

SECTION 4 - AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

This section presents a description of the Airport's existing environment and, if any, the environmental impacts presented by implementation of the Preferred Alternative. Impacts to wetlands by either dredge and fill or tree clearing activities were quantified and presented in the alternatives analysis in Section 3. Where a particular impact category will not be impacted by the Preferred Alternative, this section will so state.

4.1 AIR QUALITY

An air quality analysis was prepared which evaluated the air quality impacts for the existing condition and the Preferred Alternative (see Appendix D for a copy of the report). The analysis indicates that for the air quality parameters and standards applicable at the Airport, implementation of the Preferred Alternative action will result in less than the *des minimis* thresholds for the precursors to ozone (for which Hillsborough County is classified as non-attainment) under the Clean Air Act. Therefore, the Preferred Action will not result in detrimental impacts to air quality.

4.2 COASTAL RESOURCES

There are no coastal resources in the project area; therefore there are no impacts to coastal resources.

4.4 COMPATIBLE LAND USE

The Airport property is surrounded by a mix of commercial, industrial and residential uses. To the south and east of the Runway 32 end is largely a mix of commercial and industrial properties. To the southwest of the Airport is a residential neighborhood, while to the north and west lies a large open space watershed area that is owned by Pennichuck Water Corporation.

Compatibility of the Preferred Alternative with existing and planned land uses in the vicinity of the Airport is discussed more fully in *Section 4.13 Noise*, and Appendix E. Appendix E contains a map showing land uses surrounding the Airport.

4.4 CONSTRUCTION IMPACTS

The potential construction impacts associated with the Preferred Alternative are expected to be temporary. Temporary construction noise and air emissions will occur in the vicinity of the project due to site preparation and construction. Noise will be generated by the normal operation of construction equipment on site. Construction operations will be limited to daylight working hours to help to ensure

that noise is not generated during normal night-time and, to the extent possible, equipment access routes during construction will make every effort to avoid residential areas. Potential air pollutants during construction consist of gasoline and diesel engine emissions, asphalt fumes, and the generation of dust during construction operations. Requirements will be imposed upon the contractor to provide dust control. Engine emissions should be extremely localized and of minor impact.

Water pollution during construction can result from surface runoff, which produces erosion, siltation and sedimentation. The Preferred Alternative will utilize erosion and sedimentation control measures during construction, therefore minimal impact to the adjacent wetlands are expected during the construction phase.

Construction impacts will be of short-term duration and minor. Construction documents and plans will incorporate appropriate steps, including best management practices for erosion control and water quality to mitigate these impacts.

4.5 DEPARTMENT OF TRANSPORTATION ACT: SECTION 4(F)

Section 4(f) of the DOT Act provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance or land from a historic site of national, State, or local significance as determined by the officials having jurisdiction thereof, unless there is no practicable alternative to use of such land.

There are no Section 4(f) lands in the vicinity of the project, and therefore no impacts to Section 4(f) lands are expected as a result of the Preferred Alternative.

4.6 FARMLANDS

The Farmland Protection Policy Act (FPPA) regulates Federal actions with the potential to convert farmland to non-agricultural uses.

No farmland will be converted to non-agricultural uses as a result of the Preferred Alternative.

4.7 FISH, WILDLIFE AND PLANTS

According to correspondence dated January 7, 2008, from the U.S. Department of the Interior, Fish and Wildlife Service, in Concord, NH, there are no Federally listed endangered or threatened species present in the project area (Appendix F).

A review was conducted of the New Hampshire Natural Heritage Bureau's *Rare Plants, Rare Animals, and Exemplary Natural Communities in New Hampshire Towns 2007* for Nashua, and a review was conducted on November 17, 2007 by the New Hampshire Natural Heritage Bureau (NHNHB) of their database via the online DataCheck Tool of rare species or exemplary natural communities (Appendix F).

NHNHB data indicated that three endangered or threatened species were known to be present on or in the vicinity of the Airport (see Table 4-1):

- northern blazing star (*Liatris scariosa var. novaeangliae*) – State Endangered
- wild lupine (*Lupinus perennis*) – State Threatened
- eastern hognose snake (*Heterodon platirhinos*) - State Threatened.

The NHNHB polygons around known locations of these species are indicated on Figure 4-1.

One additional species was identified by Baystate Environmental Consultants (BEC) during their field review of rare species on the Airport (Table 4-1):

- Bird's foot violet (*Viola pedata*) – State Threatened

The known location of this species is indicated on Figure 4-1.

In addition, three other species that are not currently listed but are tracked by NHNHB are located within the vicinity of the Airport, mainly in the area of Stump Pond approximately one mile north of proposed vegetation management activities. These species include (Table 4-1):

- banded sunfish (*Enneacanthus obesus*)
- spotted turtle (*Clemmys guttata*)
- Blanding's turtle (*Emydoidea blandingii*)

The NHNHB polygons around known locations of these species are indicated on Figure 4-1.

4.7.1 Potential for Rare Species to Occur

A field review of relevant habitat characteristics present at the Airport was conducted by BEC biologists in November 2007 and the following outlines the potential for the rare species to be found on the Airport.

4.7.1.1 State Listed Species

Northern Blazing Star: Northern blazing star is a perennial plant with a tall spike-like stem of purple-pink flower heads. This species is endangered in the State of New Hampshire. This species is endemic to the northeastern United States and inhabits dry, open, grassy locations with nutrient poor, sandy soils. The growing season for this species is typically between May and October, with flowering beginning in late August. Historically, northern blazing star is dependant upon fire-influenced natural communities to curtail encroaching woody vegetation growth. Currently, northern blazing star can be effectively managed with annual mowing regimes conducted outside of the growing season to reduce encroachment of woody vegetation. Northern blazing star is associated with scrub oak, bayberry, and little bluestem grass.

Table 4-1

Endangered, Threatened or Tracked Species identified by NH Natural Heritage Bureau (NHNHB) or Baystate Environmental Consultants, Inc. (BEC) relevant to Nashua Municipal Airport (NMA).

Species / Community	Status*	Habitat	Distance from known location to proposed work at NMA	Potential to be present at NMA	Source
Northern Blazing Star (<i>Liatris scariosa</i> var. <i>novaeangliae</i>)	E	Dry, open grassy, early-successional, nutrient-poor, sandy soils.	Present at NMA, in close proximity to construction	Known to be present	NHNHB
Wild Lupine (<i>Lupinus perennis</i>)	T	Dry, sandy soils in open to partially shaded locations	500' from vegetation management	Moderate	NHNHB
Eastern Hognose Snake (<i>Heterodon platirhinos</i>)	T	Sandy, gravelly soils in open fields, river valleys, pine forests and upland hillsides in the vicinity of wetlands or vernal pools.	1.5± mile to vegetation management	Moderate	NHNHB
Bird's Foot Violet** (<i>Viola pedata</i>)	T	Well drained, sandy soil in open, unshaded locations	Present at NMA, in close proximity to construction	Known to be present	BEC
Blanding's Turtle (<i>Emydoidea blandingii</i>)	R	Lakes, ponds, creeks, wet meadows, sloughs, oxbows, vernal pools with soft substrates and abundant vegetation.	Present at NMA, in close proximity to construction	Known to be present	NHNHB
Spotted Turtle (<i>Clemmys guttata</i>)	R	Shallow wetlands including swamps, bogs, fens, wet pastures, marshes, pond edges, and small woodland streams.	1± mile to construction	Moderate	NHNHB
Banded Sunfish (<i>Enneacanthus obesus</i>)	R	Small ponds, backwaters of creeks to small rivers, and boggy brooks.	1± mile to vegetation management	Low	NHNHB

*E = Endangered, T = State Threatened, R = tracked by NH Natural Heritage, but not listed.

**Was not identified as being on site by the NH Natural Heritage database search, but was observed during site visits.

The review of the NHNHB database revealed a population of northern blazing star on the southern portion of the Airport. Based on the report, 401 stems were counted in 2006. The site review confirmed that this area is suitable habitat for this species. Although no individuals of this species were identified during the site visit, the highest potential for this species to be present outside of its documented area would be in the large grassland to the east of the southern half of the runway. Areas in the immediate vicinity of the runway and taxiways are mowed too frequently to be considered ideal habitat for this species.

Wild Lupine: Wild lupine is a state-listed threatened species in New Hampshire. This species is a perennial plant in the pea family found primarily in dry sandy soils in open to partially shaded habitats. This species is also historically dependent on fire-influenced natural communities to curtail encroaching woody vegetation growth and can be effectively managed with appropriate mowing regimes. The growing season for this species is typically between May and October, with flowering occurring from late May to June.

The review of the NHNHB database revealed a population of wild lupine along the railroad tracks to the north of the runway. These patches were identified in 2002. No individuals of this species were found during the habitat survey of Airport property in November 2007. Moderately suitable habitat for this species at the Airport is in the large grassland expanse northeast of the southern half of the runway and in the area east of the 42 end of the runway.

Eastern Hognose Snake: The eastern hognose snake prefers sandy, well-drained, or gravelly soils, typically in open fields, river valleys and pine forests. These habitat types must also be in close proximity to wetlands and or vernal pools, as eastern hognose snakes are dependent on toads, frogs and salamanders for food resources. Breeding usually occurs in July and eggs hatch in August or September. Eggs are typically laid a few inches underground or under woody debris.

The review of the NHNHB database found hognose snakes to be present in a grassy area bordering woods near Stump Pond (1.5± miles from the Airport). In general, the sandy soiled forested wetlands and grasslands of the Airport are moderately suitable for eastern hognose snakes; however, the closest known location of the species is 1.5± miles from the project area.

Bird's Foot Violet: Bird's foot violet is a state-listed threatened species in New Hampshire. This species is found in well-drained, sandy soils that tend to be acidic. It requires open, unshaded areas similar to those required by wild lupine and northern blazing star. Bird's foot violet flowers in late Spring and early Fall. The species grows relatively low to the ground; therefore, populations can be sustained under relatively frequent mowing regimes.

The November 2007 field review confirmed the presence of bird's foot violet in several patches of grassland along the parallel taxiway at the southern end of the Airport as well as just east of the southern end of the runway. This species is most

likely to occur near the runway, in locations where grasses are maintained at lower heights.

4.7.1.2 State Tracked Species

Blanding's Turtle: This species lives in shallow water habitats that are typically eutrophic. Blanding's turtle prefers lakes, ponds, marshes, creeks, wetlands and wet prairies with abundant vegetation. Suitable nesting habitat consists of large grasslands with well-drained, sandy soils. Nest locations also tend to be found along forest edges.

The presence of Blanding's turtle in and near Stump Pond, approximately 2± miles northwest of the project area, has been documented. There is also a mapped point for the species on Airport property in the thin strip of wetland along the forest edge north of the Runway 14 end. The areas with the highest potential for this species to occur are the extensive forested and wetland areas west of the runway. The sandy south-facing hill just north of the runway also provides suitable turtle nesting habitat.

Spotted Turtle: This species inhabits a variety of shallow wetland habitats including swamps, bogs, fens, wet pastures, marshes, ponds, and streams. Spotted turtles tend to prefer ecotones of forest and wetland with a thick organic soil layer. This species nests in well-drained areas exposed to full sunlight. Nest sites may also include moist sphagnum mats, grassy tussocks, and loamy soil of marshy pastures.

The review of the NHNHB database found spotted turtles to be present at Stump Pond located to the west of the Runway 14 end, and at a location approximately 1.5± mile southwest of the Runway 14 end in the Pennichuck Brook wetland system. Given the species presence in the expansive wetland system to the west and south of the Airport, the species may be potentially found in the wet depressions on the Airport.

Banded Sunfish: This species inhabits calm, vegetated water of lakes, ponds and small rivers with sandy or muddy bottoms. Banded sunfish feed primarily on insect larvae and other small crustaceans and typically range from 2-4 inches in length. Spawning typically occurs from early spring into summer.

The review of the NHNHB database revealed a relatively abundant population of at least 100 individuals in Stump Pond in 1998 (Appendix F). Stump Pond is approximately one mile northwest of the Airport. A specimen was also collected in Pennichuck Brook in 1948. It is extremely unlikely that the wet depressions or the wetlands in the project area could support a population of this species. The wet depressions lack the depth and vegetation required for this species to persist.

There is no potential habitat for this species at the Airport; therefore, the proposed work will not impact this species.

4.7.2 Potential Impacts to Rare Species

The proposed work may potentially impact known habitat for individuals of the state listed Birds Foot Violet and the state tracked Blanding's turtle. The potential impacts and means to minimize impacts or mitigate are discussed in Section 5.

4.8 FLOODPLAIN

According to the 1994 Environmental Assessment¹, “An examination of floodplain maps for the City of Nashua has established that neither the Airport, nor the Holden Property are located in, or are immediately adjacent to a designated floodplain”. The 1998 Environmental Assessment² states that “The only designated 100-Year flood boundary within the Airport property is in the vicinity of the Spectacle Brook wetlands, south of the existing runway” and across the airfield from Perimeter Road. Therefore, due to the location, design and construction of a new stormwater management system to accompany the relocated runway and taxiway, the Preferred Alternative will not result in impacts to any regulated floodplain.

4.9 HAZARDOUS MATERIALS, POLLUTION PREVENTION AND SOLID WASTE

There are no known hazardous material sites or contamination in the vicinity of the Preferred Alternative. The Airport has a Stormwater Pollution Prevention Plan (SWPPP) and Spill Prevention Control and Countermeasures (SPCC) Plan which include Best Management Practices, monitoring and water quality reporting requirements to minimize the potential exposure of pollutants to stormwater or the local environment. The Preferred Alternative will file a construction activity SWPPP with the appropriate agencies and contractors prior to construction of the proposed project and will therefore minimize opportunities to have an adverse effect on the environment during construction and in the long term.

4.10 HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

In April 2008, UMass Archaeological Services conducted a literature review and walkover survey of the Airport as part of a Phase 1A Archaeological Assessment Survey of the Airport. The survey found low sensitivity for archeological and historical resources at the Airport and concluded that the proposed action is unlikely to affect significant archaeological resources. The Archaeological Assessment Report (Appendix G) found that no additional survey or testing was recommended prior to implementation of the proposed action. On December 2, 2008 the New Hampshire Division of Historical Resources (NHDHR) accepted the findings of the report and concurred with its recommendations.

¹ Nashua Municipal Airport, Holden Property Acquisition, Environmental Assessment, prepared for: The Nashua Airport Authority, 1994, Prepared by: Dubois & King, Inc., 100 Perimeter Road, Nashua, New Hampshire

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4.11 LIGHT EMISSIONS AND VISUAL IMPACTS

The Preferred Alternative is replacing existing lighting (approach lights, runway edge lights, PAPI, REILS) with in-kind lights and is therefore not expected to have an impact on light emissions or visual impacts on sensitive receptors.

4.12 NATURAL RESOURCES AND ENERGY SUPPLY

The Preferred Alternative will not result in major changes in stationary facilities, or the movement of aircraft and ground vehicles that would have a measurable effect on local supplies of energy or natural resources. Wherever approved by FAA, Light Emitting Diode lighting will replace current lighting technologies to improve energy efficiencies in the runway and taxiway lighting systems. Therefore, the Preferred Alternative could result in a higher level of energy efficiency than what currently exists at the Airport.

4.13 NOISE

The FAA's Integrated Noise Model (INM) was used to evaluate noise exposure around the Airport. The Day-Night Sound Level (DNL) metric is used by FAA to measure noise exposure at airports and surrounding areas. A Noise Analysis (see Appendix E for a full copy of the report) evaluated the land uses surrounding the Airport and modeled the existing noise contours, the future No-Action, and forecasted contours (to 2012). Federal Aviation Regulation (FAR) Part 150, Land Use Compatibility Guidelines, define noise-sensitive land uses that are overlain by the DNL of 65 dB or greater to be non-compatible with airports, and noise-sensitive uses overlain by a DNL lower than 65 dB are considered to be compatible with airports "without restrictions".

Figure 4-2 depicts the Baseline (2007) Existing Condition DNL 65 dB noise contour as well as the Preferred Alternative (2012) DNL 65 dB noise contour. The existing condition DNL 65 dB noise exposure contour encompasses approximately 224 acres, 94% of which remains on Airport property. The remaining 6% of noise exposure of DNL 65 dB or greater overlays industrial or transportation-related land uses. No residences or other noise-sensitive facilities are located within the Existing Condition DNL 65 dB noise contour.

The Preferred Alternative DNL 65 dB noise contour encompasses approximately 269 acres, of which approximately 210 acres overlay Airport property. Of this approximately 0.4 acres of incompatible land uses are within the DNL 65 dB contour. No residential structures or other noise sensitive facilities are located within the DNL 65 dB contour of the Preferred Alternative. As such, the Preferred alternative will not have adverse noise impacts on noise sensitive receptors.

4.14 SECONDARY (INDUCED) IMPACTS

Because of the localized nature of this project, it will not produce secondary induced impacts to population patterns, movement, or growth is anticipated. No public

service demands and no changes in business and economic activity are anticipated as a result of the Preferred Alternative.

4.15 SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Socioeconomic Impacts: The Preferred Alternative will not require the relocation of residences or businesses, nor is it anticipated that it will have an impacts on local surface transportation patterns. The Preferred Alternative does not divide or disrupt established communities, nor does it disrupt orderly, planned development, or create an appreciable change in employment.

Environmental Justice: The Preferred Alternative does not present disproportionately high or adverse impacts to minority or low-income populations since the impacts expected from the Preferred Alternative are located over either open space or commercial/industrial land uses.

Children's Environmental Health and Safety Risks: The Preferred Alternative is to be implemented entirely on Airport property within a secure, fenced and gated environment and is not impacting schools or other children related infrastructure. No safety risks or environmental health hazards to children are anticipated from implementation of the Preferred Alternative.

4.16 WATER QUALITY

Both surface water and ground water resources are present within Airport property.

4.16.1 Surface Waters

The Airport property contributes to two separate watersheds and brooks;

1. Spectacle Brook, located to the southwest of the airfield; and
2. Pennichuck Brook, located to the north of the airfield.

At the northern end of the Airport, Deerwood Drive is the approximate location of the surface watershed divide between these two systems (Figure 4-5).

Almost all of developed portions of the airfield, to the south of Deerwood Drive, drain to Spectacle Pond and Spectacle Brook, located southwest of the airfield between Perimeter Road and University Drive. Areas to the north of Deerwood Drive drain to the northwest, leading ultimately to the Pennichuck River via either an intermittent stream flowing to Muddy Brook, upgradient of Pennichuck Pond, or an intermittent stream flowing to the Pennichuck Brook below the outlet of the pond.

The wetlands located between the Runway 14 end and Deerwood Drive have an outlet to the surface water drainage system located in the Main Apron area of the developed airfield and therefore contribute intermittent surface flow to Spectacle Brook. However, this connection appears to be a high overflow that only operates

during the periods of greatest inundation. Therefore, this area also likely contributes significantly to local groundwater recharge, contributing to baseflow as part of the Spectacle Brook watershed, assuming that the boundaries of the surface watersheds reflect the limits of the groundwater divides between the Pennichuck Brook and Spectacle Brook groundwater recharge areas.

Note: It should be noted that virtually all of the proposed work, with the exception of runway approach light installation and some limited tree removal, will be located within the watershed to Spectacle Brook. (i.e., the area to the southeast of Deerwood Drive). Only the relocation of the runway approach lighting system (MALSR) and some limited obstruction (tree) removal within an area already managed for vegetation will occur within the watershed to Pennichuck Brook.

4.16.1.1 Water Quality Classification

Pennichuck Brook and all its tributaries and impoundments and all their tributaries, in Hollis and Nashua from the outlet of Pennichuck Pond to the crest of the Pennichuck Water Works, Supply Pond dam, downgradient, are considered Class A waters. Class A waters are associated with the Pennichuck watershed and drinking water supply to the City of Nashua. Class A waters are acceptable for water supply use after disinfection.

All other portions of the Pennichuck Brook watershed are designated as Class B waters. Spectacle Brook is not specifically rated, but would fall into the Class B designation. However, given its significant culverting and interception of stormwater from residential development downgradient of the Airport prior to Spectacle Brook's confluence with the Nashua River, the Class B designation may not be appropriate. Acceptable for Class B waters include fishing, swimming and other recreational purposes and, after adequate treatment, for use as a drinking water supply.

4.16.1.2 Description of Airport Drainage to Spectacle Brook Watershed

The Airport has several drainage ditches around its perimeter that collect and conduct stormwater runoff, including:

- Wetlands 1 and 2 outlet swale at the Main Apron;
- Wetland 4, a stormwater ditch located between the Main Apron and parallel taxiway towards the Runway 14 end; and
- Wetland 8, a herbaceous swale and semi-isolated wetland located within the mown primary surface of the airfield, which also receives drainage from wooded wetlands.

All of these features drain to a culvert system that discharges to "Spectacle Pond", an excavated emergent wetland and ponding area located to the southwest of the Airport between University Drive and Perimeter Road. The outlet from this area

continues as Spectacle Brook, much of which is culverted beneath residentially developed portions of Nashua, to its confluence with the Nashua River, southwest of the Airport. Some of the flows from the drainage ditches also show evidence of interception of seasonally high groundwater based upon the presence of iron floc in the water.

Most of the wooded wetland areas in closest proximity to the runway also contribute flow to Spectacle Pond (see Wetlands Section), including the wetlands between the existing runway and the railroad tracks (e.g., Wetlands 1, 2, 8, and 9).

4.16.1.4 Description of Airport Drainage to Pennichuck Brook Watershed

The wetlands located to the north of Deerwood Drive on either side of the Runway 14 Approach Light System are contiguous with a larger wooded wetland complex that drains to Muddy Brook upgradient of Pennichuck Pond and to Pennichuck Brook itself, below the pond. Much of the contiguous wetlands are part of the large wooded wetland complex located on the City of Nashua Conservation Land located across Deerwood Drive, west of the Airport property boundary. The wetlands on the west side of the Approach Light System appear to drain to Muddy Brook, while the easterly wetlands drain more directly to the north, contributing to Pennichuck Brook. The wooded wetland areas have generally flat but irregular micro-topography that retain large areas of intermittent standing water, with depths exceeding one foot at some locations.

4.16.2 Groundwater Resources

Most of the Airport is apparently shallow to groundwater with a significant rise and fall in groundwater elevation throughout the typical annual seasons. This is best observed in the former gravel pit excavation area in the Runway 14 runway safety area, northwest of the Runway 14 end (Wetland Area 2). This area can show over 6 foot depth of standing water before drying out later in the summer season. While the surface watershed is not necessarily coterminous with the groundwater aquifer recharge areas, they are likely somewhat similar based upon the local surficial geology (glacial stratified drift), with most of watershed area north of Deerwood Drive contributing to aquifer recharge for the Pennichuck aquifer. The semi-confined wetland areas between the Runway 14 end and Deerwood Drive may also contribute recharge to this aquifer as well.

4.16.4 Impacts to Water Quality

Implementation of the Preferred Alternative (see Section 4) is not expected to have negative impacts to water quality. Either action (proposed or preferred) will not substantively change surface or groundwater flow directions or groundwater recharge characteristics. A new drainage system in compliance with Environmental Protection Agency (EPA) and New Hampshire Department of Environmental

Services (NHDES) stormwater standards for construction and post construction³ water quality will be designed and installed as part of the relocated runway project. It is expected that these new drainage facilities will constitute an improvement to water quality at the Airport. In addition, the Airport has recently updated its Stormwater Pollution Prevention and Spill Control and Countermeasures Plans to conform to recently adopted EPA regulations.

4.17 WETLANDS & PRINCIPAL FUNCTIONAL VALUES

There are several wetland areas located on Airport property. Wetlands were delineated at Boire Field, Nashua, NH by wetland and soil scientists according to the methodology described in the 1987 Corps of Engineers Federal Manual for Identifying and Delineating Jurisdictional Wetlands, using the three parameter methodology of vegetation, soils, and hydrology. Wetlands were also evaluated relative to functions and values of the resources. The wetland areas within the vicinity of the Preferred Alternative are graphically depicted in Figure 4-4 and are described in detail below. Quantified impacts to wetlands were reviewed and documented as part of the Alternatives Analysis presented in Section 3.

4.17.1 Wetland Area 1

Wetland Area 1 is a large predominantly wooded wetland area, the northerly portions of which were recently cut as part of the Airport's ongoing Vegetation Management activities. The wetland is located to the southwest of Runway 14-42 near the so-called India Apron. The heavily cut areas are vegetatively succeeding as shrub and sapling areas. It also includes an area dominated by white pine (*Pinus strobus*), Pin Oak (*Quercus palustris*), swamp white oak (*Quercus bicolor*), grey birch (*Betula populifolia*), red maple (*Acer rubrum*) in the overstory and highbush blueberry (*Vaccinium corybosum*), greenbriar (*Smilax sp*), maleberry (*Liguna ligustrina*), winterberry (*Ilex verticillata*), sheep laurel (*Kalmia angustifolia*) and speckled alder (*Alnus rugosa*) in the understory. Ground cover species again included sphagnum moss, cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Osmunda sensibilis*), cranberry (*Vaccinium macrocarpon*), tussock sedge (*Carix stricta*), and bracken fern (*Pteridium aquilinum*). Overstory trees in this wetland are typically rooted on medium sized hummocks that rise from the ground approximately 0.5 to 2.0 feet above ground.

This large area may provide temporary flood storage. It is located near the headwaters of local streams and is not within mapped FEMA floodplain. There were sections with prominent hydrological indicators, including water marks, water-stained leaves, oxidized root channels, mottling, and sediment removed from around tree trunks. The wetland also provides habitat and cover for deer, coyotes, songbirds, and amphibians.

³ *NH Stormwater Management Manual, Volume 2, Post Construction Best Management Practices Selection and Design*, December 2008 and *NH Stormwater Management Manual, Volume 4, Construction Phase Erosion and Sediment Control*, December 2008

Principal functional values associated with this wetland resource are primarily associated with wildlife habitat, with groundwater protection and flood water retention as important other features.

4.17.2 Wetland Area 2

Wetland Area 2 is an area of mostly mown field habitat on the southerly side of the existing runway approach light fixtures, on the Airport side of Deerwood Road. Most of the area presents as wet meadow wetlands, but the area includes areas of intermittent ponding in former sand/gravel excavation areas, which are poorly vegetated. The area also has intermittent shrubs and sapling growth in areas of irregular topography associated with historic earth moving and excavation. The mown wet meadow wetland within the existing cleared runway safety area includes open areas with little tree or shrub growth dominated by low- growth woody species and herbaceous growth including tussock sedge, swamp dewberry, deer-tongue grass (*Dicanthelium clandestinum*) and yellow nut sedge (*Cyperus esculentus*), cranberry, beak rush (*Rhynchospora capitellata*), bent grass (*Agrostis sp.*), rough-stemmed goldenrod, tussock sedge and other sedges, dewberry, hay-scented fern (*Dennstaedia punctilobula*), teaberry (*Gaultheria procumbens*) and shinning club moss (*Lycopodium lucidulum*). Shrub and sapling vegetation includes speckled alder and grey birch. The vegetation in this area was frequently mown making a more complete identification difficult due to the variable growth characteristics.

Principal functional values associated with this wetland resource are associated with wildlife habitat, which is compromised to some extent due to frequent mowing inhibiting ground nesting birds and limiting cover for wildlife. However, browse for wildlife is in abundance, which poses some conflict with Airport operations. Groundwater protection and flood water retention are also secondary features of this wetland area.

4.17.4 Wetland Area 3

Wetland Area 3 is a group of small wetland areas located just west of the parallel taxiway and Main Apron. These wetlands were apparently formed by excavation and provide some function in drainage and existing stormwater management, although one of the areas is a closed basin with no apparent inlet or outlet. Vegetation is maintained as herbaceous and low shrub growth due to its proximity to the operational part of the Airport (i.e., the apron area). The dominant species include common cattail (*Typha latifolia*), wool grass (*Scirpus cyperinus*), tussock sedge, dewberry, beak rush (*Rhynchospora capitellata*), bent grass (*Agrostis sp.*) and rough-stemmed goldenrod (*Solidago rugosa*). Flow ultimately contributes to Spectacle Brook.

The principal functional values of this wetland include flood storage potential, groundwater protection and to a limited extent, wildlife habitat protection. This area may provide stormwater retention for the northwest apron and possible habitat for amphibians or birds. It is most likely habitat for some amphibians and reptiles.

4.17.4 Wetland Area 4

Wetland Area 4 is a stormwater ditch located between the Main Apron and the parallel taxiway at the Runway 14 end. This wetland is approximately 18 feet wide and approximately 400 feet in length. The flow channel at the base is about 18 inches wide with a water depth of 6 inches. The channel flows westerly to a culvert which ultimately contributes to Spectacle Brook south of the Airport. Sheet flow from the Airport contributes to the surface flow as well as interception of groundwater, as evidenced by the presence of iron floc. The narrow fringe vegetative along the channel includes meadowsweet (*Spiraea latifolia*), cattail, purple loosestrife (*Lythrum salicaria*), wool-grass (*Scirpus cyperinus*), soft rush and fowl meadow grass (*Poa palustris*).

Principal functional values associated with this system include flood control, stormwater mitigation, groundwater protection, pollutant attenuation and a limited degree of wildlife habitat potential.

4.17.5 Wetland Area 5

Wetland Area 5 is located at the outer perimeter of the Airport grounds, southeast of the existing India Apron along Deerfield Road. Wetland Area 5 is located in an excavated depression created between two gravel roads. It is vegetated by low shrub and herbaceous growth including meadowsweet shrubs (*Spiraea latifolia*), pussy willow (*Salix discolor*), clubmoss (*Lycopodium obscurum*), tussock sedge, and wool grass.

Principal functional values associated with this system are of relatively low functional value due to repetitive mowing during the growing seasons, but may provide some limited and intermittent cover and habitat for songbirds and small mammals. It may also retain stormwater retention and provide limited treatment from the surrounding gravel roads.

4.17.6 Wetland Area 6

Wetland Area 6 is comprised of a relatively large area to the northwest of the Runway 14 end. This wetland appears to have been developed within a filled and disturbed area as evidenced by the obvious fill soils placed above a more natural topsoil layer (A horizon). This wetland is part of a regularly mown area; therefore, vegetation identification was limited. The predominant vegetation consists of herbaceous species including tussock sedge, swamp dewberry (*Rubus hispidis*), deer-tongue grass (*Dicanthelium clandestinum*) and yellow nut sedge (*Cyperus esculentus*). Occasional cranberry and shining club moss (*Lycopodium lucidulum*) groupings were observed in the wetland in discrete locations.

Principal functional values of this wetland include flood storage potential, groundwater protection and to a limited extent, wildlife habitat protection.

4.17.7 Wetland Area 7

Wetland Area 7 is located northwest of the Runway 14 end, in a broad herbaceous wetland swale with intermittent standing water. The area was created by excavation with the excavated soils apparently mounded between this wetland and a wooded wetland to the north, towards the railroad tracks (the western-most portion of Wetland Area 9). Water in this wetland system drains easterly to Wetland Area 9, and subsequently to Wetland Area 8, ultimately draining off of the Airport and contributing flow to Spectacle Brook. This wetland is routinely mown, maintaining its predominant condition as herbaceous growth. The southern side of the swale towards the existing runway is routinely mown as part of the primary surface. The remainder of the wetland is mown less frequently and has 4-4 foot growth of predominately herbaceous species with some interspersed woody stems. Dominant vegetation within this wetland complex include hydrophilic grasses, soft rush (*Juncus effusus*), cranberry, tussock sedge, grass-leaved goldenrod (*Euthamia graminifolia*), rough stemmed goldenrod, common cattail, with scattered elderberry (*Sambucus canadensis*) and silky dogwood (*Cornus amomum*).

Principal functional values associated with this wetland include wildlife habitat and stormwater remediation. The shallow intermittent open water may provide an occasional attractive stopover site for migrating avian water fowl, especially given the abundant source of herbaceous vegetation for browse and adjacent open mown surfaces. This area is likely an attractive nuisance relative to Airport operations. Stormwater runoff from Runway 14 likely drains over the vegetated primary surface to this wetland. It is, therefore, not likely to receive highly contaminated stormwater runoff. Nevertheless, the wetland offers an opportunity for interception and biological remediation of any runoff that reaches it.

4.17.8 Wetland Area 8

Wetland Area 8 is a herbaceous swale and semi-isolated wetland located within the mown primary surface of the airfield. This wetland is a continuation of the intermittent stream drainage channel within Wetland Area 9, draining towards the runway where it is culverted beneath the runway, reemerging on the southwest side of the Airport, ultimately draining to Spectacle Brook. The wetland boundaries also include some side drainage swales which collect runoff from the airfield and direct it towards the culverted intermittent stream. A small isolated wetland area was also flagged adjacent to the swales, which encloses an area that appears to occasionally pond surface runoff. Vegetation within these mown field areas included cranberry (*Vaccinium macrocarpon*), various grasses, soft rush (*Juncus effusus*), and sedges (*Carex spp.*).

Principal functional values associated with this wetland are to assist in managing stormwater runoff from the airfield. The vegetated swales likely provide some stormwater mitigative function. The berry producing cranberry may also provide intermittent browse of avian and non-avian wildlife.

4.17.9 Wetland Area 9

This wetland area is a relatively large wooded wetland complex along the northerly side of the Airport, separating the primary mown surfaces of the runway from the railroad tracks.

This wooded wetland area has increased hydrology to the west, with significant season inundation of 1 foot or greater in the portion of the wetland north of Wetland Area 7, receiving drainage from this wetland. The wooded wetland rapidly transitions in the easterly direction to forested wetland with infrequent or no evidence of periodic inundation. Further to the east, a substantial portion of the woodland continues as upland. The wooded wetland area has a generally flat but irregular micro-topography associated with typical pit-mound conditions.

An intermittent drainage swale traverses the wooded wetland along the easterly side of the wetland, generally flowing from northeast to southwest, continuing onto the primary surface of the airfield (Wetland Area 8), where it is culverted beneath the runway, ultimately combining flows with Spectacle Brook. The intermittent stream receives stormwater discharge from the industrial development to the northeast of the Airport, on the other side of the railroad tracks. The channel is approximately four feet wide and depressed one to three feet below the adjoining terrain, with the wetland boundary immediately along the southerly banks of the watercourse. The stream channel appears to have only extremely intermittent flow, perhaps only in reaction to direct precipitation. There are areas of more persistent standing water and areas of sediment deposits. There is a nearly contiguous small isolated wetland, near the fenced boundary of the Airport near the origin of the intermittent stream.

Dominant canopy species are red maple, pin oak, grey birch, and scattered white pine, eastern hemlock (*Tsuga canadensis*). Species in the shrub layer included high bush blueberry, maleberry, silky dogwood, elderberry, and winterberry. Ground cover species include cinnamon fern, sensitive fern, royal fern (*Osmunda regalis*) and skunk cabbage (*Symplocarpus foetidus*).

Principal functional values associated with this wetland system are related to wildlife habitat. The relatively dense wooded canopy, and the good vertical stratification associated with the canopy, sub-canopy and sub-layers, provide abundant nesting sites for birds and arboreal mammals. The diversity of shrub and tree species also provides an abundant source of seed, soft mast, and browse. Due to the channelized nature of this intermittent stream it is unlikely that there is much opportunity for stormwater quality remediation. However, there were an abundance of areas of sediment deposits within the stream channel suggestive of the stormwater influence from the adjacent developed lands. The frequently inundated areas may provide amphibian breeding habitat.

4.17.10 Wetland Area 10

Wetland Area 10 is an immature wooded wetland, located in the southwestern portion of the Airport property, west of Deerwood Drive and the perimeter fence, and south of the runway's approach light system. The area includes a small isolated wetland within the upland woodland. While this wetland is wooded, it was subject to tree removal activity in 2005/2006, as part of the Airport's vegetation maintenance activities. This wooded wetland area is very similar in character to Wetland Areas 1, 11 and 12.

This woodland is comprised of relative young secondary growth trees, showing evidence of prior tree clearing operations in support of the Airport's operations and safety requirements. This wetland has areas of seasonal standing water up to a foot in depth, although support of vernal pool breeding activity (e.g., wood frog, toad, salamander) has not been observed in season, presumably due to rapid loss of standing water during the amphibian breeding season. Soils within this wetland are largely loamy sands and sands, with some organic accumulation in the upper strata, with shallow redoximorphic features and reduced soil matrices below eight to fourteen 14 inches of depth.

Predominant vegetation of the wetlands and upland are an immature tree and sapling canopy of red maple, with white pine, pin oak, grey birch and shrub species including high bush blueberry, with maleberry, winterberry, shadbush (*Amelanchier sp.*), sheep laurel, and dewberry. Ground cover species again included sphagnum moss, cinnamon fern, sensitive fern, sphagnum moss, cranberry, tussock sedge, and bracken fern.

Principal functional values associated with this wetland continue to be associated with wildlife habitat, with groundwater protection and flood water retention as important other features. Wetland Areas 10, 11 and 12 are located at the top of the Pennichuck watershed, a recognized aquifer recharge area, with areas of temporary pooling. The wetland has obvious ability to retain surface waters, providing protection from downgradient flooding.

4.17.11 Wetland Area 11

Wetland Area 11 is an immature wooded wetland, located to the west of Deerwood Drive, in the northwest corner of Airport property, west of the Airport's perimeter fence. It is located to the immediate east of the utility pole right-of-way, on the northerly side of the runway's approach light system.

The wetlands are semi-inundated in the early portions of the year up to a foot in depth. Overall wetland drainage is to the west towards Wetland Area 12. No vernal pool breeding activity has been observed despite a search for amphibian egg masses in season in 2005 (e.g., wood frog, toad, salamander), which might be expected to be present at this time of year in an active vernal pool. Soils within this wetland are largely loamy sands and sands, with some organic accumulation in the upper strata, with shallow redoximorphic features and reduced soil matrices below eight to fourteen 14 inches of depth.

The area is comprised of relative young secondary growth trees, showing evidence of the 2005/2006 tree clearing operations in support of the Airport operations and safety requirements. A portion of the contiguous wetland area extends into the mown surfaces containing the runway approach lights.

Predominant vegetation of the wetland is comprised of an immature tree and sapling canopy sapling canopy of red maple, with white pine, pin oak, and grey birch among the sub-dominant species. The dominant shrub species include high bush blueberry, with maleberry, winterberry, and shadbush among other present species. Ground cover species included sphagnum moss, cinnamon fern, sensitive fern, sphagnum moss, cranberry, and tussock sedge.

Principal functional values associated with this wetland resource are principally related to wildlife habitat, groundwater protection, and protection and flood water retention. The immature canopy and dense sapling and shrub layers provide nesting and perching sites for avian and arboreal mammal species. The frequently inundated areas may provide intermittent reptile and amphibian breeding habitat, although no evidence of such was found. Wetland Areas 10, 11 and 12 are located at the top of the Pennichuck watershed, a recognized aquifer recharge area, with areas of temporary pooling. The wetland has obvious ability to retain surface waters, providing protection from downgradient flooding.

4.17.12 Wetland Area 12

Wetland Area 12 is a large wooded wetland complex located on the City of Nashua Conservation Land to the west of the Airport property boundary. The lands include both upland areas and wetland areas. Generally, the trees are predominantly red maple within the wetlands with a higher prevalence of white pine within the adjacent uplands. Similar to Wetland Areas 10 & 11, the wetlands are semi-inundated in the early portions of the year up to a foot in depth. Overall wetland drainage is to the southwest, contributing to Pennichuck Brook.

The wooded wetland area has a generally flat but irregular micro-topography associated with typical pit-mound conditions. The pit and mound micro-topography within this wetland is accentuated due to the frequently inundated conditions with standing water depths exceeding 1 foot at some locations. The wetland soils within the central portion of this wetland show significant conditions of organic topsoil layers above the sandy sub-soils. The adjacent upland soils were likewise sandy outwash derived soils with thin topsoil layers underlain by loamy sand to sand.

Predominant vegetation of the wetland is a canopy of red maple, white pine, and grey birch among the dominant species, with scattered pin oak and other species. The dominant shrub species was high bush blueberry, with maleberry, winterberry, and shadbush among other present species. Ground cover species included cinnamon fern and sensitive fern, sphagnum moss, cranberry, tussock sedge, and skunk cabbage.

Principal functional values associated with this wetland resource are primarily related to wildlife habitat, groundwater protection and flood water retention. The canopy and shrub layers provide nesting and perching sites for avian and arboreal mammal species. The relatively dense, immature wooded canopy, and the good vertical stratification associated with the canopy and shrub sub-layers, provide abundant nesting sites for birds and arboreal mammals. The diversity of shrub and tree species also provides an abundant source of seed, soft mast, and browse for the species likely to be present. The frequently inundated areas may provide intermittent reptile and amphibian breeding habitat, although no evidence of such was observed in season.

Wetland Areas 10, 11 and 12 are located at the top of the Pennichuck watershed, a recognized aquifer recharge area, with areas of temporary pooling. The wetland has obvious ability to retain surface waters, providing protection from downgradient flooding.

As Conservation Land, the area also has potential social significance and educational potential, although it is not certain that the wetland has yet been used in this capacity.

4.17.14 Wetland Area 13

Wetland Area 13 is comprised of two small, semi-isolated wooded wetlands located to the east of the Airport within the approach to Runway 42 on either side of the railroad tracks and east of Charron Ave off of Airport property. The wetlands are contiguous with drainage ditches along the railroad tracks and receive runoff drainage from adjoining industrially and commercially developed areas. The wetlands are dominated by red maple and white pine, with some emergent and shrub dominated portions. Most of the penetrations appear to be associated with tall white pines on the fringes of the wetlands.

Principal functional values would be associated with local wildlife habitat and stormwater remediation since these areas appear to receive runoff from the adjacent commercial and industrial development.

4.18 WILD AND SCENIC RIVERS

There are no wild and scenic rivers in the project area; therefore no impacts are expected to wild and scenic rivers as a result of the Preferred Alternative.