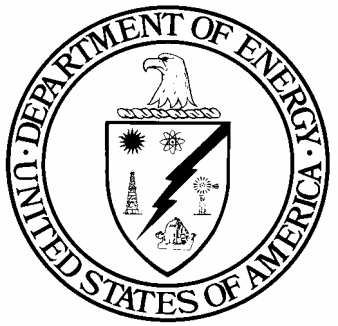
OAK RIDGE RESERVATION

RISK-BASED END STATE VISION

(Revision D1A)



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

DRAFT: March 2004

EXECUTIVE SUMMARY

This document describes the Risk-Based End State (RBES) 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 approximately 35,000 acres in Anderson and Roane Counties in eastern Tennessee. The ORR is bordered by 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.

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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.

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).

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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:

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- 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

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. In recent years, 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. 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.

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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:

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- 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.

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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 its recommendations to DOE on end uses for contaminated lands and on community values.

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Subsequent to these recommendations, watershed records of decision (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-level 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.

The current life-cycle baseline has been developed to support the end uses contained in the RODs where available and on the recommendations of the EUWG for those areas for which decisions have not been made. The end use assumed in the life-cycle baseline plan for each of these areas is:

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- 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/NSSA-controlled industrial use (with some restricted waste management areas)

Cleanup decisions made to date for the ORR and the current life-cycle baseline plan are generally consistent with the risk-based end state vision. The end 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 risk-based 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)].

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Following completion of the EM mission in 2015, the primary 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 capped waste disposal sites in Melton Valley, the Environmental Management Waste Management Facility (EMWMF) and the Bear Creek Burial Ground (BCBG) in Bear Creek Valley, and capped waste disposal sites on 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.

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A variance analysis is presented in this document to identify situations where the currently planned remedial actions may exceed what might be required to attain the risk-based end state. Such variances occur because criteria other than risk (e.g., cost, reliability, permanence, stakeholder preferences) are also involved in the remedy selection process prescribed under CERCLA. In most cases, the variances identified here constitute relatively minor deviations from the current baseline plans, 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.

Robust community participation has been a key element in the remedy selection process for the ORR sites to date. Comments on the initial draft of the RBES vision document have been received to date from the State of Tennessee and the Citizens' Advisory Panel of the Oak Ridge Reservation Local Oversight Committee (CAP-LOC). The Tennessee Department of Environment and Conservation indicated general agreement with the use of a risk-based 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 Citizens' Advisory Panel comments. In addition, the CAP-LOC 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; these issues are discussed in this revised draft document.

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[Note: The major change in this revised draft, relative to the February 1, 2004, D1 draft is the inclusion of additional maps in Sections 2, 3, and 4. In addition, some comments received to date on the February 1 draft, as well as editorial corrections, have been incorporated into this revision. Additional comments will be addressed in the final report.]

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ACRONYMS

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
BCBG	Bear Creek Burial Grounds
BYBY	Boneyard/Burnyard
CAP	Citizens' Advisory Panel
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
COC	constituents of concern
CROET	Community Reuse Organization of East Tennessee
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
HI	Hazard Index
HQ	Hazard Quotient
LOC	Oak Ridge Reservation Local Oversight Committee, Inc.
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NNSA	National Nuclear Security Administration
NEPA	National Environmental Policy Act of 1969
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
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 2002). 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 property 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 risk-based end state to involved parties, including regulators and the public. Under this policy, once the sites have developed their site-specific risk-based 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 risk-based 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 RBES 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 RBES 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 (see Figure 1.0) 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 K-25 Plant, currently called the East Tennessee Technology Park (ETTP)]. Since that time, the missions of these facilities have evolved as described below:

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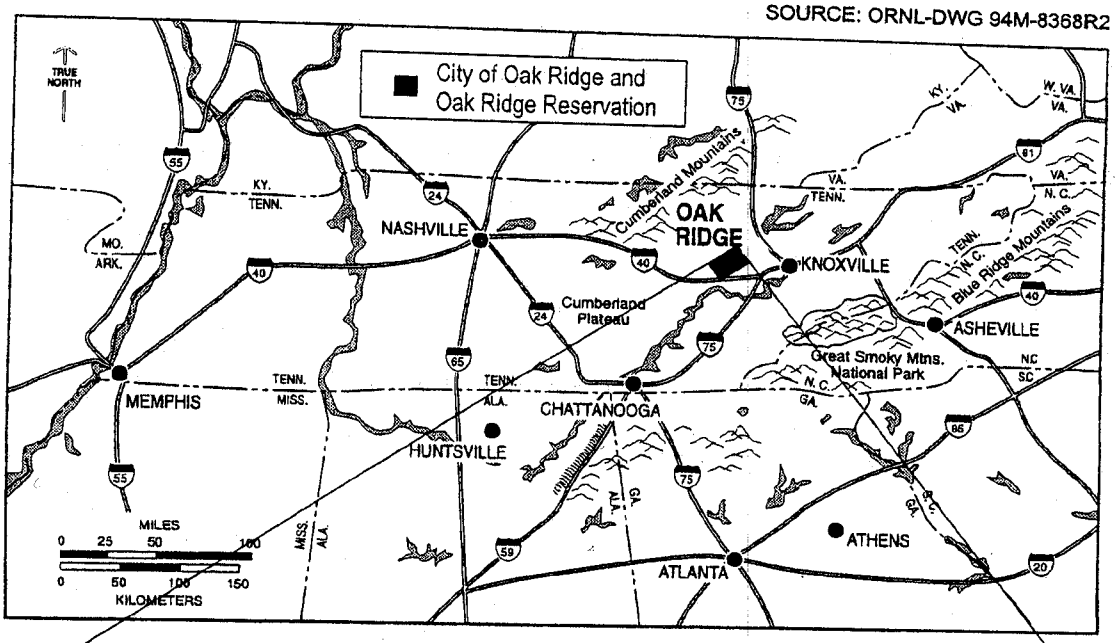

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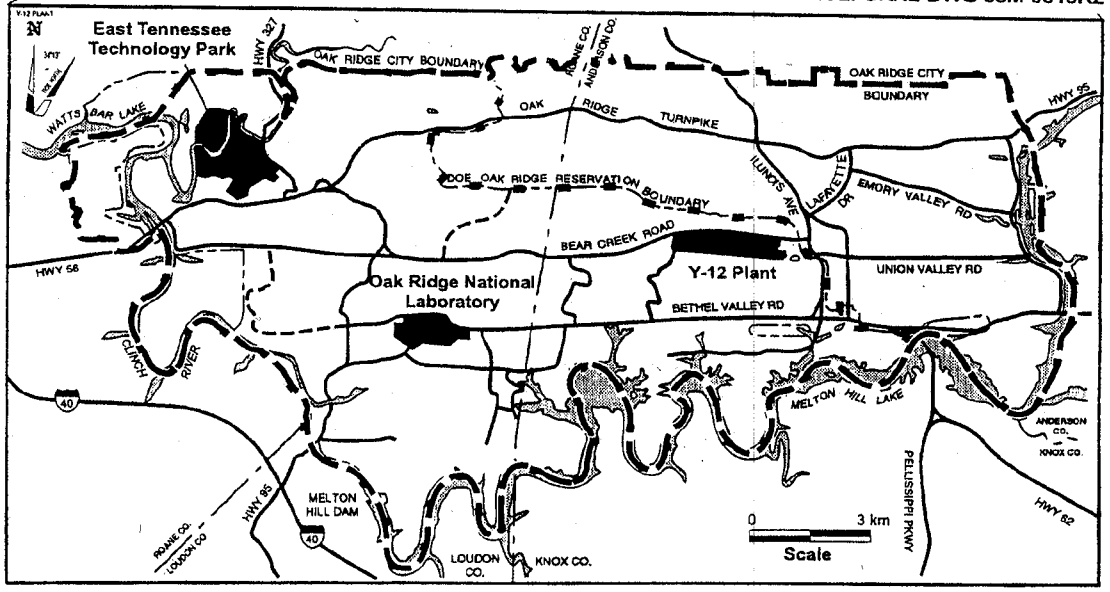

Fig. 1.0

Location of Oak Ridge Reservation

DOE - ORNL Melton Valley watershed - Oak Ridge, Tennessee

DOCUMENT ID: 35H830 0089-20/ROD	DRAWING ID: 99-16983.CDR	DRAWING DATE: February 24, 2000 SB

- **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.

  The primary cleanup challenges at ORNL include elevated concentrations of cesium, strontium, and tritium in surface water and sediment; five shutdown reactors requiring demolition; 140 acres of burial grounds; waste seepage pits, trenches, tanks, and impoundments containing high activity wastes; 2 million curies of radioactivity in a water-rich environment and migrating to the Clinch River; cleanup of soils and demolition of facilities in an operating laboratory environment; and over 6,000 yd^3 of legacy waste to be disposed. 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** - ETTP, formerly the Oak Ridge Gaseous Diffusion Plant (K-25), 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^3 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.

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- **Y-12** - Built in 1943, the original purpose of the Y-12 National Security Complex (Y-12) 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 modernization program.

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^3 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 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 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 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 variety of decision documents, including Action Memoranda, Records of Decision, and Interim Records of Decision. In addition, numerous closure actions have been conducted under the Resource Conservation and Recovery Act (RCRA).

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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 (Figure 1.1) 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
- 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:

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- 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.

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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.

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In August 2002, DOE adopted the *Oak Ridge Performance Management Plan* (PMP) 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. 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.

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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.

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_6) 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.

- **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 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 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 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 life-cycle baseline is generally based on the end 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/NSSA-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.

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In addition to the six watershed areas within the ORR listed above, CERCLA actions are planned or have been previously completed to address off-site areas of environmental contamination resulting associated with ORR activities. The planned actions for the David Witherspoon 901 and 1630 Sites and the Atomic City Auto Parts Site were listed above. The other four principal off-site areas are: 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 2003e).

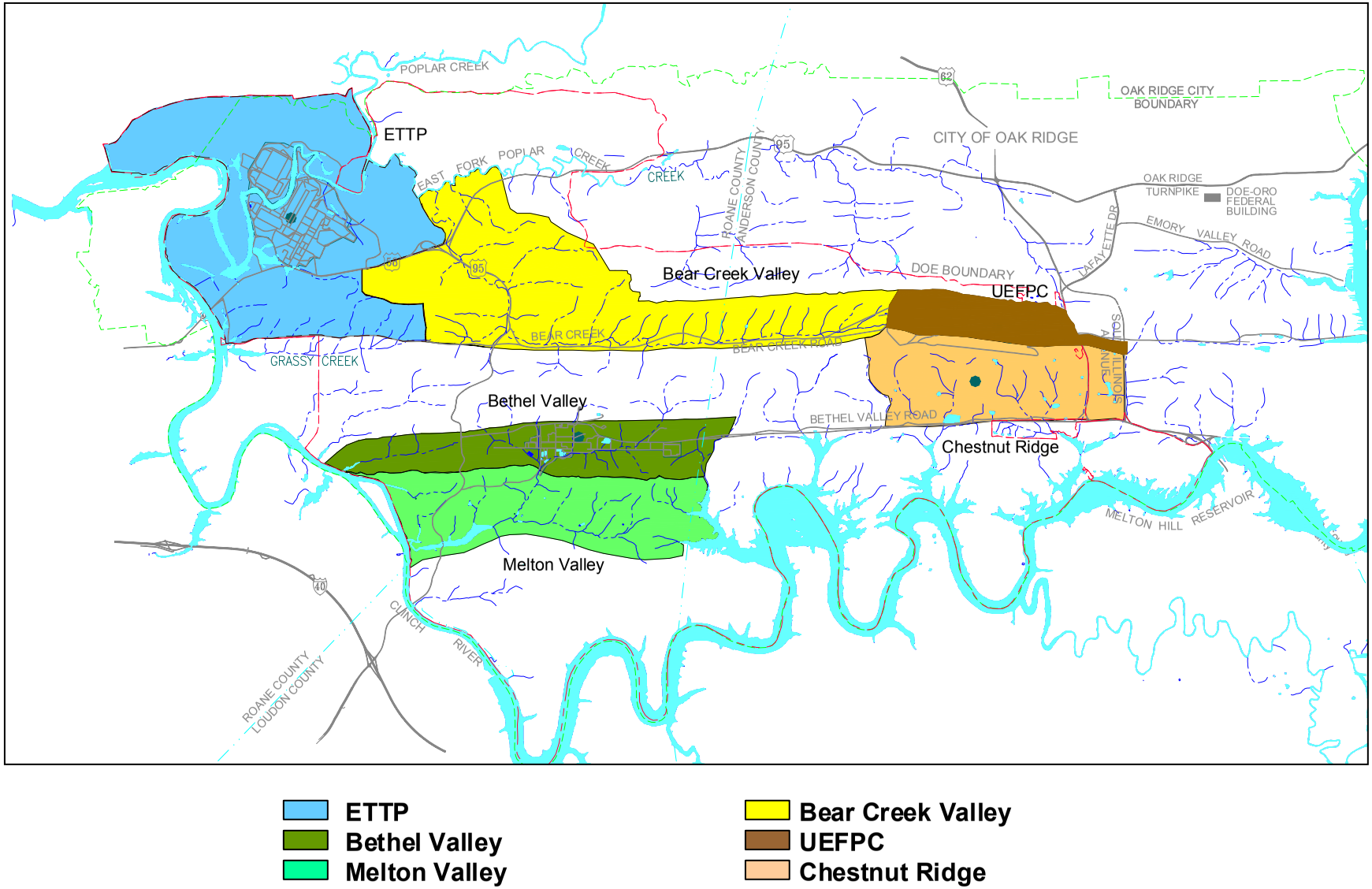

Figure 1.1 Oak Ridge Reservation watershed decision areas

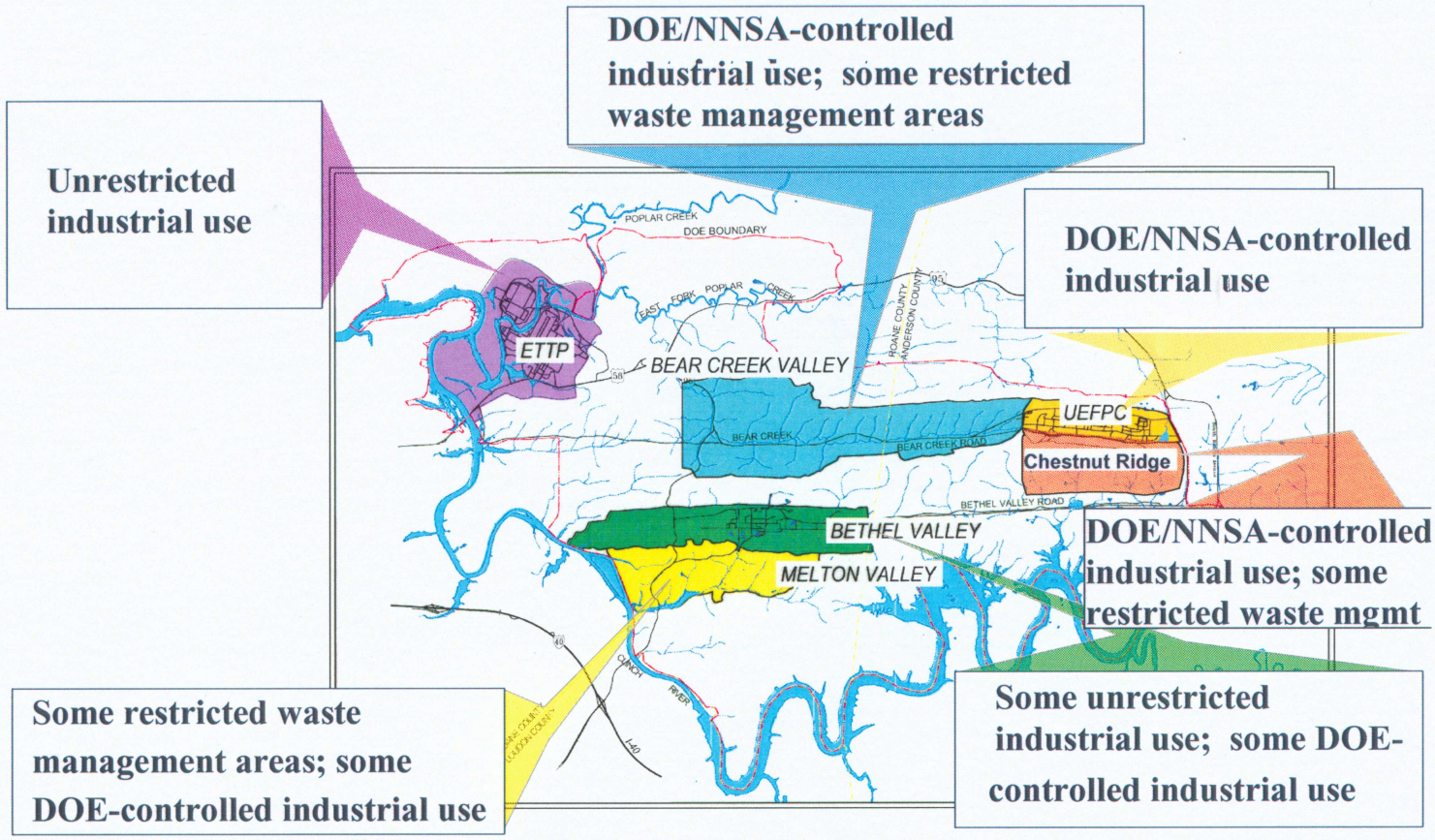

Figure 1.2 DOE-ORR Hazard Area End-Use Map