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				Alternatives Evaluation for				
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7. Abstract

This document describes the scope of Radiation Area Remedial Action activities for several different sites. These activities are planned for fiscal year 1994.

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INTERIM STABILIZATION PLAN AND ALTERNATIVES EVALUATION FOR 216-T-4-1, 218-E-12A, 216-U-8, 218-W-8, AND 216-E-7

D. L. Smith

July 1993

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CONTENTS

INTERIM STABILIZATION PLAN AND ALTERNATIVES EVALUATION FOR 216-T-4-1, 218-E-12A, 216-U-8, 218-W-8, and 216-E-7

1. PURPOSE

This document describes actions designed to provide interim stabilization of radioactive surface contamination associated with 216-T-4-1, 218-E-12A, 216-U-8, UN-216-W-41, 218-W-8, and 218-E-7.

These sites are scheduled for corrective action based partially on their relative rankings in WHC-EP-0489-2, *Hanford Site Surface Soil Radioactive Contamination Control Plan* (WHC 1993a), and WHC-SP-0665-8, *Quarterly Environmental Radiological Survey Summary First Quarter 1993 100, 200, 300, and 600 Areas* (WHC 1993b).

2. SITE DESCRIPTIONS

2.1. 216-T-4-1 POND SYSTEM

The 216-T-4-1 ditch and pond system is located in the north central portion of the 200 West Area, just north and west of the 241-T Tank Farm. It was active from 1944 to 1972. In 1973, the ditch was interim stabilized, and the pond bottom was scraped. Contaminated soil was placed in trench 27 of the 218-W-2A burial ground, located immediately south of the pond. The pond bottom was decontaminated to 400 counts per minute (cpm). The site was subsequently posted for surface contamination at a later date. It has also been noted that the pond bottom and the nearby trench 27 are incorrectly identified in the field. Concrete identification post were placed across trench 27. The result is that a portion of trench 27 is included in the interim stabilization plan.

2.2. 216-U-8 AND UN-216-W-41

The 216-U-8 crib is located south of U Plant in the 200 West Area. The 216-U-8 crib was active from 1952 to 1960. The crib consist of three wooden structures in series. The site has a history of subsidence.

UN-216-W-41 is a surface contaminated area located immediately east of the 216-U-8 crib. The zone extends north towards U Plant and covers approximately 3 acres. Because of the proximity of UN-216-W-41 to 216-U-8, both sites will be worked as one job. Spoils from UN-216-W-41 will be consolidated on the 216-U-8 crib.

2.3. 218-E-12

The 218-E-12A burial ground is located in the northeast portion of the 200 East Area. The site covers approximately 25 acres. This burial ground was interim stabilized in 1978. A number of different stabilization techniques were used at this burial ground (RHO 1980). Over the past several years, incidence of contaminated Russian thistle have been increasing. During the spring of 1993, the number of contaminated Russian thistle growing on the site increased markedly. Decontamination efforts were unsuccessful, which lead to the whole site being posted as surface contaminated.

2.4. 218-W-8 AND 218-E-7

Both of these facilities are nearly identical structures. 218-W-8 was associated with the 222-T laboratory, while the 218-E-7 was associated with the 222-B laboratory. Each waste site consists of two concrete culverts set on end and one 12-foot deep by 10-feet square wooden vault. Both sites were active in the late 1940s and early 1950s. 218-W-8 has a history of subsidence.

3. OBJECTIVE AND CONSTRAINT

The primary objective of interim stabilization is to bring inactive waste disposal facilities into compliance with the requirements of WHC-CM-7-5, *Environmental Compliance* (WHC 1988), and subsequently maintain it in that condition until the final remediation strategy is implemented. Based on the requirements of WHC-CM-7-5, Section 6.0, "Restoration and Remediation," Subsection 6.3, 'Inactive Waste Sites,' 216-T-4-1, 216-U-8, and 218-E-12B do not have an adequate barrier over the contamination to prevent migration, and the contamination of the soil surface is higher than allowed.

The main constraint which must be considered is that the interim stabilization should not, to the extent possible, eliminate any reasonable alternatives for the final remediation of the site.

4. SITE PREPARATION AND INTERIM STABILIZATION ACTIVITIES

The interim stabilization activities for inactive waste sites are described below. They consist of two phases which are the site preparation, and consolidation and stabilization.

4.1. SITE PREPARATION

4.1.1. 216-T-4-1 Pond System

Site preparation will include removal of the misplaced underground marker post, civil surveys, and radiological surveys as required. Any debris found at the job site will also be evaluated for removal.

4.1.2. 216-U-8 and UN-216-W-41

Site preparation will include civil and radiological surveys, and debris removal. Some underground concrete marker post may also be replaced.

4.1.3. 218-E-12A

Site preparation will limited at this site because it has bee previously stabilized. It will be mainly limited to removal of concrete identification post, and civil surveys. Some areas may be evaluated to determine weak points of the previous stabilization effort.

4.1.4. 218-E-7 and 218-W-8

Site preparation will mainly include the removal of the disposal chute located over one of the culverts at 218-W-8. Debris removal and radiological surveys will occur at both sites.

4.2. CONSOLIDATION AND INTERIM STABILIZATION

Stabilization activities associated with each area will be discussed separately.

4.2.1. 216-T-4-1 Pond System

The 216-T-4-1 (backfilled) and the 216-T-4-2 (active) are contained in the same surface contamination zone. Consequently, only the 216-T-4-1 will be downposted from surface contamination status. This will be accomplished by either interim stabilizing the surface of the ditch and surrounding area (excluding the active 216-T-4-2), or by decontaminating the area. If decontamination is chosen, the soil will be consolidated in the 216-T-4-1 pond area.

The 216-T-4-1 pond will be interim stabilized with 18 to 24 inches of uncontaminated backfill.

4.2.2. 216-U-8 and UN-216-W-41

Contaminated soil from UN-216-W-41 will be removed and consolidated on the 216-U-8 crib. Soil will be removed for a depth of approximately 3 to 6 inches initially. Greater amounts of soil will be removed if needed to decontaminate the area. Contaminated soil will be interim stabilized with 18 to 24 inches of clean soil. The resulting spoil pile will be approximately 4 feet high, and be as wide as the crib.

4.2.3. 218-E-12A

There will be no consolidation at this site. The entire burial ground will be interim stabilized with 18 to 24 inches of uncontaminated backfill.

4.2.4. 218-W-8 and 218-E-7

There will be a small amount of consolidation at 218-W-8 and little or no consolidation at 218-E-7. The wooden structures, at a minimum, may be covered with a precast concrete pad or similar.

5. INTERIM STABILIZATION AND CONSOLIDATION ALTERNATIVES

This section provides a comparison of several alternative methods for interim stabilization and consolidation.

5.1. CRITERIA FOR COMPARISON

To be considered a viable candidate method for interim stabilization, the primary test to be met is availability. Many technologies could be considered for application to various remediation problems at Hanford. The majority have not yet been tested or fully evaluated for applicability as interim stabilization methods. Since the time needed to accomplish this would preclude timely interim stabilization, they have not been considered as viable. For the comparison here, the methods are currently available.

Based on availability, four methods were selected for comparison. They are:

- Consolidation of surface contamination, and stabilizing with soil or rock cover
- Removal of contaminated surface soil and burial as low-level radioactive waste
- Application of a soil fixative
- Application of shotcrete over a biobarrier.

All four methods have been used at Hanford. Section 3 identified the objectives and constraint for interim stabilization. These are the prime criteria. Secondary criteria that need to be considered are described below.

- Manual Compliance. Does the method provide an adequate barrier between the contamination and the environment to prevent migration by wind, water, or vegetation uptake? Does the method render the radioactivity in the surface soil less than detectable with a field instrument and less than specified in WHC-CM-7-5, Section 6.0, "Restoraton and Remediation."

- Cost. What is the total estimated cost? Is the method affordable? Some methods may be affordable for small sites but not for large sites.

- Durability. Will the method hold up to weather and require surveillance and maintenance activities until the final remediation is implemented?

- Level of Maintenance. What type of maintenance does the treatment require to keep it functional?

- Remedial Investigation/Feasibility Study Impact. Will the method have an adverse impact on future Remedial Investigation (RI)/ Feasibility Study (FS) activities at the site?

- Potential Side Effects. Are there any potential side effects which may cause problems in the future?

- Impact on Final Remediation Alternative. What impacts will the interim stabilization method have on the potential final remediation methods in terms of cost, processes or increasing waste volumes?

5.2. EXPECTED PERFORMANCE TO CRITERIA

5.2.1. Consolidation and Soil (or Rock) Cover

This method has already demonstrated its ability to meet the barrier and surface contamination requirements. It is estimated that the cost for this alternative is $\$0.63/ft^2$. This figure varies according to operational efficiency, with large areas being the most economical. This cost is used because it is generally representative of cost incurred. The durability of soil and rock cover is very good. It is not damaged by vehicles which perform routine surveillance nor the trucks or spray rigs which may be needed for maintenance. Normally, the only maintenance required is the periodic application of herbicide. No impact is expected to future RI/FS activities. Sites that are surface contaminated are interim stabilized with soil prior to beginning RI/FS activities. No side effects are expected. Consolidation and stabilization would have a minimal effect on final remediation alternatives of multimedia caps, in situ grouting or stabilization, or in situ vitrification of soil. It will have a impact if excavation and soil treatment is chosen. While processes such as soil washing and ex situ stabilization would not be impacted, a volume increase does occur during interim stabilization activities. Volume increases are directly related to the size of the consolidation pile, and the depth below the consolidation pile that is contaminated.

5.2.1.1. 216-T-1 Pond System

Uncontaminated soil would be used to interim stabilize the pond and potentially the ditch. Total area that would be interim stabilized is approximately 3 acres. This equates to a cost of $82,330.

5.2.1.2. 216-U-8 and UN-216-W-41

Contaminated soil would be scraped and consolidated. Total acreage involved is approximately 3.5 acres. This equates to a cost of $96,050.

5.2.1.3. 218-E-12A

Uncontaminated soil would be used to interim stabilize their burial ground. Total area involved is approximately 25 acres. This equates to a cost of $686,000.

5.2.1.4. 218-W-8 and 218-E-7

Soil cover would cost approximately $7,000. Total area involved would approximately a quarter acre for each vault.

5.2.2. Removal and Burial

This method is routinely used and has been effective in achieving manual compliance. Since the surface contamination is removed from the site, no barrier is needed and the soil remaining meets the standards. This is the most expensive alternative due to the high cost of waste disposal ($33/ft^3 for low-level radioactive waste). This alternative is not viable for large sites due to the cost of burial. As with interim stabilization, this alternative is very durable and only routine herbicide application should be needed. No impact is expected to future RI/FS activities. No side effects are expected since the surface is in the same physical state that occurs naturally. This alternative is the least disruptive of all four on future remediation. No impacts are foreseen.

5.2.2.1. 216-T-4-1 Pond System

Removal and burial may be technically feasible, but the high cost of burial makes it unrealistic. Approximately 6 inches of soil could be removed from the surface of the site and taken to the burial grounds. This would cost $2,156,220. This also assumes that all the contamination in the pond area and ditch can be removed with 6 inches of soil.

5.2.2.2. 216-U-8 and UN-216-W-41

Removal and burial of surface contamination at 216-U-8 would allow the site to be downposted to underground radioactive material. This assumes that the surface contamination is removable, and did not result from operational overflows at the crib. Surface contamination removal and burial at UN-216-W-41 (approximately 3.5 acres) would cost $2,515,590 assuming that all the contamination could be removed in 6 inches of soil.

5.2.2.3. 218-E-12A

Removal and burial at this site is not feasible at this time. This is because over 2 feet of soil has already been used to interim stabilize this site previously. This soil covered contaminated soils at the burial ground. In reality, if removal and burial were pursued at this site, not only would the soil have to be removed, but all of the solid waste as well. Cost associated with this could easily exceed $25 million.

5.2.2.4. 218-E-7 and 218-W-8

Removal and burial at this site would entail the removal of the vaults and their contents. It may be possible to remove contaminated surface soils from the surface of the vault. The burial cost associated with this would be $179,685.

5.2.3. Fixative

Fixative application has not been demonstrated to provide an adequate barrier to migration. It would also not change the contamination levels in the soil surface, and therefore not meet the surface contamination standards. The cost for use of the fixative is very low at $0.10/ft^2. Past experience with fixatives has shown that they are very susceptible to damage by vehicles. It is expected that periodic herbicide application may be necessary. In fact, it appears that vegetation grows best where fixatives have been applied. The use of fixatives would have no impact on future RI/FS activities. Fixatives will result in some loss of permeability of the soil. This could result in run-off accumulations in undesirable locations. In the long term, fixatives would have probably little or no effect on final remediation alternatives of multimedia caps, in situ grouting or stabilization, or in situ vitrification of soil. It may have a impact if excavation and soil treatment is chosen, especially with regards to soil washing. Additional process steps may be required to remove the fixative from the contaminated soil.

5.2.3.1. 216-T-4-1 Pond System

Fixative application would incur a cost of $13,068 for the contaminated area surrounding the vault.

5.2.3.2. 216-U-8 and UN-216-W-41

Assuming that a fixative could be used over the entire area, a cost of approximately $15,000 would be incurred.

5.2.3.3. 218-E-12A

Fixative application would incur a cost of $109,000.

5.2.3.4. 218-W-8 and 218-E-7

Fixative application would incur a cost of approximately $2,000 for each site.

5.2.4. Shotcrete Over a Biobarrier Cloth

This method would meet both the barrier and surface contamination criteria. It is moderately expensive at about $2.40/ft^2. Shotcrete is expected to be durable and the level of maintenance low. The thick, hard cover over the site may impact on RI/FS sampling, but some form of interim stabilization would be required prior to initiating RI/FS activities. Because it is impermeable, shotcrete could have the side effect of run-off accumulations in undesirable locations. Shotcrete application may have minimal effects on the final remediation alternatives of multimedia caps,

in situ grouting or stabilization, or in situ vitrification of soil. It may have a impact if excavation and soil treatment is chosen. Additional process steps may be required to process the thick hard shotcrete layer.

5.2.4.1. 216-T-4-1 Pond System

Shotcrete application would incur a cost of approximately $314,000.

5.2.4.2. 216-U-8 and UN-216-W-41

Shotcrete application would cost approximately $366,000.

5.2.4.3. 218-E-12A

A shotcrete cover over the entire burial ground would cost approximately $2,614,000.

5.2.4.4. 218-W-8 and 218-E-7

A shotcrete cover over the site would cost approximately $52,000.

6. CONCLUSIONS

Based on the above discussions and engineering judgement the following conclusion were obtained.

6.1. 216-T-4-1 POND SYSTEM

Because this area was a liquid waste facility, it may not be possible to decontaminate the area. If this is the case, the area will be interim stabilized with uncontaminated soil and be revegetated. If the area can be decontaminated, the contaminated spoils will be consolidated in a smaller portion of the pond or on trench 27 of the 218-W-2A burial ground. Because of the large volumes of soil and postulated future activities at the site, removal and burial is not a option. Fixative application is also not an option because it would not prevent migration of radionuclides of the site over the long term. Shotcrete is not an option due to the large area requiring a cover, and the high cost of the cover.

6.2. 216-U-8 AND UN-216-W-41

The best option at this site is to consolidate contaminated soils from UN-216-W-41 on the surface of the 216-U-8 crib. Removal and burial of soil from this area would be expensive, and would not address the contamination in the crib itself. If that level of money were spent on this job, it should address the crib. Fixative application would not allow the area to be downposted, nor allow for maximum zone reduction. Shotcrete application would be expensive, and would also not allow for maximum zone reduction. A combination of consolidation and fixative or shotcrete would also fail to meet contamination control or cost criteria.

6.3. 218-E-12A

Interim stabilization of this site with uncontaminated solid the best option. No consolidation is possible at this site. Removal and burial is not feasible because it is likely that several feet of contaminated overburden exist over the buried waste. Any attempt to remove this overburden may expose contaminated solid waste. Activities of this nature would cease to be maintenance and would become remediation. A fixative would not provide for long term contamination reduction. A shotcrete cover would be unnecessarily expensive.

6.4. 218-W-8 AND 218-E-7

Because of the potential cave-in problems at both of these sites, it is prudent to consider a self-supporting barrier, as soil or rock cover would collapse if a cave-in occurred, potentially releasing contamination. This is unacceptable due to the proximity of occupied buildings. Similarly, a fixative or shotcrete cover would not be sufficient for long-term contamination control, and prevention of contamination spread resulting from a cave in. Some consolidation in conjunction with covering both sites with a precast concrete slab would solve all problems. The slab could be lifted into place easily, and removed at a latter date if required for characterization and remediation. The slab will also maintain its structural integrity if the underlying vault begins to fail. This is necessary for several reasons. First, the vaults are located near occupied buildings. Second, the wooden vaults are serious cave in concerns. There may be enough void space in the vaults to allow a significant cave-in. Finally, the vaults are shallow and contain respectable waste inventories. A concrete pad will minimize the possibility that contamination will escape if a cave-in occurs.

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