the Five-Year Review Report.

Documents reviewed for this report include:

Bechtel, 1990, *Phase II Remedial Investigation Report for a Former Pesticide Formulation Facility in Yakima, Washington:* Report to FMC dated April, 1990.

EPA, 1990, *ROD for FMC Pesticide Formulation Facility Yakima, WA*, dated September 14, 1990;

Bechtel, 1994, *Remedial Action Completion Report:* Report to FMC dated May, 1994;

ERM, 1994, *Long-Term Monitoring Plan:* Report to FMC dated June 1994;

DOJ, 1991, *Consent Decree -USA vs. FMC Corp*. dated December 6, 1991;

EPA, 1993, *Explanation of Significant Differences* dated April 24, 1993;

EPA, 1993, *Superfund Preliminary Site Closeout Report FMC Corp Yakima WA*, dated Sept. 1, 1993;

ERM, *2003, Groundwater Sampling Program Fall 2002 Results FMC Corporation, Former FMC Pesticide Formulation Facility, Yakima, Washington*;

Parsons, 2008, *Five-Year Report Fall 2007 Groundwater Monitoring Activities, Former FMC Pesticide Formulation Facility 4 West Washington Avenue, Yakima, Washington*, dated May 13, 2008;

ERM, 2011, *Supplemental Feasibility Study – Former Pesticide Formulation Facility, Yakima, Washington*, dated August 2011.

EPA, 2011, *Amended Record of Decision* dated September 28, 2011;

ERM, 2013, *Five-Year Review Report: Five-Year Groundwater Sampling Events – Former FMC Pesticide Formulation Facility in Yakima, Washington*, report to FMC dated June 2013.

Interviews, Site Visit and Inspection

See Appendix A-1 through A-5 for interview documentation. Appendix page A-6 for site visit information. One can review the completed site inspection checklist starting on page A-7.

Well Survey

No new drinking water wells in the vicinity of the site were identified during the June site visit, and a July 9, 2013, search of the WDOE well database showed no evidence for any recently installed drinking water wells in the area. The search did turn up a few older logs for water wells in the general area, but all of them were at least 1/4 mile away from the stable site plume. Based on this and previous surveys, EPA concludes there currently are no nearby domestic wells, all contemporaneous wells in the vicinity were evaluated during the RI/FS, and no one is currently using groundwater contaminated at the site for

drinking or other purposes. Also, there are institutional controls restricting the use of groundwater and preventing intrusion into residual contamination at depth. Monitoring wells associated with the site are locked to prevent access by unauthorized personnel.

Community Notification

There has been no recent EPA-initiated community involvement, nor has any interest been expressed from the community in the last 20 years. On May 20, 2013, the EPA mailed out notices to a broad distribution of area residents, businesses, government officials and representatives that the EPA was performing this Five-Year Review and soliciting comment. The comment period ended on June 21, 2013. No comments were received. The notice indicated that the report will be available in October 2013 and provided the website where it could be found at that time.

VII. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The review of documents, data, ARARs, and the results of the site inspection indicate that the remedy is functioning as intended by the ROD.

There is no evidence that contaminated soils remaining at depth have been exposed or disturbed. Groundwater monitoring confirms that the small plume is not migrating. The site inspection and well survey indicate no one is currently using or being exposed to contaminated groundwater.

No institutional controls were required by the 1990 ROD, even though hazardous substances remain on site below 7 feet and in the groundwater. To remain protective in the long term, institutional controls were added to the remedy through a ROD Amendment in 2011 (after a public comment period was held on the proposed remedy and comments were addressed). The institutional controls were implemented in 2012 through enforceable land use restrictions in environmental covenants pursuant to the Washington Uniform Environmental Covenant Act. These institutional controls prevent the use of the shallow groundwater aquifer as a drinking water source and prevent unauthorized intrusion into subsurface contamination over the land use control area identified in the ROD Amendment. See Figure 9 in the Appendix for the land use control area where institutional controls are implemented within the site.

The only operation and maintenance requirements are associated with the continued groundwater monitoring wells. All wells are currently intact and functional.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy still valid?

Yes. Exposure assumptions in the ROD were for industrial land use. RAOs were based on that land use. The 2011 ROD Amendment also incorporated institutional controls into the remedy to maintain that land use restriction. RAOs were updated by the ROD Amendment to account for progress at the site and to focus on groundwater restoration. Toxicity data used to establish cleanup levels have not changed such that the protectiveness of the remedy is in question.

There are no changes in any of the remedy components or in the physical conditions of the site that would affect the protectiveness of the remedy. This site is zoned industrial, and the surface soil cleanup levels are consistent with current commercial and potential future industrial/commercial use. Buildings have been built on the site without disturbing the deeper, contaminated soils.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No. Groundwater monitoring trends indicate that the shallow groundwater aquifer on site is on track to be restored during the 30 year time period identified in the 2011 ROD Amendment. The ROD Amendment added institutional controls to the remedy to ensure that groundwater is not used as source of drinking water until it has been restored and the EPA has approved of its use.

The remedy is currently protective despite the continued presence of dieldrin for two primary reasons. First, this contaminant is at low levels and does not travel very far in groundwater before being re-adsorbed onto soil particles. As a result, the plume extent is self-limiting, expanding and shrinking seasonally, with the largest plume existing in late summer/early fall. Even at that time it does not reach beyond the site boundary. Second, no one currently uses (or is likely to use) this shallow groundwater for drinking water, especially now that enforceable institutional controls prevent its use for drinking water. Consequently, continued compliance with the ROD as amended will prevent a complete exposure pathway for groundwater. The site is zoned industrial, served by a municipal water supply, and the current owner is fully aware of the impairment of groundwater and the institutional controls.

The detection limits used for aldrin and dieldrin were lowered to concentrations that equate to excess cancer risk below the low endpoint of the CERCLA risk range. This was achieved through application of modified sampling and analysis procedures that were approved by the EPA. These procedures were used for the first time on this site to support groundwater monitoring in advance of this fourth Five-Year Review.

Technical Assessment Summary

According to the data reviewed and the site inspection, the remedy is functioning as intended by the ROD. There have been no physical changes to the site that would affect the effectiveness of the implemented remedial action.

Since hazardous substances remain on site above levels that allow for unlimited use and unrestricted exposure, institutional controls were added to the remedy and implemented to help ensure exposure remains consistent with the industrial land use and exposure assumptions. These controls are being implemented according to the ROD Amendment and environmental covenants. Also, a lower detection limit for aldrin and dieldrin was achieved through recent modifications to sampling and analysis procedures to help ensure the site remains protective, to better track groundwater migration, and to evaluate progress toward cleanup goals.

VIII. ISSUES

There are no issues identified as a result of this fourth Five-Year Review. All issues and recommended actions from the previous Five-Year Review have been addressed. One of the reasons there are no issues this time is that EPA and FMC have agreed that two seasons of groundwater monitoring should occur prior to the next Five-Year Review, as was the case for this review. This, paired with the modified sampling and analysis methods for aldrin and dieldrin, provides for very useful information about the chronic risks from the low levels of groundwater contamination and will ensure that monitoring information can be correctly used to determine (in the future) if the site meets cleanup goals allowing for unlimited use and unrestricted exposure.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Since there were no issues identified (and all previous issues and actions have been addressed) there are no recommendations or follow-up actions.

X. STATEMENT OF PROTECTIVENESS

Protective – The remedy is protective of human health and the environment because surface and near-surface soils have been remediated to below the cleanup goals and the groundwater plume is stable beneath the site and is not a source of drinking water. To ensure that the remedy remains protective, institutional controls were added to prevent unacceptable exposure to residual soil and groundwater contamination. Finally, lower groundwater detection limits for aldrin and dieldrin were achieved through implementation of modified sampling and analysis procedures. The lower detection limits are necessary to ensure that monitoring information can be correctly used to determine (in the future) if the site meets cleanup goals allowing for unlimited use and unrestricted exposure.

XI. NEXT REVIEW

The next Five-Year Review should occur within five years (September 2018).

INTERVIEW DOCUMENTATION FORM

The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.

Name	Title/Position	Organization	Date
Larry Butler	Owner	Butler's Welding and RV Accessories	6/21/13
Chester Stephens	President	Stephens Metal Products, Inc.	6/21/13
Leroy Coble	Manager	True Value Country Farm and Garden	6/24/13
Jeff Newschwander	VECA Coordinator	WA. Dept. of Ecology	6/25/13

INTERVIEW RECORD

Site Name: FMC Corp, Yakima	EPA ID No.: WAD000643577
Subject: Fourth Five-Year Review	Time: 10:55 Date: 6/21/13
Type: ☐ Telephone ☒ Visit ☐ Other Location of Visit:	☐ Incoming ☐ Outgoing

Contact Made By:

Name: Craig Cameron	Title: RPM	Organization: USEPA

Individual Contacted:

Name: Larry Butler	Title: Owner	Organization: Butler Welding and RV Accessories

Telephone No: 509 457-4686 Fax No: E-Mail Address:	Street Address: 1909 Longtibre Avenue City, State, Zip: Yakima, WA 98903

Summary Of Conversation

He did not have any questions. He said he pretty much understands the situation on the site. He indicated that the back part of his property was surveyed. We discussed how this was part of the effort to put institutional controls in place through a covenant to keep land use as industrial/light commercial and prevent use of groundwater and digging below 2' (unless a plan is approved by EPA).

INTERVIEW RECORD

Site Name: FMC Corp. Yakima	EPA ID No.: WA0000643577
Subject: Fourth Five-Year Review	Time: 11:30 Date: 6/21/13
Type: ☐ Telephone ☒ Visit ☐ Other Location of Visit: Stephens Metal's office	☐ Incoming ☐ Outgoing

Contact Made By:

Name: Craig Cameron	Title: RPM	Organization: USEPA

Individual Contacted:

Name: Chester Stephens	Title: President	Organization: Stephens Metal Products, Inc.

Telephone No: 509 452-4088 Fax No: 509 457-0068 E-Mail Address: chester@stephensmetal.com	Street Address: 3209 W. Washington City, State, Zip: Yakima, WA 98903

Summary Of Conversation

He is well versed in site history. They are leasing their old property to another business that is in the process of moving into the warehouse. Chester said that the company moved to the 4 W. Washington address in 1995 and he started there in 1998. He did not have any concerns. I described the results of the ground-water monitoring and plans for the next 5-Yr. Review.

Page 1 of 1

INTERVIEW RECORD

Site Name: FMC Corp. Yakima	EPA ID No.: WAD000643577
Subject: Fourth Five-Year Review	Time: 4:00PM Date: 6/24/13
Type: ☒ Telephone ☐ Visit ☐ Other Location of Visit:	☐ Incoming ☒ Outgoing

Contact Made By:

Name: Craig Cameron	Title: RPM	Organization: USEPA

Individual Contacted:

Name: Leroy Coble	Title: Manager	Organization: True Value

Telephone No: cell 509 654-2830 ~~Fax No:~~ work 509 575-8877 E-Mail Address: leroy@countryfarmandgarden.net	Street Address: Country Farm + Garden City, State, Zip: 6 W. Washington Yakima, WA 98903

Summary Of Conversation

He indicated that he had no issues with the site and pointed out that drinking water is provided by the city. He concurred that the site appears to continue to be used as either commercial or light industrial. I explained the purpose of a Five-Year Review. He said he was actually concerned about Hanford because he has a brother that lives near there. We talked about groundwater and the river and cleanup.

INTERVIEW RECORD

Site Name: FMC Corp. Yakima	EPA ID No.: WAD000643577
Subject: Fourth Five-Year Review	Time: 12:35 Date: 6/25/13
Type: ☒ Telephone ☐ Visit ☐ Other Location of Visit:	☐ Incoming ☒ Outgoing

Contact Made By:

Name: Craig Cameron	Title: RPM	Organization: USEPA

Individual Contacted:

Name: Jeff Newschwander	Title: UECA Coordinator	Organization: WA Dept. of Ecology

Telephone No: 509454-7842 ~~Fax No:~~ cell 509 388-5223 E-Mail Address: jene461@ecy.wa.gov	Street Address: 15 W. Yakima, Ste. 200 City, State, Zip: Yakima, WA 98902

Summary Of Conversation

He did not have any concerns with the site, especially now that institutional controls are in place. I informed him that the owners of the parcels are well aware of the controls. I summarized the groundwater results and he requested an electronic copy of the groundwater monitoring report. I agreed to send it to him.

Five-Year Review Site Inspection Roster

FMC Corporation Yakima Superfund Site

June 21, 2013

Craig Cameron	Remedial Project Manager U.S. Environmental Protection Agency Region 10

Note: Jeff Newschwander of the Washington Department of Ecology was invited to join the site visit but declined as the site is a low priority for his agency. He was interviewed after the site visit and his interview is summarized in Appendix A3 of this fourth Five-Year Review report. Also, the Remedial Project Manager concluded that the groundwater monitoring information collected to support this review was straightforward enough that it was not necessary to involve an EPA hydrogeologist in the site visit.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: FMC Corporation Yakima	**Date of inspection:** 6/21/2013
Location and Region: Yakima, WA EPA R10	**EPA ID:** WAD000643577
Agency, office, or company leading the five-year review: EPA	**Weather/temperature:** Partly sunny Temps in the 70s.

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- ✓ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls
- ✓ Other Removal and treatment of soil (and other activities) completed about 20 years ago.

Attachments: ✓ Inspection team roster attached ✓ Site map attached (see appendix A1)

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ Name _____ Title _____ Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached Not Applicable (N/A)

2. **O&M staff** _____ Name _____ Title _____ Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached N/A

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency WA Dept. of Ecology
Contact Jeff Newschwander UECA Coordinator 6/25/13 509454-7842
Name Title Date Phone no.
Problems; suggestions; Report attached
[See interview form]

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; Report attached

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; Report attached

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

See interview forms - Appendix A3

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits	Readily available	Up to date	N/A
	Remarks			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks			
7.	**Groundwater Monitoring Records**	✓ Readily available	✓ Up to date	N/A
	Remarks Monitoring reports are submitted to EPA on an approved schedule.			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks			
10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other _____

N/A

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate _____ Breakdown attached

N/A

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			Breakdown attached
			Breakdown attached
			Breakdown attached
			Breakdown attached
			Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

N/A

However, it can aid in maintaining ICs.

V. ACCESS AND INSTITUTIONAL CONTROLS (IC) Applicable N/A

A. Fencing Fencing, according to guidance, is not an IC.

1. ✓ **Fencing damaged** Location shown on site map ✓ Gates secured N/A

Remarks No unlocked route for driving onto property. However, could access on foot because fence along railroad track (eastern boundary) is in disrepair.

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A

Remarks Only sign is on locked gate indicating property is covered by a security firm.

There are well head markers that have "Monitor Well" written on them.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes (No) N/A
Site conditions imply ICs not being fully enforced — Yes (No) N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Visual inspection
Frequency Annually - this is first time since UECA covenants put in place.
Responsible party/agency U.S. EPA is best suited to do this.
Contact Craig Cameron (Name) RPM (Title) 6/21/13 (Date) 509376-8665 (Phone no.)

Reporting is up-to-date — Yes No (N/A)
Reports are verified by the lead agency — Yes No (N/A)

Specific requirements in deed or decision documents have been met — (Yes) No N/A
Violations have been reported — Yes No (N/A)
Other problems or suggestions: Report attached
This is an unusual case where the land use never varied from assumptions in risk assessment, but ICs were put in place many years after remedy was completed.

2. **Adequacy** (ICs are adequate) ICs are inadequate N/A
Remarks
No violation of ICs, however the site would benefit from having eastern fence repaired to prevent tresspassing.

D. General

1. **Vandalism/trespassing** Location shown on site map (No vandalism evident)
Remarks

2. **Land use changes on site** N/A
Remarks No change.

3. **Land use changes off site** N/A
Remarks No change.

VI. GENERAL SITE CONDITIONS

A. Roads Applicable (N/A)

1. **Roads damaged** Location shown on site map Roads adequate (N/A)
Remarks

B. Other Site Conditions

Remarks There was a large pile of debris in the backyard of the Stephens Metal Products owned property. However, it was not in the way of any monitoring wells. Also, some soil was brought in to regrade a portion of the southern border of the Stephens Metals property to make it more level and attractive to a lessee.

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8.	**Wet Areas/Water Damage**	Wet areas/water damage not evident	
	Wet areas	Location shown on site map	Areal extent_____
	Ponding	Location shown on site map	Areal extent_____
	Seeps	Location shown on site map	Areal extent_____
	Soft subgrade	Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** Slides	Location shown on site map	No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	Applicable	N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	Location shown on site map	N/A or okay
	Remarks_____		
2.	**Bench Breached**	Location shown on site map	N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	Location shown on site map	N/A or okay
	Remarks_____		
C. Letdown Channels	Applicable	N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	Location shown on site map	No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	Location shown on site map	No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		
3.	**Erosion**	Location shown on site map	No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks_____		

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment Applicable N/A

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES

Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines

Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines

Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers
   Filters_____
   Additive (*e.g.*, chelation agent, flocculent)_____
   Others_____
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually_____
   Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

D. Monitoring Data – Used to support Five-Year Reviews only

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. There are no facilities associated with the constructed remedy.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy was completed about 20 years ago and the site has been closed out. However, there is residual contamination in the soil at depth and low concentrations in groundwater that warranted putting ICs in place. ICs are functioning and land use has not changed. - See Amended ROD from 2011 for more info.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

N/A

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. N/A

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Redundant or unnecessary groundwater monitoring wells identified for abandonment in the third Five-Year Review have been abandoned. No other opportunities at this time based on prior monitoring data.

Project No. 0120748.***

Date: 09/01/10

Drawn By: R. Olson

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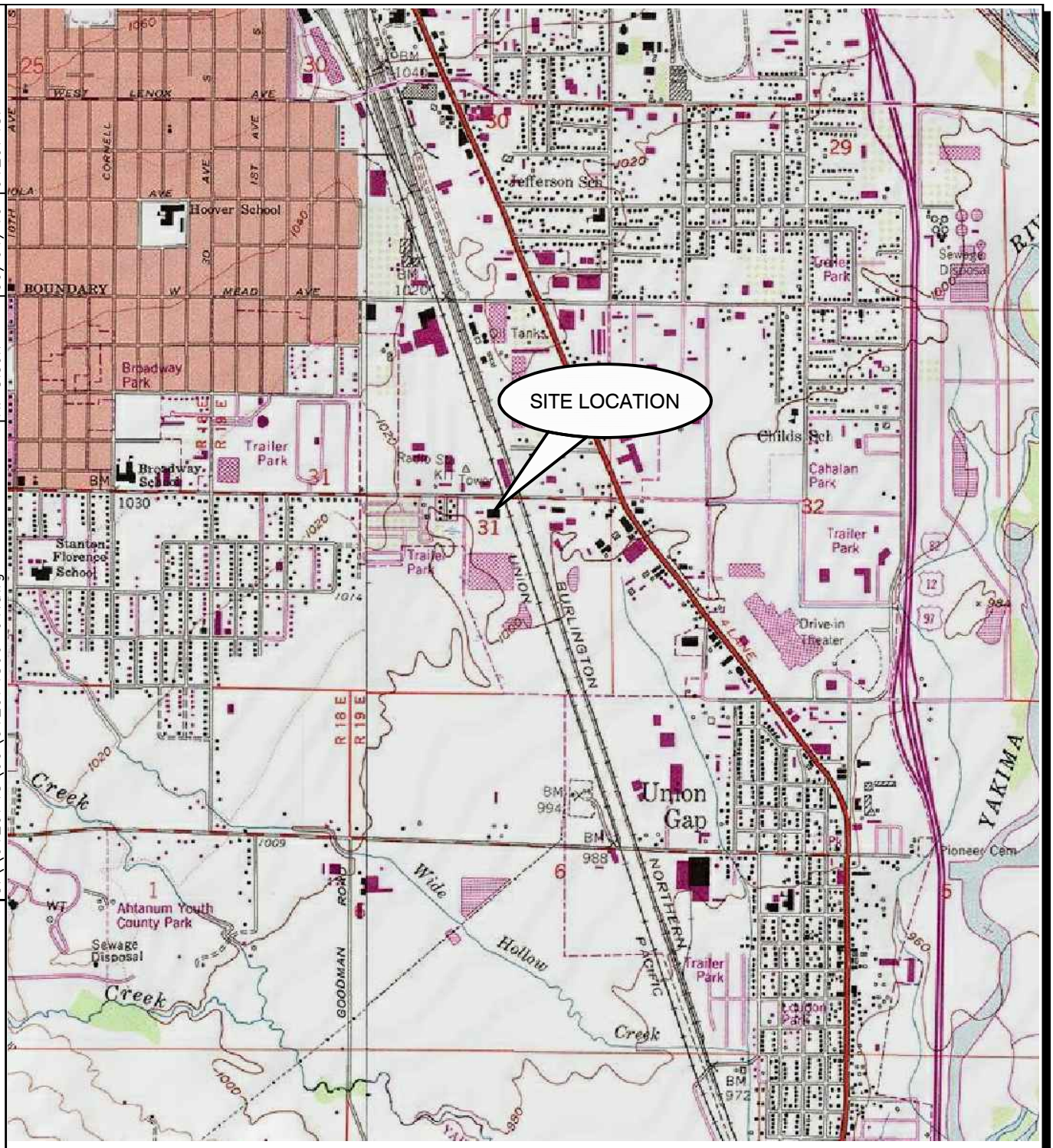

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1 .5 0 1 KILOMETER

N

References:
TOPO!® Software
U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle, Yakima East, WA
Version: 1985; Current: 1981

Figure 1
Site Location Map
Former FMC Pesticide Formulation Facility
4 West Washington Avenue
Yakima, Washington

ERM 09/10

LEGEND

- EXISTING MONITORING WELL
- ABANDONED MONITORING WELL
- FENCE
- PARCEL LINE
- ESTIMATED LOCATION OF FORMER DISPOSAL PIT

Aerial Photo Source: © 2009 Google Earth Pro Ver 5.0.11733.9347

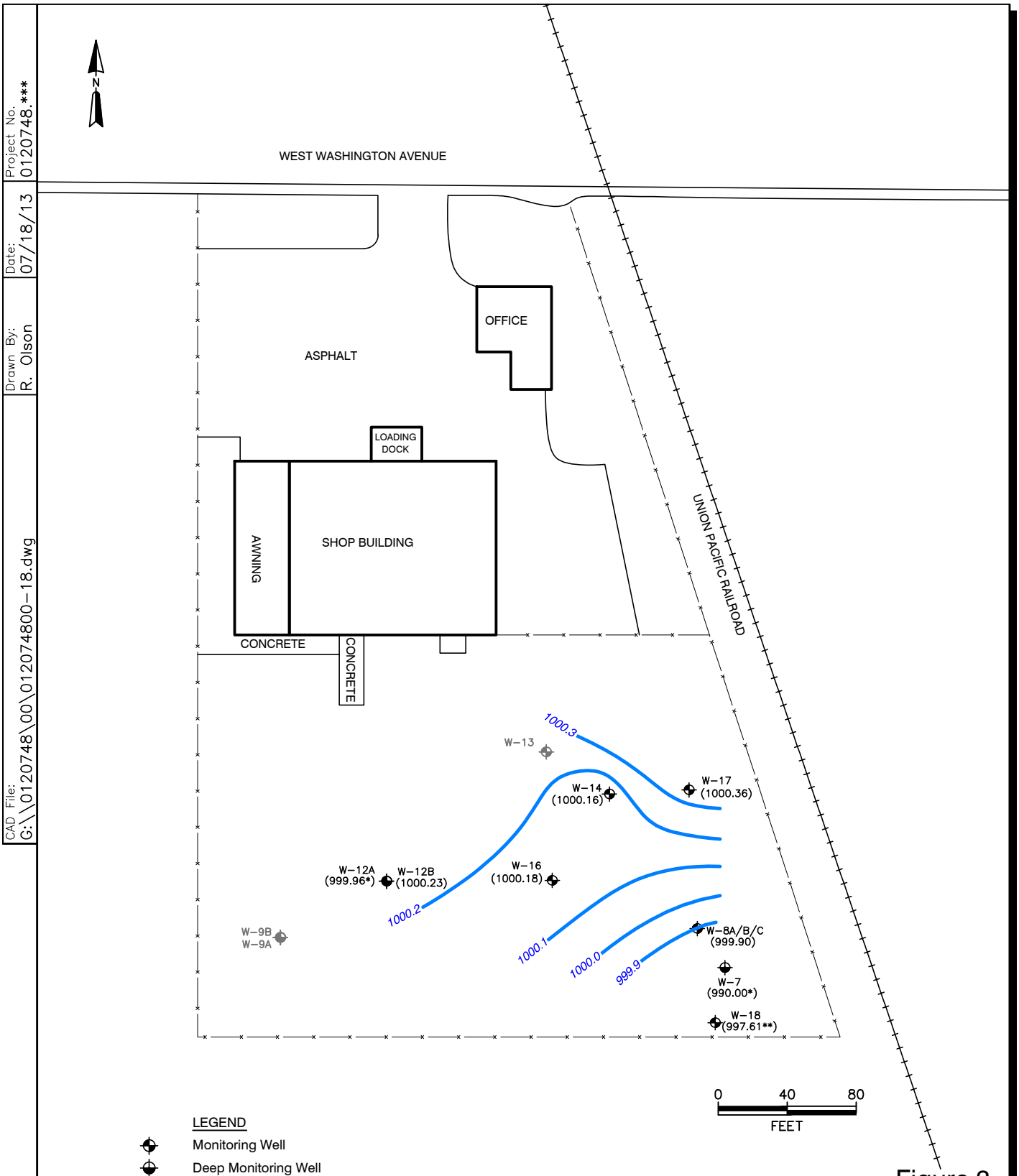
N

0 30 60
FEET

Figure 2
Current Site Layout Map
Former FMC Pesticide Formulation Facility
4 West Washington Avenue
Yakima, Washington

ERM 05/13

Project No. 0120748.***
Date: 05/03/13
Drawn By: R. Olson
CAD File: G:_0120748\00\0120748 00 12074800– 20.dwg



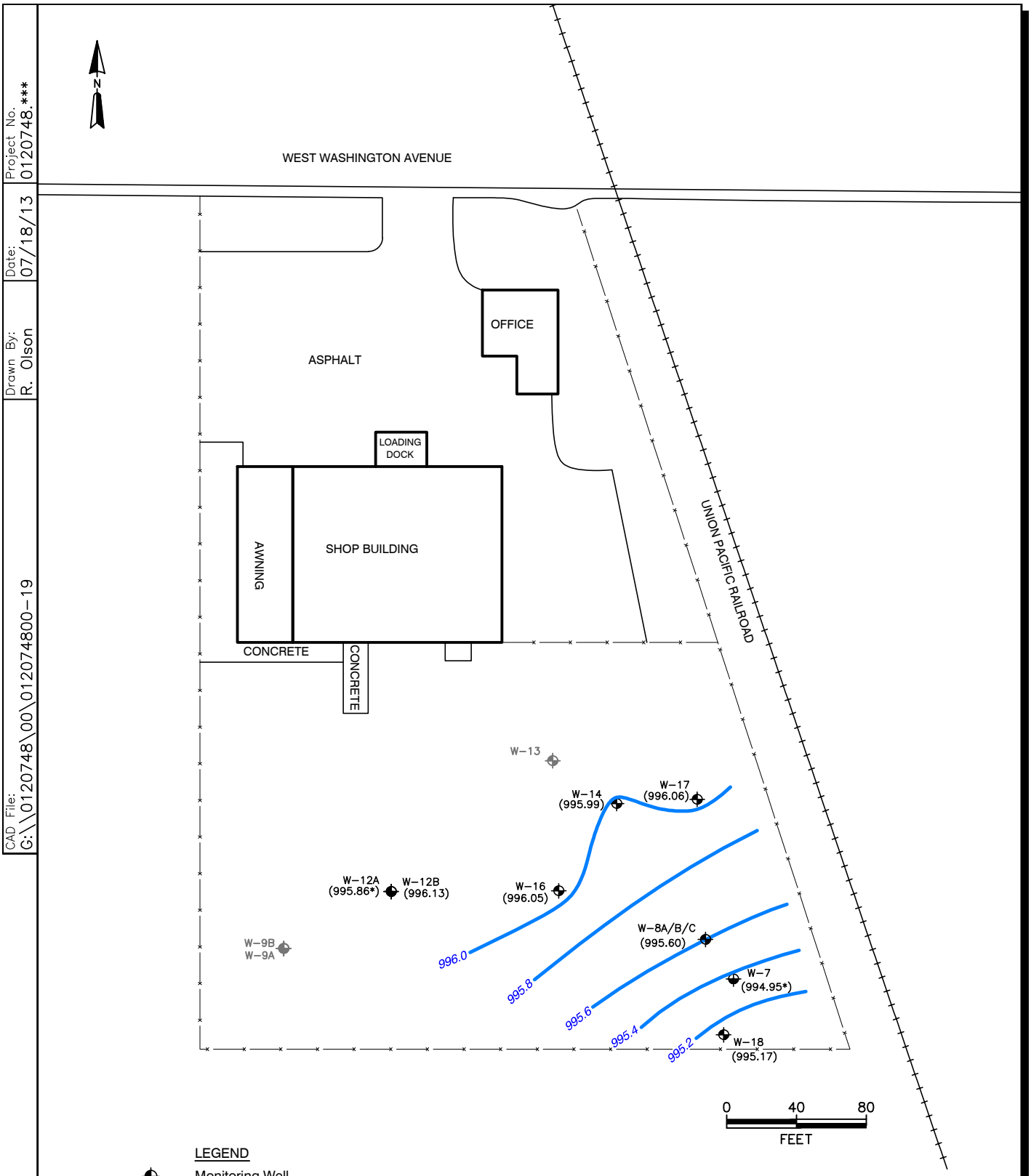
LEGEND

- Monitoring Well
- Deep Monitoring Well
- Abandoned Monitoring Well (12/7/10)
- (1000.23) Groundwater Elevation (ft amsl)
- 1000 Groundwater Elevation Contour; Dashed Where Inferred
- * Not Used for Contouring
- ** Measured on 12/5/12, Not Used for Contouring
- ft amsl Feet Above Mean Sea Level
- Fence
- Railroad

Figure 3

Groundwater Elevation Contour Map
October 2012
Former FMC Pesticide Formulation Facility
4 West Washington Avenue
Yakima, Washington

ERM 07/13



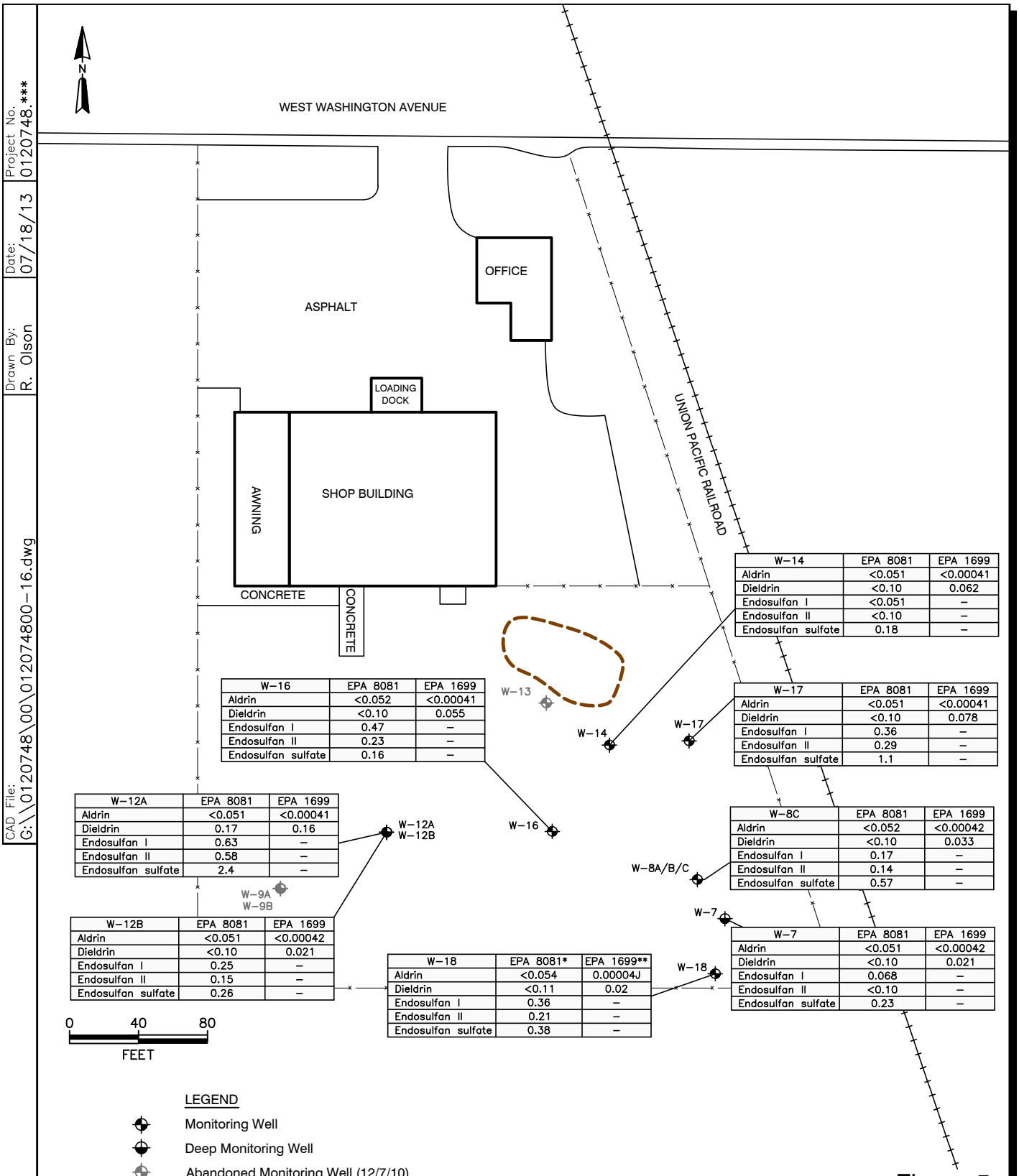
LEGEND

- Monitoring Well
- Deep Monitoring Well
- Abandoned Monitoring Well (12/7/10)
- (995.99) Groundwater Elevation (ft amsl)
- 996.0 Groundwater Elevation Contour
- * Not Used for Contouring
- ft amsl Feet Above Mean Sea Level
- Fence
- Railroad

Figure 4

Groundwater Elevation Contour Map
April 2013
Former FMC Pesticide Formulation Facility
4 West Washington Avenue
Yakima, Washington

ERM 07/13



W-14	EPA 8081	EPA 1699
Aldrin	<0.051	<0.00041
Dieldrin	<0.10	0.062
Endosulfan I	<0.051	–
Endosulfan II	<0.10	–
Endosulfan sulfate	0.18	–

W-17	EPA 8081	EPA 1699
Aldrin	<0.051	<0.00041
Dieldrin	<0.10	0.078
Endosulfan I	0.36	–
Endosulfan II	0.29	–
Endosulfan sulfate	1.1	–

W-16	EPA 8081	EPA 1699
Aldrin	<0.052	<0.00041
Dieldrin	<0.10	0.055
Endosulfan I	0.47	–
Endosulfan II	0.23	–
Endosulfan sulfate	0.16	–

W-12A	EPA 8081	EPA 1699
Aldrin	<0.051	<0.00041
Dieldrin	0.17	0.16
Endosulfan I	0.63	–
Endosulfan II	0.58	–
Endosulfan sulfate	2.4	–

W-8C	EPA 8081	EPA 1699
Aldrin	<0.052	<0.00042
Dieldrin	<0.10	0.033
Endosulfan I	0.17	–
Endosulfan II	0.14	–
Endosulfan sulfate	0.57	–

W-12B	EPA 8081	EPA 1699
Aldrin	<0.051	<0.00042
Dieldrin	<0.10	0.021
Endosulfan I	0.25	–
Endosulfan II	0.15	–
Endosulfan sulfate	0.26	–

W-18	EPA 8081*	EPA 1699**
Aldrin	<0.054	0.00004J
Dieldrin	<0.11	0.02
Endosulfan I	0.36	–
Endosulfan II	0.21	–
Endosulfan sulfate	0.38	–

W-7	EPA 8081	EPA 1699
Aldrin	<0.051	<0.00042
Dieldrin	<0.10	0.021
Endosulfan I	0.068	–
Endosulfan II	<0.10	–
Endosulfan sulfate	0.23	–

LEGEND

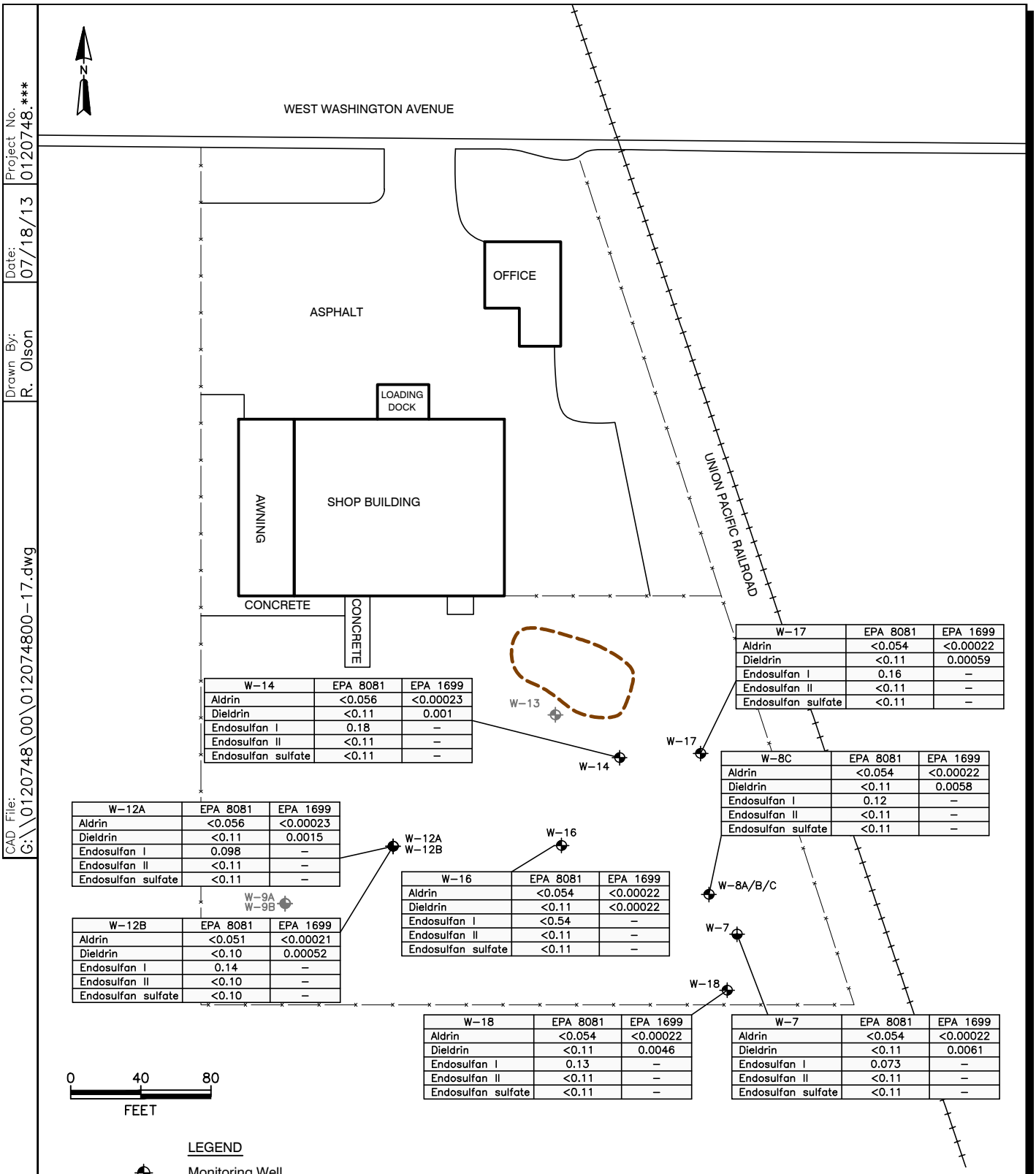
- Monitoring Well
- Deep Monitoring Well
- Abandoned Monitoring Well (12/7/10)
- Estimated Location of Former Disposal Pit
- * Sample Collected on 12/5/12
- ** Sample Collected on 1/2/13
- J Estimated Concentration
- Fence
- Railroad

Notes:
1. All concentrations in μg/L
2. Samples Collected on 10/26/12, except where noted.

Figure 5
Fall 2012 Groundwater Sampling Results by Monitoring Well Location
Former FMC Pesticide Formulation Facility
4 West Washington Avenue
Yakima, Washington

ERM 07/13

CAD File: G:\0120748\00\012074800-16.dwg
Drawn By: R. Olson
Date: 07/18/13
Project No. 0120748.***



W-14	EPA 8081	EPA 1699
Aldrin	<0.056	<0.00023
Dieldrin	<0.11	0.001
Endosulfan I	0.18	–
Endosulfan II	<0.11	–
Endosulfan sulfate	<0.11	–

W-17	EPA 8081	EPA 1699
Aldrin	<0.054	<0.00022
Dieldrin	<0.11	0.00059
Endosulfan I	0.16	–
Endosulfan II	<0.11	–
Endosulfan sulfate	<0.11	–

W-8C	EPA 8081	EPA 1699
Aldrin	<0.054	<0.00022
Dieldrin	<0.11	0.0058
Endosulfan I	0.12	–
Endosulfan II	<0.11	–
Endosulfan sulfate	<0.11	–

W-12A	EPA 8081	EPA 1699
Aldrin	<0.056	<0.00023
Dieldrin	<0.11	0.0015
Endosulfan I	0.098	–
Endosulfan II	<0.11	–
Endosulfan sulfate	<0.11	–

W-16	EPA 8081	EPA 1699
Aldrin	<0.054	<0.00022
Dieldrin	<0.11	<0.00022
Endosulfan I	<0.54	–
Endosulfan II	<0.11	–
Endosulfan sulfate	<0.11	–

W-12B	EPA 8081	EPA 1699
Aldrin	<0.051	<0.00021
Dieldrin	<0.10	0.00052
Endosulfan I	0.14	–
Endosulfan II	<0.10	–
Endosulfan sulfate	<0.10	–

W-18	EPA 8081	EPA 1699
Aldrin	<0.054	<0.00022
Dieldrin	<0.11	0.0046
Endosulfan I	0.13	–
Endosulfan II	<0.11	–
Endosulfan sulfate	<0.11	–

W-7	EPA 8081	EPA 1699
Aldrin	<0.054	<0.00022
Dieldrin	<0.11	0.0061
Endosulfan I	0.073	–
Endosulfan II	<0.11	–
Endosulfan sulfate	<0.11	–

LEGEND

- Monitoring Well
- Deep Monitoring Well
- Abandoned Monitoring Well (12/7/10)
- Estimated Location of Former Disposal Pit
- Fence
- Railroad

Notes:
1. All concentrations in μg/L
2. Samples Collected on 4/5/12

Figure 6
Spring 2013 Groundwater Sampling Results by Monitoring Well Location
Former FMC Pesticide Formulation Facility
4 West Washington Avenue
Yakima, Washington

ERM 07/13

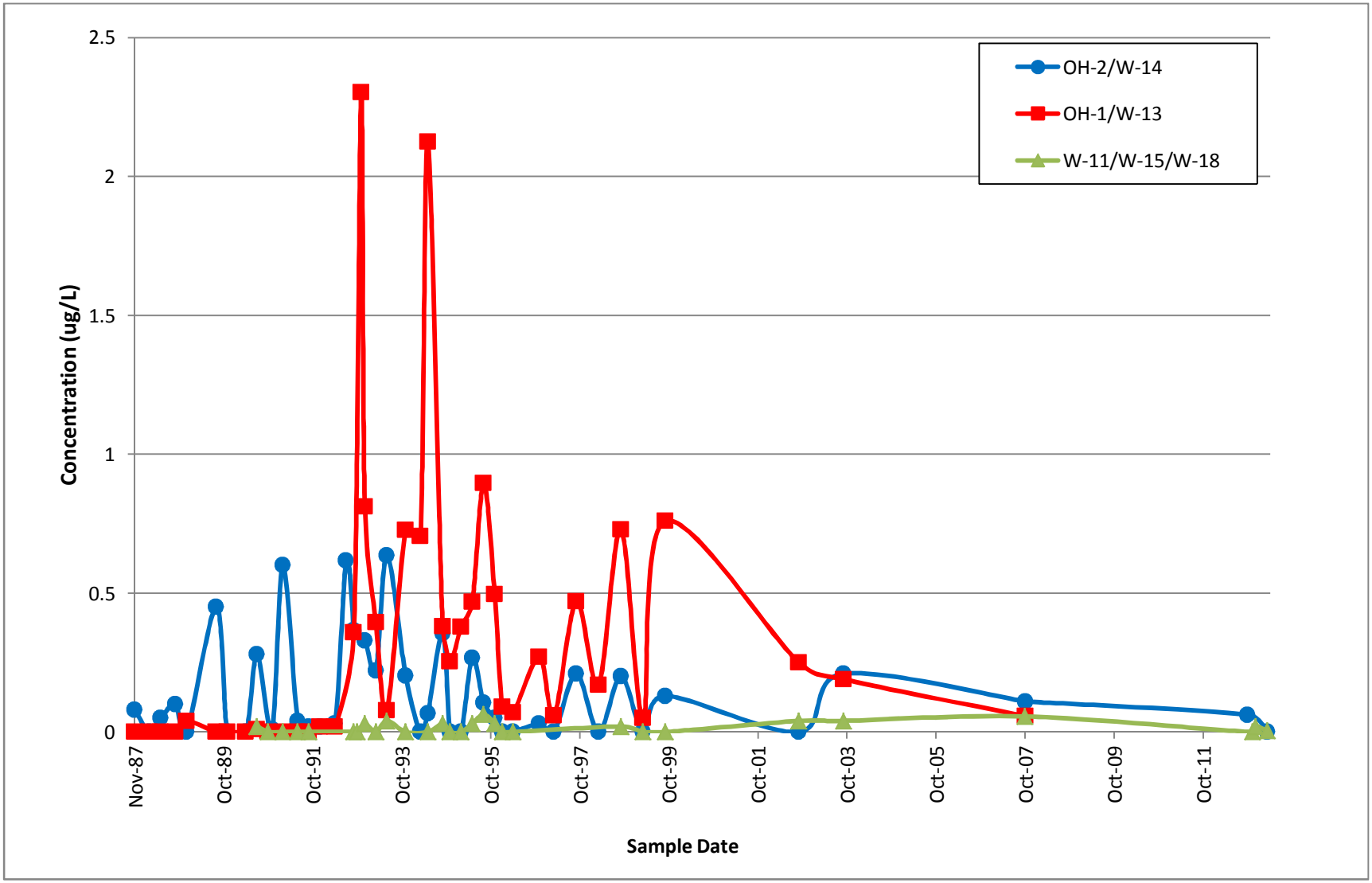


Figure 7
Long-term Trend of Dieldrin Plus Aldrin in Groundwater
Former FMC Pesticide Formulation Facility
Yakima, Washington

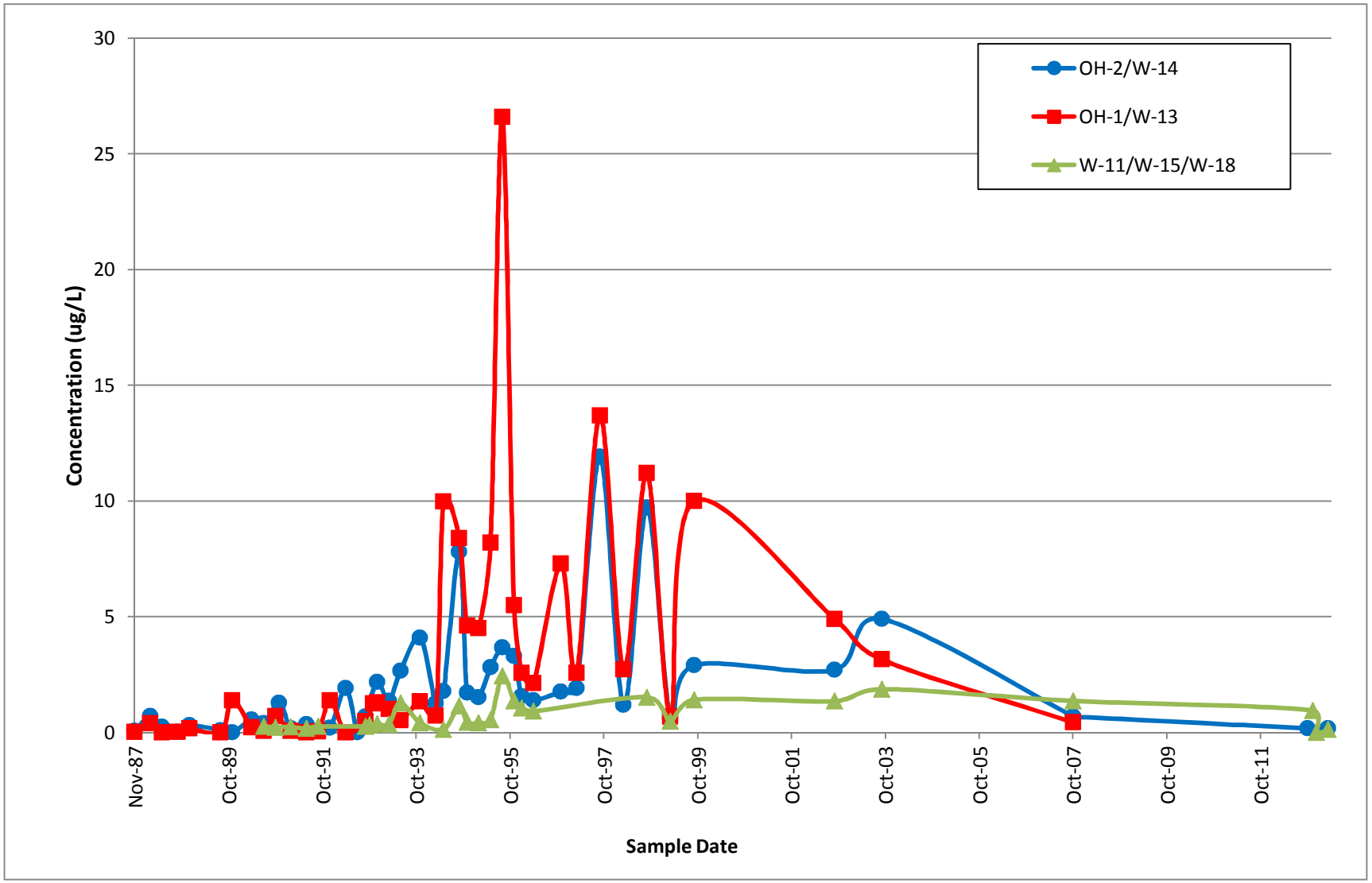


Figure 8
Long-term Trend of Total Endosulfans in Groundwater
Former FMC Pesticide Formulation Facility
Yakima, Washington

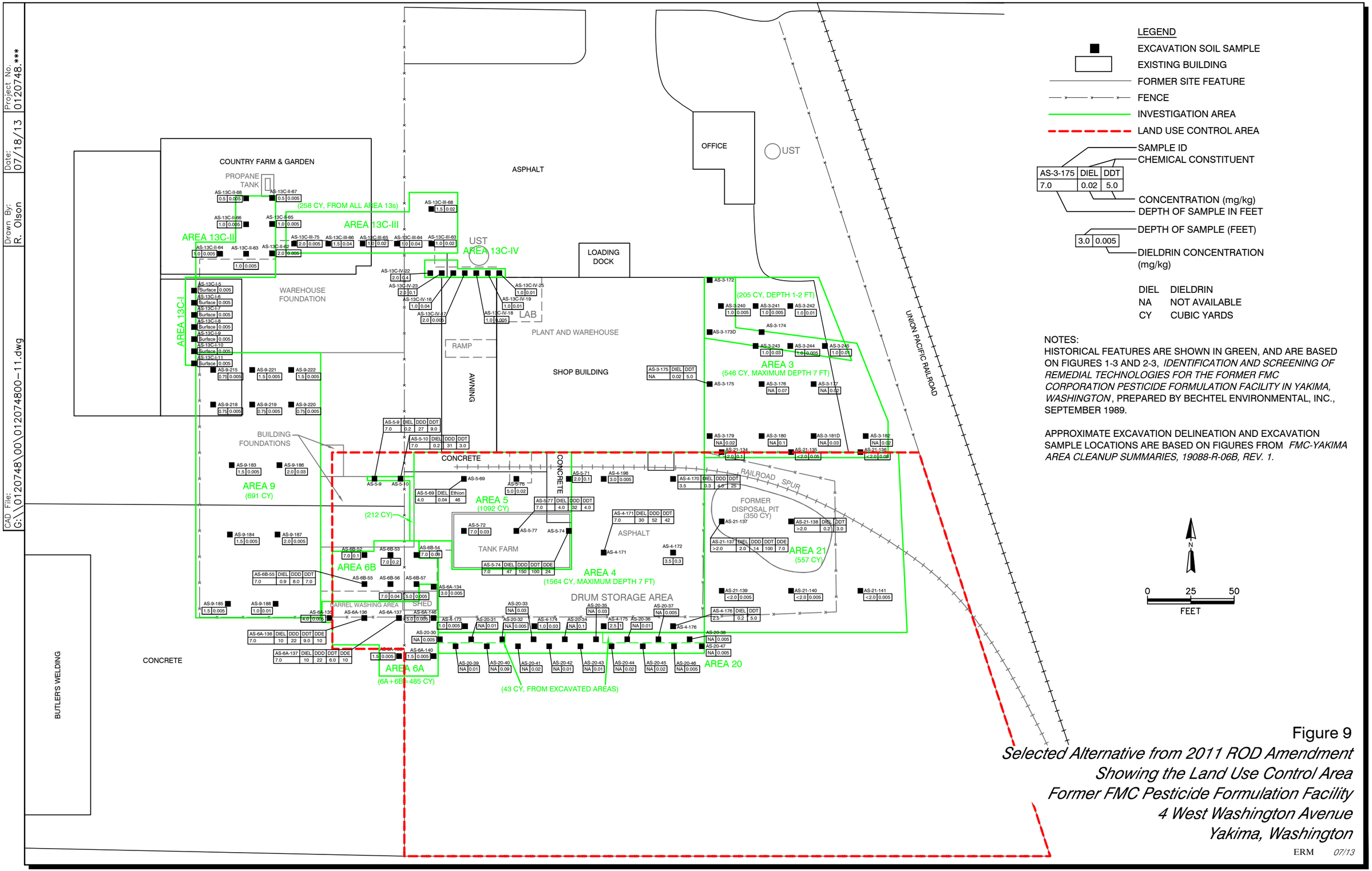


Figure 9

Selected Alternative from 2011 ROD Amendment
Showing the Land Use Control Area
Former FMC Pesticide Formulation Facility
4 West Washington Avenue
Yakima, Washington

ERM 07/13

Table 1
Fall 2012 and Spring 2013 Groundwater Elevation Data
Former FMC Pesticide Formulation Facility
Yakima, Washington

Well ID	Date	Depth to Water (ft below casing)	Casing Elevation (ft amsl)	Water Elevation (ft amsl)
W-7	10/26/2012	3.6	1002.6	999.0
	4/5/2013	7.65	1002.6	995.0
W-8C	10/26/2012	3.04	1002.9	999.9
	4/5/2013	7.35	1002.9	995.6
W-12A	10/26/2012	3.09	1003.05	1000.0
	4/5/2013	7.19	1003.05	995.9
W-12B	10/26/2012	2.91	1003.14	1000.2
	4/5/2013	7.01	1003.14	996.1
W-14	10/26/2012	3.37	1003.53	1000.2
	4/5/2013	7.54	1003.53	996.0
W-16	10/26/2012	3.05	1003.23	1000.2
	4/5/2013	7.18	1003.23	996.1
W-17	10/26/2012	3.25	1003.61	1000.4
	4/5/2013	7.55	1003.61	996.1
W-18*	10/26/2012	--	1002.14	--
	12/5/2012	4.53	1002.14	997.6
	1/2/2013	5.39	1002.14	996.8
	4/5/2013	6.97	1002.14	995.2

Notes:
ft = feet
amsl = above mean sea level
NA = data not available
* W-18 was not accessible for sampling on 26 October 2012.

Table 2
Fall 2012 and Spring 2013 Groundwater Field Parameter Data
Former FMC Pesticide Formulation Facility
Yakima, Washington

Well ID	Date	Temperature (°C)	pH	Conductivity (mS)	Dissolved Oxygen (mg/L)	Redox (mVolts)	Turbidity (NTU)
W-7	10/26/2012	15.1	6.77	0.259	5.2	154.6	0.8
	4/5/2013	15	7.02	0.347	7.2	133	0.4
W-8C	10/26/2012	15.63	6.89	0.28	4.79	154.2	0.9
	4/5/2013	16.6	7.11	0.347	10.2	133	12.7
W-12A	10/26/2012	15.35	6.78	0.282	4.3	140.2	0.5
	4/5/2013	14.6	7.11	143	7.3	0.349	0
W-12B	10/26/2012	15.13	6.79	0.285	5.76	147.2	0.5
	4/5/2013	14.02	7.11	0.354	9.9	148	0.1
W-14	10/26/2012	14.8	6.79	0.255	5.25	151.7	0.6
	4/5/2013	15.75	4.07	0.353	10.1	142	0.5
W-16	10/26/2012	15.84	6.79	0.297	5.8	151.6	0.6
	4/5/2013	14.93	7.07	0.363	10.5	141	0
W-17	10/26/2012	15.6	6.75	0.275	4.82	155.3	0.4
	4/5/2013	14.92	6.96	0.358	10.4	144	1.1
W-18*	10/26/2012	-	-	-	-	-	-
	12/5/2012	13.9	7.12	0.302	5.5	107.9	4.1
	1/2/2013	11.56	6.72	0.293	5.5	39.5	1.1
	4/5/2013	15.01	7.09	0.352	6.8	137	3.9

Notes:
°C = degrees Celsius
mS = millisiemens
mVolts = millivolts
NTU = nephelometric turbidity units
W-18 was not accessible for sampling on 26 October 2012.

Table 3
Groundwater Analytical Data - Fall 2012 and Spring 2013
Former FMC Pesticide Formulation Facility
Yakima, Washington

Well ID		W-12A	W-12A (Dup)	W-12A	W-12B	W-12B	W-14	W-14	W-16	W-16	W-17	W-17	W-18	W-18	W-18	W-18 (Dup)	W-7	W-7	W-8C	W-8C
Date Sampled		10/26/2012	10/26/2012	4/5/2013	10/26/2012	4/5/2013	10/26/2012	4/5/2013	10/26/2012	4/5/2013	10/26/2012	4/5/2013	12/5/2012	1/2/2013	4/5/2013	4/5/2013	10/26/2012	4/5/2013	10/26/2012	4/5/2013
EPA Method 8081	*Cleanup Level*																			
4, 4'- DDE	*0.26*	<0.10	<0.10	<0.11	<0.10	<0.10	<0.10	<0.11	<0.10	<0.11	<0.10	<0.11	<0.11	--	<0.11	<0.11	<0.10	<0.11	<0.10	<0.11
4, 4'-DDD	*0.36*	<0.10	<0.10	<0.11	<0.10	<0.10	<0.10	<0.11	<0.10	<0.11	<0.10	<0.11	<0.11	--	<0.11	<0.11	<0.10	<0.11	<0.10	<0.11
4, 4'-DDT	*0.26*	<0.10	<0.10	<0.11	<0.10	<0.10	<0.10	<0.11	<0.10	<0.11	<0.10	<0.11	<0.11	--	<0.11	<0.11	<0.10	<0.11	<0.10	<0.11
4, 4'-Methoxychlor		<0.51	<0.52	<0.56	<0.51	<0.51	<0.51	<0.56	<0.52	<0.54	<0.51	<0.54	<0.54	--	<0.54	<0.54	<0.51	<0.54	<0.52	<0.54
Aldrin	*0.0026*	<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
alpha-BHC		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
beta-BHC		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
delta-BHC		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
gamma-BHC		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
alpha-Chlordane		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
gamma-Chlordane		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
Chlordane		<0.51	<0.52	<0.56	<0.51	<0.51	<0.51	<0.56	<0.52	<0.54	<0.51	<0.54	<0.54	--	<0.54	<0.54	<0.51	<0.54	<0.52	<0.54
Dieldrin	*0.0055*	**0.17**	**0.18**	<0.11	<0.10	<0.10	<0.10	<0.11	<0.10	<0.11	<0.10	<0.11	<0.11	--	<0.11	<0.11	<0.10	<0.11	<0.10	<0.11
Endosulfan I	*96*	**0.63**	**0.68**	**0.098**	**0.25**	**0.14**	<0.051	**0.18**	**0.47**	<0.054	**0.36**	**0.16**	**0.36**	--	**0.13**	**0.12**	**0.068**	**0.073**	**0.17**	**0.12**
Endosulfan II	*96*	**0.58**	**0.63**	<0.11	**0.15**	<0.10	<0.10	<0.11	**0.23**	<0.11	**0.29**	<0.11	**0.21**	--	<0.11	<0.11	<0.10	<0.11	**0.14**	<0.11
Endosulfan sulfate	*96*	**2.4**	**2.6**	<0.11	**0.26**	<0.10	**0.18**	<0.11	**0.16**	<0.11	**1.1**	<0.11	**0.38**	--	<0.11	<0.11	**0.23**	<0.11	**0.57**	<0.11
Endrin		<0.10	<0.10	<0.11	<0.10	<0.10	<0.10	<0.11	<0.10	<0.11	<0.10	<0.11	<0.11	--	<0.11	<0.11	<0.10	<0.11	<0.10	<0.11
Endrin aldehyde		<0.10	<0.10	<0.11	<0.10	<0.10	<0.10	<0.11	<0.10	<0.11	<0.10	<0.11	<0.11	--	<0.11	<0.11	<0.10	<0.11	<0.10	<0.11
Endrin Ketone		<0.10	<0.10	<0.11	<0.10	<0.10	<0.10	<0.11	<0.10	<0.11	<0.10	<0.11	<0.11	--	<0.11	<0.11	<0.10	<0.11	<0.10	<0.11
Heptachlor		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
Heptachlor Epoxide		<0.051	<0.052	<0.056	<0.051	<0.051	<0.051	<0.056	<0.052	<0.054	<0.051	<0.054	<0.054	--	<0.054	<0.054	<0.051	<0.054	<0.052	<0.054
Toxaphene		<1.5	<1.5	<1.7	<1.5	<1.5	<1.5	<1.7	<1.5	<1.6	<1.5	<1.6	<1.6	--	<1.6	<1.6	<1.5	<1.6	<1.5	<1.6
EPA Method 1699																				
Aldrin	*0.0026*	<0.00041	<0.00043	<0.00023	<0.00042	<0.00021	<0.00041	<0.00023	<0.00041	<0.00022	<0.00041	<0.00022	--	**0.00004 J**	<0.00022	<0.00022	<0.00042	<0.00022	<0.00042	<0.00022
Dieldrin	*0.0055*	**0.16**	**0.17**	**0.0015**	**0.021**	**0.00052**	**0.062**	**0.001**	**0.0055**	<0.00022	**0.078**	**0.00059**	--	**0.02**	**0.0046**	**0.0045**	**0.021**	**0.0061**	**0.033**	**0.0058**

Notes:
All concentrations in micrograms per liter (ug/L).
Cleanup levels from USEPA 2011 Amended Record of Decision.
Detections are noted in bold text.
Detections equal to or greater than cleanup levels are shaded.
J = Estimated value.

FMC Corporation Yakima Superfund Site

Site Photographs

Note: All photographs were taken on 6/21/2013 by Craig Cameron, EPA Remedial Project Manager.

Front of Stephens Metal Products warehouse – parcel address is 4 W. Washington Avenue in Yakima, Washington (business has moved but is about to lease to another light industrial business).

Butler's Welding and RV Accessories – parcel address is 1909 Longfibre Road in Yakima, Washington (another long time business on the former FMC facility site).

TrueValue Country Farm and Garden – parcel address is 6 W. Washington Avenue in Yakima, Washington (another long time business at the site).

Looking north from the yard at the Stephens Metal Products property. Plume is underneath the location where the photograph was taken and the former pit area is between that position and the warehouse visible in the photograph.

Pile of debris in the yard of the Stephens Metal Products property.

Looking west toward the back of the Butler property from the Stephens Metal Products yard.

Locked gate at Stephens Metal Products property. Longview Fibre facility is visible in distance.

Area between the TrueValue store location and Stephens Metal Products warehouse. Plantings at the store are kept in large above ground planter boxes that are on top of asphalt.

Soil brought in to help grade back part of Stephens Metal Products yard. One of the monitoring wells needed to be uncovered for the fall sampling campaign because it was buried under a couple feet of this material.

Fence down along railroad track (eastern border of the Stephens Metal Products yard).