TWCSD
5.5.3

TELEDYNE WAH CHANG ALBANY SUPERFUND SITE
ALBANY, OREGON

Explanation of Significant Differences

To the September 27, 1995 Record of Decision:
Final Remedial Action for Surface and Subsurface Soil Operable Unit

TELEDYNE WAH CHANG ALBANY SUPERFUND SITE
ALBANY, OREGON

EXPLANATION OF SIGNIFICANT DIFFERENCES
To the September 27, 1995 Record of Decision: Final Remedial Action
For Surface and Subsurface Soil Operable Unit

1 INTRODUCTION

1.1 Site Name and Location

Teledyne Wah Chang Albany
Millersburg, Oregon

1.2 Lead and Support Agencies

The Environmental Protection Agency (EPA) is the Lead agency on this site. The Oregon Department of Environmental Quality (ODEQ) is the Support Agency on this site.

1.3 Explanation of Significant Difference

This document addresses significant changes to the ROD for Final Remedial Action for Surface and Subsurface Soil Operable Unit, Teledyne Wah Chang Albany Superfund Site, September 27, 1995 (Soil ROD). This document provides an Explanation of Significant Differences as required under Section 117c of CERCLA, and the National Contingency Plan (NCP) 40 C.F.R. §300.435(c)(2)(I). These changes to the ROD requirements are based on the newly available information gained from soil excavation during the first phase of the Remedial Action. The changes are significant, but not fundamental changes to the remedy.

1.4 Circumstances Leading to the Changes to the Excavation of Gamma Emitting Material Remedy in the ROD

The areal extent of buried gamma emitting material (GEM) significantly differs from what was estimated through RI/FS characterization of the site. In addition to differing conditions in the Sand Unloading Area and Front Parking Lot Area, information received from Wah Chang since the ROD and remedial action for soil indicates that other areas of the site also contain GEM.

Based on investigation collected during the RI/FS, the ROD estimated that 835 cubic feet of material would need to be excavated in the Sand Unloading Area. Actual excavation was 1890 cubic feet, however, a significant volume of GEM extending beneath existing structures was not removed during the Sand Unloading Area excavation.

In the ROD, it was estimated that 2268 cubic feet of GEM would need to be excavated in the Front Parking Lot Area. Actual excavation in the Front Parking Lot was 8100 cubic feet. In addition, the areal extent of GEM with gamma emissions below the cleanup level that is being left in place is greater than the ROD estimates.

1.5 Circumstances Leading to the Changes to the Institutional Controls for Radon in the Soil Amendment Area Remedy in the ROD

The ROD called for the implementation of institutional controls requiring future buildings to be constructed using radon resistant construction methods. In order to ensure that there is a viable remedy should institutional controls not be implementable, EPA is modifying the remedy for the Soil Amendment Area to include more protective options.

1.6 Administrative Record

This Explanation of Significant Differences will become part of the Administrative Record File for the site. The record is available in the EPA Region 10 Records Center located at 1200 6th Avenue, Seattle, Washington.

A notice of the ESD will be placed in the Albany Herald.

2 SITE BACKGROUND

The Teledyne Wah Chang Albany site is located in Millersburg, Oregon, adjacent to the city of Albany. The facility covers approximately 225 acres and is located near the Willamette River. Since site listing, Teledyne Wah Chang has changed its name to Wah Chang (WC). Thus the Superfund site is called Teledyne Wah Chang Albany, but the facility is called Wah Chang. The Wah Chang facility is divided into a 110-acre main plant area and a 115-acre Farm Ponds area (see Figures 1, 2, and 3 for site maps and locations of areas covered in this ESD).

Wah Chang is an active operating facility which primarily manufactures zirconium and other specialty metals. The manufacturing operation consists of numerous production facilities used for the extraction and refining of zirconium and hafnium metals from zircon sands, with a small amount of tantalum, columbium, titanium and vanadium metals also being produced. The plant also has a number of waste

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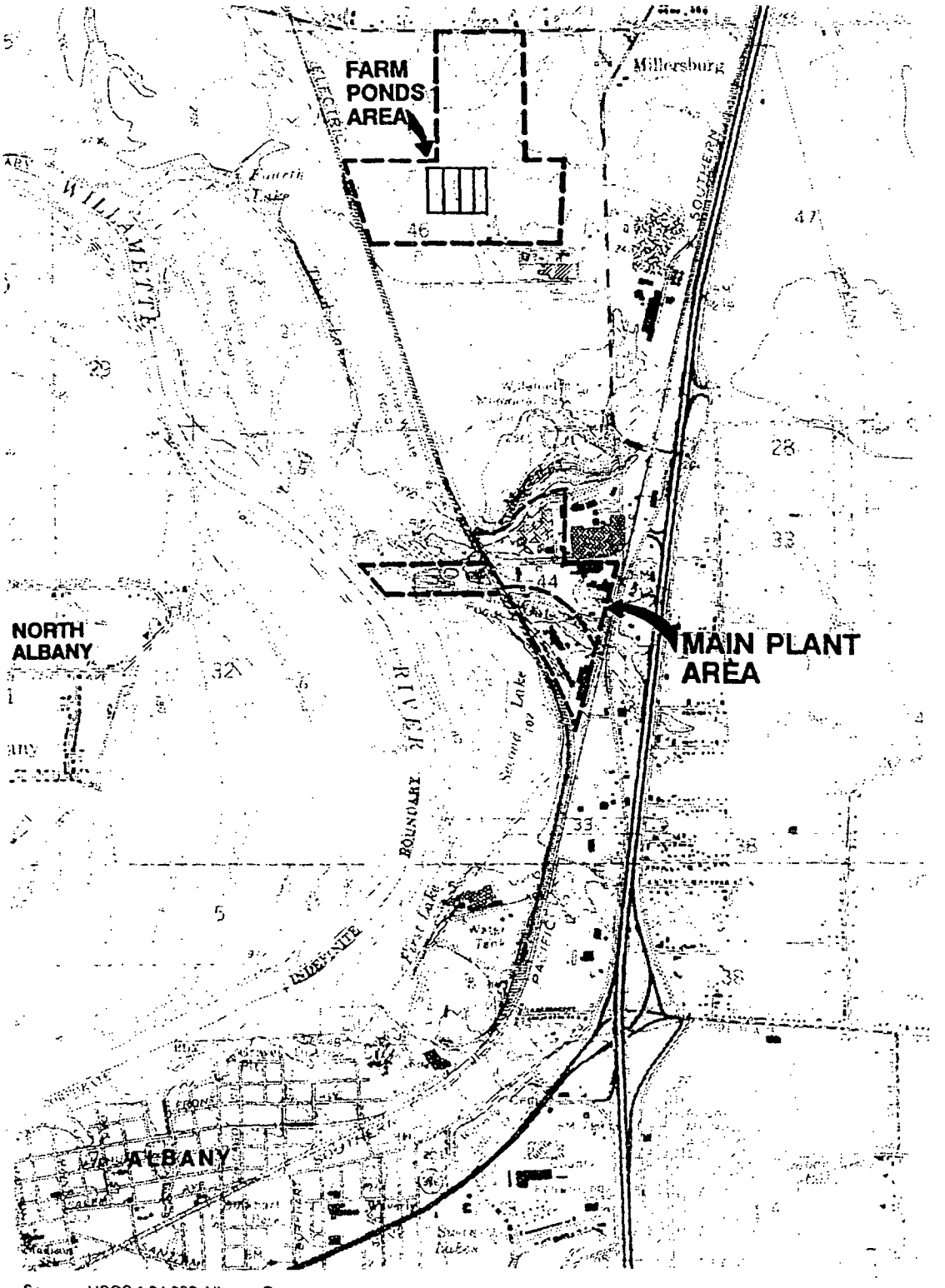

Figure 1
Location Map
Teledyne Wah Chang Albany
Albany, Oregon
CH2MHILL

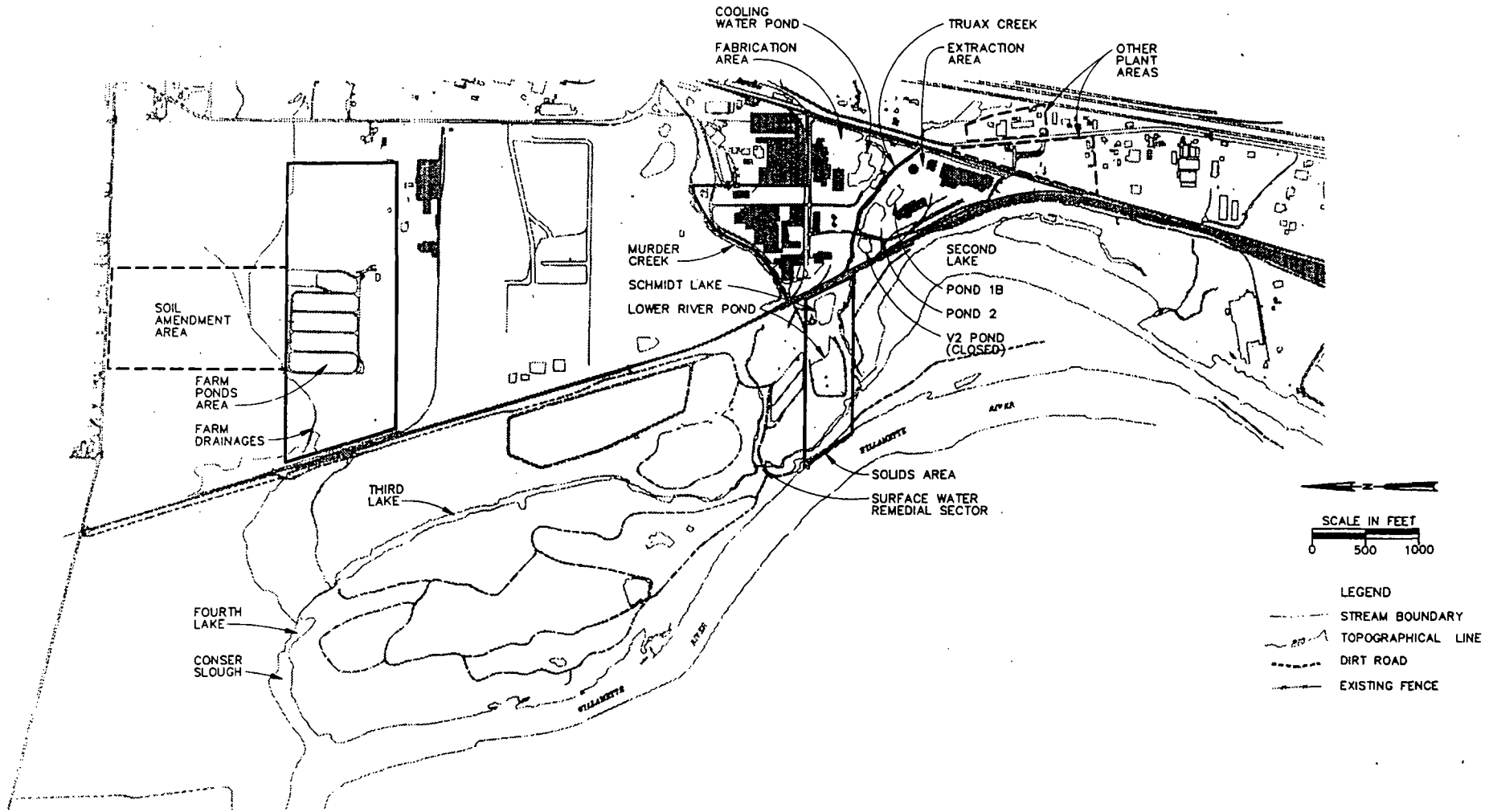

FIGURE 2
SITE MAP

WAH CHANG
ALBANY, OREGON

CH2MHILL

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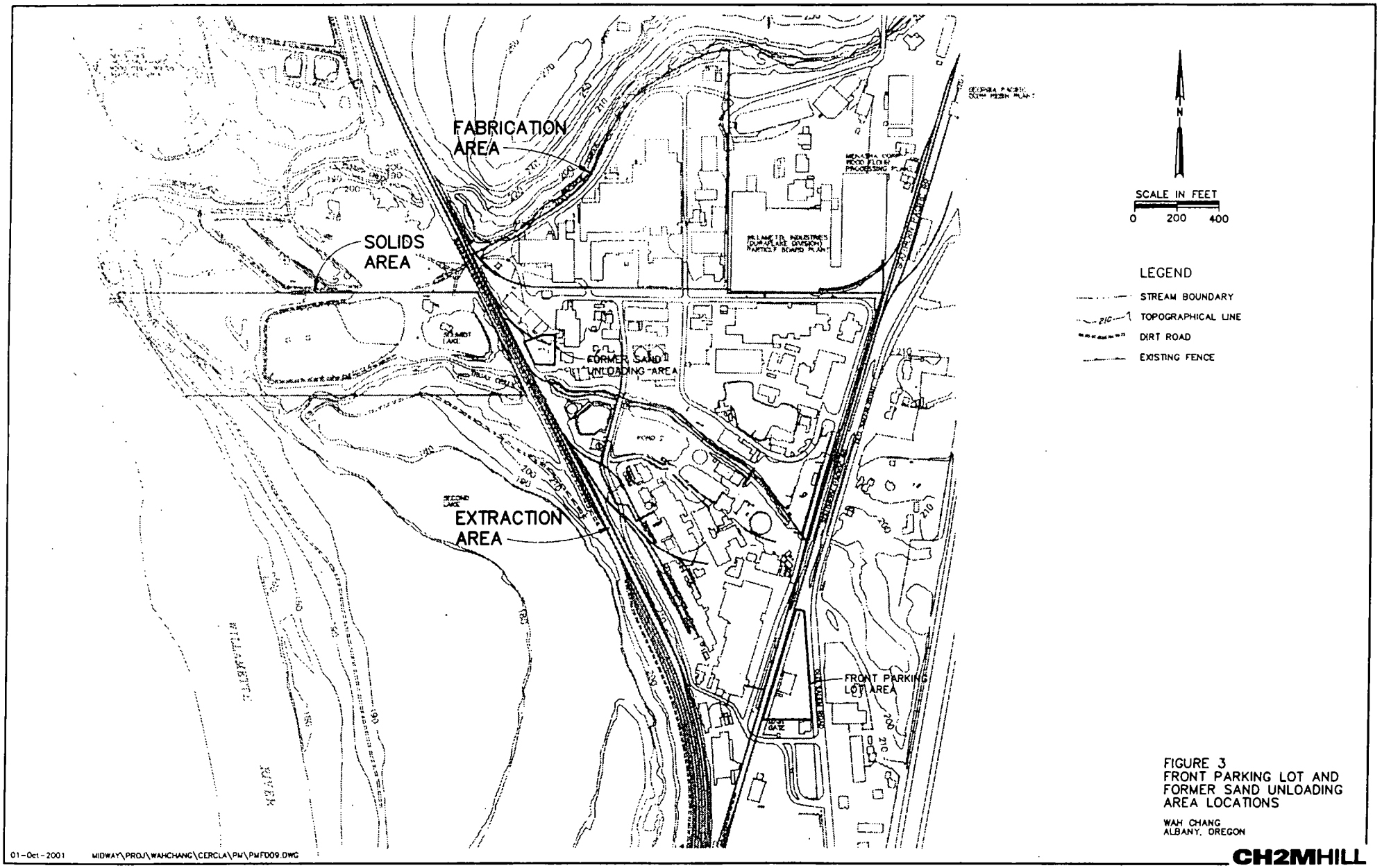

FIGURE 3
FRONT PARKING LOT AND FORMER SAND UNLOADING AREA LOCATIONS

WAH CHANG
ALBANY, OREGON

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treatment and storage facilities and several on-site ponds that were, or presently are, being used for the storage and treatment of liquids and solids.

The processing of the zircon sands generates solid, liquid, and gaseous by-products. Contaminants of concern detected in waste by-products include radionuclides, metals, polychlorinated biphenyls (PCBs), methyl isobutyl ketone (MIBK), and chlorinated organic solvents such as 1,1,1-trichloroethane and tetrachloroethylene.

Under an ODEQ permit, some of the wastewater treatment sludge generated by Wah Chang prior to 1976 was used as a beneficial soil amendment on agricultural land in an area now identified as the Soil Amendment Area, part of the 115-acre Farm Ponds Area. This sludge contained low levels of radium-226, a constituent which breaks down naturally to form radon gas. In open, uncovered areas, radon rapidly dissipates and breaks down in the atmosphere. However, without adequate controls, in buildings underlain by soil containing radium-226, radon may accumulate to levels that are not protective.

Wah Chang is regulated by the Oregon Health Division (OHD) under an Oregon Radioactive Material License (Broad Scope Naturally Occurring Radioactive Material (NORM) License). The NORM license covers handling and disposition of radioactive materials under current operations as well as at plant decommissioning. Decommissioning (i.e., safe appropriate disposition of all radioactive material under supervision of OHD and in accordance with applicable requirements) must occur whenever Wah Chang ceases operations or closes the site.

3 PROGRESS ON THE REMEDIAL ACTION FOR SOIL

3.1 Soil ROD

The Record of Decision for Final Remedial Action for Surface and Subsurface Soil, September 27, 1995 called for the following actions:

Excavation of material exceeding the gamma radiation action level of 20 µrem/hour above background, measured at one meter above the surface and averaged over 100 square meters (40 CFR 192.12).

Transportation of excavated material to an appropriate offsite facility for disposal.

For areas of the site where modeling indicates that radon concentrations in future buildings could exceed 4 pCi/liter, implement institutional controls requiring that future buildings be constructed using radon resistant construction methods.

Information on areas of subsurface PCB and radionuclide contamination that do not pose a risk if they are not disturbed will be incorporated into the Wah Chang facilities maintenance plan. This information will be made available to future site purchasers or regulatory agencies.

The determination that action is not required for certain areas of the site is based on scenarios that do not allow unrestricted use. Proper handling and disposal of excavated material in accordance with federal and state laws are required should excavation occur as part of future development of the Wah Chang main plant or the soil amendment area.

3.2 Remedial Action for Soil

3.2.1 Schmidt Lake

On August 26, 1998, Wah Chang excavated between 12 and 15 cubic yards of soil from Schmidt Lake. All areas exceeding the site action level of 20 µrem/hour above background were excavated.

3.2.2 Sand Unloading Area

The RI/FS identified a relatively small area where surface gamma radiation levels exceeded the cleanup standard of 20 µrem/hour above background. The elevated gamma radiation levels in the area were expected to be emanating from spilled zircon sands (raw materials for the zirconium process) containing a naturally occurring radium-226 component. The underlying assumption for the selection of the excavation remedy was that the RI/FS identified the location and extent of all on-site areas where surface and near surface GEM was present. As described below, during the excavation of this area, it was determined that although sand was present on the ground surface, it was not the primary source for all of the gamma emissions.

The remedial action was conducted in October 1997. Excavation was stopped when the northwestern edge of the material appeared to extend beneath a concrete slab in front of the mobile maintenance shop, and under the shop itself, and when the northernmost end of excavation would have interfered with on-site traffic with no evidence that the limit of contamination had been reached. In the areas excavated, GEM was found within 2 feet of the surface. A confirmation surface gamma survey showed that within the excavated area, levels were below the cleanup standard of 20 µrem/hour above background. The amount excavated was 1890 cubic feet, twice the ROD estimate.

While some of the gamma emissions in the area resulted from spilled sands on the ground surface, there was a significant quantity of buried material. Four primary types of material were identified in the excavation area: black sand, reddish brown sand, green sand and gray materials containing rock like "clinkers" (a waste from the former carbide process emitting significantly elevated levels of gamma radiation).

A subsequent review by Wah Chang of gamma survey and radionuclide sampling information, collected during past excavation projects in the vicinity of the Sand Unloading Area, was done in an attempt to determine the areal extent of contamination. Radionuclide contaminated material, which could exceed cleanup levels if uncovered, was found 200 feet to the north, 200 feet to the northeast, and 200 feet to the east of the area. The material found was identified as carbide waste, a process waste with a high radium-226 concentration, that had previously been disposed on the site.

Most of the Sand Unloading Area is now overlain by Wah Chang's new co-generation (COGen) Plant, a natural gas, electric generating plant. The plant is built on a 14" concrete slab, which presents an effective gamma blocking barrier (see Figure 4).

3.2.3 Front Parking Lot Area

Black sand, a low level radioactive rutile sand (natural mineral form of Titanium Dioxide) was identified for removal in the RI/FS, and was removed during the soil remedial action. A 1 to 6 inch layer of black sand was identified 6 to 12 inches below the Front Parking Lot's gravel surface. The layer of black sand covered native soil. Although the areas where surface gamma readings exceeded the cleanup level were excavated, visual observations and anecdotal evidence suggest that the entire Front Parking Lot is underlain by this material except where it was excavated for the Building S-147 concrete foundation. Samples of the sand indicate that radium-226 levels could cause radon concentrations in future buildings to exceed the radium-226 action level of 4 pCi/liter set in the ROD. If the thickness of the sand were changed (i.e., if it were consolidated) the material could exceed the cleanup standard of 20 µrem/hour above background.

3.2.4 Soil Amendment Area

The institutional controls in the soil amendment area have as yet not been implemented.

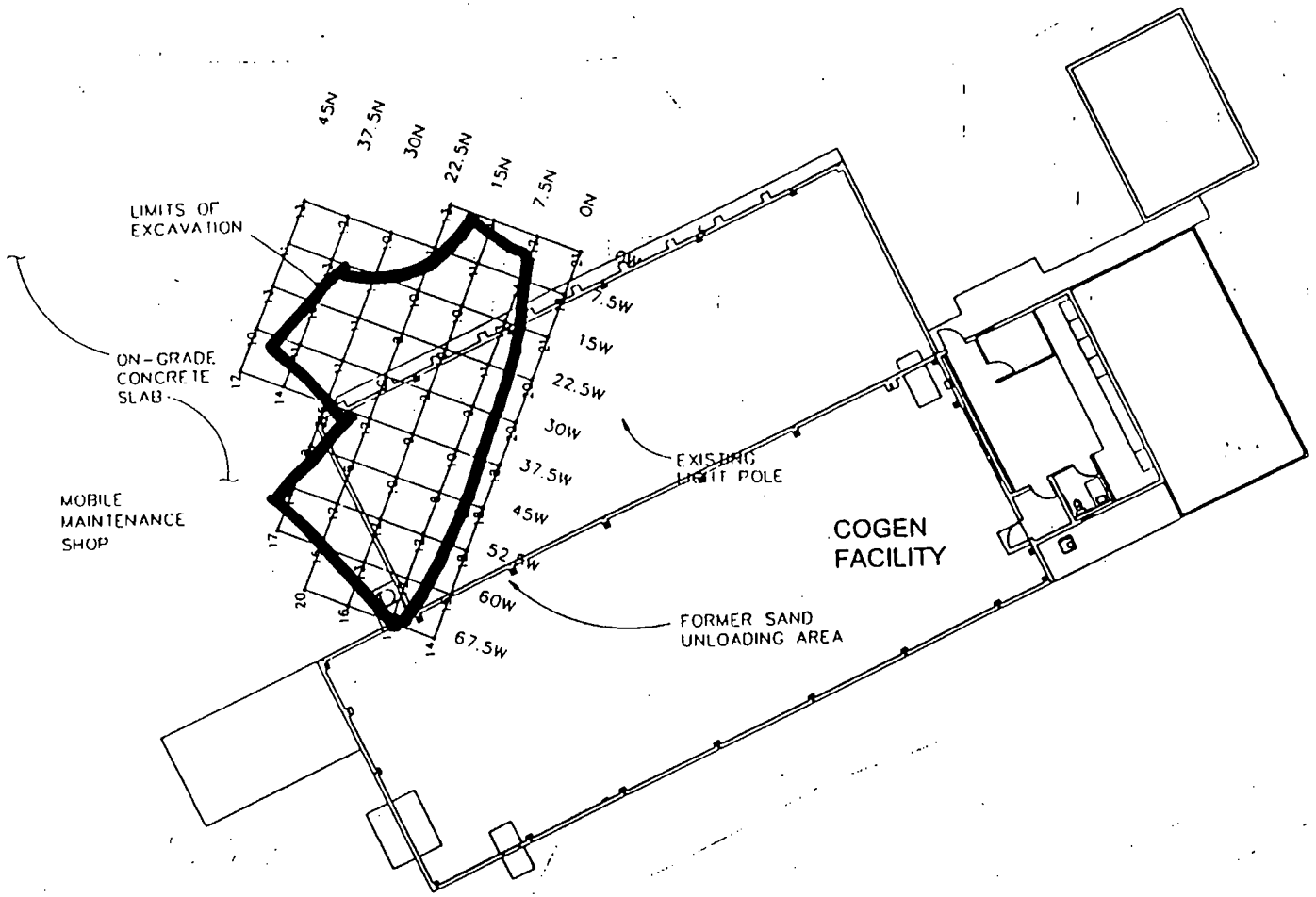

Figure 4

CoGen Building Footpring
Relative to Former Sand Unloading Are

4 CHANGES TO THE SURFACE AND SUBSURFACE SOIL ROD

4.1 Changes to the Remedy for Soil

This ESD outlines the final CERCLA remedy for this site for surface and subsurface soil. Based on current information, no additional cleanup action for radionuclides under CERCLA is anticipated.

EPA is making the changes listed below to the soil remedy. Additional information and justifications for these changes are provided in subsequent subsections.

4.1.1 Change #1: Final site closure for radionuclides will be conducted pursuant to Wah Chang's Oregon Radioactive Materials License (Broad Scope Naturally Occurring Radioactive Material License) and the Oregon Facility Siting Council (EFSC) Administrative Rules (Chapter 345, Division 50).

4.1.2 Change #2: On-site surface gamma emissions will be controlled through in-place management of contamination. Prior to site decommissioning under OHD and EFSC, surface gamma emissions must be kept below cleanup levels through in-place management under an EPA and ODEQ approved management plan, and additional excavation of contamination performed as part of ongoing excavation occurring during onsite construction.

4.1.3 Change #3: If the site is not decommissioned under OHD and EFSC to EPA's cleanup requirements, radiation management shall be a condition of property transfer to ensure that these controls remain protective. Any partial or complete property transfer shall be conditioned on implementation and maintenance of an appropriate EPA/ODEQ approved radiation management program.

4.1.4 Change #4: Excavation and either berming or offsite disposal is an acceptable remedy for the Soil Amendment Area if institutional controls cannot be implemented.

4.2 Change #1: Final site closure for radionuclides will be conducted pursuant to Wah Chang's Oregon Radioactive Materials License (Broad Scope Naturally Occurring Radioactive Material License) and the Oregon Facility Siting Council (EFSC) Administrative Rules (Chapter 345, Division 50).

EPA and ODEQ will coordinate with OHD during decommissioning to ensure that the cleanup will meet EPA requirements to the greatest extent practicable. Following decommissioning, EPA and ODEQ will evaluate whether the cleanup is protective of public health and the environment.

4.2.1 ROD Requirement

Excavation of material exceeding the gamma radiation action level of 20 µrem/hour above background, measured at one meter above the surface and averaged over 100 square meters (40 CFR 192.12).

4.2.2 Explanation of Change #1

This change applies to the entire main plant. Areas delineated in the ROD for excavation of buried GEM have been excavated. GEM is still present on the site in currently known, suspected, and potentially unknown areas. Much of this material is inaccessible for excavation without removal of current site structures and buildings. OHD and EFSC have jurisdiction over the decommissioning (cleanup) of the plant for radionuclides. Following decommissioning, EPA and ODEQ will determine whether the cleanup meets the CERCLA risk-based cleanup requirements for an industrial site.

Recent EPA guidance reaffirms that NORM site closure under License requirements may satisfy CERCLA risk-based remediation requirements. (See OSWER No. 9272.0-15P, Interim Final Evaluation of Facilities Currently or Previously Licensed NRC Sites under CERCLA, Timothy Fields, Jr. Assistant Administrator.) The CERCLA remedy does not contemplate excavation of additional radioactive material from the site beyond what has already been remediated, what will be removed per the provisions of this ESD, (see Section 4.5.4), and what will be removed when the site is decommissioned.

The cleanup standard for radionuclides is modified in this ESD to the following standards.

4.2.2.1 Excavation Cleanup Standard

When excavation occurs for any reason, within the area of excavation, prior to covering or backfilling, gamma emissions from the remaining radionuclide containing material must not exceed 20 µrem/hour above background, measured at one meter above the surface. This standard is applied as the average over 100 square meters or the area of the excavation, whichever is smaller. The 100 square meter averaging area in the ROD was based on a large excavation area. The averaging size is modified in this ESD to take into account future excavations that could be less than 100 square meters.

4.2.2.2 Plant Wide Cleanup Standard

Throughout the site, surface emissions from GEM managed in place must not exceed 20 µrem/hour above background, measured at one meter above the surface. This standard is applied as the average over 100 square meters.

4.2.2.3 Radium-226 Action Level to Prevent Unacceptable Risk from Radon Inhalation

EPA is providing the following clarification for the selected radium-226 and radon action levels.

EPA's policy provides that when a site action level is exceeded, the usually acceptable cleanup goal is within the 10^{-4} to 10^{-6} excess cancer risk range. EPA strives to select remedies at the more conservative end of this range. However, for risks from naturally occurring radionuclides, EPA generally selects remedies in the upper end of the range, because of the practical limitations in distinguishing small excess risks from the risks due to natural background radionuclide concentrations. For this site, EPA has selected the cleanup goal for radon in future buildings to be an excess cancer risk which does not exceed $1x10^{-4}$.

The radium-226 action level for protection from radon remains the same as in the ROD. The action level for radium-226 assumes that action will be taken when radon concentrations in buildings could exceed 4 pCi/liter. This concentration includes the radon component contributed from background radium-226 levels. At this concentration, excess cancer risk from radon above background levels is approximately $6x10^{-4}$ for the exposure conditions assumed. Modeling performed during the RI/FS in the 1995 Radiological Survey indicates that radon concentrations inside structures constructed without radon controls and placed on soil with radium-226 concentrations above 3 pCi/gram, could exceed 4 pCi/liter. Thus, the radium-226 action level is 3 pCi/gram.

EPA selected a technology-based cleanup requirement for radon control, rather than specifying a cleanup level that must be obtained. This is consistent with EPA's current Radon Program requirements. EPA is requiring that future buildings be constructed using radon resistant construction to protect against the potential for the radon action level to be exceeded within such structures. When the systems in the buildings are operated, radon concentrations should be below the radon cleanup goal of risk from radon not to exceed an excess cancer risk of $1x10^{-4}$. The purpose of requiring continued maintenance and operation of such systems in the buildings is to ensure that concentrations will continue to be below the radon cleanup goal.

These radon controls require that the air within buildings must be periodically tested for radon. As required in the ROD, if radon concentrations exceed the EPA recommended radon action level or promulgated standard in effect at the time of these sampling events, additional controls will be required to reduce radon concentrations below the EPA recommended action level or promulgated standard. Because the current recommended action level of 4 pCi/liter is technology based, the ROD and this ESD do not "freeze" the requirement (see Section 10.2 in the ROD).

4.2.2.4 Final Cleanup Requirements for the Wah Chang Main Plant

The current cleanup standards for chemicals and radionuclides in soil are based on industrial standards. Therefore, site use must always be restricted to industrial use. Standards for GEM are therefore based on an industrial site use scenario. The requirements of this ESD for will remain in place unless cleanup meets the following standards:

Onsite GEM must be either excavated and disposed offsite, permanently capped, or a combination of both options. During excavation, GEM must be excavated to a level where, without capping or overburden, the surface gamma emissions would be below EPA risk-based levels and/or promulgated standards in place at the time cleanup occurs. The current standard for this site is 20 µrem/hour above background. Excavated material must be disposed of at an EPA and ODEQ approved facility.

The remaining GEM must not exceed concentrations which would result in indoor radon concentrations exceeding the EPA recommended action level, or risk-based levels and/or promulgated standards in place at the time cleanup occurs

If capping is selected, the cap must be a RCRA-compliant, permanent cap. Institutional controls must then be placed on the property to permanently protect the cap. Operation and maintenance of the cap will be required. Building restrictions for radon may be needed if the cap does not provide some means for venting radon.

4.2.2.5 Post Decommissioning Actions

If decommissioning occurs and/or land use assumptions change, any new requirements or issues related to these changes will be addressed at that time or under the 5-year review.

As described under Change #2, until site closure, an appropriate radiation management program must be in place that ensures that surface gamma emissions throughout the site do not exceed 20 µrem/hour above background averaged over 100 square meters or the area of the excavation, whichever is smaller. This requirement applies to areas of disposed GEM. It does not apply to measurements from materials which are part of the current or future Wah Chang industrial processes, i.e., those in "Mem Tech" where by-product material with a radionuclide component is processed for disposal at an off-site landfill.

4.2.3 Basis for Change #1

The remedy selected by EPA in the ROD was designed to be the final remedy for buried radioactive material at the site. However, as described below, new information revealed that the extent of buried material was greater than was characterized in the RI/FS, and it is not feasible to adequately excavate the site while Wah Chang is still in operation.

During excavation of the Sand Unloading Area and the Front Parking Lot Area in the first phase of the Remedial Action, GEM volumes, areal extent, and magnitude of gamma emissions exceeded the estimates based on site characterization in the RI/FS. The original remedy in the ROD was based on information that areas of surface and near surface radionuclide contamination were delineated by the surface gamma

survey performed during the RI/FS, and that the magnitude of gamma emissions from the material in the delineated areas was relatively low (i.e., less than an order of magnitude above the cleanup standard based on a high reading in the Sand Unloading Area of approximately 80 µrem/hour.) The two areas with differing conditions from the ROD are described below.

Sand Unloading Area

The selected excavation remedy was premised on the information available at the time that there was a finite amount of spilled process sand in the area. The sand is a material from which zirconium was extracted. This sand has a naturally occurring radium-226 component that accounted for the elevated gamma readings.

In the Sand Unloading Area, approximately 6 inches to 1 foot of clean overburden effectively shielded underlying GEM so that surface gamma radiation measurements in the area were within a few µrem/hour of background levels. However, during the first phase of the remedial action, it was discovered that, beneath the overburden, the underlying material consisted of red sand, green sand and a grey black material identified as carbide waste or clinkers. This material is a process by-product which, in the Sand Unloading Area, had a gamma reading above 500 µrem/hour measured at 1 meter above ground surface (much greater than the 80 µrem/hour measured in the RI/FS).

Excavation work in this area was stopped when the excavation reached the middle of a roadway, and the edge of the concrete slab of the Mobile Maintenance Shop. It became apparent that the areal extent of radionuclide contamination greatly exceeded the discrete area assumed during remedy selection.

Information subsequently provided by Wah Chang summarizing past site excavation activities, showed that carbide waste may be located within a much larger area, approximately 200 feet in all property directions from the area slated for remediation.

Front Parking Lot Area

The excavation remedy in the ROD was based on information indicating that there was a limited area in the Front Parking Lot where rutile sand (titanium dioxide with a naturally occurring, very low radium-226 component) were placed. However, new

information provided by Wah Chang indicates the Front Parking Lot is completely underlain with rutile sand. The gamma emission level of this sand without overburden is minimally above cleanup levels or below them, based on the extent and thickness of the sand. In the Front Parking lot area, all areas above the action level for gamma emissions have been excavated.

Following excavation, radium-226 concentrations in the stockpiles of excavated material were measured at 3 to 4 pCi/g radium-226. One confirmation sample of material in place following excavation was reported at 5.8 pCi/g radium-226. These measurements indicate that indoor measurements for radon in any future buildings constructed in this area could exceed the ROD radon standard of 4 pCi/liter.

Based on the information provided by Wah Chang, GEM may also be present in other areas of the site as well, namely "Truax Fill" and "Arrowhead Lake" fill areas. The Truax Fill area was stabilized during the Truax Creek remediation. Arrowhead Lake is partially covered by a building. These areas are currently controlled in place, but need to be addressed during decommissioning.

Removal of the GEM remaining on the site is not feasible while Wah Chang is in operation. Removal would involve potentially destroying onsite buildings, and would disrupt and probably halt Wah Chang plant operations. The existing structures themselves now provide an adequate level of shielding from the GEM potentially present underneath them.

Potential exposure to GEM may result when structures are razed, or if Wah Chang conducts excavations (or experiences some other event such as an earthquake) that bring the subsurface material closer to the surface, or when the Wah Chang plant closes. The changes identified in this ESD are designed to ensure protectiveness under these circumstances.

4.3 Change # 2: Control of site surface gamma emissions through in-place management of contamination

4.3.1 ROD Requirement

Excavation of material exceeding the gamma radiation action level of 20 µrem/hour above background, measured at one meter above the surface and averaged over 100 square meters (40CFR192.12).

4.3.2 Explanation of Change #2

Areas demarcated in the ROD have been excavated. These changes to the remedy apply to those areas throughout the main plant where GEM remains in place including areas currently known, areas of GEM that may be currently unknown, and areas where future excavations, or other events, uncover GEM.

Areas where surface gamma emissions are detected above the ROD action levels shall be excavated or capped so that the levels are below the cleanup standard of 20 µrem/hour. Capping requirements are described below.

Most areas of the plant are currently overlain (capped) with asphalt, concrete or compacted fill. These materials are effective at limiting gamma emissions and must be inspected and maintained to ensure their effectiveness. In place management must continue until the material is removed and/or EPA determines that in place management is no longer required because the site meets EPA risk-based cleanup standards.

Areas where it is known that GEM is disposed, but where surface emissions do not exceed cleanup levels need to be monitored every two years, or when the areas are disturbed to ensure that surface gamma emissions remain below the cleanup levels. If these levels are exceeded, capping or excavation will be required.

Areas where in-place management is occurring shall be demarcated as described in the Record Keeping Requirements below.

This change to the remedy is an outgrowth of the remedy selection process in the RI/FS. In the Radiological Survey (Addendum 1 to the RI/FS, CH2M Hill 1995) two viable alternatives were presented for remediation; an excavation option where the material was excavated and disposed of offsite; and a capping option. The capping option called for asphaltic concrete in sufficient lift thickness to attenuate the surface gamma emissions. The ROD selected an excavation remedy because, for the conditions assumed at the time of remedy selection, excavation met ARARs, was more permanent, and was more cost effective.

In both the Sand Unloading Area and the Front Parking Lot, the areas which were demarcated in the ROD as having surface gamma emission levels exceeding the ROD criteria of 20 µrem/hour above background were excavated and the material disposed of offsite. Because the remaining radioactive material in these areas is shielded by overburden, the gamma radiation levels are below 20 µrem/hour above background.

Throughout the rest of the site, areas surveyed during the RI/FS which may have buried radioactive material, are effectively shielded by the overburden (since these areas were below the cleanup level when surveyed).

Therefore, a specialized asphalt cap is not required. Where required in the future, capping may be done using asphalt, or equivalent material (such as clay, or geotextile approved by EPA). The cap must shield gamma emissions, and be a low permeability material. If leaching of GEM into the groundwater is occurring, the cap will have to have a permeability less than 10^{-6} cm/second.

4.3.3 Basis for Change #2

There are currently areas on the site where buried GEM if uncovered could exceed EPA's cleanup level. These areas could pose a threat to public health and the environment. This change ensures that these areas are managed in place and thus the remedy remains protective.

4.4 Change #3: Requirements for Property Transfer

EPA is approving in-place management of GEM without specified capping provisions on this site because Wah Chang has an active radiation management program in place. Wah Chang shall actively monitor excavations and backfill areas and ensure that there is no gamma exposure to site workers. Site decommissioning under OHD and EFSC (to EPA's cleanup requirements) shall precede any partial or complete property transfer unless such property transfer is accompanied by adequate assurances that an appropriate radiation management program will continue. Wah Chang shall ensure that protectiveness continues if the site is transferred without being decommissioned. Any prospective new site owner/operator must submit, prior to such transfer, a radiation management program for EPA review and approval. The program must be implemented by qualified personnel.

4.4.1 Basis For Change #3

The change in remedy requires that in-place management controls exist to ensure that the remedy remains protective. This change ensures that management controls of GEM continues even if Wah Chang transfers ownership of the property without decommissioning.

4.5 Actions and Clarifications Needed to Support Remedy Changes #1, #2, and #3

The additional actions identified are needed to ensure that the remedy is protective. The clarifications to the ROD requirements are needed to ensure that current ROD requirements apply to the remedy in this ESD. These actions

and clarifications also provide for the continued collection and dissemination of critical information, which will be needed for appropriate plant closure.

4.5.1 Determination of the areal extent and chemical properties of the radioactive material in the Sand Unloading and the Front Parking Lot Areas

Wah Chang shall characterize the vertical and horizontal extent of radioactive material in the two areas of concern. Part of the characterization may rely on a visual inspection of material taken from boreholes. Visual inspections will need to be supplemented with a radiation survey measuring µrem/hour and soil radium-226 activity to confirm visual determinations. In addition, a perimeter radiation survey measuring µrem/hour and soil radium-226 activity will be needed to show that areal boundaries have been identified.

Material will be characterized to determine leachability. The leach test used should be a synthetic precipitation leaching procedure (SW 846 now has a description of such a procedure) rather than a TCLP. If material leaches above a level that could be indicative of groundwater contamination, groundwater data from downgradient wells shall be reviewed to determine whether the areas are impacting the groundwater. If EPA and ODEQ determine that there are no appropriate groundwater wells in the vicinity, new wells will be required.

4.5.2 Groundwater Control

For the Sand Unloading Area, groundwater sampling shall be conducted to determine whether or not buried material is having an impact on the groundwater. If evidence indicates that contamination from this area is impacting the groundwater, other measures such as impermeable capping or excavation shall be evaluated and implemented to prevent additional groundwater contamination. In addition, groundwater extraction will be implemented in any effected areas if contamination meets the Groundwater ROD criteria for active remediation of "hot spots" (areas where groundwater exceeds the 10^{-4} industrial risk level).

For the rest of the site, the requirements for Environmental Evaluations outlined in the Groundwater ROD apply. The requirements are "to determine whether there have been releases of contamination into the groundwater beneath [onsite structures and pavement]. Potential releases of contamination from previously uninvestigated areas could impede the ability of selected remedial actions to achieve the established cleanup levels."

4.5.3 Record Keeping Requirements

The soil ROD requires the following:

Remedy Section 10 page 81. Requirement that information on areas of subsurface PCB and radionuclides contamination which do not pose a risk if they are not disturbed, be incorporated into the [Wah Chang] facility's maintenance plan, and be made available to future Site purchasers.

This requirement is extended to cover all: 1) areas of the site with GEM currently known or discovered in the future to exceed 20 µrem/hour above background as measured or calculated without the overburden regardless of the size of the area, 2) areas with radium-226 concentrations exceeding 3 pCi/gram.

Wah Chang shall maintain a site inventory and map of locations where excavations took place, areas where radioactive material was found, and areas where it appears such material has been left in place. Areas which are not actively remediated or where material which exceeds the cleanup standards remains in place after excavation shall be appropriately decommissioned at plant closure. Information in the inventory shall include at a minimum:

1. Location of material, areal extent, both vertical and lateral.
2. Type of material excavated.
3. Soil radium concentration of material removed.
4. Soil radium concentration of material left in place.
5. Gamma emission levels within the excavated area prior to and after backfilling.
6. Remediated areas need to be demarcated as well since this information will be needed for decommissioning under OHD.

The Wah Chang plan for preparation and updating the site inventory and map shall be submitted to EPA and ODEQ for approval. Inventory information shall be submitted to the agencies on a biannual basis with the Environmental Evaluations.

4.5.4 Excavation Management Requirements

The following excavation requirements apply to excavations performed on the site in all areas.

1. For future excavations on the site, when GEM is encountered, such material shall be excavated as necessary so that, prior to backfilling, it meets the 20 µrem/hour above background standard either averaged over 100 square meters, or averaged over the footprint of the excavation, whichever is smaller. Averaging of gamma data may not use non excavated areas to "lower" the average gamma emission of the area containing GEM.

2. When an area is excavated, at a minimum, GEM exceeding 20 µrem/hour above background must be removed within the footprint of the excavation.

3. GEM left in place must be managed according to the requirements of the ROD and this ESD.

4. GEM shall be managed appropriately either as industrial waste, or as radioactive waste. Excavated material shall be disposed of only at a landfill permitted to receive such waste - either industrial waste landfill, or a landfill permitted for low level radioactive NORM waste.

5. Once excavated, material which exceeds 3 pCi/gram radium-226 or which could cause unshielded gamma levels above 20 µrem/hour above background may not be re-disposed on the site. Material with radium-226 concentrations greater than 3 pCi/gram could exceed the radium action level requiring radon resistant construction in future buildings. As discussed in Section 4.2.2.3, 4.2.2.4 and 4.6.2, this concentration of radium-226 could exceed the EPA recommended action level, risk-based levels and/or promulgated standards in place at the time cleanup. Therefore, additional action may be required during decommissioning. Because Wah Chang has an active radiation management program, EPA considers this to be protective prior to decommissioning.

4.5.5 Radon Controls

The ROD outlined areas where radon restrictions were required. These restrictions were based on the results of soil radium sampling performed during the RI/FS. The site radon controls now apply site-wide where radon could exceed 4 pCi/liter in future buildings. Because modeling for radon was based on buildings of a particular size which may not equate to the actual on-site structures, additional modeling approved by EPA and ODEQ may be conducted.

4.5.6 Long term maintenance of the modified remedy

Long term maintenance of the modified remedy applies to all areas currently known to contain GEM and such areas discovered at a later date. Any areas where GEM is covered by overburden, capped, or currently covered by structures or paving shall be maintained to ensure that gamma levels remain below 20 µrem/hour over background. Where the overburden is no longer protective, excavation or capping must be done as described in Section 4.5.4. Areas may need to be recapped, paved, or the covering repaired as needed, until decommissioning. Groundwater monitoring may be required (based on leachability of the material), and new wells required to characterize the extent of groundwater contamination in these areas. If the groundwater is found to be contaminated with radium-226 above 5 pCi/liter (the current MCL) or other level required by EPA and ODEQ, remedy modifications (such as groundwater treatment, different capping materials, excavation of material) may also be required.

4.5.7 Institutional controls

Wah Chang, the property owner (and any subsequent owner), is responsible for implementing the required institutional controls to ensure the protectiveness of the remedy. The institutional controls identified below form a component of the remedy provided in the Soils ROD and are applicable to the areas of the site covered by this ESD:

1. For areas of the Site where modeling indicates that radon concentrations in buildings could exceed 4 pCi/liter, institutional controls requiring that buildings be constructed using radon resistant construction methods.

2. Institutional controls requiring that land use remain consistent with current industrial zoning.

3. Requirement that information on areas of subsurface PCB and radionuclide contamination which do not pose a risk if they are not disturbed, be incorporated into the Wah Chang facilities maintenance plan, and be made available to future Site purchasers and regulatory agencies.

4. Excavated material must be properly handled and disposed of in accordance with Federal and State laws.

4.6 Change #4: Excavation and either berming or offsite disposal is deemed an acceptable alternative for the Soil Amendment Area, if institutional controls cannot be implemented

GEM present in soil in the Soil Amendment Area may be excavated to an EPA approved radium-226 concentration and either used in berms or disposed of in an EPA approved off-site landfill. If soil is bermed, building construction would not be allowed on the berms, and the berms would need to be capped or covered to minimize erosion and dust emissions. Long term maintenance of the berms would be required. If soil is excavated to approved levels and disposed off site, there would be no further radon restrictions on the property. In excavated areas, buildings may be constructed without radon resistant technology. These changes are a logical outgrowth of the selected remedy and the alternatives considered in the ROD. These changes evolved during the remedial design process as more information was developed on the nature of property controls requirements, and on excavation options to eliminate the need for these controls.

4.6.1 ROD Requirement

Buildings on the Soil Amendment Area must be constructed using radon controlling construction methods. The requirements would be embodied in zoning, institutional controls, building codes, deed restrictions, or deed notices.

4.6.2 Explanation of Change #4

If protective property controls and monitoring criteria cannot be developed for the Soil Amendment Area, then the selected institutional controls remedy for the Soil Amendment Area will not be implementable. In that case, two other alternatives examined in the ROD, excavation and berming of the excavated soil, and excavation and disposal of the excavated soil in an off-site landfill, are considered implementable remedial alternatives.

The Soils ROD provides an option that contaminated material in the Soil Amendment Area might be excavated and used to construct landscaping berms. The Soils ROD considered the excavation and disposal option not to be cost effective when compared with the selected remedy of implementation of property controls. However, if property controls cannot be implemented or are not sufficiently protective, then this ESD provides EPA's acceptance of both excavation and berming and excavation and disposal in an off-site landfill as viable alternatives. The property owner of the Soil Amendment Area may request approval from EPA to perform one of these alternatives (excavation and berming, or excavation and disposal) rather than implement institutional controls. If requested by the property owner, the alternatives are only acceptable if applied to remediation of the entire property. A piecemeal approach, institutional controls on some properties, excavation on others, will not be approved.

Excavation must be done to a radium-226 level which EPA and ODEQ determine is protective. If excavation is done, the radon cleanup goal described in Section 4.2.2.3 applies. The risk from radon in future buildings must not exceed an excess cancer risk of $1x10^{-4}$. As previously stated, it is EPA's policy that when the action level is exceeded, remediation is taken to reduce risks to the cleanup goal, not just to the action level.

Excavation would be required to levels statistically indistinguishable from background to ensure that radium-226 is sufficiently remediated to a level where the radon cleanup goal will be met. The residual radium-226 level needs to be statistically indistinguishable from background for two reasons: 1) modeling results indicate that approximately 0.3 pCi/gram radium-226 equates to the $1x10^{-4}$ risk level; this concentration is approximately 25% of the background radium-226 concentration and may not differentiable from background levels analytically, and 2) because buildings can preferentially accumulate radon, a small area of radium-226 concentration above background can result in an unacceptable risk in the building.

4.6.3 Basis for Change #4

This change to allow for excavation provides implementable alternatives which would allow construction of buildings without radon controls. In the ROD, Alternative 4c included excavation of the Soil Amendment Area to background levels. This was the only alternative that did not require operation and maintenance, and did not require radon-resistant building construction. Because this alternative was cost prohibitive when compared to the estimated cost of property controls, it was not selected as the preferred alternative in the ROD. Excavation with soil berming

was mentioned in the ROD. EPA considers this to be a protective remedy, and since the soil is disposed on the site, it would be more cost effective than off-site disposal. If controls cannot be implemented or are not protective, the excavation option (either excavation and berming or excavation and disposal) will be acceptable.

5 REMEDIAL ACTION OBJECTIVES

These modifications to the remedy are within the scope of the original Remedial Action Objectives (RAOs) developed for the site. Original site RAOs for soil are as follows:

1. Reduce the exposure to radon that would occur in future buildings constructed on the Main Plant and the Soil Amendment Area. Reduce surface gamma radiation exposure to acceptable levels (based on current risk assumptions, this level is 20 µrem/hour above background.)

2. Ensure that areas, where surface and subsurface chemical risks are acceptable based on industrial or agricultural use, are not used for other purposes, and that proper handling and disposal of soil occurs when it is disturbed.

3. Provide easily accessible information on the locations of the material for TWCA plant workers, future Site purchasers, or regulatory agencies, where there are areas with subsurface contamination. This includes the PCB contamination in the Fabrication Area, and the residual radionuclide contamination in the Fabrication Area and Extraction Area.

6 FIVE-YEAR REVIEW REQUIREMENTS

The following activities for gamma radiation will need to be performed as part of subsequent 5-year reviews. The next 5-year review is scheduled for 2002.

1. Review Wah Chang's radiation safety program to ensure that post excavation gamma levels are being met.

2. If the EPA has not previously been informed, determine if facility closure has occurred or is planned, and if so, verify that any required/planned closure procedures are protective. Review closure reports prepared for Oregon Health Division and the Energy Facility Siting Counsel to ensure that closure has left, or will leave the site within EPA's acceptable risk range.

3. Review excavation records to ensure that excavation requirements are being met.

4. Review groundwater data to determine whether the groundwater is being impacted by radium-226 contamination.

5. Determine whether the remedy is still protective.

6. Determine effectiveness of Radon Controls.

7. STATUTORY DETERMINATIONS

Considering the new information that has been developed and the changes that have been made to the selected remedy, the EPA has determined that the modified remedy remains protective of human health and the environment, complies with federal and state requirements that were identified in the ROD as applicable, or relevant and appropriate to this remedial action at the time the original ROD was signed, and is cost effective.

8. SUPPORT AGENCY COMMENTS

Consistent with EPA guidance, the Oregon Department of Environmental Quality (ODEQ) reviewed the ESD. Suggested changes were incorporated into the text. ODEQ supports this action and the implementation of the changes to the Record of Decision.

Michael F. Gearheard, Director for
Office of Environmental Cleanup

9/28/01
Date