ATTACHMENT A

COASTAL ZONE MANAGEMENT ACT CONSISTENCY CERTIFICATION

RUNWAY 4-22 MODIFICATIONS PROJECT
COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY CERTIFICATION

This document provides the Commonwealth of Virginia with the Metropolitan Washington Airports Authority's (the Authority) Consistency Certification and necessary data and information under CZMA Section 307(c)(3)(A) and 15 CFR Part 930, sub-part D, for the Runway 4-22 Modifications Project at Ronald Reagan Washington National Airport (DCA), Arlington County, Virginia.

Certification:

The Authority certifies that the proposed activity complies with the enforceable programs of Virginia's Coastal Resources Management Program (VCP) and will be conducted in a manner consistent with the VCP.

Necessary Data and Information:

1. The proposed action that is the subject of this certification includes modifications to Runway 4-22 and the re-opening of an existing but inactive public parking lot at DCA. The purpose of the proposed action is to offset the loss of 350-400 parking spaces due to the construction of another proposed project at DCA – the addition of new parking decks atop the existing Garages A and B/C. To offset the loss of parking spaces, the Authority will re-open, on a temporary basis, an existing but inactive paved parking lot south of Runway 4-22. Because the inactive parking lot lies within the runway safety area of Runway 4-22, modifications to the runway are also needed. Proposed modifications to the runway include line painting, adjusting fences, and relocating lights (i.e., Runway End Identifier Lights and Visual Approach Slope Indicators). In addition some minor restoration of the existing inactive parking lot pavement would be required to make it suitable for auto parking. This CZMA certification addresses the re-opening of the parking lot and the runway modifications. The project is described in the Runway 4-22 Modifications Draft Form C Environmental Assessment (EA).

2. The project site is located in Arlington County which is located within Virginia's Designated Coastal Zone Management Area.

   The proposed Runway 4-22 Modifications project will incorporate a number of actions that will take place in an area that has been previously disturbed and developed. Specific activities include relocating and relamping runway lighting and the refurbishing/construction of public parking spaces to replace those lost during public parking garage expansion.

3. An evaluation of the probable effects of the proposed actions in relation to the enforceable policies of the Virginia Coastal Resources Management Program is provided below:

a. Tidal and Non-Tidal Wetlands

The purpose of the wetlands management program is to preserve tidal wetlands and non-tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation.

There are no tidal wetlands or non-tidal wetlands located on the project site.

b. Fisheries Management

The Fisheries Management Program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities.

There are no commercial or recreational fishery activities at DCA. The proposed action would not impact the fishery resources in the Potomac River.

c. Subaqueous Lands Management

The management program for subaqueous lands established conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, tidal wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards.

There are no state-owned bottom lands within the project area at DCA.

d. Dunes Management

Dune protection is intended to prevent the destruction or alteration of primary dunes.

There are no primary dunes that are within the project site at DCA.

e. Non-Point Source Pollution Control

The Department of Conservation and Recreation (DCR) administers Virginia's Erosion and Sediment Control Law, which requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth.

The Authority's erosion and sediment control program requires any project that involves excavation, landfilling or disturbance of the ground to include erosion and sediment control measures in accordance with the Virginia Erosion and Sediment Control Law and General Criteria, including the *Virginia Erosion and Sediment Control Handbook*. Individuals who are certified by DCR as Program Administrators, Inspectors and Plan Reviewers administer the Authority's program. In addition, the Authority has in place a Stormwater Pollution

Prevention Plan (SPPP) under its VPDES permit that includes all major tenants as co-permittees.

The proposed project will not require excavation, landfilling or disturbance of the ground. The project has two main construction activities - repaving an existing but unused parking lot and cutting grooves into the existing asphalt for the electrical conduit for parking lot lighting.

Additional non-point source pollution control is achieved through the VCP Coastal Lands Management Program discussed below and in Paragraph (i). The Coastal Lands Management program is a state-local cooperative program administered by the Chesapeake Bay Local Assistance Department and localities in Tidewater Virginia including Arlington County.

All construction and subsequent operational activities at DCA is under restrictions embodied in DCA's Virginia Pollutant Discharge Elimination System (VPDES) stormwater discharge permit, as well as pertinent State guidance such as the *Northern Virginia BMP Handbook* and *Virginia Stormwater Management Handbook*. In addition to the management of stormwater runoff via existing and future temporary facilities, each applicable separate construction project is required to have individual erosion and sediment control plans approved by the Authority's Building Codes/Environmental Department.

The land disturbance from the proposed project will be below the threshold for which an erosion and sediment control plan would be required since the construction activities are not expected to disturb the underlying soil. In the event that unanticipated soil disturbance would be needed for the proposed project, then construction activities will be under the restrictions identified in DCA's VPDES stormwater discharge permit, as well as pertinent state guidance such as the *BMPs Handbook* and the *Virginia Stormwater Management Handbook*. In addition to the management of stormwater runoff, the construction aspects of the project will then be required to have an individual erosion and sediment control plan.

f. Point Source Pollution Control

VDEQ regulates discharges into state waters through the Virginia Pollutant Discharge Elimination System (VPDES) and Virginia Pollution Abatement permits. The latter are accomplished through the implementation of the National Pollutant Discharge Elimination System permit program established pursuant to Section 402 of the federal Clean Water Act.

All discharges at DCA are covered by the airport's VPDES permit. Since the proposed project involves repaving an existing but unused parking lot, there will be no new point source discharge.

g. Shoreline Sanitation

The Virginia Department of Health regulates the installation of septic tanks, sets standards, concerning soil types suitable for septic tanks, and specifies minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth.

The project does not include the installation of a septic tank.

h. Air Pollution Control

VDEQ implements the federal Clean Air Act and its Amendments to provide a legally enforceable State Implementation Plan (SIP) for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS).

Total direct and indirect emissions for the proposed project are well below *de minimis* standards and are not large enough to be regionally significant. At these emissions levels, air quality impact modeling is not required under General Conformity because it is assumed that the emissions will not cause a violation or delay in attainment of the applicable NAAQS. Because total direct and indirect emissions from the proposed project are well below *de minimis* standards and are not regionally significant the project can be presumed to conform to the applicable SIP.

i. Coastal Lands Management

The Chesapeake Bay Local Assistance Department regulates activities in Chesapeake Bay Resource Management Areas (RMAs) and Resource Protection Areas (RPAs) within 84 localities in Virginia's coastal zone including Arlington County thorough a state-local cooperative program established pursuant to the Chesapeake Bay Preservation Act. All of Arlington County is designated a Chesapeake Bay Preservation Area and is legislated in Arlington County's Chesapeake Bay Preservation Ordinance, Chapter 61. According to the Arlington County map of RPAs, DCA is within an adopted RPA.

Project activities include the repaving of an existing but unused parking lot and cutting grooves into the existing asphalt for the electrical conduit for parking lot lighting. All project activities occur on previously developed/paved areas. Even though the proposed project is located within an RPA there will be no change to the function of the RPA at DCA as a result of project activities. The Runway 4-22 Modifications project is consistent with The Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management regulations, implemented by the "Chesapeake Bay Preservation Ordinance" in the Code of the County of Arlington.

By this certification that the Runway 4-22 Modifications Project at Ronald Reagan Washington National Airport is consistent with the Virginia Coastal Resources Management Program, Virginia is notified that it has 6 months from the receipt of this letter and accompanying information in which to concur with or object to the Metropolitan Washington Airports

Authority's certification. Pursuant to 15 CFR section 930.63 (b), if Virginia has not issued a decision within 3 months following commencement of State agency review, it shall notify the Authority and the Federal Aviation Administration of the status of the matter and the basis for further delay. The State's concurrence, objection, or notification of review status shall be sent to:

Mr. William C. Lebegern
Metropolitan Washington Airports Authority, MA-32
West Building Room 155
Ronald Reagan Washington National Airport
Washington, D.C. 20001

and

Ms. Jennifer Mendelsohn
Federal Aviation Administration
Washington Airports District Office
23723 Air Freight Lane, Suite 210
Dulles Virginia 20166

CERTIFIED BY

Stephan G. Smith
Deputy Vice President for Engineering

Date

ATTACHMENT B

COMMENTS RECEIVED REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT
(to come)

RADAR ANALYSIS REPORT

Potomac Yard Development Project

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Prepared for:
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Date:
September 21st, 2009

Executive Summary

BACKGROUND AND SCOPE

This report has been generated for the purpose of determining if the Potomac Yards Development project may be affected by radar considerations, given its close proximity to the Ronald Reagan National Airport (DCA). Unlike airspace requirements, such ensuring clearance from approach paths where definitive regulations exist, there are no FAA published regulations, criteria, limitations or algorithms for determining the acceptability of a given structure or group of structures with respect to potential radar impact. Additionally, the radar issue involves not only the FAA but also the Department of Defense as well as Homeland Security.

Because of this lack of definitive, regulatory guidance the approach taken in this report is to do generate a relative comparison between the area in which the Potomac Yards project will be located with other areas surrounding DCA. The area examined was the hemisphere from due north of the airport going counter clockwise to due south of the airport or as it might be viewed, the Virginia side of the airport area. Please note the report discusses many of the technical issues related to radar affects in more detail including shadowing of areas and creation of phantom targets.

SUMMARY OF FINDINGS

The following summarizes our findings:

- The Potomac Yard project will very likely cause the FAA to raise the issue of potential radar impact. This is due to the projects close proximity to the DCA radar facility and the relative height (angle from radar to top of structure) of many of the structures.
- However, the number of large structure and relative height in the area northwest to west of DCA (Crystal City Area) is more 'dense' with more structures some of which have approximately the same relative angle to the radar as the most severe buildings in the Potomac Yard project.
- Unlike the Crystal City area, the area of radar coverage arc which 'sees' the Potomac Yard project is narrower with most significant structures within a 20 degree arc of radar coverage.
- Because of the orientation and varied height of the proposed structures for the Potomac Yard project, the radar affect will be different from either a monolithic structure, or large structures arranged adjacent to each other on streets aligned in a straight path as is the case in much of the Crystal City area. The 'campus' type design should have a mitigating factor on the overall impact.
- Unlike the Crystal City area, the Potomac Yard area is not positioned between the radar unit and the primary approach paths used by the airport. We believe this to be a significant difference.
- There are several mitigating strategies that can be employed without having a serious impact on the overall project. Frequent methods used involve the use of specific materials, such as special glass on surfaces to reduce radar reflectance as well as slight reorientation of buildings to reduce radar reflectance. Similarly,

reorientation of buildings even a small amount can reduce reflectance as well as reduce the size of the surface presented to the radar. Having control over the design and position of so many structures is a great advantage over a situation where a single building is attempting to be positioned on a single plot not much larger than the building.

- None of these mitigation methods should be considered until receiving an official FAA position regarding the project.
- This issues going forward will be to get a determination from the FAA that the presence of these structures does not generate any anomalies with the DCA radar system such as ghost images or false targets. Secondly, to get a determination that any shadowing effect that might exist because of the complex is minimal and does not create any operational impact.

RECOMMENDATIONS

We recommend the submission of the project to be FAA be done quickly so an initial FAA position can be determined as quickly as possible and dialogue can begin to resolve any perceived issues. Assuming the FAA's finds that radar issues will need to be examined, it is reasonable to expect the Department of Defense and Homeland Security will become involved, though the interfacing with these other entities will be handled by the FAA. However, all of this interagency work as well as the studies within each, will have an impact on the timeline for achieving approval. This is our basis for the recommendation for proceeding with the submission and establishment of this dialogue with the FAA should be as soon as practicable.

Radar Analysis Report for Potomac Yards Development Project

SCOPE

This report has been generated for the purpose of determining if the Potomac Yards Development project may be affected by radar considerations, given its close proximity to the Ronald Reagan National Airport (DCA). This analysis is focused solely on this aspect of the project.

BACKGROUND

Unlike the process for the determination of the interference of a structure with airport operations such as instrument approaches, the process for determining the impact on radar from a structure is not a direct process. For a single structure the effect is determined by factors including: structure size, including height and 'width' as seen by the radar; the reflectivity of the object which is effected by the materials used in construction; and how the structure is 'seen' by the radar based upon the distance from the radar as well as the radar frequency spectrum used. While a single structure is difficult, multiple structures – each with all of it own characteristics – significantly increases the complexity of the process.

Because of this complexity there is a lack of definitive, regulatory guidance. This is further complicated by the fact that the concerned parties from the government include not only the FAA, but also the Department of Defense as well as Homeland Security. An example of the sometimes vague nature of this process is indicated by a link off of the FAA website relating to obstacle determination. This link goes to a Department of Defense tool for 'screening' potential radar impact for various types of radar systems including Long Range, NEXRAD and Military Operations. Any point entered into the Long Range radar study along the Mid Atlantic States region within several hundred miles of the coast will return it as a 'red' flag indicating a study will be required – and height of the structure is not even an input to this analysis. It should be noted that this tool indicates no difficulty with NEXRAD or Military Operations.

APPROACH TAKEN IN THIS STUDY

Within the industry, a very conservative criteria for screening for structure that may require study, is to consider those objects which have an angle between the radar facility and the top of the object of one degree or greater. In this report we will periodically refer to this as the 'relative height'. Additionally, in an area such as the DCA airport, the FAA has a tremendous amount of operational experience at this airport..

In view of this FAA experience we have approached this analysis by comparing the relative 'density' (number of objects within an area) and relative 'height' of the structures located in the hemisphere to the west side of DCA airport. By taking this approach we look to develop an overall strategy to aid in addressing potential FAA concerns regarding the radar issue allowing us to draw comparisons that are directly relevant as well a contrasting the differences as they relate to the Potomac Yard project.

METHODOLOGY AND TOOLS USED IN THIS ANALYSIS

The data and most computations used in this analysis were derived from use of the Federal Airways and Airspace software tool which is a standard within the industry. While this tool provides a powerful database of structures as well as navigation aids (such as radar) it does not have the ability to provide a 'ruling' or 'opinion' on any potential radar impact, for reasons previously described.

The analysis methodology used made use of this software in both its conventional manner for analyzing the potential airports and airways impact of a proposed structure, as well as in a 'reverse method' from that normally used for analysis of existing structures with respect to DCA Radar. A total of 28 geographic points were taken from the Potomac Yards data provided and were used as the study points. The selected points all generated heights of 130' AMSL or higher. The normal analysis was run on these points and this produced the heights, distances and angles from the DCA radar facility.

> NOTE: The material provided for analysis did not include precise coordinates for the corners of all of the structures which we would consider as 'high rise' which in this analysis is an elevation of over 130' AMSL. Consequently, the nearest set of geographic coordinates was used for the cited elevation. Experimenting with the coordinates to slightly reposition them to determine what effect this might have indicated there was no substantial effect to the data that would affect this analysis.

To study the existing structures in the DCA studied area, the radar location and elevation were used in the software as the 'study point' and a report for the current surrounding obstacles was generated. This report provided the location (latitude and longitude), distance from the radar facility and the AMSL height of each of the structures. The 'angle' from the DCA radar facility to the top of the structures was then computed. Structures without significant radar impact such as smoke stacks and antennas were removed from the data output to simplify and more focus the analysis. The resulting data was then placed in tables and divided into sectors of 30 degrees of arc starting from due north and moving in a westerly (counter clockwise) direction until reaching due south. Within each of these sectors, the values were sorted by bearing from the radar facility (heading DEG), distance from the facility (heading RANGE) and the relative height (heading ANGLE). All of the information listed above is provided in tables included in the Appendix to this report on pages 1 through 4 of the Appendix. The Appendix title page provides a legend of the headers used in the data tables.

ILLUSTRATION OF DATA WITH GOOGLE EARTH

In an effort to illustrate the height and distribution of the various structures, the data was formatted and uploaded to Google Earth. Several saved images from this exercise are presented on Appendix pages 5 through 11. Also transmitted with this report is a file entitled DCA EarthPointExcel.kml. When loaded onto a computer which supports Google Earth, double click on this file and it will open Google Earth and load all of the present obstacles as well as the study points.

When viewing the obstacles in Google Earth, the following should be noted:

- Existing structures from the data tables are depicted as BLUE balloon icons, while the study points for the Potomac Yard project are depicted in RED with a small square in the center.
- The 'numbers' which appear as the name of each structure indicates the angle between the structure and the DCA radar facility.
- When zooming into lower altitudes and viewing the structures at an angle, Yellow lines will appear between the balloon icons and the ground. The ground point of the line is the actual coordinate the line length reflects the actual height of the object.

ANALYSIS AND INTERPRETATION OF DATA

- The Potomac Yard project will very likely cause the FAA to raise the issue of potential radar impact due to the following:
  - Of the 28 study points within the Potomac Yard project, all are between 4,500' and 6,800 feet of the radar antenna at DCA.
  - All 28 study points had an angular position of greater than 1 degree between the structures elevation and the radar facility.
  - 17 of these points were 1.5 degrees or greater
  - 8 were 2.0 degrees or greater.
  - Consequently, it is reasonable to believe the FAA will want to do radar analysis of this project.
  - See Appendix Pages 7 and 9 for graphical illustration of Potomac Yard project to radar and associated angles.

- However, the number of large structure and relative height in the area northwest to west of DCA (Crystal City Area) is more 'dense' with many structures some of which have approximately the same relative angle to the radar as the most severe buildings in the Potomac Yard project.
  - Within the sector between 300 and 329 degrees, there are a total of 63 structures
  - 37 with an angle greater than 1.0 degrees
  - 14 with an angle greater than 1.5 degrees
  - 5 points with an angle greater than 2.0 degrees
  - See Appendix Pages 6, 7, 8 and 10 for graphical illustration of this area and associated radar angles.

- Unlike the Crystal City area, the area of radar coverage which 'sees' the Potomac Yard project is much narrower with most significant structures within a 20 degree arc.
  - All study points fall within a 22 degree arc.
  - All points with an angle greater than 2.0 degrees are within a 16 degree arc.
  - All points with an angle greater than 1.5 degrees are within an 18 degree arc.
  - See Appendix Pages 6 and 7.

- Because of the orientation and varied height of the proposed structures for the Potomac Yard project, the radar affect is will be different from either a monolithic structure, or large structures arranged adjacent to each other on streets aligned in a straight path as is the case in much of the Crystal City area. The 'campus' type design should have a mitigating factor on the overall impact.

    - Many, though not all, of the largest structures are oriented in a manner that reduces their profile to the radar signal.

    - While many of the structures will be shadowed from the radar effect by closer and larger building, for study purposes we have assumed the ratio of such structures is equivalent to that experienced in the comparison areas. However, there is no question the campus style format, along with the lack of other existing structures of size in this area, should provide a mitigating effect.

- Unlike the Crystal City area, the Potomac Yard area is not positioned between the radar unit and the primary approach paths used by the airport. We believe this to be a significant difference. The following is a review of the DCA Arrival Routes as well as relevant instrument and visual approaches for DCA. All of the Arrival Routes and Instrument Approach procedures cited here are contained in the Appendix to this report.

    - BILLIT ONE ARRIVAL – Appendix Page 12
        - Routes traffic from the east of the airport to the airport. Traffic never travels through the Potomac Yard area.
    - CLIPER ONE ARRIVAL – Appendix Page 13
        - Routes traffic from the northeast of the airport to the airport. Traffic that will be landing on Runway 1 (to the north) will be vectored south to intercept the final approach course from the southeast and consequently not near the Potomac Yard area.
    - ELDEE FOUR ARRIVAL – Appendix Page 14
        - This arrival route would direct traffic near the Potomac Yard area, however when passing this area that would be farther west of the project an at an altitude of between 4,000' and 5,000'. The project should have no affect on radar for these operations.
    - IRONS FOUR ARRIVAL – Appendix Page 15
        - This arrival procedure is designed to position aircraft arriving in the DC area, however the procedure ends at a point 20 miles south of DCA and consequently is not a factor.
    - MOUNT VERNON VISUAL RUNWAY 1 (Visual Approach) - Appendix Page 16
        - This approach does involve an arrival from the south with the aircraft normally positioned on the approach at a point in the center of the river at a point approximately 10 nautical miles (approximately 11.5 statute miles) south of the airport. While no required or recommended altitude is provided for this point, the suggested altitude at a point approximately 6 statute miles south of the airport is 1,600'. From the point at which the aircraft is

established on this approach anywhere along its path, it is outside the radar signal that would pass through the Potomac Yard area.

- OKAAY ONE ARRIVAL – Appendix Page 17
  - This arrival is used for aircraft arriving from the south. If runway 1 is in use, the aircraft will be vectored east at IRONS intersection – over 20 miles south of DCA – and when runway 19 is in use, the aircraft will be turning north at a point that is southwest of the Potomac Yard project.
  - The arrival indicates aircraft should expect to cross the OJAAY intersection at 10,000' when landing on Runway 1. It is realistic to expect that aircraft landing on runway 19, which will have to travel much farther prior to be established on the approach, will be at a similar altitude when approach SAMMO intersection which is the nearest point to this project. Consequently, radar interference should not be a factor.
- RIVER VISUAL RWY 19 – Appendix Page 18
  - This visual approach, which one of the most frequently used arrivals at DCA, brings aircraft in from the northwest quadrant of the airport to establish them on the route where they follow the Potomac river to the airport. This path is outside any area related to the Potomac Yard project.
- WZRRD TWO ARRIVAL – Appendix Page 19
  - This arrival route ends well west of the DCA area and is not a factor.
- SKILS ONE ARRIVAL – Appendix Page 20
  - This route takes traffic east of the airport and therefore is not a factor.
- VOR RWY 1 – Appendix Page 21
  - This instrument approach has the aircraft pass between Potomac Yard and the radar facility but does not place the project between the landing aircraft and radar facility.
  - This approach plate illustrates the large number of high obstacles located to the northwest of the airport as compared with those located to the south in the area of the project. The 223' obstacle noted south of the airport is a power plant and the 462' obstacle is the Masonic Temple. Both of these items are labeled on the Mount Vernon Visual Runway 1 approach plate.
- RNAV (RNP) RWY 1 – Appendix Page 22
  - This approach has the aircraft established on its final approach course at a point almost 12 statue miles south of the airport and in a position where it is on the eastern side of the Potomac river at an altitude of 2,500'. The aircraft remain east of the project at all times.
- ILS RWY 1 (CAT I and CAT II Approaches – only CAT 1 in Appendix) – Appendix Page 23
  - This approach has the aircraft established on its final approach course at a point 5 miles south of the airport and on the east side of the river. The aircraft remain east of the project at all times.
- COPTER ILS OR LOC RWY 1 – Appendix Page 24
  - This approach is functionally the same as the ILS RWY 1 approach with respect to the project consideration.

GOING FORWARD

The issues going forward will be a) to get a determination from the FAA that the presence of these structures does not generate any anomalies with the DCA radar system such as ghost images or false targets and b) to obtain a determination that any shadowing that might exist due to this project, is minimal and does not create any operational impact.

When working with the FAA on the first issue, there are several mitigation strategies that can be used should there be a concern regarding disturbance to normal radar operation. Properly thought out and negotiated, these can be accomplished with little serious impact to the project, however mitigating that impact requires discussions with the FAA begin before the project progresses to a point where small changes become very expensive.

The most frequent methods of mitigation for these issues related anomalies generated by radar reflectance involve the use of materials to minimize radar reflect that might present a problem as well as potentially reorienting buildings to reduce not only the the building impact, but also the cumulative effect. Having control over a complex this large presents tremendous opportunities to mitigate these conditions. With virtually no existing structure in the existing area, the ability to adjust yet remain innovative with the initial design intent is far easier then working to position a single building in a previously built-up area. Issues with respect to shadowing can also be addressed with slight reorientation, however we believe the arrival procedures which exist today should in themselves aid in demonstrating any effect here will not have an operational impact.

However, none of these mitigation methods or strategies should be considered until The FAA has issued an official FAA position regarding the project. Therefore, the sooner this project is filed, the soon the FAA's studies (and those of DoD and Homeland Security as necessary) can begin.

APPENDIX

Legend for Obstacle Tables In Appendix Pages 1 - 4

STATUS – "O" indicates it is an object which the FAA has confirmed and studied, a "U" indicates it is unconfirmed (potentially grandfathered). "P" indicates proposed and is used in the final table to indicate all study points used in this analysis.

TYPE OBSTACLE – Normally obvious as a building, or building with tower or bridge. Those items which were classified as 'stacks' or as only a tower were removed from the data tables to make the study more relevant.

CITY – City in which obstacle is located.

ST – State in which the city is located

LATITUDE and LONGITUDE – In degrees, minutes and seconds. All latitudes are North and all longitudes are west.

RANGE – Distance in feet from the DCA radar facility to the base of the obstacle.

DEG – Bearing from the DCA radar facility (based upon true north) to the cited obstacle.

QUANTITY – Indicates the quantity of obstacles of that type at the cited location.

AMSL – The elevation Above Mean Sea Level to the highest point of the cited obstacle in feet.

ANGLE – The angle formed from the base of the radar facility from a horizontal plane and a line projected up to the highest point of the obstacle.

Columns to the left are used to arrange the various obstacles by their distance (in feet) from the radar facility to the obstacle. The intent is to provide a visual indication of the distribution of these obstacles and their height.

The tables are created to reflect 'sectors' of 30 degrees beginning with due north and rotating in a counter clockwise fashion. The exception to this is the last table which contains all of the proposed project study points.

Points with Angle > than (degrees) – This includes adjustments for multiple structures and consequently may total more than a straight count of the line entries unless the QUAN field is also evaluate simultaneously.

Notes Regarding Google Earth Imagines

- Blue 'Tear Drop' icons are existing obstacles and Red icons indicated the proposed project icons.
- Number associate with object indicate angle to the DCA Radar Facility.

Obstacles Plotted from DCA Radar

V 2.2 STATUS	TYPE OBSTACLE	CITY	ST	LATITUDE	LONGITUDE	All Distances In Feet RANGE	DEG	QUAN	AMSL	Degrees ANGLE	Up To 5000	5001 to 7500	7501 to 10000	10000 to 12500	12500 to 15000	15001 to 17500	17501 to 20000	20000 to 25000	> 25000'
O	BLDG-TWR	WASHINGTON	DC	38-54-08.00	077-02-06.00	20776	359	1	236	0.62								236	
O	BLDG-TWR	WASHINGTON	DC	38-54-17.00	077-02-21.00	21748	355	1	250	0.63								250	
O	BLDG	WASHINGTON	DC	38-53-56.00	077-02-33.00	19737	352	1	280	0.78							280		
O	BRIDGE	WASHINGTON	DC	38-52-27.00	077-02-20.00	10679	351	4	63	0.28				63					
U	BLDG	WASHINGTON	DC	38-54-18.00	077-02-47.00	22107	350	1	182	0.45								182	
O	BLDG	WASHINGTON	DC	38-56-16.53	077-03-29.30	34516	348	1	323	0.52									323
O	BLDG	WASHINGTON	DC	38-53-45.00	077-03-20.00	19519	341	1	147	0.40							147		
O	BLDG	WASHINGTON	DC	38-55-51.00	077-04-15.00	32987	341	1	678	1.16									678
O	BLDG	ALEXANDRIA	VA	38-53-48.30	077-04-08.50	21381	331	1	264	0.68								264	
O	BLDG	ROSSLYN	VA	38-53-51.40	077-04-12.92	21825	331	1	361	0.92								361	
O	BLDG-TWR	ARLINGTON	VA	38-53-38.00	077-04-08.00	20453	330	2	395	1.08								395	
O	BLDG	ROSSLYN	VA	38-53-42.00	077-04-12.00	20961	330	1	275	0.72								275	
O	BLDG	ROSSLYN	VA	38-53-43.00	077-04-11.00	21010	330	1	320	0.85								320	
O	BLDG	ROSSYLN	VA	38-53-52.80	077-04-19.82	22217	330	1	374	0.94								374	
U	BLDG	ARLINGTON	VA	38-53-59.00	077-04-22.00	22847	330	1	210	0.50								210	
Sector 360 to 330 degrees		Number of Multiple Structure				2		Average AMSL						63			214	287	501
		Total Additional Multiple Structures				4		Number of Structures			0	0	0	1	0	0	2	10	2
		Total Structures Including Multiples				19													

Points with Angle > than (degrees)		
	1	3
	1.5	0
	2	0

O	BLDG	ARLINGTON	VA	38-53-43.00	077-04-19.00	21331	329	1	360	0.94								360	
O	BLDG	ROSSLYN	VA	38-53-49.26	077-04-21.99	21995	329	1	422	1.07								422	
O	BLDG	ROSLYN	VA	38-53-39.00	077-04-21.00	21070	328	1	324	0.85								324	
O	BLDG	ARLINGTON	VA	38-53-37.00	077-04-22.00	20941	327	1	358	0.95								358	
O	BLDG	WASHINGTON	DC	38-56-10.00	077-06-31.00	39476	327	1	325	0.46									325
U	BLDG	WASHINGTON	VA	38-52-10.86	077-03-15.72	10780	326	1	142	0.70				142					
O	BLDG	ROSSLYN	VA	38-53-33.00	077-04-27.00	20821	326	1	336	0.90								336	
O	BLDG	ARLINGTON	VA	38-53-44.00	077-04-34.00	22053	326	1	323	0.81								323	
O	BLDG	ROSSLYN	VA	38-53-38.28	077-04-33.72	21562	325	1	407	1.05								407	
O	BLDG	ARLINGTON	VA	38-51-45.00	077-03-00.00	7929	323	4	254	1.76			254						
O	BLDG	ARLINGTON	VA	38-51-36.00	077-02-53.00	6870	322	2	188	1.48		188							
O	BLDG-TWR	ALEXANDRIA	VA	38-51-50.35	077-03-10.06	8848	321	1	220	1.36			220						
O	BLDG	ARLINGTON	VA	38-51-40.00	077-03-05.81	7835	318	1	224	1.56			224						
O	BLDG	ARLINGTON	VA	38-51-43.00	077-03-09.00	8229	318	1	269	1.80			269						
O	BLDG	ARLINGTON	VA	38-51-46.00	077-03-12.00	8614	318	1	235	1.50			235						
O	BLDG	ARLINGTON	VA	38-53-24.00	077-05-04.00	21908	318	1	380	0.97								380	
O	BLDG	ARLINGTON	VA	38-53-20.00	077-05-09.00	21878	317	1	407	1.04								407	
O	BLDG	ARLINGTON	VA	38-51-40.00	077-03-09.00	8007	316	1	168	1.13			168						
O	BLDG	ARLINGTON	VA	38-53-17.00	077-05-12.00	21824	316	1	390	1.00								390	
O	BLDG	ARLINGTON	VA	38-51-26.00	077-02-55.00	6220	315	2	174	1.51		174							
O	BLDG	ARLINGTON	VA	38-51-30.00	077-03-01.00	6842	314	5	227	1.82		227							
O	BLDG	ARLINGTON	VA	38-51-37.00	077-03-11.00	7903	314	1	214	1.48			214						
O	BLDG	ARLINGTON	VA	38-51-48.00	077-03-30.00	9760	313	2	204	1.14			204						
U	BLDG	PENTAGON CIT	VA	38-51-40.18	077-03-20.84	8692	312	1	247	1.56			247						
U	BLDG	ARLINGTON	VA	38-53-05.00	077-05-18.00	21320	312	1	328	0.85								328	
O	BLDG	ALEXANDRIA	VA	38-51-19.52	077-02-53.10	5663	311	1	226	2.18		226							

Obstacles Plotted from DCA Radar

V 2.2 STATUS	TYPE OBSTACLE	CITY	ST	LATITUDE	LONGITUDE	All Distances in Feet RANGE	DEG	QUAN	AMSL	Degrees ANGLE	Up To 5000	5001 to 7500	7501 to 10000	10000 to 12500	12500 to 15000	15001 to 17500	17501 to 20000	20000 to 25000	> 25000'
O	BLDG	ARLINGTON	VA	38-51-26.00	077-03-02.00	6625	311	5	199	1.63		199							
O	BLDG	ARLINGTON	VA	38-51-31.00	077-03-10.00	7434	311	1	279	2.07		279							
U	BLDG	PENTAGON CIT	VA	38-51-37.00	077-03-20.00	8430	311	1	233	1.52			233						
U	BLDG	ARLINGTON	VA	38-51-21.66	077-02-59.02	6160	310	1	260	2.32		260							
O	BLDG	ARLINGTON	VA	38-51-47.00	077-03-36.00	10049	310	1	253	1.39				253					
O	BLDG	ARLINGTON	VA	38-53-11.00	077-05-43.00	23206	310	1	484	1.17								484	
O	BLDG	ARLINGTON	VA	38-51-44.00	077-03-37.00	9917	309	1	252	1.40			252						
O	BLDG	ARLINGTON	VA	38-51-16.00	077-02-54.00	5492	308	1	225	2.24		225							
O	BLDG	ARLINGTON	VA	38-51-24.00	077-03-10.00	6989	307	1	223	1.75		223							
U	BLDG	ALEXANDRIA	VA	38-51-40.00	077-03-38.10	9739	307	1	258	1.46			258						
O	BLDG	ARLINGTON	VA	38-51-41.22	077-03-43.85	10179	306	1	216	1.16				216					
O	BLDG	ARLINGTON	VA	38-52-00.68	077-04-22.87	13836	305	1	345	1.39					345				
U	BLDG	ARLINGTON	VA	38-52-58.00	077-06-13.00	24299	304	1	459	1.06								459	
O	BLDG	ARLINGTON	VA	38-51-11.00	077-02-55.00	5263	303	3	224	2.33		224							
O	BLDG-TWR	ARLINGTON	VA	38-52-55.00	077-06-19.00	24526	303	1	550	1.26								550	
O	BLDG	ARLINGTON	VA	38-52-49.00	077-06-29.00	24876	301	1	489	1.10								489	
U	BLDG-TWR	ARLINGTON	VA	38-52-51.60	077-06-32.90	25275	301	1	515	1.14									515
O	BLDG	ARLINGTON	VA	38-52-50.65	077-06-43.58	25955	300	1	577	1.25									577
O	BLDG	ARLINGTON	VA	38-52-52.00	077-06-46.00	26189	300	2	490	1.05									490
O	BLDG	ARLINGTON	VA	38-53-00.00	077-07-06.00	27963	300	1	508	1.02									508
Sector 300 to 329 degrees		Number of Multiple Structure				8		Average AMSL				223	232	204	345			401	483
		Total Additional Multiple Structures				17		Number of Structures			0	10	12	3	1	0	0	15	5
		Total Structures Including Multiples				63													

Points with Angle > than (degrees)		
	1	54
	1.5	29
	2	7

O	BLDG	ARLINGTON	VA	38-52-43.36	077-06-37.45	25170	299	1	351	0.78									351
O	BLDG	ARLINGTON	VA	38-52-42.00	077-06-42.00	25420	298	1	507	1.12									507
O	BLDG	ARLINGTON	VA	38-52-19.00	077-06-14.00	22389	296	1	412	1.03								412	
O	BLDG	ARLINGTON	VA	38-50-58.48	077-03-11.78	5962	286	1	214	1.96		214							
O	BLDG	ARLINGTON	VA	38-50-56.00	077-03-06.00	5456	284	1	246	2.48		246							
O	BLDG	ARLINGTON	VA	38-50-52.47	077-03-03.28	5168	281	1	210	2.22		210							
O	BLDG	FALLS CHURCH	VA	38-50-41.00	077-06-57.00	23565	270	1	590	1.41								590	
O	BLDG	ALEXANDRIA	VA	38-50-44.00	077-07-06.00	24277	270	2	571	1.32								571	
Sector 270 to 299 degrees		Number of Multiple Structure				1		Average AMSL				223						524	429
		Total Additional Multiple Structures				1		Number of Structures			0	3	0	0	0	0	0	3	2
		Total Structures Including Multiples				9													

Points with Angle > than (degrees)		
	1	8
	1.5	21
	2	2

Obstacles Plotted from DCA Radar

V 2.2 STATUS	TYPE OBSTACLE	CITY	ST	LATITUDE	LONGITUDE	All Distances in Feet RANGE	DEG	QUAN	AMSL	Degrees ANGLE	Up To 5000	5001 to 7500	7501 to 10000	10000 to 12500	12500 to 15000	15001 to 17500	17501 to 20000	20000 to 25000	> 25000'
U	BLDG	ARLINGTON	VA	38-50-35.00	077-03-01.39	4984	261	1	165	1.78	165								
O	BLDG	ALEXANDRIA	VA	38-49-58.50	077-07-02.50	24415	259	1	554	1.28								554	
U	BLDG	ALEXANDRIA	VA	38-50-02.30	077-03-44.60	9290	244	1	242	1.43			242						
Sector 240 to 269 degrees				Number of Multiple Structure		0			Average AMSL		165		242					554	
				Total Additional Multiple Structures		0			Number of Structures		1	0	1	0	0	0	0	1	0
				Total Structures Including Multiples		3													

Points with Angle > than (degrees)	1	3
	1.5	1
	2	0

O	BLDG	ALEXANDRIA	VA	38-49-09.00	077-04-41.00	15934	233	1	265	0.92						265			
U	BLDG	ALEXANDRIA	VA	38-49-51.22	077-03-00.88	7140	223	1	144	1.08		144							
U	BLDG	ALEXANDRIA	VA	38-49-00.00	077-03-59.00	14068	222	1	370	1.47					370				
O	BLDG	ALEXANDRIA	VA	38-48-27.00	077-03-58.00	16642	214	1	462	1.56						462			
O	BLDG	ALEXANDRIA	VA	38-48-06.00	077-04-00.00	18515	211	1	275	0.82							275		
O	BLDG	ALEXANDRIA	VA	38-48-04.39	077-03-49.62	18247	209	1	226	0.68							226		
O	BLDG-TWR	ALEXANDRIA	VA	38-48-54.00	077-03-09.00	12308	207	1	241	1.08				241					
Sector 210 to 239 degrees				Number of Multiple Structure		0			Average AMSL			144		241	370	363.5	250.5		
				Total Additional Multiple Structures		0			Number of Structures		0	1	0	1	1	2	2	0	0
				Total Structures Including Multiples		7													

Points with Angle > than (degrees)	1	4
	1.5	1
	2	0

U	BLDG	ALEXANDRIA	VA	38-48-47.00	077-02-32.00	11991	193	1	191	0.86				191					
O	BLDG	ALEXANDRIA	VA	38-48-45.00	077-02-33.00	12206	193	1	267	1.21				267					
U	BRIDGE	ALEXANDRIA	VA	38-47-30.00	077-02-30.00	19648	187	1	210	0.58							210		
Sector 180 to 209 degrees				Number of Multiple Structure		0			Average AMSL					229			210		
				Total Additional Multiple Structures		0			Number of Structures		0	0	0	2	0	0	1	0	0
				Total Structures Including Multiples		3													

Points with Angle > than (degrees)	1	3
	1.5	1
	2	1

Obstacles Plotted from DCA Radar

V 2.2 STATUS	TYPE OBSTACLE	CITY	ST	LATITUDE	LONGITUDE	All Distances in Feet RANGE	DEG	QUAN	AMSL	Degrees ANGLE	Up To 5000	5001 to 7500	7501 to 10000	10000 to 12500	12500 to 15000	15001 to 17500	17501 to 20000	20000 to 25000	> 25000'
P	C1	Potomac Yard	VA	38-50-24	77-03-02	5316	249	1	234	2.41		234							
P	C6	Potomac Yard	VA	38-50-21	77-03-06	5723	247	1	181	1.71		181							
P	D1	Potomac Yard	VA	38-50-21	77-03-03	5504	246	1	166	1.62		166							
P	A1	Potomac Yard	VA	38-50-22	77-02-56	4958	245	1	235	2.60	235								
P	B1	Potomac Yard	VA	38-50-21	77-02-58	5144	245	1	273	2.93		273							
P	B3	Potomac Yard	VA	38-50-18	77-03-01	5491	243	1	198	1.96		198							
P	G1	Potomac Yard	VA	38-50-17	77-03-02	5608	242	1	169	1.62		169							
P	F1	Potomac Yard	VA	38-50-18	77-02-57	5211	241	1	207	2.17		207							
P	E1	Potomac Yard	VA	38-50-18	77-02-54	5004	240	1	249	2.73		249							
P	K1	Potomac Yard	VA	38-50-13	77-03-02	5216	239	1	125	1.13		125							
P	F2	Potomac Yard	VA	38-50-15	77-02-57	5368	239	1	280	2.88		280							
P	K2	Potomac Yard	VA	38-50-10	77-03-01	5903	236	1	180	1.65		180							
P	N1	Potomac Yard	VA	38-50-09	77-03-01	5961	235	1	130	1.15		130							
P	J2	Potomac Yard	VA	38-50-11	77-02-56	5521	234	1	214	2.12		214							
P	M1	Potomac Yard	VA	38-50-10	77-02-56	5580	234	1	196	1.91		196							
P	E2	Potomac Yard	VA	38-50-12	77-02-52	5205	233	1	154	1.58		154							
P	L10	Potomac Yard	VA	38-50-10	77-02-55	5517	233	1	145	1.40		145							
P	J1	Potomac Yard	VA	38-50-14	77-02-57	5417	233	1	282	2.87		282							
P	N2	Potomac Yard	VA	38-50-06	77-03-01	6139	233	1	179	1.58		179							
P	R1	Potomac Yard	VA	38-50-05	77-03-01	6201	232	1	170	1.48		170							
P	Q4	Potomac Yard	VA	38-50-05	77-03-00	6139	232	1	148	1.29		148							
P	R2	Potomac Yard	VA	38-50-05	77-03-00	6139	232	1	167	1.46		167							
P	E3	Potomac Yard	VA	38-50-11	77-02-51	5142	231	1	146	1.52		146							
P	M2	Potomac Yard	VA	38-50-06	77-02-56	5829	230	1	156	1.43		156							
P	R3	Potomac Yard	VA	38-50-00	77-03-04	6184	230	1	132	1.04		132							
P	Q1	Potomac Yard	VA	38-50-05	77-02-56	5894	230	1	146	1.32		146							
P	S2	Potomac Yard	VA	38-50-00	77-03-00	6465	228	1	129	1.05		129							
P	L3	Potomac Yard	VA	38-50-04	77-02-52	5725	227	1	131	1.21		131							
Potomac Yards - 249 to 227 Degrees				Number of Multiple Structure		0	Average AMSL					135							
				Total Additional Multiple Structures		0	Number of Structures				1	27	0	0	0	0	0	0	0
				Total Structures Including Multiples		28													

Points with Angle > than (degrees)		
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	1.5	17
	2	8

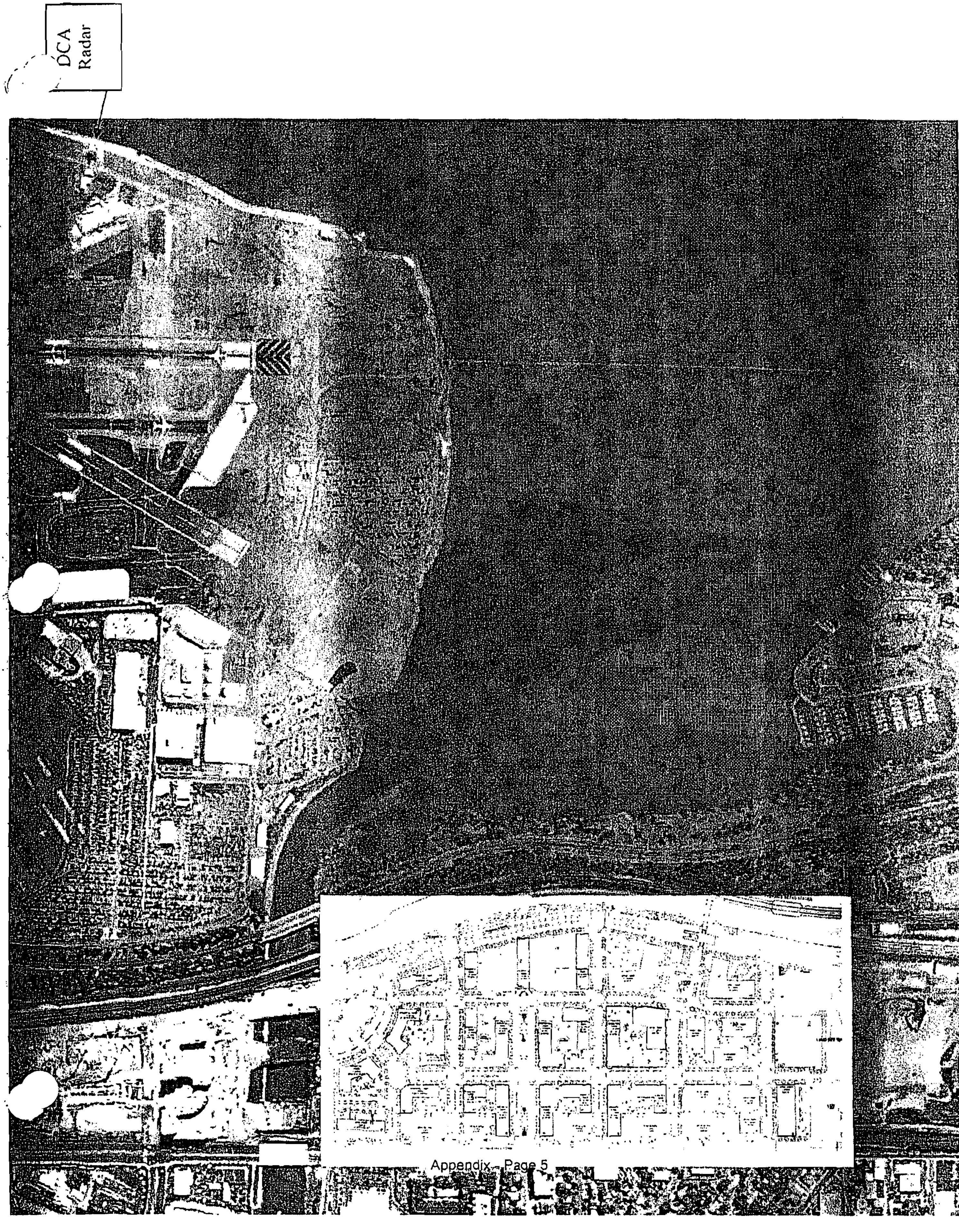
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Image © 2009 Commonwealth of Virginia
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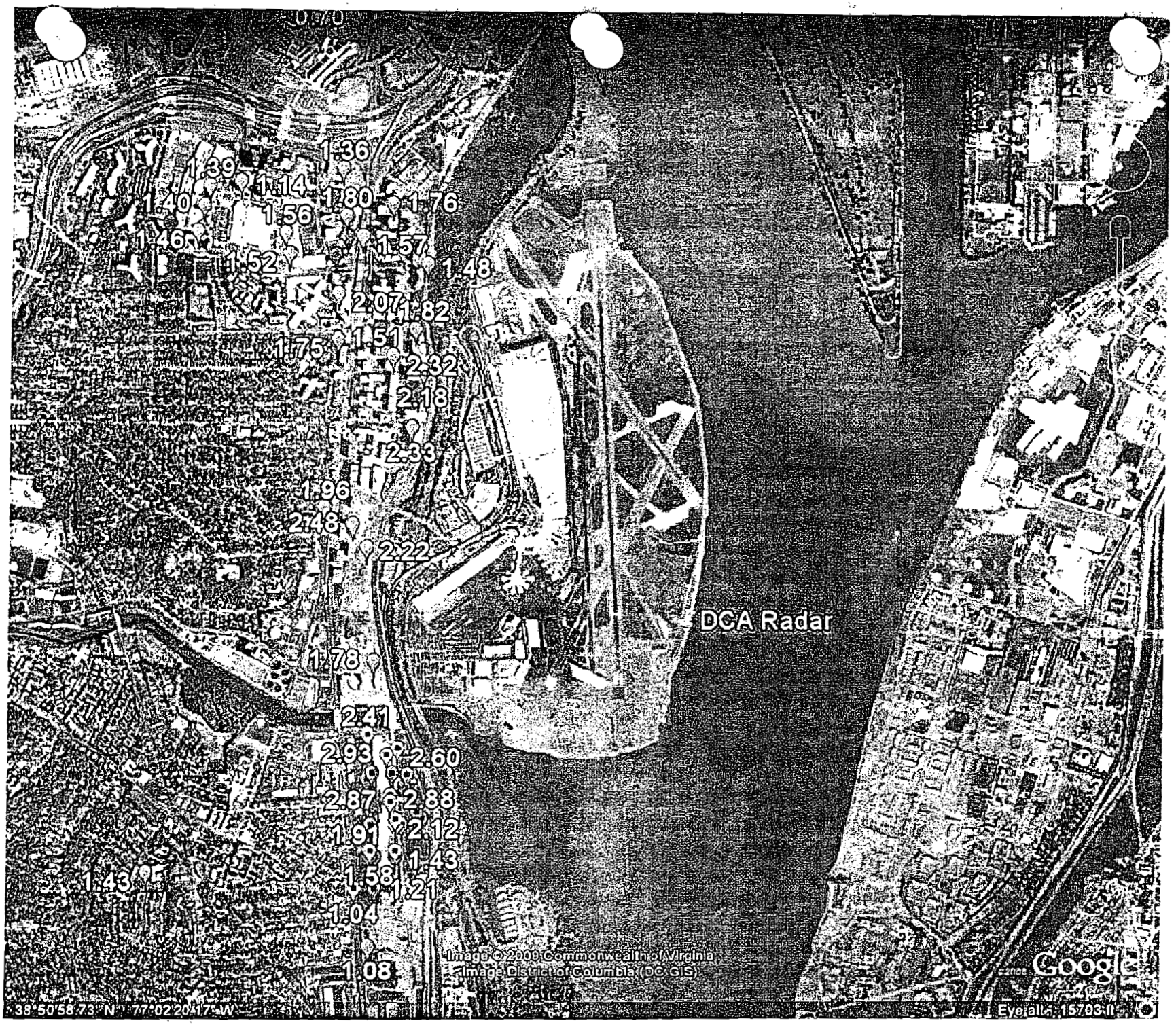
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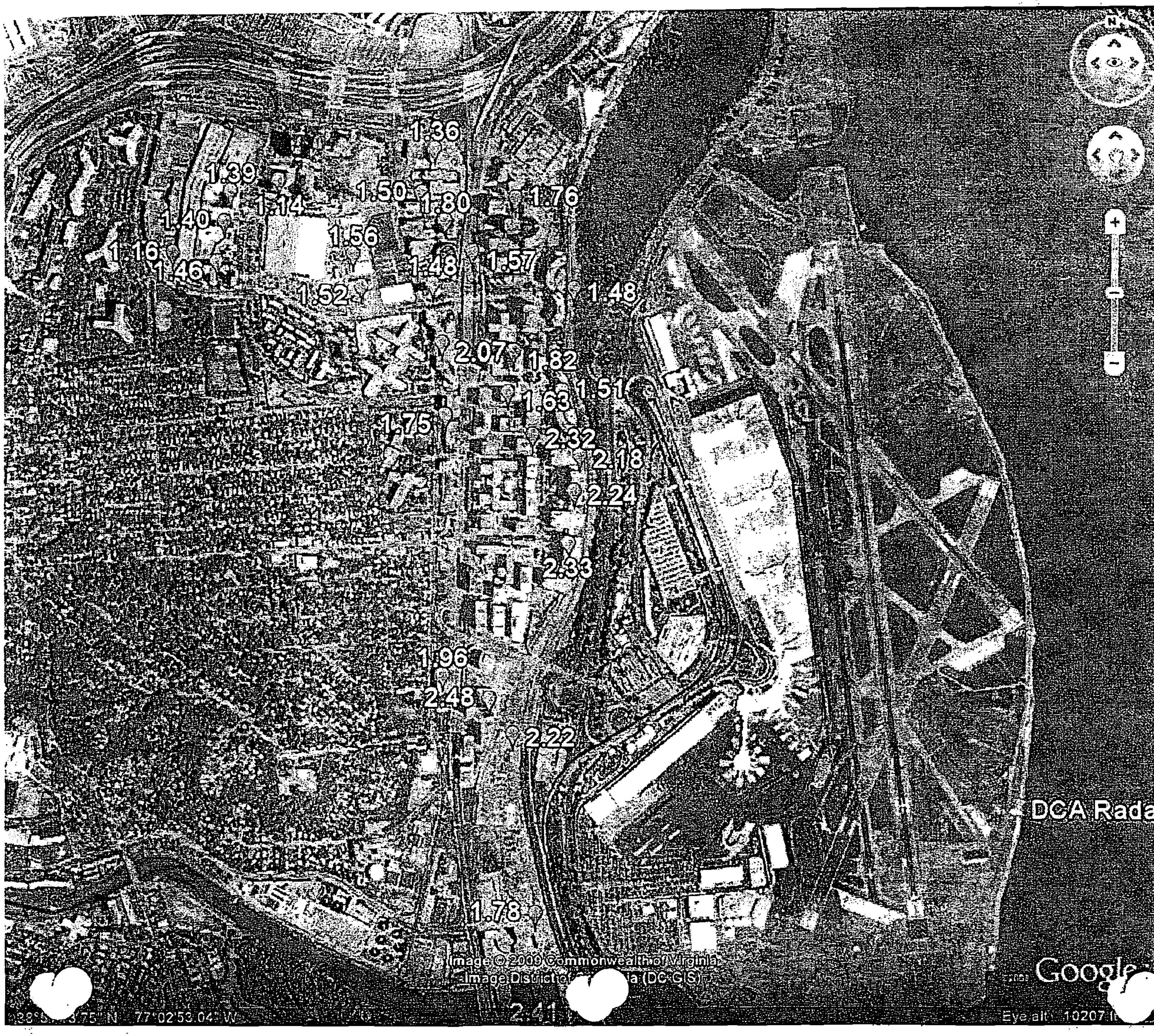
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DCA Radar
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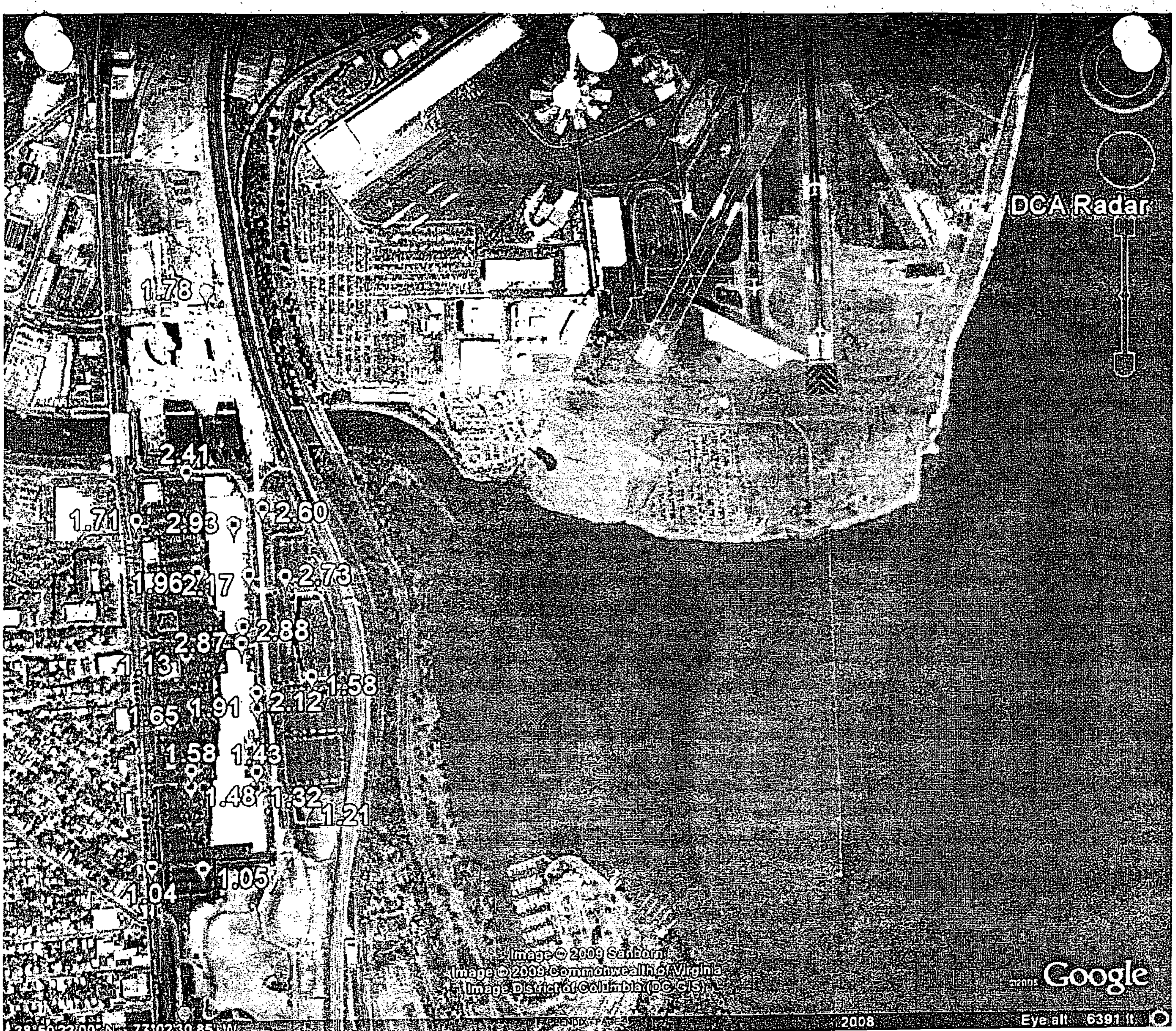
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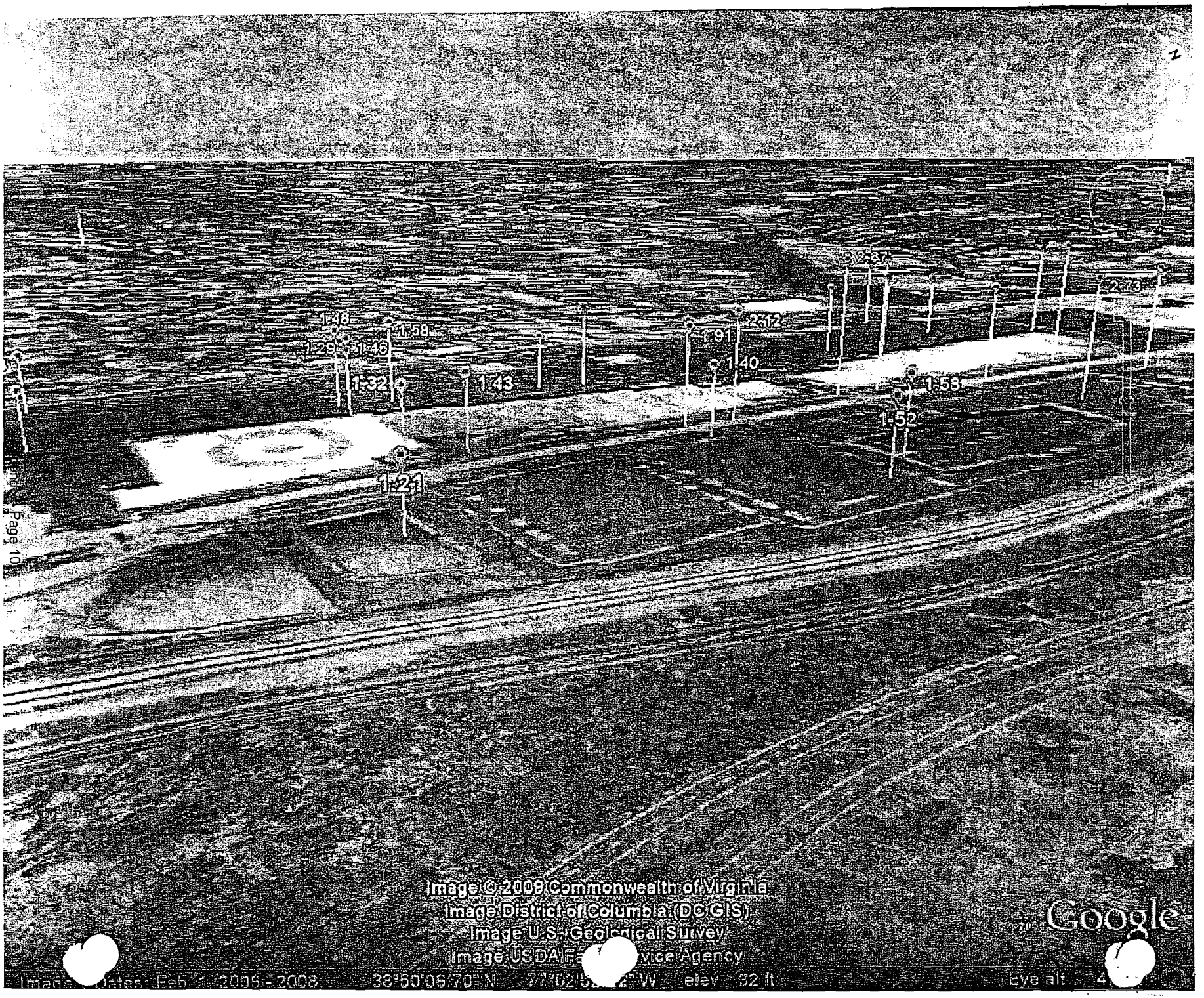
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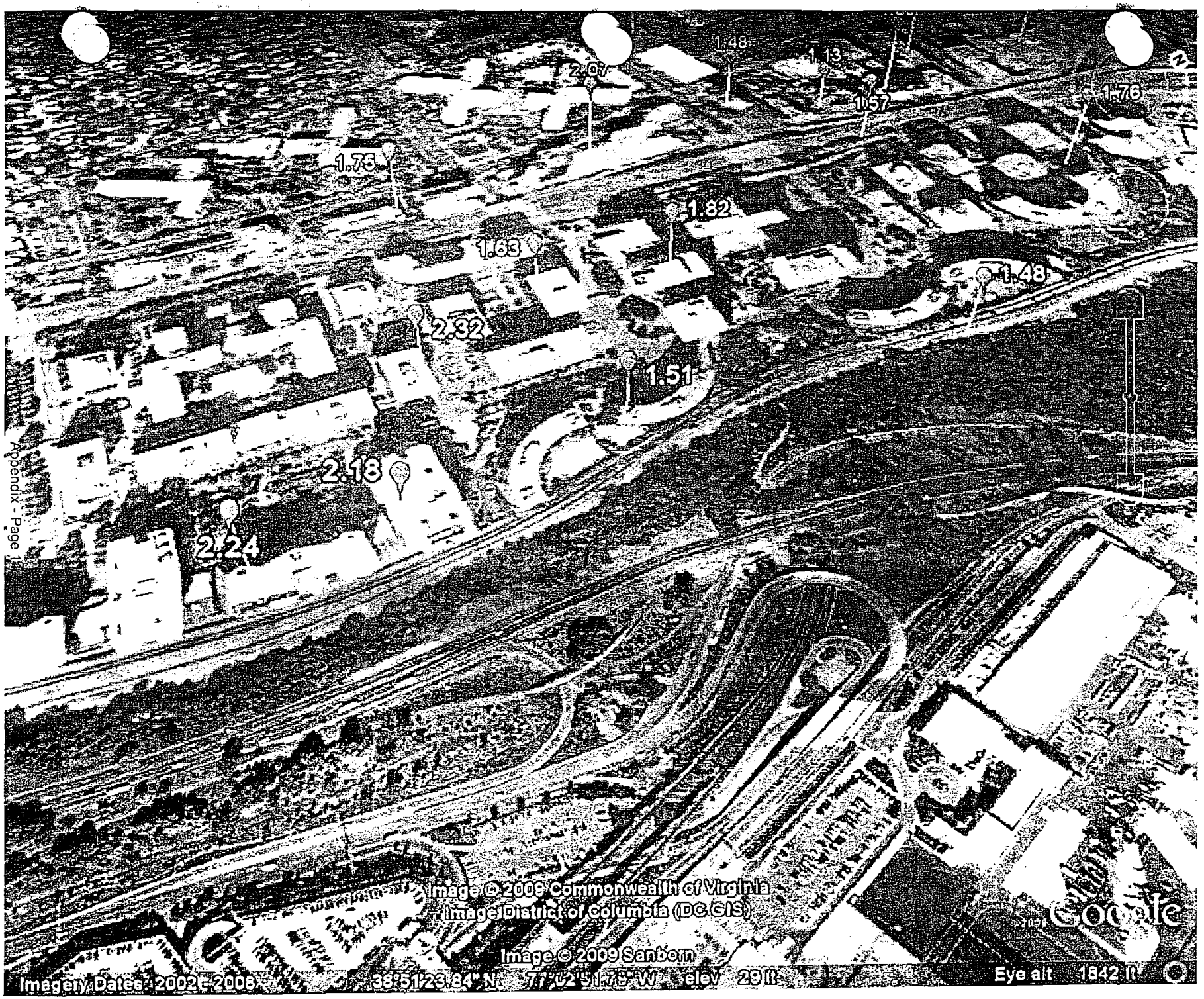
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Image District of Columbia (DC GIS)
Image © 2009 Sanborn
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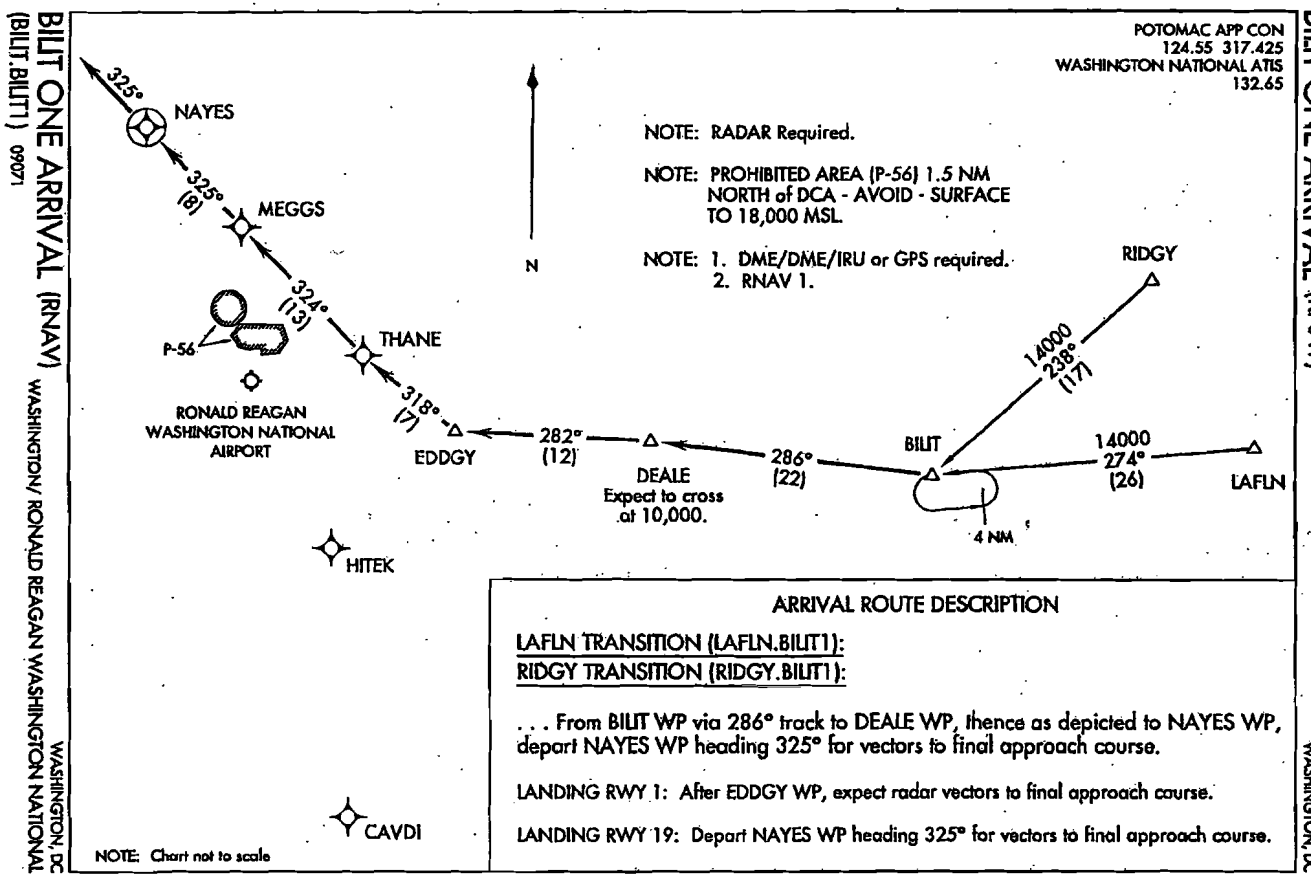
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL
WASHINGTON, DC



ARRIVAL ROUTE DESCRIPTION

LAFLN TRANSITION (LAFLN.BILIT1):
RIDGY TRANSITION (RIDGY.BILIT1):

. . . From BILIT WP via 286° track to DEALE WP, thence as depicted to NAYES WP, depart NAYES WP heading 325° for vectors to final approach course.

LANDING RWY 1: After EDDGY WP, expect radar vectors to final approach course.

LANDING RWY 19: Depart NAYES WP heading 325° for vectors to final approach course.

BILIT ONE ARRIVAL (RNAV)
(BILIT.BILIT1) 09071
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL
WASHINGTON, DC

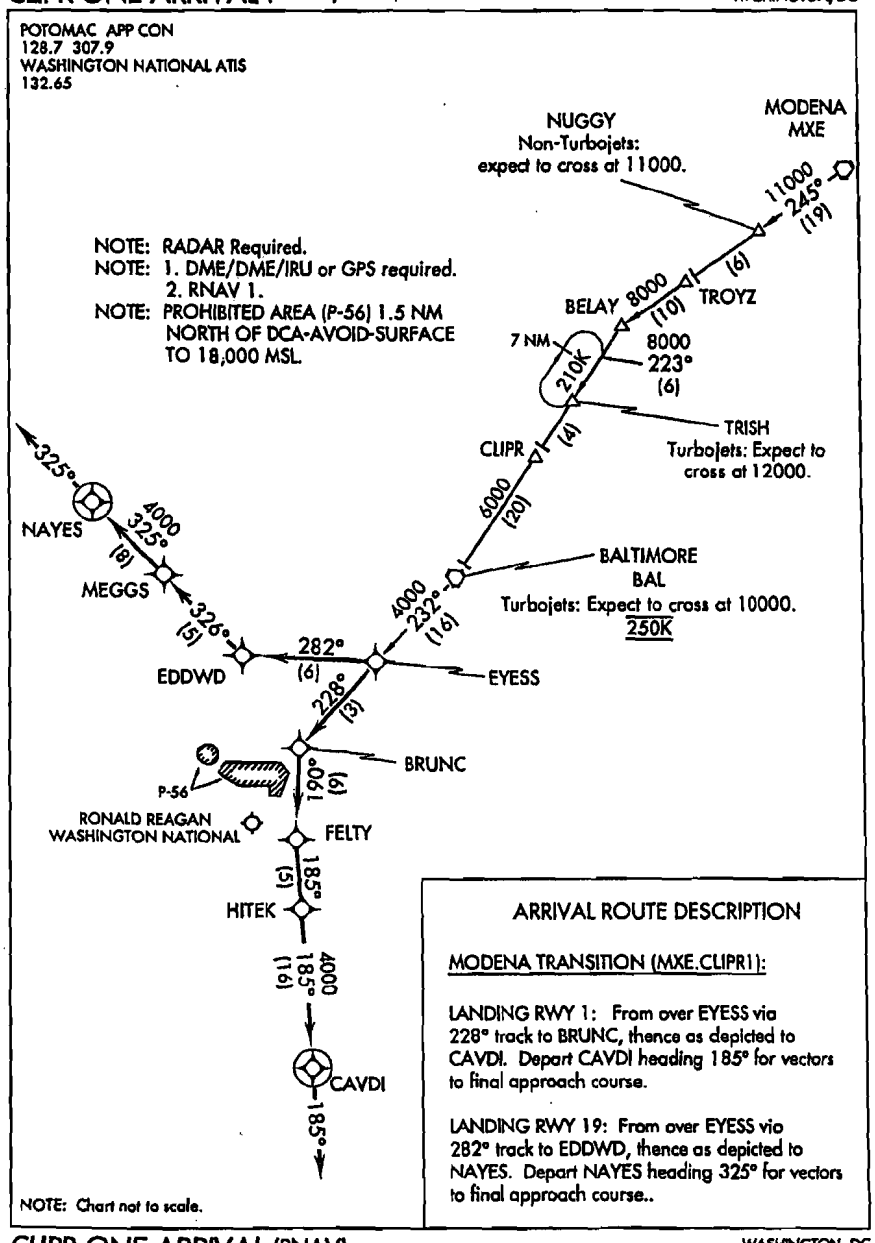
ST-443 (FAA)

(CLIPR.CLIPR1) 09071

ST-443 (FAA)

WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL
WASHINGTON, DC

CLIPR ONE ARRIVAL (RNAV)



ARRIVAL ROUTE DESCRIPTION

MODENA TRANSITION (MXE.CLIPR1):

LANDING RWY 1: From over EYESS via 228° track to BRUNC, thence as depicted to CAVDI. Depart CAVDI heading 185° for vectors to final approach course.

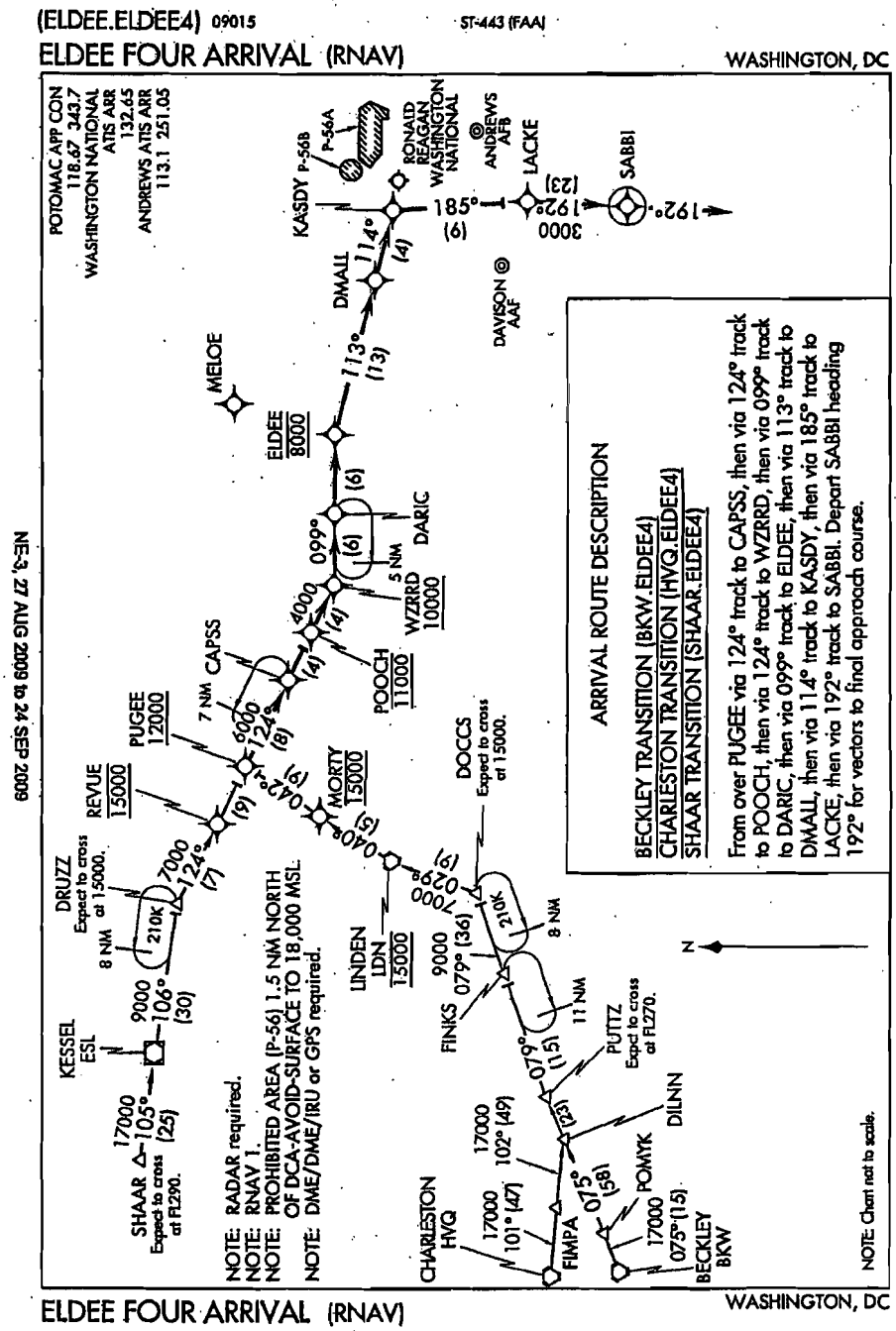
LANDING RWY 19: From over EYESS via 282° track to EDDWD, thence as depicted to NAYES. Depart NAYES heading 325° for vectors to final approach course..

NE-3, 27 AUG 2009 to 24 SEP 2009

NE-3, 27 AUG 2009 to 24 SEP 2009

CLIPR ONE ARRIVAL (RNAV)
(CLIPR.CLIPR1) 09071

WASHINGTON, DC
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL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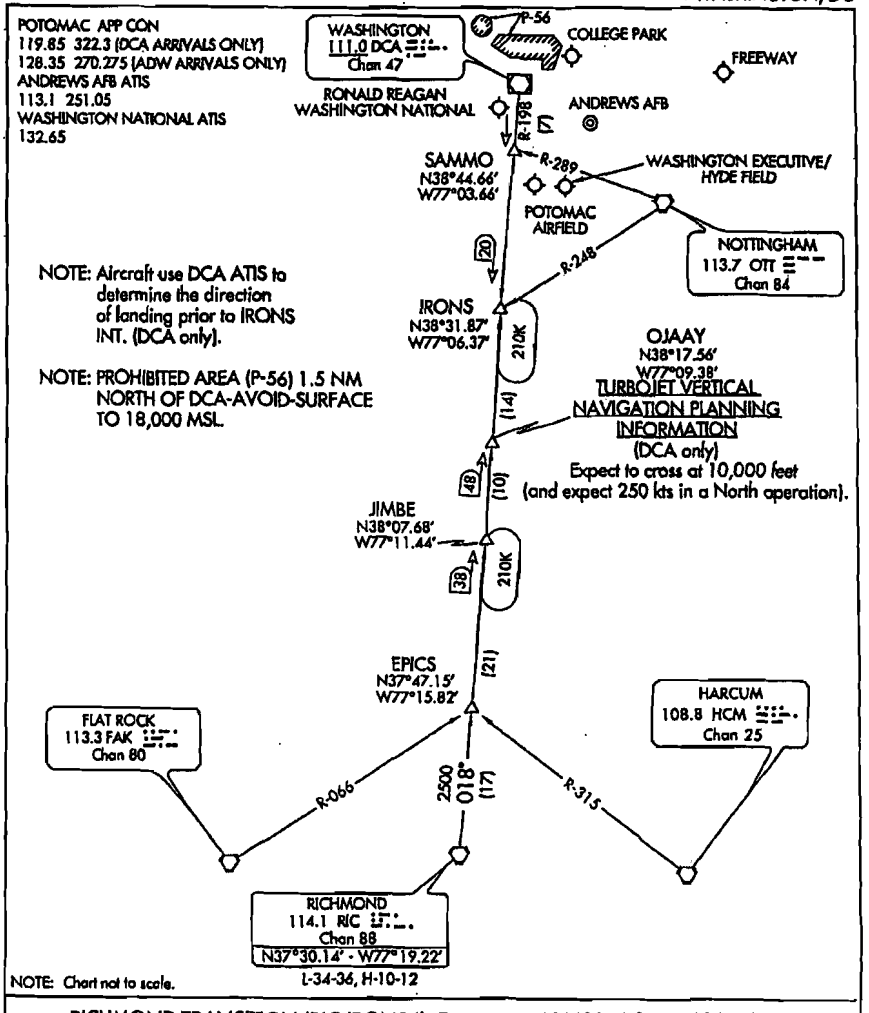
ANDREWS AFB
DAVISON AAF
KASDY P-56B
P-56A
LACKE
SABBI
DMALL
MELOE
ELDEE 8000
DARIC
WZRRD 10000
POOCH 11000
CAPSS
PUGEE 12000
REVUE 15000
MORTY 15000
DOCCS Expect to cross at 15000.
LINDEN LDN 15000
FINKS
PUTTZ Expect to cross at FL270.
DILNN
POMYK
FIMPA
CHARLESTON HVQ
BECKLEY BKW
SHAAR
Expect to cross at FL290.
KESSEL ESL
DRUZZ Expect to cross at 15000.
ARRIVAL ROUTE DESCRIPTION
BECKLEY TRANSITION (BKW.ELDEE4)
CHARLESTON TRANSITION (HVQ.ELDEE4)
SHAAR TRANSITION (SHAAR.ELDEE4)
From over PUGEE via 124° track to CAPSS, then via 124° track to POOCH, then via 124° track to WZRRD, then via 099° track to DARIC, then via 099° track to ELDEE, then via 113° track to DMALL, then via 114° track to KASDY, then via 185° track to LACKE, then via 192° track to SABBI. Depart SABBI heading 192° for vectors to final approach course.
NOTE: RADAR required.
NOTE: RNAV 1.
NOTE: PROHIBITED AREA (P-56) 1.5 NM NORTH OF DCA-AVOID-SURFACE TO 18,000 MSL.
NOTE: DME/DME/IRU or GPS required.
NOTE: Chart not to scale.
ELDEE FOUR ARRIVAL (RNAV)
WASHINGTON, DC
(ELDEE.ELDEE4) 09015

(IRONS.IRONS4) 08269 ST-443 (FAA)

IRONS FOUR ARRIVAL

WASHINGTON, DC



NE-3, 27 AUG 2009 to 24 SEP 2009

NE-3, 27 AUG 2009 to 24 SEP 2009

RICHMOND TRANSITION (RIC.IRONS4): From over RIC VORTAC via RIC R-018 and DCA R-198 to IRONS INT. Thence. . . .

. . . .From over IRONS INT:
Ronald Reagan Washington National Airport (DCA only):
LANDING SOUTH: Then via DCA R-198 to SAMMO INT, heading for vectors to the final approach course.
LANDING NORTH: Expect vectors to final approach course.
All other airports: Expect vectors.

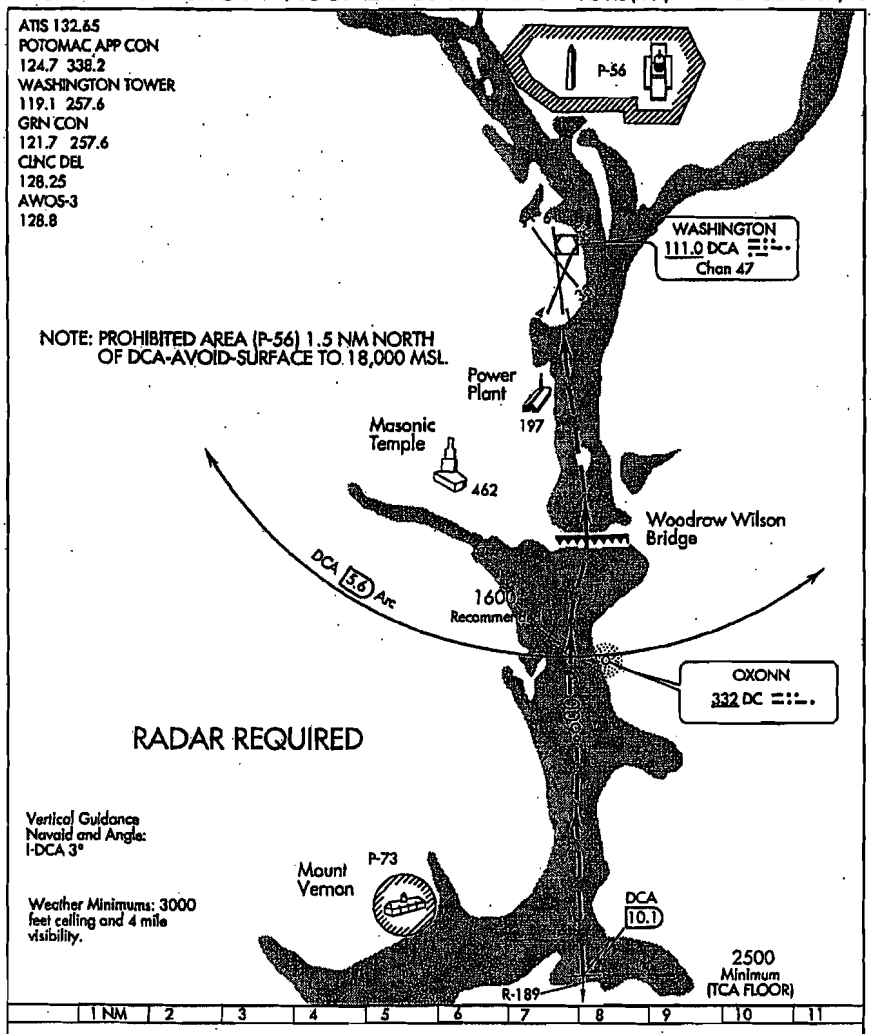
IRONS FOUR ARRIVAL
WASHINGTON, DC
(IRONS.IRONS4) 08269

Amdt 3 09015

WASHINGTON/RONALD REAGAN WASHINGTON NATIONAL (DCA)

MOUNT VERNON VISUAL RUNWAY 1

AL-443 (FAA) WASHINGTON, DC



Aircraft may proceed via DCA VOR/DME R-189 (009° inbound) to DCA 5.6 DME, then follow the Potomac River to the airport.

NE-3, 27 AUG 2009 to 24 SEP 2009

NE-3, 27 AUG 2009 to 24 SEP 2009

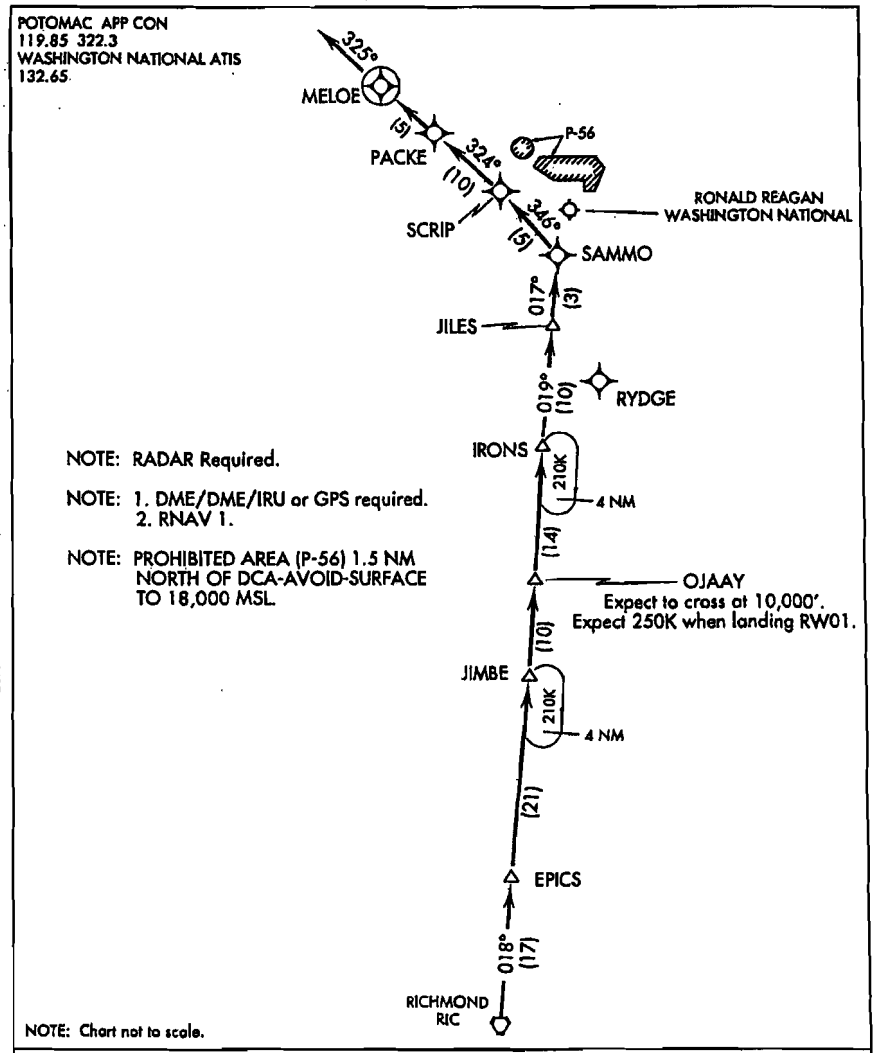
MOUNT VERNON VISUAL RUNWAY 1 38°51'N-77°02'W WASHINGTON, DC

Amdt 3 09015 WASHINGTON/RONALD REAGAN WASHINGTON NATIONAL (DCA)

(OJAAY.OJAAY1) 09183 ST-443 (FAA)

OJAAY ONE ARRIVAL (RNAV)

WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL
WASHINGTON, DC



NE-3, 27 AUG 2009 to 24 SEP 2009

NE-3, 27 AUG 2009 to 24 SEP 2009

ARRIVAL ROUTE DESCRIPTION

From RIC VORTAC via 018° track to EPICS WP, thence as depicted to MELOE WP, depart MELOE WP heading 325° for vectors to final approach course.

LANDING RWY 1: After IRONS, expect radar vectors to final approach course.

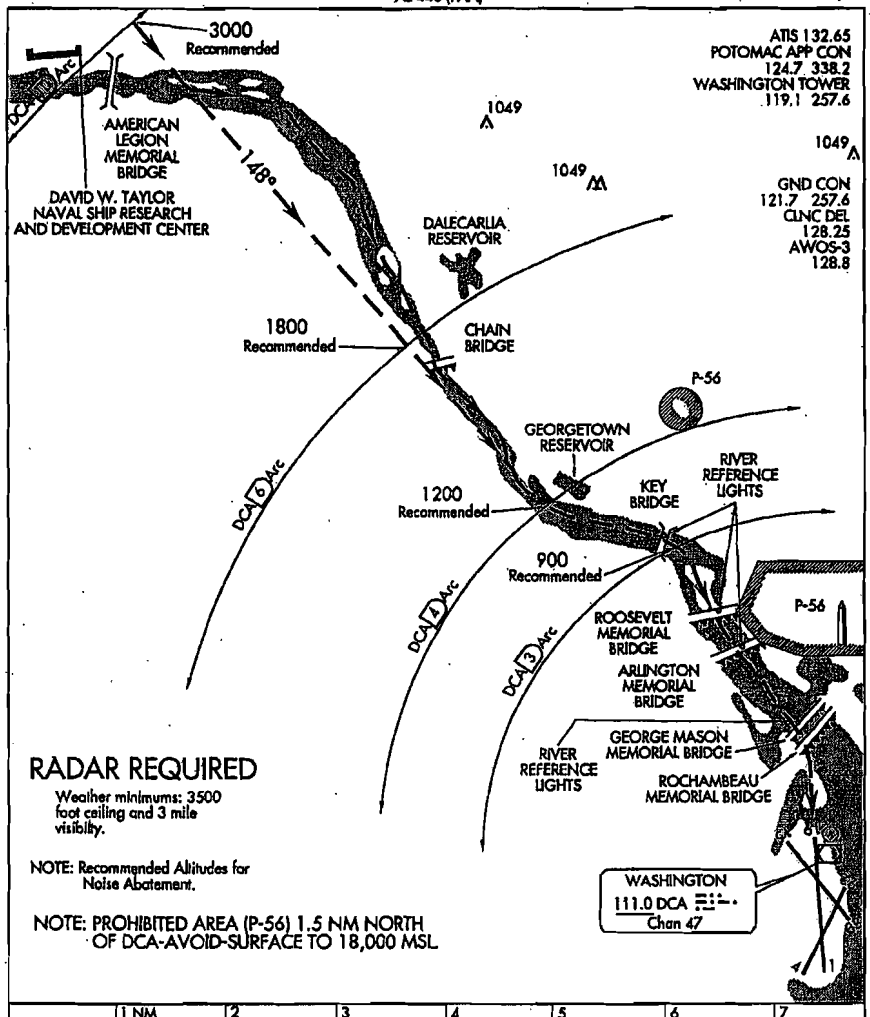
LANDING RWY 19: Depart MELOE WP heading 325° for vectors to final approach

OJAAY ONE ARRIVAL (RNAV)
WASHINGTON, DC
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL
(OJAAY.OJAAY1) 09183

Amdt 4 09015

RIVER VISUAL RWY 19

WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL (DCA)
AL-443 (FAA)
WASHINGTON, DC



NE-3, 27 AUG 2009 to 24 SEP 2009

NE-3, 27 AUG 2009 to 24 SEP 2009

RIVER VISUAL RWY 19

Aircraft may visually follow the river to the airport, or may proceed via the DCA VOR/DME R-328 (148° inbound) or via the Rosslyn LDA Rwy 19 Approach to abeam Georgetown Reservoir or the DCA 4 NM DME fix, then follow the river to the airport.

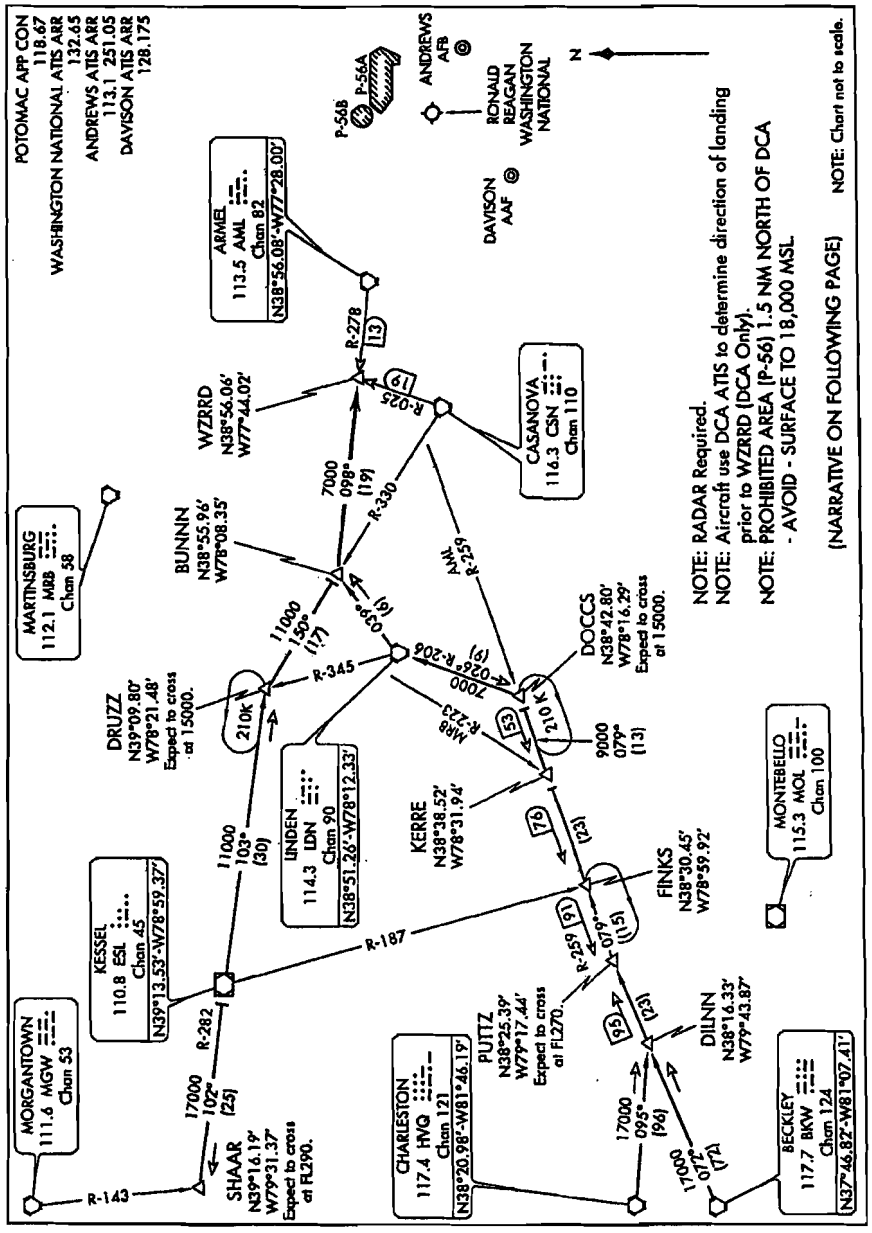
NOTE: Clearance for visual approach does not authorize penetration of P-56.

RIVER VISUAL RWY 19
38°51'N-77°02'W
WASHINGTON, DC
Amdt 4 09015
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL (DCA)

(WZRRD.WZRRD2) 09071 ST-443 (FAA)

WZRRD TWO ARRIVAL

WASHINGTON, DC



NE-3, 27 AUG 2009 to 24 SEP 2009

WZRRD TWO ARRIVAL

WASHINGTON, DC

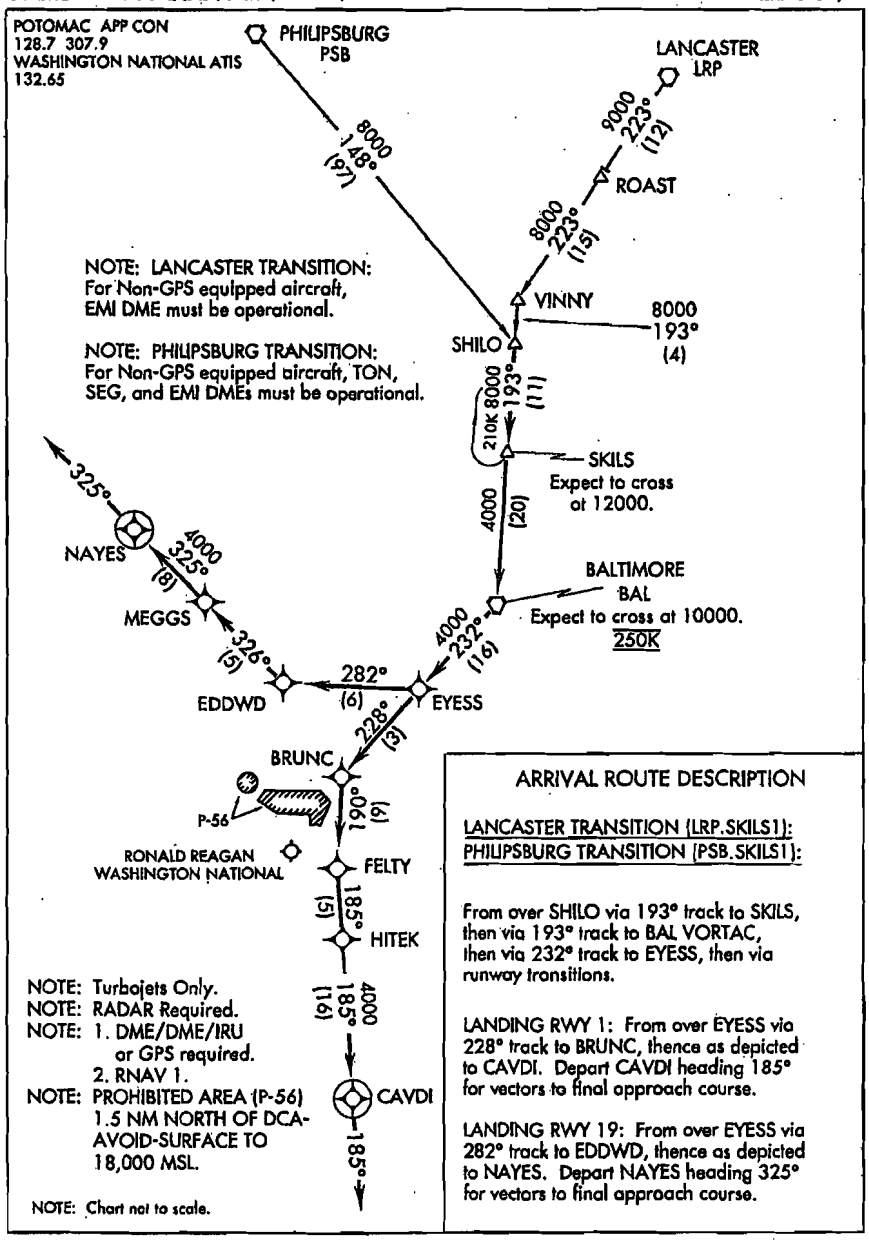
(WZRRD.WZRRD2) 09071

(SKILS.SKILS1) 09071

ST-443 (FAA)

WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL
WASHINGTON, DC

SKILS ONE ARRIVAL (RNAV)



ARRIVAL ROUTE DESCRIPTION

LANCASTER TRANSITION (LRP.SKILS1):
PHILIPSBURG TRANSITION (PSB.SKILS1):

From over SHILO via 193° track to SKILS, then via 193° track to BAL VORTAC, then via 232° track to EYESS, then via runway transitions.

LANDING RWY 1: From over EYESS via 228° track to BRUNC, thence as depicted to CAVDI. Depart CAVDI heading 185° for vectors to final approach course.

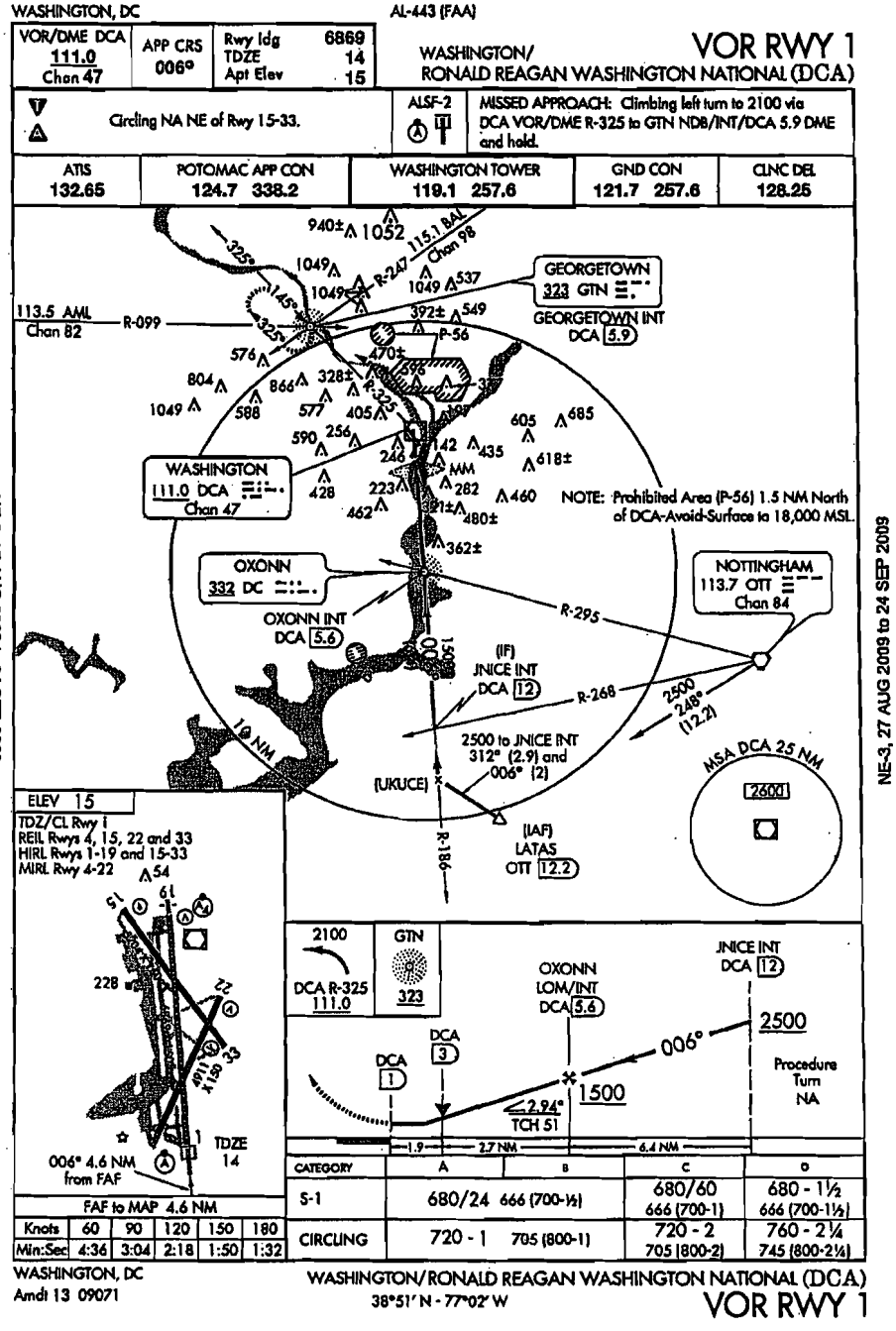
LANDING RWY 19: From over EYESS via 282° track to EDDWD, thence as depicted to NAYES. Depart NAYES heading 325° for vectors to final approach course.

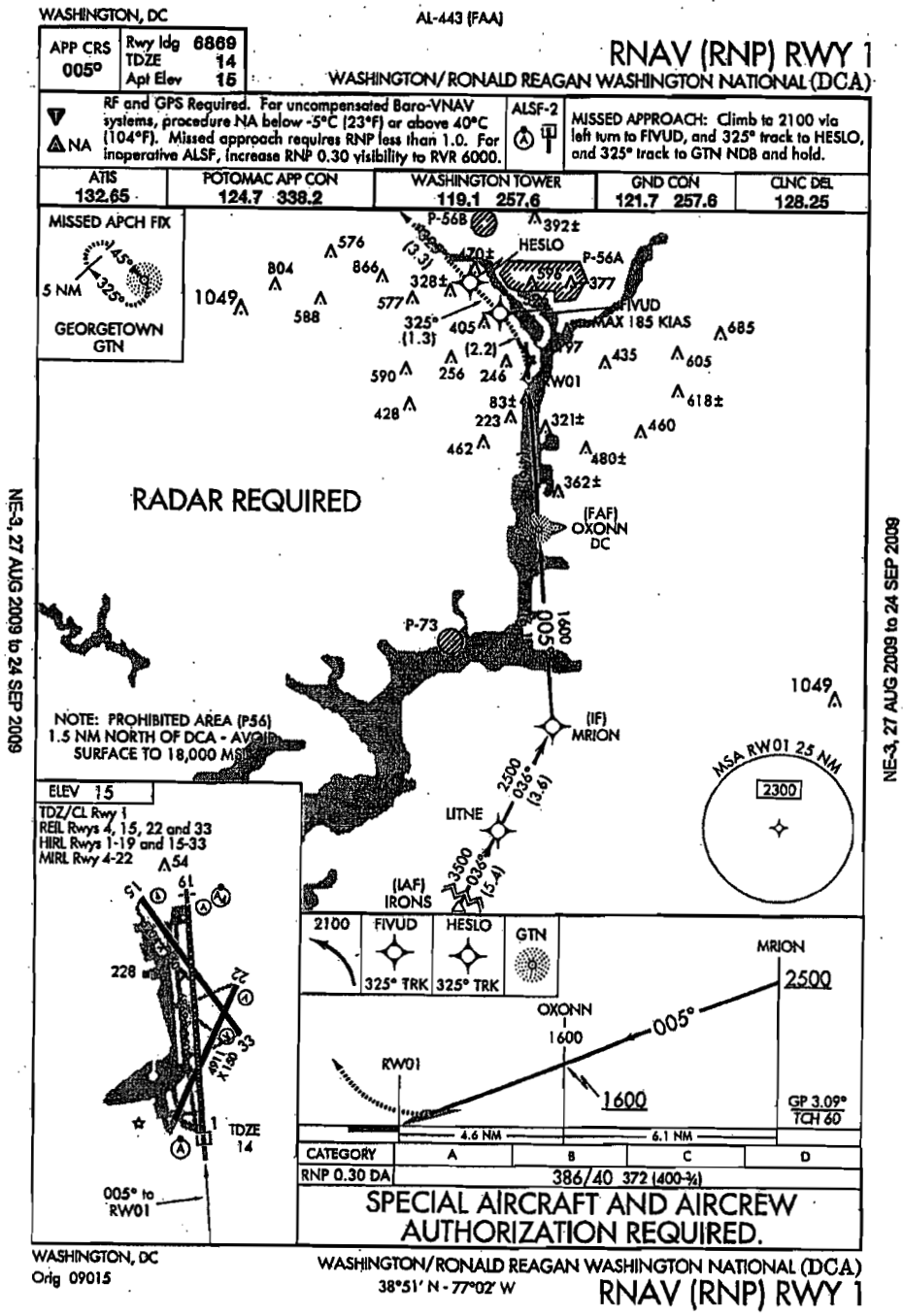
NE-3, 27 AUG 2009 to 24 SEP 2009

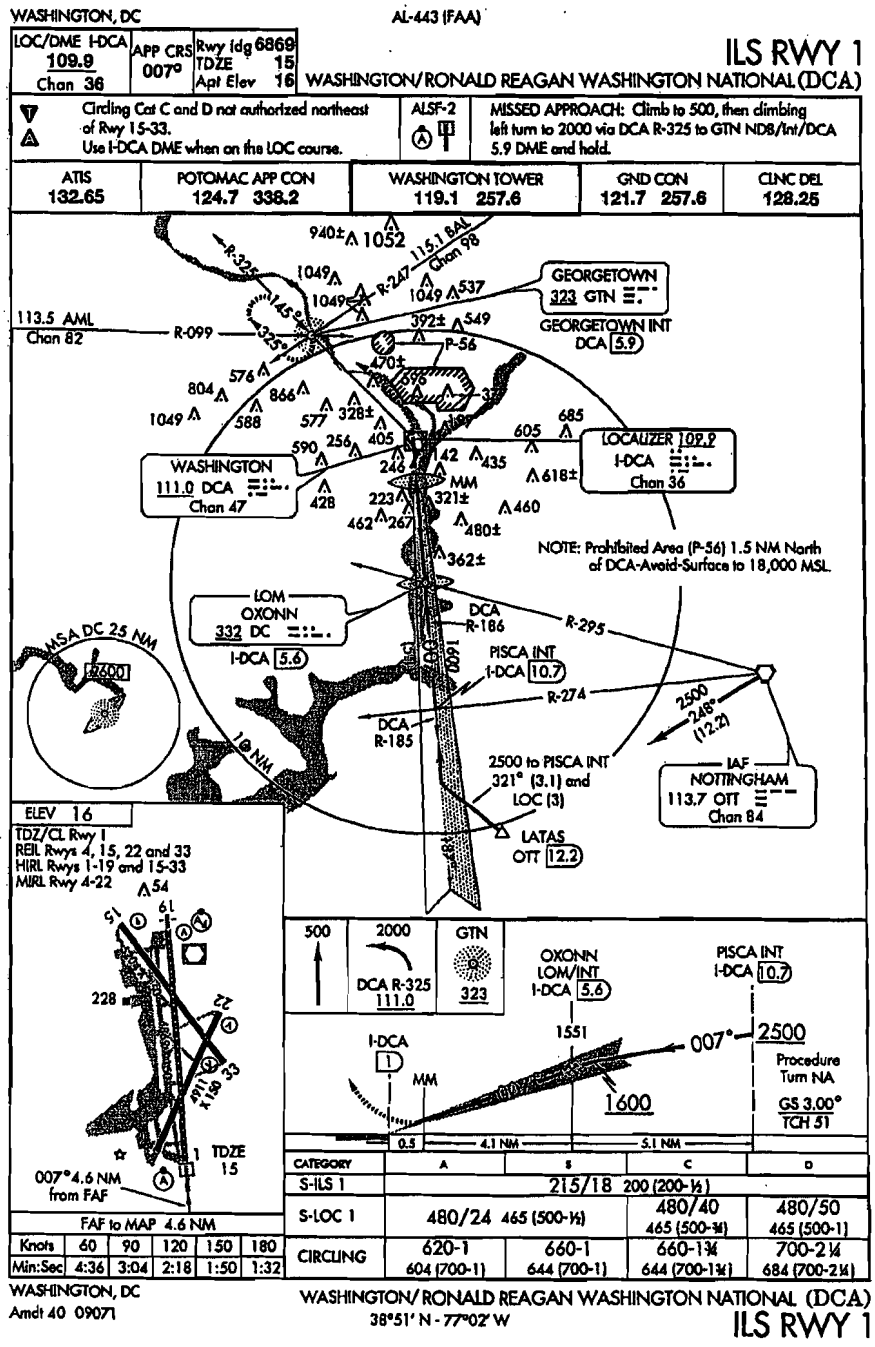
NE-3, 27 AUG 2009 to 24 SEP 2009

SKILS ONE ARRIVAL (RNAV)
(SKILS.SKILS1) 09071

WASHINGTON, DC
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL


WASHINGTON, DC
AL-443 (FAA)
VOR/DME DCA 111.0 Chan 47
APP CRS 006°
Rwy Idg 6869
TDZE 14
Apt Elev 15
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL (DCA)
VOR RWY 1
Circling NA NE of Rwy 15-33.
ALSF-2
MISSED APPROACH: Climbing left turn to 2100 via DCA VOR/DME R-325 to GTN NDB/INT/DCA 5.9 DME and hold.
ATIS 132.65
POTOMAC APP CON 124.7 338.2
WASHINGTON TOWER 119.1 257.6
GND CON 121.7 257.6
CLNC DEL 128.25
GEORGETOWN 323 GTN
GEORGETOWN INT DCA 5.9
113.5 AML Chan 82
R-099
WASHINGTON 111.0 DCA Chan 47
OXONN 332 DC
OXONN INT DCA 5.6
NOTTINGHAM 113.7 OTT Chan 84
(IF) JNICE INT DCA 12
R-295
R-268
2500 248° (12.2)
2500 to JNICE INT 312° (2.9) and 006° (2)
[UKUCE]
[IAF] LATAS OTT 12.2
R-198
MSA DCA 25 NM
2600
NOTE: Prohibited Area (P-56) 1.5 NM North of DCA-Avoid-Surface to 18,000 MSL.
NE-3, 27 AUG 2009 to 24 SEP 2009
ELEV 15
TDZ/CL Rwy 1
REIL Rwys 4, 15, 22 and 33
HIRL Rwys 1-19 and 15-33
MIRL Rwy 4-22
TDZE 14
006° 4.6 NM from FAF
FAF to MAP 4.6 NM
Knots 60 90 120 150 180
Min:Sec 4:36 3:04 2:18 1:50 1:32
2100
DCA R-325 111.0
GTN 323
OXONN LOM/INT DCA 5.6
JNICE INT DCA 12
2500
006°
Procedure Turn NA
1500
2.94° TCH 51
1.9
2.7 NM
6.4 NM
CATEGORY A B C D
S-1 680/24 666 (700-½) 680/60 666 (700-1) 680 - 1½ 666 (700-1½)
CIRCLING 720 - 1 705 (800-1) 720 - 2 705 (800-2) 760 - 2¼ 745 (800-2¼)
WASHINGTON, DC
Amdt 13 09071
WASHINGTON/RONALD REAGAN WASHINGTON NATIONAL (DCA)
38°51' N - 77°02' W
VOR RWY 1


WASHINGTON, DC
AL-443 (FAA)
RNAV (RNP) RWY 1
WASHINGTON/RONALD REAGAN WASHINGTON NATIONAL (DCA)
APP CRS 005°
Rwy Idg 6869
TDZE 14
Apt Elev 15
RF and GPS Required. For uncompensated Baro-VNAV systems, procedure NA below -5°C (23°F) or above 40°C (104°F). Missed approach requires RNP less than 1.0. For inoperative ALSF, increase RNP 0.30 visibility to RVR 6000.
NA
ALSF-2
MISSED APPROACH: Climb to 2100 via left turn to FIVUD, and 325° track to HESLO, and 325° track to GTN NDB and hold.
ATIS 132.65
POTOMAC APP CON 124.7 338.2
WASHINGTON TOWER 119.1 257.6
GND CON 121.7 257.6
CLNC DEL 128.25
MISSED APCH FIX
5 NM
GEORGETOWN GTN
RADAR REQUIRED
P-56B
P-56A
HESLO
FIVUD
MAX 185 KIAS
RW01
(FAF) OXONN DC
P-73
(IF) MRION
NOTE: PROHIBITED AREA (P56) 1.5 NM NORTH OF DCA - AVOID SURFACE TO 18,000 MSL
MSA RW01 25 NM
2300
LITNE
(IAF) IRONS
ELEV 15
TDZ/CL Rwy 1
REIL Rwys 4, 15, 22 and 33
HIRL Rwys 1-19 and 15-33
MIRL Rwy 4-22
TDZE 14
005° to RW01
2100
FIVUD
HESLO
GTN
325° TRK
325° TRK
MRION
2500
OXONN
1600
005°
RW01
1600
GP 3.09°
TCH 60
4.6 NM
6.1 NM
CATEGORY
A
B
C
D
RNP 0.30 DA
386/40 372 (400-¾)
SPECIAL AIRCRAFT AND AIRCREW AUTHORIZATION REQUIRED.
NE-3, 27 AUG 2009 to 24 SEP 2009
NE-3, 27 AUG 2009 to 24 SEP 2009
WASHINGTON, DC
Orig 09015
WASHINGTON/RONALD REAGAN WASHINGTON NATIONAL (DCA)
38°51' N - 77°02' W
RNAV (RNP) RWY 1


WASHINGTON, DC
AL-443 (FAA)
ILS RWY 1
WASHINGTON/RONALD REAGAN WASHINGTON NATIONAL (DCA)
LOC/DME I-DCA 109.9 Chan 36
APP CRS 007°
Rwy Idg 6869
TDZE 15
Apt Elev 16
Circling Cat C and D not authorized northeast of Rwy 15-33. Use I-DCA DME when on the LOC course.
ALSF-2
MISSED APPROACH: Climb to 500, then climbing left turn to 2000 via DCA R-325 to GTN NDB/Int/DCA 5.9 DME and hold.
ATIS 132.65
POTOMAC APP CON 124.7 338.2
WASHINGTON TOWER 119.1 257.6
GND CON 121.7 257.6
CLNC DEL 128.25
113.5 AML Chan 82
R-099
GEORGETOWN 323 GTN
GEORGETOWN INT DCA 5.9
P-56
WASHINGTON 111.0 DCA Chan 47
LOCALIZER 109.9 I-DCA Chan 36
NOTE: Prohibited Area (P-56) 1.5 NM North of DCA-Avoid-Surface to 18,000 MSL.
LOM OXONN 332 DC
I-DCA 5.6
DCA R-186
PISCA INT I-DCA 10.7
R-295
R-274
DCA R-185
2500 248° (12.2)
2500 to PISCA INT 321° (3.1) and LOC (3)
IAF NOTTINGHAM 113.7 OTT Chan 84
LATAS OTT 12.2
MSA DC 25 NM
7600
10 NM
ELEV 16
TDZ/CL Rwy 1
REIL Rwys 4, 15, 22 and 33
HIRL Rwys 1-19 and 15-33
MIRL Rwy 4-22
TDZE 15
007° 4.6 NM from FAF
FAF to MAP 4.6 NM
Knots 60 90 120 150 180
Min:Sec 4:36 3:04 2:18 1:50 1:32
500
2000
DCA R-325 111.0
GTN 323
OXONN LOM/INT I-DCA 5.6
PISCA INT I-DCA 10.7
I-DCA
MM
1551
007° 2500
Procedure Turn NA
GS 3.00° TCH 51
1600
0.5 4.1 NM 5.1 NM
CATEGORY A B C D
S-ILS 1 215/18 200 (200-½)
S-LOC 1 480/24 465 (500-½) 480/40 465 (500-¾) 480/50 465 (500-1)
CIRCLING 620-1 604 (700-1) 660-1 644 (700-1) 660-1¾ 644 (700-1¾) 700-2¼ 684 (700-2¼)
WASHINGTON, DC
Amdt 40 09071
WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL (DCA)
38°51' N - 77°02' W
ILS RWY 1
NE-3, 27 AUG 2009 to 24 SEP 2009
NE-3, 27 AUG 2009 to 24 SEP 2009

WASHINGTON, DC AL-443 (FAA)

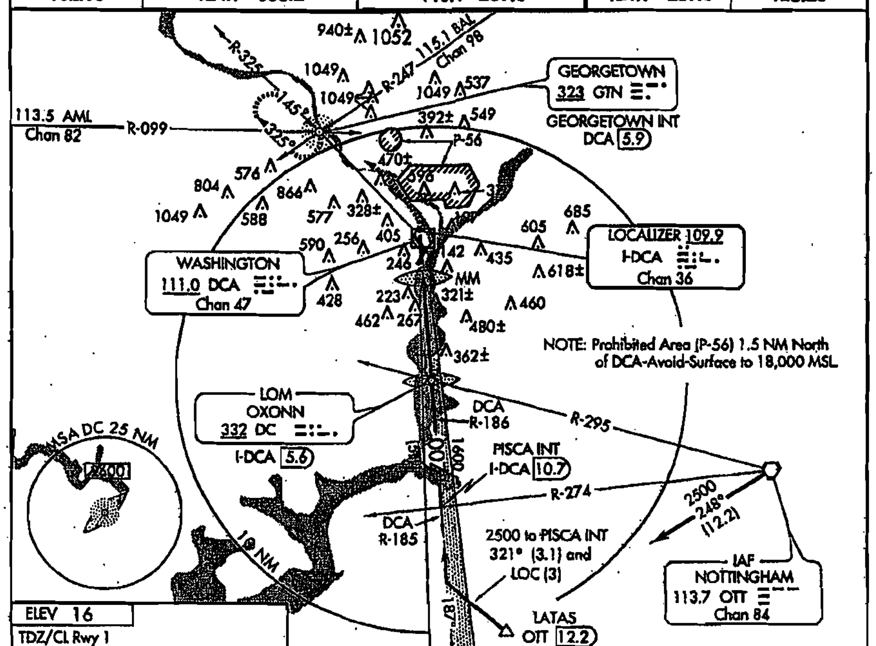
COPTER ILS or LOC RWY 1

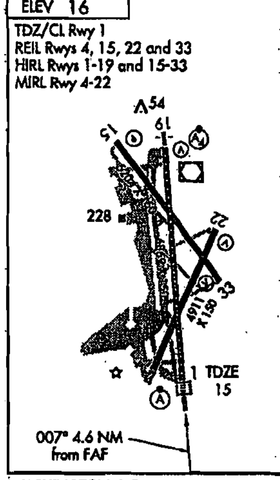
WASHINGTON/RONALD REAGAN WASHINGTON NATIONAL (DCA)

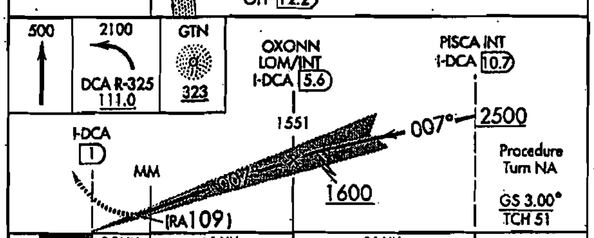
LOC/DME I-DCA	APP CRS	Rwy Idg 6869
109.9 Chan 36	007°	TDZE 15 Apt Elev 16

A NA	Use I-DCA DME when on the LOC course. Radio altimeter required.	ALSF-2	MISSED APPROACH: Climb to 500, then climbing left turn to 2100 via DCA R-325 to GTN NDB/Int/DCA 5.9 DME and hold.

ATIS	POTOMAC APP CON	WASHINGTON TOWER	GND CON	CLNC DEL
132.65	124.7 338.2	119.1 257.6	121.7 257.6	128.25







CATEGORY	COPTER	B	C	D
S-ILS 1	115/16 100 (100-¼)	NA		
S-LOC 1	480/24 465 (500-½)	NA		
CIRCLING	NA			

COPTER ILS CATEGORY II - SPECIAL AIRCREW & AIRCRAFT CERTIFICATION REQUIRED

WASHINGTON, DC
Orig-B 09071

WASHINGTON/ RONALD REAGAN WASHINGTON NATIONAL (DCA)
38°51'N-77°02'W COPTER ILS or LOC RWY 1

NE-3, 27 AUG 2009 to 24 SEP 2009

NE-3, 27 AUG 2009 to 24 SEP 2009

christopher consultants
engineering · surveying · land planning

Potomac Village
Storm Water Master Plan Concepts
August 27, 2009
Revised: November 25, 2009

Purpose

The purpose of this document is to summarize the approach to stormwater design for the Potomac Village Development team is considering to comply with the City of Alexandria Chesapeake Bay Act utilizing Conventional, Low Impact Development (LID) and Integrated Management Practice (IMP) methodologies. LID, as defined by the LID Center in Beltsville Maryland is "an innovative stormwater management approach with a basic principle that is modeled after nature: manage rainfall at the source and using uniformly distributed decentralized micro-scale controls." The design techniques used include infiltration, filtering, storage, reuse, evaporation and detention of the stormwater. Additional studies prepared by the US EPA and others can be found at www.epa.gov and www.lowimpactdevelopment.org. A primary component of the LID design effort is the implementation of IMP's. IMP's are landscape features that form the building blocks of LID. Many components of the urban environment have the potential to serve as IMP's. They can include open spaces, sidewalks, streetscapes, roof tops, medians and parking lots.

The five basic tools of the LID system include:

1. Conservation measures
2. Impervious surface reductions
3. Slowing water flow using the landscape
4. Implementation of IMP's to reduce runoff and clean the water
5. Advocate pollution prevention measures to reduce the introduction of pollutants to the environment.

During the Coordinated Development District (CDD) process, the owners of Potomac Village are considering the implementation of a variety of BMP's, LID's and IMP's concepts to manage stormwater runoff as outlined below.

Storm Water Management

Storm Water Management quantity has not been required by the City of Alexandria for the Potomac Yard Project as a whole subject to the availability of adequate outfalls to the Potomac River and Four Mile Run. In 1995, studies were conducted, submitted and approved by the City and appropriate infrastructure was constructed to collect and convey storm water to the Potomac River and Four Mile Run. If water quantity was controlled in the conventional sense, by detaining the 2 and 10 year storm events, it is likely that the peak flows resulting from the detention would coincide with peak events of the Potomac River and Four Mile Run thus

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web site www.christopherconsultants.com

aggravating previously existing flood conditions. This is documented with the Four Mile Run Channel Improvement project where the Army Corps of Engineers specifically requests that storm water detention not be provided in the lower reaches of Four Mile Run. Portions of Potomac Yard and all of Potomac Village drain directly into the Four Mile Run.

Water Quality is regulated by the Chesapeake Bay Act. Implementation of the CBA was delegated to the local authorities in the State of Virginia. Therefore, in 1990, the City of Alexandria developed their version of the CBA. It is now standard procedure in the City to treat storm water and to reduce the pollutant loads draining into waterways by implementing (designing and constructing) Best Management Practice systems into a site. This regulation is what mandates the need for water quality treatment.

Existing Conditions

As most know, the land on which the proposed Potomac Village project is sited was developed from an operating railroad yard in the late 80's and early 90's into a 69 acre, 650,000 square foot Retail Center. This site is located at the north end of the Alexandria portion of Potomac Yard. Design started on the center in 1994 and construction on the various phases was completed in 1997 and 1998. When the site was developed, several techniques were developed and implemented to comply with the Chesapeake Bay Act for water quality control. Two underground infiltration systems were designed to treat the first flush of runoff from a portion of the site. One extended detention dry pond and one wet pond were also part of the solution. Several large diameter storm water conveyance pipes were designed and constructed to convey the storm water to Four Mile Run and the Potomac River. These pipes were sized to convey future flows from lands south of the Retail Center. See the existing conditions plan for the locations of these features. These features all still exist and are functioning as designed.

When the CDD plan for the Potomac Yard south of the Retail Center was developed and approved, the large diameter storm water conveyance pipes were planned to be used as was the large wet pond south of the existing movie theater and east of the planned Potomac Avenue. The design solution anticipated with the approved CDD plan included an expansion of the Retail Center Wet Pond with the pond being integrated into the proposed Landbay K Park and open space system as an open space amenity. There was also another wet pond planned further south near Monroe Avenue and the incorporation of bioretention facilities (later approved with sand filters) into the Landbay K park. These additional systems along with the expansion and upgrade to the existing wet pond south of the movie theatre would bring the site into compliance with the City's CBA ordinance.

Design Approach

We have prepared the attached plan and handouts which will identify conceptually, the technical approach to our solution to providing water quality treatment for this project. In addition, the design team has been enhanced by adding WSSI to the team to enhance our approach to stormwater. We have included with this effort a brief history of the project, a written description of the existing conditions (both noted above) and included as part of the plan set an existing condition plan for the project. We have provided an overview of the design requirements and what a LID/IMP system is. We have provided existing and proposed drainage divide maps, an

overall grading plan, a detailed grading plan of the new wet pond designed as a Level II facility as described by the proposed Virginia stormwater regulations and the "older" water quality work sheets as currently required by the City. The purpose of including the worksheet is to show that we can comply with the City's current CBA. We have also included a supplemental memorandum by WSSI which establish new performance standards that meet or exceed the currently proposed storm water regulations in Virginia.

Potomac Village

We are considering the following solutions to treat the stormwater quality for this site in compliance with the CBA:

1. Design of an open space amenity at the north end of the site adjacent to Four Mile Run that includes a storm water feature. This facility will include a Level II wet pond and will treat approximately 2/3 of the sites runoff. See the drainage divide map for the area being treated by this facility. The water quality volume is provided in the BMP narrative and is based upon the site drainage areas overall impervious cover. The calculations are of course subject to final engineering and confirmation of site impervious cover. See WSSI memorandum for performance standards.
2. All of the building on this site will be designed with "green roofs" with 6" of soil. For our purposes, the following forms the foundation for our calculations:
    a. 50% of each building block will be considered impervious.
    b. Of the 50 % that is pervious, half will be green and half will have porous surface materials, i.e. pavers, bricks, etc.
    c. "C" values used to calculate storm water runoff and water quality volume will be reduced to 0.7 or less from the conventional 0.9 for roof tops.
3. The southern portion of the Potomac Village project cannot drain by gravity to the proposed wet pond. We therefore propose to implement a variety of LID/IMP, both modern and conventional, to treat this area. These systems could include any of the ones detailed in the attached backup information in addition but not limited to:
    a. Bioretention basins and filters (rain gardens)
    b. Sand filters
    c. Cartridge filtering systems
    d. Tree box filtering systems (a Filterra type of system)
    e. Bioretention Curb Extensions and Sidewalk Planters
4. We are considering using a block by block rainwater harvesting system that may reuse storm water from the 50% impervious roof tops for irrigation purposes. This concept will be subject to an irrigation supply and demand study but we intend to meet the goals proposed by WSSI.
5. The use of porous pavement (brick pavers or other material) for parallel parking in the public right of way.
6. The use of Rain Gardens in the open spaces within each block.
7. The use of a significant number of tree wells that will be 5' by 10' along all city streets. (see open space plan by others)
8. The use of green spaces within public rights of way at street intersections, bus stops, etc (see open space plan by others)
9. Implementation of a variety of structured systems at each inlet to begin to treat the water at the source and to slow it down.

10. As the project proceeds to be developed over the next several years, technology will change and improve. We do not want to limit ourselves at this time to whatever technology will make itself available in the future.

We do not think the following are applicable systems to be used on this site for a variety of reasons:

1. Systems relying solely on infiltration – limited by existing soil conditions, but bioretention systems with engineered soils and sub-surface pipe drainage systems may be used.
2. Bioretention and vegetated swales (grass swales are not applicable in this dense urban environment unless permitted by the City to be incorporated into the linear park system).

Landbay G (offsite water)

This Landbay was planned and designed to drain to an expanded wet pond on the southern edge of Landbay F. The expansion area has been planned on land to be dedicated by Potomac Yard Development for Landbay K. As mentioned above, this pond was to be expanded in size and upgraded to be an open space amenity in Landbay K, the linear park. If the alignment of Potomac Avenue is revised as proposed in the applicant's preferred alternative, space on the surface for this facility will be eliminated. We have developed a unique solution to this problem. The concept is to divert the first ½ inch of runoff from Landbay G into an underground storage vault. Once this vault is full, the larger storm events will be diverted into the existing large diameter storm water conveyance system which drains to Four Mile Run. We will then have designed into the storage tank, a pumping system (with backup generator) to elevate the storm water to the linear park adjacent to the railroad corridor. This water will flow in an underground drainage system, vegetated or hardscaped swale to a series of treatment systems. These systems will be made of a variety of IMP's as outlined above but most likely an underground treatment system. The possible systems can include a vegetated swale, a cartridge treatment system, tree wells, rain gardens or sand filters within Potomac Avenue or the new Park to treat the water. In addition, it is possible that this water could also be used completely or partially to irrigate the portions of the Landbay K park system

Conclusion

Let us now review once again the principal tools used in a LID/IMP storm water system and how we measure up:

1. Conservation measures:
   Given that his site is highly developed as a retail center, that Four Mile Run is a gabion flood control project designed by the Corp in the late 70's, and that until 1995, this was an operating railroad, there are not many natural features if any to protect. So this tool is not applicable.
2. Impervious surface reductions:
   As an operating retail center and a previous operating railroad yard, this site, as it stands today has a significant amount of impervious surface (parking and roof tops). With this redevelopment, over 25% of this site is planned to be pervious. See open space plan by others. This is a good tool for us.

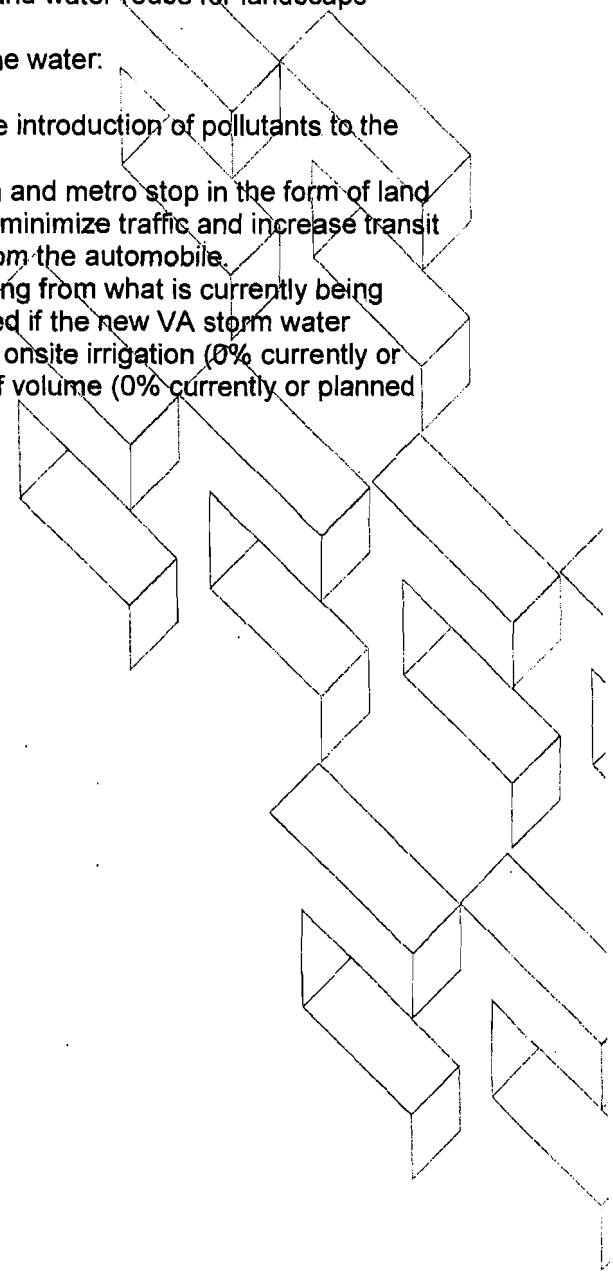
3. Slowing water flow using the landscape

   We are considering the use of a variety of IMP systems described above, including biofiltration, green roofs, bioretetion systems being integrated into the public and open spaces that are hardscaped and water reuse for landscape irrigation purposes.

4. Implementation of IMP's to reduce runoff and clean the water:

   See above

5. Advocate pollution prevention measures to reduce the introduction of pollutants to the environment
   a. The owner is helping to finance a BRT system and metro stop in the form of land donations, financial contributions, etc that will minimize traffic and increase transit ridership, thus reducing pollutant discharge from the automobile.
6. This plan proposes a 60%+ reduction in nutrient loading from what is currently being generated on the site (40% below what will be required if the new VA storm water regulations are approved), a 15% rainwater reuse for onsite irrigation (0% currently or planned to be required) and a 30% reduction in runoff volume (0% currently or planned to be required).



Wetland Studies and Solutions, Inc.

MEMORANDUM

To: **Bill Zink (via e-mail: billzink@ccl-eng.com)**

From: **Jennifer Brophy-Price**

Date: **November 24, 2009**

Re: **Potomac Village Stormwater Concepts**
Performance Specifications
WSSI #21812.01

Cc: **Mike Rolband, WSSI (via e-mail: mrolband@wetlandstudies.com)**
Morgan McCaffrey, McCaffrey Interests
(via e-mail: mmccaffery@mccafferyinterests.com)

Pursuant to Task B of the October 21, 2009, Agreement between Wetland Studies and Solutions, Inc. (WSSI) and McCaffrey Interests (the "Client"), this memo details the draft stormwater-related performance specifications for the Potomac Village project (the "Project").

WSSI has developed three performance specifications for the Project: Nutrient Loading, Water Harvesting and Reuse, and Total Runoff Volume Reduction. The specifications were developed after modeling various scenarios with the Virginia Runoff Reduction Method (VRRM) Worksheet (revision 9/30/2009). Based on the models, the performance specifications below are achievable using currently technology and allow for flexibility for future technologies.

Performance Specifications and Discussion

1. *Nutrient Loading*
   The Project shall achieve an overall post-development TP load less than or equal to 0.65 lb/ac/yr. The post-development load shall be calculated using the Virginia Runoff Reduction Method (VRRM) Worksheet (revision 9/30/2009), published by the Virginia Department of Conservation and Recreation (DCR). The loading calculations shall be performed on a block-by-block basis and shall include the effects of community-wide BMP's (such as the wet pond) that are proposed in the Plan Set titled, "Potomac Village BMP Exhibit," and dated August 28, 2009, as they apply to the subject block. For the purposes of the loading calculations, a block shall be defined as the area enclosed by the centerlines of adjacent streets; blocks shall include the portion of each adjacent street that falls within the area bounded by the centerlines.

   Those blocks served by the proposed Level II wet pond (as defined in Virginia DCR Stormwater Design Specification No. 14, Version 1.6, dated September 30, 2009) shall maintain a TP load less than or equal to 0.60 lb/ac/yr, and those blocks not served by the proposed Level II wet pond shall maintain a TP load less than or equal to 0.80 lb/ac/yr, to achieve an overall total TP load less than or equal to 0.65 lb/ac/yr.

   During the construction phase of the project, the TP load from all portions of the site shall be less than or equal to 0.80 lb/ac/yr. "Construction phase" shall be defined as any point in

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time that the proposed wet pond is in use as an erosion and sediment control BMP for purposes of constructing any portion of the Potomac Village site. Once all erosion and sediment control bonds for the project have been released, those blocks served by the wet pond shall achieve a TP load less than or equal to 0.65 lb/ac/yr.

Discussion:
Article XIII, Section 13-1036(S), of the Zoning Ordinance of the City of Alexandria (the "City"), codified through Ordinance No. 4609, adopted June 23, 2009, defines redevelopment as, "the process of developing land that is or has been previously developed." This definition applies to the Project site; therefore, the proposed DCR stormwater regulations require that the site achieve a 20% reduction in Total Phosphorus (TP) from the previous development (from approximately 1.70 lb/ac/yr to approximately 1.36 lb/ac/yr). The Project, however, seeks to go well beyond the requirements of the proposed regulations by reducing TP by over 60% to 0.65 lb/ac/yr.

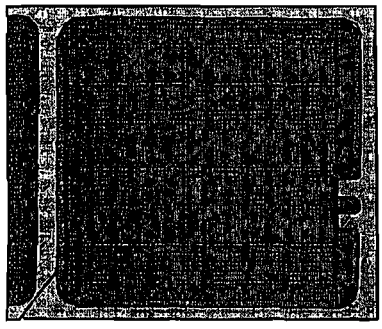
The project's construction phase presents a unique issue with regards to the proposed wet pond. It is anticipated that, during project construction, the wet pond will act as a sediment basin to control erosion and sediment runoff and will not effectively serve as a stormwater management BMP. Therefore, those areas served by the wet pond will require a TP loading goal equal to the loading required by the areas not served by the wet pond until such time as the wet pond is taken offline as an erosion and sediment control.

Calculating all post-development loads with the VRRM Worksheet (revision 9/30/2009) will ensure that all calculations are done on "equal footing" and are based on the most up-to-date regulations at the time of Master Plan approval.

2. *Water Harvesting for Reuse as Irrigation*
The Project shall re-use no less than 15% of the total annual runoff volume from the roof of each building, not to include the "green" or "pervious" portions of each roof, for irrigation of street-level and/or green roof landscaping. "Green roof" shall be defined as all rooftops that are deliberately covered with planting media and vegetation. "Pervious roof" shall be defined as all rooftops that are deliberately covered with pervious pavers or other pervious surfaces underlain by at least 6" of soil or drainage media. The storage tank size(s) for each block shall be calculated using at least 10 years of historic data from Reagan National Airport to ensure 15% annual reuse during a typical year. A typical year shall be defined as any year whose annual precipitation falls within one standard deviation of the mean annual precipitation of the historic data set used for the sizing calculation.

Discussion:
WSSI used the Cistern Design MS-Excel Spreadsheet, v. 1.0[1], to determine the runoff reduction credit for rainwater harvesting with the assumption that runoff from one-half of the total roof area would be harvested to irrigate of 6,000 square feet per block (see below). The Mechanical, Electrical, and Plumbing engineer for each block will need to design the rainwater harvesting system and determine the actual runoff reduction achieved.

[1] Available at the Virginia Stormwater BMP Clearinghouse website: http://www.vwrrc.vt.edu/swc/.



Typical Block Layout
Total area = 4.02 ac.
Total roof area (red) = 2.30 ac.
Harvested roof area = 1.15 ac.
Irrigated area (assumed) = 0.14 ac.

Other areas (assumed):
Yellow = asphalt
Blue = sidewalk
Green = pervious parking

Please note that roof delineations in the above graphic are for the sole purpose of illustrating the percentage of rooftops assumed to be harvested in the VRRM model and do not indicate or illustrate the actual layout of any roof.

The 1" storm accounts for approximately 93% of the total rainfall in the Washington, DC area; therefore; to achieve a reduction of 15% of the total annual rainfall volume from each roof (not including the "green" or "pervious" portions), a minimum of 16.2% of the first 1" of rainfall must be harvested and re-used from each roof (not including the "green" or "pervious" portions). This can be achieved using the area assumptions above.

3. *Total Runoff Volume Reduction*
   The Project shall reuse, evapotranspirate, or infiltrate a minimum of 30% of the total volume generated on the site by 1" of rainfall. Runoff volume reduction will be calculated on a block-by-block basis using the VRRM Worksheet (revision 9/30/2009). For the purposes of the loading calculations, a block shall be defined as the area enclosed by the centerline of adjacent streets; blocks shall include the portion of each adjacent street that falls within the area bounded by the centerlines.

   Discussion:
   Because the VRRM does not give runoff reduction credit for wet ponds, Specification 3 does not require different achievement goals based on whether or not certain blocks are serviced by the proposed wet pond (unlike Specification 1, Nutrient Loading).

   Calculating all post-development loads with the VRRM Worksheet (revision 9/30/2009) will ensure that all calculations are done on "equal footing" and are based on the most up-to-date regulations at the time of Master Plan approval.

Conclusion

This memo has presented three performance specifications for the Potomac Village project. The specifications were developed after WSSI modeled several scenarios using the VRRM Worksheet (revision 9/30/2009); we believe that these specifications give flexibility in the BMP's required to achieve the goals outlined in the specifications.