

No Further Action Decision Document
Oregon Air National Guard, Kingsley Field
Klamath County, Oregon
Project Manager: Cliff Walkey
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Prepared By: Cliff Walkey, Cleanup Project Manager

Approved By: Sheila Monroe, Cleanup Program Manager

Responsible Party: Oregon Air National Guard

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RP Contact: Michael P. Kubatz
ANG/CEVR
3500 Fetchet Avenue
Andrews AFB, Maryland 20762

Overview

Oregon Air National Guard (ANG) Environmental Restoration Program Site 5 is also known as the Coal Ash Disposal Site (Figure 1). Site 5 consists of approximately 11 acres of joint-use property in the southwest portion of Kingsley Field (Figure 2-2). Site 5 was used for disposal of coal ash from the heating plant from 1970 to 1978. After the heating plant was converted to use wood fuel in 1978, wood ash was disposed at Site 5 (CH2M Hill, 1982, p. 34). Ash disposal was discontinued after 1982. Site 5 is currently used as a firearms range, and portions of the site were used for temporary surface storage of demolition debris from ANG facility renovations.

This report recommends a No Further Action (NFA) finding for environmental conditions related to residual low level contamination in Site 1 soil and groundwater, which is considered protective based upon evaluation of all appropriate exposure scenarios. The recommended action was selected in accordance with Oregon Administrative Rules (OAR) Chapter 340, Division 122, and Sections 0070 to 0110 in accordance with Oregon Revised Statutes (ORS) 465.200 through 465.455.

The recommended action is based on information documented in the administrative record specific to Site 5. A Site 5-specific administrative record index is presented at the end of this report. This index lists principal documents that contain information specifically relevant to Site 5, although the cited documents may also contain information pursuant to other ANG site investigations located at Kingsley Field. This staff report specifically summarizes the more detailed information contained in the administrative file for Environmental Restoration Program

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(ERP) Site 5 (ECSI 4547). ANG and the Department of Environmental Quality (DEQ) completed a Defense-State Memorandum of Agreement (DSMOA) on June 30, 2004.

Site History

Site 5, known as the Coal Ash Disposal Site is on a parcel of land currently owned by the United States Air Force (USAF). Subsequent investigations have since identified additional Contaminants-of-Interest (COIs) in the subsurface at Site 5. Environmental conditions at Site 5 were investigated comprehensively during 1991-1992; 2000-2003; and, 2006.

Environmental Site Investigation – 1991-1992

Site 1 investigations included electromagnetic surveys (EM), groundwater specific conductivity surveys, 3 piezometer installations, 3 monitoring well installations, 1 soil boring, groundwater sampling, and collection of 3 soil samples.

The EM survey did not identify anomalous conductivity measurements, but buried coal and wood ash were inferred to exist at Site 5 locales associated with higher dissolved solids in shallow groundwater.

During the specific conductivity survey, investigators noted hydrocarbon sheen on a drive point at a sample location in the northeast corner of Site 5. As a result, a soil boring was advanced in this area and 2 samples were evaluated for total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and total xylenes (BTEX), and semi-volatile organic hydrocarbons (SVOCs). Only trace levels of benzene and xylene were measured and no phase-separated hydrocarbons were observed.

Investigators collected 3 surface soil samples and analyzed these samples for BTEX, TPH, SVOCs, and metals. TPH was observed in concentrations ranging from 210 to 940 mg/kg, and all 3 samples also contained polycyclic aromatic hydrocarbons (PAHs).

Three groundwater monitoring wells (MW05-1, MW05-2, MW05-3) were installed during November 1992 (Figure 4-2). Two sampling events during November 1992 and March 1993 evaluated for the presence of metals, cyanide, BTEX, SVOCs, and TPH. Low level TPH was observed in all 3 wells during 1992, but not during 1993. Trace level PAHs were observed in MW05-2, and metals concentrations were similar to levels observed in MW11-BG (HAZWRAP, 1994).

Environmental Site Investigation – 2001-2003

This investigation's objective was to characterize the nature and extent of potential contaminants which focused upon the following:

- Metals, BTEX, PAHs, and TPH in soil;
- Metals and SVOCs in ash samples; and,
- Metals, BTEX, SVOCs, and TPH in groundwater.

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The investigation consisted of the following:

- Advancing direct-push soil probes, collecting 88 subsurface soil samples (between 1 and 3 feet bgs), and collecting 26 groundwater grab samples;
- Collecting 26 surface soil samples and 10 ash samples from existing ash stockpiles;
- Installing 3 groundwater monitoring wells (screened 5 to 20 feet bgs), and collecting 3 soil samples from these boreholes; and,
- Collecting groundwater quality information during 8 quarters of monitoring between 1999 to 2000, and between 2002 to 2003.

Environmental Site Investigation - 2006

Three data gaps were identified in consultation with DEQ (Table 4-5). Information acquired during 2006 successfully addressed these data gaps and included:

- Inspection of the monitoring well network in preparation for resampling;
- Establishing a surface water gaging station;
- Measuring water elevations;
- Collecting groundwater quality samples for field and lab testing; and,
- Excavating test pits and conducting soil sampling.

All monitoring wells except MW05-1 were found to be in good condition. MW05-1 was not located and is believed to have been destroyed. Two surface water gaging stations were established (SW05-1, SW05-2). Depths to static water in Site 5 groundwater monitoring wells and surface water gaging stations were measured and recorded on May 1, 2006 and September 18, 2006.

Groundwater quality monitoring at Site 5 consisted of two separate events during May 2006 and September 2006 (Table 4-6). Samples were tested for arsenic, copper, selenium, molybdenum, and vanadium because these compounds were previously observed (2002-2003) at levels exceeding SLVs used at the time. During May 2006, these metals were evaluated for both total and dissolved concentrations in order to provide continuity with historical data (dissolved) and to facilitate evaluation of fate and transport and bioavailability to ecological receptors.

In addition, Site 5 groundwater was evaluated for petroleum (TPH-diesel) and petroleum fractionation (VPH, EPH) during May 2006. This evaluation was completed in order to ascertain the degree of weathering/biodegradation of petroleum (TPH) in Site 5 groundwater.

A test pit was excavated and a composite soil sample was collected at Site 5 on June 15, 2006 in order to confirm previously observed PAH levels in sample 05-II1-S.

Conceptual Site Model

A Conceptual Site Model (CSM) identifies all of the suspected or potential sources of contamination at a specific site, and summarizes where it is located, how it is likely to move, and

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who is likely to be affected. At Site 5, the CSM identified the following applicable exposure scenarios (Figure 3):

Soil

- Soil Ingestion, Dermal Contact and Inhalation – Occupational, Construction Worker, Excavation Worker, Hypothetical Residential Receptor.

Groundwater

- Groundwater in Excavation – Construction & Excavation Worker.

Contaminants-of-Interest

Contaminants-of-Interest (COIs) were established by contaminant detections observed in Site 5 soil and groundwater over the course of all site investigations. Typically, COIs are retained as Contaminants-of-Potential-Concern (COPCs) based upon identification of specific screening level exceedances. Because various screening level standards were utilized for earlier site investigations, all Site 5 data is currently screened against criteria provided in DEQ, 2003. DEQ considers it important to reconcile previous screening level evaluation of earlier data by comparison of that data against updated screening level criteria. In addition, data acquired in 2006 is also evaluated against criteria provided in DEQ, 2003. In order to retain COIs as Contaminants-of-Potential-Concern (COPCs) across all data sets, and in order to ultimately retain COPCs as Contaminants-of-Concern (COCs)¹, DEQ required the evaluation of data usability to support risk evaluation.

Soils

100-plus soil and ash samples were collected across Site 5 during site investigations that were evaluated for metals, PAHs, and TPH. Analyses of this data demonstrate the following:

- Except for arsenic, concentrations of metals in Site 5 soil are below screening levels² after consideration of the range of ambient levels. Specifically, arsenic concentrations ranged between <0.5 mg/kg and 5.45 mg/kg with 10 of 34 detections exceeding the Preliminary Remediation Goal (PRG), but still considered within the range of background levels;
- PAHs were detected throughout Site 5, but typically not at levels exceeding screening levels (Table 4-2);
- TPH, as diesel and heavy oil, were commonly observed at low levels; and,
- Volatile organic hydrocarbons (VOCs) and SVOCs testing from Site 5 soil samples demonstrate that these compounds are not COCs.

Groundwater

¹ COCs are identified from COPCs if apparent statutory exceedances of screening level concentrations cannot be discounted in consideration of mitigating factors.

² USEPA Region 9 Preliminary Remediation Goals, 2004.

Groundwater at Site 5 was evaluated in 10 separate sampling events between 1999 and 2006 and analyses of this data indicate the following:

- TPH-D in May and September 2006 was less than 2002/2003 observation and less than DEQ Risk Based Concentrations (RBCs)³ (Table 4-4);
- 2006 dissolved metals data was similar to historical data, indicating that data is temporally representative; and,
- SVOCs, VOCs, and/or metals (other than arsenic, copper, selenium, and vanadium) are not retained as COPCs at Site 5.

Risk-Based Evaluation

Human Health

Concentrations of Contaminants-of-Interest (COIs) were compared to generic risk-based concentrations (RBCs) listed in DEQ's *Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites* (RBDM) guidance dated September 22, 2003 for the pathway and receptors listed above.

The noncancer and Excess Lifetime Cancer Rate (ELCR) estimates at Site 5 are summarized in Table 11. Table 12 provides the results of the Site 5 indoor air screening for soil and groundwater. Table 13 provides the results of TPH screening for soil. Reasonable Maximum Exposure (RME) and Central Tendency Exposure (CTE) estimates for noncancer effects at Site 5 are below the regulatory threshold value of 1.0 for all exposure scenarios. The RME and CTE ELCR estimates from all carcinogenic COPCs at Site 5 are below the target of 1E-05 for cumulative risk for all exposure scenarios except the RME hypothetical residential scenario. The chemical-specific estimates for arsenic and BaP are above the target of 1E-06 under the occupational RME scenario, but not the maintenance occupational worker scenario. Arsenic (both CTE and RME), BaP (both CTE and RME), and dibenz(a,h)anthracene (RME only) exceed the individual carcinogen target for the hypothetical residential scenario. The arsenic Exposure Point Concentration (EPC)⁴ was 1.9 mg/kg compared to the maximum site background concentration of 5.1 mg/kg, indicating that risk associated with arsenic is associated with ambient levels of this compound. All maximum VOC detections in Site 5 soil and groundwater are below indoor screening levels (Table 12), and the maximum lead concentration (34.8 mg/kg) is below the screening level (400 mg/kg). TPH EPCs do not exceed screening levels (Table 13).

The individual carcinogenic risk estimate predicted for BaP (1.8E-06) exceeds the screening level threshold of 1E-06 under the occupational exposure scenario. At least 1 PAH was detected in 73 of 100 soil samples at Site 5. One or more PAH exceeded industrial PRGs in 24 of the 73 samples, and BaP exceeded industrial PRGs in all 24 samples. Twenty-three of 24 samples with BaP PRG exceedances were subsurface soil samples (>3 feet bgs).

³ DEQ, 2003, Appendix A.

⁴ EPC is defined in this memorandum as equivalent to 90% Upper Confidence Level (UCL) of data used to support risk computation. By policy, if a 90% UCL is not calculated, a maximum detection value is used as the EPC.

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BaP risk estimates only slightly exceed the acceptable risk level under the occupational RME scenario at this site. The frequency of detection was significant, indicating that BaP occurrence is widespread at Site 5, especially in subsurface soils. Variance in BaP data is relatively high with a Coefficient of Variation (CV) of 3.4. Most of the nonparametric estimators range from 0.3 to 0.42, which correspond to occupational risk estimates of 1.3E-06 to 1.5E-06. The 90th Chebyshev EPC of 0.49 corresponds to a 1.8E-06 risk estimate. Overall, the likely risks are right at, or slightly exceed the acceptable risk level. In accordance with the USEPA ProUCL user guide, the Halls and Bootstrap UCLs should be used with caution when they are inflated over other UCL estimates (as they are with this data set), indicating that estimates are erratic. In these cases, USEPA recommends considering the gamma estimators when data sets are small. Moreover, the lognormal estimate using the H-statistic, (appropriate with data sets N>30), is more aligned with the lower of the nonparametric and gamma estimators. Finally, this data set may be considered conservative due to the use of ½ reporting limits as an approximation of non-detections. Considering these characteristics of the data set in comparison of the potential estimators of the UCL on mean, it is more likely that the best estimator of the 90th UCL approximates 0.3 mg/kg with a corresponding occupational RME risk estimated at 1E-06.

Based upon the DEQ's more refined analysis of the possible significance of the BaP screening level exceedances at Site 5, and in consideration of the specific nature of current and reasonably likely future occupational exposures, DEQ recommended a change of occupational exposure duration assumptions from default values. Specifically, there was recent precedent⁵ that the current and future occupational worker at Kingsley Field is embodied in a maintenance worker who conducts mowing of grass for which DEQ recommended a modified 2 hour/7times per year exposure duration. Based upon this modification, the RME calculated risk estimate for the chemical-specific ELCR for occupational risk estimates associated with BaP is calculated to be 1.73E-13, and BaP is not retained as a human health COC at Site 5.

Ecological Risk

Level 1 Scoping Assessment identified potentially complete ecological exposure pathways prompting a Level 2 Screening Assessment to determine whether site-related constituents could pose unacceptable risks to ecologic receptors, especially wildlife. The candidate assessment endpoints and corresponding measures of exposure and effect for Site 5 is summarized in Table 17.

Site 5 downgradient perimeter wells MW05-02, MW05-03, MW05-05, and P05-3 were evaluated against Level 2 Screening Level Values (SLVs) considered protective of aquatic organisms, birds, and mammals (Table 22). DEQ SLVs were exceeded in these well points consistently through the monitoring periods evaluated (1999-2006) for barium, copper, and vanadium. However, these apparent screening level exceedances are qualitatively discounted based upon consideration of the following:

⁵ DEQ agreed that a modified exposure duration assumption for occupational workers was warranted at a similar site during 2005 at Kingsley Field.

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- Barium detections were at, or near, values associated with background. The 101 ug/L exceedance noted at MW05-03 was not reflected in results from either MW05-05 or P05-3, which are downgradient of MW05-03;
- Copper exceedances were noted during March 2003, but have not been observed above either SLV or background values during the last two sampling events; and,
- Vanadium exceedances do not appear to be site related because they are consistent over time and space at concentrations near or below background established during the 2006 sampling event.

Land and Water Beneficial Use

Site 5 is currently on land leased from the City of Klamath Falls by ANG through 2045. Klamath County has zoned the area for exclusive cropland farm uses (EFU-C). However, Site 5 currently is used as a firearms range and is adjacent to a test stand for jet engines. As such, Site 5 is internal to the active military base and these two activities preclude any development in the area for the foreseeable future. Future use of the land is expected to remain unchanged.

The private land adjacent to Site 5 is outside Klamath Fall's Urban Growth Boundary (UGB) and is expected to remain agricultural.

Water used at Kingsley Field is supplied by the City of Klamath Falls and is obtained from groundwater production wells (Conger well field). This network of water supply wells is located approximately 4 miles northwest and upgradient of Kingsley Field and produce from deep hydrostratigraphic intervals. A water well survey was completed for all known wells within a 0.5 mile radius of Kingsley Field by querying Oregon Water Resources Department (OWRD) databases identified a total of 43 wells, none of which are located within the Site 5 Locality-of-Facility (LOF)⁶.

Conclusions

Site 5 screening risk evaluation demonstrates that there are no statutory exceedances of appropriate DEQ RBCs or SLV standards for environmental media of concern⁷. Site data are considered sufficient for supporting remedial action decisions for Site 5. For human health, the chemical specific risk estimate for arsenic was slightly above a regulatory target of 1E-06 under a hypothetical residential scenario. However, this apparent exceedance is not considered to be of concern because: 1] the (hypothetical) residential scenario is considered unlikely given current and reasonably likely future land use (zoned EFU, but under lease to ANG until 2045); and, 2] the arsenic EPC (1.9 mg/kg) is within the range of values considered ambient (up to 5.1 mg/kg). For ecological risk assessment, apparent exceedances of non-toxic SLV standards are

⁶ LOF is defined in Oregon Administrative Rule (OAR) 340-122-115 as: "any point where a human or an ecological receptor contacts or is reasonably likely to come into contact with, facility-related hazardous substances...". The extent of residual contamination in groundwater at Site 5 is stable and/or diminishing both spatially and by magnitude of residual contaminant concentrations. Specifically, no COCs are identified in Site 5 groundwater because apparent screening level exceedances are qualitatively discounted based upon factors identified in this memorandum.

⁷ There were some apparent screening levels exceedances – the significance of which is further evaluated and discussed under *Risk Based Evaluation* and *Conclusions* narratives in this memorandum.

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qualitatively discounted based upon interpretation that they are reasonably associated with ambient or background, and/or that no detections have been reported in subsequent monitoring.

No additional groundwater data acquisition is considered necessary because the similarity of 2006 to earlier site data for groundwater resolves the concern about temporal representativeness.

It is not likely that Site 5 land use will change in the foreseeable future. No COPCs were retained as COCs based upon a refined screening level risk evaluation, and there is no identified unacceptable risk to either human or ecological receptors. Site 5 is therefore eligible to receive an unqualified No Further Action determination.

Recommendation

I recommend that DEQ proceed with a Public Opportunity to Comment during July 2007. Contingent upon any comments received during the formal comment period, I recommend that a No Further Action decision be issued for Site 5. The issuance of the NFA would be contingent upon ANG documentation to DEQ that all Site 5 monitoring wells have been permanently decommissioned in conformance with OWRD regulations.

Attachments⁸

Figure ES1 – Facility Scale Site Location Map

Figure 4-2 – Kingsley Field ERP Site 5

Figure 4-4 – Diesel-Range Total Petroleum Hydrocarbons in ERP Site 5 Soils

Figure 4-5 – Metals, PAH, and TPH Exceedances in Direct Push Groundwater Samples from ERP Site 5, 1999

Figure 4-6 – Kingsley Field ERP Site 5 Potentiometric Groundwater Surface, May 1-2, 2006

Figure 3 – Conceptual Site Model for Human Health and Ecological Risk Assessment

Table 4-4 – Diesel-Range Total Petroleum Hydrocarbons in Site 5 Groundwater (1999-2006)

Table 11 – Soil ERP Site 5

Table 12 – Comparison of Site 5 Maximum Groundwater and Surface Soil Concentrations with Vapor Intrusion RBCs

Table 13 – Comparison of Soil TPH Concentrations with DEQ Soil RBCs for Direct Contact Pathways

Table 17 – Ecological Endpoints

Table 22 – Screening for Groundwater Concentrations in Site 5 Perimeter Wells with Level 2 Screening Level Values for Surface Water

Administrative Record

1] Installation Restoration Program Records Search for Kingsley Field Oregon, CH2M Hill, February, 1982.

2] HAZWRAP (Hazardous Waste Remedial Actions Program) Final Kingsley Field Site Investigation Report, April, 1994.

⁸ In order of citation in text.

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- 3] Final Remedial Investigation Report for IRP Sites 1 and 5: 173rd Fighter Wing, Oregon Air National Guard, Kingsley Field, Klamath Falls, Oregon, ERM, July, 2001.
- 4] Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites, DEQ, September, 2003.
- 5] Final September 2003 Quarterly Monitoring Report for ERP Sites 1 and 5; 173rd Fighter Wing, Oregon Air National Guard, Kingsley Field, Klamath Falls, Oregon, ERM-West, Inc., March, 2004.
- 6] Final Remedial Process Optimization Site Visit Report: 173rd Fighter Wing, Oregon Air National Guard, Klamath Falls, Oregon, BB&E, July, 2005.
- 7] Environmental Restoration Program Final Interim Remedial Action Operation/Long-Term Monitoring Report, Volumes 1 & 2, CH2M Hill, Inc., January, 2007.
- 8] Environmental Restoration Program Final Interim Remedial Action Operation/Long-Term Monitoring Human Health and Ecological Risk Assessment, CH2M Hill, Inc., May, 2007.