APPENDIX H

FLOODPLAINS/WETLANDS ASSESSMENT OF POTENTIAL IMPACTS AT THE OAK RIDGE NATIONAL LABORATORY AND ARGONNE NATIONAL LABORATORY

This page intentionally left blank.

H. FLOODPLAINS/WETLANDS ASSESSSMENT OF POTENTIAL IMPACTS AT THE OAK RIDGE NATIONAL LABORATORY AND ARGONNE NATIONAL LABORATORY

This appendix presents a description of the wetlands located at Oak Ridge National Laboratory (ORNL) and Argonne National Laboratory (ANL) that could be impacted by construction and operation of the proposed Spallation Neutron Source, should one of the two sites be selected in the Record of Decision (ROD). This report describes the potential impacts to the wetlands at these sites and presents potential mitigation measures. It also describes the potential impacts on two floodplain areas on the ANL site.

This page intentionally left blank.

CONTENTS

ACRONYMS

ANL	Argonne National Laboratory
APS	Advanced Photon Source
BCST2	Bear Creek South Tributary 2
BNL	Brookhaven National Laboratory
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DOE	U.S. Department of Energy
FAC	Facultative
FACW	Facultative Wetland
FEIS	Final Environmental Impact Statement
HGM	Hydrogeomorphic Approach
LANL	Los Alamos National Laboratory
OBL	Obligate Wetland
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PEM1	Palustrine Emergent Wetland, Persistent Vegetation
PFO1	Palustrine Forested Wetland, Broad-leaved Deciduous
PSS1	Palustrine Scrub-Shrub, Broad-leaved Deciduous
SNS	Spallation Neutron Source
USACE	U.S. Army Corps of Engineers
WONT1	White Oak Creek North Tributary 1
WONT2	White Oak Creek North Tributary 2

1. INTRODUCTION

The Department of Energy (DOE) proposes to construct and operate an accelerator-based research facility called the Spallation Neutron Source (SNS). DOE has identified four siting alternatives for the proposed SNS. These are as follows:

- ORNL Alternative, Oak Ridge, Tennessee
- Los Alamos National Laboratory (LANL) Alternative, Los Alamos, New Mexico
- ANL Alternative, Argonne, Illinois
- Brookhaven National Laboratory (BNL) Alternative, Upton, New York

Executive Order 11990, *Protection of Wetlands*, dated May 24, 1977, requires federal agencies to avoid, to the extent possible, adverse impacts associated with the destruction and modification of wetlands and to avoid direct and indirect support of wetlands development wherever there is a practicable alternative. In accordance with DOE's implementing regulation for Executive Order 11990 (10 CFR 1022), this report addresses the potential individual and cumulative effects of actions in wetlands on the proposed SNS sites.

Executive Order 11988, *Floodplain Management*, requires federal agencies to ensure that potential effects of flood hazards and floodplain management are considered for actions undertaken in a floodplain and that floodplain impacts be avoided to the extent practicable. This report also addresses the potential impacts on two small floodplain areas on the proposed SNS site at ANL.

The proposed action has the potential to impact wetlands at the ORNL site and wetlands and two small floodplain areas at the ANL site. No wetlands or floodplains were identified on the proposed SNS sites at LANL or BNL. The proposed actions for each alternative are described in Chapter 3 of the Final Environmental Impact Statement (FEIS) for the SNS project. This report focuses only on those actions that have the potential to affect wetlands at the ORNL and ANL sites and the two small floodplain areas at the ANL site.

2. DESCRIPTION OF WETLANDS

2.1 INTRODUCTION

As required by the Energy and Water Development Appropriations Act of 1992, wetlands are identified using the criteria and methods set forth in the *Wetlands Delineation Manual* [U.S. Army Corps of Engineers (USACE) 1987]. USACE defines wetlands as: "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The USACE lists three characteristics that are diagnostic of wetlands:

1. The vegetation is characterized by a prevalence of macrophytes typically adapted to wetland soil and hydrological conditions. Hydrophytic vegetation is considered to be present when greater than 50 percent of the vegetation in each strata have an indicator status of obligate wetland (OBL), facultative wetland (FACW), and/or facultative (FAC), according to the classification system reported by Reed (1988).

2. The substrate is undrained hydric soil. Hydric soils are soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in a major part of the root zone.

3. The area is inundated either permanently or periodically at depths less than 2 m (6.6 ft.), or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.

The wetlands described in this report have been classified according to the system developed by Cowardin et al. (1979). This hierarchical system describes wetlands by system, class, and subclass. Additional modifiers are added for hydrologic regime, soil, and disturbances. The wetlands on the ORNL and ANL sites are in the palustrine (P) system and are either forested (FO), scrub-shrub (SS), or emergent (EM). The number "1" following these designations indicates broad-leaved deciduous vegetation (in the FO and SS classes) and vegetation with parts that persist above ground after the growing season (in the EM class). Water regime modifiers that may apply to the wetlands described in this report include temporarily flooded (A), saturated (B), seasonally flooded (C), semi-permanently flooded (F), and permanently flooded (H).

2.2 WETLANDS ON THE PROPOSED SNS SITE AT ORNL

A report from a field survey conducted in September 1997 describes the wetlands on and adjacent to the proposed SNS site (Rosensteel et al. 1997). Eight wetland areas were identified. Seven of the wetlands [WOM14, WOM15, WOM16, WOM17, WOM18, White Oak Creek north tributary 1-1 (WONT1-1), White Oak Creek north tributary 2-1 (WONT2-1)] are in the White Oak Creek watershed and one, Bear Creek south tributary 2-1 (BCST2-1), is in the riparian zone of a first-order stream in the Bear Creek (BC) watershed. The wetlands are classified as palustrine forested, broad-leaved deciduous (PFO1), palustrine scrub-shrub, broad-leaved deciduous (PSS1), and palustrine emergent, persistent (PEM1). It is most likely that the hydrologic regimes of these wetlands are B (saturated) and A (temporarily flooded). One of the wetlands that is spring-fed may be semi-permanently (F) or permanently (H) flooded. Wetland locations are shown in Figure 2.2-1.

The boundaries of all of the wetlands, except for WOM17, WOM18, and BCST2-1, were delineated and located by a civil survey. Therefore, the areal sizes given for most of the delineated wetlands are accurate, while those for WOM17, WOM18, and BCST2-1 are estimated. The total area of wetlands in the survey area is 3.62 acres (1.46 ha), the majority of which [3.27 acres (1.32 ha)] are in the White Oak Creek watershed.

A 0.03-acre (0.01-ha) emergent wetland (WONT2-1) was identified along a tributary of White Oak Creek. An infrequently-used, grass-covered road bed crosses the tributary near its confluence with White Oak Creek. The emergent wetland includes a low spot in the road where it crosses the stream and a small alluvial area at the mouth of the stream. Surface runoff and seasonal stream flow collect in and flow through the wetland area. Species in the wetland include smartweed (*Polygonum* sp.), false nettle (*Boehmeria cylindrica*), microstegium (*Microstegium vimineum*, an invasive exotic grass species), and sedges (*Carex* spp.).

A 0.05-acre (0.02-ha) emergent wetland swale (WOM15) is immediately adjacent and parallel to Chestnut Ridge Road. Discharges from two springs flow through the swale and empty into White Oak Creek just downstream of the Chestnut Ridge Road culvert. Shrubs, including alder (*Alnus serrulata*) and elderberry (*Sambucus canadensis*), grow along one side of the swale. The swale is vegetated with numerous wetland species, including watercress (*Nasturtium officiniale*), great lobelia (*Lobelia siphilitica*), cardinal flower (*Lobelia cardinalis*), turtle head (*Chelone glabra*), smartweed (*Polygonum* sp.), and sedges (*Carex* spp.).

A 0.015-acre (0.006-ha) emergent wetland (WOM14) was identified in a manmade, isolated depression in an open area. This depression is near the wetland swale (WOM15) but separated

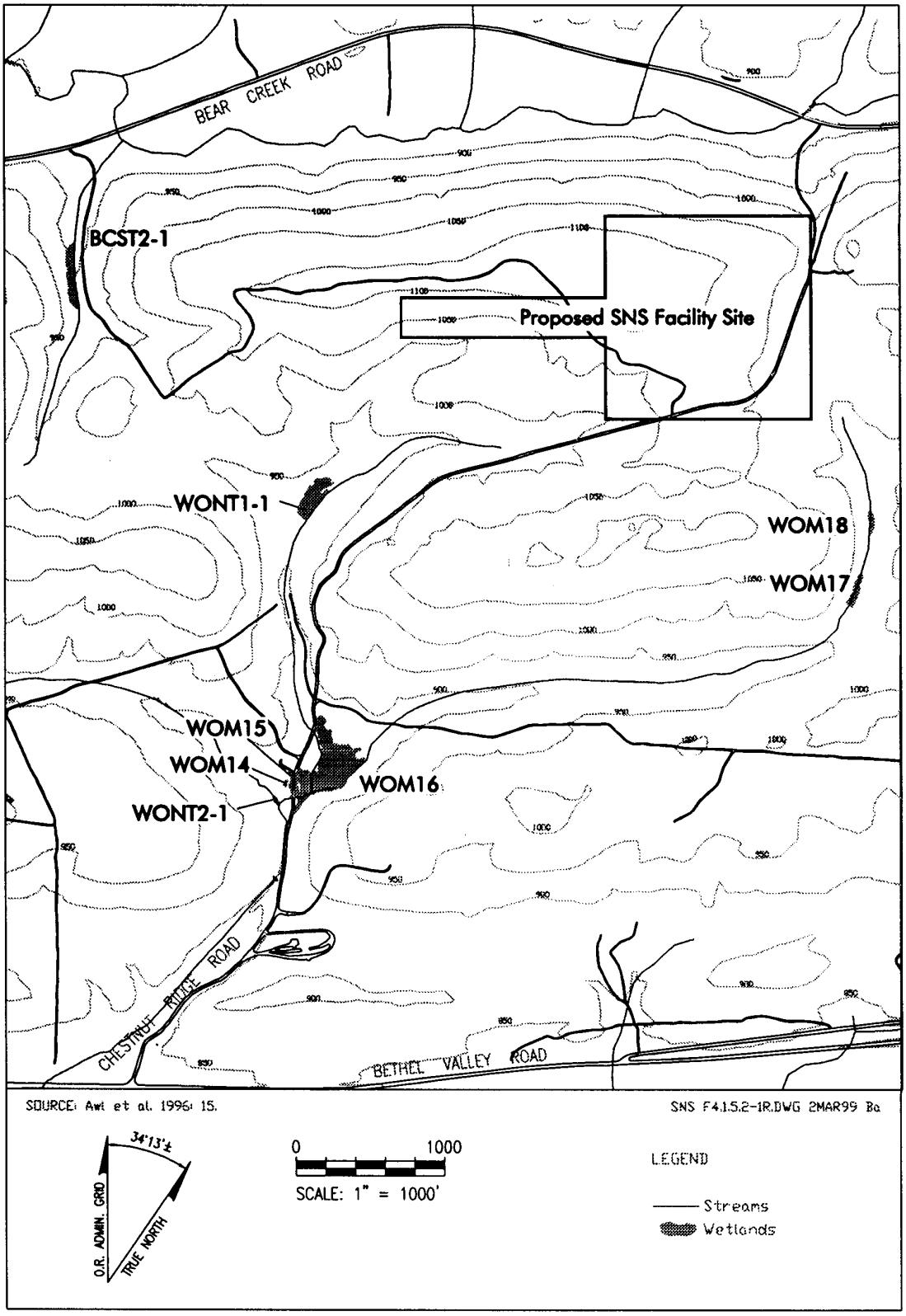

Figure 2.2-1. Wetland areas within and adjacent to the proposed SNS site at ORNL.

from it by a vegetated berm. The depression does not have a surface outlet to the swale or to White Oak Creek. There was no water in the depression on the day of the wetland survey or on follow-up visits in the summer of 1998, but it is possible that it holds precipitation and surface runoff for an undetermined period of time during the winter and spring. The soil has hydric characteristics. Species in this man-induced emergent wetland include fescue *(Festuca arundinaceae),* false nettle, smartweed, Frank's sedge *(Carex frankii*), and other sedges.

A 2.36-acre (0.96-ha) forested wetland (WOM16) is located in a seep and spring area in the floodplain of White Oak Creek immediately adjacent to the east side of Chestnut Ridge Road. This wetland includes forested areas on both sides of White Oak Creek, a portion of a transmission line right-of-way, and a swale adjacent to Chestnut Ridge Road. Except at its upper end, this swale is separated from the rest of the wetland area by a 2-3 ft (0.6-0.9 m) high upland berm. The wetland includes floodplain area on both sides of White Oak Creek. Dominant or common plant species in this wetland include sycamore *(Platanus occidentalis*), red maple *(Acer rubrum*), green ash *(Fraxinus pennsylvanica*), spicebush *(Lindera benzoin*), sedges (*Carex* spp), watercress, microstegium, false nettle, cardinal flower, bugleweed *(Lycopus virginicus*), smartweed, and hog peanut *(Amphicarpa bracteata*). The primary hydrologic source is localized (seeps and springs) and diffuse groundwater discharge. Although this wetland is primarily an undisturbed forested wetland, the section in the transmission line right-of-way is more appropriately classified as a scrub-shrub/emergent wetland that is periodically disturbed by mowing. *Carex leptalea* and *Bartonia paniculatum,* two species that are uncommon in East Tennessee, occur in the forested part of wetland WOM16. This wetland area had initially been designated an Environmental Research Park Reference Area but is now within Environmental Research Park Natural Area 55 (Awl et al. 1996).

A small area of forested wetland (WOM17) [0.15 acres (0.06 ha)] and a small, emergent wetland (WOM18) [<0.03 acres (<0.012 ha)] were identified in the upper reach of White Oak Creek. WOM17 is a 0.15-acre (0.06-ha) wetland in a seep area that appears to contribute a significant portion of the summer and early fall base flow of a section of upper White Oak Creek. The stream channel immediately upstream and downstream of this wetland area was dry on the day of the survey. The soil was saturated, and there was flowing water in shallow, surface channels on the day of the survey. The dominant vegetation species in wetland WOM17 include sweetgum, red maple, ironwood, smartweed *(Polygonum punctatum),* cardinal flower, microstegium, false nettle, and poison ivy *(Toxicodendron radicans*). WOM18 is a narrow fringe [2 to 3 ft wide (0.6 to 0.9 m)] of emergent wetlands on the edge of the stream channel. This section of stream contained flowing water. Dominant species in WOM18 include microstegium, cardinal flower, smartweed, bugleweed, and sensitive fem *(Onoclea sensibilis*).

A 0.63-acre (0.26-ha) forested wetland (WONT1-1) is located in the riparian zone of WONT1. This tributary is located in a forested drainage on the west side of Chestnut Ridge Road north of the transmission line right-of-way and is in Environmental Research Park Natural Area 55. Further downstream, the tributary crosses the power line, flows through a culvert under Chestnut Ridge Road, and empties into White Oak Creek in the WOM16 wetland. The wetland is located along the middle reach of the stream. The primary water source for this wetland is groundwater in the form of perennial seeps and a seasonal high water table. Overbank flooding may be an occasional, but not a sustaining, source of water. Dominant species include sycamore, red maple, sweetgum *(Liquidambar styraciflua*), green ash, bugleweed, cardinal flower, and cinnamon fern *(Osmunda cinnamomea*). At a perennial seep, which spreads out over a wide area, the dominant species include smartweed, watercress, bugleweed, cutgrass *(Leersia oryzoides*), leathery rush *(Juncus coriaceous*), avens *(Geum* sp), and tickseed sunflower *(Bidens* sp).

In the riparian zone of BCST2, there are three small areas of forested wetlands and emergent wetlands at streamside seeps. These three areas are close together along the stream and were combined into one wetland area (BCST2-1) for purposes of mapping and description. The approximate size of the wetland area is 0.35 acres (0.14 ha). It is downslope of, but not within, the site boundary. Dominant species include green ash, red maple, spicebush, microstegium, poison ivy, woodreed *(Cinna arundinacea*), and Virginia knotweed *(Tovara virginiana*).

2.3 WETLANDS ON THE PROPOSED SNS SITE AT ANL

A variety of wetland types, totaling approximately 17.3 acres (7 ha), occur in and around the proposed SNS site (Figure 2.3-1). Although most of these wetlands have been disturbed to some degree in the past, they continue to retain wetland value such as wildlife habitat and flood control.

A large wetland, approximately 4 acres (1.6 ha), lies in the northeast part of the proposed site. This wetland receives surface flows from an intermittent stream to the south and storm sewer drainage to the east. Surface water is generally present throughout the year within the stream channel and storm drainage. Areas not inundated are saturated within 12 in. (30 cm) of the surface for extended periods. Common cattail *(Typha latifolia)* is the dominant species in the eastern portion of the wetland and in the southern part of the stream channel, while reed canary grass *(Phalaris arundinacea),* a non-native species, is dominant within most of the stream channel and much of the central portion. Although beavers had built a dam and lodge in this wetland in the past, they have not occupied this area since 1993.

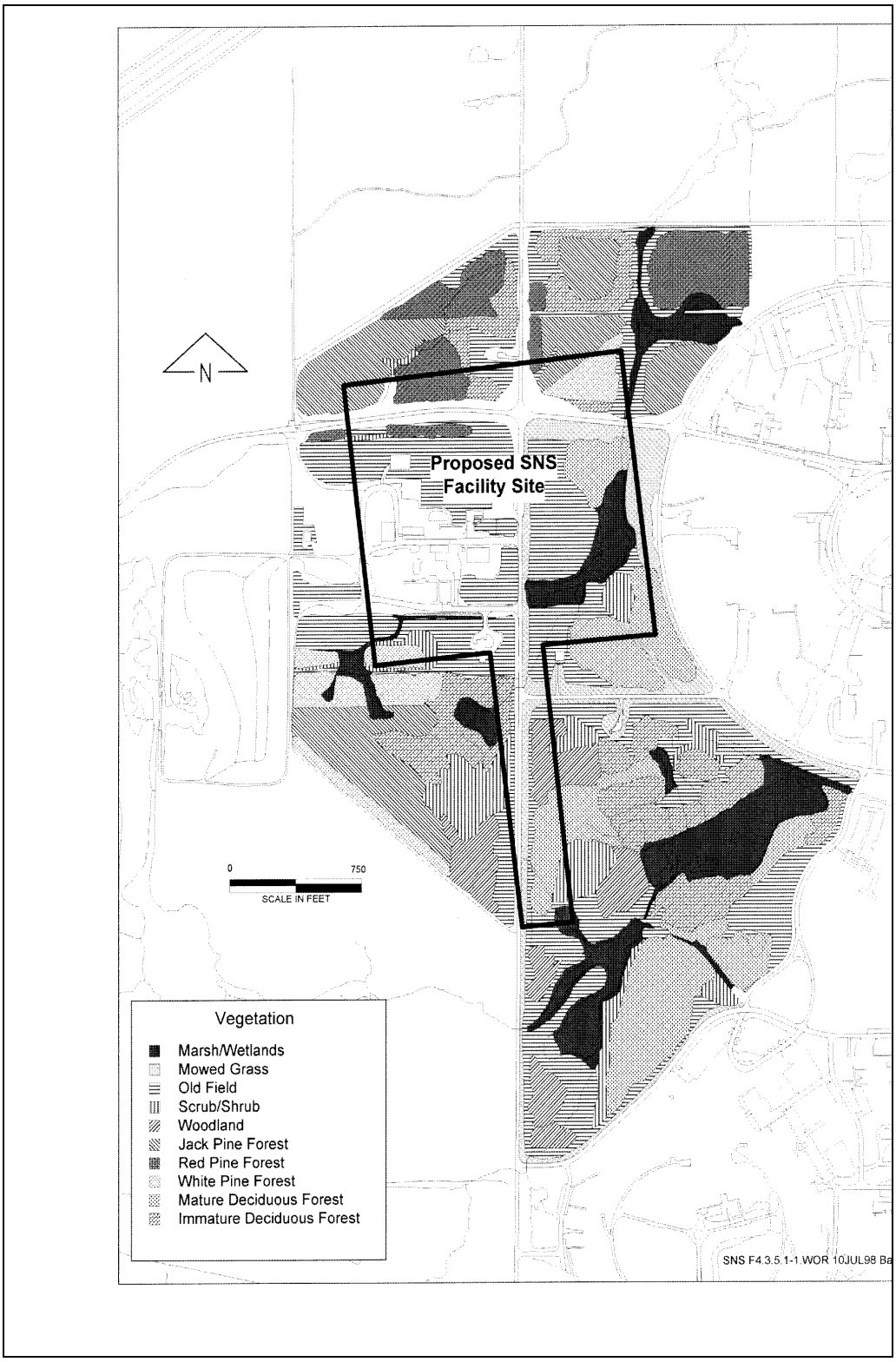

Figure 2.3-1. Vegetative cover at proposed ANL SNS site.

A 2.7-acre (1.1-ha) wetland in the eastern portion of the proposed site, almost totally within the footprint of the SNS, includes a small pond at the northern end. This wetland receives surface flows from storm sewer drainages to the east and west and an excavated channel to the west. Surface water is present throughout the year within the pond. The southwestern arm is inundated early in the growing season and generally has a narrow, shallow flow during dry months of the year. Most of this wetland, other than the pond, is dominated by narrow-leaf cattail *(Typha angustifolia).* Beavers also built a dam and lodge in this wetland, but they have not occupied this area since 1993.

A small, 0.4-acre (0.2-ha) wetland to the southeast of the proposed site receives surface water drainage from two nearby water towers. Drainage is present throughout the year and enters at the north end forming a shallow stream, which dissipates at the south end. The dominant species in this marshy wetland are common and narrow-leaf cattail.

A large wetland to the southeast of the proposed site contains surface water throughout the year that fluctuates in depth according to the level of a beaver dam at the northeast end. The area of this wetland is 7.5 acres (3.1 ha) and it receives surface flow from a small stream to the southwest (Freund Brook) and storm sewer drainages to the north. Lower water levels allow wetland plants to colonize areas that under higher levels support only submerged aquatic vegetation and nonrooted floating plants. The dominant species in this wetland are common and narrow-leaf cattail and common reed *(Phragmites australis).* Three state-listed endangered bird species have been observed at this wetland: great egret, black-crowned night heron, and pied-billed grebe.

A shallow area along Freund Brook lies immediately upstream of the previous wetland. Surface water is present throughout most of the year, although flows are sluggish during summer months. Dominant species along the muddy stream margin are large-flowered water plantain *(Alisma triviale),* rice cut-grass *(Leersia oryzoides),* lady's thumb *(Polygonum persicaria),* and marsh purslane *(Ludwigia palustris var americana).* A low marshy area along a tributary to the southeast of Freund Brook contains shallow surface water much of the year and supports rice cut grass, large-flowered water plantain, and river bulrush *(Scirpus fluviatilis).*

An 0.8-acre (0.3-ha) seasonally flooded wetland in the southern portion of the proposed site and within the SNS footprint is inundated early in the growing season, but surface water is absent by midsummer. Dominant species are wild mint *(Mentha arvensis var villosa),* smartweed, *(Polygonum* sp.), sedge *(Carex* sp.), and white grass *(Leersia virginica).* The wetland margin is lined by mature cottonwood and black willow *(Salix nigra)* trees. Hydrologic input is primarily

groundwater discharge. However, a minor surface flow is received during the spring from an excavated channel to the northwest.

A 1.4-acre (0.6-ha) wetland system to the south includes a narrow channel receiving surface water from the landfill area on the west and storm sewer drainage on the north. The southern portion of the wetland is saturated early in the growing season but is seldom inundated. Surface water is present in the channel throughout the year downstream of the storm drain outlet. Common cattail is the dominant species in the channel, while dominants in the remainder include reed canary grass, swamp marigold *(Bidens aristosa),* and sedges.

A small, 4,050-ft^2 (380-m^2) seasonal wetland occurs within a drainage ditch in the western portion of the proposed site. Surface water is present early in the growing season but is usually absent by late summer. Dominant species are narrow-leafed cattail, barnyard grass *(Echinochloa crusgalli*), common beggar's ticks *(Bidens frondosa),* and great bulrush *(Scirpus validus* var *creber).*

3. ONSITE WETLAND IMPACTS

3.1 INTRODUCTION

Scientists at the U.S. Army Engineer Waterways Experiment Station have developed the hydrogeomorphic (HGM) approach for assessing the functions of wetlands (Smith 1994). The HGM approach is intended primarily for use in meeting the requirements for project assessment under Section 404 of the Clean Water Act (CWA) and for determining mitigation requirements and success. The HGM regional guidebooks and assessment models for the classes and subclasses of wetlands present on ORNL and ANL land have not yet been developed. Therefore, the wetland assessments for the ORNL and ANL sites relied on the best professional judgement of wetland scientists with field experience and knowledge of the wetlands on these sites.

3.2 POTENTIAL WETLAND IMPACTS ON THE PROPOSED SNS SITE AT ORNL

Potential effects to wetlands during construction and operation of the proposed SNS include direct impacts, such as excavation and fill, and indirect impacts, which include erosion, sedimentation, scouring of the wetland substrate, and hydrologic alterations. Three of the wetland areas in the White Oak Creek watershed (WOM14, WOM15, and WOM16) will be directly impacted by the upgrade of Chestnut Ridge Road. There is potential for long-term, but indirect, impacts to two of the wetlands due to storm runoff from the access road (WOM16) and proximity to a retention basin (WONT1-1). Effects to the remaining four wetland areas (BCST2-1, WOM17, WOM18, and WONT2-1) would be minimal. These wetlands are not in areas that would be disturbed by construction of the proposed SNS. Proper control of runoff, especially during site preparation, would minimize effects on these wetland areas.

3.2.1 Proposed Road Construction

A total of 0.23 acres (0.09 ha) in wetlands WOM14, WOM15, and WOM16 would be filled for the upgrade of Chestnut Ridge Road. Wetland WOM14 will be completely filled. This small wetland [0.015 acres (0.006 ha)] is in an isolated, man-made depression that is temporarily saturated or flooded following precipitation. Because of its small size, isolation, and limited period of saturation, it is unlikely that wetland WOM14 performs wetland functions related to water quality or surface water flow. It may provide amphibian-breeding habitat, depending on the depth and duration of inundation in the breeding season. Plant species diversity is low and is comprised of species that are common in emergent wetlands on the Oak Ridge Reservation (ORR).

The southern half of WOM15 will be filled. WOM15 is a 0.05-acre (0.02-ha) emergent wetland swale that is immediately adjacent to Chestnut Ridge Road. This wetland begins at two springs at its northern edge and ends at White Oak Creek. The wetland supports a diverse assemblage of herbaceous species but does currently receive impacts from the existing road, including gravel, silt, and other constituents in road runoff. The functions performed by this wetland may include amphibian breeding habitat, sediment and contaminant reduction or removal, nutrient transformation and uptake, and production and export of dissolved and particulate organic material to White Oak Creek.

The southwest corner of WOM16, including a forested portion of the wetland on the south side of White Oak Creek and a portion of the roadside swale, will be filled for road construction. The functions that are most likely to be performed in wetland WOM16 include sediment retention, nutrient transformation and uptake, production and export of dissolved and particulate organic material, and provision of wildlife habitat. The seeps and springs that are within this wetland, along with the flow entering from WONT1, are major contributors to base flow in White Oak Creek. There is diffuse groundwater discharge, but no discrete seeps or springs, in the area to be filled.

3.2.2 Proposed Retention Basin

The proposed retention basin, that will hold stormwater runoff and cooling tower water discharges, would be located in the upper part of the WONT1 stream catchment. The basin is not expected to directly affect wetland WONT1-1 because it would not be located directly on the wetland. Indirect effects resulting from increased surface water inputs would not be expected because the retention basin water would be piped to a lower point in the White Oak Creek watershed, rather than released onsite. However, this wetland may be indirectly affected by the proximity of the retention basin. Potential impacts would include a change in plant community composition resulting from the creation of a forest edge and introduction of invasive, exotic plant species such as privet (*Ligustrum sinense*).

3.3 POTENTIAL WETLAND IMPACTS ON THE PROPOSED SNS SITE AT ANL

Potential effects on wetlands caused by construction of the SNS would include elimination of wetlands that would be in the SNS footprint and degradation of wetlands caused by activities outside of the wetlands, such as soil erosion, siltation, and sedimentation. Operational effects may occur from effluents released from the SNS. The assessment of potential effects on wetlands includes determining whether construction of the SNS would encroach on an existing

wetland and evaluating the potential effects from increased runoff of water and effluents released from the SNS during operations.

A 1993 survey on the ANL land identified 35 wetlands totaling 44.6 acres (18.1 ha). Only wetlands greater than 17,655 ft^2 (500 m^2) were identified; thus, many smaller wetlands on the site may not be documented. One of the wetlands has since reverted to upland because of the breaching of an old beaver dam on Freund Brook. Many of the wetlands are seasonally inundated or saturated emergent wetlands, occurring in depressions or in stream riparian zones. Some of the larger wetlands have water on the surface for the entire growing season and at least three of them have water year-round. There are three forested wetlands on the site; however, the majority of site wetlands are emergent systems. The wetlands in and around ANL have a history of disturbance, initially from agriculture, and more recently from site development. Some of the wetlands now present may have been drained in the past for agriculture but have become restored as the drainage tiles have failed over time. Current disturbances include runoff from developed areas.

Approximately 3.5 acres (1.4 ha) of wetlands on the proposed SNS site lie within the proposed footprint and would be eliminated by construction activities. The wetlands that will be eliminated include a 2.7-acre (1.1-ha) emergent wetland area that also includes an open water area and a 0.8-acre (0.3-ha) seasonally flooded wetland. This represents approximately 20 percent of the wetlands on and in the vicinity of the proposed SNS site and approximately 7.8 percent of the total area of jurisdictional wetlands on ANL land.

The wetland functions that would be lost as a result include wildlife habitat, floodflow alteration, nutrient transformation, and organic material production and export. These wetlands provide habitat for area wildlife such as amphibians and wetland birds. The primary functions of these wetlands most likely include flood-flow alteration, wildlife habitat, nutrient transformation, and organic material production and export. The wetlands on ANL land provide habitat for many species, including great egret, black-crowned night heron, pied-billed grebe, red-winged blackbird, great blue heron, mallard ducks, Canada geese, muskrat, and beaver, as well as upland species such as raccoons, raptors, and some passerine bird species that utilize wetland food resources on an occasional basis. The flood-flow alteration and nutrient transformation functions may also be of primary importance. In a study in the Lake Wingra basin in Wisconsin, Loucks (1990) found that runoff from watersheds where shallow basin [temporarily flooded] wetlands have been filled or drained is about twice that estimated for the presettlement watershed, and that nutrient loadings to the receiving lake were increased.

4. CUMULATIVE IMPACTS

4.1 CUMULATIVE WETLAND IMPACTS ON THE ORR

The cumulative impact on wetlands of construction and operation of the SNS has been evaluated in the context of the total known wetland resources and functions on the ORR, and in the White Oak Creek and the Bear Creek watersheds, the two watersheds within which the SNS site would be located.

Data on wetlands in the White Oak Creek and Bear Creek watersheds come from several published and internally reported, unpublished surveys conducted in these areas between 1992 and 1996. Wetlands have been identified in a large portion of the ORR with the most complete surveys having been completed for the East Tennessee Technology Park [ETTP (Rosensteel and Awl 1995)], the Y-12 site (Rosensteel 1997), the western end of Bethel Valley (Rosensteel 1996), the watersheds of White Oak Creek and Bear Creek (Rosensteel 1996; Rosensteel and Trettin 1993), and a few smaller watersheds that drain directly to the Clinch River.

The total number of wetlands identified on the ORR to date is 424 with an estimated total area of 601.6 acres (243.5 ha). The wetlands range in estimated size from <0.02 acres (<0.01 ha) to 112.2 acres (45.4 ha). Wetland surveys have not been conducted across the entire reservation; thus, the total number and total area of wetlands on the ORR is larger than indicated here.

The majority of the wetlands are associated with areas of groundwater discharge in riparian zones in headwater areas. The largest wetland areas are in the lower Bear Creek and White Oak Creek floodplains, in the Poplar Creek watershed, in Clinch River embayments, and associated with beaver activity on tributary streams at several locations on the ORR. Many of the wetlands support populations of state- or federally-listed plant and wildlife species and represent wetland communities and habitats that are becoming increasingly uncommon in the ridge and valley physiographic province outside of the ORR due to development and other land uses.

The functions of the wetlands on the ORR include floodflow alteration; groundwater discharge; nutrient and contaminant transformation, uptake, and sequestration; sediment retention; wildlife habitat; rare species habitat; and maintenance of biological diversity. In a preliminary study of headwater riparian areas in the Bear Creek watershed on the ORR, Eisenbies (1996) findings indicated that the hydrogeochemical processes occurring in the wetlands were sufficient to alter soil/water chemistry and that the wetlands may be acting as nutrient sinks. Several threatened and endangered plant species found on the ORR, including fen orchid (*Liparis loeselii*), heavy

sedge (*Carex gravida*), Howe's sedge (*Carex howei*), tubercled rein-orchid (*Platanthera flava* var. *herbiola*), purple fringeless orchid (*Platanthera peramoena*), and whorled mountain-mint (*Pycnanthemum verticillatum*) occur in wetlands (Awl et al. 1996). Protected vertebrate species that use wetland habitat and have recently been observed on the ORR include the southeastern shrew, four-toed salamander, great egret, northern harrier, little blue heron, and snowy egret (Mitchell et al. 1996). Rare vertebrate species that use wetland habitat and that have the potential to occur on the ORR include woodland jumping mouse, meadow jumping mouse, mole salamander, southern bog lemming, water shrew, common barn owl, king rail, and least bittern (Mitchell et al. 1996).

Current or proposed projects on the ORR that will have potential direct and indirect wetland impacts include the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Waste Disposal Facility in the Bear Creek Valley, CERCLA remediation projects in Melton Valley, and sections of Parcel ED-1 near the ETTP site in the Poplar Creek watershed. Proposed projects in the Bear Creek Valley are discussed in Section 4.1.1. Proposed projects in the Melton Valley are discussed in Section 4.1.2. Projects on the ORR outside of the Bear Creek and White Oak Creek watersheds are discussed in Section 4.1.3.

4.1.1 Bear Creek Watershed

There are 92 identified wetland areas, totaling 156.2 acres (63.2 ha), in the Bear Creek watershed. The wetlands range in size from 0.01 acres (0.02 ha) to 49.4 acres (20 ha) with a mean of 1.7 acres (0.69 ha). The majority of the wetlands occur in headwater positions in association with first-order streams. The largest wetland is in the Bear Creek floodplain just downstream of the gap through Pine Ridge.

Proposed projects in the Bear Creek Valley have the potential to impact several acres of headwater wetlands. The CERCLA Waste Disposal Facility and related remediation work in the adjacent Boneyard/Burnyard will eliminate several acres of headwater wetlands in the bottomlands of the Bear Creek headwater tributaries. It is expected that in-kind replacement in the form of wetland creation and/or restoration will be performed in the Bear Creek watershed to replace the wetland system and functions lost to construction. A programmatic wetland mitigation plan to cover all activities in the Bear Creek Valley is under development (DOE 1998c).

The SNS construction and operation is not expected to contribute to cumulative impacts in the Bear Creek watershed because no wetland fill or encroachment associated with the SNS will occur in the watershed.

4.1.2 White Oak Creek Watershed

There are at least one hundred and fifty-one (151) wetland areas in the White Oak Creek watershed, which includes the watershed of Melton Branch, a major tributary of White Oak Creek. The total acreage of wetlands is 101.6 acres (41.1 ha). The wetlands range in size from <0.02 acres to almost 24.7 acres (<0.01 ha to 9.96 ha) with a mean of 0.74 acres (0.3 ha). The majority of the wetlands are flow-through systems that occur in the relatively narrow bottomlands of headwater tributaries. The largest wetland area is a forested/scrub-shrub/emergent wetland complex in the White Oak Creek bottomland and White Oak Lake, located in the Melton Valley portion of the watershed between the ORNL main plant area and the dam at State Route 95.

Wetland impacts in the White Oak Creek watershed in recent years have been extremely limited due to successful efforts to completely avoid all wetland encroachment through resiting and reconfiguring of projects. In 1995 a small area of permitted (Tennessee Department of Environment and Conservation Rule 1200-4-7 et seq.) wetland disturbance occurred in a 1,000-ft^2 (28.3-m^2) area next to and in Melton Branch. The purpose of the activity was to clean accumulated sediments out of the area behind a weir to restore its function as a regulatory water quality monitoring site. Mitigation required as a permit condition consisted of restoration of vegetation in a roughly 900-ft x 25-ft (274.3-m x 7.6-m) area in the riparian zone of First Creek, which is a first-order tributary of White Oak Creek located in the ORNL main plant area.

The proposed remediation of contaminated soils and sediments in a large area of the White Oak Creek and Melton Branch Watershed has the potential to impact wetlands. The wetlands include forested wetlands in the White Oak Creek and Melton Branch bottomlands, scrub-shrub wetlands in the semi-permanently flooded portion of White Oak Lake, and emergent wetlands in White Oak Lake and in prior disturbed areas such as utility line rights-of-way and road sides.

Remediation activities in the Melton Valley portion of the White Oak Creek-Melton Valley watershed presents the potential for the largest area of wetland impacts. The White Oak Creek watershed in Melton Valley contains numerous contaminated sites over a 1,062-acre (430-ha) area (DOE 1998a). Contaminants include radioisotopes, volatile organic compounds, semivolatile organic compounds, and metals resulting from decades of use of Melton Valley as a primary waste disposal area for ORNL. The Feasibility Study for Melton Valley (DOE 1998a) identified six alternatives for site cleanup. Excluding the no-action alternative, the alternatives range from a minimum of 4.6 acres (1.9 ha) up to a maximum of 44.8 acres (18.1 ha) of wetland impacts (DOE 1998b). Depending on the alternative chosen, the impacts may include erosion and sedimentation; hydrologic alterations that could increase or decrease the area of wetland;

elimination of some wetlands through fill; and extensive floodplain and wetland excavation requiring vegetation removal and the excavation and removal of all contaminated soil and sediment.

Adding the top estimate of wetland disturbance in the Melton Valley Feasibility Study and the potential area of wetland fill proposed for the Chestnut Ridge Road upgrade on the SNS site, the potential cumulative acreage of wetland disturbance in the White Oak Creek watershed in the near-term is approximately 45 acres (18.3 ha). This represents 44.4 percent of the wetland area in the watershed. The majority of this (44.1 percent) is represented by the Melton Valley remediation project. The wetland fill associated with the Chestnut Ridge Road construction represents less than 0.5 percent of the total.

4.1.3 Oak Ridge Reservation

Current projects on the ORR that may have the potential to impact wetlands include Parcel ED-1. Outside of the projects in the Bear Creek and White Oak Creek watersheds that are already discussed, there are no known current or proposed projects on the ORR that have potential wetland impacts.

On Parcel ED-1, there are known wetlands in the Exclusion Area (a protected area around East Fork Poplar Creek). Because not all of the Exclusion Area was surveyed for wetlands, the Mitigation Action Plan for the lease of Parcel ED-1 (DOE 1996) states that prior to any activities in the Exclusion Area, a wetland survey is necessary to identify and delineate wetlands. No wetland encroachment on Parcel ED-1 is known or proposed at present.

The area of wetlands that may be impacted on the SNS site represents 0.04 percent of the known wetland area on the ORR. The area of wetland impacts on the SNS site was minimized to the extent possible given other site and construction constraints. The SNS construction and operations are not expected to contribute to cumulative wetland impacts on the ORR because the wetlands will be replaced through onsite or same-watershed wetland creation or restoration at a 1:1 ratio or greater.

4.2 CUMULATIVE WETLAND IMPACTS ON THE ANL

The cumulative impact assessment area includes ANL land and the 2,000+ acre Waterfall Glen Nature Preserve that surrounds the Reservation. There are at least 413.7 acres (167.4 ha) of wetlands in the Waterfall Glen Nature Preserve (Ludwig 1999). They include emergent

wetlands, riverine marshes, and swamps. These wetlands have been protected in the preserve since the early 1970's.

Combining the wetland acreage at ANL [44.6 acres (18.1 ha)] and the Nature Preserve results in a total of 458.3 acres (185.5 ha) of wetlands on and in the vicinity of the laboratory. The wetlands that would be eliminated for SNS construction represent approximately 0.8 percent of the total wetland acreage and approximately 7.8 percent of the wetland acreage on ANL land.

In 1991, as part of the requirements of a USACE Nationwide General Permit, the creation of a 1.8-acre (0.73-ha) wetland and protection of a 1.1-acre (0.45-ha) wetland was initiated at ANL. The wetland creation and protection was required as mitigation for the filling of 1.8 acres (0.73 ha) of wetlands for construction of the Advanced Photon Source (APS). The mitigation replaced wetland acreage and functions; thus, the APS project resulted in no net loss of wetlands in the watershed.

There are currently no other projects underway or proposed on ANL land that would directly or indirectly impact wetlands.

5. MITIGATION

5.1 MITIGATION OF ONSITE AND CUMULATIVE IMPACTS ON THE ORR

Direct impacts to wetlands during construction would be mitigated by avoiding and minimizing wetland encroachment through modifications in the Chestnut Ridge Road alignment. The proposed alignment would cross White Oak Creek and associated wetlands at the same location as the existing crossing. The road alignment would be modified to impact the smallest possible area of wetlands and to avoid fragmentation of the largest wetland area, WOM16. The currently proposed road alignment for ORNL reflects a compromise based on various constraints, including the maximum allowable road grade, setbacks from White Oak Creek, the minimization of disturbance to hardwood forests, and wetland impact avoidance and minimization.

Indirect impacts on wetlands during construction of the SNS, including those resulting from increased runoff and erosion, will be avoided or minimized through implementation of proper construction techniques such as silt fencing and soil stabilization.

Indirect impacts during operation of the SNS would be avoided or reduced through the diversion of site runoff and cooling water to a downstream location, engineering controls such as vegetated swales or other stormwater controls, and if necessary and feasible, modifications in the location of the holding pond.

During operations, site runoff and cooling water would be collected in a retention basin and piped to a downstream reach of White Oak Creek south of Bethel Valley Road. This would avoid impacts to the wetlands from increased surface flows that would result from releasing the water into the upper White Oak Creek watershed. This would divert a certain amount of stormwater runoff from the downstream watershed. The diversion of stormwater from the upper part of the watershed is not expected to affect the wetlands because of their distance from the upper watershed (except for WONT1-1) and because all of the wetlands, with the exception of WONT2-1 and WOM14, are primarily groundwater-driven systems. Stormwater diversions would not affect WONT2-1 because it receives runoff from the WONT2 drainage that would not be affected by SNS construction or operation. Similarly, WOM14 receives surface runoff from a very small area surrounding the depression and would not be affected by diverted stormwater runoff from the upper watershed.

Increased runoff from Chestnut Ridge Road during operations could impact portions of WOM16. This potential impact could be eliminated or minimized by the diversion of road runoff into

grassed swales or other stormwater control structures. These structures would function to reduce runoff velocity and remove sediments and other contaminants from storm runoff.

A potential indirect impact to WONT1-1 would be a change in plant community composition resulting from the opening of the canopy and the introduction of invasive, exotic species. This potential impact will be minimized by increasing the distance between the wetland and the retention basin berm to a reasonably practicable width.

In accordance with Section 404 of the federal CWA and the Tennessee State Aquatic Resources Alteration Permit program (Rules of the TDEC 1200-4 et seq.), permits would be required for road construction in the affected wetlands. Appropriate compensatory mitigation would be determined by the Tennessee Department of Environment and Conservation in consultation with the USACE, and it is expected that wetland functional replacement would be required in the same watershed at a 1:1 or greater ratio of acreage filled to acreage created or restored. At least one potential mitigation site exists in the immediate area in association with the existing springs at WOM15.

It is expected for all current and proposed projects on the ORR that direct wetland impacts would be avoided, if possible, and that unavoidable wetland impacts would be minimized to the extent possible. When wetland impacts cannot be avoided, appropriate federal and state permits authorizing direct wetland impact would be obtained, or for projects with categorical exclusions (CERCLA projects), all substantive requirements of the law would be met. In compliance with the provisions of these permits and with Executive Order 11990, *Protection of Wetlands,* wetlands would be restored or created in the same watershed, if possible, to replace the unavoidable loss of wetland acreage and functions.

5.2 MITIGATION OF ONSITE AND CUMULATIVE IMPACTS AT ANL

Although all four of the alternative sites for the SNS contain wetlands and streams, the selected site came the closest to meeting the site criteria established in the site selection process (refer to Appendix B, page B-79). Because of the many streams and marshes on ANL land, alternative sites considered for the proposed SNS would occupy similar or larger floodplains and wetlands areas. The site that was selected came the closest out of the four potential sites to meeting the site criteria. In comparison with the other alternative sites, the selected site does not contain either of the two primary streams (Freund Brook and Sawmill Creek), thus avoiding impacts to the wetlands that are in the floodplains and riparian zones of these streams. Alternative Site 1 contained small ponds, marshes, and the headwaters of Freund Brook with associated wetlands.

Alternative Site 3 contained Freund Brook, a pond, and associated wetlands. Alternative Site 4 contained Sawmill Creek and associated wetlands. The selection of the chosen alternative site does minimize wetland impacts to the extent that it does not include Freund Brook or Sawmill Creek with their associated wetlands and avoids impacts to any of the forested wetlands or wetlands with beaver colonies.

In accordance with Section 404 of the federal CWA, a permit from the USACE would be required for construction in these wetlands. As part of this permit, DOE would consult with the USACE on plans to mitigate this loss of wetlands. The most common mitigation for destruction of wetlands on ANL land is replacement (an equivalent area of wetland habitat created, preferably in the same watershed of the impacted wetlands). Because one of the wetlands that would be destroyed is relatively large, approximately 2.7 acres (1.1 ha), it would be difficult to locate a replacement wetland in the same watershed. One possibility that would be investigated would be enhancement of existing wetlands along Freund Brook.

Wetland areas in the vicinity of the proposed SNS site may be affected during construction. Proper construction techniques would be implemented to avoid or minimize the effects of increased stormwater flows, erosion, and sedimentation. In consultation with the USACE, DOE would develop a plan for the protection of these wetlands.

There are no projects currently proposed on ANL land, other than the SNS project, that would encroach on wetlands. Recent wetland disturbance and fill for the APS facility has been mitigated through the creation of a wetland and protection of an existing wetland. The wetlands in the surrounding Waterfall Glen Nature Preserve are in a protected area, and direct impacts to these wetlands would not be expected to occur at any time in the foreseeable future. If mitigated properly through the creation, restoration, or enhancement of wetlands in Sawmill Creek or a nearby watershed, the elimination of wetlands on the proposed SNS site is not expected to contribute to the cumulative loss of wetlands and wetland functions.

6. FLOODPLAINS AT ANL

The preferred site for the proposed SNS at ANL, called the 800 Area, is situated in the northwestern portion of the reservation. Because of the many streams and marshes within the ANL reservation, alternative sites considered for the proposed SNS would occupy similar or larger floodplains and wetlands areas.

At the proposed SNS site, the eastern edge of the SNS footprint overlies a portion of the 100-yr floodplain of an unnamed tributary to Sawmill Creek. This tributary originates in the 800 Area, connecting to Sawmill Creek north of ANL. In addition, the southern tip of the footprint overlies a portion of the 100-year floodplain of an unnamed tributary to Freund Brook. This tributary originates within the footprint of the proposed SNS and flows southeast to Freund Brook. Its confluence with Freund Brook is outside the footprint of the proposed SNS. The locations of these floodplain areas are shown in Figure 6-1.

Along the unnamed tributary of Sawmill Creek, construction of the proposed SNS would include filling and stabilizing those portions of the floodplains that are required for buildings and related structures. Hence, placement of the proposed SNS facility in the 800 Area location would require an alteration of drainage patterns and construction of storm drains and canals to direct storm flow to the retention basin. There are no high hazard areas, as defined in 10 CFR 1022, within this area of the proposed project. The affected areas are within the ANL boundaries. No private homes or commercial property would be impacted by flooding. If the ANL site is selected for construction of the SNS, the drainage pattern of the 800 Area would be altered. The potential impacts from this would be minimized by standard construction practices, including optimizing the placement of buildings to avoid the floodplain and the location of the retention basin. The retention basin would be sized to contain a 100-year flood and would serve to control runoff to this tributary and to replace lost capacity to control floodwater due to disruption of the floodplain. Because of the relatively small area of the 100-year floodplain, estimated to be approximately 5 acres (2 ha), that would be affected by construction, compared to the total drainage area of the watershed, and the inclusion of the retention basin to control runoff from the site, no downstream effects on floodplains are predicted from construction of the proposed SNS facility.

During operation of the SNS, 0.36 to 0.5 million gallons of discharge water per day, primarily from the cooling tower, would be discharged to the unnamed tributary of Sawmill Creek. All discharges from the SNS would be directed to the retention basin, thus normalizing the discharge of cooling tower blowdown water and runoff.

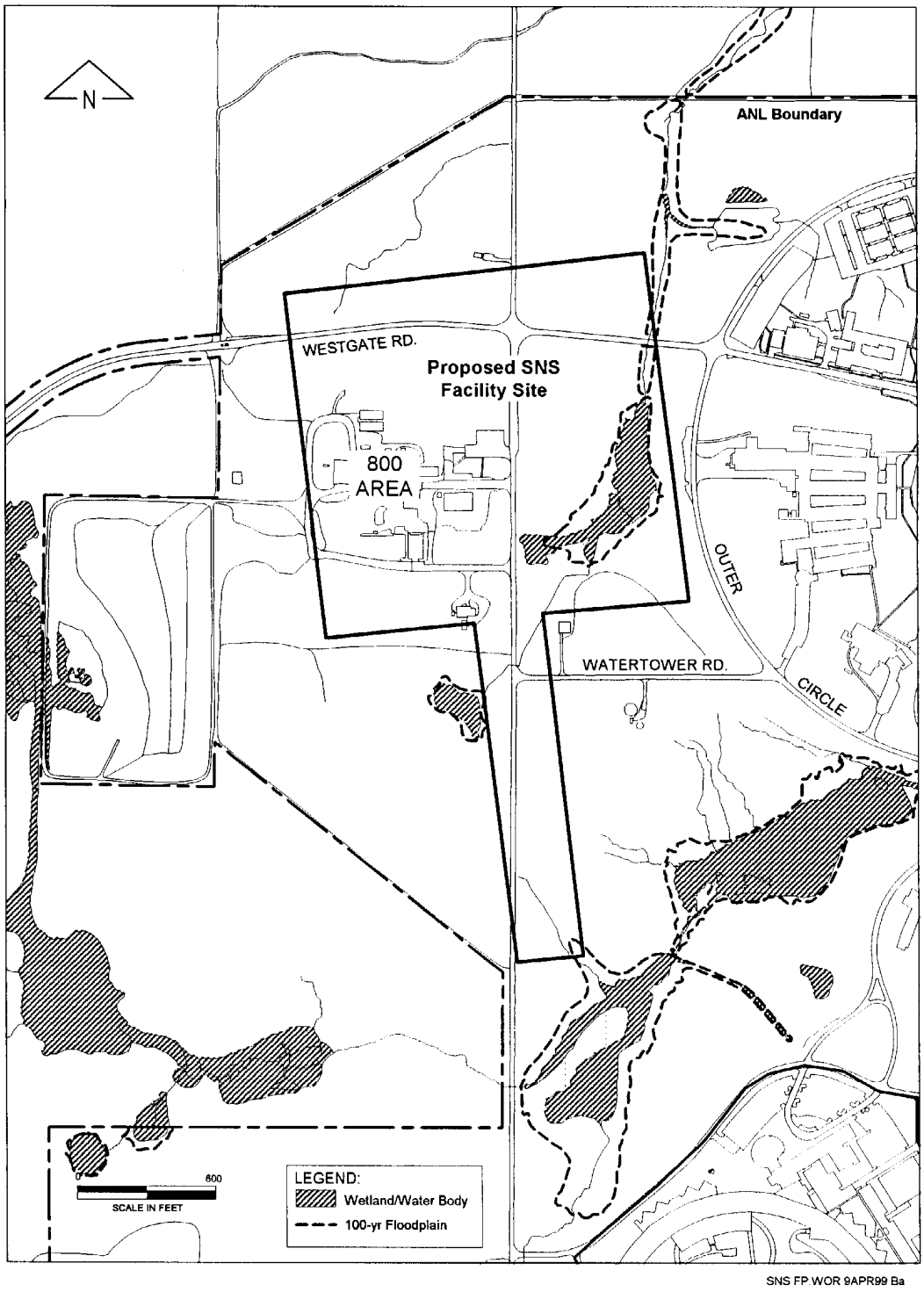

Figure 6-1. Floodplain areas on the proposed SNS site at ANL.

Along the unnamed tributary of Freund Brook, construction of the proposed SNS would include filling and stabilizing those portions of the floodplains that are required for buildings and related structures. It would also require an alteration of drainage patterns and construction of storm drains and canals to redirect stormwater flow to Freund Brook. The potential impacts of this would be minimized by standard construction practices, including optimizing the placement of buildings to avoid the floodplain. No high hazard areas are located within this area of the proposed project. Because the affected areas are within the ANL boundaries, no private homes or commercial property would be impacted by flooding. Less than 1 acre (0.40 ha) of the 100-year floodplain would be affected by construction. Because of its small size compared to the total drainage of the Freund Brook watershed and the early incorporation of drainage features during construction, no downstream effects on floodplains are expected from construction of the proposed SNS facility. Operations at the facility would not affect floodplains in the southern tip of the SNS site or downstream because no SNS cooling water would be discharged into Freund Brook.

Development in the floodplains of DuPage County is regulated by the *DuPage County Countywide Stormwater and Flood Plain Ordinance* (DuPage County Stormwater Management Committee and Environmental Concerns Department 1998). There is a question of the applicability of these regulations to DOE operations at ANL; however, because of the small area of floodplains involved and the minimal impacts that would be expected if ANL is selected for construction of the SNS, DOE expects to be in full compliance with these regulations.

7. CONCLUSIONS OF WETLANDS ASSESSMENT

DOE proposes to construct and operate an accelerator-based research facility called the Spallation Neutron Source (SNS). DOE has identified four siting alternatives for the proposed SNS. These are as follows:

- Oak Ridge National Laboratory (ORNL) Alternative, Oak Ridge, Tennessee
- Los Alamos National Laboratory (LANL) Alternative, Los Alamos, New Mexico
- Argonne National Laboratory (ANL) Alternative, Argonne, Illinois
- Brookhaven National Laboratory (BNL) Alternative, Upton, New York

Executive Order 11990, *Protection of Wetlands*, dated May 24, 1977, requires federal agencies to avoid, to the extent possible, adverse impacts associated with the destruction and modification of wetlands and to avoid direct and indirect support of wetlands development wherever there is a practicable alternative. In accordance with DOE's implementing regulations for EO 11990 (10 CFR 1022), the potential individual and cumulative effects of actions in wetlands on the proposed SNS sites were assessed for each of the proposed SNS sites.

The proposed action would impact wetlands at the ORNL and ANL sites. No wetlands were identified in the proposed SNS project sites at LANL or BNL.

Construction of the SNS will require the elimination of 0.23 and 3.5 acres (0.09 and 1.41 ha), of wetlands at the ORNL and ANL sites, respectively. The ORNL site direct impacts are associated with the upgrade of Chestnut Ridge Road. No wetlands are located in the facility footprint at the ORNL site. At the ANL site, the wetlands that will be eliminated are located in the footprint of the SNS facility.

Direct wetland impacts on the ORNL site will occur as a result of the upgrade of the existing Chestnut Ridge Road, which will be the main access road to the SNS facility, and utility lines that will be installed adjacent to the road. Important considerations in the alignment of the road upgrade were the requirements for the road grade to be less than 10%, and the maintenance of a buffer of at least 100 feet from White Oak Creek. Alternative alignments considered for the road upgrade included:

1. A route that would cross the hill on the east side of the existing road, curve back around to the north, and cross White Oak Creek some distance upstream from the existing crossing;

2. A second route that would also cross the hill on the east side of the existing road, but which would curve north almost immediately, crossing White Oak Creek just a few hundred feet upstream of the current crossing; and

3. A route that has a relatively limited deviation from the existing road alignment, but which crosses White Oak Creek at the same location as the existing road.

Alternatives 1 and 2 were rejected because they would involve clearing larger areas of forest than would otherwise be necessary, and would require a considerably longer distance, and thus cost, for road construction. In addition, alternative 2 would cross directly through the middle of the 2+ acre forested wetland and seep/spring area resulting in greater wetland impacts and possibly impacts to the hydrology of White Oak Creek. Alternative 3 minimizes impacts on wetland area and wetland functions, and reduces the amount of forest clearing, while meeting the road grade requirements. There will be direct impacts to 0.23 acres (0.09 ha) of wetlands which includes a small temporary wetland in an isolated manmade depression; a portion of an emergent wetland in a roadside spring run; and a small portion of a forested wetland next to the existing road.

On the ANL site, four alternative sites were evaluated for the SNS facility, one each in:

1. the 400 Area in the southwestern corner of the site;
2. the 800 Area in the northwestern corner of the site;
3. the 600 Area in the central area of the site; and
4. the East Area.

Because of the many streams and marshes on ANL land, alternative sites considered for the proposed SNS would occupy wetlands and streams similar or greater than that on the selected site. Alternative site 1 contained small ponds, marshes, and the headwaters of Freund Brook with associated wetlands. Alternative site 3 contained Freund Brook, a pond, and associated wetlands. Alternative site 4 contained Sawmill Creek and associated wetlands.

Direct wetland impacts have been minimized to the extent possible through the selection of alternative 2 because it avoids the two main streams on the Reservation and their associated wetlands. In comparison with the other alternative sites, the selected site does not contain either of the two primary streams on the ANL (Freund Brook and Sawmill Creek) and, thus, avoids impacts to the wetlands that are in the floodplains and riparian zones of these streams. The alternative 2 site also avoids impacts to any of the forested wetlands or wetlands with beaver colonies on the ANL site.

Indirect impacts during construction and operation, such as erosion, sedimentation, increased runoff, introduction of exotic species, and hydrologic alterations have the potential to affect additional wetland acreage on the ORNL and ANL sites. Indirect effects on wetlands will be avoided through implementation of proper construction techniques and other engineering controls designed to control stormwater runoff and water discharges during construction and operation. The distance between developed areas and wetlands will also be increased if possible to minimize the potential for hydrologic alterations and exotic species introductions.

In compliance with federal and state regulations protecting wetlands and Executive Order 11990, any unavoidable wetland impacts on the ANL and ORNL sites will be compensated through the restoration, creation, or enhancement of wetlands onsite or in the same watershed. The goals of creation, restoration, or enhancement will include the replacement or improvement of wetland functions. This will be achieved through careful site selection and site preparation to achieve the necessary hydrology, and modeling the wetland on high quality natural wetlands in the area. An additional goal of creation or restoration will be to ensure that the wetland has a connection to, or is not above some minimum distance from, other habitats and wetlands. This connectivity and proximity to other wetlands has been found to be important for maintaining regional wetland biodiversity in at least one important group of vertebrates, amphibians, and suggested to likely be important for other taxa including plants, microcrustaceans, and insects that use small wetlands (Semlitsch and Bodie 1998).

The preferred site for the proposed SNS at ANL, called the 800 Area, is situated in the northwestern portion of the reservation. Because of the many streams and marshes within the ANL reservation, alternative sites considered for the proposed SNS would occupy similar or larger wetlands areas.

8. FLOODPLAINS STATEMENT OF FINDINGS

This Floodplains Statement of Findings for Construction and Operation of the Spallation Neutron Source (SNS) was prepared in accordance with 10 CFR 1022. A notice of Floodplain and Wetlands Involvement was published in the *Federal Register* (63 FR 59292, November 3, 1998) and a Floodplain and Wetlands Assessment was incorporated into the Final Environmental Impact Statement.

The U.S. Department of Energy (DOE) proposes to construct and operate the SNS. The proposed SNS facility would consist of a proton accelerator system; spallation target; and appropriate experimental areas, laboratories, offices, and support facilities to allow ongoing and expanded programs of neutron research. DOE has identified four alternative sites for this project: Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee (the preferred alternative); Argonne National Laboratory (ANL), Argonne, Illinois; Los Alamos National Laboratory (LANL), Los Alamos, New Mexico; and Brookhaven National Laboratory (BNL), Upton, New York.

Two areas of the proposed SNS site at ANL lie within 100-year floodplains, and the proposed action would impact small portions of these floodplains. This action is proposed in these floodplain areas because there are no other potential sites at ANL that do not involve floodplains. No floodplains were identified on the proposed SNS project sites at ORNL, LANL, or BNL.

DOE evaluated the following four alternative locations for construction of the SNS at ANL (See Appendix B, Reports on the Selection of Alternative Sites for the SNS):

1. The 400 Area in the southwestern corner of the site
2. The 800 Area in the northwestern corner of the site
3. The 600 Area in the central area of the site
4. The East Area

The land within ANL contains many streams and marshes, and all four alternative sites considered for the proposed SNS involve floodplain encroachment. The 400 Area contains small ponds, marshes, and the headwaters of Freund Brook with associated wetlands. The 600 Area contains Freund Brook, a pond, and associated wetlands. The East Area contains Sawmill Creek and associated wetlands. The selection of the 800 Area site minimizes the potential impacts to floodplains because it avoids the two main streams on ANL land and their associated wetlands. In comparison with the other alternative sites, the selected site contains neither of the two

primary streams on ANL (Freund Brook and Sawmill Creek) and, thus, avoids impacts to the associated floodplains.

At the proposed SNS site, the eastern edge of the SNS footprint overlies a portion of the 100-yr floodplain of an unnamed tributary to Sawmill Creek. This tributary originates in the 800 Area, connecting to Sawmill Creek north of ANL. In addition, the southern tip of the footprint overlies a portion of the 100-year floodplain of an unnamed tributary to Freund Brook. This tributary originates within the footprint of the proposed SNS and flows southeast to Freund Brook. Its confluence with Freund Brook is outside the footprint of the proposed SNS. The locations of these floodplain areas are shown in Figure 6-1.

Along the unnamed tributary of Sawmill Creek, construction of the proposed SNS would include filling and stabilizing those portions of the floodplains that are required for buildings and related structures. Hence, placement of the proposed SNS facility in the 800 Area location would require an alteration of drainage patterns and construction of storm drains and canals to direct storm flow to the retention basin. There are no high hazard areas, as defined in 10 CFR 1022, within this area of the proposed project. The affected areas are within the ANL boundaries. No private homes or commercial property would be impacted by flooding. If the ANL site is selected for construction of the SNS, the drainage pattern of the 800 Area would be altered. The potential impacts from this would be minimized by standard construction practices, including optimizing the placement of buildings to avoid the floodplain and the location of the retention basin. The retention basin would be sized to contain a 100-year flood and would serve to control runoff to this tributary and to replace lost capacity to control floodwater due to disruption of the floodplain. Because of the relatively small area of the 100-year floodplain, estimated to be approximately 5 acres (2 ha), that would be affected by construction, compared to the total drainage area of the watershed, and the inclusion of the retention basin to control runoff from the site, no downstream effects on floodplains are predicted from construction of the proposed SNS facility.

During operation of the SNS, 0.36 to 0.5 million gallons of discharge water per day, primarily from the cooling tower, would be discharged to the unnamed tributary of Sawmill Creek. All discharges from the SNS would be directed to the retention basin, thus normalizing the discharge of cooling tower blowdown water and runoff.

Along the unnamed tributary of Freund Brook, construction of the proposed SNS would include filling and stabilizing those portions of the floodplains that are required for buildings and related structures. It would also require an alteration of drainage patterns and construction of storm drains and canals to redirect stormwater flow to Freund Brook. The potential impacts of this

would be minimized by standard construction practices, including optimizing the placement of buildings to avoid the floodplain. No high hazard areas are located within this area of the proposed project. Because the affected areas are within the ANL boundaries, no private homes or commercial property would be impacted by flooding. Less than 1 acre (0.40 ha) of the 100-year floodplain would be affected by construction. Because of its small size compared to the total drainage of the Freund Brook watershed and the early incorporation of drainage features during construction, no downstream effects on floodplains are expected from construction of the proposed SNS facility. Operations at the facility would not affect floodplains in the southern tip of the SNS site or downstream because no SNS cooling water would be discharged into Freund Brook.

Development in the floodplains of DuPage County is regulated by the *DuPage County Countywide Stormwater and Flood Plain Ordinance* (DuPage County Stormwater Management Committee and Environmental Concerns Department 1998). There is a question of the applicability of these regulations to DOE operations at ANL; however, because of the small area of floodplains involved and the minimal impacts that would be expected if ANL is selected for construction of the SNS, DOE expects to be in full compliance with these regulations.

9. REFERENCES

1. Awl, D.J., L.R. Pounds, B.A. Rosensteel, A.L. King, and P.A. Hamlett. 1996. *Survey of Protected Vascular Plants on the Oak Ridge Reservation, Oak Ridge, Tennessee,* ES/ER/TM-194, Environmental Restoration Division, Oak Ridge, Tennessee.

2. DuPage County Stormwater Management Committee and Environmental Concerns Department. 1998. *DuPage County Countywide Stormwater and Flood Plain Ordinance*. County of DuPage, Wheaton, Illinois.

3. Eisenbies, M.H., May 1996. *The Hydrologic Characterization of Three Forested Headwater Riparian Wetlands in East Tennessee*. M.S. Thesis, University of Tennessee, Knoxville, Tennessee.

4. Loucks, O.L., 1990. *Restoration of the Pulse Control Function of Wetlands and its Relationship to Water Quality Objectives*. In Wetland Creation and Restoration: The Status of the Science, J.A. Kusler and M.E. Kentula, Eds., Island Press, 1990.

5. Ludwig, D. February 19, 1999. *Personal communication with B. Rosensteel (Enterprise Advisory Services, Inc.)* regarding Glen Nature Preserve. Forest Preserve District of DuPage County, IL.

6. Mitchell, J.M., E.R. Vail, J.W. Webb, A.L. King, and P.A. Hamlett. 1996. *Survey of Protected Terrestrial Vertebrates on the Oak Ridge Reservation*. ES/ER/TM-188. US DOE, Oak Ridge, Tennessee.

7. Reed, P.B. 1988. National List of Plant Species That Occur in Wetlands. USFWS Biological Report NERC-88/18.42. U.S. Fish and Wildlife Service, Washington, D.C.

8. Rosensteel, B.A. and C.C. Trettin. 1993. *Identification and Characterization of Wetlands in the Bear Creek Watershed*. Y/TS-1016 ORNL Environmental Sciences Div., Oak Ridge, Tennessee.

9. Rosensteel, B.A. and D.J. Awl. 1995. *Wetland Survey of Selected Areas in the K-25 Site Area of Responsibility*. ORNL/TM-13033. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

10. Rosensteel, B.A. 1996. *Wetland Survey of the X-10 Bethel Valley and Melton Valley Groundwater Operable Units at Oak Ridge National Laboratory, Oak Ridge, Tennessee*. ORNL/ER-350 ORNL Environmental Sciences Div., Oak Ridge, Tennessee.

11. Rosensteel, B.A. 1997. *Wetland Survey of Selected Areas in the Oak Ridge Y-12 Plant Area of Responsibility, Oak Ridge, Tennessee*. Y/ER-279. Lockheed Martin Energy Systems Environmental Restoration Program, Oak Ridge, Tennessee.

12. Semlitsch, R. D. and J. R. Bodie. October 1998. *Are Small, Isolated Wetlands Expendable?* Conservation Biology 12(5): pp. 1-5.

13. Smith, R.D. 1994. *Hydrogeomorphic Approach to Assessing Wetland Functions Developed Under Corp's Research Program*. The Wetlands Research Program Bulletin, Vol. 4, No. 3. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

14. U.S. Army Corps of Engineers. 1987. Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.

15. U.S. Department of Energy (DOE). 1996. Mitigation Action Plan. Lease of Parcel ED-1 of the Oak Ridge Reservation by the East Tennessee Economic Council. U.S. DOE Oak Ridge Operations, Oak Ridge, TN.

16. U.S. Department of Energy (DOE). 1998a. *Feasibility Study for the Melton Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Vol I.* DOE/OR/01-1629/V1&02. Oak Ridge, Tennessee.

17. U.S. Department of Energy (DOE). 1998b. *Feasibility Study for the Melton Valley Watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Vol II.* DOE/OR/01-1629/V2&D2. Oak Ridge, Tennessee.

18. U.S. Department of Energy (DOE). 1998c. Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1990 Waste. DOE/OR/02-1637&D2. Oak Ridge, Tennessee.

This page intentionally left blank.