

Land Use Manager Application Ensures Protectiveness Following Remediation on the Oak Ridge Reservation – 13355

*Sid Garland, PE, BCEE, *Sally Brown, *Lynn Sims, and **Jason Darby
*Restoration Services, Inc., P.O. Box 4699, Oak Ridge, Tennessee 37831,
sidney.garland@ettp.doe.gov

**U.S. Department of Energy, Office of Environmental Management, Oak Ridge Site

ABSTRACT

Long-term stewardship is the set of activities necessary to return contaminated land to safe and beneficial use. The activities include physical and legal controls to prevent inappropriate exposure to contamination left in place at a site. It is the longest phase of the Department of Energy's Environmental Management Program and ensures the protection of human health and the environment for varied end uses. At the Department of Energy's Oak Ridge Reservation an automated program has been developed and implemented that tracks the multitude of long-term stewardship activities.

The Oak Ridge Reservation is a large site that currently has over 50 actions requiring long-term stewardship activities. The Oak Ridge Reservation consists primarily of three plant sites, and long-term stewardship will enable these sites to be leased to private entities (East Tennessee Technology Park), modernized for an evolving national security mission (Y-12 National Security Complex), and revitalized to continue multi-disciplinary research (Oak Ridge National Laboratory).

The varied site end uses of the individual plant sites coupled with the multitude of controls required by leaving waste in place presents challenges. A single remedial action may include surveillance and maintenance activities, media monitoring, property record notices as well as physical controls such as fences and signs. Thus, the array of long-term stewardship activities is complex and intermingled (over 200 inspections each year at various frequencies are required currently) and requires an effective tracking program, termed the Land Use Manager.

The Land Use Manager is a web-based data management application for use by personnel responsible for implementing, maintaining, and verifying engineering and land use controls on the Oak Ridge Reservation. The program is a data entry and tracking tool, as well as a notification tool. The status and performance of engineering and land use controls are checked annually for evaluation in the required Remediation Effectiveness Report, and the automated Land Use Manager collects, maintains, tracks, notifies, monitors, and manages the information necessary to perform this evaluation. Land Use Manager tracks site information including type of contamination, regulatory requirements, locates land use controls; provides information on inspections, certification, and reporting; and provides reports. Most data access features, e.g., view, print, query, and download, are available to all users; however, data input, updating, and editing are restricted to the personnel directly responsible for monitoring and inspection.

The Land Use Manager application was developed for the Department of Energy Oak Ridge Office by URS | CH2M Oak Ridge LLC, Restoration Services Incorporated, and MIJARA Corporation to meet the specific needs of long-term stewardship tracking on the Oak Ridge Reservation.

The successful implementation of long-term stewardship enables the future government and private activities being planned on the Oak Ridge Reservation to proceed.

INTRODUCTION

In Oak Ridge, Tennessee, the U.S. Department of Energy (DOE) and its predecessor agencies have had a mission over the past sixty years of uranium enrichment, weapons production, and energy research. These activities left a legacy of radioactively and chemically contaminated soil, groundwater, surface water, sediment, and buildings on the Oak Ridge Reservation (Fig. 1). The Oak Ridge Reservation was placed on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 National Priorities List in 1989 (CERCLA), and the Department of Energy, the U. S. Environmental Protection Agency, and the Tennessee Department of Environment and Conservation signed a federal facility agreement in 1992 that describes how remediation on the Oak Ridge Reservation will be performed.

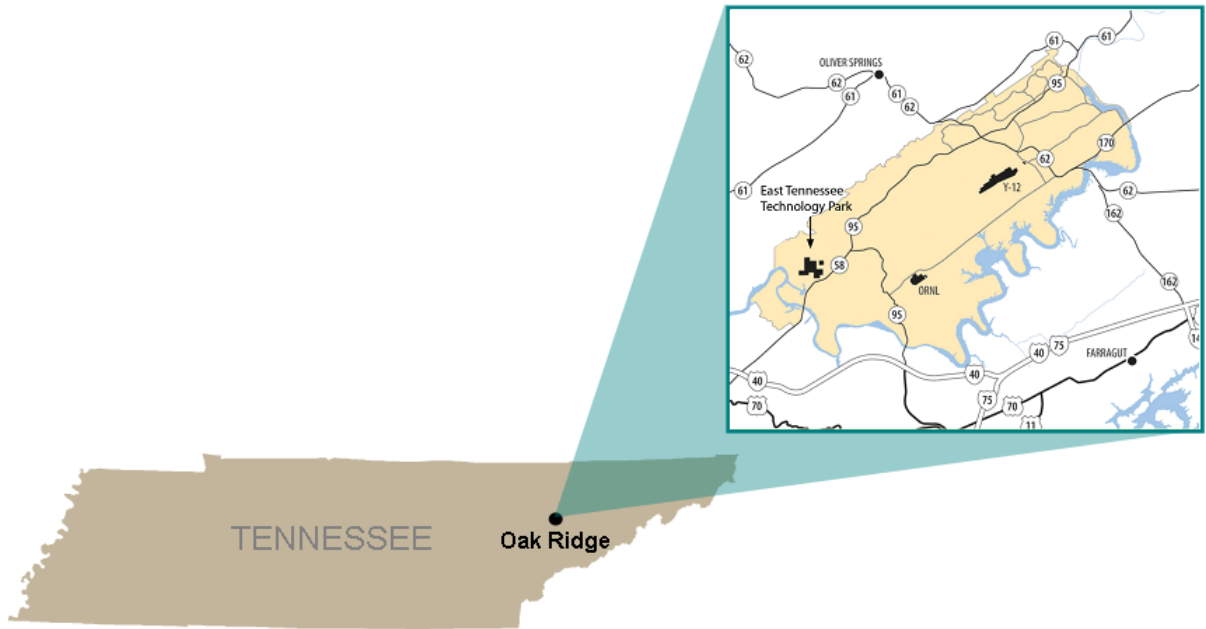


Fig 1. Oak Ridge Reservation.

In many instances, remediation on the Oak Ridge Reservation is not intended to achieve an unrestricted end use. Therefore, once remediation is complete, these areas will transition into the longest phase of the environmental management life-cycle, that of long-term stewardship (Fig. 2). The varied end uses at numerous sites coupled with the multitude of necessary controls

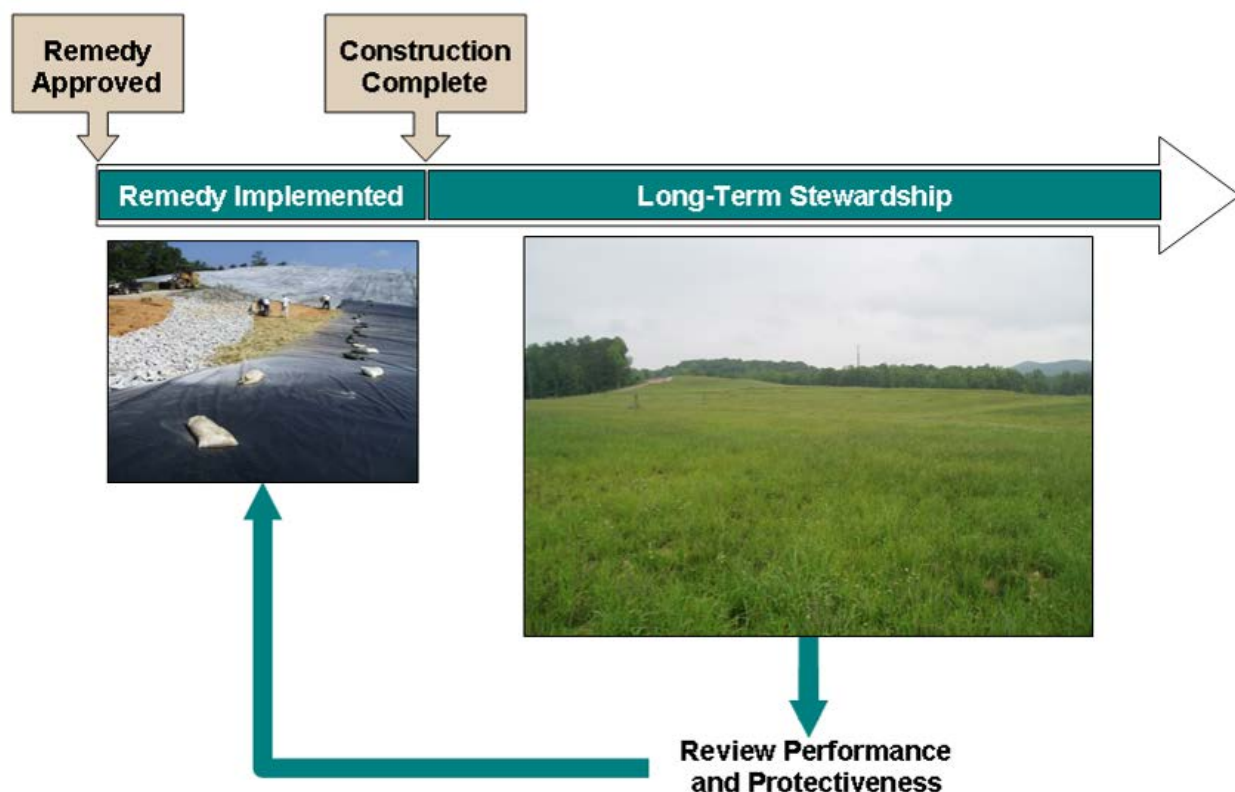


Fig. 2. Environmental Management Life-Cycle.

presents management challenges. Thus, the array of long-term stewardship activities is complex and intermingled (over 200 inspections each year at various frequencies at numerous sites are required currently) and requires an effective tracking program, termed the Land Use Manager.

This paper discusses long-term stewardship and why it is necessary on the Oak Ridge Reservation, and explains how Land Use Manager works.

END USES

Remediation decisions for the contaminated sites on the Oak Ridge Reservation are made at a watershed scale. The Clinch River bounds the Oak Ridge Reservation on three sides, and there are active creeks that flow down the valleys to the Clinch River. Watershed remediation decisions allow decisions to be made on the planned end uses for the watersheds, the appropriate clean-up levels, and the optimum set of remedial actions to achieve the clean-up levels and allow the planned end uses. The planned end uses in the five watersheds on the Oak Ridge Reservation are shown in Fig. 3.

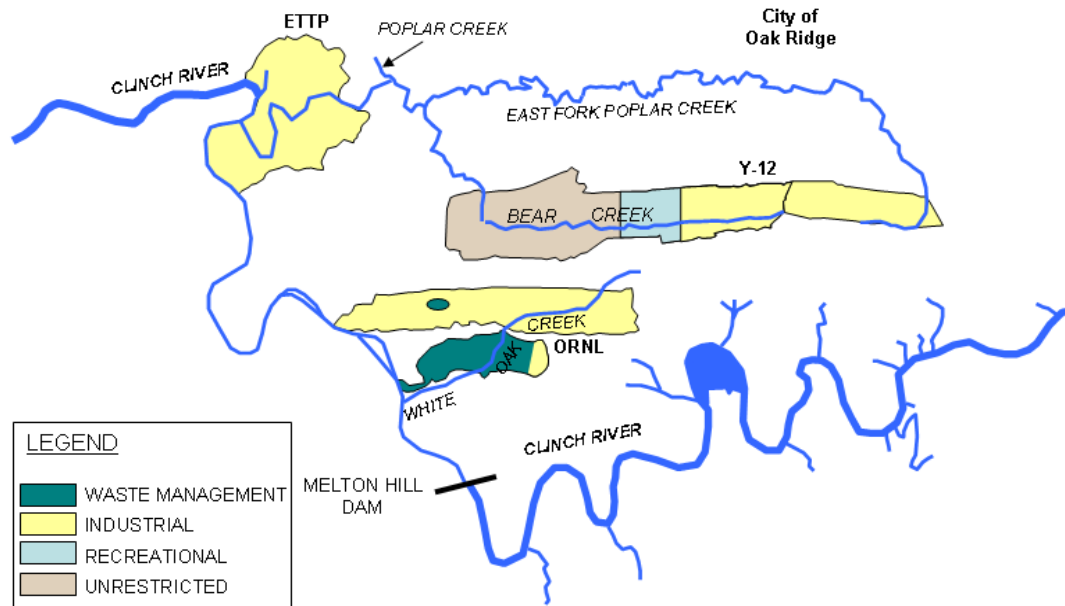


Fig. 3. End uses on the Oak Ridge Reservation.

The remedial decisions contain engineering controls and land use controls to protect human health and the environment:

- Engineering controls include actions to stabilize and/or physically contain or isolate waste, contamination, or other residual hazards. Engineering controls include *in situ* stabilization; capping of residual contamination; excavation of residual contamination; groundwater extraction and treatment systems; demolition of buildings; and vaults, repositories, or engineered landfills designed to isolate waste or materials.
- Land use controls are legal and other non-engineering measures intended to prevent the public from coming into contact with contamination left in place. Land use controls include administrative controls such as property record restrictions, property record notices, zoning notices, and excavation/penetration permit programs, as well as physical controls, such as state advisories/postings, fences, signs, and surveillance patrols.

LONG-TERM STEWARDSHIP

Since most of the remedial decisions do not allow unrestricted end use, these sites will require long-term stewardship. Long-term stewardship is the set of activities necessary to protect human health and the environment from physical hazards, residual contamination, and wastes remaining following remediation. The seven basic elements of long-term stewardship include stewards required to implement activities, operations of controls, information systems documenting the performance of the controls and residual contamination specifics, research for new technologies, public participation, public education, and the allotment of adequate funding.

The operations element of long-term stewardship ensures that the engineering controls and land use controls remain effective for an extended, or possibly indefinite, period of time until residual hazards are reduced sufficiently to permit unrestricted use and unlimited access. Long-term stewardship is designed to:

- Prevent the residual hazard from migrating to the receptor (generally through engineering controls), and
- Prevent the receptor from encountering the residual hazard (generally through land use controls).

As remediation projects are completed, the areas with residual contamination will transition to long-term stewardship.

LAND USE MANAGER

Background

The first CERCLA controls were put in place on the Oak Ridge Reservation in 1991 with the completion of the White Oak Creek Embayment Sediment Retention Structure. Long-term stewardship requirements included inspection and maintenance of the sediment retention structure, as well as land use controls to prevent access to the White Oak Creek Embayment. The mid 1990's saw an increasing number of decisions on the Oak Ridge Reservation which resulted in additional engineering and land use controls. In 1996 the first annual Remediation Effectiveness Report provided a status of environmental monitoring and controls on the Oak Ridge Reservation. A recommendation from the first CERCLA Five-Year Review in 2001 identified the need to conduct standardized checks with centralized records for verification. As a result, a long-term stewardship coordination and tracking process began that entailed site inspection check sheets for CERCLA actions (including treatment systems), as well as tracking administrative land use controls such as deed restrictions, excavation/penetration permit programs, and various other agreements/permits. These tracking check sheets were manually completed and collected from 9 different entities including multiple facility managers and personnel with the Surveillance and Maintenance Programs at the three Oak Ridge sites: Y-12 National Security Complex, Oak Ridge National Laboratory, and East Tennessee Technology Park.

In 2007 the first comprehensive watershed remedial action was completed in Melton Valley. This remedial action entailed hydrologic isolation over 59 hectares requiring comprehensive engineering controls for 14 caps, access controls at 20 locations, designated sign placements, an excavation penetration permit program, and other engineering controls. Additionally, this action required for the first time filing Property Record Restrictions at the County Register of Deeds office. By the year 2011 it became evident that the array of long-term stewardship requirements was so complex and intermingled that an effective, automated tracking program was required to aid in recording and retrieving information. In the fall of 2011, the Oak Ridge Site Specific Advisory Board Stewardship Committee (a federally appointed citizens' panel that provides independent advice and recommendations to the DOE Oak Ridge Office on its Environmental Management Program) recommended automating the long-term stewardship tracking process. After researching other tracking processes in place across the nation, it was determined that a Land Use Control Tracker system already developed for use at the US Navy Base Realignment and Closure sites would work well on the Oak Ridge Reservation.

Over the course of a year this system was augmented to become the Land Use Manager for the Oak Ridge Reservation. Currently, there are over 50 sites on the Oak Ridge Reservation with engineering controls and/or land use controls that require over 200 inspections each year at various frequencies that are tracked by Land Use Manager. As remediation proceeds, these numbers will increase because a single remedial action may include surveillance and maintenance activities, media monitoring, and property record notices as well as physical controls such as fences and signs.

The Land Use Manager was designed to provide the following: locations and descriptions of land use controls; nature and extent of contamination specific to media; contact information for person responsible for land use controls; notification when inspections or certifications are required; use of electronic notebooks for field inspections; record of inspections; downloadable site-specific documents (maps, as-built drawings, reports, etc); interactive mapping and Geographic Information System capabilities; searchable database and links to other pertinent information; tracking of property transfers; regulatory compliance tracking; identification in changes in land use; notifications of potential threats to controls; and publicly accessible information.

Land Use Manager was developed as both an office and field tracking tool. During the development of Land Use Manager field site inspectors completing paper check sheets were canvassed to ensure the automation process mimicked and in many instances streamlined their current processes. Likewise, Facility Managers (responsible for all facility actions) provided input on simplifying their approval process. From working with the field personnel the Land Use Manager proved to be a successful tool to short circuit the process that field personnel had used to repair or maintain a location that was being tracked in Land Use Manager, termed Site Maintenance Requests (SMR).

Figure 4 details the old process of maintenance request vs. the new process with Land Use Manager. The paper process involved the site inspector identifying a field maintenance (issue) to be fixed, then checking against multiple binders of paper that are carried in the field trucks to look up a previous site inspection and verify that the issue requires a new SMR number. In the old paper process this was then noted on the inspection form, the inspector would return to the office to email the information to the SMR coordinator to request a new SMR number. Once the SMR number was received, the site inspector would complete the required SMR form and forward to the SMR coordinator and Facility Manager for approval. Through working with the field and office personnel the Land Use Manager automated every step of the process. In Land Use Manager site inspectors now manage the entire process themselves through the use of their lap tops in the field. The new Land Use Manager system allows for automatic email notifications, queries to search for open SMRs, and paper backups of the forms if needed.

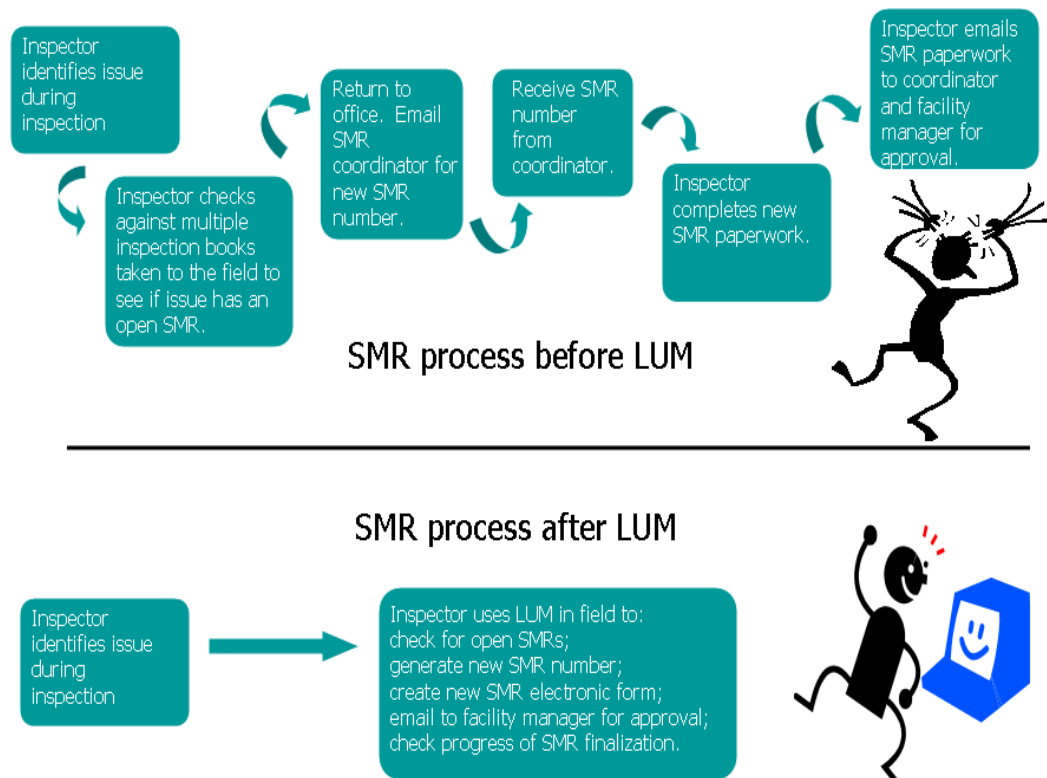


Fig. 4. Site Maintenance Request Process.

Reporting Requirements and Tracking Process

DOE is responsible for implementing, monitoring, maintaining, reporting, and enforcing land use controls and engineering controls selected in the decision documents. The annual Remediation Effectiveness Report is required by the Federal Facility Agreement and intended to collate all Oak Ridge Reservation CERCLA decision requirements, compare pre- and post-remediation conditions at CERCLA sites, and present the results of any required post-decision remediation effectiveness monitoring. As the environmental restoration activities gradually shift to post-remediation care with stewardship requirements, the Remediation Effectiveness Report focuses more each year on the implementation and verification of these requirements. The annual Remediation Effectiveness Report summarizes the implementation of the land use and engineering controls for the year, identifies any necessary maintenance that had to be performed during the year, and documents any breaches to the land use objectives. An important use of the Land Use Manager is the information summary that it provides to perform this evaluation more efficiently.

Also every five years the Oak Ridge Reservation undergoes the CERCLA-driven Five Year Review. The goal of the Five Year Review is to serve as a checkup to ensure that the selected remedies continue to protect human health and the environment. A key component of the review is the verification of the protectiveness of the long-term stewardship activities on the reservation. The Land Use Manager was designed to collect, maintain, track, and monitor these long-term stewardship activities for verification. Through automation of this process, the DOE can ensure implementation and compliance.

The long-term stewardship data needed to complete these annual and five-year reports are tracked through a process that involves many steps including document review, implementation, tracking, verification, and reporting. The Land Use Manager takes this tedious, and time consuming paper tracking process, and automates it (Fig. 5). The long-term stewardship requirements on the Oak Ridge Reservation are specified in CERCLA Decision Documents (i.e., Proposed Plans, Records of Decision, Action Memoranda, and Amendments) and Completion Documents (i.e., Phased Construction Completion Reports, Remedial Action Reports, and Removal Action Reports). Draft decision and completion documents are reviewed by the organization responsible for coordinating long-term stewardship activities, currently called the Water Resources Restoration Program (WRRP). The WRRP ensures long-term stewardship requirements that are included in these documents are consistent with other long-term stewardship requirements across the Oak Ridge Reservation. The WRRP provides comments to the document owners and works with them to ensure they understand the purpose of long-term stewardship requirements.

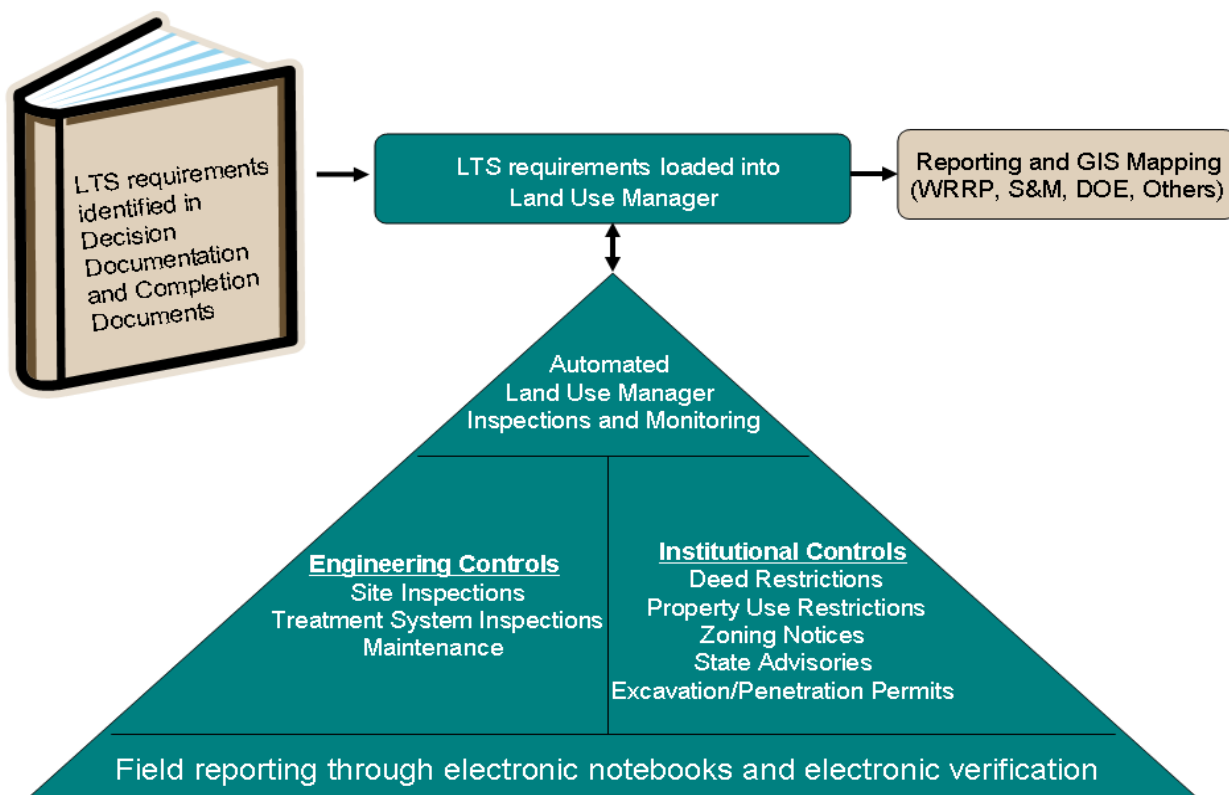


Figure 5. Land Use Manager Tracking Process.

Once a decision or completion document has been approved that establishes long-term stewardship requirements, the WRRP contacts the organization(s) responsible for implementing the long-term stewardship requirements (Fig. 6). On occasion, these implementing organizations may be different contractors or companies. In this case multiple people are contacted and held responsible for ensuring the long-term stewardship requirements are being met (i.e., subcontract coordinators). The WRRP educates these organizations on the newly required controls, the reasons for the controls, the consequences of deficiencies, and provides them with a standardized check sheet (prior to Land Use Manager) to implement the long-term stewardship requirements. If the new requirements entail a treatment or collection system, the WRRP technical leads provide input on the inspection items to ensure they capture all the necessary requirements. An inspection frequency and data submittal frequency is established. If a frequency is not defined in the decision/completion document, then quarterly inspections are required as a minimum and more frequent inspections may be conducted as a best management practice. All of this information is included in the operations and maintenance plans. The implementing organization then performs the required inspections, verifications, and operations. If problems are encountered, a maintenance request is submitted and tracked until completed. Finally, the status of implementation is reported on an annual and five year basis.

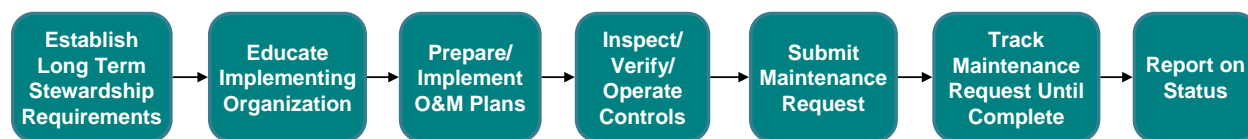


Figure 6. Implementation Process.

Once the Land Use Manager is fully operational, all implementing organizations will have access to the system. Implementing organizations will verify the engineering controls and land use controls are in place and remain effective via electronic inspections. Any repairs or maintenance needed are documented through Site Maintenance Requests. Any major repairs or downtimes are immediately brought to the attention of the WRRP Project Manager or Technical Manager who notify DOE.

In addition to providing information on inspections, the Land Use Manager collates and tracks all site information including type of contamination remaining; regulatory requirements and restrictions; an interactive map for locating inspection items; contact information for responsible person; and any site specific documents such as as-built drawings. It also has a report generating function to allow for data in the system to be queried and downloaded to an Excel spreadsheet. Having this information consolidated and readily available to the projects responsible for implementing and verifying the long-term stewardship requirements enables an understanding of the existence, purpose, and maintenance requirements of these controls.

Public Access and Mapping Features

Data from the system will be accessible to the public to educate stakeholders on the land use controls on the Oak Ridge Reservation, and, in turn, improve local oversight. Currently the system can provide summary reports listing stewardship requirements at a specific location and why they are in place. The reports are linked to a Geographic Information System map providing layers of information such as: remediated areas, capped areas, clean parcels, and site boundaries. The public will be able to access the Land Use Manager mapping features through the Oak Ridge Environmental Information System (<http://www-oreis.ettp.energy.gov/oreis/help/oreishome.html>). The system uses the Stewardship Map developed by the Oak Ridge Site Specific Advisory Board Stewardship Committee. The interactive viewer will allow the public to view sites by clicking on a printable map. Clicking on a site brings up a printable summary table that provides the description of site-specific land use controls in place and designated land uses (Fig. 7). Some other features allow for users to click on the location of their home and find out the distance to a capped landfill, for instance. The various publically available mapping features are still being designed with input from the stakeholders.

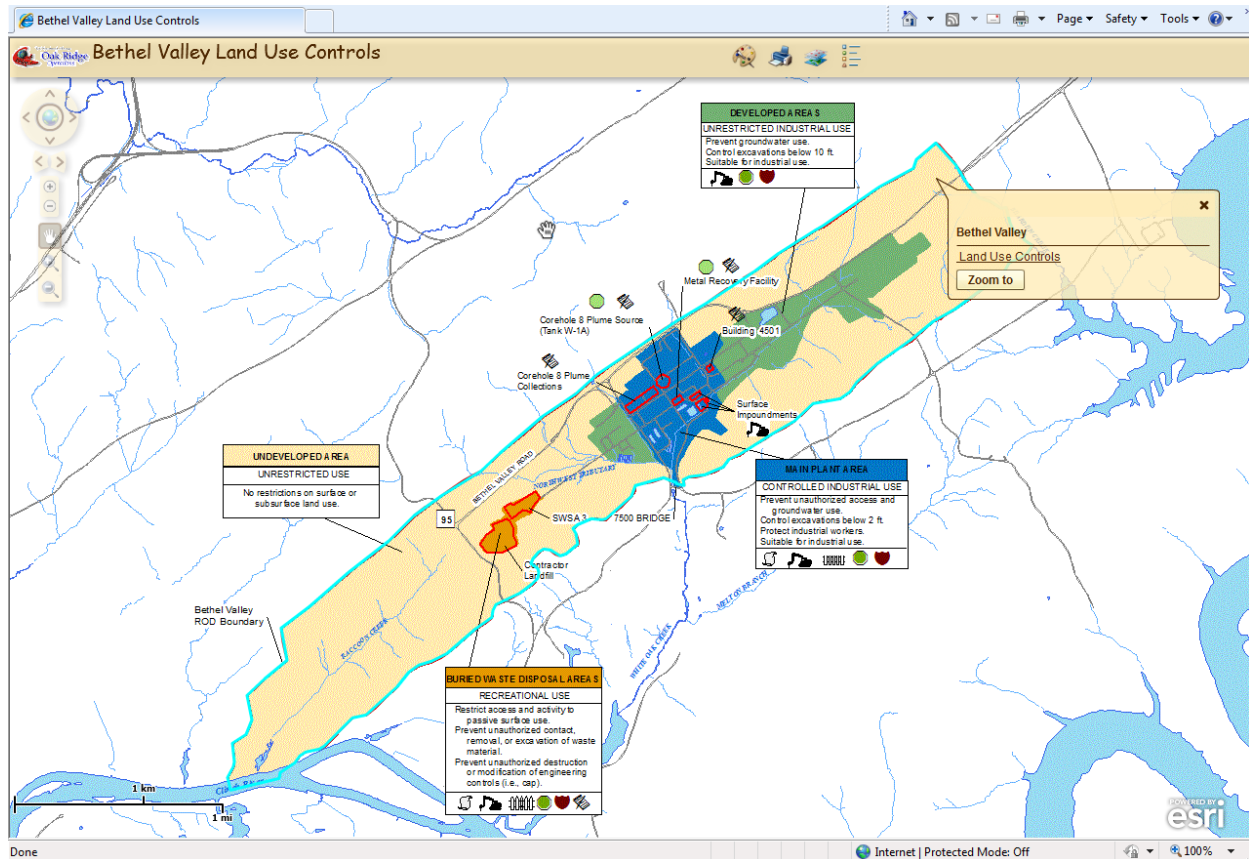


Fig. 7. Public Mapping Features.

The Land Use Manager is currently being beta tested in the field with paper backup. The inspectors use rugged Panasonic Toughbook lap top computers for accessing Land Use Manager remotely and inputting real-time data. The Toughbooks are weather-proof and can withstand six feet drops, spills, dust, and grime. Not only do the Toughbooks provide inspection forms for each site, prompt inspection schedules, send automatic emails to Facility Managers as reminders, and provide the status of maintenance requests, they also have an interactive Geographic Information System mapping feature for use in the field (Fig. 8). The site inspectors can view their inspection location; identify any signs, fences, or gates that need to be maintained as well as click on links to view a photo of the required sign or specific access control. Landfill cap boundaries can be identified and other inspection items such as riprap and storm drains locations can be easily viewed. The interactive Geographic Information System map in Land Use Manager provides the site inspector, as well as facility managers and project management, a better view of the inspection site compared to a hard copy map.

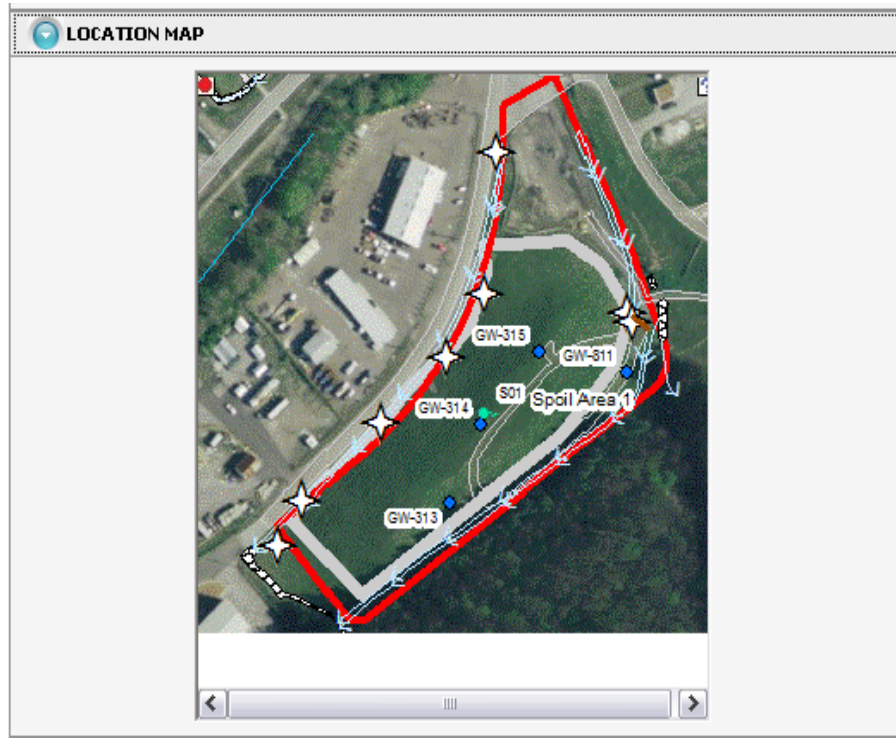


Figure 8. Land Use Manager Site Map.

CONCLUSIONS

Through the implementation of an automated program, Land Use Manager, the DOE on the Oak Ridge Reservation now tracks over 200 engineering and land use controls in real time. The program has streamlined work processes, including site maintenance requests, to ensure that all controls are working as intended to protect human health and the environment. It provides a centralized repository of information that can be queried and summarized for reporting. The program provides an accountable record of field inspections and ensures that nothing is missed.

The future of implementing long-term stewardship is consolidating information in an electronic format. In addition to managing long-term stewardship, such a collection of information could be used for all aspects of site management, decision making, and communication. Effective land use management systems can be crucial to guarantee that site-specific information about land use and engineering controls are readily available to regulators, current property owners, future purchasers, redevelopment agencies, excavators, or personnel responsible for conducting and maintaining the cleanup.