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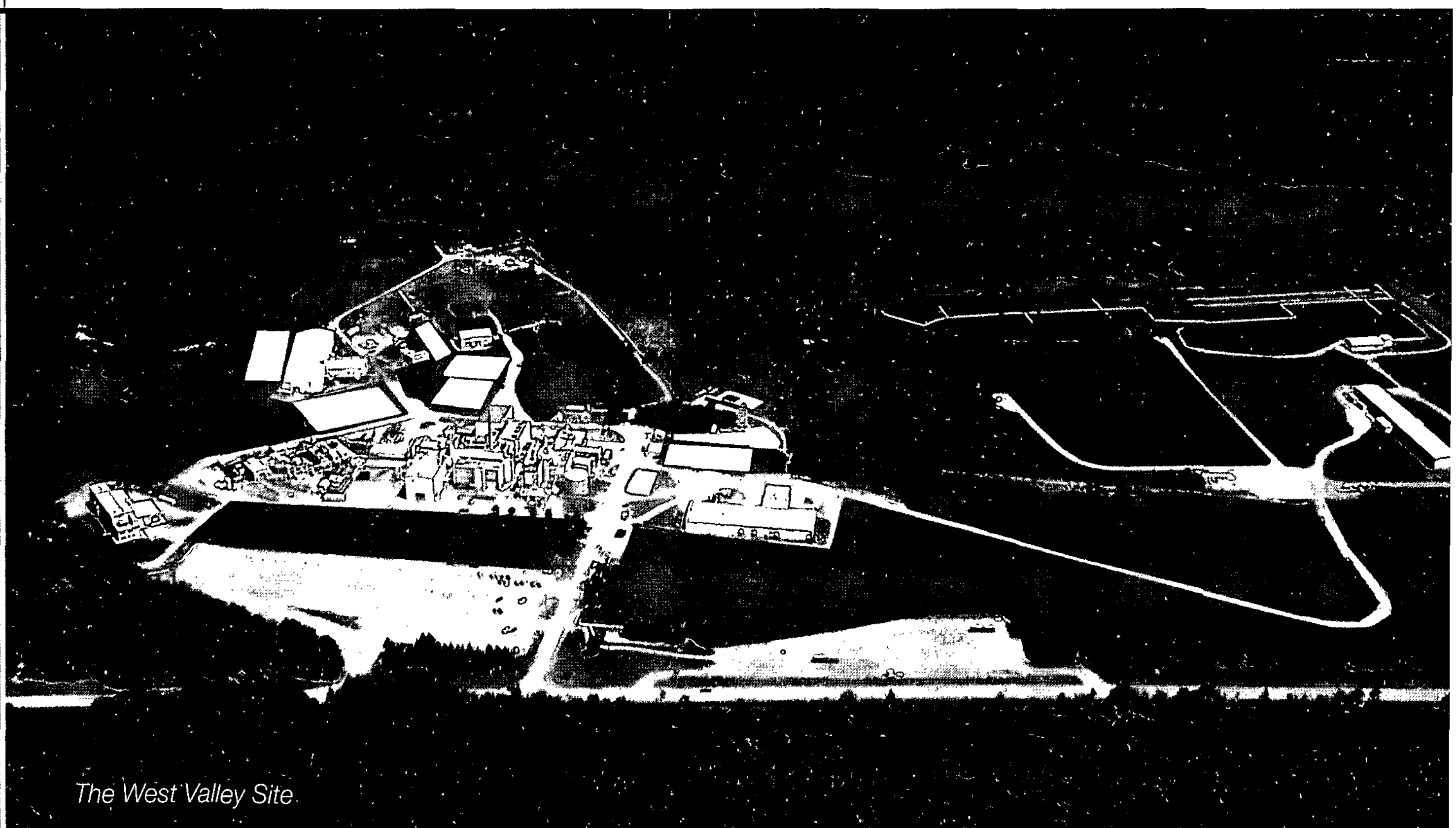
Revised Draft Environmental Impact Statement for

Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center



The West Valley Site

Volume 1

(Chapters 1 through 11)

NYSERDA

DEPARTMENT OF ENERGY · UNITED STATES OF AMERICA

AVAILABILITY OF THE
REVISED DRAFT EIS FOR DECOMMISSIONING AND/OR
LONG-TERM STEWARDSHIP AT THE WEST VALLEY
DEMONSTRATION PROJECT AND WESTERN NEW YORK
NUCLEAR SERVICE CENTER

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U.S. Environmental Protection Agency (EPA)
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Title: *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (DOE/EIS-0226-D [Revised])

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Abstract: The Western New York Nuclear Service Center (WNYNSC) is a 1,352-hectare (3,340-acre) site located 48 kilometers (30 miles) south of Buffalo, New York and owned by NYSERDA. In 1982, DOE assumed control but not ownership of the 66.4-hectare (164-acre) Project Premises portion of the site in order to conduct the West Valley Demonstration Project (WVDP), as required under the 1980 West Valley Demonstration Project Act. In 1990, DOE and NYSERDA entered into a supplemental agreement to prepare a

joint EIS to address both the completion of WVDP and closure or long-term management of WNYNSC. A Draft EIS was issued for public comment in 1996: the *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center*, also referred to as the 1996 *Cleanup and Closure Draft EIS*, DOE/EIS-0226D, January 1996. The 1996 Draft EIS did not identify a Preferred Alternative.

Based on decommissioning criteria for the WVDP issued by NRC since the publication of the 1996 Draft EIS and public comments on the Draft EIS, DOE and NYSERDA prepared this *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center* (also referred to as the *Decommissioning and/or Long-Term Stewardship* EIS), revising the 1996 Draft EIS. This EIS has been prepared in accordance with NEPA and SEQR to examine the potential environmental impacts of the range of reasonable alternatives to decommission and/or maintain long-term stewardship at WNYNSC. The alternatives analyzed in this Draft EIS include the Sitewide Removal Alternative, the Sitewide Close-In-Place Alternative, the Phased Decisionmaking Alternative (Preferred Alternative), and the No Action Alternative. The analysis and information contained in this EIS is intended to assist DOE and NYSERDA with the consideration of environmental impacts prior to making decommissioning or long-term management decisions.

Phased Decisionmaking Alternative (Preferred Alternative): Under the Preferred Alternative, decommissioning would be accomplished in two phases: Phase 1 decisions would include removal of all Waste Management Area (WMA) 1 facilities, the source area of the North Plateau Groundwater Plume, and the lagoons in WMA 2. Phase 1 activities would also include additional characterization of site contamination and studies to provide additional technical information in support of the technical approach to be used to complete site decommissioning. Phase 2 would support the completion of decommissioning actions or long-term management. In general, the Phased Decisionmaking Alternative involves near-term decommissioning and removal actions where there is agency consensus and undertakes characterization work and studies that could facilitate future decisionmaking for the remaining facilities or areas.

Public Comments: On March 13, 2003, DOE issued a Notice of Intent (NOI) in the *Federal Register* soliciting public input on development of this Draft EIS. Public comments received during the scoping period (March 13 through April 28, 2003) and comments received on the 1996 Draft EIS have been considered in the preparation of this Draft EIS. Comments on this Draft EIS will be accepted for a period of 6 months following publication of EPA's Notice of Availability (NOA) in the *Federal Register*, and will be considered in the preparation of the Final EIS. Any comments received after the comment period closes will be considered to the extent practicable. The locations and times of public hearings on the Draft EIS will be identified in the *Federal Register* and through other media such as local press notices. In addition to the public hearings, multiple mechanisms for submitting comments on the Draft EIS are available:

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Foreword

The View of the New York State Energy Research and Development Authority on the Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center

Introduction

The New York State Energy Research and Development Authority (NYSERDA) would like to thank you for participating in this very important Environmental Impact Statement (EIS) process. This Draft EIS presents alternatives for the critical next steps of the West Valley Demonstration Project (WVDP) cleanup, and assesses the environmental impacts from those alternatives. It is important for the agencies and the public to be properly informed of potential environmental impacts associated with these alternatives, and it is just as important for members of the public to provide their input to the agencies on the alternatives.

Because of the importance of the decisions that will soon be made regarding the next steps in the cleanup, NYSERDA requested the opportunity to present our agency's view on the analyses and results that are included in this Draft EIS.

NYSERDA's Role in the West Valley EIS

NYSERDA owns the Western New York Nuclear Service Center on behalf of New York State, and is a joint lead agency with the U.S. Department of Energy (DOE) in this EIS process. NYSERDA and DOE are joint lead agencies because both agencies are planning to make decisions on the future of the West Valley site. Federal and State regulations require these decisions to be assessed through an EIS.

In terms of the preparation of the EIS, DOE manages and directs the EIS contractor (Science Applications International Corporation), and NYSERDA provides its input on the EIS content, analyses, and results through consultations with DOE.

The Preferred Alternative - An Approach to Allow Important Near-Term Work to Proceed

An interagency working group[1] was established by DOE in late 2006 to resolve a number of outstanding technical issues that were identified during agency reviews of early versions of the Draft EIS. The working group was tasked with finding ways to come to concurrence on almost 1,700 comments on the EIS, many of which were related to the long-term analysis of the site. The comments also included input from an independent Peer Review Group that was convened by DOE and NYSERDA in early 2006[2]. Although the interagency working group did not resolve all issues to the satisfaction of all participating agencies, the group did identify a preferred cleanup alternative that would allow the near-term removal of several very significant site facilities and areas of contamination (the Main Plant Process Building, the Low-Level Waste Treatment System Lagoons, and the source area of the North Plateau groundwater plume). This alternative also includes deferring, for up to 30 years, decisions for certain key facilities (e.g., the High-Level Waste (HLW) Tanks[3] and the NRC-Licensed Disposal Area) to allow for improvements in the technical basis of the long-term performance analysis. Under the preferred alternative, the State-Licensed Disposal Area (SDA) would be managed in place, under regulatory controls, for up to an additional 30 years.

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[1] This interagency working group, called the Core Team, is composed of representatives from DOE, NYSERDA, U.S. Nuclear Regulatory Commission (NRC), New York State Department of Environmental Conservation (NYSDEC), U.S. Environmental Protection Agency (EPA) and New York State Department of Health (NYSDOH).

[2] This 2006 independent review group, known as the Peer Review Group, documented its findings in a report presented to NYSERDA and DOE dated April 25, 2006 (PRG, 2006). This report is available on the internet at http://www.nyserda.org/publications/westvalleypeerreviewgroup.pdf. Paper copies can be requested from NYSERDA at END@nyserda.org , or by calling Elaine DeGiglio at (716) 942-9960, extension 2423.

[3] The HLW Tanks are referred to in the EIS as "the Waste Tank Farm."

NYSERDA supports the phased decisionmaking alternative because it allows substantial facilities and contamination to be removed from the site in the near term. This removal work represents very important progress in the cleanup of the Western New York Nuclear Service Center and completion of the WVDP. The alternative also provides the opportunity to improve EIS long-term technical analyses so the agencies can consider the decision with respect to the remaining facilities in light of better information. NYSERDA believes that due to the very large costs associated with removing these facilities and the potential for significant long-term risk from leaving them in place, the long-term decision with respect to these facilities must be supported by a thorough and scientifically defensible long-term analysis. We believe that this scientifically defensible long-term analysis does not exist today.

Independent Expert Review of the Draft EIS

In the spring of 2008, NYSERDA convened a group of nationally and internationally recognized scientists to review a Preliminary Draft of the DEIS. These distinguished scientists, collectively called the Independent Expert Review Team (IERT), are experts in the disciplines of geology, erosion, groundwater hydrology, nuclear science and engineering, health physics, risk assessment, and environmental science and engineering (see the second-to-last section of this Foreword for a list of the members and their affiliations). The scope of their review was to assess the technical basis and scientific defensibility of the analyses presented in the PDEIS. The review was initiated in May 2008, and was completed in September 2008[4]. The final report was submitted to NYSERDA on September 23, 2008 (IERT, 2008).

The Independent Expert Review Team identified significant technical issues with the Preliminary Draft of the DEIS, and the results of the Independent Expert Review Team's review, along with NYSERDA staff's own review of this Draft EIS,

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[4] The report from the Independent Expert Review Team is available on the internet at: http://www.nyserda.org/publications/westvalleyindependentreview.pdf. Paper copies can be requested at END@nyserda.org, or by calling Elaine DeGiglio at (716) 942-9960, extension 2423.

allowed NYSERDA to develop an overall "view" on the Draft EIS analyses and results. The NYSERDA "View" is presented below.

NYSERDA's View on the Draft EIS Analyses and Results

NYSERDA's view on the Draft EIS analyses and results is as follows:

1. **<u>The Draft EIS Analysis of Soil Erosion Over the Long Term is Not Scientifically Defensible and Should not be used for Long-term Decisionmaking</u>**

   The Draft EIS long-term soil erosion analysis, which is intended to show how soil erosion by streams, creeks, and gullies will impact the site and site facilities over tens of thousands of years, is not scientifically defensible and should not be used for long-term decision making.

   The Draft EIS presents the results from a computer program (also called a computer model) that is used to calculate changes to the existing land surface from soil erosion over tens of thousands of years. The computer model provides predictions of how the topography of the land would change, given certain parameter values (e.g., rainfall, soil type, vegetation, and the slope of the land surface), and timeframes (thousands of years). These computer-predicted changes in the land surface were then combined with the conceptual designs for facilities that are proposed to be closed in place to see how the conceptual designs would be impacted by the computer-predicted erosion impacts.

   We recognize that it is a very difficult technical task to predict the location of streams, creeks, gullies, slumps and landslides, tens of thousands of years into the future, and to determine how the deepening and development of these creeks, gullies, landslides and other features might impact facilities and waste that remain at the site. We also recognize that DOE has expended considerable time and resources in attempting to develop a defensible erosion model that could be used to make these predictions. Unfortunately, we do not believe that these efforts have been successful at producing a scientifically defensible prediction of erosion or erosion impacts to facilities that may be closed in place for thousands of years.

   As an example of our concerns with the erosion modeling presented in this Draft EIS, the computer model result shows that the only places where any serious erosion would be expected would be in the vicinity of the Low Level

Waste Treatment Facility Lagoons, the SDA and the NDA. While this result suggests that most of the facilities and contamination remaining on the North Plateau would not be disturbed by erosion, real world observations of the North Plateau suggest otherwise. In contrast to the computer-generated result, the real North Plateau has very large, deeply incised gullies that are actively downcutting and widening in the North Plateau's unconsolidated sand, gravel, and clay soils. New gullies are forming along the North Plateau perimeter. In addition to gully growth and formation, significant slump features are evident on the slopes of Frank's Creek and Quarry Creek, showing the instability of the creek banks and the plateau edge. The modeling results appear to be inconsistent with observations of the real world, and there is no information presented in the Draft EIS that provides confidence that the computer modeling results are meaningful and reliable.

The Independent Expert Review Team provided the following observations in regard to the erosion modeling:

> "DOE and its cooperators (contractors) present the simulation results of various models used to predict current and future erosion at the West Valley Site, specifically rill and sheet erosion, gully erosion, and landscape evolution. While efforts have been made to model these various surface-erosion components, the predictions from these models cannot be accepted or ratified at this time. This opinion is based on the following four assessment criteria: First, there remains a serious disconnect between model parameterization and the hydrologic and geomorphic characteristics of the site, which has resulted in dubious, highly questionable, and physically unjustifiable assumptions in the treatment and assignment of model variables. Second, no verification or validation of any models was presented in the context of comparing model output to actual field data[5]. Third, many of the model components, especially with regard to gully erosion and landscape evolution, are unjustifiable and unsupported by current scientific evidence. Fourth, no rigorous

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[5] No demonstration has been made that the model output for surface runoff or infiltration, soil erosion, water flow, sediment transport, or stream channel widths at the West Valley Site, as predicted by SIBERIA or CHILD, have been verified or validated on the basis of actual field data. Field data can be obtained through measurements of stream channel cross-sections, collection of grab samples (to determine sediment loads), watershed characterization, measurements of stream flow velocities using a gauging weir, etc. Even though computer models can be physically-based, the models may report erroneous or aberrant results, the nature of which remains undetected, ignored, or overlooked because of this lack of field data verification.

uncertainty analysis in any model predictions was provided. The uncertainty bounds in model predictions for the gully erosion and landscape evolution are expected to be very large (orders of magnitude) considering the conceptualization, construction, parameterization, discretization, application, and interpretation of the models employed.

Most importantly, any predictions made using any gully erosion or landscape evolution model with regard to future releases of radionuclides due to the surface erosion of the West Valley Site as presented herein are scientifically indefensible. It was the opinion of the 2006 Peer Review Group that the science behind landscape evolution models is not mature enough to justify relying on these models to provide long-term predictions of erosional processes, and that the associated uncertainty bounds of these predictions should be quantified. The current Independent Expert Review Team (IERT), based on the revisions presented, recapitulates this previous opinion. "

Based on the Independent Expert Review Team review of the erosion modeling work, and based on NYSERDA staff's review of the Draft EIS, NYSERDA believes that the erosion modeling results presented in the Draft EIS should not be used for long-term decision making. Accordingly, predictions of radiation doses to the public and all other site impacts that were calculated using the erosion computer models presented in this Draft EIS should not be used to support long-term decisionmaking for the West Valley site cleanup. Until both lead agencies and the scientific community conclude that a defensible erosion analysis for the site is achievable and has been prepared, decisions will need to focus on actions that are not dependent on having scientifically defensible estimates of erosion impacts over thousands of years.

2. <u>The Draft EIS Analysis of Contaminant Transport by Groundwater Needs Improvement</u>

The analysis of the potential for transport of contaminants by groundwater, as presented in Appendix E and Appendix G of the Draft EIS, needs improvement.

The groundwater transport analyses are presented in the Draft EIS in two appendices. Appendix E presents a description of three-dimensional groundwater flow and contaminant transport models that were used to estimate the flow of groundwater through the soils and bedrock beneath the site and to assess the release and transport of contaminants by groundwater from any facilities and contamination that might be closed in place. Appendix G describes simpler, one-dimensional groundwater flow and contaminant transport models that were used in the calculations of impacts to the public that are presented in other sections in the DEIS.

While the approach to groundwater flow and contaminant transport described in Appendix E is sound, there are a number of areas where these three-dimensional models could be improved (a detailed discussion of suggested improvements to the three-dimensional groundwater models is presented in the Independent Expert Review Team (2008) report). NYSERDA recognizes the significant effort that was employed by DOE and its consultants to develop and run a three-dimensional flow and transport model for this site, and we note that this work represents a significant improvement over earlier groundwater modeling efforts that were conducted as part of preparing the Draft EIS. It is unclear, however, why the improved, three-dimensional models described in Appendix E were not actually used in the radiation dose and impact calculations. Simplified, one-dimensional flow and transport models (described in Appendix G) were used instead. In regard to this issue, the Independent Expert Review Team stated that they could identify no clear rationale for replacing the improved, three-dimensional models with one-dimensional models for the purpose of conducting the long-term dose calculations.

As was the case with the erosion modeling, the manner in which the Draft EIS identifies, analyzes, and presents uncertainty in the groundwater transport calculations is not adequate. The Draft EIS uses a deterministic approach (which means that single values are used for model inputs and model parameters), and asserts that these values are conservative[6]. NYSERDA shares the belief of the Independent Expert Review Team that additional documentation is needed to substantiate the assertion that the deterministic treatment of groundwater flow and transport is truly conservative. According to the Independent Expert Review Team, the sensitivity analyses presented are a very small subset of the potentially important analyses, and do not provide a comprehensive evaluation of uncertainty in groundwater flow and transport.

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[6] "Conservative" means that the values chosen would not likely lead to an underestimate of impacts.

Based on the Independent Expert Review Team's review of the groundwater modeling work, and on NYSERDA staff's review of the same information, NYSERDA opposes using the groundwater modeling results presented in the Draft EIS for long-term decision making. Accordingly, predictions of radiation doses to the public and all other site impacts that were calculated using the groundwater modeling approach presented in the Draft EIS should not be used to support long-term decisionmaking for the West Valley site cleanup.

3. **<u>The Draft EIS Assumptions used for the Performance of Engineered Barriers have not been Substantiated and may be Overly Optimistic</u>**

The assumptions used in the Draft EIS analysis to predict the performance of engineered features such as caps, slurry walls, reducing grout, and other engineered materials intended to keep contamination physically and chemically bound in place for tens of thousands of years, have not been substantiated and may be overly optimistic. Additional analysis and verification is required for the performance of engineered barriers that are used in the Draft EIS site closure alternatives.

In the Draft EIS analysis, the physical properties of engineered barriers are assigned a level of performance that is said to represent a degraded condition to account for barrier subsidence, cracking, and clogging. The engineered barriers are then assumed to perform at that level, without further reduction in performance, for the duration of the analysis (100,000 years). An important factor for the physical performance of engineered barriers in the Draft EIS is the assumption that the barriers used to protect North Plateau facilities will not be physically disturbed by natural processes, like erosion. Given the presence of significant erosion features (gullies and slumps) that are actively changing and impacting the North Plateau today, this assumption seems implausible, and if this assumption is going to be used in the Draft EIS, it must be supported by convincing evidence. Our review of Appendix H shows that this assumption is based solely on the results of the Draft EIS erosion modeling, and as we stated above, we believe that this modeling is not scientifically defensible. Consequently, the assumption used in the Draft EIS that the engineered barriers would be physically stable for 100,000 years on the North Plateau is not adequately supported.

The chemical properties of engineered barriers (which are intended to chemically bind contaminants and prevent their migration) are also said to be assigned degraded values, and are then assumed to remain at that level for the 100,000 year analysis period without further reduction in performance. The assumption that chemical properties of man-made engineered barriers will remain constant over tens of thousands of years is implausible. Even though a "natural" material may be stable and retain certain properties in one geologic and hydrologic setting, that same natural material may not be stable or retain those same chemical properties indefinitely in another setting, particularly when combined with other natural and man-made materials, and over timeframes as long as 100,000 years. If the Draft EIS is going to use this assumption, the Draft EIS must also provide adequate references to properly support and defend this assumption.

The Independent Expert Review Team found the information on engineered barriers to be poorly supported. The team said that the details of the barrier design were not clearly identified, and they found it difficult to understand several aspects of how the engineered barriers would be constructed. The IERT also identified several specific concerns, including the lack of support for the assumption that North Plateau barriers would not be impacted by erosion, a lack of support for the parameter values used for chemical retention of contaminants and for the permeability of shallow soils under slurry walls, and a lack of a consideration of the performance history of erosion control structures in southwestern New York.

The sensitivity analysis information presented in Appendix H in the Draft EIS shows that the assumptions used for engineered barriers in the long-term performance calculations, even in the "degraded" state, are critical to the outcome of performance for facilities that are closed in place. As such, it is very important that the Draft EIS provide clear support for all assumptions used for engineered barriers, and provide additional information on the impacts from complete and partial barrier failure and on the importance of engineered barriers in each alternative's ability to meet the decommissioning criteria[7].

Based on the Independent Expert Review Team's review of the engineered barrier assumptions, and based on NYSERDA staff's review of the Draft EIS, NYSERDA has concluded that the assumptions used for engineered barriers in this Draft EIS are not adequately supported and may lead to underestimates

[7] Under the WVDP Act, the U.S. Congress required the U.S. Nuclear Regulatory Commission to prescribe decommissioning criteria for the WVDP. Those criteria were issued by NRC in a "Policy Statement" that was published in the Federal Register on February 1, 2002.

of dose and other impacts. Accordingly, predictions of long-term radiation doses to the public and all other site impacts that were calculated based on the engineered barrier assumptions presented in this Draft EIS should not be used to support long-term decisionmaking for the West Valley cleanup.

4. **The Uncertainties in the Draft EIS Long-Term Performance Analyses are not Adequately Presented or Discussed**

The Draft EIS does not address uncertainty in a manner that provides decisionmakers with information on the critical contributors to uncertainty, or the importance of uncertainty in site cleanup decisions.

All long-term analyses in the Draft EIS are deterministic, which means that they use single models and single values for model input parameters. The Independent Expert Review Team noted that the multiple sources of uncertainty inherent in this analysis are largely unacknowledged, and there is no systematic discussion of how uncertainty has been characterized. Impacts of uncertainties on decisionmaking are supposed to be accounted for by conservative choices in scenario selection and modeling and by limited deterministic sensitivity analyses. In practice, however, the Draft EIS does not demonstrate that the deterministic analysis is either conservative, or that it has appropriately incorporated or bounded uncertainty.

The Independent Expert Review Team concluded that some potentially significant uncertainties have not been evaluated. In addition, assertions that other uncertainties have been conservatively bounded are not justified. Transparency of the long-term analysis is poor, and it is not possible to independently replicate the analyses or to otherwise understand how the results were derived. Given these observations, the Independent Expert Review Team stated that the quantitative results of the long-term analysis presented should not be used to support decisionmaking associated with the Draft EIS.

Based on the Independent Expert Review Team's review of the treatment of uncertainty, and based on NYSERDA staff's review of the Draft EIS, NYSERDA has concluded that the approach used to identify, analyze, and present uncertainty in the Draft EIS is not adequate. The sensitivity analyses in Appendix H show that varying the values of certain important parameters could make the difference between whether an alternative meets the decommissioning criteria or fails to meet the criteria. Consequently, a more comprehensive and transparent analysis and presentation of uncertainty is needed to support long-term decisionmaking for the West Valley site cleanup.

5. The Connection between the Draft EIS Analyses and the Applicable Regulatory Framework Must be Strengthened

The long-term analysis for the site, as described in Appendix D of the Draft EIS, should be closely structured and clearly tied to the NRC's License Termination Rule (LTR). The LTR is the applicable regulatory framework for decommissioning the WVDP and for the termination of the 10 CFR 50 License.

The Draft EIS identifies several regulations that were used to develop the framework for the long-term performance assessment analysis. One of these regulations is the License Termination Rule, which is the applicable regulatory framework for the West Valley Demonstration Project cleanup. Another regulation that was relied upon extensively in the development of the Draft EIS analytical approach is 10 CFR 61, the NRC's Low Level Waste disposal regulations. We are concerned that using portions of the Part 61 guidance, absent other critical parts of the Part 61 regulations (such as the facility siting requirements), may result in a nonconservative performance assessment.

10 CFR 61 requires a disposal site to be located in a geologic setting that is essentially stable, or alternatively, in an area where active features, events, and processes (such as erosion) will not significantly affect the ability of the site and design to meet the Part 61 performance objectives. The Part 61 performance assessment guidance is intended to be applied to a facility that is sited in accordance with the site suitability requirements. In such a setting, an engineered cap might not be substantially disturbed by natural processes, and it may be reasonable to assume that the cap would provide adequate protection to an intruder for the needed period of time. At the West Valley site, however, the facilities were not sited in accordance with the Part 61 site suitability requirements, and as such, the Draft EIS analysis should not take credit for site stability and the passive functioning of engineered barriers in perpetuity unless this assumption can be justified.

Although DOE has a standard approach for preparing National Environmental Policy Act (NEPA) documents, the LTR (and its implementing guidance, NUREG-1757), are directly applicable to the West Valley Demonstration Project decommissioning activities and alternatives, and the

LTR requirements and guidance should form the framework for the Draft EIS analysis. The NRC's West Valley Policy Statement prescribes the LTR as the decommissioning criteria for the WVDP, and says:

> "The environmental impacts from the application of the criteria will need to be evaluated for the various alternative approaches being considered in the process before NRC decides whether to accept the preferred alternative for meeting the criteria of the LTR. NRC intends to rely on the DOE/NYSERDA EIS for this purpose."

While DOE has stated that the Decommissioning Plan, not the EIS, is the proper document to conduct the LTR compliance analysis, it does not seem logical to prepare an EIS to assess the impacts from decommissioning actions that must meet the requirements of the NRC's LTR, and use regulations and guidance that are not part of the LTR regulatory framework to structure the analyses. As such, NYSERDA believes that the Draft EIS analyses should be reframed to reflect the requirements of the NRC's analytical requirements for decommissioning. The Part 61 guidance should not be used as part of the analytical framework for the Draft EIS unless there is a specific reason under the requirements of the LTR or WVDP Act to do so.

6. The Draft EIS Approach for Exhumation may be Overly Conservative

The approach described in the Draft EIS and its supporting documents for exhumation of the SDA, the NDA and the Waste Tank Farm appears to be overly conservative, and based on extreme conditions, rather than on conditions that are more likely to be encountered during exhumation. As a result, there is significant uncertainty in the cost estimates in the Draft EIS for the exhumation of the Waste Tank Farm and the disposal areas.

The SDA and NDA exhumation processes are conducted using very large, hard-walled concrete secondary containment structures. Primary containment structures are located within the larger secondary containment structures. While this may be an effective approach to provide containment, it may also be much more containment than what is needed to safely exhume some or all of the wastes. Further, the Draft EIS assumes that 100% of the waste resulting from demolition of these massive containment structures must be disposed of as radioactive waste. We believe this assumption to be unnecessarily conservative.

An alternative approach to the use of hard-walled containment structures would be the use of Sprung Structures™, which consist of UV-resistant fabric and PVC membrane over an aluminum support system. Sprung Structures™ have lasted 15-20 years through harsh winters, and they can be fitted with the ventilation and air filtering systems that would be needed to contain contamination within the structure. Similar structures were used at the WVDP in the 1980s during the excavation of the solvent tanks from the NDA.

In regard to the disposal costs for exhumed waste, it is projected that approximately 150,000 cubic feet of waste exhumed from the SDA and NDA will be classified as "Greater than Class C" (GTCC). This type of waste currently has no disposal path. Although this waste is not high-level waste, the Draft EIS assumes, for costing purposes, that this waste would be disposed of at Yucca Mountain, and assigns a disposal cost of $20,000 per cubic foot for this waste. Consequently, the total cost for disposing of this 150,000 cubic feet of exhumed GTCC waste is $3 billion, which represents about 40% of the total exhumation cost for the two disposal facilities. While we recognize that the Draft EIS had to assume some disposal cost for this waste, the approach selected appears to be the most expensive possible option.

In July of 2007, DOE issued a Notice of Intent for an EIS that will examine options for the disposal of GTCC waste. In this Notice of Intent, Yucca Mountain was identified as only one of several possible options for this waste. Another option being considered for this waste is disposal at the Waste Isolation Pilot Plant (WIPP). If the West Valley GTCC waste was assumed to be disposed of at $2,300 per cubic foot[8], the disposal cost for the West Valley GTCC waste would be lowered by almost a factor of ten. We also note that the GTCC Notice of Intent identified disposal options that could be even less expensive than WIPP.

For the Waste Tank Farm, the Independent Expert Review Team concluded that the cost of exhuming the Waste Tank Farm, using the exhumation approach presented in the Draft EIS, is probably underestimated. They also state, however, that by using alternative exhumation approaches for the tanks, cost savings could be realized, and the exhumation cost for the Waste Tank Farm could actually be lower than the estimate presented in the Draft EIS.

[8] $2,300 is the "derived" cost for the disposal of WVDP waste at WIPP, as presented in the Facilities Description and Methodologies Technical Report, WSMS-WV-08-0001.

Based on the Independent Expert Review Team's review of the exhumation approach, and based on NYSERDA staff's review of the Draft EIS, we believe that the exhumation approaches in the Draft EIS could be successful, but they don't use current industry practices and innovations, and don't attempt to minimize waste volumes. Furthermore, there is significant uncertainty in the costs used in the Draft EIS for disposing of exhumed waste from the SDA and NDA.

NYSERDA believes that the approach identified in the Draft EIS for exhuming the disposal areas and Waste Tank Farm should be reassessed to determine whether less conservative, but still protective, methods of exhumation could be identified that would significantly reduce the cost of exhumation. Disposal costs should also be reevaluated, and where great uncertainty exists, ranges of costs, rather than just the upper end, should be provided in the Draft EIS to better inform and support decisionmaking.

7. **<u>Nonradiological Fatalities from Waste Transportation Rail Accidents Appear to be Over- Estimated</u>**

In evaluating impacts from transportation, the predicted rail transportation fatalities in the Draft EIS are too high and are not supported by current transportation accident data.

In its evaluation of nonradiological risk from rail transportation, the EIS uses "railcar-kilometers" to assess the number of expected traffic accident fatalities. The main purpose for using this approach is that published data exists for State-specific accident rates, and the predicted number of accidents can be estimated using the cumulative shipment distance and the accident rate per mile.

In calculating impacts from rail shipping, the Draft EIS makes the assumption that there will be only <u>one</u> waste-carrying railcar per train. In other words, even though the average train can carry 68 railcars (Saricks and Tompkins, 1999), the Draft EIS assumes that each and every railcar is an individual shipment. A better measure for impacts from rail transportation would be "train-kilometers" which would assume that a single shipment is made up of multiple railcars. The accident risk would then be assigned to the entire train, rather than each individual railcar on the train.

In regard to this issue, the Independent Review Team offered the following observation:

"The railcar-kilometer metric implies that one or a few waste laden railcars are part of a larger variable construct train. (See Saricks and Tompkins, 1999 cited in Appendix J of the 2008 DEIS for a discussion of variable-construct versus dedicated trains.) If these waste-laden railcars are a small part of a much larger train (Saricks and Tompkins estimate 68 cars in an average train), then the non-radiological risk is already inherently included in the train that would run whether the few additional waste-laden railcars were present or not. This is another difference between variable-construct train and truck risks – the truck would not travel if not for the waste cargo; the same is not true for variable-construct trains. One could argue that the incremental non-radiological rail transportation risk due to an additional waste-laden railcar is negligible."

The Draft EIS shows that the expected number of shipments by truck will be twice the number of shipments by rail; yet the expected fatalities from rail transportation are predicted to be four times higher. The EIS is predicting 30 fatalities as a result of rail transportation under the Nevada Test Site option or 29 fatalities from rail transportation under the commercial landfill disposal option for the Sitewide Removal Alternative. These values appear excessive, and the conclusion that rail shipping is considerably more dangerous than highway truck transportation is not supported by government-published accident rates[9].

Considering the issues identified above, NYSERDA has concluded that the nonradiological transportation risk estimates presented in the EIS overestimate the risk from rail transportation. We believe that the predicted number of fatalities from traffic accidents identified under the two removal alternatives (Sitewide Total Removal and Phased Decisionmaking) will be substantially decreased once the analysis of rail transportation is corrected.

8. The Existing Long-Term Performance Assessment is not Adequate to Support the In-Place Closure of the Waste Tank Farm or any Other Facilities

The Draft EIS includes an analysis that attempts to quantify and present the impacts from the in-place closure of all major facilities on the site. Much of the discussion in this "View" presents NYSERDA's concerns with that long-term, in-place closure analysis. As discussed above, NYSERDA believes that the Draft EIS long-term performance assessment for the in-place closure

[9] Accident Rate Information is from the U.S. Department of Transportation Motor Carrier Management Information System.

alternative is seriously flawed and scientifically indefensible. As such, the Draft EIS long-term performance assessment should not be used to support a decision to close the Waste Tank Farm, or any other facilities, in place.

Although DOE has publicly stated that decisions on certain facilities, such as the Waste Tank Farm, would be deferred and would not be made as part of a Phase 1 decommissioning decision, DOE has not clearly outlined a path for how, and when, the Phase 2 decisions would be made. If DOE were to decide to move forward with a decision to close the Waste Tank Farm in place, NYSERDA would expect DOE to prepare, and make available for public and agency comment, an EIS with a revised and scientifically defensible long-term performance assessment that would fully analyze, identify, and disclose, the impacts from the in-place closure of the Waste Tank Farm.

NYSERDA's Quantitative Risk Assessment for the State-Licensed Disposal Area

NYSERDA's preferred alternative for the SDA is to manage the facility in place for up to 30 more years. As such, NYSERDA is required under the State Environmental Quality Review Act (SEQR) to identify and mitigate potential environmental impacts from that action. Through early discussions with DOE regarding the content of the EIS, it was determined that the EIS would not include a quantitative analysis of impacts from the in-place management of the SDA for 30 years under the Draft EIS preferred alternative. To meet its requirements under SEQR, NYSERDA tasked Dr. B. John Garrick to provide the analysis needed to assess NYSERDA's preferred alternative for the SDA. Dr. Garrick, who is the current Chairperson of the U.S. Nuclear Waste Technical Review Board, and a former President of the Society for Risk Analysis, recommended that the SDA short-term analysis should consist of a quantitative risk assessment (QRA).

The Quantitative Risk Assessment for the State Licensed Disposal Area (QRA 2008) evaluates the risk from continued operation of the SDA for the next 30 years with its current physical and administrative controls. The scope of this risk assessment is limited to quantification of the radiation dose received by a member of the public, represented by two potential receptors - a permanent resident farmer located near the confluence of Buttermilk Creek and

Cattaraugus Creek, and a transient recreational hiker / hunter who traverses areas along Buttermilk Creek and the lower reaches of Frank's Creek.

The study evaluates potential releases of liquid, solid, and gaseous radioactive materials from the 14 waste disposal trenches at the SDA site. It examines a broad spectrum of potential natural and human-caused conditions that may directly cause or contribute to these releases.

The QRA includes detailed models for the mobilization, transport, distribution, dilution, and deposition of released radioactive materials throughout the environment surrounding the SDA site, including the integrated watershed formed by Erdman Brook, Frank's Creek, and Buttermilk Creek.

Appendix P of this Draft EIS contains a summary of the QRA for the SDA, and the supporting models, data, and analyses for the QRA are available as a separate document from NYSERDA[10].

The Composition of the Independent Expert Review Team

The New York State Research and Development Authority selected a distinguished group of nationally and internationally recognized scientists and engineers to conduct an independent review of the Draft EIS for the West Valley Demonstration Project and the Western New York Nuclear Service Center. The basis of their selection was to select individuals who have distinguished themselves in the disciplines believed important to the scope of the review. The disciplines included on the IERT are geology, erosion, groundwater hydrology, nuclear science and engineering, health physics, risk assessment, and environmental science and engineering.

Dr. B. John Garrick, Chairman, U.S. Nuclear Waste Technical Review Board and an independent consultant in the nuclear and risk sciences was named as the initial member and chairman of the Independent Expert Review Team. Dr. Garrick assisted NYSERDA in selecting the review team, and he had the

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[10] The complete QRA report is available on the internet at http://www.nyserda.org/publications/sdaquantitativeriskassessment.pdf . Paper copies can be requested from NYSERDA at END@nyserda.org, or by calling Elaine DeGiglio at (716) 942-9960, extension 2423.

responsibility for integrating the reviews and leading the preparation of the team's report. The full membership and their affiliations are listed below.

James T. Bell, Ph.D., Retired, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Sean J. Bennett, Ph.D., Professor, State University of New York at Buffalo. Buffalo, New York

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B. John Garrick, PhD., Chairman, U.S. Nuclear Waste Technical Review Board, Laguna Beach, California

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Michael P. Wilson, Ph.D., Professor, State University of New York at Fredonia, Fredonia, New York

References

IERT 2008, Independent Review of the Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center, Independent Expert Review Team, September 23, 2008.

PRG 2006, Peer Review of Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center, Peer Review Group, April 25, 2006.

QRA 2008, Quantitative Risk Assessment for the State-Licensed Disposal Area, QRA Team, September 25, 2008.

Saricks and Tompkins, 1999, State-Level Accident Rates for Surface Freight Transportation, A Reexamination, ANL/ESD/TM-150, Center for Transportation Research, Argonne National Laboratory, U.S. Department of Energy, Argonne, Illinois, April 1999.

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ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ACRONYMS, ABBREVIATIONS, AND CONVERSION CHARTS

ALARA	as low as reasonably achievable
BCG	Biota Concentration Guide
CDDL	Construction and Demolition Debris Landfill
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CMS	Corrective Measures Study
D&D	decommissioning and decontamination
dBA	decibels A-weighted
DCGL	Derived Concentration Guideline Levels
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	Environmental Assessment
ECL	Environmental Conservation Law
EDE	effective dose equivalent
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPRI/SOG	Electric Power Research Institute/Seismic Owners Group
FR	*Federal Register*
GTCC	Greater-Than-Class C waste
HEPA	high-efficiency particulate air
HIC	high-integrity container
LCF	latent cancer fatality
LSA	Lag Storage Area
M&M	monitoring and maintenance
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	maximum contaminant level
MEI	maximally exposed individual
MMI	Modified Mercalli Intensity
NAAQS	National Ambient Air Quality Standards
NDA	NRC-licensed Disposal Area
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutant
NFS	Nuclear Fuel Services, Inc.
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
NYCRR	New York Code of Rules and Regulations

NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOL	New York State Department of Labor
NYSERDA	New York State Energy Research and Development Authority
PCB	polychlorinated biphenyl
PM	particulate matter
PMF	probable maximum flood
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
rem	roentgen equivalent man
RFI	RCRA Facility Investigation
ROD	Record of Decision
ROI	Region of Influence
SDA	State-licensed Disposal Area
SEQR	State Environmental Quality Review Act
SPDES	State Pollutant Discharge Elimination System
STS	Supernatant Treatment System
SWMU	Solid Waste Management Unit
TEDE	total effective dose equivalent
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
VRM	Visual Resource Management
WIPP	Waste Isolation Pilot Plant
WMA	Waste Management Area
WNYNSC	Western New York Nuclear Service Center
WVDP	West Valley Demonstration Project

CONVERSIONS

METRIC TO ENGLISH			ENGLISH TO METRIC		
Multiply	**by**	**To get**	**Multiply**	**by**	**To get**
Area					
Square meters	10.764	Square feet	Square feet	0.092903	Square meters
Square kilometers	247.1	Acres	Acres	0.0040469	Square kilometers
Square kilometers	0.3861	Square miles	Square miles	2.59	Square kilometers
Hectares	2.471	Acres	Acres	0.40469	Hectares
Concentration					
Kilograms/square meter	0.16667	Tons/acre	Tons/acre	0.5999	Kilograms/square meter
Milligrams/liter	1 [a]	Parts/million	Parts/million	1 [a]	Milligrams/liter
Micrograms/liter	1 [a]	Parts/billion	Parts/billion	1 [a]	Micrograms/liter
Micrograms/cubic meter	1 [a]	Parts/trillion	Parts/trillion	1 [a]	Micrograms/cubic meter
Density					
Grams/cubic centimeter	62.428	Pounds/cubic feet	Pounds/cubic feet	0.016018	Grams/cubic centimeter
Grams/cubic meter	0.0000624	Pounds/cubic feet	Pounds/cubic feet	16,025.6	Grams/cubic meter
Length					
Centimeters	0.3937	Inches	Inches	2.54	Centimeters
Meters	3.2808	Feet	Feet	0.3048	Meters
Kilometers	0.62137	Miles	Miles	1.6093	Kilometers
Temperature					
Absolute					
Degrees C + 17.78	1.8	Degrees F	Degrees F - 32	0.55556	Degrees C
Relative					
Degrees C	1.8	Degrees F	Degrees F	0.55556	Degrees C
Velocity/Rate					
Cubic meters/second	2118.9	Cubic feet/minute	Cubic feet/minute	0.00047195	Cubic meters/second
Grams/second	7.9366	Pounds/hour	Pounds/hour	0.126	Grams/second
Meters/second	2.237	Miles/hour	Miles/hour	0.44704	Meters/second
Volume					
Liters	0.26418	Gallons	Gallons	3.78533	Liters
Liters	0.035316	Cubic feet	Cubic feet	28.316	Liters
Liters	0.001308	Cubic yards	Cubic yards	764.54	Liters
Cubic meters	264.17	Gallons	Gallons	0.0037854	Cubic meters
Cubic meters	35.314	Cubic feet	Cubic feet	0.028317	Cubic meters
Cubic meters	1.3079	Cubic yards	Cubic yards	0.76456	Cubic meters
Cubic meters	0.0008107	Acre-feet	Acre-feet	1233.49	Cubic meters
Weight/Mass					
Grams	0.035274	Ounces	Ounces	28.35	Grams
Kilograms	2.2046	Pounds	Pounds	0.45359	Kilograms
Kilograms	0.0011023	Tons (short)	Tons (short)	907.18	Kilograms
Metric tons	1.1023	Tons (short)	Tons (short)	0.90718	Metric tons
ENGLISH TO ENGLISH					
Acre-feet	325,850.7	Gallons	Gallons	0.000003046	Acre-feet
Acres	43,560	Square feet	Square feet	0.000022957	Acres
Square miles	640	Acres	Acres	0.0015625	Square miles

a. This conversion is only valid for concentrations of contaminants (or other materials) in water.

METRIC PREFIXES

Prefix	Symbol	Multiplication factor
exa-	E	1,000,000,000,000,000,000 = 10^{18}
peta-	P	1,000,000,000,000,000 = 10^{15}
tera-	T	1,000,000,000,000 = 10^{12}
giga-	G	1,000,000,000 = 10^{9}
mega-	M	1,000,000 = 10^{6}
kilo-	k	1,000 = 10^{3}
deca-	D	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	µ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}

CHAPTER 1
INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

1.0 INTRODUCTION AND PURPOSE AND NEED FOR AGENCY ACTION

Chapter 1 of this environmental impact statement (EIS) gives an overview of the activities at the Western New York Nuclear Service Center (WNYNSC) and a brief history of events leading to the development of the document. It includes the purpose and need for agency action, the scope of the EIS and decisions to be made, the relationship of this EIS to other National Environmental Policy Act (NEPA) documentation, and the scoping process used to obtain public input on the issues addressed in this EIS. The chapter concludes with a discussion of the organization of the document.

1.1 Overview

WNYNSC is a 1,352-hectare (3,340-acre) site located 48 kilometers (30 miles) south of Buffalo, New York, and owned by New York State Energy Research and Development Authority (NYSERDA). In 1982, under terms of the Cooperative Agreement between the U.S. Department of Energy (DOE) and NYSERDA, DOE assumed control, but not ownership, of the 66.4-hectare (164-acre) Project Premises portion of the site in order to conduct the West Valley Demonstration Project (WVDP), as required by the 1980 WVDP Act (DOE and NYSERDA 1981). In 1990, DOE and NYSERDA entered into an agreement to prepare a joint EIS that addressed both WVDP completion and closure of the WNYNSC. A *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center* (also called the *Cleanup and Closure Draft EIS*) (DOE 1996a) was issued for public comment in 1996, but a Preferred Alternative was not identified, and a Final EIS was not prepared.

In March 2003, DOE and NYSERDA issued Notices in the *Federal Register* and the New York State Environmental Notice Bulletin, respectively, of their intent to prepare this *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center (Decommissioning and/or Long-Term Stewardship EIS).* This Draft EIS revises the 1996 *Cleanup and Closure Draft EIS* and analyzes site-wide alternatives for management or decommissioning of facilities and property at WNYNSC. DOE and NYSERDA are joint lead agencies for the preparation of this EIS; and NRC, the U.S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC) are cooperating agencies. New York State Department of Health (NYSDOH) and NYSDEC are involved agencies as provided for by the State Environmental Quality Review Act (SEQR).

WNYNSC was established in 1961 as the site of a nuclear center that consists of commercial spent nuclear fuel reprocessing and waste disposal facilities. Nuclear Fuel Services, a private company, built and operated the fuel reprocessing plant and the burial grounds, processing 640 metric tons (705 tons) of spent fuel at West Valley from 1966 to 1972 under an Atomic Energy Commission license. These spent fuel reprocessing operations resulted in the generation of 2,498,000 liters (660,000 gallons) of high-level radioactive waste which was stored in two underground storage tanks. In 1976, Nuclear Fuel Services withdrew from the reprocessing business and returned control of the facilities to the site owner, NYSERDA. However, Nuclear Fuel Services remained on site until 1981 to continue plant cleanup activities. The reprocessing operations and subsequent plant cleanup generated approximately 5,380 cubic meters (190,000 cubic feet) of radioactive waste that was buried in a 2.83-hectare (7-acre) burial area termed the NRC-licensed disposal area (NDA). WVDP disposed of an additional 5,663 cubic meters (200,000 cubic feet) of radioactive waste between 1982 and 1986 in the NDA. Radioactive waste was accepted for burial at a second burial area adjacent to the NDA, the 6.1-hectare (15-acre) State-licensed disposal area (SDA), from 1963 until 1975. The SDA received waste from offsite locations, as well as waste generated at WNYNSC by nuclear fuel reprocessing operations. The total volume of radioactive waste disposed of in the SDA is estimated to be approximately 68,000 cubic meters (2.4 million cubic feet).

In 1976, when Nuclear Fuel Services exercised its contractual right to leave the site and transfer ownership and responsibility for the waste and facility to the State of New York, the State initiated discussions with the U.S. Government concerning management of the waste and facilities.

In 1980, Congress passed the WVDP Act, which directed DOE to take the lead role in solidifying the liquid high-level radioactive waste remaining in underground tanks and decontaminating and decommissioning the facilities at the West Valley Site used in solidifying the waste. In particular, the Act called for DOE to:

1. Solidify, in a form suitable for transportation and disposal, the high-level radioactive waste at WNYNSC.

2. Develop containers suitable for the permanent disposal of the high-level radioactive waste solidified at WNYNSC.

3. Transport in accordance with applicable provisions of law, as soon as feasible, the waste solidified at WNYNSC to an appropriate Federal repository for permanent disposal.

4. Dispose of low-level radioactive waste and transuranic waste produced by the solidification of the high-level radioactive waste under the project in accordance with applicable licensing requirements.

5. Decontaminate and decommission the tanks and other facilities in which the solidified high-level radioactive waste was stored, the facilities used in the solidification of the waste, and any material and hardware used in connection with the project in accordance with such requirements as NRC may prescribe.

To take these actions, NYSERDA granted DOE exclusive use and possession of the Project Premises and project facilities solely for the purpose of carrying out the project. The Project Premises consists of the developed areas on WNYNSC, with the exception of the SDA.

DOE has made substantial progress on completing its WVDP Act requirements. By August 2002, DOE had completed requirements 1 and 2 above by solidifying the high-level radioactive waste and placing it in 275 canisters suitable for permanent disposal. Because a Federal repository is not available, the 275 canisters are stored in a heavily shielded cell in the former reprocessing plant, pending repository availability. Completion of WVDP involves completion of requirements 3 through 5 listed above.

While DOE has been discharging its responsibilities under the WVDP Act, NYSERDA has continued to monitor and maintain the SDA and the balance of the retained premises (that portion of WNYNSC not provided to DOE for conduct of WVDP). NRC has continued to fulfill its WVDP Act responsibilities through informal review and consultation with DOE and by conducting monitoring activities.

While most site activities have focused on the management of radioactive waste and contamination, there are also hazardous chemicals and hazardous wastes on site that are being managed consistent with EPA and New York State regulations, including those issued to implement the Resource Conservation and Recovery Act (RCRA), Subtitle C – Hazardous Waste Management Program. These regulations are referred to herein as either "RCRA regulations" when referring to EPA's regulations (40 *Code of Federal Regulations* [CFR] Parts 260-279) or "Part 373/RCRA regulations" when referring to New York State's regulations (6 New York Codes of Rules and Regulations [NYCRR] 370-374 and 376).

RCRA Background

In 1984, DOE notified EPA of hazardous waste activities at WVDP and identified WVDP as a generator of hazardous waste. This preceded the 1987 DOE interpretive rule that clarified that the nonradioactive chemically hazardous component of mixed low-level radioactive waste (waste containing both radiological and RCRA hazardous components) would be subject to regulation under RCRA. In June 1990, New York State regulations governing mixed low-level radioactive waste became effective and a RCRA Part A Permit Application for WVDP was filed with NYSDEC for the storage and treatment of hazardous waste and mixed low-level radioactive waste generated on site. Similarly, in 1990, NYSERDA submitted a RCRA Part A Permit Application to NYSDEC to store and treat hazardous and mixed low-level radioactive waste at the SDA on its portion of WNYNSC.

In March 1992, DOE and NYSERDA entered into a RCRA 3008(h) Administrative Order on Consent with NYSDEC and EPA. The Consent Order required DOE and NYSERDA to conduct RCRA Facility Investigations (RFIs) for solid waste management units (SWMUs) to determine if there had been a release or if there was a potential for release of RCRA-regulated constituents. The final RFI reports were submitted in 1997, completing the investigation activities required by the Consent Order. NYSDEC and EPA approved the RFI reports for SWMUs located within the WVDP premises; no corrective actions were required other than continued groundwater monitoring as proposed in the RFI reports. Also, NYSERDA proposed and implemented additional infiltration control measures for the SDA, which were performed as an interim measure under the Consent Order. The SDA RFI also proposed the continued operation and maintenance of installed interim corrective measures. In response to a January 2004 NYSDEC request, a report entitled *West Valley Demonstration Project Solid Waste Management Unit Assessment and Current Conditions Report* was submitted to NYSDEC. This report summarized the historic activities at individual SWMUs and provided current environmental monitoring data and information on site activities performed since the completion of the RFI reports. As a result of its review, NYSDEC determined that corrective measures studies (CMSs) pursuant to the Consent Order were required for six WVDP SWMUs. NYSERDA is preparing a CMS for the SDA.

In August 1996, to comply with the Federal Facilities Compliance Act, DOE entered into a second Administrative Consent Order with NYSDEC to prepare a Site Treatment Plan for treating mixed low-level radioactive waste inventories to meet land disposal restrictions and to update the plan annually to account for development of treatment technologies, capacities, and changes in mixed low-level radioactive waste inventories. The initial plan was submitted in 1997, and updates have been submitted each year.

WVDP RCRA Part A Permit Application is revised as changes to the site's interim status waste management operations occur. An update to the WVDP RCRA Part A Permit Application was submitted to NYSDEC in March 2001. In November 2001, NYSDEC responded that the RCRA Part A Permit Application modifications met the requirements for changes to interim status treatment and storage operations at WVDP. In February 2008, the WVDP RCRA Part A Permit Application was further revised and submitted to NYSDEC.

In July 2003, NYSDEC made an official request for the submittal of a Part 373/RCRA Permit Application for WVDP. A Part 373/RCRA Permit Application was transmitted to NYSDEC in December 2004. In February 2005, NYSDEC indicated that they were going to begin their technical review. However, NYSDEC's review of the 2005 Preliminary Draft EIS and the ongoing work at WNYNSC has taken precedence. A revised Part 373/RCRA Permit Application will need to be submitted to update the facility information and changes.

Developing a proposed method for completing WVDP and managing the decommissioning and/or long-term stewardship of WNYNSC requires consideration of both radioactive and nonradioactive hazardous materials and constituents and the regulations that govern them. DOE and NYSERDA are integrating these considerations in their decisionmaking process as applicable and are coordinating their efforts with the relevant regulatory authorities: NRC, EPA, and NYSDEC.

1.2 History of the Development of the Environmental Impact Statement

In a 1987 Stipulation of Compromise settling a lawsuit filed by local citizens, DOE agreed that by the end of calendar year 1988, it would begin a closure EIS to evaluate disposal of Class A and Class B/C waste generated by DOE activities at WVDP and to evaluate erosion impacts. On December 30, 1988, DOE published a Notice of Intent (NOI) in the *Federal Register* to prepare an EIS for completion of WVDP. A similar notice was published by NYSERDA in the *State Environmental Notice Bulletin* on January 11, 1989. After publication of these notices, public comments on the scope and content of the EIS were received in letters and during public scoping meetings. Additional characterization information to support preparation of the Draft EIS was collected and a Draft EIS was prepared. The *Cleanup and Closure Draft EIS* (DOE/EIS-0226-D) (DOE 1996a) was issued in March 1996, without identifying a Preferred Alternative.

A total of 113 comment letters were received on the 1996 Draft EIS. Some expressed a preference for a particular alternative. Other commentors felt that selection of an alternative that complied with regulations was not possible because NRC had not prescribed requirements for decontamination and decommissioning as required by the WVDP Act. Other comments attempted to apply NRC 10 CFR Part 61 requirements and drew conclusions about the acceptability of various alternatives. Still other commentors called for more characterization of the site (specifically structural geology and seismic risk) and waste. Commentors also called for erosion analysis methods that addressed gully growth. Some commentors questioned aspects of specific closure designs, including the reasonableness of assumptions and the appropriateness of specific design features.

DOE and NYSERDA acknowledged the need for additional characterization information and analytical methods to support a Final EIS and proceeded to work on the collection of additional information on structural geology, local fractures, and seismicity. Updated methods for analyzing erosion were developed and refined. The assumptions and design features for specific alternatives were reviewed and revised. Discussions took place between DOE and NYSERDA on how to select a Preferred Alternative and what a Preferred Alternative might involve.

In 1999 and 2000, DOE issued Records of Decision (RODs) based on the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste (Waste Management Programmatic EIS)* (DOE 1997a) that affected WVDP. The ROD for high-level radioactive waste issued in August 1999 called for storage of high-level radioactive waste at the site of generation until a disposal site was available. The February 2000 ROD for low-level radioactive waste and mixed low-level waste established both the Hanford Site and the Nevada Test Site as regional DOE disposal sites for low-level radioactive waste and mixed low-level radioactive waste, although the ROD did not preclude the use of commercial disposal facilities, as appropriate.

On March 26, 2001, DOE and NYSERDA issued an NOI in the *Federal Register* announcing their plan to revise the strategy for completing the 1996 *Cleanup and Closure Draft EIS* and to prepare a separate EIS on decontamination of WVDP facilities and related waste management activities. The newly announced EIS would permit DOE to perform additional facility decontamination and ship stored legacy waste and newly generated waste off site for disposal, since DOE now had access to DOE disposal facilities such as the Nevada Test Site. Completing the *West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* also ensured that DOE could make further progress toward completing WVDP Act requirements for facility decontamination and waste disposal while the *Cleanup and Closure Draft EIS* process continued.

The March 26, 2001, NOI also announced that DOE would soon initiate a new EIS jointly with NYSERDA for decommissioning and/or long-term stewardship of WVDP and WNYNSC. On November 6, 2001, DOE independently issued an Advance NOI to prepare an EIS for decommissioning and/or long-term stewardship at the WVDP and WNYNSC.

After issuance of the March 26 and November 6, 2001, Notices and consideration of public scoping comments received, DOE decided to focus the *Waste Management EIS* exclusively on waste management actions. DOE also determined that the *Waste Management EIS* would be a new EIS, and that the *Decommissioning and/or Long-Term Stewardship EIS* would instead be considered the revised draft of the 1996 *Cleanup and Closure Draft EIS*. DOE issued DOE/EIS-0337, the *Waste Management EIS* (DOE 2003e), in draft form for public comment in May 2003, and in final form in January 2004. A ROD was issued on June 16, 2005.

While DOE and NYSERDA were developing additional information and analyses to support preparation of a revised Draft EIS, NRC initiated work that culminated in the 2002 issuance of an NRC policy statement announcing the WVDP decommissioning criteria. On February 1, 2002, the NRC published in the *Federal Register* (67 FR 5003), "Decommissioning Criteria for the WVDP at the West Valley Site; Final Policy Statement." NRC decided that it would apply its License Termination Rule (10 CFR Part 20, Subpart E) as the decommissioning goal for the entire NRC-licensed site. In addition, the NRC Final Policy statement also provided specific criteria for classification of the incidental wastes that might be present after decontamination activities.

The License Termination Rule does not apply a single public dose criterion. Rather, it provides for a range of criteria. For unrestricted release, the License Termination Rule (10 CFR Part 20 Subpart E) specifies a dose criterion of 25 millirem per year total effective dose equivalent (TEDE) for the compliance receptor, plus as low as reasonably achievable (ALARA) considerations. For restricted release, the License Termination Rule specifies an individual dose criterion of 25 millirem per year TEDE plus ALARA considerations using legally enforceable institutional controls established after a public participation process. Even if institutional controls fail, individual doses should not exceed 100 millirem per year TEDE. If it is demonstrated that the 100 millirem per year TEDE criterion is technically not achievable or prohibitively expensive in the event of failure of institutional controls, the individual dose criterion in the event of failure of institutional controls may be as high as 500 millirem per year TEDE. However, in circumstances where restricted release is required, if the 100 millirem per year TEDE criterion is exceeded, and/or the use of alternate criteria has been determined, the area would be rechecked by a responsible government entity no less frequently than every 5 years. Finally, the License Termination Rule permits alternative individual dose criteria of up to 100 millirem per year TEDE plus ALARA considerations for restricted release, with institutional controls established after a public participation process.

In addition to specifying the License Termination Rule as described in the preceding paragraph, the NRC Final Policy Statement also provides certain flexibility to consider other alternatives to the License Termination Rule, if it is demonstrated that the License Termination Rule cannot be met. The Final Policy Statement indicates that the applicable goal for the entire NRC-licensed site is compliance with the License Termination Rule, but recognizes that health and safety and cost-benefit considerations may justify the use of an alternative that does not fully comply with License Termination Rule criteria. However, to support an exemption to the License Termination Rule criteria, it must be rigorously demonstrated that protection of the public health and safety for future generations could be reasonably assured through more robust engineered barriers and/or increased long-term monitoring and maintenance. The Final Policy Statement indicates that NRC is prepared to provide flexibility to assure cleanup of the NRC-licensed site to the maximum extent technically and economically feasible. Any exemptions or alternate criteria authorized for DOE to meet the provisions of the WVDP Act will also apply to NYSERDA at the time of site license termination, if license termination is possible.

On March 13, 2003, DOE and NYSERDA published Notices in the *Federal Register* and New York State Environmental Notice Bulletin announcing that they would jointly prepare an *Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center*, which would revise the 1996 *Cleanup and Closure Draft EIS*. This EIS builds upon a clearer understanding of the major regulatory requirements, including NRC WVDP decommissioning criteria and Part 373/RCRA regulations as they apply to units on site. It utilizes updated long-term performance assessment models for groundwater and erosion releases and analyzes closure designs that have waste isolation barriers. It analyzes short-term and long-term impacts, local impacts, and impacts associated with transportation. The analysis is intended to provide the decisionmakers and the public with an updated understanding of the environmental impacts of each alternative.

Following the NOI and scoping meetings of early 2003, DOE, with input from NYSERDA and the cooperating agencies, refined the definition of five alternatives and prepared a preliminary internal Draft EIS in September 2005 that analyzed the environmental impacts of the five alternatives. This preliminary Draft EIS did not present a Preferred Alternative and did not address the issue of who is responsible for what portions of the site. This preliminary Draft EIS was reviewed by the co-lead and cooperating agencies, and their comments revealed different expectations about the purpose and content of the EIS. To resolve the differences about alternatives to be analyzed and the type of analysis, and to help identify a Preferred Alternative, DOE established a core team comprised of the co-lead and cooperating agencies to discuss and, where practical, resolve the issues raised by the review of the September 2005 preliminary Draft EIS. This revised Draft EIS reflects the results of discussions with the core team regarding alternatives to be analyzed, the nature of the analysis, and the nature of the Preferred Alternative.

Figure 1–1 presents a summary of the activities discussed earlier that are part of the history of the preparation of this revised Draft EIS.

1.3 Purpose and Need for Agency Action

The WVDP Act requires DOE to decontaminate and decommission the waste storage tanks and facilities used in the solidification of high-level radioactive waste, and any material and hardware used in connection with the WVDP, in accordance with such requirements as NRC may prescribe. As discussed earlier, NRC has prescribed its License Termination Rule as the decommissioning criteria for WVDP. Therefore, DOE needs to determine the manner that facilities, materials, and hardware for which the Department is responsible are managed or decommissioned in accordance with applicable Federal and State requirements, including Part 373/RCRA regulations. To this end, DOE needs to determine what, if any, material or structures for which it is responsible would remain on site, and what, if any, institutional controls, engineered barriers, or stewardship provisions would be needed. In order to evaluate alternatives by which DOE would complete its responsibilities under the WVDP Act, this EIS is being prepared in accordance with Council on Environmental Quality and DOE implementing regulations (40 CFR Parts 1500 through 1508 and 10 CFR Part 1021).

The manner in which facilities and property for which NYSERDA is responsible, including the SDA, will be managed or decommissioned, in accordance with applicable Federal and State requirements, needs to be determined. To this end, NYSERDA needs to determine what, if any, material or structures for which it is responsible would remain on site and what, if any, institutional controls, engineered barriers, or stewardship provisions would be needed. This EIS was prepared to meet NYSERDA compliance requirements of SEQR as part of its decisionmaking process for management of the WNYNSC. As the lead New York State agency for preparing the SEQR documents for West Valley, NYSERDA will submit Public Notices and issue its Findings Statement under SEQR in parallel with DOE's publication of Notices and its ROD under NEPA.

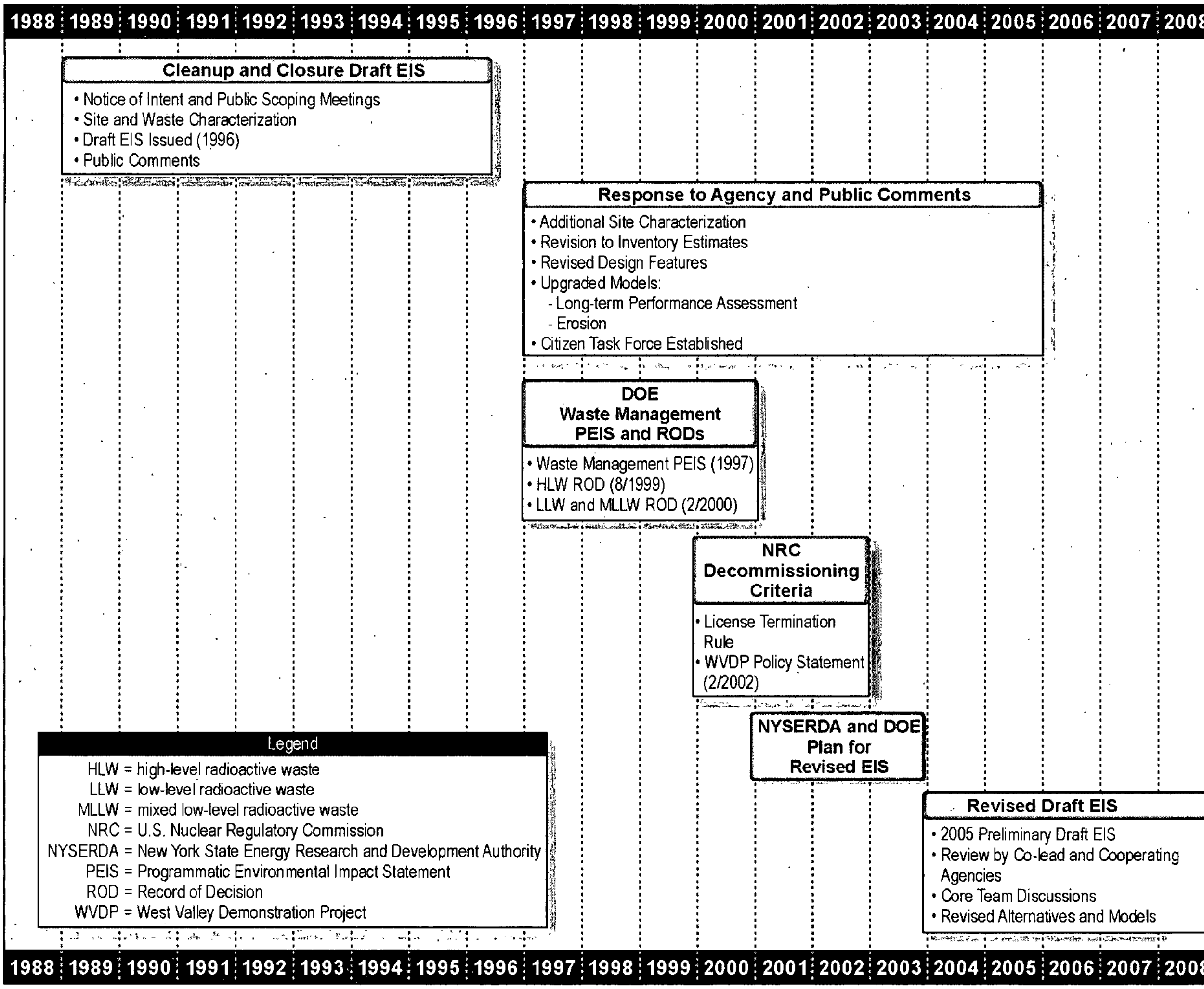

Figure 1–1 West Valley Decommissioning Environmental Impact Statement History Timeline

Cooperating and Involved Agencies

NEPA and SEQR both contain provisions that encourage participation by other Federal and state entities to reduce duplication between NEPA and state and local requirements. Cooperating agencies under NEPA are agencies other than the lead agency that have jurisdiction by law or special expertise with respect to any environmental impact involved in a major Federal action significantly affecting the quality of the human environment. Under SEQR, agencies may either be an involved agency or an interested agency. An involved agency is one that has jurisdiction by law to fund, approve, or directly undertake an action and will ultimately make a discretionary decision in that regard. An interested agency lacks the jurisdiction to fund, approve, or directly undertake an action but may participate in review of a Draft EIS because of its specific expertise or concern about the Proposed Action. An interested agency has the same ability to participate in the review process as a member of the public. No interested agencies have participated in the review of this Draft EIS. Cooperating agencies are typically invited to participate on an EIS by the EIS lead agency; involved agencies are so by definition.

DOE formally invited NRC, EPA, and NYSDEC to participate on the *Decommissioning and/or Long-Term Stewardship EIS* as cooperating agencies under NEPA. In addition, NYSDEC and NYSDOH are involved agencies under SEQR. The three cooperating agencies were invited by DOE because of both their jurisdictional roles and the special expertise they would provide to the EIS process. These agencies may ultimately choose to adopt or rely on some or all of the *Decommissioning and/or Long-Term Stewardship EIS* analyses in fulfillment of their own environmental analysis requirements under NEPA or SEQR regulations, as applicable.

U.S. Nuclear Regulatory Commission—NRC has regulatory responsibility under the Atomic Energy Act for WNYNSC, with the exception of the SDA, and this responsibility is exercised through the NRC license issued to NYSERDA pursuant to 10 CFR Part 50. The technical specifications and certain other portions of the NRC license were put into abeyance pending completion of WVDP.

The WVDP Act specifies certain responsibilities for NRC, including: (1) prescribing requirements for decontamination and decommissioning, and (2) providing review, consultation, and monitoring to DOE on WVDP for the purpose of assuring public health and safety. Because of these mandated responsibilities, NRC was invited to be a cooperating agency under NEPA on this EIS. During NRC's independent environmental review to fulfill its own NEPA responsibilities, NRC may choose to adopt all or part of this EIS to assist in its determination that the Preferred Alternative meets NRC's decommissioning criteria.

In addition, DOE has committed to provide a Decommissioning Plan to the NRC in accordance with the DOE/NRC Memorandum of Understanding. The Decommissioning Plan will be based upon the Preferred Alternative identified in the *Decommissioning and/or Long-Term Stewardship EIS*, and is expected to be prepared and delivered to the NRC for review at approximately the same time as the Draft EIS is released for public review. The Decommissioning Plan will provide the basis for NRC's determination as to whether the Preferred Alternative meets the decommissioning criteria that the NRC has identified for WVDP. If appropriate, DOE will also provide the Waste Determination to NRC on its classification of incidental wastes.

NRC retains regulatory responsibility for non-DOE activities in the non-Project and non-SDA areas to the extent that contamination exists both on- and off site resulting from activities performed when the facility was operating under its NRC 10 CFR Part 50 license.

Following completion of WVDP and reinstatement of the license, NRC will have regulatory responsibility for authorizing modification to, or termination of, the license, should NYSERDA seek it.

New York State Department of Environmental Conservation—With respect to DOE Proposed Actions, NYSDEC participates as a cooperating agency on this EIS. As a cooperating agency, NYSDEC will review this EIS and other documents developed by DOE and NYSERDA to provide early input on the analysis of environmental impacts associated with the alternatives analyzed. NYSDEC is also an involved agency under SEQR with respect to Part 380 permitting actions at the SDA and with respect to any approvals NYSDEC would issue for WVDP or WNYNSC sites under Part 373/RCRA.

NYSDEC regulates the SDA through issuance of permits under 6 NYCRR Part 380, "Rules and Regulations for Prevention and Control of Environmental Pollution by Radioactive Materials." NYSDEC also regulates hazardous and mixed low-level radioactive waste at WNYNSC pursuant to 6 NYCRR Part 370 Series. This includes permitting activities under Interim Status for RCRA-regulated units.

New York State Department of Health—NYSDOH is an involved agency as defined by SEQR because it has jurisdiction over the commercial and industrial use of radioactive materials in New York State, including the possession of radioactive materials at the SDA at WNYNSC. It now maintains authority over the radioactive materials license (originally issued by the New York State Department of Labor) that authorizes NYSERDA to possess and manage emplaced radioactive waste at the SDA.

U.S. Environmental Protection Agency—EPA is participating as a cooperating agency under NEPA and will review this EIS and other documents developed by DOE in conjunction with NYSERDA to provide input on the analyses of environmental impacts associated with the decommissioning alternatives to be evaluated. The EPA will also assess compliance with National Emission Standards for Hazardous Air Pollutants (NESHAPs) requirements in 40 CFR Part 61, Subpart H; assess the ability of the alternatives to meet the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) risk range; and consider sole-source aquifer concerns.

In addition, both EPA and NYSDEC are responsible for ensuring compliance with the 1992 joint NYSDEC/U.S. EPA 3008 (h) (New York State Environmental Conservation Law, Article 27, Titles 9 and 13) Order issued to DOE and NYSERDA. The Order required investigation of SWMUs, performance of interim corrective measures, and completion of CMSs, if necessary.

Regulatory Compliance Processes

This EIS meets the Federal procedural requirements set forth under NEPA, 1969 (as promulgated in 40 CFR Part 1500 et seq.) as well as New York State SEQR requirements (6 NYCRR Part 617). Both the Federal and State regulations require the identification and evaluation of significant environmental impacts resulting from a Proposed Action and a discussion of mitigative actions. SEQR requires the mitigation of significant environmental impacts to the extent practicable. The requirements of both NEPA and SEQR call for a comprehensive assessment of reasonable alternatives and the presentation of comparative information to facilitate agency decisionmaking. Both NEPA and SEQR have public involvement requirements to make the information available to public officials and citizens before decisions are made and actions taken.

The EIS recognizes there are regulatory requirements and processes associated with the implementation of each alternative. These regulatory requirements may consist of RCRA permitting and corrective actions under New York State and/or EPA requirements, decommissioning according to NRC requirements, assessments relative to the CERCLA risk range, and assessment of compliance with EPA NESHAPs. This EIS is not intended to replace any of the regulatory compliance actions that may be undertaken as applicable by DOE and NYSERDA in decommissioning and closing of WVDP or WNYNSC.

NYSDEC and/or EPA regulates DOE and NYSERDA compliance with RCRA requirements for management of hazardous waste at WVDP and at WNYNSC, as applicable. Details for addressing applicable Part 373/RCRA and the 1992 RCRA 3008(h) Consent Order requirements for interim status units, final status units, and SWMUs will be developed in closure plans, implementation plans, a permit application, CMSs, or a combination thereof by DOE and NYSERDA. Approval of such documents or issuance of a permit will be determined by NYSDEC and/or EPA.

The New York State RCRA Part 373 Permit Applications will require a supporting EIS that meets the requirements of SEQR. While this *Decommissioning and/or Long-Term Stewardship EIS* analyzes portions of WNYNSC in addition to those within the scope of the RCRA Part 373 Permit Application (e.g., the SDA), the appropriate sections of this EIS can be used by NYSDEC to understand the environmental impacts of actions being considered in the RCRA Part 373 Permit Application.

NRC has prescribed decommissioning criteria for WVDP under the WVDP Act. NRC, in a Final Policy Statement (67 FR 5003), prescribed its License Termination Rule as the decommissioning goal for WVDP and all NRC-licensed portions of the site. An assessment of compliance will be made when NRC reviews the Decommissioning Plans prepared for the Preferred Alternative identified by the lead agencies.

The NRC Decommissioning Plan review processes and the RCRA compliance processes focus on the actions selected by DOE and NYSERDA following completion of the NEPA and SEQR processes. If the outcome of the RCRA Part 373 Permit Application review process or Decommissioning Plan review process results in the need for actions that are substantially different from those analyzed in the EIS, the agencies would conduct a Supplement Analysis to determine if this *Decommissioning and/or Long-Term Stewardship EIS* needs to be supplemented and the ROD or Findings amended.

EPA has authority over radioactive emissions under Clean Air Act NESHAP (40 CFR Part 61) regulations at WNYNSC.

Preliminary information with respect to compliance with the decommissioning requirements noted previously is presented in Appendix L of this EIS.

1.4 Scope of the Environmental Impact Statement

This EIS consists of analysis of environmental impacts associated with the full range of reasonable alternatives for decommissioning and/or long-term stewardship of WNYNSC, as well as the No Action alternative as required by NEPA and SEQR. This EIS also analyzes the environmental impacts along the transportation route(s) for wastes that are proposed to be transported to offsite locations. The long-term impacts (post-decommissioning phase) at or near the West Valley Site for facilities or wastes that are proposed to remain in place, depending on the alternative, are also analyzed.

For further definition of the scope of the EIS, see Chapter 2, Tables 2–1 and 2–2, which describe the status of facilities at WNYNSC at the start of decommissioning.

This EIS also addresses topics called for in SEQR implementing regulations (6 NYCRR Part 617-9), including mitigating measures, adverse environmental impacts that cannot be avoided, any growth-inducing aspects of the Proposed Action[1], and the impact of the Proposed Action on solid waste management. These topics were added to this EIS so it would provide information required by SEQR and could be used to support NYSERDA decisions about management of non-WVDP portions of WNYNSC.

1.5 Decisions to be Supported by the Environmental Impact Statement

This EIS will support decisions about actions to complete WVDP and to either close or manage WNYNSC. Major decisions would consist of decommissioning of the former spent nuclear fuel reprocessing facility, storage buildings, and the NDA; exhumation or management of the SDA; and remediation and/or management of areas of contaminated soil, sediment and groundwater.

The EIS may be used by cooperating agencies. Specifically, the NRC may adopt this EIS if NRC determines that the Preferred Alternative would meet its decommissioning criteria. EPA will review the EIS and other documents to determine if the remediated site would satisfy the requirements of the 1992 RCRA 3008(h) Consent Order. Additionally, the EPA will assess if the remediated site would be consistent with the CERCLA risk range and therefore avoid the potential need to list the site on the National Priorities List. NYSDEC may rely on the environmental analyses in this EIS for purposes of SEQR to support the Part 373 Permit Application, RCRA CMS, and closure of the SDA under 6 NYCRR 380, et al., as appropriate.

[1] *SEQR specifies that the assessment of environmental impacts focuses on the growth-inducing aspects of a Proposed Action. These are generally "secondary" impacts of a Proposed Action that trigger further development. For example, actions that add substantial new land use, new residents, or new employment could induce additional development of a similar kind or support uses such as stores or other businesses.*

1.6 Relationship of this Environmental Impact Statement to Other National Environmental Policy Act Documents

This section explains the relationship between the *Decommissioning and/or Long-Term Stewardship EIS* and other relevant NEPA documents.

1.6.1 *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (Cleanup and Closure Draft EIS)* (DOE/EIS-0226-D)

The *Cleanup and Closure Draft EIS* (DOE 1996a) was issued for public comment in March 1996, and a substantial number of comment letters were received by DOE. A sequence of events, described in Section 1.2, followed, which led to the decision to revise and reissue the 1996 *Cleanup and Closure Draft EIS* using the information gained since 1996, the improved analytical methods developed since that time, and the clearer understanding of regulatory requirements. To distinguish between the 1996 *Cleanup and Closure Draft EIS* and this revised Draft EIS, the revised Draft EIS is referred to as the *Decommissioning and/or Long-Term Stewardship EIS,* consistent with its revised title. Responses to the summarized comments in the 113 comment letters are provided in Appendix A to this EIS.

1.6.2 *Final Environmental Impact Statement, Long-Term Management of Liquid High-Level Radioactive Wastes Stored at the Western New York Nuclear Service Center, West Valley* (DOE/EIS-0081)

This EIS (DOE 1982) evaluated alternatives for long-term management of liquid high-level radioactive waste stored in underground tanks. A DOE ROD was issued to construct and operate facilities at WNYNSC to solidify the liquid high-level radioactive waste into a form suitable for transportation and disposal in a Federal geologic repository. A Supplement Analysis, completed in 1993, evaluated the impacts of modifications in the design, process, and operations since the 1982 EIS ROD. A second Supplement Analysis, completed in 1998, addressed high-level radioactive waste solidification, management, and interim storage of wastes, disposal of wastes, transport of wastes, site operations, facility decontamination, and spent nuclear fuel storage. Actions evaluated by the 1982 EIS and its Supplement Analyses consist of Main Plant Process Building head-end cell decontamination, construction of a Load-In/Load-Out Facility to support shipment of vitrified high-level radioactive waste, construction of a Remote-Handled Waste Facility, decontamination of the fuel receiving and storage area, and draining the water from the fuel storage pool.

The near-term onsite management of the vitrified high-level radioactive waste canisters, currently stored in the Main Plant Process Building, and the disposition of the Remote-Handled Waste Facility and Load-In/Load-Out Facility, are the subjects of the *Decommissioning and/or Long-Term Stewardship EIS.*

1.6.3 *Final West Valley Demonstration Project Waste Management Environmental Impact Statement (Waste Management EIS)* (DOE/EIS-0337)

In the *Waste Management EIS* (DOE 2003e) issued in December 2003, DOE considered alternatives for the management of WVDP low-level radioactive waste, mixed (radioactive and hazardous) low-level radioactive waste, transuranic waste, and high-level radioactive waste, currently in storage at the site or that will be generated at the site over the next 10 years from ongoing operations and decontamination activities. In the ROD, issued June 16, 2005 (70 FR 35073), DOE decided to ship low-level radioactive waste and mixed low-level radioactive waste off site for disposal at commercial sites; one or both of two DOE sites (Nevada Test Site near Mercury, Nevada, or the Hanford Site near Richland, Washington); or a combination of commercial and DOE sites.[2] Also, consistent with the *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* ROD (64 FR 46661, August 26, 1999), DOE will store canisters of vitrified high-level radioactive waste at the WVDP Site until transfer to a geologic repository. DOE deferred a decision on the disposal of WVDP transuranic waste, pending a determination by DOE that the waste meets all statutory and regulatory requirements for disposal at the Waste Isolation Pilot Plant (WIPP) in New Mexico.

1.6.4 *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Yucca Mountain EIS)* (DOE/EIS-0250-F)

The EIS (DOE 2002b) was issued in February 2002. It analyzed a Proposed Action to construct, operate and monitor, and eventually close a geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste at Yucca Mountain in Nye County, Nevada. As part of the Proposed Action, the EIS analyzed the potential impacts of transporting spent nuclear fuel and high-level radioactive waste to the Yucca Mountain site from 77 sites across the United States, including West Valley. Because this EIS includes consideration of the shipment of the high-level waste canisters from West Valley, that analysis is summarized and incorporated by reference in this *Decommissioning and/or Long-Term Stewardship EIS.* On April 8, 2004, DOE issued a ROD (69 FR 18557) to announce its decision on the mode of waste transport and selection of the rail corridor for transportation of waste to the proposed Yucca Mountain repository.

In October 2007, DOE announced the availability of two supplements to the *Yucca Mountain EIS.* The first is a *Draft Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250F-S1D), which evaluates the Proposed Action to construct, operate, monitor and eventually close a geologic repository at Yucca Mountain, and the No Action Alternative which would terminate activities at Yucca Mountain. The second is the *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada – Nevada Rail Transportation Corridor (Final Rail Corridor SEIS)* (DOE/EIS-0250F-S2) which analyzes the potential environmental impacts of constructing and operating a railroad to connect the Yucca Mountain repository to an existing rail line near Wabuska, Nevada (the Mina corridor). This second supplement is linked with the *Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0369) issued on July 11, 2008, discussed in Section 1.6.5.

1.6.5 *Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada (Draft Rail Alignment EIS)* (DOE/EIS-0369)

In October 2007, DOE announced the availability of the *Draft Rail Alignment EIS* (DOE/EIS-0369D). This Draft EIS analyzes the potential environmental impacts associated with potential rail alignments within the Caliente and Mina corridors, and analyzes constructing and operating a railroad in Nevada to transport spent nuclear fuel, high-level radioactive waste, and other Yucca Mountain project materials to a repository at Yucca Mountain. It tiers from the broader corridor analysis in both the *Yucca Mountain EIS* and the *Draft Rail Corridor SEIS* mentioned earlier.

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[2] *In accordance with the settlement agreement between DOE and the State of Washington of January 6, 2006, regarding the case Washington v. Bodman, DOE will not ship low-level radioactive waste and mixed low-level radioactive waste from WVDP to Hanford until DOE has satisfied the requirements of the settlement agreement.*

1.6.6 *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-F)

In May 1997, DOE issued this EIS (DOE 1997a), which examined the potential environmental and cost impacts of strategic management alternatives for managing low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, high-level radioactive waste, and nonwastewater hazardous wastes resulting from nuclear defense and research activities at sites around the United States.

DOE published four RODs from this EIS. In its ROD for the treatment and management of transuranic waste, published in the *Federal Register* on January 23, 1998 (63 FR 3629), DOE decided (with one exception)[3] that each DOE site, including West Valley, would prepare its transuranic waste for disposal and store the waste on site until it could be shipped to WIPP in Carlsbad, New Mexico, for disposal.

In the second ROD, published in the *Federal Register* on August 5, 1998 (63 FR 41810), DOE decided to continue using offsite facilities for the treatment of major portions of the nonwastewater hazardous waste generated at DOE sites. This decision did not involve any transfers of nonwastewater hazardous waste between DOE sites.

In the third ROD, published in the *Federal Register* on August 16, 1999 (64 FR 46661), DOE decided to store immobilized high-level radioactive waste in a final form at the site of generation (Hanford Site, Idaho National Laboratory, Savannah River Site, and the WVDP) until transfer to a geologic repository for ultimate disposition.

In a fourth ROD, published in the *Federal Register* on February 25, 2000 (65 FR 10061), DOE addressed the management and disposal of low-level radioactive waste and mixed low-level radioactive waste. In this ROD, DOE decided to perform minimal treatment of low-level radioactive waste at all sites and continue, to the extent practicable, disposal of onsite low-level radioactive waste at Idaho National Laboratory, Los Alamos National Laboratory, Oak Ridge Reservation, and Savannah River Site. DOE identified the Hanford Site in Washington and the Nevada Test Site as regional disposal sites for low-level and mixed low-level waste from other DOE sites that do not have appropriate disposal capability, including WVDP. This decision regarding DOE sites does not preclude the use of commercial disposal sites.

1.6.7 *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE/EIS-0026-S-2)

In October 1980, DOE issued the *Final Environmental Impact Statement, Waste Isolation Pilot Plant* on the proposed development of WIPP (DOE 1980). In January 1981, the subsequent ROD, established a phased development of WIPP, beginning with construction of the WIPP facility. DOE issued the *Final Supplemental Environmental Impact Statement, Waste Isolation Pilot Plant* in January 1990 that considered previously unavailable information. Based on the *Supplemental EIS*, DOE decided to continue phased development of WIPP by implementing test-phase activities. On October 30, 1992, the WIPP Land Withdrawal Act transferred the WIPP Site from the U.S. Department of Interior to DOE. The 1997 Defense Authorization Act (September 23, 1996) amended the WIPP Land Withdrawal Act to make RCRA hazardous waste land disposal prohibitions inapplicable to WIPP. The *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE/EIS-0026-S-2), issued in September 1997, updated information contained in the 1980 and 1990 EISs, and incorporated the analysis of various treatment alternatives for transuranic waste. In a ROD issued in January 1998 (63 FR 3264), DOE decided to open WIPP for the disposal of defense transuranic waste.

[3] Sandia National Laboratories in New Mexico would ship its transuranic waste to the Los Alamos National Laboratory in New Mexico to prepare this waste for shipment to WIPP.

1.6.8 *Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (NTS EIS)* (DOE/EIS-0243)

This Final EIS (DOE 1996b) analyzed the potential impacts that could result from mission activities at the Nevada Test Site, including low-level radioactive waste and mixed low-level radioactive waste disposal. The *NTS EIS* analyzed waste management and environmental restoration activities and other mission activities for a 10-year period, including receipt of low-level radioactive waste and mixed low-level radioactive waste from other sites such as WVDP.

1.6.9 *Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (DOE/EIS-0391)

DOE issued an NOI (71 FR 5655) on February 2, 2006, to prepare this EIS to analyze and evaluate the potential health and environmental impacts of storing, retrieving, treating, and disposing of the waste inventory generated during defense production years at the Hanford Site in Washington State. This EIS will evaluate the potential health and environmental impacts of ongoing solid waste management operations at Hanford, as well as the proposed disposal of Hanford low-level radioactive waste and mixed low-level radioactive waste and a limited volume of low-level radioactive waste and mixed low-level radioactive waste from other DOE sites, such as the WVDP, in a new Integrated Disposal Facility to be located at Hanford.[4] The defense waste inventory of about 207 million liters (54.5 million gallons) of mixed radioactive and chemically hazardous waste, stored in 177 large and 61 smaller underground storage tanks, presents a major source of potential public health and environmental risks. In addition, this EIS will evaluate the potential health and environmental impacts of proposed activities to decommission the Fast Flux Test Facility and auxiliary facilities at Hanford, including managing waste generated by the decommissioning process and disposing of Hanford's inventory of bulk radioactive sodium from the Fast Flux Test Facility and other onsite facilities.

1.6.10 *Environmental Impact Statement for the Disposal of Greater-Than-Class-C Low-Level Radioactive Waste* (DOE/EIS-0375)

On July 23, 2007, DOE issued a Notice of Intent (72 FR 40135) to prepare an EIS to evaluate disposal alternatives for the disposal of Greater-Than-Class C low-level radioactive waste and similar DOE waste, which may not have an identified path to disposal. The wastes volumes being analyzed in this EIS include estimates of the amount of Greater-Than-Class C and potential non-defense transuranic waste that may be generated from decommissioning activities at WNYNSC, as well as transuranic waste currently in storage at West Valley. Currently, there is no location for the disposal of Greater-Than-Class C low-level radioactive waste, and the Federal Government is responsible for such disposal under the Low-Level Radioactive Waste Policy Amendments Act (Public Law 99-240). DOE is evaluating several disposal methods in the Greater-Than-Class C EIS, including geologic repositories, intermediate depth boreholes, and enhanced near-surface facilities at different locations. A Draft EIS is currently scheduled for issuance in 2009.

1.6.11 *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project, Final* (DOE/EA-1552)

This Environmental Assessment was issued in September 2006. As part of ongoing WVDP responsibilities and in accordance with the WVDP Act (Public Law 96-368, October 1, 1980), DOE proposed to demolish and remove 36 facilities. Although some of the facilities are currently in use, DOE would be able to eliminate or significantly reduce the functions that are undertaken in those facilities. Once the functions are replaced or no

[4] *In accordance with the settlement agreement between DOE and the State of Washington of January 6, 2006, regarding the case Washington v. Bodman, DOE will not ship low-level and mixed low-level radioactive waste from WVDP to Hanford until DOE has satisfied the requirements of the settlement agreement.*

longer needed by WVDP, DOE would demolish and remove the facilities from the site. All applicable RCRA and corollary NYSDEC Quality Services regulations for management (storage, shipping, reporting, and offsite disposal) of solid waste, including hazardous waste, would be followed in completing the work.

1.7 Public Participation

1.7.1 Public Participation Process

During the preparation of an EIS, opportunities for public involvement are provided as stipulated by NEPA and SEQR (see **Figure 1–2**). The steps followed under either set of regulations are similar. In Figure 1–2 the NEPA process steps are indicated, and, where the SEQR process steps are different or have different names, they are indicated parenthetically. As a preliminary step in development of an EIS, regulations established by the Council on Environmental Quality (40 CFR 1501.7) and DOE require "an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a Proposed Action." As part of the scoping process (40 CFR 1501.7[a]), the Council on Environmental Quality requires the agency preparing an EIS to:

- Invite the participation of affected Federal, state, and local agencies, American Indian Tribes, and other interested persons in scoping the EIS;
- Determine the scope and significant issues to be analyzed in the EIS;
- Identify and eliminate from detailed study the issues that are not significant or have been covered under other environmental reviews;
- Allocate assignments for preparation of the environmental impact statement among the lead and cooperating agencies, with the lead agency retaining responsibility for the statement;
- Indicate any other NEPA documents that are being or will be prepared that are related to the EIS but not part of the scope;
- Identify other environmental review and consultation requirements so that other necessary analyses and studies can be prepared concurrently and integrated with the EIS; and
- Indicate the relationship between the timing of the preparation of environmental analyses and the agencies' tentative planning and decisionmaking schedule.

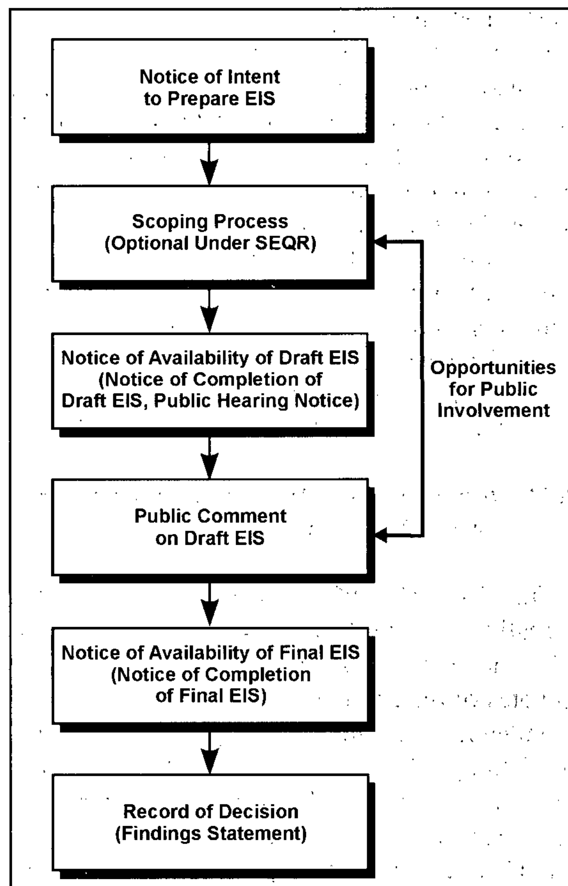


Figure 1–2 National Environmental Policy Act Process

As indicated in Figure 1–2, scoping is not required under SEQR, but may be initiated by the lead agency (6 NYCRR Part 617.8). If scoping is conducted, it must include an opportunity for public participation.

In addition to the scoping process, public participation is solicited in the review of a Draft EIS. NEPA and SEQR require that comments on a Draft EIS be assessed and considered during the preparation of a Final EIS, and a response to the comments provided.

1.7.2 Issues Raised During the Public Comment Period on the Draft 1996 EIS

The 1996 *Cleanup and Closure Draft EIS* was distributed in March 1996 to interested individuals and organizations, including appropriate state clearinghouses, regulatory agencies, and American Indian Tribes. During the 6-month public comment period, four information sessions were held during which DOE and NYSERDA were available to explain and discuss topics and issues that pertained to the Draft EIS. Two of the four sessions were held on Reservations of the Seneca Nation of Indians. A formal public hearing was conducted in three meetings on August 6, 1996, in West Valley, New York, to receive oral comments. During the 6-month comment period, DOE received 113 letters from individuals and organizations. A wide spectrum of issues was raised during the public comment period. Many of the comments related to the definition and analysis of the alternatives (the scope of the EIS), but some dealt with issues such as responsibility, determining regulatory compliance, and funding for operation of the West Valley Site, which are outside the scope of an EIS.

All of the documents received during the public comment period on the *Cleanup and Closure Draft EIS,* as well as the transcripts from the formal hearings, were reviewed; and specific comments were delineated and organized into 13 major categories:

1. Characterization of the site, waste, and contamination or presentation of data
2. Reasonableness of alternatives
3. Design or operational details
4. Near-term impacts analysis
5. Long-term erosion analysis
6. Long-term hydrologic transport analysis
7. Erosion control strategies
8. Long-term performance assessment
9. Preferences for or against a particular alternative
10. Specific recommendations for the Preferred Alternative
11. Regulatory compliance
12. Understanding the purpose and content of the EIS and its relationship to decisionmaking
13. Out of scope comments

Appendix A contains a table that cross-references each comment letter or transcript to the applicable category to assist the commentor in understanding how the lead agencies responded to the comment. For each category, examples or summaries of the comments received are provided and then a response is provided to that category of comments. For the out of scope comments, an explanation is provided as to why they were placed in that category.

1.7.3 Issues Raised During the 2003 Scoping Process (i.e., oral and written comments)

A 45-day comment period was initiated by the March 13, 2003, DOE Notice in the *Federal Register* (68 FR 12044) and NYSERDA Notice in the Environmental Notice Bulletin (NYSERDA 2003) of their intent to prepare a *Decommissioning and/or Long-Term Stewardship EIS*. DOE and NYSERDA held two public scoping meetings (April 9 and 10) in Ashford, New York, to solicit comments on the scope and content of the EIS. Transcripts of the two scoping meetings captured oral comments and issues raised by four commentors. DOE also received 10 sets of written comments on a variety of EIS-related issues, submitted several ways: by using the "Comment Form" provided by DOE at the public scoping meetings, by letter through the U.S. Postal Service, by electronic mail (email), or handed in during the April 9 and 10 meetings.

Overview of Comments

Several comments were made in the scoping meetings and comment letters that related to recommendations for the scope of the revised Draft EIS. These were:

- The scope of alternatives should be for the portion of the site controlled by DOE rather than the entire WNYNSC Center.
- The Final EIS should show the individual comments made on the revised Draft, as well as comments made on the 1996 *Cleanup and Closure Draft EIS,* and should respond to these comments individually.
- The revised Draft EIS should evaluate the Exhume and On-site Storage Alternative, which was evaluated in the 1996 *Cleanup and Closure Draft EIS.*
- The impact assessment should use probabilistic risk assessment methods.
- The erosion modeling should account for specific processes including slumping, stream capture, and gully formation. In addition, the model should be calibrated against measured changes in valley cross-section.
- The dose projections should account for populations that are reasonably expected to be exposed.
- The analysis of impacts should consider occupational exposure and the effect of activity timing on occupational exposure.
- The Final EIS should show the relationship of this EIS to other West Valley EISs.
- Requirements of the WVDP Act (Public Law 96-368) and the regulatory standards that would apply to decommissioning should be outlined.

Response: All of these comments were considered in the development of the revised Draft EIS. The scope of the alternatives continued to consider the entire site consistent with the NOI. The decision was made to address the comments received on the 1996 Draft EIS in a summary manner in this Draft EIS, due to the amount of time that has passed and the numerous changes that have occurred at the site since 1996. As discussed in Section 1.7.2, the comments on the 1996 Draft EIS were organized into categories. For each category, the summarized issue(s) and the response(s) appear in Appendix A to this Draft EIS. The revised Draft EIS considered, but did not analyze, the Exhume and On-site Storage Alternative because it was inconsistent with the purpose and need. The revised Draft EIS utilizes updated long-term performance assessment models for groundwater and erosion as described in Appendices E, F, and G. The dose *projections address the populations that are reasonably expected to be impacted by site releases. The analysis of impacts does consider occupational exposure, but does not directly investigate the effect of decommissioning timing on occupational exposure. The history of the development of this EIS, including its relationship to other West Valley EISs, is discussed in Section 1.2. The requirements of the WVDP Act and the regulatory standards that apply to decommissioning of WNYNSC are discussed in Section 1.3.*

Other portions of the discussion at the meetings and the letters involved issues related to the EIS but not directly related to recommendations for the scope of the revised Draft EIS. These out of scope issues included:

- Terms of the stipulation of compromise between DOE and the Coalition on West Valley Nuclear Wastes and Radioactive Waste Campaign
- Preference for, or dislike of, specific actions or alternatives
- Process and criteria for agency decisionmaking
- Future NRC actions, some of which might be supported by the DOE/NYSERDA EIS
- Relationship between DOE and NYSERDA
- Objection to the process for classifying waste incidental to reprocessing

1.7.4 Public Participation for the 2008 Revised Draft EIS

DOE and NYSERDA are soliciting comments on the Revised Draft EIS during a 6-month public comment period. During the public comment period, DOE and NYSERDA will jointly hold public meetings to provide interested members of the public with opportunities to learn more about the content of the Revised Draft EIS from exhibits, fact sheets, and other materials; hear DOE and NYSERDA representatives present the results of the EIS analyses; ask clarifying questions; and provide oral or written comments. A Revised Draft EIS website (www.westvalleyeis.com) has been established to further inform the public about the Revised Draft EIS, how to submit comments, public meetings, and other pertinent information. Additional comment submission mechanisms, public meeting dates, times, and locations will be announced in the *Federal Register*, in local newspapers, and on the Website (www.westvalleyeis.com). Members of the public who have expressed interest and are on the DOE and NYSERDA mailing list for the Draft EIS will be notified by U.S. mail regarding meeting dates, times, and locations.

When the Final EIS is published, its availability will be announced in the *Federal Register*, in local newspapers, and via U.S. mail. All oral and written comments received during the public comment period will be considered in preparing the Final EIS, and DOE and NYSERDA responses will be presented in a Comment Response Document that will be published as part of the Final EIS.

Based on the Final EIS and other considerations, DOE will announce a decision regarding future actions at the West Valley Site in a ROD to be published in the *Federal Register* at least 30 days after the Final EIS is published. NYSERDA will publish a Findings Statement with similar information regarding its decisions in New York State's *Environmental Notice Bulletin*.

1.8 Organization of the Environmental Impact Statement

This Draft EIS includes a separate Summary in addition to the main volume that consists of a foreword, 11 chapters and 18 appendices, as follows:

A Summary and Guide for Stakeholders which provides a summary of the results of the environmental analysis in the Draft EIS and provides a guide to locating specific information in the Draft EIS.

Contents of the Draft EIS:

Foreword (prepared by NYSERDA), which describes NYSERDA's views on the Draft EIS analyses, in terms of their decisionmaking responsibilities.

Chapter 1, Introduction and Purpose and Need for Agency Action: This chapter provides an overview of the activities at the WNYNSC, a brief history of events leading to the development of the document, the purpose and need for agency action, the scope and decisions to be supported by the EIS, the relationship of this EIS to other NEPA documentation, and the issues raised during the public participation process.

Chapter 2, Proposed Action, Facility Description, Alternatives, and Comparison of Environmental Impacts: This chapter provides a summary description of the project; a description of WNYNSC facilities and their expected status at the start of the implementation period; descriptions of the alternatives evaluated and alternatives dismissed from detailed evaluation, and a summary comparison of the environmental impacts of the four alternatives.

Chapter 3, Affected Environment: This chapter describes the existing environmental conditions at WNYNSC and surrounding areas.

Chapter 4, Environmental Consequences: This chapter describes the potential environmental impacts to WNYNSC and surrounding areas that could occur as the result of each of the reasonable alternatives during the implementation period, including long-term performance results, cumulative impacts, cost-benefit considerations, incomplete and unavailable information, and resource commitments.

Chapter 5, Applicable Laws, Regulations, and Other Requirements: This chapter describes environmental, safety and health laws, regulations, and standards applicable to the proposed decommissioning and or long-term stewardship of WNYNSC.

Chapter 6, Potential Mitigation Measures: This chapter summarizes the mitigation measures that would be used to avoid or reduce potential environmental impacts that may result from implementation of the alternatives analyzed in Chapter 4.

Chapters 7 through 11: Chapters 7 through 11 contain a list of references, glossary, index, list of EIS preparers, and distribution list of agencies, organizations, and persons to whom copies of the *Decommissioning and/or Long-Term Stewardship EIS* were sent.

The EIS contains 18 appendices that provide technical information in support of the environmental analyses presented in the main body of the document:

Appendix A – Summary of Comments Received on the 1996 Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center

Appendix B – *Federal Register* Notices

Appendix C – Descriptions of Facilities/Areas, Implementation Activities, and Description of New Construction

Appendix D – Overview of Performance Assessment Approach

Appendix E – Geohydrological Analysis

Appendix F – Erosion Studies

Appendix G – Models for Long-Term Performance Assessment

Appendix H – Long-Term Performance Assessment Results

Appendix I – Decommissioning Radiological and Hazardous Chemical Human Health Impacts Evaluation

Appendix J – Evaluation of Human Health Effects from Transportation

Appendix K – Method for Estimating Nonradiological Air Quality Impacts

Appendix L – Regulatory Compliance Discussion

Appendix M – Floodplain and Wetlands Assessment

Appendix N – Intentional Destructive Acts

Appendix O – Consultation Letters

Appendix P – The SDA Quantitative Risk Assessment (prepared by NYSERDA)

Appendix Q – Concurrence Letters

Appendix R – Contractor Disclosure Statements

CHAPTER 2
PROPOSED ACTION, FACILITY DESCRIPTION, ALTERNATIVES, AND COMPARISON OF ENVIRONMENTAL IMPACTS

2.0 PROPOSED ACTION, FACILITY DESCRIPTION, ALTERNATIVES, AND COMPARISON OF ENVIRONMENTAL IMPACTS

Chapter 2 describes the actions proposed by the U.S. Department of Energy (DOE) and the New York State Energy Research and Development Authority (NYSERDA) for the decommissioning and long-term stewardship of the Western New York Nuclear Service Center (WNYNSC). The chapter includes descriptions of the reasonable decommissioning alternatives, the No Action Alternative, and the alternatives considered and subsequently eliminated from detailed evaluation. It concludes with a summary comparison of environmental impacts, including costs associated with each of the alternatives, identifies the Preferred Alternative, and summarizes uncertainties associated with the analysis. Appendix C includes details on the WNYNSC facilities, the implementation activities associated with each alternative, and the new construction efforts involved.

2.1 Introduction

As required by the National Environmental Policy Act (NEPA) and the New York State Environmental Quality Review Act (SEQR), this environmental impact statement (EIS) presents the environmental impacts associated with the range of reasonable alternatives to meet the DOE and NYSERDA purpose and need for action and a No Action Alternative. The alternatives evaluated include:

- The Sitewide Removal Alternative, which would allow unrestricted release of the entire WNYNSC.
- The Sitewide Close-In-Place Alternative, under which existing facilities and contamination would be managed at their current locations, and areas having higher levels of long-lived contamination would use engineered barriers to control contamination.
- The Phased Decisionmaking Alternative (the Preferred Alternative), under which there would be an initial (Phase 1) 8-year period of removal actions for all facilities except the Waste Tank Farm, U.S. Nuclear Regulatory Commission (NRC)-licensed Disposal Area (NDA), State-licensed Disposal Area (SDA), and Construction and Demolition Debris Landfill. During a period of up to 30 years, DOE and NYSERDA would conduct a variety of activities intended to expand the information available to support later additional decommissioning decisionmaking (Phase 2) for those facilities and areas not addressed in Phase 1.
- The No Action Alternative, which involves the continued management and oversight of WNYNSC under the conditions that would exist at the starting point of this EIS. The No Action Alternative does not meet the purpose and need for agency action. It is included for comparison purposes as required by NEPA and SEQR.

NYSERDA and DOE recognize that, after consideration of the comments to be received during the public review period for this Draft EIS, some combination of the alternatives analyzed in this document may provide the best approach to meeting the goals of the agencies while protecting human health and safety and the environment. If a specific combination alternative is identified as preferred between the Draft and Final EISs, DOE would present the alternative and its potential impacts in the Final EIS. The combination alternative would be based on the results by Waste Management Area (WMA) of two or more alternatives presented in the Draft EIS. If the agencies were to decide to select an action that is a combination of the four alternatives, the reasons for that selection would be presented in the Record of Decision (ROD) and Findings Statement associated with that decision.

Waste Classifications Used in this EIS

High-level Waste or High-Level Radioactive Waste – The high-level radioactive waste which was produced by the reprocessing of spent nuclear fuel at the Western New York Nuclear Service Center. Such term includes both liquid wastes which are produced directly in reprocessing, dry solid material derived from such liquid waste, and such other material as the U.S. Nuclear Regulatory Commission designates as high-level radioactive waste for the purposes of protecting the public health and safety (West Valley Demonstration Project Act, Public Law 96-368; 94 Stat. 1347). Also see the definition of high-level radioactive waste in the Nuclear Waste Policy Act of 1982, as amended (Public Law 97-425, 96 Stat. 2201), and as promulgated in 10 CFR 63.2.

Transuranic Waste – DOE radioactive waste not classified as high-level radioactive waste and containing more than 100 nanocuries per gram of alpha-emitting transuranic isotopes with half lives greater than 20 years (40 *Code of Federal Regulations* [CFR] Part 191).

Hazardous Waste – A category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20-24; 6 New York Code of Rules and Regulations (NYCRR) Part 371.1(d)(1), 371.3 (ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the U.S. Environmental Protection Agency (EPA) in 40 CFR 261.3-33, or by the State of New York in 6 NYCRR 371.4. Toxicity is determined by the Toxicity Characteristic Leaching Procedure method as given in 40 CFR 261.24; 6 NYCRR 371.3(e).

Low-level Radioactive Waste – Waste that contains radioactivity and is not classified as high-level radioactive waste, transuranic waste, or spent nuclear fuel, or the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material (DOE Manual 435.1-1, 10 CFR 20.1003). In accordance with NRC regulations in 10 CFR 61.55, low-level radioactive waste is further classified into Class A waste, Class B waste, and Class C low-level radioactive waste. Low-level radioactive waste may also be categorized as low specific activity waste for the purposes of transportation analyses. Low specific activity wastes have low specific activity, are nonfissile, and meet certain regulatory exceptions and limits. Low specific activity wastes may be transported in large bulk containers.

Mixed Low-level Radioactive Waste – Low-level radioactive waste that also contains hazardous waste regulated under RCRA (42 United States Code [U.S.C.] 6901 et seq.).

Greater-Than-Class C Waste – Low-level radioactive waste that exceeds the concentration limits established for Class C waste in 10 CFR 61.55.

Construction and Demolition Debris – Discarded nonhazardous material including solid, semisolid, or contained gaseous material resulting from construction, demolition, industrial, commercial, mining, and agricultural operations and from community activities. The category does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act (42 U.S.C. 2011 et seq.).

2.2 Proposed Action

DOE proposes to decontaminate and decommission the tanks and other WNYNSC facilities in which the high-level radioactive waste solidified under the West Valley Demonstration Project (WVDP) was stored, the facilities used in the solidification of the waste, and any material and hardware used in connection with WVDP, in accordance with the requirements of the WVDP Act. DOE would dispose of low-level radioactive waste and defense-related transuranic waste generated from decontamination and decommissioning activities off site and would store the vitrified high-level radioactive waste and non-defense transuranic waste on site until it can be shipped to a Federal repository for disposal. The types of waste that would be generated are presented in the "Waste Classifications" text box. In carrying out this Proposed Action, DOE would comply with the provisions of the NRC Final Policy Statement on the Decommissioning Criteria for the West Valley Demonstration Project at the West Valley Site (67 *Federal Register* [FR] 5003) and all other applicable Federal and State requirements.

A determination needs to be made on how NYSERDA would decommission or manage the SDA and any other wastes or facilities at WNYNSC that are not within the scope of the WVDP Act. In carrying out its Proposed Action, NYSERDA will comply with all applicable Federal and State requirements, and will also comply with the NRC License Termination Rule (10 CFR Part 20, Subpart E) for all NRC-regulated facilities not within the scope of the WVDP Act.

DOE and NYSERDA need to use the NRC License Termination Rule and associated guidance provided in NRC's Final Policy Statement as the framework for decommissioning and/or long-term stewardship of WVDP facilities. The NRC License Termination Rule is the framework for decommissioning and/or long-term stewardship of NYSERDA-controlled facilities and areas within the NRC-regulated portion of WNYNSC. There is no site-specific decommissioning guidance (comparable to the NRC's Policy Statement) for the SDA; however, if the site were to be decommissioned for unrestricted use, the New York State Department of Environmental Conservation's (NYSDEC's) Cleanup Guideline for Soils Contaminated with Radioactive Materials, DSHM-RAD-0501 (formerly TAGM 4003), would apply until NYSDEC adopts regulations compatible with the NRC's License Termination Rule. RCRA and corresponding State of New York implementing regulations (6 NYCRR Part 373), along with the RCRA 3008(h) Consent Order issued by NYSDEC and EPA (NYSDEC 1992), provide the regulatory framework for management of regulated facilities containing hazardous waste or constituents. The RCRA 3008(h) Consent Order is discussed in Chapter 5.

2.3 The Western New York Nuclear Service Center and Facilities

WNYNSC, shown on **Figure 2–1**, is located 48 kilometers (30 miles) south of Buffalo, New York. It occupies 1,352 hectares (3,340 acres) in northern Cattaraugus County, New York, and approximately 5.7 hectares (14 acres) in southern Erie County, New York. WNYNSC is drained by Buttermilk Creek, which joins Cattaraugus Creek at the northern end of the property. Cattaraugus Creek flows northwest into Lake Erie approximately 50 kilometers (30 miles) southwest of Buffalo, New York.

A 3-strand barbed-wire security fence supported by metal posts runs approximately 38,100 meters (125,000 linear feet) along the perimeter of the WNYNSC property line.

The primary facilities at WNYNSC are a former irradiated nuclear fuel reprocessing plant with four associated underground radioactive waste storage tanks and two radioactive waste disposal areas. One of the disposal areas is licensed by the NRC and the other is licensed by the New York State Department of Health (NYSDOH) and permitted by NYSDEC. Information on facilities and areas at WNYNSC provided in this chapter is from a facility description and methodology technical report (WSMS 2008e) unless otherwise referenced.

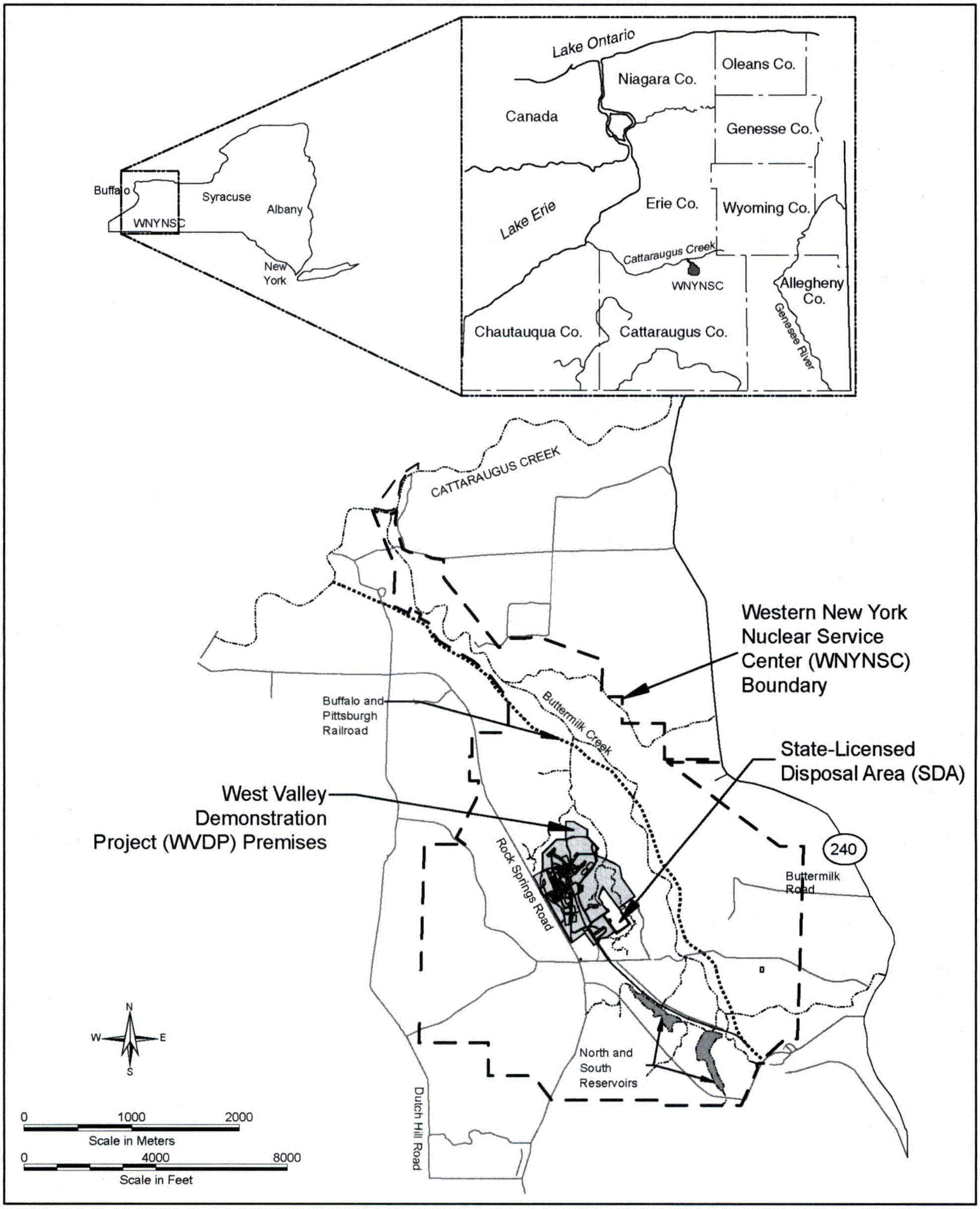


Figure 2–1 The Western New York Nuclear Service Center

WNYNSC has been divided into the 12 WMAs listed below. The locations of WMA 1 through WMA 10 are shown on **Figure 2–2**. The locations of WMA 11 and WMA 12 are shown on **Figure 2–3**.

- WMA 1: Main Plant Process Building and Vitrification Facility Area
- WMA 2: Low-Level Waste Treatment Facility Area
- WMA 3: Waste Tank Farm Area
- WMA 4: Construction and Demolition Debris Landfill
- WMA 5: Waste Storage Area
- WMA 6: Central Project Premises
- WMA 7: NRC-licensed Disposal Area (NDA) and Associated Facilities
- WMA 8: State-licensed Disposal Area (SDA) and Associated Facilities
- WMA 9: Radwaste Treatment System Drum Cell Area
- WMA 10: Support and Services Area
- WMA 11: Bulk Storage Warehouse and Hydrofracture Test Well Area
- WMA 12: Balance of Site

The 66-hectare (164-acre) Project Premises, which are controlled by DOE, are located within WNYNSC, and include WMAs 1 through 10, with the exception of WMA 8 (the SDA), which is managed by NYSERDA and is not included within the Project Premises.

In addition to the 12 WMAs, 2 other areas with unique contamination characteristics that extend through more than 1 WMA are identified in this EIS. The North Plateau Groundwater Plume, a zone of groundwater contamination which extends across portions of WMAs 1 through 6, is shown on **Figure 2–4**; and the Cesium Prong, an area of surface soil contamination extending northwest from the Main Plant Process Building in WMA 1, is shown on **Figure 2–5**. The nature and extent of the North Plateau Groundwater Plume and the Cesium Prong are described in Chapter 3 and in Appendix C.

2.3.1 Environmental Impact Statement Starting Point

The status of WNYNSC at the starting point of this EIS is called the Interim End State, estimated to be achieved by 2011. Prior NEPA reviews have been completed regarding these actions which are needed to place the site in a safe condition (DOE 2003e, 2006c). The primary activities that will be completed to achieve the starting point of this EIS are as follows:

- A number of facilities will be closed, emptied of equipment, decontaminated, and demolished down to their concrete foundations, floor slabs, or gravel pads (DOE 2006c). The disposition of the remaining concrete foundations/slabs/gravel pads is addressed in this EIS. The specific facilities to be removed to achieve the starting point of this EIS are identified in **Table 2–1**, which includes a number of Solid Waste Management Units (SWMUs) identified during the RCRA Facility Assessments that continue to be managed toward RCRA closure. The anticipated status at the EIS starting point with respect to closing these units according to RCRA requirements is listed in Table 2–1 under the column titled "RCRA Status."

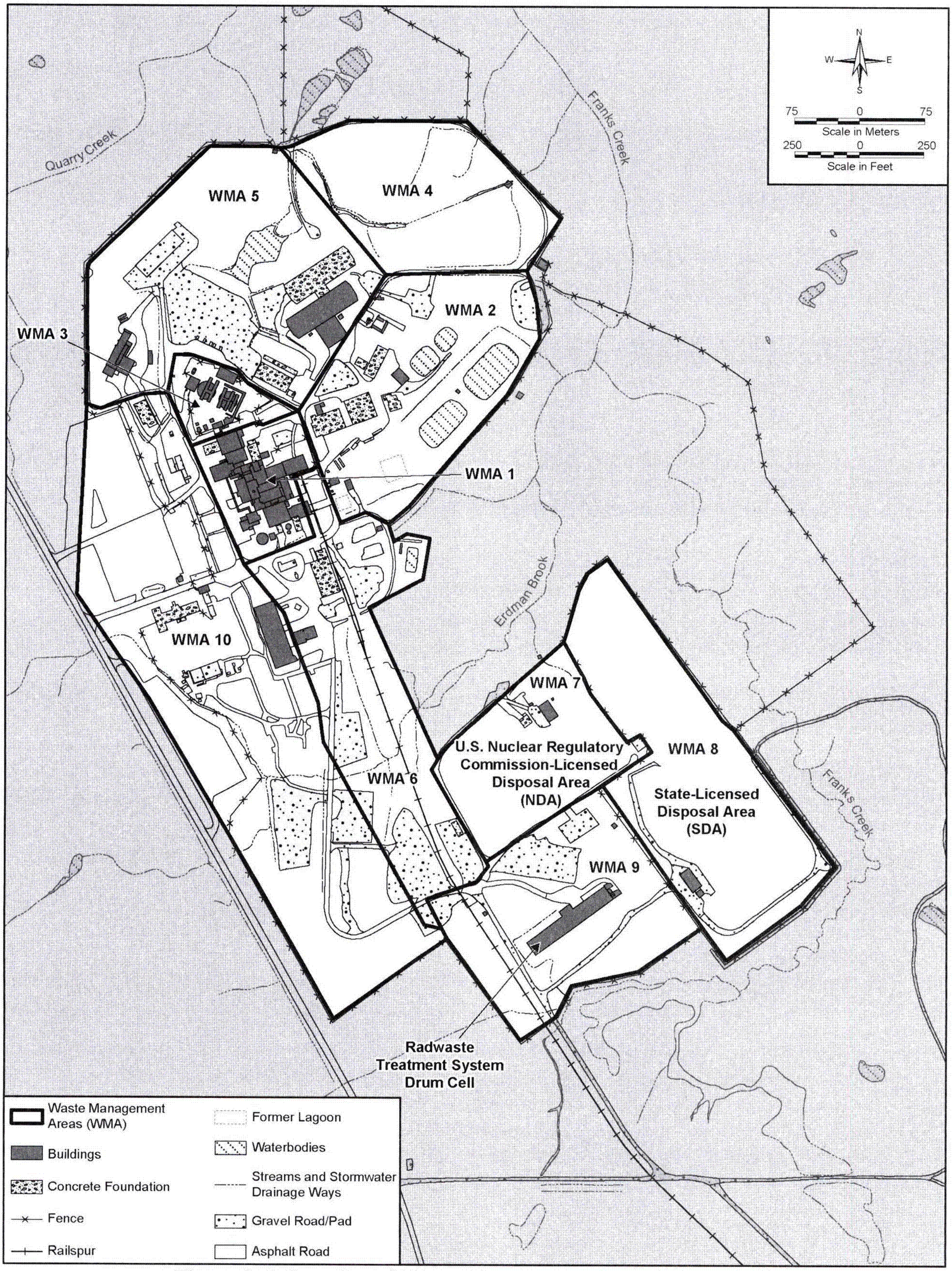


Figure 2–2 Location of Waste Management Areas 1 through 10

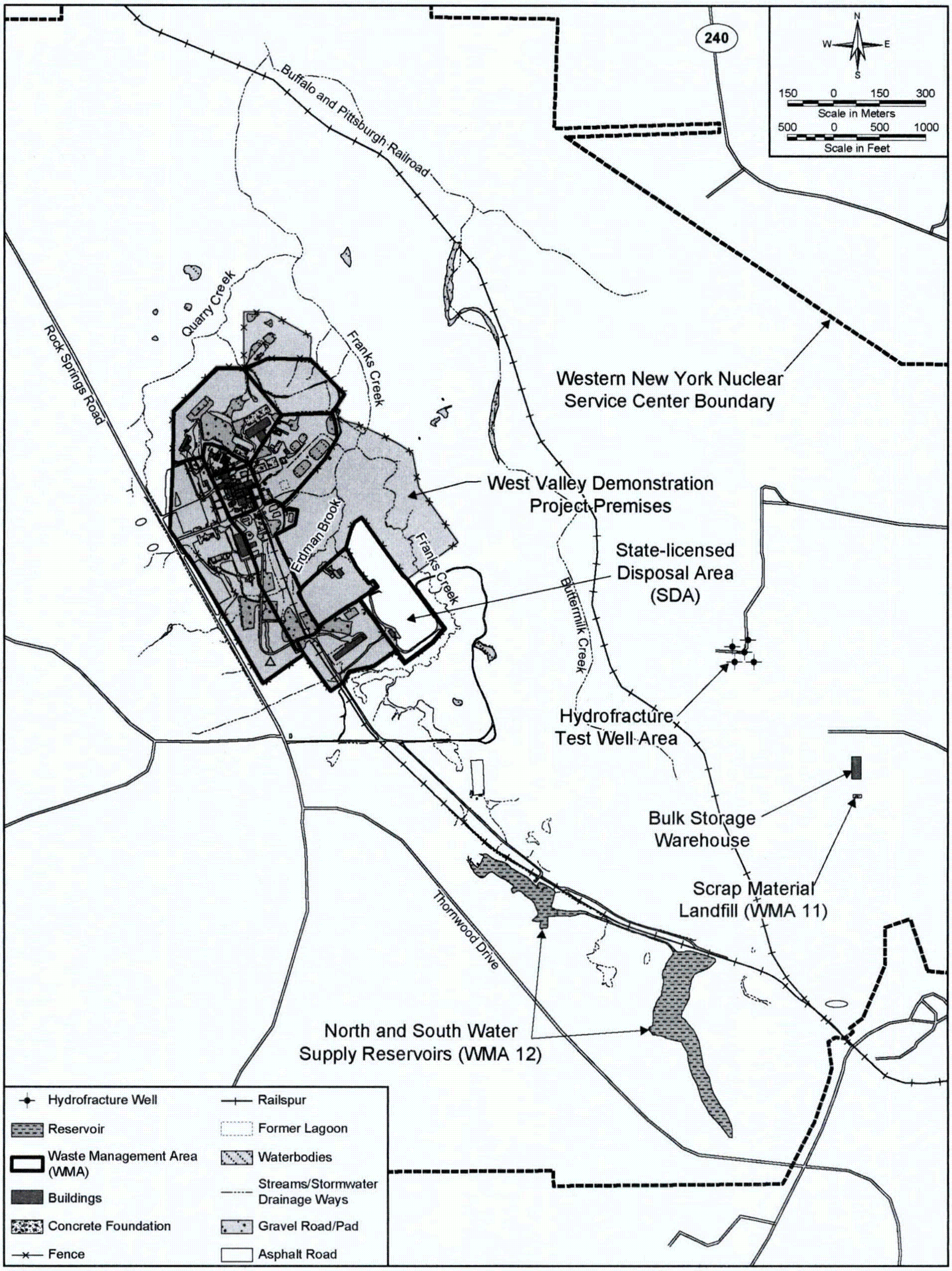


Figure 2–3 Waste Management Areas 11 and 12 – Bulk Storage Warehouse and Hydrofracture Test Area (WMA 11) and Balance of the Western New York Nuclear Service Center (WMA 12)

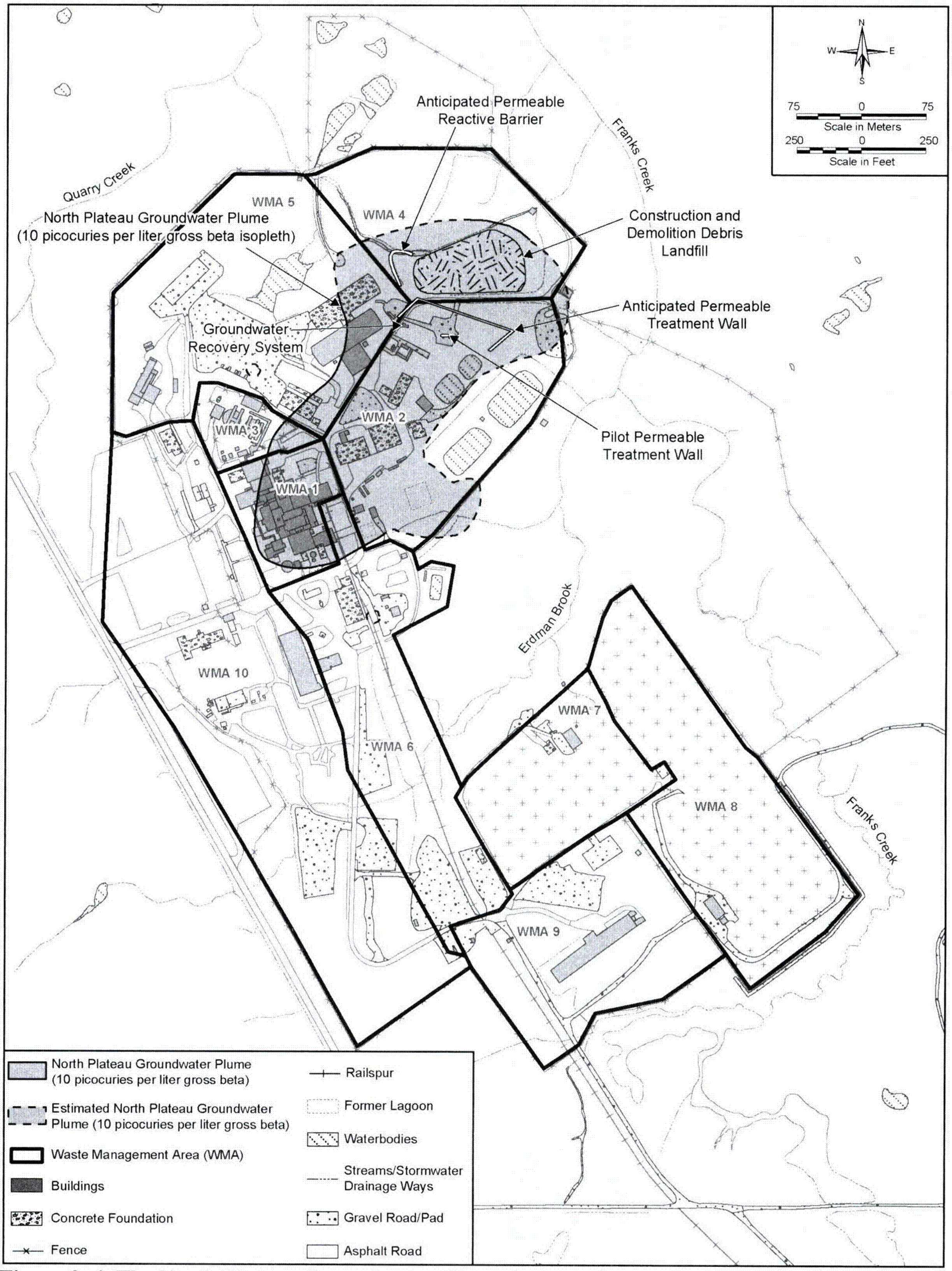


Figure 2–4 The North Plateau Groundwater Plume (a zone of groundwater contamination which extends across Waste Management Areas 1 through 6)

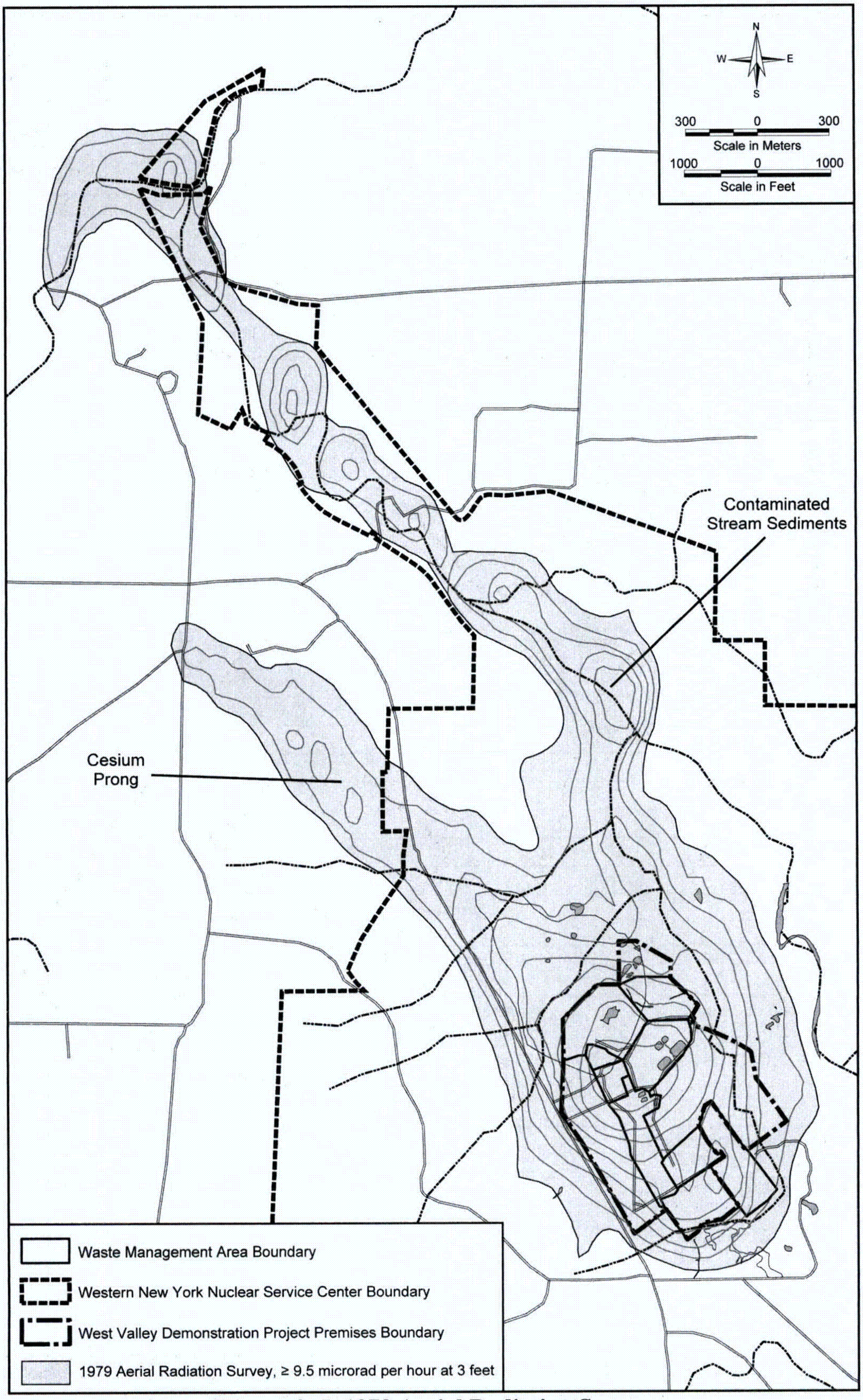


Figure 2–5 1979 Aerial Radiation Survey

Table 2–1 Site Facilities Assumed Removed before Decommissioning; Foundations/Slabs/Pads Remaining at the Starting Point of the Environmental Impact Statement

Facilities Demolished to Grade Foundations/Slabs/Pads Remaining	*RCRA Status at EIS Starting Point*	*Radiological Contamination at EIS Starting Point*
WMA 1		
Fuel Receiving and Storage Ventilation Building	N/A	Assumed to have radiological contamination based on past usage
Fuel Receiving and Storage/High Integrity Container Storage Area	Clean-closed under RCRA Interim Status	Assumed to have radiological contamination based on past usage
Radwaste Process (Hittman) Building	SWMU, NFA	Assumed to have radiological contamination based on past usage
Laundry Room	N/A	Assumed to have radiological contamination based on past usage
Cold Chemical Facility	N/A	No
Emergency Vehicle Shelter	N/A	No
Contact Size-Reduction Facility (including Master Slave Manipulator Repair Shop)	RCRA Interim Status Unit, subject to RCRA Closure	Known to have radiological contamination
WMA 2		
02 Building	SWMU, CMS being prepared	Assumed to have radiological contamination based on past usage
Test and Storage Building	N/A	No
Vitrification Test Facility	N/A	No
Vitrification Test Facility Waste Storage Area	SWMU, NFA	No
Maintenance Shop	NFA	No
Maintenance Storage Area	N/A	No
Vehicle Maintenance Shop	N/A	No
Industrial Waste Storage Area	SWMU, NFA	No
WMA 3		
None		
WMA 4		
None		
WMA 5		
Lag Storage Building	Clean-closed under RCRA Interim Status	Assumed to have radiological contamination based on past usage
Lag Storage Additions 1,2,3	Clean-closed under RCRA Interim Status	Assumed to have radiological contamination based on past usage
Hazardous Waste Storage Lockers	Clean-closed under RCRA Interim Status	No
Chemical Process Cell Waste Storage Area	Clean-closed under RCRA Interim Status	Assumed to have radiological contamination based on past usage
Cold Hardstand near CDDL	SWMU, NFA	Subsurface contamination
Vitrification Vault and Empty Container Hardstand	SWMU, NFA	No
Old/New Hardstand Area	SWMU, NFA	Assumed to have radiological contamination based on past usage
Waste Packaging Area	Clean-closed under RCRA Interim Status	Known radiological contamination
Lag Hardstand	SWMU, NFA	Assumed to have radiological contamination based on past usage
Container Sorting and Packaging Facility as Part of Lag Storage Addition 4	Clean-closed under RCRA Interim Status	Known radiological contamination
High-Level Waste Tank Pump Storage Vaults	SWMU, NFA	No

Facilities Demolished to Grade Foundations/Slabs/Pads Remaining	*RCRA Status at EIS Starting Point*	*Radiological Contamination at EIS Starting Point*
WMA 6		
Old Warehouse	N/A	No
Cooling Tower	N/A	Assumed to have radiological contamination based on past usage
North Waste Tank Farm Test Tower	N/A	No
Road Salt and Sand Storage Shed	N/A	No
Vitrification Test Facility Waste Storage Area	SWMU, NFA	No
Product Storage Area	NFA	No
WMA 7 [a]		
NDA Hardstand Staging Area	SWMU, NFA	Assumed to have radiological contamination based on past usage
WMA 8		
None		
WMA 9		
Trench Soil Container Area	N/A	Assumed to have radiological contamination based on past usage
WMA 10		
Administration Building	N/A	No
Expanded Environmental Laboratory	N/A	No
Construction Fabrication Shop	N/A	No
Vitrification Diesel Fuel Oil Storage Tank and Building	N/A	No
WMA 11		
None		
WMA 12		
None		

CDDL = Construction and Demolition Debris Landfill; CMS = Corrective Measures Study; EIS = environmental impact statement; MSM = Master Slave Manipulator; NFA = no further action required at this time under RCRA, as determined with concurrence of the NYSDEC as an outcome of the RCRA Facility Investigation; N/A = not applicable, not a RCRA-regulated SWMU; RCRA = Resource Conservation and Recovery Act; SWMU = Solid Waste Management Unit; WMA = Waste Management Area.

[a] The Interim Waste Storage Facility and pad located in WMA 7 and the Old Sewage Treatment Plant in WMA 6 have been RCRA clean-closed and are not listed in the table because there is no remaining foundation to be removed.

- The Main Plant Process Building, with the exception of the area used for storing the vitrified waste canisters and areas and systems supporting high-level radioactive waste canister storage, will be decontaminated to a demolition-ready status. Also, the 01-14 Building and the Vitrification Facility in WMA 1, as well as the Remote-Handled Waste Facility in WMA 5, will be decontaminated to a demolition-ready status.

- An upgradient slurry/barrier wall will be installed and a geomembrane cover will be placed over the NDA as part of the NDA infiltration mitigation measures. The installation of this RCRA Interim Measure is scheduled to begin during the spring and be completed by the fall of 2008. The design will be similar to that installed over the SDA in 1995.

- A Tank and Vault Drying System will be installed at the Waste Tank Farm to dry the liquid contents of Tanks 8D-1 and 8D-2. The liquid in Tank 8D-4 will be processed through absorbent media to remove most of the cesium-137 inventory. The contaminated absorbent media will be disposed of off site. The treated liquid will be added to Tank 8D-2, where it will be evaporated in accordance with appropriate regulatory requirements.

- A permeable treatment wall and a permeable reactive barrier will be installed to mitigate further North Plateau Groundwater Plume migration. The anticipated locations for the permeable treatment wall and the permeable reactive barrier are shown on Figure 2–4. The North Plateau Groundwater Plume and background soils will be sampled for potential RCRA hazardous constituents that may exist in the plume, which is anticipated to be completed by December 2008.

- All waste created by activities that are part of achieving the Interim End State will be shipped off site with the possible exception of the transuranic waste. Currently, there is no disposal pathway for non-defense transuranic waste. Transuranic waste generated by Interim End State activities will be stored on site pending either a "defense" determination[1] or availability of a disposal facility for non-defense transuranic waste.

The following sections provide summary descriptions of the facilities/areas of WNYNSC that will be standing, operational, or inactive at the starting point of this EIS and are addressed in this EIS. **Table 2–2** provides a list of these facilities/areas, along with their RCRA and radiological status as of the starting point of the EIS, and references the specific Appendix C sections where these facilities/areas are discussed in more detail. The additional details in Appendix C provide overall dimensions of key facilities, their operational history, and, for the larger facilities where information is available, radiological and hazardous chemical inventory estimates.

Table 2–2 Site Facilities/Areas at the Western New York Nuclear Service Center Assumed at the Starting Point of the Environmental Impact Statement

Facility	*EIS Starting Point*	*RCRA Status [a] at EIS Starting Point*	*Radiological/Chemical Contamination at EIS Starting Point*	*Description (Appendix C Section)*
WMA 1				
Main Plant Process Building (including HLWISF, LWTS, and A&PC Hot Cells and sealed rooms (demolition ready)	Decontaminated for uncontained demolition except for the HLWISF which contains HLW canisters	RCRA Interim Status Units, subject to RCRA closure	Yes – significant radiological source term remains	C.2.1.1
Vitrification Facility (demolition ready)	Decontaminated for uncontained demolition	RCRA Interim Status Unit, subject to RCRA closure	Yes – significant radiological source term remains	C.2.1.2
01-14 Building (includes the Cement Solidification System and the Vitrification Off-Gas System) (demolition ready)	Gutted and decontaminated for uncontained demolition	RCRA Interim Status Unit, subject to RCRA closure	Decontaminated with only residual activity remaining	C.2.1.3
Load-In/Load-Out Facility	Operational	N/A	No	C.2.1.4
Utility Room and Utility Room Expansion	Operational	N/A	No	C.2.1.5
Fire Pumphouse and Water Storage Tank	Operational	N/A	No	C.2.1.6
Plant Office Building	Operational	N/A	Subsurface soil may be contaminated	C.2.1.7
Electrical Substation	Operational	N/A	No	C.2.1.8
Underground Tanks 35104, 7D-13, 15D-6	Operational	N/A	Yes – radiological contamination remains	C.2.1.9

[1] DOE is required to make a determination whether a particular transuranic waste stream is related to defense activities. The Waste Isolation Pilot Plant (WIPP) Land Withdrawal Act of 1992 restricts WIPP disposal activities to transuranic waste generated from defense activities. This "defense waste" is defined as "nuclear waste deriving from the manufacture of nuclear weapons and the operation of naval reactors. Associated activities, such as the research carried on in the weapons laboratories, also produce defense waste" (DOE 1997b).

Facility	*EIS Starting Point*	*RCRA Status* [a] *at EIS Starting Point*	*Radiological/Chemical Contamination at EIS Starting Point*	*Description (Appendix C Section)*
Off-Gas Trench	Inactive	N/A	Yes – radiological contamination remains	C.2.1.10
WMA 2				
Low-Level Waste Treatment Facility (LLW2)	Operational	SWMU, subject to CWA closure and CA	Yes – radiological contamination remains	C.2.2.1
Lagoon 1	Inactive	SWMU, CMS being prepared	Yes – radiological contamination remains, PAH concentrations exceed TAGM criteria	C.2.2.2
Lagoons 2 through 5	Operational	SWMUs, subject to CWA closure and CA	Yes – radiological contamination remains	C.2.2.3
Neutralization Pit	Operational	SWMU, CMS being prepared	Yes – radiological contamination remains	C.2.2.4
Old Interceptor	Operational	SWMU, CMS being prepared	Yes – radiological contamination remains	C.2.2.4
New Interceptor (North and South)	Operational	SWMU, CMS being prepared.	Yes – radiological contamination remains	C.2.2.4
Solvent Dike	Inactive	SWMU, NFA	Yes – radiological contamination remains	C.2.2.5
Maintenance Shop Leach Field	Inactive	SWMU, NFA	Subsurface soil is radiologically contaminated from strontium-90 plume	C.2.2.6
Fire Brigade Training Area	Inactive	SWMU, NFA	Subsurface is radiologically contaminated from strontium-90 plume	C.2.2.7
WMA 3				
Tanks 8D-1, 8D-2, 8D-3, 8D-4	Isolated and emptied	RCRA Interim Status Units, subject to RCRA closure	Yes – contains both radiological and hazardous constituents	C.2.3.1
High-Level Waste Transfer Trench	Transfer lines, trench and pump pits remaining	RCRA Interim Status Unit, subject to RCRA closure	Contamination remains in pump pits and transfer lines	C.2.3.2
Permanent Ventilation System Building	Operational	N/A	Yes – radiological contamination primarily in the HEPA filters	C.2.3.3
Supernatant Treatment System	Isolated, liquid drained	RCRA Interim Status Unit, subject to RCRA closure	Yes – radiological contamination remains	C.2.3.4
Supernatant Treatment System Support Building	Operational	RCRA Interim Status Unit, subject to RCRA closure	Yes – radiological contamination in the valve aisle	C.2.3.4
Equipment Shelter and Condensers	Inactive	SWMU, NFA	Yes – most radiological contamination in ventilation system	C.2.3.5
Con-Ed Building	Inactive	SWMU, NFA	Yes – radiological contamination remains	C.2.3.6
WMA 4				
Construction and Demolition Debris Landfill	Inactive (previously closed)	SWMU, CMS being prepared	Radiologically contaminated from strontium-90 plume	C.2.4

Facility	*EIS Starting Point*	*RCRA Status [a] at EIS Starting Point*	*Radiological/Chemical Contamination at EIS Starting Point*	*Description (Appendix C Section)*
WMA 5				
Remote-Handled Waste Facility	Decontaminated and Deactivated	RCRA Interim Status Unit, subject to RCRA closure	Radiological contamination remains	C.2.5.1
Lag Storage Addition 4, includes Shipping Depot	Operational	RCRA Interim Status Unit, subject to RCRA closure	Small amount of radiological contamination	C.2.5.2
Construction and Demolition Area	Inactive	SWMU, NFA	No	C.2.5.3
WMA 6				
Rail Spur	Operable	N/A	Assumed to have radiological contamination based on past usage	C.2.6.1
Demineralizer Sludge Ponds	Inactive	SWMU, CMS being prepared	Yes – Radiological contamination remains with possible PAH concentrations exceeding TAGM criteria	C.2.6.2
Equalization Basin	Operational	SWMU, subject to CWA closure	No	C.2.6.3
Equalization Tank	Operational	SWMU, subject to CWA closure	No	C.2.6.4
Low-Level Waste Rail Packaging and Staging Area	Operable, waste removed	N/A	No	C.2.6.5
Sewage Treatment Plant	Operational	SWMU, subject to CWA closure	No	C.2.6.6
South Waste Tank Farm Test Tower	Operable	N/A	No	C.2.6.7
WMA 7				
NFS Special Holes	Inactive, Geomembrane Cap and Slurry Wall	SWMU, CMS being prepared	Yes – radiological contamination remains	C.2.7.1
NFS Deep Holes	Inactive, Geomembrane Cap and Slurry Wall	SWMU, CMS being prepared	Yes – radiological contamination remains	C.2.7.1
WVDP Trenches	Inactive, Geomembrane Cap and Slurry Wall	SWMU, CMS being prepared	Yes – radiological contamination remains	C.2.7.1
WVDP Caissons	Inactive, Geomembrane Cap and Slurry Wall	SWMU, CMS being prepared	Yes – radiological contamination remains	C.2.7.1
NDA Interceptor Trench	Operational	SWMU, CMS being prepared	Subsurface is radiologically contaminated. Organic constituents slightly exceed TAGM criteria	C.2.7.2
Liquid Pretreatment System	Operable	SWMU, CMS being prepared	No	C.2.7.2
Leachate Transfer Line	Operational	SWMU, CMS being prepared	Yes – radiologically contaminated and may be chemically contaminated	C.2.7.3
Former NDA Lagoon	Inactive, Geomembrane Cap and Slurry Wall	SWMU, CMS being prepared	Yes – radiologically contaminated soil	C.2.7.4

Facility	*EIS Starting Point*	*RCRA Status* [a] *at EIS Starting Point*	*Radiological/Chemical Contamination at EIS Starting Point*	*Description (Appendix C Section)*
WMA 8				
Disposal Areas	Inactive, Geomembrane Cap	SWMU, CMS being prepared	Yes – radiological and chemical contamination remains	C.2.8.1
Mixed Waste Storage Facility	Operable	RCRA Interim Status Unit, subject to RCRA closure	Yes – assumed to have radiological and chemical contamination	C.2.8.2
Former Filled Lagoons	Inactive, Geomembrane Cap	SWMU, CMS being prepared	Yes – assumed to have radiological and chemical contamination	C.2.8.3
WMA 9				
Radwaste Treatment System Drum Cell	Operable	SWMU, NFA	Assumed to have radiological contamination	C.2.9
Subcontractor Maintenance Area	In-Place	NFA	No	C.2.9
WMA 10				
New Warehouse	Operational	N/A	No	C.2.10.1
Meteorological Tower	Operational	N/A	No	C.2.10.2
Security Gatehouse and Fences	Operational	N/A	No	C.2.10.3
WMA 11				
Scrap Material Landfill	Inactive	SWMU, NFA	No	C.2.11
WMA 12				
Dams and Reservoirs	Operable	N/A	No	C.2.12.1
Parking Lots and Roadways	Inactive	N/A	No	C.2.12.2
Railroad Spur	Inactive	N/A	No	C.2.12.3
Soils and Stream Sediments	N/A	N/A	Yes – radiological contamination is present	C.2.12.4
North Plateau Groundwater Plume	Inactive	N/A	Yes – radiological contamination is present	C.2.13
Groundwater Recovery System [b]	Operational	N/A	Yes – radiological contamination is present	C.2.13.1
Pilot-Scale Permeable Treatment Wall and Full-Scale Permeable Treatment Wall [b]	Operational	N/A	Yes – radiological contamination is present	C.2.13.2
Permeable Reactive Barrier [c]	Operational	N/A	Yes – radiological contamination is present	C.2.13.3
Cesium Prong	Inactive	N/A	Yes – radiological contamination is present	C.2.14

A&PC = Analytical and Process Chemistry; CA = Corrective Action; CMS = Corrective Measures Study; CWA = Clean Water Act; EIS = environmental impact statement; HLW = high-level radioactive waste; HLWISF = High-Level Waste Interim Storage Facility; LLW2 = Low-Level Waste Treatment Facility; LWTS = Liquid Waste Treatment System; NDA = NRC-licensed Disposal Area; NFA = no further action required at this time under RCRA, as determined with concurrence of the NYSDEC as an outcome of the RCRA Facility Investigation; NFS = Nuclear Fuel Services, Inc.; N/A = not applicable, not a RCRA-regulated SWMU; PAH = polynuclear aromatic hydrocarbon; RCRA = Resource Conservation and Recovery Act; SWMU = Solid Waste Management Unit; TAGM = Technical and Administrative Guidance Memorandum; WMA = Waste Management Area; WVDP = West Valley Demonstration Project.

[a] Interim Status Unit implies that a unit is subject to permitting and closure.
[b] Physically located in WMA 2.
[c] Physically located in WMA 4.

2.3.2 Description of Waste Management Areas

2.3.2.1 Waste Management Area 1: Main Plant Process Building and Vitrification Facility Area

WMA 1 encompasses approximately 1.7 hectares (4 acres). Key facilities standing in WMA 1 at the starting point of this EIS include the Main Plant Process Building, Vitrification Facility, 01-14 Building, Load-In/Load-Out Facility, Utility Room and Utility Room Expansion, Fire Pumphouse and Water Storage Tank, Plant Office Building, and Electrical Substation. Included in WMA 1 are underground tanks, underground pipelines (including those that transferred waste to WMA 3), and the source area of the North Plateau Groundwater Plume. The plume extends through portions of WMAs 1 through 6. WMA 1 is shown on Figure 2–2, and in more detail in Appendix C, Figure C–1.

At the starting point of this EIS, WMA 1 facilities, including the Fuel Receiving and Storage Ventilation Building, Fuel Receiving and Storage High Integrity Container (HIC) Storage Area, Radwaste Process (Hittman) Building, Laundry Room, Cold Chemical Facility, Emergency Vehicle Shelter, and the Contact Size-Reduction Facility including the MSM Repair Shop will have been removed to grade. The remaining concrete foundations and slabs are addressed in this EIS.

The Main Plant Process Building was built between 1963 and 1966, and was used from 1966 to 1971 by Nuclear Fuel Services (NFS) to recover uranium and plutonium from irradiated nuclear fuel. The building is composed of a series of cells, aisles, and rooms that are constructed of reinforced concrete and concrete block. Most of the facility was constructed above grade; however, a few of the cells extend below the ground surface. One of the cells is currently used to store 275 canisters of vitrified high-level radioactive waste from the solidification of the liquid waste originally in the high-level radioactive waste tanks in WMA 3.

At the starting point of this EIS, the Main Plant Process Building will be standing, emptied of most equipment, and decontaminated to the extent that it can be demolished without the use of radiological containment. The major area not decontaminated would be the former Chemical Process Cell (now referred to as the High-Level Waste Interim Storage Facility), where the high-level radioactive waste canisters would still be stored, and those areas that support safe storage of the waste canisters. The Main Plant Process Building areas that would still be operational to support high-level radioactive waste canister storage include the Chemical Process Cell Crane Room, Equipment Decontamination Room, Ventilation Supply Room, the Ventilation Exhaust Cell, and the Head-End Ventilation Building, along with supporting plant utilities. Other equipment remaining in the Main Plant Process Building is located in the Liquid Waste Cell, Acid Recovery Cell, and Ventilation Wash Room. Prior to the starting point of this EIS, a layer of cement grout will be poured on the floors of cells with high radiation and contamination levels, such as the General Purpose Cell and the Process Mechanical Cell, to fix contamination and provide radiation shielding. Details on the Main Plant Process Building and the type and quantity of radiological and chemical contamination present are provided in Appendix C, Section C.2.1.1.

The Vitrification Facility is a structural steel-framed and sheet-metal building that houses the Vitrification Cell, operating aisles, and a control room. High-level radioactive waste transferred from Tank 8D-2 in WMA 3 was mixed with glass formers and vitrified into borosilicate glass within the Vitrification Cell. The Vitrification Facility will be decontaminated for the Interim End State to a point where it would be ready for demolition without containment, but a substantial radiological source term would remain. More detailed information regarding the status of the Vitrification Facility at the starting point of the EIS can be found in Appendix C, Section C.2.1.2.

The 01-14 Building will be in place and sufficiently decontaminated to allow uncontained demolition. The 01-14 Building is a four-story concrete and steel-framed building located next to the southwest corner of the Main Plant Process Building. This building was built in 1971 to house an NFS off-gas system and acid recovery system, which were to be located in the off-gas treatment cell and acid fractionator cell portions of the building. However, the building was never used to support NFS operations. The 01-14 Building currently houses the vitrification off-gas system and the Cement Solidification System. It is radiologically contaminated. The vitrification off-gas system and the Cement Solidification System will be removed and the building decontaminated prior to the starting point of the EIS.

The Load-In/Load-Out Facility is located adjacent to the west wall of the Equipment Decontamination Room of the Main Plant Process Building in WMA 1. The Load-In/Load-Out Facility is a structural steel and steel-sided building. It was used to move empty canisters and equipment into and out of the Vitrification Cell. It has a truck bay and a 14-metric ton (15-ton) overhead crane that is used to move canisters and equipment. It is not radioactively contaminated.

The Utility Room is a concrete block and steel-framed building located on the south end of the Main Plant Process Building. It consists of two adjoining buildings that were built at different times: the original Utility Room and the Utility Room Expansion. The original Utility Room, which was built during the construction of the Main Plant Process Building, makes up the western portion of the Utility Room. The Utility Room contains equipment that supplies steam, compressed air, and various types of water to the Main Plant Process Building. Based on process knowledge and the results of routine radiological surveys, the Utility Room is not expected to have substantial radiological contamination. However, the pipe trench in the original Utility Room is reported to be radioactively contaminated as a result of backup of contaminated water from other sources and may have chemical contamination. A water storage tank and an aboveground No. 2 fuel oil tank are located outside the Utility Room. The aboveground fuel oil tank would require closure under petroleum bulk storage regulations (6 NYCRR Part 613). Asbestos-containing material associated with the fuel oil tank will be managed as asbestos-containing waste in accordance with New York State and Toxic Substances Control Act requirements.

The Utility Room Expansion was built in the early 1990s immediately adjacent and connected to the original Utility Room. Because this building is newer, and because radioactive waste processing operations were not performed in it, the Utility Room Expansion is not expected to be contaminated, and routine radiological surveys have not detected any radiological contamination in this area.

The Fire Pumphouse was constructed when the Main Plant Process Building was built in 1963. The Pumphouse contains two pumps on concrete foundations. One is driven by an electric motor with a diesel engine backup, and the other is driven by a diesel engine. A 1,100-liter (290-gallon), double-wall, carbon-steel, diesel-fuel day tank with No. 2 fuel oil is also located in the Pumphouse. A light metal storage shed rests on a concrete slab. The shed is used to store fire hoses and fire extinguishers. The Water Storage Tank stores water for firefighting purposes. The Fire Pumphouse and the Water Storage Tank are not expected to be radioactively contaminated based on process knowledge and routine radiological surveys.

The Plant Office Building is a three-story concrete block and steel-framed structure located adjacent to the west side of the Main Plant Process Building. The Office Building is designated as an unrestricted occupancy area. Radiological contamination is present beneath the floor in the men's shower room. This contamination originated during spent nuclear fuel reprocessing from releases of radioactive acid from the acid recovery system into the adjacent southwest stairwell and into subsurface soils during NFS operations. This contamination is the primary source of the North Plateau Groundwater Plume, described in Section 2.3.2.13 of this chapter.

The Electrical Substation is located adjacent to the southeast corner of the Main Plant Process Building. A 34.5-kilovolt/480-volt transformer rests on a concrete foundation behind a steel-framed structure. The transformer contains 2,200 liters (586 gallons) of oil containing polychlorinated biphenyls at 292 parts per million, which is managed in accordance with New York State and Toxic Substances Control Act requirements. No radiologically-contaminated areas have been identified at the Electrical Substation.

Tanks 35104, 7D-13, and 15D-6 are located underground in the vicinity of the Main Plant Process Building. They are stainless steel tanks with capacities of 22,300 liters (5,900 gallons), 7,600 liters (2,000 gallons), and 5,700 liters (1,500 gallons) respectively. They served as collection and holding tanks for liquid from drains in contaminated areas and liquid waste from laundry and laboratories. They currently contain radioactive liquids and solids and RCRA constituents. Refer to Section 3.11.5.1 for a description of leaks associated with these tanks.

The Off-Gas Trench is an underground shielded concrete transfer trench located on the west side of the Main Plant Process Building between the Vitrification Facility and the 01-14 Building. It was used to transfer filtered off-gas generated by the vitrification process to the 01-14 Building for further processing before exhausting through the main stack and is radiologically contaminated.

More detailed descriptions of the Main Plant Process Building, Vitrification Facility, 01-14 Building, Load-In/Load-Out Facility, Utility Room and Utility Room Expansion, Fire Pumphouse and Water Storage Tank, Plant Office Building, Electrical Substation, underground tanks, and the Off-Gas Trench are included in Appendix C, Section C.2.1.

2.3.2.2 Waste Management Area 2: Low-Level Waste Treatment Facility Area

WMA 2 encompasses approximately 5.5 hectares (14 acres). It was used by NFS and WVDP to treat low-level radioactive wastewater generated on site. Facilities and areas evaluated in this EIS include the Low-Level Waste Treatment Facility, known as LLW2; inactive filled Lagoon 1; active Lagoons 2, 3, 4, and 5; Neutralization Pit; New and Old Interceptors; Solvent Dike; Maintenance Shop Leach Field; and Fire Brigade Training Area. Included in WMA 2 are underground pipelines, the groundwater recovery wells and the permeable treatment wall that are described in Section 2.3.2.13 of this chapter, and also a portion of the North Plateau Groundwater Plume, which extends under portions of WMAs 1 through 6. The Low-Level Waste Treatment Facility Area is shown on Figure 2–2 and in more detail on Figure C–3 of Appendix C.

At the starting point of this EIS, the O2 Building, Test and Storage Building, Vitrification Test Facility, Vitrification Test Facility Waste Storage Area, Maintenance Shop, Vehicle Maintenance Shop, Maintenance Storage Area, and Industrial Waste Storage Area will have been removed to grade. The remaining concrete foundations and slabs are addressed in this EIS.

The Low-Level Waste Treatment Facility is located southwest of Lagoon 4, and is a pre-engineered, single-story, metal-sided building on a concrete wall foundation. The packaging room, which is typically used for resin handling, includes a 3,400-liter (900-gallon) sump and is high-efficiency particulate air (HEPA) filter ventilated. The Low-Level Waste Treatment Facility is radiologically contaminated.

Lagoon 1 was an unlined pit excavated into the surficial sands and gravels. It was fed directly from the Old and New Interceptors, and had a storage capacity of approximately 1,140,000 liters (300,000 gallons). This lagoon was removed from service in 1984, after a determination was made that it was the source of tritium contamination to nearby groundwater. The liquid and sediment were transferred to Lagoon 2. Lagoon 1 was filled with approximately 1,300 cubic meters (1,700 cubic yards) of radiologically-contaminated debris from the Old Hardstand, including asphalt, trees, stumps, roots, and weeds. It was capped with clay, covered with topsoil, and revegetated.

Lagoon 2 is an unlined pit with a storage capacity of 9.1 million liters (2.4 million gallons). This lagoon was excavated into the Lavery till, and water levels are kept below the sand and gravel unit/Lavery till interface. It is used as a storage basin for wastewater discharged from the New Interceptors before its contents are transferred to the Low-Level Waste Treatment Facility for treatment. Prior to installation of the Low-Level Waste Treatment Facility, wastewater was routed through Lagoons 1, 2, and 3 in series before discharge to Erdman Brook. Radioactive contamination is known to be present in Lagoon 2 sediment.

Lagoon 3 is an unlined pit with a storage capacity of 12.5 million liters (3.3 million gallons). This lagoon was excavated into the Lavery till, and water levels are kept below the sand and gravel unit/Lavery till interface. After installation of the O2 Building, which formerly housed the low-level waste treatment equipment and was subsequently reduced to its floor slab, Lagoon 3 was disconnected from Lagoon 2, emptied, and the sediment was removed. Presently, Lagoon 3 only receives treated water from Lagoons 4 and 5. Treated wastewater in Lagoon 3 is periodically batch discharged to Erdman Brook through a State Pollutant Discharge Elimination System (SPDES)-permitted outfall. Lagoon 3 is radiologically contaminated.

Lagoon 4 was excavated into the sand and gravel unit and was lined with silty till material. Operations relied on the clay liner until 1974, when the lagoon was identified as a source of tritium in the groundwater. A hypalon membrane liner was then added. The membranes lining the lagoon were removed in the late 1990s by WVNSCO and replaced with concrete grout and an XR-5 liner. The lagoon has a capacity of 772,000 liters (204,000 gallons). It receives treated water from the Low-Level Waste Treatment Facility and discharges it to Lagoon 3. It is radiologically contaminated.

Lagoon 5 was also excavated into the sand and gravel unit and lined with silty till material. Operations relied on the clay liner until 1974, when the lagoon was identified as a source of tritium in the groundwater. A hypalon membrane liner was then added. The membranes lining the lagoon were removed in the late 1990s by WVNSCO and replaced with concrete grout and an XR-5 liner. The lagoon has a capacity of 628,000 liters (166,000 gallons). It receives treated water from the Low-Level Waste Treatment Facility and discharges it to Lagoon 3. It is radiologically contaminated.

The Neutralization Pit is a below-grade tank constructed with concrete walls and floor. The tank initially had an acid-resistant coating which failed and was replaced with a stainless steel liner. The pit is radiologically contaminated and may contain chemical constituents, such as mercury derived from the management of low-level radioactive wastewater.

The Old Interceptor is a liquid waste storage tank located below grade that received low-level liquid waste generated at the Main Plant Process Building from the time of initial operation until the New Interceptors were constructed. High levels of radioactive contamination introduced into its Old Interceptor required the addition of an 0.3-meter (1-foot) thick layer of concrete to the floor for shielding. The Old Interceptor is currently used for storing radiologically contaminated liquids that exceed the effluent standard.

The New Interceptors are twin (north and south) stainless steel lined open-top concrete storage tanks located below grade. The New Interceptors replaced the Old Interceptor and are used as liquid sampling points before transfer of the liquid to Lagoon 2.

The Solvent Dike is located about 90 meters (300 feet) east of the Main Plant Process Building. It was an unlined basin, excavated in the surficial sands and gravels. It received rainwater runoff from the Main Plant Process Building Solvent Storage Terrace, which formerly housed an acid storage tank and three storage tanks containing a mixture of used n-dodecane and tributyl phosphate. The sediment has been removed and the area has been backfilled. The Solvent Dike still contains radiologically-contaminated soil.

The Maintenance Shop Leach Field occupies an area of 140 square meters (1,500 square feet) and consists of three septic tanks, a distribution box, a tile drain field, and associated piping. The Leach Field served the Maintenance Shop and the Test and Storage Building before these buildings were connected to the sanitary sewer system in 1988. It may be radiologically contaminated by the North Plateau Groundwater Plume. RCRA hazardous constituents were detected in the sediment of one septic tank, but none of the concentrations exceeded RCRA hazardous waste criteria or action levels prescribed by NYSDEC. All three tanks are out of service and have been filled with sand.

The Fire Brigade Training Area is located north of Lagoons 4 and 5 and was used two to four times a year between 1982 and 1993 for several types of fire training exercises. Piles of wood coated with kerosene or diesel fuel were ignited and then extinguished with water and/or foam. Other exercises involved diesel fuel and water mixtures placed in a shallow metal pan that were ignited and extinguished using a steady stream of water and/or foam. These training exercises were conducted pursuant to the Restricted Burning Permits issued for the training area.

More detailed descriptions of the Low-Level Waste Treatment Facility, Lagoons 1 through 5, Neutralization Pit and Interceptors, Solvent Dike, Maintenance Shop Leach Field, and Fire Brigade Training Area are included in Appendix C, Section C.2.2.

2.3.2.3 Waste Management Area 3: Waste Tank Farm Area

WMA 3 encompasses approximately 0.8 hectares (2 acres). Waste Tank Farm Area facilities evaluated in this EIS include Waste Storage Tanks 8D-1, 8D-2, 8D-3, and 8D-4, their associated vaults, the High-Level Waste Transfer Trench, Permanent Ventilation System Building, Supernatant Treatment System (STS) and STS Support Building, Equipment Shelter and Condensers, and the Con-Ed Building. Also included in WMA 3 is the North Plateau Groundwater Plume, which extends through WMAs 1 through 6, and underground pipelines which transferred waste from WMA 1. At the starting point of this EIS, a Tank and Vault Drying System will have been added to Tanks 8D-1 and 8D-2, which would have dried the residuals left in the tanks as part of achieving the Interim End State. The Waste Tank Farm Area is shown on Figure 2–2 and in more detail on Figure C–4 of Appendix C.

Waste Storage Tanks 8D-1, 8D-2, 8D-3, and 8D-4 were built to store liquid high-level radioactive waste generated during spent nuclear fuel reprocessing operations. Tanks 8D-2 and 8D-4 were used to store PUREX and THOREX wastes respectively from reprocessing operations. Tanks 8D-1 and 8D-3 were used to store condensate from the THOREX waste. These tanks were subsequently modified to support treatment of high-level radioactive waste. Modifications included constructing a fabricated steel truss system over Tanks 8D-1 and 8D-2 to carry the weight of sludge mobilization and transfer pumps, and installation of STS equipment in Tank 8D-1. The tanks will contain residual radiological as well as hazardous chemical constituents, but all the tank contents will be dry. Piping and utilities to the tanks will be isolated to prevent transfers to and from the tanks. Details on the Waste Storage Tanks and associated vaults and the type and quantities of the waste contents at the starting point of this EIS are provided in Appendix C, Section C.2.3.

Tank 8D-1 contains five high-level radioactive waste mobilization pumps, and Tank 8D-2 contains four of these centrifugal pumps. Each pump is approximately 2.4 meters (8 feet) long and is supported by a 25.4-centimeter (10-inch) stainless steel pipe column that is 15.2 meters (50 feet) long. Tanks 8D-1, 8D-2, 8D-3, and 8D-4 also each contain a transfer pump. These centrifugal multi-stage turbine type pumps are each supported by a 35.6-centimeter (14-inch) pipe column, with an overall length of more than 15.2 meters (50 feet) for Tanks 8D-1 and 8D-2 and approximately 6 to 8 meters (20 to 25 feet) in length for Tanks 8D-3 and 8D-4. Like the mobilization pumps, the transfer pumps were driven by 150-horsepower electric motors. The mobilization and transfer pumps are radiologically contaminated. The transfer pumps will likely have more contamination, since high-level radioactive waste passed through the entire length of the pump, rather than impacting only the lower portion as with the mobilization pumps.

The High-Level Waste Transfer Trench is a long concrete vault containing double-walled piping that was designed to convey waste between the Waste Tank Farm and the Vitrification Facility in WMA 1. It is approximately 152 meters (500 feet) long, extending from the Tank 8D-3/8D-4 vault along the north side of Tanks 8D-1 and 8D-2, before turning to the southwest and entering the north side of the Vitrification Facility. The pump pits and piping used to convey high-level radioactive waste are radiologically contaminated.

The Permanent Ventilation System Building is located approximately 15.3 meters (50 feet) north of Tank 8D-2. This steel-framed building contains four rooms: the Permanent Ventilation System Room, Electrical Room, Mechanical Room, and Control Room. It is designed to provide ventilation to the STS Support Building, STS Valve Aisle, STS Pipeway, and Tanks 8D-1, 8D-2, 8D-3, and 8D-4. Most of the residual contamination in this building is in the two HEPA filters, which could contain as much as 7.5 curies of cesium-137 and much smaller activities of other radionuclides. No hazardous contamination is expected. The building contains an aboveground and an underground petroleum storage tank.

The STS was installed in and adjacent to Tank 8D-1. STS equipment installed in Tank 8D-1 (and the only STS equipment coming in contact with high-level radioactive waste) includes the STS prefilter, supernatant feed tank, supernatant cooler, four zeolite columns, STS sand post filter, sluice lift tank, and associated transfer piping.

The STS Support Building is located adjacent to and above Tank 8D-1. It is a two-story structure that contains equipment and auxiliary support systems needed to operate the STS. The upper level of the STS Support Building is a steel-framed structure covered with steel siding. The lower level was constructed with reinforced concrete walls, floor, and ceiling. The building, with the exception of the Valve Aisle, is radiologically clean. The shielded Valve Aisle is located on the first floor of the STS Building, adjacent to Tank 8D-1. The Valve Aisle is radiologically contaminated.

The Equipment Shelter is a one-story concrete-block building located immediately north of the Vitrification Facility. It is radiologically contaminated.

The Waste Tank Farm Condensers are located west of the Equipment Shelter and were originally designed to condense the overheads from Tanks 8D-1 and 8D-2, which were designed to be in a self-boiling condition during operations. The condensed overheads were directed to the Waste Tank Farm Condensate Tank to an ion-exchange unit, and then to the Low-Level Waste Treatment Facility for additional treatment before discharge to Erdman Brook. The condensers are still contaminated with small amounts of radioactivity.

The Con-Ed Building is a concrete-block building located on top of the concrete vault containing Tanks 8D-3 and 8D-4. This building houses the instrumentation and valves used to monitor and control the operation of Tanks 8D-3 and 8D-4. The Con-Ed Building is radiologically contaminated. The majority of the radiological inventory is believed to be contained in the piping and equipment inside the building.

More detailed descriptions of the High-Level Waste Transfer Trench, Permanent Ventilation System Building, STS, STS Support Building, Waste Tank Farm Equipment Shelter and Condensers, and Con-Ed Building are provided in Appendix C, Section C.2.3.

2.3.2.4 Waste Management Area 4: Construction and Demolition Debris Landfill

WMA 4, which includes the Construction and Demolition Debris Landfill (CDDL), is a 4.2-hectare (10-acre) area in the northeast portion on the North Plateau of WVDP. CDDL is the only waste management unit in WMA 4. WMA 4 is shown on Figure 2–2 and in more detail on Figure C–5 of Appendix C.

CDDL covers a 0.6-hectare (1.5-acre) area approximately 305 meters (1,000 feet) northeast of the Main Plant Process Building. CDDL was initially used by Bechtel Engineering from 1963 to 1965 to dispose of nonradioactive waste generated during Bechtel's construction of the Main Plant Process Building. CDDL was used by NFS from 1965 to 1981 to dispose of nonradioactive construction, office, and facility-generated debris, including ash from the NFS incinerator. CDDL was used by DOE from 1982 to 1984 to dispose of nonradioactive waste. Disposal operations were terminated in the CDDL in December 1984, and the landfill closed in accordance with the New York State regulations that were applicable at that time (6 NYCRR Part 360-7.6).

Some volatile organic compounds have been detected in groundwater downgradient of the CDDL. In addition, the CDDL is located in the flow path of the North Plateau Groundwater Plume. The radioactively-contaminated groundwater in the plume is assumed to have come into contact with the waste buried in the CDDL. Therefore, the buried wastes in the CDDL are assumed to require handling as radioactive wastes. A more detailed description of the CDDL is included in Appendix C, Section C.2.4.

2.3.2.5 Waste Management Area 5: Waste Storage Area

WMA 5 encompasses approximately 7.6 hectares (19 acres). Facilities in WMA 5 that will be operational or standing at the starting point of this EIS include the Remote-Handled Waste Facility, Lag Storage Area (LSA) 4 with associated Shipping Depot, and the Construction and Demolition Area. Also included in WMA 5 is the North Plateau Groundwater Plume, which extends through WMAs 1 through 6. WMA 5 is shown on Figure 2–2 and in more detail on Figure C–6 of Appendix C.

At the starting point of this EIS, WMA 5 facilities, including the Lag Storage Building; LSA 1, 2, 3; Hazardous Waste Storage Lockers; the Vitrification Vault Empty Container Hardstand; and Chemical Process Cell Waste Storage Area, will have been removed to grade. The remaining concrete foundations, slabs, and gravel pads are addressed in this EIS. In addition, the Cold Hardstand near the CDDL, Vitrification Vault and Empty Container Hardstand, Old/New Hardstand Area, Waste Packaging Area, Lag Hardstand, High-Level Waste Tank Pump Storage Vaults, and Container Sorting and Packaging Facility will have been completely removed. However, the ground underneath these facilities could be radioactively contaminated, from either, or both operational impacts or the Cesium Prong, and would be subject to decommissioning activities.

At the starting point of this EIS, the Remote-Handled Waste Facility will have been decontaminated to a point where it can be demolished without containment. It is used to remotely section and package high-activity equipment and waste and is permitted as a mixed low-level radioactive waste treatment and storage containment building.

Included in LSA 4 are a Shipping Depot, a Container Sorting and Packaging Facility, and a covered passageway between LSA 3 and LSA 4. The Shipping Depot is connected to LSA 4 and is a metal frame structure. If contamination is encountered in LSA 4, it is expected to be minimal due to packaging requirements and storage practices. LSA 4 and the Container Sorting and Packaging Facility are used for storage, sorting, and repackaging low-level radioactive waste and mixed low-level radioactive waste.

The Construction and Demolition Area, also known as the Concrete Washdown Area, is a shallow ground depression located southwest of the Remote-Handled Waste Facility approximately 91 meters (300 feet) west of the STS Building. From 1990 to June 1994, waste concrete was deposited in this area during the cleanout of concrete mixing trucks that transported concrete from offsite sources to support construction projects such as the Vitrification Facility. The waste concrete generated during truck washing was staged in this area until it hardened, after which it was placed in a dumpster for offsite disposal. Residual concrete is the only waste that was managed in this area.

More detailed descriptions of the Remote-Handled Waste Facility, LSA 4, and Construction and Demolition Area are included in Appendix C, Section C.2.5.

2.3.2.6 Waste Management Area 6: Central Project Premises

WMA 6 encompasses approximately 5.7 hectares (14 acres). Facilities standing, operable, or operational at the starting point of this EIS in WMA 6 include the rail spur, two Demineralizer Sludge Ponds, Equalization Basin, Equalization Tank, Low-Level Radioactive Waste Rail Packaging and Staging Area, Sewage Treatment Plant, and South Waste Tank Farm Test Tower. Also included in a small portion of WMA 6 is the North Plateau Groundwater Plume, which extends through portions of WMA 1 through 6. WMA 6 is shown on Figure 2–2 and in more detail on Figure C–7 of Appendix C.

At the starting point of this EIS, a number of facilities, including the Old Warehouse, Cooling Tower, North Waste Tank Farm Test Tower, Road Salt and Sand Storage Shed, Vitrification Test Facility Waste Storage Area, and the Product Storage Area will have been removed to grade. The remaining concrete foundations, slabs, and gravel pads associated with these facilities are addressed in this EIS. The ground that was underneath the previously removed Old Sewage Treatment Facility may be radioactively contaminated and would be subject to decommissioning.

The rail spur runs about 2,440 meters (8,000 feet) from the south side of the Main Plant Process Building to where it connects to the main line of the railroad. The rails are cast iron and the ties are creosote pressure-treated wood. Low-level radiological soil contamination has been detected in an area along a section of dual track east of the Old Warehouse.

The Demineralizer Sludge Ponds were built between 1964 and 1965 during construction of the Main Plant Process Building on the North Plateau. The sludge ponds are two unlined rectangular basins located southeast of the Process Building. The ponds were designed to receive liquids and sludge from the site utility water treatment system and discharge through a weir box and underground piping to an SPDES-permitted outfall. Both ponds are radiologically contaminated. Characterization activities have also identified the presence of semi-volatile chemicals in sediment that are at concentrations that slightly exceed Technical and Administrative Guidance Memorandum criteria.

The Equalization Basin is a lined basin that is excavated into the sand and gravel layer and underlain with a sand drain. Originally, the basin was called the Effluent Mixing Basin when it received effluents from the Sanitary Sewage Treatment Plant, some Utility Room discharge, and cooling water blowdown. Later it received effluents from the Sludge Ponds. Having been bypassed by installation of the Equalization Tank, the basin currently is used as an excess capacity settling pond for discharges from the Utility Room. No known hazardous or radiological contamination is present in the Equalization Basin.

The Equalization Tank was installed in 1997 to work in parallel with the existing Equalization Basin, not as a replacement. The Equalization Tank is an inground concrete tank that was designed with a total capacity of 75,700 liters (20,000 gallons) and a maximum working capacity of 56,800 liters (15,000 gallons). The Equalization Tank is not expected to be radiologically contaminated.

The Low-Level Radioactive Waste Rail Packaging and Staging Area covers approximately 2,510 square meters (27,000 square feet) east of and adjacent to the railroad tracks at the south end of WMA 6. It was used to package and ship contaminated soil stored in roll-off containers. This area is not expected to be radiologically contaminated.

The Sewage Treatment Plant is a wood-frame structure with metal siding and roofing. The base of the facility is concrete and crushed stone. Eight tanks are associated with the plant: six in-ground concrete tanks, one aboveground polyethylene tank, and one aboveground stainless steel tank. The Sewage Treatment Plant is used to treat sanitary waste. Water treatment chemicals, such as sulfuric acid, sodium hypochlorite, sodium bisulfite, and sodium bicarbonate have been used at the plant. The Sewage Treatment Plant also previously contained a satellite accumulation area that stored mercury-bearing RCRA hazardous waste from the Process Building. No hazardous or radiological contamination is known to exist there. Treated wastewater from the Sewage Treatment Plant is discharged to Erdman Brook through an SPDES-permitted discharge.

The Waste Tank Farm Test Towers, also known as training platforms, consist of two towers. The North Test Tower will have been removed at the starting point of this EIS. The South Test Tower is a pre-engineered structure erected as a stack of six modules including ladders, handrails, and grating.

More detailed descriptions of the rail spur, Demineralizer Sludge Ponds, Equalization Basin, Equalization Tank, Low-Level Radioactive Waste Rail Packaging and Staging Area, Sewage Treatment Plant, and Waste Tank Farm Tower are included in Appendix C, Section C.2.6.

2.3.2.7 Waste Management Area 7: NRC-licensed Disposal Area and Associated Facilities

WMA 7 encompasses approximately 3.3 hectares (8 acres). The NDA includes a radioactive waste disposal area and ancillary structures. The NDA is about 122 meters (400 feet) wide and 183 meters (600 feet) long on the South Plateau. It is divisible into three distinct areas: NFS shallow disposal area (known as special holes) and deep burial holes; WVDP disposal trenches and caissons; and the area occupied by the Interceptor Trench and the associated Liquid Pretreatment System structures. Other ancillary structures in the NDA include the Leachate Transfer Line and a former lagoon. The NDA is shown on Figure 2–2 and in more detail on Figure C–8 of Appendix C.

The NDA Hardstand/Staging Area will have been removed to grade at the starting point of this EIS. The removal of the remaining concrete foundation is addressed in this EIS.

The NDA was operated by NFS, under license from the NRC (formerly U.S. Atomic Energy Commission) for disposal of solid radioactive waste generated from fuel reprocessing operations. Beginning in 1966, solid radioactive waste materials from the nearby Main Plant Process Building exceeding 200 millirad per hour, and other materials not allowable in the SDA, were buried in holes and trenches and backfilled with earth. Between 1966 and 1981, NFS disposed of a variety of wastes in approximately 100 deep holes and 230 special holes in a U-shaped area along the eastern, western, and northern boundaries of the NDA. Between 1982 and 1986, after establishment of the WVDP, waste generated from decontamination and decommissioning activities was disposed of in the NDA in 12 trenches and 4 caissons. Most of these wastes were placed in trenches located in the unused parcel of land located interior to the U-shaped disposal area used by NFS. No waste has been buried at the NDA since 1986. Leachate is known to exist in some NDA disposal holes and trenches. The leachate consists of water contaminated with both radiological and chemical constituents leached from the buried wastes.

The Interceptor Trench and associated Liquid Pretreatment System were installed after groundwater chemical and radioactive contamination was detected in a well downgradient of the NDA. The purpose of the installation was to intercept potentially contaminated groundwater migrating from the NDA. The trench subsurface is radiologically contaminated and several organic constituents have been detected slightly above Technical and Administrative Guidance Memorandum criteria.

The Leachate Transfer Line is a black polyvinyl chloride pipeline that runs along the northeast and northwest sides of the NDA, continues northward across WMA 6, and terminates at Lagoon 2 in WMA 2. The transfer line was originally used to transfer liquids from the SDA lagoons via a pumphouse next to the NDA Hardstand to Lagoon 1. It is radiologically contaminated and may also be chemically contaminated.

The former lagoon was used for collecting surface water runoff. It was located in the northeastern portion of the NDA. Around 1972, it was filled with radiologically-contaminated soil from cleanup after a HEPA filter was dropped at the NDA during disposal operations.

Detailed descriptions of the disposal areas, Interceptor Trench and Liquid Pretreatment System, Leachate Transfer Line, and former Lagoon are included in Appendix C, Section C.2.7.

2.3.2.8 Waste Management Area 8: State-licensed Disposal Area and Associated Facilities

Facilities in WMA 8 which are addressed in this EIS include the North Disposal Area, South Disposal Area, the Mixed Waste Storage Facility, and three former filled lagoons. The SDA is approximately 6.2 hectares (15 acres) in size and is covered with an impermeable geomembrane to prevent infiltration of precipitation. WMA 8 is shown on Figure 2–2 and in more detail on Figure C–9 of Appendix C.

From 1963 to 1975, approximately 68,000 cubic meters (2.4 million cubic feet) of wastes were received at the SDA for burial. The wastes were disposed of in their shipping containers including 19-liter (5-gallon) steel drums, 114-liter (30-gallon) steel drums, 208-liter (55-gallon) steel drums, wooden crates, cardboard boxes, fiber drums, and plastic bags. A subsurface concrete wall was installed during 1987 immediately west of Trench 14. The concrete wall supported NYSERDA's efforts to remove the sand and gravel unit adjacent to Trench 14 and replace it with compacted till. A slurry wall located along the west side of Trench 14 was installed during 1992 to control groundwater infiltration into the SDA. It was made from a mixture of native clay and at least one percent bentonite clay. No radioactive or hazardous chemical contamination of the slurry wall is expected.

Leachate is known to exist in the SDA trenches. It consists of infiltration water contaminated with both radiological and hazardous chemical materials leached from the buried waste. The disposal areas and details on the type and quantities of waste buried in the SDA are discussed in Appendix C, Section C.2.8.

The Mixed Waste Storage Facility consists of two aboveground buildings near the southern end of the SDA. The T-1 Tank Building, which is the smaller of the buildings, is a heated weatherproof building that houses Tank T-1, a 34,800-liter (9,200-gallon) fiber-glass-reinforced plastic leachate collection tank. The lower portion of the building is built of concrete to provide secondary containment for the tank. Tank T-1 contains approximately 28,400 liters (7,500 gallons) of untreated leachate that was pumped from Trench 14 in 1991. The Frac Tank Building, the larger of the two buildings, is a nonheated weatherproof building that houses two stainless steel tanks that have never been used. These tanks provide contingency storage capacity for SDA leachate. Residual radioactive and possibly chemical contamination is expected to be found in the Mixed Waste Storage Facility.

Three lagoons were built in the SDA, and all three have been filled. The Northern Lagoon and Southern Lagoon were associated with the North Disposal Area. The third lagoon, called the Inactive Lagoon, was associated with the South Disposal Area. Based on samples collected and analyzed as part of the RCRA Facility Investigation, these lagoons contain RCRA hazardous constituents and are assumed to contain radiological contamination.

Detailed descriptions of the disposal areas, the Mixed Waste Storage Facility, and the filled lagoons are included in Appendix C, Section C.2.8.

2.3.2.9 Waste Management Area 9: Radwaste Treatment System Drum Cell

WMA 9 includes 5 hectares (12.4 acres) on the South Plateau adjacent to the NDA and SDA. The Radwaste Treatment System Drum Cell (Drum Cell) is the only facility in WMA 9. WMA 9 is shown on Figure 2–2 and in more detail on Figure C–10 of Appendix C.

At the starting point of this EIS, the pad of the Trench Soil Container Area will be in place. Removal of the pad is addressed in this EIS.

The Drum Cell was used to store square 269-liter (71-gallon) drums of cement-solidified supernatant and sludge wash liquids generated from high-level radioactive waste pretreatment and has a capacity of 21,000 drums. These drums have been shipped off site. The Drum Cell is enclosed by a temporary weather structure, which is a pre-engineered metal building. The facility consists of a base pad, shield walls, remote waste handling equipment, container storage areas, and a control room within the weather structure. Data and operational history suggests the Drum Cell is not contaminated, and it is assumed that waste generated from its decommissioning would be nonradioactive construction and demolition debris. A more detailed description of the Radwaste Treatment System Drum Cell is included in Appendix C, Section C.2.9.

The Subcontractor Maintenance Area, located on the South Plateau portion of the WVDP, is approximately 6 meters (20 feet) wide by 9 meters (30 feet) long. The area is flat, covered with compacted stone, and is adjacent to a paved highway. Prior to 1991, a construction contractor had used this area to clean asphalt paving equipment by spraying the equipment with diesel fuel. During the operation, some of the diesel fuel and asphalt material dripped off the equipment and fell onto the ground surface. Since remediation of the area in 1991, it has been used as a staging area for heavy equipment and inert construction materials, including stone and gravel.

2.3.2.10 Waste Management Area 10: Support and Services Area

WMA 10 encompasses approximately 12.3 hectares (30 acres) on the North Plateau and South Plateau. Facilities in WMA 10 addressed in this EIS include the New Warehouse, Meteorological Tower, and Security Gatehouse and fences. WMA 10 is shown on Figure 2–2 and in more detail on Figure C–11 of Appendix C.

At the starting point of this EIS, a number of facilities in WMA 10, including the Administration Building, Expanded Environmental Laboratory, Construction Fabrication Shop, and Vitrification Diesel Fuel Oil Storage Tank and Building will have been removed to grade. The concrete foundations and slabs are addressed in this EIS.

The New Warehouse was built during the 1980s and is located east of the Administration Building. It is a pre-engineered steel building, resting on about 40 concrete piers and a poured-concrete foundation wall.

The Meteorological Tower is located south of the Administration Building. It is constructed from steel supported by a concrete foundation.

The Security Gatehouse is located adjacent to the Administration Building. This gatehouse was constructed when the Main Plant was built in 1963. During the early 1980s, the Main Gatehouse was renovated and a large addition was added. A steel security fence with galvanized steel pipe posts set in concrete footings surrounds the Project Premises, SDA, and miscellaneous other locations. Its total length is approximately 7,620 meters (25,000 feet).

Detailed descriptions of the New Warehouse, Meteorological Tower, and Security Gatehouse and fences are included in Appendix C, Section C.2.10.

2.3.2.11 Waste Management Area 11: Bulk Storage Warehouse and Hydrofracture Test Well Area

WMA 11 is located in the southeast corner of WNYNSC outside the 84 hectares (200 acres) of the Project Premises and SDA. The only facility in the WMA addressed in this EIS is the Scrap Material Landfill. The disposition of the Bulk Storage Warehouse and the Hydrofracture Test Well Area were analyzed in an environmental assessment completed in 2006 (DOE 2006c); therefore, these facilities are not addressed in this EIS. The Hydrofracture Test Wells will be decommissioned per New York State regulations applicable to such wells. While the Bulk Storage Warehouse and Hydrofracture Test Well Area are not addressed in this EIS, they are shown in Figure 2–3 and Appendix C, Figure C–12, for reference.

The Scrap Material Landfill is located approximately 30.5 meters (100 feet) south of the Bulk Storage Warehouse. The surface expression of the Scrap Material Landfill is a noticeable low mound that rises above the surrounding natural grade. During 1982, NYSERDA removed scrap equipment, consisting of an aluminum transfer hood and 326 empty steel and concrete containers, from the Bulk Storage Warehouse and buried them in a trench in the Scrap Material Landfill. This waste material was radiologically surveyed, decontaminated as necessary, and released for unrestricted use before it was buried in the trench. No radioactive or hazardous waste was buried in the Scrap Material Landfill. The trench was backfilled with soil and capped with a soil cover. Two concrete markers identify the ends of the burial trench. The Scrap Material Landfill is also discussed in Appendix C, Section C.2.11.

2.3.2.12 Waste Management Area 12: Balance of Site

WMA 12 facilities addressed in this EIS consists of two earthen dams and reservoirs and parking lots. All are located outside the chain-link fence which surrounds the Project Premises and SDA. WMA 12 also includes a railroad spur, parts of roadways, and Erdman Brook and Franks Creek. The brook and creek contain radiologically-contaminated sediments resulting from regulated releases of treated process wastewater from the Low-Level Waste Treatment Facility by way of Lagoon 3. WMA 12 is shown on Figure 2–3 and on Figure C–12 of Appendix C.

The two water supply reservoirs, the South Reservoir and the North Reservoir, were constructed during 1963 about 2.4 kilometers (1.5 miles) southeast of the Main Plant Process Building. The South Reservoir has an earthen dam 22.9 meters (75 feet) high with piling to prevent seepage. The South Reservoir drains through a short canal to the North Reservoir. The North Reservoir has an earthen dam 15.2 meters (50 feet) high. It also has a control structure and pumphouse to regulate the water level. This reservoir drains into Buttermilk Creek.

Two parking lots are located off Rock Springs Road. They are designated as the Main Parking Lot and the South Parking Lot. The original Main Parking Lot was constructed during the mid-1960s. Two extensions were added during the 1980s. It has a total paved surface area of 16,700 square meters (180,000 square feet). The South Parking Lot is an irregularly-shaped area constructed during 1991. It has approximately 7,430 square meters (80,000 square feet) of parking area, and approximately 595 square meters (6,400 square feet) of driveways, covered with 20 centimeters (8 inches) of asphalt.

A railroad spur runs from the Fuel Receiving and Storage Building to a rail line junction, northeast of Riceville Station.

Roadways are constructed of a stone sub-base covered with asphalt. The total area of pavement is approximately 120,000 square meters (1,300,000 square feet). Although the paved roadways are located in most of the designated WMAs, they are addressed here collectively for convenience.

Contaminated stream sediments in WMA 12 include sediments in Erdman Brook and in Franks Creek between the Lagoon 3 (WMA 2) outfall and the confluence of Franks Creek and Quarry Creek inside the Project

Premises fence. Additional stream sediment contamination can be found along Buttermilk Creek. Stream sediment and water contamination are discussed in Chapter 3, Section 3.6.1.

Descriptions of the Dams and Water Supply Reservoirs, parking lots, roadways, and the railroad spur are included in Appendix C, Section C.2.12.

2.3.2.13 North Plateau Groundwater Plume

For the purpose of analysis in this EIS, the North Plateau Groundwater Plume is divided into two areas: a source area, directly underneath the Main Plant Process Building, and the nonsource area that encompasses the rest of the plume. More detailed information on the North Plateau Groundwater Plume is provided in Appendix C, Section C.2.13.

Groundwater in portions of the sand and gravel unit in the North Plateau of the WVDP is radiologically contaminated as a result of past NFS operations. The most significant area of groundwater contamination is associated with the North Plateau Groundwater Plume, which extends from WMA 1 into WMAs 2, 3, 4, 5, and 6, as shown on Figure 2–4. It discharges from groundwater to surface water in WMA 4. This contaminated surface water then flows from WMA 4 to Franks Creek and then to Cattaraugus Creek, where it leaves the WNYNSC. Section 3.6.2.1 describes the groundwater contamination and associated remediation efforts that have been undertaken.

A pump and treatment system, the Groundwater Recovery System, was established in 1995 in WMA 2, to control the western lobe of the plume. Groundwater is pumped from two wells and treated by ion-exchange in the Low-Level Waste Treatment Facility in WMA 2. The treated groundwater is pumped to Lagoons 4 or 5 and then to Lagoon 3, from which it is eventually discharged through an SPDES-regulated discharge point to Erdman Brook.

During 1999, a pilot-scale permeable treatment wall was installed within the leading edge of the eastern lobe of the plume to evaluate the effectiveness of this type of system in treating groundwater contaminated with strontium-90. The bottom of the pilot-scale permeable treatment wall is keyed into the Lavery till, and the wall extends above the water table level. An evaluation of monitoring data indicates that the permeable treatment wall is effective in removing strontium-90 from groundwater inside the permeable treatment wall through ion exchange although the pilot system is too short in length to mitigate the advance of strontium-90 in the east lobe. Evaluations also indicate some operational and construction improvements can be made to increase the effectiveness of the technology application if applied at full scale. Because the pilot program successfully showed that strontium-90 can be removed in situ using a permeable treatment wall, and also provided information on construction and design issues that can be overcome (Geomatrix 2007), this technology is seen as a potential full-scale remedy for managing strontium-90 affected groundwater at the site and a full-scale system, approximately 120 meters (400 feet) long, is assumed to be implemented before the EIS starting point.

For this EIS, it is assumed that the permeable reactive barrier at the seepage face of the drainage swale is installed before the EIS starting point (Geomatrix 2007). By using a dual approach with this technology, both groundwater and surface water seepage can be addressed and more effectively prevent strontium-90 migration associated with the North Plateau Groundwater Plume.

It should be noted that, in addition to these activities, the State of New York may require RCRA-related actions following future characterization activities. If NEPA or SEQR documentation is necessary for these actions, they would be addressed in a future document.

2.3.2.14 Cesium Prong

The Cesium Prong is the result of uncontrolled releases from the Main Plant Process Building in 1968 that contaminated portions of WNYNSC. Soil contamination resulted from airborne contaminants dispersion, and deposition. The primary contaminant is cesium-137. Based on historical data, the Cesium Prong extends into WMAs 1, 3, 5, 10, and 12, and outside WNYNSC (offsite impacts are addressed as part of the long-term impact analysis in Chapter 4). Studies have shown that contamination concentrations may decrease with depth with the majority of the activity present in the upper 5 centimeters (2 inches) of soil. The extent of the Cesium Prong is shown on Figure 2–5. Additional information is provided in Appendix C, Section C.2.14.

2.4 Alternatives Evaluated in this Environmental Impact Statement

As required by NEPA and SEQR, this EIS presents the environmental impacts associated with the full range of reasonable alternatives to meet the DOE and NYSERDA purpose and need for action, along with a No Action Alternative. The alternatives are based on the recognition that options for management of WNYNSC contaminated facilities and buried waste range from removal and offsite disposal, to in-place management with isolation barriers, to no action.

The description of the alternatives is based on information provided in a series of technical reports (WSMS 2008a, 2008b, 2008c, 2008d) prepared to support the EIS effort unless otherwise referenced. They describe the proposed engineered approaches for implementation of each alternative. The engineered approaches presented in the technical reports are conceptual in nature and provide information for estimating the environmental impacts of the alternatives analyzed in this EIS. The conceptual approaches evaluated in the technical reports provides a spectrum of detailed data useful for understanding and evaluating the impacts of implementing the alternatives including resource commitments, energy/utility usage, labor requirements, durations, waste volumes generated, radiological and nonradiological emissions, and costs. The technical reports also present information on the activities after completion of decommissioning actions, including monitoring and maintenance in support of any remaining facilities.

The following alternatives are analyzed in this EIS:

- ***The Sitewide Removal Alternative*** – Under this alternative, all site facilities (see Table 2–2) would be removed. Environmental media would be decontaminated. All radioactive, hazardous, and mixed low-level radioactive waste would be characterized, packaged as necessary, and shipped off site for disposal. Any orphan waste (i.e., Greater-Than-Class C or non-defense transuranic wastes) would be temporarily stored on site. The Sitewide Removal Alternative includes temporary onsite storage for the vitrified high-level radioactive waste canisters while waiting for a Federal waste repository to open. This alternative would generate waste for which there is currently no offsite disposal location (e.g., non-defense transuranic waste, commercial B/C low-level radioactive waste, Greater-Than-Class C waste). This "orphan" waste would be stored on site until an appropriate offsite facility is available. Since this alternative is estimated to require approximately 64 years to be completed, it is conceivable that the canisters could be shipped off site during this period. The entire WNYNSC would be available for release for unrestricted use. The Sitewide Removal Alternative is one type of bounding alternative that would remove facilities and contamination so that the site could be reused with no restrictions.

Assumptions Used for Analyzing Disposal Locations (by waste type) in this Environmental Impact Statement

High-level Radioactive Waste – In accordance with the Nuclear Waste Policy Act, vitrified high-level radioactive waste must be disposed of in a Federal repository. Transportation and onsite disposal impacts for high-level radioactive waste were analyzed in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (Yucca Mountain EIS)* and related documents (DOE 2002b, 2008b, 2008c). Until the high-level radioactive waste canisters can be shipped to a repository, they will be safely stored on site. Annual impacts of onsite storage are presented in this EIS.

Transuranic Waste – Under the Waste Isolation Pilot Plant Land Withdrawal Act, DOE may dispose of only that transuranic waste associated with defense activities in the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. Disposal of WVDP transuranic waste at WIPP would require a defense waste determination or a modification to the Act. For the purposes of transportation impact analysis only, DOE assumed the route characteristics of transporting transuranic waste to WIPP. Onsite impacts of transuranic waste disposal at WIPP were analyzed in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997b). All transuranic waste would be safely stored until offsite disposal capacity is available.

General Disposal Options for Low-Level Radioactive Waste

Two disposal options are considered:

DOE/Commercial Disposal Option – DOE low-level radioactive waste would be disposed of at DOE disposal facilities, while commercial low-level radioactive waste would be disposed of at commercial disposal facilities. Commercial Class A low-level radioactive waste would be disposed of at a commercial facility such as EnergySolutions in Utah, while commercial Class B and C low-level radioactive waste would be disposed of at a commercial facility, which to accept these wastes for disposal would need the appropriate permits and/or changes in state law. For purposes of analysis, DOE assumed for commercial Class B and C wastes the route characteristics for shipment to the Hanford Site in Washington State and to a disposal facility at Barnwell, South Carolina. DOE low-level radioactive wastes containing radionuclides in equivalent concentrations to Class A, B, or C wastes would be disposed of at the Nevada Test Site, as would low specific activity waste.

Commercial Disposal Option – All low-level radioactive waste would be disposed of at commercial disposal facilities. All commercial Class A low-level radioactive waste would be disposed of at a commercial disposal facility such as EnergySolutions in Utah, as would all DOE low-level radioactive waste containing radionuclides in equivalent concentrations to Class A waste, and all low specific activity waste. All commercial Class B and C low-level radioactive wastes would be disposed of at a commercial disposal facility, as would all DOE wastes having radionuclides in equivalent concentrations to Class B and C wastes. Such a disposal facility would need the appropriate permits and/or changes in state law. For purposes of analysis, DOE assumed the route characteristics for shipment to the Hanford Site in Washington State and to a disposal facility in Barnwell, South Carolina.

The NRC-licensed portion of the site would meet the NRC License Termination Rule (10 CFR 20.1402). The SDA would meet similar State criteria. Residual hazardous contaminants would meet applicable State and Federal standards. A final status survey performed in accordance with Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NRC 2002) and RCRA guidance would demonstrate that the remediated site meets the standards for unrestricted release, which would be confirmed by independent verification surveys.

- ***The Sitewide Close-In-Place Alternative*** – Under this alternative, most site facilities would be closed in place. The residual radioactivity in facilities having larger inventories of long-lived radionuclides would be isolated by specially-designed closure structures and engineered barriers. The Sitewide Close-In-Place Alternative is another type of bounding alternative where the major facilities and sources of contamination would be managed at their current location.

  This decommissioning approach would allow large portions of WNYNSC to be released for unrestricted use. The license for remaining portions of WNYNSC could remain under long-term license or permit, or the NRC-regulated portion of WNYNSC could have its license terminated under restricted conditions.

- ***The Phased Decisionmaking Alternative*** (the Preferred Alternative) – Under this alternative, the decommissioning would be completed in two phases:

  - Phase 1 would include removal of facilities as identified in Section 2.4.3.1 of this chapter, and any foundations, slabs or pads, the source area of the North Plateau Groundwater Plume, and the lagoons in WMA 2. Except for the permeable treatment wall, all facilities and the lagoons in WMA 2 would be removed. Phase 1 decisions would also include removal of a number of facilities in WMAs 5, 6, 9, and 10. No decommissioning or long-term management activities would be conducted for the Waste Tank Farm and its support facilities, the CDDL, the nonsource area of the North Plateau Groundwater Plume, or NDA. The SDA would continue under active management consistent with its permit requirements. Phase 1 activities would also include additional characterization of site contamination and studies to provide information that would support additional evaluations to determine the technical approach to be used to complete the decommissioning.

  - Phase 2 would complete the decommissioning or long-term management decisionmaking process, following the approach determined through additional evaluations to be the most appropriate.

  Phase 1 involves near-term actions where there is agency consensus and undertakes characterization work and studies that could facilitate future consensus decommissioning decisionmaking for the remaining facilities or areas.

  Phase 1 activities would make use of proven technologies and available waste disposal sites to reduce the near-term health and safety risks from residual radioactivity and hazardous contaminants at the site. Additional studies and evaluations would be conducted to clarify and possibly reduce technical uncertainties related to the decision on final decommissioning and long-term management of the site, particularly the uncertainty associated with long-term performance models, viability and cost of technology for exhuming buried waste, and availability of waste disposal sites. During Phase 1 and prior to implementation of Phase 2, DOE and NYSERDA would seek information about improved technologies for in-place containment and for exhuming the tanks and burial areas that may become available in the intervening years. See Section 2.4.3.1 of this chapter for more information regarding evaluations to determine the Phase 2 approach.

During Phase 1, DOE and NYSERDA would assess the results of site-specific studies as they become available, along with other emerging information such as applicable technology development. In consultation with the joint lead and cooperating agencies on this EIS, DOE will determine whether the new information warrants a new or Supplemental EIS. Council on Environmental Quality and DOE NEPA implementing regulations at 40 CFR 1502.9(c) and 10 CFR 1021.314(a), respectively, require a supplemental EIS if:

- The agency makes substantial changes in the Proposed Action that are relevant to environmental concerns; or
- There are significant new circumstances or information relevant to environmental concerns and bearing on the Proposed Action or its impacts.

If it is unclear whether a Supplemental EIS is needed, DOE would prepare a Supplement Analysis in accordance with 10 CFR 1021.314(c) and make this analysis and resulting determination available to the public. A Supplement Analysis would discuss the circumstances that are pertinent to deciding whether to prepare a Supplemental EIS. Subject to appropriate NEPA review, DOE would determine whether a Phase 2 decision is appropriate. DOE would issue a ROD for Phase 2 no later than 30 years after the Phase 1 ROD has been issued.

In addition to DOE, NYSERDA would assess results of site specific studies and other information during Phase 1 to determine the need for additional SEQR documentation.

- ***The No Action Alternative*** – Under the No Action Alternative, no actions toward decommissioning would be taken. The No Action Alternative would involve the continued management and oversight of the remaining portion of WNYNSC and all facilities located on WNYNSC property as of the starting point of this EIS.

Sections 2.4.1 through 2.4.4 of this chapter discuss the salient features of each alternative that pertain to the environmental impact analysis in this EIS. Because radioactive and hazardous waste would be generated with each alternative, waste management is analyzed as an integral component of each alternative. The text box above describes the disposal assumptions used for each waste type.

2.4.1 Sitewide Removal Alternative

The following sections provide summaries of the implementation activities, new construction required, time sequencing of the implementation activities, and waste generation under the Sitewide Removal Alternative, as well as any long-term monitoring and institutional controls required after its completion. Detailed discussions of implementation activities, waste generation, and new construction, are provided in Appendix C, Sections C.3.1 and C.4.

2.4.1.1 Decommissioning Activities

The following provisions would apply to the decommissioning activities for all WMAs:

- Decommissioning of the NRC-licensed portion of the site would be accomplished in accordance with an NRC-reviewed Decommissioning Plan and RCRA requirements. This plan would provide appropriate derived concentration guideline levels (DCGLs) for environmental media to support unrestricted release of the site. The removal of the SDA would be accomplished in accordance with a NYSDEC-approved plan. A licensing action by NYSDOH would be necessary to allow the property to be made available for release.

- All radioactive, hazardous, and mixed low-level radioactive waste generated during the work would be disposed of off site.
- Characterization surveys would be performed early in the process to quantify the nature and extent of environmental media contamination on WNYNSC. The design of these surveys would take into account available data on environmental contaminants. These surveys would address surface soil, subsurface soil, surface water, groundwater, and stream sediment as applicable on all impacted portions of WNYNSC. Data quality objectives would be such that data collected could also support the final status survey for those areas where no removal actions are taken.
- Before excavated areas are backfilled, final radiological and RCRA status surveys of these areas would be completed, including associated independent verification surveys.
- Areas inside and outside the Project Premises with surface soil and sediment with radioactivity concentrations in excess of DCGLs would be remediated.
- Contaminated soil, rubble, and debris would be disposed of appropriately in accordance with all applicable regulatory criteria.

Implementing this alternative (particularly for the Waste Tank Farm, NDA, and SDA) would generate some waste for which there is no offsite disposal location (e.g., non-defense transuranic waste, commercial Class B/C low-level radioactive waste, Greater-Than-Class C waste), called "orphan" wastes. These wastes would be stored on site until an appropriate offsite facility is available.

The decommissioning activities in each WMA are summarized below.

WMA 1 – The Equipment Decontamination Room and the Load-In/Load-Out Facility would be modified to support removal of the canisters of vitrified high-level radioactive waste. High-level radioactive waste canisters would then be removed from the Main Plant Process Building and stored in a new Interim Storage Facility (Dry Cask Storage Area) constructed on the South Plateau until they could be shipped off site. The Main Plant Process Building areas that had supported high-level radioactive waste canister storage would be decontaminated to the point where the building could be demolished without containment.

All facilities, including underground structures and remaining concrete floor slabs and foundations, would be completely removed, including the Main Plant Process Building, Utility Room, Utility Room Expansion, Plant Office Building, Vitrification Facility, 01-14 Building, Fire Pumphouse and Water Storage Tank, Electrical Substation, underground tanks (35104, 7D-13, and 15D-6), the underground process, wastewater, and utility lines, and the Off-Gas Trench.

The source area of the North Plateau Groundwater Plume located beneath the Main Plant Process Building would be removed, with subsurface soil removed as necessary to meet DCGLs consistent with unrestricted release. Foundation piles exposed during soil removal would be cut at the bottom of the excavation, or deeper if necessary, to support unrestricted release. All other contaminated soil and groundwater within WMA 1 would also be removed to levels supporting unrestricted release.

WMA 2 – All facilities would be completely removed, including all five lagoons, Low-Level Waste Treatment Facility, Neutralization Pit, Old Interceptor, New Interceptors, Solvent Dike, Maintenance Shop Leach Field, underground lines, and all remaining concrete slabs and foundations.

Soil, sediment, and groundwater within WMA 2 would be removed to DCGLs consistent with unrestricted release, including the area impacted by the North Plateau Groundwater Plume.

WMA 3 – All facilities would be removed, including Tanks 8D-1, 8D-2, 8D-3, 8D-4, and their associated vaults, STS and ion exchange media, high-level radioactive waste mobilization and transfer pumps, High-Level Waste Transfer Trench, Permanent Ventilation System Building, STS Support Building, Equipment Shelter and Condensers, Con-Ed Building, underground process, wastewater, and utility lines, and all remaining concrete slabs and foundations. All contaminated soil and groundwater within WMA 3 would be removed to levels supporting unrestricted release.

WMA 4 – The waste in the CDDL would be exhumed and disposed of off site. All contaminated soil, stream sediment, and groundwater would be removed to levels supporting unrestricted release.

WMA 5 – LSA 4 and the associated Shipping Depot and the Remote-Handled Waste Facility would be completely removed, along with the remaining concrete floor slabs and foundations in the area. The underground pipe running from the Remote-Handled Waste Facility to the Waste Tank Farm would also be removed. All contaminated sediment and groundwater in the area would be removed to levels supporting unrestricted release.

WMA 6 – The Sewage Treatment Plant and the South Waste Tank Farm Test Tower would be removed, along with the remaining concrete floor slabs and foundations, asphalt pads, and gravel pads. The rail spur, low-level radioactive waste rail packaging and staging area, Equalization Basin and Tank, and Demineralizer Sludge Ponds would be removed. Any contaminated soil, sediment, and groundwater in the area would be removed to levels supporting unrestricted release.

WMA 7 – The geomembrane cover, the Interceptor Trench, and the Liquid Pretreatment System would be removed, along with the buried leachate transfer line and the remaining concrete slabs and gravel pads associated with the NDA Hardstand Staging Area. The waste in the NDA would be exhumed, repackaged, and transported to suitable offsite disposal facilities. All contaminated soil, sediment, and groundwater in the area would be removed to levels supporting unrestricted release. The NDA Lagoon would be removed after the NDA wastes had been removed.

WMA 8 – A similar approach to that for the NDA would be followed for the SDA. The Mixed Waste Storage Facility would be removed and all of the waste exhumed. All contaminated soil, sediment, and groundwater in the area would be removed to levels consistent with unrestricted release.

WMA 9 – The Drum Cell would be removed, along with its associated instrumentation monitoring shed. The NDA Trench Soil Container Area gravel pad and the Subcontractor Maintenance Area would also be removed. Any contaminated soil, sediment, and groundwater in the area would be removed to levels supporting unrestricted release.

WMA 10 – The Meteorological Tower, New Warehouse, Main Security Gatehouse, and security fence would be removed, along with the remaining concrete floor slabs and foundations. Any contaminated soil, sediment, and groundwater in the area would be removed to levels supporting unrestricted release.

WMA 11 – The waste in the Scrap Material Landfill would be exhumed. Any contaminated soil, sediment and groundwater would be removed to levels supporting unrestricted release.

WMA 12 – The dams and reservoirs would be removed. Contaminated soil across the Project Premises and stream sediments would be removed as necessary to levels supporting unrestricted release.

North Plateau Groundwater Plume – The source area of the North Plateau Groundwater Plume would be removed, with subsurface soil removed as necessary to meet DCGLs consistent with unrestricted release. Soils and water within the nonsource area would be removed to levels allowing unrestricted use. In addition, the

Groundwater Recovery System pilot-scale permeable treatment wall, full-scale permeable treatment wall, and the permeable reactive barrier would be removed.

Cesium Prong – Areas exceeding DCGLs for unrestricted release would be excavated including areas within the Project Premises and the WNYNSC. Areas outside of WNYNSC are assumed to be within DCGLs.

2.4.1.2 New Construction

The following new construction would be required to support decommissioning activities at WNYNSC under the Sitewide Removal Alternative:

- An Interim Storage Facility (Dry Cask Storage Area) located in the southern portion of WMA 6 on the west side of the rail spur to temporarily store the vitrified high-level radioactive waste canisters from WMA 1 until an offsite repository becomes available.
- A Waste Tank Farm Waste Processing Facility to support exhumation of the high-level radioactive waste storage tanks in WMA 3.
- A Soil Drying Facility to process soils contaminated by the North Plateau Groundwater Plume, waste exhumed from the CDDL and contaminated sediment from Erdman Brook and Franks Creek.
- A Leachate Treatment Facility to process contaminated leachate from the NDA and SDA.
- A Container Management Facility to process wastes exhumed from the NDA and SDA. The Container Management Facility would also have a storage area to provide for long-term storage of any orphan waste (waste for which there is no immediate approved disposal location) generated by the alternative.
- A Main Plant Process Building excavation downgradient-barrier-wall in WMA 1 to facilitate removal of underground structures and contaminated soil beneath the Main Plant Process Building.
- Environmental Enclosures to support exhumation of wastes and contaminated soil from the NDA, SDA, Lagoon 1 in WMA 2, and the North Plateau Groundwater Plume Source Area.

These facilities and structures would be constructed, operated, and then demolished when their mission is complete. Descriptions of the proposed new facilities and structures are presented in Appendix C, Section C.4.

2.4.1.3 Time Sequencing of Decommissioning Activities

The time sequencing of the decommissioning activities and the overall time required to complete them under the Sitewide Removal Alternative are shown on **Figure 2–6**. The activities depicted on the figure are described in detail in Appendix C, Sections C.3.1 and C.4. The schedule is based on assumed funding levels and task sequencing that could change in the future. The task sequences are intended to provide an approximation of task durations and when the tasks would be performed relative to one another within the assumed planning constraints. The schedule supports the environmental impact analysis but does not represent a final approach.

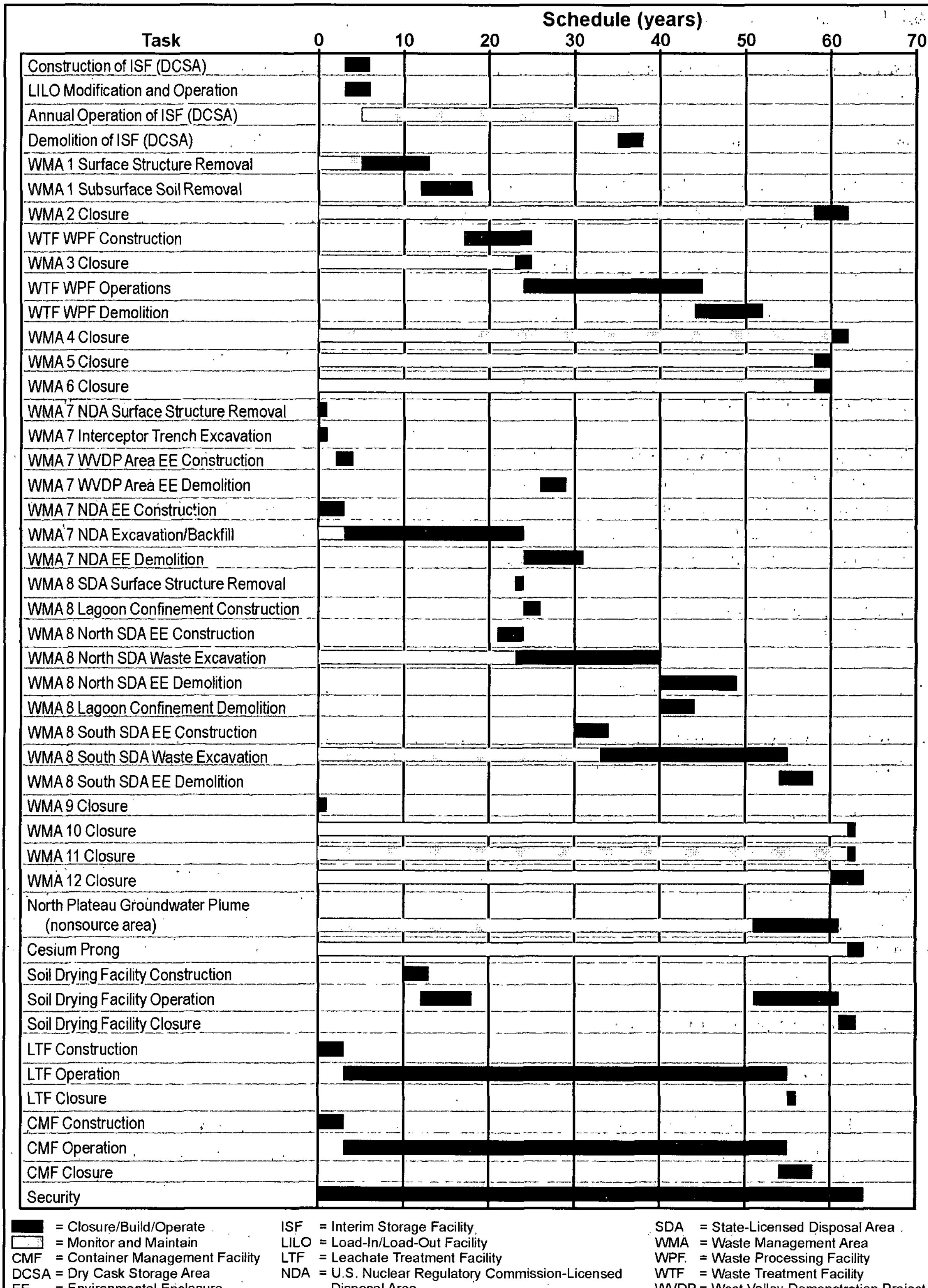


Figure 2–6 Sitewide Removal Alternative – Sequencing of Implementation Activities

2.4.1.4 Waste Generation

The waste volumes expected to be generated under the Sitewide Removal Alternative would be approximately as follows:

- Construction and demolition debris: 120,000 cubic meters (4.2 million cubic feet)
- Hazardous waste: 18 cubic meters (620 cubic feet)
- Low-level radioactive waste: 1.5 million cubic meters (53 million cubic feet)
- Greater-Than-Class C waste: 4,200 cubic meters (150,000 cubic feet)
- Transuranic waste: 1,000 cubic meters (36,000 cubic feet)
- Mixed low-level radioactive waste: 570 cubic meters (20,000 cubic feet)

These estimated waste volumes are based on commercial disposal and are given to two-digit accuracy.

Under the Sitewide Removal Alternative, the EIS analyzes two cases for potential orphan wastes: prompt shipment of such wastes and interim onsite storage of the waste in temporary storage areas until offsite disposal sites become available, with estimates for the annual costs and impacts of the onsite storage. Orphan wastes are those generated during the decommissioning that do not have an immediate approved disposal location. They would be stored in the new Container Management Facility.

Details on waste volumes that would be generated under this alternative are presented in Appendix C, Section C.3.1.

2.4.1.5 Long-term Monitoring and Institutional Controls (Long-term Stewardship)

Because the site would meet all required criteria for unrestricted release, no long-term monitoring or institutional controls would be required.

2.4.2 Sitewide Close-In-Place Alternative

The following sections summarize decommissioning activities, new construction required, the time sequencing of decommissioning activities, and waste generation under the Sitewide Close-In-Place Alternative, as well as any long-term monitoring and institutional controls required after its completion. Detailed discussions of decommissioning activities, waste generation, and new construction, are provided in Appendix C, Sections C.3.2 and C.4.

2.4.2.1 Decommissioning Activities

The following provisions would apply to the activities for all WMAs:

- The decommissioning of the NRC-licensed portion of the site, including the NDA, would be accomplished in accordance with an NRC-reviewed Decommissioning Plan. Long-term management activities for the SDA would be accomplished in accordance with NYSDEC requirements.
- Characterization surveys would be performed to quantify the nature and extent of contamination in soil and streambed sediment. The surveys would focus primarily on the known impacted areas. Much of the data collected would be intended to serve Final Status Survey purposes as well, since remediation of any areas exceeding DCGLs would not be undertaken under this alternative.

- No efforts would be made to remediate impacted surface soil in the Cesium Prong area, other surface or subsurface soil contamination, or contaminated groundwater, including that associated with the North Plateau Groundwater Plume; however, engineered barriers would be maintained to contain the plume while it decays (i.e., new treatment walls to be installed as part of the Interim End State). Radioactivity in these environmental media would be allowed to decay in place.

- In cases where below-grade portions of facilities are to be backfilled with demolition rubble or with soil, characterization or final status surveys would be performed to document the radiological status of the underground area and arrangements made for appropriate independent verification surveys to be performed before backfilling.

- Several facilities such as LSA 4 and the Remote-Handled Waste Facility would be demolished to grade with the resulting wastes shipped off site for disposal.

The decommissioning activities in each WMA are summarized below.

WMA 1 – The Equipment Decontamination Room and the Load-In/Load-Out Facility would be modified to support removal of the canisters of vitrified high-level radioactive waste. The high-level radioactive waste canisters would be removed from the Main Plant Process Building and stored in a new Interim Storage Facility (Dry Cask Storage Area) to be constructed on the South Plateau in WMA 6 until they could be shipped off site. This new facility is discussed in Appendix C, Section C.4.1. The Main Plant Process Building areas that had supported high-level radioactive waste canister storage would be decontaminated to the point where the building could be demolished without containment. All structures within WMA 1 would be demolished to grade level, including the Main Plant Process Building, Utility Room, Utility Room Expansion, Plant Office Building, Vitrification Facility, 01-14 Building, Fire Pumphouse and Water Storage Tank, and Electrical Substation. The demolition rubble from the above-grade portions of these structures would be used as backfill for the below-grade portions of the Main Plant Process Building and Vitrification Facility. The remaining debris would be used to form a rubble pile that would form the foundation of a cap. The underground tanks (35104, 7D-13, and 15D-6) would be filled with grout; and all underground process, wastewater, and utility lines, and the Off-Gas Trench would remain in place.

The backfilled, below-grade portions of the Main Plant Process Building and the Vitrification Facility and the North Plateau Groundwater Plume source area would all be closed in an integrated manner with WMA 3, within a common circumferential hydraulic barrier (such as a slurry wall), an upgradient barrier wall, and beneath a common multi-layer cap. The source area for the North Plateau Groundwater Plume would not be removed. The edge of the cap would be bounded by a wall made of large boulders to provide erosion protection and act as a perimeter intruder barrier.

WMA 2 – Decommissioning activities involve enclosing Lagoon 1 within a vertical hydraulic barrier wall, filling Lagoons 2 and 3 with compacted clean soil, removing the liners and underlying berms from Lagoons 4 and 5, and then covering the area of all five lagoons with a multi-layer cover. Other activities in WMA 2 include backfilling the Neutralization Pit and the Interceptors after breaking up their bottoms, and removing the Low-Level Waste Treatment Facility to grade. No actions would be taken on the North Plateau Groundwater Plume, which would be managed by the control measures installed as part of the Interim End State, or the Solvent Dike, Maintenance Shop Leach Field, or remaining floor slabs and foundations.

WMA 3 – The four underground waste tanks and associated vaults, with the STS equipment still in place, would be backfilled with controlled low-strength material (a self-compacted, cementious material used primarily as a backfill in lieu of compacted material). Strong grout would be placed between the tank tops and the roof vaults and in the tank risers to serve as an intrusion barrier. The underground piping in the area would remain in place and be filled with grout.

The Permanent Ventilation System Building, STS Support Building, Con-Ed Building, and Equipment Shelter and related condensers would be removed. The high-level radioactive waste mobilization and transfer pumps would be removed, along with the pump pits. The High-Level Waste Transfer Trench piping would be grouted and left in place with the transfer trench.

The Waste Tank Farm would be closed in an integrated manner with the area of the Main Plant Process Building, Vitrification Facility, and North Plateau Groundwater Plume Source Area within a common circumferential hydraulic barrier, an upgradient barrier wall, and beneath a common multi-layer cap that incorporates large boulders to provide erosion protection and serve as an intrusion barrier.

WMA 4 – The CDDL would remain in place and continue to be monitored and maintained.

WMA 5 – LSA 4 and the associated Shipping Depot and the Remote-Handled Waste Facility would be removed to grade, with the resulting debris disposed off site as appropriate. The below-grade underground portion of the Remote-Handled Waste Facility would be filled with clean soil. The remaining concrete floor slabs and foundations would remain in place.

WMA 6 – The Sewage Treatment Plant and the South Waste Tank Farm Test Tower would be removed to grade and the demolition debris disposed of off site. The rail spur would remain in place. The Demineralizer Sludge Ponds, the Equalization Basin, and the Equalization Tank would be backfilled with clean soil.

WMA 7 – The Liquid Pretreatment System would be removed and the demolition debris disposed of off site. The Interceptor Trench would be emptied of leachate and filled with material such as cement grout to provide a stable base for a multi-layer cap and to impede potential transport of groundwater contamination. Leachate would also be removed from some of the NFS disposal holes and the WVDP trenches where it accumulates and grout injected in these holes and trenches to stabilize them. The buried leachate transfer line, which has been determined to contain a small amount of residual radioactivity, would remain in place. The existing NDA geomembrane cover would be replaced with a robust multi-layer cap.

WMA 8 – Leachate would be removed from the disposal trenches and stabilizing grout injected in the disposal trenches. The Mixed Waste Storage Facility would be removed to grade with the resulting debris disposed off site as appropriate. The existing SDA geomembrane cover would be replaced with a robust multi-layer cap and a hydraulic barrier wall would be installed.

WMA 9 – The Radwaste Treatment System Drum Cell would be removed, along with its associated instrumentation monitoring shed, and the rubble disposed of off site.

WMA 10 – No decommissioning actions would be taken in WMA 10. The Meteorological Tower, the Main Security Gatehouse, and the security fence would remain in place and operational.

WMA 11 – No decommissioning actions would be implemented.

WMA 12 – The dams and reservoirs would be taken out of service in accordance with applicable State and Federal regulations with only the middle third of the dams being removed. As part of the sitewide erosion controls construction, all of the streams would be regraded and covered with erosion protection rip-rap, an activity which involves significant excavation in the streambeds. All of this excavated material, including the material that has been potentially impacted by site operations, would be utilized on site for grading fill beneath the site caps.

North Plateau Groundwater Plume – The North Plateau Groundwater Plume Source Area would be closed in an integrated manner with the area of the Main Plant Process Building, Vitrification Facility, and the Waste

Tank Farm within a common circumferential hydraulic barrier. The nonsource area of the North Plateau Groundwater Plume would be allowed to decay in place. The permeable treatment wall installed prior to the starting point of this EIS would remain in place and would be replaced approximately every 20 years.

Cesium Prong – The Cesium Prong would be managed by implementing restrictions on use for a nominal period of 100 years until in-place decay results in levels allowing for unrestricted use. Monitoring data would be routinely evaluated and access to the area reassessed as part of performance evaluations (see Section 2.4.2.5 of this chapter).

2.4.2.2 New Construction

The following new construction would be required to support decommissioning activities at WNYNSC under the Sitewide Close-In-Place Alternative.

- An Interim Storage Facility (Dry Cask Storage Area) would be located in the southern portion of WMA 6 on the west side of the rail spur to temporarily store the vitrified high-level radioactive waste canisters from WMA 1 until an offsite repository becomes available.
- A Leachate Treatment Facility would be built to treat leachate from the NDA and SDA before grouting.
- An upgradient chevron and circumferential hydraulic barrier wall would be installed around WMA 1 and WMA 3 to control groundwater.
- An integrated engineered multi-layer cover would be installed over WMA 1 and WMA 3, and erosion control structures would be installed on the North Plateau.
- A hydraulic barrier wall would be installed around Lagoon 1 in WMA 2.
- A multi-layer cover would be installed over the lagoons in WMA 2.
- Engineered multi-layer covers and erosion control structures would be installed for the NDA and SDA.
- Erosion Control Structures on the North and South Plateau would be constructed around closed in-place facilities and creeks.

Descriptions of the proposed facilities and structures are presented in Appendix C, Section C.4.

2.4.2.3 Time Sequencing of Decommissioning Activities

The time sequencing of decommissioning activities and the overall time required to complete these activities under the Sitewide Close-In-Place Alternative are shown on **Figure 2–7**. The decommissioning activities depicted on the figure are described in detail in Appendix C, Sections C.3.2 and C.4. The schedule is based on assumed funding levels and task sequencing that may change in the future. The task sequences are intended to provide an approximation of task durations and when the tasks would be performed relative to one another within the assumed planning constraints. The schedule supports the environmental impact analysis but does not represent a final approach.

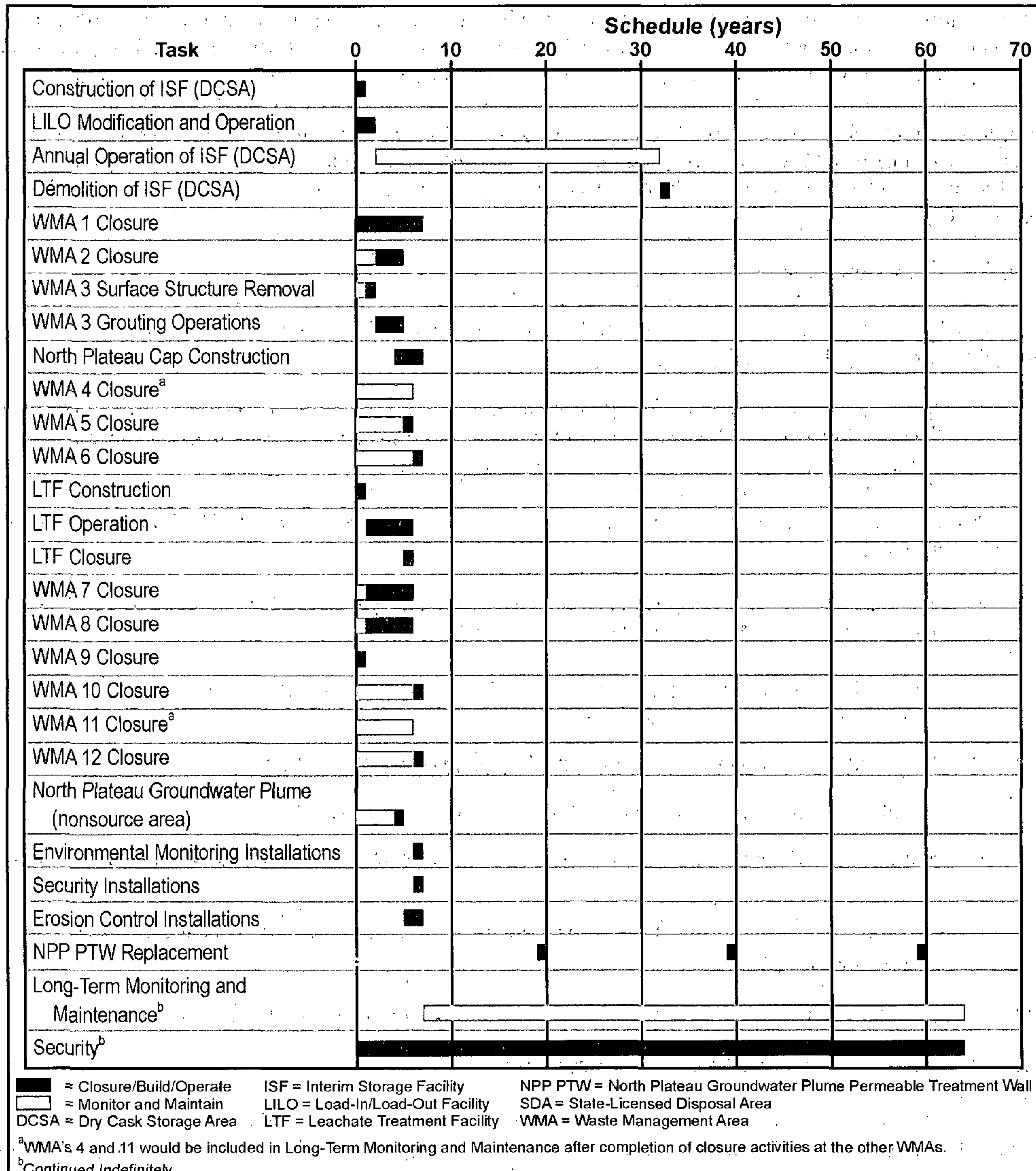


Figure 2–7 Sitewide Close-In-Place Alternative – Sequencing of Implementation Activities

2.4.2.4 Waste Generation

The waste volumes expected to be generated under the Sitewide Close-In-Place Alternative would be as follows:

- Construction and demolition debris: 15,000 cubic meters (550,000 cubic feet)
- Hazardous waste: 3 cubic meters (120 cubic feet)
- Low-level radioactive waste: 10,000 cubic meters (600,000 cubic feet)
- Greater-Than-Class C waste: 0
- Transuranic waste: 39 cubic meters (1,400 cubic feet)
- Mixed low-level radioactive waste: 410 cubic meters (14,000 cubic feet)

These estimated waste volumes are based on commercial disposal and are given to two-digit accuracy. Monitoring and maintenance activities and periodic replacement of the North Plateau Groundwater Plume permeable treatment wall would generate an average of 110 cubic meters (3,900 cubic feet) per year of low-level radioactive waste.

Details on the waste volumes that would be generated and subject to offsite disposal under the alternative are presented in Appendix C, Section C.3. If any orphan waste was to be generated under the Sitewide Close-In-Place Alternative, it would be stored in an existing storage facility.

2.4.2.5 Long-term Monitoring and Institutional Controls (Long-term Stewardship)

Monitoring and maintenance functions would be instituted for the foreseeable future and periodically addressed through performance assessment reviews. A series of monitoring devices would be installed to monitor various environmental and geotechnical parameters for a period following completion of the decommissioning actions. Monitoring devices would include, but would not be limited to: (1) groundwater monitoring wells, (2) inclinometers, and (3) survey monitors. Specific areas to be monitored would include:

- The slurry walls.
- The engineered multi-layer covers over the NDA, SDA, and the combination of WMA 1 and WMA 3.
- Erosion controls installed on Quarry Creek, Erdman Brook, and Franks Creek.

Institutional controls would also be put in place for portions of the site not released from the NRC license or the NYSDEC permit, or for which the NRC license is terminated under restrictions. The details of the institutional controls would be developed with regulatory authorities and are expected to include:

- Access controls which would be facilitated by fences and signage.
- Performance assessment reviews that would, on a specified frequency, evaluate the effectiveness of the in-place closure designs and access controls. The monitoring data identified in this section would be important input for the performance assessment reviews.

2.4.3 Phased Decisionmaking Alternative

The Preferred Alternative is the Phased Decisionmaking Alternative. Section 2.7 of this chapter provides the rationale for identifying this alternative as Preferred. The following sections summarize the decommissioning activities, new construction required, time sequencing of the decommissioning activities, and waste generation under the Phased Decisionmaking Alternative, as well as any long-term monitoring and institutional controls required after its completion. Detailed discussions of decommissioning activities, waste generation, and new construction, are provided in Appendix C, Sections C.3.3 and C.4.

2.4.3.1 Decommissioning Activities

The following provisions apply to Phase 1 decommissioning activities for all WMAs:

- Decommissioning activities would be accomplished in accordance with an NRC-reviewed Decommissioning Plan, which would specify the appropriate DCGLs. The Decommissioning Plan would also provide information on analyses performed to estimate the impacts of residual radioactivity that would remain at WNYNSC after completion of Phase 1 decommissioning activities.
- All radioactive, hazardous, and mixed low-level radioactive waste generated during the work and with an immediate path to disposal would be disposed of off site, with the possible exception of transuranic waste which could require temporary onsite storage pending a "defense" determination.
- Characterization surveys would be performed in Phase 1 to determine the nature and extent of surface soil and sediment contamination.
- Before excavated areas are backfilled, final radiological status surveys of these areas would be completed, including the associated independent verification surveys.
- Any excavation performed to remove slabs and foundations would be limited. If additional contamination were found at a depth greater than approximately 0.5 meter (2 feet), that contamination would be addressed as part of Phase 2.

Phase 1 activities in each WMA are summarized below.

WMA 1 – The canisters of vitrified high-level radioactive waste would be removed from the Main Plant Process Building and placed in a new Interim Storage Facility (Dry Cask Storage Area) constructed early in Phase 1 on the South Plateau. The Main Plant Process Building areas that support high-level radioactive waste canister storage would be decontaminated to the point where the building could be demolished without containment. All facilities in WMA 1 would be completely removed, including the Main Plant Process Building, Utility Room, Utility Room Expansion, Plant Office Building, Vitrification Facility, 01-14 Building, Load-In/Load-Out Facility, Fire Pumphouse, Water Storage Tank, underground tanks (35104, 7D-13, 15D-6), all underground process, wastewater, and utility lines, Off-Gas Trench, and all remaining concrete slabs and foundations.

The source area of the North Plateau Groundwater Plume located beneath the Main Plant Process Building would be removed, with subsurface soil removed as necessary to meet DCGLs consistent with unrestricted release. A hydraulic barrier would be installed around the Main Plant Process Building area to control groundwater during excavation. The downgradient portion of this barrier would remain in place after the excavated area is backfilled.

To remove the plume source area and the below-grade structures of the Main Plant Process Building and the Vitrification Facility, an area larger than the footprints of these two buildings would be excavated. This excavation would extend into the Lavery till where necessary to accommodate removal of extended below-grade structures such as the Cask Unloading Pool. Foundation piles exposed during soil removal would be cut at the bottom of the excavation or deeper if necessary to support unrestricted release. Underground lines within the excavated area would be removed. Pipeline sections remaining at the face of the excavation would be characterized and the portion of the piping within WMA 1 removed as necessary depending on the characterization results.

WMA 2 – All facilities in WMA 2 would be removed. A hydraulic barrier wall would be installed northwest of Lagoons 1, 2, and 3, which would be removed at the end of its operational life with excavations extending 0.6 meter (2 feet) into the Lavery till. The liners and underlying berms for Lagoons 4 and 5 would be removed.

Underground lines within the excavated areas would be removed. Pipeline sections remaining at the face of the excavations would be characterized and the portion of the piping within WMA 2 removed as necessary depending on the characterization results.

WMA 3 – The high-level radioactive waste mobilization and transfer pumps would be removed from the underground Waste Tanks. The Waste Tanks themselves would remain in place, as would the Permanent Ventilation System Building, STS Support Building, and underground piping in the area. The STS vessels and contents in Tank 8D-1 would remain in place. The Equipment Shelter and Condensers and Con-Ed Building would be removed. The Waste Tanks would continue to be monitored and maintained with the Tank and Vault Drying System operating as necessary. The piping used to convey high-level radioactive waste in the High-Level Waste Transfer Trench would be removed and the trench would remain in place. Pipe removal would be conducted with soil removal with cutoffs of the piping occurring somewhere between the excavation and the tanks. The barrier wall would also extend westward across the piping runs.

WMA 4 – The CDDL would remain in place and continue to be monitored and maintained.

WMA 5 – LSA 4 and the associated Shipping Depot and the Remote-Handled Waste Facility would be removed. The remaining concrete floor slabs and foundations in the area would also be removed.

WMA 6 – The Sewage Treatment Plant and the South Waste Tank Farm Test Tower would be removed, along with the remaining concrete floor slabs and foundations, asphalt pads, and gravel pads. The Equalization Basin and Tank, and the Demineralizer Sludge Ponds and the Low-Level Waste Rail Packaging and Staging Area would be removed. The rail spur would remain operational, potentially with a new terminus due to the excavation of the Main Plant Process Building.

WMA 7 – The NDA would continue to be monitored and maintained. The Interceptor Trench and the Liquid Pretreatment System would remain operational. The buried leachate transfer line would remain in place. The remaining concrete slabs and gravel pads associated with the NDA Hardstand would be removed. The NDA is subject to actions requested by NYSDEC during the 30-year ongoing assessment period. However the pad associated with the NDA Hardstand and the Trench Soil Container Area would be removed under the WMA 9 scope of work.

WMA 8 – The SDA would continue to be actively managed, taking any additional actions requested by the regulator, for as long as 30 years. The associated Mixed Waste Storage Facility would remain operational. The SDA is subject to actions requested by NYSDEC during the 30-year ongoing assessment period.

WMA 9 – The Drum Cell and the Subcontractor Maintenance Area would be removed, along with the associated instrumentation monitoring shed. The NDA Trench Container Area pad would also be removed.

WMA 10 – The New Warehouse and the remaining concrete floor slabs and foundations would be removed. The Meteorological Tower, Security Gatehouse, and security fence would remain in place and operational.

WMA 11 – No decommissioning actions would be implemented.

WMA 12 – The dams and reservoirs would continue to be monitored and maintained. Sediment and surface soils would be characterized to evaluate any potential contamination.

North Plateau Groundwater Plume – The source area of the North Plateau Groundwater Plume would be removed as in the Sitewide Removal Alternative.

The nonsource area of the North Plateau Groundwater Plume would be contained by the permeable reactive barrier and permeable treatment wall installed for the Interim End State. The permeable treatment wall would be replaced if necessary. The Groundwater Recovery System would be removed.

Cesium Prong – The Cesium Prong would be managed by continuing restrictions on use and access.

Phase 1 Data Collection, Studies, and Monitoring

The following types of studies would be performed during Phase 1:

- Characterization studies, which would include sampling of surface soil and stream sediments and characterization of selected underground piping that would be exposed during other removal activities;
- Data collection and studies to improve understanding of the removal option or improve its viability, such as monitoring and evaluating technology developments regarding disposal facilities for orphan waste, underground waste tank cleaning and exhumation, and exhuming buried radioactive waste; and
- Data collection and studies to improve understanding of the in-place closure option or improve its viability, such as research related to long-term performance of engineered barriers and work to enhance site erosion and hydrology models.

Evaluations to Determine the Phase 2 Approach

The approach to be followed for Phase 2 decisions for decommissioning and long-term management would be the subject of further evaluations by DOE and NYSERDA, with the participation of WNYNSC regulators, who serve as cooperating agencies for the EIS. Several factors that would be taken into account in these evaluations include:

- The results of analyses to estimate the impacts of residual radioactivity that would remain after completion of the Phase 1 activities;
- The additional information developed in the studies to be carried out in Phase 1; and
- The availability of new technologies that might be applied in Phase 2.

The evaluations would take into account the status of the underground Waste Tanks and the two waste disposal areas, which would be reviewed at approximately 5-year intervals, along with the viability of the various decommissioning or long-term management approaches. The final decision on the Phase 2 decommissioning and long-term management approach would be made within 30 years of the date of issue of the Phase 1 ROD. As new information becomes available during Phase 1, DOE would conduct appropriate NEPA reviews.

2.4.3.2 New Construction

The following new construction would be required to support decommissioning activities at WNYNSC under Phase 1 of the Phased Decisionmaking Alternative.

- An Interim Storage Facility (Dry Cask Storage Area) would be located in the southern portion of WMA 6 on the west side of the rail spur to temporarily store the high-level radioactive waste canisters from WMA 1 until an offsite repository becomes available.
- A Main Plant Process Building excavation downgradient-barrier-wall in WMA 1 to facilitate removal of below-grade structures and contaminated soil associated with the source area of the North Plateau Groundwater Plume.
- A low-permeability subsurface barrier wall would be installed in WMA 2 northwest of Lagoons 1, 2, and 3 to control groundwater.

Descriptions of the proposed facilities and structures are presented in Appendix C, Section C.4.

2.4.3.3 Waste Generation

The waste volumes expected to be generated under Phase 1 of the Phased Decisionmaking Alternative would be as follows:

- Construction and demolition debris: 35,000 cubic meters (1.2 million cubic feet)
- Hazardous waste: 7 cubic meters (260 cubic feet)
- Low-level radioactive waste: 180,000 cubic meters (6.2 million cubic feet)
- Greater-Than-Class C waste: 0
- Transuranic waste: 710 cubic meters (25,000 cubic feet)
- Mixed low-level radioactive waste: 41 cubic meters (1,400 cubic feet)

These estimated waste volumes are based on commercial disposal and are given to two-digit accuracy. Monitoring and maintenance, and periodic replacement of the North Plateau Groundwater Plume permeable treatment wall, if necessary, and the SDA geomembrane would generate an average of 190 cubic meters (6,700 cubic feet) per year of low-level radioactive waste.

Details on the waste volumes that would be generated and would be subject to offsite disposal under the alternative are presented in Appendix C, Section C.3. If any orphan waste was to be generated under Phase 1 of the Phased Decisionmaking Alternative, it would be stored on site in an existing facility.

2.4.3.4 Time Sequencing of Decommissioning Activities

The time sequencing of the decommissioning activities and the overall time required to complete these activities under Phase 1 of the Phased Decisionmaking Alternative are shown on **Figure 2–8**. The decommissioning activities depicted on the figure are discussed in detail in Appendix C, Sections C.3.3 and C.4. The schedule is based on assumed funding levels and task sequencing that may change in the future. The task sequences are intended to provide an approximation of task durations and when the tasks would be performed relative to one another within the assumed planning constraints. The schedule supports the environmental impact analysis but does not represent a final approach. Not shown in the figure are Phase 1 characterization and monitoring studies that are presented in Section 2.4.3.1 of this chapter.

2.4.3.5 Long-term Monitoring and Institutional Controls (Long-term Stewardship)

During Phase 1, existing monitoring and institutional controls would continue in place. Depending on the nature of Phase 2, there could be long-term monitoring and institutional controls that would look like the Sitewide Close-In-Place Alternative, or no monitoring and controls as in the Sitewide Removal Alternative.

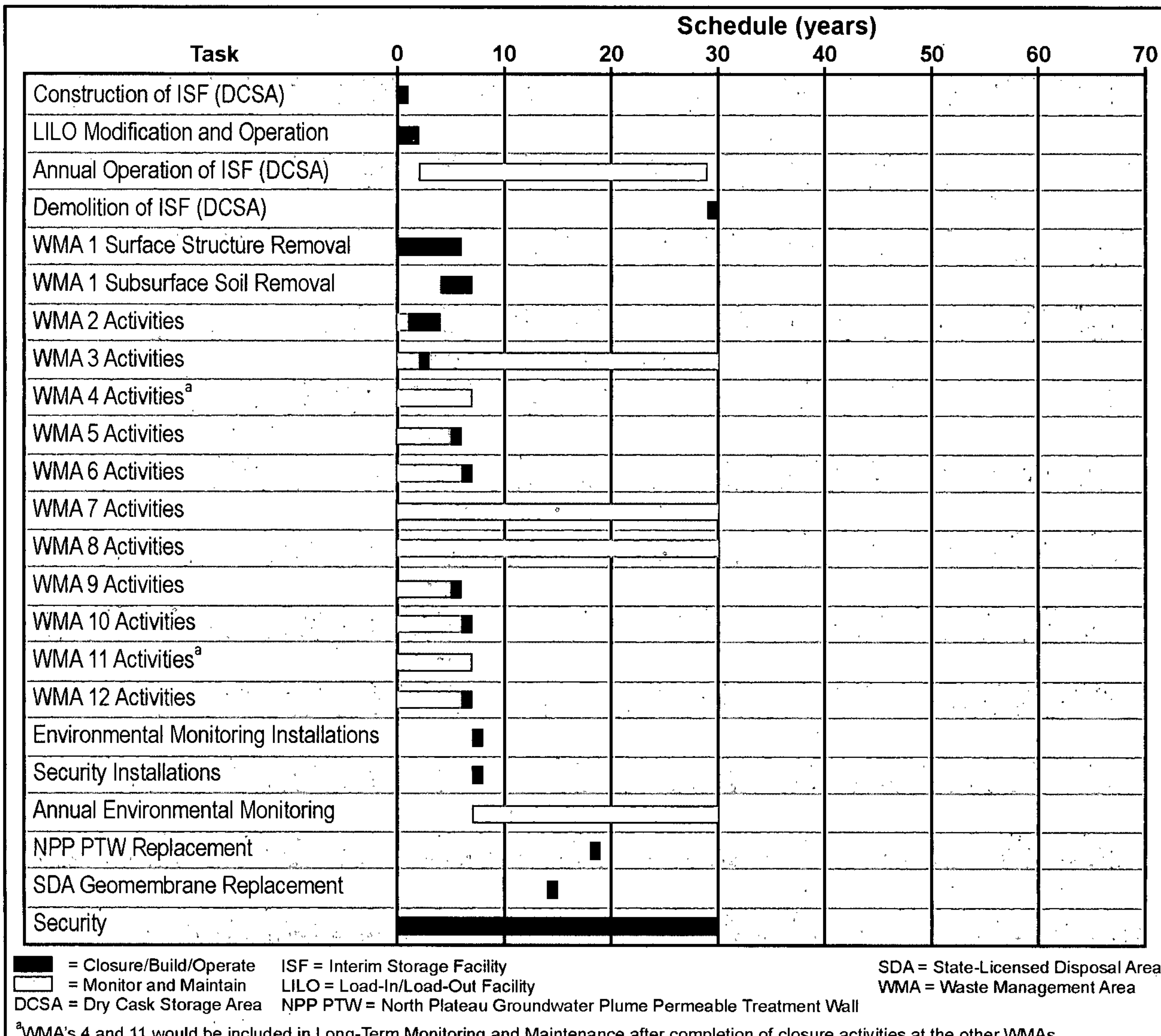


Figure 2–8 Phased Decisionmaking Alternative, Phase 1 – Sequencing of Implementation Activities

2.4.4 No Action Alternative

Under the No Action Alternative, no decommissioning or long-term management actions would take place. Consistent with the Interim End State, the site would continue to be monitored and maintained for the foreseeable future as required by State and Federal regulations to protect the health and safety of workers, the public, and the environment.

2.4.4.1 Maintenance and Replacement Activities

The site maintenance program would be modified as appropriate for facility and system conditions of the Interim End State. These conditions would include continued interim storage of the high-level radioactive waste canisters in the Main Plant Process Building. The Waste Tank Farm and all waste burial grounds would remain under Interim End State conditions.

Facilities would be repaired as necessary to maintain them in a safe condition. Portions of facilities would be replaced periodically to this end, with examples being the roofs of the Main Plant Process Building, the geomembrane covers over the waste disposal areas, and the permeable treatment wall for the North Plateau Groundwater Plume.

Capabilities would remain in place to deal with unexpected failures of structures, systems, and components, as well as with other site emergencies that might occur. Appropriate site management and oversight would remain in place.

2.4.4.2 Waste Generation

The annual waste volumes expected to be generated under the No Action Alternative would be approximately as follows:

- Demolition debris: 32 cubic meters (1,100 cubic feet)
- Hazardous waste: 0.73 cubic meters (26 cubic feet)
- Low-level radioactive waste: 450 cubic meters (16,000 cubic feet)
- Greater-Than-Class C waste: 0 cubic meters (0 cubic feet)
- Transuranic waste: 0 cubic meters (0 cubic feet)
- Mixed low-level radioactive waste: 0.14 cubic meters (5 cubic feet)

These estimated waste volumes are based on commercial disposal and are given to two-digit accuracy.

2.4.4.3 Time Sequencing of Maintenance and Replacement Activities

A typical schedule of the stewardship activities of the No Action Alternative is shown in **Figure 2–9**. The activities necessary to monitor, maintain, and/or operate facilities would be ongoing, while those activities taken to ensure protection of the public and the environment would be performed periodically (e.g., once every 20 to 25 years), and would be completed within 1 year. Maintenance and replacement activities would continue indefinitely.

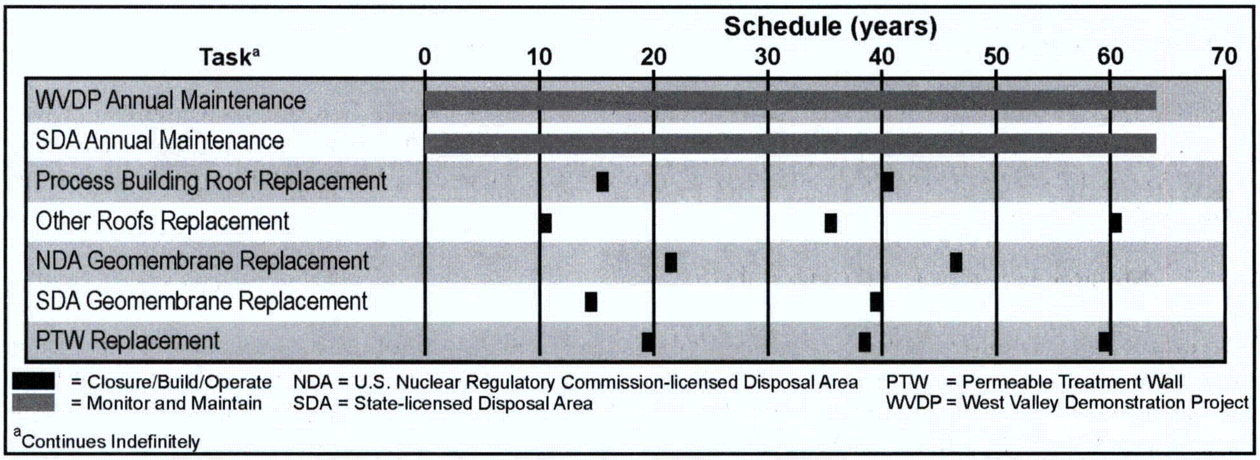


Figure 2–9 No Action Alternative – Sequencing of Implementation Activities

2.4.4.4 Monitoring and Institutional Controls

The existing monitoring and institutional controls would continue in place for the foreseeable future.

2.5 Alternatives Considered but Eliminated from Detailed Analysis

2.5.1 Indefinite Waste Storage of Decommissioning or Long-term Management Waste in Existing or New Aboveground Structures

DOE and NYSERDA do not consider the use of existing structures or construction of new aboveground facilities at WNYNSC for indefinite storage of decommissioning or long-term management waste to be a reasonable alternative for further consideration. The indefinite storage of waste is inconsistent with the NRC License Termination Rule and Final Policy Statement on WVDP Decommissioning. Under the *Waste Management Programmatic Environmental Impact Statement* (DOE 1997a), DOE decided that sites such as the Project Premises would ship their low-level radioactive waste and mixed low-level radioactive waste to other DOE sites that have disposal capabilities for these wastes (65 FR 10061). This decision did not preclude the use of commercial disposal facilities. The construction, subsequent maintenance, and periodic replacement over time of new facilities for indefinite onsite waste storage at West Valley would be impractical from a cost, programmatic, health, and environmental standpoint. Thus, DOE would not consider indefinite onsite waste storage in new or existing facilities to be a viable waste management alternative for its decommissioning actions at the Project Premises. In addition, the WVDP Act calls for DOE to decontaminate and decommission facilities. NYSERDA would use available commercial facilities for disposal of any non-Project low-level radioactive waste and mixed low-level radioactive waste that it may generate, in lieu of incurring the costs of new construction.

2.5.2 Walk Away

The 1996 *Draft Environmental Impact Statement for Completion of the West Valley Demonstration Project and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (Cleanup and Closure Draft EIS)* analyzed an alternative that involved discontinuing all West Valley operations and essentially "walking away" from the WNYNSC, its facilities, and wastes (DOE 1996a). This "Walk Away" Alternative was intended to help DOE and the public understand the inherent risks of site facilities, buried waste, environmental contamination, and site erosion. (This alternative was also identified in the March 13, 2003, Notice of Intent for this revised Draft EIS, but it was called the No Action Alternative).

In the 1996 *Cleanup and Closure Draft EIS* and in the current draft, this option was not considered as a reasonable alternative.

After additional consideration, the lead agencies, in consultation with the cooperating agencies, decided to eliminate the Walk Away Alternative as the No Action Alternative and redefine the No Action Alternative. The Walk Away Alternative, as defined in the 1996 *Cleanup and Closure Draft EIS*, was not a reasonable alternative because it would not satisfy the requirements of the WVDP Act, it would not satisfy DOE and NYSERDA requirements under 6 NYCRR Part 373 and RCRA, and would pose major health and safety issues to the public. Further, neither of the lead agencies would or could select the "Walk Away" Alternative because it would represent a violation of their duties and responsibilities.

2.6 Comparison of Alternatives

This section summarizes the environmental impacts of the alternatives in a concise comparative form, thus sharply defining the issues and providing a clear basis for selection among the alternatives as required by 40 CFR 1502.14. This section also summarizes the environmental consequences for those resource areas with impacts that have meaningful differences among the alternatives.

The environmental consequences section in Chapter 4 of this EIS presents an analysis of the direct and indirect environmental effects of each alternative. It forms the analytical basis for the concise comparison of alternatives in this section. For more information on impacts by resource area for each alternative, including those resource areas not discussed here, see Chapter 4.

The comparison of alternatives is organized into three sections that present impacts for specific resource areas that have meaningful differences in impacts among the alternatives. These include:

- Near-term impacts, which address the impacts resulting from implementing the decommissioning actions (e.g., removal or isolation)
  - land use: land available for release
  - socioeconomics: employment levels
  - human health and safety: population dose and worker dose
  - waste management: waste generation
  - transportation: population dose and worker dose
- Long-term impacts, which address impacts resulting from wastes remaining on site
  - human health and safety: population dose to downgradient water users
- Cost-benefit considerations

Other resource areas presented in Chapter 4 are not discussed in this comparison of alternatives because, although they may have differences among the alternatives, the differences are not considered meaningful enough to influence the selection of a Preferred Alternative.

The Sitewide Removal and Sitewide Close-In-Place Alternatives are complete decommissioning alternatives, where decommissioning actions are taken to achieve an end state. The Phased Decisionmaking Alternative is partial decommissioning with the end state undefined. Phase 1 impacts have been addressed, but the Phase 2 impacts would depend on future decisions on decommissioning and closure actions. However, impacts are expected to be bounded by those analyzed in the Sitewide Removal Alternative and the Close-In-Place Alternative, and a qualitative statement can be made about the range of impacts for the Phased Decisionmaking Alternative. The No Action Alternative is not a decommissioning alternative, because there are no actions to reconfigure the site.

2.6.1 Near-term Impacts

Near-term impacts for five resource areas identified as having meaningful differences among the alternatives are presented in **Table 2–3**. Additionally, the duration of the decommissioning period and monitoring and maintenance period for each of the alternatives is shown in Table 2–3 for comparison.

To construct the analytical basis for evaluation of project impacts, appropriate analytical tools and methods were used to estimate potential environmental impacts. The best available information on waste inventory and characteristics, site characteristics and processes, and engineering approaches was used in the analysis. Uncertainty was addressed by performing multiple analyses (e.g., alternate disposal configuration, alternate transportation modes, continuation as well as loss of institutional controls) and using conservative assumptions. This approach was performed in such a way that did not bias the comparison of alternatives.

2.6.1.1 Land Use

The Sitewide Removal Alternative would result in the greatest land area available for release for unrestricted use, which would be the entire 1,352 hectares (3,340 acres) encompassing WNYNSC. With the exception of land necessary to manage orphan waste that may remain on site until a disposition path is available, the entire site would be cleaned up to the point where it could meet license termination without restriction standards, potentially allowing it to be used for other purposes.

The Sitewide Close-In-Place Alternative would result in about 1,100 hectares (2,700 acres) being available for release for unrestricted use. After completion of decommissioning activities, as well as decay of the Cesium Prong and nonsource areas of the North Plateau Groundwater Plume, much of the site would be available for release for unrestricted use. Land would need to be retained for access control, as a buffer zone on the western side of the NDA and for maintenance and erosion control for the South Plateau burial grounds. The exact amount and timing of land releases would be the result of interaction between NYSERDA, NRC, and DOE.

Following completion of Phase 1 of the Phased Decisionmaking Alternative, an estimated 690 hectares (1,700 acres) of land would be available for release for unrestricted use. A determination of the amount of land available for unrestricted release following implementation of Phase 2 would depend on the selection of Phase 2 actions. If the decision is removal of remaining contamination, the remaining 662 hectares (1,600 acres) would become available, and the total for this alternative would be similar to that under the Sitewide Removal Alternative. If the decision is in-place closure of the remaining structures, an additional 430 hectares (1,100 acres) would be available, similar to the Sitewide Close-In-Place Alternative.

For the No Action Alternative, 690 hectares (1,700 acres) would be available for release for unrestricted use. This land would not be needed for continued management and oversight.

Table 2–3 Comparison of Alternatives by Resource Areas for Near-term Impacts [a]

Resource Area	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1 only)* [b]	*No Action Alternative*
Duration of Decommissioning Action	64 years	7 years	8 years	None
Duration of Ongoing Monitoring and Maintenance	Necessary only while any orphan waste is being stored	In perpetuity as part of long-term stewardship	In perpetuity as part of long-term stewardship if Phase 2 involves in-place closure	In perpetuity
Land Use [c] – land estimated to be available for unrestricted release upon completion of alternative	Entire 1,352 hectares (except for any land used for optional orphan waste storage)	1,100 hectares	690 hectares	690 hectares
Socioeconomics [d] – average employment	Decommissioning: 260 employees annually Monitoring and Maintenance: 0 employees (assuming no orphan waste management after decommissioning)	Decommissioning: 300 employees annually Monitoring and Maintenance: About 30 employees annually until Interim Storage Facility removed; then about 18, indefinitely	Decommissioning: 230 employees annually Monitoring and Maintenance: About 50 employees annually, up to 30 years	Monitoring and Maintenance: About 75 employees annually, indefinitely
Human Health and Safety (public) [e] – population dose (and risk) to the public	Decommissioning: 73 person-rem (0.018 LCF) Monitoring and Maintenance: negligible dose, even if orphan and legacy waste are stored on site	Decommissioning: 27 person-rem (0.0093 LCF) Monitoring and Maintenance: 0.00045 person-rem for permeable treatment wall replacement, if necessary	Decommissioning: 42 person-rem (0.0056 LCF) Monitoring and Maintenance: 0.0045 person-rem for permeable treatment wall replacement, if necessary	Monitoring and Maintenance: 0.077 person-rem per year
– peak annual MEI dose	0.26 millirem (8.4×10^{-8} LCF)	0.14 millirem (4.1×10^{-8} LCF)	0.84 millirem (1.1×10^{-7} LCF)	0.61 millirem (2.1×10^{-7} LCF)
Human Health and Safety (site workers) [f] – worker population dose (and risk)	Decommissioning: 1,100 person-rem (0.70 LCF) Monitoring and Maintenance following decommissioning actions: 0.15 person-rem (8.0×10^{-5} LCF) per year if orphan waste is stored on site	Decommissioning: 130 person-rem (0.080 LCF) Monitoring and Maintenance following decommissioning actions: 0.2 person-rem (1.0×10^{-4} LCF) per year	Decommissioning: 140 person-rem (0.080 LCF) Monitoring and Maintenance following decommissioning actions: 2.0 person-rem (0.001 LCF) per year	Monitoring and Maintenance: 2.6 person-rem per year (0.0020 LCF)
– average worker dose from decommissioning actions	66 millirem (4.0×10^{-5} LCF) per year	44 millirem (3.0×10^{-5} LCF) per year	58 millirem (3.0×10^{-5} LCF) per year	0 millirem (0 LCF) per year
Waste Management [g] – packaged decommissioning waste (cubic meters)	120,000 nonhazardous 18 hazardous 1,500,000 LLW [h] 4,200 GTCC [h] 1,000 TRU [h] 570 MLLW 1,600,000 Total	15,000 nonhazardous 3 hazardous 10,000 LLW [h] 0 GTCC 39 TRU [h] 410 MLLW 26,000 Total	35,000 nonhazardous 2 hazardous 170,000 LLW [h] 0 GTCC 710 TRU [h] 41 MLLW 210,000 Total	None

Resource Area	Sitewide Removal Alternative	Sitewide Close-In-Place Alternative	Phased Decisionmaking Alternative (Phase 1 only) [b]	No Action Alternative
Waste Management [g] – packaged monitoring and maintenance (M&M) or long-term stewardship (LTS) waste (cubic meters per year)	None [h] (assuming no orphan waste)	0 nonhazardous 0 hazardous 110 LLW 0 GTCC 0 TRU 0 MLLW 110 Total (LTS)	11 nonhazardous <1 hazardous 180 LLW 0 GTCC 0 TRU 0 MLLW 190 Total (M&M)	32 nonhazardous 1 hazardous 450 LLW 0 GTCC 0 TRU <1 MLLW 480 Total (M&M)
Transportation [i,j] – dose and risk to the public along transportation routes during transportation (person-rem [LCFs])	DOE/Commercial Truck: 380 (2.3×10^{-1}) Rail: 96 (5.7×10^{-2}) Commercial Truck: 360 (2.1×10^{-1}) Rail: 96 (5.7×10^{-2})	DOE/Commercial Truck: 12 (6.9×10^{-3}) Rail: 2.9 (1.8×10^{-3}) Commercial Truck: 10 (6.2×10^{-3}) Rail: 2.8 (1.7×10^{-3})	DOE/Commercial Truck: 71 (4.3×10^{-2}) Rail: 16 (9.8×10^{-3}) Commercial Truck: 59 (3.5×10^{-2}) Rail: 16 (9.7×10^{-3})	DOE/Commercial Truck: 15 (8.8×10^{-3}) Rail: 3.2 (1.9×10^{-3}) Commercial Truck: 12 (7.3×10^{-3}) Rail: 3.2 (1.9×10^{-3})
Transportation [i,j] – dose and risk to transportation workers during transportation (person-rem [LCFs]) [k]	DOE/Commercial Truck: 2,100 (1.3) Rail: 65 (3.9×10^{-2}) Commercial Truck: 2,200 (1.3) Rail: 65 (3.9×10^{-2})	DOE/Commercial Truck: 51 (3.0×10^{-2}) Rail: 2.0 (1.2×10^{-3}) Commercial Truck: 48 (2.9×10^{-2}) Rail: 1.5 (9.0×10^{-4})	DOE/Commercial Truck: 270 (1.6×10^{-1}) Rail: 11 (6.3×10^{-3}) Commercial Truck: 400 (2.4×10^{-1}) Rail: 11 (6.6×10^{-3})	DOE/Commercial Truck: 47 (2.8×10^{-2}) Rail: 2.0 (1.2×10^{-3}) Commercial Truck: 39 (2.3×10^{-2}) Rail: 1.7 (1.0×10^{-3})
Transportation [i,j] – nonradiological accident risk (number of traffic fatalities)	DOE/Commercial Truck: 7.5 Rail: 30 Commercial Truck: 7.2 Rail: 29	DOE/Commercial Truck: 0.090 Rail: 0.37 Commercial Truck: 0.080 Rail: 0.33	DOE/Commercial Truck: 1.0 Rail: 4.0 Commercial Truck: 0.90 Rail: 3.4	DOE/Commercial Truck: 0.060 Rail: 0.20 Commercial Truck: 0.050 Rail: 0.20

GTCC = Greater-Than-Class C waste, LCF = latent cancer fatality, LLW = low-level radioactive waste, MEI = maximally exposed individual, MLLW = mixed low-level radioactive waste, TRU = transuranic waste.

a Totals may not add due to rounding. All values, except for the area of the whole WNYNSC under the Sitewide Removal Alternative (which has a known acreage), are rounded to two significant figures.

b Magnitude of impacts for the Phased Decisionmaking Alternative depends on the Phase 2 activities implemented.

c Source: Chapter 4, Table 4–1, of this Draft EIS, Summary of Land and Visual Resources Impacts.

d Source: Chapter 4, Table 4–11, of this Draft EIS, Summary of Socioeconomic Impacts.

e Source: Chapter 4, Table 4–12, of this Draft EIS, Summary of Health and Safety Impacts. The peak annual dose to the MEI is the highest of the following locations: receptor at nearest site boundary, on Cattaraugus Creek near the site, or the lower reaches of Cattaraugus Creek.

f Source: Chapter 4, Table 4–18, of this Draft EIS, Projected Worker Dose and Risk During and After Decommissioning.

g Source: Chapter 4, Table 4–45, of this Draft EIS, Summary of Waste Management Impacts. For all decommissioning alternatives, up to approximately 3.2 cubic meters (110 cubic feet) per year of additional low-level radioactive waste would be generated due to management of orphan waste.

h Pre-West Valley Demonstration Project Class B and C low-level radioactive waste, Greater-Than-Class C low-level radioactive waste, and non-defense transuranic waste do not have a clear disposal path and may need to be stored on site until a disposal location is identified. DOE plans to select a location for a disposal facility for Greater-Than-Class C waste and potential non-defense transuranic waste following completion of the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (GTCC EIS)* (DOE/EIS-0375).

i Source: Chapter 4, Table 4–52, of this Draft EIS, Risks of Transporting Radioactive Waste Under Each Alternative.

[j] For the purpose of comparison to other alternatives, transportation impacts for the No Action Alternative are provided for monitoring and maintenance activities over a 25-year period. Under the DOE/Commercial Disposal Option, wastes are assumed to go to the Nevada Test Site or a western U.S. disposal site. Under the Commercial Disposal Option, only commercial facilities would be used. (There would be no disposition for transuranic and Greater-Than-Class C waste).

[k] The dose to transportation workers presented in this table does not reflect administrative controls applied to the workers. In practice, workers who are not trained radiation workers would be limited to a dose of 100 millirem per year, and trained radiation workers would be limited to an Administrative Control Limit of 2 rem per year, which would be a risk of 0.0012 LCF per year for a trained radiation worker. Enforcement of the administrative limit would most likely be necessary under the Sitewide Removal Alternative.

Note: To convert hectares to acres, multiply by 2.471. To convert cubic meters to cubic feet, multiply by 35.314.

2.6.1.2 Socioeconomics

For decommissioning activities, the Sitewide Removal Alternative would create the greatest level of employment because the duration of decommissioning activities is the longest. Both the Sitewide Close-In-Place Alternative and Phase 1 of the Phased Decisionmaking Alternative would create average annual employment levels within a similar range as the Sitewide Removal Alternative, but over a much shorter duration. The near-term socioeconomic impact of all alternatives is positive because local employment is maintained. The negative impact associated with the completion of decommissioning actions would cause limited disruption because the site is not a major employer on a local or regional scale.

There would be no post-decommissioning employment required for monitoring and maintenance activities for the Sitewide Removal Alternative, assuming there is no need for temporary orphan waste storage. The other alternatives, including the No Action Alternative, would require a reduced employment level for an indefinite period of time.

If the decision for Phase 2 of the Phased Decisionmaking Alternative is removal of remaining contamination, the employment level for that alternative would be similar to the Sitewide Removal Alternative for the duration of decommissioning actions, and there would be no post-decommissioning employment required for monitoring and maintenance. If the decision is in-place closure of the remaining structures, the decommissioning employment levels would be similar to those for Sitewide Close-In-Place Alternative, and there would be employment following decommissioning during an indefinite monitoring and maintenance period.

Based on the expected changes in employment levels for each of the alternatives, there would be no discernable impact on the economies of the local and regional areas surrounding the West Valley Site.

2.6.1.3 Human Health and Safety

Decommissioning actions would result in radiological releases to the atmosphere and to local waters. These releases would result in radiation doses and the associated risk of latent cancer fatalities (LCFs)[2] to offsite individuals and populations. The number of LCFs can be used to compare the risks among the various alternatives. The decommissioning actions would also result in occupational exposure to site workers. Radiological doses to the public and to site workers would be highest under the Sitewide Removal Alternative and lowest under the No Action Alternative. Phase 1 of the Phased Decisionmaking Alternative would generate doses to the public and workers that are higher than the Sitewide Close-In-Place Alternative.

Excluding the No Action Alternative, the projected total decommissioning dose to the general population within an 80-kilometer (50-mile) radius of WNYNSC ranges from 27 person-rem (for the Close-In-Place Alternative) to 73 person-rem (for the Sitewide Removal Alternative). The doses would be expected to result in less than 1 (0.0093 to 0.018) additional LCF within the affected population as a result of decommissioning actions under any of the alternatives. Note that the peak annual dose to an MEI located at the site boundary would be highest for Phase 1 of the Phased Decisionmaking Alternative because it has the highest annual radionuclide release rate. The peak annual dose is still less than 1 millirem (the average person in the United States receives an annual background dose of 360 millirem).

[2] *LCF is a term to indicate the estimated number of cancer fatalities that may result from exposure to ionizing radiation. Dose conversion factors are used to convert radiation dose to LCFs.*

Total estimated worker dose for decommissioning actions would range from 130 person-rem for the Sitewide Close-In-Place Alternative to 1,100 person-rem for the Sitewide Removal Alternative. The higher dose would be expected to result in up to 1 additional LCF among the involved worker population. The average individual worker dose for decommissioning would range from 44 to 66 millirem per year, which is below the site 500 millirem per year administrative limit (WVNSCO 2006). All workers in radiation areas would be monitored to ensure they stayed within annual limits.

2.6.1.4 Waste Management

Depending on the alternative, decommissioning actions would generate different types of waste including nonhazardous, hazardous, low-level radioactive, mixed low-level radioactive, transuranic, and Greater-Than-Class C waste.

The Sitewide Removal Alternative would generate the largest volume of waste from decommissioning, but no waste from long-term stewardship. Nonhazardous waste is common demolition debris that would be expected to have no adverse impact on commercial disposal facilities. Much of the Class A low-level radioactive waste is lightly-contaminated low specific activity waste that would be expected to have no adverse impact on the capacity of DOE or commercial disposal facilities. Until the issues related to disposal of commercial Class B/C low-level radioactive waste, Greater-Than-Class C wastes, and transuranic waste are resolved, these wastes would be stored in the new Container Management Facility as orphan waste. A disposal facility for Greater-Than-Class C waste and potential non-defense transuranic waste would be determined by a Record of Decision for the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (GTCC EIS)* (DOE/EIS-0375).

Phase 1 of the Phased Decisionmaking Alternative would generate the second largest volume of waste from decommissioning activities. The nonhazardous waste is common demolition debris that would be expected to have no adverse impact on commercial disposal facilities. Much of Class A low-level radioactive waste is lightly-contaminated low specific activity waste that would be expected to have no adverse impact on the capacity of DOE or commercial disposal facilities. Until the issues related to disposal of transuranic waste are resolved, this small volume of potentially orphan waste would be stored in LSA 4. If the Phase 2 decision is removal of remaining contamination, the total decommissioning wastes for the Phased Decisionmaking Alternative would be expected to be similar to those generated under the Sitewide Removal Alternative. If Phase 2 results in in-place closure of the remaining underground structures and wastes, the decommissioning waste volumes generated for the total Phased Decisionmaking Alternative would be the sum of the Phase 1 waste volume and about 30 percent of the waste volume generated under the Sitewide Close-In-Place Alternative.

The Sitewide Close-In-Place Alternative would generate the third largest volume of waste from decommissioning and some low-level radioactive waste from long-term stewardship activities. Until the issues related to disposal of commercial Class B/C low-level radioactive waste and transuranic waste are resolved, these orphan wastes would be stored in LSA 4.

The No Action Alternative would generate no waste from decommissioning activities but the largest volume of waste from monitoring and maintenance.

2.6.1.5 Transportation

Both radiological and nonradiological impacts result from shipment of radioactive materials from WNYNSC to offsite disposal sites. DOE and NYSERDA could choose to use a combination of rail and truck shipments during the implementation of any of the proposed alternatives. The dose to the general population would be expected to range between about 2.8 person-rem, which is associated with all rail shipments to commercial disposal sites under the Sitewide Close-In-Place Alternative, and about 380 person-rem associated with truck shipments to NTS under the Sitewide Removal Alternative. The additional LCFs that would be expected from such exposures to the general population would be less than 1 (0.0017 to 0.23). The impacts are dependent on the distance traveled and the number of people residing along the transportation routes.

The dose and risk information in Table 2–3 for transportation workers assumes that no administrative controls would be placed on the workers; however, it should be noted that DOE limits dose to a worker to 5 rem (10 CFR 835.202), and also sets an administrative goal at 2 rem per year (DOE 1999b). The potential risk for a trained radiation worker to develop an LCF from the maximum annual exposure limit would be less than 1 (0.0012).

For the Sitewide Removal Alternative, the highest level of radiological health impacts to transportation workers would occur under the Commercial Disposal Option using all truck shipments; the greatest impacts to the general population would occur under the DOE/Commercial Disposal Option, also using all truck shipments. For the Sitewide Close-In-Place Alternative, the highest level of health impacts to transportation workers and to the general public would both occur under the DOE/Commercial Disposal Option using all-truck shipments. For Phase 1 of the Phased Decisionmaking Alternative, the highest level of health impacts to transportation workers would be from the truck Commercial Disposal Option; the highest level of health impacts to the general public would be from the truck DOE/Commercial Disposal Option. For Phase 2, if the decision is removal of the remaining wastes, total transportation risks for this alternative (Phase 1 and Phase 2) would be equal to those evaluated under the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure, the transportation risks from the additional activities (Phase 2) would be less than those evaluated under the Sitewide Close-In-Place Alternative due to removal activities already performed under Phase 1 of the Phased Decisionmaking Alternative. However, the total transportation risks for the Phased Decisionmaking Alternative would be greater than those for the Sitewide Close-In-Place Alternative. For the No Action Alternative, the highest level of health impacts to transportation workers and population from all transportation activities would occur under the DOE/Commercial Disposal Option.

The Sitewide Removal Alternative has the highest nonradiological health risk to the public, with the risk ranging from 7.2 to 29 traffic accident fatalities for the various shipping options.[3] The other alternatives would result in less than 1 nonradiological accident fatality, except for the Phased Decisionmaking Alternative, which would have a risk of 3.4 to 4.0 fatalities for the rail shipping options for Phase 1. For Phase 2, if the decision is removal of the remaining wastes, total transportation risks for this alternative (Phase 1 and Phase 2) would be equal to those evaluated under the Sitewide Removal Alternative. If the Phase 2 decision is in-place closure, the transportation risks from the additional activities (Phase 2) would be less than those evaluated under the Sitewide Close-In-Place Alternative due to removal activities already performed under Phase 1 of the Phased Decisionmaking Alternative. However, the total transportation risks for Phased Decisionmaking Alternative would be greater than those for the Sitewide Close-In-Place Alternative. Considering that the transportation activities would occur over a period of time from about 10 to 60 years and that the average number of annual traffic fatalities in the United States is about 40,000 per year, the traffic fatality risks under all alternatives would be very small.

[3] The rail nonradiological accident fatality estimates are based on the conservative assumption of one rail car per train. The use of trains with higher numbers of waste rail cars would result in lower accident fatality estimates.

2.6.2 Long-term Impacts

This section summarizes the estimated long-term impacts associated with the alternatives. For analysis purposes, "long-term" is from the end of the decommissioning action implementation period out to at least 10,000 years and perhaps longer if the predicted peak annual dose occurs later. The impacts were estimated using models that accounted for site features and processes that facilitated contaminant transport and natural and engineered barriers that mitigated contaminant transport. The models predicted the dose consequences as a function of time to a spectrum of offsite and onsite receptors engaged in exposure scenarios. Chapter 4, Section 4.1.10, of this EIS, presents peak annual doses for the spectrum of receptors for the two alternatives where the amount and configuration of remaining contamination can be quantitatively estimated: the Sitewide Close-In-Place Alternative and the No Action Alternative.

Table 2–4 provides an overview of the potential impacts for comparison among the alternatives. More information on the impacts to human health and safety are presented in Chapter 4, Section 4.1.10, of this EIS.

Table 2–4 Comparison of Long-term Impacts

Resource Areas for Comparison of Long-term Impacts	*Sitewide Removal Alternative*	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative*	*No Action Alternative*
Peak Annual Dose to Offsite Receptors	Essentially negligible.	Less than 1 millirem per year if institutional controls remain in place. On the order of 100 millirem per year if institutional controls fail for many hundreds of years and unmitigated erosion occurs.	If Phase 2 is removal for the remaining WMAs, long-term impacts would be comparable to Sitewide Removal Alternative. If Phase 2 is close-in-place for the remaining WMAs, long-term impacts are slightly less than Sitewide Close-In-Place because the Main Plant Process Building and Low-Level Waste Treatment Facility would have been removed.	Less than 1 millirem per year if institutional controls remain in place. On the order of 100 millirem per year if institutional controls fail for many hundreds of years and unmitigated erosion occurs.
Peak Annual Dose to Onsite Receptors (assumes loss of institutional controls)	Less than 25 millirem per year for very conservative scenarios, much less for more realistic scenarios.	Moderate doses (a few to hundreds of millirem per year) to individuals who have gardens in contaminated soil or wells in contaminated water.		Very large doses (10 to 1,000 rem per year) to individuals who have gardens in contaminated soil or wells in contaminated water.

WMA = Waste Management Area.

The Sitewide Removal Alternative would have minimal long-term impacts. The contamination would be removed such that an individual in direct contact with residual contamination would receive an annual dose of less than 25 millirem per year assuming conservative land reuse scenarios that include houses, gardens and wells in the highest areas of residual contamination. Other site reuse scenarios would result in substantially lower doses and the dose to offsite individuals would be many orders of magnitude lower (i.e., negligible).

The Sitewide Close-In-Place Alternative would include additional engineering barriers and also rely on institutional controls to limit offsite and onsite doses. For this alternative, the estimated doses to offsite individuals, if institutional controls are assumed to remain in place, would be less than 1 millirem per year, and would be similar to the No Action Alternative. The estimated dose to offsite individuals in the event of failure of institutional controls would be less than 1 millirem per year if only groundwater release mechanisms are involved (less than the No Action Alternative) and on the order of 100 millirem per year (the same as the No Action Alternative) if there is extended (many hundreds of years) loss of institutional control such that unmitigated erosion occurs. If institutional controls are lost and there are intruders into the industrialized area, there could be moderate annual doses (10 to 100 millirem) to individuals who would have gardens with contaminated soil from large excavation activities or who uses water from contaminated wells. The intruder doses would be less than those for the No Action Alternative because of engineered barriers that reduce the likelihood of direct intrusion or slow the migration of contaminants. The highest doses for the Sitewide Close-In-Place Alternative would be related to the North Plateau Plume, the Main Plant Process Building and the Waste Tank Farm.

The long-term human health impacts for the Phased Decisionmaking Alternative would depend on the Phase 2 decision. If the Phase 2 decision is removal, the long-term impacts at the site and in the region would be the same as those for the Sitewide Removal Alternative. If the Phase 2 decision is close-in-place for the remaining WMAs, the long-term impacts would be slightly less than those for the Sitewide Close-In-Place Alternative because the Main Plant Process Building, the source area of the North Plateau Groundwater Plume, and the Low-Level Waste Treatment Facility lagoons, would have been removed. If one considers the time-integrated (cumulative) population dose the first 1,000 years would be reduced to about 50 percent of that of the Sitewide Close-In-Place Alternative; however, the reduction over 10,000 years is much less (less than 10 percent) because of the dose from the long-lived radionuclides in the burial grounds.

The No Action Alternative would not remove material or add engineering barriers to isolate the waste. It would rely on existing barriers and active and/or passive institutional controls to limit offsite and onsite doses. The estimated doses to offsite individuals, if institutional controls are assumed to remain in place, would be less than 1 millirem per year. The estimated dose to offsite individuals in the event of failure of institutional controls would be on the order of 10 millirem per year if only groundwater release mechanisms are involved and on the order of 100 millirem per year if there is extended (many hundreds of years) loss of institutional control such that unmitigated erosion occurs. If institutional controls are lost and there are intruders into the industrialized area, there could be very large annual doses (10 to 1,000 rem) to individuals who have gardens with contaminated soil from large excavation activities or use water from contaminated wells. The high doses could occur near any of the industrial facilities in the Project Premises and the SDA. This No Action Alternative is considered the baseline when evaluating the long-term performance of the various decommissioning actions.

2.6.3 Cost-benefit Analysis

The incremental cost-effectiveness of the dose reduction for the alternatives is presented in **Table 2–5**. This is based on the dose reduction and the present value estimates identified in Chapter 4, Table 4–56, of this EIS.

The various decommissioning alternatives take different strategies to reducing long-term risk, which is predominantly from radiological releases. Insight into the cost-effectiveness of the alternatives is provided by comparing the ratio of the incremental cost for an alternative (the cost for an alternative less the cost of the No Action Alternative) and the net 1,000-year population dose reduction (the avoided population dose due to removal or increased isolation less the worker and public population dose required to achieve the new end state). This cost effectiveness can be useful when comparing the alternatives and can be useful when evaluating compliance with decommissioning requirements. Additional information on the cost-benefit analysis is presented in Chapter 4, Section 4.2.

Based on the information in Table 2–5, the Sitewide Close-In-Place Alternative would be more cost effective than the Sitewide Removal Alternative. The incremental cost-effectiveness of the Phased Decisionmaking Alternative would be expected to lie between approximately $4,500 and $20,000 discounted cost per avoided person-rem.

Table 2–5 Cost/Benefit Comparative Assessment [a]

Sitewide Removal Alternative	*Sitewide Close-In-Place Alternative*	*Phased Decisionmaking Alternative (Phase 1 only)*	*No Action Alternative*
The Sitewide Removal Alternative would be effective in removing essentially all of the site radionuclide inventory from the accessible environment. The discounted cost per avoided person-rem is estimated to be about $20,000.	The Sitewide Close-In-Place Alternative would be effective in keeping most of the site radionuclide inventory out of the accessible environment. The incremental discounted cost per avoided person-rem (incremental cost-effectiveness) is estimated to be about $2,000.	The cost-effectiveness of this alternative would be driven primarily by the Phase 2 decision. If the Phase 2 decision is timely removal of the remaining WMAs, the incremental cost-effectiveness ($20,000) would be similar to the Sitewide Removal Alternative. If the Phase 2 decision is timely in-place closure for the remaining WMAs, the incremental cost-effectiveness ($4,500) would approach that of the Sitewide Close-In-Place Alternative.	The No Action Alternative serves as a baseline for assessing the cost-effectiveness of the decommissioning alternatives.

WMA = Waste Management Area.

[a] Cost-benefit analysis is not typically included in a DOE EIS but is included in NRC EISs. The cost-benefit analysis presented in this EIS is intended to increase the utility of the document to NRC.

2.6.4 Conclusions from Comparative Analysis of Alternatives

The following conclusions were derived from the comparative analysis of alternatives presented in this section:

- The Sitewide Removal Alternative would result in the most land available for reuse, and would not require long-term institutional controls (except for the possible management of orphan waste), but would incur the greatest radiological dose to the public and workers from onsite and transportation activities.

- The Sitewide Close-In-Place Alternative would require the least amount of time to accomplish and would generate the least amount of waste (other than the No Action Alterative) that would need to be disposed of elsewhere, but would require long-term institutional controls on site. The reasonably foreseeable long-term peak annual dose to Lake Erie water users would be very small (indistinguishable) from the dose associated with background radiation.

- Phase 1 of the Phased Decisionmaking Alternative would not result in any more land available for release than for the No Action Alternative, but would have positive impacts over the No Action Alternative because of decommissioning activities that would remove contaminated facilities and address source terms for groundwater contamination. If Phase 2 is removal, the total impacts for the Phased Decisionmaking Alternative would be similar to the Sitewide Removal Alternative. If Phase 2 were close-in-place, the total impacts of the Phased Decisionmaking Alternative would be less than the sum of Phase 1 plus the Sitewide Close-In-Place Alternative. The total impact would be less than the sum because of the reduced number of facilities that would be closed-in-place.

- The Sitewide Removal Alternative would incur the highest discounted cost per avoided person-rem to total worker and public populations, the Sitewide Close-In-Place the lowest discounted cost per avoided person-rem, and the Phased Decisionmaking Alternative would be in between.

- The No Action Alternative would not involve decommissioning. Waste and contamination would remain in their current locations, and there would be no change in site operations. This alternative and its impacts serve as the baseline when evaluating a decommissioning alternative.

2.7 Preferred Alternative Identification and Rationale

DOE and NYSERDA have selected the Phased Decisionmaking Alternative as their Preferred Alternative. The rationale for selecting the Phased Decisionmaking Alternative is as follows:

- Phase 1 of the Phased Decisionmaking Alternative would remove major facilities (such as the Main Plant Process Building, lagoons) thereby reducing or eliminating potential human health impacts while introducing minimal potential for generation of new orphan waste.
- Phase 1 of the Phased Decisionmaking Alternative would remove the source area for the North Plateau Groundwater Plume, thereby reducing the source of radionuclides that are a potential contributor to human health impacts.
- Phase 1 of the Phased Decisionmaking Alternative allows up to 30 years for collection and analysis of data and information on major facilities or areas (e.g., Waste Tank Farm, NDA, SDA), with the goal of reducing technical risks (e.g., generation of less additional orphan waste, and improved long-term performance of facilities left in place). Examples of analyses that could be performed to address technical risk could include how to address the Cesium Prong, reaching a determination regarding Wastes Incidental to Reprocessing, and further evaluation of long-term impacts.

The additional information gathering conducted in Phase 1 is expected to provide data to support decisionmaking for Phase 2 activities. Phase 2 activities could be sitewide removal of the remaining facilities and contamination (Sitewide Removal Alternative), close-in-place of the remaining facilities and contamination (Sitewide Close-In-Place Alternative), or a combination of activities from these two alternatives. It is also anticipated that during Phase 1, progress would be made in the identification and development of disposal facilities for "orphan" wastes, thereby facilitating removal actions if they are selected as part of the Phase 2 decisionmaking. Establishment of improved close-in-place designs or improved analytical methods for long-term performance assessment would facilitate close-in-place actions if they are selected as part of Phase 2 decisionmaking.

2.8 Uncertainties Associated with Implementation of the Various Alternatives

Implementing any of the project alternatives involves some amount of uncertainty. For example, there is uncertainty related to the availability of waste disposal sites for some classes of waste expected to be generated under the different alternatives. Also, there is some uncertainty involved with the availability of technologies needed to implement the alternatives. These uncertainties are discussed in greater detail in the following sections. Uncertainty associated with analytical methods and the use of new technologies has been accommodated in this EIS by making conservative assumptions in the environmental impact analysis.

2.8.1 Consequence Uncertainties

Chapter 4, Section 4.3, of this EIS presents a discussion of incomplete and unavailable information that introduces uncertainty into the consequence analyses. The areas affected include human health (occupational exposure), transportation, waste management (waste quantities and disposal options), and long-term human health. The uncertainties associated with incomplete and unavailable information related to these areas are presented in this section.

2.8.1.1 Human Health

For occupational exposure, information that is incomplete or unavailable includes (1) more detailed information on the radionuclides in the waste, particularly the gamma emitters, (2) the design details for the facilities that would be used for waste handling and processing, and (3) more detailed information on how workers would be utilized in decommissioning actions. However, the uncertainty related to the lack of this information is addressed through the use of conservative assumptions related to the development of the labor-category-specific exposure rates and the fact that no credit is taken for the decay of the gamma emitters that are expected to control the dose. Active management controls will assure that occupational dose standards are met. Appendix I further addresses uncertainties associated with short-term human health impacts.

2.8.1.2 Transportation

Information that is incomplete or unavailable includes (1) more detailed information on the distribution of radionuclides in the packaged waste, particularly the gamma emitters, (2) the radiation dose from the waste package shipment arrays, (3) the specific transportation route and (4) more precise information on how the waste would be shipped (truck, rail, or some combination of truck and rail). The uncertainty related to the lack of this information is addressed through the use of conservative assumptions related to waste package inventory and surface dose rate, and the fact that no credit is taken for the decay of the gamma emitters that are expected to control the dose. Uncertainty about disposal locations was addressed by considering two different waste disposal options (DOE/commercial and commercial) and different disposal sites for the low-level radioactive waste.

2.8.1.3 Waste Volumes

The waste management analysis has two areas of uncertainty due to incomplete and unavailable information: (1) the volumes and characteristics of waste that would be generated by each alternative, and (2) the availability of disposal sites for all the waste, particularly commercial low-level radioactive waste (Class B and C), Greater-Than-Class C waste, transuranic waste, and high-level radioactive waste. The uncertainty related to the volumes and characteristics of the waste is principally related to the amount of site characterization data available. While some soils characterization data does exist, much of the soil volume assumed to be excavated for the Sitewide Removal and Phased Decisionmaking Alternatives is based on process knowledge and operational history. The actual volumes to be exhumed could be smaller or greater than the assumptions in this EIS. Based on the above and the challenge of estimating exact volumes of water that would require treatment during excavation of soils and buried wastes, there would also be uncertainty associated with the volume and characteristics of wastes resulting from water management/treatment during excavation activities. The Phased Decisionmaking Alternative allows for some uncertainty in that additional actions could be analyzed and implemented as part of Phase 2 activities.

2.8.1.4 Waste Disposal Options

The lack of availability of disposal sites for commercial Class B and C low-level radioactive waste, Greater-Than-Class C waste, transuranic waste, and high-level radioactive waste creates uncertainty in how these wastes would be disposed of. Management options are presented in Chapter 4, Section 4.1.11.2, of this EIS. Until recently, the only commercial facility available and licensed for disposal of WVDP Class B or C waste from West Valley was in Barnwell, South Carolina; however, this facility is now no longer accepting any non-Atlantic Compact waste for disposal. Alternatives that generate commercial Class B or C wastes, therefore, would require an onsite storage facility to store these wastes until a disposal location is available.

Under the Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240), DOE is responsible for ensuring the safe disposal of Greater-Than-Class C waste in a facility licensed by the NRC; however, no such Greater-Than-Class C waste disposal facility exists at this time. A *GTCC EIS* that evaluates alternatives for developing a Greater-Than-Class C waste disposal facility is being prepared (72 FR 40135). Future options for Greater-Than-Class C waste disposal may significantly change the Greater-Than-Class C disposal cost included in the Sitewide Removal Alternative cost estimate. Under the Sitewide Removal Alternative, onsite storage would be needed for these wastes until a disposal location is available.

As discussed in Chapter 4, Section 4.1.11.2, the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (*WIPP SEIS*) analyzed the receipt and disposal of transuranic waste from WNYNSC (DOE 1997b). At this time, the WNYNSC is not approved to ship transuranic waste to WIPP because of unresolved questions regarding whether WNYNSC transuranic waste can be considered defense or commercial in origin. WIPP is currently authorized to accept only DOE defense waste. In addition, disposal of transuranic wastes from West Valley is currently being examined under the *GTCC EIS*. Until a determination is made with regard to transuranic waste originating from West Valley, it would be stored on site.

No high-level radioactive waste would be generated by decommissioning and/or long-term stewardship of WNYNSC unless the Waste Incidental to Reprocessing process determines that the empty high-level radioactive waste tanks and any applicable associated equipment are not incidental to reprocessing. If it is determined that the waste incidental to reprocessing process cannot be applied (i.e., the wastes cannot be managed as low-level radioactive waste and transuranic waste), these wastes would need to be managed as high-level radioactive waste under all of the alternatives. There is currently no waste acceptance criteria established for this type of high-level radioactive waste, and it is not included in the types of high-level radioactive waste expected to be disposed of at a future geologic repository. Therefore, under the Sitewide Removal and Phased Decisionmaking Alternatives, this waste would need to be stored on site until a disposal location is available.

For any alternative, the NRC may require a long-term license for an appropriate portion of the site until an acceptable alternative is found for the disposition of these wastes.

2.8.1.5 Long-term Human Health

The estimates of long-term doses and risk to individuals are the result of a complex series of calculations. The major elements of incomplete or unavailable pieces of information that are used in these calculations include (1) characterization of the nature and extent of the contaminants, (2) the performance of engineered barriers and caps (presented in Section 2.8.2.6 of this EIS), (3) site hydrology and groundwater chemistry, (4) contaminant release rates, (5) long-term erosion-driven releases rates of contaminants, (6) contaminant chemistry at the point of release into surface waters and the resulting adsorption and deposition, (7) bioaccumulation in plants and animals, and (8) knowledge of future human activity. To accommodate the uncertainty associated with this incomplete or unavailable information, conservative assumptions are used in the analysis, as presented in Chapter 4, Section 4.3.5, of this EIS. Appendix H further addresses uncertainties associated with long-term impacts.

2.8.2 Technology Uncertainties

There are several activities involved in the implementation of the alternatives wherein there exists uncertainty related to the technology, productivity, or safety of the workers involved in the work. This uncertainty could impact the cost and schedule of activities to mitigate these factors. The following provides a brief description of the application of technologies that may introduce greater uncertainties as compared to other technologies being implemented.

2.8.2.1 NRC-licensed Disposal Area/State-licensed Disposal Area and Container Management Facility

As presented in Appendix C, Sections C.4.4 and C.4.6.8, of this EIS, the conceptual Container Management Facility and the modular shielded environmental enclosures proposed for the NDA and SDA remediation are considered "first of a kind." There are no full-scale field examples of waste retrieval and processing operations of this magnitude involving the waste classes that would be dealt with under the Sitewide Removal Alternative. The anticipated wastes have been listed based on historic documentation. However, there exists a significant potential to discover wastes and types that are unexpected or unplanned. The cost of construction of the facilities would be fairly reliable (within the contingency specified in the estimates), as the structural and equipment components are readily available and have been used in some capacity in the past. However, project productivity and safety are items of uncertainty and will need to be managed during the conduct of operations.

One component of the waste retrieval process that involves a high level of uncertainty is the retrieval of wastes from the NFS deep holes, using primarily a telescoping boom having various end effectors. Conceptually, this equipment would be able to work vertically at depth, using different end attachments to scan, excavate, cut, and vacuum the waste materials and bring the wastes to the surface; however, this process would need to be demonstrated in a full-scale field application.

2.8.2.2 Leachate Treatment Facility

Similar to the Container Management Facility, the conceptual Leachate Treatment Facility (presented in Appendix C, Section C.4.5) is designed to process leachate generated during NDA and SDA waste removals. Management of the leachate in the excavations is assumed to occur in concert with the removal of wastes. However, difficulties in leachate management and treatment might eventually cause disruption of work progress in the NDA and SDA. Handling and treatment processes are based on currently available technologies that have been tested, but management of the wastes generated during the leachate treatment process may be problematic. Waste types, leachate volumes, and waste products are assumed based on the current leachate characterization data. Significant changes to the leachate quality or quantity might trigger significant reduction in NDA and SDA productivity. Verification tests would be performed to optimize technology performance and reduce uncertainties associated with processing of leachate.

2.8.2.3 Main Plant Process Building Foundation

During removal of the Main Plant Process Building and the North Plateau Groundwater Plume source area soils, nearly 500 foundation piles would be encountered (see Appendix C, Section C.3.1.1.8, of this EIS). Assumptions have been made regarding the pile removal that involve potentially numerous work crews working together productively in a small space (excavation and concrete demolition would be proceeding at the same time as pile removal). This working arrangement might cause reductions in work productivity to occur, increasing cost and decreasing the level of safety against worker injury. The work involved in this task is relatively common; however, coordination among the work crews would need to be managed closely.

2.8.2.4 Waste Tank Farm Mobilization Pump Removal

Several pumps have been removed from High-level Waste Tanks and stored on site, as presented in Appendix C, Section C.3.1.3.2, of this EIS. Under the Sitewide Removal, Sitewide Close-In-Place, and Phased Decisionmaking Alternatives, all of the remaining pumps would be removed and segmented. The methods and controls needed for safe removal of the pumps have been demonstrated with the previous pump removals; however, the segmenting methods and controls have not been demonstrated. The pumps would have to be segmented to fit inside of waste containers for eventual offsite disposal. Trial runs could be performed to demonstrate the effectiveness of segmenting methods and controls.

2.8.2.5 Dry Cask Storage Waste Transfers

For purposes of these evaluations, it is assumed that one canister could be removed from the Load-In/Load-Out Facility, transferred to the Dry Cask Storage Area, and unloaded into a storage unit in an 8-hour shift (Appendix C, Section C.4.1, of this EIS). This estimate is based on experience gained during the removal and placement of high and very high dose rate material (greater than 100 milliRoentgen per hour) contained in lead-shielded containers at Brookhaven National Laboratory and Oak Ridge National Laboratory, and compares favorably with the *Diablo Canyon Independent Spent Fuel Storage Installation Safety Analysis Report* (PG&E 2002) estimate of time required for similar activities (17 hours for transferring a loaded cask to the Independent Spent Fuel Storage Installation). While these events are similar to those proposed for the high-level radioactive waste canister transfer, there are differences in loading configuration and waste disposition that could affect duration and cost estimates, which could be addressed through detailed project planning and trial runs.

2.8.2.6 Performance of Engineered Hydraulic Barriers and Covers

Engineered hydraulic barriers and covers are described in Appendix C, Sections C.2.13 and C.4.7, of this EIS. Performance of the permeable treatment wall would be predicated on the effectiveness of the zeolite material on contaminant removal and its duration. To reduce uncertainties associated with the performance of the permeable treatment wall (and permeable reactive barrier), a study was conducted that evaluated the performance of the pilot-scale permeable treatment wall (Geomatrix 2007). While the study showed where construction and operational improvements could be made in a full-scale system, other factors could influence the performance of the technology. These include both hydraulic factors such as groundwater bypass around the system, and dispersal of "treated" groundwater, and operational factors such as the logistics and practicality of replacing the zeolite approximately every 20 years.

There is uncertainty about the long-term performance of other engineered barriers, including multi-layered covers, waste grout, and slurry walls. Hydraulic factors such as mounding and groundwater bypass, and other aspects such as long-term durability, potentially impact the long-term performance of slurry walls designed to keep subsurface contaminants from migrating off the site. Long-term performance of closure caps can be affected by erosion and differential settlement that increases the permeability of the engineered covers. These hydraulic factors are mitigated in the analysis by use of conservative assumptions. The performance of the hydraulic barriers as incorporated into the sensitivity analysis, is presented in Appendix H.

CHAPTER 3
AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions at the Western New York Nuclear Service Center (WNYNSC) and surrounding area. This information provides the context for understanding the environmental consequences and also serves as a baseline to evaluate the alternatives in this environmental impact statement (EIS) as of completion of the Interim End State. The affected environment at the WNYNSC is described for the following resource areas: land use and visual resources; site infrastructure; geology, geomorphology, seismology, and soils; water resources; meteorology, air quality, and noise; ecological resources; cultural resources; socioeconomics; human health and safety; environmental justice; and waste management and pollution prevention.

In accordance with the Council on Environmental Quality National Environmental Policy Act (NEPA) regulations (40 *Code of Federal Regulations* [CFR] Parts 1500 through 1508), the affected environment is "interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment." In addition, the State Environmental Quality Review Act (SEQR) (6 NYCRR 617.9) states that the affected environment is to be a "concise description of the environmental setting of the areas to be affected, sufficient to understand the impacts of the proposed action and alternatives." The affected environment descriptions provide the context for understanding the environmental consequences described in Chapter 4 of this EIS. For the purposes of this analysis, this chapter serves as a baseline from which any environmental changes brought about by implementing the alternatives can be evaluated.

For this *Revised Draft Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center (Decommissioning and/or Long-Term Stewardship EIS)*, each resource area is described that may be particularly affected by the Proposed Action and alternatives. The level of detail varies depending on the potential for impacts resulting from each alternative. A number of site-specific and recent project-specific documents are important sources of information in describing the existing environment at WNYNSC and from which information is summarized and/or incorporated by reference. Numerous other sources of site- and resource-related data were also used in the preparation of this chapter and are cited as appropriate.

The U.S. Department of Energy (DOE) evaluated the environmental impacts of the alternatives within defined regions of influence (ROIs) and along potential transportation routes. The ROIs are specific to the type of effect evaluated, and encompass geographic areas within which impacts may occur. For example, human health risks to the general public from exposure to hazardous and radionuclide airborne contaminant emissions were assessed for an area within an 80-kilometer (50-mile) radius of the WNYNSC. The human health risks from shipping materials were evaluated for populations living along certain transportation routes. Economic effects such as job and income changes were evaluated within a socioeconomic ROI that includes the county in which the WNYNSC is located and nearby counties in which substantial portions of the site's workforce reside. **Table 3–1** summarizes the affected environment resource areas and associated ROIs.

Site Facilities

Chapter 1 contains a general description of the Project Premises. The Project Premises and State-licensed Disposal Area (SDA) are shown in **Figure 3–1**. The Project Premises within the greater WNYNSC are shown in **Figure 3–2**.

Table 3–1 General Regions of Influence by Resource Area

–	*Affected Environment*	*Region of Influence*
Land use and visual resources	Land ownership information, land-use practices, policies, and controls, and viewsheds of the site and surrounding region	WNYNSC and nearby offsite areas within Cattaraugus and Erie Counties
Site infrastructure	The utilities that service the site including electricity, fuel, water, sewage treatment, and roadways	WNYNSC and nearby offsite areas in Cattaraugus and Erie Counties
Geology, geomorphology, seismology, and soils	Geologic and soil characteristics, mineral and energy resources, soil contamination, site erosion processes, and geologic hazards including seismic activity and history	WNYNSC and nearby offsite areas to include regional seismic sources
Water resources	Surface water features and watersheds, groundwater hydrology, water supply sources, and surface and groundwater quality including contaminant sources	WNYNSC and downstream surface water bodies and groundwater
Meteorology, air quality, and noise	Meteorological conditions (i.e., temperature, precipitation, severe weather), air pollutant concentrations and emissions, site and surrounding noise sources	Meteorology: WNYNSC and the Western New York region. Air Quality: WNYNSC and nearby offsite areas within local air quality control regions (nonradiological emissions) Noise: Nearby offsite areas, access routes to the site
Ecological resources	Plants and animals, habitat types and assemblages including terrestrial resources, wetlands, aquatic resources, and threatened and endangered species or special status species	WNYNSC and nearby offsite areas
Cultural resources	Historical and archaeological resources and American Indian concerns	WNYNSC and nearby offsite areas within a 146-hectare (360-acre) area, Seneca Nation of Indians
Socioeconomics	The regional population, housing, public services (i.e., safety, health, education), and local transportation facilities and services	Cattaraugus and Erie Counties – income, housing/public services 80-kilometer (50-mile) and 480-kilometer (300-mile) radius – population distribution
Human health and safety	The health of site workers and the public	WNYNSC, offsite areas within 80 kilometers (50 miles) of the site (radiological air emissions); and the transportation corridors where worker and general population radiation, radionuclide, and hazardous chemical exposures could occur
Environmental justice	The presence of minority and low-income populations	The minority and low-income populations within 80 kilometers (50 miles) of the WNYNSC
Waste management and pollution prevention	Hazardous and nonhazardous solid waste and wastewater generation and management infrastructure practices	WNYNSC

Affected Environment = describes the baseline conditions of the environment, *Region of Influence* = the geographic region evaluated by the Proposed Action or alternatives.

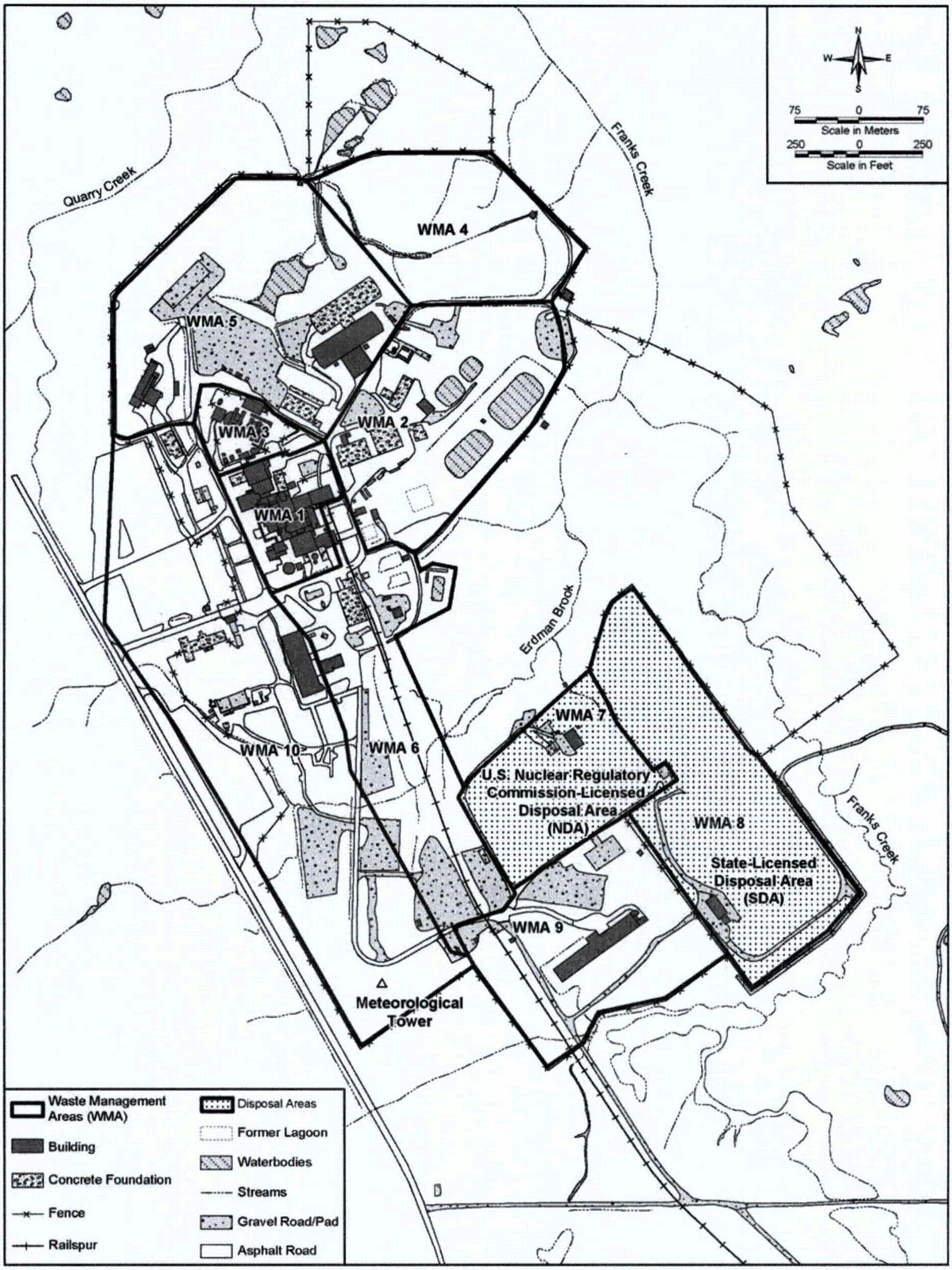


Figure 3–1 The West Valley Demonstration Project Premises (including the NRC-licensed Disposal Area) and the State-licensed Disposal Area

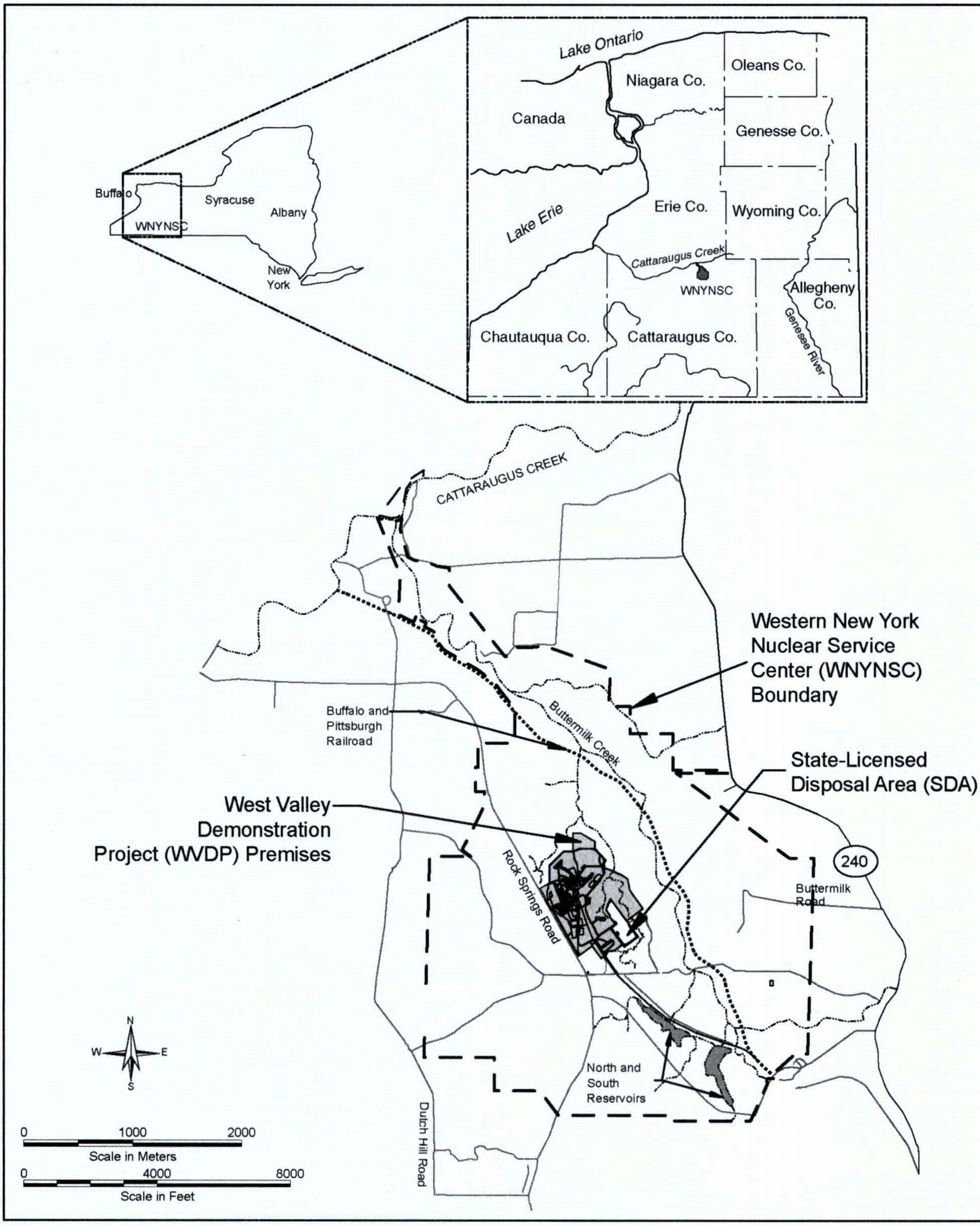


Figure 3–2 The Western New York Nuclear Service Center

Baseline conditions for each environmental resource area were determined for ongoing operations from information provided in previous environmental studies, relevant laws and regulations, and other Government reports and databases. More detailed information on the affected environment at the WNYNSC can be found in annual site environmental reports.

3.1 Land Use and Visual Resources

3.1.1 Land Use

The WNYNSC is on a 1,352-hectare (3,340-acre) site located near the hamlet of West Valley in the town of Ashford, New York, and was acquired by the State of New York in 1961. The property was leased to Nuclear Fuel Services, Inc. (NFS), who developed 67.6 hectares (167 acres) of the land and operated a nuclear fuel reprocessing center there from 1966 to 1972. NFS processed 640 metric tons (705 tons) of spent fuel at its West Valley reprocessing facility from 1966 to 1972 under an Atomic Energy Commission license. Fuel reprocessing ended in 1972 when the plant was shut down for modifications to increase its capacity, and reduce occupational radiation exposure and radioactive effluents. By 1976, NFS judged that over $600 million would be required to modify the facility. Later that year, NFS withdrew from the reprocessing business and requested to return control of the facilities to the site owner, New York State Energy Research and Development Authority (NYSERDA) (DOE 1978). In 1982, DOE assumed control, but not ownership, of the 67.6-hectare (167-acre) Project Premises portion of the site, as required by the 1980 WVDP Act. DOE provides general surveillance and security services for the entire WNYNSC (DOE 1996a, 2003e).

Major land uses in Cattaraugus County include: residential (29.3 percent); wild, forested, conservation lands, and public parks (22.8 percent); vacant land (22.4 percent); and agriculture (19.2 percent). The remaining 6.3 percent of the land within the county is classified as community services, recreation and entertainment, public services, industrial, commercial, or unknown (Crawford 2008). Land use within 8 kilometers (5 miles) of the WNYNSC is predominantly agricultural and the setting includes cropland, pasture, woodlands, natural areas, ponds, and house lots. The major exception is the Village of Springville, which comprises residential/commercial, and industrial land use (DOE 2003e). The Hamlet of West Valley is primarily characterized by residential and commercial land uses. The residential land uses are generally rural in nature (WVNS 2006).

Agricultural land uses are concentrated in the northern region of Cattaraugus County because the landscape is more favorable for agricultural practices (Paoletta 2003). Urban land use increases north of the WNYNSC toward Buffalo and west along the Lake Erie shoreline. Recreational land use increases to the south toward Allegany State Park and west toward Lake Erie. The section of Cattaraugus Creek that is downstream of the WNYNSC is primarily used for recreational purposes; however, some water is used for irrigation purposes (WVNS and URS 2006).

Light industrial and commercial (either retail or service-oriented) land use occurs near the WNYNSC. A field review of an 8-kilometer (5-mile) radius did not indicate the presence of any industrial facilities that would present a hazard in terms of safe operation of the site (DOE 2003e, WVNS 2006). A small military research installation is located approximately 5 kilometers (3 miles) northeast of the Project Premises. The facility, operated by Calspan Corporation, is used to conduct research operations for the U.S. Department of Defense. Although the facility uses small amounts of hazardous materials, it does not produce any products of a hazardous nature (DOE 2003e).

A similar land-use field review of the Village of Springville and the Town of Concord did not indicate the presence of any significant industrial facilities. Industrial facilities near the WNYNSC include Winsmith-Peerless Winsmith, Inc., a gear reducer manufacturing facility; Wayne Concrete Co., Inc., a readi-mix concrete supplier and concrete equipment manufacturing facility; and Springville Manufacturing, a fabricating facility for air cylinders. The industries within the Village of Springville and the Town of Concord, Erie County, are located in a valley approximately 6.4 kilometers (4 miles) to the north and 11.3 kilometers (7 miles) to the northwest, respectively, of the WNYNSC (DOE 2003e).

The Southern Tier West Regional Planning and Development Board, a regional planning board that includes Cattaraugus County, has issued its *2004 Regional Development Strategy* (Southern Tier West 2004). The objectives of the document include identifying an economic development strategy for the region, recommending implementation strategies, ensuring coordinated development, identifying the need to improve public facilities and utilities, facilitating economic development, and supporting Cattaraugus County corridor economic development and land use planning along U.S. Route 219 and NY Route 16 in the vicinity of the WNYNSC.

Most of the land use data for the region dates back to the late 1960s and 1970s, when many of the region's land use plans were developed. There have been no significant changes in these land use patterns since the development of this information. Minor changes include a decrease in active agricultural land acreage, an increase in maturing forest acreage, and an increase in the number of acreage lots (Southern Tier West 2004). In Cattaraugus County, use of agricultural land is expected to remain relatively unchanged. Residential growth near the WNYNSC is expected to continue in the towns of Yorkshire, Machias, and Ashford. Other towns near the WNYNSC are expected to remain rural for the foreseeable future. Commercial land use is expected to remain in the commercial centers of the county's villages, towns, and cities. Industrial land use is expected to increase in Yorkshire Township (northeast Cattaraugus County). Recreation on the Allegheny River, approximately 32 kilometers (20 miles) south of the WNYNSC, is also expected to increase.

Construction improvements to U.S. Route 219 will promote development and expansion by increasing the area's accessibility to major markets and transportation networks (Cattaraugus 2006a, 2007). Increased development is expected to occur in Ellicottville and Erie County (Cattaraugus 2007). A proposed Business Park will be located on an estimated 30 to 40 hectares (75 to 100 acres) of land within the Village of Ellicottville (Cattaraugus 2006b). The proposed Ashford Education and Business Park is located next to the Ashford Office Complex and would require approximately 8 hectares (20 acres) of land (Cattaraugus 2006a). A Railyard Industrial Park is planned at a site that previously served as a railyard in the Town of Great Valley. This park will support warehouse, industrial, distribution, intermodal, office, and research uses and facilities (Cattaraugus 2006c).

Growth in areas surrounding Ellicottville is partially due to the increased demand for tourism and recreation-related infrastructure (Southern Tier West 2006). Ski areas, including Holiday Valley and HoliMont, contribute to Ellicottville's development as a tourist destination (Cattaraugus 2006b). Proposed projects to develop tourism in Ellicottville include a tourist information center, an interpretive center, a performing arts center, and studio and shopping space that are estimated to total 32 to 40 hectares (80 to 100 acres). Tourism development will be concentrated in the central business district to limit sprawl in outlying areas (Cattaraugus 2006d). In the surrounding area, the Seneca Allegany Casino and Hotel in Salamanca was completed in March 2007 and includes a casino and a 212-room hotel (Seneca Gaming Corporation 2008).

The Zoar Valley Multiple Use Area located in the Towns of Collins, Persia, and Otto includes three areas that total 1,183 hectares (2,923 acres). The *2006 Draft Unit Management Plan* contains a proposal to designate a "protection area" that would encompass the Cattaraugus Creek gorge and nearby trails along the gorge and the banks of the Cattaraugus Creek's South Branch (NYSDEC 2006d).

3.1.2 Visual Environment

The WNYNSC is located in the northwest-southeast trending valley of Buttermilk Creek and consists mainly of fields, forests, and the ravines of several tributaries to Buttermilk Creek. The WNYNSC is in a rural setting surrounded by farms, vacant land, and single homes. From distant northern hilltops, the site appears primarily as hardwood forest and would be indistinguishable from the surrounding countryside if the Main Plant Process Building and main stack were not visible. From that distance, the Main Plant Process Building resembles a factory building or power plant. Several public roads pass through the WNYNSC, including Rock Springs Road, Buttermilk Road, and Thomas Corners Road. The site boundary is marked along the roadsides by a barbed wire fence with regularly spaced "POSTED" signs. Passers-by mainly see hardwood and hemlock forests, overgrown former farm fields, the southern end of the south reservoir bordered by pine trees, and wet low areas.

The WNYNSC facilities are predominantly located on plateaus occurring between Dutch Hill and Buttermilk Creek. The surrounding topography and forested areas obstruct views of the site areas from roadways; however, most of the facilities can be seen from hilltops along Route 240 (east of the WNYNSC). The WNYNSC is generally shielded from Rock Springs Road by pine trees, but can be seen from Rock Springs Road and Thornwood Drive when approaching from the south. Facilities including the Main Plant Process Building and stack, a warehouse, a large white tent-like lag storage area, the Remote-Handled Waste Facility, and other smaller structures, resemble an industrial complex. Two large paved parking lots are located outside the barbed wire-topped chain link security fence. Disposal areas include the SDA and NRC-licensed Disposal Area (NDA). The SDA has a geomembrane cover and is sloped to provide drainage, and the NDA is a maintained, grassed area. DOE installed a geomembrane cover over the NDA in 2008. Security lights illuminate the entire Project Premises at night. The developed portion of the site is consistent with the Bureau of Land Management's Visual Resource Management Class IV rating, where major modifications to the natural landscape have occurred. The balance of the site's viewshed generally ranges from Visual Resource Management Class II to Class III, where visible changes to the natural landscape are low to moderate but may attract the attention of the casual observer (DOI 1986).

3.2 Site Infrastructure

Site infrastructure includes those utilities required to support the operations of the WNYNSC and local transportation infrastructure, as summarized in **Table 3–2.**

Table 3–2 Western New York Nuclear Service Center Sitewide Infrastructure Characteristics

Resource	*Site Usage*	*Site Capacity*
Electricity		
Energy consumption (megawatt-hours per year)	15,860	105,120
Peak load (megawatts)	2.2 [a]	12
Fuel		
Natural gas (cubic meters per year)	2,170,000	27,300,000 [b]
Fuel oil (liters per year)	26,500	38,000 [c]
Water (liters per year)	153,000,000	795,000,000
Sanitary Sewage Treatment (liters per day)	–	151,000
U.S. Route 219 near WVDP	–	Level of Service D

[a] Peak load estimated from average sitewide electrical energy usage, assuming peak load is 120 percent of average demand.
[b] Calculated from installed capacity and may not reflect sustainable supply.
[c] Reflects onsite bulk storage only. Capacity is only limited by the ability to ship resources to the site.
Note: To convert liters to gallons, multiply by 0.264; and cubic meters to cubic feet, by 35.315.
Sources: Steiner 2006, WVNS 2004a.

3.2.1 Electricity

Electrical power is transmitted to the WNYNSC via the Niagara Mohawk (now owned by National Grid USA) distribution system (WVNS 2006). For the Project Premises, electricity is purchased through the Defense Energy Support Center (Steiner 2006). Power for the Project Premises is supplied via a 34.5-kilovolt-loop system. A feeder line from a 34.5-kilovolt switching station transmits power to the site substations where it is stepped down to 480 volts. Electricity from the 34.5-kilovolt-line is routed to two 2,500-kilowatt-ampere transformers at the Main Plant Process Building and Utility Room Expansion in Waste Management Area (WMA) 1. The substation switchgears are interconnected through cables to provide backfeed capabilities in the event that any 34.5-kilovolt to 480-volt substation transformer fails (WVNS 2006).

The reservoir pumps that supply water to the Radwaste Treatment System Drum Cell (WMA 9), the Remote-Handled Waste Facility in WMA 5, the NDA facilities, and the site perimeter monitoring stations obtain power from a separate 4,800-volt to 480-volt rural distribution system (WVNS 2006).

Backup electrical power is supplied by three standby (backup) diesel-fired generators with diesel fuel provided from onsite storage tanks. The generators include a 625-kilovolt-ampere unit located in the Utility Room (WMA 1), a 1,560-kilovolt-ampere unit located in the Utility Room Expansion (WMA 1), and a 750-kilovolt-ampere generator located in the Permanent Ventilation System Building mechanical room (WMA 3). In the event of failure of the main power supply, all of the diesel generators will initiate automatically and then the associated switchgears will disconnect the utility line and noncritical loads and supply power to essential systems. Day-tank storage capacity is sufficient for each generator to operate continuously for 8 hours (WVNS 2006).

Between April 2005 to March 2006, electrical energy consumption was 15,860 megawatt-hours (Steiner 2006). This consumption reflects an average load demand of about 1.8 megawatts. The WNYNSC substations have a combined, installed capacity of 12 megawatts, which is equivalent to a site electrical energy availability of about 105,120 megawatt-hours annually. Electricity consumption is expected to decrease as buildings continue to be decommissioned (Steiner 2008).

3.2.2 Fuel

The National Fuel Company provides natural gas, the primary fuel used by WNYNSC facilities, to the WNYNSC, through a 15-centimeter- (6-inch-) supply line. The supply is pressure regulated and metered at the Utility Room. Natural gas is distributed from the Utility Room to onsite areas for heating purposes and is regulated at the points of use. Natural gas is not routed through areas that contain or historically contained radioactive materials. A major use of natural gas is by two natural gas steam boilers housed in the Utility Room Expansion. The boilers can also use number 2 diesel fuel oil. However, cessation of nuclear fuel reprocessing operations resulted in a major reduction in steam usage and associated natural gas demand (WVNS 2006).

Natural gas consumption totaled approximately 2.17 million cubic meters (76.8 million cubic feet) in 2005. Natural gas consumption has historically averaged about 2.8 million cubic meters (100 million cubic feet) annually (Steiner 2006). The natural gas distribution system serving site facilities has an installed capacity of about 3,110 cubic meters (110,000 cubic feet) per hour or approximately 27.3 million cubic meters (964 million cubic feet) annually (WVNS 2006).

Number 2 diesel fuel oil (fuel oil) is also used to operate the backup generators and to run forklifts (Steiner 2006). In addition to day tanks at each generator, the bulk of the fuel is stored in a 38,000-liter (10,000-gallon) aboveground storage tank (Steiner 2008, WVNS 2006). In 2005, approximately 26,500 liters (7,000 gallons) of fuel oil was consumed at the site (Steiner 2006). Fuel use is expected to be smaller in the future (Steiner 2008).

3.2.3 Water

The WNYNSC has its own reservoir and water treatment system to service the site. The system provides potable and facility service water for operating systems and fire protection. The reservoir system was created by constructing dams on Buttermilk Creek tributaries south of the Project Site. The reservoirs provide the raw water source for the non-community, nontransient water supply operated on site (DOE 2003e). Specifically, the two interconnected reservoirs (North and South Reservoirs) cover about 10 hectares (25 acres) of land and contain approximately 2.1 billion liters (560 million gallons) of water (see Figure 3–2). A pump house located adjacent to the North Reservoir with dual 1,500-liters-per-minute (400-gallons-per-minute) rated pumps supplies water to the Project Premises through a 20-centimeter (8-inch) pipeline. A clarifier/filter system in WMA 1 provides treatment for incoming raw water, prior to transfer into a 1.8-million-liter (475,000-gallon) storage tank. An electric pump with a diesel backup is used to pump water from the storage tank through underground mains to the plant or utility system. Water pressure is furnished by two 950-liter-per-minute (250-gallon-per-minute) pumps that supply water at a minimum pressure of 520 kilopascals (75 pounds per square inch). The utility provides makeup water for the cooling operations and other subsystems and directly feeds the fire protection system (WVNS 2006).

Water for the domestic (potable) system is drawn on demand from the utility water and is further chlorinated using sodium hypochlorite, with the treated water stored in a 3,800-liter (1,000-gallon) accumulator tank for distribution. Demineralized water can be produced in the Utility Room (WMA 1) via a cation-anion demineralizer. The demineralized water system will normally produce 60-liters per minute (16 gallons per minute) of demineralized water that is stored in a 68,000-liter (18,000-gallon) storage tank. Three pumps are available to distribute demineralized water to chemical process areas within the WVDP (WVNS 2006).

The raw water supply system has an installed capacity of approximately 1,510 liters per minute (400 gallons per minute) or approximately 795 million liters (210 million gallons) annually (WVNS 2004a). Water use across the WNYNSC has averaged roughly 153 million liters (40.3 million gallons) annually (Steiner 2006). This estimate is based on the average demands for the site's workforce and industrial demands for systems still in operation. Annual water use may be reduced in the future due to ongoing decommissioning activities (Steiner 2008).

3.2.4 Sanitary Sewer

The Sewage Treatment Plant (WMA 6) treats sanitary sewage and nonradioactive industrial wastewater from the Utility Room. The treatment system consists of a 151,000-liter-per-day (40,000-gallon-per-day) extended aeration system with sludge handling (WVNS 2004a).

There are no entry points into the sewage system other than the toilet facilities, washroom, kitchen sinks, and shower facilities. No process area or office building floor drains are connected to the sanitary sewer system other than the floor drains in the facility shower rooms and lavatory facilities (WVNS 2004a).

Industrial wastewater from the Utility Room enters the system through dedicated pipes, tanks, and pumps. The wastewater is collected and pumped into the Sewage Treatment Plant, where it is mixed with sanitary sewage and treated. Entries to the system are through dedicated lines from the Utility Room water treatment equipment, boilers, and floor drains in the Utility Room Expansion. Liquid discharge is to one of four outfalls where liquid effluents are released to Erdman Brook. These four outfalls are identified in the State Pollutant Discharge Elimination System permit, which specifies the sampling and analytical requirements for each outfall (WVNS 2004a).

3.2.5 Local Transportation

Transportation facilities near the WNYNSC include highways, rural roads, a rail line, and aviation facilities. The primary method of transportation in the site vicinity is by motor vehicle on the local roads (see **Figure 3–3**).

The majority of the roads in Cattaraugus County, with the exception of those within the cities of Olean and Salamanca, are considered rural roads. Rural principal arterial highways are connectors of population and industrial centers. This category includes U.S. Route 219, located about 4.2 kilometers (2.6 miles) west of the site; Interstate 86, the Southern Tier Expressway located about 35 kilometers (22 miles) south of the site; and the New York State Thruway (I-90), about 56 kilometers (35 miles) north of the site. U.S. Route 219 exists as a freeway from its intersection with Interstate 90 near Buffalo, New York, to its intersection with Route 39 at Springville, New York; but exists as a 2-lane road from Springville to Salamanca, New York. Traffic volume along U.S. Route 219 between Springville and the intersection with Cattaraugus County Route 12 (East Otto Road) ranges from an average annual daily traffic volume of approximately 8,900 vehicles near Ashford Hollow to approximately 9,700 vehicles at Route 39 near Springville (NYSDOT 2006). This route, as it passes the site, operates at a level of service D, which reflects high density and unstable flow, an operating speed of 80 kilometers (50 miles) per hour, and maneuverability being limited for short periods during temporary backups (USDOT and NYSDOT 2003b).

Rock Springs Road, adjacent to the site on the west, serves as the principal site access road. The portion of this road between Edies Road and U.S. 219 is known as Schwartz Road. Along this road, between the site and the intersection of U.S. 219, are fewer than 21 residences. State Route 240, also identified as County Route 32, is 2 kilometers (1.2 miles) northeast of the site. Average annual daily traffic on the portion of NY Route 240 that is near the site (between County Route 16, Roszyk Hill Road, and NY Route 39) ranges from 880 vehicles to 1,550 vehicles (NYSDOT 2006).

One major road improvement project could impact access to the WNYNSC. In January of 2007, the New York State Department of Transportation started construction to extend the U.S. Route 219 freeway at NY Route 39 in Springville to Interstate 86 in Salamanca. Near West Valley, the new freeway will be located only 0.2 to 0.4 kilometers (0.1 to 0.25 miles) from the existing U.S. Route 219, which will be retained. Completion of a 6.8-kilometer (4.2-mile) extension from Route 39 to Peters Road in Ashford, New York (southwest of WNYNSC), is expected in Summer 2009 (NYSDOT 2008a). An interchange at Peters Road in Ashford will accommodate employees living north of the site (NYSDOT 2003). Continued expansion to I-86 in Salamanca will not proceed until an agreement is reached with the Seneca Nation or additional environmental studies have been completed (NYSDOT 2005).

The Buffalo and Pittsburgh Railroad line is located within 800 meters (2,600 feet) of the site. Owned and operated by Genesee and Wyoming Inc., the Buffalo and Pittsburgh Railroad is part of an integrated regional rail operation which includes Rochester and Southern Railroad and the South Buffalo Railway. Together they have direct connections to both major U.S. railroads that service the east (CSX Transportation and Norfolk Southern) as well as both of Canada's transcontinental railroads (Canadian National and Canadian Pacific). Major types of freight include coal, petroleum, metals and forest products (G&W 2008). In 1999, the Buffalo and Pittsburgh Railroad completed connection of track between Ashford Junction and Machias, New York. Service by the Buffalo and Pittsburgh Railroad on the rail line from the WVDP Premises to Ashford Junction and then to Machias now provides the WNYNSC with rail access (DOE 2003e).

There are no commercial airports in the site vicinity. The only major aviation facility in Cattaraugus County is the Olean Municipal Airport, located in the Town of Ischua, 34 kilometers (21 miles) southeast of the WNYNSC. Regularly scheduled commercial air service was terminated at this airport in early 1972. The nearest major airport is Buffalo Niagara International Airport, 55 kilometers (34 miles) north of the site (DOE 2003e).

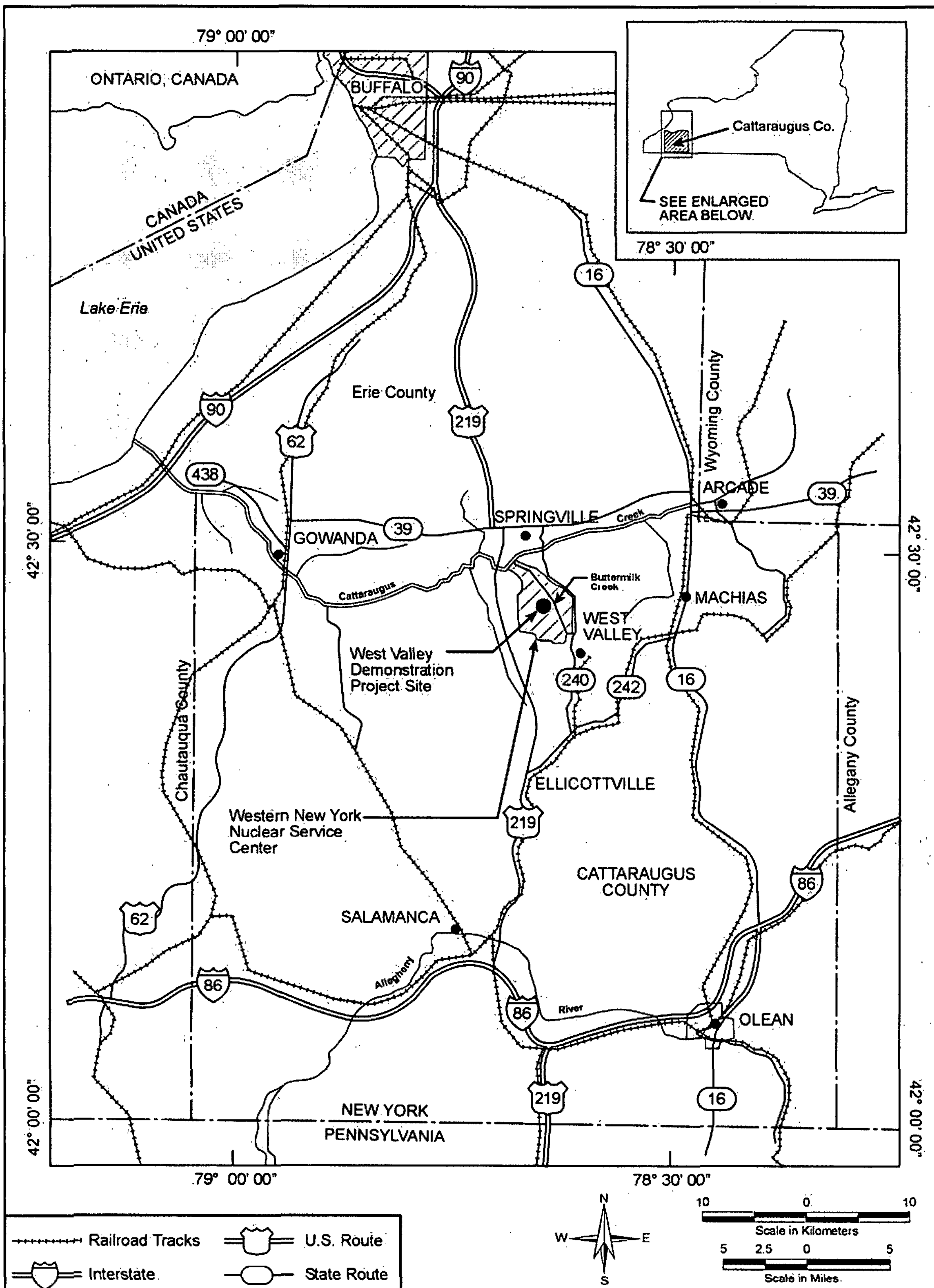


Figure 3–3 Transportation Routes Near the Western New York Nuclear Service Center

3.3 Geology and Soils

The geologic conditions including physiographic location, surface topography, glacial lithology and stratigraphy, and bedrock conditions underlying and surrounding the WNYNSC and the WVDP Premises are described in the following sections.

3.3.1 Geology

Geologic unit descriptions and origins were obtained from Prudic (1986) as modified by WVNS (1993f, 1993d). The thickness of stratigraphic units was obtained from lithologic logs of borings drilled in 1989, 1990, and 1993 (WVNS 1993h, 1994a); Well 905 (WVNS 1993d); and Well 834E (WVNS 1993f).

3.3.1.1 Glacial Geology and Stratigraphy

The WNYNSC is located within the glaciated northern portion of the Appalachian Plateau physiographic province (**Figure 3–4**). The surface topography is dominated by Buttermilk Creek and its tributaries which are incised into bedrock and the surrounding glaciated upland topography. The maximum elevation on the WNYNSC occurs at the southwest corner of the facility at an elevation of 568 meters (1,862 feet) above mean sea level. The minimum elevation of 338 meters (1,109 feet) above mean sea level occurs near the confluence of Buttermilk Creek and Cattaraugus Creek on the floodplain at the northern extent of the facility. The average elevation across the WNYNSC is 435 meters (1,426 feet) with a modal elevation of 423 meters (1,387 feet) above mean sea level (URS 2008a). The facility is approximately midway between the boundary line delineating the southernmost extension of Wisconsin Glaciation and a stream-dissected escarpment to the north that marks the boundary between the Appalachian Plateau and the Interior Low Plateau Province. The Appalachian Plateau is characterized by hills and valleys of low to moderate relief between the Erie-Ontario Lowlands to the north and the Appalachian Mountains to the south (WVNS 1993f).

The Project Premises are located on a stream-disected till plain that occurs west of Buttermilk Creek and east of the glaciated upland. Surface topography on the Project Premises declines from a maximum elevation of 441 meters (1,447 feet) in the main parking lot to 398 meters (1,305 feet) near the confluence of Franks Creek and Erdman Brook with an average elevation of 423 meters (1,389 feet) above mean sea level. Erdman Brook separates the Project Premises into North and South Plateau areas (WVNS 1993f). The confluence of Franks Creek and Erdman Brook delineates an eastern plateau area that is contiguous with the South Plateau. The surface topography east of the Project Premises declines to approximately 366 meters (1,200 feet) within the Buttermilk Creek Valley (**Figure 3–5**).

The WNYNSC is located on the west flank of the Buttermilk Creek Valley which is part of a longer steep-sided, northwest-trending U-shaped valley that has been incised into the underlying Devonian bedrock. A 150 meters (500 feet) thick sequence of Pleistocene age deposits and overlying Holocene (recent age) sediments occupies the valley. Repeated glaciation of the ancestral bedrock valley occurred between 14,500 and 38,000 years ago resulting in the deposition of three glacial tills (Lavery, Kent, and Olean tills) that comprise the majority of the valley fill deposits (WVNS 1993f, WVNS and URS 2005). The uppermost Lavery till and younger surficial deposits form a till plain with elevation ranging from 490 meters to 400 meters (1,600 to 1,300 feet) from south to north covering 25 percent of the Buttermilk Creek basin. The WVDP Premises and the SDA are located on the stream-dissected till plain west of Buttermilk Creek. The Holocene sediments were primarily deposited as alluvial fans and aprons that were derived from the glacial sediments that covered the uplands surrounding the WNYNSC and from floodplain deposits derived from the Pleistocene tills (WVNS 1993f, 2006).

Figure 3–4 Regional Physiographic Map

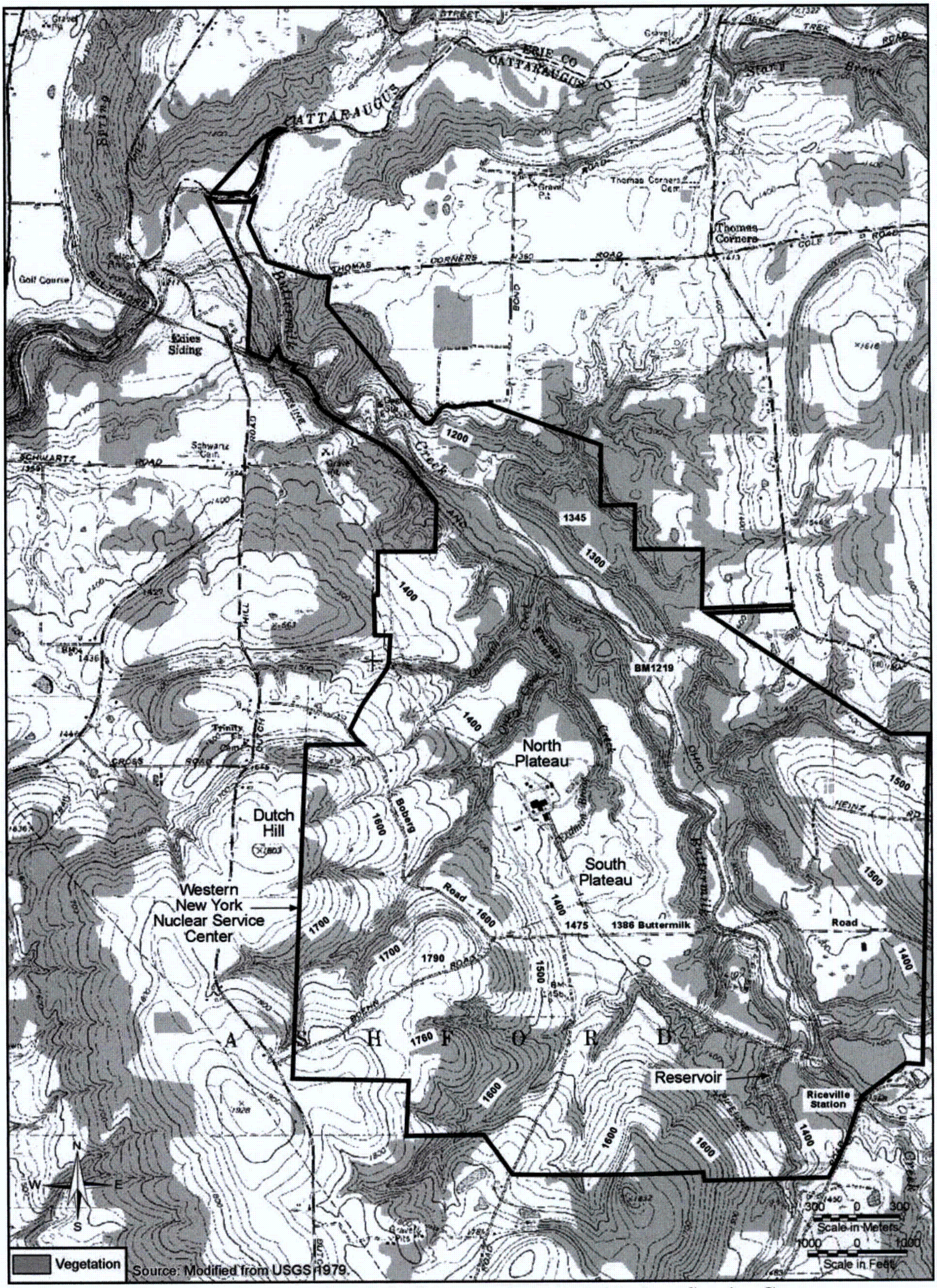


Figure 3–5 Topography of the Western New York Nuclear Service Center

The stratigraphy underlying the North and South Plateaus exhibits key differences as summarized in **Table 3–3** and shown in the generalized cross-sections in **Figures 3–6** and **3–7**, respectively. The surficial geology on the Project Premises and the SDA is shown in **Figure 3–8**. Additional information on the hydrogeologic characteristics of the site stratigraphy is provided in Section 3.6.2 and Appendix E.

Table 3–3 Stratigraphy of the West Valley Demonstration Project Premises and the State-licensed Disposal Area [a]

Geologic Unit	*Description*	*Origin*	*Thickness [b]*	
			North Plateau (meters)	*South Plateau (meters)*
Colluvium	Soft plastic pebbly silt only on slopes, includes slump blocks several meters thick	Reworked Lavery or Kent till	0.3 to 0.9	0.3 to 0.9
Thick-bedded unit	Sand and gravel, moderately silty	Alluvial fan and terrace deposits	0 to 12.5	0 to 1.5 at Well 905[c]; not found at other locations
Slack-water sequence	Thin-bedded sequence of clays; silts, sands, and fine-grained gravel at base of sand and gravel layer	Lake deposits	0 to 4.6	Not present
Weathered Lavery till	Fractured and moderately porous till, primarily comprised of clay and silt	Weathered glacial ice deposits	0 to 2.7 (commonly absent)	0.9 to 4.9, average = 3
Unweathered Lavery till	Dense, compact, and slightly porous clayey and silty till with some discontinuous sand lenses	Glacial ice deposits	1 to 31.1 Lavery till thins west of the Project Premises	4.3 to 27.4 Lavery till thins west of the Project Premises
Till-sand member of Lavery till	Thick and laterally extensive fine to coarse sand within Lavery till	Possible meltwater or lake deposits	0.1 to 4.9	May be present in one well near northeast corner of the NDA
Kent Recessional Sequence	Gravel comprised of pebbles, small cobbles, and sand, and clay and clay-silt rhythmic layers overlying the Kent till	Proglacial lake, deltaic, and alluvial stream deposits	0 to 21.3	0 to 13.4
Kent till, Olean Recessional Sequence, Olean till	Kent and Olean tills are Clayey and silty till similar to Lavery till. Olean Recessional Sequence predominantly clay, clayey silt, and silt in rhythmic layers similar to the Kent recessional sequence overlying the Olean till	Mostly glacial ice deposits	0 to 91.4	0 to 101
Upper Devonian bedrock	Shale and siltstone, weathered at top	Marine sediments	> 402	> 402

[a] Source: Geologic unit descriptions and origins from Prudic (1986) as modified by WVNS (1993f, 1993d). Thickness from lithologic logs of borings drilled in 1989, 1990, and 1993 (WVNS 1993h, 1994a); from Well 905 (WVNS 1993d); and from Well 834E (WVNS 1993f). Kent and Olean till thickness from difference between bedrock elevation (based on seismic data) and projected base of Kent recessional sequence (WVNS 1993f); upper Devonian bedrock thickness from Well 69 U.S. Geological Survey 1-5 located in the southwest section of the WNYNSC (WVNS 1993f).

[b] To convert meters to feet, multiply by 3.2808.

[c] Coarse sandy material was encountered in this well. It is unknown whether this deposit is equivalent to the sand and gravel layer on the North Plateau.

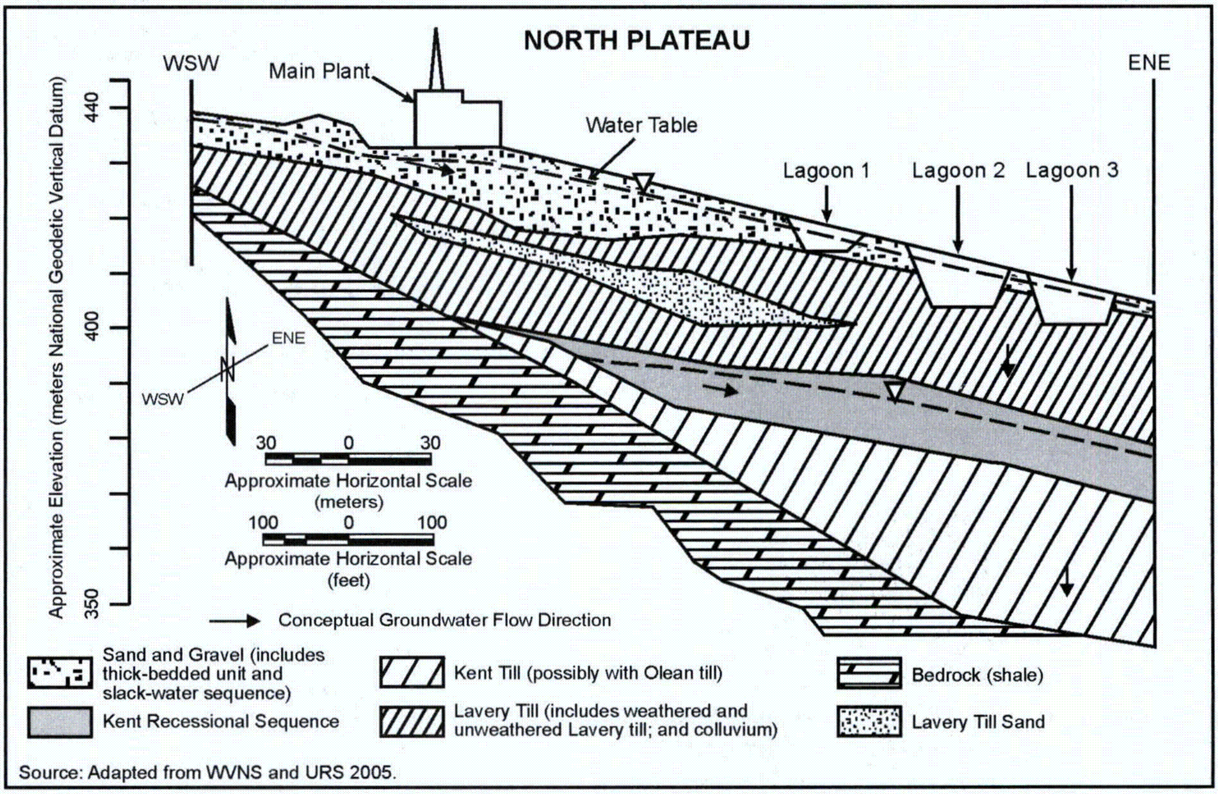


Figure 3–6 Generalized Geologic Cross-section through the North Plateau, and Colluvium (Vertical Exaggeration Approximately 2:1)

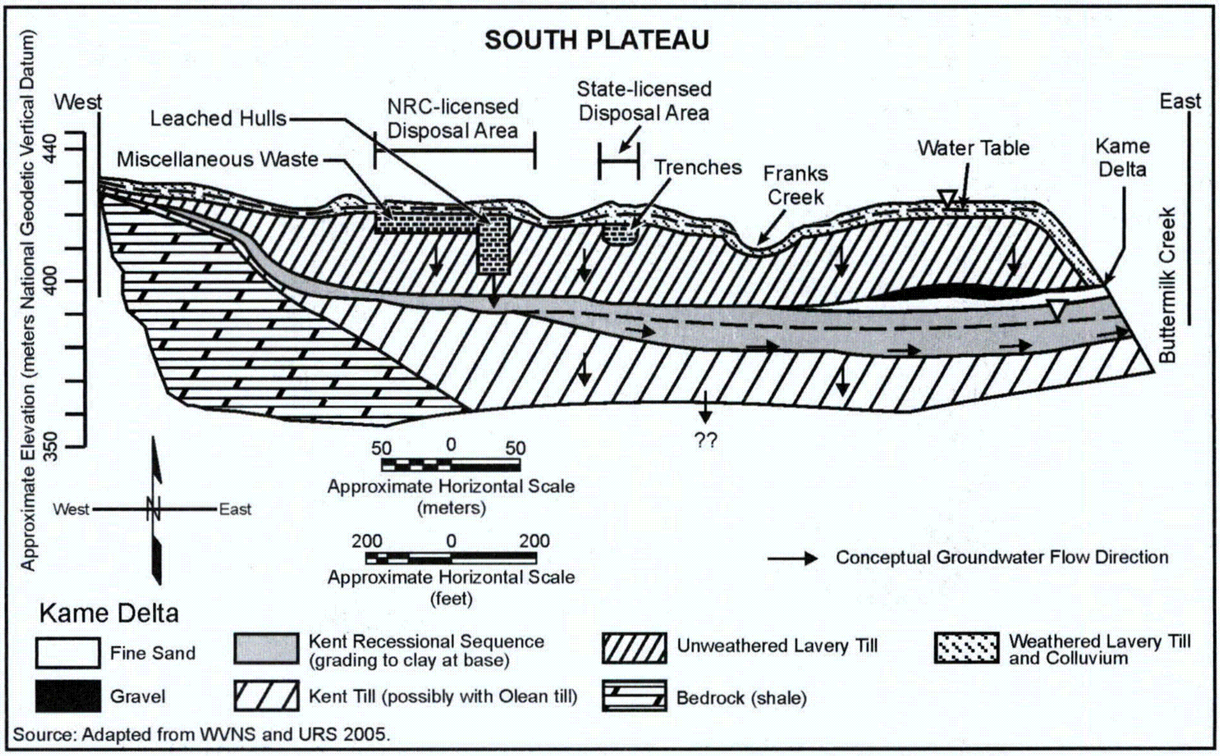
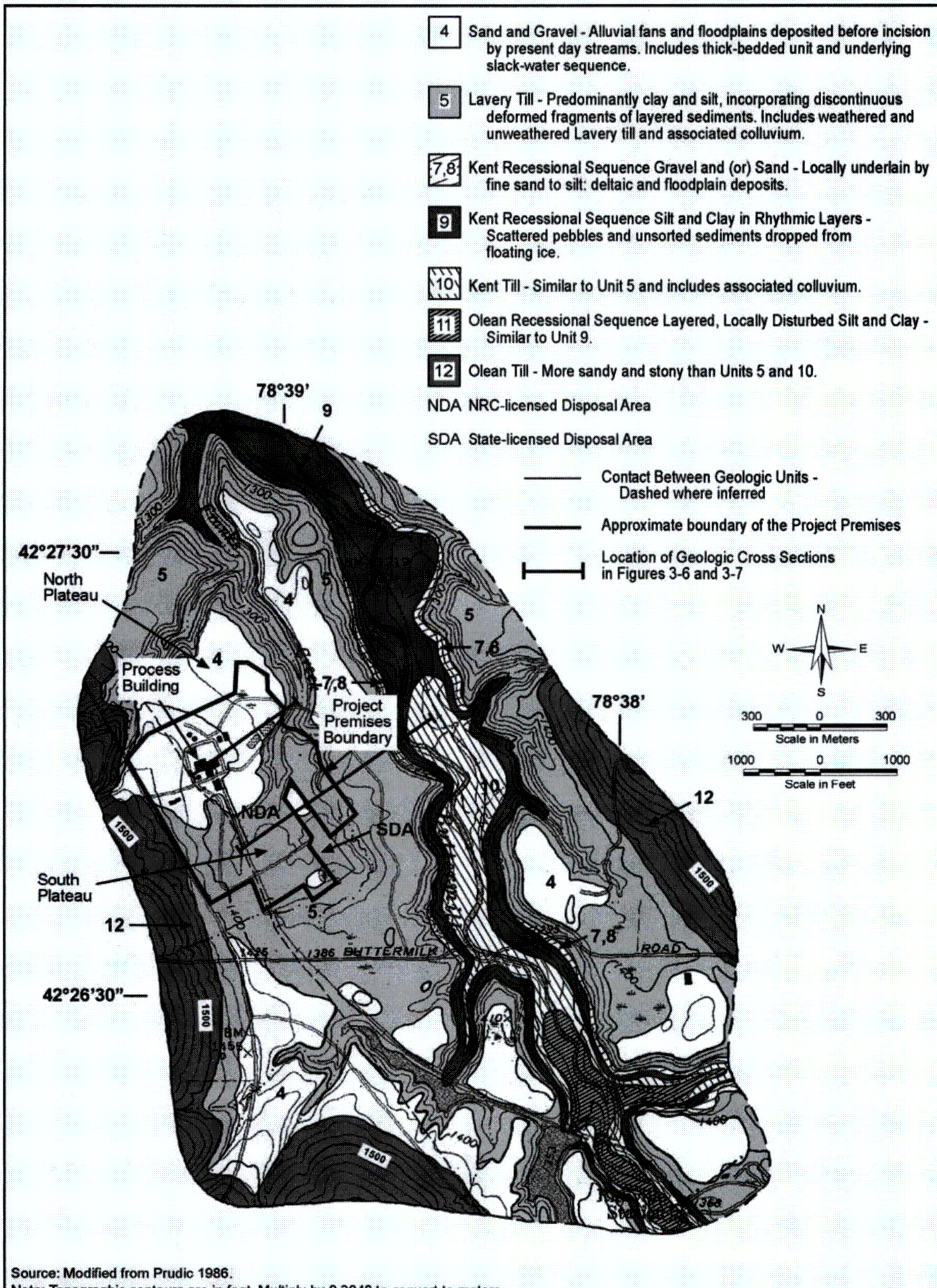


Figure 3–7 Generalized Geologic Cross-section through the South Plateau (Vertical Exaggeration Approximately 2.5:1)



Source: Modified from Prudic 1986.
Note: Topographic contours are in feet. Multiply by 0.3048 to convert to meters.

Figure 3–8 Topography and Surface Geology at the West Valley Demonstration Project Site and Vicinity

North Plateau

Surficial Units (Colluvium, Thick-bedded Unit, and Slack-water Sequence)—The surficial sand and gravel consists of an upper alluvial deposit, the thick-bedded unit, and a lower glaciofluvial gravel deposit, the slack-water sequence (**Figures 3–9** and **3–10**). The thick-bedded unit, the thicker and more extensive of the coarse deposits, is an alluvial fan that was deposited by Holocene streams entering the Buttermilk Creek Valley. The alluvial fan overlies the Lavery till over the majority of the North Plateau and directly overlaps the Pleistocene-age glaciofluvial slack-water sequence that occurs in a narrow northeast-trending trough in the Lavery till (Figures 3–9 and 3–10). The Main Plant Process Building and the adjacent facilities partially or fully penetrate the thick-bedded unit (WVNS 1993f, 1993d, 2004a). Holocene landslide deposits (colluvium) also overlies or is interspersed with the sand and gravel (WVNS 1993f) on steeper slopes. Fill material occurs in the developed portions of the North Plateau, and mainly consists of recompacted surficial sediment that is mapped with the sand and gravel (WVNS 1993d).

The slack-water sequence consists of Pleistocene glaciofluvial gravel that overlies the Lavery till in a narrow northeast trending trough across the North Plateau (WVNS 1993f, 1993d, 2004a). The slack-water sequence consists of undifferentiated thin-bedded layers of clay, silt, sand, and small gravel deposited in a glacial lake environment (WVNS 2004a).

The average textural composition of the surface sand and gravel is 41 percent gravel, 40 percent sand, 11 percent silt, and 8 percent clay classifying it as a muddy gravel or muddy sandy gravel (WVNS 1993d). The sand and gravel is thickest along a southwest to northeast trend across WMA 1 based on borehole observations. The total thickness ranges from approximately 9 meters (30 feet) along this trend to 12.5 meters (41 feet) near the northeastern corner of WMA 1. Locally thick sand and gravel deposits are inferred to correspond to channels in the underlying Lavery till. The sand and gravel thins to the north, east, and south where it is bounded by Quarry Creek, Franks Creek, and Erdman Brook, respectively, and to the west against the slope of the bedrock valley (WVNS 1993f, 1993d; WVNS and URS 2006). Recent (2007) reinterpretation of sandy intervals underlying the North Plateau has revised the extent of the Lavery till-sand and the slack-water sequence. The primary justification for the stratigraphic revision is based on the elevation of the encountered units as delineated from borings. As a result of the reinterpretation, the horizontal extent of the slack-water sequence has been expanded from previous delineations to encompass areas upgradient of the Main Plant Process Building and extended to conform to the surface of the underlying unweathered Lavery till. Since fewer borings are now considered to have encountered Lavery till-sand, the horizontal extent of the Lavery till-sand has been reduced (WVES 2007b). The hydrogeologic characteristics of the surficial sand units on the North Plateau are described in Section 3.6.2.1.

Lavery Till—The entire Project Premises are underlain by Lavery till. The till was deposited from an ice lobe that advanced into the ancestral Buttermilk Creek Valley through impounded lake waters (WVNS 1993d). The unweathered Lavery till consists of dense olive-gray, pebbly, silty clay and clayey silt that is typically calcareous. The till contains discontinuous and randomly oriented pods or masses of stratified sand, gravel, and rhythmically laminated clayey silt. The till underlying the North Plateau is predominantly unweathered and unfractured, owing to the emplacement of the overlying sand and gravel (WVNS 1993f). Weathered zones in the till underlying the North Plateau are generally less than 0.3 meters (1 foot) thick (WVNS and Dames and Moore 1997). The average textural composition of the unweathered Lavery till is 50 percent clay, 30 percent silt, 18 percent sand, and 2 percent gravel (WVNS 1993d). The till ranges in thickness from 9 to 12 meters (30 to 40 feet) beneath the process area (WMAs 1 and 3) (WVNS 1993f, WVNS and Dames and Moore 1997). The hydrogeologic characteristics of the unweathered Lavery till are described in Section 3.6.2.1.

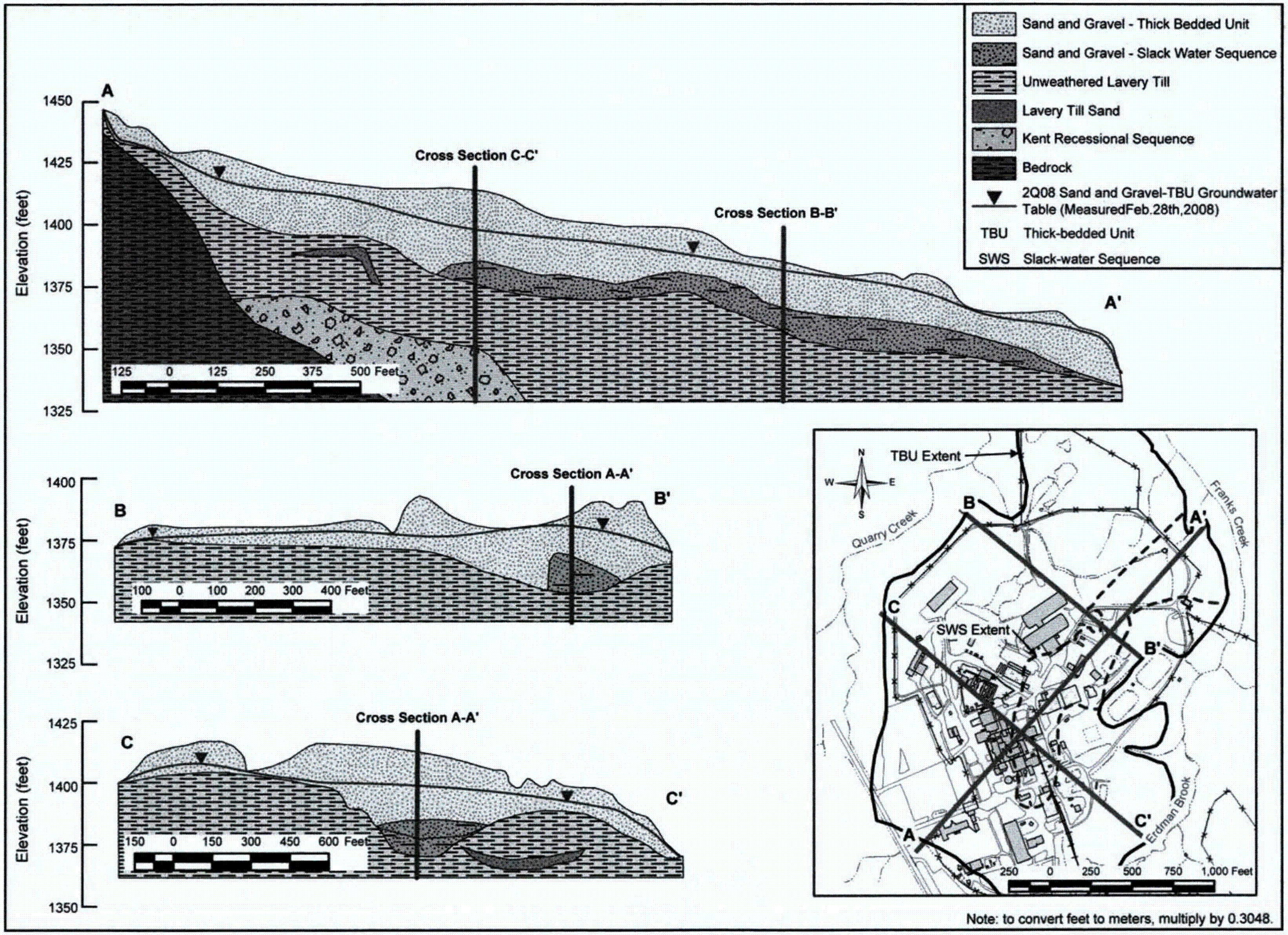


Figure 3–9 Slack-water Sequence in Profile

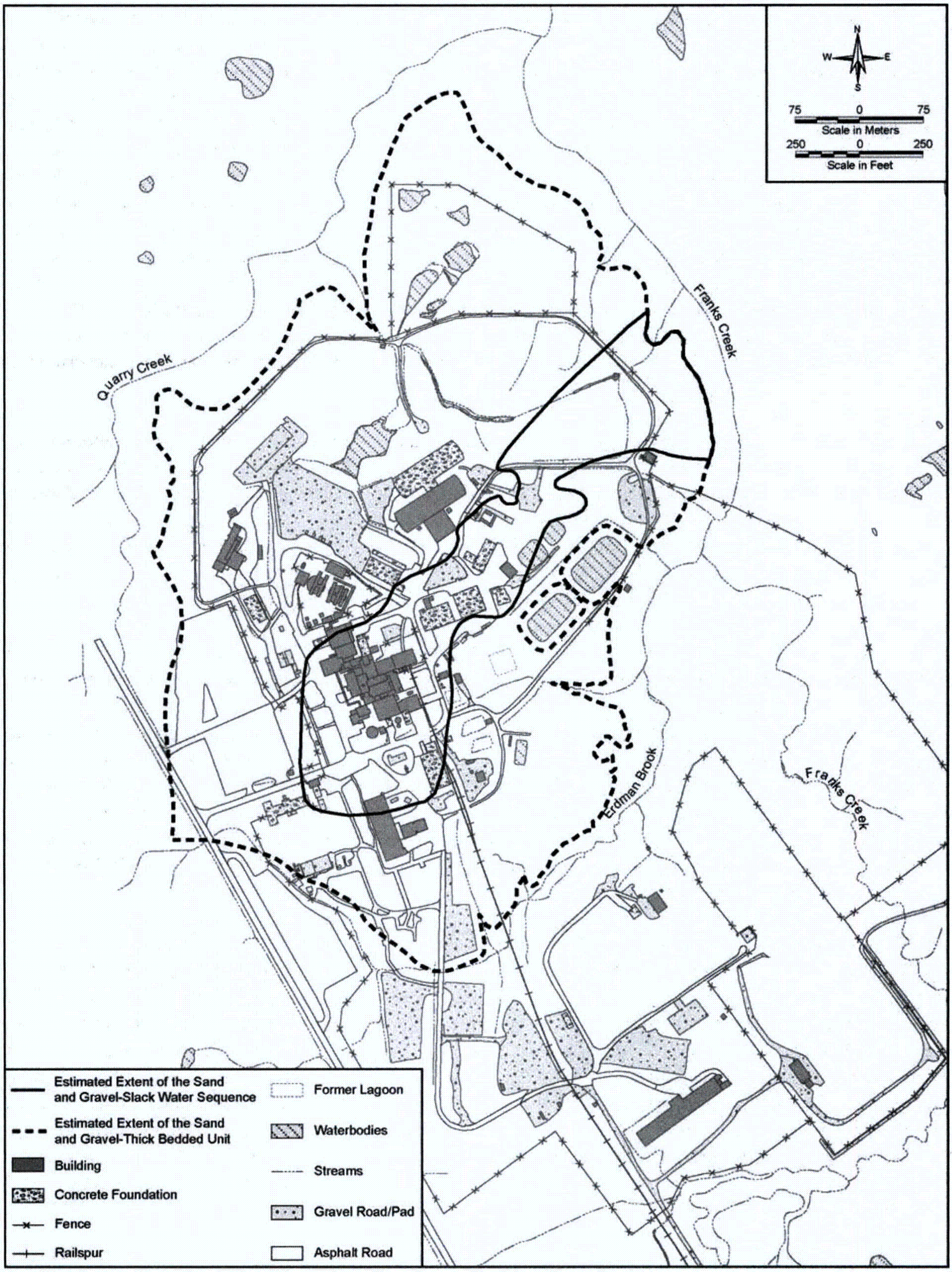


Figure 3–10 Horizontal Extent of the Thick-bedded Unit and the Underlying Slack-water Sequence on the North Plateau

Lavery Till-Sand—The Lavery till-sand is contained within the Lavery till on the North Plateau. The till-sand represents a localized, ice contact deposit resulting from the accumulation of stratified sediments entrained in debris-laden glacial meltwater. Because of dynamics in the glacial environment, transport of the coarser-grained sediment was terminated leaving the sand deposits to be incorporated into the finer-grained till during subsequent melting of the glacier. The till-sand is distinguished from isolated pods of stratified sediment in the Lavery till because borehole observations indicate that the sand is laterally continuous beneath the southern portion of the North Plateau (Figure 3–6) (WVNS 1993d, WVNS and Dames and Moore 1997). Recent (2007) reinterpretation of sandy intervals underlying the North Plateau has revised the extent of the Lavery till-sand and the slack-water sequence. Since fewer borings are now considered to have encountered Lavery till-sand, the horizontal extent of the Lavery till-sand has been reduced (WVES 2007b). The till-sand consists of 19 percent gravel, 46 percent sand, 18 percent silt, and 17 percent clay. Within the Lavery till, the till-sand occurs within the upper 6 meters (20 feet) of the till, and it ranges in thickness from about 0.1 to 4.9 meters (0.4 to 16 feet). The unit has been mapped as being up to 2.7 meters (9 feet) thick in the southeast corner of WMA 1 (WVNS 1993d). The hydrogeologic characteristics of the Lavery till-sand are described in Section 3.6.2.1.

Kent Recessional Sequence—The Lavery till is underlain by a complex association of gravel, sand, silt, and clay comprising the Kent recessional sequence (see Table 3–3). The Kent recessional sequence is comprised of alluvial, deltaic, and lacustrine deposits with interbedded till (WVNS 1993f, 1993d). The Project Premises are underlain by the Kent, except to the west where the walls of the bedrock valley truncate the sequence and the overlying Lavery till (see Figures 3–6 and 3–7). The Kent recessional sequence is not exposed on the WVDP Premises but occurs along Buttermilk Creek to the east of the site (WVNS 1993f, WVNS and URS 2005). The upper Kent sequence consists of coarse-grained sand and gravel that overlies lacustrine silt and clay (WVNS 1993d, WVNS and Dames and Moore 1997, WVNS and URS 2005). The basal lacustrine sediments were deposited in glacial lakes that formed as glaciers that blocked the northward drainage of streams. Some of the fine-grained deposits were eroded and re-deposited by subsequent glacial movement. Sand and gravel was later deposited from deltas formed where streams entered the glacial lakes and along the floodplains of streams that formed during ice-free episodes. Beneath the North Plateau, the Kent recessional sequence consists of coarse sediments that overlie either lacustrine deposits or directly overlie glacial till. The average textural composition of the coarse-grained Kent deposits is 44 percent sand, 23 percent silt, 21 percent gravel, and 12 percent clay. The composition of the lacustrine deposits is 57 percent silt, 37 percent clay, 5.9 percent sand, with 0.1 percent gravel. The Kent recessional sequence attains a maximum thickness of approximately 21 meters (69 feet) beneath the northeastern portion of the WVDP Premises (WVNS 1993d). The hydrogeologic characteristics of the Kent sequence are described in Section 3.6.2.1.

Kent Till, Olean Recessional Sequence, and Olean Till—Older glacial till and periglacial deposits of lacustrine and glaciofluvial origin underlie the Kent recessional sequence beneath the North and South Plateaus, extending to the top of the Upper Devonian bedrock (see Table 3–3) (WVNS 1993f, 2004a). The Kent till has characteristics similar to the Lavery till and was deposited during a glacial advance that occurred between 15,500 and 24,000 years ago. The Olean Recessional Sequence underlies the Kent till and has characteristics similar to the Kent recessional sequence. The Kent till and Olean Recessional Sequence are exposed along Buttermilk Creek southeast of the project (Figure 3–8). The Olean till contains more sand and gravel sized material than the Lavery and Kent tills. The Olean till was deposited between 32,000 and 38,000 years ago (WVNS 1993f) and is exposed near the sides of the valley overlying bedrock (Prudic 1986). The sequence of older glacial till and recessional deposits ranges up to approximately 91 meters (299 feet) in thickness beneath the North Plateau.

South Plateau

Substantive stratigraphic differences exist between the geologic conditions underlying the North and South Plateaus over the WVDP site area. The primary differences are the lack of sand and gravel deposits overlying the South Plateau till deposits, the absence of till-sand within the southern Lavery till, and the degree of weathering and fracturing in the till units of the South Plateau.

Weathered Lavery Till—The surficial unit underlying the South Plateau is the Lavery till, which is the host formation for buried waste in the SDA (WMA 8) and the NDA (WMA 7). Weathered Lavery till is generally exposed at grade or may be overlain by a veneer of fine-grained alluvium (WVNS 1993f). On the South Plateau, the upper portion of the Lavery till has been extensively weathered and is physically distinct from unweathered Lavery till. The till has been oxidized from olive-gray to brown, contains numerous root tubes, and is highly desiccated with intersecting horizontal and vertical fractures (WVNS 1993d, WVNS and URS 2006). Vertical fractures extend from approximately 4 to 8 meters (13 to 26 feet) below ground surface into the underlying unweathered till. The average textural composition of the weathered Lavery till is 47 percent clay, 29 percent silt, 20 percent sand, and 4 percent gravel. The thickness of the weathered Lavery till ranges from 0.9 meters (3 feet) to 4.9 meters (16 feet) across the South Plateau (WVNS 1993d, WVNS and URS 2006). The hydrogeologic characteristics of the weathered Lavery till underlying the South Plateau are described in Section 3.6.2.1.

Till Fractures—Glacial till throughout western New York commonly contains systematically oriented joints and fractures. The origin of these features may be from several mechanisms including adjustments related to glacial rebound; stresses in the Earth's crust; stress release related to movement on the Clarendon-Linden Fault System; and volumetric changes in the clay resulting from ion exchange or osmotic processes (WVNS 1993f).

Research trenching conducted by the New York State Geological Survey (Dana et al. 1979a) studied joints and fractures during a hydrogeologic assessment of the Lavery till. Based on trenching in an area to the east and southeast of the SDA, till joints and fractures were classified as: (1) prismatic and columnar joints related to the hardpan soil formation; (2) long, vertical, parallel joints that traverse the upper altered till and extend into the parent till possibly reflecting jointing in the underlying bedrock; (3) small displacements through sand and gravel lenses; and (4) horizontal partings related to soil compaction. Prismatic and columnar joints may represent up to 60 percent of the observed till fractures and were postulated to have formed under alternating wet/dry or freeze/thaw conditions. Fracture density was observed to be a function of moisture content and weathering of the till, with more pervasive fracturing occurring in the weathered, drier soil and till. Densely-spaced, vertical, fractures with spacing ranging from 2 to 10 centimeters (0.8 to 3.9 inches) were restricted to the weathered till. In contrast, the most vertically persistent fractures were observed in the relatively moist and unweathered till. Vertical fractures and joints in the weathered till were systematically oriented to the northwest and northeast, with spacing typically ranging from 0.65 to 2.0 meters (2 to 6.5 feet) and fractures extending to depths of 5 to 7 meters (16 to 23 feet). Trenching identified one vertical fracture extending to a depth of 8 meters (26 feet) (Dana et al. 1979a). Fracture spacing in the unweathered till increased with depth in conjunction with a decrease in the number of observed fractures.

Open, or unfilled, fractures in the upper portion of the Lavery till provide pathways for groundwater flow and potential contaminant migration. Tritium was not detected in two groundwater samples collected from a gravel horizon at a depth of 13 meters (43 feet), indicating that modern (post-1952) precipitation has not infiltrated to a discontinuous sand lens encountered in the Lavery till. Analysis of physical test results on Lavery till samples by the New York State Geological Survey concluded that open fractures would not occur at depths of 15 meters (50 feet) below ground surface due to the plasticity characteristics of the till (NYSGS 1979, Dana et al. 1979b).

Unweathered Lavery Till—The characteristics of the unweathered Lavery till beneath the South Plateau are similar to the till occurring beneath the North Plateau. The unweathered till consists of olive-gray, dense, pebbly silty clay and clayey silt that is typically calcareous. The till contains minor discontinuous and randomly oriented pods or masses of stratified sand, gravel, and rhythmically laminated clay and silt. The Lavery till was deposited from an ice lobe that advanced into the ancestral Buttermilk Creek Valley through impounded lake waters (WVNS 1993d). The average textural composition of the unweathered Lavery till is 50 percent clay, 30 percent silt, 18 percent sand, and 2 percent gravel (WVNS 1993d). The till ranges in thickness from 4.3 to 27.4 meters (14 to 90 feet) beneath the South Plateau (WVNS 1993f, WVNS and Dames and Moore 1997). The hydrogeologic characteristics of the unweathered Lavery till are described in Section 3.6.2.1.

Kent Recessional Sequence—The Kent recessional sequence beneath the South Plateau consists of fine-grained lacustrine deposits, with coarser sediments occurring as pods or lenses within the lacustrine deposits (WVNS 1993d). The sequence outcrops along the western bank of Buttermilk Creek, as shown in Figure 3–7. Coarse-grained sand and gravel associated with kame delta deposits overlie the lacrustrine deposits on the east end of the South Plateau and are exposed along the west bank of Buttermilk Creek (Figures 3–6 and 3–7). The Kent recessional sequence attains a thickness of approximately 13 meters (43 feet) beneath the South Plateau. The hydrogeologic characteristics of the Kent recessional sequence underlying the South Plateau are described in Section 3.6.2.1.

3.3.1.2 Bedrock Geology and Structure

The Paleozoic bedrock section immediately underlying the WNYNSC consists primarily of Devonian and older sedimentary rocks (Figure 3–11). The Paleozoic strata in the area have been deformed into a series of low-amplitude folds that trend east-northeast to northeast as a result of low angle thrust faulting in the Paleozoic section that occurred during Alleghanian deformation of the Appalachian Mountains. The uppermost bedrock unit in the vicinity of the Project Premises and SDA is the Canadaway Group, which consists of shale, siltstone, and sandstone and totals approximately 300 meters (980 feet) in thickness. The regional dip of the bedrock layers is approximately 0.5 to 0.8 degrees to the south (Prudic 1986, WVNS 1993f). Locally, measurements of the apparent dip of various strata and two marker beds in selected outcrops along Cattaraugus Creek recorded a dip of approximately 0.4 degrees to the west near the northern portion of the WNYNSC (CWVNW 1993). The upper 3 meters (10 feet) of shallow bedrock are weathered to regolith with systematically-oriented, joints and fractures. As cited by Prudic (1986) and others and observed more recently in outcrop along Quarry Creek, the joints are not restricted to the upper 3 meters (10 feet) of the bedrock but are developed throughout and continue at depth (Engelder and Geiser 1979).

A number of Paleozoic bedrock structures and other regional features have been identified in western New York (**Figure 3–12**). The Clarendon-Linden fault zone extends southward from the Lake Ontario through Orleans, Genesee, Wyoming, and Allegany Counties, east of the WNYNSC. The fault zone is comprised of at least three north-south trending faults (**Figure 3–13**) (URS 2002b, WVNS 1992a) and is aligned with the eastern edge of the underlying Precambrian Elzevir-Frontenac Boundary Zone. Satellite imagery compiled in 1997 for NYSERDA indicates the presence of two prominent bands of north to northeast-trending lineaments with the eastern-most lineament coinciding with surface mapping and the inferred subsurface extent of the Clarendon-Linden fault zone (see Figure 3–12). The western band of north to northeast-trending lineaments is parallel to, and approximately 30 kilometers (19 miles) west of, a band of lineaments associated with the Clarendon-Linden fault zone and demarcates the western edge of the Elzevir-Frontenac Boundary Zone (URS 2002b, 2004). This structure continues into Cattaraugus County, where the lineaments become less abundant and less continuous. Seismic reflection profiles across this trend reveal faults affecting deeper Ordovician strata (URS 2004).

	Age (millions of years)	System	Series	Group	Unit	Approximate Depth (meters)
Paleozoic Section		Devonian	Upper	Canadaway (shale, siltstone, minor sandstone)	Undifferentiated	
	360					
					Perrysburg	330
				West Falls (shale, siltstone; sandstone)	Java	
					Nunda	
					Rhinestreet Shale	
				Sonyea	Middlesex Shale	
				Genesee (shale)		
			Middle		Tully Limestone	
				Hamilton (shale, sandstone, minor limestone)	Moscow	
					Ludlowville	
					Skaneateles	
					Marcellus	648
					Onondaga Limestone	
			Lower	Tristates	Oriskany Sandstone	
				Helderberg (limestone, dolostone)	Manlius	
					Rondout	
	408					
		Silurian	Upper	Salina (shale, dolostone, minor anhydrite and halite)	Akron Dolostone	
					Camillus Shale	
					Syracuse	
					Vernon	894
				Lockport (dolostone)	Lockport	
				Clinton	Rochester Shale	
					Irondequoit (Packer shell)	
			Lower	Clinton	Sodus	
					Reynales	
					Thorold Sandstone	985
				Medina	Grimsby (sandstone, red shale)	
					Whirlpool Sandstone	
	438					
		Ordovician	Upper		Queenston	1,477
					Oswego Sandstone	
					Lorraine	
					Utica Shale	
			Middle	Trenton-Black River (limestone, dolostone)	Trenton	
					Black River	
			Lower	Beekmantown (limestone)	Tribes Hill/Chuctanunda	1,831
	505					
		Cambrian	Upper		Little Falls Dolostone	
					Galway (Theresa)	2,066
					Potsdam Sandstone	2,118
	570					
		Precambrian	Middle	Grenville Basement Complex (crystalline rocks)		

Source: Modified from WVNS 1993f, NYSGS 1990, NYSDEC 2006a.
Note: Principal lithology in parenthesis except where otherwise specified.

Figure 3–11 Bedrock Stratigraphic Column for the West Valley Demonstration Project Premises and Vicinity

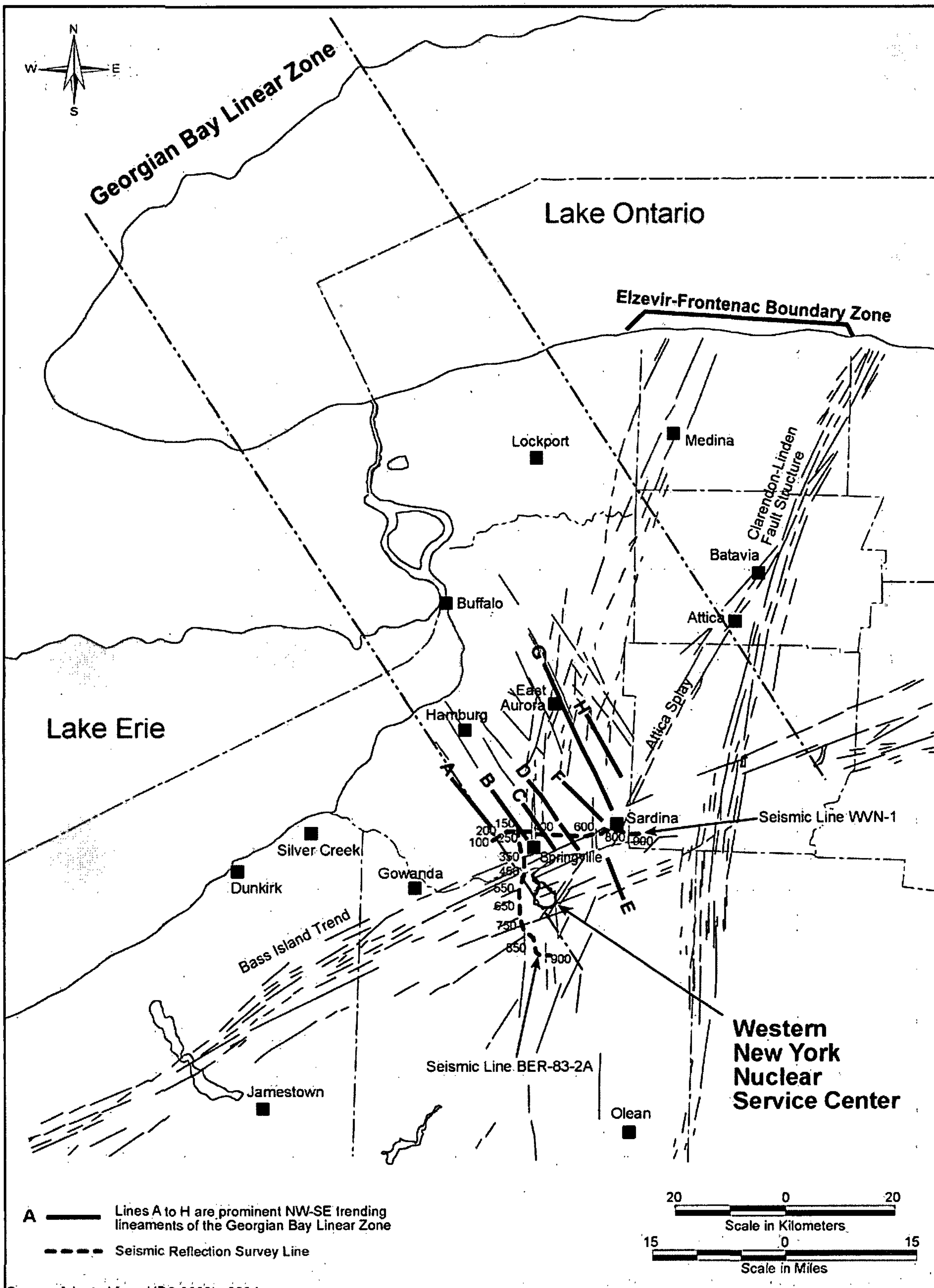


Figure 3–12 Selected Lineament Systems and Major Structural Features in Western New York

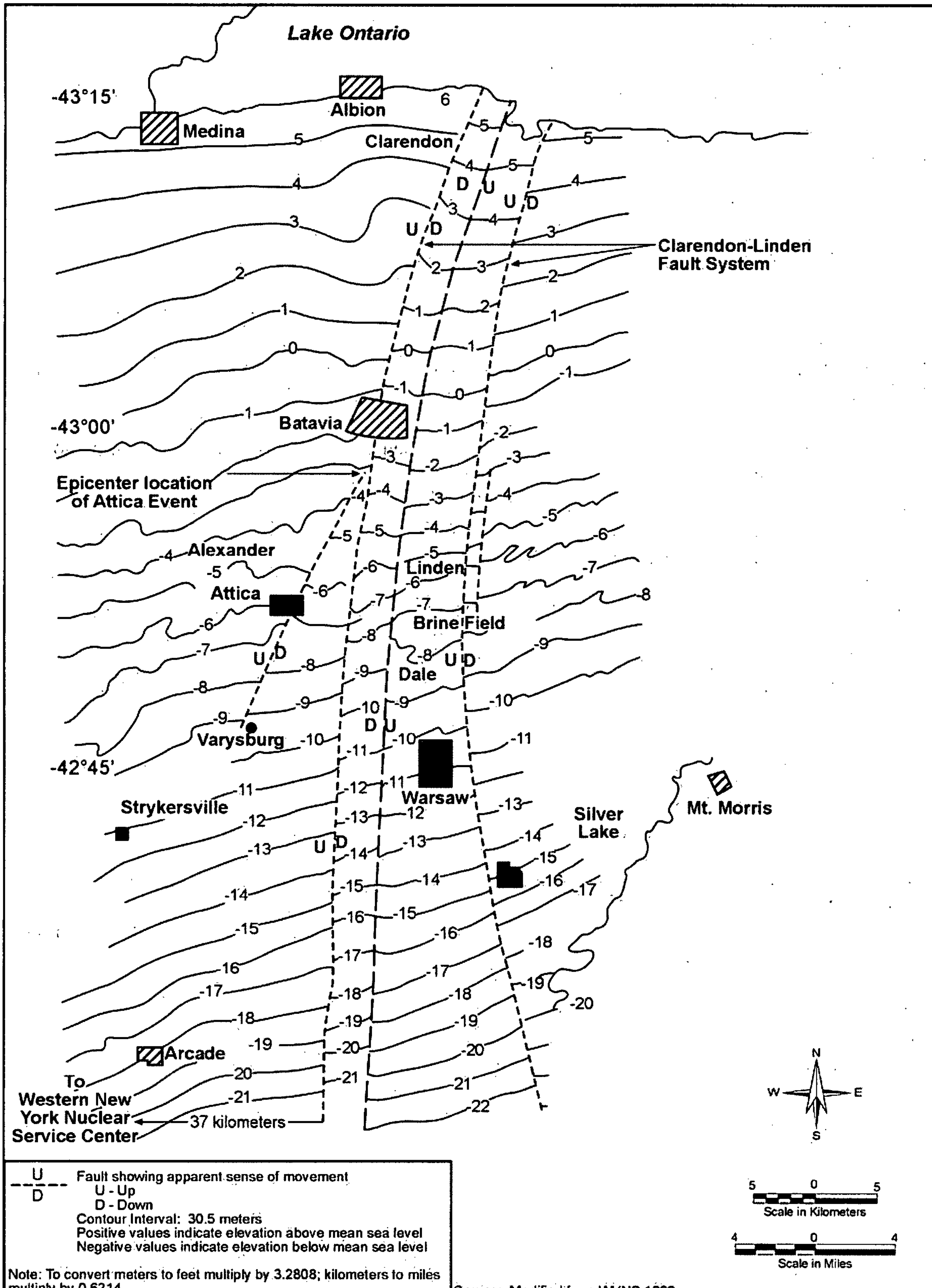


Figure 3–13 Clarendon-Linden Fault Zone Shown by Offsets of the Contours on Top of the Medina Group

Paleozoic Section

Seismic and stratigraphic data suggest that the Clarendon-Linden fault zone has been active since the early Paleozoic with a complicated movement history alternating between normal and reverse faulting (Fakundiny et al. 1978). Movement along the Clarendon-Linden fault zone has been attributed to reactivation of faults within the Elzevir-Frontenac Boundary Zone (URS 2002b).

The New York State Geological Survey (1976) suggested that surface displacement along the Clarendon-Linden fault zone in western New York was the result of smaller displacements occurring across numerous parallel or subparallel faults that may not be continuous along the entire length of the fault zone (URS 2002b). Jacobi and Fountain (2002) assessed the location and character of the Clarendon-Linden fault zone by integrating surface stratigraphic offsets, geologic structure, soil gas data, and lineament studies. The study documented that the Clarendon-Linden fault zone extends from the south shore of Lake Ontario to Allegany County and that the fault reaches the bedrock surface in the study area. North-striking lineaments that are believed to represent the surface expression of the fault segments are rarely over a few kilometers to tens of kilometers in length. Structurally, the fault zone is comprised of as many as 10 segmented north-striking parallel faults in the upper Devonian section. The fault segments are linked in the subsurface by northwest-striking and east-striking transfer zones. The fault segments and transfer zones form fault blocks that have semi-independent subsidence and uplift histories. The complex structure allows for fault segments to reactivate at different times and for tectonic stress to be accommodated on several different parallel faults (Jacobi and Fountain 2002, URS 2004).

The Attica Splay, a southwestern trending fault (traceable 10 kilometers [6 miles] southwest of Attica) branches from the western fault of the Clarendon-Linden fault zone near Batavia. The fault has been delineated through seismic reflection profiling as far southwest as Varysburg (Figure 3–13), located 37 kilometers (23 miles) from the WNYNSC (WVNS 1992a, 1993f). Well data indicate that the Attica Splay continues to the southwest, either as a fault or flexure, to Java, 30 kilometers (19 miles) northeast of the WNYNSC. The Attica Splay is the most active portion of the Clarendon-Linden fault zone (WVNS 1992a).

A seismic reflection survey completed in June 2001 (line WVN-1 on Figure 3–12) was approximately 29 kilometers (18 miles) long and located approximately 8 kilometers (5 miles) north of the WNYNSC. The seismic line was specifically located to investigate north, northwest, or northeast-trending structures in the Precambrian basement and overlying Paleozoic bedrock. Approximately 26 kilometers (16 miles) of reprocessed seismic reflection data was also reviewed that were collected in 1983 along a north-south section of U.S. Route 219 (line BER 83-2A on Figure 3–12). The two seismic lines were evaluated to identify structures that may be present at depth and to evaluate potential correlations between satellite-imaged lineaments and structures identified on the seismic lines (URS 2002b). The seismic reflection lines near the WNYNSC indicated the presence of high-angle faults in two stratigraphic intervals spanning the Precambrian to Devonian section and the Silurian to Devonian section. Several faults in the Precambrian to Devonian section were interpreted to continue upsection into Middle Devonian strata, including two west-dipping normal faults near Sardinia that may continue to the alluvium-bedrock boundary. The Sardinia faults may represent the southwest continuation of the Attica Splay into southeastern Erie County. A thin band of northeast-trending lineaments that extends from Batavia, New York and past Sardinia into Erie County may represent the surface expression of the Attica Splay (see Figure 3–13) (URS 2002b). The Clarendon-Linden fault zone is discussed in further detail in Section 3.5.

The Bass Island Trend is a northeast trending oil and gas producing structure that extends from Ohio through Chautauqua and Cattaraugus Counties into southern Erie County (URS 2002b). The structure is a regional fold that resulted from a series of thrust faults with a northwest transport direction ramping up-section from the Upper Silurian Salina Group into the Middle Devonian section (Jacobi 2002, URS 2002b). The faults associated with the Bass Island Trend are no longer active. Lineaments identified by satellite mapping generally coincide with the Bass Island Trend where it has been identified in southwestern Chautauqua and Erie County (Jacobi 2002) (see Figure 3–12). Bedrock mapping in the South Branch of Cattaraugus Creek, approximately 20 kilometers (12 miles) west of the Project Premises, delineated northeast-striking inclined bedding, folds, and faults that are associated with the Bass Island Trend (URS 2002b). Geologic mapping (Gill 1999, 2005) indicated that the subsurface structure is located approximately 8 kilometers (5 miles) northwest of the WVDP Site.

The Georgian Bay Linear Zone is a 30-kilometer- (19-mile-) wide structural zone that extends from Georgian Bay to the southeast across southern Ontario, western Lake Ontario, and into western New York. The zone has been delineated by a set of northwest-trending aeromagnetic lineaments and a 1997 satellite mapping investigation identified seven prominent northwest trending lineaments (lines A-H on Figure 3–12) that cross or potentially cross seismic line WVN-1. A variety of neotectonic structures and features have been identified in exposed bedrock and lakebed sediments within the zone. Earthquake epicenters in western Lake Ontario and in Georgian Bay appear to spatially align with the Georgian Bay Linear Zone (URS 2002b). The northwest-trending lineaments may represent the surface expression of faults occurring at depth along WVN-1 (URS 2002b).

Regional subsurface geologic mapping was conducted over portions of 18 towns and 4 counties surrounding the WNYNSC to potentially identify faulted subsurface layers from well logs. The particular area of concentration was north and northeast of the WNYNSC to assess structures possibly associated with the Attica Splay of the Clarendon-Linden fault zone. Three structure maps showing the elevation on the top of the Tully Limestone, the Onondaga Limestone, and the underlying Packer Shell horizon were prepared using well log and completion data for more than 720 wells from the New York State Department of Environmental Conservation (NYSDEC). The structure mapping showed no linear alignments to suggest that the main Clarendon-Linden Fault system, or the Attica splay of that fault system, intersects any portion of the WVDP site. Subsurface geologic mapping and interpretation of the Bass Island Trend structure indicates that this feature is located too far away from the site to have any direct impact on the subsurface geology (Gill 1999, 2005).

Precambrian Rocks

Precambrian age rocks of the Grenville Province comprise the basement rock at the site. The Grenville Province has been subdivided into the central gneiss belt, the central metasedimentary belt, and the central granulite terrain. The central metasedimentary belt is further divided into the Elzevir and Frontenac terrains with the boundary zone between the two terrains referred to as the Elzevir-Frontenac Boundary Zone. The Elzevir-Frontenac Boundary Zone is a 1.2-billion-year-old shear zone 10 to 35 kilometers (6 to 22 miles) in width, extending from southern Ontario into western New York. Seismic reflection data have interpreted the Boundary as a regional shear zone along which the Frontenac terrain was thrust to the northwest over the Elzevir terrain (URS 2002b). Seismic reflection profiling, aeromagnetic surveys, lineament studies, and other field surveys suggest that the central metasedimentary belt underlies the WNYNSC (URS 2002b).

3.3.1.3 Geologic Resources

Cattaraugus County's principal non-fuel mineral product consists of sand and gravel. Construction aggregate production for the six-county mineral district in which the WNYNSC is located totaled approximately 4.2 million metric tons (4.6 million tons) in 2002 (USGS and NYSGS 2003), roughly equivalent to 2.3 million cubic meters (3 million cubic yards) of material. More than 70 state-regulated commercial sand and gravel mines and gravel pits operate in Cattaraugus County, as well as a shale mine. Nearly 40 sand and gravel mines and gravel pits are operated in Erie County (NYSDEC 2005a). Surficial sand and gravel across the WNYNSC may be suitable for aggregate (sand and gravel) production.

Cattaraugus County is perennially one of the top oil and gas producing counties in New York. Active oil production wells are concentrated in the western portion of the county with the majority of the gas production from the south-central and southeast portion of the county (NYSDEC 2005a). A total of 427 gas wells and 1,399 oil wells produced approximately 28.3 million cubic meters (1 billion cubic feet) of natural gas and 17.5 million liters (4.6 million gallons) of oil in the county in 2002 (NYSDEC 2004a). There were 16 active gas wells and 2 active oil wells in Ashford Township that produced 640,000 cubic meters (22.6 million cubic feet) of natural gas and 421,000 liters (111,300 gallons) of oil in 2002.

3.3.2 Soils

Characteristics of the natural soil underlying the WNYNSC reflect the composition and textures of the Holocene alluvial and Pleistocene glacial deposits from which they are derived and consist of sand, gravelly silt and clay, clayey silt, and silty clay. The Churchville silt loam is found across the plateau areas, while the Hudson silt loam predominates in the Quarry Creek stream valley and the Varysburg gravelly silt loam predominates along the Franks Creek stream valley (WVNS 1993a). Churchville series soils generally consist of very deep, somewhat poorly drained soils that formed in clayey lacustrine sediments overlying loamy till. Hudson soils consist of very deep, moderately well drained soils formed in clayey and silty lacustrine sediments. The Hudson soils occur on convex lake plains, on rolling to hilly moraines and on dissected lower valley side slopes. Varysburg soils consist of very deep, well drained and moderately well drained soils on dissected lake plains. The Varysburg soils formed in gravelly outwash material and the underlying permeable clayey lacustrine sediments (USDA NRCS 2005). The Churchville and Hudson silt loams are prone to erosion, particularly on slope areas and when vegetative cover is removed (WVNS 1993a).

Soil Contamination

Soil underlying the waste management areas at the Project Premises has been impacted by radiological and chemical contamination associated with over 40 years of facility operations. Radiological soil contamination has resulted from operational incidents including airborne releases in 1968 that produced the Cesium Prong; liquid releases resulting in the North Plateau groundwater plume; waste burials; and spills during the transport or movement of contaminated equipment or materials. A site database documents spills that have occurred at the facility since 1989 and includes the location of each spill, notifications, and cleanup actions implemented for each incident.

The primary areas of radiologically contaminated soil are cesium-137 contamination associated with the Cesium Prong area; soils affected by the North Plateau strontium-90 groundwater plume; and radiologically contaminated soil associated with Lagoons 1 through 5 and the Solvent Dike (WMA 2). RCRA facility investigation sampling (WVNS and Dames and Moore 1997) identified additional areas of soil contamination exceeding radiological background levels located along drainage ditches; the Construction and Demolition Debris Landfill; the Demineralizer Sludge Ponds; subsurface soil beneath the Low-Level Waste Treatment Facility; and the Effluent Mixing Basins (WVNSCO 2004, WSMS 2008a). The volume of radiologically contaminated soil over the WVDP areas is estimated to be approximately 1,184,200 cubic meters (1,549,000 cubic yards), as shown in **Table 3–4**.

Chemical excursions from facilities have been infrequent and localized in extent. Migration of leachate consisting of 98 percent n-dodecane and 2 percent tributyl phosphate occurred from NDA Special Holes SH-10 and SH-11 in 1983 (WVNSCO 1985). Stabilization operations in 1986 resulted in the excavation and backfill of NDA Special Holes SH-10 and SH-11; exhumation of eight 3,785-liter (1,000-gallon) tanks containing solvent-impregnated absorbent; and removal and packaging of contaminated absorbent and soil. Interim measures consisting of a capped interceptor trench and a liquid pretreatment system were implemented by DOE to control potential migration of n-dodecane and tributyl phosphate from the NDA to Erdman Brook.

Table 3–4 Estimated Volumes of Contaminated Soil on the West Valley Demonstration Project Premises

Source	*Area*	*Estimated Soil Contamination Volume (cubic meters)*
WMA 1 Soil Removal	WMA 1	75,000
WMA 2 Closure	WMA 2	39,000
WMA 3 Soil Removal	WMA 3	1,000
WMA 4 Soil Removal	WMA 4	23,000
WMA 5 Closure	WMA 5	3,000
WMA 6 Closure	WMA 6	1,200
WMA 7 Closure	WMA 7	186,000
WMA 8 Closure	WMA 8	371,000
WMA 9 Closure	WMA 9	0
WMA 10 Closure	WMA 10	0
WMA 11 Closure	WMA 11	0
WMA 12 Closure	WMA 12	7,000
North Plateau Groundwater Plume	WMA-5; 12	417,000
Cesium Prong	WMA 3, 4, 5	61,000

Note: To convert cubic meters to cubic feet, multiply by 35.32.
Source: WSMS 2008a.

RCRA facility investigation soil sampling (WVNS and Dames and Moore 1997) for chemical constituents on the Project Premises identified localized chlorinated solvent, polynuclear aromatic hydrocarbon, and metal compounds occurring at concentrations below or slightly exceeding NYSDEC Technical and Administrative Guidance Memorandum 4046 soil cleanup objectives or site background levels (WVNS and Dames and Moore 1997; WVNSCO 2004, 2007). The low level chemical detections are consistent with anthropogenic activity and the industrial nature of the site. The RCRA facility investigation did not recommend further action for soil mitigation. Based on the RCRA facility investigation results, Corrective Measures Studies are ongoing (WVNSCO 2007) at six areas on the site to evaluate the potential need for further characterization, remediation, and/or monitoring:

- Construction and Demolition Debris Landfill
- NDA and the NDA Interceptor Trench Project
- SDA
- Lagoon 1
- Demineralizer Sludge Ponds
- Former Low-Level Waste Treatment Facility building (O2 Building), neutralization pit, interceptors, and the Low-Level Waste Treatment Facility building

Metals concentrations in RCRA facility investigation soil samples from these facility areas slightly exceed background or Technical and Administrative Guidance Memorandum 4046 criteria. Organic constituents consisting of chlorinated solvents, BTEX compounds, and semivolatile organic compounds, including polynuclear aromatic hydrocarbon compounds, represent chemicals of concern associated with subsurface soil at the NDA. Polynuclear aromatic hydrocarbon compound concentrations exceeding the Technical and Administrative Guidance Memorandum 4046 criteria have been detected in subsurface soil associated with Lagoon 1 (benzo[a]anthracene, benzo[a]pyrene, and chrysene) and the Demineralizer Sludge Pond (benzo(a)anthracene [692 micrograms per kilograms], benzo(a)pyrene [798.7 micrograms per kilograms], benzo(b)fluoranthene [1,286 micrograms per kilograms], and chrysene [990.5 micrograms per kilograms]). The source of polynuclear aromatic hydrocarbon soil contamination has been attributed to proximity to anthropogenic sources or buried asphalt (WVNSCO 2007). Chemical constituent concentrations at the remaining RCRA facility investigation Solid Waste Management Units were below the NYSDEC Technical and Administrative Guidance Memorandum 4046 soil cleanup objectives (WVNSCO 2007). Contamination of stream sediment is discussed in Section 3.6.1.

Cesium Prong

Uncontrolled airborne releases from the Main Plant Process Building ventilation system filters in 1968 released contaminated material through a 60-meter (200-foot) high plant stack. The releases carried contaminated material to portions of the WNYNSC and an offsite area. The contaminated area has been investigated using aerial and ground level gamma radiation surveying and soil sampling. The methods and results of these surveys are described in the *Site Radiological Surveys Environmental Information Document* (WVNS 1993c) and the *WNYNSC Off-Site Radiation Investigation Report* (Dames and Moore 1995). The data from a 1979 aerial survey showed cesium-137 levels elevated above background in the Cesium Prong on the Project Premises, on the balance of the site, and outside of the WNYNSC boundary (**Figure 3–14**).

Sampling data from the Cesium Prong within the boundary of the WNYNSC is sparse. Four surface soil samples collected northwest of the Main Plant Process Building by NYSDEC in 1971 indicated cesium-137 activity ranging from 18.2 to 43.2 picocuries per gram. Strontium-90 activity in two of the samples ranged from 37 to 39 picocuries per gram. A subsequent cesium-137 survey (Dames and Moore 1995) conducted between 1993 and 1995 in an offsite area within the Cesium Prong consisted of surface and subsurface soil sampling to measure activity levels since the time of cesium-137 deposition. The 1995 survey included sample grid blocks in background areas, open fields and forested areas, and from areas where the surface had been disturbed by human activity, such as residential yards and tilled farmland.

Cesium-137 levels decreased with depth in the undisturbed grids, with 70 percent of the activity on average in the upper 5 centimeters (2 inches), 25 percent of the activity in the 5- to-10-centimeter (2- to-4-inch) layer, and 5 percent of the activity in the 10- to-15-centimeter (4- to-6-inch) layer (Dames and Moore 1995). Higher cesium-137 levels were associated with occurrences of organic humus on the ground surface. The maximum localized cesium-137 activity was 44 picocuries per gram. For five undisturbed grid blocks, average cesium-137 activity in the upper 5-centimeter (2-inch) layer ranged from 2.7 to 25.4 picocuries per gram compared to an average background activity of 0.68 picocuries per gram. The overall results indicated that disturbance of the surface layers had either removed cesium-137, covered it with clean soil, or blended it through the soil to varying degrees (Dames and Moore 1995).

Aerial surveys and soil sampling in the Cesium Prong indicate that contaminated soil occurs on the Project Premises and on the balance of the WNYNSC site north of Quarry Creek. The estimated volume of contaminated soil (i.e., exceeding 25 millirem per year for cesium-137) in these two areas is approximately 61,000 cubic meters (2,100,000 cubic feet) (WSMS 2008a). The volume was based on the extent of a calculated 25 millirem per year area estimated by decaying the activity level measured during the 1979 aerial survey, to account for the elapsed time since the survey. The volume calculation assumed a soil removal depth of 15 centimeters (6 inches).

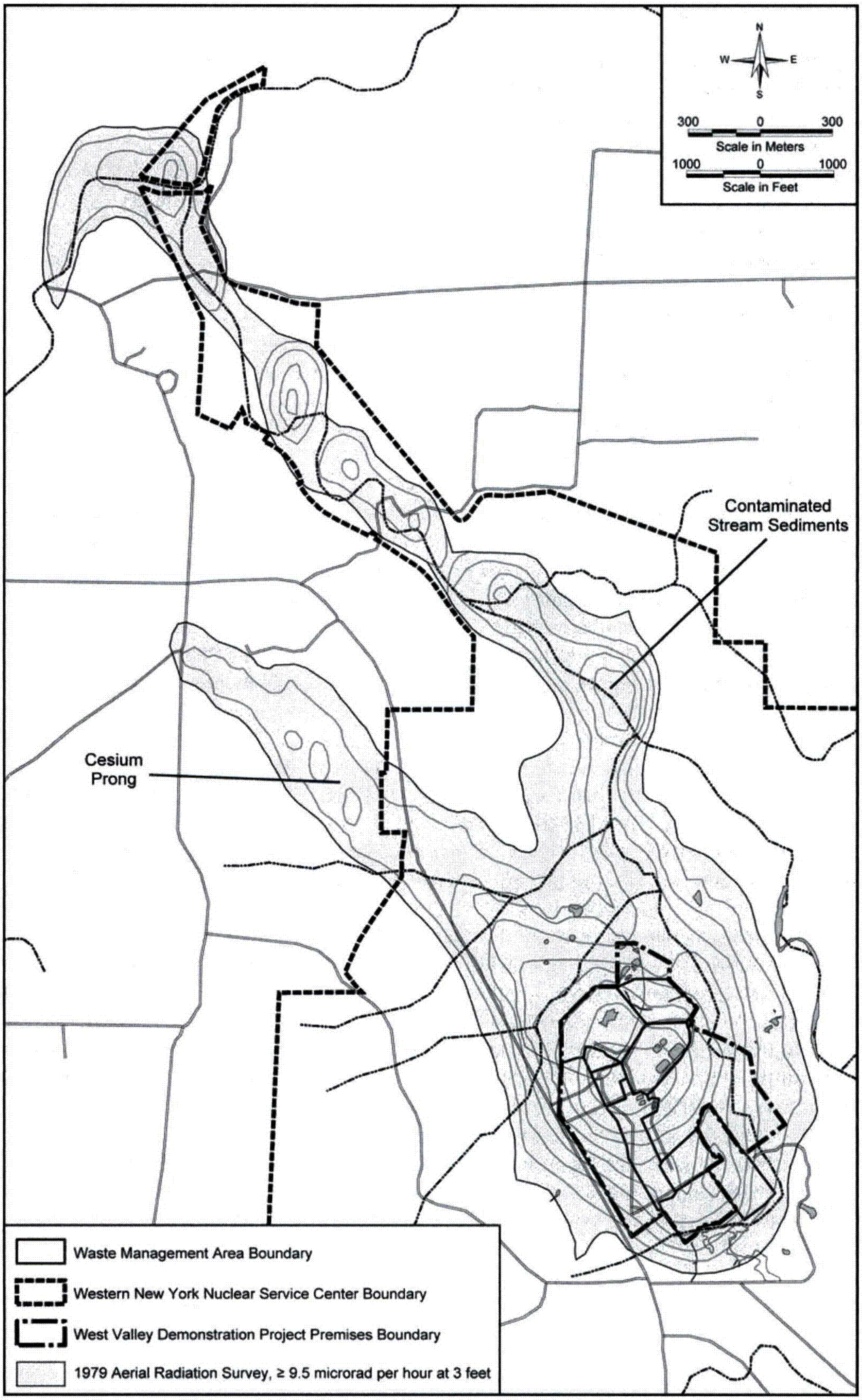


Figure 3–14 Area Affected by the Cesium Prong

3.4 Site Geomorphology

The site region continues to adjust to the glaciation and retreat process that ended 17,000 years ago. Since that time, glacial rebound of about 30 meters (100 feet) has occurred across the WNYNSC. As a result, the region is geomorphologically immature and stream profiles and patterns will continue to evolve in response to decelerating rebound and tilting (WVNS 1993f). Consequently, geomorphological studies at the WNYNSC have focused on the major erosional processes acting on Buttermilk Creek and Franks Creek drainage basins near the Project Premises and the SDA. This section describes these processes – sheet and rill erosion, stream channel downcutting and valley rim widening, and gully advance – and where they occur. A more thorough treatment and predictive analysis of these processes across the site is presented in Appendix F of this EIS.

3.4.1 Sheet and Rill Erosion

Sheet and rill erosion on overland flow areas and mass wasting on hillslopes have been monitored at 23 hillslope locations along the stream valley banks adjacent to the Project Premises (URS 2001, WVNS 1993a). Twenty-one erosion frames were originally placed on hillslopes that are close to plant facilities and contain a variety of soil types and slope angles. Two erosion frames were placed near the edges of stream valley walls to monitor potential slumping of large blocks of soil. The frames were designed to detect changes in soil depth at the point of installation and were monitored from September 1990 through September 2001. Soil gain or loss has been detected at the frame locations still in place as further described in Appendix F, Section F.2.1. The largest soil gain or loss, indicating the greatest amount of soil movement, has occurred at frames located on the north and east slopes of the SDA. These soil erosion measurements have been taken over too short a time span to be reliable for long-term projections; however, they indicate that the sheet and rill erosion process has removed small quantities of soil at a few locations within the Franks Creek watershed. Sheet and rill erosion monitoring locations are shown in **Figure 3–15**.

3.4.2 Stream Channel Downcutting and Valley Rim Widening

The three small stream channels (Erdman Brook, Quarry Creek, and Franks Creek) that drain the Project Premises and SDA are being eroded by the stream channel downcutting and valley rim widening processes. These streams are at a relatively early stage of development and exist in highly erodible glacial till material. These characteristics cause the streams to downcut their channels instead of moving laterally (WVNS 1993a).

Active stream downcutting can be observed at knickpoint locations along the longitudinal profile of the stream channels. A knickpoint is an abrupt change in the slope of the streambed (waterfall) that is caused by a change in base level. The stream erodes the knickpoint area by carrying the fine-grained sediment downstream and leaving the coarse-grained sediment (gravel and cobbles) at the base of the vertical drop. Stream turbulence from high-energy storm events agitates the accumulated gravel and cobbles and creates a scour pool. The knickpoint migrates upstream due to the movement of the gravel and cobbles by the erosing force of water, which erodes the knickpoint at its base. In addition, the channel is deepened by abrasion from the movement of gravel and cobbles downstream. As this process continues, the channel cross-section changes from a U-shaped, or flat-bottomed, floodplain with a low erosion rate to a V-shaped channel with a higher erosion rate (WVNS 1993i). **Figure 3–16** shows the locations of known knickpoints identified in a 1993 study; however, due to the dynamic nature of the downcutting process, the knickpoints have likely continued to migrate upstream since that time.

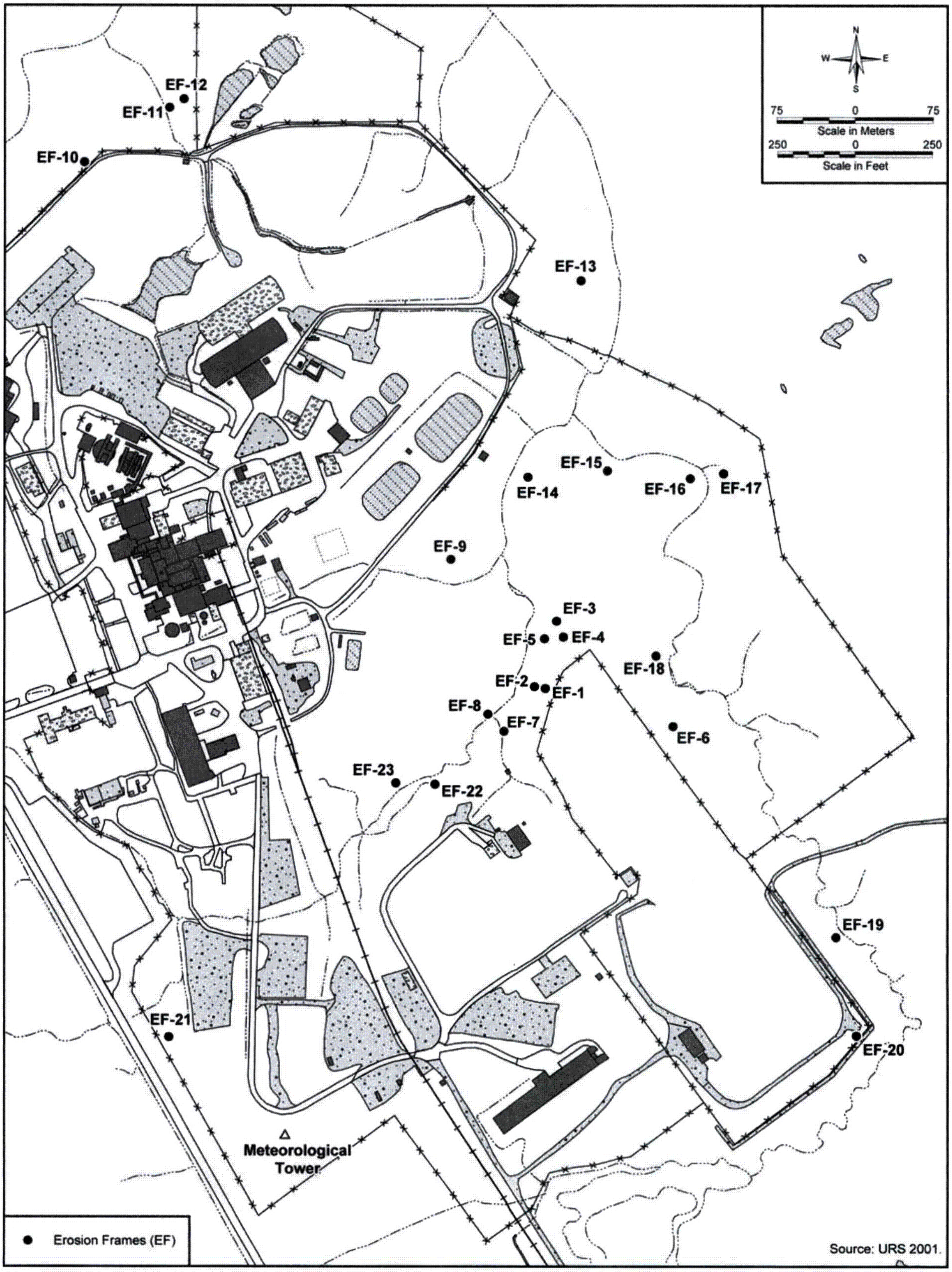


Figure 3–15 Location of Erosion Frame Measurements of Sheet and Rill Erosion

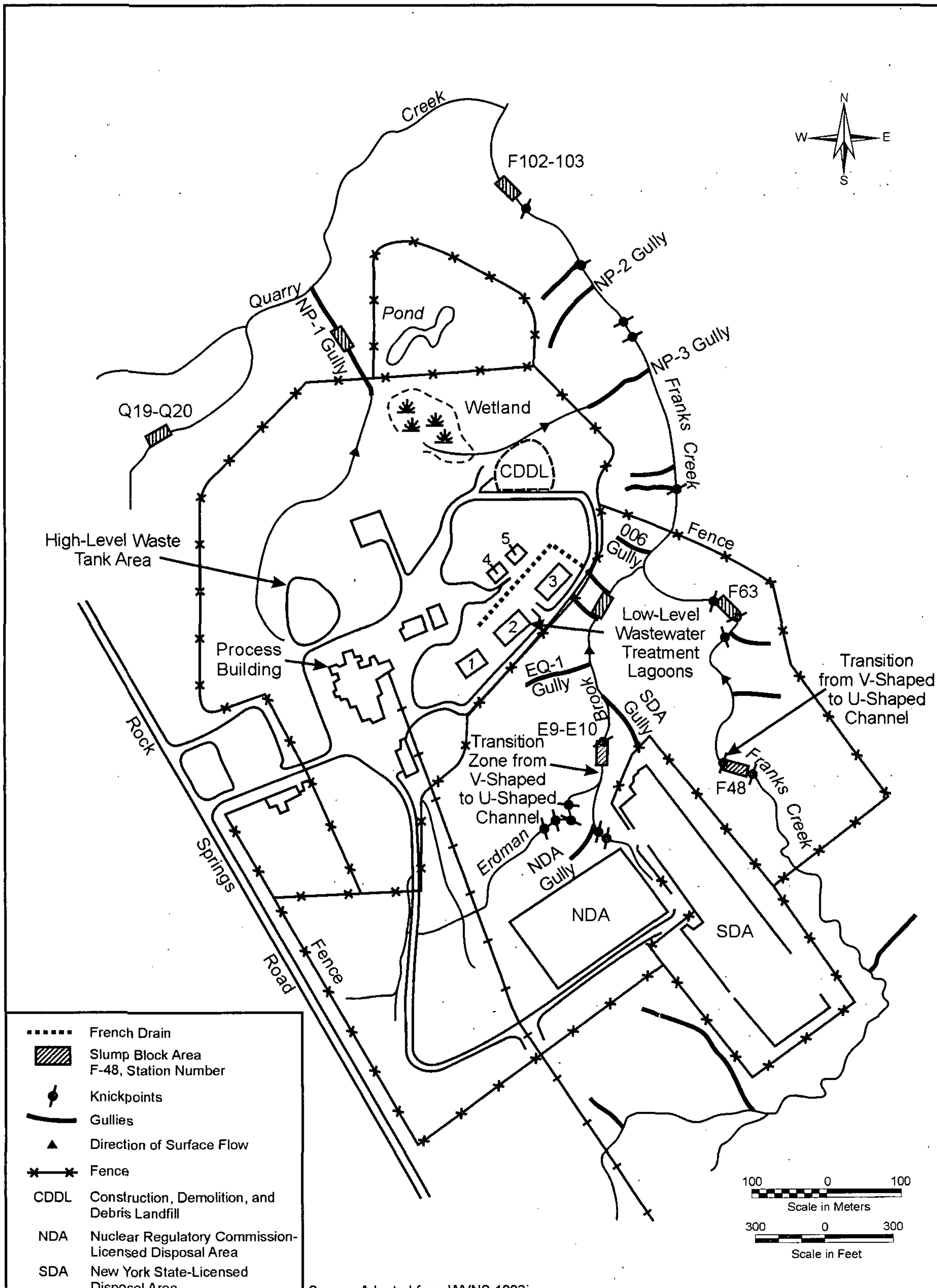


Figure 3–16 Gullies, Major Slump Blocks, Channel Transition, and Knickpoints in the Franks Creek Drainage Basin

As the downcutting progresses, the streambanks are undercut causing localized slope failures (i.e., slumps and landslides). This process commonly occurs at the outside of the meander loops and produces a widening of the stream valley rim (WVNS 1993i). While it is possible that an entire series of slump blocks on a slope can form at the same time, field observations have indicated that a single block initially forms. The redistribution of stresses and weight from the movement of the single block then adds to the forces already at work along the stream slope and eventually causing other slump blocks to form. Other factors that combine to affect slope stability include vegetative ground cover, local groundwater conditions, freeze-thaw cycles, and manmade loads (WVNS 1993a).

Three major slump block locations were initially identified on Franks Creek, one on Erdman Brook, and one on Quarry Creek. The blocks vary in length from about 1.5 meters (5 feet) to greater than 30 meters (100 feet) and tend to be about 1.0 to 1.2 meters (3 to 4 feet) in height and width when they initially formed (WVNS 1993a). These slump block locations are shown in Figure 3–15 at station numbers F48, F63, E9, F102, and Q19, and represent areas where the rim widening process is most active. Slump block movement is also potentially occurring on the Erdman Brook slope that forms the crest of the Low Level Waste Water Lagoon 3, also shown on Figure 3–15. Monitoring instrumentation is being used at this location to measure both shallow and deep-seated long-term creep (Empire Geo-Services 2006). The most erosion has occurred along a 67-meter (220-foot) length of slope along Erdman Brook north of the SDA (station number E9-E10); however, the rate of movement is not representative of the stream system as a whole because this portion of the stream is eroding through uncompacted fill, not native soil (WVNS 1993a). Slump block formation is an active mass wasting process at the WNYNSC.

3.4.3 Gullying

The steep valley walls of the stream channels within the Buttermilk Creek drainage basin are susceptible to gully growth. Gullies are most likely to form in areas where slumps and deep fractures are present, seeps are flowing, and the slope intersects the outside of the stream meander loop. Gully growth is not a steady-state process but instead occurs in response to episodic events, such as during thaws and after thunderstorms, in areas where a concentrated stream of water flows over the side of a plateau and in areas where groundwater movement becomes great enough for seepage to promote grain-by-grain entrainment and removal of soil particles from the base of the gully scarp–a process referred to as sapping. Sapping causes small tunnels (referred to as pipes) to form in the soil at the gully base, which contributes to gully growth by undermining and weakening the scarp until it collapses. Surface water runoff into the gully also contributes to gully growth by removing fallen debris at the scarp base, undercutting side walls, and scouring the base of a head scarp.

More than 20 major and moderate-sized gullies have been identified, with most shown in Figure 3–16. Some of these gullies have formed from natural gully advancement processes and others are the result of site activities. For example, runoff from the plant and parking lots directed through ditches to the head of a previously existing gully created a new gully at the upper reaches of the equalization pond outfall (WVNS 1993a). Several of the gullies are active and migrating into the edge of the North and South Plateaus. One of the active gullies was located on Erdman Brook north of the SDA and is referred to as the SDA Gully in Figure 3–16. It was advancing toward the SDA before it was reconstructed to mitigate erosion in 1995. The other two active gullies are located along Lower Franks Creek and are referred to as the NP-3 and 006 Gullies (Figure 3–16) (WVNS 1993a).

3.4.4 Erosion Rates

The erosion rates from the geomorphic processes described in the preceding sections have been measured at numerous locations throughout the drainage basins, as summarized in **Table 3–5**. Rates of sheet and rill erosion were directly measured using erosion frames along the stream valley banks adjacent to the WVDP

Premises. Rates of stream channel downcutting were determined from three indirect measurement methods (i.e., carbon-14 and optically stimulated luminescence age dating, measurement of stream channel longitudinal profile, and measurement of rate of slumping). The downcutting rates were translated into estimates of rates of stream valley rim widening using an estimate of stable slope angle for the stream valley and geometric considerations. Gully migration rates were determined using aerial photographs and the Soil Conservation Services' (now the Natural Resources Conservation Service) Technical Report-32 method (see Appendix F, Section F.2.3.3, of this EIS). These historical measurements are not predictions of future erosion rates for specific processes, but they do provide perspective by which to judge the reasonableness of erosion projections. Appendix F details erosion study observations to date and presents the results of predictive modeling of site erosion over the short- and long-term.

Table 3–5 Summary of Erosion Rates at the Western New York Nuclear Service Center

Location	*Erosion Rate (meters per year)*	*Author and Study Date*	*Method*
Sheet and Rill Erosion	0 to 0.0045	URS Corporation (2001)	Erosion frame measurements (11-year average rate)
Downcutting of Buttermilk Creek	0.0015 to 0.0021	La Fleur (1979)	Carbon-14 date of terrace – depth of stream below terrace
Downcutting of Buttermilk Creek	0.005	Boothroyd, Timson, and Dunne (1982)	Carbon-14 date of terrace – depth of stream below terrace
Downcutting of Buttermilk Creek	0.0032	USGS (2007)	Optically stimulated luminescence age dating of 9 terraces along Buttermilk Creek
Downcutting of Quarry Creek, Franks Creek, and Erdman Brook	0.051 to 0.089	WVNS 1993a	Difference from 1980 to 1990 in stream surveys
Downcutting of Franks Creek	0.06	WVNS 1993a	Stream profile, knickpoint migration 1955 to 1989
Buttermilk Creek Valley Rim Widening	4.9 to 5.8	Boothroyd, Timson, and Dana (1979)	Downslope movement of slump block over 2 years
Valley Rim Widening of Buttermilk and Franks Creeks and Erdman Brook	0.05 to 0.13	McKinney (1986)	Extrapolate Boothroyd data for 500 years
Erdman Brook Valley Rim Widening	0.02 to 0.04	WVNS 1993a	Downslope movement of stakes over 9 years
SDA Gully Headward Advancement [Reconstructed in 1995]	0.4	WVNS 1993a	Gully advancement-Soil Conservation Services' Technical Report-32 method
NP3 Gully Headward Advancement	0.7	WVNS 1993a	Gully advancement-Soil Conservation Services' Technical Report-32 method
006 Gully Headward Advancement	0.7	WVNS 1993a	Gully advancement-Soil Conservation Services' Technical Report-32 method

Note: To convert meters to feet, multiply by 3.2808.

3.5 Seismology

This section presents information about the hazard to the WNYNSC posed by earthquakes. The earthquake history of western New York and vicinity is described in Section 3.5.1. The historical record is an important element in determining the location, size, and frequency of earthquakes that might affect the WNYNSC. Although the earthquake record offers significant information about the earthquake potential of an area, the historic record is short relative to the time between large earthquakes (which can be thousands of years). The potential for earthquakes along faults and other tectonic features (even if they have not been discovered yet) is considered in Section 3.5.2. The historical seismicity and potential seismicity from tectonic features (both known and unknown) in western New York State are used to estimate the seismic hazard and liquefaction potential for the WNYNSC. Sections 3.5.3, 3.5.4, and 3.5.5 include estimates of the ground motion hazard as typified by peak horizontal ground acceleration (PGA), probabilistic seismic hazard curves (which describe the relationship between some measure of ground motion and the probability of exceeding some value), and liquefaction potential.

3.5.1 Earthquake History for Western New York State and Vicinity

Historical earthquakes are one indication of the number and size of seismic events that might occur in the future. Before the introduction of seismographic instrumentation, the magnitude of an earthquake was approximated by its effects and the damage that was inflicted. The scale used to measure the effects and damage from earthquakes is the Modified Mercalli Intensity (MMI) scale, which ranges from I (no damage) to XII (complete destruction) (**Table 3–6**). Many factors contribute to the damage caused by an earthquake, including distance from the event, the rate of attenuation in the earth, geologic site conditions, and construction methods. Between 1732 and 2004, the historical earthquake record for western New York documents 142 events within a 480-kilometer (300-mile) radius of the WNYNSC, with epicentral intensities of MMI-V to -VIII and moment magnitudes (**M**) up to **M** 6.2 (USGS 2008). At the WNYNSC, the intensity of shaking from these events was much less severe due to the distance from the event. Most regional earthquakes have occurred in the Precambrian basement and were not associated with identified geologic structures (URS 2002b).

Historic earthquakes within a radius of 480 kilometers (300 miles) to the WNYNSC and known to have produced intensities higher than MMI-III at the WNYNSC were the 1929 Attica and the 1944 Cornwall-Massena earthquakes which produced an estimated MMI-IV at the site (WVNS 2004a, 2006).

The 1929 Attica earthquake occurred on August 12 with an epicenter about 48 kilometers (30 miles) northeast of the WNYNSC. The earthquake produced MMI-VII shaking in the epicentral area and was felt over an area of about 130,000 square kilometers (50,000 square miles), including parts of Canada. In Attica, some 250-house chimneys collapsed or were damaged, and cracked walls and fallen plaster were common. Objects were thrown from shelves, monuments in cemeteries were toppled, and a number of wells went dry. The degree of damage to structures generally could be related to the type of design and construction. On the basis of the recorded damage, an MMI-VII and a body-wave magnitude (m_b) 5.2 was assigned to this event based on previous hazard analyses for the WNYNSC (WVNS 2004a). Other studies ascribe an MMI-VIII to the 1929 Attica earthquake (Stover and Coffman 1993, USGS 2005b).

Earthquakes smaller than the 1929 event have occurred frequently in the Attica area (December 1929, 1939, and 1955; July and August 1965; January 1966; and June 1967). The largest of these were the two most recent events with epicentral intensities of MMI-VI and magnitudes of m_b 3.9. These earthquakes likely resulted in intensities of MMI-III or less at the WNYNSC (USGS 2005c, WVNS 2004a). Earthquakes in the Attica, New York area have generally been ascribed to the Clarendon-Linden fault system although there is no definitive data that this is the case (WVNS 2004a, 2006).

The Cornwall-Massena earthquake occurred on September 5, 1944, with an epicenter 430 kilometers (267 miles) east-northeast of the site. It is the largest earthquake ever recorded within New York State. It produced MMI-VIII shaking at its epicenter and was felt over an area of about 450,000 square kilometers (174,000 square miles). At Massena, New York, the earthquake destroyed or damaged 90 percent of the chimneys, and many structures were rendered unsafe for occupancy. Many wells in St. Lawrence County, New York went dry, and water levels were affected in streams and wells as far away as Westchester County and Long Island, New York (WVNS 2004a). The magnitude of the earthquake has been estimated at m_b 5.8.

Table 3–6 The Modified Mercalli Intensity Scale of 1931, with Generalized Correlations to Magnitude, and Peak Ground Acceleration

Modified Mercalli Intensity [a]	*Observed Effects of Earthquake*	*Approximate Magnitude* [b, c]	*Class*	*Peak Ground Acceleration (g)* [d]
I	Usually not felt except by a very few under very favorable conditions.	Less than 3	Micro	Less than 0.0017
II	Felt only by a few persons at rest, especially on the upper floors of buildings.	3 to 3.9	Minor	0.0017 to 0.014
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motorcars may rock slightly. Vibrations similar to the passing of a truck.			
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy object striking building. Standing motorcars rock noticeably.	4 to 4.9	Light	0.014 to 0.039
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.			0.039 to 0.092
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.	5 to 5.9	Moderate	0.092 to 0.18
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.	6 to 6.9	Strong	0.18 to 0.34
VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.	7 to 7.9	Major	0.34 to 0.65
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.			0.65 to 1.24
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.			1.24 and higher
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails greatly bent.	8 and higher	Great	1.24 and higher
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.	8 and higher	Great	1.24 and higher

[a] Intensity is a unitless expression of observed effects of earthquake-produced ground shaking. Effects may vary greatly between locations based on earthquake magnitude, distance from the earthquake, and local subsurface geology. The descriptions given are abbreviated from the Modified Mercalli Intensity Scale of 1931.

[b] Magnitude is a logarithmic measure of the strength (size) of an earthquake related to the strain energy released by it. There are several magnitude "scales" (mathematical formulas) in common use, including local "Richter" magnitude, body wave magnitude, moment magnitude (M), and surface wave magnitude. Each has applicability for measuring particular aspects of seismic signals and may be considered equivalent within each scale's respective range of validity. For very large earthquakes, the M scale provides the best overall measurement of earthquake size.

[c] Correlations back to Modified Mercalli Intensity should be used with caution as they reflect the base or threshold level of shaking experienced in an earthquake with the given magnitude.

[d] Acceleration is expressed as a percent relative to the earth's gravitational acceleration (g) (i.e., [g] is equal to 980 centimeters [32.2 feet] per second squared). Given values are correlated to Modified Mercalli Intensity based on measurements of California earthquakes only (Wald et al. 1999).

Sources: Compiled from USGS 2005a, 2005b; Wald et al. 1999.

Outside the western New York region, there is a zone of major seismic activity near LaMalbaie, Quebec, in the lower St. Lawrence River Valley. Large earthquakes occurred in the LaMalbaie area in 1638, 1661, 1663, 1732 and, most recently, in 1988 (USGS 2005c, WVNS 2004a, 2006). The earthquakes were felt over the entire eastern section of Canada and the northeastern United States. The 1988 M 5.8 earthquake did not produce intensities higher than MMI-III at the WVDP site. The intensity experienced at the site from the pre-1988 earthquakes is unknown but are not expected to have exceeded MMI-IV (WVNS 2004a, 2006).

3.5.2 Tectonic Features and Seismic Source Zones

Potential seismic sources such as active faults and seismic source zones are identified and described by scientists in their approaches to estimating seismic hazard. A *tectonic feature* considered to have seismic potential is a geologic structure such as a fault tens to hundreds of kilometers in extent that is either directly observable on the Earth's surface, or that may be inferred from geophysical investigations. A seismic source zone is an area in which the seismicity is considered to be on buried seismic sources that share similar seismic-tectonic characteristics. The seismicity in a seismic source zone is assumed to occur randomly with no clear association with any of the tectonic features that might be included in the seismic source model. Both tectonic features and seismic source zones are defined by characteristics such as earthquake recurrence rate (over the range of expected magnitudes) and the maximum magnitude that is likely to occur on the feature or within the area. In the northeastern United States, earthquakes not associated with an observable tectonic feature occur primarily in the Precambrian basement beneath the Paleozoic cover. These earthquakes represent either reactivation of preexisting faults or new ruptures in or near the old fault zones (Ebel and Tuttle 2002). The purpose of the seismic source zone is to account for the probability that an event might occur in an area with no history of earthquakes or on a previously unidentified tectonic feature. The maximum magnitude and recurrence rate for seismic source zones are derived from the historical seismicity within the zone, the type of crust that the zone represents, and other factors.

Tectonic features near the WNYNSC that have been identified in seismic hazard studies include the Clarendon-Linden fault system, which marks the eastern boundary of the Elzevir-Frontenac Boundary Zone; the main fairway of the Elzevir-Frontenac Boundary Zone; north-northeast trending lineaments that appear to define the surface expression of the western side of the underlying Elzevir-Frontenac Boundary Zone; and the Bass Island Trend. The Elzevir-Frontenac Boundary Zone is an interpreted tectonic region of Proterozoic crust that has been geophysically mapped in New York State. There is no clear association between seismicity and the western band of north, northeast-trending lineaments that demarcate the western limit of the Elzevir-Frontenac Boundary Zone. The Bass Island Trend is defined by a series of buried thrust faults and associated folds. Earthquake activity has not been recorded along the Bass Island Trend, suggesting that this structure is not seismically active (URS 2002b).

The Clarendon-Linden fault system is the most prominent tectonic feature near the WNYNSC and has been identified as the source of earthquakes in and around Attica, New York (Van Tyne 1975, Fakundiny and Pomeroy 2002, Jacobi and Fountain 1996). Induced seismicity associated with the Clarendon-Linden fault system has been correlated with high pressure injection of water into a brine well (Van Tyne 1975). Boyce and Morris (2002) suggested Paleozoic faulting involving repeated reactivation and upward propagation of basement faults and fractures into overlying strata as a source of seismicity. They hypothesize that movement along the Elzevir-Frontenac Boundary Zone resulted in movement on the Clarendon-Linden fault system. Ouassaa and Forsyth (2002) found no evidence that the complete upper crustal section above the Precambrian basement is faulted. The apparent offsets identified in seismic reflection survey data were alternately attributed to changes in basal Paleozoic strata deposited within the relief of an unconformity; the response of parts of the Paleozoic section to glacial rebound; the result of sediment compaction and non-deposition over topographic relief along the unconformity; or a combination of the above (Ouassaa and Forsyth 2002). Seismicity is not evident along the entirety of the Clarendon-Linden fault system.

Jacobi and Fountain (1996) estimated from the maximum recorded earthquake magnitude for the Clarendon-Linden fault system that "it is probable that no earthquake with a magnitude greater than 6 occurred along these faults in the past 10,000 years." They also concluded that the maximum credible earthquake for the study area is between magnitude 5.2 and 6 in the next 10,000 years, although they believe that there is a small probability that an earthquake larger than magnitude 6 could occur (Jacobi and Fountain 1996). Paleoseismological evidence of activity along the fault system during the Quaternary has not been identified. Tuttle et al. (1995, 1996) did not find historic or prehistoric liquefaction features in the liquefiable deposits in the area of the 1929 Attica earthquake and south of Attica along the fault zone. Various soft-sediment structures were observed, but all could be more reasonably attributed to glacial, sedimentological, or mass wasting processes (Tuttle et al. 1995, 1996; Young and Jacobi 1998). The lack of observed paleoliquefaction features may indicate that earthquakes larger than M 6 have not occurred along the Clarendon-Linden fault system during the last 12,000 years (Tuttle et al. 1995). However, smaller earthquakes may have occurred without leaving a detectable paleoliquefaction record. The 1929 Attica earthquake demonstrated that small to moderate earthquakes can occur on or near the fault system. Although the Clarendon-Linden fault system lacks paleoseismological evidence for Quaternary faulting, seismologic evidence indicates that the system was probably active during this century (Crone and Wheeler 2000).

3.5.3 Ground Motion Hazard Estimates

The most often used engineering measure of earthquake ground shaking is PGA. Thus in estimates of the ground shaking hazard at a site, the horizontal PGA is often estimated using either deterministic and probabilistic techniques. For DOE sites, the latter approach is required by DOE orders and standards. Earthquake-induced ground shaking can be expressed as the force of acceleration relative to the earth's gravity (expressed in units of "g").

In deriving estimates of ground shaking hazard, characterizations of the location, geometry, maximum magnitude, and sense of slip are made regarding relevant seismic source zones and tectonic features affecting the WNYNSC. The maximum earthquake has been alternately defined as the magnitude of the largest historically documented event (1929 Attica earthquake) for the WNYNSC or the maximum earthquake predicted to affect a given location based on the known lengths and histories of active faults or estimates for a given seismic source zone. The PGA estimates of Dames and Moore (1992) for the WNYNSC included the effects of ground amplification due to the presence of soil and unconsolidated sediments. Two important local geologic factors in site amplification are the thickness of soil and sediments and the shear-wave velocity of those materials.

Seismic Hazard Analyses 1970 to 2004

Earthquake hazard analysis has evolved since the construction of the WNYNSC in the 1960s from deterministic to probabilistic analyses. A fundamental difference between these approaches is that deterministic analyses do not consider the frequency of earthquake occurrence, whereas a probabilistic analysis accounts for frequency of occurrence for the full range of possible earthquakes that could affect a site.

In a deterministic analysis, ground motions are estimated for a specified earthquake scenario given the magnitude of the earthquake, distance between the source of the event and the site, and site condition. Probabilistic seismic hazard analysis is a methodology used to estimate the frequency that various levels of earthquake-induced ground motion will be exceeded at a given location (Savy et al. 2002). This frequency can be expressed as an annual probability or a probability in a given exposure period. For example, the International Building Code uses a 2 percent probability of exceedance in 50 years. This is the same as a return period of 2,475 years.

It should be noted that the input parameters used in either deterministic or probabilistic analyses are subject to a high degree of uncertainty. In the central and eastern United States, the short time record of historical earthquake events; the general absence of surface expression of causative faults; and a lack of understanding of the relationship between candidate geologic features and mid-plate or passive continental margin earthquakes contribute to this uncertainty.

Seismic hazard analyses have been developed for the WNYNSC since 1970. The estimated PGA values are summarized in **Table 3–7**.

Table 3–7 Seismic Hazard Estimates

Study Author and Year	*Return Period (years)*	*Peak Horizontal Ground Acceleration (g)*	*Site Condition*
Dames and Moore (1970)	Deterministic	0.12	Soil
EDAC (1975)	135	0.042	Soil
NRC (1977)	Deterministic	0.10 to 0.13	Unknown
TERA (1981)	100 / 1,000	0.06 / 0.14	Soil
Dames and Moore (1983)	33 - 333	< 0.07	Rock
Dames and Moore (1992)	1,000	0.07	Soil
USGS (2002)	500 / 2,500	0.03 / 0.11	Rock

Dames and Moore (1970) identified the Clarendon-Linden fault system and the St. Lawrence River Valley as the major regional seismic source zones comprising potentially important sources of future earthquakes. The study noted the occurrence of several small shocks in the region that could not be associated with known geologic structure. Such events were attributed to local stress-related crustal re-adjustments or to some structural feature not identifiable from existing data. The maximum credible earthquake predicted to affect the WNYNSC was assumed to be the largest documented historical event (WVNS 1992a) for the region (1929 Attica event). Dames and Moore (1970) suggested a design-basis earthquake PGA of 0.12 g, based on an earthquake of MMI VII-VIII occurring about 37 kilometers from the site near the Clarendon-Linden fault.

EDAC (1975) identified five different regional source zones (Clarendon-Linden structure, Adirondacks, the Eastern Mesozoic Basins / Appalachian fold belts, the Ohio River Valley, and the Anna, Ohio area). The most important in terms of hazard posed to the WNYNSC was Source 1 which combined a structure trending east-west across the Niagara Peninsula with the Clarendon-Linden structure. The maximum magnitude was assumed to be equal to the largest historic event, the 1929 Attica event. EDAC obtained a PGA value of 0.042 g for any time period greater than or equal to the return period of 135 years (EDAC 1975).

The Nuclear Regulatory Commission (1977) used the Central Stable region as a source of uniform seismicity for the WNYNSC hazard assessment. The hazard model was deterministic although the mean rate of occurrence of an intensity greater than or equal to the site intensity was determined, then converted into a PGA with no uncertainty. The NRC determined PGA values of 0.10 - 0.13g (NRC 1977).

TERA Corporation (1981) identified four zones (Buffalo-Attica zone, background source zone, Southern St. Lawrence zone, Central Appalachian Fold Belt) that were believed to contribute to the seismicity of the site region. The Buffalo-Attica zone (Source 1) was divided into three sub-zones because of the proximity of the zone to the site. Zone IA consisted of the Clarendon-Linden structure and an inferred westward trending structure. Zone IB included only the Clarendon-Linden structure. Zone IC covered a wider area that assumes that the Buffalo-Attica source extends to the site. Source 2 was described as a background source zone defined as the host region for the West Valley Site. Source 3 was termed the Southern St. Lawrence zone typified by continuous, moderate seismicity. The Central Appalachian Fold Belt, a zone of low activity, comprised Source 4. TERA used a probabilistic methodology that explicitly considered the uncertainties associated with zonation, the selection of the maximum earthquake, and the determination of the recurrence relationship for the WVDP site. The best-estimate hazard curve determined from the study indicated a PGA of 0.06g for the site with a return period of 100 years, and a 0.14g for a 1,000-year return period (TERA 1981).

Dames and Moore (1983) assigned probabilities ranging from 0.05 to 0.25 to seven different source zone models, each with different source zones and maximum magnitudes. The maximum magnitude for the dominant model (Hadley and Devine 1974) was M 6.3 ± 0.5 (Dames and Moore 1983, WVNS 1992a) with uncertainty in the maximum magnitude accounted for by equally weighting three values including the best-estimate and ± 0.5 magnitude units. Two attenuation relationships were used in the determination of the PGA at the site. Dames and Moore (1983) estimated an 84th percentile PGA of 0.07 g for a return period of 33 to 333 years.

Dames and Moore (1992) applied the Electric Power Research Institute/Seismicity Owners Group (EPRI/SOG) probabilistic seismic hazard methodology to develop seismic hazard estimates for the WNYNSC. The EPRI/SOG methodology incorporated historical earthquake catalog information and the expert opinions of six teams of earth scientists who described source zones with associated maximum magnitudes and seismicity patterns for the eastern United States. For most of the teams, the main contributor to the seismic hazard for the WNYNSC was the Clarendon-Linden fault source acting in combination with a background source. Including site amplification effects, the calculated median PGA value was 0.07g for a return period of 1,000 years (WVNS 1992a).

In the most recent and comprehensive seismic hazard evaluation of the site, URS (2004) performed a site-specific probabilistic seismic hazard analysis for a hard rock site condition. Site response analyses of the North Plateau and the South Plateau areas were performed to incorporate the effects of the general soil conditions in those portions of the WNYNSC site into the ground motion hazard estimates. The specific tasks performed in this study were: (1) based on available data and information, identify all potential seismic sources in the region surrounding the site that may significantly contribute to its seismic hazard; (2) characterize the location, geometry, orientation, maximum earthquake magnitude, and earthquake recurrence of these seismic sources based on available data and information; (3) assess the effects of the subsurface geology on strong ground shaking at the site; and (4) estimate the horizontal ground motions for selected annual probabilities of exceedance by performing a probabilistic seismic hazard analysis.

In the study, 19 seismic sources were characterized and included in the probabilistic analysis: 15 regional seismic source zones and four fault systems or fault zones. The fault systems or fault zones included: the Clarendon-Linden fault zone, the Charleston fault zone, the New Madrid fault system, and the Wabash Valley fault system. Gaussian smoothing of the historical seismicity was also incorporated into the analysis.

Based on the possible association with contemporary seismicity, URS (2004) assigned a high probability that the Clarendon-Linden fault zone is active. The best estimate maximum magnitudes for the Clarendon-Linden fault zone ranged from about **M** 6 to 7. Because of the short, discontinuous nature of the individual fault sections in the Clarendon-Linden fault zone (from a few kilometers to several tens of kilometers), it was judged unlikely that earthquakes of **M** 7 or larger can be generated by the Clarendon-Linden fault zone. The best estimate recurrence interval for the fault is based on the observations that **M** > 6 earthquakes have been absent along the Clarendon-Linden fault zone in the past 12,000 years. If a relatively uniform recurrence intervals for **M** ≥ 6 earthquakes on the Clarendon-Linden fault zone is assumed, and there are no data to argue either way, then the preferred recurrence interval was 10,000 years.

To estimate ground motions, six state-of-the-art ground motion attenuation relationships for hard rock site conditions in the CEUS were used. Based on the probabilistic seismic hazard analysis and the input of the seismic source model and attenuation relationships, PGA and 0.1 and 1.0 sec horizontal spectral accelerations were calculated for three DOE-specified return periods (or annual exceedance probabilities), as shown in **Table 3–8**.

Table 3–8 Site-specific Mean Spectral Accelerations on Hard Rock (g's)

Return Period (years)	*Peak Horizontal Ground Acceleration*	*0.1 Sec Spectral Acceleration*	*1.0 Sec Spectral Acceleration*
500	0.04	0.07	0.02
1,000	0.05	0.11	0.03
2,500	0.10	0.20	0.06

Source: URS 2004.

The largest contributor to the hazard at the site was the Clarendon-Linden Fault Zone at almost all return periods. The seismicity within the Southern Great Lakes seismic source zone (includes the site) is the second most important contributor to the mean PGA hazard. These observations are not surprising since the Clarendon-Linden Fault Zone is the only significant source in the site region and the historical seismicity is at a relatively low level. At 1.0 sec spectral acceleration, the contributors to hazard are the same. The New Madrid fault system does not contribute significantly to the hazard at the site.

A site response analysis was also performed to estimate the ground motions at the WNYNSC site incorporating the site-specific geology, which includes about 30 to 50 meters (100 to 165 feet) of fill, soil, and glacial till over Paleozoic bedrock. Using a random vibration theory-based equivalent-linear site response approach and the available geotechnical data from the Waste Tank Farm and Vitrification Building, ground motions were calculated for the ground surface at the North Plateau and South Plateau areas. The results for two return periods are shown in **Table 3–9**.

Table 3–9 Site-specific Mean Spectral Accelerations on Soil (g's) for North Plateau Areas and South Plateau

Return Period (years)	*Peak Horizontal Ground Acceleration*	*0.1 Sec Spectral Acceleration*	*1.0 Sec Spectral Acceleration*
500	0.05/0.03	0.09/0.08	0.04/0.05
2,500	0.14/0.11	0.24/0.22	0.11/0.14

Source: URS 2004.

The U.S. Geological Survey has developed state-of-the-art probabilistic National Hazard Maps since 1996 based on historic seismicity and information on active faults. Their map values are summarized in Table 3–7 for a firm rock site condition.

Estimates of the peak horizontal ground acceleration values at the WNYNSC presented in this section show a range of values from 0.07 to 0.14g at a return period of 1,000 years. The site adopted a design-basis earthquake with a horizontal peak horizontal ground acceleration of 0.10 g and a return period of 2,000 years. The design-basis earthquake was established in 1983 using a probabilistic assessment consistent with analyses for a typical nuclear power plant in the eastern United States. The design-basis earthquake was quantified in engineering terms using the NRC Regulatory Guide 1.60 response spectra (WVNS 2004a, 2006).

3.5.4 Liquefaction Potential

Liquefaction describes the behavior of unconsolidated, saturated soil and sediment that are induced to the consistency of a heavy liquid or reach a liquefied state as a consequence of excess porewater pressure and decrease in effective stress. Liquefaction typically occurs where earthquake motion increases hydrostatic stresses in loose, saturated, granular soil or sediment. Earthquake-induced soil liquefaction may have potentially damaging effects on the integrity of facilities including situations where the structure itself may survive design-basis ground accelerations only to be damaged by ground failure. The greatest potential for liquefaction occurs when the water table is within 3 meters (10 feet) of the surface. Geological deposits such as the sand and gravel layer on the North Plateau have the greatest potential for earthquake-induced liquefaction. Clay-rich deposits of glacial till, such as those found at the WNYNSC, are generally not prone to liquefaction. There has been no evidence identified of earthquake-induced liquefaction in the last 12,000 years, either at the site of the 1929 Attica earthquake, where most of the modern seismicity in western New York is concentrated, or along the Clarendon-Linden fault (Tuttle et al. 2002).

Evidence of seismically induced ground failure, such as liquefaction, slumping, and fissuring, has not been observed on or near the WNYNSC. This lack of evidence is consistent with the epicentral intensities of historic earthquakes occurring within a radius of 480 kilometers (300 miles) of the WNYNSC and their projected intensity (MMI-IV) at the WVDP. Seismic intensity of MMI-IV or less are typically associated with peak ground accelerations of less than 0.05 g and would not typically produce liquefaction in the soil materials at the site (WVNS 2004a, 2006).

Methods for evaluating liquefaction potential (Seed et al. 1983, Liao et al. 1988) using data from standard penetration testing were applied to soil samples from 28 monitoring well locations on the North Plateau (WVNS 1992a). Standard penetration testing data were analyzed to estimate the probability of liquefaction at the WNYNSC resulting from a magnitude 5.25 event corresponding to a peak ground acceleration of 0.15 g. The potential for liquefaction in the sand and gravel layer underlying the Construction and Demolition Debris Landfill is estimated to be about 20 percent, 30 percent near the old meteorological tower in WMA 10, and less than 1 percent in the area near the former Chemical Process Cell Waste Storage Area in WMA 5. There are no foundations or steep slopes near these locations. The potential for liquefaction associated with stronger earthquakes is larger; however, the probability of such an earthquake at the WNYNSC is low based on the historical record. Near the old meteorological tower in WMA 10, the liquefaction potential increases to 60 percent (high) for a magnitude 7.5 earthquake. The liquefaction potential for all other sites would remain below 50 percent for such an event. A magnitude 7.5 event is larger than the maximum credible earthquake estimated for this region.

The liquefaction potential for the Lavery till and the Kent recessional units is less than that for the overlying sand and gravel. Cohesive, clay-rich glacial till, such as the Lavery till, are not easily liquefied (WVNS 1992a). Standard penetration test results from eight wells completed in the Kent recessional unit under the South Plateau indicate that there is less than a one percent chance of liquefaction from a horizontal ground acceleration of 0.15 g (WVNS 1993g). The areas of greatest liquefaction potential on the WNYNSC do not contain facilities with large inventories of radioactive material. Liquefaction poses less of a hazard to the waste-containing areas (NDA, SDA) on the South Plateau because of their encapsulation in clayey till.

3.6 Water Resources

Water enters the area of the Project Premises and SDA as a result of precipitation (i.e., rain and snow), surface runoff from higher elevations, or groundwater infiltration from areas of higher head. Water exits the Project Premises and SDA by surface runoff, evapotranspiration (i.e., evaporation or transpiration from plants), or groundwater flow. Most of the water exits by evapotranspiration and surface runoff (WVNS 1993g).

3.6.1 Surface Water

Two perennial streams drain the WNYNSC: Cattaraugus Creek and one of its tributaries, Buttermilk Creek (see **Figure 3–17**). Buttermilk Creek roughly bisects the WNYNSC and flows generally north at an average rate of 1.8 cubic meters (64 cubic feet) per second to its confluence with Cattaraugus Creek at the northernmost end of the WNYNSC boundary. Cattaraugus Creek then flows generally west and empties into Lake Erie, about 64 kilometers (40 miles) downstream of the WVDP Premises. The Project Premises and SDA are entirely within the Buttermilk Creek drainage area of 76 square kilometers (29 square miles) that also encompasses most of the WNYNSC (WVNS 2004a).

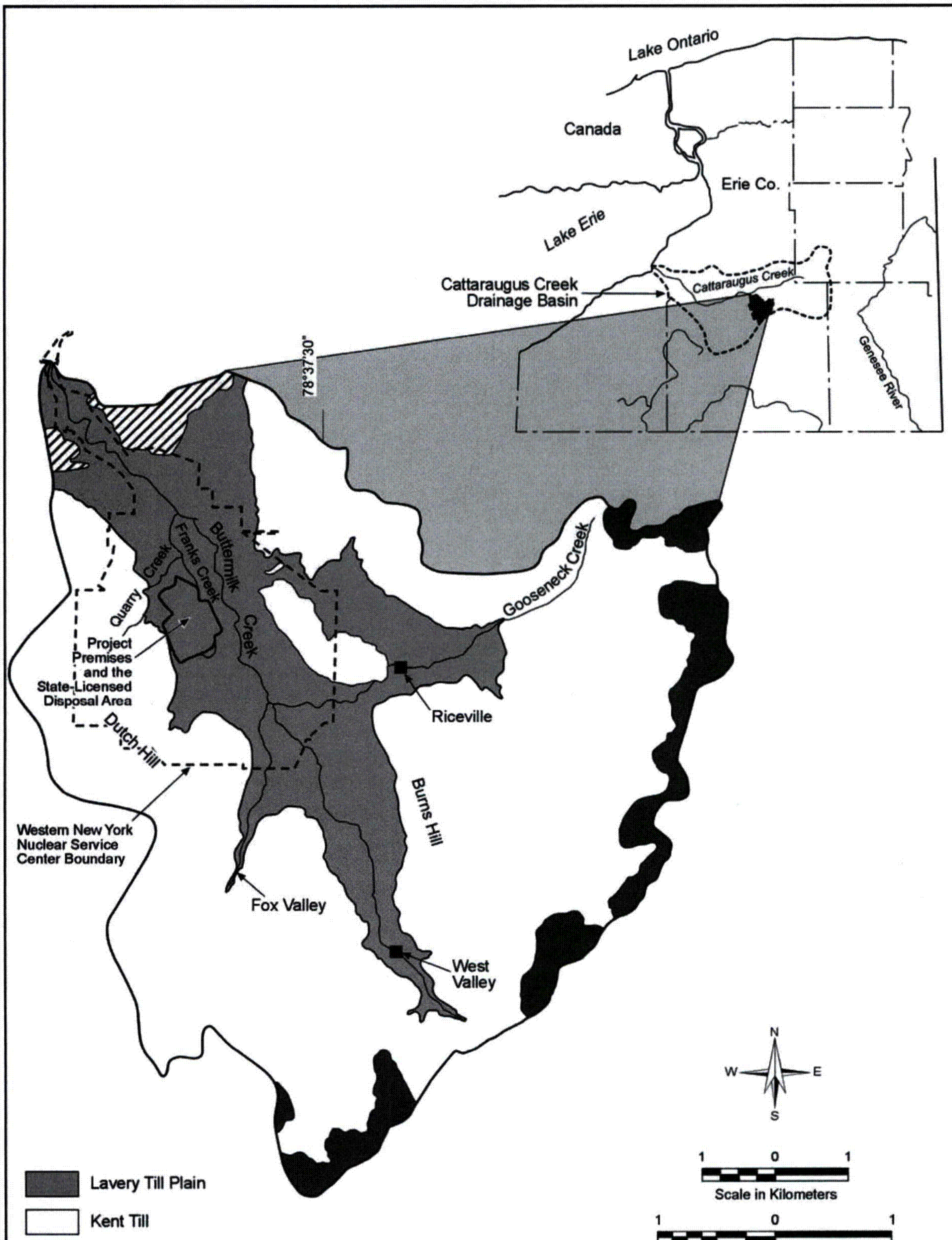


Figure 3–17 Buttermilk Creek Drainage Basin

Three small intermittent streams drain the Project Premises and SDA: Erdman Brook, Quarry Creek, and Franks Creek (see Figure 3–1). Erdman Brook and Quarry Creek are tributaries to Franks Creek, which flows into Buttermilk Creek. Erdman Brook, the smallest of the three streams, receives runoff from the central and largest portion of the Project Premises and the SDA, including the disposal areas (WMAs 7 and 8), the Low-Level Waste Treatment Facility and Lagoons 1 through 5 (WMA 2), the Main Plant Process Building area (WMA 1), the central Project Premises (WMA 6), and a major part of the parking lots (WMA 10). Quarry Creek receives runoff from the High-Level Radioactive Waste Tank Farm and vitrification area (WMA 3), the north half of the northern parking lot (WMA 10), and the waste storage area (WMA 5). Franks Creek receives runoff from the east side of the Project Premises and the SDA, including the Radwaste Treatment System drum cell (WMA 9), part of the SDA (WMA 8), and the Construction and Demolition Debris Landfill (WMA 4) (WVNS 2004a, 2006).

New York assigns water classifications to all waters in the state, defining the best usages of each waterbody. The classification is the legal basis for water quality protection programs. Cattaraugus Creek, in the immediate downstream vicinity of the WNYNSC, is identified as a Class "B" receiving water. Franks Creek, Quarry Creek, and segments of Buttermilk Creek under the influence of site water effluents, are identified as Class "C" (WVNS and URS 2007). Class "B" waters are best used for primary and secondary contact recreation and fishing and are to be suitable for fish propagation and survival. The best usage of Class "C' waters is fishing, but these waters are also intended to be suitable for fish propagation and survival as well as for primary and secondary contact recreation, although other factors may limit the use for these purposes (NYSDEC 1998a). None of the streams on the WNYNSC is on the state's current Clean Water Act Section 303(d) list as being impaired relative to attaining water quality standards and designated uses (NYSDEC 2004b).

The site maintains a State Pollutant Discharge Elimination System permit (NY0000973) issued by NYSDEC for the discharge of nonradiological liquid effluents to Erdman Brook and Franks Creek, and which specifies the sampling and analytical requirements for each outfall. The NYSDEC issued a modified permit to DOE with an effective date of September 1, 2006, and an expiration date of February 1, 2009 (NYSDEC 2004c, WVNS and URS 2007). This modified permit covers five primary outfalls (see **Figure 3–18**): outfall 001 (WNSP001, discharge from the Low-Level Waste Treatment Facility and the North Plateau groundwater recovery system via Lagoon 3); outfall 007 (WNSP007, discharge from the Sanitary and Industrial Wastewater Treatment Facility); outfall 008 (WNSP008, groundwater French drain effluent from the perimeter of the Low-Level Waste Treatment Facility storage lagoons); outfall 116 (WNSP116, a location in Franks Creek used to monitor compliance with the instream total dissolved solids limit from upstream sources and to adjust discharges from Lagoon 3 and the need for augmentation water); and outfall 01B (WNSP01B, an internal monitoring point for the liquid waste treatment system evaporator effluent) (NYSDEC 2004c, WVNS and URS 2007). While still in the State Pollutant Discharge Elimination System permit, outfall 008 (WNSP008) is no longer active, but is maintained as a potential point source. This outfall discharged groundwater and surface water runoff directed from the northeast side of the site's Low-Level Waste Treatment Facility lagoon system through a French drain to Erdman Brook until the outfall was capped off in May 2001 (WVNS and URS 2007). In addition to the five existing outfalls, the modified permit authorized discharges from 20 stormwater outfalls to include associated monitoring requirements and discharge limits. These 20 outfalls receive stormwater runoff from inactive waste disposal areas, areas where materials or wastes are stored or handled, and areas where construction or structure dismantlement or other soil disturbance activities may be performed. Among other changes, the modified permit added new requirements for reporting water treatment chemical usage, added monitoring for chemical substances used for weed control, and a new requirement to prepare and implement a Stormwater Pollution Prevention Plan (NYSDEC 2004c, WVNS and URS 2006). During 2006, none of the 1,060 effluent samples collected exceeded permitted values, for a compliance rate of 100 percent (WVNS and URS 2007).

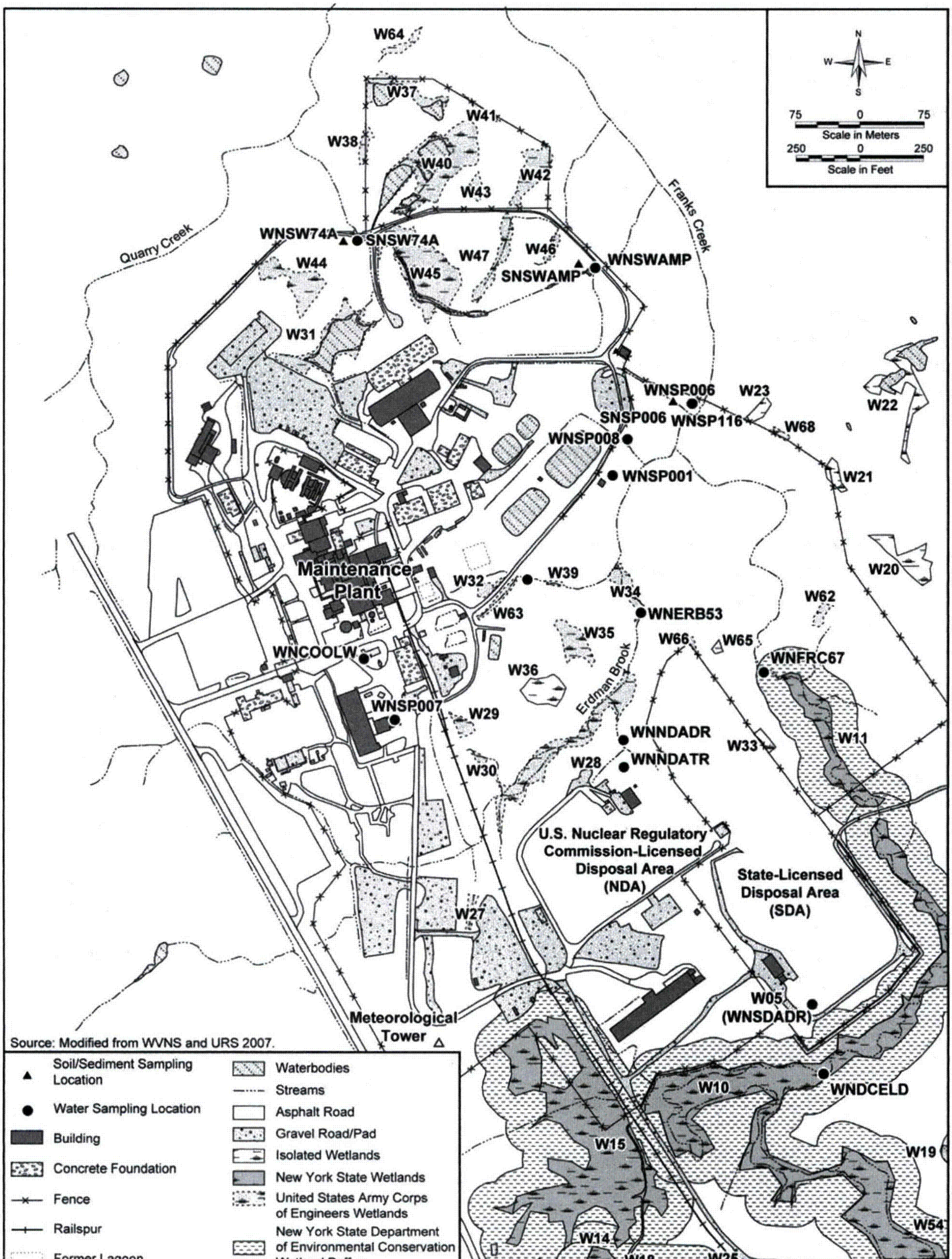


Figure 3–18 Onsite Surface Water and Soil/Sediment Sampling Locations

In September 2005, a new State Pollutant Discharge Elimination System Permit (NY0269271) was issued to NYSERDA for stormwater discharges from the SDA. The permit has an effective date of November 1, 2005, and an expiration date of October 31, 2010. This permit covers six outfalls (W01–W06) and specifies associated monitoring requirements and discharge limits. The permit also requires preparation and implementation of a Storm Water Pollution Prevention Plan (NYSDEC 2005b).

Two water supply reservoirs (part of WMA 12) are located south (upstream) of the Project Premises and the SDA. Figure 3–2 shows the location of these reservoirs that were formed by blocking two intermittent tributaries to Buttermilk Creek with earthen dams. The reservoirs drain numerous streams over a 1,255-hectare (3,000-acre) area. A short canal connects the reservoirs; the south reservoir drains to the north reservoir, which discharges into Buttermilk Creek through a sluice gate water level control structure. An emergency spillway is also located on the south reservoir (WVNS 2004a, 2006). Overtopping of the emergency spillway was originally designed to occur in the event of a 25-year storm (Dames and Moore 1986). However, some of the available storage in the reservoirs has been lost to sedimentation. In 1996, the spillway was regraded and stabilized using a geosynthetic to control erosion. Gabions are located at the top of the slope (WVNS 2004a). Other than the two water supply reservoirs and wastewater treatment lagoons in WMA 2, several small ponds are located across the WNYNSC including former borrow pits (Northern Borrow Pits) located in the northeast corner of the Project Premises (WVNS 2004a, WVNS and URS 2005). These ponds do not receive liquid effluent, but they were monitored for selected nonradiological and radiological parameters until 2005 (WVNS and URS 2006).

The streams draining the Project Premises and the SDA exhibit large flow variations. Peak streamflows occur either in spring from a heavy rainfall on snow cover with a frozen ground or in summer from thunderstorms. In the past, streamflow monitoring equipment was located at the Franks Creek-Quarry Creek confluence, the Erdman Brook-Franks Creek confluence, and at Erdman Brook just below the NDA. Peak flows measured on March 27, 1991, for the period from 1990 to 1991 were 9.6 cubic meters (340.3 cubic feet) per second at the confluence of Quarry Creek and Franks Creek, 4.6 cubic meters (161 cubic feet) per second where Franks Creek leaves the Project Premises, and more than 1.7 cubic meters (60 cubic feet) per second in Erdman Brook. Peak flow measured at the U.S. Geological Survey gauge station at the Bond Road Bridge over Buttermilk Creek (which operated from 1962 to 1968) was 111 cubic meters (3,910 cubic feet) per second on September 28, 1967 (WVNS 2004a).

Otherwise, the only current flow measurement equipment is a parshall flume at monitoring point WNSP006 in Franks Creek, just downstream from outfall 001 (WNSP001). Data for this location is used to generate the total dissolved solids compliance calculation for outfall 116 (WNSP116). Measurements are only taken when Lagoon 3 discharges, and are reported in monthly discharge monitoring reports to NYSDEC. Since 1991, there have been hydraulic changes to the watershed with increased discharges into Erdman Brook and Franks Creek. For example, discharges at outfall 001 (WNSP001) have increased (primarily due to North Plateau Plume pump and treat mitigation) by roughly 15 million liters (4 million gallons) per year since the original period when in-stream flow was measured (Malone 2006).

Flood levels for the 100-year storm (see **Figure 3–19**) show that no facilities on the Project Premises or the SDA are in the 100-year floodplain. This is partly attributable to the fact that Cattaraugus and Buttermilk Creeks, as well as Franks Creek, Quarry Creek, and Erdman Brook, are located in deep valleys such that floodwaters would not overtop their banks flooding the plateau areas where facilities are located. Indirect flood effects, including streambank failure and gully head advancement from high streamflows in the short term, could impact Lagoons 2 and 3 (WMA 2), the NDA, and site access roads in several locations (WVNS 2004a, 2006). No 500-year floodplain map is currently available for the creeks bordering the Project Premises and the SDA.

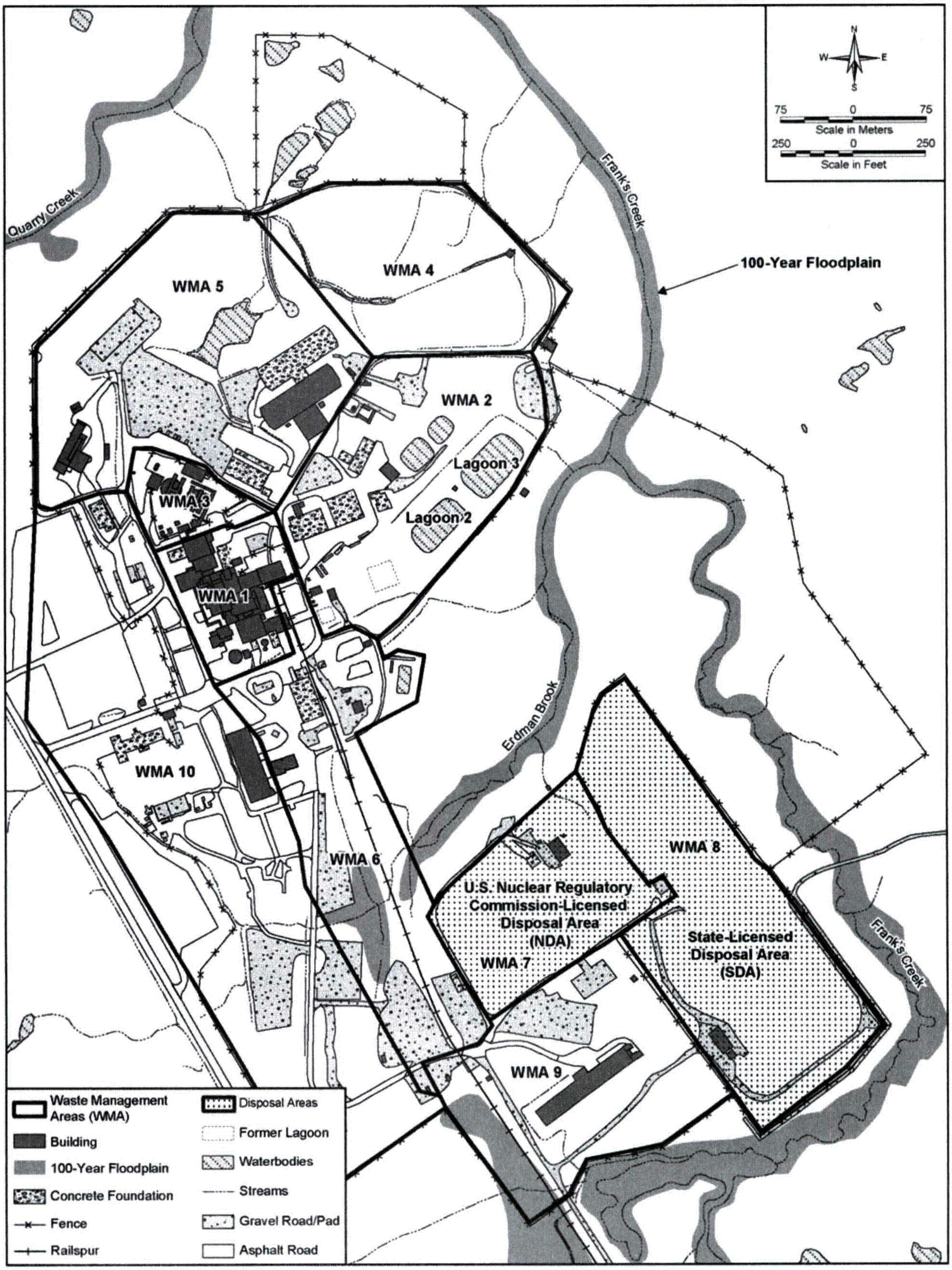


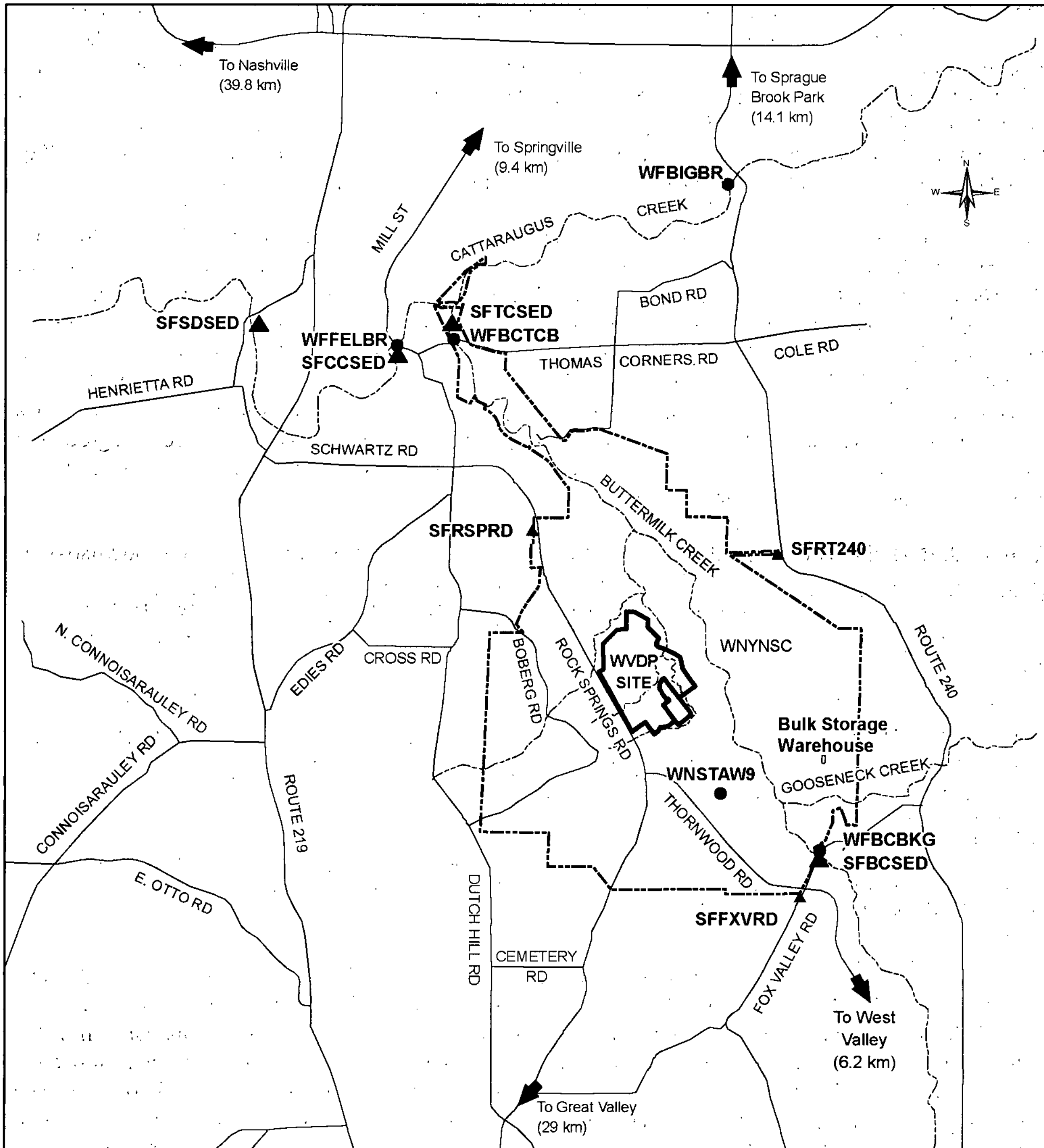
Figure 3–19 100-Year Floodplain Near the Project Premises

An analysis of the probable maximum flood based on probable maximum precipitation has been performed for this EIS (see Appendix M for more detail). The probable maximum flood is generally more conservative than the 500-year flood because it is defined as the flood resulting from the most severe combination of meteorological and hydrologic conditions (DOE 2002c). The results of this analysis indicate that the probable maximum flood floodplain is very similar to the 100-year floodplain, particularly in areas adjacent to the industrialized or developed portions of the site including areas where waste is stored or buried (URS 2008b). Most of the stream channels near the industrialized area have relatively steep sides and the probable maximum flood flow remains in these channels. The probable maximum flood floodplain is wider than the 100-year floodplain in areas where the topography is relatively flat such as the extreme upper reaches of Erdman Brook and Franks Creek. It is possible that the integrity of the northern slope of the SDA could be compromised (WVNS 2004a, 2006, 2007).

3.6.1.1 Contaminant Releases and Water Quality

Several onsite surface water monitoring locations are maintained for sampling both radiological and nonradiological constituents (see Figure 3–18). Among these, WNSP006 is the Project Premises' main drainage point and is located immediately downstream of outfall 001 (WNSP001) in Franks Creek. The northeast swamp (WNSWAMP) is sampled to monitor surface water drainage and emergent groundwater from the northeastern portion of the site's North plateau. The north swamp (WNSW74A) monitoring point is sampled to monitor drainage including emergent groundwater to Quarry Creek from the northern portion of the North Plateau. Comparative samples are also collected from an upstream background monitoring location (Buttermilk Creek at Fox Valley Road, WFBCBKG) (**Figure 3–20**). WNSP006 is located more than 4.0 kilometers (2.5 miles) upstream from Thomas Corners Bridge (WFBCTCB), the last monitoring point before Buttermilk Creek leaves the WNYNSC and before the public has access to the creek waters. In 2006, two sets of grab samples for nonradiological parameters were collected from each of the aforementioned locations. Samples were specifically analyzed for selected organic and inorganic constituents and selected anions, cations, and metals. At surface water monitoring locations WFBCTCB, WNSP006, and background reference location WFBCBKG, the maximum concentrations of total iron exceeded the state water quality standards. The elevated iron concentrations are attributable to elevated background concentrations, runoff from industrial activities, fine sediments from placement of quarried materials delivered from offsite sources, and natural silts and fine sediments from soil erosion. With the exception of iron, the other nonradiological constituents remained within the range of historical values. Monitoring results for other nonradiological parameters are detailed in the *Annual Site Environmental Report* (WVNS and URS 2007). In 2005 the sampling frequency of the offsite soil locations shown in Figure 3–20 was changed from annual to once every three years. These locations were last sampled in 2004 and are scheduled for sampling in 2007.

In addition to monitoring facility effluents for nonradiological constituents in accordance with permitted levels, radiological constituents (radionuclides) in facility effluents, as well as in onsite and offsite surface water, are monitored as part of the site environmental monitoring program. Waterborne radiological releases are from two primary sources that include discharges from the Low-Level Waste Treatment Facility via Lagoon 3 and from groundwater seepage on the North Plateau that is contaminated with strontium-90 from prior operations. The discharge from the Low-Level Waste Treatment Facility from Lagoon 3 outfall 001 (WNSP001) into Erdman Brook is the primary controlled point source of radioactivity released to surface waters from the Project Premises. There were six batch releases from the Lagoon 3 outfall in 2006 totaling about 39.3 million liters (10.4 million gallons). In total, discharges from Lagoon 3 contained an estimated 0.05 curies of tritium and 0.012 curies of gross alpha and beta-emitting radionuclides. These releases are further detailed by individual radionuclide in the *Annual Site Environmental Report* (WVNS and URS 2007).



- - - - Western New York Nuclear Service Center (WNYNSC) Boundary

—— West Valley Demonstration Project (WVDP) Site Boundary

▲ Soil/Sediment Sampling Location

● Water Sampling Location

km kilometers

Note: Arrows and given distances indicate sampling locations off the map. Beginning in 2004 the sampling frequency was changed from annual to once every three years.

Figure 3–20 Offsite Surface Water and Soil/Sediment Sampling Locations

Several sets of state and Federal regulatory guidelines and standards are incorporated into the site monitoring programs (WVNS 2006). State guidelines and standards include New York State Water Quality Standards and Guidelines from 6 NYCRR Parts 701-704, New York State Department of Health Standards of Raw Water Quality from 10 NYCRR 170.4, and New York State Department of Health Maximum Contaminant Level Sources from 5 NYCRR 5-1.52. Federal guidelines and standards include U.S. Environmental Protection Agency Maximum Contaminant Level Sources and Maximum Contaminant Level Goals (non-enforceable) from 40 CFR Part 141, and DOE Derived Concentration Guides from DOE Order 5400.5.

Based on the results of routine monitoring for radiological constituents in 2006 at location WNSP006, gross beta, strontium-90, uranium-233/uranium-234, and uranium-238 average concentrations exceeded the range of the respective background values, but did not exceed applicable DOE Derived Concentration Guides[1], as summarized in **Table 3–10**. At the northeast swamp (WNSWAMP), average gross beta, and strontium-90 concentrations of $2.32 \pm 0.01 \times 10^{-6}$, and $1.21 \pm 0.01 \times 10^{-6}$ microcuries per milliliter, respectively, exceeded background ranges in 2006. The average strontium-90 concentration also exceeded the DOE Derived Concentration Guide. At the north swamp (WNSW74A), average gross beta and strontium-90 concentrations of $1.95 \pm 0.14 \times 10^{-8}$ and $6.17 \pm 0.36 \times 10^{-9}$ microcuries per milliliter, respectively, exceeded background in 2006. The elevated gross beta concentrations at the north and northeast swamp location are attributable to strontium-90 in groundwater seepage (WVNS and URS 2007).

Table 3–10 Radiological Parameters Exceeding Background Ranges in Surface Water Downstream of the Project Premises at Franks Creek (WNSP006) in 2005

Parameter	*Average Concentration (Location WNSP006)*	*Background Range (Location WFBCBKG)*	*DOE Derived Concentration Guide* [a]
Gross Beta	$4.18 \pm 0.30 \times 10^{-8}$	$1.61 \times 10^{-9} - 7.34 \times 10^{-9}$	1.0×10^{-6} [b]
Strontium-90	$1.31 \pm 0.17 \times 10^{-8}$	$2.74 \times 10^{-10} - 1.16 \times 10^{-9}$	1.0×10^{-6}
Uranium-233/Uranium-234	$2.58 \pm 1.20 \times 10^{-10}$	$7.47 \times 10^{-11} - 2.19 \times 10^{-10}$	5.0×10^{-7}
Uranium-238	$1.95 \pm 1.04 \times 10^{-10}$	$3.74 \times 10^{-11} - 1.25 \times 10^{-10}$	6.0×10^{-7}

[a] DOE ingestion-based Derived Concentration Guides for 100 millirem per year dose limit are provided as a guideline for radiological results.
[b] Gross beta as strontium-90.
Note: All units in microcuries per milliliter. Values are reported based on a 95 percent confidence level with the plus-or-minus (±) sign marking the confidence interval in which there is a 95 percent probability that the true value lies.
Source: WVNS and URS 2006.

Surface waters are also routinely monitored for radiological and other indicator constituents at several points around the NDA (WMA 7) and SDA (WMA 8) by DOE (see Figure 3–18). For the NDA, monitoring point WNNDATR is a sump at the lowest point in the collection trench system that intercepts groundwater from the northeastern and northwestern sides of the NDA. Water collected underground at this location is pumped to the Low-Level Waste Treatment Facility for treatment prior to discharge at outfall 001 (WNSP001). Surface water drainage downstream of the NDA is monitored at WNNDADR. Further downstream is monitoring point WNERB53 in Erdman Brook which represents surface waters from the NDA before they join with drainage from the Main Plant Process Building and lagoon areas. Strontium-90 and associated gross beta were elevated with respect to background (WFBCBKG) in 2006 at all three NDA monitoring locations but below the DOE Derived Concentration Guide for strontium-90. Tritium was also elevated with respect to background at WNNDATR and WNNDADR, and gross alpha and iodine-129 were elevated at WNNDATR. Residual soil contamination from past waste burial activities is thought to be the source of the strontium-90 activity. Tritium

[1] *It should be noted that the definition of a Derived Concentration Guide, per DOE 5400.5, is "the concentration of a radionuclide in air or water that, under conditions of continuous exposure for 1 year by one exposure mode (i.e., ingestion of water, submersion in air, or inhalation), would result in an effective dose equivalent of 100 millirem."*

concentrations have generally decreased over time at both WNNDATR and WNNDADR, which may be partially attributable to radioactive decay (WVNS and URS 2007).

For the SDA, semiannual sampling is performed from one of the six designated stormwater outfalls in accordance with the SDA SPDES Permit. Immediately south of the SDA point WNDCELD is sampled to monitor surface drainage from the area around the drum cell. To the north, location WNFRC67, in Franks Creek, is sampled to monitor drainage downstream of the drum cell and the eastern and southern borders of the SDA. In addition to routine samples collected by the site, samples are collected and analyzed by the New York State Department of Health (NYSDOH) at the two stream sampling points that receive drainage from the South Plateau, WNFRC67 and WNERB53 (see Figure 3–18) (WVNS and URS 2007).

In 2006, offsite surface water quality continued to be monitored at two locations, one on Buttermilk Creek and one on Cattaraugus Creek, in addition to the upstream background monitoring location on Buttermilk Creek at Fox Valley Road (WFBCBKG) and at a background location on Cattaraugus Creek at Bigelow Bridge (WFBIGBR). Average gross beta ($6.51 \pm 9.25 \times 10^{-10}$ microcuries per milliliter) concentration at the Thomas Corners Bridge location (WFBCTCB) in Buttermilk Creek, but downstream of the WVDP, exceeded the Buttermilk Creek background range. At the Felton Bridge (WFFELBR) offsite location, downstream of the point where Buttermilk Creek enters Cattaraugus Creek, the average gross alpha concentration of $1.43 \pm 0.99 \times 10^{-9}$ microcuries per milliliter and average gross beta concentration of $6.40 \pm 1.68 \times 10^{-9}$ microcuries per milliliter exceeded the Cattaraugus Creek background ranges of 3.59×10^{-10} to 9.42×10^{-10} microcuries per milliliter and 2.8×10^{-9} to 3.62×10^{-9} microcuries per milliliter, respectively. This is the first point accessible by the general public, and these elevated concentrations may be attributed to small amounts of radioactivity moving from the site via Franks Creek. Taking into account seasonal fluctuations, gross beta activity has remained relatively constant at this location over the last decade (WVNS and URS 2007).

Drinking water, derived from the onsite reservoir system upstream of the Project Premises and SDA, is monitored at the distribution point and at other site tap water locations to verify compliance with EPA and NYSDOH regulations. Samples are collected and analyzed for metals, nitrate, fluoride, cyanide, principal organic contaminants, residual chlorine, and biological constituents. Results indicated that in 2006, the Project's drinking water continued to meet MCLs and drinking water standards of the EPA, NYSDOH, and the Cattaraugus County Health Department (WVNS and URS 2007).

3.6.1.2 Stream Sediment Contamination

Surface water and stream sediment quality downstream from the Project Premises and SDA has been impacted by past fuel reprocessing operations, primarily from previous discharges from Lagoon 3 (WMA 2) between 1966 and 1972. During this time, a yearly average of 0.7 curies of alpha emitters, 65 curies of beta emitters, and 3,500 curies of tritium were released from Lagoon 3 to Erdman Brook, which flows into Franks Creek. Subsequent radioactive discharges from Lagoon 3 were related to treatment of SDA leachate from 1975 to 1981 and from facility operations from 1972 to the present. Several of the discharged radionuclides, particularly cobalt-60, strontium-90, cesium-134, and cesium-137, have an affinity to become chemically sorbed to silt and accumulate in the streambeds. It is assumed that stream sediments within WMA 12 between the Lagoon 3 outfall on Erdman Brook and the confluence of Franks Creek and Quarry Creek is contaminated (WSMS 2008a). However, results from a 1990s RCRA facility investigation and current monitoring indicate additional contamination downstream from the confluences, as discussed below.

Soil and sediment from three onsite drainage channels are sampled annually to track waterborne movement of contaminants. Stream sediments in onsite and offsite creeks continue to be monitored for radiological constituents. Onsite monitoring locations include Franks Creek where it leaves the security fence (SNSP006) to the northeast of Lagoon 3, the north swamp drainage swale (SNSW74A) in WMA 5, and the northeast swamp drainage swale (SNSWAMP) in WMA 4. These are locations where liquid effluents leaving the site are most likely to be radiologically contaminated. Results are compared to land-use-specific threshold levels for decommissioning and decontamination of contaminated sites, established in accordance with the 2002 Memorandum of Understanding between the NRC and EPA, and to results from an upstream "background" location (Buttermilk Creek at Fox Valley Road, SFBCSED) that has not received WVDP effluents. In 2006, the NRC, in a decommissioning guidance document (NRC 2006), provided concentration screening values (NUREG-1757 value) for common radionuclides in soils that could result in a dose of 25 millirem per year. For 2006 cesium-137 concentrations at locations SNSP006 and SNSWAMP, measured at $2.33 \pm 0.14 \times 10^{-5}$ and $2.62 \pm 0.22 \times 10^{-5}$ microcuries per gram respectively, were higher than both the industrial/commercial level and the NUREG-1757 value. The strontium-90 concentrations at these two locations, $4.14 \pm 0.54 \times 10^{-7}$ and $2.96 \pm 0.13 \times 10^{-6}$ microcuries per gram, also exceeded both the industrial/commercial level and the NUREG-1757 value. These observations are indicative of contamination from historical releases. It also exceeded the 10-year averaged concentration from the Buttermilk Creek background site of $3.41 \pm 2.77 \times 10^{-8}$ microcuries per gram. No other radiological constituent concentrations exceeded the applicable respective threshold level or NUREG-1757 values, but all three onsite locations exceeded comparable background concentrations for more than one radionuclide (WVNS and URS 2007).

Sediments are collected off site at three locations downstream of the Project Premises and SDA, including Buttermilk Creek at Thomas Corners Road (SFTCSED) immediately downstream of site effluents, Cattaraugus Creek at Felton Bridge (SFCCSED), and Cattaraugus Creek at the Springville dam (SFSDSED). This third location is behind the Springville dam where significant sediments accumulate, including sediments that may have adsorbed radionuclides from the site. The 10-year averaged concentrations from a fourth location (SFBISED, Bigelow Bridge) are used as the upstream Cattaraugus Creek background for comparison purposes with the two Cattaraugus Creek locations. At the downstream Buttermilk Creek location (SFTCSED), the cesium-137 concentration of $7.44 \pm 0.59 \times 10^{-7}$ microcuries per gram significantly exceeded the 10-year averaged background concentration of $3.59 \pm 2.75 \times 10^{-8}$ microcuries per gram in 2006. The uranium-235/uranium-236 concentration ($7.32 \pm 4.55 \times 10^{-8}$ microcuries per gram) measurably exceeded the background concentration of $5.03 \pm 3.52 \times 10^{-8}$ microcuries per gram. The concentrations of cesium-137, gross beta emitters, potassium-40, uranium-233/uranium-234, and uranium-238 isotopes at the first Cattaraugus Creek location (SFCCSED) exceeded their respective background concentrations in 2006 as well as gross beta emitters, potassium-40, uranium-233/uranium-234, uranium-238, and total uranium isotopes at the Springville dam location (SFSDSED). Most notably, the cesium-137 concentration at Cattaraugus Creek location SFCCSED was $1.80 \pm 0.31 \times 10^{-7}$ microcuries per gram as compared to a background concentration of $3.73 \pm 2.27 \times 10^{-8}$ microcuries per gram (WVNS and URS 2007). No offsite strontium-90 sediment concentrations exceeded background for 2006.

Stream sediments were also collected from Franks Creek, Erdman Brook, Quarry Creek, and drainages at the North Plateau as part of a 1990s RCRA facility investigation (WVNSCO 1994). Three sampling locations – ST01, ST02, and ST03 – were located downstream of the WVDP along Franks Creek and Buttermilk Creek. The data for these locations are available from the soils characterization environmental document (WVNSCO 1994) and indicate levels of gross alpha and gross beta activities also exceeding background.

3.6.2 Groundwater

As detailed in Section 3.3.1.1, the stratigraphic units of the North and South Plateaus are different, which is reflected in the hydrologic characteristics and hydraulic properties of the units that are used to define the hydrogeologic system and associated groundwater flow regime of the WNYNSC site and vicinity. In summary, on the North Plateau, the surficial sand and gravels are underlain by the Lavery till. The Lavery till on the North Plateau further contains the Lavery till-sand unit, a lenticular unit of limited extent. There is no sand and gravel unit at the surface on the South Plateau. The uppermost unit on the South Plateau is the weathered Lavery till which is underlain by the unweathered Lavery till. The stratigraphy below these upper units on the North and South Plateaus is the same. The underlying units, presented in descending order, are the Kent recessional sequence, the Kent till, Olean till, and shale bedrock.

In the following sections, the hydrostratigraphy of the North and South Plateaus is summarized to include a description of the saturated zone, direction of groundwater flow, and the distribution and nature of groundwater contamination as derived from historical studies through the present. More detailed data on and analysis of the hydrostratigraphic units and their properties as defined in support of the three-dimensional groundwater modeling, water balance information, and the long-term performance assessment is presented in Appendix E.

3.6.2.1 Hydrostratigraphy of the North and South Plateaus

Surficial Sand and Gravel (Thick-bedded Unit and Slack-water Sequence)

The deposits comprising the surficial sands and gravels on the North Plateau include an alluvial deposit (thick-bedded unit) and a lower glaciofluvial gravel and associated basal lacustrine deposit (slack-water sequence) that attain a maximum thickness of 12.5 meters (41 feet) near the center of the North Plateau (see Section 3.3.1.1). The surficial sands and gravels are further classified as an unconfined near-surface water-bearing unit (WVNS and Dames and Moore 1997).

The extent of the surficial sands and gravels is limited as it pinches out along the north, east, south, and west perimeters of the Plateau where it is incised by Quarry Creek (north), Franks Creek (east), Erdman Brook (south), and by the slope of the bedrock valley (west) (WVNS and Dames and Moore 1997, WVNS and URS 2006). The depth to the water table ranges from 0 meters (0 feet) where the water table in the sands and gravels intersects the ground surface and forms swamps and seeps along the periphery of the North Plateau to as much as 6 meters (20 feet) beneath portions of the central North Plateau where the unit has been mapped as the thickest (WVNS 1993d). Groundwater in the sands and gravels demarcates the upper aquifer beneath the WVDP site (WVNS 2004a). Long-term water level trends suggest a pattern of high water levels from fall through spring and low water levels during the summer. Water levels are typically highest in the spring after snow melt and spring precipitation and lowest in summer when evapotranspiration is greatest and the volume of precipitation is relatively low (WVNS and Dames and Moore 1997). Precipitation occurring from December to April is lost mainly to rapid runoff and infiltration. For the warmer periods of May through November, precipitation is lost mainly to infiltration and subsequent evapotranspiration (WVNS 1993e).

Groundwater in the sands and gravels generally flows radially to the northeast across the North Plateau from the southwestern margin of the unit near Rock Springs Road toward Franks Creek, as shown in **Figure 3–21**. Groundwater near the northwestern and southeastern margins of the unit diverges from the predominant northeast flow path and flows toward Quarry Creek and Erdman Brook, respectively (see Figure 3–21). Flow is mostly horizontal, since the low hydraulic conductivity of the underlying Lavery till precludes any significant downward flow (WVNS 1993d, WVNS and Dames and Moore 1997, WVNS and URS 2006). Analyses of slug test data estimated average or mean horizontal hydraulic conductivity value of 4.2×10^{-4} centimeters per second (14 inches per day) for the sands and gravels while not distinguishing between the thick-bedded unit and slack-water sequence subunits (WVNS 1993d). This estimate combined with a hydraulic gradient of 0.031, and an effective porosity of 0.22, was used to calculate a groundwater velocity of 18.6 meters (61 feet) per year (WVNS 1993d, WVNS and Dames and Moore 1997). It is notable that field testing over the last few years has utilized automated data acquisition and the mean hydraulic conductivity (horizontal) for the thick-bedded unit has been estimated to be higher at 6×10^{-3} centimeters per second (200 inches per day) (WVNS and URS 2006). Using this range of hydraulic conductivities, the estimated groundwater velocity could be up to 260 meters (850 feet) per year.

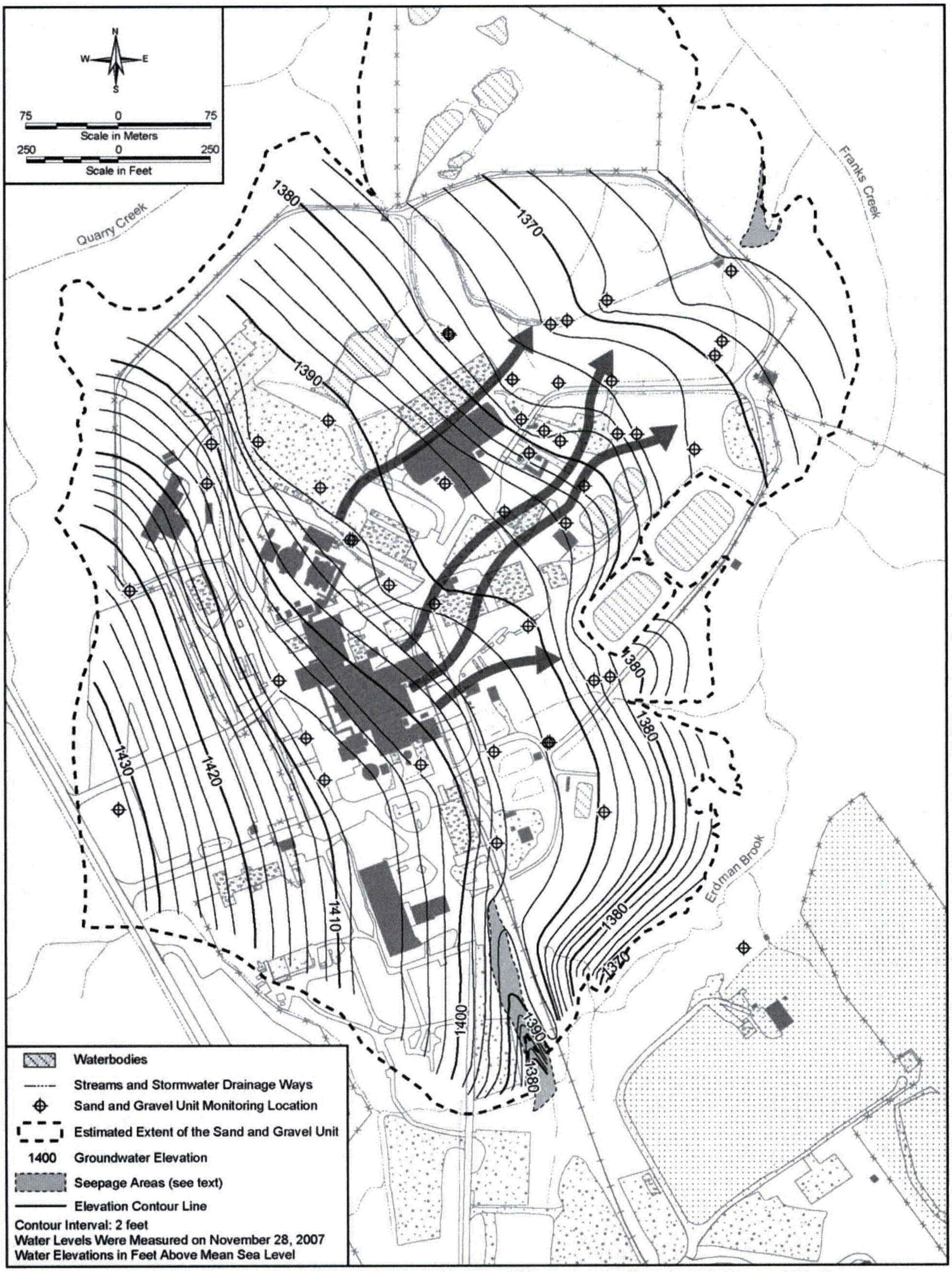


Figure 3–21 Groundwater Elevation and Flow in the Sand and Gravel Unit

Appendix E provides the results of statistical and geostatistical characterizations of all of the thick-bedded unit hydraulic conductivity data—early and recent—provide to support this EIS. These analyses demonstrate a significant difference between the earlier and more recent thick-bedded unit data, and determine the latter to be lognormally distributed with a minimum variance unbiased estimate (MVUE) of the mean of 1.6×10^{-2} centimeters (0.0063 inches) per second.

There are anthropogenic influences on the groundwater flow in the thick-bedded unit. The high-level radioactive waste tanks (WMA 3) and the Main Plant Process Building (WMA 1) locally impede groundwater flow through the sands and gravels. The high-level radioactive waste tanks and some areas of the Main Plant Process Building were excavated and constructed through the sand and gravel into the underlying till. The excavated areas near the high-level radioactive waste tanks and possibly near the Main Plant Process Building were backfilled with lower permeability materials thereby impeding groundwater flow. Water is periodically pumped from the sand and gravel layer (thick-bedded unit) near the high-level radioactive waste tanks to maintain a groundwater elevation of about 418 to 420 meters (1,372 to 1,378 feet) above mean sea level (WVNS 1993d, WVNS and Dames and Moore 1997). Groundwater flow was also locally influenced by a French drain consisting of a 15-centimeter- (4-inch-) diameter perforated pipe located 3 meters (9.8 feet) below the ground surface along the northwest boundary of Lagoons 2 and 3 and the northeast boundary of Lagoon 3 (WMA 2). This drain was intended to prevent groundwater infiltration into Lagoons 2 and 3 and drained portions of the sand and gravel unit, discharging the intercepted groundwater into Erdman Brook via outfall 008 (WNSP008) (WVNS 1993d, WVNS and Dames and Moore 1997). This discharge point was capped off in 2001, and is periodically inspected to ensure that it does not discharge (WVNS and URS 2006).

Water balances have been estimated for the surficial sand and gravel unit (Yager 1987, WVNS 1993d, 1993e). Using data developed by Kappel and Harding (1987), Yager developed a two-dimensional numerical model for the surficial sand and gravel on the North Plateau for the year 1983. As a part of the study Yager developed water budgets for the sand and gravel unit—one from the data and one from the model. Using the data of Kappel and Harding, the total annual recharge to the sand and gravel was 66 centimeters (26 inches) per year with approximately 50 centimeters (20 inches) per year from precipitation, 12 centimeters (5 inches) per year from inflow from adjacent bedrock near Rock Springs Road, and 4 centimeters (2 inches) per year from leakage from the Main Plant's outfall channel discharging into Erdman Brook. The estimated total discharge was less at 59 centimeters (23 inches) per year. Discharge to seeps and springs accounted for 21 centimeters (8 inches) per year, streams and channels 13 centimeters (5 inches) per year, discharge to the french drain (now closed off) and low-level waste treatment system 2 centimeters (1 inch) per year, evapotranspiration 18 centimeters (7 inches) per year, vertical leakage into the Lavery till 1 centimeter (0.4 inch) per year and change in storage 4 centimeters (2 inches) per year.

Yager's steady-state flow model water budget estimated a total recharge of 60.1 centimeters (24 inches) per year with 46.0 centimeters (18 inches) per year from the infiltration of precipitation, 10.4 centimeters (4 inches) per year from the bedrock inflow, and 3.7 centimeters (1 inch) per year from the outfall leakage. Model-derived discharge estimates from the sand and gravel were evapotranspiration at 20.0 centimeters (8 inches) per year, stream channels at 12.2 centimeters (5 inches) per year, french drain and low-level-waste treatment system at 4.3 centimeters (2 inches) per year, and seeps and springs at 23.5 centimeters (9 inches) per year.

In 1993, seasonal fluctuations from 35 wells installed in the sand and gravel were used to arrive at a spatially averaged annual recharge to the North Plateau (WVNS 1993d). The estimated recharge was 17.3 centimeters (7 inches) per year. The difference between this value and the recharge derived by Yager was attributed to differences in the hydraulic conductivities used in the calculations – Yager's model hydraulic conductivities (~0.001-0.01 centimeters per second) being greater by approximately an order of magnitude. In a review of the 1993 report, Yager notes also that the 1993 calculations do not consider the effects of groundwater discharge from the North Plateau and hence, underestimate the recharge (Yager 1993). Also in 1993, waterbudget and hydrological analyses for the North Plateau arrived at a total steady-state annual precipitation of 100.1 centimeters (39 inches) per year, runoff at 25.5 centimeters (10 inches) per year, infiltration at 74.7 centimeters (29 inches) per year, drainage below 4 meters (13 feet) (recharge) at 15.8 centimeters (6 inches) per year, and evapotranspiration at 56.0 centimeters (22 inches) per year (WVNS 1993e). The estimate, 15.8 centimeters (6 inches) per year, of the recharge from precipitation in this study is also significantly less than those made by Yager – 50 centimeters (20 inches) per year and 46 centimeters (18 inches) per year. Yager's 1993 review suggests that the runoff may have been over-estimated and recharge underestimated in these calculations (Yager 1993). Other analyses performed in the study produced North Plateau recharge estimates in the range of 5 centimeters (2 inches) per year to 12 centimeters (5 inches) per year.

Recognition and characterization of slack-water sequence or slack-water sequence as a distinct subunit within the North Plateau surficial sand and gravel has occurred primarily over the last 10 years. The slack-water sequence exhibits higher observed horizontal hydraulic conductivities (1×10^{-3} centimeters per second to 1×10^{-1} centimeters per second [0.0004 inches per second to 0.04 inches per second]) (see Appendix E). Numerous thin horizontal clay layers occur in the slack-water sequence and hence, vertical hydraulic conductivities may be much less than the horizontal hydraulic conductivity. Observed water-levels on the North Plateau and modeling studies suggest that the slack-water sequence is an important conduit in the transport of contamination from the vicinity of the Main Process Building to discharge locations on the northern portion of the plateau (Yager 1987, WVNSCO 2002).

Unweathered Lavery Till Unit

The unweathered Lavery till underlies the sand and gravel unit on the North Plateau and the weathered Lavery till on the South Plateau. The Lavery till ranges in thickness from about 9 meters (30 feet) on average beneath the Main Plant Process Building area (WMA 1), to 21 meters (70 feet) beneath portions of WMA 5, and up to 37 meters (120 feet). The till is thickest between Franks and Buttermilk Creeks. The unweathered Lavery till is largely a silty clay to clayey silt till (WVNS 1993f, WVNS and Dames and Moore 1997). Groundwater in the unweathered Lavery till generally flows vertically downward toward the underlying Kent recessional sequence (Prudic 1986, WVNS 1993d, WVNS and Dames and Moore 1997). This unit is perennially saturated and has relatively low hydraulic conductivity in the vertical and horizontal dimension and thus functions as an effective aquitard (WVNS and Dames and Moore 1997). Estimates of horizontal and vertical hydraulic conductivity from previous laboratory studies were 3.8×10^{-8} centimeters per second (1.3×10^{-3} inches per day) and 6.2×10^{-8} centimeters per second (2.1×10^{-3} inches per day), respectively. These results were consistent with field estimates. Recent testing indicates a mean hydraulic conductivity of 3.5×10^{-8} centimeters per second (0.001 inches per day), consistent with the earlier estimates (WVNS and URS 2006). However, the unweathered Lavery till has been treated as isotropic in models incorporating it. Analyses of available hydraulic conductivity data for the unweathered Lavery till in support of the groundwater modeling effort produces similar estimates. The observed hydraulic gradient in the unweathered Lavery till is close to unity. Assuming a unit vertical hydraulic gradient, an isotropic hydraulic conductivity of 2×10^{-8} to 8×10^{-8} centimeters per second (6.8×10^{-4} to 2.7×10^{-3} inches per day), and effective porosity of 0.15 to 0.30, the estimated vertical groundwater velocity ranges from 0.02 to 0.16 meters per year (0.07 to 0.55 feet per year).

Weathered Lavery Till Unit

On the South Plateau, the Lavery till is exposed at the ground surface or is overlain by only a thin veneer of alluvium and is weathered and fractured to a depth of 0.9 to 4.9 meters (3 to 16 feet) (see Section 3.3.1.1). This unit (weathered Lavery till) is unique to the South Plateau. On the North Plateau, the weathered unit is much thinner or nonexistent (WVNS 1993d, WVNS and URS 2006). Groundwater in the weathered Lavery till unit generally flows to the northeast across the South Plateau from higher elevations at Rock Springs Road toward lower elevations in the stream valleys of Erdman Brook and Franks Creek. In the area of the NDA (WMA 7) and SDA (WMA 8), the prevailing groundwater flowpath is interrupted by the trenches, drains, and engineered features of these facilities (WVNS 1993d, WVNS and Dames and Moore 1997). In addition, both horizontal and vertical components are involved with groundwater flow through the weathered Lavery till as groundwater can move laterally and then downward into the underlying unweathered Lavery till (WVNS and URS 2006). Recent testing indicates an average horizontal hydraulic conductivity of 2.0×10^{-5} centimeters per second (0.7 inches per day). The highest conductivities are associated with dense fracture zones found within the upper 2 meters (7 feet) of the unit (WVNS and URS 2006). Statistical analyses of available hydraulic conductivity data for the weathered Lavery till in support of the groundwater modeling effort produces higher estimates, 2×10^{-4} to 5×10^{-4} centimeters per second (see Appendix E). However, the physical and geohydrological character of the weathered Lavery till is quite variable, reflecting extreme variations in extent of weathering, fracturing, and biointrusions. Hydraulic conductivities in the field for the weathered Lavery till range from the 10^{-8} centimeters per second (10^{-4} inches per day) values representative of the unweathered till to 10^{-3} centimeters per second (34 inches per day) where the material is highly modified by the processes mentioned.

Lateral groundwater movement in the weathered Lavery till is largely controlled by topography as expressed in the weathered till/unweathered till interface and the low permeability of the underlying unweathered Lavery till. The range of hydraulic conductivities and variation in gradients lead to horizontal velocity estimates on the order of feet per year to tens of feet per year. This flow may continue a short distance before slower vertical movement through the underlying unweathered till occurs, or in some circumstances, may continue until the groundwater discharges at the surface in a stream channel. Models for the South Plateau developed by Prudic (Prudic 1986) and by Bergeron (Bergeron and Bugliosi 1988) support only moderate lateral movement through the weathered till until flow become directed downward into the unweathered Lavery till. Using these models as a starting point, Kool and Wu (Kool and Wu 1991) examined how changes in the hydraulic conductivity, vertical anisotropy and horizontal anisotropy in the hydraulic conductivity can impact flow through the weathered Lavery till. Kool and Wu then arrived at the conclusion that such factors can lead to greater lateral flow through the weathered till. Fractures in the till were not explicitly modeled but is certainly a source of anisotropies in the hydraulic conductivity.

Lavery Till-Sand Unit

This intra-till unit occurs within the upper 6 meters (20 feet) of the Lavery till across portions of the North Plateau. It has been mapped as continuous beneath portions of the Main Plant Process Building area and adjacent areas and further described in Section 3.3.1.1. Groundwater elevations in wells screened in the three separate till-sand zones have been monitored since 1990 (WVNS 1993d). Water level elevations in the main Lavery till-sand are above the top of the unit, indicating that both saturated and artesian (confining or semi-confining) conditions exist (WVNS 1993d, WVNS and Dames and Moore 1997).

Groundwater flows through this unit in an east-southeast direction toward Erdman Brook. However, surface seepage locations from the unit into Erdman Brook have not been observed (WVNS and Dames and Moore 1997, WVNS and URS 2006). This lack of seepage indicates that the till-sand is largely surrounded by the Lavery till. While fractures in the Lavery till may allow groundwater in the till-sand to discharge along the north banks of Erdman Brook, this process is occurring at a very slow rate. As a result, recharge to and discharge from the till-sand is likely controlled more by the physical and hydraulic properties of the Lavery till (WVNS 1993d). Discharge occurs as percolation to the underlying Lavery till. Recharge occurs as leakage from the overlying Lavery till and from the overlying sand and gravel unit, where the overlying Lavery till layer is not present (WVNS 1993d, WVNS and Dames and Moore 1997). Estimates of horizontal hydraulic conductivity for the Lavery till-sand range from 1.3×10^{-4} centimeters per second (4.4 inches per day) from slug tests to 6.2×10^{-5} centimeters per second (2.1 inches per day) based on particle size analysis (WVNS 1993d, WVNS and Dames and Moore 1997). Field testing over the last 5 years indicates a mean hydraulic conductivity of approximately 1 × 10^{-3} centimeters per second (34 inches per day) (WVNS and URS 2006). Statistical analyses of available hydraulic conductivity data for the Lavery till-sands performed in support of the groundwater modeling effort produce similar values.

Kent Recessional Sequence Unit and Kent Till

Gravel, sand, silt, and clay of the Kent recessional sequence unit underlies most of the Project Premises (WVNS and Dames and Moore 1997). The unit thickens from west to east across the entire Project Premises, with the thickest portion mapped beneath the northeast corner of WMA 5. Beneath the North Plateau, coarse sediments mainly comprise the unit and either overlie finer lacustrine deposits or directly overlie older tills, while finer sediments mainly comprise the unit beneath the South Plateau, as further described in Section 3.3.1.1. The unit outcrops along the west bank of Buttermilk Creek to the east and southeast of the site (WVNS 1993d). Groundwater flow in the Kent recessional sequence is toward the northeast and Buttermilk Creek (WVNS 1993d, WVNS and URS 2006). Recharge to the Kent recessional sequence comes from both the overlying till and the adjacent bedrock valley wall. Discharge occurs at bluffs along Buttermilk Creek and to the underlying Kent till (WVNS 1993d, WVNS and Dames and Moore 1997).

The upper interval of the Kent recessional sequence, particularly beneath the South Plateau, is unsaturated; however, the deeper lacustrine deposits are saturated and provide an avenue for slow northeast lateral flow to points of discharge in the bluffs along Buttermilk Creek. The unsaturated conditions in the upper sequence are the result of very low vertical permeability in the overlying till, and thus there is a low recharge through the till to the Kent recessional sequence. As a result, the recessional sequence acts as a drain to the till and causes downward gradients in the till of 0.7 to 1.0, even beneath small valleys adjacent to the SDA (WMA 8) on the South Plateau (WVNS 1993d, WVNS and Dames and Moore 1997). Previous estimates of hydraulic conductivity for the unit have varied greatly. Particle-size analysis suggested a horizontal hydraulic conductivity of 8.4 × 10^{-5} centimeters per second (2.9 inches per day) for the coarser sediments to 8.4 × 10^{-6} centimeters per second (0.29 inches per day) for the lacustrine sediments. Some field testing indicated even lower hydraulic conductivities. Using an average hydraulic conductivity of 4.5 × 10^{-6} centimeters per second (0.15 inches per day), a hydraulic gradient of 0.023, and a porosity of 0.25, a horizontal velocity for the Kent recessional sequence of 0.12 meters (0.4 feet) per year was calculated (WVNS 1993d, WVNS and Dames and Moore 1997). Recent testing supports a mean hydraulic conductivity for the unit of approximately of 8.0 × 10^{-5} centimeters per second (2.7 inches per day) (WVNS and URS 2006). Using this hydraulic conductivity value would yield an average groundwater velocity of approximately 2.3 meters (7.6 feet) per year. Analyses of available hydraulic conductivity data in the Kent recessional sequence material performed in support of the groundwater modeling effort produce higher values (see Appendix E).

As discussed in Section 3.3.1.1, the Kent till underlies the Kent recessional sequence unit beneath both the North and South Plateaus. The Kent till (and Olean till) is lithologically similar to the Lavery till, and it has been assumed that it does not provide a ready pathway for contaminant movement (WVNS 1997, WVNS and URS 2006). The potential for movement through the deeper units is discussed in more detail in Appendix E.

Bedrock Unit

Outcrops of the Devonian shales and siltstones underlying the Project Premises are limited to the areas along the upper reaches of Quarry Creek and sparsely vegetated hilltops west of the site. Regional groundwater in the bedrock tends to flow downward within the higher hills, laterally beneath lower hillsides and terraces, and upward near major streams. The upper 3 meters (10 feet) of bedrock has been both mechanically and chemically weathered and contains abundant fractures and decomposed rock, which makes this layer more hydraulically transmissive than the underlying competent bedrock. Hydraulic conductivity in the weathered zone has been estimated at 1 × 10^{-5} centimeters per second (0.3 inches per day). Wells completing in this zone yield 40 to 60 liters per minute (10.6 to 15.9 gallons per minute) and corresponds to the regional bedrock aquifer. The hydraulic conductivity of the underlying competent rock has been estimated at 1×10^{-7} centimeters per second (0.003 inches per day). The difference in conductivities between these two zones suggests preferential flow through the weathered portion, which would be directed downslope within the weathered zone toward the axis of the buried valley underlying the WNYNSC (WVNS 1993d, WVNS and Dames and Moore 1997).

North Plateau Groundwater Contamination

Groundwater in portions of the sand and gravel unit in the North Plateau is radiologically contaminated as a result of past operations. The most significant area of groundwater contamination is associated with the North Plateau Groundwater Plume, which extends from WMA 1 to WMA 4, as shown in **Figure 3–22**. The New York State Department of Environmental Conservation first reported elevated measurements of radioactivity from samples collected from a spring-fed ditch located due north of the Main Plant Process Building (WVES 2007b) and later determined that the most likely source of the contamination was the spring, recharged by the surficial sand and gravel aquifer (WVES 2007b). Monitoring of offsite discharges and groundwater, at specific sampling locations, continued through the early 1990s. At that time a more comprehensive evaluation of groundwater conditions at the site was conducted to support the WVDP RCRA facility investigation. In 1993 elevated gross beta concentrations were detected in surface water samples from the northeast swamp ditch located along the north side of the CDDL, near the northeast edge of the plateau aquifer (WVES 2007b). Topography and groundwater elevations in this area suggested that contaminated groundwater was the probable source of the impacted surface water.

In 1994 a Geoprobe® soil and groundwater investigation was initiated to characterize the lateral and vertical extent of the elevated groundwater gross beta concentrations on the north plateau and to determine the isotopes present (WVNSCO 1995). The highest gross beta concentrations in soil and groundwater were found in areas south of the fuel receiving and storage area and southeast of the Main Plant Process Building. Strontium-90 and its daughter product, yttrium-90, were identified as the major contaminants present. On the basis of these data and an evaluation of potential sources, leaks from process lines within the Main Plant Process Building that occurred during NFS fuel reprocessing operations were identified as likely sources of the contamination. Elevated gross beta concentrations (greater than 1,000 picocuries per liter) comprised a groundwater plume extending northeastward from the southwest corner of the Main Plant Process Building to the southwest corner of the CDDL. The vertical extent appeared limited with the body of the plume found in the surficial sand and gravel. **Figure 3–23** shows a series of strontium-90 concentration isopleths (greater than 1,000 picocuries per liter) at increasing depths in the sand and gravel as inferred from the 1994 data.

In 1997 a second Geoprobe® investigation indicated some advancement of the plume's leading edge near the western portion of the CDDL, and provided additional definition of the relatively narrow eastern plume lobe (WVNSCO 1999a). The report also noted the existence of a narrow layered geologic subunit within the sand and gravel unit, suggesting that this subunit appears to provide a preferential flowpath for plume migration. This narrow subunit was later defined as the "slack-water sequence," and the remaining portion of the sand and gravel unit was designated the "thick-bedded unit." Earlier Yager had noted the higher hydraulic conductivities in the surficial sand and gravel in that vicinity and the existence of an old stream channel eroded into the top of the Lavery till (Yager 1987).

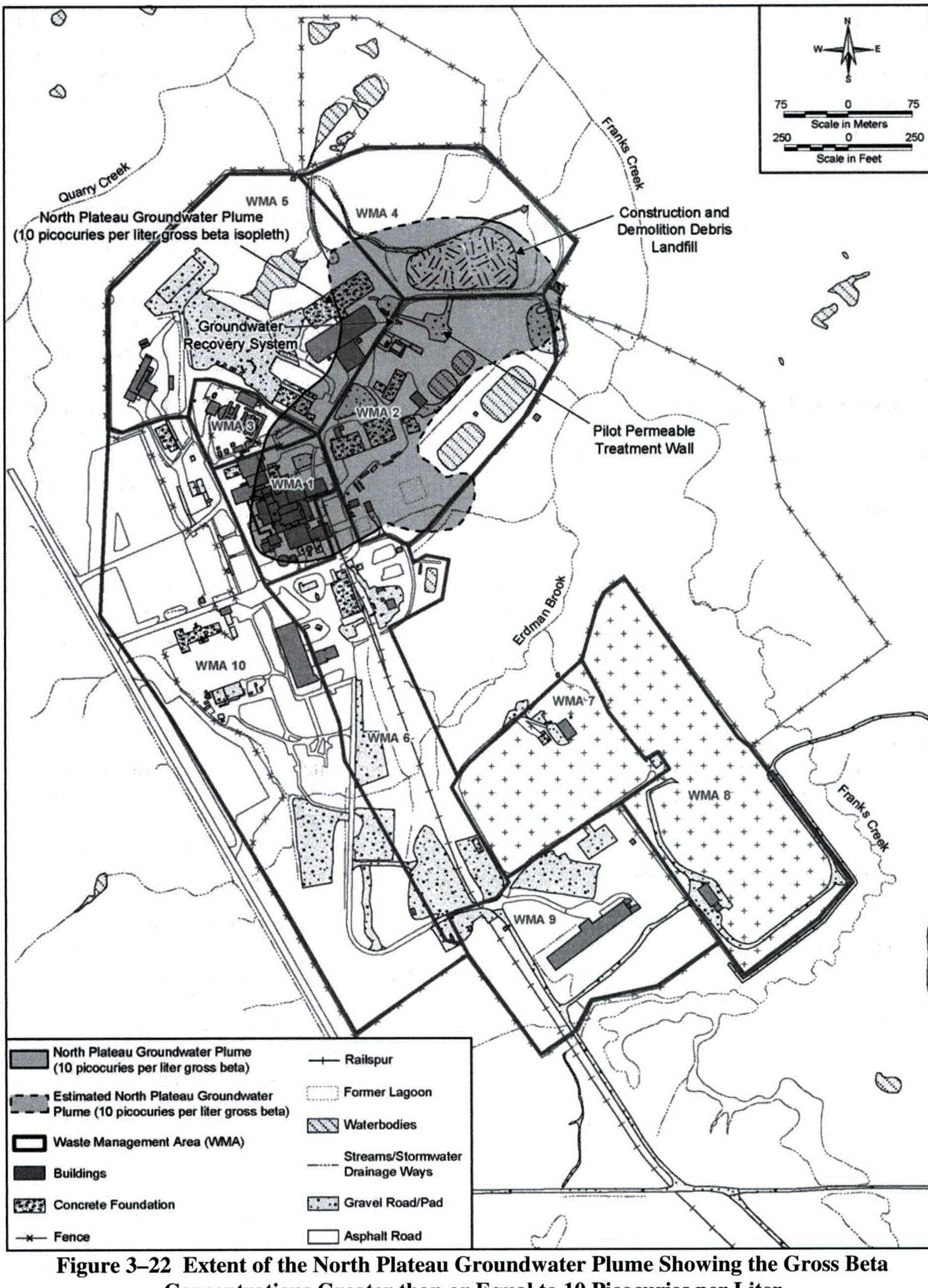
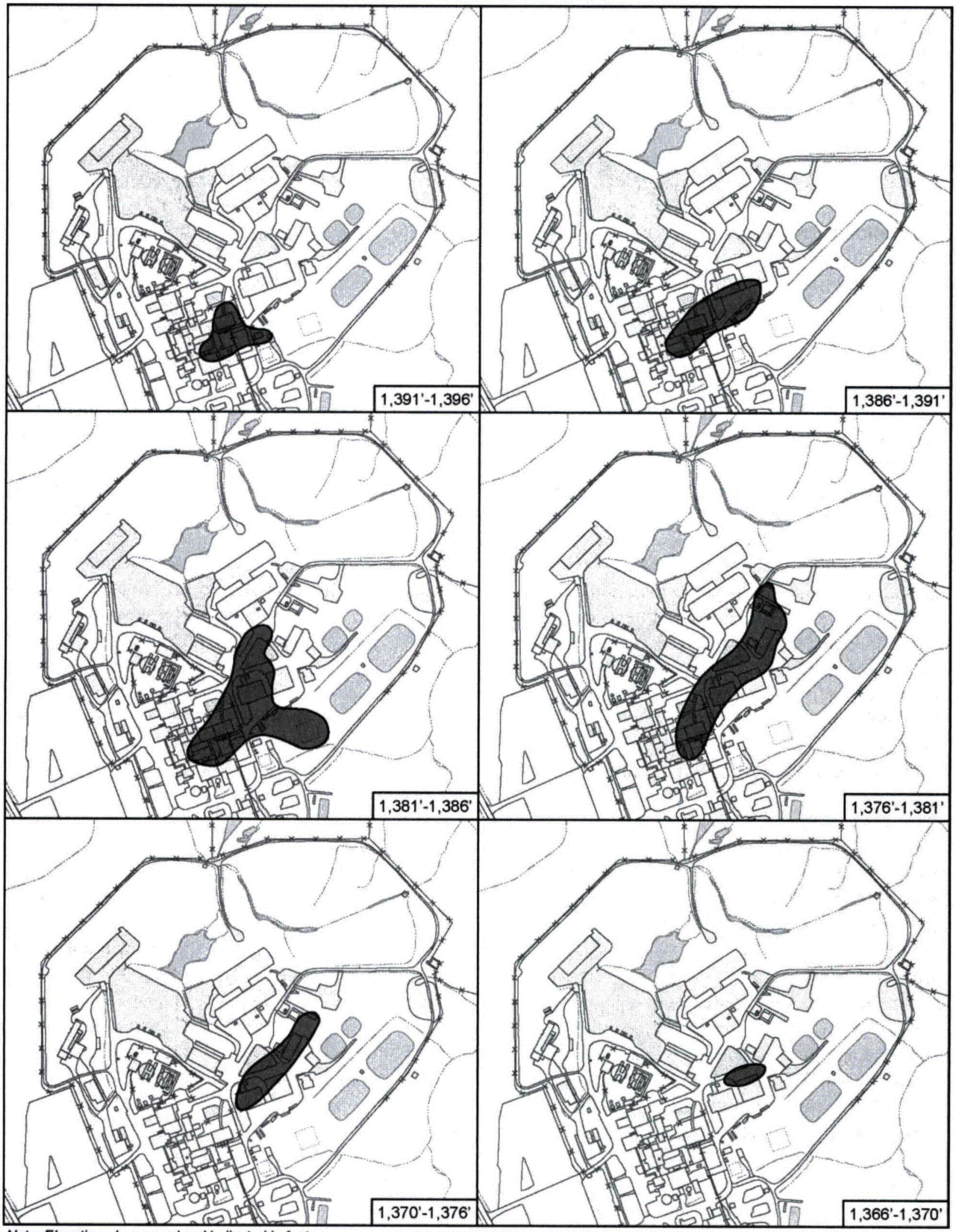


Figure 3–22 Extent of the North Plateau Groundwater Plume Showing the Gross Beta Concentrations Greater than or Equal to 10 Picocuries per Liter



Note: Elevation above sea level indicated in feet.

Figure 3–23 Vertical Distribution of North Plateau Strontium-90 Plume in 1994 Geoprobe Study

In 1998, the area in the vicinity of the probable source was investigated (WVNSCO 1999a). This Geoprobe® study confirmed that the probable source was located near the southwest corner of the Main Plant Process Building. Strontium-90 concentrations in soil and groundwater samples collected during the investigation generally were lower than those measured in 1994, suggesting radiological decay and plume migration in the interim.

In 2001, 43 test borings were completed and 33 monitoring wells were installed near the leading edge of the plume in the vicinity of a pilot project, the permeable treatment wall (WVNSCO 2002). A number of hydraulic conductivity tests (both slug tests and pump tests) were performed providing detailed hydrostratigraphic information that was used to evaluate contaminant migration across the North Plateau. This information was also used to implement groundwater flow and contaminant transport models for the strontium-90 groundwater plume (WVES 2007b).

The current monitoring program for the strontium-90 plume includes 74 active wells and the permeable treatment wall riser that are sampled biweekly, monthly or quarterly for gross beta and/or strontium-90 (WVES 2007b). Water levels are also measured at these locations and at 10 piezometers surrounding the pilot permeable treatment wall. Data collected as part of the sitewide quarterly Groundwater Monitoring Program are also used to monitor the plume. The previous monitoring program included more frequent sampling, as well as isotopic analysis for strontium-90 at all North Plateau monitoring locations. In January 2005, the number of wells sampled monthly for strontium-90 was reduced to 12 wells. Quarterly strontium-90 sampling at the remaining 61 locations monitored monthly was replaced with quarterly gross beta sampling. Monitoring of the pumping wells remained on a biweekly schedule. Gross beta data can be used in lieu of direct strontium-90 analyses because historical monitoring has established that approximately one-half of the gross beta activity measured in the plume is attributable to strontium-90. The remaining activity is attributable to short-lived yttrium-90. The special sampling for water quality parameters in groundwater surrounding the permeable treatment wall was no longer required after the pilot permeable treatment wall evaluation was completed. Consequently, sampling from selected monitoring points near the pilot permeable treatment wall for calcium, potassium, and strontium was discontinued in January 2005. At the same time as the analytical sampling was reduced, the frequency of water level measurements at all North Plateau monitoring wells was also reduced from biweekly to monthly.

As shown in Figure 3–22, the North Plateau Groundwater Plume is currently a 200-meter- (600-foot-) wide by 500-meter- (1,640-foot-) long zone of groundwater contamination that extends northeastward from the Main Plant Process Building in WMA 1 to the Construction and Demolition Debris Landfill in WMA 4, where it splits into western and eastern lobes. Strontium-90 and its decay product yttrium-90 are the principal radionuclides in this plume, with both radionuclides contributing equal amounts of beta activity. The highest strontium-90 concentrations have been found in groundwater on the east side of the Main Plant Process Building (WSMS 2008a). Another portion of the plume extends approximately 100 meters (330 feet) east of the main body of the plume, where it continues beneath and to the east of Lagoon 1 in WMA 2. While the primary source of strontium-90 contamination in this portion of the plume is the Main Plant Process Building, former Lagoon 1 and to a lesser extent the old interceptors may also have been contributors (WVNS and URS 2007). Generally, mobile radionuclides such as tritium, strontium-90, iodine-129, and technetium-99 were able to migrate with the groundwater along the northeast groundwater flow path in the North Plateau. Less-mobile radionuclides, such as cesium-137, americium-241, plutonium isotopes, the curium isotopes, and neptunium-237 are expected to have remained beneath the immediate source area because of the high cesium sorptive capacity of the minerals in the sand and gravel unit (WSMS 2008a). While the chemical speciation is an important factor in the mobility of radionuclides, carbon-14 may exhibit a potentially unique dependence on the carbonate chemistry of the groundwater. The North Plateau Groundwater Plume is further described in Appendix C, Section C.2.13.

In November 1995, a groundwater recovery system was installed to mitigate the movement of strontium-90 contamination in groundwater in the western lobe of the plume and reduce groundwater seepage northeast of the Main Plant Process Building. Three recovery wells and associated groundwater recovery facility, referred to as the North Plateau Groundwater Remediation System, installed near the leading edge of the western lobe of the groundwater plume, extract groundwater from the underlying sand and gravel unit (see Figure 3–22). This groundwater is then treated at the Low-Level Waste Treatment Facility using ion-exchange to remove strontium-90. After the groundwater is processed, it is discharged to Lagoon 4 or 5 of the Low-Level Waste Treatment Facility and ultimately to Erdman Brook. Approximately 163 million liters (43 million gallons) of groundwater have been treated by the system since 1995, including about 16 million liters (4.1 million gallons) in 2005 (WVNS and URS 2006).

A pilot-scale permeable treatment wall was constructed in 1999 in the eastern lobe of the plume (see Figure 3–22). This passive, in situ remediation technology consists of a trench that is backfilled with clinoptilolite, a natural zeolite selected for its ability to adsorb strontium-90 ions from groundwater. The wall extends vertically downward through the sand and gravel unit to the top of the underlying Lavery till and is approximately 9 meters (30 feet) long by 2 meters (7 feet) wide (WVNS and URS 2006). The permeable treatment wall is further described in Appendix C, Section C.2.13.

As noted above, additional test borings and monitoring well installations had been completed in the vicinity of the permeable treatment wall during the fall of 2001 to obtain improved definition of hydrogeologic conditions. Monitoring and evaluation of water levels and radiological concentrations upgradient, within, and downgradient of the wall continued during 2004. The evaluation concluded that complex hydrogeologic conditions and disturbances from the installation are influencing groundwater flow into and around the pilot permeable treatment wall (WVNS and URS 2006). As part of WNYNSC site-wide groundwater surveillance monitoring, groundwater samples were collected as scheduled from 69 onsite locations in 2005, including 63 monitoring wells, 5 seepage points, and 1 sump/manhole. This groundwater surveillance encompasses the five hydrogeologic units previously described. The 2005 groundwater program continued to indicate that strontium-90 is still the major contributor to elevated gross beta values in the North Plateau Plume. In 2005, 12 wells in the sand and gravel unit had gross beta concentrations that exceeded the DOE Derived Concentration Guide for strontium-90 (1.0×10^{-6} microcuries per milliliter [1,000 picocuries per liter]), as shown in **Figure 3–24**. The media or source of the water is nonspecific, therefore the Derived Concentration Guides may be applied to groundwater. Derived Concentration Guides are applicable to ingested water. The source of the plume's activity can be traced to the soils beneath the southwest corner of the Main Plant Process Building, as discussed above. Lagoon 1, formerly part of the Low-Level Waste Treatment Facility, has been identified as a source of the gross beta activity at the remaining wells (wells 8605 and 111) (WVNS and URS 2006). Figure 3–24 also presents isocontours for groundwater monitoring results for 1994, 2001, and 2007, to illustrate changes in the configuration of the plume's core area.

While elevated tritium concentrations (as compared to background) continued to be detected in several wells in 2005, essentially all sand and gravel monitoring locations where tritium concentrations have been elevated in the past now exhibit decreasing trends. Decreasing tritium concentrations are the result of the radiological decay and/or dilution of residual tritium activity associated with previous historical site fuel reprocessing operations. As a result, tritium concentrations at many locations are currently close to or within the background range of between 1.18×10^{-8} to 2.63×10^{-7} microcuries per milliliter (WVNS and URS 2006).

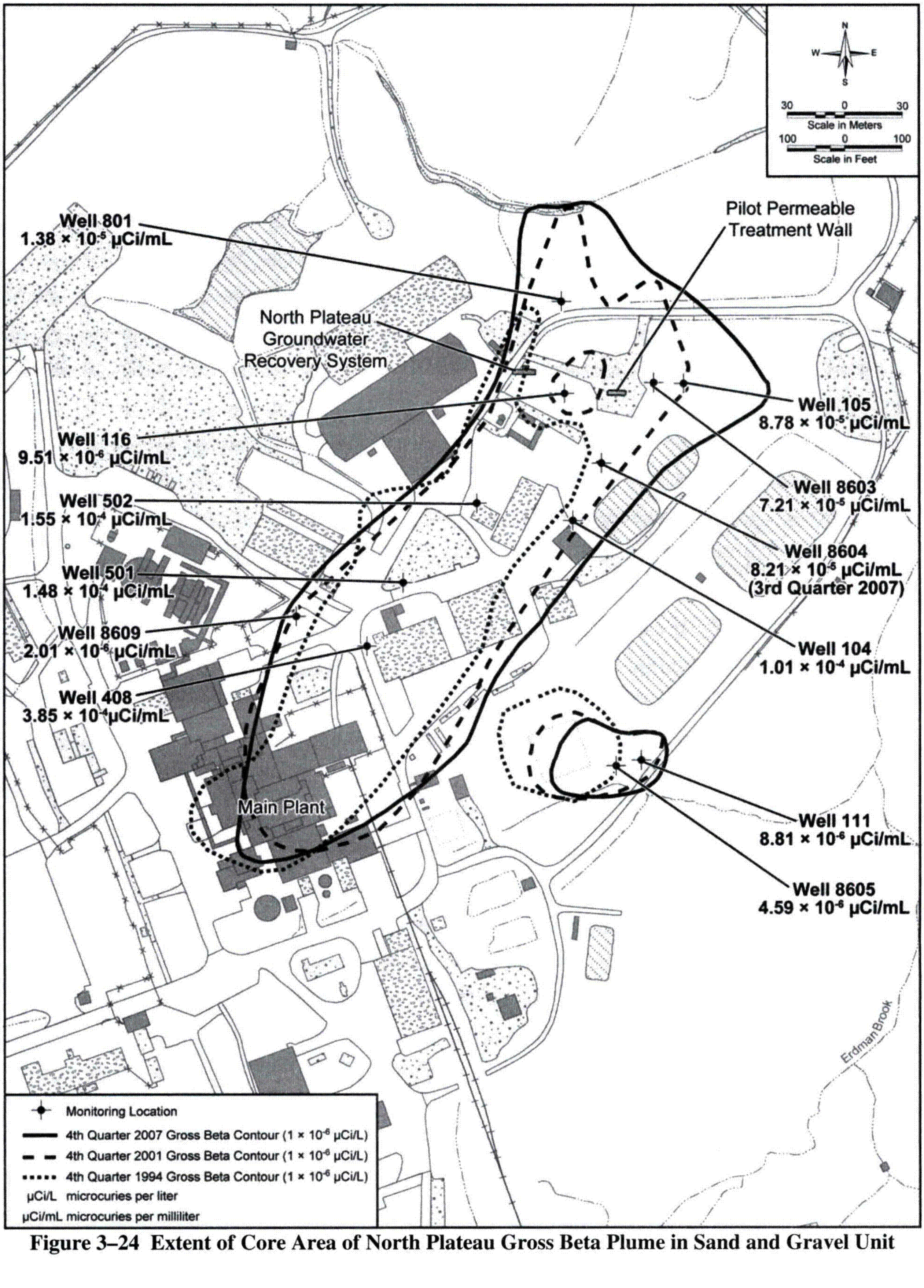


Figure 3–24 Extent of Core Area of North Plateau Gross Beta Plume in Sand and Gravel Unit

In addition to collecting samples from wells, groundwater was routinely collected from seeps on the bank above Franks Creek along the northeastern edge of the North Plateau. With the exception of one location (SP11), gross beta concentrations from all seep monitoring locations were less than or similar to those at the background seep location during 2005. At SP11 gross beta concentrations show an increasing trend since early 1999 and somewhat larger increases during 2001 through 2005. The North Plateau plume—predominantly strontium-90—is upgradient from the seep and the gross beta discharged into drainage ditches at SP11 is believed to be to a result of reinfiltration of strontium-90 contaminated water that has surfaced from the plume (WVNS 2006). Although the observed activity is elevated above background, it is still well below the DOE Derived Concentration Guide.

Again in 2005, volatile and semivolatile organic compounds were sampled at specific locations that have shown historical results above practical quantitation limits (WVNS and URS 2006). With the exception of the compounds 1,1-dichloroethane, 1,1,1-trichloroethane, and dichlorodifluoromethane at well 8612 and tributyl phosphate from well 8605 near former Lagoon 1, results are consistently nondetectable. The presence of volatile organic compounds in this area is presumed to be the result of wastes buried in the CDDL (WVNS and URS 2006). In the past, volatile organic compounds were repeatedly detected at a few additional monitoring locations, such as wells 803 and 8609 and seepage monitoring locations GSEEP and SP12, but recent analytical results from these monitoring locations have not detected those volatile organic compounds. Volatile organic compounds have not been positively detected at GSEEP since 1993, or at SP12 since 2002 (WVNS and URS 2006).

The WNYNSC does not use groundwater for drinking or operational purposes, nor does it discharge effluent directly to groundwater. No public water supplies are drawn from groundwater downgradient of the WNYNSC or from Cattaraugus Creek downstream of the WNYNSC. However, groundwater upgradient of the WNYNSC is used for drinking water by local residents, as further discussed in Section 3.6.2.3 (WVNS and URS 2006).

South Plateau Groundwater Contamination

On the South Plateau, radioactively contaminated groundwater has resulted from waste disposal and management activities at the NDA (WMA 7) and SDA (WMA 8). At both the NDA and SDA, radioactive waste was disposed of in trenches and holes within the Lavery till. Leachates exist in both the NDA and SDA disposal holes and trenches (Kool and Wu 1991, Bergeron et al. 1988) and are contaminated with both radiological and chemical constituents leached from the buried wastes (Prudic 1986, Blickwedehl et al. 1989).

The SDA 1100-series wells along the perimeter of the SDA are sampled on a semi-annual basis as a part of routine groundwater monitoring activities by NYSERDA. Analytical parameters monitored semiannually include gross alpha, gross beta, tritium, and field water quality parameters (conductivity, pH, temperature and turbidity). Analytical parameters monitored annually included gamma-emitting radionuclides by gamma spectroscopy, four beta-emitting radionuclides (carbon-14, iodine-129, strontium-90 and technetium-99) and volatile organic compounds. There was only one positive radionuclide detection in 2006—strontium-90 at 1107A at 4.21E-09±0.55E-09 microcuries per milliliter (NYSERDA 2006b). Control charting of strontium-90 results for this well was initiated in 2003 because five positive detections previously had been reported, but the 2006 result did not exceed the reporting criteria. All volatile organic compound results in 2006 were reported as "not detected," and thus the volatile organic compound data are not included in this report. The 2006 water quality measurements were consistent with historical results.

A trench system was previously constructed along the northeast and northwest sides of the NDA to collect groundwater that potentially contaminated with a mixture of n-dodecane and tributyl phosphate. No n-dodecane and tributyl phosphate was detected in groundwater near the NDA in 2005. Groundwater elevations are monitored quarterly in and around the trench to ensure that an inward gradient is maintained, thereby minimizing outward migration of potentially contaminated groundwater. Gross beta and tritium concentrations in samples from location WNNDATR, a sump at the lowest point of the interceptor trench, and from downgradient well 909 screened in the Lavery till continued to be elevated with respect to background monitoring locations on the South Plateau. Concentrations were still well below DOE Derived Concentration Guides. During 2005, gross beta and tritium concentrations at WNNDATR were similar to those seen during 2004. Overall, gross beta concentrations are slightly increasing with time, while tritium concentrations have significantly decreased over the last 10 years. Radiological indicator results at well 909 have historically fluctuated. In general, upward long-term trends in both gross beta and tritium were discernible until 1999, when both trends declined, followed by relatively consistent results during recent years. Concentrations of both gross beta and tritium during 2005 were similar to those seen during 2004. Residual soil contamination near well 909 is the suspected source of elevated gross beta concentrations, which are slightly higher than those at WNNDATR (WVNS and URS 2006).

Two water quality and three radiological indicators are routinely determined in the Kent recessional sequence groundwaters at six wells as a component in the site groundwater monitoring program (WVNS and URS 2007). The water quality indicators measured are conductivity and pH and the radiological indicators are gross alpha, gross beta, and tritium. In 2005, the radiological indicator concentrations were well below their respective applicable standards and guidelines, and the pH remained within the range indicated in the standards. No comparison for the conductivity is given and the standards listed in Appendix E of the 2006 *Annual Site Environmental Report* (WVNS and URS 2007) do not include standards for that parameter.

3.6.2.2 Cattaraugus Creek Basin Aquifer System

The hydrologic units underlying the WNYNSC are part of the Cattaraugus Creek Basin Aquifer System. The EPA has designated this system a sole or principal source of drinking water (EPA 1987). A sole-source aquifer determination can be made if it is established that the aquifer in question provides at least 50 percent of the drinking water consumed in the area overlying the aquifer. Such a designation requires that EPA review federally assisted projects that could contaminate such aquifers through a recharge zone and create a significant hazard to public health. The aquifer's area encompasses approximately 842 square kilometers (325 square miles) of the southernmost part of the Lake Erie-Niagara River drainage basin in New York State, including portions of Cattaraugus, Erie, Wyoming, and Allegany Counties. The boundary of both the designated area and aquifer service area is the drainage divide of the Cattaraugus Creek Basin (see Figure 3–17). For purposes of the sole-source aquifer determination, the area is considered to include the entire townships of Freedom and Yorkshire and parts of Arcade, Sardinia, Concord, Ashford, Centerville, Rushford, Farmersville, Machias, Ellicottville, East Otto, Otto, Persia, Collins, Java, Wethersfield, and Eagle Townships in New York (EPA 2003).

Because the Cattaraugus Creek Basin is covered with permeable sediments, the recharge zone, where water percolates directly to the aquifer, includes the entire areal extent of the Cattaraugus Creek Basin Aquifer. This means that all projects with Federal financial assistance constructed in this basin are subject to EPA review to ensure that they are designed and constructed so as not to create a significant hazard to public health.

On a regional basis, the aquifer system consists of: (1) surficial, unconfined sand and gravel deposits; (2) confined sand and gravel lenses separated from the unconfined deposits above by relatively impermeable clay till and lacustrine sediments; and (3) fractured shale bedrock (EPA 2003). This comprises the whole of the approximately 80-meter- (250-feet-) thick hydrostratigraphic sequence defined beneath the North and South Plateaus of the WNYNSC, including the saturated Holocene deposits, the Kent recessional sequence, the Kent and Lavery tills, and the upper fractured portions of the Canadaway Group.

3.6.2.3 Offsite Drinking Water

A 1985 survey of offsite groundwater use indicated 151 private wells located in the vicinity of the site (WVNS 2006). The types of well installations found in the survey included dug wells, drilled wells, augered wells, well-points and springs. Wells are screened in both the shale bedrock and in alluvial gravel deposits. Groundwater samples are collected routinely from nine offsite residential supply wells that represent the closest unrestricted use of groundwater near the site as a part of the routine groundwater monitoring program (WVNS and URS 2007). Results from the radiological and chemical analyses of these samples have been indistinguishable from background. None of the wells draw from groundwater units that underly the site.

3.7 Meteorology, Air Quality, and Noise

3.7.1 Meteorology

The general climate of the region in which the WNYNSC is located is classified as humid continental, which is predominant over the northeastern United States and common for mid-latitudes. Meteorological conditions at the WNYNSC, which is 427 meters (1,400 feet) above mean sea level, are greatly influenced by the Great Lakes to the west and by the jet stream (polar front), where warm and cold air masses collide. Wind speeds in the region are generally light, with the strongest winds occurring during the winter months associated with the frequent passage of cold fronts. Precipitation is moderate and relatively evenly distributed throughout the year, with only slightly more precipitation falling during the summer season due to thunderstorms (NOAA 2007, WVNS 1993e).

Local and regional topographic features influence the climate at the WNYNSC. The difference in elevation (400 meters [1,310 feet]) between the Lake Erie shoreline and the WNYNSC affects precipitation, wind direction, and wind speed. Atmospheric dispersion at the site is affected by local mountain (upslope) and valley (downslope) winds (WVNS 1993e).

Climatological data (temperature, wind speed, wind direction, and the standard deviation of the wind direction [sigma theta]) have been collected at the WNYNSC since 1983. The meteorological tower is located in WMA 10 south of the Administration Building and Annex Trailer Complex as shown in Figure 3–1. The onsite meteorological tower is located to the south of the parking areas, inside the fenceline, near Rock Springs Road. It is located about 91 meters (300 feet) south-southwest from a warehouse, the nearest major structure, in an area that is mostly grass covered. The onsite meteorological tower is used to collect wind speed, wind direction, and temperature data at 60-meter (197-foot) and 10-meter (33-foot) elevations. Dewpoint, precipitation, and barometric pressure are also monitored at this location (DOE 2003e). Wind speed and wind direction are also monitored at an offsite location about 8 kilometers (5 miles) south of the Project Premises at a 10-meter (33-foot) elevation (WVNS and URS 2007). The climatological baseline presented here is based on 5 years of WNYNSC meteorological data (1998 to 2002) and is representative of meteorological conditions at the WNYNSC. A more detailed climatological data record dating back more than 50 years is available from the Buffalo National Weather Service station, which is located 71 kilometers (44 miles) northwest of the site. These data include regional airflow, upper airflow patterns, and temperature. However, surface airflow data at this National Weather Service station may not be comparable to similar data measured at the WNYNSC because of terrain differences between these locations and the close proximity of the Buffalo National Weather Service station to Lake Erie (WVNS 1993e).

The shifting boundaries of the jet stream subject the western New York region to extreme seasonal temperature variations. Further to the west and closer to the lakes, the mean temperatures are very similar, although disparities in the temperatures between Lake Erie and the WNYNSC are a result of differences in the elevation

(NOAA 2007, WVNS 1993e). The maximum temperature recorded on the site over the 5-year period, 1998 through 2002, was 32.7 degrees Centigrade (91 degrees Fahrenheit) in August, and the minimum was -23.6 degrees Centigrade (-10 degrees Fahrenheit) in January. Comparatively, the maximum temperature at the Buffalo National Weather Service over the 55-year period was 37.2 degrees Centigrade (99 degrees Fahrenheit), and the minimum was -28.9 degrees Centigrade (-20 degrees Fahrenheit) (NRCC 2003a, 2003b).

Annual precipitation is distributed evenly throughout the year, with more snow than rain in the winter. The site is not subject to flooding because it is located at a topographic high point within the region. Mean total water equivalent precipitation at the WNYNSC averages approximately 102 centimeters (40 inches) per year. The WNYNSC region receives an annual average of 3 meters (10 feet) of snowfall, with snow squalls totaling 0.3 to 0.9 meters (1 to 3 feet) over a 2- to 3-day period common (WVNS 1993e). Rains resulting from warm fronts are usually light but last for several days; cold fronts often cause heavier rainfall in shorter periods.

Wind speed and direction is affected by local terrain that produces a sheltering effect and lower wind speeds on the WNYNSC, as well as a more seasonal variation in direction than at the National Weather Service station in Buffalo. During an average month, the predominant wind direction is from the northwest during the late fall through early spring and from the south-southeast in the spring through most of the fall. The exception to this is July, where the predominant direction is northwest. At the National Weather Service station in Buffalo, the predominant wind direction only varies from the southwest to west throughout the year. Hourly averaged wind speeds are approximately 2.2 meters per second (5 miles per hour) on an annual basis, with the highest average wind speeds occurring in January and February and the lightest in August. The climatological average wind speeds at National Weather Service Buffalo depict a similar pattern, but are significantly higher overall, averaging 5.3 meters per second (11.9 miles per hour) annually. Most of this increase can be attributed to the National Weather Service averaging methodology, which uses 1-minute averages to represent hourly values. The peak hourly averaged wind speed measured at WNYNSC during the 5-year period was 11.1 meters per second (24.8 miles per hour). At the National Weather Service station in Buffalo, the peak instantaneous wind gust over the last 50 years (1948 to 1998) was 40.7 meters per second (91.0 miles per hour) (NRCC 2003c, 2003d; NWS 2003).

Severe weather at the WNYNSC occurs as straight-line winds and tornadoes. The dominant straight-line high-wind directions are from the southwest (67 percent) and the west (23 percent) (Fujita et al. 1979). Normally, higher wind speeds occur in winter and early spring months. Thunderstorms occur in this region approximately 30 days per year, most often in June, July, and August. Severe thunderstorms with winds greater than 22.4 meters per second (50 miles per hour) occur in western New York State. Remnants of tropical cyclones occasionally affect the western New York region, but the impact from these cyclones is usually increased local rainfall and rarely damaging winds (WVNS 1993e).

The frequency and intensity of tornadoes in western New York are low in comparison to many other parts of the United States. An average of about two tornadoes of short and narrow path length strike New York each year. From 1950 to 1990, 17 tornadoes were reported within 80 kilometers (50 miles) of the WNYNSC (WVNS 2004a). The probability of a tornado striking a 2.6-square kilometer (1-square mile) section of the WNYNSC was estimated to occur once every 10,000 years. For wind speeds less than or equal to 54 meters per second (121 miles per hour) (or a hazard probability level of 2.5×10^{-5}), straight-line winds are the more likely cause; for higher wind speeds, tornadoes are more likely. Straight-line winds are the dominant form of severe weather at recurrence intervals of less than 100,000 years (McDonald 1981).

Favorable atmospheric dispersion conditions exist during periods of moderate to strong winds, unstable conditions, and maximum mixing heights. Mean morning mixing heights vary from 850 meters (2,788 feet) during winter to 450 meters (1,476 feet) in the summer; mean afternoon mixing heights are highest during summer (approximately 1,600 meters [5,249 feet]) and lowest during winter months (approximately 850 meters

[2,788 feet] [Holzworth 1972]). Actual daily mixing heights will vary due to local wind and terrain influences. However, the most favorable dispersion conditions will occur during non-overcast daytime hours when wind speeds are moderate to strong.

3.7.2 Ambient Air Quality

3.7.2.1 Nonradiological Releases

New York State is divided into nine regions for assessing state ambient air quality. The WNYNSC is located in Region 9, comprising Niagara, Erie, Wyoming, Chautauqua, Cattaraugus, and Allegany Counties. The EPA has both primary and secondary National Ambient Air Quality Standards designed to protect human health and welfare from adverse effects from the six criteria pollutants: carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, particulate matter, and lead. The most stringent of the state and Federal ambient standards for each of these pollutants are given in **Table 3–11**. The area encompassing WNYNSC and the surrounding area in Cattaraugus County is classified as an attainment area for all six criteria pollutants except for the northern portion of WNYNSC which is in Erie County which is classified as nonattaining for the ozone 8-hour standard (40 CFR 81.333). Monitoring data for 2006 for the nearest State air pollutant monitors are shown in Table 3–11. These monitors are the closest to the WNYNSC but collect data from the more populated areas of Buffalo and Niagara Falls, rather than the less populated rural area around WNYNSC. The only large sources at WNYNSC are two steam boilers. Emissions of criteria pollutants in Cattaraugus County are less than in Erie County, which includes Buffalo and Niagara Falls (EPA 2006a). Therefore, actual background concentrations at WNYNSC would be expected to be lower.

The ambient air quality standards, other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The 24-hour PM_{10} standard is attained when the standard is not exceeded more than once per year over a 3-year average. The annual $PM_{2.5}$ standard is attained when the 3-year average of the weighted annual mean concentrations does not exceed the standard. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of the 98th percentile of the 24-hour concentrations does not exceed the standard. The 8-hour ozone standard is met when the average of the annual fourth-highest daily maximum 8-hour average concentration is less than or equal to the standard (40 CFR Part 50).

No Prevention of Significant Deterioration Class I areas exist within 100 kilometers (60 miles) of the WNYNSC.

Criteria pollutants and various toxic pollutants are released from WNYNSC primarily from combustion sources such as boilers, standby diesel generators, motor vehicles, and construction and materials handling equipment.

3.7.2.2 Radiological Releases

Airborne emissions of radionuclides released at the WVDP Site during 2006 are shown in **Table 3–11**. Most of the sources of these releases would be shut down and prepared for demolition by completion of the Interim End State.

Table 3–11 Ambient Air Quality Measurements for Buffalo, New York

Pollutant	*2006 Monitoring Data* [a]	*Standard* [b]	*Averaging Period*
Carbon monoxide [c] (micrograms per cubic meter)	7,000 3,500	40,000/ 10,000	1 Hour 8 Hours
Sulfur dioxide [c] (micrograms per cubic meter)	94 34 7.9	1,300/ 365/ 80	3 Hours 24 Hours Annual
Nitrogen dioxide [c] (micrograms per cubic meter)	30	100	Annual
Ozone [d] (micrograms per cubic meter)	163 [d]	157	8 Hours
Particulate matter with aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$) [c] (micrograms per cubic meter)	34 [f] 11	35 15	24 Hours Annual
Lead (micrograms per cubic meter)	NA [g]	1.5	Calendar Quarter
Particulate matter with aerodynamic diameter less than or equal to 10 microns (PM_{10}) (micrograms per cubic meter) [e]	28 13	150/ 45	24 Hours Annual

[a] Maximum reported value for the year.
[b] National Ambient Air Quality Standards, 40 CFR Part 50; State Ambient Air Quality Standards, 6 NYCRR 257.
[c] Buffalo, New York – 185 Dingens Street (State/Local Air Monitoring Station).
[d] Erie County, Amherst, Audubon Golf Course (National/State Local Air Monitoring Station). Monitored value represents the 3-year average of the 4th highest values for 2004 through 2006.
[e] Niagara Falls, New York – Frontier Avenue at 55th Street - 2005 data.
[f] 3-year average of 98th percentile values.
[g] No monitor exists in this part of the state. Data reported for 2004 included a value of 0.01 at a monitor in Niagara Falls.
Note: New York State also has a 3-hour ambient standard for nonmethane hydrocarbons and annual, 30-, 60-, and 90-day, and 24-hour standards for total suspended particulates. The total suspended particulate standards have been superseded by the Federal PM_{10} and $PM_{2.5}$ standards, although not yet officially adopted by the state. The state also has ambient standards for beryllium, fluorides, hydrogen sulfide, and settleable particulates.
Sources: EPA 2007c, NYSDEC 2007.

Table 3–12 Airborne Radioactive Effluent Released from Monitored Release Points in 2006

Isotope	*Release (curies)*
Gross Alpha	4.88×10^{-7}
Gross Beta	9.69×10^{-6}
Hydrogen-3	1.24×10^{-3}
Cobalt-60	5.38×10^{-8}
Strontium-90	3.06×10^{-6}
Iodine-129	2.51×10^{-5}
Cesium-137	3.72×10^{-6}
Europium-154	1.13×10^{-7}
Uranium-232	5.31×10^{-8}
Uranium-233/234	2.31×10^{-8}
Uranium-235/236	8.11×10^{-9}
Uranium-238	2.13×10^{-8}
Plutonium-238	6.54×10^{-8}
Plutonium-239/240	1.06×10^{-7}
Americium-241	2.15×10^{-7}

Source: WVNS and URS 2007.

The EPA, under the Clean Air Act and its implementing regulations, regulates airborne emissions of radionuclides. DOE facilities are subject to 40 CFR Part 61, Subpart H. Subpart H contains the national emission standards for emissions of radionuclides other than radon from DOE facilities. The applicable standard for radionuclides is a maximum of 10 millirem (0.1 millisievert) effective dose equivalent (EDE) to any member of the public in 1 year.

DOE holds permits for radiological air emissions under the National Emissions Standards for Hazardous Air Pollutants. The following emissions sources are monitored on a continuous basis for radionuclides: the Main Plant Process Building ventilation stack; the former vitrification heating; ventilation and air conditioning system; the 01-14 building ventilation stack; the supernatant treatment system ventilation stack; and the Remote-Handled Waste Facility (WVNS and URS 2007). These air emission sources will have been shut down and prepared for demolition by completion of the Interim End State except for the permanent ventilation system which provides ventilation to the Supernatant Treatment System and waste storage tanks 8D-1, 8D-2, 8D-3, and 8D-4. Permitted portable outdoor ventilation enclosures are used to provide the ventilation necessary for the safety of personnel working with radioactive materials in areas outside permanently ventilated facilities or in areas where permanent ventilation must be augmented. One ambient air sampler continued operating in 2006 to monitor air near the onsite lag storage area. The combined emissions from the monitored sources resulted in doses that were calculated to be less than 1 percent of the 10 millirem per year EPA standard for total radionuclides (WVNS and URS 2007).

3.7.3 Noise

Existing noise sources at WNYNSC include heating, ventilation, and air conditioning systems; material handling equipment (fork lifts and loaders); construction equipment; trucks; and automobiles. Noise levels produced by activities at the WNYNSC are expected to be compatible with adjoining land uses. Noise levels near the WNYNSC but outside the WNYNSC are generated predominantly by traffic movements and, to a much lesser degree, residential-, agricultural-, commercial-, and industrial-related activities. No data currently exist on the routine background ambient noise levels produced by activities at WNYNSC or noise levels near the WNYNSC. The land uses in the area would indicate that the noise levels in the area would be low, and range from that typical of rural residential areas (L_{dn} [Day-Night Average Sound Level] 35 to 50 dBA [decibels A-weighted] [EPA 1974]) to industrial locations. Noise measurements made in preparation of the *U.S. Route 219 Final Environmental Impact Statement* (USDOT and NYSDOT 2003a) indicate one-hour equivalent sound levels ($L_{eq}(1)$) during off peak traffic hours of 52 and 54 dBA, along Schwartz Road and County Route 12, respectively. This data was collected in 1996 at least 15 meters (50 feet) from the road. These levels may be representative of roads near the WNYNSC. Nearby noise sensitive areas include residences located near to the WNYNSC boundary such as those along Route 240 to the northeast; along Buttermilk Road to the east; along Fox Valley Road to the southwest; along Rock Spring Road to the south and northwest; along Dutch Hill Road to the southwest and west; and along Boberg Road to the west-northwest (URS 2002a).

3.8 Ecological Resources

Ecological resources include terrestrial resources, wetlands, aquatic resources, and threatened and endangered species. Each resource area is addressed separately below.

3.8.1 Terrestrial Resources

The WNYNSC lies within the Eastern Deciduous Forest Floristic Province, near the transition between the beech-maple forest and hemlock-white pine-northern hardwood forest regions. Typical plant associations of both forest regions exist at the site along with some elements of the boreal forest (WVNS 1996). Currently, the site is nearly equally divided between forestland and abandoned farmland that has not been farmed, grazed, or logged since the 1960s. The relatively undisturbed nature of large portions of the area has allowed for natural succession, thus permitting native vegetation to become reestablished (DOE 2003e). The abandoned farmland has reverted to successional old field, shrubland, and young forest plant communities (WVNS and URS 2004b).

The WNYNSC provides habitat especially attractive to white-tailed deer (*Odocoileus virginianus*) and other various resident and migratory birds, reptiles, and small mammals. Although an overall sitewide wildlife management plan does not exist, NYSERDA sponsors a program to control the deer population by giving hunters limited access to WNYNSC (excluding the Project Premises) during the deer hunting season, a decision that is made on an annual basis (WVNS and URS 2005). Specific controls are also in place for handling nuisance wildlife (i.e., woodchuck [*Marmota monax*]) before site safety is compromised. While methods of control vary, humane treatment of the animals during control activities is a priority and is performed by trained personnel. Wildlife that is caught or found dead is surveyed for radiological contamination before final disposition (WVNS 2005).

Amphibians and Reptiles—Over 35 species of amphibians and reptiles may occur on or near the WNYNSC; however, only 10 amphibians and 1 reptile species actually have been observed. The species observed frequent aquatic and wetland habitats. Although no reptiles other than snapping turtles (*Chelydra serpentina*) have been recorded on the site, several snake species including rat snakes (*Elaphe* spp.), garter snakes (*Thamnophis* spp.), and king snakes (*Lampropeltis* spp.) are likely to be present (WVNS 1996).

Birds—Approximately 175 species of birds have been recorded on or near the WNYNSC. Diversity of bird populations and species varies seasonally due to migration. Permanent residents account for 10 percent of the regional bird list and include the American crow (*Corvus brachyrhynchos*), black-capped chickadee (*Poecile atricapillus*), blue jay (*Cyanocitta cristata*), dark-eyed junco (*Junco hyemalis*), downy woodpecker (*Picoides pubescens*), European starling (*Sturnus vulgaris*), great horned owl (*Bubo virginianus*), northern cardinal (*Cardinalis cardinalis*), red-tailed hawk (*Buteo jamaicensis*), rock dove (*Columba livia*), ruffed grouse (*Bonasa umbellus*), and wild turkey (*Meleagris gallopavo*). Nonpermanent bird species make up the majority of the recorded populations, with 67 percent classified as summer residents, 19 percent as migrants, and 4 percent as visitors, which visit but do not breed in the area (WVNS 1996).

Mammals—More than 50 mammal species potentially inhabit the WNYNSC, with at least 22 having been observed. Large mammals known to inhabit the site include the white-tailed deer, which is representative of the general region (WVNS 1996). As noted above, NYSERDA has initiated a program to control the deer population on the site.

Other mammals observed at the WNYNSC include several species of bats, beaver (*Castor canadensis*), Eastern chipmunk (*Tamias striatus*), Eastern cottontail (*Sylvilagus floridanus*), Eastern gray squirrel (*Sciurus carolinensis*), meadow jumping mouse (*Zapus hudsonicus*), muskrat (*Ondatra zibethicus*), opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), red squirrel (*Tamiasciurus hudsonicus*), and woodchuck (*Marmota monax*) (WVNS 1996).

3.8.2 Wetlands

Wetlands perform numerous environmental functions that benefit the ecosystems as well as society, such as removing excess nutrients from the water that flows through them. The benefit derived from nutrient removal is improved or maintained water quality. This in turn promotes clean drinking water, safe recreation, and secure fish and wildlife habitat. Further, wetlands absorb, store, and slowly release rain and snowmelt water, which minimizes flooding; stabilizes water flow, retards runoff erosion, and controls sedimentation. Wetlands filter natural and manufactured pollutants by acting as natural biological and chemical oxidation basins. Water leaving a wetland is frequently cleaner than water entering. Wetlands can also be helpful in recharging groundwater and serve as groundwater discharge sites, thereby maintaining the quality and quantity of surface water supplies. Wetlands are one of the most productive and valuable habitats for feeding, nesting, breeding, spawning, resting, and providing cover for fish and wildlife (NYSDEC 2005c).

The most recent wetland delineation was conducted in July and August of 2003, and verified in November 2005, on approximately 152 hectares (375 acres) of the WNYNSC, including the Project Premises and adjacent parcels to the south and east of the Project Premises (WVNS and URS 2004b, Wierzbicki 2006). Wetland plant communities identified within the limits of the assessment area include wet meadow, emergent marsh, scrub shrub, and forested wetland. The investigation identified 68 areas comprising approximately 14.78 hectares (36.52 acres) as jurisdictional wetlands, with each area ranging from 0.004 to 2.95 hectares (0.01 to 7.3 acres) as shown in **Figure 3–25** and **3–26**.

A field investigation conducted on November 2, 2005, by the U.S. Army Corps of Engineers in conjunction with review of relevant reports and maps, confirmed the 2003 wetlands delineation results that there are wetlands totaling 14.78 hectares (36.52 acres). Twelve wetlands, totaling 0.98 hectares (2.43 acres), were observed to exhibit no surface water connection to a water of the United States, and are considered isolated, intrastate, and nonnavigable wetlands. It was concluded that 13.8 hectares (34.09 acres) of wetlands are waters of the United States subject to regulation under Section 404 of the Clean Water Act. These waters were determined to be part of an ecological continuum constituting a surface water tributary system of Buttermilk Greek, Cattaraugus Creek, and Lake Erie. The U.S. Army Corps of Engineers approved DOE's wetland determination application on January 26, 2006, which will remain valid for a period of 5 years unless new information warrants revision prior to the expiration date (Senus 2006).

In addition to being considered jurisdictional by the U.S. Army Corps of Engineers, certain wetlands are also regulated by New York as freshwater wetlands. Article 24 of New York State's Freshwater Wetlands Act regulates draining, filling, construction, pollution or any activity that substantially impairs any of the functions and values provided by wetlands that are 5 hectares (12.4 acres) or larger. The state also regulates work within a 30.5-meter (100-foot) buffer zone around designated freshwater wetlands. Although there are no wetlands currently mapped by the NYSDEC, six wetlands (W10, W11, W14, W15, W18, and W54) encompassing 7.0 hectares (17.3 acres) and delineated in the 2003 field investigation appear to be hydrologically connected (see Figure 3–25). The majority of these wetlands are located just south of the south Project Premises fence (WVNS and URS 2004b). On December 28, 2005, NYSDEC-Region 9 concurred with the wetland delineation conducted in 2003. The Agency concluded that the six wetland areas are hydrologically connected, exceed 5 hectares (12.4 acres) and therefore in aggregate constitute an Article 24 state jurisdictional wetland (Ermer 2005). These wetland areas are dominated by wet meadow plant communities but also include emergent marsh, scrub shrub (shrub swamp), and forested wetland (deciduous swamp) plant communities (WVNS and URS 2004b). According to the New York State Freshwater Wetlands classification system the presence of emergent marsh, scrub shrub, and forested vegetation require that the complex be considered a Class IV wetland (of the four classes, Class I has the highest value) (WVNS and URS 2004b). The classification system recognizes that different wetland types have different values and applies different standards for permit issuance.

Several onsite surface water monitoring locations are maintained for sampling both radiological and nonradiological constituents; two of these are associated with site wetlands (see Figure 3–18). The northeast swamp (WNSWAMP) is sampled to monitor surface water drainage and emergent groundwater from the northeastern portion of the site's North Plateau. The north swamp (WNSW74A) monitoring point is sampled to monitor drainage including emergent groundwater to Quarry Creek from the northern portion of the North Plateau. Sampling results are discussed in Section 3.6.1.

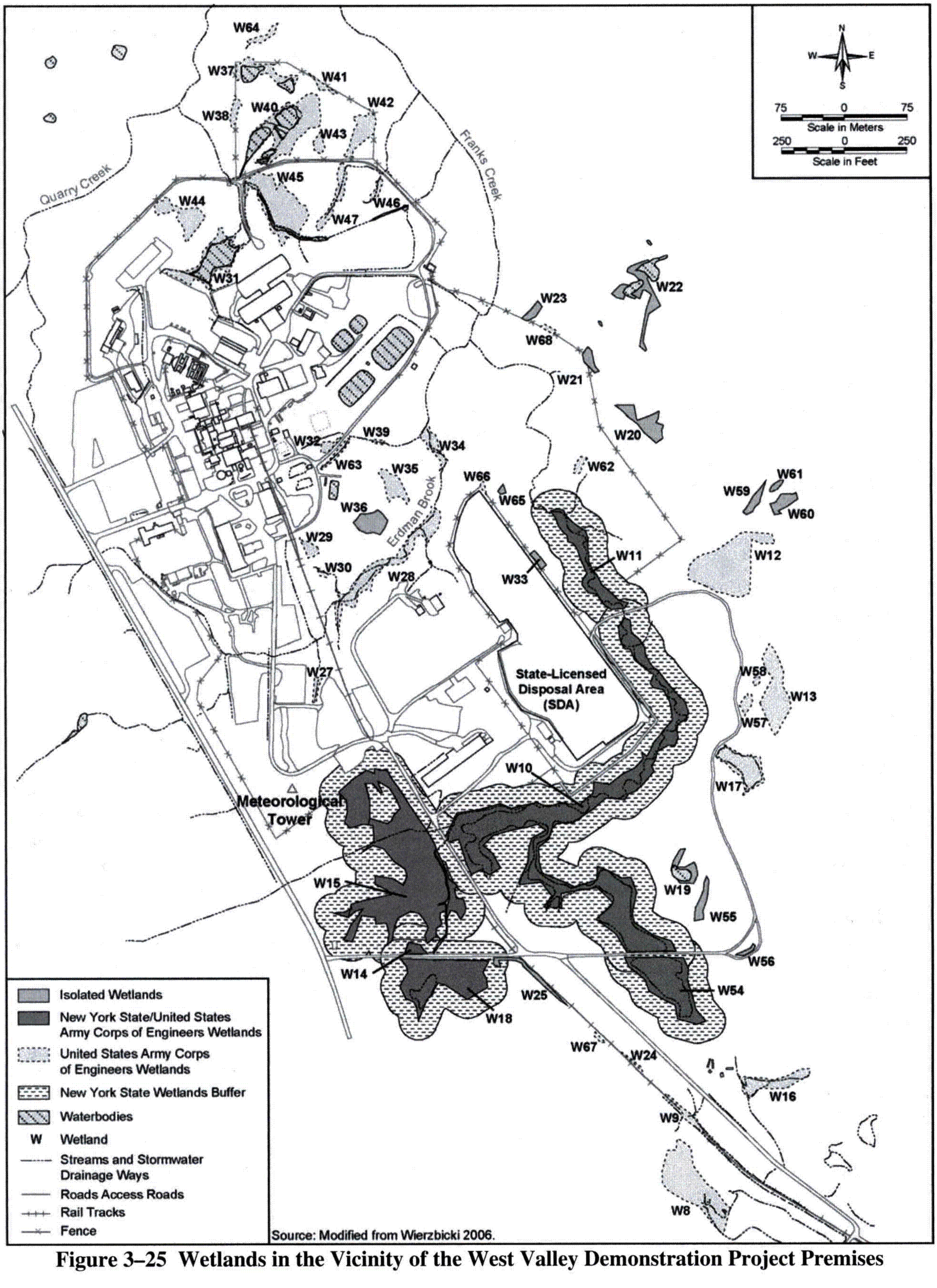


Figure 3–25 Wetlands in the Vicinity of the West Valley Demonstration Project Premises

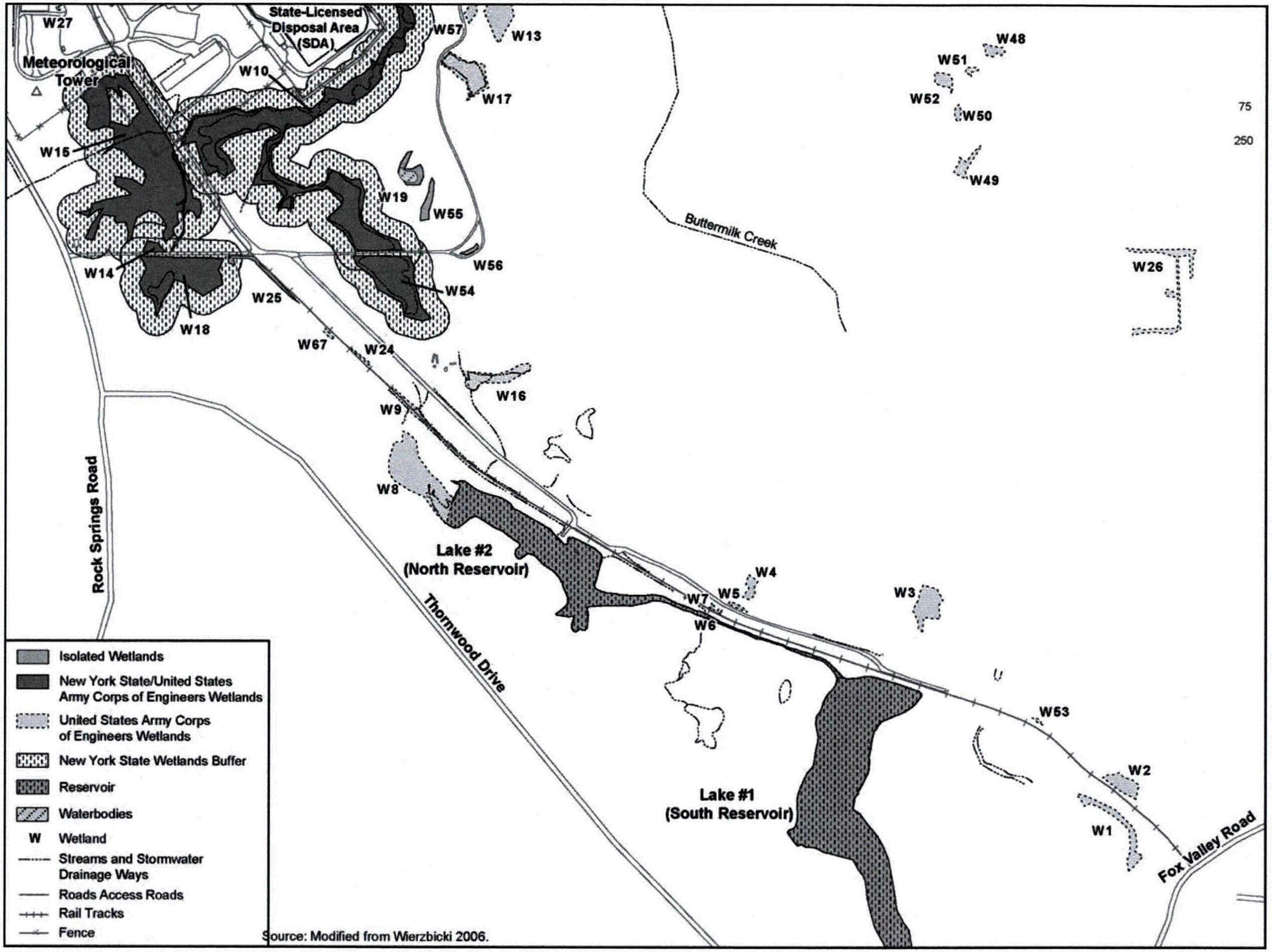


Figure 3–26 Wetlands in the Southern Vicinity of the West Valley Demonstration Project Premises

3.8.3 Aquatic Resources

Aquatic habitat within the Project Premises consists of stream channels, including Franks Creek, Erdman Brook, and Quarry Creek; four active waste treatment facility lagoons; two utility wastewater sludge ponds; one effluent mixing basin (equalization pond); and various maintained stormwater drainages. Two large reservoirs, located in the southern part of the site, overflow to Buttermilk Creek, which then flows northwest to Cattaraugus Creek (WVNS and URS 2005). At least 20 fish species have been observed in the creeks on the WNYNSC, including the Eastern blacknose dace (*Rhinichthys atrarulus*), bluntnose minnow (*Pimephales notatus*), creek chub (*Semotilus atromaculatus*), northern hogsucker (*Hypentelium nigricans*), shiner (*Notropis* spp.), stonecat (*Noturus flavus*), white sucker (*Catostomus commersonii*), and brown trout (*Salmo trutta*). Unique to Cattaraugus Creek, probably due to the presence of the deep pool (near the Route 240 bridge), were largemouth bass (*Micropterus salmoides*) and sunfish (*Lepomis* spp.), as well as horny head chub (*Nocomis biguttatus*). Rainbow darter (*Etheostoma caeruleum*) were found only in Buttermilk Creek, and fantail darter (*Etheostoma flabellare*) were observed only in Quarry Creek. There is less fish diversity in the ponds and reservoirs, in which sunfish are the most common species, than in the creeks. Blacknose dace, largemouth bass, shiners and sunfish have been seen in the north reservoir; only sunfish have been seen in the south reservoir. Bluegill (*Lepomis macrochirus*) live in the farmer's pond located off Route 240 to the east and brown bullhead (*Ameiurus nebulosus*) and white crappie (*Pomoxis annularis*) were observed in the beaver pond near Boberg Road to the west of the site (WVNS 1996).

3.8.4 Threatened and Endangered Species

Consultations with the U.S. Fish and Wildlife Service and New York Natural Heritage Program, as well as previous studies, have identified a number of special status species that could occur on the site (see **Table 3–13**). Critical habitat for the species identified in the table does not occur on the site.

Although the state endangered rose pink (*Sabatia angularis*) was reported on the site in 1992, a field botanical investigation conducted in 2000 failed to relocate it (DOE 2003e). The bald eagle (*Haliaeetus leucocephalus*), which has been delisted in the lower 48 states by the U.S. Fish and Wildlife Service (72 FR 37346), is listed in New York as threatened and may be an occasional transient to the site. Delisting the bald eagle as a threatened species under the Endangered Species Act does not affect the protection provided under the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, or New York-State laws (Doran 2008). The clay-colored sparrow (*Spizella pallida*) has not been recorded on the site but has been found within the vicinity (Seoane 2008). A northern harrier was observed on the site during a spring 1991 biological survey; however, there is little suitable habitat on the site for this species as it prefers open wet meadows for hunting (WVNS 1992b).

The clubshell and rayed bean, although reported in Cattaraugus County, were not found in Buttermilk or Cattaraugus Creeks when those streams were surveyed in 1991 (Doran 2008, WVNS 1992b). Additionally, they were not reported by the New York Natural Heritage Program when that organization was consulted concerning state-listed species potentially present in the vicinity of the site (Seoane 2008).

Although not protected by Federal or state regulations, the cobblestone and Appalachian tiger beetles are ranked as critically imperiled and imperiled, respectively, by the New York Natural Heritage Program. The former species has been found on a cobble bar along Cattaraugus Creek downstream from the confluence of Buttermilk and Cattaraugus Creeks while the latter has been found in the vicinity of the confluence of these two streams (Seoane 2008).

Table 3–13 Threatened, Endangered, and Other Special Status Species Occurring in the Vicinity of the Western New York Nuclear Service Center

Common Name	*Scientific Name*	*Federal Status*	*State Status*	*Natural Heritage New York State Rank*
Plants				
Rose pink	*Sabatia angularis*		Endangered	
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	Delisted [a]	Threatened	
Clay-colored Sparrow	*Spizella pallida*			Imperiled
Northern harrier	*Circus cyaneus*		Threatened	
Freshwater Mussels				
Clubshell	*Pleurobema clava*	Endangered	Endangered	
Rayed bean	*Villosa fabalis*	Candidate	Endangered	
Beetles				
Appalachian tiger beetle	*Cicindela ancocisconensis*			Imperiled
Cobblestone tiger beetle	*Cicindela marginipennis*			Critically imperiled

[a] Effective August 8, 2007, the bald eagle was removed from the list of threatened wildlife in the lower 48 states (72 FR 37346).

Federal:
Delisted – Removed from the list of threatened and endangered species.
Candidate – Current information indicates the probable appropriateness of listing as endangered or threatened.
Endangered – In danger of extinction throughout all or a significant portion of its range.
Threatened – Likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

State:
Endangered – Any native species in imminent danger of extirpation or extinction in New York State.
Threatened – Any native species likely to become an endangered species within the foreseeable future in New York State.

New York State Natural Heritage State Rank:
Critically imperiled – Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making is especially vulnerable in New York State.
Imperiled – Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York Sate.

Sources: DOE 2003e; Doran 2008; NYSDEC 2008c, 2008d; Seoane 2008; WVNS 1992b.

3.9 Cultural Resources

The most recent cultural resources study of the WNYNSC took place between June and December 1990 and involved two stages: (1) literature search and sensitivity assessment; and (2) field investigation (Pierce 1991). The study area consisted of approximately 146 hectares (360 acres) that may be affected by future plans and/or WNYNSC closure. The study area was subdivided into 29 study units (A through Y, and AA through EE) based on a number of factors including ease of access, vegetation, and topographic features. The study area included narrow linear parcels paralleling tributaries to Buttermilk Creek as far as its confluence with Cattaraugus Creek, parcels adjacent to the Project Premises, and a parcel encompassing the Bulk Storage Warehouse area in WMA 11 as shown in **Figure 3–27**.

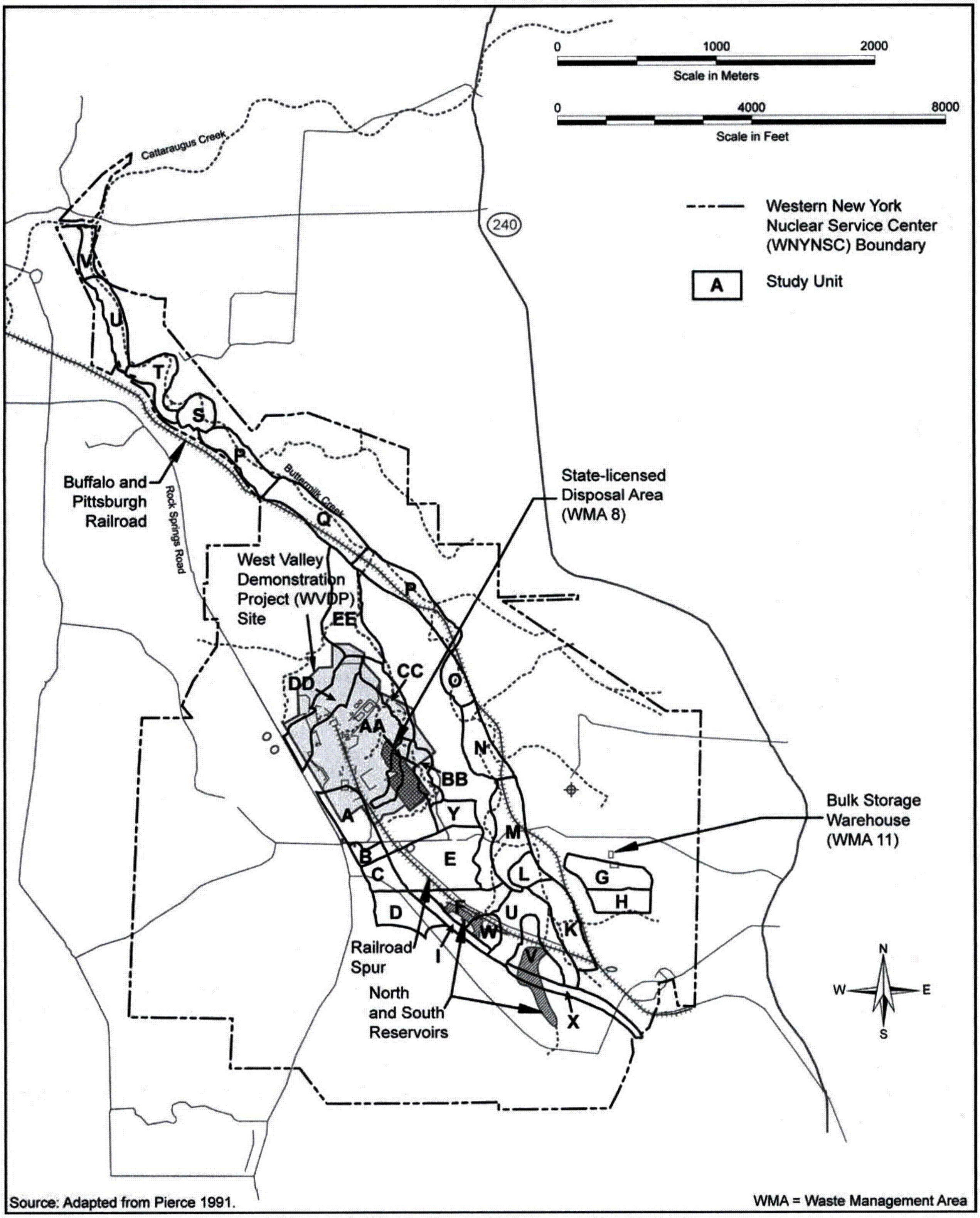


Figure 3–27 Cultural Resources Study Units

A variety of field methods, singly and in combination, were employed throughout the study area: intensive walkover reconnaissance, exposed creek bank and terrace inspection, and shovel testing. In addition to occasional isolated historic cultural material recovered during surface inspections and/or shovel testing, the investigation yielded one prehistoric and eight historic archeological sites, and two historic standing structures. The variety of cultural resources identified in the study area reinforced the belief that a microcosm of local and regional lifeways and settlement patterns might be found there. Western New York has a long and varied culture history ranging from the prehistoric past through Euroamerican settlement to the nuclear age (Pierce 1991). Based on the background research and preliminary walkover inspection, the cultural resource sensitivity within the study area was considered to be moderate to high for locating unrecorded prehistoric and/or historic resources. However, these sensitivities were moderated by the extremely high degree of natural erosion and manmade impacts that have occurred within the study area.

The study concluded that unrecorded archaeological sites are probably present within the WNYNSC. However, they were not located in the study area and are more likely to be found on the higher terrace or upland and headwater locations (Pierce 1991). Further, the New York State Historic Preservation Office has determined that facilities on the Project Premises are not eligible for inclusion in the National Register of Historic Places (Kuhn 1995), and no properties on the WNYNSC have been determined eligible for the National Register of Historic Places (DOE 2005a, DOE 2006d, Kuhn 1995).

3.9.1 Prehistoric Resources

A scraping tool was found in Study Unit E west of the access road leading into the borrow pit (Study Unit Y). The site is situated in a former agricultural field and orchard on a slight ridge overlooking an intermittent drainage leading to Erdman Brook. Fourteen additional shovel test pits were excavated in the vicinity, and no other cultural material was recovered, nor were any cultural features (e.g., hearths, pits) observed. The artifact is considered to be a "stray find" because it was isolated and not in association with other prehistoric cultural material or features (Pierce 1991).

3.9.2 Historic Resources

Of the eight historic sites and two historic structures found during the study, three additional investigations prior to any further disturbance would likely be required as indicated in the following description of the resources (Pierce 1991).

Goodemote/Spittler Farmstead Site (Study Unit A)—Isolated historic artifacts were recovered that were primarily farm related including several rusting metal objects (i.e., nails, pitchfork fragments, and iron plate), and two ceramic whiteware shards. Historical maps indicate there were two farmsteads in the vicinity, but the recovered artifacts were thought to be from the Goodemote/Spittler Farmstead. The barns, residences, and outbuildings of both farmsteads were demolished in the early 1960s during the development and construction of the reprocessing plant. The artifacts recovered from this site do not, in themselves, possess characteristics that would make them eligible for the National Register of Historic Places because they are typical items utilized in the daily routine of a farm and are considered to be isolated from the primary center of the farmstead, which was completely destroyed. No additional cultural resource investigations are believed necessary for this area (WVNS 1994b).

Frank Farmstead Site (Study Unit D)—This site originally contained a residence, barn, outbuilding, and semi-circular drive. Subsurface testing at this site recovered a concentration of ceramics (datable to the second quarter of the nineteenth century) and construction materials (e.g., bricks, nails, glass, and roofing material). Some mixing and burning of materials was apparent, which was consistent with the information on the demolition procedures used following condemnation of the farmstead in the 1960s. The Frank Farmstead site could provide information on the early settlers to the area, as the Frank family was the first to settle in the town of Ashford in the early 1800s. The Frank Farmstead site appears to maintain integrity in the configuration of the structures that were once there. A comparison of the artifacts from this site with those of other early German settlements in western New York may provide information on the similarity or uniqueness of the Ashford population. The site may also provide information on the cultural behavior of one family through time, as the farmstead was occupied by the Franks until its demolition.

Fleckenstein Farmstead Site (Study Unit L)—Historical maps and interviews conducted indicated a farmstead might be found and the walkover investigation verified a farmstead complex consisting of the remains of three foundations and ornamental shrubbery. Two of the foundations are comprised of fieldstone and concrete, one of which is probably a residence, while the remains of the barn are made of cobbles and rocks. Very few artifacts were recovered from the shovel testing and, with the exception of two ceramic fragments, no datable cultural deposits were recovered. Based on these findings, no additional cultural resources investigations are recommended because the material found does not meet the eligibility criteria for the National Register of Historic Places.

Hoyt's Siding Site (Study Unit O)—This site consists of the remains of a railroad stop constructed sometime between 1869 and 1920. Artifacts recovered include railroad debris, a rectangular concrete slab, and railroad tracks. No shovel test pits were excavated at this site (WVNS 1994b). At the direction of the State Historic Preservation Office, additional Stage 1B cultural resource investigations (shovel testing) could be undertaken to recover datable cultural resource deposits and to allow a determination as to whether the site would be eligible for inclusion in the National Register of Historic Places (WVNS 1994b).

Capron Farmstead Site (Study Unit S)—This site was found on the earliest map available for the study, with a date of 1869. Preliminary walkover reconnaissance identified a house foundation, a bridge, a U.S. Geological Survey gauging station, a concrete foundation, and a barn or mill foundation. The bridge was built sometime after 1949, when it replaced an earlier structure that was constructed in 1932. Shovel testing at this site produced ceramics, metal fragments, milk cans, bricks, and fragments of mechanical items. None of the materials dated to the earlier occupation; however, the area near the possible residence was not tested (WVNS 1994b). At the direction of the State Historic Preservation Office, additional Stage 1B cultural resource investigations (shovel testing) could be undertaken to recover datable cultural resource deposits and to allow a determination as to whether the site would be eligible for inclusion in the National Register of Historic Places (WVNS 1994b).

Late Twentieth Century Hunting Camp (Study Unit U)—The remains of an apparent hunting camp were located adjacent to Buttermilk Creek. A building was thought to be located in the camp and it appears to have been square with a gable roof and an associated unidentified concrete structure. No artifacts were recovered and because of the recent age of the materials, no excavations were conducted. Due to the contemporary date of this site and the fact that it is not unique to the area, it is not considered to be significant and does not possess characteristics that would make it eligible for the National Register of Historic Places.

Rider/Harvey/Whiteman Silo/Barn Site (Study Unit AA)—This site consists of the remains of a concrete and fieldstone silo pad with a barn foundation. Historic maps and resident interviews indicated that the silo/barn remnants probably belonged to the former Rider/Harvey/Whiteman Farmstead, which was demolished during the construction of the reprocessing plant and railroad. Because of severe disturbances, this site is not considered to be significant.

Erdman/Gentner Trash Midden (Study Unit DD)—This site represents a late 1950s to early 1960s residential and agricultural trash deposit. It contained an unusually high number of metal pails, which reinforces information that the Erdman/Gentner farm was functioning as a dairy farm. Other artifacts include other metal objects (e.g., lawn chairs, nails, and bedsprings), bottles, glass fragments, and ceramics. The material found is not inconsistent with material found elsewhere on recent farm sites; the midden contained recent datable artifacts (e.g., 1950s ceramics, bottle, etc.), as well as material related to daily subsistence and maintenance activities conducted on farms (e.g., dairying, maple sugaring, etc.). None of the midden material nor its context make it eligible for the National Register of Historic Places.

Buttermilk Hill Schoolhouse (Study Unit C)—The District 14 Schoolhouse was a one-and-a-half-story frame structure located at the northeast corner of Rock Springs and Buttermilk Hill Roads and appeared on historic maps of the area somewhere between 1869 and 1920. No cultural material was recovered during shovel testing, and because the structure lacks architectural uniqueness, and integrity, this resource was not considered to be eligible for the National Register of Historic Places (Pierce 1991). The schoolhouse was demolished in 2007.

Twentieth Century Hunting Camp (Study Unit D)—Located at the north edge of the north reservoir, this hunting camp was formerly accessible by an unimproved dirt and grass road. The 6 by 7.6 meter (20 by 25 foot), one-story, frame structure is constructed of plywood with packing crate walls. Half-logs had been applied to its exterior, probably to give it the appearance of a log cabin. The cabin has a gable roof on one half with a salt-box type roof on the other. Its wooden floor, now deteriorated, was once set on concrete piers formed in bushel baskets. The structure appeared to have been divided into two rooms, a living area with a fieldstone and concrete fireplace, and a kitchen area containing a deteriorating gas stove and refrigerator. Because of its recent age and lack of association with historic periods or events, this resource does not possess characteristics that would make it eligible for the National Register of Historic Places.

3.9.3 Traditional Cultural Resources

Although American Indian archaeological materials are limited at the WNYNSC, other traditional use areas may be present. The WNYNSC is approximately 24 kilometers (15 miles) upstream from the Cattaraugus Indian Reservation, land reserved for the Seneca Nation of Indians. Communications with the Seneca Nation are ongoing to address potential impacts to their cultural sites and resources as a result of implementing the selected alternative. Specifically, the Seneca Nation of Indians request that planning and decisions regarding the site take into consideration, in detail, their way of life, the herbs they gather and consume, and the degree of their subsistence on aquatic life within Cattaraugus Creek (Snyder 1993). See Section 5.6 regarding communications with the Seneca Nation of Indians.

3.10 Socioeconomics

This section briefly describes the socioeconomic conditions of a two-county ROI, an area in western New York State comprised of Cattaraugus and Erie Counties that are most directly affected by ongoing activities at the WNYNSC. Approximately 95 percent of the employees currently reside in these counties (Malone 2003). This socioeconomic characterization focuses on the regional economic characteristics, population and demographic characteristics, housing and public services, utilities, and transportation.

3.10.1 Regional Economic Characteristics

The WNYNSC is one of the largest employers in Cattaraugus County and as of August 2006 employed 384 people directly, including contractors, security, DOE and NYSERDA personnel (WVES 2008). Employment at the WNYNSC also creates additional employment in the ROI. The WNYNSC contributes to the economic condition of the region through the wages it pays and the goods and services it purchases. It is estimated that the WNYNSC generates indirect employment of approximately 412 jobs. Therefore the total employment that can be attributed WNYNSC activities in the ROI is approximately 796 jobs.

In fiscal year 2008, it is estimated that WNYNSC paid approximately $27 million for base annual salaries (WVES 2008). The WNYNSC also purchased about $11 million in goods and services from firms in the local area in fiscal year 2006 (WVES 2008). As of March 2008, the average salary for the largest employer at WNYNSC was $70,168 (WVES 2008), which was higher than the average salary for all industrial sectors for both Cattaraugus and Erie Counties (BLS 2008a).

Annual payments of approximately $500,000 are made from WNYNSC to local municipalities in the ROI in lieu of property taxes. The West Valley Central School District is the largest recipient of the payments at about $280,000. The town of Ashford receives $160,000, and Cattaraugus County receives $60,000. These payments are provided to compensate local governments for any loss in revenue that could have been earned if the site was not publicly owned (WVES 2008).

Based on 2007 annual information, the distribution of employment by industry sector shows that the largest number of workers in the ROI are government employees (17.5 percent in the ROI), followed by professional and business services (12.8 percent), health care and social assistance (12.7 percent), and retail trade (11.1 percent) (NYSDOL 2008a). In 2007, as a percentage of the civilian labor force, the unemployment rates for Cattaraugus and Erie Counties were 5.1 percent and 4.6 percent, respectively, which were in line with the New York State average of 4.5 percent (NYSDOL 2008b). In 2006, approximately 3.2 percent of the Cattaraugus and Erie County workforce who did not work from home commuted an hour or more to work (DOC 2006). This may be indicative of the approximate percentage of people leaving these counties to work elsewhere.

3.10.2 Population and Demographic Characteristics

Figures 3–28 and **3–29** show the population distribution within 80 kilometers (50 miles) and 480 kilometers (300 miles) of the site, respectively (DOC 2008a, ESRI 2008, Statistics Canada 2008). Census estimates from the 2006 American Community Survey indicate relatively stable overall population levels in the two counties surrounding the WNYNSC. The total population in these counties decreased by 1.8 percent between the 1990 census and the 2000 census. From 2000 through 2006, the census estimates the population in these two counties decreased by another 3.0 percent. **Table 3–14** shows the demographic profile of the ROI population. Persons self-designated as minority individuals comprise about 19 percent of the total population. This minority population is composed largely of Black or African American residents.

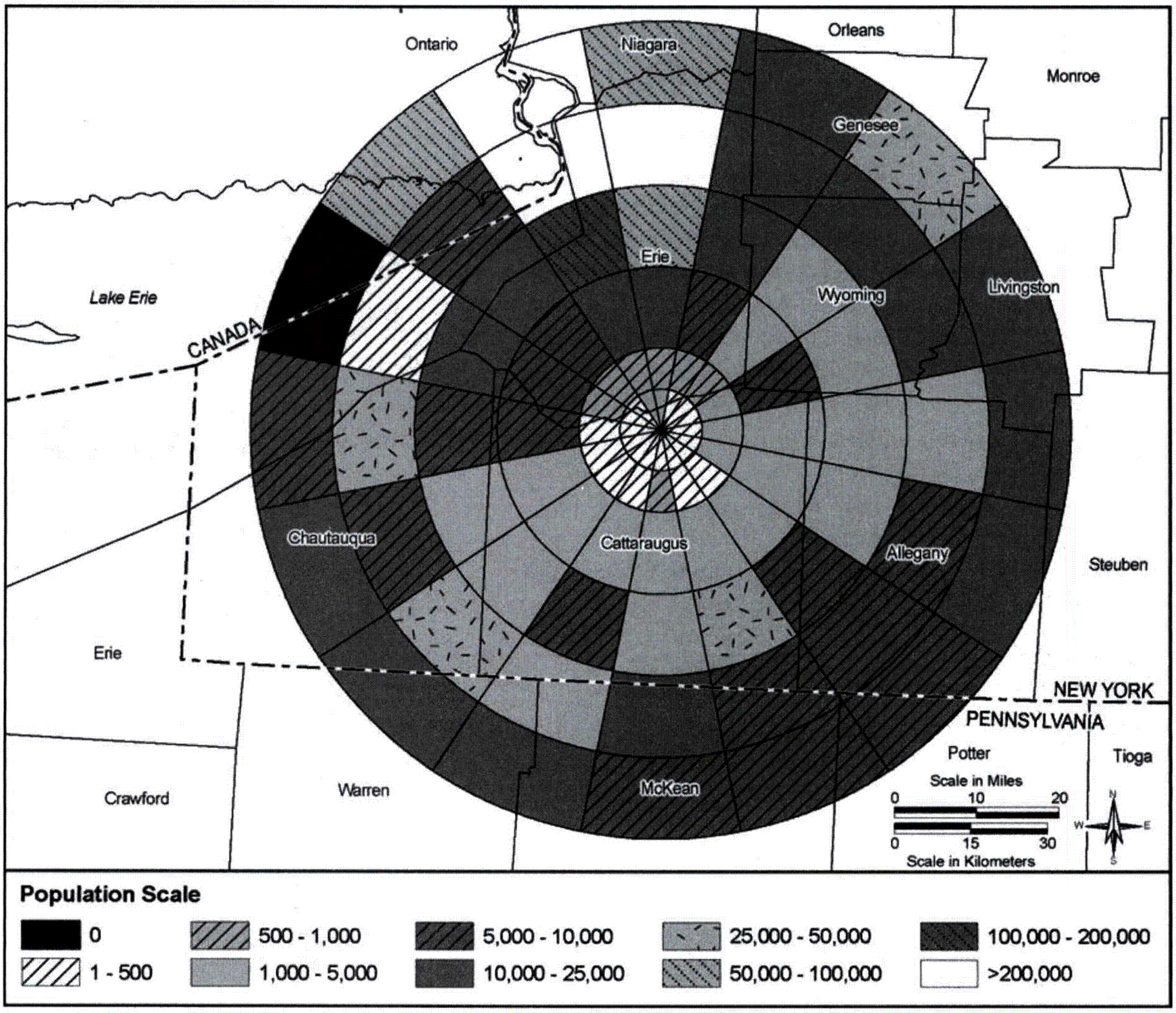


Figure 3–28 Population Distribution within 80 Kilometers (50 miles) of the Site

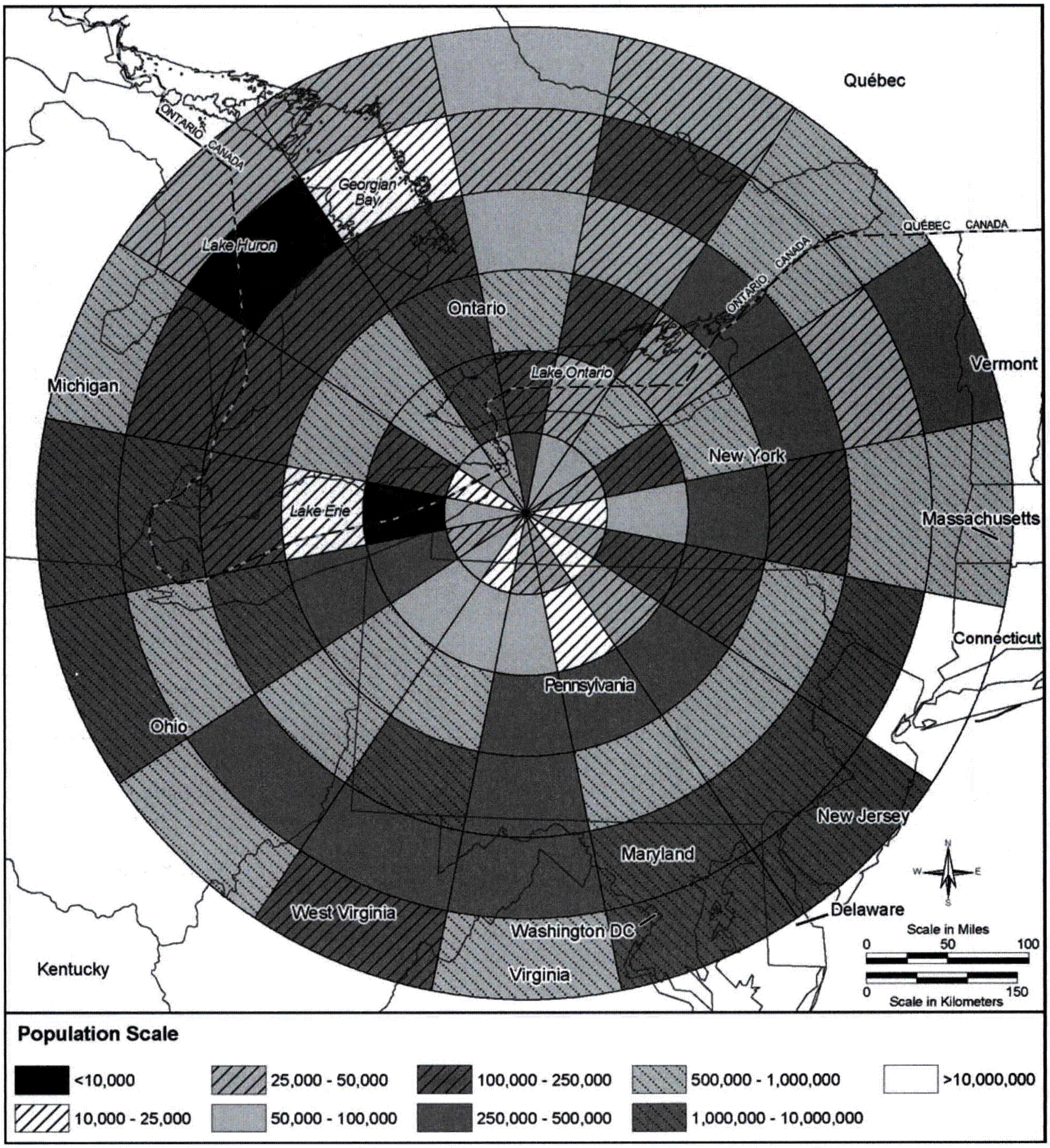


Figure 3–29 Population Distribution within 480 Kilometers (300 miles) of the Site

Table 3–14 Demographic Profile of the Population in 2000 in the Western New York Nuclear Service Center Region of Influence

	Cattaraugus County		*Erie County*		*Region of Influence*	
Population						
2006 population	81,534		921,390		1,002,924	
2000 population	83,955		950,265		1,034,220	
Percent change from 2000 to mid-2006	-2.9		-3.0		-3.0	
Race (2006)	*Total*	*Percent*	*Total*	*Percent*	*Total*	*Percent*
White, not of Hispanic Origin	75,989	93.2	734,642	79.7%	810,631	80.8
Black or African American [a]	1,163	1.4	123,273	13.4%	124,436	12.4
American Indian and Alaska Native [a]	2,207	2.7	4,861	0.5%	7,068	0.7
Asian [a]	613	0.8	18,689	2.0%	19,302	1.9
Native Hawaiian and Other Pacific Islander [a]	0	0.0	65	0.0%	65	0.0
Some other race [a]	77	0.1	12,296	1.3%	12,373	1.2
Two or more races [a]	681	0.8	13,310	1.4%	13,991	1.4
White Hispanic	804	1.0	14,254	1.5%	15,058	1.5
Total minority	5,545	6.8	186,748	20.3%	192,293	19.2
Total Hispanic [b]	929	1.1	33,271	3.6%	34,200	3.4

[a] Includes persons who self designated themselves as Hispanic or Latino.
[b] Includes all persons who self designated themselves as Hispanic or Latino regardless of race.
Sources: DOC 2000, 2006.

Income information for the two-county ROI is included in **Table 3–15**. The median household incomes in Cattaraugus and Erie Counties are below the median household income level for New York State. Cattaraugus County is below the state level by approximately $12,300, and Erie County is below the state level by about $8,900. Erie County's median household income, $42,494, is 8 percent higher than Cattaraugus County's household income. According to census estimates, 14.5 percent of the population in Erie County was below the official poverty level in 2005, while 14.7 percent of the population in Cattaraugus County was below the poverty level, as compared to 14.2 percent of the state (DOC 2006).

Table 3–15 Income Information for the Western New York Nuclear Service Center Region of Influence

	Cattaraugus County	*Erie County*	*New York*
Median household income 2006 ($)	39,066	42,494	51,384
Percent of persons below the poverty line (2005)	14.7	14.5	14.2

Source: DOC 2006.

3.10.3 Housing and Public Services

3.10.3.1 Housing

Erie County housing inventory accounted for 91.3 percent of housing units in the ROI in 2006 (DOC 2006). More than half of the homes in the ROI in 2006 were attached or unattached single-family units (60 percent). In 2006, the estimated vacancy rate was 7.4 percent for units for sale or rent, excluding seasonally vacant units (DOC 2006).

3.10.3.2 Public Services

This section describes public services available in the area surrounding the WNYNSC, including public safety, public health, and education.

Public Safety

The New York State Police and the Cattaraugus County Sheriff Department have overlapping jurisdictions for the West Valley area. Any assistance needed may be obtained from the State or County Police Departments (DOE 2003e). The State Police substation in Ellicottville has jurisdiction over the WNYNSC. Another State Police substation located in Machias, about 12.8 kilometers (8 miles) away would provide backup assistance (Mogg 2003). There is a Cattaraugus County Sheriff substation at the WNYNSC, with three to four officers that would respond to emergencies at the WNYNSC (WVES 2008). Backup support is available from Cattaraugus County's entire Sheriff Department which is comprised of 104 full- and part-time sworn officers (DCJS 2008). The nearest station in Cattaraugus County is in Ellicottville. In 2006 there were 2,043 sworn full or part-time police officers in the two county ROI. The ratio of sworn officers to every one-thousand people in the ROI was 2.0. Sworn officers to population ratios for Cattaraugus and Erie Counties were 2.5 and 2.0, respectively. The New York State ratio of sworn officers to every thousand people was 3.1. These ratios do not include State Troopers since they patrol larger regional jurisdictions throughout the state (DCJS 2008).

The West Valley Volunteer Hose Company provides fire protection services to the WNYNSC and the Town of Ashford. The West Valley Volunteer Hose Company, which is part of the West Valley Fire District I, has 70 active volunteers (Gentner 2008) and provides emergency response to the WNYNSC through a Letter of Agreement. The WNYNSC also has a Letter of Agreement with West Valley Fire District I for emergency services (Chilsom 2003). Responders are trained and briefed annually by the Radiation and Safety Department at the WNYNSC and NYSERDA on hazards at the site. Responders have limited training and capability to assist in chemical or radioactive occurrences. The West Valley Volunteer Fire Department has an agreement with the bordering towns' fire departments for mutual assistance in situations needing emergency backup. These neighboring volunteer fire departments are the William C. Edmunds Fire Company (East Otto), Ellicottville Volunteer Fire Department, Machias Volunteer Fire Department, Chaffee-Sardinia Memorial Fire Department, Delevan Volunteer Fire Department, East Concord Volunteer Fire Department, and Springville Volunteer Fire Department (DOE 2003e).

Public Health

The Cattaraugus County Health Department provides health and emergency services for the entire county, with the closest locations to the WNYNSC being in the towns of Machias and Little Valley. Other resources providing health care services include Promedicus Health Group; Evergreen Women's Health; LLP; Main Urology Associates; Concord Medical Group; and several private physician practices located in Springville. The Bertrand Chaffee Hospital in Springville in Erie County is the closest hospital to the WNYNSC, located approximately 6 kilometers (4 miles) north on Route 39 in Springville. This facility has 49 beds and will likely remain the primary health services supplier in the area. A written protocol for emergency medical needs at the WNYNSC provides the basis for support in the event of emergency from Bertrand Chaffee Hospital (DOE 2003e) and the Erie County Medical Center. Cattaraugus County has 2 hospitals: Olean General Hospital in Olean with 186 beds and TLC Health Network in Gowanda with 34 certified beds. Erie County has 10 hospitals with a total of 2,635 beds (NYSDOH 2008a). The New York State Physician Profile listed 1,070 physicians in Erie County and 68 in Cattaraugus County (NYS Physician Profile 2008).

Education

There are 13 school districts in Cattaraugus County and 29 in Erie County (NYSED 2008). These districts provide preschool through high school education. In the 2005 to 2006 school year, there were 14,888 students enrolled in public schools in Cattaraugus County and 129,618 in Erie County. Erie County has a student teacher ratio of about 12.5 students per teacher, while Cattaraugus County has a ratio of 11.2 students per teacher (NYSED 2008).

3.11 Human Health and Safety

Public and occupational health and safety issues include the determination of potential adverse effects on human health that could result from acute and chronic exposure to ionizing radiation.

3.11.1 Radiation Exposure and Risk

3.11.1.1 Environmental Monitoring Program Overview

Exposure of human beings to radioactivity would be primarily through air, water, and food. At the WNYNSC, all three pathways are monitored, but air and surface water pathways are the two primary near-term means by which radioactive material can move off site.

The onsite and offsite monitoring programs at the WNYNSC include measuring the concentrations of alpha and beta radioactivity, conventionally referred to as "gross alpha" and "gross beta," in air and water effluents. Measuring the total alpha and beta radioactivity from key locations produces a comprehensive picture of onsite and offsite levels of radioactivity from all sources.

More detailed measurements are also made for specific radionuclides. Strontium-90 and cesium-137 are measured because they have been previously detected in WNYNSC waste materials. Radiation from other important radionuclides such as tritium or iodine-129 is not sufficiently energetic to be detected by gross measurement techniques, so it is analyzed separately using more sensitive methods. Heavy elements such as uranium, plutonium, and americium require special analysis to be measured because they exist in such small concentrations in the WNYNSC environs.

3.11.1.2 Radiation Exposure

Major sources and levels of background radiation exposure to individuals in the vicinity of the site are shown in **Table 3–16**. Annual background radiation doses to individuals are expected to remain constant over time. Background radiation doses are unrelated to site operations.

Normal operational releases of radionuclides to the environment from site operations provide another source of radiation exposure to individuals. Types and quantities of radionuclides released from operations in 2006 are listed in the *Annual Site Environmental Report, Calendar Year 2006* (WVNS and URS 2007). Estimated doses from these releases are summarized below.

Airborne Emissions

The EPA, under the Clean Air Act and its implementing regulations, regulates airborne emissions of radionuclides. DOE facilities are subject to 40 CFR Part 61, Subpart H. Subpart H contains the national emission standards for emissions of radionuclides other than radon from DOE facilities. The applicable standard for radionuclides is a maximum of 10 millirem (0.1 millisievert) EDE to any member of the public in 1 year.

Table 3–16 Sources of Background Radiation Exposure to Individuals in the United States Unrelated to Western New York Nuclear Service Center Operations

Source	*Effective Dose Equivalent (millirem per year)*
Natural Background Radiation	
External cosmic, ground level [a]	28
External terrestrial [b]	28
Internal terrestrial and global cosmogenic	39
Radon (in homes)	200
Other Background Radiation	
Diagnostic x-rays and nuclear medicine	53
Other, including weapons test fallout	2
Consumer and industrial products	10
Total	360

[a] Cosmic radiation doses are lower in the lower elevations and higher in the mountains.
[b] Variation in the external terrestrial dose is a function of the variability in the amount of naturally occurring uranium, thorium, and potassium in the soil and in building materials.
Sources: NCRP 1987, WVNS and URS 2007.

Maximum Dose to an Offsite Individual—Based on the nonradon airborne radioactivity released from all sources at the site during 2006, it was estimated that a person living in the vicinity of the site could have received a total EDE of 0.0011 millirem from airborne releases. This maximally exposed offsite individual would be located 1.9 kilometers (1.2 miles) north-northwest of the site and was assumed to eat only locally produced foods. This maximum dose to an offsite individual is a small fraction (0.01 percent) of the EPA air limit of 10 millirem.

Collective Dose to the Population—Based upon the latest U.S. census population data collected in 2000, about 1.5 million people were estimated to reside within 80 kilometers (50 miles) of the site. This population received an estimated dose of 0.0062 person-rem total EDE from radioactive airborne effluents released during 2006.

Waterborne Releases

Waterborne releases from the site involve routine batch releases from Lagoon 3, effluent from the sewage treatment facility, and drainage from the North Plateau. Doses to an offsite individual and population are estimated on the basis of radioactivity measurements supplied by the environmental monitoring program.

Maximum Dose to an Offsite Individual—Based on the radioactivity in liquid effluents discharged from the site during 2006, an offsite individual could receive a maximum EDE of 0.048 millirem, based on liquid effluent releases and drainage from the north plateau. This exposure would be less than the 4 millirem regulatory limit as defined by the Primary Drinking Water Standards.

Collective Dose to the Population—As a result of radioactivity released in liquid effluents during 2006, the population living within 80 kilometers (50 miles) of the site would have received a collective EDE of 0.21 person-rem.

Dose from All Pathways

The potential dose to the public from both airborne and liquid effluents released from the site during 2006 is the sum of the individual dose contributions. The calculated maximum EDE from all pathways to a nearby resident was 0.049 millirem. This is a small fraction (0.049 percent) of the 100-millirem annual limit in DOE Order 5400.5.

The total collective EDE to the population within 80 kilometers (50 miles) of the site was 0.22 person-rem, with an average EDE of 0.00014 millirem per individual. The estimated population dose from airborne radon, calculated annually, was approximately 0.34 person-rem.

Figures 3–30 and **3–31** show the calculated annual dose to the hypothetical maximally exposed individual and the collective dose to the population respectively over the last 10 years. The overall radioactivity represented by these data confirms the continued inconsequential addition to the natural background radiation dose that the individuals and population around the WNYNSC receive from site activities.

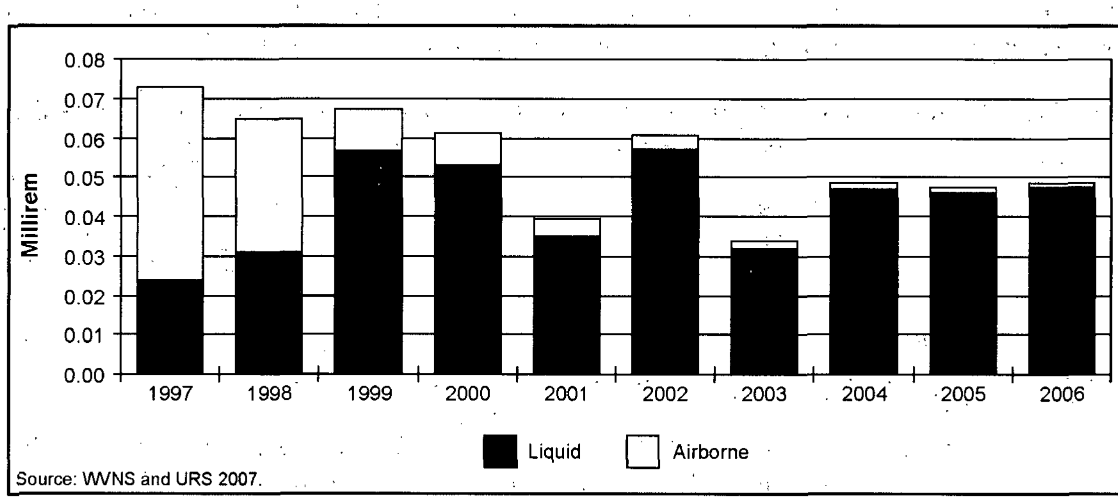


Figure 3–30 Effective Dose Equivalent from Liquid and Airborne Effluents to a Maximally Exposed Individual Residing Near the Western New York Nuclear Service Center

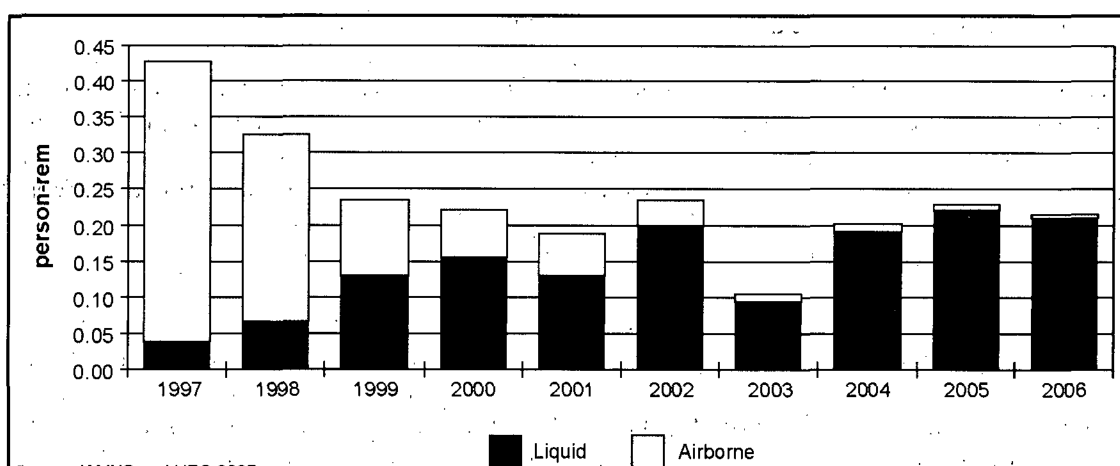


Figure 3–31 Collective Effective Dose Equivalent from Liquid and Airborne Effluents to the Population Residing within 80 Kilometers (50 miles) of the Western New York Nuclear Service Center

3.11.2 Health Effect Studies

Both the State of New York Health Department and the U.S. National Cancer Institute maintain statistical records of cancer incidence and mortality rates. Cancer incidence and mortality rates for the counties surrounding the site are compared to those for New York State for the time period of 2000 to 2004 in **Table 3–17** (NYSDOH 2008b). When compared to New York State, excluding New York City since it is not representative of the rural demographics of the counties on and around the site, Cattaraugus County and its collocated counties have comparable cancer incidence rates to the State. The Cattaraugus County death rate from cancer is lower than 23 of the 62 counties in the State and its cancer incidence rate is lower than 41 of the 62 state counties for the time period of 2000 to 2004. Furthermore, comparison of Cattaraugus County cancer incidence and mortality rates to that of adjacent counties does not show that it has a higher rate (it is lower than some and higher than others). There is no statistically significant trend that indicates that the cancer incidence of the population around the site is different than other counties or the State of New York.

Table 3–17 Comparison of 2000 to 2004 Cancer Rates for Counties around the West Valley Demonstration Project and New York State

Cancer Incidence per 100,000 people	*Cattaraugus County*	*Allegany County*	*Chautauqua County*	*Erie County*	*Wyoming County*	*New York State (excluding New York City)*
Incidence - male	581.4	587.6	627.1	590.6	621.5	571.1 (594.1)
Incidence - female	451.5	445.4	406.2	437.6	444.7	427.4 (451.5)
Annual deaths - male and female	204.9	221.7	205.0	210.3	207.0	189.7

Source: NYSDOH 2008b.

The National Cancer Institute analyses (NCI 2008) show that the Cattaraugus County cancer death rate is similar to that for United States through 2004, with a stable trend (i.e., not increasing or decreasing) for all cancers from 2000 to 2004. From 1976 through 1998, the Cattaraugus County invasive malignant tumor incidence rate among both males and females was lower than that of New York State (excluding New York City) and comparable during the period from 2000 to 2004. It is important to note that cancer incidence rate is related, among other factors, to the availability and use of medical services in each county.

All cancer incidence and death rate statistical data from the State of New York (NYSDOH 2008b) and the National Cancer Institute (NCI 2008) from 1976 to 2004 substantiate that the region around the site does not exhibit any unusual or excessive cancers in the public population, but rather is typical of the area, New York State, and the United States. There is no identifiable increase in cancer risk in the area around the WNYNSC.

3.11.3 Chemical Exposure and Risk

Hazardous chemicals can cause cancer- and noncancer-related health impacts. Effective administrative and design controls that decrease hazardous chemical releases to the environment and help achieve compliance with permit requirements (e.g., air emission and the National Pollutant Discharge Elimination System permit requirements) minimize health impacts on the public. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts on the public may result from inhaling air containing hazardous chemicals released to the atmosphere. Risks to public health from other possible pathways, such as ingestion of contaminated drinking water or direct exposure, are lower than those from the inhalation pathway.

Exposure pathways to workers during normal operations may include inhaling contaminants in the workplace atmosphere and direct contact with hazardous materials. The potential for health impacts varies among facilities and workers, and available information is insufficient for a meaningful estimate of impacts. However, DOE policy requires that conditions in the workplace be as free as possible from recognized hazards that cause, or are likely to cause, illness or physical harm. In general, workers are protected from workplace hazards through adherence to Occupational Safety and Health Administration and EPA standards that limit workplace atmospheric and drinking water concentrations of potentially hazardous chemicals. Worker exposure to hazardous chemicals in the workplace is minimized by techniques such as appropriate training, use of protective equipment, monitoring of the workplace environment, limits on duration of exposure, and engineered and administrative controls. Monitoring and controlling hazardous chemical usage in operational processes help ensure that workplace standards are not exceeded and worker risk is minimized.

The site complies with the Emergency Planning and Community Right-to-Know Act for reporting chemical inventories and toxic release inventories. The site also complies with all Toxic Substances Control Act requirements pertaining to asbestos and PCB regulations. For 2006, the site reported the following chemicals in quantities above the Emergency Planning and Community Right-to-Know Act 312 Threshold Planning Quantities: hydrogen peroxide solution (35 percent), portland cement, ion exchange media, liquid nitrogen, diesel fuel #2, sodium hydroxide, oils of various grades, gasoline, and sulfuric acid. This information is annually submitted to state and local emergency response organizations and fire departments specifying the quantity, location, and hazards associated with chemicals stored at the site (WVNS and URS 2007).

Underground and aboveground storage tanks are used for storage of certain hazardous chemicals. RCRA regulations cover the use and management of underground tanks for storage of petroleum and hazardous substances and establish minimum design requirements to protect groundwater resources from releases. New York State also regulates underground storage tanks through two programs: petroleum bulk storage (6 NYCRR Parts 612-614) and chemical bulk storage (6 NYCRR Parts 595-599). State registration and minimum design requirements are similar to those of the Federal program, except that petroleum tank fill ports must be color-coded using American Petroleum Institute standards to indicate the product being stored (WVNS and URS 2007).

A single 2,080-liter (550-gallon), double-walled, steel underground storage tank, upgraded in 1998 to bring it into compliance with the most recent EPA requirements (40 CFR 280.21), is used to store diesel fuel for the supernatant treatment system/permanent ventilation system standby power unit. This tank is equipped with aboveground piping, an upgraded interstitial leak detection system, and a high-level warning device, and therefore meets the state requirements of 6 NYCRR Parts 612–614. This is the only underground petroleum storage tank currently in use at the site. There are no underground chemical bulk storage tanks at the site (WVNS and URS 2007).

New York State regulates aboveground petroleum and chemical bulk storage tanks under 6 NYCRR Parts 612–614 and Parts 595–599, respectively. These regulations require secondary containment, external gauges to indicate the content levels, monthly visual inspections of petroleum tanks, and documented daily, annual, and five-year inspections of chemical tanks. Petroleum tank fill ports also must be color coded, and chemical tanks must be labeled to indicate the product stored. Petroleum bulk storage is also addressed through the Spill Prevention, Control, and Countermeasures plan prepared in accordance with 40 CFR Part 112. Tank registration at the end of 2006 included nine aboveground petroleum tanks (five containing diesel fuel, three containing #2 fuel oil, and one containing unleaded gasoline) (WVNS and URS 2007).

The site regularly applies a NYSDEC-registered biocide to control algae and waterborne pathogens in the site cooling water tower system. Control of the organisms is necessary to minimize the potential for cooling system damage due to fouling from algae buildup and minimize the potential for worker exposure to waterborne pathogens such as *Legionella* (WVNS and URS 2007).

3.11.4 Occupational Health and Safety

Table 3–18 presents the calculated WNYNSC injury rates and associated data for the years 1999 through 2005, and the 7-year average. The table shows that the 7-year average is below the average associated with related industries, as published by the Bureau of Labor Statistics. In addition, the industry rates at WNYNSC have significantly decreased between 1999 and 2005. Worker safety at WNYNSC has improved with the implementation of DOE's Voluntary Protection Program which promotes safety and health excellence through cooperative efforts among labor, management, and government at the DOE contractor sites.

Table 3–18 Injury Rates at West Valley Nuclear Services Company

Calendar Year	*Lost Workday Injury Rate* [a]	*Recordable Injury Incidence Rate* [a]
1999	1.14	1.99
2000	0.89	1.77
2001	1.60	3.09
2002	1.3	2.4
2003	0.2	0.5
2004	0.0	0.3
2005	0.0	0.2
7-Year Average	0.73	1.46
National Average for Waste Management and Remediation Services Industry [b]	3.9	6.5
National Average for Industrial Inorganic Chemicals Manufacturing Industry [b]	1.4	2.7
National Average for Heavy and Civil Engineering Construction Industry [b]	3.0	5.3

[a] Rates are per 100 full-time workers.
[b] 2006 rates from the Bureau of Labor Statistics, Industry Injury and Illness Data (BLS 2008b).
Sources: DOE 2002f, BLS 2008b.

With respect to radiological occupational exposure at the WNYNSC, DOE reports a collective total EDE of 16.5 person-rem for 2000, 22.2 person-rem for 2001, 30.5 person-rem for 2002, 41.7 person-rem for 2003, 39.7 person-rem for 2004, 14.5 for 2005 and 16.1 for 2006 (DOE 2003a, 2004a, 2006a). This equates to an average dose to workers with a measurable total EDE of 67 millirem in 2000, 95 millirem in 2001, 128 millirem in 2002, 201 millirem in 2003, 165 millirem in 2004, 69 millirem in 2005, and 85 millirem in 2006 (DOE 2007). Although collective occupational doses increased during the period of cleanup operations in the 2002 to 2004 timeframe, there were no instances of a worker at West Valley receiving a dose in excess of the total EDE regulatory limit (5 rem) (DOE 2003a, 2004a, 2006a).

Incidents involving worker radiation exposure occur from time to time. One of the more serious worker radiation exposure incidents occurred in January 2005, when a waste container liner holding debris from cleanup of the vitrification cell was moved into the adjoining crane maintenance room without a required detailed radiation survey. A worker placing packaged radioactive waste into the liner and a technician performing radiological surveys of this waste received unplanned radiation exposure from an unidentified hot spot on the liner, which measured 50 rem per hour 2 inches from the surface. While exposures to the worker and technician exceeded the contractor's daily limit of 100 millirem, their cumulative exposure totals for the year were small fractions of the 5 rem annual regulatory limit for radiation workers (Mellor 2005, WVNSCO 2005).

The site historic worker injury rates and radiological occupational exposure are significantly lower than other related industries and regulatory guidelines. This comparison is indicative of the practices, procedures, and controls used for occupational health and safety.

3.11.5 Accident History

The following summary addresses site accidents that are known to have resulted in environmental impacts and others that might have, based on available operating records and evidence in the form of measured contamination in environmental media. Note that the term *accidents* is used here in a broad sense to also include releases of radioactivity and hazardous materials that are known to have impacted the environment as a consequence of: (1) unintentional releases, (2) planned releases, (3) facility design, (4) site practice, (5) site hydrogeology, and (6) combinations of these factors.

Insofar as practical, accidents are divided into those that occurred during the period when NFS was responsible for the site and the WVDP period. Accidents involving radioactivity are first discussed, followed by those involving hazardous materials. This subsection concludes with a discussion of the integrity of underground tanks and lines.

3.11.5.1 Nuclear Fuel Services Period – 1966 through 1981

Accidents Involving Radioactivity

Chapter 2 briefly describes the environmental consequences of two significant radiological accidents that occurred at the West Valley Site, the radioactive nitric acid spill that was the dominant contributor to the North Plateau groundwater plume and the 1968 uncontrolled releases that resulted in the extended area of surface soil contamination known today as the Cesium Prong. Both took place during reprocessing operations.

The spill identified as the major source of the North Plateau groundwater plume involved an estimated 760 liters (200 gallons) of recovered nitric acid that leaked from Line 7P-240-1-C in the off-gas operating aisle, ran down the walls of the off-gas cell and the adjacent southwest stairwell below, and leaked under the Main Plant Process Building through a floor expansion joint (WVNSCO 1995). Strontium-90 and its decay product, yttrium-90, are the principle radionuclides of health concern in this plume. In addition, leakage from Lagoon 1, principally water containing tritium also contribute to the gross beta activity in the plume. The potential dose effects of tritium are, however, small in comparison with the potential effects from strontium-90. More details on the sources and extent of the plume and the estimated inventory of the activity involved are shown in Appendix C, Section C.2.13. This release impacted WMAs 1, 2, 3, 4, and 5.

The uncontrolled, airborne releases in 1968 occurred when a high-efficiency particulate air filter in the main ventilation system failed and part of the filter media was drawn into the blower, cut into pieces, and discharged out the main stack (Urbon 1968). The consequences of this accident were underestimated by NFS, who stated initially that "radioactivity [within the plant exclusion fence] was retrieved during clean-up operations" (Urbon 1968). The scope of this release became more apparent in a series of aerial radiological surveys begun in the late 1960s that culminated in 1984 (EG&G/EM 1991). The offsite effects were later more fully defined in an investigation sponsored by NYSERDA (Luckett 1995).

Other accidents involving radioactivity that occurred during reprocessing operations included:

- In February 1967, a spill occurred during a waste transfer from the General Purpose Evaporator (7C-5) to waste tank 8D-2. Approximately 2,100 liters (555 gallons) of high-activity liquid from Line 7P-170-2-C in the Acid Recovery Pump Room entered the room sump and drained to the old interceptor in WMA 2. Radioactivity from this spill contaminated the interceptor to the point where 30 centimeters (12 inches) of concrete were poured on the interceptor bottom to reduce resulting high radiation levels (Winchow 1967). This release may have also impacted environmental media beneath this portion of the Main Plant Process Building.

- A February 1967 spill of an unknown volume of radioactive liquid from wastewater Line 7P-160-2-C occurred immediately south of Tank 7D-13 outside the southern end of the Plant Office Building in WMA 1 (NYSERDA 2006a).

- In 1967, contaminated groundwater "flowing underground from the general plant area" was discovered during construction of the new interceptors, indicating the presence of contaminated groundwater and subsurface soil in WMAs 1 and 2 before the January 1978 release from Line 7P-240-1-C in the off-gas operating aisle (Taylor 1967).

- In 1967, three fires occurred in the Main Plant Process Building General Purpose Cell in which spent fuel cladding (zirconium hulls) ignited, two of which activated the cell fire suppression system (Lewis 1968). Airborne radioactivity from these fires apparently did not impact environmental media.

- In 1967 and 1968, other small fires occurred from time to time in the Chemical Process Cell when high-temperature reactions involving uranium or zirconium hulls burned holes in dissolver baskets (Lewis 1968, Urbon 1968). Airborne radioactivity from these fires apparently did not impact environmental media.

- On March 8, 1968, failure of a dissolver off-gas system filter in the Main Plant Process Building resulted in a radioactivity release through the Main Plant Process Building stack, causing releases to reach the monthly allowance 2 days later, which included 0.28 curies of particulate activity (North 1968). This release may have produced minor impacts downwind.

- On March 20, 1968, failure of a vessel off-gas system filter in the Main Plant Process Building resulted in a radioactivity release thorough the Main Plant Process Building stack causing the March 1968 releases to exceed the monthly allowance by 15 percent (North 1968). This release may have produced minor impacts downwind.

- Several leaks during the 1968 to 1977 period were associated with condensate line 8P-46-6-A5 from Tank 8D-2 in the section between the Equipment Shelter and the west wall of the Acid Recovery Pump Room. This six-inch carbon steel line, a portion of which was rerouted in 1967, was maintained under vacuum and an unexpected 62,000-liter (16,400-gallon) liquid volume increase in Tank 8D-2 was attributed to groundwater leaking into this line being drawn into the tank. Leaks from this line may have impacted subsurface soil and groundwater in WMAs 1 and 3, but the impacts likely would have been small since the line was maintained under vacuum (Duckworth 1977, NYSERDA 2006a).

- A 1970 to 1971 investigation of unexpected tritium and gross beta contamination in Erdman Brook led to the discovery of contamination in the sanitary sewer system that resulted in discharge of approximately 0.5 curie gross beta and 0.05 curie strontium-90 from the Old Sewage Treatment Plant into this stream through the treated sewage outfall (Duckworth 1972). This release impacted water and sediment in Erdman Brook and downstream.

- In August of 1974, a failed sanitary sewer line located near underground Tank 7D-13 was discovered to be contaminated by groundwater in the area; leakage into the sewer line was believed to be responsible for elevated gross beta and strontium-90 concentrations observed in the sewage outfall during the 1970 to 1972 period that impacted water and sediment in Erdman Brook and downstream (WVNSCO 1995).

- Numerous spills of radioactive liquid and/or radioactive debris occurred inside various areas of the Main Plant Process Building – including pieces of spent fuel and spent fuel cladding – that did not appear to affect the environment.

- Numerous releases of airborne radioactivity occurred inside Main Plant Process Building areas, some of which led to installation of a new ventilation system in 1970 (Michalczak 2003). Minor environmental impacts from increased stack emissions may have resulted.

- Migration of tritium from Lagoon 1 that impacted subsurface soils and groundwater in WMA 2 that eventually led to closure of this unlined lagoon in 1984 (WVNSCO 1994).

- Releases of radioactive liquid effluents contributed to sediment contamination in Franks Creek, Buttermilk Creek, and Cattaraugus Creek, the scope of which became evident in 1968 (Barasch and Beers 1971) and by later aerial radiation level measurements.

Note that spills of radioactive materials inside the Main Plant Process Building process cells were an anticipated consequence of plant operations and these cells were designed to contain them. Consequently, such spills generally did not impact outside areas.

Low-level radioactive contamination in surface soil in the Cesium Prong area has likely been naturally spread by precipitation into ditches and channels that saw surface water runoff from this area. This phenomenon may have enlarged the area impacted by the deposition of airborne radioactivity from the Main Plant Process Building stack, although detailed data that show this effect are not available.

From 1966 to 1971, Lagoons 1, 2, and 3 were used sequentially. These Lagoons discharged to Erdman Brook. The O2 Building and Lagoons 4 and 5 were built in 1971 to actively treat wastewater before discharge to Erdman Brook. Liners were installed in Lagoons 4 and 5 in 1974 after Lagoons 1, 2, and 3 were suspected of leaking wastewater to the underlying sand and gravel.

Another phenomenon related to site hydrology is the seepage of groundwater to the surface and in drainage ditches in swampy areas of WMA 4. Gradual migration of radioactivity in the North Plateau groundwater plume eventually led to radioactivity in this plume reaching the surface in the seep locations, resulting in contaminated surface soil and drainage ditch sediment in these areas.

Releases Involving Hazardous Materials

Some of the radioactivity releases described above contained hazardous contaminants. Additional hazardous materials releases involved the solvent dike, which received runoff from the Solvent Storage Terrace located on the Main Plant Process Building from 1966 to 1987. Radioactive tributyl phosphate and n-dodecane spilled from solvent tanks in the Solvent Storage Terrace were conveyed through a floor drain and related underground piping to the dike. The solvent dike was removed from service in 1987 by removing and packaging the berm and radiologically contaminated soil and sediment, along with the drain line.

3.11.5.2 West Valley Demonstration Project Period – 1982 to Present

The site documents accidents involving radioactivity and hazardous materials using a tiered system based on accident seriousness. All are investigated and actions taken to prevent recurrence and similar problems. The potential environmental consequences are also evaluated and considered in connection with the site environmental monitoring program, which addresses compliance with regulatory standards for environmental releases (WVNS and URS 2005).

Accidents Involving Radioactivity

Accidents with actual or potential environmental consequences related to radioactive contamination include:

- A radioactive release to the ground, apparently associated with outdoor storage of contaminated equipment and waste was discovered in 1983 at the old hardstand located at the west end of Lag Storage Additions 3 and 4 in WMA 5. This hardstand consisted of an outdoor lay-down area with an asphalt surface approximately 45 meters by 45 meters (150 feet by 150 feet), surrounded by unpaved ground and woods. Gamma radiation levels as high as 1,500 millirem per hour were measured 5 centimeters (two inches) above the ground surface. In 1983, aboveground portions of contaminated trees were removed. In 1984, approximately 1,302 cubic meters (46,000 cubic feet) of contaminated soil, asphalt, tree stumps, roots, and other vegetation were removed from this area and placed in the decommissioned Lagoon 1 in WMA 2. Note that this release apparently occurred entirely during the NFS period. A 1995 estimate of the activity in the old hardstand debris placed in Lagoon 1 totaled approximately 18 curies, including the short-lived progeny of strontium-90 (yttrium-90) and cesium-137 (barium 137m) (Keel 1984, WVNSCO 1994, 1995, 1997a).

- In 1985, a spill of approximately 1,900 liters (500 gallons) of radioactive condensate from Tank 8D-1 from a leaking valve filled a valve pit west of Tank 8D-2, ran onto the ground into a buried culvert, and entered a drainage ditch in WMA 2, necessitating removal of contaminated soil in the Waste Tank Farm area (WVNSCO 1985). This release primarily impacted surface soil in WMA 3.

- In 1986, a spill of low-level contamination occurred at the pipe chase on the roof of the Utility Room in WMA 1; it did not result in any environmental impact (WVNSCO 1986a).

- In 1986, a small amount of contaminated sludge was spilled on the concrete sidewalk outside of the O2 Building in WMA 2 that was readily decontaminated (WVNSCO 1986b).

- In 1987, 19 to 38 liters (5 to 10 gallons) of slightly radioactive condensate from a portable ventilation unit filter spilled on the ground near Tank 8D-2 in WMA 3; this release did not produce any measurable contamination in the soil (WVNSCO 1987a).

- In 1987, a small amount of contaminated liquid spilled from a 208-liter (55-gallon) drum containing spent resin at the Lag Storage Addition hardstand in WMA 5, resulting in removal of a small amount of contaminated soil (WVNSCO 1987b).

- In 1997, a small spot of relatively high-activity, previously-unidentified soil contamination was found in WMA 2 north of Lagoon 5 during a radiological survey near environmental characterization activities (WVNSCO 1997c).

- In 1999, approximately 230 liters (60 gallons) of demineralized flush water overflowed a manhole at the Equalization Basin, resulting in no environmental impact (WVNSCO 1999b).

- In 2003, a breach in a riser was found from Line 15WW-569, that received laundry water. Approximately 3,400 liters (900 gallons) per day was released through the breach (DOE 2003f). The line was repaired.

- In 2004, two radiologically contaminated bees' nests were found when a walkway was removed between the Vitrification Test Facility and a nearby trailer in WMA 2. Experience indicated that the nests were likely built with mud from one of the lagoons (WVNSCO 2004). This incident is representative of cases where low-level radioactive contamination has been found to be spread by insects or small animals from time to time.

- In 2005, two small fires occurred inside the Vitrification Cell in the Vitrification Facility that did not result in release of radioactivity outside of the building (DOE 2005b).

Other documented radioactive spills that did not impact the environment occurred inside the Main Plant Process Building, 01-14 Building, Vitrification Facility, the former Radwaste Processing Building, the Drum Cell, the former Lag Storage Areas 3, and Low-Level Waste Treatment Facility Area buildings.

Accidents Involving Hazardous Materials

The number of documented WVDP accidents involving hazardous materials has been small compared to the number involving radioactivity. Representative hazardous materials spills include the following:

- In 2000, mercury from a previous spill was discovered in the Utility Room while workers were removing a cover plate to gain access to a floor drain piping cleanout plug (WVNSCO 2000a).

- In 2000, a small amount of nitric acid leaked on the floor of the Cold Chemical Room during repair of nitric acid valves (WVNSCO 2000b).

3.11.5.3 Underground Tank and Underground Line Integrity

No documented leaks from underground storage tanks have occurred. Several leaks from underground lines that carried radioactive liquid or gas are known to have occurred, as explained above.

High-Level Waste Tanks

The assumed integrity of underground storage Tanks 8D-1, 8D-2, 8D-3, and 8D-4 is based on the absence of documented leaks and other factors, such as:

- The presence of the reinforced concrete tank vaults, which provide secondary containment for these tanks and annular spaces that facilitate monitoring for possible tank leakage;

- The leak detection systems associated with Tanks 8D-1 and 8D-2, which employ instruments to monitor liquid levels in the pans under each tank and in the tank vaults, along with recorders and alarm systems;

- The analytical results of samples of in-leakage of surface water or groundwater into the vaults of Tanks 8D-1 and 8D-2, which have experienced such in-leakage;

- The results of monitoring of the sump level in the common vault for Tanks 8D-3 and 8D-4;

- The use of operating procedures to ensure actual parameters associated with liquid transfers correspond with expected conditions, to identify anomalies such as unexpected liquid losses;

- The absence of unexplained liquid losses;

- Analytical data from groundwater monitoring hydraulically downgradient from the tanks, which have not identified radioactive contamination from possible tank leakage; and

- Analytical data from the RCRA facility investigation of the tank farm area, which do not indicate a release of RCRA hazardous contaminants from the tanks (WVNSCO 1997b).

Other Underground Tanks

The assumed integrity of other underground tanks, including the concrete interceptors that are open to the atmosphere, is based on factors such as:

- The absence of documented leaks and unexplained liquid losses;

- The use of operating procedures to ensure actual parameters associated with liquid transfers correspond with expected conditions, to identify anomalies such as unexpected liquid losses;

- Analytical data from groundwater monitoring hydraulically downgradient from the tanks, which have not identified radioactive contamination from possible tank leakage; and

- Analytical data from the RCRA facility investigation of the Low-Level Waste Treatment Facility, which do not indicate a release of RCRA-hazardous contaminants from the tanks (WVNSCO 1997a).

Underground Lines that Carried High-Activity Liquid

The assumed integrity of underground lines that carried high-activity liquid is based on factors such as:

- Construction materials that provided durability and corrosion resistance. Stainless steel piping joined by field welds was used for lines that carried high-activity liquid or chemical solutions.

- The use of double-walled pipe or stainless steel conduits that provided secondary containment for high-activity lines. The waste transfer lines that carried PUREX and THOREX waste from the Main Plant Process Building to Tank 8D-2 and Tank 8D-4, respectively, are of double wall construction. The waste transfer lines that run from the high-level waste tanks to the Vitrification Facility in the High-Level Waste Trench are also double walled. The underground lines that run from the M-8 Riser of Tank 8D-2 to the Supernatant Treatment System Building are enclosed in a 50-centimeter (20-inch) stainless steel pipe.

Any major leaks would likely have been identified at the time they occurred, based on considerations such as:

- The use of operating procedures to ensure that actual parameters associated with liquid transfers correspond with expected conditions, to help identify anomalies such as unexpected liquid losses.

- The leak detection system in the annular space between the inner and outer walls of the waste transfer piping in the High-Level Waste Transfer Trench provided added assurance that these lines did not leak, and the concrete pipe trench provided assurance that any leaks from these lines would not have reached the surrounding soil.

Other Underground Lines

The assumed integrity of other underground lines is based on similar factors, such as:

- Equipment design;
- The use of operating procedures to ensure actual parameters associated with liquid transfers correspond with expected conditions, to identify anomalies such as unexpected liquid losses;
- The results of groundwater monitoring associated with the WVDP environmental monitoring program, especially samples from nearby wells hydraulically downgradient of the lines; and
- The results of subsurface soil sample analysis associated with RCRA facility investigations.

The environmental impacts of any undetected leaks would not likely be widespread because the constant downward slope provided to promote gravity flow would minimize the volume of any leaks that may have occurred.

Conclusions

Such design features, controls, and monitoring programs provide reasonable assurance that there have been no leaks from the high-level waste tanks or from underground lines that carried high-activity liquid, and that the probability of leaks from other tanks or underground lines that have produced widespread environmental impact is low.

Most incidents at the Project Premises are typical of industrial sites and do not involve any radioactivity or radiation exposure. The following five incident descriptions are illustrative of these types of events (DOE 2002e, 2003b, 2003c, 2003d, 2004c).

- On July 8, 2004, a worker repositioning a pipe dislodged an 11-kilogram (25-pound) piece of temporary grating that fell and grazed another worker's head. Medical examination resulted in no treatment required for this worker.
- On February 1, 2003, a large mass of ice was discovered to have fallen from a roof scupper and damaged a roof located 30 feet (9.1 meters) below. A temperature rise caused the ice mass to break free from the roof. No workers were injured as a result of this event.
- On January 30, 2003, a quality assurance inspector discovered counterfeit bolts on one ratchet lever tie-down strap that was going to be used to secure a low-level radioactive waste container to a pallet for shipping. All other bolts were inspected and found to be satisfactory, and the suspect bolt was confiscated and replaced prior to any use of the strap. No injuries resulted from this incident.
- On May 30, 2002, a 54.5-kilogram (120-pound) crane load block (hoist hook) and its 9-kilogram (20-pound) wire rope fell to a lower floor just missing a worker standing near the point of impact. Crane hoist limitations, inadequate prejob briefing, and inadequate operator training were found to be the root cause of this event. No workers were injured in this incident.
- On May 31, 2000, electricians were in the process of moving electrical conduits and receptacles with an indication that the circuit breaker feeding the affected circuit was deenergized. However, before beginning their work, the electricians noticed that pilot lights on a battery pack that was connected to the same circuit were illuminated indicating that the circuit was still energized. The cause of this

situation was found to be multiple errors in the labeling of circuits and circuit breakers. No workers were injured in this incident.

3.12 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies, and activities on minority and low-income populations. Minority persons are those who identify themselves in the 2000 census as Hispanic or Latino, Asian, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, Some Other Race, or multiracial (with at least one race designated as a minority race under Council of Environmental Quality Guidelines). Persons whose income was below the Federal poverty threshold in 2000 are designated as low-income.

Demographic information obtained from the U.S. Census Bureau was used to identify low-income and minority populations within 80 kilometers (50 miles) of the site (DOC 2008b). The 80-kilometer (50-mile) radius encompasses all or part of 10 counties in New York (Allegany, Cattaraugus, Chautauqua, Erie, Genesee, Livingston, Niagara, Orleans, Stueben, and Wyoming), 3 counties in Pennsylvania (McKean, Potter, and Warren), and 8 census subdivisions in Ontario, Canada (Dunnville, Fort Erie, Niagara Falls, Pelham, Port Colborne, Thorold, Wainfleet, and Welland).

Census data were compiled at a variety of levels corresponding to geographic areas. In order of decreasing size, the areas used are states, counties, census tracts, and block groups. A "block group" is geographically the smallest area for which the Census Bureau tabulates sample data used to identify low-income populations. For this reason block groups were used to identify minority and low-income populations that reside in the United States in this analysis. Block groups consist of all the blocks in a census tract with the same beginning number.

Minority populations are identified in block groups where either the minority population percentage of the block group is significantly greater than the minority population percentage in the general population or if the minority population of the block group exceeds 50 percent. The term "significantly" is defined by NRC guidance as 20 percentage points (69 FR 52040). The minority population percentage of New York State in 2000 was 38 percent; therefore the lower threshold of 50 percent was used in this analysis to define the term "minority population." In the 13 U.S. counties surrounding the site, 1,505 block groups were identified to be all or partially included in the 80-kilometer (50-mile) radius. Two hundred and twenty-eight of these block groups were identified to contain minority populations. **Figure 3–32** shows the minority population distribution within an 80-kilometer (50-mile) radius within the United States. In 2001, the percentage of Canadians identifying themselves as a minority in all of the 8 Canadian census subdivisions within the 50-mile radius of West Valley is far lower than the minority population percentage in all of Ontario (20 percent) and Canada (16.1 percent). The average minority population percentage in the potentially affected areas in Canada in 2001 was approximately 4.9 percent (Census Canada 2001a).

There are four American Indian Reservations within the potentially affected area. The closest (25 kilometers [15 miles]) to WNYNSC is the Cattaraugus Reservation of the Seneca Nation of Indians, which has a minority population of 90 percent. The Allegany Reservation, which is 35 kilometers (20 miles) from WNYNSC, consists of 23 percent minorities; the Tonawanda Reservation, which is 60 kilometers (40 miles) from WNYNSC, consists of 48 percent minorities; and the Oil Springs Reservation, which is 40 kilometers (25 miles) from WNYNSC, consists of 9 percent minorities. Several other census block groups with minority populations in excess of 50 percent exist in the Buffalo metropolitan area. The total minority population within the 80-kilometer (50-miles) radial distance from the WVDP Site accounts for approximately 14 percent of the population in the area, or about 240,000 people. The racial and ethnic composition of this population is predominantly African-American and Hispanic.

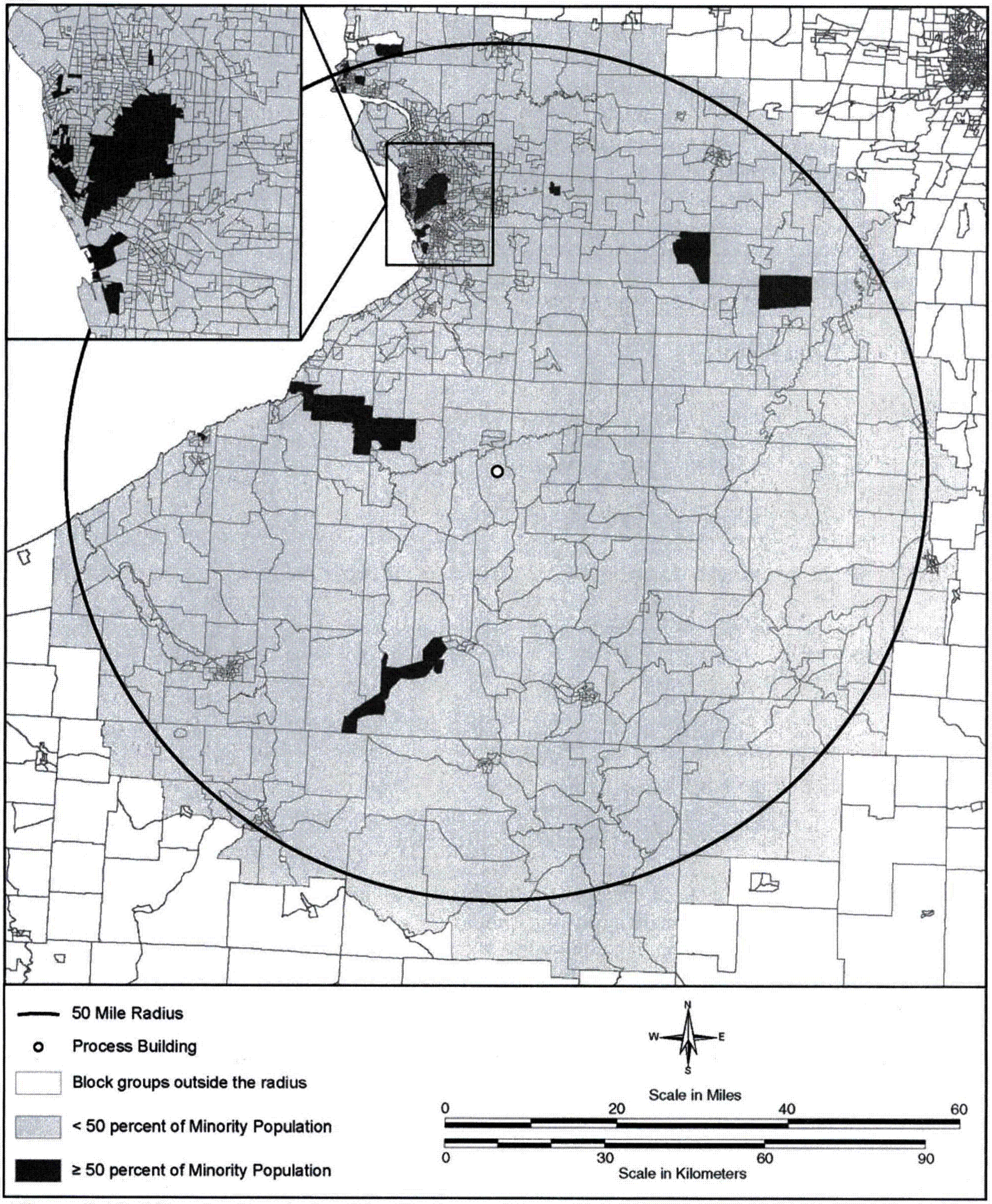


Figure 3–32 Minority Population Distribution within an 80-Kilometer (50-mile) Radius of the Site

Low-income populations in the United States are identified in block groups in the same manner as minority populations as discussed above. As shown in **Figure 3–33**, the percentage of people whose income in 1999 was below the poverty level in New York State was 14.6 percent; therefore a threshold of 34.6 percent was chosen as the criteria for identifying low-income populations. Of the 1,505 block groups in the potentially affected area, 165 were identified to contain low-income populations above the threshold. In 2001, the percentage of Canadians considered to be living in poverty in the 8 census subdivisions within the 50-mile radius of West Valley is consistent with the poverty rates for Ontario (14.2 percent) and Canada (16.2 percent) (Census Canada 2001a, 2001b; CCSD 2007). The average rate of poverty (incidence of low-income) in the potentially affected areas in Canada in 2001 was approximately 13.1 percent (Census Canada 2001b).

3.13 Waste Management and Pollution Prevention

3.13.1 Waste Management

The categories of waste that currently exist at WVDP include nonhazardous waste, hazardous waste, low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, and high-level waste. These waste types are defined in Chapter 2, Section 2.1 in a text box. Further, under NRC requirements in 10 CFR 61.55, commercial low-level radioactive waste is divided into classes. Those classes are Class A, Class B, and Class C. **Table 3–19** shows the limits on concentrations of specific radioactive materials allowed in each class. Radioactive waste not meeting the criteria for these classes falls into a fourth class, known as Greater-Than-Class C.

- Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A waste must meet the minimum requirements set forth in 10 CFR 61.56(a). If Class A waste also meets the stability requirements set forth in 10 CFR 61.56(b), it is not necessary to segregate the waste for disposal. Low-level radioactive waste may also be categorized as low specific activity waste for the purposes of transportation analyses. Low specific activity wastes have low specific activity, are nonfissile, and meet certain regulatory exceptions and limits. Low specific activity wastes may be transported in large bulk containers.

- Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in 10 CFR 61.56.

- Class C waste is waste that not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in 10 CFR 61.56.

- Greater-Than-Class C waste is waste that exceeds the low-level waste Class C criteria of 10 CFR 61.55 and are generally not acceptable for near-surface disposal. There may be some instances where Greater-Than-Class C waste would be acceptable for near-surface disposal and these instances will be evaluated on a case-by-case basis.

Vitrified high-level waste in stainless steel canisters is currently stored in the High-Level Waste Interim Storage Area. Low-level radioactive waste is stored in steel drums and boxes either outside on hardstands or inside storage structures. Hazardous and mixed low-level radioactive wastes are packaged, treated (neutralized) and disposed on site; packaged and treated on site, and disposed off site; or packaged on site, and treated and disposed off site. Mixed low-level radioactive waste not able to be treated is being stored on site pending a decision on disposition of these materials per the Federal Facility Compliance Act Consent Order and Site Treatment Plan (WVES 2007a).

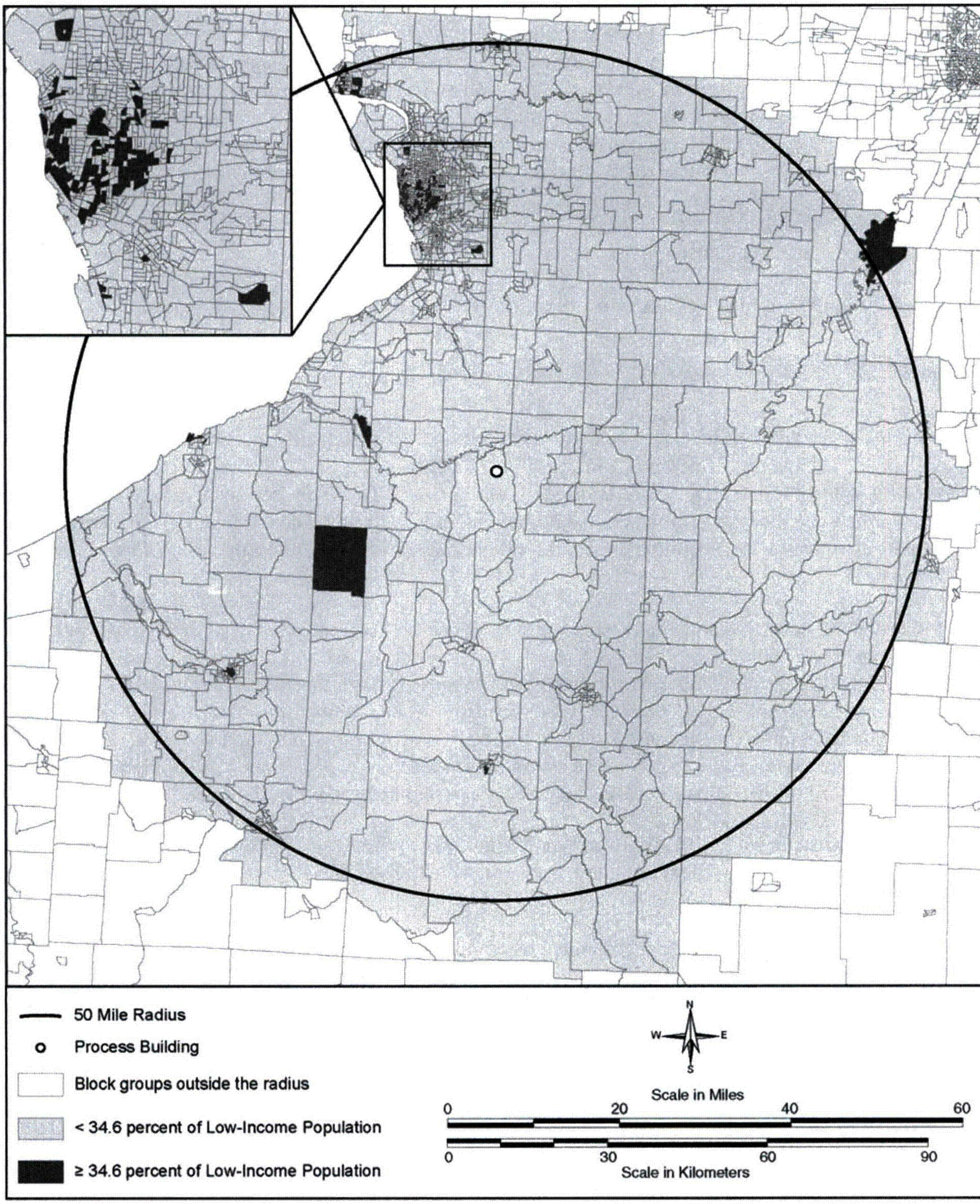


Figure 3–33 Low-Income Population Distribution within an 80-Kilometer (50-mile) Radius of the Site

Table 3–19 Nuclear Regulatory Commission Radioactive Waste Classification Criteria – Abbreviated

Radionuclide	*Class A*	*Class B*	*Class C*	*Greater-Than-Class C*
Tritium-3 (curies per cubic meter)	≤ 40	No limit	No limit	No limit
Carbon-14 (curies per cubic meter)	≤ 0.8	—	> 0.8 to 8	> 8
Cobalt-60 (curies per cubic meter)	≤ 700	No limit	No limit	No limit
Nickel-63 (curies per cubic meter)	≤ 3.5	> 3.5 to 70	> 70 to 700	> 700
Strontium-90 (curies per cubic meter)	≤ 0.04	> 0.04 to 150	> 150 to 7,000	> 7,000
Technetium-99 (curies per cubic meter)	≤ 0.3	—	> 0.3 to 3	> 3
Iodine-129 (curies per cubic meter)	≤ 0.008	—	> 0.008 to 0.08	> 0.08
Cesium-137 (curies per cubic meter)	≤ 1	> 1 to 44	> 44 to 4,600	> 4,600
Alpha emitting transuranic nuclides with half-life greater than 5 years (nanocuries per gram)	≤ 10	—	> 10 to 100	> 100
Plutonium-241 (nanocuries per gram)	≤ 350	—	> 350 to 3,500	> 3,500
Curium-242 (nanocuries per gram)	≤ 2,000	—	> 2,000 to 20,000	> 20,000

Source: 10 CFR 61.55.

The site has a radioactive waste management program that implements DOE Order 435.1. The *WVDP Waste Acceptance Manual* describes how radioactive waste is managed at the site. Hazardous wastes are managed in accordance with 6 New York Code of Rules and Regulations Parts 370 to 374 and 376. Mixed low-level radioactive waste is treated in accordance with applicable hazardous and radioactive waste requirements, and the WVDP Site Treatment Plan that contains proposed schedules for treating mixed low-level radioactive waste to meet the land disposal restrictions of the Resource Conservation and Recovery Act. Hazardous and mixed low-level radioactive waste activities are reported to NYSDEC annually in the *WVDP's Annual Hazardous Waste Report*, which specifies the quantities of waste generated, treated, and disposed of, and identifies the treatment, storage, and disposal facilities used (WVNS and URS 2005, 2007).

The wastes that are currently generated by DOE and contractor activities at WNYNSC will be phased out as these activities near completion. The *West Valley Demonstration Project Waste Management EIS* (*WVDP WMEIS*) (DOE 2003e) and *WVDP WMEIS Supplement Analysis* (DOE 2006b) were prepared to determine how DOE should disposition the operations and decontamination wastes that are in storage or will be generated over a 10-year period. DOE did not evaluate nonhazardous and hazardous waste management in the *WVDP WMEIS*. In addition, the wastes evaluated in the *WVDP WMEIS* do not include wastes generated by the alternatives evaluated in this West Valley Decommissioning EIS.

In the Record of Decision (ROD) for the *WVDP WMEIS* (70 FR 35073), DOE decided to partially implement Alternative A, the Preferred Alternative. Under Alternative A of the *WVDP WMEIS*, DOE is shipping low-level radioactive waste and mixed low-level radioactive waste off site for disposal in accordance with all applicable regulatory requirements, including permit requirements, waste acceptance criteria, and applicable DOE Orders. DOE is currently disposing of low-level radioactive waste and mixed low-level radioactive waste at commercial sites, the Nevada Test Site near Mercury, Nevada, or a combination of commercial and DOE sites, consistent with DOE's February 2000 decision regarding low-level radioactive waste and mixed low-level radioactive waste disposal (65 FR 10061). Waste handling and disposal activities at the commercial disposal site in Utah are regulated by the NRC and the State of Utah under a Radioactive Material License (UT2300249). Low-level radioactive waste and mixed low-level radioactive waste handling and disposal activities at Hanford and the Nevada Test Site are described in the *Final Waste Management Programmatic Environmental Impact Statement for Managing, Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE 1997a), and the *Final EIS for the Nevada Test Site and Off-Site Locations in the State of Nevada* (DOE 1996b). Disposal of low-level radioactive waste and mixed low-level radioactive waste at Hanford is contingent upon DOE's meeting the terms of the Settlement Agreement with Washington Department of Ecology, in the case of Washington v. Bodman.

DOE has deferred a decision on the disposal of transuranic waste, pending a determination by DOE that the waste meets all statutory and regulatory requirements for disposal at the Waste Isolation Pilot Plant (WIPP). The impacts of disposal of transuranic waste at WIPP are described in the *Waste Isolation Pilot Plant Disposal Phase Final Supplemental Environmental Impact Statement* (DOE 1997b). DOE is preparing an EIS that will examine the disposal of "Greater-Than-Class C" (GTCC) low-level radioactive wastes and similar DOE waste streams for which disposal is not currently available (72 FR 40135). Because of the uncertainty in the defense determination, DOE plans to include WVDP transuranic waste in the scope of the *Disposal of Greater-Than-Class C Low-Level Radioactive Waste Environmental Impact Statement (Greater-Than-Class C EIS)*, which may later be determined to be defense related and eligible for disposal at WIPP.

Consistent with the *Waste Management Programmatic Environmental Impact Statement High-Level Waste* ROD (64 FR 46661), DOE will store canisters of vitrified high-level waste at the WVDP site until transfer for disposal in a geologic repository (assumed to be the Yucca Mountain Repository). The impacts of disposal of high-level radioactive waste at Yucca Mountain are described in the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE 2002b), as modified by the *Supplemental Environmental Impact Statement* (DOE 2008b).

The *Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project (WVDP DD&R EA)* (DOE 2006c) and FONSI (DOE 2006d) was issued and signed on September 14, 2006. The Environmental Assessment (EA) identified 36 facilities that are (or in the next 3 years will be) no longer required to safely monitor, maintain, or support future removal of vitrified high-level radioactive waste, or the closure of other onsite facilities. DOE issued a FONSI, based on the analysis contained in the EA, determining that the Proposed Action did not constitute a major Federal action significantly affecting the quality of the human environment (WVNS and URS 2007). DOE is currently in the process of decontamination, demolition, and removal of these facilities, and disposal of the resulting wastes.

Table 3–20 shows the waste volumes that need to be managed at the site. These are based on the volumes of waste that are currently in storage and projections of additional wastes that could be generated from ongoing operations and decontamination, demolition, and removal of unneeded facilities over a 10-year period. These volumes do not include wastes generated by the alternatives evaluated in this West Valley Decommissioning EIS.

The current legacy transuranic waste inventory volume is estimated at approximately 760 cubic meters (27,000 cubic feet) of contact handled waste and 1,100 cubic meters (38,000 cubic feet) of remote handled waste. In addition, another approximately 200 cubic meters (7,000 cubic feet) of contact handled transuranic waste and 85 cubic meters (3,000 cubic feet) of remote handled transuranic waste are projected to be generated during ongoing decontamination activities through the end of FY 2011 (Chamberlain 2008).

In accordance with past site practices, industrial waste is currently shipped to landfills in Model City, New York and Angelica, New York, for disposal. Hazardous waste is shipped to a landfill in Indianapolis, Indiana for disposal (DOE 2006c). Digested sludge from the site sanitary and industrial wastewater treatment facility is shipped to the Buffalo Sewer Authority for disposal (WVNS and URS 2007).

Table 3–20 10-Year Projected Waste Volumes (cubic meters) [a]

Waste Type	*WVDP Waste Minimization Plan* [b]	*WVDP WMEIS* [d]	*WVDP DD&R EA* [c]	*Total* [e]
Nonhazardous Waste	9,157	Not estimated	16,380	25,537
Hazardous Waste	4.9	Not estimated	1,994	1,999
Total Low-level Radioactive Waste	–	23,235	2,124	25,359
Class A Low-level Radioactive Waste	–	14,768	2,124	16,892
Class B Low-level Radioactive Waste	–	2,191	0	2,191
Class C Low-level Radioactive Waste	–	6,276	0	6,276
Mixed Low-level Radioactive Waste Class A	–	670	77	747
Total Transuranic Waste	–	1,388	0	1,388
Contact-handled Transuranic Waste	–	1,133	0	1,133
Remote-handled Transuranic Waste	–	255	0	255
High-level Radioactive Waste	–	275 canisters	0	275 canisters

WVDP WMEIS = West Valley Demonstration Project Waste Management EIS, WVDP DD&R EA = Environmental Assessment for the Decontamination, Demolition, and Removal of Certain Facilities at the West Valley Demonstration Project.

[a] Does not include wastes generated by the alternatives evaluated in this West Valley Decommissioning EIS.

[b] 10-year nonhazardous and hazardous waste volumes estimated using 2004 generation rates (WVNS 2004b). Converted conservatively assuming a density of 500 kilograms per cubic meter of waste.

[c] 4-year waste volumes from the *WVDP DD&R EA* (DOE 2006c).

[d] 10-year waste volumes from the *WVDP WMEIS* (DOE 2003e) and *WVDP WMEIS Supplement Analysis* (DOE 2006b).

[e] If the waste incidental to reprocessing process is not applied, approximately 310 cubic meters (11,000 cubic feet) of waste would be added to the inventory of high-level radioactive waste already stored on the site, and the amount of low-level radioactive waste and transuranic waste would be reduced by about 160 cubic meters (5,700 cubic feet) and 150 cubic meters (5,300 cubic feet), respectively.

Note: To convert cubic meters to cubic feet, multiply by 35.314.

Wastes subject to offsite disposal under the decisions made in the *WVDP WMEIS* ROD are being processed and stored in several WVDP buildings until shipped off site. Vitrified high-level radioactive waste is currently stored in the Main Plant Process Building. Low-level radioactive waste and transuranic wastes are stored in Lag Storage Areas 3, and 4 and the Chemical Process Cell Waste Storage Area. Volume reduction of oversized contaminated materials occurs in the Remote-Handled Waste Facility (DOE 2003e). As described in the *WVDP DD&R EA* (DOE 2006c), Lag Storage Area 3, and the Chemical Process Cell Waste Storage Area are scheduled for decontamination, demolition, and removal by 2010. In addition, under the Interim End State, the Main Plant Process Building and the Remote-Handled Waste Facility are scheduled to be gutted and decontaminated by 2011 (Bower 2007).

Lag Storage Areas 3 and 4: Lag Storage Area 3 and 4 are low-level radioactive waste, and mixed low-level radioactive waste RCRA interim status, storage facilities. They are twin structures located about 152 meters (500 feet) northeast of the Main Plant Process Building. Originally built in 1991 and upgraded in 1996 (Lag Storage Area 3) and 1999 (Lag Storage Area 4), these buildings provide enclosed storage space for waste containers. Lag Storage Areas 3 and 4 have operating capacities of 4,701 cubic meters (166,018 cubic feet) and 4,162 cubic meters (146,980 cubic feet), respectively (DOE 2003e). Wastes currently stored in these buildings are being removed and disposed under the ROD for the WVDP WMEIS (70 FR 35073). Lag Storage Area 3 is scheduled for decontamination, demolition, and removal by 2010 (DOE 2006c).

Located just inside and to the west of Lag Storage Area 4's south wall roll-up door is the Container Sorting and Packaging Facility. This engineered area was added in 1995 for contact sorting of previously packaged wastes. On the south side of Lag Storage Area 4, there is an enclosed shipping depot to enhance the WVDP's ability to ship wastes off site for disposal (DOE 2003e).

Chemical Process Cell Waste Storage Area: The Chemical Process Cell Waste Storage Area, about 274 meters (900 feet) northwest of the Process Building, was constructed in 1985 as a storage area primarily for radioactively contaminated equipment removed from the Chemical Process Cell. Painted carbon steel waste storage boxes of various sizes are stored within the Chemical Process Cell Waste Storage Area. These boxes, which contain contaminated vessels, equipment, and piping removed from the Chemical Process Cell, are stored in the center area of the enclosure. This center area is surrounded by hexagonal concrete shielding modules. These modules provide line-of-sight shielding around the waste boxes they encircle. Additional carbon steel waste boxes were placed on the east and west ends of the enclosure for additional shielding. This outer layer of waste boxes contains low dose low-level radioactive waste equipment and material removed from clean-up activities carried out in the Product Purification Cell and Extraction Cell 3 (DOE 2003e). Wastes currently stored in this building are being removed and disposed under the ROD for the *WVDP WMEIS* (70 FR 35073). The Chemical Process Cell Waste Storage Area is scheduled for decontamination, demolition, and removal by 2010 (DOE 2006c).

Main Plant Process Building: The Main Plant Process Building is comprised of a series of cells, aisles, and rooms constructed of reinforced concrete and concrete block. Several cells in rooms in the Main Plant Process Building were decontaminated to prepare them for reuse as interim storage space for high-level radioactive waste or as part of the Liquid Waste Treatment System. Among the areas decontaminated was the Chemical Process Cell. The Chemical Process Cell is currently used for storage of 275 canisters of high-level radioactive waste vitrified in a borosilicate glass matrix (DOE 2003e). The Main Plant Process Building is scheduled to be gutted and decontaminated by 2011 (Bower 2007).

Tank Farm: The Tank Farm includes four waste storage tanks (8D-1, 8D-2, 8D-3, and 8D-4). Built between 1963 and 1965, the waste storage tanks were originally designed to store liquid high-level radioactive waste generated during fuel reprocessing operations. The two larger tanks, 8D-1 and 8D-2, are reinforced carbon steel tanks. Each of these tanks has a storage capacity of about 2.8 million liters (750,000 gallons) and is housed within its own cylindrical concrete vault. Tank 8D-2 was used during reprocessing as the primary storage tank for high-level radioactive waste, with 8D-l as its designated spare. Both were modified by the WVDP to support high-level radioactive waste treatment and vitrification operations. The two smaller tanks are stainless steel tanks with a storage capacity of about 57,000 liters (15,000 gallons) each. A single concrete vault houses both of these tanks. Tank 8D-3, once designated as the spare for 8D-4, is currently used to store decontaminated process solutions before they are transferred to the Liquid Waste Treatment System for processing. Tank 8D-4, which was used to store liquid acidic THOREX waste generated during a single reprocessing campaign, is no longer used for vitrification. DOE manages these tanks in such a way as to minimize the risk of contamination leaching into the surrounding stream corridors (DOE 2003e).

Remote Handled Waste Facility: Wastes that have high surface radiation exposure rates or contamination levels require processing using remote-handling technologies to ensure worker safety. These remote-handled wastes are processed in the Remote-Handled Waste Facility (DOE 2003e).

The Remote-Handled Waste Facility is located in the northwest corner of the WVDP site, northwest of the STS Support Building and southwest of the Chemical Process Cell Waste Storage Area. Primary activities in the Remote-Handled Waste Facility include confinement of contamination while handling, assaying, segregating, cutting, and packaging remote-handled waste streams. Equipment in the Remote-Handled Waste Facility can cut relatively large components into pieces small enough to fit into standard types of waste containers (DOE 2003e).

The wastes to be processed in the Remote-Handled Waste Facility are in the form of tanks, pumps, piping, fabricated steel structures, light fixtures, conduits, jumpers, reinforced concrete sections, personal protective equipment, general rubble, and debris. Wastes from the Remote-Handled Waste Facility are packaged in

208-liter (55-gallon) drums and B-25 boxes (DOE 2003e). The Remote-Handled Waste Facility began operations in June 2004 (WVNS and URS 2005). The Remote-Handled Waste Facility is scheduled to be gutted and decontaminated by 2011 (Bower 2007).

3.13.2 Waste Minimization and Pollution Prevention

The site maintains a program of reducing and eliminating the amount of waste generated from site activities. Each year, waste reduction goals are set for all major waste categories and then tracked against these performance goals. The emphasis on good business practices, source reduction, and recycling minimizes the generation of low-level radioactive waste, mixed low-level radioactive waste, hazardous waste, industrial wastes, and sanitary wastes, such as paper, wood, and scrap metal. The following items were recycled during 2006 (WVNS and URS 2007):

- Office and mixed paper – 27.8 metric tons (30.6 tons),
- Corrugated cardboard – 19.6 metric tons (21.6 tons),
- Stainless steel – 27.8 metric tons (30.6 tons),
- Iron/steel – 190 metric tons metric tons (210 tons),
- Batteries – 8.1 metric tons (8.9 tons),
- Fluorescent light bulbs – 0.39 metric tons (0.43 tons), and
- Wood – 2.8 metric tons (3.1 tons).

A hazardous waste reduction plan that documents efforts to minimize the generation of hazardous waste is filed with NYSDEC every 2 years and updated annually (70 FR 35073).

The WVDP's Pollution Prevention Awareness Program is a significant part of the waste minimization program. The plan establishes the strategic framework for integrating waste minimization and pollution prevention into waste generation and reduction activities, procuring recycled products, reusing existing products, and conserving energy. A main goal of the program is to make all employees aware of the importance of pollution prevention (WVNS and URS 2007).

The WVDP is a charter member of EPA's National Environmental Performance Track program. The National Environmental Performance Track program encourages facilities with strong environmental records to go above and beyond their legal requirements by setting measurable goals to improve the quality of our nation's air, water, and land. The WVDP renewed its membership in the Performance Track program for Calendar Year 2007 through Calendar Year 2009 (WVES 2007a).