10.0 NATURAL RESOURCES

10.1 Introduction

This chapter provides a summary of the detailed information in Appendix F: Natural Resources Written Reevaluation/Technical Report.

10.1.1 Water Resources

In the absence of appropriate stormwater treatment practices, surface water resources may be impacted by additional stormwater runoff that occurs as a result of increasing the roadway pavement area within a watershed. Roadway stormwater runoff may include sediments, nutrients, and deicing salt which can potentially reduce stream water quality and impact aquatic biota. Roadway stormwater runoff impacts from sediments and nutrients on surface water can be reduced by stormwater treatment practices such as detention basins and grass lined swales. Deicing salt in stormwater runoff cannot be removed by these stormwater treatment practices, but can be addressed by load reduction Best Management Practices (BMPs).

Phosphorus

Stormwater runoff containing phosphorus is a principal concern for some waterbodies, including Cobbetts Pond in the I-93 corridor. Phosphorus is generally the limiting nutrient for plant and algae growth in fresh waters. Increased inputs of phosphorus to lakes can stimulate and promote algal growth, which can lead to excessive vegetative growth that can interfere with the recreational use of the lake and could lead to a decline in water quality conditions. As algal growth increases, water clarity decreases, which reduces the sunlight penetration to the bottom layers and affects the aquatic life communities and certain beneficial plant species. Each year as algal cells die off, the organic matter sinks to the bottom and consumes oxygen as part of the decomposition process. As this cycle progresses, lakes continue to have increasing algal growth and tend to have little to no oxygen in the bottom layers for extended periods of the year. Highly productive lakes, with an abundance of aquatic weed and algal growth are generally referred to as being “eutrophic”, while lakes having minimal algal productivity and excellent water clarity are classified to be “oligotrophic”. Lakes that are moderately productive are classified as being “mesotrophic.”

Chloride

Chloride from dissolved deicing salt cannot be removed with stormwater treatment structures. Both the U.S. Environmental Protection Agency (EPA) and the New Hampshire Department of Environmental Services (NHDES) have established a secondary drinking water standard of 250 mg/l for chloride (Env-Ws 316.01: State Water Quality Standards) to avoid aesthetic problems associated with taste. NHDES has also established aquatic life criteria for chloride in fresh water resources to protect aquatic life (Env-Wq 1700). The chronic and acute criteria for chloride have been set at 230 and 860 mg/l, respectively, to protect aquatic life.

Clean Water Act

The Clean Water Act (CWA) was promulgated to restore and maintain the chemical, physical and biological integrity of the Nation's waters (33 U.S.C. § 1251). EPA is required to develop programs for preventing, reducing or eliminating pollution and improving the sanitary condition of the nation's waters. As mandated by EPA, NHDES has established water quality standards in the New Hampshire Surface Water Quality Regulations in Env-Wq 1700.

Section 303 (d) of the CWA requires states to identify and publish every two years a list (303 (d) list) of surface waters that are water quality impaired. Water quality impairment occurs when a waterbody fails to meet the applicable water quality standards (33 U.S.C. § 1313). Section 303 (d) of the CWA also requires development of a pollutant loading and reduction plan, called a Total Maximum Daily Load (TMDL), for each waterway on the 303(d) list (33 U.S.C. § 1313). The purpose of the TMDL is to identify existing loads in order to identify and eliminate the impaired status. In New Hampshire, NHDES is the agency responsible for conducting TMDL studies and establishing TMDLs. The TMDL process studies existing loadings, identifies responsible parties and establishes the allowable loadings of pollutants for a waterbody based on the relationship between pollutant sources and instream water quality conditions. The States establish water quality based controls to reduce pollution from the identified sources and restore water quality.

10.1.2 Floodplains

Floodplains are defined as the land along waterbodies that is inundated with water during floods. Beneficial floodplain functions include flood attenuation, water quality maintenance, groundwater recharge, riparian plant and wildlife habitat, natural beauty, open space, and agriculture. Absent appropriate design of fill placement and the hydraulic capacity of structures (e.g., culverts and bridges), roadway construction in floodplains can potentially raise flood elevations.

The Federal Emergency Management Agency (FEMA) oversees Flood Insurance Rate Mapping maps which depict 100-year and 500-year floodplains, floodways and base flow elevations in some areas. The 100-year floodplain map shows the area with a one percent risk of flooding each year. The "Regulatory Floodway" is generally defined as the channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation more than one foot at any point.

10.1.3 Wetland Resources

Wetlands are defined in the Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1, (January, 1987) as: "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted to life in saturated soil conditions." Studies over the past few decades have found that wetlands provide habitat for numerous aquatic plant and animal species, and function in the protection and enhancement of surface and groundwater resources. Wetlands help to filter and purify water by trapping soil particles along with the pollutants they carry before these pollutants enter watercourses. Wetlands have an

ability to absorb nutrients such as nitrogen and phosphorus, and later release these nutrients when they are less likely to degrade water quality. Wetlands act to regulate the release of stormwater by acting as temporary storage basins, which can lower flood crests and reduce the destructive potential of severe storms. Wetlands stabilize the shores along rivers and lakes, and further buffer the destructive forces of storms by absorbing the impact of waves. Some wetlands also augment groundwater supplies by passing surface water and direct precipitation through the wetland soil into the underlying aquifers.

Federal protection is accorded wetlands under Section 404 of the Clean Water Act and Section 10 of the Federal Rivers and Harbors Act. The U.S. Army Corps of Engineers (ACOE) is charged with the duty of overseeing and regulating activities in wetlands at the Federal level. EPA also reviews projects that may impact wetlands and has veto authority over discharges they find unacceptable.

The State of New Hampshire regulates activities in wetlands under RSA 482-A, which grants regulatory authority to NHDES. Communities in New Hampshire possess, at minimum, recommendation authority to NHDES as to whether a permit to dredge or fill wetlands should be issued. Communities also have the ability to enact their own ordinances to regulate activities in wetlands.

10.1.4 Wildlife Resources

Wildlife habitat is the land or water area and resources that species need to survive and reproduce. Wildlife habitat requirements are different for different species, some requiring more area than others, specific types of vegetation, or access to water. Areas with a high amount of residential and commercial development typically provide lower quality habitat than undeveloped areas. New Hampshire has 318 species of terrestrial wildlife (vertebrates other than fish) species that occur as either migrants or residents. This variety of wildlife species is valuable to the state both economically relative to tourism and recreational activities, and as integral components of ecological food webs, energy flow, and biodiversity.

The U.S. Fish and Wildlife Service (USFWS) has been charged with responsibility for the listing and management of threatened and endangered species native to the United States by the federal Endangered Species Act, which was enacted in 1973. An endangered species is defined as being in danger of extinction throughout all or a substantial portion of its range. A threatened species is defined as likely to become endangered in the foreseeable future (USFWS, 2005). The State of New Hampshire also protects threatened and endangered species under the Endangered Species Conservation Act of 1979. The New Hampshire Fish and Game Department (NHF&GD) designates state-listed threatened and endangered species.

10.2 Summary of 2004 FEIS Analysis and Record of Decision Commitments

10.2.1 Water Resources

Surface Water

Stormwater Runoff
The 2004 FEIS analyzed potential stormwater runoff impacts using a preliminary design for stormwater treatment practices and assumptions capturing a half inch of runoff and a 60 percent removal efficiency for pollutants associated with particulates. It was determined that 50 extended detention basins and 24 vegetated swales could adequately treat all the stormwater from the project. The 2004 FEIS found that in at least 13 of the corridor watersheds, extended detention basins could treat runoff from nearly 100 percent of the new and reconstructed roadway area. This level of treatment would result in stormwater pollutant loadings less than the loadings under existing conditions. In five other watersheds, at least 80 percent of the new and reconstructed roadway area would be directed to extended detention basins while the remaining 20 percent would be directed to grass swales. This level of treatment would result in no substantial increase in pollutant loadings in comparison to existing conditions.

In the remaining three watersheds (tributary to Porcupine Brook at Exit 1, the north tributary to Flatrock Brook, and the south tributary to Beaver Brook), approximately 65 to 75 percent of the new and reconstructed roadway area would be treated by extended detention basins, with the remaining area being treated by grass swales. In these three watersheds where less than 80 percent of the total roadway area is being proposed for treatment by extended detention basins, there is the potential for a slight increase in pollutant concentrations from highway runoff. However, the 2004 FEIS concluded that given the conservative assumptions used in the analysis, the level of increase would be expected to be minimal and not result in any measurable impact to water quality or the designated uses of the affected waterbodies.

Lake Phosphorus Concentrations
Average annual in-lake phosphorus concentrations attributable to I-93 were calculated using a modified version of the Vollenweider model, as presented in the Federal Highway Administration (FHWA) report *Pollutant Loadings and Impacts from Highway Stormwater Runoff, Volume 1: Design Procedures* (Driscoll et al., 1990). Assuming a phosphorus removal efficiency of 40 percent with extended detention basins, the 2004 FEIS found that the 2005 Selected Alternative could increase phosphorus concentrations by 0.7 and 0.6 µg/l in Canobie Lake and Cobbetts Pond, respectively. Even if a removal efficiency of only 20 percent were assumed (grass swales), the in-lake phosphorus concentrations would increase by only 1.5 and 1.6 µg/l, to 13.5 µg/l and 12.6 µg/l respectively. The 2004 FEIS concluded that these theoretical increases were relatively minor given the existing lake phosphorus concentrations and would not be expected to cause a discernable or measurable change in quality conditions in either lake. The total amount of new and reconstructed roadway area would represent 2.2 and 2.4 percent of the overall lake watershed area for Cobbetts Pond and Canobie Lake, respectively. Less than a third of the total predicted future phosphorus concentrations would be associated with highway runoff, meaning that the majority of the phosphorus inputs would continue to be derived from other sources.

Deicing Salt

A mass balance analysis was conducted as part of the 2004 FEIS to estimate the long-term average annual concentrations of chloride in receiving streams attributable to the I-93 roadway. The deicing salt mass-balance analysis found that future chloride concentrations could potentially exceed the chronic life criteria (230 mg/l) in four streams under the 2005 Selected Alternative:

- Tributary to Harris Brook,
- South Tributary to Canobie Lake,
- North Tributary to Canobie Lake and
- Dinsmore Brook.

Also, Policy Brook had currently elevated chloride levels and a predicted future concentration that approached the chronic criteria. For tributary to Harris Brook, Policy Brook, and the North Tributary to Canobie Lake, most of the existing chloride concentrations were attributed to sources other than the I-93 roadway, given that the upstream concentrations were elevated. The elevated upstream chloride concentrations in the North Tributary to Canobie Lake were potentially linked to the water softening process at the nearby Pennichuck Water Works wells.

The 2004 FEIS concluded that Dinsmore Brook and the South Tributary to Canobie Lake could be affected the most by the 2005 Selected Alternative based on the predicted increases in average annual chloride concentrations. Dinsmore Brook and the South Tributary to Canobie Lake are small waterbodies with watershed areas of about 200 acres or less. The relatively large increase predicted for the South Tributary to Canobie Lake was largely due to a change in the drainage direction, where nearly 0.5 miles of the roadway that currently drains to Porcupine Brook would be diverted back to the Canobie Lake watershed. This change was made based on a request from the Salem Board of Selectmen and the Water Department officials to maximize the surface recharge of the lake.

Aquatic Life

The 2004 FEIS found that the majority of the stream bed impacts of the 2005 Selected Alternative would be due to culvert lengthening, typically ranging from 50 to 200 feet. Exceptions where larger areas of disturbance could occur included the realignment of 750 feet of the Tributary to Harris Brook in Salem and the relocation of 2,400 linear feet of stream channel in the Wheeler Pond Tributary in Londonderry due to highway widening and sound wall construction.

Two tributaries to the Merrimack River, Cohas Brook in Manchester and Little Cohas Brook in Londonderry were evaluated for potential impacts on the designated essential fish habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) for Atlantic Salmon. Coordination with National Marine Fisheries Service (NMFS) and completion of the EFH Assessment Worksheet indicated that the 2005 Selected Alternative would have an "adverse effect" on EFH that is "not substantial." For more information on the EFH impact analysis, see Appendix F: Natural Resources Written Reevaluation/Technical Report.

Groundwater

The 2005 Selected Alternative would increase the area of impervious surface within the stratified-drift aquifers in the project corridor by 82 acres, a small percentage of the overall aquifer size (over 5,000 acres). Given the low transmissivity and the limited overall use of the affected aquifers for water supply, the expected increase in roadway area under the 2005 Selected Alternative was not expected to result in any measurable adverse impacts to the aquifer. The sodium and chloride groundwater analysis found that even with the doubling of roadway lane miles under the 2005 Selected Alternative, average sodium and chloride concentrations in groundwater at the edge of the right-of-way were projected to be well below the 250 mg/l secondary drinking water standard for sodium and chloride.

The 2004 FEIS identified protection measures consistent with the NHDES guidelines based on the results of the wellhead protection area encroachment analysis. The sodium and chloride analysis for public wells identified four wells with greatest potential for impact—the Pennichuck Water Works wells located along the west side of Canobie Lake, the Yankee Trader (Citizens Bank) and the Plaza-93 wells, that are both located along Route 111 within the Exit 3 interchange, and the Boumil Grove Condominium complex in Londonderry, just south of the Exit 4 interchange.

10.2.2 Floodplains

Floodplain impacts calculated for the 2005 Selected Alternative in the 2004 FEIS were 43.4 acre-feet (across eight waterbodies) plus floodway impacts of 6.3 acre-feet (across five waterbodies), for a total impact of 49.7 acre-feet. A detailed hydraulic analysis conducted for Policy Brook and Spicket River in Salem concluded that the 100-year flood elevation would experience minor, if any, change as a result of the proposed highway improvements. As such, the 2005 Selected Alternative was expected have a negligible impact on these watercourses' ability to convey floodwaters.

Taking into account the proposed floodplain mitigation measures (See Section 10.2.5), the 2004 FEIS made a floodplain finding in accordance with Executive Order 11988 *Floodplain Management*, and 23 CFR 650A *Location and Hydraulic Design of Encroachments on Floodplains*, that there was no practicable alternative to the proposed construction in floodplains and that the 2005 Selected Alternative includes all practicable measures to minimize harm to floodplains.

10.2.3 Wetland Resources

Wetlands

The 2004 FEIS identified 77 acres of wetland impacts for the 2005 Selected Alternative. The majority of the wetland impacts were located along the edge of wetland systems that have already been impacted by highway construction. The 2004 FEIS concluded that in most cases, these "edge impacts" represent only a small percentage of the total wetland acreage within the system and, while representing an incremental loss of wetland area, will not eliminate the

functions and values performed by the remaining wetland. Based on consideration of the extent and type of wetland impacts, and of the proposed wetlands mitigation plan, FHWA made a wetlands finding pursuant to Executive Order 11990 that there was no practicable alternative to the proposed construction in wetlands and that the proposed action includes all practicable measures to minimize harm to wetlands that may results from such use.

Vernal Pools

The 2004 FEIS found that the 2005 Selected Alternative would impact three vernal pools. North of Exit 3, the 2005 Selected Alternative would impact vernal pool #13, which is located within the highway median. The functioning of this pool would likely be eliminated as 1,350 square feet or 90 percent of the areal extent of the pool would be filled. Vernal pool #13 has limited use by breeding amphibians, probably due to inadequate upland habitat around the pool and water quality degradation.

The 2005 Selected Alternative would impact portions of vernal pools #21 and #22, located on the east side of I-93 north of Exit 4. The 2005 Selected Alternative would impact the western edges (that currently exhibit signs of habitat degradation, i.e. filamentous algae, trash) of the pools amounting to approximately 3,000 square feet, or 30 percent of vernal pool #20 and 3,000 square feet or 15 percent of vernal pool #21 being filled.

10.2.4 Wildlife Resources

Wildlife Resources

The 2004 FEIS described potential wildlife habitat impacts related to the construction noise and disturbance, home range impacts, wildlife/vehicle collisions, and riparian corridors. The 2005 Selected Alternative would convert 260 acres of land outside the existing right-of-way. An estimated 60 percent (156 acres) of this is useable wildlife habitat, i.e., wetland, upland forest and shrubland, or agriculture. In drawing conclusions regarding wildlife habitat impacts, the 2004 FEIS cited comments from NHF&GD stating that it "recognizes that the improvements, involving for the most part the widening of an existing interstate facility, are of less consequence to wildlife and fishery resources than would otherwise be the case with the construction of a brand new facility on new location. As such, fragmentation of the wildlife habitat is not an issue. The acreage of impact is substantial, but given that the area impacted is directly adjacent to an existing interstate facility, the wildlife, wetlands, and habitat resources are of lesser quality or only peripherally affected by the widening."

Threatened and Endangered Species

The 2004 FEIS identified one state-listed threatened plant that may be affected by the 2005 Selected Alternative. A small population of the perennial wildflower wild lupine (*Lupinua perennis*) is located within 15 feet from the travel lane on the west side of I-93 between Exits 1 and 2 within the currently maintained right-of-way.

Correspondence with New Hampshire Natural Heritage Bureau identified the eastern hognose snake as the only known state-listed wildlife species in the project vicinity. The 2004 FEIS noted that due to the difficulty of surveying for this species in the wild, an accurate assessment of project impacts is difficult. Through consultations with NHF&GD it was determined that impacts to the eastern hognose snake cannot be entirely ruled out due to the fact potential habitat appears to occur within the highway corridor.

In their review of the project USFWS expressed the opinion that the project would have no effect on the occasional, transient threatened bald eagles that may occur in the project area.

The field investigation for the candidate species New England cottontail did not locate any populations of the New England cottontail within the study corridor or the proposed mitigation sites, despite surveying all potentially suitable habitats.

10.2.5 Permit Conditions/Mitigation

Water Resources

The Record of Decision commits the New Hampshire Department of Transportation (NHDOT) to an adaptive management approach to maintain salt usage/chloride loadings at existing levels through incremental implementation of the project in the event that TMDL load reductions for state roads are not met. The Record of Decision made several other commitments to reduce surface water resource impacts through treatment practices, and best management practices for deicing salt application. Refer to Appendix F: Natural Resources Written Reevaluation/Technical Report for the complete list of the commitments.

The I-93 Salem to Manchester Section 401 Water Quality Certification was issued by NHDES on May 2, 2006. By issuing the Water Quality Certification NHDES has determined that any discharge associated with the project will not violate surface water quality standards, or cause additional degradation in surface waters not presently meeting water quality standards. The Water Quality Certification conditions include and/or require:

- Inspection and maintenance plans for construction soil erosion control BMPs (Condition E-2).

- Stormwater BMPs be designed, implemented and maintained as proposed in the 2004 FEIS and ROD (Condition E-4).

- Design plans for stormwater BMPs along with pollutant load and removal efficiency estimates for sediments, phosphorus and nitrogen be submitted to NHDES for concurrence (Condition E-4).

- Design and implementation of a water quality monitoring plan for affected surface waters (Condition E-5).

- Design and implementation of a monitoring plan for chlorides (Condition E-6).

- Fund and participate in TMDL studies for surface waters impaired for chlorides (Condition E7-E11).

Appendix F: Natural Resources Written Reevaluation/Technical Report provides more information on the Water Quality Certification conditions.

Floodplains

The Record of Decision made the following commitments with respect to floodplains:

- Direct impacts to the 100-year floodplain and floodways will be minimized during final design, by steepening highway embankments and/or utilizing retaining walls where appropriate.

- A series of up to 14 basins will be constructed at locations immediately adjacent to impacted floodplains or where natural valley storage is being lost.

- Additional flood storage compensation will be created at locations adjacent to flood-susceptible brooks and rivers, or locations upgradient from flood-prone areas. Detention basins are being proposed for stormwater treatment and floodwater storage at a number of locations along the widened highway. These basins are typically designed to store up to a 50-year storm event before discharging to nearby watercourses.

- The design of the wetland creation sites will include the goal of providing both floodflow alteration and compensatory flood storage. These sites include the Pelham Road Mitigation Site, Waste Water Treatment Plant Site, and Baggett Site in Salem, Highway Median Site in Windham; and the South Road Mitigation Site in Londonderry.

The 2004 FEIS estimated that 155-161 acre-feet of flood storage would be provided by the proposed mitigation measures.

Wetland Resources

The Record of Decision made the following commitments with respect to wetlands:

Compensation for unavoidable losses of wetlands and project impacts will include a combination of creation, restoration/enhancement, and preservation of the following project mitigation/enhancement package, involving protection of approximately 1,000 acres at 16 sites throughout the study corridor. The recommended mitigation sites are summarized as follows:

Salem
Total mitigation provided by four sites in Salem will amount to 90 acres (including creation, preservation, and flood storage replacement elements). These sites are:

- Cluff Crossing Road (Site #30), 27 acre parcel

- Pelham Road Mitigation Site (Site #31), 25 acre parcel
- Salem Wastewater Treatment Plant Site (Site #32), 32 acre site
- Baggett Property (Site #38) about six acres in size

Windham
Total mitigation provided by three sites in Windham will amount to nearly 318 acres (creation, preservation, and flood storage replacement). Each of the sites is described below.

- Highway Median Site (Site # 24), 17 acres
- Armstrong Property (Site #49), 11 acre parcel
- Southeast Lands Area (Site #45), approximately 290 acres

Derry
Total mitigation provided by the site in Derry would amount to nearly 200 acres (preservation). The proposed mitigation site is described below.

- Sybiak Farm Property (Site #16)

Londonderry
Total mitigation provided by four sites will amount to approximately 290 acres, including preservation, creation, and flood storage replacement. Each of these sites is discussed below.

- South Road Mitigation Site (Site #14 and 15), 75 acre parcel
- Norwood Site (Site #63), 37 acre parcel
- Musquash Brook Parcels (Site #61), 110 acres
- Scobie Pond Area Properties (Site #58), 70 acres

Manchester
Total mitigation provided by the five Crystal Lake area sites in Manchester will amount to about 120 acres (preservation). The sites are described below.

- Filip Farm Site, Filip Glen Phase 2 (Site #3), 16 acres
- Giovagnoli Farm Property (Site #44), 20 acres
- Podsadowski Property - The Hill (527 Corning Road Realty) (Site 46), 34 acres
- Greek Picnic Grounds (Potomac Glen) (Site 47), 40 acres
- Demers Property (Site 53), 10 acres

The Clean Water Act Section 404 permit for the 2005 Selected Alternative was issued by the ACOE on March 29, 2007 (permit number NAE-2004-233). In May 2006, NHDES issued the state wetland permit for the I-93 Improvements project, with conditions (permit number 2002-02033).

The Section 404 permit and NHDES permit conditions include standard provisions related to the restoration of disturbed areas, sedimentation and erosion control practices, and the requirement to comply with the conditions of the Section 401 Water Quality Certification. The permit conditions include the completion of the wetlands compensatory mitigation package as described in the 2004 FEIS and ROD, and adherence to the Memorandum of Agreement on historic properties between NHDOT, FHWA and the State Historic Preservation Officer signed August 8, 2002.

Wildlife Resources

The Record of Decision included the following commitments with respect to wildlife and fisheries resources:

- Direct habitat loss, in particular to wetlands, will be offset through the project mitigation in the form of extensive habitat preservation. Generally the preservation sites will be contiguous with adjacent undeveloped or protected properties to create larger unfragmented blocks and provide opportunity to manage portions for varying successional stages.

- The design of the wetland creation sites will include the goal of replacing the wildlife functions of impacted wetlands.

- All culverts and bridges at the major stream crossings along the highway corridor (i.e. Cohas Brook, Beaver Brook, Porcupine Brook and Policy Brook) will be examined during final design to determine how a dry-land passage ("shelf") for mammals can be incorporated into the structures. Other culvert crossings for smaller perennial streams will also be examined to ensure there are no blockages to wildlife or fish passage.

- Several measures will be taken during construction to further reduce impacts on wildlife habitat. The amount of land cleared of vegetation will be limited as practical, especially in areas where there are currently only narrow buffer strips between the highway and other human development. Re-vegetation of the land disturbed by construction activities will take place as soon as possible after construction is completed, so that erosion is minimized and wildlife habitat is restored. Brush clearing or tree thinning in forests adjacent to the construction areas will not be proposed.

The Record of Decision made the following commitments with respect to threatened and endangered species:

- Mitigation of impacts to wild lupine south of Exit 3 will focus on relocating these individuals by means of re-seeding or transplantation. A written mitigation plan specific to this population will be completed in consultation with the New Hampshire Natural Heritage Inventory prior to construction.

- A preconstruction study conducted in conjunction with the NHF&GD of potential eastern hognose snake habitat using GIS-level analysis and/or other means will evaluate a sample of known occupied habitats within southern New Hampshire to determine their characteristics. This effort will help identify potential habitat within the project area that might be affected. Construction contractor personnel will be trained to recognize the hognose snake and be informed of its protected status through a cooperative effort of NHDOT and NHF&GD. Procedures for reporting occurrences of the snake will be established to ensure proper response and reporting of the snake, if encountered during construction.

10.3 Methodology

10.3.1 Water Resources

On May 24, 2007, NHDES issued a document entitled *Interim Guidance for the Structural Design of Stormwater Best Management Practices Needed to Achieve Results of Pollutant Loading Analyses*. NHDOT agreed to strive to design and analyze the permanent stormwater treatment BMPs for the I-93 project in accordance with the new guidance. Key changes to the water resources impact analysis assumptions since the 2004 FEIS as a result of the new guidance include:

1. The runoff or Water Quality Volume that needs to be treated increased from the first half-inch to a full inch.
2. The analysis needed to include Total Nitrogen (TN) and Total Phosphorus (TP), as specified in the Water Quality Certificate.
3. Restrictions on placing the Stormwater Treatment Structures in wetlands

The interim guidance substantially changed the design of the project stormwater treatment BMPs. The number of basins proposed has increased from 50 to approximately 100, and the predominant type of basins has been changed from dry extended detention basins to wet extended detention basins and gravel wetlands to maximize removal efficiencies for TN and TP. NHDOT has been and will continue to coordinate with NHDES regarding the project stormwater treatment BMPs, including NHDES review of design plans and pollutant loading analysis for these structures. While the design of the project stormwater treatment BMPs was ongoing at the time of the preparation of the DSEIS, it is anticipated that sufficient treatment capacity will be provided to meet or exceed the 2004 FEIS and ROD commitments with respect to highway runoff. Where feasible and consistent with other environmental and design considerations, NHDOT will continue to strive to design the stormwater treatment structures in accordance with the NHDES interim guidance. See Appendix F: Natural Resources Written Reevaluation/Technical Report for a more detailed explanation of stormwater treatment on the project.

10.3.2 Floodplains

On May 17, 2005, the Federal Emergency Management Agency (FEMA) issued a Digital Flood Insurance Rate Map (DFIRM) for Rockingham County, New Hampshire. The DFIRM data is made available to the public through the New Hampshire Geographically Referenced Analysis and Information Transfer System (NH GRANIT). The 2005 DFIRM replaces the previous paper FIRMs.

As part of the final design process, NHDOT has conducted an update of the I-93 widening floodplain impacts, including the use of the 2005 DFIRM for Rockingham County. It should be noted that mapped FEMA floodplain boundaries typically do not accurately reflect site-specific topography in many locations. Often times the floodplain boundary presented on a FEMA map will cross contours in a manner that is obviously impossible given the estimated flood elevation compared to actual ground elevations. For this reason, NHDOT prepared a "corrected

floodplain" boundary for the updated floodplain impact analysis. The corrected floodplain map was developed by incorporating the 2005 DFIRM data with the topographic and roadway data included in project plans. This enabled the identification of areas where the DFIRM flood boundary clearly did not reflect or was inconsistent with the existing topography information. The floodplain boundary was then modified to reflect topographic conditions and the resultant floodplain data was developed into a computer file containing the digital 100-year floodplain and floodway mapping. The corrected floodplain mapping is a more accurate representation of the estimated 100-year floodplain for the project corridor than the unaltered DFIRM data.

10.3.3 Wetland Resources

In 2006, the I-93 corridor wetland boundaries were verified and delineated to just beyond the proposed toe-of-slope or the proposed edge of right-of-way, which ever was furthest. The delineation was based on the three parameter approach, which considers plants, soils and hydrology in the determination of the wetland/upland boundaries, as detailed in the 1987 *Corps of Engineers Wetland Delineation Manual* (ACOE, 1987), and utilized GPS units and field sketches to create revised wetland boundary information on updated base maps.

The 2004 FEIS wetland impact calculations were based on preliminary design information and did not include impacts related to drainage structures since those structures had not yet been designed. As the final design has progressed on the first eight construction contracts (10418I, 10418G, 10418N, 13933C, 13933F, 13933G, 13933K and 14633E), updated wetlands impacts have been calculated. The updated impact calculations incorporate the results of the 2006 wetland delineations. The first eight construction contracts cover approximately one third of the corridor and are representative of the types of changes that have occurred since the 2004 FEIS. These changes include an increased area of wetlands as a result of updated mapping, changes in stormwater treatment requirements which increased the size of some BMPs, and other changes in final design to accommodate unanticipated problems. For the purposes of the SEIS update analysis, the change in wetland impacts for the first eight construction projects was extrapolated to estimate the change in impacts that could occur for the entire project.

10.3.4 Wildlife Resources

For the SEIS, updated information on the occurrence of rare, threatened and endangered species near the I-93 corridor was obtained from the New Hampshire Natural Heritage Bureau on July 21, 2008. Information was also requested from USFWS, however no response to the request was received.

The 2004 FEIS commitment to study wildlife crossing structure opportunities during final design has been met. Detailed reports were prepared documenting the characteristics of the existing crossing structures at stream crossings along the corridor, the availability and quality of upstream and downstream habitat at each crossing, and the engineering feasibility of potential wildlife/fish

passage enhancements.[1] The specific measures that will be implemented continue to be coordinated with the resource agencies.

10.4 Existing Conditions

10.4.1 Water Resources

Since the 2004 FEIS there has been a substantial increase in the amount of data available to characterize chloride concentrations and loadings in the I-93 corridor as a result of post-FEIS monitoring by NHDOT, NHDES and EPA, TMDL studies for four corridor waterbodies, and chloride surveillance monitoring of streams outside the TMDL watersheds. Updated information on phosphorus concentrations in Canobie Lake and Cobbetts Pond is available from the Volunteer Lake Assessment Program (VLAP).

Chloride Total Maximum Daily Load (TMDL) Studies

Prior to beginning chloride TMDL studies, NHDES, NHDOT, EPA and the U.S. Geological Survey (USGS) developed and agreed to roles and responsibilities, technical tasks, and detailed analysis procedures for all TMDL studies. These procedures are documented in the report entitled *Total Maximum Daily Loads for Chloride for Waterbodies in the Vicinity of the I-93 Corridor from Massachusetts to Manchester, NH Quality Assurance Project Plan* (NHDES, 2006). The TMDL study included the collection of road salt loading information from the State and Municipalities, estimates of road salt loading for private entities, and in-stream chloride concentration, specific conductance, water temperature, and stream flow data for the four chloride impaired waterbodies from 7/1/06 to 6/30/07. The data obtained through the study is analyzed and presented in a document entitled *Data Report for the Total Maximum Daily Loads for Chloride For Waterbodies in the Vicinity of the I-93 Corridor From Massachusetts to Manchester, NH: Policy-Porcupine Brook Beaver Brook Dinsmore Brook North Tributary to Canobie Lake* (NHDES, 2007). All of the chloride TMDL related documents referenced in this section are available on the I-93 project website (http://www.rebuildingi93.com/).

Following an opportunity for public comment on Draft TMDL reports for Beaver Brook, Dinsmore Brook, the north tributary to Canobie Lake, and Policy Brook in 2007, Final TMDL reports were submitted by NHDES to EPA for approval in April 2008. On January 22, 2009, EPA issued a letter to NHDES approving the TMDL reports as meeting the requirements of Section 303(d) of the Clean Water Act and EPA's regulations (40 CFR 130).

While EPA approves the TMDL reports establishing the total reduction in chloride loadings needed to achieve water quality standards, NHDES is responsible for the implementation of the TMDLs. For the chloride impaired waterbodies in the I-93 corridor, NHDES will prepare an Implementation Plan containing chloride load allocations. The load allocations will be distributed among the various entities responsible for chloride loadings (e.g. NHDOT for roads

[1] *Wildlife/Fish Corridor Enhancements. I-93 Improvements Project Windham to Manchester, New Hampshire*. Prepared by The Smart Associates, Inc. 2007. and *Wildlife and Fish Passage Inspection Report Salem to Manchester, IM-IR-93-1(174)0, 10418-C*. Prepared by The Louis Berger Group, Inc. 2008.

maintained by the State, individual municipalities for municipal roads, etc.). The individual chloride source entities are allowed to develop their own proposed implementation plans for submission to NHDES, but the load allocations will ultimately be determined by the NHDES Implementation Plan. There will be an opportunity for public comment on the NHDES TMDL Implementation Plan.

Beaver Brook[2]

The Beaver Brook watershed assessed in the TMDL study is 30.33 square miles in size, covering portions of Derry, Londonderry, Auburn and Chester. The waterbody was placed on the 303(d) list in 2006 based on violations of the chronic water quality standard (230 mg/l) in 2004 and 2005. During the 2006-2007 TMDL study data collection, no violations of the chronic water quality standard were recorded; as such, NHDES used data from previous years to establish a load reduction. Based on this data, NHDES estimated that the major sources of chloride loadings in the watershed were parking lots (44 percent or 5,506 tons) and municipal roads (37 percent or 4,703 tons). State roads were estimated to contribute 10 percent (1,290 tons) of total loadings to Beaver Brook. The chloride TMDL for Beaver Brook (using the percent reduction goal method[3]) was set at 9,069 tons of salt per year. In the 2006-2007 season, when chronic violations did not occur, salt imports to the watershed were below the goal (6,380 tons/year) (although violations of the acute standard (860 mg/l) were recorded during the 2006-2007 TMDL study at two monitoring stations located upstream from I-93 (08-SHB, and I93-BVRU03-01)).

Dinsmore Brook[4]

The Dinsmore Brook watershed is located within the Town of Windham and is 0.55 square miles in size. The waterbody was placed on the 303(d) list in 2006 based on violations of the chronic water quality standard (230 mg/l) through 2005. During the 2006-2007 TMDL study data collection, the chronic standard was exceeded for 68.5 days of the year (18.8 percent) at the monitoring location downstream of I-93 before the Dinsmore Brook empties into Cobbetts Pond (I93-DIN-01), primarily during the period between July and the end of September. The TMDL study estimated that state roads were the largest source of chloride loadings to Dinsmore Brook at 50 percent (81.7 tons), followed by parking lots (26 percent or 43.4 tons) and private roads (21 percent or 34.3 tons). This result is not surprising given the small size of the watershed and that I-93 Exit 3 interchange is located in the watershed. The chloride TMDL for Dinsmore Brook using the percent reduction goal method was set at 126 tons of salt per year, or 24.3 percent less than the 166.5 tons applied in the watershed in the 2006-2007 season.

[2] Total Maximum Daily Load (TMDL) Study For Waterbodies in the Vicinity of the I-93 Corridor from Massachusetts to Manchester, NH: Beaver Brook in Derry and Londonderry, NH (NHDES, 2008).

[3] The percent reduction goal calculation was based on the reduction in loadings needed to achieve the standards during the "dry" hydrologic condition (e.g.). For detailed technical information on how the percent reduction goal calculations were performed, refer to the Quality Assurance Project Plan (NHDES,2006).

[4] Total Maximum Daily Load (TMDL) Study For Waterbodies in the Vicinity of the I-93 Corridor from Massachusetts to Manchester, NH: Dinsmore Brook in Windham, NH (NHDES, 2008).

North Tributary to Canobie Lake[5]

The North Tributary to Canobie Lake is located in the Town of Windham and has a watershed area of 0.2 square miles. The North Tributary to Canobie Lake is a sub-watershed of Policy Brook and one implementation plan will be established for both of these watersheds. The waterbody was placed on the 303(d) list in 2006 based on violations of the chronic water quality standard (230 mg/l) in 2003 through 2005. During the 2006-2007 TMDL study data collection, the chronic standard was exceeded for 68.1 days of the year (18.7 percent) at a sampling location (I93-NTC-01) located downstream of I-93 prior to this waterbody emptying into Canobie Lake. State roads, including I-93 were estimated to contribute 84 percent (38.8 tons) of the chloride loadings. However, this figure may be misleading because a water softener was formerly the largest source of salt to the watershed (approximately 55 tons per year) resulting from the discharge of brine, from a community water supply well field directly into the wetland. The brine discharges were stopped in September 2005, but it is likely that large quantities of chloride from past discharges reside in the groundwater. The chloride TMDL for North Tributary to Canobie Lake using the percent reduction goal method was set at 28.1 tons of salt per year, or 39.6 percent less than the 46.5 tons imported in the watershed in the 2006-2007 season.

Policy-Porcupine Brook[6]

The Policy-Porcupine Brook watershed is located in the Towns of Salem and Windham and is 10.8 square miles in size. The waterbody was placed on the 303(d) list in 2006 based on violations of the chronic water quality standard (230 mg/l) in 2003 through 2005. During the 2006-2007 TMDL study, the chronic chloride standard was exceeded for 87.7 days of the year (24 percent) at the outlet station for the Policy-Porcupine Brook watershed (Station I93-POL-01V). At station I93-POL-04X, which is upstream of I-93, 66 days were in violation of the chronic standard (18 percent), along with three violations of the acute standard. The TMDL study estimated that the major sources of chloride loadings in the watershed were parking lots (50 percent or 2,426 tons) and municipal roads (27 percent or 1,305 tons). State roads were estimated to contribute nine percent (456 tons) of total loadings to Policy-Porcupine Brook. The chloride TMDL for Policy-Porcupine Brook using the percent reduction goal method was set at 3,635 tons of salt per year, or 24.5 percent less than the 4,814 tons applied in the watershed in the 2006-2007 season.

NHDOT TMDL Implementation Plan

In May 2009, NHDOT submitted a TMDL implementation plan specific to State highways to NHDES.[7] The objective of the NHDOT implementation plan is to continue to provide reasonably safe highway conditions during winter weather, while addressing the need to reduce salt use in the TMDL watersheds. The NHDOT implementation plan also takes into account the

[5] Total Maximum Daily Load (TMDL) Study For Waterbodies in the Vicinity of the I-93 Corridor from Massachusetts to Manchester, NH: North Tributary to Canobie Lake in Windham, NH (NHDES, 2008).

[6] Total Maximum Daily Load (TMDL) Study For Waterbodies in the Vicinity of the I-93 Corridor from Massachusetts to Manchester, NH: Policy-Porcupine Brook in Salem and Windham, NH (NHDES, 2008).

[7] Implementation Plan to Increase the Efficiency and Effectiveness of Road Salt Use To Meet Total Maximum Daily Load For Chloride In Water Bodies Along the I-93 Corridor From Salem to Manchester, NH: Beaver Brook, Dinsmore Brook, North Tributary to Canobie Lake and Porcupine-Policy Brook (NHDOT, 2009).

salt loadings from the proposed widening of I-93 to four lanes in each direction, provides an estimated timeline for the implementation of various deicing BMPs, and outlines monitoring procedures to assess NHDOT salt use in comparison to objectives of the plan. The salt load allocations proposed in the NHDOT implementation plan include salt loading savings resulting from a 20% improvement in application efficiency over past practices. In addition, the current and future salt loads were compared to an independent variable, vehicle usage (e.g. traffic volumes and vehicle lane miles). The vehicle usage comparison allowed NHDOT to assess the efficiency (how many vehicles are served by the application of salt), by sector (State, Municipal and Private applicators). The NHDOT TMDL implementation plan report is available on the project website (http://www.rebuildingi93.com/).

Chloride Surveillance Monitoring

On October 19, 2006 NHDOT and NHDES published the *I-93 Expansion Chloride Surveillance Monitoring Plan*. The purpose of the plan was to establish the sampling and analysis procedures for meeting the Section 401 Water Quality Certificate condition (E-6) requiring chloride monitoring outside of the TMDL watersheds. Chloride monitoring involves eight rounds of sampling per year at the following locations:

- NH Route 28 Bypass / Cohas Brook
- Symmes Drive / Little Cohas Brook
- Parmenter Road / Nesenkeag Brook
- Island Pond Road / Taylor Brook
- NH Route 28 / Flatrock Brook
- Church Road / Golden Brook

Since sampling began in June 2007, no violations of the chronic or acute chloride standards have been recorded at any of the chloride surveillance sites.

Volunteer Lake Assessment Program (VLAP)

The 2004 FEIS reported VLAP data for Canobie Lake and Cobbetts Pond through 2002. Updated information taking into account VLAP data through 2008 is summarized below.

In Canobie Lake, chlorophyll-a levels and lake transparency have remained relatively constant since 2002. There is no apparent change in total phosphorus concentrations in Canobie Lake since 2002. Although there has been variation from year to year, the epilimnion (upper layer) phosphorus concentration in 2008 (7.2 µg/l) was nearly identical to 2002 concentration (7.0 µg/l). Hypolimnion (lower layer) phosphorus concentrations appear to have decreased since 2002, from 19 µg/l to 13 µg/l in 2008.

In Cobbetts Pond, chlorophyll-a levels have varied considerably from year to year since 2002. High levels of chlorophyll-a were recorded in 2004 and 2005, but in 2006 declined to the 2002 levels. Lake transparency was lower than 2002 levels in 2003, 2004, and 2005, but substantially higher than 2002 levels in 2006, in contrast to the long term trend. Phosphorus concentrations have decreased in the hypolimnion at both sampling locations on Cobbetts Pond. Phosphorus

concentrations have increased slightly in the epilimnion at station 2 (southern section), but remained approximately the same at station 1 (northern section).

- Epilimnion Station 1: 11.5 µg/l in 2002 to 12 µg/l in 2008
- Hypolimnion Station 1: 40 µg/l in 2002 to 15 µg/l in 2008

- Epilimnion Station 2: 7 µg/l in 2002 to 13 µg/l in 2008
- Hypolimnion Station 2: 31 µg/l in 2002 to 26 µg/l in 2006

Since the 2004 FEIS, NHDES has classified Cobbetts Pond as eutrophic based on the available water quality monitoring data. Phosphorus sources contributing to the eutrophication of Cobbetts Pond include increased impervious surface cover, lawn fertilizers, malfunctioning septic systems, and the construction of sandy beaches (June 28, 2007 letter from NHDES to Derek Monson, Cobbetts Pond Improvement Association).

Cobbetts Pond Watershed Restoration Plan

NHDES and the Cobbetts Pond Improvement Association, with the assistance of a federal grant, are funding the development of a watershed restoration plan for the Cobbetts Pond watershed. The plan will include the identification of pollutant loading sources and necessary reductions in loadings needed to achieve the water quality goals of the plan. The development of the watershed restoration plan will include the following tasks:

- comprehensive review of historic lake data;
- six months of lake and tributary water quality monitoring (scheduled for spring-fall 2009);
- hydrologic and pollutant load modeling;
- development of a prioritized list of potential stormwater improvements in the Cobbetts Pond watershed;
- engineering, permitting and construction of several high priority watershed restoration sites; and
- collaboration with watershed stakeholders through a series of public forums and educational workshops.

The watershed restoration plan is expected to be completed by fall 2009.

10.4.2 Floodplains

The waterbodies with floodplains and floodways delineated have not changed since the 2004 FEIS. However, the exact boundaries of the floodplains and floodways have been corrected based on detailed topographic information for the project corridor. The corrected floodplain boundary does not change the flood elevations reported on the DFIRM, which are generally the same of the previous paper FIRM flood elevations. The corrected floodplain mapping reduces the size of the floodplain in areas affected by 2005 Selected Alternative, as described in Section 10.5.2, below.

10.4.3 Wetland Resources

The 2006 wetland verification and delineation resulted in an increase in the area of wetlands in comparison to the 2004 FEIS wetland boundaries.

10.4.4 Wildlife Resources

The response from NHNHB did not identify any new known occurrences of rare, threatened or endangered species since the 2004 FEIS within the impact area of the 2005 Selected Alternative. The database search noted that Golden Brook may contain the brook floater (*Alasmidonta varicose*), a state-listed mussel. Golden Brook itself is outside the project limits, although two tributaries to Golden Brook originates in the project area.

10.5 Impacts

10.5.1 Water Resources

The water quality commitments from the 2004 FEIS and ROD remain valid. Any changes in pollutant loadings as a result of the changes in the proposed stormwater treatment practices described in Section 10.3.1 are being done in cooperation with and with concurrence from NHDES. NHDOT will continue to coordinate with NHDES with respect to stormwater management and to ensure that the conditions of the Section 401 Water Quality Certification are met.

The number of roadway lanes proposed as part of the 2005 Selected Alternative (four in each direction) has not changed; therefore the 2004 FEIS analysis and conclusions regarding deicing salt loadings have not changed. For chloride loadings related to deicing salt applications, NHDOT has been implementing the management practices outlined in the Record of Decision and MOA (See Section 10.6.1).

10.5.2 Floodplains

Table 10-1 presents the updated 100-year floodplain impact analysis results using the 2004 FEIS floodplain mapping (1998 FIRM), 2005 DFIRM, and the corrected floodplain mapping. At 19.8 acre-feet, the floodplain impact calculated using the corrected floodplain boundaries is substantially less than the impacts calculated using the uncorrected DFIRM (49.7 acre-feet). The total floodplain impact using the uncorrected DFIRM data (50.0 acre-feet) is similar to the estimated impact using the 2004 FEIS data. As discussed previously (Section 10.3.2), the corrected floodplain impact calculation is the most accurate estimate of floodplain boundaries available, accounting for site specific topography.

In addition to reductions in 100-year floodplain impacts, updated design information indicates a reduction in floodway impacts for the 2005 Selected Alternative. Through avoidance and minimization measures in final design, floodway impacts reported in the 2004 FEIS have been eliminated for the Spicket River, Tributary to Wheeler Pond, and Cohas Brook/Long Pond Brook. The two remaining floodway impacts estimated for the 2005 Selected Alternative are at

Beaver Brook (1.9 acre-feet) and Wheeler Pond (0.01 acre-feet). These floodway impacts are less than the floodway impacts predicted for these waterbodies in the 2004 FEIS (2.4 acre-feet for Beaver Brook and 0.05 acre-feet for Wheeler Pond).

Table 10-1
Updated 100-Year Floodplain Impacts

		Floodplain Data Source		
Resource	**Municipality**	**2004 FEIS (1998 FIRM) (acre-feet)**	**2005 Uncorrected DFIRM (acre-feet)**	**Corrected Floodplain (acre-feet)**
Spicket River	Salem	2.4	0	0
Harris Brook Tributary	Salem	6.2	16.8	3.1
Porcupine Brook	Salem	12.5	4.2	0.7
Policy Brook -1	Salem	15.0	1.5	4.2
Policy Brook- 2	Salem	0.5	0.3	1.0
Golden Brook	Windham	1.5	15.6	2.2
Beaver Brook	Derry	4.7	4.7	4.4
Wheeler Pond	Londonderry	1.6	1.6	1.0
Tributary to Wheeler Pond	Londonderry	2.5	2.5	2.2
Cohas/Long Pond Brooks	Manchester	2.8	2.8	1.0
Total		49.7	50.0	19.8

10.5.3 Wetland Resources

For the first eight construction contracts, final design wetland impacts of the 2005 Selected Alternative total about 27.4 acres versus 24.6 acres estimated in the 2004 FEIS and Section 404 permit application. This represents an increase of about 11 percent for this portion of the project due to a revised delineation of wetlands along the corridor, design refinements, increases in the number/size of stormwater treatment areas and more accurate mapping. Extrapolating these results to the entire project would mean total wetland impacts of approximately 85 acres, or about 8 acres more than estimated in the 2004 FEIS and Section 404 permit application. While the acreage of impacts has increased slightly since the 2004 FEIS, the type of impacts and the conclusions of the wetlands impact analysis have not changed. The wetland impacts occur on the edges of the corridor wetland systems and represent only a small percentage of the total wetland acreage within the system and, while representing an incremental loss of wetland area, will not eliminate the functions and values performed by the remaining wetland.

10.5.4 Wildlife Resources

Similar to wetland impacts, wildlife habitat impacts are expected to have increased slightly with final design as compared to the 2004 FEIS. Potential increases in total impacts may have occurred as a result of changes in stormwater treatment requirements which increased the size of some BMPs, among other design changes. Assuming the same 11 percent increase found for

wetland impacts, the wildlife habitat impacts of the 2005 Selected Alternative would increase by 30 acres, to 290 acres total. As noted in the 2004 FEIS, the 2005 Selected Alternative primarily affects the edges of habitat areas adjacent to the existing I-93.

As noted in Section 10.4.3, the New Hampshire Natural Heritage Bureau response memo noted that the state-listed brook floater may occur in Golden Brook. Golden Brook is outside the project limits and is not impacted by the project, however two tributaries of Golden Brook originate in the corridor. The stormwater treatment practices associated with the 2005 Selected Alternative would attenuate the stormwater pollutant loadings, including sediment, to these waterbodies (See Section 10.5.1). Therefore the 2005 Selected Alternative would not have any effect on populations of the brook floater located farther (at least two miles) downstream in Golden Brook itself.

10.6 Mitigation

10.6.1 Water Resources

NHDES guidance addressing the requirements of the Water Quality Certificate (see Section 10.3.1) has substantially increased the number of stormwater treatment structures included in the project. The adoption of this guidance has essentially doubled the number of these structures from the total number detailed in the 2004 FEIS. The guidance also added a requirement to treat nutrients (nitrogen and phosphorous) contained in stormwater. Innovative detention basins, such as gravel wetlands, have been incorporated into the design of I-93 to strive to achieve the goals of the guidance. In cooperation with NHDES, NHDOT is implementing the water resources commitments made in the Record of Decision, Water Quality Certification, and NHDOT/NHDES MOA. With respect to chlorides, some of the mitigation commitments NHDOT have made are summarized below:

- Provided $560,000 in funding for and participation in four TMDL studies. As part of this effort, a Salt Reduction Workgroup has been established to advise NHDES on the TMDL study and NHDES's Implementation Plan, and to advise and assist with the implementation of required salt load reductions. The workgroup includes representatives from the following organizations: NHDES; NHDOT; EPA; FHWA; the selectmen's office of each town with area in a TMDL watershed; the public works department of each town with area in a TMDL watershed; the University of New Hampshire Technology Transfer (T2) Center; private winter road and parking lot maintenance companies; motorist associations; the State Police; the Southern New Hampshire Regional Planning Commission; the Nashua Regional Planning Commission; and the Rockingham Planning Commission. Representatives from pertinent watershed organizations and state-wide environmental organizations were invited to join the workgroup in 2008. A professional facilitator retained by the Steering Committee and funded by NHDOT leads the Salt Reduction Workgroup meetings. The Salt Reduction Workgroup has published two reports: *Results of the Workgroup Interviews for the I-93 Salt Reduction Workgroup* (Jeffrey H. Taylor & Associates and Center for the Environment, Plymouth State University, 2007) and *Potential Solutions for Reducing Road Salt Use in New Hampshire*

(Jeffrey H. Taylor & Associates and Center for the Environment, Plymouth State University, 2008)

- Dedicated $2.5 million to I-93 corridor municipalities to fund salt reduction.

- Committed $700,000 to fund regional salt reduction, including plow driver training (state, local and private), public education and salt use tracking.

- NHDOT has purchased equipment to improve the efficiency of deicing salt applications, including two ground oriented pre-wetting spreaders, four brine trucks, two Road Weather Information System (RWIS) stations and established a Maintenance Decision Support System (MDSS), which is plow and salting forecasting software system.

10.6.2 Floodplains

As a result of the substantially reduced floodplain impacts ensuing from corrected floodplain mapping and design changes since the 2004 FEIS, NHDOT and FHWA are eliminating the proposed valley storage mitigation areas. Many of these previously identified valley storage areas consist of undeveloped and naturally vegetated areas. Creation of flood storage at these locations would result in wildlife habitat impacts from the extensive tree removal and earthwork required. The impacts associated with constructing the valley storage areas, which were deemed be acceptable in the 2004 FEIS, are no longer prudent due to the substantial reduction in floodplain impacts and consistent with FHWA's mitigation regulations which require that the "proposed mitigation represents a reasonable public expenditure after considering the impacts of the action and the benefits of the proposed mitigation measures" (23 CFR 771.105(d)). During the December 17, 2008 natural resource agency meeting, agreement was obtained from ACOE, NHDES and the other resource agencies to eliminate these valley storage areas from the mitigation package.

Another change in floodplains mitigation involves the Salem Waste Water Treatment Plant Site (Salem WWTP), which was proposed as a wetland mitigation site and compensatory flood storage area in the 2004 FEIS. NHDOT has determined that the extent of soil and groundwater contamination on the Salem WWTP site is greater than was known at the time of the 2004 FEIS. Due to the uncertainties associated with the site clean up, remediation costs for the 32 acre Salem WWTP could range from $3.5 million up to $16.5 million. Portions of the proposed 7.0-acre floodplain creation area have been determined to be located in an area with some of the greatest groundwater contamination located within the mitigation site. Shifting the proposed floodplain mitigation to avoid the most contaminated area would require impacting an area of undeveloped wooded wetland and upland. Concerns have also been expressed by the NHDES' Waste Management and Water Divisions that the potential would still exist that the existing groundwater contamination could be exposed by any excavation and could potentially migrate through the created area from changes in groundwater flows or by seeping into surface waters. During the December 17, 2008 natural resource agency meeting, agreement was obtained from

ACOE, NHDES and the other resource agencies to eliminate the Salem WWTP site from the mitigation package.[8]

NHDOT is investigating alternative sites for the creation of flood storage to replace the Salem WWTP site. One of the locations under consideration is Haigh Avenue in Salem, a residential street located on the east side of I-93 just north of the of New Hampshire/Massachusetts border (See Figure 10-1). The residences on Haigh Avenue have experienced severe flooding in the past from Policy Brook and the Spicket River. The Haigh Avenue residents are willing to relocate and requested that the Town of Salem apply for a residential buyout grant from FEMA. Although a previous request was denied, the Town of Salem has resubmitted a request for funding for residential buyout program. If a residential buyout program was initiated in the future with or without FEMA involvement, the Haigh Avenue site could be effective as a compensatory flood storage area. The Haigh Avenue site could provide up to 27.7 acre-feet of flood storage, greater than the 22.1 acre-feet of storage than would have been provided at the Salem WWTP site. The Haigh Avenue site is also adjacent to the Policy Brook floodplain that will be impacted by the 2005 Selected Alternative. Additional benefits associated with the Haigh Avenue site would include the conversion of previously developed areas and the removal of impervious surfaces, including driveways, road surfaces, and rooftops. The use of the Haigh Avenue site would also eliminate the need for 1,500 feet of noise barrier and associated fill, and provides a location for the potential enhancement and restoration of Policy Brook.

A second potential replacement site for the Salem WWTP site is the Cluff Crossing site, located south of Rockingham Park Boulevard in Salem (See Figure 10-1). The Cluff Crossing site is presently the location of a 27 acre mitigation site (Site ID #30) with 21 acres in preserved in its natural state and 6 acres accommodating Town of Salem recreational fields. Preliminary estimates indicate that approximately 12.5 acre-feet of flood storage could be created on these 6 acres adjacent to Policy Brook.

Additional investigations of the suitability of the Haigh Avenue and Cluff Crossing sites for floodplain mitigation will be conducted as necessary. Proposed changes to the project floodplain mitigation commitments have been and will continue to be coordinated with the resource agencies.

10.6.3 Wetland Resources

NHDOT has been and will continue to coordinate with the ACOE, NHDES and other natural resource agencies regarding the increase in the total acreage of wetland impacts. As is typical for projects of this scope, the regulatory agencies understand that wetland impacts will change as the project progresses and have therefore made provisions for updating permits to reflect the actual impacts. As discussed in Section 10.6.2, NHDOT is evaluating replacing the Salem WWTP mitigation site with a new mitigation site in Salem.

[8] Meeting summary available at:
http://www.nh.gov/dot/org/projectdevelopment/environment/units/projectdevelopment/nracrmeetings.htm

The current status of the project wetland mitigation sites is included in Appendix F: Natural Resources Written Reevaluation/Technical Report. A total of 956 acres of wetland and upland preservation plus 24 acres of wetland creation is proposed.

10.6.4 Wildlife Resources

NHDOT will coordinate with the resource agencies regarding the potential increase in the total acreage of wildlife habitat impacts. Given the extent of the wildlife habitat being provided by the project wetland and upland land preservation sites, no increase in mitigation is warranted. No new threatened or endangered species impacts were identified; therefore no new mitigation is necessary.

NHDOT has examined the feasibility of a dry-land passage ("shelf") being incorporated into the major stream crossings of I-93 at Cohas Brook, Beaver Brook, Porcupine Brook, and Policy Brook. Additionally, other culvert crossings for smaller perennial streams were evaluated to determine if improvements to the culvert conditions would enhance passage of fish and wildlife. For culverts that would need replacement, consideration would be given to over-sizing these new structures, as appropriate, to better facilitate wildlife crossing. For detailed information on the recommended stream crossing improvements, see Appendix F: Natural Resources Written Reevaluation/Technical Report. Coordination on wildlife crossing issues is ongoing with NHF&G, USFWS, ACOE and NHDES.

10.7 Conclusions

10.7.1 Water Resources

Any changes in pollutant loadings as a result of the changes in the design of the proposed stormwater treatment practices are being done in cooperation with and with concurrence from NHDES. NHDOT will continue to coordinate with NHDES with respect to stormwater management and to ensure that the conditions of the Section 401 Water Quality Certification are met. The number of roadway lanes proposed as part of the 2005 Selected Alternative (four in each direction) has not changed; therefore the 2004 FEIS analysis and conclusions regarding deicing salt loadings have not changed. With the exception of the design changes in the stormwater treatment practices (doubling the number of detention basins), water resources commitments in the Record of Decision, Water Quality Certification, and NHDOT/NHDES MOA remain valid.

10.7.2 Floodplains

Since the 2004 FEIS, 100-year floodplain impacts have been substantially reduced from 49.7 acre-feet to 19.8 acre-feet as a result of design modifications and updated floodplain mapping, which includes floodway impacts having been reduced from 6 acre-feet to 2 acre-feet. The reductions in estimated floodplain and floodway impacts indicate that reductions in the floodplain mitigation commitments would be appropriate. In addition, NHDOT has identified new potential compensatory flood storage areas at Haigh Avenue and Cluff Crossing in Salem that could replace the previously proposed Salem Waste Water Treatment Plant site, which

requires extensive hazardous materials remediation. Proposed changes to the floodplains mitigation commitments have been and will continue to be coordinated with the resource agencies.

10.7.3 Wetland Resources

Based on the first eight construction contracts, the total wetland impacts of the 2005 Selected Alternative are estimated to have increased by about eight acres since the 2004 FEIS, to a total of 85 acres due to a revised delineation of wetlands along the corridor, design refinements, increases in the number/size of stormwater treatment areas and more accurate mapping. However, the type of impacts (generally edge impacts) and 2004 FEIS conclusions regarding the wetland impacts has not changed—the impacts are a small proportion of the total area of the affected wetland systems and the functions and values of the remaining wetland area will not be eliminated. NHDOT has been and will continue to coordinate with resource agencies regarding the increase in the total acreage of wetland impacts.

10.7.4 Wildlife Resources

Although the total acreage of wildlife habitat impacted by the 2005 Selected Alternative may increase by 30 acres as result of final design, the 2004 FEIS conclusions regarding wildlife habitat impacts have not changed. The 2005 Selected Alternative primarily affects the edges of habitat areas adjacent to the existing I-93; it does not cause habitat fragmentation. The update evaluation did not identify any new known occurrences of threatened or endangered species. The mitigation measures identified in the Record of Decision remain valid. Continued coordination on wildlife crossing issues has been ongoing with the natural resource agencies.