EWING COLE

REPLACE QUANTICO MIDDLE HIGH SCHOOL

Marine Corps Base, Quantico, VA

National Capital Planning Commission Project Narrative

EWINGCOLE PROJECT NUMBER: 20130353

June 5, 2015

The sponsoring agency for this project is the **Naval Facilities Engineering Command**, Washington District, Marine Corps Base, Quantico, VA acting for the project proponent. P.O.C.'s for these organizations are as follows:

Naval Facilities Engineering Command, Washington District
1314 Harwood St. SE
Washington Navy Yard, DC 20374-5018

Installation Project Lead
Sam Nouri: 202-685-8463 NAVFAC Liaison to NCPC

This Project Report has been prepared for the Replace Middle High School project at Marine Corps Base, Quantico, VA.

This report has been prepared for FINAL submission to the National Capital Planning Commission for their review and approval.

PROJECT DESCRIPTION

1.1 PROJECT BACKGROUND

The existing Middle High School facilities were constructed in 1960 and have a poor condition rating. Existing classroom and education spaces are undersized and have inadequate infrastructure that fails to meet the standards of the current DoDEA Education Specifications. Aging utility infrastructure systems result in excessive maintenance costs. Most infrastructure components, such as HVAC, electrical and plumbing, have exceeded their useful life. The roof system is failing and there are numerous leaks that cause damage to the interior of the facility. There are numerous NFPA Life Safety and ADA code deficiencies, no fire suppression systems, and poor indoor air quality. The facilities do not meet construction standards for energy efficiency. Numerous maintenance and repair problems have developed and are becoming non-repairable. The existing facilities do not meet many of the current AT/FP requirements.

1.2 PROJECT DESCRIPTION

The scope of this Project includes the demolition of the existing 81,000 SF middle high school buildings, the construction of a new middle high school building of approximately 116,000 SF on an adjacent site, and related site improvements.

The Program, as provided by DoDEA, reflects a projected student enrollment of 350 and 36.5 FTE staff in grades six through twelve and will meet the requirements and guidelines for DoDEAs 21st Century Educational Facilities Specifications. These requirements and goals include the online Educational Facilities Specifications, Mandatory Design Guidelines, Community Strategic Plan, Healthy Base Initiative, as well as all relevant codes and UFCs.

The Project consists primarily of constructing a two story school building composed of standard foundations, insulated concrete form (ICF) walls and a structural steel frame with a combination of brick, cast stone, metal panel, and aluminum and glass curtainwall/window systems at the exterior walls. The pitched roofs will be a metal standing seam system and the low-slope roofs will be a membrane system.

The Project includes site improvements such as wayfinding and regulatory signage, fencing, parking lot and service access paving, landscaping, walkways, exterior lighting, utilities, and athletic fields with field-house facilities.

The Project includes general purpose classrooms, lab spaces, information center, gymnasium, cafeteria, library, supply areas, specialist rooms, art room, learning impaired room, teacher work rooms, counseling areas, storage, administrative offices, and other required areas for a fully functioning middle/high school.

These facilities shall be designed in accordance with DoDEA Education Facilities Specifications, AT/FP standards, Americans with Disabilities Act Accessibility Guidelines, National Fire Protection Association Life Safety Code, Standards of Seismic Safety for Federally Owned Buildings, and energy conservation standards and other criteria as stated in paragraph 2.0 Design Criteria.

The Project is designed to achieve a LEED Silver Certification utilizing the U.S. Green Building (USGBC) LEED for Schools standards.

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1.3 PROJECT DATA

Total Area of Building Site and Allocation of Land to Proposed Uses

The Project site consists of approximately 21 acres on two non-contiguous sites (the area surveyed for engineering purposes is approximately 15 acres). The North Site contains the existing Middle High School and future baseball field and the South Site contains the existing Russell Elementary School and the future Middle High School. The two sites are bifurcated by Purvis Road. The boundaries of both sites are shown on the civil engineering drawings.

North Site Total Area = 8 acres
Area of Existing Middle High School to be removed = 2 acres
Area of Existing parking lot and roadways to remain = 2 acres
Area of New Baseball Field and Related Improvements = 2 acres

South Site Total Area = 13 acres
Area of Existing Russell Elementary School to be removed = 1.5 acres
Area of Existing parking lot to be removed = 0.5 acres
Area of New Middle High School footprint = 1.8 acres
Area of New Parking Lot and Paved Roadways = 1.7 acres
Area of New Hardscapes and Sidewalks = 1.4 acres
Area of New Football Field, Softball Field, and Related Improvements = 3 acres

Area of Building and Site Coverage

New Middle High School Building Footprint = 78,789 SF
New Middle High School Gross Program Area = 116,000 SF

Existing Assigned Employment and Project Assigned Employment over a 20-Year Period, in 5-Year Increments

The existing Middle High School has 75 employees (including aids, service personnel, and faculty). Student enrollment fluctuates and is approximately 316 currently. The new School is planned to accommodate 350 Students and there is no projected change in employment for this facility.

Parking

The existing Middle High School has 107 parking spaces and is inadequate to serve the current needs. The new Middle High School has been authorized to provide 89 spaces plus 35 visitor spaces for a total of 124 spaces per the breakdown below:

- Students (grades 11 & 12) 20
- Faculty & Staff 47
- Visitor 35
- Service Personnel 22

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DoDEA funds and provides buses for all students who live more than 1-mile from the school.

These 124 spaces are designed to support 47 teachers/faculty, 22 support staff, 350 students, and 700 parents. For employees and parents, this represents a parking ratio of 1:6.1. In addition to employees, the new Middle/High School utilizes volunteers, such as parents, to help-out certain curriculum (volunteers are not counted in the employee numbers).

DoDEA typically only reserves parking spaces for the Principal and Vice Principal... other spaces are on a first come, first served basis.

The DoDEA planning factor for sizing school parking lots is one per faculty member, plus 10% of student population (5% of parents), plus 20% of Grades 11-12 students. Applying standard DoDEA planning factors to the new Quantico Middle High School yields 69-spaces for employees, plus 35-spaces for parents/visitors plus 20-spaces for students, for a total of 124-spaces.

The driveway in the front of the school (north side) is the "student drop-off loop" for parents driving their children to school. The driveway loop also includes a "bus drop off-loop" for buses to deliver students. The driveway on the southeast side of the school is the service drive, primarily for trucks to deliver food to the kitchen or books/curriculum/supplies to the school.

Description of the Relationship of the Project to the Agency's Master Plans, Where Applicable, Including Rationale for any Deviations

DoDEA form DD1391 FY2014 Military Construction Program indicates Project is consistent with the Installation Master Plan.

Status of Coordination with Affected Local and State Governments
A public notice ran in the local newspaper. No comments were received.

Status of Community Participation, including Summary of Community Views
Design and planning for this Project is being coordinated with the U.S. Department of Defense Education Activity, MCB Quantico Public Works, and NAVFAC Washington.

Schedule for Construction and Occupancy
Construction will begin after NCPC review is finalized. Current construction date is spring of 2015 with Occupancy in fall of 2016.

Total Estimate Cost of Project and Funding Status
The Total Estimate Cost is $40,586,000. The Project has been funded by FY2014 MILCON Project Number AM00021 "MILITARY CONSTRUCTION AND VETERANS AFFAIRS, AND RELATED AGENCIES APPROPRIATIONS ACT, 2014" which appropriated funding for Quantico Middle/High School. The law was approved by both houses of Congress and the President. The appropriated funding has been received by DoD and DoDEA.

Transportation Management Program
The Project will not increase the employment level on the work site to 500 or more employees. A Transportation Management Plan is not applicable.

PROJECT DESCRIPTION

Environmental Documentation
Refer to Environmental Assessment Report, dated November 2013, included in this Report.

Historic Preservation Documentation
This Project will not negatively affect any existing historic resources and does not involve any historic structures or landscapes; refer to Environmental Assessment Report, dated November 2013, included in this Report

Floodplain Management and Wetlands Protection
The areas of building 3307 (Existing Middle High School) and Russell Elementary (Site of New Middle High School) are depicted on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) number 51153C0312D, panel 312 of 330 (Appendix C). The FIRM shows the proposed project area in Flood Zone X (unshaded) which is an area outside of the 500-year floodplain.

No wetlands exist in the proposed project areas. The nearest wetland is located more than one mile from building 3307.

1.4 SELECT DRAWINGS

Preliminary Renderings (see Appendix):

- First Floor Plan
- Second Floor Plan
- Site Plan
- Exterior Elevation – North – Main Entry
- Select Exterior Perspectives

(Full-size Drawings under separate cover)

VF101	Overall Layout
VF102	Legend and Symbol
VF103	Existing Site Layout
VF104	Existing Site Layout
VF105	Existing Site Layout
VF106	Existing Site Layout
VF107	Existing Site Layout
VF108	Existing Site Layout
CD101	Demolition Plan
CD102	Demolition Plan
CD103	Demolition Plan
CD104	Demolition Plan
CI 101	Site Layout Plan
CI 102	Site Layout Plan
CI 103	Site Layout Plan
CI 104	Site Layout Plan
CI301	Road Profiles

PROJECT DESCRIPTION

CI302	Road Profiles
CI701	Layout Coordinate & Alignment Tables
CG101	Grading Plan
CG102	Grading Plan
CG103	Grading Plan
CU121	Water & Sewer Plan
CU122	Water & Sewer Plan
CU321	Sanitary Sewer Profiles
CU322	Sanitary Sewer Profiles
CU331	Water Line Profiles
CU332	Water Line Profiles
CU721	Sewer and Water Tables
H101	Hazardous Materials Abatement - General Notes
H102	Hazardous Materials Abatement - Layout

L001	Landscape Architectural Cover Sheet
L002	Landscape Architectural Key Plan
L100	Landscape Architectural Site Plan Area A
L101	Landscape Architectural Site Plan Area B
L102	Landscape Architectural Site Plan Area C
L110	Landscape Architectural Dimensioning Plan Area A
L111	Landscape Architectural Dimensioning Plan Area B
L112	Landscape Architectural Dimensioning Plan Area C
L120	Landscape Planting Plan Area A
L121	Landscape Planting Plan Area B
L122	Landscape Planting Plan Area C
L400	Landscape Architectural Site Plan Enlargements
L401	Landscape Architectural Site Plan Enlargements
L402	Landscape Architectural Site Plan Enlargements
L500	Landscape Architectural Details
L501	Landscape Architectural Details
L502	Landscape Architectural Details
L503	Landscape Architectural Details
L504	Landscape Architectural Details

A001	Site Demo Plan
A002	Reference Site Plan
A003	Partial Site Plan - North
A004	Partial Site Plan - South
A101	First Floor Reference Plan
A102	Second Floor Reference Plan

A103	Roof Plan
A201	Overall Exterior Elevations
A301	Overall Building Sections

1.5 SITE ENGINEERING DESCRIPTON

Overview: The project site is located along Purvis Road on MCB Quantico, VA. The majority of the project site is located on the southern side of Purvis Road in the location of the current Russell Elementary School and the MWR softball fields to the east of the Elementary School. In addition, the project includes the site of the existing Middle High School to be used for a new baseball field north of Purvis Road. The entire project site, including the area for the new baseball field to the north of Purvis Road, is 15 acres (as surveyed). The area of the baseball field site north of Purvis Road is approximately 2.6 acres.

A separate contract (for the new Quantico Consolidated Elementary School north of Purvis Road) will include demolition of the existing Russell Elementary School south of Purvis Road, prior to the start of construction for the new Middle High School.

The project is located on an existing DoDEA school site and as is in alignment with the base master plan. The site boundary has been expanded to accommodate DoDEA's programmatic requirements. A revised survey for the base boundary permit has not been provided.

Traffic: A NAVFAC traffic study (dated 2012) recommends shoulder improvements to Purvis road (which will be constructed under a separate contract). No new lane additions or signalization will be provided.

Topographic Survey: A new site topographic survey completed on 12 June 2014 is provided to include the entire site area. The scope of this survey was to get topographic and utility data up to the tree line along the south side of the site. Additional topographic data beyond the tree line was added based on data provided from the elementary school project.

Soils: A new geotechnical survey and report has been completed for the site.

Drainage: The existing site is relatively flat and drains gently to the west, south and southeast. The grades at the perimeter of the development area are fairly steep. The open spaces on the existing site are mostly grass covered. Existing storm drains that served the prior development flow into two separate unnamed tributaries of the North Branch Chopawamsic Creek. Chopawamsic Creek is tributary to the tidal Potomac River. One existing storm drain outfalls into an existing drainage way on the west side of the proposed building. A second existing storm drain outfalls into an existing drainage way on the southeast side of the proposed building. These storm drains will be removed and replaced by new storm drains that outfall at or near the existing outfall locations.

Pedestrian Access: Access to the school from the bus drop-off will be via a sidewalk that leads to the front door. This sidewalk cannot be covered in areas where it would prevent the access for fire rescue vehicles. An asphalt path will be provided around the new northern baseball field to

connect the path from the housing to the north to the sidewalk coming up from Purvis to the south (to match width of existing sidewalk).

Service access: Service access occurs at the loading area on the south side of the new facility Service vehicles access the school from Purvis Road.

UXO: A copy of the new Environmental Assessment report was received. UXO is an issue. A UXO technician must be present on site for borings, or any other penetration into the ground.

Hazardous Materials: A hazardous material inspection of the existing Middle High School has been performed to fully develop the hazardous material demolition scope of work.

ATFP: ATFP site design is in accordance with UFC4-010-01, Minimum Antiterrorism Standards for Buildings. The new school is considered a Primary Gathering Facility in an area with a controlled perimeter. Per Table B-1 Standoff Distances for New and Existing Buildings, the minimum standoff distance is 12 feet. For Drive-Up/Drop-Off Areas, such as schools, the standoff distances will be measured to the nearest legal parking spaces, not the drive-ups or drop-offs.

1.6 SITE PLANNING AND DESIGN

Applicable Codes and Standards:

- EISA (Energy Independence and Security Act) Section 438
- UFC 3-210-10N Low Impact Development
- UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings
- NR&EA (Natural Resources and Environmental Affairs) MCB Quantico
- Virginia DCR (Virginia Department of Conservation and Recreation)
- Virginia DH (Virginia Department of Health)

Objective:

Stormwater Management: Low Impact Development (LID) Stormwater Management is an important component of the site organization and a prominent feature on the site. LID best management practices (BMPs) will be incorporated into the design of the stormwater management facilities. The project will be designed per the current Virginia State Stormwater Management (VA SWM) regulations. NREA suggested there be a meeting after the initial design for SWM, LID, BMPs etc.

Stormwater management practices and policies as outlined in LID policies and the Energy Independence and Security Act (EISA) Section 438 and complying with UFC 3-210-10N shall be used as a stormwater design basis for the site. One of the goals of LID is to reduce impacts and minimize impervious areas. Redevelopment of the existing school site will have minimal impact on adjacent natural areas.

According to the VA SWM regulations, the required water quality volume treatment is the first 1.0 inch of rainfall utilizing the Virginia Runoff Reduction Method. In December 2009, the EPA issued "Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act". According to preliminary information it is determined that the required 95th percentile rainfall event for the

PROJECT DESCRIPTION

Quantico, VA region is approximately 1.7 inches. This requirement may be more stringent than the requirement outlined by the VA SWM regulations.

NREA stated that there is a downstream erosion issue on "Little Creek". Because of this, some additional water quantity management may be required by NREA. This will need to be discussed with NREA. NREA indicated they would accept use of the area under the athletic fields for underground SWM storage if needed. NREA prefers that this captured water be used for irrigation, or infiltrated, and not just stored.

There are no wetlands or stream valley buffers on the site. The banks of the stream channels are to be considered as limits of Waters of the U.S. Any impact will have to obtain an authorization from USACE. No impacts to these areas are expected.

The primary BMPs for the site will likely be bioretention and bio-swales located within the parking lot islands, along roadways, and in open space areas adjacent to the building and ball fields. BMPs can be located within the ATFP standoff areas. The stormwater management areas can double as outdoor learning areas.

There may be a small green roof included for demonstration purposes but there will not be a green roof large enough to have an impact on water quality. No rain harvesting for toilet use is allowed by Quantico. Rooftop capture for irrigation use is encouraged, but would not be of a large enough scale to impact water quality design on site.

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared and submitted to NREA.

The site will be graded such that runoff is directed away from the building and towards the SWM facilities.

The impact to the woods due to the building will be minimized. The impact due to adding a new trail/path through the woods was deemed to be acceptable.

The athletic fields will be natural grass, not artificial turf. There will be no mechanical irrigation system on site.

1.7 SITE ENGINEERING

Potable Water / Sewer:

Water service to the new Middle High School will be provided by constructing a new water line in a loop around the new school that ties in to the existing water line to the east, just south of Purvis Road, and also at the west side of the school, south of Purvis Road.

Water and sanitary sewer services shall be supplied to the concession stand and restroom facility by the athletic field.

The sanitary sewer will exit the school at the north side and connect to the existing sanitary sewer line which runs to the southeast. It was requested that this sewer outfall pipe tie into the same manhole as the Elementary school project. This manhole will need to be relocated further

upstream on the existing line in order for the new sewer line to run along the northeasterly edge of the new football field and not directly under the new field.

There are no known issues with the age or condition of the existing water & sewer mains to which the new school will connect. There may be existing asbestos water pipes, and any demolition will be performed per applicable regulations. There are no known issues with capacity of the existing sewer system to which the school will connect. There are no known issues with capacity of the existing water system to which the school will connect (pressure/flow). A new fire flow test will be performed. New pumps feeding the Thomason water tank are still planned. No schedule was provided.

Complete domestic water, sanitary sewer, and roof drainage systems will be provided, including connections to the existing mains. Water and Sewer construction will be per Prince William County standards (base to confirm this).

PAVEMENTS

Pavements for site access, site circulation and parking have been provided. The drive aisles serving the parking bays require a 12 foot wide lane in each direction. All circulation roads are proposed to be 2 inches of asphalt over 4 inches of asphalt base with 8 inches of aggregate base. Parking areas are proposed to be a minimum of 1.5 inches of asphalt over 2 inches of asphalt base with 6 inches of aggregate base. The apron area at the loading dock will be concrete. VDOT standards will be used for pavement construction. Typical paved areas will include concrete curbs and gutters. Where appropriate, the curb and gutter will be eliminated to allow free flow of runoff from paved areas into stormwater management areas. No permeable paving of any type is allowed.

FIRE PROTECTION

Fire department access to the front of the school will be from the Main Access Road. The Truck Access Road will provide fire department access to the loading dock area at the rear of the school. An asphalt fire lane will provide fire department access around the southwest corner of the school, from the loading dock area to the Main Access Road.

Fire department access roads will be located between 10 feet and 33 feet off the face of the building and will have an unobstructed width of not less than 20 feet and an unobstructed vertical clearance of not less than 13 feet 6 inches. Fire department access roads will be designed to support the loads of fire apparatus. Dead-end access roads in excess of 150 feet in length shall be provided with approved provisions for the fire apparatus to turn around.

PROJECT DESCRIPTION

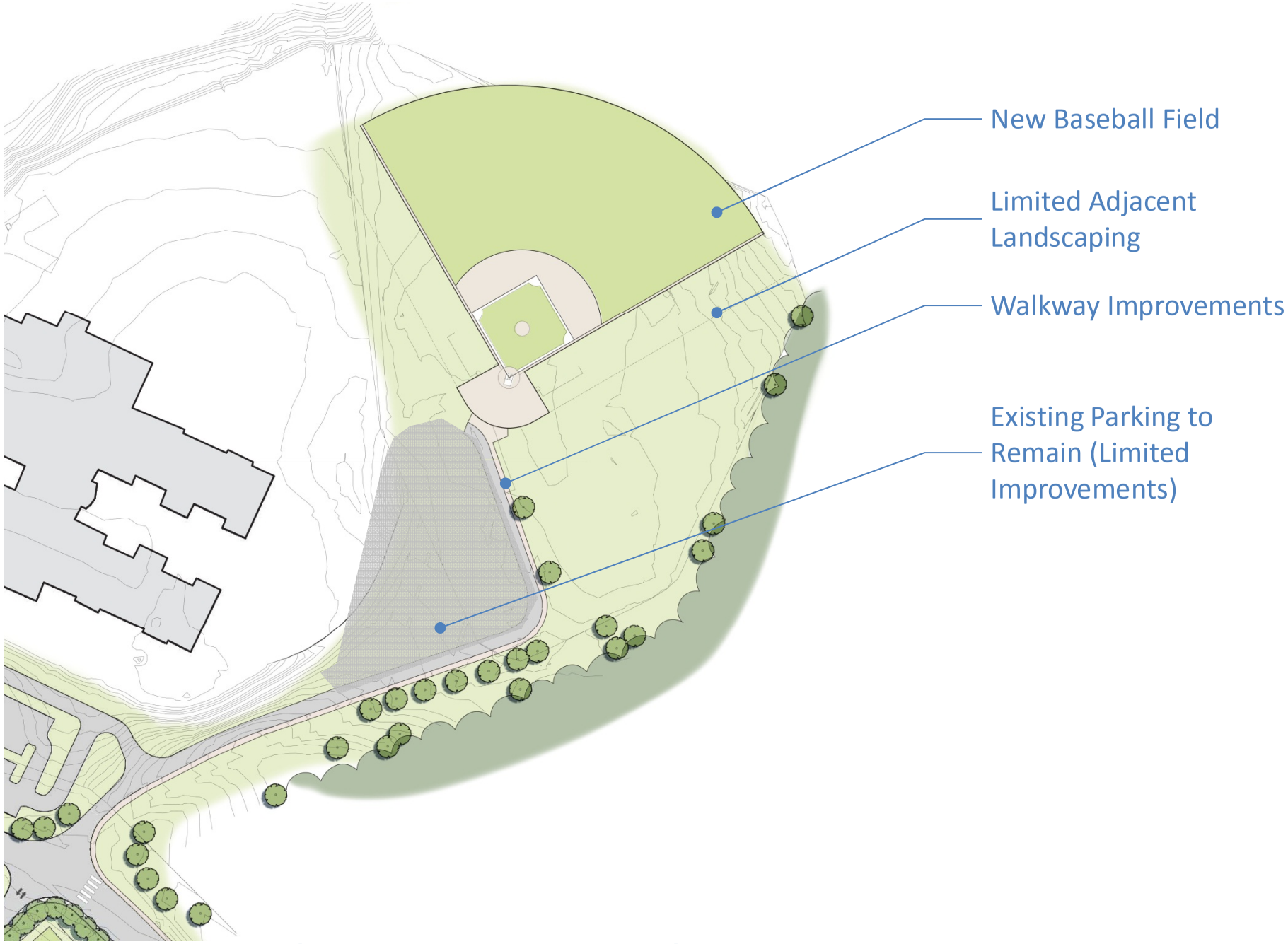
1.8 APPENDIX

Select Architectural Renderings

Environmental Assessment Report to Construct a Middle School/High School at Marine Corps Base, Quantico, Prince William County, Virginia, November 2013.

Stormwater Management Calculations

Site Plan – Overview



Site Plan – Overview – North Site

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New Parking Lot

Walkway and Landscape Improvements

New Middle High School

New Football Field

New Softball Field

New Service Drive

Site Plan – Overview – South Site

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- Administration
- Commons
- Gym/Athletics
- Academic Support
- Learning Studios
- Student Services
- Specials
- Building Services

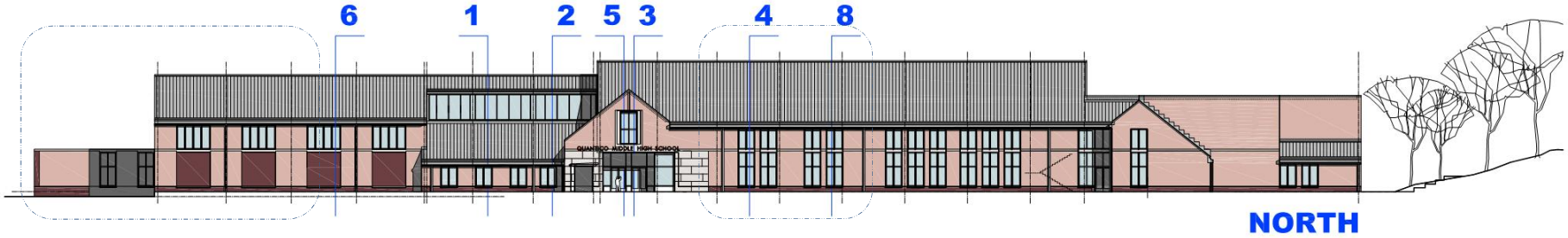
Space Planning – Level 1 Overview

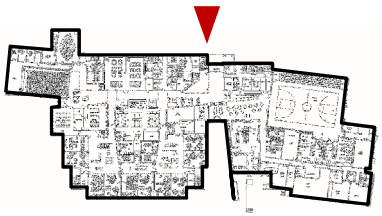
- Administration
- Commons
- Gym/Athletics
- Academic Support
- Learning Studios
- Student Services
- Specials
- Building Services

Space Planning – Level 2 Overview

Confirmed Elevations

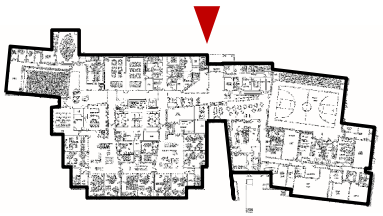
North Elevation





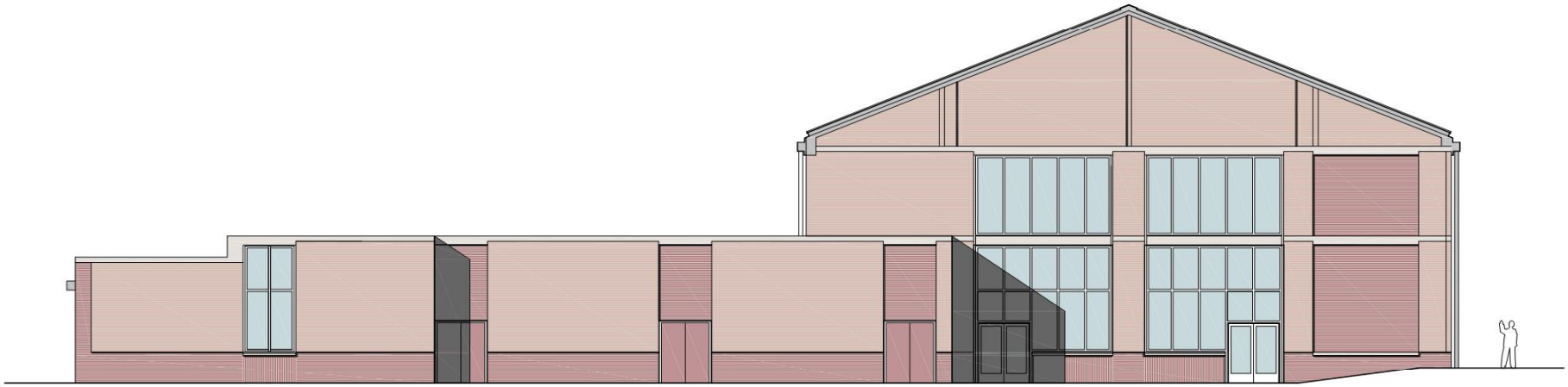
Confirmed Elevations

North Elevation – Gym Detail

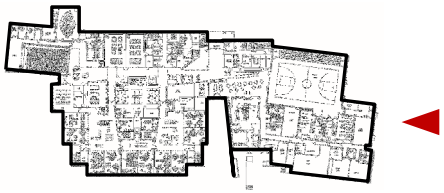


Confirmed Elevations

East Elevation

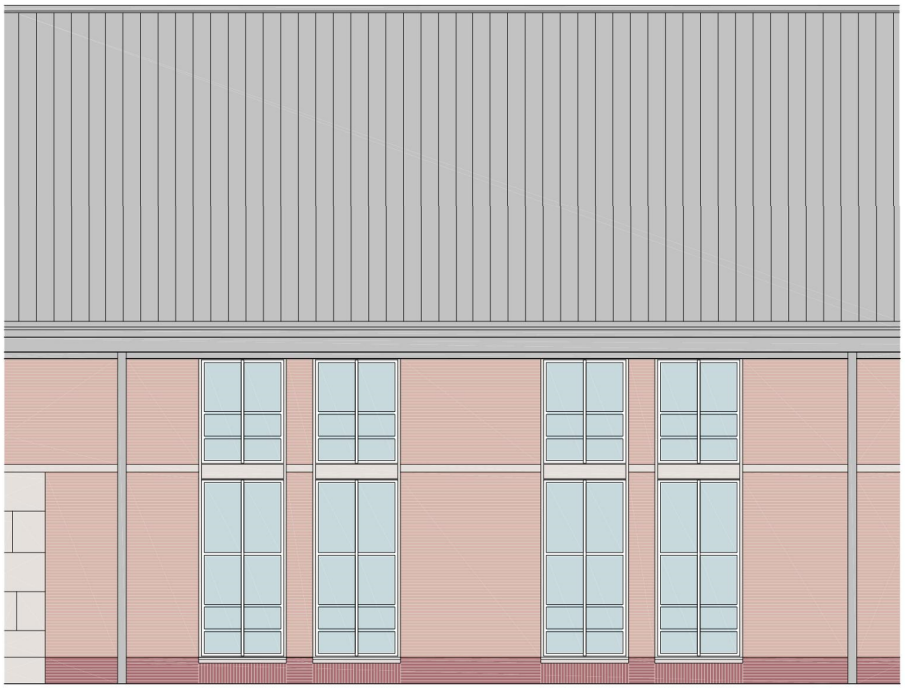


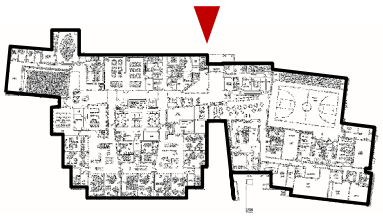
EAST



Confirmed Elevations

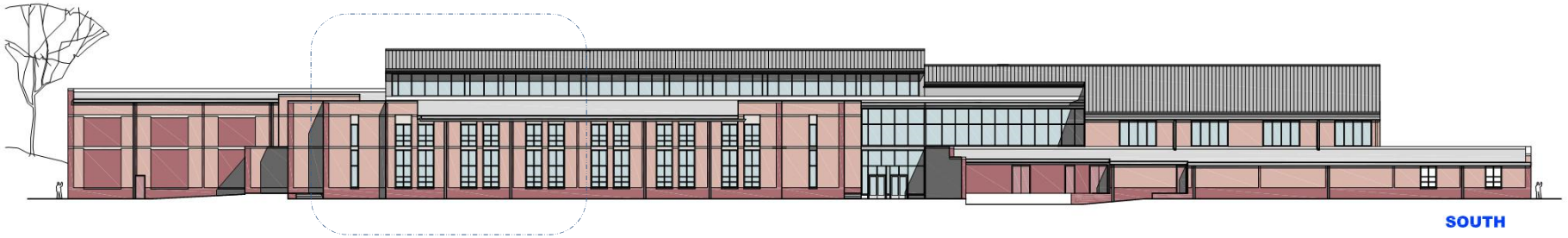
North Elevation – Gym Detail

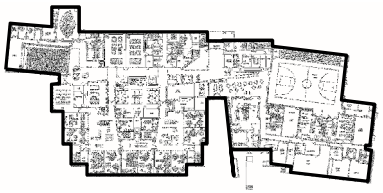




Revised Elevations with Brick

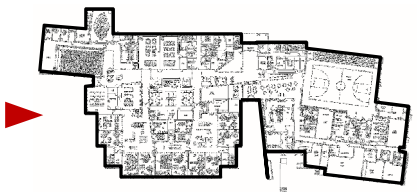
South Elevation





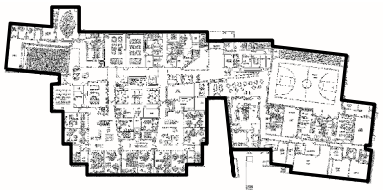
Revised Elevations with Brick

West Elevation

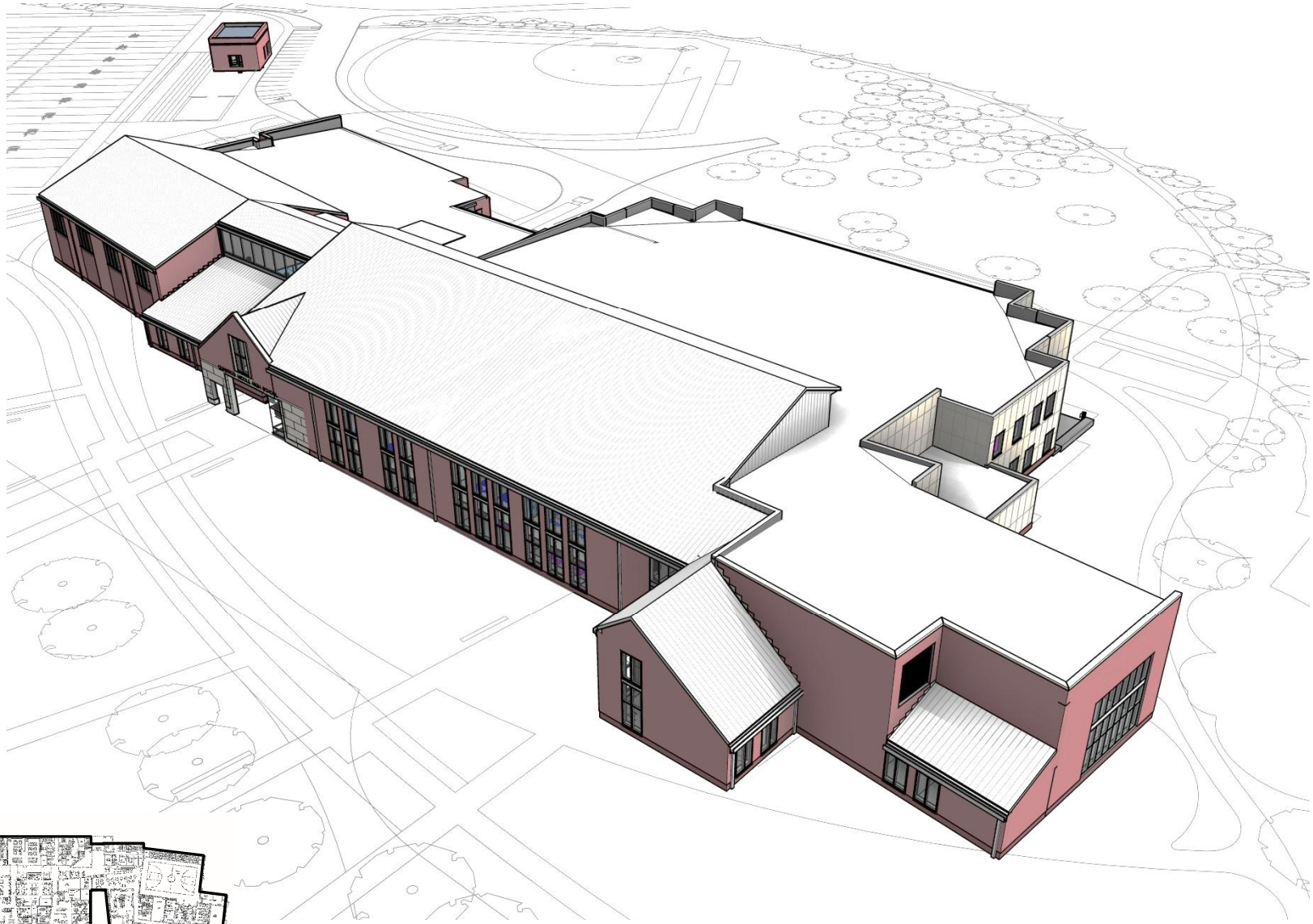


Revised Elevations with Brick

South Elevation Detail



Building Massing



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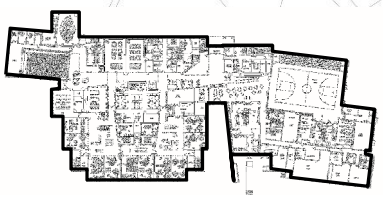

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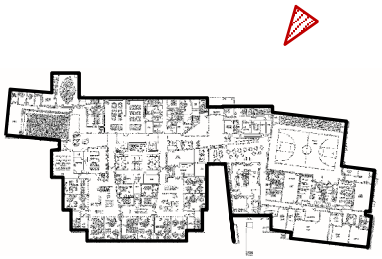
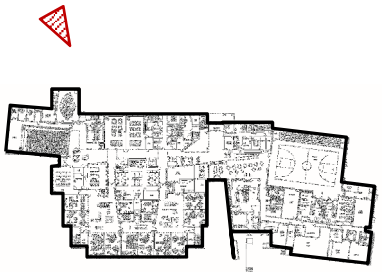


Building Massing



ENVIRONMENTAL ASSESSMENT
TO
CONSTRUCT A MIDDLE SCHOOL/HIGH SCHOOL
AT
MARINE CORPS BASE, QUANTICO,
Prince William County, Virginia

National Environmental Policy Act (NEPA) Coordination Section
Natural Resources and Environmental Affairs Branch
Installation and Environment Division
Marine Corps Base, Quantico, Virginia

November 2013

Proposed Agency Action: Construct a Middle School/High School, Marine Corps Base, Quantico, Virginia

Type of Statement: Environmental Assessment

Lead Agency: United States Marine Corps

For further information on this NEPA document:
Natural Resources and Environmental Affairs Branch (B046)
Attn: Heather A. McDuff
3250 Catlin Avenue
Marine Corps Base
Quantico, VA 22134
Heather.a.mcduff@usmc.mil
(703) 432-6771

Document Date: November 2013

Abstract: This Environmental Assessment is intended to meet NEPA requirements to construct a Middle School/High School. The No Action Alternative (Alternative A) and the Action Alternative (Alternative B) were evaluated. Alternative A would have no adverse effects on cultural/natural resources or the human environment as the status quo would be maintained.

Alternative B would allow for the construction of a Middle School/High School complex to serve the educational needs of the dependent children of active duty personnel residing on Marine Corps Base, Quantico. There would be no significant impacts to land use, water resources, biological resources, cultural resources, air quality, noise, infrastructure, traffic, socioeconomics, or hazardous waste issues. Temporary water quality impacts associated with soil disturbance resulting from demolition activities would be mitigated through appropriate Erosion and Sediment Control measures per the Virginia Erosion and Sediment Control Handbook. Building 3307 would be demolished as part of this project.

Alternative B is the preferred action and, if the stated mitigation measures are executed, would not have significant impacts on the human environment.

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1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

This environmental assessment (EA) has been prepared pursuant to the National Environmental Policy Act (NEPA) of 1969; regulations of the Council on Environmental Quality (CEQ) 40 CFR parts 1500-1508; and Marine Corps Order P5090.2A, which documents the US Marine Corps' internal operating instructions on how to implement NEPA. This EA is intended to meet NEPA requirements to construct a Middle School/High School (MS/HS) at Marine Corps Base, Quantico (MCBQ).

This Environmental Assessment is being executed, in part, to satisfy 36 CFR 800.6(a) which states that a federal agency when presented with the potential of an adverse effect as a result of its undertaking must "develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize or mitigate adverse effects on historic properties."

1.1 Conditions of Quantico Middle School/High School

Quantico Middle School/High School (QMHS), building 3307, was constructed in 1960 for use as a school for military dependent children living on MCBQ. The building exterior is constructed of red brick on a concrete foundation. The existing facility is approximately 82,000 square feet (SF).

The building currently has a failing condition rating. The existing classroom and education spaces are undersized and have inadequate infrastructure that fails to meet the standards of the Department of Defense Education Activity Education (DoDEA) Specifications. The aging utility infrastructure systems have resulted in increased maintenance costs. Most of the existing infrastructure components, such as the heating, ventilation, and air conditioning system, electrical, and plumbing, have exceeded their useful life. The roof system is failing, and there are numerous leaks that cause damage to the interior of the facility.

There are numerous National Fire Protection Association (NFPA) Life Safety and Americans with Disabilities Act (ADA) code deficiencies. Also, there are no fire suppression systems and poor indoor air quality. The facilities do not meet construction standards for energy efficiency. Several maintenance and repair problems have developed, and many cannot be repaired. Additionally, the existing facilities do not meet many of the Anti-Terrorism/Force Protection (AT/FP) requirements.

Building 3307 is in deteriorated condition due to lack of maintenance. Due to the lack of alternative facilities, the building is still occupied. It is beyond economical repair, and no reuses have been identified.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Alternative A – No Action

Under the no action alternative, building 3307 would remain in operation. The continued use of deficient, inadequate, and undersized facilities that do not accommodate the current student population will continue to impair the overall education program for students. Yearly maintenance and utility costs will continue to increase and the school will continue to have difficulties performing its mission in a limited capacity due to the inadequate facilities.

2.2 Alternative B – Construct a Middle School/High School

Under this alternative, a new MS/HS would be constructed on the site of the existing Russell Elementary School. Building 3307 would be demolished as part of this project, after completion of the new MS/HS. Russell Elementary will be demolished as part of the project to construct a consolidated elementary school, reviewed in February 2012. Site maps and proposed plans are at Appendix A.

The new facility would be approximately 116,100 SF. The building would have a structural steel frame with brick, cast stone, and glass. Interior construction would include concrete masonry walls, drywall, and exposed ceilings with energy-efficient lighting. Flooring would be composed of hard tile and solid vinyl tile. The facility would include spaces for general classrooms, laboratories, an information center, gymnasium, cafeteria, library, supply areas, specialist rooms, teacher works room, counseling, and administrative areas. Site improvements would include parking lots (consisting of 82 spaces), landscaping, covered walkways, exterior lighting, utilities, athletic fields, fencing, signage, and service access.

Utilities that would be installed at the new facility as part of this project include electric, plumbing, fire protection (via wet pipe sprinkler systems), communication lines, and heating, ventilation, and air conditioning.

Two options for a softball/baseball field are being considered. Option 1 (labeled “Planning Charrette Scheme 2”) would construct the ballfield to the south of the new MS/HS. Option 2 (labeled “Planning Charrette Scheme 3”) would construct the ballfield on the site of the existing building 3307. Due to the extensive environmental protection measures that would be required if Option 1 is chosen, the environmentally preferable option for locating the ballfield is Option 2.

Sustainable principles would be maximized in the design, development, and construction of the new MS/HS in accordance with Executive Order 13123 and other applicable laws and executive orders. Energy conservation and environmentally safe measures would be incorporated into this project wherever feasible, practical, or required by regulation. Energy and natural resource conservation measures would be maximized in the design to the extent possible. A minimum of Leadership in Energy and Environmental Design (LEED) “Silver” certification would be the goal of this project.

Facilities would be designed in accordance with current DoDEA Education Specifications, Americans with Disabilities Act (ADA) Accessibility Guidelines/Architectural Barriers Act, National Fire Protection Association (NFPA) Life Safety Code, AT/FP requirements, Standards for Seismic Safety for Federally Owned Buildings, and energy and water conservation standards.

2.3 Alternative C – Relocate Purvis Road

This alternative would construct a new MS/HS per Alternative B and relocate Purvis Road to the south, as shown at the map labeled “Planning Charrette Scheme 4”. This alternative is considered infeasible due to the costs involved with relocating the road. There is also the potential for significant environmental impact due to the topography in the new road location and streams/wetlands in the area. Due to these factors, Alternative C was dropped from further consideration.

2.4 Alternatives dropped from further review

Renovation of the existing QMHS was dropped from further review due to the exorbitant cost that would be required to bring the facility up to current standards. Leasing of nearby or off-base facilities is not a viable option due to the lack of available and suitable facilities nearby.

3.0 Existing Environmental Conditions

CEQ regulations for implementing NEPA (40 CFR Part 1500) require documentation that succinctly describes the environment of the area or areas potentially affected by the alternatives being considered under the proposed action, and discusses the impacts in proportion to their significance.

All the alternatives under consideration for this proposal are located within the Mainside at MCBQ, in Prince William County, Virginia. The existing environmental conditions described in this section will be the same for all alternatives.

3.1 Land Use

MCBQ is divided into two areas; Mainside, 6,000 acres east of Interstate 95 and U.S. Route 1, and Guadalcanal, 53,200 acres west of the same highways.

Building 3307 is located at Mainside MCBQ, adjacent to land currently serving as residential areas. The proposed construction site is not heavily forested, and consists of buildings, maintained grass, and parking areas.

3.1.1 Geology

The proposed action would occur within the Mainside portion of the base, which lies in the Coastal Plain geologic region. The region consists of Mesozoic and Cenozoic marine sediments, some consolidated into sandstone and marl. The project area is specifically within the Patapsco formation, which dates to the Cretaceous Period at the end of the Mesozoic Era. It is comprised of sand and clay from shallow aquatic deposits, which cover Pre-Cambrian crystalline rock with a thickness of approximately 150 feet. These deposits are generally unconsolidated.

3.1.2 Soils

The soils found in the Coastal Plain are the result of the soil formation on the underlying sediments. Soils of the project areas are disturbed due to past construction and development. There are several soil types in and adjacent to the proposed project area, as shown at Appendix B.

The primary soil type is Caroline fine sandy loam (map unit CaC2). Soil types adjacent to the existing Russell Elementary School are Aura-Galestown-Sassafras complex (AwD and AwE).

The soil type at the existing QMHS is composed of Cut and Fill Land (Cw). This soil is not uniform and it has been removed or reworked by machinery. This type of soil is not hydric. Hydric soils are soils that are saturated long enough during the growing season to develop oxygen deficient conditions in their upper portions and are typically associated with wetlands. The Cw soil series is not a highly erodible soil.

A geotechnical survey has not been completed for the proposed action. It is advised that a geotechnical engineer survey the underlying soil in the event that these areas should be redeveloped in the future.

3.1.3 Topography

The terrain of the proposed project areas consists of disturbed, man-made landscapes. The areas are mostly level due to development, and are located at elevations of approximately 180 feet above sea level.

3.2 Water Resources

Due to the rugged upper Coastal Plain topography and proximity to various water bodies, activities conducted on the Base could potentially affect the water resources of the area.

Activities in surface waters (including streams) and wetlands are regulated under numerous federal laws, regulations, and policies. The proposed action would be bound by the following:

- Section 404 of the Clean Water Act, which requires a permit from the US Army Corps of Engineers for the discharge of dredged or fill material in to “waters of the US” a term that includes most streams, wetlands, and ponds.
- Executive Order 11990, *Protection of Wetlands*, requires federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.
- Department of the Navy “no net loss” policy, for implementing E.O. 11990.

The Commonwealth of Virginia also regulates streams and wetlands that are considered “waters of the state” through a number of laws and provisions. Any action that requires a federal Section 404 permit may also require a Section 401 water quality certification from the Virginia Department of Environmental Quality (VDEQ), and under certain circumstances, the Virginia Marine Resources Commission.

In 1988 Virginia enacted the Chesapeake Bay Preservation Act (CBPA). This Act established a cooperative program between state and local governments to improve water quality in the Bay by requiring resource management practices in the use and development of environmentally sensitive land features. As defined by the CBPA, Resource Protection Areas (RPA) are buffer zones that include all areas within 100 feet of a tidal wetland, contiguous non-tidal wetlands, or perennial streams. Other areas are designated as Resource Management Areas (RMA). The RMA includes the 100-year floodplain, highly erodible soils, highly permeable soils, and non-tidal wetlands that are not part of an RPA. The Department of Defense is a signatory to an agreement supporting the CBPA and its associated regulations and will comply to the maximum extent possible consistent with the military mission and budget constraints.

3.2.1 Surface Waters

Building 3307 and the proposed construction site are located on opposite sides of Purvis Road. The closest surface water is Little Creek, which lies to the north and drains into the Potomac River. Both of these surface waters are perennial streams with associated RPAs.

3.2.2 Wetlands

No wetlands exist in the proposed project areas. The nearest wetland is located more than one mile from building 3307.

3.2.3 Floodplains

Executive Order 11988, *Floodplain Management* requires federal agencies to take action to minimize occupancy and modification of floodplains. The order specifically prohibits federal agencies from funding construction in the 100-year floodplain unless no practicable alternative exists.

The areas of building 3307 and Russell Elementary are depicted on the Federal Emergency Management Agency’s (FEMA) Flood

Insurance Rate Map (FIRM) number 51153C0312D, panel 312 of 330 (Appendix C). The FIRM shows the proposed project area in Flood Zone X (unshaded) which is an area outside of the 500-year floodplain.

3.2.4 Groundwater

A band along the western edge of the Coastal Plain is the groundwater recharge area for underground aquifers that extend eastward under the Chesapeake Bay. MCBQ lies within that aquifer. In this aquifer water can be reached at depths between 200 and 350 feet. One of the largest surface recharge areas for the Potomac Aquifer exists in Stafford County, near Interstate 95. No comprehensive studies of groundwater resources have been conducted at MCBQ to date.

3.2.5 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) of 1972 (16 USC § 1451, et seq., as amended) provides guidance to states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. The CZMA states that “the boundary of a State’s coastal zone must exclude lands owned, leased, held in trust or whose use is otherwise by law subject solely to the discretion of the Federal Government, its officers, or agents” (16 USC § 1453 [1]). According to this statute, MCBQ is not within Virginia’s coastal zone.

Section 307 of the CZMA covers coordination and cooperation issues. Section 307 mandates that federal projects that affect land uses, water uses, or other coastal resources of a state’s coastal zone must be consistent to the maximum extent practicable with the enforceable policies of that state’s federally-approved coastal management plan. If a proposed federal project or activity affects coastal resources or uses beyond the boundaries of the federal property, Section 307 of the CZMA applies.

The Commonwealth of Virginia has developed and implemented a federally-approved coastal resources management program (CRMP) describing current coastal legislation and enforceable policies. The Virginia CRMP has nine enforceable policies which include: wetlands management, fisheries management, subaqueous lands management, dune management, non-point source pollution control, point source pollution control, shoreline sanitation, air pollution control, and coastal lands management.

3.2.6 Stormwater

The proposed project areas are located upslope from a significant water resource, Little Creek, which drains directly into the Potomac River. Stormwater runoff from the area surrounding building 3307 is discharged into Little Creek via drainage outlets. Sheet flows from the area can also reach Little Creek.

3.3 Biological Resources

3.3.1 Vegetation

The land adjacent to these project areas is maintained grass, buildings, parking areas, and riparian areas. Land disturbance will be limited to the footprints of the buildings and vegetation clearing will not be required.

3.3.2 Wildlife

This portion of the base supports a wide variety of both game and non-game species and a diversity of wildlife habitat is available. Game species include white-tailed deer, wild turkey, gray squirrel, cottontail rabbit and bobwhite quail. Non-game species include resident and migratory songbirds, raptors, and various reptiles, amphibians, and insects.

3.3.3 Threatened and Endangered Species

The Endangered Species Act requires federal agencies to ensure that their actions will not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of its critical habitat.

There are two endangered species and one threatened species known to be present at Quantico. These are, respectively, the dwarf wedge mussel (*Alasmidonta heterodon*), harperella (*Ptilimnium nodosum*), and small whorled pogonia (*Isotria medeoloides*).

3.4 Cultural Resources

Implementation of the proposed action must comply with the National Historic Preservation Act (NHPA) of 1966, as amended. Under the NHPA, consideration of historic preservation issues must be integrated into the early planning stages of project planning by federal agencies. Under Section 106 of the NHPA, a

federal agency is required to account for the effects of the proposed action on any district, site, building, structure, or object that is included or eligible for inclusion in the National Register of Historic Places (NRHP), prior to the expenditure of funds on the action. Section 110 requires the identification and evaluation of any cultural resources on federal property that meet the eligibility criteria of the NRHP.

Building 3307 is not listed in the NRHP as a contributing element of the Quantico Marine Corps Base Historic District. Building 3301, Russell Elementary School, is an example of the typical architectural style and design used for schools constructed both on military installations and in civilian communities. According to a Historical Resource Survey and Evaluation, Marine Corps Base, Quantico, Virginia, done by John Milner Associates, Inc., in June, 2008 (shown at Appendix D), building 3301 is not considered to be "a rare or exemplary model and does not display the exceptional qualities of integrity (location, design, setting, materials, workmanship, feeling, and association) necessary for individual listing on the National Register of Historic Places". Both schools were constructed during the same time period; building 3301 in 1952, and 3307 in 1960.

Architectural historians with the U.S. Army Construction Engineering Research Laboratory conducted a survey of Quantico buildings between 1992 and 1994 (USCERL 1994). They identified significant historic buildings and landscapes on the base. Building 3307 was not evaluated or identified at the time as a contributing resource. The Historical Resource Survey and Evaluation of June 2008 evaluated building 3301, Russell Elementary School, and found it to not be a contributing element, due to the reasons detailed above. Seven themes forming the historic context for the subsequently nominated National Register of Historic Places, Quantico Marine Corps Base Historic District include: First Permanent Construction, Aviation, Education, Industrial, Naval Clinic, African American Barracks, and Lustron Housing.

3.5 Air Quality

The Environmental Protection Agency (EPA) defines ambient air (40 CFR Part 50) as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act (CAA) as amended in 1977 and 1990, the EPA has produced ambient air quality standards and regulations. The EPA has issued National Ambient Air Quality

Standards (NAAQS) for six criteria pollutants: carbon monoxide, sulfur dioxide (SO_2), particulate matter (PM) at two levels - particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}) and less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$), ozone, nitrogen dioxide (NO_x), and lead. Areas that do not meet NAAQS are called non-attainment areas. The location of the proposed action is within the Metropolitan Washington (DC) Region that has been designated as a moderate non-attainment area for the 8-hour ozone NAAQS and in non-attainment for $PM_{2.5}$.

For a moderate ozone non-attainment area, the *de minimis* criterion for ozone precursors is 100 tons per year for NO_x and 50 TPY for volatile organic compounds, and the $PM_{2.5}$ *de minimus* criterion is 100 TPY. The *de minimis* levels apply to direct and indirect sources of emissions that can occur during the construction and operational phases of the proposed action.

3.6 Noise

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with military installations. The major sources of noise at MCBQ include aircraft, artillery, small arms, explosives, vehicles, heavy equipment, and machinery.

Existing noise levels in the project area are primarily from temporary construction activities, but these are generally minor. Ordnance used in live and simulated fire exercises, is usually conducted at ranges on the western “Guadalcanal” side of the base, eight miles or more from the project area. There would be no additional noise associated with the sites after demolition activities.

3.7 Infrastructure, Utilities, and Transportation

3.7.1 Infrastructure and Utilities

Building 3307 is currently served by all necessary utilities. Utilities will not be removed as a result of the proposed demolition activities.

3.7.2 Transportation

No roads or parking structures will be demolished as a part of the proposed alternatives. The proposed action alternatives would not create a significant increase in daytime traffic

during the work week. Demolition crews associated with this project would not create a significant impact on traffic or parking availability. Parking lots at building 3307 would be demolished, and new parking lots constructed at the new MS/HS.

3.8 Environmental Justice

Executive Order (EO) 12898, *Federal Actions to address Environmental Justice in Minority Populations and Low-income Populations*, was issued in 1994. This order directs agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these groups. The proposed action will not involve effects specific to minority or low-income populations.

EO 13045, *Protection of Children from Environmental Health and safety Risk*, was issued in 1997. This order requires agencies, to the extent permitted by law and mission, to identify and assess environmental health and safety risks that might disproportionately affect children.

3.9 Hazardous Materials/Waste

Due to the age of building 3307, asbestos containing materials, Polychlorinated biphenyls (PCBs), and lead-based paints could be present. Environmental remediation of these materials would be performed as needed. The proposed location of the MS/HS is on unexploded ordnance (UXO) site 021, which is a known munitions response site that is a former impact area. A surface clearance/removal action was conducted in 2010.

3.10 Recreation

The area surrounding building 3307 is within no hunting zones. Wooded trails exist in areas adjacent to building 3307, and in the area surrounding Russell Elementary. The trails would not be impacted by construction or demolition activities.

3.11 Military Training

Building 3307 is within the Mainside of MCBQ and within an area used for military housing and dependent education. The MCAF resides approximately 1.5 miles southwest of building 3307. Routine military training does not occur in this area.

4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the anticipated direct, indirect, and cumulative environmental impacts of the no action alternative and one action alternative for construction of a new MS/HS, and demolition of building 3307.

4.1 Land Use

The no action alternative would result in continuation of building 3307 being used as an educational facility. No action, Alternative A, would not be expected to impact the current geologic, topographic, or soils conditions at MCBQ or the surrounding area.

Alternative B would not affect the land use in the adjacent Mainside residential areas. No land clearing activities would be conducted as a part of the proposed building demolition.

Alternative B, the action alternative, would not be expected to significantly change or affect the geology of the area nor impact the topography of the base.

To prevent the loss or movement of soils from the disturbed areas, erosion and sediment control measures would be implemented during construction. Approximately 15 acres of land would be disturbed to implement Alternative B, with the option of constructing the ballfield on the site of building 3307. With implementation of proper erosion and sediment control measures, the action alternative is not expected to significantly impact on-site or area soils. Erosion and sediment control (E&SC) plans and stormwater pollution prevention plans (SWPPP) are required to be submitted to the Water Program Manager, NREA Branch, MCBQ at least 70 days prior to work starting on the project.

4.2 Water Resources

Potential impacts to the water resources were assessed based on the water quality, hydrology, surface water and wetlands, groundwater, and flooding potential in the project area.

It is expected that impacts to water resources would remain the same if no action, as proposed under Alternative A, is taken. Building 3307 and surrounding parking areas currently constitute impervious surfaces which can contribute to increased stormwater

velocity. Area stormwater flows discharge to Little Creek and the Potomac River.

The proposed action, Alternative B, would improve stormwater management through the provision of stormwater management facilities. Low Impact Development Stormwater Management best management practices (BMPs) would be incorporated into the design.

No wetlands or surface waters would be directly affected through filling or alteration of hydrology. Potential water quality impacts from soil disturbances would be mitigated through the implementation of BMPs per the Virginia Erosion and Sediment Control Handbook (1992). The construction and demolition projects would require installation of proper E&SC measures (such as proper silt fence and storm drain inlets) prior to the onset of land disturbing activities.

The proposed action alternative would require no fill within the 100-year floodplain, which is considered an RMA under the CBPA. None of the alternatives would adversely affect an RPA or RMA as defined under the CBPA.

The proposed demolition projects are consistent to the maximum extent practicable with the enforceable policies of Virginia's Coastal Management Plan. The proposed project is not expected to directly affect water resources (including wetlands) and not expected to have adverse effects on fisheries, shorelines, subaqueous lands, dunes, or coastal lands.

Alternative B would not adversely affect wetlands, surface waters, groundwater, Chesapeake Bay Protection Act requirements, or floodplain areas.

4.3 Biological Resources

Implementation of the no action alternative, Alternative A, would not have a significant impact on vegetation, wildlife, or threatened or endangered species.

Due to the scope of work and the required Best Management Practices to protect water quality, there is no potential for the action alternative to adversely affect threatened and endangered species or habitats used by these species.

The proposed demolition project will not have an adverse effect on vegetation since land clearing will not be required.

The demolition of building 3307 would have no adverse effects on wildlife (including migratory birds) or wildlife habitat.

4.4 Cultural Resources

Alternative A, the no action alternative, would have no effect upon the Base Historic District as building 3307 is not located within or within the viewshed of the district. The building would remain in poor condition.

Demolition of building 3307, as proposed under Alternative B, would not constitute an adverse effect on the NRHP eligible Marine Corps Base, Quantico Historic District.

The proposed action has no potential to impact archaeological resources. Ground disturbing activities will be limited to areas which have no potential to contain significant archaeological resources. The areas are severely disturbed.

4.5 Air Quality

Neither the no action alternative nor the action alternative would significantly impact the current air quality conditions at MCBQ or the Metropolitan Washington non-attainment area. The proposed action would have minor emissions resulting from the use of demolition equipment.

For a moderate ozone non-attainment area, the *de minimis* criterion is 100 tons per year (TPY) for NO_x and 50 TPY for volatile organic compound (VOC) within an ozone transport region. The *de minimus* criterion for $PM_{2.5}$ is 100 TPY. Sources of NO_x, VOC, $PM_{2.5}$, and SO_2 associated with the proposed action alternative would include emissions from demolition equipment, crew commuting vehicles, fugitive dust ($PM_{2.5}$), and from use of fuel-burning equipment. The *de minimis* levels apply to direct and indirect sources of emissions that can occur during demolition activities. Alternative B is not anticipated to exceed *de minimus* levels.

The contractor in charge of demolition will be responsible for ensuring compliance with the Fugitive Dust Standard. As stated in the Title V Operating Permit for MCBQ, Section N, Subpart N “Fugitive Dust Emission Standard”:

“During the operation of a stationary source or any other building, structure, facility or installation, no owner or other

person shall cause or permit any materials or property to be handled, transported, stored, used, constructed, altered, repaired, or demolished without taking reasonable precautions to prevent particulate matter from becoming airborne. Such precautions may include, but are not limited, to the following:

- Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land;
- Application of asphalt, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which may create airborne dust; the paving of roadways and the maintaining of them in a clean condition;
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty material. Adequate containment methods shall be employed during sandblasting or other similar operations;
- Open equipment for conveying or transporting material likely to create objectionable air pollution when airborne shall be covered or treated in an equally effective manner at all times when in motion; and
- The prompt removal of spilled or traced dirt or other materials from paved streets and of dried sediments resulting from soil erosion. (9 VAC 5-40-90 and 9 VAC 5-50-90)”

The proposed action alternative would not have significant air quality impacts.

4.6 Noise

The no action alternative would not create additional impacts to existing noise levels on the base or the surrounding area.

Noise associated with the construction of a new MS/HS and demolition of building 3307 under Alternative B would be temporary and continually changing as work at the project sites progressed. Given the type and duration of the noise to be generated, lack of sensitive receptors near the project area, and the ambient noise level adjacent to the project sites, noise generated by demolition activities is not expected to result in significant noise impacts.

4.7 Infrastructure, Utilities, and Transportation

Due to the scope of the proposed work, implementing Alternative A or B is not expected to alter the existing infrastructure or utilities within MCBQ and will not affect traffic patterns. Demolition crews would not have a significant impact on traffic or parking space availability.

4.8 Environmental Justice

Implementing either of these proposed alternatives would not be expected to significantly impact the socioeconomics or create disproportionately high and adverse human health or environmental effects to minority or low-income populations at MCBQ or in the surrounding area.

4.9 Hazardous Materials/Waste

The proposed no action or action alternatives would have no effect on general procedures for hazardous materials and hazardous waste management at MCBQ.

Due to its age, it is possible that asbestos, lead, or PCB containing materials exist within building 3307. No hazardous materials would be introduced under any of the alternatives and any hazardous waste generated would be disposed of according to all Federal and State regulations.

Reports of waste generated (including recycling) including material type (CDD, concrete, scrap metal, used oil, etc), tons, disposal destination, and disposal cost shall be reported on the Construction Waste Management Plan form (Appendix E) and submitted to the Natural Resources and Environmental Affairs Branch within 30 days of the close of the project, and no later than October 15 to be included in annual report submissions.

The proposed location of the MS/HS is on unexploded ordnance (UXO) site 021, which is a known munitions response site that is a former impact area. A surface clearance/removal action was conducted in 2010. However, in order to build on this site, a subsurface removal action would need to be performed by a qualified UXO contractor. At this time, Environmental Restoration Program, Navy (ER,N) funding is not programmed to clean up the site prior to construction; therefore, the project manager shall ensure funding is available to cover the munitions removal action. The munitions removal action will also require the preparation of an Explosive Safety Submission and an After

Action Report that are required to be submitted to Marine Corps Systems Command (MARCORSYSCOM) for review and approval. According to the Marine Corps Order 5090.2A. Ch. 3, Chapter 10, Section 2, Paragraph 10221:

"All efforts must be made to ensure that Marine Corps' projects are not constructed on contaminated sites. However, there may be times when the project is being planned or is underway and contamination is discovered.
1. If contamination is discovered during the planning stage, Naval Facilities (NAVFAC) can investigate and determine the need for clean up using ER,N funds and following ER procedures. However, the site investigation/clean-up must compete with other environmental restoration (ER) sites based on risk management. In most cases, this will take several years and the site may not be available in time for the project.
2. If contamination is discovered during construction and it is Defense Environmental Restoration Program (DERP) eligible, NAVFAC can carry out the site investigation/cleanup using ER,N funds. However, the site will compete with other ER sites based on risk management. If ER,N funding is not available in time to meet the construction schedule, the installation must use project funds to investigate/clean up the site. If neither ER,N nor project funding is available in time to meet the construction schedule, the installation must stop the project altogether or re-site it. An installation does not have an option to pay for any DERP-eligible work with installation Navy Operations and Maintenance (OM,N) funds except to accomplish DERP-eligible work within the scope of an OM,N funded construction project.

4.10 Recreation

Building 3307 is in a "no hunting" zone, so the proposed action alternative would not have an adverse effect on hunting opportunities aboard MCBQ. Construction and demolition activities would not affect MCBQ fishing or hiking opportunities.

There are existing ballfields to the immediate southeast of building 3301. The fields would be reconfigured to accommodate the new MS/HS, and a new ballfield would be constructed on the site of building 3307. The ballfields would be unusable during construction activities.

4.11 Military Training

Alternative A would have no effects on military training.

In the event mechanical crane usage is needed for demolition, the MCAF must be informed prior to crane erection as coordination with the Federal Aviation Administration (FAA) may be required. The action alternative will not have adverse effects on military training.

4.12 Cumulative Impacts

For NEPA analysis, a cumulative impact is defined as the impact on the environment, which results from the incremental impact of the action when added to other past, present, or reasonably foreseeable future action. Impacts can result from individually minor but collectively significant actions taking place over a period of time.

The following actions are recent past, ongoing, or future projects adjacent to or in the vicinity of building 3307:

- Construct a Consolidated Elementary School
- Repairs to Purvis Road
- Fuller Road repairs
- Little Creek stabilization activities
- Route 1 Widening

Mitigation measures similar to those outlined in this EA for building 3307 will or have been completed for the above mentioned projects. SHPO consultation is also completed for all demolition projects at MCBQ.

4.13 Unavoidable Adverse Impacts

The primary adverse impact associated with this action is the increase in daily traffic along Purvis Road, avoided only in the no action alternative, Alternative A.

Measures to mitigate this impact are detailed in section 4.14.1.

4.14 Mitigation Measures

4.14.1 Mitigation of Effects on Purvis Road Traffic

A traffic plan will be developed once the construction contract has been awarded. The traffic plan will be made available for review and comment prior to its implementation.

4.14.2 Mitigation of Effects to Water Quality

The implementation of basic erosion and sediment control practices would be required during demolition as specified in the Virginia Erosion and Sediment Control Handbook (VDCR 1992). The proper installation and maintenance of erosion and sediment control measures would minimize the movement of disturbed soils off-site and into the Potomac River watershed. Following demolition, the disturbed area will be seeded and returned to pervious surfaces.

5.0 CONCLUSION

Two alternatives regarding the demolition of building 3307 have been evaluated. The project proponent has determined that Alternative B is the preferred alternative. Alternative B would not have significant impacts on the human environment.

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Mr. John Giannico, Forestry Section Head

Office of Counsel (C 050), MCB, Marine Corps Base, Quantico, VA 22134
Mr. Nathan Stokes, Associate Counsel

8.0 REFERENCES

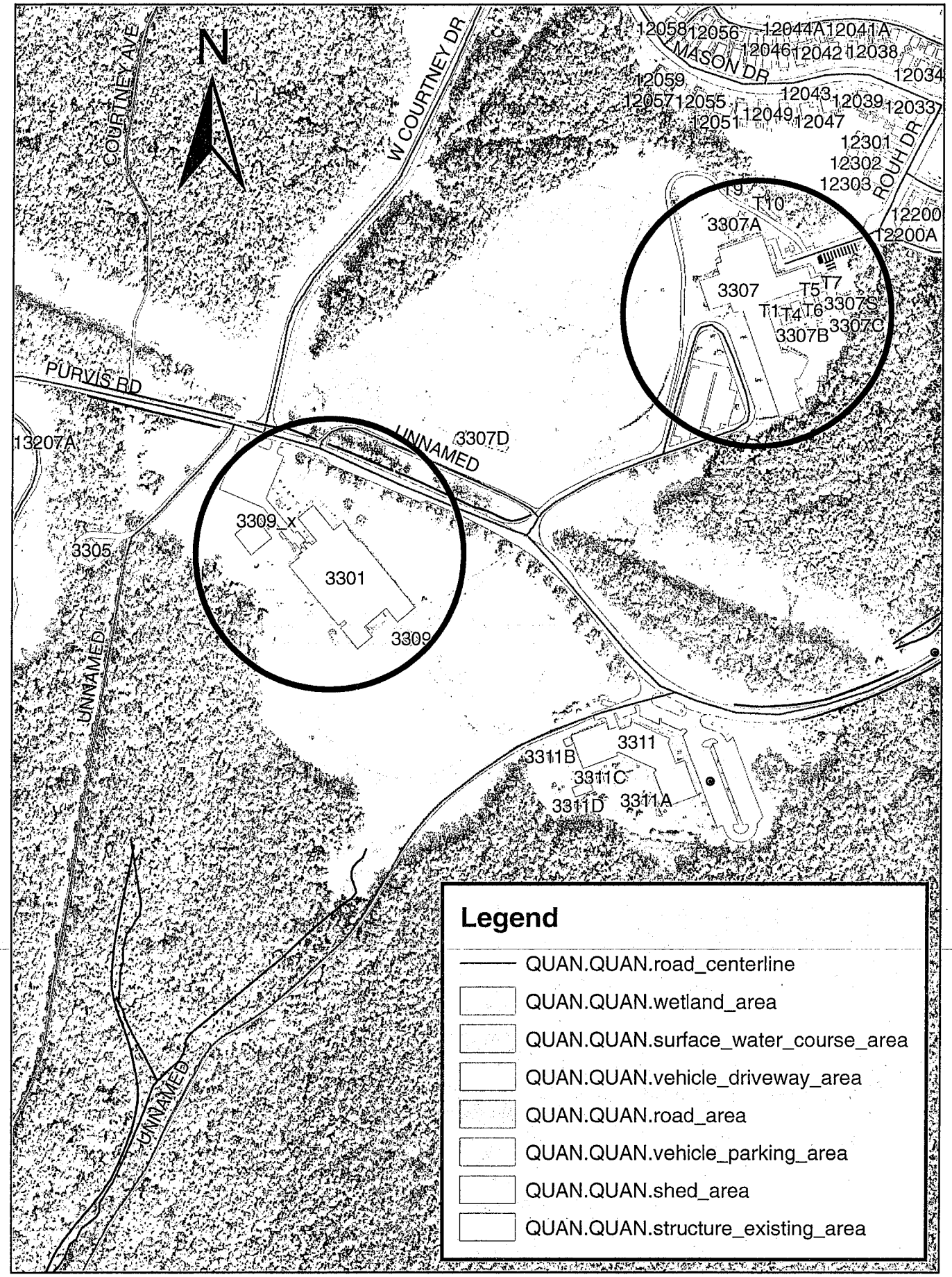
Natural Resources and Environmental Affairs Branch (NREA)
2007 Integrated Cultural Resource Management Plan for Marine Corps Base, Quantico, Virginia. Natural Resources and Environmental Affairs Branch, Marine Corps Base, Quantico, Virginia.

VDCR (Virginia Department of Conservation and Recreation)
1992 *Virginia Erosion and Sediment Control Handbook*, Richmond, Virginia.

Historical Resource Survey and Evaluation, Marine Corps Base, Quantico, Virginia. John Milner Associates, Inc., 5250 Cherokee Avenue, Suite 300, Alexandria, VA 22312, June, 2008.

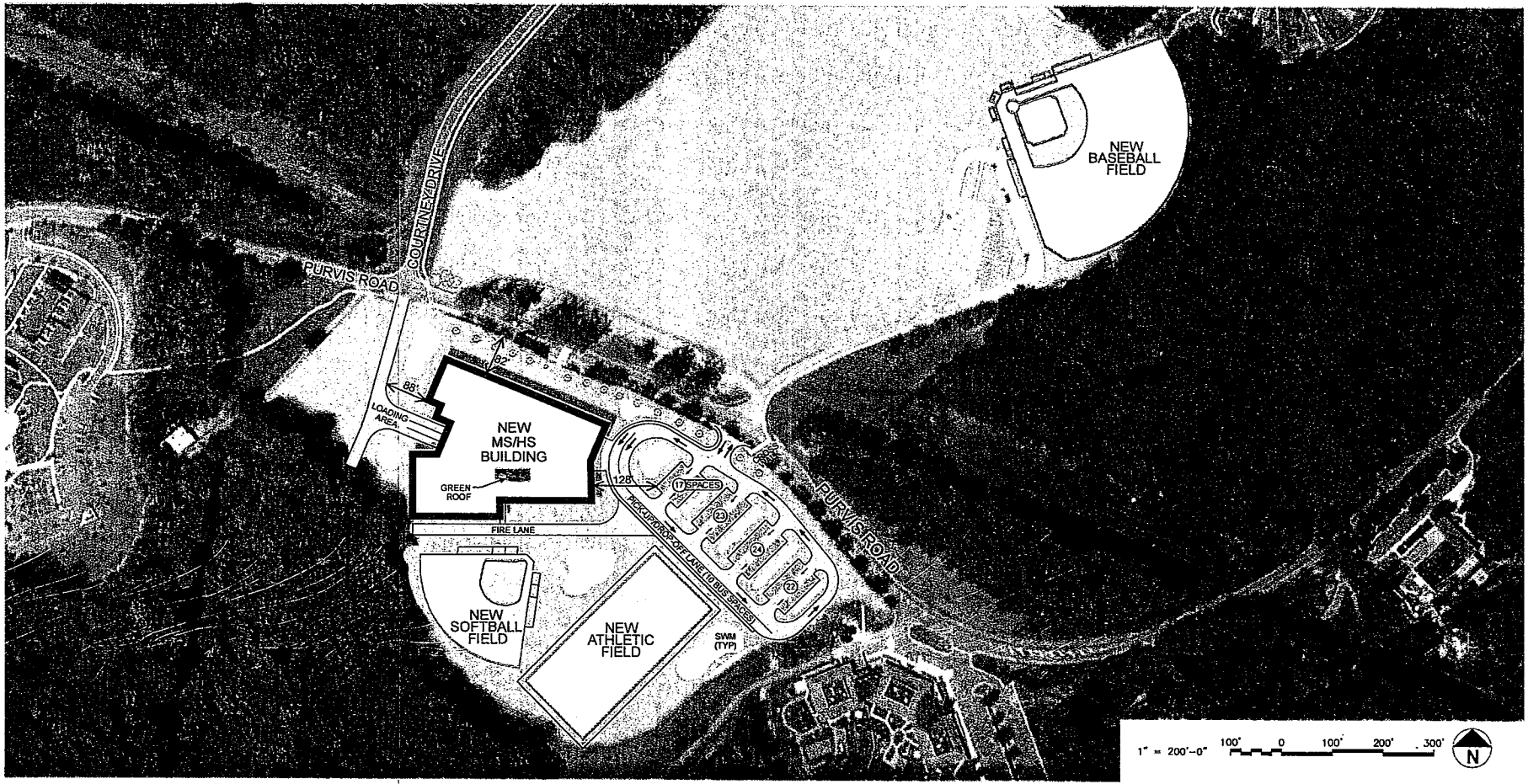
APPENDIX A
Maps and Proposed Plans

Construct Quantico Middle School/High School - Existing Environment



QUANTICO MIDDLE HIGH SCHOOL

SCHEMATIC SITE PLAN



MARINE CORPS BASE QUANTICO

QUANTICO, VA

EWING COLE

5/10/12

QUANTICO MIDDLE HIGH SCHOOL

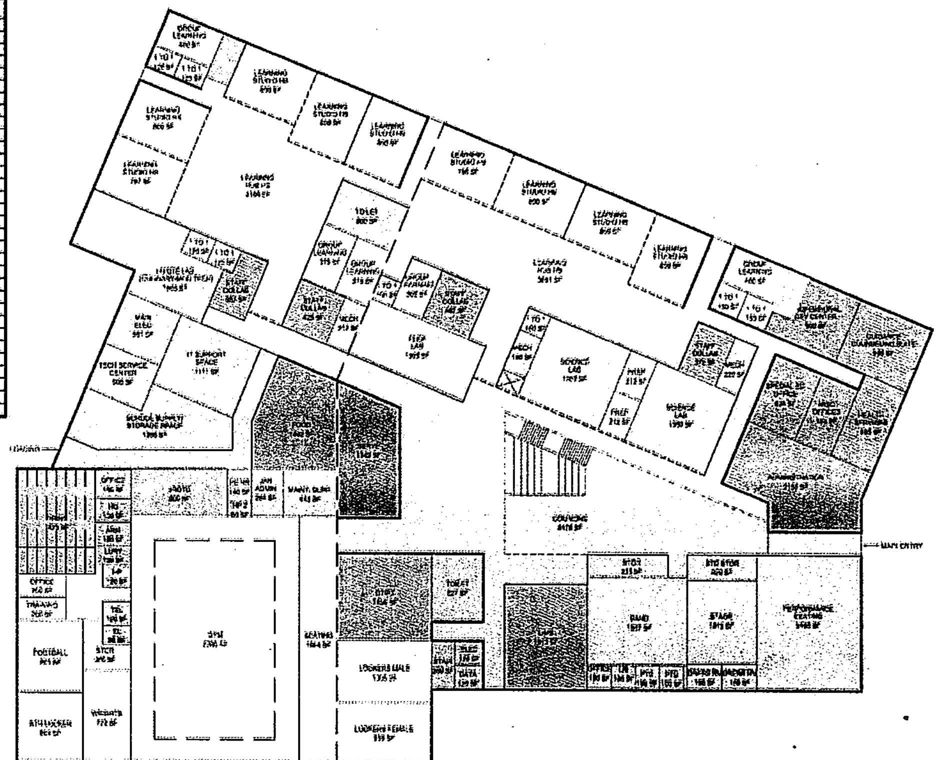
SCHEMATIC FLOOR PLAN - FIRST FLOOR

ROOM AREA SCHEDULE - FIRST FLOOR	
ROOM NAME	AREA
1 TO 1	120 SF
1 TO 1	120 SF
1 TO 1	100 SF
1 TO 1	120 SF
1 TO 1	120 SF
1 TO 1	150 SF
1 TO 1	150 SF
1 TO 1	100 SF
ADMINISTRATION	2155 SF
APM	150 SF
ATH LOCKER	504 SF
BAND	1527 SF
COMMONS	8470 SF
DATA	120 SF
DRESS RM	160 SF
DRESS RM	160 SF
EL	95 SF
ELEC	120 SF
[illegible]	1472 SF
FLEX LAB	1702 SF
FOOD	1402 SF
FOOTBALL	801 SF
GROUP LEARNING	375 SF
GROUP LEARNING	400 SF
GROUP LEARNING	375 SF
GROUP LEARNING	302 SF
GROUP LEARNING	400 SF
GUIDANCE COUNSELING SUITE	900 SF
GYM	7260 SF
HEALTH SERVICES	650 SF
HF	120 SF
HF 2	60 SF
HO	150 SF
IT SUPPORT SPACE	1111 SF
JAN ADMIN	264 SF
JROTC	903 SF
LDRY	120 SF
LEARNING HUB HS	3931 SF
LEARNING HUB MS	3160 SF
LEARNING STUDIO HS	800 SF
LEARNING STUDIO HS	600 SF
LEARNING STUDIO HS	800 SF
LEARNING STUDIO HS	900 SF
LEARNING STUDIO HS	799 SF
LEARNING STUDIO HS	800 SF
LEARNING STUDIO HS	900 SF
LEARNING STUDIO HS	800 SF
LEARNING STUDIO HS	797 SF
LG CIL LAB (CULINARY/BIO TECH)	1695 SF
LIB	100 SF
LMS	1513 SF
LOCKERS FEMALE	959 SF
LOCKERS MALE	1005 SF
MAIN ELEC	581 SF
MAINT. SUPP.	449 SF
MECH	320 SF
MECH	160 SF
MECH	212 SF
MISC OFFICES	481 SF

ROOM AREA SCHEDULE - FIRST FLOOR	
ROOM NAME	AREA
OFFICE	100 SF
OFFICE	155 SF
OFFICE	200 SF
OT/PT	1455 SF
PE RR	140 SF
PERFORMANCE SEATING	2450 SF
PREP	212 SF
PREP	212 SF
PROFESSIONAL DEV. CENTER	900 SF
PTC	150 SF
PTC	155 SF
SCHOOL SUPPLY/ STORAGE SPACE	1356 SF
SCIENCE LAB	1300 SF
SCIENCE LAB	1320 SF
SEATING	1864 SF
SERVE	1349 SF
SPECIALIZED OFFICE	524 SF
STAFF COLLAB	392 SF
STAFF COLLAB	467 SF
STAFF COLLAB	425 SF
STAFF COLLAB	370 SF
STAGE	1015 SF
STAIR	200 SF
STG. STOR	320 SF
STOR	335 SF
STOR	360 SF
TECH SERVICE CENTER	560 SF
TEL	120 SF
TOILET	627 SF
TOILET	500 SF
TRAINING	200 SF
WEIGHTS	775 SF

TOTAL SF 77230 SF

FIRST FLOOR GSF (INCLUDING FIELD HOUSE) 84000 SF
SECOND FLOOR GSF 49039 SF
TOTAL GSF 133039 SF



0 25' 50' 100'
SCALE: 1/50"=1'-0"

NORTH

MARINE CORP BASE QUANTICO
QUANTICO, VA

EWING COLE

5/10/12

QUANTICO MIDDLE HIGH SCHOOL

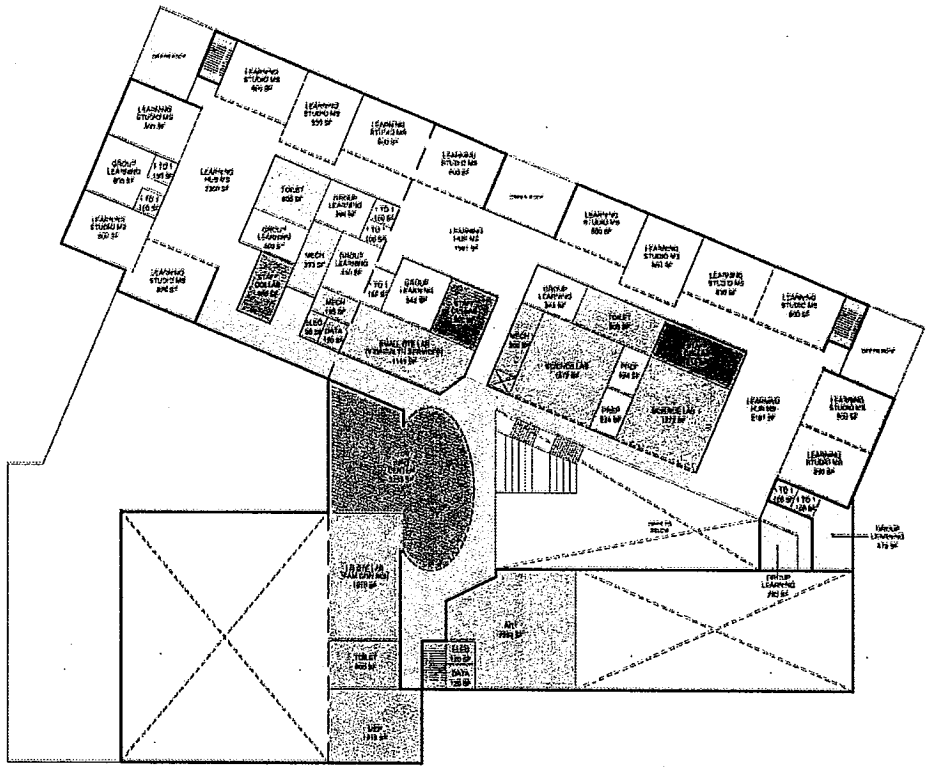
SCHEMATIC FLOOR PLAN - SECOND FLOOR

ROOM AREA SCHEDULE - SECOND FLOOR	
ROOM NAME	AREA
I.D. 1	100 SF
I.D. 1	100 SF
I.D. 1	100 SF
I.D. 1	100 SF
I.D. 1	100 SF
I.D. 1	157 SF
I.D. 1	100 SF
ART	2286 SF
DATA	120 SF
DATA	120 SF
ELEC	120 SF
ELEC	96 SF
GROUP LEARNING	642 SF
GROUP LEARNING	700 SF
GROUP LEARNING	650 SF
GROUP LEARNING	473 SF
GROUP LEARNING	260 SF
GROUP LEARNING	350 SF
GROUP LEARNING	284 SF
GROUP LEARNING	440 SF
HUB CENTER	3251 SF
LEARNING HUB MS	2260 SF
LEARNING HUB MS	2161 SF
LEARNING HUB MS	1961 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF

ROOM AREA SCHEDULE - SECOND FLOOR	
ROOM NAME	AREA
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LEARNING STUDIO MS	800 SF
LG CIR LAB (FAM CON SCI)	1013 SF
MECH	195 SF
MECH	191 SF
MECH	800 SF
MEP	1212 SF
PREP	724 SF
PREP	724 SF
SCIENCE LAB	1372 SF
SCIENCE LAB	1372 SF
SMALL CIR LAB (VB/HEALTH SCIENCE)	1149 SF
STAFF DOLLAR	500 SF
STAFF DOLLAR	400 SF
STAFF DOLLAR	814 SF
TOILET	540 SF
TOILET	600 SF
TOILET	600 SF

TOTAL SF 37722 SF

FIRST FLOOR GSF
(INCLUDING FIELD HOUSE) 84000 SF
SECOND FLOOR GSF 49039 SF
TOTAL GSF 133039 SF



0 25' 50' 100'

SCALE: 1/50"=1'-0"

NORTH

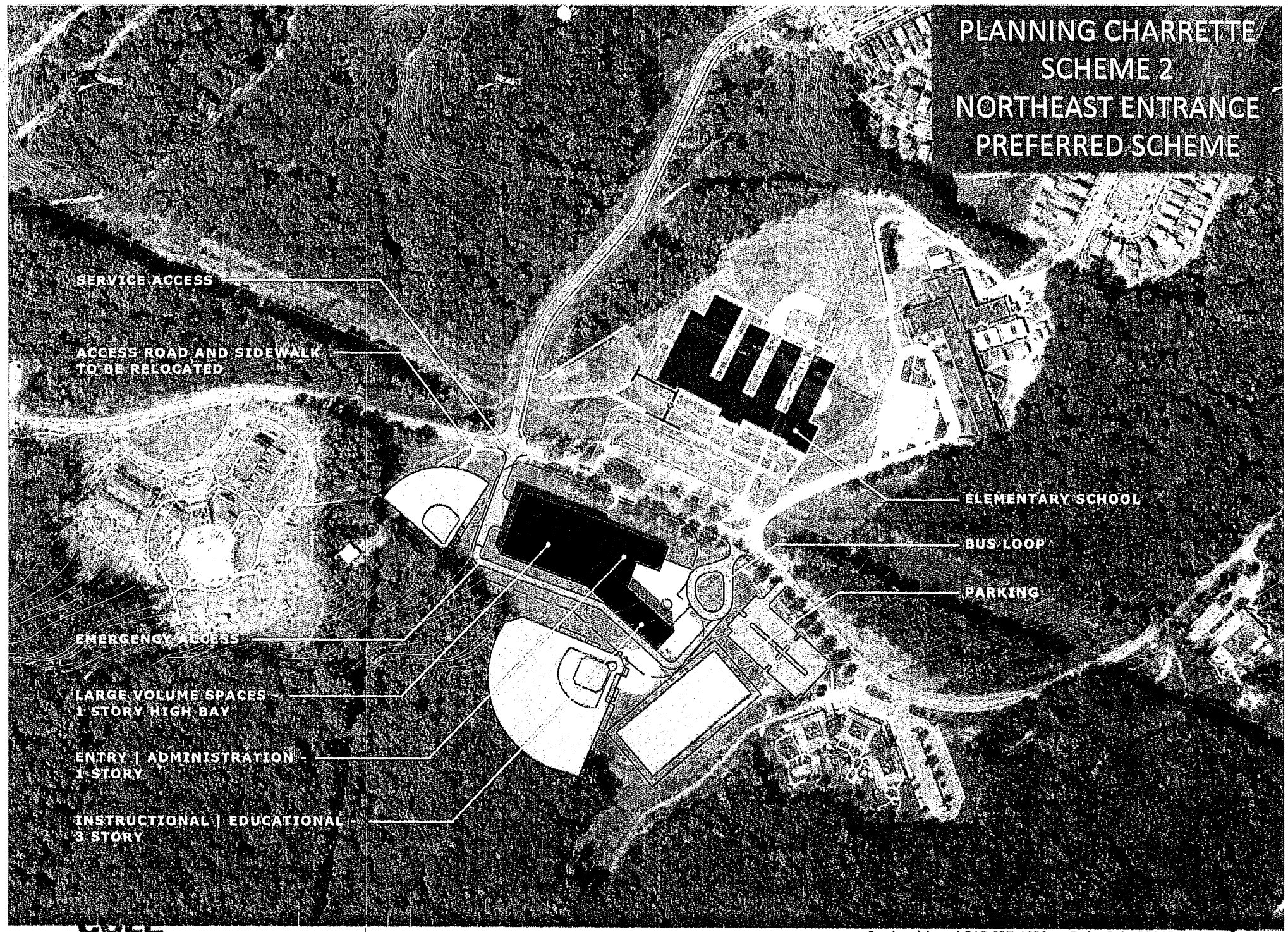
MARINE CORP BASE QUANTICO

QUANTICO, VA

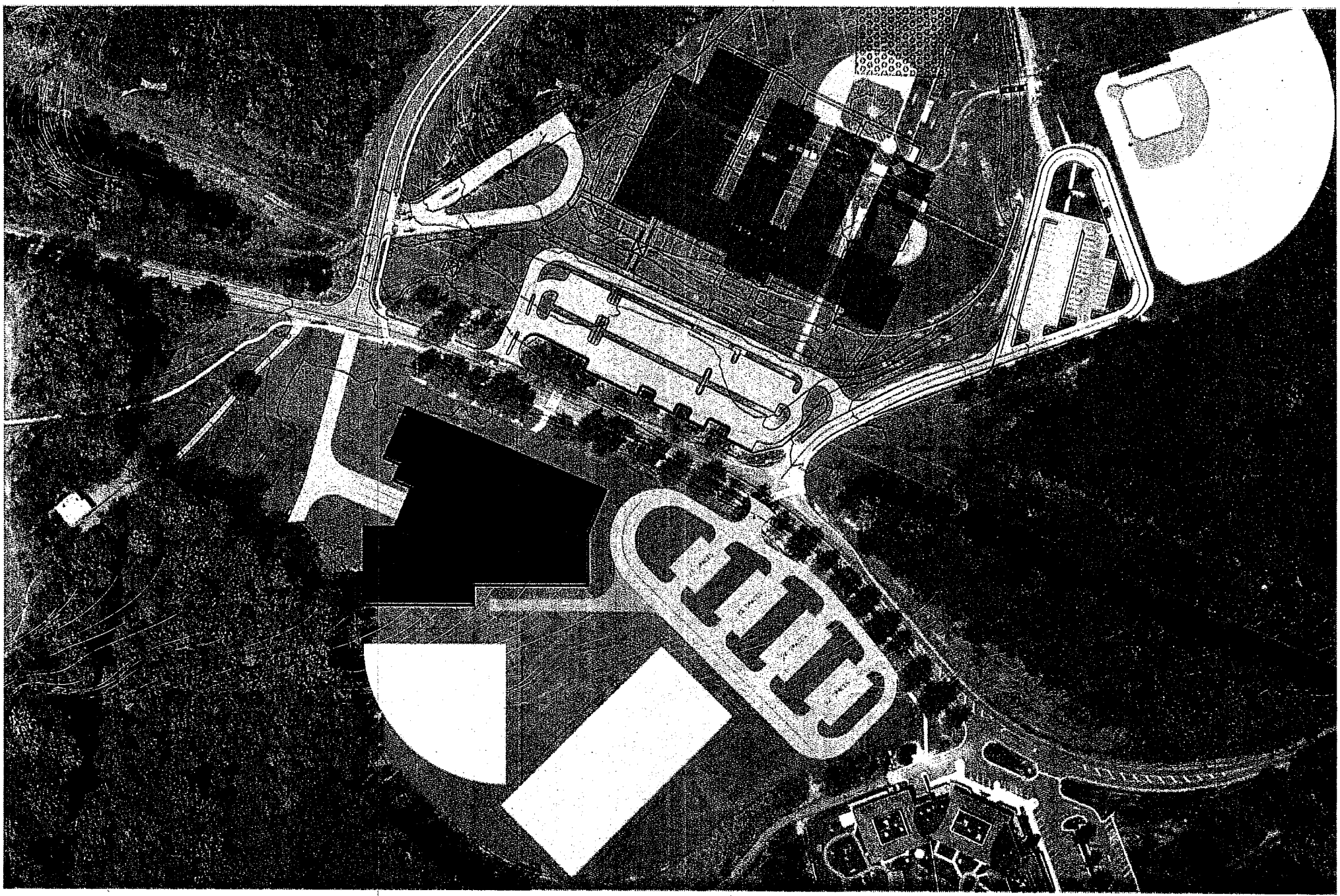
EWING COLE

5/10/12

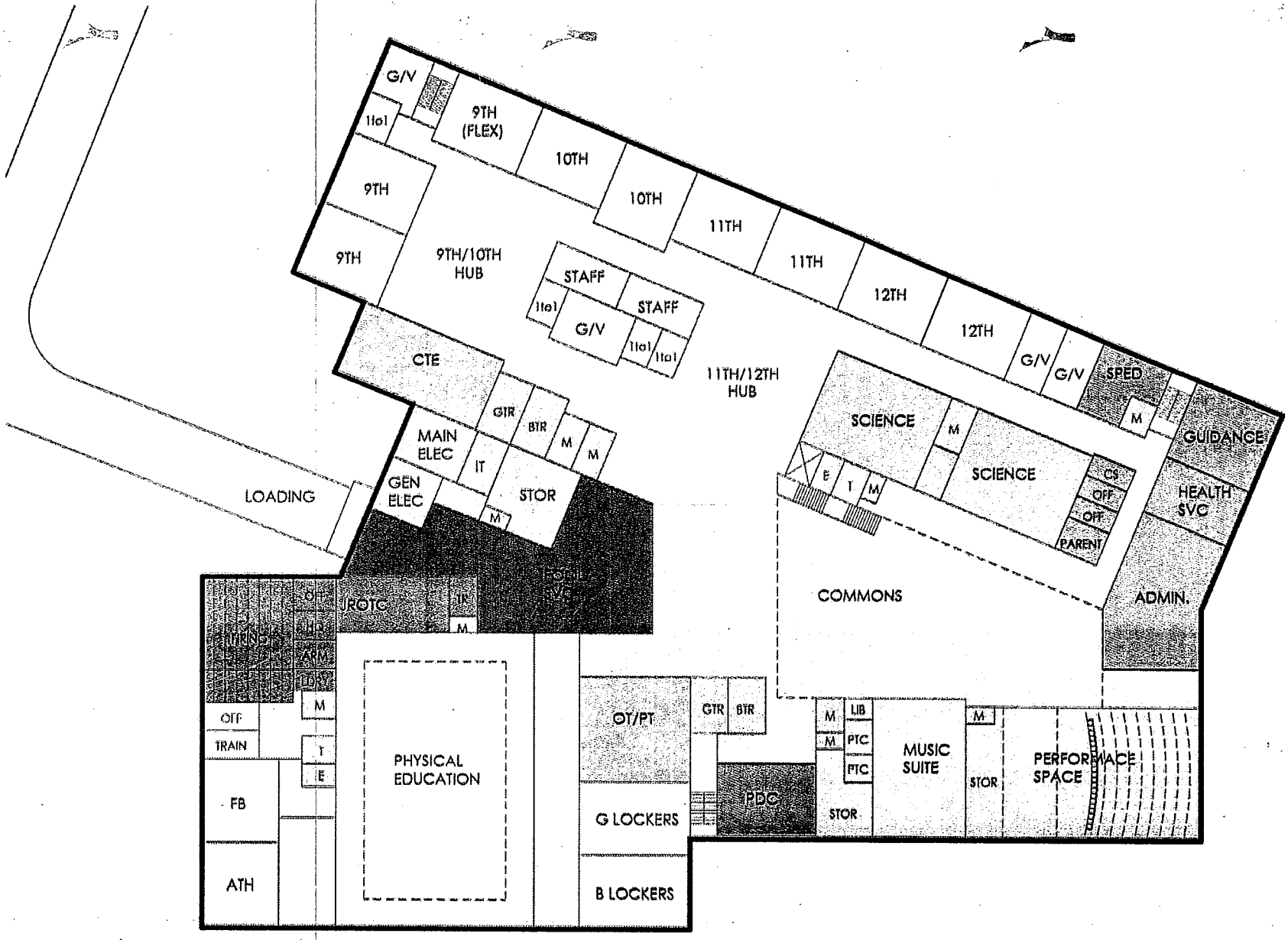
PLANNING CHARRETTE
SCHEME 2
NORTHEAST ENTRANCE
PREFERRED SCHEME



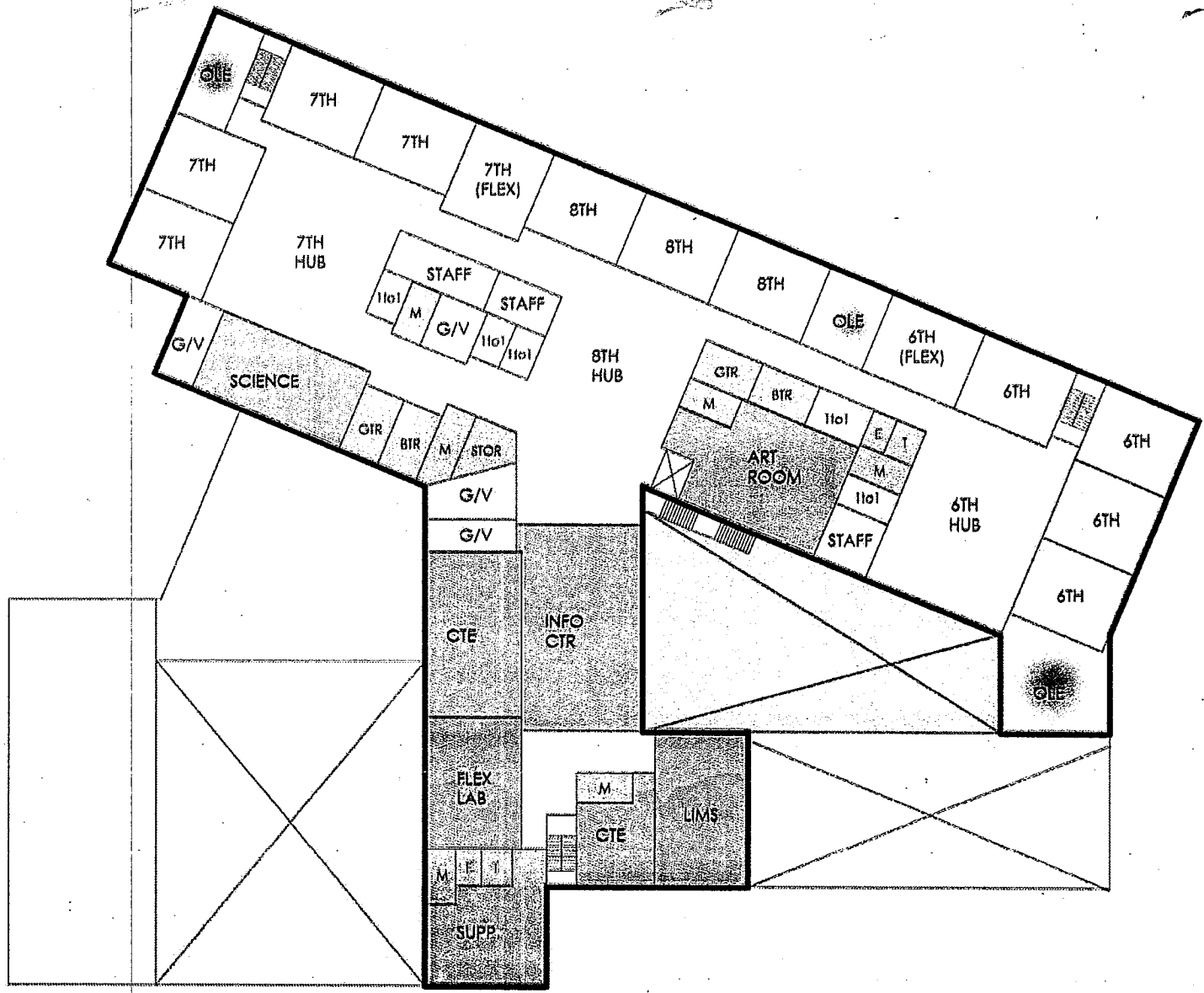
Joe Landrigan | 215.625.4639



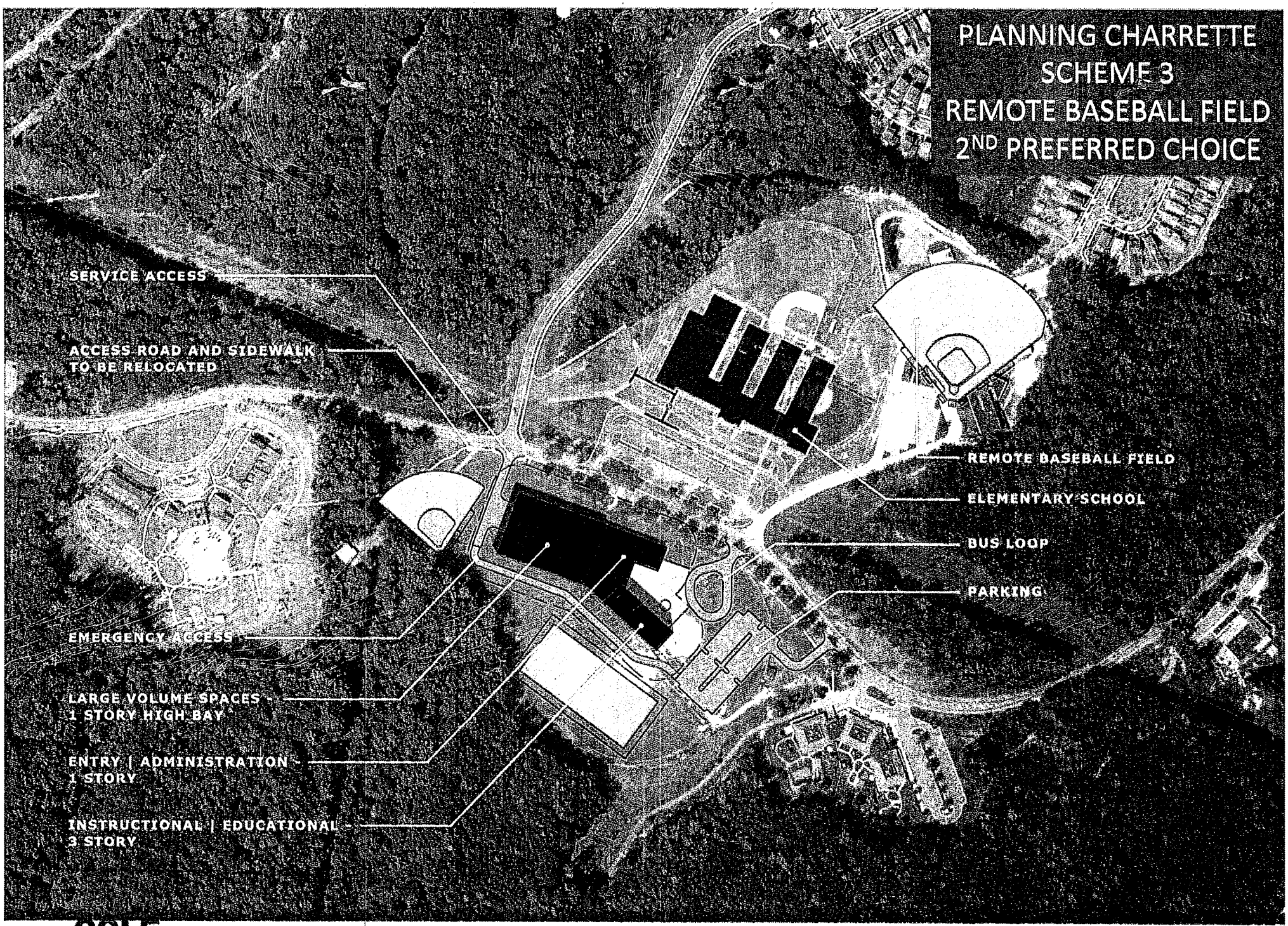
EWING COLE QUANTICO MIDDLE/HIGH SCHOOL
SCHEME B – SITE PLAN

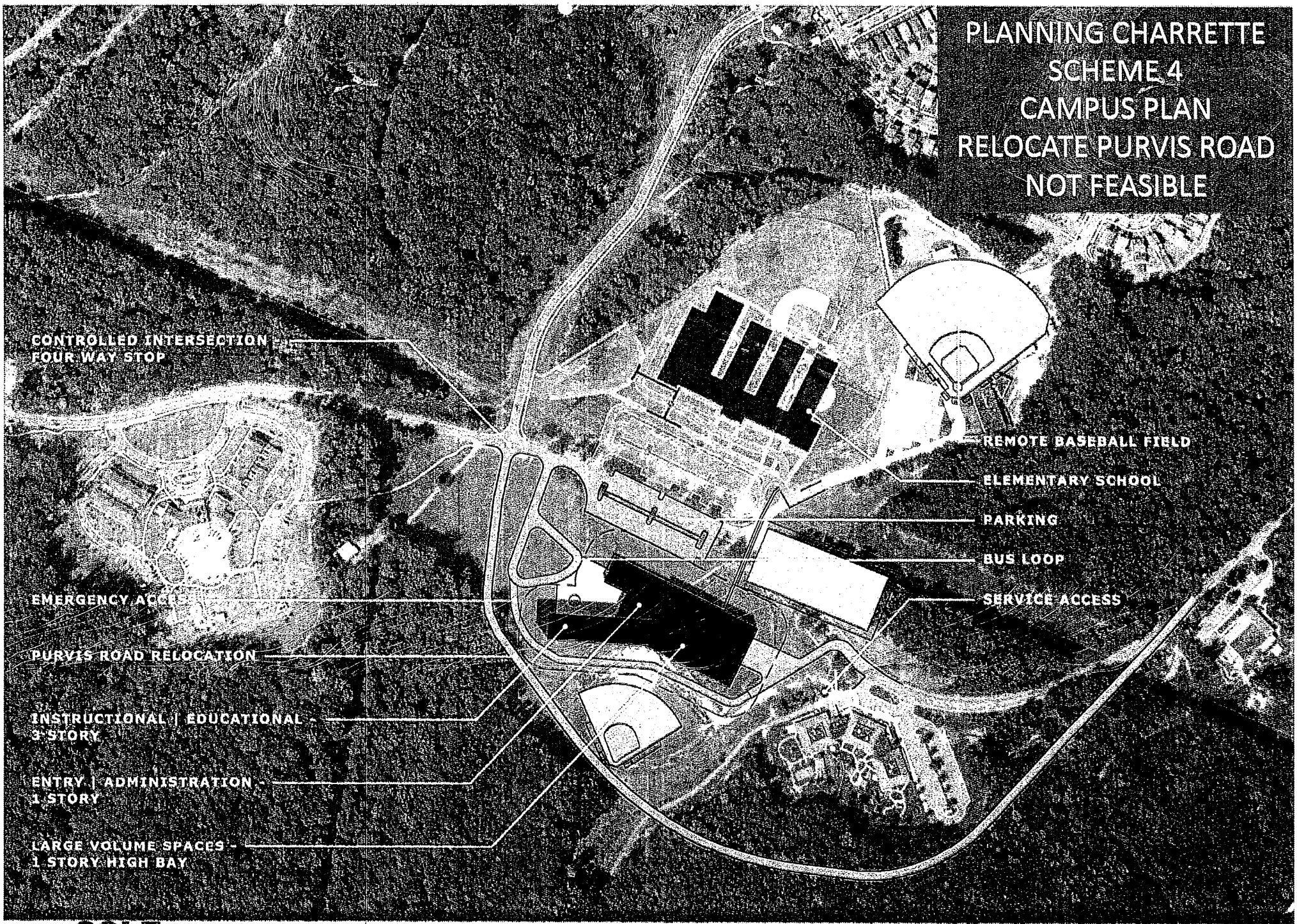


EWING COLE QUANTICO MIDDLE/HIGH SCHOOL
SCHEME B – FIRST FLOOR



EWING COLE QUANTICO MIDDLE/HIGH SCHOOL
SCHEME B – SECOND FLOOR


PLANNING CHARRETTE
SCHEME 3
REMOTE BASEBALL FIELD
2ND PREFERRED CHOICE
SERVICE ACCESS
ACCESS ROAD AND SIDEWALK TO BE RELOCATED
EMERGENCY ACCESS
LARGE VOLUME SPACES - 1 STORY HIGH BAY
ENTRY | ADMINISTRATION - 1 STORY
INSTRUCTIONAL | EDUCATIONAL - 3 STORY
REMOTE BASEBALL FIELD
ELEMENTARY SCHOOL
BUS LOOP
PARKING


PLANNING CHARRETTE
SCHEME 4
CAMPUS PLAN
RELOCATE PURVIS ROAD
NOT FEASIBLE
CONTROLLED INTERSECTION -
FOUR WAY STOP
REMOTE BASEBALL FIELD
ELEMENTARY SCHOOL
PARKING
BUS LOOP
SERVICE ACCESS
EMERGENCY ACCESS
PURVIS ROAD RELOCATION
INSTRUCTIONAL | EDUCATIONAL -
3 STORY
ENTRY | ADMINISTRATION -
1 STORY
LARGE VOLUME SPACES -
1 STORY HIGH BAY

6.0 SCHEMATIC SITE PLAN

The project site is located along Purvis Road on MCB Quantico, VA. The majority of the project site is located on the southern side of Purvis Road in the location of the current Russell Elementary School and MWR softball fields to the east of Russell Elementary School. In addition, the project site extends to the area north of Purvis Road to include a new baseball field. The entire project site, including the area for the new baseball field to the north of Purvis Road is 15 acres. The area of the baseball field north of Purvis Road is approximately 2.6 acres.

The site is at the location of the existing Russell Elementary School which is to be demolished under a separate contract to build a new Quantico consolidated elementary school north of Purvis Road.

There is a site survey that encompasses the area of the existing Russell Elementary School to be demolished that was done for the Quantico consolidated elementary school RFP. The area of the ball fields that are to be included in the site area were not part of the surveyed. Approximately 1,600 linear feet of fencing is required around the ball fields. The balance of the data for the site comes from the MCB Quantico GIS data. There are no soil borings or subsurface investigations from the proposed site. Site plan approval will be required by National Capital Region.

The existing site is relatively flat and drains gently to the west, south and southeast. The grades at the perimeter of the development area are fairly steep. The existing site is mostly grass covered. Existing storm drains that served the prior development flow into two separate unnamed tributaries of the North Branch Chopawamsic Creek. Chopawamsic Creek is tributary to the tidal Potomac River. One existing storm drain outfalls into an existing drainage way on the west side of the proposed building. This storm drain will be removed by the elementary school demolition project and will be replaced by a new storm drain that outfalls at or near the existing outfall location. A second existing storm drain outfalls into an existing drainage way on the southeast side of the proposed building. This storm drain will be removed and replaced by a new storm drain that outfalls at or near the existing outfall location.

The current layout most closely resembles the Scheme A Site Plan as depicted in the April 19, 2012 Quantico Middle/High School Code 3 Parametric Design Workshop Outbrief. This plan was developed to respond to the tight site constraints evident in the charrette developed plan. The only drawback to this plan is the need to cross Purvis Road to access the field, which is considered a safety issue by school personnel. The crosswalk and sidewalk leading to the baseball field are marked on the overall site plan.

The project is located on an existing DoDEA school site and as such it is to be in alignment with the base master plan and a formal site approval is not needed. However; there are existing MWR softball fields to the east of the existing Russell Elementary School that are part of the project site. It is currently unclear if these fields are contained in the existing DoDEA approved site boundary.

The education specifications for the school require parking for 82 staff and visitors. The entire facility will be handicap accessible and comply with requirements of the Uniform Federal Accessibility Standard and ADA Accessibility Guidelines. According to current ADA scoping guidelines, when the total number of parking spaces is between 76-100, a minimum of 4 accessible parking spaces are required.

Vehicular Circulation: The one-way pick-up/drop-off lane affords access to the east entrance to the school and allows parking for 10 busses. The parking area is interspersed with bioretention surface areas for stormwater management in the islands.

Pedestrian Access: Access to the school from the bus drop-off is via a sidewalk that leads to the front door of the Middle School/High School. This sidewalk cannot be covered in areas where it would prevent the access for fire rescue vehicles. Service access occurs at the loading area on the west side of the new facility with 3 bays. Service vehicles will access the school from Purvis Road. Emergency access for fire response is at the south side of the school.

ATFP site design shall be in accordance with UFC4-010-01, Minimum Antiterrorism Standards for Buildings. The new school is considered a Primary Gathering Facility in an area with a controlled perimeter. Per Table B-1 Standoff Distances for New and Existing Buildings, the minimum standoff distance is 12 feet. For Drive Up/Drop Off Areas, such as schools, the standoff distances will be measured to the nearest legal parking spaces, not the drive-ups or drop-offs. No hardening of the school will be required to compensate for the closer standoff distances associated with the drive-ups or drop-offs.

The landscape shall provide an aesthetically pleasing environment for the school, complement the architecture of the building, and screen unsightly views. Shade trees shall be planted for the comfort of building occupants and pedestrians at and in groupings around the site to define the open space. Foundation plantings shall be provided that shall conform to the UFC4-010-01 non-concealment requirement within the 33 foot unobstructed space. Plantings specified for the bioretention areas shall be harmonious with the site landscaping and enhance the landscape design of the site. Plants specified shall be native and non-invasive ornamental species that conform to the MCB Quantico BEAP plant palette and are adapted to the site climate and soils, requiring no fertilization or irrigation outside of the plant establishment period, low maintenance and are pest and disease resistant.

7.0 SUPPORTING INFRASTRUCTURE

A Site Preparation/Grading

A vehicle rated fire lane for fire safety access will be designed as shown on the site plan. The lane shall be a minimum of 20 feet wide and shall be graded such that runoff shall be directed away from the building. That portion of the lane (also a walkway) located directly in front of building shall be graded to provide sheet flow to the SWM facilities.

Low Impact Development (LID) Stormwater Management is an important component of the site organization and a prominent feature on the site. Low impact development, best management practices (BMPs) will be incorporated into the design of the stormwater management facilities.

Stormwater management practices and policies as outlined in NAVY LID policies and EISA Section 438 and complying with UFC 3-210-10N shall be used as a stormwater design basis for the site.

According to the Virginia State Stormwater Management regulations the required water quality volume treatment is the first 0.5 inch of site runoff. In December 2009, the EPA issued "Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act" (EISA). According to preliminary information it is determined that the required 95th percentile rainfall event for the Quantico, VA region is approximately 1.7 inches of runoff. This requirement is more stringent than the requirement outlined by the Virginia State SWM regulations. The remaining areas not draining to the designated BMP facilities shall not be treated for the 95th percentile rainfall event due to site-specific factors such as maintaining the drainage patterns and inadequate runoff conveyance systems. The stormwater management plans shall be submitted to VA DCR for approval.

It is likely that there will be no storm detention pond. Approximately 10,000 SF of bioretention surface area will be implemented on the project site. This will include 3" of mulch, 30" of planting soil, sand 3," pea gravel, 12" gravel with 6" perforated pvc underdrain.

Existing storm drains will be removed and replaced with a new storm drain system. Approximately 1100' of 15" storm drain and 260' of 24" storm drain will be required for the project.

The primary BMPs for the site will be bioretention and bio-swales located within the parking lot islands, along roadways, and in open space areas adjacent to the building and ball fields.

Drive aisles, entrance drives, and fire lanes will be constructed as conventional pavement.

The artificial "turf" athletic field may require treatment for stormwater depending on the type and compaction required for subgrade soils, and the final design of the filter layers and subdrainage system employed on the "turf" field. No irrigation is anticipated for the athletic fields. The southern corner of the athletic field may require a retaining wall due to existing grades in this location.

Demolition of the existing Middle/High School Buildings will include some levels of environmental remediation. Previous asbestos inspection data (2010 AHERA Reinspection/ Management Plan) has been reviewed for Quantico Middle/High School. No information was provided for other potential Hazardous Material/Hazardous Waste issues that may impact the cost or schedule of demolition such as lead, PCBs, Mercury, or aboveground/ underground fuel storage tanks at the school.

Based on the DODEA provided, 2010 AHERA Asbestos Management Plan for the Quantico Middle/High School, the following asbestos-containing materials (ACMs) remain in the school. We have provided a concept level cost estimate for the asbestos abatement.

In addition to the abatement costs there will be abatement monitoring and final air sampling costs that will add approximately 15% to the estimated costs.

The federal National Emissions Standards for Hazardous Air Pollutants (NEHSAPS) regulations, contained in 40 CFR Part 61 (Subpart M) define "Regulated Asbestos-Containing Material" (RACM) as (a) friable asbestos material, (b) Category I non-friable ACM that has become friable, (c) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting or abrading, or (d) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

The regulations also require that the regional asbestos administrator be notified of asbestos abatement projects involving at least 160 square or 260 linear feet of RACM. The notification is required at least 10 days prior to the commencement of asbestos abatement project activities. Other NESHAPs requirements prescribe engineering controls, waste handling, disposal and reporting requirements.

The contractor performing asbestos abatement for this project is also subject to the Occupational Safety and Health Administration (OSHA) construction standard for asbestos, 29 CFR 1926.1101. The OSHA asbestos construction standard requires the asbestos abatement contractor to utilize prescribed removal methods to monitor employee exposure to asbestos and other requirements (e.g., providing specific training, protective equipment and medical monitoring, and recordkeeping for asbestos abatement workers).

Special precautions necessary for proper asbestos abatement should be outlined in the developed specification for asbestos removal and disposal.

No Lead-containing/lead-based paint (LBP) inspection data was provided for review. It is recommended that a LBP survey be completed to identify where Lead-containing paints were utilized.

Once survey information is available, project specifications can be developed that will identify LBP locations and require submittals (compliance plans of action) from the Contractor describing how occupant protection and regulatory compliance will be achieved during either the removal/demolition of the impacted materials or during any required surface preparation for recoating of lead-containing surfaces.

Fluorescent lamps contain small amounts of mercury, lead, and sometimes cadmium. When disposed of in large volumes as during the renovation of a large commercial building, the lamps generate quantities of these toxic metals that are subject to regulation. Mercury-contain electrical switches and thermostats may also be present at the school. A survey for mercury-containing items and an evaluation of sink traps in any chemistry laboratories is recommended. Specifications can then be developed to properly handle mercury related issues. Often lamps are recycled or disposed, unless the lamps can be reused by Public Works.

Polychlorinated Biphenyl's (PCBs) are often found in pre-1978 building's electronic lighting ballasts contained in fluorescent light fixtures, electric motors, some electrical transformers, and possibly in hydraulic fluids such as may be used in elevators or lifts. No data was provided to evaluate this potential hazardous waste issue at the school.

B Structural (Loads & Seismic)

Geotechnical information for this project was derived from the preliminary geotechnical data report for the nearby Quantico Consolidated Elementary School project, performed by Independent Consultants & Engineers, Inc., dated March 14, 2011. Results from this subsurface investigation revealed the presence of man-placed fill, decayed wood and

organic material in some local areas on the proposed site of the Quantico Consolidated Elementary School, at depths in excess of 12 feet. Initial recommendations state that the use of conventional shallow spread footings for the foundation system of the new construction will most likely be appropriate, but do mention the requirement for a more detailed exploration and evaluation of the site. Depending on the results of the more detailed investigation, an alternate foundation system or local zones of over-excavation and soil exchange may be required to remediate areas of unsatisfactory soil.

Assuming an alternate foundation system is not selected, the foundations for the high/middle school will consist of reinforced concrete spread footings at column locations and continuous reinforced concrete wall footings for the perimeter wall construction. Perimeter foundations will bear a minimum of 2'-6" feet below existing grade elevations for frost protection. Special inspection will be required for foundations.

The high/middle school will consist of a ground floor, one supported floor and a roof. The concrete slab on grade will consist of 5 inches of normal weight concrete reinforced with welded wire fabric and will be poured on a crushed stone subbase and vapor barrier. The slab on grade at receiving areas and mechanical areas will be increased to 6 inches.

The structural framing system for the supported floors will consist of slab on deck construction supported by composite steel wide flange beams. Structural steel columns will support framing beams and girders at the interior of the building. At the building perimeter, reinforced concrete bearing walls, cast in insulating concrete forms, will support the elevated floor and roof framing. Some areas will require longer spans in order to accommodate an open floor plan.

The structural framing system for the roof will likely consist of galvanized metal roof deck supported by open web structural steel joists and/or structural steel beams, supported by structural steel wide flange girders. All roof steel will be sloped to create positive drainage.

The lateral load resisting system for the new high/middle school will likely consist of a combination of reinforced concrete shear walls along the perimeter and steel concentrically braced frames on the interior.

C Water/Sewer

Water and sanitary sewer connections to the existing site utilities shall be provided as shown on site utility plan.

Water service to the Middle School/High School will be provided by constructing

approximately 1900 linear feet of 8" ductile iron water line in a loop around the new Middle/High School that ties in to the existing water line to the east, just south of Purvis Road and also at the west side of the school, south of Purvis Road.

Water and sanitary sewer shall be supplied to the concession stand and restroom facility by the athletic field.

The sanitary sewer shall exit the school at the south east corner of the facility and connect in a southeasterly direction to the existing sanitary sewer line, which runs to the southeast. The new connection will also require tying in to the sanitary sewer line that runs to the north and west along the south side of Purvis Road. Approximately 360 linear feet of new 8" PVC sanitary sewer line must be constructed to make this connection. Additionally approximately 120 linear feet of 6" PVC line will complete the connection to the building.

There are 3 proposed fire hydrants at the site, as depicted on the site utility plan.

Quantico Middle/High School Utility Plan – the following has been delineated on this exhibit: Water Line location. Two 30" storm drain line outfalls, and Sanitary sewer connection.

Plumbing and piping systems will be provided to serve the new Middle School/High School. Plumbing fixtures shall be provided as indicated on the architectural drawings. All water closets, lavatories, sinks, drinking fountains, floor drains, etc. shall be commercial grade.

New domestic water, sanitary and roof drainage systems complete including termination to the existing municipal systems will be provided. The domestic water system shall consist of a main building water shut-off valve, and 3" parallel reduced pressure backflow preventors. All water piping shall be Type "L" copper with wrought copper fittings and 1" fiberglass insulation.

The sanitary piping will require cleanouts at every pipe direction change and on 75 foot centers. Provide a complete roof drainage system including roof drains and an overflow roof drainage system. All sanitary and roof drainage piping shall be PVC with solvent welded joints. Certain underslab sanitary piping shall service weight cast iron hub and spigot piping with compression gasket joints where hot water discharges to floor drains (kitchens, mechanical rooms, etc). All plumbing vents shall terminate a minimum of 25 feet from any outdoor air intake. The main sanitary service shall be 6" in size. Acid water and vent piping and dilution basins shall be provided for the science lab area.

Domestic hot water will be produced from two 199,000 btuh high efficiency condensing

water heaters. An instantaneous gas-fired water heater shall be provided for the dishwasher. A solar domestic heating system shall also be provided to accommodate 30% of the facility's requirements. Cold, 110°F, and 110°F recirculating water will be routed throughout the facility.

D Pavements

Pavements for site access, site circulation and parking for the school will be installed as a part of this facility as depicted on the schematic site plan. The drive aisles serving the parking bays require a 12 foot wide lane in each direction. The one way circulation lane for cars and busses is 16' wide. All circulation roads are proposed to be made of 2 inches of asphalt over 4 inches of asphalt base with 8 inches of aggregate base. Typical sections will include concrete curbs and gutters. The soils engineer is to specify the paving section. Bioretention and other methods (other than permeable paving which is not allowed at MCB Quantico) will be used to reduce the stormwater runoff and meet low impact development requirements.

E Electrical

A new underground, medium voltage primary utility service will be extended from a new utility company power pole at the sight boundary to a new 277/480V utility company pad-mounted transformer. Utility transformer to be located a minimum of 25' away from the building. The transformer will provide electrical services for all requirements associated with the new building. The secondary service lateral to the building will be underground.

The main 277/480V service switchboard will be rated 2000 amps. Service switchboard will be front accessible with TVSS protection on full-function, electronic trip, 100% rated main. Distribution sections will be circuit breaker type.

A single line diagram of the proposed equipment arrangement for the school has been prepared and included in the appendices.

It is proposed that most of the lighting loads be served at 277 V, motor loads (larger than 1 horsepower [HP]) be served at 480 V, and receptacle and miscellaneous loads be served at 120 V. The electric service equipment was sized based on HVAC loads, motor loads, and other loads as shown on the single line diagram. As a comparison, the load was also estimated using nominal Watts per square foot data from Table D5010-1151 in the 2009 R.S. Means Electrical Cost Data book. Watts per square foot data for middle/high schools are as follows:

- Lighting, 3 Watts
- Devices, 1.9 Watts

- HVAC, 5.3 Watts
- Miscellaneous, 1.3 Watts

For a total of 11.5 watts per square foot. The anticipated building size is approximately 133,039 square feet, for a total electrical load estimate of approximately 1,530 kW. The estimate is consistent with the estimate established in the single-line diagram.

AMI metering will be provided for all utility connections to the facility. Lighting, receptacle, HVAC and other loads will be sub-metered and monitored by the Building Automation System. This information will be made available for public use on the educational digital dashboard.

Lighting for common areas, gymnasium and corridors will be controlled through the web-based DDC control system through relay control panels. Classrooms, enclosed offices, storage rooms, etc. will have stand alone occupancy sensors to control lighting.

Dark sky compliant exterior lighting will be provided for the site, parking lot, exit doors and to light the perimeter of the building. Exterior emergency egress lighting will be accomplished using the architectural lighting fixtures with remote battery back-up in accordance with local building code requirements. Any life-safety emergency fixture which is switched will have an emergency bypass relay allowing the fixture to be energized regardless of switch/relay position on loss of normal power. LED fixtures are being considered, with type and style to be confirmed. Exterior lighting will meet the latest Illuminating Engineering Society of North America (IESNA) Handbook and IESNA Recommended Practices. Lighting for sport fields will be metal halide and meet the latest Illuminating Engineering Society of North America (IESNA) Handbook and IESNA Recommended Practices. Site, field and parking lot lighting will be controlled through the web-based DDC control system through relay control panels.

F Communications

Communication infrastructure shall consist of CAT 6 horizontal cabling.

12 Strand, OM3, multi-mode and 12 strand, OM3, single-mode fiber optic riser cable will be provided to each IT room.

Service to the Middle School/High School will consist of 12 Strand, OM3, multi-mode and 12 strand, OM3, single-mode fiber optic and 100-pair copper cable and will be adequate for the Middle School/High School requirements.

G HVAC

The HVAC system for this project consists of unitary geothermal heat pumps for zone

control and two outside air handling units with energy recovery. For planning purposes include 65, 2-ton heat pumps. Also include 2 – 15 ton heat pumps for the gymnasium and 2 – 7 ton heat pumps for the Commons/Dining area. Each heat pump will be a high efficiency, 2-stage heat pump unit with an ECM fan motor. All units will be floor-mounted and installed in distributed mechanical room spaces located throughout the facility. Each zone will have a heat pump with a thermostat, BAS interface and occupancy sensor interlock. Also, the main electrical service room, main mechanical room and server rooms will be conditioned with a geothermal heat pump unit. All units shall have fully ducted supply and return sheetmetal ductwork. All ductwork shall constructed of sheet metal per SMACNA guidelines at a minimum. All supply ductwork and un-conditioned air ducts shall be insulated with 1.5" thick, ¾ pcf duct wrap with vapor barrier. Return air ductwork will not be insulated. Provide each unit with exterior mounted pre-filter racks. The pre-filters shall be 24"x24" Flanders/FFI PrePleat 40. Each heat pump shall include integral disconnect. Condensate for each unit will be disposed of through and floor drain or open receptacle into the sanitary system. In lieu of a central pumping system, each heat pump will have a dedicated circulating pump (B&G PL-55 or equal) that shall cycle on when the compressor cycles on, the circulating pump shall be powered through the heat pump unit. Flexible stainless steel braided hoses shall be used at the connection of each unit. The hose kits shall include shut-off valves on each the supply and return and a strainer on the supply hose.

The outside air systems for the facility shall be de-coupled. Outside air shall be provided directly to the occupied space. The dedicated outside air handling units will be indoor type and have double wall construction. The units shall be variable volume energy recovery type units utilizing building (toilets, lockers rooms, etc.) exhaust and general exhaust air to precondition the outside air through a total energy recovery wheel. All conditioned outside air ductwork and building exhaust air ductwork will not be insulated – this applies to positive pressure outside air ductwork and negative pressure exhaust air ductwork. All un-conditioned air ducts shall be insulated with 1.5" thick, ¾ pcf duct wrap with vapor barrier – this applies to negative pressure outside air ductwork and positive pressure exhaust air ductwork. The units will consist of the following sections/components: stacked on top and in the direction of air flow will be a pre-filter, energy recovery wheel, and plenum type direct-drive exhaust air fan-wall, on the bottom will be a pre-filter, energy recovery wheel, access, hot / chilled water coil (2-pipe), access, plenum type direct drive supply air fan-wall. Each fan will be controlled by a VFD and each unit will be approximately 11,000 cfm in capacity. The exhaust fan shall be sized at 20% reduction in capacity, 8,800 cfm. The supply air distribution system will supply outside air to approximately 70 VAV terminal units for distribution of outside air to each area.

To control outside air, a central CO2 monitoring system will be provided to take advantage of building diversity. Each occupied area will contain a CO2 measuring port

with a high quality central CO2 sensor. The VAV terminal will modulate in accordance with the CO2 measurements. The VAV terminal will also be interlocked with room occupancy sensor.

The outside air conditioning system will be provided with two nominal 20 ton, water to water, reverse cycle chiller units (2-pipe system) located in the mechanical room. The units will provide hot or chilled water as required to condition the outside air. The 2-pipe system will changeover from heating to cooling and vice versa based on outside air temperature. A separate primary constant volume hydronic pumping system will circulate water to the dedicated outside air handling units. This system will have a primary and backup pump with lead/lag operation. The 2-pipe loop will consist of steel and copper piping and also contain approximately 30% propylene glycol with chemical treatment and rust inhibitors. The 2-pipe loop will be insulated with 1" thick glass fiber insulation for 1.5" and smaller piping. Larger piping will be insulated with 2" thick glass fiber insulation.

The geothermal well field will consist of ~180 wells each being 300 feet deep. This wellfield size is preliminary and the final wellfield size will be established during the design phases utilizing on-site test data and computerized simulation software. The bores are 6" in diameter and will include a factory made DR-9, 1-1/4" U-tube, fully grouted well. One manufactured geothermal vault structure will be required and shall include a minimum of 18 isolatable circuits per vault. The wells shall be installed on a 20' by 20' staggered grid system. One circuit shall be considered spare/redundant. The final wellfield size will be established during the design phase utilizing on-site test data and computerized simulation software. All horizontal mains shall be a minimum of three feet below grade and the trenches shall be 100% back filled with rock or other suitable materials. All geothermal piping exterior of the building shall be HDPE butt-fused joints and fittings. All geothermal piping mains interior of the building shall be HDPE butt-fused joints and fittings. Heat pump runouts shall be copper. All geothermal piping exterior of the building shall be HDPE butt-fused joints and fittings. All geothermal piping mains interior of the building shall be HDPE butt-fused joints and fittings. Heat pump runouts shall be copper. The geothermal loop will contain approximately 20% antifreeze fluid. The heat transfer fluid shall be an ethanol based solution non-toxic antifreeze heat transfer fluid formulated specifically for use in geothermal heat pump systems. The wellfield piping and building piping will be purged to remove dirt, debris and air. All concealed geothermal piping interior of the building shall be insulated with 1" thick fiberglass insulation with an all service jacket. Valve tags and charts shall be provided for every valve 1" and larger within the facility.

A web-based DDC controls system shall be provided for the entire building and associated systems. The BAS shall also interface with the building lighting controls, and switch gear / electric metering. BTUH metering shall be provided for the central geothermal system. The system shall be ASHRAE 135 BACnet compliant.

The kitchen shall be provided for Type I and Type II hoods as required. Fire suppression systems shall also be provided. Make up air shall be provide through a gas-fired heating-only rooftop makeup air unit and interlocked as required. The fans shall be the variable speed type and a variable speed style hood control system shall be provided. The Type 1 exhaust duct shall be welded stainless steel for exposed ductwork and welded carbon steel for concealed ducts with appropriate cleanouts provided. All components of the Type 1 rangehood and exhaust fan system shall be UL listed for grease laden vapor applications. The dishwasher duct shall be welded aluminum construction and be sloped towards to the dishwasher for drainage. All fans and makeup air unit will be located on the roof directly above the kitchen.

Fume hoods will be installed with a dedicated exhaust fan controlled by a local switch on the hood. All hood exhaust ductwork will be constructed of stainless steel. The narrative will be updated accordingly.

The concession stand and restroom facility building will be heated and ventilated/exhausted. Ventilation rates for this building will comply with ASHRAE 62 as a minimum. The concession stand shall be provided with Type I and Type II hoods as required similar to the school kitchen. Fire suppression systems shall also be provided. Make up air shall be provide through a gas-fired heating-only rooftop makeup air unit and interlocked as required. The fans shall be the variable speed type and a variable speed style hood control system shall be provided. The Type 1 exhaust duct shall be welded stainless steel for exposed ductwork and welded carbon steel for concealed ducts with appropriate cleanouts provided. All components of the Type 1 rangehood and exhaust fan system shall be UL listed for grease laden vapor applications. All fans and makeup air unit will be located on the roof directly above the concession stand.

H Fire Protection

The fire lane to the south of the new school will cover approximately 11950 SF of area and be made of Portland cement pavement.

3 hydrants are accessible as shown on the site plan.

The latest edition of the applicable codes and standards shall be used including the more restrictive UFC 3 600-10N. Refer to Appendix. Where a deviation or conflict occurs, the more stringent code or standard shall be applied.

The building shall be fully sprinkler protected per NFPA 13, UFC 3-600-01 and UFC 3-600-10N requirements. Systems shall be automatic wet-pipe type. The suppression systems will be served by a water service connected to the municipal supply loop. Domestic and

Fire water are served from a combined looped gridded system owned by Quantico MCR. There is a 10" main under Purvis Road. Meters are required for all utilities.

The sprinkler system demands will be based on Light and Ordinary Hazard Group 1. Design basis will follow the requirements of UFC 3-600-01, which calls for a design basis area of 3,000 square feet. The calculation area reductions permitted by NFPA 13 for Light and Ordinary Hazard occupancies with quick response sprinklers and ceiling heights of 20 feet or less are permitted. There will be no standpipe systems in the building.

Sprinkler Design Bases are as follows:

Hazard Class	Design Basis	Adjustment for Ceiling Height	Final Design Basis
Light	0.10 gpm/sf over 3,000 sf	40% area reduction to be investigated in Design Phase	0.10 gpm/sf over 3000 sf
Ordinary Group 1	0.15 gpm/sf over 3,000 sf	40% area reduction to be investigated in Design Phase	0.15 gpm/sf over 3000 sf

All sprinkler system piping will be Schedule 10 or Schedule 40. The Corrosion Resistance Ratio (CRR) for all fitting methods shall be 0.95 or greater. Plain-end fittings will not be permitted.

Any kitchen cooking equipment will be provided with pre-engineered UL 300 fire suppression systems. These will be monitored by the fire alarm system.

Fire Alarm and Mass Notification Installation shall be in accordance with NFPA 72, UFC 4-021-1 and UFC 3-600-01 and the Marine Corps requirements found within.

The base NFPA 101 requirement is for a manual fire alarm system. Automatic smoke detection will be provided in select locations as required. The site utilizes Kingfisher Radio system for reporting. A separate control valve dual contact flow switch for power shunt tripping is requested for any elevator machine room.

Fire alarm notification appliances will consist of speakers and strobes. These devices will be located throughout the entire building. In general, every classroom will have a speaker/strobe combination device for fire alarm.

Mass Notification system shall be a standalone system (separate from Fire Alarm) per Marine service exception in UFC 4-021-1. The system will interface with site's the Giant Voice system.

Fire Department apparatus access will be provided as required per UFC 3-600-01 and NFPA 1 Chapter 18 and site specific requirements. Fire Hydrants must be located so that

building exterior walls are within 350-ft of hydrants.

A fire department access road shall extend to within 50 ft of at least one exterior door that can be opened from the outside and that provides access to the interior of the building and around 75% of the building perimeter (per Charrette report).

Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 450 ft from an access road. More than one fire department access road shall be provided when it is determined by the AHJ that access by a single road could be impaired by vehicle congestion, condition of terrain, climatic conditions, or other factors that could limit access.

Fire department access roads shall have an unobstructed width of not less than 20 ft and an unobstructed vertical clearance of not less than 13 ft 6 in. Fire department access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be provided with an all-weather driving surface. Dead-end fire department access roads in excess of 150 ft in length shall be provided with approved provisions for the fire apparatus to turn around.

FIGURE 4 SCHEMATIC SITE UTILITY: See the Following Page

8.0 SAFETY/SECURITY

The site is in compliance with all applicable anti-terrorism/force protection (AT/FP) criteria as outlined in Unified Facilities Criteria (UFC) 4-010-01 DoD Minimum Anti-terrorism Standards for Buildings. All roads with adjoining sidewalks within the school campus will have raised curbs for AT/FP requirements and as a protective and safety measure. A drop-arm or other acceptable protective measures such as bollards are required for the service access drive and the fire lane. The minimum conventional construction standoff distance from the Middle/High School for Reinforced Concrete construction is 16 feet. There must be a 33 foot unobstructed space around the entire perimeter of the Middle/High School for fire access and visibility.

9.0 SUSTAINABLE DESIGN/ LEED

A Applicability

All DoDEA projects are required to meet the requirements of the DoDEA Administrative Instruction Sustainability and Energy Efficiency Program. This program applies to the execution of all DoDEA military construction (MILCON) projects, sustainment, restoration and modernization (SRM) projects that include the replacement or improvement of building energy systems (including the building envelope, lighting, and HVAC), and minor construction projects that exceed 25% of the current replacement value and includes the replacement or improvement of building energy systems (including the building envelope, lighting, and HVAC). This regulation will apply to construction activities outside the continental United States (OCONUS) to the extent possible considering mission objectives and Host Nation Agreements.

Projects shall be registered with GBCI by the geographic district/region in the pre-design stage using the current LEED for Schools rating System. The geographic district/region shall provide project and GBCI data sheet access to the Designer of Record once under contract. All new facilities must apply for certification at no less than a LEED Silver level under the U.S. Green Building Council's most applicable current LEED rating system, or apply for a comparable rating under no less than an equivalent green building rating system, so long as a third party provides such rating.

To accomplish this goal, DoDEA will document Sustainability Program costs on DD Form

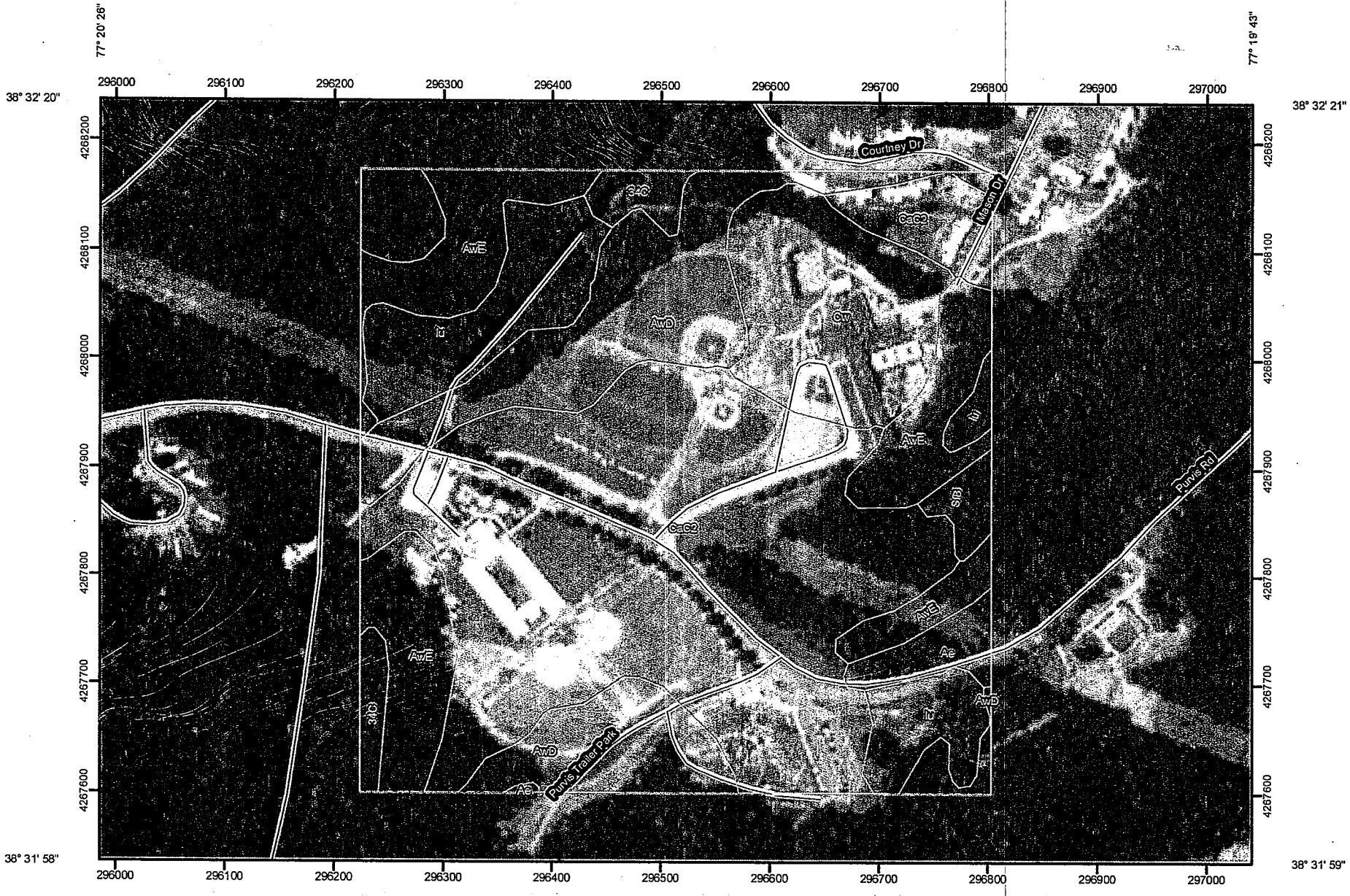
1391, with a separate line item under primary facility costs identified as "LEED AND FEDERAL ENERGY ACTS COMPLIANCE". These costs will be programmed at no more than Five percent of the primary facility cost unless specific detailed costs are determined.

A LEED Accredited Professional has evaluated the proposed Elementary School for potential to achieve LEED Silver certification and the results are documented in the LEED Checklist for New Construction V3.0 contained in Table 2 below. A summary of the preliminary LEED strategy follow Table 2. The individual credit costs are provided in the appendices.

TABLE 2 LEED CHECKLIST: See the Following Page

Appendix B
Soil Maps

Soil Map—Prince William County, Virginia



USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

Map Unit Legend

Prince William County, Virginia (VA153)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
34C	Lunt loam, 7 to 15 percent slopes	1.8	2.2%
Ae	Alluvial land, wet	1.5	1.9%
AwD	Aura-Galestown-Sassafras complex, 6 to 15 percent slopes	13.1	16.0%
AwE	Aura-Galestown-Sassafras complex, 15 to 30 percent slopes	11.4	13.9%
CaC2	Caroline fine sandy loam, 6 to 10 percent slopes, eroded	37.4	45.6%
Cw	Cut and fill land	8.2	10.0%
Iu	Iuka fine sandy loam, local alluvium, 0 to 4 percent slopes	7.7	9.4%
SfB	Sassafras fine sandy loam, 2 to 6 percent slopes	0.9	1.1%
Totals for Area of Interest		**82.0**	**100.0%**

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:5,010 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

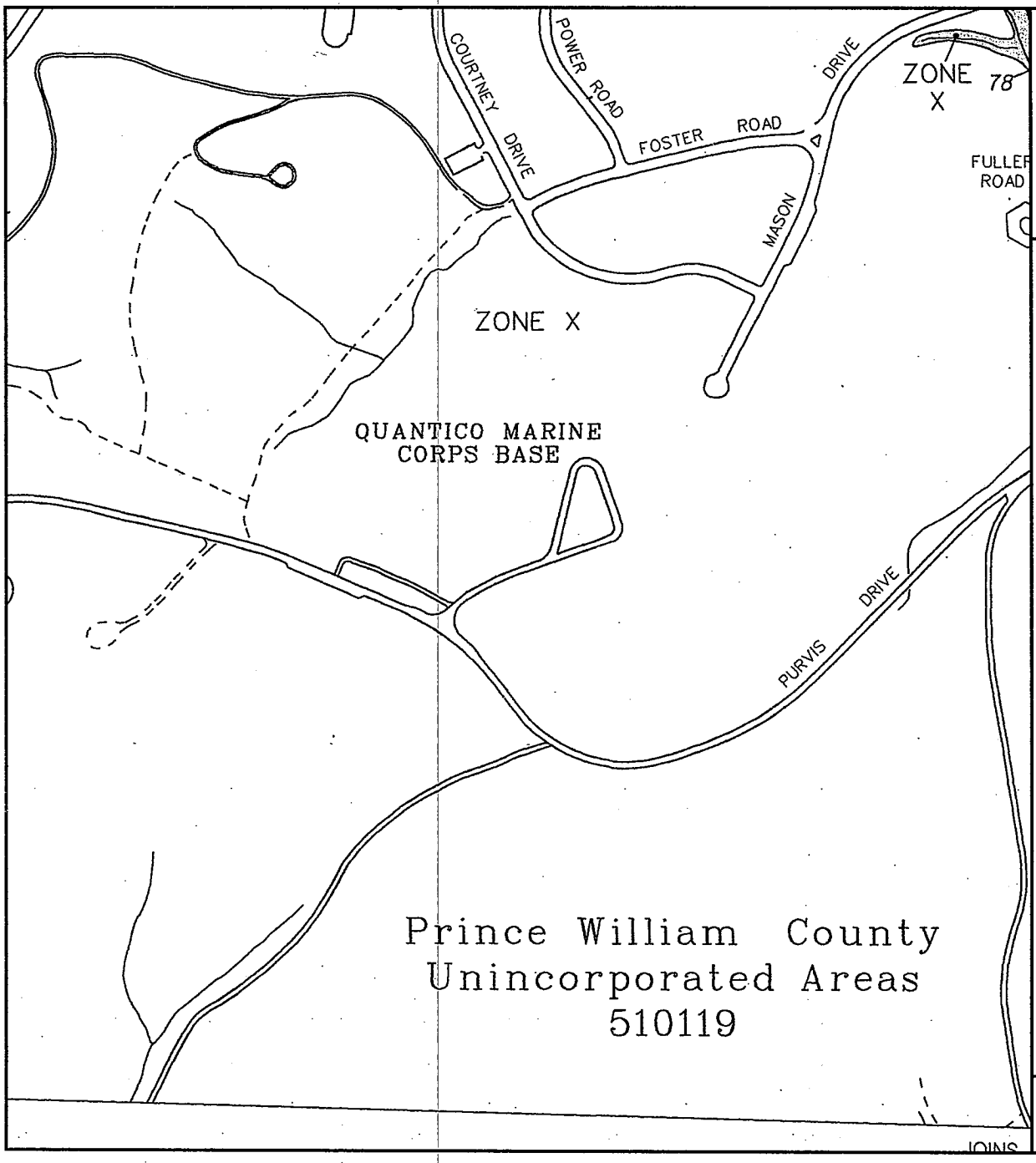
This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Prince William County, Virginia
Survey Area Data: Version 11, Jan 25, 2010

Date(s) aerial images were photographed: 6/24/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Appendix C
FEMA FIRM



APPROXIMATE SCALE

500 0 500 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

PRINCE WILLIAM COUNTY, VIRGINIA AND INCORPORATED AREAS

PANEL 312 OF 330

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DUMFRIES, TOWN OF	5020	032	D
UNINCORPORATED AREAS	5019	032	D

Notice to User: The MAP NUMBER shown below should be used when placing map orders; the COMMUNITY NUMBER shown above should be used on insurance applications for the subject community.

MAP NUMBER
51153C0312 D

EFFECTIVE DATE:
JANUARY 5, 1995

Federal Emergency Management Agency

Appendix D
Excerpt from
Historical Resource Survey and Evaluation, Marine Corps Base, Quantico, Virginia, John Milner Associates, Inc.

exceptional qualities of integrity (location, design, setting, materials, workmanship, feeling, and association) necessary for inclusion in the National Register of Historic Places (DOI 1997, 4). Therefore, JMA concludes that Building No. 3252 should be considered as contributing to the established district.

3.1.4.12 Building No. 3301, Russell Elementary School

(287-5058)

Site Description:

Building No. 3301 is located on Purvis Road, a primary access road leading to residential neighborhoods currently under construction (2007).

The large green spaces which surround the school are primarily dedicated to the recreational activities of children. Metal chain link fencing surrounds the entire property.

Building No. 3301, Russell Elementary School

Architectural Description:

This 1950s school building consists of brick construction with flat roof and large windows. The windows feature metal frames, painted white. The primarily one-story building features an irregular plan. There are white metal gutters and downspouts. A large, brick smoke stack is located at the rear of the building.

Initially constructed in 1952, a major addition was completed five years later.

Statement of Significance:

Education has always played an important role at Quantico, including the education of the children associated with the base.[38]

Constructed in 1952, John H. Russell School was named after the 16th Commandant of the Marine Corps, John H. Russell. Russell served from March 1, 1934, to November 30, 1936. Original drawings, dated March 1952, indicate John M. Walton and Associates, Arlington, Virginia, were the architects; H.W. Redmite and Associates served as mechanical engineers; and J.L. Fatsant and Associates were the structural engineers. The Marine Corps Elementary School, Quantico, Virginia, was under the jurisdiction of the Housing and Home Finance Agency, Office of the Administration for United States Office of Education.

An addition was completed in 1957. The addition included new sidewalks, new front entrances, and a rear addition which transformed the previously U-shaped building in to a square-shaped plan with interior courtyard. The addition was completed by the same architectural and structural engineer firms which had been involved in the original construction. Lee Kendrick and Associates were the mechanical engineers for the project.

In 1989 the report, "AHERA Management Plan for Russell Elementary School" was submitted to MCBQ. The firm Law Environmental, Inc., of Kennesaw, Georgia, conducted investigations to determine the presence, location, and condition of asbestos containing building materials within the school building.[39]

[38] The first post school was constructed during the late 1930s, as part of the second phase of major permanent construction at Quantico (Gernand 2004:124).

[39] The report is filed in the Public Works Branch of MCBQ.

Currently Quantico has three elementary schools, and one middle/high school. At present, John H. Russell Elementary School houses preschool to third grade, while Ashurt Elementary School houses kindergarten through third grade and Burrows Elementary School houses grades four and five. The Quantico Middle/High School houses grades six through twelve. The elementary school which children attend is determined by the families housing (on base family housing is assigned by MCBQ). The schools are administered by NY/VA Domestic Dependents Elementary and Secondary Schools (DDESS).

The architectural style and design of elementary schools constructed on military installations is typically reflective of what was being built during the same time period in the civilian community. Building No. 3301, Russell Elementary School, is an example of this practice. The school is not a rare or exemplary model and does not display the exceptional qualities of integrity (location, design, setting, materials, workmanship, feeling, and association) necessary for individual listing on the National Register of Historic Places (DOI 1997, 4).

Built during one of MCBQ major construction period, Building No. 3301 is of minor importance to the development of the base as a whole, and therefore the resource would not be considered as contributing to a National Register eligible or listed historic district.

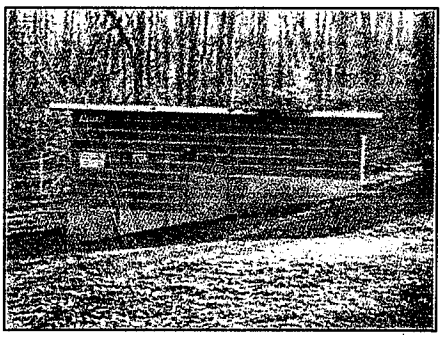
Therefore, JMA concludes that this resource does not possess the individual significance necessary to be considered eligible for inclusion in the National Register of Historic Places, nor does it contribute to the significance associated with MCBQ and would not be considered as contributing to a historic district.

3.1.4.13 Building No. 3302, Waterworks Pump Station

(287-5059)

Site Description:

Building No. 3302 is located in a wooded area, behind the Ashurst Elementary School. Metal fencing, with barbed wire on the top, surrounds the resource.



Building No. 3302, Water Pump Station

Architectural Description:

This basic concrete block structure features a flat, metal, roof and a concrete foundation. Built into the side of a slope, the simple structure includes a square plan.

Statement of Significance:

Building No. 3302, a pump station is a generic example of a utilitarian structure. Constructed in 1953, the overall massing and form of the resource are intact with minimal alterations or additions. The building continues to function in the capacity of a waterworks pump station.

However, this isolated building lacks the architectural or historical significance necessary to be eligible for the National Register of Historic Places. Additionally, research did not uncover any historical significance associated with this building and it appears evident that it has not contributed to the significance associated with MCBQ. Therefore it should not be considered as contributing to the district.[40]

[40] Building No. 3302 could, potentially contribute to a multi-property listing (National Register of Historic Places) focusing on MCBQ historic infrastructure.

Appendix E
Construction Waste Management Report

ISWM Program Manager Rcvd: _____
FY Reporting Period: _____

Construction Waste Management Report
Quantico Marine Corps Base

Report Date: _____
Project Number: _____ Project Name: _____
Contract Number: _____ Contract Task Order/Delivery Order: _____
Reporting Period: _____ to _____

SUBMIT THIS FORM BY FAX TO (703) 784-4953, OR BY EMAIL TO: ronald.king@usmc.mil

Comments: _____
_____

Waste Stream	Disposal (Tons)	Disposal Cost	Recycled (Tons)	Recycled Cost	Recycled Revenues
C&D		$		$	$

CONSTRUCTION & DEMOLITION DEBRIS (C&D).

- Record hazardous and non-hazardous C&D waste as one entry. Enter total tons of C&D disposed of in a landfill, by incineration, and/or by hazardous waste contract.
- Enter total disposal cost for C&D.
- Enter the recycled hazardous and non-hazardous C&D tons as one entry under the recycling column. You can also claim C&D diversion conducted by a construction contractor or MILCON project. If you have recycled C&D, it is likely that some was disposed of as well. Therefore, if there are recycled tons of C&D there should be some disposed tons of C&D.
- Enter the cost associated with recycling. Recycling costs include handling, processing, transportation, and other costs associated with recycling C&D. Soils that are used at another location or that are reclaimed count toward recycling.
- Enter Recycling Revenues. Enter only actual revenues received from recycling. Do not enter cost avoidance for recycling revenues.

Reported by:
Company: _____ Contact: _____
Address: _____ Title: _____
_____ E-mail address: _____
Telephone: _____ Fax: _____

Definitions:

Construction and Demolition (C&D) Debris. Waste derived from the construction, renovation, demolition or deconstruction of residential and commercial buildings and their infrastructure. C&D waste typically includes concrete, wood, metals, gypsum wallboard, asphalt, and roofing material.

Other Select Waste (OSW). Construction and demolition debris are the "Other Select Waste" categories for purposes of DoD metric reporting via SW module. If the Other Select Wastes are hazardous they must also be reported in the calendar year HW module.

Quantico MS/HS
SWM

Stantec

Runoff Reduction Method

SA = 13.3 Ac Imp Area = 5.3 Ac
Turf Area = 8.0 Ac (1.8 Ac A, 6.2 Ac C)

%I = 40 %T = 60 %F = 0

P = 1.0" $R_{vT} = \frac{(1.8)(.15) + (6.2)(.22)}{8.0} = 0.20$

Runoff Reduction Volume

$T_v = \frac{(1.0)[(.95)(.40) + (.20)(.60)](13.3)}{12} = 0.55 \text{ Ac-ft} = 23,958 \text{ ft}^3$

Soil Compost Amendment

Area = 2.5 Ac (0.4 Ac A-Soil & 2.1 Ac C-Soil)

$R_v = 0.04$

Recalculate $R_{vT} = \frac{(2.5)(.04) + (1.4)(.15) + (4.1)(.22)}{8.0} = .15$

Recalculate $T_v = \frac{(1.0)[(.95)(.40) + (.15)(.60)](13.3)}{12} = 0.52 \text{ Ac-ft} = 22,651 \text{ ft}^3$

Bioretention Level 2 Design (RR: 80 TP: 50)

Reqd Surface Area $= \frac{(1.25)(T_v)}{\text{storage depth}} = \frac{(1.25)(22,651)}{[(0.5) + (4.25)(.40)]} = 12,870 \text{ ft}^2$

Designed by: Rand L. Postell 6/13/2014 Checked by:

5. RUNOFF COEFFICIENTS – MOVING BEYOND IMPERVIOUS COVER

The negative impacts of increased impervious cover (IC) on receiving water bodies have been well documented (CWP 2003, Walsh et al. 2004; Shuster et al. 2005; Bilkovic et al. 2006). Due to widespread acceptance of this relationship, IC has frequently been used in watershed and site design efforts as a chief indicator of stormwater impacts.

More recent research, however, indicates that other land covers, such as disturbed soils and managed turf, also impact stormwater quality (Law et al, 2008). Numerous studies have documented the impact of grading and construction on the compaction of soils, as measured by increase in bulk density, declines in soil permeability, and increases in the runoff coefficient (OCSCD et al, 2001; Pitt et al, 2002; Schueler and Holland, 2000). These areas of compacted pervious cover (lawn or turf) have a much greater hydrologic response to rainfall than forest or pasture.

Further, highly managed turf can contribute to elevated nutrient loads. Typical turf management activities include mowing, active recreational use, and fertilizer and pesticide applications (Robbins and Birkenholtz 2003). An analysis of Virginia-specific data from the National Stormwater Quality Database (Pitt et al. 2004) found that runoff from monitoring sites with relatively low IC residential land uses contained significantly higher nutrient concentrations than sites with higher IC non-residential uses (CWP & VA DCR, 2007). This suggests that residential areas with relatively low IC can have disturbed and intensively managed pervious areas that contribute to elevated nutrient levels.

The failure to account for the altered characteristics of disturbed urban soils and managed turf can result in an underestimation of stormwater runoff and pollutant loads generated from urban pervious areas. Therefore, the computation and compliance system for nutrients should take into account impervious cover as well as other land cover types.

The runoff coefficients provided in **Table 4** were derived from research by Pitt et al (2005), Lichter and Lindsey (1994), Schueler (2001a), Schueler, (2001b), Legg et al (1996), Pitt et al (1999), Schueler (1987) and Cappiella et al (2005). As shown in this table, the effect of grading, site disturbance, and soil compaction greatly increases the runoff coefficient compared to forested areas.

Table 4. Site Cover Runoff Coefficients (Rv)

Soil Condition	Runoff Coefficient
Forest Cover	0.02 to 0.05*
Disturbed Soils/Managed Turf	0.15 to 0.25*
Impervious Cover	0.95
*Range dependent on original Hydrologic Soil Group (HSG) Forest A: 0.02 B: 0.03 C: 0.04 D: 0.05 Disturbed Soils A: 0.15 B: 0.20 C: 0.22 D: 0.25	

The advantage of a computation system for nutrients that takes into account a range of land covers is that site stormwater designs will have a higher likelihood of treating all relevant land uses that contribute nutrients to waterways. In addition, such a system can incorporate site design incentives, such as maintaining or restoring forest cover, as a means of reducing site compliance requirements.

6. TREATMENT VOLUME – THE COMMON CURRENCY FOR SITE COMPLIANCE

Treatment Volume (Tv) is the central component of the Runoff Reduction method. By applying site design, structural, and nonstructural practices, the designer can reduce the treatment volume by reducing the overall volume of runoff leaving a site. In this regard, the Treatment Volume is the main "currency" for site compliance.

Treatment Volume is a variation of the 90% capture rule that is based on a regional analysis of the mid-Atlantic rainfall frequency spectrum. In Virginia, the 90th percentile rainfall event is defined approximately as one-inch of rainfall. Additional rainfall frequency analyses across the State will further refine the one-inch rule.

Figure 2 illustrates a representative rainfall analysis for Reagan Airport in Washington, D.C. (DeBlander, et al., 2008). The figure provides an example of a typical rainfall frequency spectrum and shows the percentage of rainfall events that are equal to or less than an indicated rainfall depth. As can be seen, the majority of storm events are relatively small, but there is a sharp upward inflection point that occurs just above one-inch of rainfall (90th percentile rainfall event).

The rational for using the 90th percentile event is that it represents the majority of runoff volume on an annual basis, and that larger events would be very difficult and costly to control for the same level of water quality protection (as indicated by the upward inflection at 90%). However, these larger storm events would likely receive partial treatment for water quality, as well as storage for channel protection and flood control.

Table 5: Determining the Stormwater Treatment Volume

$$Tv = \frac{P * (Rv_I * \%I + Rv_T * \%T + Rv_F * \%F) * SA}{12}$$

Where

Tv = Runoff reduction volume in acre feet
P = Depth of rainfall for "water quality" event
Rv_I = runoff coefficient for impervious cover[1]
Rv_T = runoff coefficient for turf cover or disturbed soils[1]
Rv_F = runoff coefficient for forest cover[1]
% I = percent of site in impervious cover (fraction)
%T = percent of site in turf cover (fraction)
%F = percent of site in forest cover (fraction)
SA = total site area, in acres

[1] Rv values from **Table 4.**

The proposed Treatment Volume has several distinct advantages when it comes to evaluating runoff reduction practices and sizing BMPs:

- The Tv provides effective stormwater treatment for approximately 90% of the annual runoff volume from the site, and larger storms will be partially treated.
- Storage is a direct function of impervious cover and disturbed soils, which provides designers incentives to minimize the area of both at a site
- The 90% storm event approach to defining the Treatment Volume is widely accepted and is consistent with other state stormwater manuals (MDE, 2000, ARC, 2002, NYDEC, 2001, VTDEC, 2002, OME, 2003, MPCA, 2005)
- The Tv approach provides adequate storage to treat pollutants for a range of storm events. This is important since the first flush effect has been found to be modest for many pollutants (Pitt et al 2005).
- Tv provides an objective measure to gage the aggregate performance of environmental site design, LID and other innovative practices, and conventional BMPs together using a common currency (runoff volume).
- Calculating the Tv explicitly acknowledges the difference between forest and turf cover and disturbed and undisturbed soils. This creates incentives to conserve forests and reduce mass grading and provides a defensible basis for computing runoff reduction volumes for these actions.

7. RUNOFF REDUCTION PRACTICES

Various BMPs are capable of reducing the overall volume of runoff based on the post-development condition. Historically, BMP performance has been evaluated according to the pollutant removal efficiency of a practice. However, in some cases, this underreported the full capabilities of BMPs to reduce pollutant loads. More recent BMP performance research has focused on runoff reduction as well as overall pollutant removal.

A literature search was performed to compile data on the Runoff Reduction capabilities for different BMPs. Runoff Reduction data were limited for most practices. However, many recent studies have started documenting Runoff Reduction performance. Based on the research findings, Runoff Reduction rates were assigned to various BMPs, as shown in **Table 6**. A range of values represents the median and 75th percentile runoff reduction rates based on the literature search. Several BMPs reflected moderate to high capabilities for reducing annual runoff volume. Others – including filtering, wet swales, wet ponds, and stormwater wetlands -- were found to have a negligible affect on runoff volumes, and were not assigned runoff reduction rates.

Table 6. Runoff Reduction for various BMPs (from Table 2)

Practice	**RR (%)**
Green Roof	*45 to 60*
Rooftop Disconnection	*25 to 50*
Raintanks and Cisterns	*40*
Permeable Pavement	*45 to 75*
Grass Channel	*10 to 20*
Bioretention	*40 to 80*
Dry Swale	*40 to 60*
Wet Swale	*0*
Infiltration	*50 to 90*
ED Pond	*0 to 15*
Soil Amendments	*50 to 75*
Sheetflow to Open Space	*50 to 75*
Filtering Practice	*0*
Constructed Wetland	*0*
Wet Pond	*0*
Range of values is for Level 1 and Level 2 designs – see Section 9 & Appendix D	

Runoff Reduction data for several practices were limited, so some of the values are considered provisional. Documentation for the recommended Runoff Reduction rates can be found in **Appendix B**. Practice eligibility for the range of Runoff Reduction rates is included in **Appendix E**.

8. POLLUTANT REMOVAL PRACTICES

Pollution removal occurs through a variety of mechanisms, including filtering, biological uptake, adsorption, and settling. There is wide variability in the ability of BMPs to remove nutrients through these mechanisms.

Some of the studies in the National Pollutant Removal Performance Database (version 3; CWP, 2007) reported EMC-based pollutant removal rates. Reporting EMC-based efficiencies can help to isolate the pollutant removal mechanisms of a BMP and offers an approach to assessing BMP performance apart from Runoff Reduction. In this regard, the Runoff Reduction function of a BMP can be seen as the "first line of defense" and the Pollutant Removal mechanisms help to treat the remaining runoff that "passes through" the BMP.

The literature search was expanded to refine EMC-based pollutant removal efficiencies. Studies reporting EMCs were isolated from the NPRPD. The search was then broadened to include more recent studies and studies not included the NPRPD. **Table 7** summarizes the EMC pollutant removal rates of TP and TN for various BMPs. A range of values represents the median and 75th percentile pollutant removal rates. **Appendix C** provides further documentation on the methodology and recommended Pollutant Removal rates.

Table 7. EMC based pollutant removal for various BMPs (from Tables 2 and 3)

Practice	Total Phosphorus PR (%)	Total Nitrogen PR (%)
Green Roof	*0*	*0*
Disconnection	*0*	*0*
Raintanks and Cisterns	*0*	*0*
Permeable Pavement	*25*	*25*
Grass Channel	*15*	*20*
Bioretention	*25 to 50*	*40 to 60*
Dry Swale	*20 to 40*	*25 to 35*
Wet Swale	*20 to 40*	*25 to 35*
Infiltration	*25*	*15*
ED Pond	*15*	*10*
Soil Amendments	*0*	*0*
Sheetflow to Open Space	*0*	*0*
Filtering Practice	*60 to 65*	*30 to 45*
Constructed Wetland	*50 to 75*	*25 to 55*
Wet Pond	*50 to 75*	*30 to 40*

Range of values is for Level 1 and Level 2 designs – see Section 9 & Appendix D

Soil Map—Prince William County, Virginia

Map Scale: 1:1,800 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

Prince William County, Virginia

CaC2—Caroline fine sandy loam, 6 to 10 percent slopes, eroded

Map Unit Setting

Mean annual precipitation: 31 to 52 inches
Mean annual air temperature: 48 to 66 degrees F
Frost-free period: 210 to 230 days

Map Unit Composition

Caroline and similar soils: 85 percent

Description of Caroline

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

H1 - 0 to 9 inches: very strongly acid, fine sandy loam
H2 - 9 to 65 inches: very strongly acid, clay
H3 - 65 to 99 inches: very strongly acid, clay loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: About 42 to 60 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

Data Source Information

Soil Survey Area: Prince William County, Virginia
Survey Area Data: Version 12, Dec 13, 2013

Prince William County, Virginia

AwD—Aura-Galestown-Sassafras complex, 6 to 15 percent slopes

Map Unit Setting

Elevation: 10 to 330 feet
Mean annual precipitation: 31 to 52 inches
Mean annual air temperature: 48 to 66 degrees F
Frost-free period: 210 to 230 days

Map Unit Composition

Aura and similar soils: 35 percent
Galestown and similar soils: 25 percent
Sassafras and similar soils: 20 percent

Description of Aura

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium

Typical profile

H1 - 0 to 12 inches: extremely acid, gravelly fine sandy loam
H2 - 12 to 84 inches: extremely acid, gravelly sandy clay loam
H3 - 84 to 99 inches: extremely acid, gravelly sandy loam

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A

Description of Galestown

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex

VIRGINIA DCR STORMWATER DESIGN SPECIFICATION No. 4

SOIL COMPOST AMENDMENT

VERSION 1.8
March 1, 2011

SECTION 1: DESCRIPTION

Soil restoration is an Environmental Site Design (ESD) practice applied after construction, to deeply till compacted soils and restore their porosity by amending them with compost. These soil amendments can reduce the generation of runoff from compacted urban lawns and may also be used to enhance the runoff reduction performance of downspout disconnections, grass channels, and filter strips (**Table 4.1**).

SECTION 2: PERFORMANCE

Table 4.1: Stormwater Functions of Soil Compost Amendments [1]

Stormwater Function	HSG Soils A and B		HSG Soils C and D	
	No CA [2]	With CA	No CA	With CA
Annual Runoff Volume Reduction (RR)				
Simple Rooftop Disconnection	50%	NA [3]	25%	50%
Filter Strip	50%	NA [3]	NA [4]	50%
Grass Channel	20%	NA [3]	10%	30%
Total Phosphorus (TP) EMC Reduction [4] by BMP Treatment Practice	0		0	
Total Phosphorus (TP) Mass Load Removal	Same as for RR (above)		Same as for RR (above)	
Total Nitrogen (TN) EMC Reduction by BMP Treatment Practice	0		0	
Total Nitrogen (TN) Mass Load Removal	Same as for RR (above)		Same as for RR (above)	
Channel Protection & Flood Mitigation	**Partial.** Designers can use the RRM spreadsheet to adjust the curve number for each design storm for the contributing drainage area, based on annual runoff volume reduction achieved.			

[1] CWP and CSN (2008), CWP (2007)

[2] CA = Compost Amended Soils, see Stormwater Design Specification No. 4.

[3] Compost amendments are generally not applicable for A and B soils, although it may be advisable to incorporate them on mass-graded B soils to maintain runoff reduction rates.

[4] Filter strips in HSG C and D should use composted amended soils to enhance runoff reduction capabilities. See Stormwater Design Specification No. 2: Sheetflow to Vegetated Filter Strip or Conserved Open Space.

SECTION 3: DESIGN TABLE

Not applicable.

SECTION 4: TYPICAL DETAILS

Not applicable.

SECTION 5: PHYSICAL FEASIBILITY & DESIGN APPLICATIONS

Compost amended soils are suitable for any pervious area where soils have been or will be compacted by the grading and construction process. They are particularly well suited when existing soils have low infiltration rates (HSG C and D) and when the pervious area will be used to filter runoff (downspout disconnections and grass channels). The area or strip of amended soils should be hydraulically connected to the stormwater conveyance system. Soil restoration is recommended for sites that will experience mass grading of more than a foot of cut and fill across the site.

The second soil test is taken at least one week after the compost has been incorporated into the soils. This soil analysis should be conducted by a reputable laboratory to determine whether any further nutritional requirements, pH adjustment, and organic matter adjustments are necessary for plant growth. This soil analysis should be done in conjunction with the final construction inspection to ensure tilling or subsoiling has achieved design depths.

6.3. Runoff Volume Reduction

The runoff volume reduction achieved by soil restoration depends on the site application and the pre-construction hydrologic soil group. When compost amendments are used simply to reduce runoff volume from compacted lawns, the lower runoff coefficients shown in **Table 4.2** can be used to lower the total treatment volume for the site as a whole. If the soil restoration area accepts runoff from adjacent impervious areas, the higher runoff reduction rates outlined in **Table 4.1** above may be used for the indicated practices.

Table 4.2. Runoff Coefficients for Use for Different Pervious Areas

Hydrologic Soil Group	Undisturbed Soils [1]	Disturbed Soils [2]	Restored and Reforested [3]
A	0.02	0.15	0.02
B	0.03	0.20	0.03
C	0.04	0.22	0.04
D	0.05	0.25	0.05

Notes:
[1] Portions of a new development site, outside the limits of disturbance, which are not graded and do not receive construction traffic.
[2] Previously developed sites, and any site area inside the limits of disturbance as shown on the E&S Control plan.
[3] Areas with restored soils that are also reforested to achieve a minimum 75% forest canopy

6.4. Determining Depth of Compost Incorporation

The depth of compost amendment is based on the relationship of the surface area of the soil amendment to the contributing area of impervious cover that it receives. **Table 4.3** presents some general guidance derived from soil modeling by Holman-Dodds (2004) that evaluates the required depth to which compost must be incorporated. Some adjustments to the recommended incorporation depth were made to reflect alternative recommendations of Roa Espinosa (2006), Balousek (2003), Chollak and Rosenfeld (1998) and others.

Table 9.3. Bioretention Filter and Basin Design Criteria

Level 1 Design (RR 40 TP: 25)	Level 2 Design (RR: 80 TP: 50)
Sizing (**Section 6.1**): Surface Area (sq. ft.) = (T_v – the volume reduced by an upstream BMP) / Storage Depth [1]	Sizing (**Section 6.1**): Surface Area (sq. ft.) = [(1.25)(T_v) – the volume reduced by an upstream BMP] /Storage Depth [1]
Recommended maximum contributing drainage area = 2.5 acres	
Maximum Ponding Depth = 6 to 12 inches [2]	Maximum Ponding Depth = 6 to 12 inches [2]
Filter Media Depth minimum = 24 inches; recommended maximum = 6 feet	Filter Media Depth minimum = 36 inches; recommended maximum = 6 feet
Media & Surface Cover (**Section 6.6**) = supplied by vendor; tested for acceptable phosphorus index (P-Index) of between 10 and 30, ***OR*** Between 7 and 21 mg/kg of P in the soil media	
Sub-soil Testing (**Section 6.2**): not needed if an underdrain used; Min infiltration rate > 1/2 inch/hour in order to remove the underdrain requirement.	Sub-soil Testing (**Section 6.2**): one per 1,000 sq. ft. of filter surface; Min infiltration rate > 1/2 inch/hour in order to remove the underdrain requirement.
Underdrain (**Section 6.7**) = Schedule 40 PVC with clean-outs	Underdrain & Underground Storage Layer (**Section 6.7**) = Schedule 40 PVC with clean outs, and a minimum 12-inch stone sump below the invert; ***OR***, none, if soil infiltration requirements are met (**Section 6.2**)
Inflow: sheetflow, curb cuts, trench drains, concentrated flow, or the equivalent	
Geometry (**Section 6.3**): Length of shortest flow path/Overall length = 0.3; ***OR***, other design methods used to prevent short-circuiting; a one-cell design (not including the pre-treatment cell).	Geometry (**Section 6.3**): Length of shortest flow path/Overall length = 0.8; ***OR***, other design methods used to prevent short-circuiting; a two-cell design (not including the pretreatment cell).
Pre-treatment (**Section 6.4**): a pretreatment cell, grass filter strip, gravel diaphragm, gravel flow spreader, or another approved (manufactured) pre-treatment structure.	Pre-treatment (**Section 6.4**): a pretreatment cell *plus* one of the following: a grass filter strip, gravel diaphragm, gravel flow spreader, or another approved (manufactured) pre-treatment structure.
Conveyance & Overflow (**Section 6.5**)	Conveyance & Overflow (**Section 6.5**)
Planting Plan (**Section 6.8**): a planting template to include turf, herbaceous vegetation, shrubs, and/or trees to achieve surface area coverage of at least 75% within 2 years.	Planting Plan (**Section 6.8**): a planting template to include turf, herbaceous vegetation, shrubs, and/or trees to achieve surface area coverage of at least 90% within 2 years. If using turf, must combine with other types of vegetation [1].
Building Setbacks [3] (**Section 5**): 0 to 0.5 acre CDA = 10 feet if down-gradient from building or level (coastal plain); 50 feet if up-gradient. 0.5 to 2.5 acre CDA = 25 feet if down-gradient from building or level (coastal plain); 100 feet if up-gradient. (Refer to additional setback criteria in **Section 5**)	
Deeded Maintenance O&M Plan (**Section 8**)	
[1] Storage depth is the sum of the Void Ratio (V_r) of the soil media and gravel layers multiplied by their respective depths, plus the surface ponding depth. Refer to **Section 6.1**. [2] A ponding depth of 6 inches is preferred. Ponding depths greater than 6 inches will require a specific planting plan to ensure appropriate plant selection (**Section 6.8**). [3] These are recommendations for simple building foundations. If an in-ground basement or other special conditions exist, the design should be reviewed by a licensed engineer. Also, a special footing or drainage design may be used to justify a reduction of the setbacks noted above.	

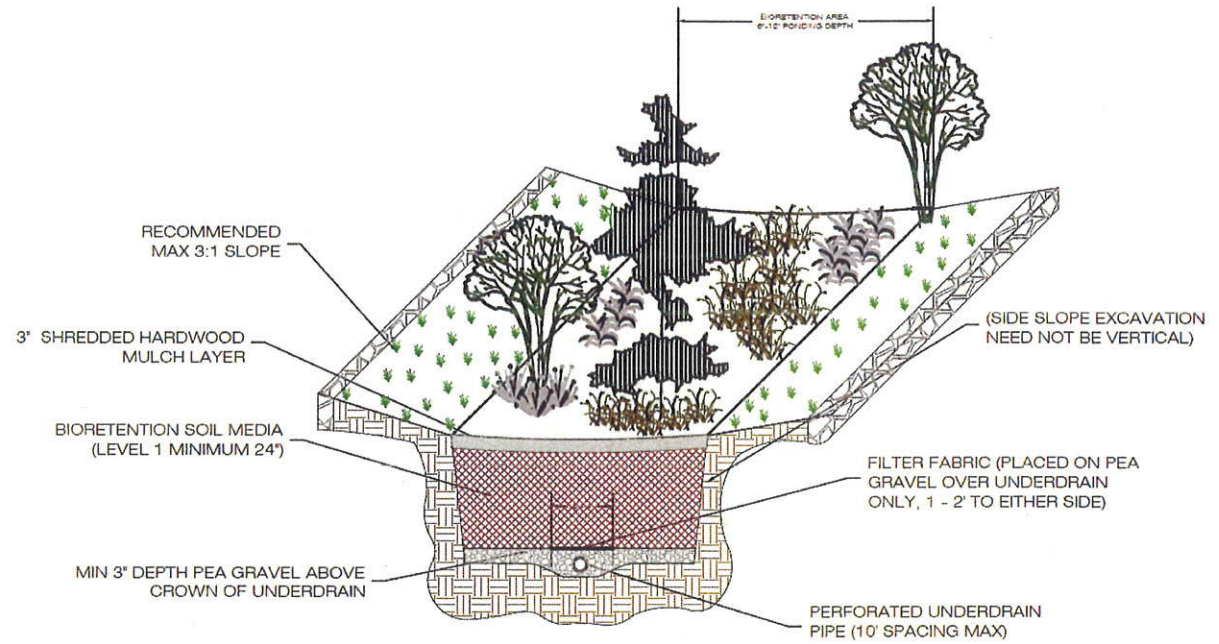


Figure 9.4a: Typical Detail of Bioretention Basin Level 1 Design

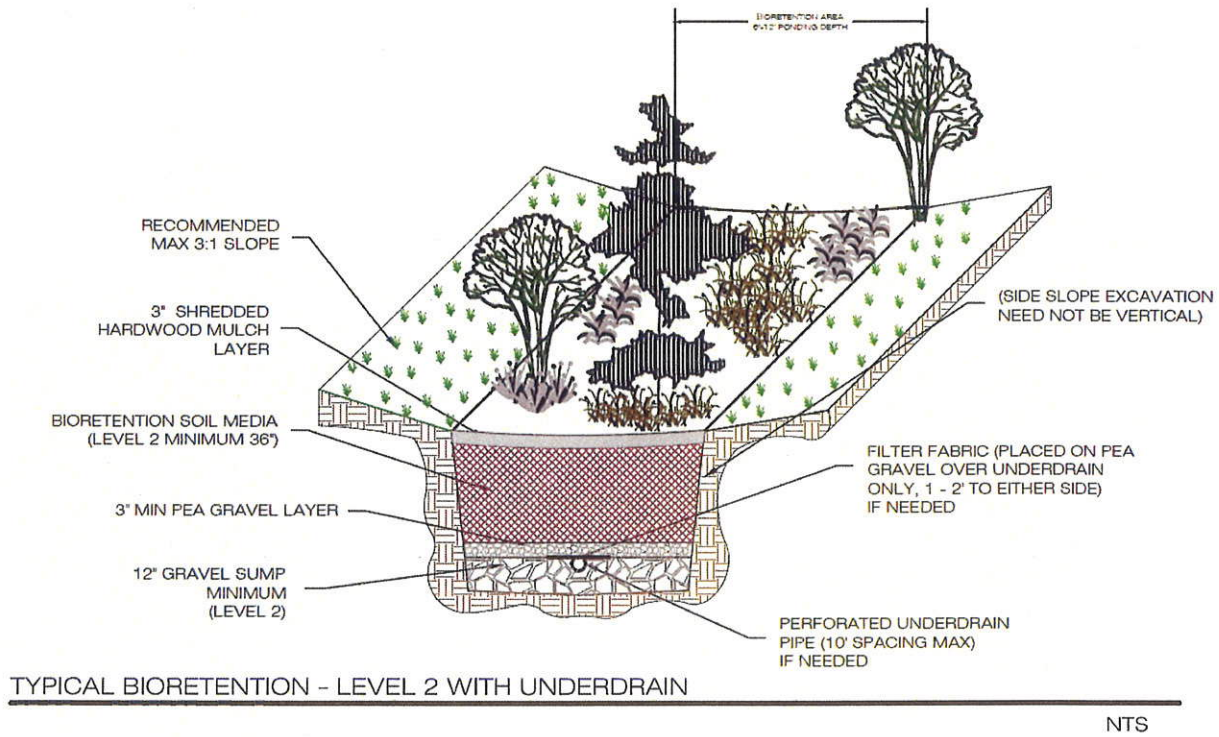


Figure 9.4b: Typical Detail of Bioretention Basin Level 2 Design

Quantico MS/HS
SWM

Stantec

EISA Section 438

Project Area = 13.3 Ac

Predeveloped Condition

2.4 Ac A - Soil Woods 10.9 C - Soil Woods

Composite RCN = $\frac{(2.4)(25) + (10.9)(70)}{13.3}$ = 61.9 Say 62

From Table1 95th Percentile Storm = 1.7"

From TR-55 Q_a = 0.03"

Total Volume of runoff = $\frac{(0.03")(13.3\ Ac)(43560\ ft^2/Ac)}{12\ in/ft}$ = 1448 ft^3

Proposed Condition

5.3 Ac Imp 8.0 Ac grass (1.8 Ac A, 6.2 Ac C)

Composite RCN = $\frac{(5.3)(98) + (1.8)(39) + (6.2)(74)}{13.3}$ = 78.8 Say 79

From TR-55 Q_a = 0.36"

Total Volume of runoff = $\frac{(0.36\ in)(13.3\ Ac)(43560\ ft^2/Ac)}{12\ in/ft}$ = 17,380 ft^3

Difference between Prop & Pred = 17,380 − 1448 = 15,932 ft^3

Designed by: Randl. Postell 6/13/2014 Checked by:

Quantico MS/HS
SWM

Stantec

EISA Section 438

Prop Cond - Check runoff from imp areas only

5.3 Ac Imp RCN = 98

From TR-20 Q_a = 1.48"

Total Volume of Runoff = $\frac{(1.48\text{in})(5.3\text{Ac})(43560\text{ ft}^2/\text{Ac})}{12\text{ in/ft}}$ = 28,474 ft^3

Difference between Prop & Pred = 28,474 - 1448 = 27,026 ft^3

∴ Total Runoff Reduction Required = 27,026 ft^3

Designed by: Randi L. Postell 6/13/2014 Checked by:

Quantico MS/HS
SWM

Stantec

EISA Section 438

Reqd LID Treatment Volume for Section 438 = 27,026 ft^3

Provide Bio Af = 16,000 ft^2

Mostly C-Soil Infiltration = 3.43 in/24 hrs

Volume infiltrated in first 24 hours = 4573 ft^3

Evapo transpiration = (.20)(4)(16000) = 12,800 ft^3

Shortfall = 27,026 - 4573 - 12,800 = 9653 ft^3

Provide 1.5' gravel Storage below underdrain

Volume = (1.5)(.40)(16000) = 9600 ft^3

$\frac{(1.5)(.40)(12)}{3.43}$ = 2.1 days To fully infiltrate

If Soils are more infiltratible below the surface

Infiltration = 9.743 in/24 hrs

Volume infiltrated in first 24 hours = 12,991 ft^3

Shortfall = 27,026 - 12,991 - 12,800 = 1235 ft^3

Provide 0.25' of gravel storage below underdrain

Designed by: Rand L. Postell 6/13/2014 Checked by:

Option 1 was identified because it is a simplified approach to meet the intent of Section 438 in contrast to Option 2 which requires the designer to conduct a hydrologic analysis of the site based on site-specific conditions.

Table 1. Example 95th Percentile Storm Events for Select U.S. Cities (adapted from Hirschman and Kosco, 2008).

City	95th Percentile Event Rainfall Total (in)	City	95th Percentile Event Rainfall Total (in)
Atlanta, GA	1.8	Kansas City, MO	1.7
Baltimore, MD	1.6	Knoxville, TN	1.5
Boston, MA	1.5	Louisville, KY	1.5
Buffalo, NY	1.1	Minneapolis, MN	1.4
Burlington, VT	1.1	New York, NY	1.7
Charleston, WV	1.2	Salt Lake City, UT	0.8
Coeur D'Alene, ID	0.7	Phoenix, AZ	1.0
Cincinnati, OH	1.5	Portland, OR	1.0
Columbus, OH	1.3	Seattle, WA	1.6
Concord, NH	1.3	Washington, DC	1.7
Denver, CO	1.1		

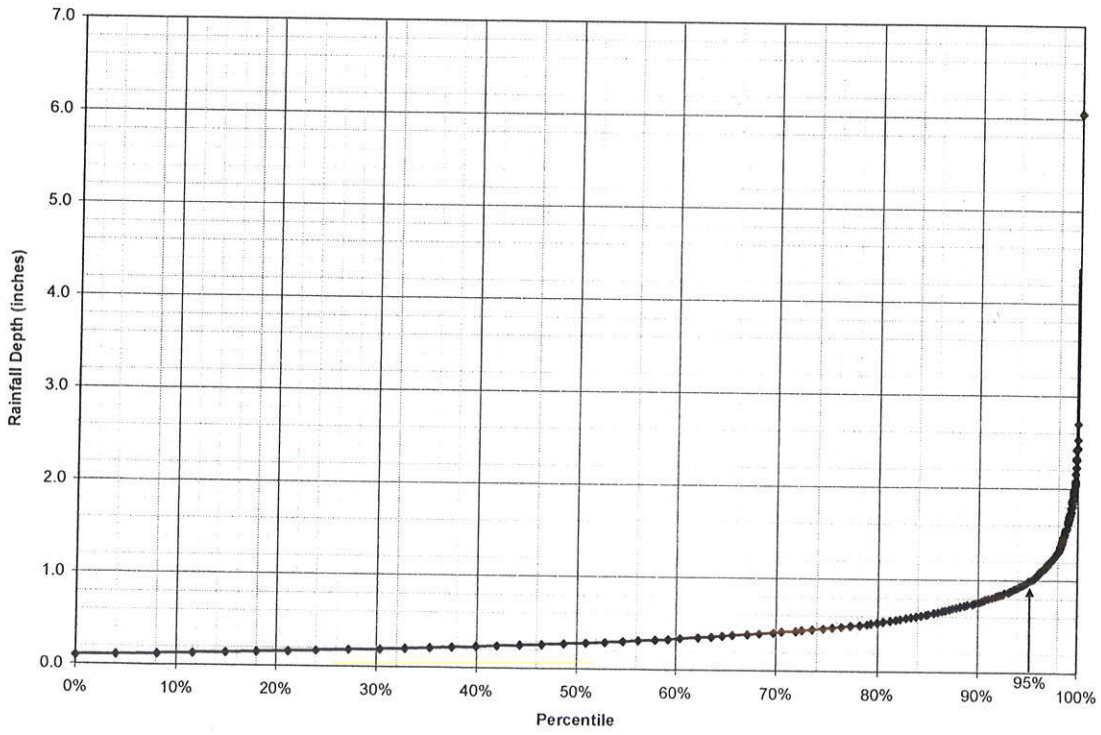


Figure 7. Rainfall Frequency Spectrum showing the 95th percentile rainfall event for Portland, OR (~1.0 inches)

RAINFALL-RUNOFF DEPTHS FOR SELECTED RUNOFF CURVE NUMBERS

CURVE 62

Inches \ Tenths	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0										
1						0.01	0.02	0.03	0.05	0.07
2	0.09	0.11	0.13	0.16	0.19	0.22	0.25	0.28	0.32	0.36
3	0.40	0.44	0.48	0.52	0.56	0.61	0.66	0.71	0.76	0.81
4	0.86	0.91	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.38
5	1.44	1.50	1.56	1.62	1.68	1.74	1.81	1.88	1.95	2.02
6	2.09	2.16	2.23	2.30	2.37	2.44	2.51	2.58	2.65	2.72
7	2.80	2.87	2.94	3.02	3.09	3.17	3.24	3.32	3.40	3.48
8	3.55	3.63	3.71	3.79	3.86	3.94	4.02	4.10	4.18	4.26
9	4.34	4.42	4.50	4.59	4.67	4.75	4.83	4.91	5.00	5.08
10	5.16	5.25	5.33	5.41	5.50	5.58	5.66	5.75	5.83	5.92
11	6.00	6.09	6.17	6.26	6.34	6.43	6.52	6.60	6.69	6.77
12	6.86	6.95	7.04	7.13	7.21	7.30	7.39	7.48	7.56	7.65

CURVE 63

1						0.02	0.03	0.04	0.06	0.08
2	0.10	0.12	0.15	0.18	0.21	0.25	0.28	0.32	0.35	0.39
3	0.43	0.47	0.52	0.57	0.61	0.66	0.71	0.76	0.81	0.86
4	0.92	0.98	[illegible]							
5	1.51	1.58	1.64	1.70	1.76	1.83	1.90	1.97	2.04	2.11
6	2.18	2.25	2.32	2.39	2.47	2.54	2.61	2.68	2.76	2.83
7	2.91	2.98	3.06	3.13	3.21	3.28	3.36	3.44	3.52	3.59
8	3.67	3.75	3.83	3.91	3.99	4.07	4.15	4.23	4.31	4.39
9	4.48	4.56	4.64	4.72	4.80	4.89	4.97	5.05	5.14	5.22
10	5.30	5.39	5.47	5.56	5.64	5.73	5.81	5.90	5.98	6.07
11	6.15	6.24	6.33	6.41	6.50	6.59	6.68	6.76	6.84	6.93
12	7.02	7.11	7.20	7.29	7.38	7.47	7.55	7.64	7.73	7.82

CURVE 64

1	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.05	0.07	0.09
2	0.11	0.14	0.17	0.20	0.23	0.26	0.30	0.34	0.38	0.42
3	0.47	0.51	0.56	0.60	0.65	0.70	0.75	0.80	0.85	0.91
4	0.97	1.03	1.09	1.15	1.21	1.26	1.32	1.38	1.45	1.51
5	1.58	1.64	1.71	1.77	1.84	1.91	1.98	2.05	2.12	2.19
6	2.26	2.33	2.40	2.48	2.55	2.62	2.70	2.77	2.85	2.92
7	3.00	3.07	3.15	3.23	3.30	3.38	3.46	3.54	3.62	3.69
8	3.77	3.85	3.93	4.01	4.09	4.18	4.26	4.34	4.42	4.50
9	4.59	4.67	4.75	4.84	4.92	5.00	5.09	5.17	5.26	5.34
10	5.43	5.51	5.59	5.68	5.76	5.85	5.94	6.02	6.11	6.20
11	6.28	6.37	6.46	6.55	6.64	6.72	6.81	6.90	6.99	7.07
12	7.16	7.25	7.34	7.43	7.52	7.61	7.70	7.78	7.87	7.96

Exhibit 2-7A

RAINFALL-RUNOFF DEPTHS FOR SELECTED RUNOFF CURVE NUMBERS

CURVE 77

Inches \ Tenths	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03
1	0.05	0.07	0.10	0.14	0.18	0.22	0.26	0.30	0.34	0.39
2	0.45	0.50	0.56	0.62	0.68	0.74	0.80	0.86	0.93	1.00
3	1.07	1.14	1.21	1.28	1.35	1.43	1.50	1.57	1.65	1.73
4	1.91	1.89	1.97	2.05	2.13	2.21	2.29	2.37	2.45	2.53
5	2.62	2.70	2.79	2.87	2.96	3.04	3.13	3.22	3.30	3.39
6	3.48	3.56	3.65	3.74	3.83	3.92	4.00	4.09	4.18	4.27
7	4.36	4.45	4.54	4.63	4.72	4.81	4.90	5.00	5.09	5.18
8	5.27	5.36	5.45	5.55	5.64	5.73	5.82	5.92	6.01	6.10
9	6.19	6.29	6.38	6.47	6.57	6.66	6.76	6.85	6.94	7.04
10	7.13	7.23	7.32	7.42	7.51	7.60	7.70	7.79	7.89	7.98
11	8.08	8.18	8.27	8.37	8.46	8.55	8.65	8.75	8.84	8.94
12	9.03	9.13	9.23	9.32	9.42	9.51	9.61	9.71	9.81	9.90

CURVE 78

0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03
1	0.06	0.09	0.12	0.15	0.19	0.23	0.27	0.32	0.37	0.42
2	0.48	0.54	0.60	0.66	0.72	0.79	0.86	0.93	0.99	1.06
3	1.13	1.20	1.27	1.35	1.43	1.50	1.58	1.65	1.73	1.81
4	1.89	1.97	2.05	2.13	2.22	2.30	2.38	2.46	2.54	2.63
5	2.72	2.81	2.89	2.98	3.06	3.15	3.24	3.32	3.41	3.50
6	3.59	3.67	3.76	3.85	3.94	4.03	4.12	4.22	4.31	4.40
7	4.48	4.58	4.67	4.76	4.85	4.94	5.03	5.12	5.22	5.31
8	5.40	5.49	5.58	5.67	5.77	5.86	5.95	6.05	6.14	6.24
9	6.33	6.43	6.52	6.61	6.71	6.80	6.90	6.99	7.09	7.18
10	7.27	7.37	7.46	7.56	7.65	7.75	7.84	7.94	8.04	8.13
11	8.23	8.33	8.42	8.52	8.61	8.71	8.80	8.90	8.99	9.09
12	9.19	9.28	9.37	9.47	9.56	9.66	9.76	9.86	9.95	10.05

CURVE 79

0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.05
1	0.07	0.10	0.13	0.17	0.21	0.26	0.31	0.36	0.41	0.46
2	0.52	0.58	0.64	0.70	0.77	0.84	0.91	0.98	1.05	1.12
3	1.19	1.26	1.34	1.42	1.49	1.56	1.64	1.72	1.80	1.88
4	1.96	2.04	2.13	2.21	2.29	2.38	2.46	2.55	2.63	2.72
5	2.80	2.89	2.98	3.07	3.15	3.24	3.32	3.41	3.50	3.59
6	3.68	3.77	3.86	3.95	4.04	4.13	4.22	4.31	4.40	4.49
7	4.58	4.68	4.77	4.86	4.95	5.04	5.13	5.23	5.32	5.42
8	5.51	5.60	5.68	5.78	5.88	5.98	6.07	6.16	6.26	6.35
9	6.45	6.54	6.63	6.73	6.82	6.92	7.01	7.11	7.20	7.30
10	7.39	7.49	7.58	7.68	7.77	7.87	7.97	8.06	8.16	8.25
11	8.35	8.44	8.54	8.64	8.74	8.83	8.92	9.02	9.12	9.22
12	9.31	9.41	9.50	9.60	9.70	9.79	9.89	9.98	10.08	10.18

Exhibit 2-7A

2-50.14

RAINFALL-RUNOFF DEPTHS FOR SELECTED RUNOFF CURVE NUMBERS

Inches \ Tenths	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.00	0.01	0.07	0.15	0.23	0.32	0.41	0.51	0.60	0.69
1	0.79	0.89	0.99	1.09	1.19	1.28	1.38	1.48	1.58	1.68
2	1.78	1.88	1.98	2.08	2.18	2.27	2.37	2.47	2.57	2.67
3	2.77	2.87	2.97	3.07	3.17	3.27	3.37	3.47	3.57	3.67
4	3.77	3.87	3.97	4.07	4.17	4.27	4.37	4.47	4.57	4.67
5	4.77	4.87	4.97	5.07	5.17	5.27	5.37	5.47	5.57	5.67
6	5.77	5.87	5.97	6.07	6.17	6.27	6.37	6.47	6.57	6.67
7	6.77	6.87	6.98	7.07	7.17	7.27	7.37	7.47	7.57	7.67
8	7.76	7.86	7.96	8.06	8.16	8.26	8.36	8.46	8.56	8.66
9	8.76	8.86	8.96	9.06	9.16	9.26	9.36	9.46	9.56	9.66
10	9.76	9.86	9.96	10.06	10.16	10.26	10.36	10.46	10.56	10.66
11	10.76	10.86	10.96	11.06	11.16	11.26	11.36	11.46	11.56	11.66
12	11.76	11.86	11.96	12.06	12.16	12.26	12.36	12.46	12.56	12.66

CURVE
98

Exhibit 2-7A

REFERENCE		
SCS TR-16	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	RTSC-NE-ENG. 220 SHEET 14 OF 14

					B	C	D
45	22.5	0.3	0.1	0.02	0.15	0.05	0.01
46	23	0.3	0.1	0.02	0.15	0.05	0.01
47	23.5	0.3	0.1	0.02	0.15	0.05	0.01
48	24	0.3	0.1	0.02	0.15	0.05	0.01
Sum: Infiltration loss during 24 hours [c]					9.743	3.430	0.769

[a] Calculated infiltration rate at each time by Equation (2)
[b] Calculated infiltration volume from the previous time to the current time by Equation (3)
[c] Integrated infiltration volume for 24 hours with a half hour Δt by Equation (4)

Based on the above calculation, 24-hr infiltration losses for pervious areas and bioretention areas were modeled as follows:

- Soil Group B: 9.743 inches
- Soil Group C: ~~4.430~~ inches 3.430
- Soil Group D: 0.769 inches

Infiltrations of underlying soils at paver blocks were modeled conservatively by applying the minimum infiltration rate for each soil type (Infiltration loss = f_{min} · 24) because the soils under the paver blocks may require or be subjected to some compaction for engineering stability. The estimated infiltration losses for each soil are presented below:

- Soil Group B: (0.3 in/hr) · (24 hrs) = 7.2 inches
- Soil Group C: (0.1 in/hr) · (24 hrs) = 2.4 inches
- Soil Group D: (0.02 in/hr) · (24 hrs) = 0.48 inches

Design Storage of Management Practices

Bioretention

Reference	Ponding (inches)[1]	Mulch (inches)	Soil media (ft)	Soil Media Porosity	Underdrain
1	up to 12	2 - 4 (optional)	1 - 1.5	about 40%	bioretention systems utilize infiltration rather than an underdrain
2	6 - 12	2 - 3	2.5 - 4	about 40%	recommended, especially if initial testing infiltration rate < 0.52 in/hr
3	6 - 12		2 - 4		
4		2 - 3	1.5 - 4		if necessary
5	up to 6		1.5 - 2	30 - 40%	Optional
6	6 - 18	as needed	2 - 4		if necessary

1. State of New Jersey. (2004). *New Jersey Stormwater Best Management Practices Manual* www.nj.gov/dep/stormwater/tier_A/pdf/NJ_SWBMP_9.1 print.pdf.
2. Maryland Department of the Environment (MDE), (2000). *2000 Maryland Stormwater Design Manual, Volumes I & II*, prepared by the Center for Watershed Protection and the Maryland Department of the Environment, Water Management Administration, Baltimore, MD. www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/stormwater_design/index.asp.

[1] Ponding is a measure of retention capacity

Stantec

Quantico MS/HS
SWM

Check Maryland MDE Sizing

Project area = 13.3 Ac Imp Area = 5.3 Ac

I = 5.3/13.3 = 40% R_v = .410

2.4 Ac (18%) A & 10.9 Ac (72%) C Soil

Table 5.3 A-Soil P_E = 1.8" C-Soil P_E = 1.8" Use 1.8"

$$\text{Reqd } ESD_v = \frac{(1.8\text{in})(.410)(13.3\text{Ac})(43560\text{ ft}^2/\text{Ac})}{12\text{ in/ft}} = 35{,}630\text{ ft}^3$$

$$\text{Reqd Micro-bio } A_f = \frac{(35630\text{ ft}^3)}{(0.75\text{f} + (0.4)(4.0\text{ ft})} = 15{,}162\text{ ft}^2$$

Say 16,000 ft^3 Micro-bio

Designed by: Rand L. Postell 6/13/2014 Checked by:

Table 5.3 Rainfall Targets/Runoff Curve Number Reductions used for ESD

Hydrologic Soil Group A										
%I	RCN*	P_E = 1"	1.2"	1.4"	1.6"	1.8"	2.0"	2.2"	2.4"	2.6"
0%	40									
5%	43									
10%	46									
15%	48	**38**								
20%	51	40	**38**	**38**						
25%	54	41	40	39						
30%	57	42	41	39	**38**					
35%	60	44	42	40	39					
40%	61	44	42	40	39					
45%	66	48	46	41	40					
50%	69	51	48	42	41	**38**				
55%	72	54	50	42	41	39				
60%	74	57	52	44	42	40	**38**			
65%	77	61	55	47	44	42	40			
70%	80	66	61	55	50	45	40			
75%	84	71	67	62	56	48	40	**38**		
80%	86	73	70	65	60	52	44	40		
85%	89	77	74	70	65	58	49	42	**38**	
90%	92	81	78	74	70	65	58	48	42	**38**
95%	95	85	82	78	75	70	65	57	50	39
100%	98	89	86	83	80	76	72	66	59	40

Hydrologic Soil Group B										
%I	RCN*	P_E = 1"	1.2"	1.4"	1.6"	1.8"	2.0"	2.2"	2.4"	2.6"
0%	61									
5%	63									
10%	65									
15%	67	**55**								
20%	68	60	**55**	**55**						
25%	70	64	61	58						
30%	72	65	62	59	**55**					
35%	74	66	63	60	56					
40%	75	66	63	60	56					
45%	78	68	66	62	58					
50%	80	70	67	64	60					
55%	81	71	68	65	61	**55**				
60%	83	73	70	67	63	58				
65%	85	75	72	69	65	60	**55**			
70%	87	77	74	71	67	62	57			
75%	89	79	76	73	69	65	59			
80%	91	81	78	75	71	66	61			
85%	92	82	79	76	72	67	62	**55**		
90%	94	84	81	78	74	70	65	59	**55**	
95%	96	87	84	81	77	73	69	63	57	
100%	98	89	86	83	80	76	72	66	59	**55**

Cp_v Addressed (RCN = Woods in Good Condition)

RCN Applied to Cp_v Calculations

Table 5.3 Runoff Curve Number Reductions used for Environmental Site Design (continued)

Hydrologic Soil Group C										
%I	RCN*	P_E = 1"	1.2"	1.4"	1.6"	1.8"	2.0"	2.2"	2.4"	2.6"
0%	74									
5%	75									
10%	76									
15%	78									
20%	79	**70**								
25%	80	72	**70**	**70**						
30%	81	73	72	71						
35%	82	74	73	72	**70**					
40%	84	77	75	73	71					
45%	85	78	76	74	71					
50%	86	78	76	74	71					
55%	86	78	76	74	71	**70**				
60%	88	80	78	76	73	71				
65%	90	82	80	77	75	72				
70%	91	82	80	78	75	72				
75%	92	83	81	79	75	72				
80%	93	84	82	79	76	72				
85%	94	85	82	79	76	72				
90%	95	86	83	80	77	73	**70**			
95%	97	88	85	82	79	75	71			
100%	98	89	86	83	80	76	72	**70**		

Hydrologic Soil Group D										
%I	RCN*	P_E = 1"	1.2"	1.4"	1.6"	1.8"	2.0"	2.2"	2.4"	2.6"
0%	80									
5%	81									
10%	82									
15%	83									
20%	84	**77**								
25%	85	78								
30%	85	78	**77**	**77**						
35%	86	79	78	78						
40%	87	82	81	79	**77**					
45%	88	82	81	79	78					
50%	89	83	82	80	78					
55%	90	84	82	80	78					
60%	91	85	83	81	78					
65%	92	85	83	81	78					
70%	93	86	84	81	78					
75%	94	86	84	81	78					
80%	94	86	84	82	79					
85%	95	86	84	82	79					
90%	96	87	84	82	79	**77**				
95%	97	88	85	82	80	78				
100%	98	89	86	83	80	78	**77**			

Cp_v Addressed (RCN = Woods in Good Condition)

RCN Applied to Cp_v Calculations