Frederick High School
Feasibility Study Report

Frederick County Public Schools

Final Submission
December 21, 2012

Prepared by:

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Nyikos, Inc., Foodservice
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EXECUTIVE SUMMARY

Constructed in 1939, with additions in 1955 and 1966 and major additions and renovations completed in 1977 through 1981, Frederick High School in Frederick, Maryland does not provide an optimum teaching and learning environment for the students of Frederick County. As it exists, the facility does not meet the current Educational Specifications requirements for a standard Frederick County high school in several categories of program and area. Overall, the physical learning environment at Frederick High School is deficient due to a lack of space, inefficient layout of and circulation between existing spaces, a dearth of daylight in classrooms, and aging building systems. Site vehicular circulation is difficult to manage and potentially unsafe as buses line up along the loop road on the south side of campus, which impedes the ability of other vehicles to move around the campus efficiently when busses are present. There is also a lack of student parking, a lack of parking near the athletic facilities, and no dedicated student drop-off location for parents.

This study was commissioned to assist the Board of Education in assessing its options to improve Frederick High School's facility to meet the proposed Educational Specifications. Several possibilities were evaluated and six options emerged:

1. **Option 1 – Rehabilitate Entire Existing School with Additions**
   This approach will involve a rehabilitation of the existing school as well as the construction of an addition or additions as required to provide the additional space required under the proposed Educational Specifications. The renovated facility will achieve the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) Silver certification. Existing "open space" classrooms will be reconstructed with hard partitions and other interior reconfiguration of the facility will be undertaken to address building code and life safety concerns. As no significant structural changes will be made, deficiencies will remain with regard to the area and adjacency requirements of the Educational Specifications. Building systems will be updated or replaced. The existing site configuration will be mostly retained. The expectation is that students will remain in the facility during the phased project.

2. **Option 2 – Rehabilitate Existing 1939 Wing with Major Additions**
   Under this option, the front (north) wing of the original 1939 school will be retained and rehabilitated while the remainder of the existing facility will be demolished and replaced. Building code and life safety issues will be corrected in the existing building. Major additions will provide new spaces for the gymnasium, physical education department, auditorium, fine arts department, food service areas, administration, and most classrooms. The renovated facility will achieve the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) Silver certification. The existing site configuration will be mostly retained but a separate lot for bus stacking will be constructed. Students will be moved into relocatable classrooms or other temporary facilities during construction.

3. **Option 3 – Complete Replacement on Location of Existing Building**
   This option involves demolition of the existing building and construction of a new facility within a similar footprint. The new school will be designed in accordance with the Educational Specifications and will comply with current building, life safety, and accessibility codes and standards. Designed to achieve the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) Silver certification, the new building will provide a safe, healthy, and inspiring learning environment. The existing site configuration will be mostly

retained but a separate lot for bus stacking will be constructed. Students will be moved into relocatable classrooms or other temporary facilities during construction.

4. **Option 4 – Complete Replacement on Upper Playing Fields**
   A new facility designed in accordance with the Educational Specifications will comply with current building, life safety, and accessibility codes and standards. Designed to achieve the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) Silver certification, the new building will provide a safe, healthy, and inspiring learning environment. Students will remain in the existing building during construction of the new building. Play fields and courts are grouped together efficiently. Site safety and circulation will be improved with separation of vehicular circulation patterns.

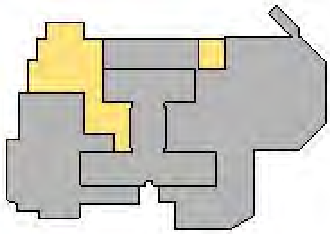
5. **Option 5 – Complete Replacement on Parking Lot**
   A new facility designed in accordance with the Educational Specifications will comply with current building, life safety, and accessibility codes and standards. Designed to achieve the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) Silver certification, the new building will provide a safe, healthy, and inspiring learning environment. Students will remain in the existing building during construction of the new building. Play fields and courts are grouped together efficiently. Site safety and circulation will be improved with separation of vehicular circulation patterns.

6. **Option 6 – Complete Replacement on Parking Lot**
   A new facility designed in accordance with the Educational Specifications will comply with current building, life safety, and accessibility codes and standards. Designed to achieve the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED™) Silver certification, the new building will provide a safe, healthy, and inspiring learning environment. Students will remain in the existing building during construction of the new building. Play fields and courts remain in similar locations to the existing arrangement. Site safety and circulation will be improved with separation of vehicular circulation patterns.

Following, on page 7, is a comparison of overall building area, project costs, 35-year life-cycle costs, and anticipated construction duration for the options. Refer to Appendices A and B for detailed analyses of the construction costs and life-cycle costs and to pages 55 through 111 for more detailed discussion of each option.

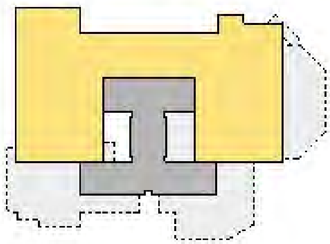
After thorough evaluation of the feasibility study options, the committee agreed that Option 5 was preferred to recommend to the Board of Education. Further discussion of the committee's reason for recommending this option can be found on page 119.

OPTIION 1



Total Area w/o Pool	N/A
Total Area w/Pool	258,816 GSF
Total Estimate Project Cost w/o Pool	N/A
Total Estimate Project Cost w/Pool	$110,915,370
35-year Life Cycle Cost w/o Pool	N/A
35-year Life Cycle Cost w/ Pool	$150,370,370
Construction Duration	6 years

OPTION 2



Total Area w/o Pool	272,300 GSF
Total Area w/Pool	287,000 GSF
Total Estimate Project Cost w/o Pool	$93,131,401
Total Estimate Project Cost w/Pool	$98,557,472
35-year Life Cycle Cost w/o Pool	$130,491,401
35-year Life Cycle Cost w/ Pool	$137,934,472
Construction Duration	3 years

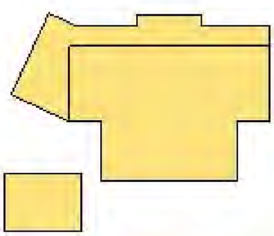
OPTION 3

Total Area w/o Pool	260,000 GSF
Total Area w/Pool	274,000 GSF
Total Estimate Project Cost w/o Pool	$84,027,711
Total Estimate Project Cost w/Pool	$89,014,420
35-year Life Cycle Cost w/o Pool	$114,768,711
35-year Life Cycle Cost w/ Pool	$121,549,419
Construction Duration	2.5 years

OPTION 4

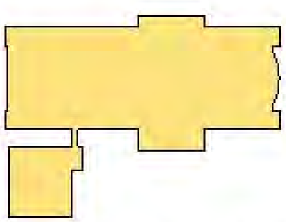
Total Area w/o Pool	256,000 GSF
Total Area w/Pool	270,700 GSF
Total Estimate Project Cost w/o Pool	$86,053,513
Total Estimate Project Cost w/Pool	$91,037,436
35-year Life Cycle Cost w/o Pool	$116,298,513
35-year Life Cycle Cost w/ Pool	$123,075,436
Construction Duration	2 years

OPTION 5



Total Area w/o Pool	256,000 GSF
Total Area w/Pool	272,000 GSF
Total Estimate Project Cost w/o Pool	$84,995,092
Total Estimate Project Cost w/Pool	$90,622,675
35-year Life Cycle Cost w/o Pool	$114,874,092
35-year Life Cycle Cost w/ Pool	$122,453,674
Construction Duration	2 years

OPTION 6



Total Area w/o Pool	256,000 GSF
Total Area w/Pool	270,700 GSF
Total Estimate Project Cost w/o Pool	$84,995,092
Total Estimate Project Cost w/Pool	$90,346,129
35-year Life Cycle Cost w/o Pool	$114,874,092
35-year Life Cycle Cost w/ Pool	$122,018,129
Construction Duration	2 years

KEY: NEW EXIST DEMO

NOTE: Project costs are escalated to midpoint of construction and include equipment and other soft costs. Refer to Appendix A for detailed cost breakdowns.

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1.0 INTRODUCTION

1.1 Background

This feasibility study was conducted for Frederick County Public Schools. The Feasibility Study Steering Committee included FCPS staff and educators, architects and engineers, and a participant from Maryland State Department of Education. FCPS also conducted a significant public outreach program in an effort to gauge comments and concerns of students, staff, parents, neighbors, and community members. Additional details of the public outreach can be found in Appendix G.

The existing State Rated Capacity of the facility is 1,603 and the current Full Time Enrollment as of September, 2012 is 1,340. FHS will be renovated or replaced at the same SRC in keeping with Board of Education Policy 202.2 that establishes maximum school capacity at elementary, middle and high schools.

The focus of this study is to evaluate design options for four approaches to modify Frederick High School. These are as follows: Retain Entire Existing School with Additions, Retain and Rehabilitate Existing 1939 Wing with Additions, Complete Replacement on Current Site, and Complete Replacement Elsewhere on Campus.

GWWO, Inc./Architects would like to thank the members of the Frederick High School Feasibility Study Steering Committee for their time and effort in helping to develop this study. The Committee's input and creativity has proved invaluable in understanding and addressing the needs of Frederick High School.

1.2 Purpose

The purpose of the feasibility study is to identify school facility renovation/modernization needs, the cost of meeting these needs for Frederick HS, and the plan for meeting the needs with each alternative. This study will consider all available options including renovating the existing school; partial demolition, addition and renovation; complete demolition and replacement of school on site; and complete demolition and replacement of school at another site. Included in the consideration will be the ability to meet the educational program, physical condition of the existing school, constructability of each option, local and state regulations, cost of each option, length of construction time, available space for relocating students during each option and available alternative school sites. Unique features of Frederick HS will be given attention with regards to the ability to retain, reuse or replace the unique feature. An example of a unique feature is the indoor swimming pool. This study will consider the ability to retain the existing pool, reuse the existing pool or replace the existing pool including the costs to do each.

It is expected that the information presented in this study will assist the Board of Education in determining the most appropriate alternative that satisfies the Educational Specification and optimizes the delivery of a contemporary instructional program at a reasonable cost.

1.3 Methodology / Process

The Feasibility Study Steering Committee completed multiple tasks to develop this Feasibility Study. The process involved multiple meetings to identify project goals, evaluate and identify approaches and individual schemes. Additional tasks, including field investigations; review of drawings of the existing building; code/ADA analysis and preliminary reviews were conducted by the Architect/Engineering team to determine the impact of the existing building systems on the various schemes.

Based on the above analysis, the Committee developed advantages, disadvantages and costs associated with each of the schemes. The Committee then evaluated these factors to consider how each scheme addressed the project goals and facility needs of Frederick High School.

1.4 FCPS Mission and Strategic Goals

MISSION – Frederick County Public Schools' mission is to:

- *REACH* our students with exceptional teaching and caring support,
- *CHALLENGE* them to achieve their potential, and
- *PREPARE* them for success in a global society.

STRATEGIC GOALS – FCPS will establish an environment that capitalizes on all children's natural curiosity, nurtures their desire to learn and respects their individual learning styles.

1. Every student will learn in an intellectually challenging environment, prepared as a life-long learner to excel in college, further study and the workplace.
2. Every student will learn in a safe, caring and engaging environment, and be prepared to participate as a productive citizen and contributing member of our global society.
3. All employees will be highly qualified for their jobs, motivated and effective at work, and valued and respected by their students and community.
4. Every family will have access to the programs and services needed for their children to enter school ready to learn.
5. All sectors of the community will be engaged in the education of our children.
6. Every division and school will have sufficient resources and will manage those resources in a publicly accountable and cost-effective manner.

SCHOOL MOTTO – “Enter to Learn, Go Forth to Serve.”

2.0 FACILITY HISTORY AND DESCRIPTION

Frederick High School (FHS) is a three story masonry building of 234,105 GSF located on Carroll Parkway in Frederick, Maryland. As the oldest school in Frederick County, FHS dates to 1923 when the Frederick boys' and girls' high schools (established 1891) merged to form Frederick High School. The school relocated to the current site in 1939, when the earliest portion of the existing facility, an "H"-shaped, three story building, opened. In 1955, a one-story satellite building was constructed 95 feet to the north of the 1939 building. The facility originally housed additional classroom space as well as a large vocational agriculture workshop. A small addition was constructed off of the ground floor cafeteria kitchen in 1961. Further additions and renovations were completed in 1966, with single story additions for a lecture room and expanded athletic locker facilities on the southeast corner of the 1939 building as well as an addition to the east side of the 1955 satellite containing a sheet metal shop and graphic arts classroom.

The most significant changes to the facility came in 1977 through 1980 when a multi-phased addition and renovation project brought about the building form, spatial organization, and site layout that largely still exist as of the writing of this report. Three sizable additions were constructed in three phases. On the north and west sides of the 1939 building, a two story addition was part of the first phase. It obscured much of that building's north and west exterior facades filled the previously open space between the 1939 and 1955/1966 buildings. It contained administrative spaces, classrooms, art and music rooms, back of house spaces for the 1939 auditorium, and a new media center. The second phase was an L-shaped single-story addition to the north and west sides of the 1955/1966 satellite. The phase I and II additions encircled almost all of the satellite building except a portion of the 1966 addition's east facade. This addition contained vocational shops, a commercial-style teaching kitchen, and a greenhouse. The third phase of the project involved an athletic complex addition on the south end of the 1939 building, with a new gymnasium, swimming pool, team rooms, locker rooms, and other support spaces.

The only significant work to occur since the early 1980s was science lab renovations completed on the west end of the ground floor in 1999. Other minor reconfiguration of rooms and spaces has occurred over the years based on the school's changing programmatic needs.

The high school building is not listed on any historic registers (refer to Appendix F). With much of the original 1939 fabric having been altered, removed, or obscured over the years, the historical significance of the structure is minimal however the school and local community take great pride in the high school. The image of the arched original front entry on the east side of the 1939 building appears in many of the printed materials associated with the school and many school alumni and officials have indicated that retaining the arch – or at least its image – is an important consideration if alterations or reconstruction are undertaken.

Most of the existing finishes in the school date to the late 1970s and early 1980s. The majority of the original finishes in the older sections of the school were replaced or obscured at that time, although there are a few finishes such as terrazzo floors and portions of marble toilet partitions that likely date to 1939. Most of the interior materials, such as casework, lockers, flooring, ceilings, walls, and doors, are in fair to poor condition. A good portion of exterior brick and precast concrete is deteriorating due to age and water infiltration and the roof is reported by FCPS personnel to be near the end of its expected lifespan.

The site is shared with West Frederick Middle School in a campus setting that is 43.4 acres. The existing high school building is situated in the north-central portion of the site and the middle school is toward the south-central area. There is a parking lot to the northwest of the two buildings. Total parking on site is 414 cars with some additional parking available on the surrounding streets. The main parking lot has three sections, with approximately 191 spaces oriented to the high school, 114 oriented to the middle school, and 114 central to both. The following athletic facilities are on site: football field, bleachers, tennis courts, practice and multi-purpose fields, baseball field, softball field, and basketball courts.

Construction History:

3.0 EXISTING CONDITIONS

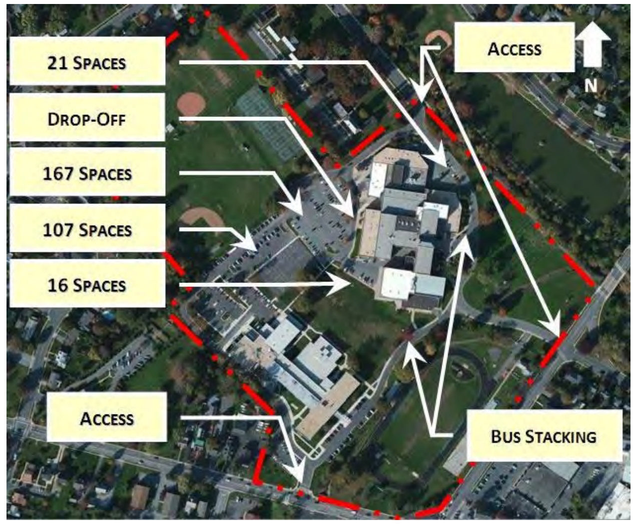
3.1 Existing Conditions – Site

3.1.1 Site Description

Frederick High School resides at 650 Carroll Parkway in Frederick, MD 21701. The site is 43.4 acres and is shared with West Frederick Middle School. The Frederick High School building is located on the site, approximately 580' west of W. College Terrace. and 900' north of W. Patrick Street (MD Route 144). The property is also known as parcel 59 on tax map 413, grid 5. The tax account number for the property is 02-020947. The site was purchased by the Board of Education of Frederick County over several years. Deeds for the property can be found at the Frederick County courthouse at Liber/Folio's: 414/357; 460/575; 619/300; and 6488/069. Several easements and dedication areas also exist on the site. Deeds and plats for these areas can be found and the Frederick County courthouse at Liber/Folio's: 402/333; 527/488; 577/201; 1119/353; 3208/296; 5291/611; 5291/612, and Plat Book/Page: 58/5, and Maryland State Highway Plat #53523. The property is bounded by a City of Frederick property known as Baker Park, Culler Lake, and Parkview apartments to the north. West College Terrace, and a mixture of single family residential and commercial properties are located to the east. West Patrick Street (MD Route 144) and a mixture of single family residential and commercial properties are located to the south, and a single family community known as Westbrook is located to the west.

3.1.2 Site Circulation and Parking

There are multiple access points into the site. One access point is north of the high school building at Carroll Parkway adjacent to the Parkview apartments. This drive allows access into the main parking area located behind the school as well as providing access to the school's service area, secondary parking adjacent to the service area, and to the front of the high school building. Secondary access is located off of West Patrick Street (MD Route 144) at the main drive to the middle school. Vehicles entering this location must drive through the middle schools secondary parking lot. This access point allows vehicles to follow the drive in a northeasterly direction to the front of the high school building, around past the service area and into the main parking lot. Vehicles entering this also appear to be able to access the high school building by traversing the front of the middle school building drive, through their main parking lot and into the high school's main parking area. The third access point is located at the front of the school off of West College Terrace. Vehicles can exit the site from the front of the school building proceeding directly to the drive and out to West College Terrace.



Directional arrow striping is only provided sporadically throughout the campus. Pavement directional arrows are provided at the front of the school which require vehicles traveling in a northerly direction to remain on the lower or eastern most portion of the loop located at the front of the school, while vehicles proceeding in a southerly direction must take the western most portion of the loop closest to the school to continue proceeding in a southerly direction. Pavement directional arrows are also located within the main parking area located behind the school. This parking area is set up to provide one way traffic along and through the outermost drive located on the outside portion of the lot. This allows for this road to serve as a true drop-off lane. All drive isles located within the parking area are designated with pavement arrows as two-way.

There are essentially four (4) main parking areas located adjacent to the high school building, totaling three hundred and eleven (311) spaces. The main parking area is located immediately behind the school within the drop off loop. This lot provides parking for one hundred and sixty seven (167) vehicles. A secondary overflow lot is located immediately southwest of this lot between the main parking lot and the middle school parking. This lot provides parking for one hundred and seven (107) vehicles. A small parking area is located immediately east of the main parking lot that provides parking for a total of sixteen (16) vehicles, and the last parking area is located within and adjacent to the service area. Parking in this vicinity totals twenty one (21) parking spaces. There are an additional one hundred and sixty two (162) spaces located around the middle school building providing a total campus parking of four hundred and seventy three (473) spaces. Paving within all these areas appears to be in fair to good condition.

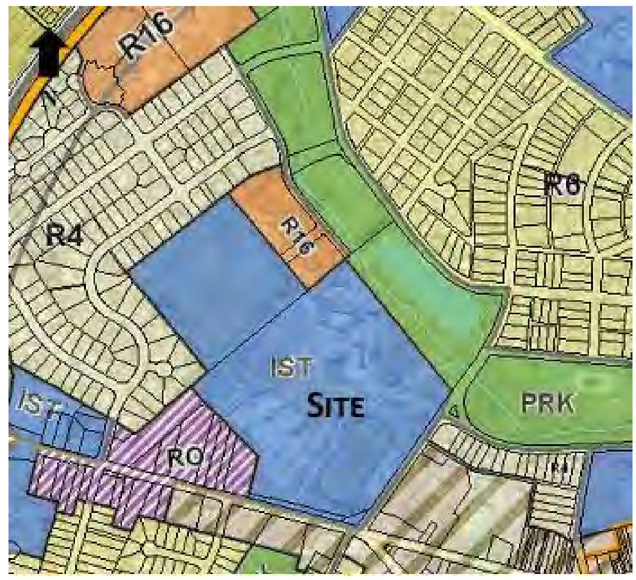
Based on the current City of Frederick “Design and Improvement Standard” Article 6, Section 607, parking for a public school is a minimum of one (1) per classroom and a maximum of two and a half (2.5) per classroom.

The school is currently served by twenty five (25) buses which stage along the main front loop road. Two (2) to three (3) handicap buses drop off at the rear main lobby. Generally, bus stacking is designed to provide forty five feet (45’) per bus. The totaling stacking/staging distance for twenty five (25) buses is one thousand one hundred and twenty five feet (1,125’). Utilizing this distance buses have adequate single file staging for all buses along the loop road from the back of the middle school building to the entry drive of the main parking area off of Carroll Parkway. It was mentioned during development of the study that some buses park in a manner that fully blocks vehicular traffic in some areas which potentially impedes emergency vehicle access.

The main parking lot drop off loop provides approximately one thousand feet (1,000') of vehicle stacking for drop-off. The current layout and function of both vehicular and bus drop off appears to provide adequate safety for pedestrian traffic through the high school site.

Emergency vehicle access appears to be adequate throughout, with the exception as noted during bus pick-up.

3.1.3 Zoning Information



The school property is located in an IST (Institutional Floating) Zone. Uses within the IST District are not subject to dimensional standards. Uses are subject to "Design and Improvement Standards" as well as the "Environmental Standards" of the City of Frederick. The IST Zone allows for discretionary review by the City for projects to mitigate impacts on surrounding communities.

The properties surrounding the school site vary in zoning. Parkview apartments are currently zoned R16 (high density residential), Baker Park and Culler Lake are currently zoned PRK (open space). Properties to the east of the school are currently zoned DB (downtown commercial/residential), properties to the south are currently zoned RO (residential-office) and the Westbrook Community is zoned R4 (low density residential)

Dimensional and Density Regulations within these zones are as follows.

District	Lot Size (SF)	Max. Density	Min. Frontage (FT)	Max. Height (FT)	Min. Street Setback (FT)	Min. Interior Setback (FT)	Min. Rear Setback (FT)	Impervious Surface Ratio
IST	Not subject to standards							
R4 Single Family	8,000	4.0	65	40	25	8	30	.4
R16 Duplex Dwelling	3,500	16.0	25	45	10	5(*)	20	.7
PRK	Not subject to standards							
RO	10,000	4.0	65	40	20	10	40	.6
DB Single Family Mixed Use	 2,000 3,000	 40.0 75	 20 --	 45 75	 0 0	 3(**) 0	 20 10	 -- --

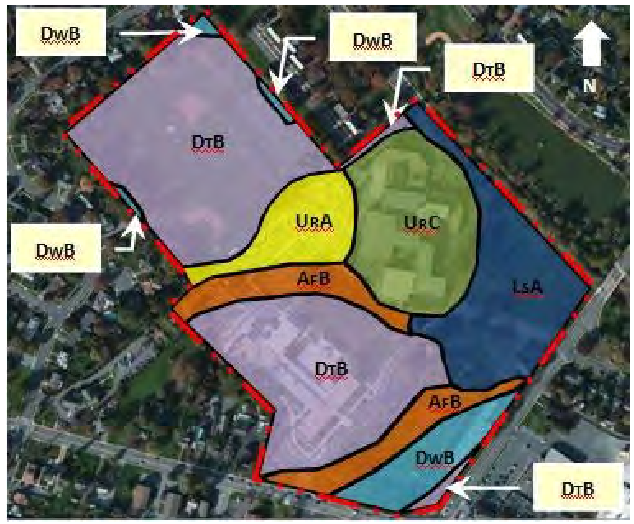
(*) end units only
(**) at least one side

Current Dimensional and Density measurements within the Frederick High School property are as follows.

District	Lot Size (SF)	Min. Frontage (FT)	Max. Height (FT)	Min. Street Setback (FT)	Min. Interior Setback (FT)	Min. Rear Setback (FT)	Impervious Surface Ratio
	<1,890,500	<100	64±	<100	<100	<500	.4

3.1.4 Site Soils

According to information obtained from the United States Department of Agriculture Natural Resources Conservation Service, the site falls into six (6) distinct soil groups:

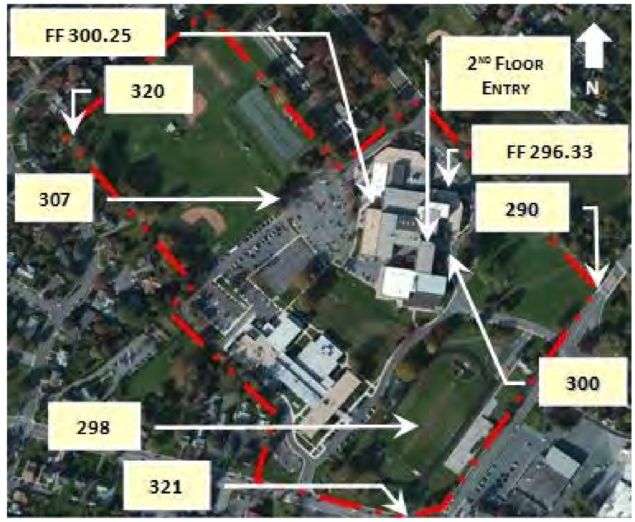


AfB – Adamstown-Funkstown complex, 0 to 8 percent slopes.
DtB – Duffield-Ryder silt loams, 3 to 8 percent slopes.
DwB – Duffield-Hagerstown-Urban land complex, 3 to 8 percent slopes.
LsA – Lindside silt loam, 0 to 3 percent slopes.
UrA - Urban land, 0 to 3 percent slopes.
UrC – Urban land, 3 to 15 percent slopes.

Additional information regarding these soils is indentified below:

Map Unit	Percent of Site Area	Hydric Soils	Depth to Water Table	Depth to Restrictive Feature	Topsoil Source	Drainage System
AfB	11.4%	No	Approx. 24" to 42"	More than 80"	Fair	Moderately well drained
DtB	48.8%	No	More than 80"	Possible paralithic bedrock 24" to 40"	Fair	Well drained
DwB	7.6%	No	More than 80"	More than 80"	Fair	Well drained
LsA	16.1%	Partial	Approx. 18" to 36"	More than 80"	Fair	Moderately well drained
UrA	6.0%	No	Not rated	Not rated	Not rated	No rating provided
UrC	10.2%	No	Not rated	Not rated	Not rated	No rating provided

3.1.5 Site Topography



The site topography generally slopes away from the building in all directions. The elevation immediately around the perimeter of the building is 300. The high school building's main floor elevation is 300.25 (rear entry off of main parking lot), with a lower entry elevation of 296.33 at the service yard. The original front entry facing West College Terrace enters at the second floor.

Slopes within parking areas, drives, and exterior hard and soft surface play areas range from approximately 1.0% to 2.5%. There are several steep slope areas adjacent to the main drive along Carroll Parkway and West College Terrace, slopes in these areas range from 10%-20% and flow in an easterly direction towards the tributary of Carroll Creek.

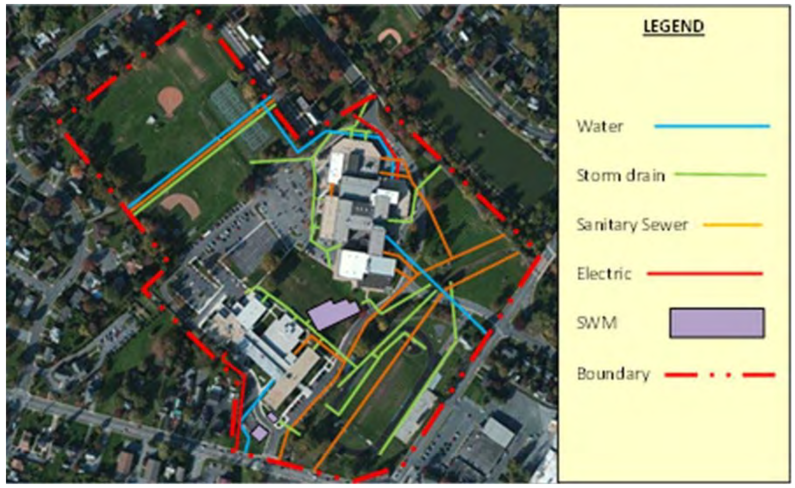
Elevations at the far northeastern corner of the property are approximately 290. Elevations along the far western side of the property that currently contain the ball fields range from 307 to 320 at the extreme northwestern corner. Elevations along the corner of the property located at West Patrick Street (MD Route 144) and West College Terrace are at 321 and then slope down in excess of 30% to the stadium field. Elevations at the stadium field are generally around 298 and then fall in a westerly direction towards the tributary to Carroll Creek.

3.1.6 Utilities

<u>Water</u>
The high school is currently served by an eight inch (8") water service that's tapped off of a (12") twelve inch public line that traverses the property and is located adjacent to the tennis courts and Parkview apartments. The water service enters the high school building along the northern wall at the service yard. The eight inch (8") service line was installed to replace the existing four inch (4") service that was installed in 1938/39 located at the front of the building.

There are also two (2) secondary waterlines located on site that serve on-site hydrants and provide water service to the middle school. The eight inch (8") service that serves the hydrants is also tapped off of the existing twelve (12") inch waterline that spans the fields, and the middle school's service is a six inch (6") line that is tapped from an existing twelve inch (12") waterline located within West Patrick Street (MD Route 144).

Sanitary Sewer



The site currently contains three (3) gravity flow public sanitary sewer systems. All public sanitary sewers are located within an easement. There is currently a parallel system located along the eastern side of the site. It appears that the original system pre-dated the 1930's, in 1980 the City of Frederick installed a system parallel to the older gravity sewer. Building connections from the high school that were previously connected to the older system were then connected to the new system. The more recent twelve inch (12") v.c.p.x. (vitrified clay pipe) gravity flow system flows in a southerly to northerly direction. Sanitary sewer mainly leaves the high school along the eastern side of the building at various locations via five inch (5") lines. Numerous building connections were made throughout the life of the building since new connections were added as additions were constructed, so the age of the connections will vary based on the construction of the portion of building in question.

The third gravity flow system is contained within a sixty foot (60') wide shared sanitary sewer/storm drain easement that bisects the ball fields located west of the school building. The gravity line flows in a southerly to northerly direction and enters the site at Lot 19 of the Westbrook subdivision and exiting under the tennis courts adjacent to the Parkview apartments.

It should be noted that the dedication plat recorded for the property in 2007 notes that the City of Frederick previously recorded a plat for the property at which time a six (6) month reservation of wastewater treatment capacity was granted, which had since expired. The City of Frederick has a Water and Sewer Ordinance which requires all development to obtain water and sewer allocations for the property. Since this time the City has revised their process so that water and sanitary sewer allocations are reviewed concurrently with the permit application. Allocation is not thought to be of concern for this project.

As a part of this plat the City had granted approval of multiple water connections on one property. The city will likely not require consolidation of connections due to the precedent of multiple connections existing on site.

Storm Drains

The site is currently served by a closed storm drain system with a majority of the open space grassed areas conveying stormwater via overland flow. Storm drain pipe sizes range from six inch (6") to forty eight inch (48"), vary in material from concrete, to c.m.p (corrugated metal pipe), to b.c.c.m.p. (bituminous coated corrugated metal pipe) and vary in age from pre-1930's to 1980.

The site is split into several drainage areas with the far eastern side of the site (stadium field and portions along West College Terrace) draining in a westerly direction. Large portions of the stadium facility are captured in two closed storm drain systems ranging in size from six inch (6”) to fifteen inch (15”) which discharge directly into the Carroll Creek tributary. Areas south of the high school building drain in an easterly direction with small paved areas and a portion of the southern half of the building being connected into a closed storm drain system which also range in size from six inch (6”) to fifteen inch (15”) and discharge directly into the Carroll Creek tributary. Two (2) piped/culvert areas exist within the on-site tributary. The first (upstream) pipe is a forty eight inch (48”) line that captured the tributary just south of the stadium field visitor bleachers and conveys the tributary via the closed line north exiting just south of the access drive. Twin forty two inch (42”) pipes are located approximately forty feet (40’) north of the previous closed section which continues to convey the tributary under the access drive. These pipes terminate at a headwall on the north side of the access drive at which point the tributary becomes open section again until it reaches the macadam path at the far northeast corner of the site. Areas east and north of the building generally flow in a north or northeasterly direction with pipe sizes ranging from six inch (6”) to twenty one inch (21”) which then discharge directly into Carroll Creek. Areas located within the western portion of site (ball fields) drain in an easterly and northerly direction eventually discharging into Carroll Creek.

There is also a large forty two inch (42”) drain located within the shared easement mentioned above. The 42” drain conveys drainage from the Westbrook subdivision through the school property and to Carroll Creek.

<u>Gas & Electric</u>
The site is served via a four inch (4”) gas line which enters the site at the far northeast corner along West College Terrace. The four inch (4”) line was installed in 1980 to replace the existing three inch (3”) service.

Electric enters the site along the northern property line adjacent to Parkview apartments. The electric then proceeds underground under the drive located off of Carroll Parkway towards the service area to a ground mounted transformer.

3.1.7 Stormwater Management

Although construction has occurred at various points since the high school was initially constructed the site does not contain any stormwater management facilities associated with the high school. However, there are three (3) separate underground facilities that were installed for the renovation of the middle school in 2008. Two (2) of these underground facilities are located along the front of the existing middle school at the entry from West Patrick Street (MD Route 144). The third underground facility is located between the middle school and high school within the grass area.

Any new construction that occurs will be required to meet the requirements established by the Stormwater Act of 2007. These guidelines establish a process by which new construction needs to utilize sustainable or environmental site design (ESD) to the maximum extent possible to satisfy water quality requirements. ESD’s include but are not limited to micro-bioretention, dry and/or wet swales, rain gardens, etc. Attempts should be made to provide for impervious disconnects and to allow for adequate open space to construct multiple smaller facilities throughout the site to satisfy these requirements. Based on our preliminary review of the soils information it appears that infiltration of stormwater should be achievable on site and cursory conceptual layouts have been reviewed to provide areas for ESD's to the maximum extent possible.

3.1.8 Floodplains, Wetlands and Waterways

Portions of the site lie within the 100 and 500 year floodplain as delineated on FEMA flood insurance rate map 24021C0291D, dated September 19, 2007.

A majority of the site lies within zone C which means an area of minimal flooding. However, a large portion of the property located along Carroll Parkway, West College Terrace and West Patrick Street (MD Route 144) lie within zone's AE and X.

Zone AE is defined as Base Flood Elevations determined. The 1% annual chance flood (100-year flood), also known as base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. Base Flood Elevations vary across the site. The 100 year Base Flood Elevation along Carroll Parkway adjacent to Parkview apartments is approximately 294, the elevation transitions to 295 in the vicinity of the culvert located adjacent to the existing pool wing, and then transitions again to 298 between the high school building and middle school building.

Zone X is defined as area of 0.2% (500-year flood) annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. Based on a review of the FEMA map it appears that two (2) small additional areas exist on site that qualify as zone X and elevations appear to be approximately 295.

According to COMAR (Code of Maryland Regulations), the Monocacy River and all tributaries north of US Route 40 are considered use IV streams, trout waters. There is currently a stream located within the floodplain area immediately east of the school. The stream is visible at various locations along the front of the school and there are also several portions of this stream that contained within a closed storm drain system under the main front access drive and along a majority of the stadium field. Any work within the immediate vicinity of the tributary will require coordination with Maryland DNR (Department of Natural Resources). Based on previous experience coordination with DNR may allow for portions or all of the tributary located within the school property to be designated as use I and therefore allow work within this area.

3.1.9 Landscape, Trees and Forest Conservation

Landscaping throughout the site consists of lawn and sporadic planting. The planting areas are mainly concentrated along the property line, within the parking areas and along drive aisles. Plantings in both of these areas consist of mature deciduous trees, several of which are very large and potentially specimen caliber. None of the on-site planted areas appear to meet the definition of forest.

One of the defining features of the site is the specimen English Elm tree located inside the driveway loop at the front (north) of the existing building. With a canopy 95 feet tall and 95 feet in diameter and a trunk of approximately 18 feet in circumference, it is believed to be the largest English Elm in Maryland and perhaps the largest in the United States.

In 2008, the City of Frederick Arborist commissioned Bartlett Tree Experts to evaluate the tree and provide recommendations for its care and maintenance. In the *Management Plan for the English Elm at Frederick High School*, Bartlett reported that the tree to be in good health and listed several measures that could be taken to help preserve the tree (refer to Appendix E for the full report). It appears that the report's recommendations have not been implemented as of the writing of this narrative.

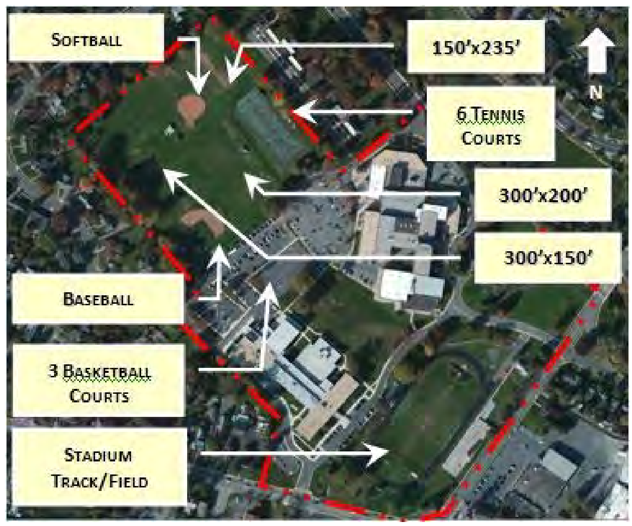
Bartlett's evaluation also put to rest questions about the tree's species. Prior to the report, it was unclear to many observers whether the tree was an English Elm or a Slippery Elm. As a Slippery Elm, the tree was eligible for listing on the *Maryland State Champion Tree List* as well as American Forests' *National Register of Big Trees.* As an English Elm, it is not eligible to be included on these lists because the English Elm is not considered to be native to Maryland or the United States. Bartlett laboratory tests confirmed the tree as an English Elm.

Regardless of species, the tree stands as a prominent feature of the campus and is cherished by members of the surrounding communities. Because of its importance, all of the feasibility study options have put the English Elm off limits to removal or further encroachment by new construction. To enforce protection of the elm during construction, the recommendation is that FCPS impose a penalty fee to the contractor who does not set up adequate protection or who damages the tree. It is also recommended that FCPS hire an arborist to monitor the tree protection throughout construction.

There are no documented forest conservation easements on site. Any construction will require compliance with the Maryland Forest Conservation Act. A forest stand delineation should be completed at the beginning of the design phase of the project to determine if any of the mature trees qualify as specimen trees and to document their location. During this time a forest conservation worksheet should be completed to more adequately determine the forest conservation acreage required based on the construction option chosen. On site afforestation may likely be required and could possibly be met at various locations on site. If it is determined that the selected construction option chosen will not allow for adequate on site afforestation then off-site planting can occur, if an off-site location cannot be identified then a fee in lieu in the amount of thirty (30) cents per square foot can be paid into the City's Forest Conservation Fund.

3.1.10 Practice Fields / Athletic Fields / Athletic Courts

The school's fields are located sporadically throughout the site. The stadium track/field is located at the far southeastern corner of the property. The stadium track is an eight lane track with one (1) long jump area, one (1) pole vault area, and one (1) high jump area located inside of the track surface. The field is natural turf with two (2) permanent football goal posts. A small shot put is located just outside of the northern court surface. A press box and two (2) permanent areas for home seating are located along the east side of the track and a smaller permanent visitor seating area is located along the west side of the track.



As the stadium and track/field are within the 100 year floodplain area, their site location is not eligible to be considered as a location for a replacement school. Also, the press box and home seating bleachers were constructed in 2001 and are in good condition. Considering these factors, the recommendation of this report is that the stadium and most of its existing facilities remain in place with minimal alteration however it is assumed that replacement of the existing natural turf with artificial turf may be considered as the design moves forward.

Three (3) new full court basketball courts are located immediately south of the main parking lot. The remaining sports fields are all located west of the school and main parking lot. This area contains six (6) tennis courts, a baseball field, softball field and open grassed areas that appear to be utilized for other sports (field hockey, soccer, etc.). The existing multi-purposed areas overlap uses with baseball and softball. There is currently an open area approximately three hundred feet (300') by two hundred plus feet (200') located and overlapped north of the grassed area shared with the baseball field. A secondary open grassed area measuring approximately three hundred feet (300') by one hundred and fifty feet (150') is located and overlapped west of the grassed area shared with the baseball field, and a much smaller open space grass area located north of the softball field measures approximately one hundred and fifty feet (150') by two hundred and thirty five feet (235').

Aside from not having an ideal situation with having all outdoor sports areas located in one area, the school is lacking the required fields per the County's current High School Educational Specification, as follows:

- The stadium track/field is deficient one (1) long jump pit.
- Deficient three (3) partial practice football fields (three required).
- Deficient one (1) soccer field (two required).
- Deficient two (2) field hockey fields (three required, two practice, one regulation), assuming regulation field is shared with soccer currently.

The deficiencies noted above will continue to some degree under any of the possible site redevelopment options due to lack of space. For comparison, sites for other recent replacement and new high schools in Frederick County have been three to eight acres larger than the FHS site. The other recent high schools also do not share property and parking with other schools while FHS shares a site with West Frederick Middle School. As a result, each school's needs for parking, open space, and outdoor athletic facilities have been taken into account in developing options for improving FHS.

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3.2 Existing Conditions – Building

3.2.1 General

In many respects the original 1939 section of the school is in better condition than its later additions. It boasts a higher level of initial craftsmanship with many of its shortcomings stemming from later alterations. Its layout is simple and traditional, as is its structural system. Its classroom areas feature corridors with classrooms on each side (double-loaded corridors). Classrooms originally all had large exterior windows, flooding rooms with daylight. These long-standing design conventions had fallen out of favor by the time of the school's last major renovation but they have come back to prominence in the time since.

By contrast, the level of initial craftsmanship and quality of materials seen in later additions is below average. The additions are a jumble of materials and structural systems. Floor plans do not follow any conventional design patterns. Rooms in the additions generally do not have windows.

Because of the differences between the original building and the additions, they are often discussed separately in the following narrative. While the 1939 could be rehabilitated and incorporated into a reinvigorated school with relative ease, there would be significant challenges in making the additions part of a modern high school facility.

3.2.2 Exterior

Roof

Most of the existing roofing is a multi-ply built-up membrane except for the central section of the 1939 building which is slate shingles. Some built-up roof areas have gravel ballast while other areas have rubberized cap sheets. FCPS maintenance reports that the gymnasium has a PVC cap sheet applied over a failed built-up roof. This was a short term repair recently implemented with the understanding the existing school may be renovated or replaced in the near future. Other similar short term repairs exist at selected locations around the roof. The overall condition of the roofing and coping is generally fair to poor although active leaks appear minimal due to ongoing repair efforts. Replacement of the roofing will be required within five years.

Above: Typical existing roof.

Exterior Walls

The original building is solid brick masonry and the additions are brick veneer on concrete block backup. There is no cavity insulation in the walls of the original building. Maintenance personnel reported that a large section of masonry on the third floor of the 1939 building failed in the late 2000s and was reconstructed. Sealants around precast concrete trim on the 1970s/80s additions have failed, contributing to water infiltration at those areas. Water penetration has resulted in failing cast stone sills and deterioration of mortar. Repair of these items has been addressed by maintenance personnel in a piecemeal fashion, but the entire exterior will require complete repointing within the next ten years.

Above: Exterior corner at west elevation of high roof with wet brick and deteriorating mortar joints. Occurs on both sides of high roof.

<u>Exterior Windows</u>

A handful of original wood windows exist in the 1939 building but most have been removed and the openings partially or completely in-filled with brick. Where they exist, original wood windows are in good condition. Where original openings were not completely in-filled, new windows were inserted. The existing units are double-hung, double-pane aluminum framed and appear to be new within the last ten years. They are in good condition. Windows in the 1970s/80s additions are fixed, single-pane aluminum framed units in fair to poor condition. Classroom windows throughout provide a minimum amount of daylight and several rooms and spaces throughout the building have no access to daylight at all.

<u>Exterior Entrances and Storefront</u>

Wood doors are in fair to poor condition and require replacement or reconditioning. Exterior hollow metal door frames and metal doors are generally in fair condition however doors and hardware generally have not been upgraded to meet accessibility requirements. The typical single glazed metal frame entrance systems should be replaced and all exterior doors and hardware should be updated. In some locations, door accessibility issues extend beyond the doors and frames themselves and involve spatial constraints and floor level changes in the vicinity of the doors. School officials report that the building has 56 exterior doors, which makes it difficult to supervise and secure the facility.

Above: Wood door at 1939 wing with deteriorating wood and failing paint.

3.2.3 Interior

Layout

The existing school lacks the clear, efficient, centralized internal circulation systems that characterize newer FCPS high schools. Corridors are narrow and in some locations are interrupted by internal stairways. Some areas of the school are accessed by passing through other rooms and spaces.

Above: Typical corridor in 1939 wing.

The 1939 section of the building features two main perpendicular corridors forming a "T" shape following the exterior form of the building. Rooms and spaces in that section of the building are generally accessed from those corridors. The 1970s/80s additions added and extended corridors on the first floor. Also when those additions were constructed, many of the new and existing spaces were configured into an "open space" layout concept.

Above: "Open space" classroom with partial height partition and circulation space beyond.

A departure from the traditional configuration of fully enclosed rooms and spaces being laid out along corridors, the "open space" rooms do not necessarily have defined circulation spaces. They instead rely on circulation passing through one or more rooms or spaces to access others.

The existing circulation system creates disruption for the building users, particularly in the cafeteria and media center. In the cafeteria, there is a point of conflict between those passing through the space and those moving through the food serving lines. The media center must be traversed for access to the English department, which is highly disruptive in what ideally would be a quiet space. In all cases where this occurs, it also effectively reduces the square footage available for student instruction. The existing media center, for example, is actually larger than the current Educational Specification requires however the available area is reduced significantly due to circulation usage.

The "open space" areas also do not necessarily have solid, permanent walls between rooms. Folding partitions, accordion partitions, demountable partitions, floor-standing screens or space dividers, and furniture are all used to define instructional spaces. Many of the classrooms do not have doors, with only openings in room dividers to provide access.

The "open space" layout is problematic in achieving a modern educational facility. Because of the lack of corridors and fully enclosed rooms, existing spaces are not fully compliant with current building and life safety code requirements for egress, smoke enclosure, and travel distance (refer to Code Analysis below for further discussion). The "open space" rooms also do not comply with current requirements for acoustical separation between instructional spaces.

Retrofitting these "open space" classrooms into traditional configurations with permanently divided rooms and central corridors can be difficult and costly due to the constraints of an existing structural grid configuration and mechanical air distribution system.

Ceilings

A mixture of 2x2 and 2x4 acoustical panel ceilings exist throughout most of the building. Overall ceilings are in good to poor condition depending on the location and use of the space.

Flooring

Terrazzo flooring is in fair condition in the cafeteria and the corridors of the original and 1955 buildings. Instructional spaces have a mixture of carpet and vinyl composition tile (VCT) flooring generally in fair condition. VCT is also throughout the corridors 1970s/80s additions as well as in any newer corridors in the older structures created during that renovation. There is carpet in the media center and administrative spaces. Ceramic tile in the toilet and locker rooms is failing and should be replaced. The stage and gym wood floors should be reconditioned.

Interior Partitions

Typical partitions are a mixture of concrete masonry unit (CMU), plaster on masonry, gypsum board stud walls, modular metal walls, modular folding partitions, and accordion partitions. CMU, plaster, and gypsum board partitions are generally in good condition however maintenance personnel reported repeated CMU cracking issues in the athletic complex area. The modular metal walls, folding partitions, and accordion partitions are in fair to poor condition. They do not create the acoustical and visual separation required under current educational standards. They also do not extend above the ceiling in some locations where full height partitions would be required under current code for smoke separation. These modular systems should be replaced with CMU or gypsum board on stud walls.

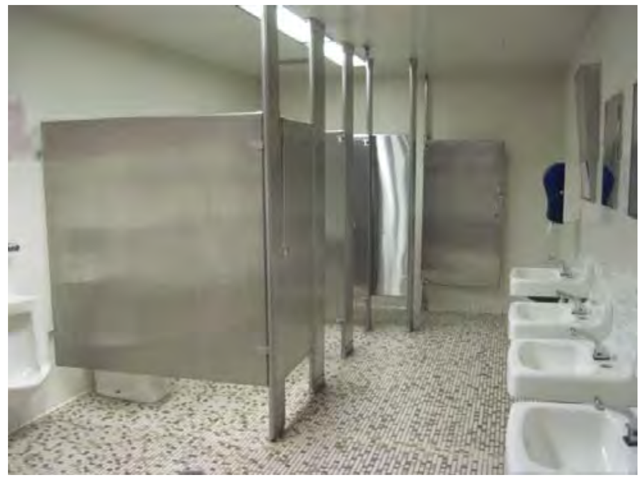
Above: Example of interior modular partitions which do not provide the ideal acoustical separation between instructional spaces.

Doors/Hardware

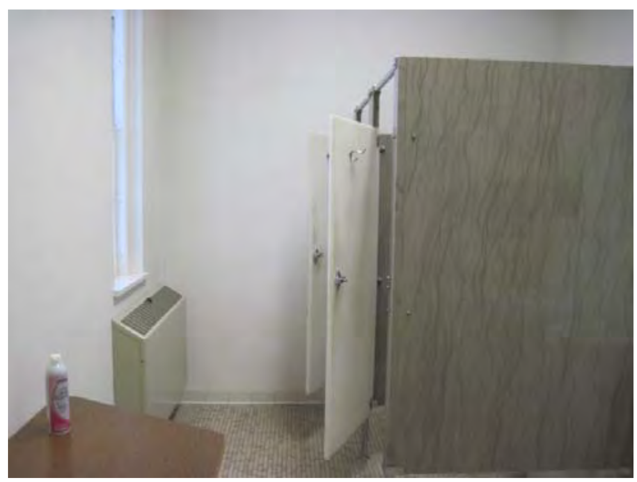
Typical door hardware does not meet accessibility requirements. Some doors have excessive amounts of glazing where a rated door with reduced glazed area would be required under current code. Several interior doors and most door hardware should be replaced.

Toilet Rooms

Plumbing fixtures all appear to be dated and beyond their useful life. The water closets are floor-mounted, urinals are floor and wall-mounted, and lavatories are individual wall hung type. Plumbing fixtures no longer meet code requirements for water usage and are not properly configured for accessibility. Toilet partitions are a mixture of marble, stainless steel, painted steel, and laminate, depending on location. Marble partitions likely date to 1939. Marble and stainless steel partitions are generally in good condition while others are in fair to poor condition. The existing arrangement of the toilet compartments is not in compliance with current accessibility requirements. The marble partitions have salvage value with the potential to recondition and partially reuse them in a new or renovated facility.



Above: Typical toilet room in 1970s addition.



Above: Marble toilet partitions in 1939 wing in good condition.

School staff report existing toilet rooms are not adequate in quantity or location. Fixture counts will need to be verified with applicable building codes during design of a renovated or replacement facility. The distribution of toilet rooms around the facility should also be analyzed during design to confirm the facilities are appropriately placed for conveinence and student supervision.

Casework

Typical classroom casework dates to the 1970s/80s and is in good condition for its age. Unfortunately it is not compliant with current accessibility requirements and in many cases it is not matched to the current utilization of rooms and spaces that originally had other functions. It is virtually impossible to make accessibility upgrades and other alterations to existing casework without major compromises to its strength and appearance.

Science classrooms were renovated in 1999 and casework in those rooms was replaced concurrently. That casework is still in excellent condition. Although it met Frederick County requirements for high school science classrooms at the time of its installation, we have not exhaustively analyzed subsequent changes to science program requirements. The expectation is that current requirements may be somewhat different. Also, accessibility requirements have changed since 1999 and there may be some compliance deficiencies with the existing configurations.

Lockers
The existing school has a mixture of flush mounted, surface mounted, and freestanding lockers. Existing lockers likely date to 1939 to 1981, depending on their location. Lockers are generally in fair to poor condition due to age and they are typically narrower/smaller than those seen at new Frederick County high schools.

FHS staff report that there is a conflict between locker users and students circulating in corridors due to the narrow width of corridors. Most of the general lockers are not used. Ninth grade students are assigned lockers but upperclassmen must request them. The participation rate is approximately 50 percent, which is reportedly higher than participation rates at many peer schools. Previous schools have had one locker per student but the quantity of lockers may be worth revisiting with extra space being used for circulation in a renovated or new school.

Musical Practice Modules
The existing facility has three Wenger sound modules. The modules appear dated but in good condition. As the quantity does not match that required for a new high school, it may be worth salvaging the units and relocating them to another school.

Miscellaneous Fixtures and Equipment
Fixtures and equipment such as auditorium seats, stage fly system, gymnasium bleachers, and gymnasium basketball goals generally all date to the late 1970s and are in good to fair condition. They are not likely to be worth reusing in a renovated or new facility as code, accessibility, and safety requirements have changed significantly over the past few decades.

3.3 Existing Conditions – Structural System

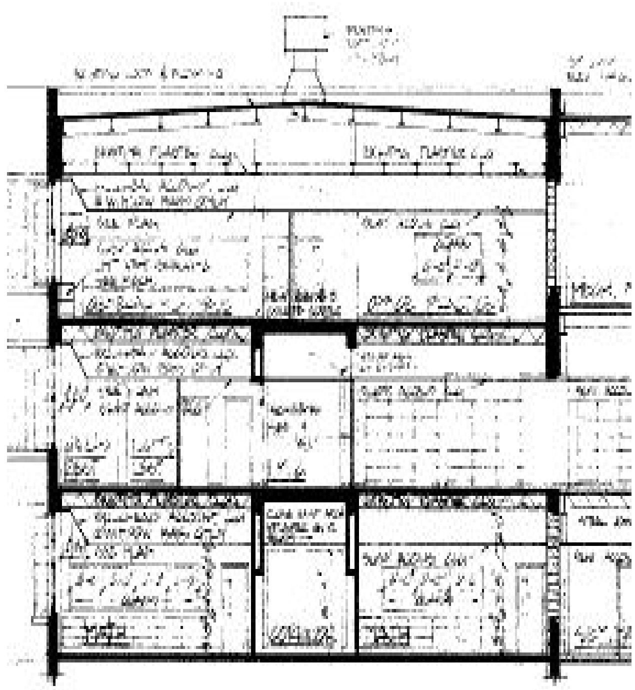
General Description

The original 1939 School building is a three story steel frame structure with exterior brick bearing walls. Floor and roof framing is supported by a double row of steel wide flange interior columns with the exterior brick walls acting as load bearing masonry walls to support both roof and floor framing. Roof framing consists of concrete encased steel beams at approximately 6'-0" on center with a concrete roof slab. Beam spans vary from 9'-7" to 20'-6" and span the longitudinal direction of the building wings. Roof framing is sloped to accommodate drainage, with a high point in the center, sloping down to the exterior walls.

Above: Typical 1939 classroom floor construction; open web steel floor joist at upper left, concrete floor slab on metal lath at top, existing plaster ceiling at center.

First and second floor framing consists of open web steel joists spanning 23'-0" at the classrooms, and are located approximately 2'-0" on center. Joist span is in the direction of the building width. Joists are supported by wide flange girders, which are supported by the wide flange interior columns. Along the perimeter of the building, the joists are supported by exterior load bearing brick walls. Joists support a 2-1/2" concrete slab on wire lath. The center bay, located under the corridor, consists of a 6-1/2" thick reinforced concrete slab, which spans approximately 11'-7".

There is an additional level of framing at the third floor ceiling to support a plaster ceiling. Steel beams are located at approximately 4'-0" on center and support the plaster ceiling. There is a small attic space between the ceiling and roof framing.



Above: Cross section of 1939 classroom wing showing sloping roof at top with ceiling structure below and open web steel joists at second and third floors spanning classrooms.

Wide flange steel columns are supported by a shallow spread footing foundation system. Load bearing masonry walls are supported by continuous concrete wall footings. The first floor consists of a concrete slab on grade.

The auditorium and gymnasium of the 1939 building are two story spaces. Roof framing consists of structural steel trusses clear spanning the approximately 60' wide spaces. The roof between the trusses is supported by steel beams at approximately 4'-0" on center, supporting gypsum decking.

The majority of the existing framing for the 1939 structure was inaccessible due to finishes, and could therefore not be observed. During our evaluations, we looked for cracking, signs of water damage, indications of excessive deflection or movement of structural elements, and any other indicators that would suggest structural distress. In general the existing structure appeared sound. Below are some areas that were identified. We recommend that if the existing building is to be maintained operational, these items be addressed in the renovations.

Exterior
Exterior mortar is soft and deteriorating in many locations, particularly around the west entrance. Mortar joints should be raked and re-pointed. Depending on the length of time this condition has been present, there may be water damage inside the wall. Several exterior corners of the building, as well as the parapets, have been re-pointed. We were unable to determine the extent of any previous water infiltration. Exterior corners at the west elevation of the high roof present indications of wet brick. Given the height of the wall, it is difficult to

Above: Deteriorating mortar at exterior walls.

Above: Exterior upper corner of 1939 building with lighter color mortar as evidence of previous re-pointing work.

Above: Exterior west corner of 1939 building with wet brick.

tell, but mortar joints appear to be deteriorating. This occurs on both sides of the high roof. Coping should be reviewed and mortar joints raked and re-pointed.

Above: Rusting lintel above opening previously infilled with brick.

Lintels at Door and Window Openings
Many existing steel brick lintels are showing signs of corrosion. In advanced cases, the corrosion causes the steel material to swell which can cause mortar joints to open and crack the surrounding brick mortar joints. Lintels will need to be cleaned and painted with rust inhibiting paint. Where corrosion is severe enough, the lintel may need to be replaced. Any cracked brick or mortar joints would need repaired as well.

Grand Stair
Steps located at the east entrance of the 1939 building are exhibiting rust stains. These are likely due to the steel reinforcing bars located in the nose of the stair, commonly referred to as nosing bars. The rust is an indication that moisture is able to access the reinforcing steel. Through successive winters, and additional freeze thaw cycles, any existing cracks will open wider. The reinforcing bars will continue to rust and eventually cause spalling of the concrete. There are also mortar joints in the walls adjacent to the stairs that need to be re-pointed due to loose and deteriorating mortar.

Above: Evidence of rusting reinforcing bars is exhibited on the faces of the east grand stair.

1939 Original Building – Evaluation
Structurally the 1939 Building appears to be in acceptable condition, especially for a structure of this age. We believe it to be structurally sound. The items identified above are primarily maintenance items, which we recommend be repaired to avoid potential structural issues in the future.

Architectural finishes do not show any signs of distress that would indicate potential structural issues. Exterior brick bearing walls appear to be in acceptable condition, with the exception of the mortar joints at the top of the exterior walls. If this building is to continue in operation, the cause of the water infiltration and subsequent mortar deterioration should be investigated and corrected. This conclusion is based on the limited review of the existing structure that is visible for review.

With the limited information related to the existing structure that is available, if any of the structure is to be re-used in a different function, some of the architectural finishes will need to be removed to fully determine the existing structural members sizes and spacing. Additional testing may also be warranted to determine material strengths that can be used in further analysis.

<u>1955 Satellite Building – Evaluation</u>

This is a one story structure that was originally constructed in 1955 as a stand-alone vocational agriculture facility. No structural drawings are available for this building. Later additions to the high school connected this stand-alone building with the main school.

Above: Ceiling plenum in 1955 original shop area with abandoned in place skylights.

Our description of the structure is based on our field observations. The roof over the classroom appears to have been designed for a future floor. The construction consists of steel joists spaced at approximately 2'-0" to 2'-6" on center and supports a concrete slab on permanent metal form deck. Roof joists are supported by exterior and interior brick load bearing walls. During the 1978 additions, a mechanical penthouse was added over the classroom concrete roof slab.

The roof of the space originally housing a shop and presently used for classrooms is clear spanned by steel wide flange beams spanning approximately 49 feet, and spaced at approximately 8' on center. These roof beams support a Tectum (a structural load carrying insulated acoustic roof panel) roof deck. There were no visible signs of any structural issues in the existing roof framing.

<u>1966 Additions – Evaluation</u>

Three separate single story additions were constructed as part of this project. In all three additions, the exterior masonry walls are utilized as load bearing walls. Interior bearing walls are either existing brick bearing walls or masonry bearing walls built as part of the additions. The two additions located to the east of the 1939 buildings consist of open web steel roof joists with metal roof deck. The third addition, which is located to the east of the 1955 building, consists of open web steel joists with a Tectum roof deck.

We observed similar issues at this portion of the school as described earlier. Corrosion of the brick angle lintel has resulted in loose or missing mortar and cracking in the joints. Cracks are present in some locations at the existing masonry bearing walls. The cracks are apparently allowing water to penetrate and the water infiltration has caused deterioration in the Tectum roof panels. Tectum loses its structural integrity when in a wet condition so we recommend this condition be reviewed to insure this is not an ongoing water infiltration issue. Depending on the extent of the deterioration, the roof deck may require localized repairs.

In general, the 1966 Additions appear to be structurally sound and in an acceptable condition for occupancy. Isolated issues described above should be addressed and repaired so that the condition doesn't worsen and become a structural concern.

<u>1977 Additions – Evaluation</u>
Additions in the 1977 project are one to three stories. They are steel framed with structural steel beams, open web steel joists, and steel columns supported on a shallow spread footing foundation system. Foundations were designed for an allowable bearing pressure of 2000 pounds per square foot.

The boiler room is constructed on a concrete mat foundation with cast in place reinforced concrete foundation walls and a one way cast in place reinforced concrete slab supported on cast in place reinforced concrete beams.

Typical floor framing consists of open web steel joists at 2'-0" on center supporting a 3" thick concrete slab (total thickness) on 9/19" permanent metal form deck. The live load capacity used for the design of the floor structure varies from 60 pounds per square foot to 85 pounds per square foot including a partition load. This is consistent with current live loading requirements for classroom spaces.


Above: Deterioration around lintel at 1966 addition.


Above: Water damage to Tectum roof deck in 1966 addition.


Above: Typical ceiling plenum with steel joists at 4'-0" on center with 1-1/2" metal roof deck in 1977 addition.

Typical roof construction is open web steel joists at 4'-0" on center supporting 1-1/2" metal roof deck. The penthouse floor framing consists primarily of composite steel beams located at eight feet on center supporting a 6" concrete slab on 2" deep composite metal deck. There are also areas of the penthouse where the steel floor beams support 1-1/2" steel bar grating.

Exterior walls are comprised of masonry with brick veneer and precast concrete bands.
Based on our review of the existing structure, we believe the 1977 addition to be structurally sound as there were no indications of any structural distress.

<u>1978 Addition – Evaluation</u>
This is a one story addition with masonry load bearing walls supporting open web steel roof joists with 1-1/2" metal roof deck. We observed similar issues at brick lintels and mortar joints as described with previous additions, and recommend these be repaired to avoid the condition worsening and developing into a structural condition. These issues are primarily maintenance issues and are not considered serious. In our opinion, this addition is structurally sound.

<u>1981 Addition – Evaluation</u>
The 1981 addition is one story with masonry bearing walls. Roof framing over the main gym consists of long span open web steel joists supporting metal roof deck. Roof construction over the locker rooms consists of open web steel joists supporting metal roof deck. The gymnasium superstructure appears to be in good condition. There are a few minor cracks at interior walls, primarily at door locations. These do not impact the structural integrity of the wall, but we recommend they be re-pointed.

Above: Concrete swimming pool deck in poor condition.

Roof construction over the pool consists of precast concrete double tees. The pool super structure appears to be in acceptable structural condition. The concrete pool deck has a number of cracks. Some of these have been patched and some have not. There are also a number of locations where the concrete deck surface has spalls or pock marks. We recommend replacing the slab and finishing the new slab with an appropriate concrete finisher and sealer.

<u>Summary</u>
In summary, at all areas of the existing high school, we did not find any indications of serious structural issues. Because much of the structure is not visible, issues may exist that were not apparent. This is especially true at water damaged areas, where ongoing moisture infiltration may cause problems inside the walls or roof structures. However, in general, the school is in good condition structurally, and could continue to be occupied for a number of years if maintenance and repairs are implemented.

3.4 Existing Conditions – Mechanical Systems

3.4.1 General

The current Frederick facility high school consists of 233,816 square feet. The original high school facility was constructed in 1939 and consisted of 77,328 square feet. Additions occurred in 1955 consisting of 12,500 square feet, 1967 consisting of 14,880 square feet, 1977 consisting of 65,451 square feet and 1980 consisting of 53,987 square feet. Renovations occurred in 1977 consisting of 77,328 square feet and 12,500 square feet as well as in 2000 consisting of 18,500 square feet for Science classrooms. Additionally in 2002, the 1974 "A" wing had its ventilation system upgraded. The facility includes a pool which was part of the 1980 addition.

3.4.2 Existing Mechanical Systems/Evaluation

General
The current HVAC system, largely comprised of the major addition and renovation during 1977 and 1980 addition consists of a 4-pipe central heating and cooling plant serving a variety of air distribution equipment (air handling units, dedicated outdoor air units, fan coil units, unit ventilators, etc.) and heating terminal units (unit heaters, cabinet unit heaters, convectors, etc.) These systems are thirty five (35) years old (1977 project) or are original to later additions (1980) and renovations (2000 & 2002) and are at or beyond their useful life.

The building is served by a hodge podge of systems that have continuously been patched to keep them operational over the years. There are significant comfort issues throughout the building with temperature inconsistencies from room to room. The HVAC system is very unpredictable based on failing controls, insufficient cooling capacity and systems that have been connected and extended to over the years. As a result of minimal ceiling space for infrastructure, return air plenum systems were used in areas of the building. In other areas mechanical equipment is located on metal grating systems open to the classroom ceiling spaces creating less than desirable indoor air quality conditions. Other air handling equipment is installed in areas which have limited accessibility for servicing and/or require major wall/roof removal if equipment or major components need to be replaced. The multitude of system types, the way the building has evolved over the years, the lack of infrastructure space, and failing local pneumatic controls would significantly complicate the phasing of the building if renovated. Additionally it is doubtful that any equipment, including newer equipment could be reused based on current energy code requirements and/or LEED considerations.

Heating System
The 1980 project included a hot water heating plant consisting of two (2) cast iron boilers for heating the building as well as the pool. The boilers were manufactured by H.B. Smith, 650 series, 24 section and each have the capacity of 253 BHP. The boilers are dual fuel, natural gas and oil fired and utilize Iron Fireman Dunham Bush burners. An underground 20,000 gallon fuel oil storage tank also installed as part of the 1980 project serves these boilers. The UST is not equipped with a current leak detection and monitoring system. It has also been reported that fuel oil blows out of the tanks vent pipe. A base mounted end suction pump and standby pump distribute heating water overhead to the main building.

The pumps were manufactured by Bell and Gossett and have a rated capacity of 330 GPM at 115 ft. of HD. Two additional base mounted end suction pumps rated at 330 GPM serve perimeter type heating devices.

Central Cooling

The majority of the building is served by the central cooling system. A single centrifugal chiller as manufactured by Carrier and installed in 2004 generates chilled water. The chiller is rated for 420 tons but does not have sufficient capacity to meet the current building load. A roof mounted induced draft cross flow cooling tower as manufactured by Baltimore Air Coil (BAC) was installed at the same time as the chiller in 2004. A base mounted end suction chilled water pump rated for 1007 GPM at 150 feet of head, a base mounted end suction condenser water pump rated for 1260 PGM at 79 feet of head and a base mounted end suction common standby pump rated for 1375 GPM at 95 feet of head serve the central cooling plant. All are constant volume pumps.

Air Distribution Systems

Twenty-eight (28) air handling units serve the building. These air handling systems consist of various types, manufacturers, age and location. A return air plenum system was used extensively through the facility based on the era of installation and lack of infrastructure space. Accessibility for service and maintenance varies with some units located in areas that are extremely challenging while others are readily accessible. Some units are located on mechanical platforms with metal grating floors open to classroom ceilings below. This condition does not provide the desired indoor air quality conditions.

Control

The majority of the buildings automatic temperature controls are local pneumatic type as manufactured by Barber Coleman. There are limited direct digital controls as manufactured by Johnson in the building. Most controls are in failing condition and lead to comfort issues. Based on the age and condition of the existing pneumatic system the issues that occur are often unpredictable on a day to day basis. There is no interface to the county wide energy management system (EMS).

Recommendations

All mechanical systems for the high school are either at or are beyond their useful life or do not meet current code requirements, energy requirements, or LEED objectives. Capacities are questionable and controls would have to be replaced. In all likelihood, any type of renovation or reconfiguration of spaces and functions would not allow reuse of this equipment. All systems and equipment are recommended to be replaced in their entirety. New mechanical systems shall be designed to meet and/or exceed the latest LEED prerequisites and ASHRAE Standard 90.1-2010.

3.5 Existing Conditions – Plumbing

General
The building has various ages and material types for the plumbing systems including galvanized screw pipe, cast iron and copper most of which is original to the areas original construction. The entire plumbing system is in a failing condition and has been patched and repaired as failures occur.

Domestic Water
An 8" galvanized main incoming water service enters the main boiler room. This incoming combined service line serves both the fire protection system and building domestic water system. The water is high in iron content possibly caused by the galvanized piping materials which causes the water to look brown while staining plumbing fixtures. The water clarity issue is a significant problem and is probably caused by the old galvanized cold water lines serving the building. Two (2) gas fired hot water heaters as manufactured by A.O. Smith generate domestic hot water. The domestic hot water system is located in a Mechanical Equipment Room.

Sanitary
Most if not all of the sanitary collection system is original to its construction and ties into the public sewer system. A lot of the sanitary and vent piping materials are galvanized screw piping.

Storm Water
The existing storm water collection system is original and ties into the onsite storm water system. Similar to the sanitary piping system, various materials were used based on the time of installation including galvanized screw pipe.

Fire Protection
The main building is sprinklered and consists of six (6) sprinkler zones originating in the main boiler room.

Natural Gas
The building is served by natural gas used for comfort heating, domestic hot water generation, pool heat, science labs land cooking equipment. The incoming gas service enters the main mechanical equipment room.

Pool
The pool is currently heated by the main boiler system through a heat exchanger. The pool filtration system is in poor condition and at the end of its useful life. There is no dehumidification/pool type unit that should serve the space. A heating and ventilating unit mounted on the roof currently conditions the pool area.

Recommendations
All plumbing systems for the high school are either at or are beyond their useful life or do not meet current code requirements, energy requirements, or LEED objectives. Capacities are questionable and controls would have to be replaced. In all likelihood, any type of renovation or reconfiguration of spaces and functions would not allow reuse of this equipment. All systems and equipment are recommended to be replaced in their entirety.

New plumbing systems shall be designed to meet and/or exceed the latest LEED prerequisites and ASHRAE Standard 90.1-2010.

3.6 Existing Conditions – Electrical Systems

Frederick County Public Schools and Maryland State Department of Education Standards of the latest edition, as well as the proposed Educational Specifications for this project, are used as the basis for the evaluation of the electrical systems.

3.6.1 Power

Site Electric
Frederick High School has 480/277V, 3 phase, 4 wire secondary service from Allegheny Power via a pad-mount transformer. The primary feeder originates on Carroll Parkway, and transitions underground to the transformer located in the parking area at the rear of the building. The meter is mounted on the transformer. The secondary feeder is routed underground to the service entrance switchboard in the boiler room mezzanine.

Electrical Distribution System
The main distribution switchboard is configured with two 1600A fused bolted pressure switch mains. Ground fault protection is provided for the mains and each feeder breaker. The switchboard, manufactured by Square D, was installed in 1981. Facilities personnel have indicated that a fused switch, as well as ground fault modules, has failed. Replacement parts were difficult to obtain, and refurbished parts were installed. The ground fault protection installed on the feeder breakers has been a source of nuisance tripping.

Electrical distribution equipment is located within electrical closets located throughout the building. Dry type transformers provide 208/120V, 3 phase, 4 wire service. A single transformer is located in each closet, serving a distribution panel that in turn serves branch circuit panelboards. Lighting panels and low voltage relay cabinets, emergency panels, sound cabinets, and telephone terminal blocks are located in the dedicated electrical closets. Square D Model 4 motor control centers are typically located in mechanical equipment space to serve motor loads.

Panelboards are also installed throughout the building, in spaces such as the Kitchen, Shop Areas, Pool Pump Room, etc. Additional panelboards have been installed over time throughout the building, in order to accommodate additional branch circuits. Receptacles have been added in tele/power poles where partitions have been installed to enclose classroom space. Newer panelboards, installed for computer loads, are equipped with surge protection.

Emergency Distribution System
A 45kW, 480/277V, 3 phase, 4 wire generator serves emergency loads in the building. The generator, manufactured by Onan, is located within the Boiler Room. The generator is natural gas-fired, supplied by the gas service to the building. The generator serves a single automatic transfer switch, located adjacent to the generator. The generator and transfer switch date to 1981.

The emergency generator serves panel BR1E, in the main electrical room. Several other emergency panels, along with dry type transformers and panels for 208/120V loads, are strategically located in the building to serve emergency egress lighting, fire alarm system, public address and master clock system.

3.6.2 Lighting

The lighting system generally utilizes 32W T8 fluorescent lamps and electronic ballasts. Fixtures are primarily 2'x4' prismatic lensed recessed fluorescent troffers. Corridor fixtures contain two lamps, while classroom fixtures contain four lamps. Many fixtures have a black reveal and appear to be part of the air distribution system. Surface mounted lensed wraparound 1'x4' fixtures are also located in locker areas, restrooms, and other areas without ceilings. Industrial strip fixtures with wireguards are utilized in the Shop Areas.

The gymnasium utilizes metal halide high bay fixtures with prismatic lenses. The old gym/weight room has 8' long 2-lamp fluorescent with wireguards, mounted well below the ceiling/structure. Metal halide fixtures with stainless steel housing are utilized in the pool area. Supplemental fluorescent fixtures are mounted along the side walls, connected to an emergency circuit. These are showing signs that they are not as suited to the harsh environment as the HID fixtures. Lighting controls for the metal halide fixtures in both the gym and pool area are low voltage via relays.

The auditorium house lights consist of incandescent downlights, both pendant and recessed mounted, for performances. In addition, recessed fluorescent 1'x4' fixtures are installed in the balcony area for instructional use. The theatrical lighting control board is relatively new, although the Electro Controls 450A dimming cabinet, located in the mechanical penthouse, was not been replaced at the same time.

A large number of the fixtures in the building have prismatic lenses that have yellowed over time. This is a result of the UV radiation given off by the fluorescent lamps. Incandescent fixtures are still in use in mechanical equipment room spaces.

Classroom lighting is controlled manually via two toggle switches. Two levels of illumination are provided by switching the fixtures in a checkerboard pattern. Corridor lighting is controlled locally via toggle switches or keyed toggle switches. Emergency lighting circuits throughout are continually on, utilized as night lights.

HID wall packs are located on the building perimeter for general security lighting. Shoebox fixtures, similar to the parking lot fixtures, are wall mounted at the main entrance. There does not appear to be exterior emergency egress lighting at each entry/exit door. The parking area is equipped with shoebox cut-off fixtures on 15' poles at the sidewalk near the building, and 30' poles in the parking area.

Lighting controls are located adjacent to the source panels, including time clocks for exterior lighting and low voltage relay panels for interior fixtures.

3.6.3 Fire Alarm System

The fire alarm control panel (FACP) is General Electric EST. It is located in the Administration area main office. The system contains manual pull stations, speakers and strobes for voice evacuation throughout, sprinkler flow and tamper switches, heat and smoke detectors. The annunciator panel (FAAP) is located at the entry doors to the main lobby.

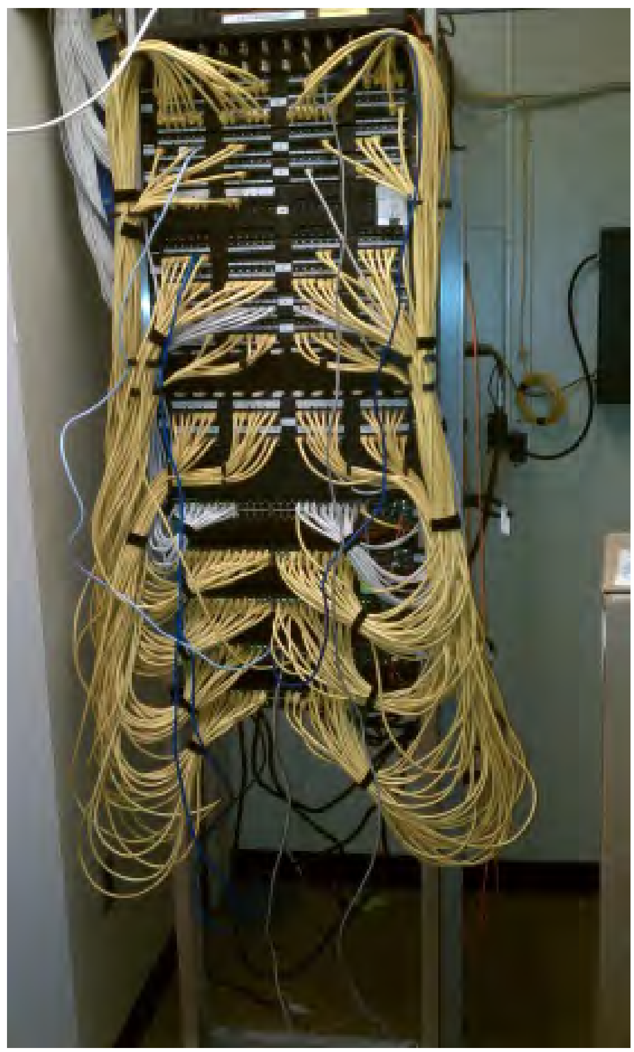
The fire alarm system is reported to shut off the building air handling unit equipment automatically. An AHU shutoff pushbutton switch is located adjacent to the FAAP. The fire alarm system has been recently replaced, and appears to comply with current codes and ADA requirements.

3.6.4 Public Address System

A Rauland Borg Telecenter is used for the public address (PA) system. The PA is located in the main school office and is reportedly in good working condition. A Latham master clock system is also co-located in the main office area.

3.6.5 Telecom Spaces

The school contains a Telecommunication Equipment Room (TER) which is the main IT equipment room and additional IT rooms known as Telecommunication Rooms (TR). These TR's serve as intermediate equipment rooms, each connected to the TER via fiber optic cable and multi-pair copper cabling. Each TR serves an area of the school with horizontal category 6 voice and data cable. The TER is located on the second floor in a room off the library, and contains distribution racks, servers, punch down fields and a room air conditioner unit. The TER and TR contain similar and well organized wallboards containing 110 blocks for the telephone network and amplifiers for video distribution.



Should the existing school remain in use, the main telecom equipment room should be increased in size to allow for proper support of a modern school and its many low voltage systems. The use of the TER should be restricted to telecom and security equipment, to increase security and prevent casual damage of the equipment.

Because the currently installed cabling

system is co-located in programmed spaces (offices and storage areas), the cabling in place will most likely need to be relocated and updated to category 6 cabling. Fiber optic backbone cabling should also be installed, connecting all telecom spaces back to the main telecom equipment room. Current telephone and data electronics may be able to be reused, with some additional switching equipment to augment and upgrade the backbone. However, a major renovation of the school that included new systemic upgrades would require the entire replacement of the communications infrastructure systems.

3.6.6 Data Network

The existing data network consists of category 5 Unshielded Twisted Pair (UTP) cabling in the horizontal and fiber optic backbone cabling. Both the layout/configuration and the data network equipment used in each of the TRs were very similar. The TRs use Dell PowerConnect 5448 10/100/1000 switches, UPS (uninterrupted power supply) equipment, and 24- and 48-port patch panels. TR equipment seems to be in good working condition. Most cabling is routed through surface mounted raceway of varying types to surface mounted outlet boxes. Most faceplates are in disrepair with damaged outlets or missing blank covers. Wireless Access Points have been located in some areas to provide wireless coverage. Most classrooms have two data outlets at the teaching station with data outlets in the rear or side of the classroom for student workstations. Because of the open floor plan and movable room dividers in most of the classrooms, there are only a few locations for data outlets for student use.

3.6.7 Classroom Audio-Visual

Most classrooms and other instructional spaces have a Promethean board with a ceiling mounted projector hung 10-12 feet from the presentation wall. An audio-visual wiring harness is run from the ceiling mounted projector to the instructor's station.

The existing Promethean Boards should be utilized in any renovation or replacement scenario. The audio-visual harness should be upgraded to current cabling types and consider a sound enhancement system to equalize sound levels in each learning area.

3.6.8 Video Distribution System

An analog coaxial "Tap and drop" distribution system is currently in place in all sections of the building. Amplifiers have been located in telecom spaces with trunk cabling running throughout the school. This system could remain in use, given only minor restoration of classrooms and a minimum of reprogramming spaces. Once locations of classrooms and viewing devices are added or moved, the existing design will not work as installed, and will need to be redesigned and replaced. A major renovation of the school would require replacement of the system.

3.6.9 Security System

The school contains access control, door intercom, CCTV surveillance and intrusion detection systems. The access control system is a Best system, with card readers on selected exterior doors. There is a combination of fixed and PTZ cameras on the exterior of the school providing some coverage of the grounds. An AI door intercom unit is in use at the main entrance. Door contacts and motion detectors are present as part of the intrusion detection system. Existing systems seem to be in good working order, and could be reused if properly protected during any other renovation effort. Additional cameras should be considered to more sufficiently monitor the building.

3.6.10 Summary

The majority of the electrical systems are at least 30 years old, and have exceeded their anticipated useful life of 25-30 years and are recommended to be replaced. Any newer equipment, including the fire alarm system, installed within the last 10 years is recommended to be salvaged for reuse where feasible.

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3.8 Existing Conditions – Kitchen Equipment

The Frederick High School main kitchen contains approximately 2,018 square feet and operates as a full-service prep/production facility equipped to produce and serve meals to the students and staff. The majority of the equipment is original to the 1980's renovation of the building. Much of the equipment, although well-maintained, is old, outdated, inefficient, non-compliant with current codes, and has seen its useful life. Electric service is inadequate as staff report that circuit breakers are tripping-off constantly. There is a lack of electrical outlets to merchandise added food items. Student lunch participation is at 50%.

Above: Existing kitchen.

<u>Finishes</u>

- Floors – Kitchen and serving areas have thick-set quarry tile with coved base. Although old, most tiles appear in sound condition. Due to smooth surfaces, tiles are very slippery when wet or laden with grease.
- Walls – CMU with ceramic tile up to finished ceiling. Tile is cracked and broken at exposed corners.
- Ceilings – 2' x 4' suspended metal grid with acoustic panels. Panels are badly stained and discolored and mismatched. Tiles are perforated and porous in violation of current health regulations. The metal grid is badly discolored.
- Lighting – 2' x 4' twin-tube recessed light fixtures with lens covers. Light levels throughout space are well below the current code standards of 50 foot candles per square foot.

<u>Areas</u>

- Receiving – Food product is received through a single over-sized door off a public corridor through a stairwell that leads to the outside. Food deliveries conflict with students in the corridor and stairwell during early morning hours. Doors are heavily worn from years of use. Removal of trash follows the same path posing sanitation and safety issues. No electronic monitoring device exists on the exterior door to notify manager of deliveries, therefore door remains unlocked. There is no raised loading dock, which makes food deliveries difficult.
- Manager's Office – The office is undersized per the proposed Educational Specification but is well located with windows throughout for good surveillance.
- Dry Storage – Product is stored on chrome-plated wire shelving surrounding the perimeter and center of room. Various sections are broken and rusting. Space is undersized to properly and safely store the required magnitude of food product. Ceiling is dropped down to below 8 feet, further limiting the availability of space.
- Walk-in Cooler/Freezer Storage – 10' x 7' each compartment with stainless steel finish interior/exterior. Product is stored on wire shelving and dunnage racks.

Lighting levels are inadequate. There are no high-temperature alarms or monitoring device as required for Hazard Analysis and Critical Control Points (HACCP) compliance. Space is inadequate to properly and safely store the required magnitude of food product.

- Kitchen – The area is inadequately ventilated and staff members report that it is extremely hot during warmer months and cold during winter months. This condition contributes to worker stress and fatigue. Some items of cooking equipment are not used due to obsolescence or constant breakdowns and lack of parts. Additional equipment needed to properly prepare current menu items is absent. A single hand washing sink to cover the entire kitchen space in violation of current health code. Light levels are below current code standards of 50 foot candles per square foot. Gas, water, and drains line around cooking areas are rusting, unsanitary, and difficult to properly keep area clean. Aisles are tight and cramped.
- Serving – The serving area consists of one T-shaped "institutional looking" cafeteria counter with provisions for hot and cold items, each with a dedicated cashier. Multiple hot food wells do not work which poses health concerns regarding proper food holding temperatures. The serving area is located in an active corridor that traverses through the dining room. Cross-flow of traffic causes congestion and confusion. The area contains no hand washing sinks which is in violation of current health requirements. Since the area is open to students, the kitchen staff is unable to secure food items. A make-shift ala carte/deli serving line set up in the cafeteria is difficult to service from the main kitchen. Staff reports that students regularly complain about length of time to move through serving lines.

Above: Existing cafeteria serving area.

- Cafeteria – The dining area is undersized to adequately service the number of students. Large columns tightly spaced are a hindrance to circulation and block views.
- Dishwashing – FCPS utilizes disposable dinnerware. The dishmachine is used primarily for sanitizing sheet pans. The dishmachine is old, inefficient, and leaks persistently. The area contains a 3-compartment pot washing sink and shelving to store pots and pans. There are limited area floor drains which results in water pooling on the floor. This presents a slip and fall hazard. There is a washer and dryer located adjacent to the dishmachine for cleaning aprons, rags, etc.
- Janitor Closet – Space is insufficient to adequately store cleaning supplies. The raised wall-mounted mop sink creates difficulty in emptying mop buckets.
- Toilet/Locker Room – A unisex staff toilet room with lockers and a toilet stall is located adjacent to the kitchen. The area is not in compliance with current ADA requirements and lighting levels are poor.

- Chemical Storage – There is a 4' x 6' room adjacent to the dishwashing area with wire shelving for storage of chemicals and cleaning supplies.

Equipment

- Exhaust Hood – Stainless steel construction with water-wash feature. Dirty, grease-laden. Very low light levels.
- Fire Protection System – Does not meet current NFPA UL300 standards.
- Cooking Equipment –
  - (2) Convection Steamers – These were replaced in 1996 and are in good condition. However, these boiler-based models are inefficient.
  - (2) Convection Ovens – One unit replaced in 2001 is in good condition. The second unit is old and inefficient with painted sides that are scratched and rusting. Additional oven capacity is needed for current menu items.
  - (1) Combi-oven – Installed in 2001 and in good condition.
- Serving Counters – Counters have stainless tops and galvanized bases. Counters date to the 1980 renovation. Various hot food wells do not maintain even heat. Ice cream cabinets are not operational. Compressors for cold pans break-down regularly. Units are very "institutional" in appearance.
- Worktables, Prep Sinks, Pot Sinks – Stainless tops, painted galvanized bases badly scratched and rusting. Painted finishes require high maintenance.

Summary

The existing kitchen and serving areas are undersized and inefficiently organized. Much of the equipment is outdated, inefficient, and not compliant with current codes, and is beyond its expected useful lifespan. The recommendation is that the kitchen and serving areas be enlarged or replaced and that all equipment be replaced.

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3.9 Existing Conditions – Educational Specification Compliance

Because there is not yet an approved Educational Specification for the renovation or replacement of Frederick High School, the Feasibility Study Steering Committee adapted the Educational Specification used for the latest Frederick County high school. Programs not present at FHS were removed and programs present at FHS such as ELL, commercial foods, and wood shop were added. This gave the committee an approximation of what an ed spec for FHS might look like and also provided a basis for evaluating the adequacy of the existing facility.

Comparing the existing facility to this adapted Educational Specification (a full comparison can be found in Appendix C), the quantity and area of general humanities and mathematics classrooms is actually greater in the new school than is required. However, because planning rooms are small or non-existent, some classrooms are in makeshift spaces, and some classrooms are "open space" and must be passed through to access others, these numbers may be a bit misleading.

In several other areas, the existing school is undersized. Technical, business, arts, and physical education areas are all undersized by more than 2,000 square feet each. The cafeteria and kitchen area is undersized by more than 3,500 square feet. The custodial and maintenance areas are undersized by slightly less than 2,000 square feet. The health suite is not adequately sized to allow separate boys' and girls' examination and toilet facilities. The indoor swimming pool is significantly undersized by current standards (refer to Appendix D for more information).

In total, the existing building is undersized by approximately 15,000 net square feet. Applying a standard grossing factor of 1.4 as well as additional factors to make up for the existing building's circulation, layout, and structural inefficiencies, an addition of approximately 25,000 gross square feet would be appropriate to provide the amount of space necessary to meet the adapted Educational Specification.

This addition would not include an expanded pool as it would be impractical to attempt an expansion of the current pool. Were the pool to be expanded, an additional 10,000 gross square feet would be required, bringing the total addition to 35,000 gross square feet.

Beyond square footage requirements, the existing school also falls short of complying with a contemporary high school Educational Specification in terms of ability of spaces to be easily supervised, departmental grouping and adjacencies, instructional technology infrastructure, acoustical isolation between instructional spaces, and heights of ceilings in many spaces.

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4.0 CODE ANALYSIS

4.1 Accessibility Evaluation

The existing school is minimally accessible in that the main entry permits public access into the school and an elevator installed with the 1977 addition makes the second and third floors generally accessible. There are a few instructional spaces on the north end of the building that would be accessible to persons in wheelchairs only by way of exiting the building and reentering through a classroom exterior egress door and other spaces where access would only be available by traversing other rooms. Existing corridor ramps are not in compliance with current ADA requirements.

A general examination of the existing school found the following areas to be deficient. All must be further reviewed and addressed during the schematic design phase of this project:

- Additional accessible entries and exits must be added.
- An accessible route to all public rooms and spaces within the building must be created.
- Toilet rooms and stalls must be made accessible, including all plumbing equipment.
- Clearances around some doors are not adequate for accessibility.
- Door hardware must generally be replaced with accessible door hardware.
- Height of electrical switches and signage does not comply, and must be corrected.
- Classroom and other public space entries must be reviewed for ADA compliance.
- All egress door swings and clearances must be reviewed and brought into compliance.
- Door closers must be tested, so that force required to open doors is compliant.
- Assistive listening devices will be required in public spaces.
- ADA compliant signage will be required.
- ADA compliant seating positions must be provided in assembly areas including the gymnasium, auditorium, and natatorium.

4.2 Building / Life Safety Code Evaluations

The existing school is a mixture of concrete masonry bearing wall and steel frame construction types totaling 234,105 GSF. The majority of the building is currently sprinklered with exceptions being the pool and a few other rooms and spaces within the athletic wing. The building can be classified as Type 2B (non-combustible/unprotected) construction in accordance with the 2012 International Building Code (IBC) however the building could be classified as Type 2A if the sprinkler system were to be extended to cover the entire facility. The occupancy classification is Mixed Use, including Educational and Assembly type occupancies. Both of these classifications must be confirmed with City of Frederick code officials during schematic design if the Board of Education elects to move forward with either Option 1 or Option 2.

The existing school is currently non-compliant in terms of height and area allowed. In the options including code upgrade work, the automatic fire sprinkler system will be extended to cover the entire school. This will result in the allowable height and area limitation being increased. However, given the size of the existing building and the additions proposed in both the Revitalization and Modernization options, the building will still exceed the increased area limitations requiring the building be divided into separate fire areas. The additions will have to be separated from the existing building with a fire wall, making them entirely separate buildings from a code standpoint.

Special considerations should be given to the following code concerns in future phases:

- Existing stairs are in some cases too narrow to handle the maximum occupant loads mandated by current code.
- Several existing stairs are not configured with exit discharge in conformance with current code.
- Ceiling heights in some stairs are too low per current code.
- Existing areas in which occupants must pass through a stair enclosure to circulate through the building on the same level may not meet the egress continuity requirements of the current code.
- The fire alarm system may require upgrading if additions are constructed as part of a building revitalization or modernization.
- The sprinkler system must be upgraded and extended.
- Assembly uses shall be properly separated from Educational uses.
- Smoke barriers must be installed between the corridors and other spaces.

5.0 DEVELOPMENT OF OPTIONS

The Feasibility Study Steering Committee evaluated numerous options for rehabilitation, partial replacement, and full replacement of the existing Frederick High School building. Considerations weighed in the development of the options are discussed on this page through page 87. Following, on pages 89 through 111, each option is described in further detail with discussion of advantages and disadvantages and full description of the scope of work envisioned for each option.

Option 1 – Rehabilitation:
In addition to the physical deficiencies noted above, the existing building lacks the square footage needed to accommodate the program outlined in the proposed Educational Specification (refer to Appendix C for Educational Specification comparison). The rehabilitation option includes moderately sized additions to make up for the difference between the existing and proposed gross square footage.

Option 2 - Partial Replacement:
The partial replacement option saves only the original 1939 portion of the school. The option was developed in response to the image of the original arched front (south) entrance and stairs. The brick arch and grand stair are seen in numerous historic and current images of the school and is largely known by members of the school and larger community as the "face" of the school. The 1939 building is in fairly good condition and is a simple, straight-forward structure that could be separated from later additions and restored to its original appearance with new sensitive additions. Although the 1939 building is not known to be on any national, state, or local historic registers, this option acknowledges that the structure may still have historical value to some stakeholders.

Above: Frederick High School front façade and drive as it appeared from 1939 through 1967.

Options 3 through 6 – Full Replacement:
The Steering Committee initially evaluated whether the Frederick County Public Schools high school prototype design recently utilized for Tuscarora, Linganore, and Oakdale High Schools would be appropriate and feasible for use on the Frederick High School site. The prototype is roughly 450 feet square in footprint with a two story classroom occupying just over half of the footprint and single story lobby, auditorium/performing arts, mechanical, cafeteria/kitchen, and athletics spaces occupying the remainder. Previous sites on which FCPS utilized the prototype design range

Above: FCPS Prototype (orange) overlaid on existing school parking lot and footprint (bright green) with attached pool (yellow).

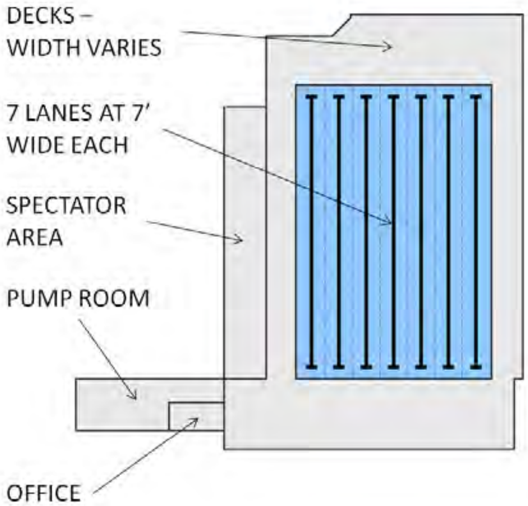
from 46.7 to 51.3 acres, are generally in areas of low density suburban or rural character, are not shared with other FCPS facilities, and do not have swimming pools. Frederick High School's site is 43.4 acres, is in a high density suburban neighborhood, is shared with West Frederick Middle School, and has a swimming pool. The determination was that implementation of the prototype would require significant compromises in quantity of parking and/or quantity of outdoor athletic facilities, particularly if the pool were to be retained.

In consideration of the above, all of the partial and full replacement options are nominally three stories, with large athletic and performing arts spaces being in single or two story wings. A taller, more compact footprint follows the precedent of the existing Frederick High School and also allows the existing quantity of parking and outdoor athletic facilities to be retained or improved.

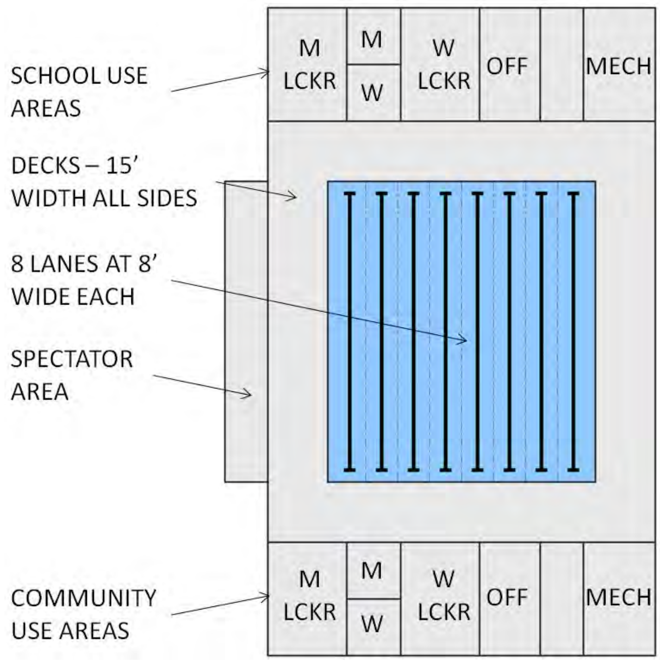
Site Placement:

Regarding site placement of a replacement school, areas within the 100 year floodplain were not considered viable locations for a new building. The remainder of the site – essentially the areas to the northwest of Carroll Parkway – was considered for alternate locations. The only additional constraint is a utility right-of-way bisecting the existing ball fields. Evaluating the feasibility of relocating those utilities was beyond the scope of this study, however doing so would likely involve a lengthy permitting process, extension of the anticipated construction duration, and significant additional cost. All of the replacement school options avoid construction that would necessitate relocation of these utilities.

Swimming Pool:



Above: Existing indoor swimming pool.
Right: Proposed indoor swimming pool.



All options were evaluated both with and without an indoor swimming pool and costs for the pool have been estimated separately. The Maryland State Department of Education does not count the area of the pool toward the SRC (state rated capacity) of the school. A pool may be designed within the maximum gross area allowed per the SRC but doing so would require reducing or eliminating other educational or support spaces. In essence, State funding is not available for swimming pool construction without compromising other requirements of the Educational Specification. Working under the assumption that the pool would be funded locally, the Steering Committee developed options that would allow it to be constructed as a bid alternate.

Since no recent Frederick County precedent exists for programming a new high school swimming pool, GWWO developed proposed space requirements based on the recommendations of USA Swimming, a national governing organization for competitive swimming (refer to Appendix D – FHS Pool Proposed Space Requirements). The USA Swimming recommendations gave us a platform for evaluating the construction of a new pool at FHS, but they should be further vetted with FCPS athletic program directors and local swimming officials during the composition of the final Educational Specification.

Under options where a new pool is considered (options 2 through 6), the pool can be constructed either as an attached addition to the high school building or as a freestanding building. If the pool is a separate building, a few more locker and toilet facilities will be required as it would be impractical to attempt to share such spaces with a detached high school.

Summary:
Key points considered in developing and evaluating the options are as follows:

- The committee determined that implementation of the FCPS prototype high school would require significant compromises in quantity of parking and/or quantity of outdoor athletic facilities, particularly if the pool were to be retained.

- All of the partial and full replacement options are nominally three stories
- Areas within the 100 year floodplain were not considered viable locations for a new building.
- A new pool can be constructed either as an attached addition to the high school building or as a freestanding building under options 2 through 4.

6.0 ANTICIPATED SCOPE OF WORK – ALL OPTIONS

The expectation is that all options will involve significant work to completely renovate or replace the existing facility and transform it into a contemporary educational facility with instructional and support spaces, systems, materials, and finishes comparable to those present at other recent Frederick County high schools.

6.1 Architectural

Interior

Existing Construction to Remain:

- Spaces will be reconfigured to the extent feasible within existing structural constraints. Therefore, many renovated existing spaces may not comply with the Educational Specifications.
- Existing finishes will be upgraded in accordance with the Educational Specifications.
- All floor tile, carpet, wall base, ceiling panels, suspended grids, and ceramic tile will be replaced. Walls in spaces to remain will be patched and repainted.
- All casework will be redesigned and replaced to meet the Educational Specifications.
- Interior doors, frames, and hardware will be replaced to meet accessibility requirements.
- Existing terrazzo flooring will be maintained where it is in good condition.
- Lockers will be replaced in accordance with the Educational Specifications.
- The existing elevator will be relocated and replaced.
- Several departments and program areas will be relocated to facilitate improved adjacencies and grouping.
- Compliance with existing building codes and accessibility requirements will be improved to the extent feasible, however some deficiencies may have to remain as “grandfathered” items.
- Building entry and circulation will be improved.

New Construction/Additions:

- A new building or addition will meet all Educational Specifications requirements.
- Materials and equipment will be designed to meet FCPS Design Guidelines.
- All classrooms, offices, and common spaces will have abundant daylight.
- Circulation will be straightforward and well defined.
- New spaces will comply with current code and accessibility requirements.

Exterior

Existing Construction to Remain:

- Windows, doors, and storefronts will be replaced within existing openings. Where feasible, additional windows will be cut into exterior walls and windows will be reinserted into openings previously infilled with brick.

- Brick will be re-pointed (mortar replaced) on the 1939 building. Brick veneer will be removed and replaced on other sections of the building with insulation being added where possible.
- The existing roof will be replaced with new built-up roofing.

New Construction/Additions:

- A new building or addition will meet all Educational Specifications requirements.
- Materials and equipment will be designed to meet FCPS Design Guidelines.
- A well-defined central entry will be provided.

6.2 Site

- Reconfiguration of existing site design/layout is anticipated. Scope of reconfiguration varies by feasibility study option.
- Milling and resurfacing of all existing paved services scheduled to remain.
- Replacement of existing concrete sidewalks as necessary to serve buildings, parking, and site features and to bring facility into compliance with current ADA requirements.
- Restoration of disturbed areas of sod and landscaping.
- Artificial turf stadium and practice fields may be provided as a bid alternate.

6.3 Structural

Existing Construction to Remain:

- Minor repairs as required.
- Modifications to roof and floor framing as required for building reconfiguration.
- Additional foundations for new fire walls and stairs.
- Modifications and reinforcements to existing structure as required for new mechanical units, electrical equipment, new floor, roof, and wall penetrations and openings, and to comply with current snow loading requirements.
- New elevator masonry shaft with foundation at new elevator.
- Floor level in 1955 wing will be raised to a level consistent with the level of the first floor.
- Reinforcing of isolated structural elements may be required.
- Existing abandoned openings and penetrations will be patched.

New Construction/Additions:

- Load bearing CMU walls with structural steel framed structure.
- The roof structure will consist of long span open web steel joists with galvanized metal or Tectum roof deck.
- Steel beams and columns will be provided as required by the architectural layout.
- A geotechnical investigation will be conducted during the design phase to determine foundation recommendations.
- If a slab on grade is feasible from a geotechnical standpoint, then a concrete slab on grade reinforced with welded wire mesh will be considered.

- We anticipate a shallow spread footing foundation system, consistent with the existing building, will be appropriate. However, this must be confirmed by a geotechnical investigation.

6.4 Mechanical

Proposed General Mechanical System Description
The Mechanical Systems shall include all work associated within the building of Heating, Ventilating, Air Conditioning (HVAC), and Plumbing Systems. These systems shall extend to 5 feet beyond the building wall.

The Mechanical Systems, in concert with the Architectural considerations, are intended to create spaces that are flexible, functional, energy efficient, and respond to the needs of this facility.

Within the envelope of the new facility, the proper heating, cooling, ventilation, air exchanges, and Automatic Temperature Control/Energy Management Systems shall be provided for all spaces to create the appropriate thermal environment. Stairwells shall be provided with heat only. All areas shall be provided with heating, ventilation, and air conditioning. The HVAC and related Mechanical Systems shall not only be functional and responsive to the need, but shall be simple, reliable, durable, maintainable, and easily accessible. The HVAC System utilizes energy conservation techniques to the greatest extent possible, while maintaining comfortable control. All HVAC components shall be capable of a complete override from the Energy Management System.

Heating and Cooling Systems and their associated controls shall be designed and zoned to enable the building to operate at less than full occupancy without conditioning the entire building.

The Mechanical Systems shall be designed to meet or exceed ASHRAE Standard 90.1-2010 (current State of Maryland minimum energy requirement) in an effort to achieve LEED Silver Certification. Sustainable design guidelines such as ANSI/ASHRAE/USGBC/IES Standard ASHRAE Advanced Energy Design Guide for K-12 School Buildings shall be recourses used to exceed the minimum energy performance requirements of ASHRAE 90.1-2010.

Sub system monitoring of gas, electric (HVAC, lighting plug loads, kitchen) and water shall be considered and reviewed during the Design Development Phase. As a minimum the design of the mechanical and electrical infrastructure shall be set up in a way that supports sub-metering such that only the installation of sub-meters will be required to determine energy usage for mechanical systems (kw), plug loads (kw) kitchen loads (kw), lighting loads (kw), domestic hot water energy usage (therms) comfort heating (therms) and kitchen (therms).

The Mechanical Systems including plumbing systems shall be designed in accordance with ASHRAE Standards, International Mechanical and Building Codes, NFPA, the International Plumbing Code, County Code Requirements, and IAC Standards.

<u>Option 1 – Renovation</u>

Under Option 1, renovation, incorporating an energy efficient system into the existing building will be complex (i.e. expensive). There are often physical limitations which result in compromise to the system design often reducing system efficiency. Typically older structures cannot support rooftop penthouses for equipment without substantial structural modifications. The existing building utilizes a return air plenum so ceiling space for a ducted return air system is limited. Typically a decentralized fan coil unit system or geothermal water to air heat pump system using mechanical closets can be employed to minimize ceiling space requirements however large dedicated outdoor air units are still needed and the mechanical closets reduce usable floor space for education. The system which “fits” into the existing building may end up being different than that proposed for the addition as the addition can be constructed to maximize the efficiency of the mechanical system. A different system for the addition may also be needed to enhance the total building energy efficiency. A new mechanical equipment room would be needed in the Phase I new addition to feed new areas of construction as the existing systems are removed such that the last phase includes the demolition of the main mechanical equipment (boiler/chiller) room. Typically as a result of selective demolition/temporary requirements, compromises in equipment locations and infrastructure sizing and routing the initial construction cost and operating cost are both higher compared to a new building. Additionally reuse of a building will require a larger square foot area as the net to gross ratio is less. This also typically results in higher building envelope areas (exterior walls, windows, roof) all of which increases the capacity of the heating and cooling requirements which ultimately increases annual energy usage.

<u>Option 2 – Limited Replacement</u>

Option 2, limited replacement, is less complex than Option 1 as a greater percentage of the building is new construction and a lower percentage is renovation. The same complexities exist but are of a smaller magnitude.

<u>Options 3 through 6 – Replacement</u>

The full replacement options maximize the efficiency of the systems while simplifying constructability issues associated with working within the physical limitations of an existing building.

<u>HVAC System</u>

The proposed HVAC Systems to be analyzed during Design Development consist of a high efficiency conventional four-pipe Heating/Cooling Distribution System, a Geothermal Water Source Heat Pump System and a Hybrid type of System using an Earth Heat Exchanger (Geothermal) in conjunction with a 4-pipe Conventional Heating/Cooling System.

The Office/Administration Area, Media, Gymnasium, Cafeteria and Auditorium which functions twelve (12) months a year, and/or during non-educational times shall be zoned such that it can operate independently from the rest of the school. All other areas shall be separately zoned based on use and function.

The proposed four (4) systems that are recommended to be analyzed during the Design Phase shall include:

Option A: Four-pipe high efficiency variable air volume system with heat recovery and free cooling outdoor air economizer cycle.

Option B: Four-pipe fan-coil units used in conjunction with a decoupled dedicated outdoor air system (DOAS) with integral heat recovery for ventilation and water economizer cycle.

Option C: Geothermal water source water to air and water to water heat pumps used in conjunction with a decoupled dedicated outdoor air system (DOAS) with integral heat recovery for ventilation.

Option D: Hybrid system with geothermal water to water heat pumps used in conjunction with conventional 4-pipe system supplemented by high efficiency condensing boilers and water cooled variable speed compressor type chillers.

From an energy efficiency and 2009 LEED NC-EA credit 1 the proposed system options shall obtain the following minimum requirements based on new construction.

HVAC OPTION	% ENERGY COST SAVINGS	POSSIBLE LEED POINTS
Option A	22%	6
Option B	20%	5
Option C	26%	8
Option D	24%	7

6.4.1 HVAC System Alternatives

OPTION A: High Efficiency Variable Air Volume System

Heating System
The proposed Heating System is hot water. The building shall be heated by means of a Hot Water Circulating System servicing hot water heating coils located in air handling units, room terminal control units, baseboard radiation, unit heaters, and convectors.

The boiler’s fuel source shall be natural gas.

Base-mounted horizontal split case distribution system centrifugal pumps, located in a mechanical space, shall circulate the required quantities of hot water, by piping systems, to air handling units, room terminal units
and miscellaneous heating units. A redundant circulating pump shall serve as a back-up to the lead circulating pump.

The heating water loop shall be variable flow and shall provide the necessary low temperature (140°F maximum) hot water to air handling unit coils, unit heaters, terminal control units, baseboard radiation, and miscellaneous terminal heating units. The heating water pump shall utilize a variable frequency drive to vary pump speed based on the system's differential pressure requirement. The system differential pressure operating setpoint shall be automatically reset based on analyzing all control valve positions. The heating water loop supply temperature shall be reset based on outside air temperature. Constant hot water circulation by means of centrifugal in-line type circulating pumps shall provide the necessary freeze protection of air handling unit preheat coils. A redundant circulating pump shall serve as a back-up to the lead circulating pumps. These circulating pumps shall utilize ECM motors to enhance their operating efficiency.

Heating water pumps shall be trimmed with flexible connectors, suction diffusers (strainers for in-line pumps), multipurpose valves, isolation valves, pressure gauges and flow meters.

Generation equipment shall include six (6) high efficiency (90%-95% efficiency) variable flow condensing type fire tube hot water boilers (i.e., AERCO Benchmark, Cleaver Brooks Clearfire or Fulton Vantage), utilizing stainless steel construction and sized to optimize the heating
plant performance while meeting the total heating capacity required for the building These boilers shall be located in the Boiler Room.

Water expansion and air removal devices shall be provided in the Heating Water System. Water pressure regulators located downstream of backflow preventers shall provide the make-up water requirements. All makeup water shall be metered and monitored through the EMS.

Chemical Treatment Systems shall be provided for the Hot Water Circulating System.

Hot Water Heating System piping shall be Schedule 40 Black Steel and insulated in accordance with ASHRAE Standards.

The Heating System shall operate whenever the outside air temperatures are 65 degrees or less.

Cooling Systems
The building shall be cooled by means of a Central Chiller Plant with chilled Water Circulating System serving chilled water cooling/dehumidification coils located in air handling units.

Chilled water shall be generated by multiple (two minimum/three recommended) high efficiency, variable speed compressor(s), magnetic bearing water cooled centrifugal type chiller. The chillers shall use an environmentally safe refrigerant in accordance with The Clean Air Act. Additionally to optimize system performance a heat pump chiller located in the side stream position shall be considered so as to simultaneously generate chilled water for cooling and low temperature hot water for heating. When simultaneous heating is not required, an earth heat sink shall be considered as an alternative to rejecting the heat to the atmosphere via a cooling tower.

Secondary/distribution base-mounted horizontal split case centrifugal pumps, located in the Mechanical Room, shall circulate the required quantities of chilled water, by piping systems, to air handling unit cooling coils. A redundant circulating pump shall serve as a back-up to the lead circulating pump, each chiller shall be provided with a base mounted end suction primary/generation pump which shall circulate chilled water through its associated chiller. All chilled water pumps (primary and secondary) shall utilize a variable speed drive and the chilled water plant shall operate as a variable primary flow system based on system differential pressure. The primary chilled water pumps shall volumetrically track the secondary flow rate down to the minimum via chiller flow rate. The system differential pressure operating setpoint shall be automatically reset based on analyzing all control valve positions.

The full load performance capacity and part load efficiency of the chillers shall be selected to precisely and efficiently track the building load based on hour-by-hour building load requirements and shall be capable of a high turn down ratio. If three (3) chillers are utilized, two (2) shall be equal in capacity while the third chiller (possibly heat pump chiller) shall be a lesser capacity and sized for the lowest expected part load condition. This smaller chiller shall be located in the secondary loop upstream (in series) of the base load chillers. The base load chillers shall be installed in parallel in a conventional primary/secondary piping configuration.

It is recommended that all chilled water control valves be a high quality pressure independent type (PIC) as manufactured by Danfoss, Griswold or Flow Control Industries. The use of pressure independent control valves shall provide a stable water temperature difference to maintain the designed energy performance of the cooling plant. While a 15°F chilled water system temperature difference (45°F supply/60°F return) is recommended, energy modeling during the design phase shall determine the optimal water temperature difference which will ultimately be dependent upon the specific building, layout and equipment selection.

An induced air cooling tower associated with each chiller utilizing a variable speed fan shall reject heat to the atmospheric heat sink. A remote sump for each cooling tower located in the mechanical room is recommended for freeze protection while providing heat rejection capability for mechanical cooling whenever outdoor air temperatures are above 50°F during the winter season.

Base-mounted end suction centrifugal pumps for condenser water shall be located in the Mechanical Equipment Room.

Chilled water and condenser water pumps shall be trimmed with flexible connectors, suction diffusers, multipurpose valves, isolation valves, pressure gauges, and flow meters.

Water expansion and air removal devices shall be provided in the Chilled Water System. Water pressure regulators located downstream of backflow preventers shall provide the make-up water requirements for each system.

Independent Chemical Treatment Systems shall be provided for the chilled water and condenser systems.

Makeup water for the chilled water and condenser water system shall be metered and monitored through the EMS.

Chilled water piping shall be welded Schedule 40 Black Steel and shall be insulated in accordance with ASHRAE Requirements. Condenser water piping shall be Schedule 40 Galvanized Steel with mechanical couplings. Condenser water piping shall be insulated.

The Chiller System (i.e., mechanical cooling) shall operate automatically whenever outside air temperatures are above 50 degrees F.

Air Distribution Systems

Multiple air handling units shall provide the necessary ventilation and supply air to maintain the desired environmental conditions and make-up air requirements. Minimum ventilation air rates shall be determined by the requirements set forth by the current ASHRAE Standard 62 and the International Mechanical Code.

All air handling unit systems shall be provided with 100% outside air economizer cycles for free cooling. All air-moving equipment and ductwork shall be installed in accordance with requirements of SMACNA and ASHRAE.

Multiple air handling units shall be provided and shall serve Classroom Areas, Office/Administration Suite, Gymnasium, Cafeteria, Auditorium and Media Center. These air handling unit zones shall be coordinated with the Facilities Department and defined during the Design Phase.

The proposed air handling unit(s) shall be single zone, variable air volume, medium pressure air handling unit(s) with direct drive, plenum type airfoil supply fan, belt drive backward inclined airfoil return fan, economizer Section, mixing box, filter Section with 30% (MERV 8) prefilters and 85% (MERV 13) final filters (with differential pressure gauge across each filer bank), hot water preheat coil with circulating pump(s), and chilled water dehumidification/cooling coil. Air handling units serving assembly spaces (i.e. without terminal control units) shall be provided with a heating coil(s) located downstream of the cooling coil and shall be low pressure type. The supply and return fan shall be provided with a variable flow controller (i.e., variable speed drives). Direct drive fans shall be provided wherever practical to increase fan efficiency by eliminating belt losses. Outside air, relief air, return air and supply air streams shall be equipped with air flow measuring stations. Return air shall volumetrically track supply air and relief air shall volumetrically track outside air to maintain a slight positive building pressure. The proposed air handling units shall be strategically located within penthouses near the area they serve to minimize fan transportation energy.

All outside air required for minimum ventilation requirements shall be preconditioned through the use of a total energy (sensible and latent) heat recovery device so as to capture and reuse waste heat. A dedicated outdoor air system (DOAS) unit(s) shall serve multiple adjacent air handling units, an individual air handling unit or a heat recovery device shall be an integral component within the air handling unit. All air handling units shall also be provided with a separate outdoor air duct for free cooling economizing cycles.

Variable air volume type air handling units shall distribute supply air (55°F) to room terminal control units through a medium pressure round/flat oval duct system. Each classroom shall be provided with a room terminal control unit for independent space temperature control. The proposed room terminal control unit is a standard (i.e., non-fan powered) variable air volume terminal control unit equipped with hot water heating coil which shall vary the amount of conditioned primary air to the space from the air handling unit. Low pressure sound lined rectangular supply air ductwork located at the outlet of room terminal control units shall serve ceiling supply diffusers.

For assembly type spaces (Gymnasium, Cafeteria, Auditorium, etc.) air handling units shall additionally be provided with an auxiliary free reheat sensible heat recovery device integral with the unit which shall be utilized for free reheat during the dehumidification sequence of operation. The air handling units supply fan shall modulate airflow capacity to maintain space temperature setpoint conditions much like the modulating damper in a thermostatically controlled variable air volume terminal control unit. Duct systems serving these spaces shall be internally lined, double wall type.

A return air fan equipped with a variable speed control shall be controlled to volumetrically track the supply fan air flow. Outside air shall be measured and the relief air shall volumetrically track the outdoor air flow rate (minimum ventilation air and economizer) to maintain a slight positive building pressure. Air flow measuring stations shall be the high quality type such as those manufactured by Ebtron or Air Monitor, Inc.

A low pressure duct system shall return air from room return air grilles to air handling units.

It is recommended that demand controlled ventilation utilizing high quality carbon dioxide sensors be used throughout the facility to enhance energy efficiency. As a minimum demand controlled ventilation shall be used for variable occupancy assembly spaces and as required for ASHRAE Standard 90.1-2010.

OPTION B: Four-Pipe Fan-Coil Unit System with Dedicated Outdoor Air System (DOAS) Units:

Heating System

The proposed Heating System is hot water. The building shall be heated by means of a Hot Water Circulating System servicing hot water heating coils located in air handling units, fan coil units, baseboard radiation, unit heaters, and convectors.

The boiler’s fuel source shall be natural gas.

Base-mounted horizontal split case distribution system centrifugal pumps, located in a mechanical space, shall circulate the required quantities of hot water, by piping systems, to air handling units, fan-coil units and miscellaneous terminal heating units. A redundant circulating pump shall serve as a back-up to the lead circulating pump.

The heating water loop shall be variable flow and shall provide the necessary low temperature (140°F maximum) hot water to air handling unit coils, unit heaters, fan-coil units, baseboard radiation, and miscellaneous terminal heating units. The heating water pump(s) shall utilize a variable frequency drive to vary pump speed based on the system's differential pressure. The system differential pressure operating setpoint shall be automatically reset based on analyzing all control valve positions. The heating water loop supply temperature shall be reset based on outside air temperature. Constant hot water circulation by means of centrifugal in-line type circulating pumps shall provide the necessary freeze protection of air handling unit preheat coils. A redundant circulating pump shall serve as a back-up to the lead circulating pumps.

Heating water pumps shall be trimmed with flexible connectors, suction diffusers (strainers for in-line pumps), multipurpose valves, isolation valves, pressure gauges and flow meters.

Generation equipment shall include six (6) high efficiency (90%-95% efficiency) condensing type fire tube hot water boilers (i.e., AERCO Benchmark, Cleaver Brooks Clearfire or Fulton Vantage) using stainless steel construction and sized to optimize the heating plant performance while meeting the total heating capacity required for the building. These boilers shall be located in the Boiler Room.

Water expansion and air removal devices shall be provided in the Primary Heating Water System. Water pressure regulators located downstream of backflow preventers shall provide the make-up water requirements. All makeup water usage shall be metered and monitored through the EMS.

Chemical Treatment Systems shall be provided for the Hot Water Circulating System.

Hot Water Heating System piping shall be Schedule 40 Black Steel and insulated in accordance with ASHRAE Standards.

The Heating System shall operate automatically whenever the outside air temperatures are 65 degrees or less.

Cooling Systems

The building shall be cooled by means of a Central Chiller Plant with chilled Water Circulating System serving chilled water coils located in air handling units and fan coil units.

Chilled water shall be generated by three (3) high efficiency, variable speed compressor(s), magnetic bearing water cooled centrifugal type chiller. The chillers shall use an environmentally safe refrigerant in accordance with The Clean Air Act.

Base-mounted horizontal split case centrifugal pumps, located in the Mechanical Room, shall circulate the required quantities of chilled water, by piping systems, to air handling unit and fan coil unit cooling coils. A redundant circulating pump shall serve as a back-up to the lead circulating pump, each chiller shall be provided with a base mounted end suction primary/generation pump which shall circulate chilled water through its associated chiller. All chilled water pumps (primary and secondary) shall utilize a variable speed drive and the chilled water plant shall operate as a variable primary flow system to maintain a minimum system differential pressure setpoint. This operating setpoint shall be automatically reset based on analyzing control valve positions. The primary chilled water pumps shall volumetrically track the secondary flow rate down to the minimum via chiller flow rate. A differential pressure bypass shall maintain minimum chilled water flow through the chiller(s).

The full load performance capacity and part load efficiency of the chiller(s) shall be selected to precisely and efficiently track the building load based on the hour-by-hour building load requirements and shall be capable of a high turn down ratio. Two (2) chillers shall be equal in capacity while the third chiller (possibly heat pump chiller) shall be less in capacity, sized for the minimum part load condition. This smaller chiller shall be located in the secondary loop upstream (in series) of the base load chillers. The base load chillers shall be installed in parallel in a conventional primary/secondary piping configuration.

It is recommended that all chilled water control valves be a high quality pressure independent type (PIC) as manufactured by Danfoss, Griswold or Flow Control Industries.

The use of pressure independent control valves shall provide a stable water temperature difference to maintain the designed energy performance of the cooling plant. While a 15°F chilled water system temperature difference (45°F supply/60°F return) is recommended, energy modeling during the design phase shall determine the optimal water temperature difference which will ultimately be dependent upon the specific building, layout and equipment selection.

An induced air cooling tower associated with each of the larger chillers utilizing a variable speed fan to reject heat to the atmospheric heat sink. The single smaller chiller shall utilize a forced draft cooling tower so as to have the ability to operate at lower outdoor conditions. A remote sump for each cooling tower located in the mechanical room is recommended for freeze protection while providing heat rejection capacity for mechanical cooling whenever outdoor air temperatures are above 50°F during the winter season. A flat plate and frame type heat exchanger shall be installed in parallel with the smaller chiller and shall be used in conjunction with the forced draft cooling tower to generate chilled water (water economizer) during low outdoor ambient conditions when mechanical cooling is required within the building. Similarly a flat plate and frame heat exchanger shall be utilized to capture waste heat during the cooling season to generate low temperature heating water when needed for dehumidification.

Base-mounted end suction centrifugal pumps for condenser water shall be located in the Mechanical Equipment Room.

Chilled water and condenser water pumps shall be trimmed with flexible connectors, suction diffusers, multipurpose valves, isolation valves, pressure gauges, and flow meters.

Water expansion and air removal devices shall be provided in the Chilled Water System. Water pressure regulators located downstream of backflow preventers shall provide the make-up water requirements for each system.

Makeup water usage for the chilled water and condenser systems shall be independently metered and monitored through the EMS.

Independent Chemical Treatment Systems shall be provided for the chilled water and condenser systems.

Chilled water piping shall be welded Schedule 40 Black Steel and shall be insulated in accordance with ASHRAE Requirements. Condenser water piping shall be Schedule 40 Galvanized Steel with mechanical couplings. Condenser water piping shall be insulated.

The Chiller System (i.e., mechanical cooling) shall automatically operate whenever outside air temperatures are above 50 degrees F.

Air Distribution System
A Four-Pipe Fan-Coil Unit System with Dedicated Outdoor Air System (DOAS) shall serve the majority of the spaces including classroom areas. Air handling systems as described in Option 1 shall serve assembly type spaces, (Gym, Cafeteria, Auditorium) locker rooms, etc.

Individual vertical fan-coil units with ducted supply air system to ceiling supply air diffusers shall be provided for each room. These units shall be 100% recirculating air type with heating and cooling coils (i.e. 4-pipe) controlled to maintain the desired indoor temperature conditions (i.e. sensible heating and cooling only).

Heat Recovery Ventilation Air Units (100% outside air) shall be used as part of the Dedicated Outdoor Air System (DOAS) to dehumidify, temper and heat ventilation air to a neutral air temperature (70°F). These units shall provide the minimum amount of outside air for ventilation as determined by the requirements set forth by ASHRAE Standard 62, The International Mechanical Code, the Educational Specifications and the makeup air requirements to maintain a slight positive building pressure. This conditioned/tempered outside air shall be directly injected into each classroom. Relief air (used outdoor air) shall be brought back to the heat recovery unit for energy reclamation via a ducted return air system, then discharged to the outside. Multiple heat recovery devices inside these units (heat wheels, flat plate heat exchangers) shall be employed to provide the necessary preconditioning (sensible and latent energy) and free reheat (sensible energy) of outside air. Additionally these units shall be equipped with a supply fan, exhaust/relief fan, filters, cooling/dehumidification coil, and heating coil. The heating and cooling medium shall be provided by the building's central cooling and heating plant.

The proposed vertical fan coil units would be located in equipment closets adjacent to the classroom being served. It is desired to locate multiple units in each equipment closet. An extensive condensate collection system shall be required to connect all the terminal fan coil units.

Multiple fan-coil units may have to be grouped and located in common equipment rooms where mechanical closets are not practical. Fan coil units need to be located within approximately fifty (50) feet of the room they serve due to limited capability of supply fan static pressure capability. Fan coil units are not recommended to be located above ceilings of classrooms due to acoustical reasons.

To reduce energy usage it is recommended to cycle the units fan based on the demand for heating and cooling in lieu of running these low efficiency fans continuously during the occupied mode. Additionally it is recommended these fans utilize the higher efficiency ECM motors in lieu of PSC type.

OPTION C: Geothermal Water Source Heat Pump with Dedicated Outdoor Air System (DOAS):

Geothermal Water Source Heat Pumps

Water source heat pumps are single packaged reverse cycle heat pumps utilizing a closed recirculating water loop into which units absorb or reject heat. Typical condenser water flow rates are based on three (3) gallons per minute (gpm) per ton of cooling (12,000 BTUH). Water source heat pump components include a complete refrigeration system consisting of a compressor, refrigerant to water heat exchanger, refrigerant to air heat exchanger, refrigerant expansion devices, and a refrigerant reversing valve.

Similar to fan-coil units, water source heat pumps do not have the latent capacity to condition (dehumidify) outside air. Therefore, a separate decoupled dedicated outdoor air system (DOAS) using heat recovery ventilation air unit(s), as described hereinbefore, shall be used in conjunction with geothermal water source heat pumps.

There are two (2) main types of geothermal water source heat pump units; water to air type and water to water type. As their name type implies water to air heat pumps use the geothermal water loop to exchange heat absorbed (cooling) or rejected (heating) from the air stream via the refrigeration system to the water loop. Similarly water to water heat pumps utilize the refrigeration system to absorb heat from a re-circulating water system to create chilled water while rejecting this heat via the refrigeration cycle to the geothermal loop. During the heating mode the refrigeration system absorbs heat from the geothermal loop and coupled with the waste heat created by compressor inefficiency the combination of heat sources create low temperature heating water, typically about 120°F.

The system concept is also similar to the fan-coil units, utilizing vertical type water to air heat pump units in equipment closets. For larger areas, (Gymnasium, Cafeteria, Auditorium and Media Center type areas) separate, independent conventional type air handling systems shall be used and be served by water to water heat pumps.

A disadvantage of any heat pump/decentralized system is their anticipated life expectancy is shorter (20-25 years) when compared to conventional centralized equipment (25-30 years). Typically, when they reach the end of their life expectancy, all units shall need to be replaced, as these packaged type units are typically not as feasible to be rebuilt and life extended. The earth heat exchanger has a longer life (greater than 50 years) so only the terminal units shall need to be replaced.

Geothermal water to air heat pumps need to be used in conjunction with a decoupled dedicated outdoor air system. Water to air heat pumps shall be recirculating air type to provide sensible heating and cooling to the space where the DOAS shall provide dehumidified, conditioned and tempered ventilation air to each space. The heat recovery units are the same as described for the fan coil unit option except they shall have a single dual temperature coil (i.e. 2-pipe) in lieu of separate heating and cooling coils (i.e., 4-pipe).

It is recommended that all dedicated outdoor air system units and all conventional air handling units be provided with a two-pipe/dual temperature coil and be served by a dual temperature system using geothermal water to water heat pumps. Water to water heat pumps or a geothermal chiller shall generate either chilled water (45°F supply) or low temperature heating water (120°F supply) which through a separate 2-pipe loop shall provide heating or cooling to the dual temperature heating/cooling coil. A high efficiency condensing boiler(s) incorporated into this dual temperature loop is recommended to provide supplemental heating capacity when needed (morning warm up, redundancy). As an alternative dedicated outdoor air system units can be self-contained compressorized geothermal type units in lieu of the central station 2-pipe type.

Geothermal heat pumps take advantage of using the earth as the loop's heat sink. Approximately 5'-0" below the earth's surface, a relatively constant 55-57°F temperature is maintained. Due to the extended temperature operating range, the piping system must be insulated and the loop shall be provided with a high efficiency condensing boiler which can provide supplemental heating to the loop while protecting the loop (i.e. clear water) from freezing conditions.

The proposed closed loop earth heat exchanger system utilizes the vertical well concept with plastic tubing installed in a U-bend configuration within a +/- 375 to 425 feet deep well which is filled with an enhanced thermal conductivity grout-type material. Based on the geology of the area it is anticipated that air rotary drilling system shall be used and the soil thermal conductivity shall be in the 1.5 – 2.0 range. It is anticipated each vertical well shall be capable of +/- 1.50 – 2.00 tons of heat exchange depending on actual soil and grout thermal conductivities. A thermal conductivity test prior to the CD Phase is recommended if a geothermal system is recommended during the Design Development Phase. It is anticipated that between 600 bore holes and 700 bore holes located in a 20 foot by 20 foot grid would be required.

A base mounted horizontal split case pump with standby for the geothermal and dual temperature system shall be located in the Mechanical room. Variable speed pumping and individual unit solenoid valves shall be utilized to minimize pump energy. Individual constant volume in-line circulating pumps shall be used for the load side of water to water heat pumps.

Geothermal and dual temperature pumps shall be trimmed with flexible connectors, suction diffusers (strainers for in-line pumps), multipurpose valves, isolation valves, pressure gauges and flow meters.

Water expansion and air removal devices shall be provided in the Geothermal and Dual Temperature Water System. Water pressure regulators located downstream of backflow preventers shall provide the make-up water requirements. Makeup water usage for the Geothermal and Dual Temperature System shall be independently metered and monitored through the EMS.

Chemical Treatment Systems shall be provided for the Geothermal and Dual Temperature Water Circulating System.

Geothermal and Dual Temperature Water Heating System piping shall be Schedule 40 Black Steel and insulated in accordance with ASHRAE Standards.

OPTION D: Hybrid Geothermal System:

General

A hybrid geothermal system can be used in conjunction with a conventional variable air volume system (Option 1) or four-pipe fan-coil unit system (Option 2). Basically the air distribution systems as previously described remain the same however, the heating and cooling plant would use a combination of water to water geothermal heat pumps with conventional high efficiency condensing boilers and magnetic bearing chillers to optimize the energy efficiency of the generation of heating and cooling especially during low load conditions (spring, fall, warm winter days). Geothermal water to water heat pumps have the inherent heat recovery capability to capture waste heat from interior spaces and reuse it for perimeter spaces when the building requires both heating and cooling in separate areas (Spring/Fall seasons). Chillers would supplement the geothermal system during peak cooling periods while the boilers would supplement the geothermal system during peak heating periods.

Hot Water Heating Plant

The proposed Heating System is low temperature hot water. The building shall be heated by means of a Hot Water Circulating System servicing hot water heating coils located in air handling units, terminal control units, fan coil units, baseboard radiation, unit heaters and convectors. A low temperature heating water distribution loop operating at 120 degrees F supply, 100 degrees F return is proposed to serve classroom fan coil units or terminal control units (VAV boxes), air handling units, dedicated outdoor air units and all terminal heating units.

The low temperature heating water loop allows waste heat from interior room mechanical cooling requirements to be reclaimed and boosted in temperature to serve perimeter fan coil or terminal control units during the heating mode and/or for free reheat if dehumidification is required. This shall be described more in depth under the geothermal heat pump system description.

Generation equipment shall include four (4) to six (6) high efficiency variable flow fire tube type condensing boilers sized equally for the total heating capacity. These boilers shall be located in the Boiler Room. Boilers shall be the high efficiency condensing type and shall be controlled in lead/lag fashion to maintain the supply water temperature setpoint. The boiler's fuel source shall be natural gas. A new gas service shall be required to support the demand loads.

Horizontal split case distribution system centrifugal pumps, located in the mechanical equipment room, shall circulate the required quantities of low temperature hot water, by piping systems, to air handling, DOAS units, terminal heating devices (cabinet unit heaters, baseboard radiation, convectors, etc.) and room terminal control units (i.e. VAV boxes)/fan coil units. A redundant circulating pump shall serve as a back-up to the lead circulating pump.

The heating water loop shall be variable flow and shall serve air handling units, VAV box heat coils, fan coil units, DOAS units, and miscellaneous heating units. The heating water pumps(s) shall utilize a variable frequency drive to vary pump speed based on the system's differential pressure. The differential pressure operating setpoint shall automatically be reset by analyzing control valve positions. Constant hot water circulation by means of circulating pumps shall provide the necessary freeze protection of preheat coils. A redundant circulating pump shall serve as a back-up to the lead circulating pumps. Circulating pumps shall be the centrifugal in-line type.

Heating water pumps shall be trimmed with flexible connectors, suction diffusers (strainers for in-line pumps), multipurpose valves, isolation valves, pressure gauges and flow meters.

Water expansion and air removal devices shall be provided in the Primary Heating Water System. Water pressure regulators located downstream of backflow preventers shall provide the make-up water requirements. Makeup water usage will be metered and monitored through the EMS.

Chemical Treatment Systems shall be provided for the Hot Water Circulating System.

Hot Water Heating System piping shall be Schedule 40 Black Steel and insulated in accordance with ASHRAE Standards.

The Heating System shall operate automatically whenever the outside air temperatures are 65 degrees or less.

Cooling Systems
The building shall be cooled by means of a Central Chiller Plant with chilled Water Circulating System serving chilled water coils
located in air handling units, dedicated outside air units, and/or fan coil units.

Chilled water shall be generated by multiple variable speed magnetic bearing centrifugal type water-cooled chillers (two minimum). Independent induced draft type cooling towers associated with each chiller shall be used to reject condenser heat to the atmosphere heat sink. The chillers shall supplement water to water heat pumps or geothermal chiller(s) to generate chilled water while rejecting condenser water heat to the earth heat sink or reusing this waste heat for heating the building. This shall be described in more depth under the geothermal heat pump system description. The chillers shall use an environmentally safe refrigerant (R134A) in accordance with The Clean Air Act. The Mechanical Room shall be provided with a Refrigerant Monitoring System and shall be interlocked with the Ventilation System for room purging.

Secondary/distribution base-mounted horizontal split case centrifugal pumps, located in the Mechanical Room, shall circulate the required quantities of chilled water, by piping systems, to air handling unit cooling coils, dedicated outdoor air units and/or fan coil unit cooling coils. A redundant circulating pump shall serve as a back-up to the lead circulating pump. Each chiller shall be provided with a base mounted end suction primary/generation pump which shall circulate chilled water through its associated chiller. All chilled water pumps (primary and secondary) shall utilize a variable speed drive and the chilled water plant shall operate as a variable primary flow system based on system differential pressure. The primary chilled water pumps shall volumetrically track the secondary flow rate down to the minimum chiller flow rate. The system differential pressure operating setpoint shall be automatically reset based on analyzing all control valve positions.

The capacities of variable flow high efficiency variable speed magnetic bearing centrifugal water-cooled chillers used in conjunction with water-to-water heat pumps will be evaluated on peak and part load performance. The capacity and performance of these chillers and quantity of water to water heat pumps shall be selected to precisely and efficiently track the building load based the hour-by-hour building load requirements to maximize energy efficiency, part load performance and maximize the turn down ratio while providing the most cost efficient solution. Variable flow primary pumping strategies coupled with equipment staging shall efficiently distribute the minimum cooling energy needed to offset the building loads. Small in-line type centrifugal pumps shall insure a constant flow through individual water to water heat pumps while a building distribution pump shall provide a varying chilled water flow where needed to the building.

Base-mounted end suction centrifugal pumps for the condenser water system and base-mounted horizontal split case centrifugal pumps for chilled water distribution shall be located in the Mechanical Equipment Room.

All chilled water and condenser water pumps shall be trimmed with flexible connectors, suction diffusers, multipurpose valves, isolation valves, pressure gauges, and flow meters.

Water expansion and air removal devices shall be provided in the Chilled Water System. Water pressure regulators located downstream of backflow preventers shall provide the make-up requirements for each system.

Independent Chemical Treatment Systems shall be provided for the chilled water and condenser systems.

Makeup water usage for the chilled water and condenser water systems shall be independently metered and monitored through the EMS.

Chilled water piping shall be Schedule 40 Black Steel and shall be insulated in accordance with ASHRAE Requirements.

Condenser water piping shall be Schedule 40 galvanized steel piping with mechanical couplings.

The Chilled Water System (i.e. mechanical cooling) shall operate automatically whenever the outside air temperature is 55 degrees F or above.

<u>Geothermal Water-To-Water Heat Pump System</u>
A geothermal water-to-water heat pump or geothermal reversible chiller is capable of generating chilled water (42°F) when operating in the cooling mode and capable of generating low temperature (120°F) hot water when operating in the heating mode.

The use of flat plate and frame heat exchangers may be necessary to simplify the operation (balancing and control) of the system when multiple banks of water to water heat pumps are used to provide simultaneous heating and cooling during intermediate outdoor air conditions (50°F - 65°F).

<u>Cooling Mode</u>
During the cooling mode, the water-to-water heat pumps/reversible chiller are incrementally energized based on building load to generate (42 degrees F) chilled water. A flat plate and frame heat exchanger shall separate the heat pump chilled water loop (load) from the primary chilled water loop (45 degrees F). When simultaneous heating is not required, waste condenser water (source side) heat shall be rejected to the ground heat sink. As additional cooling is required, the water-cooled chillers shall energize in lead-lag fashion. The chilled water distribution pump shall deliver chilled water throughout the building where needed. Heat pump and chiller sequencing shall be determined through flow metering and BTU usage/generation as determined by the Energy Management System.

The proposed geothermal water-to-water heat pumps/reversible chiller shall be designed as two (2) equal capacity banks using multiple equally sized water-to-water heat pumps (or single heat pump chiller) in each bank. The source side of each water-to-water heat pump shall be provided with a solenoid valve wired directly to the units controller. Both banks of water-to-water heat pumps shall be capable of operating in the cooling mode during peak cooling demands.

<u>Heating Mode</u>
During the heating mode, the water-to-water geothermal heat pumps/reversible chiller shall incrementally be energized based on building load to generate low temperature heating water serving the building.

A flat plate and frame heat exchanger shall separate the heat pump heating water loop (load) from the building low temperature heating water loop (115 degrees F). When the heat pumps are in the heating-only mode, heat is absorbed from the ground and circulated to the source side of the water-to-water heat pump. The heat pump, operating in reverse refrigerant cycle, uses the source water as the evaporator and load water as the condenser to generate low temperature heating water (120 degrees F).

As described in the cooling mode each water-to-water heat pump shall be provided with a solenoid valve wired directly to the units controller on the source side and utilize a constant volume in line centrifugal pump on the load side.

The condensing boilers shall provide supplemental heat when needed. If the source water from the earth ever became too cold, possibly creating a freezing condition, the heat pump system shall
be de-energized and all heating energy shall be provided by the central boiler system.

An override shall allow the supply water temperature to be reset higher (up to 140 degrees F) which would disable the heat pumps and use boilers exclusively for morning warm up and/or below outdoor air design conditions (10°F) when additional heat is required.

<u>Simultaneous Heating/Cooling Mode</u>
Based on the various exposures of the building and high internal cooling loads of interior spaces, there shall be many hours of operation when mechanical cooling shall be required for interior classrooms and associated support spaces while heating will simultaneously be required for perimeter classrooms and offices.

The water-to-water heat pump system takes advantage of this requirement by using waste heat generated by mechanical cooling of interior spaces and using the waste heat for perimeter spaces. In essence, the perimeter of the building becomes the heat rejection heat sink and the interior of the building becomes the heat absorption heat sink; thus, the ground loop is not required. This design creates a heat recovery fly wheel effect where heat/energy is transported and used where needed within the building.

By using a plate and frame heat exchanger to separate the “source” circulating water loops, either heat pump bank can operate in the heating or cooling mode while the heat exchanger allows the condenser water (source) from the HP bank operating in the cooling mode to cool down, while heating the source side of the heat pump bank. By utilizing this waste heat, the coefficient of performance (COP) increases during the heating mode. For instance, using 40 degree F water from the earth to generate 120 degree F heating water, the temperature difference between the source (40 degrees F) and load (120 degrees F) is 80 degrees F with a corresponding COP of 3.8 to 4.0 (380% to 400% efficient).

By using the 95 degree F condenser water heat for the heat pump bank operating the cooling mode, the source water for the heating mode heat pumps may warm to 60 degrees F (source), thus with 120 degrees F (load), the COP increases to 5.0 (500% efficient) and with 75 degrees F (source) water, the COP increases to 6.0 (600% efficient). The water temperature and corresponding efficiency shall be dependent upon how many heat pumps are functioning in the cooling mode versus the heating mode. The more units operating the cooling mode versus the heating mode increases the source water temperature and thus the heating efficiency.

The coefficient of performance is defined as useful energy out versus energy in. That is to say, with a COP of 6, there are 6 BTU's of useful heat for every 1 BTU input. Since the input is waste heat from cooling, there is additional system efficiency achieved. A conventional combustion type boiler system (80% efficient) has a COP of .8 as for every 1 BTU of energy in, only .8

BUT's of energy are usable, as the other .2 BTU's are waste heat discharged to the atmosphere through the chimney as flue gas.

6.4.2 Building Automatic Temperature Controls / Energy Management System

It is recommended that the system have full direct digital controls, including space terminal unit controls, which is consistent with the County Standard. All controls shall be electric/electronic actuation. All control and monitoring points shall be consistent with the County's current Standards and shall be reviewed with the Facilities Management Department during Design. It is recommended that the building Automation System be tied into the County Energy Management System.

Automatic Temperature Controls shall be capable of operating per the sequence of operation, including when the Energy Management System is manually overridden.

The Basic Design Criteria shall be as follows:

1. Cooling Mode:

   Outdoor Temperature: 95°F DB, 78°F WB
   Indoor Temperature: 75°F DB, 65% RH or less

2. Heating Mode:

   Outdoor Temperature: 10°F DB
   Indoor Temperature: 70°F DB

3. Chilled Water System (at 95 deg F Ambient):

   45°F Supply Water Temperature
   60°F Return Water Temperature

4. Heating Water System (at 10 deg F Ambient):

   Conventional:
   140°F Supply Water Temperature
   120°F Return Water Temperature

   Hybrid Geothermal:
   120°F Supply Water Temperature
   90°F Return Water Temperature

5. Condenser Water System:

   Outdoor Temperature: 95°F DB, 78°F WB

   85°F Supply Water Temperature
   95°F Return Water Temperature

6. Ventilation Rates (ASHRAE Standard 62):

   Classrooms:
   10 CFM per person
   .12 CFM per sq. ft.

   All Other Spaces:
   5 CFM per person
   .06 CFM per sq. ft.

7. Water Source Heat Pump:

   Geothermal Loop:
   40°F Minimum supply water temperature.
   90°F Maximum supply water temperature.

Central Heating Plant
The building central heating system shall be energized to operate whenever outside air temperatures are 65°F or less. When indexed on, the distribution pump shall be energized and vary its flow through the variable speed controller to maintain its system differential pressure set-point. The differential setpoint shall automatically be reset based on analyzing the positioning of all heating control valves.

Through integral sequencing software by the boiler manufacturer the boilers shall be staged in lead-lag and rotational fashion to maintain system supply water set-point.

The heating water temperature supply shall be reset (linear type) based on outside air temperature.

Central Chilled Water Plant
The building central chilled water system shall be energized to operate whenever outside air temperatures are 50 deg F or above. The chilled water system shall be variable primary flow where the system pump shall vary in speed to maintain the system differential pressure setpoint. This setpoint shall be automatically reset based on analyzing all the chilled water control valve positions. A system bypass valve should be controlled to maintain minimum flow through the chiller(s). When activated, the chillers and its associates chilled water pumps shall be energized in lead-lag fashion. The cooling tower(s) and condenser water pump(s) shall be energized when their associated chiller is energized. The condenser water supply temperature shall be reset based on outdoor air wet and dry bulb conditions.

The chiller shall be controlled through its internal control panel to maintain discharge evaporator water temperatures.

Variable Air Volume Terminal Control Units shall be controlled by room temperature sensors (direct digitally controlled). The room temperature sensors shall modulate the quantity of supply air (from the air handling unit) via a modulating damper integral to the terminal control unit. When additional heat is required, the room temperature sensor shall modulate the terminal room control unit's heating coil valve.

For Constant Volume Air Handling Units, a room temperature sensor shall modulate the associated air handling units' cooling coil valve and outside air economizer controls to provide the necessary cooling. When the mixed air temperature falls below its setpoint the supply duct temperature sensor modulates the unit's hot water preheat coil valve to maintain 55°F temperature off the coil. If heat is required by the space, the space temperature sensor shall modulate the unit's heating coil valve. Preheat coil circulating pumps shall be energized whenever the outside air temperature falls below 40°F. Constant volume air handling units shall be provided with a heat recovery device to precondition the outside air (sensible and latent heat) and a heat recovery device with face and bypass damper control to provide free reheat (sensible heat) when operating in a dehumidification/cooling mode. Supply and return fans shall be provided with variable speed drives and shall vary in fan speed to match the space load.

For variable Air Volume Air Handling Units, a supply duct temperature sensor sensing the discharge air temperature shall modulate preheat coil valve or chilled water valve in conjunction with air economizer control to maintain constant supply air temperature. A heat recovery device shall be used to precondition the outside air (sensible and latent heat) required for ventilation purposes.

Duct static pressure sensors strategically located downstream in the supply duct shall vary supply air fan speed to maintain its set-point.

The return air fan speed shall vary so as to maintain a constant volumetric difference between supply air and return air (i.e. fan tracking). Relief/exhaust air system air flow rates shall be slightly less than outside air flow rates to maintain a slight positive building pressure.

All air handling units shall be provided with safety features such as low limit control, freeze stat, supply and return air smoke detectors, and high static pressure sensors (for variable air volume units only). All air handling units shall be provided with energy conservation features such as economizer cycles, night setback, and morning warm-up cycles of operation. Space carbon dioxide sensors shall be used for control of outdoor air (demand controlled ventilation or DCV) for high occupancy spaces as currently classified as 25 or more occupants.

Space relative humidity sensors shall be used throughout the building and shall automatically index the dehumidification control mode if its maximum setpoint condition is reached.

Supply air discharge air temperature set-points shall be reset based on the space within the zone requiring the greatest cooling.

Fan-Coil Units shall be controlled by room temperature sensors. Cooling coil and heating coil control valves shall modulate to maintain room temperature set-point.

Heat Pump Units shall be controlled by room temperature sensors. Reversing valves shall be positioned to either heating or cooling and the compressor shall cycle (on/off) to maintain room temperature set-point.

Dedicated outdoor air units shall provide 100% outside air to individual spaces. An enthalpy (sensible and latent heat) heat recovery wheel shall pre-condition the outside air stream. A heating or cooling/dehumidification coil shall heat or sub-dehumidify the outside air stream. When operating in a dehumidification mode, a reheat heat exchanger (typically a plate heat exchanger) shall provide the necessary free reheat (sensible heat) to prevent sub-cooling the spaces while enhancing the efficiency of the heat wheel. A face and bypass damper control shall be provided for the reheat heat recovery unit and a variable speed motor shall control the enthalpy heat recovery wheel. The heat wheel shall be stopped during the economizer outside air conditions and/or for frost control.

Air flow measuring shall be utilized to monitor the supply, return, relief and outside air systems.

6.5 Plumbing

General
A complete system of plumbing shall be provided throughout the building to comply with the requirements set forth in the program and installed in strict accordance with all applicable codes and regulations, including ADAAG, and Frederick County Public Schools Standards.

The plumbing systems shall consist of but not be limited to:

- Domestic Cold Water
- Domestic Hot Water with Recirculation
- Sanitary Drainage and Vent
- Storm Water Drainage including Footing Ground Water Drainage
- Natural Gas
- Fire Suppression (Described separately under Fire Protection Systems)

Plumbing Fixtures
All plumbing fixtures shall be good commercial grade of institutional quality.

Water closets and urinals shall be water-conserving, high efficiency type (1.28 gpf closets and 1/8 gpf urinals) LEED compliant type, with manual flush valves. Water closets shall be floor-mounted type, and urinals shall be wall hung.

All lavatories shall have self-metering faucets with flow-restricting devices set to limit water flow to 0.5 GPM maximum. All fixtures shall be where required in accordance with ADA requirements. Mounting heights for all fixtures shall be coordinated with the Owner.

Showers shall be provided with showerheads to limit water flow to 1.5 GPM and ASSE 1016 thermostatic/pressure balancing mixing valves.

Drinking water stations shall be provided with dual height Electric Water Coolers, one with bubbler and bowl height suited for wheelchair accessibility.

Miscellaneous sinks, janitorial mop sinks, kitchen sinks, exam room sinks, shall be provided with flow restricting fitting faucets to limit the flow to 1.5 GPM max.

ANSI compliant emergency eyewash shall be provided in the vicinity of chemical treatment equipment in the mechanical room(s) per ANSI and
OSHA requirements. Mop receptor faucets within selected janitorial closets will be provided with ANSI approved emergency eye-sprayers.

Chemistry Labs will be provided with emergency shower-eyewash stations, and eyewashes at teacher's stations.

Domestic Water System
A new 8" combined water service shall be provided for domestic water and fire protection systems. The incoming water service shall enter the sprinkler room and split into two: the fire suppression piping shall be provided with a backflow preventer (BFP) assembly, OS & Y valves with tamper-switches, etc. and the domestic water line with appropriate isolating valves, backflow preventer, water pressure regulating valve, water meter, bypass valve, all

racked along one wall. The BFP shall be mounted at 40-42" above floor with minimum 12" clearance all around.

Hot and cold water piping shall be extended to serve the fixtures and equipment as required. All domestic water piping shall be copper Type L with wrought copper fittings and lead-free 95-5 soldering. All water piping
shall be insulated with the exception of non-handicapped final branch run-outs for connection to fixtures/equipment.

Backflow preventers and vacuum breakers shall be provided at make-up water for HVAC systems and connections to ice-maker, etc. to prevent back siphonage and contamination of the potable water system.

Freezeproof wall hydrants shall be located every 150 feet along the building's exterior perimeter, and at the courtyard wall. Hose bibs in concealed boxes shall be provided in gang toilet rooms, kitchen areas which require washdown, can wash room, and mechanical equipment rooms.

A minimum of two gas-fired high efficiency domestic water heaters shall be strategically located in the First Floor Mechanical Room. Alternatively, condensing type water heaters, in conjunction with hot water storage tank, if required, shall be evaluated. Solar or geothermal heat sources shall be also be considered for heating or preheating domestic hot water for LEED points. Hot water shall be circulated throughout the building at 140 degree F to mitigate microbial growth, especially Legionella bacteria. A hot water recirculating loop with in-line type centrifugal pump shall be utilized. Pumps shall be Taco, Bell & Gossett or Armstrong.

Lavatories, showers and other fixtures shall be provided water at 105 deg F as required per ASHRAE 90.1. The water to these fixtures shall be provided via ASSE 1070 thermostatic mixing valves. Emergency fixtures shall be provided tepid water at 85F via ASSE 1071 thermostatic mixing valve.

<u>Sanitary Waste and Vent Piping System</u>
A sanitary drainage system shall be provided to serve the plumbing fixtures and floor drains, sized per the requirements of the American Society of Plumbing Engineers, the County Plumbing Code, and the International Plumbing Code. Vent piping shall be routed to exist through the roof, appropriately located away from any air intakes or building openings. Vent stack terminations from toilets shall be provided with vandal-proof vent caps.

Cleanouts shall be provided in all risers at the foot, at every 90 degree bends and at 100-foot intervals in straight horizontal runs. Exterior cleanouts at grade shall be provided in minimum 12"x12" concrete pads.

Waste piping from Lab Sinks shall be provided with acid neutralizing cartridges.

Kitchen Grease waste piping shall be routed to an underfloor grease interceptor. Dual cleanouts shall be provided before and after the grease trap.

All floor drains in the restrooms shall be provided with automatic trap primers tapped off one of the toilet flush lines, via ASSE 1001 vacuum breakers. Floor drains in mechanical rooms, locker rooms, etc. shall be provided with ASSE 1044 electronically controlled trap priming systems.

Elevator pit shall be provided with a sump pump with integral on-off float controls and oil-detector sensor & alarm. Discharge from the elevator sump pump shall be piped to the building sanitary system.

Cooling tower blowdown shall be provided with pretreatment system prior to discharge into the building sanitary system.

Service weight cast iron soil pipe shall be specified: hub and spigot type below grade and heavy duty no-hub couplings above ground. No galvanized or heat fusion piping shall be acceptable.

Storm Water System
The building shall be provided with primary and secondary roof drainage systems. The primary system comprising of roof drains with vandal proof domes and stainless steel gravel guards, shall be piped to horizontal rain water conductors, and down vertical rain leaders along furred columns or inside pipe chases. All the rain leaders shall be connected to underfloor storm water piping and extended out of the building to a point or points 5 feet from the exterior wall.

Storm drainage piping shall be picked up from these points and extended to the site storm water system under another division.

Secondary overflow drains will be piped independently down to first floor level discharge points at exterior walls, and extended through walls via downspout nozzles.
The Storm Water System shall be sized per the requirements of the American Society of Plumbing Engineers, the County Plumbing Code, and the International Plumbing Code.

4” perforated schedule 40 PVC piping will be provided around the perimeter footings for foundation drainage, and piped to the site storm water system under another division.

Natural Gas System
The local gas company shall provide new natural gas service, including gas meter and pressure regulating station, located in a fenced area outside the mechanical room. The new service shall be sized for the domestic water system requirements, comfort heating requirements and to serve supplemental condensing boilers tied into the heat pump system to prevent the loop from falling below 40 degrees F.

All gas piping inside the building shall be schedule 40 black steel.

Fire Protection
The entire building shall be protected by a wet pipe sprinkler system. All fire protection zones shall be consistent with the fire alarm zones. All zones valves shall be located in a common fire protection room where the incoming fire service is located. All piping shall be Schedule 40 black steel pipe. The fire protection system shall be hydraulically designed by a

registered fire protection engineer to meet all NFPA requirements as well as the requirements of the City of Frederick and authority having jurisdiction.

Sustainable Design Features
The following are minimum additional sustainable design alternatives which shall be considered to achieve LEED Silver Certification.

- A rain water collection system is recommended for the irrigation system for the football field. As a minimum the system should be designed even if it is bid under an add alternate.
- A condensate water collection system is recommended to serve as makeup water for the cooling tower system or be used for irrigation if the rain water collection system is implemented.
- Metering and measurement with verification plan is recommended to be designed even if it is bid under an add alternate. Sub-meters shall be designed to measure plug loads, lighting loads, HVAC loads, kitchen load, makeup water usage, domestic hot water usage and fuel oil usage. An enhancement to this option is to include a dashboard system.
- Solar hot water heating system is recommended to heat or preheat domestic hot water. A Geothermal water heater system is also recommended to be considered.

6.6 Electrical

General
The existing electrical systems are recommended to be replaced under all the proposed building options. Many of the systems are 30 years old, and have exceeded their anticipated useful life of 25-30 years. Although most of the electrical distribution is 30 years old, newer equipment installed within the last 10 years is recommended to be salvaged for reuse, where feasible, under Option 1 (Existing Building with Additions). The new fire alarm system is also recommended to be reused and reconfigured under this option, if feasible. All new systems are recommended for Option 2 (1939 Building with Additions) to match the system descriptions for a new facility under Options 3, 4a and 4b.

Option 1 is recommended to have a new building electric service and generator installed under the first phase of construction. The main electrical room will be located in the building addition. The existing electrical service will be back-fed and the electrical distribution system replaced during subsequent construction phases. The remaining options are all proposed to be constructed in a single phase, therefore maintaining and back-feeding the existing services will not be required.

Electrical Distribution System
The electrical distribution system will be 480/277 volt, three phase, four wire from the main switchboard to panelboards throughout the building. The main switchboard will contain molded case, electronic-trip circuit breakers and Owner-metering equipment, as well as ground fault protection on the main circuit breaker and surge suppression device. A lightning protection system with a UL Master label will be provided for the building, connected to the building grounding system.

Dry type transformers will be provided to supply 208/120 volt, three phase, four wire service to panelboards throughout the building. Panelboards and transformers will be installed locally throughout the building to minimize voltage drop on branch circuits. General lighting and mechanical equipment will be served at 480/277 volts and receptacles and office equipment will be served at 208/120 volts.

Cascaded surge protection devices will be provided on panelboards serving non-linear computer loads. Dedicated panelboards with 200% rated neutrals are recommended for this application, served from K-factor rated dry type transformers. A separate neutral conductor is recommended to be installed for each computer circuit in order to reduce the effects of harmonics caused by non-linear loads.

Double duplex receptacles will be provided for all computers and selected equipment at all work stations, teaching stations, Office and Administration Area workstations/desks. Computer lab circuits and vending machine circuits will be timeclock controlled.

Typical classrooms/instructional areas will have a minimum of five computer receptacles (one [1] teacher and four [4] student) on three 20-ampere circuits. In addition, general receptacles will be provided on one to two circuits per classroom. Science Rooms, Computer Labs, and other specialized instructional areas will be provided with computer and general receptacles per student station as required.

Individual motor starters in appropriate enclosures will be provided to serve remote mechanical equipment. Power factor correction capacitors will be provided for motors to maintain a minimum power factor of 90%. Phase loss protection will be provided for three phase HVAC equipment.

<u>Emergency Distribution System</u>
A packaged diesel engine generator set and automatic transfer switches will be provided, sized to serve emergency lighting, fire alarm system, fire pump, and all life safety related and other selected loads in the high school. The generator will be located outside the building in a weatherproof enclosure. A dedicated electrical room shall be provided for the automatic transfer switches and related distribution equipment.

Kitchen refrigeration equipment, heating plant equipment, MDF and IDF cooling systems are recommended to be connected to the generator, as well as loads required to enable the school function as an emergency shelter. Multiple automatic transfer switches will be required to separate life safety and optional standby loads. Panelboards and dry-type transformers would be provided to accommodate the load requirements.

<u>Lighting</u>
Lighting is a critical aspect of the Building Design. The School will have a variety of lighting design criteria for each vision task, and lighting levels will be provided as recommended by the Illuminating Engineering Society Lighting Handbook, Tenth Edition. Lighting systems that meet adopted energy codes for lighting power density as well as controllability will be provided.

General lighting will be 2' x 4' fluorescent static troffers utilizing two, three or four 32-watt T-8 lamps and energy-efficient electronic ballasts. Classrooms lighting will be switched by row to facilitate A/V presentations, and provide three levels of illumination. Offices, media center, cafeteria, computer labs, and other selected areas will have multi-level switching for inboard/outboard lamp control.

Lighting in the gymnasium(s) will be surface troffers utilizing four or six T5HO lamps, with multilevel switching. This provides better color renditioning than traditional metal halide high bay fixtures, and allows instant on capability. Wire guards will be provided for all devices in the gymnasium(s).

A complete theatrical stage lighting dimming system will be provided in the Auditorium, with programmable console main controller located in the projection booth. A house lighting dimming system will also be provided, with wall mounted pre-set controls at each entrance, stage, and in the projection booth.

Track lighting and other specialty fixtures controlled by local key switches will be provided for accent and at art display areas. Use of different fixture and lamp types, however, will be kept to a minimum. LED lighting will be investigated as an alternative to incandescent house lighting in the Auditorium.

Lighting controls will be required to incorporate full automatic shutoff of building lighting systems, therefore local occupancy sensors will be provided throughout. Lighting controls will be low voltage, to incorporate manual "on" capability. Automatic daylight harvesting via photocell control of fixtures in proximity to windows will also be provided.

Emergency lighting will be provided for all paths of egress throughout the school and in selected areas. Where emergency lighting is provided where room darkening is required, UL 924 listed emergency transfer relays will be provided so that lighting will automatically turn on in the event of a power loss, despite the switch position. LED array exit signs, as well as interior corridor night security lighting, will also be included in the design.

Exterior lighting will be provided for evening functions and to enhance security around the building and in the parking lots. Site lighting will utilize metal halide or LED building-mounted fixtures and pole-mounted high cutoff type luminaires. Building-mounted lighting and security lighting will be on dusk to dawn. Main entrance and parking area lighting will be zoned separately by location. Electronic astronomical time clocks will be utilized for control of exterior lighting with manual override capability. Solar operated sign lighting will be provided in selected areas.

Compact fluorescent or LED lighting will be provided at egress doors, connected to an emergency standby source per code and controlled via photocell. Exterior lighting served by a normal power source is proposed to be photocell enabled, controlled via the building time clock.

6.7 Fire Alarm System

A complete state-of-the-art, addressable Fire Alarm System with a graphic annunciator panel at the main entrance(s) will be provided. The existing system is recommended to be reused to the fullest extent possible if the facility is renovated. An autodialer will be provided for communication of alarm to the local monitoring agency. Interconnection to the Security System will also be provided.

The entire Fire Alarm System will be designed in accordance with the State of Maryland Fire Code, IBC, and NFPA. Voice evacuation capability will be provided throughout. All audible, visible, and initiating devices will be designed to meet all ADA requirements.

6.8 Public Address and Sound System

A new public address system will be provided for the entire school including the existing building and new additions. Ceiling and wall speakers will be installed in different spaces. Call buttons and volume control devices will be installed as necessary. Special sound systems will be provided in the gymnasium, auditorium, and music spaces. The new sound system will include speakers, microphone/jacks and control panels with necessary components/devices.

6.9 Data, Telephone and Intercommunication Systems

New data, telephone, and intercommunication systems located in server rooms/closets will be provided for entire school. A standard sized (8' x 10') telecom room will be provided for every 50,000 square feet of floor space. These systems include all servers, wireless communication devices and UPS units to maintain the operation of servers and other equipment without any interruption in case of power outage.

6.10 Security System

New security system will be provided for entire school. New system includes door contacts, window contacts, motion detectors and security monitoring system with CCTV cameras. This system will be designed by a security consultant and will be installed under supervision of school security personnel.

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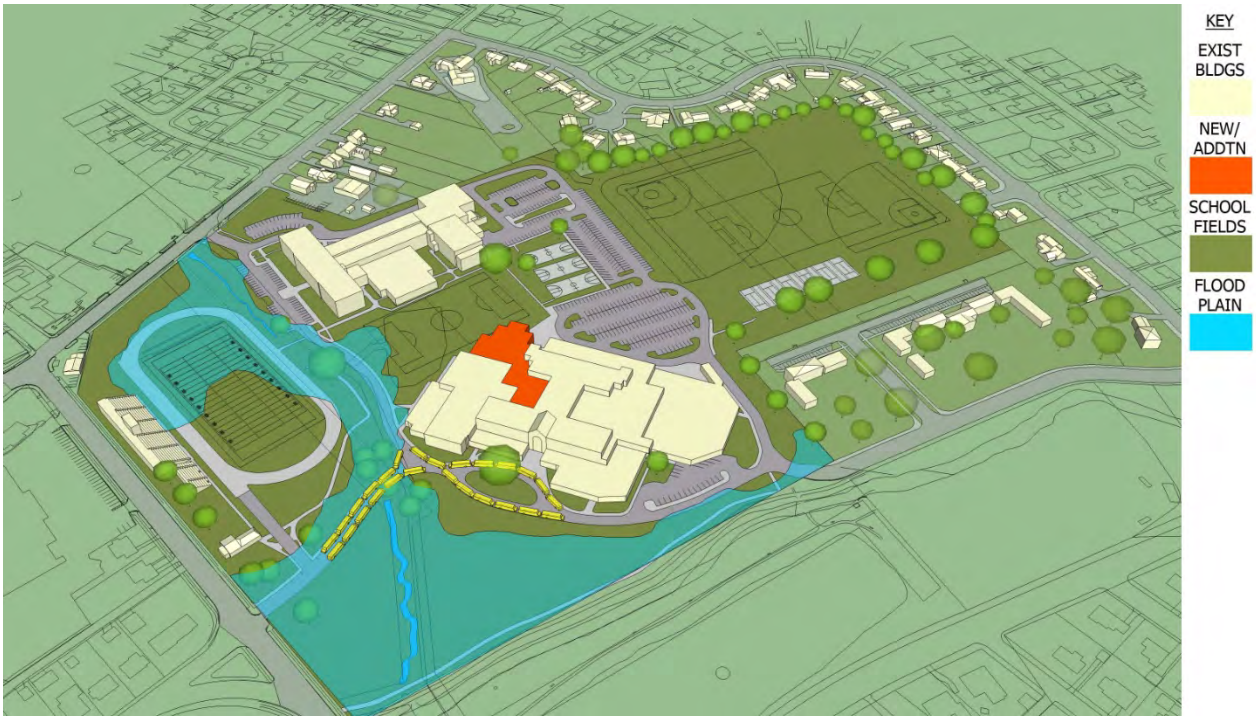
OPTION 1: REHABILITATE ENTIRE EXISTING SCHOOL WITH ADDITIONS



Assessment

In this scheme most of the existing structure will be totally gutted with only the steel framing, floor slabs, roof decks, some exterior walls, and some existing original components of the 1939 building being retained. Significant sections of the first floor slab on grade will be removed to allow replacement of aging subgrade piping. Structural steel framing and load bearing walls will remain with only minor modifications in selected locations. Exterior masonry walls will be reconstructed, the roof will be completely replaced, and new exterior doors and windows will be installed at most locations. Previously bricked up window openings will be reopened. The interior will be significantly reconfigured, with most non load-bearing partitions being reconstructed in a new interior space plan that will rectify some of the deficiencies of the existing building and create true classrooms in lieu of the current "open space" floorplan.

To bring the school into closer compliance with the Educational Specifications and to create a main lobby bearing some similarities to those at other new Frederick County high schools, an addition will be constructed behind the existing gymnasium housing a new auditorium and new main lobby. Another small addition will infill the recessed area in front of the existing main lobby with new classroom space. Even with these additions, the school still will not fully meet the area and adjacency requirements of the Educational Specifications. Also, due to constraints imposed by retaining the existing structure, many classrooms will continue to be either over or under their specified area. The existing swimming pool will be retained, but as noted above, its lane sizes and other features are undersized by current recommendations.

Site work will be minimal, with the existing site plan essentially being retained. Some sidewalks will need to be replaced and disruptions to some roads, parking areas, and athletic fields will occur periodically to allow replacement of underground utilities and possible installation of wells for a geothermal heat pump system. All paved surfaces will be milled and overlaid with new asphalt at the project's conclusion.

Construction activities will be heavy and extensive and students will have to be moved around multiple times as the phased project moves forward. Some of the most disruptive work can be limited to summers and evenings, but this will incur cost and time premiums which are reflected in our estimated cost. Even with extensive measures taken to minimize the project's impact, it will still be disruptive to students and staff and may limit the possibilities for summer, evening, and community use programs to continue during construction.

The completed project will roughly meet the Educational Specification, with some major deficiencies remaining. Spaces will have a new feel but many rooms will continue without windows or access to daylight. Ceilings will be low or room proportions awkward in some instances. The facility will be nominally adequate for its purpose but its rooms and spaces will not have the same characteristics of light, openness, and organization as those in other newer Frederick County high schools.

Advantages

Building

1. Reuses much of the existing building's structure.
2. Grouping of program areas and departments improved over current design.
3. 1939 front portion of building is retained and rehabilitated.
4. Main entry becomes more defined.
5. Compliance with current building, life safety, and accessibility codes and standards will be improved.
6. Interior circulation is improved through the addition of a new central atrium and new corridors.
7. Addition will alleviate space shortage.
8. The cafeteria and kitchen are relocated within the existing building and will meet Educational Specification area requirements. New cafeteria location will be closer to the loading dock area.
9. Ventilation will be improved.
10. Energy efficient electrical and mechanical systems will be installed in the existing building.
11. Least impact to neighbors.
12. LEED certified building.

Site

1. Alteration to existing site configuration including roads, parking, and athletic fields is minimal and very little site work required.
2. Relationship between school facilities and the surrounding neighborhood is essentially unchanged.
3. Pedestrian circulation to/from building, parking, and outdoor athletic fields is unchanged.

Construction Project

1. Alteration to existing site configuration including roads, parking, and athletic fields is minimal and very little site work required.
2. Least impact to outdoor athletic fields.

Disadvantages

Building

1. Does not meet all Education Specification requirements. Only spaces in the new additions will fully meet Educational Specification area requirements since there will not be structural modifications made to spaces in the existing building.
2. Some program area, departmental, and room adjacencies and proximities will still not be ideal as compared to a new facility.
3. Inflexibility of facility to accommodate future program and curriculum changes is not substantially improved.
4. Most narrow corridors in the existing building will remain.
5. Some stairs and corridors not in compliance with existing building and life safety codes will be grandfathered and remain due to infeasibility of alterations.
6. Multiple floor levels with ramps and stairs on first and third floors will remain.
7. Obstructions causing supervision issues in corridors will not be fully eliminated.
8. Minimal opportunities to add windows and skylights – many rooms will remain without windows.
9. Ceilings will be lower to accommodate added ductwork and other systems.
10. Possible inefficiencies of mechanical/electrical systems due to existing design constraints.
11. Limited opportunities to incorporate sustainable design features and practices.
12. Much of the existing building will have to be reconstructed due to code and deterioration issues.
13. Building will not be as energy efficient as full replacement options.
14. Existing non-compliant pool to remain.

Site

1. Does not meet all Educational Specification site requirements.
2. Limited opportunities to incorporate sustainable design features and practices.
3. Entrance drives for buses and cars are not separated.
4. No dedicated bus parking / bus drop-off area provided.
5. Existing ambiguous vehicular circulation patterns not corrected.
6. Existing site safety issues – multiple points of potential pedestrian/vehicle conflict – are not corrected.
7. No additional parking for stadium provided.

Construction Project

1. Longest construction duration.
2. Multiple phases of construction.
3. High likelihood of unforeseen conditions due to multiple layers of previous construction.
4. Construction activities and staging will be significantly disruptive to the learning environment.
5. Building is occupied during construction activities.
6. Programs and students will be relocated a minimum of two times to facilitate renovations.
7. Will require relocatable classrooms or moving students off-site during construction.
8. Limitations of instructional programs during construction.
9. After hours school activities may need to be reduced during construction.
10. Possible limitations of outside agency use of building and grounds during duration of construction.
11. Disruptions to swimming pool during construction including loss of use for several months.

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OPTION 2: REHABILITATE EXISTING 1939 WING WITH MAJOR ADDITIONS

Assessment

In this scheme the entire existing structure except for the original 1939 building will be completely demolished and the 1939 building will be totally gutted with only the steel framing, floor slabs, roof decks, exterior walls, and some original finish materials being retained. Significant sections of the first floor slab on grade will be removed to allow replacement of aging subgrade piping. Mortar in exterior masonry walls, stone copings at roofs, the roof covering, exterior doors, and exterior windows will be replaced or extensively rehabilitated. Previously bricked up window openings will be reopened. The interior will be reconfigured with the auditorium and cafeteria/kitchen moving out and the media center and additional classrooms moving in. The existing auxiliary gym will be restored to its original full size, which is roughly compliant with current area requirements.

To provide the balance of space required by the Educational Specifications, large two and three story additions will be constructed to wrap around the rear of the 1939 building. The addition will include space for a new indoor swimming pool that can be constructed as a bid alternate.

Site work will be minimal, with the existing site plan essentially being retained. Additional visitor parking will be constructed at the front bus loop. A new service and loading area will be constructed at the side of the school. Most sidewalks will be replaced. Disruptions to some roads, parking areas, and athletic fields will occur periodically to allow replacement of underground utilities and possible installation of wells for a geothermal heat pump system. All paved surfaces will be milled and overlaid with new asphalt at the project's conclusion.

It would not be practical to implement this project under a phased scenario. If the facility is not occupied, a contractor will be able to accomplish major demolition early on in a single stage and move forward with construction of the major additions within a reasonable construction duration. The students will need to be relocated to temporary facilities during construction. If relocatable classrooms are used to house students, there will be major impacts to instruction, security, parking, and athletic fields. Moving the entire student body into relocatable classrooms would also present challenges in that special instructional spaces such as labs, vocational shops, gymnasium, media center, and auditorium would likely be lost during construction.

The completed project will largely meet the Educational Specifications with only a few very minor deficiencies remaining. This scheme will provide some of the best and most important features of a new high school while the portion of the school that has stood as a major community icon since 1939 is maintained and restored.

Advantages

Building
1. Building is mostly all-new construction – new feel to school.
2. Grouping of program areas and departments significantly improved over current design.
3. Flexible space for future program and curriculum changes.
4. 1939 front portion of building is retained and rehabilitated.
5. Interior circulation organization and potential for supervision improved.
6. Multiple floor heights on first floor eliminated – floor will be level.
7. LEED certified building.
8. Facility has potential to meet virtually all Educational Specification requirements as well as all building, life safety, energy, and accessibility codes and standards.
9. All stairs will be reconstructed to meet current building and life safety codes.
10. Windows/daylighting in most classrooms.
11. New swimming pool.

Site
1. Alteration to existing site configuration including roads, parking, and athletic fields is minimal and very little site work required.
2. Relationship between school facilities and the surrounding neighborhood is essentially unchanged.
3. More parking provided near front/stadium area.
4. Potential for slight improvement to bus drop-off configuration.
5. Pedestrian circulation to/from building, parking, and outdoor athletic fields is similar to existing.

Construction Project
1. Alteration to existing site configuration including roads, parking, and athletic fields is minimal and very little site work required.
2. Shorter construction duration than Option 1.
3. Reduced likelyhood for unforeseen conditions due to previous construction as only one construction period is retained.

Disadvantages

Building
1. Some program area, departmental, and room adjacencies and proximities will still not be ideal as compared to an all-new facility.

2. Only spaces in the new additions will fully meet Educational Specification area requirements since there will not be structural modifications made to spaces in the existing building.
3. Most narrow corridors in the existing building will remain.
4. Ceilings in existing areas to remain will be lower to accommodate added ductwork and other systems.
5. Possible inefficiencies of mechanical and electrical systems due to existing design constraints.
6. Building will not be as energy efficient as full replacement options.
7. Building layout necessitates a large amount of corridor space – inefficient layout.

Site
1. Practice field between Middle and High Schools will be reduced well below ideal size/shape.
2. Impossible to meet all Educational Specification site requirements.
3. Limited opportunities to incorporate sustainable design features and practices.
4. Entrance drives for buses and cars are not separated.
5. No dedicated bus parking / bus drop-off area provided.
6. Existing ambiguous vehicular circulation patterns not corrected.
7. Existing site safety issues – multiple points of potential pedestrian/vehicle conflict – are not corrected.
8. No additional parking for stadium provided.

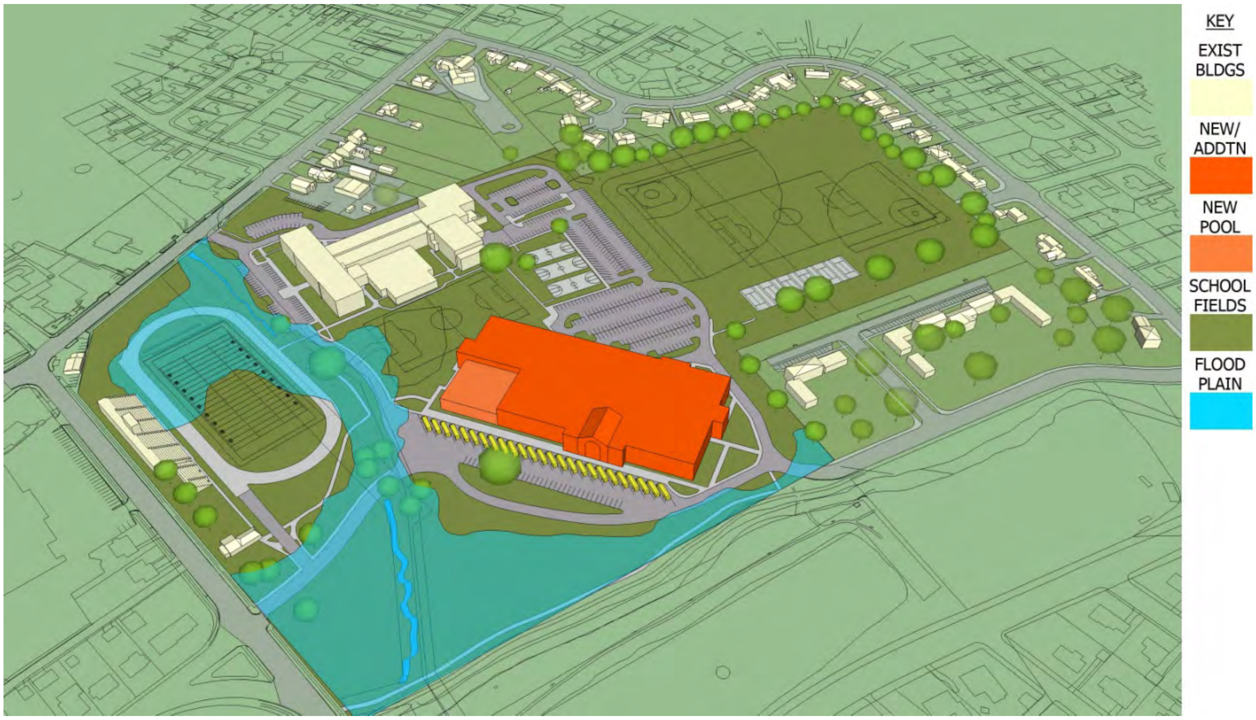
Construction Project
1. Extended construction duration.
2. Minimal opportunities for phased construction. Students must be moved into relocatable classrooms or off-site during construction.
3. Will require relocatable classrooms or moving students off-site during construction.
4. Limitations of instructional programs during construction.
5. After hours school activities may need to be reduced during construction.
6. Possible limitations of outside agency use of building and grounds during duration of construction.
7. No swimming pool during construction.

Alternate Scheme

In response to comments from some community members who suggested a scheme in which the 1939 building could be retained and added to without having to move students into relocatable or off-site facilities, the committee considered an alternate Option 2 scheme. In this alternate, a new three story wing containing a cafeteria and classrooms would be constructed on the parking lot behind the existing facility in the first phase. In the second phase, students would move into the completed classroom addition and all of the old school building other than the front wing of the 1939 building would be demolished. The space between the 1939 wing and the new classroom wing would be completed with a new gym, auditorium, and support spaces.

Although the committee praised the alternate scheme in its ability to address many of the construction project disadvantages associated with Option 2, the conclusion was the finished project would have an awkward site and internal circulation, a disjointed organization of interior spaces, and an inefficient net to gross square footage ratio. The committee felt the infill section between the front and rear wings essentially created two separate buildings that would be difficult to secure and supervise. As a result, the committee opted not to conduct further evaluation, scoring, or costing of this alternate.

OPTION 3: COMPLETE REPLACEMENT ON CURRENT SITE



Assessment

In this scheme the entire existing structure will be completely demolished and an all new school will be constructed roughly on top of the footprint of the demolished building. The building will consist of two and three story sections and will include space for a new indoor swimming pool that can be constructed as a bid alternate.

Site work will be minimal, with the existing site plan essentially being retained. The most significant change will be the addition of a dedicated parking and drop-off area for 25 busses at the front of the school. Additional visitor parking will also be constructed at the front bus loop. A new service and loading area will be constructed at the side of the school. Most sidewalks will be replaced. Disruptions to some roads, parking areas, and athletic fields will occur periodically to allow replacement of underground utilities and possible installation of wells for a geothermal heat pump system. All paved surfaces will be milled and overlaid with new asphalt at the project's conclusion.

It would not be practical to implement this project under a phased scenario. If the facility is vacated entirely, a contractor will be able to accomplish major demolition early on in a single stage and move forward with construction of the new building within a reasonable construction duration. The students will need to be relocated to temporary facilities during construction. If relocatable classrooms are used to house students, there will be major impacts to instruction, security, parking, and athletic fields. Moving the entire student body into relocatable classrooms would also present challenges in that special instructional spaces such as labs, vocational shops, gymnasium, media center, and auditorium would likely be lost during construction.

The completed project will fully meet the Educational Specifications. Although the 1939 building will be lost, the original orientation toward Culler Lake will be retained and the new school can be designed with architectural features reminiscent of the original school.

Advantages

Building
1. All-new construction – new feel to the school.
2. Facility will meet all Educational Specification requirements as well as all current building, life safety, energy, and accessibility codes and standards.
3. Well defined main entry.
4. Clear internal circulation.
5. Flexible space for future program and curriculum changes.
6. LEED certified building.
7. Windows/daylighting in most classrooms.
8. New swimming pool.

Site
1. Original building orientation to Culler Lake maintained.
2. Provides dedicated bus parking and drop-off area.
3. Parking is increased.
4. Minimal alteration to rear parking area and existing athletic fields is required.
5. Relationship between school facilities and the surrounding neighborhood is essentially unchanged.
6. More parking provided near front/stadium area.
7. Pedestrian circulation to/from building, parking, and outdoor athletic fields is similar to existing.

Construction Project
1. Minimal alteration to rear parking area and existing athletic fields is required.
2. Shorter construction duration than Options 1 and 2.
3. Low likelihood for unforeseen conditions as construction is all new.

Disadvantages

Building
1. Not all major spaces are directly off of main atrium due to grouping of gym and pool close to existing athletic fields.
2. Due to building configuration parameters dictated by reusing the existing site, some classrooms on lower levels do not have ideal daylight access.
3. 1939 building lost.

Site
1. Practice field between Middle and High Schools will not be ideal size.
2. Impossible to meet all Educational Specification site requirements for athletic fields.
3. Existing ambiguous vehicular circulation patterns not corrected.
4. Existing site safety issues – multiple points of potential pedestrian/vehicle conflict – are not fully corrected.

Construction Project

1. Extended construction duration.
2. Minimal opportunities for phased construction. Students must be moved into relocatable classrooms or off-site during construction.
3. Limitations of instructional program during construction.
4. After hours school activities may need to be reduced during construction.
5. Possible limitations of outside agency use of building and grounds during duration of construction.
6. No swimming pool during construction.

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OPTION 4: COMPLETE REPLACEMENT ON UPPER FIELDS

Assessment

In this scheme the entire existing school will remain occupied and in use while a new school is constructed on the upper athletic fields. Once the new school is completed, the existing building will be completely demolished athletic fields displaced by new construction will be relocated to the site of the old building and its parking. No temporary facilities for housing students will be required. The building will consist of two and three story sections and will include space for a new indoor swimming pool that can be constructed as a bid alternate.

Site work will be extensive with significant work required to provide roads, parking, and utilities for the new building. The new site scheme will have teacher and staff parking and a dedicated parking and drop-off area for 25 busses at the rear and student and visitor parking at the front. Athletic practice fields will be consolidated to the center of the site. Disruptions to roads and parking areas can be kept to a minimum during construction, but practice athletic fields will temporarily disappear from the site. All paved surfaces will be milled and overlaid with new asphalt at the project's conclusion.

The completed project will fully meet the Educational Specifications. The 1939 building and its orientation toward Culler Lake will be lost.

Advantages

Building
1. All-new construction – new feel to the school.

2. Facility will meet all Educational Specification requirements as well as all current building, life safety, energy, and accessibility codes and standards.
3. Well defined main entry.
4. Clear internal circulation.
5. Flexible space for future program and curriculum changes.
6. LEED certified building.
7. Windows/daylighting in most classrooms.
8. New swimming pool.

<u>Site</u>

1. Provides dedicated bus parking and drop-off area.
2. Parking is increased.
3. Athletic fields can be consolidated to the center of the site creating an athletic complex.
4. Education Specification compliance for athletic fields increased over Options 1 through 3.
5. A full-size football or soccer practice field can be added to the site.
6. Gives the most "breathing room" between middle and high school buildings and parking.
7. Site vehicular circulation is improved with clear areas for busses, parent drop-off, teacher parking, and student parking.
8. Site safety is improved with separation of vehicles as noted above and with clear pedestrian paths to school.

<u>Construction Project</u>

1. Students can remain in existing school while new school is constructed.
2. Normal construction duration (approximately two years).
3. Will not require relocatable classrooms.
4. Construction activities and staging will be least disruptive to the classroom environment of all options.
5. Fewer potential limitations to evening and summer school during construction than presented by Options 1 through 3.
6. Fewer potential limitations to afterhours school activities than presented by Options 1 through 3.
7. Fewer potential limitations to outside agency use of building during construction.
8. Low likelihood for unforeseen conditions as construction is all new.

Disadvantages

<u>Building</u>

1. Not all major spaces are directly off of main atrium due to grouping of gym and pool close to existing athletic fields.
2. Due to building configuration parameters dictated by engaging the swimming pool within the building, some classrooms on lower levels do not have ideal daylight access.
3. 1939 building lost.
4. Most direct negative impact to neighbors.

<u>Site</u>

1. Original building orientation to Culler Lake lost.
2. Building starts to feel "lost" at the rear of the site.
3. Brings high school building and parking very close to the Westbrook community.
4. Parking becomes further removed from stadium.

5. Parking currently shared between middle and high schools becomes removed from middle school.
6. Site location of bus drop-off area makes school bus double runs more difficult.
7. Pedestrian distance between school and stadium/lower athletic areas is increased – may create difficulties in supervising students traveling between facilities and may complicate using these athletic facilities for instructional programs as students may not have adequate time to walk between areas.
8. School building location creates potential increase in negative pedestrian impacts to surrounding neighborhood.

<u>Construction Project</u>

1. Major impacts to outdoor athletic fields and facilities during construction.
2. Potential for major limitations of outside agency use of school grounds during construction.

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OPTION 5: COMPLETE REPLACEMENT ON EXISTING PARKING LOT

Assessment

In this scheme the entire existing school will remain occupied and in use while a new school is constructed on the parking area shared between the two existing schools. Once the new school is completed, the existing building will be completely demolished and parking displaced by new construction will be relocated to the site of the old building and its parking. No temporary facilities for housing students will be required however temporary reconfiguration or relocation of the existing building's main entrance may be required depending on the exact site location of the new school. The building will consist of two and three story sections and will include space for a new indoor swimming pool that can be constructed as a bid alternate. The pool is shown as a separate building but can also be constructed attached to the school building.

Site work will be moderate with work required to provide roads, parking, and utilities for the new building. The new site scheme will have a dedicated parking and drop-off area for 25 busses and teacher, staff, student, and visitor parking at the front. Athletic practice fields will remain in their approximate present locations on the site. Disruptions to roads and parking areas during construction will be significant and temporary parking will be required at some stages. Some practice athletic fields will temporarily disappear from the site, but the upper portion of the practice fields may be accessible, depending on contractor staging needs. All existing paved surfaces to remain will be milled and overlaid with new asphalt at the project's conclusion.

The completed project will fully meet the Educational Specifications. The 1939 building will be lost however the new school will still be prominent on site and it can be designed with orientation toward Culler Lake and with architectural features reminiscent of the original school.

This option is a modified version of the original Option 5, which was modified slightly in response to committee discussions and comments received from community members.

Advantages

Building
1. All-new construction – new feel to the school.
2. Facility will meet all Educational Specification requirements as well as all current building, life safety, energy, and accessibility codes and standards.
3. Well defined main entry.
4. Clear internal circulation with "Main Street" feel.
5. Flexible space for future program and curriculum changes.
6. LEED certified building.
7. Windows/daylighting in virtually all classrooms.
8. New swimming pool.
9. Strengthens "campus" feel between middle and high school buildings.

Site
1. Maintains strong building orientation to Culler Lake/Baker Park.
2. Provides dedicated bus parking and drop-off area.
3. Parking is increased.
4. Maintains separation from the Westbrook community.
5. Gives the middle school a practice field of its "own".
6. A full-size football or soccer practice field can be added to the site.
7. Site vehicular circulation is improved with clear areas for busses, parent drop-off, teacher parking, and student parking.
8. Site safety is improved with separation of vehicles as noted above and with clear pedestrian paths to school.
9. Pedestrian circulation to/from building, parking, and outdoor athletic fields is similar to existing.

Construction Project
1. Students can remain in existing school while new school is constructed.
2. Normal construction duration (approximately two years).
3. Will not require relocatable classrooms.
4. Fewer potential limitations to evening and summer school during construction than presented by Options 1 through 3.
5. Fewer potential limitations to afterhours school activities than presented by Options 1 through 3.
6. Fewer potential limitations to outside agency use of building during construction.
7. Low likelihood for unforeseen conditions as construction is all new.

Disadvantages

Building
1. 1939 building lost.
2. Moderate impact to neighbors.

Site
1. Brings middle and high school buildings and vehicular circulation very close together.

2. Education Specification compliance for athletic fields not increased over Options 1 through 3.

Construction Project

1. Major impacts to outdoor athletic fields and facilities during construction.
2. Major impacts to site circulation and parking during construction.
3. Construction activities and staging will be moderately disruptive to the learning environment.
4. Potential for major limitations of outside agency use of school grounds during construction.
5. Some new building footprint schemes may bring new and existing buildings too close together, complicating phasing and requiring relocation of existing building main entrance during construction.

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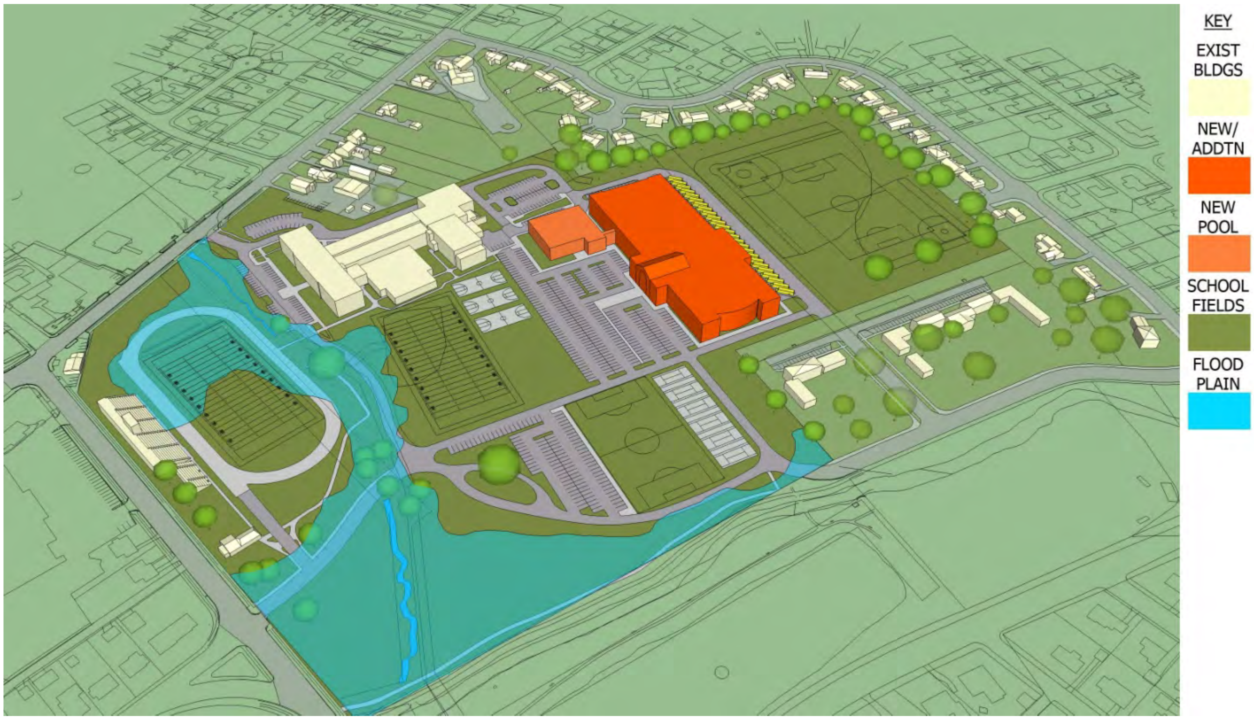
OPTION 6: COMPLETE REPLACEMENT ON EXISTING PARKING LOT



Assessment

In this scheme the entire existing school will remain occupied and in use while a new school is constructed just north of the parking area shared between the two existing schools. Once the new school is completed, the existing building will be completely demolished athletic fields and parking displaced by new construction will be relocated to the site of the old building and its parking. No temporary facilities for housing students will be required. The building will consist of two and three story sections and will include space for a new indoor swimming pool that can be constructed as a bid alternate.

Site work will be moderate with work required to provide roads, parking, and utilities for the new building. The new site scheme will have a dedicated parking and drop-off area for 25 busses at the rear and teacher, staff, student, and visitor parking at the front. Athletic practice fields will be scattered around the perimeter of the site. Disruptions to roads and parking areas during construction will be significant and temporary parking will be required at some stages. Some practice athletic fields will temporarily disappear from the site, but the upper portion of the practice fields may be accessible, depending on contractor staging needs. All paved surfaces will be milled and overlaid with new asphalt at the project's conclusion.

The completed project will fully meet the Educational Specifications. The 1939 building will be lost.

Advantages

Building

10. All-new construction – new feel to the school.
11. Facility will meet all Educational Specification requirements as well as all current building, life safety, energy, and accessibility codes and standards.
12. Well defined main entry.
13. Clear internal circulation with "Main Street" feel.
14. Flexible space for future program and curriculum changes.
15. LEED certified building.
16. Windows/daylighting in virtually all classrooms.
17. Potential for L-shaped addition in the future.
18. New swimming pool.

Site

10. Better possibilities for maintaining building orientation to Culler Lake than Option 4.
11. Provides dedicated bus parking and drop-off area.
12. Parking is increased.
13. Maintains separation from the Westbrook community.
14. Gives the middle school a practice field of its "own".
15. Education Specification compliance for athletic fields increased over Options 1 through 3.
16. A full-size football or soccer practice field can be added to the site.
17. Site vehicular circulation is improved with clear areas for busses, parent drop-off, teacher parking, and student parking.
18. Site safety is improved with separation of vehicles as noted above and with clear pedestrian paths to school.
19. Pedestrian circulation to/from building, parking, and outdoor athletic fields is similar to existing.

Construction Project

8. Students can remain in existing school while new school is constructed.
9. Normal construction duration (approximately two years).
10. Will not require relocatable classrooms.
11. Fewer potential limitations to evening and summer school during construction than presented by Options 1 through 3.
12. Fewer potential limitations to afterhours school activities than presented by Options 1 through 3.
13. Fewer potential limitations to outside agency use of building during construction.
14. Low likelihood for unforeseen conditions as construction is all new.

Disadvantages

Building

3. Mechanical penthouses may interfere with gym daylighting.
4. Linear classroom layout may make it difficult to keep departments clustered together if needs change in the future.
5. 1939 building lost.
6. Moderate impact to neighbors.

Site

3. Brings middle and high school buildings and vehicular circulation very close together.
4. Parking locations not optimal for stadium.

Construction Project

6. Major impacts to outdoor athletic fields and facilities during construction.
7. Major impacts to site circulation and parking during construction.
8. Construction activities and staging will be moderately disruptive to the learning environment.
9. Potential for major limitations of outside agency use of school grounds during construction.
10. Some new building footprint schemes may bring new and existing buildings too close together, complicating phasing and requiring relocation of existing building main entrance during construction.

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7.0 EVALUATION MATRIX

To aid in selecting a preferred option, the Feasibility Study Steering Committee developed an evaluation matrix with several criteria deemed important in achieving a modern high school facility. Each criterion received a score for each feasibility study option. Base scores were multiplied by importance factors agreed upon by the committee. Total scores for each option assisted the committee in evaluating the options and, when compared against probable costs, in understanding the value each option may represent in consideration of dollars spent.

A "Weighing by Advantages Matrix" tabulates these scores starting on page 115. Explanation of the matrix is as follows:

Evaluation Criteria
Criteria were broken into site, building, and project categories, similar to option descriptions above.

Site Criteria	Definitions
Educational Specification Compliance	Project's ability to meet requirements of the Educational Specification for site features and amenities including sports fields, ball courts, etc.
Safety	Degree to which potential conflict points between cars, busses, and pedestrians are minimized as well as the degree to which all areas of the site can be easily observed/supervised.
Parking	Adequacy of parking both in quantity and in convenience to the facilities being served.
Building Relationships - on Campus	Degree to which site placement of new buildings or additions allow Frederick High and West Frederick Middle facilities to maintain a feeling of separation and unique identity.
Building Relationships - adjoining properties	Degree to which new buildings or additions are sited in a way that does not worsen noise, light, or view impacts upon neighboring properties beyond current conditions.
Traffic Circulation - on Campus	Bus and vehicular circulation on campus is clear and efficient.
Traffic Circulation - off Campus	Site design does not appreciably increase traffic or parking beyond existing levels in surrounding neighborhoods.
Pedestrian Circulation	Buildings, parking, fields, and facilities are centrally located and main school building is easy to reach on foot from public streets in surrounding neighborhoods.
Environmental Impact	Minimized grading and tree removal; maximized potential for geothermal wells and other sustainable design features.

Building Criteria	Definitions
Educational Specification Compliance	Project's ability to meet requirements of the Educational Specification for space quantities, sizes, and adjacencies.
Safety	Degree to which all areas of the site can be easily observed/ supervised as well as the ability to separate "public" from "private" spaces.
Space Efficiency	Gross floor area as compared to net floor area in square feet.
Energy Efficiency	Potential to achieve energy efficient mechanical, electrical, and lighting systems in a new or renovated building. Compactness

	of building footprint helps achieve efficiency.
Historical Relevance	Degree to which a new or renovated structure could preserve or be reminiscent of the 1939 original building.
Daylighting	Potential for every instructional room/space to have access to sunlight through windows and/or skylights.
Building Occupant Circulation	Clear interior wayfinding, well organized corridors, potential for supervision of corridors and circulation spaces.
Maintainability	Ease of maintenance for new or renovated building materials and equipment.

Project Criteria	Definitions
Construction Duration	Construction of project in the least amount of time.
Impact to Students	Possibility to minimize disruptions, noise, loss of facilities, and other factors that would negatively affect students during construction.
Phasing	Construction of project without having students in or near construction zones, without having to move students multiple times, and with minimized loss of fields/facilities during construction.
Construction Impact on Community	Potential to minimize construction noise, traffic, dust, and disruptions that might affect surrounding neighborhoods.
Optimized Green Compliance	Ease with which LEED silver or better certification might be achieved for the project.

Importance Factor
Importance factors are on a scale from 1 to 4:

1 – Low importance
2 – Moderate importance
3 – Very important
4 – Imperative

Original Scores
Original scores are on a scale from 1 to 5:

1 – Poor or not compliant
2 – Below average
3 – Average
4 – Above average
5 - Exceptional

Weighted Scores
Weighted scores are the original score multiplied by the importance factor for the line item being scored. These weighted scores are summed in category subtotals and in the project total for each option.

Costs
Refer to appendices A and B for additional details on life cycle and probable construction costs.

Site	Importance Factor	Option 1 Original Score	Option 1 Weighted Score	Option 2 Original Score	Option 2 Weighted Score
Educational Specification Compliance	4	3	12	4	16
Safety	4	2	8	3	12
Parking	2	1	2	1	2
Building Relationships - on Campus	1	3	3	3	3
Building Relationships - adjoining properties	3	3	9	3	9
Traffic Circulation - on Campus	2	2	4	2	4
Traffic Circulation - off Campus	2	3	6	3	6
Pedestrian Circulation	2	4	8	4	8
Environmental Impact	3	5	15	4	12
Subtotal Site:			**67**		**72**

Building	Importance Factor	Original Score	Weighted Score	Original Score	Weighted Score
Educational Specification Compliance	4	2	8	3	12
Safety	4	2	8	3	12
Space Efficiency	3	1	3	3	9
Energy Efficiency	3	1	3	3	9
Historical Relevance	3	5	15	5	15
Daylighting	3	2	6	4	12
Building Occupant Circulation	3	1	3	3	9
Maintainability	3	1	3	3	9
Subtotal Building			**49**		**87**

Project	Importance Factor	Original Score	Weighted Score	Original Score	Weighted Score
Construction Duration	3	1	3	1	3
Impact to Students	4	1	4	1	4
Phasing	3	1	3	2	6
Construction Impact on Community	3	4	12	3	9
Optimized Green Compliance	3	2	6	3	9
Subtotal Project			**28**		**31**
Project Total			**144**		**190**

		Option 1	Option 2
Project Cost Without Pool (millions)		**N/A**	**$93.1**
35 Year Life Cycle Cost w/o Pool (millions)		**N/A**	**$130.5**

		Option 1	Option 2
Project Cost With Pool (millions)		**$110.9**	**$98.6**
35 Year Life Cycle Cost w/ Pool (millions)		**$150.4**	**$137.9**

		Option 3		Option 4	
Site	**Importance Factor**	**Original Score**	**Weighted Score**	**Original Score**	**Weighted Score**
Educational Specification Compliance	4	2	8	5	20
Safety	4	3	12	5	20
Parking	2	3	6	2	4
Building Relationships - on Campus	1	3	3	2	2
Building Relationships - adjoining properties	3	3	9	1	3
Traffic Circulation - on Campus	2	3	6	2	4
Traffic Circulation - off Campus	2	3	6	3	6
Pedestrian Circulation	2	4	8	1	2
Environmental Impact	3	3	9	2	6
	Subtotal Site:		**67**		**67**

Building	**Importance Factor**	**Original Score**	**Weighted Score**	**Original Score**	**Weighted Score**
Educational Specification Compliance	4	5	20	5	20
Safety	4	4	16	5	20
Space Efficiency	3	5	15	5	15
Energy Efficiency	3	4	12	5	15
Historical Relevance	3	3	9	1	3
Daylighting	3	4	12	5	15
Building Occupant Circulation	3	4	12	4	12
Maintainability	3	5	15	5	15
	Subtotal Building		**111**		**115**

Project	**Importance Factor**	**Original Score**	**Weighted Score**	**Original Score**	**Weighted Score**
Construction Duration	3	2	6	4	12
Impact to Students	4	1	4	5	20
Phasing	3	2	6	5	15
Construction Impact on Community	3	3	9	1	3
Optimized Green Compliance	3	4	12	4	12
	Subtotal Project		**37**		**62**
	Project Total		**215**		**244**

		Option 3	Option 4
Project Cost Without Pool (millions)		**$84.0**	**$86.1**
35 Year Life Cycle Cost w/o Pool (millions)		**$114.8**	**$116.3**
Project Cost With Pool (millions)		**$89.0**	**$91.0**
35 Year Life Cycle Cost w/ Pool (millions)		**$121.5**	**$123.1**

Site	Importance Factor	Option 5 Original Score	Option 5 Weighted Score	Option 6 Original Score	Option 6 Weighted Score
Educational Specification Compliance	4	4	16	4	16
Safety	4	5	20	4	16
Parking	2	5	10	5	10
Building Relationships - on Campus	1	4	4	2	2
Building Relationships - adjoining properties	3	3	9	2	6
Traffic Circulation - on Campus	2	4	8	3	6
Traffic Circulation - off Campus	2	3	6	3	6
Pedestrian Circulation	2	4	8	3	6
Environmental Impact	3	3	9	3	9
	Subtotal Site:		**90**		**77**

Building	Importance Factor	Original Score	Weighted Score	Original Score	Weighted Score
Educational Specification Compliance	4	5	20	5	20
Safety	4	5	20	5	20
Space Efficiency	3	5	15	5	15
Energy Efficiency	3	4	12	5	15
Historical Relevance	3	4	12	1	3
Daylighting	3	4	12	4	12
Building Occupant Circulation	3	5	15	4	12
Maintainability	3	5	15	5	15
	Subtotal Building		**121**		**112**

Project	Importance Factor	Original Score	Weighted Score	Original Score	Weighted Score
Construction Duration	3	4	12	4	12
Impact to Students	4	3	12	4	16
Phasing	3	4	12	4	12
Construction Impact on Community	3	3	9	2	6
Optimized Green Compliance	3	4	12	4	12
	Subtotal Project		**57**		**58**
	Project Total		**268**		**247**

		Option 5	Option 6
Project Cost Without Pool (millions)		**$85.0**	**$85.0**
35 Year Life Cycle Cost w/o Pool (millions)		**$114.9**	**$114.9**
Project Cost With Pool (millions)		**$90.6**	**$90.3**
35 Year Life Cycle Cost w/ Pool (millions)		**$122.5**	**$122.0**

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8.0 PREFERRED OPTION

The Feasibility Study Steering Committee utilized several tools and sources of information for selecting a preferred option. Discussion of advantages and disadvantages of individual options as reflected on pages 89 through 111, the Weighing by Advantages Matrix presented on pages 113 through 117, cost estimates (Appendix A), life-cycle cost analysis (Appendix B), and feedback from the community (Appendix G) were all taken into consideration when making the selection.

Options in which students would need to be housed in relocatable classrooms, off site, or some combination thereof were thought to be impractical and to have too many potential impacts upon instruction and the cohesiveness of the student body. Most committee members felt strongly that the only viable options were those in which a new building could be constructed in full while students remained in the existing facility. As a result, Options 1, 2 and 3 were rejected by the committee for recommendation as the preferred option.

Among the remaining Options 4, 5, and 6, Option 4's negative effects on the neighbors and its relocation of the building to the "rear" of the site made it significantly less desirable to the committee than Options 5 and 6. The committee's concerns with Option 6 were that the building is still close to some Westbrook neighbors, it loses the Culler Lake orientation of the existing school, and its parking was not as optimal for stadium events as that of Option 5. Some committee members expressed a preference for Option 6, stating they felt it had more potential to maintain separation of the middle and high school buildings and preferring its site arrangement for accommodation of more practice fields than are feasible under Option 5.

The majority of committee members agreed that Option 5 strikes a good balance between the instructional mission of the school, the history of the site to its surroundings, and the wishes of both the immediate neighbors and larger community. In addition, the committee commended Option 5 for its well-defined main entry, similar site orientation to the 1939 building, its central location of the building near athletic fields, and its location of parking centrally to the school, stadium, and potential pool location. Option 5 also received the best score on the Weighing by Advantages Matrix and is one of the lower cost options. There was wide agreement that Option 5 could be further enhanced by blending many of the advantages of Option 6 into Option 5 as the project moves into design.

The committee recommends Option 5 as the preferred option with the understanding that increasing the distance between the middle and high school buildings and working to maximize athletic practice fields will be further explored as the project moves forward into design.

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APPENDIX A – DETAILED COST ESTIMATES

Construction costs for this estimate were derived from R.S. Means Construction Cost Data 2012 and 2103 editions, guidance from the Maryland State Department of Education, and analysis of bid costs for comparable high school projects currently under construction within the region. Because the project is still in a preliminary, pre-design phase, we included design and construction contingencies. Contingency amounts vary for the options in which all or some of the existing building is to remain. For the replacement building options, the contingency totals 15% of which 10% is the design contingency and the balance of 5% being the construction contingency.

This estimate assumes that the stadium athletic field will be upgraded to artificial turf under all options. An additional artificial turf practice field is assumed for any options where the required number of practice fields cannot be fit on the site. Although we understand a final determination on turf fields will be made at a later stage of the project, the feeling was that it was better to reflect these costs in the initial estimates.

There are two categories of demolition presented. Selective demolition occurs in options where some or all of the existing building is being retained. Where selective demolition occurs, greater care must be taken to protect items scheduled to remain in place. In contrast, gross demolition represents a wholesale razing of some or all of the existing building. Such work requires significantly less care/skill and therefore is less costly.

Pool costs are tabulated separately from school building so that they may be evaluated independently.

A 2% per year escalation factor has been applied to the costs to the anticipated midpoint of construction. Escalation factors for the building and pool may be different under options where pool construction lags behind the school building.

Estimates begin on page 123.

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	Item	Option 1 Quantity	Unit	Cost	TOTAL
Site Costs	Site Work	318,906	sf	$4.00	$1,275,624.00
	Stadium Artificial Turf Fields	1	ea	$1,000,000.00	$1,000,000.00
	Practice Artificial Turf Fields Small	1	ea	$850,000.00	$850,000.00
	Subtotal Site Cost				$3,125,624.00
	General Conditions			10%	$312,562.40
	Design Contingency			15%	$596,343.60
	Construction Contingency			12%	$484,143.60
	Escalation to Construction - 2% per year	6 years		12.60%	$569,352.87
	Total Site Construction Cost				**$5,088,026.47**
Building Costs	Hazmat Abatement	1	ls	$1,000,000.00	$1,000,000.00
	Selective Demolition	233,816	sf	$30.00	$7,014,480.00
	Gross Demolition	0	sf	$6.00	$0.00
	Building - Renovation	233,816	sf	$150.00	$35,072,400.00
	Building - New Construction	25,000	sf	$175.00	$4,375,000.00
	Phasing Costs	13	phase	$100,000.00	$1,300,000.00
	Premium for Off-Hours Work			6%	$2,925,712.80
	Subtotal Building Cost				$51,687,592.80
	General Conditions			10%	$5,168,759.28
	Design Contingency			15%	$8,191,995.84
	Construction Contingency			12%	$7,805,801.75
	Escalation to Construction - 2% per year	6 years		12.60%	$9,179,622.86
	Total Building Construction Cost				**$82,033,772.53**
	Total Construction Cost				**$87,121,799.00**
Soft Costs	AE-CM Fees	9% CM/9% AE			$15,681,923.82
	FF&E				$5,600,000.00
	LEED Certification (Note 1.)	258,816	sf	0.045	$11,646.72
	Permits, Utility Connection Fees, etc.				$400,000.00
	Relocatables	14	ea	$150,000	$2,100,000.00
	Temporary School Facility				
	Total Soft cost				**$23,793,570.54**
	Total Project Cost - No Pool				**N/A**
Pool Costs		**Alternate - Swimming Pool Addition**			
	Additional Site Work	Pool Already Exists and Will Be Renovated Under the Base Bid Renovation Project			
	Pool Addition				
	General Conditions				
	Design Contingency				
	Construction Contingency				
	Escalation to Construction - 2% per year				
	Total Pool Construction Cost				
Pool Soft Costs	AE-CM Fees				
	FF&E				
	LEED Certification (Note 1.)				
	Total Soft cost				
	Total Project Cost - With Pool				**$110,915,369.54**

Notes:
1. Cost of regestering project with USGBC

	Item	Quantity	Unit	Cost	TOTAL
		Option 2			
Site Costs	Site Work	353,297	sf	$4.00	$1,413,188.00
	Stadium Artificial Turf Fields	1	ea	$1,000,000.00	$1,000,000.00
	Practice Artificial Turf Fields Small	1	ea	$0.00	$0.00
	Subtotal Site Cost				$2,413,188.00
	General Conditions			10%	$241,318.80
	Design Contingency			12%	$289,582.56
	Construction Contingency			8%	$235,527.15
	Escalation to Construction - 2% per year	4 years		8.40%	$267,087.79
	Total Site Construction Cost				**$3,446,704.30**
Building Costs	Hazmat Abatement	1	ls	$750,000.00	$750,000.00
	Selective Demolition	100,500	sf	$30.00	$3,015,000.00
	Gross Demolition	129,226	sf	$6.00	$775,356.00
	Building - Renovation	100,500	sf	$150.00	$15,075,000.00
	Building - New Construction	171,800	sf	$175.00	$30,065,000.00
	Phasing Costs	0	phase	$0.00	$0.00
	Premium for Off-Hours Work			0%	$0.00
	Subtotal Building Cost				$49,680,356.00
	General Conditions			10%	$4,968,035.60
	Design Contingency			12%	$5,961,642.72
	Construction Contingency			8%	$4,848,802.75
	Escalation to Construction - 2% per year	4 years		8.80%	$5,760,377.66
	Total Building Construction Cost				**$71,219,214.73**
	Total Construction Cost				**$74,665,919.02**
Soft Costs	AE-CM Fees	7% CM/7% AE			$10,453,228.66
	FF&E				$5,600,000.00
	LEED Certification (Note 1.)	272,300	sf	0.045	$12,253.50
	Permits, Utility Connection Fees, etc.				$400,000.00
	Relocatables	0	ea	$150,000	$0.00
	Temporary School Facility	1	ls	$2,000,000	$2,000,000.00
	Total Soft cost				**$18,465,482.16**
	Total Project Cost - No Pool				**$93,131,401.19**
Pool Costs		**Alternate - Swimming Pool Addition**			
	Additional Site Work	14,700	ls	$4.00	$58,800.00
	Pool Addition	14,700	sf	$220.00	$3,234,000.00
	General Conditions			10%	$329,280.00
	Design Contingency			12%	$395,136.00
	Construction Contingency			8%	$316,673.28
	Escalation to Construction - 2% per year	4 years		8.80%	$381,382.26
	Total Pool Construction Cost				**$4,715,271.54**
Pool Soft Costs	AE-CM Fees	7% CM/7% AE			$660,138.02
	FF&E				$50,000.00
	LEED Certification (Note 1.)	14,700	sf	0.045	$661.50
	Total Soft cost				**$710,799.52**
	Total Project Cost - With Pool				**$98,557,472.24**

Notes:
1. Cost of regestering project with USGBC

	Item	Option 3 Quantity	Unit	Cost	TOTAL
Site Costs	Site Work	343,646	sf	$4.00	$1,374,584.00
	Stadium Artificial Turf Fields	1	ea	$1,000,000.00	$1,000,000.00
	Practice Artificial Turf Fields Small	1	ea	$850,000.00	$850,000.00
	Subtotal Site Cost				$3,224,584.00
	General Conditions			10%	$322,458.40
	Design Contingency			10%	$407,458.40
	Construction Contingency			5%	$197,725.04
	Escalation to Construction - 2% per year	3.5 years		6.30%	$261,590.23
	Total Site Construction Cost				**$4,413,816.07**
Building Costs	Hazmat Abatement	1	ls	$500,000.00	$500,000.00
	Selective Demolition	0	sf	$30.00	$0.00
	Gross Demolition	229,726	sf	$6.00	$1,378,356.00
	Building - Renovation	0	sf	$150.00	$0.00
	Building - New Construction	260,000	sf	$175.00	$45,500,000.00
	Phasing Costs	0	phase	$0.00	$0.00
	Premium for Off-Hours Work			0%	$0.00
	Subtotal Building Cost				$47,378,356.00
	General Conditions			10%	$4,737,835.60
	Design Contingency			10%	$4,737,835.60
	Construction Contingency			5%	$2,842,701.36
	Escalation to Construction - 2% per year	3.5 years		6.30%	$3,760,893.90
	Total Building Construction Cost				**$63,457,622.46**
	Total Construction Cost				**$67,871,438.53**
Soft Costs	AE-CM Fees	6% CM/6% AE			$8,144,572.62
	FF&E				$5,600,000.00
	LEED Certification (Note 1.)	260,000	sf	0.045	$11,700.00
	Permits, Utility Connection Fees, etc.				$400,000.00
	Relocatables	0	ea	$150,000	$0.00
	Temporary School Facility	1	ls	$2,000,000	$2,000,000.00
	Total Soft cost				**$16,156,272.62**
	Total Project Cost - No Pool				**$84,027,711.15**
Pool Costs		**Alternate - Swimming Pool Addition**			
	Additional Site Work	14,700	ls	$4.00	$58,800.00
	Pool Addition	14,700	sf	$220.00	$3,234,000.00
	General Conditions			10%	$329,280.00
	Design Contingency			10%	$329,280.00
	Construction Contingency			5%	$194,628.00
	Escalation to Construction - 2% per year	3.5 years		6.30%	$261,197.24
	Total Pool Construction Cost				**$4,407,185.24**
Pool Soft Costs	AE-CM Fees	6% CM/6% AE			$528,862.23
	FF&E				$50,000.00
	LEED Certification (Note 1.)	14,700	sf	0.045	$661.50
	Total Soft cost				**$579,523.73**
	Total Project Cost - With Pool				**$89,014,420.12**

Notes:

1. Cost of regestering project with USGBC

	Item	Quantity	Unit	Cost	TOTAL
		Option 4			
Site Costs	Site Work	877,779	sf	$6.50	$5,705,563.50
	Stadium Artificial Turf Fields	1	ea	$1,000,000.00	$1,000,000.00
	Practice Artificial Turf Fields Small	0	ea	$0.00	$0.00
	Subtotal Site Cost				$6,705,563.50
	General Conditions			10%	$670,556.35
	Design Contingency			10%	$670,556.35
	Construction Contingency			5%	$402,333.81
	Escalation to Construction - 2% per year	3.5 years		6.30%	$532,287.63
	Total Site Construction Cost				**$8,981,297.64**
Building Costs	Hazmat Abatement	1	ls	$500,000.00	$500,000.00
	Selective Demolition	0	sf	$30.00	$0.00
	Gross Demolition	229,726	sf	$6.00	$1,378,356.00
	Building - Renovation	0	sf	$150.00	$0.00
	Building - New Construction	256,000	sf	$175.00	$44,800,000.00
	Phasing Costs	0	phase	$0.00	$0.00
	Premium for Off-Hours Work			0%	$0.00
	Subtotal Building Cost				$46,678,356.00
	General Conditions			10%	$4,667,835.60
	Design Contingency			10%	$4,667,835.60
	Construction Contingency			5%	$2,800,701.36
	Escalation to Construction - 2% per year	3 years		6.24%	$3,670,039.06
	Total Building Construction Cost				**$62,484,767.62**
	Total Construction Cost				**$71,466,065.26**
Soft Costs	AE-CM Fees	6% CM/6% AE			$8,575,927.83
	FF&E				$5,600,000.00
	LEED Certification (Note 1.)	256,000	sf	0.045	$11,520.00
	Permits, Utility Connection Fees, etc.				$400,000.00
	Relocatables	0	ea	$150,000	$0.00
	Temporary School Facility				
	Total Soft cost				**$14,587,447.83**
	Total Project Cost - No Pool				**$86,053,513.09**
Pool Costs		**Alternate - Swimming Pool Addition**			
	Additional Site Work	14,700	ls	$4.00	$58,800.00
	Pool Addition	14,700	sf	$220.00	$3,234,000.00
	General Conditions			10%	$329,280.00
	Design Contingency			10%	$329,280.00
	Construction Contingency			5%	$194,628.00
	Escalation to Construction - 2% per year	3 years		6.24%	$258,709.65
	Total Pool Construction Cost				**$4,404,697.65**
Pool Soft Costs	AE-CM Fees	6% CM/6% AE			$528,563.72
	FF&E				$50,000.00
	LEED Certification (Note 1.)	14,700	sf	0.045	$661.50
	Total Soft cost				**$579,225.22**
	Total Project Cost - With Pool				**$91,037,435.96**

Notes:
1. Cost of regestering project with USGBC

		Option 5			
	Item	Quantity	Unit	Cost	TOTAL
Site Costs	Site Work	627,564	sf	$6.50	$4,079,166.00
	Stadium Artificial Turf Fields	1	ea	$1,000,000.00	$1,000,000.00
	Practice Artificial Turf Fields Small	1	ea	$850,000.00	$850,000.00
	Subtotal Site Cost				$5,929,166.00
	General Conditions			10%	$592,916.60
	Design Contingency			10%	$677,916.60
	Construction Contingency			5%	$359,999.96
	Escalation to Construction - 2% per year	3.5 years		6.30%	$476,279.95
	Total Site Construction Cost				**$8,036,279.11**
Building Costs	Hazmat Abatement	1	ls	$500,000.00	$500,000.00
	Selective Demolition	0	sf	$30.00	$0.00
	Gross Demolition	229,726	sf	$6.00	$1,378,356.00
	Building - Renovation	0	sf	$150.00	$0.00
	Building - New Construction	256,000	sf	$175.00	$44,800,000.00
	Phasing Costs	0	phase	$0.00	$0.00
	Premium for Off-Hours Work			0%	$0.00
	Subtotal Building Cost				$46,678,356.00
	General Conditions			10%	$4,667,835.60
	Design Contingency			10%	$4,667,835.60
	Construction Contingency			5%	$2,800,701.36
	Escalation to Construction - 2% per year	3 years		6.24%	$3,670,039.06
	Total Building Construction Cost				**$62,484,767.62**
	Total Construction Cost				**$70,521,046.73**
Soft Costs	AE-CM Fees	6% CM/6% AE			$8,462,525.61
	FF&E				$5,600,000.00
	LEED Certification (Note 1.)	256,000	sf	0.045	$11,520.00
	Permits, Utility Connection Fees, etc.				$400,000.00
	Relocatables	0	ea	$150,000	$0.00
	Temporary School Facility				
	Total Soft cost				**$14,474,045.61**
	Total Project Cost - No Pool				**$84,995,092.34**
Pool Costs		**Alternate - Detached Swimming Pool**			
	Additional Site Work	32,000	ls	$6.50	$208,000.00
	Pool Addition	16,000	sf	$220.00	$3,520,000.00
	General Conditions			10%	$372,800.00
	Design Contingency			10%	$372,800.00
	Construction Contingency			5%	$213,280.00
	Escalation to Construction - 2% per year	3 years		6.24%	$292,461.31
	Total Pool Construction Cost				**$4,979,341.31**
Pool Soft Costs	AE-CM Fees	6% CM/6% AE			$597,520.96
	FF&E				$50,000.00
	LEED Certification (Note 1.)	16,000	sf	0.045	$720.00
	Total Soft cost				**$648,240.96**
	Total Project Cost - With Pool				**$90,622,674.61**

Notes:
1. Cost of regestering project with USGBC

	Item	Option 6 Quantity	Unit	Cost	TOTAL
Site Costs	Site Work	627,564	sf	$6.50	$4,079,166.00
	Stadium Artificial Turf Fields	1	ea	$1,000,000.00	$1,000,000.00
	Practice Artificial Turf Fields Small	1	ea	$850,000.00	$850,000.00
	Subtotal Site Cost				$5,929,166.00
	General Conditions			10%	$592,916.60
	Design Contingency			10%	$677,916.60
	Construction Contingency			5%	$359,999.96
	Escalation to Construction - 2% per year	3.5 years		6.30%	$476,279.95
	Total Site Construction Cost				**$8,036,279.11**
Building Costs	Hazmat Abatement	1	ls	$500,000.00	$500,000.00
	Selective Demolition	0	sf	$30.00	$0.00
	Gross Demolition	229,726	sf	$6.00	$1,378,356.00
	Building - Renovation	0	sf	$150.00	$0.00
	Building - New Construction	256,000	sf	$175.00	$44,800,000.00
	Phasing Costs	0	phase	$0.00	$0.00
	Premium for Off-Hours Work			0%	$0.00
	Subtotal Building Cost				$46,678,356.00
	General Conditions			10%	$4,667,835.60
	Design Contingency			10%	$4,667,835.60
	Construction Contingency			5%	$2,800,701.36
	Escalation to Construction - 2% per year	3 years		6.24%	$3,670,039.06
	Total Building Construction Cost				**$62,484,767.62**
	Total Construction Cost				**$70,521,046.73**
Soft Costs	AE-CM Fees	6% CM/6% AE			$8,462,525.61
	FF&E				$5,600,000.00
	LEED Certification (Note 1.)	256,000	sf	0.045	$11,520.00
	Permits, Utility Connection Fees, etc.				$400,000.00
	Relocatables	0	ea	$150,000	$0.00
	Temporary School Facility				
	Total Soft cost				**$14,474,045.61**
	Total Project Cost - No Pool				**$84,995,092.34**
Pool Costs		**Alternate - Swimming Pool Addition**			
	Additional Site Work	1	ls	$313,782.00	$313,782.00
	Pool Addition	14,700	sf	$220.00	$3,234,000.00
	General Conditions			10%	$354,778.20
	Design Contingency			10%	$354,778.20
	Construction Contingency			5%	$197,177.82
	Escalation to Construction - 2% per year	3 years		6.24%	$277,961.81
	Total Pool Construction Cost				**$4,732,478.03**
Pool Soft Costs	AE-CM Fees	6% CM/6% AE			$567,897.36
	FF&E				$50,000.00
	LEED Certification (Note 1.)	14,700	sf	0.045	$661.50
	Total Soft cost				**$618,558.86**
	Total Project Cost - With Pool				**$90,346,129.23**

Notes:
1. Cost of regestering project with USGBC

APPENDIX B – LIFE-CYCLE COST ANALYSIS

Annual energy costs were developed utilizing computer modeling for the six proposed building schemes for the Frederick HS life cycle operating cost study. The annual operating cost was then multiplied by 35 years to provide a simple cost analysis for a 35 year life span. The mechanical system modeled for each scheme was a High Efficiency Variable Air Volume System. Additionally, a Geothermal Heat Pump system was also modeled for the Replacement building schemes. Refer to the mechanical system options narrative & schematic diagrams for additional descriptions and information on these systems.

The following are summaries of the 35-year energy cost based on today's electric/fuel rates. The 35-year cost is a simple cost and does not reflect inflation of the fuel sources.

The life-cycle cost presented herein is:

1. Equipment costs take into account inflation present worth value factor for future costs/prices.
2. Set forth in accordance with IAC direction for feasibility studies.

School Building	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Annual operating cost per SF	$5.06	$4.55	$4.05	$4.05	$4.05	$4.05
Annual maintenance cost per SF	$4.25	$3.83	$3.40	$3.40	$3.40	$3.40
Total annual O&M cost per SF	**$9.31**	**$8.38**	**$7.45**	**$7.45**	**$7.45**	**$7.45**
Estimated SF	258,816	272,300	252,000	248,000	245,000	245,000
Total annual O&M cost	$2,409,577	$2,281,602	$1,877,400	$1,847,104	$1,824,760	$1,824,760
Period [years]	35	35	35	35	35	35
Assumed interest rate	5%	5%	5%	5%	5%	5%
Present value of O&M expense stream	$39,455,000	$37,360,000	$30,741,000	$30,245,000	$29,879,000	$29,879,000
Project cost [a/e construction estimate]	$110,915,370	$93,131,401	$84,027,711	$86,053,513	$84,995,092	$84,995,092
Building 35-Year Life Cycle Cost	**$150,370,370**	**$130,491,401**	**$114,768,711**	**$116,298,513**	**$114,874,092**	**$114,874,092**

Swimming Pool	Option 1*	Option 2	Option 3	Option 4	Option 5	Option 6
Operating cost per SF	$5.06	$4.55	$4.05	$4.05	$4.05	$4.05
Annual maintenance cost per SF	$4.25	$3.83	$3.40	$3.40	$3.40	$3.40
Total annual O&M cost per SF	**$9.31**	**$8.38**	**$7.45**	**$7.45**	**$7.45**	**$7.45**
Estimated SF	N/A*	14,700	14,700	14,700	16,000	14,700
Total annual O&M cost	N/A*	$123,172	$109,515	$109,486	$119,168	$109,486
Period [years]	35	35	35	35	35	35
Assumed interest rate	5%	5%	5%	5%	5%	5%
Present value of O&M expense stream	N/A*	$2,017,000	$1,794,000	$1,793,000	$1,952,000	$1,793,000
Project cost [a/e construction estimate]	N/A*	$5,426,071	$4,986,708	$4,983,923	$5,627,582	$5,351,037
Pool 35-Year Life Cycle Cost	**N/A***	**$7,443,071**	**$6,780,708**	**$6,776,923**	**$7,579,582**	**$7,144,037**
Total 35-Year Life Cycle Cost w/ Pool	**$150,370,370**	**$137,934,472**	**$121,549,419**	**$123,075,436**	**$122,453,674**	**$122,018,129**

*Note: Costs for renovation of the existing swimming pool are included in the base costs for Option 1.

APPENDIX C – FUNCTION AND AREA SUMMARY

Beginning on page 133 is a side-by-side comparison of the adapted Educational Specification discussed in section 3.8 and the room and space areas of the existing FHS facility. Differences between existing and proposed are shown in the right hand column. Negative numbers indicate deficiencies in the existing school; positive numbers indicate areas of the existing school that are oversized.

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COMPARISON OF INSTRUCTIONAL SPACE REQUIREMENTS TO EXISTING SCHOOL

Space	Proposed New School				Existing School				Difference
	Number of CRs		Size of CR (net Sq ft)	Totals (sq. ft)	Number of CRs		Avg Size of CR (net Sq ft)	Totals (sq. ft)	
ELL CENTER									
ELL office	1	@	400	400	0	@	0	0	
Classrooms	7	@	775	5,425	6	@	750	4,500	
Total ELL				**5,825**				**4,500**	-1,325
HUMANITIES CLUSTER									
English									
Classrooms	10	@	775	7,750	11	@	798	8,778	
Departmental Staff Lounge/Storage	0	@	0	0	1	@	391	391	
Storage	1	@	350	350	0	@	0	0	
Total English				**8,100**				**9,169**	1,069
Social Studies									
Classrooms	9	@	775	6,975	10	@	798	7,980	
Departmental Staff Lounge	0	@	0	0	1	@	400	400	
Storage	1	@	350	350	2	@	222	444	
Total Social Studies				**7,325**				**8,824**	1,499
Foreign Language & ESL									
Classrooms/ESL Rooms	6	@	775	4,650	6	@	758	4,548	
Storage	1	@	250	250	2	@	82	164	
Seminar Rooms	2	@	100	200	0	@	0	0	
Total Foreign Language & ESL				**5,100**				**4,712**	-388
Humanities Common Planning Room	1	@	800	**800**	1	@	307	**307**	-493
Include work area, BR(?), refrig(?),									
Total Humanities Cluster				**21,325**				**23,012**	1,687
SCIENCE, MATH & TECHNOLOGY CLUSTER									
Science									
Lab, Biology	4	@	1360	5,440	4	@	1255	5,020	
Lab, Chemistry	2	@	1360	2,720	2	@	1255	2,510	
Lab, Physics	2	@	1360	2,720	2	@	1255	2,510	
Lab, Physical Science	3	@	1360	4,080	3	@	1255	3,765	
Preparation Area	2	@	200	400	1	@	694	694	
Department Office/Work Room	0	@	0	0	1	@	461	461	
Storage Room	2	@	300	600	4	@	125	500	
Chemical Storage Room	1	@	200	200	1	@	100	100	
Book Storage	2	@	200	400	1	@	515	515	
Total Science				**16,560**				**16,075**	-485
Mathematics									
Classrooms	10	@	775	7,750	11	@	775	8,525	
Storage	1	@	350	350	1	@	215	215	
Department Office/Work Room	0	@	0	0	1	@	575	575	
Department Staff Lounge	0	@	0	0	1	@	440	440	
Total Math				**8,100**				**9,755**	1,655
Technical Education									
Classroom	0	@	0	0	1	@	543	543	
Foundations									
Lab [1 FOT lab, 1 Pre Enginnering Lab}	2	@	2100	4,200	1	@	1418	1,418	
Storage	2	@	200	400	1	@	108	108	
Computer Business Center									
Labs	3	@	1060	3,180	2	@	965	1,930	
Storage	1	@	100	100	0	@	0	0	
Animal Science									
Labs	1	@	1280	1,280	1	@	3685	3,685	
storage	1	@	200	200	1	@	311	311	
Wood									
Lab	1	@	2400	2,400	1	@	1710	1,710	
Storage	1	@	200	200	5	@	233	1,165	
Horticulture									
Lab	1	@	1400	1,400	1	@	808	808	
Storage	1	@	200	200	1	@	277	277	
Headhouse	1	@	300	300	1	@	200	200	
Green House	1	@	1200	1,200	1	@	891	891	
Commercial Foods									
Kitchen	1	@	1100	1,100	1	@	698	698	

FREDERICK HIGH SCHOOL

21 December 2012

COMPARISON OF INSTRUCTIONAL SPACE REQUIREMENTS TO EXISTING SCHOOL

Space	Proposed New School: Number of CRs		Size of CR (net Sq ft)	Totals (sq. ft)	Existing School: Number of CRs		Avg Size of CR (net Sq ft)	Totals (sq. ft)	Difference
Classroom/Restaurant	1	@	725	725	1	@	665	665	
Dry Storage	1	@	100	100	0	@	0	0	
Teacher/Chef Office	1	@	75	75	1	@	78	78	
Girls Locker	1	@	100	100	1	@	60	60	
Boys Locker	1	@	100	100	1	@	54	54	
Total Technical				**17,260**				**14,601**	-2,659
Business Education									
Business Work/Study									
Classroom	1	@	775	775	0	@	0	0	
Storage	1	@	200	200	0	@	0	0	
Business Program									
Lab (3)	3	@	975	2,925	1	@	1010	1,010	
Storage	1	@	100	100	0	@	0	0	
Total Business				**4,000**				**1,010**	-2,990
Science, Math, Tech. Common Planning Rm	1	@	800	800	0	@	0	0	-800
Total Science, Math & Technology Cluster				**46,720**				**41,441**	-5,279
HEALTH AND HUMAN SERVICES CLUSTER									
Family and Consumer Science/Life Skills									
Multi-purpose Lab #2, Foods	1	@	975	975	1	@	1220	1,220	
Laundry	0	@	0	0	1	@	83	83	
Child Dev. Lab	1	@	1200	1,200	1	@	1400	1,400	
Storage	1	@	300	300	1	@	127	127	
Office	1	@	100	100	1	@	188	188	
Total				**2,575**				**3,018**	443
Special Education									
Classroom Self-Contained	1	@	775	775	1	@	730	730	
Classroom Read 180	1	@	775	775	1	@	483	483	
Resource Room	2	@	775	1,550	2	@	367	734	
Support Employment Office	1	@	100	100	1	@	300	300	
General Office	0	@	0	0	1	@	573	573	
Satellite Office	0	@	0	0	1	@	292	292	
Itinerant/Speech and Language Room	1	@	150	150	1	@	293	293	
Conference Room	1	@	300	300	0	@	0	0	
Total				**3,650**				**3,405**	-245
Physical Education									
Gym (main) 100'x120'x25'; 1,200 seats	1	@	12,000	12,000	1	@	11,692	11,692	
Gym (auxiliary) 5,400 SF	1	@	5,400	5,400	1	@	3,000	3,000	
Gym Food Concession	0	@	0	0	1	@	160	160	
Classrooms	0	@	0	0	2	@	952	1,904	
Conditioning Room	1	@	2,400	2,400	1	@	2,400	2,400	
Wrestling/Fitness Room	1	@	2,400	2,400	0	@	0	0	
Indoor Equipment Storage	1	@	400	400	1	@	220	220	
Indoor Supply Storage	1	@	200	200	0	@	0	0	
Boys' Locker Room	1	@	1,700	1,700	1	@	1,275	1,275	
Girls' Locker Room	1	@	1,700	1,700	1	@	1,389	1,389	
Shower Room, Boys	1	@	300	300	1	@	235	235	
Shower Room, Girls	1	@	300	300	1	@	320	320	
Drying Room, Boys	1	@	150	150	1	@	160	160	
Drying Room, Girls	1	@	150	150	1	@	235	235	
Restroom (Boys)	1	@	150	150	1	@	90	90	
Restroom (Girls)	1	@	150	150	1	@	221	221	
Varsity Dressing Room (Boys)	1	@	600	600	1	@	1,731	1,731	
Toilet	0	@	0	0	1	@	81	81	
Drying	0	@	0	0	1	@	154	154	
Shower	0	@	0	0	1	@	456	456	
Office	0	@	0	0	1	@	90	90	
Locker	0	@	0	0	1	@	615	615	
Football equipment storage	1	@	250	250	1	@	320	320	
Varsity Dressing Room (Girls)	1	@	600	600	0	@	0	0	
Uniform Storage (Boys)	1	@	150	150	0	@	0	0	
Uniform Storage (Girls)	1	@	150	150	0	@	0	0	
Laundry Room	1	@	150	150	1	@	117	117	
Male & Female Coach Office/Shower	2	@	200	400	2	@	144	288	
Football Coach Office	0	@	0	0	1	@	146	146	
First Aid /Training Room	1	@	200	200	1	@	180	180	
Toilet Room	0	@	0	0	1	@	55	55	

FREDERICK HIGH SCHOOL

21 December 2012

COMPARISON OF INSTRUCTIONAL SPACE REQUIREMENTS TO EXISTING SCHOOL

Space	Proposed New School				Existing School				
Space	**Number of CRs**		**Size of CR (net Sq ft)**	**Totals (sq. ft)**	**Number of CRs**		**Avg Size of CR (net Sq ft)**	**Totals (sq. ft)**	**Difference**
Out-Door Storage	1	@	600	600	1	@	250	250	
Athletic Storage	1	@	400	400	1	@	220	220	
Athletic Director's Office	1	@	150	150	1	@	485	485	
Male&Femal PE Teachers' office	1	@	400	400	1	@	637	637	
Total				**31,450**				**29,126**	-2,324
Health & Human Services Planning Room	1	@	800	**800**	0	@	0	**0**	-800
Total Health & Human Services Cluster				**38,475**				**35,549**	-2,926
ARTS AND COMMUNICATIONS CLUSTER									
Visual Arts									
Drawing/Painting Studio	1	@	1,175	1,175	1	@	1,029	1,029	
Ceramics/Crafts Studio	1	@	1,175	1,175	1	@	1,659	1,659	
Kiln Room	1	@	250	250	1	@	214	214	
Digital photo lab	1	@	1,100	1,100	1	@	1,336	1,336	
Computer Graphics Lab	1	@	1,100	1,100	1	@	1,300	1,300	
Storage	2	@	350	700	2	@	227	454	
Publicaitons	1	@	350	350	1	@	295	295	
Total				**5,850**				**6,287**	437
Performing Arts									
Chorus Room	1	@	1,550	1,550	1	@	1,442	1,442	
Band Room	1	@	1,950	1,950	1	@	2,520	2,520	
Large Instrumental Room	1	@	700	700	1	@	740	740	
Piano Labaoratory	1	@	1,000	1,000	1	@	767	767	
Audio Tech Lab	1	@	700	700	0	@	0	0	
Band/Choral Music Library/Instrument Repair	1	@	300	300	1	@	295	295	
Wenger Sound Modules Area (4@50)	4	@	50	200	3	@	50	150	
Instrument Storage Room	1	@	500	500	1	@	270	270	
Percussion Storage Room	1	@	300	300	1	@	380	380	
Band Uniform Storage Room	1	@	250	250	1	@	222	222	
Color Guard Equip/props storage	1	@	200	200	1	@	119	119	
Choral Robes/Costume Storage	1	@	150	150	0	@	0	0	
Total				**7,800**				**6,905**	-895
Drama and Auditorium									
Drama Classroom	1	@	800	800	0	@	0	0	
House Area 750 - 800 seats	1	@	5,600	5,600	1	@	4,580	4,580	
Stage Area	1	@	1,700	1,700	1	@	2,344	2,344	
Orchestra Area	1	@	400	400	0	@	0	0	
Production Office	1	@	100	100	0	@	0	0	
Dressing/Makeup	2	@	400	800	2	@	120	240	
Green Room	0	@	0	0	1	@	364	364	
Costume Storage	1	@	300	300	1	@	135	135	
General Storage	0	@	0	0	1	@	375	375	
Scenery Storage	1	@	800	800	1	@	547	547	
Piano/Music Storage	1	@	350	350	1	@	333	333	
Light Production Booth	1	@	150	150	1	@	158	158	
Ticket Booth	1	@	100	100	1	@	50	50	
Custodiam/Lobby Storage	1	@	100	100	1	@	110	110	
Total				**11,200**				**9,236**	-1,964
Media Center & TV/Multi-Media Production									
Main Reading, Resource Area and Circulation Desk	1	@	4,500	4,500	1	@	5,967	5,967	
Reading room	1	@	750	750	1	@	645	645	
Research lab	1	@	750	750	1	@	605	605	
Media Office	1	@	300	300	1	@	262	262	
Work/Processing Area	1	@	500	500	1	@	600	600	
Television Studio/Control Room (900SF + 100SF)	1	@	1,000	1,000	0	@	0	0	
Audio Visual Equipment Storage	1	@	500	500	1	@	215	215	
Non Print/Periodical Storage	1	@	400	400	1	@	410	410	
Total				**8,700**				**8,704**	4
Instructional Technology									
Sign up Lab 1	1	@	925	925	1	@	850	850	
Sign up Lab 2	1	@	925	925	1	@	637	637	
Sign up Lab 3	0	@	0	0	1	@	434	434	
Total				**1,850**				**1,921**	71
Total Arts and Communications Cluster				**35,400**				**33,053**	-2,347
STUDENT SERVICES CLUSTER									

FREDERICK HIGH SCHOOL 21 December 2012

COMPARISON OF INSTRUCTIONAL SPACE REQUIREMENTS TO EXISTING SCHOOL

Space	Proposed New School				Existing School				
	Number of CRs		Size of CR (net Sq ft)	Totals (sq. ft)	Number of CRs		Avg Size of CR (net Sq ft)	Totals (sq. ft)	Difference
Health Suite									
Health Office	1	@	100	100	0	@	0	0	
Waiting Room	1	@	100	100	1	@	300	300	
Examination/Consultation Room, Boys	1	@	100	100	0	@	0	0	
Examination/Consultation Room, Girls	1	@	100	100	0	@	0	0	
Examination/Consultation Room, Unisex	0	@	0	0	1	@	40	40	
Cot Rooms	2	@	120	240	1	@	32	32	
Restrooms	2	@	50	100	1	@	25	25	
Total				**740**				**397**	-343
Administration									
Reception Area	1	@	600	600	2	@	181	362	
Student Waiting Area	1	@	400	400	1	@	288	288	
Principal's Office	1	@	250	250	1	@	182	182	
Assistant Principal Office	4	@	150	600	4	@	173	692	
Financial Secretary's Office	1	@	150	150	1	@	113	113	
Attendance/Computer Office	1	@	250	250	1	@	144	144	
Open office area	0	@	0	0	3	@	120	360	
Conference Room	1	@	300	300	0	@	0	0	
Conference Room	1	@	150	150	0	@	0	0	
Heritage Room	0	@	0	0	1	@	1,600	1,600	
Work/mail Room	1	@	300	300	1	@	218	218	
Storage Room	1	@	200	200	1	@	250	250	
Utilities Room	1	@	150	150	2	@	40	80	
Rest Rooms	2	@	50	100	2	@	25	50	
Total				**3,450**				**4,339**	889
Guidance/School Support									
Counselor's Office	5	@	120	600	5	@	120	600	
School Support Office	1	@	150	150	1	@	155	155	
Waiting Room	1	@	300	300	1	@	500	500	
Conference Room	1	@	250	250	0	@	0	0	
Career Center	1	@	450	450	1	@	350	350	
Storage	0	@	0	0	1	@	130	130	
Records Room	1	@	200	200	1	@	190	190	
Total				**1,950**				**1,925**	-25
Cafeteria/School Support									
Seating	1	@	7,000	7,000	1	@	6,000	6,000	
Storage	1	@	200	200	1	@	190	190	
Inside Receiving	1	@	160	160	0	@	0	0	
Dry Food Storage	1	@	450	450	1	@	175	175	
Refrigerator Storage	1	@	180	180	1	@	68	68	
Freezer Storage	1	@	250	250	1	@	93	93	
Non-food Storage	1	@	90	90	1	@	30	30	
Food Prep Area	1	@	1,050	1,050	1	@	757	757	
Serving Area (4 lines)	1	@	1,670	1,670	1	@	354	354	
Dishwashing Area	1	@	400	400	1	@	178	178	
Personnel Area	1	@	150	150	1	@	122	122	
Office	1	@	150	150	1	@	88	88	
Total				**11,750**				**8,055**	-3,695
Other School Support									
Instructional Assistants' Offices	0	@	0	0	8	@	144	1,152	
Testing Storage	0	@	0	0	1	@	155	155	
Unutilized Office	0	@	0	0	1	@	128	128	
Total				**0**				**1,435**	1,435
Total Student Services Cluster				**17,890**				**16,151**	-1,739
BUILDING SERVICES									
Staff Lounge									
Lounge Area	1	@	800	800	1	@	644	644	
Rest Rooms	2	@	50	100	2	@	33	66	
Total				**900**				**710**	-190
School Store									
School Store Sales Area	1	@	100	100	1	@	350	350	
Storage Room	1	@	50	50	0	@	0	0	
Total				**150**				**350**	200

FREDERICK HIGH SCHOOL

21 December 2012

COMPARISON OF INSTRUCTIONAL SPACE REQUIREMENTS TO EXISTING SCHOOL

Space	Proposed New School Number of CRs		Size of CR (net Sq ft)	Totals (sq. ft)	Existing School Number of CRs		Avg Size of CR (net Sq ft)	Totals (sq. ft)	Difference
Custodial Services									
Outdoor Storage	1	@	600	600	0	@	0	0	
Custodial Offices	1	@	250	250	0	@	0	0	
Shower/Locker Areas	4	@	75	300	0	@	0	0	
Restrooms	4	@	25	100	0	@	0	0	
Lead custodian office	1	@	120	120	0	@	0	0	
Indoor Central Storage	1	@	500	500	1	@	114	114	
Indoor Satellite Storage	7	@	75	525	6	@	55	330	
Total				**2,395**				**444**	-1,951
Maintenance Services									
Maintenance Office Area	1	@	150	150	1	@	187	187	
Shower/Locker areas	2	@	125	250	1	@	127	127	
Workshop	1	@	800	800	1	@	309	309	
Storage	1	@	400	400	0	@	0	0	
Outdoor Storage Building (separate contract)									
Total				**1,600**				**623**	-977
Total Building Services				**5,045**				**2,127**	-2,918
TOTAL NET SQUARE FEET - WITHOUT POOL				**170,680**				**155,833**	-14,847
Times 1.4 net to gross ratio				1.40				N/A	
TOTAL GROSS SQUARE FEET - WITHOUT POOL				**238,952**				**224,967**	-13,985
SWIMMING POOL									
Swimming Pool Floor Area	1	@	5,025	5,025	1	@	3,750	3,750	
Swimming Pool Decks	1	@	5,175	5,175	1	@	3,596	3,596	
Spectator area - 150 person capacity	1	@	800	800	1	@	725	725	
High School Lockers & Showers - Boys	1	@	500	500	1	@	0	0	
High School Lockers & Showers - Girls	1	@	500	500	1	@	0	0	
High School Toilet - Boys	1	@	150	150	1	@	0	0	
High School Toilet - Girls	1	@	150	150	1	@	0	0	
High School Storage	1	@	300	300	1	@	290	290	
High School Coach Office w/ Toilet	1	@	400	400	1	@	93	93	
Community Lockers & Showers - Men	1	@	500	500	1	@	0	0	
Community Lockers & Showers - Women	1	@	500	500	1	@	0	0	
Community Toilet - Men	1	@	150	150	1	@	0	0	
Community Toilet - Women	1	@	150	150	1	@	0	0	
Community Storage	1	@	300	300	1	@	0	0	
Community Coach Office w/ Toilet	1	@	400	400	1	@	0	0	
Mechanical/Electrical/Pumps/Filtration	1	@	1,000	1,000	1	@	365	365	
				16,000				**8,819**	-7,181
TOTAL NET SQUARE FEET - WITH POOL				**186,680**				**164,652**	-22,028
Times 1.4 net to gross ratio				1.40				N/A	
TOTAL GROSS SQUARE FEET - WITH POOL				**261,352**				**233,816**	-27,536

Summary:

	Proposed New School	Existing School	Difference
Total ELL	**5,825**	**4,500**	**-1,325**
Total Humanities Cluster	**21,325**	**23,012**	**1,687**
Total Science, Math & Technology Cluster	**46,720**	**41,441**	**-5,279**
Total Health & Human Services Cluster	**38,475**	**35,549**	**-2,926**
Total Arts and Communications Cluster	**35,400**	**33,053**	**-2,347**
Total Student Services Cluster	**17,890**	**16,151**	**-1,739**
Total Building Services	**5,045**	**2,127**	**-2,918**
TOTAL NET SQUARE FEET - WITHOUT POOL	**170,680**	**155,833**	**-14,847**
TOTAL GROSS SQUARE FEET - WITHOUT POOL	**238,952**	**224,967**	**-13,985**
TOTAL NET SQUARE FEET - WITH POOL	**186,680**	**164,652**	**-22,028**
TOTAL GROSS SQUARE FEET - WITH POOL	**261,352**	**233,816**	**-27,536**

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APPENDIX D – PROPOSED POOL SPACE REQUIREMENTS

Space	SF	Exist Facility
Eight lane short course pool (Per USA swimming recommendations 25 yards long X 67' wide plus 15' wide decks all around)	10,200	7,346*
Spectator area (3 rows of bleachers – 150 person capacity)	800	725
HS lockers & showers – Boys	500^	^
HS toilets – Boys	150^	^
HS lockers & showers – Girls	500^	^
HS toilets – Girls	150^	^
Community lockers & showers – Men	500	N/A
Community toilets – Men	150	N/A
Community lockers & showers – Women	500	N/A
Community toilets – Women	150	N/A
HS teacher office	400	93
Community office	400	N/A
HS storage	300	300
Community storage	300	N/A
Mechanical/Electrical/Pumps/Filtration	1,000~	365~
Total:	**16,000**	**8,830**

* = The existing pool is 25 yards long and 6 lanes wide however its lanes are 7 feet wide, which is the minimum width for competition use per USA Swimming. The current USA Swimming recommendation is that lanes for high school or higher level competitive swimming are 8 feet wide, minimum. Lanes of less than 8 feet are recommended for youth and practice use. The existing pool also does not meet the recommendation for decks at 15 feet.
^ = The existing pool shares the general physical education locker, shower, and toilet facilities and does not have dedicated rooms for these functions. These spaces could be provided or omitted for a new pool depending on its proximity to the main athletic department locker and toilet rooms.
~ = The existing pool is heated by boilers in a general remote mechanical room not included in this square footage. The recommendation for a new pool is that it is mechanically independent from the balance of the facility, so a new pool mechanical room would need to be larger than the existing to accommodate dedicated boilers. There is also usually a tunnel system under the deck to provide access to piping and/or a lower level equipment space for pumps, balance tanks, etc that have to be in a flooded condition. Those spaces are excluded from the new 1,000 SF number. Also excluded are the air handling and pool dehumidification units that would typically be roof mounted.

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APPENDIX E – MANAGEMENT PLAN FOR THE ENGLISH ELM

The *Management Plan for the English Elm* prepared by Bartlett Tree Experts in 2008 begins on page 143.

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Management Plan for the English Elm
At Frederick High School, Frederick MD

Prepared by

Bartlett Tree Experts
Daniel Yates
ISA Certified Arborist #PD-1514A
MD Licensed Tree Expert #001618

Introduction

Thank you, for giving me the opportunity to evaluate and make recommendations for the care of the remarkable elm tree at Frederick High School. Over the past several weeks I've stopped by to examine the tree at the request of Tom Rippeon (the City Arborist for Frederick) after he was approached by members of your club. I share yours and Tom's enthusiasm for this tree whole-heartedly and am glad to hear that you have taken the initiative to look out for its future. As an arborist I have been in awe of it since I moved into the area 3 years ago, but its is also badly in need of care, and in jeopardy of declining or suffering irreparable damage if it is not administered soon.

It is surely a staggeringly beautiful tree, and one of the largest of its kind, but its canopy covers and overhangs an extremely high use area with great risk to the people underneath it because of defects and injuries. Below, I've outlined the program and included photographs and supporting research and information on the tree and on mature trees in general, and following the recommendations I've included a program cost sheet that outlines the costs over the next 3 years. There is flexibility in the performance of some of the program, but the pruning, cabling, and lightning protection should be considered top priorities due to their immediate effect on the safety of the children, faculty, staff, and parents that regularly congregate under the tree.

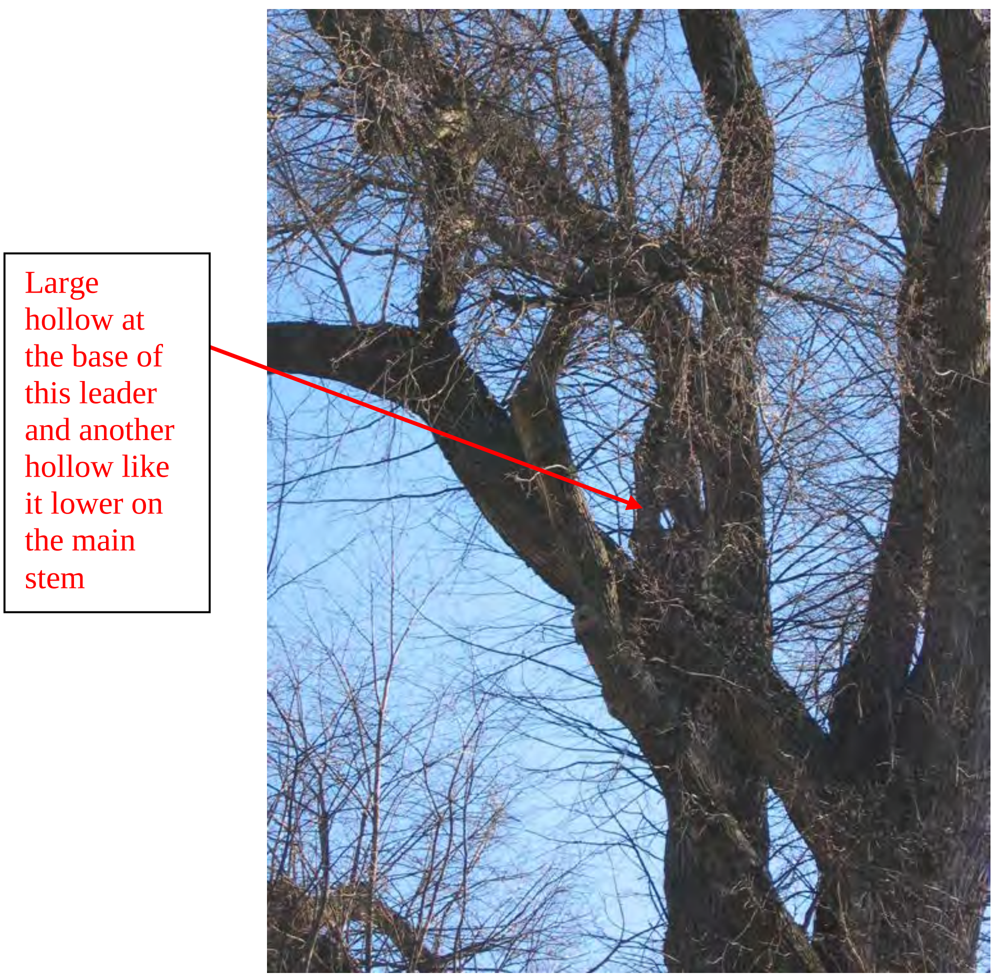
Dan Yates
Bartlett Tree Experts
ISA Certified Arborist
MD Licensed Tree Expert

Contents

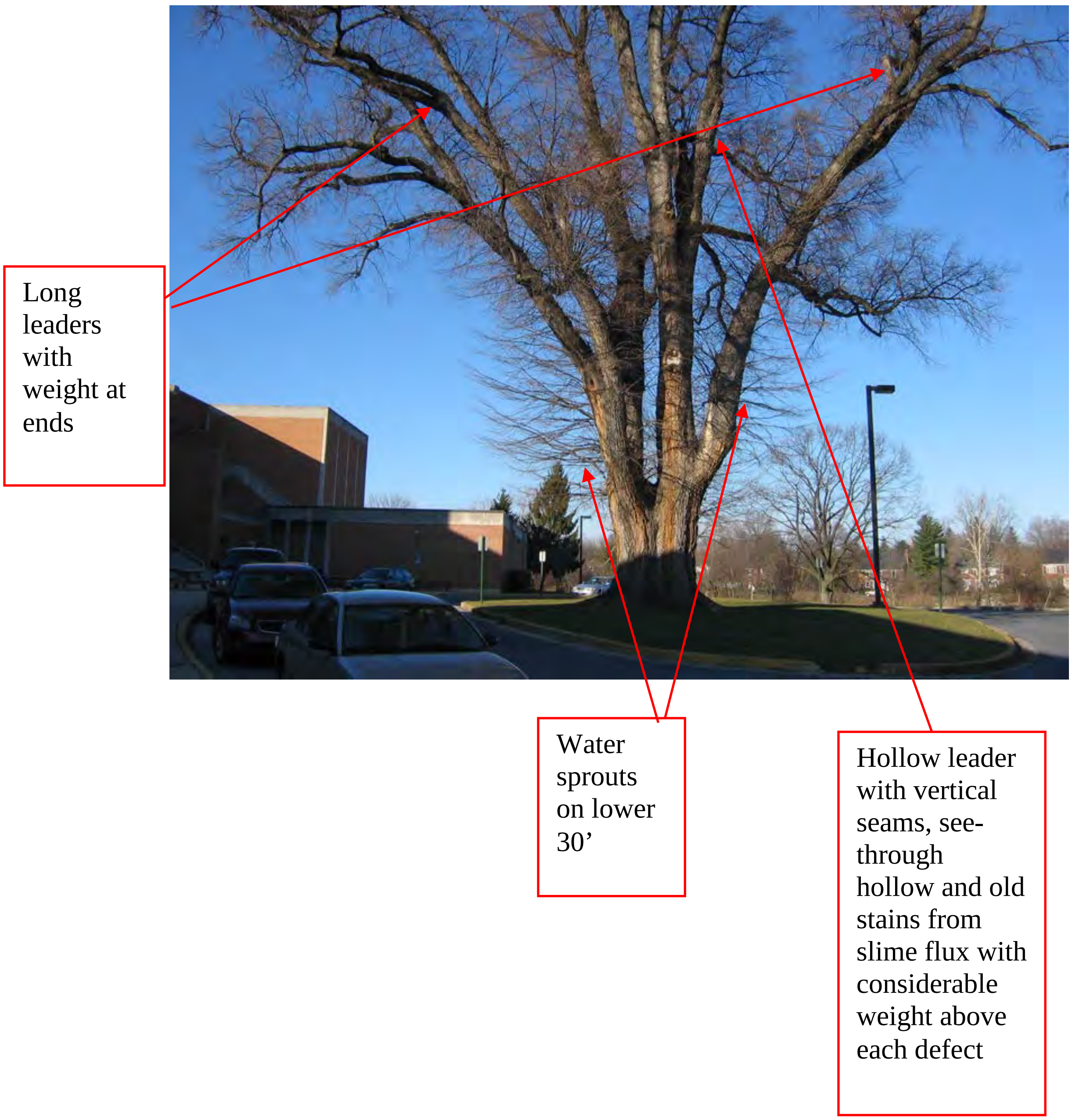
Outline of Program

I have included documents from our research laboratory regarding the recommended schedule of care for the English Elm tree through an average year, as well as explanations and descriptions of the items in this outline.

1. ***Tree Structure Evaluation*** – There are several large leaders (trunks) in the elm with areas of weakness visible from the ground. These include large open hollows on the main trunk, the leader growing out away from the building but over the circle drive, wind-throw seams running vertically on high, stress-loaded limbs, and visible stains from slime flux where possible cavities may exist. Evaluation by climbers and/or bucket operators will need to be performed prior to any other work being completed to ensure the scope of work will reduce risk as much as possible, and to ensure the scope of work is comprehensive of the tree's and the school's needs.



2. ***Pruning –*** This winter, all of the dead, broken, and damaged branches should be removed to reduce the risk of injury or death to the children, parents, and faculty and staff below it, as well as any property damage that could be incurred from falling limbs. Very selective thinning should be done to reduce the risk of long lateral limbs breaking by reducing the weight of the branch ends, especially to weakened limbs and leaders such as the hollow leader that can be seen through from the ground. While there, selective removal of the low water sprouts on the bottom 20’ of the trunk should also be removed



3. ***Cabling –*** From my initial inspection from the ground I can see at least 5 limbs or leaders in the tree that should be cabled to add mechanical support to the overall crown. Cables do not prevent limbs from breaking, but they reduce the stress on weak connections by allowing the tree to move more as one great body than as separate spars under differing loads, and they can help control or hold limbs that do break out of the tree, reducing the risk of their striking the ground. They need to be installed approximately 2/3rds of the distance above the weak connection to the tip of the branch/limb/leader. The initial inspection will clarify the positions and number of cables necessary to provide support. (see Cabling and Bracing technical report)

4. ***Lighting Protection –***The elm had lightning protection installed previously, but the system has fallen into disrepair and is potentially dangerous in its present condition. The conductor has metal wire coiled around it, frayed strands, and is lying against the trunk, making side flashing a dangerous possibility. Lightning protection has to be connected to cabling systems to prevent further side-flashing, and so should be done after the cabling. (see Lightning Protection)

   The image shows the ground entry of one of the two systems – it has no connectors for at least 25', and ANSI standards require spacing of no more than 6', the lines are kinked, frayed, and lying against the trunk – reconnecting the conduction into the tree. Any sharp bends, frays, or contact can interrupt the flow of current and result in side flashing.

5. ***Dutch Elm Disease*** **–** *Ceratocystis ulmi* – one of the most destructive and pervasive diseases of elms in North America, DED is responsible for the death of millions of elms in the US and Europe. Introduced in the United States around the 1930's by elm bark beetles and human elm transportation. Control of the disease requires removal of infected tissue and dead elm trees killed by the disease that become vectors for the bark beetles to spread to healthy trees. Treating trees for European and native elm bark beetles requires bark sprays. The best measure for key elm trees is the administration of one of two trunk injections, either preventatively or as a control measure once the disease has been introduced. Preventative control with Arbotect is done every two years, but is not effective for treating the disease once introduced. Alamo (propiconazole) is the best product for therapeutic treatment and can be injected annually.

6. ***Nutrient Management*** **–** A sample of the soil will be sent to our laboratory in Charlotte, NC for nutrient analysis. Based on the results of that analysis, they will return recommendations for fertilization, soil conditioning, the addition of organic material, pH adjustments, and correcting micronutrient deficiencies. The tree would be treated bi-annually according to their specifications. (see Managing Mature Trees)

7. ***Mulching and Protection*** – The area surrounding the base of the elm is a very sensitive region of a tree. The majority of fine feeder roots (those responsible for most of the tree's water and nutrient uptake) are found in the region 80% of the distance from the trunk to the edge of the canopy (dripline), in the upper 8-10" of the soil. Turf is highly competitive with tree roots for water and nutrients, and both require very different cultures to thrive. In addition, factors like the compression of soil from foot traffic can make the region less porous for both water and air movement – critical for tree health. As the school does a lot of leaf removal, they are inadvertently removing a great source of natural nitrogen the tree would normally reclaim in a wooded setting. The easiest and most effective measure that can be taken to help the tree retain moisture, return nitrogen, and reduce compaction in the root zone is mulching to a depth of 3-4". Beginning feathered around the root collar and we suggest the entire area that is now under grass. In addition to the mulching, a low ornamental fence could circle the area to reduce the amount of foot traffic and discourage tampering with the lightning protection system.

English Elm (*Ulmus procera*)

There is some controversy surrounding the true nature of the English elm – whether or not it is a true species or the hybridization of two other established elms. Your particular tree sparked controversy and generated arguments among several notable horticulturists, arborists, and researchers. This merely illustrates the difficulty of identifying elm trees. I have sent several samples and pictures to our laboratory in Charlotte, NC, to the curator of our arboretum for confirmation.

Arguments were posed that the tree was actually *Ulmus rubra*, otherwise known as red elm, or slippery elm, but the size and lack of mucilaginous bark or raised lenticels would seem to disqualify that characterization. Michael Dirr suggests the possible hybridization of *Ulmus glabra* – Scotch elm, and *Ulmus carpinifolia* – smoothleafed elm. Certainly size and bark characteristics are similar, but distinguishing the leaves and reproductive parts should also rule out either. The main reason for concern about exact species is that Arbotect, one of the key preventative products for Dutch Elm Disease is phytotoxic to Ulmus rubra, so if ther is the remotest chance the tree is Ulmus rubra, Alamo should be used instead, which is what we are recommending.

Hardy to Zone 4, the tree prefers rich, loamy soils, but can tolerate a variety of soil types effectively, as well as varying soil moisture, pH, and tolerates salt. It can regularly grow to 70-90', with larger specimens abundant. The crown shape is generally umbrella like, or with protruding pillars of leads exploding out of the general crown. Its root zone is massive, dense, and vigorous.

Generally, elms as a species have had a rough go, falling prey to Dutch Elm Disease, elm bark beetles, elm yellows, and various cankers. But anyone in Minneapolis, MN can tell you that parallel lined streets filled with elms provide an elegant shade cover and stunning vista like the inside of a large gothic cathedral.

Schedule of Care

The outlined work would not all need to be completed at once. The following schedule is based on the best times of year for the health of the tree, timing of diseases and insects, and anticipation of Winter and Spring storms.

Winter

- Soil sampling for nutrient analysis
- Pruning for dead wood, broken limbs, and thinning to reduce weight
- Installation of cabling for mechanical support of weak limbs and connections
- Installation of lightning protection

Spring

- Trunk injection with Alamo for prevention of Dutch Elm Disease (DED)
- Fertilization
- Mulching
- Inspect tree for bark beetle activity

Summer and Fall

- Treatments of trunk for elm bark beetle
- Bulk density analysis of soil to measure compression
- If results of bulk density indicate compressed soil in the root zone, consideration of root invigoration (aeration)

Annually

- Inspection of tree for bark beetles, and other pest and disease issues
- Fertilization to keep optimal soil nutrient levels
- Inspection for hazardous conditions
- Tilling and top dressing of old mulch to encourage breakdown and prevention of fungus matting

Five Years

- Maintenance pruning to remove dead branches/limbs
- Inspection of cables and lightning protection systems

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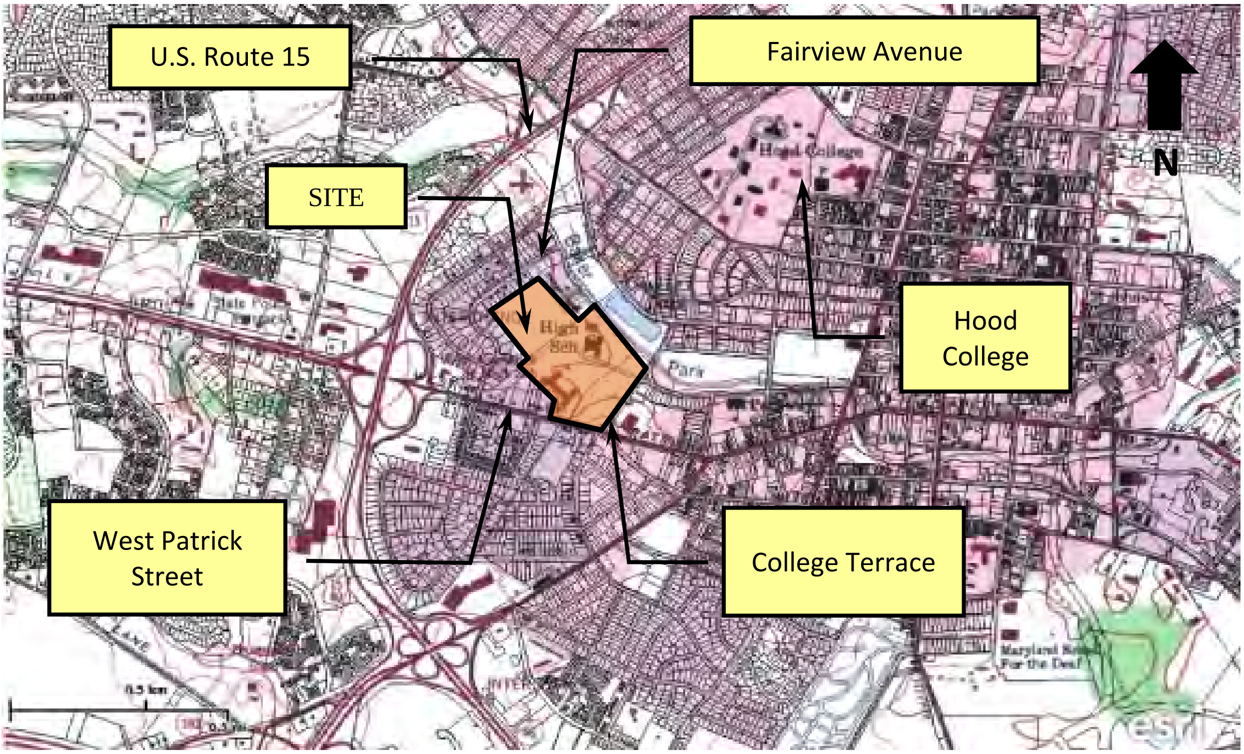
APPENDIX F – MARYLAND HISTORICAL TRUST SUBMISSION & REVIEW



Frederick High School is a three story masonry building of 234,105 GSF located on Carroll Parkway in Frederick, Maryland. The institution reportedly dates to 1923, when the Frederick boys' and girls' high schools merged to form Frederick High School. The school relocated to the current site in 1939, when the earliest portion of the existing facility, an "H"-shaped, three story building, opened. In 1955, a one-story satellite building was constructed 95 feet to the north of the 1939 building. The facility originally housed additional classroom space as well as a large vocational agriculture workshop. A small addition was constructed off of the ground floor cafeteria kitchen in 1961. Further additions and renovations were completed in 1966, with single story additions for a lecture room and expanded athletic locker facilities on the southeast corner of the 1939 building as well as an addition to the east side of the 1955 satellite containing a sheet metal shop and graphic arts classroom.

The most significant changes to the facility came in 1977 through 1980 when a multi-phased addition and renovation project brought about the building form, spatial organization, and site layout that largely still exist as of the writing of this report. Three sizable additions were constructed in three phases. On the north and west sides of the 1939 building, a two story addition was part of the first phase. It obscured much of that building's north and west exterior facades filled the previously open space between the 1939 and 1955/1966 buildings. It contained administrative spaces, classrooms, art and music rooms, back of house spaces for the 1939 auditorium, and a new media center. The second phase was an L-shaped single-story addition to the north and west sides of the 1955/1966 satellite. The phase I and II additions encircled almost all of the satellite building except a portion of the 1966 addition's east facade. This addition contained vocational shops, a commercial-style teaching kitchen, and a greenhouse. The third phase of the project involved an athletic

complex addition on the south end of the 1939 building, with a new gymnasium, swimming pool, team rooms, locker rooms, and other support spaces.

Most of the existing finishes in the school date to the late 1970s – early 1980s. The majority of the original finishes in the older sections of the school were replaced or obscured at that time, although there are a few finishes such as terrazzo floors and portions of marble toilet partitions that likely date to 1939.

As it currently exists, the facility does not provide an optimum teaching and learning environment for the students of Frederick County as it does not meet the current Educational Specifications requirements for a standard Maryland high school in several categories of program and area. This feasibility study was commissioned to assist Frederick County Public Schools (FCPS) in assessing options to improve Frederick High School's facility to meet the approved Educational Specifications. Options being evaluated include renovation and modernization of the existing building, partial demolition of the existing building with new additions, and full demolition of the existing building with complete replacement by a new building.

Funding for the feasibility study is being provided by the Maryland State Department of Education (MSDE) Public Schools Construction Program (PCSP) and the expectation is that funding for implementation of the study's recommendations will be provided by PCSP as well.

MDP

PROJECT REVIEW FORM

Request for Comments from the Maryland Historical Trust/ MDSHPO on State and Federal Undertakings

MHT USE ONLY
Date Received: 9/4/12 S PSCP JES Log Number: 201204380

Submit hard copy of form and all attachments to:
Beth Cole, MHT, 100 Community Place, Crownsville, MD 21032

Print Form

Section A: General Project Information

Project Name: Frederick High School Renovation County: Frederick

[X] This is a new submittal **OR** This is additional information related Project Log Number:

Section B: Primary Contact Information

Contact Name: Bryan Fisher Company/Agency: GWWO, Inc./Architects
Mailing Address: 800 Wyman Park Drive, Suite 300
City: Baltimore State: Maryland Zip: 21211
Email: bfisher@gwwoinc.com Phone Number: +1 (410) 332-1009 Ext.

Section C: Description of Undertaking

Location - Attach a map, preferably a section of a USGS quad, showing the location and boundaries of the project

Address: 650 Carroll Parkway City/Vicinity: Frederick

List all federal and state agencies / programs (funding, permits, licenses) involved in this project (e.g. Bond Bill ...n of 2009, Chapter #; Transportation Enhancement Grant; HUD/CDBG; MDE/COE permit; etc.)	Agency Type	Agency/Program/Permit Name	Project/Permit/Tracking Number (if applicable)
	State	MD State Dept of Education	

Received
SEP 11 2012
GWWO, Inc.

Proposed Work - Attach project description, scope of work, site plans / drawings

This project includes (check all applicable): [X] **New Construction** [X] **Demolition** [X] **Remodeling/Rehabilitation**

This project involves: [ ] **State or Federal Rehabilitation Tax Credits**
[ ] **Properties subject to an easement held by MHT, MET, or another entity**

Section D: Identification of Historic Properties

This project involves: [ ] **Properties designated as historic by a local government, listed in the National Register, or included in Maryland Inventory of Historic Properties**

Property/District Name:

The subject property [ ] **has** [X] **has not** been the subject of previous archeological, architectural, or historical investigations.

Please describe:

Attachments [X] **Map** [X] **Project Description/Scope of Work** [ ] **Site Plans/Drawings**

[X] **Photographs** - Attach prints or digital photographs showing the project site including images of **all** buildings and structures, preferably keyed to a site plan

[X] **Conditions** - Attach a brief description of past and present conditions of the project area (wooded, mined, developed, agricultural uses, etc) including construction dates of buildings, if known.

...T Determination MHT Reviewer: Jonathan Sager Date: 9/7/12

[X] There are **NO HISTORIC PROPERTIES** in the area of potential effect
[ ] The project will have **NO EFFECT** on historic properties
[ ] The project will have **NO ADVERSE EFFECT** on historic properties
[ ] The project will have **NO ADVERSE EFFECT WITH CONDITIONS**
[ ] **MHT REQUESTS ADDITIONAL INFORMATION**
[ ] The project will have **ADVERSE EFFECTS** on historic properties

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APPENDIX G – COMMUNITY ENGAGEMENT

Development of Engagement Program

During July 2012, Frederick County Public Schools (FCPS) prepared a community engagement program that would be carried out during the feasibility study phase of the Frederick High School (FHS) renovation/modernization project. The purpose of this program was two-fold:

1) Provide stakeholders with detailed information and regular updates, and
2) Provide stakeholders with several mechanisms to ask questions, share concerns and provide comments and input into the decision-making process.

Methods of Outreach

Traditional mechanisms as well as social media were used to start discussions and gather feedback.

Traditional Outreach Mechanisms

1) Web Pages: Dedicated Web pages with a friendly URL (www.fcps.org/FHSRenovation) provided FHS renovation/modernization project background, the project timeline, answers to frequently asked questions, a calendar of events and direct access to social media sites.

2) Print Media: Since July 2012, Communication Services office has issued five project-related news releases:
   a. 7/9/2012, *Planning Begins for Frederick High Renovation*
   b. 8/8/2012, *Frederick High Feasibility Study: Informational Meetings Scheduled*
   c. 11/1/2012, *A Chance to Compare the Old and New: Tours Set for Frederick and Tuscarora Highs – Community Meetings Planned*
   d. 11/13/2012, *Public Input Sought – Frederick High Feasibility Study Produces Potential Options*
   e. 12/11/2012, *FCPS Opens Survey on FHS Renovation/Modernization Options*

   All news releases were posted on the FCPS Web site and were accompanied by a FindOutFirst (FOF) message[1].

3) E-mail: As new information became available, e-mails providing details were sent to key communicators to share with their respective communities. Key communicators included the FHS principal and PTSA president, FHS feeder school principals and PTSA/PTA presidents, FHS Alumni Association president, Neighborhood Advisory Council (NAC) 9 organizers, and Friends of Baker Park.

   A dedicated e-mail account, FHSRenovation@fcps.org, was set up specifically for community members to ask questions and provide input. Questions were answered by the FCPS Facilities Planner.

   From the start of the feasibility study through October 14, FCPS received 81 e-mails: 71 expressed concern over maintaining and/or improving the pool facilities.

[1] Recipients of the FindOutFirst messages were individuals who subscribed to receive information about news releases or news about FHS or one of its feeder schools.

Additional correspondence, both electronic and handwritten, was received. In addition to support for retaining the pool, overriding themes included maintaining the historical features of the building (brickwork, staircase, Palladian window), fixing the "open classroom" situation, renovating/modernizing the auditorium and science labs, and provide for better lighting.

Subsequent to the first presentation of the six potential options on October 15, FCPS received 75 e-mails: 43 supported one of the options that involved new construction on a new footprint while 12 advocated for Options 1, 2 or 3. Those who supported new construction on a different footprint cited that staff/students could remain together in the current building during construction which would have the least disruption for students, cost, concern that the renovated building would not meet educational specifications, and that site issues such as parking and circulation would not be addressed. Those advocating for Options 1, 2 or 3 expressed concern about the location of a new building relative to Kline Avenue residences and impact on the community, potential decrease in home property values due to new location, and maintaining the historical facade.

4) Meetings: Facilities Services and Communication Services representatives attended 16 community meetings. Ten meetings were held during the initial phase of the project and prior to the committee developing initial options. These meetings introduced the project to the community and gathered initial community comments. Six additional meetings were held following the committee's initial development of options to gauge community concerns. There were general community meetings and meetings with 9 specific interest groups[2]. GWWO architect Paul Hume attended the general community meetings and one meeting with the NAC-9 group. In addition, the steering committee meetings were open to the public and public comment was received at the end of each meeting. The community comments were considered by the committee in developing the final report and recommendations.

Overriding themes expressed during the first 10 meetings were: keep the pool, do not open Mercer Place for property access, preserve/incorporate the east facade of the building, preserve the English elm tree, keep or preserve the Heritage Room/senior walls, and the final product should be the flagship high school in Frederick County. The community questioned whether the athletic fields and concession stand were included in the project. Finally, several community members expressed a desire to participate in the work of the feasibility study steering committee.[3]

During the final six meetings, a detailed presentation of the options was provided and questions were answered. Questions were asked about what was included in the cost projection, where would students and staff be housed in each option, how large will the building be in each option, how does each option affect parking and traffic circulation, will athletic fields be included, will the school system request new access points for the property, and what's next in the process. Overriding concerns expressed were that community members who reside adjacent to the property did not want the school's footprint moved closer to Kline Avenue, and parents and staff were not happy that students would have to be relocated for options 2 and 3, and if relocated,

[2] FHS Alumni Association, FHS Back-to-School Night, FHS Faculty Meeting, FHS PTSA Meeting, NAC9, Parkway Elementary PTA Meeting, Whittier Elementary PTA Meeting

[3] In response to community members' request, FCPS announced on September 10, 2012 that committee work sessions were open to the public and that public comment would take place at the end of each meeting.

that they might be split between multiple locations. They were also uncomfortable that a location would not be determined prior to the recommendation of an option.

5) Survey Results: Community members were asked to participate in two online surveys. The FCPS Research & Accountability Department aided in the design and implementation of the survey.

   The first survey was available from September 6-19, 2012 and asked general questions such as what building and site issues would community members like addressed through the renovation/modernization project. Noteworthy statistics:

   a) 763 respondents: community members (40%), current or future FHS parents (32%), alumni (11%), FHS staff members (5%), current students (4%), other (9%)
   b) 24% of the respondents live within 1 mile of the school's campus.
   c) 70% of the respondents attend events at the school.
   d) Participants were asked to rate the following factors for developing options for Frederick High School on a scale of 1 (not important) to 10 (extremely important).
      - 75.5% rated *Educational program* a 10 (6 or greater: 98%)
      - 20.2% rated *Cost of construction* a 10 (6 or greater: 75%)
      - 23.5 % rated *Length of construction time* a 10 (6 or greater: 76%)
      - 68.7 % rated *Maintain a rigorous academic program during renovation/construction* a 10 (6 or greater: 97%)
      - 28.4% rated *Unique features of the building and property* a 10 (6 or greater: 75%)
      - 25.0% rated *Frederick High's historic significance* a 10 (6 or greater 69%)
      - 43.4% rated *Physical condition of the existing building* a 10 (6 or greater: 85%)
   e) 441 responded to the open-ended question asking what building issues should be addressed during the renovation/moderation project.
      - 32% and 35% want crowded/narrow/unsafe/dark stairwells and hallways, respectively addressed.
      - 20% want the lack of natural lighting addressed.
      - 16% want the lack of permanent/solid walls due to open classroom design addressed.
      - 23% want the pool maintained and/or upgraded.

      Several respondents also mentioned mold, temperature control problems, poor ventilation, the outdated facility for educational program, auditorium, restrooms/locker rooms, and the cafeteria.
   f) General site issues that respondents want addressed are traffic flow/circulation and lack of parking. Specific site issues that respondents would like addressed are clear indication of which is the main entrance, lack of traffic flow signs, not enough stadium, auditorium, pool and visitor/short-term parking, pedestrian crossing areas, separate parking for staff and students, and traffic flow issues created by West Frederick traffic flow cones. Several respondents commented that they do not want Mercer Place opened for property access and want illegal parking on yellow curbs addressed. One respondent recommended planting a 30-foot buffer of at least 12-foot trees between any structures, roads, parking and sports announcing machines or field lights and the neighboring back yards of Kline Boulevard and Carroll Parkway.
   g) Respondents want to see the brick façade, Palladian window, staircase, elm tree, Terrazzo tile and the pool preserved. One individual suggested replicating the Heritage room and renaming it the 1939 room in honor of the original building.

The second survey was available from December 11-17, 2012 and requested feedback on the options as presented. Noteworthy statistics:

a) 434 respondents: current or future FHS parents (29.7%), community members (23%), other (26%), FHS staff members (9%), current students (7.4%), alumni (4.8%)
b) 33.2% of the respondents live within 1 mile of the school's campus.
c) 37.3% attended a meeting that provided a detailed overview of the potential options.
d) Respondents were asked to select the two options that are most conducive to or best suited to meet the following criteria (top two options per criterion with percentage):
   - The learning environment during renovation/construction: 69.9%-Option 6, 64.7% Option 5
   - The ability to meet educational programs upon completion of the renovation/construction: 69.1% - Option 6, 63.6% Option 5
   - Length of time for renovation/construction: 74.1%-Option 6, 55.5%-Option 5
   - Location of students during renovation/construction: 72.9%-Option 6, 63%-Option 5
   - Location of school relative to adjoining properties: 56.8%-Option 5, 53.4%-Option 6
   - Location of school relative to the middle school: Option 6-53.1%, Option 5-52.4%
   - Location of the school relative to the athletic fields: Option 6-61.5%, Option 5-57.7%
   - Parking: Option 6-68%, Option 5-59%
   - Circulation of traffic on the property: Option 6-69.3%, Option 5-58.7%
   - Cost of the project: Option 6-74.5%, Option 5-61%
e) The percentage of respondents who felt that the options as presented were viable for moving forward:
   - Option 1 – 11.8%
   - Option 2 – 5.5%
   - Option 3 – 22.8%
   - Option 4 – 22.8%
   - Option 5 – 48.6%
   - Option 6 – 48.6%

<u>Social Media</u>

1) Facebook: As of 12/18, 213 individuals have *liked* the FHS Renovation page. The total reach to date is 52,839 (meaning that information about the FHS renovation/modernization project appeared on the Facebook pages of 52,839 people). FCPS posted conversation starters and calendar information to the site. Most public comments focused on the pool, the historic façade and advocacy necessary to keep the project moving forward in the capital budget.
2) Twitter: As of 12/18, the FHS Renovation has 77 followers and tweeted 75 times. Most tweets were retweeted via the main FCPS Twitter account which has 1,985 followers.
3) YouTube: FCPS TV segments, *FHS Renovation: Share Your Stuff* and *FHS Renovation: Join the Conversation*, were viewed 2,432 and 356 times respectively. A narrated video of the 6 options, *FHS Renovation - Options for Moving Forward*, was viewed 905 times. Short video clips of classroom damage following rain were posted.
4) Flickr: FCPS TV shared 11 photos of FHS to start the conversation and additional photos were added from the community meetings. The photo stream has 18 items and 139 views.

<u>Tours</u>: Community members expressed an interest in visiting FHS and one of FCPS' newer high schools. On November 7 from 4-6 PM, the public was invited to visit FHS and Tuscarora High, which opened in 2003. Student ambassadors were available to show guests through the buildings, highlighting the cafeterias, gymnasiums, auditoriums, classrooms and offices.

APPENDIX H – SUSTAINABLE DESIGN

Replacement options will be registered with the US Green Building Council as a LEED project and will pursue LEED Silver certification (within the range of 50-59 total points). The design will incorporate sustainable techniques and materials. The following outlined categories follow the divisions of the LEED for Schools rating system and possible points to achieve.

1. Sustainable Sites

Integrating building location and sustainable site features will minimize the environmental impact of buildings on the site. Potential Strategies include:

a. Minimize site disruption, soil erosion, and air pollution associated with construction activities.
b. Appropriate landscaping for energy conservation.
c. Planting native trees species.
d. Eliminate the use of pesticides in order to promote protection of regional watersheds
e. Examining alternative energy systems such as photovoltaic panels for potential use as pedestrian walkway shading and weather protection devices in addition to or instead of roof mounted.
f. No "light pollution" since exterior lighting is installed at a minimum (for safety requirements) to allow for view of night sky.
g. High albedo roofing to reduce heat island effect.
h. Low-emitting and fuel efficient vehicle parking spots.

2. Water Efficiency

Water harvesting and water conservation are to be implemented. Potential Strategies include:

a. Reduce the need for municipally supplied water and carbon cost of treating that water.
b. Maximize water conservation – students, staff, and community can learn about these features – educational tool.
    i. Eliminate the use of potable water for irrigation.
    ii. Low flush toilet fixtures
    iii. Low flow aerators for sink faucets
    iv. Low flow shower heads
    v. Recycled water for mechanical system recharge
    vi. Recycle mechanical system condensate.
c. Manage and conserve storm water and reduce storm water runoff
    i. Harvesting rainwater for many uses including irrigation.
    ii. Designing pervious parking lots and paved surfaces to capture storm water below paved areas instead of as runoff
    iii. Using retention and detention ponds as educational tools

3. Energy and Atmosphere

Reduce energy consumption of buildings. Potential Strategies include:

a. Computer energy modeling used to inform the design of the building. Annual energy savings and yearly operating cost reduction goal should be a minimum of 30% over the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) Standard 90.1
b. The building should be zoned and controlled in a way specific to occupancy and use profiles. These systems will recognize the mass and building characteristics of the building as well as control logic designed to maximize the return on investment.
c. All building system components selected will be free of chlorofluorocarbons (CFCs) and hydro chlorofluorocarbons (HCFCs).
d. Daylighting should be present in all classrooms and spaces that are regularly occupied by students along with intelligent controls of electric lighting that recognize the amount of useful daylight present in each space.
e. Natural ventilation should be used where possible.
f. Mechanical ventilation should be decoupled from space conditioning to ensure fresh air and energy recovery independent of space conditioning requirements.
g. The project should incorporate full enhanced building system commissioning to insure that the design intent will be met.

4. Materials and Resources

Sustainable material choices will reduce use of virgin materials within the building. Potential Strategies:

a. Storage and collection of recyclable materials within the school.
b. Divert a minimum of 75% of the materials during demolition and construction from the landfills through recycling or salvaging.
c. Using new construction materials that have a significant percentage of recycled content.
d. Using materials that are harvested, extracted, and manufactured within a 500 mile radius of the project site
e. All wood products used on the project are Forest Stewardship Council (FSC) certified products.

5. Indoor Environmental Quality (IEQ)

Reducing levels of contaminants, increasing filtered outside air and ventilation, and monitoring humidity all contribute to a more desirable indoor air quality. Potential strategies include:

a. Smoke free school zone.
b. Classroom spaces will meet a certain STC rating for acoustics - increased insulation, seals and special acoustic ceiling tiles for better communication between teachers and students.
c. Low emitting materials including adhesives & sealants, paints & coatings, flooring systems, agrifiber products, furniture, and ceiling & wall systems.

d. Appropriate ventilation and elimination of chemicals and pollutants such as copy machines and tracked-in dirt from the exterior.
e. Use outdoor spaces as instructional areas giving students the opportunity for fresh air during the day.
f. Carbon dioxide (CO2) monitors that inform the building controls to insure adequate amounts of ventilation where and when needed.
g. Designing electric lights to take advantage of natural light in spaces.
h. A mold free environment.
i. The building additions and renovations or new construction implementing the use of daylight and views throughout.
j. Individual temperature regulation of rooms to provide adequate comfort for all occupants.

6. Innovation in Design

Incorporating innovative techniques that are unique to SPHS and setting a precedent for other LEED school projects in the future. One potential example of an innovation credit for this project would be:

a. Green housekeeping plan for the school – use of non-toxic cleaning and maintenance products and environmentally friendly practices.

7. Regional Priority

Frederick and surrounding Frederick County areas potentially have materials or regional differences that could result in achieving specific Regional Priority credits. More research will be done to determine what sets the area apart and where we could achieve these additional credits.

8. The school as a teaching tool

The school building can be used and incorporated as part of the school day curriculum. Students will take part in recognizing how the building works and why the various sustainable features of the building are important for understanding the larger built environment.

End of Frederick High School Feasibility Study Report.