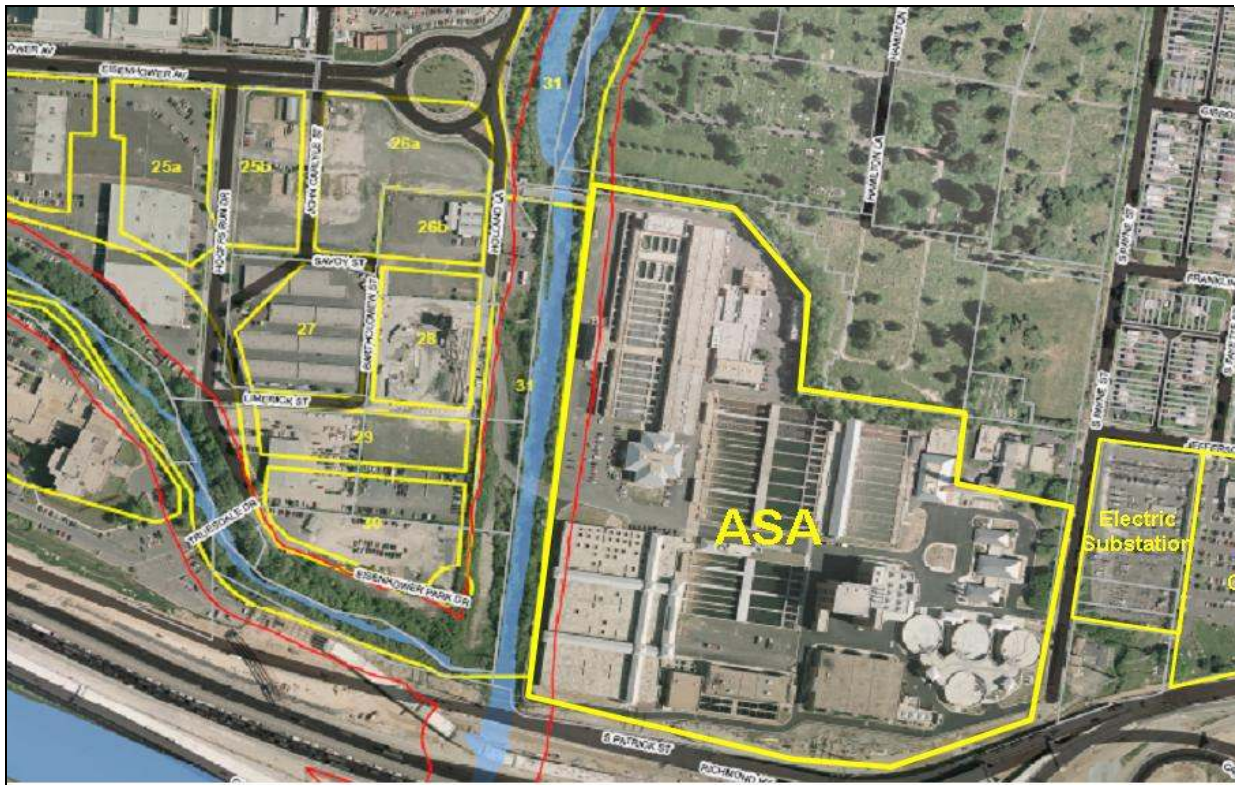


Docket Item #12

MASTER PLAN AMENDMENT #2007-0004  
SECTION 9.06 CASE # 2007-0004

Planning Commission Meeting  
March 4, 2007

# Alexandria Sanitation Authority



Docket Item #12

MASTER PLAN AMENDMENT #2007-0004  
SECTION 9.06 CASE # 2007-0004

Planning Commission Meeting  
March 4, 2007

**ISSUE:** Consideration of a request for 1) to amend the Eisenhower East Small Area Plan ("EESAP") Chapter of the Master Plan to include public utility as an allowable principle use for Blocks 29 and 30 of the EESAP, currently owned by Hooff-Fagelson Tract, LLC, and other amendments to allow the Alexandria Sanitation Authority to expand the wastewater treatment plant onto Blocks 29 and 30 of the EESAP with a Special Use Permit; 2) to amend the Eisenhower East Design Guidelines with applicable amendments to match the Master Plan Amendment; and 3) for the Planning Commission to approve the general location of a public utility on Blocks 29 and 30 of the EESAP pursuant to Section 9.06 of the Charter for the City of Alexandria.

**APPLICANT:** Alexandria Sanitation Authority  
by Jonathan P. Rak, Esq.

**STAFF:** Jeffrey Farner, Division Chief, Development  
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Katie Parker, Urban Planner  
[Katie.Parker@alexandriava.gov](mailto:Katie.Parker@alexandriava.gov)

**LOCATION:** 310, 350, 414, 454, and 514 Hooffs Run Drive

**ZONE:** Coordinated Development District/CDD #11

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## **I. PROPOSAL**

The Alexandria Sanitation Authority (ASA) has requested approval of the following:

- a Master Plan amendment to include public utility/wastewater treatment facility as an allowable principal use for Blocks 29 and 30 within the Eisenhower East Small Area Plan (EESAP);
- an amendment to the Eisenhower East Design Guidelines; and
- Section 9.06 approval.

Currently, ASA operates the wastewater treatment facility just outside of the Eisenhower East Plan boundaries, immediately east of Blocks 29 and 30. This facility was expanded in 2000 to comply with the last round of discharge regulations and as a result, the 33 acre site is almost entirely built-out. However, with stricter Federal and State environmental regulations regarding wastewater treatment becoming effective in 2011 and continued development in the City, the facility will need to expand. Given ASA's location between the Capital Beltway, historic cemeteries, a City recreation and office building (Lee Center), and electric substations, there are limited opportunities for contiguous expansion. The applicant is proposing that the plant expansion occur on Block 29 and Block 30, as designated by the Eisenhower East Plan.



**Figure 1: ASA and EESAP Blocks**

The five parcels that make up these two blocks, which are currently owned by Hooff Fagelson Tract, LLC, are approximately 10.6 acres, but nearly 5 acres are within a Resource Protection Area (RPA). ASA has studied expansion options and has determined that 5 acres will provide an adequate amount of land for the expansion to address the new regulations. Since wastewater

treatment facilities require a special use permit and approval by the City Council, ASA intends to submit a development special use permit following the approval of the Master Plan amendment so design can be completed and construction can begin to meet the 2011 regulations. At this time a site plan for expansion of the wastewater treatment facility has not yet been submitted to the City for review.



Figure 2: Hooff Fagelson Parcels and RPA

## II. BACKGROUND

### A. *Alexandria Sanitation Authority*

ASA was created in 1952 by City Council to construct, operate, and maintain a wastewater treatment facility that would serve the Alexandria sewershed, which encompasses most of the City of Alexandria and portions of Fairfax County. Prior to the creation of ASA, Alexandria discharged its sewage into the Potomac River and its tributaries. The existing wastewater treatment facility has been in operation since its approval in 1954. No approval by City Council for the initial construction was required because the site was zoned I-2/Heavy industrial, which permitted essentially any use without approval of a special use permit. In 1972, although the zoning for the site was still I-2, given the size of the expansion, the Planning Director required approval of a special use permit (SUP#864) to upgrade and expand the facility from 18 million gallons per day to 54 million gallons per day. At that time, by agreement with Fairfax County, the facility was sized to accommodate the wastewater treatment needs of the entire Cameron Run watershed as well as the service area needs for the City of Alexandria.

In the last decade, ASA has requested approval of various improvements and upgrades to the site and facility through special use permits. On June 6, 1998, City Council approved SUP #98-0037 to construct a 105 foot tall Solids Processing Building and four smaller buildings to upgrade the facility. On June 12, 1999, City Council approved an amendment (DSUP#99-0020) for constructing a “Primary Weir Observation Building” (located over existing primary settling tanks), demolition of the “Sludge Dewatering Building”, construction of an additional “Sludge Digester (Tank #4) with a Digester Complex” structure, and relocation and construction of a new “Waste Gas Burner Station” (Flare Station) at the southwest corner of the main building with a 60 foot tall stack. On May, 13, 2000, City Council approved an amendment to construct a 1,334 square foot building addition to the Main Building, located on the east side of the site along the frontage of South Payne Street, to house conveying equipment for transferring materials to dumpsters which are picked up by a truck drive-through at the north and south building ends.

Recently, in light of the new regulations which will require facility expansion, ASA approached the owner of Blocks 29 and 30 about purchase of their property. ASA and the property owner

have been in negotiations for nearly three years, but to date, have not been able to come to a purchase agreement. As a result, ASA has filed a petition to condemn the property, thus giving ASA a legal interest in the property and standing to file a request for a master plan amendment.

## ***B. Facility Overview***

The main purpose of a wastewater treatment facility is to remove wastewater pollutants that would harm the aquatic environment. In the past, the primary goal of wastewater treatment process was to remove organic waste, which is known to cause oxygen depletion in water streams. More recently, greater attention is also being paid to the removal of nutrients such as nitrogen and phosphorus because they reduce the quality of aquatic bodies by promoting excessive algal and plant growth.

The ASA facility effluent discharges into Hunting Creek, which flows into the Potomac River and the Chesapeake Bay. The amount of nutrients that can be discharged by the facility is governed by the operating permit issued by the State of Virginia Department of Environmental Quality. By limiting the amount of organic waste, nitrogen, and phosphorus, the wastewater facility helps to preserve and protect the Chesapeake Bay environment.

ASA achieves nutrient removal through a combination of biological and chemical-flocculation treatment processes. A high level of nutrient removal is required under the operating permit, which specifies limits for nitrogen and phosphorus concentrations in the plant effluent. The main goals of the biological nutrient removal system are to reduce the concentrations of organic waste and nitrogen to permitted values. The main goal of the chemical flocculation treatment process is to remove excess phosphorus to permitted values.

The most recent plant upgrade was completed in phases between 1999 and 2006 and it includes the following enhancements:

- Reduces the nutrient levels (nitrogen and phosphorous) in the plant effluent to meet the water quality requirements of the Potomac Embayment Standards and the voluntary requirements of the 1987 Chesapeake Bay Agreement.
- Reduces of the odor impact on adjacent neighbors by collecting and treating odorous air in an advanced odor control system.
- Produces high quality reclaimed water by providing advanced final treatment, including plate settlers and polishing filters.
- Uses of state-of-the-art ultraviolet light (UV) for disinfection of final effluent, thus reducing the potential for chlorine byproducts.
- Produces exceptional quality Class A biosolids that have beneficial use in land-application.
- Provides continuous and automatic monitoring and control of all the systems in the plant through a Supervisor Control and Data Acquisition System (SCADA).

### ***Major Interceptor Sewers***

The major Interceptor sewers conveying wastewater to the plant include the following: the Holmes Run Trunk Sewer, which is approximately 6.4 miles long, is a separate sewer and conveys sewage collected from the western half of the City of Alexandria and the Dowden

Terrace and Cameron Run areas of Fairfax County; the Commonwealth Interceptor is approximately 3.2 miles long, extends from the Four-Mile Run Pump station force main discharge to the Hooff's Run Junction Chamber and through the ASA plant site, ending at the first treatment process. The separate sewer serves the Four Mile Run Pump Station and most of the western portion of Old Town Alexandria, as well as the Jones Point area of Fairfax County (which discharges into the Commonwealth Interceptor at Junction Chamber A inside the plant site). The Duke Street combined sewer area also discharges to this interceptor; the Potomac Interceptor, which is approximately 2.4 miles long and conveys sewage collected in a combined sewer system in the eastern portion of the City of Alexandria; and the newly constructed Potomac Yard Trunk Sewer, which is approximately 1.6 miles long and collects in a separate sewer system in the Potomac Yard development site. This site is located in the eastern portion of the City of Alexandria.

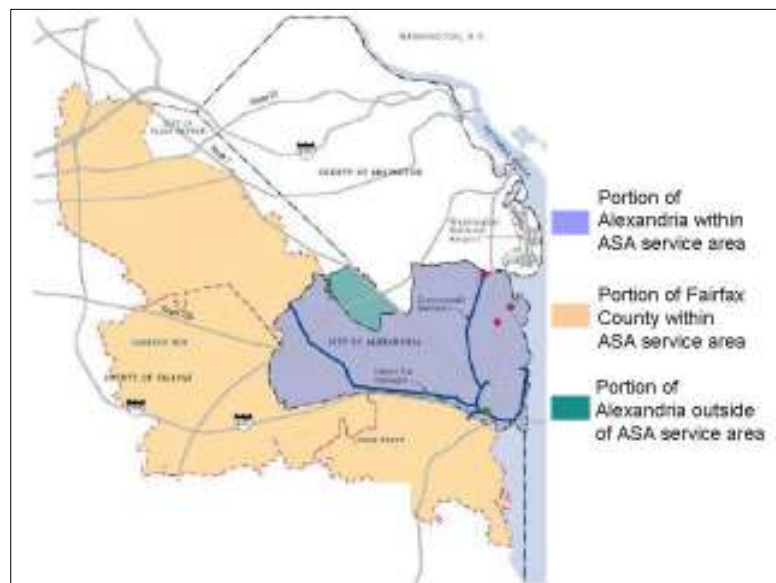
### ***Pumping Stations***

Several pumping stations convey the sewage in the collection systems to the treatment facility. These are the Four Mile Run Pumping Station, the River Road Pumping Station, the Slater's Lane Pumping Station and the Potomac Yard Pumping Station, currently under construction.

For additional information on the specific operations and functions of the facility, see *Attachment #1*

### ***C. Need for Plant Expansion***

The existing facility east of Blocks 29 and 30 is the only wastewater treatment facility in the City. The facility has a design capacity of 54 million gallons per day (MGD) and treats sewage for approximately 350,000 people within the 51 square mile treatment area. Wastewater for most of the City is treated at this location, in addition to sewage from areas of Fairfax County to the west and south. A small portion of the City of Alexandria is served by the Arlington County wastewater treatment facility. The current agreement<sup>1</sup> between ASA and Fairfax County allocates 60% of



**Figure 3: Service Areas**

<sup>1</sup> The joint, shared sewer service arrangement between the City and Fairfax County is historic and fundamental. When ASA was created by the City in 1954, service to portions of Fairfax County was contemplated. The relationship between Fairfax County and the City has been the subject of a number of Service Agreements over the years. The January 1973 Agreement, and the 1976 Trust Agreement, last were incorporated in the current Amended and Restated Service Agreement dated as of October 1, 1998.

the plant capacity to Fairfax County with the remaining 40% to the City. Therefore, the City has rights to 21.6 MGD of the plant capacity and Fairfax County has the rights to 32.4 MGD. Any change to that allocation would require the consent of Fairfax County and likely would require Alexandria to reimburse Fairfax County for a proportionate amount of its share of capital costs invested in ASA. Furthermore, Fairfax County representatives have recently told ASA that they need all of the allocated capacity to meet their needs.

There are several factors contributing to the need for expansion of the plant, which are discussed below.

### **Capacity**

The increase in development the City has experienced over the last decade and will likely continue to see through the next several decades has some implications on ASA's overall treatment capacity. While this is not the immediate reason for an expansion, it will be an issue that must be analyzed and addressed within the next ten to twenty years. Since this issue has serious consequences for the future of growth in the City, development capacity and long term expansion needs are discussed in more detail in the staff analysis.

### **Changes in Federal and State Regulations**

The factor requiring the need to expand is the effect of stricter Federal and State environmental regulations. ASA is subject to the requirements of the Clean Water Act and operates under these regulations. In 1999, ASA began expansion of their facility to construct technologies to meet the requirements to reduce nitrogen and ammonia discharges. In November 2006, the Virginia Department of Environmental Quality (VDEQ) adopted new regulations that required further reduction in the nitrogen discharge from the plant and ASA must comply with these requirements by January 2011. A comparison of the effluent requirements in 1974, 1986, current, and future is provided in *Table 1* below with significant changes shown in bold text.

**Table 1: ASA Water Effluent Requirement Comparison**

	1974 Water Effluent Requirements	1986 Water Effluent Requirements	Current Water Effluent Requirements (2004 thru 2009)	After January 1, 2011 *
Total Permitted Plant Flow	27.0 MGD	54 MGD	54 MGD	54 MGD
Flow (city allocation)	10.8 MGD	21.6 MGD	21.6 MGD	21.6 MGD
Biochemical Oxygen Demand	46 mg/l	10 mg/l	5 mg/l	5 mg/l
Total Suspended Solids	51.0 mg/l	10 mg/l	6.0 mg/l	6.0 mg/l
Ammonia as Nitrogen (Apr-Oct)	Not regulated	Not regulated	1.0 mg/l	1.0 mg/l
Ammonia as Nitrogen (Nov-Jan)	Not regulated	Not regulated	8.4 mg/l	8.4 mg/l
Ammonia as Nitrogen (Feb-Mar)	Not regulated	Not regulated	7.4 mg/l	7.4 mg/l
<b>Total Nitrogen (concentration)</b>	Not regulated	Not regulated	<b>8.0 mg/l</b>	<b>3.0 mg/l</b>
<b>Total Nitrogen (pounds/year)</b>	Not regulated	Not regulated	<b>Not regulated</b>	<b>493,381</b>
Total Phosphorus (concentration)	Not regulated	0.18 mg/l	0.18 mg/l	0.18 mg/l
<b>Total Phosphorus (pounds/year)</b>	Not regulated	Not regulated	<b>Not regulated</b>	<b>29,603</b>
Dissolved Oxygen (minimum)	Not regulated	6.0 mg/l	6.0 mg/l	6.0 mg/l

	1974 Water Effluent Requirements	1986 Water Effluent Requirements	Current Water Effluent Requirements (2004 thru 2009)	After January 1, 2011 *
pH (standard units)	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0
Fecal Coliform	200/100 mls	200/100 mls		
E. Coli	Not regulated	Not regulated	126 n/100 mls	126 n/100 mls
Whole Effluent Toxicity	Not regulated	Not regulated	No toxic effect	No toxic effect

\* This covers a change in nutrients only. Current permit to be reissued in 2009, which may include reductions in existing requirements or additional limits for new parameters.

In addition to these requirements, additional requirements have been discussed and are likely to be implemented. Later this year ASA anticipates that DC, Virginia, and Maryland will produce a water quality requirement for PCB discharge. VDEQ has also recommended regulating nonylphenol, which is commonly found in wastewater. New processes will be designed to remove this chemical pursuant to the standard. Following the declining conditions of the Chesapeake Bay and the Potomac River, VDEQ has also recommended regulating discharges of chlorophyll *a* which is a chemical that fosters algal blooms. This may require even further reductions to nitrogen and phosphorus discharges as well as an increase in the minimum dissolved oxygen required to be discharged to the Potomac River.

### ***Increased Needs for Processing Solids***

Another factor influencing the need for expansion of the wastewater treatment facility is the increased amount of solid material the plant must process. Over the last decade the amount of suspended solids in the liquid waste has increased by approximately 66%. At the same time, the new treatment processes implemented to comply with the stricter discharge limits result in the extraction of more solids. The increased quantities of solids results in the need for additional solids processing facilities.

Currently, after the solids are processed at the ASA facility, they are temporarily stored on site before being trucked to places outside of Alexandria for disposal, typically on agricultural land. In response to Virginia regulations, the localities that accept the solids are imposing restrictions on what can be accepted, which then requires ASA to further treat the solids on site before shipping offsite for disposal. In addition, the new Nutrient Management Plan regulations have severely limited the amount of land that is available for the solids disposal. The implications of this mean ASA will have to treat and dispose of additional quantities of solids on-site.

### ***Power Supply***

The last factor influencing the need for ASA expansion pertains to the supply of electric power. All of the wastewater treatment facilities on the ASA site are operated by electric power. The new processes that will be implemented to comply with the stricter pollutant removal regulations will require additional electric service. Ideally, this additional service would be provided by a new substation on site. ASA is also evaluating the need for a back-up power supply to ensure that the facility continues operating in the event of a power outage. With the next upgrade to the



facility, ASA anticipates the construction of a backup generator next to the new substation. ASA estimates that the substation and the backup generator will require approximately a half acre.

### ***C. Implications of not expanding the Wastewater Treatment Facility***

If ASA is not permitted to expand its treatment facilities onto Blocks 29 and 30, it will not be able to comply with the enhanced nutrient removal requirement by the deadline of January 2011 and be in violation of Federal and State law. As previously discussed, the existing 33 acre ASA property is completely built-out. Without additional land for expansion, ASA would be forced to demolish existing structures and stack additional treatment facilities. ASA estimates indicate that expanding the plant on-site would be the most expensive option resulting in these costs being based onto the ratepayers in the City served by the plant. In addition, the demolition and reconstruction of existing facilities would also result in extended periods during which effluent is discharged without complying with current permit requirements. The consequence of these violations would include fines of up to \$32,500 per day per violation. The discharge of sewage that does not meet permit requirements would also adversely affect water quality in Hunting Creek, the Potomac River and Chesapeake Bay. The City also relies on the nitrogen removal by the ASA plant to comply with limits on combined sewer discharges.

Although the purpose of the expansion onto Blocks 29 and 30 is to comply with treatment requirements for existing sewage flows, ASA will also need additional land if the City requests more capacity to accommodate development. With development of Eisenhower East and Potomac Yard at current and anticipated usage rates, the City will fully utilize the 21.6 million gallons per day available at the ASA treatment plant. In other jurisdictions, the lack of available sewage treatment capacity has necessitated a moratorium on further development. A similar outcome is foreseeable in Alexandria, with the result that development and re-development outside Eisenhower East and Potomac Yard would be substantially delayed if not altogether precluded.

### ***D. Condemnation of Block 29 and Block 30***

Blocks 29 and 30 are owned by Hooff Fagelson Tract LLC. Based on new and anticipated regulatory requirements, ASA determined in 2005 that the property is needed to meet treatment requirements. The USEPA and VDEQ require compliance with the new, more stringent effluent limitations by January 1, 2011. ASA began negotiations with the owner in early 2005 for a purchase or lease of the property. These negotiations continued through 2006. Because the negotiations did not produce an agreement, the ASA Board of Directors held a public hearing on April 17, 2007 to document and affirm the public need and to authorize the use of eminent domain. A bona fide offer of \$20,400,000 was made to Hooff Fagelson based on a third party appraisal. This offer was not accepted, so a petition to acquire the property was filed in Alexandria Circuit Court on June 19, 2007.

Hooff Fagelson objected to the condemnation alleging that the condemnation could not proceed because the Eisenhower East Small Area Plan does not designate Blocks 29 and 30 for expansion of the sewage treatment plant. ASA requested an amendment to the EESAP to allow expansion of the treatment plant as an option for the property in June 2006 but could not file a formal

amendment without the consent of the property owner. The City Attorney has determined that the filing of the condemnation petition creates a legal interest in the property sufficient to allow ASA to file a master plan amendment pursuant to section 11-902 of the Zoning Ordinance. ASA filed this application to amend the Small Area Plan on August 9, 2007. The trial of the condemnation case is currently scheduled for July 2008. ASA and Hooff Fagelson have continued to discuss a possible settlement of the condemnation case.

### ***E. EESAP and Proposed Uses for Blocks 29 & 30***

In November 2001, in response to the development pressures in East Eisenhower, the City initiated a small area planning process to develop a plan for development in this area. During the following two years, the City encouraged input and participation from many of the stakeholders in Eisenhower East, including property owners, business owners, civic associations, the Eisenhower Partnership, and ASA. Through this cooperative process, a vision for East Eisenhower was developed which called for an urban extension of Old Town and Carlyle that maximized transit options, established Eisenhower Avenue as a grand boulevard, created a network of urban streets, and created a coordinated open space system. The Plan was adopted by City Council in April 2003 as a chapter of the 1992 Master Plan.

The Plan has created a shared vision among the community, property owners and the City concerning the future direction of this neighborhood. The Eisenhower East planning effort is now well into the implementation stage and the Plan's overall vision is being realized. The EESAP anticipated ultimate build-out through 2020. Today there is approximately 5 million square feet of building space currently in the development planning process in the concept, final, or construction stages.



**Figure 4: Development Activity in Eisenhower East and Carlyle**

The area around the Eisenhower Metro Station and the area south of Eisenhower Avenue and Carlyle (referred to as South Carlyle) were two areas the Plan focused on and provided specific recommendations. For South Carlyle, the Plan called for a mix of residential, office, and retail uses, the implementation of a street network, and a neighborhood park that connected to a larger park. In addition to the City, South Carlyle is comprised of land owned by five different property owners. Of these five property owners, Hooff Fagelson owns Blocks 29 and 30, which are the two southernmost blocks in South Carlyle.

The Plan identified Block 29 as a location for 170,000 sf of residential use. Considering its southernmost location and adjacency to the Capital Beltway, Block 30 was slated for a maximum of 512,000 sf of office use in the form of 10-15 story buildings. The total allowable floor area for these two blocks is 682,000 sf which is a significant portion of the 2.6 million sf allowed by the Plan for South Carlyle. Additionally, the Plan identifies several new or extended streets surrounding these blocks to contribute to the overall street network in South Carlyle that is currently nonexistent.



**Figure 5: South Carlyle**

Prior to adoption of the Plan, the Hooff Fagleson parcels were zoned OCM, which is a medium office and commercial zone that allows an FAR of 1.5. For a 10.6 acre site, a maximum of 692,604 square feet of development could be permitted. However, since the RPA occupies a large portion of these parcels, development of the entire permitted floor area could not be possible on these parcels. While the Plan did not significantly increase the permitted floor area for these two blocks, the Plan did permit an increase in height from 100 feet to 200 feet on the southern block primarily in response to the required grid of street and open space required by the Plan.

### **III. REVISIONS TO THE EISENHOWER EAST SMALL AREA PLAN**

*Table 2* summarizes the revisions to the EESAP as a result of this amendment. See *Attachment #2* for the revised pages to the EESAP.

**Table 2: Revisions to EESAP**

<b>Page / Section</b>	<b>Revision</b>
v / Infrastructure	Add “Additionally, the wastewater treatment facility may need to expand in response to long term development and stricter environmental regulations.”
2-9 / Infrastructure and Public Facilities	Change last sentence of second paragraph to state “ <u>While recent upgrades...Eisenhower East area, projections for potential development indicate the need for additional capacity.</u> ”

Page / Section	Revision
4-5/ The Grid Pattern East of Mill Road	Add “An access road crossing Hooff’s Run shall be permitted. Such a road would be constructed by ASA. If Blocks 29 and 30 are developed as an expansion of the wastewater treatment facility, the proposed street between Blocks 29 and 30 and the portions of Eisenhower Park Drive and Holland Lane to the west, south, and east of Blocks 29 and 30 shall not be required to be constructed or dedicated to the City for public use.”
4-14 / <i>Figure 4-10: Development Controls CDD 11</i>	Add a third asterisk to the table to the Principal Use for Block 29 and 30 stating “The Principal Use for these blocks may also be wastewater treatment facility/Public Utility if approved by a special use permit.”
4-17 / Alexandria Sanitation Authority (new section)	New section discussing the expansion of the wastewater treatment facility and development controls that would be required for the special use permit.
4-27 / Land Use and Development Controls	New paragraph stating “In the event blocks 29 and 30 are acquired for expansion of the wastewater treatment facility, a transfer of the planned office and residential floor area to other sites within the Eisenhower East boundaries may be considered. Any such transfer should maintain the overall balance of uses set forth in the Plan.

Staff is also recommending revisions to the Eisenhower East Design Guidelines to reflect the proposed amendment to the Master Plan. The amendment to the Design Guidelines, as depicted in *Table # 3*, requires approval by the Planning Commission. See *Attachment #3* for the revised pages of the Design Guidelines.

**Table 3: Revisions to EE Design Guidelines**

Page / Section	Revision
9 / Development Controls Chart	Add a third asterisk to the table to the Principal Use for Block 29 and 30 stating “The Principal Use for these blocks may also be wastewater treatment facility/Public Utility if approved by a special use permit. Refer to Page 4-17 of the EESAP for general development guidelines.”
15 / Street Frontage Design Principles	Add “An access road crossing Hooff’s Run shall be permitted. Such a road would be constructed by ASA. If Blocks 29 and 30 are developed as an expansion of the wastewater treatment facility, the proposed street between Blocks 29 and 30 and the portions of Eisenhower Park Drive and Holland Lane to the west, south, and east of Blocks 29 and 30 shall not be required to be constructed or dedicated to the City for public use.”

#### **IV. STAFF ANALYSIS**

The proposed Master Plan amendment raises several fundamental policy questions for the City to consider that include:

- Provision of adequate City infrastructure;
- Short-term and long-term City infrastructure needs;
- Maintaining the intent of the Eisenhower East Small Area Plan; and
- Maintaining appropriate densities near the metro stations.

This proposal puts the intent of the Eisenhower East Plan to achieve higher density, mixed use development near the metro station against the need for sewage capacity and treatment within not only Eisenhower East but the entire City. It is unfortunate ASA did not indicate to the City that future expansion would be needed on a short-term or long-term basis as part of the Eisenhower East planning process. Now less than four years after the adoption of the Plan, ASA is proposing a five acre expansion of the existing facility. If the need for the proposed expansion of ASA had been known or at least anticipated during the planning process, elements such as uses, street, heights, and open space would most likely have been allocated differently than the current Plan.

While it would have been ideal to have known about the need for an expansion, the fact is that because of Federal and State requirements the plant needs to expand in order to comply with upcoming statutory requirements. As discussed in more detail below, staff was initially concerned about the loss of development for Blocks 29 and 30 and impacts to the intent of the Eisenhower East Plan. However, after analysis of all the potential alternatives, staff believes that currently the most viable location for the plant expansion would be Block 29 and Block 30.

As part of the proposed expansion, staff wanted to ensure that the proposed expansion would accommodate the long-term sewage needs for the City, in addition to the short-term regulatory requirements. However, as part of the staff analysis it became apparent that even with the expansion on Blocks 29 and 30, the facility would exceed capacity based on projected development by the year 2030.

Staff is recommending approval of the proposed Master Plan amendment, with the understanding that the proposed expansion would require a special use permit and would have requirements to mitigate the potential impacts, as discussed in more detail below. Staff is also recommending that the City and ASA undertake a comprehensive and long-term analysis of the future sewage treatment needs of the City. Staff believes this could be accomplished through an infrastructure master plan for the City or a comparable long-term analysis.

#### ***A. Current and Long Term Expansion Needs***

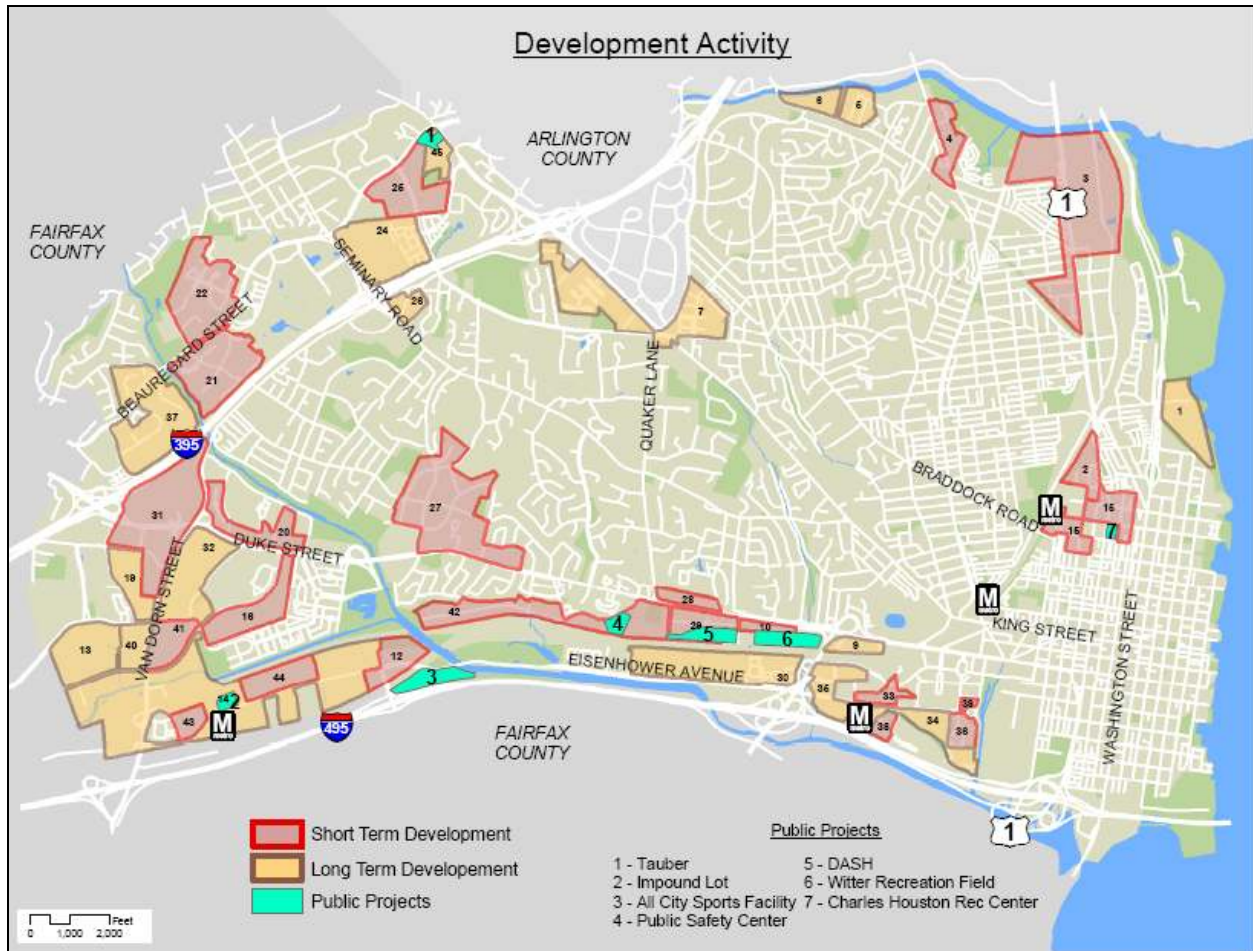
A major concern of staff was not only the short term impact of this proposal but also the long-term implications for the City. With the build-out of the Eisenhower East Plan, the facility will eventually be land locked preventing future expansion options, even with the expansion of Block 29 and Block 30. Therefore, as part of this effort, staff compiled short-term (until 2030) and longer term (until 2050) growth projections.

The immediate need of the ASA for use of blocks 29 and 30 is for the purpose of complying with increased regulatory requirements, not for expansion of capacity. Expansion of capacity of the treatment plant above the current 54 MGD will require extensive lead time for design, state and

federal permitting and construction. ASA estimates that such an expansion will take approximately ten years from beginning of construction until the completion of the proposed expansion. This lengthy timeframe emphasizes the importance of analyzing and addressing the capacity issue as soon as possible.

The existing facility can accommodate development in areas with recently approved small area plans, such as Eisenhower East and Potomac Yard, and ASA accounted for this additional development when determining adequate capacity. However, as the City continues to adopt small area plans for other areas of the City, such as Braddock Metro, Landmark-Van Dorn, and Eisenhower West, as well as grow in other areas of the City, this new construction will have significant implications for the capacity of the plant. Staff believes that this proposed expansion must consider not only the growth anticipated for the short-term, but also the long-term needs, to ensure that the City can meet environmental obligations for the facility and realize the small areas plans as they are adopted by the City. This long term planning is especially important given that due to the complexity of the design, construction, and permitting process, a plant expansion take nearly ten years to complete. For comparison, the most recent plant expansion began in 1997 and was completed in 2006.

It is clear that Alexandria has experienced a great deal of growth in the last decade and projections indicate this trend will continue. When the request for the Master Plan amendment was originally made, the primary reason for the expansion was to provide for the additional facilities to comply with the new 2011 regulations. While meeting with ASA about this amendment, City staff asked ASA to research the facility's capacity to treat future development projected out 20 to 40 years. To do this, staff identified areas that are likely to develop in the short term (by 2030) and the long term (by 2050) (see map). Through this analysis, staff estimates approximately 66 million square feet of new development by 2030 and an additional 60 million square feet by 2050. Using established industry standards and flow requirements as dictated by the Virginia Sewage Collection and Treatment Regulations, ASA staff converted the estimated square footages provided by the Planning staff into projected million gallons of wastewater generated and then determined the additional land that would be need to treat this amount of wastewater. *Table 4* summarizes these findings.



**Figure 6: Development Activity**

The initial capacity calculations and expansion analysis in *Table 4* does not take into account the existing buildings in the redevelopment areas. A preliminary review shows that there is approximately 17 million square feet of development in these areas, which would offset the total increase in capacity based on the development projections. ASA does not see a significant “savings” from the existing development in the short term. The possible change in uses and intensities and improved conservation technologies make it difficult to determine the exact savings the existing capacity would have on future demands. However, this highlights the need for an in depth analysis of development projections and a more detailed determination of how much additional land will be needed to sustain long term growth.

The challenge with growth projections is that they involve certain assumptions. To determine whether the projected development figures were reasonable, staff reviewed recent growth patterns and approved and anticipated small area plans. In the past ten years, the City has grown an average of three million square feet per year. This number serves as a reasonable benchmark, which would equate to approximately sixty million square feet of additional development in the next twenty years, which is consistent with the short term development estimate discussed above.

**Table 4: Development Capacity**

Scenario	Development Capacity	New Development (sf)	Total Land needed (acres)	Additional Cost
A	Current Development (includes Potomac Yard and Eisenhower East)	n/a	33 (existing)	\$356 million (actual cost of 1997 expansion)
B	Current Development (includes Potomac Yard and Eisenhower East)	n/a	36*	\$125 million
C	Planned Areas **	20 million	38	\$175 million
D	Short Term Development - Build out 2030	66 million	38	\$400 million
E	Long Term Development - Build out 2050	60 million	45-48 ***	\$570 million

\* Additional land needed to comply with 2011 requirements

\*\* Upper Potomac Yard, Eisenhower West, Landmark-Van Dorn, Braddock Road

\*\*\* More analysis on the impact of existing development on the cumulative capacity is needed to determine the actual amount of land needed to accommodate the long term development.

### ***Scenario A***

Scenario A provides a benchmark for comparison of the four other development capacity scenarios. The facility's capacity on the existing 33 acre site can accommodate current development projections, including future development in Potomac Yard and Eisenhower East under the existing discharge requirements. These calculations take into consideration the impact of the recent expansion completed in 2006.

### ***Scenario B***

By 2011, the facility must comply with the new Federal and State requirements. In order to meet these regulations, additional treatment structures must be constructed and since the existing 33 acre site is nearly built-out, additional land will be needed. Scenario B shows that in order to provide for the current development and comply with the 2011 requirements, an additional 3 acres will be needed. An assumption is made that the additional land is contiguous to the existing facility.

### ***Scenario C***

There are three areas within the City that are at various stages of the planning process: Braddock Road, Landmark/Van Dorn, and Eisenhower East. In addition, redevelopment of the existing Potomac Yard shopping center is also a possibility that could occur around the same timeframe as redevelopment in these three areas. Scenario C estimates the potential development in these areas to be approximately 20 million square feet. In order to accommodate this additional floor area, ASA would need approximately 5 additional acres above what they currently have, for a total of 38 acres.



### ***Scenario D***

As part of this analysis, the City identified the areas that are likely to redevelop in the short term and long term. Scenario D uses the estimate of approximately 66 million square feet of new development by 2030, in addition to the planned areas discussed in Scenario C. ASA will need 5 acres above the existing 33 acre site, for a total of 38 acres to support this additional development. This is the same amount of land required to accommodate Scenario C, but given that the additional development is three times more, there will be a greater cost to upgrade the facility.

### ***Scenario E***

The final scenario illustrates the situation for the potential long term development (up to 2050). Staff estimates that there is a potential of approximately 60 million square feet of long-term development. According to preliminary calculations, ASA has determined that 48 total acres would be needed to accommodate this additional development, which is 15 acres more than the existing 33 acre site and 10 acres more than an expanded facility on the 5 acres of Blocks 29 and 30. Scenario E highlights the need to study this further, to ensure that when the time comes, adequate land and/or technology is available to sustain the growth that is possible in the City.

## ***B. Short-Term (2008 to 2030) Expansion Options***

With significant future growth likely, the new regulations for allowable discharges, requirements for solids processing, and the need for an electric power supply on site, it is unavoidable that ASA will need to construct additional wastewater processing and treatment structures. Considering the requirement for compliance with the new regulations by January 2011, ASA explored the possible options for providing these structures, including additional construction on the current site, plant relocation, and expansion onto the surrounding properties. Staff from various departments also explored the possible expansion options as discussed in more detail below. However, upon review, it was determined that the only feasible option is expansion onto Blocks 29 and 30.

### ***Construction on Site***

As seen in the aerial of the ASA site, the facility has expanded to occupy nearly all 33 acres of their property. After the most recent expansion, there is very little room to construct additional wastewater processing structures. Even with the previous expansion, ASA had to implement non-traditional practices such as vertical construction of the solids processing building. If additional construction could somehow be added to the existing site, it could not be done without interrupting sewage treatment. The result of this would be untreated sewage discharging into Hunting Creek and the Potomac River in violation of Federal and State regulations. In addition to



**Figure 7: 2006 Aerial of ASA site**

significant environmental damage, non-compliance with these regulations would lead to considerable fines on a per day basis.

### ***Facility Relocation***

Relocation of the wastewater facility is not a feasible option for ASA for several reasons. The sewer infrastructure throughout the City and portions of the Fairfax County service area has been installed and designed to flow to the current location. This particular location was chosen for its position as a lowest point in the watershed which makes gravity sewage flow more efficient by minimizing sewage pumping. Additionally, there is not a large enough tract of land within the watershed to relocate the plant. More importantly, relocation of the facility and the relevant infrastructure would be financially infeasible. Alexandria and Fairfax County have invested over half a billion dollars in the existing plant. Even if a new site were available, relocating the treatment plant would effectively abandon that investment and impose unsustainable costs on ratepayers.

Staff has also asked whether ASA could accommodate its expansion needs with a separate, additional treatment plant elsewhere in the city. According to ASA, this is not feasible for several reasons. First, the cost of a new treatment plant would far exceed the cost of expanding the existing plant, because capital facilities and operating expenses would be duplicated. Furthermore, the cost of a new plant would not be shared by Fairfax County and would be paid for entirely by Alexandria. Second, the primary reason for ASA's expansion proposal is because with the existing plant they cannot meet the limits on the rate of nitrogen discharge that become effective in 2011. It would not be possible to acquire land, obtain Federal and State permits, and design and construct a new treatment plant in less than three years. Third, Federal and State environmental laws are much more stringent on new treatment plants and on treatment plants that discharge into non-tidal streams. Finally, establishing a new sewage treatment plant in a different location will likely encounter considerable community opposition. If the amount of long term growth occurs in the West End based on the highest projections, it is conceivable that a second treatment plant might be part of that solution. However, a second treatment plant would not relieve the need for the current expansion proposal.

### ***Surrounding Property***

The next option for providing the additional processing structures for the facility is to expand to an adjacent property. The land immediately to the north of the facility is occupied by a number of historic cemeteries. Expansion into the cemetery property is not a feasible option. The property to the east is owned by Virginia Dominion Electric Company, who uses the site as an electric substation. Beyond that is the Lee Center, which is one of the City's recreational facilities. ASA is bordered by the Capital Beltway to the south, which precludes expansion in that direction.



Figure 8: Ownership of Land around ASA

Finally, to the west there are several vacant properties ASA analyzed. ASA owns a two acre parcel west of the facility at 1500 Eisenhower Avenue. However, this parcel would not be large enough for the additional processing operations associated with the expansion. Also, this parcel is close to Eisenhower Avenue and would have the greatest impact on the surrounding area. A second parcel is the Virginia Concrete site at 340 Hooff's Run Drive. As with the previous parcel, this two acre site would not be large enough for the intended expansion and would also impact the intended residential, office, and retail development to the north, west, and south of the site. Both the two acre ASA parcel and the Virginia Concrete parcel have a higher elevation than the existing treatment plant, requiring an additional pumping station to convey the sewage from the main plant to the expansion.

The last site to the west is five parcels identified as Blocks 29 and 30 in the EESAP. Collectively, these five parcels are approximately 10.6 acres, although portions would not be usable due to the Resource Protection Area running along the western, southern, and eastern boundaries of the site. While not ideal, the expansion of the ASA facility onto these Blocks would have the least impact on the surrounding area since it the southernmost property in the Plan and is bordered by the Public Safety Center to the west, the Capital Beltway to the south, and the existing ASA facility to the east. Blocks 29 and 30 have an elevation equal to or less than the existing treatment plant which allows for connection to the plant without additional pumping stations. Additionally, the site can currently be accessed by Hooff's Run Drive on the west and Holland Lane to the east.

### ***C. Long-Term Expansion (2031 to 2050)***

Preliminary projections show that ASA will not have enough land to accommodate the City's projected long-term development. This raises considerable concern for impacts to future growth within the City and impacts to the Eisenhower East area. To ensure coordination the City and ASA for future sewage capacity and infrastructure, staff is recommending that a comprehensive analysis of short-term and long-term development trends and infrastructure needs be done.

### ***D. Impact on the EESAP***

When the EESAP was adopted in 2003, the vision for all of Eisenhower East, including South Carlyle, was that of an urban neighborhood with a mix of uses, a street network, and coordinated open space. Block 29 was slated for 170,000 sf of residential use and Block 30 was to be up to 512,000 sf of office use. The planning process for developing this plan was extensive and involved many stakeholders, including ASA. Since the Plan's adoption, development activity has occurred on several other properties within South Carlyle, including Block 27 (300,000 sf residential use), which is currently under construction, and Block P (342,000 sf office use with 30,000 sf retail), which plans to begin construction spring 2008. Along with the construction of these buildings, each block is required to install the portion of the street grid within each block.

East of Block 27 is the existing Virginia Concrete facility, still in operation. Due to the nature of this use, the original approval stated the use could continue only as long as it remained compatible with nearby commercial areas. The special use permit was approved with the condition that it be reviewed every five years. Most recently, the SUP was reviewed by the City Council in January 2007 and considering the approval of the residential use at Block 27, a condition was imposed that allowed the use to continue up until the first occupancy permit for Block 27 was issued. The Plan has identified this block for a maximum of 282,000 sf of residential use, similar to what is permitted for Block 27.

The Plan also calls for a neighborhood park for the South Carlyle community, to be comprised of land contributions from Block P, Block 27, Hoffman, and the City (Hooffs Run Drive right-of-way). A condition of approval for Block 27 required the applicant to begin development of a plan for the park. At this time, a consultant has been hired and is working with the City on the design of the park. Since a portion of the land for the park is owned by Hoffman, who currently does not have any immediate plans for redevelopment, the park will be developed in two phases. Phase I will be implemented with the construction of Block 27 and Block P and Phase II will be implemented upon the future redevelopment of the Hoffman property to the west.

Approximately 26% (682,000 sf) of the development for South Carlyle was proposed on Block 29 and Block 30. The elimination of these blocks from a development standpoint does create some problems for the success of the plan, but with careful planning and consideration these problems can be mitigated to some extent. The street network is a key component of the Plan, particularly for South Carlyle as the network was previously non-existent. With ASA expanding onto Blocks 29 and 30, the full extension of Eisenhower Park Drive and Holland Lane as well as the new east-west street between the two blocks will not occur. However, Limerick Street, the east-west street immediately north of Block 29, will still be installed, thus creating the

connection between the Eisenhower Park Drive and Holland Lane to complete a cohesive network.

With regard to open space, development occurring on Blocks 29 and 30 would have been required to dedicate a substantial portion of the original parcels to the City for the Eisenhower Park, the linear park connecting the African American Heritage Park to South Carlyle and western Eisenhower East. Since much of this land is within the RPA, development is not permitted, regardless of whether it's used for commercial, residential or the wastewater facility. Dedication of this property would fulfill the owner's open space contribution to the Eisenhower East Open Space Fund, since the value of the land exceeds the amount of the contribution that would be required. If ASA acquires these blocks, the City will still require dedication of the area identified in the Plan for open space, which is approximately 4 acres. The dedication of this property will help fulfill a significant component of the open space that was envisioned in the Plan.

### ***E. Development Controls for Future ASA Expansion***

While ASA has yet not proposed a specific development plan for expansion, staff believes it is important to incorporate development parameters for the future plant expansion to maintain the intent of the Eisenhower East Plan for South Carlyle.

#### ***Open Space***

As part of the amendment, staff has proposed language for the Plan to ensure that a proposed plant expansion on Blocks 29 and 30 would not preclude or reduce the required area for open space for the future Eisenhower Park. In addition, staff has proposed language for the Plan that will require appropriate screening and buffers adjacent to the future Eisenhower Park. This may involve walls, fencing and/or landscaping and will need to be evaluated as part of the subsequent development special use permit that would be required for the plant expansion.

A condition of the earlier approvals for the expansion of the ASA facility required ASA to provide a bike trail along the southern boundary of the property. This bike trail will be a segment of the larger bike trail that will eventually link Eisenhower to the Mount Vernon trail.



**Figure 9: Eisenhower Park**



**Figure 10: Alexandria Bike Plan - Mill Race Connector**

VDOT is currently constructing the Route 1 ramps for the Beltway immediately south of the ASA facility and have agreed to install this trail segment once construction is complete. If ASA expands onto Blocks 29 and 30, a likely condition of the special use permit will be the requirement to construct the portion of this trail adjacent to the expansion property and include a bridge across Hooff's Run to connect to the other segment of the trail.

### ***Street Construction and Dedication***

A key element of EESAP is the creation of a street network, especially in South Carlyle where it is non-existent. With the construction of Block 27, Limerick Street, the east-west street north of Block 29 will be partially constructed. When Block 28 redevelops, the applicant will be required to complete the street segment. While most of the right-of-way for Limerick Street falls within the northern properties, it is important that ASA provide the additional land necessary to complete the street as called for in the Design Guidelines with on-street parking and sidewalks.

Since the full extension of Eisenhower Park Drive and Holland Lane will not be constructed if ASA expands onto Blocks 29 and 30, the design of the intersections of these two streets with Limerick Street must be carefully planned. ASA will be required to coordinate with the owners of both blocks to ensure the connections are designed appropriately.

### ***Uses – Design***

In order to lessen the impact of a wastewater treatment facility on the neighboring residential uses, any expansion proposal will be required to provide active uses, buildings, and/or structures/walls along the northern portion of the site.

One option would be to relocate the administration building to this site. Screening walls can also include architectural elements to make them appear as buildings adjacent to the street. Additionally, as these two blocks are part of Eisenhower East, the design of the buildings and structures must be reviewed and approved by the Eisenhower East Design Review Board (DRB), with the final design subject to the review and approval by the Planning Commission and City Council.



**Figure 11: Street Network and Uses**

The view of the plant and associated structures from the Beltway is a considerable concern of staff because this is a view that will be visible from many motorists and will contribute to the overall perception of the Eisenhower East/Carlyle area. It is for this reason that so much attention has been paid to building tops, such as the recently approved west building on Block P and the ATA residential building on Block 19. Staff believes that a high architectural standard must be applied to any plant on Block 29 and 30 to ensure that the plant be designed to appear as

buildings rather than a typical sewage treatment plant. While staff does have concerns about the possible design of the plant, with the added recommendations regarding design review, staff believes the design and compatibility issues can be addressed through the standard special use permit review process. In addition, the existing plant has successfully integrated into the neighborhood with the majority of the facilities designed as “buildings” and with many of the operations occurring within enclosed structures.



Figure 12: Block P Building Top

### ***F. Potential Loss of Floor Area***

Another concern of staff was that the use of Blocks 29 and 30 for an expansion to the wastewater treatment facility would result in the loss of approximately 170,000 sf of residential use and 500,000 sf of office use. It was envisioned that these residents and office employees would provide much needed additional patrons for the retail uses on John Carlyle Street and contribute towards the 50/50 mix of office and residential uses anticipated by the EESAP.

Providing a wastewater treatment facility within close proximity of a metro station is not necessarily the highest and best use for the two blocks. However, as discussed, Blocks 29 and 30 are the only viable sites for the proposed expansion. A unique element of Carlyle and Eisenhower East is that floor area can be “transferred” from one block to another with special use permit approval by the Planning Commission and City Council. Therefore, some or all of the floor area could potentially be “transferred” to some of the adjoining blocks. While the transferring of floor area would require several technical zoning approvals, the transfer would potentially enable the City to retain some of the floor area that would be displaced from Blocks 29 and 30.

There are several possible receiving sites in the area that the floor area from Blocks 29 and 30 could be transferred to. For example, based on a conceptual analysis of Block P and Block 26B, staff believes that approximately 300,000 to 400,000 sf could potentially be transferred to these blocks and still maintain acceptable heights. Several of the adjoining blocks in South Carlyle, such as Block 26B (the 2 acre ASA property), Block 28 (Virginia Concrete), or Blocks 24 and 25A



Figure 13: Possible Receiving Sites

(Hoffman) could also potentially receive a portion of the allocated office and residential floor area for Blocks 29 and 30. However, a transfer of floor area to any of these blocks may require additional building height. Therefore any proposed transfer would need to be closely reviewed to ensure the overall design is not comprised by any additional height and/or floor area.

While there is a potential for transferring the floor area to some of the adjoining blocks, there is also the potential that for market reasons, or other reasons, that none of the floor area would or could be transferred, thereby resulting in a loss of approximately 650,000 sf near the Eisenhower Metro station. While staff does not consider this a likely scenario, it is a possibility since the transfer of floor area is a negotiation between the owner of the block that would be transferring floor area (ASA) and the owner of the block receiving the floor area.

### ***G. Section 9.06 Approval***

Section 9.06 of the Alexandria City Charter states “no public utility, whether publicly or privately owned, shall be constructed or authorized in the city or in the planned section or division thereof until and unless its general location, but not its character and extent, has been submitted to and approved by the commission”. As part of the request for the master plan amendment, the applicant has requested that the Commission review and approve the general location of the proposed expansion to the wastewater treatment facility. Upon approval of the master plan amendment, the location of the wastewater treatment facility on Blocks 29 and 30 would be consistent with the City’s Master Plan and it would be appropriate for the Commission to approve the location per Section 9.06 of the Charter.

### ***H. Community***

In September 2007, ASA and City Staff met with the Eisenhower Partnership to discuss the proposed master plan amendment and possible expansion. The existing ASA facility is located in an area of town with very few established community associations. Taking this into consideration, on November 17, 2007, ASA invited the Planning Commission, City staff, and other community members to tour the ASA facility. The tour took participants through the various areas of the plant and provided a sense of scale for the additional components that would be needed for the expansion.

## **V. CONCLUSION AND RECOMMENDATION**

Staff recommends **approval** of the master plan amendment, amendment to the Eisenhower East Design Guidelines, and a Section 9.06 case, as outlined in *Attachment # 1* and *Attachment # 2* (Note: new text is indicated by underline).

**STAFF:** Faroll Hamer, Director, Planning and Zoning;  
 Rich Baier, Director, Transportation and Environmental Services;  
 Jeffrey Farnar, Chief, Development, P&Z;  
 Emily Baker, City Engineer, T&ES; and  
 Katye Parker, Urban Planner, P&Z.



**CITY DEPARTMENT COMMENTS**

Legend: C - code requirement R - recommendation S - suggestion F - finding

**Archaeology**

- F-1 A preliminary assessment of this property indicates that during prehistoric times this property may have been in an environment that was conducive to occupation and use by Native Americans. However, the potentially significant soil layers are now covered with at least 10 to more than 20 feet of fill.
- C-1 Archaeological work shall be required on this project if the impacts will penetrate the fill that overlies the site. It is recommended that the applicant work with Alexandria Archaeology as early as possible so that the necessary conditions below can be satisfied and the required work can be completed in a timely fashion.

## Attachment #1

### Overview of Liquid Treatment Processes

#### *Preliminary/Primary Treatment*

##### *Coarse Screening*

The raw sewage entering the plant first goes through coarse screens to remove trash 3 inches in diameter and larger that may clog or damage downstream equipment. The trash is disposed in dumpsters and taken to a landfill.

##### *Raw Sewage Pumping*

The raw sewage pump station consists of six pumps with a total peak capacity of 130 MGD with all pumps in service. The pump station discharges through two 60-inch pressure headers to the influent channel in Preliminary Treatment Building K.

##### *Fine Screening*

The fine screening system consists of four belt-type rotating screens with ¼ inch openings, removing smaller solids. The screenings are washed with plant effluent water, compacted and moved by screw conveyors to a truck loading bay for landfill disposal.

##### *Grit Removal*

The grit removal system consists of four vortex chambers that settle the heavy inorganic solids, such as sand, gravel and other heavy materials, to the bottom of the inner chamber. The grit is washed and dewatered and then moved by screw conveyors to a truck loading bay for disposal.

##### *Primary Treatment*

The primary treatment system consists of eight primary settling tanks where the smaller solids settle to the bottom by gravity and are pumped out as sludge to the gravity thickeners. Grease, oils and other floating solids rise to the surface of the tanks and are removed by a skimming mechanism. The clear water goes over weirs at the end of the tanks and is pumped to the Biological Reactor Basins (BRBs). The suspended solids removed in the primary settling tanks contain particulate organic matter, phosphorus and organic nitrogen (TKN).

Ferric chloride and polymer can be added to the primary influent. Adding ferric chloride improves phosphorus removal in the primary by precipitating soluble phosphorus as ferric phosphate which settles out into the sludge blanket. Ferric chloride and polymer are also used to aid settling and improve suspended solids removal by coagulating smaller solids into larger solids that settle faster.

Primary scum contains grease, oil, food particles, paper particles and other small light organic materials that are not readily biodegradable and therefore will not be eliminated in the Biological Reactor Basins. This material tends to float so it cannot be removed with the settling solids as primary sludge. The scum accumulates at the surface of the tank and is collected with skimmers

and troughs in the Primary Settling Tanks and dewatered prior to disposal. Concentrated scum is sent to the truck bays for disposal to a landfill.

### ***Secondary Treatment***

#### ***Primary Effluent Pumping***

The primary effluent pump station, located in the basement of Building L, consists of six pumps and discharges through two 48-inch pressure headers to the BRB operating gallery where the flow is split into each one of the reactor basins.

#### ***Biological Nitrogen Removal (BNR)***

The BNR system consists of five biological reactor basins (BRBs) and six secondary settling tanks. Each BRB has a volume of 4 million gallons and is divided into anoxic and aerobic zones. The aerobic zones, which are aerated by fine bubble air diffusers, grow micro-organisms that transform ammonia nitrogen to nitrate. Because ASA has one of the most restrictive summer ammonia limits in the country, full nitrification is required to meet the limit, which increases the amount of aerobic zones needed to meet quality limits. The anoxic zones grow micro-organisms that transform the nitrate to nitrogen gas, which is released into the atmosphere. Methanol can also be added as a food source for the micro-organisms to aid them in converting the nitrogen compounds and increase the nitrogen removal. The current nitrogen removal goal for ASA requires us to denitrify, again requiring 50% more anoxic biological volume as well as chemical addition with methanol, to meet the quality limits consistently. The water and micro-organism mix is called mixed liquor.

After the biological reactor basins, the mixed liquor flows into six secondary settling tanks. These tanks allow the micro-organisms to settle by gravity. The settling process is aided by adding ferric chloride and/or polymer, which also helps remove phosphorous from the water. The solids, which are rich in micro-organisms, are removed from the bottom of the settling tanks and returned to the biological reactor basins. A portion of the solids is diverted to the solids handling system as waste activated sludge (WAS).

The Process Air Compressor System provides the Biological Reactor Basins (BRBs) with sufficient low-pressure air to oxygenate the mixed liquor and maintain the activated solids in suspension. The Process Air Compressor System also provides a small amount of air to the influent channel of the Secondary Settling Tanks to agitate the solids and prevent the solids from settling in the bottom of the channel.

### ***Tertiary Treatment***

The Primary, Secondary, Tertiary Settling Tanks, and the Rapid Mix/Flocculation Tanks are the key units of the chemical-flocculation treatment process. The treatment is known as a multi-point addition system because ferric chloride, alum, or polymer can be added at different points between the primary and the tertiary settling tanks. The multi-point system provides for flexibility and enhanced efficiency of the phosphorus removal process.

### *Intermediate Pumping*

The intermediate pump station consists of 6 pumps and lifts the water from the secondary tanks to the tertiary treatment processes.

### *Tertiary Settling*

The tertiary settling process consists of eight tanks. Each tank is sub-divided into a rapid mix tank, a flocculation tank and plate settling tank. The flow first enters the rapid mix tank where a coagulant (normally alum or alternatively, ferric chloride) is added to the water and thoroughly mixed. The flow then passes through the flocculation tank where gentle mixing is provided to allow the suspended solids in the water to form a cluster or floc. In the final tank, the flow passes through inclined plate settlers, where the flocs settle by gravity thus removing suspended solids and phosphorous from the water.

### *Filtration*

The filtration system consists of twenty two sand gravity filters to remove fine solids as it passes through the fine filter media. The flow through the filter is controlled by an effluent valve. The filters are equipped with a backwashing and air scouring system that periodically removes the particles accumulated in the filter media and recycles this flow to the intermediate pump station.

### *Final Treatment*

#### *UV Disinfection*

The UV disinfection system consists of six parallel channels. The UV light inactivates the various pathogens found in the water as it passes through the lamp banks.

#### *Post-Aeration*

The post-aeration system consists of two long rectangular channels with fine bubble diffusers along the bottom. Air can be introduced through these diffusers to increase the dissolved oxygen concentration in the water prior to discharge to Hunting Creek.

## **Overview of Solids Handling Processes**

Federal regulations (40 CFR Part 503) as well as the Virginia Department of Health biosolids regulations (12 VAC 5-585) require that biosolids are stabilized to a Class A or Class B level before being applied to land. The Alexandria WWTP is designed with the capability to pre-pasteurize and digest sludge to a Class A level and to lime stabilize sludge to a Class B level.

### *Gravity Thickening*

The gravity thickening system consists of five circular tanks with sloped cone bottoms. Primary and tertiary sludge are pumped to these tanks and thickened by allowing the solids to settle by gravity to the bottom. The thickened sludge is then pumped out of the bottom of the cone to the thickened sludge equalization tanks. The clarified water at the surface of the tank overflows a weir and is drained by gravity to the primary effluent pump station.

### *Mechanical Thickening*

The mechanical thickening system consists of four thickening centrifuge trains. The centrifuges spin the sludge at high velocities, causing the heavier solids to travel to the outside of the bowl and the clarified water, or centrate, to remain in the center. Polymer is added to the sludge to aid the liquid/solid separation process. The solids are then discharged to the thickened sludge equalization tanks where they are blended with the gravity-thickened sludge and pumped to the pre-pasteurization facility.

### *Pre-Pasteurization*

The sludge pre-pasteurization system reduces the pathogens in the sludge by heating it. The blended thickened sludge passes through two sludge screening presses to remove any fibrous materials that can damage other equipment. The sludge is then pumped through heat exchangers where it is heated to a temperature of 158 °F. The hot sludge is held in a heated sludge holding tank at the target temperature for at least 30 minutes. The sludge is then cooled and sent to the digesters.

### *Digestion*

The digestion system consists of four anaerobic digesters. The digesters reduce the pathogenic organisms, reduce the mass of solids for disposal and produce methane gas which can be utilized for mixing and for fuel. The sludge is pumped to the digesters and is continuously recirculated for heating and mixing. The sludge must be maintained at a temperature of 95°F. The digester gas is withdrawn from the top of the tanks and returned to the digesters for mixing. Excess gas is utilized for operation of the steam boilers or burned in the waste gas flares.

### *Centrifuge Dewatering*

The centrifuge dewatering process consists of three dewatering centrifuge trains, similar in operation and nature to those in sludge thickening. The purpose of this process is to convert the digested sludge, which has a solids concentration of 3 to 10 percent (3 to 10% TS) into a dewatered sludge cake with a solids concentration of 30 percent (30% TS) and above.

### *Biosolids Storage and Handling*

The biosolids storage and handling system consists of six biosolids storage silos. The biosolids are discharged from the centrifuge into the biosolids silos and from there, loaded into trucks for land application or other beneficial reuse.

## ***Odor Control and Process Chemicals***

### *Odor Control*

Odoriferous air is collected from various sources throughout the plant with one main goal: to provide centralized treatment of plant odors. Odoriferous air is conveyed using above ground and buried collection ductwork to the Solids Processing Building for treatment. Three odor control treatment systems in the building provide removal of particulates and odors:

Particulate scrubbers are used to remove particulate matter in select odoriferous air-streams in the Solids Processing Building. Removal of the particulates helps to prevent fouling of downstream odor control ductwork and equipment.

An acid scrubber is used to remove ammonia odors from the particulate scrubber exhausts, as well as other potentially ammonia-laden odorous air streams in the Solids Processing Building.

Packed tower scrubber systems are used to remove hydrogen sulfide and ammonia from all odorous air streams, including the acid scrubber exhaust.

#### *Process Chemicals*

The ASA plant uses several chemicals in the liquids and solids treatment processes and for process support. The main chemical unloading and storage facility for all plant chemicals is located in the Solids Handling Building L. In addition, the plant has a methanol storage facility (Methanol Building M) and chemical day tanks in the Advanced Wastewater Treatment (AWT) Facility (G).

#### *Plant Utilities*

In addition to process-related systems and facilities, the plant uses several other systems that support these process-related facilities. These include storm drain and sanitary systems; potable water; natural gas, electrical, SCADA and phone systems.