ACTION

HOWARD COUNTY
PUBLIC SCHOOL SYSTEM

BOARD OF EDUCATION OF HOWARD COUNTY
MEETING AGENDA ITEM

TITLE: Wilde Lake Middle School Schematic Design Report **DATE:** April 10, 2014

PRESENTER(S): Mr. Bruce Gist, Director of School Construction
Mr. Michael Lahowin, Principal, TCA Architects

OVERVIEW:
The attached schematic design report describes the new replacement school for Wilde Lake Middle School. Wilde Lake Middle School opened in 1969 with an open classroom design for Grades 6 – 8. The school is a single story building with masonry exterior wall construction. The school has had one building addition and major renovation in 1975 and 1996 respectively.

This project will be an adaptation of the current middle school prototype design and will be constructed directly behind the existing school. The replacement school is a two-story building, based on the General Educational Specifications for New Howard County Middle Schools, designed to accommodate a total population of 702 students.

An extra emphasis on energy efficient systems will be incorporated into the design. It is the intent that the design and construction of the building not only achieve a LEED (Leadership in Energy and Environmental Design) “Gold” designation, but become the state and county’s first Net Zero Energy school.

The design team has worked collaboratively with the planning committee to ensure an appropriately updated building which will serve the current and future needs of the middle school program at the school.

RECOMMENDATION/FUTURE DIRECTION:
It is recommended that the schematic design report for Wilde Lake Middle School be approved as submitted.

Submitted by:

Bruce Gist
Director, School Construction

Approval/ Concurrence:

Renee A. Foose, Ed.D.
Superintendent

Susan C. Mascaro
Chief of Staff

Ken Roey
Chief Facilities Officer

tca | architects

Annapolis, Maryland

Aerial view of schematic phase net zero energy prototype middle school

Schematic Design Report

(NEW) WILDE LAKE MIDDLE SCHOOL

Howard County Public School System

tca | architects

Annapolis, Maryland 410-841-6205

April 10, 2014

Specializing in the design of educational facilities

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Schematic Design Report

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Planning Advisory Committee

Planning Committee

Joyce Agness	HCPSS, Instructional Facilitator, MS / Special Education
Heather Bartham	Wilde Lake Middle School, PTA President
Mike Borkoski	HCPSS, Technology Officer
Robert Coffman	HCPSS, Instructional Facilitator, Secondary Social Studies
Gary Davis	HCPSS, Construction Project Manager
Marie DeAngelis	HCPSS, Director of Elementary Curricular Programs
Frank Eastham	HCPSS, School Administration
Tonge Enoh	Wilde Lake Middle School, Student Representative
Peter Gaylord	Wilde Lake Middle School, Assistant Principal
Bruce Gist	HCPSS, Director of School Construction
Annette Grzybinski, RN	Wilde Lake Middle School, Cluster Nurse
Marcy Hersl	HCPSS, Analyst, Safety, Environment & Risk Management
Dan Keiser	HCPSS, Construction Program Manager
Lindsay Kelley	Wilde Lake Middle School, Math Instructional Support
Phil Lindberg	Wilde Lake Middle School, Parent
Wendy McNeill	Wilde Lake Middle School, Media Specialist
Dave Messick	Wilde Lake Middle School, Band Director
Ron Miller	HCPSS, Manager of Safety, Environment, & Risk Management
Dr. Eric Minus	HCPSS, Administrative Director of Middle Schools
April Motaung	Wilde Lake Middle School, G/T Resource Teacher
Tiffanie Nunley	WLMS, Instructional Team Leader, Special Eduction
Nichelle Parker	Maryland Energy Administration, Program Manager
Judith Pattik	HCPSS, Coordinator, Special Education
David Ramsay	HCPSS, Director of Transportation
Ken Roey	HCPSS, Chief Facilities Officer
Bala Srini	Maryland Energy Administration, Energy Program Consultant
Lisa Smithson	Wilde Lake Middle School, Principal
Michael Walsh	Wilde Lake Middle School, Science Teacher
Scott Washington	HCPSS, Manager of Design and Preconstruction Services
Ann Yetter	Wilde Lake Middle School, Principal Secretary
Betsy Zentz	HCPSS, Interagency Specialist

Architects

Mike Lahowin, AIA	Principal, LEED AP
Robyn Toth, AIA	Project Manager, LEED AP
Michael Smith, RA	Staff Architect, LEED AP

Design Team

ARCHITECT	TCA Architects	Annapolis, MD
CIVIL ENGINEER	Fisher, Collins & Carter, Inc.	Ellicott City, MD
STRUCTURAL ENGINEER	Johnson Engineering Assoc.	Darnestown, MD
M/E/P ENGINEER	James Posey Associates	Baltimore, MD
DAYLIGHTING ENGINEER	EMO Energy Solutions	Falls Church, VA
ROOFING CONSULTANT	Gale Associates, Inc.	Baltimore, MD
ACOUSTICAL ENGINEER	Miller, Beam & Paganelli, Inc.	Reston, VA
FOODSERVICE DESIGN	Nyikos Associates	Gaithersburg, MD
SOLAR PV ENGINEER	SepiSolar, Inc.	Sausalito, CA
CONSTRUCTION MANAGER	Oak Contracting	Towson, MD

Project Description

The new Wilde Lake Middle School will be constructed directly behind the existing Wilde Lake Middle School. This building will be an adaptation of the current prototype middle school design.

The prototype middle school plan is a two-story building design based on the “General Educational Specifications for New Howard County Middle Schools” and is designed to accommodate a population which includes 662 students in Grades 6 thru 8, plus 40 full-time equivalent special education students, for a total of 702 students.

Just as with Ellicott Mills, Folly Quarter and Thomas Viaduct Middle Schools, the first floor of this school will be level rather than stepped-down as was required by the sites of Lime Kiln and Bonnie Branch Middle Schools. This design variation was anticipated when the prototype was originally developed.

The ‘Space Analysis’ section of this report contains a complete listing of middle school spaces including all program spaces found in the existing Wilde Lake Middle School and compares the size of the room in the existing building to the actual size of each space in the new middle school design.

The Howard County Public School System (HCPSS) has elected to take advantage of the Net Zero Schools Initiative grant provided by the Maryland Energy Administration (MEA) to modify the prototype middle school design to significantly reduce energy consumption and to provide the balance of energy that needs to be generated to run the building, by way of solar photovoltaic (PV) panels located on the school’s roof. (See page 7 for more on Net Zero Energy Design.)

It is the intent that the design and construction of this new middle school achieve a Leadership in Energy and Environmental Design (LEED)‘Gold’ designation making this facility yet another ‘Green’ school for the HCPSS. The 2009 version of ‘LEED for Schools’ released by the U.S. Green Building Council (USGBC) will provide the necessary goals and requirements to obtain LEED Certification. (See page 6 for Sustainable ‘Green’ Design Goals.)

The Planning Process

In February and March 2014, the Planning Committee attended three meetings with the project architect and the HCPSS School Planning and Construction staff to review the site design and evaluate floor plan modifications that would be required to adapt the prototype middle school design (last modified for Thomas Viaduct Middle School which is currently under construction) for the new Wilde Lake Middle School.

The meetings focused on re-familiarizing the committee with the prototype floor plan and the proposed site design layout. During the course of the these meetings, the committee participated in a thorough discussion of the building layout, and contributed helpful input refining the building design. Refer to pages 15 and 17 for a summary of significant modifications to the prototype floor plans.

To assist with the cost and construction aspect of the design, the Construction Manager participated in the planning process from the beginning.

Project Facts

	Existing Wilde Lake MS	New Wilde Lake MS
Total size of site	± 15.0 acres	± 15.0 acres
On site car parking provided	68 cars	110 cars
On site bus parking provided	15 busses	15 busses
Building Square Footage	70,530 gsf	103,028 gsf
Student Capacity	506 Students	702 Students *

* 662 + 40 special education students

Project Schedule

Planning Meetings Completed	March 10, 2014
Schematic Design presented to Board of Education for Review and Approval	April 10, 2014
Design Development presented to Board of Education for Review and Approval	July 2014
Construction Documents presented to Board of Education for Review and Approval	November 2014
Project out for Bids: (1 month)	February 2015
Bids Received	March 2015
Construction Starts	May 2015
Construction Completed (27 months)	August 2017

Sustainable 'Green' Design Goals

It is the intent that the design and construction of this new school achieve a LEED 'Gold' certification, making this facility a 'Green' school.

Simply stated, a 'Green' school is a building designed to conserve energy, water, and materials, thus reducing negative impacts on human health and the environment. A 'Green' learning environment provides natural daylight, enhanced classroom acoustics, improved indoor air quality, thermal comfort, and opportunities to integrate green features into the school's curriculum.

In order to measure and compare how 'Green' a building is, the USGBC, founded in 1993, has developed industry standards with design and construction rating systems and guidelines for many different building types.

One such rating system is the USGBC 2009 Edition of "LEED for SCHOOLS" to which the design will closely adhere. Final LEED certification levels are based on the number of credit points obtained in the "LEED for SCHOOLS" rating system. The four levels of certification from lowest to highest are: Certified, Silver, Gold, and Platinum.

We have included an 'in progress' LEED scorecard below which summarizes the credits most likely obtainable at this time. As the project continues to evolve, new credits may be possible while others may become increasingly difficult to engineer or too costly to provide. At this time we have identified 78 likely credits (with an additional '11 possible credits') allowing for the loss of some and still complying with the goal of a LEED 'Gold' Building with a remote chance of achieving a 'Platinum' level.

LEED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

LEED for Schools 2009 Scorecard
(New) Wilde Lake Middle School

Sustainable Sites — Possible Credits: 17

Prereq 1	**Construction Activity Pollution Prevention**
Prereq 2	**Environmental Site Assessment**
Credit 1	**Site Selection**
Credit 2	**Development Density & Community Connectivity**
Credit 4.1	**Alternative Transportation,** Public Transportation Access
Credit 4.2	**Alternative Transportation,** Bicycle Use
Credit 4.3	**Alternative Transportation,** Low Emitting Vehicles
Credit 5.2	**Site Development,** Maximize Open Space
Credit 6.1	**Stormwater Design,** Quantity Control
Credit 6.2	**Stormwater Design,** Quality Control
Credit 7.2	**Heat Island Effect,** Roof
Credit 10	**Joint Use of Facilities**

Water Efficiency — Possible Credits: 7

Prereq 1	**Water Use Reduction,** 20% Reduction
Credit 1	**Water Efficient Landscaping,** No Potable Use or No Irrigation
Credit 3	**Water Use Reduction,** 30% Reduction

Energy and Atmosphere — Possible Credits: 30

Prereq 1	**Fundamental Commissioning of Building Energy Systems**
Prereq 2	**Minimum Energy Performance**
Prereq 3	**Fundamental Refrigerant Management**
Credit 1	**Optimize Energy Performance,** 48% energy savings
Credit 2	**On-Site Renewable Energy,** 13%
Credit 3	**Enhanced Commissioning**
Credit 5	**Measurement & Verification**

Materials and Resources — Possible Credits: 7

Prereq 1	**Storage & Collection of Recyclables**
Credit 2	**Construction Waste Management,** Divert 75% from Disposal
Credit 4	**Recycled Content,** 20%
Credit 5	**Regional Materials,** 20%
Credit 7	**Certified Wood**

Indoor Environment Quality — Possible Credits: 8

Prereq 1	**Minimum IAQ Performance**
Prereq 2	**Environmental Tobacco Smoke (ETS) Control**
Prereq 3	**Minimum Acoustical Performance**
Credit 3.1	**Construction IAQ Management Plan,** During Construction
Credit 3.2	**Construction IAQ Management Plan,** Before Occupancy
Credit 4.1	**Low-Emitting Materials,** Adhesives & Sealants
Credit 4.2	**Low-Emitting Materials,** Paints & Coatings
Credit 4.3	**Low-Emitting Materials,** Flooring Systems
Credit 4.4	**Low-Emitting Materials,** Composite Wood & Agrifiber Products
Credit 6.1	**Controllability of System,** Lighting
Credit 8.1	**Daylight & Views,** Daylight 75% of Classrooms

Innovation and Design Process — Possible Credits: 5

Credit 1.1	**Innovation in Design,** Exemplary Performance SSc5.2
Credit 1.2	**Innovation in Design,** Green Cleaning Program
Credit 1.3	**Innovation in Design,** Exemplary Performance EAc1
Credit 1.4	**Innovation in Design,** Exemplary Performance EAc2
Credit 2	**LEED Accredited Professional**

Regional Priority Credits — Possible Credits: 4

Credit 1	**Regional Priority,** SSc4.1
Credit 2	**Regional Priority,** SSc6.2
Credit 3	**Regional Priority,** EAc1
Credit 4	**Regional Priority,** EAc2

78 Total Credits (not including 11 maybe credits)

LEED for Schools 2009 Rating Scale:
Certified 40-49 Silver 50-59 Gold 60-79 Platinum 80-112

Net Zero Energy Design

A net-zero energy building generates as much energy as it uses over the course of a year, as a result of extreme building system efficiencies and on-site renewable energy sources such as solar and geo-exchange systems. The HCPSS has elected to take advantage of a $2,700,000 grant provided by the MEA to modify the prototype middle school design to significantly reduce energy consumption and then to generate the balance of energy needed to run the building on the school site. $2,200,000 is to be used for the construction of the building, while the balance of the grant monies is allocated for the design. In order for a building to achieve zero energy without over-reliance on renewable energy, the design must get all the basics of sustainable design right.

According to a comparative study and analysis of eleven net-zero energy schools titled "Zero Energy Schools - Beyond Platinum" by author/architect Paul C. Hutton, the fundamental design strategies necessary to achieve zero energy are:

1. **Building Orientation and Massing:**
   Orienting the long axis of the building within 15 degrees of east-west axis results in energy savings by reducing heating loads on the building in the summer and by facilitating daylight harvesting. Buildings should also seek to utilize multi-story construction in lieu of single floor designs. Combining optimum orientation and massing can easily yield 15 percent energy savings.

2. **Building Envelope:**
   By exceeding the current building code requirements for the thermal design of exterior walls and roofs, a well designed, constructed, and insulated building envelope can yield energy savings of 15% over minimal code compliant construction.

3. **Daylighting:**
   Electric lighting can consume as much as 20 percent of the total energy use in a building. Substituting free daylight for costly electric light during the day, can reduce electric lighting energy by half with proper light dimming controls as discussed below.

4. **Electric Lighting and Controls:**
   The first step to reduce energy use related to electric lighting is to minimize lighting power density (LPD) while maintaining comfortable interior lighting. This is accomplished through careful fixture selection and placement, as well as, automated controls such as occupancy sensors and dimming sensors in response to daylighting.

5. **HVAC and Controls:**
   The combination of space heating, ventilation, and air-conditioning consume more energy than any other single component in a school building. It was found that geothermal systems reduce energy use substantially and were utilized in all but two of the eleven net-zero energy schools in this study.

6. **Occupant Behavior and Plug Loads:**
   Occupant behavior poses a challenge to school districts attempting to predict energy usage for the designer's energy model. Nowhere is this more evident than in the effort to control potentially excessive and wasteful plug loads. When a staffer: brings in an appliance such as a small refrigerator; uses incandescent desk lamps; neglects to turn off computers and monitors each night or stores very little food in a large walk-in kitchen cooler while school is closed for the summer; these examples of occupant behaviors can substantially increase the energy use in a building over the course of a year.

7. **Renewable Energy:**
   Renewable energy sources on a school building or site are necessary in order to achieve Net Zero Energy. Photovoltaic (PV) panels, otherwise known as 'solar panels' and wind power are the two most commonly used technologies for renewable energy. It was found that PV panel systems were utilized in all but one of the eleven net-zero energy school in the study regardless of geographic, climatic, size or programmatic variation among each of the schools.

Net Zero Design for New Wilde Lake Middle School

As a result of pursuing a net-zero energy building for the already energy efficient, prototype middle school design, some of the more noteworthy modifications and required upgrades for the new Wilde Lake Middle School design are listed below:

A. The prototype geothermal system will be modified to a 'unitary' geothermal design for each room of the building while also employing energy recovery wheels within the outside air rooftop units.

B. The storage and delivery of hot water throughout the school will be redesigned to consist of four gas-fired condensing type instantaneous type water heaters distributed throughout the school. This system has an extremely high level of energy efficiency and significantly reduces or eliminates energy usage associated with conventional hot water storage and distribution systems.

C. The building lighting plan will be redesigned to minimize the lighting power density by way of careful LED light fixture selection and placement. LED lighting will also be utilized for all exterior building and site lighting. All interior lighting will utilize occupancy sensor controls as well as photocell dimming capabilities where natural daylighting exists.

D. The design will strive to maximize daylight opportunities while carefully analyzing and balancing the amount of wall and roof openings against the overall thermal building envelope goals and rooftop PV system design.

E. The building envelope will be upgraded to provide a minimum of R-25 for the exterior walls by way of increased wall insulation, higher performing triple-glazed windows and the use of thermally broken exterior doors and door frames. The roof design will remain at the current R-30 unless whole building energy modeling dictates otherwise.

F. The current roof structure design will be modified to support the additional PV panel loads of 5 lbs/s.f.

G. Food service equipment will need to be the most energy efficient equipment available. Options such as central glycol refrigeration system, thicker insulated walk-in cooler and freezer walls, use of natural gas appliances, demand defrost system for walk-in boxes, ventless heat recovery dish machine systems, and boiler-less steamers will be integrated into the design.

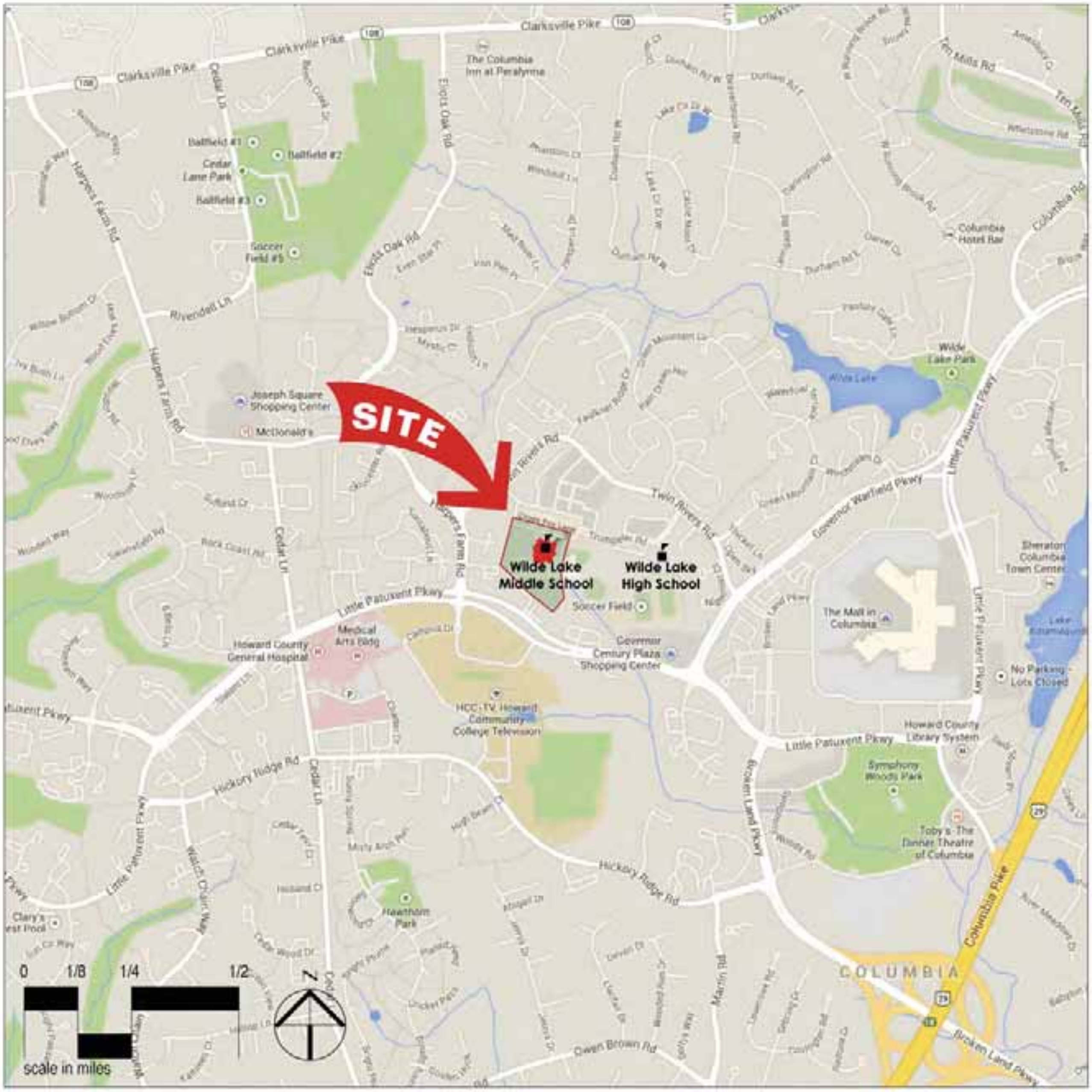
H. Design and engineering services for the construction of a PV Panel system (both rooftop and at grade) will be provided.

Energy Use Index Comparison

Existing Wilde Lake Middle School Building	66 kBTU/sf
Base Building per ASHRAE 90.1-2007/ LEED Minimum	51 kBTU/sf
Middle School No.20	38 kBTU/sf
Net Zero Goal Wilde Lake Middle School Replacement Building	**25** kBTU/sf

Energy Use Index (EUI) is the measure of the total energy consumed in cooling or heating of a building during the course of a year, expressed in thousand British thermal unit (kBtu) per square feet (sf).

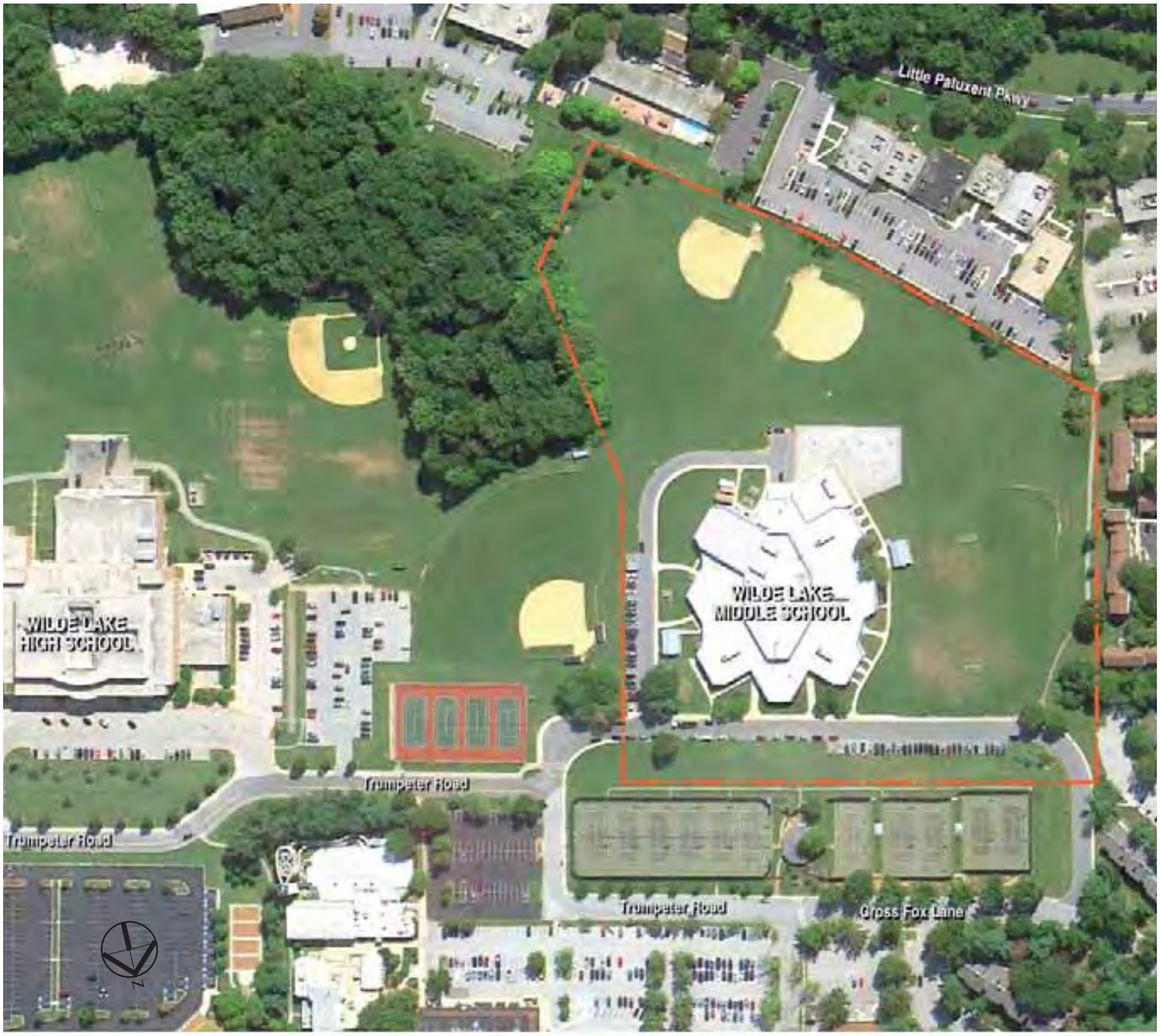
Vicinity Map



The existing Wilde Lake Middle School is located on Cross Fox Lane in Columbia, Maryland approximately one mile west of the Mall in Columbia.

Public water, sewer and natural gas serve the site.

Aerial Site Photo

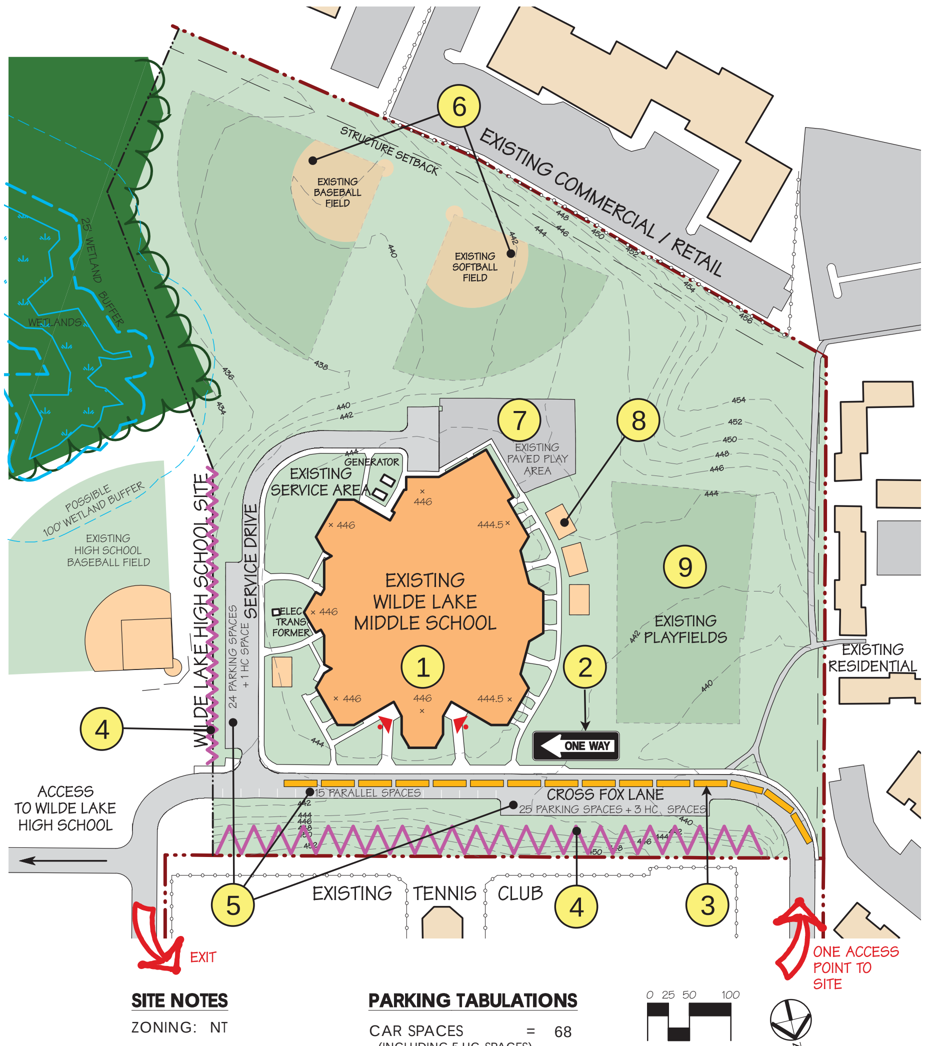


The Wilde Lake Middle School site was originally developed for the school in 1969 and is currently shared with Wilde Lake High School. The middle school site elements utilize ± 15 acres of the shared site.

Wilde Lake Middle School is bordered to the north by a tennis club, to the west by a residential community, and to the south by a commercial area and to the east by Wilde Lake High School.

Note: The aerial site plan is rotated 180° from the Vicinity Map on page 9. North is facing the bottom of the page to match the orientation of the subsequent drawings in the report.

Existing Site Plan



SITE NOTES

ZONING: NT

ACRES: ± 15 ACRES

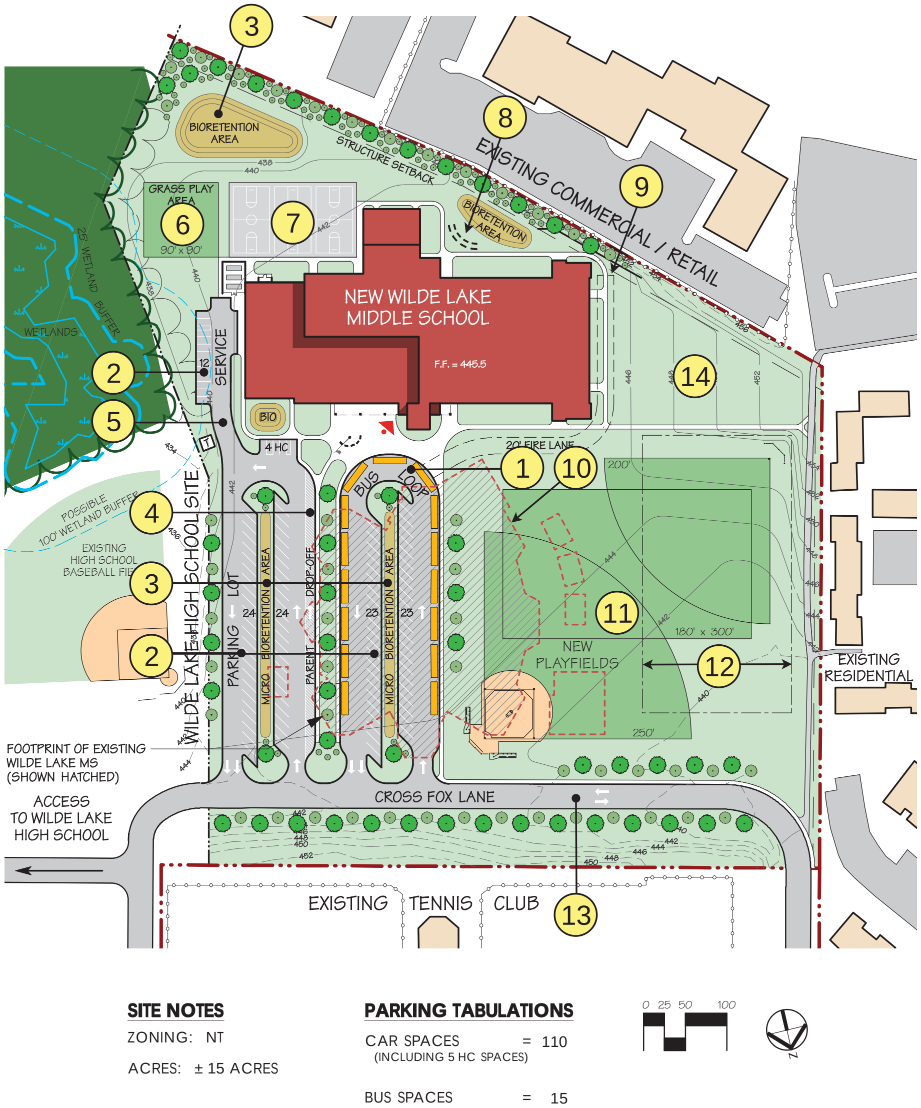
PARKING TABULATIONS

CAR SPACES (INCLUDING 5 HC SPACES)	=	68
BUS SPACES	=	15

Existing Site Conditions

1. The existing 70,000 sf Wilde Lake Middle School shares a site with Wilde Lake High School. The middle school utilizes approximately 15 acres of this combined site.
2. Cross Fox Lane is the only vehicular access to the middle school. It is a one-way road which is shared by busses and cars during student drop-off and pick-up, delivery trucks accessing the service area and cars parking for the middle school or traveling to the high school site.
3. 15 curbside bus spaces are provided on the one-way road in front of the school.
4. Steep slopes exist along the north and east property lines.
5. The number of existing staff parking spaces is inadequate. The number of parking spaces provided on the one-way road in front of the school and within the service drive totals 68 car parking spaces.
6. Existing baseball and softball fields.
7. Existing paved play area with two outdoor basketball courts.
8. Currently there are four portable classrooms on site; three to the west of the school and one on the east.
9. Existing multi-purpose play field.

Proposed Site Plan

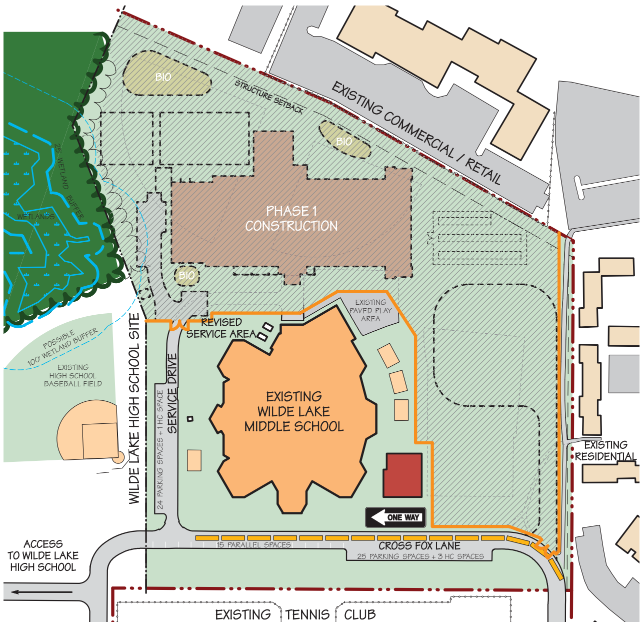


Proposed Site Features

1. Curbside bus parking for 15 busses. The bus driveway is separate from the parent drop-off driveway to reduce vehicular congestion on site.
2. 110 parking spaces have been provided in three areas in an effort to provide as much car parking on site as possible.
3. Five potential locations have been designated for stormwater management bio-retention facilities.
4. Parent drop-off and pick-up area near the main entrance with ample queuing area to eliminate back-ups on Cross Fox Lane in front of the school.
5. Service drive for access to kitchen and mechanical spaces and twelve staff parking spaces.
6. Grass play area near the cafeteria for use during student recess.
7. Paved play area with three outdoor basketball courts adjacent at gymnasium and cafeteria.
8. Outdoor classroom area located adjacent to a bio-retention area, outside the art room and easily accessible from the science labs.
9. 20' wide fire access lane.
10. Building footprint of existing Wilde Lake Middle School to be demolished and converted into parking lot, bus loop and playfields after the new Wilde Lake Middle School is occupied.
11. All playfields are accessible from the school without students crossing any vehicular roads or driveways.
12. Approximate location of new geothermal well field for heating, ventilation and air conditioning (HVAC) system, ±60,000 sf.
13. Cross Fox Lane could possibly be converted to a road with two-way traffic, which would provide two options for all vehicles entering and exiting the site.
14. Possible location of ground mounted solar photovoltaic (PV) panel field.

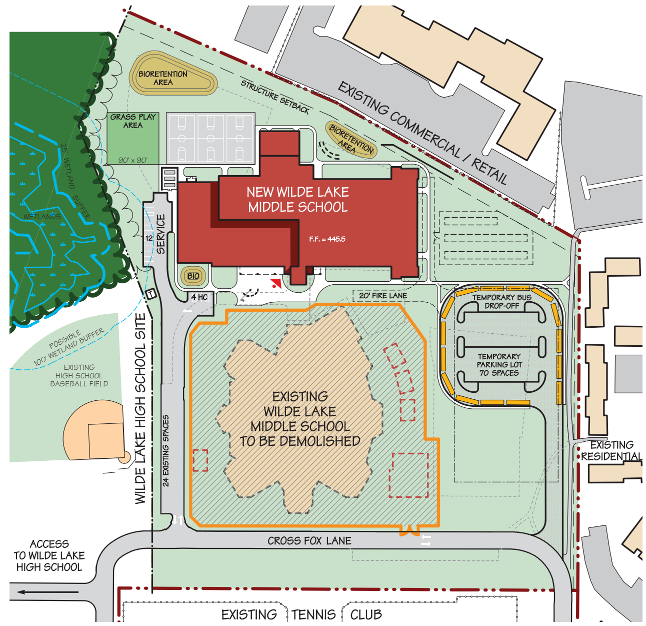
Conceptual Site Phasing Diagrams

(27 month duration)



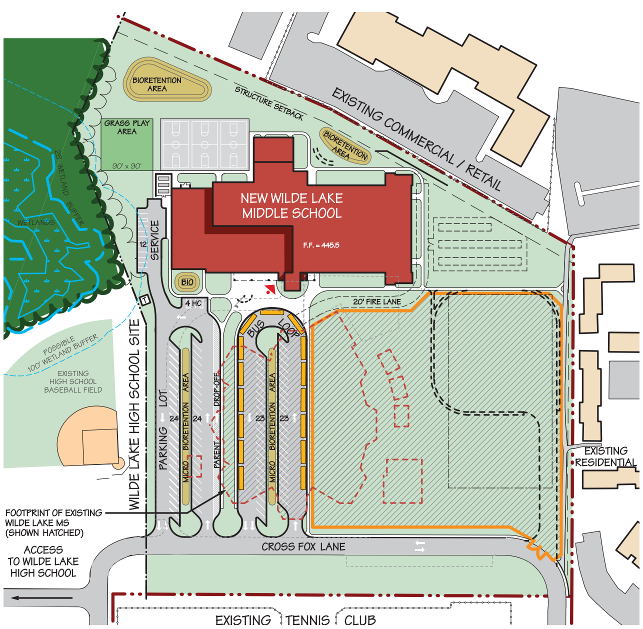
Phase 1

Relocate existing stormwater piping.
Provide temporary service area.
Drill geothermal wells.
Construct new school.
Construct temporary bus loop and parking area.
No playfields and reduced paved play area.



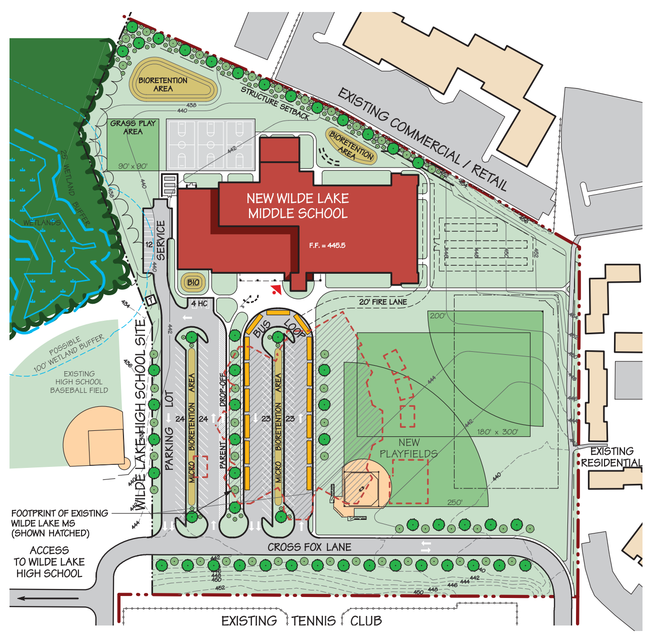
Phase 2

Demolish existing school.
Construct new bus loop and parking lot.
No playfields during this phase.



Phase 3

Remove temporary bus loop and parking area.
Install and stabilize new playfields.
No playfields during this phase.

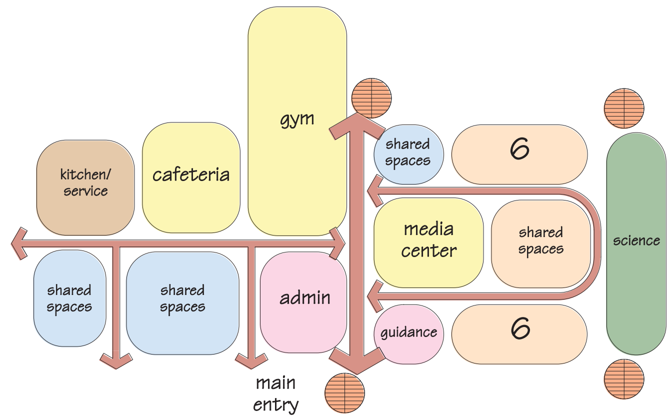


Final Site Plan

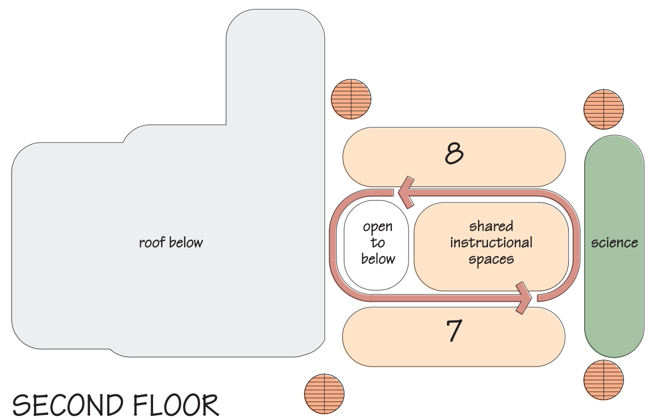
Basic Prototype Floor Plan Features

Basic features of the layout include:

- The office location has a commanding view of the main entrance and visibility of the parent drop-off areas.
- The health suite, staff lounge, and staff workroom are adjacent to the office area.
- Circulation patterns are simple and direct.
- The elevator is very close to the main entrance and near the office for supervision.
- The guidance suite is near the main entrance, easily accessible to visitors and convenient to the office, yet has a separate identity.
- Related-arts spaces are grouped together.
- The sixth-grade classrooms are separated cfrom seventh- and eighth-grade areas, and placed on the first floor to facilitate travel to related-arts spaces, cafeteria, and guidance.
- Teacher planning, special education, storage, and restrooms are easily accessible to each grade level.
- A centrally located media center is convenient to all grade levels and visible from much of the school as a symbol of the learning process.



FIRST FLOOR



SECOND FLOOR

- The music rooms are near the stage for easy access and are acoustically separated from adjacent spaces by corridors.
- The gymnasium, cafeteria, and physical education activity room are arranged so that access can be easily restricted to these spaces for after-hours use.
- The seventh-grade and eighth-grade classrooms on the second floor are physically separated so that each grade has its own area of the school.
- Science labs are located on both floors for convenience to all grade levels.
- The fifth science lab is on the second floor adjacent to a stair so it can be conveniently used by any grade level.
- The gifted and talented room is centrally located on the second floor, overlooking the media center.
- Plenty of flexible spaces have been provided, so that when the student population increases, there are more spaces which could function as a classroom, if needed.

See the space analysis on page 22 of this report for a listing of all spaces in the school.

Modifications to First Floor Prototype Plan

The plan is based on the latest prototype middle school, Thomas Viaduct Middle School, which is currently under construction.

Specific revisions to the first floor requested by the Planning Committee are listed below and are identified by the circled letters on the proposed first floor plan on page 16.

A. Reconfigured administrative suite so that principal secretary's office is adjacent to the reception area to allow for supervision of the main entrance, if needed. Added an enclosed office in the main office to accommodate the administrative intern. Rearranged the health suite to ensure that the nurse's assistant is centrally located and is able to adequately supervise the entire suite. Relocated school store and removed volunteer room from this area.

B. Added an operable wall to the family and consumer science room to create two separate teaching stations, one of which could be used as a general classroom.

C. Rotated technology education suite to allow for exterior windows in the production lab. Moved ensemble room closer to music suite and enlarged the space.

D Provided rectangular teaching spaces for the music suite.

E Added stairs that discharge on the opposite side of the stage as the ramp, thus providing two ways to enter and exit the stage during performances.

F. Added two secure areas for stage storage: one small space in an alcove at end of ramp and one larger space accessible directly from the cafeteria.

G. Added an office for the student resource officer (SRO) and an alternative education resource room near the lobby to the cafeteria and gymnasium. These program spaces are found in the existing Wilde Lake Middle School building.

H. Reconfigured gym planning area to provide two separate offices for conferencing with students and one-way glass panel for supervision of locker rooms.

I. Added a data clerk office to the guidance suite. This program space is found in the existing Wilde Lake Middle School building.

J. Removed TV studio from media production room.

K. Added a speech room, academic life skills (ALS) classroom and special education planning room to meet the program needs of the existing new Wilde Lake Middle School population. These spaces are grouped with special education department to create a suite on first floor.

L. Flipped the art suite to allow for more natural daylight into the space.

M. Moved the computer lab to a typical classroom block, allowing for flexibility in use.

N. Moved two classrooms to the first floor, so that science lab five could be upstairs near the seventh and eighth grade classrooms. Added english for speakers of other languages (ESOL) resource room to the second floor directly across the corridor from world languages.

O. Moved special education resource rooms two and three to the first floor to an exterior wall with window, in order to increase the mechanical space provided on the second floor. In addition, a third seminar room has been added to the floor plan. The three mechanical rooms added to the second floor will house the roof top units for the heating, ventilation and air conditioning (HVAC) system, thus clearing up more roof area for solar (PV) panels that will provide renewable energy to the school.

P. Unitary heat pump rooms have been distributed throughout the building to support the highly efficient geothermal mechanical system.

For a complete description of the plans refer to the 'Floor Plan Narrative' on page 19.

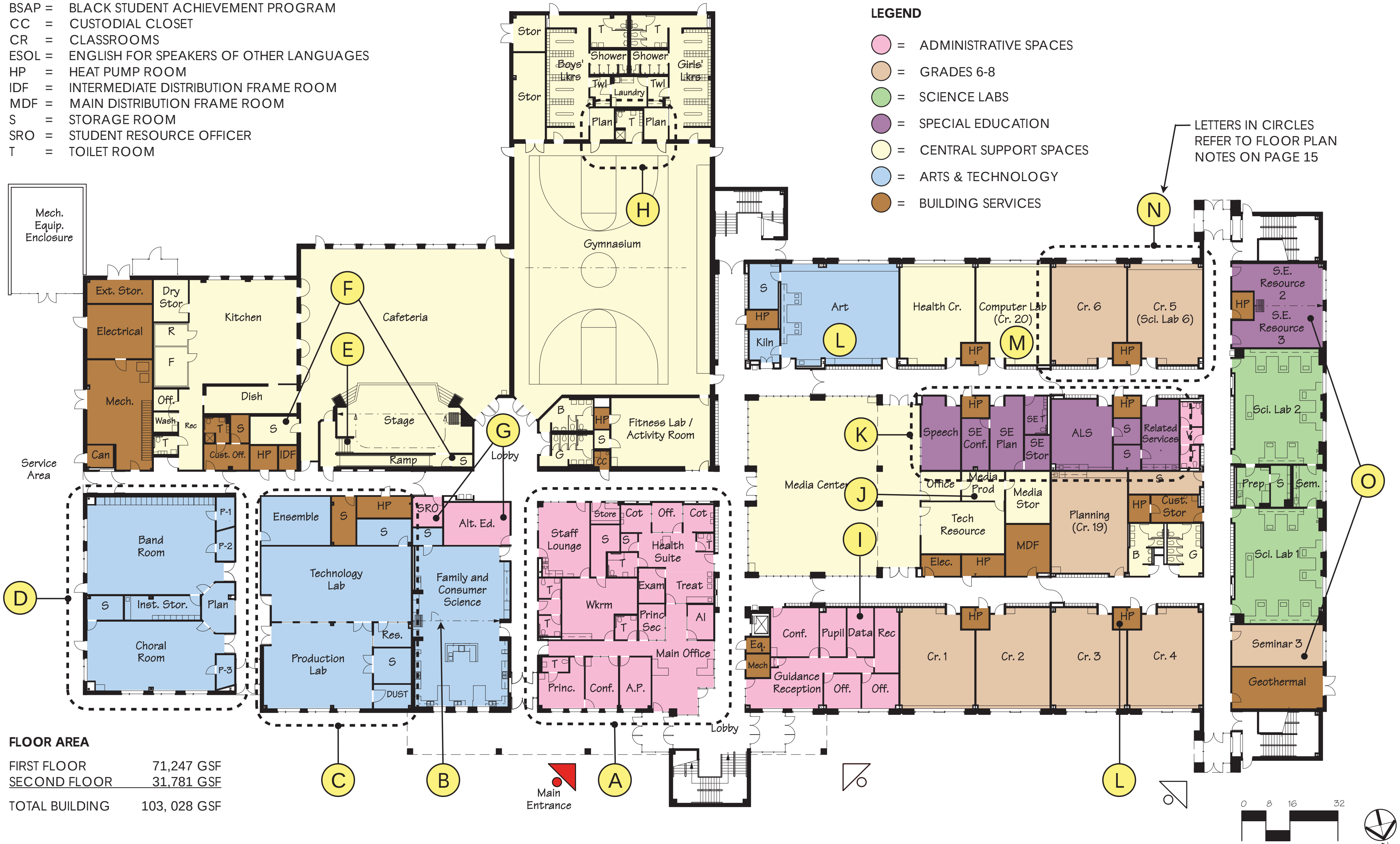
Proposed First Floor Plan

ABBREVIATIONS

- ALS = ACADEMIC LIFE SKILLS
- BSAP = BLACK STUDENT ACHIEVEMENT PROGRAM
- CC = CUSTODIAL CLOSET
- CR = CLASSROOMS
- ESOL = ENGLISH FOR SPEAKERS OF OTHER LANGUAGES
- HP = HEAT PUMP ROOM
- IDF = INTERMEDIATE DISTRIBUTION FRAME ROOM
- MDF = MAIN DISTRIBUTION FRAME ROOM
- S = STORAGE ROOM
- SRO = STUDENT RESOURCE OFFICER
- T = TOILET ROOM

LEGEND

- = ADMINISTRATIVE SPACES
- = GRADES 6-8
- = SCIENCE LABS
- = SPECIAL EDUCATION
- = CENTRAL SUPPORT SPACES
- = ARTS & TECHNOLOGY
- = BUILDING SERVICES



FLOOR AREA

FIRST FLOOR	71,247 GSF
SECOND FLOOR	31,781 GSF
TOTAL BUILDING	103, 028 GSF

Modifications to Second Floor Prototype Plan

The plan is based on the latest prototype middle school, Thomas Viaduct Middle School, which is currently under construction.

Specific revisions to the second floor requested by the Planning Committee are listed below and are identified by the circled letters on the on the proposed second floor plan on page 18.

N. Moved two classrooms to the first floor, so that science lab five could be upstairs near the seventh and eighth grade classrooms. Added ESOL resource room to the second floor directly across the corridor from world languages.

O. Moved special education resource rooms two and three to the first floor to an exterior wall with window, in order to increase the mechanical space provided on the second floor. In addition, a third seminar room has been added to the floor plan. The three mechanical rooms added to the second floor will house the roof top units for the HVAC system, thus clearing up more roof area for solar (PV) panels that will provide renewable energy to the school.

P. Unitary heat pump rooms have been distributed throughout the building to support the highly efficient geothermal mechanical system.

Q. Added a black student achievement program (BSAP) office. This program space is found in the existing Wilde Lake Middle School building.

R. Moved volunteer room to the second floor.

S. Created a dedicated TV studio space, separate from the media production room and adjacent to the gifted and talented classroom, since the G/T teacher is typically responsible for the TV productions.

T. Relocated seminar one and seminar two to the core of the building allowing another typical classroom to be placed along the perimeter wall with access to natural daylight.

U. Moved world language space across the corridor from the ESOL room.

For a complete description of the plans refer to the 'Floor Plan Narrative' on page 19.

Proposed Second Floor Plan

ABBREVIATIONS

ALS = ACADEMIC LIFE SKILLS
BSAP = BLACK STUDENT ACHIEVEMENT PROGRAM
CC = CUSTODIAL CLOSET
CR = CLASSROOMS
ESOL = ENGLISH FOR SPEAKERS OF OTHER LANGUAGES
HP = HEAT PUMP ROOM
IDF = INTERMEDIATE DISTRIBUTION FRAME ROOM
MDF = MAIN DISTRIBUTION FRAME ROOM
S = STORAGE ROOM
SRO = STUDENT RESOURCE OFFICER
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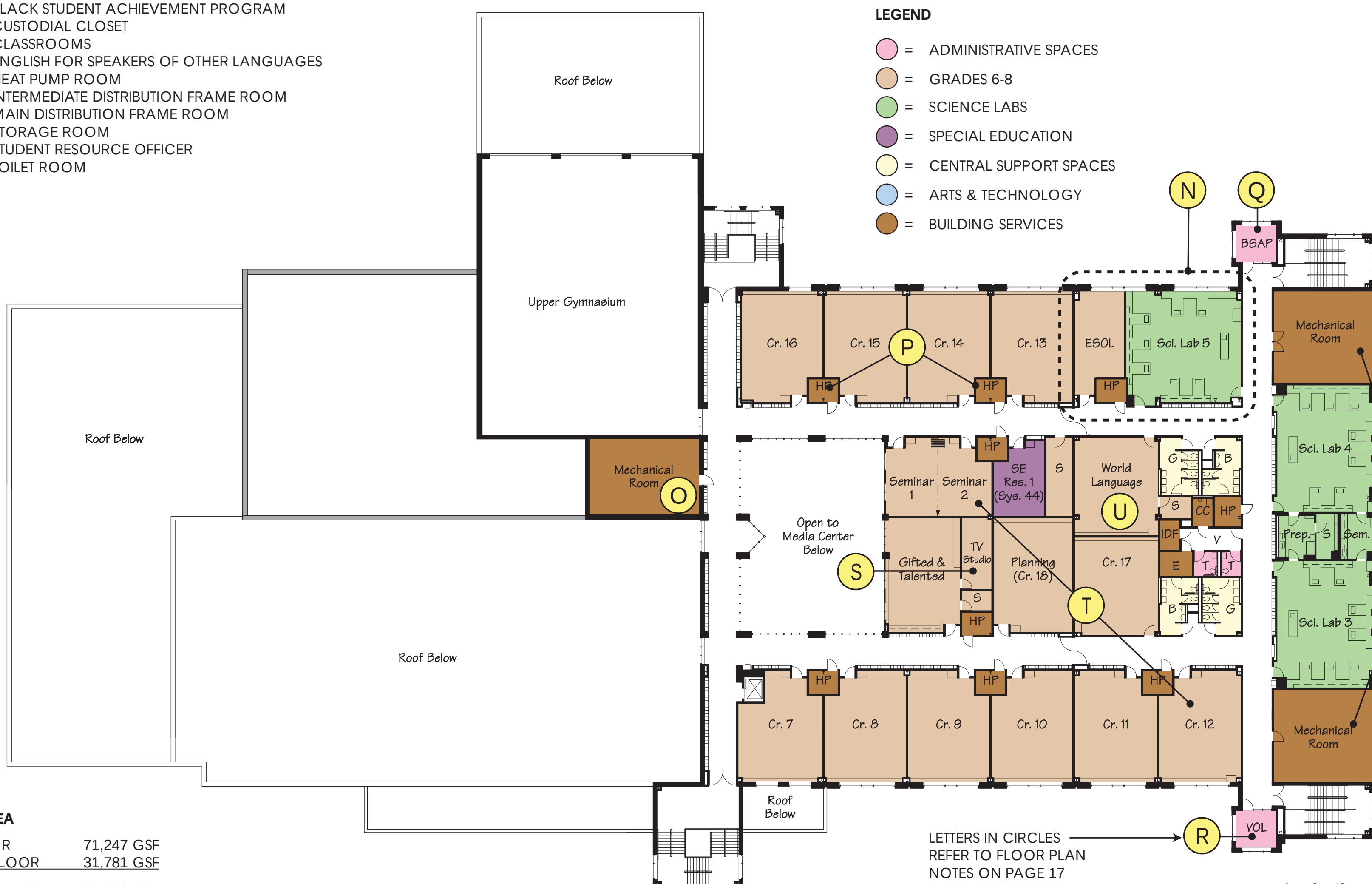
LEGEND

= ADMINISTRATIVE SPACES
= GRADES 6-8
= SCIENCE LABS
= SPECIAL EDUCATION
= CENTRAL SUPPORT SPACES
= ARTS & TECHNOLOGY
= BUILDING SERVICES



LETTERS IN CIRCLES REFER TO FLOOR PLAN NOTES ON PAGE 17

FLOOR AREA

FIRST FLOOR	71,247 GSF
SECOND FLOOR	31,781 GSF
TOTAL BUILDING	103, 028 GSF

0 8 16 32

Floor Plan Narrative

In addition to the basic features of the prototype layout listed on page 14, the new Wilde Lake Middle School will maintain the following spatial relationships:

Access and Circulation

Entrances

The main entrances are clearly marked for visitors by both their location and by the architectural significance of the projecting main stairwell.

Entrances are arranged to distribute student traffic during arrival and departure times, to meet code egress requirements, and to permit easy access to the gym and cafeteria for after-hours activities. Particular attention has been paid to providing an adequate number of doors in the heavily populated classroom areas for dismissal time.

Corridor Arrangement

A conscious effort was made to develop a corridor pattern which is clear-cut in its arrangement and easy to supervise. Stairs are located at the four corners of the two-story wing. As noted, an elevator is provided very close to the main entrance for the use of handicapped persons and for the easy movement of furniture and equipment.

The main interior stair at the front of the building is next to the main entrances and is immediately adjacent to the administrative area.

Student Lockers are located along corridor walls throughout the classroom areas in lieu of a pod design with concentrated areas of lockers. Lockers are located on just one side of corridors, wherever possible, to minimize congestion.

Student Restrooms are located on both floors near stairways in all three grade level areas and adjacent to the cafeteria and gymnasium entrances. The cafeteria/gymnasium lobby restrooms are also intended to be used during after-hours activities. Teachers' toilets are located on both floors of the classroom wing and adjacent to the staff lounge.

The **administrative area** is central to the building and adjacent to the main entrance with a view of the parent and bus drop-off areas. The **health suite** and **staff lounge** are all directly accessible from this area. Both the health suite and the staff lounge have separate entrances from main corridors. The teachers' mail boxes, which will be in the workroom, can be conveniently serviced from the administrative area. Proximity to the cafeteria was also a consideration in the location of the staff lounge.

The **guidance suite** is located in an easy-to-reach location, convenient to the office area, yet with a distinct identity.

Classrooms are located in the two-story portion of the school and arranged so that each grade level has its own distinct area. Almost all classrooms are located on exterior walls with windows.

Science laboratories have been placed on both levels convenient to all three grade levels. Four of the five labs are adjacent to prep rooms and project/seminar rooms. One classroom will have a safety shower and cabinetry to support basic science instruction.

Teacher planning rooms, seminar rooms, and **storage rooms** are distributed throughout the two story classroom wing.

Floor Plan Narrative (continued)

A **special education suite** is located on the first floor of the classroom wing. This suite includes the speech room, classroom, related services therapy room, handicap accessible toilet, a conference room, planning room, storage room and two resource rooms. The system 44 room has been located on the second floor.

The **media center** is the symbolic, as well as, the actual center of the school. It is located on the first floor in the middle of the classroom area and is visible from the second floor corridors above. Natural daylight from above brightens this dramatic two-story high space and the rooms surrounding it on both floors. The media center can be entered from all three adjacent corridors to encourage student use. The **technology resource room** is entered and monitored from the media center.

The **gifted and talented resource room** has a central location in the second floor classroom area overlooking the media center. The **TV studio** is adjacent to this space, since it is monitored by the G/T teacher.

The **art classroom** and the **health classroom** are located on the first floor, near other related-arts spaces and easily reached from all classroom areas. Both of these rooms are located on an exterior wall with windows.

The **world languages classroom** is placed in the center of the second floor classroom area across the corridor from the **ESOL resource room**.

The **technology education rooms**, **family and consumer science rooms**, and **music suite** are located on the first floor away from the quiet two-story classroom wing, yet are easy to access both during the school day and for after-hours use.

The **gymnasium** is located so that it can be entered from the classroom side of the school or from a lobby which also serves the cafeteria entrance. Direct access has been provided from the gym to the outdoor paved play area and a grass play area. The gym and the adjoining **fitness lab/activity room** are located for easy, but controlled, access during after-hours activities. Locker rooms are designed to be entered from inside the gymnasium for visual control by physical education teachers and are provided with access directly to the outside.

The **cafeteria** is located for easy access by after-hours users and in close proximity to the music rooms for use of the stage. For after-lunch recess there is direct access to the outdoor paved play area and there is convenient access to the gymnasium and to restrooms. Large windows are provided to ensure visibility from the cafeteria to the paved play area during lunch time supervision. Kitchen serving lines are entered from inside the cafeteria and there is convenient access to the service area for trash removal. An operable wall has been provided at the front of the **stage** to permit use of this area as a teaching station during lunch periods. A ramp has been provided for handicap access to the stage.

The **kitchen** has a full-preparation arrangement and is convenient to the service area for deliveries and trash removal.

The **custodial areas** are placed on a main corridor near the service entrance and adjacent to the mechanical and electrical rooms. Custodial closets are distributed throughout the school and placed next to restrooms for plumbing economy.

The **service area** has direct corridor access to the center of the school, allowing for convenient deliveries and trash removal.

Architectural Character

Just as the exterior facade for the prototype middle school (Thomas Viaduct MS) was entirely redesigned to reflect the traditional design aesthetic of the Oxford Square community, the facade of the new Wilde Lake Middle School will be redesigned due to the need for a highly insulated building envelope which, secondarily, will help distinguish this building from the other prototype middle schools.

The facade will incorporate super-insulated masonry walls on the first floor and where greater durability is required and highly insulated metal wall panels on the second floor with masonry on the interior face.

Exterior masonry unit sizes will recall those used on the adjacent Wilde Lake High School. Triple-glazed, thermally broken aluminum windows will allow daylight into the building while resisting thermal temperature differences between the interior and exterior. Where necessary, exterior windows will also be provided with exterior sunshades to shield the interior from the high, hot summer sun, while allowing the low winter sun to penetrate the interior during the heating season.

As seen in the image above, the main entrance 'stair tower' will be flooded with diffused northern daylight with a wall of glass and provide exterior views from the main office and lobby, due to the redesigned stair which will be open below the landings to the first floor.

Space Analysis

	Existing Wilde Lake Middle School Area(s)	Existing Wilde Lake Middle School Total Net	New Wilde Lake Middle School Area(s)	New Wilde Lake Middle School Total Net
Administration		**2,224**		**2,993**
Principal's Office (incl. toilet)	1	237	1	247
Assistant Principal's Office	1	220	1	176
Conference Room	1	215	1	189
Workroom/Mailroom (inclu. storage)	2	294	1	574
Reception Area / Secretarial	1	316	1	533
Staff Dining	1	497	1	411
Principal's Secretary	1	119	1	102
Toilet	5	191	7	358
Security Office (SRO) *	**1**	**135**	**1**	**98**
Administrative Intern *	**0**	**0**	**1**	**100**
Volunteer/Community Room **	**0**	**0**	**1**	**139**
School Store **	**0**	**0**	**1**	**66**
Art		**942**		**1,546**
Studio	1	874	1	1,294
Kiln Room	1	68	1	106
Storage **	**0**	**0**	**1**	**146**
Cafeteria / Food Service		**5,326**		**7,097**
Kitchen Area	1	1,514	1	2,050
Dry Storage Area	1	166	1	161
Office	1	63	1	59
Student Dining	1	2,800	1	3,509
Stage	1	631	1	912
Stage Storage	1	152	2	176
Stage Ramp **	**0**	**0**	**1**	**230**
Computer Lab		**406**		**779**
Computer Lab	1	406	1	779
Building Services		**1,951**		**6,963**
Can Wash	1	105	1	63
Decentralized Custodial Closets	3	290	3	226
General School Storage	1	276	1	127
Outside Equipment Storage	2	245	1	169
Toilet w/ shower	1	33	1	66
Electrical	4	478	3	552
Mechanical (incl. Heat Pump Rooms)	1	440	28	5,177
Main Distribution Frame (MDF) Room	1	84	1	247
Telecommunications (IDF)**	**0**	**0**	**2**	**102**
Kitchen Custodial Closet **	**0**	**0**	**1**	**52**
Work Storage Area **	**0**	**0**	**1**	**56**
Custodial Office **	**0**	**0**	**1**	**126**
General Academic Areas		**14,874**		**16,383**
Classrooms (does not include 1 classroom located in portable classroom)	15	11,920	17	13,229
Storage Area	6	454	2	369
Teacher Planning Room	1	267	2	1,673
Seminar Room (includes existing CRs below 660sf)	5	2,233	3	1,112

Space Analysis (continued)

	Existing Wilde Lake Middle School Area(s)	Existing Wilde Lake Middle School Total Net	New Wilde Lake Middle School Area(s)	New Wilde Lake Middle School Total Net
Gifted & Talented Resource Room		**474**		**1,016**
GT Resource Room	1	274	1	768
TV Studio	1	144	1	194
Planning Storage Room	1	56	1	54
Guidance		**837**		**1,363**
Secretarial/ Reception (incl. closet)	1	195	1	369
Counseling Offices	2	372	2	282
Record Storage	2	136	1	172
Data Clerk *	1	134	1	144
Conference Room **	0	0	1	259
Pupil Services Office **	0	0	1	137
Health Education		**0**		**781**
Classroom ***	0	0	1	781
Health Suite		**264**		**817**
Waiting	1	52	1	200
Treatment	1	64	1	92
Office	1	50	1	98
Rest Area	1	56	2	182
Toilets	1	42	2	113
Exam **	0	0	1	99
Storage **	0	0	1	33
Family and Consumer Science		**815**		**1,693**
Classroom	1	815	2	1,638
Storage **	0	0	1	55
Media Center		**3,411**		**4,259**
Main Reading Room	1	2,683	1	3,268
Technology Resource Room	1	225	1	476
Office/Work Space	1	84	1	126
Media Production	1	364	1	137
Storage Area	2	55	1	252
Music		**2,135**		**3,389**
Choral Room	1	876	1	989
Band Room	1	851	1	1,387
Instrument Storage	1	171	1	200
Materials Storage	1	80	1	95
Teacher Planning	1	157	1	157
Ensemble Room ***	0	0	1	372
Practice Rooms **	0	0	3	189
Physical Education		**8,431**		**8,880**
Gymnasium	1	6,421	1	5,555
Shower Area	2	420	2	202
Lockers (incl. toilets)	2	1,276	2	1,395
Storage (Large Equipment)	1	146	1	308
Storage (Towel)	2	30	2	120
Office/Shower/Toilet	2	138	2	268
Laundry **	0	0	1	114
Storage (Small Equipment) **	0	0	1	127
Fitness Lab / Activity Room (incl. storage) **	0	0	1	791

Space Analysis (continued)

	Existing Wilde Lake Middle School Area(s)	Existing Wilde Lake Middle School Total Net	New Wilde Lake Middle School Area(s)	New Wilde Lake Middle School Total Net
Science		**4,895**		**6,279**
Science Laboratories	5	4,308	5	5,579
Preparation Room	1	261	2	272
Storage Room	3	326	2	170
Project/Seminar Room **	0	0	2	258
Special Education		**1,323**		**2,872**
Conference Room	1	180	1	152
Teacher Planning Room *	2	536	1	255
Speech *	1	267	1	304
ALS Classroom (including storage) *	1	340	1	535
Related Services Therapy Area (incl. storage) **	0	0	1	352
Classrooms **	0	0	3	1,085
Storage **	0	0	1	97
ADA Toilet **	0	0	1	92
Student Support Spaces		**455**		**451**
BSAP (Academic Mentor Office) *	1	120	1	139
Alternative Education (Contract Room) *	1	335	1	312
Technology Education		**2,212**		**2,732**
Production Lab	1	1,462	1	1,014
Tech Laboratory	1	591	1	1,220
Resource	1	159	1	98
Dust Room **	0	0	1	99
Storage Rooms **	0	0	2	301
Toilet Rooms		**1,096**		**1,313**
Public Toilets (Men & Women)	4	1,096	4	1,313
World Language		**166**		**1,227**
ESOL *	1	166	1	420
Classroom (incl. storage) ***	0	0	1	807

Space Analysis Summary

	Existing Wilde Lake Middle School	New Wilde Lake Middle School
Total Net Sq. Ft.	51,235	66,755
Mech/Elec Spaces	1,002	6,078
Walls, Circulation, Structure, Shafts, etc	18,293	30,195
Gross Area Total	**70,530**	**103,028**

* Existing program at WLMS

** New space at WLMS

*** Currently located in portable classroom

Construction Cost Estimate

The New Wilde Lake Middle School

Site Work (includes demolition of existing building)	$ 5,250,944
Building (includes solar PV system)	$ 25,747,802
Construction Cost Total	$ 30,998,746
Less Net Zero School's Initiative grant from MEA for construction	(- $ 2,200,000)
Total for Project	**$ 28,798,746**

Notes

- Construction cost was prepared by the construction manager, Oak Contracting, and assumes that bids will be received in March 2015.
- Construction cost includes cost of foodservice equipment.
- Estimate includes a schematic phase cost estimate contingency of +5 percent.
- Estimate assumes non-wage rate pricing. (Add +9 percent for wage rate.)
- Estimate does not include a project contingency.
- Estimate includes a cost contingency for constructing a LEED 'Gold' design.

APPENDIX

Architectural Design Narrative

The new Wilde Lake Middle School will be an adaptation of Howard County's current prototype middle school design and will be constructed on the existing Wilde Lake Middle School site. The prototype middle school plan is a two-story building design based on the "General Educational Specifications for New Howard County Middle Schools" and is designed to accommodate a population which includes 662 students in Grades 6 thru 8, plus 40 full-time equivalent special education students, for a total of 702 students.

The prototype design was reviewed and modified in 2012 for both changes in curriculum and the implementation of geothermal mechanical system before construction began on the latest prototype middle school scheduled to be occupied in August 2014.

Upon completion of the new (prototype) Wilde Lake Middle School, the existing middle school building will be demolished and replaced with a new bus loop, car parking lot and parent drop-off area. This will allow bus and vehicular traffic to be separated providing pedestrian safety.

The new middle school features major support spaces including the administrative area, health suite, gymnasium, cafeteria and media center that are centrally located near the intersection of two major circulation spines running north-south and east-west. The north-south corridor connects on both ends to vertical circulation stairwells and elevator, effectively maximizing building circulation efficiency. New construction will allow for all the latest HCPSS technology specifications to be fully integrated into the design.

The prototype middle school floor plan lacks some educational programs found at the existing Wilde Lake Middle School, such as ALS, BSAP, alternative education and ESOL. Therefore, design modifications will be made to the prototype design in order to incorporate these educational programs into the prototype building footprint.

It is the intent that the design and construction of this new middle school achieve a LEED 'Gold' designation making this facility yet another 'Green' school for the Howard County Public School System. The 2009 version of 'LEED for Schools' released by the USGBC will provide the necessary goals and requirements to obtain LEED Certification.

Project Facts

Total size of existing site	± 15 acres	
On site car parking provided with new site design	110 cars	(existing = 68 cars)
On site bus parking provided	15 busses	(existing = 15 busses)
Building Square Footage	103,028 gsf	(existing = 70,530 gsf)
Student Capacity (662 + 40 special education students)	702 students	(existing = 506 students)

Net-Zero Energy School Design

The Maryland Energy Administration (MEA) will be providing grant money for the new Wilde Lake Middle School to offset the additional design and construction costs necessary to construct a net-zero energy school. Simply stated, a net-zero energy building is a building with greatly reduced energy needs through efficiency gains such that the balance of energy needs can be supplied with renewable technologies.

Given the project goal to construct a net-zero energy school, modifications to the prototype design will be necessary to significantly reduce energy consumption and to provide the balance of energy required for the school by way of solar PV panels on the school's roof and at grade as necessary.

For this reason, the following upgrades and revisions will likely be necessary to achieve significant energy use reductions:

1. Unitary geothermal design for each room of the building with outside air RTU's and recovery wheels. Energy Usage Index goal of 25 kBTU/sf. (current protoype = 38.3 kBTU/sf)
2. Domestic hot water system will consist of four gas-fired condensing type instantaneous type water heaters distributed in four small loops throughout the school
3. Redesign building lighting plan to minimize lighting power density (LPD) by way of careful LED light fixture selection and placement. LPD goal of 0.670 Watt/sf.
(current protoype = 0.76 Watt/sf)
4. Utilize exterior LED lighting for building and site.
5. Utilize occupancy sensors, timed sweeps, and photocell dimming in response to daylighting.
6. Maximize natural daylight opportunities in conjunction with photocell dimming.
7. R-30 roof design.
8. Goal for exterior walls should be a minimum of R-25 [effective] by way of increased wall insulation, higher performing triple-glazed windows utilizing Solarban 70XL glazing with Sungate 600, and the use of thermally broken exterior doors and door frames.
9. Modify roof structure design for roof mounted PV panel loads. (estimated load is 5 lbs/sf)
10. Energy efficient foodservice design. Foodservice equipment would need to be the most energy efficient equipment available. Options such as central glycol refrigeration system, use of natural gas appliances, demand defrost system for walk-in boxes, heat recovery dish machine systems, and boiler-less steamers will be considered and integrated into the design along with other energy efficient strategies that may be discussed or requested.

Sustainable 'Green' Design Goals

It is the intent that the design and construction of the new Wilde Lake Middle School achieve a LEED 'Gold' certification, making this facility a 'Green' school. Simply stated, a 'Green' school is a building designed to conserve energy, water, and materials, thus reducing negative impacts on human health and the environment. A 'Green' learning environment provides natural daylight, enhanced classroom acoustics, improved indoor air quality, thermal comfort, and opportunities to integrate green features into the school's curriculum.

In order to measure and compare how 'Green' a building is, the USGBC, founded in 1993, has developed industry standards with design and construction rating systems and guidelines for many different building types.

One such rating system is the USGBC 2009 Edition of "LEED for SCHOOLS" to which the design and construction of the new Wilde Lake Middle School will closely adhere. Final LEED certification levels are based on the number of credit points obtained in the "LEED for SCHOOLS" rating system. The four levels of certification from lowest to highest are: Certified, Silver, Gold, and Platinum.

We have included an 'in progress' LEED scorecard below which summarizes the credits most likely obtainable at this time. As the project continues to evolve, new credits may be possible while others may become increasingly difficult to engineer or too costly to provide. At this time we have identified 79 likely credits (with an additional '10 possible credits') allowing for the loss of some and still complying with the goal of a LEED 'Gold' Building with a remote chance of achieving a 'Platinum' level.

LEED — LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

tca | architects
LEED for SCHOOLS 2009

LEED Scorecard
(New) Wilde Lake Middle School
Howard County Public School System

SS — Sustainable Sites — Possible Credits: 24

R		Prereq 1	**Construction Activity Pollution Prevention**
R		Prereq 2	**Environmental Site Assessment**
1		Credit 1	**Site Selection**
4		Credit 2	**Development Density & Community Connectivity** (4 credits)
	X	Credit 3	Brownfield Redevelopment
4		Credit 4.1	**Alternative Transportation,** Public Transportation Access (4 credits)
1		Credit 4.2	**Alternative Transportation**, Bicycle Use
2		Credit 4.3	**Alternative Transportation**, Low Emitting & Fuel Efficient Vehicles (2 credits)
	2	Credit 4.4	**Alternative Transportation**, Parking Capacity (2 credits)
	X	Credit 5.1	Site Development, Protect or Restore Habitat
1		Credit 5.2	**Site Development**, Maximize Open Space
1		Credit 6.1	**Stormwater Design**, Quantity Control
1		Credit 6.2	**Stormwater Design,** Quality Control
	X	Credit 7.1	Heat Island Effect, Non-Roof
1		Credit 7.2	**Heat Island Effect**, Roof
	X	Credit 8	Light Pollution Reduction
	X	Credit 9	Site Master Plan
1		Credit 10	**Joint Use of Facilities**
17	2		Total Sustainable Sites Credits

WE — Water Efficiency — Possible Credits: 11

R		Prereq 1	**Water Use Reduction,** 20% Reduction
4		Credit 1	**Water Efficient Landscaping**, Reduce by 50% (4 credits)
	X	Credit 2	Innovative Wastewater Technologies (2 credits)
3		Credit 3	**Water Use Reduction**, 30%, 40% Reduction (4 credits)
	X	Credit 4	Process Water Use Reduction
7	0		Total Water Efficiency Credits

EA — Energy and Atmosphere — Possible Credits: 33

R		Prereq 1	**Fundamental Commissioning of the Building Energy Systems**
R		Prereq 2	**Minimum Energy Performance**
R		Prereq 3	**Fundamental Refrigerant Management**
19		Credit 1	**Optimize Energy Performance**, 12-48% New / 8-44% Exist. (19 credits)
7		Credit 2	**On-Site Renewable Energy,** 1-13% (7 credits)
2		Credit 3	**Enhanced Commissioning** (2 credits)
	X	Credit 4	Enhanced Refrigerant Management
2		Credit 5	**Measurement & Verification** (2 credits)
	2	Credit 6	**Green Power** (2 credits)
30	2		Total Energy and Atmosphere Credits

MR — Materials and Resources — Possible Credits: 13

R		Prereq 1	**Storage & Collection of Recyclables**
	X	Credit 1.1	Building Reuse, Maintain 75%, 95% of Existing Walls, Floors & Roof (2 credits)
	X	Credit 1.2	Building Reuse, Maintain 50% of Interior Non-Structural Elements
2		Credit 2	**Construction Waste Management**, Divert 50, 75% from Disposal (2 credits)
	X	Credit 3	Materials Reuse, 5%,10% (2 credits)
2		Credit 4	**Recycled Content**, 10%, 20% (post-consumer + 1/2 pre-consumer) (2 credits)
2		Credit 5	**Regional Materials**, 10%, 20% Extracted, Processed & Manufactured Regionally(2 credits)
	X	Credit 6	Rapidly Renewable Materials
1		Credit 7	**Certified Wood**
7	0		Total Materials and Resources Credits

EQ — Indoor Environment Quality — Possible Credits: 19

R		Prereq 1	**Minimum IAQ Performance**
R		Prereq 2	**Environmental Tobacco Smoke (ETS) Control**
R		Prereq 3	**Minimum Acoustical Performance**
	1	Credit 1	**Outdoor Air Delivery Monitoring**
	X	Credit 2	Increased Ventilation
1		Credit 3.1	**Construction IAQ Management Plan,** During Construction
1		Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy
1		Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants
1		Credit 4.2	**Low-Emitting Materials**, Paints & Coatings
1		Credit 4.3	**Low-Emitting Materials**, Flooring Systems
1		Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products
	1	Credit 5	**Indoor Chemical & Pollutant Source Control**
1		Credit 6.1	**Controllability of System,** Lighting
	1	Credit 6.2	**Controllability of System,** Thermal Comfort
	1	Credit 7.1	**Thermal Comfort,** Design
	1	Credit 7.2	**Thermal Comfort,** Verification
2		Credit 8.1	**Daylight & Views**, Daylight 75%, 90% of Classrooms, 75% all other spaces (3 credits)
	X	Credit 8.2	Daylight & Views, Views for 90% of Spaces
	X	Credit 9	Enhanced Acoustical Performance
	X	Credit 10	Mold Prevention
9	5		Total Indoor Environment Quality Credits

ID — Innovation and Design Process — Possible Credits: 6

1		Credit 1.1	**Innovation in Design,** Exemplary Performance SSc5.2
1		Credit 1.2	**Innovation in Design,** Green Cleaning
1		Credit 1.3	**Innovation in Design,** Exemplary Performance EAc1
1		Credit 1.4	**Innovation in Design,** Exemplary Performance EAc2
1		Credit 2	**LEED Accredited Professional**
	1	Credit 3	**School as a Teaching Tool**
5	1		Total Innovation and Design Process Credits

RP — Regional Priority — Possible Credits: 4

1		Credit 1	**Regional Priority,** SSc4.1
	X	Credit 2	Regional Priority, SSc5.1
1		Credit 3	**Regional Priority,** SSc6.2
	X	Credit 4	Regional Priority, WEc2
1		Credit 5	**Regional Priority,** EAc1 (40%)
1		Credit 6	**Regional Priority,** EAc2 (1%)
4	0		Total Regional Priority Credits

79 — **Total Credits (10 'Maybe' Credits)**

Key to Possibility of Earning Credit: [R|] = Required   [#|] = Yes   [|#] = Maybe   [|X] = No

Project Credit Totals: Certified 40–49   Silver 50–59   Gold 60–79   Platinum 80–112

<End of Architectural Design Narrative>

Civil Engineering Narrative

Zoning

NT (New Town)

Drives, Walks and Parking

Cross Fox Lane will no longer serve as a drop-off lane for cars and busses. The perpendicular parking spaces will be removed and the width of the road will be reduced to that of a standard one-way road. Access to both the new bus loop and new parking lot will be from Cross Fox Lane.

New walkways will be provided to connect all the new site elements with each other and the residential community to the west of the site.

Parking will be provided in a new parking lot, along the service drive and within the bus loop for a total of 110 car parking spaces on site.

Utilities

Water - Existing 6" service enters building at mechanical room near service drive.

Sanitary Sewer - Existing sanitary lines exit the building near the main entrance and run westward parallel to Cross Fox Lane.

Storm Drain - Existing stormwater leaves the site at the southeast corner of the property towards the wooded area.

Stormwater Management - New bioretention areas will need to be constructed to accommodate the treatment of the water for the new addition and new impervious paving.

Gas - Existing service enters building at mechanical room near service drive.

Additional Information

Landscape Plan - Proposed planting will consist only of what is necessary to vegetatively stabilize the disturbed areas of the site. Plantings will be necessary for the stormwater management facility in order to meet requirements of the 2000 Maryland Stormwater Design Manual and the 2007 update. Taking this into consideration, additional landscape material proposed for the school site as part of the new building will be kept to a minimum in order to accommodate the school's desire to minimize maintenance.

Grading Permit - Since there will be more than 5,000 square feet of disturbance, a grading permit will be required.

Wetlands and Waterways - An environmental survey has not been performed at this time, but no existing wetlands are known to be on the site.

Forest Conservation - This requirement is not applicable within Columbia.

Columbia Association - A new middle school will require an Environmental Concept Plan showing proposed stormwater management devised for the impervious areas. Upon County approval of the Environmental Concept Plan a Site Development Plan will be required for County processing. The total process is approximately one year from original submission of the Environmental Concept Plan. The non-credited open space area will be increased from the recorded area in the Final Development Plan documents due to the new site plan, which results in re-recording and amending the Final Development Plan criteria documents. Amending the Final Development Plan criteria will require a meeting with the Howard Hughes Corporation at an early stage in the process. This Final Development Plan process will take approximately one year to complete.

<End of Civil Engineering Narrative>

Structural System Narrative

Structural steel framing will be used except for the gymnasium, cafeteria, and adjacent areas which will be masonry wall bearing. Foundation will consist of conventional spread footings. First floor will be reinforced concrete slab on grade. Second floor will be composite steel framing with decking and concrete fill. Exterior walls will consist of brick faced insulated masonry cavity wall construction. Roof system will consist of steel deck on open web steel joists.

<End of Structural Design Narrative>

Foodservice Design Narrative

The foodservice facility for the new Wilde lake Middle School will included enhancements to significantly reduce energy consumption by providing the following equipment:

- Reach-in refrigerators and freezers will utilize the new R-290 refrigerant (propane) which will reduce energy consumption by 20 percent vs. a traditional energy-star rated refrigerator and freezer.

- Walk-in cooler and freezer will be specified with thicker walls (R-Value: 4”=32; 5”=38; 6”=45) which will provide higher insulation value.

- Refrigeration systems for walk-in cooler and freezer will utilize the “Demand Defrost” option with smart controller reducing energy consumption by 20 percent.

- A ventless dishmachine with a heat recovery unit will eliminate the need for an exhaust vent and motor. This will also reduce the amount of time required to increase water temperature for final rise application.

- Gas cooking equipment will be provided reducing the electrical usage to 120V controls only.

- The foodservice facility will utilize a Energy Management System (EMS) for the exhaust and make-up air fans. This includes a Variable Frequency Drive (VFD) with EMS controls which energize fans automatically when increased duct temperature is sensed, an estimated 15 percent annual energy saving based on air volume. When in stand-by mode, the fans operate at 15 percent. As cooking begins, the fans increases to 100 percent offering 85 percent reduction in air volume.

- L.E.D. lighting will be provided in the kitchen, walk-in cooler and freezer and reach-in refrigerators and freezers.

- Boiler-less convection steamers will be utilized vs. traditional boiler-base units.

<End of Foodservice Design Narrative>

Mechanical Systems Narrative

Design Criteria

Applicable Codes and Standards

- 2012 International Building Code (IBC)
- 2012 International Mechanical Code (IMC)
- 2012 International Energy Conservation Code (IECC)
- 2012 International Fire Code (IFC)
- 2012 National Standard Plumbing Code
- 2012 National Fuel Gas Code
- ASHRAE Standard 55-2007 - Thermal Environmental Conditions for Human Occupancy
- ASHRAE Standard 62.1-2007 - Ventilation for Acceptable Indoor Air Quality
- ASHRAE Standard 90.1-2010 - Energy Standard for Buildings
- NFPA 13: Standard for the Installation of Sprinkler Systems, latest edition
- NFPA 90A: Standard for the Installation of Air Conditioning and Ventilating Systems, latest edition

Design Standards

HVAC system design will be based on the following conditions:

<u>Outdoor Design Temperatures:</u>

- Summer: 95°F (Dry Bulb) / 78°F (Wet Bulb)
- Winter: 0°F DB

<u>Indoor Design Temperatures (per HCPSS "Guidelines for Energy Conservation"):</u>

- Occupied Cooling Setpoint: 76°F DB (+2 F) / 50 percent Relative Humidity (Maximum)
- Occupied Heating Setpoint: 70°F DB (-2 F)
- Unoccupied Heating Setpoint: 55°F DB (-2 F)
- Utility Space Heating: 65 to 55°F DB (occupied / unoccupied)

<u>Building Occupancy Densities:</u>

- Architectural Furnishing Plans
- Estimated Maximum Occupancy Densities Provided in IMC Chapter 4

<u>Ventilation Rates:</u>

- Minimum Ventilation Rates: IMC Chapter 4 and ASHRAE Standard 62.1-2007
- Ceiling Supply Air Systems: 1.0 Ez (Zone Air Distribution Effectiveness)

<u>Filtration Criteria:</u>

- Pre-filters: 30 percent efficient (including all heat pump unit systems)
- Final filters: 85 percent efficient (for compliance with LEED IEQc5)

Life Cycle Cost Analysis

A 20-year life-cycle cost analysis will be conducted during the design development phase to confirm the final mechanical system selection for the facility. The following mechanical system options will be considered during this analysis:

- Ground-coupled geothermal heat pump unit system, consisting of vertical extended range type heat pump units for space conditioning and rooftop energy recovery unit systems for ventilation.
- Vertical four-pipe fan coil units for space conditioning and rooftop energy recovery units for ventilation. The four-pipe distribution system will be served by gas-fired boilers and an air-cooled chiller.
- Four-pipe rooftop VAV air-handling units with single-duct VAV terminal units for both space conditioning and ventilation. The four-pipe distribution system will be served by gas-fired boilers and an air-cooled chiller.
- Water-source geothermal heat pump unit system, consisting of vertical heat pump units for space conditioning and rooftop energy recovery unit systems for ventilation. A forced-draft cooling tower and condensing boilers will support the building heat pump unit loop.

The mechanical system described below is expected to meet the project's energy efficiency and life-cycle cost goals. All mechanical system components will be designed in strict accordance with all applicable codes, regulations, and the design standards described previously.

Mechanical Systems

Heating and Cooling System

The installation of a ground-coupled geothermal heat pump unit system is anticipated for Wilde Lake Middle School. This type of mechanical system provides the ability to have independent heating or cooling year-round, while delivering an extremely high level of overall building energy efficiency.

A ground-coupled geothermal borehole field will be positioned below the adjacent athletic fields. Geothermal boreholes will be approximately 400- to 450-feet in depth, depending on the thermal properties and ground temperature associated with the project site. Vertical geothermal borehole loop piping will be encased in a thermally enhanced grout, promoting good heat transfer between the loop piping and earth. Circuit mains from geothermal boreholes will be routed to the first floor mechanical room, positioned near the western perimeter wall of the building.

A series of base-mounted pumps will circulate a 20 percent propylene glycol solution between the building and geothermal borehole field. Utilizing a "water only" heat pump loop solution in lieu of propylene glycol will be evaluated as the design progresses. Two pairs of dedicated inline geothermal pumps will serve the dedicated outdoor air systems located within the two story classroom area, with remaining building supported from two base-mounted end suction type pumps located within the first floor geothermal mechanical room. Geothermal pumping systems will be provided with redundancy such that the operation of the building can be maintained in the event of a single pump failure. In addition, these pumping systems will be equipped with variable frequency drives for reduced energy consumption during periods of reduced system demand. Major mechanical infrastructure components, including distribution pumps, incoming geothermal piping, associated headers, an air separator, and an expansion tank will be located within the first floor geothermal mechanical room, positioned near the western perimeter wall of the building.

HVAC Systems

- <u>Classroom Areas (Including General, Science, Tech Ed, Family and Consumer Science, and Music Classroom Areas)</u>

  Extended range vertical heat pump units will be utilized for space conditioning within classroom areas and located within support closets positioned near the area served. Doors for support closets will be accessed from the corridor for routine maintenance. Heat pump units will be equipped with two-stage type compressors, helping to extend compressor life and improve the overall energy efficiency of these systems under part load operation.

  Conditioned outdoor air will be supplied to classroom areas by a series of indoor and rooftop dedicated outdoor air systems, complete with water-cooled compressors for heating and cooling, as well as energy recovery for pre-conditioning of outdoor air. Dedicated outdoor air systems serving the two-story classroom areas will be housed within two mechanical room areas located at the western side of the second floor level. The dedicated outdoor air system serving the Tech Ed, Home Economics, and Music classroom areas will be located at the rooftop level. Each system will be equipped with a minimum of one digital scroll or variable speed compressor for stability during part load operation. Supply and exhaust air fans for dedicated outdoor air systems will be equipped with variable frequency drives and provided with static pressure control, reducing fan energy during periods of reduced ventilation demand. The use of plate-and-frame heat exchangers will be considered for heating-type systems, with enthalpy wheel energy recovery devices provided for all other systems.

  Airflow supplied from the classroom dedicated outdoor air units will be dehumidified, conditioned, and delivered to a series of variable air volume (VAV) retrofit-type air terminal units, installed within the ductwork systems. Each classroom will be provided with a dedicated VAV air terminal unit, regulating the quantity of outdoor air supplied to each space as follows:

  - A room carbon dioxide sensor will control the airflow setpoint of these VAV terminal units during periods of increased outdoor air temperature and humidity levels.

  - During periods of reduced outdoor air temperature and humidity levels, the airflow setpoint of these VAV terminal units will be controlled through the room temperature sensor (subject to maintaining proper room carbon dioxide levels), providing "free cooling" for the areas served.

  This method of terminal unit control provides the ability to reduce outdoor air quantities when outdoor air cooling is required, while providing "free cooling" during the winter months. A design summer supply air temperature of 55° F is anticipated, with a sliding scale increase in supply air temperature during periods of reduced outdoor air temperatures during the winter months. The final setpoints of this sliding scale will be evaluated during design, maximizing the system's free cooling benefit during the winter months. A maximum supply air dewpoint temperature of 55° F will be maintained at all times.

  Exhaust airflow from classrooms, restrooms, and storage room areas will be routed through the dedicated outdoor air unit's heat exchanger for pre-conditioning of outdoor air. The use of retrofit-type air terminal units will be provided at select exhaust air locations for maintaining a constant airflow during periods of reduced fan speeds.

- Administration and Administrative Support Areas

  The administration and administrative support areas will be provided with space conditioning through a variable refrigerant flow (VRF) system, complete with heat recovery type water-cooled compressors connected to the heat pump loop. The use of ceiling cassette type VRF units is anticipated, promoting good access for filter replacement.

  Conditioned outdoor air will be supplied to the administration and administrative support areas by a single rooftop dedicated outdoor air system, complete with water-cooled compressors for heating and cooling, as well as energy recovery for pre-conditioning and tempering of outdoor air. This dedicated outdoor air system will be positioned within the "shadow region" of the rooftop level, located adjacent to the north wall of the second floor mechanical room. The system will be equipped with a minimum of one digital scroll or variable speed compressor for stability during part load operation. Supply and exhaust air fans for dedicated outdoor air systems will be equipped with variable frequency drives for balancing purposes. The use of an enthalpy wheel energy recovery device is anticipated for pre-conditioning outdoor air, with a plate heat exchanger provided for tempering supply air.

  Airflow supplied from the administration dedicated outdoor air unit will be dehumidified, conditioned, and supplied to each space. A design supply air temperature ranging between 70 and 55° F is anticipated, with a reset of design supply temperature occurring on sliding scale basis. The final setpoints of this sliding scale will be evaluated during design. A maximum supply air dewpoint temperature of 55° F will be maintained at all times. Exhaust airflow from the offices, conference rooms, restrooms, and storage areas will be routed through the dedicated outdoor air unit's enthalpy wheel for pre-conditioning of outdoor air.

- Media Center

  A single-zone indoor heat pump unit will support the space conditioning and ventilation requirements for the media center area. This unit will be housed within the second floor mechanical room, positioned north of the gymnasium area, and provided with extended range water-cooled compressors connected to the geothermal piping system. Supply and return air fans will be equipped with variable frequency drives for reducing airflow quantities during periods of reduced cooling demand. A room carbon dioxide sensor will reduce minimum outdoor air quantities during periods of reduced space occupancy. Media center support areas will be provided with space conditioning from a series of vertical extended range type heat pump units, located within support closets positioned near the areas served.

- Cafeteria

  A single-zone indoor heat pump unit will support the space conditioning and ventilation requirements for the cafeteria area. This unit will be housed within the eastern first floor mechanical room, positioned adjacent to the kitchen area, and provided with extended range water-cooled compressors connected to the geothermal piping system. Supply and return air fans will be equipped with variable frequency drives for reducing airflow quantities during periods of reduced cooling demand. A room carbon dioxide sensor will reduce minimum outdoor air quantities during periods of reduced space occupancy. Excess outdoor air quantities will be transferred to the adjacent kitchen area for exhaust air make-up.

- Kitchen

  Space conditioning for the kitchen area will be accomplished primarily through transfer airflow from the adjacent serving line and cafeteria areas. The mechanical systems supporting the kitchen hood will be subject to the final kitchen equipment design provided for the facility. Refer to the kitchen design portions of this narrative for additional information on these systems.

  A gas-fired heating-only make-up air unit will provide replacement air for the kitchen area, supplementing the airflow deficit between the kitchen exhaust and available transfer airflow to this space. The kitchen hood type provided for the facility (Type I or Type II) will be evaluated with the HCPSS kitchen personnel during design, with the understanding that a Type II hood will assist with reducing the exhaust airflow and overall energy usage of the kitchen area. The use of a demand ventilation system for the kitchen area is anticipated, allowing for reduced exhaust and make-up airflow requirements based on the temperature and smoke generation below the kitchen hood.

  The use of water-cooled condensing units for walk-in coolers and freezers will be evaluated during design. Condensing units will be connected to the geothermal piping loop, delivering an improved level of energy efficiency, as compared with traditional air-cooled condensing units.

- Gymnasium

  A single-zone indoor heat pump unit will serve the heating and ventilating requirements of the gymnasium area. Air-conditioning is currently not anticipated for this space, as the HCPSS does not provide air-conditioning for gymnasium areas. This unit will be housed within the second floor mechanical room, positioned north of the gymnasium area, and provided with extended range water-cooled compressors connected to the geothermal piping system. The gymnasium system will be provided with supply and return air fans for room airflow distribution. A room carbon dioxide sensor will reduce minimum outdoor air quantities during periods of reduced space occupancy.

  A series of rooftop exhaust fans and companion outdoor air intakes will provide room ventilation during periods of increased outdoor air temperatures, rather than utilizing the heating and ventilating unit. Options for utilizing industrial type ceiling fans, in lieu of separate rooftop exhaust fans and companion outdoor air intakes, are recommended and will be evaluated with the HCPSS as the design progresses. These ceiling fans promote heat desertification during the winter months and perceived cooling from continuous air motion during the summer months, helping to improve thermal comfort and reduce energy consumption throughout the year without the need for separate rooftop fan systems.

- Locker Rooms

  Locker room areas will be served by a rooftop dedicated outdoor air heating and ventilating rooftop unit with energy recovery. This unit will be positioned at the rooftop level of locker room area, in close proximity to the south wall of gymnasium. Air-conditioning is currently not anticipated for these areas, as the HCPSS does not provide air-conditioning for locker room areas. Heating for this unit will be accomplished either through an indirectly-fired gas furnace or through a series of water-cooled compressors connected to the geothermal piping system. This unit will be provided with supply and exhaust air fans for room airflow distribution. Airflow will be ducted to and from these areas and distributed through overhead air devices. Exhaust air from the locker and storage room areas will be routed through the energy recovery unit's heat exchanger for preconditioning of the outdoor air.

Building Automation Control System

A building automation system consisting of direct digital control (DDC) components will be provided for the facility. Damper and valve components will be provided with electric or electronic actuation. DDC control components will be utilized for all heat pump units, dedicated outdoor air systems, and heating and ventilating equipment. Manufacturer's packaged controls will only be utilized for refrigeration and burner controls, including manufacturer's safety functions. DDC interface with the room occupancy sensor provided for lighting control is anticipated, allowing "occupancy based" space temperature reset and room ventilation control throughout each zones occupied mode of operation.

All control system components will be interfaced with the central HCPSS energy management control system for remote monitoring and energy management routines. All system components will be designed to meet the HCPSS automation standards and naming conventions.

<End of Mechanical Systems Narrative>

Plumbing Systems Narrative

Storm Water Piping Systems

Storm water drainage, including roof drains, overflow drains, and storm water piping systems will be provided for the school. Above- and below-grade piping will be constructed from cast-iron, with no-hub piping connections provided only for above-grade piping components. All storm water piping systems will exit the building at various locations, in accordance with the storm water management plan developed for the facility.

Sanitary and Vent Piping Systems

Sanitary waste and vent piping systems will be provided for supporting plumbing fixtures within the school. Similar to the storm water piping, above- and below-grade sanitary and vent piping will be constructed from cast-iron, with no-hub piping connections provided only for above-grade piping components. Vent piping will terminate at the roof level, with a minimum 25-foot separation provided between vent piping terminations and any outdoor air intake locations. Sanitary piping systems will exit the building at various locations and will be coordinated with available site connections provided for the building.

The following special sanitary and vent piping systems are anticipated:

- Equipment and sinks that may discharge grease into the sanitary system from the kitchen will be piped to an underground concrete grease interceptor located adjacent to the kitchen area. The discharge from this interceptor will connect to site sanitary piping system.

- Acid-resistant piping systems will be provided for sanitary and vent piping serving science classrooms and laboratory areas. A below-grade acid neutralizer tank will be provided for neutralizing sanitary waste from science areas, prior to connecting to the site sanitary piping system.

- Sinks within the art classrooms will be provided with solids interceptors, collecting debris and preventing it from entering into the site sanitary piping system.

Domestic Water Piping Systems

A combination fire and water service will enter the building on the east side, into the mechanical room located adjacent to the kitchen area. This service will be capable of supporting both the fire and water service demands of the new facility. A new domestic water service, complete with basket strainer and dual reduced pressure zone backflow preventers, will separate the domestic water and fire services prior to distributing water throughout the facility. Domestic water piping will be distributed from this mechanical room area to plumbing fixtures and equipment located throughout the school.

Domestic hot water can represent a significant energy source for any facility. Energy usage associated with domestic hot water is comprised of three distinct components, which include production, storage, and distribution. All three factors must be considered when evaluating the overall energy usage of this system.

The following system will be used for the production, storage, and distribution of domestic hot water throughout the building:

Instantaneous Type Water Heaters

A distributed hot water system, consisting of multiple instantaneous type water heaters will be used for this project. A series of gas-fired condensing type instantaneous water heaters would be positioned throughout the school. Based on the proposed building floor plan, a total of four water heater systems are anticipated:

- Water Heater System 1: Serving the southern building areas, including the locker room and laundry room areas.
- Water Heater System 2: Serving the eastern building areas, including the kitchen and serving line areas.
- Water Heater System 3: Serving the northern building areas, including the administration area and adjacent group restroom.
- Water Heater System 4: Serving the western building areas, including the science classroom and group restroom areas located at the first and second floor levels.

Preheating of the domestic water make-up will be considered, with preheating accomplished from either the geothermal piping loop or associated heat pump unit equipment. All water heaters would be fully instantaneous and provided without storage, eliminating the energy consumption associated with hot water storage. In addition, each water heater would be positioned in a manner to minimize (or eliminate) the use of recirculation pumps and hot water piping loops. This approach helps to reduce (or eliminate) the energy associated with the hot water distribution.

This system has an extremely high level of energy efficiency for production of domestic hot water, significantly reduces or eliminates energy usage associated with hot water storage and distribution, and provides a reduced first cost as compared with a centralized solar hot water system. The utilization of instantaneous type water heaters eliminates the use of rooftop collectors, maximizing roof area available for photovoltaic systems.

Natural Gas Piping Systems

A natural gas service will be provided for the school. The gas service meter and pressure reducing station will be located at the rear of the building and adjacent to the kitchen area. Gas piping will serve the emergency generator systems prior to entering the building. Gas distribution piping will be located at the roof level and extend to the science lab areas, mechanical equipment, and water heater systems located throughout the school.

Plumbing Fixtures

Institutional grade plumbing fixtures will be provided throughout the school. These fixtures will include floor-mounted water closets utilizing dual flush type 1.6/1.1 gallon per flush valves, wall-hung urinals, and wall-hung lavatories with self-closing hot and cold water faucets that supply 0.35 gallons per minute. The use of either pint flush (0.125 gallon per flush) or waterless type urinals will be evaluated during design, based on LEED water conservation requirements. Koehler model K4917-0 urinals will be specified if waterless type urinals are utilized. All plumbing fixtures will comply with ADA.

Fire Protection Systems

An incoming fire service entrance will be provided in the mechanical room. The service entrance will be complete with a double-check backflow preventer, alarm check valve, and piping connection to the fire department connection. A fire line will be routed to zone valve assemblies located throughout the building. Branch sprinkler piping will be configured to accommodate the building's architectural layout, with sprinkler heads provided throughout. All work will be specified to conform to standards of the National Fire Protection Association (NFPA) and will include requirements for performance verification through hydraulic calculations.

<End of Plumbing Systems Narrative>

Electrical Systems Narrative

Design Criteria

Applicable Codes and Standards

- ADA Standards for Accessible Design, 2010
- ASHRAE Standard 90.1, Energy Standard for Buildings, 2010
- IEEE Standards, Power and Telecommunications
- IESNA Lighting Handbook, 10th Edition
- International Building Code (IBC), 2012 Edition
- International Energy Conservation Code (IECC), 2012 Edition
- Life Safety Code, NFPA 101, 2012 Edition
- Maryland Occupational Safety and Health Act (MOSH Act)
- National Electrical Code (NEC) with local amendments, NFPA 70, 2011
- National Electrical Manufacturers Association (NEMA), standards
- National Fire Alarm and Signaling Code, NFPA 72, latest edition

General

The electrical systems will include work associated with the power, electrical provisions for the solar photovoltaic (PV) system, emergency power, lighting, lighting controls, classroom technology, data and video, telephone, intercom, public address, master clock, sound, building security, and fire alarm systems. The electrical systems, in concert with the architectural and mechanical considerations, are intended to create spaces that are flexible, functional, energy efficient and respond to the needs of this facility. The electrical design will comply with applicable codes, regulations, standards, and authorities having jurisdiction. Sustainable technologies will be incorporated into the design to achieve the goal of LEED 'Gold' certification.

Electrical Service

There will be an outdoor BGE pad-mounted utility transformer located in the service yard adjacent to the loading dock of the school. (The front of the utility transformer will be within 20 feet from the service driveway.) A secondary service concrete-encased ductbank (with minimum 8 ducts) will be run from the utility transformer to the CT section of the main switchboard in the main electrical room.

Power Distribution

Power will be distributed at 277/480 volts and 120/208 volts. The distribution system will consist of the following electrical equipment:

- Main switchboard
- Distribution panelboards
- Lighting panelboards
- Branch circuit panelboards
- Dry-type transformers
- Disconnecting switches and/or enclosed circuit breakers
- Combination starters and/or variable frequency drives for motor loads

The main electrical room will consist of a main switchboard, distribution panelboards, dry-type transformers, lighting panelboard, branch circuit panelboards, electrical equipment to support the PV system, and generator-connected equipment. Generator-connected equipment will consist of automatic transfer switches, dry-type transformers, and branch circuit panelboards.

The main switchboard will be a 2500-ampere, 277/480-volt, 3-phase, 4-wire, switchboard with a CT section, main section with 2500-ampere (100 percent rated) electronic-trip main circuit breaker, and distribution section with molded-case branch circuit breakers. The main switchboard will incorporate ground fault and surge protection.

Panelboards will be rated at 277/480 volts and 120/208 volts and serve as distribution, branch circuit, or lighting panels. Panelboards will have a copper bus structure. Panelboards will be sized with approximately 25 percent spare capacity and 25 percent spare breaker space.

There will be dedicated panelboards for lighting, mechanical loads, general receptacle loads, and "clean power" computer receptacle loads.

Computer panels will have a 200 percent rated neutral bus to account for harmonic distortion. A three-phase surge protective device (SPD) will be connected to (and mounted adjacent to) each respective computer panel.

The typical dry-type transformer will have a 480-volt delta primary and 208/120-volt, 3-phase, 4-wire, wye secondary distribution. Transformers serving general receptacle panelboards will be general-purpose, energy-efficient type, complying with NEMA TP-1. Transformers serving computer panelboards will be either UL K-13 type or harmonic-mitigating type.

Lighting will be served at 277 volts, single-phase. Mechanical equipment will be served at either 120 volts, single-phase; 208 volts, single-phase; 208 volts, 3-phase; 277 volts, single-phase; or 480 volts, 3 phase, depending upon the load requirements. Motors one horsepower or higher will be connected at 480 volts, 3-phase. Three-phase motor loads will be provided with phase-loss protection. General receptacles will be served at 120 volts, single phase. Each feeder and branch circuit will have a separate copper grounding conductor in the same raceway.

The wiring system will be copper conductors with THHN-THWN insulation installed in metallic conduit. The minimum size conduit will be 3/4 inches. Flexible metal conduit (FMC) will be used to connect to transformers. Liquid-tight flexible metal conduit (LFMC) will be used to connect to motors and other vibrating equipment. FMC and LFMC will be limited to a maximum 6-foot length.

Electrical metallic tubing (EMT) will be used throughout except where flexible conduit is required and as noted above. Polyvinylchloride (PVC) conduit will be used for all exterior underground circuits. Intermediate metal conduit (IMC) will be used on roofs and other damp or wet locations.

Receptacle branch circuits will utilize #12 wiring when the run is 50 feet or less, #10 wiring when the run is between 50 and 100 linear feet, and #8 wiring when the run is more than 100 linear feet in length.

Power wiring will be installed in raceway or conduit. Type MC cable will be considered in order to reduce construction costs.

Electrical Provisions for Photovoltaic (PV) System

The solar photovoltaic system will consist of PV panels on the roof.

The solar PV system will use exterior distributed inverters. The inverters will be grouped together in clusters at several locations. Each inverter "cluster" will either connect to a nearby dedicated "PV" panelboard (to be located in an electrical closet within the building) or connect directly to a "PV" main distribution panelboard (MDP). These inverters will have integral disconnects that comply with NEC 690.14, so an external disconnect per inverter will not be needed.

The "PV" MDP will have the "Point of Connection" (POC) to the utility (BGE) grid at the main switchboard. The "PV" MDP can be located either in the main electrical room or in a room closer to the inverter "clusters." The location of the "PV" MDP will depend on the cost/benefit analysis of running multiple smaller circuits versus running single larger feeders back to the POC.

The POC at the main switchboard will be either on the "load side" or "line side" of the main service disconnect of the switchboard, utilizing a circuit breaker or fuse in the switchboard. Connections will be in accordance with 2011 NEC 690.64 and 705.12.

- Line side: The POC will be between the BGE CT cabinet and the building main electrical service disconnect.
- Load side: The POC will be at the distribution section of the switchboard.

The main electrical room will remain on the east side of the building near the loading dock or service yard.

The distributed solar PV inverters will be outside the building, in lieu of inside the building, due to the amount of heat produced by inverters.

The solar PV system will be on the line side of any generator automatic transfer switch (ATS). In other words, the solar PV system and generator power will always be separate from each other.

The solar PV system will be utility grid-connected ("on-grid") and not use on-site battery storage. If there is a desire to have an "off-grid" or "bi-modal" (meaning both on-grid and off-grid) solar PV system, it is understood that an "off-grid" or "bi-modal" solar PV system will require on-site battery storage, which may be cost and space prohibitive. *(Note: Lithium-ion batteries are used on solar PV systems, which are the same batteries used in electric vehicles. The space required for lithium-ion batteries is 4 kWh per square foot for a 6-foot tall battery system, or 0.66 kWh per cubic foot. There is 50 percent space adder when using lead-acid batteries.)*

Emergency Power

An outdoor natural-gas generator in a weatherproof enclosure will be installed in the service yard adjacent to the loading dock of the school. The generator will be rated at 277/480 volts, 3-phase, 4-wire.

The generator will be sized at 150 kW and be connected to two automatic transfer switches (ATS) located in the main electrical room.

- ATS #1 will be the "life safety" ATS and will serve emergency panelboards. Emergency panelboards will provide power to the fire alarm system, security panels, emergency egress lighting in corridors and classrooms, and exit signs.
- ATS #2 will be the "optional standby" ATS and will serve the ATC/BAS (Building Automation System) panels, kitchen refrigeration equipment, public address system equipment, voice communications equipment, selected data communications equipment, security equipment, heat trace, and other equipment and devices as determined by the HCPSS. The "optional standby" ATS will also serve selected receptacles in the principal's office, main office, corridors, gym, cafeteria, and kitchen.

Provisions will be made in order to connect a temporary portable generator to serve building heating equipment in the school, as well as HVAC, lighting, receptacle, and kitchen loads for areas in the school that may be designated for public shelter by the Maryland Emergency Management Agency (MEMA). Equipment will include an outdoor generator docking station (in order to make connections to the temporary portable generator), a manual transfer switch, and distribution switchboard. Equipment will be sized in order accommodate the building heating equipment loads and public shelter loads.

Lighting

Building lighting will generally consist of recessed 2' x 4' luminaires (lighting fixtures), recessed downlights in selected areas, industrial-type luminaires for support spaces with open ceilings, exit signs, exterior perimeter building-mounted luminaires, and exterior pole-mounted luminaires at parking lots.

In order to reduce energy consumption within the building, luminaires within the school will utilize LED technology with LED light engines and LED drivers.

The standard luminaire will be a 2' x 4' recessed troffer-type lensed LED luminaire. These luminaires will be used in the main office area, corridors, stairs, classrooms, labs, activity rooms, and music rooms. Gymnasium and cafeteria will use high-bay type luminaires. Lockers and toilets will use vandal-resistant luminaires. Kitchen will use gasketed luminaires with smooth lenses (for easier cleaning). Mechanical and electrical rooms will use industrial-type luminaires. Luminaires in the media center will be determined during the design development phase of this project. Exit signs will be red LED type. Exterior building-mounted and pole-mounted luminaires will be full-cutoff, with finish selected by the architect.

Classrooms will have an average between 30 and 50 foot-candles at the task plane. Switching of luminaires will be both multi-level and zoned as appropriate for the room's use.

The lighting design will comply with (or exceed the requirements of) ASHRAE/IESNA Standard 90.1-2010. The lighting power density (LPD) will not exceed 0.87 watts per square foot for the entire school. The selection of lighting fixtures for the building will be compliant with the energy standard.

Lighting levels will be designed in accordance with the recommendations of the Illuminating Engineering Society of North America (IESNA). Maintained illumination values will be calculated using a total maintenance factor of 80 percent. Horizontal and vertical illumination levels, luminance ratios, and other lighting characteristics shall be appropriate for each location and task.

Lighting Controls

The general control strategy for the building utilizes occupancy sensors wherever possible for interior lighting and mechanical contactors for exterior lighting. Emergency lighting circuits will remain on in public spaces until the building is locked by the security system, at which time they will be shut off via mechanical contactors. A manual override switch will be provided adjacent to the security panel to manually activate the emergency lighting in the event of failure of the security panel.

Automatic daylight controls (photocontrol with dimming ballasts) for daylight harvesting will be utilized where required per ASHRAE Standard 90.1-2010, Section 9.4.1.4. Daylight harvesting will be required in rooms where the total square foot area of vertical glazing (or *primary sidelighted area*) in a particular room or enclosed space equals or exceeds 250 square feet. This would include the cafeteria. Also, daylight harvesting will be required in rooms over 900 square feet where skylights are used.

Automatic daylight controls (photocontrol with dimming ballasts) for daylight harvesting where not required by ASHRAE Standard 90.1-2010, Section 9.4.1.4, will be considered if it is determined that there will be a significant energy savings to allow for less PV panels on the roof.

Additional control strategies for specific spaces are listed below.

Lighting within typical classrooms will be controlled by the following devices and programming settings:

- Manual control: Teachers will have access to manual controls in two zones; the row of lights along the teaching wall and the remaining lights in the room. Both zones will be provided with low-voltage switches to access dimming setpoints at 0 percent, 50 percent, or 100 percent.
- Automatic control: Lights must be turned on manually upon entering the room. Ceiling-mounted 360° dual-technology occupancy sensors will turn off lights within the room after 15 minutes of inactivity. Occupancy sensors will only be responsible for turning lights off.

Lighting within offices will be controlled by the following devices and programming settings:

- Manual and automatic controls (small offices): Dual-relay line-voltage wall station occupancy sensor will be provided. The sensor will be manual-on by selecting one or both of the "on" buttons, providing flexibility of lighting at 0 percent, 50 percent, and 100 percent relative light output. Sensor will be factory set to turn off lighting when room is unoccupied for 15 minutes.
- Manual and automatic controls (larger offices): Ceiling-mounted 360° dual-technology occupancy sensor or sensors will be provided, which will be set to automatically turn off lighting when room is unoccupied for 15 minutes. Wall-mounted low-voltage lighting control station(s) or switch(es) will be provided at the door(s) for control of the lighting at 0 percent, 50 percent, and 100 percent relative light output.

Lighting within the gymnasium will be controlled by the following devices and programming settings:

- Manual control: Line-voltage key switches will be provided at the entry doors to the gymnasium for control of all of the lighting within each room.
- Automatic control: Mechanical contactors connected to the building security system will be provided to satisfy the automatic control requirements for these spaces.

Lighting within the media center will be controlled by the following devices and programming settings:

- Manual control: Manual switches will be provided to control the lighting in three zones. For the lights surrounding each projection screen, additional low-voltage override switches will be provided on the face of the adjacent column to allow for these lights to be independently turned off during the use of the projection screen.
- Automatic control: Mechanical contactors connected to the building security system will be provided on the line side of the switches to automatically shut off the lighting in case the lighting within the space was left on after hours.

Lighting within restrooms will be controlled by the following devices and programming settings:

- Manual control: There will be no manual controls in the group restrooms. There will be a manual override switch within wall station occupancy sensor in private toilet rooms.
- Automatic control: Group restrooms will have ceiling mounted occupancy sensors that will automatically turn lighting on upon entry and automatically turn off after being unoccupied for 15 minutes. Private restrooms will have wall station occupancy sensors which will be programmed to require a manual initiation to turn lighting on, but will automatically turn off after being unoccupied for 15 minutes.

Lighting within storage rooms will be controlled by the following devices and programming settings:

- Manual/automatic control: Small closets and storage rooms will have a single wall station occupancy sensor, programmed to require manual activation to turn the lights on and will automatically turn lights off after being unoccupied for 15 minutes. Larger spaces will have ceiling-mounted occupancy sensors without manual override control stations and switches. Lighting will turn on and off automatically.

Lighting within mechanical, electrical, and telecom rooms will be controlled by the following devices and programming settings:

- Manual control: Line-voltage toggle switches will be provided at each entrance to the space. Automatic controls will not be provided for these spaces due to concerns for safety during maintenance.

Exterior lighting will be controlled by the following devices and programming settings:

- Automatic control: Lighting will be controlled by a signal from the building automation system through mechanical contactors. Contactors will be mechanically-held, electrically-operated, and provided with hands-off-automatic (HOA) control pushbuttons to allow manual override.

Classroom Technology

Classrooms will be equipped with dedicated computer receptacles connected to a separate "clean-power" computer panel. The teacher's desk receptacles will also be connected to this "clean-power" source.

The general classroom design will include a VCR/DVD tuner combination device, audio amplifier and mixer, wireless microphone device and audio override relays. All of these devices will be housed in the teacher's wardrobe. The general classroom will also contain a wall-mounted LCD projector, screen, computer hook-ups, speakers, and necessary wiring to connect to the projector, amplifier, mixer, speakers, and wireless microphone as one system. The outlet configurations will be in accordance with the latest HCPSS standards.

Data and Video System

The network system design will include device outlet boxes, conduit and raceways, and conduit sleeves for the installation of network cabling. Cabling will include copper Category 6 UTP station and multimode fiber optic backbone cables. The building will have fully functional wireless connectivity throughout with no dead zones. The system will include the hardware, controllers, switches, transceivers, and cabling.

Ceiling-mounted wireless access points (wireless routers) will be located throughout the school. Category 6 cable run will run from each wireless access point to respective telecom room.

With the advances in wireless technology for data transfer, it is proposed that a significant portion of data cabling be deleted from the project as follows:

- Student outlets in classrooms, totaling four student data jacks (required by Maryland Public School Standards for Telecommunications Distribution Systems) will not be installed.
- Clerical outlets (with two data jacks and one voice jack at each outlet) in storage rooms over 100 square feet (required by Maryland Public School Standards for Telecommunications Distribution Systems) will not be installed.
- Data jacks in the computer lab and the media center will not be installed, if it is not required for Maryland School Assessment (MSA) testing through the Maryland Department of Education.

The data network in the school can be used for video streaming. Therefore, it is recommended that the cable television (CATV) distribution system that includes outlets and broadband coaxial cabling to the teachers' workstation and high and low LCD projector outlets be deleted for this project. This will offer a cost savings to the project if the cable television (CATV) distribution system is not provided.

Telephone System

The telephone system design will include device outlet boxes, conduit and raceways, and conduit sleeves for the installation of cabling and equipment.

The telecommunications system will be provided by an HCPSS-approved information technology contractor.

Intercommunication, Public Address and Master Clock Systems

The intercom system will include device outlet boxes, conduit, and cabling for installation of call switches in each instructional area with ceiling speakers. Speakers will be provided in corridors, workrooms, selected offices and other occupied spaces. The intercom system will have administrative consoles, minimum of four. Cabling will be as recommended by the manufacturer. The system will be integrated with the security, fire alarm, phone, cafeteria and gymnasium sound systems. The master clock portion will be used for system clocks in the corridors, cafeteria, gymnasium, media center, selected offices, and classrooms.

An HCPSS-approved systems contractor will provide the intercom, public address and master clock systems.

Sound Systems

Individual sound systems for the cafeteria and gymnasium with transmitter for hearing impaired will be provided. These systems will be complete with speakers, microphone jacks, auxiliary jacks, and wall mounted equipment cabinets.

An HCPSS-approved systems contractor will provide the sound systems.

Building Security

The seurity system design will include device outlet boxes, conduit, and raceways for the installation of contact switches, control unit, card readers, connections to electric strikes, override switches, motion detectors, and cameras. DVR, monitors, a 32-inch monitor in main office, and a 26-inch monitor in the principal's office will be provided. The system will be connected to the generator power system. The head-end security equipment will be housed in the main telecom room (MDF room).

An HCPSS-approved security contractor will provide the security system. The HCPSS head administrative and security office will monitor the system.

Fire Alarm System

The fire alarm system will be designed to comply with State of Maryland Fire Code, local authorities having jurisdiction, International Building Code, and NFPA. The fire alarm system will be a stand-alone, addressable, analog system and will have voice evacuation capability. The main fire alarm control panel (FACP) will be located in the main telecom room (MDF room). The basis-of-design manufacturer will be by Edwards Systems Technology (EST).

There will be two fire alarm annunciators. The first annunciator will be a remote graphic annunciator panel at the main entrance. The second annunciator will be an LED display with a static graphic map in the custodial office. The graphics will show the fire alarm zones. Zoning will follow the sprinkler zones.

Fire alarm manual pull stations will be provided at each exterior egress door. Smoke detectors will be provided at the FACP, in the corridors, and on each side of a door with fire alarm magnetic door holders. Duct smoke detectors with remote test stations will be provided for air-handling systems where required, and will interface with the HVAC equipment for shutdowns. Each initiation device will have its own address.

Fire alarm combination speaker/strobes will be installed in classrooms, toilet rooms, corridors, labs, music rooms, activity rooms, lockers, gymnasium, cafeteria, and kitchen. Notification appliance circuit (NAC) power extender panels will be provided where needed for combination speaker and strobe devices. Strobe spacing and locations will be per NFPA requirements for rooms and corridors. Candela minimum required light output intensity will be indicated on the drawings.

<End of Electrical Systems Narrative>

Energy Statement

Sustainability and energy conservation is a fundamental aspect of the design for Wilde Lake Middle School. Many energy saving techniques are being incorporated into the building to achieve energy efficiency and compliance with LEED energy requirements, along with achieving the project's "net zero" energy usage goals. These techniques include the following:

- Mechanical, electrical, and plumbing systems will exceed the energy efficiency requirements of ASHRAE Standard 90.1-2010 and the 2012 International Energy Conservation Code.
- The use of ground-coupled geothermal technology is anticipated.
- Mechanical systems will utilize decoupled ventilation systems, complete with energy recovery devices for pre-conditioning ventilation airflow. The use of variable speed fan control and variable speed or digital scroll type compressors is anticipated for dedicated outdoor air systems.
- Heat pump units will be provided with electronically commutated motors (ECM) and two-stage type compressors, for increased operating efficiencies.
- Mechanical systems will include variable frequency drives to allow systems to operate at lower capacities when building loads are reduced. Premium efficiency motors will be specified for all motors.
- VAV retrofit-type air terminal units will be utilized for demand control ventilation within classroom areas, as well as for "free cooling" when outdoor air temperature and humidity levels permit.
- Single-zone rooftop unit systems will incorporate dry-bulb economizer control allowing the use of "free cooling" when outdoor air temperature and humidity levels permit.
- Systems providing outdoor air will include MERV 13 filtration to improve indoor air quality.
- Mechanical systems will be designed to maximize indoor air quality by effectively mixing and delivering fresh air to building occupants.
- High occupancy areas will include carbon dioxide monitoring to reset the quantity of outdoor air required during periods of reduced occupancy.
- Environmentally friendly refrigerants will be specified for mechanical equipment.
- A distributed hot water system consisting of multiple instantaneous gas-fired condensing water heaters will reduce or eliminate hot water storage and distribution energy.
- Energy meters will be placed in electrical rooms to meter energy (kWH) usage for the following: Main electrical service, lighting loads, receptacle plug loads, HVAC/ mechanical loads, and kitchen loads.
- Photovoltaic solar panels will be installed on the roof for onsite power generation.
- LED luminaires (lighting fixtures) will be provided throughout, in lieu of fluorescent luminaires, in order to significantly reduce the energy used to light the school.
- Lighting controls will include manual-on in offices, work rooms, instructional areas, and storage rooms. Lights will not automatically turn-on in these spaces, therefore reducing energy usage.
- Occupancy sensors will automatically turn off lighting in areas when unoccupied.
- Daylight harvesting will be incorporated where required in rooms with vertical glazing and/or operable skylights. A daylight monitoring photocell/sensor will automatically reduce the lighting levels in a room when adequate daylight is present, which in turn reduces energy usage.
- Full-cutoff exterior LED luminaires (lighting fixtures) will reduce light pollution to the surrounding areas.

<End of Energy Statement>