

**U. S. DEPARTMENT OF ENERGY**

**OAK RIDGE RESERVATION**

**END STATE VISION**

**(Revision D2)**



**U.S. Department of Energy  
Oak Ridge Operations Office  
Oak Ridge, Tennessee**

December 2004

## EXECUTIVE SUMMARY

This document describes the end state vision for the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee, in support of DOE Policy 455.1, "Use of Risk-Based End States", and the associated guidance document. The risk-based end state represents site conditions that reflect the planned future use of the property at the completion of the EM mission and is appropriately protective of human health and the environment consistent with that land use. The intent of this policy is to ensure that cleanup efforts throughout the DOE complex are driven by clearly defined, risk-based end states and to identify any potential variances between current cleanup plans and actions required to attain the risk-based end state.\*

The ORR encompasses 33,749 acres located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee, in Anderson and Roane Counties in eastern Tennessee. The ORR is bordered by developed portions of the City of Oak Ridge to the north and east, and the Clinch River to the south and west. Land use in the surrounding area includes residential, commercial and agricultural properties. Other than the city of Oak Ridge, property immediately adjacent to the ORR is primarily rural.

The three primary DOE installations located within the ORR are the East Tennessee Technology Park (ETTP), Oak Ridge National Laboratory (ORNL), and the Y-12 National Security Complex (Y-12). Operations at these facilities dating from the Manhattan Project in 1942 have resulted in contamination of the environment, leading to the listing of the entire ORR by the Environmental Protection Agency (EPA) on the National Priorities List in 1989. The DOE Environmental Management (EM) Program is responsible for environmental restoration of contaminated sites within the ORR. In 2002, DOE adopted a plan to accelerate completion of the EM mission for the ORR, with remediation of the highest risk sites by 2006 and completion of the overall EM scope by 2015 (DOE 2002a).

Each of the major facilities that comprise the ORR has a different expected end use. The East Tennessee Technology Park has no continuing DOE mission and will be remediated to allow use as a commercial industrial park without a significant DOE presence. Oak Ridge National Laboratory will continue to be operated by the DOE Office of Science (DOE-SC) as a multi-disciplinary research and development center (UT-Battelle 2002). The Y-12 National Security Complex will continue to be operated by the National Nuclear Security Administration (NNSA) for national defense operations (BWXT 2003).

In order to facilitate and streamline remedial decision-making, the contaminated areas of the ORR have been divided into the following six areas roughly equivalent to the major hydrologic watersheds:

- East Tennessee Technology Park
- Melton Valley at the Oak Ridge National Laboratory
- Bethel Valley at the Oak Ridge National Laboratory
- Upper East Fork Poplar Creek at the Y-12 National Security Complex

---

\* In response to a national workshop conducted October 6-7, 2004, the term "risk-based end state" has been revised to "end state" to better reflect the range of criteria considered in determining the end state vision for each site.

- Bear Creek Valley at the Y-12 National Security Complex
- Chestnut Ridge at the Y-12 National Security Complex

Remedial actions for the ORR are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and a Federal Facility Agreement approved by DOE, EPA, and the Tennessee Department of Environment and Conservation (TDEC) in 1992. Numerous remedial actions have been conducted for contaminated sites throughout the ORR. Historically, most remediation decisions on the ORR have been single project actions for individual CERCLA units, designed primarily to address immediate threats and known sources of off-site releases. Each of these decisions has been documented through either a Record of Decision (ROD) for remedial action or an Action Memorandum (AM) for removal actions. A total of 58 RODs, Interim Records of Decisions (IRODs), and AMs have been issued for the ORR since the first two actions in 1990.

More recently, remediation decisions have evolved from narrowly focused actions designed to address individual contaminated sites to watershed-scale decisions designed to best address the cumulative impacts of multiple contaminated sites within a watershed and to optimize available resources toward meeting CERCLA watershed-scale goals. The resultant watershed decision-making allows a decision on the end state to be made in concert with the decision on the series of remedial actions needed to protect human health and the environment for that end state. By considering the technical practicability and cost of achieving a range of end states, the decision-makers can make informed risk-based decisions consistent with the anticipated end use.

In order to gain a better understanding of community values and desired future uses for contaminated areas on the ORR, DOE asked the Oak Ridge Reservation Environmental Management Site Specific Advisory Board (SSAB) to develop recommendations for end uses of contaminated areas on the ORR and community values that could be used to guide DOE's remedial action decision-making process. The End Use Working Group (EUWG) was formed in January 1997 to develop these recommendations. The EUWG was composed of individuals with a broad range of public interests and included participation by TDEC and EPA. They considered the contaminants, the contaminant pathways, a range of end uses, and the cost and technical implications of achieving various end uses. In July 1998, the EUWG published (EUWG 1998) its recommendations to DOE on end uses for contaminated lands and on community values.

Subsequent to these recommendations, watershed RODs have been approved under CERCLA for Melton Valley, Bethel Valley, Bear Creek Valley, part of Upper East Fork Poplar Creek, and part of the East Tennessee Technology Park; and decisions are underway for the remainder of the East Tennessee Technology Park and Upper East Fork Poplar Creek. In each case, the remedial actions have been designed to support the desired end use for that property. Additional CERCLA decision documents are planned for Chestnut Ridge and for additional actions in Bear Creek Valley. The watershed-scale RODs issued to date are considered interim decisions, designed to address specific contaminant source areas and mitigate the potential for release of contaminants. Site-wide response actions for groundwater protection and long-term institutional controls have been deferred to future decisions.

While CERCLA decisions made to date have not determined final remediation goals or actions for groundwater within the ORR, the *Oak Ridge Reservation Groundwater Strategy* (DOE 2004a) provides a framework to identify data needs, develop alternatives, and make groundwater remediation decisions. Groundwater contamination exists under roughly 1500 acres of the 33,749-acre ORR, and includes organics, radionuclides, and other inorganic contaminants. The ORR groundwater strategy follows a three-phased approach. Phase 1, early actions, provides for protection of existing resources or receptors from a single component of a problem. Phase 2, source control, ensures more effective risk control by considering all problem components and major source control decisions. Phase 3, groundwater remediation, makes the final groundwater remediation decisions once source action impacts have been assessed. Goals for Phase 1 and 2 are to protect existing resources and receptors and control unacceptable releases off-site. The final Phase 3 goals may range from restoration to the highest beneficial use to the use of waivers, alternative concentration limits (ACLs), or reclassification allowing for alternative levels to be used. The determination of which goal to apply will be based on an assessment of the practicality of restoring the groundwater, which will be completed after the source actions have been implemented.

Similarly, the watershed-level remediation decisions made to date do not include final decisions for ecological risks. DOE is currently developing a comprehensive strategy for consideration of ecological risks in remediation decisions across the ORR (DOE 2004c). This strategy includes consideration of potential requirements from the Natural Resources Damage Assessment (NRDA) process during the CERCLA decision process. The strategy recommends revising traditional administrative watershed boundaries to be consistent with ecological receptors and pathways, and recommends that the current life-cycle baseline plans for individual ecological decisions at each administrative watershed be modified into one ORR-wide ecological decision. The strategy also identifies a phased transition from intensive media monitoring to more focused and sustainable biological monitoring as remediation progresses toward long-term stewardship.

The current life-cycle baseline is generally based on the end-state land uses specified in the CERCLA RODs for areas where these decisions have been approved and on the EUWG recommendations for most areas for which decisions have not been made. The end-state land use assumed in the life-cycle baseline plan for each of these major watershed areas is:

- East Tennessee Technology Park – Unrestricted industrial use (commercial industrial park)
- Melton Valley – Some restricted waste management areas, some DOE-controlled industrial use
- Bethel Valley – Some DOE-controlled industrial use, some unrestricted industrial use
- Upper East Fork Poplar Creek – DOE/NNSA-controlled industrial use
- Bear Creek Valley – DOE/NNSA-controlled industrial use with some restricted waste management areas
- Chestnut Ridge – DOE/NNSA-controlled industrial use with some restricted waste management areas

The end state vision described in this document is consistent with that used for the development of previous cleanup decisions for the ORR and the current life-cycle baseline plan. The end-state land use recommended for each area by the EUWG has been carefully considered and integrated in the CERCLA decision process, and risk management decisions have been developed through a broad-based effort that considered the technical and financial implications of achieving a range of potential end uses. Remedial action objectives are designed to achieve adequate protection of human health and the environment under the planned end use conditions. Remediation decisions made to date and this end state vision document also have been developed in consideration of the respective long-term planning documents for each site with an ongoing mission [e.g., currently including the *Oak Ridge National Laboratory Land and Facilities Plan* (UT-Battelle 2002) and the *Y-12 National Security Complex Ten-Year Comprehensive Site Plan* (BWXT 2003)].

Following completion of the Oak Ridge EM mission in 2015, the primary EM-related hazards remaining at the ORR are expected to consist primarily of the areas dedicated to long-term management of radioactive and hazardous waste. These include 128 acres of capped waste sites in Melton Valley, the Environmental Management Waste Management Facility (EMWMF) and the Bear Creek Burial Grounds (BCBG) in Bear Creek Valley, and numerous capped waste sites in Chestnut Ridge and other locations. Additional hazards may include contaminated sediments in White Oak Creek and White Oak Lake in Melton Valley and miscellaneous smaller hazard areas. Potential risks from each of these hazards will be managed primarily through the use of institutional controls to restrict access to these areas and ongoing monitoring and surveillance.

A variance analysis is presented in this document to identify situations where the currently planned remedial actions may differ from what might be required to attain the end state. The variances identified here constitute relatively minor deviations from the life-cycle baseline plan, as the great majority of completed and planned remedial actions at the ORR facilities already have been developed specifically to manage risks to future receptors to acceptable levels based on the planned end use for each site – that is, the watershed-scale decision-making approach recently adopted for the ORR already has accomplished most objectives of the end state vision process. Variances identified in this document will be fully evaluated and any resulting changes to existing CERCLA decision documents will be formally documented through the CERCLA process [e.g., ROD amendments, Explanation of Significant Differences (ESD), etc.].

Robust community participation has been a key element in the remedy selection process for the ORR sites to date. Comments on the initial draft (D0) of the end state vision document were submitted by the State of Tennessee and the Citizens' Advisory Panel of the Oak Ridge Reservation Local Oversight Committee (CAP). The Tennessee Department of Environment and Conservation indicated general agreement with the use of the end state approach, but expressed concerns regarding long-term institutional controls: that risk-based cleanup decisions should be selected to minimize the need for long-term controls; and, where this is not possible, a mechanism for assured long-term funding should be in place. Similar concerns also were expressed in the CAP comments. In addition, the CAP comments also objected to deviations from the 1998 recommendations of the End Use Working Group for the Upper East Fork Poplar Creek and Bear Creek Valley watersheds.

Comments on the revised draft (D1/D1A) vision report were received from TDEC, the Oak Ridge Reservation Local Oversight Committee Inc. (LOC), the Oak Ridge Site-Specific Advisory Board, the U.S. Department of the Interior, Fish and Wildlife Service (FWS), and from several individuals. TDEC noted that CERCLA already provides mechanisms for evaluating remedial alternatives based on various end-states and for pursuing changes to remediation decisions, and that decisions regarding the variances proposed in this document must be pursued through the CERCLA process. The SSAB noted general support for the approach, but stated that sufficient information was not provided for adequate evaluation of the proposed variances. The LOC reiterated support for the previous CAP comments and acknowledged the potential variances identified in the report to be “potentially viable changes”, but noted reservations about each, particularly regarding the K-1070-C/D burial ground at ETTP. The LOC indicated a primary concern that liability problems should not be created for the City of Oak Ridge and involved Counties and that any plans should maximize the land returned to tax roles. The FWS comments focused on concerns about inadequate evaluation of ecological risks and potential natural resource damage issues. This D2 document has been revised to address these comments to the extent practicable.

## TABLE OF CONTENTS

1.0 INTRODUCTION .....	1
1.1 Organization of Report .....	1
1.2 Site Mission .....	1
1.3 Status of Cleanup Program .....	3
2.0 REGIONAL CONTEXT END STATE DESCRIPTION.....	14
2.1 Physical and Surface Interface.....	14
2.2 Human and Ecological Land Use .....	15
3.0 SITE SPECIFIC END STATE DESCRIPTIONS .....	21
3.1 Physical and Surface Interface.....	21
3.2 Human and Ecological Land Use .....	24
3.3 Site Context Legal Ownership .....	28
3.4 Site Context Demographics .....	31
4.0 HAZARD SPECIFIC DISCUSSION .....	34
4.1 East Tennessee Technology Park.....	37
4.2 Melton Valley .....	52
4.3 Bethel Valley .....	67
4.4 Upper East Fork Poplar Creek .....	82
4.5 Bear Creek Valley.....	95
4.6 Chestnut Ridge.....	109
5.0 REFERENCES .....	120
APPENDIX A. VARIANCE ANALYSIS	
APPENDIX B. DATA SOURCES FOR MAPPING	

## LIST OF TABLES

	<u>Page</u>
Table 1-1 Oak Ridge Reservation Cleanup Prioritization	8
Table 4-1 Soil average remediation levels to protect industrial user at ETTP	38
Table 4-2 Maximum carcinogenic risk and hazard index values in soils by Zone 1 areas	39
Table 4-3 Maximum carcinogenic risk and hazard index values in soils by Zone 2 areas	39
Table 4-4 Soil remediation criteria from the Melton Valley ROD	54
Table 4-5 Primary contaminants of concern in soil for Melton Valley watershed	54
Table 4-6 Soil & sediment remediation criteria from the Bethel Valley ROD	69
Table 4-7 Primary contaminants of concern in Bethel Valley soils and sediments	70
Table 4-8 Soil remediation levels for UEPC soils	84
Table A-1 Variance report for the DOE Oak Ridge Reservation End State Vision	124

## LIST OF FIGURES

	<u>Page</u>
Figure 1.1 Oak Ridge Reservation Watershed Decision Areas	11
Figure 1.2 DOE-ORR Hazard Area End-use Map	12
Figure 1.3 Status of DOE-ORR Watershed-Level CERCLA Decisions	13
Figure 2.0 Location of the Oak Ridge Reservation and Surrounding Region	14
Figure 2.1a Regional Physical and Surface Interface Map – Current State	16
Figure 2.1b Regional Physical and Surface Interface Map – RBES	17
Figure 2.2a Regional Human and Ecological Land Use Map – Current State	19
Figure 2.2b Regional Human and Ecological Land Use Map – RBES	19
Figure 3.1a Site Physical and Surface Interface Map – Current State	22
Figure 3.1b Site Physical and Surface Interface Map – RBES	23
Figure 3.2a Site Human and Ecological Land Use Map – Current State	26
Figure 3.2b Site Human and Ecological Land Use Map – RBES	27
Figure 3.3a Site Legal Ownership Map – Current State	29
Figure 3.3b Site Legal Ownership Map – RBES	30
Figure 3.4a Site Demographics Map – Current State	32
Figure 3.4b Site Demographics Map – RBES	33
Figure 4.0a Site-Wide Hazard Map – Current State	35
Figure 4.0b Site-Wide Hazard Map – RBES	36
Figure 4.1a1 Hazard Area 1, ETTP, Map – Current State	44
Figure 4.1b1 Hazard Area 1, ETTP, Map – RBES	46
Figure 4.1a2 Conceptual Site Model – Hazard Area 1, ETTP – Current State	48
Figure 4.1b2 Conceptual Site Model – Hazard Area 1, ETTP – End State	50
Figure 4.2a1 Hazard Area 2, Melton Valley, Map – Current State	59
Figure 4.2b1 Hazard Area 2, Melton Valley, Map – RBES	61
Figure 4.2a2 Conceptual Site Model – Hazard Area 2, Melton Valley – Current State	63
Figure 4.2b2 Conceptual Site Model – Hazard Area 2, Melton Valley – End State	65
Figure 4.3a1 Hazard Area 3, Bethel Valley, Map – Current State	74
Figure 4.3b1 Hazard Area 3, Bethel Valley, Map – RBES	76
Figure 4.3a2 Conceptual Site Model – Hazard Area 3, Bethel Valley – Current State	78
Figure 4.3b2 Conceptual Site Model – Hazard Area 3, Bethel Valley – End State	80
Figure 4.4a1 Hazard Area 4, Upper East Fork Poplar Creek, Map – Current State	89
Figure 4.4b1 Hazard Area 4, Upper East Fork Poplar Creek, Map – RBES	91
Figure 4.4a2 Conceptual Site Model – Hazard Area 4, UEFPC – Current State	93
Figure 4.4b2 Conceptual Site Model – Hazard Area 4, UEFPC – End State	95
Figure 4.5a1 Hazard Area 5, Bear Creek Valley, Map – Current State	101
Figure 4.5b1 Hazard Area 5, Bear Creek Valley, Map – RBES	103
Figure 4.5a2 Conceptual Site Model – Hazard Area 5, BCV – Current State	105
Figure 4.5b2 Conceptual Site Model – Hazard Area 5, BCV – End State	107
Figure 4.6a1 Hazard Area 6, Chestnut Ridge, Map – Current State	111
Figure 4.6b1 Hazard Area 6, Chestnut Ridge, Map – RBES	113
Figure 4.6a2 Conceptual Site Model – Hazard Area 6, Chestnut Ridge – Current State	115
Figure 4.6b2 Conceptual Site Model – Hazard Area 6, Chestnut Ridge – End State	117
Figure A.1 Site-Wide Hazard Map with Variances – Current State	127
Figure A.2 Site-Wide Hazard Map with Variances – RBES	128

## ACRONYMS

ACL	alternative concentration limit
ALARA	as low as reasonably achievable
AM	Action Memorandum
ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
BCBG	Bear Creek Burial Grounds
BYBY	Boneyard/Burnyard
CAP	Citizens' Advisory Panel of the Oak Ridge Reservation Local Oversight Committee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	<i>Code of Federal Regulations</i>
COC	constituents of concern
CROET	Community Reuse Organization of East Tennessee
CR/PC	Clinch River/Poplar Creek
DARA	Disposal Area Remedial Action
DNAPL	dense nonaqueous-phase liquid
DOE	U.S. Department of Energy
ELCR	excess lifetime cancer risk
EMWMF	Environmental Management waste management facility
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
ETTP	East Tennessee Technology Park
EUWG	End Use Working Group
FFA	Federal Facility Agreement
FS	feasibility study
FWS	U.S. Department of the Interior, Fish & Wildlife Service
FY	fiscal year
HI	Hazard Index
HQ	Hazard Quotient
LEFPC	Lower East Fork Poplar Creek
LOC	Oak Ridge Reservation Local Oversight Committee, Inc.
LWBR	Lower Watts Bar Reservoir
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NNSA	National Nuclear Security Administration
NPL	National Priorities List
NRDA	Natural Resource Damage Assessment
ORAU-SCF	Oak Ridge Associated Universities South Campus Facility
ORLUPFG	Oak Ridge Land Use Planning Focus Group
ORNERP	Oak Ridge National Environmental Research Park
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations Office
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
ppm	parts per million

ppt	parts per trillion
RAO	remedial action objective
RBES	Risk-Based End State
RCRA	Resource Conservation and Recovery Act of 1976
RI	remedial investigation
ROD	record of decision
ROI	region of influence
SSAB	Site-Specific Advisory Board
TDEC	Tennessee Department of Environment and Conservation
TWRA	Tennessee Wildlife Resources Agency
UEFPC	Upper East Fork Poplar Creek
VOC	volatile organic compound
WAG	waste area grouping

## 1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Oak Ridge Operations Office (ORO) has developed this document in support of DOE Policy 455.1, *Use of Risk-Based End States* (DOE 2003a), and in accordance with the associated guidance document, *Guidance for Developing a Site-Specific Risk-Based End State Vision* (DOE 2003b). DOE P 455.1 was issued in July 2003, in response to the DOE Top-to-Bottom Review (DOE 2002b). Its purpose is to improve the effectiveness of cleanup actions throughout the DOE complex by focusing on achieving clearly defined, risk-based end states which integrate both risk and future land use considerations.

Risk-based end states are representations of site conditions and associated information that reflect the planned future use of the site and are appropriately protective of human health and the environment consistent with that use. The policy and guidance manual require each DOE site to prepare a "Risk-Based End State Vision" document that communicates the site specific end state to involved parties, including regulators and the public. Under this policy, once the sites have developed their site-specific end state vision, they are directed to re-evaluate their current cleanup activities and strategies to determine if it is appropriate to change site baseline documents and renegotiate agreements. Sites would then work with their regulators to modify, as needed, their cleanup strategies, cleanup agreements and baselines, and then update their cleanup baselines and performance plans accordingly to better reflect the end state vision of the site.

### 1.1 Organization of Report

This document is organized to meet the requirements of the *Guidance for Developing a Site-Specific Risk-Based End State Vision* (DOE 2003b). The DOE mission for the Oak Ridge Reservation (ORR) is discussed in Section 1.2 and the current status of the cleanup program is summarized in Section 1.3. Section 2 describes the current state and end state conditions at the ORR at the regional level, with respect to physical and surface features and human and ecological land use. Section 3 presents a similar discussion at the site-specific level. Section 4.0 describes each of the hazard areas for the ORR under current state and end state conditions, including conceptual site models. A variance analysis is presented in Appendix A.

### 1.2 Site Mission

In 1942, approximately 58,000 acres were acquired in Anderson and Roane Counties in east Tennessee to build facilities for large-scale production of fissionable material for the world's first nuclear weapons. In 1943, construction began on the X-10 nuclear research facility [now known as the Oak Ridge National Laboratory (ORNL)], the first uranium enrichment facility (now known as the Y-12 National Security Complex), and a gaseous diffusion enrichment facility [the

---

\* In response to a national workshop conducted October 6-7, 2004, the term "risk-based end state" has been revised to "end state" to better reflect the range of criteria considered in determining the end state vision for each site. This revised terminology is used throughout the remainder of this document.

K-25 Plant, currently called the East Tennessee Technology Park (ETTP)]. Since that time, the missions of these facilities have evolved as described below:

- **ORNL** - The Oak Ridge National Laboratory was built in 1943 to produce and chemically separate the first gram quantities of plutonium as part of the national effort to produce the atomic bomb. As its role in the development of nuclear weapons decreased, the work at ORNL expanded to include fuel processing research; production of radioisotopes; construction and operation of various nuclear reactor designs; fundamental research in a variety of sciences; research involving hazardous and radioactive materials; environmental research; and radioactive waste disposal. ORNL has become DOE's largest multi-program research and development laboratory and is currently embarking on a major revitalization program.

With respect to the EM mission, the primary cleanup challenges at ORNL include elevated concentrations of cesium, strontium, and tritium in surface water and sediment; 140 acres of radioactive waste burial grounds; waste seepage pits, trenches, tanks, and impoundments containing high activity wastes; five shutdown reactors requiring demolition; and over 6,000 yd<sup>3</sup> of legacy waste to be disposed. The total inventory of contaminants includes 2 million curies of radioactivity in a water-rich environment with the potential for off-site release to the Clinch River. The cleanup of soils and demolition of facilities in an operating laboratory environment is a special challenge. The two major watersheds within the ORNL site are addressed separately for purposes of remediation. Bethel Valley includes the main industrial complex of ORNL, while Melton Valley includes most of the waste burial grounds.

- **ETTP** – The East Tennessee Technology Park, formerly named the Oak Ridge Gaseous Diffusion Plant and the K-25 Site, was built during World War II to supply enriched uranium for nuclear weapons production. The EM Program became the landlord for the site after the facility was placed in “ready standby” mode in 1985 and operations were permanently shut down in 1987. In 1990, the mission became the demonstration and development of technology for environmental restoration, waste management, and decontamination and decommissioning. In 1997, the site was renamed ETTP to reflect the new mission to reindustrialize the site's infrastructure for use by the private sector. There is no continuing DOE mission at ETTP.

Degrading, contaminated, 50-year-old gaseous diffusion and support buildings are the principal threat at ETTP. Unstable structures, roof integrity failures, intense rainfall events, and other natural phenomena increase the risk of uncontrolled releases of uranium and other contaminants to Poplar Creek, a tributary of the Clinch River which flows off the ORR. Coupled with these risks are the burdensome “mortgage costs,” e.g., utilities, security, surveillance and maintenance, and fire protection, required to maintain the site in a stable configuration. In addition, approximately 27,000 yd<sup>3</sup> of low-level waste must be disposed. For purposes of remediation, ETTP is being addressed in three distinct components: remediation of soils in Zone 1 (property outside the main industrial complex), remediation of soils and structures in Zone 2 (the main industrial complex), and remediation of site-wide groundwater and ecological impacts.

- **Y-12** – The Y-12 National Security Complex (Y-12) is an active manufacturing and developmental engineering facility. It occupies approximately 600 acres within Bear Creek Valley near the northeastern corner of the ORR, adjacent to the City of Oak Ridge. Built in 1943, the original purpose of the Y-12 facility was uranium enrichment and nuclear weapons production. Uranium enrichment using the electromagnetic separation process was discontinued in 1947, but other aspects of weapons production continued until 1993. Y-12's role has evolved into providing capabilities for highly sophisticated manufacturing; producing, fabricating, and dismantling nuclear weapons components; stockpile stewardship for enriched uranium and lithium materials; drawdown and disposition of special nuclear materials; and other complimentary missions. The Y-12 National Security Complex is currently embarking on a major modernization program, with significant new construction and renovation of facilities and infrastructure expected to be phased over a 20-year period.

The primary cleanup challenges at Y-12 include elevated levels of mercury in soil, sediment, and surface water; offsite migration of volatile organic compounds in groundwater; uranium burial grounds; roughly 9,000 yd<sup>3</sup> of low-level waste to be disposed; and contaminated buildings with no further use for national defense. For purposes of remediation, the Y-12 site is subdivided into three distinct watersheds: Upper East Fork Poplar Creek, which includes the main Y-12 industrial complex; Bear Creek Valley, which is located to the west of the main industrial complex and contains most of the major waste disposal areas at Y-12; and Chestnut Ridge, which is located to the south of the main industrial complex and includes several waste disposal areas.

These production and research activities have left a legacy of contaminated sites and facilities requiring cleanup. Radioactive and hazardous materials from burial grounds, ponds, seepage pits and trenches, tanks, underground pipelines, and surplus facilities have contaminated soils, groundwater, and surface water. Major contaminants include strontium, cesium, tritium, uranium, mercury, polychlorinated biphenyls (PCBs), and volatile organic chemicals (VOCs).

### **1.3 Status of Cleanup Program**

The Environmental Protection Agency (EPA) placed the ORR on the National Priorities List (NPL) in 1989. Consequently, remedial actions for the ORR are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). A Federal Facility Agreement (FFA) was approved by DOE, EPA, and the Tennessee Department of Environment and Conservation (TDEC) in 1992. Numerous remedial actions have been conducted for contamination sites throughout the ORR through a total of 58 decision documents, including Action Memoranda (AMs), Records of Decision (RODs), and Interim Records of Decision (IRODs) since 1990. In addition, numerous closure actions have been conducted under the Resource Conservation and Recovery Act (RCRA).

Historically, most remediation decisions on the ORR have been single project actions for individual CERCLA units, designed primarily to address immediate threats and known sources of off-site releases. In recent years, remediation decisions have evolved from narrowly focused

actions designed to address individual contamination sites to watershed-scale decisions designed to best address the cumulative impacts of multiple contamination sites within a watershed. In order to facilitate and streamline remedial decision-making, the contaminated areas of the ORR have been divided into the following six areas designated as administrative watersheds (these areas are similar but not identical to the true hydrologic watersheds):

- East Tennessee Technology Park
- Melton Valley at the Oak Ridge National Laboratory
- Bethel Valley at the Oak Ridge National Laboratory
- Upper East Fork Poplar Creek at the Y-12 National Security Complex
- Bear Creek Valley at the Y-12 National Security Complex
- Chestnut Ridge at the Y-12 National Security Complex

In 1996, prior to any watershed decisions, DOE issued a draft proposal on its preferred remediation method for four surface impoundments at ORNL. This proposal included the creation of a consolidated disposal cell within the area of the surface impoundments. However, the State of Tennessee favored an alternative proposal involving complete excavation of the impoundments with disposal of contaminated material off the ORNL site. The State also believed that DOE's remediation decisions lacked community involvement. Subsequently, the State recommended that any remediation decision for the surface impoundments should include broad-based public involvement.

In response to the State's recommendation, DOE asked the Oak Ridge Reservation Environmental Management Site Specific Advisory Board (SSAB) to initiate a process to gain a better understanding of community values and desired future uses for contaminated areas on the ORR. The DOE asked the SSAB to develop:

- recommendations for end uses of contaminated areas on the ORR
- community values that could be used to guide DOE's remedial action decision-making process.

The SSAB determined that a broad, independent group was needed for such an effort. In January 1997 the SSAB sponsored a public meeting to seek volunteers for the End Use Working Group (EUWG). More than 100 attendees discussed the issues and process of the EUWG. As a result, more than 20 individuals initially participated as EUWG members, while a similar number requested to be kept informed by receiving EUWG materials. EUWG membership was diverse and included members from most area stakeholder organizations, including the Oak Ridge Environmental Peace Alliance, both the Citizens' Advisory Panel and the Board of the Oak Ridge Reservation Local Oversight Committee, the Oak Ridge Reservation Environmental Management Site Specific Advisory Board, Friends of Oak Ridge National Laboratory, Oak Ridge Environmental Quality Advisory Board, League of Women Voters, and Coalition For a Healthy Environment. Oak Ridge City government also participated through members of the Oak Ridge City Council and the Oak Ridge Regional Planning Commission. Participation by individuals with different perspectives enhanced the quality of discussions and the development and evaluation of alternative end uses for contaminated areas within each watershed. The

EUWG also coordinated with EPA Region 4 and TDEC staff to ensure that activities were serving the regulators' environmental decision-making expectations.

The EUWG discussed the contaminants and contaminant transport in each watershed, considered a range of differing end uses, and evaluated the cost and technical implications of achieving the differing end uses. In July 1998 the EUWG published its recommendations (EUWG 1998) to DOE on end uses for contaminated lands and on community values.

The Oak Ridge Land Use Planning Focus Group was formed in 2001 at the request of DOE to develop suggestions for the utilization of approximately 5100 acres of land in the northwest portion of the ORR. This Focus Group consisted of 20 individuals with expertise in economic development, environmental and historic values, and community needs. The group's mission was "to provide DOE with recommendations in developing a comprehensive plan for the future use of the land resources of the Oak Ridge Reservation that are currently or potentially surplus to DOE's mission for the next 20 years..." Based on a review of DOE programmatic needs, it was determined that the Focus Group would consider only the designated land in the northwest portion of the ORR. The group studied four scenarios for development of this land (greenspace emphasis, development emphasis, modified parcel ED-3, and less development), and reached general agreement on use of approximately 87% of the land under consideration. The group also identified the following list of most highly ranked values to be considered in land use decisions: protection of threatened/endangered species, concern for water quality, increasing the tax base for the City of Oak Ridge, concentrating any new industry, and increasing the number of jobs in Oak Ridge. Recommendations of the Focus Group were issued in September 2002 (ORLUPFG 2002, SAIC 2002).

Subsequent to the EUWG recommendations, watershed records of decisions have been issued under CERCLA for Melton Valley, Bethel Valley, Bear Creek Valley, part of Upper East Fork Poplar Creek, and part of the East Tennessee Technology Park; and decisions are underway for the remainder of the East Tennessee Technology Park and Upper East Fork Poplar Creek. Additional CERCLA decision documents are planned for Chestnut Ridge and for additional actions in Bear Creek Valley. The watershed-level RODs developed to date are considered interim decisions, designed to address specific contaminant source areas and mitigate the potential for release of contaminants. Site-wide response actions for groundwater protection and long-term institutional controls have been deferred to future decisions. Planned remedial actions for each of these watersheds are briefly summarized in the remainder of this section and discussed in greater detail in Section 4.

In August 2002, DOE adopted the *Oak Ridge Performance Management Plan (PMP)* (DOE 2002a) to achieve accelerated completion of the EM mission for the ORR, by implementing the recommendations of the *Top to Bottom Review* issued by the DOE Assistant Secretary for Environmental Management in February 2002 (DOE 2002b). This cleanup strategy is a risk-based approach that focuses first on those contaminant sources that are the greatest contributors to risk. The overall strategy is based on surface water considerations, encompassing the watersheds that are impacted by the DOE industrial sites and potential off-site releases to the Clinch River. While risk reduction is the major cleanup driver, other factors that must be considered to achieve risk reduction are execution logic and mortgage reduction. The reduction

of mortgage costs provides a dramatic benefit due to the reinvestment of these saved funds into accelerated risk reduction and reduces amount and duration of funding needed from the Cleanup Reform Account. The plan also includes a number of substantive changes to work practices designed to facilitate work execution.

The PMP is based on the following land use assumptions, which are consistent with the recommendations of the EUWG and CERCLA decisions made to date as well as the long-range planning documents for those sites with an ongoing mission [specifically including the *Oak Ridge National Laboratory Land and Facilities Plan* (UT-Battelle 2002) and the *Y-12 National Security Complex Ten-Year Comprehensive Site Plan* (BWXT 2003)]:

- **ORNL** will continue to operate as a world-class research facility. The EM mission is to reduce remaining risks and complete cleanup as quickly and safely as possible.
- **Y-12** will continue to operate, fulfilling its national security mission. The EM mission is to reduce remaining risks and complete cleanup as quickly and safely as possible.
- **ETTP** will be available for use as a private-sector industrial park with minimal DOE presence.

Under the PMP, completion of the EM mission will be accomplished using a phased approach. The following projects with the greatest potential for risk reduction and/or mortgage reduction will be completed by 2008:

- **Melton Valley: Completion by 2006** – The Melton Valley actions have been widely reviewed and accepted by the public through the CERCLA process and a signed interim record of decision is in place. The Melton Valley burial grounds pose the highest risks on the ORR, and therefore this project provides the opportunity for early and significant risk reduction. Completion actions include: hydraulic isolation through installation of multi-layer caps; removal, treatment, and disposal of retrievable transuranic (TRU) waste; soil and sediment excavation and disposal; demolition of facilities without identified future use; in-situ grouting; plugging and abandonment of wells; and disposition of spent nuclear fuel and legacy waste.
- **ETTP: Closure by 2008** – ETTP consists of hundreds of facilities, including 50-year-old gaseous diffusion process buildings and other site infrastructure, that require nearly \$60 million per year in landlord costs. Therefore, this project provides the greatest opportunity for significant mortgage reduction which frees funding to be applied to further risk reduction. Closure actions include: demolition of all facilities without identified future use by private industry; off-site disposition of uranium hexafluoride (UF<sub>6</sub>) cylinders; excavation of burial grounds and highly contaminated soils; completion of groundwater contamination actions in accordance with the CERCLA process; and disposition of legacy waste.
- **Y-12** – Specific high risk reduction actions at Y-12 include mitigation of off-site releases of mercury in surface water; bioremediation of an off-site volatile organic compound (VOC) groundwater plume; and, excavation of uranium hot spots and hydraulic isolation of other contaminant sources.

- **Bethel Valley at ORNL** – Specific high risk reduction actions at Bethel Valley include completion of an engineering evaluation to identify further sources of groundwater contamination; completion of the Corehole 8 removal action; excavation of highly contaminated sediment from surface impoundments in the center of ORNL (completed in 2003); and removal of the Molten Salt Reactor Experiment fuel salts.
- **Offsite Areas** – DOE-ORO also has responsibility for remediation of several off-site, non-DOE-owned properties, the David Witherspoon 901 and 1630 sites in Knoxville, Tennessee, and the Atomic City Auto Parts site in Oak Ridge. Planned actions at these sites include removal of contaminated structures, debris, soil, and sediment for disposal at the EMWMF. In addition, remedial actions have been previously completed for the Clinch River/Poplar Creek (CR/PC), Lower Watts Bar Reservoir (LWBR), Lower East Fork Poplar Creek (LEFPC), and the Oak Ridge Associated Universities South Campus Facility (ORAU-SCF). The ORAU-SCF is a former experimental station, while the other three areas involve bodies of water that receive groundwater and surface water releases from the ORR. RODs have been issued for each of these areas and remedial actions completed; ongoing monitoring and stewardship activities to ensure the continued protectiveness of the completed actions are documented annually in the Remediation Effectiveness Report for the ORR (DOE 2004b).
- **Accelerate Disposition of All Legacy Waste** – All legacy waste will be dispositioned by 2005 with priority given to those waste streams in Melton Valley and ETTP that are on the critical path for completion of those projects. A key element to accelerating the disposition of legacy low-level waste is onsite disposal in EMWMF for nearly 60% of the legacy low-level waste inventory that is stored outdoors at ETTP.
- **Accelerate Transfer of Newly Generated Waste Responsibility** – All facilities and systems that the EM Program currently operates to manage waste actively generated by the National Nuclear Security Administration and the Office of Science will be returned to those programs. EM funds will be used only to address EM legacy and remediation waste.

Following completion of these initial actions by 2008, additional actions to accomplish further risk reduction and completion of the EM mission will be completed by 2015:

- **Y-12** – Planned EM actions include the demolition of the Alpha 4 facility, two recently transitioned facilities, and remaining waste management facilities; remediation of mercury- and PCB-contaminated soil and sediment; hydraulic isolation of subsurface mercury contamination beneath facilities in the West End Mercury Area; removal and disposal or closure-in-place of materials at Chestnut Ridge; and hydraulic isolation of remaining buried materials in Bear Creek Valley.
- **ORNL** – Planned EM actions include the demolition of inactive buildings, facilities, and reactors; removal of surface soil with contamination above remediation levels in the controlled industrial area; remediation of White Oak Lake and White Oak Creek;

hydraulic isolation of Solid Waste Storage Areas (SWSAs) 1 and 3; and selected groundwater actions for Corehole 8 and East Bethel Valley.

- **Long-term Stewardship** - The CERCLA process will determine any necessary final actions for groundwater in each of the watersheds subsequent to completion of the actions described above. All of the major remedial actions require the need for long-term stewardship actions, including surveillance and maintenance of installed structures and systems, and access and land use controls for as long as necessary to protect human health and the environment.

The logic for prioritization of actions under the PMP is summarized in Table 1.1.

**Table 1.1 Oak Ridge Reservation Cleanup Prioritization (from DOE 2002a)**

Priority	Scope	Basis for Priority
1	Melton Valley	Greatest source of offsite contaminant releases.
2	Offsite Properties	Private property with public access and risk to current industrial workers.
3	High-Risk-Reduction Projects in Bethel Valley and UEFPC	Next highest sources of offsite contaminant releases.
4	ETTP	The deteriorated condition of facilities poses a significant physical risk to maintenance workers. Landlord costs will be significantly reduced, freeing up funds for other remediation efforts. Contaminated soils are a source of contaminant migration to surface water and groundwater. Construction logic dictates that the buildings be demolished prior to soil remediation.
5	ORNL Building 3026 Demolition	This facility presents a current industrial hazard due to its deteriorated condition and requires high landlord cost.
6	MSRE	This facility is a safety hazard and requires high landlord cost.
7	Bear Creek Valley	Release of uranium to Bear Creek.
8	Bethel Valley	Integrate with ORNL revitalization program. Soil contamination poses potential risk to workers. Construction logic dictates that soil remediation follow building demolition.
9	Upper East Fork Poplar Creek	Integrate with Y-12 modernization program.
10	Groundwater	Logic dictates delaying until all sources are remediated.
11	Chestnut Ridge	Onsite contamination with no known release.
12	White Wing Scrap Yard	Onsite contamination with no known release.
13	Clinch River/Poplar Creek Record of Decision	Receptor for entire Reservation; logic dictates delaying until remediation of all sources is complete.

The life-cycle baseline is generally based on the end-state land uses contained in the CERCLA RODs for areas where these decisions have been approved and on the recommendations of the End Use Working Group for those areas for which decisions have not been made. Minor deviations have been made in some cases based on information that became available subsequent to the CERCLA decisions and/or EUWG recommendations. For example, the EUWG recommended that the eastern-most area in Upper East Fork Poplar Creek could be suitable for unrestricted industrial use, and the EUWG and Phase I ROD for Bear Creek Valley assumed that the western-most portion of Bear Creek Valley could be suitable for unrestricted use; however, the NNSA has since determined that these areas should remain under DOE/NNSA control for the foreseeable future, and the end use for these areas has been designated DOE/NNSA-controlled

industrial use for the purpose of this analysis. The current end uses upon which the life-cycle baseline is developed are as follows:

- East Tennessee Technology Park – Unrestricted industrial use (commercial industrial park)
- Melton Valley – Some restricted waste management areas, some DOE-controlled industrial use
- Bethel Valley – Some unrestricted industrial use, some DOE-controlled industrial use
- Upper East Fork Poplar Creek – DOE/NNSA-controlled industrial use
- Bear Creek Valley – DOE/NNSA-controlled industrial use (with some restricted waste management areas)
- Chestnut Ridge – DOE/NNSA-controlled industrial use (with some restricted waste management areas)

Locations of these hazard areas within the ORR and the planned end use designation for each area are depicted in Figures 1.1 and 1.2. Additional discussion of each of these hazard areas is provided in Section 4.

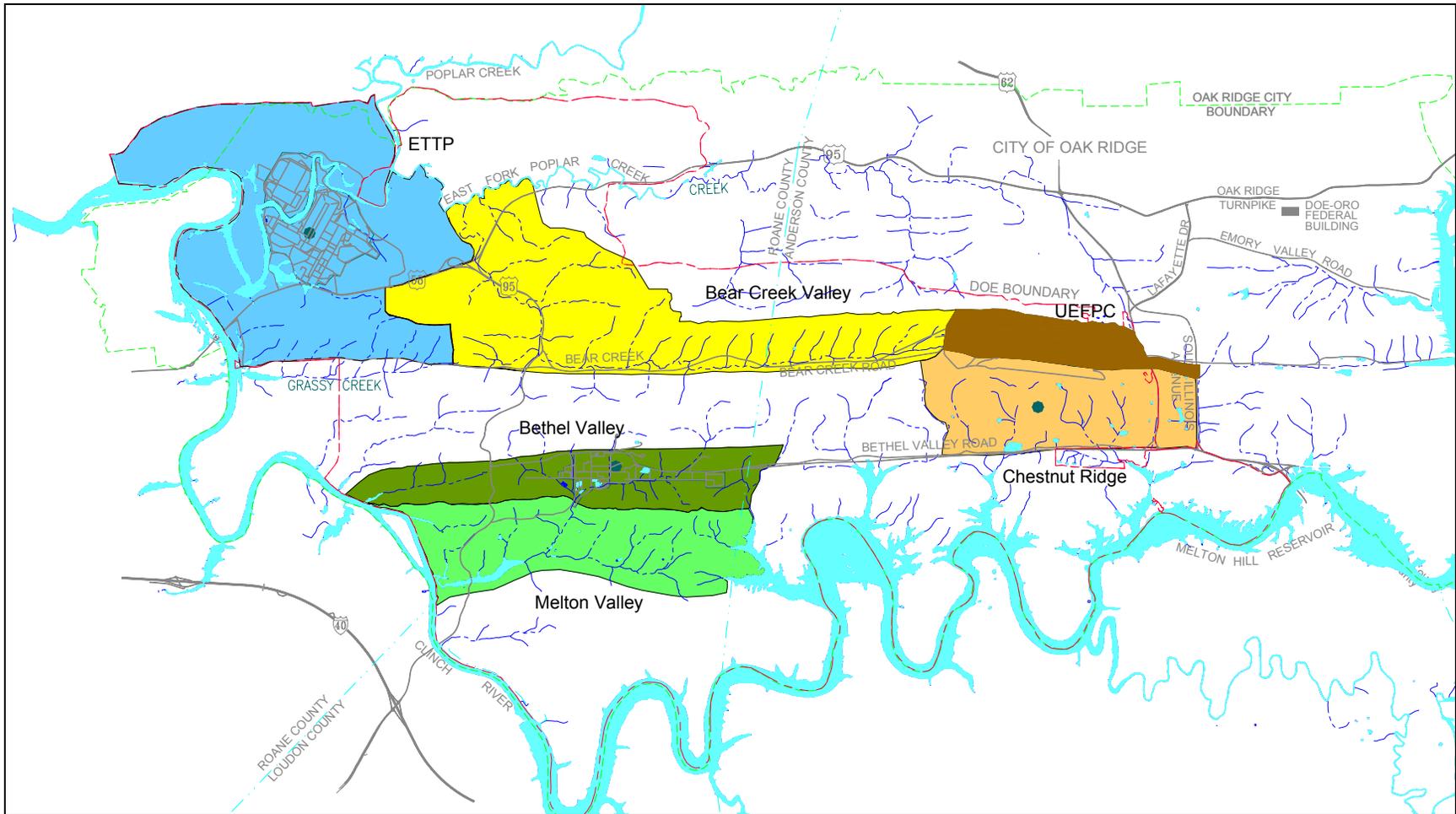
A summary of the planned remedial actions under the PMP is depicted in Figure 1.3. For each administrative watershed, the portion of the bar that is shaded represents a qualitative assessment of the percentage of the overall remediation covered by existing decisions. Bullets under the bars illustrate the types of projects covered by both existing and future decisions, but are not comprehensive. The arrow labeled “FY2003” above each bar indicates how far the projects have progressed through the end of FY 2003 in completing actions under existing decisions. As is evident from this Figure, both the status of decision making and the status in completing existing decisions vary significantly among the watersheds.

In addition to the six watershed areas within the ORR listed above, CERCLA actions are underway or have been previously completed to address off-site areas of environmental contamination resulting associated with ORR activities. As noted above, these include the David Witherspoon 901 and 1630 Sites, the Atomic City Auto Parts Site, Clinch River/Poplar Creek (CR/PC), Lower Watts Bar Reservoir (LWBR), Lower East Fork Poplar Creek (LEFPC), and the Oak Ridge Associated Universities South Campus Facility (ORAU-SCF). These sites are not included within the scope of this end state vision for the ORR. Ongoing monitoring and stewardship activities to ensure the continued protectiveness of the completed actions are documented annually in the Remediation Effectiveness Report for the ORR (DOE 2004b).

While CERCLA decisions made to date have not determined final remediation goals or actions for groundwater within the ORR, the *Oak Ridge Reservation Groundwater Strategy* (DOE 2004a) provides a framework to identify data needs, develop alternatives, and make groundwater remediation decisions. Groundwater contamination exists under roughly 1500 acres of the 33,749-acre ORR, and includes organics, radionuclides, and other inorganic contaminants. The ORR groundwater strategy follows a three-phased approach. Phase 1, early actions, provides for

protection of existing resources or receptors from a single component of a problem. Phase 2, source control, ensures more effective risk control by considering all problem components and major source control decisions. Phase 3, groundwater remediation, makes the final groundwater remediation decisions once source action impacts have been assessed. Goals for Phase 1 and 2 are to protect existing resources and receptors and control unacceptable releases off-site. The final Phase 3 goals may range from restoration to the highest beneficial use (drinking water) to the use of waivers, alternative concentration limits (ACLs), or reclassification allowing for alternative levels to be used. The determination of which goal to apply will be based on an assessment of the practicality of restoring the groundwater, which will be completed after the source actions have been implemented. It is expected that the end-state land use will be an important consideration in these eventual groundwater decisions.

Similarly, DOE-ORO is currently developing a comprehensive strategy for consideration of ecological risks in remediation decisions across the ORR (DOE 2004c). This strategy includes consideration of potential requirements from the Natural Resources Damage Assessment (NRDA) process during the CERCLA decision process. It encompasses ecological studies, decisions, and/or approaches that have been previously conducted for individual units and is intended to provide an integrated framework for future ecological decisions on the ORR. Final ecological decisions have been made for off-site areas including Lower East Fork Poplar Creek, Clinch River, Poplar Creek, and Lower Watts Bar Reservoir. Decisions on interim actions have been made in Bear Creek Valley, Melton Valley, and Bethel Valley; final decisions for these areas and for Upper East Fork Poplar Creek are planned for the future. Currently a sitewide ecological risk assessment is being conducted at ETPP with a sitewide decision scheduled for 2006. The new strategy recommends revising traditional administrative watershed boundaries to be consistent with ecological receptors and pathways, and recommends that the current life-cycle baseline plans for individual ecological decisions at Bear Creek Valley, UEFPC, Melton Valley, and Bethel Valley be modified into one ORR-wide ecological decision. The strategy also identifies a phased transition from intensive media monitoring to more focused and sustainable biological monitoring as remediation progresses toward long-term stewardship.



- |  |  |
|--|--|
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #00aaff; border: 1px solid black; margin-right: 5px;"></span> ETPP          | <span style="display: inline-block; width: 15px; height: 15px; background-color: #ffff00; border: 1px solid black; margin-right: 5px;"></span> Bear Creek Valley |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #006400; border: 1px solid black; margin-right: 5px;"></span> Bethel Valley | <span style="display: inline-block; width: 15px; height: 15px; background-color: #8b4513; border: 1px solid black; margin-right: 5px;"></span> UEFPC             |
| <span style="display: inline-block; width: 15px; height: 15px; background-color: #00ff00; border: 1px solid black; margin-right: 5px;"></span> Melton Valley | <span style="display: inline-block; width: 15px; height: 15px; background-color: #ff8c00; border: 1px solid black; margin-right: 5px;"></span> Chestnut Ridge    |

**Figure 1.1 Oak Ridge Reservation watershed decision areas**

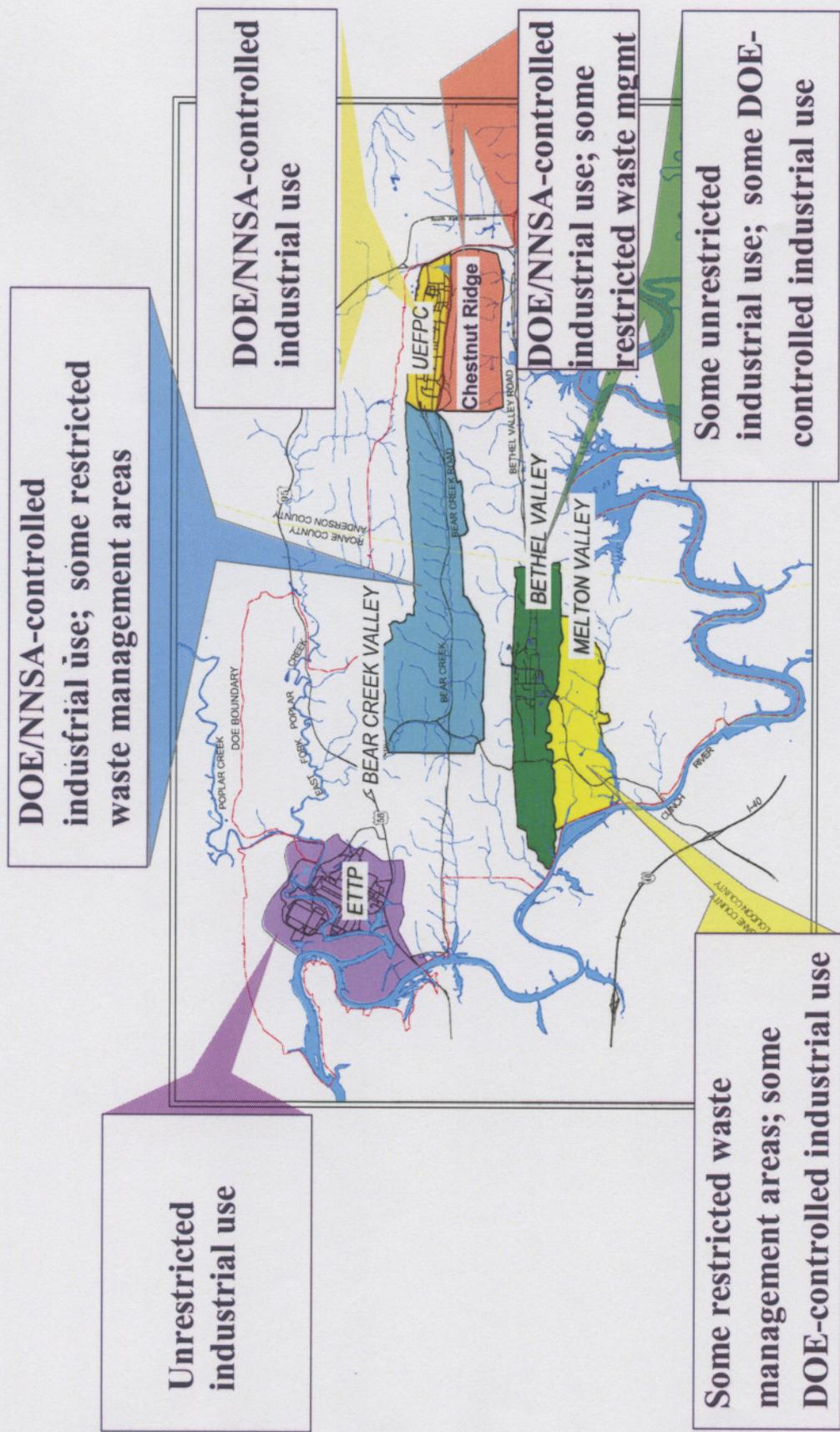


Figure 1.2 DOE-ORR Hazard Area End-Use Map

<b>Melton Valley</b>	 <b>ROD for Interim Actions</b>			<b>Future ROD</b>
	<ul style="list-style-type: none"> <li>• Solid Waste Storage Areas</li> <li>• Soils and Sediments</li> </ul>			<ul style="list-style-type: none"> <li>• Ecological</li> <li>• Groundwater</li> <li>• Creek, Lake Sediments</li> </ul>
<b>Bethel Valley</b>	 <b>ROD for Interim Actions</b>			<b>Future ROD</b>
	<ul style="list-style-type: none"> <li>• Soils</li> <li>• Burial Grounds</li> <li>• Buildings</li> </ul>			<ul style="list-style-type: none"> <li>• Groundwater</li> </ul>
<b>UEFPC</b>	 <b>Phase 1 ROD</b>		<b>Future ROD</b>	
	<ul style="list-style-type: none"> <li>• Mercury Sources</li> <li>• Surface Water Releases</li> </ul>		<ul style="list-style-type: none"> <li>• Soils</li> <li>• Groundwater</li> </ul>	
<b>Bear Creek Valley</b>	 <b>Phase 1 ROD</b>		<b>Future ROD</b>	
	<ul style="list-style-type: none"> <li>• Boneyard/Burnyard</li> <li>• Oil Landfarm Soils</li> </ul>		<ul style="list-style-type: none"> <li>• S-3 Site Pathway 3* *deferred to 2009</li> <li>• Dara Soils</li> <li>• Burial Grounds</li> <li>• Groundwater</li> </ul>	
<b>ETTP RA</b>	 <b>Zone 1 ROD</b>		<b>Future ROD</b>	
	<ul style="list-style-type: none"> <li>• Zone 1 Soils</li> <li>• Scrap</li> </ul>		<ul style="list-style-type: none"> <li>• Zone 2 Soils, Burial Grounds</li> <li>• Groundwater</li> <li>• Ecological</li> </ul> 	
<b>ETTP D&amp;D</b>	<b>Group 2 AM</b>		<b>K-25/K-27 AM</b>	<b>Remaining Facilities AM</b>
	<ul style="list-style-type: none"> <li>• K-1064 D&amp;D</li> <li>• Powerhouse D&amp;D</li> </ul>		<ul style="list-style-type: none"> <li>• K-25/K-27</li> </ul>	<ul style="list-style-type: none"> <li>• K-31/K-33</li> <li>• Balance of Site</li> </ul>
<b>Others and Off-Site</b>	<b>LWB</b>	<b>CR/PC</b>	<b>LEFPC</b>	<b>Future ROD</b>
	<ul style="list-style-type: none"> <li>• LWB Surface Water, Sediment, Ecological</li> <li>• CR/PC Sediment, Ecological</li> <li>• LEFPC Sediment/Soil, Groundwater, Ecological</li> </ul>			<ul style="list-style-type: none"> <li>• White Wing Scrap Yard</li> <li>• Clinch River Surface Water</li> <li>• LEFPC Surface Water</li> <li>• Chestnut Ridge</li> </ul>