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Volume 1—Draft Environmental Impact Statement (DEIS)

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Acronyms

ACM	asbestos-containing materials
ADT	average daily traffic
AHR	American Heritage River
ANC	Advisory Neighborhood Commission
AQCR	Air Quality Control Region
AST	aboveground storage tank
AUES	American University Experiment Station
AWWTP	advanced wastewater treatment plant
bgs	below ground surface
C&O	Chesapeake and Ohio
CAA	Clean Air Act
CCI	Commercial Construction Indicators
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS-NFRAP	Comprehensive Environmental Response, Compensation, and Liability Information System—No Further Remedial Action Planned
CIA	Central Intelligence Agency
CIP	Capital Improvement Plan
CO	carbon monoxide
CSO	combined sewer overflow
CSX	Railway company
CWA	Clean Water Act
dBa	decibels, acoustic
DC	District of Columbia
DC DOH	District of Columbia Department of Health
DC FEMS	District of Columbia Fire and Emergency Medical Services
DC LUST	Leaking UST in DC
DC UST	Registered UST in DC
DC WASA	District of Columbia Water and Sewer Association
DCMR	District of Columbia Municipal Regulations
DCOP	District of Columbia Office of Planning
DCOZ	District of Columbia Office of Zoning
DC DOT	District of Columbia Department of Transportation
DC SHPO	District of Columbia State Historic Preservation Office
DDT	dichloro-diphenyl-trichloroethane

DEIS	Draft Environmental Impact Statement
DO	dissolved oxygen
DOPAA	Description of the Proposed Action and Alternatives
DOT	Department of Transportation
DWM	dwarf wedge mussel
EA	EA Engineering, Science, and Technology
EDR	Environmental Data Resources, Inc.
EFH	essential fish habitat
EFS	Engineering Feasibility Study
EIS	environmental impact statement
EMS	Emergency Medial Service
EO	Executive Order
E-OT	Enviro-Organic Technologies
ERL	effects range—low
ERM	effects range—medium
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FWA	Fairfax Water Authority
FFCA	Federal Facilities Compliance Agreement
FINDS	Facility Index System
FTE	full-time equivalent
FUDS	Formerly Used Defense Site
GWMP	George Washington Memorial Parkway
HMIRS	Hazardous Materials Information Resource System
HWMP	Hazardous Waste Management Plan
ICIS	Integrated Compliance Information System
kWh	kilowatt hours
LBP	lead-based paint
LCSA	Loudoun County Sanitation Authority
MAIA	Mid-Atlantic Integrated Assessment
MD DOT	Maryland Department of Transportation
MDA	Maryland Department of Agriculture

MDE	Maryland Department of Environment
MDNR	Maryland Department of Natural Resources
mgd	million gallons per day
MHW	mean high water
MLW	mean low water
M-NCPPC	Maryland National Capital Park & Planning Committee
mph	miles per hour
MPN	most probable number
MSA	Metropolitan Statistical Area
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSHA	Maryland State Highway Administration
MSL	mean sea level
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NCDB	National Compliance Database
NCPC	National Capital Planning Commission
NEPA	National Environmental Policy Act
NESHAP	National Emission Standard for Hazardous Air Pollutants
NGA	National Geospatial-Intelligence Agency
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NIMA	National Imagery and Mapping Agency
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	operations and maintenance
OSHA	Occupational Safety and Health Administration
OWRM	Office of Water Resources Management
PACL	polyaluminum chloride
Pb	lead
PCB	polychlorinated biphenyls
PEPCO	Potomac Electric Power Company
PI	Potomac Interceptor

PM	particulate matter
POI	points of interest
RBF	riverbank filtration
RBI	riverbank infiltration
RCRA	Resource Conservation and Recovery Act
RCRAINFO	Resource Conservation and Recovery Act Information System
RCRIS-SQG	Resource Conservation and Recovery Information System—Small Quantity Generator
ROD	Record of Decision
ROI	region of influence
ROW	Right of Way
RTE	rare, threatened, or endangered species
SAV	submerged aquatic vegetation
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SNS	shortnose sturgeon
SO_2	sulfur dioxide
STC	Sound Transmission Class
TC	Toxicity Characteristic
TCLP	Toxicity Characteristics Leaching Procedure
TMDL	Total Maximum Daily Load
TSS	total suspended solids
TTU	trade, transportation, and utilities
USEPA	U.S. Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of Interior
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UXO	unexploded ordinance
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VIMS	Virginia Institute of Marine Science
VOC	volatile organic compound

VPA	Virginia Pollutant Abatement
VPDES	Virginia Pollutant Discharge Elimination System
WFP	water filtration plant
WMATA	Washington Metropolitan Area Transit Authority
WSR	Wild and Scenic River
WSSC	Washington Suburban Sanitary Commission
WTF	water treatment facility
WTP	water treatment plant
WWTP	wastewater treatment plant

Volume 2—Appendix

Volume 3—Response to Comments

Volume 4—Engineering Feasibility Study Compendium

Executive Summary

Purpose of the Document

The purpose of this Integrated Feasibility Study and Draft Environmental Impact Statement for Washington Aqueduct Water Treatment Residuals is to evaluate alternatives for managing its water treatment residuals for the next 20 years. This is necessary for the Washington Aqueduct to comply with its National Pollutant Discharge Elimination System (NPDES) NPDES Permit (Permit No. DC 0000019) within the Federal Facilities Compliance Agreement (FFCA) deadlines.

This Draft Environmental Impact Statement (DEIS) has been prepared in accordance with the National Environmental Policy Act (NEPA) and supporting regulations promulgated by the Council on Environmental Quality and the United States Army Corps of Engineers. Members of the public, regulatory agencies and other stakeholders are encouraged to review and comment on this draft document during the 45-day comment period following its publication. After this comment period has closed, a Final EIS (FEIS) will be prepared to address the comments received and to fully describe the environmental, social and economic consequences of implementing the preferred alternative and other feasible alternatives. The FEIS will be the evidentiary basis for the Record of Decision (ROD) developed by the Baltimore District of the Corps of Engineers that identifies the alternative to implement. During the public comment period, Washington Aqueduct will schedule, publicize and conduct a Public Hearing on this project.

Background and Project History

The Washington Aqueduct, a Division of the U.S. Army Corps of Engineers (USACE), Baltimore District, operates the Dalecarlia and McMillan Water Treatment Plants (WTPs) in Washington, DC, serving over 1 million persons in the DC and northern Virginia area with potable water. The treatment process removes solid particles (e.g., river silt) from the Potomac River supply water, treats and disinfects the water, and distributes the finished water to the metropolitan service area. The solids removed during the treatment process have historically been returned to the Potomac River, but the recently reissued version of the Washington Aqueduct's Permit No. DC 0000019 effectively precludes the discharge of water treatment solids (i.e., residuals) to the river.

Consequently, Washington Aqueduct has evaluated water treatment residuals management alternatives that minimize or eliminate the discharge of residuals to the river. Washington Aqueduct developed objectives for the proposed residuals management process with the intention of ensuring compliance with all permit and other legal mandates, and preserving or improving upon the safety, reliability, and efficiency of the current water treatment process. In addition, Washington Aqueduct incorporated into the objectives a concern for minimizing impacts to the human and natural environment.

The following objectives define the purpose and need for the proposed residuals management process assessment and were listed in the Notice of Intent, published in the *Federal Register* on January 12, 2004. (Measurement indicators in parentheses).

- To allow Washington Aqueduct to achieve complete compliance with NPDES Permit DC00000019 and all other federal and local regulations.
- To design a process that will not impact current or future production of safe drinking water reliably for the Washington Aqueduct customers. (Peak design flow of drinking water).
- To reduce, if possible, the quantities of solids generated by the water treatment process through optimized coagulation or other means. (Mass or volume of solids generated).
- To minimize, if possible impacts on various local and regional stakeholders and minimize impacts on the environment. (Traffic, noise, pollutants, etc.).
- To design a process that is cost-effective in design, implementation, and operation. (Capital, operations, and maintenance costs).

Proposed Action

The proposed action is to develop, design, and construct a permanent residuals management process that will cost-effectively collect, treat, and dispose of the water treatment residuals in conformance with the purpose and need stated in Section 1. The selected action must meet the Federal Facilities Compliance Agreement (FFCA) compliance deadlines. It must also address the management of projected residuals quantities for a period of at least 20 years. Table 2-1 lists the current and future volume of water treatment and Forebay residuals generated daily as estimated for the Engineering Feasibility Study (EFS) (Volume 4 of DEIS). This table also presents the number of truck trips associated with the residuals quantities, based on a 5-day week. Not all of the alternatives evaluated in detail in this DEIS use trucking for final disposal of dewatered residuals. The larger residuals values listed in the design year columns reflect the larger quantity of water demand anticipated 20 years in the future.

TABLE 2-1
Washington Aqueduct Basis for Residuals Quantities

	Daily Generated Volume (Cubic Yards)[a]		Truck Trips/Day[b]			
			22 Cubic Yards/ Truck		11 Cubic Yards/ Truck	
Residuals	Current Average	Design Year Average	Current Average	Design Year Average	Current Average	Design Year Average
Water Treatment	94	120	7	8	13	16
Forebay	22	28	2	2	3	4

[a] Based on 7 days per week production.
[b] Based on hauling to a final disposal site 5 days per week.

Development of Alternatives

The first step in the National Environmental Policy Act (NEPA) alternative identification process was to review the project history and compile a full range of possible alternatives that had the potential to meet the stated purpose and need. Washington Aqueduct has been evaluating residuals management approaches for a number of years due to changes in or expected changes in regulations. During that time many alternatives have been identified. Some of these alternatives are no longer consistent with the regulatory requirements defined in the April 2003 National Pollutant Discharge Elimination System (NPDES) permit and associated FFCA.

A total of 160 residuals management alternatives and eight options were identified and screened to determine if they could be carried forward for detailed evaluation in the DEIS. Twenty-six of these alternatives were identified from a combination of historical documentation and ideas provided by the public during an initial Scoping period in early 2004. The remaining alternatives were identified during subsequent opportunities for public input in the third and fourth quarter of 2004 and the first quarter of 2005.

All of the alternatives have been incorporated into the list of alternatives detailed in Volume 4 of this DEIS, the Engineering Feasibility Study Compendium, and summarized in the Section 2 of this report. The original objectives as published in the Notice of Intent have remained in effect.

To facilitate the screening process and to make it easier for the reader to cross-reference this document with the other DEIS volumes, the residuals alternatives were grouped into one of the following categories before they were screened:

- No Action Alternative
- Alternatives that do not require continuous trucking from the Dalecarlia WTP
- Alternatives with a discharge to the Potomac River
- Alternatives involving alternate uses of the Dalecarlia Reservoir
- Alternatives with facilities at the McMillan Water Treatment Plant (WTP)
- Alternatives with facilities at the Dalecarlia WTP (involving trucking from Dalecarlia WTP Complex)

These categories recognize the similarity of many of the alternatives, grouping alternatives by common critical components, such as method of dewatering or disposal, or location of processing facilities. Once categorized, all residuals alternatives and options were evaluated using the same screening criteria. Volume 4 of this DEIS provides detailed technical information on each alternatives, as well as a complete description of the screening evaluation and results.

Alternatives Evaluated in Detail in the DEIS

The alternatives screening process concluded that five of the 160 screened alternatives were consistent with the purpose and need of the project, or required by NEPA to be evaluated in detail. All of these remaining alternatives, except the No Action alternative, have several common residuals collection and unthickened liquid residuals conveyance facilities. The common facilities include new residuals dredge collection, pumping, and conveyance facilities located at the Georgetown Reservoir and new residuals collection equipment, pumping, and unthickened conveyance piping located at the Dalecarlia WTP sedimentation basins. The five processing and disposal alternatives along the potential common facilities, have been evaluated in more detail in this DEIS to determine their impacts. While none of the action alternatives avoid all conveyance of residuals by truck, they do represent a mix of methodologies that potentially reduce, expand or alter the location and impact of any trucking.

The five alternatives to be evaluated in detail were designated alternatives A through E following the completion of the extended screening process as follows:

Alternative A: Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Alternative A does not require continuous trucking from the Dalecarlia WTP site. With this alternative, residuals would be collected continuously from the Dalecarlia Sedimentation Basins, periodically dredged from the Georgetown Reservoir and pumped to new residuals thickening and dewatering facilities located on the Dalecarlia WTP at a site in the northwestern corner of the property designated the Dalecarlia WTP Northwest site. Following dewatering, the residuals would be trucked across MacArthur Boulevard and disposed of in a new monofill constructed in the Dalecarlia Woods area of the Dalecarlia WTP complex.

Residuals processing, including gravity thickening and dewatering would occur at the Dalecarlia WTP Northwest site with this alternative. Following processing, onsite trucks would haul the residuals across MacArthur Boulevard and up Little Falls Road to the monofill disposal site. On average, six (20-ton) trucks worth of water treatment residuals would be hauled to the monofill site each day.

As currently conceived the residuals disposal monofill would be approximately 50 ft tall on the Dalecarlia Parkway side and 80 ft tall on the Dalecarlia Reservoir side. The footprint of the monofill is anticipated to occupy approximately 30 acres.

Alternative B: Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

For alternative B, residuals are collected from the Georgetown Reservoir and the Dalecarlia WTP sedimentation basins and conveyed to the Dalecarlia WTP similar to Alternative A. Once dewatered, residuals are contract hauled to a final disposal site.

Residuals processing, including gravity thickening and dewatering would occur at the Dalecarlia WTP Northwest site with this alternative. Following processing, the dewatered residuals would be contract hauled to a permitted offsite disposal facility. An estimated eight truck trips per day (5 days per week) of dewatered residuals are expected to be transported from the Dalecarlia WTP site on average. Higher numbers of truck trips, as defined in Volume 4 -Engineering Feasibility Study Compendium, would be required during peak residuals production periods.

Alternative C: Thickening and Piping to Blue Plains AWWTP

Alternative C does not rely upon trucks to transport dewatered residuals from the Dalecarlia WTP but it does require transporting by truck from Blue Plains AWWTP. Residual processing at the Dalecarlia WTP site is limited to gravity thickening with this alternative. Thickened residuals are then pumped through a dedicated pair of pipelines to the Blue Plains Advanced Wastewater Treatment Plant (AWWTP) for dewatering. Residuals disposal is accomplished via contract hauling and off-site disposal. The proposed route for the dedicated thickened residuals pipeline follows the west bank of the Potomac River to the Blue Plains AWWTP.

Alternative D: No Action Alternative

Although not consistent with the purpose and need of the project, Alternative D, the No Action Alternative, is retained as a NEPA requirement. This alternative assumes that residuals would continue to be discharged directly from the Dalecarlia WTP sedimentation basins and the Georgetown Reservoir to the Potomac River in the future. This practice would be in violation of the strict solids concentrations defined in the NPDES permit discharge limits.

Alternative E: Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

This alternative is similar to Alternative B, except residuals processing is accomplished at a site on the eastern portion of the Dalecarlia WTP (and Reservoir) property designated as the East Dalecarlia Processing site. Following processing, the dewatered residuals would be contract hauled to a permitted offsite disposal facility. An estimated eight truck trips per day (5 days per week) of dewatered residuals are expected to be transported from the Dalecarlia WTP site on average. Higher numbers of truck trips, as defined in Volume 4—Engineering Feasibility Study Compendium, would be required during peak residuals production periods.

Evaluation of Impacts

The potential for and significance of environmental, social, and economic consequences associated with implementing any of the project alternatives is described in this DEIS. The specific resource areas evaluated are:

- Land use
- Noise
- Air quality
- Aquatic resources
- Biological resources
- Cost
- Cultural resources
- Hazardous, toxic, and radioactive substances
- Implementation uncertainty
- Soils, geology, and groundwater
- Infrastructure
- Land application
- Public health
- Transportation
- Visual resources
- Social and economic resources, including Environmental Justice and Protection of Children

Criteria for evaluating potential impacts and determining their significance were determined by the CEQ (40 CFR 1508.27). The regulations state that significance is determined by the intensity or severity of the impact and the context in which it occurs. Intensity criteria were based on the following:

- The degree to which the action affects public health or safety
- The degree of change to unique geographic characteristics, such as visual quality, prime agricultural land, archaeological sites, wetlands, or ecologically critical areas
- Potential for environmental or scientific controversy
- Known or unknown level of risk
- Potential for establishing a precedent for future actions or representing a decision in principle about a future consideration
- The relation of impact to other actions, individually insignificant but with cumulative impact
- The proximity of the action to resources that are legally protected by various statutes, such as wetlands, historic properties listed in the National Register of Historic Places, regulatory floodplains, and federally listed threatened or endangered species
- The potential for violating federal, state, or local laws or requirements in place to protect the environment

Using these criteria, the following levels of impacts were identified:

No Impact—implementation of the action has little or no effect upon the resource.

No Significant Impact—implementation of the action has an impact, either adverse or beneficial, but it does not meet the significance criteria for the given resource relative to intensity and context.

Significant Impact—the predicted impact, either adverse or beneficial, meets the significance criteria for the given resource. Significant impacts may be reduced to an insignificant level by implementing appropriate mitigation measures.

The cumulative impacts that could be associated with the implementation of the proposed action in concert with one or more other past, present, or reasonably foreseeable future actions or projects are also evaluated. Specifically, this evaluation is prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) and guidance from the CEQ, *Considering Cumulative Effects Under the National Environmental Policy Act*.

Selection of the Preferred Alternative

Each of the alternatives evaluated (with the exception of the No Action Alternative) necessitates developing infrastructure in an urban setting, characterized by important natural and man-made resources. All five of the alternatives (including the No Action Alternative) evaluated to meet this federally mandated action will carry some degree of impact. Of particular concern is the ability of an alternative to meet the project's purpose and need, while minimizing impacts to the communities surrounding the potential operations, no matter where they be located. Particular emphasis was naturally placed in evaluating impacts near the Dalecarlia Reservoir, Dalecarlia Water Treatment Plant (WTP), Georgetown Reservoir, and Blue Plains AWWTP facilities, as well as intermediate conveyance areas potentially impacted by Alternative C, the pipeline alternative. The **Preferred Alternative** for the DEIS should be the alternative that best meets the objectives of the project, as stated in the Notice of Intent (published in the *Federal Register* on January 12, 2004).

The following sources of information were considered by Washington Aqueduct while selecting the proposed action from the five possible residuals alternatives:

- Information on the potential impacts revealed by the technical evaluation (detailed in Sections 3 and 4 of this DEIS),
- Ideas and concerns raised by the public during five open public meetings or submitted directly to Washington Aqueduct staff, and
- Consultations with regulatory authorities at the federal, state, and local levels (detailed in Section 4).

Both Alternatives A (Dewatering and Disposal by Monofill) and C (Thickening and Piping to Blue Plains AWWTP) have beneficial elements that contribute to the objectives of the Clean Water Act and NEPA, by enabling the Washington Aqueduct to stop discharging residuals into the Potomac River, and prevent residuals-bearing trucks from traveling on local community roads nearest to the Dalecarlia WTP facilities. However, implementation of Alternatives A and C would not allow Washington Aqueduct to comply with the Federal Facility Compliance Agreement schedule issued by the U.S. Environmental Protection Agency (USEPA), and they both would have significant long-term adverse impacts on various natural and community resources.

More specifically, during the course of this NEPA process, we have learned that the development of Alternative A is not consistent with the schedule for investigations of this site by the U.S. Army Corps of Engineers for its ongoing remediation efforts for the American University Experimental Station (AUES) Formerly Used Defense Site (FUDS) project. Further, Alternative C, like the other piping alternatives examined during the screening process, is not consistent with the District of Columbia Water and Sewer Authority's (DC WASA's) long-term plans for its Blue Plains AWWTP and is more than double the cost of each of the other alternatives. Both alternatives would have unacceptably large potential visual, cultural, forest habitat, and perhaps recreational, impacts.

Alternative D, the no-action alternative, cannot be selected by the Washington Aqueduct because it would place it in violation of the Federal Clean Water Act, the terms of their NPDES permit, and the FFCA issued by USEPA. Throughout the DEIS preparation process, USEPA has confirmed that they would be unwilling to modify the NPDES permit to allow the Washington Aqueduct to return to a residuals disposal practice consistent with the No Action alternative, despite the Washington Aqueduct's consideration of it and a number of similar river discharge alternatives during this process.

The Washington Aqueduct selected between Alternatives B and E for the proposed action. Both alternatives can be implemented within the required timeframe with a much greater degree of certainty than is possible for either Alternative A or C. The costs of these alternatives are consistent with the project budget, which is wholly dependent for financial support from the three local wholesale customers and the rate-paying public. Both alternatives, as did the other action ones, feature residuals processing with trucking, albeit to off-site disposal locations. They differ in the location of the processing facilities and the location in which the trucks enter the local roadways. Alternative B would construct the residuals processing facility at the Northwest Dalecarlia WTP location and the trucks would enter the local roadways at the existing facility entrance to MacArthur Boulevard. Alternative E would construct the residuals processing facilities at the East Dalecarlia WTP location and trucks would enter the local roadways at the existing intersection of Little Falls Road and Dalecarlia Parkway. These differences form the basis of the tradeoffs between each alternative.

Alternatives B and E present equally feasible options, from an engineering perspective, for a residuals management program that eliminates residuals discharge to the Potomac River. Each would enable the Aqueduct to meet the conditions of the recent Permit No. DC 0000019 within the schedule put forth in its Federal Facilities Compliance Agreement with the USEPA. Alternative E offers advantages in the following areas:

- Less visual impact to surrounding residential neighbors
- Site topography allows impacts to be minimized
- Less truck noise attributable to residuals trucks travelling on Loughboro Road
- Greater distance between surrounding neighborhoods and proposed residuals processing facilities
- Fewer apparent soils issues

Therefore, Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking is recommended as the Proposed Action for the DEIS.

Agency and Public Participation

During the preparation of the DEIS, a public scoping period was held in early 2004. Also in 2004, four (4) additional public forums were hosted by the Washington Aqueduct to provide interested members of the public with an opportunity to better understand the project and the proposed alternatives. The Washington Aqueduct also consulted with numerous local and federal agencies and elected officials as well as participated by invitation in a variety of forums hosted by community groups to continue to describe the project and the alternatives being evaluated in the DEIS. The Aqueduct created and maintained a public web site devoted exclusively to this project.

Members of the public, elected officials, and regulatory agencies in the District of Columbia and Maryland used the public involvement process leading up to the publication of the DEIS to voice concerns, ideas and opinions about the project and its proposed alternatives.

A summary of major public concern on DEIS alternatives A through E communicated during this process is as follows:

Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

There was significant public concern about removing a 30-acre stand of mature, mixed hardwood forest and replacing it with a residuals monofill with a 20 year life span. Specific issues centered on the visual impact to nearby Maryland residences, operational impacts of light, noise and dust, the loss of biological resources that are currently protected from human activity, and the potential for the water quality in the reservoir to be affected. Some area residents characterized this alternative as creating a permanent impact (clearcutting the forest) for a temporary solution (a monofill with capacity for 20 years of disposal).

From an agency standpoint, the Corps of Engineers Baltimore Division leading the AUES FUDS environmental restoration project expressed concern that portions of the Dalecarlia Reservoir property, including the monofill footprint, fell within an area historically known as "Government Woods". They have reasonable suspicion that this property may have been associated with the AUES's World War One era research and testing activities. This suspicion has led to scheduled testing of portions of the Dalecarlia Reservoir property. This scheduled testing in 2008 and associated remedial actions, if any conflict with the Aqueduct's timetable for FFCA compliance.

Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Public concern developed focused on the appearance of the processing facilities. Specifically its potential to impact the visual character of the immediate area and to be seen by residents of Maryland's Brookmont neighborhood downgradient of the site's western boundary, residents of Windward and Leeward Place overlooking the site's northern boundary, and users of the portion of the Capital Crescent Trail passing through the Aqueduct's WTP property. Nearby residents have also voiced concern about operational issues of noise, light pollution, and the potential for odors.

Beyond the immediate neighbors, this alternative attracts public concern about truck traffic on area roads, which is viewed as a congestion, pedestrian safety, and residential foundation hazard. Regulatory agencies have not voiced concerns specific to this alternative.

Alternative C—Thickening and Piping to Blue Plains AWWTP

Maryland and DC residents from the neighborhoods surrounding the Dalecarlia Reservoir and WTP have been largely supportive of this alternative because it involves the smallest amount of visibly-observed facility development in this geographic area and does not involve trucks carrying residuals on their area roads, which effort would instead be transferred to I-295 and Southeast D.C. Under this alternative, the potential operational impacts of the residuals processing facility would be transferred to the Blue Plains AWWTP approximately 12 miles away in the opposite corner of the District of Columbia.

Three regional offices of the NPS have expressed significant concern about the pipeline corridor as it passes through the C&O National Historical Park and Georgetown Historic District, and areas adjacent to the Lincoln Memorial, the Franklin Delano Roosevelt Memorial, and Thomas Jefferson Memorial.

The Washington Area Sanitation Authority (DC WASA) evaluated the prospect of hosting the residuals processing facility at their Blue Plains facility. They have determined that all potentially available site space must be reserved for planned facilities to accomplish greater wastewater nutrient removal and store and treat CSOs (see Engineering Feasibility Study Compendium—Volume 4 of the DEIS for more detail on this issue). As a result, they cannot host the Washington Aqueduct's facilities as part of this alternative.

Alternative D—No Action Alternative

A portion of the public dialog has focused on the need for the Washington Aqueduct to change its current and historical practice of Potomac River residuals disposal. There has been some public support for this alternative, with the argument that a new residuals management process creates a set of land-based impacts that are greater than the impacts associated with water-based disposal. Neither the impact balancing that occurred during this NEPA process, nor the stictures of the Clean Water Act support this argument.

From a resource agency perspective, the Washington Aqueduct received the current Permit No. DC 0000019, and entered into an FFCA following 9 years of research and detailed discussion over the need to alter the residual disposal process from river discharge to land application. An extensive administrative record was created by USEPA Region 3 to support this decision. Once made, the FFCA was needed to set forth a timetable for the Washington Aqueduct to meet Permit No. DC 000019. This permit for all practical purposes precludes continuation of river disposal. The failure to enter into the FFCA would have most likely resulted in USEPA revoking Permit No. DC 0000019, or USEPA entering a unilateral order and schedule.

Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

This alternative is an outcome of the extended public comment period ending in mid-November 2004. It has the benefit of moving the facility further from the Brookmont neighborhood and will have better access to the Dalecarlia Parkway, reducing the local noise from the expected truck traffic. The building would be visible from the Westmoreland neighborhood that faces the reservoir, but it would be in the same sight line as the existing hospital high rise buildings. The topography of the site offers opportunities to minimize the visibility of the structures.

Conclusion

The alternatives screening criteria are linked to the project's purpose and need. Washington Aqueduct developed them subsequent to the issuance of the Notice of Intent.

The production of safe drinking water delivered with one hundred percent reliability to Washington Aqueduct's wholesale customers at a reasonable cost must be maintained during construction and operation of the selected alternative. This is the inherent duty of the Washington Aqueduct management.

The screening criteria were then applied to all of the alternatives -- those that were initially developed by Washington Aqueduct staff and consultants and those that were suggested by the public. Four alternatives met the screening criteria and their effects are evaluated in this DEIS.

A fifth alternative, the "no action" alternative is also included.

While "no action" is an alternative that must be evaluated in any environmental documentation accomplished under the National Environmental Policy Act, it cannot be the selected action in this case. The issuance of NPDES Permit DC 0000019 which itself was evaluated in a public process pursuant to EPA regulations, requires some kind of solids collection and disposal process as an alternate to the current method of flushing them to the Potomac River.

Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking is recommended as the Proposed Action for the DEIS bcauase it best meets the purpose and need of the project.

SECTION 1

Introduction

1.1 Background and Project History

The Washington Aqueduct, a Division of the U.S. Army Corps of Engineers (USACE), Baltimore District, operates the Dalecarlia and McMillan Water Treatment Plants (WTPs) in Washington, DC, serving over 1 million persons in the DC and northern Virginia area with potable water. The treatment process removes solid particles (e.g., river silt) from the Potomac River supply water, treats and disinfects the water, and distributes the finished water to the metropolitan service area. The solids removed during the treatment process have historically been returned to the Potomac River, but a recently reissued version of the Washington Aqueduct National Pollution Discharge Elimination System (NPDES) permit (Permit No. DC 0000019) effectively precludes the discharge of water treatment solids, or residuals, to the river.

Consequently, Washington Aqueduct is in the process of evaluating water treatment residuals management alternatives that minimize or eliminate the discharge of residuals to the river. The residuals management option that is ultimately selected has a potential to affect the human environment, and thus development of the residuals management plan must comply with the National Environmental Policy Act (NEPA) (passed into law in 1970). This Draft Environmental Impact Statement (DEIS) has been prepared in compliance with NEPA and supporting regulations promulgated by the Council on Environmental Quality and the USACE. NEPA requires federal agencies to integrate environmental considerations into their decision-making processes by evaluating the environmental impacts of their proposed actions and feasible alternatives to those actions.

The current water treatment system consists of a series of reservoirs and treatment facilities (Figure 1-1). Raw water diverted from the Potomac River is collected in the Dalecarlia Reservoir. Natural sedimentation of river silt typically occurs in the Forebay of the Dalecarlia Reservoir (Figure 1-2). This silt (Forebay residuals) is periodically dredged, temporarily land applied on Washington Aqueduct property for drying, and then trucked off-site or utilized on-site. The part of this process that involves trucking of dried Forebay solids occurs approximately every seven years.

While some natural sedimentation continues as the river water flows through the Dalecarlia Reservoir, Washington Aqueduct water treatment operations achieve an additional level of sediment removal by adding aluminum sulfate (alum) as a coagulant. Alum is added after the water has passed through the Dalecarlia Reservoir, but prior to reaching the four sedimentation basins at the Dalecarlia WTP (Figure 1-2) and the Georgetown Reservoir (Figure 1-3), where the coagulated sediment (i.e., water treatment residuals) is removed. The settled residuals are periodically flushed from the basins to the Potomac River. This process had been previously permitted through the U.S. Environmental Protection Agency's (USEPA's) NPDES permitting process.

The reissued NPDES permit, which became effective on April 15, 2003, significantly reduced both the allowable total mass and concentration of residuals that may be discharged by the Washington Aqueduct to the Potomac River. The permit also describes numerical limits for parameters such as total suspended solids, total aluminum, and dissolved iron that essentially eliminate residuals discharges from these outfall locations. The NPDES permit covers discharges from the Dalecarlia Sedimentation Basins 1, 2, 3, and 4 through Outfall 002 and discharges from the Georgetown Sedimentation Basins 1 and 2 through Outfalls 003 and 004.

Washington Aqueduct and USEPA Region 3 entered into a Federal Facilities Compliance Agreement (FFCA) on June 12, 2003 to allow the continued production of drinking water during the development of a new residuals management process to meet the requirements of the new permit. The FFCA includes a strict schedule for delivering documentation and achieving compliance with the NPDES permit, including completion of an alternatives evaluation and a disposal study, a Draft EIS (DEIS), and final compliance with the numerical discharge limitations.

1.2 Purpose and Need for Action

The purpose and need for the proposed residuals management process assessment were defined in the Notice of Intent, published in the *Federal Register* on January 12, 2004, as restated below:

> The objectives of the proposed residuals management process are as follows, not necessarily in order of precedence (measurement indicators in parentheses):
>
> - To allow Washington Aqueduct to achieve complete compliance with NPDES Permit DC00000019 and all other federal and local regulations.
> - To design a process that will not impact current or future production of safe drinking water reliably for the Washington Aqueduct customers. (Peak design flow of drinking water).
> - To reduce, if possible, the quantities of solids generated by the water treatment process through optimized coagulation or other means. (Mass or volume of solids generated).
> - To minimize, if possible impacts on various local and regional stakeholders and minimize impacts on the environment. (Traffic, noise, pollutants, etc.).
> - To design a process that is cost-effective in design, implementation, and operation. (Capital, operations, and maintenance costs).

Washington Aqueduct developed objectives for the proposed residuals management process with the intention of ensuring compliance with all permit and other legal mandates, and preserving or improving upon the safety, reliability, and efficiency of the current water treatment process. In addition, Washington Aqueduct incorporated into the objectives a concern for minimizing impacts to the human and natural environment.

The alternatives screening criteria are linked to the project's purpose and need. Washington Aqueduct developed them subsequent to the issuance of the Notice of Intent. These screening criteria were reviewed by the public during the scoping period and then applied to all of the alternatives – those that were initially developed by the Washington Aqueduct and consultants and those that were suggested by the public. The comments received during the scoping process for the DEIS did not result in any modifications to the original objectives as published in the Notice of Intent. The objectives and screening criteria have been incorporated into the analysis of all of the alternatives, as detailed in Volume 4 of this DEIS, the Engineering Feasibility Study Compendium, and summarized in Section 2 of this report.

Four alternatives met the screening criteria and their effects are evaluated in the DEIS. A fifth alternative, the no action alternative is also included. While no action is an alternative that must be evaluated in any environmental documentation accomplished under the National Environmental Policy Act, it cannot be selected in this case. The issuance of NPDES Permit DC 0000019, which itself was evaluated in a public process pursuant to EPA regulations, requires solids collection and disposal processes as an alternative to the current method of flushing them to the Potomac River.

The production of safe drinking water delivered with one hundred percent reliability to Washington Aqueduct's wholesale customers at a reasonable cost must be maintained during the construction and operation of the selected alternative. This is the inherent duty of the Washington Aqueduct management.

Washington Aqueduct is also committed, as indicated in the project objectives, to minimize (if possible) potential impacts on stakeholders and the environment. All of the alternatives under consideration have potential impacts. However, it is anticipated that mitigative measures may be planned and implemented in order to minimize these potential impacts for whichever of the alternatives that is selected.

Washington Aqueduct has a proposed action among those presented in Section 2 for implementation. The final alternative selected may be contingent on authorization, approvals, or issuance of permits or easements by various public agencies or private entities including, but not limited to, the relevant State Historic Preservation Office (SHPO), the National Capital Planning Commission (NCPC), the USEPA, the National Park Service (NPS), and the Washington Aqueduct Wholesale Customers (i.e., the District of Columbia Water and Sewer Authority, Arlington County, Virginia, and the City of Falls Church, Virginia).

FIGURE 1-1
Washington Aqueduct Supply and Treatment System

Legend

- District Boundary
- Existing Buildings
- Roads

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 375 750 1,500 Feet

Figure 1-2
Dalecarlia Reservoir and Forebay Facilities

Legend

District Boundary
Existing Buildings
Roads

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

N
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Feet

Figure 1-3
Georgetown Reservoir

SECTION 2

Description of Proposed Action and Alternatives

2.1 Proposed Action

The proposed action is to develop, design, and construct a permanent residuals management process that will cost-effectively collect, treat, and dispose of the water treatment residuals in conformance with the purpose and need stated in Section 1. The selected action must meet the Federal Facilities Compliance Agreement (FFCA) compliance deadlines. It must also address the management of projected residuals quantities for a period of at least 20 years. Table 2-1 lists the current and future volume of water treatment and Forebay residuals generated daily as estimated for the Engineering Feasibility Study (EFS) (Volume 4 of DEIS). This table also lists the number of truck trips associated with the residuals quantities, based on a 5-day week. Not all of the alternatives evaluated in detail in this DEIS use trucking for final disposal of dewatered residuals. The larger residuals values listed in the design year columns reflect the larger quantity of water demand anticipated 20 years in the future.

TABLE 2-1
Washington Aqueduct Basis for Residuals Quantities

	Daily Generated Volume (Cubic Yards)[a]		Truck Trips/Day[b]			
			22 Cubic Yards/ Truck		11 Cubic Yards/ Truck	
Residuals	**Current Average**	**Design Year Average**	**Current Average**	**Design Year Average**	**Current Average**	**Design Year Average**
Water Treatment	94	120	7	8	13	16
Forebay	22	28	2	2	3	4

[a] Based on 7 days per week production.
[b] Based on hauling to a final disposal site 5 days per week.

2.2 Development of Alternatives

Washington Aqueduct has been evaluating residuals management approaches for a number of years due to potential changes to the regulations. During that time many potential alternatives were identified. Some of these alternatives are not consistent with the regulatory requirements defined in the April 2003 National Pollutant Discharge Elimination System (NPDES) permit and associated FFCA.

The first step in the National Environmental Policy Act (NEPA) alternative identification process was to review the project history and compile a full range of possible alternatives that have the potential to meet the stated purpose and need. The following documents were reviewed to develop the historical list:

- Department of the Army, Baltimore District, U.S. Army Corps of Engineers (USACE), Washington Aqueduct. "Dalecarlia Water Treatment Plant and Georgetown Reservoir Residuals Collection and Treatment Engineering Estimate (35 percent Design)." Whitman, Requardt, and Associates. November 1996
- Department of the Army, Baltimore District, Corps of Engineers, Washington Aqueduct. "Dalecarlia Water Treatment Plant and Georgetown Reservoir Residuals Disposal Facilities Residuals Disposal Study." Whitman, Requardt, and Associates in association with Malcolm Pirnie, Inc. September 1995
- Department of the Army, Baltimore District, Corps of Engineers, Washington Aqueduct. "Draft NPDES Permit Review Memorandum on Residual Solids Evaluations." AH Environmental Consultants, Inc., and Greeley and Hansen LLC. May 30, 2003

Additional alternatives and approaches with the potential to improve the historical alternatives were also developed. Suggestions made by the public during the scoping process, such as plasma heat treatment of residuals, were also considered. This effort culminated in a list of 26 alternatives, which were screened following the Scoping Meeting and discussed in more detail in the Description of Proposed Action, and Alternatives (DOPAA) issued in May 2004.

Subsequent to the issuance of the DOPAA, the public was given two structured opportunities to suggest additional residuals alternatives for consideration, such as consideration of alternate residuals processing sites. These represent the second and third alternative suggestion periods to this Draft Environmental Impact Statement (DEIS). These alternative suggestion periods closed on November 15, 2004 and February 14th, 2005, respectively. A total of 142 additional residuals alternatives and options were received from the public during these additional alternative suggestion periods. Two of these alternatives offered during these periods were combined for further consideration of alternate residuals processing sites (i.e., the East Dalecarlia Processing Site adjacent to Little Falls Road).

This section discusses the process and criteria used to screen all of the alternatives, summarizes the results of the screening process, further explained in more detail in Volume 4—Engineering Feasibility Study Compendium, and describes the four alternatives plus the No Action alternative evaluated in this DEIS.

2.3 Alternative Screening Process and Criteria

Screening of alternatives is an approach commonly used as part of the NEPA process to identify the feasible alternatives and ensure a reasonable range of alternatives for detailed evaluation in the DEIS. In this document, each previously or newly identified alternative (or individual component of a residuals management approach) was screened against the established criteria. The draft screening criteria were circulated for public review and comment during the Scoping Process before they were finalized and applied to all alternatives.

The screening criteria used to determine attainment of purpose and need are:

- Is able to meet the FFCA, including schedule.

- Preserves the quality, reliability, and redundancy of the existing water treatment and distribution system.
- Uses proven methods (i.e., proven design water treatment processes, construction equipment and techniques, and operating principles).
- Complies with NPDES permit to reduce or eliminate discharge to the Potomac River.
- Does not produce an undue economic hardship on Washington Aqueduct customers for additional facilities that cost more than 30 percent of the baseline 2004 construction cost budget of $50 million (to increase total project cost beyond $65 million) that are not needed for other feasible alternatives for the five basic project elements of residuals collection, conveyance, thickening, dewatering, and disposal. (Note: All project costs identified in this DEIS were developed in 2004 dollars.)
- Complies with zoning and land use regulations, institutional constraints, and other Federal and local regulations.
- Reduces residual quantities, if possible.

Key schedule milestones included within the FFCA include the following:

- No later than October 17, 2005 (modified from June 3, 2005), "the Corps shall identify in a notice to EPA the engineering/best management practices it will implement in order to achieve compliance with the numeric discharge limitations set forth in the NPDES Permit and a schedule for implementing the identified engineering/best management practices as expeditiously as practicable, including selection of a contractor, preliminary design, and final design, as well as the construction phase..."
- No later than March 1, 2008, "the Corps shall exercise best efforts, consistent with the best engineering judgement, to achieve compliance with the numeric discharge limitations set forth in the NPDES Permit at one or more of the sedimentation basins..."
- No later than December 30, 2009, "achieve full compliance with the numeric discharge limitations at all basins…"

2.4 Alternatives Description and Screening Results

A total of 160 residuals alternatives plus eight treatment options were evaluated for this project. Twenty-six of these alternatives, including the no action alternative, were either developed during previous residuals project phases or defined by the project team early in this phase of the project. The remaining 135 alternatives plus eight options were submitted by the public during one of the three public involvement opportunities. However, many of these publicly submitted alternatives duplicated in part or wholly some of the early alternatives.

To facilitate the screening process and to make it easier for the reader to cross-reference this document with the other DEIS volumes, the residuals alternatives were grouped into one of the following categories before they were screened:

- No-Action Alternative

- Alternatives that do not require continuous trucking from the Dalecarlia WTP
- Alternatives with a discharge to the Potomac River
- Alternatives involving alternate uses of the Dalecarlia Reservoir
- Alternatives with facilities at the McMillan Water Treatment Plant (WTP)
- Alternatives with facilities at the Dalecarlia WTP

These categories recognize the similarity of many of the alternatives, grouping alternatives by common critical components, such as method of dewatering or disposal, location of processing facilities, etc.

Once categorized, all residuals alternatives and options were evaluated using the same screening criteria, as listed above. Volume 4 of this DEIS provides detailed technical information on each alternatives, as well as, a complete description of the screening evaluation and results. The results of the Engineering Feasibility Study include a determination of feasible alternatives with consideration given to the most environmentally sound, economical, and practical methods. Table 2-2 presents a brief summary of the screening results presented in the Engineering Feasibility Study.

TABLE 2-2
Alternatives Screening Summary

Alternative Category	Number of Alternatives Screened	Number of Alternatives Consistent with Screening Criteria	Alternatives Consistent with Screening Criteria
No Action Alternative[b]	1	1	D
Alternatives that do not Require Continuous Trucking from the Dalecarlia WTP	130	2	A and C
Alternatives with a Discharge to the Potomac River	4	0	N/A
Alternatives Involving the Dalecarlia Reservoir	5	0	N/A
Alternatives with Facilities at the McMillan WTP	8	0	N/A
Alternatives with Facilities at the Dalecarlia WTP	12	3[a]	B and E

[a] Two similar publicly submitted alternatives were combined into alternative E.

[b] Required for consideration in DEIS by NEPA

2.5 Feasible Alternatives Evaluated Further in the DEIS

The alternatives screening process concluded that four of the 160 screened alternatives plus the No Action alternative were consistent with the purpose and need of the project. These alternatives were designated alternatives A through E (as shown in Table 2-2) following the completion of the screening process as follows:

- **Alternative A:** Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill
- **Alternative B:** Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking
- **Alternative C:** Thickening and Piping to Blue Plains Advanced Wastewater Treatment Plant (AWWTP)
- **Alternative D:** No Action Alternative
- **Alternative E:** Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

For all alternatives, Forebay residuals were assumed to be processed by current methods and periodically hauled. The environmental impacts associated with an alternate Forebay residuals processing option is also analyzed in the DEIS for each resource area.

The residuals collection, conveyance, processing, and disposal facilities associated with each of these alternatives are described briefly below. A more detailed description of the alternatives, along with the reasons why the remaining alternatives did not satisfy the screening criteria are provided in Section 3 of Volume 4 of this DEIS - Engineering Feasibility Study Compendium. The residuals collection, processing, and public options evaluated in this DEIS are summarized in Section 4 of Volume 4 of the DEIS.

2.5.1 Residuals Facilities Common to All Alternatives except the No Action Alternative

All alternatives, except the No Action alternative, have several common residuals collection and unthickened liquid residuals conveyance facilities. These facilities include new residuals dredge collection, pumping, and conveyance facilities located at the Georgetown Reservoir and new residuals collection equipment, pumping, and unthickened conveyance piping located at the Dalecarlia WTP sedimentation basins.

2.5.1.1 Common Georgetown Reservoir Residuals Collection, Pumping, and Conveyance Facilities

Two new electric powered dredges and associated cable positioning systems will be installed in Georgetown Reservoir Basins 1 and 2 to periodically collect the residuals that settle out in these basins. These dredges will operate 16 hours per day, 5 days per week over an anticipated 9-month annual dredging period. Each dredge will be programmed to automatically collect residuals from the basins, following a serpentine collection path that covers the entire floor area of each basin. A combination of a semi-submerged flexible hose attached to the dredge and a buried pipeline will be used to transport residuals to a new below-ground residuals transfer pump station located north of Basin 1. This pump station will transfer residuals through a new pipeline installed inside the Georgetown Conduit, which runs beneath the center median of MacArthur Boulevard, to the Dalecarlia WTP residuals processing site. A new aboveground electrical building will be constructed north of Georgetown Reservoir basin 1 (approximately 14 feet wide by 22 feet long by 12 feet high). This building will house the electrical equipment required to power the dredges and the residuals transfer pump station. The new building will be constructed in a low-lying area to minimize the visual impact of the facility.

2.5.1.2 Common Dalecarlia Sedimentation Basin Residuals Collection, Pumping, and Conveyance Facilities

New residuals collection mechanisms will be installed inside each of the four existing Dalecarlia WTP sedimentation basins to permit continuous removal of residuals. With the exception of the collection mechanism drive units and associated access walkway, the mechanisms will be installed beneath the water surface in the sedimentation basins.

New residuals pumps and conveyance piping will be installed underground if practical, either in existing below ground galleries or in a new below ground pump station located south of sedimentation basins 3 and 4. A small building, approximately 6 feet wide by 14 feet long by 12 feet high, may be required to access the stairwell into the below ground pump station. The new residuals pumps will discharge directly to the new residuals processing facility through two dedicated water treatment residuals transfer pipelines.

2.5.2 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

With this alternative, residuals would be collected continuously from the Dalecarlia Sedimentation Basins, periodically dredged from the Georgetown Reservoir and pumped to new residuals thickening and dewatering facilities located on the northwest Dalecarlia WTP site. Following dewatering, the residuals would be trucked across MacArthur Boulevard and disposed of in a new monofill constructed in the Dalecarlia Woods area of the Dalecarlia WTP complex. Figure 2-1 presents a site plan for the proposed Alternative residuals facilities. Alternative A does not require continuous trucking from the Dalecarlia WTP.

2.5.2.1 Residuals Collection and Liquid Conveyance Facilities

Residuals collection and conveyance would be accomplished by the common facilities identified above.

2.5.2.2 Residuals Processing, Solids Conveyance and Disposal

Residuals processing, including gravity thickening and dewatering, would occur at the Northwest Dalecarlia Processing Site with this alternative. Following processing, onsite trucks would haul the residuals across MacArthur Boulevard and up Little Falls Road to the monofill disposal site. On average, eight 20-ton truckloads of water treatment residuals would be hauled to the monofill site five days per week.

As currently conceived the residuals disposal monofill would be approximately 50 ft tall on the Dalecarlia Parkway side and 80 ft tall on the Dalecarlia Reservoir side. The footprint of the monofill is anticipated to occupy approximately 30 acres.

2.5.3 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

For alternative B, residuals are collected from the Georgetown Reservoir and the Dalecarlia WTP sedimentation basins and conveyed to the Dalecarlia WTP similar to Alternative A. Once dewatered, residuals are contract hauled to a final disposal site. Figure 2-2 presents a site plan of the proposed Alternative B residuals facilities.

2.5.3.1 Residuals Collection and Liquid Conveyance Facilities

Residuals collection and conveyance would be accomplished by the common facilities identified above.

2.5.3.2 Residuals Processing, Solids Conveyance and Disposal

Residuals processing, including gravity thickening and dewatering, would occur at the Northwest Dalecarlia Processing Site with this alternative. Following processing, the dewatered residuals would be contract hauled to a permitted offsite disposal facility. An estimated eight truck trips per day 5 days per week of dewatered residuals are expected to be transported from the Dalecarlia WTP site on average. Higher numbers of truck trips, as defined in Volume 4—Engineering Feasibility Study Compendium, would be required during peak residuals production periods.

2.5.4 Alternative C—Thickening and Piping to Blue Plains AWWTP

For Alternative C residuals processing at Dalecarlia is limited to gravity thickening Northwest Dalecarlia Processing site. Thickened residuals are then pumped through a dedicated pair of pipelines to the Blue Plains AWWTP for dewatering. Residuals disposal is accomplished via contract hauling and off-site disposal. Figure 2-3 presents an overview map showing the approximate locations of the residuals facilities associated with Alternative C. The proposed route for the dedicated thickened residuals pipeline follows the west bank of the Potomac River to the Blue Plains AWWTP. Figure 2-4 presents a site plan of the proposed Alternative C residuals facilities located at the Georgetown Reservoir and Dalecarlia WTP sites. Alternative C does not rely upon trucks to transport dewatered residuals from the Dalecarlia WTP but it does require transporting dewatered residuals by truck from Blue Plains AWWTP.

2.5.4.1 Residuals Collection and Liquid Conveyance Facilities

Residuals collection and conveyance to the Dalecarlia WTP thickening facility would be accomplished by the common facilities identified above.

2.5.4.2 Residuals Processing, Solids Conveyance and Disposal

Following thickening, residuals would be conveyed to the Blue Plains AWWTP through two dedicated pipelines approximately 10 miles long and 12-inches in diameter each. Residuals dewatering would be accomplished with dedicated dewatering equipment located at the Blue Plains AWWTP. Following dewatering, the residuals would be contract hauled to a permitted off-site disposal facility.

2.5.5 Alternative D—No Action Alternative

Although not consistent with the purpose and need of the project, Alternative D, the No Action Alternative, is retained as a NEPA requirement. This alternative assumes that residuals would continue to be discharged directly from the Dalecarlia WTP sedimentation basins and the Georgetown Reservoir to the Potomac River in the future. This practice would be in violation of the solids concentrations defined by the NPDES permit effluent discharge limits.

2.5.6 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

This alternative is similar to Alternative B, except residuals processing is accomplished at the East Dalecarlia WTP site. Figure 2-5 presents a site plan of the proposed Alternate E residuals facilities.

2.5.6.1 Residuals Collection and Liquid Conveyance Facilities

Residuals collection and conveyance would be accomplished by the common facilities identified above.

2.5.6.2 Residuals Processing, Solids Conveyance and Disposal

Residuals processing, including gravity thickening and dewatering, would occur at the Dalecarlia WTP East site with this alternative. Following processing, the dewatered residuals would be contract hauled to a permitted offsite disposal facility. An estimated eight truck trips per day (5 days per week) of dewatered residuals are expected to be transported from the Dalecarlia WTP site on average. Higher numbers of truck trips, as defined in Volume 4—Engineering Feasibility Study Compendium, would be required during peak residuals production periods.

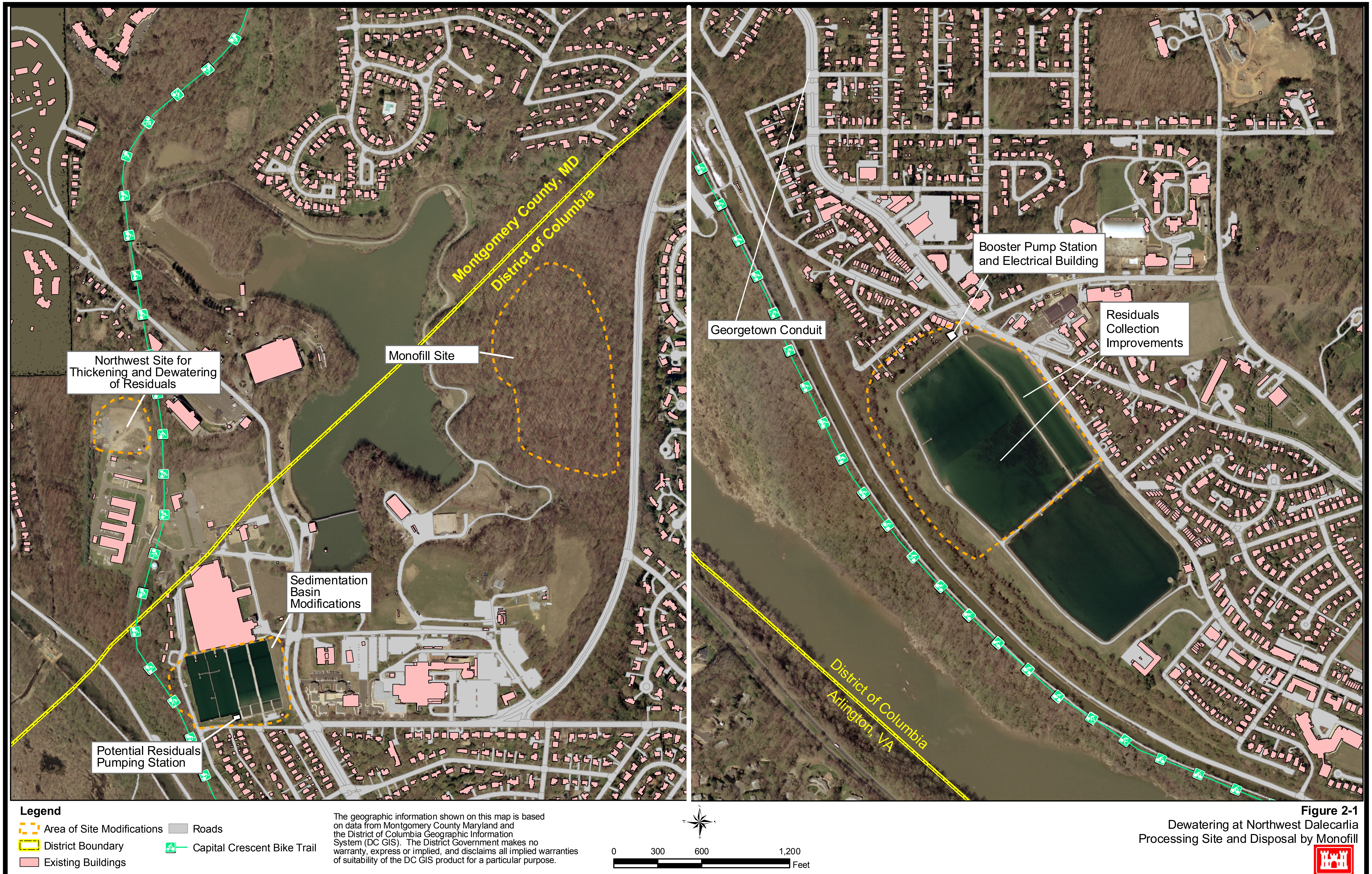
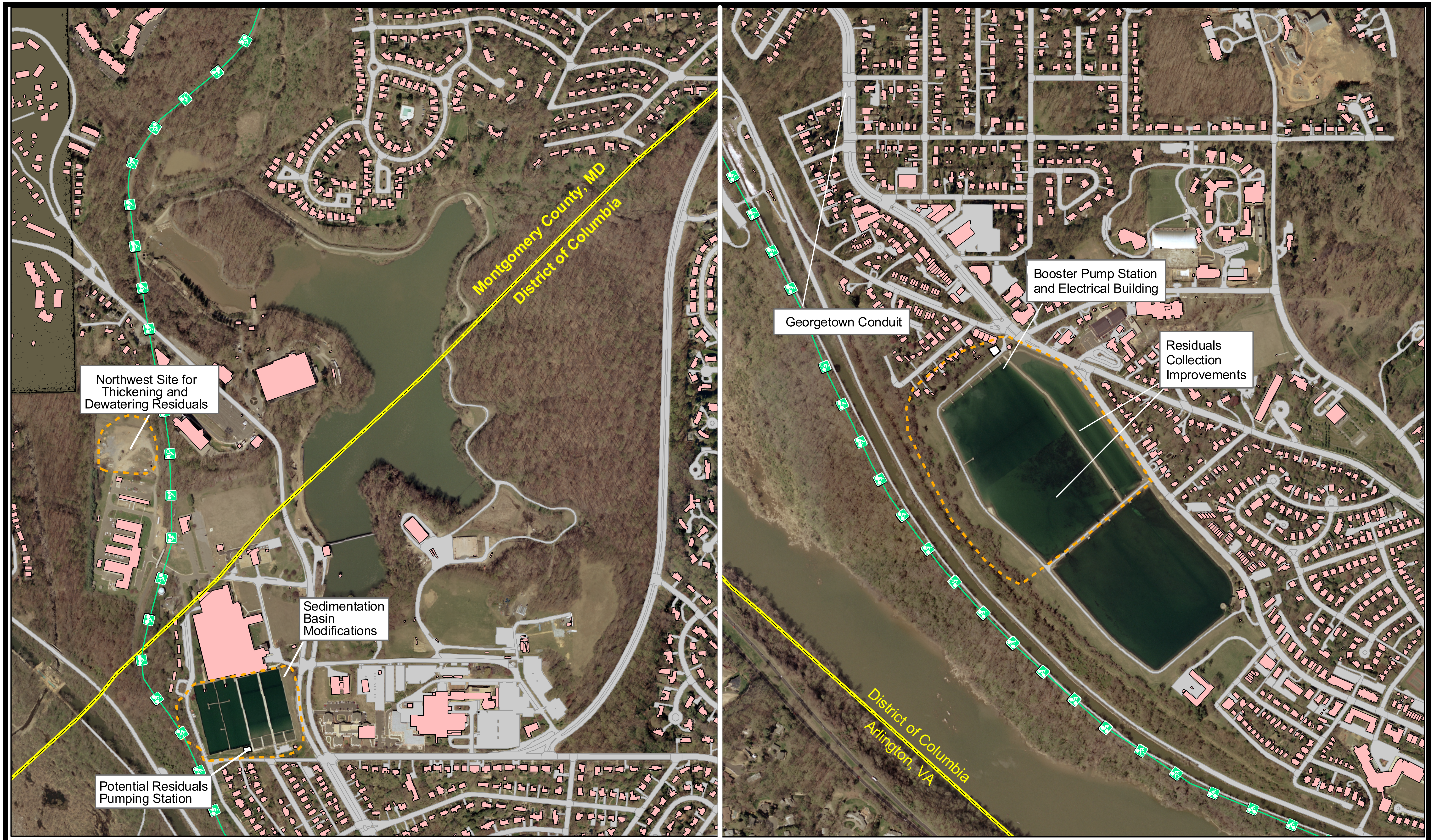


Figure 2-1
Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill



Legend

- Area of Site Modifications
- District Boundary
- Existing Buildings
- Roads
- Capital Crescent Bike Trail

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0 300 600 1,200 Feet

Figure 2-2
Dewatering at Northwest Dalecarlia Processeing Site and Disposal by Trucking

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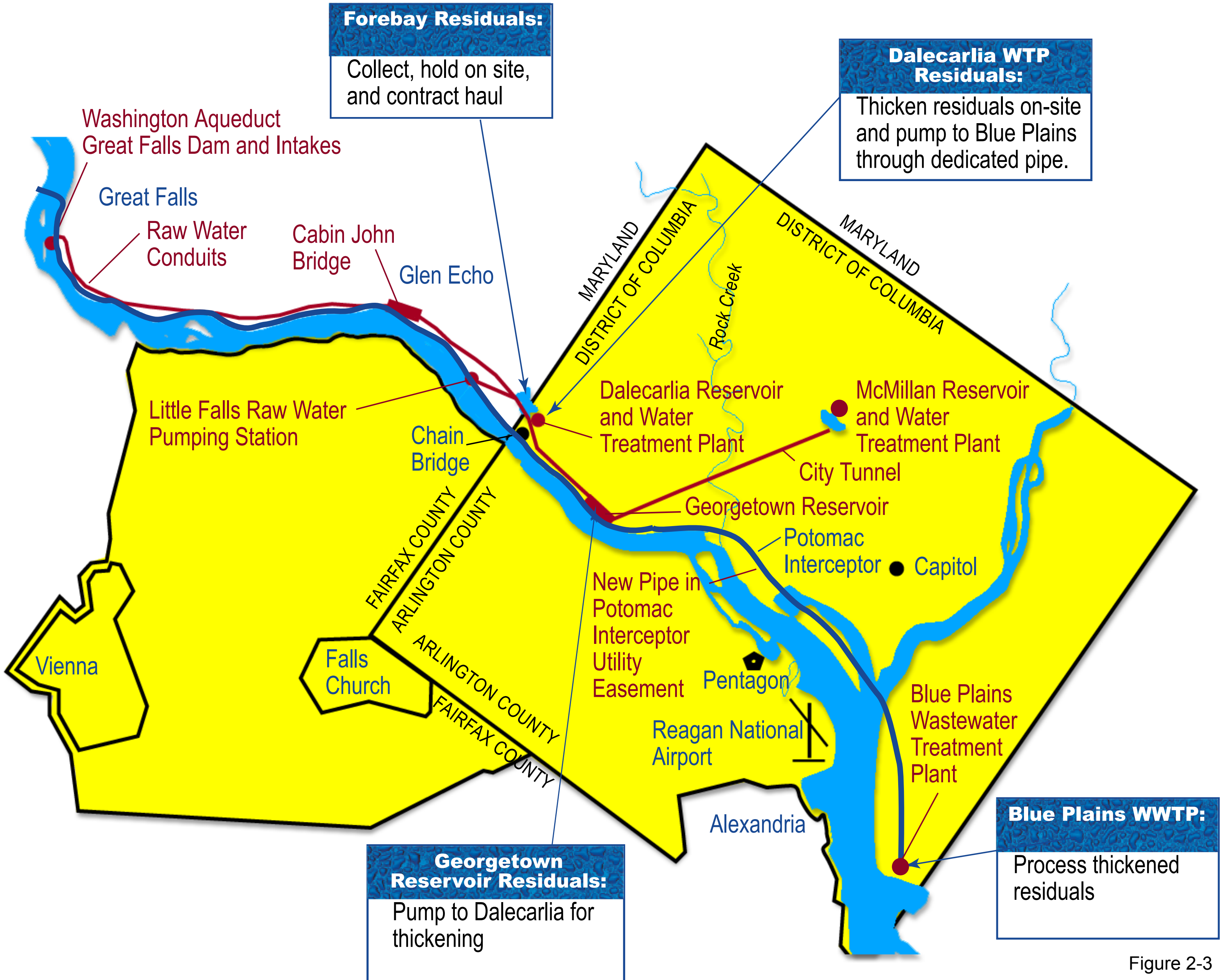
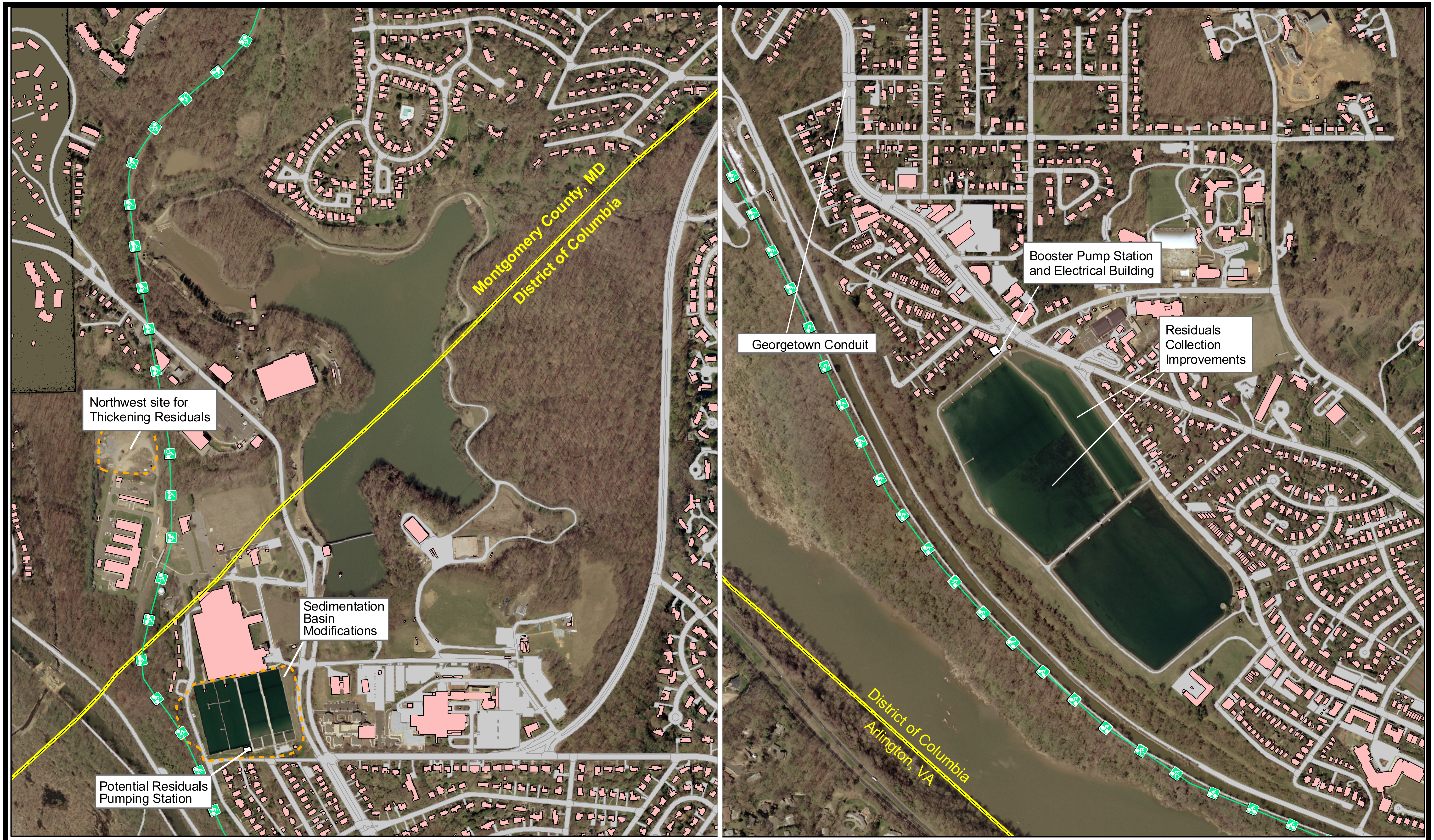


Figure 2-3
Overview of Alternative C
Thickening and Piping to Blue Plains AWWTP



Legend

- Area of Potential Facilities
- District Boundary
- Existing Buildings
- Roads
- Capital Crescent Bike Trail

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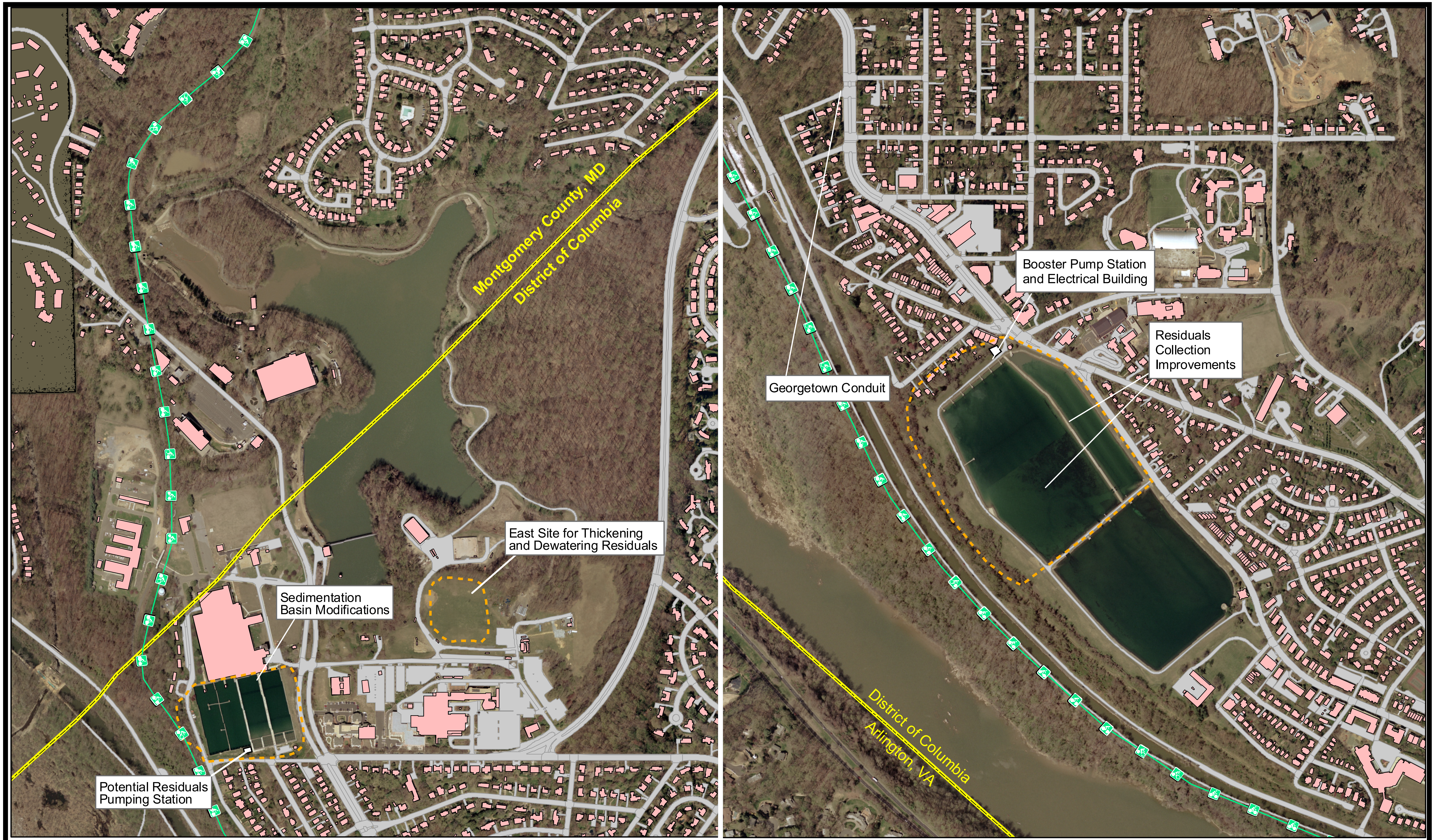
Figure 2-4
Thickening and Piping to Blue Plains AWWTP



Legend

- Area of Potential Modifications
- District Boundary
- Existing Buildings
- Roads
- Capital Crescent Bike Trail

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0 300 600 1,200 Feet

Figure 2-5
Dewatering at east Dalecarlia Processing Site and Disposal by Trucking

SECTION 3

Existing Conditions

This section presents an existing conditions evaluation for the resources potentially impacted by the proposed action. Each resource has a defined area of influence, determined in part by the location of the alternatives under consideration and in part by how data is collected and analyzed to regulate the resource. Some resources are evaluated on a regional basis, while others are evaluated on a more localized level. For example, the area of influence for air quality is the Metropolitan Washington Interstate Air Quality Control Region (AQCR), which includes the District of Columbia and portions of Maryland and Virginia, while the area of influence for soils, geology, and groundwater includes specific locations being evaluated for alternative development. Existing conditions for each resource are presented in this section, providing the basis against which potential impacts are identified and presented in Chapter 4.

The resources in this section are:

- Land use
- Noise
- Air quality
- Aquatic resources
- Biological resources
- Cultural resources
- Hazardous, toxic, and radioactive substances
- Soils, geology, and groundwater
- Infrastructure
- Transportation
- Visual resources
- Social and economic resources, including Environmental Justice and Protection of Children

Cost, implementation uncertainty, land application, and public health are resource areas evaluated under the impacts section of this document. The subject matter for these resource areas relates only to the residuals management alternatives under consideration. They do not have an existing condition independent of the proposed residuals management activity and are therefore not evaluated within this section of the DEIS.

3.1 Land Use

3.1.1 Regional Context

The Washington Aqueduct Residuals Treatment and Management project (Project) components are generally located along the Potomac River, in Northwest Washington DC and Montgomery County, Maryland (Figure 1-1). The main components of the project—including the Dalecarlia Reservoir property, the Dalecarlia Water Treatment Plant (WTP), the Potomac Interceptor pipeline route, and the Blue Plains Advanced Wastewater Treatment Plant (AWWTP)—exist in the proximity of areas characterized by residential, commercial, and federal "Open Space" uses. These land uses are depicted in Figures 3-1, 3-2, and 3-3, respectively.

3.1.2 Dalecarlia Reservoir Property

3.1.2.1 Historic Land Uses

A portion of the East Dalecarlia Processing Site, approximately 10 acres, was formally used for housing storage of outdoor maintenance equipment. The complex included buildings such as a paint shop, vehicle maintenance, and outdoor equipment storage area that were used for Washington Aqueduct operational activities. Photographic images of this area are presented in Volume 2 of the DEIS. The complex was decommissioned in the 1970s and a portion of it was filled. This area is currently used to temporarily store Forebay residuals.

3.1.2.2 Present and Planned Land Uses

The Dalecarlia Reservoir property is located on the border of Washington DC and Montgomery County, MD, with portions of the site in each municipality. The property consists of a Forebay, the open water portion of the Reservoir, approximately 47 acres of mixed hardwood forest, and cleared areas hosting warehousing, parking, and other operational facilities. A maintained dirt road follows the eastern perimeter of the reservoir and provides access to the Forebay site by Aqueduct personnel only. Much of the area surrounding the reservoir within the property bounty is characterized as "Permanent Open Space, Buffer, and Reservoir Protection" (USACE, 1983).

One small portion of the property contains a temporary, non-Aqueduct use. This area, across Little Falls Road from Sibley Memorial Hospital, currently hosts the administrative office trailers for USACE's American University Experiment Station (AUES) Formerly Used Defense Site (FUDS) investigation and remediation project. In recognition of the historic maintenance uses and in support of continued water treatment activities the national planning act of 1946 (administered by NCPC) supports development. An update to the master plan will be required if residuals processing facilities are planned for the East Dalecarlia Processing Site.

The Dalecarlia Reservoir property's future land use plans are focused on continued water treatment activities, which are compatible with the following Comprehensive Plan for the District of Columbia goals:

> "It is the goal of the District to assure the efficient use of land resources within legal, economic, fiscal, environmental, and other public policy constraints to meet

> neighborhood, community; and District-wide needs, and to help foster other District goals." (District of Columbia Office of Planning [DCOP], 2004).

Generally speaking, the reservoir property is bordered by residential land use along most of its northern and eastern portions and commercial services along its southern and western portions. The property's northern border is shared by Little Falls Park and a portion of the Westmoreland Hills residential area. The Dalecarlia Parkway forms the eastern border. Little Falls Road and Sibley Memorial Hospital form the southern border and MacArthur Boulevard forms the western border of the property. The facilities and buildings of the Dalecarlia Water Treatment Plant lie on the other side of MacArthur Boulevard from the Reservoir Property.

Adjacent land uses also include government-owned recreational areas, such as public access pathways and forested lands that surround the facility, shown in Figure 3-1. Sibley Memorial Hospital is planning a new 8-story office building and evaluating its potential location. This building would not be located on property owned by the Washington Aqueduct, so future Washington Aqueduct plans should not conflict with those of the Hospital.

3.1.2.3 Adopted Plans and Goals of the Community

The border between the District of Columbia and Montgomery County, Maryland, bisects the reservoir property from northeast to southwest. The Dalecarlia Reservoir property is zoned as Government by the District of Columbia Office of Zoning (DCOZ, 2004) and by the Montgomery County Maryland Office of Zoning (Montgomery County, 2004). Areas adjacent to the Washington Aqueduct property are zoned as Government and Residential (ranging from Single Family Detached Dwellings to Low Density Apartments).

3.1.3 Dalecarlia Water Treatment Plant

3.1.3.1 Present and Planned Land Uses

The facilities and buildings comprising the Dalecarlia WTP property are located immediately south and west of the Dalecarlia Reservoir site. This site is bordered by a mix of residential and commercial office uses immediately to the north, by MacArthur Boulevard (and beyond that, the Reservoir property described above) to the east, by residential uses to the south, and by woodland to the west. The property is characterized as commercial services and maintained as developed land in a campus-like setting. A portion of the Capital Crescent Trail passes through this property on an approximately north-south axis. The property, including specific layouts of the facilities that make up the WTP, can be found in the EFS (Volume 4 of this DEIS) and in the figures in Section 2 of the DEIS.

Adjacent land uses in the vicinity of the Dalecarlia WTP include residential, mixed forest, commercial services, and government-owned recreational areas. The land forming the western border of the property slopes through woodland area down to the residential community of Brookmont on the Maryland side of the property and directly to the Clara Barton Parkway/Canal Road on the District of Columbia side. Palisades Park and the Potomac River lie directly to the west of the parkway.

Figure 3-1 illustrates these varying land uses near the reservoir and the plant. As previously discussed, the Washington Aqueduct also characterizes much of the area surrounding the WTP as "Permanent Open Space, Buffer, and Reservoir Protection" (USACOE, 1983).

3.1.3.2 Adopted Plans and Goals of the Community

The District of Columbia Office of Zoning (DCOZ) and Montgomery County, Maryland Office of Zoning both zone the Dalecarlia WTP as Government (DCOZ, 2004). The zoning of these parcels is incorporated into the existing land use classifications.

Future land use plans for the Dalecarlia WTP are focused on continued water treatment activities compatible with the land use goals in the Comprehensive Plan for the District of Columbia.

As previously discussed, Sibley Memorial Hospital is planning a new office building. The location for this 8-story building is still under evaluation, but would not require property owned by the Washington Aqueduct. Future Washington Aqueduct plans should not conflict with those of the Hospital.

3.1.4 Pipeline Route from Dalecarlia to Blue Plains AWWTP (Potomac Interceptor)

3.1.4.1 Present and Planned Land Uses

This pipeline would parallel the route of the existing Potomac Interceptor, which currently transports materials to the Blue Plains AWWTP.

The existing Potomac Interceptor travels in an easterly direction from west of the Dalecarlia Reservoir, and continues just south of the Dalecarlia Reservoir, south of the Georgetown Reservoir, south of Georgetown University, through West Potomac Park, south of the Lincoln Memorial and the Tidal Basin, and through East Potomac Park. It then crosses under the confluence of the Anacostia River and the Potomac River, continues in a southerly direction within the boundaries of the Naval Air Station, and crosses Bolling Air Force Base and the Naval Research Laboratory prior to reaching the Blue Plains AWWTP.

Between the Dalecarlia Reservoir and the Blue Plains AWWTP, the Potomac Interceptor traverses federal historic, recreational, and monument use areas, parks, and parklands, including Palisades Park, West Potomac Park, and East Potomac Park. Additional land uses traversed by the Potomac Interceptor include residential and commercial areas as shown in Figures 3-2a, 3-2b, 3-2c, and 3-2d. According to the DCOZ, the Potomac Interceptor traverses two primary zoning areas—government and mixed residential/commercial (DCOZ, 2004).

In 2003, the National Capital Planning Commission (NCPC) released its *South Capitol Street Urban Design Study*, which proposes several potential scenarios for the revitalization of the South Capitol Street corridor and the Southeast Waterfront, including three detailed ideas for the street and for the open space and bridge alignment at the terminus of the Anacostia waterfront (NCPC, 2004). Additional studies have identified opportunities to increase Washington, DC waterfront areas, including those along the Potomac and Anacostia Rivers. The NCPC has also published a document, *NCPC Strategic Plan 2004-2009*, outlining the Commission's goals over the next several years.

3.1.4.2 Adopted Plans and Goals of the Community

The NCPC's *Comprehensive Plan for the National Capital* outlines the most significant factors in the planning of the national capital, including Federal Workplace, Foreign Missions and International Organizations, Transportation, Parks and Open Space, Federal Environment, Preservation and Historic Features, and Visitors (NCPC, 2004). According to the NCPC, "the Federal Elements of the Comprehensive Plan are linked by three guiding principles and by themes that have emerged within these principles. The three guiding principles are: (1) accommodating federal and national capital activities; (2) reinforcing smarter, more coordinated growth; and (3) supporting coordination with local and regional governments in the National Capital Region to promote mutual planning and development objectives" (NCPC, 2004).

3.1.5 Blue Plains AWWTP

3.1.5.1 Present and Planned Land Uses

The Blue Plains AWWTP is located in southern Washington, DC, and is bordered by the Potomac River to the west, Bolling Air Force Base to the north, and Interstate 295 to the east. The Blue Plains AWWTP is the largest advanced wastewater treatment plant in the world, having a capacity of 370 million gallons per day (mgd) and a peak capacity of 1.076 billion gallons per day and covering 150 acres (District of Columbia Water and Sewer Authority [DC WASA], 2004). Wastewater is collected by the DC sewer system, added to that from the Maryland and Northern Virginia suburbs, and delivered to the Blue Plains AWWTP.

Land use at the Blue Plains AWWTP is characterized as Commercial Services. Land uses in the vicinity of the WWTP include residential, government, transportation, and industrial. These land uses are illustrated in Figure 3-3.

According to DCOZ, the Blue Plains AWWTP and associated facilities are located in an area zoned as High Bulk Commercial and Light Manufacturing (DCOZ, 2004). Surrounding areas are zoned as Government and Low Bulk Commercial and Light Manufacturing.

Future land use plans for the facility are focused on the continued facility operations, which are compatible with the previously discussed goals of the Comprehensive Plan for the District of Columbia's Land Use element. DC WASA and the Metropolitan Council of Governments (MWCOG) confirmed the future land use plans for the Blue Plains AWWTP land, as presented in the Appendices to this document.

3.2 Noise

The primary source of noise surrounding the Dalecarlia WTP, the Dalecarlia Reservoir near Sibley Memorial Hospital, and Georgetown Reservoirs is vehicular traffic on surrounding roads and highways. Other sources of noise in these areas include aircraft noise (when wind comes from the south requiring air traffic from Regan National Airport to fly over the plant sites), emergency vehicles traveling to Sibley Memorial Hospital and other local hospitals and activities associated with grounds maintenance and mechanical equipment at neighboring office buildings.

To assess existing noise levels, a noise monitoring survey at select locations was performed on July 12, 2004. The survey was conducted in accordance with the District of Columbia Municipal Regulations (DCMR), Title 20, Chapter 29 Noise Measurement Test Procedures. Field measurements of noise levels were conducted in a manner consistent with ANSI S1.13, *Measurement of Sound Pressure Levels in Air*. The sound level meter was set to the "A"-weighted filter response and to the "slow" time-constant meter settings. Four locations were selected for monitoring: three near the Dalecarlia WTP and Reservoir sites and one near the Georgetown Reservoir. Sampling locations are shown in Figure 3-4, and sampling results are listed in Table 3-1 as well as provided in the Appendices. Three 15-minute daytime monitoring events were conducted at each location and two nighttime monitoring events were conducted at three of the four locations. Nighttime noise level measurements were not taken along the bike path.

TABLE 3-1
Summary of Existing Ambient Noise Levels at Sensitive Locations Around the Proposed Project Sites

Monitoring Locations	Day L_{AVG} (dBa)	Day L_{MAX} (dBa)	Night L_{AVG} (dBa)	Night L_{MAX} (dBa)
Dalecarlia Reservoir				
Residential Area (Windward Place)	38.3	80.0	<40	76.7
Recreational Area (Bike Path)	55.6	84.4	ND	ND
Roadway (Loughboro Road)	64.4	91.7	58.5	86.1
Georgetown Reservoir				
Residential Area (Hutchins Place)	<40	79.6	<40	72.8

dBa = decibels, acoustic
L_{AVG} = Average noise level over the 15-minute study period.
L_{MAX} = Maximum noise level during any 1-minute period.
ND = No data—monitoring was not conducted at this location during the nighttime period.

The residential area along Windward Place is just off MacArthur Boulevard and overlooks theproposed project site. As depicted in Figure 3 -4, this area represents the closest residential receptor to northwest Dalecarlia processing site associated with Alternatives A, B, C and D. Daytime noise levels were influenced by truck traffic along MacArthur Boulevard and air traffic overhead. Nighttime noise level measurements were influenced by the on/off cycling of air conditioning systems.

The closest public access to the northwest Dalecarlia processing site is the bikeway that runs though the Dalecarlia property. Daytime noise level measurements only were taken at this location. Noise level measurements at this site were influenced by airplanes overhead and mechanical equipment at nearby office buildings.

Loughboro Road may be a primary access route for truck traffic entering or leaving the proposed northwest Dalecarlia site dewatering facilities. The road goes up a gradient; daytime and nighttime noise levels were strongly influenced by car, truck, bus, and motorcycle traffic climbing this grade.

Little Falls Road may also be a primary access route for truck traffic entering or leaving the proposed dewatering facilities for Alternatives B or E. Traffic on this road is usually limited to vehicles seeking parking access or delivering services to the hospital. Background noise measurements were not made along Little Falls Road. However, existing noise levels are likely to be lower than those observed along Loughboro Road because it is not a primary roadway and the traffic load is less. Background noise levels measured along Windward Place are likely to be lower than those expected along Little Falls Road, so the Windward Place measurements were used to assess incremental noise impacts.

The residential area along Hutchins Place, noise monitoring location near the Georgetown Reservoir (Figure 3-4), is the closest residential area to proposed construction at this site. Daytime and nighttime noise level measurements were similar to those recorded along Windward Place. Vehicle traffic and airplanes traveling overhead were the primary noise influences.

New facilities construction and treatment process operations may contribute to background noise levels for various alternatives. Some sounds may be broad-spectrum sounds, which have no specific frequency, such as a jackhammer. Others may be pure tones—specific frequency sounds that can be heard through background noise—such as the back-up beeper on a truck. Potential noises that may be associated with the proposed alternatives are discussed in Section 4.

Construction activities will comply with Chapter 28 of the DCMR details of construction in residential zones. Daytime (7:00 am to 7:00 pm) noise levels on any weekday are limited to 80 dBa as measured 25 feet from the outermost limits of the construction site. Noise from construction is not permitted in residential areas on Sundays or legal holidays or from 7:00 pm to 7:00 am.

3.3 Air Quality

Regional air quality and air pollution in the Metropolitan Washington Interstate Air Quality Planning Region is regulated by U.S. Environmental Protection Agency (USEPA) using two sets of criteria: National Ambient Air Quality Standards (NAAQS) and General Conformity.

3.3.1 National Ambient Air Quality Standards

The Clean Air Act (CAA) and its associated 1977 and 1990 amendments established NAAQS for six criteria pollutants: lead, carbon monoxide (CO), nitrogen dioxide, sulfur dioxide, particulate matter and ozone. The NAAQS established primary standards at concentrations that protect human health and secondary standards that protect the public welfare—particularly vegetation, livestock, building materials, and other environmental elements. These standards are periodically reviewed and revised, if necessary, as is currently being done for particulate matter and ozone.

The Washington, DC area is in attainment for all criteria pollutants except ozone. This means that the measured values for these criteria pollutants are below the air quality standards. The 1990 amendments to the CAA categorized the nation's non-attainment ozone areas into five groups, based on increasing severity of exceedance of the standard: marginal, moderate, serious, severe, and extreme. The DC area is designated as being in severe non-attainment for ozone.

An interstate planning area was developed called the National Capital Interstate Air Quality Control Region (AQCR) to reduce ozone concentrations and bring the Washington, DC area into compliance. To bring the AQCR into compliance the states and district included in this area are tasked with developing a plan by November 17, 2005. The implementation plan must outline specific measures to be taken and a means of monitoring progress toward attainment.

3.3.2 General Conformity

Section 176(c) of the 1990 CAA amendments requires that federal actions conform to applicable state implementation plans, ensuring that the actions do not interfere with strategies developed for NAAQS attainment. The USACE Washington Aqueduct management alternatives for water treatment plant residuals are considered a federal action. This action must not interfere with the National Capital Interstate AQCR's established plans to attain ozone ambient air quality standard compliance. If the total direct and indirect emissions calculated for each non-attainment or maintenance area pollutant are below the de minimis threshold levels established in 40 CFR 93.153 of the State Implementation Plan (SIP), the project is presumed to conform to the regional implementation plans.

3.3.3 Emissions Inventory for Washington Aqueduct

The most recent air emissions inventory for the Dalecarlia Reservoir and Little Falls Raw Water Pump Station is summarized in Table 3-1. This table shows that the existing facilities are a minor source of air emissions, contributing less than 1 ton per year for all pollutants, with the exception of volatile organic compounds, which contribute less than 3 tons per year. Ozone is not listed in this table because, although it is measurable in the atmosphere, it is not measurable as an emission. Instead, two of its primary precursors are measured: nitrogen oxides and volatile organic compounds.

The de minimis threshold levels for the region's SIP, as listed in 40 CFR 93.153, are also listed in Table 3-2. If the total air emissions (the sum of all individual sources) of an alternative are less than the de minimis level, that alternative is presumed to be in conformance with the state implementation plans and will not adversely affect plans to bring the region into compliance with the NAAQS.

TABLE 3-2
Estimated Actual Emissions for Calendar Year 1999 from Stationary Sources at the Washington Aqueduct Division
Dalecarlia and Georgetown Reservoirs

Pollutant	Dalecarlia WTP and Little Falls Raw Water Pump Station	Criteria Pollutant de minimis Threshold
Particulate Matter (PM)	0.15 tons/yr	100 tons/yr
Carbon Monoxide (CO)	0.22 tons/yr	100 tons/yr
Sulfur Dioxide (SO_2)	0.53 tons/yr	100 tons/yr
Nitrogen Oxides (NOx)	0.45 tons/yr	25 tons/yr
Volatile Organic Compound (VOC)	2.74 tons/yr	25 tons/yr
Lead (Pb)	0.000018 tons/yr	25 tons/yr

Source: "1999 Air Emissions Inventory for U.S. Army Corps of Engineers Washington Aqueduct Division", prepared by Air Force Institute for Environmental Safety and Occupational Health Risk Analysis, Air Quality Branch, May 2000.

3.4 Aquatic Resources

This category focuses primarily on the Potomac and Anacostia rivers and contains descriptions of the respective river systems' hydrology and hydrodynamics; water quality; sediment quality; and aquatic resources, including the benthic community, fisheries, essential fish habitat (EFH), and submerged aquatic vegetation (SAV). A summary discussion of the shortnose sturgeon (SNS) is presented in the Aquatic Special Status Species section. This discussion is relevant for its role in the National Pollutant Discharge Elimination System (NPDES) permit renewal. "Aquatic resources" also addresses river navigation, floodplains, and whether the rivers qualify for special designations, such as American Heritage River (AHR) or Wild and Scenic River (WSR).

3.4.1 Aquatic Special Status (Rare, Threatened, and Endangered) Species

There are three federally threatened and endangered aquatic species that potentially use the Potomac drainage area: shortnose sturgeon, dwarf wedge mussel (DWM) and Hay's Spring Amphipod.

Shortnose Sturgeon

As part of the NPDES permit renewal for the Dalecarlia WTP discharges, USACE coordinated with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) regarding the federally endangered fish species (shortnose sturgeon) within the project area. Historical records of shortnose sturgeon from the Potomac River suggested the presence of the species in the Potomac River near Little Falls in 1899. There were no other records of the species until after the institution of the Atlantic Sturgeon Rewards Program in 1996. After that time, six shortnose sturgeon were taken in the lower river, 55 to 123 miles downstream of the project area. In addition to implementing the rewards program, USFWS conducted two sampling studies in the Potomac River, approximately 30 to 74 miles downstream of the Dalecarlia WTP. In 4,590 hours of gillnetting, no shortnose sturgeon was captured. Seventy-seven hours of gillnetting were also conducted in the vicinity of Little Falls but yielded no shortnose sturgeon. However, the area near Little Falls is considered by NMFS to be consistent with the preferred spawning habitat for shortnose sturgeon (NMFS, 2003).

Informal consultations began in spring of 2001 and formal consultations began in June 2002, when USEPA submitted a biological evaluation (BE) to NMFS. The BE included data from site-specific water quality studies and the results of the Potomac River shortnose sturgeon studies and other shortnose sturgeon studies in the Chesapeake Bay. NMFS rendered their final biological opinion (BO) on shortnose sturgeon relative to the Dalecarlia WTP discharges on July 15, 2003. Based on available information, the July 2003 BO concluded that "for the purposes of this analysis, National Oceanic and Atmospheric Administration (NOAA) Fisheries has made the precautionary assumption that shortnose sturgeon are present and spawn near Little Falls, and as such, may be affected by the Aqueduct's discharges" (p. 16). Consequently, the species is considered to be potentially present in the project area. Also, discharges may occur during high river flow periods in the spring when the adults would be making spawning migrations or when early life stages of the species may be in the river. NMFS does not believe that Dalecarlia WTP operations would interrupt spawning migrations but is concerned that the discharge plumes might impact early life stages that may be in the river (NMFS, 2003).

The BO indicated that a discharge by the Dalecarlia WTP during the shortnose sturgeon spring spawning period (defined as 1 March–15 May) might adversely affect shortnose sturgeon eggs and larvae, but is not likely to jeopardize the continued existence of the Chesapeake Bay shortnose sturgeon population. To avoid any discharges during this period of time, several special permit conditions were specified and have been incorporated by USEPA into the final NPDES permit.

Dwarf Wedge Mussel

The DWM (*Alasmidonta heterodon*) is a bottom dwelling freshwater mussel. As summarized in the Virginia Fish and Wildlife Information Service database (2005), the species is usually found in sand, firm muddy sand, and gravel bottoms in rivers with slow to moderate currents. They are typically buried in the substrate in shallow riffle and shoal areas, and require a silt-free and stable streambed to survive. Moser (1993) states that hey have been collected in three smaller tributary streams in the Potomac River drainage basin (McIntosh Run in St. Mary's County, MD; Nanjemoy Creek in Charles County, MD; and Aquia Creek in Stafford County, VA). Because the DWM requires a nearly silt-free environment, the Potomac mainstem in the study reach is not considered to be suitable habitat for the species.

Hay's Spring Amphipod

Hay's Spring amphipod (*Stygobromus hayi*) is one of three federally listed species for the District of Columbia (the other two are discussed in the Terrestrial Resources section). Hay's Spring amphipod is only known from one population in Washington, DC, that inhabits an underground aquifer in an urban area. The animal has been collected from a single spring at the south end of National Zoological Park DC and at four other locations within Rock Creek Park, which adjoins the National Zoo. The Hay's Spring amphipod inhabits a ground water outlet that feeds into a low gradient creek. The species is restricted to subterranean groundwater habitats, and are characterized by their limited dispersal ability, their geographic isolation, and their restriction to groundwater aquifers. This aquatic crustacean's survival has been threatened by habitat modification from flooding and construction activities and by over-collection for scientific purposes (USFWS 2005). The Hay's Spring Amphipod is not expected in the Potomac mainstream within the study reach.

3.4.2 Potomac River

For the purposes of this aquatic assessment, the project area is defined as that part of the mainstream Potomac River below Little Falls Dam, downstream to the Arlington Memorial Bridge (approximately 5.5 miles), as seen in Figure 2-1. For its entire length, except for the reach that runs through Washington, DC, the Potomac River lies within the state of Maryland and is managed by the Maryland Department of Natural Resources (MDNR) and the Maryland Department of the Environment (MDE). Within Washington, DC, the river's resources are under federal jurisdiction and are managed by the National Park Service (NPS) and the DC Department of Health (DC DOH).The riverine portions of the project area lie in the District of Columbia, except the uppermost reaches, which are in Maryland.

Hydrology/Hydrodynamics

The Potomac River drains more than 14,670 square miles of the mid-Atlantic coastal region, and can be divided into four zones: free-flowing, tidal freshwater, transition, and saline. The Potomac River is free-flowing for approximately 300 miles, from its West Virginia headwaters in the Appalachian Mountains to the fall line at Chain Bridge, approximately 1.5 miles below the Little Falls dam in Washington, DC. From this point to the Chesapeake Bay, the river is influenced, to varying degrees, by tidal currents. The freshwater tidal zone extends approximately 40 miles from the Chain Bridge downstream to Quantico, Virginia. The transition zone extends from Quantico, downstream, to the Route 301 bridge. In this zone, the freshwater of the upper Potomac mixes with the saline water of the lower Potomac, and salinity can range from 0 to 7 parts per thousand (ppt). The area south from the Route 301 bridge to the Chesapeake Bay is the most saline portion of the river, with average salinity ranges between 7 and 11 ppt.

Most of the project area is in the freshwater tidal zone with salinity lower than 0.5 ppt, particularly in the upper reaches near Little Falls. This region is strongly influenced by the flow of the upper Potomac and deeper areas in the downstream reaches of this freshwater tidal zone are subject to inflows of heavier, slightly more saline water from the Chesapeake Bay. Within the project area, the Potomac is generally free flowing with some minor tidal influence.

Aquatic habitat mapping of the reach revealed that bottom conditions and depths are quite variable. The river immediately below Little Falls is dominated by boulder and large cobble substrates; the banks are steep and rocky and the current is turbulent and fast moving. Depths in this reach are 6 to 20 ft. Boulders and cobbles also dominate the thalweg throughout much of the project area, with varying degrees of embeddedness and fines deposition. The stream margins, particularly along the northeast shoreline and backwater areas, are more deeply embedded, to the point that sands and fines become the dominant substrate. Depths range from 6 ft in the wider areas to 45 ft or more in the narrow reaches, with the wider areas typically of more uniform depth. Substrates around Roosevelt Island transition to gravel with significant mud deposition in some places, particularly on the southwest side of the island (adjacent to Virginia), where depths only range from 3 to 11 ft and currents are lower than the main channel of the River. Although this area is the most likely to be tidally influenced, the tidal range is generally less than 0.3 ft under normal conditions.

Previous studies in the project area looked at sediment deposition and accumulation (EA Engineering, Science, and Technology [EA], 2001; Dynamac, 1992). Both reports found that a very large load of sediment naturally moves through the project area from the upstream watershed (the bed load of the Potomac), making sedimentation patterns dynamic. During the 20-year period (1980–1999), total suspended solids (TSS) were measured approximately monthly at Chain Bridge. As presented in EA (2001), the overall median TSS concentration was 15 mg/L with concentrations increasing rapidly at higher river flows (e.g., at 17,000 and 35,000 cfs, TSS concentrations increased to between 50 and 200 mg/L, respectively). Deposition from the current Dalecarlia WTP discharges was estimated using sediment transport models. For Outfall 002, the depositional footprint was estimated to be 1 mm thick in the outfall's immediate vicinity and decreased to approximately 0.02 mm downstream, in the vicinity of Roosevelt Island. For Outfall 003, the depositional footprint typically exceeded 1 mm in the first 350 m, exceeded 0.2 mm for approximately 2,500 m along the shallow, near-shore region downstream, and decreased to approximately 0.05 mm in the vicinity of Roosevelt Island (EA 2001). Sediment accumulations are short-lived in most parts of the study area and bottom sediments are being continually redistributed and transported downstream (Dynamac, 1992).

Water Quality

The most recent water quality assessment for DC indicates that Segment 3 (Chain Bridge to Key Bridge) is classified as Tidal Fresh Water. As presented in the District's water quality standards (21 DCMR §1101), the "current" designated uses for the Potomac River include: secondary contact recreation, aquatic life support, fish consumption, and navigation. However, according to the District's §305(b) report, this segment does not currently support fish consumption, and only partially supports secondary contact recreation (DC DOH 2002). More specifically, the segment is affected by elevated coliform levels, sediment toxics, and fish tissue contamination (DC DOH 2002). Dissolved oxygen, temperature, and pH were generally supportive of the aquatic life uses (i.e., they met the District's aquatic life standards). Swimming uses were not supported due to elevated fecal coliform levels, which were attributed to urban runoff and combined sewer overflow (CSO). Fish consumption uses were not supported and are detailed in the fisheries section below.

The U.S. Geological Survey (USGS) maintains a gauging station at Little Falls Dam, immediately upstream of the project area. Although river flow is measured instantaneously, other water quality parameters are monitored only intermittently. The USEPA investigated general water quality within the District as part of a larger Mid-Atlantic Integrated Assessment (MAIA) in 1997–1998 (USEPA, 2002). The findings indicated that nutrient enrichment within the project area was "fair," meaning that there is only a moderate risk of eutrophication and phytoplankton blooms; however, the deeper parts of the river within the study area are subject to severe hypoxia in the warmer months (USEPA, 2002).

Sediment Quality

The most recent sediment quality assessment for the District of Columbia indicates that, within Segment 3 (Chain Bridge to Key Bridge, the most upstream segment in the District), toxic compounds are present in sediments. Contaminants in this reach are attributed to urban runoff, CSO events, and adjacent industrial facilities (DC DOH, 2002).

USEPA investigated sediment quality further downstream (in Segment 2 below Arlington Memorial Bridge) as part of the MAIA performed in 1997–1998 (USEPA, 2002). Using effects range—low (ERL) or effects range—medium (ERM) guidance values, sediment quality was evaluated for potential ecological effects on biological organisms. ERL values are the lowest concentration of a contaminant that produces adverse effects in 10 percent of the data reviewed. ERM designates the level at which half of the studies reported harmful effects. Concentrations below the ERL value are not expected to elicit adverse effects, while levels above the ERM value are likely to be toxic. The constituents examined in this downstream depositional area included nine metals, polycyclic aromatic hydrocarbons, total polychlorinated biphenyls (PCBs), and dichloro-diphenyl-trichloroethane (DDT). Sampling occurred just downstream of the project area (below Arlington Memorial Bridge). For all contaminant groups, the Potomac's tidal freshwater reach sediment contamination rated "intermediate". This indicates that some contaminants are present in levels exceeding the ERL (so some biological impairment is likely) but below the ERM values. When sediment bioassays were conducted using the amphipod *Ampelisca abdita*, survival was good, at over 80 percent (USEPA, 2002).

Aquatic Resources

Because the Potomac within the project area is a large and dynamic riverine system, the most significant habitat features are described in the hydrology section. The river is free-flowing in the upper reaches of the project area and tidal (freshwater) in the downstream area around Roosevelt Island. Flows fluctuate seasonally (as described previously) and can increase dramatically as a result of significant precipitation in the watershed.

Throughout the project area, SAV, described below, occurs in most years and provides significant fish habitat. Except in the more quiescent areas along the margins and in coves/backwaters, substrates in the project area are rocky (cobble, boulder, gravel) with some fines accumulating along the downstream margins. Previous investigations found that sediment accumulations were short-lived in most parts of the study area and bottom sediments are continually being redistributed (Dynamac, 1992).

Benthic Community

A recent water quality assessment for DC indicates that within Segment 3 (Chain Bridge to Key Bridge) the benthic community is severely stressed (DC DOH 2002). Site-specific studies in the vicinity of the Dalecarlia WTP outfalls were conducted in 1991–1992 (Dynamac, 1992) and again in 2000 (EA, 2001). These studies found the benthic community to be characteristic of a disturbed, poor quality stream. The dominating organisms in the benthic community are tolerant of disturbance. No impact to the benthic community were found relative to the outfall discharges from settling basins relative to the stresses of the natural river conditions.

The substrate and flow conditions within some parts of the study area could support larger benthic invertebrates such as freshwater mussels. There are two ongoing studies that target identification and quantification of mussels in the area of Fletcher's Cove and over a larger area of the river in the vicinity of the Dalecarlia WTP. Preliminary findings indicate that certain species of freshwater mussels are a key component of the benthic community in this reach of the Potomac (USGS, 2004).

Fisheries

The Potomac River and its tributaries support a diverse fishery, including both recreationally and commercially important species. It serves as a spawning and nursery area for many fish species of regional importance and the SAV beds found throughout the river are an important foraging ground for juvenile and adult fish species.

Previous investigations of fisheries in the project area (EA, 2001) identified the following species of concern:

- Striped bass (*Morone saxatilus*)
- White perch (*Morone americana*)
- American shad (*Alosa sappidissima*)
- Blueback herring (*Alosa aestivalis*)
- Alewife (*Alosa psuedoharengus*)
- Yellow perch (*Perca flavescens*)
- Smallmouth bass (*Micropterus dolomieu*)

- Pumpkinseed (*Lepomis gibbosus*)
- Bluegill (*Lepomis macrochirus*)
- Channel catfish (*Ictalurus punctatus*)
- Brown bullhead (*Ameiurus nebulosus*)
- Shortnose sturgeon (*Acipenser brevisostrum*)

With the exception of shortnose sturgeon, all of these species have been documented recently and are expected to spend all or part of their life cycle within the project area. The project lies within the natural (known) spawning range or provides habitat suitable for many of the species including: white perch, American shad, alewife, blueback herring, pumpkinseed, bluegill, channel catfish, and brown bullhead. Striped bass and yellow perch spawn downstream of the project area. Beach seining studies of the area have also identified a variety of forage fish species typical of tidal freshwater systems in the area, including several shiner (*Notropis*) species, bluntnose minnow (*Pimephales notatus*), inland silversides (*Menidia beryllina*), bay anchovy (*Anchoa mitchilli*), banded killifish (*Fundulus diaphanus*), and several minnow species (Dynamac, 1992).

All of the species of concern, except shortnose sturgeon, support recreational fisheries within the study area. DC DOH also identified walleye (*Stizostedion vitreum*), blue catfish (*Ictalurus furcatus*), and hickory shad (*Alosa mediocris*) as species targeted by anglers (John Seimen, personal communication). Fishing occurs from shoreline sites and by boat. The bass tournaments in the Potomac normally occur further downstream, near Alexandria, Virginia. However, boat anglers do use most of the project area when flows are safe for navigation. Because of the very limited access to this segment of the river, Fletcher's Boat House, located upstream of the Chain Bridge, is the predominant point of origin for boat recreation within the project reach. Shoreline angling occurs throughout the project area, but it is greatest within Fletcher's Cove. Fletcher's Cove is one of the top three shore angling hot spots within the District of Columbia (John Seimen, DC DOH, personal communication). Analysis of SAV coverage versus fisheries resources near Roosevelt Island revealed a positive relationship between the two in terms of overall fisheries abundances, although fish diversity and harvestable largemouth bass abundances were unaffected by poor SAV densities (DC DOH, 2003).

Tissue samples from selected fish species taken within Segment 3 of the Potomac (Chain Bridge to Key Bridge) indicated elevated levels of several contaminants, including chlordane and PCBs. Therefore, this segment does not support fish consumption. Use and public health advisories are in place. The advisories urge nonconsumption of catfish, carp, and eels and limited consumption of other fish species.

Several fish species and one macroinvertebrate support commercial harvests within the Potomac River. These include blue crab (*Callinectes sapidus*), striped bass, white perch, largemouth bass, river herring and American shad. However, no commercial harvesting occurs within the District of Columbia or within the project area (John Seimen, personal communication).

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires Federal agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken that may adversely affect EFH under the Act. The Secretary of Commerce approved the first designations of EFH in the Northeastern United States on March 3, 1999.

With review of EFH it was determined that the Potomac River is designated as EFH for the following species and their life stages: summer flounder (*Paralichthys dentatus*), juvenile and adult life stages; bluefish (*Pomatomus saltatrix*), juvenile and adult life stages; windowpane flounder (*Scopthalmus aquosus*), juvenile and adult life stages; cobia (*Rachycentron canadum*), all life stages; red drum (*Sciaenops ocellatus*), all life stages; king mackerel (*Scomberomorus cavalla*), all life stages; and Spanish mackerel (*Scomberomorus maculatus*). (National Marine Fisheries Service, Northeast Region, Habitat Conservation Division EFH Web site, www.nero.nmfs.gov/ro/doc/hcd.htm.)

However, because of the low salinity (less than 0.05 ppt), the project area would not be considered EFH for the seven species that are currently managed by the MSFCMA in the lower Potomac River. The two species of concern in the middle reaches of the Chesapeake Bay are bluefish and summer flounder. While it is possible that noncritical life stages of these species could utilize the lower reaches project area, they would only be transients during the lowest flow periods. However, some of the preferred prey species for bluefish and summer flounder (e.g., alosids and juvenile white perch) do use the project area.

Submerged Aquatic Vegetation

The DC DOH (Fish and Wildlife Division) has conducted annual shoreline surveys of submerged Aquatic Vegetation (SAV) since 1993. These surveys supplemented the overflight data collected by the Virginia Institute of Marine Science (VIMS), surveying the tidal waters of the Chesapeake Bay. Since September 1991, overflights of the Washington, DC, area have been limited and shoreline surveys have become the most reliable source of information for this resource. Through the survey period, SAV bed densities have fluctuated considerably and seem to be directly related to stream discharges. In 2002, SAV distribution, abundance, and species diversity were the best on record for the Potomac and within the study area (DC DOH, 2003). However, little was found in 2003 (DC DOH, 2004), which was a year of record rainfall and river discharge/turbidity in the region (DC DOH, 2004).

Eight species of SAV occur within the District of Columbia. However, only seven are known to occur in the project area, defined as the Upper (Section 5) and Middle Potomac River areas (Section 6) in the District's surveys (DC DOH, 2003). The seven species are: hydrilla (*Hydrilla verticuillata*), water milfoil (*Myriophullum spicatum*), water stargrass (*Heteranthera dubia*), Coontail (*Ceratophyllum demersum*), wild celery (*Vallisneria American*), bushy pondweed (*Najas guadalupensis*), and brittle waternymph (*Najas minor*). Beds within the project area are predominantly associated with Roosevelt Island (approximately 2 miles downstream from the Georgetown reservoir), particularly the quiescent area along the south-southwest shoreline. The backwater and river margins of the main channel also support isolated SAV beds. Fletcher's Cove is one of the areas that typically support significant SAV acreage (Daniel Ryan, DC DOH, 2004 personal communication).

In 2002, the beds near Roosevelt Island covered 87 acres (DC DOH, 2003) with only about 10 acres elsewhere in the section (DC DOH, 2003). Only 1.2 acres were found around Roosevelt Island in 2003 (DC DOH, 2004). Prior to 2003, hydrilla was the dominant species (up to 90 percent of the composition) in most beds between Key Bridge and Arlington Memorial Bridge. Upstream of Key Bridge, water stargrass was the codominant species, constituting up to 50 percent of some beds. Total SAV acreage in the Upper Potomac (Section 5) was only approximately 7.4 acres in 2002 (DC DOH, 2003), but none was found in 2003 (DC DOH, 2004). Since 1993, the trend, for beds such as those around Roosevelt Island is to gradually increase in diversity and become slightly less dominated by hydrilla (D. Ryan, 2004 personal communication, DC DOH).

Floodplains

As described previously, high cliffs and rocky conditions along the Virginia shoreline dominate the banks of the Potomac River within the project area. The corresponding Maryland and DC shoreline is a wide floodplain with some freshwater wetlands. The width of the floodplain immediately adjacent to the Dalecarlia WTP facility is approximately 600 to 1,400 ft. Vegetation consists of typical floodplain and bottomland vegetation for the region, including sycamore, silver maple, green ash, common cottonwood, box elder, river birch, black willow, American elm, and black walnut. The Chesapeake and Ohio (C&O) canal and tow path run through the floodplain along the Maryland and DC shoreline. The disturbed areas have been invaded by a variety of non-native species, such as tree-of-heave, black locust, and a variety of understory plants including poison ivy, Virginia creeper, Japanese honeysuckle, and wild grape. The area between the Little Falls dam and Chain Bridge includes an area known as Chain Bridge Flats—this area is subject to intensive scouring and supports sparse vegetation and stunted trees (Dynamac, 1992).

The floodplain narrows downstream of the Dalecarlia WTP to the point where the river splits around Roosevelt Island. Downstream of this point, the land is fairly low-lying and the floodplain broadens to several miles wide in some places. Although the floodplain near the Dalecarlia WTP is mostly undeveloped, intensive shoreline development begins near Key Bridge and the floodplain in the lower project area is highly developed.

Most of the Dalecarlia WTP's operations are located above the floodplain. The only structures associated with existing operations that are currently located within the floodplain are intake facilities, a portion of the conduit and outfall structures.

American Heritage River

Executive Order (EO) 13061 was adopted in 1997 to aid states in protecting and restoring rivers and adjacent communities. The AHR initiative focuses on natural resource and environmental protection, economic revitalization, and historic and cultural preservation. The initiative accommodates use of existing federal resource agencies and programs to aid local grass-roots organizations in various initiatives to protect and restore river resources. The Friends of the Potomac River nominated the Potomac River and it was designated as an AHR in 1998.

Wild and Scenic Rivers

The WSR Act (16 U.S.C. 1271-1287) was adopted in 1968 to recognize that "certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." No reach of the Potomac River is designated as a WSR.

Navigation

The Potomac and Anacostia Rivers are the primary water transportation routes near the project area. Both routes are supported by the Federal Navigation Channel in the Potomac River downstream of Washington. The channels support waterborne commerce into Alexandria, Virginia, and, to a limited extent, to the District of Columbia. Within the Potomac River, no maintenance dredging occurs upstream of the confluence of the Anacostia River, and, although some naturally deeper areas occur upstream, commercial traffic ceases at the confluence of the Anacostia River (6 miles downstream of Dalecarlia WTP discharges).

3.4.3 Anacostia River

The Anacostia River enters into the tidal Potomac River approximately 7.5 miles downstream of Dalecarlia. The watershed is approximately 400 square kilometers and extends into two physiographic provinces (the Piedmont and Coastal Plain provinces) and three political jurisdictions (Washington, DC, and Montgomery and Prince George's Counties in Maryland). There are three major drainage areas in the watershed: the Northwest Branch, the Northeast Branch, and the tidal drainage.

Hydrology/Hydrodynamics

The total drainage area of the Anacostia River at its confluence with the Potomac River is 169.9 square miles. The Anacostia River contains two USGS flow gauges—one on the Northeast Branch at Riverdale, Maryland, and the second on the Northwest Branch near Hyattsville, Maryland. The daily average river flows at the two USGS gauges were obtained for the 21-year historical period from January 1979 to September 2002. The combined flows for the Northeast Branch and the Northwest Branch were scaled to estimate flows at the Washington Navy Yard site, which is located near the Anacostia's confluence with the Potomac River (about 1 mile upstream). These data yielded a mean annual flow of 91 cfs, with monthly mean flows ranging from 40 cfs in September to 149 cfs in March. NOAA tide tables for the area indicate that the mean tidal range at Washington DC is 2.8 feet and the spring tide range is 3.0 feet.

Erosion and sediment deposition have been continuing problems in the lower tidal portion of the Anacostia River for more than 100 years. Because the Anacostia River functions simila to a tidal lake, it is an efficient sediment trap, and an estimated 85 percent of the incoming sediment load remains trapped within the river. This deposition pattern has necessitated frequent sediment removal to maintain marina areas and navigation channels.

Water Quality

The most recent §305(b) water quality assessment for the District of Columbia indicates that Segment 01 (the lower segment of the Anacostia River from the Pennsylvania Avenue Bridge to the confluence with the Potomac River) is classified as Tidal Fresh Water. The designated uses include: primary and secondary contact recreation, aquatic life support, fish consumption, and navigation. However, as presented in DC DOH (2002), Segment 01 is adversely affected by elevated coliform levels, sediment toxics and sediment toxicity, low dissolved oxygen (DO), and fish tissue contamination (DC DOH, 2002). More specifically, 11.5 percent of the DO observations were in violation of aquatic life standards, 86 percent of the fecal coliform bacteria measurements were in violation of the primary contact recreation standard (swimming), and 35 percent were in violation of the secondary contact recreation standard. Further, because of fish consumption advisories, the lower Anacostia did not support its fish consumption use designation. The segment's navigation use designation was fully supported.

Based upon these water quality impairments in the lower Anacostia, Total Maximum Daily Loads (TMDLs) have or are being developed for numerous constituents, including: pesticides, metals, pathogens, organic enrichment, and priority organics.

DC DOH (2002) also documents floating debris, the presence of toxic chemicals in the sediments, elevated fish tissue concentrations of chlordane and PCBs, and a severely stressed benthic community.

Sediment Quality

The most recent sediment quality assessment for the District of Columbia indicates that toxic compounds are present in sediments within Segment 01 of the Anacostia (Pennsylvania Avenue Bridge to the mouth at the Potomac). Contaminants in this reach are attributed to urban storm water runoff, polluted upstream tributaries, CSO events, and adjacent industrial facilities (DC DOH 2002).

As noted in the District's §305(b) report, "surveys conducted over the past several years reveal the presence of toxics in sediments. Fish tissue samples of certain species show elevated levels of contaminants including chlordane and PCBs. Biological samples from the site suggest a severely stressed benthic community." Further, U.S. Fish and Wildlife Service studies have documented a prevalence of tumors and skin lesions in bottom feeding and bottom-associated fish species.

3.5 Biological Resources (Terrestrial)

Biological Resources encompasses a broad range of subjects. This section focuses on terrestrial resources, which include land-based special status species; flora and fauna found at the northwest and east processing sites, Dalecarlia WTP area, Dalecarlia Reservoir area, the Georgetown Reservoir and the land-based resources along the Potomac Interceptor pipeline route. Wetland resources are also included in this category.

Biological resources associated with aquatic ecosystems such as those found in the Potomac and Anacostia rivers, including special status species, are presented in the Aquatic Resources section.

3.5.1 Terrestrial Special Status (Rare, Threatened, and Endangered) Species

The Endangered Species Act (ESA) of 1973 and subsequent amendments provide for conservation of threatened and endangered species of animals and plants and the habitats in which they are found. Consultation regarding rare, threatened, and endangered (RTE) species has been initiated with the MDNR, the NMFS, and Fisheries Division of the DC Department of Health, and the Fisheries and Wildlife Division of the U.S. Department of Interior (USDOI), Fish and Wildlife Service (FWS). According to consultations with the MDNR and the FWS for previous projects, no threatened or endangered species are known to occur at the Dalecarlia or Georgetown Reservoir sites. The most recent Environmental Baseline Report prepared by USACE (USACE, 1994) states that, except for possible occasional transient individuals, no RTE species are known to occur at the Dalecarlia Reservoir.

For purposes of this analysis, lists of RTE species and Natural Heritage Program species for Washington, DC, and Montgomery County, Maryland were obtained from available public information. The District of Columbia currently has three federally listed species: Hay's Spring Amphipod (*Stygobromus hayi*) described under Aquatic Special Status Species (Section 3.4.1)—endangered; bald eagle (*Haliaeetus leucocephalus*)—threatened and proposed for delisting; and eastern puma (*Felis concolor cougar*)—endangered. According to the USFWS, no plant species of concern are listed in the District of Columbia. Montgomery County, Maryland also has three federally listed species: dwarf wedge mussel (*Alasmidonta heterodon*)—endangered; bald eagle—threatened and proposed for delisting; and a plant, small whorled pogonia (*Isotria medeoloides*)—threatened.

The bald eagle has been proposed for de-listing by the federal government, but is still considered threatened. The bald eagle is the second largest North American bird of prey, with an average 7-foot wingspan. It has a distinctive white head and white tail offset against a dark brown body and wings in adult birds. The shorelines of major creeks, rivers, and lacustrine areas provide valuable nesting, foraging, and loafing habitat for resident and migratory bald eagles. Throughout their range, they select large, super-canopy roost trees that are open and accessible, mostly conifers. They winter primarily in coastal estuaries and river systems (USFWS 2005). The decline of the bald eagle coincided with the introduction of the pesticide DDT in 1947. Eagles contaminated with DDT failed to lay eggs or produced thin eggshells that broke during incubation. Other causes of decline included shooting, trapping, and poisoning. Today, threats include loss of nesting habitat due to development along the coast and near inland rivers and waterways.

The eastern puma is described as a large, unspotted, long-tailed cat. Its body and legs are a uniform fulvous or tawny hue. Its belly is pale reddish or reddish white. Eastern puma is of the cougar family which feed primarily on deer, but their diet may also include small mammals, wild turkeys, and, occasionally, domestic livestock. No preference for specific habitat types has been noted. The apparent primary need is for a large wilderness area with an adequate food supply. Male cougars of other subspecies have been observed to occupy a range of 25 or more square miles and females of between 5 and 20 square miles (USFWS 2005).

The small whorled pogonia is generally found in open, dry, deciduous woods with acid soil. Flowering is inhibited where it occurs in habitat with relatively high shrub coverage or high sapling density. Flowering occurs from about mid-May to mid-June, with the flowers lasting only a few days to a week (USFWS Endangered Species Web site).

3.5.2 Terrestrial Resources

3.5.2.1 Dalecarlia Water Treatment Plant

The following sections provide descriptions of those areas within the Dalecarlia Water Treatment Plant and the Dalecarlia Reservoir properties that could potentially be affected by the project alternatives.

Residuals Thickening and Dewatering Facility at Northwest Dalecarlia Processing Site

The following observations were made based upon a site visit conducted by a study team biologist on March 5, 2004. The proposed Northwest Dalecarlia Processing Site for the Residuals Thickening and Dewatering Facilities is an open, previously disturbed area currently used to store materials. An 8-ft chain-link fence with barbed wire across the top surrounds the area. Inside this fence line, the area is covered by mowed and maintained turf. A gravel/dirt road runs into and around the perimeter of the area. Piles of dirt, sand, and gravel and stacks of piping exist around the perimeter. A small covered shed housing drums of waste oil is on the western side of the site. A pile of tree limbs and large dumpster containing wood debris are on the northern portion of the site.

Other than grass, there was no vegetation growing inside the fenced perimeter. A thin strip of mature trees, shrubs, and vines lies to the east of the site outside the fence line. To the north of the fence is a somewhat open grassy area, with a few scattered trees in the foreground and some evergreen shrubs and trees in the background. The grassy area appears to be regularly mowed. To the south of the fence, is a developed area with buildings, shed to house construction vehicles and supplies and the government fueling station. To the west of the fence is a large area of mature trees, shrubs, and vines. This area slopes downward to the west, eventually leading to the Potomac River. It is in this area that Little Falls Branch enters the Potomac. No surface water resources, such as small waterways or wetlands, were observed within or directly adjacent to this project area. Wildlife in this area consists only of typical urban wildlife such as squirrels, crows, mockingbirds, American robins, and other avian species.

Residuals Thickening and Dewatering Facility at East Dalecarlia Processing Site

The following observations were made during a site visit by on January 14, 2005. A portion of the site containing the AUES FUDS staging and office area is disturbed and has gravel areas used for storage, parking surrounding the trailers near the entrance gate, and temporary buildings scattered within the open field near the southern fence line facing Sibley Memorial Hospital. An open grassy field is northeast of the trailer units and runs along the majority of the eastern fence line. Mature woods surround the AUES FUDS staging and office area (outside the fence line) to the north and east. Approximately 20 to 30 mature trees are located within the fence line to the north, south, and west.

A small drainage swale is located between the site trailers and the gravel storage area to the west. The drainage flows under one of the access roads, which crosses through the middle of the AUES FUDS staging and office area. During the site visit there was almost no water in the swale, despite heavy rains.

A large ditch is located at the far southeast corner of the AUES FUDS project site. This ditch runs along the fence line facing Sibley Memorial Hospital and ends behind the trailers near the entrance gate. Mature trees, such as tulip poplar and red maple, are scattered among two to four feet of standing water. This ditch connects with a drainage swale that runs parallel to Dalecarlia Parkway before curving to the north/northwest to East Creek.

The former shop area is just inside the entrance road and is an open, grassy field where Forebay residuals were recently placed for drying and this area has scattered grasses and forbs along the edges. The center of this area contains disturbed soils and residuals. A small pond was observed at the northwest corner of this field. Rip-rap berms and silt fences are being used to capture the flow of the water from the open field into this pond. High water levels have created a large water flow causing water to cascade over the silt fence and down the northwest slope of the open field. This cascading water is causing erosion down the slope before entering a drainage channel that leads to east creek. This channel is lined with mature trees, including red maples (*Acer rubrum*), American sycamore (*Platanus occidentalis*), and some oak species. Seven mature white-tailed deer (*Odocoileus virginianus*) were seen at the East Dalecarlia WTP location. In addition to the deer, approximately 50 northern juncos (*Junco hyemalis*) were observed in the brush along the open grassy field.

Northeast and downslope of the field is a large storage building surrounded by storage for construction and maintenance activities. A large concrete pad with half walls approximately three feet high is located to the east of the storage building. This area is largely disturbed and the ground is covered in gravel. The area to the west of the storage building slopes steeply down to the Dalecarlia Reservoir. Large mature trees line the edge and the slope. There are no trees in the flat area surrounding the storage building or the concrete pad.

Sedimentation Basins

The following observations were made based on a site visit conducted by the study team biologist on March 5, 2004. The areas surrounding the sedimentation basins adjacent to the Dalecarlia Water Treatment Plant consist of mowed lawn and manicured trees and shrubs. This area is completely within the water treatment plant and is surrounded by an 8-ft chain-link fence with barbed wire across the top. To the west of this area, there is a large area of mature trees, shrubs, and vines which slopes downward to the west, toward the Potomac River. There are no natural areas, natural surface water resources, or wetlands observed within this project area. Wildlife in this area consists only of typical urban wildlife such as squirrels, Canada geese, crows, and other avian species.

Georgetown Reservoir

The following observations were made based upon a site visit conducted by the study team biologist on March 5, 2004. The Georgetown Reservoir consists of three large sedimentation basins surrounded by an 8-ft chain-link fence with barbed wire across the top. The area within the fence consists of a hard packed gravel road and mowed grass. There are no natural areas, natural surface water resources, or wetlands observed within this project area.

MacArthur Boulevard and a residential area are on the east side of the reservoir and a small residential neighborhood is on the north, with a small strip of mature trees between these two areas. The area to the west of the Georgetown Reservoir consists of a large area of mature trees, shrubs, and vines, which slopes downward to the west, toward the Potomac River.

Wildlife inside the fence consists only of typical urban wildlife such as squirrels, Canada geese, crows, and avian species. Geese were seen swimming in the reservoir. Although a nest was not seen, two bald eagles were observed circling above the southwestern corner of the site adjacent to the Potomac River.

Dalecarlia Monofill Site

The proposed monofill site would encompass a large portion of a deciduous hardwood forest located on the eastern side of the Dalecarlia Reservoir, shown in Figure 2-3. The area slopes westward toward the Dalecarlia Reservoir and Potomac River. The site includes some of the highest elevations on the property, which range from 200 to 250 ft above mean sea level, and the site abuts the highest elevation on the property 270 ft above mean sea level, adjacent to the Dalecarlia Parkway on the southwestern boundary (USACE, 1994). The site terrain is intersected by several east-west-oriented cuts between small, steep slopes.

The proposed monofill site is bordered to the north by a residential area and on the east by the Dalecarlia Parkway. The southern perimeter slopes steeply southward to a cleared easement adjacent to an 18-in. sanitary sewer line that originates on the eastside of Dalecarlia Parkway. The sanitary sewer line easement is a relatively flat, open area approximately 75 ft in width, aligned east to west, and lying between two steeply sloped banks. According to the proposed alternative, the steep embankments on either side of the easement would be bridged for road access to the monofill site. The road over the easement would be elevated. A storm sewer runs parallel to the sanitary sewer line and into East Creek near the current reservoir access road. A segment of East Creek depicted on topographic maps of the area was no longer visible in the easement; although it appeared that the creek was no longer flowing above ground and may have been channelized underground into the storm sewer, no definite determination could be made. Erosion from episodes of runoff was evident in the easement and along the steeply sloped bank opposite the proposed monofill site. Exposed soil in open areas and eroded channels was fine-grained sand.

The western perimeter of the deciduous woods in the vicinity of the monofill site follows the channel of East Creek as it flows northward along the reservoir's current gravel access road. East Creek flows north until it meets with Mill Creek near the spillway in the northern corner of Dalecarlia Reservoir. The west bank of East Creek immediately adjacent to the reservoir access road has been fortified with large quarried stones; the east bank along the deciduous forest edge is naturally formed. The bank height varies in from approximately 8 to 15 inches on both sides of the creek. Water in the creek was approximately 2 – 6 inches deep, clear, and flowing. The substrate varies from predominantly sand to sand and some stones. Gravel and sandbars are present in several stretches of the creek.

A site visit was conducted to assess and characterize the terrestrial resources of the proposed monofill site on July 6, 2004 (see Volume 2 of DEIS). Information gathered from field observations collected during this site visit is supplemented with information found in the Final Environmental Baseline Report for the Dalecarlia, Georgetown, and McMillan Reservoirs, prepared by USACE (1994).

Botanical Resources

The monofill site would be located on part of a 47-acre plot of deciduous woods on the eastern side of the Dalecarlia Reservoir and entirely within the Dalecarlia WTP property. A general description of the land adjacent to the Dalecarlia Reservoir in the baseline assessment report describes habitats present as oak-hickory/mixed hardwood forest and a bottomland forest (USACE, 1994). Field observations in the proposed monofill site on July 6, 2004, concurred with the general assessment description and found the forest to be a mixed deciduous hardwood dominated by oaks. A plant species inventory developed during the site visit is presented in Table 3-3 (next page).

The dominant forest canopy species were northern red oak (*Quercus rubra*), tulip poplar (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), southern red oak (*Quercus* *falcata*), cherry (*Prunus sp.*), and hickory (*Carya sp.*). The understory was composed of younger trees of these species and also included sassafras (*Sassafras albidum*), box elder (*Acer negundo*), willow oak (*Quercus phellos*), and pawpaw (*Asimina triloba*). Shrubs included raspberry (*Rubus sp.*). Vines found in the understory were poison ivy (*Toxicodendron radicans*) and wild grape (*Vitis sp.*). Little herbaceous growth was observed within the proposed site. Species observed included false nettle (*Boehmeria cylindrica*) and lady's thumb (*Polygonum persicaria*). The dominant groundcover species was Japanese stilt grass (*Microstegium vimineum*). Occasional patches of Christmas fern (*Polystichum acrostichoides*) were also observed.

TABLE 3-3
Plant Species Observed in the Monofill Area

Scientific Name	Common Name
Deciduous	
Acer rubrum	Red Maple
Acer negondo	Box-Elder
Asminina triloba	Common Pawpaw
Carya sp.	Hickory species
Fagus grandifolia	American Beech
Liriodendron tulipifera	Tulip-tree
Paulownia tomentosa	Princess-tree
Platanus occidentalis	Sycamore
Prunus sp.	Cherry species
Quercus phellos	Willow Oak
Quercus alba	Eastern White Oak
Quercus falcate	Southern Red Oak
Quercus rubra	Northern Red Oak
Robinia pseudoacacia	Black Locust
Sassafras albidum	Sassafras
Ulmus rubra	Slippery Elm
Shrubs	
Ligustrum vulgare	Privet
Rubus sp.	Raspberry species
Vines	
Toxicodendron radicans	Poison Ivy
Vitis, sp.	Grape species
Herbaceous	
Boehmeria cylindrical	False Nettle
Convolvulus arvensis	Field Bindweed
Iris versicolor	Larger Blue Flag
Lepidium virginicum	Wild Peppergrass
Melilotus officinalis	Sweet Yellow Clover
Polygonum cuspidatum	Japanese Knotweed
Polygonum persicaria	Lady's Thumb
Trifolium repens	White Clover
Verbascum thapsus	Common Mullein
Vernonia noveboracensis	New York Ironweed
Groundcover	
Microstegium vimeneum	Japanese Stiltgrass
Polystichum acrostichoides	Christmas Fern

Botanical species identified from observation points along the gravel access road on the western edge of the proposed site were consistent with the sites in the vicinity of the southern boundary and proposed monofill access road. In open areas around the edge of the proposed site, a few other species were noted, including black locust (*Robinia pseudoacacia*), princess-tree (*Paulownia tomentosa*), slippery elm (*Ulmus rubra*), common mullein (*Verbascum thapus*), and New York ironweed (*Veronia noveboracensis*).

Of the species identified in the vicinity of the monofill site, several are considered non-native, including princess-tree, privet, field bindweed, lady's thumb, Japanese knotweed, and Japanese stilt grass.

Wildlife Resources

The Dalecarlia Reservoir property is located in an urban-suburban section of the District of Columbia and Montgomery County, Maryland (USACE, 1994). The earlier baseline ecological assessment conducted in 1994 (USACE, 1994) described the existing wildlife resources of the Dalecarlia Reservoir as including species adapted to human disturbance and activity, as well as those associated with an aquatic environment.

Reptiles and Amphibians

In the 1994 baseline assessment, the Center for Urban Ecology, under the NPS, generated a list of reptiles and amphibians potentially associated with the Dalecarlia Reservoir. The study team reviewed this list for habitat and life history requisites. Species considered to be potentially present in the deciduous hardwood habitat of the proposed monofill site are presented in Table 3-4. An American toad was the only species on the list that was observed in the vicinity of the proposed monofill site during the field survey.

Mammals

Based on the biological assessment (USACE, 1994), mammals expected to inhabit the vicinity of the proposed monofill site include opossum (*Dedelphis virginiana*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), white-tailed deer (*Odocoileus virginianus*), and eastern cottontail (*Sylvilagus floridanus*), as well as a variety of small rodents such as mice, moles, shrews, and voles. Mammal sightings during the field survey at the monofill site included tracks and sign, as well as brief sightings of red fox (*Vulpes vulpes*) and gray squirrel. These are presented in Table 3-5 (next page).

TABLE 3-4
Reptile and Amphibian Species Potentially Present on the Proposed Monofill Site

Scientific Name	Common Name
Amphibians	
Ambystoma maculatum	Spotted Salamander
Ambystoma opacum	Marbled Salamander
Plethodon cinereus	Red-backed Salamander
Bufo americanus	American Toad
Scaphiopushol brooki	Eastern Spadefoot Toad
Rana sylvatica	Wood Frog
Reptiles	
Carphophia amoenus	Worm Snake
Coluber constrictor	Northern Black Racer
Diadophis punctatus	Southern Ringneck Snake
Elaphe obsolete	Black Rat Snake
Heterodon platyrhinos	Eastern Hog-nosed Snake
Lampropeltis gestulus	Eastern Kingsnake
Thamnophis sirtalis	Eastern Garter Snake
Agkistrodon contortrix	Copperhead
Terrapene carolina	Eastern Box Turtle
Eumeces inexpectatus	Southeastern Five-lined Skink

Based on U.S. Army Corps of Engineers, Baltimore District (USACE) Final Environmental Baseline Report for the Dalecarlia, Georgetown, and McMillan Reservoirs, May 9, 1994

Birds

The July timing of the field assessment survey determined that the avian species observed in the vicinity of the proposed monofill site could be categorized as either summer resident species or year-round resident species. By definition, a summer resident species migrates in fall to wintering grounds further south and returns in the spring to nest in its breeding habitat. Examples of summer resident species observed in the vicinity of the monofill site are Acadian flycatcher (*Empidonax virescens*), great crested flycatcher (*Myiarchus crinitus*), red-eyed vireo (*Vireo olivaceous*), yellow -throated vireo (*Vireo olivaceous*), house wren (*Troglodytes aedon*), blue-gray gnatcatcher (*Polioptila caerulea*), and Kentucky warbler (*Oporornis formosus*).

Year-round species are those that remain throughout the year in a given habitat. Examples of resident species are red-bellied woodpecker (*Melanerpes carolinus*), downy woodpecker (*Picoides pubescens*), American crow (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), Carolina chickadee (*Poecile carolinensis*), white-breasted nuthatch (*Sitta carolinensis*), and Carolina wren (*Thryothorus ludovicianus*).

TABLE 3-5
Wildlife Species Observed in the Vicinity of the Proposed Monofill Area (July 2004)

Scientific Name	Common Name	
Insects		
Papilio glaucus	Eastern Tiger Swallowtail	
Pieris rapae	Cabbage White Butterfly	
Polygonia comma	Eastern Comma	
Ancyloxypha numitor	Least Skipper	
Libellula luctuosa	Widow Skimmer Dragonfly	
Diapheromera femorata	Walking Stick	
Birds		
		Occurrence[a]
Cathartes aura	Turkey Vulture	R
Cathartes atratus	Black Vulture	R
Accipiter	Accipiter Hawk	R
Zenaida macroura	Mourning Dove	R
Chaetura pelagica	Chimney Swift	S
Melanerpes carolinus	Red-bellied Woodpecker	R
Picoides pubescens	Downy Woodpecker	R
Empidonax virescens	Acadian Flycatcher	S
Myiarchus crinitus	Great Crested Flycatcher	S
Tyrannus tyrannus	Eastern Kingbird	S
Vireo olivaceous	Red-eyed Vireo	S
Vireo flavifrons	Yellow-throated Vireo	S
Corvus brachyrhynchos	American Crow	R
Baeolophus bicolor	Tufted Titmouse	R
Poecile carolinensis	Carolina Chickadee	R
Sitta carolinensis	White-breasted Nuthatch	R
Thryothorus ludovicianus	Carolina Wren	R
Troglodytes aedon	House Wren	S
Polioptila caerulea	Blue-gray Gnatcatcher	S
Turdus migratorius	American Robin	R
Sturnus vulgaris	European Starling	R
Dumetella carolinensis	Gray Catbird	S
Oporornis formosus	Kentucky Warbler	S
Melospiza melodia	Song Sparrow	R
Cardinalis cardinalis	Northern Cardinal	R
Quiscalus quiscula	Common Grackle	S
Caruelis tristis	American Goldfinch	R
Passer domesticus	House Sparrow	R
Mammals		
Vulpes vulpes	Red Fox	
Sciurus carolinensis	Gray Squirrel	

[a] R= year-round resident species; S=summer resident species

Near the residential area at northern end of the proposed monofill site, species such as mourning dove (*Zenaida macroura*), house wren, American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), and house sparrow (*Passer domesticus*) were observed. These species are well-known inhabitants of urban-suburban areas and are tolerant of human activity. Turkey vulture (*Cathartes aura*), black vulture (*Cathartes atratus*), and chimney swift (*Chaetura pelagica*) were observed flying over the site during the field visit.

Fledged young of several species were noted during the site visit and provided evidence of successful nesting for those species. Young of red-bellied woodpeckers, Carolina chickadees, Carolina wrens, blue-gray gnatcatchers, and American robins were observed and documented. A complete list of bird species observed during the site visit and their seasonal occurrence is presented in Table 3-5.

In general, the species observed in the vicinity of the proposed monofill site are relatively common species found in deciduous woodlands and suburban neighborhoods in the Northern Virginia–DC–Maryland area.

Insects

Insects identified during the site visit are presented in Table 3-5. Primarily butterflies, they were most often associated with the open areas surrounding the edge of the proposed monofill site.

Dalecarlia Reservoir and Forebay Area

The Forebay for the Dalecarlia Reservoir is located on the northwestern end of the reservoir. To assess the habitat and wildlife in the current Forebay area, field reconnaissance was conducted along with the survey at the proposed monofill site on July 6, 2004.

The Forebay site is a relatively flat, open terrain bounded by mowed/maintained lawn, the gravel access road, and a buffer of deciduous woods on the northwest and southeast. This area has been disturbed by maintenance and operational activities of the Washington Aqueduct.

TABLE 3-6
Plant Species Observed in the Forebay Area (July 2004)

Scientific Name	Common Name
Coniferous	
Juniperus virginiana	Eastern Red Cedar
Deciduous	
Acer negundo	Box-Elder
Acer platanoides	Norway Maple
Asimina triloba	Common Pawpaw
Fagus grandifolia	American Beech
Liriodendron tulipifera	Tulip tree
Paulownia tomentosa	Princess-tree
Platanus occidentalis	Sycamore
Prunus sp.	Cherry species
Quercus phellos	Willow Oak
Quercus rubra	Northern Red Oak
Robinia pseudoacacia	Black Locust
Sassafras albidum	Sassafras
Ulmus rubra	Slippery Elm
Shrubs	
Lindera benzoin	Spicebush
Lonicera sp.	Honeysuckle species
Rosa multiflora	Multiflora rose
Rubus sp.	Raspberry species
Rubus odorous	Flowering Raspberry
Viburnum dentatump.	Southern Arrowwood
Vines	
Hedera helix	English Ivy
Parthenocissus quinquefolia	Virginia Creeper
Toxicodendron radicans	Poison Ivy
Vitis sp.	Grape species
Herbaceous	
Boehmeria cylindrical	False Nettle
Erigeron annuus	Daisy Fleabane
Galium tinctorium	Clayton's Bedstraw
Convolvulus arvensis	Field Bindweed
Verbascum thapsus	Common Mullein
Vernonia noveboracensis	New York Ironweed
Groundcover	
Microstegium vimineum	Japanese Stilt grass
Polystichum acrostichoides	Christmas Fern

Botanical Resources

The area immediately surrounding the Forebay is open, with a mowed and maintained lawn and a row of approximately six to eight eastern red cedars (*Juniperus virginiana*). A gravel access road separates the mowed, maintained area from a thin buffer of trees, shrubs, and vines along the property boundary with the Capital Crescent public recreation trail. The area is also close to a residential area. Many of the species identified in the deciduous woods of the proposed monofill site were present in the buffer area surrounding the Forebay and at the Forebay spoils area. A few species consistent with the more open and disturbed characteristics of the areas were identified and included daisy fleabane (*Erigeron annuus*), Clayton's bedstraw (*Galium tinctorium*), and field bindweed (*Convolvulus arvensis*). Several species of non-native vegetation were identified in the Forebay area and the Forebay spoils site. These are princess-tree, honeysuckle, multiflora rose, English ivy, field bindweed, and Japanese stilt grass. Species identified at the Forebay area is presented in Table 3-6 (previous page).

Wildlife Resources

In general, the wildlife resources of the wooded buffer around the Forebay area are expected to be similar to those found in the vicinity of the monofill site. Potential reptile and amphibian species inhabiting the area are those listed previously on Table 3-4. One documented observation of a copperhead snake occurred north of the Forebay area on a past visit (Michael Peterson, personal communication). Observed species are shown in Table 3-7.

Mammals

The open, mowed/maintained habitat surrounding the Forebay does not provide appropriate habitat for woodland species but is expected to have raccoons, opossum, white-tailed deer, striped skunk, groundhog, and other mammals foraging in the area. A large burrow found along the edge of the access road may have been the burrow of a red fox or groundhog (*Marmota monax*) but there were no signs available to verify identity.

TABLE 3-7
Wildlife Species Observed in the Forebay Area (July 2004)

Scientific Name	Common Name
Insects	
Pieris rapae	Cabbage White Butterfly
Celestrina ladon neglecta	Summer Azure Butterfly
Birds	
Ardea herodias	Great Blue Heron
Branta Canadensis	Canada Goose
Aix sponsa	Wood Duck
Ceryle alcyon	Belted Kingfisher
Melanerpes carolinus	Red-bellied Woodpecker
Picoides pubescens	Downy Woodpecker
Colaptes auratus	Northern Flicker
Contopus virens	Eastern Wood-Pewee
Empidonax virescens	Acadian Flycatcher
Sayornis phoebe	Eastern Phoebe
Myiarchus crinitus	Great Crested Flycatcher
Vireo olivaceous	Red-eyed Vireo
Hirundo rustica	Barn Swallow
Poecile carolinensis	Carolina Chickadee
Sitta carolinensis	White-breasted Nuthatch
Thryothorus ludovicianus	Carolina Wren
Polioptila caerulea	Blue-gray Gnatcatcher
Utrdus migratorius	American Robin
Cardinalis cardinalis	Northern Cardinal
Molothrus ater	Brown headed Cowbird
Mammals	
Microtus sp.	Vole sp.
Odocoileus virginianus	White-tailed Deer

White-tailed deer tracks were noted and a family of voles (*Microtus* sp.) was observed in the dense leaf litter of the wooded buffer along the southern edge of the Forebay.

Birds

Birds in the vicinity were either using the wooded buffer or found in the open area immediately adjacent to the Forebay. Species using the open area were belted kingfisher (*Ceryle alcyon*), eastern phoebe (*Sayornis phoebe*), eastern kingbird (*Tyrannus tyrannus*), barn swallow (*Hirnudo rustica*), American robin, and brown-headed cowbird (*Molothrus ater*). Species found in the wooded buffer were similar to those identified in the deciduous hardwood habitat at the proposed monofill site and also included northern flicker (*Colaptes auratus*) and eastern wood-pewee (C*ontopus virens*). A great blue heron was observed flying over the reservoir at the Forebay area. A list of wildlife species observed during the site visit is presented in Table 3-7.

Insects

Insects identified during the site visit are presented in Table 3-7. Primarily butterflies, they were most often associated with the open areas surrounding the edge of the Forebay.

3.5.2.2 Potomac Interceptor Utility Easement

The proposed pipeline will run parallel to the Potomac from the Dalecarlia Water Treatment Plant to the Blue Plains AWWTP. Table 3-8 (next page) describes the location and habitat found at each of the proposed staging areas along this easement.

According to the National wetland Inventory maps prepared by the USDOI, the Potomac Interceptor Utility Easement crosses potential wetlands in the following areas:

- Tributary to the Potomac River at Battery Kemble Park—classified as R3UBH—Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded
- Tributary to the Potomac River east of Georgetown University—classified as R3UBH—Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded
- Rock Creek east of Washington Circle—classified as R1UBV—Riverine Tidal Unconsolidated Bottom Permanent-Tidal
- Two wetland areas—classified as R1USN—Riverine Tidal Unconsolidated Shore Regularly Flooded
- The Tidal Basin—classified as L1UBV—Lacustrine Limnetic Unconsolidated Bottom Permanent-Tidal
- The point where Washington Channel and Anacostia River merge and intercept the Potomac River

TABLE 3-8
Washington Aqueduct—Potomac Interceptor Route (Potential Drill Rig and Pipe Feed Sites)

Potential Drill Rig and Pipe Feed Sites	Location	Descriptions
Site 1	Residuals Thickening and Dewatering Facility Site	Disturbed area with gravel on ground. Storage for construction activities. Surrounded by chain-link fence.
Site 2	Between Potomac River and the Washington Aqueduct Sedimentation Basins.	Mature trees and heavy underbrush. Near bike path.
Site 3	Slightly South of Chain Bridge Road Bridge on C&O Canal Path	Mature trees and heavy underbrush on both sides of the C&O Canal Path
Site 4	Below Palisades Park on C&O Canal Path. Adjacent to Fletcher's Boathouse.	Mature trees and heavy underbrush on both sides of the C&O Canal Path
Site 5	Below Georgetown Reservoir on C&O Canal Path	Mature trees and forested wetland on western side of the canal path which faces the Potomac River
Site 6	Slightly South of the Georgetown Reservoir on the C&O Canal Path	Mature trees and forested wetland on western side of the canal path; canal and roadway to the east
Site 7	Intersection of MacArthur Blvd and Canal Road on C&O Canal Path	Scattered mature trees facing the Potomac River; Canal Road to the east
Site 8	Park and Parking lot near the Washington Harbor Complex	Parkland with urban development surrounding
Site 9	Between E Street Expressway and 23rd Street	Urban development with some grass and scattered trees
Site 10	Beside the U.S. Navy Medicine and Surgery Building	Large open grassy area; no access due to fencing
Site 11	West Potomac Park along the Potomac River	Sports playing field composed of grass and scattered mature trees
Site 12	West Potomac Park near the Franklin D Roosevelt Memorial Site	Sports playing field composed of grass and scattered mature trees
Site 13	East Potomac Golf course adjacent to the National Capital Park Headquarters and the U.S. Park Police Headquarters	Golf course greens with scattered mature trees
Site 14	Ohio Drive along the East Potomac Golf course	Golf course greens with scattered mature trees
Site 15	Ohio Drive along the East Potomac Golf course	Golf course greens with scattered mature trees
Site 16	Anacostia Naval Station	No access
Site 17	Bolling Air Force Base	No access
Site 18	Bolling Air Force Base	Family Housing—No access
Site 19	Bolling Air Force Base	Family Housing—No access
Site 20	Bolling Air Force Base	Family Housing—No access; potentially an open field
Site 21	Blue Plains AWWTP	No access
Site 22	Blue Plains AWWTP	No access

3.6 Cultural Resources

Cultural resources can be defined as sites, structures, buildings, landscapes, districts, and objects that are significant in history, prehistory, architecture, archaeology, engineering, and/or culture. These resources are protected by a number of statutes and regulations at all levels of government and must be taken into consideration during the National Environmental Policy Act (NEPA) process.

For any federally funded project, potential impacts on historical and archaeological cultural resources must be reviewed, using a process often referred to as the "Section 106" process. The Section 106 process is described in the National Historic Preservation Act (NHPA) of 1966, as amended, which established a federal policy of avoiding or minimizing adverse effects to cultural resources when planning and constructing federal projects. The process includes consulting with State Historic Preservation Office (SHPO) and other interested parties. Section 106 can also be triggered as part of a wider NEPA documentation process. For purposes of this DEIS, if an alternative other than the No Action alternative is chosen, compliance with Section 106 of the NHPA would be mandatory.

A review of reports, surveys, plans, and other assessments was completed to understand the breadth and significance of the cultural resources located within the boundaries of the Dalecarlia. Meetings were held with NPS and NCPC and a phone conversation was conducted with Nancy Kassner (DC SHPO) in 2004. Following is a brief discussion of the archaeological and historic resources within Dalecarlia, relevant to the proposed alternatives.

3.6.1 Washington Aqueduct Archaeological Resources

Several archaeological surveys have been completed within the boundaries of the Washington Aqueduct system. At this time, no archaeological sites have been recorded for any portion of the Washington Aqueduct property; however, the Washington Aqueduct Cultural Resource Management Plan has identified disturbed and archaeologically sensitive areas within the property's boundaries. The plan designated the disturbed areas as either highly or minimally disturbed. Highly disturbed are those that have experienced intensive development, thereby reducing the likelihood of finding archaeological prehistoric and/or historic resources. Conversely, minimally disturbed areas, those with very little development, potentially have prehistoric and/or historic archaeological resources.

Areas such as the unmodified ridge tops and small stream valleys in the north and east portions of the Dalecarlia Reservoir have been minimally disturbed and therefore have a high potential for prehistoric archaeological sites. Areas to the south and north of the Dalecarlia Reservoir are highly disturbed with the construction of Aqueduct buildings and the landscape has been greatly modified. The potential for cultural resources in these areas is very low and two previous surveys within this area located no resources.

The Georgetown Reservoir area is severely disturbed, reducing the chance of finding any archaeological resources. Below the Georgetown Reservoir, the floodplain of the Potomac River has been assessed as having low to moderate potential for prehistoric or historic resources.

3.6.2 Washington Aqueduct Historic Architectural and Engineering Resources

The USACE has owned, maintained, and operated the Washington Aqueduct since construction on it began, in 1853. The system, although expanded over time, has remained in continuous operation since it first delivered water to the District of Columbia in 1864 (Washington Aqueduct Cultural Resource Management Plan, 1998).

The Washington Aqueduct and many of its associated structures are listed or are eligible to be listed in the National Register of Historic Places (NRHP), which is the official list of sites, districts, structures, buildings, landscapes, and objects significant in American history, archaeology, architecture, engineering, and culture. In addition to being on the NRHP, the primary resources associated with the original design and construction of the Aqueduct are listed as a National Historic Landmark (NHL). A NHL designation is reserved for sites that are exceptionally significant at the national level.

The Washington Aqueduct's current facilities include intake works on the Potomac River at Great Falls and Little Falls, Maryland; two approximate 10-mile long aqueducts; and two major WTPs (Dalecarlia and McMillan) with attendant pumping facilities, transmission mains, and underground finished water storage. The Washington Aqueduct System has three Reservoirs, Dalecarlia and Georgetown, located approximately 2 miles apart, and the McMillan Reservoir. The Dalecarlia WTP has four sedimentation basins and the Georgetown Reservoir has two sedimentation areas. The total area of the Washington Aqueduct System, including all its facilities, is approximately 395 acres (Federal Environmental Baseline Report, 1994.)

3.6.3 National Historic Landmark

The Washington Aqueduct, from the intake works at Great Falls on the Potomac River to the Georgetown Reservoir in northwest Washington, DC, was designated a NHL November 7, 1973. In the revised 1999 NHL nomination, the Washington Aqueduct was described as a linear historic district composed of a series of aboveground elements physically linked by a below-ground conduit or by underground water mains.

A total of 77 built resources were identified within the NHL boundaries. Of this total, 43 are considered contributing elements, while the remaining 34 elements are noncontributing. One of the contributing resources within the NHL boundaries, the Castle Gatehouse, was included as a contributing resource in the 1973 NHL nomination, but was revised in the 1999 nomination as a noncontributing resource based on more recent archival research that revealed that it was built in 1901. However, it was listed individually on the NRHP in 1975. Portions of the Aqueduct property are excluded from the NHL boundaries because of their development during the twentieth century and are therefore outside the period of nomination's significance (1853 – 1880); these portions include the Little Falls pumping facility, the Dalecarlia property west of MacArthur Boulevard, and the McMillan WTP.

Significant elements of the district include the dam across the Potomac River at Great Falls; the water intake works; the approximately 10 mile long and 9 ft diameter conduit; 5,392 ft of tunnels; six bridges; and the pipelines into the city. The Dalecarlia and Georgetown Reservoirs were included in the boundary of the original landmark designation and were also individually listed on the NRHP in 1975 (Final Environmental Baseline Report, 1994).

3.6.4 Resource Integrity

The Washington Aqueduct system, as a whole, retains a high level of integrity to convey its period of significance. Most early American water systems of this type, such as New York's Croton Aqueduct and Boston's Cochituate Aqueduct, are no longer in service. Washington's system remains in use and, despite expansions and equipment upgrades, operates according to Meigs's original design (NHL, 1999).

Although the system has been expanded, most of the Meigs-designed buildings and structures survive in good condition with minimal alterations and retain their integrity. The buildings designed by Meigs, such as the sluice tower at Dalecarlia and the influent gatehouse at Georgetown, retain their original design and materials. Some of the resources, such as the culverts and bridges, have undergone modifications. These changes have not detracted from their engineering significance and the resources were determined to have maintained their integrity (NHL, 1999).

3.6.5 Dalecarlia Reservoir

The Dalecarlia Reservoir straddles the DC–Maryland border. Only the property on the east side of MacArthur Boulevard is included in the NHL boundaries. The reservoir basin (receiving reservoir), created by damming Mill Creek between 1854 and 1858, was the first feature established at Dalecarlia. As originally designed, the reservoir had a total holding capacity of approximately 150 million gallons. By 1859, a sluice tower and effluent gatehouse (no longer present) were completed and the system between Dalecarlia and the city of Washington became operable, fed by Mill Creek and Little Falls Branch (NHL, 1999). A filtration plant was added in 1928 (Levy and Ghioto, 1973).

The first water filtration plant for the Washington Aqueduct was the McMillan Filtration Plant, opened in 1902. During the 1920s, Dalecarlia became Washington's second filtration plant. Most of the construction occurred on the west side of MacArthur Boulevard. Once the filtration plant was in operation, the Dalecarlia Reservoir fed both the Georgetown reservoir and the Dalecarlia filtration plant. The Dalecarlia Treatment Plant is not included in the Washington Aqueduct NHL district boundaries due to its later construction date (NHL, 1999).

3.6.6 Georgetown Reservoir

The Georgetown Reservoir occupies approximately 65 acres in northwest Washington. The facility originally consisted of seven built resources.

The Georgetown Reservoir basin was excavated between 1862 and 1864. Originally, the reservoir was surrounded by an earthen dike paved with riprap to assist the sedimentation process and preserve the dike walls. The Georgetown Reservoir was initially designed as the distributing reservoir for the Aqueduct system and stored water before distributing it to the city. Influent and effluent gatehouses were built to control the flow of water in and out of the reservoir (today only the influent gatehouse survives). In 1875, a dwelling was built at the distributing reservoir for the gatekeeper. This building has since been demolished (NHL, 1999).

One building, the Castle Gatehouse, is often mistaken for one of the original resources designed by Meigs. This castellated structure was constructed in 1901 in association with the new Washington City Reservoir and Tunnel, the first major expansion of the Aqueduct. The Castle Gatehouse regulates the flow of water from the Georgetown Reservoir into the City Tunnel. The building was individually listed on the NRHP in 1975 (NHL, 1999).

3.6.7 Other Cultural Resources within the Potential Project Area

The potential project area may include cultural resources outside the boundaries of the Washington Aqueduct. These cultural resources could include areas administered by the NPS, military installations, a wastewater treatment plant (WWTP) and several historic neighborhoods. The NPS has numerous parks and properties that fall within the study area. These include the C&O National Historical Park, the George Washington Memorial Parkway, East and West Potomac Parks, and areas adjacent to the Lincoln, Franklin Delano Roosevelt, and Thomas Jefferson Memorials. The three memorials are part of the National Mall and are administered by the NPS. Three military installations located along the Anacostia River—Bolling Air Force Base, the U.S. Naval Research Laboratory, and the Naval District Washington Anacostia Annex—are also in the study area. Historic neighborhoods, such as the Georgetown Historic District, are in the study area along with the Blue Plains AWWTP. Following are brief descriptions of these resources.

Construction began in the C&O Canal in 1828 with the goal to create a new commercial waterway along the Potomac River. The concept was first envisioned by George Washington, who wanted to link the Potomac and Ohio River valleys. To overcome obstacles in the Potomac River, Washington proposed constructing a series of canals and locks to navigate around the worst areas of the river. Construction of the C&O Canal system was completed in 1850. The canal operated from 1828 to 1924, allowing products such as flour, grain, building stone, and coal to be hauled from western Maryland to the port in Georgetown. Significant as an example of a transportation system during the Canal Era, the current National Historical Park, comprised of locks, lockhouses, and aqueducts and the tow path, runs almost 185 miles along the Potomac River from Cumberland, Maryland, to Georgetown, in Washington, DC.

The George Washington Memorial Parkway, which was opened in 1932 and expanded in the 1950s, 1960s, and 1970s, was developed to serve as a pastoral motorway to Washington, DC. The parkway runs along both sides of the Potomac River from Mount Vernon in Virginia, through Alexandria, and up to the Washington Beltway. On the other side of the river, the parkway begins northwest of the capital and runs through Maryland to the Beltway. The Maryland segment was constructed in 1970 and is known as the Clara Barton Parkway. The parkway has evolved from the initial sixteen mile motorway to include 7,600 acres of landscape and native habitat along the Potomac shoreline. The parkway also includes over twenty-five sites associated with the life of George Washington. Trucking alternatives using the George Washington Parkway system would require a permit from the NPS.

The National Mall, a combination of museums, parks, and open space, was originally designed by Pierre L'Enfant in 1791 and finalized in 1902 by the McMillan Commission. The potential project area may include areas adjacent to memorials within the National Mall, including the Lincoln Memorial, the Thomas Jefferson Memorial, and the newly completed

Franklin Delano Roosevelt Memorial. Within the National Mall are two parks that would lie within the potential project area: East and West Potomac Park.

Both East and West Potomac Park were established on lands created from dredged material: East Potomac Park, consisting of 327 acres, was created with material dredged from the Washington Channel and West Potomac Park, in the area southwest of the Washington Monument, consists of 394 acres of reclaimed land from the Potomac River. East Potomac Park became part of the National Capital Parks system in 1907 and West Potomac Park followed in 1913. East Potomac Park, also known as Hains Point, includes the area between the Potomac River, the Washington Channel, and the Tidal Basin. The park's landscape includes cherry trees, a public golf course, and a miniature golf course. The most impressive feature of the park is the sculpture "The Awakening." This large artwork, created in 1980, is a five-piece depiction of a man rising out of the ground.

Several major memorials are located in West Potomac Park, including the Lincoln Memorial. This memorial was constructed in 1914 as a tribute honoring President Abraham Lincoln. The memorial is built to resemble a Greek temple; it has 36 Doric columns—one representing each state at the time of Lincoln's death.

A joint resolution in 1934 authorized the construction of the Thomas Jefferson Memorial to honor a president who was instrumental in founding the United States of America. The memorial's design is based on the circular dome style used by Jefferson for his house at Monticello and for the University of Virginia. Jefferson's designs were influenced by the classic design of the Pantheon.

The Franklin Delano Roosevelt Memorial, completed in 1997, is a memorial both to the former president and to the era he served. This large memorial of trees, waterfalls, statuary, and alcoves is a departure from the other presidential memorials The memorial is divided into four separate areas to represent the four terms of office Roosevelt held. Although not historic at this time, this resource is part of the National Mall.

Across from East Potomac Park, where the Potomac River, the Anacostia River, and the Washington Channel meet, are a series of military installations. The largest is Bolling Air Force Base, established in 1918 to serve as Washington's primary aviation facility. The base was named after Colonel Raynal C. Bolling, an early advocate for U.S. Army airmanship, who was killed during World War I. The base is located on an area with an extensive history—it was documented as the location of human habitation by the Nacotchtanke Indians; in the mid-1600s, was used as a plantation home for several affluent Maryland families; and later served as a Civil War cavalry depot.

Since its beginnings as an aviation base, Bolling Air Force Base has served as a research and testing ground for new aviation equipment. The base, in its early years, provided aerial defense of the capital. Many significant persons associated with aviation history have used Bolling Air Force Base, including Charles Lindbergh, Eddie Rickenbacker, Billy Mitchell, H.H. "Hap" Arnold, Jimmy Dolittle, Ira C. Eaker, and Wiley Post. Located between National Airport and Andrews Air Force Base, Bolling lost its fixed-wing activities in 1962, due to air congestion. Since that time, Bolling's mission has changed, and it now serves as the home to the 11th Wing, "The Chief's Own," and has evolved into the ceremonial and administrative headquarters for the Air Force in the national capital region. Many of the buildings that once housed airplanes now serve as offices, shops, and warehouses. What was once the runway has been converted to an area of family housing and office buildings.

The U.S. Naval Research Laboratory, located in the Anacostia area of Washington, DC, was established in 1923, at the suggestion of Thomas Edison and after eight years of effort to get congressional funding. The lab was created as an "idea factory" that, since its creation, has been the source of many important scientific developments, both for the military and for broader operations, such as space and pharmaceuticals. Some of these include radar in the 1920s and cosmic ray and other experiments with captured German V-2 rockets during World War II. During the Cold War, many of the lab’s activities were classified. The lab assisted in developing the first American satellite program, "the Vanguard project," in the 1950s. The Galactic Radiation and Background system, the nation's first reconnaissance satellite system, was launched in 1960 and used during the Cold War to gather information on the Soviet air defense radar. More recently, the lab has played a key role in developing the Global Positioning System. The lab consists of 103 acres, with over 100 buildings.

The Naval District Washington Anacostia Annex is located north of Bolling Air Force Base and the Naval Research Lab. This facility, established as a Naval Air Station in 1918, started as a test facility for new seaplanes. The base provided support to naval aviation until its air station functions were transferred to Andrews Air Force Base in 1961. Currently, the Annex serves as a support base for activities in the region's installations.

Blue Plains AWWTP first began its mission in 1938, as Washington's first WWTP. Prior to construction of the plant, raw sewage for Washington, DC, was discharged directly into the Potomac River. Because of this practice, the river was closed in the early 1930s due to bacterial pollution caused by raw sewage. In 1934, the federal government provided funding to construct a primary treatment plant for wastewater. The plant opened in 1938 and was initially designed to serve a population of 650,000. Since then, the plant has been expanded numerous times to meet the needs of a rapidly expanding population. In 1959, a secondary treatment process was added; in 1968, chlorination was added to disinfect effluent. However, even with these efforts, the Blue Plains AWWTP facility could not keep up with population growth. The secondary plant was expanded between 1970 and 1983.

There are many different historic neighborhoods within the project area. Some lie adjacent to the proposed truck routes, such as Georgetown. Georgetown, designated as a National Historic Landmark in 1967, is also listed in the National Register of Historic Places and is included in the DC inventory of historic places. The district is bounded by Whitehaven, Rock Creek Parkway, the Potomac River, and Georgetown University. Originally established as a port, this district of approximately 4,000 primary buildings, built from 1765 to 1940, includes residential, commercial, institutional, and industrial buildings.

Numerous other neighborhoods, both historic and non-historic, lie adjacent to the roads of the proposed truck routes. Neighborhoods that are designated as local historic districts include areas of Chevy Chase, Bethesda, and Friendship Heights.

3.7 Hazardous, Toxic, and Radioactive Substances

Dalecarlia Water Treatment Plant is a conditionally exempt, small-quantity generator of hazardous waste. Normal operations at the Dalecarlia WTP generate wastes that are regulated by federal, Maryland, and District of Columbia regulations governing chemicals handling, transportation, and disposal. The Washington Aqueduct has a Hazardous Waste Management Plan (HWMP) which addresses pollution prevention management and disposal of regulated hazardous waste, nonregulated chemical wastes, PCBs, asbestos, and Department of Transportation (DOT)-regulated chemicals. (HWMP, 2002) An oily smell was noted during soil borings collected in 1995 at the Dalecarlia Northwest Processing Site. This potential contamination will be further investigated and addressed regardless of the residuals project.

3.7.1 Underground Storage Tanks and Aboveground Storage Tanks

There are currently four underground storage tanks (USTs) in use at the Dalecarlia WTP. Two of these USTs (5,000 gallon [gasoline] and 2,500 gallon [diesel]) are located south of the proposed northwest residuals processing site. Both USTs are fiberglass-reinforced plastic and service the Dalecarlia Reservoir Dispatch Office. Three former USTs were also found in this location and were removed in 1994 and 1999, respectively. There are no known spills or leaks associated with the current or former tanks in this location. There are no ASTs located in the proposed areas of the Dalecarlia WTP property where residuals management facilities are proposed.

There are no USTs or ASTs at the Georgetown Reservoir.

Used oil is stored within the area of the proposed northwest residuals thickening and dewatering facilities. Small quantities of used oil is stored in 55-gallon drums and placed on wooden pallets located on concrete secondary containment awaiting recycle. There are no documented spills or leaks associated with this oil storage area.

3.7.2 Polychlorinated Biphenyls

PCBs are industrial compounds used in electrical equipment—primarily capacitors and transformers—because they are electrically nonconductive and stable at high temperatures. Because of their chemical stability, PCBs persist in the environment, bioaccumulate in organisms, and become concentrated in the food chain.

The Washington Aqueduct considers the water treatment facility to be PCB compliant (less than 50 ppm PCB content in oil-cooled electrical equipment) (WA, personal communication, July 2004). The Washington Aqueduct has maintained an effort to identify and replace or remove all PBC-containing materials.

3.7.3 Radon

Radon gas is a naturally occurring, odorless, and colorless radioactive gas produced by the decay of naturally radioactive material (e.g., potassium, uranium, etc.). Atmospheric radon is diluted to insignificant levels; however, when concentrated in enclosed areas, radon can present human health risks. Radon gas is a Class "A" carcinogen and is associated with the long-term health risk of lung cancer. The USEPA and the USGS have compiled a map of radon zones for counties within Maryland and the District of Columbia. The rocks and soils found in the vicinity of Dalecarlia WTP were mapped as having low to moderate radon potential (average readings of 0 to 4.0 picocuries per liter (pCi/L). (http://energy.cr.usgs.gov/radon/rncounty.html).

3.7.4 Asbestos-Containing Materials

USEPA and the Occupational Safety and Health Administration (OSHA) regulate remediation for asbestos-containing materials (ACM). Asbestos fiber emissions into ambient air are regulated in accordance with Section 112 of the CAA, which established the National Emission Standard for Hazardous Air Pollutants (NESHAP). These standards address the demolition or rehabilitation of buildings with ACM.

Two categories are used to describe ACM. Friable ACM is defined as any material containing more than 1 percent asbestos (as determined by polarized light microscopy) that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. Nonfriable ACM is material containing more than 1 percent asbestos that does not meet the criteria for friable ACM.

There is ACM in place in various locations throughout the Washington Aqueduct facility (July 2004, personal communication, Michael Peterson). ACM is properly managed by qualified personnel during regular maintenance events and construction activities at the Washington Aqueduct.

3.7.5 Lead-Based Paint

Lead-based paint (LBP) was used extensively prior to 1977, until the Consumer Product Safety Commission prohibited the sale of LBP to consumers and banned the use of such paints in places where consumers may have direct contact with the paint.

Because LBPs were widely used until the late 1970s, it is reasonable to assume most buildings at the Washington Aqueduct were painted with LBP. LBP in known areas of the facility is properly managed by qualified personnel during regular maintenance events and construction activities.

3.7.6 Pesticides/Herbicides/Fertilizers

The Washington Aqueduct personnel do not widely use pesticides, herbicides, or fertilizers at the facilities, except for over-the-counter products intended for household-type uses. Therefore, there are no pesticides, herbicides, or fertilizers associated with the proposed alternative areas.

3.7.7 Adjacent Property Concerns

3.7.7.1 Dalecarlia Reservoir

The National Geospatial-Intelligence Agency (NGA) in Bethesda is located adjacent to the Dalecarlia Reservoir on the east side and northeast of the proposed Northwest Dalecarlia Processing Site. NGA conducted photo-processing and cartographic operations through the mid-1990s. Currently, minimal photo processing is conducted at the Dalecarlia site (TAMS Consultants [TAMS], 2001). NGA has ensured that spilled substances do not enter the Dalecarlia Reservoir and preventative measures at the facility have included closing USTs/ASTs, rerouting the site’s stormwater drainage from the reservoir directly to Little Falls Branch, and changing delivery and storage procedures for hazardous materials and wastes (TAMS, 2001). There are no known potential concerns about hazardous substances migrating from NGA to the Dalecarlia Reservoir proposed alternative sites.

3.7.7.2 Residual Thickening and Dewatering Facility at East Dalecarlia Processing Site

Sibley Memorial Hospital is located south of the proposed residual thickening and dewatering facility (thickening/dewatering facility). Environmental Data Resources, Inc. (EDR) indicates that Sibley Memorial Hospital is a small-quantity hazardous waste generator site licensed to use radioactive materials for medical purposes (EDR, 2004). There are no known environmental issues associated with the hospital's radioactive material use or waste generation (EDR, 2004). There are four USTs located on Sibley Memorial Hospital property. There are no known spills or releases associated with these USTs (personal communication, Sibley Director of Land Operations and Maintenance, December 2004). Based on the known information, it is unlikely Sibley Memorial Hospital would impact the thickening/dewatering facility through migration of hazardous substances.

The Washington Aqueduct's Warehouse 6 is located north of the proposed east proposed thickening/dewatering facility. Warehouse 6 currently stores pipes, lumber, raw materials, sand for roads in winter, potassium permanganate totes (3,307 pounds per tote) and copper sulfate totes (275 gallons per tote) for the Washington Aqueduct facilities (personal communication, Michael Peterson, December 2004). No industrial activity is known to have occurred in this area prior to construction of the aqueduct and there have been no known hazardous substance spills or releases reported for this warehouse (USACE, 1994).

The AUES FUDS consists of approximately 660 acres in the northwest section of Washington, DC. During World War I, the site was known as the AUES, and was used by the U.S. Government to research and test chemical agents, equipment, and munitions. Today, the Spring Valley neighborhood encompasses approximately 1,200 private homes, several embassies and foreign properties, the American University, and Wesley Seminary. (USACE, 2004). USACE, Baltimore District, is currently conducting both soil and groundwater investigations at various locations within the project site, as well as removal and remedial actions. The eastern-most portion of the proposed east Dalecarlia processing site would be located within the boundaries of the AUES FUDS, specifically within Grouping 13. Between 2001 and 2003, USACE collected and analyzed surface and subsurface soil within Grouping 13 for arsenic. The sample area was divided into a system of 2-acre lots for initial screening of arsenic levels (USACE, 2003). Four of the sample lots within Grouping 13 exhibited arsenic exceedances above the established screening level (USACE, 2003). This triggered 20-ft by 20-ft grid-based sampling in these areas. The grid sampling results indicated areas of arsenic in soil above the clean-up goal of 20 ppm. Some of these are located on the edge of the area of the proposed east Dalecarlia processing site. Removal, if necessary, will be accomplished prior to any construction activities. There is no plan to perform geophysical investigation in this area. There are no known buried munitions or hydrocarbon plumes based on 2005 soil borings.

Currently an investigation is underway to determine the nature and extent of any groundwater contamination from chemicals used at AUES. In addition, due to the discovery of perchlorate in local groundwater the investigation will include a characterization and evaluation of local groundwater hydrology and attempt to determine the source of the perchlorate contamination. The agencies involved with these investigations include the Baltimore District USACE, AUES FUDS cleanup program, Environmental Protection Agency Region 3, the District of Columbia Department of Health and Washington Aqueduct. Testing to date indicates that the perchlorate concentration in the drinking water provided by the Washington Aqueduct is below all anticipated drinking water regulatory concentrations.

A limited number of soil borings were recently drilled at the East Dalecarlia Processing Site to allow the fill under the site to be classified and determine whether pile foundations would be required if Alternative E were implemented. Attention was paid to whether any of the east soil borings exhibited an oily smell to allow a comparison with the borings previously drilled at the Northwest Dalecarlia processing site. None of the soil borings drilled at the east site had an oily smell and no evidence of contamination was found. Subsequent to drilling the east site soil borings, a new monitoring well was installed immediately north of Little Falls Road, in an area near the East Dalecarlia processing site. A small vessel, apparently filled with an oily substance, was encountered approximately 5-feet below grade.

3.7.7.3 Proposed Monofill Site

The proposed monofill site is partially located within the boundaries of the AUES FUDS and is considered a potential area for unexploded ordnance (UXO). Evidence suggests that ordnance had been found within the proposed monofill site in the past. An extensive geophysical investigation of the area is scheduled to begin in fiscal year 2008.

An investigation of groundwater at the proposed monofill site is currently underway. Therefore, it is not known if contamination associated with the AUES FUDS exists in the area of the monofill.

3.7.7.4 Pipeline to Blue Plains AWWTP

In June 2004, EDR completed a computerized search of environmental databases for areas within a standard 1-mile proximity to the proposed location of the residual pipeline. The results of this search were used to document the potential of any sites listed in the EDR report to have an impact on the construction of the proposed pipeline.

The area of most concern is the portion of the proposed pipeline route located along the southwestern shoreline portion of the Anacostia Naval Station and along the western shoreline portion of Bolling Air Force Base. Both federal facilities have a history of military industrial activities that have left behind old industrial sites and places where hazardous substances may have been released into the environment. Currently, both facilities implement Environmental Restoration Programs designed to identify, investigate, and clean up former waste disposal sites.

Table 3-9 identifies the sites of potential concern and issues identified by the EDR search. Figure 3-31 displays the approximate pipeline route to convey residuals from the Dalecarlia complex to the Blue Plains AWWTP.

TABLE 3-9
Adjacent Properties of Potential Concern Noted in the Computerized Environmental Database Review

Database Site Number	Listed Site	Databases	Issues
338	Anacostia Naval Station	CERCLIS-NFRAP, RCRIS-SQG, FINDS, DC UST	Currently undergoing environmental investigation and cleanup activities. EDR noted 8 violations (1995-2002) related to generator transport requirements. ICIS, NCDB, RCRAINFO
339	Anacostia Naval Station	ENRS	1989, No source known. Sheen appeared coming from storm drain. No other tributary other than Station Anacostia. Action: Secured storm sewer pumps and pumped intermittently while booming off the outfall. Suspected only light quantity of oil due to small size of sheen.
344	Bolling Air Force Base	DC LUST	Leaking underground storage tank reported (Open).
345	Bolling Air Force Base	ENRS	1990, 45’ Barge sank, releasing 10 gallons of gasoline into the water. Gasoline was contained with a boom and barge recovered from river.
345	Bolling Air Force Base	ENRS	1987, 7000 Gallon #2 Fuel Oil spill. May have gone into storm sewer system to Potomac.
345	Bolling Air Force Base—Darwin Construction Company Bldg. 1300	RCRIS-SQG, FINDS,	Federal Facility—EDR notes 5 violations (1989-1998) of Generator Transport Requirements. RCRAINFO
151	Association of Trial Lawyers of America-1050 31st St., NW	DC LUST	Leaking underground storage tank reported (Open).
154	Adwork-1025 Thomas Jefferson St, NW	RCRIS-SQG, FINDS	No violations noted (RCRIS), RCRAINFO
156	Incinerator of Georgetown-1003 Wisconsin Ave., NW	DC LUST	Leaking underground storage tank reported (Open).
156	K St/Wisconsin Ave., NW	ERNS	1993,Suspected leak of oil from Colonial Pipeline
156	Thrifty Car Rental-1001 Wisconsin Ave., NW	DC LUST	Leaking underground storage tank reported (Closed).
165	Claridge House Cooperative-950 25th St, NW	DC UST, DC LUST (2)	2 Leaking underground storage tank reported (Closed).
299	NPS—East Potomac Maintenance Yard-1100 Ohio Dr., SW	RCRIS-SQG, FINDS, DC UST, DC LUST	5 violations noted (1998-99)—Generator record keeping requirements. Leaking underground storage tank reported (Closed). RCRAINFO
310	Landmark Services Tourmobile Inc.-1000 Ohio Dr., SW	DC LUST (2)	Gas Station LUST, Facility Closed
310	NPS—1000 Ohio Dr., SW	DC LUST, DC UST	Leaking underground storage tank reported (Closed).

CERCLIS-NFRAP—Comprehensive Environmental Response, Compensation, and Liability Information System—No Further Remedial Action Planned

DC UST—Registered UST in DC
DC LUST—Leaking UST in DC
ERNS—Emergency Response Notification System
FINDS—Facility Index System
HMIRS—Hazardous Materials Information Resource System
RCRIS-SQG—RCRIS Small Quantity Generator

Acronyms for FINDS sites:
ICIS—Integrated Compliance Information System
NCDB—National Compliance Database
RCRAINFO—Resource Conservation and Recovery Act Information System

3.8 Soils, Geology, and Groundwater

3.8.1 Information Sources

Principal sources of information were obtained from existing literature and included the following:

- Soil Survey of District of Columbia, U.S. Department of Agriculture (USDA), Soil Conservation Service
- Soil Survey of Montgomery County, MD, USDA, Soil Conservation Service
- Existing NEPA documents
- Geology and Groundwater Resources of Washington, DC and Vicinity, USGS Water Supply Paper
- Other existing groundwater data related to the AUES FUDS

3.8.2 Physiography and Topography

The project area is situated within two physiographic provinces, the Piedmont Plateau and the Atlantic Coastal Plain. These provinces are differentiated based upon the predominant rock types that underlie each area. The boundary between these regions, known as the Fall Line, runs north to south through northwest Washington, DC, along Rock Creek Park. In Maryland, the Fall Line continues northeastward through Baltimore City, exiting Maryland into Delaware north of the Chesapeake Bay.

The Dalecarlia and Georgetown Reservoirs lie northwest of the Fall Line in the Piedmont Plateau. The Dalecarlia Reservoir property slopes from east to west toward the Potomac River. The highest elevation on the property, more than 270 feet above mean sea level, is located along the eastern border of the property near the Dalecarlia Parkway and is wooded upland. Elevations in the lower area range from 140 to 150 feet above mean sea level. The Georgetown Reservoir property is sited on a level area ranging in elevation of between 140 and 150 feet above mean sea level.

3.8.3 Geology

The Piedmont Plateau is made up of hard, crystalline igneous and metamorphic rock. Metamorphic rocks of the Wissahickon Formation of the Glenarm Series predominate the area where the Dalecarlia and Georgetown Reservoirs are located. The formation directly underlying the sites is characterized as medium to coarse crystalline, layered to massive, jointed quartz-feldsparbiotite gneiss with scattered quartz pods and schist and amphibolite cobbles; it is overlain by sandy, reddish-brown, well drained saprolite, as much as 120 ft thick on the uplands but less then 25 ft where overlain by Coastal Plain strata.

The Atlantic Coastal Plain is composed of a wedge of unconsolidated gravel, sand, silt, and clay. The sediments along the western border of the Coastal Plain overlap the rocks of the Piedmont Plateau. Moving eastward, the Coastal Plain dips slightly, generally less than one degree, and increases in depth, up to a maximum thickness of 40,999 feet, approximately 75 miles off shore.

3.8.4 Soils

Soils at the sites range from highly weathered Utisols to relatively young Inceptisols and Entisols. At the Dalecarlia Reservoir and Treatment Plant, the soils include those disturbed by the USACE Coastal Research Center demolition and periodic application of dredge and fill material. This area received material removed for the construction of two sedimentation basins, from operation maintenance dredging of the reservoir's Forebay and other construction fill. Soils are primarily fine-grained loams on a variety of slopes.

According to the Soil Surveys for the District of Columbia and Montgomery County, Maryland, the dominant soil associations for the Dalecarlia Reservoir and Treatment Plant are the Manor-Glenelg and the Glenelg-Manor-Chester. The Manor-Glenelg association consists of deep, steep to nearly level, well-drained, and somewhat excessively drained soils underlain by acid crystalline rocks, on uplands with broad ridgetops. The Glenelg-Manor-Chester association consists of well-drained, silty, micaceous soils that are mainly strongly sloping. The Glenelg, Manor, and Chester soils are dominant, but small areas of other soils are included. The Glenelg and Manor soils are moderately deep; the Chester soils are the deepest soils in Montgomery County, Maryland.

The dominant soil association for the Georgetown Reservoir is the Udorthents. The Udorthents association consists of deep to moderately deep, nearly level, moderately well drained soils that consist of cuts, fills, or otherwise disturbed land, on all landscape positions. The Udorthents units found at the Georgetown Reservoir consist of earthy fill material that was placed on poorly drained to somewhat excessively drained soils on uplands, terraces, and floodplains of the Coastal Plain and Piedmont, to provide sites for development.

3.8.5 Groundwater

Groundwater occurrence in Montgomery County, Maryland depends largely on the character, areal extent, and structure of the rock formations. In general, the groundwater moves downward and laterally from upland areas to lowland areas, where it is discharged into springs and streams. Groundwater in the vicinity of the Dalecarlia Reservoir and Treatment Plant is usually unconfined and occurs both within the overburden and underlying rock formations of the Piedmont. Depending upon depth, the direction of unconfined groundwater flow typically follows surface bedrock contours.

On the basis of site topography and bedrock contours, it is probable that groundwater in the overburden flows generally to the west and southwest, towards the Potomac River. Considering the depth to bedrock, perched water could occur within the overburden and influence groundwater flow direction. It is likely that high groundwater levels occur between November and April. High groundwater is usually at depths greater than 5 feet for the soils identified in these areas.

For the Dalecarlia and Georgetown areas, the underlying Piedmont formations yield little water because of the compact fabric of the crystalline rock. Groundwater occurrence and movement within the rock are primarily controlled by rock fractures and depth of weathering. The average yield of wells in the Piedmont formation is 13 gallons per minute. The unconsolidated sediments of the Atlantic Coastal Plain are generally capable of supplying higher yield wells.

In general, groundwater in the Piedmont formations is soft, high in iron, and low in chlorides and dissolved solids.

3.9 Infrastructure

Infrastructure is defined as the region's resources for providing electric power, potable water, wastewater, solid waste (municipal solid waste and construction debris), and gas service. The goal of this evaluation is to determine whether the proposed alternatives stress the region's capacity to provide these services during the 20-year life of the project. Potable water is not considered as part of the existing conditions or project infrastructure impacts analyses because the facility produces potable water and its use rate is relatively low. Therefore, supply is plentiful.

3.9.1 Existing Conditions at Washington Aqueduct

The existing demand of the Washington Aqueduct's current operation is the baseline for assessing project impacts. To that end, this section describes the Aqueduct's usage, sources, quantity, and general infrastructure configuration for electricity, wastewater, solid waste disposal practices, and fuel.

3.9.1.1 Electricity

Electricity is currently supplied to the Dalecarlia WTP by the Potomac Electric Power Company (PEPCO) through buried lines. Average annual electric consumption is approximately 36 million kilowatt-hours (kWh) per year. For the 2003-2004 Operating Year, the Washington Aqueduct experienced a peak electric demand of 11,233 kWh.

Blue Plains AWWTP also receives electric power from PEPCO. Average annual electric consumption is approximately 280 million kWh per year.

3.9.1.2 Wastewater

This section is limited to a discussion of municipal wastewater. The future water treatment residuals waste stream and wastewater discharges from the processing facilities or monofill are evaluated in the impacts section associated with this subject (Section 4.10).

Wastewater is currently generated by restroom facilities, kitchens, drinking fountains, etc. in buildings throughout the plant. No other discharges to the DC WASA system are made. Wastewater flows by gravity to the Potomac Interceptor and is treated by the Blue Plains AWWTP. The Blue Plains AWWTP has an annual average capacity of 370 mgd and a peak wet weather capacity of 1.076 bgd.

3.9.1.3 Solid Waste

Small amounts of municipal solid waste are currently generated at buildings associated with Washington Aqueduct operations at the Dalecarlia WTP. This waste is collected and disposed of by a private contractor.

At Blue Plains AWWTP, debris and grit removed from wastewater is contract hauled to a landfill. Biosolids generated by the Blue Plains AWWTP treatment process (approximately 1,350 tons per day) are primarily disposed of by land application to agricultural fields in Maryland and Virginia.

3.9.1.4 Fuel

Natural gas and number two heating oil are used to heat Washington Aqueduct. Natural gas or heating oil heats the Administration Building and heating oil heats all other buildings. Approximately 111,000 therms/year of natural gas are supplied by Washington Gas to heat the Administration Building.

The Blue Plains AWWTP also uses natural gas as a partial heating source. Approximately 96,000 therms/year of natural gas are currently supplied to the Blue Plains AWWTP facility.

3.9.2 Existing Conditions at Blue Plains AWWTP

As mentioned above, the Blue Plains AWWTP provides wastewater treatment to over 2 million people and is permitted for an average daily flow of 370 mgd. The facility can also treat flow rates of 740 mgd for up to 4 hours and continuous, peak, full-treatment flow of 511 mgd. Additionally, up to 336 mgd of storm water flow must receive partial treatment, resulting in a total plant capacity of 1,076 mgd.

The plant is considered to be the world's largest advanced wastewater treatment facility. Infrastructure provides sufficient water, sewer, power, and fuel for equipment and facilities operations. DC WASA is currently in the midst of several important capital improvement programs to modernize and upgrade the facilities to meet future regulatory requirements (See Volume 2 to this document).

3.10 Transportation

3.10.1 Introduction

Transportation and its land use relationships are an important element of an Environmental Impact Statement (EIS). This is particularly relevant to the proposed project, since potential transportation impacts would pertain primarily to the generation of heavy truck trips involved in hauling residuals from Dalecarlia. This section presents an overview of the key existing transportation conditions within the immediate/local area of the Washington Aqueduct Dalecarlia site, as well as along eight potential haul routes. This section also highlights key opportunities and constraints, as part of the base conditions for selecting the preferred haul route(s) and for identifying potential impacts in Section 4 on the adjacent corridors, including residential communities and other "sensitive" land uses. "Sensitive" land uses are considered by transportation planners and traffic engineers to include residential communities, schools, Federal Facilities, hospitals and other institutions.

This existing transportation conditions overview is based on various field investigations and related analyses, review of relevant planning documents, as well as telephone discussions and correspondence with staff of the District of Columbia Department of Transportation (DC DOT), the Maryland State Highway Administration (MSHA) and the Virginia Department of Transportation (VDOT). The field investigations and analyses conducted included intersection and roadway link traffic volume and classified counts, travel time and delay surveys, as well as other studies conducted by the above agencies (see Volume 2 of this document). The observations collected also include identification of facilities "sensitive" to hauling operations. The remainder of this section presents the results of the existing transportation conditions assessment undertaken, as well as the key issues identified.

3.10.2 Site Location and Accessibility

The Washington Aqueduct's Dalecarlia Reservoir is situated along the east side of MacArthur Boulevard, within Northwest Washington, DC and the southwest area of Montgomery County, Maryland. On the west side of MacArthur Boulevard, is located the Dalecarlia Water Treatment Plant, and the area just to the north (within Montgomery County, MD) is the northwest Dalecarlia processing site identified for a new residuals collection and treatment facility. The immediate areas to the north, east and south are primarily developed with well-established residential communities. The primary exceptions are the Sibley Memorial Hospital complex located south of the Dalecarlia Reservoir within the District, and the NGA offices located to the north within Montgomery County, Maryland. Further to the east is the American University Campus. Running north-south to the west is the Potomac River, beyond which is Fairfax County, Virginia.

The site is reasonably well served with regional access, via a number of arterial roadways, which interchange with the Capital Beltway (I-495) and other freeway facilities. These arterial roadways include the following:

Massachusetts Avenue: This is designated a Principal Arterial on the City's Functional Classification Map (2003), and an Urban Minor Arterial (Route 396) within Montgomery County, Maryland. This roadway runs generally north-south; and is two- to four-lane undivided within Montgomery County, MD, and four-lane undivided between the District Line and the Downtown Area. Massachusetts Avenue serves significant commuter/regional traffic between the Glen Echo – Somerset area of Montgomery County, MD and Downtown, Washington, DC The average daily traffic (ADT) volume served is in the range of 26,250 within Montgomery County, MD. Within the City, near the Dalecarlia WTP site, the ADT volumes are in the range of 25,000.

River Road: This is designated a Principal Arterial on the City's Functional Classification Map (2003), and an Urban Principal Arterial (Route 190) between the District Line and the Capital Beltway in Montgomery County, MD. This roadway runs generally north-south; and is four-lane divided between the Capital Beltway and Springfield Drive, and four-lane undivided between Springfield Drive and the District Line. Within the City, River Road is primarily two-lane undivided. River Road serves significant commuter/regional traffic between the Capital Beltway and its southern terminal at Wisconsin Avenue. The ADT volumes carried by River Road ranges from 28,000 to 58,000, between the District Line and the Capital Beltway, and from 9,000 to 13,000 within the City.

Other arterials within the general site area, which interchange with the Capital Beltway, include Wisconsin Avenue and Connecticut Avenue, which both traverse Montgomery County, MD and the District. Access to the Capital Beltway is also provided to the west within the State of Virginia, via major arterials including Chain Bridge Road – Dolley Madison Boulevard (VA 123) and Georgetown Pike (VA 193).

The above-noted arterials are connected to the site via several arterials within the City. These include MacArthur Boulevard, Canal Road, Loughboro Road, Dalecarlia Parkway and Western Avenue. Some of these roadways also provide immediate access to the Washington Aqueduct Dalecarlia Reservoir area. The location of the site and its regional access roadways are shown in Figure 3-6.

3.10.3 Local Access Roads

The Dalecarlia is accessed directly off MacArthur Boulevard. Other roads providing local access to the Dalecarlia include Loughboro Road and Dalecarlia Parkway. The functional and service characteristics of these roads are as follows:

MACARTHUR BLVD, NW

MacArthur Boulevard: This roadway is classified as a Minor Arterial on the City's Functional Classification Map (2003), and the current Montgomery County, MD Master Plan of Transportation. It runs in a north-south direction; and is a two-lane facility within Montgomery County, MD. South of the city line, the roadway widens to four-lanes at the entrance to the Dalecarlia WTP. Parking is allowed along both sides, generally between Little Falls Road (just north of Loughboro Road) and beyond Arizona Avenue to the south. MacArthur Boulevard serves considerable commuter/regional traffic between the southwest area of Montgomery County, MD and the Georgetown area of the City. The ADT volumes served by this roadway ranges from 14,200 at the District Line, to 19,700 in the vicinity of Arizona Avenue. The posted speed limit is 25 miles per hour (mph).

MacArthur Boulevard has a weight limit north of the Mongomery County/District of Columbia line due to the presence of the raw water conduits. This restricts truck access on this portion of the road.

Loughboro Road: This roadway runs east west between MacArthur Boulevard and Massachusetts Avenue. It is classified as a Minor Arterial between MacArthur Boulevard (to the west) and Dalecarlia Parkway, a collector between Dalecarlia Parkway and Arizona Avenue, and primarily as a Major Arterial between Arizona Avenue and Massachusetts Avenue (to the east). This two-way roadway primarily provides two (2) lanes of travel, and on-street parking (along the southern side), between MacArthur Boulevard and Arizona Avenue. East of Arizona Avenue, four (4) lanes of travel are provided, and on-street parking is prohibited. Loughboro Road rises steeply between MacArthur Boulevard and a point west of the signalized entrance to the Sibley Memorial Hospital. The ADT volumes along Loughboro Road range from are in the range of 12,200. The posted speed limit is 25 mph.

Dalecarlia Parkway: This is a four-lane Minor Arterial on the City's Functional Classification Map (2003). It runs between Loughboro Road (to the southwest) and connects with the Westmoreland Circle (to the northeast). Dalecarlia Parkway serves ADT volumes in the range of 15,000. The posted speed is 40 mph.

3.10.4 Traffic Conditions Assessment

The local area setting of Dalecarlia is shown in Figure 3-7. An assessment of the existing traffic conditions within the local area was undertaken based on the following criteria:

1. Field observations and traffic turning movement counts conducted at selected intersections along MacArthur Boulevard and Loughboro Road, during the morning and afternoon peak periods (i.e., 7:00 – 9:00 a.m. and 4:00 – 6:00 p.m., respectively). These included the MacArthur Boulevard intersections at Little Falls Road, Loughboro Road, and Cathedral Avenue; and the Loughboro Road intersections at the main and secondary entrances to the Sibley Memorial Hospital, and at Dalecarlia Parkway.
2. Automatic/continuous vehicle volume and the classification counts along MacArthur Boulevard, Loughboro Road and Dalecarlia Parkway, in the vicinity of the Reservoir;
3. Observations of vehicle travel speeds along the roadways noted in Item (b); and review of accident data provided by DC DOT, for the last three (3) years for which such data is available; and
4. Analysis of the data obtained through Items (a) to (c) above, primarily based on guidelines and procedures stipulated by the FHWA and the DC DOT.

The results indicate that the local area roadway network currently operates within the acceptable Level-of-Service standards developed by DC DOT, with the exception of the unsignalized intersection of Loughboro Road at Dalecarlia Parkway. This intersection operates at capacity during the morning peak period only. The determination that this intersection is not within the acceptable Level-of-Service is primarily attributed to the extensive delays experienced by vehicles turning left from southbound Dalecarlia Parkway onto eastbound Loughboro Road.

Level-of-Service is a qualitative measure that describes operational conditions within a traffic stream on a roadway segment or at an intersection, and reflects the perception by drivers and other roadway users. Principal level-of-service considerations are speed, travel time, delay, and freedom of maneuver, traffic interruptions, comfort, convenience and safety. Current engineering practice defines six (6) levels of service (A-F), with "A" representing best operating conditions, and "F" representing the worst conditions. Level of Service "D" is generally considered by the District of Columbia as the minimum acceptable standard for planning and design purposes.

Analysis of the vehicle classification data around Dalecarlia shows that passenger vehicles are the dominant type of vehicle, and heavy trucks constitute a low percentage (approximately 1.2%) of the total traffic volumes along the local study area roadways. Field observations indicate that heavy trucks encounter some difficulty in climbing the gradient along Loughboro Road between the intersections of MacArthur Boulevard and Dalecarlia Parkway. Vehicles waiting to turn left from Loughboro Road into the secondary entranceway of the Sibley Memorial Hospital adds to the congestion on this roadway segment.

Vehicular speeds and travel time and delay surveys were conducted on the local roadways for the haul routes. The data indicate that average vehicular speeds are in the range of the posted speed limits. The field observations also indicate that pedestrian activity is low to moderate. The highest pedestrian crossings occur at the intersection of Loughboro Road at the Sibley Memorial Hospital Main Entrance. However, the pedestrian signalization and crosswalks provided at this intersection allow such movements to occur safely. The accident data obtained confirm that there are no significant safety deficiencies within the local area roadway network.

3.10.5 Proposed Residuals Haul Routes

The Washington Aqueduct Residuals Management Project includes the dredging of the Dalecarlia and Georgetown Reservoirs, and the subsequent haulage of the residuals to various sites, which are primarily accessible via the Capital Beltway (I-495). The proposed haulage operations would occur generally between 6:00 a.m. and 4:00 p.m., and be concentrated between 9:00 a.m. and 3:00 p.m., on weekdays only. The haulage activity would therefore have a minimal impact on the morning peak period and would have no impacts on the afternoon peak period by restricting hauling to this timeframe.

All hauling routes analyzed, with the exception of southeastern route H, were previously considered by the Washington Aqueduct for dredging the Dalecarlia Reservoir. Prior to September 11, 2003, the southern routes were feasible for trucking residuals through the District of Columbia. New security measures adopted after September 11, 2003 have limited the roadways where trucks may travel making routes F and G infeasible. In response, a new haul route has been proposed that directs truck traffic from the Dalecarlia WTP to the south, ultimately connecting with Route 395. This route has been designated Route H.

Eight potential haul routes (A to H), as illustrated in Figures 3-8, through 3-16 respectively, have been evaluated within the DEIS. Five of those routes connect Dalecarlia to the Capital Beltway. The remaining three routes connect Dalecarlia to the southeast/southwest freeway. The eight routes are as follows:

- Route A - To the north via MacArthur Boulevard—Loughboro Road—Dalecarlia Parkway—Western Avenue—Wisconsin Avenue (MD 355)—Capital Beltway (I-495).
- Route B - To the northwest via MacArthur Boulevard—Loughboro Road—Dalecarlia Parkway—Western Avenue—River Road (MD 190)—Capital Beltway (I-495).
- Route C - To the northwest via MacArthur Boulevard—Loughboro Road—Dalecarlia Parkway—Massachusetts Avenue (MD 396)—Little Falls Parkway—River Road (MD 190)—Capital Beltway (I-495).
- Route D - To the west via MacArthur Boulevard—Arizona Avenue—Canal Road—Chain Bridge Road (VA 123)—Dolley Madison Boulevard (VA 123) - Dulles Access/Toll Road - Capital Beltway (I-495).
- Route E - To the west via MacArthur Boulevard - Arizona Avenue - Canal Road - Chain Bridge Road (VA 123) - Georgetown Pike (VA 193) - Capital Beltway (I-495).
- Route F- To the southeast via MacArthur Boulevard-Loughboro Road-Dalecarlia Parkway-Massachusetts Avenue-23rd Street-Constitution Avenue-9th Street (Tunnel)-Southwest/Southeast Freeway (I-395)
- Route G-To the southeast via MacArthur Boulevard-Canal Road-Whitehurst Freeway-23rd Street-Constitution Avenue-9th Street (Tunnel)-Southwest/Southeast Freeway (I-395)

- Route H- To the southeast via MacArthur Boulevard-Loughboro Road-Dalecarlia Parkway-Massachusetts Avenue-Mount Vernon Square-New York Avenue-Southwest/Southeast Freeway (I-395) (In reverse direction, Southwest/Southeast Freeway (I-395)-2nd NW-Massachusetts Avenue-7th Street-Mount Vernon Square-Massachusetts Aveune-Dalecarlia Parkway-Loughboro Road-MacArhur Boulevand.

For ease of reference, these routes would be referred to as Route A—Wisconsin Avenue (MD 355), Route B—River Road (MD 190), Route C—Massachusetts Avenue (MD 396), Route D—Dolley Madison Boulevard (VA 123), Route E—Georgetown Pike (VA 193), Route F—Southeast Freeway (I-395), Route G—Southeast Freeway (I-395) Alt1 and Route H—Anacostia Freeway (I-295). These routes are illustrated in Figure 3-8 and Figures 3-9 to 3-17.

All potential haul routes were evaluated based on their functional and service characteristics. Key criteria included peak versus off-peak directional patterns, ADT/Lane Configuration and Level-of-Service relationships, vehicle classification characteristics, travel time - distance relationships, capacity/operational constraints, safety deficiencies, impacts on “sensitive” land uses.

The base data for the above criteria were obtained through the performance of windshield field reconnaissance activities, during which the abutting land uses, peak and off-peak traffic flow conditions, as well as access/circulation opportunities and constraints were noted. Travel time and delay surveys were also conducted along the haul routes. These surveys were undertaken during the peak and off-peak periods that would likely be impacted by the hauling operations. The site specific field data obtained was supplemented by ADT, vehicle classification and accident data obtained as part of the local area impact assessment, as well as through relevant data provided by the Maryland State Highway Administration and VDOT.

Based on the above, the key functional and service characteristics of the eight (8) routes evaluated, are presented below:

Route A—Wisconsin Avenue (MD 355)

This route is approximately 6.6 miles long. It provides at least two lanes of travel per direction, except along Loughboro Road (in the vicinity of the Sibley Memorial Hospital complex) where a single lane is provided. The ADT volumes vary from 12,250 (along Loughboro Road) to 64,000 (along Wisconsin Avenue near the Capital Beltway).

The roadways forming this route operate at acceptable Levels of Service, based on the standards established by DC DOT, the MSHA and the Maryland-National Capital Park and Planning Commission (M-NCPPC). The existing percentages of heavy trucks range from 1.0% (along Western Avenue) to 5% (along Wisconsin Avenue at the Capital Beltway).

The morning peak period directional traffic flow along the longest roadway of this route, Wisconsin Avenue, is southbound during

WISCONSIN AVENUE (MD 355)
at Friendship Heights Metrorail Station

the morning peak period. This distribution pattern provides capacity/operational advantages for outbound trucks traveling in the opposite direction. The principal potential constraints observed include the following:

The gradient along Loughboro Road is in the vicinity of the Sibley Memorial Hospital is relatively steep.

LOUGHBORO ROAD, NW
with Sibley Memorial Hospital to the left

Left-turn movements from eastbound Western Avenue onto northbound Wisconsin Avenue are not provided with exclusive signal phasing. This encourages vehicles to turn during the yellow and all-red traffic light phases.

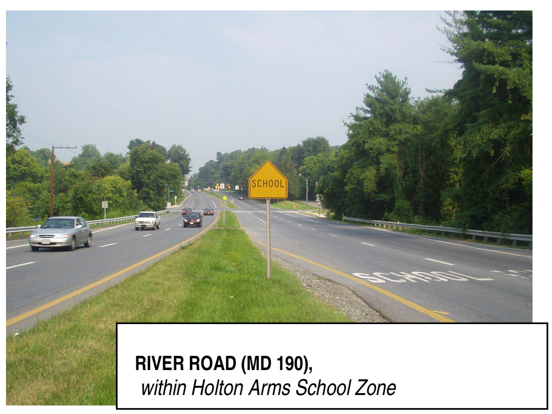
Heavily loaded trucks/vehicles tended to travel at lower speeds when climbing a gradient, or upgrade, this may lower the speeds of following vehicles. This is particularly true when trucks do not arrive with momentum at the upgrade. In the case of Loughboro Road and Rt. 123 the trucks will be climbing the gradient after having stopped at or turned from an at-grade intersection.

The route consists of major high-volume intersections, where there are significant vehicular-pedestrian conflicts. Such locations include those situated adjacent to the Friendship Heights and Bethesda-Chevy Chase Metrorail Stations, on the Red Line of the Washington Metropolitan Area Transit Authority (WMATA) rail system.

The abutting “sensitive” land uses include the Sibley Memorial Hospital complex; residential uses particularly along Loughboro Road and Western Avenue; major concentrations of commercial, retail and residential uses along Wisconsin Avenue adjacent to the Friendship Heights and Bethesda - Chevy Chase Metrorail Stations; and Federal institutions along Wisconsin Avenue, comprising the National Institute of Health, the National Library of Medicine and the National Naval Medical Center. The latter institutional uses are served by the Medical Center Metrorail Station on WMATA’s Red Line. Key elements of the characteristics noted above are illustrated in Figure 3-9 & 10.

Route B—River Road (MD 190)

This route is approximately 6.4 miles long. It includes the section of Route A (Wisconsin Avenue), between MacArthur Boulevard and River Road. The route provides two (2) lanes of travel per direction, except along Loughboro Road adjacent to the Sibley Memorial Hospital.



RIVER ROAD (MD 190),
within Holton Arms School Zone

The ADT volumes vary from 12,250 (along Loughboro Road) to 58,600 (along River Road at the Capital Beltway). The roadways constituting this route operate at acceptable Levels of Service, based on the standards established by the DC DOT, the MSHA and the M-NCPPC. The existing percentages of heavy trucks range from 1.0% (along Western Avenue) to 2.1% (along River Road at the Capital Beltway).

The morning peak period directional traffic flow along the longest roadway of this route, River Road, is southbound during the morning peak period. This distribution pattern provides capacity/operational advantages for outbound trucks traveling in the opposite direction to the Capital Beltway.

No significant capacity/operational or safety constraints were observed, apart from the gradient along Loughboro Road. The key abutting land uses include the Sibley Memorial Hospital complex; and residential uses along Loughboro Road, Western Avenue and River Road (between Western Avenue and Little Falls Parkway). A school zone exists in the area of the Holton Arms School, which is situated just inside the Capital Beltway.

Moderate pedestrian activity was observed along River Road, between the Little Falls Parkway and Ridgefield Road intersections, where the abutting land uses include small shopping centers. Key elements of the characteristics noted above are illustrated in Figure 3-11.

Route C—Massachusetts Avenue (MD 396)

This route is approximately 6.3 miles long. The route segment between the Dalecarlia and Massachusetts Avenue is also a part of Routes A and B; and the segment of River Road, north of Little Falls Parkway to the Capital Beltway, is also a part of Route B. This route provides two lanes of travel per direction, except along Loughboro Road adjacent to the Sibley Memorial Hospital, and Little Falls Parkway between Massachusetts Avenue and River Road where a single lane is provided.

The ADT volumes vary from 12,250 (along Loughboro Road) to 26,250 (along Massachusetts Avenue). The roadway links forming this route operate at acceptable Levels of Service, based on the standards established by the DC DOT, the MSHA and the M-NCPPC. The existing percentages of heavy trucks range from 1.2% (along Loughboro Road) to 3.4% (along Massachusetts Avenue).

The morning peak period directional traffic flows along the longest roadway of this route, River Road, is southbound during the morning peak period. This distribution pattern provides capacity/operational advantages for trucks leaving Dalecarlia with residuals. Additionally, it was observed that an inadequate turning radius is provided for large vehicles, including heavy trucks turning from northbound Massachusetts Avenue to eastbound Little Falls Parkway.

LITTLE FALLS PARKWAY

The key abutting land uses include the Sibley Memorial Hospital complex, residential uses along Loughboro Road and Massachusetts Avenue, and the Holton Arms School situated along River Road just inside the Capital Beltway. Moderate pedestrian activity was observed along River Road, between the Little Falls Road and Ridgefield Road intersections, where the abutting land uses include small shopping center uses. Key elements of the aspects noted above are illustrated on Figure 3-12.

Route D—Dolley Madison Boulevard (VA 123)

This route is approximately 7.8 miles long. It provides at least two (2) lanes of travel per direction, except in the following areas:

- Arizona Avenue between MacArthur Boulevard and Canal Road;
- Canal Road, between Arizona Avenue and Chain Bridge, where the number of lanes vary from one (1) to two (2), depending on the time of day and peak direction of travel;
- Chain Bridge, across the Potomac River; and
- Chain Bridge Road (VA 123), between the Bridge and Kirby Road (VA 695).

The ADT volumes vary from 14,200 (along MacArthur Boulevard) to 47,000 (along Dolley Madison Boulevard near the Capital Beltway).

The route roadway network operates at acceptable Levels of Service, based on the standards established by the DC DOT, and the VDOT. The existing percentages of heavy trucks range from 1.4% (along MacArthur Boulevard) to 3.0% (along Dolley Madison Boulevard).

CHAIN BRIDGE ROAD (VA 123)

During the morning peak period, the outbound truck trips are likely to encounter varying capacity/Level-of-Service conditions, due to different peak directional traffic flow patterns along the various segments of the route. For example, the outbound trips would impact the peak directional traffic flow along MacArthur Boulevard, during the morning peak period. However, the truck trips would be part of the reverse peak directional traffic movements along southbound Arizona Avenue, northbound Canal Road, and westbound Chain Bridge Road.

Two significant operational constraints are worthy of note:

- A steep downward gradient and horizontal curve exist along Arizona Avenue, between MacArthur Boulevard and Canal Road. Trucks laden with residuals will be forced to travel at slower than the posted speed as they approach the signalized Arizona Avenue/ Canal Road intersection, particularly with wet pavement surface conditions. The empty trucks may also experience slow movement in the reverse upward direction.

- Chain Bridge Road (VA 123) rises somewhat steeply from a signalized intersection just west of the Chain Bridge. This situation could present significant operational problems for trucks loaded with residuals, particularly after stopping at the intersection.

The key abutting land uses include the Sibley Memorial Hospital; residential uses particularly along MacArthur Boulevard and Dolley Madison Boulevard and the George Bush Center for Intelligence/Central Intelligence Agency (CIA) Headquarters along Chain Bridge Road (VA 123). No significant pedestrian activity was noted. Key elements of the characteristics noted above are illustrated in Figure 3-13.

Route E—Georgetown Pike (VA 193)

This approximately 6.8-mile long route includes the segment of Route D, which runs from the Dalecarlia to the Dolley Madison Boulevard /Georgetown Pike intersection. This route provides at least two (2) lanes of travel per direction, except those areas noted above for Route-D, and Georgetown Pike between Chain Bridge Road and the Capital Beltway.

The ADT volumes vary from 9,700 (along Georgetown Pike) to 19,650 (along MacArthur Boulevard). The roadways involved operate at acceptable Levels of Service, based on the standards established by the DC DOT and VDOT. The existing percentages of heavy trucks range from 1.0% (along Georgetown Pike) to 1.4% (along MacArthur Boulevard).

GEORGETOWN PIKE (VA 193)

The potential access situation for outbound trucks, during the morning peak period, is the same as that described above for Route D. Similarly applicable are the operational constraints noted for Route D.

The key abutting land uses include the Sibley Memorial Hospital complex, residential uses along MacArthur Boulevard, the George Bush Center for Intelligence /CIA complex along Chain Bridge Road (VA 123), as well as the Langley High School and Saint Luke’s Catholic Church School zones along Georgetown Pike (VA 123). There were no observations of significant pedestrian activity, associated with these land uses. Key elements of the aspects noted above are illustrated in Figure 3-14.

Routes F & G—Southeast/Southwest Freeway (I-395) and Anacostia Freeway (I-295)

These routes were used during the previous dredging operations, to haul residuals primarily to the Southwest-Southeast Freeway (I-395) and beyond. Route F was also used to haul residuals to Rock Creek Park sites (in the vicinity of Massachusetts Avenue). These routes do not connect Dalecarlia directly with the Capital Beltway (I-495). Instead, they run through Downtown Washington, DC, only to connect with the Southwest-Southeast Freeway (I-395) and Anacostia Freeway (I-295) systems, which in turn connect with the Capital Beltway at several points.

The key abutting land uses include major institutional and recreational facilities, which generate significant volumes of vehicular and pedestrian traffic, particularly along Constitution Avenue. These uses include the following:

- The American University campus and the US Navy Security Site at the Massachusetts Avenue - Nebraska Avenue Circle;
- The Washington National Cathedral complex at the Massachusetts Avenue – Wisconsin Avenue intersection;
- The U.S. Naval Observatory, situated just south of the Washington National Cathedral;
- George Washington University Campus, and the WMATA Foggy Bottom Metrorail Station (on the Blue and Orange Lines), situated at the 23rd Street/ K Street, N.W. intersection;
- The Georgetown residential area and the Georgetown University Campus, situated along MacArthur Boulevard and Canal Road; and
- The City's Central Employment/Monumental Core along Constitution Avenue, which includes a significant number of Federal office uses, as well as monuments and museums on the National Mall. These uses generate significant pedestrian activity across Constitution Avenue.

Constitution Avenue also provides access to the U.S. Capitol, and is in proximity to the White House and other key "sensitive" land uses. Considering the current state of security consciousness regarding government buildings and public spaces, it is likely that the hauling of residuals along Constitution Avenue would not be permitted by the U.S. Capitol Police. Based on the above, Routes F and G do not appear to be alternatives worthy of strong consideration. Further details regarding the operational characteristics of these routes are therefore not provided, as was done for the other routes. Key elements of the aspects noted above are illustrated in Figures 3-15 and 3-16, for Routes F and G, respectively.

Route H—Southeast/Southwest Freeway (I-395) and Anacostia Freeway (I-295)

An alternate southeastern route, Route H, is evaluated that does not direct trucks around the U.S. Capital and thus does not require enhanced security restrictions. This route extends southward from the Washington Aqueduct site to the Southeast/Southwest Freeway situated south of the City's monumental and federal building core. The southbound route would primarily run from Macarthur Boulevard to Loughboro Road, Dalecarlia Parkway, Massachusetts Avenue, Mt Vernon Place, New York Avenue, and the I-395 Center Leg to the Southeast/Southwest Freeway. The reverse route would run from the Southeast/Southwest Freeway to the I-395 Center Leg, 2nd Street NW, Massachusetts Avenue (between 2nd and 7th Streets, NW), 7th Street, Mt Vernon Place, Massachusetts Avenue, Dalecarlia Parkway, Loughboro Road and Macarthur Boulevard to the site. Most of these roadways provide two or more lanes of travel in each direction. No significant operational/capacity and safety constraints for vehicular and pedestrian movements were noted at the key intersections along this route.

I-395 CENTER LEG

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However, it is noted that the I-395 Center Leg has a 13 feet height restriction. The key "sensitive" abutting land uses include the following:

- The American University campus and the US Navy Security Site at the Massachusetts Avenue - Nebraska Avenue Circle;
- The Washington National Cathedral complex at the Massachusetts Avenue – Wisconsin Avenue intersection;
- The U.S. Naval Observatory, situated just south of the Washington National Cathedral; and
- Washington Convention Center and the City of Washington Museum.

Key elements of the aspects noted above are illustrated in Figure 3-17 for Route H

As noted earlier, accident data was obtained for the intersections within the immediate area of Dalecarlia, and information regarding "High Accidents Locations" was obtained from MSHA, DCDOT, and VDOT for the entire length of the proposed eight (8) routes. Based on the information obtained, it was determined that none of the routes is characterized by an intersection(s) or roadway link(s), which has significant safety deficiencies warranting detailed evaluation and remediation.

3.11 Visual Aesthetics

3.11.1 Definition

Visual aesthetics, or visual resources, are defined as the natural and built features of the landscape that can be seen and contribute to the enjoyment of the site. The goal of this section is to characterize the baseline aesthetic conditions. This visual study employs assessment methods based on the U.S. Department of the Transportation (USDOT) FHWA (USDOT, 1988) as well as other accepted visual analysis techniques as summarized by Smarden et al. (1986).

3.11.2 Existing Conditions

The project alternatives being evaluated entail changes at the Washington Aqueduct's Dalecarlia Reservoir and Water Treatment Plant (Dalecarlia) on the border between the District of Columbia and Montgomery County, MD; at the Georgetown Reservoir located near the Potomac River at the western edge of the District of Columbia's Georgetown neighborhood; at the Blue Plains AWWTP located along the District's southern corner of the Potomac; and along the right of way of the approximately 12 mile underground sewer trunk line system that would extend from Dalecarlia along the eastern edge of the Potomac River within the District of Columbia until reaching the Blue Plains AWWTP facility. The general locations of these areas are indicated on Figures 3-1 through 3-3.

A systematic assessment of the existing visual conditions is completed as a foundation for assessment of aesthetic impacts. A general description is provided for the visual conditions of the areas where facilities could potentially be constructed. Within each proposed location aesthetic changes caused by new facilities as seen by members of the public are identified. If facility development is likely to result in visible changes, photographs are provided of representative public views toward the areas where the changes would take place.

There are thirteen viewpoints in total, identified on Figure 3-18, selected as general representations of the view, taking into consideration the location and concentration of viewers. All photos were taken using a 35mm camera with a 50-mm lens to create images that provide a close approximation of what is seen by the human eye. For each of the 13 representative views, an assessment is provided in this section for the existing aesthetic conditions. This assessment includes an overall rating of the level of scenic quality prevailing in the view and the sensitivity of the view, based on the number of viewers and the duration of time for the view. These ratings were developed based on field observations made in March 2004, review of photographs of the affected area, review of methods for assessment of visual quality, and review of research on public perceptions of the environment and scenic beauty ratings of landscape scenes.

The assessment of scenic quality was made based on professional judgment taking into consideration:

- Natural features, including topography, water courses, rock outcrops, and natural vegetation
- Positive and negative effects of man-made alterations and built structures on visual quality
- Visual composition, including an assessment of the vividness, intactness, and unity of patterns in the landscape

The visual quality ratings assigned to each view fit within the rating scale summarized in Table 3-10 (next page). This scale mimics a scale developed for use with an artificial intelligence system to evaluate landscape visual quality (Buhyoff et al., 1994) and incorporates landscape assessment concepts applied by the U.S. Forest Service and the U.S. Department of Transportation.

In addition to rating the character and quality of the views, seasonal variations in viewing conditions as well as the kinds of viewers (residential, recreational, etc.) who experience the view are considered. The scale used for rating visual sensitivity ranges from high to low sensitivity. In general, residential views and views from officially designated scenic areas and scenic routes are assumed to be most sensitive, and decreasing levels of sensitivity are assumed for views from recreational areas, travel routes, commercial areas, and industrial areas. The assessment of visual sensitivity takes into account not only the type of viewing area and viewer affected, but also the number of viewers affected, the average duration of view exposure, and any cultural values that may be associated with the view. A viewpoint which is experienced from a number of residents who look at something daily is given a higher weight than a viewpoint that is experienced from only one resident. The same is true of a viewpoint that is seen from a large number of recreational users, for example those along an easily accessible bike path, as compared to a viewpoint experienced by a limited number of recreational enthusiasts, for example a lightly used trail.

TABLE 3-10
Landscape Scenic Quality Scale

Visual Quality Rating	Explanation
Outstanding	A rating reserved for landscapes with exceptionally high visual quality. These landscapes are significant nationally or regionally. They usually contain exceptional natural or cultural features that contribute to this rating. They are what we think of as “picture post card” landscapes. People are attracted to these landscapes to view them.
High	Landscapes that have high quality scenic value. This may be due to cultural or natural features contained in the landscape or to the arrangement of spaces contained in the landscape that causes the landscape to be visually interesting or a particularly comfortable place for people. These landscapes have high levels of vividness, unity, and intactness.
Moderately High	Landscapes which have above average scenic value but are not of high scenic value. The scenic value of these landscapes may be due to man-made or natural features contained within the landscape, to the arrangement of spaces, in the landscape or to the two-dimensional attributes of the landscape. Levels of vividness, unity, and intactness are moderate to high.
Moderate	Landscapes that are common or typical landscapes that have average scenic value. They usually lack significant man-made or natural features. Their scenic value is primarily a result of the arrangement of spaces contained in the landscape and the two-dimensional visual attributes of the landscape. Levels of vividness, unity, and intactness are average
Moderately Low	Landscapes that have below average scenic value but not low scenic value. They may contain visually discordant man-made alterations, but these features do not dominate the landscape. They often lack spaces that people perceive as inviting and provide little interest in terms of two-dimensional visual attributes of the landscape.
Low	Landscapes that have below average scenic value. They may contain visually discordant man-made alterations, and often provide little interest in terms of two-dimensional visual attributes of the landscape. Levels of vividness, unity, and intactness are below average.

Note: Rating scale based on Buhyoff et al., 1994; USDOT FHWA, 1988, and U.S. Department of Agriculture (USDA) Forest Service., 1995.

Both the visual quality and visual sensitivity of the areas where site modifications are considered are evaluated in this section.

3.11.3 Dalecarlia

3.11.3.1 Overview

The Dalecarlia property is an approximately 277-acre site located in an upland area east of the Potomac River, and along the border between the District of Columbia’s northwest boundary and Montgomery County, MD. Figure 1-2 is an aerial map that depicts the Dalecarlia and surrounding community. Dalecarlia includes the man-made Dalecarlia Reservoir and a water treatment plant, which includes two underground finished water storage reservoirs; a finished water pumping station; an underground filter backwash water storage and recycle facility; a maintenance facility; equipment, materials, and chlorine storage facilities; an administration building; a chemical building; two filter buildings; and miscellaneous other buildings.

Dalecarlia is divided into two different contiguous areas by MacArthur Boulevard. The reservoir is located on the east side of the boulevard (Dalecarlia Reservoir area), and the water treatment plant on the west (Dalecarlia WTP area). The portions of the property on both the east and west side of MacArthur Boulevard are surrounded by a chain link fence, and public access is restricted. The Dalecarlia WTP area on the west side of MacArthur Boulevard, is bisected by the 11-mile-long Capital Crescent Trail, formerly occupied by the Georgetown Branch of the B&O Railroad, which in 1996 was converted into a pedestrian and bicycle trail extending from Georgetown in the District of Columbia to Silver Spring, Maryland. This trail provides for public visual access through this portion of Dalecarlia, but because the trail is bordered on both sides by a chain link fence, trail users are restricted to the trail. A bridge built in 1996 carries the trail over a roadway that connects the portions of Dalecarlia on the east and west sides of the fenced trail corridor. At the northern end of the bridge, the trail passes under MacArthur Boulevard by way of the historic Dalecarlia railroad tunnel. On the north side of MacArthur Boulevard, the trail skirts around the Dalecarlia Reservoir area Forebay before continuing into Little Falls Branch area.

Dalecarlia Reservoir area is 47 acres in size and is surrounded by earth berms designed to prevent local surface water from flowing into the reservoir. The reservoir has two parts: a Forebay (approximately 3 acres in size) where raw water enters the reservoir and initial sedimentation takes place, and the main 44-acre portion of the reservoir which receives water from the Forebay via the booster pump station. The water from the main reservoir is routed either to the Georgetown Reservoir or to the Dalecarlia WTP area located on the west side of MacArthur Boulevard.

The high point at Dalecarlia is a hill located in Dalecarlia woods, between the Dalecarlia Reservoir area and Dalecarlia Parkway rising to 270 ft above sea level. The surface of the Dalecarlia Reservoir is maintained at an elevation of 148.5 ft and is surrounded primarily by mixed hardwood (oak-hickory forest) vegetation. On the west side of MacArthur Boulevard, most of Dalecarlia is landscaped with trees and shrubs consisting primarily of horticultural species.

The Dalecarlia WTP area has a developed character, with a complex of large water treatment structures, ancillary office and maintenance buildings, and with artificial landscaping. The top of the tower at Dalecarlia WTP's main building is 135 ft high, and the top of the chemical building located at the northern end of the WTP complex is 51 ft high. Many of the buildings housing the treatment facilities date from the 1920s designed in a Colonial Revival style with red brick facades, white trim, and Palladian windows.

The original aqueduct and Dalecarlia Reservoir was first developed as a part of the Washington Aqueduct system in the 1850s and 1860s. The Dalecarlia WTP was developed in the 1920s. Consequently, the aqueduct itself and most of its associated structures are listed on the National Register of Historic Places. Because of their national significance, those structures that were included in the original design have been designated a National Historic Landmark, thus potentially having high scenic quality value.

3.11.3.2 Views Toward the Proposed Northwest Dalecarlia Processing Site

The northwest Dalecarlia processing site for residuals thickening and dewatering is being considered under Alternatives A and B, and for the residuals thickening facility being considered under Alternative C would be located in the open area at the northwestern corner of the portion of the Dalecarlia WTP area west of MacArthur Boulevard (See Figure

3-18). This area is located to the west of the Capital Crescent Trail, and to the north of the equipment shelter and equipment parking area at the northern end of the shop building complex. At present, the portion of this area closest to the equipment parking area is open in character, surrounded by a chain link fence, and used as a storage and brush yard. The northern portion of this northwest Dalecarlia processing site consists of a grassy meadow with clusters of small to medium sized trees. The most unobstructed views into this area are those from the Capital Crescent Trail and from the residential area on the hillside that borders this area on the north of the Dalecarlia WTP area. A large office building used by NGA, a federal agency, is located on the hillside to the east of this site. Because the NGA building is oriented toward the southwest, and because of the screening provided by the intervening trees, the proposed residuals thickening and dewatering facilities on the northwest Dalecarlia processing site visibility from this NGA building would be limited. A smaller office building used by the Frank S. Phillips Company is located to the northeast on the hillside to the northwest Dalecarlia processing site. Most of the windows on this building are not directly oriented toward the northwest Dalecarlia processing site, and the existing thick tree cover provides substantial screening. As a consequence the proposed facilities will not be highly visible from the Frank S. Phillips Company office building. On the west, the proposed northwest Dalecarlia processing site is bordered by Little Falls Branch. The heavy forest cover along this stream screens views from the nearest properties of Brookmont residential community, located approximately 500-600 ft to the west.

The locations of all view points evaluated in this section are identified on Figure 3-18.

View 1—View Toward a Proposed Northwest Dalecarlia Processing Site from the Capital Crescent Trail.

Figure 3-19 is a view toward the proposed northwest Dalecarlia processing site as seen from the Capital Crescent Trail. The view is taken from the high point of the Capital Crescent Trail bridge where it crosses through Dalecarlia. The viewpoint is the one from which the northwest Dalecarlia proposed residuals treatment facility will be most visible to trail users because of its elevated position and the absence of significant screening vegetation. Applying the criteria summarized in Table 3-10, the visual quality of this view is rated as moderate due to the tree backdrop on the hill along with the presence of buildings in the foreground. This location lies within immediate views from the Capital Crescent trail. Trail counts taken on a sunny weekday in August, 2004 near the proposed facility documented a total of more than 1,200 trail users from 6:00 a.m. through 7:00 p.m. Observations on weekends suggest that use levels on weekend days are even higher. As the trail receives high levels of use, this view has a moderate level of sensitivity.

View 2—View Toward a Proposed Northwest Dalecarlia Processing Site from Hillside to North.

Figure 3-20 is a view toward the proposed northwest Dalecarlia Processing Site as seen from the parking lot adjacent to the Frank S. Phillips building on MacArthur Boulevard. This viewpoint overlooks the single-family residential area along Windward and Leeward Places on the hillside bordering the northern edge of the proposed northwest Dalecarlia processing site. A few of the homes in this area have the potential for views toward this proposed facility. The view depicted in Figure 3-20 is representative of the leaf-off view that these residents experience toward the northwest Dalecarlia processing site. Applying the criteria summarized in Table 3-10, the visual quality of this view is rated as moderate under leaf-off conditions. The primary asset of this view is the long vista toward the ridgeline along the

Virginia side of the Potomac River providing a moderate level of vividness. The unity and intactness of this view are reduced by the obstructing vegetation in the immediate foreground and the presence of the Dalecarlia structures in the middle ground. The overall level of sensitivity is moderate.

View 3—View Toward a Proposed Northwest Dalecarlia Processing Site from Brookmont Park.
Figure 3-21 represents a view toward the proposed northwest Dalecarlia Processing Site as seen from Broad Street at 62nd Street in the Brookmont Park residential area. This viewpoint, located approximately 900 feet to the west of the location of the proposed northwest Dalecarlia Processing Site facilities, is typical of views from Brookmont community. The thick forest cover that exists in the corridor along the Little Falls Branch screens the views of the proposed northwest Dalecarlia Processing site from the Brookmont community. Minimal changes to this view are anticipated in the future. The visual landscape quality of these views from Brookmont toward the proposed northwest Dalecarlia processing site is moderate to moderately high. Twenty or more occupants of the Brookmont community experience this view. The visual sensitivity of this view is moderately high.

3.11.3.3 Views Toward the Proposed Monofill Site

As a part of Alternative A (Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill), thickened and dewatered residuals would be disposed of in a monofill proposed to be located in the Dalecarlia Woods. The location of the proposed monofill, the road to provide access to the monofill and the proposed northwest Dalecarlia processing facilities are indicated on Figure 3-18. The monofill structure and access road have the potential to affect views from MacArthur Boulevard, from Dalecarlia Parkway, from the residential area on the bluff to the east of Dalecarlia Parkway on the hillsides to the north of Dalecarlia, and from the upper floors of Sibley Memorial Hospital. The thick forest cover that surrounds the NGA's buildings limits the views toward the monofill from their on-site offices in this building.

View 4—View Toward Monofill Site from MacArthur Boulevard.
Figure 3-22 is a view toward the site of the proposed monofill as seen from MacArthur Boulevard. This view is representative of the views experienced by the occupants of the 14,200 vehicles that travel this roadway segment on an average day. Applying the scenic quality criteria summarized in Table 3-10, the visual quality is rated as having a moderately high to high level of visual quality. The reservoir, the forested hill, and the low profile grassy area in the foreground create a moderate level of vividness. The paved roadway and the guard rail in the foreground combine with the vividness and create moderately high levels of unity and intactness. Because of the large numbers of motorists who experience this view, the view's level of sensitivity is moderately high.

View 5—View Toward Monofill Site from Dalecarlia Parkway at Warren Place, N.W.
Figure 3-23 is a view toward the monofill site from Dalecarlia Parkway at Warren Place, NW, a street located east of Dalecarlia Parkway. Warren Place, NW provides access into the residential neighborhood located on the bluff overlooking the Dalecarlia Reservoir Complex. This view shown in Figure 3-23 is seen by residents of this area as they leave their neighborhood, as well as by other motorists using the Dalecarlia Parkway. The visual quality of this view is moderately high, and the sensitivity, given the large numbers of motorists who experience it, is moderately high.

View 6—View Toward Monofill Site from Chalfont Place.
Figure 3-24 is a view toward the monofill site from the area behind Chalfont Place, a street located in the residential area located on the hillside that borders the northern end of the Dalecarlia Reservoir area. This view is representative of the interior views from about 20 residences located on Chalfont Place, Torchlight Circle, and Boxwood Road. The view represented in this photo is representative of a "worst case" view because there is less tree screening in the foreground and thus a less obstructed view toward the monofill site than is the case from many of the other residences that overlook the reservoir in this area. existing visual quality of this view is high. Because this is a view seen by residents of approximately 20 residences, the level of sensitivity is high.

3.11.3.4 Views Toward the East Dalecarlia Processing site

Under Alternative E, a residuals processing facility would be built at the east Dalecarlia processing site as seen in Figure 3-18. Previously this area was used for drying sediment that has been dredged out of the reservoir's Forebay. The area has been graded and stabilized. It is currently a gently sloping grassy area. A portion of this site closest to Little Falls Road is graded and has been used for hospital parking. Small portions of the site are forested.

View 7—View Toward a proposed East Dalecarlia Processing Site from the Sibley Memorial Hospital Parking Lot
Figure 3-25 is a view toward the east Dalecarlia processing site as seen from the parking lot located on the north side of Sibley Memorial Hospital. This view is generally representative of views seen by users of this lot (employees, patients of this 328-bed hospital, and visitors). Because of the past use of this site for parking and the recent drying of dredged sediments, the location has a moderately low level of visual quality. Because of its visibility to users of the parking lot and people in the hospital, the site has a moderate level of sensitivity in this view.

View 8—View Toward a Proposed East Dalecarlia Processing Site from MacArthur Boulevard
Figure 3-26 is a view toward the east Dalecarlia processing site as seen from MacArthur Boulevard at the boundary line between the District of Columbia and Montgomery County, MD. In this view, the proposed facility site is located behind the trees on the elevated area above the Dalecarlia Reservoir Area. The visual quality of this view is moderate. The level of visual sensitivity is moderate because this view is experienced by the occupants of the 14,200 vehicles per day that travel on this portion of the boulevard.

View 9—View Toward a Proposed East Dalecarlia Processing site from Chalfont Place
Figure 3-27 is a view toward the east Dalecarlia processing site from Chalfont Place. Chalfont Place is located in a residential area on the hillside that borders the northern end of the Dalecarlia Reservoir area. This view is representative of the views from about 20 residences located on Chalfont Place, Torchlight Circle, and Boxwood Road. The site is located behind the trees and in front of the hospital buildings. The existing visual quality of this view is moderately high to high. Because this is a view seen by residents of approximately 20 residences, the level of sensitivity is high as well.

3.11.3.5 View Toward the Forebay Residuals Removal Facility

One of the options being considered as a part of this project is installation of a mechanical silt removal facility (dredge) in the Forebay. Because of the topography and the forest cover surrounding the Forebay, the Forebay is not visible from surrounding streets and residential areas. However, the Forebay is visible from the Capital Crescent Trail, which passes within approximately 50 feet of the Forebay's western edge.

View 10—View Toward the Forebay from the Capital Crescent Trail.
Figure 3-28 is a view toward the Forebay seen from the Capital Crescent Trail as it crosses the bridge at the Forebay's western end. At this point, there is a clearing in the tree cover, providing an unobstructed view toward the Forebay, which is approximately 50 ft away. At other points along the trail in this area, views toward the Forebay are screened to a large degree in the summer, and to a lesser degree in the winter by the intervening forest vegetation. Applying the criteria summarized in Table 3-10, the visual quality of this view is rated as moderately high. The presence of the water, the tree backdrop and the sense of enclosure provide positive visual values and a moderately high level of vividness. However, the presence of the power pole and gate equipment in the immediate foreground of the view, as well as the booster pump station at the far end of the Forebay detract to some degree from the view's levels of unity and intactness. The sensitivity of this view is moderate because it is seen by the large numbers of people who use the Capital Crescent Trail.

3.11.3.6 View Toward the Proposed Sedimentation Basin Pump Station

As an element of all of the alternatives being considered for modification of operations at Dalecarlia, changes will be made to the existing settling basins located to the south of the WTP's filter buildings. The element of these changes that will be visible will be a new pump station to be housed in a small structure proposed to located at the southern end of the basins, close to Norton Street.

View 11—View of proposed Sedimentation Basin Pump Station Site from Norton Street
Figure 3-29 is a view from the residential area along Norton Street toward the site of the proposed sedimentation station pump station, which would be located in the area of bare ground visible just inside Dalecarlia perimeter fence. In this view, the settling basins are partially visible in the foreground of a view toward the WTP's historic and attractively designed structures, and contribute to the aesthetic appeal of the composition. Applying the criteria summarized in Table 3-10, the visual quality of this view is rated as having a moderately high level of visual quality, in spite of the presence of the chain link fence in the foreground of the view. The moderate level of this view's visual quality is not attributable to the natural features of the landscape, but to the moderate levels of vividness, unity, and intactness provided by this composition that includes a historic, attractive and consistent architectural design theme, the attractive water surfaces of the settling basins, and the role of the open space provided by the basins in allowing an unobstructed view toward the building complex.

3.11.3.7 Georgetown Reservoir

The Georgetown Reservoir is located approximately 2 miles to the southeast of the Dalecarlia Reservoir on a 65-acre site that lies between the Potomac River, the C&O Canal, and the B&O Railroad to the west, and MacArthur Boulevard to the east. The reservoir is manmade and rectangular in form, and consists of three basins. A gravel perimeter road surrounds the reservoir, and a chain link fence surrounds the reservoir property. One of the notable visual elements on the site is the ACE castle gatehouse, which is located next to MacArthur Boulevard at the reservoir's southern end. The Georgetown Reservoir is a part of the system of Washington Aqueduct facilities designated as a National Historic Landmark. In addition, the castle gatehouse located on the reservoir property has its own individual listing on the National Register of Historic Places.

The narrow strip of land that lies between the reservoir and the perimeter fence is landscaped with a mix of vegetation that includes Eastern hemlock (Tsuga canadiensis) Austrian Pine (Pinus nigra), flowering dogwood (Cornus kousa), pear trees (Pyrus calleryana), and crab apple trees (Malus sp.). The area that surrounds the reservoir property to the north, east and south, is primarily residential in character. Views across the reservoir are readily available from MacArthur Boulevard, which borders the reservoir property to the east, and from the portions of the residential areas on the hillside to the east of MacArthur Boulevard.

All of the alternatives being considered as a part of this project include installation of residuals collection technologies in the Georgetown Reservoir's two northern basins. The proposed residuals collection provisions will include construction of a new pump station in the reservoir at the northern end of Basin No. 2, and a new structure to house electrical equipment at the northern end of Basin No. 1. These basins are most visible from the portion of MacArthur Boulevard which runs along the immediate edge of the easternmost of these basins, from the residences located on the east side of MacArthur Boulevard in this area, and from the school located on the slope on the east side of Reservoir Road at MacArthur Boulevard.

View 12—Georgetown Reservoir Northern Basins Seen from MacArthur Boulevard. Figure 3-30 is a view toward the Georgetown Reservoir's northern basins from MacArthur Boulevard at the intersection with Reservoir Road. This view is representative of the views experienced by the occupants of the approximately 19,700 vehicles that pass by the Georgetown Reservoir on an average day and by the occupants of the school and approximately 16 residences located along the east side of MacArthur Boulevard in this area. In this view, the Georgetown Reservoir's basins are the dominant element, and the presence of the reservoir has the effect of creating an open area across which the ridgeline along the Virginia side of the Potomac River can be seen. Applying the criteria summarized in Table 3-10, the visual quality of this view is rated as having a moderate to moderately high level of visual quality. The reservoirs water surface, the openness of the view, and the vista toward the distant ridgeline create a moderately high level of vividness. The level of visual unity is moderate at most because of the contrast in color and texture created by the extensive expanses of concrete basin walls that are visible. The. chain link fence in the immediate foreground of the view adversely affects the view's level of intactness

3.11.3.8 Pipeline Route and Blue Plains Advanced Waste Water Treatment Plant

The underground pipeline being considered, as a part of Alternative C would follow the route indicated in Figure 3-31. For the purposes of description and analysis of the route's existing aesthetic qualities, the route has been divided into segments within which the urban landscape conditions are generally similar. The locations of these segments are also indicated on Figure 3-31. The pipeline will be located underground, and will be built using directional drilling technology, which will minimize the disturbance of surface features through directional drilling and pipe feed activities (See Figures 3-32 and 3-33) Use of these sites will require clearance of areas that are approximately 100 feet by 150 feet in size. For sites, such as those in the C&O Historic Canal National Park that are not adjacent to existing streets, access roads will need to be developed.

Segment A is an approximately 3.7 mile route segment that extends from Dalecarlia to the corridor along the Clara Barton Parkway and the C&O Canal, which it follows until reaching the Frances Scott Key Bridge. Throughout most of this segment, the route travels through the C&O Canal National Historic Park. There may be a need for up to 6 drill rig and pipe feed sites in this segment. The northernmost of these sites is located in a steep, heavily forested area on the eastern edge of Clara Barton Parkway. The other five sites are located in areas of flat, heavily forested terrain located to the immediate west of the C&O canal. All of these sites have moderately high to high levels of visual quality, and have high levels of sensitivity, in one case because of visibility from the Clara Barton Parkway, and in the others, because of visibility from the heavily used recreational corridor along the C&O Canal.

Segment B is an approximately 1.6-mile segment that extends from the Frances Scott Key Bridge to Constitution Avenue. This route segment passes in close proximity to several of the District's most important landmarks, including the Watergate complex and the Kennedy Center for the Performing Arts. In this segment, there would be a need for 3 or more rig and pipe feed sites. The context of these sites is urban in nature, but they are all sited in areas devoted to landscaped open space located adjacent to heavily traveled roads. The visual quality of views toward these sites is moderately high, and the sensitivity is high because of the number of viewers, the high density of residential population, and the locations of these sites in proximity to major landmarks and at the gateway to the area where many of the District's monuments are located.

Segment C extends for approximately 3.0 miles, from Constitution Avenue to the Anacostia River. This portion of the route travels through West Potomac Park and East Potomac Park, and passes close to the Lincoln Memorial, the Franklin Delano Roosevelt Memorial, and the Jefferson Memorial, and adjacent to plantings of Japanese cherry trees along Ohio Drive in East Potomac Park. In this segment, there may be a need for up to five rig and pipe feed sites. These sites will be located within West Potomac Park and East Potomac Park, and will be immediately adjacent to and highly visible from Ohio Drive. Some of these sites may be visible in middle ground views from the Lincoln Memorial, the Franklin Delano Roosevelt Memorial, and the Jefferson Memorial. In addition, several of these sites will be located within and will be visible from the East Potomac Golf Course. A present, the areas where these sites are located consist of either landscaped park land or portions of developed recreational areas (i.e. baseball fields or golf courses). The visual quality of these areas ranges from moderate to high. The visual sensitivity of these areas is high because of their location in a park of national importance, their location in proximity to some of the District's most important monuments, and their visibility to a very large number of sightseers and recreational users.

Segment D is an approximately 2.75 mile segment that extends from the north bank of the Anacostia River to the Blue Plains AWWTP. In this segment, the route passes through the Anacostia Naval Station, Bolling Air Force Base, and the Naval Research Laboratory. It is estimated there will be a need for up to 6 drill rig and pipe feed sites to construct the pipeline in this segment. Five of these sites are located in areas of open space land that is currently landscaped to one degree, and one site is located in a paved area that lies within the boundaries of the Blue Plains AWWTP complex. For the five sites located within the landscaped open space areas, the level of visual quality is moderate to moderately high, while for the site located within the Blue Plains AWWTP complex, the level of visual quality is low. For the site located within the Blue Plains AWWTP complex, the level of visual sensitivity is low as well. Three of the sites are located in close proximity to housing complexes, and for these sites, the level of visual sensitivity is moderately high. For the two sites that are located in open space areas, but which or not in close proximity to housing or other concentrations of sensitive viewers, the level of visual sensitivity is moderate.

View 13—Aerial View of the Blue Plains AWWTP.

Figure 3-34 is an aerial view of the Blue Plains AWWTP located along the Potomac River at the District's southwest corner. Under Alternative C, the pipeline from Dalecarlia would terminate at the Blue Plains AWWTP, and a new facility would be built to process thickened residuals arriving through the pipeline from the Dalecarlia WTP. The location of the proposed sites for the thickened residuals processing facility at Blue Plains AWWTP and the potential location of one of the pipe feed sites are highlighted on Figure 3-31. As this aerial view indicates, the Blue Plains AWWTP facility encompasses a number of large wastewater treatment buildings, numerous large tanks, and large areas devoted to aeration ponds. The site is heavily industrial in character, and the scenic quality of views within the complex is low. Because this is a major infrastructure complex to which access to the public is restricted, the level of visual sensitivity of views within the complex is low.

3.12 Socioeconomic and Environmental Justice

The socioeconomic indicators used for this DEIS include regional economic activity, population, and housing data that characterize the region of influence (ROI) and surrounding counties. An ROI is a geographic area selected as the basis of analysis for demographic and economic impacts. In addition, local recreation, schools, public safety, and related community services are discussed.

The ROI for the proposed action is the 2000 Metropolitan Washington Council of Governments (MWCOG) region, which consists of the greater Washington, DC, metropolitan area. Within the ROI, the areas surrounding facility where any changes in demand for community service would most likely occur are the District of Columbia's northwest sector and the Montgomery County, Maryland Bethesda-Chevy Chase planning area.

Year 2000 Census data were used as the baseline for socioeconomic indicators, unless more recent data were available from other sources.

3.12.1 Economic Development

The total workforce for the ROI is around 2.4 million. The area's predominant industries include services; trade, transportation, and utilities (TTU); and government. The economy itself is quite robust, with low unemployment levels. The highest unemployment rate was found in the District of Columbia, with 6.8 percent recorded in 2000. The remaining counties varied between 1.6 percent (Loudoun County) and 4.1 percent (Prince George's County) (U.S. Census, 2000).

With the nation's capital as the hub of the ROI, a significant portion of the economy revolves around federal spending and procurement. In 2002 alone, over $87.5 billion was spent, with 43 percent or $37.3 billion awarded to private contractors (Economic Trends in Metropolitan Washington, MWCOG).

Another factor highlighting the substantial economic activity of the ROI is construction. Commercial development was 33.2 million square feet for 2002 and residential permits for new housing units reached 34,967 new licenses (Economic Trends in Metropolitan Washington, MWCOG).

In the central jurisdictions of the MWCOG region, construction of 7.5 million square feet (valued at $843 million) of office space, 2.1 million ft^2 ($334 million) of educational and medical space, and 1.8 million ft^2 ($468 million) of other commercial space began in 2002. These Figures do not include utility-related facilities such as the Washington Aqueduct project, which is budgeted at approximately $50 million, a relatively small amount in the context of regional construction activity.

Northern Virginia led the region in new construction projects, but in the District of Columbia alone, 44 new construction projects were added in 2002, contributing 19 percent of new commercial construction in the region, worth $1.2 billion. In Montgomery County Maryland, $636 million in new projects were recorded, with 7.9 million square feet being built (Commercial Construction Indicators [CCI], MWCOG).

Regional data reveals that most major construction projects are commercial. In the DC area, such projects are concentrated in the central areas of the District, while the major projects in Montgomery County Maryland are several miles north of the proposed project site. No projects greater than 50,000 square feet were undertaken within 1 mile of Dalecarlia in 2002 (CCI, MWCOG).

In 2002, the District of Columbia employed a total of 14,604 workers in the construction industry and 209,383 construction workers were employed in the Washington-Arlington-Alexandria, DC-VA-MD-WVA Metropolitan Statistical Area (MSA) (Bureau of Economic Analysis, 2002).

3.12.2 Demographics

Population trends within the ROI have been similar to national trends, with population shifting from central cities to suburban areas and suburban development spreading into the surrounding rural areas. From 1990 to 2000, the total population of the MWCOG region grew at 13.4 percent to 4.5 million people. The District of Columbia itself experienced the smallest increase in population (6.5 percent) within the ROI. In contrast, the surrounding suburbs have grown at a rapid pace, with nine of the remaining twelve municipalities experiencing double digit growth from 1990 to 2000 (Our Changing Region, MWCOG).

Looking forward, the population of the region as a whole is projected to grow 21 percent by the year 2015. The District of Columbia is expected to have the smallest population increase (2.9 percent), while half of the remaining counties, including Montgomery County Maryland, will continue to experience double digit growth (Our Changing Region, MWCOG).

3.12.3 Housing

Since the proposed project site is strictly limited to the water treatment facilities themselves, the supply of housing in the region is not a factor in this process. Overall, a total of 1,684,215 total housing units were recorded in the MWCOG for 2000, with 1,607,261 of those housing units being occupied (4.6 percent vacancy rate). In the District of Columbia as a whole, a total of 274,845 units were present, with 248,338 units being occupied (9.6 percent vacancy rate) (Our Changing Region, MWCOG).

3.12.4 Quality of Life

3.12.4.1 Law Enforcement Services

Law enforcement support is provided to DC by the Metropolitan Police force. The Police headquarters for the project site is located in District Two, 3320 Idaho Ave, NW. This office oversees the operations of seven subdistricts, including those that have jurisdiction over Dalecarlia (subdistrict 202) and the Georgetown Reservoir (subdistrict 206). Residents are asked to report any crimes, incidents, accidents or suspicious individuals or activity to this station. In the case of an emergency, residents should call 911, which will be routed back to District Two headquarters for a response.

Within the MWCOG region, law enforcement is administered separately by each county or independent city. Intergovernmental measures to coordinate law enforcement, when needed, are in place under local homeland security programs and cooperative agreements (Metropolitan [DC] Police Department Web site).

3.12.4.2 Fire Protection Services

The fire protection and Emergency Medical Service (EMS) services within the District are provided by 32 fire and EMS stations. The facility located closest to Georgetown and Dalecarlia is Engine Company 29, 5th Battalion, on 4811 MacArthur Boulevard, NW. The station is staffed by nine firefighters, one fire engine, and one fire truck, and operates with a mutual aid agreement with all surrounding counties in the area, including Montgomery County Maryland. The closest station with EMS capabilities is Engine Company 5, 5th Battalion, on 3412 Dent Place NW, which is located in the vicinity of Georgetown University. A hazardous material unit is located at 5th and Rhode Island NE. All stations are brush-fire capable (District of Columbia Fire and Emergency Medical Services [DC FEMS] Web site, 2004).

Within the greater MWCOG region, fire and medical services are provided by each county separately, with regional coordination measures in place for emergencies (DC FEMS Web site, 2004).

3.12.4.3 Medical Services

The closest full-service hospital is Sibley Memorial Hospital, located immediately across from Dalecarlia. The fully accredited facility maintains a 13 bedroom Emergency Room center and treated over 24,000 patients last year (Sibley Memorial Hospital Site, 2004).

Georgetown University Hospital is a fully staffed facility that provides immediate care, emergency treatment, walk-in care, and a wide variety of other services. The hospital is located close to the Georgetown Reservoir and is also within service area for Dalecarlia. Riverside Hospital is also near the Georgetown Reservoir project site (Sibley Memorial Hospital Web site, 2004).

The nearest hospital to the Blue Plains AWWTP site is Hadley Memorial Hospital. Greater Southeast Hospital is also within the service area, about two miles away. Greater Southeast is a full-service acute care hospital that offers a wide range of inpatient, outpatient and emergency medicine services (DC Chamber of Commerce website, 2004).

3.12.4.4 Schools

Georgetown and Dalecarlia are in close proximity to several schools and educational centers. Dalecarlia is within 1 mile of Wesley Seminary, and 1.2 miles of Key Elementary School. Seven academic facilities are within a 1-mile radius of Georgetown Reservoir, including Georgetown University, Georgetown Day School, Hardy Middle School, Harrison School, Woodmont School, Mt. Vernon Junior College, and Conduit Road Seminary. The pipeline route bypasses several schools, including the aforementioned facilities, George Washington University, and twelve additional schools (LandView6®, 2004). Nearly 1.2 million inhabitants of the MWCOG region are enrolled in school, 157,475 of whom are DC residents (Our Changing Region, MWCOG).

3.12.4.5 Shops and Services

With the MWCOG's large population and busy economy, there are a wide variety of shops and services available within the greater DC area. In the immediate area, the Spring Valley Shopping Center provides the community with several small scale retailers. Along the pipeline route, there are several shops and retail services, particularly in the Georgetown University area. The Les Champs Shopping Mall sits on the shoreline of the Potomac, also along the pipeline.

The final third of the pipeline route does not affect shops and services at all (LandView6®, 2004).

3.12.4.6 Recreation

Numerous recreational facilities are available, within a 1-mile radius of both reservoirs, for families, children, and retirees. The following recreational opportunities are available (LandView6®, 2004):

- Capital Crescent Trail (Dalecarlia)
- Spring Valley Park (Dalecarlia)
- C&O Canal National Park (Dalecarlia and Georgetown)
- Friendship Recreation Center (Dalecarlia)
- Little Falls Branch (Dalecarlia)

- Chesapeake Canal (Dalecarlia)
- Hardy Playground (Georgetown)
- Georgetown Reservoir Playground (Georgetown)
- Hardy Recreation Center
- Palisades Community Center
- Westmoreland Playground

The Capital Crescent Trail is a bicycling/jogging trail that runs from suburban Maryland to downtown DC. It has its own right-of-way and bridges and is fenced off from Dalecarlia. The trail's proximity to the Dalecarlia Reservoir, the Dalecarlia Water Treatment Plant, and the Georgetown Reservoir is shown in Figures 3-35, 3-36a and 3-36b. The trail is extremely popular with cyclists (both recreational and commuting), jogging enthusiasts, walkers, and children.

On the Georgetown side, the reservoir adjoins the boundaries of the C&O Canal National Park, another local and regional resource for recreational cyclists, joggers, and walkers.

Several major parks and monuments are in close proximity to the pipeline route. In addition to the aforementioned park areas, the pipeline route also passes through Rock Creek Park and is close to East Potomac Park, James Monroe Park, the Jefferson Memorial, and the National Mall, as well as recreation centers and playgrounds (LandView6®, 2004). Many of the sensitive receptors found near the Potomac Interceptor route are shown in Figures 3-36a, 3-36b, 3-36c, and 3-36d. Table 3-11 (next page) lists parks and other sensitive receptors that are located near relevant areas north of the Chesapeake Bay and into the state of Delaware.

3.12.5 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The purpose of this order is to require each federal agency to identify and address any disproportionately high and adverse environmental or economic effects that its programs and policies might have on minority or low-income populations. *Environmental Justice: Guidance Under the National Environmental Policy Act* (Council of Environmental Quality [CEQ], 1997) defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, or Hispanic. Any minority population in the affected area should be identified if it exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population.

Low-income populations are identified using the Census Bureau's statistical poverty threshold, which varies by household size and number of children. For example, the 2000 poverty threshold for a family of four with two children was $17,463. The nationwide

TABLE 3-11
Public Facilities

Name	Type
Dalecarlia	
Wesley Seminary	School
Crescent Trail	Park
Spring Valley Park	Park
C&O Canal National Park	Reserve
Friendship Recreation Center	Recreation
Little Falls	River
Chesapeake Canal	River
Georgetown	
Hardy Middle School	School
Georgetown Day School	School
Georgetown University	School
Harrison School	School
Woodmont School	School
Mt. Vernon Junior College & Seminary	School
Conduit Road School	School
Hardy Playground	Park
Reservoir Playground	Park
C&O Canal National Park	Reserve
Hardy Recreation Center	Recreation
Riverside Hospital	Hospital
Georgetown University Hospital	Hospital
Engine Company 29	Fire
Pipeline Route	
Key Elementary School	School
Prospect Learning Center	School
Hyde Elementary School	School
Saint Stevens School	School
Saint Stephens School	School
Stevens Junior High School	School
Francis Junior High School	School
George Washington University	School
Schools Without Walls Senior High School	School
Jefferson Junior High School	School
Hawthorne High School	School
Leckie Elementary School	School
Patterson Elementary School	School
National Mall	Feature
Reflecting Pool	Feature
East Potomac Park	Park
International Athletic Park	Park
C&O Canal National Park	Reserve
Palisades Park and Recreation Center	Recreation
The Potomac Gorge	Park
Georgetown Playground and Recreation Center	Park
Georgetown Waterfront Park	Park
Rock Creek Park	Park
James Monroe Park	Park
Lincoln Memorial	Park
West Potomac Park	Park
Jefferson Memorial	Park
Potomac River	River
Rock Creek	River
Anacostia River	River

Source: U.S. Bureau of the Census, USGS and USEPA: LandView6®

poverty rate was 12.4 percent at the 2000 Census and 11.7 percent in 2001 (U.S. Census, 2000). The Census Bureau defines a "poverty area" as a census tract in which 20 percent or more of the residents have incomes below the poverty threshold and an "extreme poverty area" as one with 40 percent or more below the poverty level (U.S. Census, 2000).

To provide the baseline against which any environmental justice impacts can be identified and analyzed, Table 3-12 presents demographic information on race, ethnicity, and poverty status in the MWCOG region and in the areas immediately surrounding the proposed construction areas.

The MWCOG region is slightly more than half white (57 percent) with substantial African American (28.2 percent), growing Hispanic or Latino (9.7 percent), and stable Asian (7.6) minorities. The District of Columbia itself runs contrary to this trend, with a 60 percent African American majority and 31 percent white population. Despite such diversity, most counties in the region are predominantly white—the outer suburbs more so than the central jurisdictions closest to the city.

Although the surrounding jurisdictions (District of Columbia, Montgomery County Maryland, and Arlington County Virginia) are not defined as low-income areas, the District of Columbia has a higher poverty rate than the other jurisdictions in the MWCOG region (Census, 2000). In 2000, the overall poverty rate for individuals living in the District of Columbia was 16.9 percent, as compared to the rates of 7.6 percent for the region and 7.1 percent for the other central jurisdictions (LandView6®, 2004).

The census block groups (which are a subset of census tracts) comprising and immediately adjoining Dalecarlia and Georgetown, which include the neighborhood roads that potentially could be affected by truck traffic (see "best routes" identified in the Transportation subsection) under the residuals hauling alternatives, reflect a largely white population, unlike the majority African American population in the District of Columbia as a whole.

According to census block group data, these neighborhoods show 93 and 84 percent white-majority populations living around Dalecarlia and Georgetown, respectively. The largest minority in the adjacent area is the Hispanic or Latino population, with 4.4 and 8.9 percent populations around Dalecarlia and Georgetown, respectively (LandView6®, 2004).

These Figures also run contrary to the surrounding MWCOG region's Figures of a 57 percent white majority with an African American minority of 28.2 percent (U.S. Census, 2000).

TABLE 3-12
Census 2000 Demographic Data for Washington Aqueduct and Surrounding Jurisdictions

	ROI (MWCOG Region)	District of Columbia	Montgomery County MD	Arlington County VA	Adjacent to Dalecarlia[3]	Adjacent to Georgetown[4]	Adjacent to Pipeline Route[5]	Adjacent to Blue Plains AWWTP[6]
Total Population 1990	3,923,600	537,218	989,655	170,936	–	–	–	–
Total Population 2000	4,450,300	572,059	873,341	189,453	909	4,264	14,913	6,869
Percent Change 1990-2000	13.4	6.5	15.4	10.8	–	–	–	–
Persons per square mile	1,474	9,317	1,762	7,323	–	–	–	–
Projected Growth 2015[1]	5,392,900	588,000	975,000	207,200	–	–	–	–
Percent Change 2000-2015[1]	21.2	2.8	11.6	9.4	–	–	–	–
Median Age (years)	34.9	34.6	36.8	34	–	–	–	–
Average household size	2.6	2.16	2.66	2.15	–	–	–	–
White (%)	57.0	30.8	64.8	68.9	93.3	83.9	75.6	8.2
Black or African American (%)	28.2	60.0	15.1	9.3	1.7	5.3	15.2	88.8
American Indian & Alaska Native (%)	0.3	0.3	0.3	0.3	0.0	0.3	0.4	0.2
Asian, Hawaiian and Other Pacific Islander (%)	7.6	2.7	11.3	8.6	4.4	8.9	4.8	0.9
Some other race (%)	4.0	3.8	5.0	8.3	0.7	0.4	2.0	0.7
Two or more races (%)	3.0	2.4	3.4	4.3	0.2	1.3	2.0	1.3
Hispanic or Latino Origin[2] (%)	9.7	7.9	11.5	18.6	4.7	5.2	6.7	2.1
Poverty Rate (%)	7.6	16.9	4.2	7.1	2.6	12.4	9.4	25[6]
Median Income	$42,726	$39,970	$49,107	$49,683	$117,552	$78,303	$89,458	not available[6]

Notes

1. Population projections are not available below the county/city level

2. Persons of Hispanic or Latino origin may be of any racial group and are also included in those percentages

3. Block Groups 1, 2, 6 and 7, Census Tract 9.01(DC) ; Block Groups 3 and 4, Census Tract 7057.02 (Montgomery County Maryland); Block Groups 1, 2 and 3, Census Tract 7058 (Montgomery County Maryland);environmental justice statistics only

4. Block Group 4, Census Tract 8.01 (DC); Block Groups 2 and 3, Census Tract 8.02 (DC); environmental justice statistics only

5. Block Group 4, Census Tract 1 (DC); Block Group 4, Census Tract 2.02 (DC); Block Group 4, Census Tract 8.01 (DC); Block Group 3, Census Tract 8.02 (DC); Block Group 7, Census Tract 9.01 (DC); Block Group 4, Census Tract 9.02 (DC); Block Group 1, Census Tract 62.02 (DC); Block Group 1, Census Tract 73.01 (DC); Block Group 1, Census Tract 73.08 (DC); Block Group 3, Census Tract 7057.02 (Montgomery County Maryland); environmental justice statistics only

6. Estimated by LandView® 6 Population Estimator, centered on the coordinates of pipeline terminus, using block points (demographics) and block group points (income and poverty). The summarize function does not calculate median income. Poverty rate is calculated only for families, not individuals (all other poverty rates shown are for individuals). With 1,824 individuals below poverty and based on total population in the 1-mile area, it would be about 27 percent.

Sources: U.S. Bureau of the Census, USGS and USEPA: LandView® 6 (Census 2000 data); MWCOG (projected growth 2015)

The data for the census block groups around the reservoirs also show a largely upper-income population. With regards to income, the Dalecarlia area has a relatively high median income level of $117,552 (individual blocks varied from $96,000 to $198,000), with a poverty rate of 2.6 percent. The Georgetown Reservoir area's median income is $78,302 (ranging from $62,000 to $111,000), with a poverty rate of 12.4 percent. These can be compared to median incomes of $39,970 for the District of Columbia and $42,726 for the region. Although the poverty levels for both the Dalecarlia and Georgetown areas are lower than the District of Columbia's poverty level of 16.9 percent, the Georgetown Reservoir area's rate (12.4 percent) is higher than the regional average of 7.6 percent (LandView6®, 2004).

For the area that would be affected by the pipeline alternative, ten census block groups are involved with a wider variety of economic and social composition than the other affected areas. The overall population along the proposed pipeline route is 75.6 percent white, 15.2 percent African American, and 6.7 percent Hispanic or Latino, with smaller percentages of other races (LandView6®, 2004). Although these figures are somewhat more representative of the MWCOG region (57.7 percent white, 28.2 percent African American), the affected area is still anomalous when compared to the District of Columbia's African American majority of 60 percent (MWCOG, 2001). However, one of the affected block groups (Block Group 1, Tract 73.08) that would be crossed by the pipeline route has a higher African American majority population (82 percent, or 315 of 382 persons) than the District of Columbia as a whole.

Economically speaking, the pipeline route has average incomes ranging from $61,801 to $198,801, with an overall median income of $89,457. The overall poverty rate is 9.4 percent, ranging from 1.8 to 90.3 percent within individual blocks along the route. Eight of the ten blocks that would be traversed by the pipeline have poverty rates below the area average of 16.9 percent, while seven of the ten blocks are below the MWCOG level overall. However, two block groups affected (Block Group 1, Tract 73.08 and Block Group 4, Tract 2.02) have poverty levels of 90.4 percent and 33.2 percent respectively. Except for crossing these two block groups, the overall pipeline route avoids minority and low income areas (LandView6®, 2004).

The area (1-mile radius) surrounding the Blue Plains AWWTP (where the pipeline would end, a residuals processing plant would be built, and additional trucks would enter and exit from the Anacostia Freeway), has a population that is 8.2 percent white, 88.8 percent African American, and 2.1 percent Hispanic and Latino, with smaller percentages of other races,. About 25 percent of families in this area have incomes below the poverty threshold (LandView6®, 2004). DC Village, currently being used as a shelter for homeless families, is located within the 1-mile radius. Some of the housing at Bolling Air Force Base is also within the area. Although there is much variety within the neighborhoods in this portion of Ward 8, statistically the nearby area clearly meets the criteria for both a minority population and a poverty area.

3.12.6 Protection of Children

On April 21, 1997, the President issued EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," which seeks to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of government policies, programs, activities, and standards. Children are present near

Dalecarlia and Georgetown as residents in the area and as visitors in schools, parks, and recreation centers. The Washington Aqueduct has taken, and will continue to take, precautionary measures to reduce risk to children by providing fencing, security, and other means by which child interaction onsite can be prevented.

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-2_Landuse_Around_Dalecarlia.mxd

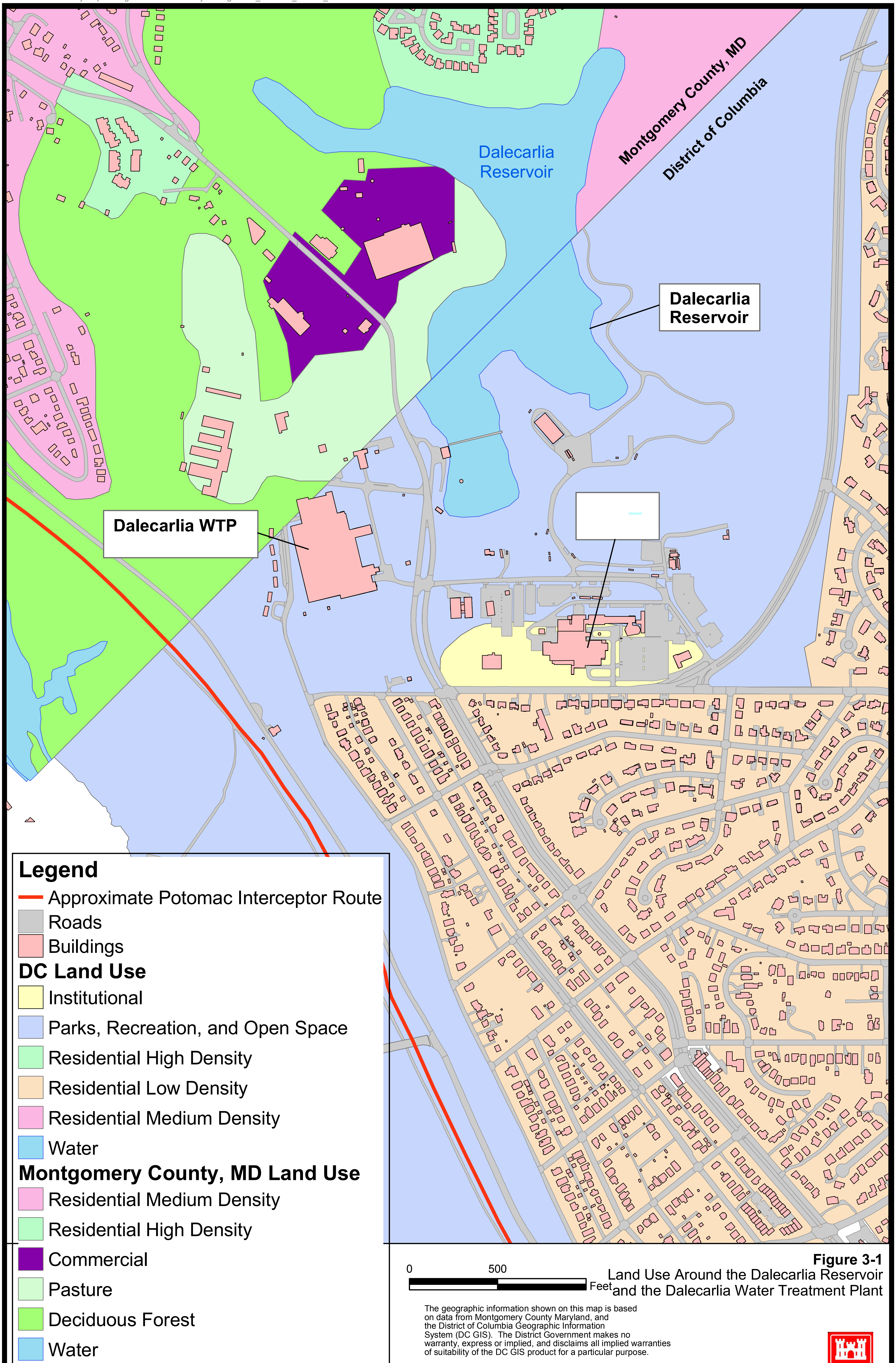


Figure 3-1
Land Use Around the Dalecarlia Reservoir and the Dalecarlia Water Treatment Plant

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-3a_Landuse_Near_the_Potomac_Interceptor.mxd

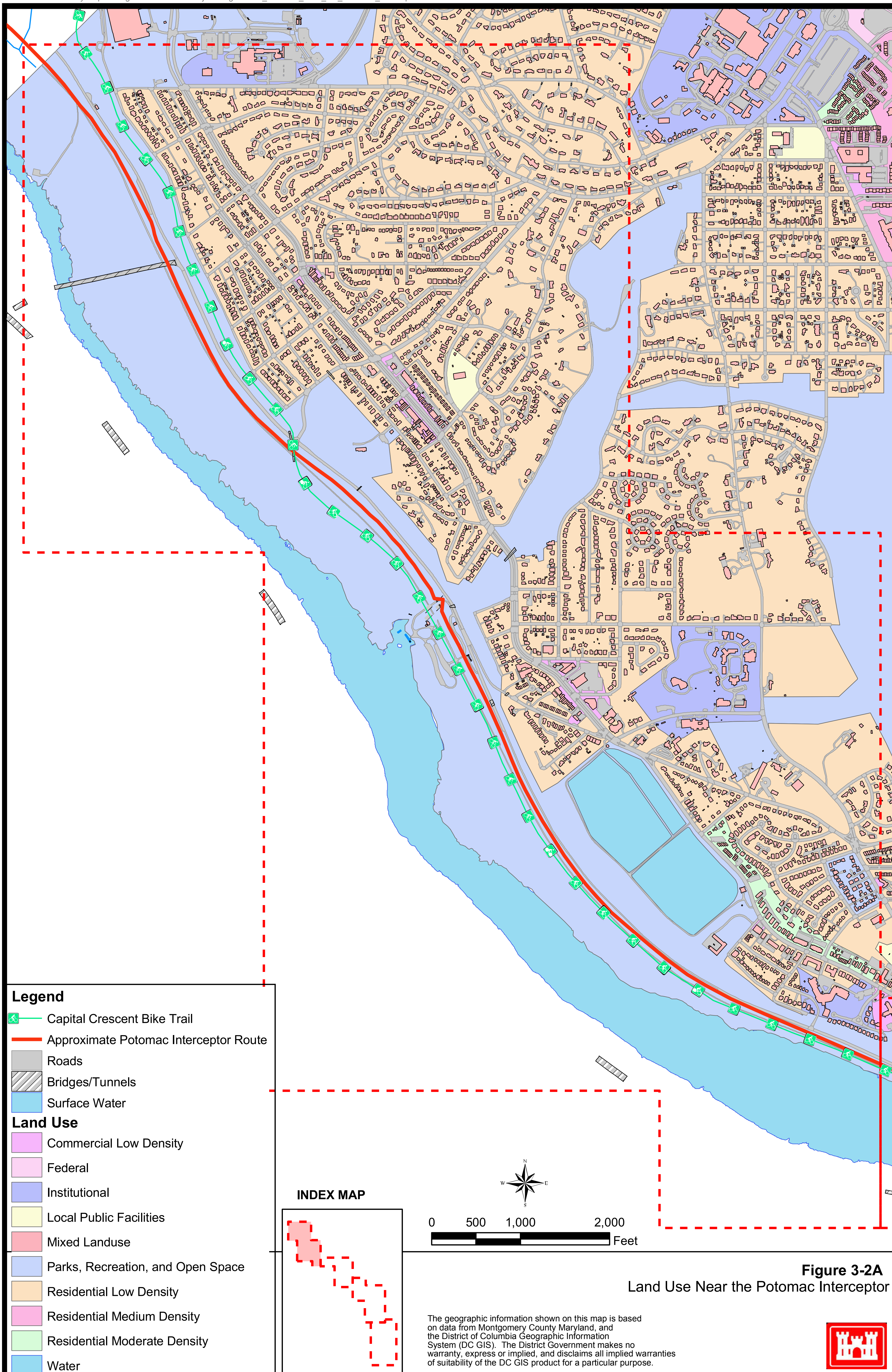


Figure 3-2A
Land Use Near the Potomac Interceptor

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-3b_Landuse_Near_the_Potomac_Interceptor.mxd

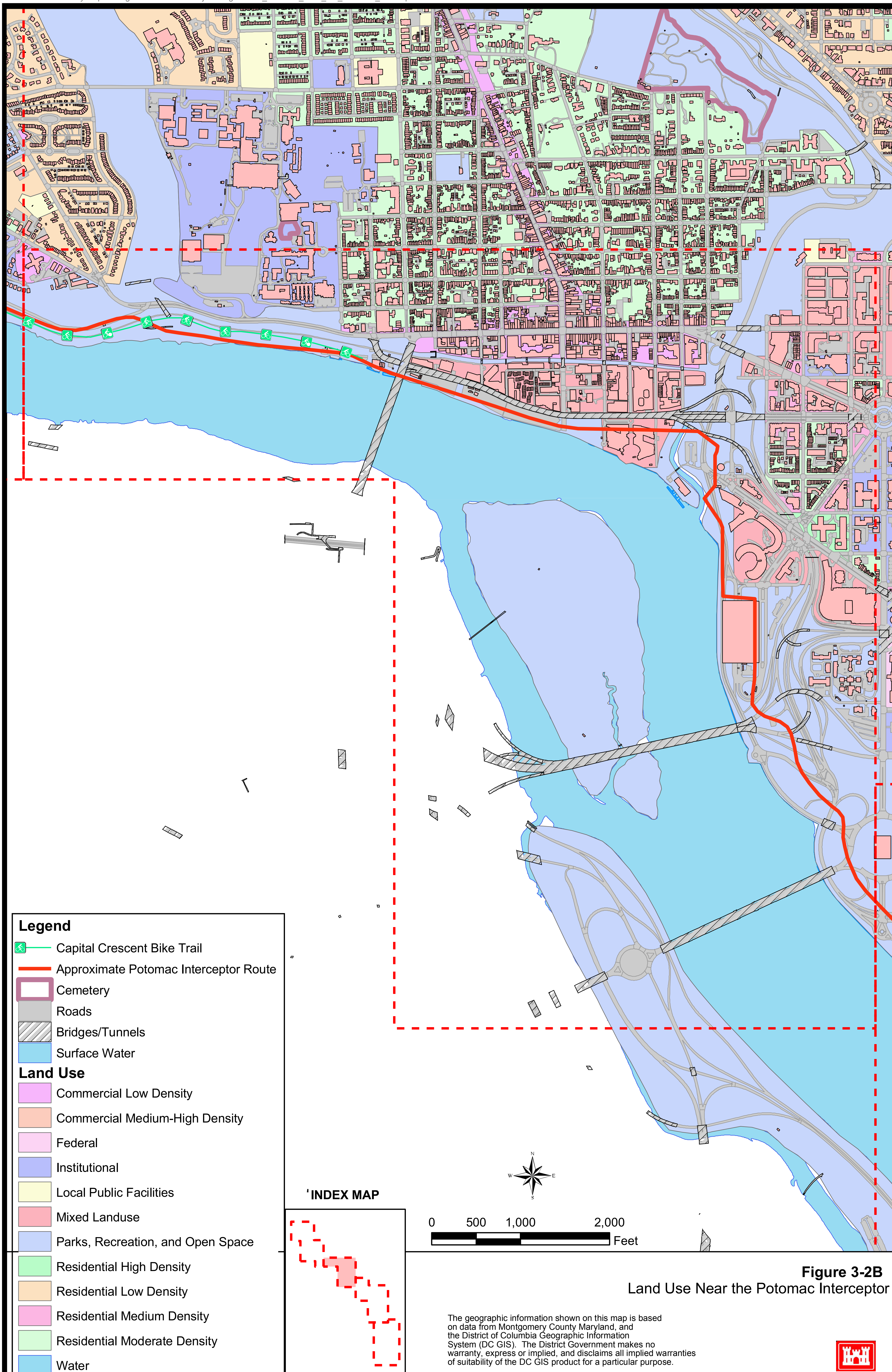


Figure 3-2B
Land Use Near the Potomac Interceptor

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-3c_Landuse_Near_the_Potomac_Interceptor.mxd

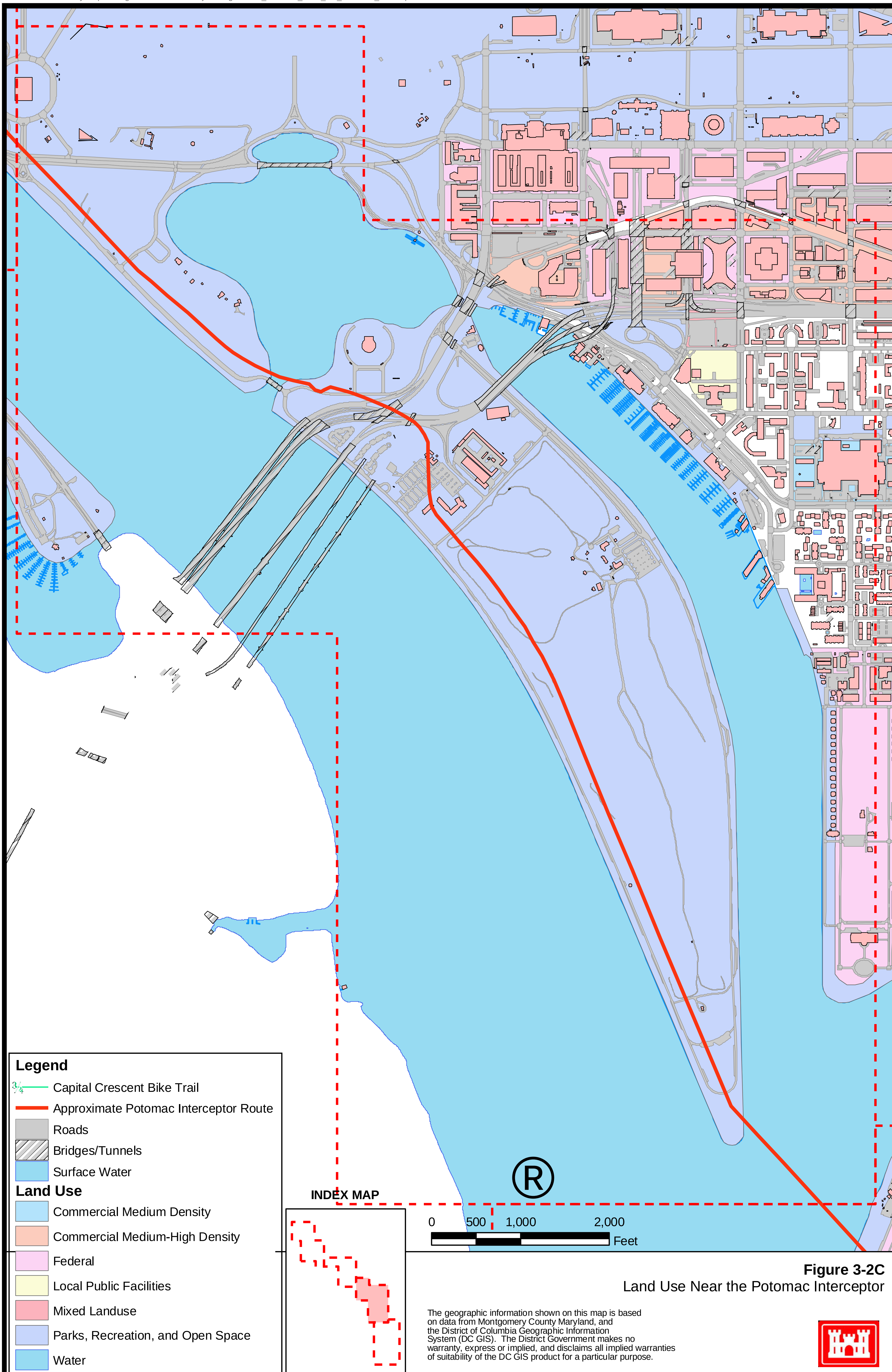


Figure 3-2C
Land Use Near the Potomac Interceptor

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-3d_Landuse_Near_the_Potomac_Interceptor.mxd

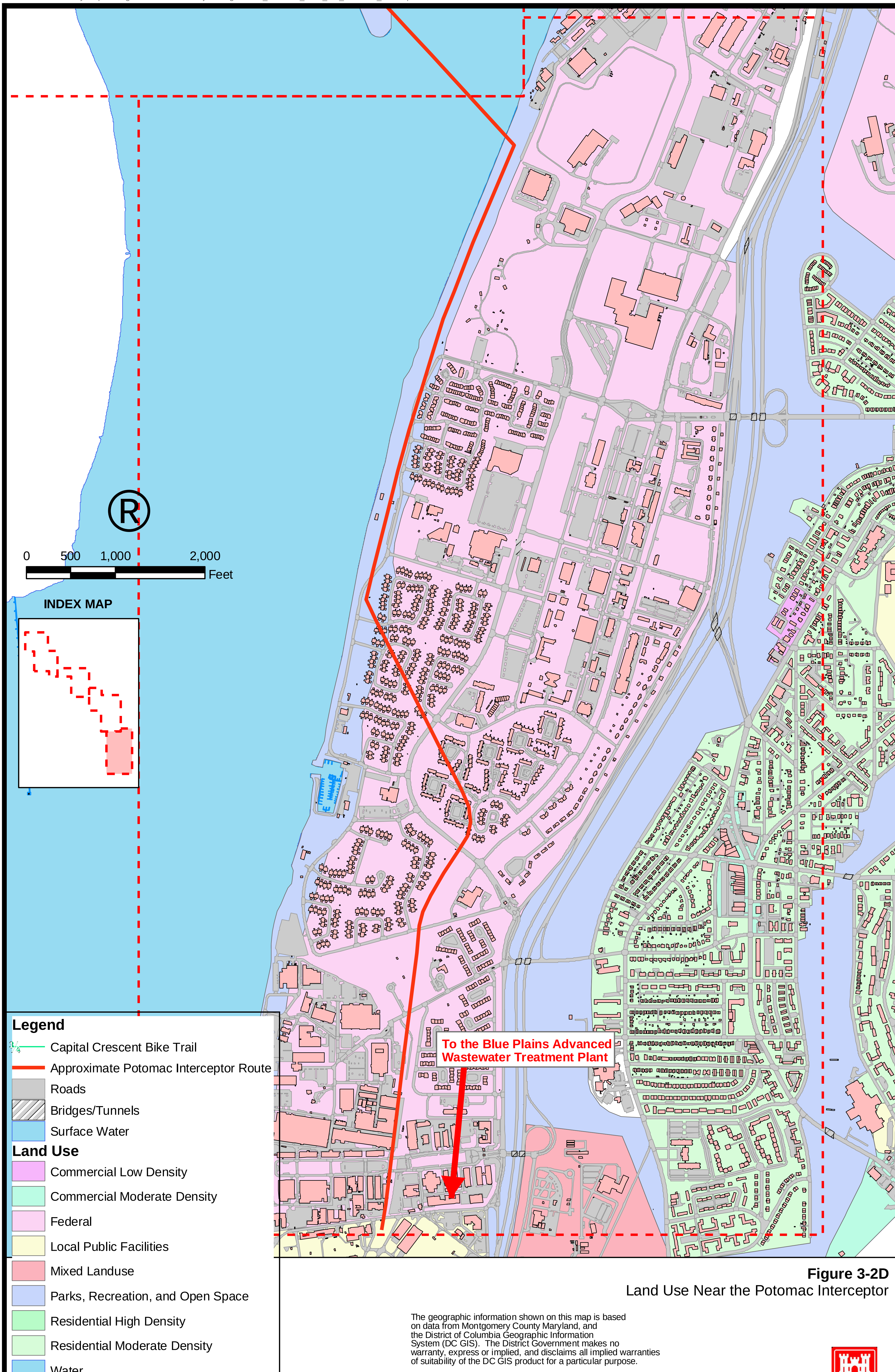


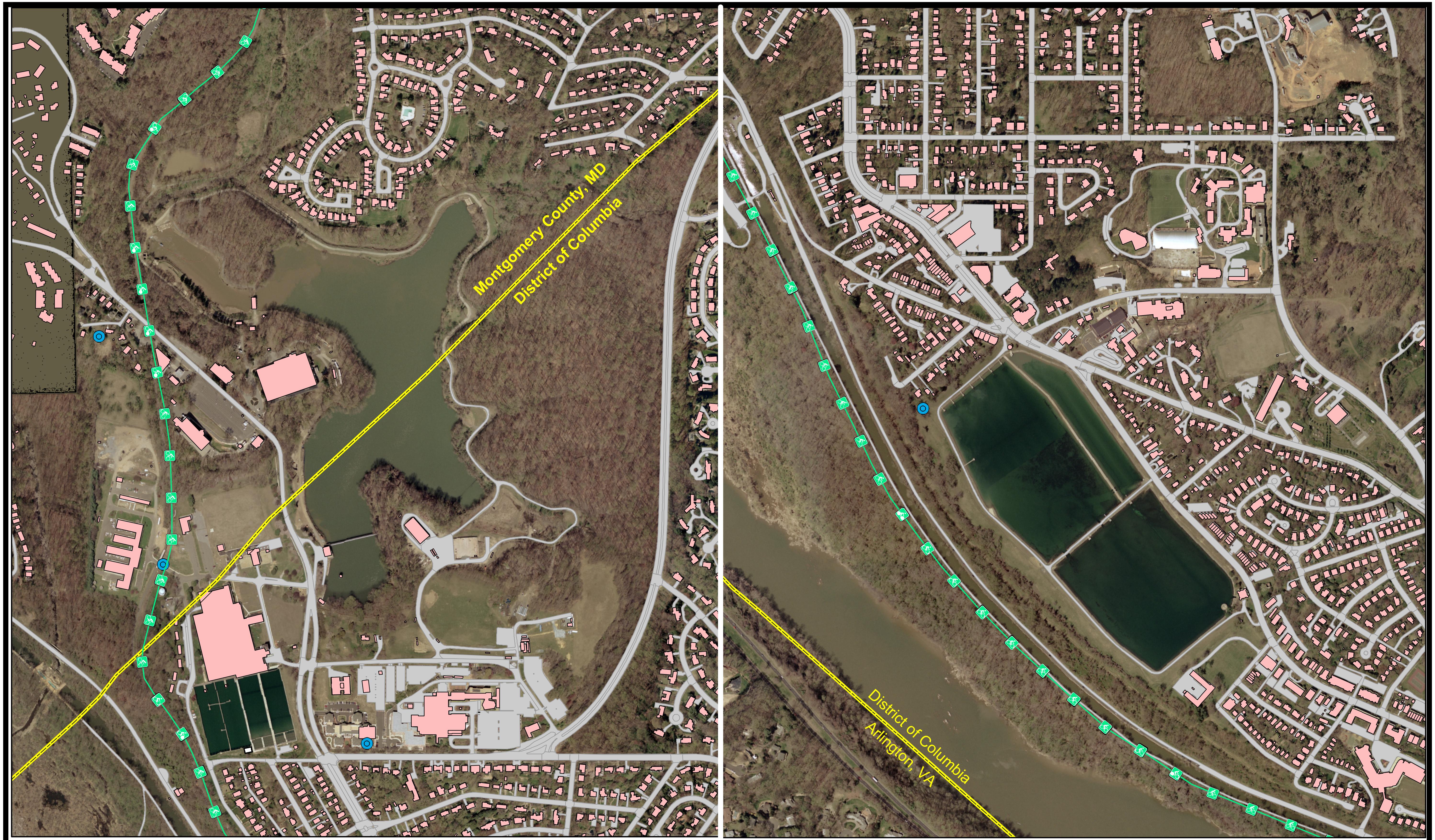
Figure 3-2D
Land Use Near the Potomac Interceptor

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-4_Landuse_Around_BluePlains.mxd

Figure 3-3
Land Use Around the Blue Plains
Advanced Wastewater Treatment Plant

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.



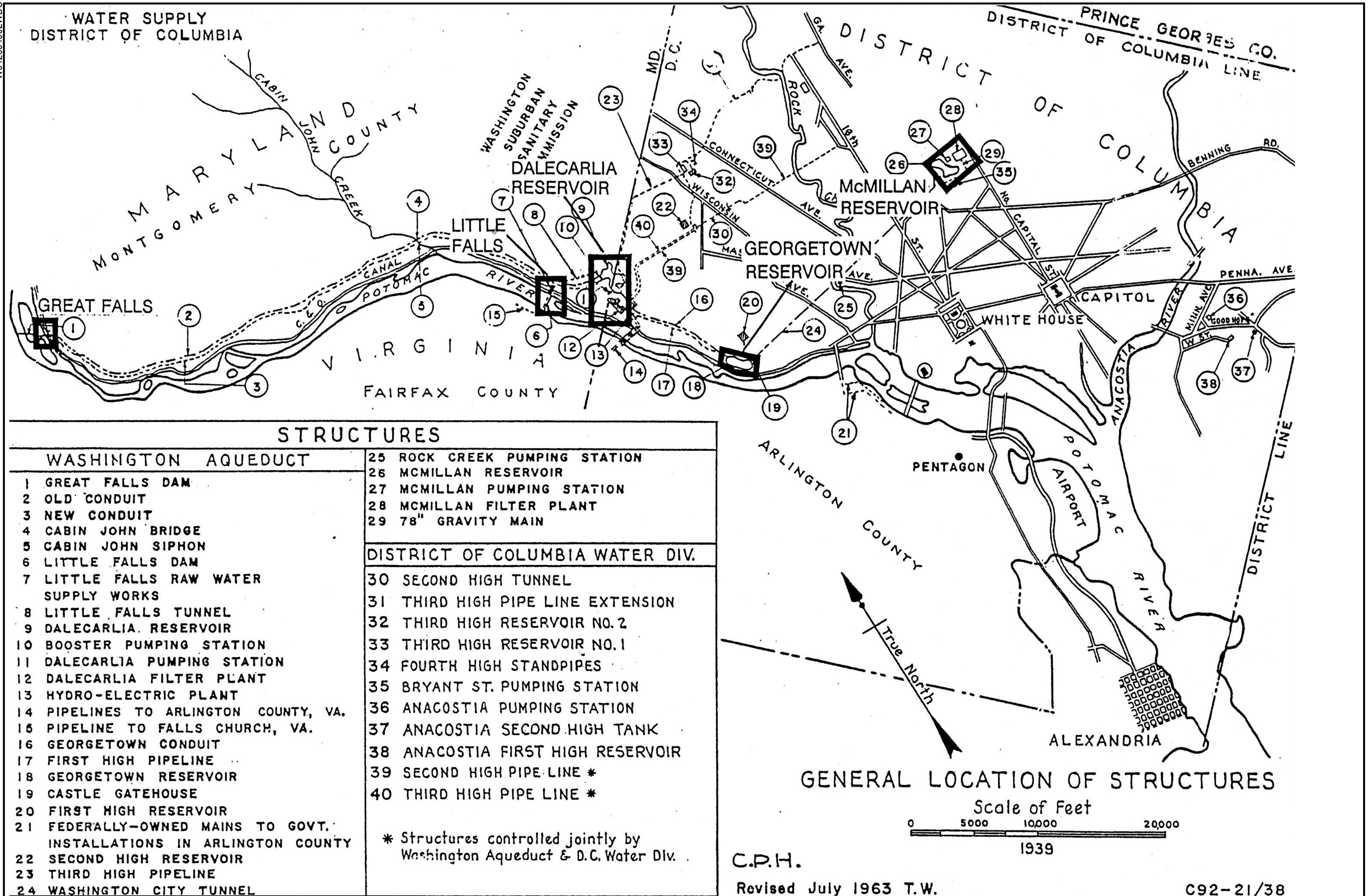
Legend

- Noise Monitoring Locations
- Capital Crescent Bike Trail
- District Boundary
- Existing Buildings
- Roads

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 300 600 Feet

Figure 3-4
Noise Monitoring Locations Near the Dalecarlia Reservoir and the Georgetown Reservoir



STRUCTURES

WASHINGTON AQUEDUCT

1 GREAT FALLS DAM
2 OLD CONDUIT
3 NEW CONDUIT
4 CABIN JOHN BRIDGE
5 CABIN JOHN SIPHON
6 LITTLE FALLS DAM
7 LITTLE FALLS RAW WATER SUPPLY WORKS
8 LITTLE FALLS TUNNEL
9 DALECARLIA RESERVOIR
10 BOOSTER PUMPING STATION
11 DALECARLIA PUMPING STATION
12 DALECARLIA FILTER PLANT
13 HYDRO-ELECTRIC PLANT
14 PIPELINES TO ARLINGTON COUNTY, VA.
15 PIPELINE TO FALLS CHURCH, VA.
16 GEORGETOWN CONDUIT
17 FIRST HIGH PIPELINE
18 GEORGETOWN RESERVOIR
19 CASTLE GATEHOUSE
20 FIRST HIGH RESERVOIR
21 FEDERALLY-OWNED MAINS TO GOVT. INSTALLATIONS IN ARLINGTON COUNTY
22 SECOND HIGH RESERVOIR
23 THIRD HIGH PIPELINE
24 WASHINGTON CITY TUNNEL
25 ROCK CREEK PUMPING STATION
26 MCMILLAN RESERVOIR
27 MCMILLAN PUMPING STATION
28 MCMILLAN FILTER PLANT
29 78" GRAVITY MAIN

DISTRICT OF COLUMBIA WATER DIV.

30 SECOND HIGH TUNNEL
31 THIRD HIGH PIPE LINE EXTENSION
32 THIRD HIGH RESERVOIR NO. 2
33 THIRD HIGH RESERVOIR NO. 1
34 FOURTH HIGH STANDPIPES
35 BRYANT ST. PUMPING STATION
36 ANACOSTIA PUMPING STATION
37 ANACOSTIA SECOND HIGH TANK
38 ANACOSTIA FIRST HIGH RESERVOIR
39 SECOND HIGH PIPE LINE *
40 THIRD HIGH PIPE LINE *

* Structures controlled jointly by Washington Aqueduct & D.C. Water Div.

Figure 3-5
Map of the Washington Aqueduct, Highlighting the four principal areas of the system: Great Falls, Dalecarlia, Georgetown, and McMillian
from "Washington Aqueduct Cultural Resources Management Plan" June, 1998

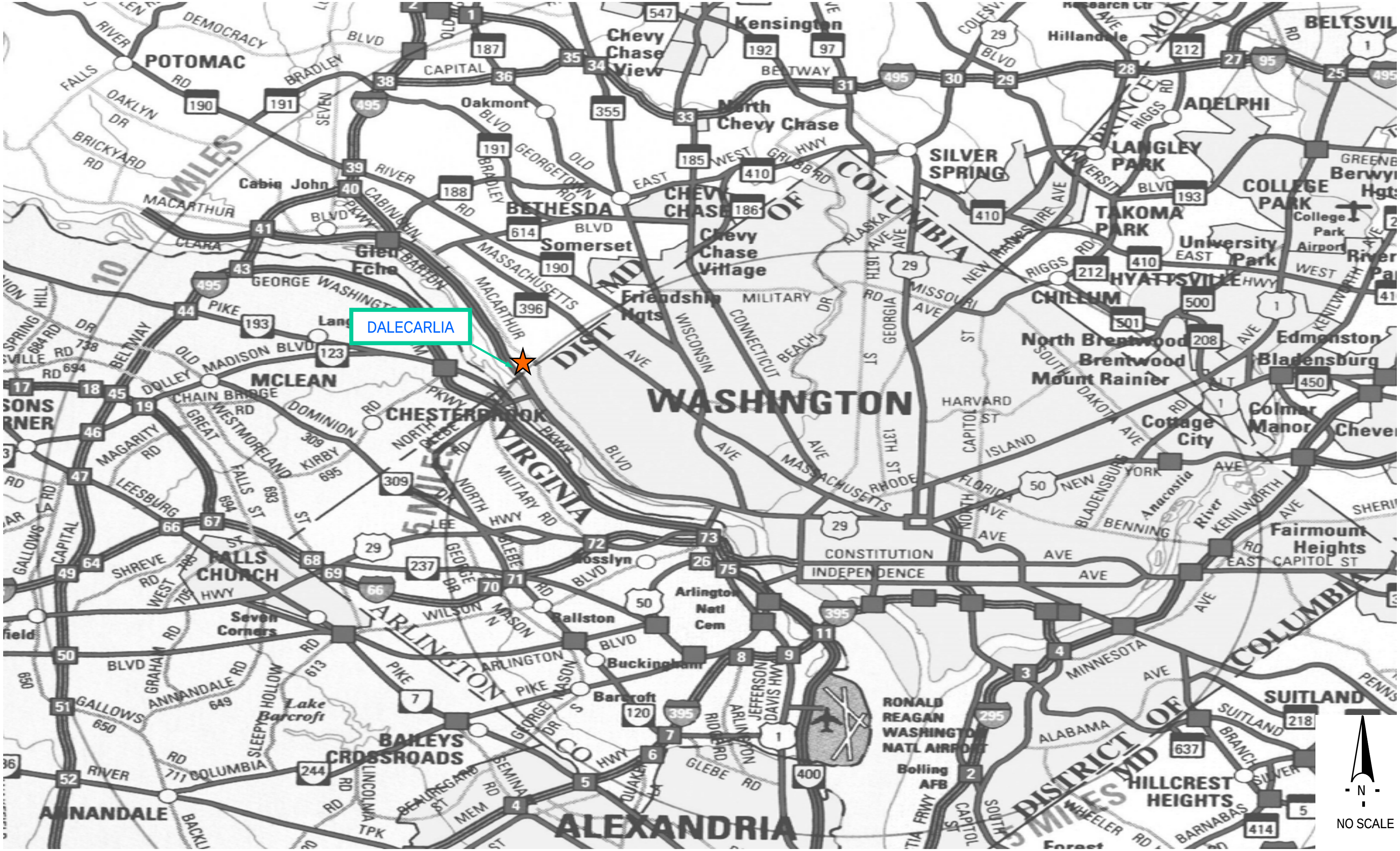


FIGURE 3-6

SITE LOCATION – REGIONAL SETTING

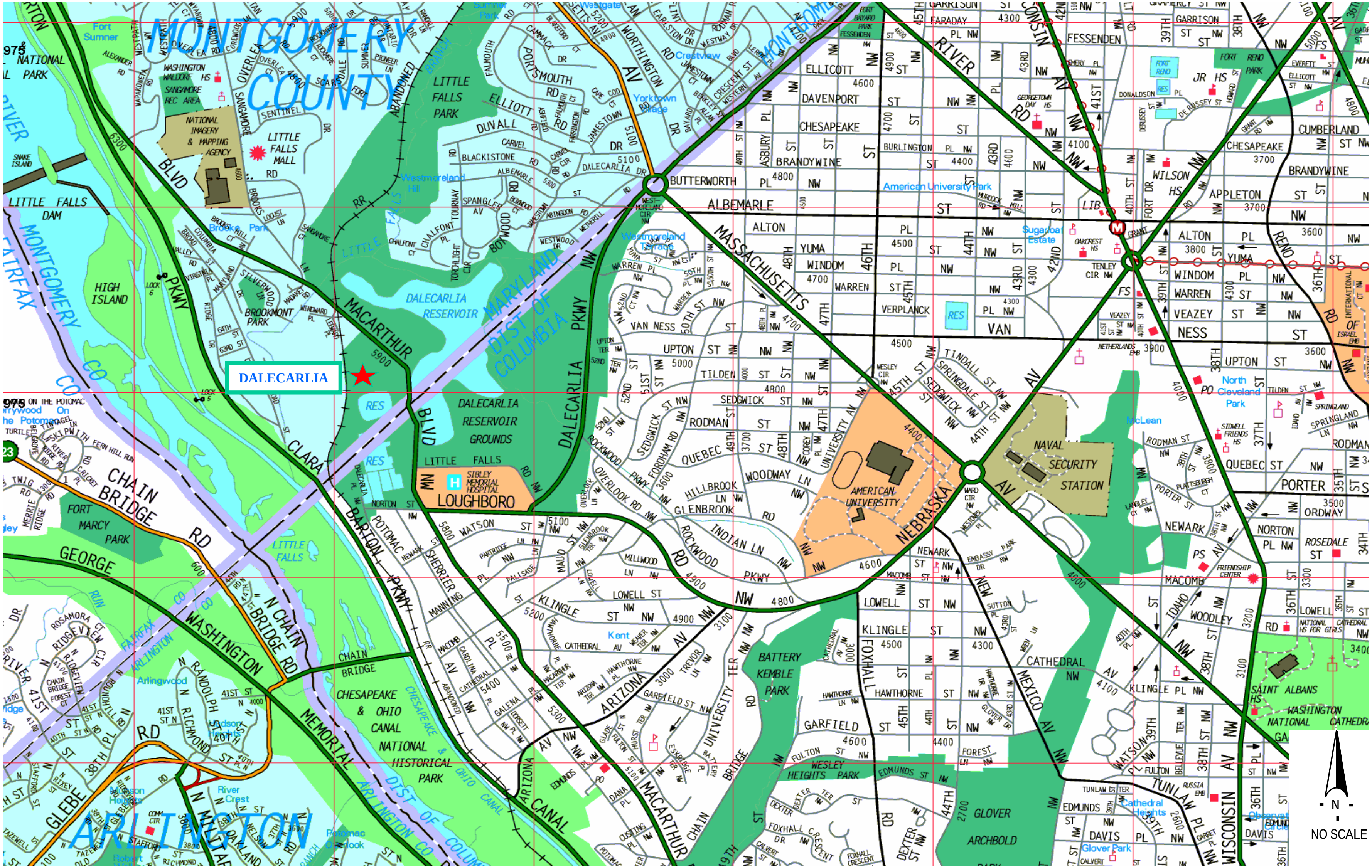


FIGURE 3-7
LOCAL AREA SETTING

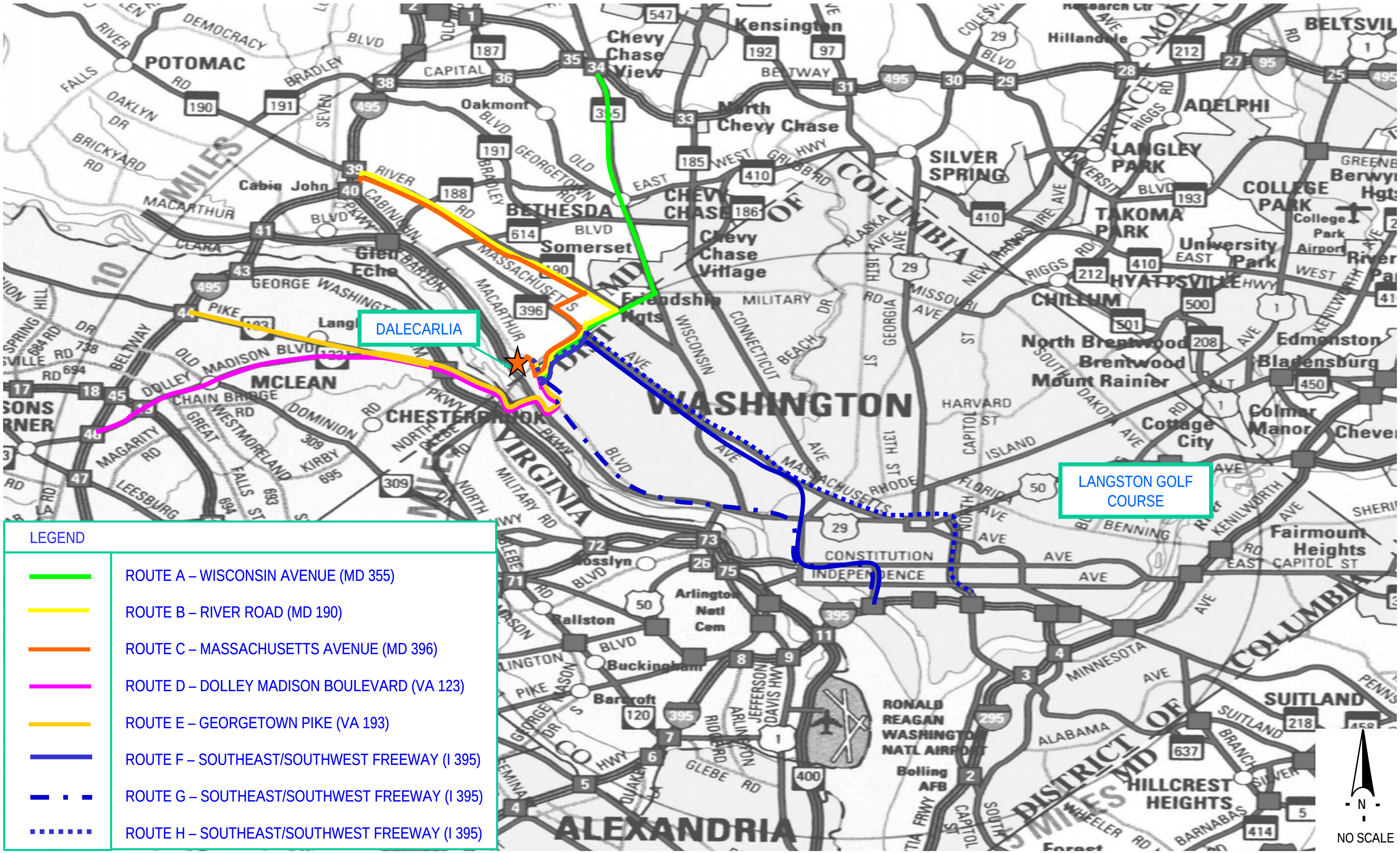


FIGURE 3-8

POTENTIAL TRUCK HAUL ROUTES

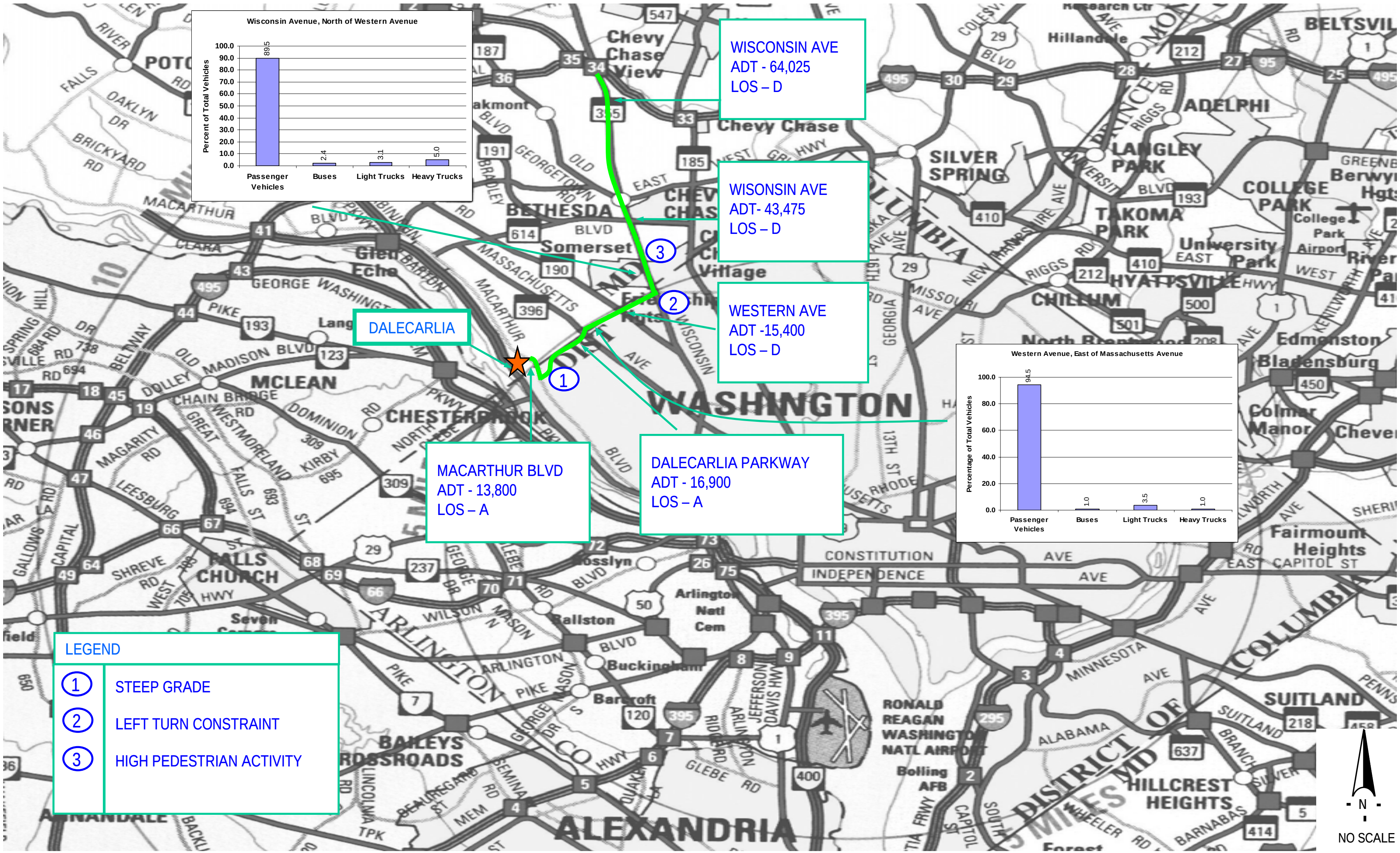


FIGURE 3-9

ROUTE A (WISCONSIN AVENUE – MD 355) – KEY TRANSPORTATION ELEMENTS

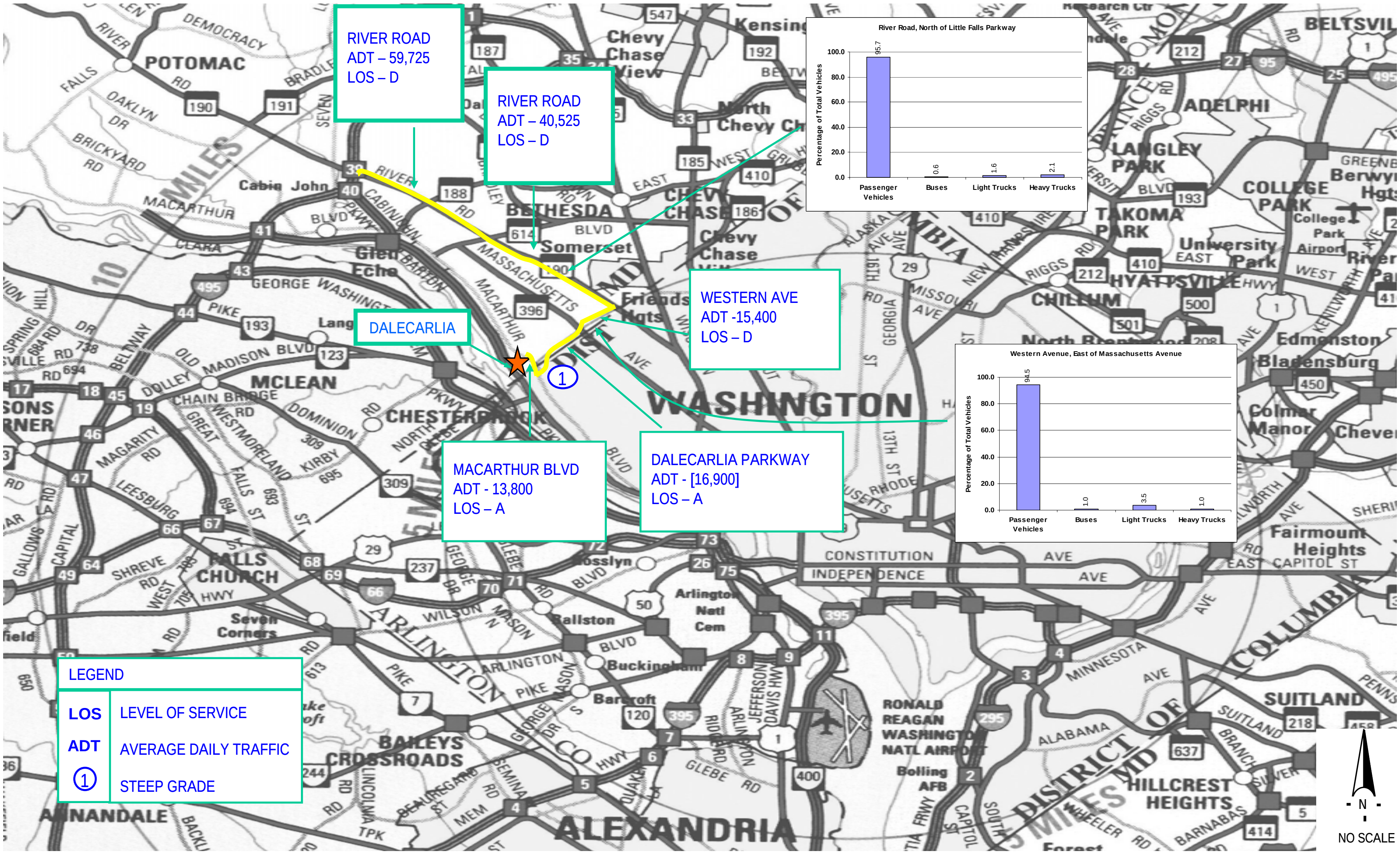


FIGURE 3-10

ROUTE B (RIVER ROAD- MD 190) – KEY TRANSPORTATION ELEMENTS

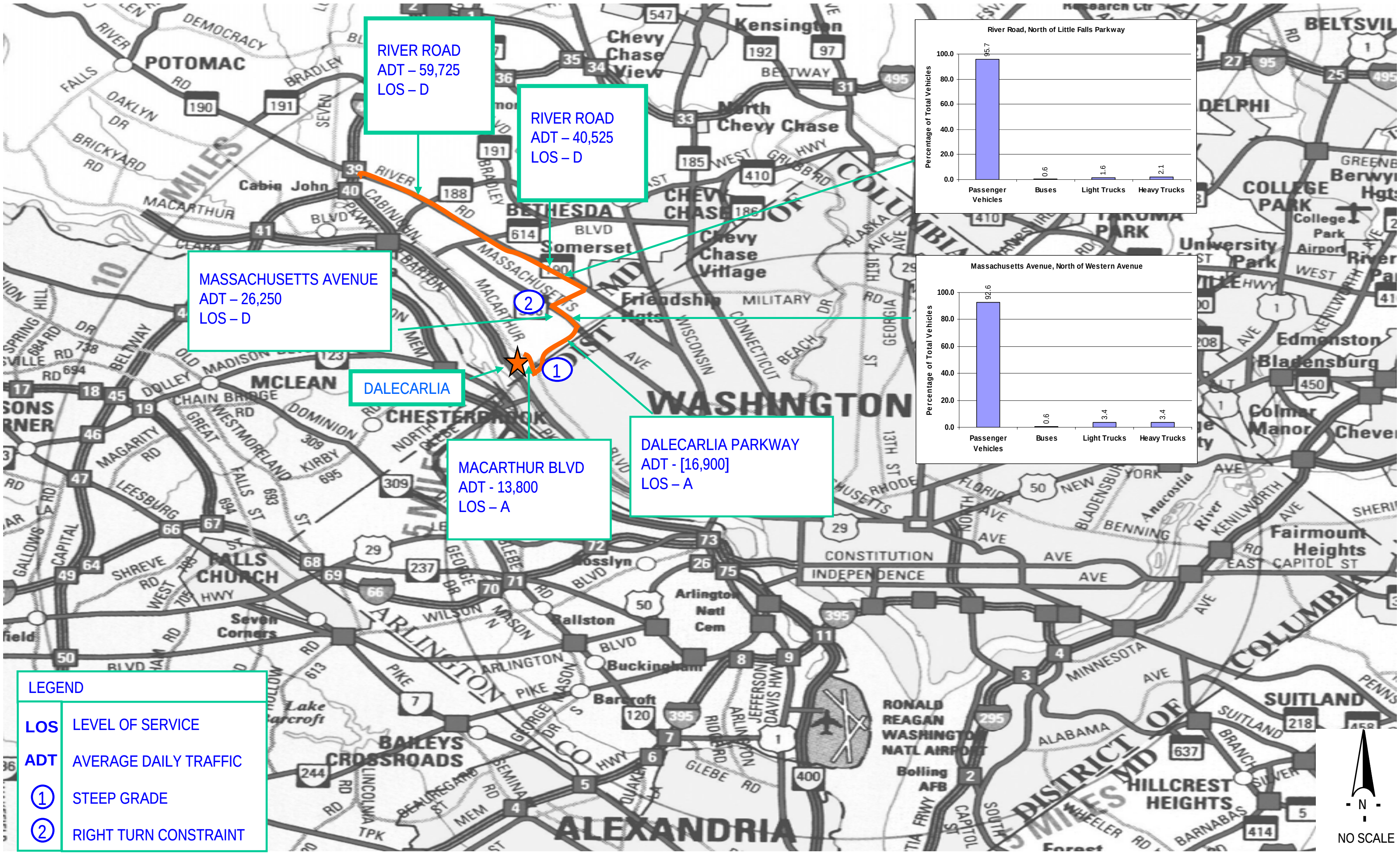


FIGURE 3-11

ROUTE C (MASSACHUSETTS AVENUE – MD 396) – KEY TRANSPORTATION ELEMENTS

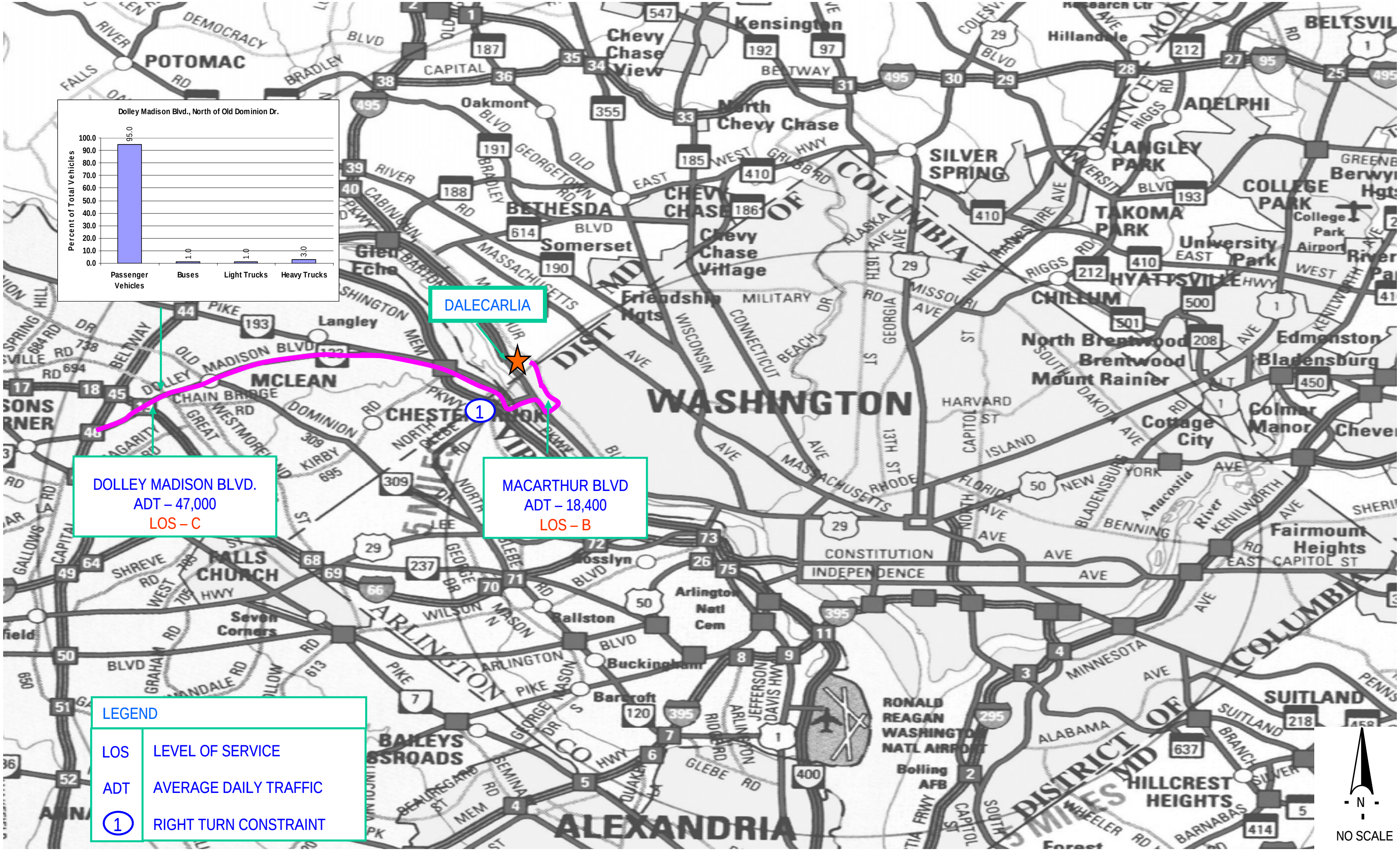


FIGURE 3-12

ROUTE D (DOLLEY MADISON BOULEVARD – VA-123) – KEY TRANSPORTATION ELEMENTS

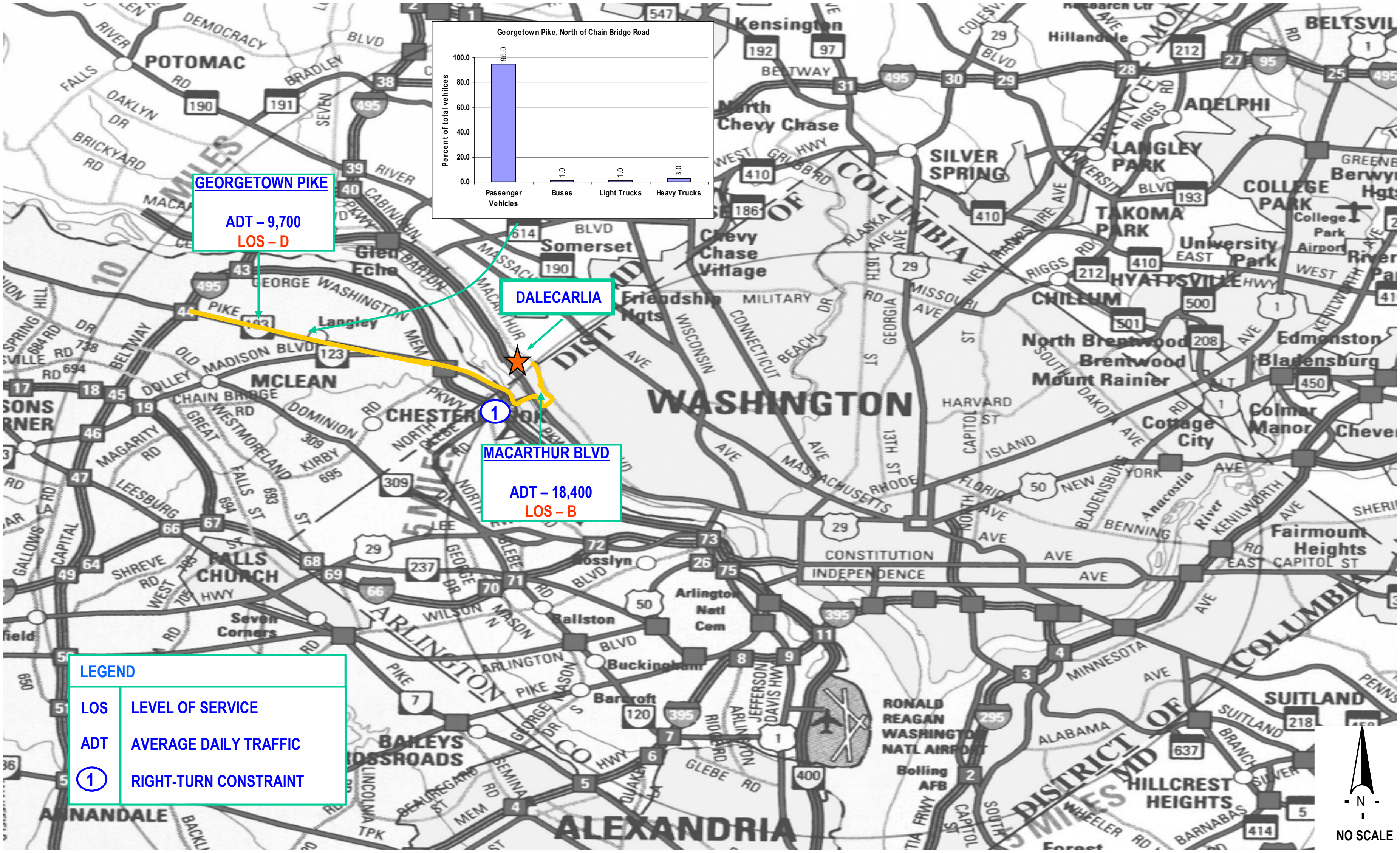


FIGURE 3-13

ROUTE E (GEORGETOWN PIKE – VA 193) – KEY TRANSPORTATION ELEMENTS

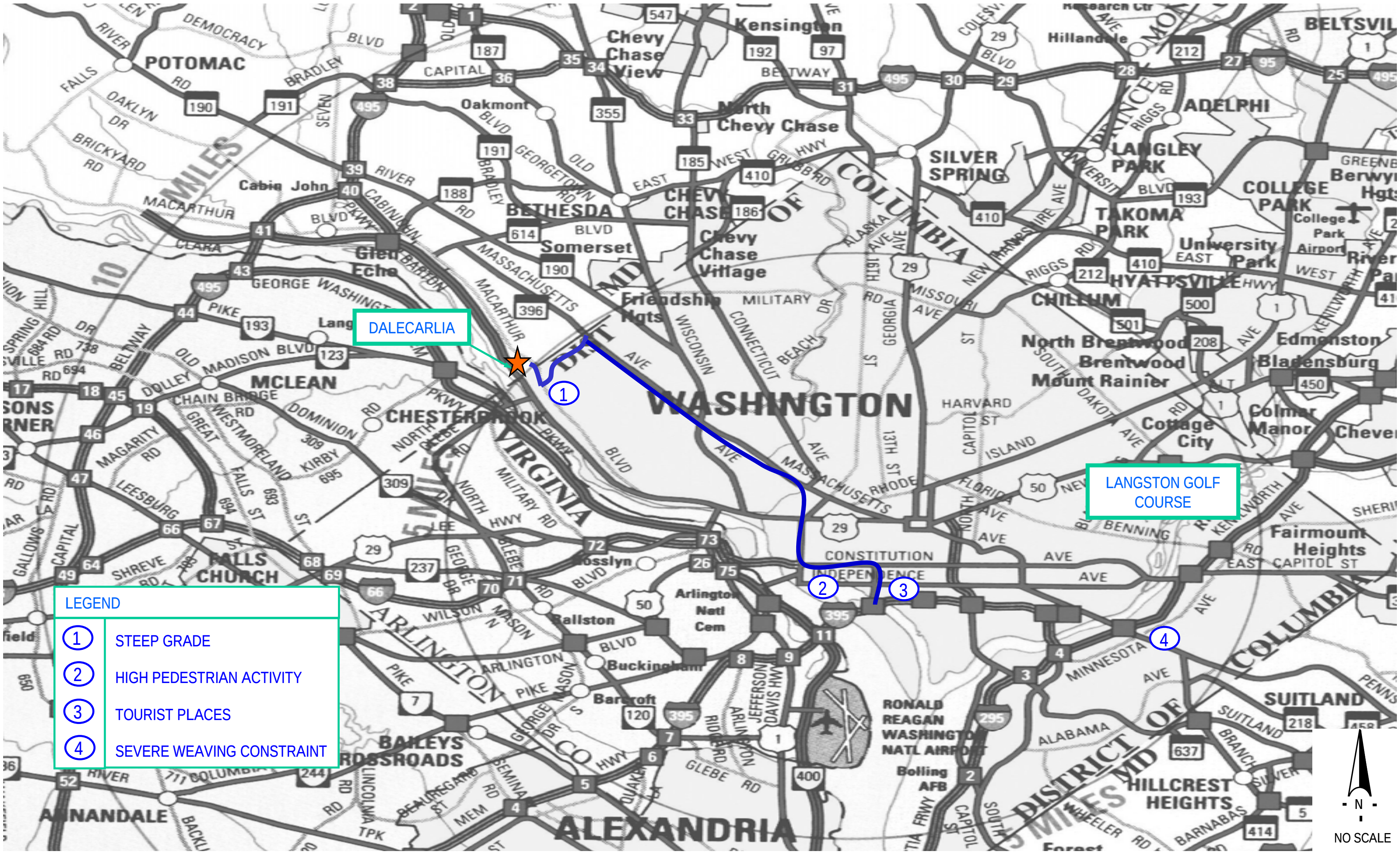


FIGURE 3-14
ROUTE F (SOUTHEAST/SOUTHWEST FREEWAY – I-395) – KEY CONSTRAINTS

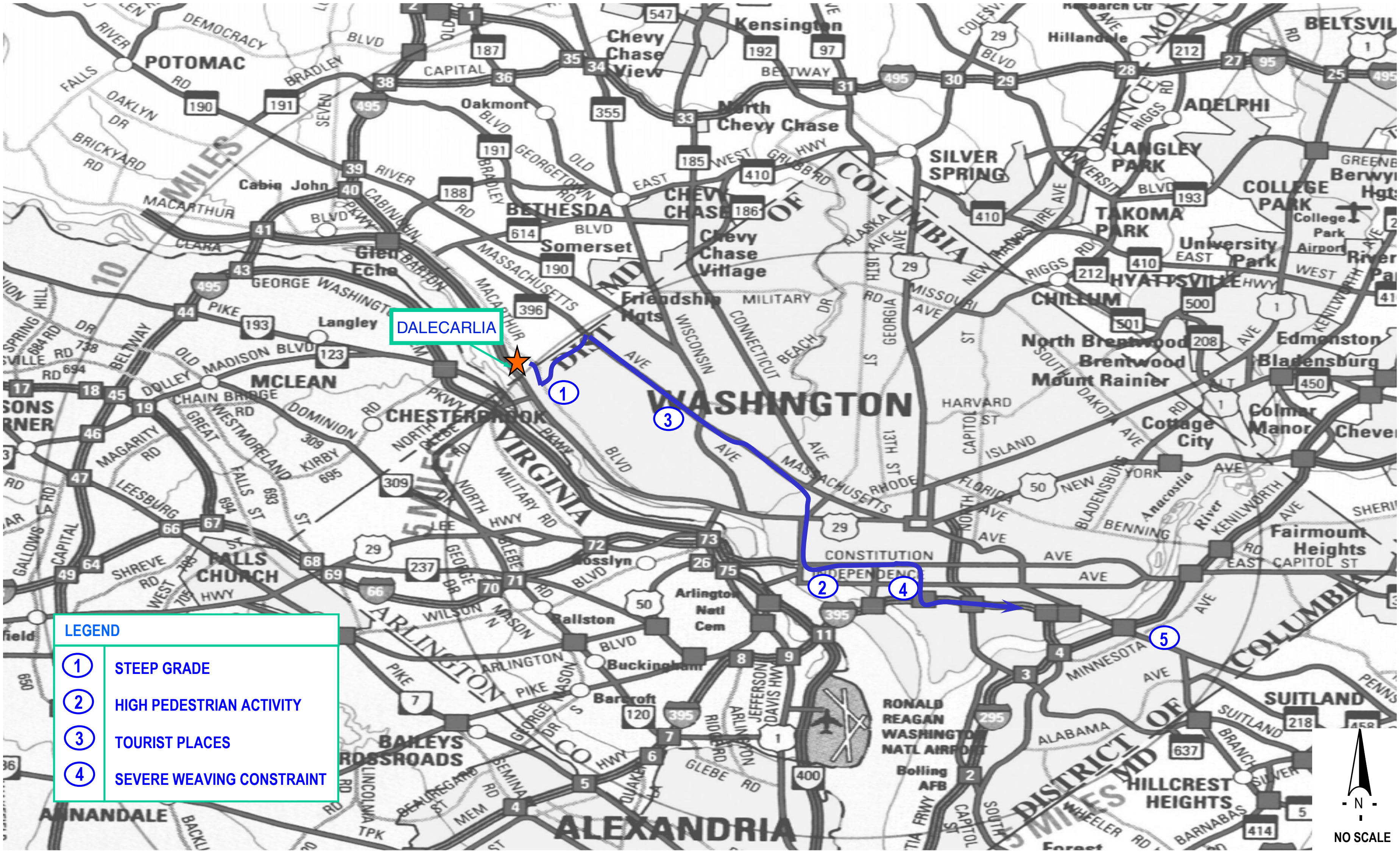


FIGURE 3-15

ROUTE G (SOUTHEAST FREEWAY - I-395 ALT 1) – KEY CONSTRAINTS

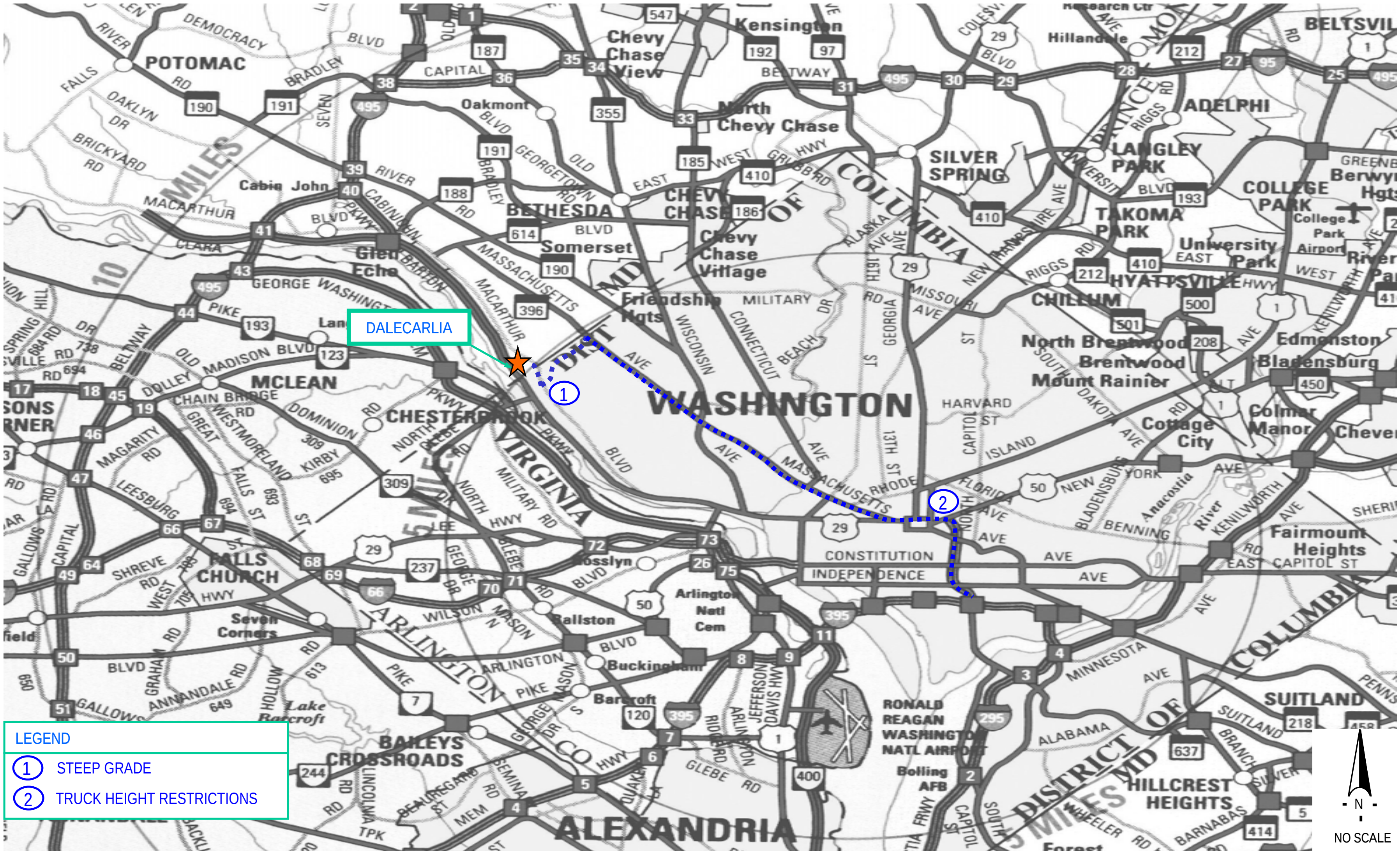


FIGURE 3-16

ROUTE H (SOUTHEAST/SOUTHWEST FREEWAY) – KEY CONSTRAINTS

Legend

- Approximate Location of Some New/Modified Facilities
- Viewpoint Locations near Dalecarlia Complex
- Capital Crescent Bike Trail
- District Boundary
- Existing Buildings
- Roads
- Monofill Access Road

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0 375 750 Feet

Figure 3-17
Visual Analysis Viewpoint Locations Near the Dalecarlia Water Treatment Plant and the Dalecarllia Reservoir

W012005001WDC

Viewpoint 1
View toward a Proposed Northwest Dalecarlia Processing Site from Capital Crescent Trail

Figure 3-18

Viewpoint 2
View toward a Proposed Northwest Dalecarlia Processing Site from Hillside to South

Figure 3-19

W012005001WDC

Viewpoint 3
View toward a Proposed Northwest Dalecarlia Processing Site from Brookmont

Figure 3-20

Viewpoint 4
View toward Monofill Site from MacArthur Boulevard

Figure 3-21

W012005001WDC

Viewpoint 5
View toward Monofill Site from Dalecarlia Parkway at Warren Place, NW

Figure 3-22

Viewpoint 6
View toward Monofill Site from Chalfont Place

Figure 3-23

Viewpoint 7

View toward a Proposed East Dalecarlia Processing Site from the Sibley Memorial Hospital Parking Area

Figure 3-24

Viewpoint 8

View toward a Proposed East Dalecarlia Processing Site from MacArthur Boulevard

Figure 3-25

Viewpoint 9
View toward a Proposed East Dalecarlia Processing Site from Chalfont Place

Figure 3-26

Viewpoint 10
View toward the Forebay as seen from the Capital Crescent Trail

Figure 3-27

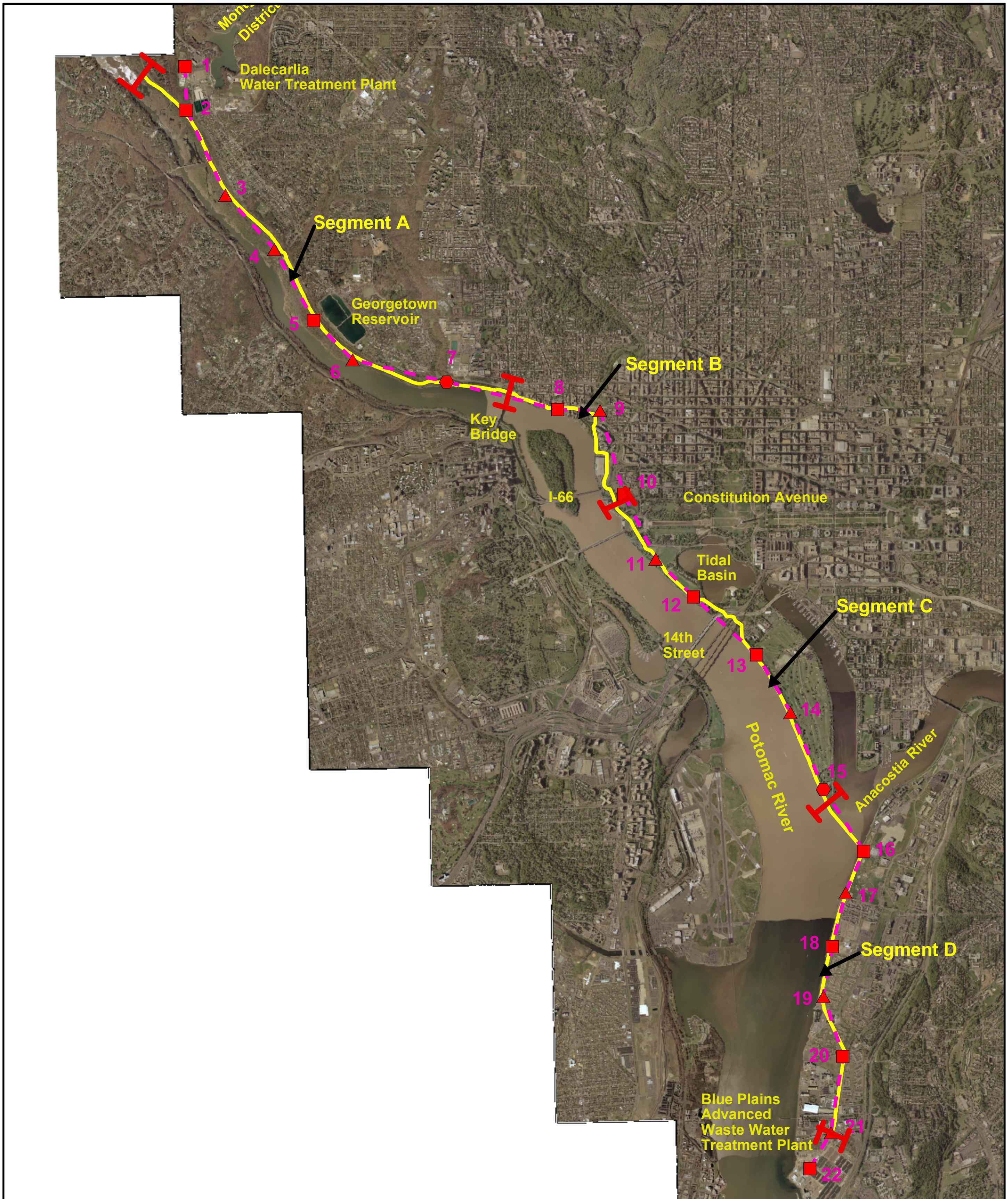
Viewpoint 11
View from Norton Street toward Potential Residuals Pumping Station Site

Figure 3-28

Viewpoint 12
Georgetown Reservoir as seen from MacArthur Boulevard

Figure 3-29

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure 3-31 - Pipeline Route Aesthetic Analysis Segments.mxd



Legend

- Potomac Interceptor Route
- Proposed Pipe Feed Route
- Drill Rig Site
- Pipe Feed Site
- Potential Drill Rig and Pipe Feed Site

0 2,750 5,500 Feet

Figure 3-30
Pipeline Route Aesthetic Analysis Segments

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W012005001WDC

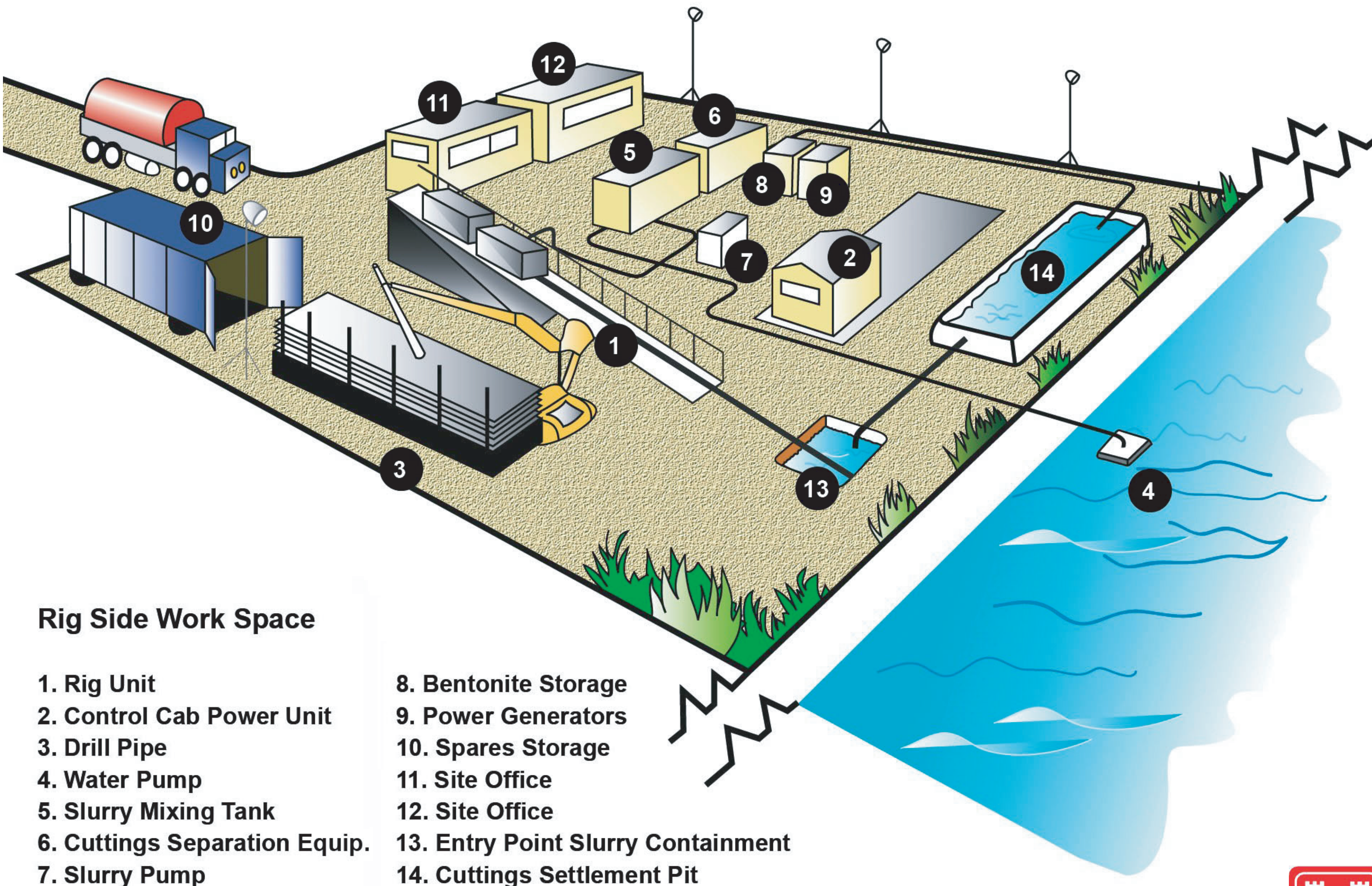


Figure 3-31
Simulation of directional drilling rig side work space

W012005001WDC

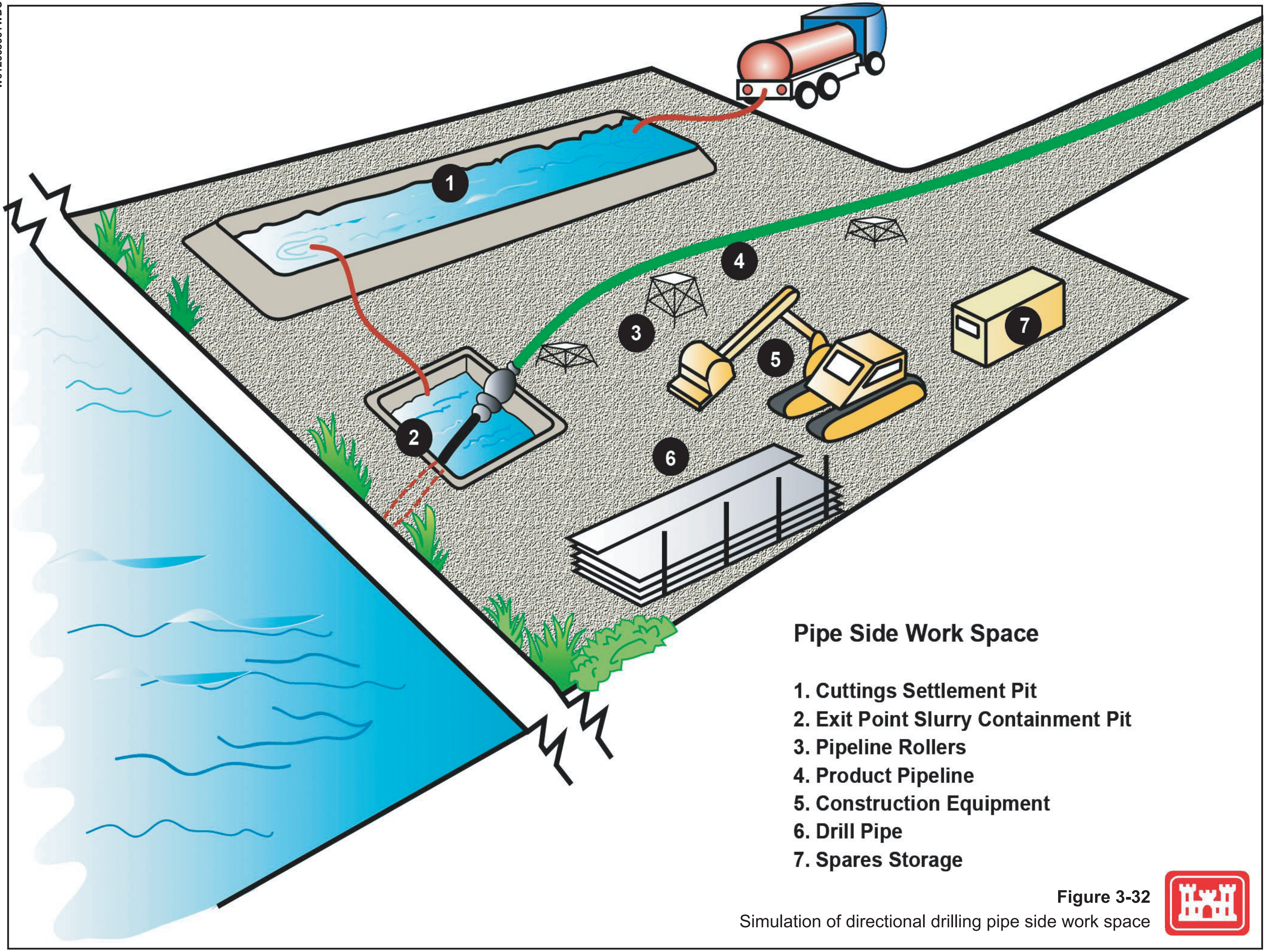
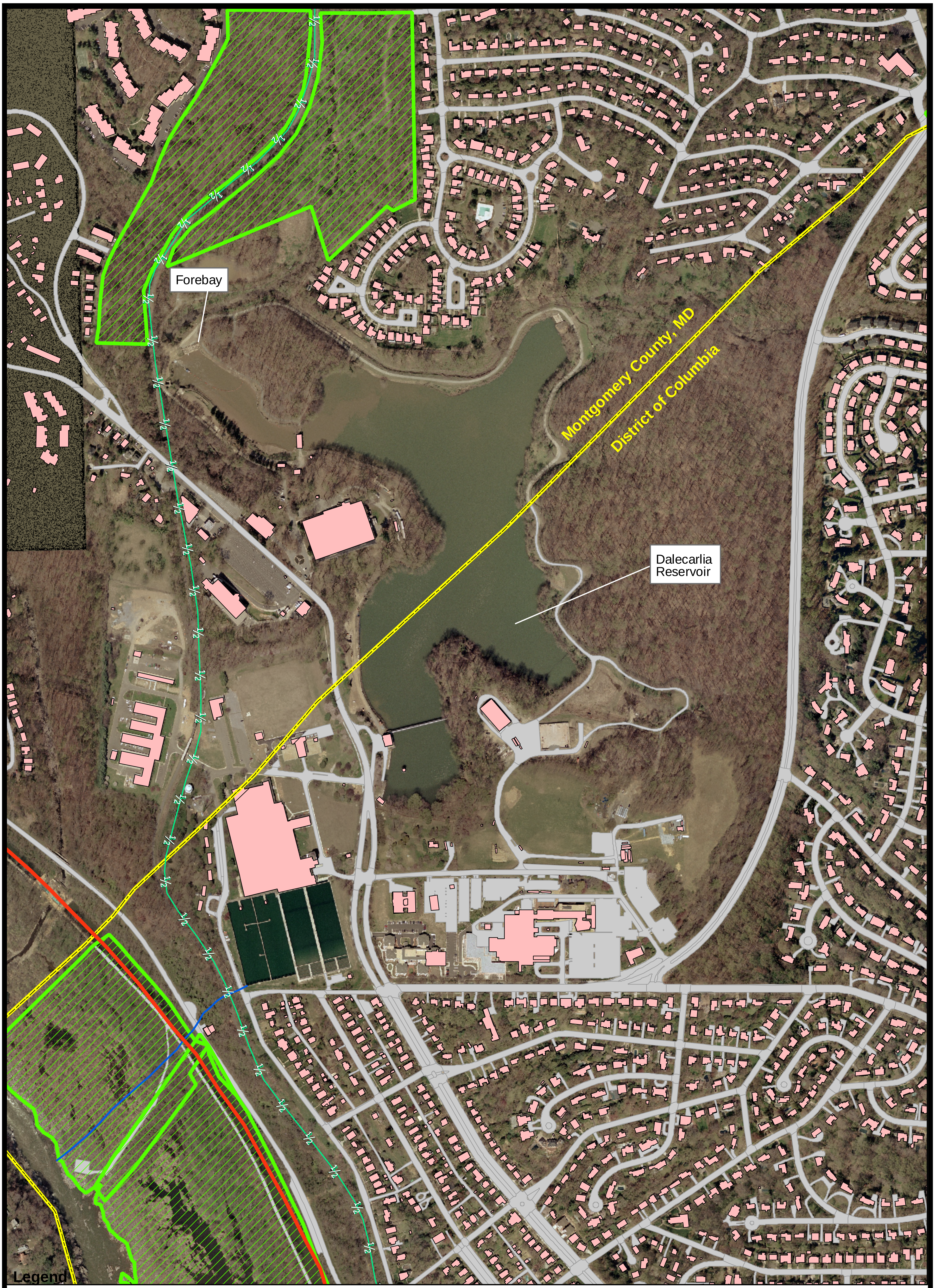


Figure 3-32
Simulation of directional drilling pipe side work space

Viewpoint 13
Aerial of the Blue Plains Advanced Wastewater Treatment Plant

Figure 3-33



Capital Crescent Bike Trail
Approximate Potomac Interceptor Route
District Boundary
Approximate Location of the Discharge Pipe to the Potomac Interceptor
Buildings
Parks
Park
Roads

The geographic information shown on this map is based on data from Montgomery County Maryland, and the District of Columbia Geographic Information System (DC GIS). The District Government makes no warranty, express or implied, and disclaims all implied warranties of suitability of the DC GIS product for a particular purpose.

0 250 500 1,000 Feet

Figure 3-34
Park Locations Around Dalecarlia

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-7a_Socioeconomic_resources_near_the_potomac_interceptor.mxd

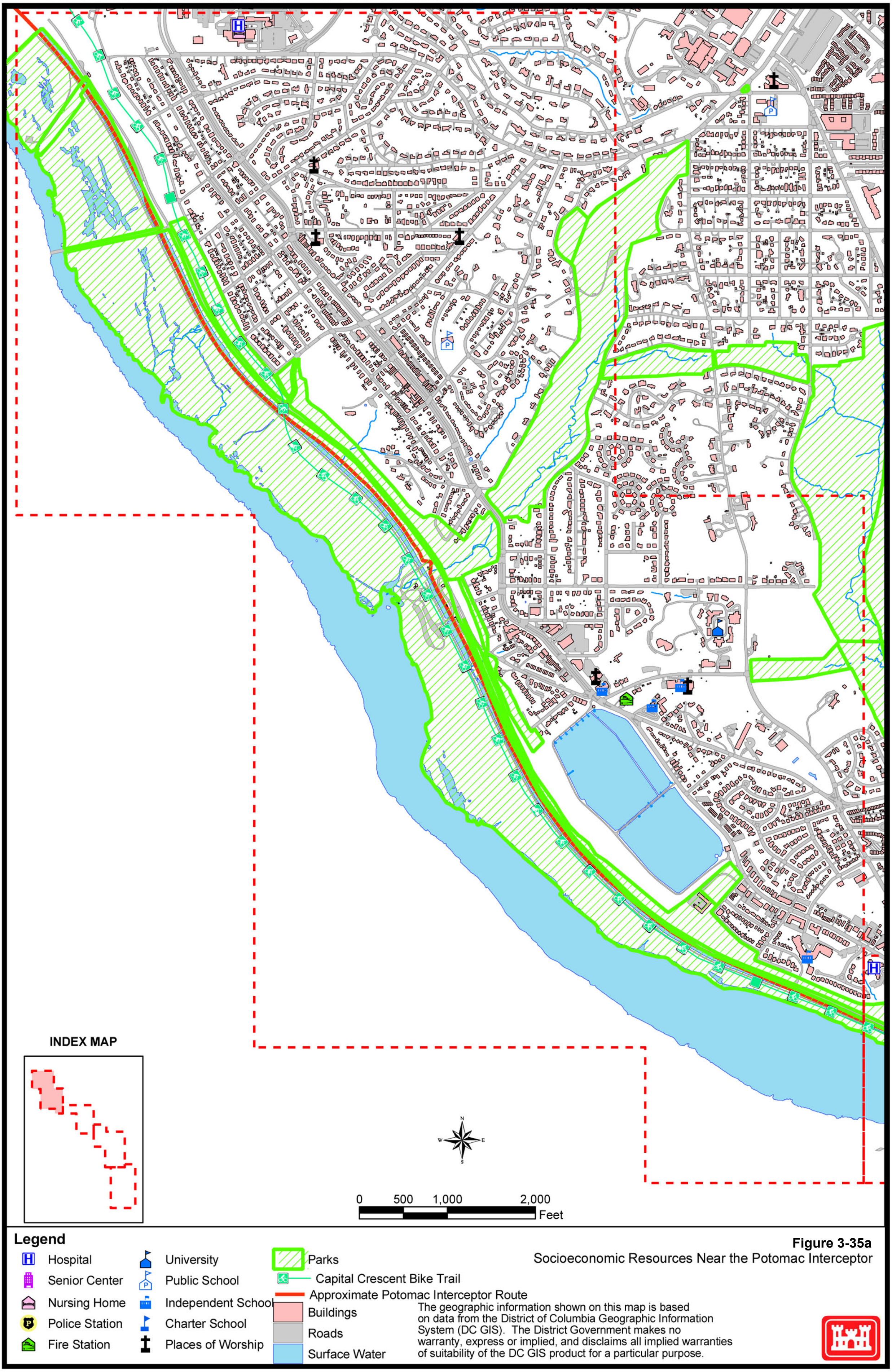
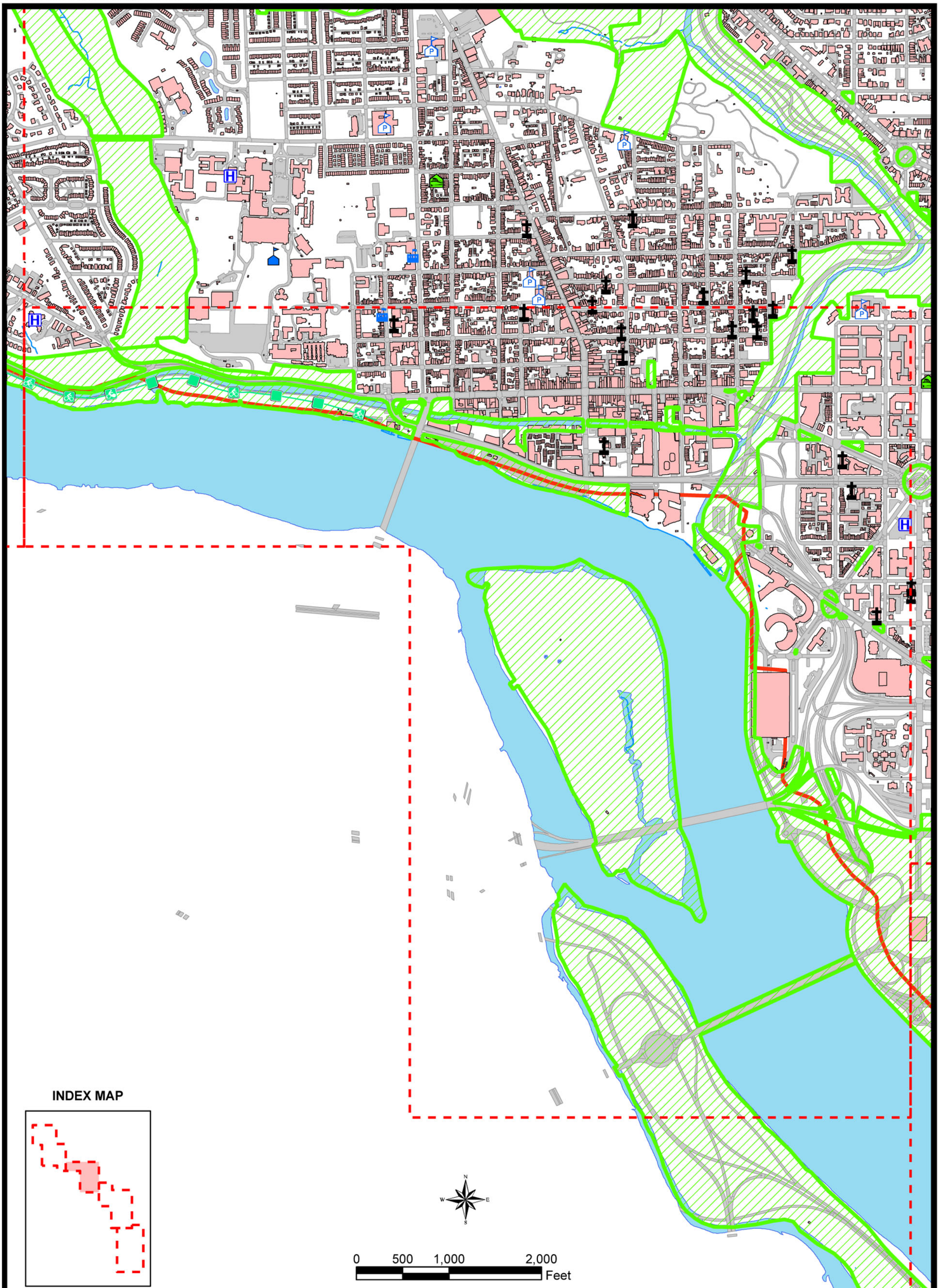


Figure 3-35a
Socioeconomic Resources Near the Potomac Interceptor

File Path: V:\USArmyCorpsOfEnginee\186970\AVProjects\Figure3-7b_Socioeconomic_resources_near_the_potomac_interceptor.mxd



Legend

- Hospital
- Senior Center
- Nursing Home
- Police Station
- Fire Station
- University
- Public School
- Independent School
- Charter School
- Places of Worship
- Parks
- Capital Crescent Bike Trail
- Approximate Potomac Interceptor Route
- Buildings
- Roads
- Surface Water

Figure 3-35b
Socioeconomic Resources Near the Potomac Interceptor

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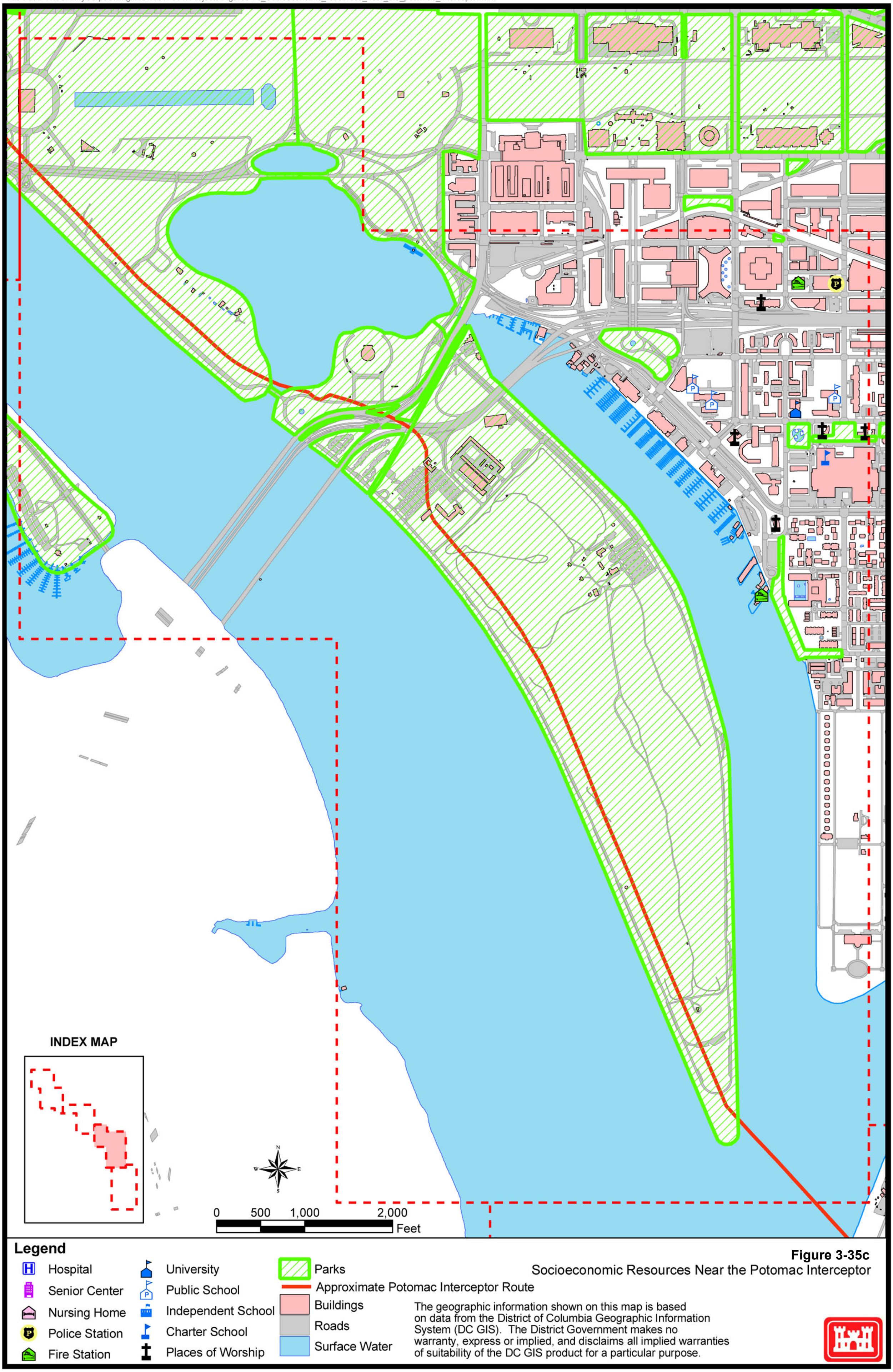

Figure 3-35c
Socioeconomic Resources Near the Potomac Interceptor

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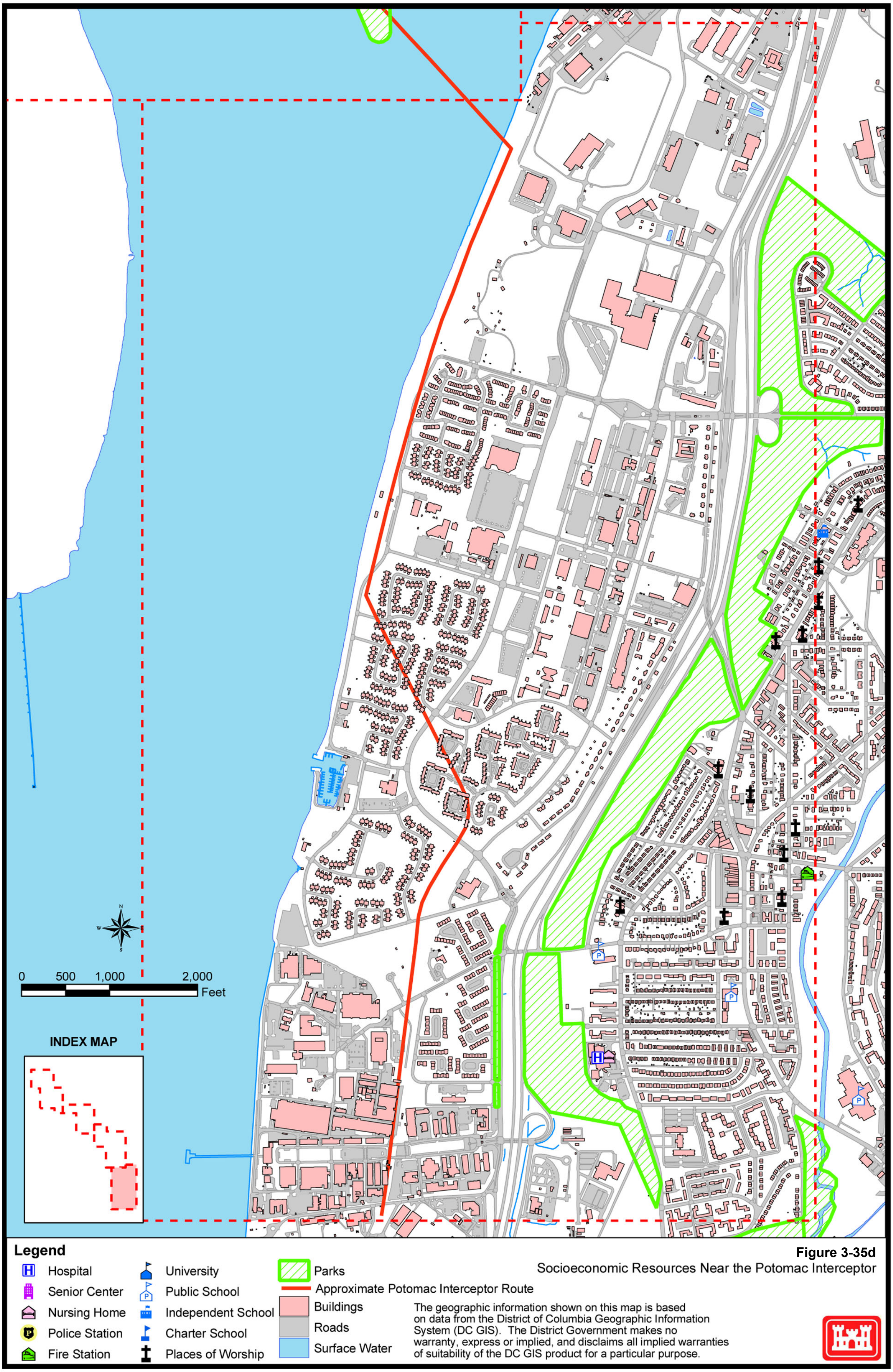

Figure 3-35d
Socioeconomic Resources Near the Potomac Interceptor

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SECTION 4

Impacts Evaluation

4.1 Introduction

This chapter discusses the potential for and significance of environmental, social, and economic consequences associated with implementing any of the project alternatives. These evaluations are presented by resource area in the same order as Chapter 3, Existing Conditions. There are several subjects included in this analysis that do not have a corresponding section in Chapter 3. These sections are cost, implementation uncertainty, land application, and public health. The subject matter for these sections relates only to the residuals management alternatives under consideration. They do not have an existing condition independent of a residuals management activity.

Within this section, resource impacts are presented by alternative. The impacts issues associated with each alternative are broken down by location (i.e., Georgetown Reservoir, Dalecarlia sedimentation basins, Northwest residuals processing site, etc.). A complete description of the treatment facilities included in each alternative is provided in Section 2.5 of this DEIS.

4.1.1 Standards of Significance Criteria

Criteria for evaluating potential impacts, either positive or adverse, and determining their significance were determined by the CEQ (40 CFR 1508.27). The regulations state that the intensity or severity of the impact and the context in which it occurs determines significance. Intensity criteria were based on the following:

- The degree to which the action affects public health or safety
- The degree of change to unique geographic characteristics, such as visual quality, prime agricultural land, archaeological sites, wetlands, or ecologically critical areas
- Potential for environmental or scientific controversy
- Known or unknown level of risk
- Potential for establishing a precedent for future actions or representing a decision in principle about a future consideration
- The relation of impact to other actions, individually not significant but with cumulative impact
- The proximity of the action to resources that are legally protected by various statutes, such as wetlands, historic properties listed in the National Register of Historic Places, regulatory floodplains, and federally listed threatened or endangered species
- The potential for violating federal, state, or local laws or requirements in place to protect the environment

Using these criteria, the following levels of impacts were identified:

No Impact—implementation of the action has little or no effect upon the resource.

No Significant Impact—implementation of the action has an impact, either adverse or beneficial, but it does not meet the significance criteria for the given resource relative to intensity and context.

Significant Impact—the predicted impact, either adverse or beneficial, meets the significance criteria for the given resource. Significant impacts may be reduced to a not significant level by implementing appropriate mitigation measures.

Direct and Indirect Impacts—A direct impact is caused by the considered alternative and occurs at the same time and place. One type of indirect impact is caused by the considered alternative and is reasonably foreseeable, but occurs later in time or farther removed in distance from the project site. Other indirect impacts can be those performed by others as a consequence of the considered alternative.

Short-Term and Long-Term Impacts—Short-term impacts are immediate and of temporary duration. Long-term impacts are immediate and continue until other factors occur.

4.2 Land Use

4.2.1 Definition

This assessment determines whether an alternative would substantially alter the present or planned land use of an area or would conflict with adopted plans and goals of the community.

4.2.2 Land Use Significance Criteria

Impact assessment is based on whether an alternative would conflict with adopted plans and goals of the community (i.e., zoning, Comprehensive Plan for the National Capital, and other planning documents), or whether it would substantially alter the present or planned land use of an area. These changes would be considered direct impacts. If an alternative would result in new development or prevent new development elsewhere, it could have an indirect impact. Assessments of impacts on compatible land uses incorporated the nature of the impact in addition to the estimated number of individuals impacted.

Significance criteria used for the Land Use portions of the Draft Environmental Impact Statement (DEIS) incorporate land use compatibility, zoning, and the overall use of land within the immediate project area and the surrounding areas. Further, alternatives presented in the DEIS will be assessed as having no impact, no significant impact, or significant impact, as described below.

No Impact

An alternative will be considered to have no impact if it is consistent with existing land uses and future plans for the property or does not change the land use and zoning in the local area.

No Significant Impact

An alternative will be considered to have no significant impact if it represents a minor alteration of existing or planned land use, and does not create a direct conflict among neighboring land use activities.

Significant Impact

An alternative will be considered to have a significant impact if it substantially alters existing or planned land use, violates existing land use/zoning plans and ordinances, or creates a direct conflict among neighboring land uses or land use activities.

4.2.3 Impact Evaluation by Alternative and Option

4.2.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

The construction of Alternative A would alter the present and planned future land use of the following locations and would create a significant long-term, direct, adverse impact to land use.

Northwest Dalecarlia Processing Site

The construction of Northwest Dalecarlia Processing Site facilities would represent a change in the present land use for the designated portion of the WTP property. However, it would be consistent with the planned uses of that property and facility as a whole. The facilities are also consistent with the property's zoning. Any impacts are associated with potential conflicts with the adjacent residential land use to the immediate north of the property and the residential use to the west and down slope from the property. Public involvement during the preparation of the DEIS indicated concern from area residents about long-term operational impacts on these residential areas.

The design of the thickening and pumping facilities proposed for Alternative C and the thickening and dewatering facilities' design proposed for Alternatives A, B and E are planned to be consistent with the existing water treatment plant facilities, which do not conflict with land use for the neighboring community. While this is not considered a no impact modification, the land use issues associated with the Northwest Dalecarlia Processing Site modifications are considered to have no significant impact, as the facility is not expected to alter or influence neighboring land uses.

Monofill

The construction of the monofill would alter the present and planned land use of the Dalecarlia Reservoir Property. Clearing approximately 30 acres of mature mixed-forest area and changing the land use to a function more closely associated with commercial or industrial use as a water treatment residuals monofill creates these long-term impacts. Short-term impacts associated with monofill construction may include the immediate environmental impact associated with tree-clearing activities and other impacts associated with noise, visual aesthetic and transportation (discussed in Sections 4.10, 4.16, and 4.15 respectively).

Although the construction of the monofill would not violate local zoning, public involvement during the preparation of the DEIS indicated that it will be viewed by adjacent communities as creating a direct conflict with adjacent land uses. It may also be inconsistent with the National Capital Planning Commission's (NCPC's) planning policies for federal land, which seek to promote the federal government as an environmental steward and identify the NCPC's planning policies related to the maintenance, protection, and enhancement of the region's natural environment (NCPC, 2004).

These long-term impacts to the adopted plans and goals of the community further support the designation of significant impact from this alternative.

Georgetown Reservoir

The use of two new residuals dredges in basins 1 and 2 of the Georgetown Reservoir and the construction of a new below ground residuals booster pump station and associated electrical building, each located immediately north of basin 1 would not alter the present land use of the Georgetown Reservoir property. This is considered a no impact modification to land use.

Dalecarlia Sedimentation Basins

The installation of new residuals removal equipment inside the existing Dalecarlia sedimentation basins and the installation of the associated pumping facilities in a new below ground pump station located south of basins 3 and 4 would not alter the present water treatment land use of the Dalecarlia WTP Area. The Dalecarlia sedimentation basin modifications are considered to have no impact on land use.

It is our finding that Alternative A would have a significant impact on land use.

4.2.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

The construction of Alternative B would have no significant long-term, direct, adverse impact to land use.

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Trucking Routes

Trucking of dewatered residuals to an existing permitting disposal site would have no impact on land use. See Section 4.11 Transportation for additional information.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B would have no significant impact to land use.

4.2.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

The construction of Alternative C has the potential to alter the present and planned land use of portions of the pipeline corridor and would create short-term and long-term, direct, significant land use impacts.

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Pipeline Route to Blue Plains AWWTP

Alternative C includes constructing and operating a pipeline, approximately 12 miles in length, to transport thickened residuals from the Washington Aqueduct facility to the Blue Plains AWWTP. The entire length of the 12-mile pipeline would be constructed using directional drilling methods. This approach to installing pipeline includes using several staging areas along the proposed alignment where long segments of pipeline would be inserted into the ground, and pushed to the next staging area. The purpose of this approach is to minimize both temporary and long-term disturbances along the proposed alignment during construction activities.

Although directional drilling of the proposed pipeline would reduce disturbances over the entire length of the pipeline corridor, workspace sites and staging areas would be needed at intervals along the length of the corridor for staging the drill rigs and feeding the pipe into the ground. These sites are typically 100 feet by 150 feet in size and will be required at intervals between 1,000 feet and 4,000 feet along the corridor. Given the length of the corridor, up to 27 of these sites would be required to construct the proposed pipeline. Measured collectively, these 27 sites would result in a total of approximately 10 acres of land being either cleared or otherwise disturbed during construction. Permanent access and maintenance points would also be required.

Impacts could range from clearing forested areas on the Chesapeake & Ohio (C&O) Canal corridor in National Park Service (NPS) land to disturbing open maintained areas along the Tidal Basin and East Potomac Park. Disturbing forested lands on NPS property is considered to be a significant impact because of its long-term nature and its inconsistency with existing uses of the land and with the policies of the NCPC's Comprehensive Plan for the National Capital. However, if the drill rig and pipe feed sites could be located in areas of maintained lawns or similar areas where significant tree-clearing would not be an issue, impacts could minimized.

Blue Plains AWWTP

The construction of additional residuals dewatering facilities at the Blue Plains AWWTP would not conflict with the zoning of the existing plant but it would conflict with the planned uses of the Blue Plains site. The site space available to accomplish the regional wastewater treatment function assigned to the Blue Plains facility is limited. Their site space needs, including allowances for future additions intended to address pending enhanced Chesapeake Bay nutrient removal requirements and treatment of CSO flows, precludes the construction of dewatering facilities dedicated to Washington Aqueduct residuals.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative C would have significant impact on land use.

4.2.3.4 Alternative D—No Action Alternative

This alternative would not result in any changes to existing land use, zoning, or neighboring land uses. Because there would not be any changes associated with the No Action alternative, there would no impacts related to land use.

It is our finding that Alternative D would have no impact on land use.

4.2.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

The construction of Alternative E would have no significant long-term, direct, adverse impact to land use.

East Dalecarlia Processing Site

The construction of the proposed thickening and dewatering facilities on the cleared property at the East Dalecarlia Processing Site would be expected to create no significant impact to land use. The proposed facilities represent a change from the existing land use of the designated portion of the Dalecarlia Reservoir Area. However, they are consistent with the planned land use and function of the Dalecarlia WTP as a whole. The change in land use would require an update to the NCPC Site Plan approval granted previously to construct residuals dewatering facilities on the Northwest Dalecarlia Processing Site.

The proposed residuals processing facilities would be consistent with the closest neighbor, the Sibley Memorial Hospital complex. From a land use perspective, medical complexes have more in common with thickening and dewatering facilities than they do with the adjacent residential neighborhood. The Sibley Memorial hospital complex is planning significant facility expansion involving additional patient and office space, parking, and access road improvement further solidifying the immediate area of the thickening and dewatering facilities as a commercial/industrial land use.

Short term land use impacts associated with construction would have no significant impact if properly planned and coordinated with the Hospital and the American University Experiment Station (AUES) Formerly Used Defense Site (FUDS) project. This coordination would be needed to accommodate relocating, if needed, the temporary parking area and the AUES FUDS administrative buildings in time for construction to begin. Sibley Memorial Hospital recently completed construction of a parking garage that is on a similar scale to the dewatering facilities without any short or long-term land use impact.

Trucking Routes

See Alternative B discussion above.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative E would have no significant impact on land use.

4.2.3.6 Forebay Residuals Treatment Option

This option would result in no changes to existing land use, zoning, or neighboring land uses. Because there would not be any change in land use associated with the Forebay

Residuals Treatment Option, there would no impact related to land use, zoning, or neighboring land uses.

4.3 Noise

4.3.1 Definition

The propagation of sound in the ambient environment follows the inverse square law (i.e., 6-dBa attenuation per doubling of distance from a reference level). For example, a 60-dBa noise level measured 5 feet from a door or window on the dewatering building would result in a 28-dBa noise level at 200 feet from the door or window. Wind speed and direction and temperature gradient effects can affect the propagation of noise in the ambient environment.

To compare the insulation performance of alternative construction materials, the Sound Transmission Class (STC) is used as a measure of each material's ability to reduce sound. For example, to reduce the noise level of 85 dBa within the dewatering area to 60 dBa outside the room, an STC of 25 dBa is required.

4.3.2 Noise Significance Criteria

For a typical suburban environment, noise levels are normally about 50 to 60 acoustic decibels (dBa) of background noise and about 70 dBa near sidewalks adjacent to roadways. New facility construction and treatment process operations may contribute to background noise levels for various alternatives. Some sounds may be broad-spectrum sounds and others may be pure tones. Noises that are potentially associated with the proposed alternatives are evaluated.

The noise modeling used to evaluate the potential impact of the proposed alternatives consisted of spreadsheet-based, logarithmic calculations. Impacts are categorized as no impact, not significant impact, or significant impact.

No Impact

Implementing the action has little or no effect upon ambient noise levels in residential areas. Human perception varies, but for many people, the minimum perceptible change is 3 dBa. Therefore, a sound pressure level increase of less than 3 dBa is considered to have no impact.

No Significant Impact

Numerically, a sound pressure level increase of 10 dBa doubles the acoustical power. An alternative with construction or operation noise less than 10 dBa above background noise levels, and not exceeding maximum limits for residential areas (see below), is considered no significant impact.

Significant Impact

An alternative with construction or operation noise exceeding maximum established noise level limits for residential areas is considered to present a significant impact. Assuming the ambient noise levels are below 60 dBa during the day and 55 dBa at night, exceeding these levels classifies a proposed action as a significant impact. If background noise levels are already above these levels, a new exceedence must be over 10 dBa higher to be considered significant.

4.3.3 Impact Evaluation by Alternative and Option

4.3.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

This alternative would have no significant long-term direct or indirect adverse impact to area noise. The activities that are likely to generate noise with this alternative are the dewatering operation, residuals hauling by truck, and construction related activities.

Northwest Dalecarlia Processing Site

The equipment used for dewatering thickened solids can be noisy. The noise associated with the operation of the dewatering equipment installed at the Northwest Dalecarlia Processing Site could be mitigated through site planning, architectural design, construction methods, and barrier construction. Truck doors would be oriented to open away from residential areas and kept closed during normal operation. Use of sound adsorbing material not only attenuates noise to make a better working environment, but also minimizes the noise that reaches the ambient environment. If the working environment has a noise level of 85 dBa and the STC rating for construction of the dewatering building is 25 dBa, the ambient noise level within 5 feet of a door or window would be 60 dBa. This would attenuate through the atmosphere to a noise level of 28 dBa. When this is added to background noise level of 38.3 dBa, the combined noise level is 38.7 dBa (calculations for noise are logarithmic, not additive). This noise level increase is less than 3 dBa and therefore it would have no significant impact. Noise levels outside the dewatering building would have to exceed 80 dBa for the incremental noise threshold level to exceed 10- dBa in the neighboring residential area.

Monofill

There are no significant impacts from noise associated with the monofill on the closest permanent residents located on Loughboro Road (see analysis for trucking associated with Alternative B). For residences closest to the monofill site, noise impacts associated with hauling residuals to the monofill site or periodically (every few days) leveling the residuals placed in the monofill area would be intermittent and well below the incremental 10 dBa threshold.

The removal of trees from the proposed monofill site during the construction phase would have a significant short-term impact on noise.

Georgetown Reservoir

The operation of two new residuals dredges in basins 1 and 2 of the Georgetown Reservoir and the construction of a new below ground residuals booster pump station and associated electrical building, each located immediately north of basin 1 would have no long-term impact on noise. The use of an electrically powered dredge positioning system and electrically driven submersible dredge pumps would result in the dredge generating no significant noise. Similarly, the dredge booster pump station would be equipped with electrically powered submersible pumps installed in a below-grade wet well. This configuration would ensure that the pumping system generates no significant noise. The proposed electrical building would also not be a source of noise.

A short-term significant noise impact could be associated with the construction of the proposed Georgetown Reservoir improvements. This noise could impact residents located along Windward Place and Hutchins Place, north of the Georgetown Reservoir. Construction activities, such as the use jackhammers to breakup pavement, pile drivers to place sheet piling or set foundations, and backup beepers on trucks, could result in short term noise impacts that reach 90 dBa at or near the construction site. Construction methods will be selected that minimize neighborhood noise impacts.

Dalecarlia Sedimentation Basins

The operation of new residuals removal equipment inside the existing Dalecarlia sedimentation basins and the installation of the associated pumping facilities in a new below ground pump station located south of basins 3 and 4 would have no long-term impact on noise. A short-term, intermittent adverse noise impact could be associated with the periodic maintenance of the residuals pump station proposed at the south end of sedimentation basin 3 and 4. This impact would be limited to the residents located immediately south of the sedimentation basins. A second source of short-term, direct adverse impact on noise levels would be the construction of sedimentation basin improvements and residuals pump station. The duration of this noise impact would be relatively short but would impact residents located along Norton Street.

It is our finding that Alternative A would have no significant impact on area noise levels.

4.3.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

This alternative would have no significant, long-term direct or indirect, adverse impact on noise. The activities that are likely to generate noise with this alternative are the dewatering operation, residuals hauling by truck, and construction related activities.

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Trucking Routes

For this alternative, trucks would haul the dewatered solids from the Dalecarlia plant to an offsite disposal area. Potential noise sources include the solids trucking along offsite roadways.

Three routes under evaluation for trucking residuals from the Dalecarlia Treatment Plant would follow Loughboro Road. This road has a steep grade that causes vehicles of all types to be noisier than they might be on level grade. Trucks traveling uphill can have a peak noise level of 105 to 108 dBa and an average of 78 to 88 dBa. The District of Columbia Municipal Regulations (DCMR) for Noise (Title 20, Chapters 27, 28, and 29) define the average noise level measurements as the basis for determining noise impacts. The noise from a loaded truck traveling up Loughboro Road would result in a noise impact of 58 to 70 dBa at the nearest residential receptor, however, the frequency of trucks passing along Loughboro Road would not greatly increase, resulting in no significant impact on noise for the residents along Loughboro Road.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B would have no significant impact on area noise levels.

4.3.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

There would be no long-term noise impacts for this alternative. The activities that are likely to generate noise with this alternative are the dewatering operation, residuals hauling by truck, and construction related activities.

Northwest Dalecarlia Processing Site
The operation of new residuals thickeners and associated thickened residuals pump station on the Northwest Dalecarlia Processing Site would have no significant long-term impact on noise. A short-term, intermittent adverse noise impact could be associated with the periodic maintenance of the residuals pump station. This impact would be limited to the residents located immediately north of the site, on Leeward Place. A second source of short-term, direct adverse impact on noise levels would be the construction of thickeners and residuals pump station. The facilities to be constructed at the Dalecarlia Treatment Plant would be smaller for this alternative than for the other disposal alternatives. The duration of this noise impact would be relatively short but would be adverse.

Pipeline Route to Blue Plains AWWTP
The construction of the proposed pipeline would result in a short-term, significant adverse impact on noise along the pipeline route. Much of this route is located in quiescent National Park area. The duration of the construction noise impacts would be most significant in those areas where directional drilling was underway. Once constructed, noise impacts associated with the pipeline would be limited to periodic inspection activities along the pipeline route. These activities would be extremely short-term and not significant.

Blue Plains AWWTP
Operational noise and trucking noise from the Blue Plains AWWTP facility would be a small part of total operational noise and would also be no impact.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative C would have no impact on area noise levels but would have a significant short-term impact during the construction period.

4.3.3.4 Alternative D—No Action Alternative

It is our finding that Alternative D would have no impact on area noise levels.

4.3.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

This alternative would have no significant, long-term direct or indirect, adverse impact on noise. The activities that are likely to generate noise with this alternative are the dewatering operation, residuals hauling by truck, and construction related activities.

East Dalecarlia Processing Site

Noise impacts attributable to the East Dalecarlia Processing Site would be similar in character and intensity to those identified above for Alternative A. For this new alternative, residuals dewatering would occur north of Little Falls Road near Sibley Memorial Hospital. Trucks would haul the dewatered solids from the dewatering facility to an offsite disposal area. The East Dalecarlia Processing Site offers one advantage over the Northwest Residuals Processing Site used for Alternative A in that that the relief of the site slopes away from the closest neighbor, the Sibley Memorial Hospital. This site characteristic offers an opportunity to use the hill above the proposed residuals processing facility as a sound barrier to minimize noise impacts associated with dewatering and trucking on the temporary residents (patients) and staff that work at the hospital.

The working environment for the dewatering processing facility would have noise levels of 85 dBa. Proven methods for site planning, architectural design, construction methods, and barrier construction can be used to mitigate noise impacts to 60 dBa. Atmospheric attenuation reduces noise levels. Although there are no residences immediately adjacent to the proposed dewatering facility, Sibley Memorial Hospital is more than 200 feet from the dewatering building. By the time the noise levels reach Sibley Memorial Hospital, the noise level will be reduced from 60 dBa to 28 dBa. When this is added to the background noise level of 38.3 dBa, the combined noise impact is 38.6 dBa. Noise levels outside the dewatering building would have to exceed 80 dBa for the incremental noise threshold level to exceed 10 dBa at Sibley Memorial Hospital.

Residuals processing at the East Dalecarlia Processing site would have no significant long-term impact on noise.

Trucking Routes

For this alternative, trucks would haul the dewatered solids from the East Dalecarlia Processing Site to an offsite disposal area. Potential noise sources include the solids trucking along offsite roadways.

Within the immediate vicinity of the dewatering facilities, it is anticipated that residuals trucks will exit the East Dalecarlia Processing Site and access Little Falls Road and then travel either east to Dalecarlia Parkway or west to MacArthur Boulevard and then south on MacArthur Boulevard as shown on Figures 4-1. This local route would prevent trucks from climbing up the gradient along Loughboro Road and offer an advantage over Alternative B. There is no significant long-term impact on noise due to disposal by trucking for Alternative E.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative E would have no significant impact on area noise levels.

4.3.3.6 Forebay Residuals Treatment Option

The method by which residuals are removed from the Forebay would not have an additional noise impact. Current methods for on-site removal of residuals from the Forebay include collecting, and trucking the residuals to the temporary storage/natural dewatering area. The proposed method improves residuals collecting and dewatering so that the number and frequency of truck trips required to periodically travel on the Dalecarlia Reservoir access road is reduced with this residuals removal option. The noise associated with trucking the residuals offsite to a permanent disposal site remains unchanged.

4.4 Air Quality

4.4.1 Definition

This section discusses the impact of each project alternative on regional air quality in the Metropolitan Washington Interstate AQCR. Specific comparisons are made to air emission threshold levels for particulate matter, sulfur dioxide, CO, lead, and ozone.

The U.S. Environmental Protection Agency (EPA) currently classifies the air quality in this region as better than the ambient standard for all of these substances except ozone, for which it is in severe non-attainment with respect to the 1-hour air quality standard and moderate with respect to the 8-hour standard.

State Implementation Plans (SIPs) prepared by the State of Maryland, the Commonwealth of Virginia, and the District of Columbia include control strategies to reduce volatile organic compounds and nitrogen oxides that contribute to the formation of ozone.

4.4.2 Air Quality Significance Criteria

Section 176(c) of the 1990 CAA Amendments requires that federal actions conform to the applicable state implementation plans to ensure that actions do not interfere with the strategies developed to attain the National Ambient Air Quality Standards (NAAQS). The total direct and indirect emissions were calculated for each pollutant and compared to the *de minimis* threshold levels established in 40 CFR 93.153. The project is presumed to conform to the regional implementation plans if the potential increase in emissions is less than the *de minimis* thresholds.

By using these criteria, the following levels of impacts were identified:

No Impact

If implementation of the action causes an increase in air emissions that is less than the *de minimis* threshold levels, the alternative is considered to have no impact.

No Significant Impact

If implementation of the action causes an increase in air emissions that is greater than the *de minimis* threshold levels but has been accommodated with the existing regional implementation plan, the action has no significant impact.

Significant Impact

A significant impact occurs if the potential increase in emissions is above the *de minimis* thresholds and requires a demonstration of regional significance to determine whether an adverse air quality impact would result. Significant impacts may be reduced to no significant level by implementing appropriate mitigation measures.

4.4.3 Impact Evaluation by Alternative and Option

The Washington Aqueduct must determine if their proposed actions exceed *de minimis* thresholds listed in the regulations (40 CFR 93.153) and specific to the pollutant attainment status of the National Capital Interstate Air Quality Control Region (AQCR). If they do, they will have to take additional steps to demonstrate whether the proposed emissions are regionally significant in order to assure conformance with the region's SIP.

To make this comparison, a worst-case air pollution scenario was developed to represent the largest emission factors from the components of the various alternatives. Two scenarios were developed: one for Alternative A, which includes a monofill, and one for Alternatives B, C and E, which all involve the construction of residuals thickening and dewatering facilities and rely upon trucking dewatered residuals to a remote dewatering site. The location of the dewatering site and the direction that the trucks take on the highways is somewhat different for Alternatives B and E versus Alternative C, however, the net impact on air pollution is similar. Stationary facilities and mobile sources (such as trucks) are included in these estimates.

The various alternatives were reviewed and the air emissions source likely to contribute the greater air emissions release was identified. These air emissions sources were combined to produce a hybrid scenario with respect to the air emissions potential.

The primary sources of air emissions include diesel exhaust from trucks used to transport residuals to onsite or offsite disposal areas, use of natural gas for dewatering building heating, and fugitive dust from the onsite monofill. Not all of these activities are included in each of the action alternatives. However, the maximum potential emissions from these activities are quantified and presented in Table 4-1 for Alternative A and Table 4-2 for Alternatives B, C, and E (next page).

4.4.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

The construction and operation of Alternative A would increase short-term and long-term air emissions to a degree less than the *de minimis* threshold levels and therefore presents no short-term or long-term direct or indirect impacts.

Northwest Dalecarlia Processing Site

Heating emission allowances are included for this facility in Table 4-1. In addition to these long-term impacts, the construction of the Northwest Dalecarlia processing facilities would be anticipated to produce a short-term adverse impact on air quality caused by dust associated with construction activities. Wetting down haul roads and conducting daily sweeping of paved areas would be anticipated to minimize these short-term adverse impacts to a degree less than the *de minimus* threshold and therefore present no short-term or long-term, direct or indirect impact to the affected resource.

Monofill

Truck emission allowances are included for this facility in Table 4-1. Air emissions associated with trucking solids from the monofill are minimized due to the short distance from the dewatering building to the final disposal site as opposed to the longer distance for offsite disposal. The use of a monofill for onsite residuals disposal also produces air

TABLE 4-1
Potential Air Emissions Associated with Residuals Disposal Alternative A (tons per year)
Washington Aqueduct DEIS

Pollutant	Truck Trips	Thickening and Dewatering Building Heating	Monofill	Potential Air Emissions	De minimis Threshold Levels
Volatile Organic Compounds (VOC)	0.029	--	--	0.029	25
Carbon Monoxide (CO)	0.14	0.065	--	0.21	100
Nitrogen Oxides (NOx)	0.14	0.152	--	0.29	25
Particulate Matter (PM10)	--	--	4.1	4.1	100
Sulfur Dioxide (SO_2)	0.002	--	--	0.002	100

Notes:

(1) Based on 20 truck trips per day, 5 days per week, and 1 mile per trip. The 20 truck trips per day estimate is based on an 11 cubic yard truck operating 5 days per week for the design year, as defined in Table 2-1 in the Engineering Feasibility Study Compendium (Volume 4 of this DEIS). This estimate is conservative of annual emission estimates as emission rates are based on heavy duty diesel vehicles and these types of trucks are more representative of trucks larger than 11 cubic yards.

(2) Based on a heating requirement of 3.3 billion Btu per year using natural gas in heaters with a less than 0.3 MMBtu per hour heat input requirement.

(3) Based on applying 6,300 tons per day of residuals on a 30-acre site. Average wind speed of 12 miles per hour (mph) and average moisture content of 10% was assumed.

(4) Lead is not listed as a pollutant because it is not an emission associated with the elements of the alternatives measured for this analysis.

TABLE 4-2
Potential Air Emissions Associated with Residuals Disposal Alternatives B, C and E (tons per year)
Washington Aqueduct DEIS

Pollutant	Truck Trips	Dewatering Building Heating	Potential Air Emissions	De minimis Threshold Levels
Volatile Organic Compounds (VOC)	4.3	--	4.3	25
Carbon Monoxide (CO)	21.3	0.065	21.4	100
Nitrogen Oxides (NOx)	20.4	0.152	20.5	25
Particulate Matter (PM10)	--	--	--	100
Sulfur Dioxide (SO_2)	0.3	--	0.3	100

Notes:

(1) Based on 20 truck trips per day, 5 days per week, and 150 miles per trip. The 20 truck trips per day estimate is based on an 11 cubic yard truck operating 5 days per week for the design year, as defined in Table 2-1 in the Engineering Feasibility Study Compendium (Volume 4). This estimate is conservative of annual emission estimates as emission rates are based on heavy-duty diesel vehicles and these types of trucks are more representative of trucks larger than 11 cubic yards.

(2) Based on a heating requirement of 3.3 billion Btu per year using natural gas in heaters with a less than 0.3 MMBtu per hour heat input requirement.

(3) Lead is not listed as a pollutant because it is not an emission associated with the elements of the alternatives measured for this analysis.

emissions associated with fugitive emissions from the monofill. As with the Northwest Dalecarlia Processing Site facilities, the construction and operation of the monofill would increase air emmissions to a degree less than the *de minimus* threshold and therefore present no short-term or long-term, direct or indirect impact to the affected resource. Careful control of soil moisture content would be maintained throughout the earth-moving portion of the construction phase to ensure that contruction impacts do not become significant.

Georgetown Reservoir

The operation of two new residuals dredges in basins 1 and 2 of the Georgetown Reservoir and the operation of a new below ground residuals booster pump station and associated electrical building, each located immediately north of basin 1, would have no long-term impact on air. The use of an electrically powered dredge positioning system and electrically driven submersible dredge pumps would result in the dredge generating no significant air emissions. Similarly, electric space heaters will be used to heat the proposed pump station and electrical building. This facility does not contribute air pollution to the alternative. There will be short-term air emissions associated with construction activities. Construction and operation of the Georgetown Reservoir would increase air emmissions to a degree less than the *de minimus* threshold and therefore present no short-term or long-term, direct or indirect impact to the affected resource.

Dalecarlia Sedimentation Basins

The operation of new residuals removal equipment inside the existing Dalecarlia sedimentation basins and the installation of the associated pumping facilities in a new below ground pump station located south of basins 3 and 4 would have no long-term impact on air. Electric space heaters will be used to heat the proposed residuals pump station. This facility does not contribute air pollution to the alternative. Construction and operation of the Dalecarlia Sedimentation Basins would increase air emmissions to a degree less than the *de minimus* threshold and therefore present no short-term or long-term, direct or indirect impact to the affected resource.

It is our finding that Alternative A would have no impact on air quality and would have no significant short-term impact on air quality.

4.4.3.2 Alternatives B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking, C—Thickening and Piping to Blue Plains AWWTP, and E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

These alternatives are discussed together because they have similar facilities and their relative impact on air pollution within the metropolitan area can be directly compared. Constructing and operation of Alternatives B, C or E would increase air emissions to a degree less than the *de minimis* threshold levels and therefore present no short term, long-term, direct, or indirect adverse impacts to the affected resources.

Northwest or East Dalecarlia Processing Site

The use of a pipeline to transport thickened solids to Blue Plains AWWTP creates air emissions associated with the dewatering building heating. However, the dewatering building would be located on the Blue Plains AWWTP site rather than the Dalecarlia WTP site. Heating emission allowances are included for this facility in Table 4-2 (next page). Also see additional construction related impacts discussion in Alternative A summary above.

Trucking Routes
Offsite residuals trucking causes an air emissions increase that is less than the *de minimis* threshold levels and, therefore, presents no short term, long-term, direct, or indirect adverse impact to the affected resource.

The haul distance associated with each of these alternatives is significantly longer than for Alternative A, however, there would be no onsite monofill with these alternatives. As a result, no fugitive emissions allowance has been included in Table 4-2.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternatives B, C, and E would have no impact on air quality.

4.4.3.3 Alternative D—No Action Alternative

It is our finding that Alternatives D would have no impact on air quality.

4.4.3.4 Forebay Residuals Treatment Option

The method by which residuals are removed from the Forebay has no impact on air quality.

4.5 Aquatic Resources

4.5.1 Definition

This section discusses impacts of each alternative on aquatic resources, primarily the various resources associated with the Potomac and Anacostia Rivers. Alternatives A, B, and E are land-based activities with little interaction with aquatic resources. Alternative C involves construction activities near the rivers and an underground crossing of the Anacostia River. The no-action alternative would involve continuing residuals discharge to the Potomac River. Due to the nature of the impacts, this section is largely an analysis of the impacts associated with Alternative D—No Action Alternative.

4.5.2 Aquatic Resources Significance Criteria

Impact levels are defined as no impact, no significant impact, or significant impact. Standards of significance were used for two criteria, which are 1) ability to meet the federal Clean Water Act (CWA) provisions as expressed in the National Pollutant Discharge Elimination System (NPDES) permit and 2) impact to river-based environmental indicators such as hydrology and hydrodynamics, water quality, sediment quality, aquatic resources including the benthic community, fisheries, essential fish habitat (EFH), special status species, and submerged aquatic vegetation (SAV).

No Impact
An alternative is determined to have no impact if it would not cause a violation of the NPDES permit and would not adversely impact the river-based environmental indicators.

No Significant Impact

An alternative is determined to have no significant impact if its construction has the potential to cause disturbance to aquatic resources, but these disturbances can be mitigated by appropriate erosion and control procedures, waste disposal, or other appropriate construction approaches.

Significant Impact

An alternative will be determined to have a significant impact if it causes a violation of the Clean Water Act provisions as expressed in the Washington Aqueduct's NPDES permit.

4.5.3 Impact Evaluation by Alternative and Option

4.5.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Implementation of this alternative has no impact on Aquatic Resources.

Northwest Dalecarlia Processing Site

Construction of the proposed residuals thickening and dewatering facilities on the Northwest Dalecarlia Processing Site would have no long-term, direct, adverse impact on aquatic resources. Temporary silt removal facilities would be provided to control runoff and remove silt from discharge flows. A dedicated stormwater detention pond would also be provided on the dewatering site to remove silt from runoff flows and mitigate peak stormwater flows following construction.

Monofill

Construction of the proposed monofill in the Dalecarlia Woods would have no long-term, direct, adverse impact on aquatic resources. Construction activities will be limited to the wooded area located east of the Dalecarlia Reservoir. Runoff attributable to the construction activities would be treated in stormwater ponds to remove any silt that passes through temporary construction silt controls, such as silt fences. Stormwater ponds would be maintained following construction to help minimize peak stormwater flows associated with the area surrounding the active monofill cells. Stormwater that strikes an active monofill cell would be captured and treated along with the monofill leachate flow. This flow would not be expected to leave the Dalecarlia property.

Georgetown Reservoir

The proposed modification would have no long-term, direct, adverse impact on aquatic resources. Temporary silt removal facilities would be provided to control runoff and remove silt from discharge flows.

Dalecarlia Sedimentation Basins

The proposed modification to these water treatment basins would have no long-term, direct, adverse impact on aquatic resources. Temporary silt removal facilities would be provided to control runoff and remove silt from discharge flows.

It is our finding that Alternative A would have no impact on aquatic resources.

4.5.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Implementation of this alternative has no impact on Aquatic Resources.

Northwest Dalecarlia Processing Site
See Alternative A discussion above.

Trucking Routes
There would be no impacts on Aquatic Resources.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative B would have no impact on aquatic resources.

4.5.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Implementation of this alternative would have no significant short term, direct impact on aquatic resources.

Northwest Dalecarlia Processing Site
See Alternative A discussion above.

Pipeline Route to Blue Plains AWWTP
The proposed pipeline route is designed to parallel the existing Potomac Interceptor for most of the approximately 12-mile route. As such, this alignment will parallel the Potomac River. Directional drilling (trenchless) technology would be used for constructing the pipeline to minimize most disturbances to land-based or aquatic environmental or cultural resources. However, the drilling technology still requires the use of staging areas that contain the potential for stormwater runoff or release of drilling fluid. This impact can be reduced or eliminated through the use of best management practices for erosion and sedimentation control during the drilling process.

The impact on aquatic resources associated with the Anacostia River crossing will be minimized by directional drilling under the bed of the existing river.

Blue Plains AWWTP
The construction and operation of a residuals processing facility located on the Blue Plains AWWTP site would have no long-term, direct, adverse impact on aquatic resources. Construction and operational impacts would be limited to the plant site itself and stormwater would be controlled.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative C would have no significant impact on aquatic resources.

4.5.3.4 Alternative D—No Action Alternative

The Washington Aqueduct must comply with its NPDES permit.

No Action involves continued intermittent discharge of residual solids to the Potomac River. For the purposes of this analysis, the term "current project operations" is used to describe the No Action alternative. This includes no discharge from the sedimentation basins during the spring spawning periods for anadromous fish species and shortnose sturgeon (February 15 through June 30), as required by the Washington Aqueduct's NPDES permit.

The no action alternative is inconsistent with the provisions of the CWA of 1987 that require water utilities to use the best available technology to minimize the discharge of pollutants to the waters of the United States as enumerated in the Aqueduct's current NPDES permit. Implementation of the no action alternative is inconsistent with Washington Aqueduct's NPDES permit and the associated Federal Facilities Compliance Agreement schedule for removing water treatment residuals from the Potomac River. As a result, this alternative is not feasible.

Rare, Threatened, and Endangered Species (Aquatic Only)

The conclusion of NMFS's (2003) Biological Opinion for the shortnose sturgeon indicated that if a discharge from the aqueduct occurred during the SNS spawning period (1 March – 15 May), and SNS eggs and larvae were present, the discharge would adversely affect those life stages within a very small area adjacent to the discharges. It would therefore not jeopardize the continued existence of the Chesapeake Bay SNS population. Because of this NMFS recommendation, the Washington Aqueduct's current NPDES permit does not allow a discharge between 15 February and 30 June to address the broader spring spawning period for resident anadromous species. These time of year restrictions have being implemented, are part of the No Action alternative, and are expected to be protective of the early life stages of SNS.

NMFS and USEPA also recognized the potential need to have an emergency discharge during the spring spawning period, and included Special Conditions in the Washington Aqueduct's NPDES permit that must be implemented if a discharge occurs. More specifically, if an emergency discharge occurs between March 1 and May 15, National Oceanic and Atmospheric Administration (NOAA) Fisheries must be alerted and provided with river temperature information to assess whether spawning or early life stages of SNS are likely to be in the project area. It is expected that compliance with the time of year restrictions and other NPDES permit Special Conditions will be protective of SNS and no impacts to this rare, threatened, or endangered (RTE) species are expected.

The dwarf wedge mussel (DWM) and Hay's Spring Amphipod are not known to occur within the study area so the project will not impact these species.

Floodplains

The majority of the floodplain within the project area is not developed and is subject to the natural hydrologic conditions within the river. Aqueduct operations have no impact on the functioning of the floodplains or river hydrology. Therefore no impacts to floodplains or floodplain resources are expected.

American Heritage River
The No Action alternative results in no significant adverse impact on the AHR status of the Potomac River since this alternative is the No Action alternative and the river currently has status as an AHR.

Wild and Scenic Rivers
Because no reach of the Potomac River is designated as a Wild and Scenic River (WSR), Washington Aqueduct operations (the No Action alternative) are in compliance with the WSR Act.

Navigation
No federal navigation channels lie within the project area. Current project operations have never effected navigation. Alternative D has no impact on navigation.

Implementation of this alternative would have no significant impact on Aquatic Resources. Implementation of this alternative does not, however, reflect best management practice for protection of aquatic resources.

4.5.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking
Implementation of this alternative would have no impact on Aquatic Resources.

East Dalecarlia Processing Site
Construction of the proposed residuals thickening and dewatering facilities on the East Dalecarlia Processing Site would have no long-term, direct, adverse impact on aquatic resources. See Alternative A discussion for additional discussion of short-term impacts.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative E would have no impact on aquatic resources.

4.5.3.6 Forebay Residuals Treatment Option
The proposed Forebay Residuals Treatment Option would have no impact on aquatic resources.

4.6 Biological Resources (Terrestrial)

4.6.1 Definition
This section discusses impacts of each alternative on the biological resources at the proposed project locations. Biological resources considered at the potential project sites include special status species and protected and critical habitats such as wetlands or forested habitats.

4.6.2 Biological Resources (Terrestrial) Significance Criteria

Impact levels are defined as no impact, no significant impact, or significant impact. Standards of significance were used for two biological resource criteria, which are 1) special status—or threatened and endangered—species and 2) protected and critical habitats.

4.6.2.1 Special Status (Threatened and Endangered) Species

Several criteria were used to determine the significance of impact. These include the presence or absence of threatened and endangered species, the regulatory status (e.g., federal, state, or local, and endangered, threatened, or special concern), mobility, and habitat requirements.

No Impact
An alternative is determined to have no impact if there are no affected special status species or protected and critical habitats identified through agency coordination or has no impacts related to the District of Columbia Urban Forest Protection Program.

No Significant Impact
If any special status species, protected and critical habitat, or urban forest are identified, further communication with the relevant agency will be used to determine the proper methods to be followed (i.e., surveys, relocation, best management practices, etc.) in order to avoid impacts to these resources, taking into consideration mobility and habitat requirements. Significance of impact will be measured based on the level of effort needed to fully avoid or mitigate the potential impacts of the alternatives. If impacts can be fully avoided or mitigated, then an alternative is considered to have no significant impact. In the case of an urban forest, it is envisioned that mitigation measures would restore the environmental benefits of the impacted forest through planting of seedlings.

Significant Impact
In the event that an alternative cannot avoid impacting a special status species, protected and critical habitat, or urban forest and mitigation measures are not feasible and/or sufficiently protective, an alternative is determined to have a significant impact. In the case of an urban forest, it is envisioned that mitigation measures cannot restore the environmental benefits of the impacted forest through planting of seedlings, requiring monitoary compensation to be paid.

4.6.2.2 Protected and Critical Habitats

Specific habitats (including those defined as critical for special status species), habitat types (such as streams and wetlands), and areas (such as floodplains) that are protected by statute or regulation are identified and their specific status is determined. Impacts are evaluated as follows:

No Impact
An alternative is considered to have no impact if the following circumstances are met:

- There are no critical habitats or special habitat classifications
- There are no wetlands or waters of the U.S. involved
- There are no protected forested habitats impacted

- There are no regional considerations such as habitat fragmentation or protection of wildlife corridors

No Significant Impact

The subject of wetlands leaves the most room for interpretation of impacts. The U.S Army Corps of Engineers currently has two commonly used levels of permitting for activities in wetlands and waters of the United States. The lower tier of permitting is known as the Nationwide Permit Program and is generally reserved for projects with minimal impact to wetlands and waters of the United States. The threshold for determining whether the project has more than minimal impact to wetlands is when the wetland impacts are between one-tenth acre and one acre. The threshold for determining whether the project has more than minimal impact to waters of the United States is when the linear length of stream channel affected is greater than 300 feet. State wetland regulations are applicable here and were considered particularly where there is a difference between District of Columbia and State of Maryland regulations.

When impacts exceed either of these thresholds, the second tier of permitting takes precedence and an Individual Permit is required. In order to obtain an Individual Permit, an alternative analysis must be performed and impacts must be minimized to the greatest extent practicable. Impacts at the level of the Individual Permit are significant enough to require compensatory mitigation.

If there are impacts, but the thresholds are not exceeded and a Nationwide Permit will cover the activity, a conclusion of no significant impact is reached.

Additional information is evaluated if necessary to determine the levels of impacts between alternatives. This includes the type and total acreage of wetlands or linear feet of waters of the U.S. impacted by the project, the total number of these types of habitats in the project area and adjacent areas, and the quality of impacted habitat. For example, forested wetlands have higher value than emergent wetlands and therefore have higher replacement ratio requirements than emergent wetland impacts. Therefore, impacts to forested wetlands are considered to have more negative environmental effects than impacts to emergent wetlands. In addition, if a certain type of wetland is impacted and this type of wetland exists in abundance in the project area, environmental impacts are scored lower than if another type of wetland is impacted and this type of wetland does not exist (or is rare) elsewhere in the project area or in surrounding areas.

Significant Impact

Significant Impact is assigned to a project alternative if there are protected and critical habitats present or if an Individual Permit for wetlands is required.

4.6.3 Impact Evaluation by Alternative and Option

4.6.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Implementation of this alternative would result in a significant impact to terrestrial biological resources.

Northwest Dalecarlia Processing Site

No direct adverse impact to Special Status (Threatened or Endangered) Species or Protected and Critical Habitats would occur at this site with this alternative. The existing site is developed and cleared, provides limited habitat, and contains no wetlands.

Monofill

Implementation of this alternative would result in a long-term, direct significant adverse impact to 30 acres of deciduous hardwood forest protected under the District of Columbia's Urban Forest Preservation Act. The action has no significant adverse impact on critical habitat although construction of the monofill would remove non-critical habitat for insects, amphibians, reptiles, birds, and mammals. There would not be any impact to special status species or wetlands.

Special Status Species

Federal, state, and local agencies were contacted in order to determine the potential presence of any special status (e.g., threatened or endangered) species for plants and animals within or directly adjacent to the monofill. Regulatory agencies have not identified, through correspondence, any known presence of special status species within the project boundary (awaiting confirmation in writing from regulatory agency).

According to USFWS records, there are three federally listed species known to occur within Washington, D.C. (Hay's Spring Amphipod, the bald eagle, and the eastern puma). According to the USFWS, no plant species are listed in the District of Columbia. It is highly unlikely that the eastern puma is located within the monofill area as males have been observed to occupy ranges of 25 or more square miles while females occupy ranges of approximately 5 to 20 square miles. The area in which the monofill would potentially be constructed is not large enough to sustain a population of puma. Currently, there are not any bald eagles nests in the monofill area; however, the area would need to be checked prior to removing any trees. The amphipod occurs in groundwater springs. Given the presence of springs in the Spring Valley area, there may be potential for the amphipod to also be present at the monofill site.

Protected and Critical Habitats

Special Habitats. The area proposed for monofill construction is not classified as a National Park, WSR, National Wildlife Refuge, or a state wildlife management area. Therefore, no impacts to special habitat are expected.

Wetlands. No long-term negative impacts to wetlands are expected from the potential construction of the monofill. According to the National Wetlands Inventory (NWI) maps there are no wetlands located in the area in which the monofill is proposed. Based upon the steep topography of the site, there is potential for some small seeps to occur; however, the actual acreage of wetlands is not expected to be significant. Prior to any ground-disturbing activities at this site, a jurisdictional wetland delineation would be conducted and approved by the U.S. Army Corps of Engineers (USACE) to confirm this finding. Avoidance of wetlands will be the first priority; however, if avoidance of wetlands is not practicable, mitigation will be provided (in the form of creation, restoration, or enhancement) in order to meet the USACE's policy of no net loss of wetlands. All fieldwork and permitting activities will be completed prior to construction. Mitigation of impacted wetlands will include an evaluation of the functionality of the lost wetlands and mitigation will include the replacement of these wetland functions. Therefore, there would be no net loss of wetlands or wetland functions.

Forest. The construction of a monofill would have a significant long term direct adverse impact on the forest itself. As stated in Section 3 of this document, the site that has been selected for the monofill encompasses a large portion of contiguous deciduous hardwood forest. Vegetation lists are provided in Section 3. As stated earlier, Washington DC's Urban Forest Preservation Act of 2002 establishes an urban forest preservation program requiring permits for Special Tree removals or replacements and maintains a Tree Fund to be used to plant trees and defray costs associated with implementation of the Act. The Preservation Act requires that removal of any trees greater than 55 inches in circumference, when measured at a height of 4 ½ feet, requires a Special Tree Removal Permit. A quantity of replacement saplings whose aggregated circumference equals or exceeds the circumference of the Special Tree in question must be provided unless a fee is paid.

Wildlife Habitat. Long-term adverse impacts to wildlife are expected from this alternative. In addition to the removal of trees in general, construction of the monofill would remove habitat for insects, amphibians, reptiles, birds, and mammals. Species observed at the site are listed in Section 3.

Georgetown Reservoir

No significant direct adverse impact to Special Status (Threatened or Endangered) Species or Protected and Critical Habitats would occur at this water treatment facility with this alternative.

Dalecarlia Sedimentation Basins

No direct adverse impact to Special Status (Threatened or Endangered) Species or Protected and Critical Habitats would occur at this water treatment facility with this alternative.

It is our finding that Alternative A would have a significant impact on biological resources.

4.6.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Implementation of this alternative would result in no impact to terrestrial biological resources.

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Truck Routes

No direct adverse impact to Special Status (Threatened or Endangered) Species or Protected and Critical Habitats would occur along the truck routes with this alternative.

Land Application Sites

Special Status Species

No impacts to any federally- or state-listed rare, threatened, or endangered species are expected to occur due to this alternative. Land application operations and land disposal sites must be permitted by the appropriate state agency. Permits for such actions would not be granted if special status species were affected.

Protected and Critical Habitats
No impacts to any special habitats, wetlands or waters of the U.S., forested areas, or wildlife habitat are expected to occur due to this alternative. Land application operations and land disposal sites must be permitted by the appropriate state agency. Permits for such actions would not be granted if special status species were affected.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative B would have no impact on biological resources.

4.6.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Implementation of this alternative would have a no significant long-term, direct adverse impact to terrestrial biological resources.

Northwest Dalecarlia Processing Site
See Alternative A discussion above.

Pipeline Route to Blue Plains AWWTP
Implementation of this alternative would likely result in significant, long-term impacts to forest resources along select sections of the pipeline corridor. Although forest resources are renewable, the time needed for regrowth exceeds that of the construction period and the impacts are therefore considered to be more of a long-term impact than a short-term impact. Some habitat loss may accompany the loss of trees, but the action has no significant long term direct adverse impact because the area is not a protected or critical or protected habitat.

Special Status Species
Federal, state, and local agencies were contacted in order to determine the potential presence of any special status (e.g., threatened or endangered) species for plants and animals within or directly adjacent to the proposed pipeline alignment. Regulatory agencies have not identified, through correspondence, any known presence of special status species within the project boundary (awaiting confirmation in writing from regulatory agency).

Because the proposed method of pipeline construction will utilize directional drilling techniques for the entire route, no impacts to the species described in Chapter 3 are anticipated. Additional workspace required for construction activities will disturb segments of land totaling approximately 10 acres along the entire length of the proposed route, but it is unlikely that these areas provide suitable habitat for the, bald eagle, or eastern puma. Additionally, impacts to these areas for additional workspace requirements would be temporary, and disturbed areas would be allowed to re-vegetate to pre-construction conditions.

Protected and Critical Habitats
Special Habitats. The proposed pipeline route is designed to parallel the existing Potomac Interceptor for most of the approximately 12-mile route. As such, this alignment will parallel the Potomac River, but is not expected to traverse areas designated as WSRs,

National Wildlife Refuges, or state wildlife management areas. Therefore, no impacts to these special habitats are expected.

Wetlands. No long-term negative impacts to wetlands are expected from the potential construction of the proposed pipeline. It is anticipated that staging areas for construction activities can be located to avoid impacting the potential wetland areas as described in Section 3.2.2.3. Prior to any ground disturbing activities at this site, a jurisdictional wetland delineation will be conducted and approved by USACE. Avoidance of wetlands is the first priority; however, if avoidance of wetlands is not practicable, mitigation will be provided (in the form of creation, restoration, or enhancement) to meet the USACE's policy of no net loss of wetlands. All fieldwork and permitting activities will be complete prior to construction. Mitigation of impacted wetlands will include an evaluation of the functionality of the lost wetlands and mitigation will include the replacement of these wetland functions. Therefore, there would be no net loss of wetlands or wetland functions.

Forest. The construction of a pipeline would require additional workspace for construction activities. This additional workspace would include approximately 10 acres in total, spread out among up to 27 workspace sites, each site being approximately 0.35 acres in size. Final placement of these additional workspace sites has not been confirmed; however, if these areas are located within forested portions along the alignment, this alternative could have a significant negative impact on the forest areas. As stated earlier, Washington DC's Urban Forest Preservation Act of 2002 establishes an urban forest preservation program requiring permits for Special Tree removals or replacements and maintains a Tree Fund to be used to plant trees and defray costs associated with implementation of the Act. The Preservation Act requires that removal of any trees greater than 55 inches in circumference when measured at a height of 4 ½ feet, requires a Special Tree Removal Permit be filed. A quantity of saplings whose aggregated circumference equals or exceeds the circumference of the Special Tree in question must be provided unless a fee is paid for each Special Tree removed.

Staging areas two through seven (see Figure 3-31) could have impacts to forested areas between the Potomac River and the C&O Canal. Staging area four could potentially be located in the disturbed park-like area adjacent to Fletcher's Boathouse to avoid impacts to the forest. The remainder of the staging areas is located in urban areas that are already somewhat disturbed. All staging areas will be carefully sited in order to minimize forested impacts to the maximum extent practicable. In addition, areas cleared for use, as staging areas will be allowed to re-vegetate to pre-construction conditions when the drilling is completed. Thus, any impacts in these areas would be expected to be temporary.

Wildlife Habitat. Because the entire route would be constructed using directional drilling methodologies, negative impacts to wildlife habitats will be minimized to the greatest extent practicable. However, if tree clearing is required long-term impacts to habitat would occur.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative C would have no significant impact on biological resources.

4.6.3.4 Alternative D—No Action Alternative

Implementation of this alternative would result in no impact to terrestrial biological resources. Please refer to the Aquatic Resources section for a more detailed analysis of potential biological impacts.

Special Status Species
No impacts to any federally- or state-listed rare, threatened, or endangered terrestrial species are expected to occur due to this alternative.

Protected and Critical Habitats
No impacts to any special habitats, wetlands or waters of the U.S., forested areas, or wildlife habitat are expected to occur due to this alternative.

Wetlands. No impacts to wetlands are expected to occur under the No Action alternative.

Forest. No impacts to forests are expected to occur under the No Action alternative.

Wildlife Habitat. No impacts to terrestrial wildlife habitat are expected to occur under the No Action alternative.

It is our finding that Alternative D would have no impact on biological resources.

4.6.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

Implementation of this alternative would have no impact to terrestrial biological resources.

Special Status Species
Federal, state, and local agencies were contacted in order to determine the potential presence of any special status (e.g., threatened or endangered) species for plants and animals within or directly adjacent to the proposed alternative dewatering and thickening site. Regulatory agencies have not identified, through correspondence, any known presence of special status species within the project boundary (awaiting confirmation in writing from regulatory agency).

Protected and Critical Habitats
Special Habitats. The area proposed for the alternative dewatering and thickening site construction is not classified as a National Park, WSR, National Wildlife Refuge, or a state wildlife management area. Therefore, no impacts to special habitat are expected.

Wetlands. No long-term negative impacts to wetlands are expected from the potential construction of the alternative dewatering and thickening site. Based upon the flat plateau-like topography of the site, it is unlikely there are any wetlands in the Storage Yard area. A large, ponded, low area was observed in the southeast corner of the AUES FUDS office and staging area, however, this area is not located in the area for proposed construction of buildings or associated roads.

Prior to any ground-disturbing activities at this site, wetland delineation and/or a wetland determination would be conducted by USACE. Avoidance of wetlands would be the first priority; however, if avoidance of wetlands were not practicable, mitigation would be provided (in the form of creation, restoration, or enhancement) in order to meet the USACE's policy of no net loss of wetlands. All fieldwork and permitting activities would be complete prior to construction. Mitigation of impacted wetlands will include an evaluation of the functionality of the lost wetlands and mitigation would include the replacement of these wetland functions. Therefore, there would be no net loss of wetlands or wetland functions.

Forest. The construction of the alternative dewatering and thickening site is not expected to have a significant negative impact on any forest habitat, as this area is already disturbed and does not contain any forested areas.

Wildlife Habitat. No negative impacts to wildlife are expected from this alternative as this area is already disturbed and does not contain any habitat for wildlife.

East Dalecarlia Processing Site

No direct adverse impact to Special Status (Threatened or Endangered) Species or Protected and Critical Habitats would occur at this site with this alternative. The existing site is developed and cleared, provides limited habitat, and contains no wetlands.

Trucking Routes

See Alternative B discussion above.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative E would have no impact on biological resources.

4.6.3.6 Forebay Residuals Treatment Option

Implementation of this option will result in no impact on biological resources.

Special Status Species

No impacts to any federally- or state-listed rare, threatened, or endangered species are expected to occur due to this alternative because no construction will occur in undeveloped areas.

Protected and Critical Habitats

Special Habitats. No negative impacts to special habitats are expected to occur due to this alternative.

Wetlands. No impacts to wetlands or waters of the U.S. are expected to occur due to this alternative because no construction will occur in undeveloped areas. The Forebay itself is considered to be part of the water treatment plant (WTP) and is not a jurisdictional wetland or water of the United States.

Forest. No negative impacts to forests are expected to occur due to this alternative because no construction will occur in undeveloped areas.

Wildlife Habitat. No negative impacts to special habitats are expected to occur due to this alternative because no construction will occur in undeveloped areas.

4.7 Cultural Resources

4.7.1 Definition

Cultural resources are defined as sites, structures, buildings, landscapes, districts, and objects that are significant in history, prehistory, architecture, archaeology, engineering, and/or culture. These resources are protected by a number of statutes and regulations at all level of government and must be considered during the National Environmental Policy Act (NEPA) process.

4.7.2 Cultural Resource Significance Criteria

The criteria and methodology used to determine the impacts of the proposed alternatives were based on Federal Regulation 36 CFR Part 800, generally, and § 800.9, specifically, as described in the Cultural Resource Management Plan for the Washington Aqueduct. The proposed alternatives for this project were determined to have no impact, no significant impact, or significant impact based upon the historic properties of the Washington Aqueduct and the potential areas of effect, or archaeological resources, that lie within each of the alternatives.

No Impact

No impact means that no cultural resources, such as sites, structures, buildings, landscapes, districts, and objects that are significant in history, prehistory, architecture, archaeology, engineering, and/or culture would be affected by the proposed undertaking.

No Significant Impact

No Significant Impact on cultural resources typically refers to actions such as routine building maintenance. For example, there would be no adverse effect if the maintenance performed follows the *Secretary of the Interior's Standards for Rehabilitation* and the "Washington Aqueduct Preservation/Maintenance Guidelines." For archaeological resources, no significant impact is extremely rare. As an example, if an existing site is crossed by a road or covered in grass, continually driving across the road or routinely cutting the grass would have no significant impact.

Significant Impact

A significant impact can be defined as one that alters a cultural resource so that the resource would no longer qualify for listing on the National Register or so that the resource would be delisted. A cultural resource would be delisted in the National Register if the action diminishes "the integrity of the location, design, setting, materials, workmanship, feeling, or association" [36 CFR 800.5(a)(1)]. An alternative would be considered to have a significant on archaeological resources if the impact cannot be mitigated.

4.7.3 Impact Evaluation by Alternative and Option

4.7.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Northwest Dalecarlia Processing Site

The proposed residuals processing facilities located at the Northwest Dalecarlia Processing Site would have no impact on cultural resources. Construction of a new water treatment facility to process residuals would be located in an area of Washington Aqueduct property, referred to as Dalecarlia WTP, determined to have low potential for prehistoric or historic archaeological resources. There are no known historic resources within the proposed project area for Alternative A. Therefore, there would be no direct impacts to historic or archaeological resources with the implementation of Alternative A. However, the new treatment facility would be designed to be compatible with the existing historic buildings already located on the Dalecarlia WTP site. Construction of the new processing plant would require new temporary workspaces. These new workspaces would not impact existing known cultural resources.

In addition to direct impacts on historical properties, 36 CFR 800.5 requires that an assessment of adverse effects must also consider "visual and audible elements that diminish the integrity of the property's significant historical features…" Construction of a new treatment facility would not adversely affect the visual elements of any historic or archaeological resources with the proposed project are for Alternative A given there are no listed resources in the Dalecarlia WTP area. Construction of a new treatment facility would not adversely affect the visual integrity of the other historic properties within Dalecarlia.

Monofill

Alternative A, construction of a proposed monofill within the boundaries of the Dalecarlia WTP, would have no significant adverse impacts, either direct or indirect, to historic properties within the area of potential effect for this alternative. The Dalecarlia Resevoir is a contributing resource to the Washington Aqueduct National Landmark. The monofill would be visible from the reservoir, but it would not diminish the property significance.

There could potentially be significant direct adverse impacts to presently undetected archaeological resources if this alternative were implemented. Currently, there are no known sites within the footprint of the proposed monofill that are listed on the National Register of Historic Places. However, the area for the proposed monofill has been identified as having a high probability for both prehistoric and historic archaeological resources, because the area is minimally disturbed, with little or no development. The construction of a monofill would have a direct adverse impact on these resources because the monofill would cover possible archaeological resources. Covering an archaeological site is sometimes considered a form of protection from looters, as long as the resource is available for recovery and research. However, covering a potential site with 30-50 feet of material may not be considered protective because recovery would be difficult. Additionally, there would still be areas surrounding the footprint of the alternative that would experience adverse impacts. Construction of a monofill would introduce foot and truck traffic to the site, which could lead to unexpected discoveries. For example, the landscape would be modified for the monofill, allowing previously protected artifacts to be exposed and either damaged or removed.

In addition, the weight of trucks delivering residual material could alter or permanently damage archaeological resources on the approach to and from the Alternative A project area. These direct adverse impacts would be long term because any currently unknown resources would be permanently altered or destroyed.

Implementation of Alternative A could also result in significant short-term adverse impacts. If the site were constructed, construction equipment could destroy archaeological resources that are not within the final footprint of the monofill but that lie within the temporary work spaces.

If avoidance of high probability areas is not possible and Alternative A is implemented, consultation with the State Historic Preservation Office (SHPO) would be required and a mitigation plan for the site, including a survey of the area of impact to determine if there are archaeological resources present, would be negotiated. If archaeological resources are then found, SHPO would be consulted and a Memorandum of Agreement drafted to determine appropriate mitigation. Mitigation could include documentation and/or recovery of the archaeological resources.

Georgetown Reservoir

The existing Georgetown Reservoir is a contributing Resource to a National Historical Landmark—the original Washington Aqueduct water supply system components from Great Falls, MD through the Georgetown Reservoir. The proposed modifications to the Georgetown Reservoir would have no significant impact on the cultural resources, however they would have a visual impact on this existing historic facility. The historic significance of this facility is associated with its engineering design and function. Neither of these characteristics would be significantly impacted by the proposed modifications. In order to mitigate the impact, in consultation with the SHPO, new facilities, such as the electrical building will be designed with the historically significant nature of the Georgetown Reservoir facility in mind. New exposed structures will be designed to match the architectural style of other similar nearby historical structures.

Dalecarlia Sedimentation Basins

The proposed modifications to the Dalecarlia Sedimentation Basins would have no impact on cultural resources. As with the new exposed Georgetown Reservoir facilities, the new exposed portions of the residuals pump station will be designed to match the historical architectural style of the existing water treatment plant building adjacent to the sedimentation basins.

It is our finding that Alternative A could have a significant impact on cultural resources.

4.7.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Alternative B, Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking, would not adversely impact historic or archaeological resources.

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Trucking Routes

Several of the proposed truck routes would run through historic neighborhoods, but there would be no visual or audible impacts to these neighborhoods since the additional truckload would not alter the existing conditions.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B would have no significant impact on cultural resources.

4.7.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Alternative C, Thickening and Piping to Blue Plains AWWTP would present a significant adverse impact to both archaeological and historic resources along the proposed pipeline corridor.

Northwest Dalecarlia Processing Site

See Alternative A discussion above for similar impact discussion.

Pipeline Route to Blue Plains AWWTP

Direct adverse impacts along the pipeline corridor would include physical destruction of an entire resource or damage or alteration to a portion of a historic resource within the project area. Construction of a new pipeline wouldhave an adverse short-term impact on cultural resources listed on the National Register of Historic Places. Historic and archaeological resources that would be indirectly impacted include a National Register historic district; five National Parks and National Monuments, including the Lincoln Memorial, the Korean War Veterans Memorial, the Franklin D. Roosevelt Memorial and the Thomas Jefferson Memorial; the Kennedy Center; numerous individually listed National Register properties; significant *in situ* prehistoric and historic archaeological resources; historic landscapes; and presently unknown archaeological resources. Most of the existing cultural resources are historically significant at the local, state, and national level.

Construction of a new pipeline would also include adverse short-term indirect impacts. Visual and noise impacts would indirectly affect cultural resources. Visual impacts would include short-term alterations to the landscape that would affect the context of the cultural resources. Noise impacts would affect a visitor’s experience of the cultural resources. Construction would also impede visitor access to existing historic and archaeological resources and NPS properties. These adverse impacts would be considered short term since construction would be time-limited. However, periodic access to facilities along the pipeline route would also offer an adverse impact, although limited in frequency.

If these significant cultural resources cannot be avoided, mitigation of the adverse impacts would require consultation with the DC SHPO, the NPS, and other agencies, ensuring that mitigation would offset the potential loss.

Blue Plains AWWTP

The existing Blue Plains AWWTP site is a highly industrialized site that has been highly disturbed. As a result, the construction of additional residuals facilities would not impact any known historic properties or archaeological resources.

Trucking Routes

The trucking route from the Blue Plains AWWTP would quickly access an interstate. As a result, it would have no impact on historic properties or archaeological resources.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative C would have a significant impact on cultural resources.

4.7.3.4 Alternative D—No Action Alternative

The No Action alternative assumes continued use of the Washington Aqueduct facilities with no changes. Therefore, there would be no impacts to historic properties or archaeological resources.

It is our finding that Alternative D would have no impact on cultural resources.

4.7.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

Alternative E, Dewatering at East Dalecarlia Processing Site and Disposal by Trucking, would have no significant adverse impact historic or archaeological resources listed on the National Register of Historic Places.

East Dalecarlia Processing Site

For this alternative, a new treatment facility to thicken and dewater the residuals would be constructed in an area of Washington Aqueduct property, in close proximity to Sibley Memorial Hospital that has been highly disturbed. Due to this disturbance, it has been determined that this area would have a low potential for prehistoric or historic archaeological resources. The Dalecarlia Resevoir is a contributing resource to the Washington Aqueduct National Landmark. The site would be visible from the reservoir, but it would not diminish the property significance. Construction of the new processing treatment plant for this alternative would require new temporary workspaces. These new workspaces would not impact existing known cultural resources.

Trucking Routes

See Alternative B discussion above.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative E would have no significant impact on cultural resources.

4.7.3.6 Forebay Residuals Treatment Option

The existing Forebay is a contributing Resource to a National Historical Landmark—the original Washington Aqueduct water supply system components from Great Falls, MD through the Georgetown Reservoir. Processing Forebay residuals on site and periodically hauling them would result in no adverse significant impact on these existing historic or archaeological resources, however, construction of new silt removal facilities within and adjacent to this historic facility would impact the historic nature of the Forebay and have a visual impact. The historic significance of this facility is associated with its engineering design and function. It is acknowledged that resources listed on the National Register of Historic Places, such as the Aqueduct, will change over time in response to changes in technology. The addition of a new structure will not adversely impact these resources. The Forebay has a low potential for prehistoric or historic archaeological resources since the Forebay has been dredged regularly over many years. Therefore construction of a new structure in the Forebay would not potentially impact any unknown archaeological resources. Therefore, there would be no impacts to any historic resources with this option.

4.8 Hazardous, Toxic, and Radioactive Substances

4.8.1 Definition

The objective of the hazardous, toxic, and radioactive substances evaluation is to determine if there are any impacts on hazardous materials present at the site or by hazardous materials being added to the site as a result of implementing the proposed alternatives. Impacts could be caused by the storage, treatment, disposal, or accidental release of hazardous, toxic, and radioactive substances regulated by the Resource Conservation and Recovery Act (RCRA) the Comprehensive Environmental Resource Compensation and Liability Act (CERCLA) or other Maryland Department of Environment (MDE) or District of Columbia Department of Health (DC DOH) regulations.

Other, non-CERCLA environmental factors were evaluated for this impacts evaluation. These include polychlorinated biphenyls (PCBs), radon, ACM, lead-based paints (LBP), and pesticides. Some of these factors may be associated with modification to existing buildings.

The potential impact of hazardous, toxic, and radioactive substances will be evaluated for each alternative using known and existing information.

4.8.2 Hazardous, Toxic, and Radioactive Substances Significance Criteria

The potential impacts associated with each alternative depends on the proposed areas of construction, demolition, or rehabilitation and the presence of USTs/ASTs, PCBs, radon, ACM, LBP, pesticides/herbicides/fertilizers, water treatment chemicals, or other hazardous substances.

Environmental impact from production and potential release of hazardous waste and/or materials is evaluated using the following criteria:

No Impact

Implementation of the proposed alternatives does not result in the production of additional hazardous materials within the project area or the releases of hazardous substances to the environment. Moreover, concentrations and flow regimes of contaminants already in the groundwater will not be changed by an action that has no impact.

No Significant Impact

Implementation of the proposed alternatives results in a minimal increase in the production of hazardous waste or materials within the project area. State and/or federal permits will be obtained and followed as required for the storage and disposal of any hazardous substances that will be produced. Any potential releases to the environment would be prevented or responded to in accordance with all applicable laws and regulations to prevent risks to human health or the environment.

Significant Impact
Implementation of the proposed alternatives results in an adverse impact to human health and the environment. An example of an adverse significant impact includes implementation of a proposed alternative resulting in risks to human health, i.e., worker exposure to hazardous substances through contact with contaminated media (e.g., groundwater, soil).

4.8.3 Impact Evaluation by Alternative and Option

4.8.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

The construction of Alternative A may have a significant direct adverse impact to human health and the environment from potentially hazardous substances.

Northwest Dalecarlia Processing Site
In 1995, Whitman Requardt and Associates completed twenty-five geotechnical soil borings in the proposed Thickening/Dewatering facility area for a previous residuals design project for the Washington Aqueduct. During the collection of five of the soil borings, strong solvent and/or petroleum odors were noted at 5 to 30 feet below ground surface (bgs) (see Appendices). Because these borings were performed for geotechnical purposes only, soil samples from these borings were not collected for chemical analyses. Additional soil borings would be drilled during the design phase of the project. The extent of soil contamination would be identified and as necessary remediated.

Construction of the thickening and dewatering facility at the Northwest Dalecarlia Processing Site would have no impact on hazardous, toxic, and radioactive substances because this alternative would not increase the production of hazardous waste or materials or pose a risk of release to the environment.

Monofill
Construction of a proposed monofill within the boundaries of the Dalecarlia WTP would have a significant direct impact to human health and the environment from potentially hazardous substances. The proposed monofill location is partially located within the boundaries of the AUES FUDS. Potential impact is considered to be long-term due to the scheduled geophysical investigation ad uncertainty associated with activities of AUES. Although the risks are based on uncertainty, there is enough certainty of past activities in this area to classify a risk in the proposed monofill location.

The monofill location is identified by the USACE as an area needing further investigation (See Section 4.11.7). In the past, WWI era munitions were located above ground in the proposed monofill area. Subsurface evaluations had been conducted between 1993 and 1995; however, identified subsurface anomalies were not analyzed during these evaluations. The USACE is scheduled to evaluate the subsurface of the proposed monofill location in 2008 with the use of technology designed to locate ferrous objects and other anomalies. The data generated from the subsurface evaluation will be reviewed, and identified anomalies addressed accordingly. If an anomaly were found related to the FUDS, removal and restoration would likely occur. The minimum duration of this subsurface evaluation is two years, not including any removal actions that may be necessary.

Georgetown Reservoir

The modifications proposed to the Georgetown Reservoir would have no impact on hazardous, toxic, or radioactive substances. No known substances of these types are present in the Georgetown Reservoir area.

Dalecarlia Sedimentation Basins

The modifications proposed to the Dalecarlia Sedimentation Basins would have no impact on hazardous, toxic, or radioactive substances. No known regulated substances of these types are present in the sedimentation basin area. Although perchlorate has been observed in the groundwater in the vicinity of the sedimentation basins at the Dalecarlia WTP, no impact is expected for Alternative E due to perchlorate in the groundwater. Groundwater would not be encountered during the construction of the proposed residuals pump station.

It is our finding that Alternative A would have no significant impact due to hazardous, toxic or radioactive materials.

4.8.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Northwest Dalecarlia Processing Site

See Alternative A discussion above. No adverse impact would be anticipated as a result of construction or processing water treatment residuals and disposing via contract hauling.

Trucking Routes

No impact on hazardous, toxic, or radioactive substances would be associated with this alternative.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B would have no impact due to hazardous, toxic or radioactive materials.

4.8.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Pipeline Route to Blue Plains AWWTP

Alternative C, Thickening and Piping to Blue Plains AWWTP, would have a short-term significant impact, due to the uncertainties and risks associated with potentially hazardous areas located in proximity to the proposed pipeline route. The short-term impact would also occur due to additional waste that would be generated from the directional drilling method, which is the assumed construction method for the pipeline. This method would generate additional material that has the potential to be regulated hazardous waste requiring appropriate disposal.

The pipeline depth would range from approximately 5 to 40 feet deep. In addition to the geotechnical work, planning and permitting required to develop the final route of the pipeline, the areas of potential concern identified in Section 3-7 would also need to be taken into consideration. These areas would either need to be avoided or evaluated if this alternative is selected. These potentially hazardous areas might have a possible direct impact on the construction of the pipeline and may pose concern to worker health and safety during construction activities.

A portion of the proposed pipeline route is located along the southwestern shoreline portion of the Anacostia Naval Station and the western shoreline portion of Bolling Air Force Base (AFB). Both facilities have a history of military industrial activities that have left behind old industrial sites and locations where hazardous substances may have been released into the environment. Both facilities currently implement Environmental Restoration Programs designed to identify, investigate, and cleanup former waste disposal sites. The proposed pipeline route is in proximity to environmental cleanup sites on both military installations.

Implementing this alternative will require careful communication with the Environmental Restoration Programs at both bases to determine the precise relationship of the pipeline location to their exact locations of the installation remediation areas.

Blue Plains AWWTP
No known impact on hazardous, toxic, or radioactive substances would be associated with constructing residuals dewatering facilities at this location.

Trucking Routes
See Alternative B discussion above.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative C would have no significant long-term impact due to hazardous, toxic or radioactive materials, but would have a short-term significant impact with respect to hazardous, radioactive and/or toxic materials.

4.8.3.4 Alternative D—No Action Alternative

If the no action alternative were selected, there would be no impact, since this alternative assumes continued use of the Washington Aqueduct facilities with no changes.

It is our finding that Alternative D would have no impact due to hazardous, toxic or radioactive materials.

4.8.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

East Dalecarlia Processing Site
Although perchlorate has been observed in the groundwater in the vicinity of the East Dalecarlia Processing Site, as well as the vicinity of the sedimentation basins at the Dalecarlia WTP, no impact is expected for Alternative E due to perchlorate in the groundwater. Perchlorate is not regulated, however investigations are underway to work toward determining the source of the perchlorate contamination. This investigation is occurring regardless of the residuals project. Construction in the East Dalecarlia Processing

Site will not likely reach the groundwater in this area due to the depth of the water table (greater than 26 feet). Therefore, exposure of workers to perchlorate is not expected.

On March 27, 2005, during the installation of a groundwater monitoring well on Washington Aqueduct property at the east Dalecarlia processing site, drillers encountered a concrete structure below the ground surface containing an oily material. This concrete structure appeared to be a remnant of a demolished Washington Aqueduct building. At the time of this printing, the concrete structure and its contents were under investigation. The location of this structure is outside of the area that would likely be developed for the proposed water treatment residuals processing facilities, and therefore no conflict with alternative E is anticipated. However, Washington Aqueduct will take all steps necessary to satisfy applicable regulations in managing the concrete structure and its contents.

Trucking Routes
See Alternative B discussion above.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative E would have no impact due to hazardous, toxic or radioactive materials.

4.8.3.6 Forebay Residuals Treatment Option

It is our finding that Forebay residuals treatment option would have no significant impact due to hazardous, toxic or radioactive materials.

4.9 Soil, Geology, and Groundwater Resources

4.9.1 Definition

This section will evaluate the soil, geology and groundwater resources that may be impacted by the proposed alternatives. This section is of particular importance for evaluating the potential impact of constructing and operating the monofill and pipeline. For the monofill, issues related to slope stability, depth to bedrock, and the potential for interaction with existing surface soil and groundwater contamination may affect the facility permitting process and the implementation schedule.

4.9.2 Geology, Soils, and Groundwater Significance Criteria

The impacts associated with each alternative are defined based on one of the following criteria: no impact, no significant impact, or significant impact.

No Impact
A project alternative would be considered to have no impact if it does not result in any disturbance to protected soils, any interface with the groundwater table, any rock excavation, and the soils are suitable to support the proposed facilities.

No Significant Impact

A project alternative would be considered to have no significant impact if it results in minimal disturbance to protected soils, limited interface with the groundwater table that can easily be accommodated using conventional construction techniques, such as well points, or limited rock excavation. Within this categorization, the existing soils may be incompatible with the foundation requirements of the proposed facilities, however, this incompatibility can be accommodated with conventional foundation design techniques, such as pile foundations.

Significant Impact

A project alternative would be considered to have significant impact if it results in significant disturbance to protected soils, requires a significant modification of the localized groundwater table that could impact surrounding structure foundations, or requires significant rock excavation. Within this categorization, the existing soils would be unsuitable to serve as foundation support and must be overexcavated and replaced before a new facility could be constructed.

4.9.3 Impact Evaluation by Alternative and Option

The purpose of this section is to evaluate alternatives with respect to their environmental influences on soils, topography, geology, and groundwater.

4.9.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

It is anticipated that Alternative A will have no significant impact on geology, soils, topography and groundwater.

Northwest Dalecarlia Processing Site

A residuals processing facility would be constructed on the Northwest Residuals Processing Site to dewater water treatment residuals. The facility would consist of four circular thickeners, each approximately 110-feet in diameter, and a 76 feet wide by 128 feet long by 78 feet tall processing building. The installed thickeners would rise approximately 21-feet above the ground surface, with the center sloped floor extending approximately 12-feet below grade.

The Northwest Residuals Processing Site was previously filled. Consequently, the average depth to bedrock is greater than the proposed monofill site, typically 25 feet below ground surface or greater. As a result, rock should not be encountered during the construction of the circular thickeners. Recent soil borings in the area also indicate that groundwater should not be encountered at the foundation depths proposed for the thickeners. The depth to the water table in the proposed residuals processing facility construction area is around 30 feet below grade.

The nature of the fill material placed on the site is unlikely to be suitable to support the new facilities without requiring pile foundations, however. As a result, this facility would have no significant adverse impact on geology, soils, topography, and groundwater.

Monofill

Geology, Soils, and Topography

Alternative A would involve excavating an approximately 800 by 1,600 foot area on top of the hill adjacent to the western boundary of Dalecarlia Reservoir to a depth just above the maximum elevation for groundwater. Sufficient soil thickness should be in place to preclude encountering bedrock during excavation of the monofill.

Glenelg, Chester, and Manor soils will be removed to accommodate placement of a basal liner and the residuals processing facility. These soil types are not associated with protected soils for agricultural purposes. In addition, these soil associations should not present any engineering problems related to slope failure, poor drainage, or subsidence after the monofill is constructed. The depth to the top of competent bedrock in the area averages around 14 feet in the proposed monofill area. As a result, bedrock should not be encountered during construction of the monofill, resulting in no impact on geology, soils, and topography.

Groundwater

A major underlying assumption of Alternative A is that the monofill would be designed so that the base of the liner, and the underlying leak mitigation system would lie at least two feet in elevation above the annual high water table. Appropriate engineering measures would be implemented to avoid encountering groundwater during excavation of the monofill. Static water levels in two piezometers south of the monofill are around 30 feet below grade. Subsequently, encountering groundwater during installation or operation of the monofill would not be anticipated. In addition, systems would be designed to prevent stormwater runoff on the monofill from infiltrating to the water table.

As water levels are relatively deep in the area around the monofill and residuals dewatering/thickening area, groundwater should not be encountered during installation or operation of the new facilities. Subsequently, Alternative A should be considered to have no impact on groundwater.

Georgetown Reservoir

The proposed modifications at the Georgetown Reservoir would have no significant impact on geology, soils, topography, and groundwater. There are no protected soils at this site, however, it is likely that the groundwater table will be encountered during the construction of the residuals booster pump station. Rock excavation is not anticipated to be required.

Dalecarlia Sedimentation Basins

The proposed modifications at the Dalecarlia sedimentation basins would have no significant impact on geology, soils, topography, and groundwater. There are no protected soils at this site, the groundwater table will not be encountered during the construction of the residuals pump station, and rock excavation is not anticipated to be required. However, the soils may not be suitable to construct slab on grade foundations – potentially requiring pile foundations under the sedimentation basin pump station.

It is our finding that Alternative A will have no significant impact on geology, soils, and groundwater.

4.9.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Northwest Dalecarlia Processing Site

See Alternative A discussion above. For this alternative, construction on the Northwest Dalecarlia Processing Site would be limited to four new thickeners plus a new thickened residuals transfer pump station. The impacts associated with these facilities would be similar to those defined for Alternative A.

Trucking Routes

No impact is anticipated to geology, soils, topography, and groundwater along the trucking routes.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B will have no significant impact on geology, soils, and groundwater.

4.9.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Pipeline Route to Blue Plains AWWTP

In Alternative C, a pipeline would be installed using directional drilling techniques to convey water treatment residuals from the Dalecarlia and Georgetown Reservoirs to the Blue Plains AWWTP. The pipeline would extend approximately 12 miles crossing the Fall Line one-mile east of Georgetown Reservoir.

Installation of pipelines by the directional drilling technique is inherently safer and involves less soil disturbance than conventional excavation operations. Sufficient thickness of unconsolidated material appears available along the pipeline route to preclude concerns of drilling into bedrock to advance the borehole. Located adjacent to the floodplain of the Potomac River, most of the pipeline route is level. No special engineering properties are required for soils in the implementation, or long term stability of Alternative C.

Directional drilling techniques will inevitably encounter the water table at several points along the route of the pipeline during construction. As with any rotary drilling technique, a drilling fluid consisting of various clay minerals and polymers are applied to lubricate the drill bit and stabilize the borehole. These fluids mix with groundwater in the subsurface. Typically, drilling fluids are not toxic and represent no danger to workers or local users of the groundwater. Drilling fluids break down into relatively inert components after a short time in the subsurface.

Potential long-term impacts to groundwater would only occur if a leak developed in the constructed system. Often pipeline leaks can go undetected for years. If the pipeline is installed beneath the water table, leaking fluids could discharge directly the shallow groundwater system, or infiltrate to the water table if the pipe lies above the water table.

Blue Plains AWWTP

It is anticipated that the foundation requirements at the Blue Plains AWWTP would be similar to the Northwest Dalecarlia Residuals Processing site in that pile foundations would be required. Due to the close proximity to the Potomac River, measures would also likely have to be taken to manage groundwater flow. Construction on this site would, therefore, be considered to pose no significant impact on soils and groundwater.

Trucking Routes

See Alternative B discussion above.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative C will have no significant impact on geology, soils, and groundwater.

4.9.3.4 Alternative D—No Action Alternative

Alternative D would involve no construction activities to store or transport water treatment residuals.

Geology, Soils, and Topography

Alternative D represents no impact to local geology, soils, or topography.

Groundwater

Alternative D represents no impact to groundwater.

It is our finding that Alternative D will have no impact on geology, soils, and groundwater.

4.9.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

East Dalecarlia Processing Site

Alternative E would involve removal of dewatered water treatment residuals by trucking from Dalecarlia Reservoir Area to a permitted offsite location for disposal. A new residuals-dewatering and thickening facility would be constructed in the East Dalecarlia Processing Area, an area of moderate relief located north of Little Falls Road. The facility would consist of four gravity thickeners plus a dewatering building or similar dimensions to the Alternative A facility. The facilities would be constructed with two of the thickeners positioned uphill from the dewatering building and the other two thickeners positioned downhill from the building. This arrangement would allow the proposed facilities to be built into the sloped site in a stairstep arrangement with the uphill thickener installed at a higher elevation that the dewatering building and the downhill thickener. This approach will help minimize the apparent height of the proposed residuals facilities when compared with Alternative A, which is constructed on a relatively flat site.

Soils beneath the area planned for the residuals thickening and dewatering facility are primarily assorted fill materials. Boring logs from four soil borings installed in the area indicate the fill is composed of clay and sandy silt. Soils are moist and represent a heterogeneous mix. Competent bedrock occurs between 26 to 45 feet below grade. The deepest proposed structure would be expected to be no more than 20-feet below existing grade. As a result, it is not anticipated that bedrock would be encountered during the construction of the thickening and dewatering facilities.

The depth to the water table is approximately 30 feet below grade. As construction operations and excavation will not approach the elevation of the water table, Alternative E should be considered to have no impact on local groundwater.

Trucking Routes
See Alternative B discussion above.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative E would have no significant impact to geology, soils, and groundwater.

4.9.3.6 Forebay Residuals Treatment Option

The modifications anticipated at the Forebay are not expected to have a significant adverse impact on geology, soils, topography, and groundwater. Soil borings taken in the area indicate that bedrock should not be encountered during the construction of the proposed facilities. However, it is anticipated that some form of groundwater control will be required to construct the proposed facilities.

4.10Infrastructure

4.10.1 Definition

Infrastructure is defined as the region's resources for providing electric power, potable water, wastewater, solid waste (municipal solid waste and construction debris), and gas service. The goal of this evaluation is to determine if the proposed alternatives stress the region's capacity to provide these services during the project's 20-year design period.

The existing demands of the Aqueduct's current operation were developed as the baseline of assessment. To that end, the existing condition section will describe the Aqueduct's use, sources, quantity, and general infrastructure configuration for electricity, wastewater, solid waste disposal practices, and fuel.

The wastewater section will be limited to municipal wastewater. The current water treatment residuals waste stream, since it is not a part of the regional infrastructure, will be described in a separate section entitled Final Land Disposal of Water Treatment Residuals. The future water treatment residuals waste stream, either the stream itself or wastewater discharges from the processing facilities or monofill, will be evaluated in the impact section associated with this subject.

4.10.2 Infrastructure Significance Criteria

Each project alternative will be categorized according to three categories: no impact, no significant impact, and significant impact.

No Impact

A project alternative will be considered to have no impact if it would neither reduce nor increase the demand for electric power, wastewater, solid waste (municipal solid waste and construction debris), and gas service.

No Significant Impact

A project alternative will be considered to have no significant impact if it would result in a slight increase in demand on these services, but the demand would be met by either existing capacity or with modifications to the existing infrastructure considered minor by the respective utilities.

Significant Impact

A project alternative will be considered to have a significant impact if it would exceed the capacity of a component of the regional infrastructure system within the 20-year design period and require large and unplanned modifications to meet its infrastructure needs.

4.10.3 Impact Evaluation by Alternative and Option

4.10.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Northwest Dalecarlia Processing Site

For Alternative A, residuals from the Dalecarlia Sedimentation Basins and the Georgetown Reservoir would be collected and thickened/dewatered at the Dalecarlia WTP before being disposed of in the Dalecarlia monofill. The proposed dewatering facility would be constructed at the Northwest Dalecarlia Processing Site. The dewatering facility would contain equipment such as centrifuges, gravity thickeners and pumps that would require electricity. The facility would also require natural gas heating. The operators working in the building would generate small amounts of solid waste.

It is estimated that the dewatering facility would require a peak electric load of approximately 1,500 kW. For the 2003-2004 Operating Year, the Washington Aqueduct experienced a peak electric demand of 11,233 kW. The estimated peak demand for the dewatering facility, if it were to occur at the same time as the peak demand for the existing Dalecarlia WTP facilities, would increase the total peak demand by approximately 13%. Dave Pirtle, an engineer with Potomac Electric Power Company (PEPCO), confirmed that this increase in demand would require only minor modifications to the existing electrical infrastructure serving the plant.

The estimated natural gas usage for the dewatering facility is 40,000 therms per year. This would be a 36% increase over the current yearly average usage at Dalecarlia. This may require an increase in the sizing of the pressure-regulating valve on the gas supply line to Dalecarlia. Given that changing the size of this valve would require minimal effort and expense, this has no significant adverse impact.

The dewatering facility is likely to contain a maximum of two restroom facilities. Potable water would be supplied to the restrooms via a pipeline connected to the existing potable water line at the Dalecarlia WTP. Wastewater would be generated from the restrooms, but it is anticipated that the volume of wastewater generated would have no significant impact on the existing wastewater infrastructure.

Monofill

The monofill would have no significant impact on infrastructure because it would require minimal electricity, no fuel and no potable water. In addition, wastewater and solid waste would not be generated at the monofill site.

Georgetown Reservoir

The Georgetown Reservoir facilities would pose no significant impact on infrastructure. The electrical demand associated with the dredge and the residuals booster pump station is anticipated to be 160 kW. This demand can be accommodated by the existing electrical infrastructure available at the Georgetown Reservoir location. No other infrastructure demands are anticipated for this facility.

Dalecarlia Sedimentation Basins

The proposed Dalecarlia sedimentation basin improvements and new residuals pump station would pose no significant impact on infrastructure. The electrical demand associated with these facilities is anticipated to be 400 kW. This demand can be accommodated by the existing electrical infrastructure available at the Dalecarlia WTP site. No other infrastructure demands are anticipated for this facility.

It is our finding that Alternative A would have no significant impact on infrastructure.

4.10.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Trucking Routes

As part of Alternative B, dewatered residuals would be generated and trucked off-site to an as-yet undetermined disposal site. It is estimated that the dewatering facility will generate residuals at a yearly average of 33 tons/day or 12,000 tons per year and a peak generation of 96 tons/day. In 2003, the State of Maryland accepted 7.3 million tons of solid waste. If the dewatered residuals are disposed of in a landfill in Maryland, it would result in a 0.2% increase in solids waste collection. This increase is not anticipated to result in a change to solids waste infrastructure.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B would have no significant impact on infrastructure.

4.10.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Northwest Dalecarlia Processing Site

For Alternative C, residuals would be thickened at a new facility at the Dalecarlia WTP, conveyed in a pipeline to the Blue Plains AWWTP and dewatered at the Blue Plains AWWTP. The pipeline is anticipated to have no impact on wastewater, solid waste, or fuel infrastructure. If constructed, the pipeline would include two booster pump stations that exert a peak electric load of 730 kW. This has a small impact when compared to the existing electric consumption at the Dalecarlia WTP and the Blue Plains AWWTP.

The new thickening facility at the Dalecarlia WTP would have no significant impact on the regional infrastructure for electricity, fuel, wastewater and solid waste. It is estimated that thethickening facility would require a peak electric load of approximately 500 kW. Compared with a current peak demand of 11,233 kW for the Dalecarlia WTP, this 5% increase would have no significant impact on the electric infrastructure. As with Alternative A, small quantities of wastewater and solid waste would be generated from the new thickening facility. However, this is not expected to have a significant impact on the existing infrastructure.

Pipeline Route to Blue Plains AWWTP

The pipeline route to the Blue Plains AWWTP would pose no impact on infrastructure.

Blue Plains AWWTP

The new dewatering facility at the Blue Plains AWWTP would require a peak electric load of approximately 1000 kW. Given the existing electric loads at Blue Plains AWWTP, the additional load generated at the dewatering facility would have a small impact to the existing electric infrastructure. It is assumed that the dewatering facility would be heated using natural gas. The increase in natural gas requirements may require an increase in the sizing of the pressure regulating valve on the gas supply line to the Blue Plains AWWTP. Given that changing the size of this valve would require minimal effort and expense, this can be considered no significant impact. Small amounts of wastewater would likely be generated from rest room facilities in the dewatering facility, causing minimal impact on wastewater facilities. The volume of residuals that would be generated at the Dewatering Facility at Blue Plains AWWTP would the same as described under Alternative A. Therefore, the solid waste impact for this alternative can be considered no significant.

Trucking Routes

See Alternative B discussion above.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative C would have no significant impact on infrastructure.

4.10.3.4 Alternative D—No Action Alternative

This alternative would have no impact on plant infrastructure.

It is our finding that Alternative D would have no impact on infrastructure.

4.10.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

Alternative E would have similar impacts to infrastructure as those described under Alternative A. Operation of the dewatering facility would have no significant adverse impacts on electricity, fuel, potable water, wastewater and solid waste.

East Dalecarlia Processing Site
See Alternative A discussion above. Impacts would be similar for the East and West Dalecarlia Residuals Site.

Trucking Routes
See Alternative B discussion above.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative E would have no significant impact on infrastructure.

4.10.3.6 Forebay Residuals Treatment Option

It is our finding that Forebay residuals treatment option would have no significant impact on infrastructure.

4.11 Transportation

4.11.1 Definition

This section evaluates the potential traffic impacts of the construction and long-term operation of the proposed alternatives. Eight haul routes have been identified to convey the treated residuals to either Interstate 495 or 395 from the Dalecarlia Treatment Plant. The routes consist primarily of major arterial roadways within the District of Columbia, Maryland and Virginia. They have been selected to help Washington Aqueduct's decision-makers and other stakeholders understand the range of potential impacts associated with trucking the residuals to permitted offsite facilities. The routes provide a variety of truck hauling options to give the Washington Aqueduct sufficient operational flexibility, should trucking from the Washington Aqueduct property be determined to be a necessary component of the preferred alternative.

4.11.2 Transportation Significance Criteria

Impacts of truck traffic ranging from eight trucks per day under average conditions (5 days per week) to 33 trucks per day under peak conditions (5 days per week) were evaluated for each route. The evaluation included the identification of potential local traffic impacts. For the purposes of the local analysis, the extent of the haul routes considered was from the Dalecarlia WTP entranceway to a freeway, such as Interstate 495 (Beltway), Interstate 395 (Southeast-Southwest Freeway), or Interstate 295 (Anacostia Freeway).

The assessment of the potential local traffic impacts is based primarily on capacity/Level-of-Service analyses undertaken for the existing and future traffic conditions, including the proposed residuals hauling activity. Consideration is also given to the related recommendations of the proposed District of Columbia truck traffic management plan. The capacity analyses are based on the Highway Capacity Manual procedures, as required by the DC DOT.

"Level of Service" is a qualitative measure that describes operational conditions within a traffic stream or at an intersection, and reflects their perception by drivers and other roadway users. Principal considerations are factors such as speed and travel time, delay, freedom of maneuver, traffic interruptions, comfort convenience and safety. Current engineering practice defines six Levels of Service (A-F) with an "A" representing best operating conditions, and "F" representing worst operating conditions. The City's Ward 3 Plan indicates Level-of-Service C as the desired minimum standard. However, DC DOT generally considers Level-of-Service "D" as the minimum acceptable standard for planning and design purposes.

Additional factors were considered in the analysis. These included the future base condition, regional traffic growth trends, planned or proposed developments along the haul routes, and programmed roadway improvements.

Each alternative will be categorized according to three categories: no impact, no significant impact, and significant impact.

No Impact

An alternative will be considered to have no impact if it does not result in any change to the existing Level of Service and no road improvements are required to accommodate the alternative.

No Significant Impact

An alternative will be considered to have no significant impact if it does not result in any change to the existing Level of Service but minor road improvements are required to accommodate the alternative.

Significant Impact

An alternative will be considered to have a significant impact if it results in a change to the existing Level of Service and significant road improvements are required to accommodate the alternative.

4.11.3 Impact Evaluation by Alternative and Option

The existing transportation conditions assessment (presented in the Appendices) highlighted several opportunities and constraints regarding the immediate/local area roadway network and the haul routes under consideration. The key highlights are as follows:

a) The local area roadway network currently operates within the acceptable Level-of-Service standards of DC DOT, except for minor capacity constraints at the unsignalized Loughboro Road/Dalecarlia Parkway intersection, during the morning peak hour only.

b) Heavy trucks encounter some difficulty in traveling eastward along Loughboro Road, in front of the Sibley Memorial Hospital complex. This is due to a steep gradient in the roadway. Vehicles turning left into a secondary hospital entranceway from Loughboro Road exacerbate this situation.

c) The potential haul routes provide varying levels of opportunities and constraints based on their characteristics.

Of the five alternatives under consideration, Alternatives B and E rely on off-site trucking from Washington Aqueduct property for conveyance and ultimate disposal. For this reason, the transportation analysis focuses primarily on these two alternatives, and is appreciatively longer than for the other project alternatives.

4.11.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Northwest Dalecarlia Processing Site and Truck Route to the Monofill

As shown in Figure 4-1, this alternative would involve a "jog" movement, between the Dalecarlia WTP entrance and Loughboro Road, by residuals-carrying trucks. This movement would be required to access the Monofill area.

This alternative would primarily impact a relatively short (1,100 feet) section of MacArthur Boulevard. Based on the observed left-turning traffic conditions and roadway configurations at the affected intersections, the hauling operations would not have any appreciably adverse capacity/operational or safety impacts.

Monofill

No adverse impacts on transportation would occur at this facility.

Georgetown Reservoir

No adverse long-term impacts on transportation would occur at this facility. Only periodic maintenance and construction vehicles would access the Georgetown Reservoir site. No significant short-term impacts are expected.

Dalecarlia Sedimentation Basins

No adverse long-term impacts on transportation would occur at this facility. Only periodic maintenance and construction vehicles would access the sedimentation basins. No significant short-term impacts are expected.

It is our finding that Alternative A would have no impact on transportation.

4.11.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Northwest Dalecarlia Processing Site

See Trucking Routes discussion below.

Trucking Routes

As noted earlier, this would involve hauling the residuals to adjacent freeways, and to various sites. Eight haul routes from the Dalecarlia Reservoir to adjacent freeways were evaluated. These routes are illustrated in Figure 3-8.

The following factors were considered in determining the potential traffic impacts of the proposed residuals hauling process:

a) Projected increase in regional/through traffic on the local roadways and the extended haul routes, into the year 2024. This is based on the growth trends indicated by historical ADT obtained for locations along the routes;

b) Projected trip generation and assignment for planned/proposed land use developments within the immediate area of the Reservoir and the areas encompassing the extended haul routes;

c) Planned/programmed roadway improvements within the immediate site area and along the haul routes; and

d) Projected peak hour trip generation for the proposed residuals hauling activity.

Regional Traffic Growth Trends

The growth trends along the haul routes were determined based on ADT data provided by DC DOT, the Maryland State Highway Administration and the Virginia Department of Transportation (VDOT), for the period 1990 – 2004. The ADT data collected through mechanical/continuous counts undertaken as part of this project was also considered. The computed average annual growth rates are presented in Table 4-3 (next page).

The data show that traffic growth has declined generally over the period 1990 - 2004, except for Loughboro Road, Dalecarlia Parkway, River Road, and Dolley Madison Boulevard, which have experienced a marginal traffic growth.

Planned/Proposed Developments

The Development Activity records of the City's Office of Planning were reviewed to determine the land use developments that would have an appreciable adverse impact on traffic conditions along the potential haul routes. In addition, similar information was obtained through telephone discussions with staff of the Montgomery County Maryland - National Capital Park and Planning Commission (M-NCPPC) and the Fairfax County Department of Planning.

Based on the above, it was determined that major residential and commercial developments are planned for or are under construction along the Wisconsin Avenue corridor, within the Friendship Heights area of the District of Columbia and Montgomery County Maryland. Further detail on these developments is presented in the Cumulative Impacts Section. No significant land uses are planned for the other haul route corridors.

TABLE 4-3
Average Annual Growth Trends

Roadway Segment	Average Annual Growth Rate
1) MacArthur Boulevard, N.W.	
Loughboro Rd to City Line	-0.3%
Loughboro Rd to Arizona Ave	-1.2%
2) Loughboro Road, N.W.	
MacArthur Blvd to Dalecarlia Pkwy	+0.9%
3) Dalecarlia Parkway, N.W.	
Loughboro Rd to Western Ave	+1.4%
4) Massachusetts Ave., N.W.	-2.67%
5) Western Avenue	
Mass. Ave to River Rd	-2.4%
River Rd to Wisconsin Ave	-0.8%
6) Massachusetts Avenue (MD 386)	
Western Ave to Little Falls Pkwy	-0.9%
7) River Road (MD 190)	
Western Ave to Little Falls Pkwy	+1.7%
Little Falls Pkwy to I-495	+3.2%
8) Wisconsin Avenue (MD 355)	
Western Ave to MD 410	-0.3%
MD 410 to I-495	-2.9%
9) Dolley Madison Boulevard (VA 123)	
MD 193 to I-495	+2.0%
10) Georgetown Pike (VA 193)	
Chain Bridge Rd to VA 123	-5.6%
VA 123 to I-495	-3.7%

Source: DC DOT, Maryland State Highway Administration, VDOT and O. R. George & Associates, Inc.

Programmed Roadway Improvements

Discussions were held with staff of the District of Columbia and Virginia Departments of Transportation, and the Maryland Department of Transportation (MD DOT) Consolidated Transportation (FY 2004 – 2009) was reviewed to identify any roadway improvements planned/programmed for the proposed travel routes. Based on the above, the following was noted:

a) Resurfacing/rehabilitation improvements were recently completed along Dolley Madison Boulevard (VA 123), between VA 193 and I-495 in Virginia; and along Massachusetts Avenue (MD 396) between Western Avenue and Onondaga Road in Maryland.

b) No roadway improvements are currently programmed for any segment of the proposed haul routes.

Previous Dalecarlia Reservoir Dredging

The Dalecarlia Reservoir was dredged in the late 1990's after having not been dredged for an extended period of time. This operation is remembered in the adjacent residential community and only serves as a recent basis of comparison with the proposed residuals hauling under Alternative B. The dredging operation and truck hauling activities were scheduled between 6:00 a.m. and 4:00 p.m., on weekdays only. Table 4-4, on the next page, presents a summary of the dredging output/haulage activity between September 20, 1998 and July 4, 1999.

Table 4-4 indicates that the daily truckloads ranged from 5 to 83. The average daily output was 40 truckloads.

Projected Residuals Hauling Trips

Predicted Number of Truck Trips per Day

Alternatives B and E would require between 7 and 33 water treatment residual truck trips per day depending upon the volume of residuals being generated at the plant. The volume of residuals is impacted by weather conditions (i.e., rainfall) which can significantly impact the amount of silt and colloidal material present in the raw water entering the plant. Eleven years of historical raw water quality data was analyzed to determine the magnitude of the variations in raw water total suspended solids concentrations (a measure of the amount of silt and colloidal material is present in the water) and the frequency of the peaks. Two out of eleven years were characterized as "wet years" which exhibited significantly higher total suspended solids concentrations. Data from the entire 11-year period was also averaged to gain an understanding of typical peaks.

Table 4-5 summarizes the impact of these raw water quality variations on the number of water treatment residuals truck hauling trips that would be required if Alternative B or E were implemented. As shown in Table 4-5, the maximum required number of 33 truck trips per day occurs only for one week per year, 2 years out of every 11 years, during wet years. Under more typical wet years conditions, between 11 and 17 truck trips would be required per day. During average conditions, the number of truck trips drops further, averaging 8 trips per day over a long-term average and rising to 13 truck trips per year during the peak month each year. The transportation analysis presented in this section has been based on the maximum 33 truck trips per day value. However, the information presented in Table 4-5 shows that this number of trucks is not typically anticipated to occur.

In addition to the truck trip counts listed in Table 4-5, approximately one 4,000-gallon truckload of polymer would be required to be delivered to the Dalecarlia WTP every 24 days. This chemical is used in the residuals dewatering process.

TABLE 4-4
Dalecarlia Reservoir Dredging—Truck Trip Generation Summary (9/20/98 – 7/4/99)

Week		Truck	
From	To	Loads/Week*	Daily Average
9/20/98	9/20/98	38	8
9/29/98	10/03/98	50	10
10/04/98	10/10/98	183	37
10/11/98	10/17/98	123	25
10/18/98	10/24/98	155	31
10/25/98	10/31/98	171	34
11/1/98	11/14/98	0	0
11/15/98	11/21/98	25	5
11/22/98	11/28/98	119	24
11/29/98	12/5/98	134	27
12/6/98	12/12/98	106	21
12/13/98	12/19/98	96	19
12/20/98	12/26/98	73	15
12/27/98	1/16/99	0	0
1/17/99	1/23/99	271	54
1/24/99	1/30/99	221	44
1/31/99	2/6/99	222	44
2/7/99	2/13/99	231	46
2/14/99	2/20/99	255	51
2/21/99	2/27/99	322	64
2/28/99	3/6/99	413	83
3/7/99	3/13/99	282	56
3/14/99	3/20/99	389	78
3/21/99	3/27/99	366	73
3/28/99	4/3/99	250	50
4/4/99	4/10/99	284	57
4/11/99	4/17/99	363	73
4/18/99	4/24/99	206	41
4/25/99	5/1/99	254	51
5/2/99	5/8/99	260	52
5/9/99	5/15/99	306	61
5/16/99	5/22/99	222	44
5/23/99	5/29/99	361	72
5/30/99	6/5/99	320	64
6/6/99	6/12/99	270	54
6/13/99	6/19/99	56	11
6/20/99	6/26/99	0	0
6/27/99	7/3/99	142	28
7/4/99	7/13/99	129	26
	TOTAL	**7,668**	**39.66**

* Refers to the five (5) weekdays.
Source: GDC, Inc., and O. R. George & Associates, Inc.

TABLE 4-5
Water Treatment Residuals Trucking Distribution

Operating Condition	Required Trucks/Day (5 days per week)
Wet Year with Design Flow Processed by the WTP	
Design Event: Frequency = one week per year, two years out of every 11 years (or two weeks in 11 years)	33
Max Month Event: Frequency = One month per year, two years out of every 11 years (or two months in 11 years)	17
Annual Average Event: Frequency = daily average over 2 year period (every day average for two out of 11 years)	11
Long Term Average Conditions with Design Flow Processed by the WTP	
Max Month Event: Frequency = One month per year, every year	13
Annual Average Event: Frequency = daily average, every year	8

Anticipated Truck Hauling Schedule
It is anticipated that the proposed residuals hauling activity would to take place five days per week between the hours of 7:00 a.m. and 7:00 p.m. Truck trips will be minimized during critical morning and afternoon peak traffic periods.

Based on the above, residuals hauling activities associated with Alternatives B and E would have no significant impact on existing and future traffic conditions along all of the haul routes. The project would therefore not worsen traffic conditions along the impacted routes, from the perspectives of roadway capacity and operational efficiency. Alternatives B and E would also not impact the health, safety and welfare of existing and future roadway users, or the adjacent residential neighborhoods within the vicinity of the Reservoir.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative B will have no significant impact on transportation.

4.11.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Northwest Dalecarlia Processing Site
The Northwest Dalecarlia Processing Site is anticipated to have no impact on transportation. The treatment facilities proposed for this site under this alternative are limited to gravity thickening and pumping facilities. Neither of these facilities requires truck access similar to Alternatives A, B, or E.

Pipeline Route to Blue Plains AWWTP

The pipeline route to the Blue Plains AWWTP is anticipated to have no impact on transportation.

Blue Plains AWWTP and Trucking Routes

The Blue Plains AWWTP residuals processing facilities are anticipated to have no significant impact on the existing transportation infrastructure surrounding the Blue Plains AWWTP. Truck traffic departing from the Blue Plains AWWTP would exit the facility directly onto the Anacostia Freeway (I295) the same way the facilities Biosolids trucks exit the facility. Following the logic of this traffic analysis, quantification of impacts has not been done because the trucks are not using local roads.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative C would have no significant impact on transportation.

4.11.3.4 Alternative D—No Action Alternative

There would be no transportation impact from this alternative. Truck traffic currently associated with the operational needs of the Dalecarlia WTP would continue.

It is our finding that Alternative D would have no impact on transportation.

4.11.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

The analysis and conclusions for Alternative B apply to this alternative as well. If implemented, Alternative E would pose no significant, long-term impact on transportation. The truck traffic would approach the haul routes from the location of Little Falls Road at Dalecarlia Parkway. This existing intersection provides for full access movements and currently operates within the City’s acceptable Level of Service standards. This location would prevent loaded trucks from climbing the steep grade on Loughboro Avenue and would reduce noise impacts associated with this activity. The remainder of the haul routes would be the same as for Alternative B.

The impacted segment of Little Falls Road may not be constructed to carry heavy truck traffic and should be investigated further during the project’s design phase.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative E would have no significant impact on transportation.

4.11.3.6 Forebay Residuals Treatment Option

The modifications proposed for the Forebay would have no impact on transportation. Truck access to the Forebay would no longer be required, except to perform maintenance functions. The number of trucks required to periodically haul Forebay residuals to their ultimate disposal site would not change.

4.12 Visual Aesthetics

4.12.1 Definition

4.12.1.1 Analysis Procedure

This analysis of the visual effects of changes that might be brought about by the project is based on review of the data on existing conditions; project descriptions, maps, plans, elevations, and cross-sections, and, in some cases, computer-generated visual simulations of changes to views where project features have the potential to result in noticeable alterations of existing visual conditions.

For the views for which visual simulations were created, photographs are presented to represent the "before" conditions from each simulation viewpoint. Visual simulations were produced to illustrate the "after" visual conditions from each of these points, to provide a clear image of the location, scale, and visual appearance of the proposed facilities. The simulation images represent the project's features in the period immediately after completion of construction of the project feature and installation of the landscaping. The computer-generated simulations are the result of an objective analytical and computer-modeling process described briefly below. The images are accurate within the constraints of the available site and project data.

Computer modeling and rendering techniques were used to produce the simulated images of the views of the site as they would appear after development of the facilities. Existing topographic and site data provided the basis for developing an initial digital model. The project engineers provided site plans and digital data for the proposed project features, which were used to create three-dimensional (3-D) digital models. These models were combined with the digital site model to produce a complete computer model of the project features on their sites.

For each viewpoint, viewer location was digitized from topographic maps and scaled aerial photos, using 5 feet as the assumed eye level. Computer "wire frame" perspective plots were then overlaid on the photographs of the views from the simulation viewpoint to verify scale and viewpoint location. Digital visual simulation images were produced as a next step based on computer renderings of the 3-D model combined with high-resolution digital versions of base photographs. The final visual simulation images that appear in this analysis were produced from the digital image files using a color printer.

4.12.2 Visual Aesthetics Significance Criteria

Analysis of the project's impacts was based on evaluation of the changes to the existing visual resources that would result from construction and operation of the project. In making a determination of the extent and implications of the visual changes, consideration was given to:

4.12.2.1 Degree of View Change

The extent to which the project-related modifications will be visible, and the degree to which the project will alter the vividness, intactness, and unity of the view.

4.12.2.2 View Sensitivity

View sensitivity signifies the extent to which people are impacted by the changes. This includes the sensitivity of the view and the numbers and kinds of viewers who would experience it. This includes consideration of the number and sensitivity of the various categories of viewers who would experience each view, including residential viewers, recreational viewers, office and institutional viewers, and the number of viewers experiencing the view from vehicles. In visual impact analyses, it is commonly assumed that residential viewers are the most sensitive, that recreational viewers have a moderate degree of sensitivity (but that varies depending on the activity), and that viewers in vehicles have a lower degree of sensitivity (although it might be higher if they are on a designated scenic route).

The determination of whether the visual changes associated with a given alternative constitutes a significant visual impact takes into account the existing level of visual quality of the views affected, the degree of change, the numbers of viewers affected, and their degree of sensitivity.

Table 3-10 presents the visual quality scale that was applied to rate the simulated views to identify the visual quality of the view with the project in place. This rating was compared to the rating of the view under the pre-project condition to identify the degree to which the presence of the project would change the view's level of visual quality. To determine whether the project would have significant, no significant, or no impact on visual sensitivity, the degree of view change was evaluated in the context of the numbers of viewers and their relative level of sensitivity.

No Impact

An alternative was considered to have no visual impact if it either would result in no permanent changes to the visual environment or if it is occurring in an area with and existing level of visual quality that is low to moderately low.

No Significant Impact

An alternative was considered to have no significant impact if it occurs in an area that has an existing level of visual quality that is moderate and would either result in a decreases of visual quality by no more than one visual quality level, or is seen only by viewers with low levels of sensitivity or a small number of viewers with moderate to high levels of sensitivity.

Significant Impact

An alternative would be considered to have a significant impact if any of the views affected are of outstanding or high visual quality and if the project changes would reduce the level of visual quality of these high quality views by one visual quality level or more, and if the altered view would be seen by large numbers of sensitive viewers.

4.12.3 Impact Evaluation by Alternative and Option

4.12.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Residuals Treatment Facility

Description

Under this alternative, the residuals would be pumped to a new facility constructed on the Northwest Dalecarlia Processing Site (see Figures 4-2a and b). Here, the residuals would be thickened and dewatered to reduce the volume of residuals that ultimately requires disposal.

The residuals dewatering equipment would be housed in a building measuring approximately 76 feet wide, 128 feet long, and 78 feet high. The exterior of this structure would be clad in brick and will have architectural features intended to make it compatible with the existing water treatment plant buildings. The residuals processing facility would be surrounded by four gravity thickener tanks that would be approximately 110 feet in diameter and 21 feet high. The exterior of the thickener tanks would be clad with brick with a color that matches that of the bricks used on the exterior of the existing water treatment structures. Figures 4-3 and 4-4 are simulations that depict the facility as it will appear in views from the Capital Crescent Trail and from the hillside to the north.

Construction Impacts

Construction of the residuals treatment facility would take place over a period of approximately 32 months. In addition, a staging area would be established. Construction of the facility would entail a moderate amount of excavation. During the construction period, the residuals treatment facility site would have a disturbed appearance, with areas of exposed earth, the presence of cranes and other heavy equipment, and the presence of the exposed, partially built residuals treatment structure. To the extent that lighting is used during the construction period, it would be restricted to the levels required for safety, and light fixtures would be hooded and directed toward the work areas to minimize offsite impacts.

In the view toward the residuals treatment facility site from the Capital Crescent Trail, the area in the foreground of the view would be disrupted by ground disturbance and the presence of construction equipment, stored materials, and on-going construction activities. The existing character of this view would be changed by the presence of the construction activities, and the level of visual quality would be lowered to some degree. Given the large number of recreational viewers who would be seeing the changes in the foreground, but the short duration of their view, the overall degree of visual impact would not be substantial. However, because the construction impacts would be short term in nature, they would not be considered significant.

In the view from the hillside area to the north, the construction activity would be somewhat less evident because of the screening provided by the intervening vegetation. However, some of the ground disturbance and equipment, as well as the partially built structures would be highly visible, at least under leaf-off conditions, creating a moderately high level of change in the current character and quality of the view. The overall level of impact would not be significant because of the short-term nature of these impacts.

Construction work on the upper portions of the residuals treatment building may be visible through the forest from a few locations. Because of the distance, the forest screening, and the small portion of the view that would be affected, the level of impact will be low, and the short-term impact would not be significant.

Impacts During the Operational Period

As the simulation presented in Figure 4-3 indicates, the presence of the residuals treatment facility would alter the view seen from the Capital Crescent Trail (Viewpoint 1), decreasing the sense of openness, and partially blocking the view toward the area's hill backdrop. The aesthetic impact would be moderate because the change would be consistent with the visual character of the rest of the treatment facility campus, and although the facility would reduce the intactness of the view to some degree, it would have little adverse effect on its vividness and unity. Although this view is seen by very large numbers of recreational viewers (on the order of 1,200 per day on summer weekdays, and considerably more on weekend days) and is therefore relatively sensitive, the level of visual impact would be less than significant because this view's overall level of visual quality, which is now moderate, would not be substantially changed.

The simulation presented as Figure 4-4 is a view of the proposed northwest residuals treatment facility as it would appear in views from the hillside to the north (Viewpoint 3). As this photo indicates, under leaf-off conditions, the upper stories of the residuals treatment facility would be visible in the foreground of this view, and would alter the view's now-open character. In the winter, there would be a moderate degree of impact to the views from the parking lot and the residences on Leeward Place, and the overall level of visual quality, which is now moderate, would be reduced to some extent. During the summer, the change would be less apparent because of the tree screening. The impact is less than significant because of the moderate level of change in visual quality and the very small number of high sensitivity residential viewers.

Because of the thick forest screening, visibility of the residuals treatment structure from Brookmont (Viewpoint 3) would be very limited, even during leaf-off conditions. This is illustrated by Figures 4-2a and b. These cross sections from Brookmont through the proposed northwest residuals treatment facility demonstrate the screening role of the forest cover that lies between Brookmont and the project site. Given the proposed WTP structure's distance from potential viewing areas in Brookmont (600 feet and more) and the thick tree screening, the level of impact on views from Brookmont would be less than significant.

Monofill

Description

Figure 4-5 presents a topographic map of a portion of the reservoir property that indicates the location of the monofill and access road, and the contours of its final grading. The monofill would occupy an 800-foot by 1,800-foot area on the east side of the reservoir. The monofill area would be surrounded by a berm, and residual material deposited on the site would be placed in a mound that would extend up to as much as 80 feet above the existing ground surface. To provide access for the trucks that would transport the residuals to the monofill, an 800-foot long road would be constructed from Little Falls Road through the area on the southern and eastern edge of the reservoir property.

Construction Impacts and Impacts During the Operational Period

The construction and operational impacts of the monofill need to be considered together. The first stage of the monofill's development would entail building the monofill's access road, which would require clearing a corridor across a grassland area and through an area with a dense forest of mature hardwood trees. Creation of the monofill would require clearing the heavy tree cover on the monofill's 800-foot by 1,800-foot site, deposition of the residual material on the site, grading it into a mound-like form, and establishment of a vegetative cover on the slopes of the mounded material. The clearing and grading of the monofill site would occur in stages to limit the amount of forest disturbance that occurs at one time. The monofill would be filled incrementally in sections, reducing the area of active disturbance, and allowing some areas of the monofill to be temporarily renegotiated while filling takes place in other areas.

The monofill's access road would be visible in the open area along Little Falls Road opposite Sibley Memorial Hospital, but for the most part, it would be screened from view by the surrounding forest cover, and would have relatively little effect on views toward the reservoir property from the surrounding area.

Figures 4-6a and b present a set of cross-sections through the monofill that depict the monofill's extent and height. As review of the sections indicate, the height of the monofill would be lower than the height of the surrounding forest, and the forest buffer that would be retained around the monofill would screen the monofill in views from surrounding areas that are accessible to the public.

Figures 3-22, 3-23, and 3-24 in Section 3 are photos that represent existing views toward the monofill site from sensitive viewing locations. In the views from all of these areas, the monofill itself is not likely to be visible, particularly during the seasons when there are leaves on the trees, due to the presence of forest trees. However, in the views from MacArthur Boulevard and from the residential area in the vicinity of Chalfont Place (Figures 3-24 and 3-27) the existing view would be changed with the removal of a large area of the forest behind the tree screen to accommodate the monofill. This would reduce the mass of the tree canopy that is now visible against the skyline in these views and reduce the visual integrity of these views, resulting in a moderate level of impact on their visual quality.

The tree clearing and monofill may be visible to some degree from residences along 52nd Street and along the cul-de-sacs that extend from it in the bluff area on the east side of Dalecarlia Boulevard that overlooks the reservoir property. The tree clearing and monofill would be highly visible from the upper floors of Sibley Memorial Hospital In these views, the presence the forest clearing and the monofill have the potential to create a moderate to high degree of impact.

Construction of the monofill would conflict with NCPC policies that explicitly call for preservation of the open space character and natural area qualities of the Dalecarlia Reservoir, and to preserve forested areas and wooded buffer areas around federal facilities.

The visual changes the creation of the monofill would bring about impacts that would be seen by a large number of viewers along MacArthur Boulevard (the occupants of the 14,200 vehicles a day that use this street) and small numbers of sensitive viewers in the residential areas around Chalfont Place. Because the changes to views from these areas would be relatively subtle, the impacts to views from these areas would be less than significant. The potential exists that the changes to the views seen by small numbers of sensitive viewers in the area along 52nd Street and the larger number of viewers at Sibley Memorial Hospital would be substantial enough that the impacts on these views would be significant. Given the monofill's conflict with NCPC policies to protect the natural area qualities of the Dalecarlia Reservoir property, the aesthetic impacts of the monofill would be significant.

Georgetown Reservoir

Description

Under all of the alternatives being considered, a set of modifications would be made at Georgetown Reservoir to improve the removal of sediments. These modifications would include the installation of a new below ground pump station, located at the northern end of Basin No. 1, with associated above ground stair access enclosure. It is also anticipated that a new electrical building, measuring approximately 14 feet wide by 22 feet long by 12 feet high would be constructed in a low-lying area located immediately to the north of the north entrance to the reservoir property. The electrical building could be rectangular in shape or octagonal, to match the shape of the existing Influent Gate House. The low profile and consistent nature of the proposed facilities would honor the intent of the existing views. The proposed locations of these structures are shown in Figure 3-30 in Chapter 3.

Two small, floating dredges would also be installed at the Georgetown Reservoir. These dredges would be approximately 8 feet long by 22 feet wide by 4 feet high. These proposed changes at the Georgetown Reservoir are described in more detail in the Volume 4 of this DEIS and a simulated view of the proposed modifications is shown in Figure 4-12.

Construction Impacts

Construction of the pump station and electrical building would require the presence of stored materials and construction equipment on the site. The construction activities would be prominently visible in foreground views from nearby areas of MacArthur Boulevard and from the residential areas on the hillside to the east of it. The visual changes would not be significant. The construction period associated with the changes would be short and thus not significant.

Installation of the dredges would require little physical modification of the reservoir itself. Because dredge installation would take place relatively quickly and would not require the substantial presence of equipment, materials, and work crews at the reservoir site, it would have little effect on views of the reservoir from publicly accessible areas nearby, and its visual impacts would have no significant adverse impact.

Impacts During the Operational Period

The new structures and the dredges would be visible in views from nearby areas of MacArthur Boulevard, and Figure 4-12 is a simulation of its appearance from these areas. As this simulation indicates, the new structures would be visible in this view. As the simulation indicates, the dredge would be a relatively small feature floating on the surface of the reservoir, and would have relatively little effect on the character and quality of these views. The level of visual impact would have no significant adverse impact.

Dalecarlia Sedimentation Basins

Description

With the exception of new access walkways that span sedimentation basins 1 and 2 and the construction of a new access stair shaft located over the proposed residuals pump station, all of the sedimentation basin improvements would be constructed either below the sedimentation basin water surface elevation or below grade. Above grade structures would be constructed with brick facades, designed to honor the existing water treatment architecture.

A small underground pump station, housing a pumping station would be constructed at the southern end of the sedimentation basins located to the south of the Dalecarlia Water Treatment Plant. The proposed location of this structure is indicated on Figure 2-4. The pumping station would be constructed below grade with the exception of a stair access shaft that would extend approximately 12 feet above grade and measure approximately 6 feet wide by 14 feet long.

Construction Impacts

During the construction period, construction equipment, stored materials, and construction personnel would be visible in the open area near the pumping station site. The construction activities would be prominently visible in foreground views from nearby areas of Norton Street, and to a lesser degree from MacArthur Boulevard. Because of the small size of the new building, the level of visual change related to the construction activity would be limited.

Impacts During the Operational Period

When completed, the new pump station stair access shaft would be visible in the foreground area of the view from the residential area along Norton Street (Viewpoint 11). However, because of the small size, and its architectural compatibility with the rest of the water treatment complex, it would create relatively little change to the overall character and quality of the view of the view toward the water treatment campus from this area. The aesthetic impact of this project element would have no significant adverse impact.

It is our finding that Alternative A would have significant impact on visual aesthetics.

4.12.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Trucking Routes

No significant visual impact is anticipated on the trucking routes.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B would have no significant impact on visual aesthetics.

4.12.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Thickening Facility

Description

A residuals thickening and pumping facility would be constructed at the Northwest Dalecarlia Processing Site with this alternative. The thickening facility would be similar to the thickening portion of Alternative A and would include four gravity thickener tanks that will be approximately 110 feet in diameter and 21 feet high. Instead of surrounding a 78-foot high residuals dewatering building, the thickeners surround a one-story thickened residuals pumping building. As would be the case with the Alternative A facilities, the proposed residuals thickening and pumping facility envisioned for Alternative C would have brick exteriors and architectural detailing that is consistent with the architecture of the remainder of Dalecarlia.

Construction Impacts

The construction period impacts would be generally similar to those associated with the residuals treatment facility described under Alternative A. The primary difference would be that because the thickening facility's treatment building structure will be only one story tall, the activities related to the construction of the building will not be as visible or last as long as those related to construction of the residuals treatment facility.

The existing character of the view from the Capital Crescent Trail will be changed by the presence of the construction activities, and the level of visual quality will be lowered to some degree. Given the large number of recreational viewers who will be seeing the changes in the foreground of the view, the overall degree of visual impact will be significant. However, the construction impacts will be short term in nature and less than significant.

The construction activity will be somewhat less evident from the hillside area to the north because the intervening vegetation provides screening. Some of the ground disturbance and equipment, as well as the partially built structures will be visible, at least under leaf-off conditions, creating a moderate level of change in the current character and quality of the view. Based upon the short-term nature of these impacts and small number of viewers, the overall level of impact will not be significant.

The construction activities are not likely to be detectable in views from the Brookmont residential area. As a result, no significant short-term impact is anticipated.

Impacts During the Operational Period

As the simulation presented in Figure 4-7 indicates, the presence of the thickening facility may alter the view seen from the Capital Crescent Trail (Viewpoint 1), decreasing the sense of openness, and creating a small degree of blockage of the view toward the area's hill backdrop. The aesthetic impact will be moderately low because the change will be consistent with the visual character of the rest of the treatment facility campus, and although the facility will reduce the intactness of the view to some degree, it will have little adverse effect on its vividness and unity. Although this view is seen by very large numbers of recreational viewers (on the order of 1,200 per day on summer weekdays, and considerably more on weekend days) and is therefore relatively sensitive, the level of visual impact will be less than significant because this view's overall level of visual quality, which is now moderate, will not be substantially changed.

In views from the hillside to the north the low tank and thickening facility building will have limited visibility, and will not interfere with views out across the low lying area in which the Dalecarlia water treatment campus is located. As a consequence, the visual impacts of this alternative on this view are low and less than significant.

Because the thickening facility's relatively low features will be entirely screened by the thick forest cover that lies between the project site and the Brookmont residential area, the thickening facility would have no adverse impact on views from Brookmont.

Pipeline to Blue Plains AWWTP

Description

The pipeline that would be built under this alternative to transport the thickened residuals from the Dalecarlia facility to the Blue Plains AWWTP at the District's southeast corner, would follow the route indicated on Figure 3-31. The pipeline and its construction operations are described in detail in the Engineering Feasibility Study Compendium (EFS). Because the pipeline would be buried, it would not be visible. At Blue Plains AWWTP, the pipeline would terminate at the new residuals dewatering facility that would be built as a part of this project.

Construction Impacts

Because the pipeline would be built using directional drilling technology, the total area that would be disturbed during the construction process would be very limited. The disturbance would take place at a total of up to 22-drill rig and pipe feed sites as currently proposed whose locations are indicated on Figure 3-31. Each of these sites would be 100 feet by 150 feet in size, and would need to be entirely cleared of existing vegetation and any structures to accommodate the pipeline equipment and materials. The pipeline construction process would be expected to extend over several years.

The segment-by segment impacts on these sites are summarized below.

Segment A—Dalecarlia Treatment Plant to the Frances Scott Key Bridge
The northernmost of the sites in this segment is likely to be located on a sloped, heavily forested area on the eastern edge of Clara Barton Parkway. Use of this site would require removal of the mature forest cover and some degree of slope cutting and grading to create a flat working area. This area would be visible in the immediate foreground of views from Clara Barton Parkway. The creation of an excavated and cleared rig site immediately adjacent to Clara Barton Parkway would produce both a short and long-term change that would be moderately high and that would be significant because of its visibility to large numbers of travelers on the parkway.

Five of the sites are likely to be located in the forested area to the immediate west of the C& O Canal. Use of these sites would require removal of the existing forest cover, and would likely require cutting new roads through the forests to provide access for heavy equipment. In addition, temporary bridges over the canal may be required to get equipment to these sites. These changes would be visible from the canal, the recreational trail alongside it, and Betsy Ross Parkway and Canal Road. The temporary bridges across the C&O Canal would contrast with the historic appearance and scenic quality of the canal and have a significant short-term impact. The cutting of the forest cover to clear the drill rig and pipe feed pads and equipment access roads would create a high level of short-and long-term impact on views from the canal, the recreational trail, Clara Barton Parkway, and Canal Road.

The removal of the forest cover on the six rig and pipe feed sites likely to be located on lands that are a part of the C&O Canal National Historic Park would constitute a conflict with NPS policies. This forest cover removal would also constitute a conflict with policies of the NCPC to preserve forested areas.

The short and long-term aesthetic impacts of the directional drilling rig and pipe feed sites and the access provisions that would be required in this area will be significant.

Segment B—Frances Scott Key Bridge to Constitution Avenue.
Along this route segment, there may be a need for three or more rig and pipe feed sites. Because these sites would be readily accessible from existing streets, there would be no need to construct new access roads. These rig and pipe feed sites would be highly visible from adjacent, heavily traveled streets.

Development of the rig and pipe feed sites in this area would entail use of landscaped open space areas along major roads, and will require temporary removal of lawns, trees, and other plantings. The presence of the rig and pipe feed sites during the construction period would have a moderate to moderately high short-term impact on visual quality. With sensitive location and good screening, these impacts could be substantially reduced. Because any construction period impacts would be short-term, they would be less than significant.

Without restoration of the sites to their original condition, there could be a moderate to moderately high impact on visual conditions, which under some circumstances, could be significant. With the mitigation recommended, the long-term aesthetic impacts would be less than significant

Segment C—Constitution Avenue to the Anacostia River.
Along this route segment, there may be a need for up to five rig and pipe feed sites. Because these sites would be readily accessible from existing streets, there would be no need to construct new access roads. Development of rig and pipe feed sites in this area would entail use of landscaped areas within the Franklin Roosevelt Memorial Park and East Potomac Park that would require temporary removal of lawns, trees, and other plantings. The development of some of these sites may require removal of cherry trees, which are landmark features of national importance.

The presence of the rig and pipe feed sites during the construction period would have a moderately high to high short-term impact on visual quality. With sensitive location and good screening, these impacts could be reduced to some degree. Although the construction period impacts would be short-term, given the high sensitivity of this area, and the conflicts with NPS policies, the impacts are likely to be significant. With application of the mitigation measures, it is possible that these impacts could be reduced to a level that is less than significant.

Without restoration of the sites to their original condition, there would be a high impact on visual conditions, which would be significant. With the mitigation recommended, the long-term aesthetic impacts could be reduced to a level that is less than significant.

Segment D—North Bank of the Anacostia River to the Blue Plains AWWTP.
Along this segment of the route, there would be need for up to 6 drill rig and pipe feed sites. Because these sites would be readily accessible from existing streets, there would be no need to construct new access roads.

Development of the rig and pipe feed sites in this area would entail use of open space areas and portions of parking lots. In some cases, there may be a need to remove trees and other landscape plantings.

The presence of the rig and pipe feed sites during the construction period would have a moderate to moderately high short-term impact on visual quality, primarily on views from nearby housing areas. With sensitive location and good screening, these impacts could be substantially reduced. Because any construction period impacts would be short-term, they would be less than significant.

Without restoration of the sites to their original condition, there could be a moderate impact on visual conditions, due to loss of existing vegetation, but these impacts would be likely to be less than significant. With the mitigation recommended the probability that the long-term aesthetic impacts would be less than significant would be further increased.

Impacts During the Operational Period
During the operational period, the pipeline itself would have no visual effects because it would be buried. Although the new residuals treatment facility that would be developed at the Blue Plains AWWTP complex as a part of the pipeline alternative would be visible, at least in localized views within the Blue Plains AWWTP facility, it would not create significant adverse aesthetic effects. The aesthetic impacts of this facility would be limited because of its location well within the interior of the Blue Plains facility, (see Figure 3-31), where it will not be highly visible from residential and other potentially sensitive viewing areas, and where it would constitute a relatively small incremental addition to the assemblage of treatment facilities now visible in that area.

Northwest Dalecarlia Processing Site
See Alternative A discussion above.

Blue Plains AWWTP
The proposed modifications to the Blue Plains AWWTP would have no significant impact on the visual character of the existing Blue Plains plant. The new residuals dewatering building would be designed to match the architecture of the existing Blue Plains treatment facilities.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative C would have a significant impact on visual aesthetics.

4.12.3.4 Alternative D—No Action Alternative

Under the No Action Alternative, there would be no visible project-related changes to the Dalecarlia Reservoir and WTP, the Georgetown Reservoir, the Blue Plains AWWTP, or to the route of the pipeline that is proposed to connect the Dalecarlia facilities to the Blue Plains facility. Because the project would produce no visible changes, there would be no project-related impacts to project area aesthetic resources.

It is our finding that Alternative D would have no significant impact on visual aesthetics.

4.12.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

East Dalecarlia Processing Site

Description

Under this alternative, the residuals would be pumped to a new treatment facility that would be developed on the East Dalecarlia Processing Site, where it would undergo processing. The residuals treatment facility would be housed in a structure that will be approximately 76 feet wide, 128 feet long, and 74 feet high. The exterior of this structure will be faced with brick and be given an architectural treatment intended to make it visually compatible with the existing and planned structures at the nearby Sibley Memorial Hospital complex. The residuals treatment building would be surrounded by four gravity thickener tanks that would be approximately 110 feet in diameter and 15 to 21 feet high. The exterior of the thickener tanks would be clad with brick in a color that matches that of the bricks used on the exterior of the water treatment structures. The design of the residuals treatment facility is described in detail in the EFS. A footprint diagram of the proposed facility is presented in the EFS.

Construction Impacts

Construction of the residuals treatment facility at the East Dalecarlia Processing Site would take place over a period of approximately 32 months. In addition, a staging area would be established adjacent to the proposed facility location. Construction of the facility would entail a moderate amount of excavation. During the construction period, the residuals treatment facility site would have a disturbed appearance, with areas of exposed earth, the presence of cranes and other heavy equipment, and during a portion of the construction period, the presence of the exposed, partially built residuals treatment structure. In early morning and evening hours, during some portions of the year, use of floodlights would be required to illuminate areas where construction is taking place. Because no construction would take place after 8:00 p.m., the total number of hours when lighting would be required will be limited. To the extent that lighting is used during the construction period, it would be restricted to the levels required for safety, and light fixtures would be hooded and directed toward the work areas to minimize offsite impacts.

In the view toward the residuals treatment facility site from the Sibley Memorial Hospital Parking lot (Viewpoint 7), the area in the foreground of the view would be disrupted by ground disturbance and the presence of construction equipment, stored materials, and on-going construction activities. The existing character of this view would be changed by the presence of the construction activities, and the level of visual quality would be lowered to some degree, although because the site already has a somewhat disturbed appearance the change would not be substantial. In light of the moderate level of change to the site's visual quality, the moderate level of viewer sensitivity, and the relatively short-term duration of the construction period, Alternate E would have no significant short-term adverse impact.

In the views from MacArthur Boulevard (Viewpoint 8) and from Chalfont Place (Viewpoint 9), the construction activity would be considerably less evident because of the viewing distance, angle of view, and particularly, the screening provided by the intervening vegetation. Because relatively little of the construction activity would be visible in these views and because of the short term of the construction period, Alternative E would have no significant short term adverse visual impacts.

Impacts During the Operational Period

As the simulation presented in Figure 4-8 indicates, the presence of the proposed residuals treatment facility will alter the view seen from the Sibley Memorial Hospital parking lot (Viewpoint 7). The majority of the gravity thickeners and the truck hauling operations would be hidden from view by the existing berm located immediately north of Little Falls Road. This berm will be regraded to improve it's visual appeal as part of the project.

The simulation presented as Figure 4-9 is a view of the proposed east residuals treatment facility as it would appear in views from MacArthur Boulevard. The view of the proposed residuals dewatering is largely obscured by the trees and vegetation on the east side of the Dalecarlia Reservoir. As a result, no significant impact is predicted for this viewpoint

The simulation presented as Figure 4-10 is a view of the proposed residuals treatment facility as it would appear in views from residences in the area around Chalfont Place. The relatively similar mass of the proposed residuals building and the existing Sibley Memorial Hospital, combined with the natural tree screen provided between the Dalecarlia Reservoir site and the East Dalecarlia Processing Site, result in the proposed facility having no significant impact.

Trucking Routes

See Alternative B discussion above.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative D would have no significant impact on visual aesthetics.

4.12.3.6 Forebay Residuals Removal Option

Description

Under this option, a small dredge, similar to the dredges proposed for the Georgetown Reservoir, would be installed in the Forebay area of the Dalecarlia Reservoir to remove residuals from the river water before it enters the main body of the reservoir. The dredge is described in detail in the EFS and shown in Figure 4-11. Due to the similarity of the Georgetown Reservoir dredge, a simulation has not been prepared for the Forebay dredge. In addition to a dredge, a small, below ground pump station wet well would be constructed at the southwest corner of the Forebay. The pump station would be constructed entirely below grade with the exception of a stair access building approximately 6 feet wide by 14 feet long by 12 feet high. The stair access building would be constructed of materials that match surrounding buildings and positioned away from the primary view area from the Capital Crescent Trail.

Construction Impacts

The construction period activities would be visible to members of the public using the segment of the Capital Crescent Trail that is immediately adjacent to the Forebay. During this period, the views from the trail toward the Forebay would be altered by the presence of heavy construction equipment, stored building materials, and the activities of the construction workers. The installation of the dredge could be accomplished relatively quickly, limiting the visual impact. The pump station construction would take longer - perhaps one year. However, the proposed pump station location on the southern end of the Forebay minimizes visual impacts. Given the proximity of the construction area to the trail and the highly focused nature of the view, and the sensitivity of the trail's recreational users, the visual impacts would be substantial. However, because the construction activities will be short-term in nature, the action would have no significant adverse impact.

Impacts During the Operational Period

The proposed dredge will not alter the existing Forebay view since the Washington Aqueduct currently uses dredges to remove silt from the Forebay during the warmer months. The addition of a new below ground pump station at the southern end of the Forebay is also not anticipated to have a significant visual impact on the Forebay.

It is our finding that Forebay residuals treatment option would have no significant impact on visual aesthetics.

4.13 Socioeconomic and Environmental Justice

4.13.1 Definition

This section discusses potential social and economic impacts of implementing the alternatives. Socioeconomic impacts are linked through cause-and-effect relationships. Implementation of an action can affect socioeconomic conditions by changing the rate of population growth, the demographic characteristics of a community, or employment and income within the affected region. Government payrolls and local procurement contribute to the economic base for the region of influence (ROI). During the construction period, direct jobs will be created, generating new income and increasing personal spending. This spending generally creates secondary jobs, increases business volume, and can increase local revenues for schools and other social services. These effects cease when construction is completed. Ongoing changes in operational expenditures and jobs can create similar, long-term effects.

4.13.2 Socioeconomic Significance Criteria

Using the following criteria can identify the level of impacts:

No Impact

Implementation of the action would not appreciably affect population or regional economic activity. Regional economic modeling of direct, indirect, and induced growth is not required to determine significance of economic impacts. Minor population or employment growth is not enough to appreciably affect the demand for community services.

No Significant Impact

Implementation of the action would increase (or decrease) population or regional economic activity, but at a level consistent with historical fluctuations in population or economic indicators, as determined by regional economic modeling of direct, indirect and induced growth. Demand for community services may increase or decrease somewhat. Construction could disturb local business or recreational facilities at a level consistent with a typical construction project.

Significant Impact

Implementation of the action would increase or decrease population or regional economic activity above historical fluctuations in regional economic indicators, as determined by regional economic modeling. Implementation of the action would increase (or decrease) the demand for community services at levels that would require additional hiring (or layoffs) or cause overcrowding. Disruption of local business or recreational facilities would exceed that expectedof a typical construction project. Significant Impacts may be reduced to a no significant level by implementing appropriate mitigation measures.

Specifically, an action could cause significant impacts to these resources by:

• Population	Causing regional population to exceed historic rates of growth or decline
• Employment	Causing regional employment to exceed historic fluctuation in rates of growth or decline, or reducing jobs enough to affect the regional unemployment rate
• Income	Changing regional income by more than historic fluctuation in rates of growth or decline
	Causing a substantial increase in fees for Washington Aqueduct customers due to construction costs
• Community services (housing, schools, police, fire, medical, retail, recreation)	Causing residential population change or peak increase in workforce (including short-term construction workforce) to substantially increase or decrease demand, at levels that would require hiring (or layoffs) of public service personnel or purchase of additional equipment, or would cause overcrowding
	Disrupting local business by construction activities/ traffic blocking business entrances or customer parking for more than four hours per day for an extended period of time
	Taking a substantial amount of land out of recreational use without in-kind replacement, or disruption of recreational facilities due to noise, dust, or blocking entrances more than four hours per day for an extended period of time
• Environmental Justice	Creating potential for serious health and safety effects disproportionately affecting minority or low-income populations
• Protection of Children	Potentially causing uncontrolled safety risks or serious health risks affecting children

As detailed in the following subsections, the impacts related to regional economy, demographic changes and related services (housing, schools, and public safety), environmental justice, and protection of children were evaluated.

4.13.3 Impact Evaluation by Alternative and Option

For this resource, impacts are described by alternative, rather than by both treatment facility and alternative. The discussion for each alternative includes the Dalecarlia Sedimentation Basins and Georgetown Reservoir areas.

4.13.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Economic Development

Minor beneficial effects on the local and regional economy would be expected. Construction expenditures would increase business volume in industries that supply material and services, many (but not all) of which would be in the Metropolitan Washington Council of Governments (MWCOG) region. In addition, convenience businesses (retail, fast food, gas stations) in the local area near the construction site would benefit from personal spending by construction workers in the vicinity.

Due to the sheer size of economic activity within the MWCOG region and the District of Columbia, however, the Washington Aqueduct project is highly unlikely to have any appreciable economic impact upon the regional economy. The total anticipated construction expenditures for the monofill alternative ($63 million) pales in comparison to the aggregate federal spending within the MWCOG region each year ($87.5 billion) (MWCOG, 2002).

The cost of construction for Alternative A represents about 1.7 percent of the total value of commercial construction starts in the region during 2001-2002 ($3.7 billion). These MWCOG CCI data do not include construction of facilities that serve a utility purpose or public works projects that do not provide additional space for employees, such as water supply and treatment buildings, landfills, pipelines or sewer projects (MWCOG, 2002). If such construction projects were included in the CCI, the relative percentage for the Washington Aqueduct project would be even lower.

Based on the construction cost estimates contained in this DEIS, typical breakdown between labor and materials costs, and average construction wages in the region, construction of Alternative A would be expected to generate 165 full-time equivalent (FTE) construction jobs. With the large regional construction workforce within commuting distance of the work site, there would be no need for short-term employees to move into the area for the duration, however.

After construction, residuals processing and disposal in the monofill would generate only about 3.3 FTE permanent jobs and operations and maintenance expenditures of approximately $0.87 million each year, a miniscule amount in comparison to annual aggregate federal spending within the MWCOG region each year ($87.5 billion).

Demographics

Since the project sites themselves are located within the boundaries of the Washington Aqueduct properties and no employees are expected to move into the area as a result of this alternative, no population change is expected.

Housing

Construction employment would not be expected to generate any demand for short-term housing in the immediate area, because construction workers would commute daily to the work site from within the region. With the minimal increase in long-term employment, no appreciable effect on the local housing market would be expected. The Alternative A projects themselves are limited to the confines of the Washington Aqueduct property, thereby eliminating any chance of existing housing units being removed or altered.

Quality of Life

Some minor adverse effects to local recreational resources would be expected, along with some long-term beneficial effects, as described below. Construction traffic and noise would temporarily disturb residents living near Dalecarlia Reservoir. In addition, the view of the reservoir from the Capital Crescent Trail, as well as nearby residences, would be permanently altered, resulting in an adverse effect on visual resources. (See the Noise, Traffic, and Aesthetics and Visual Resources sections for more detailed discussion of these impacts.) The following paragraphs discuss effects on various community resources.

Law Enforcement, Fire, and Medical Services

No appreciable adverse effect on local public safety resources would be expected. Based on standard planning factors, the peak workload of 165 construction workers would generate only minimal additional demand for services of approximately 0.09 additional police FTEs, 0.07 additional fire fighter FTEs and 1.5 additional Emergency Medical Service (EMS) calls annually, for the three-year construction period.

Due to heightened security conditions after September 11th, a security contingency plan may be needed to protect the reservoir and WTP during the construction period. This could require some additional police/security personnel for the duration. However, the anticipated impact would be minimal.

Schools

No long-term adverse effect on local schools would be expected. There would be no population-driven change in school enrollments. However, minor short-term adverse effects are possible. In particular, noise and increased traffic could be a short-term nuisance to schools near the construction areas. Such effects are described in the Noise and Traffic sections.

Shops and Services

No long-term demand for shops and services would be expected to arise from the project. Since the area surrounding the proposed monofill site is almost exclusively residential, no major disruption to retail businesses in the area is expected. With the exception of Sibley Memorial Hospital, few other local businesses are located close enough to experience nuisance effects during construction. Local convenience businesses (retail, fast food, gas stations) would benefit from the additional construction workers in the area.

Recreation

Some impact to nearby recreation facilities would result from this alternative. With the construction of both a monofill on the reservoir property and the residuals treatment facility on the plant property, Capital Crescent Trail would be in close proximity to two construction sites. However, the entire property surrounding the water treatment facility is fenced off and removed from the trail and from Spring Valley Park, which is adjacent to the reservoir. A limited amount of open space available for passive and some active recreation may be temporarily reduced during construction. Noise and construction runoff could also be additional temporary nuisances.

Environmental Justice

Construction impacts are temporary in nature, but they can range from annoying to detrimental for those living near a construction site. None of the block groups immediately surrounding the two reservoir facilities are defined as minority or low-income areas (US Census, 2000). Therefore, no disproportionately adverse impacts to low-income and minority communities would be expected.

Protection of Children

In the short term, because construction sites can be enticing to children, construction activity could present be an unavoidable increased safety risk. Barriers and "no trespassing" signs will be placed around construction sites to deter children from playing in these areas. All construction vehicles, equipment and materials will be stored in fenced areas and secured when not in use. During construction, safety measures stated in 29 CFR 1926, Safety and Health Regulations for Construction, and other applicable regulations and guidance will be followed to protect the health and safety of residents surrounding the treatment facilities, as well as construction workers.

It is our finding that Alternative A would have no impact on socioeconomic and environmental justice issues.

4.13.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Economic Development

Like the other alternatives, Alternative B would result in minor beneficial effects on the local and regional economy, particularly to local convenience businesses during construction, but is would be unlikely to have any appreciable economic impact upon the regional economy. The cost of construction for Alternative B ($55.1 million) would represent from 1.5 percent of the total value of commercial construction starts in the region during 2001-2002 ($3.7 billion).

Alternative B would be expected to generate about 150 FTE construction jobs. With the large regional construction workforce within commuting distance of the work site, there would be no need for construction employees to move into the area during the three-year construction period.

After construction, residuals processing and contract hauling to a commercial landfill would generate only about 2.33 FTE permanent jobs and will require operations and maintenance expenditures of approximately $1.9 million each year, more than Alternative A (less than Alternative C), but still minor in comparison to annual aggregate federal spending within the MWCOG region each year ($87.5 billion).

Demographics

Since the project site is located within the boundaries of the water utility properties, and there would be no need for short-term or permanent employees to move into the area as a result of this alternative, no population change would be expected.

Housing

Construction employment would not be expected to generate any demand for short-term housing in the immediate area, because construction workers would commute daily to the work site from within the region. With the minimal increase in long-term employment, no appreciable effect on the local housing market would be expected. The Alternative B projects themselves are limited to the confines of the Washington Aqueduct property, thereby eliminating any chance of existing housing units being removed or altered.

Quality of Life

With the construction of the residuals treatment facility on the plant property, the Capital Crescent Trail would be in close proximity to one construction site. Construction traffic and noise would also temporarily disturb residents of the area. Unlike Alternative A, however, the view of the reservoir from the Capital Crescent Trail and nearby residences would not be permanently altered. Truck traffic would increase somewhat along certain routes. (See the Noise, Traffic, and Aesthetics and Visual Resources sections for more detailed discussion of these impacts.)

Law Enforcement, Fire, and Medical Services

No appreciable adverse effect on local public safety resources would be expected. Based on standard planning factors, the peak workload of 150 construction workers could generate only minimal additional demand for services, requiring about 0.09 additional police, 0.06 additional fire fighters, and 1.5 additional EMS calls for the duration of the construction period. As previously mentioned, heightened security during the construction period could require a few more police/security personnel than estimated by standard planning factors. The impact would be expected to be minor.

Schools

No long-term adverse effect on local schools would be expected. There would be no population-driven change in school enrollments. However, noise and increased traffic could be a short-term nuisance to schools in the vicinity of construction areas. Such effects are described in the Noise and Traffic sections. There are few schools in the immediate vicinity of Dalecarlia Reservoir (see the Noise and Traffic sections).

Shops and Services

No long-term demand for shops and services would be expected to arise from the project. Since the area surrounding the Dalecarlia Reservoir is almost exclusively residential and construction at Georgetown Reservoir would not be expected to affect access to local businesses. Local convenience businesses (retail, fast food, gas stations) would benefit from the additional construction workers in the area.

Recreation

An adverse but not significant effect to nearby recreation facilities would result from the proposed action. Construction of the residuals processing facility at the Dalecarlia site would cause construction nuisances and noise adjacent to the Capital Crescent Trail. Nevertheless, the entire property surrounding the water treatment facility is fenced off from the trail and Spring Valley Park. Alternative B would not be expected to reduce the amount of open space available for passive and some active recreation.

Environmental Justice

Construction impacts are temporary in nature, but they can range from annoying to detrimental for those living near a construction site. None of the block groups immediately surrounding the two reservoir facilities and trucking routes are defined as minority or low-income areas (US Census, 2000). Therefore, little or no adverse impacts to low-income and minority communities would be expected.

Protection of Children

In the short term, because construction sites can be enticing to children, construction activity could present an unavoidable increased safety risk. Barriers and "no trespassing" signs would be placed around construction sites to deter children from playing in these areas. All construction vehicles, equipment and materials would be stored in fenced areas and secured when not in use. During construction, safety measures stated in 29 CFR 1926, Safety and Health Regulations for Construction, and other applicable regulations and guidance would be followed to protect the health and safety of residents surrounding the treatment facilities, as well as construction workers.

It is our overall finding that Alternative B will pose no adverse impact to socioeconomic and environmental justice.

It is our finding that Alternative B would have no impact on socioeconomic and environmental justice issues.

4.13.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Economic Development

Alternative C has the highest construction cost and will result in higher, but still relatively minor beneficial effects on the local and regional economy. In particular, business volume of regional suppliers of construction-related goods and services, as well as local convenience businesses serving construction workers (over a much larger area than the other alternatives) would increase during the construction phase.

However, as described under Alternative A, due to the sheer size of economic activity within the MWCOG region and the District of Columbia, the project would be unlikely to have any appreciable economic impact upon the regional economy. The cost of construction for Alternative C ($165.1 million) would represent 4.5 percent of the total value of commercial construction starts in the region during 2001-2002 ($3.7 billion).

One sector would be affected only by Alternative C, however. Because this project would be one of the largest directional drilling construction projects in the nation, it has the potential to monopolize the regional directional drilling equipment and contractors for an extended period of time, with beneficial effects to those contractors but adverse effects to other pipeline projects. Alternative C could adversely affect scheduling and could increase the cost of other pipeline projects nationally. The impact cannot be quantified without detailed study, but significant delays to other pipeline projects are theoretically possible. In addition to directly affecting other pipeline construction projects, this could result in short-term, indirect economic effects from delays in users' access to natural gas, oil, water supply and wastewater removal in areas where such pipeline projects are planned.

Alternative C would be expected to generate about 450 FTE construction jobs. With the large regional construction workforce that exists within commuting distance of the work site (over 209,000 in 2002), there would be no need for short-term employees to move into the area for the duration.

After construction, the pipeline and residuals processing would generate only about 2.33 FTE permanent jobs and will require operations and maintenance expenditures of approximately $2 million each year, more than Alternative A but still minor in comparison to annual aggregate federal spending within the MWCOG region each year ($87.5 billion).

Demographics

Since the project sites themselves are located within the boundaries of the water utility properties, and there would be no permanent employees relocating to the area, no population change is expected.

Housing

As mentioned above, the projects themselves are limited to the confines of the Washington Aqueduct, NPS, or DC-WASA property, thereby eliminating any chance of housing units being removed or altered. Little or no need for temporary housing for construction workers would be anticipated, because construction workers would commute daily to the work site from within the surrounding region. Directional drilling contractors based elsewhere may bring in some equipment operators from outside the region, who would require temporary housing, but there is a sufficient supply of hotels/motels and rental housing within commuting distance in the region to accommodate them. (Due to the cost of close-in rental housing, however, their commutes could be an hour or more.) With the minimal increase in long-term employment, no appreciable long-term effect on the local housing market would be expected.

Quality of Life

Law Enforcement, Fire, and Medical Services

No appreciable adverse effect on local public safety resources would be expected. Due to heightened security conditions post September 11th, a security contingency plan may be needed during the construction period. The peak workload of 450 construction workers would generate only minimal additional demand for services. Up to 0.22 additional police FTEs, 0.18 additional fire fighter FTEs, and four additional EMS calls annually are estimated, for the duration of the construction period. Compared to the additional workload placed on District of Columbia resources during large public events on the National Mall and elsewhere in the city, this level of increased demand would be minimal.

Schools

No adverse effect on local schools would be expected. There would be no population-driven change in school enrollments. Since the pipeline passes by several schools along its projected route, however, increased noise and construction traffic could present short-term nuisances if any of the aboveground setup locations were near a school. Such disturbances are discussed in greater detail in the Noise and Traffic sections.

Shops and Services

No long-term increase in demand for shops and services would be expected from this alternative. It should be noted, however, that the pipeline route passes through several waterfront areas, with moderate to heavy commercial activity. Some disruption would be expected, but should not be significant, due to the relatively small areas of disturbance (similar to other utility projects).

Recreation

The pipeline would cross several parks, including but not limited to, East Potomac Park, Rock Creek Park, and the Chesapeake and Ohio National Canal Park. Additionally, several parks are within close proximity to the pipeline route. Increased noise and construction traffic, as well as possible restrictions on park use in certain areas would occur.

The directionally drilled construction of the pipeline would not be expected to interrupt marine and water-based recreational traffic where it passes under on the Anacostia River, but some disruption could occur at setup locations (“rig side” drilling or “pipe side” pipe pulling operations) along its shores.

Environmental Justice

Construction impacts are temporary in nature, but they can range from annoying to detrimental for those living near a construction site. None of the block groups immediately surrounding the two reservoir facilities are defined as minority or low-income areas (US Census, 2000). Two out of ten block groups crossed by the pipeline route are low-income areas, with one of the two also being a minority community. Overall, however, most of the pipeline route avoids low-income and minority areas.

The area (1-mile radius) surrounding the Blue Plains AWWTP (where the pipeline would end and a residuals processing plant would be built, which includes the area where trucks would enter and exit from the Anacostia Freeway) does meet the criteria for both a minority population and a poverty area.

However, since the construction site is in the middle of the Blue Plains AWWTP industrial facility, and Blue Plains is separated from adjacent housing areas by the Anacostia Freeway, there is very little chance that the construction project would result in direct adverse impacts to the low-income and minority population within the surrounding area. This project would not cause hazardous air emissions or surface water discharges, which are the only factors that might affect area residents separated from the site by a major road. The pipeline alternative would result in increased truck traffic entering and exiting Blue Plains AWWTP from the Anacostia Freeway, which is not likely to result in appreciable impacts to residents of the area compared to the existing traffic on that highway (see Transportation section).

Therefore, no disproportionately adverse impacts to low-income and minority communities would be expected.

Protection of Children

The impacts are similar to the previous alternatives.

It is our finding that Alternative C would have no impact on socioeconomic and environmental justice issues.

4.13.3.4 Alternative D—No Action Alternative

The No Action alternative would not effect local population or economic activity in the ROI. To the extent that continued discharge of sediments into the river affects fish populations or other environmental resources, the value of the river as a recreational resource could be adversely affected over time. (See the Biological Resources section for more information.)

It is our finding that Alternative D would have no impact on socioeconomic and environmental justice issues.

4.13.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

Siting the residuals facilities near the reservoir and Sibley Memorial Hospital, and using either Little Falls Road or a newly-constructed road to access Dalecarlia Parkway, would be similar to the effects of Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking (see discussion of that alternative for additional details).

Economic Development

Like the other alternatives, Alternative E is unlikely to have any appreciable economic impact upon the regional economy. The cost of constructing and operating the residuals processing facility would be similar to Alternative B. If a new access road is constructed, instead of using Little Falls Road, costs and construction jobs would increase but would remain below the cost of construction for Alternative C—Thickening and Piping to Blue Plains AWWTP. After construction, residuals processing and contract hauling to a commercial landfill would generate the same number of jobs and expenditures as Alternative B.

Demographics

As for Alternative B, no population change would be expected.

Housing

As for Alternative B, construction employment would not expected to generate any demand for short-term housing in the immediate area.

Quality of Life

Construction of the residuals treatment facility near Sibley Memorial Hospital would place it further from the Capital Crescent Trail and residences adjacent to the Dalecarlia treatment plant property, reducing the likelihood of temporary disturbance during construction to trail users and those residents in comparison to Alternative B. However, the view of the reservoir from the Capital Crescent Trail and from the other residences that adjoin the reservoir could be permanently altered, but to a lesser degree than for Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill. Truck traffic would increase somewhat along certain routes (but decrease along others in comparison to Alternative B). (See the Noise, Traffic, and Aesthetics and Visual Resources sections for more detailed discussion of these impacts.)

Law Enforcement, Fire, and Medical Services

Similar to Alternative B, no appreciable adverse effect on local public safety resources would be expected.

Schools

Similar to Alternative B, no long-term adverse effect on local school enrollment would be expected, but noise and increased traffic could be a short-term nuisance to schools in the vicinity of construction areas.

Shops and Services

Similar to Alternative B, no long-term demand for shops and services would be expected to arise from the project and construction would not be expected to affect access to local businesses. Local convenience businesses (retail, fast food, gas stations) would benefit from the additional construction workers in the area.

Recreation

An adverse but not significant impact to nearby recreation facilities would result from the proposed action. Construction of the residuals processing facility near Sibley Memorial Hospital would cause construction nuisances and noise adjacent to the Capital Crescent Trail, but to a lesser degree than for Alternative B where the construction site would be much closer to the trail. The entire property surrounding the reservoir is fenced off from the trail and Spring Valley Park. Although people who use areas outside the fence for passive recreation could experience nuisance effects during construction, and their view of the reservoir would be permanently altered, Alternative E will not directly reduce the amount of open space available for passive and some active recreation.

Environmental Justice

None of the block groups immediately surrounding the processing facility site near Sibley Memorial Hospital, the reservoir, and the associated trucking routes are defined as minority or low-income areas (US Census, 2000). Therefore, little or no adverse impacts to low-income and minority communities would be expected.

Protection of Children

In the short term, because construction sites can be enticing to children, construction activity could present be an unavoidable increased safety risk. Barriers and "no trespassing" signs would be placed around construction sites to deter children from playing in these areas. All construction vehicles, equipment and materials would be stored in fenced areas and secured when not in use. During construction, safety measures stated in 29 CFR 1926, Safety and Health Regulations for Construction, and other applicable regulations and guidance would be followed to protect the health and safety of residents surrounding the treatment facilities, as well as construction workers.

It is our finding that Alternative E would have no impact on socioeconomic and environmental justice issues.

4.13.3.6 Forebay Residuals Treatment Option

The method by which residuals are removed from the Forebay has no additional socioeconomic or environmental justice impacts.

It is our finding that Forebay residuals treatment option would have no impact on socioeconomic and environmental justice issues.

4.14 Cost

4.14.1 Definition

The potential cost to the customers represented by the proposed alternatives takes into consideration both initial capital costs and long-term operational and maintenance costs.

4.14.2 Cost Significance Criteria

No Impact

An alternative has no impact on cost if its capital cost (in 2004 dollars) is below the $50,000,000.00 capital budget allocation for the residuals project.

No Significant Impact

An alternative has no significant impact on cost if its capital cost (in 2004 dollars) is above the $50,000,000.00 capital budget allocation for the project but below amount equal to 30-percent over the budget allocation, or $65,000,000.00.

Significant Impact

An alternative has a significant impact on cost if its capital cost (in 2004 dollars) is above $65,000,000.00.

4.14.3 Impact Evaluation by Alternative and Option

For this resource, impacts are described by alternative, rather than by both treatment facility and alternative. For each alternative, the initial capital cost and the estimated annual costs are used to calculate the present worth, or present value of the project, using a 20-year evaluation period. It is assumed that present worth costs have a directly proportional impact on the rates charged by the Washington Aqueduct's wholesale customers. For this reason, present worth costs are useful for comparing and ranking the alternatives from a life cycle cost perspective. Specific rate impacts for each alternative have not been prepared for the DEIS. Cost serves as only one of the decision variables used to select the preferred alternative.

Table 4-6 presents a summary of the construction costs for the four alternatives (excluding Alternative D—No Action Alternative) that are evaluated in detail in this DEIS. These figures are prepared at an order of magnitude level. Costs for sedimentation and residuals collection options are also summarized in Table 4-8. As was discussed in Section 4 of the Engineering Feasibility Study Compendium, previous cost estimates by Whitman Requardt and Associates for facilities such as residuals conveyance through the Georgetown Conduit, thickening, and dewatering were updated for inflation and used as the basis for this estimate. New construction cost estimates were developed for other facilities, such as the modifications to the sedimentation basins and the residuals collection equipment for the Georgetown Reservoir and the Forebay.

For Alternative C—Thickening and Piping to Blue Plains AWWTP, it was assumed that a dewatering building, equivalent in cost to the one proposed for the Dalecarlia WTP, would need to be constructed at Blue Plains AWWTP.

The cost for the monofill was based on the cost for a monofill of similar size, constructed in Northern Virginia in the mid-1990s for lime residuals. Actual bid costs were used as the basis for the estimate and were updated for inflation.

TABLE 4-6
Order-of-Magnitude Construction Cost Summary for the Selected Alternatives

Cost Item	Alternative A Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill	Alternatives B and E Dewatering at Northwest or East Dalecarlia Processing Site and Disposal by Trucking	Alternative C Thickening and Piping to Blue Plains AWWTP
Retrofit of Existing Basins with Collection Equipment	$14,200,000	$14,200,000	$14,200,000
Dredging System at Georgetown	$2,400,000	$2,400,000	$2,400,00
Subtotal— Sedimentation and Residuals Collection	$16,600,000	$16,600,000	$16,600,000
Gravity Thickeners and Thickened Residuals Pump Station	$9,700,000	$9,700,000	$9,700,00
Dewatering Building	$19,700,000	$19,700,000	$19,700,00
Miscellaneous Support Facilities	$1,600,000	$1,600,000	$1,600,000
Subtotal— Collection and Processing Facilities	$47,600,000	$47,600,000	$47,600,000
Dalecarlia Monofill	$6,700,000	—	—
Thickened Residuals Pump Station and Pipeline	—	—	$95,000,00
Total Construction Cost ($2004)	$54,300,000	$47,600,000	$142,600,000
Construction Cost Escalated to Mid-Point of Construction (July 2008)	$62,900,000	$55,100,000	$165,100,000

Based on the construction costs listed in Table 4-7 (next page), Alternatives A would have no significant impact on cost because its cost is between $50,000,000.00 and $65,000,000.00. Alternatives B and E would have no impact on cost because their costs are each below $50,000,000.00. Alternative C has significant impact on cost because its cost is well above $65,000,000.00 and between 2.5 and 3.0 times the cost of the other three alternatives.

Table 4-7 presents preliminary present worth costs for each of the four alternatives evaluated in detail in the DEIS. Each alternative assumes that the existing Dalecarlia sedimentation basins will be retrofitted with residuals collection equipment and that new dredging equipment will be installed in the Georgetown Reservoir to collect residuals, along with a thickening and dewatering facility. The present worth cost was calculated for a 20-year project life at a discount factor (interest rate) of 3 percent.

Table 4-8 is a summary of the assumptions used to create the annual operations and maintenance (O&M) costs used in the evaluation. At this preliminary level of detail, the general conclusion is that Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill has the lowest present worth cost. Onsite processing with hauling of dewatered residuals to an offsite location (Alternatives B and E) has the second lowest present worth cost, Alternative C—Thickening and Piping to Blue Plains AWWTP has the highest present worth cost.

The costs presented in this DEIS are preliminary. It is important to note that cost is only one of the factors considered in choosing the recommended alternative for implementation. This DEIS evaluates other factors specifically pertaining to environmental and other impacts that will be used by Washington Aqueduct to choose the recommended alternative for implementation.

TABLE 4-7
Net Present Value for the Selected Alternatives

Residuals Process	Alternative A Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill	Alternatives B and E Dewatering at Northwest or East Dalecarlia WTP Location and Disposal by Trucking	Alternative C Thickening and Piping to Blue Plains AWWTP
Capital Costs			
Collection and Processing	$47,600,000	$47,600,000	$47,600,000
Additional Facilities	$6,700,000	$0	$95,000,000
Total Capital Cost ($2005)	**$54,300,000**	**$47,600,000**	**$142,600,000**
Annual O&M Costs			
Labor (Thickening and Dewatering)	$374,000	$374,000	$374,000
Labor (Monofill Operation)	$69,000	$0	$0
Chemicals (Thickening and Dewatering)	$238,000	$238,000	$238,000
Power	$117,000	$117,000	$192,000
Other (Monofill-Specific Costs)	$79,000	$0	$0
Other (Contract Hauling)	$0	$1,194,000	$1,194,000
Total (Annual O&M Costs)	**$877,000**	**$1,923,000**	**$1,998,000**
Present Worth Costs			
Present Worth of Annual Costs	$13,100,000	$28,600,000	$29,700,000
Salvage Value	$0	$0	$0
Net Present Value	**$67,400,000**	**$76,200,000**	**$172,300,000**

TABLE 4-8
Assumptions for the Preliminary Net Present Value Calculations

Category	Assumptions
Residuals Production	
Production	32 dry tons/day @ 30% dry solids; 109 wet tons/day
Average Operating Period	16 hours/day; 5 days/week; 52 weeks/year
Chemicals	
Polymer Use	8 to 10 Lbs. active material per ton of dry solids
Polymer Cost	$2.00 per pound of active material
Power	
Electrical Power Costs	$0.045 to $0.070 per kWh ($0.06/kWh was used for the evaluation)
Labor Costs	
Burdened Operations Labor Costs	$33.00 per hour
Burdened Managerial Labor Costs	$47.00 per hour
Managerial to Operations Ratio	1 to 6 (for thickening and dewatering only)
Thickening and Dewatering Labor	2 people; 16 hours/day
Landfill Labor	1 person; 40 hours/week
Contract Hauling	
Contract Hauling	$30.00 per wet ton
Net Present Value Calculations	
Discount Rate	3%
Present Worth Period	20 years
Salvage Value	None

Other Assumptions:

1. Maintenance costs for equipment and facilities are not included in the evaluation.
2. Annual costs for the monofill and costs for contract hauling are based on discussions with the Upper Occoquan Sewage Authority (Centreville, VA).
3. Costs for contract hauling will depend on the competitive environment and hauling distances.
4. Capital costs are not escalated to the mid-point of construction.
5. Cost calculations for assume that the capital and annual costs to thicken at the Dalecarlia WTP and dewater at Blue Plains are the same as an all-Dalecarlia WTP operation.

4.15 Implementation Uncertainty

4.15.1 Definition

As part of the EFS, the alternatives evaluated in detail in the DEIS have been determined to be feasible using a screening-level analysis. However, within this definition of feasibility there are varying levels of uncertainty regarding engineering, construction, and regulatory permitting implementation.

Using the assumption that uncertainty usually equates to a schedule delay, a qualitative evaluation was conducted for each alternative to identify aspects of project implementation with which some uncertainty is associated. This measure of uncertainty included an evaluation of questions such as:

- How common are the proposed construction methods?
- Is the permitting process standardized?
- What is the relative number of easements or inter-municipal agreements that need to be secured to allow construction of an alternative?

4.15.2 Implementation Uncertainty Significance Criteria

No Impact

An alternative has no impact on implementation uncertainty if it can be implemented within the FFCA schedule and there are no other agency issues of concern. Agency issues of concern could include the need for additional route studies, unexploded ordnance investigations, additional cultural investigations, etc. or an anticipated project cost that exceeds the project budget.

No Significant Impact

An alternative has no significant impact if it can be implemented within the FFCA schedule, there are agency issues of concern but they are small in number and do not prevent compliance with the FFCA schedule, and the project cost is within 130-percent of the budget.

Significant Impact

An alternative has a significant impact if it cannot be implemented within the FFCA schedule and agency approval will delay the project beyond the FFCA schedule, or the project cost is greater than 130-percent of the budget.

4.15.3 Impact Evaluation by Alternative and Option

The alternatives are ranked on a relative basis as to the uncertainty associated with their implementation. Impact areas for each alternative include the following:

4.15.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Alternative A has a significant impact on implementation uncertainty because it cannot be completed within the project schedule. A significant number of agencies would be required to approve the project due to forest mitigation issues. In addition, the project cost is above 130-percent of the $50,000,000.00 project budget. Specific areas of concern include the following:

Northwest Dalecarlia Processing Site

- Possible petroleum contamination at proposed Northwest Dalecarlia Processing Site ay need to be cleaned up as part of construction effort.

Monofill

- Unexploded ordnance investigations planned for the monofill site will not completed until 2008. Additional cleanup activities may be required after 2008. Both of these activities would need to be completed before construction could begin on the proposed monofill. Based upon these factors, this alternative cannot be completed within FFCA schedule.
- Tree protection requirements must be addressed as applicable to the monofill site. It is anticipated that a large number of existing trees located within the 30-acre footprint of the proposed monofill would qualify for consideration under this ordinance. Mitigation (through either planting seedlings or financial compensation) would likely be required to offset the loss of these trees if this alternative were implemented.
- Potential archeological issues pertaining to the monofill site must be addressed.
- Regional planning agencies, such as the National Capital Planning Commission, would need to review and approve the substantial change in the view shed associated with the existing Dalecarlia Reservoir and surrounding forested area. While possible, this approval process could require additional public meetings and take an extensive amount of time to accomplish.

Georgetown Reservoir

- The proposed modifications to the Georgetown Reservoir would not impact the implementation of this alternative.

Dalecarlia Sedimentation Basins

- The proposed modifications to the Georgetown Reservoir would not impact the implementation of this alternative.

It is our finding that Alternative A would have a significant impact on implementation uncertainty.

4.15.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Alternative B has no significant impact on implementation uncertainty because it can be completed within the project schedule with relatively minor agency input, and the project cost is within 130-percent of the project budget. Specific areas of concern include the following:

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Trucking Routes

Although area residents have expressed concern over the implementation of a trucking alternative, traffic studies reveal that disposal by trucking can be accomplished without adversely impacting Levels of Service on area roads. Given the relatively small number of truck trips predicted to be required and their negligible impact on level of service, disposal by trucking is not anticipated to cause any delay to the schedule or have any agency issues. These is no anticipated implementation uncertainty with this alternative.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

It is our finding that Alternative B would have no significant impact on implementation uncertainty.

4.15.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Alternative C has a significant impact on implementation uncertainty because it can not be completed within the project schedule, a significant number of agencies would be required to approve the project because of issues related to the pipeline, and the project cost is significantly above 130-percent of the project budget. Specific areas of concern include the following:

Northwest Dalecarlia Processing Site

See Alternative A discussion above.

Pipeline Route to Blue Plains AWWTP

- Even if directional drilling techniques are used to minimize the environmental impacts associated with the installing the proposed residuals pipeline, approximately 10 acres of land would need to be disturbed along the pipeline route (principally within the C&O National Historic Park). These impacts would be long term in nature, including the clear cutting of existing trees. Acquiring approval from the NPS for these activities is anticipated to be time consuming and perhaps, infeasible.

- Nineteenth century industrial waste is expected to be encountered in Georgetown waterfront area when the new pipeline is installed. This could delay project and increase costs.

- ROW issues would need to be addressed as follows:

> Construction of this alternative would require a Right-of-Way (ROW) permit from the NPS. A ROW permit is issued by the NPS to public utility companies for such things as water conduits that need to cross NPS lands. The ROW granted is not permanent and does not grant any interest in the land. It would only allow for construction of the pipeline. NPS is under congressional mandate to not allow any "use of NPS lands that would impair or be a degradation of the values or purposes for which the park was authorized or be incompatible with the public interest, except when authorized by Congress." (Appendix 5 Rights-Of-Way, NPS RM-53 Reference Manual: Special Park Uses, Release Number 1, April 2000, A5-1).
>
> The process for obtaining a ROW permit is stringent. The permitting process would require an initial request by the utility company to each of the five parks involved. The application would include a metes and bounds drawing illustrating each of the parks' features and the proposed pipeline. The permitting process also requires NEPA and Section 106 compliance in the form of an environmental assessment or environmental impact statement prepared by the utility company and submitted to

each park for approval. This is required “in every instance” when the resource is disturbed or affected. The submitted ROW permit would then be reviewed and approved by the NPS Regional Director. NPS authority for ROW permits is found in 36 CFR Part 14.

According to NPS permit guidelines, “all new utility lines in parks will be placed underground and in conduit.” (IBID, A5-2) For example, NPS requires that underground lines be directionally drilled; trenching is not allowed.

In order for this alternative to be implemented, a permit is required and, as part of the permit process, NPS requires a Phase I investigation for the length of the proposed pipeline that falls within NPS lands. A Phase I investigation would require a literature search and review of all documents and resources related to the parks. NPS staff, during a meeting (September 22, 2004), estimated that the Phase I investigation would take at least a year due to the amount of documents related to each of these historically significant parks.

Blue Plains AWWTP

- DC WASA has indicated that they must reserve space at Blue Plains AWWTP for future wastewater treatment facilities. As a result, DC WASA does not have any extra room available to construct new Washington Aqueduct water treatment residuals dewatering facilities on their site.

Georgetown Reservoir

See Alternative A discussion above.

Dalecarlia Sedimentation Basins

See Alternative A discussion above.

Additional Implementation Concerns

- The project can’t be completed within the FFCA schedule:
  - Pipeline routing and archeological studies need to be completed before the Final Environmental Impact Statement can be approved. These studies add approximately 1 year to the project schedule and may identify the need for a new route.
  - A very large number of local and federal stakeholders and associated permits are required to construct the pipeline. The timeline for permit acquisition will also impact the ability to meet the FFCA schedule for the project.
  - At least local and federal projects would be impacted along the pipeline route, increasing the likelihood of schedule delay and cost increase.
- The cost of the alternative is more than three times the budget amount.

It is our finding that Alternative C would have a significant impact on implementation uncertainty.

4.15.3.4 Alternative D—No Action Alternative

Alternative D has a significant impact on implementation uncertainty because it would violate the letter and spirit of the Washington Aqueduct FFCA and would result in noncompliance with the Clean Water Act. Significant agency opposition could be anticipated if this alternative were selected. Specific areas of concern include the following:

- USEPA does not intend to re-open the NPDES permit process or extend the overall FFCA schedule for the process. The previous NPDES permit approval effort took 9 years to complete and was an open, public process.
- The intent of Clean Water Act is use best management practices to remove residuals from water bodies similar to the Potomac River.
- This alternative is not feasible.

It is our finding that Alternative D would have a significant impact on implementation uncertainty.

4.15.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

Alternative E has no significant impact on implementation uncertainty because it can be completed within the project schedule with relatively minor agency input, and the project cost is within 130-percent of the project budget. Specific areas of concern include the following:

Trucking Routes
See Alternative B discussion above.

Georgetown Reservoir
See Alternative A discussion above.

Dalecarlia Sedimentation Basins
See Alternative A discussion above.

It is our finding that Alternative E would have no impact on implementation uncertainty.

4.15.3.6 Forebay Residuals Treatment Option

The Forebay residuals treatment option is not required to implement any of the other alternatives listed above. It represents an improvement to whatever alternative is ultimately selected. A significant level of implementation uncertainty is associated with the Forebay residuals treatment option because no funds are currently available for this option. As a result, it may not be constructed in this project phase.

4.16 Land Application of Water Treatment Residuals

This section of the study evaluates the impacts of using a licensed contractor to haul residuals to a licensed, non-dedicated land disposal site. This section is relevant to the following three residuals disposal alternatives that involve disposal of processed residuals via contract hauling:

- Alternative B: Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking
- Alternative C: Thickening and Piping to Blue Plains AWWTP

- Alternative E: Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

The market for contract hauling and disposal of water treatment residuals is expected to evolve to meet changing demand, location, and regulations during the 20-year design life of the project. An evaluation based solely on the permits and capacity of specific locations is unable to accommodate a variety of land disposal practices that may take place in a dynamic market place over a period of two decades. This section of the DEIS uses a programmatic approach to evaluate the ability of the residuals disposal marketplace to meet increasing demand within an approved regulatory environment. The evaluation is based largely on the recent history of land application and disposal of residuals in the Washington, DC metropolitan area.

4.16.1 Definition

Because the land disposal method of beneficial reuse of water treatment residuals is not discussed in Section 3 of the DEIS, this section provides the background information required to gain an understanding of how a land disposal program at the Washington Aqueduct would be permitted and regulated and how the program might be operated. This background information is provided first, followed by a discussion of the significance criteria used to evaluate each alternative and a discussion of the impact evaluation that results from the application of these criteria to each residuals alternative.

Background Information on Existing Regional Land Application Regulations and Environmental Impact Track Record

Regulatory Framework

Water treatment residuals can be land applied in both Maryland and Virginia. Both states have well-developed regulatory guidelines for the practice, which are summarized below.

Two local utilities, the Fairfax Water (formerly know as Fairfax County Water Authority (FCWA) and the Washington Suburban Sanitary Commission (WSSC), currently use land application as an important method for beneficial reuse of their water treatment residuals. These utilities are used as example cases in the subsequent text to describe the practices of local and regional utilities and contract haulers.

Regulatory Framework in Maryland

In Maryland, the land application of water treatment residuals is permitted through the Maryland Department of Agriculture (MDA) under the Maryland Commercial Fertilizer Law. The Soil Chemist Section of MDA administers the program. Because the nutrient content of the residuals is generally low, and because there is some variability in the composition of the residuals, the material is generally considered for registration as a "soil conditioner," and not as a "fertilizer."

To be approved for land application, the registrant must make a claim that the material can be used as a soil conditioner, and must provide MDA with a recent routine laboratory report for the residuals product for the Toxicity Characteristics Leaching Procedure (TCLP) test. The registrant must also:

- Submit to MDA a completed application form for registration of the product;

- Submit to MDA documentation that there is no industrial plant, or other facility (particularly a pulp and paper mill), discharging an effluent into the water source before the water treatment that would adversely affect the product;
- Notify MDA of the location and time of application of the residuals product, prior to application;
- Provide to MDA, upon request, or allow MDA to collect, a sample of any residuals product for analysis;
- Submit to MDA a monthly report on the application of each product, including:
- Site and location of the application;
- Method of application;
- Application rate of the product;
- Soil pH;
- Application rate of lime, if required to raise pH above 6.5;
- Total amount of nitrogen applied; and
- Total tonnage (net weight) of residuals applied.
- Prepare for each site of application an approved nutrient management plan;
- Submit to MDA a semiannual statement of the tonnage of each soil conditioner distributed and pay the inspection fee of $0.25 per ton, on a wet weight basis;
- Meet other requirements of the Maryland Commercial Fertilizer Law and regulations pertaining to distribution of soil conditioners or fertilizers.

Contractors are expected to apply water treatment residuals in a responsible manner. According to the state guidelines, "Registration by MDA of a water treatment residuals product as a soil conditioner or fertilizer does not imply approval of the application method used or the rate of application and does not preclude the registrant from complying with any State of local regulations or ordinances relating to air quality (odor), water quality, zoning, or transport, etc."

Regulatory Framework in Virginia

In Virginia, land application is regulated by the Virginia Department of Environmental Quality (VDEQ) under the Virginia Pollutant Abatement (VPA) program as an "industrial waste." This program is also used to authorize the land application of wastewater and wastewater biosolids (usually in rural areas). Consequently, the administrative requirements cover both treatment and disposal practices. The VDEQ Office of Water Resources Management (OWRM) issued an internal guidance document (OWRM Program Guidance No. 95-002) that provides guidance to staff for reviewing applications and writing VPA permits. The application process for the VPA permit tends to be somewhat more detailed than the corresponding Maryland permitting process. The VPA permitting process is outlined below to provide a full understanding of the regional context for the land application of water treatment residuals.

A preliminary meeting between the applicant and the permit writer is recommended by VDEQ before preparation and submission of VPA Permit Application Form C. The application is divided into Part C-I (a description of the residuals material and treatment, storage, and handling facilities, and Part C-II (a description of proposed land application sites. The following requirements are included in the Part C-I of the permit application:

- Facility name
- Sources of waste
- Narrative
- Flow chart
- Sewage handling (if applicable)
- Operational parameters
- Non-hazardous declaration (does not need to be supported with TCLP testing, but test results may be submitted, if available)
- Waste characterization (as described in the guidance document)
- Handling, treatment, and disposal of wastes
- Type of storage facilities
- Approved treatment and storage facilities
- Facilities expansion
- Conceptual design and groundwater protection (if applicable)
- Flood potential
- Facilities for the control of storm water runoff

The following requirements are included in the Part C-II of the permit application for a proposed land application site:

- Topographic maps and site plan
- Agronomic practices (level of detail depends on the frequency of use for the site)
- Land application methods and equipment used
- Soils maps and soils information
- Soil borings for frequent appliers
- Soil analysis
- Land area determination
- Hydraulic loading rate
- Site ownership
- Land owner authorization and signature

The written VPA permit may include monitoring requirements for the residuals, limitations on the hydraulic and mass loading rates, site monitoring that may include groundwater monitoring, and monthly and annual reporting requirements.

Regional Residuals Disposal Case Studies

Washington Suburban Sanitary Commission

WSSC operates two major WTPs in the Washington metropolitan area, the Potomac Water Filtration Plant (WFP) on River Road in Potomac, Maryland, and the Patuxent WTP in Laurel, Maryland. The Potomac Plant withdraws raw water from the Potomac River, and is located approximately 10 miles upstream of the Washington Aqueduct plant. It has an average design capacity of 190 mgd, and a peak production capacity of 285 mgd.

In order to minimize the discharge of alum residuals to the Potomac River, WSSC has recently upgraded the Potomac WFP by constructing residuals processing facilities (gravity thickening, followed by residuals dewatering).

The contract for the removal and transport of the processed residuals is procured through a competitive bidding process. The contract has been in place for about two years, and will be rebid in May 2005. A firm by the name of Deb's Trucking holds the current contract. WSSC is currently paying a price of $14.50/wet ton for the hauling service. The original bid was for $9.70/wet ton, compared to losing bids of about $18.00/wet ton. The contract price was renegotiated after the fact, because the selected contractor could not make a profit under the original bid price. In Fiscal Year 2003, average residuals production was about 1,483 wet tons/month. Total production for the Potomac WFP was 17,806 wet tons in FY 2003.

Presently, the processed residuals are not land applied in the traditional sense. However, they are used as a soil supplement. They are hauled to Beallsville Farms, a small "mulch and soil" blending operation in Beallsville, Maryland. The one-way hauling distance from the Potomac WFP to Beallsville Farms is about 20 miles.

Beallsville Farms creates various soil products by blending top soil, composted manure, mulch, and water treatment residuals together. The final product is sold to landscaping companies and is sometimes used for site reclamation. Allen Belt, the owner of the operation, is a retired farmer who gets additional income from this relatively small business. He describes WSSC's water treatment residuals as "real good dirt."

Fairfax Water

Fairfax Water operates major plants at two locations in Northern Virginia. At the Occoquan plants in the southern part of the county (the two plants at this location are currently being consolidated into one new facility), all residuals are discharged into a rock quarry. The supernatant from the quarry is discharged to the Occoquan River under a Virginia Pollutant Discharge Elimination System (VPDES) permit. Fairfax Water is currently negotiating the use of an adjacent quarry nine times larger than the one they are currently using. Since the combined capacity of these quarries is essentially unlimited, Fairfax Water has no plans to change its practices or add a dewatering facility at its Occoquan location.

The second Fairfax Water facility is the Corbalis WTP in Herndon, Virginia. It has a capacity of 150 mgd, and uses alum, polyaluminum chloride (PACL), or a combination of these two chemicals as coagulants. Residuals from this facility are thickened, dewatered, and hauled offsite for land application. Currently, plate and frame presses are used for dewatering. Lime is used as a residuals conditioner with the plate and frame presses. The added lime provides some additional value to the material for use as a Soil Conditioner.

Fairfax Water is evaluating whether to add belt filter presses to the dewatering operations in the future. The existing plate and frame presses are starting to get old, and the added lime is maintenance intensive. The Corbalis WTP has onsite facilities to store about 30 days of residuals, in the event that the material cannot be applied due to wet weather, etc.

Fairfax Water also selects the residuals hauling and land application contractor through a competitive bidding process. Enviro-Organic Technologies (E-OT), of New Windsor, Maryland is the current holder of the contract. FCWA described the cost for hauling and land application as approximately $20.00/wet ton for residuals lime conditioning, and

$23.00/wet ton for residuals without lime conditioning. Phil Snader, the owner of E-OT, estimated that future costs would be somewhat higher than the costs provided by Fairfax Water.

E-OT has been in business since 1996 and has a fairly large operation for the land application of water treatment residuals and residuals from the food industry. They are currently working with about 30 water treatment purveyors in several states and 30 to 40 Maryland farmers from Hagerstown to the Eastern Shore. While the Corbalis WTP is located in Virginia, residuals from the facility are land applied in Maryland.

E-OT is currently applying about 5,000,000 gallons of liquid residuals and about 35,000 wet tons of dewatered material per year. E-OT customers include FCWA (E-OT's largest contract), the City of Fairfax (VA), Berryville, VA, Staunton, VA, Rockville, MD, Camden, NJ, and Cumberland, MD. Most of the material that is collected for land application is composed of alum, ferric chloride, or alum/lime residuals.

Mr. Snader notes that the water treatment residuals are beneficial to the soil as a conditioning agent because they increase the water-holding capacity of the soil. This is especially important helpful during dry years. The residuals, while low in organic and nutrient content, can increase soil organic content over time due to the silt/sediments contained in the material. He noted that the material definitely can be of agronomic benefit to the soil, but that the benefit is different from that of biosolids from wastewater treatment, which act more as like a fertilizer than a soil conditioning agent. Mr. Snader is also a farmer and land applies the material on his own property.

Mr. Snader felt that the "market" was potentially large enough to absorb more water treatment residuals. However, he noted that he would have to recruit additional farmers to add another large water treatment facility, such as the Washington Aqueduct, as a new customer. Synagro was contacted to discuss the market outlook for the land application of water treatment residuals. Synagro was of the opinion that the market was not very strong for the land application of water treatment residuals because the nutrient value is low. However, they acknowledged that most of their current business is for the land application of wastewater biosolids, and that they have not performed a market analysis for the land application of water treatment residuals. Synagro did bid on the residuals contracts for both Fairfax Water and WSSC, so one can assume that they would also bid on a potential contract with the Washington Aqueduct. Their bids were competitive, but they did not win either contract.

Regional Environmental Impacts Track Record

Representatives from the Maryland Department of Agriculture and the VDEQ were contacted to review the procedures in place to minimize impacts associated with land disposal of residuals and discuss the environmental impacts track record of typical residuals land disposal contractors. Based on the location of the proposed Washington Aqueduct residuals processing facilities and the disposal track record of similar large local water utilities, Maryland and Virginia are considered the most likely locations to dispose of the Washington Aqueduct residuals.

The following impact criteria were used to gauge the environmental impacts track record for local land disposal contractors:

- Contractor or hauler certification requirements defined
- Residuals characterization required
- Primary nutrient loading evaluation required
- Application rates limited
- Routine submittals required to ensure effective controls
- Changes in operation require resubmission of information to regulators
- Record keeping requirements defined
- Penalties for violation defined
- Requirements for groundwater evaluation defined
- Inspection requirements defined
- Regulation of truck traffic addressed
- Issuance and compliance with Clean Water Act permits required

The following description summarizes the combined land disposal impact feedback received from the Maryland and Virginia regulators:

Contractor or Hauler Certification Requirements Defined

Disposal contractors typically obtain disposal permits from the state when a water utility chooses to hire a contractor to dispose of their residuals. This contractor would also typically be responsible for providing laboratory analysis data for the residuals to confirm their suitability for land application on the intended disposal site. Water utilities can also obtain disposal permits if they prefer.

Residuals characterization required: Both Virginia and Maryland regulations require the disposal permit applicant to submit residuals characterization data before approval can be obtained to land apply residuals.

Primary nutrient loading evaluation required: Nutrient loads are considered as the residuals management plan prepared for each land disposal site, along with proposed residuals application rates, crops being grown, etc. Nutrient loadings are not as significant a concern for water treatment residuals as they are for wastewater residuals, since water treatment residuals have relatively low nutrient concentrations.

Application rates limited: Application rates are reviewed as part of a regulatory submittal requesting approval of each waste or site. Alum-based water treatment residuals present a special case for regulators because over-application of these residuals can bind up phosphorous present in the soil to the alum residuals, making it unavailable for uptake by crops.

Routine submittals required to ensure effective controls: Both MDA and VPA require regular reports summarizing the status of the residuals land disposal practices to be submitted for review and approval. Information that can be required in these reports, depending on the state regulatory agency involved, includes application rates of specific metals (aluminum, copper, cadmium, etc.), general quality of applied material, groundwater monitoring well data (if required), etc. In addition to regular reports, VPA also requires each land applier to produce an annual report summarizing their land disposal activities.

Changes in operation require resubmission of information to regulators: Examples of changes in operation that would require additional information to be submitted to regulators include: the selection of a new residuals hauling contractor, requesting approval of a new disposal site, or changing the type coagulant used at the WTP (which could impact the constituents of the residuals requiring disposal).

Record keeping requirements defined: See routine submittals required to ensure effective controls write-up above.

Penalties for violation defined: Permit revocation or other enforcement procedures as defined by the regulatory body responsible for enforcement.

Requirements for groundwater evaluation defined: Maryland and Virginia have different approaches to groundwater monitoring. However, both states consider this issue in their evaluation of ongoing residuals disposal activities.

Inspection requirements defined: Maryland and Virginia regulate the land application of residuals to ensure that it is carried out in an environmentally sensitive manner. Periodic inspections are part of that compliance program.

Regulation of truck traffic addressed: Truck traffic associated with residuals disposal is generally not regulated by the same agency responsible for overseeing the proper disposal of the residuals. Truck inspection is the responsible of the Department of Motor Vehicles and appropriate state licensed inspection stations. Traffic enforcement is the responsibility of the local law enforcement department. Inside the District of Columbia, truck route designations are the responsibility of District of Columbia government.

Issuance and compliance with Clean Water Act permits required: In general, the well defined nature of the residuals disposal regulations in place in Maryland and Virginia and the presence of appropriate monitoring and enforcement programs and a generally good track record of compliance with these regulations indicates that land disposal of residuals can be accomplished in a environmentally responsible manner that results in minimal impacts.

4.16.2 Land Disposal Significance Criteria

Impacts are defined as no impact, no significant impact, or significant impact. Impacts are evaluated in three areas that affect the feasibility of developing a land disposal program for Washington Aqueduct:

- Regulatory framework and environmental impacts track record
- Availability of suitable resources (i.e., the “market” for the beneficial reuse of water treatment residuals)
- Best practices for implementing a land disposal program

4.16.2.1 Regulatory framework and environmental impacts track record

No Impact

An alternative is determined to have no impact if the regulatory framework for an action is not applicable to that alternative because the action is not a component of the alternative, or if a well-defined regulatory framework is currently in existence. The proposed residuals disposal alternative must also be viewed by the surrounding State regulatory agencies as having a good record of regulatory compliance to be considered as having no impact.

No Significant Impact

An alternative has no significant impact if the regulatory framework to allow an action is somewhat undefined, or if modifications, variances, or exceptions to current regulations would be required to allow an action. The proposed residuals disposal alternative should also be viewed by the surrounding State regulatory agencies as having a generally good record of regulatory compliance to be considered as having no significant impacts.

Significant Impact

An alternative would have a significant impact if an action would be expressly prohibited according to existing or anticipated future regulations or if the environmental compliance track record of the proposed residuals disposal practice is poor, indicating that compliance with established requirements is rare.

4.16.2.2 Availability of Suitable Resources

No Impact

An alternative has no impact if there is sufficient availability of suitable resources in the region to allow a land disposal program to be sustainable. Available land surface area (i.e., a sufficient number of farms in the region), the assimilative capacity of the available land, the availability of outside contractors, and the potential for contractors to operate a gainful profitable enterprise are all important considerations. Since Washington Aqueduct would likely procure an outside vendor to operate the land disposal program, this criterion can also be generally described as the “market” for the land disposal of water treatment residuals.

No Significant Impact

An alternative has no significant impact if an ongoing “market” for land disposal exists or if there is a potential market that can be developed further with a reasonable amount of research, effort, or expertise.

Significant Impact

An alternative has a significant impact if there is no “market” for the land disposal of residuals, or there appears to be little or no interest on the part of potential contractors in the action or practice due to the costs, level of difficulty, or perceived lack of benefit from the implementation of that action or practice.

Best Practices for Implementing a Land Disposal Program

No Impact

An alternative has no impact if the means and methods needed to successfully implement an action or practice are developed, understood, and widely disseminated or known by those who would be involved with implementation of the action. The impact of various constraints that Washington Aqueduct might impose on the land disposal operation (i.e., restrictions on truck routes or hours of operations, etc.) is also an important consideration.

No Significant Impact

An alternative has no significant impact if the means and methods for implementing an action are not well developed and understood, or not very widely disseminated or known by those who would be involved with implementation of the action. The potential imposition of operating constraints that might limit of feasibility of successfully operating the program would also fall into this category.

Significant Impact

An alternative has a significant impact if the means and methods for implementing an action have not been developed at all, are not understood, or are not widely disseminated or known by those who would be involved with implementation of the action. An example would be an action that could not be implemented until a significant amount of research is conducted, or until a new and "state-of-the-art" complementary or accompanying technology is developed that would enable potential users to understand how, or practically allow, users to implement the action.

A summary of the anticipated impacts for each alternative was evaluated based on regulatory framework, availability of suitable resources, and best practices. Details of the evaluation of anticipated impacts are presented in the paragraphs that follow.

4.16.3 Impact Evaluation by Alternative and Option

For this resource, impacts are described by alternative, rather than by both treatment facility and alternative.

4.16.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

There are no impacts in any of the three criterion areas because the monofill alternative does not involve land application of water treatment residuals via contract hauling.

It is our finding that impacts associated with Alternative A would have not be applicable to land application.

4.16.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Regulatory Framework and Environmental Impacts Track Record. A well-defined regulatory program exists in both Maryland and Virginia that would allow the land disposal of water treatment residuals. District of Columbia regulations are not relevant because there is no sufficiently rural and available land in the District that could accommodate the land disposal of water treatment residuals except for golf courses and parks. Because the Virginia regulations are part of the Virginia Pollutant Abatement Program, which was developed for the land treatment of municipal and industrial wastes, they would be more applicable to a utility that might want to create and operate a permanent program. The City of Newport News, Virginia, for example, has been spreading its alum residuals on a 320-acre forested plot within its reservoir watershed for approximately 10 years.

Maryland regulations, which are administered by the MDA, are structured to make the maximum use of individual plots of farmland. Once the residuals are certified as suitable for use as a soil conditioner, responsibility for administration of the land application program on a day-to-day basis falls to the contract hauler.

Because the regulatory framework for the land application of water treatment residuals in the region is well defined and the residuals land disposal industry has a good track record of environmental impacts, Alternative B was determined to have No Impact on this criterion. This determination assumes that Washington Aqueduct's residuals will be found suitable for use as a soil conditioner by the MDA.

Availability of Suitable Resources. Through discussions with utilities, regulators, and contractors, it was determined that the land disposal component of Alternative B is viable, but would have No Significant Impact. Two large plants, comparable in size to the Washington Aqueduct, were identified as having successful programs for the land application of alum residuals. Several firms did, indeed, bid on the WSSC and FCWA contracts, indicating that the market was active and viable, and that there are a number of vendors that would be interested in the contract.

However, the most active contract hauler indicated that additional agricultural end users would need to be identified before all of Washington Aqueduct's residuals could be assimilated into the market. Another large vendor indicated that they typically concentrate on the wastewater biosolids marketplace, but would likely bid on a Washington Aqueduct contract.

Consequently, it can be concluded that the market for the land disposal of water treatment residuals is viable, but that it is not as well developed as the market for the land application of wastewater biosolids. Further development of the market is needed to mitigate the impact of the increase of residuals to the marketplace that Washington Aqueduct's residuals would represent.

Best Practices for Implementing a Land Disposal Program. The land disposal component of Alternative B is expected to have No Impact with regard to the Best Practices criterion. Any potential impacts from land disposal will be mitigated through the use of best practices in well-run land application program. The best practices needed to maintain a sustainable land disposal program are well known, understood, and widely disseminated in the literature. Modern agronomic principles must be used to ensure that the assimilative capacity of a particular site is taken into account to determine the appropriate soil loading rate for the various minerals and nutrients in the residuals, as well as their potential interaction with crops and fertilizers. Use of best practices is expected, and is built into the regulatory framework already in place in both Maryland and Virginia.

Land application of biosolids, while not exactly the same as the land application of water treatment residuals, is the dominant method of beneficial reuse for wastewater residuals in the Maryland/Virginia region. The experience gained by utilities, contract haulers, and landowners through the land application of wastewater biosolids is directly applicable to the Washington Aqueduct program.

It is our finding that Alternative B would have no significant impact on land application.

4.16.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

At the time of this writing, it is assumed that if the pipeline alternative were to be implemented, the residuals pumped to Blue Plains AWWTP would be processed separately from the wastewater biosolids currently being processed at Blue Plains AWWTP. The processed water treatment residuals would then be land applied offsite. This would be a completely separate operation from that used for the Blue Plains biosolids. Therefore, all impacts would be offsite and all would be the same as those described below for Alternative B (Trucking from Dalecarlia WTP Site).

This evaluation does not consider other options that could be contemplated for Blue Plains AWWTP. For example, dewatered Washington Aqueduct residuals could be blended with dewatered Blue Plains residuals to create a custom "product" that might be suitable for special site reclamation applications, such as mine reclamation. The impacts of these options would potentially be greater than those for Alternative C because the regulatory framework for both the water treatment residuals and the biosolids could potentially be affected.

As Blue Plains AWWTP moves towards an operation to Class A biosolids in the future, it will need to either use a specified set of treatment processes to achieve the Class A certification, in accordance with Rule 503 regulations, or it will need to prove that its customized blending operation is equivalent. Because of the cost and time involved in the certification process, there may be a disincentive to experiment with a residuals blending operation, even if there may be some potential benefits of such an operation. It can be assumed, however, that any of these increased impacts could be mitigated through discussions with regulatory agencies and/or demonstration projects.

It is our finding that Alternative C would have no impact on land application.

4.16.3.4 Alternative D—No Action Alternative

There are no impacts in any of the three criterion areas because the No Action alternative does not involve land application of water treatment residuals.

It is our finding that Alternative D would have no impact on land application.

4.16.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

The residuals disposal aspects of this alternative are expected to be identical to those associated with Alternative B: Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking. Therefore, all impacts would be the same as those described for Alternative B.

4.16.3.6 Forebay Residuals Treatment Option

Should this option be implemented, Forebay residuals would be blended with water treatment residuals and disposed of under the same contract. Impacts would be the same as for Alternative B.

It is our finding that Forebay residuals treatment option would have no significant impact on land application.

4.17 Public Health

4.17.1 Definition

This section addresses potential public health impacts associated with the chemical and pathological characteristics of the two types of residuals produced at the Washington Aqueduct water treatment facilities, Forebay and water treatment residuals. Forebay residuals consist primarily of sand and silt particles that enter the front section, or Forebay, of the Dalecarlia Reservoir from the Potomac River and subsequently settle out of solution. Water treatment residuals consist of colloidal particles of natural organic material that remains in solution after the Dalecarlia Reservoir, combined with coagulant (currently alum) added to the raw water upstream of the sedimentation basins. Water treatment residuals are collected in the Georgetown Reservoir and Dalecarlia WTP sedimentation basins. Water treatment residuals are routinely dewatered and disposed of on land in this country.

Various analytical tests were performed on samples of Forebay and water treatment residuals to define any potential public health concerns associated with the land disposal of these residuals in either a landfill or dedicated monofill, or on agricultural land. TCLP, metals, and pathogen testing were performed on both types of residuals. The analytical results presented in this section include information collected during the 1994-1995 timeframe and during 2004. Both sets of residuals data are presented for comparison purposes.

4.17.1.1 Residuals Testing Protocols

No single test, or list of criteria, has been developed for the specific purpose of determining whether water treatment residuals could be detrimental to public health when applied to land. Generally, water treatment residuals are not viewed as hazardous due to the nature of the compounds produced through the use of coagulation chemicals, the historical track record of the water industry, and the relatively high quality of source water used to produce potable water. The Federal government has not developed regulations that specifically address this issue, and individual states handle the issue in a number of different ways, depending on how the residuals are being applied.

To address this question, samples of Forebay and Washington Aqueduct water treatment residuals were collected for analysis using a variety of different tests and criteria. The tests were originally developed for related purposes, and are sometimes required by regulatory agencies for the land application or disposal of water treatment residuals. The samples were analyzed using tests and standards originally developed for RCRA and the final "Standards for the Use and Disposal of Sewage Residuals," promulgated by the USEPA in 40 CFR 503, USEPA, 1993a (also known as the Part 503 Rule).

Residuals Toxicity

The TCLP is generally viewed as the recommended method of evaluating the mobility of both organic and inorganic constituents within a soil medium. Therefore, its use is applicable the monofill alternative (alternative A) and the three alternatives that would result in the land application of dewatered residuals (alternatives B, C, and E).

The TCLP test was developed for use in conjunction with RCRA, which governs the proper management of both hazardous (Subtitle C) and non-hazardous (Subtitle D) waste, including municipal waste. It is the responsibility of the waste generator to document that the waste material is not hazardous.

Toxicity is one of four characteristics used to determine whether a solid waste (i.e., a waste material that is not listed as a hazardous waste) should be classified as hazardous. The other characteristics are ignitability, corrosivity, and reactivity. Since the development of the RCRA regulations, toxicity has been defined by the extraction procedure associated with the TCLP.

For disposal of residuals within a monofill, TCLP sampling will be required. Some states also require TCLP testing when land application of residuals is planned. In some cases, the testing may only be required as part of the initial permit application process.

TCLP testing of water treatment residuals usually results in the finding that the residuals are not toxic. The TCLP determination is part of the Toxicity Characteristic (TC) rule. The TC of a waste material is established by determining the concentrations of eight metals and 31 organic constituents in the leachate from a waste sample.

Four steps are involved in the TCLP procedure:

- Sample preparation for leaching
- Sample leaching
- Preparation of leaching for analysis
- Leachate analysis

Metals Concentration

The Part 503 regulations provide standards for application of metals to land. While the regulations were developed for biosolids, and not for water residuals, they can be used to provide approximate boundary limits for the land application of all types of residuals, since no written standards are available for land application of water treatment residuals. However, the application rates (i.e., kg/hectare, etc.) for biosolids listed in the Part 503 regulations are specific to biosolids, and should not be used to develop application rates for water treatment residuals. Application rates for water treatment residuals are dependent on the assimilative capacity and agronomic needs of the soil and crops to which the materials will be applied. These application rates are generally developed on a case-by-case basis.

Water treatment residuals do not usually contain high concentrations of metals, other than aluminum, which is not listed as a metal of concern. Generally, the range of metals concentrations for water treatment residuals is similar to the background range exhibited by typical soils.

The Part 503 standards for metals are summarized in Table 4-9.

TABLE 4-9
Standards for Metals from the Part 503 Regulations

Metal	Ceiling Concentration (mg/kg)	Cumulative Pollutant Loading Rates (kg/hectare)	Monthly Average Concentration (mg/kg)	Annual Loading Rate (kg/hectare)
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Nickel	75	420	420	21
Selenium	420	100	100	5.0
Zinc	7,500	2,800	2,800	140

All values are on a dry weight basis

4.17.1.2 Pathogens

Water treatment residuals generally contain few or no pathogens due to the relatively good quality of the source water and the use of various disinfection or inactivation processes as part of the water treatment process. As with metals, the Part 503 regulations could cautiously be used as guidelines for the allowable maximum concentration of pathogens for land application.

Subpart B of the 503 Rule prescribes operational standards that designate the level of pathogen reduction required for certain wastewater biosolids management methods. Biosolids that can be designated as either "Class A" or "Class B" are suitable for land application. Class A biosolids can be used on a lawn or garden, sold, or distributed to the general public as fertilizers. Class B biosolids are generally applied to agricultural lands, subject to certain buffer and public access restrictions.

To achieve either designation, biosolids must achieve certain pathogen reduction goals through either a prescribed treatment process, or by demonstrating that the required pathogen reduction goals have been achieved.

Table 4-10 summarizes the maximum allowable pathogen concentrations for both Class A and Class B biosolids.

TABLE 4-10
Maximum Allowable Pathogen Requirements for Biosolids

Class A Biosolids
Use one of six USEPA-approved means/methods for achieving Class A treatment of biosolids, plus demonstrate pathogen reduction to the following levels:
<1,000 most probable number (MPN) fecal coliforms per gram of total solids
Or, >3 MPN Salmonella per four grams of total solids
Class B Biosolids
Use one of three USEPA-approved means/methods for achieving Class B treatment of biosolids. One of the methods includes demonstration of pathogen reduction to the following levels:
<2,000,000 MPN or coliform-forming units of fecal coliforms per gram of total solids

4.17.2 Public Health Significance Criteria

The potential public health impacts will be evaluated by comparing the residuals characteristics to the benchmarks and criteria described above. The chemical benchmarks and criteria to be considered will be those associated with land application permits and concentrations determined to be protective of the environment and public health through various regulatory programs. Impacts will be determined as follows:

No Impact

Analytical results which indicate that the Forebay and water treatment residuals are suitable for disposal in a monofill or through beneficial reuse by land application will be used to make a determination that the residuals are of no impact to public health.

No Significant Impact

Analytical results which indicate that there is a limited potential for the disposal in a monofill or through beneficial reuse by land application, or that additional treatment of the residuals would be required before monofilling or land application, will be used to make the determination that the residuals could be of no significant impact to public health.

Significant Impact

Analytical results that indicate that there is no potential for the disposal of the Forebay or water treatment residuals in a monofill or through beneficial reuse through land application will be used to make the determination that the residuals could be of significant impact to public health.

Residuals Sampling Results

Table 4-11 summarizes the results of the historical and recent laboratory analyses performed on the Washington Aqueduct Forebay and water treatment residuals. The results are broken down into three categories as follows:

- Historical Water Treatment Residuals Sampling Results (left side of table)
- Recent Water Treatment Residuals Sampling Results(center of table)
- Historical Forebay Residuals Sampling Results (right side of table)

TABLE 4-11
Insert 11x17 page 1 here

TABLE 4-11
Insert 11x17 page 2 here

Water treatment residuals have been sampled and analyzed twice, once during the 1994-1995 timeframe and, more recently, during 2004. Historical water treatment residual metals and nutrient test results obtained during the 1994-1995 timeframe were previously summarized in Exhibit 2-1 of the September, 1995 report prepared by Whitman, Requardt, and Associates in association with Malcolm Pirnie, Inc. entitled Dalecarlia WTP and Georgetown Reservoir Residuals Disposal Facilities—Residuals Disposal Study. Historical water treatment residual TCLP results obtained during the same timeframe were previously summarized in Exhibit 2-2 of the same September, 1995 report. Table 4-11 presents a summary of these previous water treatment residuals sampling results.

Forebay residuals were also sampled in the 1994-1995 timeframe as part of a Dalecarlia Reservoir dredging activity. Historical sampling results were previously summarized in a May 14, 1995 memorandum prepared by CH2M HILL, entitled Report for Sediment Testing of Dalecarlia Reservoir. Table 4-11 presents a summary of these previous Forebay residuals sampling results. Forebay residuals were not re-sampled as part of the current project phase.

The historical Forebay sample results are considered representative of the current residuals water quality since the raw water quality has not changed significantly since 1994-1995.

As shown in Table 4-11, TCLP and metals and nutrient analyses have been performed on both water treatment and Forebay residuals. Pathogen analysis has only been completed on water treatment residuals.

In addition to the sampling results associated with each category of residuals, Table 4-11 also identifies regulatory levels (or maximum allowable concentrations) for each constituent listed on the left side of the table. The regulatory levels listed for the constituents common to both TCLP and Part 503 Sludge Regulations tend to be different for each test. This is appropriate because the analytical protocols followed for the two types of tests are quite different (i.e., a leachate analysis is used for the TCLP versus a more robust digestion procedure to determine residuals concentrations for the Part 503 Sludge Regulations).

4.17.2.1 Historical Water Treatment Residuals Sampling Results

Both centrifuge and belt filter press dewatered residuals cake data are presented under the Historical Water Treatment Residuals Sampling Results heading in Table 4-11. This data was collected during the 1994-1995 timeframe as part of a previous residuals dewatering pilot program.

TCLP Results

In all cases, the historical water treatment residuals TCLP concentrations are significantly below the regulatory levels assigned to the associated constituent, indicating that the water treatment residuals have historically been non-toxic.

Metals and Nutrient Test Results

In all cases, the historical water treatment residuals metals concentrations measured for the centrifuge or belt filter press cake were lower (typically much lower) than the 503 Sludge Regulation requirements for metals, indicating that the residuals are suitable for land application. Other metal and nutrient concentrations are typical for water treatment residuals and do not offer any cause for concern.

4.17.2.2 Recent Water Treatment Residuals Sampling Results

Recent Water Treatment Residuals Sampling Result data are also presented under the Historical Water Treatment Residuals Sampling Results heading in Table 4-11. The recent residuals sample was collected directly from one of the sedimentation basins located at the Dalecarlia WTP. This residual sample was not dewatered mechanically prior to analyzing it for the constituents listed in the Table 4-11. However, the historical and recent water treatment residuals data are directly comparable.

TCLP Results

In all cases, the recent water treatment residuals TCLP concentrations are significantly below the regulatory levels assigned to the associated constituent, indicating that the water treatment residuals continue to be non-toxic.

Metals and Nutrient Test Results

In all cases, the recent water treatment residuals metals concentrations are lower (typically much lower) than the 503 Sludge Regulation requirements for metals, indicating that the residuals are suitable for land application. Other metal and nutrient concentrations are typical for water treatment residuals and do not offer any cause for concern.

Pathogen Test Results

The pathogen test results obtained during the recent water treatment residuals sampling event indicate that the fecal coliform level is very significantly below the maximum count considered appropriate for land application, indicating that the water treatment residuals are suitable for land application.

4.17.2.3 Historical Forebay Residuals Sampling Results

Select TCLP, metals, and nutrient analyses were performed on historical residuals removed from the Dalecarlia Reservoir Forebay as listed in Table 4-11.

TCLP Results

In all cases, the historical Forebay residuals TCLP concentrations are significantly below the regulatory levels assigned to the associated constituent, indicating that the Forebay residuals are also non-toxic.

Metals and Nutrient Test Results

The historical Forebay residuals metals concentrations are also much lower than the 503 Sludge Regulation requirements for metals, indicating that the Forebay residuals are also suitable for land application. Other metal and nutrient concentrations are typical for reservoir residuals that consist of primarily sand and silt.

4.17.2.4 Residuals Sampling Conclusions

The combination of the historical and recent Forebay and water treatment residuals analytical results indicate that both types of residuals produced by Washington Aqueduct are not-toxic, comply with the 503 Sludge Regulations and are consistent with other typical water treatment residual concentrations, and contain a relatively low pathogen count. The sum of these results indicates that the Forebay and water treatment residuals are entirely suitable for land disposal.

4.17.3 Impacts Evaluation by Alternative and Option

For this resource, impacts are described by alternative, rather than by both treatment facility and alternative.

4.17.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

The Forebay and water treatment analytical results are consistent with Alternative A. Public health criteria have no impact on this alternative.

It is our finding that Alternative A would have no impact on public health.

4.17.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

The Forebay and water treatment analytical results are consistent with Alternative B, or any other alternative that involves land disposal of Forebay or water treatment residuals. Public health criteria have no impact on this alternative.

It is our finding that Alternative B would have no impact on public health.

4.17.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

The residuals public health issues associated with this alternative are identical Alternative B issues. Public health criteria have no impact on this alternative.

It is our finding that Alternative C would have no impact on public health.

4.17.3.4 Alternative D—No Action Alternative

The results of the residuals public health analysis have no impacts on this alternative. Water treatment residuals are not disposed of on the land with this alternative and the Forebay residuals public health analysis indicate that there is no impact on the existing Forebay residuals disposal methods.

It is our finding that Alternative D would have no impact on public health.

4.17.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

The residuals public health issues associated with this alternative are identical Alternative B issues. Public health criteria have no impact on this alternative.

4.17.3.6 Forebay Residuals Treatment Option

Public health criteria have no impact on this treatment option because it does not result in any changes to the concentration of the constituents associated with the Forebay residuals.

SECTION 5

Public Involvement

5.1 Public Involvement

The National Environmental Policy Act (NEPA) process is the systematic examination of possible and probable environmental consequences of implementing a proposed action. The requirement for public involvement (40 CFR 1506.6) recognizes that all potentially interested or affected parties will be involved when practicable. Public comments are to be invited and two-way communication is to be encouraged. Public involvement is specifically provided for in a scoping process and also in the preparation of draft and final Environmental Impact Statements.

5.1.1 Scoping Process

The scoping process (40 CFR 1501.7) is intended to help determine the range of actions, alternatives and impacts for consideration in the Draft Environmental Impact Statement (DEIS). A scoping meeting is typically held as an informal meeting during this process where the gathering and evaluation of information relating to potential environmental impacts can be initiated. The initial scope of the DEIS is determined by the project proponent, in this case the Washington Aqueduct, during and after the scoping process.

A Notice of Intent (NOI) to prepare a DEIS appeared in the *Federal Register* on January 12, 2004. The NOI described the regulatory mandate for the project, the objectives of the proposed action and the range of alternatives that may be considered. The NOI also described the date and location of the Public Scoping Meeting and the overall scoping process.

A public scoping meeting was held on Wednesday January 28, 2004 at the St. Patrick's Episcopal Church and Day School from 7:00 to 9:00 p.m. A display advertisement for the Scoping Meeting ran in both the *Washington Post* and the *Northwest Current* on January 22, 2004. A personal invitation letter was mailed on January 14, 2004 to 63 agency officials, community representatives, and private citizens previously associated with the Washington Aqueduct environmental issues.

The scoping meeting was conducted as a public open house. Participants were able to attend at any point during the two-hour period of availability and view a series of eight exhibit boards illustrating different aspects of the project. Each of the exhibits was staffed by an employee of the Washington Aqueduct knowledgeable about that particular aspect of the project. Topics discussed on the boards included:

- historical information about the Washington Aqueduct including treatment process used to produce potable water,
- summary of content of the new National Pollutant Discharge Elimination System (NPDES) permit explaining the reasoning for mandating that the Washington Aqueduct to remove residuals from the Potomac river,

- a description of some potential methods to collect, convey, process and dispose of residuals,
- background on the NEPA process, the process for screening alternatives as well as the suggested criteria used for screening which meet the project's purpose and need,
- a listing of the disciplines that will be evaluated in the detailed DEIS, for example air quality,
- and the project schedule.

A stenographer was available to record comments of individuals wishing to have their concerns incorporated into the project record.

The potential impact of truck traffic in the neighboring communities emerged as a dominant theme of the comments during the scoping meeting and during the entire 30-day Scoping Period, which ran from January 12, 2004 to February 11, 2004. Additional comments focused on processing technologies, non-trucking alternatives, and concerns related to continued river discharge of the residuals.

After the meeting, a copy of the exhibit boards and a summary of the Scoping Meeting were posted on a public webpage http://washingtonaqueduct.nab.usace.army.mil/aqueduct.htm developed exclusively for this project. This summary also stated that the Washington Aqueduct would hold a public forum to discuss the alternatives that would be evaluated in detail in the DEIS.

In response to the dominant Scoping Period theme of truck traffic concerns, the Washington Aqueduct worked in its technical feasibility study to identify and include project alternatives that did not feature the use of trucks to transport residuals to processing or disposal locations. During the scoping process two ideas were received from the public for new project alternatives. One alternative included the use of Plasma Oven technology to reduce the quantity of residuals and another alternative featured the use of barges on the Potomac River to transport residuals to the Blue Plains Advanced Wastewater Treatment Plant (AWWTP) in Southwest DC. Both of these ideas were fleshed out technically and then evaluated carefully to see if they met the purpose and need of the project. This process is discussed thoroughly in the Engineering Feasibility Study Compendium, Volume 4 of the DEIS.

5.1.2 Public Involvement During the Preparation of the DEIS

During the preparation of the DEIS, four (4) public forums were hosted by the Washington Aqueduct to provide interested members of the public with an opportunity to better understand the project and the proposed alternatives. The Washington Aqueduct also participated by invitation in a variety of forums hosted by other groups to continue to describe the project and the alternatives being evaluated in the DEIS.

5.1.2.1 First Public Forum

The Washington Aqueduct hosted a public outreach meeting on May 26, 2004 at the Sibley Memorial Hospital Ernst Auditorium from 7:00 to 9:00 P.M. to describe the screening process and the detailed alternatives so that interested members of the public could understand how the project was progressing and better anticipate the content of the DEIS.

A display advertisement ran in the *Northwest Current* on Thursday, May 20, 2004 and in the *Washington Post* on Monday, May 24, 2004. A personal invitation was mailed to 144 neighbors living in the vicinity of the Dalecarlia Reservoir grounds in Maryland and 88 letters were sent to residents in the District of Columbia in addition to the letters sent to the list of agency officials, community representatives, and private citizens contacted directly during the scoping period.

The public meeting started with a slide presentation followed by an open house question and answer session. The appearance and operation of the proposed residuals monofill emerged as a dominant theme during the question and answer period that followed the presentation. Additional comments focused on truck traffic, other alternatives to consider for the Feasibility Study and residuals disposal technologies.

5.1.2.2 Second Public Forum

In response to increasing public interest in the project, the Washington Aqueduct hosted a public forum on September 7, 2004 at its Dalecarlia Treatment Facility. This meeting was advertised by mailing 1,040 letters to Maryland and DC residents in the broad vicinity of the Dalecarlia facilities and to the list of agency officials, community representatives and private citizens contacted previously. Also, display advertisements were printed in the *Northwest Current*, the *Bethesda Gazette*, and the *Washington Post.* This meeting was conducted as a public open house with participants able to attend exhibit stations focused on the alternatives screening process and presenting details on the three project action and no-action alternatives being evaluated in the DEIS. The appearance of the proposed residuals monofill was again a dominant theme of the public comments. Additional comments focused on the desire of the area residents for greater engagement in the screening process and the shortcomings of the open house format for large-group question and answers.

5.1.2.3 Third Public Forum

As a follow-up to the expressed public concerns, the Washington Aqueduct re-opened the period during which the public could suggest new residuals alternatives between September 10, 2004 and November 15, 2004 and hosted a third public forum on September 28, 2004 at the Sibley Memorial Hospital Ernst Auditorium from 7:00 to 10:30 p.m. This meeting was advertised similarly by mailing approximately 1,200 letters to neighbors, community representatives and agency representatives, and by printing display advertisements in the *Northwest Current*, the *Bethesda Gazette*, and the *Washington Post.* The meeting featured an update on the technical analyses on the project alternatives. This update included descriptions of the range of topics to be evaluated in the DEIS and information about aspects of each alternative that affected their ability to be implemented as a Proposed Action in the DEIS. Public comments during this forum focused on the public notification for the January 28, 2004 Scoping Meeting, the alternatives screening process, the monofill and its relation to the American University Experiment Station (AUES) Formerly Used Defense Site (FUDS) project, the physical appearance of the proposed residuals management facilities, comments about the potential toxicity of the residuals, truck traffic, and the U.S. Environmental Protection Agency's (US EPA's) enforcement of the Clean Water Act.

5.1.2.4 Fourth Public Forum

As a follow-up to the previous public meetings, the Washington Aqueduct held a fourth public forum on November 16, 2004 at the Sibley Memorial Hospital Ernst Auditorium from 7:00 to 10:00 p.m. This meeting was advertised similarly by mailing approximately 1,200 letters to neighbors, community representatives and agency representatives, and by printing display advertisements in the *Northwest Current*, the *Bethesda Gazette*, and the *Washington Post.* The meeting featured an update on the technical analysis of the project alternatives, with particular emphasis paid to the feasibility of the Blue Plains AWWTP alternative. The status of the other alternatives being evaluated in detail, including public alternatives submitted during the first re-opened public alternative submission period that ended on November 15, 2004, was also discussed. Public comments focused on their desire for the Washington Aqueduct to locate another site for the residuals facilities that did not require construction of a large processing building near the Brookmont community or to develop an alternative that did not require trucking residuals through neighborhood streets. Some public participants expressed concern that compliance with the FFCA schedule was a factor in preventing alternatives from becoming the proposed action. The Washington Aqueduct maintains that the FFCA schedule compliance is an essential element of the project's purpose and need and would continue to help determine the feasibility of any alternative.

5.1.2.5 Public Hearing Held by the District of Columbia Committee on Public Works and the Environment

The Public Works and Environment Committee of the Council of the District of Columbia held a public hearing was held on November 17, 2004 at 4:00 p.m. in the John Wilson Building to discuss the Washington Aqueduct's proposed disposal of solids from its water treatment process. Councilperson Carol Schwartz chaired the hearing. The hearing included public testimony by four members of the public and Tom Jacobus of the Washington Aqueduct. The Washington Aqueduct portion of the testimony summarized the status of the DEIS project, including a description of the feasible alternatives and the issues limiting the implementation of some of the alternatives. The contribution of 102 new public alternatives or options, submitted during the recently closed public alternative suggestion period was also noted.

5.1.2.6 Additional Stakeholder Outreach

The Washington Aqueduct also worked to respond to specific inquiries made by individuals when possible. This included meeting with individual stakeholders and representatives of groups of stakeholders. The following is a project-related listing of meetings, presentations, and tours involving the Washington Aqueduct:

- Meeting with Montgomery County MD Department of Environmental Protection representatives (February 2004)
- Meeting with DC Council Staff (May 2004)
- Meeting with Advisory Neighborhood Commission (ANC) 3D Commissioners (July 2004)
- Meeting with Montgomery County Maryland Council Member Denis, Montgomery County Maryland Department of Environmental Protection representative, and Westmoreland Citizens Association Co-presidents (July 2004)

- Meeting with individual Westmoreland Hills resident (July 2004)
- Attended Coordinating Committee on Friendship Heights meeting (July 2004)
- Meeting with Maryland Congressional Staff (July 2004)
- Meeting with Bon Air Heights residents (August 2004)
- Meeting with Westmoreland Citizens Association Co-presidents, other Westmoreland residents, attorneys, a Spring Valley resident, and Maryland congressional staff member (September 2004)
- Several meetings with (including a tour for) Brookmont residents (September – October 2004)
- Tour for Westmoreland Citizens Association Co-presidents and another Westmoreland resident (November 2004)
- Meeting with “Sludge Stopper” representative (November 2004)
- Presentation at Spring Valley (AUES FUDS) Restoration Advisory Board (November 2004)
- Meeting with Bon Air Heights residents (November 2004)
- Palisades Citizens Association meeting (December 2004)
- Tour for a Brookmont resident and Westmoreland Citizens Association attorneys and engineer (December 2004)
- Meeting with Sibley Memorial Hospital Administrator
- ANC meeting (March 2005)
- Palisades Citizens Association meeting (March 2005)

5.1.2.7 Project Website

The Washington Aqueduct created and maintained a website specifically for this project. The address of the website is: http://washingtonaqueduct.nab.usace.army.mil/aqueduct.htm. The website was made available to the public in January 2004. It has been updated periodically with specific documents related to the NPDES Permit and compliance agreement, as well as documents generated as part of the NEPA process. In addition, contact information and a comment form is available on the website.

5.1.3 First Extension of Alternatives Identification Period

At the September 28, 2004 Public Forum the Washington Aqueduct noted that interested members of the public could provide additional project alternatives for consideration through November 15, 2004. The second alternatives identification period was re-opened on September 10, 2004.

Participants at the meeting were informed that the screening process applied to the set of alternatives in the Feasibility Study would be applied to any new alternatives put forward by the public. If new alternatives met the project’s purpose and need as expressed in the screening criteria they would be included in the DEIS. Screening criteria is described in Section 2 of this document and the EFS (Volume 4 of the DEIS).

During this comment period the Aqueduct received 102 suggested alternatives and options. One alternative suggested by the public in this comment period was to construct a dewatering facility on federal property controlled by the Navy at Carderock, Maryland. This site was seen to have the advantages of proximity to the Capital Beltway. The needs of the project were subsequently presented to the Navy. The Navy, after their evaluation, determined that providing the space required by the project was inconsistent with their ongoing mission.

Another alternative suggested by the public during this period was that the dewatering facility should be located at the east Dalecarlia processing site. This alternative may have better truck access to the Dalecarlia Parkway compared to the northwest Dalecarlia processing site. This alternative is included as Alternative E: Dewatering at East Dalecarlia Processing Site and Disposal by Trucking.

5.1.4 Second Extension of Alternatives Identification Period

At the request of U.S. Senator Paul Sarbanes from Maryland, the Washington Aqueduct on December 23, 2004 issued a second extension to the alternatives identification period. This period ended February 14, 2005. The screening process and criteria used for the feasibility study and the first extension to the alternatives identification period were applied to the 40 alternatives, options or ideas received during the second extension period.

The 40 new alternatives proposed by the public during the third alternative identification period were similar to some of the alternatives suggested during the second alternative suggestion period. Many of these alternatives involve constructing some or all residuals facilities at other water treatment utility sites, such as the WSSC Potomac WTP or FCWA Corbalis WTP sites, or at other federally owned sites, such as the Carderock site. Three new sites, not previously considered, were also suggested. These included the CIA and FHWA, federally owned sites located in Virginia, and the Rockville WTP site. As a coutesy to the organization that suggested these alternate locations, representatives from each of these facilities were contacted to determine if it would be feasible to construct a Washington Aqueduct residuals facility at their location. Following evaluation, two of the new agencies (CIA and the Rockville WTP) have indicated that they cannot permit a Washington Aqueduct residuals facility to be constructed on their site. The third agency (FHWA) has not yet responded, however, regardless of the availability of their land this alternative is not feasible because it cannot be implemented within the FFCA schedule and does not meet the cost screening criteria. The screening analysis for these new alternatives is summarized in the Engineering Feasibility Study Compendium—Volume 4 of the DEIS.

5.2 Agency Consultation

As part of the DEIS, the Washington Aqueduct consulted with those agencies with jurisdiction over environmental resources within the project area. This section includes a summary of the consultation with these agencies and the dates when consultation occurred. More complete notes for each of these meetings are provided on the project web site.

5.2.1 April 7, 2004 Project Team Meeting with DC WASA

Discussed feasibility of sending water treatment residuals to Blue Plains AWWTP for treatment via Potomac Interceptor

5.2.2 June 10, 2004, Project Team Meeting with USEPA Region 3

Held in Philadelphia, Pennsylvania. Submitted the draft Engineering Feasibility Study (EFS) to USEPA for their review and presented the DOPAA public meeting information.

5.2.3 July 15, 2004, Project Team Meeting with the Spring Valley Project Team at Baltimore District Headquarters, U.S. Army Corps of Engineers

Discussed status of AUES FUDS cleanup activities and associated issues related to the Dalecarlia Reservoir site.

5.2.4 August 16, 2004, Project Team meeting with DC WASA

Held at the Dalecarlia WTP. Continued to discuss feasibility of sending water treatment residuals to the Blue Plains AWWTP.

5.2.5 September 1, 2004, Project Team Meeting with National Park Service representatives for the C&O Canal National Historical Park

Held at C&O Canal Park offices in Hagerstown, Maryland. Discussed the feasibility of obtaining a construction permit for a new residuals pipeline parallel to the existing Potomac Interceptor.

5.2.6 September 22, 2004 Project Team Meeting with National Park Service representatives for the National Capital Region

Held at the Dalecarlia WTP. Discussed the feasibility of obtaining a construction permit for a new residuals pipeline parallel to the existing Potomac Interceptor.

5.2.7 September 24, 2004 Project Team Meeting with the Office of the Attorney General for the District of Columbia

Held at the Attorney General's offices in Washington DC. Confirmed that the construction of a monofill on the Dalecarlia Reservoir site is not prohibited by DC regulations.

5.2.8 October 13, 2004 Project Team Meeting with USEPA Region 3

Held in Washington DC at USEPA Headquarters. Reviewed status of DEIS project including agency coordination activities and public comments and discussed path forward for remainder of project.

5.2.9 October 26, 2004, Project Team Meeting with National Capital Planning Commission (NCPC)

Held in Washington DC at NCPC Headquarters. Reviewed progress of DEIS project to date and discussed their involvement and requirements for the project.

5.2.10 November 29, 2004 Meeting with Carderock Facility Staff

Held at the Carderock site and included a windshield tour of the facility. Carderock staff was briefed on the project, the current status and the nature of the suggested alternative involving use of property on the Carderock site for dewatering facilities. In addition to the use of land, Carderock staff indicated that other concerns—including preservation of viewshed, transportation issues with both NPS and neighboring communities, visual impacts on neighboring communities—would all need to be considered.

Following review, the Navy defined the reasons why the construction of a Washington Aqueduct residuals processing facility on the Carderock site was inconsistent with their mission. A letter summarizing this position was issued in February 2005.

5.2.11 December 2, 3, and 14 2004, Conference Calls with Various Agencies Involved with the NPDES Permit

A conference call was held with the various agencies previously involved with the NPDES permit to brief the agencies on the status of the residuals DEIS project and solicit their input. Agencies involved included the Environmental Protection Agency, the Department of Interior (including representatives from the National Park Service (NPS) and the U.S. Fish and Wildlife), National Marine Fisheries Service, and the District of Columbia Department of Health (DC DOH).

5.2.12 December 2, 2004, Project Team Meeting with the National Park Service

Held at the George Washington Memorial Parkway Headquarters at Turkey Run Park in McLean, Virginia. Reviewed the overall status of the residuals DEIS project and asked the NPS to comment on the feasibility and impacts associated with two new residuals suggested by the public:, including constructing an alternate truck access route from the west side of the existing Dalecarlia WTP site to the Clara Barton Parkway, and constructing residuals processing facilities at Carderock. The Carderock alternative might involve transporting dewatered residuals on the Clara Barton Parkway from the Carderock site to the Beltway.

5.2.13 March 18, 2005, Project Team Meeting with the Maryland - National Capital Park and Planning Commission (M–NCPPC)

Held at the M–NCPPC office on Georgia Avenue in Silver Springs, MD. Reviewed a brief history of the Washington Aqueduct, the NPDES permit process, and the residuals DEIS progress to date. Discussion topics included: how have the public suggestions been evaluated (the Carderock alternative was specifically discussed), how would the Capital Crescent Trail be impacted by the residuals alternatives under consideration, and traffic issues truck routes and anticipated number of residuals trucks were discussed).

5.3 Summary of public and agency concerns about the project alternatives

Members of the public, elected officials, and regulatory agencies in the District of Columbia and Maryland used the public involvement process leading up to the publication of the DEIS to voice concerns, ideas and opinions about the project and its proposed alternatives. These concerns are summarized in this section. The goal of the NEPA process, including public involvement, is to help decision-makers (in this case the Washington Aqueduct) make the most informed of choices. The Aqueduct ultimately must make the best balance of tradeoffs between environmental, economic and social factors in determining the preferred alternative for the Record of Decision (ROD) A portion of the factors to be addressed in this decision-making process are included here. Sections three (Existing Conditions) and four (Impacts Evaluation) present the objective technical analysis that also contributes to Aqueduct decision-making.

5.3.1 Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

There was significant public concern about permanently removing a 30-acre stand of mature, mixed hardwood forest and replacing it with a residuals monofill over a 20 year life span. Specific issues centered on the visual impact to nearby Maryland residences, operational impacts of light, noise and dust, the loss of biological resources that are currently partially protected from human activity, and the potential for the water quality in the reservoir to be affected. Some area residents characterized this alternative as creating a permanent impact (clearcutting the forest) for a temporary solution (a monofill with capacity for 20 years of disposal).

The U.S. Army Corps of Engineers, Baltimore District, is leading the AUES FUDS environmental restoration project. Public information available during the scoping and alternative screening phase of the DEIS project indicated that portions of Dalecarlia, including the monofill footprint, contained soils with elevated arsenic concentrations. Surface arsenic remediation at the few areas it is present in Area 13 of AUES FUDS, will be achievable within timeframe required to build on the Dalecarlia Reservoir property. Subsequent to the screening phase, a meeting was held with U.S. Army Corps of Engineers, Baltimore District Office to further discuss the DEIS project. During this meeting, it was learned that an area within the monofill footprint historically known as the “Government Woods” may have been associated with the AUES’s World War One era research and testing activities. This suspicion has led AEUS FUDS to schedule soil investigation of portions of the Dalecarlia Reservoir property. The scheduled testing will occur in 2008, and resulting remedial actions if any, conflict with the Washington Aqueduct’s timetable for FFCA compliance.

5.3.2 Alternative B—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Trucking

Public concern developed focused on the appearance of the processing facilities—specifically, its potential to impact the visual character of the immediate area and to be seen by residents of Maryland’s Brookmont neighborhood downgradient of the site’s western boundary, residents of Bon Air Heights at the site’s northern boundary, and users of the portion of the Capital Crescent Trail passing through the Aqueduct’s WTP property. Nearby residents have also voiced concern about operational issues of noise, light pollution, and the potential for odors.

Beyond the immediate neighbors, this alternative attracts public concern about truck traffic on area roads, which is viewed as a congestion, pedestrian safety, and residential foundation hazard. Regulatory agencies have not voiced concerns specific to this alternative.

5.3.3 Alternative C—Thickening and Piping to Blue Plains AWWTP

Maryland and DC residents from the neighborhoods surrounding the Dalecarlia Reservoir and WTP have been largely supportive of this alternative because it involves the smallest amount of visibly-observed facility development in this geographic area and does not involve trucks carrying residuals on area roads local to Dalecarlia. Under this alternative, the potential operational impacts of the residuals processing facility would be transferred to the Blue Plains AWWTP approximately 12 miles away in the opposite corner of the District of Columbia.

Three regions of the NPS have expressed significant concern about the pipeline corridor as it passes through the C&O National Historical Park and Georgetown Historic District, and areas adjacent to the Lincoln Memorial, the Franklin Delano Roosevelt Memorial, and Thomas Jefferson Memorial.

The Washington Area Sanitation Authority (DC WASA) evaluated the prospect of accommodating the residuals processing facility at their Blue Plains AWWTP facility. They have determined that all potentially available site space must be reserved for planned facilities to accomplish greater wastewater nutrient removal and store and treat CSOs (see Engineering Feasibility Study Compendium—Volume 4 of the DEIS for more detail on this issue). As a result, they cannot host the Washington Aqueduct's facilities as part of this alternative.

5.3.4 Alternative D—No Action Alternative

A portion of the public dialog has focused on the need for the Washington Aqueduct to change its current and historical practice of Potomac River residuals disposal. There has been some public support for this alternative, with the argument that a new residuals management process creates a set of land-based impacts that are greater than the impacts associated with water-based disposal.

From a resource agency perspective, the Washington Aqueduct entered into a Federal Facility Compliance Agreement following 9 years of negotiation that sets forth a timetable for meeting its most recent NPDES permit issued by USEPA. This permit for all practical purposes precludes continuation of river disposal.

5.3.5 Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking

This alternative is an outcome of the extended public comment period ending in mid-November 2004. It has the benefit of moving the facility further from the Brookmont neighborhood, a community that would be in close proximity to the East Dalacarlia Processing Site, and could have slightly better access to the Dalecarlia Parkway. The building would be visible from the Westmoreland and overlook neighborhoods that face the reservoir, but it would be in the same sight line as the existing hospital high rise buildings. The topography of the site offers opportunities to minimize the visibility of the structures. Sibley Memorial Hospital has been supportive of Alternative E in general as demonstrated through meetings and has not raised any particular objection.

SECTION 6

Selection of Proposed Action

Each of the alternatives under evaluation (with the exception of the No Action Alternative) necessitates developing infrastructure in an urban setting, characterized by important natural and man-made resources. All alternatives under evaluation to meet this federally mandated action will carry some degree of impact. Of particular concern is the ability of an alternative to meet the project's purpose and need, while minimizing impacts to the communities surrounding the Dalecarlia Reservoir, Dalecarlia Water Treatment Plant (WTP), and Georgetown Reservoir facilities.

Section 2 describes the process used to identify the five alternatives that were evaluated in detail in the DEIS. Further information on the complete set of alternatives evaluated is contained within the Engineering Feasibility Study Compendium—Volume 4 of the DEIS. This volume contains the evaluation of alternatives and options provided by the public from mid-September through November 15, 2004, and again by the public from the end of December 2004 through February 14, 2005.

Three alternatives, including the no-action alternative, cannot be recommended as the proposed action. The rationale leading to these conclusions is based on the analysis in Section 4 and is described in this section. The decision-making rationale used to determine the proposed action from between the remaining two alternatives are also presented.

Tables 6-1 through 6-5 summarize the impacts by resource area for each alternative. It provides a reference point to quickly compare the alternatives and to highlight the tradeoffs involved in determining the proposed action.

6.1 Decision-Making Rationale

The following sources of information were considered by the Washington Aqueduct while selecting the proposed action from the five possible residuals alternatives:

- Information on the potential impacts revealed by the technical evaluation (detailed in Sections 3 and 4 of this DEIS),
- Ideas and concerns raised by the public during five open public meetings or submitted directly to the Washington Aqueduct staff, and
- Consultations with regulatory authorities at the federal, state, and local levels (detailed in Section 4).

The **Proposed Action** for the DEIS should be the alternative that best meets the objectives of the project, as stated in the Notice of Intent (published in the *Federal Register* on January 12, 2004). These include the following:

TABLE 6-1
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TABLE 6-2

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TABLE 6-3

Insert 11x17 here

TABLE 6-4

Insert 11x17 here

TABLE 6-5
Insert 11x17 here

- To allow the Washington Aqueduct to achieve complete compliance with National Pollutant Discharge Elimination System (NPDES) Permit DC00000019 and all other federal and local regulations.
- To design a process that will not impact current or future production of safe drinking water reliably for the Washington Aqueduct customers.
- To reduce, if possible, the quantities of solids generated by the water treatment process through optimized coagulation or other means.
- To minimize, if possible impacts on various local and regional stakeholders and minimize impacts on the environment.
- To design a process that is cost-effective in design, implementation, and operation.

6.2 Non-Recommended Alternatives

Both Alternatives A (Dewatering and Disposal by Monofill) and C (Thickening and Piping to Blue Plains Advanced Wastewater Treatment Plant (AWWTP) have beneficial elements that contribute to the objectives of the Clean Water Act, by enabling the Washington Aqueduct to stop discharging residuals into the Potomac River, and prevent residuals-bearing trucks from traveling on local community roads. However, implementation of Alternatives A and C would not allow the Washington Aqueduct to comply with the Federal Facility Compliance Agreement schedule issued by the U.S. Environmental Protection Agency (USEPA). In addition, when each alternative is thoroughly evaluated and balanced against the purpose and need for the project, each one presents additional impacts that preclude selection as the preferred alternative.

Some of the impacts associated with these alternatives could be mitigated to lesser levels, but none of the work is possible within the schedule required by the FFCA. The development of Alternative A is not consistent with the schedule for investigations of this site by the U.S. Army Corps of Engineers for its ongoing remediation efforts for the American University Experimental Station (AUES) Formerly Used Defense Site (FUDS) project. Alternative C is not consistent with the District of Columbia Water and Sewer Authority's (DC WASA's) long-term plans for its Blue Plains AWWTP and is more than double the cost of each of the other alternatives.

6.2.1 Detailed Reasons for Not Selecting Alternative A—Dewatering at Northwest Dalecarlia Processing Site and Disposal by Monofill

Biological Resources

The project would necessitate clear-cutting approximately 30 acres of mature woodland within the District of Columbia. While not strictly prohibited, the action is counter to the intent of the District's Urban Forest Preservation Act which is to maintain urban forest benefits of heat mitigation, improved air quality, reduced water pollution, and quieter and more beautiful neighborhoods and NCPC's policies for federal facilities in the National Capital Region.

Cultural Resources

The footprint of the proposed monofill occupies a high-probability area for pre-historic and historic in-ground cultural resources. While the potential presence of these resources does not preclude monofill development, their required investigation, documentation, and potential recordation and preservation may prevent the project from being developed in time to meet the FFCA 2009 deadline.

Hazardous, Toxic, and Radioactive Waste

A portion of the monofill footprint occupies an area historically known as the "Dalecarlia Woods". This area is targeted for further investigation by the AUES FUDS project. Onsite investigations supporting project design and construction can not begin until the site has been investigated and cleared of any materials of concern. These investigations are scheduled to begin in 2008 and are expected to be complete in two years. The possible results are unknown at this time. Even under the best case scenario of finding no materials associated with the American University Experimental Station, there would not be sufficient time to design, permit, construct, and have a monofill operational by the FFCA 2009 deadline.

Land Use

Any monofill development by the Washington Aqueduct would take place on federally owned land. This potential action would not be in violation of District of Columbia regulations. However, it does represent a significant change in existing land use, is potentially incompatible with adjacent land uses, and runs counter to a number of the National Capital Planning Commission's policies on the management of federal land within the National Capital Region—specifically those that seek to preserve open space character and forested areas.

Visual

The views of the Dalecarlia reservoir present visual properties of moderately high to high value. If constructed, the monofill facility would affect the view from some of the adjacent properties, nearby residences, and MacArthur Boulevard. While phased construction, site topography, and landscaped buffers offer the potential to reduce the impacts associated with viewing the monofill, some views will be partially and permanently altered.

Implementation Uncertainty

Because it is operating under an FFCA, the Washington Aqueduct must select and develop an alternative that is known to be capable of meeting the Agreement's compliance deadlines. The implementation of this alternative within the required time frame is unlikely because of the schedule for the related AUES FUDS Investigation and cultural resources investigations and the potential for further action based on the resultant findings.

6.2.2 Detailed Reasons for Not Selecting Alternative C—Thickening and Piping to Blue Plains AWWTP

Biological Resources

Consultation with the National Park Service (NPS), through whose land much of the pipeline will pass, revealed their preference for directional drilling to minimize impacts to important resource areas. Even with this technology, there will be a need for approximately twenty-seven 150′ x 100′ staging areas for the pipeline construction. Some of the areas are likely to require a significant amount of tree cutting—particularly in the portion of the route passing through the Chesapeake and Ohio (C&O) Canal National Historical Park. This long-term damage has the potential to impact wetland resources and runs counter to both the District's Urban Forest Preservation Act and the National Capital Planning Commission's policies for parks and open space.

Cultural Resources

The entire route, with the exception of the portion crossing military facilities, intersects with high-value historic and pre-historic resources, as well as with important cultural resources in the form of national parks and monuments. While directional drilling has been evaluated for its potential to minimize impacts to these resources, detailed corridor alternative analyses and cultural resources investigations would still need to be conducted to meet the National Park Service's interest in resource documentation and preservation and to comply with the NHPA and related laws. These studies would prevent the design and construction of the project from being completed before the Washington Aqueduct's FFCA deadlines.

Hazardous Toxic and Radioactive Waste

The project corridor is in a highly urban setting and includes two military facilities where hazardous substances may have been released into the environment. While directional drilling holds potential to reduce impact to and from these sites, the construction of the staging areas and the handling and disposal of the drilling mud and excess excavated material may create the potential for managing regulated material. This could create further project delays beyond the Washington Aqueduct's FFCA deadlines.

Infrastructure

In consultation with DC WASA, the owner and operator of the Blue Plains AWWTP, it was concluded that there is insufficient space at the Blue Plains AWWTP facility to construct and operate the proposed residuals processing facilities. DC WASA's long-term operational needs necessitate that the currently available land is preserved for the future development of both CSO control facilities and facilities to reduce the nutrient loading to the Chesapeake Bay watershed. Implementing this alternative is impossible without the ability to construct facilities to dewater the residuals and load them onto trucks for offsite disposal, originating from the Blue Plains AWWTP facility.

Land Use

With the use of directional drilling, staging areas to support the operation will impact approximately 10 acres of land, collectively, along the pipeline corridor. These impacts will be long-term and significant if they involve the clear-cutting of trees in the C&O Canal

National Historical Park. Significant short-term impacts are likely, as the construction operation in the proposed corridor restricts tourist access to important national monuments and reduces the quality of their viewing experience.

Visual

Construction of the pipeline will involve operation of heavy machinery, noise, and muddy staging areas along a corridor prized for its visual character. This visual character contributes significantly to the park experience for its users. Construction-related impacts are not considered to be long-term. However, any tree removal along the corridor is considered to be significant and long term.

Implementation Uncertainty

Because it is operating under an FFCA, the Washington Aqueduct must select and develop an alternative that is known to be capable of meeting the compliance deadlines. Further refinement of the pipeline alignment, aimed at minimizing impacts on biological, visual, land use and cultural resources, holds the potential for delay well beyond the FFCA compliance deadlines. Coordination with a myriad of federal and local agencies affected by the alternative creates further uncertainty for schedule compliance.

Cost

The cost of each alternative has been evaluated. The pipeline alternative’s construction cost, escalated to midpoint of construction, was previously estimated to be $74,000,000.00. This cost was based on the assumption that the pipeline could be installed using conventional cut and cover installation techniques. Since that time, the NPS has indicated that they would require that trenchless technology be used to install the pipeline throughout its entire route. This change causes the pipeline alternative’s construction cost to increase to approximately $165,100,000.00 (escalated to the mid-point of construction). This cost is more than double the comparable cost for Alternative A ($62,900,000.00) and Alternatives B or E ($55,100,000.00).

6.2.3 Reasons for Not Selecting Alternative D—No Action Alternative

The Washington Aqueduct cannot select alternative D, the no-action alternative, because it would place it in violation of the Federal Clean Water Act, the terms of their NPDES permit, and the FFCA issued by USEPA. Throughout the DEIS preparation process, USEPA has confirmed that they would be unwilling to modify the NPDES permit to allow the Washington Aqueduct to return to a residuals disposal practice consistent with the No Action alternative.

6.3 Recommendation of the Proposed Action

As stated at the beginning of this section, there is no alternative for this federally mandated action that will not carry some degree of impact. Washington Aqueduct selected between Alternatives B and E for the proposed action. Both alternatives can be implemented within the required timeframe with a much greater degree of certainty than is possible for either Alternative A or C. The costs of these alternatives are consistent with the project budget. Both alternatives feature residuals processing with trucking to off-site disposal locations.

They differ in the location of the processing facilities and the location in which the trucks enter the local roadways. Alternative B would construct the residuals processing facility at the Northwest Dalecarlia Processing Site and the trucks would enter the local roadways at the existing facility entrance to MacArthur Boulevard. Alternative E would construct the residuals processing facilities at the East Dalecarlia Processing Site and trucks would enter the local roadways at the existing intersection of Little Falls Road and Dalecarlia Parkway. These differences form the basis of the tradeoffs between each alternative. Implementation and operation of the proposed action will be within the required federal laws and regulations. This is documented on Table 6-6 (next page).

Land Use

Both facilities would use federally owned property designated for continuing the mission of theWashington Aqueduct. The Northwest Dalecarlia Processing Site (Alternatives A,B, and C) has residential land uses in closer proximity to the facility location than the East Dalecarlia Processing Site (Alternative E). The land uses adjacent to the East Dalecarlia Processing Site are the Sibley Memorial Hospital facilities and the Dalecarlia Reservoir property. The Sibley Memorial Hospital site serves as a buffer for the residential community located on the south side of Loughboro Road. The Dalecarlia Reservoir serves as a buffer for the Westmoreland Hills residential area located on its northern border. The Dalecarlia Parkway separates this site from the neighborhoods of Overlook and Spring Valley. For these reasons, Alternative E offers greater compatibility with adjacent land uses.

Hazardous, Toxic, and Radioactive Waste

Both alternatives present the potential for encountering currently unknown hazardous materials based on either previous soil boring results or previous land uses. A 1995 geotechnical investigation conducted on the portion of the Northwest Dalecarlia WTP site designated for Alternative B's residuals processing facility noted strong solvent and/or petroleum odors at 5 to 10 feet bgs in some of the soil borings.

The previous uses (i.e., vehicle maintenance shop, paint shop, etc.) of the East Dalecarlia potential WTP location, designated for Alternative E's facilities also imply potential for soil contamination. A limited number of soil borings were drilled on the Alternative E site as part of the DEIS to gather information useful in defining foundation requirements and as a preliminary screening step for any potential buried contamination that could be present on this site. The results of the limited geotechnical investigation conducted on the East site indicate that contamination is not present.

Both the northwest and the east sites would require further investigation during the design phase of the project to either better define the degree of soil contamination present (Northwest Dalecarlia Processing Site) and its potential to impact either the construction or operation of the residuals facility, or the facility's potential to cause these materials to impact other resources, or confirm that soil contamination is not present (East Dalecarlia WTP Location). However, based on the findings to date, the East Dalecarlia WTP location offers advantages over the Northwest Dalecarlia WTP location.

TABLE 6-6
Compliance with Federal Environmental Statutes

Compliance with Federal Environmental Statutes	
Environmental Statutes	***Compliance***
Anadromous Fish Conservation Act	Full
Clean Air Act, as amended (Public Law 88-206)	Full
Clean Water Act, as amended (Public Law 95-217)	Full
Coastal Barrier Resources Act	NA
Coastal Zone Management Act	Full
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986	Full
Endangered Species Act of 1973, as amended (Public Law 93-205)	Ongoing
Estuary Protection Act	NA
Farmland Protection Policy Act	NA
Federal Water Pollution Control Act (Public Law 92-500)	Full
Federal Water Project Recreation Act	Full
Fish and Wildlife Coordination Act, as amended (16 United States Code [U.S.C.] 661, et seq.)	Ongoing
Land and Water Conservation Fund Act	Full
Marine Mammal Protection Act	Full
Magnuson Fishery Conservation and Management Act, as amended (Public Law 94-265)	Full
National Environmental Policy Act of 1969 (Public Law 91-190)	Ongoing
National Historic Preservation Act of 1966, as amended (Public Law 89-665)	Ongoing
Noise Control Act of 1972, as amended (Public Law 92-574)	Full
Resource Conservation and Recovery Act (Public Law 94-580)	Full
Rivers and Harbors Act	Full
Safe Drinking Water Act, as amended (Public Law 93-523)	Full
Solid Waste Disposal Act of 1965, as amended	Full
Toxic Substances Control Act of 1976 (Public Law 94-469)	Full
Watershed Protection and Flood Prevention Act of 1954 (16 U.S.C. 1101, et seq.)	Full
Wetlands Conservation Act (Public Law 101-233)	Full
Wild and Scenic Rivers Act (Public Law 90-542)	NA
Compliance with Federal Environmental Executive Orders	
Executive Orders	***Compliance***
Flood Plain Management (Executive Order 11988)	Full
Protection of Wetlands (Executive Order 11990)	Ongoing
Federal Compliance with Pollution Standards (Executive Order 12088)	Full
Environmental Justice in Minority Populations and Low-Income Populations (Executive Order 12898)	Full
Protection of Children From Environmental Health Risks and Safety Risks (Executive Order 13045)	Full
Invasive Species (Executive Order 13112)	Full

1) Full compliance denotes implementation and operation of the Proposed Action will be within required laws and regulations.

2) Ongoing means that consultation is not complete at this time and will have concurrence with appropriate agencies prior to project implementation.

3) Not Applicable (N/A) denotes that this specific law was not found to apply to this action.

Traffic

Traffic impacts have been studied in detail. Both Alternative B and Alternative E could use the eight haul routes designated for the purpose of maintaining operational flexibility during changing traffic conditions with the exception of Routes F and G. The studies indicate that all of the haul routes have available capacity to accommodate the described truck volume without disrupting traffic or jeopardizing the physical safety of people along the routes. Alternative E's likely entrance point to the local roadways would be the existing intersection of Little Falls Road and Dalecarlia Parkway. This location may be considered an advantage because it would prevent loaded trucks from climbing the steep grade of Loughboro Road or Little Falls Road in front of Sibley Memorial Hospital.

Visual

The residuals processing facility for Alternative B will be directly visible by users of the Capital Crescent Trail and some residents along the northern border of the property. Smaller portions of the facility may also be visible, particularly during the winter, from some residences in the Brookmont area. The facilities for Alternative E will be visible to patients and visitors to the Sibley Memorial Hospital, as well as by residents in Overlook, Spring Valley, and Westmoreland Hills. The topography of the Alternative E residuals processing site presents greater opportunities to reduce the visual impact of the proposed residual facilities. The reservoir property also provides some buffer to neighboring residential viewers. While the appearance of the facilities at either location would be closely coordinated with the National Capital Planning Commission and the Commission on Fine Arts, Alternative E presents a lesser overall visual impact.

Noise

For both alternatives, the residuals processing facility will be constructed of sound-proofing materials so that noise levels outside of the buildings, as measured at the border of the property, do not exceed the existing background noise measurements of the area. Noise from the trucks has been modeled and compared to background conditions. While the analysis showed that the noise generated by the trucks on Loughboro Road (primarily for Alternative B) did not violate the standard criteria for a significantly adverse impact, Alternative E's proposed truck entrance location on Dalecarlia Parkway avoids some of the loaded-truck noise associated with Alternative B's trucks climbing up hill on Loughboro Road. The nearest residences to Alternative E's facilities are farther away than are the nearest residences to Alternative B's facilities.

Alternative E is relatively close to the Sibley Memorial Hospital site and, therefore, offers some potential for increased noise levels on the Sibley Memorial Hospital site. However, the existing topography of this site could be used to minimize this impact by locating the residuals thickening and dewatering facility at a lower elevation than Sibley Memorial Hospital and constructing an earth berm between the hospital and the proposed residuals facilities. The Sibley Memorial Hospital complex is configured such that the majority of the patient rooms are located on the south side of the facility. The buildings located along the north property line, adjacent to the proposed residuals processing facilities, serve primarily office space and parking functions. These facilities are less likely to be impacted by any potential noise associated with the residuals processing operations than would be full-time patient rooms. Based on these factors, the East Dalecarlia WTP location proposed for Alternative E offers a slight advantage in terms of noise impacts.

Cost

The costs of the two alternatives (B and E) are comparable, offering no advantage to either of the alternatives.

6.3.1 Conclusion

Alternatives B and E present equally viable options for a residuals management program that eliminates residuals discharge to the Potomac River. Each would enable the Washington Aqueduct to meet the conditions of its most recent NPDES permit within the schedule put forth in its Federal Facilities Compliance Agreement with the USEPA. After extensive public consultation and technical analysis, the Washington Aqueduct recognizes that the location of Alternative E offers opportunities for reducing some of the potential impacts. Alternative E offers advantages in the following areas:

- Less visual impact to surrounding residential neighbors
- Site topography allows impacts to be minimized
- Less truck noise attributable to residuals trucks travelling on Loughboro Road
- Greater distance between surrounding neighborhoods and proposed residuals processing facilities
- Fewer apparent soils issues

Therefore, Alternative E—Dewatering at East Dalecarlia Processing Site and Disposal by Trucking is recommended as the Proposed Action for the EIS.

Table 6-1
Alternative A: Dewatering and Disposal by Monofill

Technical Criteria / Resource Groups	Air	Aquatic Resources	Biological Resources (Terrestial)	Cultural Resources	Hazardous, Toxic & Radioactive Waste	Infra-structure	Land Use	Noise	Socio-Economic & Environmental Justice	Soils, Geology, & Ground-water	Transport-ation	Visual	Public Health	Implement-ation Uncertainty	Land Application
No Impact		△							△		△		△		N/A
No Significant Impact	□ §				□	□		□		□				□	
Significant Impact			●	●			●					●			

Capital Cost (current dollars): $54,300,000.00

Key: △ = No Long-term Impact
□ = No Significant Long-term Impact
● = Significant Long-term Impact
§ = Short-term Impact

Assumptions:

- Monofill footprint is approximately 30 Acres on reservoir property
- Monofill structure is between 50 to 80 feet taller than existing grades at its tallest points
- 8 Truck trips/day (5 days/week)
- 78 feet high residuals processing structure planned for Northwest Dalecarlia WTP location
- Dewatering building surrounded by four 21 foot high gravity thickeners
- Current practice for Forebay residuals
- Two small floating dredges remove residuals from Georgetown Reservoir
- New residuals removal equipment installed in Dalecarlia sedimentation basins
- Schedule for Spring Valley investigations constrains implementation of alternative

Table 6-2
Alternative B: Dewatering at Northwest Dalecarlia WTP Location and Disposal by Trucking

Technical Criteria / Resource Groups	Air	Aquatic Resources	Biological Resources (Terrestial)	Cultural Resources	Hazardous, Toxic & Radioactive Waste	Infra-structure	Land Use	Noise	Socio-Economic & Environmental Justice	Soils, Geology, & Ground-water	Transport-ation	Visual	Public Health	Implement-ation Uncertainty	Land Application
No Impact	△	△	△		△				△				△		
No Significant Impact				□		□	□	□		□	□	□		□	□
Significant Impact															

Capital Cost (current dollars): $47,600,000.00

Key:
△ = No Long-term Impact
□ = No Significant Long-term Impact
● = Significant Long-term Impact
§ = Short-term Impact

Assumptions:

- Eight, 20-ton trucks/day (average)
- 78 feet high residuals processing structure planned for Northwest Dalecarlia WTP location
- Dewatering building surrounded by four 21 foot high gravity thickeners
- Current practice for Forebay residuals
- Two small floating dredges remove residuals from the Georgetown Reservoir
- New residuals removal equipment installed in Dalecarlia sedimentation basins

Table 6-3
Alternative C: Thicken and Pipe to Blue Plains AWWTP

Technical Criteria / Resource Groups	Air	Aquatic Resources	Biological Resources (Terrestial)	Cultural Resources	Hazardous, Toxic & Radioactive Waste	Infra-structure	Land Use	Noise	Socio-Economic & Environmental Justice	Soils, Geology, & Ground-water	Transport-ation	Visual	Public Health	Implement-ation Uncertainty	Land Application
No Impact	△							△	△				△		△
No Significant Impact		■	■		■	■				■	■			■	
Significant Impact				●	§		●	§				●			

Capital Cost (current dollars): $142,600,000.00

Key: △ = No Long-term Impact
■ = No Significant Long-term Impact
● = Significant Long-term Impact
§ = Short-term Impact

Assumptions:

- Dual 12 inch diameter pipelines
- Directional drilling construction – 5 to 40 feet deep
- 11.3-mile route
- Approximately 27 staging areas – 100 by 150 feet
- Initial estimates at $800/linear foot = approximately $95 Million
- 54 month design and construction schedule
- Residuals dewatering facility at Blue Plains
- Residuals thickening facility at Dalecarlia
- Trucks departure from Blue Plains on standard routes
- Eight, 20-ton trucks/day daily average
- Current practice for Forebay residuals
- Two small floating dredges remove residuals from Georgetown Reservoir
- New residuals removal equipment installed in Dalecarlia sedimentation basins
- Evolution of pipeline alternative
  - Convey residuals in Potomac Interceptor
  - WASA concerns about accepting loads at front end of treatment processes
  - CSO concerns
  - Pipe within a pipe
  - New Pipe within Potomac Interceptor Right of Way
  - New pipe in new corridor
  - Blue Plains land not available for dewatering facilities
  - COG advises against Blue Plains Option

Table 6-4
Alternative D: No Action Alternative

Technical Criteria / Resource Groups	Air	Aquatic Resources	Biological Resources (Terrestial)	Cultural Resources	Hazardous, Toxic & Radioactive Waste	Infra-structure	Land Use	Noise	Socio-Economic & Environmental Justice	Soils, Geology, & Ground-water	Transport-ation	Visual	Public Health	Implement-ation Uncertainty	Land Application
No Impact	△		△	△	△	△	△	△	△	△	△		△		N/A
No Significant Impact		□										□		□	
Significant Impact															

Capital Cost (current dollars): No additional cost

Key: △ = No Long-term Impact

□ = No Significant Long-term Impact

⬤ = Significant Long-term Impact

§ = Short-term Impact

Table 6-5
Alternative E: Dewatering at East Dalecarlia WTP Location and Disposal by Trucking

Technical Criteria / Resource Groups	Air	Aquatic Resources	Biological Resources (Terrestial)	Cultural Resources	Hazardous, Toxic & Radioactive Waste	Infra-structure	Land Use	Noise	Socio-Economic & Environmental Justice	Soils, Geology, & Ground-water	Transport-ation	Visual	Public Health	Implement-ation Uncertainty	Land Application
No Impact	△	△	△		△				△				△	△	
No Significant Impact				■		■	■	■		■	■	■			■
Significant Impact															

Capital Cost (current dollars): $47,600,000.00

Key: △ = No Long-term Impact

■ = No Significant Long-term Impact

● = Significant Long-term Impact

§ = Short-term Impact

Assumptions:

- Eight, 20-ton trucks/day daily average
- 74 feet high residuals processing structure planned for East Dalecarlia WTP Location
- Dewatering building surrounded by four 21 foot high gravity thickeners
- Current practice for Forebay residuals
- Two small floating dredges remove residuals from the Georgetown Reservoir
- New residuals removal equipment installed in Dalecarlia sedimentation basins

SECTION 7

Cumulative Impacts and Mitigation

7.1 Cumulative Impacts

This section addresses potential cumulative impacts to the environment that could be associated with the implementation of the proposed action in concert with one or more other past, present, or reasonably foreseeable future actions or projects. Specifically, this section is prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) and guidance from the CEQ, *Considering Cumulative Effects Under the National Environmental Policy Act*. The CEQ regulations define a "cumulative impact" for purposes of NEPA as follows:

> Cumulative impact is the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7)

This section gives emphasis to the actions or projects that may be more likely to cause cumulative impacts (i.e., projects that would occur relatively close to the project site). Only resource areas potentially impacted are discussed.

7.1.1 Scope of Cumulative Impact Analysis

The geographic area addressed in this analysis is the same as that used for the traffic impact analysis. For the traffic analysis, the eight haul routes were evaluated from the Dalecarlia plant up to the point where they would enter one of two major Interstate Highways: I-495 or I-395. The logic behind this approach is that decision-makers were best served by understanding the potential for trucks hauling residuals to impact local roads. Evaluating highway systems (which are designed to absorb large volumes of traffic) would not help decision-makers understand distinctions in suitability between haul routes as they passed through area communities. Retaining the same geographic reference for the cumulative impact analysis recognizes that many of the concerns voiced about hauling residuals focus on how trucks impact local communities. The analysis focuses, but is not limited to, understanding actions that may increase area traffic and thereby cause additive effects with the proposed action.

This geographic area is generally defined as Ward 3 of the District of Columbia; the portion of Montgomery County, Maryland bounded by the Capital Beltway (I-495) and the Washington DC line; and the portion of Fairfax County, Virginia bounded by the Capital Beltway, Route 66 and the Arlington County Line.

Identification of Past, Present and Reasonably Foreseeable Actions/Projects

The Development Activity Records of the District of Columbia's Office of Planning were reviewed to determine the land use developments that could potentially impact traffic conditions along the potential haul routes. Similar information was obtained through telephone discussions with the staff of the Montgomery County Park and Planning Office of the Maryland-National Capital Park and Planning Commission (M-NCPPC) and the Fairfax County Department of Planning.

Discussions were also held with staff of the District and Virginia Departments of Transportation. The Maryland Department of Transportation (MD DOT) Consolidated Transportation Program (FY 2004-2009) was reviewed to identify any roadway improvements planned or programmed for the proposed haul routes.

Recent Actions

Resurfacing/rehabilitation improvements were recently completed along Dolley Madison Boulevard (VA 123), between VA 193 and I-495 in Virginia; and along Massachusetts Avenue (MD 396) between Western Avenue and Onondaga Road in Maryland. These were both maintenance actions and did not expand the roadway capacity. In the past two years, there have been several developments built in Ward Three of the District of Columbia that have significantly increased the commercial space within the immediate area of the site. These are listed in Table 7-1 and their locations are shown on Figures 7-1 to 7-3.

TABLE 7-1
Recently Completed Developments in the District of Columbia

Development Name	Location	Land use & Density
3901 Connecticut Avenue, NW	39012 Connecticut Avenue, NW	66 Condo/Apartment units
AASHA Building	2519 Connecticut Avenue, NW	30,000 SF Office space
Alban Towers	3700 Massachusetts Avenue, NW	227 condo/apartment units
The Delano	2745 29th Street, NW	127 condo/apartment
Henry Adams House	2701 Calvert Street, NW	211 condo/apartment
Nigerian Chancery	3519 International Court, NW	70,000 SF office space
Cityline at Tenley	4500 Wisconsin Avenue, NW	208condo/apartment units
Sunrise Assisted Living	5111 Connecticut Avenue, NW	106 apartment
Park Connecticut Apartments	4411 Connecticut Avenue, NW	142 apartment

SF = square feet
Source: District of Columbia Office of Planning Development Activity Records

Present and Reasonably Foreseeable Actions

Based on the previously described review of records and discussions, it was determined that major residential and commercial developments are planned for or are under construction within the Friendship Heights area of the District of Columbia and Montgomery County and the Bethesda area of Montgomery County Maryland. These developments would have varying traffic impacts on the three haul routes within Montgomery County Maryland, particularly the Wisconsin Avenue route. The elements of these developments and their likely impacts are presented in Table 7-2 and shown in Figure 7-2. No significant developments or land use changes are planned for the other haul route corridors.

TABLE 7-2
Planned Land Use Developments—Wisconsin Avenue Corridor

Development Name	Land Use/Density	Potential Impacts on Haul Routes
	Washington, DC	
1. 5401 Western Avenue	123 Condo/apartments	low
2. Washington Metropolitan Authority Transit Authority (WMATA) Garage Redevelopment	440 Apartments/condos 90 SF Retail	moderate
	Montgomery County Maryland	
1. Air Rights Center	182 Apartments/condos	low
2. Chase Tower	226,252 SF Office	moderate
	31,729 SR Retail	
3. Wisconsin Place	123,812 SF Retail	high
	40,000 SF Grocery	
	450,000SF Office	
	275 Apartments/condos	
4. Friendship Commons (GEICO)	810,000 SF Office	high
	300 Apartments/condos	
	200 Townhouses	
5. Norfolk Ave./Cordell Ave	33,000 SF Retail	Low to moderate
	322 Apartments/condos	
6. Arlington East	180 Apartments/condos	Low to moderate
	50,800 SF Retail	

7.1.2 Assessment and Management of Cumulative Impacts

This section focuses on select impact categories within the geographic area targeted for the Cumulative Impact analysis. The categories are transportation, air quality, noise, socio-economic resources and biological (terrestrial) resources.

The significance criteria developed for each resource area in Section 4 are applied to this analysis. In assessing significance, the intent is to understand and identify the incremental contribution of the proposed action on the potential collective impact of the other unrelated actions in the area.

Transportation

The truck traffic generated by the proposed action will have a long-term, no significant cumulative impact on transportation conditions in the area being evaluated. Traffic patterns from the unrelated developments are influenced by different push and pull factors that cause the patterns to be dispersed over a broader network of roads than just the potential haul routes for the residuals trucks. In some cases traffic is greatly reduced by a development's proximity to a Metro Station. For these reasons it is unlikely that the traffic generated collectively by the developments will influence the Level of Service of area roads. It is even more unlikely that incremental addition of the traffic generated by residuals hauling will cause the collective traffic volume to exceed the area roadway capacity, or lower existing levels of service at impacted intersections or links.

All proposed multi residential or commercial developments within the study area must develop a transportation assessment and submit it to the appropriate regulatory agency for review and approval prior to the start of construction. This is the process in place that safeguards area roadway capacity. These agencies, DC DOT, MD DOT and Virginia Department of Transportation (VDOT), review development proposals in context with other development pressures and additional traffic impacts being generated in the region. In this way, their approval, denial, or mitigation requirements imposed on proposed developments take a managed approach to the cumulative traffic generation over time and geography. Permits are granted only when a developer satisfies the adequacy of roadway improvements.

Air Quality

The proposed action will not result in significant long-term cumulative impacts within the Nation's Capital AQCR. The projected annual emissions from the proposed action are below the de minimis thresholds as defined in the Air Quality Conformity Rule and thus presumed to be in compliance with the State Implementation Plans (SIP) developed to achieve compliance with the National Ambient Air Quality Standards (NAAQS) for ozone. The de minimis thresholds for volatile organic compounds (VOC) and nitrogen oxides (NOx) were recently reduced to 25 tons per year, to reflect the severity of ozone non-attainment in this AQCR. The projected emissions from this proposed action are considered not significant compared to the total emission inventory for this AQCR and other projects (public or private) that could cause or contribute to continued ozone non-attainment.

The regulatory environment is in place to review development proposals in context with other development pressures in the region. The lowering of the de minimis thresholds to reflect the severity of non-attainment means that more emissions sources come under review. For pollutants that are in attainment, the de minimis threshold is 100 tons per year. The designation of severe ozone non-attainment resulted in a reduction in the de minimis threshold to 25 tons per year. Thus, all projects with potential emissions less than 100 tons per year, but greater than 25 tons per year, for VOC and NOx are now subject to review and evaluation. In this way regulatory authorities can evaluate cumulative impacts without overburdening the review process.

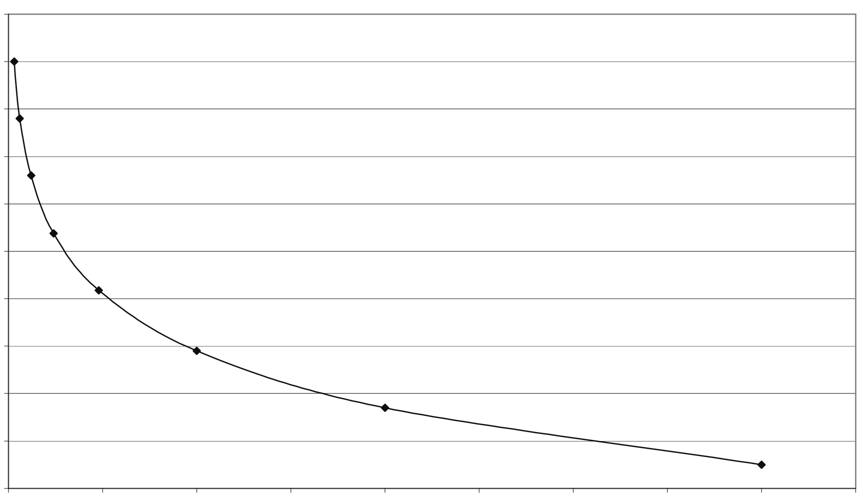
If this project (or some other federal action) did have air emissions that exceeded the de minimis threshold levels, the regulations governing General Conformity would require the project to determine whether these emissions are regionally significant. Such a determination might conclude that adequate planning in the preparation of the regional emission inventory was made to account for the emissions associated with that federal action. If the regional emission inventory was found to be inadequate with respect to future growth to account for the federal action, emission offsets or some further reduction in emissions would be required in order to comply with the SIP. Such is not the case here, since the air emissions associated with the proposed project do not exceed the de minimis threshold levels.

Noise

The region will not experience a significant cumulative, long-term impact to background noise levels. While additional noise will be generated by construction activities and traffic, as shown in Figure 7-4, noise levels diminish exponentially with distance. Noise sources that are more than ¼ mile (1000 ft) apart effectively become independent sources and do not contribute to any cumulative impacts. Also, noise sources are not additive. Two noise sources with similar noise levels located adjacent to each other do not represent a doubling of the noise impact. Thus, noise impacts affect those closest to the source of the noise and do not contribute to noise levels on a regional basis.

Point source noise impacts associated with the thickening and dewatering operation and the off-site disposal of water treatment plant residuals result in an not significant long-term impact. None of the identified projects are located close enough to the proposed construction and operation of the thickening and dewatering facility that they would increase the ambient noise level at the most sensitive receptor locations. As Figure 7-2 shows, the planned development nearest to the proposed action site is 1-2 miles away.

Truck traffic along the planned haul routes will not significantly affect the level of service along these roadways (see Transportation section). Thus, noise impacts associated with existing and anticipated future car and truck traffic will not be increased significantly with the addition of off-site trucking activities from the proposed action and noise impacts from these roadways are not expected to increase significantly above existing ambient levels.



Biological Resources (Terrestrial)

There will be no cumulative, long-term impact to biological resources. The proposed action will occur in a highly urbanized region where biological resources carry great value because of their relatively limited nature. Even in this context there will be no cumulative impact because the action would occur on previously disturbed land with little biological value. The land is also zoned for purposes associated with treating and distributing potable water. Because there is no impact to biological resources it cannot add an incremental impact to any collective impact on these resources posed by the developments identified in this analysis.

Social and Economic impact

There will be no cumulative, long-term impact to social and economic resources. Although the other past and planned future actions identified in this analysis will increase demands on local social services and community facilities (police, fire, schools, parks, and so forth), the proposed action does not add any incremental demand on these services and facilities. A cumulative benefit to the regional economy, including the labor market and local government revenues, will occur as a result of construction and operational expenditures from the proposed action and the other future projects identified. However, this cumulative impact will not be significant in comparison to the size and overall growth of the regional economy.

7.2 Mitigation

Implementation of Alternative E is not expected to result in any long-term significant impacts. As a result, a formal impacts mitigation plan is not technically required. However, the further reduction of either short term or long term, non-significant impacts is also preferred if practicable. Following certain practices during construction and facility operation may reduce these impacts. The potential actions for reducing the non-significant project impacts are described in this section and organized according the resource area that would receive the most benefit.

7.2.1 Air

The primary short-term impacts to air quality are associated with the period of construction activity for the residuals processing facilities. Activities with the greatest air quality benefit focus on controlling fugitive dust from exposed soils. These activities include:

- Water exposed soils with hoses or watering trucks
- Wash trucks with a hose to keep dirt from the construction site from covering or coating local roadways. This activity not only reduces fugitive dust, but may also prevent surface water runoff from being contaminated with site soils.

The primary long-term impacts to air quality are associated with contract hauling of residuals to off-site disposal locations.

- Long-term vehicle emissions from the contract hauling operation, while not significant from a regulatory perspective, may be reduced through using a dedicated fleet of trucks using alternative fuels to reduce NOx, CO, and VOC, and diesel particulates.

- Trucks less than five years old have higher fuel efficiencies and lower air emission rates.

At the time of this writing there are no known contract-hauling companies that use alternative fuel trucks. This type of provision will not be included in the contract hauling specifications because it is unlikely that the marketplace would be able to meet a demand for alternative fuels. This does not rule out including alternative fuel specifications so that impacts are minimized later in the life cycle of the residuals management system.

7.2.2 Hazardous, Toxic, and Radioactive Materials

Soil borings have been drilled to determine the suitability of the soils to support a structure and to informally screen for the presence of contaminants, such as solvents or oil. Field observations made during the boring process indicate that no contaminants were encountered during the recent geotechnical investigation. Additional soil borings will be drilled during the design phase of the project. During this phase soil samples will be tested to confirm the absence of soil bearing contamination.

7.2.3 Biological Resources (Terrestrial)

Wetland delineation may need to be conducted as part of the standard set of activities associated with permitting a facility of this size. If modifications to Little Falls Road are planned, then mitigation plans for any potential tree removal will have to be prepared in accordance with the Washington DC Urban Forest Preservation Act requiring permits for Special Tree removals or replacements.

7.2.4 Noise

The primary short-term noise impacts are associated with the period of construction activity for the residuals processing facilities. To reduce potential impacts during this time, construction activity can be limited to daytime hours.

Operational noise can be reduced several measures. These may include:

- Creating one way traffic flows for trucks to avoid triggering the required back-up beeper noise
- Placing the truck doors so that they do not open toward residential areas or the hospital can further reduce the noise associated with truck loading
- Designing a truck loading system that minimizes or eliminates the need to shift the truck position while loading
- Loading trucks in enclosed areas
- Using acoustical materials to reduce noise in the dewatering area.

7.2.5 Transportation

The proposed action is expected to have no significant long-term impact on existing and future traffic conditions along all of the haul routes. This assessment is from the perspectives of roadway capacity and operational efficiency. Although the proposed action is also not expected to impact the health, safety and welfare of existing and future roadway users or the adjacent residential neighborhoods, certain measures could be taken to reduce potential impacts.

a) The Aqueduct could commit to a daily maximum of up to 33 inbound and 33 outbound truck trips.

b) The Aqueduct could commission independent trip generation surveys to monitor compliance with the trip generation commitments noted in Item (a) above.

c) Haul routes B (River Road - MD 190), C (Massachusetts Avenue - MD 396), D (Dolley Madison Boulevard - VA 123), E (Georgetown Pike - VA 193), which present the least capacity/operational, safety and security issues, could be prioritized for all of the hauling operations during normal roadway conditions.

d) Route A (Wisconsin Avenue - MD 355) could be used only on an emergency basis due to significant pedestrian - vehicular conflict and land use development issues. Routes F, G , and H (Southeast Freeway - I-395) could be similarly designated due to significant pedestrian - vehicular conflict and high security issues related to the National Mall, White House and Capitol, as well as the adjacent Federal Employment Core. These designations would be in keeping with the DC DOT's current truck route policies and recommendations.

e) Trucks accessing Little Falls Road could be provided with adequate stacking space on-site and restricted from parking or standing along the adjacent roadways.

f) A new driveway solely for the residuals facility operation could be constructed in accordance with DC DOT design standards. This driveway could intersect the Dalecarlia Parkway approximately 400 feet north of the existing Dalecarlia Parkway/Loughboro Road intersection. This access would eliminate potential adverse traffic and noise impacts to the Sibley Memorial Hospital complex and the residential uses along Loughboro Road.

7.2.6 Visual

The dewatering facilities are the tallest structures associated with residuals processing. For this reason, the long-term visual impact to the Sibley Memorial Hospital users and residents of Spring Valley can be reduced by placing the dewatering facilities on the lowest grade area of the site that is practicable and by using architecture consistent with area buildings. The visual impact to the Westmoreland Hills residents capable of seeing the facility from views across the reservoir can be reduced by constructing a berm and planting it with visually consistent vegetation and by building the facilities into the side slope of the hill to lower their apparent height. Required lighting for the facility can be kept to minimal needs to assure security and operational requirements.

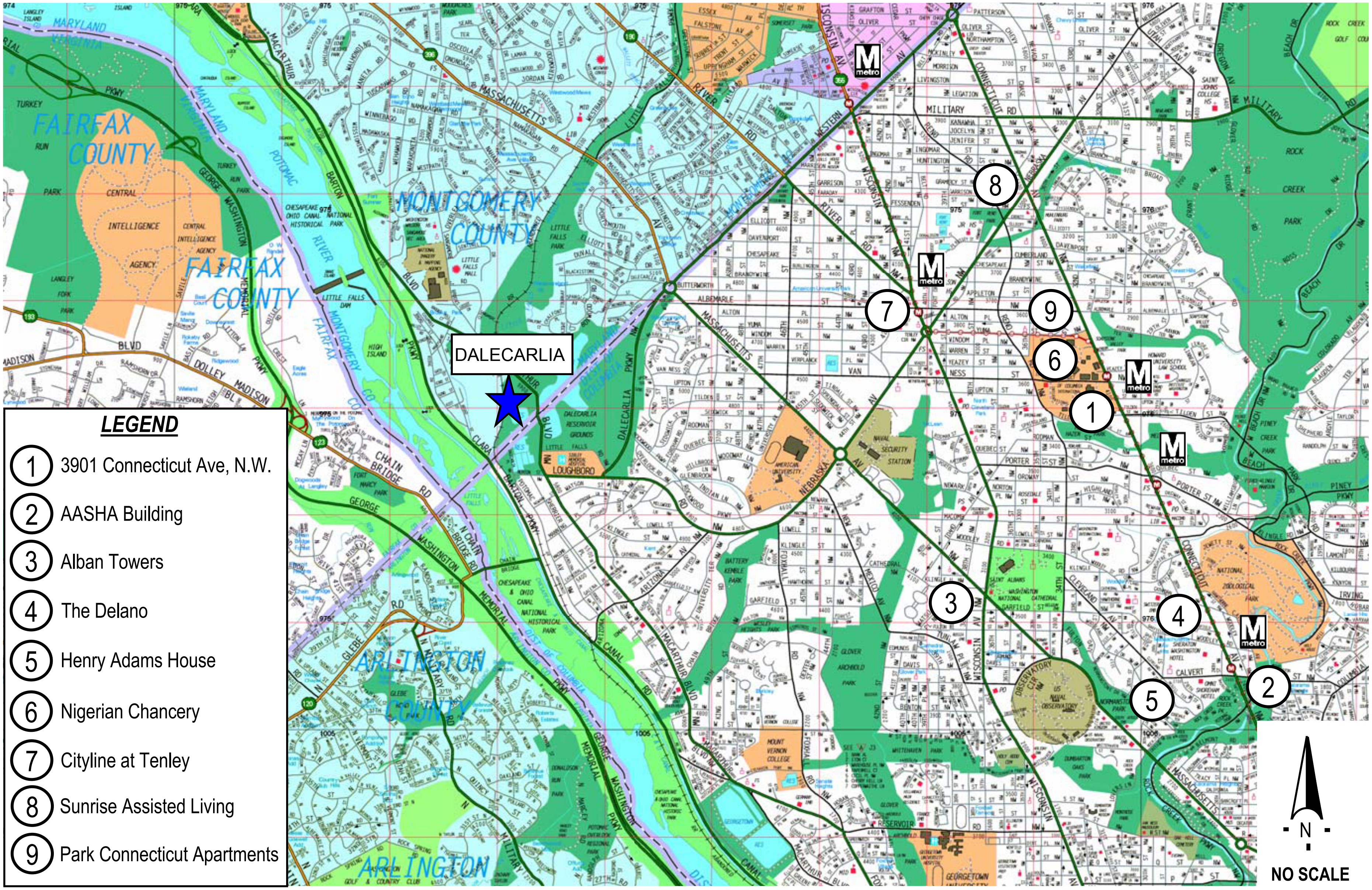


Figure 7-1

Approximate Locations of Planned/Proposed Developments - Northwest Washington, D.C.

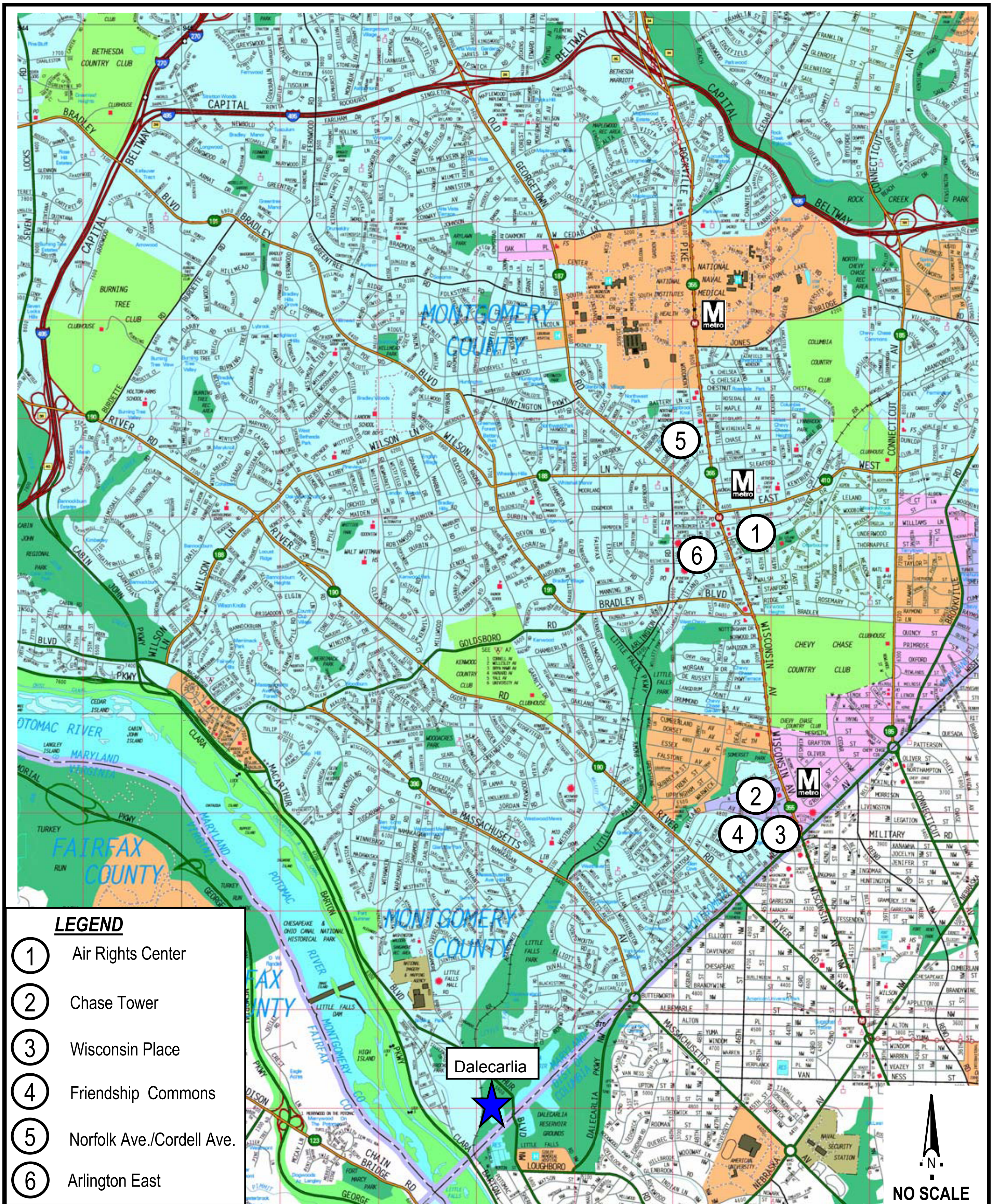


Figure 7-2

Approximate Locations of Planned/Proposed Developments - Montgomery County, Maryland, and Wisconsin Ave. corridor

SECTION 8

List of Preparers and Agencies

List of Preparers

Washington Aqueduct and other Baltimore District USACE Staff

Thomas P. Jacobus, P.E., General Manager, Washington Aqueduct
Qualifications:
Project Role: Overall Project Responsibility
Patricia A. Gamby, Chief, Waterworks/Environmental/ Electrical Section, Planning and Enginering Branch, Washington Aqueduct
Qualifications: B.S., Civil Engineering, University of Maryland, College Park, 1982
Project Role: Project Manager

David MacGregor, Chief, Planning and Engineering Branch, Washington Aqueduct
Qualifications: B.S., Civil Engineering, University of Maryland, College Park, 1971
Project Role: Senior Project Manager

Michael C. Peterson, Environmental Engineer, Planning and Engineering Branch, Washington Aqueduct
Qualifications: B.S., Civil Engineering, University of Maryland, College Park, 1999
Project Role: Staff Engineer, Public Outreach Point-Of-Contact

Andrea Walker, Environmental Protection Specialist, Planning and Environmental Services Branch, Planning Division
Qualifications: B.S., Recreation and Leisure Administration, York College of Pennsylvania, 1994.
Project Role: NEPA Advisor

Ron Mardaga, Environmental Program Manager, Planning and Environmental Services Branch, Planning Division
Qualifications: A.A., Business Administration, Baltimore County Community College, 1971.
Project Role: NEPA Advisor

James Bemis, JD, Attorney, Baltimore District Office of Counsel
Qualifications: B.S., Public Affairs/Administration, Indiana University, 1979, M.P.A., Public Financial Administration, Indiana University, 1985, J.D., Indiana University, 1985
Project Role: Project Counsel

CH2M HILL Staff:

Project Management and Quality Control Staff:
Glenn Palen, P.E., Principle Project Manager
Qualifications: B.S., Civil Engineering, Clarkson College of Technology, 1979, M.S., Environmental Engineering, University of North Carolina, 1981
Project Role: Project Manager

Tom Decker, P.E., Vice President
Qualifications: B.S., Civil Engineering, University of Missouri-Columbia, 1972, M.S., Civil Engineering, University of Missouri-Columbia, 1974
Project Role: Principle in Charge

Jed Campbell, Senior Technologist
Qualifications: B.S., Environmental Resource Management and Economics, Allegheny College, 1983, Trained Mediator, PennAccord Center for Environmental Dispute Resolution
Project Role: Public Involvement and NEPA Task Manager

Jamie Maughan, PhD, Principal Technologist
Qualifications: Ph.D., Oceanography, University of Rhode Island 1986,
M.S., Ecology, Virginia Polytechnic Institute & State University 1974,
B.S., Biology, Old Dominion University 1971
Project Role: EIS Quality Manager

Jennifer Armstrong, Associate Engineer
Qualifications: M.S., Environmental Engineer, Duke University, 1998
B.S., Engineering Technology, Bates College, 1994
B.E., Chemical Engineering, Dartmouth College, 1994
Project Role: EIS Task Manager

Ed Fleischer, P.E., Environmental Engineer
Qualifications: B.S., Civil Engineering, University of Massachusetts 1987,
M.S., Environmental Engineering, University of Massachusetts 1987,
B.A., Education, University of Massachusetts 1975
Project Role: Feasibility Study Task Manager

Al Wollmann, P.E., Senior Technologist

Qualifications: B.S., Civil Engineering, Purdue University, 1964
Project Role: Senior quality control reviewer for the Engineering Feasibility Study

Phil Hecht, P.E., Senior Environmental Engineer
Qualifications: M.E., Environmental Engineering, Manhattan College, 1991
B.E., Civil Engineering, Manhattan College, 1988
Project Role: Senior water treatment process engineer

Environmental Impact Statement Staff:

EA Engineering, Science, and Technology, Inc.
Contact: William Rue, Jr.
Qualifications: M.S., Biology and Aquatic Toxicology, 1979, B.S., Biology, 1974
Project Role: Biological Resources

Jennifer Armstrong, Associate Engineer
Qualifications: M.S., Environmental Engineer, Duke University, 1998
B.S., Engineering Technology, Bates College, 1994
B.E., Chemical Engineering, Dartmouth College, 1994
Project Role: Public Health, Infrastructure, Trasportation, Implementation Uncertainty

Elizabeth Calvit, Cultural Resource Specialist
Qualifications: M.A., American Studies/Graduate Program in Historic Preservation, The George Washington University, September 1994, B.I.D., Interior Design, FIDER accredited, Louisiana State University, 1991, B.S., General Studies (Psychology and Art History), Louisiana State University, 1981.
Project Role: Cultural Resources

Jed Campbell, Senior Technologist
Qualifications: B.S., Environmental Resource Management and Economics, Allegheny College, 1983, Trained Mediator, PennAccord Center for Environmental Dispute Resolution
Project Role: Public Involvement

Ken McGill, Senior Hydrogeologist
Qualifications: Groundwater Modeling, Drexel Univeristy, Pennsylvania,
Graduate Studies Hydrogeology/Wright State University, Ohio,
B.S., Geology, Upsala College, NJ 1974
Project Role: Soils, geology and groundwater

Michael Clayton, Environmental Scientist
Qualifications: B.S., Entomology and Applied Ecology, University of Delaware, 1995
Project Role: Land Use, Wetlands, and geology

Ginny Farris, Environmental Planner
Qualifications: B.A., Psychology, George Mason University, 1978
Project Role: Socioeconomic

Ed Fleischer, P.E. , Environmental Engineer
Qualifications: B.S., Civil Engineering, University of Massachusetts 1987,
M.S., Environmental Engineering, University of Massachusetts 1987,
B.A., Education, University of Massachusetts 1975
Project Role: Land Application of Residuals, Public Health and Cost

Laura Haught, Environmental Scientist
Qualifications: B.S., Biology, George Mason University, 1998
Project Role: Biological Resources, Soils, Geology, and Groundwater

Erin Mosley, P.E., Civil Engineer
Qualifications: B.S., Civil Engineering, Northeastern University, 1995
Project Role: Infrastructure

O. R. George and Associates, Inc.
Contact: Cullen E. Elias
Qualifications: MS Urban and Regional Planning [focus on transportation planning], University of Iowa
Project Role: Transportation

Glenn Palen, P.E., Principle Project Manager
Qualifications: B.S., Civil Engineering, Clarkson College of Technology, 1979, M.S., Environmental Engineering, University of North Carolina, 1981
Project Role: Implementation Uncertainty analysis and Infrastructure

Ray Porter, Senior Air Quality Meteorologist
Qualifications: M.S., Environmental Engineering, Georgia Institute of Technology, 1984
B.S., Meteorology, University of Lowell, 1978
Project Role: Air Quality and Noise

Tom Priestley, Senior Environmental Planner
Qualifications: Ph.D., Environmental Planning, University of California, Berkeley
M.L.A., Environmental Planning, University of California, Berkeley
M.C.P., City Planning, University of California, Berkeley
B.U.P., Urban Planning, University of Illinois
Project Role: Visual Aesthetics

Kiesha Wilson, Environmental Scientist
Qualifications: B.S., Environmental Science, University of South Florida, 1997
Master's Public Policy, George Mason University (in progress)
Project Role: Hazardous, Toxic, and Radioactive Substances

List of Agencies, Organizations, and persons to whom copies of the statement are sent

AGENCY and ORGANIZATION RECIPIENTS

- U.S. Environmental Protection Agency, Office of Federal Activity
- U.S. Department of Interior
- D.C. Department of Public Works
- District of Columbia Fire and Emergency Medical Services
- Montgomery County Government
- D.C. Department of Transportation
- Metropolitan Police Department
- Montgomery County Department of Public Works and Transportation
- Solid Waste Management, D.C. Department of Public Works
- Metropolitan Washington Council of Governments
- Montgomery County District 1 Councilmember (Maryland)
- Fisheries and Wildlife Division, D.C. Department of Health
- Water Quality Division, D.C. Department of Health
- Chesapeake Bay Field Office, U.S. Fish and Wildlife Service
- Water Management Administration, Maryland Department of the Environment
- D.C. Water and Sewer Authority
- National Capital Region, National Park Service
- District of Columbia Councilmember Carol Schwartz
- D.C. Parks and Recreation Department
- Protected Resource Division, National Marine Fisheries Service
- Office of the Deputy Mayor for Planning and Economic Development
- Guest Services Incorporated
- County Manager, Arlington County (Virginia)
- Bureau of Environmental Quality, D.C. Department of Health
- City Manager, City of Falls Church (Virginia)
- Attorney General for the District of Columbia
- Air Quality Division, D.C. Department of Health
- National Capital Planning Commission
- Mayor, City of Falls Church (Virginia)
- Soil Resources Management, D.C. Department of Health
- County Executive, Montgomery County (Maryland)
- Department of Environmental Services, Arlington County (Virginia)
- Honorable Paul S. Sarbanes
- American Sportfishing Association
- The Nature Conservancy of Maryland/D.C.
- Advisory Neighborhood Commission 2E (District of Columbia)
- Arlington County Board
- Historic Preservation Division, D.C. Office of Planning
- Cabin John Citizens Association
- Office of Federal Agency Programs, Advisory Council on Historic Preservation
- Western Avenue Citizens Association

- Chief Operating Officer, Sibley Memorial Hospital
- Advisory Neighborhood Commission 1B (District of Columbia)
- Advisory Neighborhood Commission 3B (District of Columbia)
- District of Columbia Councilmember Jim Graham
- Washington DC Regional Office, Natural Resources Defense Council
- Advisory Neighborhood Commission 3C (District of Columbia)
- National Wilderness Institute
- Advisory Neighborhood Commission 3E (District of Columbia)
- District of Columbia Councilmember Jack Evans
- Honorable Chris Van Hollen
- Honorable Eleanor Norton
- Palisades Citizens Association
- Office of Maryland Senator Brian Frosh
- Honorable Jim Moran
- Advisory Neighborhood Commission 3D (District of Columbia)
- District of Columbia Councilmember Kathy Patterson
- Watershed Protection Division, D.C. Department of Health
- U.S. Commission of Fine Arts
- General Manager for Environmental Services, City of Falls Church (Virginia)
- Virginia Department of Environmental Quality
- Audubon Naturalist Society
- Honorable George P. Radanovich
- U.S. EPA Region III
- Arlington County Environment and Energy Conservation Commission (Virginia)
- Water Quality Division, D.C. Department of Health
- Arlington County Fiscal Affairs Advisory Commission
- Office of Environmental Impact Review, Commonwealth of Virginia
- C&O Canal NHP Headquarters, National Park Service
- Maryland Historical Trust
- MD DNR - Wildlife and Heritage Service
- Westmoreland Citizens Association
- Citizens' Cooperating Committee on Friendship Heights
- Spring Valley-Wesley Heights Citizens Association
- Honorable Barbara A. Mikulski
- Department of Environmental Programs
- Chesapeake Bay Field Office
- District of Columbia Councilmember Marion Berry
- District of Columbia Councilmember-At-Large Kwame R. Brown
- District of Columbia Councilmember-At-Large Phil Mendelson
- District of Columbia Councilmember-At-Large David Catania
- Bethesda-Chevy Chase, Regional Service Center, Montgomery County (Maryland)
- Montgomery County Council (Maryland)
- State Highway Administration (Maryland)
- Maryland National Capital Park and Planning Commission, Montgomery County Park and Planning

CITIZEN RECIPIENTS

- One hundred ninety private citizens in Maryland and the District of Columbia. Names are omitted for privacy.

SECTION 9

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SECTION 10

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