CHAPTER 6.0
MITIGATION

6.1 INTRODUCTION

This chapter presents mitigation measures developed by the Federal Aviation Administration (FAA) and the Metropolitan Washington Airports Authority (MWAA) to minimize, or compensate for the unavoidable environmental impacts associated with the proposed improvements at Washington Dulles International Airport (IAD)[1]. All of the alternatives considered in this Draft Environmental Impact Statement (DEIS) would result in unavoidable environmental impacts to several resource categories that may warrant mitigation. The analysis of impacts indicates that the following resource categories will warrant mitigation:

- Noise, Land Use, and Social Impacts,
- Air Quality,
- Water Quality,
- Historic and Archaeological Resources (Section 106),
- Wetlands,
- Floodplains,
- Coastal Zone Management Program, and
- Construction.

Section 6.2 describes potential mitigation measures for all of the Build Alternatives. These general measures were initially identified as possible options to mitigate for adverse impacts that could apply to an airport development program such as the one proposed by MWAA. These measures were evaluated for preliminary consideration only and may or may not result in practicable mitigation for the impacts associated with the Build Alternatives. **Section 6.3**, to be added after the publication of the DEIS and FAA's review of comments on the DEIS, will describe the MWAA's mitigation program for the Preferred Alternative for the development of IAD that will be implemented by the MWAA. In all cases, the mitigation measures will be implemented prior to or in conjunction with the realization of the actual impacts.

6.2 MITIGATION

6.2.1 NOISE, LAND USE, AND SOCIAL IMPACTS

6.2.1.1 Noise

Increases of 3 DNL or greater between 60 and 65 DNL, as well as increases of 5 DNL or greater between 45 and 60 DNL would occur for both Build Alternatives 3 and 4. These increases do not exceed FAA's Threshold of Significance for noise impacts. However, both FAA and MWAA acknowledge that people may be adversely affected by these increases in aircraft noise levels associated with Build Alternatives 3 and 4.

[1] NOAA will prepare separate NEPA documentation from this FAA EIS that will contain a description of mitigation measures associated with the NOAA/NWS facility relocation. FAA and NOAA/NWS will be coordinating their respective decisions regarding any required property transfer to MWAA and relocation of NOAA/NWS facilities.

Since none of the alternatives would result in significant noise impacts, mitigation measures are not required. However, mitigation should be considered for noise-sensitive areas that exceed the 3.0 DNL increase between 60 and 65 DNL. Fifteen residential parcels in Loudoun County would experience increases greater than 3.0 dBA between the 60 and 65 DNL, relative to the No-Action Alternative. No residences in Fairfax County or any noise-sensitive receptors in Loudoun or Fairfax County would exceed the 3.0 DNL criteria between the 60 and 65 DNL. Therefore, mitigation could be considered for the fifteen residential parcels in Loudoun County. Mitigation is not warranted for noise-sensitive areas that exceed the 5.0 DNL increase between 45 and 60 DNL.

The 3.0 DNL increase between 60 and 65 DNL are primarily the result of departures on Runway 30L. Methods to mitigate these increases could include:

- Operational measures to change the size and/or shape of the noise contours to result in an increase less than 3.0 DNL,
- Land use measures to modify or improve the affected areas, and
- Program management measures to implement, monitor, and manage the noise mitigation program.

Land use and program management measures are discussed further in **Section 6.2.1.2**. Operational measures are discussed below.

Operational measures to change the size and shape of the noise contours would primarily involve changing how and/or where aircraft fly. Examples of such measures that could be both practical and effective for departures on Runway 30L include:

- Preferential Runway Use, and/or
- Preferential Flight Track Use.

Further details regarding these two operational mitigation measures are discussed below.

Preferential Runway Use - Preferential runway use pertains to the directing of traffic toward one or more runways for the purposes of minimizing off-airport noise levels. For example, directing more westerly departure traffic to Runway 30R and less traffic to 30L (than is currently predicted) would be preferential departure runway use. This example would shift more departures to Runway 30R, thus reducing the departure noise exposure to Runway 30L.

Preferential Flight Track Use - Preferential flight track use pertains to the directing of traffic toward one or more flight tracks for the purposes of minimizing off-airport noise levels. For example, directing more westerly departure traffic to Tracks 30LD52, 30LD56, and 30LD57 and less traffic to Tracks 30LD51, 30LD54, and 30LD58 (than is currently predicted) would be preferential departure flight track use. This example would shift more departures to Tracks 30LD52, 30LD56, and 30LD57, thus reducing the departure noise exposure in the areas currently projected to experience increases of 3.0 DNL or greater.

6.2.1.2 Land Use and Social Impacts

Land use and social impacts associated with Build Alternatives 3 and 4 primarily consist of acquisition of an entire parcel and portions of four parcels of land. This property acquisition would be included for each alternative on the west side of IAD in order to meet Federal Aviation Regulations (FAR) Part 77 and Runway Protection Zone (RPZ) clearance requirements and to serve as a buffer to neighboring properties (see **Volume 4**, Supplemental Technical References, for FAR Part 77 and RPZ clearance requirements). All acquisitions would be conducted in accordance with the provisions of the *Uniform Relocation Assistance and Real Property Acquisition Act of 1970*, as codified in FAA Advisory Circular (AC) 150/5100-17, *Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects*.

Mitigation could be considered for the fifteen residential parcels in Loudoun County that exceed the 3.0 DNL increase between 60 and 65 DNL. The following paragraph presents a summary of potential mitigation measures that could be implemented by MWAA following the issuance of the Record of Decision. A detailed mitigation program for the Preferred Alternative will be developed after the publication of the DEIS for inclusion in the Final EIS (FEIS).

Fee simple property acquisition, sound insulation, and/or acquisition of avigation easements could be considered for the fifteen residential parcels in Loudoun County that exceed the 3.0 DNL increase between 60 and 65 DNL.

The Vision 100 Century of Aviation Reauthorization Act, states the following in Section 189:

> Title 49, Section 47504(b) [Noise compatibility programs; approvals] is amended by adding at the end the following:
>
> (4) The Secretary shall not approve in fiscal years 2004 through 2007 a program submitted under subsection (a) if the program requires the expenditure of funds made available under Title 49, Section 48103 [Airport and Airway Trust Fund Authorizations, Airport planning and development and noise compatibility planning and programs] for mitigation of aircraft noise less than 65 DNL.

Therefore, any approval and funding for such mitigation would have to be sought outside the FAR Part 150 Noise Compatibility Program process. MWAA can pursue approval and funding for the proposed mitigation as part of the FEIS, where the costs of such mitigation could be included in the overall development costs for construction of the Preferred Alternative.

6.2.2 AIR QUALITY

Air quality mitigation measures for airports and aviation-related activities are best implemented during the planning and design stages of the project. In this way, air emissions associated with the construction and operational phases are most effectively minimized. For the planned airport and airfield improvement projects at IAD, the following air quality mitigation measures are possible.

6.2.2.1 Construction Period Emissions

During the construction period, the potential impacts to air quality can be avoided, minimized, and/or mitigated for by the adherence to the following measures:

- Through the contractor's work provisions, all construction activities shall be carried out in full compliance with pollution control provisions and specifications contained in FAA AC 150/5370-10A, *Standards for Specifying Construction of Airports*.

- Any required air quality permits for asphalt and concrete batch plants, etc. shall be obtained by the contractor before the commencement of the activities.

- Stockpiles of soil, dirt and other earthen materials; solid wastes including construction debris; and other raw materials shall be covered or stabilized by the contractor to help prevent the generation of wind-blown particles and smoke.

- Heavily used work sites (i.e., contractor's staging areas, haul roads, loading/unloading platforms, etc.) shall be shielded, treated, or otherwise maintained by the contractor to help prevent, or minimize, the generation and release of dust.

- To the extent feasible, staged construction schedules shall be adopted by the contractor that would help reduce the exposure of wind-erodeable soils to minimal amounts and time periods. Similarly, work sites shall be recovered as soon as possible.

- Construction equipment (i.e., earthmovers, haul trucks, etc.) shall be properly maintained by the contractor to help minimize excess exhaust emissions.

As discussed previously in **Section 5.5**, the project-related construction emissions are included in the most recent State Implementation Plan (SIP) for the area's ozone non-attainment designation. In order for Build Alternative 4 construction emissions of nitrogen oxides (NO_x) to be within the SIP budget, a revised schedule of projects to be completed between 2006 and 2010 may be required.

6.2.2.2 Operational Emissions

Some of the operational air quality mitigation measures that are already in place at IAD or are inherent to the planned projects are summarized as follows:

- Provide adequate capacity on the airside infrastructure (i.e., runaways, taxiways, terminal area aprons, etc.) to accommodate the existing and forecasted activity levels; thus avoiding or minimizing airfield delays, which contribute to the generation of excess emissions.

- Plan for the efficient layout and design of the runway/taxiway/terminal complex systems enabling smooth, swift, and uninterrupted movements of aircraft from the runway ends to the terminal/cargo areas; thereby reducing excess emissions.

- Provide adequate capacity and efficient design of the landside infrastructure (i.e., access/egress roadways, terminal curbfronts, parking facilities, etc.), which help to reduce excess emissions associated with slow-moving, idling and roaming motor vehicles.

- Avoid or minimize areas or conditions which contribute to zones of restricted air movement or create localized "hot-spots" of air pollution.

- Allow for open space or buffer zones that provide distance between the emission sources (i.e., aircraft, Ground Support Equipment [GSE], motor vehicles) and any nearby sensitive receptors.

6.2.3 WATER QUALITY

Implementation of either Build Alternative 3 or 4 would result in impacts to surface water quality. In the Commonwealth of Virginia, stormwater is managed by the Virginia Department of Environmental Quality (VDEQ) and the Virginia Department of Conservation and Recreation (VDCR). The Virginia stormwater management regulations are derived from Federal and state mandates including the Clean Water Act, Virginia's Pollutant Discharge Elimination System (VPDES) program, and the *State of Virginia Sediment and Erosion Control Handbook*.

The design, construction, and operation of the facilities described in Build Alternatives 3 and 4 are all required to follow the guidance of Federal, state, and/or local water quality regulations, stormwater management practices, and other permitting requirements in order to reduce and control environmental impacts. FAA has developed AC 150/5320-5B, *Airport Drainage*, to provide methods and procedures for controlling stormwater runoff on airport property which should be used as a guideline for the drainage design of these alternatives. To control post-development discharge volumes and velocities from stormwater management facilities, the Commonwealth of Virginia has developed the Stormwater Management handbook with regulations, 4VAC 3-20-10, Stormwater Management Act, Title 10.1, Chapter 6, Article 1.1 of the Virginia Code. The new facilities under these alternatives may be required to follow the Virginia stormwater management regulations regarding water quality. Other Virginia state regulations for the alternatives could include criteria GC-7 of the *Sediment and Erosion Control Handbook* and the Chesapeake Bay Program's voluntary Biological Nutrient Removal program.

Section G of IAD's VPDES permit outlines the requirements for authorized stormwater discharges from construction activities. IAD must notify VDEQ 30 days before beginning operations from construction activities that will generate stormwater discharges. Currently, IAD submits an annual report that lists projects with land disturbing activities. IAD is also required to update the site plan and describe appropriate controls to be implemented during construction to prevent stormwater pollution. IAD's existing Stormwater Pollution Prevention Plan (SPPP) must also be modified to include construction activities and construction-related Best Management Practices (BMPs). IAD's SPPP must also be updated to include any additional land areas or activities that IAD requires.

As discussed in **Section 5.6**, Water Quality, MWAA recently completed a *Comprehensive Stormwater Management Plan* (CSMP) in June 2002 (MWAA, 2002b), which was prepared in accordance with all required Federal and Virginia regulations. The CSMP provides guidelines and design criteria for appropriate mitigation measures for water quality impacts resulting from future land development, such as Build Alternatives 3 and 4, that occur within the land operated by MWAA. The CSMP discusses three future conditions. Future 1 includes construction of a new north-south runway (Runway 1W/19W), while Future 2 includes the construction of the east-west runway (Runway 12R/30L). The combination of

Future 1 and Future 2 appear to be very similar to Build Alternative 3. Build Alternative 4 is also very similar, but the separation distance for the north-south runway would increase by 700 feet. Future 3 is not part of the development evaluated for this DEIS, but for future development at the airport.

6.2.3.1 Wet Detention Ponds

Wet detention ponds can be used for both stormwater quality and quantity management. This section discusses the function of wet detention ponds for surface water quality treatment, while quantity control (floodplain management) is discussed in **Section 6.2.6**.

Wet detention ponds are one of the best methods for removing pollutants from stormwater runoff. The U.S. Environmental Protection Agency's (EPA) National Urban Runoff Program studies found that properly designed wet ponds can provide pollutant removals in excess of 90 percent. Wet ponds are also frequently used to attenuate peak discharges.

The tendency of wet detention ponds to attract wildlife is of special concern to FAA and MWAA. Any wet detention pond designs would be required to meet the standards in FAA AC 150/5200-33, *Hazardous Wildlife Attractants On or Near Airports*, dated May 1, 1997, which provides design recommendations for wet ponds that create a less attractive environment to wildlife such as gulls and waterfowl. To facilitate hazardous wildlife control, FAA recommends using steep-sided, narrow, linearly-shaped, rip-rap lined water detention basins rather than retention basins. When possible, these ponds should be placed away from aircraft movement areas to minimize aircraft-wildlife interactions. All vegetation in or around detention basins that provide food or cover for hazardous wildlife should be eliminated (Subsection 3-7, FAA AC 150/5200-33).

If soil conditions and other conditions are adequate, FAA encourages the use of underground stormwater infiltration systems, such as French drains, infiltration basins or dry detention ponds (as discussed in **Section 6.2.3.2**) because they are less attractive to wildlife.

Two wet detention ponds are part of the existing stormwater drainage system at the airport: Horsepen Lake and Dulles Lake. Dulles Lake receives runoff from impervious surfaces within the airport and discharges into Horsepen Run. Horsepen Run and Stallion Branch discharge to Horsepen Lake. As discussed in the CSMP, the proposed Build Alternatives would increase the peak 100-year discharge from Stallion Branch to Horsepen Lake from 1,505 cubic feet per second (cfs) to 1,643 cfs, an increase of 9 percent (MWAA, 2002b). The peak water surface elevation during the 100-year storm would increase from 257.5 feet mean sea level (MSL) to 257.7 feet MSL, an increase of approximately 3 inches. The emergency spillway of Horsepen Lake has an elevation of 258.50 feet MSL, which is above the proposed 100-year flood elevation in the lake. Therefore, Horsepen Lake should provide sufficient detention for the increased flows from Stallion Branch. Several modifications are discussed for Horsepen Lake in the CSMP, including sediment forebays, dredging, and riser modifications.

6.2.3.2 Dry Detention Ponds

A dry detention pond can also remove pollutants from stormwater runoff and attenuate peak discharges. A dry pond does not have a wet pool under normal conditions. The pollutant removal of dry ponds is considerably less than wet ponds, but they can still provide water quality benefits.

Dry ponds are not as attractive to wildlife as wet ponds, and therefore the threat of wildlife interference with airport operations is significantly reduced. However, like wet ponds, dry ponds are still considered an attractant to wildlife, and the design of dry ponds must also follow the guidelines published in FAA AC 150/5200-33.

6.2.3.3 Proposed Stormwater Management Facilities

The CSMP recommends two new stormwater management facilities. These two large centralized facilities are proposed to manage the stormwater runoff in the Cub Run and Cabin Branch sub-basins. These facilities were designed based on the future development conditions as discussed in the CSMP to accommodate all three Future scenarios.

The Cub Run facility is proposed to be located 200 feet south of proposed new Runway 12R/30L. Based on the ultimate development conditions (Future 3), the facility would provide approximately 719 acre-feet of storage, and has a planned dewatering speed of 48 hours to prevent the facility from attracting wildlife. The weir structure was designed to detain up to the 10-year storm in accordance with Virginia's Erosion and Sediment Control regulations (4VAC50-30-40). The facility was located on IAD property in accordance with FAA AC 15-5370-2C. The facility was also designed to increase the 100-year flood elevation of the receiving stream by no more than one foot (MWAA, 2002b).

The Cabin Branch stormwater facility is proposed to be located outside the RPZ for existing Runway 12L/30R. Based on the ultimate development conditions (Future 3), this facility would provide approximately 182 acre-feet of storage, and has a planned dewatering speed of 48 hours to prevent the facility from attracting wildlife. The weir structure was designed to detain up to the 10-year storm in accordance with Virginia's Erosion and Sediment Control regulations (4VAC50-30-40). The facility was located on IAD property in accordance with FAA AC 15-5370-2C. The facility was also designed to increase the 100-year flood elevation of the receiving stream by no more than one foot (MWAA, 2002b).

6.2.3.4 Deicing

In April 2002, MWAA developed the *Comprehensive Deicing Concepts for Washington Dulles International Airport* (MWAA, 2002c). The primary objective of the study is the use of centralized deicing, which increases the capture of spent aircraft deicer fluid (ADF) and increases the glycol concentration of the recovered ADF so that more of it will be suitable for recycling. According to this document, the Washington Area Sewer Authority (WASA) developed the following requirements for MWAA regarding ADF-contaminated discharges to the sanitary sewer:

- MWAA is required to notify WASA prior to any discharge of dilute glycol solutions,
- MWAA is required to hold the dilute glycol solutions on site to allow for degradation of glycol to lower Biological Oxygen Demand (BOD) levels,
- The glycol solution will be pretreated through a sand filter followed by an activated carbon filter to remove suspended solids and organic contaminants,
- The wastewater will be aerated prior to discharge to increase dissolved oxygen levels, and
- The average flow rate will be not greater than 150 gallons per minute (gpm).

With the No-Action Alternative and the airport expansion related to either Build Alternative, both ADF and subsequent wastewater volumes will increase. Both capacity and BOD loading must be considered and negotiated prior to implementation of either Build Alternative (MWAA, 2002c).

6.2.3.5 Collection, Separation, and Disposal of Spills

The collection, separation, and disposal of hazardous chemicals during spills must be considered. The proposed development could include holding tanks or oil/water separators in the storm drain system, especially in areas of aircraft maintenance activities.

6.2.3.6 Oil/Water Separators

The CSMP lists water quality inlets, commonly referred to as oil/water separators, as one of the potential methods for controlling stormwater runoff quality. The separator consists of a series of chambers that promote separation of the oil from the stormwater and also promotes settling of coarse grit materials. Runoff from maintenance areas is anticipated to be the largest potential source of oil and grease contamination of area surface waters. Proper design and location of oil/water separators will serve to minimize, if not virtually eliminate, the potential for such contamination to occur.

6.2.3.7 Erosion and Sedimentation Control

Soil erosion and sedimentation control techniques will be required for construction of either Build Alternative 3 or 4, as the land-disturbing activities will exceed one acre. IAD will use the Virginia requirements for erosion and sediment control as specified in the *State of Virginia Sediment and Erosion Control Handbook*. The handbook states that "properties and waterways downstream from development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff."

Prior to construction activities, MWAA must submit a permit application for coverage under a VPDES Construction Permit to VDEQ. The permit would include the site's construction plans and specifications and would provide minimum requirements for stormwater management and sediment and erosion control during construction activities. The existing SWPPP must also be modified to include construction activities and construction-related BMPs. Mitigation measures, which would be used to minimize impacts during construction, include BMPs such as silt fence, bank stabilization, and stormwater runoff control.

6.2.3.8 Water Supply

IAD will coordinate with the FCWA to determine the appropriate conditions for the increase in water usage at IAD. See **Section 5.6**, Water Quality, for details on the water supply demand associated with the Build Alternatives and the No-Action Alternative. MWAA can also incorporate water conservation measures into their future development such as water-efficient plumbing fixtures, maintenance and repair of existing pipes, and employee training.

6.2.4 HISTORIC/ARCHAEOLOGICAL RESOURCES

FAA has submitted a Section 106 Report to the Virginia State Historic Preservation Office (SHPO) that details the results of the historic and archaeological surveys conducted within the Detailed Study Area (DSA). The Section 106 Report includes an identification and evaluation of previous and newly surveyed historic and archaeological resources within the DSA and an assessment of effects to these properties as a result of implementing the Build Alternatives at IAD.

The report also provides a recommendation on eligibility for previously unsurveyed resources within the DSA. Based on the results of the analysis conducted for this EIS, FAA is not recommending any of the newly surveyed historic or archaeological resources identified within the DSA as eligible for listing in the National Register of Historic Places (NRHP).

FAA is seeking concurrence from SHPO on its eligibility determination and assessment of effects. If SHPO concurs with FAA's findings, then implementation of the Build Alternatives would not result in significant impacts to historic or archaeological resources and mitigation measures are not required.

If the SHPO does not concur with either FAA's eligibility determination or assessment of effects, FAA will continue consultation with the SHPO, the results of which will result in the development and ratification of a Memorandum of Agreement (MOA) between FAA, the SHPO, MWAA, and others stipulating what measures, if any, would be implemented to avoid, reduce, or mitigate the adverse effects the Preferred Alternative would have on historic/archaeological resources. Should an MOA be necessary, execution of the MOA would satisfy FAA's Section 106 responsibilities for all actions associated with the Preferred Alternative. Potential mitigation measures for adverse effects to Section 106 resources could include the following:

- Conversion to a compatible land use through rezoning or acquisition and implementation of a preservation program without alteration of the structure,
- Modify the proposed project through redesign, reorientation of construction site,
- Documentation/recordation of the resource, and
- Preservation and maintenance operations.

Details of the mitigation program for adverse effects to historic/archaeological resources will be developed, if warranted, after issuance of the DEIS and Section 106 Report and prior to the publication of the FEIS. Terms of the mitigation program/MOA will be included in FAA's FEIS document.

6.2.5 WETLANDS AND STREAM MITIGATION

A Clean Water Act (CWA) Section 401 water quality certification and Section 404 permit will be required prior to starting any work that would impact wetlands and streams. As part of the certification/permit application process, MWAA is required to show that steps have been taken to avoid wetland and stream impacts where practicable, to minimize potential impacts to wetlands, and to provided compensation for any remaining, unavoidable impacts by incorporating plans to restore or create wetlands.

The avoidance of wetland and stream impacts was considered during the initial formulation of on-site alternative runway configurations. However, due to numerous specific safety, operational, and preliminary engineering siting requirements, it was determined that all of the Build Alternatives would result in unavoidable impacts to wetland and stream resources. Subsequently, the various alternative runway layouts were further analyzed to minimize wetland and stream impacts. Of the two Build Alternatives that fulfill the purpose and need for the proposed project, the runway layout of Build Alternative 3 would impact fewer wetlands and streams. During construction, BMPs such as erosion

control and stormwater runoff control would be utilized to further minimize impacts to wetlands and streams. Within the Wildlife Hazard Management (WHM) areas, wetland vegetation would be cleared and actively maintained by routine mowing. However no grubbing, grading, filling, or paving would occur within WHM wetland areas. In addition, drainage and crossing structures would be used to minimize impacts to existing wetland hydrology.

Implementation of Build Alternative 3 would create the unavoidable loss of approximately 174.7 acres of jurisdictional wetlands and 60,858 linear feet of streams within the Limits of Disturbance (LOD). The estimates of wetland and stream impacts and loss are preliminary and subject to revision through the CWA Section 401/404 permit process. MWAA is committed to meeting all U.S. Army Corps of Engineers (USACE), EPA, and VDEQ mitigation requirements in a manner that is compatible with safe aviation (per FAA AC 150/5200-33, *Hazardous Wildlife Attractants On or Near Airports*). As a result, a mitigation plan is being developed in consultation with the USACE, EPA, VDEQ, and FAA to compensate for the unavoidable wetland and stream impacts. MWAA first considered the mitigation preference of on-site, in-kind restoration, creation, and enhancement. However, on-site mitigation was determined to be incompatible with safe aviation practices. Therefore, to compensate for the unavoidable wetland and stream losses, MWAA has proposed to purchase credits from wetland and stream mitigation banks whose service area includes the airport property. A mitigation bank is a wetland or stream area that has been restored, created, enhanced, or (in exceptional circumstances) preserved, and then set aside to compensate for future impacts to wetlands and streams from development.

Wetlands are generally mitigated at a set ratio associated with wetland type. Palustrine Forested Wetlands are mitigated at a 2:1 ratio, Palustrine Scrub/Shrub Wetlands are mitigated at a 1:1.5 ratio, and Palustrine Emergent Wetlands and Palustrine Open Waters are mitigated at a 1:1 ratio. Compensatory stream mitigation protocols are currently being developed by the USACE and VDEQ.

On December 19, 2003, the USACE in conjunction with the VDEQ issued *A Proposed Stream Attributes Crediting Methodology: Impact and Compensation Reaches* for assessing stream conditions and determining compensation requirements. The purpose of the assessments is to provide a more predictable, reliable, and repeatable methodology to quantify stream impacts and compensatory mitigation in the Piedmont Physiographic Province. The USACE and VDEQ are requesting that all stream impact permit applications submitted after January 15, 2004 for work in streams within the Piedmont Physiographic Region utilize this methodology to quantify proposed impacts and compensatory mitigation.

In compliance with this recent requirement, a stream assessment study was conducted in accordance with the new methodology for all of the stream reaches within the DSA that are proposed to be impacted by Build Alternatives 3 and 4 (EA Engineering, 2004). Field surveys of approximately 47 streams in five stream systems were conducted. The five stream systems included Stallion Branch, Cub Run, Cabin Branch, Dead Run, and Sand Branch. The impact Total Stream Condition Unit (TSCU) for each stream reach was calculated within the proposed build areas. The impact TSCUs are used in conjunction with mitigation TSCUs as the exchangeable currency to assess the overall stream impact and compensatory mitigation. Mitigation TSCUs will be calculated as part of the stream mitigation design process. As such, required mitigation bank credits are to be determined as part of future considerations with USACE and VDEQ.

Build Alternative 3 impacts would require the purchase of approximately 248.5 wetland credits and an undetermined number of stream credits to mitigate for the unavoidable impacts. **Table 6.2.5-1** summarizes the proposed Build Alternative 3 wetland and stream impacts and mitigation ratios by wetland type, which result in the required mitigation credits. **Table 6.2.5-2** indicates the required credits for each major disturbance area for the Build Alternative 3 LOD (Runway 1W/19W, Runway 12R/30L, and Tier 3 Concourse development).

MWAA has proactively purchased wetland mitigation credits from a USACE-approved mitigation bank located in Virginia towards meeting the mitigation requirements for the proposed project. The remainder of the wetland and stream mitigation credits will be obtained in a similar fashion.

In comparison, under Build Alternative 4, approximately 180.5 acres of jurisdictional wetlands and 63,500, linear feet of streams would be unavoidably lost within the LOD. Approximately 252.9 wetland credits and an undetermined number of stream credits would be required by the USACE, EPA, and VDEQ. **Table 6.2.5-3** summarizes Build Alternative 4 wetland impacts and wetland mitigation ratios by wetland type, which result in the required mitigation credits. **Table 6.2.5-4** presents the impacts and required mitigation credits by major disturbance area for Build Alternative 4 LOD.

6.2.6 FLOODPLAINS

Construction of Build Alternative 3 or Build Alternative 4 would result in 100-year floodplain impacts. The goals of floodplain mitigation measures are to minimize impacts to floodplains and to avoid increases in downstream flooding and upstream water surface elevations. The following mitigation measures have been identified to maintain existing beneficial 100-year floodplains and to comply with applicable regulations and standards.

TABLE 6.2.5-1
WETLAND MITIGATION REQUIREMENTS FOR BUILD ALTERNATIVE 3

Wetland Types	Mitigation Ratio	Wetland Loss within the LOD (acres or linear feet)[1]	Required Mitigation Bank Credits[1]
Palustrine Emergent Wetlands	1:1	90.7	90.7
Palustrine Scrub/Shrub Wetlands	1:1.5	1.3	2.0
Palustrine Forested Wetlands	1:2	73.1	146.2
Palustrine Open Waters	1:1	9.6	9.6
Lacustrine Wetlands	1:1	0.0	0.0
Total		**174.7**	**248.5**
Total Linear Feet of Impacted Streams	**1:1**	**60,858**	**To be determined**

[1] The estimates of wetland and stream impacts and mitigation requirements are preliminary and subject to revision through the CWA Section 401/404 permit process.

Source: URS Corporation, 2004.

TABLE 6.2.5-2
WETLAND MITIGATION REQUIREMENTS FOR BUILD ALTERNATIVE 3 BY DISTURBANCE AREA

Disturbance Area	Mitigation Ratio	Wetland Loss within the LOD (acres) or (linear feet)[1]	Required Mitigation Bank Credits[1]
Runway 1W/19W			
Palustrine Emergent Wetlands	1:1	39.3	39.3
Palustrine Scrub/Shrub Wetlands	1:1.5	0.2	0.3
Palustrine Forested Wetlands	1:2	21.1	42.2
Palustrine Open Waters	1:1	0.0	0.0
Total Runway 1W/19W Wetland Impacts by Disturbance Area	N/A	60.6	81.8
Total Runway 1W/19W Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	1:1	17,331	**To be determined**
Runway 12R/30L			
Palustrine Emergent Wetlands	1:1	27.8	27.8
Palustrine Scrub/Shrub Wetlands	1:1.5	0.5	0.8
Palustrine Forested Wetlands	1:2	47.8	95.6
Palustrine Open Waters	1:1	9.6	9.6
Total Runway 12R/30L Wetland Impacts by Disturbance Area	N/A	85.7	133.8
Total Runway 12R/30L Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	1:1	33,575	**To be determined**
Tier 3 Concourse			
Palustrine Emergent Wetlands	1:1	23.6	23.6
Palustrine Scrub/Shrub Wetlands	1:1.5	0.6	0.9
Palustrine Forested Wetlands	1:2	4.2	8.4
Palustrine Open Waters	1:1	0.0	0.0
Total Tier 3 Concourse Wetland Impacts by Disturbance Area	N/A	28.4	32.9
Total Tier 3 Concourse Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	1:1	9,952	**To be determined**
Grand Total Wetland Impacts by Disturbance Area	**N/A**	**174.7**	**248.5**
Grand Total Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	**1:1**	**60,858**	**To be determined**

[1] The estimates of wetland and stream impacts and mitigation requirements are preliminary and subject to revision through the CWA Section 401/404 permit process.

Source: URS Corporation, 2004.

TABLE 6.2.5-3
WETLAND MITIGATION REQUIREMENTS FOR BUILD ALTERNATIVE 4

Wetland Types	Mitigation Ratio	Wetland Loss within the LOD (acres)[1]	Required Mitigation Bank Credits[1]
Palustrine Emergent Wetlands	1:1	97.6	97.6
Palustrine Scrub/Shrub Wetlands	1:1.5	1.3	2.0
Palustrine Forested Wetlands	1:2	71.7	143.4
Palustrine Open Waters	1:1	9.9	9.9
Lacustrine Wetlands	1:1	0.0	0.0
Total		**180.5**	**252.9**
Total Linear Feet of Impacted Streams	**1:1**	**63,500**	**To be determined**

[1] The estimates of wetland and stream impacts and mitigation requirements are preliminary and subject to revision through the CWA Section 401/404 permit process.

Source: URS Corporation, 2004.

TABLE 6.2.5-4
WETLAND MITIGATION REQUIREMENTS FOR BUILD ALTERNATIVE 4 BY DISTURBANCE AREA

Disturbance Area	Mitigation Ratio	Wetland Loss within the LOD (acres) or (linear feet)[1]	Required Mitigation Bank Credits[1]
Runway 1W/19W			
Palustrine Emergent Wetlands	1:1	46.2	46.2
Palustrine Scrub/Shrub Wetlands	1:1.5	0.2	0.3
Palustrine Forested Wetlands	1:2	19.7	39.4
Palustrine Open Waters	1:1	0.3	0.3
Total Runway 1W/19W Wetland Impacts by Disturbance Area	N/A	66.4	**86.2**
Total Runway 1W/19W Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	1:1	19,973	**To be determined**
Runway 12R/30L			
Palustrine Emergent Wetlands	1:1	27.8	27.8
Palustrine Scrub/Shrub Wetlands	1:1.5	0.5	0.8
Palustrine Forested Wetlands	1:2	47.8	95.6
Palustrine Open Waters	1:1	9.6	9.6
Total Runway 12R/30L Wetland Impacts by Disturbance Area	N/A	85.7	**133.8**
Total Runway 12R/30L Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	1:1	33,575	**To be determined**
Tier 3 Concourse			
Palustrine Emergent Wetlands	1:1	23.6	23.6
Palustrine Scrub/Shrub Wetlands	1:1.5	0.6	0.9
Palustrine Forested Wetlands	1:2	4.2	8.4
Palustrine Open Waters	1:1	0.0	0.0
Total Tier 3 Concourse Wetland Impacts by Disturbance Area	N/A	28.4	**32.9**
Total Tier 3 Concourse Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	1:1	9,952	**To be determined**
Grand Total Wetland Impacts by Disturbance Area	**N/A**	**180.5**	**252.9**
Grand Total Riverine Wetland (Stream) Impacts by Disturbance Area (linear feet)	**1:1**	**63,500**	**To be determined**

[1] The estimates of wetland and stream impacts and mitigation requirements are preliminary and subject to revision through the CWA Section 401/404 permit process.
Source: URS Corporation, 2004.

6.2.6.1 Culverts

Floodplain impacts would occur within the Federal Emergency Management Agency (FEMA)-established floodplains of Stallion Branch within the Broad Run Watershed. (As discussed in **Section 5.12**, Floodplains, impacts will also occur in the Cub Run sub-basin, where the floodplains are not recognized by FEMA.) Obstructing Stallion Branch and its tributaries would decrease their capacities and subsequently increase flow rates and flood stages. Therefore, culverts (circular and box) would be constructed within the main channel and the tributaries at runway, taxiway, and roadway crossings of these creeks to convey flow. The culverts would be designed to minimize floodplain impacts by maintaining natural drainage paths and water levels at or below the 100-year flood elevations within the floodplain. These culverts may create post-development flow velocities that exceed the pre-development velocities. Therefore, maximum acceptable outlet velocities would be determined to prevent scour and downstream channel erosion. If the design of the culvert cannot produce acceptable velocities, stabilization or energy dissipation devices should be provided at the culvert outlet.

6.2.6.2 Stormwater Runoff Detention

Stormwater detention can perform many beneficial functions such as reducing peak discharges by providing compensatory storage for impacted floodplains. Attenuating these peak discharges will help to avoid downstream flooding as well as flooding on IAD property.

Floodplain mitigation measures would be designed and implemented to avoid creating potential safety hazards from birds or other wildlife. Therefore, the use of dry ponds and other BMPs that are not as attractive to wildlife would be considered first when selecting stormwater BMPs during the design process. If site conditions such as poor soil permeability exist, wet detention ponds could then be used if they are designed to FAA requirements, including steep-sided, narrow, linearly shaped and rip-rap lined.

As discussed in the CSMP, Build Alternatives 3 and 4 will increase the peak 100-year discharge from Stallion Branch to Horsepen Lake from 1,505 cfs to 1,643 cfs, an increase of 9 percent (MWAA, 2002a). The peak water surface elevation during the 100-year storm would increase from 257.5 feet MSL to 257.7 feet MSL, which is an increase of approximately 3 inches. The emergency spillway has an elevation of 258.50 feet MSL, which is above the proposed 100-year flood elevation in the lake. Therefore, Horsepen Lake should provide sufficient detention of the increased flows from Stallion Branch. Several modifications are discussed for Horsepen Lake in the CSMP including sediment forebays, dredging, and riser modifications (MWAA, 2002a).

The CSMP also discusses two additional proposed stormwater management facilities. These large centralized facilities are proposed to manage the stormwater runoff in the Cub Run and Cabin Branch sub-basins. Both Cub Run and Cabin Branch would have increases in stormwater runoff with the construction of new Runway 12R/30L. These stormwater management facilities were designed based on the future development conditions as discussed in the CSMP.

The Cub Run facility is proposed to be located 200 feet south of new Runway 12R/30L (MWAA, 2002a). Based on the ultimate development conditions (Future 3), the facility would provide approximately 719 acre-feet of storage and has a planned dewatering speed of 48 hours to prevent the facility from attractive wildlife. The weir structure was designed to detain up to the 10-year storm in accordance with Virginia's Erosion and Sediment Control regulations (4VAC50-30-40). The facility was located on the property in accordance with FAA AC 15-5370-2C. The facility was also designed to increase the 100-year flood elevation of the receiving stream by no more than one foot (MWAA, 2002a).

The Cabin Branch facility is proposed to be located outside Runway 12L/30R RPZ (MWAA, 2002a). Based on the ultimate development conditions (Future 3), the facility would provide approximately 182 acre-feet of storage, and has a planned dewatering speed of 48 hours to prevent the facility from attractive wildlife. The weir structure was designed to detain up to the 10-year storm in accordance with Virginia's Erosion and Sediment Control regulations (4VAC50-30-40). The facility was located on the property in accordance with FAA AC 15-5370-2C. The facility was also designed to increase the 100-year flood elevation of the receiving stream by no more than one foot.

6.2.6.3 Limit Fill within Floodplain Areas

During MWAA's design process for the Preferred Alternative, the placement of fill in the floodplains of Stallion Branch, Cub Run and their tributaries should be minimized. However, airport runways and taxiways must be designed to meet specific criteria related to runway profiles and cross slope. Some fill within the floodplain is unavoidable. Infield areas should be graded to reduce potential floodplain impacts and comply with floodplain regulations and requirements.

6.2.7 COASTAL ZONE MANAGEMENT PROGRAM

As discussed in **Section 5.13**, implementation of Build Alternatives 3 and 4 would result in impacts to wetlands, water quality, air quality, and coastal lands, which is inconsistent with the enforceable policies of the Virginia Coastal Resources Management Program (VCRMP). MWAA has prepared a Federal Consistency Determination (see **Appendix C-3**) in accordance with 16 USC Section 1456.307 and 15 CFR 930.39. As part of their review of this document, VDEQ will review this Consistency Determination and issue their concurrence. In addition, a copy of this DEIS will be submitted to Fairfax County for their concurrence. MWAA will design and construct the proposed project in a manner that is consistent with both the VCRMP and the Fairfax County Chesapeake Bay Preservation Ordinance.

6.2.8 CONSTRUCTION MITIGATION

Minimization/preventative actions that might reduce or eliminate construction impacts include measures outlined in FAA AC 150/5370-10, *Standards for Specifying Construction of Airports*. Temporary pollution controls should include limiting work activities to normal business hours; no open burning; wetting of active equipment work areas; covering of all trucks hauling loose materials; stabilizing materials, mulch, sandbags, slope drains, sediment basins, sediment checks, artificial covering, and berms.

Several other control measures to mitigate construction emissions and noise will be used by MWAA if construction activities warrant mitigation:

- Exposing the minimum area of erodable earth,
- Temporary mulch with or without seeding,
- Use of silt fence and turbidity barriers,
- Water trucks or other means of using moisture for dust control,
- Dust stabilizers or penetration asphalt on haul roads,
- Plastic sheet coverings,
- Alternative power sources or fuels for construction equipment,
- Routing truck traffic to avoid residential areas,
- Schedule the timing of truck traffic to not disturb heavy traffic flows (when practicable),
- Maintaining construction vehicles and using reduced speeds,

- Suspending certain activities during high-wind conditions (when practicable), and
- Limiting working hours to daylight hours such that construction activity does not affect sleep patterns of residential land uses in proximity to construction areas.

Mitigation measures, which will be used by MWAA to minimize impacts during construction, include BMPs such as erosion control and stormwater runoff control and drainage and crossing structures. To compensate for unavoidable impacts to wetlands, mitigation through participation in a wetlands bank has been proposed (see **Section 6.2.5**, Wetlands and Stream Mitigation, for further information).

All applicable local, state, and Federal environmental construction controls should be incorporated into the specifications and construction plans necessary for the proposed project.