# RECORD OF DECISION FOR THE MELTON VALLEY WATERSHED, OAK RIDGE NATIONAL LABORATORY, OAK RIDGE TENNESSEE FROM DECISION DOCUMENT APPROVAL TO PLANNING FOR IMPLEMENTATION[a]

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## ABSTRACT

Much planning was required and undertaken by Bechtel Jacobs Company LLC (BJC) teamed with the Department of Energy (DOE) to prepare for the implementation of a Comprehensive Environmental Response, Compensation, and Liability Act remedial decision encompassing in excess of 200 contaminated sites in the Melton Valley near Oak Ridge, Tennessee. Remedial actions to be implemented include the installation of approximately 150 acres of caps, acres of contaminated soil excavation, decontamination or demolition of numerous contaminated structures, in-situ grouting, in-situ vitrification, water treatment facilities; in all, this remediation effort is estimated to cost in excess of $250 million. The Melton Valley watershed is identified as an area of more than 1062 acres throughout which numerous contaminated sites, ranging in size from 10's of square feet to more than 40 acres, are located. Included within these waste units are three major radioactive and mixed waste burial grounds, numerous auger holes that were used for the disposal of radioactive waste, seven seepage pits and trenches, nine impoundments, and two deep hydrofracture liquid radioactive waste injection wells. Interspersed throughout the valley are more than 1000 monitoring wells requiring remediation and numerous low-level-liquid waste pipelines and areas of surface contamination. Primary contaminants in Melton Valley include radionuclides (short- and long-lived), metals, and organic compounds (e.g., volatile organic compounds and polychlorinated biphenyls) in waste, soil, groundwater, surface water, sediment, and biota. Migration from shallow groundwater to surface water is the principal exit pathway from contaminant source areas in Melton Valley.

The Decision Document Remedial Action Objective was designed with 'source control' as a primary objective. The remedial decision covers over 200 individual primary waste sites; however, some elements are not within the scope of this decision (i.e., long-term stewardship, White Oak Creek and White Oak Lake). Due to the size and complexity of the decisions being made, approval of the ***Record of Decision for Interim Actions for the Melton Valley Watershed at the Oak Ridge National Laboratory, Oak Ridge, Tennessee*** comprised an extensive five-year team effort involving DOE, the U.S. Environmental Protection Agency, Tennessee Department of Environment and Conservation, the public, and BJC representatives inclusive.

A massive effort was undertaken to plan for the implementation of this sizeable and complex remedial action. Prioritization of remedial actions was primarily based upon risk. Additionally, grouping of like projects was instrumental in realizing implementation efficiencies. Successful completion of this baselining/sequencing effort is credited to the combined efforts of the staff of the ORNL Project Team, including DOE representatives. This effective planning is expected to

result in the efficient, cost-effective, and timely implementation of remedial actions in Melton Valley.

## BACKGROUND/SITE DESCRIPTION

The 34,516-acre Oak Ridge Reservation (ORR) is located within and adjacent to the corporate city limits of Oak Ridge, Tennessee, in Roane and Anderson counties. The ORR is located approximately 12.5 miles west-northwest of Knoxville, and is bounded to the east, south, and west by the Clinch River (Melton Hill and Watts Bar) and on the north by the developed portion of the city of Oak Ridge. ORR hosts three major industrial research and production facilities originally constructed as part of the World War II-era Manhattan Project: East Tennessee Technology Park (formerly the K-25 Site), Oak Ridge National Laboratory (ORNL), and the Y-12 National Security Complex (formerly the Oak Ridge Y-12 Plant).

The Melton Valley watershed, situated just south of ORNL, encompasses approximately 1062 acres. ORNL historic missions—plutonium production during World War II and nuclear technology development during the postwar era—produced a diverse legacy of contaminated inactive facilities, research areas, and waste disposal areas in Melton Valley. From 1955 to 1963, ORNL's solid waste areas were designated by the Atomic Energy Commission as the Southern Regional Burial Ground. During this period, ORNL served as a major disposal site for wastes from over 50 off-site government-sponsored installations, research institutions, and other isotope users. Contaminants present in Melton Valley include radionuclides (short- and long-lived), metals, and volatile organic compounds (VOCs) in waste, soil, groundwater, surface water, sediment, and biota. Migration from shallow groundwater to surface water is the principal exit pathway from contaminant source areas in Melton Valley. Figure 1 shows the locations of principal contaminated areas in the Melton Valley watershed.

### Buried Solid Low-Level Waste

Shallow land burial was used routinely at ORNL for disposal of solid low-level waste (LLW) from 1943 to 1986, when improved disposal technologies were implemented. The principal waste burial sites in Melton Valley are Solid Waste Storage Areas (SWSAs) 4, 5, and 6. Early burial procedures used unlined trenches and auger holes covered by either soil from the trench excavation or a combination of concrete caps and soil.

### Landfills

On-site landfills were used for disposal of bulky solid waste that was not considered LLW. Landfills usually contain construction debris and used equipment that was placed in large excavations or ravines. These excavations were then backfilled with the excavated soil. Landfills in Melton Valley include the SWSA 5 NW Landfill, SWSA 5 NE Landfill, SWSA 5 Dump Area, and the Contractors Spoil Area.

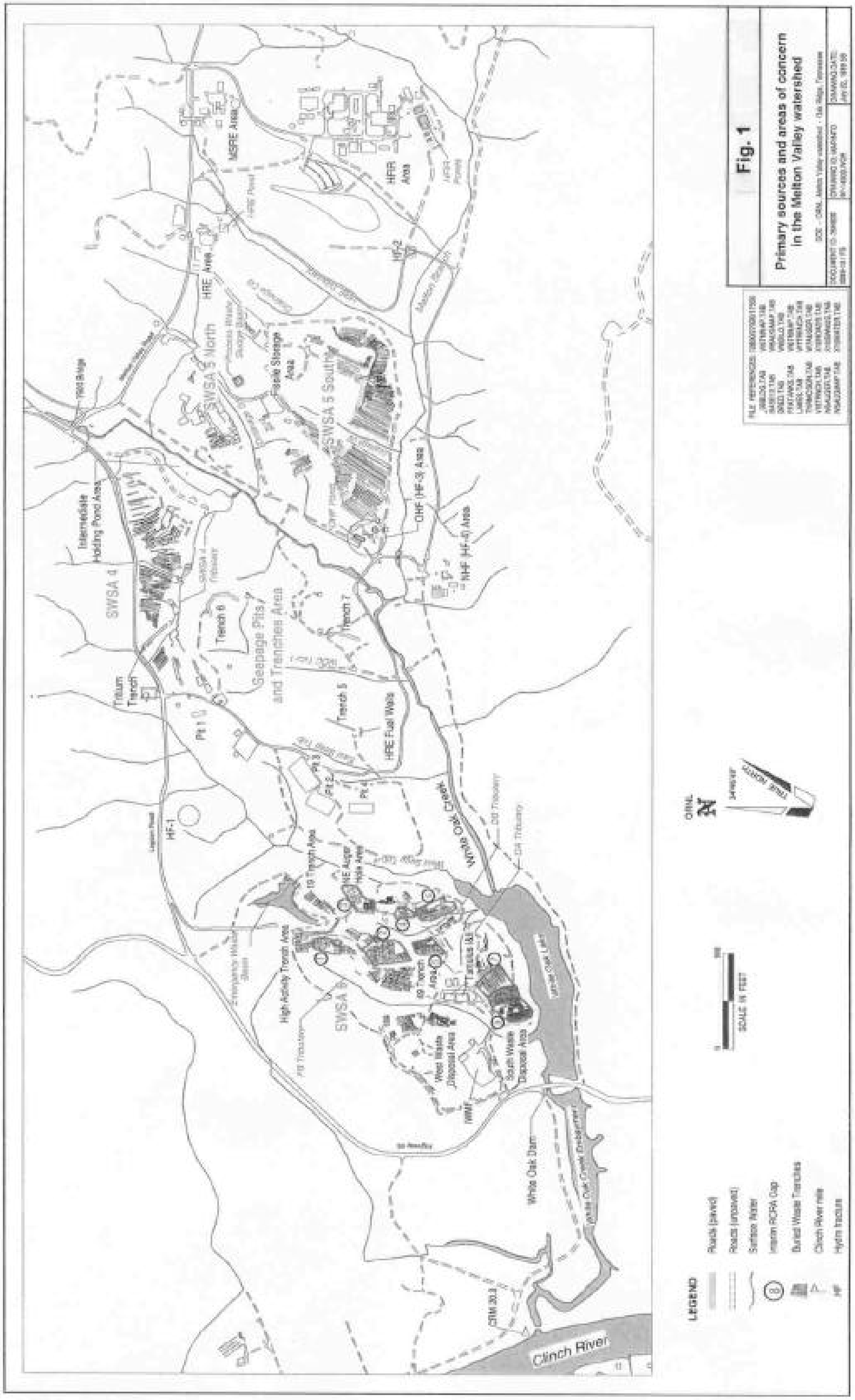


Fig. 1

Primary sources and areas of concern in the Melton Valley watershed

## Tanks

During the early years of ORNL operation, liquid low-level (radioactive) waste (LLLW) produced by ORNL was concentrated and stored in underground storage tanks constructed of concrete (Gunite) or steel. As programs were terminated, some tanks were abandoned in place with liquid waste and sludge left in them. All of the Melton Valley tanks are made of steel. Some of these tanks have neither cathodic protection to prevent corrosion nor secondary containment to capture possible leaks.

## Impoundments

Several impoundments were created in Melton Valley to store wastewater and provide additional settling and storage capacity for LLLW. Impoundments in the Melton Valley watershed include Old Hydrofracture (OHF) Pond, Homogeneous Reactor Experiment (HRE) Pond, Process Waste Sludge Basin (PWSB), the Emergency Waste Basin (EWB), High Flux Isotope Reactor (HFIR) Waste Collection Basins, and the HFIR Cooling Tower Surface Impoundment. These impoundments were made of natural clays with no liner, except the PWSB, which has a polyvinyl chloride liner. The HRE Pond has been filled and capped with asphalt and has been cryogenically isolated in a technology demonstration.

## Seepage Pits and Trenches

In Melton Valley during the early 1950s, chemically treated LLLW was disposed of in large seepage pits and trenches excavated in low-permeability soil. As intended, LLLW seeped into the surrounding clay soil. This clay soil acted as a sorption agent for some radionuclides contained within the waste. Seven seepage pits and trenches were used from 1951 to 1966 until the hydrofracture method of liquid waste disposal became operational.

## Hydrofracture Wells

Four hydrofracture well injection sites are located in Melton Valley. Two were used for experimental purposes. The OHF and the New Hydrofracture Facility (NHF) were used for waste disposal. In the hydrofracture waste disposal process, a waste/grout slurry was pumped into the hydraulically fractured bedrock 800–1000 ft below ground and allowed to harden. The waste and cement mixture spread in thin layers between the nearly horizontal bedrock strata for distances of several hundred feet. Most of the approximately 1.5 million Ci of radioactive waste consisted of fission products such as $^{137}$Cs and $^{90}$Sr, although approximately 2000 Ci of long-lived radionuclides in waste sludges were disposed in the NHF grout sheets. The cement in the grout mixture hardened to contain waste sludges and most of the liquid in a solid form. During operations, dozens of wells ranging in depth from approximately 600–1000 ft deep were installed to monitor performance of the hydrofracture process. Unless properly plugged and abandoned, these wells are potential pathways for contaminated fluids to migrate from deep groundwater to shallower groundwater zones.

## Buried Pipelines

The LLLW system includes a complex series of buried waste pipelines used to transport radioactive liquid waste from generator facilities to storage tanks and seepage pits/trenches or hydrofracture injection sites for disposal. These buried waste pipelines are constructed of various materials, including carbon steel, black iron, and stainless steel.

## Surface Structures

Surface structures were required to support research, waste management, or other operations at ORNL. Facilities that are inactive and have no future use include OHF and NHF surface structures, Molten Salt Reactor Experiment (MSRE) support facilities, and HRE support facilities. In some cases, environmental media (including soil, sediment, groundwater, and surface water) surrounding these surface structures have been impacted by contaminant release.

## Contaminated Soil and Sediment

Radiological and hazardous chemical contamination of soil and sediment occurs in many areas of the Melton Valley watershed. Causes of soil contamination include: spills on the ground surface, LLLW pipeline leaks, surface breakouts of contaminated liquids during operation of seepage pits and trenches, and surface breakouts of water seeping through the waste burial trenches, contaminated floodplain soil and sediment, and contaminated biological material including leaves and animal droppings.

The area of White Oak Creek containing the most highly contaminated floodplain soil is the former Intermediate Holding Pond (IHP) area east of SWSA 4.

# MELTON VALLEY CHARACTERIZATION SUMMARY

Several portions of the Melton Valley watershed contain high inventories of radioactive wastes. Hydrofracture sites alone account for more than 1 million Ci of activity. Other high inventory areas include the Seepage Pits and Trenches Area (400,000 Ci), SWSA 6 (540,000 Ci), SWSA 5 South (34,000 Ci), and SWSA 4 (20,000 Ci). Fission products with half-lives of approximately 30 years or less comprise an estimated 95% of the buried radionuclide waste in Melton Valley. Buried wastes containing long-lived isotopes such as uranium, thorium, plutonium, and americium were disposed of in shallow land burial trenches and auger holes, primarily in SWSA 5 North and portions of SWSA 5 South, SWSA 4, and SWSA 6. Approximately 5% or less of buried radioactive materials is long-lived radionuclides.

Most areas releasing significant quantities of contamination to surface water appear to be associated with perennially inundated shallow land burial trenches. For releases to surface water to occur, wastes must be susceptible to leaching, water must come in contact with wastes, and a pathway to a discharge point to surface water must exist. Most areas associated with the largest contaminant releases to surface water contain waste that is perennially or seasonally inundated with groundwater (i.e., SWSA 5 South, SWSA 4, and HRE). Generally, inundated trenches are located near White Oak Creek, Melton Branch, or one of the tributaries.

Releases of contaminants to surface water in the Melton Valley watershed produce radionuclide concentrations that result in unacceptable risk levels at the confluence of White Oak Creek with the Clinch River and at points upstream in Melton Valley. The principal radionuclides causing unacceptable potential human health risk at White Oak Dam under a residential exposure scenario are $^{3}H$ (48%), $^{90}Sr$ (45%), and $^{137}Cs$ (7%) of the risk.

Radiologically contaminated surface soils are a significant problem in the valley, as shown by human health and ecological risk assessments. Contaminated surface soils that present potential risks to human health occur in contaminant source units, in secondarily contaminated soils along seepage pathways, and in broad floodplain areas. The most common radionuclide present in contaminated surface soils is $^{137}Cs$, although $^{60}Co$ is also present in some areas. Potential ecological risks to terrestrial receptors from exposure to radionuclides in surface soil were also identified.

Hydrofracture wastes and wells are a long-term site management problem. The large quantity of injected waste and the likely deterioration of the deep wells associated with the waste require long-term site management. Although the bedrock permeability is low and the flow rate is very slow at depths where the waste-grout mixture was injected, contaminant migration from the grout sheets into shallow groundwater is a possibility that will require well closure, groundwater monitoring, and long-term institutional controls.

Groundwater exceeds maximum containment levels (MCLs) throughout much of the Melton Valley watershed. A relatively continuous zone of shallow groundwater contamination exists throughout Melton Valley. As presented in the *Remedial Investigation Report for the Melton Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee,* groundwater exceeds Safe Drinking Water Act MCLs in all 14 drainage basins that comprise Melton Valley watershed. Contaminated groundwater originates from source areas (e.g., seepage pits, waste disposal trenches, and lagoons) and typically follows shallow pathways to nearby surface water bodies. Consequently, groundwater is not expected to migrate along deep pathways outside the current zone of groundwater contamination at concentrations exceeding MCLs.

## MELTON VALLEY ROD SELECTED REMEDY

The objective of remedial action in Melton Valley was to address present and potential future threats to human health and the environment posed by disposed waste and contaminated media in the watershed utilizing primarily a source control approach. The remedial decision was made from the watershed perspective to ensure that actions within this geographic area are consistent.

The scope of this Record of Decision (ROD) does not include active facilities in Melton Valley. The two inactive experimental nuclear reactors (i.e., HRE and MSRE) are also not in the scope of the selected remedy; their decommissioning and decontamination (D&D) will be planned in separate CERCLA documents. Five LLW tanks in Melton Valley (ID number 5.16, 8.5, 8.6, 8.7A, and 8.7B in Appendix A) are not included in the scope of this ROD and will be addressed as part of the Bethel Valley decision process. The Bethel Valley portion of the White Oak Creek watershed is the subject of separate CERCLA documentation.

Remedy selection for the following items is not included in this ROD:

- streambed and lakebed sediments (White Oak Lake, embayment, creeks);
- floodplain soil exhibiting radiation < 2500 µR/hour;
- groundwater;
- reactor buildings and associated media up to 2 ft from reactor buildings;
- active units;
- transuranic (TRU)-waste containers located in 23 trenches in SWSA 5 North and KEMA (Keuring van Electrotechnische Materialen) Fuel located in SWSA 6;
- five Melton Valley tanks included in Bethel Valley scope; and
- units located in Melton Valley but outside the Melton Valley watershed area.

Deferred units will be addressed in a future CERCLA decision document; however, land use controls as appropriate are included as part of this selected remedy until a final decision is made.

The selected remedy is not the final remedial decision for Melton Valley but is expected to be consistent with any future remedial decisions for Melton Valley.

## Remedial Action Objective/Anticipated Land Uses

As described above, the major problems identified in Melton Valley are the presence of high inventories of short-half-life radiological waste and lesser quantities of long-half-life radiological wastes, contaminant releases to surface water, and widespread contamination in secondary media. A remedial action objective (RAO) was developed to focus remedial planning to address these environmental problems. This RAO evolved slightly to its present form (Table I) during the process of remedy selection.

Figure 2 shows the approximate boundaries of the three land use endpoints: industrial area, waste management area, and surface water and floodplain area. The recreational scenario identified for the surface water and floodplain area is considered an endpoint because Melton Valley surface waters are classified for recreational use by the state. However, DOE does not reasonably foresee actual recreational use of Melton Valley in the near future. The Melton Valley watershed Feasibility Study evaluated several different alternatives for remediation of the surface water and floodplain area. However, the three Federal Facility Agreement parties [i.e., DOE, U.S. Environmental Protection Agency (EPA), Tennessee Department of Environment and Conservation (TDEC)] agreed to defer remedy selection for floodplain soils with < 2500 µR/hour gamma exposures and for lakebed and streambed sediments until after implementation of source control actions. This remedy addresses water quality but does not fully address fish consumption or sediment/floodplain soil contact or exposure under the recreational scenario. This remedy also protects the hypothetical recreational user through a combination of remedial actions including land use controls.

## Major Components of Selected Remedy

The major components of the selected remedy are identified in Table II. Generally the major components include hydraulic isolation (i.e., multilayer caps, upgradient diversion trenches, and downgradient collection trenches) for the major contaminant source areas in Melton Valley; in-situ vitrification trenches in the Seepage Pits and Trenches Area; removal of the HFIR Waste Collection Basins and the HRE Pond and surrounding contaminated soils; maintenance of cryogenics for the HRE Pond until removal; plugging and abandonment (P&A) of all wells that have no future use, including the hydrofracture injection and monitoring wells; removal or hydraulic isolation of various contaminated surface soils above remediation levels throughout Melton Valley; removal, stabilization, or isolation of inactive waste pipelines as necessary to address contamination; in-situ grouting of the HRE fuel wells in the Seepage Pits and Trenches Area; monitoring to verify the effectiveness of remedial actions and the protection of ecological receptors and to support a future decision for deferred portions of Melton Valley; and utilization of interim land use controls to restrict access to contaminated areas and groundwater.

Table I. RAO for the Melton Valley watershed selected remedy, ORNL, Oak Ridge, Tennessee

| Area/receptor | Goal |
|---|---|
| Waste management area (includes SWSA 4, 5, and 6 and Seepage Pits and Trenches) | • Manage waste disposal sites as a restricted waste management area<br>• Protect maintenance workers<br>• Meet AWQC in surface water in a reasonable amount of time<br>• Mitigate further impact to groundwater |
| Industrial use area (generally the area east of SWSA 5) | • Manage areas generally east of SWSA 5 as an industrial area<br>• Protect industrial workers<br>• Meet AWQC in surface water in a reasonable amount of time<br>• Mitigate further impact to groundwater |
| Surface water and floodplain area | • Achieve numeric and narrative AWQC for waters of the state in a reasonable amount of time<br>• Remediate contaminated floodplain soils to 2500 µR/hour[a]<br>• Protect an off-site resident user of surface water at the confluence of White Oak Creek with the Clinch River from contaminant sources in Melton Valley<br>• Make progress toward meeting Clinch River's stream use classification as a drinking water source at the confluence of White Oak Creek with the Clinch River |
| Human receptors | • Protect maintenance workers, industrial workers, and off-site resident users of surface water (at the confluence of White Oak Creek with Clinch River) to a $10^{-4}$ to $10^{-6}$ excess lifetime cancer risk and an HI of 1<br>• Protect hypothetical recreational users of waters of the state[b] |
| Ecological receptors | • Protect ecological populations[c] |

[a]A future CERCLA decision will be prepared to determine whether additional actions are required for floodplain soils <2500 µR/hour. During the Feasibility Study phase, this goal was to remediate all contaminated sediments and floodplain soils to recreational risk-based limits.

[b]This remedy addresses water quality but does not fully address fish consumption or sediment/floodplain soil contact or exposure under the recreational scenario. This remedy protects the hypothetical recreational user through a combination of remedial actions including land use controls. A future CERCLA decision will be prepared to assess whether any additional actions are required.

[c]The selected remedy enhances overall protection of valleywide ecological populations and subbasin-level populations over a majority of the valley. However, portions of the valley that are not addressed by the selected remedy may pose potential unacceptable risks to ecological receptors. Additional data collection and evaluation will be conducted as part of this remedy to further assess the status of ecological receptors in these areas. A report documenting results of this ecological monitoring will be milestoned in Appendix E of the Federal Facility Agreement. If any additional actions are necessary, they will be included in a future remedial decision.

| | |
|---|---|
| AWQC = ambient water quality criteria | RAO = remedial action objective |
| HI = hazard index | SWSA = solid waste storage area |
| ORNL = Oak Ridge National Laboratory | CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980 |

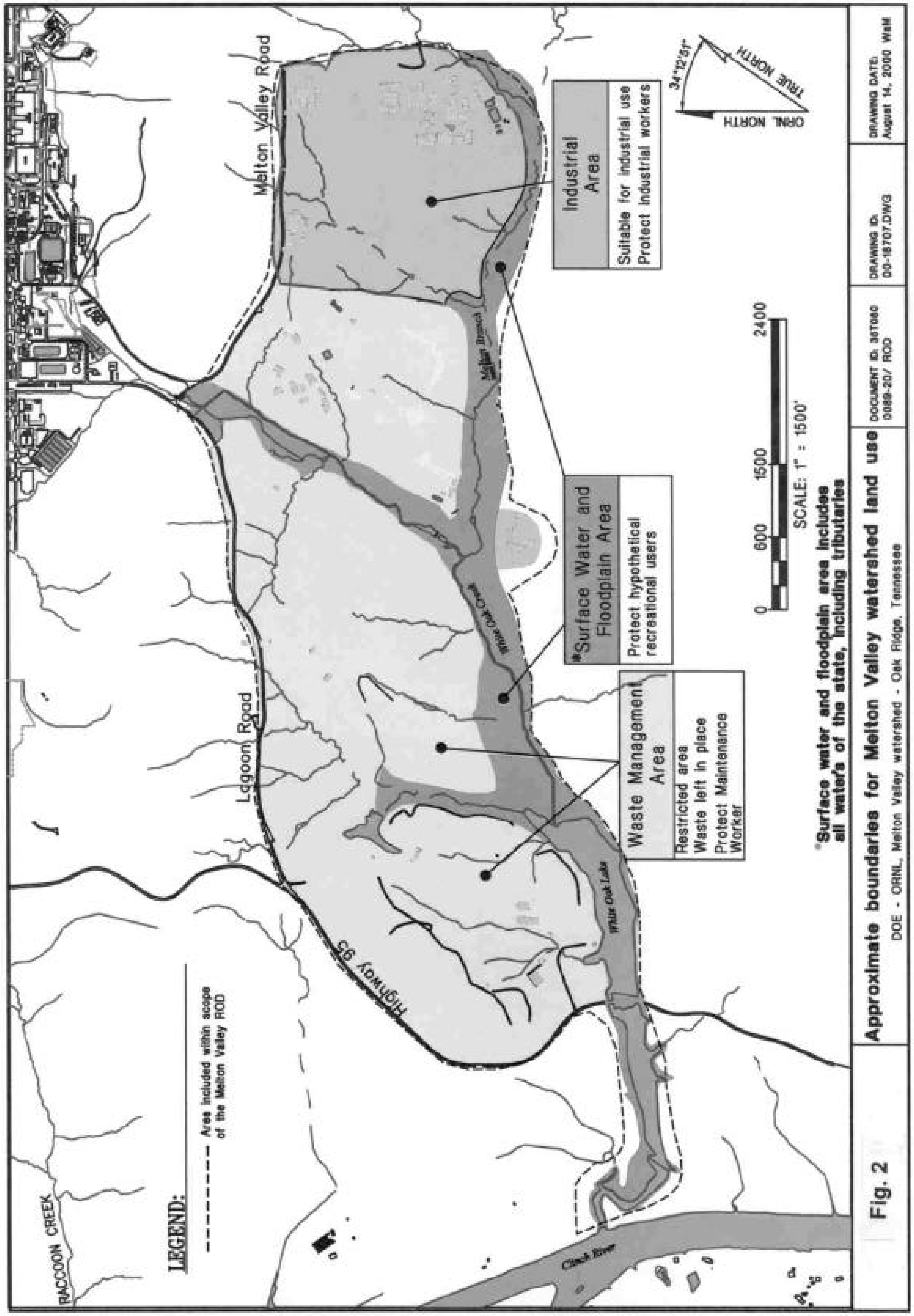


Fig. 2 Approximate boundaries for Melton Valley watershed land use

DOE - ORNL, Melton Valley watershed - Oak Ridge, Tennessee

**Table II. Summary of remedial actions in the selected remedy, Melton Valley watershed, ORNL, Oak Ridge, Tennessee**

| Unit name/ location | Unit type | Selected remedial action | Preference for treatment |
|---|---|---|---|
| SWSA 4 | Buried wastes | Hydraulic isolation[a] | Ex-situ treatment not used because of significant cost and worker risk; in-situ treatment not cost effective |
| SWSA 5 South | Buried wastes | Hydraulic isolation[a,b] | |
| SWSA 6 | Buried wastes | Hydraulic isolation[c] | |
| SWSA 5 North | Contaminated soil | Lower 23 trenches—management of excavated soils resulting from retrieval of TRU waste | Dewatering as needed to meet EMWMF WAC |
| | Buried wastes | Upper 4 trenches—hydraulic isolation[a,b] | Ex-situ treatment not used because of significant cost and worker risk; in-situ treatment not used because bulk waste already grouted in place |
| Grout sheets | Hydrofracture | Institutional controls and monitoring | Additional treatment neither cost effective nor technically feasible |
| Injection and monitoring wells | Hydrofracture | Plug and abandon, except wells designated for future monitoring | Pressure grouting (part of P&A) used to block migration and immobilize contaminants |
| Process Waste Sludge Basin | Impoundment | Removed | Sediment excavated under removal action |
| HRE Pond | Impoundment | Removal (continue cryogenics until removal) | Excavated material dewatered prior to disposal at EMWMF |
| HFIR Waste Collection Basins | Impoundment | Removal | Sediment dewatered prior to disposal at EMWMF |
| HRE fuel wells | Liquid seepage unit | Grout wells | In-situ grouting performed to immobilize contaminants |
| Pits 1, 2, 3, and 4 and Trench 6 | Liquid seepage unit | Hydraulic isolation[a] | ISV not used because of incompatibility with shallow water table |
| Trenches 5 and 7 | Liquid seepage unit | ISV | ISV performed |
| OHF, NHF, and MSRE and HRE ancillary facilities | Structure | Mostly demolish; decontaminate and stabilize some subsurface structures | Size reduction performed where appropriate |
| Inactive process and transfer pipelines | Inactive pipelines | Isolation, removal, or stabilization | Grouting performed to immobilize contaminants |
| Contaminated surface soils throughout Melton Valley | Surficially contaminated soil | Hydraulic isolation[a] or removal; actions depend on exposure potential | Removal generally preferred; treatment as needed to meet WAC |
| WOL, WOC Embayment, and streams | Lakebed and streambed sediment | Institutional controls and monitoring | Sediments deferred to future CERCLA decision |

**Table II. Summary of remedial actions in the selected remedy, Melton Valley watershed, ORNL, Oak Ridge, Tennessee**

| Unit name/ location | Unit type | Selected remedial action | Preference for treatment |
|---|---|---|---|
| WOC, Melton Branch, tributaries, and Intermediate Holding Pond | Floodplain soil | Excavation of floodplain soil > 2500 µR/hour | Excavated floodplain soils dewatered prior to disposal at EMWMF; other soils deferred to future CERCLA decision |

[a]Hydraulic isolation includes capping and in some cases upgradient diversion and downgradient collection trenches.

[b]A post-ROD engineering study will evaluate further the feasibility of removal and ex-situ treatment for the upper four trenches in SWSA 5 North (i.e., 11, 14, 16, and 17) and five trenches in SWSA 5 South (i.e., T-128, T-168, T-214, T-188, and T-206).

[c]Required removals will be completed before hydraulic isolation.

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
EMWMF = Environmental Management Waste Management Facility
HFIR = High Flux Isotope Reactor
HRE = Homogeneous Reactor Experiment
in. = inch
ISV = in-situ vitrification
µR = microroentgen
MSRE = Molten Salt Reactor Experiment
NHF = New Hydrofracture Facility
OHF = Old Hydrofracture Facility
ORNL = Oak Ridge National Laboratory
P&A = plugging and abandonment
ROD = record of decision
SWSA = solid waste storage area
TRU = transuranic
WAC = waste acceptance criteria
WOC = White Oak Creek
WOL = White Oak Lake

## DISCUSSION OF TEAMING EFFORT THAT LED TO MV ROD APPROVAL

The effort to remediate the contamination in Melton Valley began in 1989 when the site was placed on the National Priorities List. From 1991 through 1994, the CERCLA process at the site was implemented through the division of the contaminated areas within the valley into Waste Area Groupings (WAGs), whose boundaries mirrored geographic features within the valley. WAGs typically encompassed tens of acres of land and each WAG included several CERCLA-regulated sites that were closely associated. During the mid-1990s a number of early actions were taken. Because the primary mode of contaminant transport out of the valley is through surface water contamination, the majority of early actions focused on preventing high-activity contaminated groundwater seeps from entering the surface water system. These actions were highly effective and resulted in a significant reduction in the levels of surface water contamination within the valley.

Additionally over this period, Site Investigations and Remedial Investigations were performed on several contaminated areas throughout the valley. The investigations, although not exhaustive, established a broad basis of information upon which to base remedial decisions. Most importantly, these investigations allowed the program to identify the primary contributors to current risk and to establish which sites pose the greatest future risks within the valley.

In the fall of 1995, the structure of the CERCLA program at the site was revised. It was recognized that there was value added in considering the remedial decisions on a broader scale (i.e., watershed-wide scale) so that consistency in remedial action decisions could be achieved.

It was recognized that continuation of the approach based on WAGs would also involve multiple CERCLA decision documents. Based upon these factors, the CERCLA process evolved from a WAG-based approach to watershed scale (i.e., valley-wide) and the Melton Valley watershed ROD project was initiated.

The shift from planning projects and making remediation decisions at the WAG-scale to making such decisions at the watershed-scale was accomplished with an acceptance on the part of the project team that the remedial action decisions would become high level and the Feasibility Study alternatives would be conceptual. Instead of performing exhaustive pre-decision investigations and preparing very detailed Feasibility Study designs, the project team relied as much as possible on existing data from the site and alternative conceptual designs. With this shift in strategy, project planning would incorporate additional post-ROD data gathering to support detailed design and construction of the selected remedy.

The first major focus of the project was to compile and evaluate the large volume of environmental data that had been generated over preceding years. This data was summarized and presented to the newly formed project team, inclusive of DOE, Regulators, and technical staff in the form of a "Data Quality Objectives" meeting. The objective of this meeting was to evaluate the environmental data to determine if sufficient data existed upon which to base high-level remedial decisions and to prepare the feasibility study. The finding from the Data Quality Objectives meeting was that, with the exception of limited additional soil data required for terrestrial ecological risk assessment, sufficient data existed to make remedial decisions.

At this time, two activities were undertaken: (1) field work was initiated to obtain the additional soil data that was identified as necessary; and (2) preparation of the Melton Valley Watershed Remedial Investigation Report, which concisely compiled and presented the existing data upon which remedial decisions would be made. Preparation of the Remedial Investigation Report and the Feasibility Study covered a two-year period, which culminated in submittal of the final Feasibility Study in the summer of 1998. Closely integrated DOE-Regulator teaming on the Melton Valley ROD project helped to ensure approval of the ROD. Document revisions were made on a chapter-by-chapter basis and were accomplished in close consultation with the Regulators, utilizing frequent working sessions with DOE, EPA, state representatives, and technical staff in attendance.

Due to the size and complexity of the decisions being made, preparation and approval of the Remedial Investigation report, the Feasibility Study, the Proposed Plan, and the ROD was a process that required nearly 5 years to complete. A major challenge to implementing the team approach for projects such as the Melton Valley ROD is change of personnel both in the decision-making and technical support capacity over the duration of the process. New team members often bring with them new operating philosophies that necessitate re-evaluation or modification of decisions or agreements reached prior to their arrival. The loss or change of technical support personnel brings with it a loss of institutional knowledge that can also be a detriment. The Melton Valley team was fortunate in that the core technical and regulatory team remained intact for the 5 years necessary to complete this effort.

In parallel with the Feasibility Study and Proposed Plan preparation activities for the Melton Valley project, DOE supported the ORR Site Specific Advisory Board End Use Working Group (EUWG), which prepared future land use recommendations for the ORR CERCLA sites. Members of the DOE team briefed the EUWG extensively on the Melton Valley contaminated sites and remediation options. The EUWG recommendation for Melton Valley included restricted future use with protection of workers in the area and control of further migration of contamination in Melton Valley to ensure that the quality of water released to the Clinch River is protective of human health and the environment.

## PLANNING FOR REMEDIAL IMPLEMENTATION

Preparing and gaining approval of the Melton Valley ROD was a sizeable effort. The effort undertaken to plan for the implementation of this large and complex remedial action was equally complex. Completion of this task required the efforts of engineers, schedulers, and cost estimators alike and covered a two-year period.

### Factors Considered In Implementation Planning

Prioritization and sequencing of remedial actions was primarily based upon the risk posed by the sites to be remediated. Sites posing the greatest risk were scheduled to be remediated in the early years of implementation. Another factor considered in timing of implementation was the geographic position of the waste area within the watershed. It was necessary to begin remediation at the upper margin of the valley and work toward the lower section of the watershed so that recontamination would not occur. Two additional criteria were utilized in the sequencing of the remediation. One concept utilized was the grouping of similar projects to achieve implementation efficiencies. Finally, the practical need to sequence some actions before major remediations could occur. For example, the need to perform D&D activities at small facilities and plug and abandon pipelines that would intersect the footprint of major burial ground capping projects was required.

Using these concepts as the basis, the sequencing of remediation in Melton Valley became relatively straightforward. The major contributors to off-site contamination, SWSA 4 and 5 burial grounds, were identified for early remediation. To remediate these areas, the D&D of several small facilities and the plugging and abandonment of several groundwater wells became predecessor activities. SWSA 6, which is a low contributor to off-site release, was sequenced much later in the remediation activities.

### Sequencing and Milestones

Remedial actions in Melton Valley sequenced over a period of approximately 14 years. The general sequence of major remedial actions is shown in Fig. 3. This sequence of cleanup actions for the Melton Valley watershed is based on the factors identified above and resource availability (planning includes expected annual funding levels). The sequence of actions shown in Fig. 3. indicate that some actions are precursors to other projects and convey a general activity sequence for major activities.

## Acknowledgements

Approval of the ***Record of Decision for Interim Actions for the Melton Valley Watershed at the Oak Ridge National Laboratory, Oak Ridge, Tennessee,*** now culminating in the implementation of large-scale remediation in Melton Valley, was made possible by the combined dedicated efforts of people too numerous to list. Individuals contributing to this effort include representatives of DOE, EPA, TDEC, BJC, and multiple subcontracting organizations. Successful completion of the baselining/sequencing effort that followed approval of the Melton Valley ROD is attributed to the combined efforts of the staff of the ORNL Project Team, including DOE representatives. The effective planning embodied by this baselining effort is expected to result in the efficient, cost-effective, and timely implementation of remedial actions in Melton Valley. All involved in these efforts should be commended for a job well done and will be rewarded in future years with the satisfaction of seeing these plans come to fruition. The Melton Valley ROD, approved September 21, 2000, exemplifies the efforts of a team working together to preserve nature's resources.

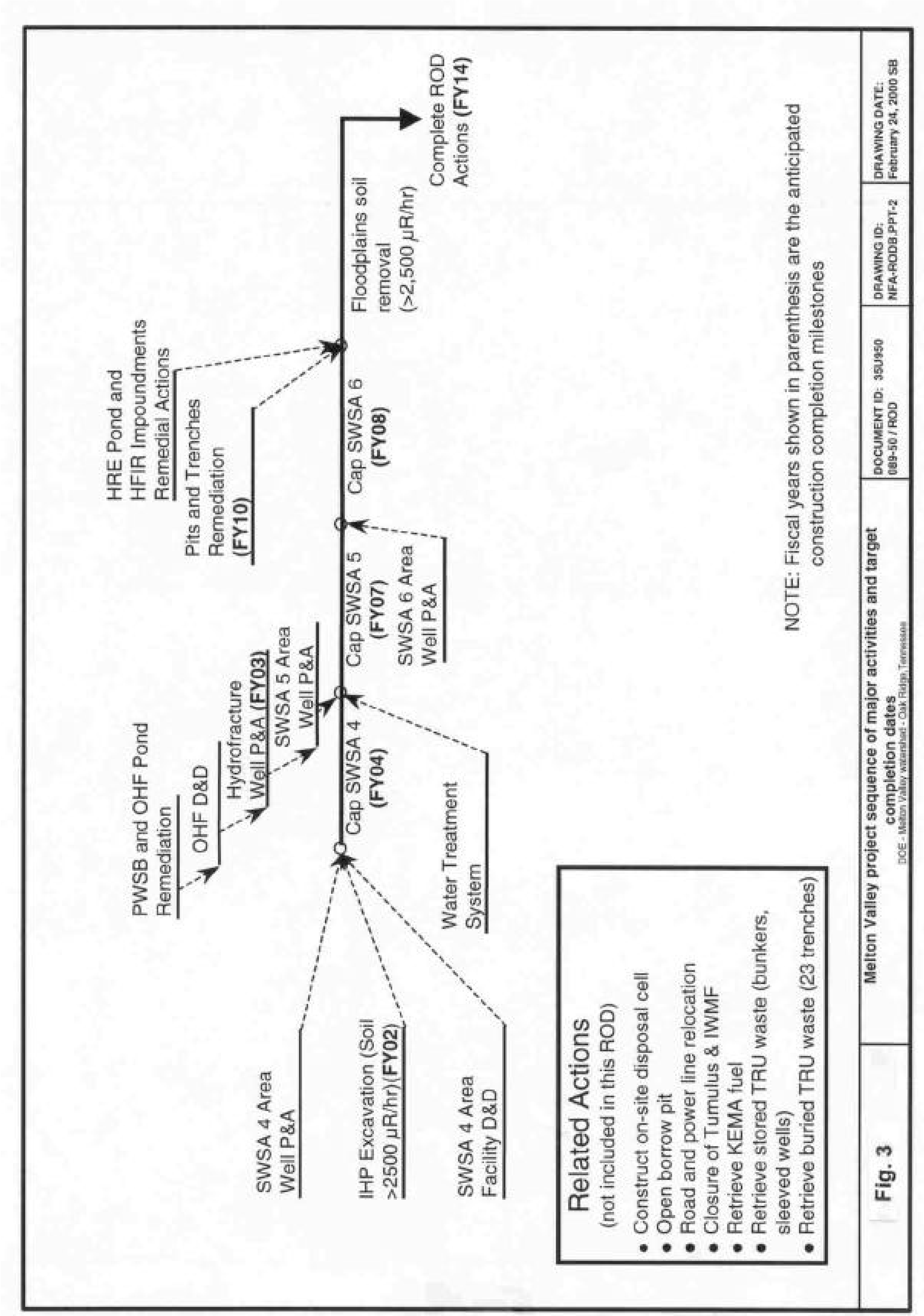


**Fig. 3** Melton Valley project sequence of major activities and target completion dates

DOE - Melton Valley watershed - Oak Ridge, Tennessee

## Footnote

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