Greg Gibson
Vice President, Regulatory Affairs

750 East Pratt Street, Suite 1600
Baltimore, Maryland 21202

UniStar
NUCLEAR ENERGY

December 8, 2009

UN#09-503

Amanda Sigillito, Chief
Non-Tidal Wetlands and Waterways Division
Maryland Department of the Environment
Water Management Administration
1800 Washington Boulevard
Baltimore, Maryland 21230

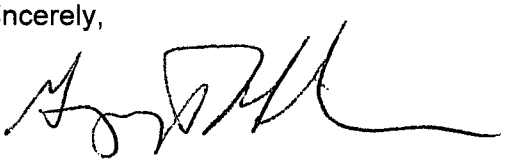
Kathy Anderson, Biologist
U.S. Army Corps of Engineers – Baltimore District
10 S. Howard Street
Baltimore, Maryland 21201

Subject: Conceptual Phase II Non-Tidal Wetland and Stream Mitigation Plan for Calvert Cliffs Nuclear Power Plant, Unit 3 in Calvert County, Maryland, MDE Project Number 08-WL-1462 (T), 09-NT-0191 (NT), USACE Tracking No. NAB-2007-08123-M05

Enclosed for review and approval, please find the Conceptual Phase II Non-Tidal Wetland and Stream Mitigation Plan dated December 2009, for the proposed Calvert Cliffs Nuclear Power Plant, Unit 3 in Calvert County, Maryland.

If you have any questions concerning the attached document, please call Mr. Dimitri Lutchenkov at (410) 470-5524.

Sincerely,



Greg Gibson

Enclosure – Conceptual Phase II Non-Tidal Wetland and Stream Mitigation Plan for the Calvert Cliffs Nuclear Power Plant, Unit 3, Calvert County, Maryland, December 2009

cc: Laura Quinn – NRC Project Manager, Environmental Projects Branch 2 (w/enclosure)
Susan Gray – Power Plant Research Program (w/enclosure)

GTG/KAB/mdf

UN#09-503

Enclosure

Conceptual Phase II Non-Tidal Wetland and Stream Mitigation Plan
for the
Calvert Cliffs Nuclear Power Plant, Unit 3
Calvert County, Maryland
December 2009

Calvert Cliffs Nuclear Power Plant, Unit 3
Conceptual Phase II Nontidal Wetland and Stream Mitigation Plan
Lusby, Maryland

Prepared for:
UniStar Nuclear Energy
Baltimore, Maryland

Prepared by:
EA Engineering, Science, and Technology
15 Loveton Circle
Sparks, Maryland 21152

December 2009

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LIST OF ACRONYMS AND ABBREVIATIONS

EA	EA Engineering, Science, and Technology, Inc.
EPA	Environmental Protection Agency
CCNPP	Calvert Cliffs Nuclear Power Plant
COMAR	Code of Maryland Regulations
FGM	Fluvial Geomorphic
FIDS	Forest Interior Dwelling Species
IMTF	Interagency Mitigation Task Force
JPA	Joint Permit Application
MBSS	Maryland Biological Stream Survey
MDE	Maryland Department of the Environment
NRC	Nuclear Regulatory Commission
ORAM	Ohio Rapid Assessment Method
RBP	Rapid Bioassessment Protocols
RGL	Regulatory Guidance Letter
RSC	Regenerative Stormwater Conveyance
SE	Stream Enhancement
SR	Stream Restoration
SWM	Stormwater Management
UniStar	UniStar Nuclear Energy
USACE	U.S. Army Corps of Engineers
WC	Wetland Creation
WE	Wetland Enhancement

1.0 EXECUTIVE SUMMARY

EA Engineering, Science, and Technology, Inc. (EA) has been retained by UniStar Nuclear Energy (UniStar) to develop the Phase II Final Mitigation Plan for wetland and stream impacts associated with the construction of a new nuclear power plant (Unit 3) at the project site known as the Calvert Cliffs Nuclear Power Plant (CCNPP). EA has prepared this Conceptual Phase II Mitigation Plan to present the conceptual design for the stream and wetland mitigation sites for review and comment. This Phase II Mitigation Plan has been developed from the Phase I Mitigation Plan (MACTEC, 2009) which was approved by the United States Army Corps of Engineers (USACE) on July 30, 2009 and the Maryland Department of the Environment (MDE) on March 30, 2009. Future submittals will incorporate comments from the agencies and will include more design detail. The final design will include sufficient detail to obtain construction bids and construct the project.

The Conceptual Phase II Mitigation Plan documents the existing baseline conditions, the anticipated impacts, the proposed mitigation treatments, and the primary maintenance, monitoring, and management plans associated with the mitigation areas and has been prepared in accordance with the Final Compensatory Mitigation Rule issued by the USACE and the Environmental Protection Agency (EPA), published April 10, 2008. Federal and state regulations require that the losses be compensated through mitigation for activities that cause unavoidable losses of wetlands and streams. Wetland and stream mitigation is defined as the creation, restoration, enhancement, or preservation of wetlands or streams, to compensate for the wetlands and streams that will be lost. This document provides supporting details for the wetland and stream mitigation plan proposed for the Unit 3 project at CCNPP.

The limit of disturbance for the construction of the CCNPP Unit 3 facility has been designed to avoid and minimize impacts to natural resources to the greatest extent practical while still meeting the project needs. However, the construction of the project would not be possible without permanently impacting Waters of the United States, including federally regulated wetlands and streams.

To determine the required compensatory mitigation for wetland impacts, USACE–Baltimore District was consulted to determine the appropriate mitigation strategies for the project. The mitigation strategy chosen for the CCNPP Unit 3 project is onsite, in-kind mitigation. During the development of the Phase II Mitigation Plan it was determined that the potential exists to obtain more mitigation credits on-site then is required for the proposed impacts. The impacts for the development of CCNPP require the mitigation of 11.72 acres of wetlands and 8,350 linear

feet of stream channels. However, the conceptual Phase II Mitigation Plan anticipates 14.32 acres of wetland credits and 12,226 linear feet of stream credits, creating a surplus of 2.60 acres of wetland credits and 3,876 linear feet of stream credits. UniStar Nuclear Energy has elected to include the additional mitigation areas into this Phase II Mitigation Plan in an effort to create a reserve of mitigation credits for potential future use for impacts that may arise for future projects on-site.

The overall goal of the Phase II Mitigation Plan is to replace functions and values lost due to proposed development. It is proposed that 1.6 acres of emergent and 12.37 acres of forested nontidal wetlands will be created, as well as 19.59 acres of forested wetland enhancement in order to obtain 14.32 acres of wetland credit. The creation and enhancement of nontidal wetlands are being proposed to enhance water quality and habitat, as well as provide functional replacement for impacted wetlands. Stream mitigation credits will be achieved through restoration, enhancement, and preservation techniques with the goal of protecting and improving aquatic resource functions and returning natural/historic functions to a former or degraded aquatic resources. The Phase II Mitigation Plan includes 9,688 linear feet of stream restoration and 2,538 linear feet of stream preservation in order to obtain the required stream mitigation credits. Furthermore, the Phase II Mitigation plan is also designed to reduce secondary impacts from the proposed development and reduce impacts to the American eel populations on-site.

The proposed wetland creation and enhancement areas will be planted with native hydrophytic vegetation after excavation and the establishment of bottom elevations. The plant material will predominantly be representative of the species composition of the wetlands within the CCNPP property and native to the region. In addition, the plant material will include species that have been identified as suitable for installation on wetland mitigation projects by the Chesapeake Bay Critical Area Commission.

Dense stands of phragmites have been observed in the sediment basins of the Lake Davies Disposal Area, Johns Creek, and other forested wetland areas on the CCNPP Unit 3 site. The control of phragmites through herbicide application, mowing practices, and flooding of the sediment basins is proposed under the compensatory mitigation plan for the wetland creation and enhancement areas presently containing the invasive species. Reducing phragmites populations will replace the existing sterile environment with a more diverse community through the planting of more desirable plant species.

Stream mitigation work is designed to meet the goals and objectives of this Phase II Final Mitigation Plan in accordance with the guidance of regulating entities. In-channel work will be

performed in intermittent channels during periods of little or no base flow, and work will be performed in accordance with an approved Erosion and Sediment Control Plan. The Phase II Mitigation Plan proposes to utilize restoration and preservation techniques to meet the mitigation objectives and goals. Restoration practices throughout the project include Priority 1 restoration by introducing flow into abandoned floodplain channels, planting of riparian wetland species throughout the stream reaches, and the placement of log and root structures in an effort to raise groundwater elevations in some reaches. A similar technique to Regenerative Stormwater Conveyance (RSC) will be utilized in some stream restoration reaches. RSC is an infiltration practice that uses a series of open channel, sand seepage step pools and riffle weirs, through which stormwater flows are conveyed. The purpose of these systems is to reduce the commonly seen erosion in ordinary stormwater conveyances and convert stormwater to groundwater, mitigating nutrient pollution and thermal impacts to the receiving waters. This approach is similar to a Priority 1 stream restoration, which replaces an incised channel with a re-dimensioned channel at a higher elevation. Priority 1 restoration techniques are employed in this restoration plan, usually in re-establishing flow in an abandoned floodplain channel which meets the pattern and dimension criteria appropriate for the reach.

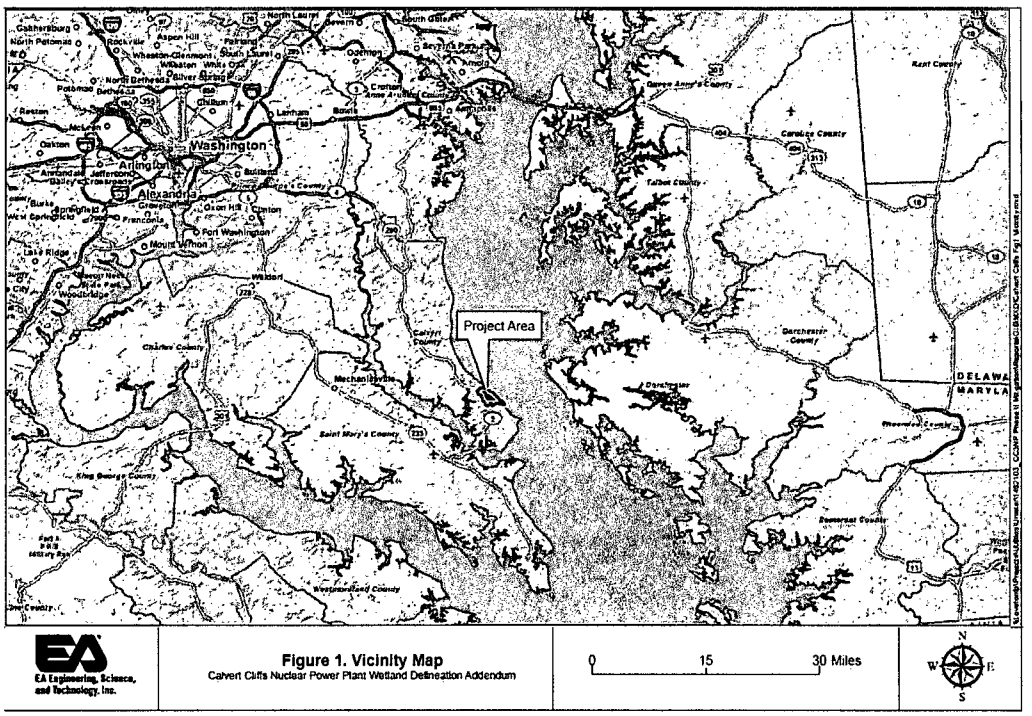
The Phase II Mitigation Plan includes the creation and enhancement of nontidal wetlands, as well as the restoration, enhancement, and preservation of nontidal stream channels. The compensatory mitigation is proposed to be onsite and shall be protected in perpetuity through the use of a Conservation Easement or a Declaration of Restrictions.

After the onsite wetland creation and enhancement activities are complete, a 5-year annual monitoring program will be implemented in accordance with the *Maryland Compensatory Mitigation Guidance* (IMTF, 1994), and the guidance provided in RGL No. 08-03 (USACE, October 2008). Performance standards for the wetland mitigation monitoring program will be conducted in accordance with the MDE guidelines and with consideration of other permitting agencies as mandated by the State of Maryland.

Monitoring of the stream channels proposed within the mitigation plan will be performed in an effort to compare post-construction conditions and pre-construction baseline data, for the purpose of assessing the success of the mitigation in relation to the mitigation goals, and determine the degree of success the mitigation project has achieved in meeting the objectives of providing proper channel function and increased habitat quality. Success criteria will be gathered annually to document the success of the proposed mitigation. At present, a monitoring period of 5 years is expected. Monitoring reports will be submitted in accordance with the wetland mitigation monitoring requirements.

2.0 INTRODUCTION

UniStar Nuclear Energy (UniStar) is considering construction of a new nuclear power plant (Unit 3) at the project site known as the Calvert Cliffs Nuclear Power Plant (CCNPP), located in the Lusby area of Calvert County, Maryland, along the shoreline of the Chesapeake Bay, about 45 miles southeast of Washington D.C (Figure 1). CCNPP is being proposed for expansion to provide additional energy service to meet the growing regional demand. A joint permit application and proposal for onsite mitigation of wetlands and streams has previously been submitted. EA Engineering, Science, and Technology, Inc. (EA) has been retained to develop the Phase II Final Mitigation Plan in accordance with the Final Compensatory Mitigation Rule issued by the U.S. Army Corps of Engineers (USACE) and the Environmental Protection Agency (EPA), published April 10, 2008.



EA Engineering, Science, and Technology, Inc.

Figure 1. Vicinity Map
Calvert Cliffs Nuclear Power Plant Wetland Delineation Addendum

Federal and state regulations require that the losses be compensated through mitigation for activities that cause unavoidable losses of wetlands and streams. Wetland and stream mitigation is defined as the creation, restoration, enhancement, or preservation of wetlands or streams, to compensate for the wetlands and streams that will be lost. This document provides supporting details for the wetland and stream mitigation plan proposed for the Unit 3 project at CCNPP.

EA has prepared this Conceptual Phase II Mitigation Plan to present the conceptual design for the stream and wetland mitigation sites for review and comment. This Phase II Mitigation Plan has been developed from the Phase I Mitigation Plan (MACTEC, 2009), which was approved by the USACE on July 30, 2009 and the Maryland Department of the Environment (MDE) on March 30, 2009. Future submittals will incorporate comments from the agencies and will include more design detail. The final design will include sufficient detail to obtain construction bids and construct the project.

The Conceptual Phase II Mitigation Plan documents the existing baseline conditions, the anticipated impacts, the proposed mitigation treatments, and the primary maintenance, monitoring, and management plans associated with the mitigation areas. The Final Phase II Mitigation Plan will be prepared in accordance with the *Maryland Compensatory Mitigation Guidance* (Interagency Mitigation Task Force [IMTF], 1994) and the USACE Regulatory Guidance Letter (RGL) No. 08-03, dated October 10, 2008.

3.0 BASELINE INFORMATION FOR DEVELOPMENT AREA/IMPACTS

Jurisdictional wetlands and streams will be permanently impacted as a result of constructing the proposed Unit 3 project. The limit of disturbance for the construction of the CCNPP Unit 3 facility has been designed to avoid and minimize impacts to natural resources to the greatest extent practical while still meeting the project needs. However, the construction of the project would not be possible without permanently impacting Waters of the United States, including federally regulated wetlands. The previously submitted permit application for the project proposes 8,350 linear feet of stream impacts and impacts to 11.72 acres of jurisdictional wetlands and open water ponds. A comprehensive description of the impact sites has been provided in the previously submitted wetland delineation report dated May 2007 and the Joint Permit Application (JPA) submitted on May 16, 2008.

3.1 Nontidal Wetlands Proposed for Impact

The wetland areas to be impacted by the construction of Unit 3 include forested and emergent nontidal wetlands as well as open water ponds and are detailed in Table 1 below.

Table 1
Nontidal Wetland Impacts

Wetland Type	Area of Impact	Impact Type
Forested Wetland	7.88 acres	Permanent Grading/Fill
Emergent Wetland	1.21 acres	Permanent Grading/Fill
Open Water	2.63 acres	Permanent Grading/Fill
Total Area of Permanent Impacts = 11.72 acres		

Common functions of the impacted wetlands were previously determined to be groundwater recharge, groundwater discharge, flood flow alteration, sediment/shoreline stabilization, sediment/toxicant retention, nutrient removal/transformation, production export, aquatic diversity/abundance, and wildlife habitat diversity/abundance. Common values were also determined to be recreation, uniqueness/heritage, education/scientific value, and visual quality/aesthetics. The Ohio Rapid Assessment Method (ORAM), as outlined in the *Ohio Rapid Assessment Method for Wetlands* (Mack, 2001) was used to quantify the functions and values of wetland communities on the CCNPP Unit 3 project site to determine the appropriate level of mitigation. The areas assessed not only consisted of the wetlands that would be impacted by the proposed development but included the wetlands not being impacted, in order to determine the viability of mitigation sites. A majority of the wetland systems proposed for impacts appear to be degraded and exhibited moderate functions and values. The detailed results of the wetland evaluation have been included in Section 5.0 of the *Supplemental Environmental Resource Report*, which was previously submitted with the joint permit application.

3.2 Stream Channels Proposed for Impact

Approximately 8,350 linear feet of jurisdictional (perennial and intermittent) stream channels were identified within the proposed limit of disturbance on the CCNPP Unit 3 project site which will be impacted as described in Table 2 below. The stream identification numbers listed in Table 2 correspond to the USACE identification system used during the Jurisdictional Determination site inspection and documented in the Phase I Mitigation Plan (MACTEC, 2009).

Table 2
Stream Impact Summary

Stream Reach Identification	Impact Length (linear feet)
RA-I-A	729
RA-IVC-A	1,595
RA-IVN-A	102
RA-IVN-B	2,943
RA-IVN-C	555
RA-IVN-D	1,342
RA-VIIN-A	521
RA-VIIS-A	563
Total Impact Length = 8,350 linear feet	

An onsite evaluation of the stream channels using the Rapid Bioassessment Protocols (U.S. EPA, 1999) was conducted as well as a benthic macro-invertebrate assessment using the Maryland Biological Stream Survey (MBSS) guidelines (Kazyak, 2001). Most of the stream reaches proposed for impact received scores of suboptimal, as based on the Rapid Bioassessment Protocols (RBP). Detailed results from these stream assessments were provided in Section 6.0 of the *Supplemental Environmental Resource Report*, which was included in the previously submitted joint permit application.

As part of the Phase II Mitigation Plan, EA has calculated the anticipated temporary impacts to wetlands and stream channels that will be impacted during the mitigation construction activities. In addition to the permanent impacts to 11.72 acres of wetlands and 8,350 linear feet of stream channels, the mitigation activities are anticipated to temporarily impact no more than 1.75 acres of wetlands and 590 linear feet of stream channels. These impacts associated with the mitigation activity are temporary and will be removed upon completion of the mitigation construction. The anticipated temporary impacts are proposed for construction access, temporary crossings, and other activities associated with ongoing construction activities. Fill material placed within the streams and wetlands will be removed and restored to original grade upon completion of the mitigation activities and re-planted with appropriate hardwood vegetation. Mitigation construction laydown areas are proposed be placed outside of the wetland and stream limits. A detailed set of plans, including the proposed limit of disturbance (LOD) will be included in the Sediment and Erosion Control Plans, to be submitted with the Final Phase II Mitigation Plan.

4.0 MITIGATION CREDIT ACCOUNTING

The limit of disturbance for the construction of the CCNPP Unit 3 facility has been designed to avoid and minimize impacts to natural resources to the greatest extent practical while still meeting the project needs. However, the construction of the project would not be possible without permanently impacting Waters of the United States, including federally regulated wetlands and streams.

To determine the required compensatory mitigation for wetland impacts, USACE–Baltimore District was consulted to determine the appropriate mitigation strategies for the project. The mitigation strategy chosen for the CCNPP Unit 3 project is onsite, in-kind mitigation. Therefore, no purchasing of mitigation bank credits is proposed to satisfy compensatory mitigation requirements. The Phase I Mitigation Plan (MACTEC, 2009) was underway prior to issuance of the Final Compensatory Mitigation Rule issued by USACE and EPA and it was determined that there were no approved, State of Maryland, wetland/stream mitigation banks within the service area.

4.1 Nontidal Wetland Mitigation

To meet a "no net loss" goal of nontidal wetland mitigation, the 11.72 acres of nontidal wetland impacts caused by the construction of the proposed project must be mitigated by creating, restoring, or enhancing an equal area of nontidal wetlands. The Phase II Mitigation Plan for the Calvert Cliffs Unit 3 project includes the creation of new wetland areas onsite as well as enhancing existing wetlands. The wetland creation areas will include creation of both forested and emergent wetlands. A portion of open water creation is also proposed in order to replace functions and values lost from the impacted areas, as well as create a wetland mosaic within the mitigation area. The Phase I Mitigation Plan for the project had been approved by USACE and the Maryland Department of the Environment (MDE) prior to design of the Phase II Mitigation Plan. The following wetland mitigation ratios have been approved within the Phase I Mitigation Plan:

- Forested Wetland Creation = 2:1 ratio
- Wetland Enhancement = 3:1 ratio
- Emergent Wetland Creation = 1:1 ratio

Wetland enhancement will consist of the removal and control of common reed (*Phragmites australis*, commonly referred to as phragmites), along with planting of native bottomland

hardwood species within existing wetlands. It has been determined through the Phase I Mitigation Plan approval that this technique will yield mitigation credits at a 3:1 ratio. A summary of wetland mitigation credits is described below in Table 3.

Table 3
Wetland Mitigation Credit Summary

Mitigation Type	Mitigation Amount (acres)	Mitigation Ratio	Mitigation Credit (acres)
Forested Creation	12.37	2:1	6.19
Emergent Creation	1.61	1:1	1.61
Forested Enhancement	19.59	3:1	6.53
		Total Credit Amount = 14.33 acres	

4.2 Stream Mitigation

As previously stated, the construction of the project would not be possible without permanently impacting 8,350 linear feet of jurisdictional stream. As stated in the approved Phase I Mitigation Plan, the amount of stream mitigation proposed is based on a mitigation ratio of 1:1 for linear feet of stream impacts. Therefore, the Phase II Mitigation Plan includes greater than the required 8,350 linear feet of stream mitigation credits through restoration and preservation techniques as described in Table 4 below.

Table 4
Stream Mitigation Credit Summary

Mitigation Type	Mitigation Amount (linear feet)	Mitigation Ratio	Mitigation Credit (linear feet)
Stream Restoration	9,141	1:1	9,688
Stream Preservation	2,885	1:1	2,538
		Total Credit Amount = 12,226 linear feet	

Restoration

The mitigation proposed for the project consists of restoration of aquatic resources through the manipulation of the physical, chemical, or biological characteristics of resources with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in aquatic resource area, restoration is divided into two categories: re-establishment and rehabilitation. Re-establishment results in rebuilding a former aquatic

resource and results in a gain in aquatic resource area and functions. Rehabilitation has the goal of repairing natural/historic functions to a degraded aquatic resource. Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Preservation

Preservation will minimize the threat to, or prevent the decline of, aquatic resources by future actions. This includes the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Several preservation strategies will be employed in the mitigation design. Upland practices will be implemented to minimize changes to the stormwater runoff hydrograph due to impervious area in the watershed. Impervious area can cause excessive runoff, limit infiltration, and can cause erosive flow at greater frequency and magnitude, thus destabilizing existing stream channels. Deed restrictions may also be utilized as protection mechanisms for preservation of the aquatic resources.

Enhancement

Stream Enhancement is defined by manipulating the physical, chemical, or biological characteristics of the aquatic resources to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement strategies proposed in the Phase II Mitigation Plan were coupled with restoration practices onsite and therefore, were not counted as a standalone practice. Enhancement practices include the addition of vegetation to floodplain and riparian areas, as well as invasive species removal and other management practices.

The Final Mitigation Rule that has been adopted by USACE states that enhancement differs from restoration, rehabilitation, and re-establishment because the objective of enhancement is usually to improve one or two functions, which may result in a decrease in the performance of other functions. Increasing those particular functions does not change the amount of area occupied by the aquatic resource. In contrast, re-establishment and rehabilitation (which are forms of restoration) are intended to return most, if not all, natural and/or historic functions to a former or degraded aquatic resource. If a compensatory mitigation activity results in an increase in aquatic resource area, in addition to increases in one or more aquatic resource functions, then it is appropriately classified as restoration.

4.3 Additional Mitigation Credit Reserve

During the development of the Phase II Mitigation Plan it was determined that the potential exists to obtain more mitigation credits on-site then is required for the proposed impacts. The impacts for the development of CCNPP require the mitigation of 11.72 acres of wetlands and

8,350 linear feet of stream channels. However, the conceptual Phase II Mitigation Plan anticipates 14.32 acres of wetland credits and 12,226 linear feet of stream credits, creating a surplus of 2.60 acres of wetland credits and 3,876 linear feet of stream credits.

UniStar Nuclear Energy has elected to include the additional mitigation areas into this Phase II Mitigation Plan in an effort to create a reserve of mitigation credits for potential future use for impacts that may arise for future projects on-site. The reserve of mitigation credits would not be sold or transferred to any project located off-site. The purpose of this proposed reserve is to provide compensatory mitigation for future unavoidable impacts to Waters of the United States, including nontidal wetlands that result from activities authorized under Section 404 of the Clean Water Act and the Maryland Nontidal Wetlands Protection Act, provided such use has met all applicable requirements and is authorized by the appropriate authority(s). The credit reserve would be used to comply with the special condition mitigation requirements of permitted projects by providing in-kind compensation for authorized wetlands losses and may only be used for future projects after all appropriate and practical steps to avoid and minimize adverse impacts to aquatic resources, including nontidal wetlands and streams have been taken.

The mitigation credit reserve does not provide ultimate Federal and/or State authorization for specific future projects impacting Waters of the United States, exclude such future projects from any applicable statutory or regulatory requirements, or preauthorize the use of credits from the reserve for any particular project.

5.0 MITIGATION GOALS AND OBJECTIVES

As part of the planning process for proposed Unit 3 and associated facilities, steps were taken to ensure avoidance and minimization of impacts to Wetland and Stream resources to the maximum extent practicable. A detailed description of the Avoidance and Minimization procedure has been included in the JPA (Section 4-F) as well as within Section 6.0 of the previously submitted *Supplemental Environmental Resource Report*. However, due to numerous safety, operational, and engineering requirements and restraints, the anticipated development would result in unavoidable permanent impacts to wetlands and stream resources.

5.1 Aquatic Resource Functions

The overall goal of the Phase II Mitigation Plan is to replace functions and values lost due to proposed development. The wetland and stream impacts on the CCNPP Unit 3 site occur within the same hydrologic units as the proposed wetland enhancement and creation areas and the

stream enhancement and restoration areas; i.e., the Patuxent River Lower and West Chesapeake Bay hydrologic units. The geographic relationship between the areas of nontidal wetland and stream losses and the proposed mitigation sites provide an opportunity to mitigate impacts at an upper watershed level. The watershed approach used in the design of the compensatory mitigation plan for CCNPP Unit 3 is consistent with the ongoing natural resource management activities that have been conducted at CCNPP over the years. The mitigation activities are also compatible with comprehensive watershed management plans for CCNPP.

Based on the above mitigation credit summaries, 11.72 acre-credits would be required to compensate for the unavoidable nontidal wetland impacts and 8,350 linear feet of stream mitigation credits for impacts associated with the proposed project. It is proposed that 1.6 acres of emergent and 12.37 acres of forested nontidal wetlands will be created, as well as 19.59 acres of forested wetland enhancement in order to obtain 14.32 credits for the required wetland mitigation. The creation and enhancement of nontidal wetlands are being proposed to enhance water quality and habitat, as well as provide functional replacement for impacted wetlands.

The 8,350 linear feet of stream mitigation credits will be achieved through restoration, enhancement, and preservation techniques with the goal of protecting and improving aquatic resource functions and returning natural/historic functions to a former or degraded aquatic resources. Similarly, through the establishment of headwater wetland and infiltration practices in head-cut and upland situations, restoration of historical channel functions, historical groundwater elevations, and increases in base flow will be achieved. The Phase II Mitigation Plan includes 9,688 linear feet of stream restoration and 2,538 linear feet of stream preservation in order to obtain the required stream mitigation credits.

5.2 Prevention of Secondary Impacts

The proposed Phase II Mitigation Plan has been designed to account for proposed development and stormwater discharges in order to minimize their potential impacts on the existing aquatic resources. This is accomplished through the utilization of energy dissipation structures, re-connection of the channel with the existing floodplain, and appropriate channel sizing. The addition of infiltration practices and planting of riparian trees and shrubs is intended to increase base flow propagation in the watershed as well as reduce the potential for thermal impacts from stormwater discharges.

The mitigation design has been created to utilize construction techniques with minimal impact to existing water resources as well as existing vegetation. The design is intended to work with

existing trees and shrubs to minimize canopy disturbance, and to utilize tree materials created through the clearing and grubbing phase of the construction of Unit 3.

Furthermore, the creation of headwater wetlands and infiltration practices are proposed to promote base flow, attenuate spikes in the hydrograph which may be erosive to stream channels, and compensate for existing and proposed impervious areas. These practices are proposed in order to have a successful mitigation outcome utilizing watershed approaches.

5.3 Reduce Impacts to the American Eel

The American eel has suffered extreme decline since colonization of America. The American eel is a catadromous species that begins its life by hatching from eggs in the Sargasso Sea, an area of the Atlantic Ocean north of the Bahamas. The eels then migrate to estuaries of the Atlantic Coast where they spend most of their lives before returning to the Sargasso Sea to spawn (Murdy et al. 1997). Historically, American eels were found throughout the East Coast streams, comprising more than 25 percent of the total fish biomass (ASFMC 2000). As development of the rivers began and eel harvesting increased, the American eel populations began to decline throughout its range. During the upstream migration from the Sargasso Sea to the tributaries and estuaries of the Atlantic Ocean, American eels are forced to go through many obstacles in order to successfully reach their nursery grounds. Therefore, eels are susceptible to a variety of habitat, overfishing, and parasitic pressures. Changes in water quality and obstacles to fish passage present the two largest obstacles to their success in eastern freshwater streams. Eels mature in these freshwater streams for between 10 and 40 years. Since they live in a limited home range, the habitat must not be ephemeral (Ford, 1986).

American eel habitat enhancement and preservation has been identified as a priority for this project. This habitat includes undercut banks, crevices, hollow and overhanging logs, and sheltered areas. These areas coincide with roots, leaf mat, and partially and fully submerged woody debris in the channel.

The Phase II Mitigation Plan includes preservation of stream reaches identified as having known eel populations or potential habitat, and enhancements in other reaches to create suitable eel habitat. Enhancement of stream reaches to provide potential habitat for the American eel include placement of woody debris in the channel, log overhead cover structures, and work to raise the groundwater elevation to enhance base flow in the channels. At present, many channels exhibit excellent woody debris and cover elements; however, they lack base flow. Through enhancing base flow, additional habitat can be created for American eel. In addition, many reaches have head-cuts with large drops that may present migration barriers for American eel during their

inland migration. These head cuts would be eliminated through creation of steps, or through other uplift techniques.

6.0 EXISTING CONDITIONS / BASELINE DATA

The subject property consists of approximately 2,070 acres located in the Lusby area of Calvert County, Maryland, along the shoreline of the Chesapeake Bay, about 45 miles southeast of Washington, D.C. The site is bound to the north and south by wooded land, to the east by the Chesapeake Bay, and to the west by Maryland State Highway 2/4. The proposed Unit 3 development is primarily sited on the southern portion of the subject property.

The current site conditions consist primarily of forested areas along the northern and southern portion of the site around the existing development. The topography of the site consists of gently rolling slopes within the center of the site and stream valleys with narrow floodplains, adjoined by steep side slopes located within the forested undeveloped portions of the site. The streams and wetlands on the site were identified as nontidal, as the steep shoreline cliffs prevent tidal influence from extending beyond the sandy beaches.

After reviewing the Phase I Mitigation Plan, EA conducted multiple site visits of the project site in order to verify the Phase I findings and collect additional data to support the Phase II design. EA conducted field reviews from August through October in order to; 1) complete the delineation of remaining streams and wetlands within the project area, 2) perform a detailed Fluvial Geomorphology Investigation of the proposed stream mitigation sites, 3) perform an assessment of the proposed wetland mitigation areas, and 4) conduct a Baseline Conditions Assessment of the existing streams.

6.1 Nontidal Wetland Mitigation Areas

Locations for potential wetland enhancement and wetland creation areas were identified within the approved Phase I Mitigation Plan (MACTEC, 2009). These areas were determined after field reviews conducted in 2007 and 2008, in which specific locations were identified as having ecological lift potential for wetland enhancement or as being suitable for the creation of wetland communities from upland landscape. The Phase I concept included the creation and enhancement within the Lake Davies Disposal Area sediment basins (WC-2 and WE-1), the portion of Johns Creek to the south of the sediment basins (WE-2), as well as an upland grassed field at the Camp Conoy area (WC-1). Refer to the attached drawings for detailed locations of each mitigation area.

However, after review of existing data and field reconnaissance conducted by EA, some revisions to the locations for wetland creation have been proposed. The following is a list of the proposed wetland creation and wetland enhancement areas proposed to meet the mitigation requirements.

- WC-1 – Creation of forested head water wetland system at the head of Woodland Branch, near the open field north of the old visitor center.
- WC-2 – The creation of a forested/emergent wetland system with open water habitat, within the middle manmade sediment basin of the Lake Davies Disposal Area.
- WE-1 – The enhancement of an existing wetland located within a smaller manmade, abandoned, sediment basin within the Lake Davies Disposal Area.
- WC-3 – The creation of two small forested wetland areas adjacent to WE-1.
- WE-2 – The enhancement of a portion of Johns Creek and a linear drainageway extension occurring to the south of the Lake Davies Disposal Area.
- WE-3 and WC-4 – The creation and enhancement of forested wetlands in the location of the old open water ponds located below Camp Conoy Pond.
- WE-4, WC-5, and WC-6 – The creation and enhancement of forested wetlands along Johns Creek, in the area of two proposed stormwater management (SWM) outfalls.

The Phase I Mitigation Plan (MACTEC, 2009) included a forested wetland creation area within an upland grassed field adjacent to the existing pond at Camp Conoy (previously WC-1). After review of the site conditions, and development layout, EA determined that this area may not be suitable for the previously proposed forested wetland. The area formerly proposed for WC-1 will be proposed for upland reforestation in order to close the canopy within the Critical Area and increase FIDS habitat.

Wetland Creation Area #1 (WC-1), Drawing S-4

Mitigation Site WC-1 is located at the head of Woodland Branch, near the open field north of the old visitor center. The majority of the proposed mitigation site exists within the forested area along Woodland Branch with a small portion extending into the existing open grass field. The uppermost portion of Woodland Branch is highly incised and degraded, with a large head-cut located at the origin of the stream. The current development onsite directs stomwater runoff from the adjacent impervious surface towards the stream channel and has contributed to the

identified degradation. The existing vegetation and the soil profile within the WC-1 site were examined during field reconnaissance. The forested portion of this mitigation site consists predominantly of red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), white oak (*Quercus alba*), American beech (*Fagus grandifolia*), and American holly (*Ilex opaca*). Meanwhile the nearby open grass field appears to be a warm seasonal grass meadow area that is maintained on a low level. The topography in this area drains down to Woodland Branch and receives runoff from the existing development.

Wetland Creation Area #2 (WC-2), Drawing W-1

Mitigation Site WC-2 is located within the middle sediment basin of the Lake Davies Disposal Area, which was created during the construction of the existing development. The basin is surrounded by earthen berms on all sides, with an outlet on the western side that drains to Goldstein Branch. During the site evaluation, EA observed a dense stand of common reed (*Phragmites australis*) which dominates the entire sediment basin. Native vegetation was observed around the outer perimeter of the basin and consisted of red maple, tulip poplar, and black willow (*Salix nigra*). The underlying soils were observed during the site evaluation to identify the presence of hydric soils. The upper layer of the underlying soils appears to consist of material and sediment from the dredge spoils which have formed a dense clay layer containing an abundance of phragmites rhizomes. Below the dense clay layer, EA identified hydric soils with the presence of saturation, oxidized root channels and extensive mottling.

Wetland Enhancement Area #1 (WE-1), Drawing W-1

Mitigation Site WE-1 is located within the lower basin of the Lake Davies Disposal Area, which is also surrounded by large earthen berms on all sides. This lower basin contains two drains located on the southern end, which appear to drain the basin and convey flow to the lower drainageway located to the south (WE-2). Similar to WC-2, this basin is dominated by phragmites with native vegetation along the perimeter. A small pocket of native vegetation was also observed within the center of the basin. Dominant native vegetation within this mitigation area consists of red maple, black willow, tulip poplar, and small spike false nettle (*Boehmeria cylindrica*). The underlying soils were observed during the site evaluation to identify the presence of hydric soils. The soils within this basin were similar to the soils observed at WC-2, in which the upper layer contained a dense clay layer containing an abundance of phragmites rhizomes. Below the dense clay layer, EA identified hydric soils with the presence of saturation, oxidized root channels and extensive mottling.

Wetland Creation Area #3 (WC-3), Drawing W-1

Mitigation Site WC-3 consists of two small topographic low areas adjacent to the lower basin of the Lake Davies Disposal Area (WE-1). These two areas are currently not identified as existing wetlands as they lack the presence of wetland hydrology. Dominant native vegetation within these creation areas consist of red maple, sweetgum (*Liquidambar styraciflua*), and tulip poplar, with some phragmites extending into these areas. The soils within the two creation areas were similar to the soils observed at WE-1. However, the dense clay observed in the adjacent sediment basin was only a few inches deep in these areas, and contained a more natural underlying soil matrix. Wetland hydrology was not observed in these areas.

Wetland Enhancement Area #2 (WE-2), Drawing W-2, W-3, and W-4

Mitigation Site WE-2 includes the existing linear drainageway that conveys flow from the aforementioned lower basin of the Lake Davies Disposal Area (WE-1), down to Johns Creek and the lower portion of the stream valley along Johns Creek. The enhancement area along Johns Creek includes approximately 3,000 linear feet of stream valley dominated by phragmites. The portions of the Johns Creek reach that are not infested with phragmites consist of a bottomland hardwood forest community dominated by red maple, sweetgum, and black gum (*Nyssa sylvatica*) with New York fern (*Thelypteris noveboracensis*), sensitive fern (*Onoclea sensibilis*), soft rush (*Juncus effusus*), and lizard tail (*Saururus cernuus*) dominating the understory. The linear drainageway extending down from WE-1 is dominated by phragmites. Wetland hydrology and hydric soils were identified throughout the area of WE-2.

Wetland Enhancement Area #3 and Creation Area #4 (WE-3 and WC-4), Drawing S-5

Mitigation Sites WC-4 and WE-3 are located along the stream channel downstream of the existing Camp Conoy Pond. The proposed mitigation area is within a forested area between the developed camp area and the Chesapeake Bay and consists of a series of open water ponds located in-line to the existing stream channel proposed for restoration. A large head cut is located at the downstream portion of the stream channel. During the site investigation, it appeared that the water elevation in Camp Conoy Pond had been lowered and the hydrology within the wetlands downstream has been affected. The existing vegetation and the soil profile within this area were examined during field reconnaissance. The forested portion of this mitigation site consists predominantly of red maple, sweetgum, tulip poplar, white oak, American beech, and American holly. Meanwhile the open water ponds predominately contain false nettle along the edges. The topography in this area drains down to the Chesapeake Bay and receives runoff from the existing camp area. This area is proposed to receive increased discharges from the proposed SWM plan for Unit 3.

Wetland Enhancement Area #4 and Creation Areas #5 and #6, (WE-4, WC-5, and WC-6), Drawing S-6

Mitigation Sites WC-5, WC-6, and WE-4 are located along Johns Creek, in the area of two proposed SWM outfalls. The proposed mitigation areas are within two topographic swales that drain down to Johns Creek. WC-5 consists of a forested slope dominated by upland shrubs and contains upland soils. WC-6 and WE-4 comprise the remaining downstream portion of wetlands that are within the Unit 3 disturbance. The existing wetland area of these mitigation sites consists predominantly of red maple, sweetgum, black gum, New York Fern, and sensitive fern. Meanwhile the open water ponds predominately contain false nettle along the edges. The topography in this area drains down to Johns Creek. These areas are proposed to receive increased discharges from the proposed SWM plan.

6.2 Stream Mitigation Areas

Locations for potential stream restoration and enhancement areas were previously identified within the approved Phase I Mitigation Plan (MACTEC, 2009) and are described in Table 5. These lengths have been revised during the development of the Phase II Mitigation Plan.

Table 5
Phase I Stream Mitigation Areas

Mitigation Area	Location	Mitigation Type	Length (linear feet)
SR-1	Lower Woodland Branch	Restoration	2,114
SR-2	Upper Woodland Branch	Restoration	1,534
SR-3	Chesapeake Bay Tributary 1	Restoration	1,237
SR-4	Johns Creek	Restoration	951
SR-5	UT Johns Creek	Restoration	447
SE-1	UT Lower Woodland Branch	Enhancement	1,160
SE-2	Woodland Branch	Enhancement	655
SE-3	UT Upper Woodland Branch	Enhancement	507
SE-4	Chesapeake Bay Tributary 2	Enhancement	920
SE-5	UT Johns Creek	Enhancement	904

6.2.1 Fluvial Geomorphology Investigation

The stream mitigation areas identified for potential stream restoration in the Phase I concept were utilized by EA to conduct a more detailed stream evaluation to formulate a successful mitigation plan. EA performed a detailed Fluvial Geomorphology Investigation during September and October 2009, in which approximately 2,900 linear feet of representative channel were surveyed to determine channel measurements and longitudinal profile in the formulation of the mitigation design. In addition, pebble counts, bar samples, cross sections, and protrusion measurements, were utilized to quantify the key fluvial geomorphic (FGM) data to derive conclusions about the long-term stability of the reach. Total station survey along with some field measurement was utilized to measure channel form factors such as radius of curvature, belt width, etc.

A longitudinal profile survey was conducted at locations that depicted the departure of the reach from stable to unstable conditions, showing reference conditions in relation to upstream or downstream entrenchment conditions. Cross sections were shot for the channel depicting departure as well as reference conditions. Survey locations were limited to the approximate limits of those reaches identified as part of the Phase I Mitigation Plan.

In reference reaches, cross sections of riffle, run, pool, and glide representative facets were surveyed. In degraded reaches, only cross sections of riffles and pools were surveyed. These are the most easily identified features in these degraded reaches. Many reaches were shot "in the dry"; however, some reaches did have base flow at the time of field survey. Where base flow was available, water surface elevations were recorded in the longitudinal profile. Bar, berm, and other in-channel features were identified in longitudinal profiles, along with abandoned floodplain channels, channel sinuosity, valley cross sections, and other contextual features. Reference reaches are identified on the attached drawings and are typically proposed for preservation.

Particular attention was given to log features in the channel. As many of these reaches are dominated by logs and woody or root matter in the channels providing grade control, survey of how these log features influence channel profile was seen as essential to provide a template of acceptable slopes, inverts, and methodologies to construct similar features in restoration reaches. Many of these log features were accompanied by the deepest and best habitat pools observed onsite; these data were used in the mitigation design.

6.2.2 Fluvial Geomorphology Findings

An assessment of the FGM data is currently being conducted and will be included in the Intermediate Design level of the Phase II Mitigation Plan. After a preliminary evaluation of the FGM data, it has been determined that stable, unconfined stream forms onsite are low bankfull width, low bankfull depth, high width/depth ratio, low gradient (channel bankfull slope is approximately 1 percent), sand-silt bed streams with relatively low sinuosity between 1.2 and 1.5. Channels are well connected to floodplains, with floodplain elevation being approximately equal to the bankfull indicator elevation. The valley bottom serves as the belt width and flood-prone width in most cases. Reaches are characterized by logs and roots providing grade control and forming steep facet features, resulting in scour pools immediately downstream. Without logs or root features, pools are relatively shallow or found in backwater areas. Leaf matter is abundant in the channel bed in many locations. Streams classify as C5 type, with potential to evolve increased sinuosity E5 stream types over a prolonged time period through natural, stable states of erosion, accretion, and vegetation maturation.

Stream channels in the stable state are well connected to their floodplain. Numerous abandoned or dry channels exist, as well as wetland matrix throughout the entire valley bottom. Abandoned terraces are rare; generally the valley bottoms are flat and transition within only a few feet to upland conditions. In this way, floodplains are sinks for sediments with sources generally coming from upland areas.

The majority of reaches requiring restoration classify as B5c channels with a low width depth ratio (out of range of the typical B channels). This indicates that the streams are in a state of flux, incising toward F and G channel types, depending on their sinuosity. Channels mimic the sinuosity of stable stream types in most cases; however, head cuts, block bank failures, disturbed vegetation, and silt veneer over sandy beds dominate. Entrenchment ratios approach a value of 1. Meanwhile, preservation reaches, such as SR-3 and portions of SR-2/SE-3 (as identified in the Phase I Mitigation Plan), appear to have down-cut in the past and have reformed bankfull benches and overhead cover habitat, establishing a small but defined floodplain. Channel upper and lower banks have well defined vegetation, including upland vegetation which provides bank cover and channel roughness.

Over all, the majority of channels are dominated by sandy bed materials and silt/clay banks. Impaired reaches often displayed a veneer of silt over a bed material of fine to medium sand. This is indicative of stream bank erosion in these reaches. Only one reach had a defined impermeable layer. This reach was SR-3 (Drawing S-5), with a consolidated clay confining

layer, as well as gravel bed in the lower portions of the reach where the confining layer was not present at the bed surface.

Stream Mitigation Area: SE-1, Drawing S-2

SE-1 as defined in the Phase 1 Mitigation Plan has been assessed in three separate reaches which include the upstream and downstream portions of the stream that are incised and degraded with a reference reach separating the two reaches.

The upper reach of SE-1 begins at a 24-inch concrete pipe culvert under an existing logging road. The culvert causes destabilization of the channel, due to excess downstream velocity and maintenance activities for approximately 110 feet downstream of the culvert. The channel has exposed silt banks and evidence of erosion throughout, indicating the beginning stages of channel incision.

SE-1 Reference is characterized by small, connected floodplain channels. This reach is the basis for restoration design used on SE-1. This reach requires no enhancement or restoration work, aside from possible transitions to impaired reach work areas as required at its upstream and downstream limits.

The entrenched lower portion of this headwater tributary to Woodland Branch alternates between moderate to severe entrenchment with the occurrence of root wads and logs in the channel. The base flow of the channel becomes subsurface in several portions of the reach.

Stream Mitigation Area: SR-1, Drawing S-1

SR-1 is the main stem of Woodland Branch. Assessment of SR-1 included two separate reaches. Each reach was characterized by entrenchment throughout. The upper-most assessment reach of SR-1 begins below an 18-inch corrugated steel pipe culvert, and as seen on SE-1, this culvert has caused instability downstream. The upper portions are moderately entrenched, and poorly connected to the adjacent floodplain. The floodplain is dominated by upland species, indicating the incision and resulting lowered water table have been present for an extended period of time. The floodplain has several abandoned channels that have similar dimension to the suitable reference reaches onsite. This channel has a gravel content that appears to be limestone from road maintenance activities. Although this stone is seen in bar features, it is not considered the bedload of the reach, as riffles are populated with fine to medium sands, with a veneer of silt over top. Channel banks are silt sand materials, further supporting this assumption. Banks are vertical and erosive over much of the reach with little overhead cover, and poor root mass. At the time of survey, there was no base flow in the upper assessment reach of SR-1.

The lower assessment reach of SR-1 is more incised than the upper assessment reach. Tree roots are contained on only the upper-most foot of the banks, leaving vertical, erosive silt banks exposed. This reach, when surveyed, was also without base flow. Channel substrate is sand with silt, similar to upper reaches.

Stream Mitigation Area: SE-2, Drawing S-3

The lower portion of the SE-2 reach on Woodland Branch was observed with minimal base flow. This portion of the reach is wide with a high width/depth ratio, and has channels predominantly of clean, fine to medium sand. Numerous additional floodplain channels can be observed which are either abandoned or utilized only in high flow situations. The reach has little evidence of significant erosion, block failures, or excessive shear stress. Roots, logs, and leaf matter are present in the channel. The reach at its lower extent is controlled by an 18-inch metal pipe and stone crossing which serves as grade control. At the lower extent of the reach there is evidence of connected wetlands and fresh sand on the floodplain, suggesting an aggredation situation; however, channel and wetland stability appears to be strong. Vegetation is dense, contributing to floodplain and channel stability.

The upper half of SE-2 is characterized by a relatively stable sand channel, with high width / depth ratio, which emerges from an incised state at the top, and becomes slightly incised through the bottom portion before becoming a preservation reach. Much of this reach is incised and lacks habitat. There is less woody debris in the channel than is seen on other reaches; however, the channel did contain base flow at the time of assessment. The floodplain is largely unconnected to the channel, although abandoned channels in the floodplain are present and may be active at higher stages. The floodplain exhibits mature upland species primarily with small pockets of adjacent wetlands.

Stream Mitigation Area: SR-2, Drawings S-2 and S-4

This reach has experienced incision and re-creation of a floodplain within the channel. The channel is not well connected to the floodplain; however, the banks exhibit dense vegetation growth, overhead cover, and root mass directly in the channel. Although some evidence exists for minor erosion, the channel is mostly stable. It is anticipated that even if minor work were to be completed on this channel, construction disturbance may cause widespread destabilization of the reach.

Stream Mitigation Area: SE-3, Drawing S-4

SE-3 begins as a wetland complex and degrades into an incised channel, with low width depth ratio and an entrenchment ratio approaching a value of 1. Major uplift is required to enhance floodplain wetlands and mitigate erosion throughout the reach.

Stream Mitigation Area: SR-3, Drawing S-5

SR-3 was identified as having an abundance of American eels, which are targeted for preservation onsite. SR-3 is unique in that the majority of the entire reach is a hard-bottomed channel with imbricated fossilized *Chesapecten nefrens* scallops, now extinct, dating this geologic feature to approximately 12-15 millions years old. This consolidated clay layer serves as grade control of the reach, rendering it stable. Additionally, a gray consolidated clay layer is located above this layer, which is very stable and fairly resistant to erosion.

The upper portions of the reach are severely incised, with banks in excess of 10 vertical feet. The lower portions of the reach are less incised, with stable bench features and no visible grade control other than logs and root wads. Gravel beds are observed in the lower portions of the reach. The entire reach has large amounts of submerged and overhanging woody debris, undercut banks, and submerged roots. It appears that American eel utilize these features for habitat.

Stream Mitigation Area: SE-4, Drawing S-5

SE-4 reach is located in the Camp Canoy area of the site and drains directly to the Chesapeake Bay. The reach is influenced by three impoundments. The watershed contains the present Camp Canoy Pond, and the reach begins as the outfall from a pond with another pond located immediately before a steep drop to the Chesapeake Bay. There is evidence in the reach that an additional pond once existed there but was breached. The channel is fairly steep and moderately incised, with silt-sand bed and silt banks. There is little riparian vegetation but a fairly developed upland canopy over the site. At the time of survey, the only water observed was in the ponds, and a small groundwater base flow in the portion of the reach which directly connects to the Chesapeake Bay. The floodplain does not contain significant abandoned floodplain channels and it is unlikely that the floodplain is accessed by the ordinary flow events occurring onsite.

Stream Mitigation Area: SR-4, Drawing S-6

SR-4 is the main stem of Johns Creek. Prior to this restoration reach, the stream is considered to be a reference and becomes a highly connected wetland channel system with sparse trees and thick sedge floodplain and banks. The reach reference portion of the reach is extremely flat with little discernable movement of the water. Within the more channelized portion of the reference,

slopes are approximately 1.1 percent with a sinuosity of approximately 1.5—the highest observed in the assessment of the site. Immediately downstream of the reference, the reach becomes deeply incised within approximately 50 channel feet, until uplifted through beaver activity backwatering in lower reaches. Evidence of abandoned floodplain channels is strong within SR-4 floodplain areas, with pattern and dimension of these abandoned channels matching closely with those of reference reaches.

Stream Mitigation Area: SR-5 and SE-5, Drawing S-7

SE-5 and SR-5 reaches are a connected first order headwater tributary to Johns Creek. The reaches culminate in the Johns Creek Valley wetland complex with poorly defined channels. The reaches alternate between moderate and severe entrenchment, with many fluctuations between these states throughout. These reaches are incised with grade control provided by occasional logs or root sills. The reach at the time of assessment contained base flow throughout. The majority of the reach is low sinuosity, low slope, with the greatest amounts of slope occurring at log and root grade controls. Channel beds are fine to medium sand with silt components, most likely sourced from overland flow and stream bank erosion. The floodplain is moderately drained with upland and wetland species present.

6.2.3 Possible Factors Influencing Channel Departure

There are several main features which are seen as causing channel departure on the site. Breaks in the riparian canopy and lack of woody debris introduction into the channel appear to be significant factors in channel departure. As the fine silt/sand soils and bed material of the reaches is highly erosive, in situations where the channel is not situated on a hard compacted clay footing, logs and woody debris provide the grade control that prevents channel incision. Similarly observed, after channel incision has occurred, channel recovery or partial recovery is initiated through logs, leaf matter, and roots creating partial blockages and channel roughness. Through natural occurrence or beaver activity, the continual introduction of woody debris into the channel is seen as essential for preserving stability. Similarly, a vigorous riparian buffer is seen as essential to channel restoration. In some reaches, deer that are present in large numbers may be removing riparian vegetation and causing instability.

Previous agricultural disturbance and logging activity may also contribute to the channel degradation onsite. Although many portions of the site have been untouched since the 1960s when the facility was first developed; the effects of agricultural and logging activity can still be observed onsite, including erosion in many old logging roads and general floodplain disturbance including mounds, pot holes, and other excavation activity. These influences may explain

channel incision and disturbance at some portions of the site. Trenching, straightening, and other factors may have also contributed to channel destabilization.

Changes in the watershed following the 1960s facility development are believed to account for changes in the hydrograph and groundwater recharge which have directly affected reaches onsite. The most prominent example is the headwater reaches of SR-2 on Woodland Branch, which drain the watershed that includes the Visitor Center, associated parking lot, and a large cleared field that has been planted in a warm-season grass mix. Due to flow concentration and runoff from impervious surfaces, this reach quickly degrades into a 10- to 15-foot-deep head cut. This reach also lacks a strong base flow, which may be caused by excessive runoff and lack of infiltration due to the watershed land use. Other similar headwater areas onsite do not exhibit these traits, leading to the conclusion that impervious area and lack of forest cover result in stream channel destabilization. It is likely that without this disturbance, the headwater areas of SR-2 would not exhibit channel traits at all; rather, they would appear to be more of a forested wetland type of system.

7.0 WORK PLAN

The proposed Conceptual Phase II Mitigation Plan accounts for proposed development and stormwater discharges in order to minimize their potential impacts on the existing aquatic resources. This is accomplished through the utilization of energy dissipation structures, re-connection of the channel with the existing floodplain, and appropriate channel sizing. The addition of infiltration practices and planting of riparian trees and shrubs is intended to increase base flow propagation in the watershed as well as reduce thermal impacts from stormwater discharges. EA has worked closely with the Unit 3 SWM design team in order to effectively design the Phase II Mitigation Plan to account for the changes in discharge locations and flows. The Final SWM Plans have not been approved at the time of the development of the Conceptual Phase II Mitigation Plan; any revisions to the SWM Plans will be incorporated into the Intermediate Design. The proposed wetland and stream mitigation concepts described below are proposed in accordance with our Goals and Objectives, as stated in Section 5.0.

7.1 Nontidal Wetland Mitigation

Onsite compensatory mitigation for unavoidable impacts to approximately 11.72 acres of jurisdictional, nontidal forested wetlands, emergent wetlands, and open water ponds is being proposed in order to meet a "no net loss" goal of nontidal wetland mitigation. The Phase II Mitigation for the Calvert Cliffs Unit 3 project includes the creation of new forested and

emergent wetland areas onsite as well as enhancement of existing wetlands in areas previously described in Section 6.1 of this report. A portion of open water creation is also included in order to replace functions and values lost from the affected areas, as well as create a wetland mosaic within the mitigation area.

Mitigation Area: WC-1, Drawing S-4

Forested wetland creation is proposed for the upland areas at the origin of Woodland Branch, located north of the existing Visitor Center. The existing head cut and incised stream channels at the head of Woodland Branch are unlikely to maintain stable conditions if proposed for restoration. Rather, EA has evaluated the potential to fill this head cut and replace it with headwater infiltration wetlands to enhance base flow, dissipate energy, and promote stability and allow for transition to the preservation reaches downstream. The primary strategy for the creation of the headwater wetland is utilizing design techniques similar to regenerative stormwater conveyance (RSC) practices. RSC is an infiltration practice that uses a series of open channel, sand seepage step pools and riffle weirs, through which stormwater flows are conveyed. The purpose of these systems is to reduce the commonly seen erosion in ordinary stormwater conveyances and convert stormwater to groundwater, mitigating nutrient pollution and thermal impacts to the receiving waters, while promoting base flow in Woodland Branch downstream. Currently, this area receives runoff from the surrounding development which would be utilized as a hydrology source for the created wetland system. Micropools and other microtopography features will be included in the system design to diversify habitat for wetland flora and fauna. WC-1 will be planted with seedlings of native hydrophytic tree species to create a wetland hardwood forest community (See Attached Vegetative Species Planting List). Approximately 2.20 acres of forested wetlands will be created at a 2:1 mitigation credit ratio yielding approximately 1.10 acres of wetland credit. An increase in wetland function is anticipated through the creation of wildlife habitat, increase in groundwater recharge/discharge, and an increase in sediment retention and nutrient removal/uptake.

Mitigation Area: WC-2, Drawing W-1

WC-2 consists of a wetland creation area proposed within the middle basin of the Lake Davies Disposal Area. Wetland creation will be established through the creation of three separate vegetative zones consisting of an interior open water pond planted with floating aquatic species. The open water pond will be surrounded with an emergent fringe wetland that will be planted with herbaceous plant species. The remaining area will consist of a created bottomland hardwood forest with a system of low flow channels created from proposed outfall discharges.

Wetland fill material will be deposited within the sediment basin to create the different zones and provide microtopography features that will be included in the system design to diversify habitat for wetland flora and fauna. Soil material from the affected onsite wetland areas will be used for the WC-2 mitigation site; however, only wetlands that do not contain phragmites will be considered as a source of hydric soil material. A flow control structure will be utilized at the outfall point of the basin in order to manipulate and control hydrology within the wetland creation area. Grading details will be included in the Intermediate Design. WC-2 will require the removal and control of phragmites prior to grading and planting the wetland creation area as described below.

Through these mitigation activities, approximately 1.61 acres of emergent wetland will be created at a mitigation credit ratio of 1:1 and approximately 7.22 acres of forested wetland at a 2:1 credit ratio, yielding approximately 1.61 and 3.61 acres, respectively, of wetland credit. In addition, this design will include the creation of approximately 0.90 acres of open water habitat.

The creation of open water, emergent marsh, and bottomland hardwood forest will greatly increase wetland habitat diversity within this basin and be an improvement over the existing habitat conditions. Additionally, an increase in wetland function is anticipated through the increase in groundwater recharge/discharge, and an increase in sediment retention and nutrient removal/uptake.

Mitigation Area: WE-1, Drawing W-1

WE-1 consists of a wetland enhancement area proposed within the lower basin of the Lake Davies Disposal Area. Enhancement of this area is proposed through the eradication of phragmites, by mowing and application of chemical herbicide as described below, and the planting of native tree and shrub wetland species. The enhancement proposed in this area consists of approximately 2.53 acres of existing wetlands at a mitigation credit ratio of 3:1. Therefore, approximately 0.84 acres of wetland credit is anticipated for WE-1. It is anticipated that the planting of native woody species within the enhancement area, along with phragmites eradication, will provide an increase in wetland function (habitat improvement) and values (visual quality/aesthetics).

Mitigation Area: WC-3, Drawing W-1

Mitigation Site WC-3 consists of two small topographic low areas adjacent to the lower basin of the Lake Davies Disposal Area (WE-1). Wetland creation will be established through the grading of these two pockets to an elevation equal to WE-1 and provide microtopography features that will diversify habitat for wetland flora and fauna through planting of native

hardwood wetland species. Grading details for this area will be included in the Intermediate Design. WC-3 will also require the removal and control of phragmites prior to grading and planting the wetland creation area as described below.

Through these mitigation activities, approximately 0.50 acres of forested wetland will be created at a mitigation credit ratio of 2:1, yielding approximately 0.25 acres of wetland credit. It is anticipated that the planting of native woody species within this area, along with phragmites eradication, will provide an increase in wetland function (habitat improvement) and values (visual quality/aesthetics).

Mitigation Area: WE-2, Drawings W-2, W-3, and W-4

Mitigation Site WE-2 includes the existing linear drainageway that conveys flow from the aforementioned lower basin of the Lake Davies Disposal Area (WE-1), down to Johns Creek and the lower portion of the stream valley along Johns Creek. Enhancement of this area is proposed through the eradication of phragmites, by the application of chemical herbicide as described below, and the planting of native tree and shrub wetland species. The enhancement proposed in this area consists of approximately 15.89 acres of existing wetlands at a mitigation credit ratio of 3:1. Therefore, approximately 5.30 acres of wetland credit is anticipated for WE-2. It is anticipated that the planting of native woody species within the enhancement area, along with phragmites eradication, will provide an increase in wetland function (habitat improvement) and values (visual quality/aesthetics).

Wetland Creation Area #4 and Enhancement Area #3 (WC-4 and WE-3), Drawing S-5

Mitigation Sites WC-4 and WE-3 are located along the stream channel downstream of the existing Camp Conoy Pond. The proposed mitigation area exists within a forested area between the developed camp area and the Chesapeake Bay and consists of a series of open water ponds located in-line to the existing stream channel proposed for restoration. This area is proposed to receive increased discharges from the proposed SWM plan. Potential to enhance the open water areas and create additional forested wetland areas along the existing stream channel, in addition to Priority 1 stream restoration to the existing channel exists. The primary strategy for the creation and enhancement of the wetland areas is utilizing design techniques similar to RSC practices.

Modifications to the existing earthen berms and placement of water control structures will be utilized to enhance open water areas to encompass emergent wetland features. The secondary purpose of these systems is to reduce impacts to the existing aquatic resources from the proposed SWM discharges while promoting base flow back into the existing channel downstream.

Microtopography features will be included in the system design to diversify habitat for wetland flora and fauna. This area will be planted with seedlings of native hydrophytic tree species to create a wetland hardwood forest community as well as emergent plantings in and around the open water ponds (See Attached Vegetative Species Planting List). Approximately 1.33 acres of forested wetlands will be created at a 2:1 mitigation credit ratio yielding approximately 0.67 acres of wetland credit, and approximately 1.08 acres of wetlands will be enhanced at a 3:1 mitigation credit ratio yielding approximately 0.36 acres of wetland credit. An increase in wetland function is anticipated through the creation of wildlife habitat, increase in groundwater recharge/discharge, and an increase in sediment retention and nutrient removal/uptake.

Wetland Creation Areas #5 and #6, and Enhancement Area #4 (WC-5, WC-6, and WE-4) , Drawing S-6

Mitigation Sites WC-5, WC-6, and WE-4 are located along Johns Creek, in the area of two proposed SWM outfalls. The proposed mitigation areas are within two topographic swales that drain down to Johns Creek. WC-5 consists of a forested slope dominated by upland shrubs and contains upland soils. WC-6 and WE-4 consist of the remaining downstream portion of proposed affected wetlands. These areas are proposed to receive increased discharges from the proposed SWM plan.

The Phase II Mitigation Plan includes the possibility to create and enhance forested wetland areas along the existing stream channel. The primary strategy for the creation and enhancement of the wetland areas is utilizing design techniques similar to those proposed at WC-1 and WC-4. The potential exists to create a series of vegetated sand seepage step pools and riffle weirs in order to protect the aquatic resources existing in this area. Micropools and other microtopography features will be included in the system design to diversify habitat for wetland flora and fauna. These areas will be planted with seedlings of native hydrophytic tree species to create a wetland hardwood forest community. Within the area of WC-5, approximately 0.72 acres of forested wetlands will be created at a 2:1 mitigation credit ratio yielding approximately 0.36 acres of wetland credit. Additionally, approximately 0.40 acres of forested wetlands will be created at a 2:1 mitigation credit ratio yielding approximately 0.20 acres of wetland credit, and approximately 0.09 acres of wetlands will be enhanced at a 3:1 mitigation credit ratio yielding approximately 0.03 acres of wetland credit. These wetland areas are proposed to provide surface water infiltration and to support base flow within the reach and reduce potential impacts from the proposed SWM discharges.

The previously described wetland mitigation work plan includes 1.61 acres of emergent and 12.81 acres of forested nontidal wetlands that will be created, as well as 19.59 acres of forested

wetland enhancement in order to obtain 14.55 credits for the required wetland mitigation (Table 6).

Table 6
Summary of Wetland Mitigation Work Plan

	Mitigation Area	Type	Acreage	Ratio	Credit
Creation	WC-1	Forest	2.2	2:1	1.10
	WC-2	Forest	7.22	2:1	3.61
	WC-2	Emergent	1.61	1:1	1.61
	WC-2	Open water	0.9	**	**
	WC-3	Forest	0.5	2:1	0.25
	WC-4	Forest	1.33	2:1	0.67
	WC-5	Forest	0.72	2:1	0.36
	WC-6	Forest	0.4	2:1	0.20
Enhancement	WE-1	Forest	2.53	3:1	0.84
	WE-2	Forest	15.89	3:1	5.30
	WE-3	Emergent	1.08	3:1	0.36
	WE-4	Forest	0.09	3:1	0.03
				Total wetland credit =	**14.33**

** Open water creation is proposed to replace lost functions of existing impacts. However it is understood that no credit for wetland acreage is credited for open water creation areas.

The proposed wetland creation and enhancement areas will be planted with native hydrophytic vegetation as detailed in the attached Vegetative Species Planting List. After excavation and the establishment of bottom elevations, the wetland creation areas will be planted using the following spacing:

- Canopy tree species will be planted at a density of 680 stems per acre (8-foot centers);
- Understory shrub species will be planted at a density of 680 stems per acre (8-foot centers); and
- Emergent herbaceous species will be planted at a density of 4,800 stems per acre (3-foot centers).

Plant spacing was determined to allow for anticipated mortality from wildlife depredation and defoliation by insects during early seedling establishment. The plant material will predominantly be representative of the species composition of the wetlands within the CCNPP property and

native to the region. In addition, the plant material will include species that have been identified as suitable for installation on wetland mitigation projects by the Chesapeake Bay Critical Area Commission. However, final selection of plant stock will be determined to some extent by availability. The selected tree species will consist of containerized and/or bare root stock protected by tree shelters. The tree shelters will provide protection from wildlife depredation, wind, or other influences.

Phragmites is a large, coarse, perennial grass that usually forms large, dense stands reducing the diversity of plant and wildlife species. These stands exist in various locations within the CCNPP property. Phragmites identified onsite has been observed to be more than 10 feet in height. Flowering and seed set occur between July and September. Germination occurs in spring on exposed moist soils. Vegetative spread by belowground rhizomes (roots) can result in dense patches with up to 20 stems per square foot. Phragmites is capable of vigorous vegetative reproduction and often forms dense, nearly monospecific stands, as have been observed in the sediment basins of the Lake Davies Disposal Area, Johns Creek, and other forested wetland areas on the CCNPP Unit 3 site.

The control of phragmites through herbicide application, mowing practices, and flooding of the sediment basins is proposed under the compensatory mitigation plan for the wetland creation and enhancement areas presently containing the invasive species. Eradicating phragmites will replace the existing sterile environment with a more diverse community through the planting of desirable plant species. The eradication of phragmites within the mitigation sites will include multiple treatment events through the monitoring period, due to the high density of this invasive species. The application of glyophosphate will be conducted prior to grading and planting of the proposed native vegetation.

7.2 Stream Mitigation

Stream mitigation work is designed to meet the goals and objectives of this Phase II Final Mitigation Plan in accordance with the guidance of regulating entities. In-channel work will be performed in intermittent channels during periods of little or no base flow, and in all cases of flow, in accordance with an approved Erosion and Sediment Control Plan. Work will be performed by a qualified contractor, experienced in the field of stream restoration, with the specialized small and low ground-pressure equipment necessary to complete the job with minimal site disturbance. Work will be performed with sufficient construction oversight to ensure the specifications of the design are met and in-field changes which may occur are conducted appropriately. Although a revision to the mitigation techniques (enhancement,

restoration, and preservation) has been made from the Phase I Mitigation Plan (MACTEC, 2009), the naming convention for the mitigations areas were not revised for the concept plan in order to keep consistency between the Phase I and Phase II Mitigation Plans. However, a revised naming convention is proposed and will be included in the intermediate level Phase II Mitigation Plan.

One of the methods employed for meeting restoration objectives is an upland approach called Regenerative Stormwater Conveyance (RSC). RSC is an infiltration practice that uses a series of open channel, sand seepage step pools and riffle weirs, through which stormwater flows are conveyed. The purpose of these systems is to reduce the commonly seen erosion in ordinary stormwater conveyances and convert stormwater to groundwater, mitigating nutrient pollution and thermal impacts to the receiving waters. Additional supporting information on these practices can be found in the references portion of this report. This approach is similar to a Priority 1 stream restoration, which replaces an incised channel with a re-dimensioned channel at a higher elevation. Priority 1 restoration techniques are employed in this restoration plan, usually in re-establishing flow in an abandoned floodplain channel which meets the pattern and dimension criteria appropriate for the reach.

Stream Restoration Reach SR-1, Drawing S-1

Given the abundance of abandoned channel features in the floodplain, priority 1 restoration of the reach includes re-use of these floodplain channels. Use of these channels will require that some log grade controls be installed; however, grading and pattern adjustment is minimal, and this alternative is seen as a low-impact restoration alternative. Existing channels would be filled or turned into oxbow wetlands. This method of restoration is expected to significantly raise groundwater elevations throughout the reach.

Stream Restoration Reach SE-1A, Drawing S-2

Alternating logs sills and log/root structures are proposed to be utilized to provide energy dissipation and channel uplift in this reach, correcting the conditions created by the existing culvert. The floodplain has trees and canopy cover and requires only minor planting improvements. No significant floodplain grading is anticipated, however, channel fill will accompany uplift activities.

Stream Restoration Reach SE-1B, Drawing S-2

SE-1B will require channel cut-offs and uplift. There is potential to utilize existing abandoned floodplain channels to provide this uplift, as they have the same dimension and similar pattern as nearby stable reference reaches. This would lead to creation of oxbow wetlands in existing

entrenched locations, and an uplift of the water table creating floodplain wetlands. Minor floodplain grading is proposed in this reach as associated with channel relocation. Replacement and augmentation of riparian vegetation is proposed for this reach.

Lower Stream Preservation Reach SE-2, Drawing S-3

This portion of the reach has been selected for preservation; with the exception being any stabilization or enhancement required in the floodplain since there will be contractor access through this reach.

Stream Restoration Reach SE-2, Drawing S-3

This reach is proposed as a restoration and enhancement reach. Portions of the reach, once uplifted through the installation of log structures and channel cut-offs, will only require installation of riparian vegetation in the floodplain and channel banks for stabilization. More advanced restoration will be required at the upper and lower extremes, where transition must be made to preservation reaches which will prevent the migration of incision through those preserved reaches.

Stream Restoration Reach SR-2/SE-3, Drawing S-4

This reach has experienced incision and the re-creation of a floodplain within the channel. The channel is not well connected to the floodplain; however, the banks exhibit dense vegetation growth, overhead cover, and root mass directly in the channel. Although some evidence exists for minor erosion, the channel is mostly stable. It is anticipated that even if minor work were to be completed on this channel, construction disturbance may cause widespread destabilization of the reach. Therefore, emphasis has been placed on expanding base flow through the reach and preserving the connection and fish passage of the reach with other reaches. The primary strategy for the stabilization of SE-3 is the installation of watershed practices, such as headwater wetland creation and headwater wetland creation practices similar to those using (RSC) methodologies.

These practices propose work in the incised portions of the channel as well as in upland locations. The goal is to raise the water table and promote base flow in Woodland Branch. The only work proposed in this reach will be as a result of contractor access to the adjacent areas, and restoration/enhancement activities to repair those temporary disturbances.

Stream Preservation Reach SR-3, Drawing S-5

SR-3, because of its superior eel habitat, is targeted for preservation to allow existing habitat elements to continue to exist as they are. It also has unique bed features which cannot be replicated through construction activities, creating unique habitat within the site.

Stream Restoration Reach SE-4, Drawing S-5

It is proposed that this reach is restored using a combination of RSC and Priority 1 stream restoration. The proposed restoration plan preserves portions the existing ponds online with the reach; however, it modifies the berms and outfalls from these ponds and enhances open water areas to encompass emergent features. From the last pond to the bay, the reach is to be designed as a cascade step pool, with an elevated groundwater table to provide base flow. With the step pools, woody debris will be incorporated for American eel habitat. The lowest reaches will be further excavated to form a defined channel and small cove and tidal wetland complex. As this reach is within 100 feet of endangered Tiger Beetle habitat, great care must be taken to limit the area of disturbance and perform work during suitable, unrestricted times of the year.

Stream Restoration Reach SR-4, Drawing S-6

The goals of SR-4 are to uplift the channel, replicating the floodplain wetlands observed upstream of the reach and also below the reach in the beaver dam influenced areas. A primary goal of the restoration is to arrest the incision occurring in this reach before it drains the reference reach and connected floodplain wetland areas upstream. Additionally, treatment using RSC practices at proposed stormwater outfalls to this reach, as well as energy dissipation structures, are proposed to preserve stability within SR-4 and within the reference reach upstream.

Restoration practices throughout the reach includes channel cutoffs, log and root structures, Priority 1 restoration by introducing the channel into abandoned floodplain channels, and planting of riparian and wetland species throughout the reach. As phragmites is observed adjacent to this reach, the Johns Creek restoration areas will require ongoing maintenance to control invasive species.

Stream Restoration Reach SR/SE-5, Drawing S-7

Restoration practice throughout the reach includes channel cutoffs, log and root structures, Priority 1 restoration by introducing the channel into abandoned floodplain channels, and planting of riparian and wetland species throughout the reach. Headwater wetlands and RSC treatment in the upper portions of the reach are proposed to provide surface water infiltration and to support base flow within the reach.

The above stream mitigation work plan includes 9,150 linear feet of restoration and 2,885 linear of feet of stream preservation be performed on the existing stream channels (Table 7).

Table 7
Detailed Stream Mitigation Credits by Reach

	Mitigation Area	L.F.
Restoration	SR-1	2156
	SE-1	1218
	SE-2	900
	SR-2/SE-3	1671
	SE-4	976
	SR-4	1200
	SR/SE-5	1567
	Total Restoration =	**9688**
Preservation	SE-1	182
	SE-2	1079
	SR-2	477
	SR-3	800
	Total Preservation =	**2538**
	Total Stream Mitigation =	**12226**

The final stream restoration areas will ultimately include detailed planting plans that delineate planting zones (i.e., upland, floodplain, and riparian). Each zone will incorporate native temporary and permanent seed mixtures as well as a mixture of plant species identified in the planting species list for the wetland areas. Permanent seeding will be applied at a rate of approximately 50 pounds per acre and temporary seeding will be applied at approximately 125 pounds per acre. Live stakes will be placed at 2 feet on center, and the spacing and type of individual plantings will be determined based on the scale of disturbance, and the time of planting for successful establishment of the stage of development.

8.0 SITE PROTECTION INSTRUMENT

The Phase II Mitigation Plan includes the creation and enhancement of nontidal wetlands, as well as the restoration, enhancement, and preservation of nontidal stream channels. The compensatory mitigation is proposed to be onsite and shall be protected in perpetuity. Therefore, the mitigation areas will be protected in the future to prohibit activities including construction, grading, filling, excavating, ditching, draining, as well as the removal, cutting, mowing, burning, or harming of vegetation unless otherwise approved by USACE.

The applicant proposes to use a Conservation Easement or a Declaration of Restrictions in order to ensure the protection of the streams and wetlands included in the Phase II Mitigation Plan. The protection document will allow for measures and accommodations required by the Nuclear Regulatory Commission (NRC) including but not limited to:

- The removal of dead and/or diseased trees,
- Management of wildlife, and
- Accommodation of possible future utility crossings.

Upon approval of the Final Phase II Mitigation Plan, the applicant will draft the appropriate protection document for approval by USACE prior to finalizing the document. Permits will generally require that the approved preservation mechanism be properly executed and recorded within 30 days of permit issuance unless the District exercises flexibility where it appears there is no immediate threat to the property; the terms of the preservation mechanism have been agreed to by necessary parties; and legitimate reasons for a limited extension of time exist.

In accordance with Code of Maryland Regulations (COMAR) 26.23.0403, the protection document utilized for the mitigation areas for the proposed project will also include language granting the recipient agency, or any successor agency, access to the mitigation sites for inspections during the monitoring period and for construction of the mitigation project, if the permittee or person conducting the proposed activity forfeits a bond and the recipient agency decides to complete construction of the mitigation project and shall also include language that the restriction is perpetual, binding on the grantor's personal representatives, heirs, successors, and assigns and runs with the land.

9.0 POST CONSTRUCTION MONITORING AND PERFORMANCE STANDARDS

9.1 Nontidal Wetlands

After the onsite wetland creation and enhancement activities are complete, a 5-year annual monitoring program will be implemented in accordance with the *Maryland Compensatory Mitigation Guidance* (IMTF, 1994), and the guidance provided in RGL No. 08-03 (USACE, October 2008). The mitigation monitoring effort will include the collection of specific data for reporting, including the following:

- The growth and vitality of the planted hydrophytic species;
- Current site conditions at fixed photographic points;

- The species composition of recruited, desirable plant species;
- The species composition and areal cover of nuisance/non-native plant species;
- Wildlife utilization and depredation; and
- Measurements of surface inundation or groundwater.

The monitoring procedure will include a baseline monitoring event, conducted immediately following the completion of the mitigation site construction activities. After the baseline event is completed, a 5-year monitoring schedule will be conducted. Typical annual sampling events are performed during September-October of each year and associated reports will be completed and submitted to the regulatory agencies by the end of each calendar year. Each annual monitoring report will include the vegetative sampling results, current hydrologic conditions, photographic documentation, descriptions of problems encountered, and discussion of maintenance actions taken. Following agency review and coordination, remedial measures will be implemented, as needed.

The success criteria for the monitoring program will include, at a minimum, the success of the planted vegetation, as measured through survivorship counts and observations of vitality and growth, and the existence of wetland hydrology for the created wetlands. If success criteria have been satisfied at the completion of the 5-year monitoring program, a request for release from monitoring will be made to USACE and/or MDE.

Performance standards for the wetland mitigation monitoring program will be conducted in accordance with the MDE guidelines and with consideration of other permitting agencies as mandated by the State of Maryland.

The primary success criteria for the CCNPP Unit 3 wetland creation/enhancement mitigation sites will include:

- 85% survival rate of wetland vegetation (planted and naturally regenerated/recruited stems);
- The appearance of positive growth indicators for planted species, such as height and/or ground level diameter;
- A value of no more than 10 percent areal cover of phragmites within the treated wetland mitigation sites; and

- The establishment of appropriate inundation conditions or saturated soil conditions during the growing season and under normal yearly climatological conditions for the wetland creation mitigation sites.

9.2 Stream Channels

Monitoring of the stream channels proposed within the mitigation plan will be performed in an effort to compare post-construction conditions and pre-construction baseline data, for the purposes of assessing the success of the mitigation project in relation to the mitigation plan goals and determine the degree of success the mitigation project has achieved in meeting the objectives of providing proper channel function and increased habitat quality. Success criteria will be gathered annually to document the success of the proposed mitigation plan to achieve its goals of no net loss of stream function. Mitigation reaches will be monitored annually for the duration of the monitoring period as determined by the regulating agencies. At present, a monitoring period of 5 years is expected. Monitoring reports will be submitted in accordance with the wetland mitigation monitoring requirements.

At the time of the as-built survey of the mitigation reaches, the project owner will survey and install monumented cross sections on the mitigation reaches as directed by the Contract Drawings and the Engineer. At a minimum, one cross section shall be installed per 300 linear feet of stream channel. Cross sections will capture the channel features at a maximum of 0.2-foot resolution and floodplain features at a minimum of 1-foot resolution. Cross sections should capture riffle and pool features. Monitoring reports will overlay these cross sections annually on a figure and annually calculate values of channel width, depth, cross-sectional area, width/depth ratio, and any associated notes or observations obtained through monitoring data collection. Cross sections will be collected for both restoration and portions of selected preservation reaches.

On portions of new stream channel, as found in Priority 1 restoration areas, longitudinal profiles will be surveyed by the owner detailing the channel bed, water surface (if present), top of bank, and bankfull features found on the restoration reach. These survey areas will continue upstream and downstream of the reach for a minimum of 50 channel feet or until the limits of the restoration reach.

Wolman riffle pebble counts, point bar samples, and measurements of the largest and second largest particles found on the point bar surface will be collected annually from the restoration

reaches. A minimum of one bar sample and one riffle pebble count will be obtained from each reach per year, and must be collected in the same locations each monitoring year.

Furthermore, structures and treatments as identified on the as-built survey shall be monitored with photographs and evaluated for effectiveness annually. Monitors will note any noticeable failures or erosion in the proximity of the structures. Installed riparian trees and shrubs will also be monitored for survival (85 percent survival of planted species required after 5 years).

Annual monitoring reports will be prepared in accordance with the *Mitigation and Monitoring Guidelines* (USACE, 2004), the protocols presented in the *Maryland Compensatory Mitigation Guidance* (IMTF, 1994), and the guidance provided in RGL No. 08-03 (USACE, October 2008). The monitoring program will be conducted pursuant to the MDE mitigation monitoring guidelines and protocols, and monitoring reports will contain a discussion of any deviations from as-built and an evaluation of the significance of these deviations and whether they are indicative of a stabilizing or destabilizing situation. At a minimum each annual monitoring report will include the following:

- Identification of parties responsible for monitoring.
- Location of monitoring stations depicted on an 11'x17' map).
- Description of methods used for data collection.
- Photo documentation
- Documentation of channel aggradation/degradation, bank erosion, channel stability, success of riparian vegetation, effectiveness of erosion control measures, and presence or absence of developing instream bars.
- Discussion of observed ecological function
- Pebble count data to determine size of bed material, and successful change toward desired composition.
- Documentation of any change from the as-built drawings and proposed remedies, if required.

10.0 LONG-TERM MANAGEMENT RESPONSIBILITIES

Long-term management and maintenance of the wetland mitigation sites will be assured through the placement of Conservation Easement or a Declaration of Restrictions on the mitigation area.

Formal management/maintenance of the mitigation site beyond the monitoring period will be the responsibility of the site owner. If the mitigation area should ever be sold, all appropriate protective mechanisms (which will have been recorded) will remain in effect and will remain with the site into perpetuity. The applicant proposes that a Performance Bond be provided for the mitigation effort (COMAR 26.24.05.02).

11.0 FINANCIAL ASSURANCE

If success criteria are not met within the proposed mitigation area by the fifth (or otherwise determined final) year of the monitoring program, some additional replanting, re-grading, or hydrologic modification may be necessary at the mitigation site and mitigation monitoring may be extended. The USACE may require financial assurances on a permit-by-permit basis to ensure the initiation and successful completion of required compensatory mitigation. If required by the USACE as a special condition of the permit, sufficient funding for this potential activity will be provided in the form of a Performance Bond or Letter of Credit to be posted before construction authorized by the permit commences. The amount of the Performance Bond or Letter of Credit will be determined and justified based on the required land management strategies and activities required to achieve ecological success. If the mitigation area(s) are not successful (i.e., do not provide adequate compensatory mitigation for authorized impacts and causing a net loss in wetland function), some form of contingency would need to be in place to assure that remedial activities can be funded to bring the site into compliance. Financial guarantees provide assurances to the permitting agencies that monies will be available to perform remedial activities should they be required. The financial assurances for the proposed mitigation plan for the re-development site will be established in accordance with the USACE RGL No. 05-1 (February 14, 2005) Guidance on the Use of Financial Assurances and may be provided in the form of a Performance Bond or Letter of Credit.

12.0 REFERENCES

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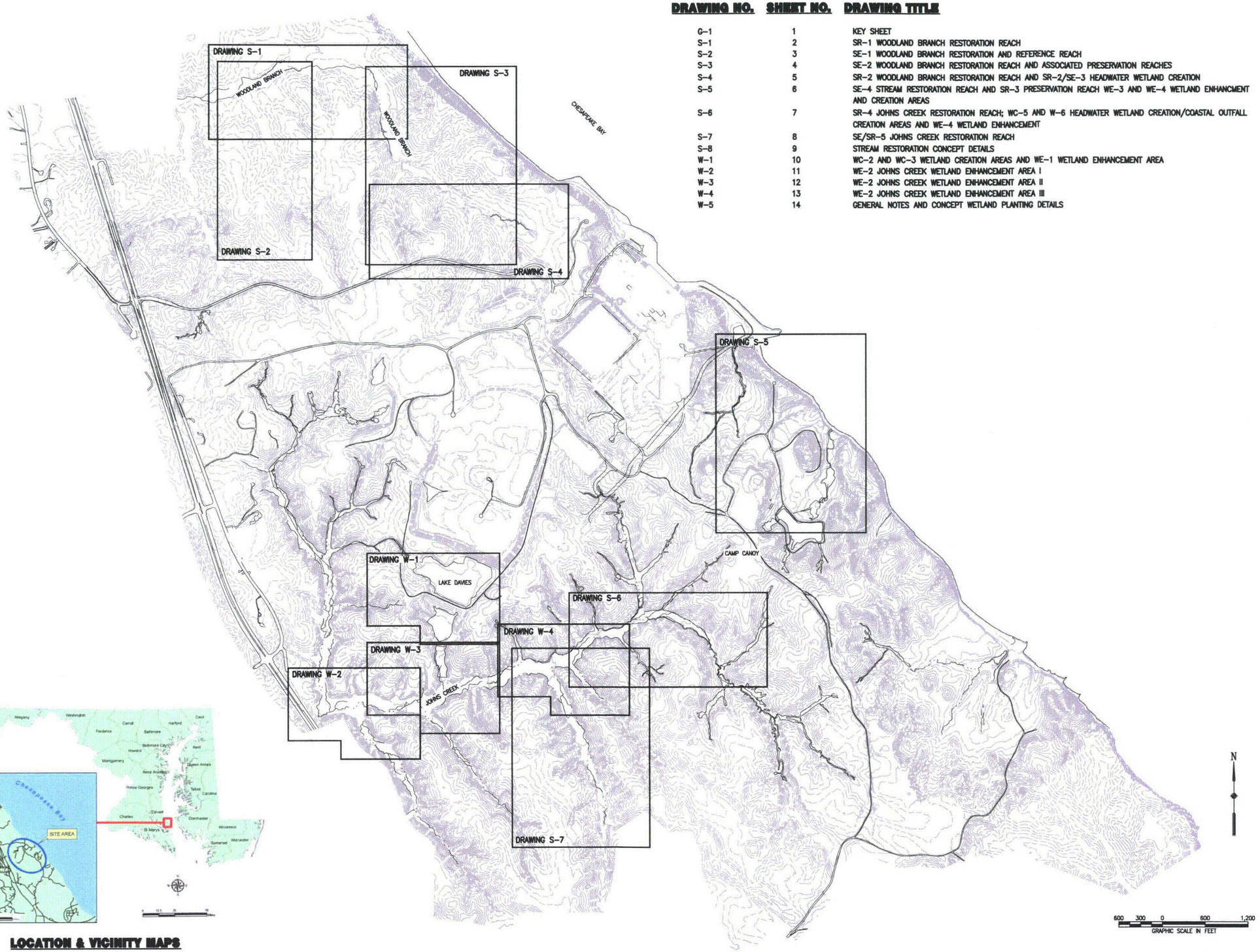
Vegetative Species Planting List

Scientific Name	Common Name	Wetland Status	Area For Planting	Typical Spacing (OC')	Found Onsite
WETLAND CREATION AREAS 1, 3, 4, 5, & 6 (WC-,1 WC-3, WC-4, WC-5, & WC-6)					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American Sycamore	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FAC+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Viburnum dentatum	Southern arrowwood	FAC	Forested understory	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory	8	No
Lindera benzoin	Spicebush	FACW-	Forested understory	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested understory	8	Yes
WETLAND CREATION AREA 2 (WC-2) & WETLAND ENHANCEMENT AREA 3 (WE-3)					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American Sycamore	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FAC+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Viburnum dentatum	Southern arrowwood	FAC	Forested understory / transition zone	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory / transition zone	8	No
Lindera benzoin	Spicebush	FACW-	Forested understory / transition zone	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested understory / transition zone	8	Yes
Asclepias incarnata	Swamp Milkweed	OBL	Emergent	3	Yes
Carex crinita	Fringed Sedge	OBL	Emergent	3	Yes
Juncus effusus	Soft Rush	FACW+	Emergent	3	Yes
Carex lurida	Lurid Sedge	OBL	Emergent	3	No
Panicum virgatum	Switchgrass	FAC	Emergent	3	Yes
Saururus cernuus	Lizards Tail	OBL	Emergent	3	Yes
Peltandra virginica	Arrow arum	OBL	Emergent	3	No
Boehmeria Cylindrica	Small Spike False Nettle	FACW+	Emergent	3	Yes
Potamogeton sp.	Pondweed	OBL	Open Water	**	No
Nymphaea odorata	American White Water lily	OBL	Open Water	**	No
WETLAND ENHANCMENT AREA 1 (WE-1)					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American Sycamore	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FAC+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Viburnum dentatum	Southern arrowwood	FAC	Forested understory	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory	8	No
Lindera benzoin	Spicebush	FACW-	Forested understory	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested understory	8	Yes
WETLAND ENHANCEMENT AREA 2 & 4 (WE-2 & WE-4)					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American Sycamore	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FACW+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Salix nigra	Black Willow	FACW+	Forested canopy	8	Yes
Viburnum dentatum	Southern arrowwood	FAC	Forested understory	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory	8	No
Vaccinium corymbosum	Highbush Blueberry	FACW-	Forested understory	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested understory	8	Yes

DRAWING NO.	SHEET NO.	DRAWING TITLE
G-1	1	KEY SHEET
S-1	2	SR-1 WOODLAND BRANCH RESTORATION REACH
S-2	3	SE-1 WOODLAND BRANCH RESTORATION AND REFERENCE REACH
S-3	4	SE-2 WOODLAND BRANCH RESTORATION REACH AND ASSOCIATED PRESERVATION REACHES
S-4	5	SR-2 WOODLAND BRANCH RESTORATION REACH AND SR-2/SE-3 HEADWATER WETLAND CREATION
S-5	6	SE-4 STREAM RESTORATION REACH AND SR-3 PRESERVATION REACH WE-3 AND WE-4 WETLAND ENHANCMENT AND CREATION AREAS
S-6	7	SR-4 JOHNS CREEK RESTORATION REACH; WC-5 AND W-6 HEADWATER WETLAND CREATION/COASTAL OUTFALL CREATION AREAS AND WE-4 WETLAND ENHANCEMENT
S-7	8	SE/SR-5 JOHNS CREEK RESTORATION REACH
S-8	9	STREAM RESTORATION CONCEPT DETAILS
W-1	10	WC-2 AND WC-3 WETLAND CREATION AREAS AND WE-1 WETLAND ENHANCEMENT AREA
W-2	11	WE-2 JOHNS CREEK WETLAND ENHANCEMENT AREA I
W-3	12	WE-2 JOHNS CREEK WETLAND ENHANCEMENT AREA II
W-4	13	WE-2 JOHNS CREEK WETLAND ENHANCEMENT AREA III
W-5	14	GENERAL NOTES AND CONCEPT WETLAND PLANTING DETAILS



LOCATION & VICINITY MAPS

CONCEPT

REVISIONS

NO.	DATE	BY	DESCRIPTION

SEAL

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 15453, EXPIRATION DATE: JULY 2, 2011.

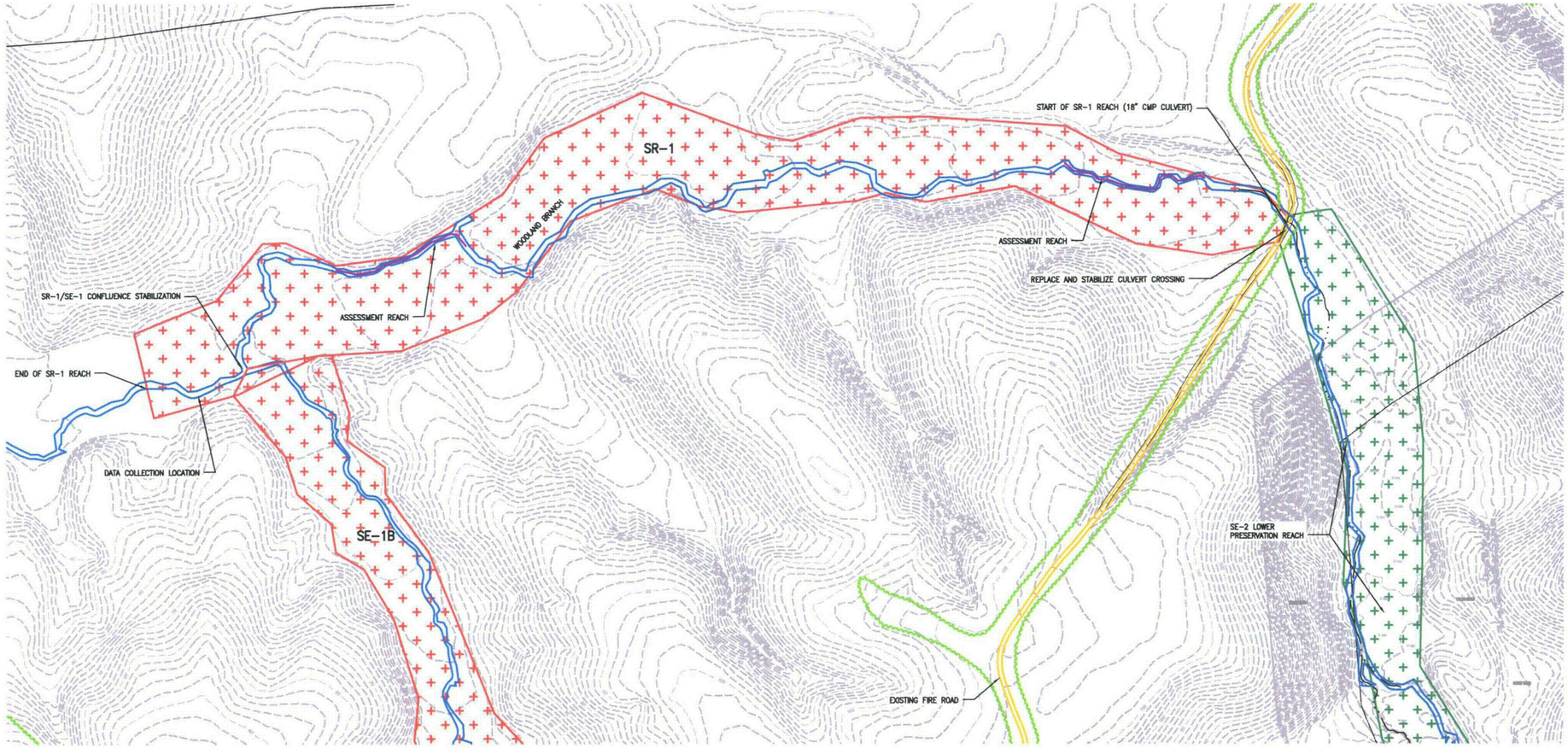
UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

KEY SHEET

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	MP
DRAWN BY	JAP
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	G-1
SHEET NUMBER	1 OF 14

FILE PATH: (LOCATION: G:\PROJECTS\14621-03 - UNISTAR\GIS DATA\MXD FIGURES\G-1.MXD [G-1] 11/17/09)



LEGEND

- RESTORATION REACH
- REFERENCE / PRESERVATION REACH
- EXISTING STREAM (SURVEYED)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- ASSESSMENT REACH

GENERAL NOTES:

1. ASSESSMENT REACHES ARE LOCATED IN PORTIONS OF THE RESTORATION REACHES WHICH ARE TYPICAL OF THE CONDITION OF THE REACH AS A WHOLE, AND/OR SHOW THE TRANSITION BETWEEN IMPAIRED AND STABLE REACHES.
2. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.

PROPOSED RESTORATION CONCEPT:

1. STABILIZE EXISTING CULVERT CROSSINGS AT FIRE ROAD AND INSTALL ENERGY DISSIPATION LOGS AND RANDOM BOULDERS TO PREVENT DOWNSTREAM CHANNEL INCISION.
2. UPLIFT REACH USING LOG CHANNEL CUT-OFF STRUCTURES. IN MIDDLE PORTION OF REACH, UTILIZE ABANDONED FLOODPLAIN CHANNELS AS NEW CHANNELS, BACKFILLING EXISTING CHANNELS OR CREATING OXBOW WETLANDS. STABILIZE CHANNELS AS NECESSARY WITH LOG AND ROOT STRUCTURES.
3. ENHANCE FLOODPLAIN WITH RIPARIAN PLANTINGS.
4. AT DOWNSTREAM END OF RESTORATION REACH, INSTALL STONE AND LOG STRUCTURES TO TRANSITION TO EXISTING UNRESTORED CHANNEL.
5. SUMMARY: SR-1 2,156 LF OF STREAM RESTORATION

N

100 50 0 100 200
GRAPHIC SCALE IN FEET

CONCEPT

NO.	DATE	BY	DESCRIPTION

REVISIONS

SEAL

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 15453, EXPIRATION DATE: JULY 2, 2011.

UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN

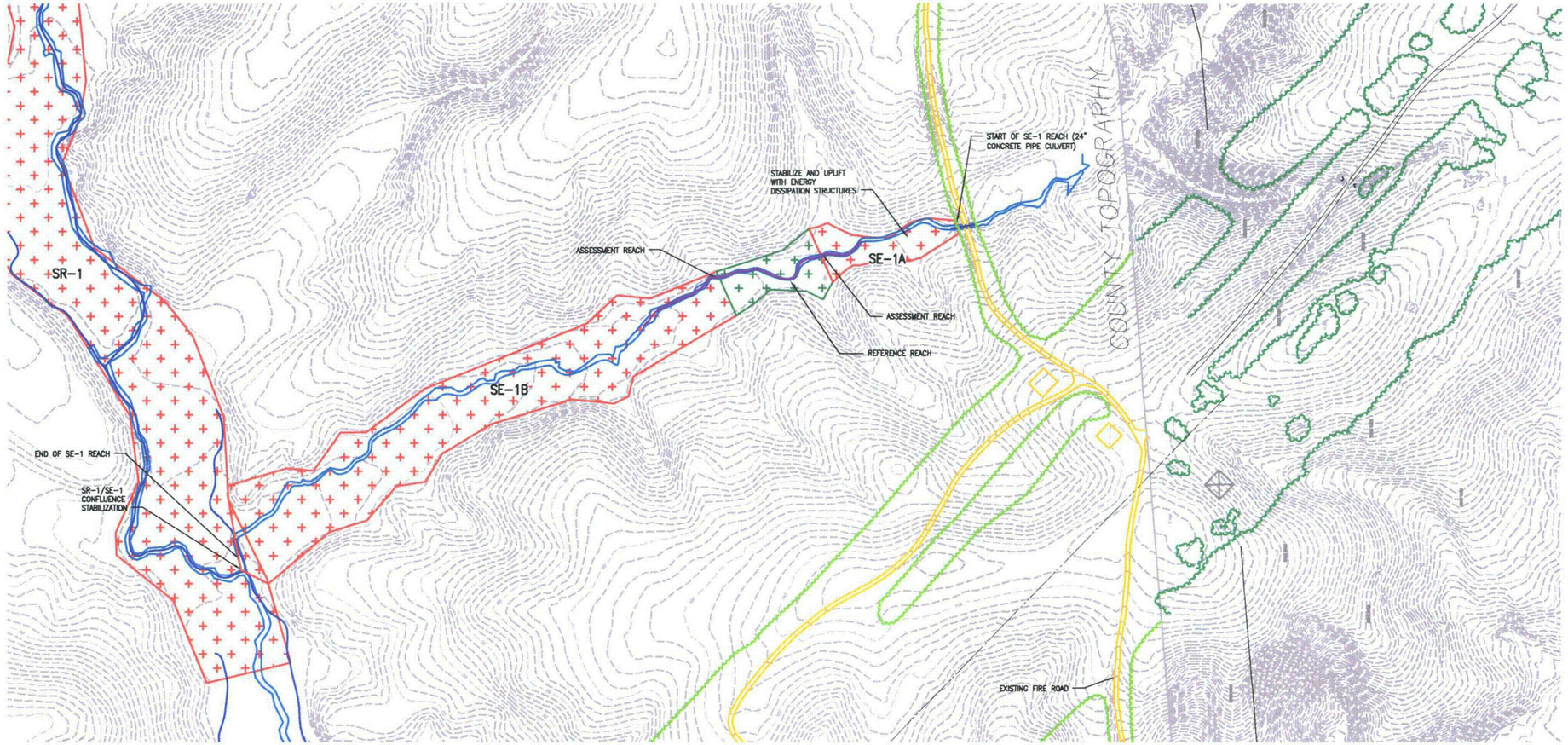
LUSBY, MARYLAND

SR-1 WOODLAND BRANCH RESTORATION REACH

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JJM
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-1
SHEET NUMBER	2 OF 14



LEGEND

- RESTORATION REACH
- REFERENCE / PRESERVATION REACH
- EXISTING STREAM (SURVEYED)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- ASSESSMENT REACH

GENERAL NOTES:

1. ASSESSMENT REACHES ARE LOCATED IN PORTIONS OF THE RESTORATION REACHES WHICH ARE TYPICAL OF THE CONDITION OF THE REACH AS A WHOLE, AND/OR SHOW THE TRANSITION BETWEEN IMPAIRED AND STABLE REACHES.
2. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.

PROPOSED RESTORATION CONCEPT:

1. INSTALL ENERGY DISSIPATION LOGS AND ROUGHNESS ELEMENTS TO PREVENT DOWNSTREAM CHANNEL INCISION BELOW EXISTING CULVERT.
2. UPLIFT REACH USING LOG CHANNEL CUT-OFF STRUCTURES. IN MIDDLE PORTIONS OF THE REACH, DOWNSTREAM OF REFERENCE, UTILIZE ABANDONED FLOODPLAIN CHANNELS AS NEW CHANNELS, BACKFILLING EXISTING CHANNELS OR CREATING OXBOW WETLANDS. STABILIZE CHANNELS AS NECESSARY WITH LOG AND ROOT STRUCTURES.
3. ENHANCE FLOODPLAIN WITH RIPARIAN PLANTINGS.
4. AT DOWNSTREAM END OF RESTORATION REACH, INSTALL STONE AND LOG STRUCTURES TO TRANSITION TO SR-1 RESTORATION REACH (CONFLUENCE STABILIZATION).
5. SUMMARY: 182 LF OF PRESERVATION (REFERENCE), 1,218 LF OF STREAM RESTORATION

N

100 50 0 100 200

GRAPHIC SCALE IN FEET

CONCEPT

NO.	DATE	BY	REVISIONS DESCRIPTION

SEAL

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UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN

LUSBY, MARYLAND

SE-1 WOODLAND BRANCH RESTORATION AND REFERENCE REACH

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JJM
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-2
SHEET NUMBER	3 OF 14

FILE PATH: [LOVETON] Q:\PROJECTS\14621.03 - UNISTAR\EA CREATED FIGURES\CONCEPT_STREAM_FIGURE.DWG [C-2] 11/4/09

LEGEND

- WETLAND CREATION – FORESTED WETLANDS
- RESTORATION REACH
- REFERENCE / PRESERVATION REACH
- EXISTING STREAM (SURVEYED)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- ASSESSMENT REACH

GENERAL NOTES:

1. ASSESSMENT REACHES ARE LOCATED IN PORTIONS OF THE RESTORATION REACHES WHICH ARE TYPICAL OF THE CONDITION OF THE REACH AS A WHOLE, AND/OR SHOW THE TRANSITION BETWEEN IMPAIRED AND STABLE REACHES.
2. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.

PROPOSED RESTORATION CONCEPT:

1. STABILIZE ALL DISTURBANCE FROM SITE ACCESS TO PRESERVATION AREAS.
2. UPLIFT RESTORATION REACH USING LOG CHANNEL CUT-OFF STRUCTURES. FOR INCISED PORTIONS. UTILIZE ABANDONED FLOODPLAIN CHANNELS AS NEW CHANNELS. BACKFILLING EXISTING CHANNELS OR CREATING OXBOW WETLANDS. STABILIZE CHANNELS AS NECESSARY WITH LOG AND ROOT STRUCTURES.
3. ENHANCE FLOODPLAIN WITH RIPARIAN PLANTINGS.
4. AT DOWNSTREAM END OF RESTORATION REACH, INSTALL STONE AND LOG STRUCTURES TO TRANSITION TO EXISTING UNRESTORED PRESERVATION CHANNEL.
5. SUMMARY: SE-2 900 LF OF STREAM RESTORATION, 1,079 LF OF PRESERVATION. SR-2 477 LF OF PRESERVATION (THIS SHEET)

CHESAPEAKE BAY

SR-2 (SEE SHEET S-4)

SR-2

START OF SR-2 PRESERVATION REACH. INSTALL LOG AND STONE STRUCTURES TO STABILIZE TRANSITION BETWEEN REACHES

SR-2

SE-3

START OF SE-2 RESTORATION AND ENHANCEMENT REACH (EXISTING LOG JAM – STABILIZE WITH UPPER REACH)

ENHANCEMENT PORTION OF REACH WITH MINOR LOG STRUCTURES FOR POOL DEVELOPMENT

SE-2

UPLIFT RESTORATION PORTION OF REACH WITH CHANNEL CUT-OFFS AND LOG STRUCTURES FOR FLOODPLAIN RECONNECTION

ASSESSMENT REACH

START OF SE-2 PRESERVATION REACH

SE-2

WOODLAND BRANCH

EXISTING FIRE ROAD AND 18" CMP CULVERT

REPLACE AND STABILIZE CULVERT CROSSING

CALVERT CLIFFS PARKWAY

100 50 0 100 200
GRAPHIC SCALE IN FEET

N

CONCEPT

NO.	DATE	BY	DESCRIPTION

REVISIONS

SEAL

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 15454, EXPIRATION DATE: JULY 2, 2011.

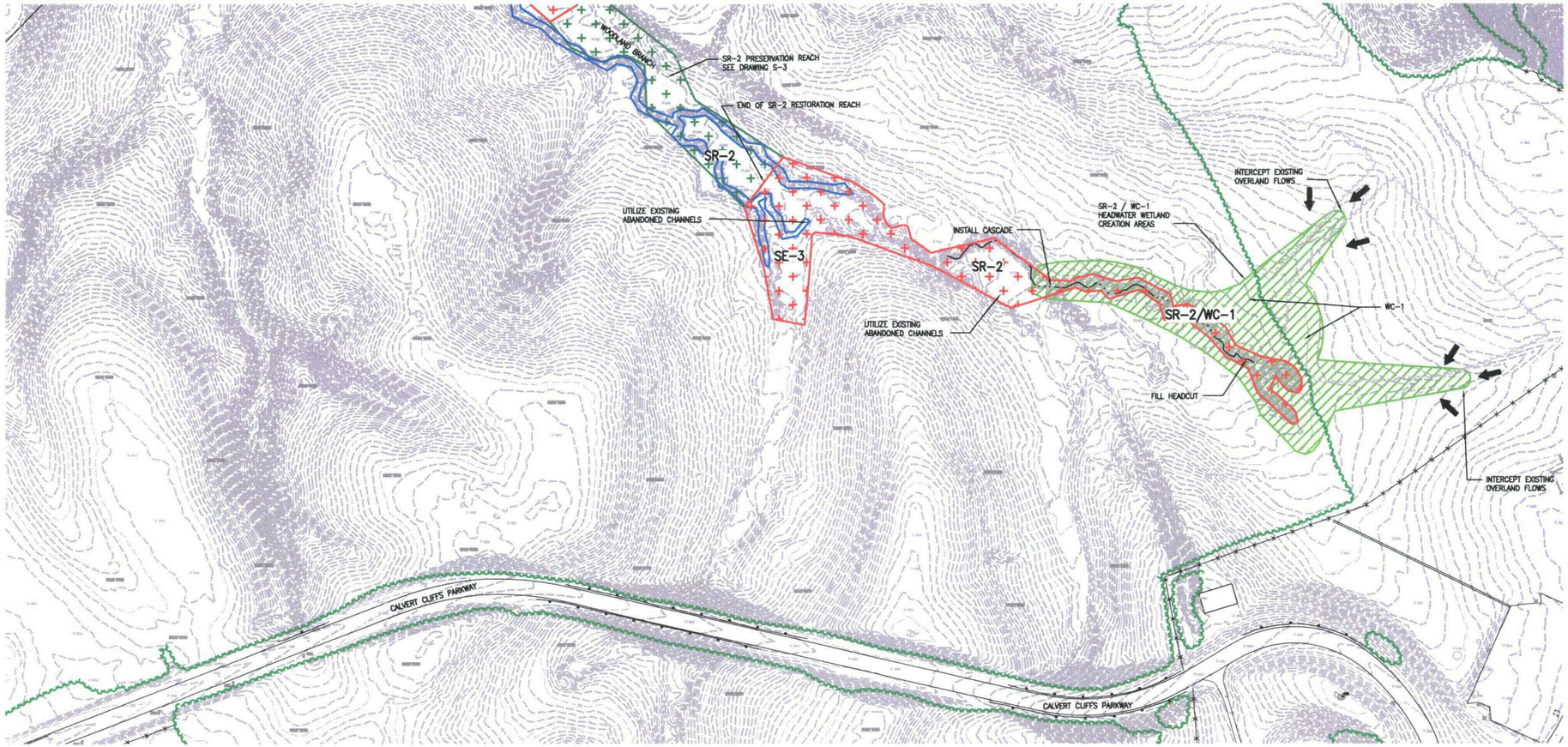
UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

SE-2 WOODLAND BRANCH RESTORATION REACH AND ASSOCIATED PRESERVATION REACHES

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JJM
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-3
SHEET NUMBER	4 OF 14

FILE PATH: (LOVETON) G:\PROJECTS\14621.03 - UNISTAR\EA CREATED FIGURES\CONCEPT_STREAM_FIGURE.DWG [C-3] 11/4/09



LEGEND

- WETLAND CREATION – FORESTED WETLANDS
- RESTORATION REACH
- REFERENCE / PRESERVATION REACH
- OVERLAND FLOW DIRECTION
- EXISTING STREAM (SURVEYED)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- ASSESSMENT REACH

PROPOSED RESTORATION CONCEPT:

1. HEADWATER WETLAND AREAS EXTEND TO INTERCEPT AND INFILTRATE OVERLAND FLOW IN EXISTING GRASSLAND AREAS. CREATION TO INCLUDE PRESERVING EXISTING TREES WHERE POSSIBLE.
2. UPLIFT UPPERMOST INCISED AREAS OF SR-2 REACH THROUGH MASS FILL AND GRADE CONTROL DEVICES, AND INSTALL INFILTRATION PRACTICES IN HEADWATER WETLAND AREAS.
3. ENHANCE REACH WITH RIPARIAN AND HEADWATER WETLAND PLANTINGS.
4. AT DOWNSTREAM END OF WETLAND AREA, INSTALL STONE AND LOG STRUCTURES TO TRANSITION TO EXISTING ABANDONED FLOODPLAIN CHANNEL. INSTALL CHANNEL CUTOFFS TO CREATE OXBOW WETLANDS IN EXISTING INCISED CHANNEL.
5. TRANSITION TO EXISTING PRESERVATION REACH CHANNEL WITH STONE / LOG STRUCTURES.
6. SUMMARY: SR-2 1,471 LF OF STREAM RESTORATION, SE-3 200 LF OF STREAM RESTORATION, AND APPROXIMATELY 2.2 ACRES OF HEADWATER WETLAND CREATION

GENERAL NOTES:

1. ASSESSMENT REACHES ARE LOCATED IN PORTIONS OF THE RESTORATION REACHES WHICH ARE TYPICAL OF THE CONDITION OF THE REACH AS A WHOLE, AND/OR SHOW THE TRANSITION BETWEEN IMPAIRED AND STABLE REACHES.
2. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.

N

100 50 0 100 200
GRAPHIC SCALE IN FEET

CONCEPT

REVISIONS			
NO.	DATE	BY	DESCRIPTION

SEAL

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 15453, EXPIRATION DATE: JULY 2, 2011.

UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN

LUSBY, MARYLAND

SR-2 WOODLAND BRANCH RESTORATION REACH AND SR-2/SE-3 HEADWATER WETLAND CREATION

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JJM
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-4
SHEET NUMBER	5 OF 14

LEGEND

- WETLAND CREATION – FORESTED WETLAND
- WETLAND ENHANCEMENT
- RESTORATION REACH
- REFERENCE / PRESERVATION REACH
- EXISTING STREAM (SURVEYED)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- ASSESSMENT REACH

GENERAL NOTES:

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2. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.

PROPOSED RESTORATION CONCEPT:

1. PRESERVE EXISTING SR-3 EEL HABIT TO THE FULLEST EXTENT SITE DEVELOPMENT WILL ALLOW.
2. CREATE HEADWATER WETLANDS AND WETLAND ENHANCEMENT ON REACH SE-4. UPLIFT CHANNEL AND CREATE INFILTRATION AND UPLIFT DEVICES TO PROMOTE BASE FLOW.
3. ENHANCE FLOODPLAIN OF SE-4 WITH RIPARIAN PLANTINGS.
4. AT DOWNSTREAM END OF SE-4 RESTORATION REACH, INSTALL STONE AND LOG STRUCTURES TO TRANSITION TO CHESAPEAKE BAY.
5. SUMMARY: 1.33 ACRES OF WETLAND CREATION (WC-4) AND 1.08 ACRES OF ENHANCEMENT (WE-3), 976 LF OF STREAM RESTORATION (SE-4). SR-3: APPROXIMATELY 800' OF PRESERVATION

CONCEPT

REVISIONS			
NO.	DATE	BY	DESCRIPTION

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 15453. EXPIRATION DATE: JULY 2, 2011.

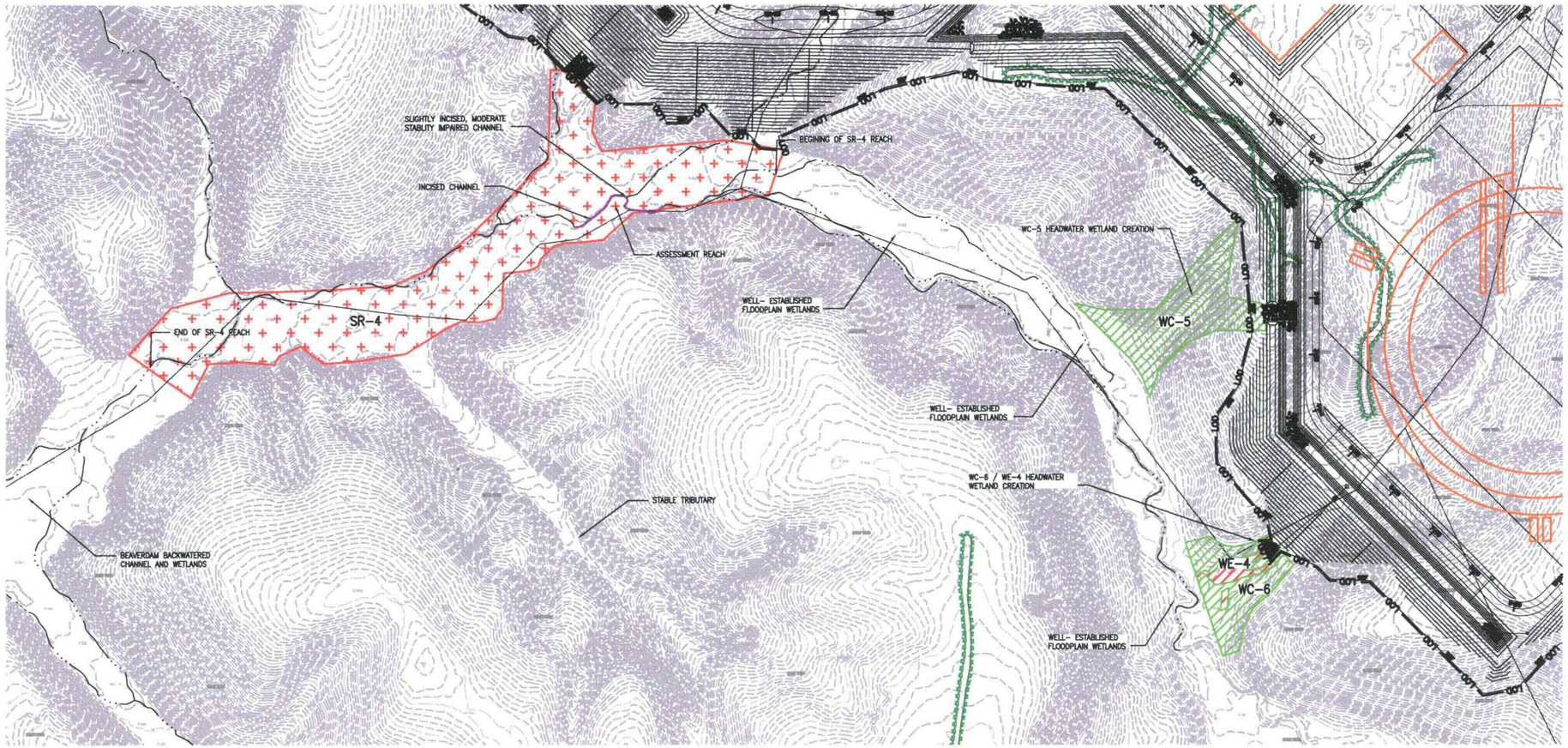
SEAL

UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

SE-4 STREAM RESTORATION REACH AND SR-3 PRESERVATION REACH
WE-3 AND WE-4 WETLAND ENHANCMENT AND CREATION AREAS

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JJM
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-5
SHEET NUMBER	6 OF 14



LEGEND

- WETLAND CREATION – FORESTED WETLANDS
- WETLAND ENHANCEMENT
- RESTORATION REACH
- REFERENCE / PRESERVATION REACH
- EXISTING STREAM (SURVEYED)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- ASSESSMENT REACH

(COMPLETE EXISTING CONDITIONS TO BE ADDED TO LEGEND AT LATER DATE)

GENERAL NOTES:

1. ASSESSMENT REACHES ARE LOCATED IN PORTIONS OF THE RESTORATION REACHES WHICH ARE TYPICAL OF THE CONDITION OF THE REACH AS A WHOLE, AND/OR SHOW THE TRANSITION BETWEEN IMPAIRED AND STABLE REACHES.
2. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.

PROPOSED RESTORATION CONCEPT:

1. STABILIZE PROPOSED SITE DEVELOPMENT STORMWATER OUTFALLS USING COASTAL OUTFALL METHODOLGY TO DISSIPATE ENERGY AND RECHARGE SHALLOW GROUNDWATER.
2. UPLIFT RESTORATION REACH USING LOG CHANNEL CUT-OFF STRUCTURES. IN LOWER PORTION OF REACH, UTILIZE ABANDONNED FLOODPLAIN CHANNELS AS NEW CHANNELS, BACKFILLING EXISTING CHANNELS OR CREATING OXBOW WETLANDS. STABILIZE CHANNELS AS NECESSARY WITH LOG AND ROOT STRUCUTRES.
3. ENHANCE FLOODPLAIN WITH RIPARIAN PLANTINGS AND WETLAND PLANTINGS WHERE APPLICABLE.
4. AT END OF RESTORATION REACH, INSTALL STONE AND LOG STRUCTURES TO TRANSITION TO EXISTING UNRESTORED CHANNEL.
5. SUMMARY: SR-4 1,200 LF OF RESTORATION, WITH 1.13 ACRES OF HEADWATER WETLAND CREATION, AND 0.09 ACRES OF HEADWATER WETLAND ENHANCEMENT.

N

100 50 0 100 200
GRAPHIC SCALE IN FEET

CONCEPT

NO.	DATE	BY	REVISIONS DESCRIPTION

SEAL

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 15453, EXPIRATION DATE: JULY 2, 2011.

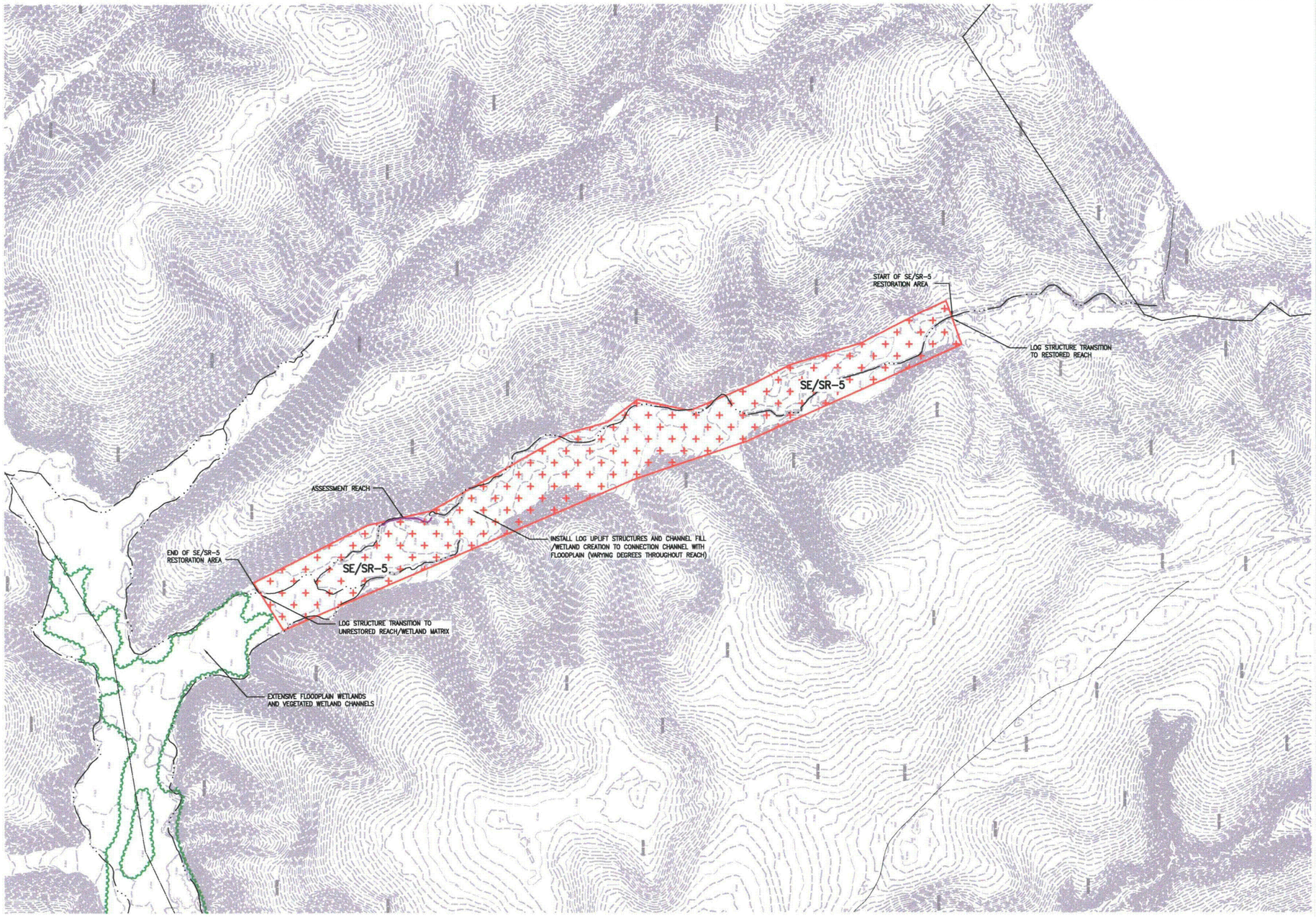
UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN

LUSBY, MARYLAND

SR-4 JOHNS CREEK RESTORATION REACH; WC-5 AND W-6 HEADWATER WETLAND CREATION/COASTAL OUTFALL CREATION AREAS AND WE-4 WETLAND ENHANCEMENT

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JJM
CHECKED BY	CAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-6
SHEET NUMBER	7 OF 14



LEGEND

- PROPOSED HEADWATER WETLANDS
- PROPOSED RESTORATION REACH
- REFERENCE / PRESERVATION REACH
- EXISTING STREAM (SURVEYED)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- ASSESSMENT REACH

(COMPLETE EXISTING CONDITIONS TO BE ADDED TO LEGEND AT LATER DATE)

GENERAL NOTES:

1. ASSESSMENT REACHES ARE LOCATED IN PORTIONS OF THE RESTORATION REACHES WHICH ARE TYPICAL OF THE CONDITION OF THE REACH AS A WHOLE, AND/OR SHOW THE TRANSITION BETWEEN IMPAIRED AND STABLE REACHES.
2. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.

PROPOSED RESTORATION CONCEPT:

1. REACH IS CHARACTERIZED BY ALTERNATING LOG JAMS AND GRADE CONTROLS, RESULTING IN FLUCTUATIONS BETWEEN MODERATE AND SEVERE ENTRENCHMENT.
2. INSTALL CHANNEL UPLIFT STRUCTURES AND UTILIZE ABANDONED FLOODPLAIN CHANNELS WHERE APPLICABLE.
3. ENHANCE FLOODPLAIN WITH RIPARIAN PLANTINGS.
4. AT END OF RESTORATION REACH, INSTALL STONE AND LOG STRUCTURES TO TRANSITION TO EXISTING STABLE REACH.
5. SUMMARY: SE/SR-5 1,567 LF OF RESTORATION

N

100 50 0 100 200

GRAPHIC SCALE IN FEET

CONCEPT

REVISIONS			
NO.	DATE	BY	DESCRIPTION

SEAL

PROFESSIONAL CERTIFICATION. I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 15653, EXPIRATION DATE: JULY 2, 2011.

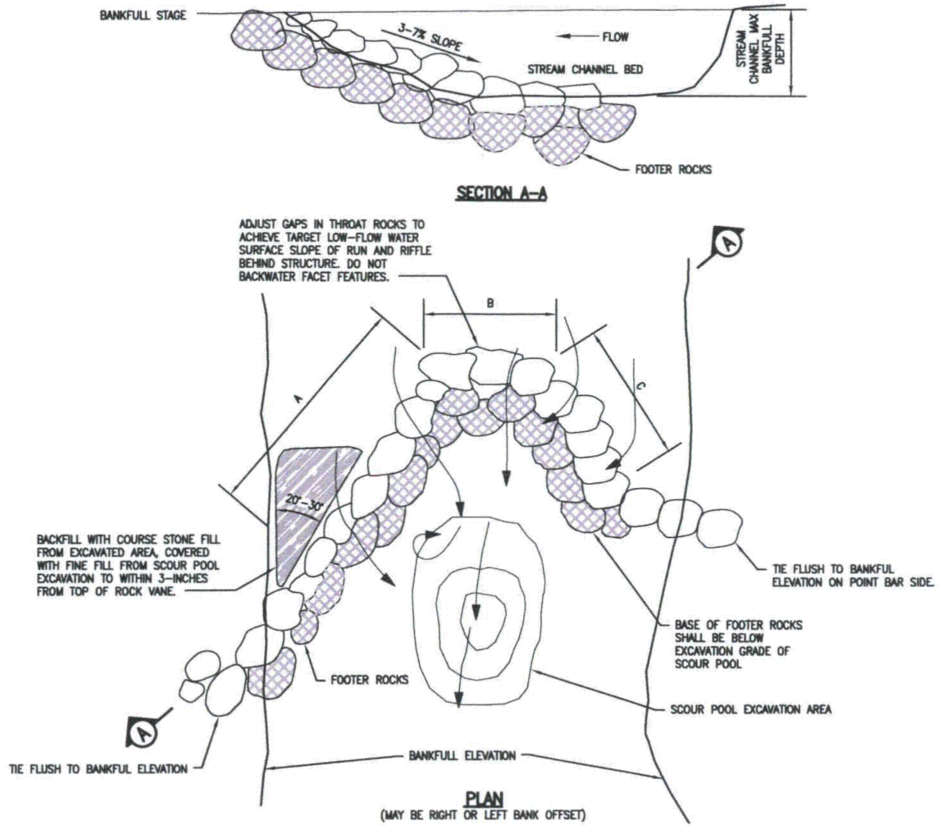
UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN

LUSBY, MARYLAND

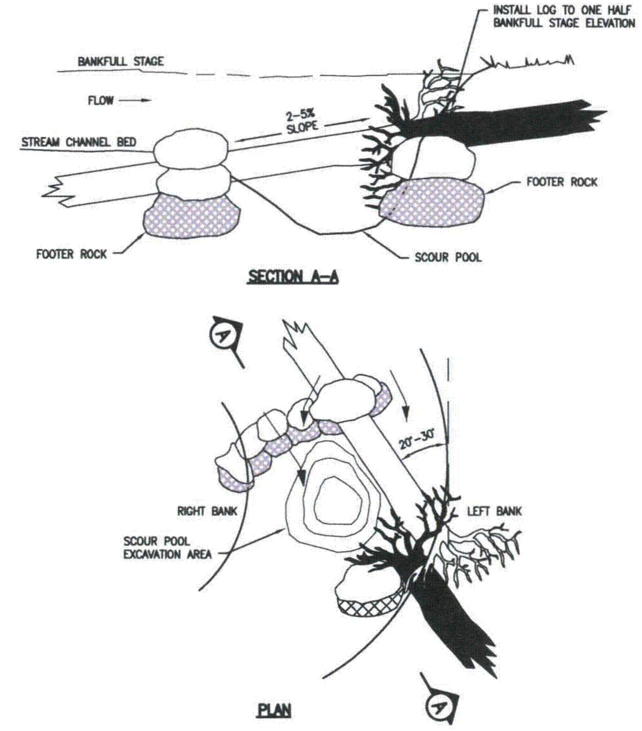
SE/SR-5 JOHNS CREEK RESTORATION REACH

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

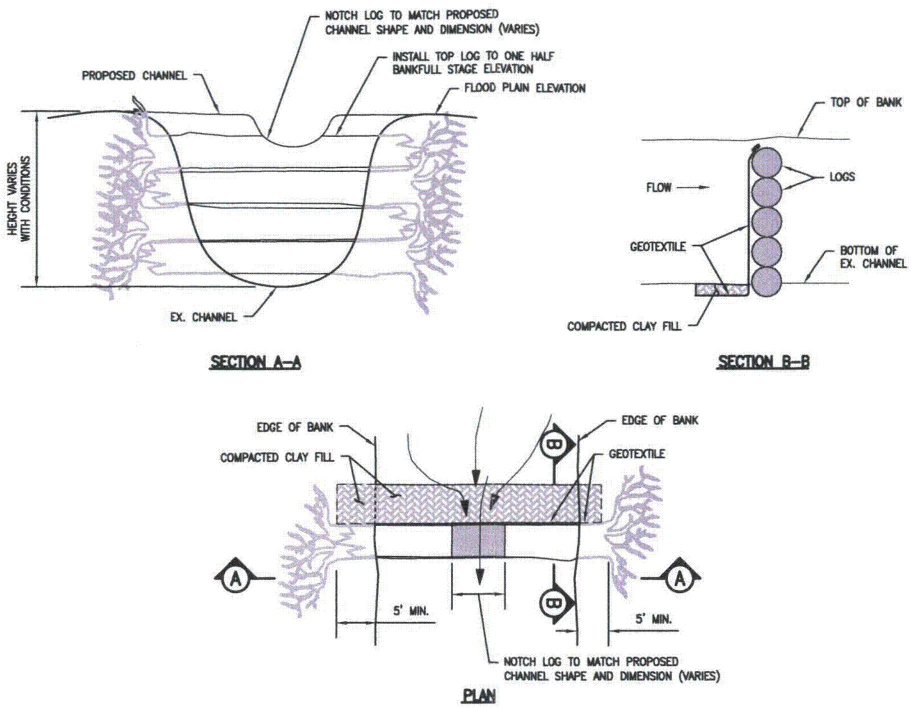
DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JJM
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-7
SHEET NUMBER	8 OF 14



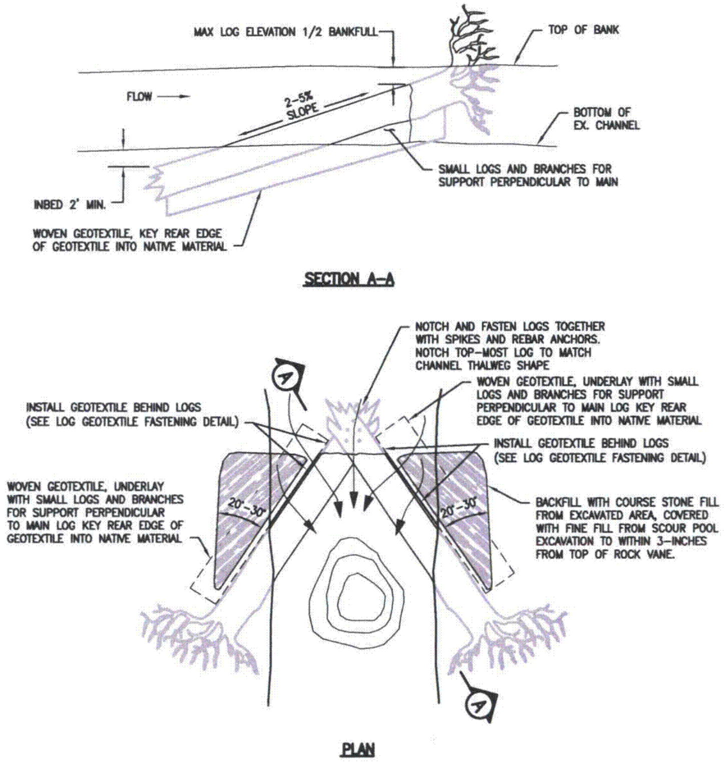
J HOOK VANE DETAIL (JHV)
NOT TO SCALE



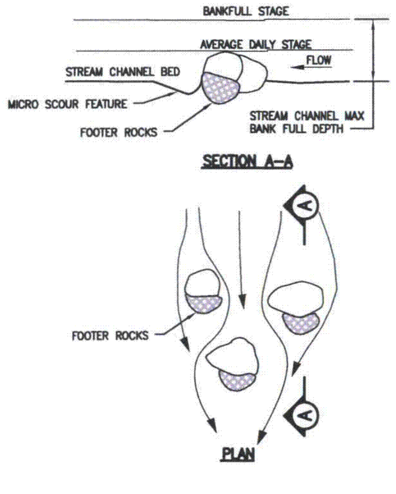
ROOT WAD / LOG VANE DETAIL
NOT TO SCALE
MUST BE FIELD-FIT. CONFIGURATION MAY VARY.



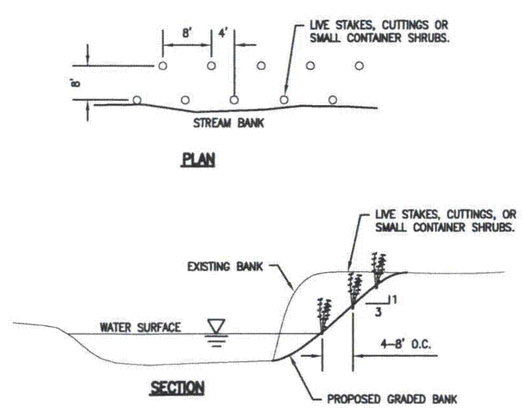
LOG CHANNEL CUTOFF STRUCTURE
NOT TO SCALE



LOG CROSS VANE DETAIL
NOT TO SCALE



RANDOM BOULDER PLACEMENT
NOT TO SCALE
MUST BE FIELD-FIT. CONFIGURATION AND NUMBER MAY VARY.



RIPARIAN PLANTING DETAIL FOR GRADED STREAM BANK
NOT TO SCALE

PLANTING NOTES:

THIS PROJECT WILL UTILIZE SEVERAL BIOENGINEERING TECHNIQUES WHICH WILL INVOLVE:

- ROOTED WILLOW CUTTINGS
- WILLOW CUTTINGS
- WILLOW LIVE STAKES

CONTAINER 12-18" DOGWOODS 4-8' O.C. AND VARIOUS RIPARIAN TREE PLANTINGS USING 12-24" CONTAINER TREES 4-8' O.C.
THE NUMBER OF PLANTS WILL BE DETERMINED DURING PLANTING BY THE PROJECT ENGINEER.

CONCEPT

REVISIONS: NO. | DATE | BY | DESCRIPTION

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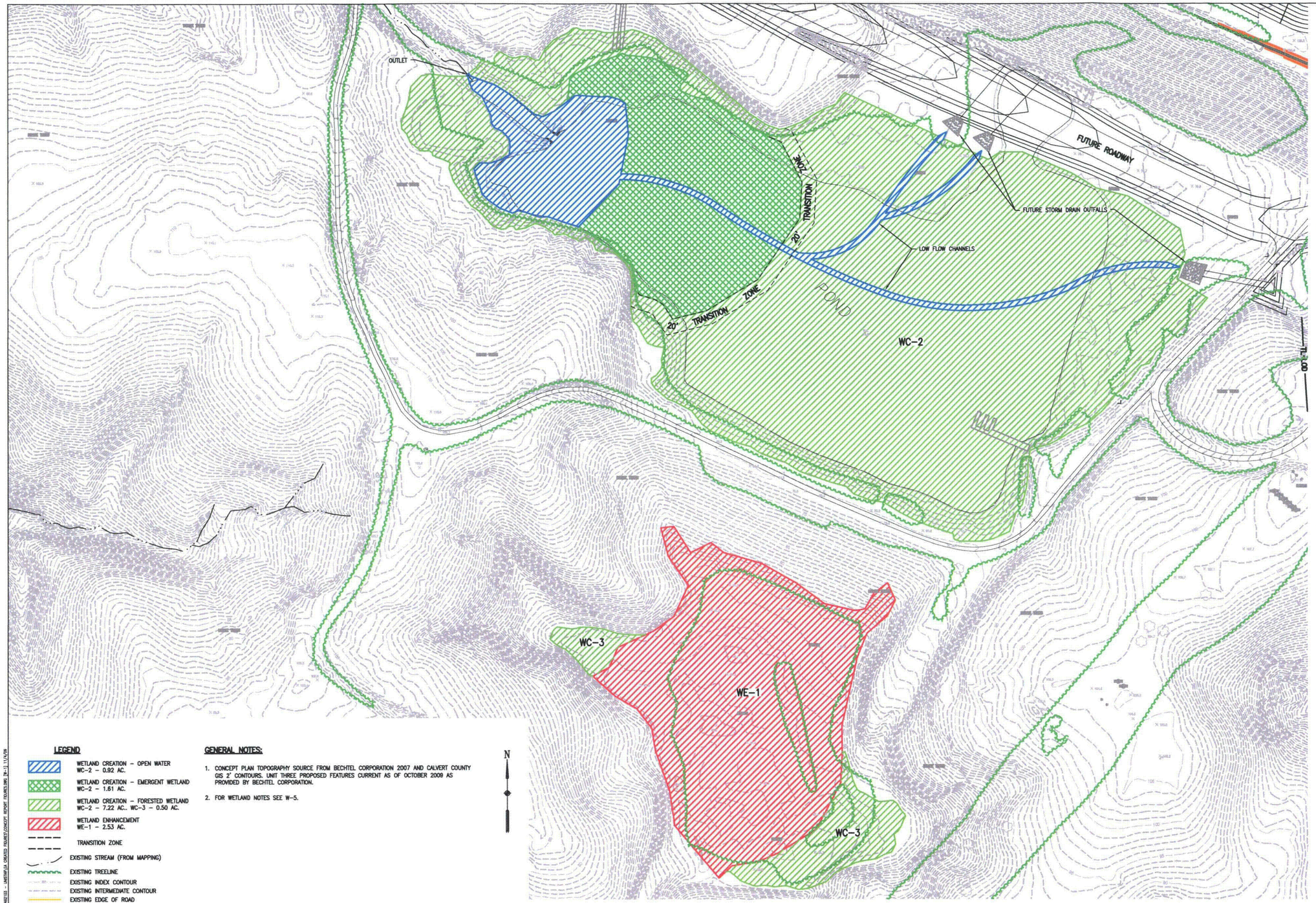
SEAL

UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

STREAM RESTORATION CONCEPT DETAILS

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	JJM
DRAWN BY	JAP/JJM
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	S-8
SHEET NUMBER	9 OF 14



LEGEND

- WETLAND CREATION – OPEN WATER WC-2 – 0.92 AC.
- WETLAND CREATION – EMERGENT WETLAND WC-2 – 1.61 AC.
- WETLAND CREATION – FORESTED WETLAND WC-2 – 7.22 AC., WC-3 – 0.50 AC.
- WETLAND ENHANCEMENT WE-1 – 2.53 AC.
- TRANSITION ZONE
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD
- PROPOSED INDEX CONTOUR (SITE DEVELOPMENT)
- PROPOSED INTERMEDIATE CONTOUR (SITE DEVELOPMENT)

GENERAL NOTES:

1. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.
2. FOR WETLAND NOTES SEE W-5.

N

60 30 0 60 120
GRAPHIC SCALE IN FEET

CONCEPT

FILE PATH: [LOVITONI.GLV]PROJECTS\14621.03 - UNISTAR UX CREATED FIGURES\CONCEPT REPORT FIGURES.DWG [W-1] 11/4/09

REVISIONS			
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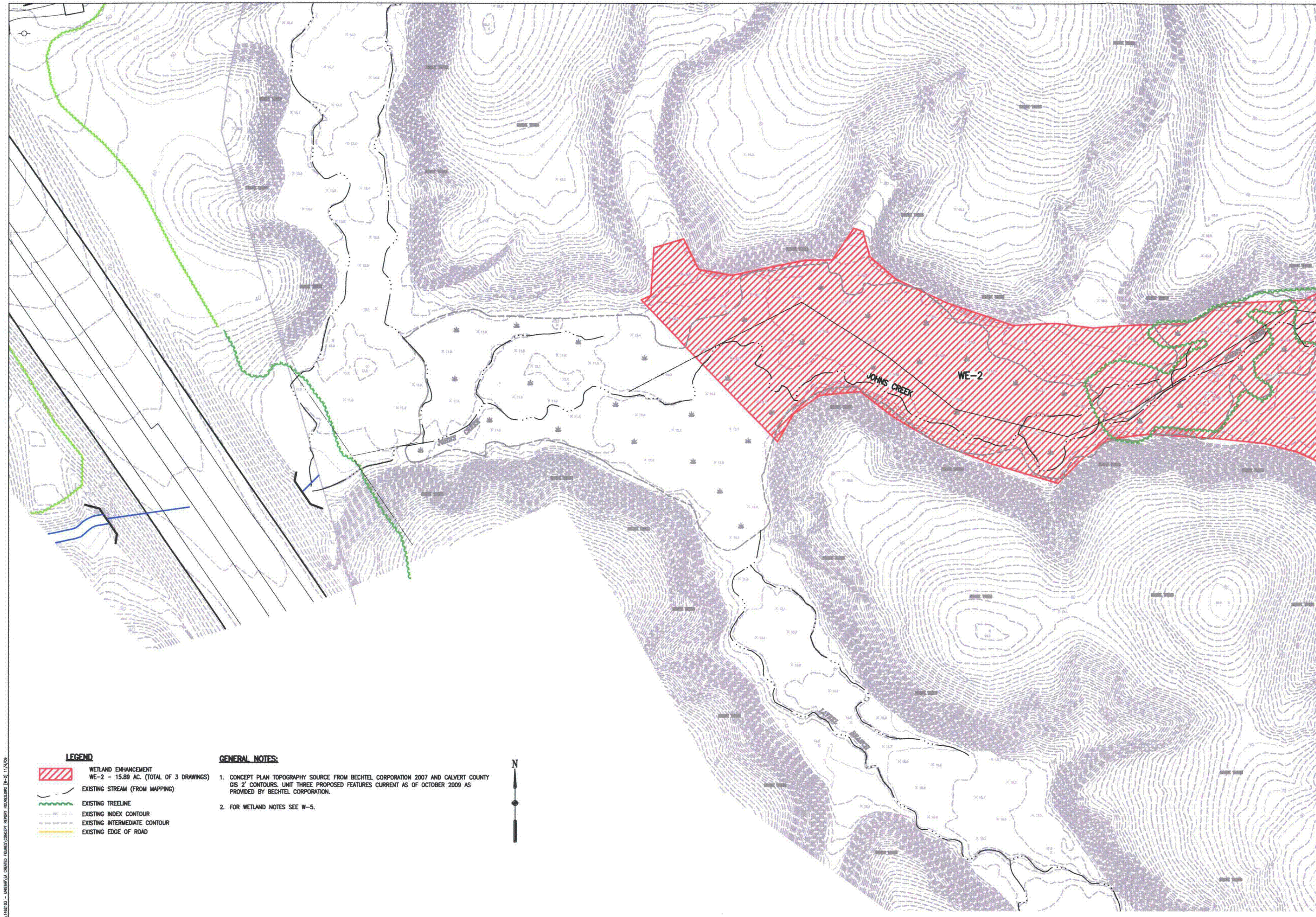
UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN

LUSBY, MARYLAND

WC-2 AND WC-3 WETLAND CREATION AREAS AND WE-1 WETLAND ENHANCEMENT AREA

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	MP
DRAWN BY	MP
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	W-1
SHEET NUMBER	10 OF 14



LEGEND

- WETLAND ENHANCEMENT WE-2 – 15.89 AC. (TOTAL OF 3 DRAWINGS)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING EDGE OF ROAD

GENERAL NOTES:

1. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.
2. FOR WETLAND NOTES SEE W-5.

N

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GRAPHIC SCALE IN FEET

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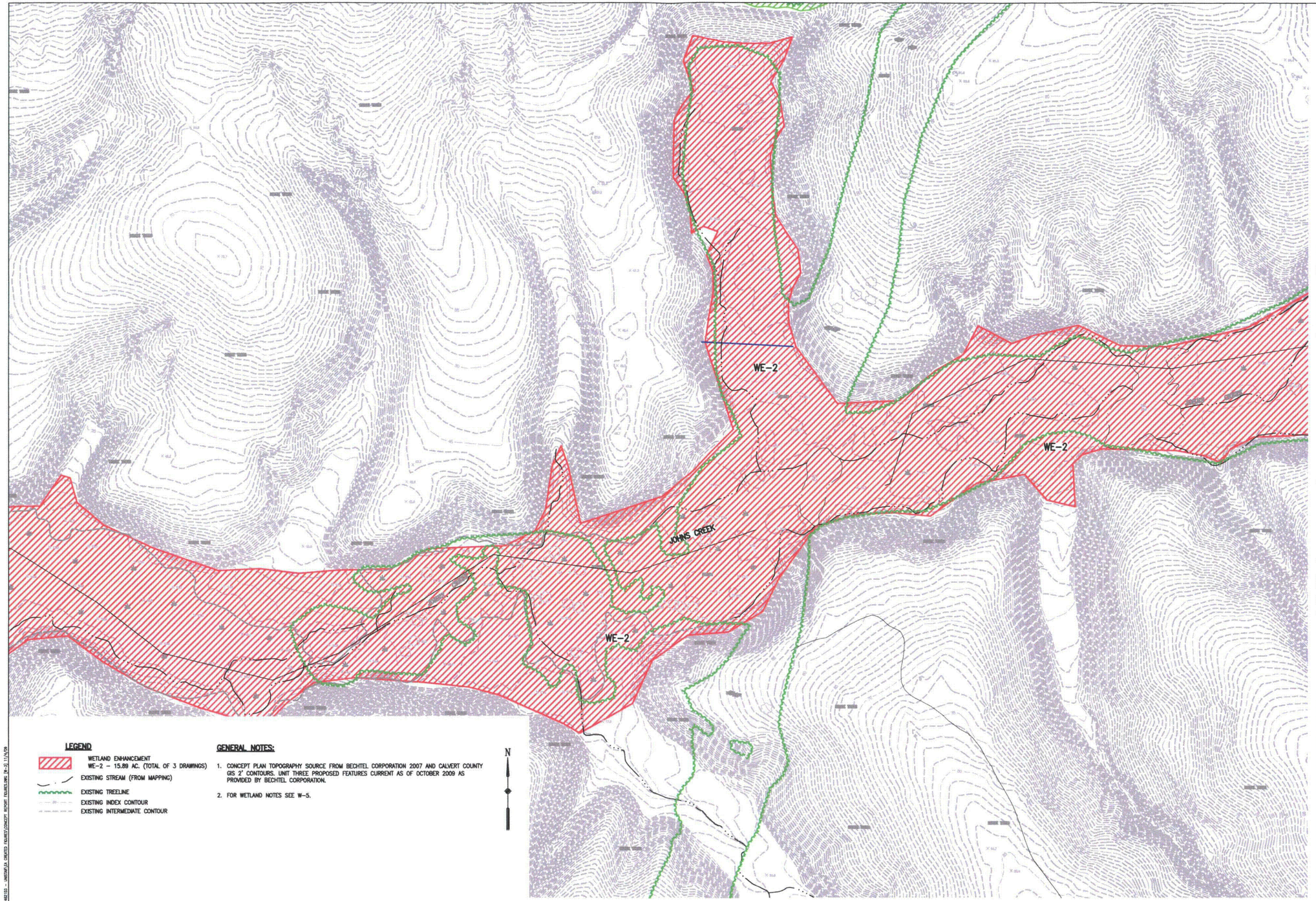
UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

WE-2 JOHNS CREEK WETLAND ENHANCEMENT AREA I

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
DESIGNED BY	MP
DRAWN BY	MP
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	W-2
SHEET NUMBER	11 OF 14



LEGEND

- WETLAND ENHANCEMENT WE-2 – 15.89 AC. (TOTAL OF 3 DRAWINGS)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR

GENERAL NOTES:

1. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.
2. FOR WETLAND NOTES SEE W-5.

N

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UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

WE-2 JOHNS CREEK WETLAND ENHANCEMENT AREA II

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
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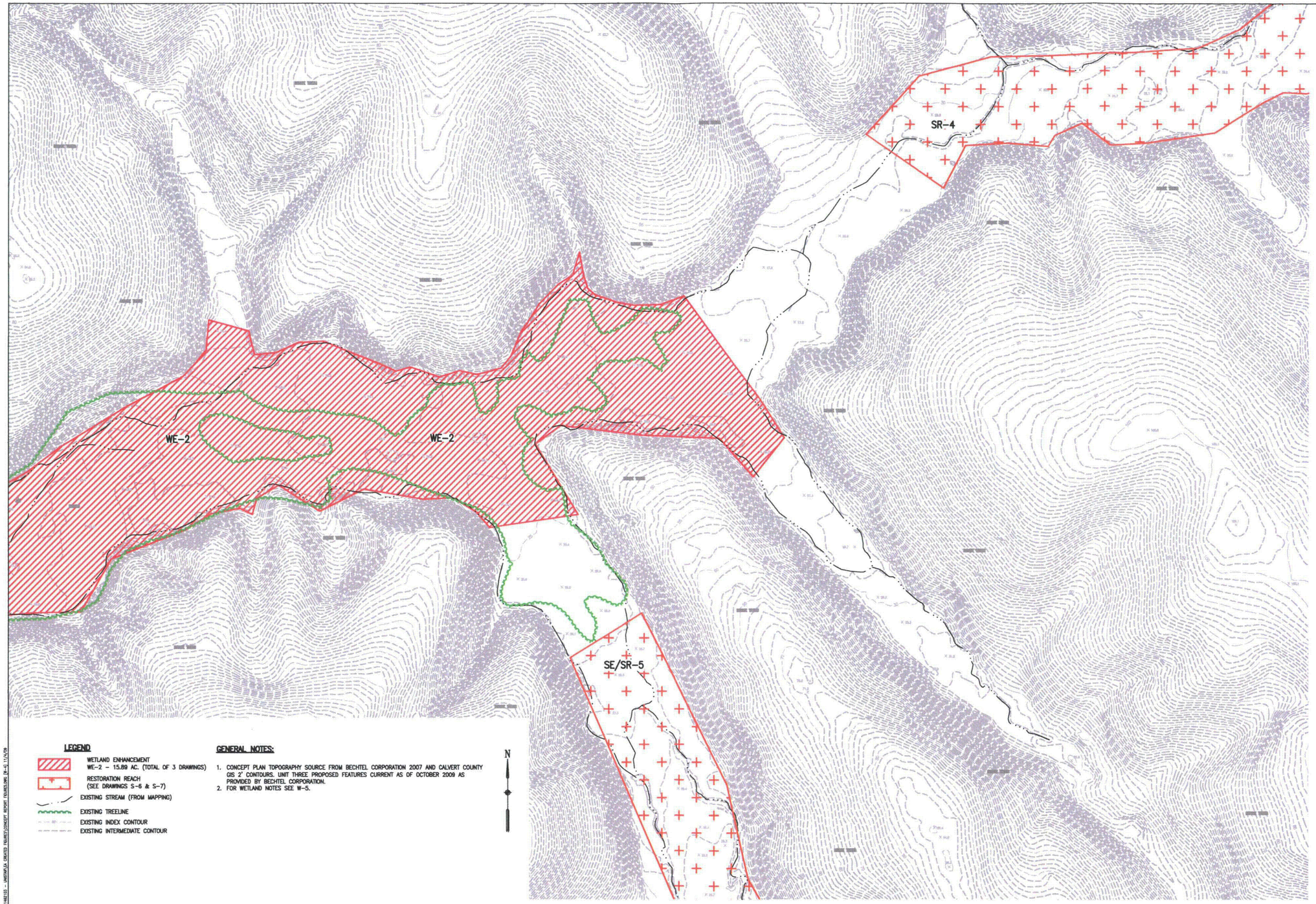
DRAWN BY	MP
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	W-3
SHEET NUMBER	12 OF 14



LEGEND

- WETLAND ENHANCEMENT
  WE-2 – 15.89 AC. (TOTAL OF 3 DRAWINGS)
- RESTORATION REACH
  (SEE DRAWINGS S-6 & S-7)
- EXISTING STREAM (FROM MAPPING)
- EXISTING TREELINE
- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR

GENERAL NOTES:

1. CONCEPT PLAN TOPOGRAPHY SOURCE FROM BECHTEL CORPORATION 2007 AND CALVERT COUNTY GIS 2' CONTOURS. UNIT THREE PROPOSED FEATURES CURRENT AS OF OCTOBER 2009 AS PROVIDED BY BECHTEL CORPORATION.
2. FOR WETLAND NOTES SEE W-5.

N

60 30 0 80 120
GRAPHIC SCALE IN FEET

CONCEPT

FILE PATH: [CONTENT.G:\PROJECTS\14621.03 - UNISTAR\CA GRADED FIGURES\CONCEPT REPORT FIGURES.DWG 8-4-1] 11/4/09

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UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

WE-2 JOHNS CREEK WETLAND ENHANCEMENT AREA III

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE	NOVEMBER 2009
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DRAWN BY	MP
CHECKED BY	GAT
PROJECT MANAGER	RP
PROJECT NUMBER	14621.03
DRAWING NUMBER	W-4
SHEET NUMBER	13 OF 14

GOALS AND OBJECTIVES:

THE OVERALL GOAL OF THE PHASE II MITIGATION PLAN IS TO REPLACE FUNCTIONS AND VALUES LOST FROM IMPACTS TO EXISTING RESOURCES ONSITE FROM THE PROPOSED DEVELOPMENT. DUE TO NUMEROUS SAFETY, OPERATIONAL AND ENGINEERING REQUIREMENTS AND RESTRAINTS, THE PROPOSED DEVELOPMENT WILL RESULT IN UNAVOIDABLE PERMANENT IMPACTS TO WETLANDS AND STREAM RESOURCES. 11.72 ACRE CREDITS WOULD BE REQUIRED TO COMPENSATE FOR THE UNAVOIDABLE NONTIDAL WETLAND IMPACTS AND 8,350 LINEAR FEET OF STREAM MITIGATION CREDITS FOR IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT.

THE CREATION AND ENHANCEMENT OF NONTIDAL WETLANDS ARE BEING PROPOSED TO ENHANCE WATER QUALITY AND HABITAT, AS WELL AS PROVIDE FUNCTIONAL REPLACEMENT FOR IMPACTED WETLANDS. 11.72 ACRE-CREDITS WOULD BE REQUIRED TO COMPENSATE FOR THE UNAVOIDABLE NONTIDAL WETLAND IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT. IT IS PROPOSED THAT 1.6 ACRES OF EMERGENT AND 12.81 ACRES OF FORESTED NONTIDAL WETLANDS BE CREATED, AS WELL AS 19.59 ACRES OF FORESTED WETLAND ENHANCEMENT TO OBTAIN A TOTAL OF 14.55 ACRES OF CREDITS FOR WETLAND MITIGATION.

THE 8,350 LINEAR FEET OF STREAM MITIGATION CREDITS WILL BE ACHIEVED THROUGH RESTORATION, ENHANCEMENT AND PRESERVATION TECHNIQUES WITH THE GOAL OF PROTECTING AND IMPROVING AQUATIC RESOURCE FUNCTIONS AND RETURNING NATURAL/HISTORIC FUNCTIONS TO FORMER OR DEGRADED AQUATIC RESOURCES. SIMILARLY, THROUGH THE ESTABLISHMENT OF HEADWATER WETLAND AND INFILTRATION PRACTICES IN HEAD-CUT AND UPLAND SITUATIONS, RESTORATION OF HISTORICAL CHANNEL FUNCTIONS, HISTORICAL GROUNDWATER ELEVATIONS AND INCREASES IN BASE FLOW WILL BE ACHIEVED. THE PHASE II MITIGATION PLAN INCLUDES 9,141 LINEAR FEET OF STREAM RESTORATION AND 2,885 LINEAR FEET OF STREAM PRESERVATION IN ORDER TO OBTAIN THE REQUIRED LINEAR FEET OF STREAM MITIGATION CREDITS.

ADDITIONAL GOALS FOR THIS MITIGATION PROJECT ARE TO ENHANCE WILDLIFE HABITAT, INCREASE DIVERSITY OF THE PLANT COMMUNITY, CYCLE NUTRIENTS AND PREVENT SECONDARY IMPACTS RESULTING FROM THE PROPOSED DEVELOPMENT.

NOTES:

1. THROUGHOUT THE PROPOSED STREAM RESTORATION SITES, THE CHANNEL RELOCATION DESIGN WILL ATTEMPT TO ACCOUNT FOR A MASS BALANCE WHERE THE AMOUNT OF CUT EQUALS THE AMOUNT OF FILL.
2. DETAILED QUANTITIES, TYPE AND LOCATION OF EARTHWORK ACTIVITIES FOR ALL PROPOSED MITIGATION SITES WILL BE PROVIDED CONCURRENT WITH THE DEVELOPMENT OF THE INTERMEDIATE DESIGN OF THE PHASE II MITIGATION PLAN.
3. FOR ALL WETLAND AND STREAM MITIGATION GRADING ACTIVITIES, AN APPROVED SEDIMENT AND EROSION CONTROL PLAN WILL BE PREPARED AND SUBMITTED FOR APPROVAL. THE PLAN WILL BE PHASED APPROPRIATELY (INITIAL AND FINAL) AND, WHEN IMPLEMENTED, WILL INCORPORATE TEMPORARY AND PERMANENT STABILIZATION MEASURES AND PROMOTE MANAGED WORK AREAS (DIVERSION, UMP AROUND AND DEWATERING MEASURES).
4. PLANTINGS SHALL BE INSTALLED DURING THE GROWING SEASON (JUNE-JULY). PLANTING SHALL NOT BE PERFORMED WHEN THE SOIL IS TOO DRY OR TOO WET, OR OTHERWISE IN A CONDITION NOT GENERALLY ACCEPTED AS SATISFACTORY FOR PLANTING.
5. WETLAND MITIGATION AREAS WILL BE MOWED WITH A BRUSH HOG. INVASIVE SPECIES WILL BE ERADICATED IF PRESENT AND PLANTING AREA WILL BE SPOT SPRAYED WITH PRE AND POST EMERGENT KILL TO EXISTING PLANTS AND PREVENT GERMINATION OF EXISTING SEEDS IN SOIL PRIOR TO PLANTING (SEE PHRAGMITES CONTROL).
6. THERE SHALL BE NO DEVELOPMENT ACTIVITIES, CLEARING, DUMPING OR OTHER DISTURBANCE TO THE MITIGATION SITES AFTER PLANTING OCCURS.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING UTILITY COMPANIES, UTILITY CONTRACTORS AND "MISS UTILITY" A MINIMUM OF 48 HOURS PRIOR TO BEGINNING WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO UTILITIES DUE TO NON-COORDINATED WORK. CONTRACTOR MAY MAKE MINOR ADJUSTMENTS IN SPACING AND LOCATION OF PLANT MATERIALS TO AVOID CONFLICTS WITH UTILITIES.
8. PLANT MATERIAL, UNLESS OTHERWISE SPECIFIED, SHALL BE NURSERY GROWN, UNIFORMLY BRANCHED AND HAVE A VIGOROUS ROOT SYSTEM. PLANT MATERIAL SHALL BE HEALTHY, VIGOROUS PLANTS FREE FROM DEFECTS, DECAY, DISFIGURING ROOTS, SUNSCALD INJURIES, ABRASIONS OF THE BARK, PLANT DISEASE, INSECT PEST EGGS, BOXERS, INFESTATIONS OR OBJECTIONABLE DISFIGUREMENTS. PLANT MATERIAL THAT IS WEAK OR WHICH HAS BEEN CUT BACK FROM LARGER GRADES TO MEET REQUIREMENTS WILL BE REJECTED. TREES WITH FORKED LEADERS WILL NOT BE ACCEPTED. PLANTS SHALL BE FRESHLY DUG; NO HELLED-IN PLANTS OR PLANTS FROM COLD STORAGE WILL BE ACCEPTED.
9. UNLESS OTHERWISE SPECIFIED, PLANT MATERIAL SHALL CONFORM TO "AMERICAN STANDARD NURSERY STOCK" ANSI Z60.1-2004 PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMAN, INCLUDING ADDENDA.
10. TO LESSEN THE CHANCE OF LOSS, THE TREES SHOULD BE CHECKED FROM TIME TO TIME TO INSURE THAT THEY ARE RECEIVING SUFFICIENT WATER. AS A PREVENTATIVE MEASURE AGAINST DAMAGE CAUSED BY LACK OF MOISTURE, THE ROOTS OF THE TREES CAN BE DIPPED IN A POLYMER BEFORE PLANTING. THIS MATERIAL HAS THE ABILITY TO ATTRACT MOISTURE FROM THE SOIL AND MAKE IT AVAILABLE TO THE TREES.
11. THE SELECTED TREE SPECIES WILL CONSIST OF CONTAINERIZED AND/OR BARE ROOT STOCK PROTECTED BY TREE SHELTERS (I.E. BLUE-X, TREE PRO OR MIRACLE TUBE TREE SHELTERS). THE TREE SHELTERS WILL PROVIDE PROTECTION FROM WILDLIFE DEPREDATION, WIND OR OTHER INFLUENCES.

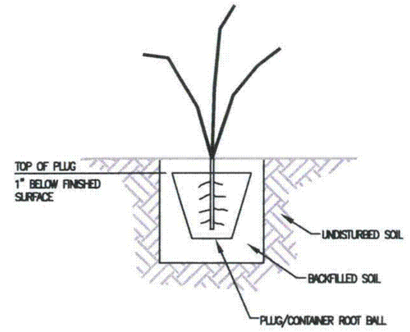
INVASIVES REMOVAL PRACTICES

INVASIVE PLANTS ARE PLANTS THAT ARE NOT CURRENTLY GROWING IN THEIR NATIVE HABITAT. INVASIVE PLANTS ARE TAKING OVER MANY OF THE NATURAL AREAS AT ABERDEEN PROVING GROUND. THIS DOCUMENT DISCUSSES THE INVASIVE PLANTS COMMONLY FOUND AT ABERDEEN PROVING GROUND ALONG WITH SUGGESTIONS FOR CONTROL.

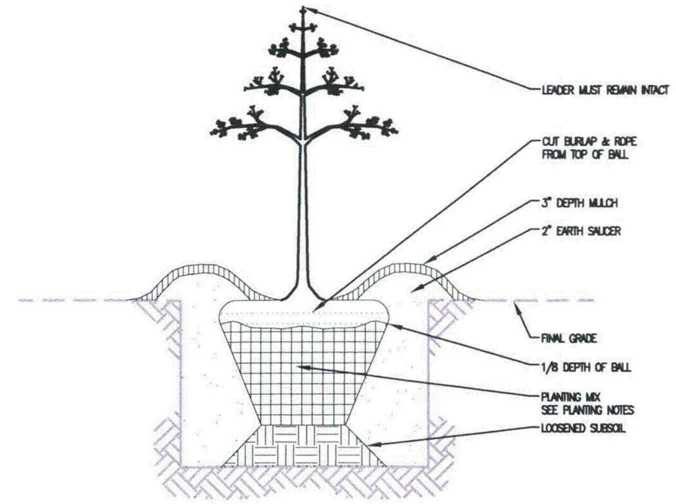
PHRAGMITES (PHRAGMITES AUSTRALIS)

PHRAGMITES IS A TALL GRASS THAT HAS A THICK STALK THAT CAN REACH 13 FEET IN HEIGHT. IT HAS A LARGE PLUME-LIKE FLOWER THAT PERSISTS THROUGHOUT THE YEAR. PHRAGMITES SPREADS BY CREEPING RHIZOMES. IT AGGRESSIVELY INVADES MARSHES AND WETLANDS.

CONTROL - TECHNIQUES USED TO CONTROL PHRAGMITES MAY INCLUDE CHEMICAL TREATMENT (I.E., SPRAYING HERBICIDES) OR PHYSICAL TREATMENTS SUCH AS MOWING AND FLOODING. MULTIPLE TREATMENTS ARE USUALLY NECESSARY TO EFFECTIVELY CONTROL A HEAVY STAND. CONTROLLING PHRAGMITES IN WETLANDS BY ANY METHOD MAY REQUIRE ADVANCE APPROVAL BY STATE AND FEDERAL AGENCIES BEFORE TREATING. THE MOST PRACTICAL METHOD OF CONTROLLING PHRAGMITES IS TREATING THE PLANTS WITH GLYPHOSATE OR IMASZAPYR HERBICIDES APPROVED FOR AQUATIC USE. GLYPHOSATE (THIS FORMULATION IS APPROVED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY FOR USE IN WETLANDS. IT IS SOLD UNDER TRADE NAMES SUCH AS RODEO, AQUANEAT, AND AQUASTAR) IS A BROAD SPECTRUM AQUATIC HERBICIDE THAT IS VIRTUALLY NONTOXIC TO MAMMALS, BIRDS, AND FISH WHEN USED ACCORDING TO INSTRUCTIONS. IMAZAPYR IS THE ACTIVE INGREDIENT UTILIZED IN THE FORMULATION OF HABITAT WHICH IS ALSO A BROAD SPECTRUM HERBICIDE EFFECTIVE IN CONTROLLING PHRAGMITES. ALL HERBICIDES MUST INCLUDE A NON-IONIC SURFACTANT WHICH ALLOWS THE HERBICIDES TO ADHERE TO THE PLANTS LEAVES, STALKS AND RHIZOMES FOR EFFECTIVE CONTROL. SURFACTANTS MUST BE ACQUIRED SEPARATELY AND ADDED TO TANK MIXTURES, UNLESS OTHERWISE NOTED ON LABEL RECOMMENDATIONS OBTAINED WITH THE HERBICIDES. FOR BEST RESULTS, THE SAME AREA SHOULD BE SPRAYED IN TWO SUCCESSIVE YEARS, THEN SPOT-TREATED IN SUCCEEDING YEARS TO PREVENT REESTABLISHMENT.

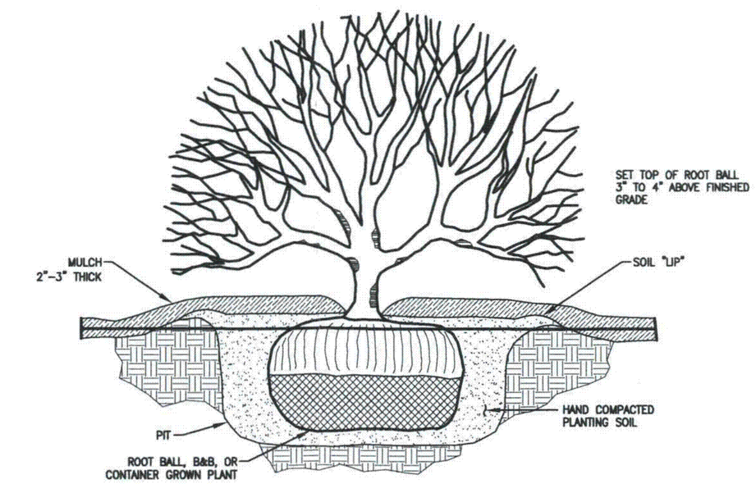


PLUG/CONTAINER PLANTING DETAIL
NOT TO SCALE



TYPICAL TREE PLANTING FOR 1" CAL. TREES DETAIL
(FOR DECIDUOUS AND EVERGREEN TREES)
NOT TO SCALE

1. PLACE UPRIGHT STAKES PARALLEL TO WALKS & BUILDINGS.
2. KEEP MULCH 1" FROM TRUNK.



TYPICAL TREE/SHRUB PLANTING DETAIL
NOT TO SCALE

ROOT BALL DIAMETER	PIT DIAMETER
12" OR LESS	B + 16"
GREATER THAN 12"	B + 24"

Scientific Name	Common Name	Wetland Status	Area For Planting	Typical Spacing (OC')	Found Onsite
WETLAND CREATION AREAS 1, 3, 4, 5, & 6 (WC-,1 WC-3, WC-4,					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FAC+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Viburnum dentatum	Southern	FAC	Forested	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory	8	No
Lindera benzoin	Spicebush	FACW-	Forested understory	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested understory	8	Yes
WETLAND CREATION AREA 2 (WC-2) & WETLAND ENHANCEMENT					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FAC+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Viburnum dentatum	Southern arrowwood	FAC	Forested understory / transition zone	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory / transition zone	8	No
Lindera benzoin	Spicebush	FACW-	Forested understory / transition zone	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested understory / transition zone	8	Yes
Asclepias incarnata	Swamp Milkweed	OBL	Emergent	3	Yes
Carex crinita	Fringed Sedge	OBL	Emergent	3	Yes
Juncus effusus	Soft Rush	FACW+	Emergent	3	Yes
Carex lurida	Lurid Sedge	OBL	Emergent	3	No
Panicum virgatum	Switchgrass	FAC	Emergent	3	Yes
Saururus cernuus	Lizards Tail	OBL	Emergent	3	Yes
Peltandra virginica	Arrow arum	OBL	Emergent	3	No
Boehmeria Cylindrica	Small Spike False Nettle	FACW+	Emergent	3	Yes
Potamogeton sp.	Pondweed	OBL	Open Water	**	No
Nymphaea odorata	American White Water lily	OBL	Open Water	**	No

Scientific Name	Common Name	Wetland Status	Area For Planting	Typical Spacing (OC')	Found Onsite
WETLAND ENHANCMENT AREA 1 (WE-1)					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FAC+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Viburnum dentatum	Southern	FAC	Forested	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory	8	No
Lindera benzoin	Spicebush	FACW-	Forested understory	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested	8	Yes
WETLAND ENHANCEMENT AREA 2 & 4 (WE-2 & WE-4)					
Acer rubrum	Red Maple	FAC	Forested canopy	8	Yes
Plantanus occidentalis	American	FACW-	Forested canopy	8	Yes
Quercus phellos	Willow oak	FACW+	Forested canopy	8	Yes
Quercus palustris	Pin Oak	FACW	Forested canopy	8	Yes
Salix nigra	Black Willow	FACW+	Forested canopy	8	Yes
Viburnum dentatum	Southern	FAC	Forested	8	No
Cornus amomum	Silky Dogwood	FACW	Forested understory	8	No
Vaccinium corymbosum	Highbush	FACW-	Forested	8	Yes
Sambucus canadensis	Elderberry	FACW-	Forested understory	8	Yes

FILE PATH: (LOVETON) Q:\PROJECTS\1462103 - UNISTAR\EA CREATED FIGURES\PC-1.DWG [LAYOUT2] 11/9/09

CONCEPT

REVISIONS: NO. | DATE | BY | DESCRIPTION

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UNISTAR NUCLEAR ENERGY
CALVERT CLIFFS NUCLEAR POWER PLANT
UNIT 3 PHASE II MITIGATION PLAN
LUSBY, MARYLAND

GENERAL NOTES AND CONCEPT WETLAND PLANTING DETAILS

EA ENGINEERING, SCIENCE, AND TECHNOLOGY
Loveton Center
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

DATE: NOVEMBER 2009
DESIGNED BY: MP
DRAWN BY: MP
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PROJECT MANAGER: RP
PROJECT NUMBER: 14621.03
DRAWING NUMBER: W-5