THE HIGH SCHOOL PROJECT

T.C. WILLIAMS: MINNIE HOWARD CAMPUS REDEVELOPMENT

CONCEPT DESIGN: FINAL SUBMISSION 5

MARCH 26, 2021

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TABLE OF CONTENTS

EXECUTIVE SUMMARY 5

TAB 1: CREATIVE ANALYSIS

1.1 ENGAGEMENT 10
1.2 PROGRAM / ED SPEC SUMMARY 19
1.3 ZONING 22
1.4 SITE ANALYSIS 24

TAB 2: DESIGN CONCEPTS

2.1 CONCEPT CONSIDERATIONS 38
2.2 CONCEPT SUMMARY 42
2.3 CONCEPT 1 - HAND SCHEME 45
2.4 CONCEPT 2 - CRESCENT SCHEME 55
2.5 CONCEPT 3 - PINWHEEL SCHEME 65
2.6 COMPARISON MATRIX 76

TAB 3: CONCEPTS ANALYSIS

3.1 CONSTRUCTION PHASING PLAN 81
3.2 TRAFFIC & PARKING ANALYSIS 82
3.3 ALEXANDRIA GREEN BUILDING POLICY & NET ZERO ENERGY ANALYSIS 85
3.4 STORMWATER MANAGEMENT ANALYSIS 92
3.5 UNIVERSAL DESIGN AND ACCESSIBILITY FEATURES 94
3.6 LIFE SAFETY BUILDING CODE ANALYSIS 95

TAB 4: SITE INFORMATION

4.1 SITE SURVEYS 110
4.2 ARCHAEOLOGY 113

TAB 5: BUILDING SYSTEMS

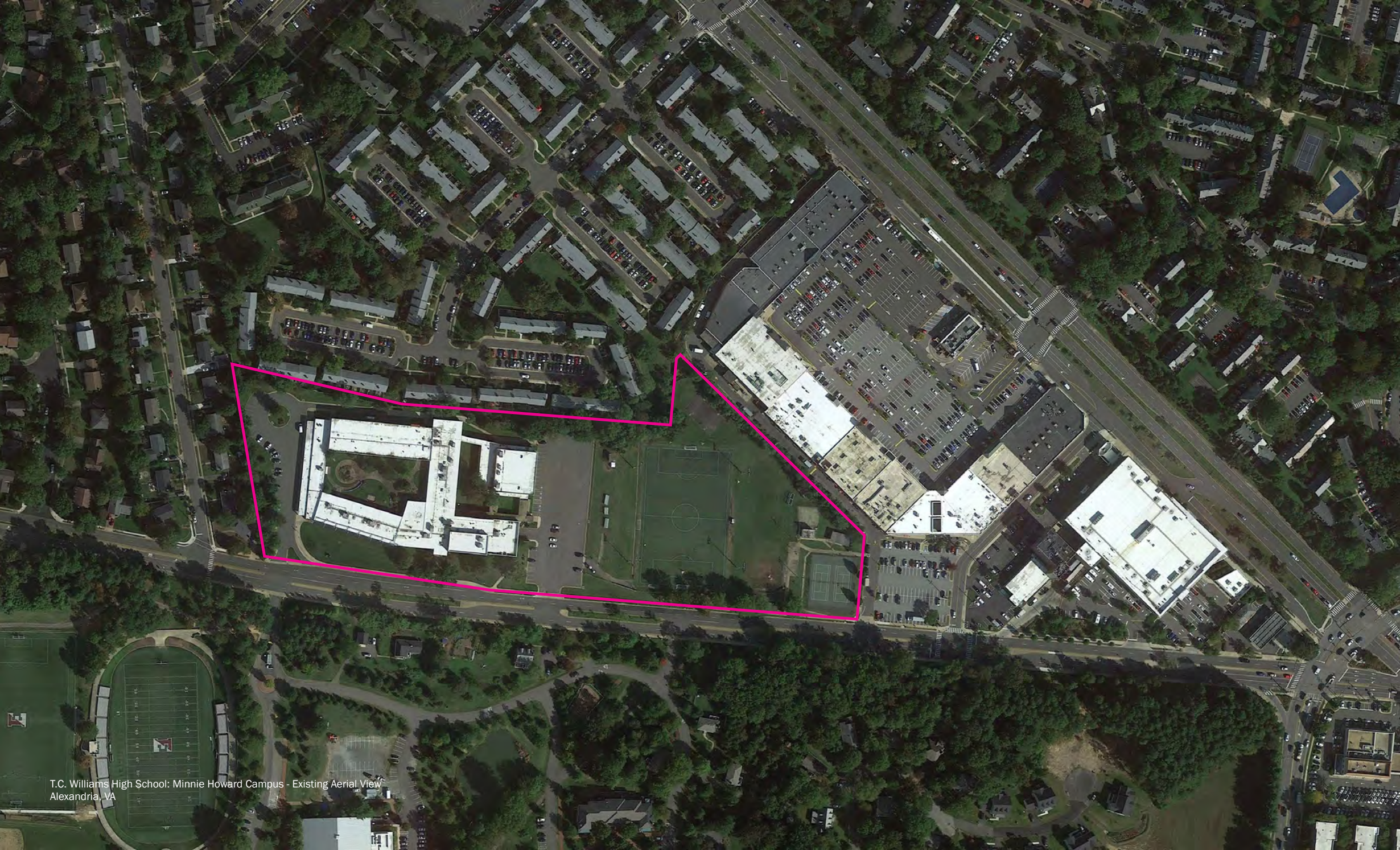
5.1 MECHANICAL SYSTEMS 118
5.2 PLUMBING AND FIRE PROTECTION SYSTEMS (INCL. HYDRANT FLOW TEST) 126
5.3 ELECTRICAL SYSTEMS 132
5.4 AV/IT/ SECURITY SYSTEMS 136
5.5 STRUCTURAL SYSTEMS 138
5.6 ACOUSTICAL DESIGN 140
5.7 AQUATIC DESIGN 146

TAB 6: PROJECT EXECUTION

6.1 PROJECT BUDGET & ESTIMATING DECISION TOOL 150
6.2 CONCEPT COST ESTIMATES 156
6.3 PROJECT SCHEDULE 162

TAB 7: APPENDIX

7.1 SPACE PROGRAM TABLE 168
7.2 ACOUSTIC CODE DETAILS 181
7.3 T.C. WILLIAMS' ATHLETIC PROGRAMS 189
7.4 ARCHAEOLOGICAL STUDY 190
7.5 MEETINGS 195



T.C. Williams High School: Minnie Howard Campus - Existing Aerial View
Alexandria, VA

EXECUTIVE SUMMARY

PURSUING EQUITY FOR ALL

The design and redevelopment of the new Minnie Howard Campus, as part of the Connected High School Network (CHSN), will play a vital and exciting role in the realization of the innovative vision that has been created for the ACPS High School Project. With the combined goals of rethinking the way that ACPS delivers its high school education, solving space issues that come with its growing student body, and supporting the core values of “Welcome, Empowerment, Equity, Innovation and Results’’ articulated within ACPS’s Equity for All 2025 Strategic Plan, the Connected High School Network promises to help transform Alexandria City Public Schools into a better, more equitable and richer learning environment for all of its students.

The Minnie Howard Campus is an essential part of ACPS’s Connected High School Network (CHSN) that also includes King Street, Satellite, and Chance for Change. The new Minnie Howard facility is being designed to accommodate at least 1,600 students and will continue to complement the King Street campus.

Community use of, and access to the building will be supported through the creation of community access zones that will allow portions of it to be safely used during and outside of school hours. These resources may include the gyms, the “Forum,” the Library/Learning Commons, an aquatics center, and other services that may be provided by the Alexandria Health Department and Department of Community and Human Services.

CREATING CONCEPTS FOR THE RENEWED MINNIE HOWARD CAMPUS

Building upon the Comprehensive Program/Site Specific Educational Specifications the design team has generated three options for the Minnie Howard campus. Called the “Hand”, the “Crescent,” and the “Pinwheel,” each option is striving to create a redesigned Minnie Howard facility and campus to provide a dynamic and agile learning environment that fully supports: 1.) Learners’ future success in post-secondary educational options; 2.) Meaningful and experience-based preparation for the rapidly changing world of work and career pathways; and 3.) Instructional delivery that is personalized, engaging, and culturally responsive.

In looking to achieve these goals, each option has sought to realize each of the “Design Patterns” identified within the Educational Specifications. At this conceptual stage of development, the patterns that are most influential to the concept designs, include:

- Interdisciplinary Communities
- Community Use and Access
- Heart of the School
- STEAM Adjacencies
- Distributed Dining
- Distributed Sciences
- CTE, Fabrication and Arts
- Integrated Arts

EXECUTIVE SUMMARY

As they explore these patterns, each concept is structured to create “creative commons,” organizing the building’s STEAM programing including new and expanded CTE, science, and art resources around exciting new dining and extended learning spaces, as well as interdisciplinary “neighborhoods” featuring flexible classrooms, and teacher collaboration areas organized around extended learning spaces. Each option can be evaluated using the patterns, and how well these ideas have been achieved.

Site planning associated with the options addresses the open space programming associated with the POS zone and school programs, pedestrian and vehicular access, parking, and service. Each option assumes that the existing Minnie Howard building will remain in operation until the new building is open. This limits the location of the new construction to the area of the existing fields on the eastern side of the site. In reviewing the site plans, it should also be noted that they can, to some extent, be considered independently of the building options. Accordingly, aspects of a preferred site plan can likely be integrated into a preferred building plan.

A HEALTHY AND HIGH-PERFORMANCE BUILDING

The design of the Minnie Howard Campus aims to create a new kind of 21st Century learning environment that reduces environmental degradation, engages and fosters life-long learning, promotes community resiliency, and enhances health and wellness for every student, family, and members of the community. We know that the redesign of this campus will help to redefine opportunities offered to the children families and community of Alexandria. With this design we have the opportunity to synthesize sustainable design, Net Zero Energy, public health and materials, and building systems to foster an idea of “Holistic Wellness.” This idea is a commitment to create a healthy, high performance place to learn that sets students on a life-long path to healthier, happier, more productive lives.

Each concept has the opportunity to achieve these important goals. Opportunities to achieve these goals include establishing an aggressive “energy budget” for the campus, beginning with the proper orientation of each concept to take the most advantage of the sun for daylighting, while protecting the building from heat gain and glare. Challenges will include the impact of the aquatic facility on the energy budget, as it can add as much as 20% to the energy consumption of the building, and the team has not found a precedent for a Net Zero Energy pool complex. In any scenario, considering the compact site and building footprints, the project will require photovoltaic panels on the roof of the building and on portions of the site.

EXECUTIVE SUMMARY

COST CONTROL

ACPS has established an all-inclusive construction budget of $150 million for the project. The initial phases of a project are often the best opportunity to control the cost of the project, as strategic decisions on the scope and program to be delivered can be made without significant impact on the project schedule in these initial project phases.

To assist in this strategic decision-making process, the design team has been actively working with ACPS to refine the building's programming to meet the approximately 285,000 gross square feet that initial analyses project are available within the project's budget. To achieve this target, some elements of the initial educational specifications have been scaled back or removed from the program. These include the elimination of the DCHS Early Childhood program which was projected to require approximately 11,000 gsf. Other elements of the original test fit site plans that have also been removed from the scope to better target the budget include the structured parking. The assumed scope of work now has surface parking.

The cost model also indicates that the pool cannot be built within the $150 million budget. ACPS and the City are currently exploring alternative methods to fund this facility. Accordingly, the pool is currently being shown in the concept designs.

These actions are among the first and most strategic endeavors within a project long effort to deliver the new building and its site on budget while meeting the needs of the school and the community. As the design develops, the team working closely with ACPS will identify and pursue additional opportunities as necessary to steer the project to an on-time and on-budget delivery.

Dunbar Senior High School
Washington, DC

1

TAB 1:
CREATIVE ANALYSIS

1.1 ENGAGEMENT

ENGAGEMENT METHODOLOGY & PARTICIPANT GROUPS

The concepts illustrated in this report began with the site analysis and site test fits developed the Pre-Design Phase, and with the creation of a Comprehensive Program/Educational Specification. The test fits began to identify opportunities and constraints in applying the program to the site. Concurrently, input received from teachers, administrators, and students informed the Design Patterns, and proposed revisions to the school's class schedule, the space projection, and the organizational strategies discussed in the Comprehensive Program/Ed Spec. The combination of these inputs underpins each concept option.

Engagement to date has included:

- School Board Work Session on Test Fits
- EDT Meetings on Design Patterns and Organizational Diagrams
- Working Sessions with School Leadership on the Class Schedule
- Faculty Briefings on the Comprehensive Program/Educational Specifications
- Focus Groups with Faculty and Departments on Space Needs
- An Interactive Student Workshop (input illustrated on these pages)
- Superintendent's Advisory Team Meetings
- Community meetings

1.1 ENGAGEMENT

It's super cool and relaxing to be there and for study too

Really great

I think there are allot of good options in the Library

They should be opened until 6pm

there is so many books but it will be nice if they bring books about scary story's

really amazing and so quite to study

More reading nooks

many options where you can sit

What do you think about the existing King Street library?

counselors academy, its everyones go to if not the cafeteria

School cafeteria

Cafeteria

International Academy.

Help Desk

Chinquapin Field.!!

class and the gym

The different academies

req: Put more cameras.

What is the "Heart" of the King Street Building?

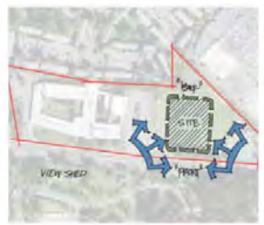
the cafeteria

the gym is the heart of the school AFTER 3:30

Anywhere that students are. If no one wants to be there, its boring

the gym

the rotunda



If you were designing the new building, what features would you include?

make it more big like T.C and and more class's

Bigger, better air conditioning as well as a much bigger gym

the Pencil Sharpeners that are drilled into the wall, they add a little nastalgic effect to sharpening our pencils. they are unnecessary but they are nice

Make it big enough to accommodate students needs

more windows, some classes had none

water bottle filler

eco-friendly things like the water bottle stations and air hand dryers

bathroom stall "brush" dividers for privacy

actual parking

I feel like the auxillary gym could use some renovation. The main gym looks so nice but the aux gym isn't as nice.

mirrors in the bathroom, there are MINI sized ones at Minnie

Make classroom sizes bigger

good WATER PRESSURE !

make clasroom slzes bigger

much bigger library and better bathrooms, some sinks were way too small/low in certain areas

Renovate MH. Especially the gym and hallways.

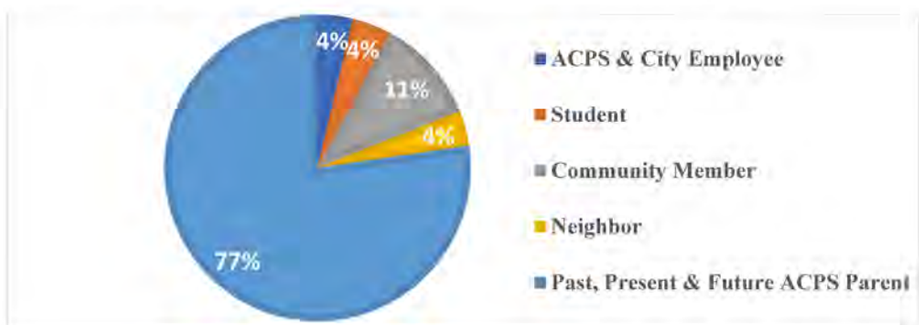
1.1 ENGAGEMENT

OVERVIEW

On March 2, 2021 a community visioning survey seeking stakeholder feedback on the Minnie Howard Campus redevelopment was published on the project website and emailed to ACPS staff, students, parents, and City of Alexandria community members. The survey was structured to capture the impacted and interested stakeholders' high-level goals and aspirations on the project design concepts to help define how the public will experience the new school building and fields. It was translated in Spanish, Amharic, and Arabic and remained open until March 10 to allow as many as possible to submit comments. 216 surveys were completed (207 in English and 9 in Spanish).

The following provides a summary of how community members identified themselves:

Type of Community Member	Number of Responses	Percentage
ACPS & City Employee	8	4%
ACPS Student	9	4%
Community Member	8	11%
Neighbor to Minnie Howard Campus	24	4%
Past, Present & Future ACPS Parent	167	77%



SURVEY SUMMARY:

Survey questions asked respondents to choose: 1) the themes they believed important, 2) building design features they would like to see, and 3) their biggest concerns regarding the design of the redeveloped Minnie Howard Campus. A summary of survey responses is provided below.

What is important to you in the redevelopment of the Minnie Howard Campus?

Major Themes	Responses
Capacity for Future Student Enrollment Growth	72
Flexible & Adaptive Spaces	69
Student Centered Learning Environments	50
Outdoor/Green Spaces	32
Energy Efficiency/Sustainability	32

If you were designing the redevelopment Minnie Howard Campus, what features of the site or building would you like to include?

Major Themes	Responses
Collaborative & Hands-on Learning Spaces	54
Innovative & Tech Ready	48
Lots of Light	44
Sustainability	30
Full Size Athletic Fields	29

Please prioritize the concepts /ideas you think are most important in the design?

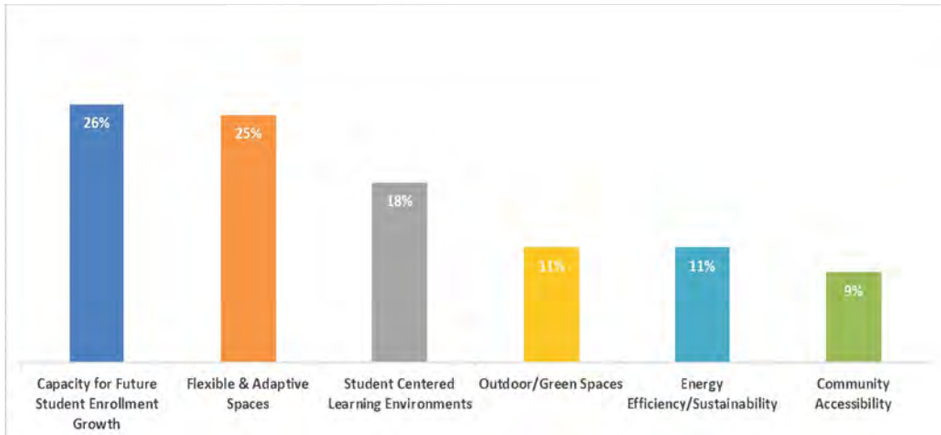
Most Important	Responses
Design for Education	165
Community Access	27
Athletic/Recreation Fields Design	40
Sustainable Design	54

What are your biggest concerns/worries, if any, regarding the design of the redeveloped Minnie Howard Campus?

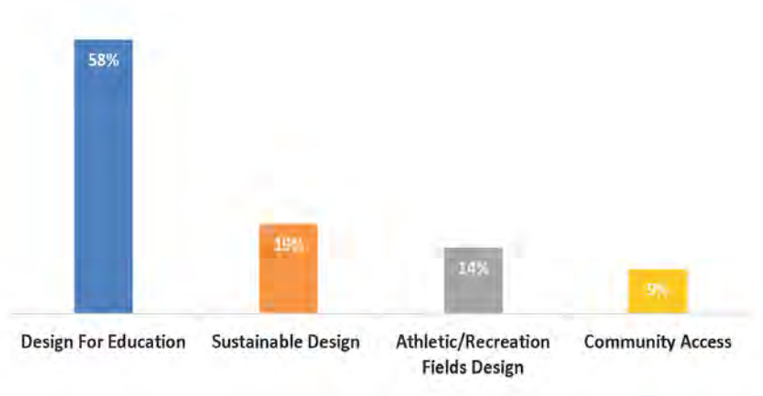
Major Themes	Responses
Future Student Enrollment Capacity	42
Collaboration Between Campuses	24
Budget	15
Safety	15
Impact on neighbors	12
Traffic	10
Noise	10

1.1 ENGAGEMENT

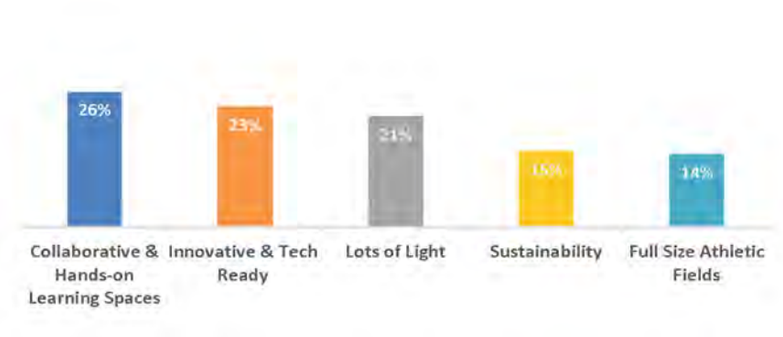
WHAT IS IMPORTANT TO YOU IN THE REDEVELOPMENT OF THE MINNIE HOWARD CAMPUS?



PLEASE PRIORITIZE THE CONCEPTS /IDEAS YOU THINK ARE MOST IMPORTANT IN THE DESIGN?



IF YOU WERE DESIGNING THE REDEVELOPMENT MINNIE HOWARD CAMPUS, WHAT FEATURES OF THE SITE OR BUILDING WOULD YOU LIKE TO INCLUDE?



WHAT ARE YOUR BIGGEST CONCERNS/WORRIES, IF ANY, REGARDING THE DESIGN OF THE REDEVELOPED MINNIE HOWARD CAMPUS?

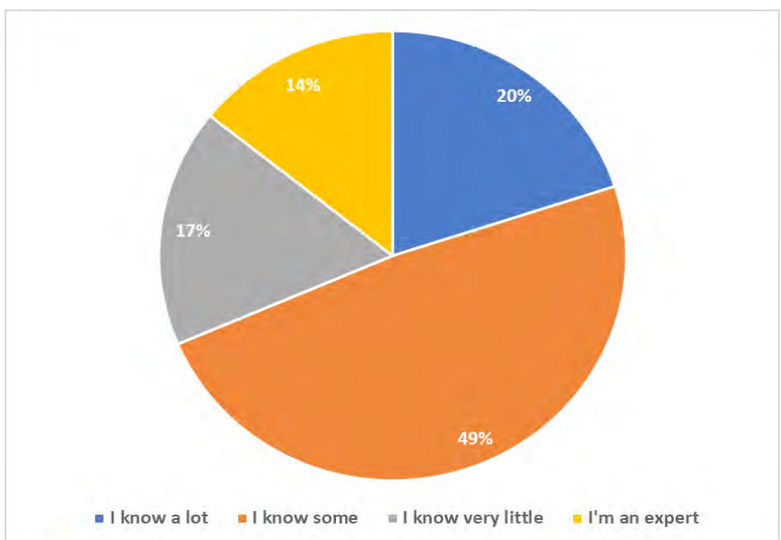
1.1 ENGAGEMENT

OVERVIEW

On March 8, 2021, the High School Project (THSP) team held a virtual community open house via Zoom to kick-off the design process for the new Minnie Howard building. Event notification was conducted by the ACPS Communications Department and Face Center. Additionally, simultaneous interpretation was provided in Spanish, Amharic, and Arabic. The virtual open house was attended by 48 community members. The presentation was designed to collect input on high-level goals and aspirations for the new school building and fields. Community feedback was collected on five questions through the Zoom polling feature.

The project team hosted a virtual community meeting on March 16th and will host another community meeting on March 25, 2021 for community members to view and provide feedback on three design concepts for the new Minnie Howard building.

HOW MUCH DO YOU KNOW ABOUT THE HIGH SCHOOL PROJECT?

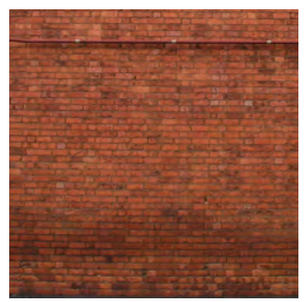


1. CIVIC ENTRANCE/PRESENCE

2. PEDESTRIAN CONNECTIVITY

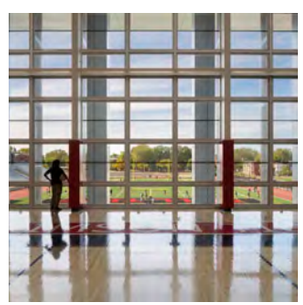
3. COURTYARD AS A PLACE

4. VISIBLE SUSTAINABILITY

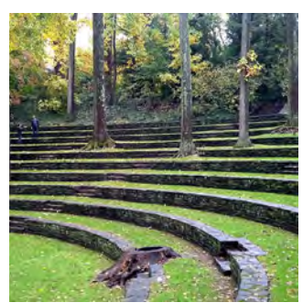


5. LOCAL BUILDING TRADITIONS

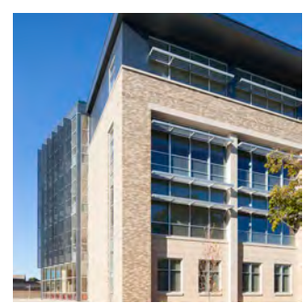
6. HISTORY OF PLACE



7. INDOOR-OUTDOOR CONNECTION



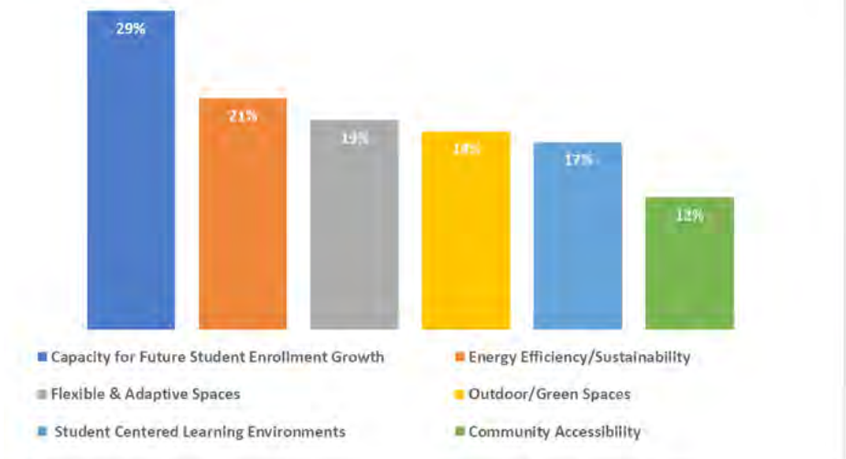
8. OUTDOOR LEARNING



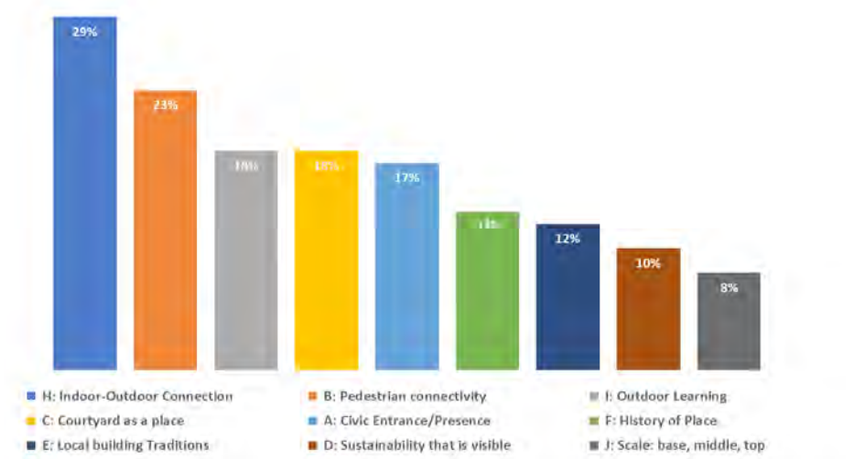
9. SCALE: BASE, MIDDLE, TOP

1.1 ENGAGEMENT

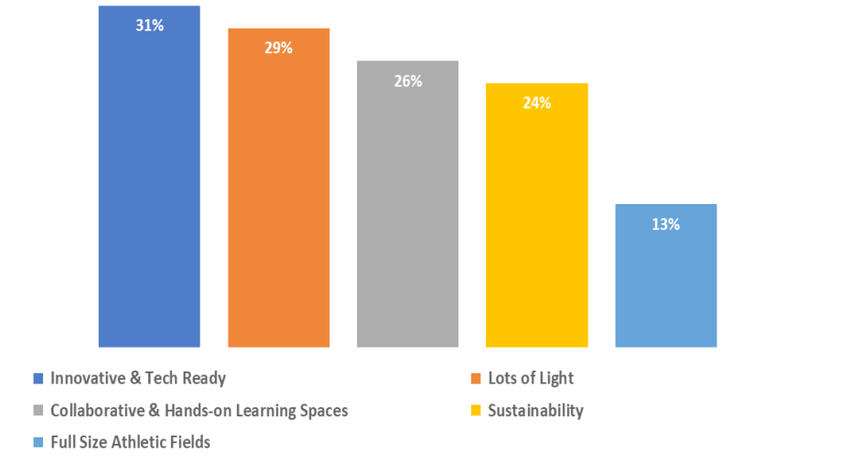
WHAT IS IMPORTANT TO YOU IN THE REDEVELOPMENT OF THE MINNIE HOWARD CAMPUS?



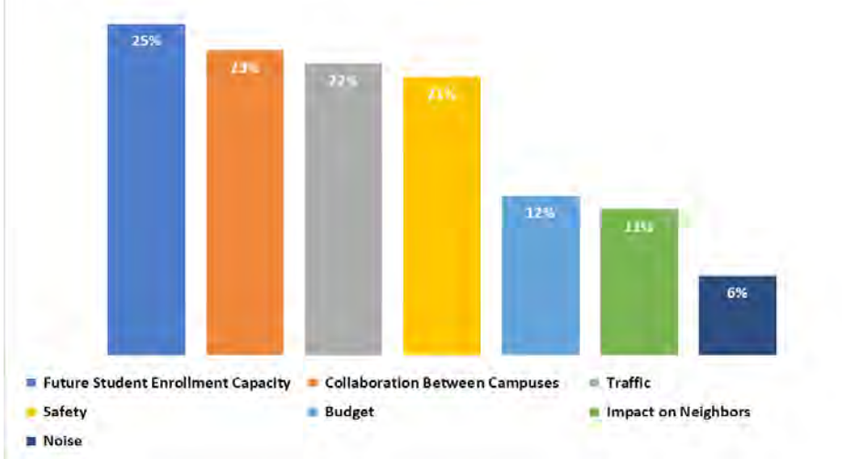
WHICH IMAGES DO YOU CONNECT WITH THE MOST?



WHICH FEATURES WOULD YOU LIKE TO SEE IN THE DESIGN OF THE SITE OR BUILDING?



WHAT ARE YOUR BIGGEST CONCERNS/WORRIES, IF ANY, REGARDING THE DESIGN OF THE REDEVELOPED MINNIE HOWARD CAMPUS?



T.C. Williams High School
Alexandria, VA

1.1 ENGAGEMENT

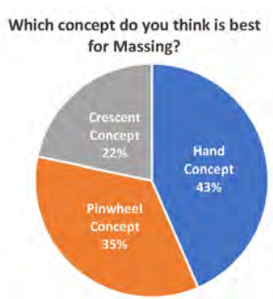
OVERVIEW

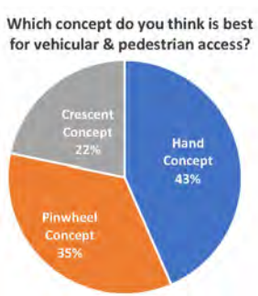
On March 16, 2021, the High School Project (THSP) team held a virtual community open house via Zoom to update the community on the three design concepts, Hand, Crescent and Pinwheel, in consideration for the redeveloped Minnie Howard Campus. Event notification was conducted by the ACPS Communications Department and Face Center. Additionally, simultaneous interpretation was provided in Spanish, Amharic, and Arabic. The virtual open house was attended by 38 community members.

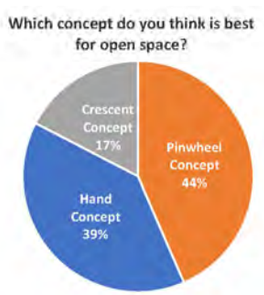
During the presentation, community feedback was collected on the three concepts through the Zoom polling feature. A summary of the poll responses for each concept is provided as follows.

Once the attendees reviewed all three concepts, they were asked which concept they considered the best in the following three categories: massing, vehicular & pedestrian access, and open space.

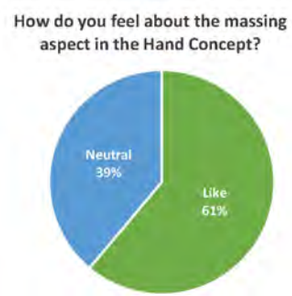
SUMMARY OF THE POLL RESPONSES:

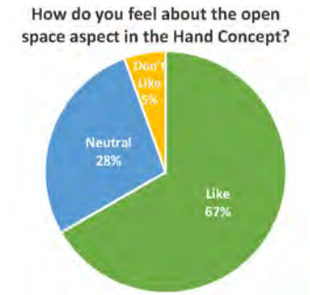




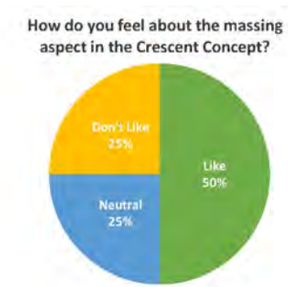


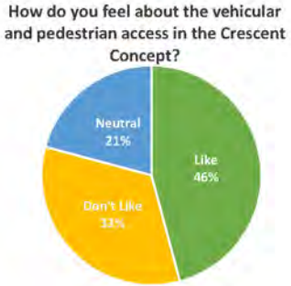
HAND CONCEPT:

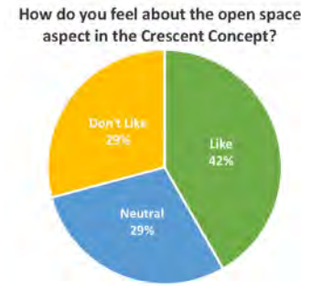




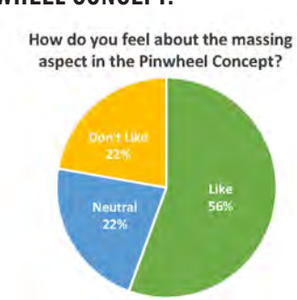
CRESCENT CONCEPT:

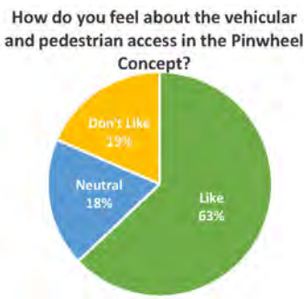


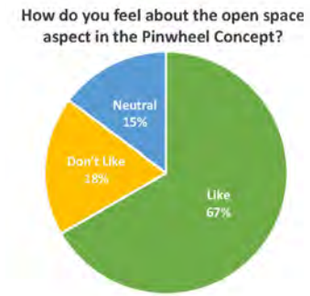


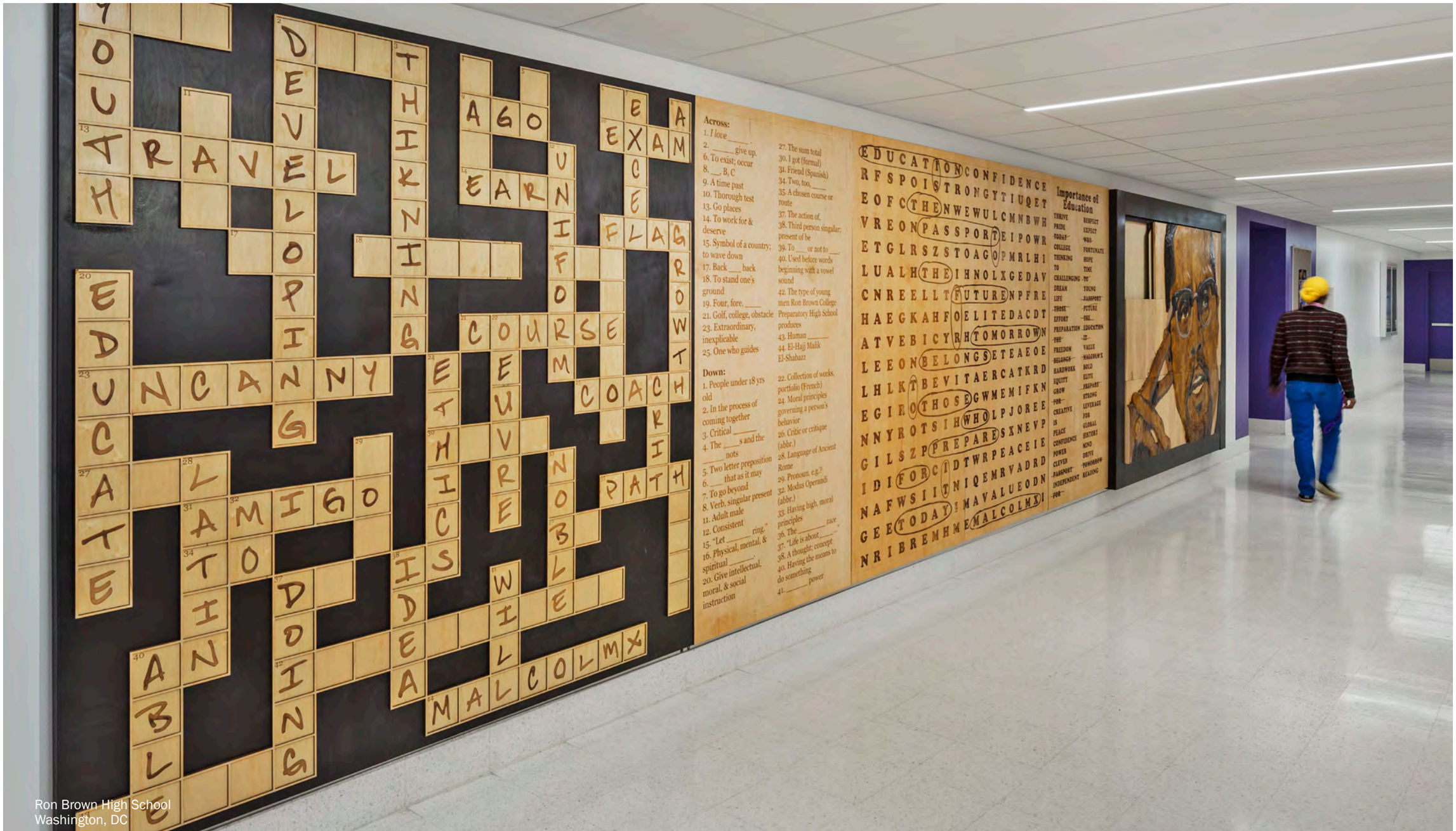


PINWHEEL CONCEPT:









Ron Brown High School
Washington, DC

1.2 PROGRAM / ED SPEC SUMMARY

This section outlines a preliminary site specific space projection for the new building at the Minnie Howard campus. This space projection seeks to respond directly to the vision established by ACPS for the Connected High School Network, and the corresponding plan to educate 1,600 students at the Minnie Howard Campus within the network.

Key aspects of ACPS's vision influencing this space projection include: equity and access across the Connected High School Network, Career and Technical Education, STEAM, Project-Based Learning, and a revised class schedule for the King Street and Minnie Howard campuses. Accordingly, this projection reflects the conversations held to date with ACPS leadership and the Educational Design Team that have been codified in the Design Patterns, preliminary organizational strategies, and the school scheduling analysis discussed in the Comprehensive Space and Site Program/Educational Specification.

The goal of this preliminary projection is to develop an initial understanding of the likely space needs in achieving these goals. While we believe that this projection is an appropriate first draft, the projection will continue to evolve as the scheduling analysis is further advanced and the design team continues the conversation with the EDT, school leadership, and the school community.

Key assumptions underlying this projection include enrollment projections for 2029 where:

- Minnie Howard will accommodate 1,600 students;
- King Street campus will accommodate 2,900 students;
- NOVA will accommodate 400 students;
- The Satellite Center will accommodate 100 students

Major assumptions underlying the space projection include:

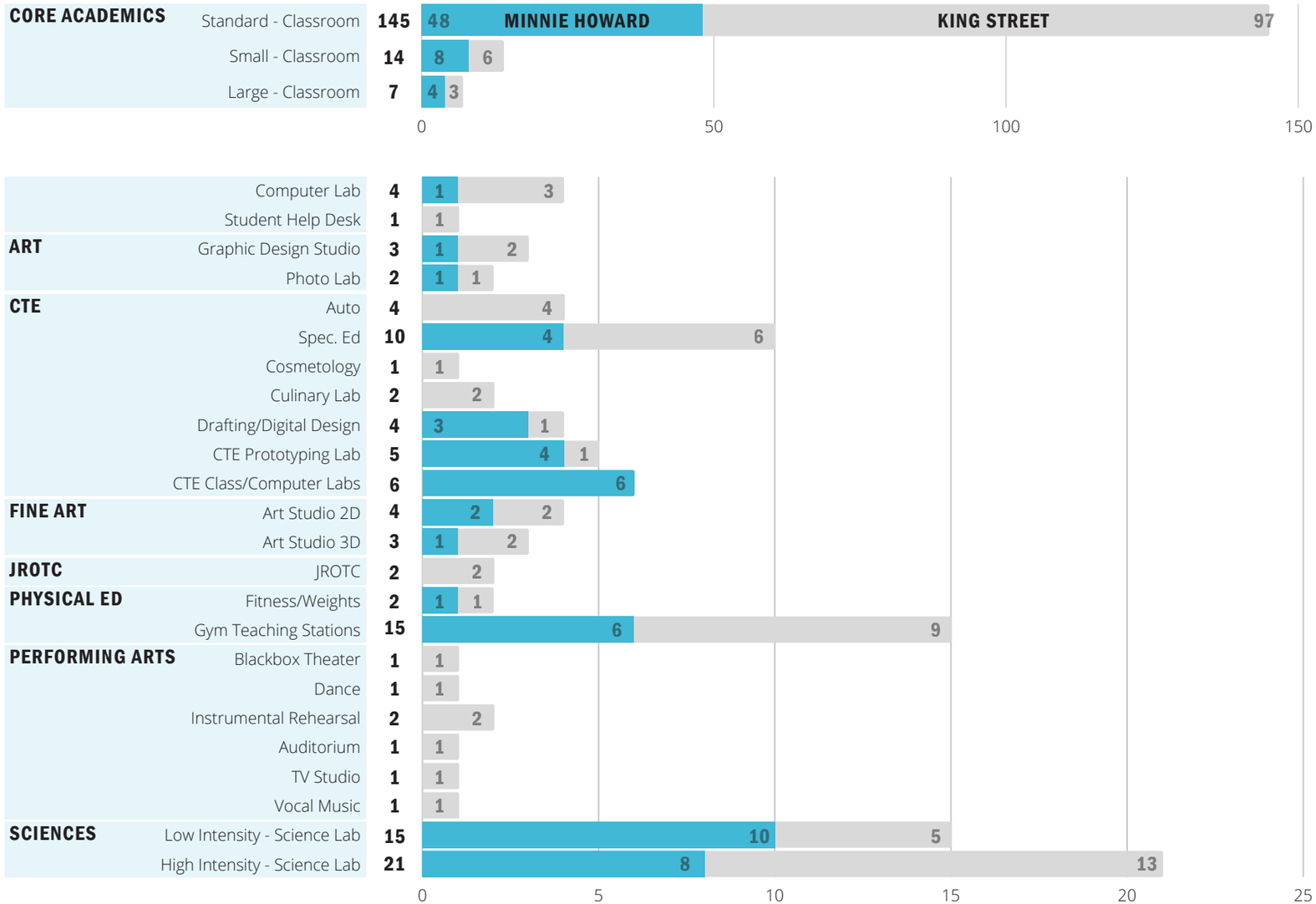
- Students will move between King Street and Minnie Howard to use various resources offered at each campus;
- Each campus will be structured around Interdisciplinary Communities;
- The Interdisciplinary Communities at Minnie Howard will be organized to accommodate 400 students each;
- Interdisciplinary Communities at Minnie Howard will offer spaces with a mix of:
  - CTE
  - Fine Art
  - Science
  - Humanities
  - Faculty Collaboration
  - Counseling
  - Learning Community Administration
  - Extended Learning
  - Dining/Creative Commons
  - Physical Education

1.2 PROGRAM / ED SPEC SUMMARY

Reinforcing the vision of a Connected High School Network, the development of the Site Specific Educational Specifications (SSES) has taken into account not only the needs of the Minnie Howard campus, but also space needs at the King Street campus as well. The accompanying table quantifies the number of instructional spaces existing on both campuses and the number proposed after the new construction is complete at Minnie Howard.

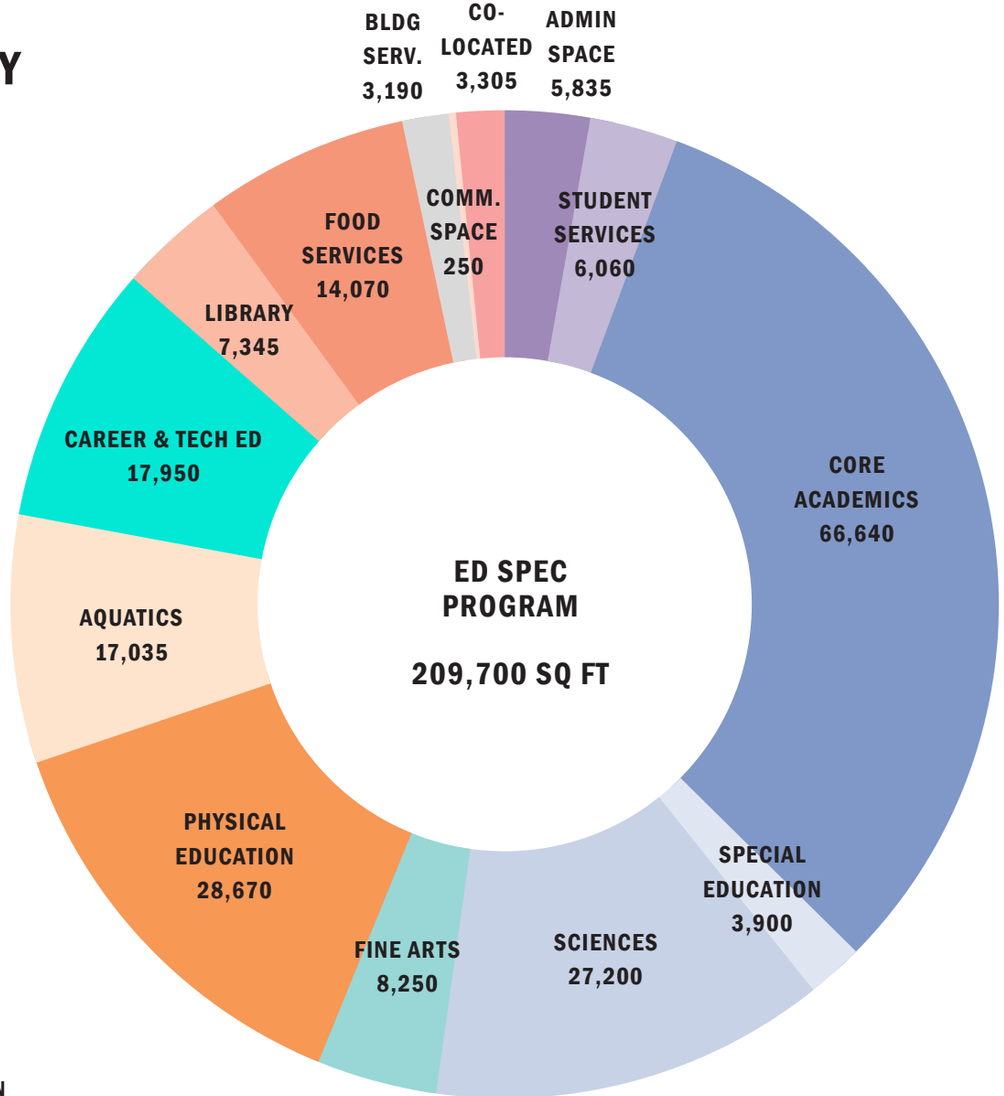
Additionally, it is important to note that even where there is a one-to-one replacement in some of the spaces projected for the new building, qualitatively, the new spaces will be significantly better places for the high schools curriculum. Minnie Howard was designed for a 1970's elementary school program. The existing classrooms and other spaces that are ordinarily in use there, including the gym, will not compare to the modern, 21st Century, flexible, Project-Based Learning environments that the new building will provide.

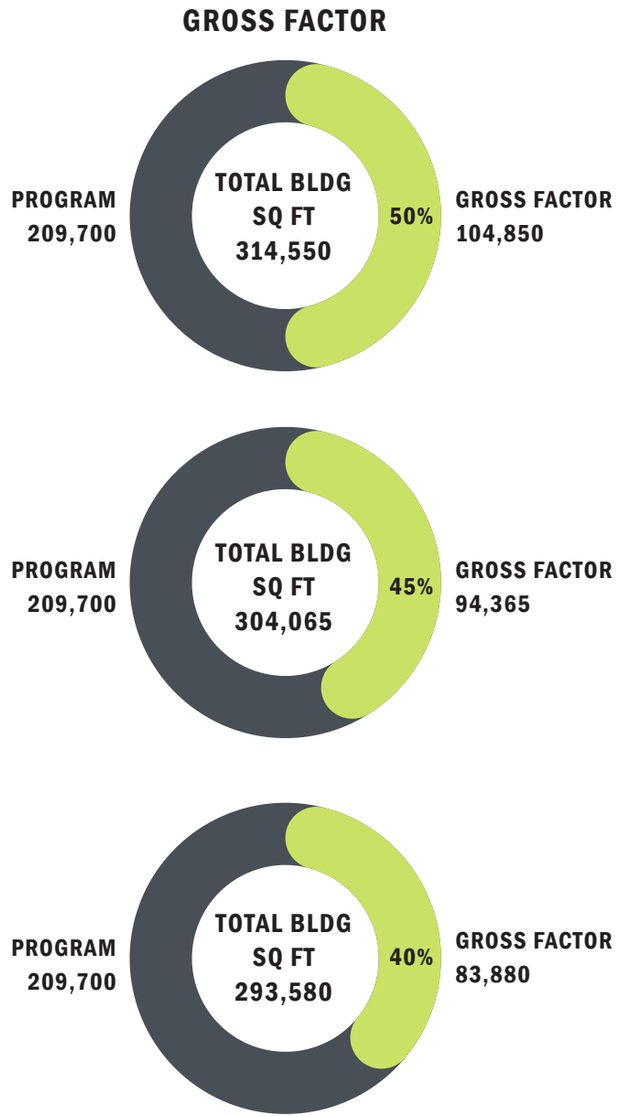
As well, while the SSES projects space to be built at the Minnie Howard campus, it also lays the groundwork for strategic renovations at the King Street campus. Most notably, the SSES opens up the opportunity to expand the Culinary Arts, JROTC and Fitness programs at King Street. Several existing labs at King Street will also be replaced by new labs at Minnie Howard. Reuse of these existing spaces will create opportunities for new spaces/programming at King Street.



1. Does not include co-located partner spaces
2. Does not include administrative, student support, or buildings & grounds space

1.2 PROGRAM / ED SPEC SUMMARY

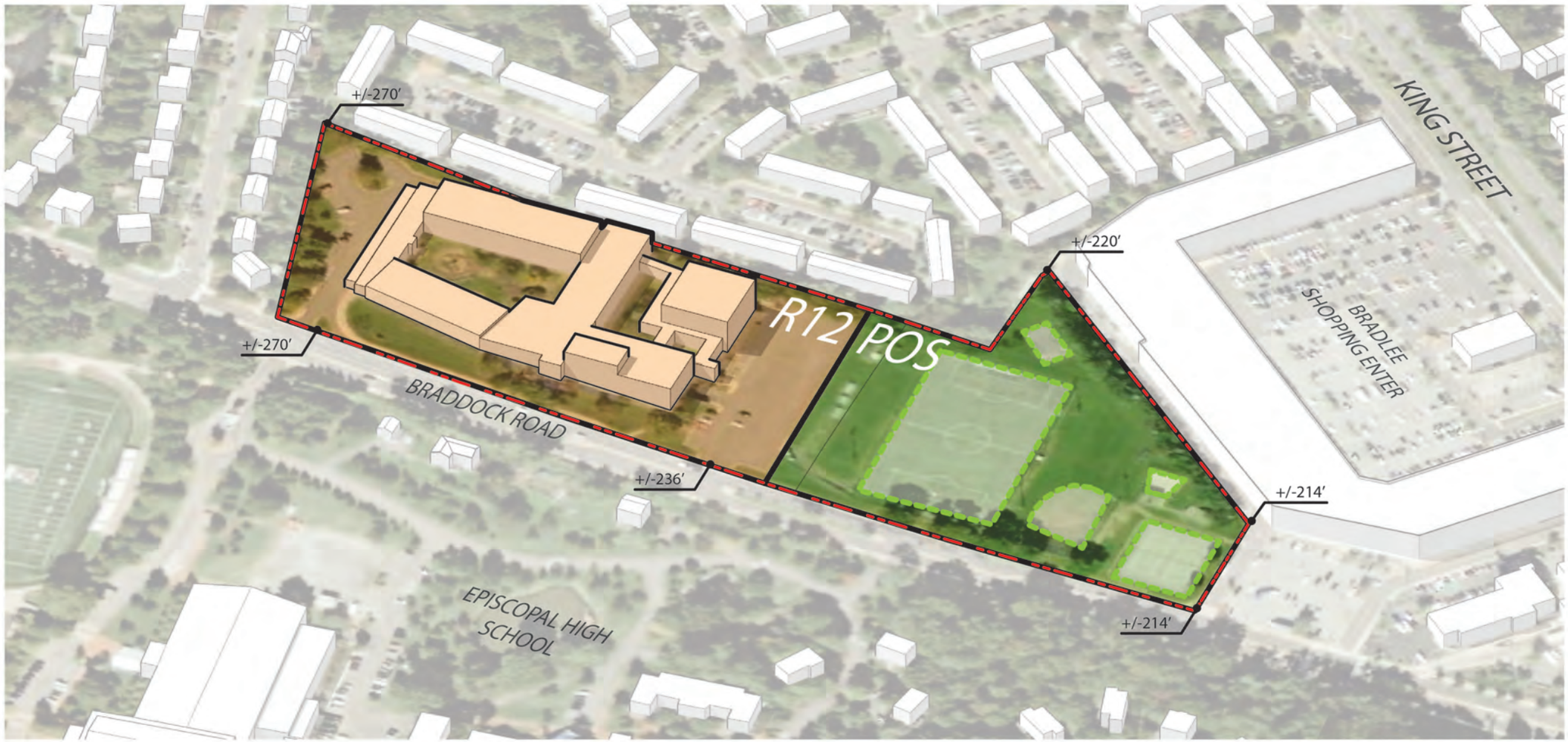




MINNIE HOWARD PROGRAM DISTRIBUTION

A comprehensive breakdown of the program spaces is listed within the full Educational Specification (Ed Spec)

1.3 ZONING



T.C. Williams High School,
Minnie Howard Campus, Alexandria, VA - Existing Zoning Diagram

1.3 ZONING

ZONING ANALYSIS

The existing Minnie Howard School sits on a 12 acre site along the north side of Braddock Rd. The school and its associated parking at the west end of the lot is in an R-12 zone of approximately 7 acres. The play fields on the east end of the site are zoned as public open space (POS) on approximately 5 acres.

To develop the new high school, we will need to build on the east end of the site, allowing the existing building to continue in operation until the new building is occupiable. Alexandria's Department of Planning and Zoning proposes to move the POS zone and its associated square footage to the west end of the lot to permit construction for the new high school.

The existing buildable R-12 zone has a floor area ration (FAR) of .3. With the 7 acre lot, a building with a total gross square footage to be 91,500 square feet may be constructed. The proposed, new high school has a space program of approximately 295,000 gross square feet. The lot will need to be rezoned to accommodate the new high school building.

An OCM(50) zone with an FAR of 1.5 will permit approximately 457,800 square feet of development. This zone accommodates the proposed new high school, considering a future addition. If a parking structure was included in the project, it may contribute to the square footage on the site. The allowable height for the new buildings would be up to 77 feet.

The following matrix outlines the zoning requirements of the OCM(50) zone and possible development area for a 295,000 gsf high school.

Alexandria High School
Architectural Site Tabulations - OCM 50 ZONE (295,000 GSF)
3/26/2021

Existing Site Area	ACRE	SF of site	FAR *	Total Allowable Area
TOTAL ALLOWABLE	12.00	522,850		***457,823***
OCM 50 ***	7.01	305,215	1.50	*457,823*
POS ***	5.00	217,635		

PROPOSED BUILDING AREAS (OCM 50)	Note	SF	FAR
High School		295,000	
High School Future Classrooms		50,000	
Parking (surface)		0	
TOTAL GSF PROPOSED		***345,000***	1.13

HEIGHT	Allowable	SUP	Proposed
Building Heights OCM 50	**50'**	**77'**	70'

POSSIBLE LOT AREAS	Lot Area	Required	Proposed
High School Footprint			85,000
Future High School Addition Footprint			12,500
Structured Parking Foot Print			-
TOTAL LOT AREA (parking and drive NIC)			**97,500**

PARKING - HIGH SCHOOL		Students or GSF	Zoning	Provided
Proposed Enrollment	1 per 10 seats	1,600	160	
DCHS and Teen Wellness*	1 per 1000 gsf	4,180	5	
Future Enrollment	1 per 10 seats	0	0	
Total			165	**165**

* Teen wellness + DCHS: (9) (b)Outside the enhanced transit area:

i. Minimum requirement—0.75 spaces per 1,000 square feet of floor area.

ii. Maximum requirement—2.25 spaces per 1,000 square feet of floor area Consider shared use agreement

*** Site area is based on survey information from Kimley Horn and not COA tax records

1.4 SITE ANALYSIS

The existing Minnie Howard school sits on the high west end of the site and the public open space occupies the east end of the site at a lower elevation. Overall, the elevation change drops from west to east approximately sixty feet. The site is expressed in approximately three tiers, the existing Minnie Howard school building and upper parking lot, the school's lower parking lot and the public open space at the lowest elevation.

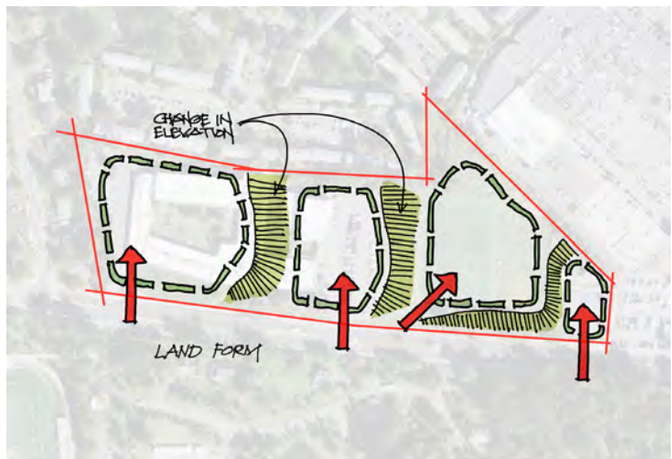
To allow the existing school building to remain in operation, the new High School will be developed over the existing public open space at the east end of the site. Once the new High School is occupied, the existing building will be demolished and the new public open space will be constructed.

ACCESS, CIRCULATION, TRANSPORTATION

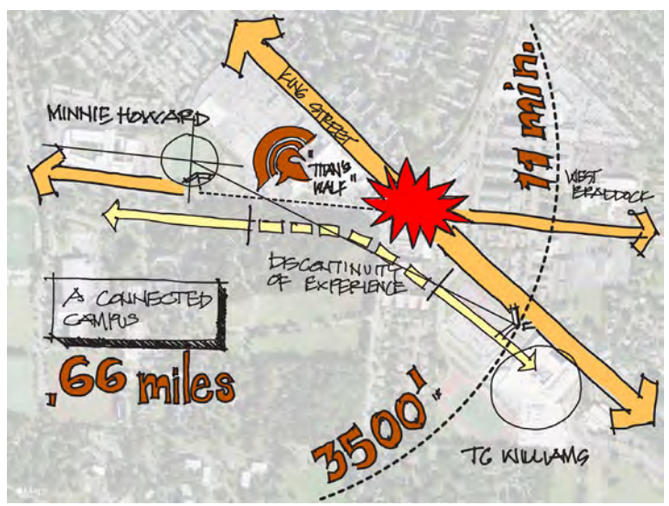
General Access

A preliminary site analysis of the existing Minnie Howard Campus was completed for ACPS in November 2019. That analysis for the existing campus determined the following. The parking facilities are at capacity. The current site access does not include separation of buses from parking and pick-up/ drop-off areas. Braddock Road has two lanes in each direction, reducing back-ups on the street itself. The current connections and circulation between the King Street and Minnie Howard campuses are not conducive to pedestrians/bicycles due to the auto-oriented nature of the roadways connecting the campuses. A traffic study is in progress that will provide more information on the existing Minnie Howard site.

The site will be planned and designed to accommodate a range of users including students, parents, visitors, faculty, and staff to and from the Minnie Howard site in a safe and effective manner. ACPS does not provide parking spaces for employees of service contractors who work on site. It is anticipated that students will arrive and depart via a variety of modes of transportation and mobility. Proposed site development will accommodate each mode with the goal of reducing conflicts between them.



TOPOGRAPHY LAND FORMS



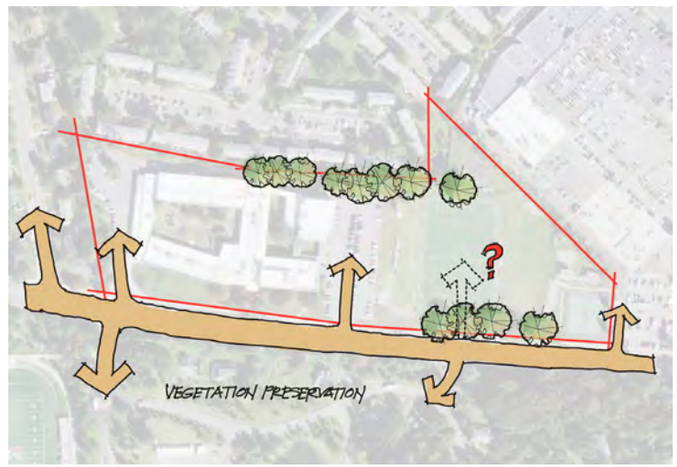
CREATING A CONNECTED CAMPUS

1.4 SITE ANALYSIS

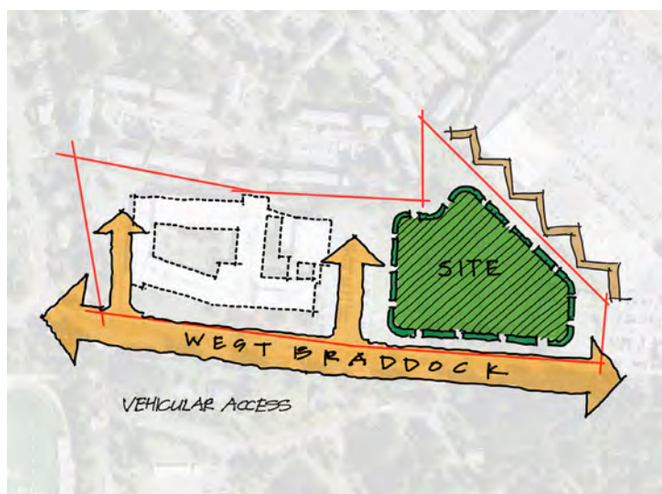
Separate faculty/staff parking, student parking, bus loading/unloading, and storage, parent drop-off, and visitor access are each potentially conflicting uses. Existing parking constraints, introduction of new student-drivers, service, and emergency access each present unique singular capacity challenges on the site that will best be addressed comprehensively. After-school and evening-use of recreation facilities – such as the rectangular field will contribute to access and mobility needs that may result in continuation of existing shared parking and similar arrangements. These constraints in context with transportation management goals of the City to encourage commuters to consider methods other than single occupancy vehicles create a need for site design and school programming that incentivize students and staff to shift to less auto-centric travel choices.

Movement Between Campuses

The King street and Minnie Howard campus are less than a mile apart. Students and staff currently move back and forth between the campuses. Movement by students between the existing King Street and Minnie Howard Campuses will continue in part to ensure that all students experience both campuses. At present, a shuttle between campuses is used and anticipated with new development. It is understood that some students prefer to walk or bike.The active path for walking or biking between campuses is challenging, due to narrow sidewalks, congested traffic, lack of signage, and minimal pedestrian lighting. For example, the most direct route requires navigation of heavily traveled intersections including the one at King Street, Quaker Lane, and West Braddock Road. The City's installation (understood from Staff to be installed prior to project completion) of a High-Intensity-Activated Crosswalk (HAWK) Beacon at the intersection of West Braddock Road and Marlee Way will be an attribute to assisting student movement between campuses.



SITE ACCESS AND VEGETATION



VEHICULAR ACCESS

1.4 SITE ANALYSIS

Site Development and Traffic Impacts
Access is currently provided to the site via two full-movement, stop-controlled driveways. These access locations and any proposed modifications in the design process will be evaluated through a traffic impact study, in coordination with the City's Department of Transportation and Environmental Services. Consistent with current conditions, future access to site is anticipated only along the West Braddock Road Frontage because private property constrains the three remaining property boundaries. If significant impacts are projected, mitigation strategies will be explored to ensure that the surrounding transportation network can safely and effectively manage the new travel demands. Maintenance of traffic plans will also be developed to minimize disruption and inconvenience during construction.

Parking
It is understood that both campuses have reached their parking capacities under existing conditions. With the proposed enrollment of 1,600 students, City co-located spaces, and future expansion projections, the Minnie Howard Campus could require 165 spaces. There will be a need to manage transportation demands through other modes of travel than single-occupancy vehicles.

Bus Access
The various concepts all have similar configurations and can be summarized into two different layouts: central vertical bus loop, and along West Braddock Road south of the field.

Refer to Tab Section 3.2 for parking, bus access, and site circulation analysis relative to the design concepts.

Transportation Demand Management (TDM)
The City and ACPS have goals to reduce the number of staff and students arriving to the campuses by personal vehicles. Currently, students living outside of the walkable area of the schools are provided free transit service through designated school bus routes and free ridership on DASH bus service. Even with over 55 routes provided to serve both high school campuses, some students still choose to drive to school. The project team will coordinate with ACPS to better understand how they arrive to school and their reasons for doing so, in pursuit of developing strategies for increased transit use, carpooling, and walking and biking. Some of these strategies may include transit subsidies for staff, bus service modifications, increased bike storage, and improvements to bicycle and pedestrian facilities near the campuses, among others.

Accessibility
All routes, crosswalks, paths of travel and access ways constructed in relationship to new site development will be designed to be consistent with the Americans with Disabilities Act (ADA).

Service Access
Site development and access will be required to accommodate service access to the proposed development. This will include general delivery vehicles, food, refuse/recycling collection, and sundry delivery on a daily and weekly schedule. Minimizing traffic conflicts and perceived noise through coordination of schedules in compliance with noise ordinances.

Emergency Vehicle Access
Site development and access will be required to provide adequate emergency vehicle access to designated parts of the project. These areas are required to not conflict with hydrant and fire connections and other site access, circulation, or parking. The City of Alexandria Fire Marshall will provide guidance related to direct building access, clear lines of circulation and open accessible areas. Based on the final building and site layout either asphalt pavement or heavy-duty drivable concrete will be needed for fire truck access to most of the building facade.

OPEN SPACE PLANNING AND DESIGN REQUIREMENTS

Open Space General Design Requirements
The basis of design for site development and planning will integrate the Site Specific Educational Specifications, stakeholder interests, and shared-use facilities with the City of Alexandria's requirements for entitlement/site development. This information will be disseminated as program elements such as overall site organization, environmental requirements, access/circulation, building massing, stormwater management, preservation of vegetation, species diversity of native plantings, life-safety measures, and site engineering.

1.4 SITE ANALYSIS

Open Space Planning
In addition to City and ACPS staff input, source materials may draw upon existing documents such as City Small Area Plans for Fairlington/Bradlee, Seminary Hill/Strawberry Hill, Taylor Run/Duke Street, and the City's Green Building Policy, Urban Design Guidelines, Landscape Guidelines, Park Facilities Standards Manual and Wayfinding Guidelines. The reference standard for each document will be the most current edition/version in January 2021. The anticipated post-development quantity of Open Space will be determined in consultation with City staff, ACPS, and site programming.

City/ACPS Joint Use of Site Facilities
By example, with understanding that the Department of Recreation, Parks and Cultural Activities (RPCA) is responsible for grounds maintenance and snow removal at all ACPS facilities, the City's Park Facilities Standards Manual for Design and Construction will provide important direction related to standardization of future site operations. It is anticipated that ACPS will need to confirm an agreed-upon and predictable foundation for site programming, composition of shared-use facilities, and priorities for implementation and future operations.

Site Facilities
Existing City facilities are known as Minnie Howard Field and are comprised of 1 rectangular compliant multi-purpose field, 2 tennis courts, 1 basketball court, and supporting restroom situated on a 5.00-acre portion of the site. The tennis courts and multi-purpose field are designed at National Federation of High Schools (NFHS) standards for play surface safety, light-levels, and facility dimensions.

The existing diamond-field was abandoned in 2004 during construction of the multi-purpose field and has not since been programmed for use by the City. A temporary ticket booth is also present on site at the field entrance walk. The tennis courts have 30-foot height lights and multi-purpose field has 75-foot height lights, each previously approved by City Special Use Permit. Retention of lighted facilities is anticipated as a part of proposed site development. New lights are to be installed as the field and court locations are changing.

The existing multi-purpose field has an extensive high-performance irrigation/wash down system. With site redevelopment/relocation of the facility, it is anticipated that the system will be salvaged by Recreation, Parks and Cultural Activities staff, and a new system deployed in association with the new field. Because of the high intensity of use and play hours, it is strongly recommended that the replacement multi-purpose field use a non-rubber organic infill system, high stitch-rate carpet, and underlayment pad system as a matter of player-safety.

Proposed outdoor activity space requirements were articulated in a meeting with ACPS, TCW, and the Department of Recreation, Parks and Cultural Activities. It is anticipated that with exception of the basketball court, temporary ticket booth, and abandoned diamond-field, other items will be replaced 1:1 as a part of project development. Outdoor activity spaces supporting physical education, athletic use, and recreation on the Minnie Howard Campus may include:

1. Large field (NFHS regulation size)
2. Two tennis courts (NFHS regulation size)
3. Basketball court (this could be located as component public space in lieu of stand-alone, or overlap with tennis courts)
4. Practice field (non-regulation size)
5. Paved pathway with distance marking

These spaces are listed in priority order. Additional information defining each space is provided in the December 18, 2020 Pre-Design Progress 1 Submission.

Parking for the existing facilities is provided in the paved lot that lies between the multi-purpose field and existing school, and with new development shared parking is anticipated to remain on-site.

During construction the athletic fields and courts will be displaced and will need to be accommodated off-site. ACPS is to explore holding physical education classes at the King Street Campus and Chinquapin Park.

SITE KEY

- Existing School & Parking
- Existing Trees
- Existing Geothermal
- Steep Topography

EXISTING SITE AREA & ELEMENTS

R12 Parcel (Left Parcel)	288,484 sq ft (6.62 Acres)
POS Parcel (Right Parcel)	234,350 sq ft (5.38 Acres)
Total Existing Site Area	522,834 sq ft (12.00 Acres)
Parking	57 Spaces
Fields	5.38 Acres
Geothermal	+/- 60 Wells

EXISTING CONDITIONS DIAGRAM

0 250 500 ft

SITE KEY

- Existing School & Parking
- Existing Trees
- Existing Geothermal
- Steep Topography
- Proposed Setbacks
- Proposed School Area (For Scale Only, Final Location TBD)
- Proposed Additional Development Area (For Scale Only, Final Location TBD)

EXISTING SITE AREA & ELEMENTS

R12 Parcel (Left Parcel)	217,672 sq ft (7.00 Acres)
POS Parcel (Right Parcel)	305,178 sq ft (5.00 Acres)
Total Existing Site Area	522,834 sq ft (12.00 Acres)
Parking	57 Spaces
Fields	5.00 Acres
Geothermal	+/- 60 Wells

PROPOSED SITE PROGRAM SURFACE AREA & ELEMENTS

Approx. School Area	85,000 sq ft (1.95 Acres)
Approx. Add. Develop. Area	20,000 sq ft (0.46 Acres)
Approx. Total Program Area	105,000 sq ft (2.41 Acres)
Parking	200 Spaces / 70k sq ft (1.6 Acres)
Fields	5.00 Acres
Geothermal	+/- 300 Wells

POTENTIAL SITE DEVELOPMENT DIAGRAM

0 250 500 ft

1.4 SITE ANALYSIS

Recreation Facilities Use

The facilities are managed by the Department of Recreation, Parks and Cultural Activities (RPCA) and jointly used by ACPS through a joint use agreement with RPCA. During the academic year, ACPS holds gym classes on the multi-purpose field, and in the evening, the field is used for City-affiliated play including the Alexandria Soccer Association. The T.C. Williams girls' field hockey and men's and women's lacrosse teams also use the field.

Refer to the document "T.C. Williams Athletic Programs" in the Appendix. This document demonstrates that T.C. Williams programs are accommodated on many sites.

Landscape Architectural Strategy

The basis of design for site development will be:

- Spatially enhance site areas related to active and passive program uses.
- Maximize provision of contiguous open space in context to building, parking and other site uses.
- Prioritize project access spaces such as main building entrance and courtyards.
- Prioritize development of multi-purpose/dual-use spaces. Site uses.
- Integrate site cultural history and geography into design interpretation of spaces.
- Integrate site lighting and wayfinding into design response.
- Provide green edge for adjacent residential areas that are a combination of existing and proposed plantings.
- Integrate stormwater management areas with landscape/plantings.
- Provide a strong landscape presence of street trees and open green space along West Braddock Road.
- Organize plantings to enhance optimal views to the site and mitigate less-desirable views.
- Use of indigenous planting palette that upon establishment, require minimize future operations and maintenance.
- Provide consistency with City of Alexandria Landscape Guidelines.

West Braddock Road Medians

Approximately 400-linear feet in 2-segments of 200-feet each of turf area exists in the median of West Braddock Road. These areas contain street trees of varying species and health/condition. Based on likelihood of multiple utility connections being made in the West Braddock Road right-of-way and pedestrian interface/crossing of West Braddock Road, it is anticipated that the City will require replacement/supplemental plantings in these areas. Although some medians (such as at West Braddock/Mount Vernon Avenue and Washington Street) in the City have individual irrigation water source and controls, use of indigenous plantings will mitigate the need.

Existing Vegetation

Several trees are present on the subject property. In general, trees are located along West Braddock Road, in relationship to the existing school or along property boundaries. Initial field observation suggests that many existing trees exhibit compromised health and/or are in various stages of stress/decline. Initial observation indicates that the site does not contain individuals of significant horticultural merit for which extensive measures will be expended for preservation. Various volunteer vegetation is present throughout the site, particularly as vines and indigent species along property boundary fences and edges. It is anticipated that these locations will be cleared of such.

EROSION AND SEDIMENT CONTROL

This project is required to comply with Virginia Department of Environmental Quality (DEQ) standards and specifications for erosion control. Erosion and sediment control practices will be implemented to reduce soil loss/erosion during construction and ensure that sediment generated within the site is contained on site. Specialized construction mitigation methods such as silt fence, inlet protection, filter logs, erosion control fabric, dewatering devices, check dams, and sediment traps will be deployed to attain compliance with DEQ standards. Phased erosion and sediment control plans and sequencing of corresponding mitigation activities is anticipated to accommodate the proposed site construction and subsequent demolition of the exiting building.

1.4 SITE ANALYSIS

SITE GRADING

Existing Conditions

This site has a large topographic fall from west to east across the site ranging from 270 feet to 210 feet elevation. Currently there are a few 'tiers' of project site features, with the multiple floor entry elevations on the school building and parking areas, to a lower tier rectangular field, and the tennis facility along the eastern edge. Along the northern property line exists a swale to capture small areas of surface runoff and convey water east to towards a defined swale and inlet adjacent to the Bradlee Shopping Center.

The current school open space is approximately 8 to 10 feet above the curb elevation of the rear service drive aisle of the shopping center-along the northeast property boundary. Careful consideration of grading is needed against this shopping center drive aisle as not to direct additional water to the curb inlets and pipe system for the adjacent development. The image (Image 1) to the right is a representation of the grade change between the existing Minnie Howard property and the adjacent shopping center drive aisle.

Proposed Grading

The proposed site grading will vary depending on individual criteria of selected concept layout however, all will have similar design methodology. We expect the site grading to be a 'tiered' approach similar to the existing conditions where the finished grade is at 1st floor on the east of the building and then 2nd floor elevation on the west side of the building. It is likely that the athletic field may be vertically similar to the 3rd floor elevation. An accessible route will be provided throughout the site for site features to building entry points and athletic facilities.

We assume that retaining walls will be needed near some of the property lines, specifically along the north property line residential property and northeast adjacent to the Bradlee Shopping Center. Provision of retaining walls will allow proposed grading to capture storm water rainfall and direct on-site stormwater management while minimizing impact on existing storm inlets and pipes adjacent to the project site.

Image 1: Grade change between M.H. & Shopping Center

Image 2: Swale outfall to the Shopping Center

1.4 SITE ANALYSIS

STORMWATER MANAGEMENT

Overall Requirements

This project will comply with the storm water quantity and quality requirements of Article XIII of the City of Alexandria Zoning Ordinance, the City of Alexandria 2019 Green Building Policy, and subject matter requisites of the Virginia Department of Environmental Quality (DEQ) and the Chesapeake Bay Preservation Act.

Existing Condition-Overview

The project area has two outfalls that eventually discharge in differing local watersheds. One 15-inch Reinforced Concrete Pipe (RCP) pipe exits the site northward and eventually outfalls at Four Mile Run. Multiple RCP pipes exit the site to a 36" RCP City pipe system beneath West Braddock Road and eventually outfalls at Taylor Run.

Based on topographical survey and field observation, another site outfall exists at the northern triangle area shared with the Bradlee Shopping Center. A small drainage swale exists along the northern property line between the existing site and residential property that conveys water eastward and ultimately to an inlet discharging to a storm pipe along the rear drive aisle of the shopping center. This area appears to capture drainage from three adjacent and abutting properties - two of which are separate from the project site. Additional investigation is ongoing to identify the ultimate drainage area of this outfall as it appears much of the rear of the residential property and the school property drain to this location. Image on the previous page (Image 2) shows the swale outfall to the shopping center.

Basis of Water Quantity Design

Each of the two site outfalls will be analyzed individually consistent with Virginia water quantity requirements. In comparison to pre-development conditions, the intent is to reduce the post-development peak flow rate from a 1-year 24-hour storm event in order to reduce the total energy (product of flow rate and velocity) by 20-percent. Similarly, the intent is to reduce the post-development peak flow rate from a 10-year 24-hour storm event to below the pre-development condition. It is anticipated that water quantity requirements for this project will be accomplished by underground detention system(s).

Basis of Water Quality Design

The site will be analyzed for compliance with water quality requirements of the City of Alexandria's Article XIII of the City Zoning Ordinance, City's 2019 Green Building Policy, and Virginia Department of Environmental Quality (DEQ). The City of Alexandria Water Quality Volume Default (WQVD) requirement states that the first ½-inch of runoff over post-development impervious areas requires treatment using a water quality Best Management Practice (BMP). 100-percent of impervious areas within the property bounds must also be captured and routed to a water-quality BMP. 100-percent of stormwater treatment is required to be provided through above-ground green infrastructure. Virginia DEQ requires phosphorus reduction based on the amount of impervious site area in the pre-development and post-development conditions.

Anticipated Design Response

A combination of urban-bioretention (stormwater planter boxes), dry swales, green roof, and permeable pavement will be considered to meet the requirements. In general, urban bioretention areas will be strategically placed adjacent to buildings to collect runoff from roof drains. Bioretention areas and dry swales are particularly effective when used to collect surface runoff adjacent to large impervious areas such as parking areas and travel-ways. Permeable pavement systems may also be deployed as a means of reducing surface runoff.

It is generally anticipated that impervious areas within the property boundaries will be captured and treated in water-quality BMP facilities. However, initial analysis suggests that some areas, especially near the right-of-way of West Braddock Road may not be practically routed due to topography to proposed BMPs. A contribution to the Water Quality Improvement Fund (WQIF) or a WQIF-Waiver from the City may be necessary to offset this condition.

Refer to Tab Section 3.5 for stormwater management analysis relative to the design concepts.

UTILITIES (WATER, SEWER, GAS, ELECTRIC, GEOTHERMAL)

Initial site survey information appears to indicate that primary wet/dry utilities are available to the site. Future connections are anticipated along the West Braddock Road frontage.

1.4 SITE ANALYSIS

Water

Existing water service is available in a main beneath West Braddock Road. One meter is required that will provide potable water service to the site. A separate meter for landscape irrigation and operations wash down of facilities, such as tennis and the athletic field, may be set to eliminate sanitary fees for this use. Fire protection will require a pressurized loop with hydrants spaced at a maximum clear distance of 300-feet with provision of coverage to all sides of each building.

Sanitary Sewer

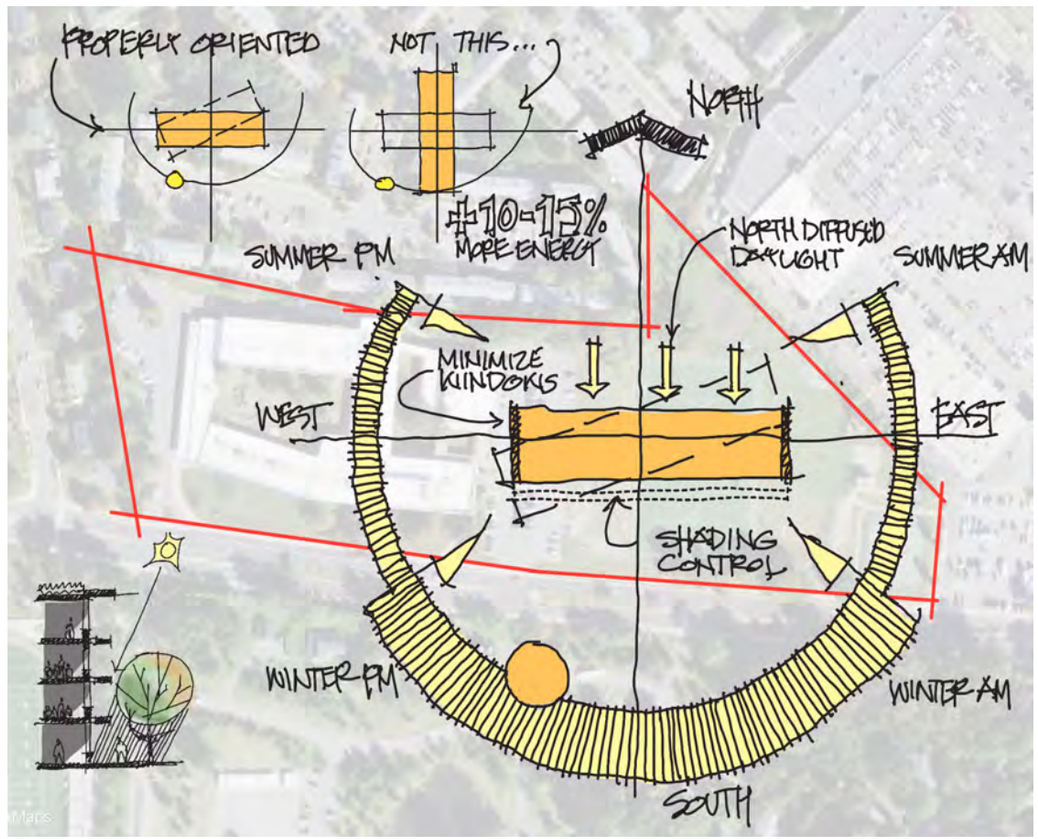
An existing 10-inch main lies within the right-of-way of West Braddock Road. Service connection is anticipated at one of the existing utility access holes within the right-of-way. The City of Alexandria requires that a downstream adequate outfall analysis be performed to a downstream trunk sewer with a minimum diameter of 24-inches. This will be performed to confirm that adequate minimum velocity and capacity is available for any flow increase.

Natural Gas

Natural gas service is available in the right-of-way of West Braddock Road. The existing school has a gas service connection. With redesign of the school, a new service connection can be provided. The most-direct route without conflict with other utilities is preferred. A new meter may be required.

Electric

Electric service is available in the right-of-way of West Braddock Road. The existing school has an electric service connection at the front of the building and is routed to the building rear. This is the main power service to the school building. With redevelopment of the school site, it is likely that a new service connection is to be provided at another location eastward along the West Braddock Road frontage in the vicinity of the proposed school building. Doing so will eliminate duplication of service on the interior to the site. An alternative would be to access electric service along the northeast property frontage adjacent to the Bradlee Shopping Center. Connection location and metering in coordination with the utility provider, Dominion Energy Virginia, will best optimize service access.



SOLAR ORIENTATION

Dunbar High School
Washington, DC

1.4 SITE ANALYSIS

Fiber

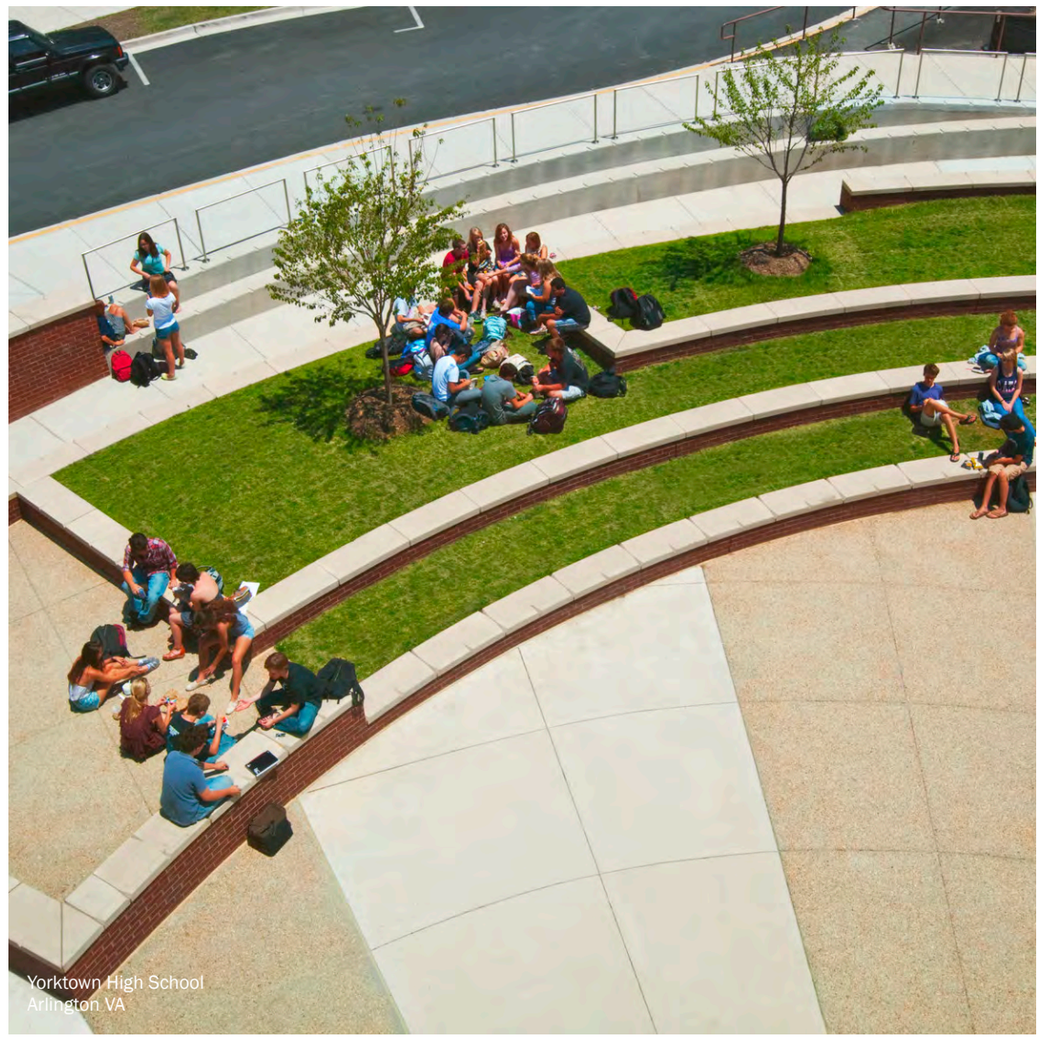
Fiber service enters the site from West Braddock Road. Service enters the existing building at the southwest corner and west building side. Multiple fiber pull-boxes are located along the west building side and appear to access the rear of the facility. With redevelopment of the school, it may be necessary to provide another connection at a new location eastward along the West Braddock Road frontage. This will eliminate redundancy in parallel access leads. The final connection location will be coordinated with the fiber communication provider.

Geothermal Wells

There are approximately 77-existing geothermal wells below the west parking area. It appears that they are operational and provide resources to the existing school. With redevelopment of the site, adapting/re-dedication of these resources is anticipated. A new geothermal well field will be provided to serve the additional needs of the new school. Refer to diagrams in the Tab 5 Mechanical Systems section which includes approximate projected size of new geothermal well field.

Site Security and Technology

Site security and technology will be studied during design.



Yorktown High School
Arlington VA

2 TAB 2: DESIGN CONCEPTS

2.1 CONCEPT CONSIDERATIONS

DESIGN PRINCIPLES

1. CIVIC ENTRANCE/PRESENCE - Civic buildings should have a civic scaled entrance that is clear, inviting and provides a backdrop to pedestrian safe areas for congregation.

2. PEDESTRIAN CONNECTIVITY - Traffic calming measures should be integrated into the site design prioritizing pedestrian connectivity over other forms of mobility. Car, Buses, and bicycles are still important and their networks will be connected.

3. COURTYARD AS A PLACE - Courtyards serve to amplify pedestrian connectivity, provide a micro environments for people to gather and increase the indoor outdoor connectivity of the school.

4. VISIBLE SUSTAINABILITY - High performance buildings many times suffer from an inability to demonstrate their high level of performance. All of the features that help the building achieve a high quality of human comfort, high level of energy performance, and environmental quality recede from view. What is the building through its architecture, is able to communicate these aspirations. Can the building bridge how it works with what it looks like?

5. LOCAL BUILDING TRADITIONS - Buildings should aspire to be from their place. How important is it to reflect local building traditions, new and old, in the architecture of the school?

6. HISTORY OF PLACE - The Lee family once owned a farm in the site of the school. Can that rich history play a larger role in our understanding of the site? In our understanding of place? Is there a larger idea of interpretation of the site that includes its rich history.

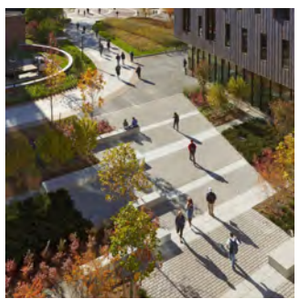
7. INDOOR-OUTDOOR CONNECTION - Studies have demonstrated that access to daylight and views has a significant positive impact in the quality of life we have in buildings. Creating amenable outdoor environments, and connecting to them either physically and visually contributes to this quality. Strategically placed windows will maximize daylight but will also choreograph views to the outside, particularly from the central spaces important to the social and academic life of the school.

8. OUTDOOR LEARNING - Now more than in recent times, the importance of extended learning to the outdoor has become of great interest to educators. How can the site facilitate outdoor gathering spaces that help animate the school grounds, but are flecible enough be used for educational activities. How can things like stormwater management features, required as part of the development, promote and educational value and help students understand both the science at work in them as well as the site of the school as place?

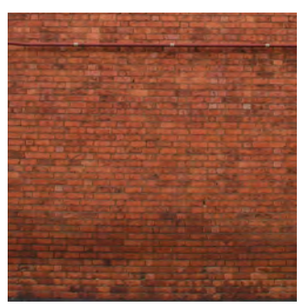
9. SCALE: BASE, MIDDLE, TOP - Like a good story that has a beginning, a middle, and an end, buildings should be organized with a reflection on the qualities of its base, middle, and top. The base relates to the site and the ground the building sits on, the middle is a reflection of the presence of humans and their activities within, the top relates to how the building meets the sky. How a building reflects these themes can sometimes be subtle, but in all cases lend the built environment a readability.


1. CIVIC ENTRANCE/PRESENCE

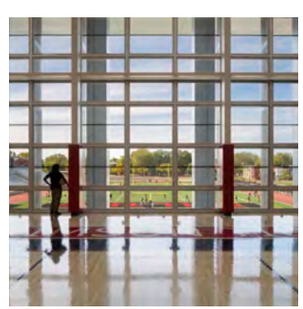

2. PEDESTRIAN CONNECTIVITY

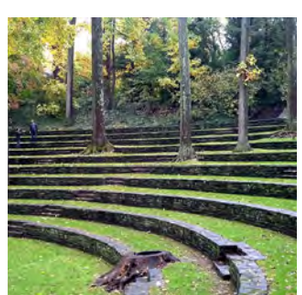

3. COURTYARD AS A PLACE

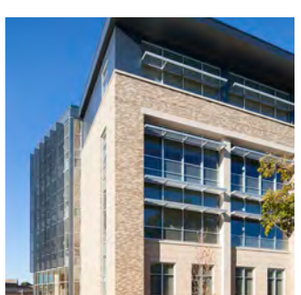

4. VISIBLE SUSTAINABILITY


5. LOCAL BUILDING TRADITIONS


6. HISTORY OF PLACE


7. INDOOR-OUTDOOR CONNECTION


8. OUTDOOR LEARNING

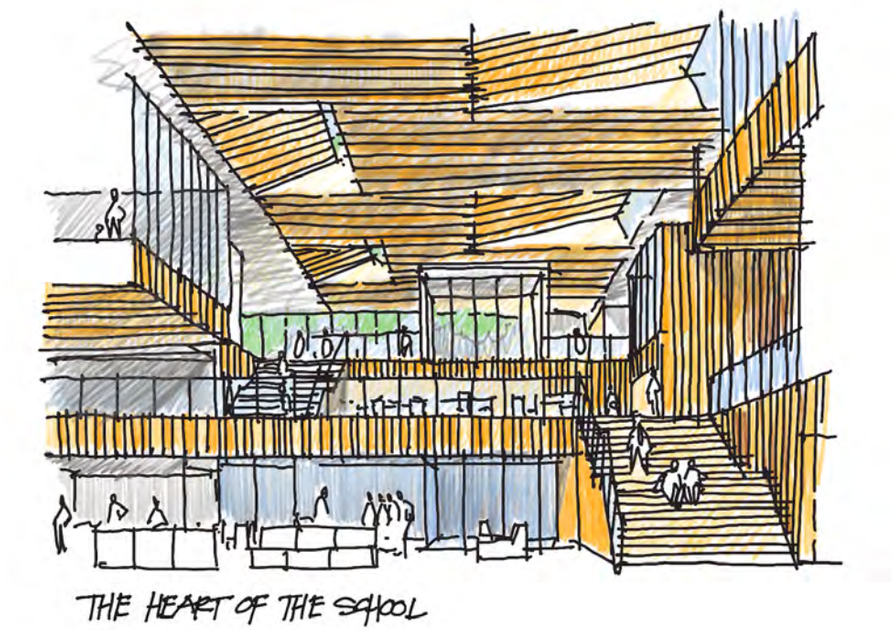

9. SCALE: BASE, MIDDLE, TOP

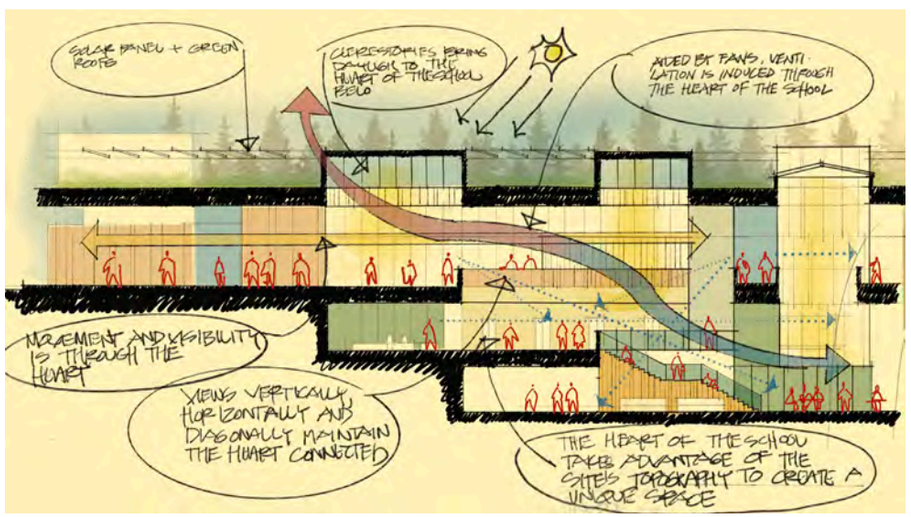
2.1 CONCEPT CONSIDERATIONS

HEART OF THE SCHOOL

The history of the design of learning environments is colored by the influence of what was thought to be of necessity. It was necessary to house the functions of the school in an efficient arrangement, neat rows of classrooms, all the same. It was necessary to organize spaces for a high degree of functionality and optimization. It was necessary to align students in neat rows, accountable and easy to supervise. It was necessary to do all of these things, it was believed, but with none of the “heart”. Schools today need to be dynamic environments that cater to the intellectual, social, and emotional needs of young adults. What does a school that is invested around the needs of the whole child look like? How does it work? What is the first impression of this kind of school?

We consider this first impression to be of critical importance, communicated by what we call the “Heart of the School”. The heart of the school is not only the first impression upon entering, it is also the beating pulse of the learning community. From this vantage point a very dynamic learning environment can be appreciated, many of the exciting opportunities to be a life long learner can be seen.





2.1 CONCEPT CONSIDERATIONS

PARKING STRATEGIES

The following parking strategies were considered while studying the different possible site & building orginizations. Due to budget constraints, the three concepts include only surface parking, and no above or below grade structured parking.

1. PARKING ON GRADE (SURFACE PARKING)

- Pro - Cheapest Option
- Con - Uses Open Site Space

2. STRUCTURED PARKING (ABOVE GRADE)

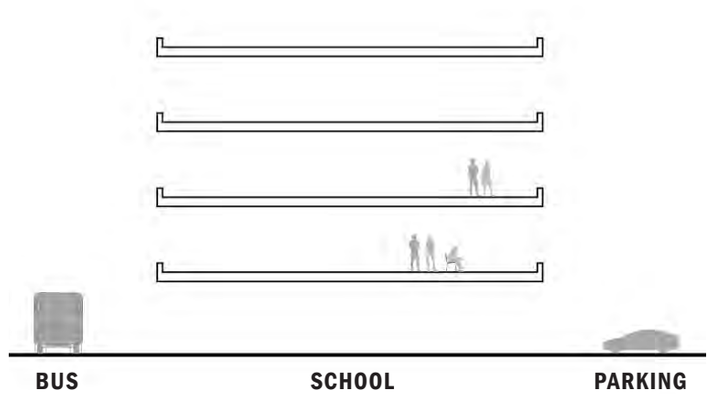
- Pro - Condenses Surface Parking Vertically
- Con - Costs More Than Surface Parking

3. PARKING BELOW FIELD

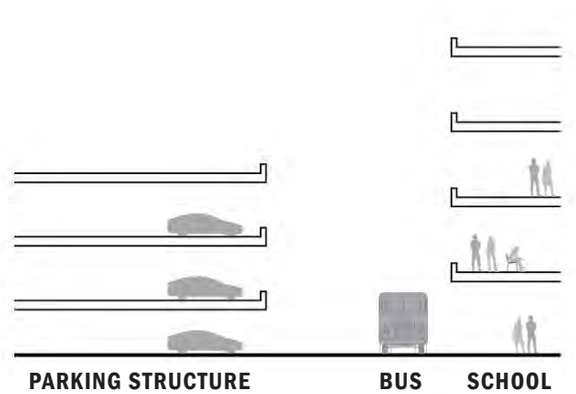
- Pro - No Loss Of Site Open Space
- Con - Costs More Than Surface And Above Grade Structured

4. PARKING BELOW SCHOOL

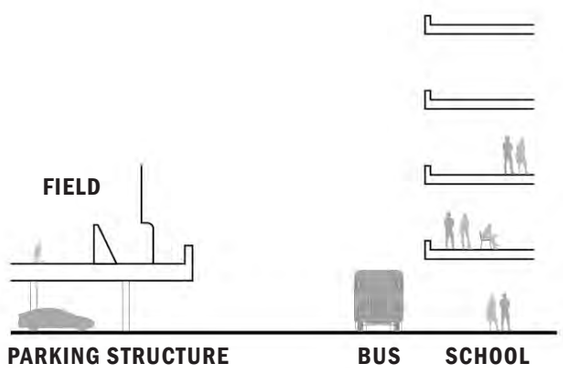
- Pro - No Loss Of Site Open Space
- Con - Costs More Than Surface And Above Grade Structured Parking



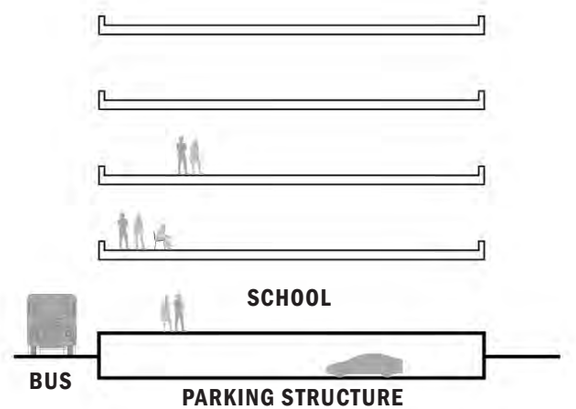
1. PARKING ON GRADE



2. STRUCTURED PARKING (ABOVE GRADE)



3. PARKING BELOW FIELD (BELOW/SEMI BELOW GRADE)

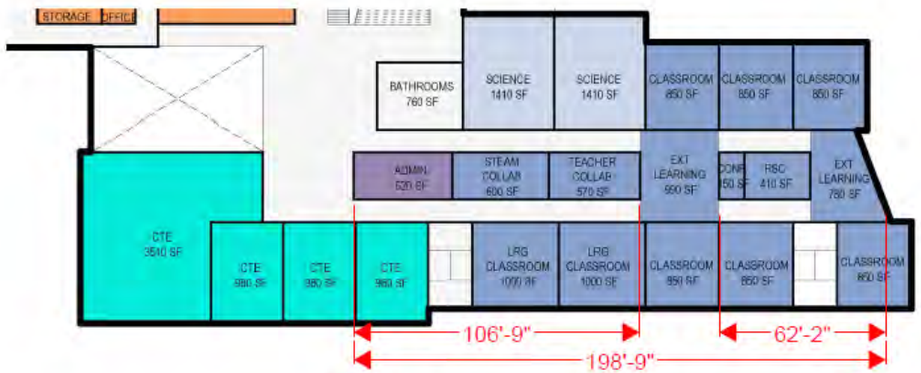


4. PARKING BELOW SCHOOL

2.1 CONCEPT CONSIDERATIONS

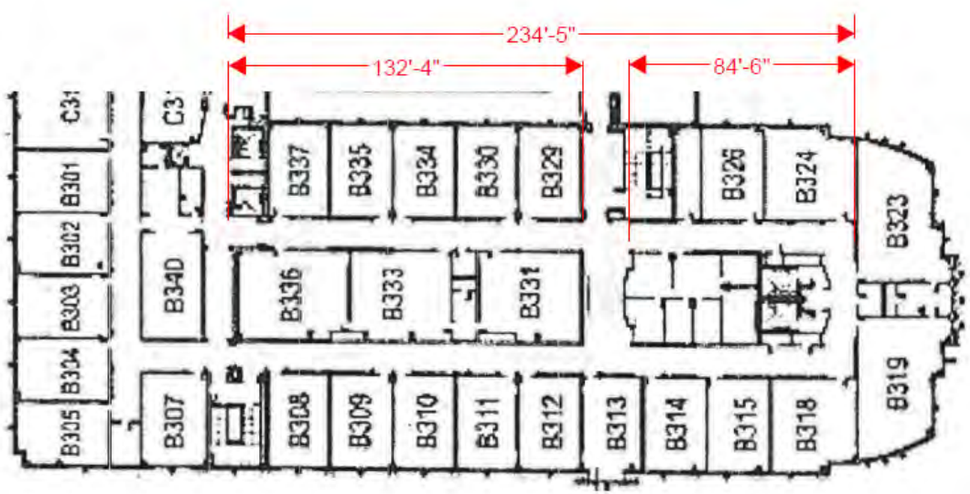
BUILDING CIRCULATION COMPARISON

Throughout the proposed concept design, the circulation length and pathway organization was carefully considered. The proposed Interdisciplinary Communities within each concept seek to minimize the total length of travel from the heart of the school to the farthest classrooms, along with providing a diverse series of extended learning spaces and path choices along the way.



1. Proposed Minnie Howard Interdisciplinary Community

   Total Length: +/- 200’
   Intermediate Break at: +/- 106’



2. Existing King Street Classroom Wing

   Total Length: +/- 235’
   Intermediate Break at: +/- 132’

2.2 CONCEPT SUMMARY

CONCEPT SUMMARY

The following pages detail three conceptual design schemes addressing the geometric organization of the school, its relationship to the site/proposed athletic fields, and surface parking strategies. Following the individual concepts a comparison matrix highlights how well each concept supports the project's design patterns and criteria.

Each concept offers a formal response, but it is not limited to, the criteria set out in 1.4 Site Analysis, with special emphasis on:

No net loss of outdoor recreation space. The site is examined for its capacity to include:

- Multi-use field (Football, Soccer, Lacrosse, Field Hockey)
- Tennis and Pickleball combined multi-use surface
- Basketball and Futsal combined multi-use surface (may overlap with Tennis Courts)
- Practice Field
- Measured Distance Walking Path
- Exploring the viability of a playground space for the youngest of park users.

Creative stacking strategies that minimize the footprint of the building so that more can be done with the site.

Circulation movement for buses, parents, service vehicles, bicycles and pedestrians.

- Consideration for impact of a structured, below grade parking garage under the multi-use field was explored, but not further developed due to budget constraints.
- Landscape buffers and treatments to create a place that fits in the community.
- Reservation of land for storm water management features.
- Reservation of land for potential expansion of school program.

Consideration for environmental features, components, and strategies that support energy conservation measures and high performance building practices.

- Consideration for geothermal wells
- Consideration of the building's solar orientation
- Consideration for on-site power generation in the form of a solar panel array.

As a response, each concept is not exclusive of its answer to the criteria set above. It is possible that a preferred solution will have aspects of a combination if not all three concepts. A hybrid solution is also possible.

2.2 CONCEPT SUMMARY

CONCEPT 1 - HAND SCHEME

Stacked in pairs on the plan, the Learning Neighborhoods are oriented with classrooms facing north and south. The physical education spaces are organized on the western front providing convenient access to the site's outdoor recreation and fields. The heart of the school is the connective link between all the parts both horizontally on each floor as well as vertically. The concept gets it's name from the configuration of the learning spaces which extend eastward like a hand reaching out towards King Street. In this concept the idea of parking on-grade is explored.

The two academic wings extending east create a three sided courtyard open along its eastern edge. The concept combines indoor & outdoor spaces as a continuous experience from east to west.

CONCEPT 2 - CRESCENT SCHEME

The Crescent Concept organizes academic learning neighborhoods along the southern edge of the site along Braddock Road. The gentle curved frontage creates a decisive civic facade to the south. The eastern leading edge is also a "front", facing east, deferring to the companion campus at King Street. Similarly to the Hand Scheme, the Learning Neighborhoods places learning spaces facing north and south, maximizing daylight opportunities. In this concept the idea of parking on-grade is explored.

A notable difference is how the media center is uniquely positioned to bridge between the learning neighborhoods. Its placement encloses the courtyard, and collectively with the academic wings and the heart of the school, create a outdoor space enclosed on its four sides. Entry to the school is primarily from its eastern side.

CONCEPT 3 - PINWHEEL SCHEME

As it's name suggests, the Pinwheel Concept organizes the Learning Neighborhoods and the athletic facilities in orbit around the heart of the school, the connective circulation and social center for the school. With this organization a three sided courtyard is placed along the western side providing an outdoor connection to the fields. In this concept the idea of parking on-grade is explored. In this concept the idea of parking on-grade is explored.

We note that the vast majority of the parking is able to be housed on the east side of the lot, adjacent to the Bradlee Shopping Center. This placement defers to the school buildings as the primary use of the site. Vehicular movement of the buses is shifted to the west, just south of the athletic fields.

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2.3 CONCEPT 1 - HAND SCHEME

CONCEPT 1 - HAND SCHEME

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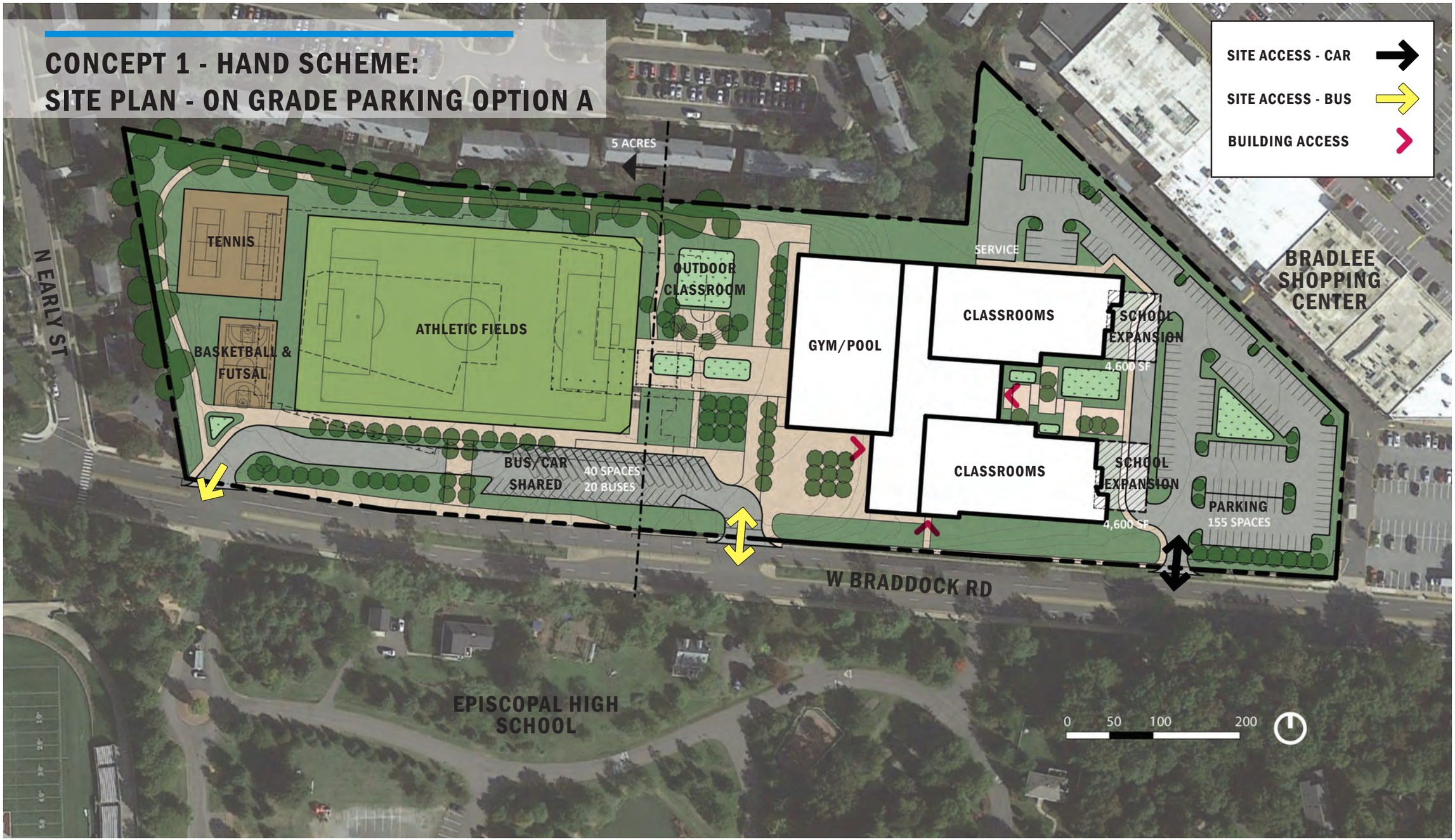
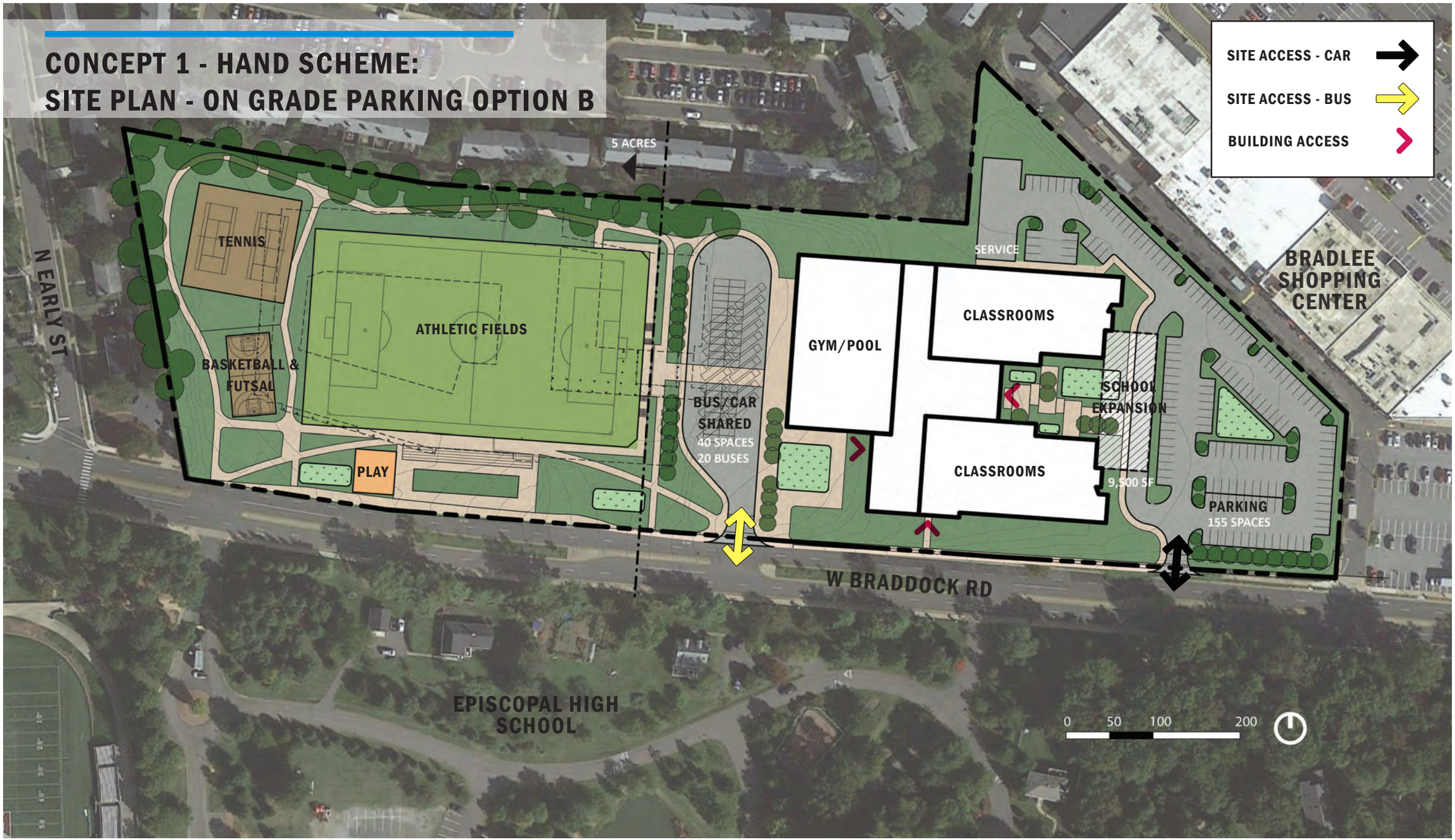
CONCEPT 1 - HAND SCHEME:
SITE PLAN - ON GRADE PARKING OPTION A



CONCEPT 1 - HAND SCHEME:
SITE PLAN - ON GRADE PARKING OPTION B



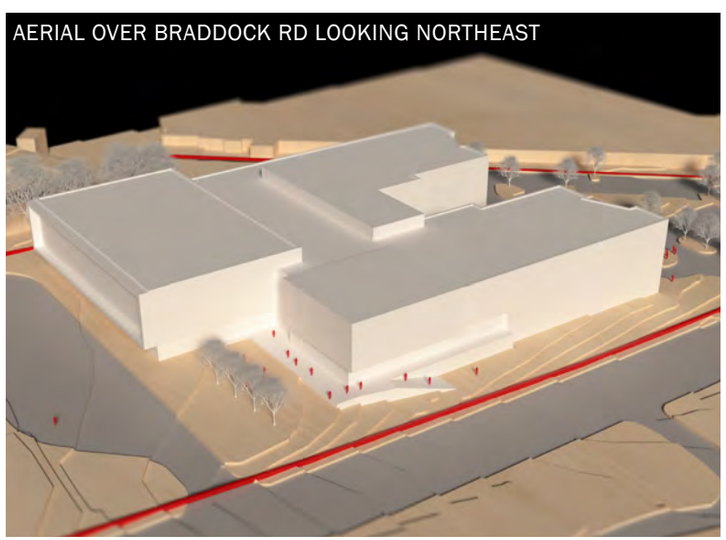
CONCEPT 1 - HAND SCHEME: MASSING EXPERIENCE

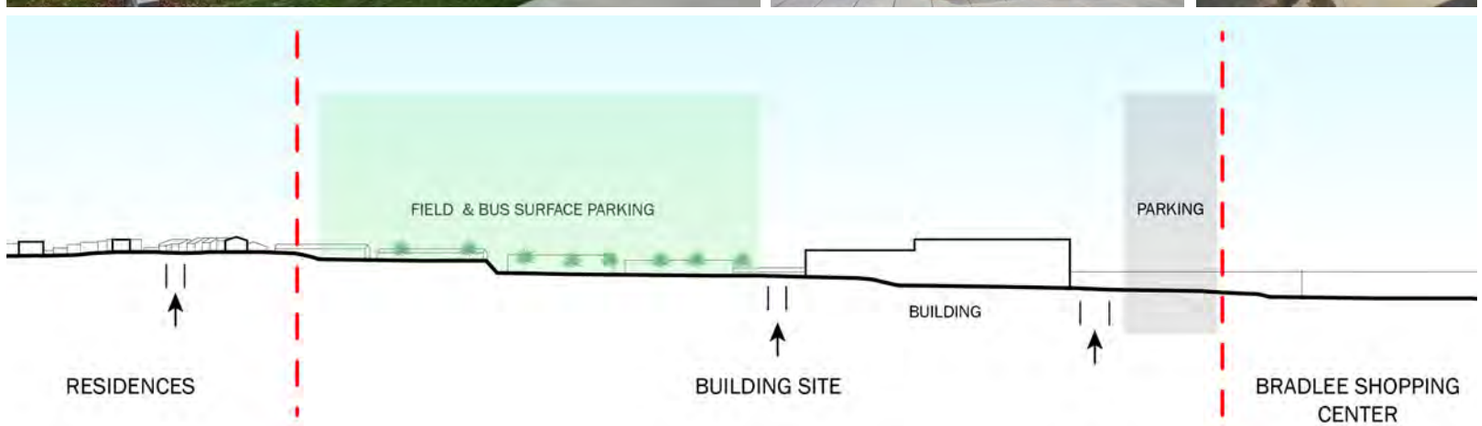
AERIAL OVER ENTIRE SITE LOOKING NORTH

CONCEPT 1 - HAND SCHEME: MASSING PRECEDENTS & SITE SECTION

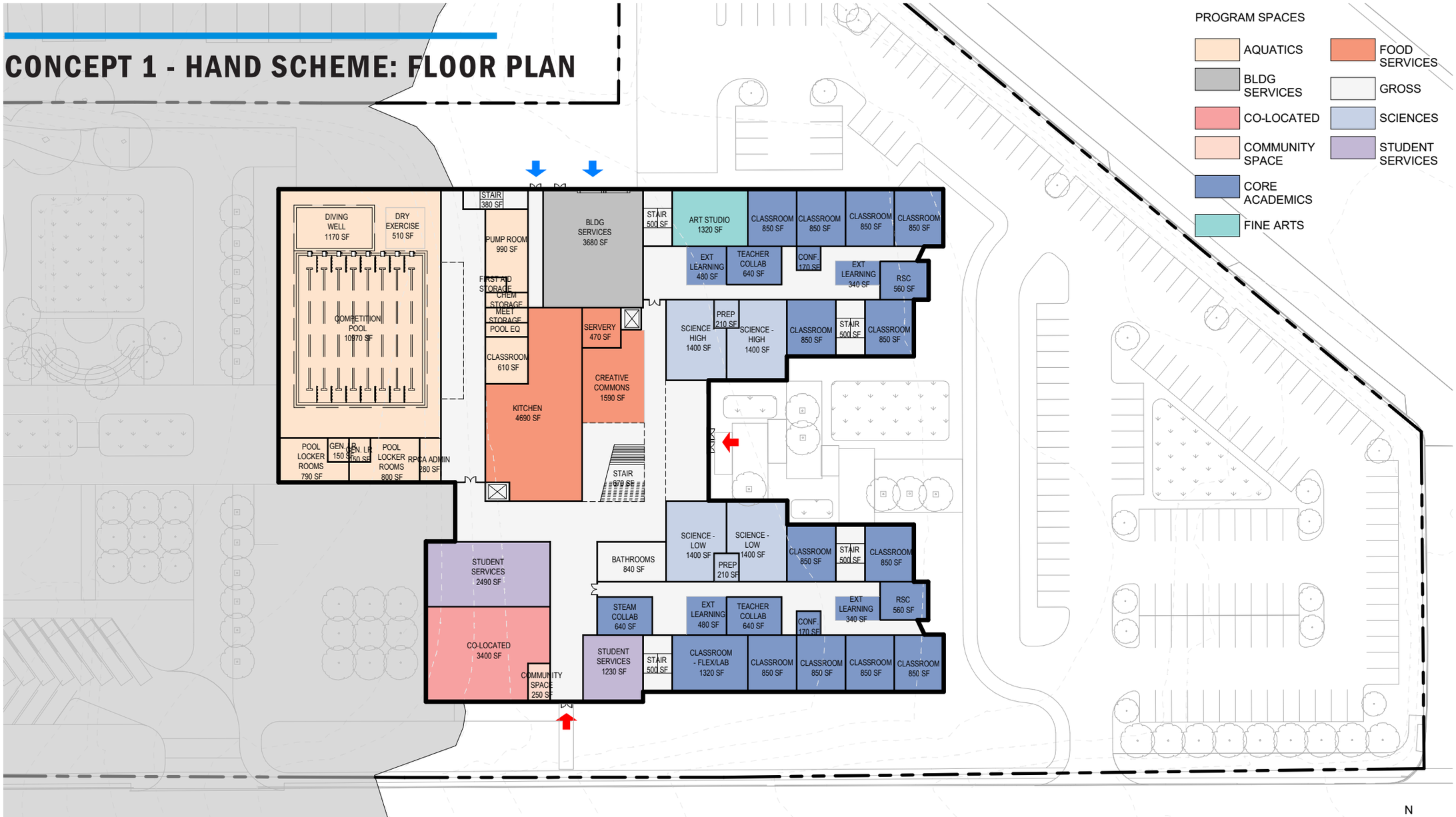
PRECEDENTS

1. Boldrewood Innovation Campus, UK (Grimshaw)
2. Manhattan High School, KS (Gould Evans)
3. Yorktown High School, VA (Perkins Eastman)
4. Oakland University Human Health Building, MI (Smith Group)
5. Mount Si High School, WA (NAC)
6. Madden Innovation Center, New Zealand (Warren & Mahoney)



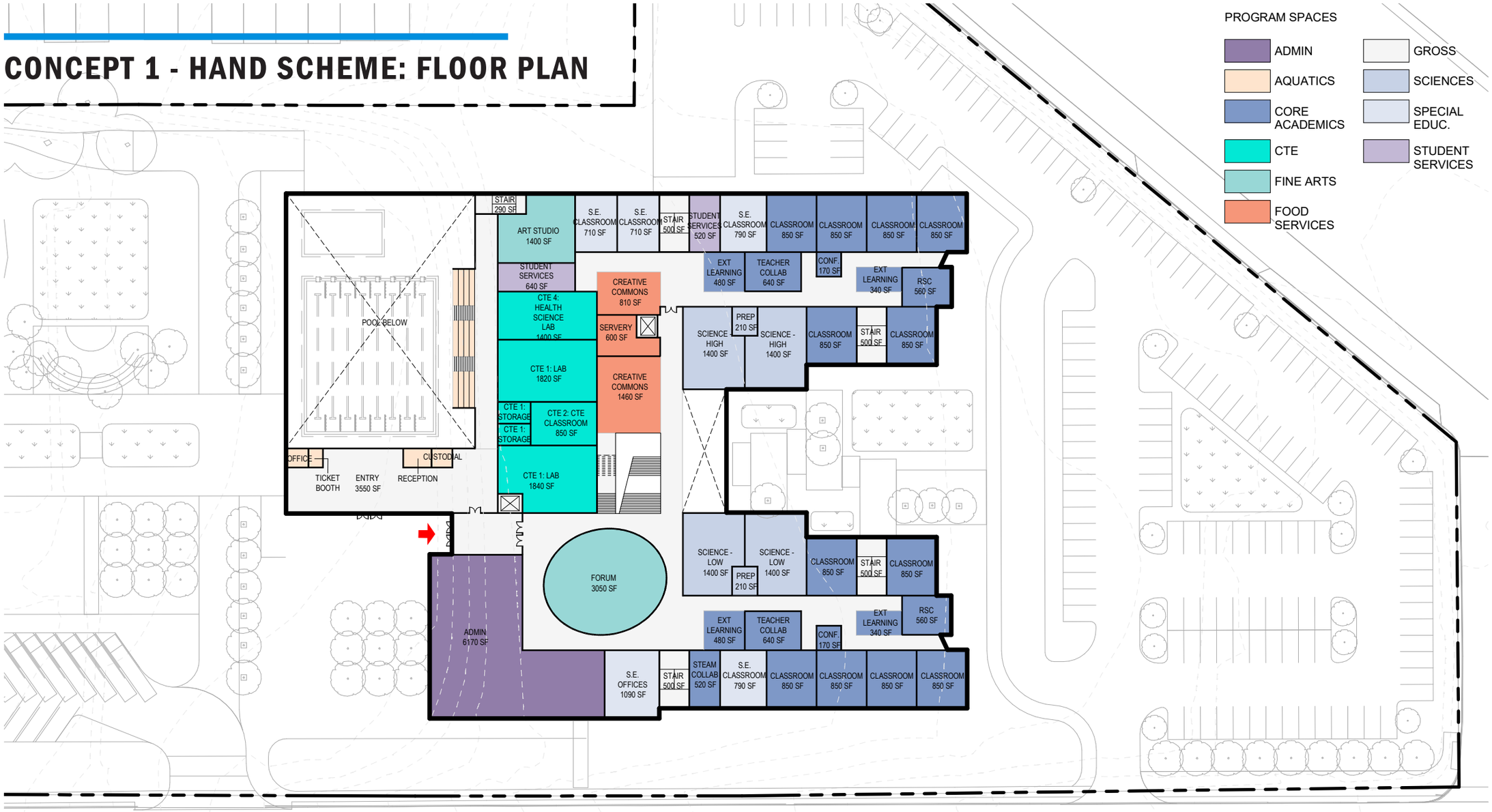


CONCEPT 1 - HAND SCHEME: FLOOR PLAN



FLOOR PLAN - LEVEL 01

CONCEPT 1 - HAND SCHEME: FLOOR PLAN

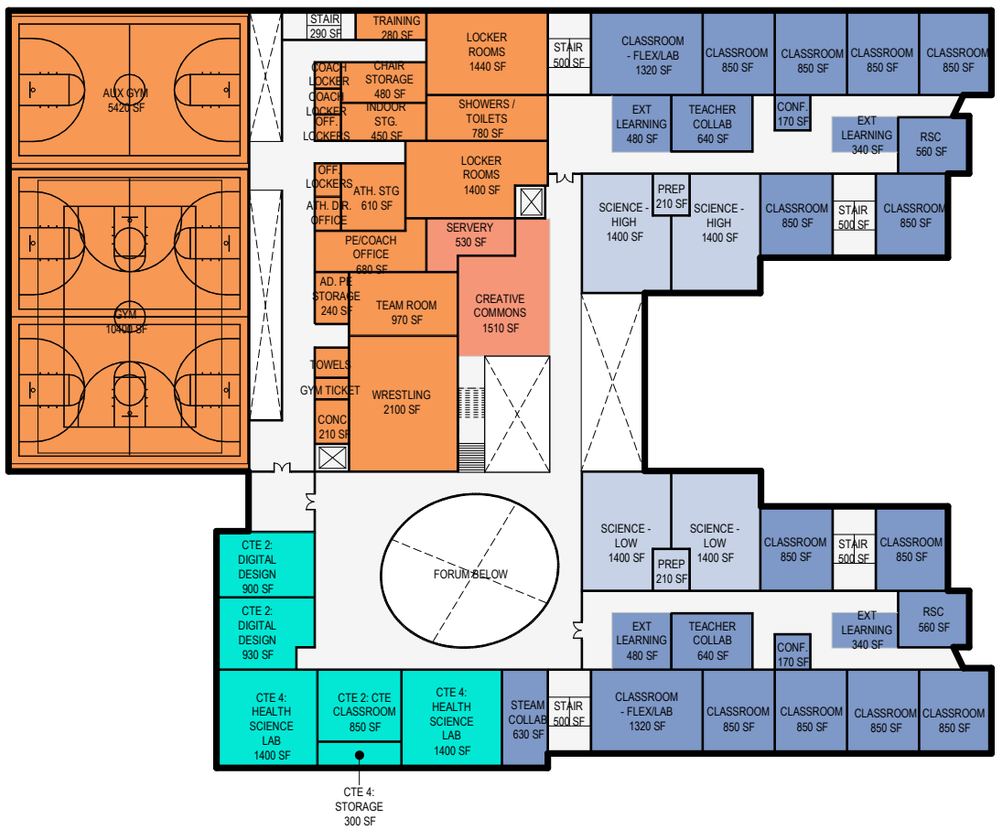


FLOOR PLAN - LEVEL 02

CONCEPT 1 - HAND SCHEME: FLOOR PLAN

PROGRAM SPACES

- CORE ACADEMICS
- CTE
- FOOD SERVICES
- GROSS
- PHYS. EDUC.
- SCIENCES



FLOOR PLAN - LEVEL 03

0' 25' 50' 100' 150'

SCALE : 1" = 50'-0"

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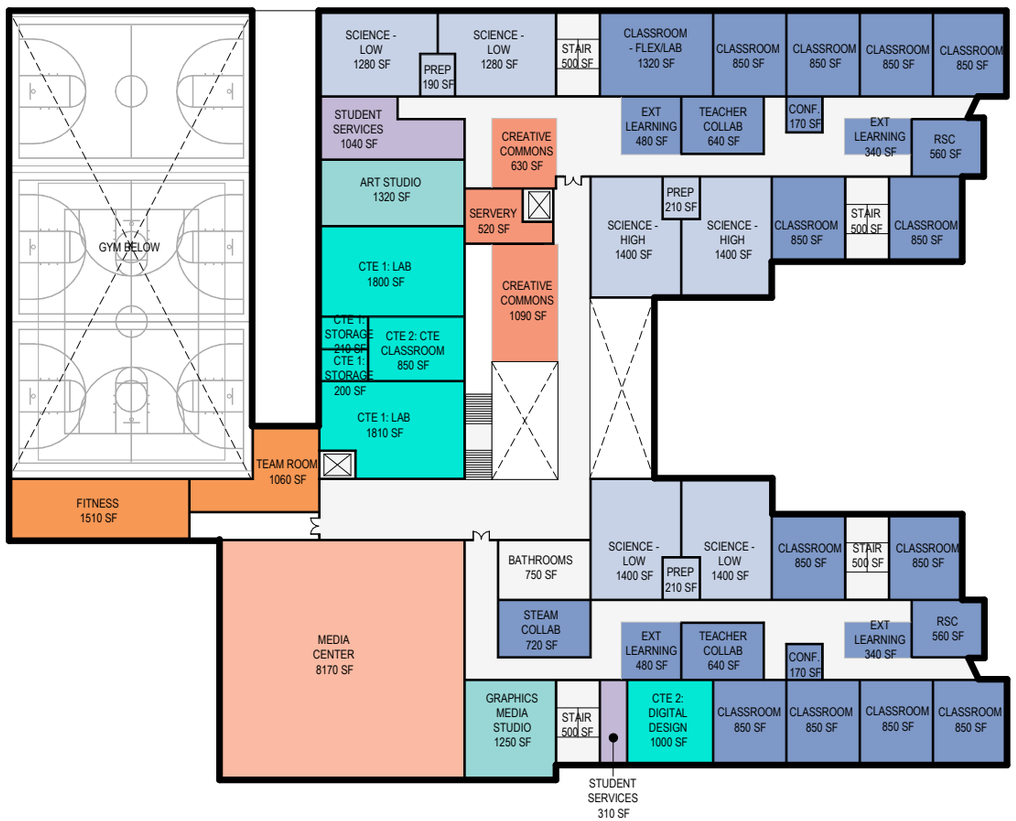
CONCEPT 1 - HAND SCHEME: FLOOR PLAN



PROGRAM SPACES

- CORE ACADEMICS
- PHYS. EDUC.
- CTE
- SCIENCES
- FINE ARTS
- STUDENT SERVICES
- FOOD SERVICES
- GROSS
- LIBRARY

0' 25' 50' 100' 150'

SCALE : 1" = 50'-0"

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FLOOR PLAN - LEVEL 04

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2.4 CONCEPT 2 - CRESCENT SCHEME

CONCEPT 2 - CRESCENT SCHEME

The Crescent Concept organizes academic learning neighborhoods along the southern edge of the site along Braddock Road. The gentle curved frontage creates a decisive civic facade to the south. The eastern leading edge is also a “front”, facing east, deferring to the companion campus at King Street. Similarly to the Hand Scheme, the Learning Neighborhoods places learning spaces facing north and south, maximizing daylight opportunities. In this concept the idea of parking on-grade is explored.

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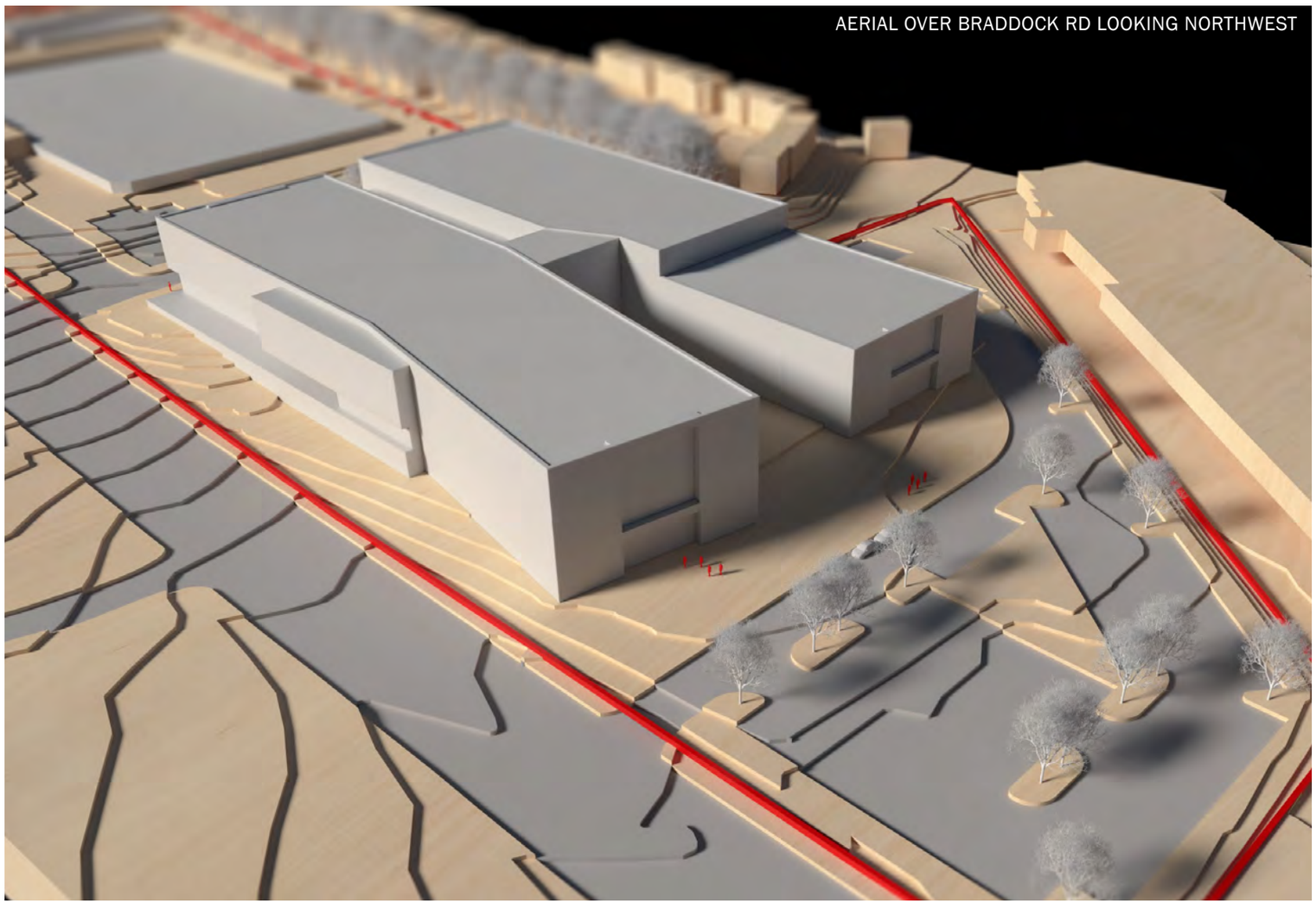
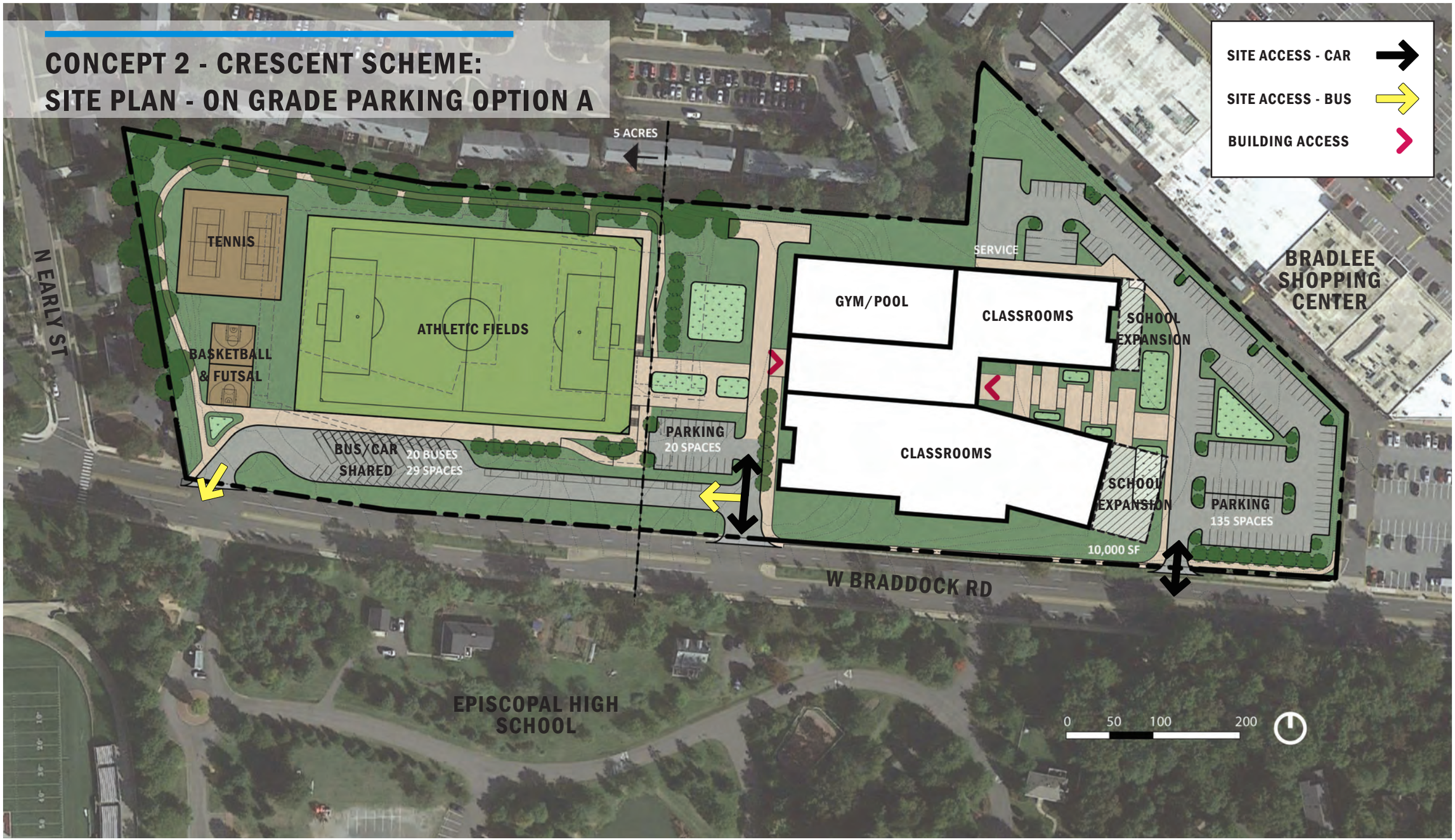
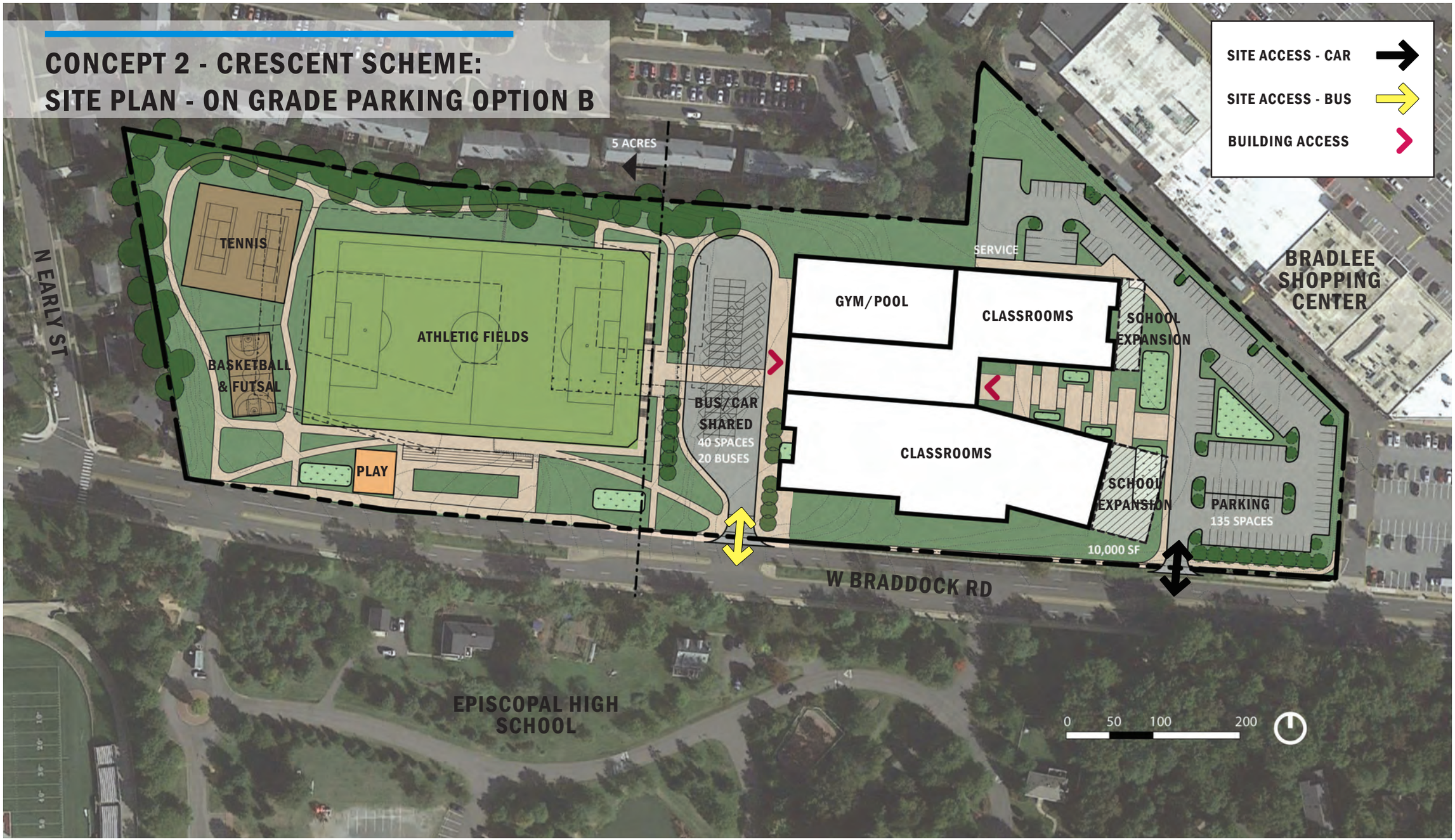


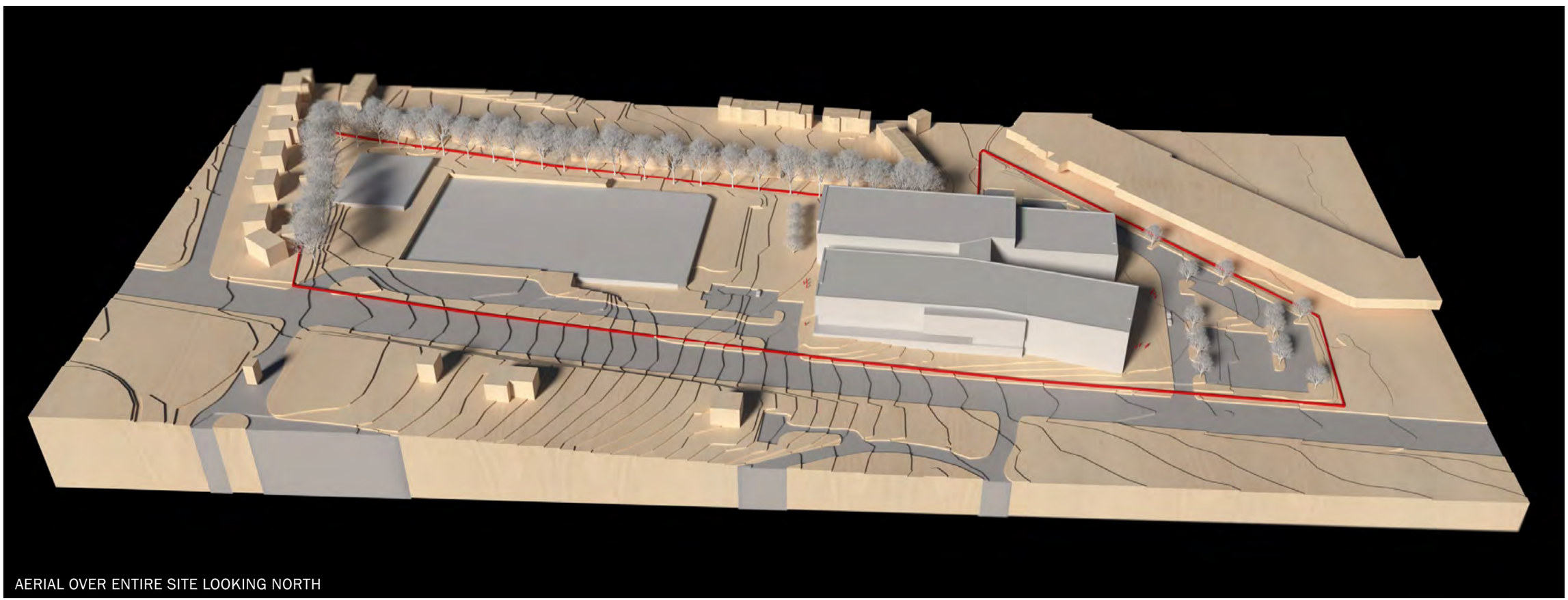
CONCEPT 2 - CRESCENT SCHEME:
SITE PLAN - ON GRADE PARKING OPTION A



CONCEPT 2 - CRESCENT SCHEME:
SITE PLAN - ON GRADE PARKING OPTION B



CONCEPT 2 - CRESCENT SCHEME: MASSING EXPERIENCE



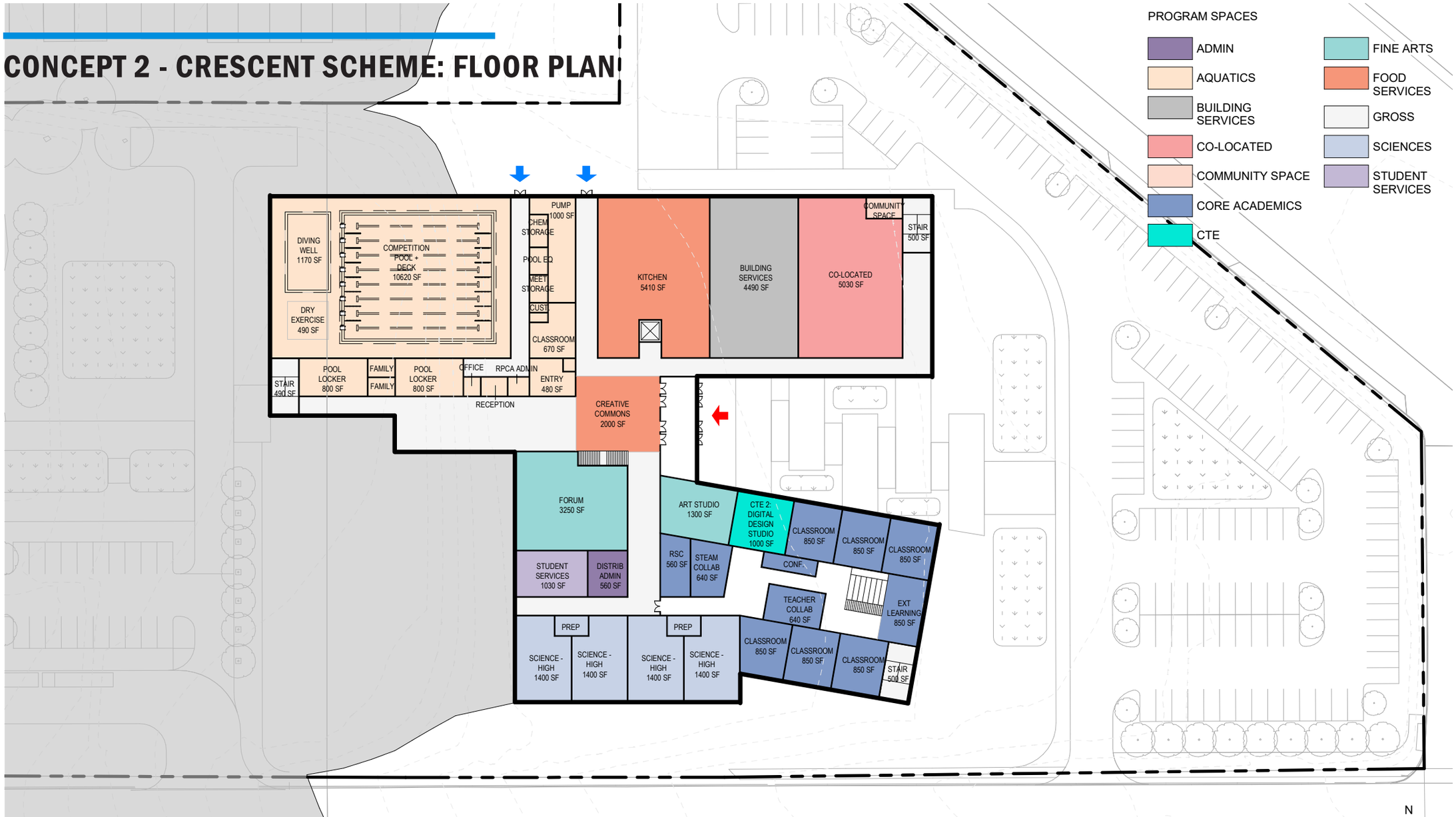
AERIAL OVER ENTIRE SITE LOOKING NORTH

CONCEPT 2 - CRESCENT SCHEME: PRECEDENTS & SITE SECTION

PRECEDENTS

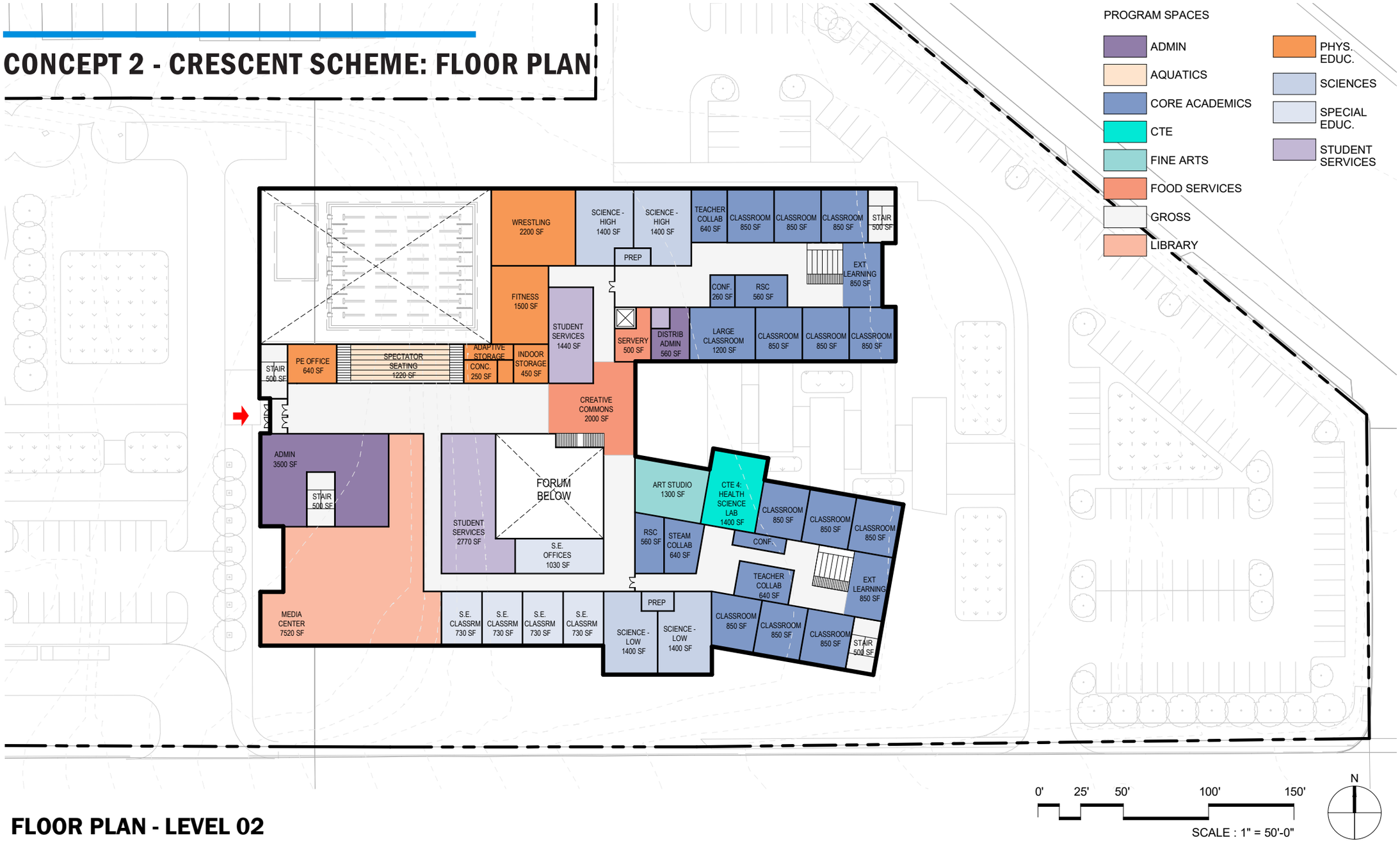
1. Baton Rouge Magnet High School, LA (Chenevert + RHH)
2. Yorktown High School, VA (Perkins Eastman)
3. North Edge, WA (Perkins + Will)
4. Fairleigh Dickinson Univ. Campus Center, NJ (Perkins Eastman)
5. Dunbar High School, DC (Perkins Eastman)
6. Mount Si High School, WA (NAC)

CONCEPT 2 - CRESCENT SCHEME: FLOOR PLAN



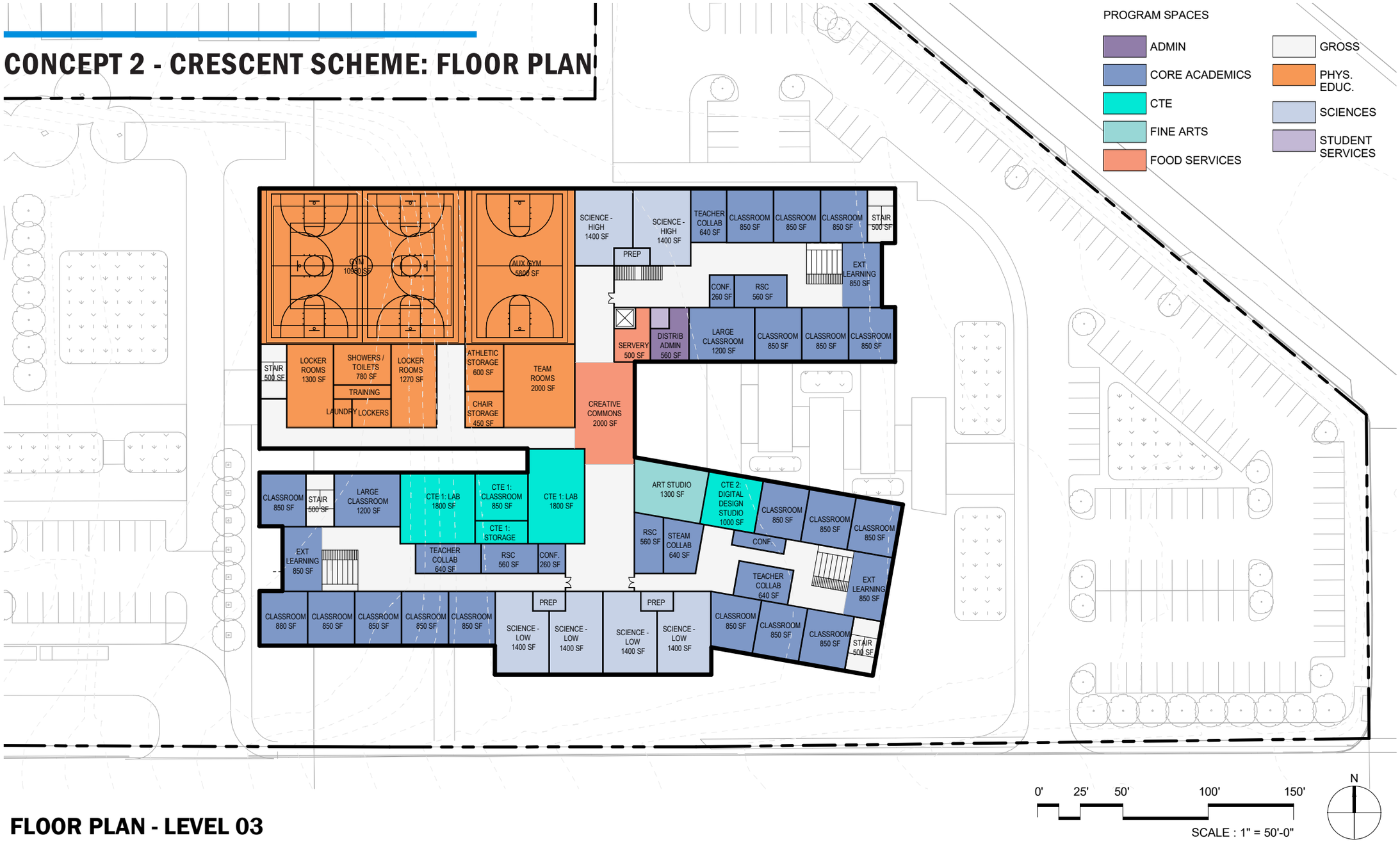
FLOOR PLAN - LEVEL 01

CONCEPT 2 - CRESCENT SCHEME: FLOOR PLAN



FLOOR PLAN - LEVEL 02

CONCEPT 2 - CRESCENT SCHEME: FLOOR PLAN



FLOOR PLAN - LEVEL 03

CONCEPT 2 - CRESCENT SCHEME: FLOOR PLAN

PROGRAM SPACES

- ADMIN
- CORE ACADEMICS
- CTE
- FINE ARTS
- FOOD SERVICES
- GROSS
- SCIENCES
- STUDENT SERVICES

FLOOR PLAN - LEVEL 04

0' 25' 50' 100' 150'

SCALE : 1" = 50'-0"

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3 2.5 CONCEPT 3 - PINWHEEL SCHEME

CONCEPT 3 - PINWHEEL SCHEME

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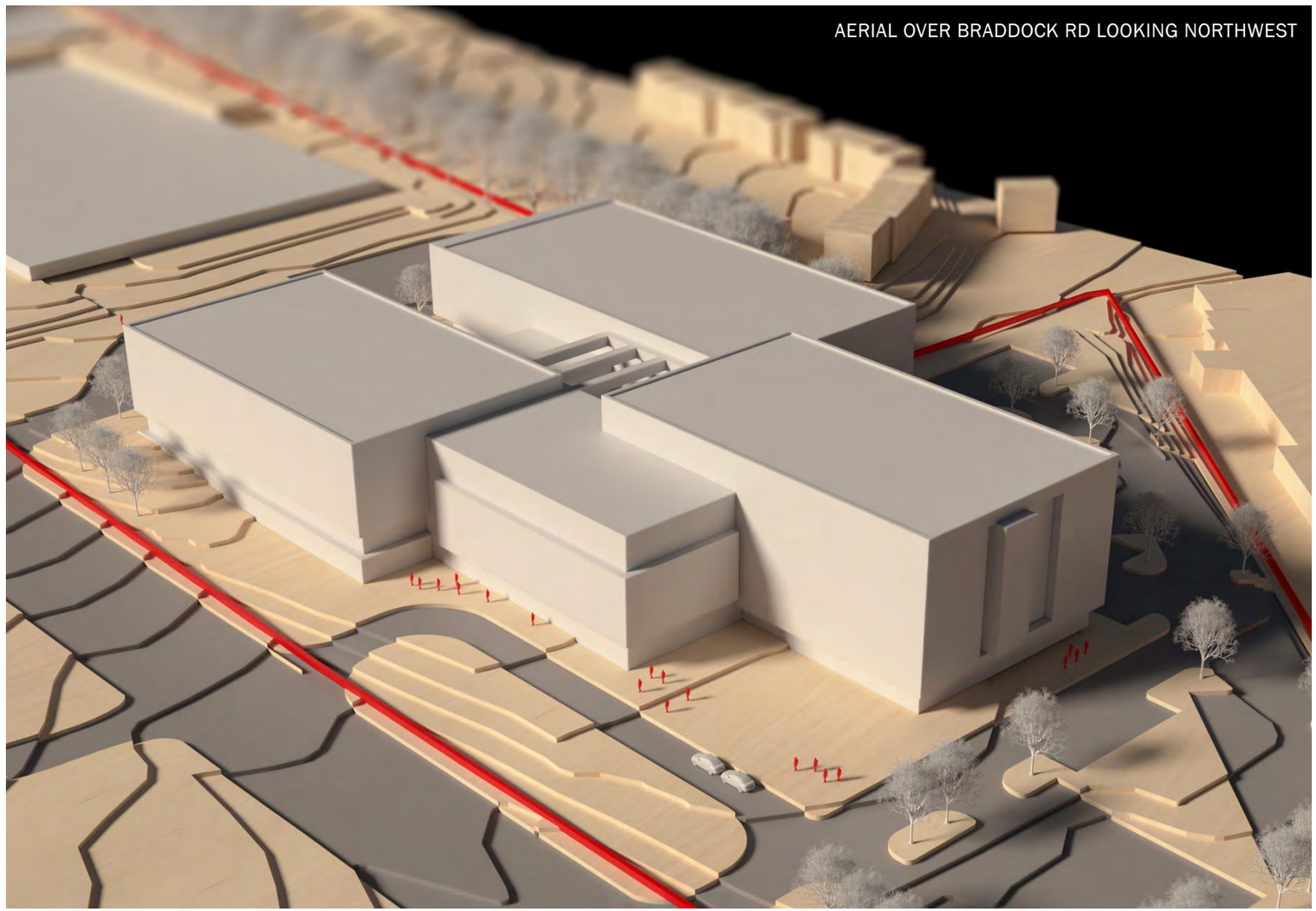
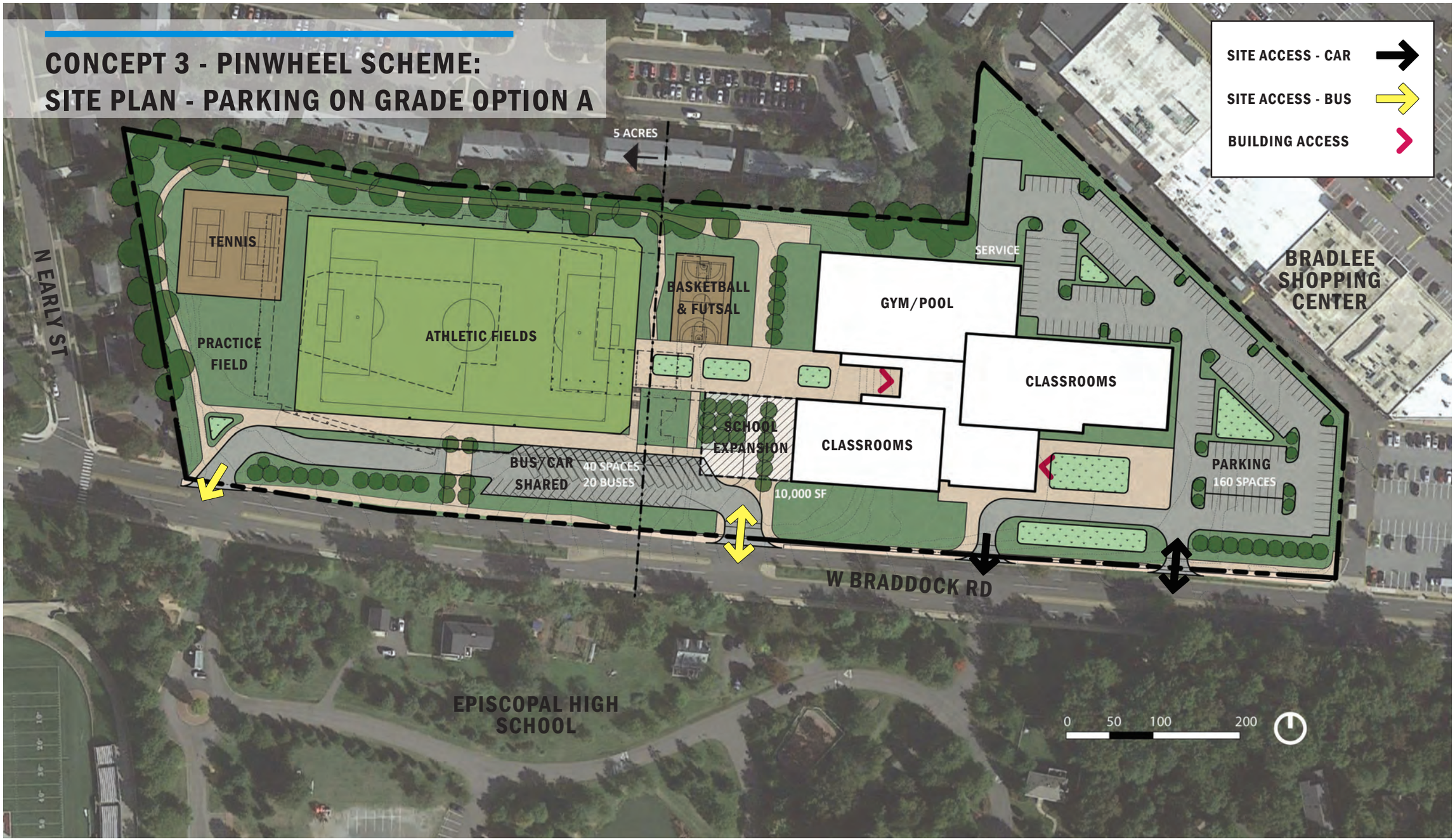
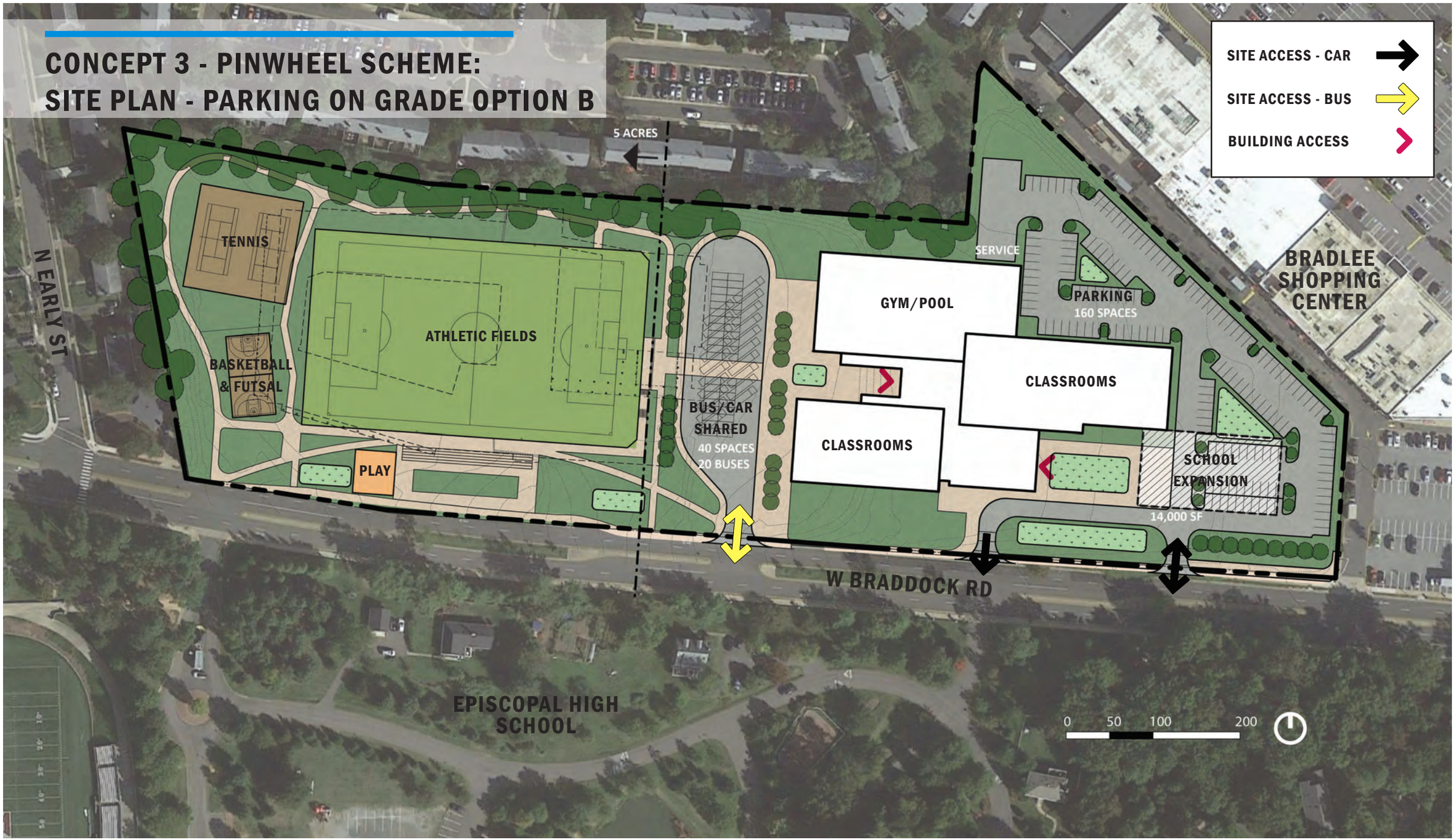


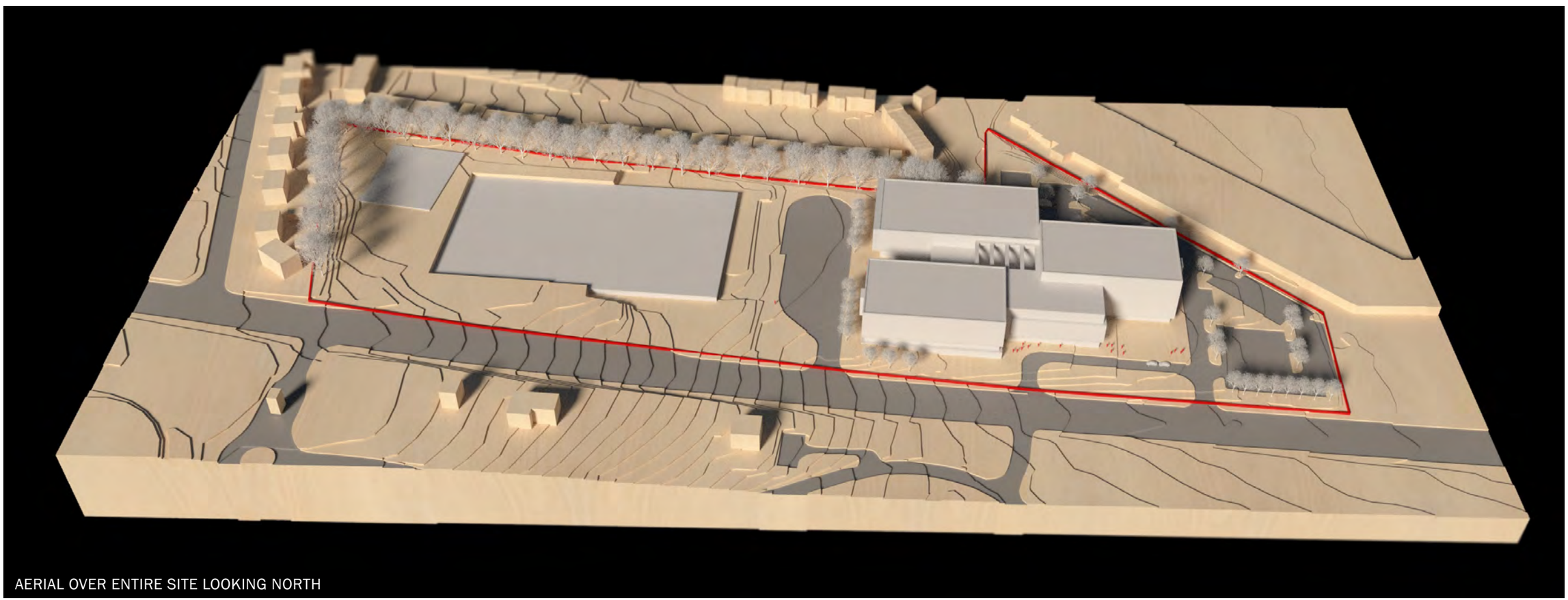
CONCEPT 3 - PINWHEEL SCHEME:
SITE PLAN - PARKING ON GRADE OPTION A



CONCEPT 3 - PINWHEEL SCHEME:
SITE PLAN - PARKING ON GRADE OPTION B



CONCEPT 3 - PINWHEEL SCHEME: MASSING EXPERIENCE

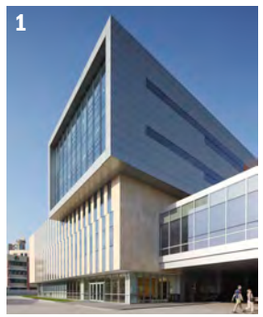


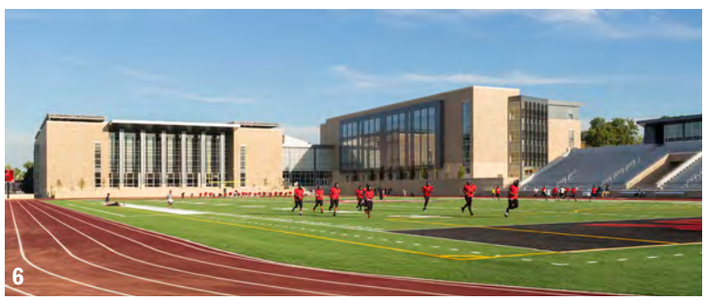
AERIAL OVER ENTIRE SITE LOOKING NORTH

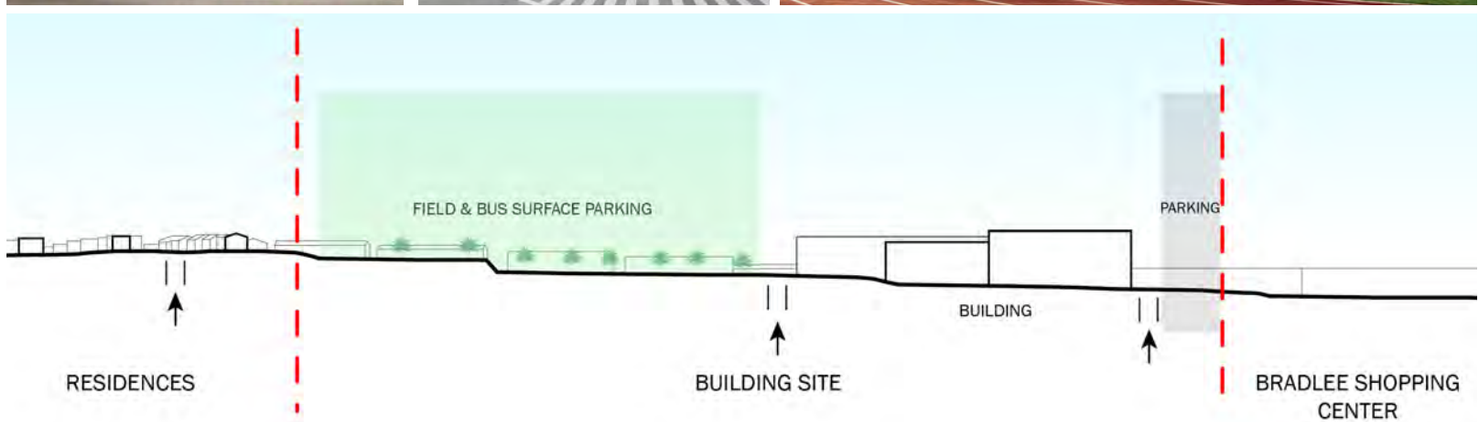
CONCEPT 3 - PINWHEEL SCHEME: PRECEDENTS & SITE SECTION

PRECEDENTS

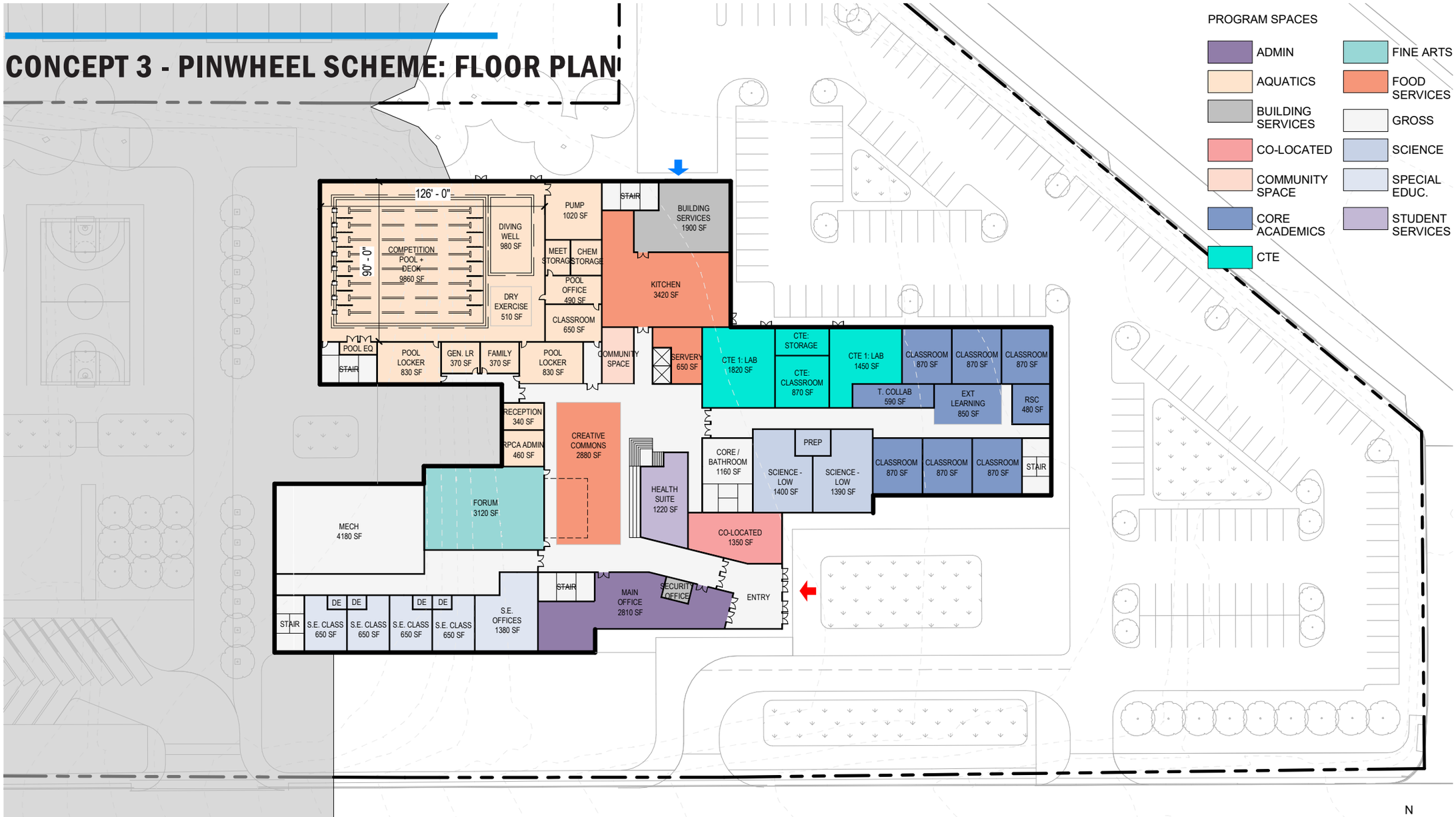
1. Concordia International School, Shanghai (Perkins Eastman)
2. Banneker High School, DC (Perkins Eastman)
3. UMass Design Building, MA (Leers Weinzapfel Associates)
4. Manhattan High School, Kansas (Gould Evans)
5. Traditional Industries Innovation Center, Taiwan (MAYU Architects)
6. Dunbar High School, DC (Perkins Eastman)





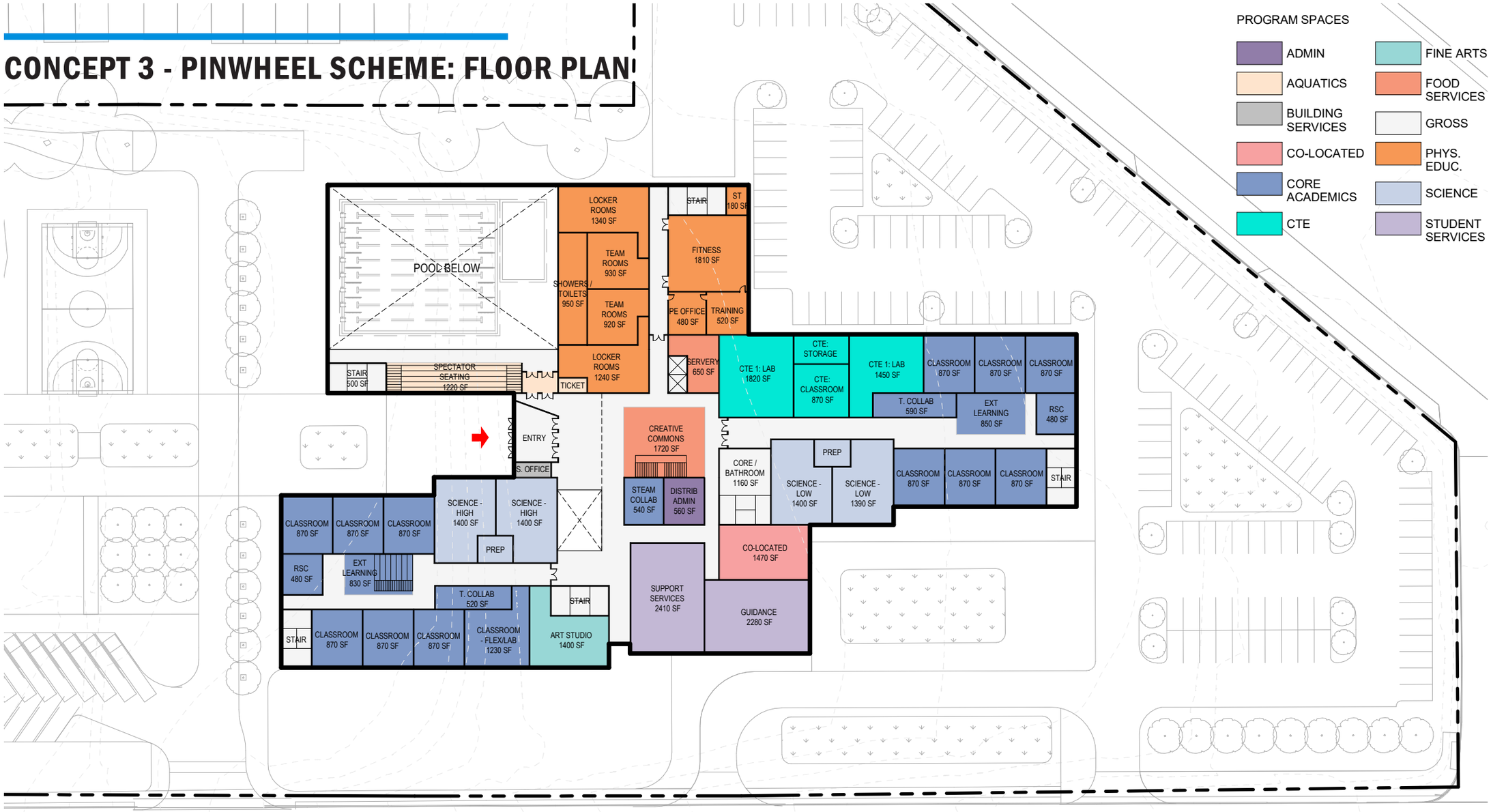


CONCEPT 3 - PINWHEEL SCHEME: FLOOR PLAN



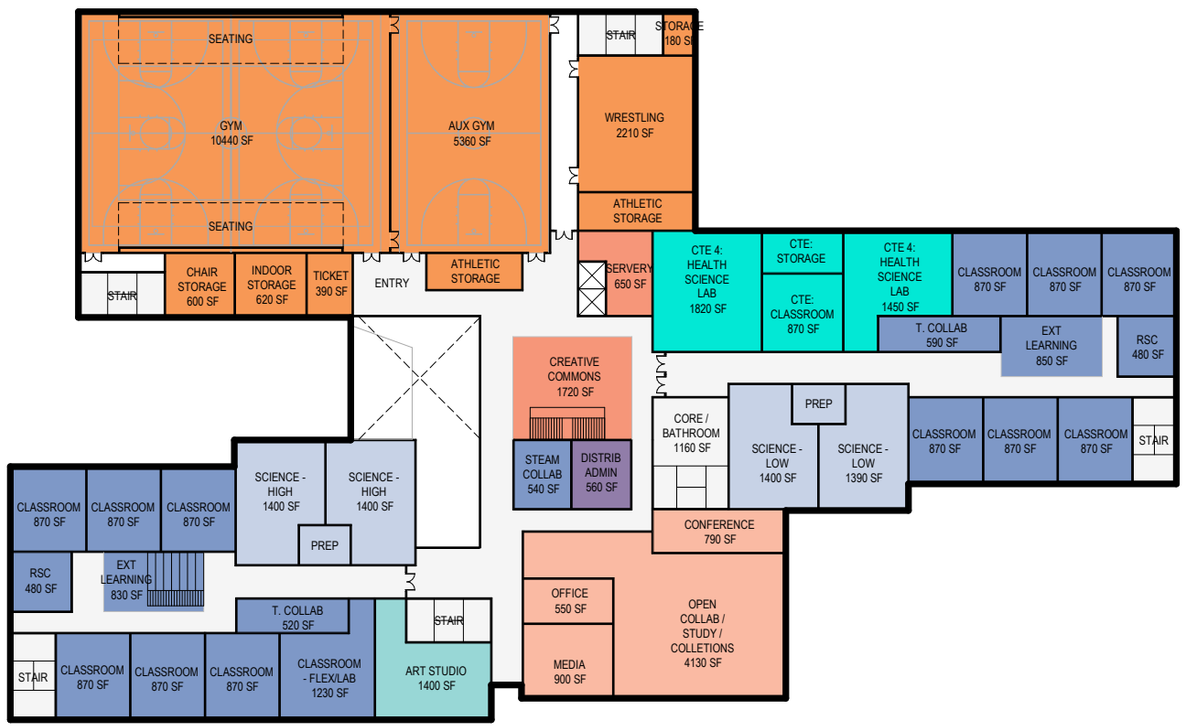
FLOOR PLAN - LEVEL 01

CONCEPT 3 - PINWHEEL SCHEME: FLOOR PLAN



FLOOR PLAN - LEVEL 02

CONCEPT 3 - PINWHEEL SCHEME: FLOOR PLAN



PROGRAM SPACES

- ADMIN
- CORE ACADEMICS
- CTE
- FINE ARTS
- FOOD SERVICES
- GROSS
- LIBRARY
- PHYS. EDUC.
- SCIENCE

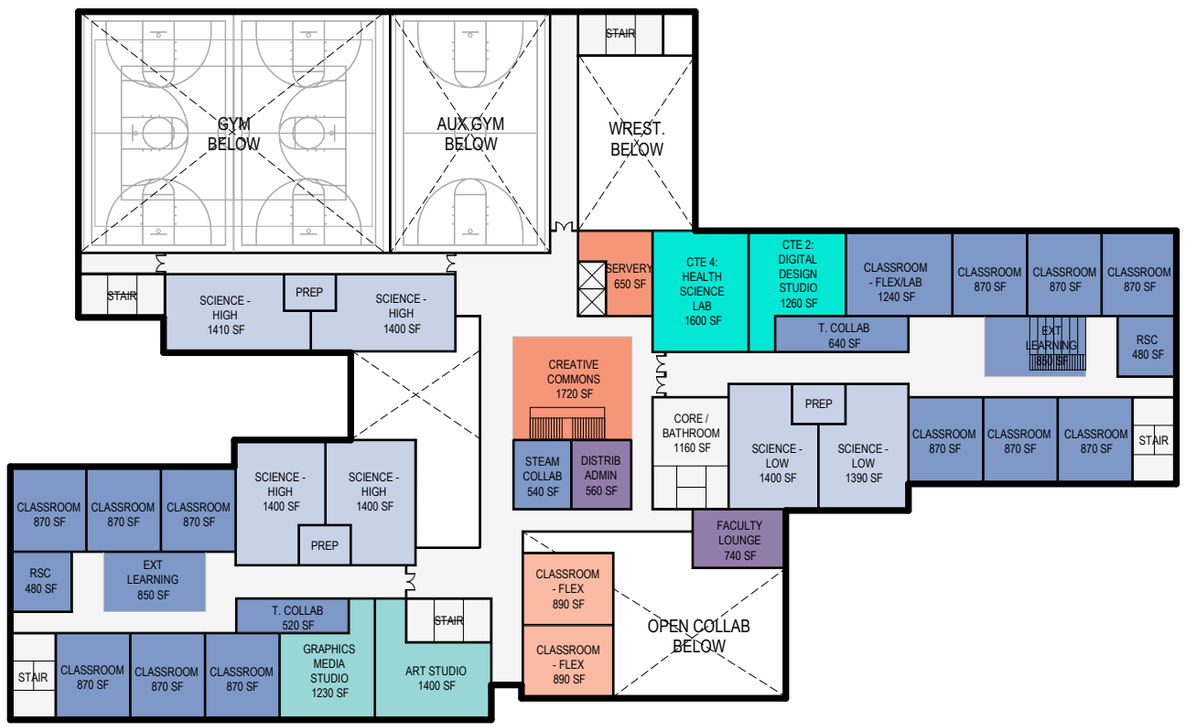
0' 25' 50' 100' 150'

SCALE : 1" = 50'-0"

N

FLOOR PLAN - LEVEL 03

CONCEPT 3 - PINWHEEL SCHEME: FLOOR PLAN



PROGRAM SPACES

- ADMIN
- CORE ACADEMICS
- CTE
- FINE ARTS
- FOOD SERVICES
- GROSS
- LIBRARY
- SCIENCE

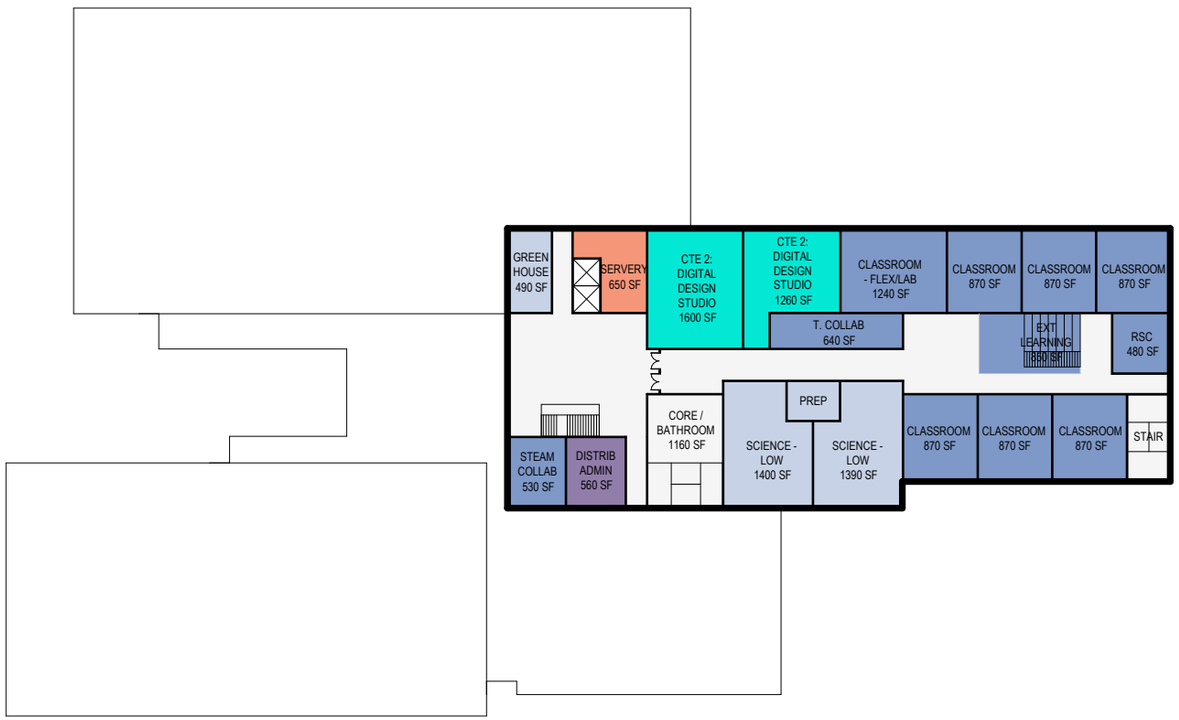
0' 25' 50' 100' 150'

SCALE : 1" = 50'-0"

N

FLOOR PLAN - LEVEL 04

CONCEPT 3 - PINWHEEL SCHEME: FLOOR PLAN



PROGRAM SPACES

- ADMIN
- CORE ACADEMICS
- CTE
- FOOD SERVICES
- GROSS
- SCIENCE

0' 25' 50' 100' 150'

SCALE : 1" = 50'-0"

N

FLOOR PLAN - LEVEL 05

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2.6 COMPARISON MATRIX

COMPARISON MATRIX

The three concepts are evaluated against the Design Patterns and Criteria on the following page.

FLEXIBILITY COMPARISON

When comparing the three concept layouts for flexibility, consider space for future school expansion (due to enrollment increases), space for co-locating ACPS Administration Offices (in the future), surface parking and vehicular circulation, and open space. The Hand and Pinwheel concepts are slightly more flexible than the Crescent concept as they have smaller building footprints on the site. These concepts are continuing to develop.

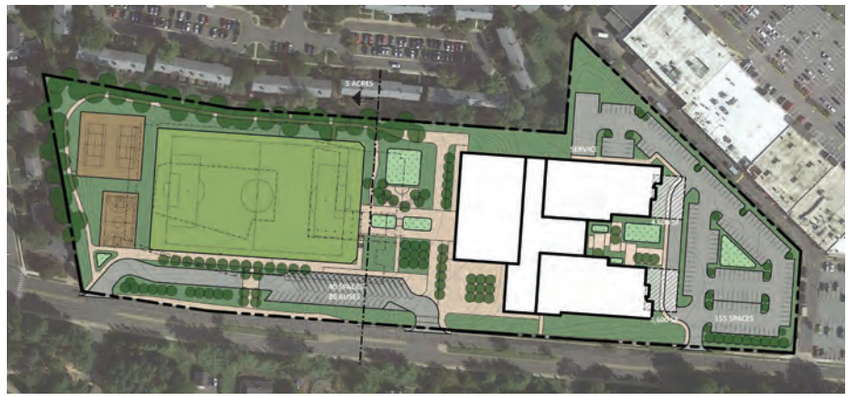
SITE PROGRAM FLEXIBILITY

The site layouts are flexible in multiple ways. Both the Hand and Pinwheel concepts are shown with the bus loop both centrally located and along Braddock Road. The future school expansion space will be explored in different locations. The basketball/futsal court, outdoor classroom space, and small athletic practice field are similar in size and interchangeable in location.

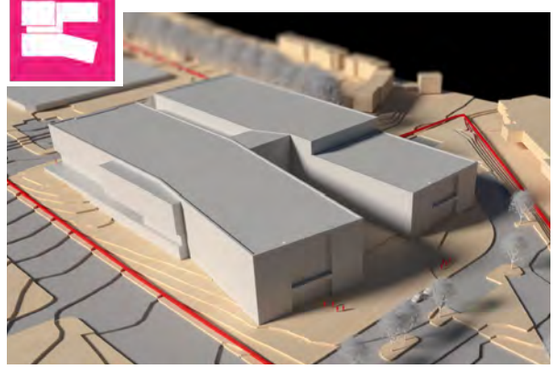
PROGRAM & SIZE COMPARISON

	CONCEPT		
	HAND	CRESCENT	PINWHEEL
Building GSF	293,300	294,300	297,300
Open Space GSF	343,900	342,300	346,300
Total Parking Spaces	195	184	200
Dedicated Spaces	155	155	160
Shared Spaces	40	29	40

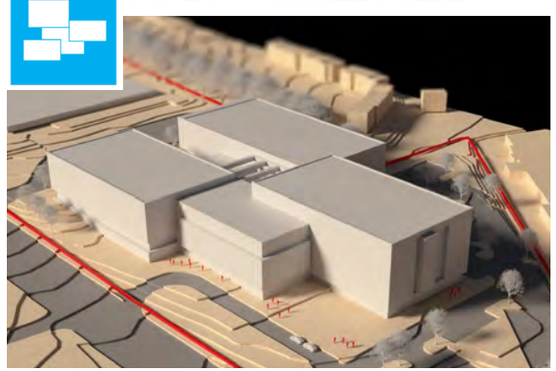
CONCEPT 1 - HAND SCHEME



CONCEPT 2 - CRESCENT SCHEME



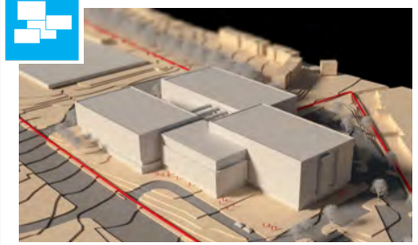
CONCEPT 3 - PINWHEEL SCHEME



LEGEND

ACHIEVES GOAL

- Very well
- Somewhat
- Not Well
- Pending



	Concept	HAND SCHEME	CRESCENT SCHEME	PINWHEEL SCHEME
DESIGN PATTERNS	Connected High School Network	●	●	●
	Equity and Access	●	●	●
	Heart of School/ Library- Learning Commons	●	●	●
	Community Use and Access	●	●	●
	STEAM Adjacencies	●	●	●
	Integrating the Arts	●	●	●
	Flexibility and Adaptability	●	●	●
	Interdisciplinary Communites	●	●	●
	Extened Learning Areas and Breakout Rooms	●	●	●
	Distributed Science Labs	●	●	●
	Distributed Dining Venues	●	●	●
	Centralized and Distributed Admin and Support	●	●	●
	Shared Teacher Office and Collaboration Areas	●	●	●
	Indoor/ Outdoor Connections	●	●	●
CRITERIA	Program Accommodation	●	●	●
	Outdoor Athletic Program	●	●	●
	Future Expansion/Flexibility	●	●	●
	Sustainability (Rooftop PV Production)	●	●	●
	Walk/Bike/Bus/Drive	●	●	●
	Parking	●	●	●
	Constructability	●	●	●

3

TAB 3:
CONCEPTS ANALYSIS

Essex Technical High School
zz, MA

3.1 CONSTRUCTION PHASING PLAN

PHASING PROCESS

To allow the existing school building to remain in operation, the new high school will be developed on the existing public open space at the east end of the site. Once the new high school is occupied, the existing building can be demolished and the new public open space will be constructed.

PARKING AND TRAFFIC DURING CONSTRUCTION PHASES

During construction, parking displacements may occur for faculty and staff that need to be accommodated off-site. Additional off-site parking may be required for construction workers. ACPS will explore nearby properties that are likely to have parking vacancies during school operating and construction hours. The current MH western parking lot may be available for ACPS use during construction. Prior to construction the Construction Manager (CM) will work with ACPS on site access and exiting of construction vehicles.

PHYSICAL EDUCATION DURING CONSTRUCTION PHASES

During construction the athletic fields and courts will be displaced and will need to be accommodated off-site. ACPS is to explore holding physical education classes at the King Street Campus, Chinquapin Park and alternate locations.

WEST - EXISTING BUILDING
EAST - EXISTING FIELD
1

WEST - EXISTING BUILDING
EAST - CONSTRUCTION
2

WEST - CONSTRUCTION
EAST - NEW BUILDING
3

WEST - NEW FIELD
EAST - BUILDING
4

3.2 TRAFFIC & PARKING ANALYSIS

The three design concepts all have similar configurations for the site and parking, and can be summarized into three different layouts: surface parking, central parking deck (above grade parking structure), and parking beneath the school.

PARKING ANALYSIS

Surface parking

Surface parking provides 155 to 200 parking spaces, depending on the building concept. The hand concept provides 155 parking spaces (195 including spaces shared with buses), is accessed via a right-in-right-out driveway and provides a drop-off area directly in front of the building. This drop off is located further away from W Braddock Road and can stack through the parking spaces for extra queuing. This scenario is less likely to queue onto W Braddock than other concepts. The crescent concept provides 155 parking spaces (184 including spaces shared with buses), that are split over two parking area. 135 spaces are accessed east of the building via one right-in-right-out driveway and another 22 spaces are provided west of the building, accessed via a shared full-access driveway with the bus loop. This concept should provide assigned parking spaces to prevent staff from circulating between the two parking areas, looking for a space. The pinwheel concept provides 160 parking spaces (200 including spaces shared with buses), is accessed east of the building via one right-in-right-out driveway. A student drop-off is provided within the parking area that allows for right and left exit, but is closer to W Braddock Road than in the hand concept.

The additional shared spaces provided during off-peak hours for all three building concepts when buses are not parked or loading and unloading.

Central Parking Deck (Above Grade Parking Structure)

This is no longer being explored due to budget constraints.

This structured parking scheme provides the most full-time parking spaces, providing 200 spaces across three parking decks. This configuration provides direct pedestrian access to the school and athletic fields without crossing additional vehicular traffic. Parking vehicles need to traverse through a student drop-off loop to access the parking deck, which could create loading and unloading conflicts, as well as delayed access to the parking deck.

Parking beneath the School

This is no longer being explored due to budget constraints.

Access to the underground parking deck, beneath the school, varies based on the building concept. Both the crescent and hand concept provide 146 parking spaces via two access points, one full-access driveway at an existing median break opposite of Episcopal High School and another right-in-right-out driveway to the east. While two points of ingress/egress provide better circulation, it also introduces additional conflict points along W Braddock Road. The pinwheel concept provides 160 parking spaces with access via one right-in-right-out driveway. The pinwheel concept is the only scheme with a designated space for student drop-off, which occurs immediately off W Braddock Road. If this drop-off loop becomes congested, it could delay access to the parking deck.

PARKING ANALYSIS

The various concepts all have similar configurations and can be summarized into three different layouts: east bus turn around, central vertical bus loop, and along West Braddock Road south of the field.

Eastern Bus Turn Around

This is no longer being explored due to feedback from Stakeholders.

The bus access is separated from passenger vehicle access which helps to keep these vehicles independent of each other and reduces conflicts. Bus passengers loading and unloading is separated from staff parking at the property, creating a direct path to the front of the school. This layout constrains bus exit movements by limiting access to right-in-right-out from West Braddock Road. These movements force buses to use the King Street/Quaker Lane/West Braddock Road intersection. Increased bus routing to and from the school will be likely required for bus routes to travel to and from their destination without the ability to make left turns at the school.

3.2 TRAFFIC & PARKING ANALYSIS

Central Vertical Bus Loop

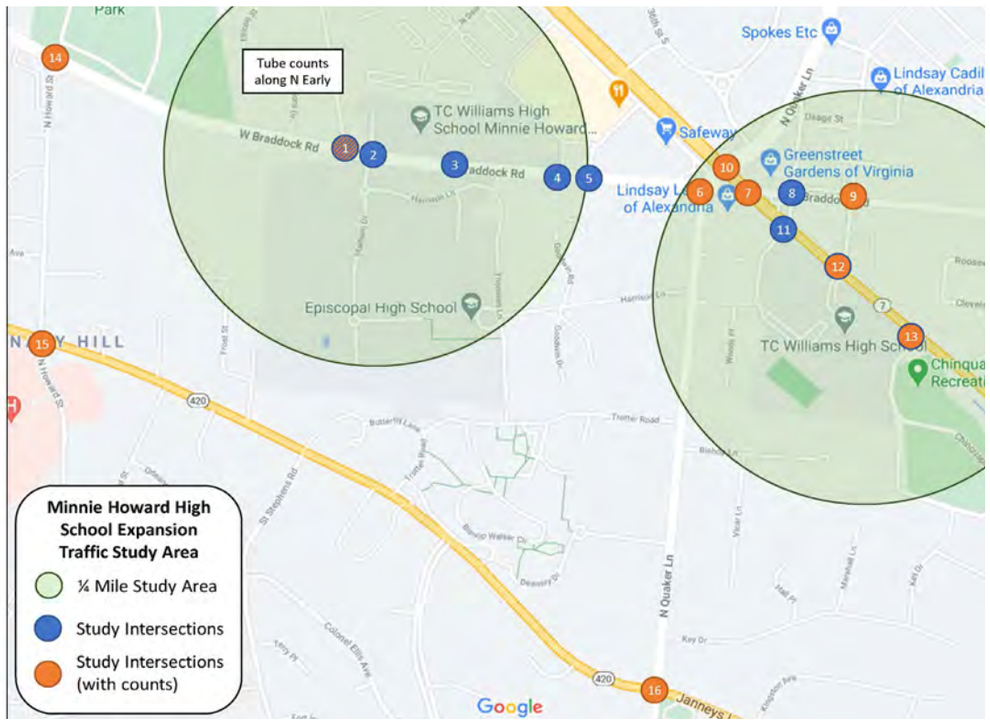
This configuration maintains the separation of bus traffic from passenger vehicles. The bus entry and exit to the site is located at a full- access intersection, allowing the bus traffic to make both left and right turns to access the site from any approach or departure direction.

A challenge of this layout is that it requires pedestrian movement between the building and the athletic facilities to cross the vehicular travel way for buses, creating conflict points between the two modes. For physical education or after school activities, if pedestrians need to travel between the two uses, a crosswalk will be needed through the bus loop, or passenger vehicle parking area during after school hours.

Along West Braddock Road

This bus loop is the preferred configuration for bus vehicular movements throughout the site. This layout maintains full access movements for buses entering and exiting the property. A one-way loop of the bus facility provides student loading and unloading directly to a sidewalk and allows pedestrian movement to the building entrances and athletic facilities without any conflict points with other vehicular movements. An exception to this condition is presented in the crescent concept, in which parking is split between the east and west sides of the building. In this scheme, pedestrians would need to cross the parking lot to access the school from the bus bays. This layout will also keep bus traffic adjacent to West Braddock Road and minimize vehicle noise for the adjacent residential properties.

Separately, this bus configuration will allow for contiguous park and athletic elements without the interference of vehicular traffic for safe pedestrian connectivity.



POTENTIAL TRAFFIC STUDY AREA

Roosevelt High School Exterior Courtyard
Washington, DC

3.3 ALEXANDRIA GREEN BUILDING POLICY & NET ZERO ENERGY ANALYSIS

ALEXANDRIA 2019 GREEN BUILDING POLICY

The City of Alexandria 2019 Green Building Policy came into effect on March 2, 2020, and will shape the project in multiple ways. The most significant impact is the requirement for Net Zero Energy, meaning that on a yearly basis the project will produce as much energy on site as it consumes. The implications of this will be discussed in the next section. Furthermore, the Green Building Policy also requires that the project achieve LEED Gold certification, and requires that the project achieve certain credits. Many of these credits are relatively typical in LEED Gold buildings, but two credits that will require extra attention are Indoor Water Use Reduction and Daylight. Because the Indoor Water Use Reduction credit requires 40% savings, the design team will carefully select water fixtures that limit water use. It should be noted that the 40% savings threshold is an aggressive target that will require very low-flow fixtures (for instance 1.1 gpf toilets and 0.35 gpm faucets) and/or reuse of greywater (which can add significant cost). Both of these options will be studied in more detail as design advances to determine the most appropriate pathway. Regarding the daylight credits, the design team will also study window layout for classrooms, and carefully balance the need for effective daylight against the impact on building envelope and heating / cooling systems.

STORMWATER	100% of the required stormwater treatment through green infrastructure.
NET ZERO ENERGY	An energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy.

Stormwater and Net-Zero requirements in Alexandria 2019 Green Building Policy

2019 GREEN BUILDING POLICY | Leadership in Energy and Environmental Design (LEED)

RATING SYSTEM	MINIMUM LEVEL OF CERTIFICATION		PERFORMANCE POINTS									
			ENERGY USE REDUCTION			WATER EFFICIENCY			INDOOR ENVIRONMENTAL QUALITY			
	Private	Public	POINTS Private	POINTS Public	CREDIT	POINTS Private	POINTS Public	CREDIT	POINTS Private	POINTS Public	CREDIT
LEED BUILDING DESIGN AND CONSTRUCTION (BD+C)	Silver	Gold	5	7	Optimize Energy Performance	4	4	Indoor Water Use Reduction	1	1	Low-Emitting Materials
			2	3	Renewable Energy Production				1	1	Construction Indoor Air Quality Management Plan
			1	1	Advanced Energy Metering[2]	1	1	Outdoor Water Use Reduction	1	1	Thermal Comfort
			Optional	3	Enhanced Commissioning				Optional	2	Daylight
									Optional	1	Indoor Air Quality Assessment

Required LEED credits in Alexandria 2019 Green Building Policy

PHOTOVOLTAICS

PV AND DESIGN RESPONSE

The requirement for Net Zero Energy will be met through two strategies: reducing building energy use as much as possible, and maximizing potential for PV generation on the building and/or site. As part of the pre-design exercises, Perkins Eastman and CMTA have undertaken studies on the balance between building performance and PV electricity generation potential. Here are some general takeaways:

- A critical metric for the team to evaluate is Energy Use Intensity, or EUI. This is a measure of how much energy the building uses per square foot per year. A lower number indicates a more efficient building, and also means that fewer PV panels will be needed to hit the Net Zero Energy goal. An EUI of 20 assumes the project will have a geothermal system but no pool in the project scope; EUI 25 assumes both geothermal and the pool are included. Without a geothermal system the EUI goes to 30-40 depending on whether a pool is included.
- According to preliminary analysis of PV generation potential, all massing options will require at least some site PV – in other words, the PV array on the school roof is not large enough to hit Net Zero Energy on its own. The total amount of PV required to hit Net Zero Energy depends on both the energy use of the building as well as the efficiency of the PV panels. Highly efficient PV panels can reduce the amount of PV that is needed off the roof, but tend to be more costly (although by reducing the amount of PV needed off the roof, on-site PV array structural costs can be reduced). The design team will work to incorporate the off-roof PV as seamlessly into the site as possible. Options that are being considered include locating PV on the roof of a potential site building, canopy mount PV above the pathways on the site, adding canopy mount PV above some of the surface parking spaces, and including PV sunshades on the building. Some of these options will increase the cost associated with providing PV panels – especially where off-roof PV is mounted on freestanding structures such as over parking areas and pathways. The design team will prioritize locating off-roof PV in locations that are cost effective, and in areas that do not adversely shade important site elements. As design progresses, the design team will continue to evaluate the massing and envelope of the building in order to understand how it affects all project goals, including cost, functionality, energy use, and aesthetics.

Below are illustrations of how much PV is predicted to be required to meet Net Zero Energy, given certain assumptions about the building's energy use (EUI) and the efficiency of the PV panels. In all images, an approximate massing of the new building is at the right half, and the existing footprint is shown below on the left side for reference. The required area of PV to achieve Net Zero Energy is shown in blue. Please note that the actual location and amount of building and site-mounted PV will continue to be refined as design continues, and these diagrams represent area but not necessarily exact placement at this stage.

EUI 20 target, medium efficiency panels: Roughly 2/3 of the PV production will be on-roof (assuming PV area on the roof is maximized), roughly 1/3 off-roof.

Illustration of required PV area: PV panels shown in blue; massing of school roof shown at right.

PHOTOVOLTAICS

EUI 25 target, medium efficiency panels: Roughly ½ the panels will be on-roof, ½ off.

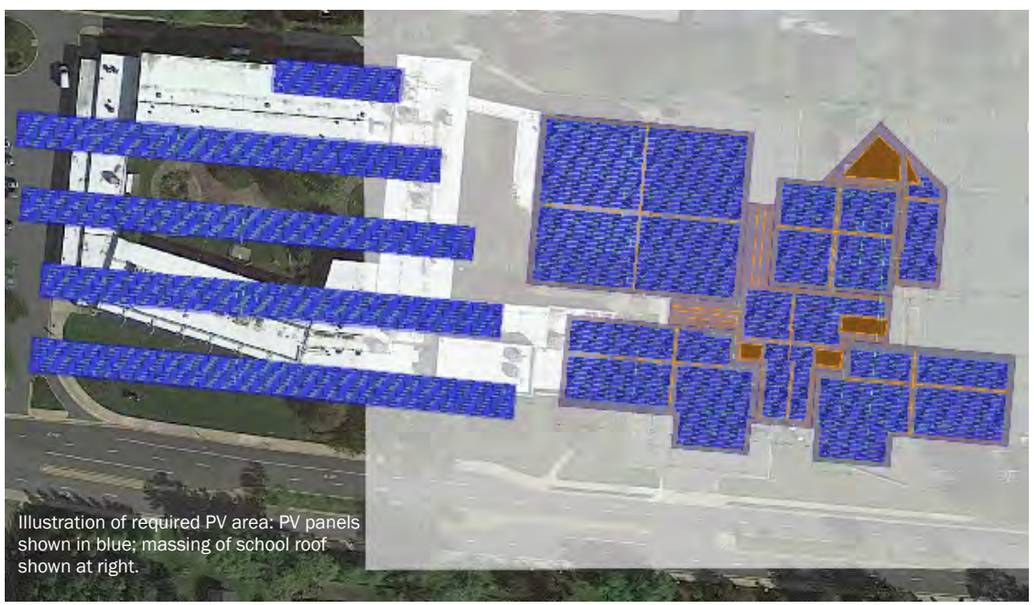


Illustration of required PV area: PV panels shown in blue; massing of school roof shown at right.

EUI 20 target, most efficient (and costly) panels available on the market today: will require one large bank of PV

Illustration of required PV area: PV panels shown in blue; massing of school roof shown at right.

Martin Luther King, Jr. School
Cambridge, MA

PHOTOVOLTAICS - INITIAL STUDIES

PV PROCUREMENT

The path to achieve Net Zero Energy starts with drastic energy reduction, and the design team is focused on making good design decisions that comply with the project's budget, performance, and energy reduction goals. In addition to this, the procurement methods for the PV system must be considered in order to achieve the Net Zero Energy requirement within the given budget. The budget analysis (refer to Appendix) has two approaches. One approach is for ACPS to purchase the PV system and is included in the "high" cost model. Another approach, included in the "low" cost model, is that procurement of the solar power would occur outside of the contract and is not included in the current budget.

There are two options to provide the PV system within the "low" cost approach. The first option is to pursue a Power Purchase Agreement (PPA), whereby the PV developer pays the capital expense of building the system and shares the energy savings with the Owner over a set period of time. Under this approach the Owner must renew the lease agreement at the end of the term to maintain use of the PV system. The second option to procure the required PV system is to use an Energy Savings Performance Contract (ESPC) and/or an Energy Service Company (ESCO) to fund the procurement of the PV system. The ESPC / ESCO would execute multiple Energy Conservation Measures (ECM's) throughout the school district which would deliver enough operational savings to fund the capital costs of the ACPS PV system over a 15-20 year period. The advantage of the ESPC / ESCO approach in comparison to the PPA is that owner retains the rights to the panels at the end of the term, and also gets access to the Solar Renewable Energy Credits (SRECS) which have monetary value. ACPS may have the design team evaluate whether an ESPC / ESPO could be a viable means to fund procurement of the PV system, while providing operational improvements to existing buildings in the ACPS district.

Martin Luther King, Jr. School
Cambridge, MA

PRELIMINARY COMPARISON OF DESIGN OPTIONS

The following analyses are from March 10th. Data will be updated.

WEIGHING PV POTENTIAL, ENERGY, AND DAYLIGHT

As part of the conceptual design process the team evaluated the three design options to see whether there were any significant differences in performance caused by differences in building massing and orientation. While the analysis is very preliminary due to the lack of detail in the design, it can suggest whether there are meaningful differences in performance due to variables like total rooftop area, surface to volume ratio, and orientation of massing. The variables that were studied included the potential amount of rooftop and on-site PV production, approximate energy losses through envelope, and the degree to which natural daylight can be brought into the floor plate:

- PV production: Because Option 2 has the largest roof area,it has the highest capacity for PV production, resulting in roughly 20-25% more PV production on the roof than option 3. Option 1 has a slightly higher roof area than option 3, producing 5-10% more PV production on the roof. While all options will require some site-mounted PV to attain Net Zero Energy, Option 2 will require a significantly smaller amount of on-site PV to hit that goal.
- Energy Use: All three options appear to have similar energy losses through the envelope. While Option 3 appears to have a slightly higher energy loss through the envelope, the difference is small enough that it can be offset by strategic design solutions in the envelope and glazing.
- Daylight: Options 1 and 2 appear to have nearly identical potential for daylight. The massing for Option 3 results in roughly 5-10% more daylight, likely due to the fact that a greater percentage of its floor area is in the wings of the “pinwheel”.

The diagrams to the upper right show how much PV is required to achieve net-zero assuming an EUI of 25 and average efficiency PV panels (the panels appear in blue). The diagrams to the lower right illustrate the maximum potential for daylight for the different massing, with red showing high levels of daylight, yellow showing moderate daylight, and blue showing low potential for natural daylight.

Option 1 - Hand Scheme: Illustration of total required PV and maximum daylight potential

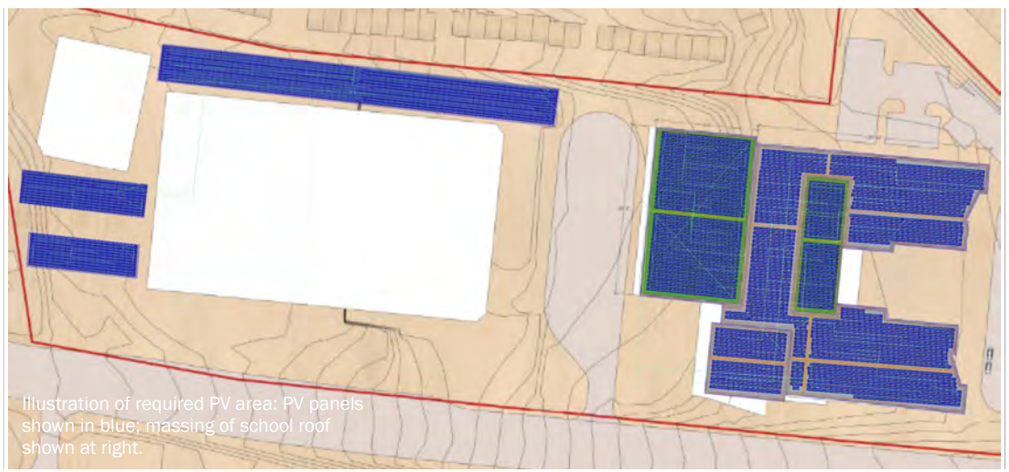
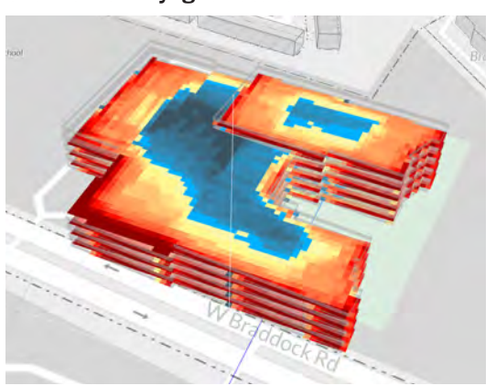
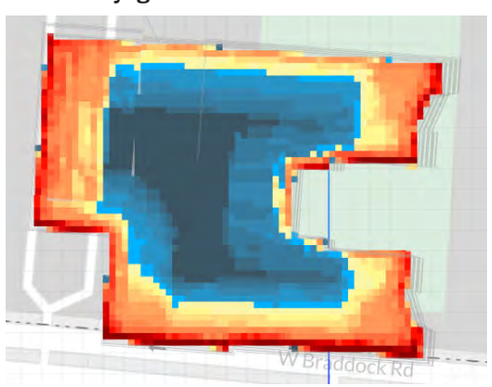


Illustration of required PV area: PV panels shown in blue; massing of school roof shown at right.

Overview of Daylight Potential

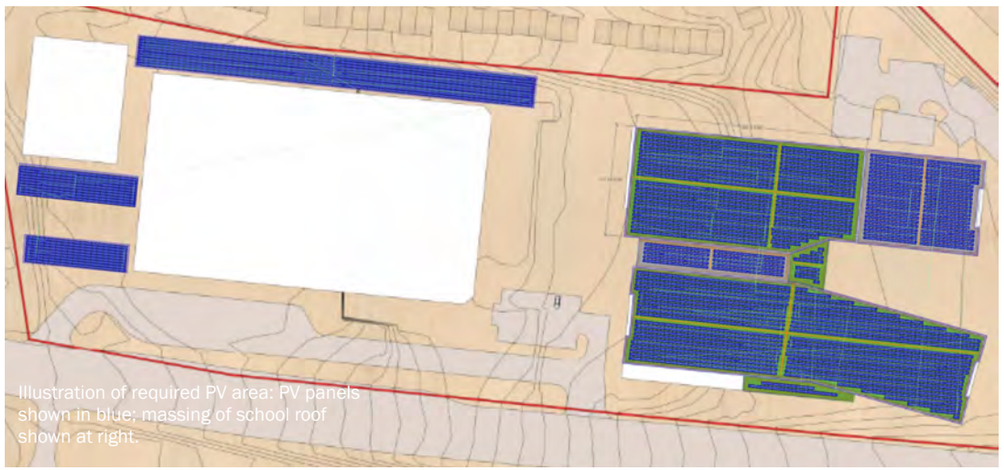


Level 2 Daylight Potential

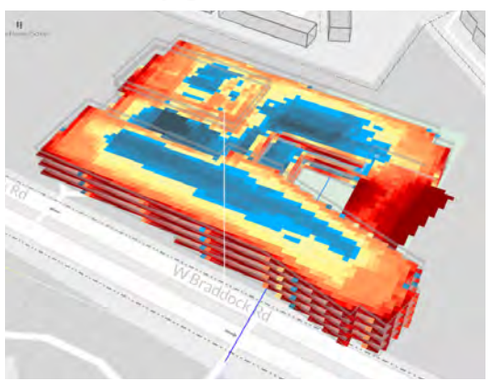


PRELIMINARY COMPARISON OF DESIGN OPTIONS

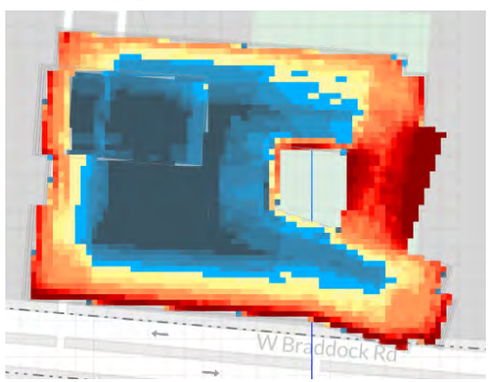
Option 2-Courtyard: Illustration of total required PV and maximum daylight potential



Overview of Daylight Potential

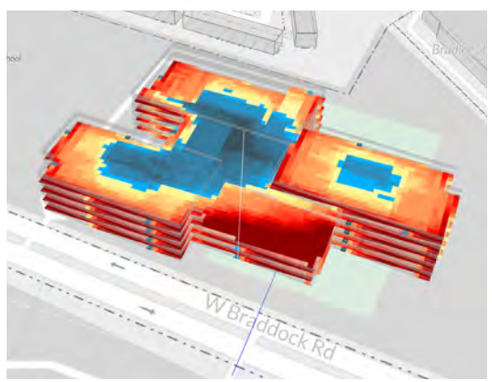


Level 2 Daylight Potential

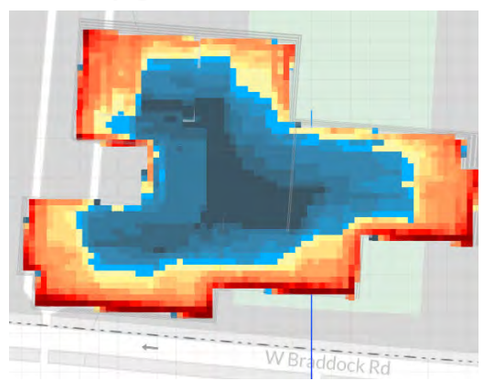


Option 3-Pinwheel: Illustration of total required PV and maximum daylight potential

Overview of Daylight Potential



Level 2 Daylight Potential



3.4 STORMWATER MANAGEMENT ANALYSIS

The three design concepts all have similar configurations for the site and parking, and can be summarized into either on grade surface parking or structured parking (above grade or below grade/ building). The following analyzes the stormwater management relative to each concept and layout.

HAND CONCEPT – SURFACE PARKING

The overall layout of this concept, with the planned expansion area of the building, makes for difficult areas east of the building to provide water quality and quantity treatment. Pervious pavement can be utilized underneath the parking spaces of the surface lot in combination with an underground detention system. A large open space between the athletic field and school allows for treatment of the field, multipurpose court, and bus loop. We anticipate that an underground detention system will be needed beneath the bus loop pavement to meet stormwater quantity peak flow discharge requirements.

Space constraints on this concept make this more challenging to meet stormwater management requirements that other concept.

HAND CONCEPT – STRUCTURED PARKING (ABOVE GRADE STRUCTURE OR BELOW GRADE/ BUILDING)

This is no longer being explored due to budget constraints.

This concept has an opportunity to utilize many of the above ground BMPs described above. There exist large areas which can be utilized for bioretention for treatment of the impervious surfaces. Options exist to put underground detention system beneath the bioretention media to meet for the water quantity management requirements for the property discharge to the City storm system. We anticipate the rooftop drainage would be routed through an on-grade bioretention or a stormwater planter located adjacent to the exterior of the building before being discharged to the quantity management system. The synthetic turf athletic field will be counted as pervious pavement and provide treatment for itself for water quality.

CRESCENT CONCEPT – SURFACE PARKING

This concept has the impervious areas more spread out throughout the property. Surface parking allows for pervious pavement (pavers, asphalt, concrete) to be utilized as a surface BMP for treatment of the parking areas. The pervious pavement allows for localized point source treatment of the runoff rather than needing to route to a centralized BMP for treatment. A large open space at the south and east corner of the building is available for surface treatment but would need to be designed to allow for the planned expansion of the building. Incorporating plantings in the bioretention areas along West Braddock Road is recommended as a means of enhancing the most public project face. The on-grade parking lot west of the building allows for a separate underground detention area to meet the quantity requirements ant not need to pipe the impervious areas from the athletic field, bus parking, and surface parking around the building. This methodology for two separate systems will help.

CRESCENT CONCEPT – STRUCTURED PARKING (ABOVE GRADE STRUCTURE OR BELOW GRADE/ BUILDING)

This is no longer being explored due to budget constraints.

This concept also has many large areas to be utilized for above ground BMPs for stormwater management treatment. Many of these are clustered east of the building which may be difficult to drain impervious areas from the west of the building around the building to the east BMP areas. We anticipate rooftop drainage would be routed through an on-grade bioretention or stormwater planter adjacent to the building. Careful consideration will need to be paid to the stormwater quantity needs for the location of an underground detention system. The ideal location for this is the eastern property line with the existing parking lot, but similar to surface runoff the on-site pipes will need to be routed around the building.

PINWHEEL CONCEPT – SURFACE PARKING

This concept allows use of pervious pavement under the parking areas to meet water quality needs. Configuration of the field and bus loop allows ample areas for surface BMPs and underground detention areas for needs of the western portion of the site. This concept allows for surface BMPs in the general vicinity of the building that may capture rooftop areas and direct water to bioretention or stormwater planters. Configuration of the service area in the rear of the building allows ample surface for stormwater management treatment and quantity at the north triangle adjacent to the shopping center.

This concept provides a balance of space planning and functionality of the school property and programming blended with surface stormwater management requirements.

3.4 STORMWATER MANAGEMENT ANALYSIS

PINWHEEL CONCEPT – STRUCTURED PARKING WITH ALTERNATE BUS LOOP (ABOVE GRADE STRUCTURE OR BELOW GRADE/BUILDING)

This is no longer being explored due to budget constraints.

This concept with parking below the building and the alternate bus loop configuration along West Braddock Road provides the most desirable configuration of stormwater management areas along with location of impervious vehicular areas. The large open areas west of the school will allow surface BMP treatment of the field and bus loop in bioretention and dry swale areas. The rooftop drainage may be discharged to on-grade bioretention or stormwater planters south, west, or east of the building. Building geometry, with many south facing facades provides ample and good conditions of the bioretention or stormwater planter boxes.

Along the east property line, stormwater management may be designed for a future stand-alone ACPS Administration building in open space areas adjacent to the drive aisle. Stormwater quantity may be met with two separate underground detention systems on either side of the building for each drainage area prior to discharge to the City's system under West Braddock Road.

Concordia International School
Shanghai, China

3.5 UNIVERSAL DESIGN AND ACCESSIBILITY FEATURES

EQUITY AND ACCESS

If all students are to reach their potential, the entire building must be accessible to students with special needs and enable teachers and administrators to use universal design for learning strategies that provide access to the curriculum for all students. Additionally, the building will employ an “Access for All” strategy for restroom facilities, allowing privacy for gender sensitivity. The interest and well-being of the students should be at the center of every design decision, with careful thought given to ensuring that shared spaces throughout the building—such as dining areas, library learning commons, and CTE labs—are easily accessible, as well as foster a sense of connection to the larger school community.

It is essential that, as the new campus is developed, it does not create inherent inequity between campuses. Unless enrolled at the Satellite or Chance for Change campuses, all T.C. Williams students will attend classes in both the King Street and Minnie Howard Campuses and, except for specialized programs, all courses will be available to all students within the Connected High School Network.

IMPLICATIONS FOR THE DESIGN OF THE MINNIE HOWARD CAMPUS

- Employ principles of Universal Design that ensure physical accessibility to all students, teachers, and community members;
- Support Universal Design for Learning strategies that allow teachers to meet the varied needs and learning styles of all students;
- Distribute Special Education support services and well-outfitted resource rooms and breakout rooms throughout the facility to promote ease of push-in enrichment and intervention;
- Provide extended learning areas (ELAs) for small group, independent and pull-over activities.

Roosevelt Senior High School
Washington, DC

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

The new high school will be a free standing building, situated on the eastern portion of the twelve acre site. The building will be analyzed under the Virginia Construction Code 2015 and its referenced standards. The building will be considered an E, education, use group, having accessory business, storage and assembly uses that support the main education use. With approximately 300,000 square feet of floor area, the building will have a fully sprinklered fire protection system with an automatic fire alarm system.

The new building will be separated from neighboring buildings by over 30 feet, eliminating the need for special fire ratings. Fire truck access around a minimum of 75% of the building's perimeter is considered in the design concepts, along with new fire hydrants and a fire department connection at the building. A minimum of two fire rated exit stairs are planned. The building may be four to five stories tall requiring a non-combustible construction type of either a IB or a IIA type. A steel framed structure with concrete and steel composite floors will help advance a construction schedule and provide a structural system compatible with the proposed construction type.

The following code analysis is based on the preliminary concept designs and approximate areas, and analyzed per 2015 Virginia Construction Code.

DC International School
Washington, DC

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

ALEXANDRIA HIGH SCHOOL - MINNIE HOWARD CAMPUS

BUILDING CODE INFORMATION	PROPOSED BUILDING INFORMATION	
COMMENTS	**PROPOSED**	**COMMENTS**
FULLY SPRINKLERED BUILDING	E - EDUCATIONAL USE GROUP	WITH ACCESSORY OFFICES, STORAGE AND ASSEMBLY USES
FIRE ALARM SYSTEM IN ACCORDANCE WITH NFPA 72	**PROPOSED AREAS - *APPROXIMATE***	
	77,500	First Floor
	77,500	Second Floor
	77,500	Third Floor
	77,500	Fourth Floor
	310,000	TOTAL GSF

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED	NOTES
CHAPTER 3: USE AND OCCUPANCY CLASSIFICATION				
VCC/IBC	**305.1**	**USE GROUP E**		HIGH SCHOOL
VCC/IBC	**304.1**	**USE GROUP B (Teen Wellness)**		EXAM ROOMS, OFFICES, RECEPTION (POSSIBLE ACCESSORY USE)
VCC/IBC	**305.2**	**USE GROUP E**		DAY CARE FACILITY
CHAPTER 5: GENERAL BUILDING HEIGHTS AND AREAS				
VCC/IBC	**T504.4**	**NUMBER OF STORIES ABOVE GRADE**		BUILDING WILL BE FULLY SPRINKLERED
				5 STORIES WILL REQUIRE TYPE I B FOR E USE GROUP
				4 STORIES WILL REQUIRE TYPE II A FOR E USE GROUP

TABLE 504.4[a, b] ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
A-1	NS	UL	5	3	2	3	2	3	2	1
	S	UL	6	4	3	4	3	4	3	2
A-2	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
B	NS	UL	11	5	3	5	3	5	3	2
	S	UL	12	6	4	6	4	6	4	3
E	NS	UL	5	3	2	3	2	3	1	1
	S	UL	6	4	3	4	3	4	2	2

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

ALEXANDRIA HIGH SCHOOL - MINNIE HOWARD CAMPUS

BUILDING CODE INFORMATION		PROPOSED BUILDING INFORMATION	
COMMENTS		**PROPOSED**	**COMMENTS**
FULLY SPRINKLERED BUILDING		E - EDUCATIONAL USE GROUP	WITH ACCESSORY OFFICES, STORAGE AND ASSEMBLY USES
FIRE ALARM SYSTEM IN ACCORDANCE WITH NFPA 72		**PROPOSED AREAS - *APPROXIMATE***	
		77,500	First Floor
		77,500	Second Floor
		77,500	Third Floor
		77,500	Fourth Floor
		310,000	TOTAL GSF

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED	NOTES
CHAPTER 3: USE AND OCCUPANCY CLASSIFICATION				
VCC/IBC	**305.1**	**USE GROUP E**		HIGH SCHOOL
VCC/IBC	**304.1**	**USE GROUP B (Teen Wellness)**		EXAM ROOMS, OFFICES, RECEPTION (POSSIBLE ACCESSORY USE)
VCC/IBC	**305.2**	**USE GROUP E**		DAY CARE FACILITY
CHAPTER 5: GENERAL BUILDING HEIGHTS AND AREAS				
VCC/IBC	**T504.4**	**NUMBER OF STORIES ABOVE GRADE**		BUILDING WILL BE FULLY SPRINKLERED
				5 STORIES WILL REQUIRE TYPE I B FOR E USE GROUP
				4 STORIES WILL REQUIRE TYPE II A FOR E USE GROUP

TABLE 504.4[a, b] ALLOWABLE NUMBER OF STORIES ABOVE GRADE PLANE

OCCUPANCY CLASSIFICATION	SEE FOOTNOTES	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
A-1	NS	UL	5	3	2	3	2	3	2	1
	S	UL	6	4	3	4	3	4	3	2
A-2	NS	UL	11	3	2	3	2	3	2	1
	S	UL	12	4	3	4	3	4	3	2
B	NS	UL	11	5	3	5	3	5	3	2
	S	UL	12	6	4	6	4	6	4	3
E	NS	UL	5	3	2	3	2	3	1	1
	S	UL	6	4	3	4	3	4	2	2

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED	NOTES
	506.2.3			
	ALLOWABLE AREA E			
	$A_a = [A_t + (NS \times I_f)] \times S_a$			UNLIMITED AREA DOES NOT NEED INCREASE (TYPE IB)
				CALCULATION IS FOR II A CONSTRUCTION TYPE
	$A_a = \{A_t+\{NSxI_f\}$ x Sa			
	A_a	**Allowable area (square feet).**	**371,000**	**ALLOWABLE BUILDING AREA TYPE IIA CONSTRUCTION (4 STORIES)**
	A_t	Tabular allowable area factor (NS, S13R or SM value, as applicable) in accordance with Table 506.2.	79,500	
	NS	Tabular allowable area factor in accordance with Table 506.2 for a nonsprinklered building (regardless of whether the building is sprinklered).	26,500	
	I_f	Area increase factor due to frontage as calculated in accordance with Section 506.3.	0.50	CONSIDER 75% FRONTAGE OF 30'
	Sa	Actual number of building stories above grade plane, not to exceed three. For buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.2, use the actual number of building stories above grade plane, not to exceed four.	4	
VCC/IBC	**508.3**	**NON SEPARATED OCCUPANCIES**		The most restrictive provisions of Chapter 9 that apply to the nonseparated occupancies shall apply to the total nonseparated occupancy area
VCC/IBC	**509**	**INCIDENTAL USES**		
		LABORATORIES AND VOCATIONAL SHOPS LOCATED IN GROUP E OCCUPANCY REQUIRE 1 HR FIRED SEPARATION **OR** SPRINKLER SYSTEM		SPRINKLER SYSTEM PROVIDED
CHAPTER 6: TYPES OF CONSTRUCTION				
VCC/IBC	**T601**			
				5 STORIES - TYPE IB CONSTRUCTION
				4 STORIES - TYPE II A CONSTRUCTION

TABLE 601 FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A	B	A	B	HT	A	B
Primary structural frame[f] (see Section 202)	3[a]	2[a]	1	0	1	0	HT	1	0
Bearing walls Exterior[e, f] Interior	3 3[a]	2 2[a]	1 1	0 0	2 1	2 0	2 1/HT	1 1	0 0
Nonbearing walls and partitions Exterior	See Table 602								

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED			NOTES					
		Nonbearing walls and partitions interior[d]	0	0	0	0	0	0	See Section 602.4.6	0	0
		Floor construction and associated secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
		Roof construction and associated secondary members (see Section 202)	$1\frac{1}{2}$[b]	1[b,c]	1[b,c]	0[c]	1[b,c]	0	HT	1[b,c]	0

For SI: 1 foot = 304.8 mm.

a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof *construction* is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
c. In all occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.

VCC/IBC	**T602**	**CONSTRUCTION CLASSIFICATION**		FIRE SEPARATION DISTANCE MAY BE APPLICABLE WITH A SEPARATE, STRUCTURED PARKING BUILDING

SECTION 602
CONSTRUCTION CLASSIFICATION

TABLE 602 FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE[a, d, g]

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H[e]	OCCUPANCY GROUP F-1, M, S-1[f]	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U[h]
X < 5[b]	All	3	2	1
5 ≤ X < 10	IA Others	3 2	2 1	1 1
10 ≤ X < 30	IA, IB IIB, VB Others	2 1 1	1 0 1	1[c] 0 1[c]
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.

b. See Section 706.1.1 for party walls.
c. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
d. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
e. For special requirements for Group H occupancies, see Section 415.6.
f. For special requirements for Group S aircraft hangars, see Section 412.4.1.
g. Where Table 705.8 permits nonbearing exterior walls with unlimited area of unprotected openings, the required fire-resistance rating for the exterior walls is 0 hours.
h. For a *building* containing only a Group U occupancy private garage or carport, the exterior wall shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet (1523 mm) or greater.

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED	NOTES
	602.2	TYPES I AND II CONSTRUCTION ARE THOSE TYPES OF CONSTRUCTION IN WHICH THE BUILDING ELEMENTS LISTED IN TABLE 601 ARE OF NONCOMBUSTIBLE MATERIALS, EXCEPT AS PERMITTED IN SECTION 603 AND ELSEWHERE IN THIS CODE.		NEW CONSTRUCTION IS NON COMBUSTIBLE
VCC/IBC	**603**	**COMBUSTIBLE MATERIAL IN TYPE I AND II CONSTRUCTION**		
CHAPTER 7: FIRE AND SMOKE PROTECTION FEATURES				
VCC/IBC	**704.2**	**COLUMN PROTECTION**		
	704.9	**IMPACT PROTECTION**		
	704.13	**SFRM**		
		Sprayed fire-resistant materials		
VCC/IBC	**705.3**	**BUILDINGS ON THE SAME LOT**		
		WHERE A NEW BUILDING IS TO BE ERECTED ON THE SAME LOT AS AN EXISTING BUILDING, THE LOCATION OF THE ASSUMED IMAGINARY LINE WITH RELATION TO THE EXISTING BUILDING SHALL BE SUCH THAT THE EXTERIOR WALL AND OPENING PROTECTION OF THE EXISTING BUILDING MEET THE CRITERIA AS SET FORTH IN SECTIONS 705.5 AND 705.8.		COMPARE FIRE SEPARATION DISTANCE ADJACENCIES WITH EXISTING STRUCTURES, IN PARTICULAR REVIEW LOCATION TO OPENINGS, AREA OF GLAZING, AND OPENING PROTECTION, COORDINATE WITH SECTION 602
VCC/IBC	**705.8**	**OPENINGS**		Fire separation distances may be required with a spearate structured parking garage
VCC/IBC	**707**	**FIRE BARRIERS**		
	707.3.1, 2, 3, 4, 5			FIRE RATINGS OF EGRESS COMPONENTS
	707.4			CONTINUITY OF FIRE RATING AT EXTERIOR WALLS ENCLOSING SHAFTS, STAIRS, ETC.
VCC/IBC	**708.1**	**FIRE PARTITIONS**		
	708.3	CORRIDORS AS REQUIRED BY 1018.1, FIRE RESISTANCE RATING NOT LESS THAN 1 HR		COORDINATE WITH MEANS OF EGRESS SECTION CHAPTER 10
	708.4	CONTINUITY		
	708.5	EXTERIOR WALLS		
	708.6	OPENINGS IN A FIRE PARTITION SHALL BE PROTECTED IN ACCORDANCE WITH SECTION 716		
	708.7	PENETRATIONS OF FIRE PARTITIONS SHALL COMPLY WITH SECTION 714.		
	708.8	JOINTS MADE IN OR BETWEEN FIRE PARTITIONS SHALL COMPLY WITH SECTION 715.		
	708.9	PENETRATIONS IN A FIRE PARTITION BY DUCTS AND AIR TRANSFER OPENINGS SHALL COMPLY WITH SECTION 717.		
VCC/IBC	**716**	**OPENING PROTECTIVES**		
		PROVIDE AS FOLLOWS:		COORDINATE TABLE 716.5

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED	NOTES
VCC/IBC	**721**	**PRESCRIPTIVE FIRE RESISTANCE**		
	TABLE 721.1 (1,2,3)			COORDINATE WITH TABLE 601, AS NEEDED
VCC/IBC	**722**	**CALCULATED FIRE RESISTANCE**		
	TABLE 722.2.1.1			CONFIRM CONCRETE ASSEMBLIES ARE COMPLIANT, AS NEEDED
				COORDINATE WITH STRUCTURAL
CHAPTER 8: INTERIOR FINISHES				
		CLASSIFICATION OF MATERIALS USED AS INTERIOR FINISHES, TRIM AND DECORATIVE MATERIALS WITH FIRE PERFORMANCE AND SMOKE DEVELOPMENT		CONFIRM FIRE PERFORMANCE AND SMOKE DEVELOPMENT OF INTERIOR MATERIALS
VCC/IBC	**805**	**COMBUSTIBLE MATERIALS IN TYPES I AND II CONSTRUCTION**		COORDINATE WITH SECTION 410
CHAPTER 9: FIRE PROTECTION SYSTEMS				
VCC/IBC	**903**	**AUTOMATIC SPRINKLER SYSTEMS**		
	903.3.1.1 NFPA 13	COORDINATE WITH SECTION 506.3		
		Throughout all Group E fire areas greater than 20,000 square feet (1858 m2) in area.		
	905.3.1	**CLASS 1** STANDPIPE SYSTEMS SHALL BE INSTALLED THROUGHOUT BUILDINGS WHERE THE FLOOR LEVEL OF THE HIGHEST STORY IS LOCATED MORE THAN 30 FEET (9144 MM) ABOVE THE LOWEST LEVEL OF FIRE DEPARTMENT VEHICLE ACCESS		STANDPIPES ARE NEEDED, COORDINATE WITH BUILDING SECTION, INDICATE LOWEST LEVEL OF FD VEHICLE ACCESS AND HIGHEST STORY
	905.4	COORDINATE LOCATION OF STANDPIPES		
VCC/IBC	**906.1**	**PORTABLE FIRE EXTINGUISHERS**		
	906.3	Size and distribution		INDICATE FE LOCATIONS ON CODE ANALYSIS PLANS
				COORDINATE DETAIL FOR MOUNTING, RECESSED OR SURFACE

[F]TABLE 906.3(1)
FIRE EXTINGUISHERS FOR CLASS A FIRE HAZARDS

	LIGHT (Low) HAZARD OCCUPANCY	ORDINARY (Moderate) HAZARD OCCUPANCY	EXTRA (High) HAZARD OCCUPANCY
Minimum Rated Single Extinguisher	2-A[c]	2-A	4-A[a]
Maximum Floor Area Per Unit of A	3,000 square feet	1,500 square feet	1,000 square feet
Maximum Floor Area for Extinguisher[b]	11,250 square feet	11,250 square feet	11,250 square feet
Maximum Travel Distance to Extinguisher	75 feet	75 feet	75 feet

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929m^2, 1 gallon = 3.785 L.

VCC/IBC	**907**	**FIRE ALARM AND DETECTION SYSTEMS**		

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED	NOTES
		An approved fire alarm system installed in accordance with the provisions of this code and NFPA 72 shall be provided in new buildings and structures in accordance with Sections 907.2.1 through 907.2.23 and provide occupant notification in accordance with Section 907.5, unless other requirements are provided by another section of this code.		
	907.2.3 GROUP E	PROVIDE FIRE ALARM SYSTEM WITH MANUAL PULL STATIONS		
		Manual fire alarm boxes shall not be required in Group E occupancies where the building is equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1, the occupant notification system will activate on sprinkler water flow and manual activation is provided from a normally occupied location.		
VCC/IBC	**912**	**FIRE DEPARTMENT CONNECTIONS**		
CHAPTER 10: MEANS OF EGRESS				
VCC/IBC	**1004.1.2**	**MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT**		

SPACE	AREA (SF)	OCCUPANT LOAD FACTOR (SF)		NUMBER OF CLASSROOMS	FUNCTION OF SPACE	OCCUPANTS
Graphic Design Studio	**1000**	20	SF/NET	1		50
Photo Lab						
Special Education/Career Prep	**630**	20	SF/NET	4		126
Drafting / Digital Design	**1000**	20	SF/NET	1		50
Robotics/Prototyping Lab	**1400**	50	SF/NET	4		112
CTE Class/Computer Labs	**1400**	50	SF/NET	6		168
Art Studio - 2D	**1200**	20	SF/NET	2		120
Art Studio - 3D	**1200**	20	SF/NET	1		60
Large Flex Class/Lab	**1200**	20	SF/NET	4		240
Classroom - Standard	**850**	20	SF/NET	48		2,040
Classroom - Small	**650**	20	SF/NET	8		260
Fitness/Weights	1	20	SF/NET	1		0
Gym				3	three classes of 30 student each	90
Low Intensity Science Lab	**1400**	50	SF/NET	10		280
High Intensity Science Lab	**1400**	50	SF/NET	8		224
Administration	5060	100	SF/GROSS	1		51
Student Services	5775	100	SF/GROSS	1		58
Special Ed. Admin	1300	100	SF/GROSS	1		13

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED	NOTES
			TOTAL	**3,941**
VCC/IBC	**1005.3**	**REQUIRED CAPACITY BASED ON OCCUPANT LOAD**		
		EQUIPPED WITH AUTOMATIC SPRINKLER SYSTEM PER SECTION 903.3.1.1 OR 903.3.1.2		
		STAIRWAYS: 0.2 INCHES PER OCCUPANT		
		OTHER: 0.15 INCHES PER OCCUPANT		
VCC/IBC	**1007**	**ACCESSIBLE MEANS OF EGRESS**		
	1007.3	STAIRWAYS		
		EXCEPTION 1 - 48" CLEAR WIDTH BETWEEN HANDRAILS NOT REQUIRED IF BUILDING IS EQUIPPED WITH AUTOMATIC SPRINKLER SYSTEM PER NFPA 13		
		EXCEPTION 2 - AREA OF REFUGE IS NOT REQUIRED IF BUILDING IS EQUIPPED WITH AUTOMATIC SPRINKLER SYSTEM PER NFPA 13		
VCC/IBC	**1009**	**STAIRWAYS**		
VCC/IBC	**T1017.2**	**EXIT ACCESS TRAVEL DISTANCE**		
		250 ft		

TABLE 1017.2 EXIT ACCESS TRAVEL DISTANCE[a]

OCCUPANCY	WITHOUT SPRINKLER SYSTEM (feet)	WITH SPRINKLER SYSTEM (feet)
A, E, F-1, M, R, S-1	200	250[b]
I-1	Not Permitted	250[b]
B	200	300[c]
F-2, S-2, U	300	400[c]
H-1	Not Permitted	75[d]
H-2	Not Permitted	100[d]
H-3	Not Permitted	150[d]
H-4	Not Permitted	175[d]
H-5	Not Permitted	200[c]
I-2, I-3, I-4	Not Permitted	200[c]

VCC/IBC	**T1018.1**	**CORRIDORS**		
		USE GROUP E - CORRIDOR FIRE RATING = 0 HR		
VCC/IBC	**T1018.1**	**CORRIDORS**		
		USE GROUP E - MINIMUM CORRIDOR WIDTH = 72"		
		DEAD END CORRIDORS = 50 FEET		

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS

APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE

CODE	SECTION	REQUIREMENT	PROPOSED		NOTES
		BUILDING IS EQUIPPED WITH AUTOMATIC SPRINKLERS PER SECTION 903.3.1.1			
VCC/IBC	**1022**	**EXITS FROM STORIES**			
VCC/IBC	**1023**	**INTERIOR EXIT STAIRWAYS AND RAMPS**			
		INTERIOR EXIT STAIRWAY AND RAMP ENCLOSURES SHALL HAVE A FIRE-RESISTANCE RATING OF NOT LESS THAN 1 HOUR WHERE CONNECTING LESS THAN FOUR STORIES			
	1022.7	EXTERIOR WALL OF STAIRWELL SHALL BE RATED, PER 1022.2			
		EXTERTIOR WALLS AND OPENINGS, ADJACENT TO EXTERIOR WALLS OF STAIRWALL, LOCATED AT AN ANGLE OF LESS THAN 180 DEGREES AND WITHIN 10 FEET SHALL HAVE A FIRE-RESISTANCE RATING OF NOT LESS THAN 1 HOUR.			
		OPENINGS WITHIN SUCH WALLS SHALL BE RATED NO LESS THAN 3/4 HR			
		RATED CONSTRUCTION AT STAIRS EXTENDS FROM GROUND UP TO 10'-0" ABOVE TOPMOST LANDING OF STAIR			
VCC/IBC	**1027**	**EXIT DISCHARGE**			
	1027.1	EXCEPTION 1.3:			
		50 PERCENT OF THE NUMBER AND CAPACITY OF INTERIOR EXIT STAIRWAYS AND RAMPS IS PERMITTED TO EGRESS THROUGH AREAS ON THE LEVEL OF EXIT DISCHARGE IF EGRESS PATH IS PROTECTED BY AUTOMATIC SPRINKLER SYSTEM PER 903.3.1.1 OR 903.3.1.2			
		EXCEPTION 2.4:			
		50 PERCENT OF THE NUMBER AND CAPACITY OF INTERIOR EXIT STAIRWAYS AND RAMPS IS PERMITTED TO EGRESS THROUGH A VESTIBULE THE AREA IS USED ONLY FOR MEANS OF EGRESS AND EXITS DIRECTLY TO THE OUTSIDE.			
CHAPTER 11: ACCESSIBILITY					
VCC/IBC	**1104.2**	**WITHIN A SITE**			
		AT LEAST ONE ACCESSIBLE ROUTE SHALL CONNECT ACCESSIBLE BUILDINGS, ACCESSIBLE FACILITIES, ACCESSIBLE ELEMENTS AND ACCESSIBLE SPACES THAT ARE ON THE SAME SITE.			
VCC/IBC	**1105.1**	**PUBLIC ENTRANCES**			
		IN ADDITION TO ACCESSIBLE ENTRANCES REQUIRED BY SECTIONS 1105.1.1 THROUGH 1105.1.6, AT LEAST 60 PERCENT OF ALL PUBLIC ENTRANCES SHALL BE ACCESSIBLE.			
VCC/IBC	**1109.2**	**OTHER FEATURES AND FACILITIES**			
		EXCEPTION 6: WHERE TOILET FACILITIES ARE PRIMARILY FOR CHILDREN'S USE, REQUIRED ACCESSIBLE WATER CLOSETS, TOILET COMPARTMENTS AND LAVATORIES SHALL BE PERMITTED TO COMPLY WITH THE CHILDREN'S PROVISIONS OF ICC A117.1			

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

PRELIMINARY CODE ANALYSIS					
APPLICABLE CODES - 2015 VIRGINIA CONSTRUCTION CODE					
CODE	**SECTION**	**REQUIREMENT**	**PROPOSED**		**NOTES**
VCC/IBC	**1109.5**	**DRINKING FOUNTAINS**			
	1109.5.1	MINIMUM NUMBER			
		2 DRINKING FOUNTAINS MINIMUM, WITH ONE ACCESSIBLE			
CHAPTER 12: INTERIOR ENVIRONMENT					
VCC/IBC	**1210.2**	**FINISH MATERIALS**			
	1210.2.1	AT TOILETS - FLOOR FINISH SHALL BE SMOOTH NON ABSORBENT MATERIAL WITH 4" MINIMUM VERTICAL BASE			
	1210.2.2	AT SINKS - WALLS WITHIN 2'-0" SHALL BE SMOOTH NON ABSORBENT MATERIAL UP TO 4'-0" AFF			
		ACCESSORIES SHALL BE INSTALLED AND SEALED TO PROTECT STRUCTURAL ELEMENTS AGAINST MOISTURE			

3.6 LIFE SAFETY BUILDING CODE ANALYSIS

ALEXANDRIA HIGH SCHOOL - MINNIE HOWARD CAMPUS

CODE ANALYSIS - PLUMBING FIXTURE COUNT *(APPROXIMATE)*

APPLICABLE CODES - IBC 2015/VCC 2015							
OCCUPANCY	**OCCUPANT LOAD**	**WATER CLOSETS**		**LAVATORIES**		**DRINKING FOUNTAINS**	**OTHER (SERVICE SINK)**
		M	**F**	**M**	**F**		
BUSINESS		**1 PER 25 FIRST 50, 1 PER 50 FOR REMAINDER**		**1 PER 40 FIRST 80, 1 PER 80 FOR REMAINDER**		**1 PER 100**	
REQUIRED	121	3	3	2	3	2	1
EDUCATION		**1 PER 50**		**1 PER 50**		**1 PER 100**	
REQUIRED	3820	38	39	38	38	38	1

Langley High School
McLean, VA

4 TAB 4: SITE INFORMATION

4.1 SITE SURVEYS

SITE SURVEY

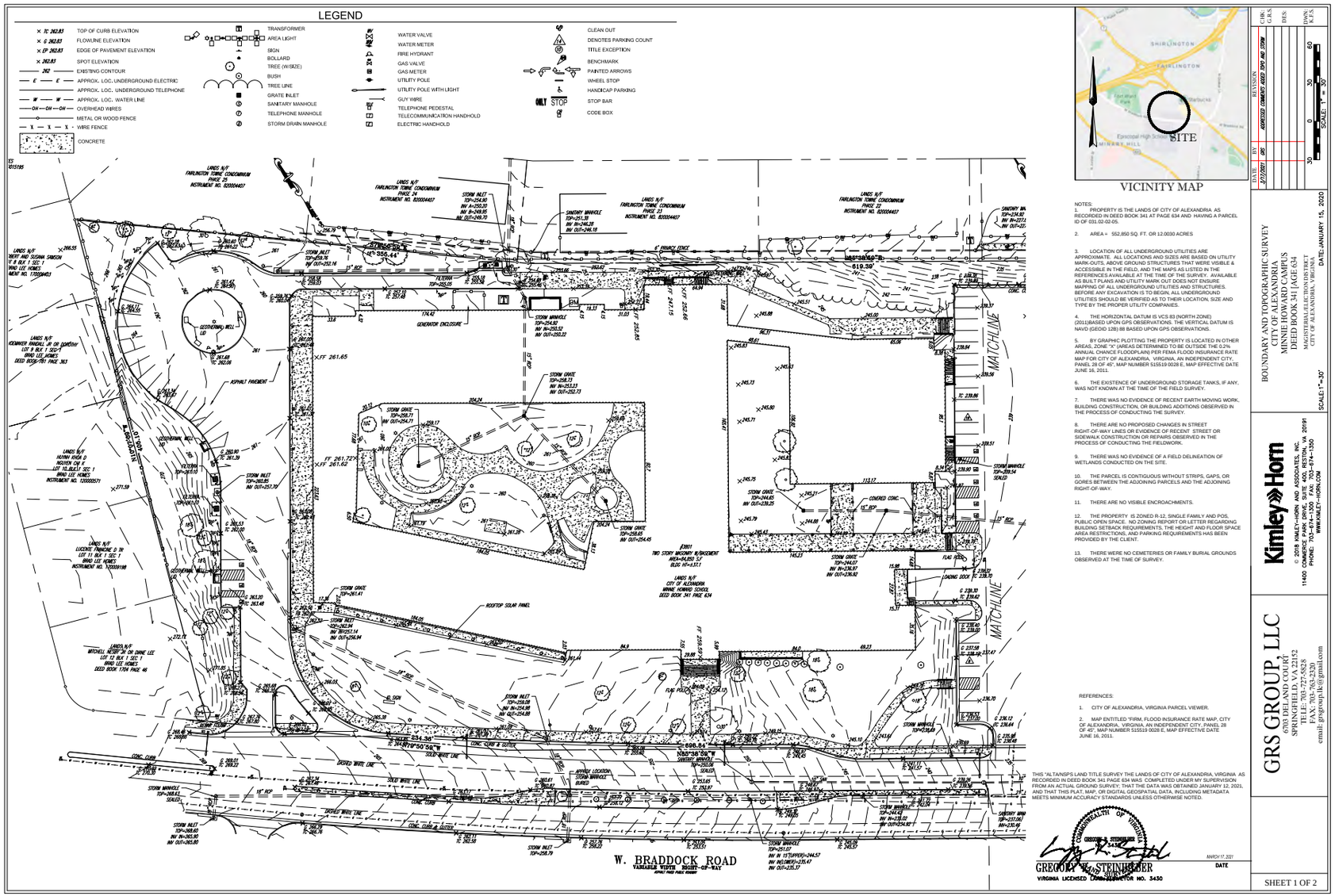
Kimley-Horn performed a boundary and topographical survey of the existing Minnie Howard site. To the right and the following page are the site surveys.

HAZARDOUS MATERIAL SURVEY

ECS Mid-Atlantic, LLC will conduct a hazardous material survey and analysis of the existing Minnie Howard building, with the final report being provided during the Schematic Design phase.

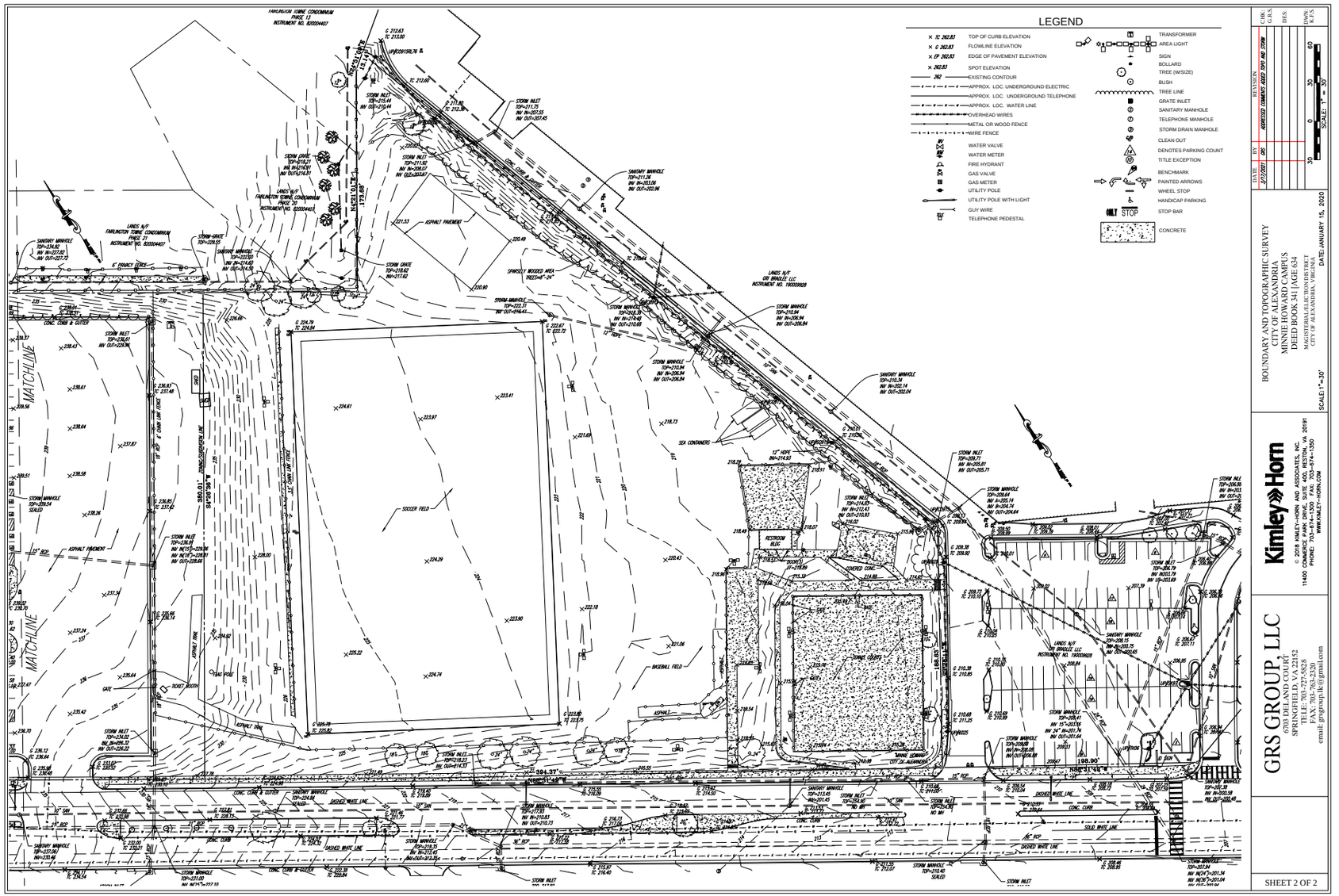
GEOTECHNICAL SURVEY

ECS Mid-Atlantic, LLC will conduct a geotechnical survey of the existing site once a concept has been selected and the building and site layout further developed. A geotechnical report will be provided during the Schematic Design phase.



PRELIMINARY BOUNDARY AND TOPOGRAPHICAL SURVEY: WEST SIDE OF SITE

4.1 SITE SURVEYS



PRELIMINARY BOUNDARY
AND TOPOGRAPHICAL SURVEY:
EAST SIDE OF SITE

Ron Brown High School
Washington, DC

4.2 ARCHAEOLOGY

An archaeology meeting was held with the Office of Historic Alexandria/Alexandria Archaeology, Commonwealth Heritage Group (CHG), Kimley-Horn, and Perkins Eastman. In this section, CHG has compiled initial historical research on the Minnie Howard Campus. CHG's comprehensive Documentary Study and Archaeological Assessment of the property will be provided under separate cover. Further discussions to occur on how to possibly incorporate the history of the site in the design (e.g. interpretive signs) and/or curriculum.

HISTORY OF THE PROJECT AREA

The project area is situated on lands that were conveyed to Henry Awbrey by a 1729 land grant of 1,261 acres from Thomas, Sixth Lord Fairfax, and proprietor of the Northern Neck property (Mitchell 1977:116-117). In 1749, William Ramsay, a Scottish merchant, acquired the entire 1,261-acre parcel from Awbrey (Fairfax County Land Records [FCLR] C1:16). William Ramsay was one of the founders of Alexandria and served as the town's first mayor. He was a tobacco merchant who purchased tobacco from local planters and sold imported European goods in exchange. He likely also maintained a farm in the western portion of this tract, referred to in later deeds as "Ramsay's Old Field", that may have been worked by some of the seven enslaved African Americans that Ramsay mentioned in his 1785 will (Moon 2014:14-16). Robert Allison, the son-in-law of William Ramsay, acquired the tract in 1797, and then proceeded to subdivide the parcel into smaller lots (Moon 2014:17-18). The chain of title for the project area between 1797 and 1847 is unclear.

The earliest deed located that was directly associated with the project area is an April 12, 1870 conveyance from Cassius Francis Lee and his wife Ann Eliza Lee, for 125 acres to be held in trust for Ann by their son, Cazenove G. Lee (Fairfax County Land Records [FCLR] L4:35). The 1870 deed contained references to previous transactions showing that Cassius F. Lee had originally acquired the property as three parcels between 1847 and 1848 from David Porter, Ellen M. Whiting, and Georgiana Slacum. Georgiana Slacum had inherited her property in 1829 after the death of her father Captain George Slacum (FCLR M3:305). Slacum's 60-acre summer estate, Prospect Hill, stood at the present Bradlee Shopping Center located immediately north of the project area (Kaye 1987:16).

Menokin, Braddock Road near King Street.
Photo, The Winterthur Library

Cassius F. Lee's estate was called Menokin, which was also the name of Francis Lightfoot Lee's house on the Northern Neck of Virginia. The main house was located immediately north of the project area and was accessed from a lane on Braddock Road that runs north-south through the project area. Along the access lane are depicted three other buildings, possibly a barn, and a slave quarters noted on the 1860 census. These three buildings are located in the western one-third of the project area. On the 1862 map, the building east of the lane is separately fenced, the two buildings east of the lane are included in a larger fenced area extending north to the main house (1862 Sketch). On the 1865 Map of the Environs of Washington, the eastern two-thirds of the project area is depicted as two separately fenced fields with trees, possibly the apple and peach orchard described in the 1870 census (1865 Environs).

The Slave Schedule for 1850 shows that C. F. Lee claimed ownership of seven women and children ranging in age from only three years old to 65 (USBC 1850). The Slave Schedule for 1860 shows that C. F. Lee claimed ownership of four individuals (USBC 1860). Based on their ages, these are all different people than those enslaved individuals listed in the 1850 schedule. One "slave house" is listed, this column was not an option on the 1850 schedule, so it is unclear when the slave quarters were constructed.

During the beginning of the war, Cassius F. Lee remained at his home. Lee eventually relocated his family to their Alexandria house on Washington and Oronoco Streets (Barber 1988:21). There are no official records of Civil War camps within C. F. Lee's farm, but given its location near the Middle Turnpike (Leesburg Pike) and Braddock Road, as well as its proximity to Fort Ward and the Federal army hospital at the Seminary, and the reports of many temporary camps housing thousands of soldiers in 1862, it is likely that there was some Civil War activity and camping within the project area.

4.2 ARCHAEOLOGY

In July 1885, Cassius rescinded all interest in the property and it was sold at a public auction on April 14, 1888 to Marguerite DuPont Lee, wife of Cazenove Gardner Lee and daughter-in-law of Cassius F. and Ann Eliza Lee (FCLR I5:417). Cazenove G. Lee, now a lawyer based in Washington, D.C., and his wife Marguerite owned Menokin for over ten years, selling it in April 1896 to Clarence Thomas of Washington, D.C. for an undisclosed sum (FCLR M6:133).

No census records were able to be definitively associated with Clarence Thomas for the 1900 Population Census. In February 1908, Clarence Thomas sold the property to Maurice DuPont Lee, Cazenove and Marguerite Lee's son (FCLR Y6:637). Maurice owned the property briefly, selling it three months later to Robert Lee Pickett for $10,000 (FCLR Z6:296). In April 1919, Mr. Pickett sold Menokin to Webb Metz for an undisclosed purchase price (FCLR T8:362). Mr. Metz owned the property for only six years. No census record for the 1920 Population Census was able to be located for Mr. Metz.

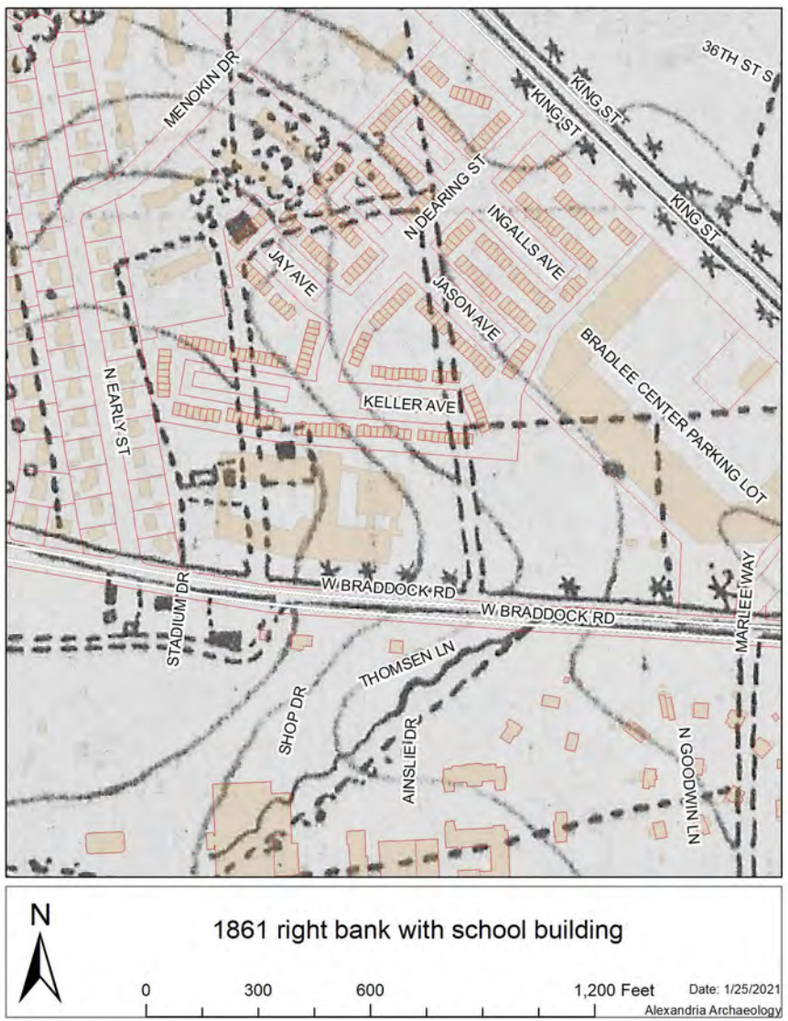
In April 1925, Walter duBois Brookings purchased the 90.625-acre property from Mr. Metz for an undisclosed sum (FCLR M9:78). Mr. Brookings would be the last owner to reside at Menokin. After Walter Brookings' death in 1950, the property was subdivided into smaller parcels. The parcel that includes the project area was donated to the City of Alexandria for the construction of the Minnie Howard School. The plans for Minnie Howard were approved by the Alexandria School Board in the Fall of 1952 (Washington Post 1952:19).

For additional information, refer to these Alexandria Times articles:
https://www.alexandriava.gov/uploadedFiles/historic/info/attic/2012/Attic20120419Menokin.pdf
https://www.alexandriava.gov/uploadedFiles/historic/info/attic/2016/Attic20161110aerial.pdf
https://www.alexandriava.gov/uploadedFiles/historic/info/attic/2016/Attic20161117WWII.pdf

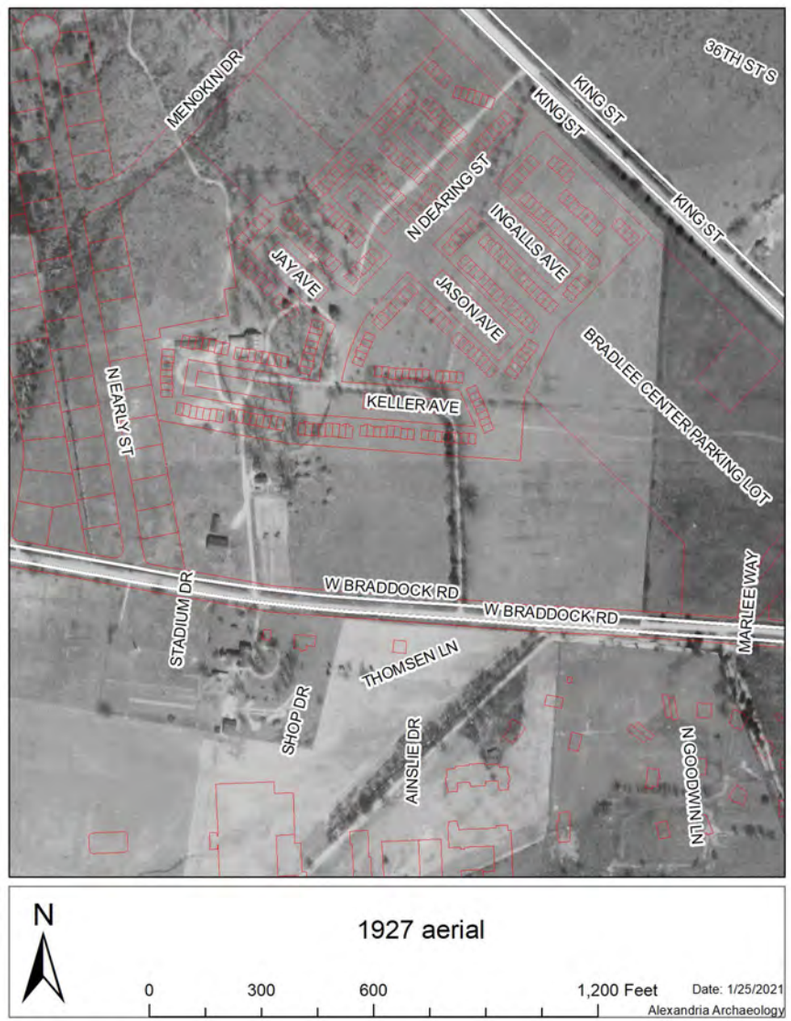
Aerial photo of area around the intersection of King Street, Braddock Road, and Quaker Lane, 1949. Office of Historic Alexandria.

4.2 ARCHAEOLOGY

1861 Map with school building overlayed.
Provided by Office of Historic Alexandria/ Alexandria Archaeology



1927 Aerial view with properties overlayed.
Provided by Office of Historic Alexandria/ Alexandria Archaeology



5

TAB 5:
BUILDING SYSTEMS

5.1 MECHANICAL SYSTEMS

CODES AND STANDARDS

The New Minnie Howard High School shall incorporate an HVAC system designed to meet the requirements of the following:

- Virginia Construction Code (2015)
- Virginia Mechanical Code (2015)
- Virginia Energy Conservation Code (2015)
- 2015 International Fire Code
- Virginia Statewide Fire Prevention Code (2015)
- Virginia Building and Fire Code Related Regulations (2015)
- Americans with Disability Act Accessibility Guidelines (ADAAG)
- LEED for Schools (v4)
- ASHRAE Guidelines (2013)
- Alexandria City Public Schools Educational Specifications – High Schools (JULY 2014)
- Guidelines for School Facilities in Virginia's Public Schools (September 2013) Virginia Department of Education

HEATING AND AIR CONDITIONING SYSTEMS

GEOTHERMAL WELL FIELD AND GEOTHERMAL SYSTEM:

The HVAC system for Minnie Howard High School will be a geothermal water-source heat pump system. The geothermal well field for this approximately 300,000 square foot facility shall consist of 220 geothermal wells at 550 feet deep each, located outside of the building footprint on the site. The geothermal well field shall have a dedicated pumping system consisting of lead-standby base mounted pumps, circulating water from the building to the well field as needed depending on the building loop heat pump supply and return temperature. In lieu of a combined centralized pumping system for the building and well field, the building loop serving water source heat pumps (heat pump supply and return hydronic system) shall be served by a lead standby base mounted pumping system.

The geothermal pumping system shall be a decoupled system meaning the well field can be pumped and achieve flow rates as required to maintain a specified heat rejection or absorption in the well field. The building geothermal loop (heat pump supply and return hydronic system) serving water source refrigeration equipment in the building shall be designed as a base mounted pumping system allowing the building loop to flow independently of the well field.

A single 40,000 CFM packaged water source heat pump dedicated outside air machine shall provide ventilation air for the entire building.

Final sizing of the geothermal well field will be established during the design phases utilizing on-site test bore data and computerized simulation software. Design Team proposes 2 geothermal test bores will be performed to determine geological conditions and a single conductivity test of one test well in order to finalize the well field design.

The well bores will be 6" in diameter and will include a factory-made DR-9, 1-1/4" U-tube, fully grouted well. Multiple wells will be piped into a single circuit. Design is 11 circuits of 20 wells, all circuits will enter a mechanical room. Each circuit will be located on a geothermal header in the mechanical room and shall be equipped with isolation valves, temperature gauges, and pressure gauges on both the supply and return pipe, as well as a balancing valve on the return pipes. All hydronic accessories for the circuits will be accessible at a geothermal header constructed in the below grade mechanical room. The wells shall be installed on a 20' by 20' staggered grid system. The geothermal test bore described previously will be used as functional well in the final layout. All horizontal mains shall be a minimum of 42 inches below grade and the trenches shall be 100% back filled with rock or other suitable materials. Caution tape with an integrated tracer wire shall be placed above the horizontal piping to prevent future damage.

5.1 MECHANICAL SYSTEMS

All geothermal piping exterior of the building shall be HDPE butt-fused joints and fittings. All geothermal piping mains interior of the building shall also be HDPE butt-fused joints and fittings or mechanically coupled so as to eliminate steel piping in this Hydronic loop. Heat pump branch runouts shall be copper. The well field piping and building piping will be purged to remove dirt, debris and air. Ports for purging of air shall be installed in the mechanical room and accessed through egress doorways sized for installing and removing mechanical equipment. Ports shall be installed on the well field side of the system, building loop side of the system, and throughout the building as necessary in order to isolate zones for more thorough purging.

Geothermal piping shall not require insulation as the loop temperatures shall be above the dew point where piping is located in the building. Valve tags and charts shall be provided for every valve 1" and larger within the facility. Where piping is exposed in finished spaces, the piping shall be insulated with ½" thick fiberglass insulation and include a canvas wrap that will be painted or protected with a color selectable PVC jacket. Where piping transitions to cooper or schedule 40 steel, ½" thick fiberglass insulation shall be provided.

VENTILATION SYSTEM

The outside air systems for the facility shall be de-coupled from the primary heating and cooling. In general, outside air shall be provided directly to the occupied space. The dedicated outside air handling unit will be indoor type with double wall construction and located inside a mechanical room or penthouse. Preliminary calculations for this building size and occupant density resulted in one outside air unit sized for 40,000 cubic feet per minute (cfm). The unit shall be a variable volume energy recovery type unit utilizing building exhaust and general exhaust air to precondition the outside air through a total energy recovery wheel. All conditioned outside air ductwork and building exhaust air ductwork will not be insulated – this applies to positive pressure outside air ductwork and negative pressure exhaust air ductwork. All un-conditioned air ducts shall be insulated with 1.5" thick, ¾" pcf duct wrap with vapor barrier – this applies to negative pressure outside air ductwork and positive pressure exhaust air ductwork.

The outside air unit will consist of the following sections/components: exhaust air stream pre-filter, energy recovery wheel, and (x4) plenum type direct-drive exhaust air plenum fans, on outside air stream will be a pre-filter MERV 13, energy recovery wheel, access, DX coil, variable speed compressors, pressure independent valves for condenser water, access, x4 plenum type direct drive supply air fans. Each fan array will be controlled by a single VFD. The exhaust fan shall be sized at 10% reduction in capacity from the supply fan. The supply air distribution system will supply outside air to VAV terminal units for distribution of outside air to each zone.

To control outside air, a central CO2 monitoring system will be provided to take advantage of building diversity. Each occupied area will contain a CO2 measuring port with a high-quality central CO2 sensor. The VAV terminal will modulate in accordance with the CO2 measurements. The VAV terminal will also be interlocked with room occupancy sensors.

The 100% outside air conditioning system is provided as packaged water source unit. The single dedicated outside air machine is provided geothermal water via the building pumping system to satisfy absorption and rejection of variable speed compressor. A DX coil provides conditioned outside air to the building.

ACADEMIC SPACES (CLASSROOMS)

Cooling and heating for the Academic Spaces shall be provided by unitary water-source heat pumps. Each classroom will be served by a dedicated heat pump, sized to meet the heating and cooling loads of the space. Where applicable a single heat pump will serve two classrooms of similar exposure and each space provided with an adjustable thermostat that will average temperatures for control through the BAS system. Each heat pump will be a high efficiency heat pump unit with an ECM fan motor. Most units will be floor mounted and installed in distributed mechanical room spaces located throughout the facility, separate from the Academic Spaces in order to eliminate sound transmission from the equipment to the space. Where mechanical space cannot be programmed into the building footprint, horizontal heat pumps above ceiling will be utilized.

Martin Luther King Jr. School
Cambridge, MA

5.1 MECHANICAL SYSTEMS

Units for each space will be controlled by a thermostat, BAS interface and occupancy sensor interlock. The BAS interface will allow the heat pump unit to communicate with the building control system, and the occupancy sensor shall monitor the occupancy in the space, allowing the unit to go into setback mode when the room is vacant for a period of time. All heat pump units shall have fully ducted supply and return sheet metal ductwork. All supply air ductwork shall be insulated with 1.5" thick, ¾ pcf duct wrap with vapor barrier. Return air ductwork will not be insulated. Each heat pump unit will include a duct-mounted filter rack, to house 24"x24" Flanders/FFI PrePleat 40 filters, standardizing filter sizes throughout the school. The Owner shall be engaged to discuss implementation of MERV 13 filters in lieu of MERV 8 filters at terminal equipment. Each heat pump unit will utilize refrigerant R-410A and will have an ozone depleting potential (ODP) of 0.05 or less. Each heat pump shall include integral disconnect. Condensate for each unit will be disposed of through a dedicated schedule 40 PVC piping system and shall be tied into the storm water system outside the building.

ADMINISTRATION SPACES

Cooling and heating for the Administration spaces shall be provided by unitary water-source heat pumps. HVAC zoning for the Administration spaces shall be divided such that similar-use spaces (i.e., a row of offices) shall be combined to be served by one unit. Interior spaces shall be zoned separately from spaces with exterior exposures, in accordance with sound engineering practices. Each unit shall be equipped with a thermostat and BAS interface, fully ducted air distribution duct systems with insulation, R-410 refrigerant, disconnect, duct-mounted filter rack, and condensate disposal as described above. Where one unit serves multiple spaces, ventilation air shall be controlled by occupancy sensors, which operate a VAV box to provide ventilation air ducted into the return air duct system of the unit or directly into the space.

PHYSICAL EDUCATION/GYMNASIUM

Cooling and heating for the gymnasium shall be provided by a dedicated multi-stage water source heat pump unit with hot-gas reheat for dehumidification, sized to meet the heating and cooling load for the fully occupied gymnasium. This unit shall also be equipped with an outside air intake and relief outlet, in order to allow for the unit to utilize 100% outside air for space conditioning in economizer mode when the ambient air conditions allow.

Ventilation air to the gymnasium shall be supplied directly to the space via a dedicated VAV box as described previously. Supply ductwork to the gymnasium shall be double-wall spiral ductwork with diffusers mounted to the side of the duct. The return air for the gymnasium water source heat pump unit shall be accomplished with a low return air inlet, in order to address any air stratification concerns. Low return air inlets will be supplied with heavy-duty return grilles.

The ancillary support spaces (offices, gym storage, etc.) will be served by unitary water-source heat pumps, with all associated items as described previously. Ventilation to these spaces will be either supplied directly to the space, or into the return air inlet of the associated heat pump, depending on the space layout and mechanical space configuration.

DINING/CREATIVE COMMONS

Heating and cooling for the dining areas shall be provided by multiple unitary water-source heat pumps, with all associated items as described previously. Zoning of the dining areas shall be planned in accordance with the final layout and exterior exposure(s) of the space. Ventilation to these dining areas shall be supplied directly to the space, controlled by a CO2 sensor which will modulate a VAV box to provide outside air to the space.

Heating and cooling for the kitchen shall also be provided by a unitary water-source heat pump, sized to meet the heating and cooling loads for the kitchen, including all kitchen equipment loads. The heat pump will be provided with all associated items described previously.

The kitchen exhaust hood shall be a Type II, heat-removal hood. The Type II hood is selected for energy savings, due to the reduced airflow requirements that can be accomplished with absence of grease vapors from the kitchen equipment. Kitchen equipment beneath the exhaust hood shall be selected accordingly. The kitchen hood shall be connected to a dedicated up-blast exhaust fan, and provided with aluminum ductwork where concealed and stainless steel where exposed.

5.1 MECHANICAL SYSTEMS

The dishwasher exhaust hood shall also be a Type II hood with a dedicated exhaust fan, similar to the kitchen exhaust hood. However, consideration should be given to a heat-recovery dish machine, which would eliminate the need for an exhaust hood and would provide potential energy savings by reducing the hot water heating load for the machine. All dishwasher ductwork shall be stainless steel or aluminum.

The walk-in refrigerator and freezer shall each be equipped with dedicated refrigeration systems, provided by the kitchen equipment supplier. These condensing units shall be water-cooled, and provided with dedicated circulating pumps. These units will be connected into the building geothermal heat pump loop. Consideration should be given to a freezer that is entered thru a cooler for efficiency.

SMALL GROUP/COLLABORATION

Cooling, heating, and ventilation for the Small Group/Collaboration spaces shall be similar to the Academic Spaces. The occupancy status of these spaces shall be monitored by occupancy sensors, to allow these spaces to go into heating/cooling setback mode when they are vacant. When these spaces are occupied, the sensors in the Academic Spaces where the students have relocated from will put those units into setback mode. This tracking of occupant movement in the building provides energy savings by taking advantage of the diversity of use within these spaces.

ELECTRICAL ROOMS

The main electrical room will be served with a cooling-only, unitary geothermal water-source heat pump. A thermostat, BAS controller, ductwork, and filter rack will be provided as described herein. Remote electrical rooms will not be conditioned or ventilated.

DATA ROOMS/TECHNOLOGY SPACES

The main server room and data rooms will be conditioned with dedicated ductless split systems with water source variable refrigerant flow heat pump units. This allows these spaces to maintain temperature during unoccupied setback modes, as these systems will operate independently with dedicated distributive pumps. Technology storage spaces, used for materials storage and laptop charging carts, will be conditioned by dedicated unitary water-source heat pumps as described previously.

NATATORIUM

The natatorium will be served by an indoor water source pool dehumidification unit. The unit will be located in a mechanical room or penthouse. The water source pool dehumidification unit will be connected to the geothermal system. Hot gas reheat coils will be provided inside the unit that allow fir the pool dehumidification unit to be the first stage of pool heating. Remaining pool heating will be accomplished through geothermal water to water heat pumps.
Associated locker spaces, pool equipment mechanical/support spaces, and mechanical rooms will be provided with code compliant exhaust and ventilation per IMC.

UNDERGROUND (ENCLOSED) PARKING GARAGE VENTILATION

Currently the budget will not allow for an underground parking garage. If a garage were to be added to the project, the garage will be ventilated using mechanical exhaust air fans. The dedicated exhaust fans will be located in a mechanical room on the garage level adjacent to a shaft or above grade wall in order to discharge garage exhaust to the atmosphere. Each fan will be ducted to a wall louver or duct mounted grilles that are distributed through the garage volume in a manner that allows fresh makeup air to be pulled through the enclosed garage space. The fans will discharge through exhaust ductwork, routed to an atmospheric discharge point that will be located in compliance with the mechanical code.

The makeup air will be supplied through the garage car entry opening and pulled across the entirety of the garage level to exhaust grilles located opposite of the entry. Mechanical makeup air will be reviewed as an option based on the velocity of air moving through the car access point.

An Armstrong (or equal) garage ventilation control system will be provided which monitors carbon monoxide and nitrogen dioxide. Sensors will be provided for every 7,000 SF of garage area.

5.1 MECHANICAL SYSTEMS

TEMPERATURE CONTROL

A web-based BAC-Net DDC controls system shall be provided for the entire building and associated systems. Acceptable manufactures/controls systems providers will be discussed with the Owner during the design phase. The controls system will also include a JACE panel to communicate (wired/wireless) over the web-based area network to the district wide building management system if applicable. The BAS shall also interface with the building lighting controls, and with utility meters provided on the main building electrical, domestic water, and natural gas (if applicable) systems. Energy sub-metering shall be provided to monitor the power usage of the central geothermal system, HVAC systems, kitchen systems, lighting systems, etc. The system shall be ASHRAE 135 BACnet compliant.

NET ZERO ENERGY DESIGN-MECHANICAL

The systems selected and described in this narrative play a major role in achieving a net-zero design. It is very important to understand that a reduction in building energy consumption is an integral part of achieving net-zero and doing so in a fiscally responsible manner. Every Kilowatt consumed in an annual calendar year must be accounted for in the design of the photovoltaic system. The systems selected are intended to be cost effective, maintainable, and simple in nature compared to others.

In order to reduce energy consumption, the mechanical system utilizes 2-stage geothermal water source heat pumps for space conditioning. This system has proven time and time again to be the most efficient means of conditioning a K-12 building. The ventilation air is delivered to the building by a single dedicated outside air system with total enthalpy energy recovery that provides fresh air to variable air volume boxes which respond to CO2 air measurement devices. Utilizing one dedicated outside air machine served by the geothermal system provides mechanical efficiency, energy efficiency, programming space efficiency, and cost efficiency, all contributing to achieving a net-zero design. The pumping system is a decoupled base mounted pumping system. The base mounted pumps for the well field pump on temperature differential across the well field thus only pumping a volume of fluid required to match the load of the building. The base mounted pumps serving equipment in the building shall pump to maintain a differential pressure sensor in the building loop and at a capacity to satisfy all operational geothermal water source equipment in the building. The decoupling of the hydronic system along with the pumping strategies utilized are selected to achieve the most efficient pumping for the geothermal system and provides the best system load matching. The design of the kitchen equipment and interaction it has with the mechanical system will also work to contribute to achieving net-zero. Exhaust air is to be reduced with type II hoods, heat recovered where possible with equipment, makeup air delivered through the dedicated ventilation system, geothermal utilized for freezer and cooler, and domestic hot water shall be generated by geothermal water source heat pumps. The DDC controls system will be utilized to monitor and control the building within designed parameters. These DDC controls will be carefully defined in the contract documents to establish operational parameters approved by ACPS that best suit achieving net-zero design. Finally, Building Pressurization Testing – In accordance with IECC 2015, Chapter 4, Section C402.5, Air Leakage Testing is required as part of thermal envelope analysis. This is a mandatory requirement of the IECC. Testing performed shall be in accordance with ASTM E 779 at a differential pressure of 0.30 inches water gauge and air leakage rate shall not exceed 0.40 cfm per square foot. CMTA suggests that the Architect, Engineer, Owner, and Commissioning Agent be present to witness this testing. CMTA shall issue a Division 01 Specification, Section 018316 – Exterior Enclosure Performance Requirements, outlining the requirements and suggested targets. In a high-performance design, CMTA recommends a goal of 0.15 cfm per sq. ft. at 0.30 inches water gauge, exceeding the minimum code requirement. This is achieved through diligent testing procedures paired with remediation strategies to overcome possible deficiencies. The pressure testing will ultimately require high construction standards and provide an envelope designed to perform at a high level and reduce the total strain on the HVAC system which accounts for upwards of 40% building energy while providing a quality indoor environment.

5.1 MECHANICAL SYSTEMS

The following illustrations of the different geothermal well locations can be applied to all concepts and site plans.

These diagrams illustrate the number of new geothermal wells that will be needed to serve the school. The final configuration will depend on school size / efficiency, layout, and depth of geothermal well. All design options will require a similar number of wells, and all assume that the existing geothermal wells at the Northwest corner of the site will be preserved.

230 WELLS AT 550 FEET DEEP: EAST OPTION 1B

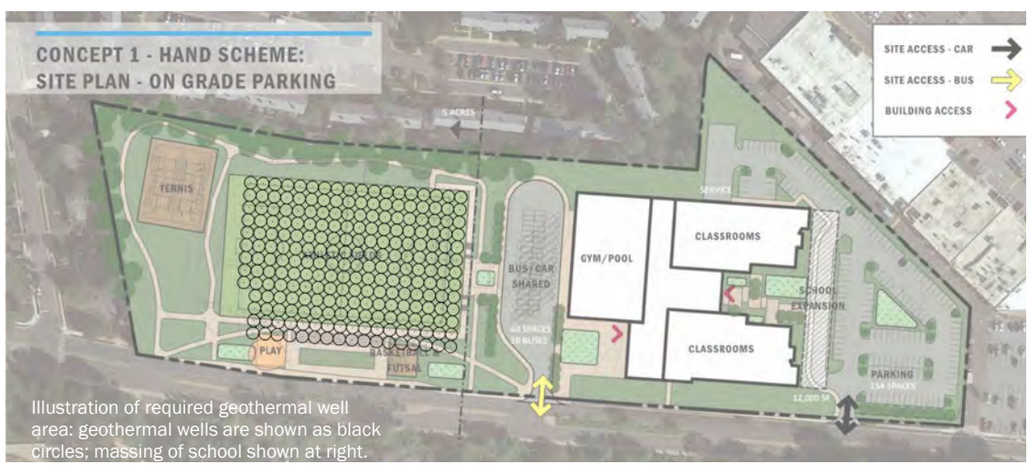


Illustration of required geothermal well area: geothermal wells are shown as black circles; massing of school shown at right.

230 WELLS AT 550 FEET DEEP: EAST OPTION 1B

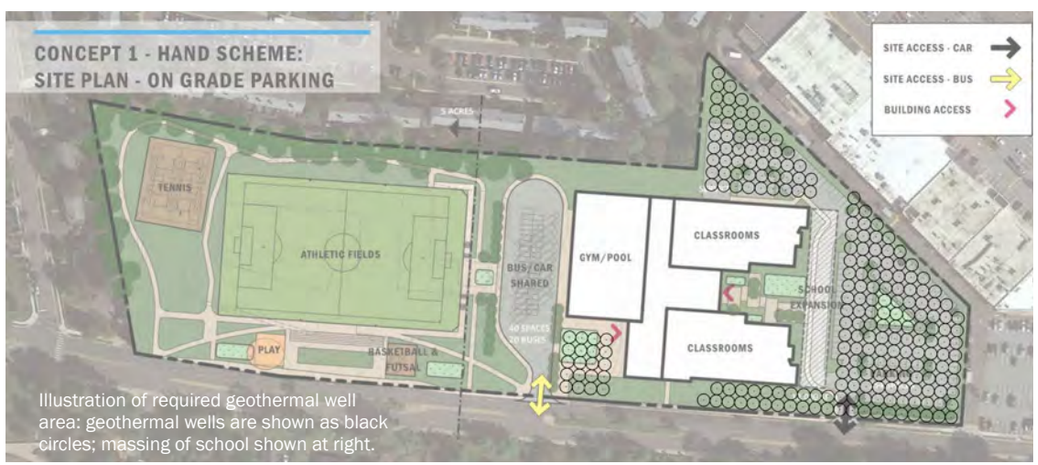


Illustration of required geothermal well area: geothermal wells are shown as black circles; massing of school shown at right.

5.1 MECHANICAL SYSTEMS

The following illustrations of the different geothermal well locations can be applied to all concepts and site plans.

158 WELLS AT 800 FEET DEEP: WEST OPTION 2A

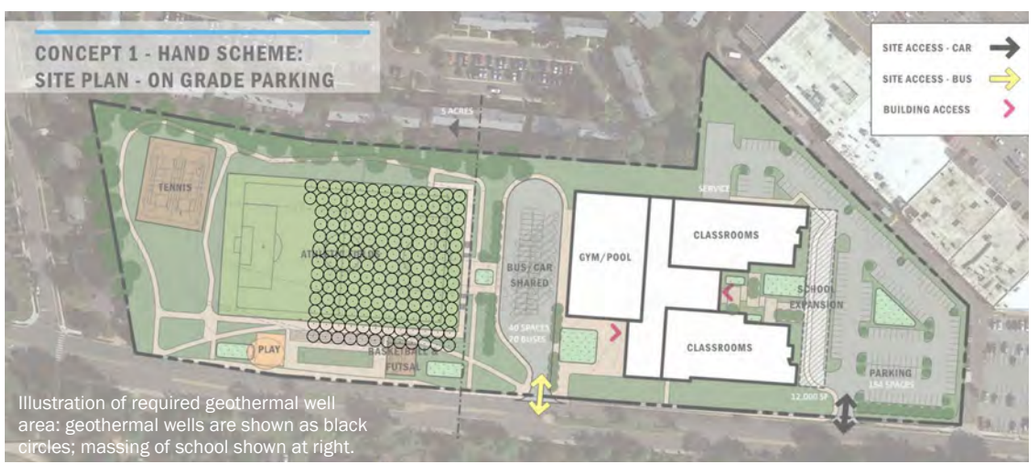


Illustration of required geothermal well area: geothermal wells are shown as black circles; massing of school shown at right.

158 WELLS AT 800 FEET DEEP: EAST OPTION 2B

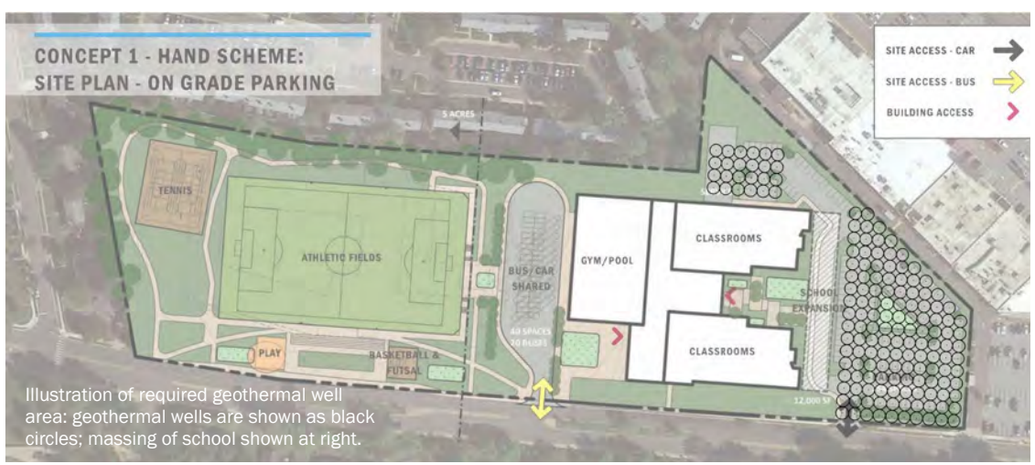


Illustration of required geothermal well area: geothermal wells are shown as black circles; massing of school shown at right.

5.2 PLUMBING AND FIRE PROTECTION SYSTEMS

CODES AND STANDARDS

The new Minnie Howard High School shall incorporate a Fire Protection and Plumbing system designed to meet the requirements of the following:

- Virginia Construction Code (2015)
- Virginia Mechanical Code (2015)
- Virginia Energy Conservation Code (2015)
- 2015 International Fire Code
- Virginia Statewide Fire Prevention Code (2015)
- Virginia Building and Fire Code Related Regulations (2015)
- Virginia Fuel Gas Code (2015)
- Virginia Plumbing Code (2015)
- Americans with Disability Act Accessibility Guidelines (ADAAG)
- LEED for Schools (v4)
- ASHRAE Guidelines (2013)
- Alexandria City Public Schools Educational Specification for The High School Project
- Guidelines for School Facilities in Virginia's Public Schools (September 2013) Virginia Department of Education

FIRE PROTECTION

A new metered fire service line will be supplied to Minnie Howard High School via underground supply from the local utility service. A flow test has been performed to ascertain if a fire pump will be required. The results are as follows:

Test Site 3801 W Braddock Rd.
Flow Hydrant #5015: 2817 gpm
Residual Hydrant #5016: Static Pressure – 57 PSI and Residual Pressure 47 PSI
3500 GPM is the limit of available fire flow

The team is working with the assumption we will be connecting to a city water main with a new tap for fire and domestic water. Incoming fire service shall include a post indicator valve and a double detector check valve assembly. Installation shall meet or exceed all applicable requirements of NFPA, state, and local codes. A fire pump is required based on preliminary calculations that will be further evaluated as building information and conditions become available. The fire pump will be assumed to be 1000 gallons. Fire pump and entrance riser(s) are to be located in a mechanical room. Stand pipes will be provided in egress stairwells.

The entire building shall be provided with a new fire suppression system designed in accordance with all applicable standards of NFPA including but not limited to NFPA 13. Piping 2" and smaller shall be schedule 40 steel pipe with threaded fittings, and 2-1/2" and larger shall be schedule 10 steel pipe with grooved type fittings. There shall be wet stand pipes in each of the egress stairs.

Sprinklers shall be recessed, quick response, pendant type sprinklers in areas containing ceilings. Upright sprinklers shall be used in areas containing no ceilings, such as mechanical rooms, etc. Dry pendant/upright type sprinklers shall be utilized in the areas subject to freezing temperatures such as a loading dock and or all freezer/cooler boxes.

Sprinkler drain risers will be provided to allow system to be fully drained. Sprinkler drain piping shall be routed and spilled to grade or to a drain capable of handling the discharge flow.

A fire hydrant flow test has been performed to determine available static pressure, residual pressure, and flow for design and coordination. A new flow test shall be conducted by the awarded project sprinkler contractor during construction.

5.2 PLUMBING AND FIRE PROTECTION SYSTEMS

HYDRANT FLOW TEST

5.2 PLUMBING AND FIRE PROTECTION SYSTEMS

PLUMBING

Plumbing fixtures shall be provided as indicated on the architectural and plumbing drawings as they are developed. All water closets, lavatories, sinks, drinking fountains, emergency showers, floor drains, etc. shall be commercial grade. All Plumbing requirements will be reviewed in the ACPS standards.

Provide new domestic water and sanitary system complete including termination to the site systems, which are interconnected to the existing municipal systems.

WATER SERVICE

The domestic water system shall consist of a main building water shut-off valve, and 4" reduced pressure backflow preventers located in a water meter room or mechanical room. A domestic water booster pump shall be required based on the flow test. A new tap will be made on a City of Alexandria water main on the site.

The anticipated water pressure available at the site requires a domestic water booster pump sized for approximately 40 PSIG of lift at a discharge pressure of 80 PSIG at (500 GPM). A 50/50 duplex domestic booster pump system will be used to provide pressure and flow to the domestic system with (2) 250 GPM pumps each. The pumping package will be variable speed. The domestic water system shall include a building booster pump, located in a mechanical room.

NATURAL GAS SERVICE

A metered natural gas service will be supplied to the building to serve the emergency generator. This will be evaluated with the school system and diesel vs natural gas will be evaluated.

DOMESTIC HOT WATER SYSTEM

Domestic hot water will be produced from two Colmac geothermal heat pump units. The water to water heat pump boilers shall be located in the main mechanical room and will provide the domestic hot water heating. Hot water shall be stored in a single 300-gallon insulated storage tank that feeds four 120-gallon air source heat pump water heaters with a 100-degree temperature rise capability to act as back up heating source. Cold, hot, and recirculating water piping will be routed throughout the school. All recirculation pumps shall have redundant pumps. All hand washing sinks & showers will be provided with a dedicated ASPE mixing valve to achieve the required temperatures to avoid scalding.

KITCHEN

Domestic hot water will be produced by the geothermal water heaters and supplied at 140°F. All hand washing sinks will be provided with a dedicated ASPE mixing valve to achieve the required temperatures to avoid scalding.

The kitchen will require grease piping and associated floor sinks which are distributed (interconnected) to two 1500-gallon, concrete construction, grease/water separator. Provide a heavy-duty traffic duty manhole for access to the unit.

ART ROOMS

Art room sinks will be provided with plaster traps on sanitary waste lines.

SCIENCE ROOMS

Science rooms will be served with natural gas piping for torrents and hoods. Sinks and hoods will be provided with lab waste and vent piping. All science lab waste and vent piping will be tied into an exterior acid dilution pit prior to connecting back into onsite sanitary piping. All labs will be provided with shutoff per Virginia Building Codes and ACPS Standards.

5.2 PLUMBING AND FIRE PROTECTION SYSTEMS

PLUMBING DESIGN

Plumbing Waste and Vent Piping:

- Extra Heavy Hubless Cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 888 and CISPI Standard 301. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International. Hubless Couplings shall conform to CISPI Standard 310 and be certified by NSF® International. Heavy Duty couplings shall conform to ASTM C 1540 and shall be used. Gaskets shall conform to ASTM C 564. All pipe and fittings to be produced by a single manufacturer and are to be installed in accordance with manufacturer's recommendations and applicable code requirements. Couplings shall be installed in accordance with the manufacturer's band tightening sequence and torque recommendations. Tighten bands with a properly calibrated torque limiting device. The system shall be hydrostatically tested after installation to 10 ft. of head (4.3 psi maximum).
- Polyvinyl chloride (PVC) plastic pipe in IPS diameters Schedule 40 with solvent welded joints may be used for sanitary and waste.
- Extra Heavy weight cast iron hub and spigot piping with compression gasket joints. Hub and Spigot Cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 74. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute ® and listed by NSF® International. Joints can be made using a compression gasket manufactured from an elastomer meeting the requirements of ASTM C 564 or lead and oakum. All pipe and fittings to be produced by a single manufacturer and are to be installed in accordance with manufacturer's recommendations and applicable code requirements. The system shall be hydrostatically tested after installation to 10 ft. of head (4.3 psi maximum).
- Soil and waste piping serving mechanical rooms, laundries and kitchens shall be cast iron regardless whether PVC piping is allowed or not. Cast iron will also be required at any other location where waste water temperature can exceed 120°F. Cast iron shall extend a minimum of 35' past last waste inlet.
- Acid Waste and Vent Piping - (Below Slab and Grade or Above Slab).
- Below slab: Schedule 40 non-flame retardant polypropylene pipe conforming to ASTM D4101 with joints made in accordance with the DC Plumbing Code. Below grade piping shall be installed with fusion joint fittings.
- Above slab, pipe in non-plenum area: Schedule 40 flame retardant polypropylene pipe conforming to ASTM D4101 with joints made in accordance with the VA Plumbing Code. Piping shall be installed with fusion joints within concealed spaces and with mechanical joints in accessible areas. All mechanical couplings below casework or exposed shall have the clamp edges smoothed or covered to keep sharp edges from cutting people.
- Above slab, pipe in plenum: Schedule 40 PVDF per ASTM F1673 with mechanical joint fittings meeting ASTM E84 for flame spread and smoke generation (less than 25 and 50 respectively).
- Type DWV copper drainage piping with cast bronze drainage pattern fittings with solder joints or Polyvinyl chloride (PVC) plastic pipe in IPS diameters Schedule 40 with solvent welded joints.
- The sanitary piping will require cleanouts at every pipe direction change and on 75 foot centers. Provide a complete roof drainage system including roof drains and an overflow roof drainage system. All sanitary and roof drainage piping shall service weight cast iron hub and spigot piping with compression gasket joints. All plumbing vents shall terminate a minimum of 50 feet from any outdoor air intake.

Princeton Day School
Princeton, NJ

5.2 PLUMBING AND FIRE PROTECTION SYSTEMS

Roof Drains and Piping:

- All above ground storm piping is collected by roof drains and routed through the building in PVC with solvent welded joints in roof leader piping. All horizontal roof leaders shall be insulated with ½" fiber glass insulation for 3" piping or less and 1" fiberglass insulation for piping 4" and greater.
- Below ground piping for the primary and overflow roof drainage systems will be PVC with solvent welded joints (or similar, refer to site storm design).

Domestic Water Piping:

- Underground - Type K Hard Copper with lead free solder. 150 lb, flanged or screwed, gate or ball, bronze valves.
- Above ground - Type L Hard Copper with lead free solder. 150 lb, flanged or screwed, gate or ball, bronze valves.

NET ZERO DESIGN–PLUMBING

The plumbing design will look to follow LEED criteria for plumbing fixture water flow rates and usage, and exceed this where coordinated with Owner. The reduction in water usage will aid in generating less hot water demand from the efficient geothermal domestic water heating system. All equipment and fixture selections will be done so with net zero in mind. Where applicable plumbing and fire protection systems will be tied into building controls for monitoring and efficient ACPS approved scheduling and operation.

Martin Luther King Jr School
Cambridge, MA

5.3 ELECTRICAL SYSTEMS

CODES AND STANDARDS

The new Minnie Howard High School shall incorporate an Electrical system designed to meet the requirements of the following:

- Virginia Construction Code (2015)
- Virginia Energy Conservation Code (2015)
- National Electric Code 2014
- City of Alexandria Electrical Code
- Americans with Disability Act Accessibility Guidelines (ADAAG)
- LEED for Schools (v4)
- ASHRAE Guidelines (2013)
- Alexandria City Public Schools Educational Specification for The High School Project
- Guidelines for School Facilities in Virginia's Public Schools (September 2013) Virginia Department of Education

SITE LIGHTING, POWER, AND SECURITY

A new pad mount transformer will be provided for the building. Transformer will be provided and installed by Dominion Energy. Locations of all items will be coordinated with Dominion Energy and reviewed by Owner and architect. There could be a possibility of multiple transformers to feed electrical needs around the site such as athletic court lighting, parking garage (if added), or possibly the pool as this might be separately metered and this might end up being the way to perform this.

The facility and surrounding site shall be illuminated with LED type light fixtures. Building mounted (wall pack) style fixtures as well as pole mounted lighting for the parking areas shall be utilized. All site lighting shall be controlled via photocell sensors. If desired certain fixtures could be equipped with motion sensors to completely turn off at night if no motion is detected, thus allowing them to go to full bright upon any motion in the area. Light fixtures shall be equipped with cutoff technology to control light spill to adjacent properties/housing areas.

LED lighting will also be provided for the flag pole as well as any marquee signs at the site entrance. These light fixtures would also be controlled via photocell sensors.

POWER

The new service will be provided with a 2000A-2500A, 480/277V, three phase, four wire electrical system. This service will serve all immediate building and immediate site needs. As mentioned above, smaller additional services may be provided, depending upon final layouts and site distribution. Additional services for site and pool could total between 400A and 600A. Distribution transformers will be located throughout the building to provide services to 120V receptacles and any 208V, single phase or three phase loads. The main breaker will be provided with ground fault protection as well as maintenance switch for Arc Flash Energy Reduction requirement. Panels will be located throughout the building to reduce branch circuit length.

An emergency generator will be designed for the building. There will be two transfer switches (branches) associated with the emergency system. All life safety system such as fire alarm and egress lighting, lighting controls, PA Intercom system, and Security/Panic systems will be provided on life safety branch. All misc. loads such as cooler/freezer, IT closet cooling, IT closet receptacles, EMS controls, kitchen cooler and freezer, kitchen fire suppression, elevators, and any other Owner requested system will be put on standby branch.

Receptacles will be located at teacher workstation locations, fixed locations where equipment requires power, and multiple locations on each wall for convenience. Receptacles will be provided throughout the corridor for maintenance and general use purposes. Any group learning areas in corridors or open spaces will be provided with additional power per classroom standards. Additionally, any outdoor teaching areas will be provided with multiple receptacles. Most receptacles will be provided with integral USB outlet for device charging. These outlets accept both regular 120V plug heads and USB connections.

5.3 ELECTRICAL SYSTEMS

RENEWABLE ENERGY

The school will be provided with solar photovoltaics which will primarily be concentrated to the roof. There is a Net Zero Energy goal for the facility, so additional site mounted solar photovoltaics will likely need to be included to achieve the renewable energy required for Net Zero, whether the pool is included in the project or not. With the inclusion of the pool in the Net Zero Energy requirement, more solar would need to be included on the site.

Utilizing an EUI of 25 (includes school and pool), to achieve the net zero energy goal, the total PV generation would be approximately 1.65 MW with an annual production of approximately 2,346,000 kWh. To achieve this Net Zero Energy goal, approximately 3,704 panels are required. At this concept level we have shown three different options all ranging from 1.62 MW to 1.67 MW with panels on the site and roof as required. We utilized the REC 450W module for our basis of design. If the pool is not required to be included in the Net Zero Energy scope, the building's energy goal would be an EUI of 20 and would require roughly 700 less panels. As the designs progresses and final concept selected, the roof and/or canopy layout and quantities as well as the basis of design panel selection is subject to change. We have included an exhibit in Tab Section 3.4 with concept layouts for reference.

Net Zero metering is calculated over a 12 month period. In the winter months the building will likely be using more energy than the solar panels produce, but in the summer the panels will be producing more energy than the building uses. The goal over the course of the entire year is to have the PV system produce more energy than the building consumes.

METERING

All portions of the HVAC and electrical system will be metered for student and owner use. In addition to the main building meters associated for each utility, additional sub meters will be located throughout the building. The sub meters could measure different use group areas such as kitchen, gym, library, IT closets, classroom wing, etc, as well as individual loads like general receptacles, lighting, and HVAC. Additionally, student areas can be metered and competitions set up between those areas or from a baseline target. Students could track throughout the year to see if goals were met. Depending on how the pool discussion progresses, an additional meter or service may be provided for this as well.

FIRE ALARM

An audible and visual evacuation type fire alarm system will be provided for the building. Manual pull stations and speaker/strobes will be located throughout the building to notify all occupants of potential fires. Refer to each area for additional information.

ACADEMIC SPACES (CLASSROOMS, LABS)

Classroom lighting shall be 2x4 lay-in recessed LED lighting with digital controls such as vacancy and daylight sensors where applicable such as rooms with large window surface area. Full dimming will be provided in classrooms and fixtures shall be switched so that teaching wall can be switched separately. Classroom power will be served by locally placed panel boards in dedicated electrical spaces. The classrooms shall also contain fire alarm devices as required by code. Additional lighting may be added in lab areas of building to increase light levels, and additional outlets may be required.

ADMINISTRATION SPACES

Lighting shall be architectural, lay-in and down light LED fixtures with digital controls such as vacancy/occupancy and daylight sensors. Dimming will be provided in administration areas for light level control. Daylight sensors shall be provided in rooms with window surface area large enough for consideration. General power will be served by locally placed panel boards in dedicated electrical spaces. Admin spaces shall also have fire alarm devices as required by code.

PHYSICAL EDUCATION/GYMNASIUM

The gymnasium lighting shall be high-bay type LED fixtures with digital controls such as occupancy and daylight sensors where applicable. Full dimming will be provided and rows will be switched individually. General power will be served by locally placed panel boards in dedicated electrical spaces to serve the gymnasium. Fire alarm devices shall be provided per code. All lighting and fire alarm devices shall be protected from damage by sports equipment.

Shanghai Community International School
Changing, China

5.3 ELECTRICAL SYSTEMS

DINING/CREATIVE COMMONS

The dining area lighting shall be architectural/downlight LED fixtures to work with the ceiling types. The lighting shall have digital controls such as vacancy/occupancy and daylight sensors where applicable such as rooms with window surface area large enough for consideration. The kitchen lighting shall be gasketed LED fixtures also controlled by the lighting control system such that lights are turned off during unoccupied hours. General power will be served by locally placed panel boards in dedicated electrical spaces near the dining space. All kitchen equipment shall also be fed from these local panels such as coolers, freezers, the exhaust hood, microwaves, warming equipment, and miscellaneous small loads. Fire Alarm devices shall be provided as required by code.

LIBRARY

The library lighting shall be architectural, pendant mount, direct/indirect, lay-in and downlight LED fixtures with digital controls such as vacancy/occupancy and daylight sensors where applicable such as rooms with window surface area large enough for consideration. Full dimming will be provided for all fixtures. General power will be served by locally placed panel boards in dedicated electrical spaces. Fire Alarm devices shall be provided as required by code.

FORUM

Lighting shall consist of both house lighting and performance lighting in this area. Pendant mounted cylinder LED downlights will be provided for non-theatrical use, such as setting up sets, maintenance, etc. For consideration, theatrical lighting may consist of pipe batton with 250-500 watt LED, RGBW spot light arrays. All lighting will be dimmable. Digital lighting controls will be provided at control booth or similar space with additional remote stage manager controls around the perimeter.

SMALL GROUP/COLLABORATION

Lighting shall be architectural, lay-in and downlight LED fixtures to work with the ceiling types within the spaces. Lighting controls will be digital controls such as vacancy/occupancy and daylight sensors where applicable such as rooms with window surface area large enough for consideration. Dimming will be provided in these areas. General power will be served by locally placed panel boards in dedicated electrical spaces. As with all other spaces fire alarm devices shall be provided as required by code.

PT/OT/SPEECH/HEALTH

Lighting shall be direct/indirect LED fixtures to work with the ceiling types designed within each space. Lighting shall be controlled via digital controls such as vacancy/occupancy and daylight sensors where applicable such as rooms with window surface area large enough for consideration. Full dimming will be provided. General power will be served by locally placed panel boards in dedicated electrical spaces. Each space shall also have fire alarm devices as required by code. Tunable white fixtures will be provided in these spaces for additional behavioral benefits.

ART

Lighting shall be architectural LED fixtures with digital controls such as vacancy/occupancy and daylight sensors where applicable such as rooms with window surface area large enough for consideration. Full dimming will be provided. General power will be served by locally placed panel boards in dedicated electrical spaces. Fire Alarm devices shall be provided as required by code.

5.4 AV/IT/SECURITY SYSTEMS

CODES AND STANDARDS

The new Minnie Howard High School shall incorporate Technology systems designed to meet the requirements of the following:

- International Building Code (2012)
- National Electric Code 2011
- Americans with Disability Act Accessibility Guidelines (ADAAG)
- Alexandria City Public Schools – Telecommunications and Low Voltage Wiring Standards
- Alexandria City Public Schools Educational Specification for The High School Project
- Guidelines for School Facilities in Virginia's Public Schools (September 2013) Virginia Department of Education
- AVIXA Standards and Best Practices
- NEMA SB 40 – Communications Systems for Life Safety in Schools
- BICSI Standards and Best Practices

AUDIOVISUAL (AV)

Audiovisual systems across the facility will consist of flat panel displays, large format projection systems, short throw projection systems, etc.

Audio and video will be digital and consist of hardwired inputs and wireless casting capabilities. Where appropriate, the system will leverage the building network to increase flexibility, scalability and simplicity.

Cafeteria and gym sound systems will be fully integrated with video and designed to be simple to use. Rack locations will be coordinated and accessible for future upgrades or necessary maintenance. Bluetooth connectivity will be provided for bring-your-own-device connectivity. Wireless microphones will be provided (both hand held and belt pack+lavilier).
Assistive listening devices will be provided in areas required by ADA.

Audiovisual systems will be coordinated with the fire alarm system to auto-mute upon activation of fire alarm.

ELECTRONIC SAFETY AND SECURITY (ESS)

Electronic safety and security system will consist of IP based surveillance camera system that will leverage the building network and have on premise NVR storage servers. In addition to the camera system an access control system will be provided with centralized power supplies and controllers located in the MDF/IDFs.

All camera views will be closely coordinated with ACPS requirements and coverage goals for this building's location.

Access control system will be closely coordinated with Division 08 door hardware specifications to ensure division of responsibility is clear between contractors. All required devices that are part of the access control system will be shown on the plans (door position sensors, request to exit, card readers, keypads, mag locks, etc.)

5.4 AV/IT/SECURITY SYSTEMS

INFORMATION TECHNOLOGY (IT)

The contractor will provide all rough-ins, face plates, cabling paths, cabling and patch panels for all telephone and data systems. Telephone system shall be IP based. Owner shall provide active components including wireless access points. Minimum stub-out conduit size will be 1'' and cabling paths will consist of 12'' cable tray with J-hook assemblies on 48'' centers.

The horizontal data network will utilize CAT 6 infrastructure. Wireless coverage will be provided for the entire school utilizing CAT 6A cabling.

Fiber backbone will consist of 12 strand multi mode OM4 fiber optic cable with LC connectors supporting full 10gig up links, along with a 25 pair CAT5E copper backbone from MDF to each IDF.

MDFs and IDFs will be designed per ACPS Ed Specs in tandem with BICSI best practices for future flexibility and reliability.

CLOCK SYSTEM

The clock system will consist of wireless clocks that will all be synchronized to a head end unit and the bell system. (Sapling or equal)

Clock format will be dependent on location – single face, double face, etc. will be coordinated with Architect and Owner.

PUBLIC ADDRESS SYSTEM

The public address system will consist of a distributed speaker, call switch system per ACPS standards and building requirements.

The public address system will be connected to the fire alarm system, sound systems (gym, café, etc.) and telephone system for integrated and code-required functionality.

A dedicated Uninterrupted Power Supply (UPS) will be provided to ensure communications are available during power outage.

DISTRIBUTED ANTENNA SYSTEM (DAS)

The building will receive a DAS with head end equipment located in the MDF with fiber optic cabling out to all required multi-band radio units with coax cabling to multi-band antennas.
Device locations will be determined based on building materials and coverage requirements.

Incoming service providers to be determined by ACPS.

DIGITAL SIGNAGE

Digital signage displays will be provided in public spaces, corridors, etc. infrastructure will consist of power and data with a digital signage player located at each digital signage location.

If a large marquis sign will be provided outdoors, either building mounted or standalone mounted to a base at the front of the property, fiber optic cable will be routed to the sign with media converters for signal transmission and content updating.

5.5 STRUCTURAL SYSTEMS

The structural narrative describes the structural elements and components for the Concepts, which are the same for each.

SCHOOL BUILDING

The following narrative is intended to outline the design vision and design guidelines that will serve

Foundation

- The current expectation is that the foundation will be shallow spread footings. A geotechnical investigation and report is forthcoming.

Slab-on-Grade

- Traditional 5 inch thick concrete slab supported on grade over vapor barrier and 6" stone sub-base.

Elevated Floor Slabs

- For a Type I building the typical floors are expected to be 3.25 inches of lightweight concrete over 2 inch composite floor deck. For a Type II building the typical floors are expected to be 3 inches of normal weight concrete instead.

Elevated Floor Framing

- Compositely designed structural steel framing consisting of beams spaced at 8 to 9 feet on center supported by steel girders.

Columns

- Columns will be W12 or W14 series wide flanges, assumed stacking floor to floor.
- Transfer girders will be avoided.

Lateral Resistance Systems

- Steel braced frames consisting of slotted tubes welded to gussets arranged in a chevron pattern.

Roof Framing, Typical

- The project is pursuing net zero energy, structural narrative anticipates low-profile mounted (non-ballasted) PV Panels throughout the roof. A ballasted PV panel system and/or green roof would decrease framing spacing, thereby increasing the amount of steel.
- Metal deck supported on bar joist and steel framing spaced up to 6 feet on center supported by steel girders.

Roof Framing over the Gym

- The project is pursuing net zero energy, structural narrative anticipates low-profile mounted (non-ballasted) PV Panels throughout the roof. A ballasted PV panel system and/or green roof would decrease framing spacing, thereby increasing the amount of steel.
- The gym roof has a 90 feet span requiring 3 inch metal deck supported DLH joist spaced at 10 feet on center.

5.5 STRUCTURAL SYSTEMS

Gym Floor (Floor Level over Aquatic Facility)

- With the gym floor located over the aquatic facility, the steel framing in the aquatic facility will need to be galvanized to G90 and be coated with an appropriate High-Performance Coating.
- The aquatic center is roughly 100 feet wide.
- The slab will be at least 4.5 inches of normal weight concrete over 3 inch galvanized and painted composite deck.
- Framing to be cambered trusses spaced at 20 feet on center with a weight of 600 PLF per truss with infill beam framing between the trusses.

PARKING STRUCTURE

Currently the budget will not allow for an underground parking garage. If a garage were to be added to the project, these are proposed structural systems.

Above Grade Stand Alone Parking Garage Structure

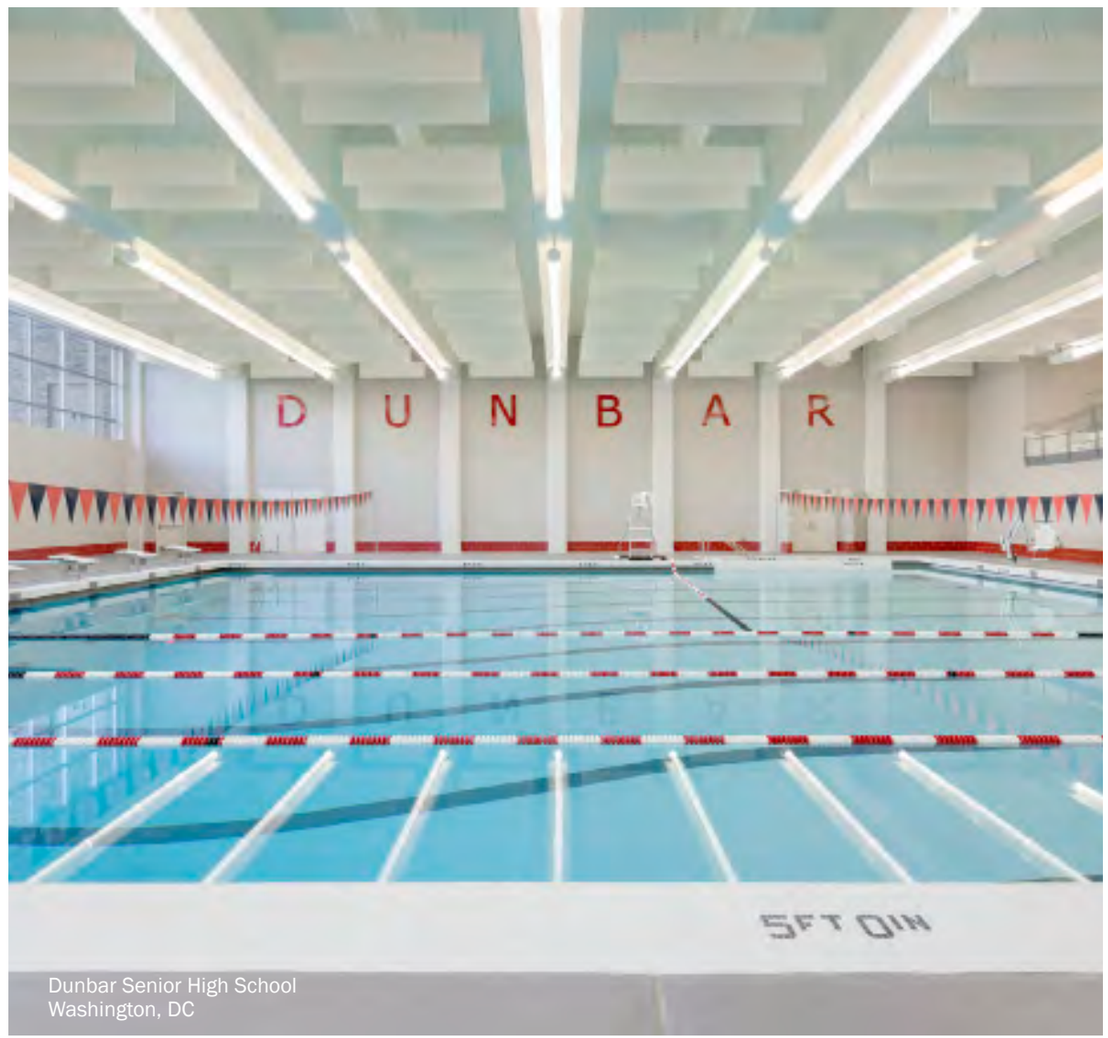
- Precast parking structure supported on shallow spread footings.

Parking Garage below the School

- Maintaining the same structural grid, the below grade parking under the school will be a cast-in-place flat plate slabs with drop panels supported on columns and basement walls.

Below Grade Parking under the Athletic Fields

- The structure will be cast-in-place concrete flat slab with drop panels supported in concrete columns and the exterior basement walls.



Dunbar Senior High School
Washington, DC

5.6 ACOUSTICAL DESIGN

INTRODUCTION

The following narrative is intended to outline the design vision and design guidelines that will serve as the guiding principles behind Polysonics' architectural and interior acoustics design of the major spaces in the Minnie Howard project.

In recent years, acoustics in schools has risen in prominence with the advent of the LEED Green Building system and new ANSI acoustics for school's performance standards. While each space within the school will have unique acoustical goals and challenges, the overriding design parameters can be broken into two major concepts: architectural acoustics and interior acoustics.

Architectural acoustics can be thought of as designing spaces which keep inside noises in, and outside noises out, often called acoustical isolation. Acoustical isolation is chiefly determined by the walls, floor, and ceiling of a space that includes windows, doors, thru-wall A/C units, access panels, etc.

Interior acoustics can be thought of as controlling the buildup of noise within a space and the path sound takes as it moves throughout the space. This can be done by using acoustical treatments such as ceiling tiles, wall panels, baffles, etc.

DESIGN GUIDELINES

Polysonics has evaluated multiple spaces utilizing the following codes and standards:

- ANSI S12.60-2010 "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools"
- LEED for Schools™ Version 4
- ACPS Educational Specifications (March 1, 2021)
- Virginia Department of Education Guidelines for School Facilities

For clarity, detailed descriptions of the codes/standards used have been provided in the appendix. Throughout this report, the codes/standards used in the design of each space is shown using a superscript notation following each section title, as follows: SPACE1,2 indicating codes 1 and 2 have been used in the design of the space. The superscript codes associated with each standard are contained in the Endnotes section of the Appendix.

TYPICAL CLASSROOMS [1,2,4]

A. Per LEED, the ceiling treatment is to remain at or below 10' in height to be acoustically effective. The higher ceiling height will be considered for our calculation. This adjustment may require the use of acoustical wall panels to compensate for increased ceiling height and reverberation time. Wall panels such as MBI Colorsonix or equal may be required. Lower ceiling height is preferred for reverberation control as well as providing increased acoustic isolation between vertically adjacent classrooms.

B. Suspended acoustical ceiling tile shall be hung in a grid. LEED requires ceiling tile with a CAC of 35 or higher and NRC of 0.70 or higher.

C. It is highly recommended that ceiling tile shall cover 100% of the ceiling – excluding lights, fixtures, diffusers, and intakes.

FOOTNOTES (The following endnotes are described in detail in Section 7.2 of the Appendix)

[1] ANSI S12.60-2002, "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools"

[2] LEED for Schools™ Version 4

[3] ACPS Educational Specifications (March 1, 2021)

[4] Virginia Department of Education Guidelines for School Facilities

5.6 ACOUSTICAL DESIGN

D. If demountable glass wall partitions are used, we recommend that they be rated for STC 45. To ensure the STC 45 rating and prevent sound from entering classrooms over the top of the partition, a drywall closure piece will be needed to ensure slab-to-slab construction. An entry door (including transom and side lite) to the classroom is recommended meet an STC 30 rating.

E. Any wall partitions separating mechanical closets from the classrooms is recommended to achieve STC 60 and extend from floor to slab. The supply and return air ducts should not penetrate sound rated partitions to directly enter the classrooms and between classrooms.

F. If two classrooms are designed with an operable partition to provide the flexibility to expand or contract spaces, we recommend that the partition is rated for STC 56. The operable partition with a door between classrooms will lower the STC rating.

G. LEED requires maintaining HVAC noise levels of 40 dBA (≈NC 35).

ART STUDIO [1,2,4]

A. Polysonics understands this to be a core learning space.

B. Per LEED, the ceiling treatment is to remain at or below 10' in height to be acoustically effective. The higher ceiling height will be considered for our calculation. This adjustment may require the use of acoustical wall panels to compensate for increased ceiling height and reverberation time. Wall panels such as MBI Colorsonix or equal may be required. Lower ceiling height is preferred for reverberation control as well as providing increased acoustic isolation between vertically adjacent classrooms.

C. Suspended acoustical ceiling tile shall be hung in a grid. LEED requires ceiling tile with a CAC of 35 or higher and NRC of 0.70 or higher.

D. It is highly recommended that ceiling tile shall cover 100% of the ceiling – excluding lights, fixtures, diffusers, and intakes.

E. If demountable glass wall partitions are used, we recommend that they be rated for STC 45. To ensure the STC 45 rating and prevent sound from entering classrooms over the top of the partition, a drywall closure piece will be needed to ensure slab-to-slab construction. An entry door (including transom and side lite) to the classroom is recommended meet an STC 30 rating.

F. LEED requires maintaining HVAC noise levels of 40 dBA (≈NC 35).

G. Any wall partitions separating mechanical closets from the Art Classrooms are recommended to achieve be STC 60 and extend from floor to slab. The supply and return air ducts should not penetrate sound rated partitions to directly enter the Art Classrooms and between Art Classrooms.

SPECIAL EDUCATION [1,2,4]

A. This space shall provide an appropriate learning environment for students who have physical, emotional, or educational needs. It can primarily be used for individual and small group instruction.

B. Per LEED, the ceiling treatment is to remain at or below 10' in height to be acoustically effective. The higher ceiling height will be considered for our calculation. This adjustment may require the use of acoustical wall panels to compensate for increased ceiling height and reverberation time. Lower ceiling height is preferred for reverberation control as well as providing increased acoustic isolation between vertically adjacent classrooms.

FOOTNOTES (The following endnotes are described in detail in Section 7.2 of the Appendix)

[1] ANSI S12.60-2002, "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools"

[2] LEED for Schools™ Version 4

[3] ACPS Educational Specifications (March 1, 2021)

[4] Virginia Department of Education Guidelines for School Facilities

5.6 ACOUSTICAL DESIGN

C. Suspended acoustical ceiling tile shall be hung in a grid. LEED requires ceiling tile with a CAC of 35 or higher and NRC of 0.70 or higher.

D. It is highly recommended that ceiling tile shall cover 100% of the ceiling – excluding lights, fixtures, diffusers, and intakes.

E. If demountable glass wall partitions are used, we recommend that they be rated for STC 45. To ensure the STC 45 rating and prevent sound from entering classrooms over the top of the partition, a drywall closure piece will be needed to ensure slab-to-slab construction. An entry door (including transom and side lite) to the classroom is recommended meet an STC 30 rating.

F. Any wall partitions separating mechanical closets from the classrooms are recommended to achieve STC 60 and extend from floor to slab. The supply and return air ducts should not penetrate sound rated partitions to directly enter the classrooms and between classrooms.

G. If two classrooms are designed with an operable partition to provide the flexibility to expand or contract spaces, we recommend that the partition is rated for STC 56. The operable partition with a door between classrooms will lower the STC rating.

H. LEED requires maintaining HVAC noise levels of 40 dBA (≈NC 35). However, we recommend lower background sound level of NC 30 for classrooms assigned to autistic students.

LIBRARY [2,4]

A. Polysonics understands a portion of the library to be a core learning space.

B. Polysonics understands these spaces to be a blend of traditional hard copy reading materials and technology. The library will have various rooms that students can go work.

C. The primary acoustic goals for the library would be control of reverberation time, reduced HVAC background noise, prevention of flutter echoes, and acoustic isolation from noises in adjacent spaces. Reverberation Time should be at or below 0.6 second.

D. The design goals can be achieved by providing an appropriate ceiling tile and wall panels to help control reverberation. Polysonics recommends ceiling tile with CAC 35 or higher and NRC 0.80 or higher.

E. Alternate ceiling treatment to ACT such as acoustical clouds, direct-attached ceiling panels and/or spray-on insulation material on the underside of slab are available and will be reviewed during the design phase.

F. Acoustical wall panels may be required to balance reverberation time in the space and for additional absorption. Carpet flooring is highly recommended.

G. If demountable glass wall partitions are used, we recommend that they be rated for STC 45. To ensure the STC 45 rating and prevent sound from entering classrooms over the top of the partition, a drywall closure piece will be needed to ensure slab-to-slab construction. An entry door (including transom and side lite) to the classroom is recommended meet an STC 30 rating.

H. LEED requires maintaining HVAC noise levels below 40 dBA (≈NC 35).

FORUM [1,2,4]

A. Polysonics understands this will be a general-purpose space to accommodate a wide range of configurations, including drama, musical practice, musical performance, large group gathering, and a community meeting space. This flexible use will require a reasonable compromise between speech intelligibility and music clarity.

FOOTNOTES (The following endnotes are described in detail in Section 7.2 of the Appendix)

[1] ANSI S12.60-2002, “Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools”

[2] LEED for Schools™ Version 4

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[4] Virginia Department of Education Guidelines for School Facilities

5.6 ACOUSTICAL DESIGN

B. Since this is a multiple use space, a lower reverberation time for speech intelligibly is desired with a well-balanced acoustic signature to allow live music performance to sound pleasing in the space. The design recommendations provided below are intended to aid in design of the space. As more information becomes available, Polysonics will work with the architect to enhance and improve acoustical designs.

C. The primary acoustic goals would be control of reverberation time for good speech intelligibility, prevention of rear wall flutter echoes, as well as control of harshness and excessive reverberation. The acoustics should allow the performers to hear themselves clearly (acoustical feedback and support), clearly hear each other, and hear instruction from the teacher (good speech intelligibility).

D. The design goals can be achieved by providing adequate room volume and providing the appropriate acoustical treatment. Additionally, walls, floors, and ceilings should have adequate sound attenuation characteristics.

E. For improved acoustics, Polysonics recommends absorptive treatments on the walls.

F. An additional goal is to prevent the intrusion of sounds from adjacent spaces. We will analyze noise isolation during the design phase.

G. The walls and floor-ceiling assemblies demising the Forum from adjacent core learning and performance spaces are recommended to achieve a minimum STC-60 to control noise generated in these rooms from interfering with other rooms.

H. It is also recommended that entry doors to this space to be minimum STC-45, except where a vestibule is used. Lower rated STC doors may be used at vestibules.

I. Polysonics recommends maintaining HVAC noise levels of NC 30 (NC 35 required).

GYMNASIUM [1,2,4]

A. This will be a typical gymnasium used to hold indoor athletic events. Emphasis is on reducing the reverberant nature, typical of gymnasiums with hard surfaces, while maintaining highly durable and impact resistant surfaces.

B. The primary acoustic goals for the Gymnasium would be control of reverberation time for acceptable speech intelligibility, moderate diffusion of wall-to-wall flutter echoes, as well as control of harshness and excessive reverberance. The acoustics should allow the athletes to hear each other, and to understand instructions from the coaches and referees. Reverberation Time should be at or below 1.5 seconds.

C. The design goals can be achieved by adding absorption to the space where possible.

D. Additional sound panels shall be added to further reduce reverberation in this space. Polysonics recommends additional acoustic panels such as 2 wall panels at higher elevations.

E. Floor under basketball court shall be a sprung athletic floor such as Connor UniForce or equivalent.

F. Entry doors are recommended to meet STC-40.

G. Polysonics recommends maintaining HVAC noise levels of NC 40.

COMPETITION POOL [1,2,4]

A. This will be a typical gymnasium used to hold indoor athletic events. Emphasis is on reducing the reverberant nature.

B. The primary acoustic goals for the Competition Pool area would be control of reverberation time for acceptable speech intelligibility. The acoustics should allow the athletes to hear each other, and to understand instructions from the coaches and referees. Reverberation Time should be at or below 1.5 seconds.

FOOTNOTES (The following endnotes are described in detail in Section 7.2 of the Appendix)

[1] ANSI S12.60-2002, “Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools”

[2] LEED for Schools™ Version 4

[3] ACPS Educational Specifications (March 1, 2021)

[4] Virginia Department of Education Guidelines for School Facilities

5.6 ACOUSTICAL DESIGN

C. The design goals can be achieved by adding absorption to the space where possible.

D. Additional sound panels shall be added to further reduce reverberation in this space. Polysonics recommends additional acoustic panels such as 2 wall panels at higher elevations.

E. Entry doors are recommended to meet STC-40.

F. Polysonics recommends Maintain HVAC background noise levels of NC 40 to enhance instructions.

DINING/ CREATIVE COMMONS [1,2,4]

A. The design intent is to reduce the amount of reverberant noise build up in the dining area space, thus reducing the amount of noise which may intrude into noise sensitive areas adjacent to the dining area.

B. Use acoustical ceiling tiles rated NRC 0.70 or higher or an equivalent sound absorptive material throughout the entire ceiling, or at least 80% coverage.

C. Acoustical wall panels may be needed around the perimeter walls.

D. Polysonics recommends maintaining HVAC noise levels below NC 35.

ADMINISTRATION

A. Ceiling tile must generally cover 100% of the ceiling – excluding lights, fixtures, diffusers, and intakes. Suspended acoustical ceiling tile shall be hung in a grid. We recommend ceiling tile with a CAC of 35 or higher and NRC of 0.70.

B. The wall partitions shall be extended from the floor to the underside of the metal deck/slab and designed to achieve acoustical privacy.

C. Polysonics recommends maintaining HVAC noise levels of NC 30-35.

IEQ OVERVIEW

Compliant Space Types for Indoor Environmental Quality Credits

The following list identifies school spaces considered to be regularly occupied for applicability to indoor environmental quality credits. In these spaces, daylight, views, thermal comfort, and/or acoustics affect the quality of occupants' regular use. LEED will evaluate exceptions to these classifications on a case-by-case basis for spaces with atypical uses or those in which the strategies required for compliance may compromise the function of the space.

Regularly Occupied Spaces: Classroom and Core Learning:
This category consists of spaces that are used for at least 1 hour per day for educational activities where the primary functions are teaching and learning:

- art
- band
- biology lab
- chemistry lab
- classroom
- computer lab
- gymnasium
- instructional technology
- language lab or arts
- library
- physical education
- physics lab
- vocational arts

FOOTNOTES (The following endnotes are described in detail in Section 7.2 of the Appendix)

[1] ANSI S12.60-2002, "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools"

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[4] Virginia Department of Education Guidelines for School Facilities

5.6 ACOUSTICAL DESIGN

Other Regularly Occupied Spaces:
This category includes all non-learning spaces that are used by occupants for 1 or more hours per day to perform work-related activities:

- administrative conference room
- administrative office
- administrative staff room
- cafeteria, cafetorium
- counseling conference room
- counselor's office
- custodial office
- faculty office
- faculty workroom
- forum
- kitchen
- maintenance staff room
- natatorium
- school nurse's office
- school nurse's treatment room
- school security office
- staff dining room
- staff lounge

Spaces Not Regularly Occupied:
Spaces considered not regularly occupied are those that occupants pass through and those that are not regularly used for at least 1 hour per day:

- administrative
- waiting room
- backstage
- corridor
- locker room
- main entrance
- receiving area
- secondary entrance
- stairs
- students' activity room
- students' locker room


Essex Technical High School
Hathorne, MA

FOOTNOTES (The following endnotes are described in detail in Section 7.2 of the Appendix)

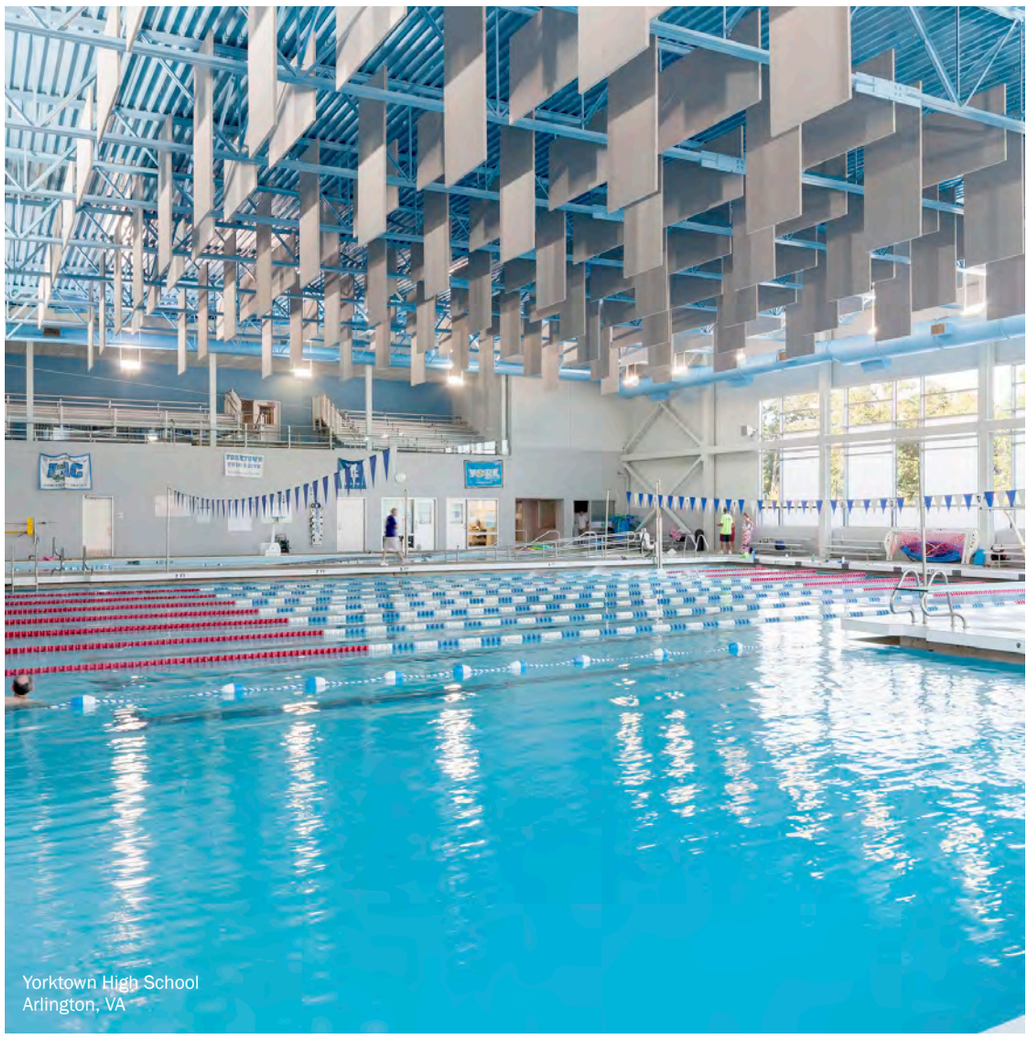
[1] ANSI S12.60-2002, "Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools"

[2] LEED for Schools™ Version 4

[3] ACPS Educational Specifications (March 1, 2021)

[4] Virginia Department of Education Guidelines for School Facilities

5.7 AQUATIC DESIGN



Yorktown High School
Arlington, VA

OVERVIEW

Including an aquatic facility in the Minnie Howard campus is desired by both ACPS and the City of Alexandria Recreation, Parks & Cultural Activities (RPCA). ACPS envisions using the pool for the high school (HS) students' physical education classes, HS swim & dive sports teams, and teaching elementary students to swim. RPCA has emphasized the community's need for the pool.

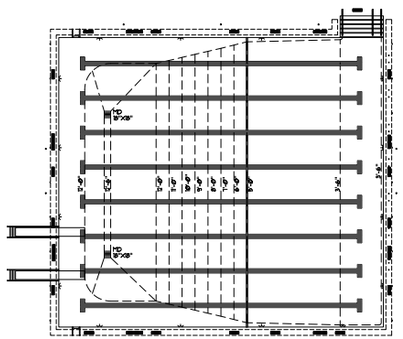
Several meetings focused on the aquatic space program at Minnie Howard were held. Aquatic Design Group (ADG), Perkins Eastman's pool design consultant, developed seven pool layout options in response to these conversations, ranging from Option 1, which is smaller than the Educational Specification (Ed Spec) establishes, through Option 7, which is much larger and allows for more uses. Refer to the pool layouts on the following page. In a meeting with several TC Williams' physical education teachers and swim & dive coaches and RPCA staff, it was determined that the preferred pool options are 4, 6, and 7.

The Option 4 program includes an 8-lane x 25 yard competition/lap pool with a de-coupled dive well utilizing two one-meter springboards. The pool configuration is an "L-configuration". Adjacent to the main pool will be a 1,500 square foot training/learn-to-swim pool. This pool will operate at a warmer temperature and offers an accessible ramp. The Option 6 program is much like Option 4. The key programmatic change is that the de-coupled dive well would be completely detached from the competition pool. This will allow the dive well to operate at a warmer temperature, thus optimizing diving operations. Option 7 offers a 15-lane x 35 yard competition pool, with integral diving and a movable bulkhead. This option will allow for the most programmatic flexibility and capacity, but will increase the size of the natatorium and budget.

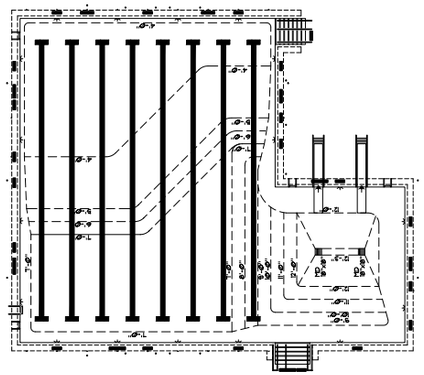
The Ed Spec and concept designs include a pool that is sized between Options 2 and 3, and the configuration is similar to Option 3 with a pool and dive well. Currently ACPS' construction budget does not include funding for the aquatic facility. Additionally, there will be an increase in the size and cost of the aquatic facility if Option 4, 6, or 7 is selected. Further meetings will occur to discuss which pool design will be selected and how the pool will be funded.

5.7 AQUATIC DESIGN

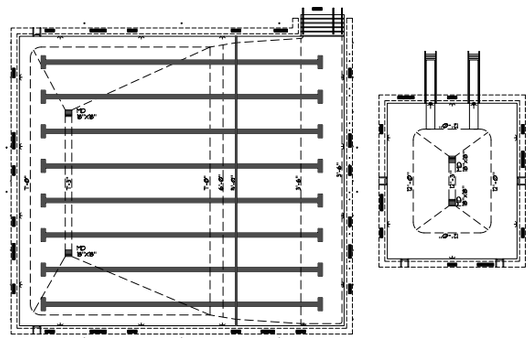
ACPS THSP POOL OPTIONS BY AQUATIC DESIGN GROUP



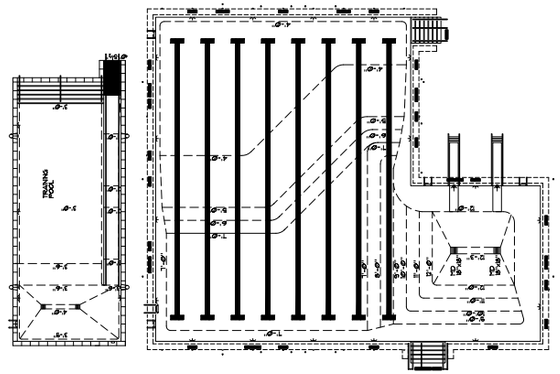
Option 1



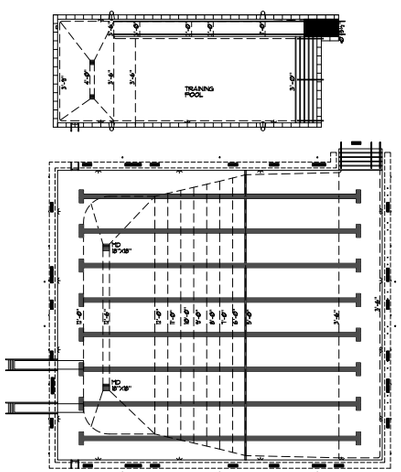
Option 2



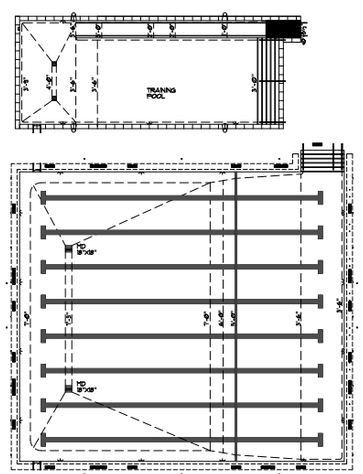
Option 3



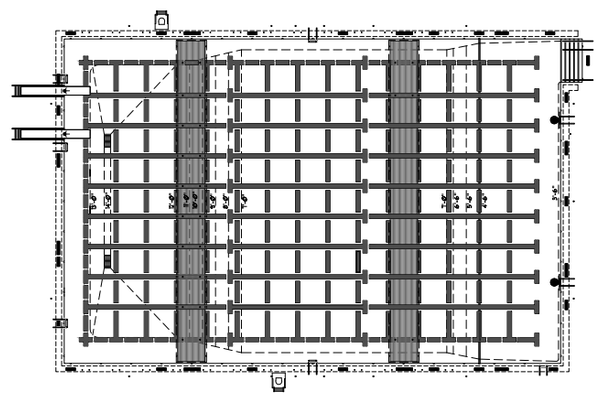
Option 4



Option 5



Option 6



Option 7

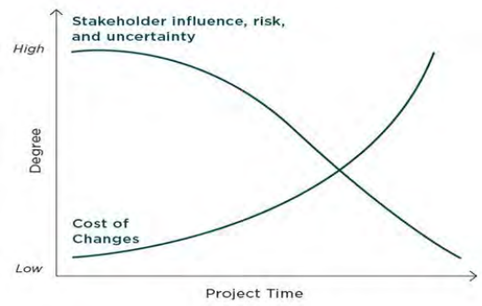
6 TAB 6: PROJECT EXECUTION

6.1 PROJECT BUDGET & ESTIMATING DECISION TOOL

MINNIE HOWARD COST MODEL

The cost model presented in this tab is our team's initial review and analysis of the construction costs associated with the High School Project at the Minnie Howard Campus as currently understood by the team.

A cost model at this phase of a project takes a conservative approach due to the number of unknowns, ongoing stakeholder input, and owner decisions still to be made. As can be seen in the figure to the right, as the project time elapses, the cost of decisions, or lack thereof, come at a high risk of budget increase and schedule delays. Therefore, it is important to fully examine the levels of uncertainty and risk in the current project assumptions at this phase. It is for this reason that the cost model includes a comprehensive listing of the potential elements that might be incurred during the construction phase of the project. This includes a line item for City of Alexandria on and off site requirements that often arise during the DSUP process.



Our cost model has looked at distinct cost elements, as each of these elements have different cost drivers and underlying assumptions. As such, scope decisions and design considerations will impact project costs in different manners. By breaking down the costs into these elements the owner can more confidently understand the dynamic nature of better informing assumptions and their risks as scope decisions are formalized.

The cost model represents the best parametric probable construction estimate based on the assumptions at this phase of the project and is a dynamic tool designed to help advise during the decision-making process to confirm the project scope. We have outlined each major element with a 'confidence level', the objective of utilizing this tool will be to conduct informative discussions and activities that bring all elements to a "high" level of confidence. This will allow the team to track progress related to the critical cost decisions, program and square footage assumptions, and unit costs until these can be informed by actual design documents. This process will continue through the design of the project.

The cost model in this tab compares the potential project cost to the following three ACPS budgets:

- Previous project budget included in the CHSN Alternative 02 study (see CHSN Alternative 02 Study later in section) lists a total budget of $178,853,863 including hard cost budget of $143,083,091; although the chart is outdated, it provides the history of the budget development. The current total budget request for the project is $194,000,000 which must fund costs such as furniture, technology, owner contingency, and possible costs associated with fields and parking that will not be available during the development of the Minnie Howard campus. ACPS' objective is to maximize the use of the anticipated funds;
- Total hard + soft construction budget of $128,000,000 included in the RFP and as estimated in ACPS's approved FY 2021-2030 CIP;
- Total hard + soft construction budget of $150,000,000 as estimated in ACPS's proposed FY 2022-2031 CIP.

The cost model studies both a "low" and "high" cost to aid in the decision making process; see yellow columns in the cost model spreadsheet later in this tab section. The total hard + soft construction cost for each is as follows:

- Cost Estimate Builder 1 includes a 285K gsf building, surface parking, and leased photovoltaics, which totals approx. $153,241,388;
- Cost Estimate Builder 2 includes a 310K gsf building, underground parking garage, and purchased photovoltaics, which totals approx. $176,585,149.
- Cost Estimate Builder 1 and 2 costs noted above do not include the cost to construct the Alexandria Health Department and Department of Community & Human Services' (DCHS) Co-Located Community and Early Childhood spaces, which range from $3.6M to $6.9M based on program size.

6.1 PROJECT BUDGET & ESTIMATING DECISION TOOL

The current Concepts Cost Estimate Builder is shown in the orange column in the cost model spreadsheet later in this tab section. This includes a 310K gsf building (average size of the three concepts), surface parking, pool, and purchased photovoltaics (for school building and pool), which totals approx. $165.5M. This does not include the cost to construct the Alexandria Health Department and CHDS Co-Located spaces; Community spaces are approx. $2.3M and Early Childhood spaces are approx. $5.0M, based on larger childhood program.

This does not by any means indicate that we view the project to be over budget, instead it highlights a number of areas where the collective A/E Team and ACPS are to work collaboratively to clarify ACPS' original assumptions and reduce the number of unknowns in each cost factor, moving the overall Cost Model's confidence rating from "LOW" to "HIGH."

This cost model does NOT include:

- Costs for upgrades at T.C. Williams King Street Campus;
- Public space improvements between the campuses;
- Housing development – hard and soft costs beyond A/E optional service #3;
- ACPS Administrative space development (office space) - hard and soft costs;
- Typical Soft Costs
  - A/E Fee
  - FF&E
  - Security/AV/IT devices/equipment/panels
  - Moving Costs
  - Professional Services, Project Management and Legal Fees
  - Other third party expenses not carried by A/E (commissioning, testing & inspections, plan review)
  - Owner contingency outside of Contractor/CMR Contract - Recommend 10%

ACPS has confirmed that the following construction soft costs are included in ACPS' budget and they are included in the cost model:

- Permit Fees
- Utility Fees
- Builder's Risk

ACPS has confirmed that the following construction soft costs are included in ACPS' budget and they are included in the cost model within the hard cost unit prices:

- Contractor/CMR General Conditions, Fee, Overhead, and Profit
- Bonds and Insurance/ SDI
- Taxes

NET ZERO ENERGY PERFORMANCE:

The path forward to achieve Net Zero Energy Performance has two fundamental components. First, the campus will be designed as a High Performance Campus with all aspects meeting a drastic energy reduction goal within the proposed cost budget. Secondly, a Renewable Energy Solar Photovoltaic (PV) array will be provided and sized to produce more energy within a year than the campus consumes, fundamentally achieving the Net Zero Energy goal. The acquisition of the Solar PV Array has three potential paths. Purchasing and owning the PV Array with it being included in design and construction would presumably be an expensive approach and is included in the "high" cost model labeled "Cost Estimate Builder 2. The lowest cost approaches to ACPS would include leasing the Solar PV Array through a Power Purchase Agreement (PPA) or acquiring the PV System through a Guaranteed Energy Performance Contracting project and energy savings by an Energy Service Company (ESCO). Both the PPA and the ESCO approach would eliminate first costs and have similar financial models which will be studied by the team as part of this project moving forward. The "low" cost model labeled "Cost Estimate Builder 1" assumes leased PV.

Preliminary Cost Model on the following pages is in progress.

ACPS: THE HIGH SCHOOL PROJECT: MINNIE HOWARD CAMPUS

Prelim Cost Model to Support Decision-Making

DRAFT FOR DISCUSSION: 3/12/2021

		CONCEPTS COST ESTIMATE BUILDER: 310K SF BUILDING + SURFACE PARKING + PURCHASED PV					COST ESTIMATE BUILDER 1: 285K SF BUILDING (LOW RANGE OF SIZE) + SURFACE PARKING + LEASED PV					COST ESTIMATE BUILDER 2: 310K SF BUILDING (HIGH RANGE OF SIZE) + UNDERGROUND PARKING GARAGE + PURCHASED PV				
		A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
		Qty	Units	Unit Price	Proposed Budget in 2020 $'s	Escalation to midpoint of construction	Qty	Units	Unit Price	Proposed Budget in 2020 $'s	Escalation to midpoint of construction	Qty	Units	Unit Price	Proposed Budget in 2020 $'s	Escalation to midpoint of construction
					Escalation Factor:	1.03				Escalation Factor:	1.03				Escalation Factor:	1.03
					Years to Mid-Point:	2.50				Years to Mid-Point:	2.50				Years to Mid-Point:	2.50
H1	HARD COSTS															
	Construction															
H1.1	Base School - High Performance Building, New School Construction	229,115	SF	$ 385	$ 88,209,275	$ 94,974,565	212,424	SF	$ 385	$ 81,783,240	$ 88,055,680	230,242	SF	$ 385	$ 88,643,170	$ 95,441,738
H1.2	School Common Areas and Shared Community Spaces - High Performance Building, New School Construction	42,056	SF	$ 385	$ 16,191,560	$ 17,433,386	42,056	SF	$ 385	$ 16,191,560	$ 17,433,386	42,056	SF	$ 385	$ 16,191,560	$ 17,433,386
H1.3	Indoor Aquatics Facility - High Performance Building, New Construction	22,589	SF	$ 495	$ 11,181,555	$ 12,039,134	22,589	SF	$ 495	$ 11,181,555	$ 12,039,134	22,589	SF	$ 495	$ 11,181,555	$ 12,039,134
H1..4	Athletic Fields	132,000	SF	$ 15	$ 1,980,000	$ 2,131,858	132,000	SF	$ 15	$ 1,980,000	$ 2,131,858	132,000	SF	$ 15	$ 1,980,000	$ 2,131,858
H1.5A	Net Zero Renewable Energy Premium - School Building, Shared Community Spaces, Co-Located Spaces - Purchased PV	253,741	LS	$ 2,850,000	$ 2,850,000	$ 3,068,583	237,050	LS	$ -	$ -	$ -	253,832	LS	$ 2,850,000	$ 2,850,000	$ 3,068,583
H1.5B	Net Zero Renewable Energy Premium - Indoor Aquatics Facility- Purchased PV	22,589	LS	$ 1,100,000	$ 1,100,000	$ 1,184,365	22,589	LS	$ -	$ -	$ -	22,589	LS	$ 1,100,000	$ 1,100,000	$ 1,184,365
H1.6	Net Zero Renewable Energy Premium - School Building - Leased PV	298,919	LS	$ -	$ -	$ -	282,228	LS	$ -	$ -	$ -	299,010	LS	$ -	$ -	$ -
H1.7	Underground Parking Garage	0	Spaces	$ 50,000	$ -	$ -	0	Spaces	$ 50,000	$ -	$ -	200	Spaces	$ 50,000	$ 10,000,000	$ 10,766,959
H1.8	Surface Parking	200	Spaces	$ 5,500	$ 1,100,000	$ 1,184,365	200	Spaces	$ 5,500	$ 1,100,000	$ 1,184,365	0	Spaces	$ 5,500	$ -	$ -
H1.9	Demolish Existing Building	166,500	SF	$ 15	$ 2,497,500	$ 2,689,048	166,500	SF	$ 15	$ 2,497,500	$ 2,689,048	166,500	SF	$ 15	$ 2,497,500	$ 2,689,048

ACPS BUDGET			ASSUMPTION AND COST FACTORS CONFIDENCE		BUDGET ASSUMPTION NOTES
Source: CHSN Alt 02 Max Minnie Howard	Budget $128M (RFP)	Budget $150M	Current Level	Action Item to Refine & Advance Confidence	
			MEDIUM	Discuss w/ ACPS	3% seems reasonable w/ current market conditions but subject to unknown impacts of the pandemic. Confirm ACPS rate & method
			HIGH		Construction starts March 2022 (site clearing & grading), school sub. compl May 2024, thus May 2023 is assumed mid-point (2.5 years)
$ 112,320,000			MEDIUM	[1] SF: To be confirmed during pre-Design programming activities. Goal: February [2] $/SF: Continued research will occur on identifying an appropriate benchmark based on recent comparable projects. Goal:	[1] Square footage: • RFP states 312,000 SF and 195 GSF per Student, with 1,600 students. • Ed Spec program reflects 285,000 GSF and has been determined to be an adequate total square foot figure to accomodate the program. There is also a stated desire to potentially reduce the total GSF as a budget reconciling strategy while still meeting the program and mazimizing student capacity. • Feb 2021 Site Specific Ed Spec notes range on building size due to efficiency factor; 290K to 310K GSF. • Cost Model include estimate at 285K GSF and 310K GSF • The Base Building total deducts Aquatics GSF, Co-Located Community Spaces, and Community Asset Spaces from Ed Spec. [2] ROM Unit Price Historical cost data used from recent regional projects: • ACPS was previously using $360/SF - Need to confirm that source & year as it appears low • Douglas MacArthur $396/SF (DD Estimate) - includes site work and most likely parking • Falls Church City Public Schools - George Mason High School, Net Zero Ready and LEED Gold / Geothermal --> $372 per GSF, $365 w/o site work (bid in 2018 - $385 in 2020 $'s). Durable design, limited use of high end finishes (no parking garage, does not include demo)
Assume Included in Hard Costs			MEDIUM	[1] SF: To be confirmed during pre-Design programming activities. Goal: Mid-February	[1] Square footage: • Includes Library, Main Gym, Aux Gym, and Forum spaces (no associated support spaces e.g. locker rooms, offices, storage). • Comp Program/Ed Spec submitted 2/1/2021 includes 10,000 SF Main Gym, 5,400 SF Aux Gym, 3,640 SF Library, 8,000 SF Dining, and 3,000 SF Forum for spaces that are Community Assets. • Co-Located Community Spaces: 30,040 w/ 40% grossing factor = approx. 42,056 GSF
Assume Included in Hard Costs			LOW	[1] SF: To be confirmed during pre-Design programming activities. Goal: Mid-February [2] $/SF: Need to understand key assumptions that impact costs such as foundations & specialized storage of chemicals and equipment. Goal:	[1] Square footage: • Assumed 8 lane, 25 meter by 25 yard indoor pool, w/ diving well , 300 spectator seating. • Aquatics Facility listed as 15,285 GSF in RFP. • Comp Program/Ed Spec submitted 2/1/2021 includes 16,135 GSF for aquatics facility. • Aquatics Facility: 16,135 w/ 40% grossing factor = approx. 22,589 GSF [2] ROM Unit Price Historical cost data used from recent regional projects: • Similar to Dunbar High School program:16,250 GSF at $422.03 GSF (2011 dollars escalation to 2020 @3% is $551), minus ~10% DC CBE/First Source Factor ~$495 • Other: Barry Farm Rec Center 15,500 GSF at $561.03 (2013 dollars escalation to 2020 @ 3% is $690), minus ~10% is $620/SF • These cost benchmarks include pool base building, locker rooms, pumps, chemical storage rooms • Both also did not need deep foundations which adds cost and cost factor modeled here assumes standard building foundations.
Assume Included in Site Development			LOW	[1] Size / Program: To be confirmed during pre-Design programming activities. Goal: End of January? [2] $/SF: Need to confirm cost factors are adequate Goal: End of December?	• Based on RFP blocking and stacking which indicated two multi-purpose fields • About 3 acres of field space out of the 12 total acres • Clarity being provided by ACPS - in progress: NFHS Soccer Field w/ small bleacher area, small restrooms, fields lights, and TBD • Cost per square foot based on 2019 artificial turf field projects at Patrick Henry, Roosevelt HS (DC) & Wilson HS (DC). • Cost includes typical drainage associated with turf field and sub-grade preparation.
Confirm Where Carried			LOW	This cost factor is intended to model the scenarios related to the costing and sourcing of renewable energy. [A] Zero Energy Performance (Purchased Solar) - ASSUMED [B] Zero Energy Performance (Leased Solar) [C] Zero Energy Performance (ESCO Provided)	The base building is assumed to be high performance and includes geothermal as well as the costs associated with enhancing the exterior. A potential additional premium for NZ pool is unknown at this time and a risk that should be tracked. Track that the base building cost factors are evaluated to include: • Mechanical, Electrical and Plumbing • Structure (minimum for PV) • Electrical switchgear and raceways (for PV connections) • Exterior / Envelope PV Cost if Purchased: • At EUI of 20 for the building, estimating 825kW roof mount and 300kW canopy mount
Confirm Where Carried			LOW	This cost factor is intended to model the scenarios related to the costing and sourcing of renewable energy. [A] Zero Energy Performance (Purchased Solar) - ASSUMED [B] Zero Energy Performance (Leased Solar) [C] Zero Energy Performance (ESCO Provided)	The base building is assumed to be high performance and includes geothermal as well as the costs associated with enhancing the exterior. A potential additional premium for NZ pool is unknown at this time and a risk that should be tracked. Track that the base building cost factors are evaluated to include: • Mechanical, Electrical and Plumbing • Structure (minimum for PV) • Electrical switchgear and raceways (for PV connections) • Exterior / Envelope PV Cost if Purchased: • Estimating an additional +5 EUI (for pool) (total EUI of 25) = approx 25% more canopy mount PV
Confirm Where Carried			MEDIUM	This cost factor is intended to model the scenarios related to the costing and sourcing of renewable energy. [A] Zero Energy Performance (Purchased Solar) [B] Zero Energy Performance (Leased Solar) - ASSUMED [C] Zero Energy Performance (ESCO Provided)	The base building is assumed to be high performance and includes geothermal as well as the costs associated with enhancing the exterior. A potential additional premium for NZ pool is unknown at this time and a risk that should be tracked. Track that the base building cost factors are evaluated to include: • Mechanical, Electrical and Plumbing • Structure (minimum for PV) • Electrical switchgear and raceways (for PV connections)
$ 4,550,000			LOW	[1] Space count: To be confirmed during pre-Design programming activities. Goal: End of January? [2] $/Space: Need to confirm one level underground or other major cost impacts. Goal: End of December?	[1] Spaces • Current P&Z conversation is 1 space per 10 students = 1,600 spaces • 200 spaces cited in the budget document shared by ACPS [2] ROM Unit Price • ACPS was previously modeling 'structured parking' as a cost per SF vs. space (a method more typical for surface parking): Assumed 350 SF per space = 70,000 SF, $65 per SF for a total assumption of $4.5M - these figures are also more applicable to above grade) • Industry typically models structured parking per space and costs range can range vastly depending on method.
-			MEDIUM		[1] Spaces • Surface parking approx $5,500 per space • 200 parking spaces approx = $1,100,000
$ 1,665,000			MEDIUM	[1] Confirm Haz Mat assumptions and confirm value with D&S [2] Confirm timing and potential need to apply additional escalation applied (to 2025)	[1] ROM Unit Price • ACPS was previously using $10/SF - confirm that source as it appears low to our team. • Existing Minnie Howard was renovated in the mid 1990's. Assume all Haz-Mat was mitigated during that renovation. • DC Public School demolition pricing has ranged between $19 per SF to $23 per SF, but does include Haz-Mat removal. • Confirm value w/ D&S: $11 (if there is still HazMat use $20) • Budget Model assumption uses $15 per SF based on demolition commencing on active site and no Haz-Mat. [2] Timing of Escalation • Construction starts March 2022 thus May 2023 is assumed mid-point (2.5 years) for base building.

ACPS: THE HIGH SCHOOL PROJECT: MINNIE HOWARD CAMPUS

Prelim Cost Model to Support Decision-Making

DRAFT FOR DISCUSSION: 3/12/2021

		CONCEPTS COST ESTIMATE BUILDER: 310K SF BUILDING + SURFACE PARKING + PURCHASED PV					COST ESTIMATE BUILDER 1: 285K SF BUILDING (LOW RANGE OF SIZE) + SURFACE PARKING + LEASED PV					COST ESTIMATE BUILDER 2: 310K SF BUILDING (HIGH RANGE OF SIZE) + UNDERGROUND PARKING GARAGE + PURCHASED PV				
		A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
		Qty	Units	Unit Price	Proposed Budget in 2020 $'s	Escalation to midpoint of construction	Qty	Units	Unit Price	Proposed Budget in 2020 $'s	Escalation to midpoint of construction	Qty	Units	Unit Price	Proposed Budget in 2020 $'s	Escalation to midpoint of construction
					Escalation Factor:	1.03				Escalation Factor:	1.03				Escalation Factor:	1.03
					Years to Mid-Point:	2.50				Years to Mid-Point:	2.50				Years to Mid-Point:	2.50
H1	HARD COSTS															
	Construction															
H1.10	Additional Site Restoration/Improvements & Utilities	1	LS	$ 10,000,000	$ 10,000,000	$ 10,766,959	1	LS	$ 10,000,000	$ 10,000,000	$ 10,766,959	1	LS	$ 10,000,000	$ 10,000,000	$ 10,766,959
H1.11	Off-Site City Required Improvements	1	LS	$ 2,500,000	$ 2,500,000	$ 2,691,740	1	LS	$ 2,500,000	$ 2,500,000	$ 2,691,740	1	LS	$ 2,500,000	$ 2,500,000	$ 2,691,740
H1.12	Pad Ready Site for Future Development (ACPS Offices?, School Expansion)	0	LS		$ -	$ -	0	LS		$ -	$ -	0	LS		$ -	$ -
H1.13	Sub-Total				$ 137,609,890	$ 148,164,009				$ 127,233,855	$ 136,992,174				$ 146,943,785	$ 158,213,775
H1.14	Design Contingency	10%			$ 13,760,989	$ 14,816,401	10%			$ 12,723,386	$ 13,699,217	10%			$ 14,694,379	$ 15,821,378
H1.15	Contractor Contingency					Included in unit cost above					Included in unit cost above					Included in unit cost above
H1.16	TOTAL HARD COSTS				$ 151,370,879	$ 162,980,410				$ 139,957,241	$ 150,691,392				$ 161,638,164	$ 174,035,153
	Gross Escalation:	$ 11,609,531		Per SF:	$506.39	$545.23	$ 10,734,151		Per SF:	$495.90	$533.93	$ 12,396,989		Per SF:	$540.58	$582.04
S1	CONSTRUCTION RELATED SOFT COSTS															
S1.1	Permit Fees	1		$ 1,400,000	$ 1,400,000	$ 1,400,000	1		$ 1,400,000	$ 1,400,000	$ 1,400,000	1		$ 1,400,000	$ 1,400,000	$ 1,400,000
S1.2	Utility Fees	1		$ 750,000	$ 750,000	$ 750,000	1		$ 750,000	$ 750,000	$ 750,000	1		$ 750,000	$ 750,000	$ 750,000
S1.3	Builder's Risk	1		$ 400,000	$ 400,000	$ 400,000	1		$ 400,000	$ 400,000	$ 400,000	1		$ 400,000	$ 400,000	$ 400,000
S1.4	Contractor/CMR General Conditions, Fee, Overhead, and Profit	0			Included in hard cost above	Included in hard cost above	0			Included in hard cost above	Included in hard cost above	0			Included in hard cost above	Included in hard cost above
S1.5	Bonds and Insurance/ SDI	0					0					0				
S1.6	Taxes	0					0					0				
S1.7	TOTAL CONSTRUCTION RELATED SOFT COSTS				$2,550,000	$2,550,000				$2,550,000	$2,550,000				$2,550,000	$2,550,000
HS1	TOTAL HARD + CONSTRUCTION RELATED SOFT COSTS				$153,920,879	$165,530,410				$142,507,241	$153,241,392				$164,188,164	$176,585,153
H2	HARD COSTS - CO-LOCATED COMMUNITY SPACES															
	Construction															
H2.1	Co-Located Community Spaces - High Performance Building, New School Construction	5,159	SF	$ 385	$ 1,986,215	$ 2,138,550	5,159	SF	$ 385	$ 1,986,215	$ 2,138,550	4,123	SF	$ 385	$ 1,587,355	$ 1,709,099
H2.2	Sub-Total				$ 1,986,215	$ 2,138,550				$ 1,986,215	$ 2,138,550				$ 1,587,355	$ 1,709,099
H2.3	Design Contingency	10%			$ 198,622	$ 213,855	10%			$ 198,622	$ 213,855	10%			$ 158,736	$ 170,910
H2.4	Contractor Contingency					Included in unit cost above					Included in unit cost above					Included in unit cost above
H2.5	TOTAL HARD COSTS - CO-LOCATED COMMUNITY SPACES				$ 2,184,837	$ 2,352,405				$ 2,184,837	$ 2,352,405				$ 1,746,091	$ 1,880,008
H3	HARD COSTS - CO-LOCATED EARLY CHILDHOOD SPACES															
	Construction															
H3.1	Co-Located Early Childhood Spaces - High Performance Building, New School Construction	11,081	SF	$ 385	$ 4,266,185	$ 4,593,384	2,772	SF	$ 385	$ 1,067,220	$ 1,149,071	10,990	SF	$ 385	$ 4,231,150	$ 4,555,662
H3.2	Sub-Total				$ 4,266,185	$ 4,593,384				$ 1,067,220	$ 1,149,071				$ 4,231,150	$ 4,555,662
H3.3	Design Contingency	10%			$ 426,619	$ 459,338	10%			$ 106,722	$ 114,907	10%			$ 423,115	$ 455,566
H3.4	Contractor Contingency					Included in unit cost above					Included in unit cost above					Included in unit cost above
H3.5	TOTAL HARD COSTS - CO-LOCATED EARLY CHILDHOOD SPACES				$ 4,692,804	$ 5,052,722				$ 1,173,942	$ 1,263,979				$ 4,654,265	$ 5,011,228

ACPS BUDGET			ASSUMPTION AND COST FACTORS CONFIDENCE		BUDGET ASSUMPTION NOTES
Source: CHSN Alt 02 Max Minnie Howard	Budget $128M (RFP)	Budget $150M	Current Level	Action Item to Refine & Advance Confidence	
			MEDIUM	Discuss w/ ACPS	3% seems reasonable w/ current market conditions but subject to unknown impacts of the pandemic. Confirm ACPS rate & method
			HIGH		Construction starts March 2022 (site clearing & grading), school sub. compl May 2024, thus May 2023 is assumed mid-point (2.5 years)
$ 9,240,000			LOW	[1] Size / Program: To be confirmed during pre-Design programming activities. Goal: End of January? [2] $/SF: Need to confirm cost factors are adequate Goal: End of December?	• Total 12 Acres of Development - potential range from $4M to $14M based on review of recent projects with 'urban' sites • Would include costs for site grading, on-site utilities and tie-ins to existing mains, site lighting, vehicular and pedestrian access and pathways • Excludes geo-thermal wells, unsuitable soils or contaminated soils, unknown archeological finds • Excludes public space improvements beyond Minnie Howard Campus
Not Included			LOW	Need to confirm what will be required from the City (P&Z, T&ES)	Need to figure out what may be required for off-site improvements (e.g. signaling, median changes).
Not Included				Need to confirm that there is no pad ready site to be provided.	Need assumptions from ACPS on what will be required to support future development (i.e. ACPS Offices, expansion)
Escalation amount incorrect at $141,666,426					ACPS Subtotal Hard Costs w/ Escalation (factor and timing assumption unknown)
$ 127,775,000				With escalation applied (except for ACPS CHSN Alt 02 Budget Column)	
$ 1,416,664			LOW	Design Contingency (assumed incorporated within benchmark)	Design contingency set at 10% to match ACPS's budget, Industry standard for AACE at this Class 4 Level recommendation is 25%
Not Included				This is approx. 3-4% of construction cost. It is included within the Contractor's hard cost above (in unit prices and LS amounts)	
$ 143,083,091				Total Hard Costs w/ Escalation and Design Contingency	
$ 458.60	$ -	$ -			
			LOW	Includes all permit fees (incl environmental, SWPPP, VDOT, etc)	
			LOW	This pertains to water availability and electric; may require water meter	
Noted as 25% of hard cost			MEDIUM		
				This is approx. 10% of construction cost. It is included within the Contractor's hard cost above (in unit prices and LS amounts)	
				This is approx. 10% of construction cost. It is included within the Contractor's hard cost above (in unit prices and LS amounts)	
				This is approx. 10% of construction cost. It is included within the Contractor's hard cost above (in unit prices and LS amounts)	
$ 35,770,773					
$ 178,853,864	$ 128,000,000	$ 150,000,000		ACPS "Design-To-Budget"	
Assume Included in Hard Costs			LOW	[1] SF: To be confirmed in discussion with ACPS and City Agencies. Requested spaces by DCHS higher GSF than RFP listed, to be reviewed. Goal: Mid-March	[1] Square footage: • Includes Alexandria Health Dept and Dept of Community and Human Services (DCHS) program, including Teen Wellness Center, excludes Early Childhood center. • Co-located community spaces listed as 5,665 GSF in RFP; w/ 40% grossing factor = approx. 7,931 GSF. Early Childhood classess assumed to be (2) classrooms w/ toilets, subtracted here. (Cost Builder 1) • Site Specific Ed Spec submitted Feb 1, 2021 includes 2,945 GSF for co-located community spaces; w/ 40% grossing factor = approx. 4,123 GSF (Cost Builder 2) • Site Specific Ed Spec submitted Mar 1, 2021 includes 3,685 GSF for co-located community spaces; w/ 40% grossing factor = approx. 5,159 GSF (Concepts)
$ -	$ -	$ -		With escalation applied (except for ACPS CHSN Alt 02 Budget Column)	
$ -	$ -	$ -	LOW	Design Contingency (assumed incorporated within benchmark)	Design contingency set at 10% to match ACPS's budget, Industry standard for AACE at this Class 4 Level recommendation is 25%
Not Included				This is approx. 3-4% of construction cost. It is included within the Contractor's hard cost above (in unit prices and LS amounts)	
$ -	$ -	$ -		Total Hard Costs w/ Escalation and Design Contingency	
Assume Included in Hard Costs			LOW	[1] SF: To be confirmed in discussion with ACPS and City Agencies. Requested spaces by DCHS higher GSF than RFP listed, to be reviewed. Goal: Mid-March	[1] Square footage: • Includes Alexandria Human Services (DCHS) program for Early Childhood center. • Co-located community spaces listed as 5,665 GSF in RFP; w/ 40% grossing factor = approx. 7,931 GSF. Early Childhood classess assumed to be (2) classrooms w/ toilets. (Cost Builder 1) • Site Specific Ed Spec submitted Feb 1, 2021 includes 7,850 GSF for co-located early childhood spaces; w/ 40% grossing factor = approx. 10,990 GSF (Cost Builder 2)
$ -	$ -	$ -		With escalation applied (except for ACPS CHSN Alt 02 Budget Column)	
$ -	$ -	$ -	LOW	Design Contingency (assumed incorporated within benchmark)	Design contingency set at 10% to match ACPS's budget, Industry standard for AACE at this Class 4 Level recommendation is 25%
Not Included				This is approx. 3-4% of construction cost. It is included within the Contractor's hard cost above (in unit prices and LS amounts)	
$ -	$ -	$ -		Total Hard Costs w/ Escalation and Design Contingency	

6.2 CONCEPT COST ESTIMATES

CONCEPT COST ESTIMATES

This section contains information from Downey & Scott, LLC's (D&S) cost report. The following pages include a summary comparison chart of the three concepts' costs, and D&S' clarifying notes & exclusions. The summary chart to the right includes the total hard construction cost with escalation and construction related soft costs for the Hand, Crescent, and Pinwheel concepts, compared to ACPS' construction budget of $150,000,000. As the design develops, the design team will work closely with ACPS to identify and pursue additional opportunities as necessary to steer the project to an on-time and on-budget delivery.

Note, all three concepts have similar life cycle costs. Once a preferred concept is selected by the School Board, a life cycle cost analysis will be provided.

THESE NOTES APPLY TO COST SUMMARY CHARTS ON THE FOLLOWING PAGE

Notes:

1. *Hard Construction Cost is from Downey & Scott's cost estimates. Refer to Downey & Scott's Cost Estimate Clarifying Notes & Exclusions. D&S' hard construction cost estimate for each concept is as follows, including school building and site, aquatics facility, AHD Teen Wellness Center, DCHS spaces, PV, and surface parking.

Concept	Cost
Hand	$159,297,672
Crescent	$164,416,176
Pinwheel	$161,301,593

2. **DCHS spaces do not include an early childhood program.

3. Construction Related Soft Costs are a prorated portion of permit fees, utility fees, and builder's risk based on program's approx Ed Spec gross square footage.

Construction Related Soft Costs	
Permit Fees	$1,400,000
Utility Fees	$750,000
Builder's Risk	$400,000
TOTAL	$2,550,000

4. Prorated PV array and construction related soft costs are based on program's approx Ed Spec gross square footage.

Program	Gross SF
Aquatics Facility	22,000
AHD: Teen Wellness Center	2,030
DCHS Spaces	2,149

6.2 CONCEPT COST ESTIMATES

COST ESTIMATE SUMMARY				
	CONCEPTS			
ELEMENTS	HAND	CRESCENT	PINWHEEL	NOTES
SCHOOL				
Building and Site Hard Construction Cost*	$137,170,897	$142,289,401	$139,174,818	Cost includes construction of school program, sitework, athletic fields, surface parking, and demolition of existing building
PV Array	$5,332,904	$5,332,904	$5,332,904	Cost includes pro-rated portion of PV
Off-Site City Required Improvements	$2,700,000	$2,700,000	$2,700,000	TBD, cost pending further plan development and coordination w/ City through DSUP process
Construction Related Soft Costs	$2,323,707	$2,323,707	$2,323,707	See note 4 below
TOTAL SCHOOL: HARD + CONSTRUCTION RELATED SOFT COST	**$147,527,508**	**$152,646,012**	**$149,531,429**	**ACPS BUDGET = $150,000,000**
AQUATICS FACILITY				
Building Hard Construction Cost*	$13,780,000	$13,780,000	$13,780,000	Average cost of concepts' aquatic facility
PV Array	$1,200,000	$1,200,000	$1,200,000	Cost is aquatics portion of PV
Construction Related Soft Costs	$190,169	$190,169	$190,169	See note 4 below
TOTAL AQUATICS FACILITY: HARD + CONSTRUCTION RELATED SOFT COST	**$15,170,169**	**$15,170,169**	**$15,170,169**	

COST ESTIMATE SUMMARY				
	CONCEPTS			
ELEMENTS	HAND	CRESCENT	PINWHEEL	NOTES
CO-LOCATED ALEXANDRIA HEALTH DEPARTMENT (AHD): TEEN WELLNESS CENTER				
Building Hard Construction Cost*	$822,150	$822,150	$822,150	Cost is program GSF x $405/gsf
PV Array	$45,601	$45,601	$45,601	Cost includes pro-rated portion of PV
Surface parking	$11,000	$11,000	$11,000	Cost is 2 parking spaces x $5,500/space
Construction Related Soft Costs	$17,547	$17,547	$17,547	See note 4 below
TOTAL AHD: HARD + CONSTRUCTION RELATED SOFT COST	**$896,299**	**$896,299**	**$896,299**	
CO-LOCATED ALEXANDRIA DEPARTMENT OF COMMUNITY & HUMAN SERVICES (DCHS) SPACES**				
Building Hard Construction Cost*	$870,345	$870,345	$870,345	Cost is program GSF x $405/gsf
PV Array	$48,274	$48,274	$48,274	Cost includes pro-rated portion of PV
Surface parking	$16,500	$16,500	$16,500	Cost is 3 parking spaces x $5,500/space
Construction Related Soft Costs	$18,576	$18,576	$18,576	See note 4 below
TOTAL DCHS: HARD + CONSTRUCTION RELATED SOFT COST	**$953,696**	**$953,696**	**$953,696**	

DC International School
Washington, DC

6.2 CONCEPT COST ESTIMATES

DOWNEY & SCOTT'S COST ESTIMATE CLARIFYING NOTES AND EXCLUSIONS

- D&S has incorporated construction costs for a single Contractor procurement via CM at Risk.
- Without exception, D&S has included hard construction costs only and all soft construction costs are excluded. Please refer to list of Owner Budget Items.
- The Limits of Construction are those indicated on the documents provided.
- D&S has included an allowance for hazardous material abatement.
- Design Contingency accounts for the costs of yet unidentified scope requirements. A Design Contingency has been included due to the development level of the project drawings.
- Construction Contingency accounts for the costs of change orders. A Construction Contingency has not been included. D&S recommends that the owner carry an additional 5% Construction Contingency for unforeseen conditions.
- Escalation accounts for the inflationary effects of elapsed time. Escalation costs have been included in the amount indicated in the project summary.
- D&S's costs do not include any Owner Furniture storage or moving costs.
- All cost data is based on Open shop wage and burden rates.

OWNER COSTS NOT INCLUDED IN DOWNEY & SCOTT'S COST ANALYSIS

D&S has found during the budgeting phase; Owners sometimes do not fully consider all the costs they will incur when implementing capital improvements. For convenience, D&S has provided below a list of common non-construction Owner costs.

Furniture, Fixture & Equipment (FF&E)

- Loose, unattached system furniture, traditional furniture, etc.
- Special fixtures relevant to subject facility operations and uses
- Communications equipment, such as servers, telephone sets, instruments, & accessories
- Vending equipment purchases and/or leases, etc.
- Exterior equipment, such as exercise equipment, pay telephones

Moving & Storage Costs

- Contract and/or internal staff implemented moving costs
- Temporary storage and insurance
- Removal and disposal of furnishings of no salvage value

Temporary Facilities

- Non-contractor temporary storage trailers
- Non-contractor temporary utilities

6.2 CONCEPT COST ESTIMATES

Real Estate

- Land acquisitions, leases, easements and rights of way
- Real estate taxes
- Transfer taxes
- Recordation fees & taxes
- Brokerage commissions
- Settlement charges
- Legal fees

Management- Indirect Owner Mgt Expenses

- Realestate necessary to house management & staff
- Utilities
- Insurance
- Furniture, fixture & equipment
- Project management salaries
- Communications, telephone, facsimile expenses, e-mail, etc.
- Travel, parking, courier services, etc.
- Security
- Office equipment & supplies

Promotion/ Responding to Public & Media Inquiries

- Artwork and reproduction of advertising, brochures, hand-outs
- Advertising fees
- Postage
- Signage
- Photography
- Renderings
- Public and/or promotional events, such as hearings, fund raisers, etc.

Financial

- Accounting [in-house]
- Accounting [CPA]
- Interim financing [loan, bond, other] origination fees, expenses & interest
- Permanent financing [loan, bond, other] origination fees, expenses & interest
- Appraisal fees
- Working capital / start-up
- Performance [Owner, not to be confused with contractor] bonds

Insurance Premiums

- Builder's risk
- Liability
- Title
- Other

6.2 CONCEPT COST ESTIMATES

Legal Fees

- Real estate, land, zoning, proffers
- Partnerships
- Financing
- Contracts
- Leasing

Jurisdictional Fees

- Zoning, site and general building permit fees & expenses. Note: jurisdictional trade permit fees are included in our computations.
- Primary water utility availability and connection fees
- Primary sewer utility availability and connection fees
- Gas Company fees
- Power company fees
- Telephone company fees
- Cable TV company fees
- State & local highway fees
- Mandatory completion bonds
- Adjoining owner demands
- Mandated off-site storm water management contributions

Design Fees

- Architect / Engineer / Cost Management / Construction Management Consultant Fees
- Surveys, Civil Engineering, Testing and Third Party Inspection Fees
- Traffic Consultant Fees

RECOMMENDED COST CONTROL PROCESS

Controlling construction costs is a continuous process that spans from the initial programmatic level through to final completion.

MARKET CONDITIONS & OPINIONS OF PROBABLE COST

Downey and Scott, LLC has no control over market conditions or acts of God that can create rapid fluctuations in material prices. D&S has extensive experience in similar projects and has employed their best judgment in analyzing the subject project. D&S cannot, however, guarantee that actual construction costs will not vary from the opinions of probable construction costs herein provided.

6.3 PROJECT SCHEDULE

The following project schedule captures the major activities and milestones required to complete the comprehensive redevelopment of the Minnie Howard campus. The goal is to provide a campus that is ready for instruction in the school year beginning September 2024. The athletic fields are planned for completion in Spring 2025.

The schedule is formatted to track the permitting process through the City of Alexandria (above in red text), the design phases, associated reviews by ACPS, and the School Board (below in black text). The critical path for the new school building runs through the City of Alexandria's approval process to breaking ground in Spring 2022 through construction completion and occupancy.

Noted in red text, the City's approval process has two distinct components, one is the public entitlement process for the Development Special Use Permit (DSUP), including concept and preliminary plans and the final site plan, and the other is the building permit review required for the building permit

The outline design schedule, below the City's approval process schedule accounts for time associated with ACPS and School Board review, and cost estimating during each phase. Most likely there will be other submissions and updates by ACPS and the School Board in each of the design phases. The first major milestone is the final selection and development of the concept plan, allowing for the initial submission meeting of Concept 1 and 2 requirements to the City's Planning and Zoning Department. The schedule plans for Concept 1 and 2 submission in the middle of May 2021 to allow for the input from public engagement and ACPS reviews.

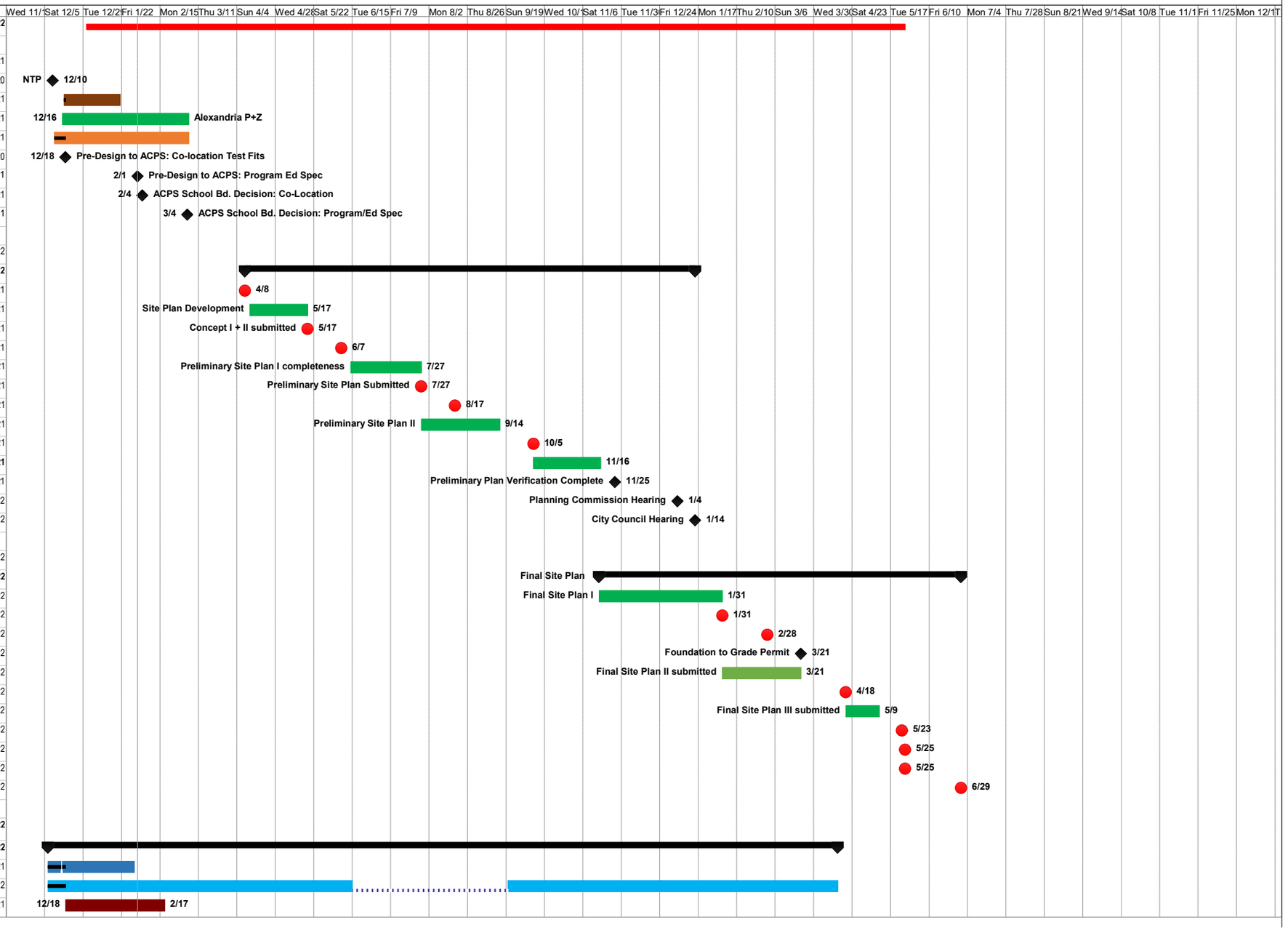
The next major milestone will be the Preliminary Site Plan submission and approval that will allow the project to be heard at the January 2022 Planning Commission Hearing and City Council Hearing. This milestone aligns with the completion of the design development process and the subsequent submission of the final site plan. Given our schedule, the final site plan development package will need to begin prior to the hearings such that submission can occur immediately following a Council approval.

Once the final site plan 1 has been reviewed and the comments addressed, the clearing and grading permit may be issued to allow the contractor to begin construction in Spring of 2022. We anticipate the final building permit to be issued by summer 2022, giving a two year construction phase from the foundations in place, with substantial completion at the end of May 2024. This will allow for adequate time for furnishing and equipment to be installed, and the teachers can set up to meet the first day of school in the 2024-2025 school year.

Once the 2023-2024 school year ends in June 2024, the existing Minnie Howard building may be demolished, and the work associated with constructing the fields and the west end of the site, can begin in the summer of 2024. We anticipate this work to last approximately 10 months so the fields may be accessible in the late Spring of 2025.

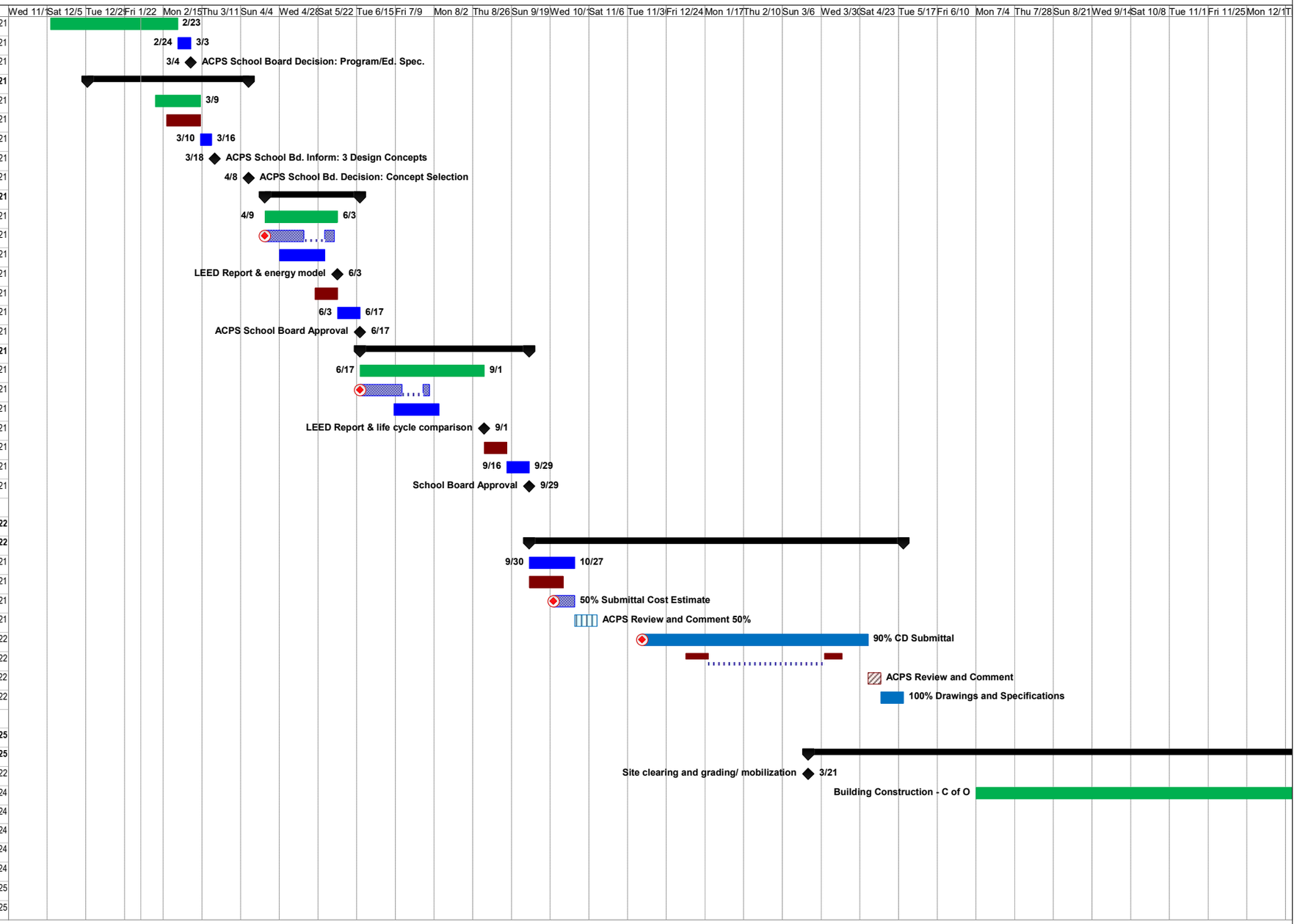
PROJECT WORK PLAN AND TIMELINE - THE HIGH SCHOOL PROJECT

ID	Task Name	Start	Finish
1	**SITE PLAN DEVELOPMENT**	**Thu 12/31/20**	**Wed 5/25/22**
2			
3	A. PREDESIGN	Thu 12/10/20	Thu 3/4/21
4	NTP	Thu 12/10/20	Thu 12/10/20
5	Site Survey	Thu 12/17/20	Wed 1/20/21
6	Alexandria P+Z	Wed 12/16/20	Thu 3/4/21
7	Public Outreach	Fri 12/11/20	Thu 3/4/21
8	Pre-Design to ACPS: Co-location Test Fits	Fri 12/18/20	Fri 12/18/20
9	Pre-Design to ACPS: Program Ed Spec	Mon 2/1/21	Mon 2/1/21
10	ACPS School Bd. Decision: Co-Location	Thu 2/4/21	Thu 2/4/21
11	ACPS School Bd. Decision: Program/Ed Spec	Thu 3/4/21	Thu 3/4/21
12			
13	B. CONCEPT AND PRELIMINARY PLANS	Thu 4/8/21	Fri 1/14/22
14	**Entitlement Process**	**Thu 4/8/21**	**Fri 1/14/22**
15	ACPS School Bd. Decision: Design Concept	Thu 4/8/21	Thu 4/8/21
16	Site Plan Development	Mon 4/12/21	Mon 5/17/21
17	**Concept I + II submitted**	Mon 5/17/21	Mon 5/17/21
18	Concept Review Comments	Mon 6/7/21	Mon 6/7/21
19	**Preliminary Site Plan I completeness**	Mon 6/14/21	Tue 7/27/21
20	Preliminary Site Plan Submitted	Tue 7/27/21	Tue 7/27/21
21	Preliminary Completeness Comments	Tue 8/17/21	Tue 8/17/21
22	**Preliminary Site Plan II Submitted**	Wed 7/28/21	Tue 9/14/21
23	Premininary Plan Deemed Complete	Tue 10/5/21	Tue 10/5/21
24	**Preliminary Site Plan Verification**	**Wed 10/6/21**	**Tue 11/16/21**
25	Preliminary Plan Verification Complete	Thu 11/25/21	Thu 11/25/21
26	**Planning Commission Hearing**	Tue 1/4/22	Tue 1/4/22
27	**City Council Hearing**	Fri 1/14/22	Fri 1/14/22
28			
29	C. SITE PLAN SUBMITTAL	Tue 11/16/21	Wed 6/29/22
30	**Final Site Plan**	**Tue 11/16/21**	**Wed 6/29/22**
31	Final Site Plan I	Tue 11/16/21	Mon 1/31/22
32	**Final Site Plan I submitted**	Mon 1/31/22	Mon 1/31/22
33	Final Site Plan I comments sent	Mon 2/28/22	Mon 2/28/22
34	**Foundation to Grade Permit**	Mon 3/21/22	Mon 3/21/22
35	**Final Site Plan II submitted**	Tue 2/1/22	Mon 3/21/22
36	Final Site Plan II comments sent	Mon 4/18/22	Mon 4/18/22
37	**Final Site Plan III submitted**	Tue 4/19/22	Mon 5/9/22
38	Final Site Plan III comments sent	Mon 5/23/22	Mon 5/23/22
39	Mylars submitted	Wed 5/25/22	Wed 5/25/22
40	**Building Permit Submitted to Code**	Wed 5/25/22	Wed 5/25/22
41	Building Permit Issued	Wed 6/29/22	Wed 6/29/22
42			
43	**D. SCHEMATIC/DESIGN DEVELOPMENT**	**Mon 12/7/20**	**Wed 4/13/22**
44	**Predesign Submission**	**Mon 12/7/20**	**Wed 4/13/22**
45	ACPS Programming Meetings	Mon 12/7/20	Fri 1/29/21
46	ACPS Stakeholder Meetings (EDT, IAB, etc.)	Mon 12/7/20	Wed 4/13/22
47	Prelim. Cost Estimate	Fri 12/18/20	Wed 2/17/21



PROJECT WORK PLAN AND TIMELINE - THE HIGH SCHOOL PROJECT

ID	Task Name	Start	Finish
48	Pre-Design Submissions	Mon 12/7/20	Tue 2/23/21
49	ACPS Review	Wed 2/24/21	Wed 3/3/21
50	ACPS School Board Decision: Ed. spec.	Thu 3/4/21	Thu 3/4/21
51	**Concept Design**	**Wed 12/30/20**	**Thu 4/8/21**
52	3 Design Concept Submission to ACPS	Wed 2/10/21	Tue 3/9/21
53	Cost Estimate	Wed 2/17/21	Tue 3/9/21
54	ACPS Review	Wed 3/10/21	Tue 3/16/21
55	ACPS School Bd. Inform: 3 Design Concepts	Thu 3/18/21	Thu 3/18/21
56	ACPS School Bd. Decision: Concept Selection	Thu 4/8/210	Thu 4/8/21
57	**Schematic Design**	**Mon 4/9/21**	**Thu 6/17/21**
58	Schematic Design	Mon 4/9/21	Thu 6/3/21
59	**LEED meeting**	Mon 4/19/21	Mon 5/31/21
60	Material + Systems Outline	Wed 4/28/21	Tue 5/25/21
61	LEED Report & energy model	Thu 6/3/21	Thu 6/3/21
62	Cost Estimate	Thu 5/20/21	Thu 6/3/21
63	ACPS Review + Comment	Thu 6/3/21	Thu 6/17/21
64	ACPS School Board Approval	Thu 6/17/21	Thu 6/17/21
65	**Design Development**	**Thu 6/17/21**	**Wed 9/29/21**
66	Design Development Submission	Thu 6/17/21	Wed 9/1/21
67	**LEED meeting**	Thu 6/17/21	Thu 7/29/21
68	Material + Systems Outline	Thu 7/8/21	Wed 8/4/21
69	LEED Report & life cycle comparison	Wed 9/1/21	Wed 9/1/21
70	Cost Estimate	Thu 9/2/21	Wed 9/15/21
71	ACPS Review + Comment	Thu 9/16/21	Wed 9/29/21
72	School Board Approval	Wed 9/29/21	Wed 9/29/21
73			
74	**E. CONSTRUCTION DOCUMENTS**	**Thu 9/30/21**	**Thu 5/19/22**
75	**CD Drawings**	**Thu 9/30/21**	**Thu 5/19/22**
76	50% Contract Documents	Thu 9/30/21	Wed 10/27/21
77	Enhanced commissioning	Thu 9/30/21	Wed 10/20/21
78	50% Submittal Cost Estimate	Fri 10/15/21	Wed 10/27/21
79	ACPS Review and Comment 50%	Thu 10/28/21	Wed 11/10/21
80	90% CD Submittal	Thu 12/9/21	Wed 4/27/22
81	Prepare/Submit Cost Estimates (2)	Wed 1/5/22	Mon 4/11/22
82	ACPS Review and Comment	Thu 4/28/22	Thu 5/5/22
83	100% Drawings and Specifications	Fri 5/6/22	Thu 5/19/22
84			
85	**F. CONSTRUCTION**	**Mon 3/21/22**	**Wed 4/30/25**
86	**SITE WORK**	**Mon 3/21/22**	**Wed 4/30/25**
87	Site clearing and grading/ mobilization	Mon 3/21/22	Mon 3/21/22
88	Building Construction - C of O	Mon 7/4/22	Fri 5/31/24
89	Substantial Completion	Fri 5/31/24	Fri 5/31/24
90	Teacher set up in classrooms	Mon 6/3/24	Fri 7/12/24
91	First Day of School Minnie Howard Campus	Tue 9/3/24	Tue 9/3/24
92	Demolition of Existing Building	Thu 6/20/24	Tue 7/9/24
93	Field Construction	Wed 7/10/24	Tue 4/29/25
94	Final Cert. of Occupancy Project Complete	Wed 4/30/25	Wed 4/30/25



PROJECT WORK PLAN AND TIMELINE - THE HIGH SCHOOL PROJECT

ID	Task Name	Start	Finish
48	Pre-Design Submissions	Mon 12/7/20	Tue 2/23/21
49	ACPS Review	Wed 2/24/21	Wed 3/3/21
50	ACPS School Board Decision: Program/Ed. Sp	Thu 3/4/21	Thu 3/4/21
51	**Concept Design**	**Wed 12/30/20**	**Thu 4/8/21**
52	3 Design Concept Submission to ACPS	Wed 2/10/21	Tue 3/9/21
53	Cost Estimate	Wed 2/17/21	Tue 3/9/21
54	ACPS Review	Wed 3/10/21	Tue 3/16/21
55	ACPS School Bd. Inform: 3 Design Concepts	Thu 3/18/21	Thu 3/18/21
56	ACPS School Bd. Decision: Concept Selection	Wed 12/30/20	Thu 4/8/21
57	**Schematic Design**	**Mon 4/19/21**	**Thu 6/17/21**
58	Schematic Design	Mon 4/19/21	Thu 6/3/21
59	**LEED meeting**	Mon 4/19/21	Mon 5/31/21
60	Material + Systems Outline	Wed 4/28/21	Tue 5/25/21
61	LEED Report & energy model	Thu 6/3/21	Thu 6/3/21
62	Cost Estimate	Thu 5/20/21	Thu 6/3/21
63	ACPS Review + Comment	Thu 6/3/21	Thu 6/17/21
64	ACPS School Board Approval	Thu 6/17/21	Thu 6/17/21
65	**Design Development**	**Thu 6/17/21**	**Wed 9/29/21**
66	Design Development Submission	Thu 6/17/21	Wed 9/1/21
67	**LEED meeting**	Thu 6/17/21	Thu 7/29/21
68	Material + Systems Outline	Thu 7/8/21	Wed 8/4/21
69	LEED Report & life cycle comparison	Wed 9/1/21	Wed 9/1/21
70	Cost Estimate	Thu 9/2/21	Wed 9/15/21
71	ACPS Review + Comment	Thu 9/16/21	Wed 9/29/21
72	School Board Approval	Wed 9/29/21	Wed 9/29/21
73			
74	**E. CONSTRUCTION DOCUMENTS**	**Thu 9/30/21**	**Thu 5/19/22**
75	**CD Drawings**	**Thu 9/30/21**	**Thu 5/19/22**
76	50% Contract Documents	Thu 9/30/21	Wed 10/27/21
77	Enhanced commissioning	Thu 9/30/21	Wed 10/20/21
78	50% Submittal Cost Estimate	Fri 10/15/21	Wed 10/27/21
79	ACPS Review and Comment 50%	Thu 10/28/21	Wed 11/10/21
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82	ACPS Review and Comment	Thu 4/28/22	Thu 5/5/22
83	100% Drawings and Specifications	Fri 5/6/22	Thu 5/19/22
84			
85	**F. CONSTRUCTION**	**Mon 3/21/22**	**Wed 4/30/25**
86	**SITE WORK**	**Mon 3/21/22**	**Wed 4/30/25**
87	Site clearing and grading/ mobilization	Mon 3/21/22	Mon 3/21/22
88	Building Construction - C of O	Mon 7/4/22	Fri 5/31/24
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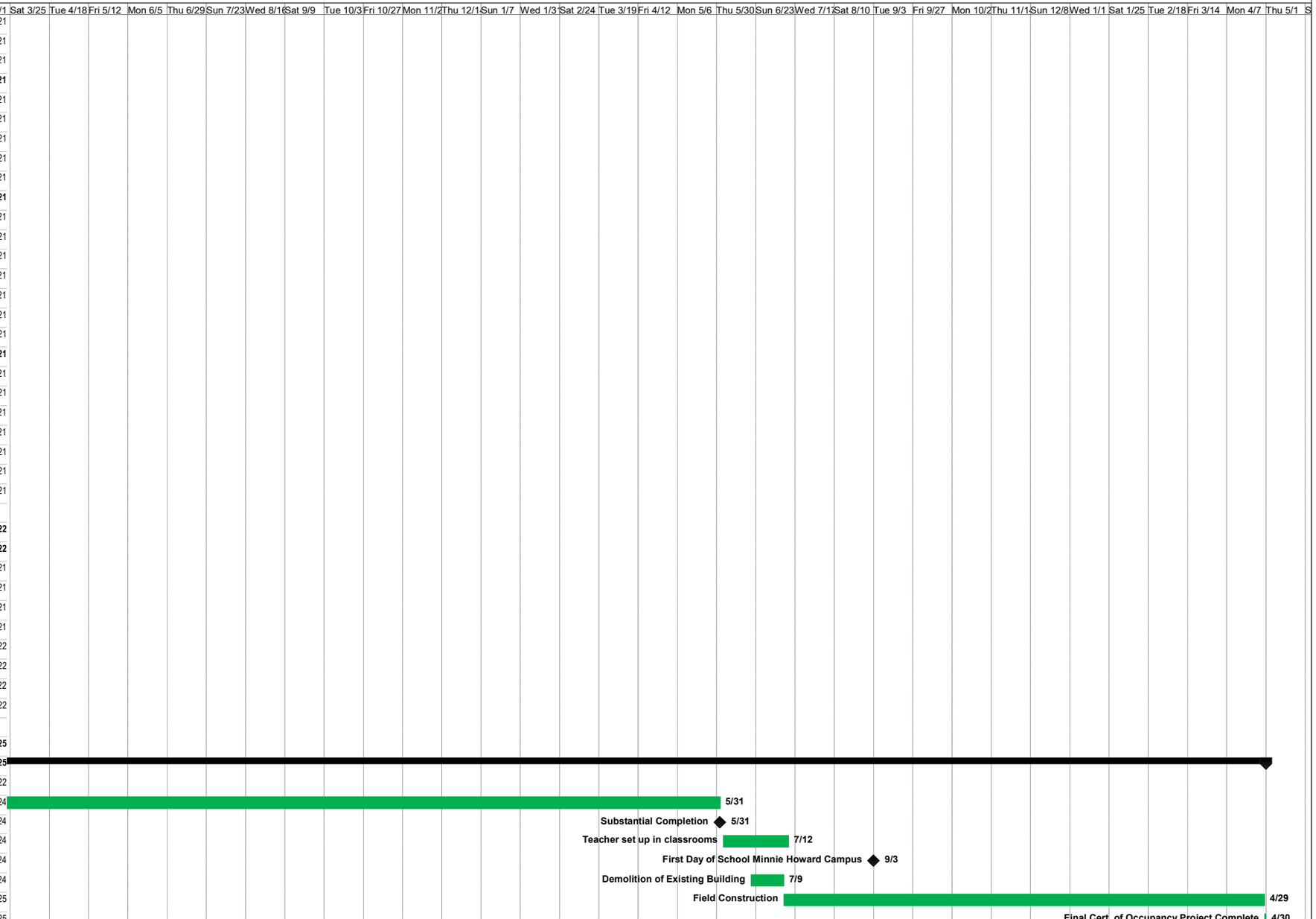

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TAB 7: APPENDIX

7.1 SPACE PROGRAM TABLE

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
1	**ADMIN**								
1.1	**MAIN OFFICE**								
1.1.1	Reception		1	1125	1125	1	600	600	
1.1.2	Conference		1	250	250	1	250	250	
1.1.3	Workroom		1	400	400	1	400	400	No minimum sf per DOE
1.1.3.1	Faculty Mail Room					1	150	150	
1.1.4	Fire Resistive Record Storage		1	250	250	1	250	250	
1.1.5	Secure Storage		1	75	75	1	75	75	
1.1.6	See storage above				0	0	0	0	No minimum sf per DOE
1.1.7	Principal / Campus Administrator		1	150	150	1	150	150	
1.1.8	Administrative Assistant		1	100	100	2	100	200	
1.1.9	General Office with clerical workstations				0	0	0	0	No minimum sf per DOE
1.1.10	Flex Office		1	100	100	1	100	100	
1.1.11	Coat Closet		1	25	25	1	25	25	
1.1.12	Attendance Office		1	100	100	1	100	100	
1.1.13	Registrar		1	100	100	1	100	100	
1.1.14	Testing Coordinator					2	100	200	
1.1.15	Director of Counseling					1	120	120	
1.1.16	Assistant Director of Counseling					1	100	100	
1.2	**Distributed Administration**								
1.2.1	Assistant Principal / SLC Administrator		4	150	600	4	150	600	
1.2.2	Conference		1	150	150	4	160	640	
1.2.3	Storage		1	50	50	4	50	200	
1.2.4	SLC Reception / Adminstrative Assistant					4	200	800	
1.3	**Faculty Support**								
1.3.1	Faculty Lounge		1	775	775	1	775	775	
1.3.2	Staff Toilets				0	0	0	0	No minimum sf per DOE
	Subtotal		**18**		**4250**	**34**		**5835**	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
2	**Student Services**								
2.1	**Guidance**								
2.1.1	Office		6	100	600	8	120	960	
2.1.2	Waiting		1	400	400	0	400	0	
2.1.3	Conference		1	350	350	0	350	0	
2.1.4	Career Center		1	500	500	1	500	500	
2.1.5	Storage		1	100	100	1	100	100	
2.1.6	Testing		1	75	75	0	75	0	
2.1.7	Scholarship Fund of Alexandria					1	500	500	
2.2	**Health Suite**								
2.2.1	Reception/Waiting Area/ Admin Assistants		1	300	300	1	300	300	
2.2.2	Exam Room		2	100	200	3	100	300	
2.2.3	Student Rest Area		1	575	575	1	200	200	
2.2.4	Office		1	100	100	1	100	100	
2.2.5	Storage		1	100	100	1	100	100	
2.2.6	Prep Area (Alcove)				0	1	100	100	
2.2.7	Student Toilet		1	100	100	1	100	100	
2.2.8	Lab/Pharmacy					0	0	0	
2.2.9	Counseling					0	120	0	
2.3	**Support Services**								
2.3.1	Psychologist		2	100	200	2	120	240	
2.3.2	Social Worker		3	100	300	2	120	240	
2.3.3	Flex Office		4	100	400	4	100	400	
2.3.4	Records Storage		1	75	75	1	75	75	
2.3.5	SGA Office		1	275	275	0	275	0	
2.3.6	School Store		1	325	325	1	325	325	
2.3.7	Technology Integration Specialists/PD Space					1	560	560	
2.3.8	Technology Help Desk					1	100	100	
2.3.9	Help Desk Storage/Work Area					1	300	300	
2.3.10	Coaching Office (Instructional)					1	560	560	
	Subtotal		**30**		**4975**	**34**		**6060**	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
3	**Core Academics**								
3.1	**Classrooms**								Marker / White boards minimum lengths - Display 12 ft. Marker 16 ft. Mounting heights floor to marker/ Chalk rail 36" (minimum 42" in height). Length of classrooms no more than 1.5 X W unless otherwise stated. 9' minimum ceiling height.
3.1.1	General Classroom (was: Economics)		3	850	2550	48	850	40800	700 sf
3.1.2	English		11	850	9350			0	700 sf
3.1.3	Math		11	850	9350			0	700 sf
3.1.4	Social Studies		11	850	9350			0	700 sf
3.1.5	Large Flexible /Class Lab					4	1200	4800	
3.2	**Shared Spaces**								
3.2.1	ELA		6	900	5400				
3.2.2	Resource		6	250	1500	8	560	4480	
3.2.3	Teacher Collaboration Suites (Neighborhoods)		6	560	3360	8	640	5120	
3.2.4	Teacher Collaboration/Small Resource Room					8	160	1280	
3.2.5	SLC Storage		8	200	1600	8	100	800	
3.2.6	Extended Learning Area					8	850	6800	
3.2.7	Teacher Collaboration Suites (STEAM)					4	640	2560	
	Subtotal		**62**		**42460**	**96**		**66640**	
4	**Special Education**								
4.1	**General**								
4.1.1	Classroom (2 ED; 2 ID/ASD)		4	850	3400	4	650	2600	
4.1.2	Director's Office (was: Office)		1	120	120	1	120	120	
4.1.3	Adminstrative Assitant & Records		1	120	120	1	120	120	
4.1.4	De-Escalation Room for ED Classroom					2	80	160	
4.1.5	Bathroom for ID/ASD Classroom					2	60	120	
4.1.6	Speech/Language Office					1	140	140	
4.1.7	IEP Conference Room					1	400	400	
4.1.8	Lead Accountability Specialist					1	100	100	
4.1.9	OT/PT					1	140	140	
	Subtotal		**6**		**3640**	**14**		**3900**	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
5	**Sciences**								
5.1	**Science Labs**								1,100 net sf minimum, 24 student workstations per lab
5.1.1	Biology		2	1400	2800			0	
5.1.2	Chemistry		3	1400	4200			0	
5.1.3	Physics		3	1400	4200			0	
5.1.4	Environmental Sciences		3	1400	4200			0	
5.1.5	High Intensity Lab (Gas, H2O, Power, Hood)					8	1400	11200	
5.1.6	Low Intensity Lab (H2O, Power)					10	1400	14000	
5.2	**Science Support**								
5.2.1	Prep		6	200	1200	9	200	1800	1 Lab 200sf, 2 Labs 300 sf
5.2.2	Storage		5	100	500	0	100	0	
5.2.3	Chemical Storage		1	250	250	0	250	0	
5.2.4	Greenhouse		1	200	200	1	200	200	
	Subtotal		**24**		**17550**	**28**		**27200**	
6	**Fine Arts**								
6.1	**Visual Arts**								
6.1.1	Art Studio		2	1200	2400	2	1200	2400	45 sf per student
6.1.2	Art Studio 3D		1	1200	1200	1	1200	1200	
6.1.3	Graphics / Media Studio			1000	0	1	1000	1000	
6.1.4	Storage		2	100	200	3	100	300	400 sf
6.1.5	Kiln/ Ceramic Storage		1	100	100	1	100	100	
6.2	**Music (or: Alternatively, centralized at King Street?)**								
6.2.1	Instrumental Music (Band)		1	3050	3050	0	2400	0	
6.2.2	Vocal Music		1	1675	1675	0	1400	0	15 sf per member, 10 ft. minimum ceiling height
6.2.3	Practice Room		1	700	700	0	700	0	
6.2.4	Instrument Storage		1	600	600	0	600	0	200 sf minimum
6.2.5	Uniform Storage		2	100	200	0	100	0	
6.2.6	Office		2	100	200	0	100	0	
6.2.7	Library/ Music Storage		1	150	150	0	150	0	
6.2.8	Orchestra?					0	1800	0	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
6.3	**Assembly (was: Drama)**								
6.3.1	Classroom		1	900	900				
6.3.2	Forum (was: Black Box Theatre)		1	2000	2000	1	3000	3000	
6.3.3	Storage (was: Control Room)		1	100	100	1	250	250	
6.4	**Auditorium**								Located adjacent to band, chorus and drama classrooms.
6.4.1	Theatre / Auditorium		1	8525	8525	0	8525	0	1/3 to 1/2 ADM (8 sf per seat) 3,000-5,000 sf stage
6.4.2	Stage W/ Pit		1	3125	3125	0	3125	0	
6.4.3	Ticket Booth		1	100	100	0	100	0	
6.4.4	Control Room		1	150	150	0	150	0	
6.4.5	Costume / Prop Stage		1	525	525	0	525	0	
6.4.6	Dressing Rooms		1	525	525	0	525	0	
6.4.7	Student Toilet		2	50	100	0	50	0	
6.4.8	Set Construction		1	700	700	0	700	0	
	Subtotal		**27**		**27225**	**10**		**8250**	
7	**Specials**								
7.1	**Foreign Language**								
7.1.1	Classroom		6	900	5400			0	
7.1.2	Storage		1	100	100	0	100	0	
	Subtotal		**7**		**5500**	**0**		**0**	
8	**Physical Education**								
8.1	**Physical Education**								
8.1.1	Gym		1	10000	10000	1	10000	10000	62' X 100' X 22' (clear height) - not including bleachers. Safety space of 6' on each side and 8' on each end of a basketball court free of bleachers. A small office should be considered for use (by the partnering local parks and rec office) if outside community is planned to use the gym.
8.1.2	Auxiliary Gym		1	8475	8475	1	5400	5400	62' X 50' X 22' (clear height) - not including bleachers
8.1.3	Wrestling (Optional)			2500	0	1	2200	2200	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
8.1.4	Fitness/ Weight Room		1	1500	1500	1	1500	1500	
8.1.5	Dance/ Activity Room (Optional)			1500	0	0	1500	0	
8.1.6	Health Classroom & Human Growth and Development		6	850	5100	0	850	0	
8.1.7	Chair Storage					1	450	450	
8.2	**Physical Education Support**								
8.2.1	Locker Rooms		1	2775	2775	1	2775	2775	1 Locker per student. 15 sf per pupil based on the largest class.
8.2.2	Showers/ Toilets		1	775	775	1	775	775	6 per gender
8.2.3	Team Rooms		4	300	1200	2	1000	2000	
8.2.4	PE Teachers Office		1	200	200	1	640	640	
8.2.5	Teacher / Coach Lockers & Toilets		2	90	180	2	90	180	
8.2.6	Coaches Office (was AD Office)		1	120	120	1	120	120	
8.2.7	Training / Whirlpool		1	120	120	1	250	250	
8.2.8	Laundry / Towels		1	100	100	1	150	150	
8.2.9	Concession		1	100	100	1	250	250	
8.2.10	Outdoor Storage		1	400	400	1	400	400	250 sf minimum
8.2.11	Indoor Storage		1	450	450	1	450	450	800 sf (minimum)
8.2.12	Athletic Storage		1	600	600	1	600	600	
8.2.13	Adaptive PE Storage		1	250	250	1	250	250	
8.2.14	Officials Lockers		2	90	180	2	90	180	
8.2.15	Tickets					1	100	100	
	Subtotal		**28**		**32525**	**22**		**28670**	
9	**Aquatics**								
9.1	**Pool**								
9.1.1	Competition Pool		1	4505	4505	1	4505	4505	
9.1.2	Diving Well		1	1150	1150	1	1150	1150	
9.1.3	Deck Area		1	5400	5400	1	5400	5400	
9.1.4	Pool Equipment Storage		1	150	150	1	150	150	
9.1.5	Swim Meet Storage		1	150	150	1	150	150	
9.1.6	Spectator Seating - 300 Seats		1	1200	1200	1	1200	1200	
9.1.7	Locker Rooms (was Rest Rooms)		2	800	1600	2	800	1600	
9.1.8	Dry-land Exercise Space		1	200	200	0	200	0	
9.1.9	Gender Nuetral/Family Locker?					2	150	300	
9.1.10	Public Entry Lobby					1	250	250	
9.1.11	Reception					1	150	150	
9.1.12	Classroom					1	600	600	
9.1.13	RPCA Administrative Office					1	100	100	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
9.2	**Support Spaces**								
9.2.1	Pump / Filtration Room		1	300	300	1	1000	1000	
9.2.2	Chemical Storage		1	180	180	1	180	180	
9.2.3	Custodial Room		2	50	100	2	50	100	
9.2.4	First Aid Storage		1	50	50	1	50	50	
9.2.5	Life Guard Office		1	100	100	1	100	100	
9.2.6	Ticket Booth		1	50	50	1	50	50	
	Subtotal		**16**		**15135**	**21**		**17035**	
10	**CTE**								
10.1	**CTE 1: Prototyping/Robotics Lab**								
10.1.1	Lab		1	2000	2000	4	1800	7200	
10.1.2	Project / Material Storage		1	100	100	4	200	800	
10.2	**CTE 2: Classrooms & Computer Labs**								
10.2.1	Fabrication Lab		1	2000	2000	0	3500	0	
10.2.2	Project / Material Storage		1	100	100	0	200	0	
10.2.3	Digital Design Studio		1	1050	1050	3	1000	3000	
10.2.4	Storage		1	100	100	0	100	0	
10.02.5	CTE Classroom					3	850	2550	
10.3	**CTE 5: JROTC**								
10.3.1	Classroom		1	850	850	0	850	0	
10.3.2	Changing Room		2	150	300	0	150	0	
10.3.3	Uniform Storage		1	250	250	0	250	0	
10.3.4	Supplies		1	200	200	0	200	0	
10.3.5	Armory		1	100	100	0	100	0	
10.3.6	Office		1	200	200	0	120	0	
10.3.7	Book Storage		1	25	25	0	25	0	
10.3.8	Cadet Operations		1	150	150	0	150	0	
10.3.9	Indoor Practice		1	4500	4500	0	4500	0	
10.3.10	Outdoor Practice		TBD						
10.3.11	Culinary Arts Lab (moved below to CTE 3					0	0	0	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
10.4	**CTE 3: Culinary Arts Lab**								
10.4.1	Culinary Arts Lab		1	1400	1400	0	0	0	
10.4.2	Project / Material Storage		1	100	100	0	100	0	
10.4.3	Project / Material Storage		1	200	200	0	200	0	
10.4.4	Classroom/Dining					0	850	0	
10.5	**CTE 3: Governors School - Health & Medical Sciences**								
10.5.1	Classroom		2	425	850	0	850	0	
10.5.2	Studio/ Lab		1	1000	1000	3	1400	4200	
10.5.3	Project / Material Storage		1	200	200	1	200	200	
	Subtotal		**23**		**15675**	**18**		**17950**	
11	**Library / Learning Commons**								
11.1	**Library / Learning Commons**								
11.1.1	Open Collaboration/Study/Collections		1	7800	7800	1	3640	3640	
11.1.2	Office / Workroom		1	450	450	1	250	250	150 sf minimum.
11.1.3	A/V and Magazine Storage		1	100	100	0	100	0	120 sf.
11.1.4	Head End Room		1	275	275	1	275	275	100 sf.
11.1.5	Historic Collections		1	100	100	0	100	0	
11.1.6	General Storage		1	100	100	0	100	0	
11.1.7	Makerspace		1	525	525	0	525	0	
11.1.8	Conference Room / Project Room				0	4	120	480	120 sf.
11.1.9	Distant Learning				0			0	120 sf.
11.1.10	Librarian Office				0			0	120 sf.
11.1.11	Flexiblbe Class Meeting Area					2	850	1700	
11.2	**Communications**								
11.2.1	TV / Video Studio		1	1600	1600	0	1600	0	
11.2.2	Control / Editing Lab		1	150	150	0	150	0	
11.2.3	Media (was: Publication) Lab		1	450	450	1	900	900	
11.2.4	Storage		1	100	100	1	100	100	Electronic/ Software storage 150 sf.
11.2.5	Graphics Lab		1	975	975	0	975	0	
11.2.6	Communicating Room				0	0	0	0	48 sf.
	Subtotal		**12**		**12625**	**11**		**7345**	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
12	**Food Services**								
12.1	**Dining**								
12.1.1	Creative Commons/Dining (was: Cafeteria)		1	7700	7700	4	2000	8000	Dining = 3600 - 4500 sf. Formula = (Total Enrollment / lunch seatings (3) X sf per pupil = dining room floor area.) Rectangular tables with attached seats 11 sf per student, rectangular tables with stacking chairs 11-14 sf per student, round tables with stacking chairs 11-14 per student. Dining rooms under 3,000 sf ceiling height should be 12', rooms over 3,000 sf is 14'.
12.1.2	Furniture Storage		1	400	400	1	400	400	
12.2	**Food Services**								
12.2.1	Kitchen		1	1600	1600	1	1600	1600	Prep/ cooking = 1000 - 1250 sf. Formula = (1,000 sf + 1 sf X total enrollment)
12.2.2	Serving		1	1450	1450	4	500	2000	1400 - 1800 sf. 20-25% of dining room floor area.
12.2.3	Office		1	100	100	1	100	100	150 - 160 sf
12.2.4	Walk-in Freezer		1	350	350	1	350	350	
12.2.5	Walk-in Chiller		1	350	350	1	350	350	Refrigerated / Storage = 600 - 700 sf.
12.2.6	Dry Storage		1	500	500	1	500	500	600 - 700 sf
12.2.7	Dish Room		1	600	600	1	300	300	350 - 400 sf
12.2.8	Soap Storage		1	50	50	1	125	125	100 - 125 sf
12.2.9	Pan Wash		1	50	50	1	0	0	125 - 150 sf
12.2.10	Locker / Toilet		1	120	120	1	120	120	250 sf
12.2.11	Receiving		1	225	225	1	225	225	100 - 125 sf
12.2.12	Trash & Recycled Material Storage				0			0	
12.2.13	Mop Closet				0			0	
12.2.14	Can Wash/ Dry				0			0	150 - 160 sf.
	Subtotal		**13**		**13495**	**19**		**14070**	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
13	**Building Services**								
13.1	**Maintenance/ Operations**								
13.1.1	Receiving		1	400	400	1	400	400	
13.1.2	Central Storage		1	450	450	1	450	450	
13.1.3	Custodial Office / Breakroom (was: Operations)		1	250	250	1	250	250	
13.1.4	Locker / Toilet		1	120	120	1	120	120	
13.1.5	Security Office		1	150	150	1	150	150	
13.1.6	Custodial Closet		7	60	420	7	60	420	
13.1.7	Custodial Storage (was: Recycling)		1	400	400	1	400	400	
13.1.8	Outdoor Storage		1	200	200	1	200	200	
13.1.9	Laundry					1	100	100	
13.1.10	Building Engineer's Office					1	100	100	
13.1.11	School Safety Officer Office					1	100	100	
13.2	**Toilet**								
13.2.1	Staff Toilet		10	50	500	10	50	500	
	Subtotal		**24**		**2890**	**27**		**3190**	
14	**Community Space**								
14.1	**Family Resource Room**								
14.1.1	Family Resource Room		1	150	150	1	150	150	
14.1.2	Office		1	80	80	0	80	0	
14.1.3	Toilet		1	50	50	0	50	0	
14.2	**After School Support**								
14.2.1	Storage		1	100	100	0	100	0	
14.2.2	Pantry		1	50	50	0	50	0	
14.2.3	Office		1	80	80	0	80	0	
14.3	**Services**								
14.3.1	Pantry		1	80	80	0	80	0	
14.3.2	Personal Care / Lactation Room		1	100	100	1	100	100	
14.3.3	Laundry		1	100	100	0	100	0	
14.3.4	Storage		1	25	25	0	25	0	
14.4	**Community Gathering / Testing Hall**								
14.4.1	Dividable Testing Hall / Professional Development		1	4500	4500	0	2400	0	
14.4.2	Chair Storage		1	350	350	0	350	0	
	Subtotal		**12**		**5665**	**2**		**250**	

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
15	**Co-located Spaces**								
15.1	Alexandria Health Department Teen Wellness Center				2200	0	2200	0	
15.1.1	Reception/Waiting Area/ Admin Assistants		1	300	300	1	300	300	
15.1.2	Exam Room		2	100	200	2	120	240	
15.1.3	Student Rest Area		1	575	575	0	300	0	
15.1.4	Office		1	100	100	2	120	240	
15.1.5	Storage		1	100	100	1	100	100	
15.1.6	Prep Area (Alcove)				0	1	100	100	
15.1.7	Student/Staff Toilet		1	100	100	2	100	200	
15.1.8	Lab/Pharmacy					1	150	150	
15.1.9	Counseling					1	120	120	
15.2	Department of Community and Human Services				3465				
15.3	DCHS Services Family Resources Suite								
15.3.1	Reception					1	150	150	
15.3.2	Office					6	100	600	
15.3.3	Conference Room					1	240	240	
15.3.4	Restroom					1	65	65	
15.3.5	Pantry					1	140	140	
15.3.6	Storage					1	100	100	
15.4	DCHS Services Distributed Offices								
15.4.1	Workforce Office					1	140	140	
15.4.2	Therapist					1	100	100	
15.5	RPCA Outdoor Support Space					0		0	
15.5.1	Outdoor Bathrooms					2	60	120	
15.5.2	Outdoor Storage					1	200	200	
	Subtotal				**7040**			**3305**	

NOTE

DCHS' Early Childhood program spaces have been removed from the program.

2017 Ed Spec #	PROGRAM Room Description	ED SPEC Students or Staff Served	2017 ACPS ED SPEC 1600 Students			MH - SITE SPECIFIC ED SPEC 1600 Students			VA DOE GUIDELINES dated Sept 2013
			ACPS Quantity	ACPS Net SF	ACPS Total SF	MH Quantity	MH SF	MH Net SF	VA DOE GUIDELINES
	TOTAL		**302**		**210650**	**336**		**209700**	
								104,850	50.0%
	Grossing Factor	1.5			315,975			314,550	
					66.7%			66.7%	
	Grossing Factor	1.45			305,443			304,065	
					69.0%			69.0%	
	Grossing Factor	1.4			294,910			293,580	
					71.4%			71.4%	

Langley High School
McLean VA

7.2 ACOUSTIC CODE DETAILS

Details of the codes outlined in the Acoustical Design section of this narrative are provided below.

LEED MINIMUM ACOUSTIC PERFORMANCE (PREREQUISITE)

A. Based on LEED for Schools™ Version 4 Indoor Environmental Quality Prerequisite (Minimum Acoustic Performance) there are 3 goals for classroom and other core learning areas:

ii. Background noise level from HVAC systems must be under 40 dB(A).

iii. Exterior Noise: For high-noise sites (peak-hour req. above 60 dBA during school hours), implement acoustic treatment and other measures to minimize noise intrusion from exterior sources and control sound transmission between classrooms and other core learning spaces. Projects at least one-half mile (800 meters) from any significant noise source (e.g., aircraft overflights, highways, trains, industry) are exempt.

iv. Reverberation time

1. Classrooms and core learning spaces under 20,000 cubic feet:

I. Option 1 - The total surface area of acoustic wall panels, ceiling finishes, and other sound absorbent finishes equals or exceeds the total ceiling area of the room excluding lights, diffusers, and grilles. Materials must have an NRC 0.7 or higher to be included in the calculation. OR

II. Option 2 – Confirm through calculations described in ANSI Standard S12.60-2010 that rooms are designed to meet reverberation time requirements as specified in that standard.

2. Classrooms and core learning spaces over 20,000 cubic feet; reverberation time must be designed as described in the NRC-CNRC Construction Technology Update No. 51, Acoustical Design for Rooms for Speech (2002), or a local equivalent for projects outside the US.

LEED ACOUSTIC PERFORMANCE (CREDIT)

B. Based on LEED for Schools™ Version 4 Indoor Environmental Quality Credit there are 2 goals for classroom and other core learning areas.

i. Background noise level from HVAC systems must be under 35 dB(A).

ii. Design classrooms and other core learning spaces to meet sound transmission class (STC) requirements of ANSI S12.60-2010 Part 1, or a local equivalent. Exterior windows must have an STC rating of at least 35, unless outdoor and indoor noise levels can be verified to justify a lower rating.

7.2 ACOUSTIC CODE DETAILS

LEED FOR SCHOOLS™ VERSION 4 ACOUSTICS REQUIREMENTS FOR CORE LEARNING SPACES

The LEED for Schools™ Version 4 requirements for acoustics is detailed below.

1. LEED for Schools™ Version 4 Indoor Environmental Quality Prerequisite requires design classrooms and other core learning spaces to include sufficient sound-absorptive finishes for compliance with reverberation time presented below:
   A. Classrooms and core learning spaces over 20,000 cubic feet:
      i. Option 1 - The total surface area of acoustic wall panels, ceiling finishes, and other sound absorbent finishes equals or exceeds the total ceiling area of the room excluding lights, diffusers, and grilles. Materials must have an NRC 0.7 or higher to be included in the calculation. OR
      ii. Option 2 – Confirm through calculations described in ANSI Standard S12.60-2010 that rooms are designed to meet reverberation time requirements as specified in that standard.
   B. Classrooms and core learning spaces over 20,000 cubic feet; reverberation time must be designed as described in the NRC-CNRC Construction Technology Update No. 51, Acoustical Design for Rooms for Speech (2002), or a local equivalent for projects outside the US.
2. Classrooms and core learning spaces under 20,000 cubic feet:
3. Option 1 - The total surface area of acoustic wall panels, ceiling finishes, and other sound absorbent finishes equals or exceeds the total ceiling area of the room excluding lights, diffusers, and grilles. Materials must have an NRC 0.7 or higher to be included in the calculation. OR
4. Option 2 – Confirm through calculations described in ANSI Standard S12.60-2010 that rooms are designed to meet reverberation time requirements as specified in that standard.
5. Classrooms and core learning spaces over 20,000 cubic feet; reverberation time must be designed as described in the NRC-CNRC Construction Technology Update No. 51, Acoustical Design for Rooms for Speech (2002), or a local equivalent for projects outside the US.

CHANGES FROM LEED 2009 for Minimum Acoustic Performance (Prerequisite):

- The maximum allowable background noise has been revised from 45 dBA to 40 dBA.
- An exterior noise requirement has been added to minimize exterior noise intrusion into classrooms and core learning spaces.
- The ANSI referenced standard has been updated to ANSI S12.60-2010.
- The ASHRAE referenced standard has been updated to 2011 HVAC Applications ASHRAE Handbook, Chapter 48, Noise and Vibration Control.
- For spaces 20,000 cubic feet or larger, the referenced standard for reverberation time has changed to NRC-CNRC Construction Technology Update No. 51. This standard specifies variable reverberation time and total sound absorption values depending on the size of the space.
- Exceptions for projects with limited renovation scopes or strict historic preservation requirements have been added.

LEED FOR SCHOOLS™ VERSION 4 EQ CREDIT REQUIREMENTS

LEED for Schools™ Version 4 credit requirement for HVAC noise control and acoustics is detailed below.

1. LEED for Schools™ Version 4 Indoor Environmental Quality Credit for Acoustic Performance requires the background noise level from HVAC systems under 35 dB(A) or less for classrooms and other core learning spaces.
2. Core learning spaces shall not exceed the maximum airflow velocities 1200 FPM in the main duct: 950 FPM in the branch ducts and 400 FPM in the final runouts. The return airflow velocity should not exceed 500 FPM in the return air duct. Polysonics recommends diffuser air flow velocity limits as follows:
   - Classrooms and Core learning spaces – Supply: 400 fpm Return: 500 fpm

7.2 ACOUSTIC CODE DETAILS

3. LEED for Schools™ Version 4 Indoor Environmental Quality Credit for Acoustic Performance requires building shell, classroom partitions and other core learning spaces as follows:
   A. STC 45 – This wall type demises classrooms from corridors, offices, and conference rooms. For CMU construction, this can be accomplished using an 8" thick CMU wall. If glass walls or windows are considered between the classrooms and the corridors, Polysonics shall be informed to verify conformance.
   B. STC 50 – This wall type demises classrooms from other classrooms. For gypsum board construction, this can be accomplished using 3-5/8" studs with two layers of 5/8" GWB on both sides of the studs and batt filled cavity.
   C. STC 50 – Exterior noise control requirements for IEQ Credit are given in the form of STC ratings for exterior wall elements. However, in high noise environments the STC ratings required in IEQ Credit may not be sufficient; additional noise control measures should be taken as required. This wall type demises classrooms from outdoors (exterior walls); greater if the outdoor noise level is higher than 65 dB. The window assemblies on the exterior wall must achieve a minimum STC rating of 35 or higher to meet the LEED for Schools™ Version 4 IEQ Credit.
   D. Entry doors to classrooms should be solid wood or hollow metal with a laboratory STC rating of 30 or higher. This can be achieved by using a solid wood door (or a hollow core steel door constructed of 18-gauge steel) with excellent gasketing. Note that gaskets must be maintained, or their acoustic effectiveness will decrease over time. Music rooms will require STC 40 door assemblies.
   E. STC 53 – This wall type demises classrooms from bathrooms/toilets. An example of this, using drywall construction, is a staggered stud wall. For CMU construction, this can be accomplished by using a 10" thick CMU with all cores filled with grout.
   F. STC 60 – This wall type demises classrooms, corridors and offices from music rooms, cafeteria, Gym, Natatorium, mechanical room/closets, etc. An example of this, using drywall construction, is a double stud wall.
4. All the sound rated walls shall extend from floor to underside of the metal deck or the concrete slab. When details of the existing wall partitions become available, we will evaluate them for sound ratings and flanking transmission.
5. If there are instances where loud rooms (mechanical rooms, music rooms, etc.) are directly above or below classrooms, it is strongly recommended that additional noise control measures such as a noise control suspended ceiling be employed.
6. Design the floor-ceiling assemblies to achieve a minimum Impact Insulation Class (IIC) rating of 50. For existing school buildings, consider a permanent resilient underlayment or carpet to isolate the finished floor from the structural floor system.
7. Comprehensive design guidelines for classrooms are based on ANSI/ASA S12.60-2010/Part 1 American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools.
8. The Sound Transmission requirement of IEQ Credit provides required design sound transmission class ratings for classrooms and other core learning spaces adjacent to a variety of spaces. The tables below provide required Sound Transmission Class (STC) ratings.

Table 1: STC requirements for Classroom Assemblies

Adjacent Space Type	Minimum STC Rating
Other Classrooms	50
Outdoors	50
Bathrooms	53
Corridor	45
Offices, Conference Rooms	45
Music Rooms	60
Mechanical Equipment Room	60
Cafeteria, Gym, Natatorium	60

7.2 ACOUSTIC CODE DETAILS

Table 2: STC Ratings for Windows and Doors

Location	Minimum STC Rating
Classroom Entry Door	30
Music Room Entry Door	40
Exterior Windows	35

The structure-borne impact sound isolation of floor-ceiling assemblies of normally occupied rooms located above learning spaces shall be designed for a laboratory test rating of at least IIC 45 if they are located above core learning spaces, and IIC 40 if they are located above ancillary learning spaces. These IIC ratings shall apply without carpeting on the floor in the room above the learning space. In new construction, gymnasium, dance studios, or other rooms with high floor-impact activity shall not be located above classrooms or other core learning spaces. In renovation, existing gymnasium, dance studios, and similar rooms with high floor-impact activity when it is located above core learning spaces shall either be relocated or the IIC rating of the separating floor-ceiling assembly shall be at least 70 when located above a core learning space with an enclosed volume not greater than 566 m3 (20,000 ft3); at least 65 when located above a core learning space with an enclosed volume greater than 566 m3 (20,000 ft3); and at least 65 when located above an ancillary learning space.

CHANGES FROM LEED 2009 for Acoustic Performance (Credit):

- The background noise level limit has decreased from 40 dBA to 35 dBA.
- The referenced ANSI S12.60 standard has been updated from 2002 to 2010.
- AHRI Standard 885-2008 has been added as a referenced standard for background noise.
- Equivalent local codes may now be used in place of the national codes specified in the credit requirements.

LEED FOR SCHOOLS™ VERSION 4 EQ HVAC REQUIREMENTS AND NOISE GUIDELINES

LEED for Schools™ Version 4 requirement for HVAC noise control is detailed below.

1. Based on LEED for Schools™ Version 4 Indoor Environmental Quality Prerequisite, the background noise level from HVAC systems for classroom and other core learning areas is presented below. Background noise level from HVAC systems must be under 40 dB(A) for core learning spaces which includes, but are not limited to, the classrooms (enclosed or open plan), instructional pods or activity areas, group instruction rooms, conference rooms, libraries, offices, speech clinics, offices used for educational purposes and Forum for practice and performance.
2. Ideally, the core learning spaces shall not exceed the maximum airflow velocities of 1200 FPM in the main duct: 950 FPM in the branch ducts and 400 FPM in the final runouts. The return airflow velocity should not exceed 450 FPM in the return air duct. Polysonics recommends diffuser air flow velocity limits as follows:
    - Lobby – Supply: 550 fpm Return: 650 fpm
    - Corridors – Supply: 550 fpm Return: 650 fpm
    - Classrooms, Academic Spaces, Faculty Offices – Supply: 400 fpm Return: 500 fpm
3. The design guidelines for HVAC related background noise for the Forum shall be Noise Criterion (NC) 25-30. These recommendations are provided to achieve the established noise criteria per ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) standard.
    - Forum/Performance spaces – Supply diffuser: 350 fpm Return register: 450 fpm
4. All air-handling units shall be placed away from the sound sensitive spaces such as core learning spaces and performance spaces. The sound power of RTU, DOAS units and/or ERV in any frequency band shall not exceed 84 dB. These levels can be achieved by using backward inclined or plenum fans. We recommend round ducts for performance spaces with 2” sound lining for the first 25’ of length. Avoid obstructing the inlet or crowding the coils or filters. In addition to the fan isolation, the air handling unit (with casing) shall be vibration isolated. Provide 4” thick housekeeping pad under air-handling units. The total static pressure of the system shall not exceed 3.00 inches. We recommend additional options such as double wall cabinet construction, 4”-3 lb. density liner for the discharge plenum and mount the compressors/motor on the rubber mounts.

7.2 ACOUSTIC CODE DETAILS

5. Propose all DOAS units, ERV and/or RTUs over the corridors or non-sound sensitive spaces, away from the core learning spaces. The maximum allowable discharge/casing radiated sound power levels for large rooftop units is provided below:

Table 3: Sound Power Levels (dB Re 10^{-12} watts) for one ERV/RTU

Octave band Center Frequency, Hz							
63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
78	81	84	82	79	75	72	68

6. Vibration isolation methods, such as: rubber pads or spring systems under the mounting points, should always be employed under rotating machinery to isolate it from floor-ceiling systems and prevent structurally transmitted sound from entering sound sensitive spaces, such as learning and performance spaces. This isolation is particularly important for roof-mounted rotating machinery where the deflection of the roof must be considered in vibration isolation design. The MEP shall provide detailed drawings to Polysonics for design coordination.
7. Provide 2” sound lining for the first 15’ of duct length from the FCUs and/or VRF ducted ceiling units supplying air to core learning and sound sensitive spaces.
8. If fan powered terminal units or VAV terminal units are used in the design, select them for low noise (NC ≤35). Try to keep total air volume of the VAV units below 1000 CFM. Install VAV units outside the core learning spaces in the corridors, at least 5-feet from the ceiling openings for light fixtures and linear diffusers. The ductwork entering the fan-powered VAV should be straight for at least 5 equivalent duct diameters upstream of the unit with 2” sound lining. The low-pressure ductwork leaving a fan powered VAV unit shall have 2” sound lining for 10’ length. Install Fan Powered Terminal units on spring isolators with minimum 0.75” static deflection.
9. If Cassette type (4-way) ceiling units are used in the classrooms, academic spaces, collaborative areas, conference rooms, offices, etc., design them to operate at or below 35 dBA. It is critical to note that units that are 3 ton or higher will not meet the minimum background sound requirement.
10. Locate ducted ceiling VRF units outside learning spaces, preferably in the corridor. Select them at or below 35 dBA. Since VRV/VRF FCU manufacturers do not publish full octave discharge and return sound power/pressure levels, we will not be able to generate acoustical calculation for classrooms as required by LEED for Schools standards. In the absence of these calculation, USGBC may ask for background noise level field measurements/verification for new classrooms and core learning spaces.
11. Locate VRF branch selector boxes outside classrooms, offices, conference rooms and other core learning spaces, preferably over the corridors. BS units generate a “click” sound in case any unit operating in the same system (or even if an indoor unit connected to the BS unit is stopped). ME to ensure their locations. Select them for 35 dB(A) or less.
12. Variable Refrigerant Flow (VRF) condensing units proposed on the roof are generally quiet but will have a prominent acoustic tone from the compressor(s). The proposed arrangement could likely transmit distinct tonal noise (humming) to spaces below. To minimize any fan or compressor noise transmission through the roof, locate VRF units over the corridor, storage rooms, janitor closets, restrooms, etc. Provide 4” thick normal weight concrete pad extending 12” outside equipment footprint. Install them on 1” deflection restrained springs.
13. Keep the aspect ratio of the supply ducts minimum. Duct transitions should not exceed an included expansion angle of 15°, or the resulting flow separation may produce rumble noise. Use turning vanes in large 90° rectangular elbows and branch takeoffs. This provides a smoother directional transition, thus reducing turbulence.
14. No main ducts dropping or running over classrooms. Do not locate shafts adjacent or near the classrooms.
15. Outdoor mechanical and electrical equipment will be required to meet the noise levels required by the City of Alexandria, Virginia Noise Control Code Chapter 5 - Noise Control.

7.2 ACOUSTIC CODE DETAILS

16. The design guidelines for plumbing related background noise for sound sensitive spaces such as classrooms and other core learning spaces shall be 35 dB(A) as per ANSI S12.60-2010.
17. The Mechanical Engineer should provide the full octave sound power/pressure levels of mechanical equipment to Polysonics for review. The ME should coordinate with Polysonics if deviations from the above design standards are necessary.

GENERAL HVAC NOISE GUIDELINE

General guidelines for HVAC from ANSI S12.60-2010 Annex B are as follows:

1. Unducted systems should not be employed since the sound they produce is inherently unable to conform to the background noise level criteria [specified].
2. All grilles and diffusers (air devices) should be selected to have a catalog Noise Criteria (NC) rating of NC 18 or less for a single diffuser, providing the NC catalog ratings are based on a correction of 10 dB for sound absorption in the room.
3. Airflow velocities in trunk ducts should not exceed 4.1 m/s (800 ft/min). Branch ductwork sizes should match the air device's duct connection size. Duct silencers will be required inside the air-handling unit or in the main supply and return air ducts in most systems.
4. All ductwork should be fabricated and installed to achieve a low static pressure loss in accordance with procedures in the Sheet Metal & Air-Conditioning Contractors National Association (SMACNA) for HVAC System Duct Design. To achieve the rated performance of air diffusers, the plenum depth should be the equivalent of at least three to four diameters of the duct going to the diffuser.
5. All rotating equipment and equipment with static pressure control dampers should be 3.3m (10 ft) or farther if possible, from the classroom. HVAC fan equipment serving more than one classroom should be farther from the classrooms than equipment serving only one classroom.
6. Centrifugal fans with airfoil-shaped blades should be used in most cases to achieve the background sound levels required for the learning spaces. Centrifugal fans with forward curved blades should be avoided (especially with central air distribution systems) because this fan design typically generates excessive low-frequency noise when the total static pressure is greater than 2 inches of water.
7. Ductwork serving adjacent learning spaces should include sound attenuators or sound-absorbing duct lining (if required), or both, to reduce crosstalk through the duct system. The attenuation should be sufficient to preserve the noise isolation between the adjacent learning spaces.
8. To minimize HVAC noise transmission into core learning spaces, variable air volume (VAV) boxes and fan-powered boxes should not be located in these spaces. Instead, the elements should be located over less sensitive spaces, which may include corridors, storage rooms and restrooms.

GENERAL PLUMBING NOISE GUIDELINES

General guidelines for plumbing from ANSI S12.60-2010 Annex B are cited as follows:

1. Run piping above corridor ceilings, not above learning spaces.
2. Locate restrooms away from classrooms.
3. Use cast iron wastewater pipes, when possible. Plastic piping may require special care during installation to ensure quiet operation and should be wrapped with one or more layers of sound-attenuating material, for plastic waste pipe, wrapped with sound-absorbing material and boxed with gypsum wallboard.
4. Isolate all water piping from the building walls and structure using foam rubber wrapping or resilient clamps and hangers.

7.2 ACOUSTIC CODE DETAILS

5. When necessary for a plumbing wall chase to be adjacent to a learning space, the wall should employ double stud construction with two layers of gypsum board on the classroom side and sound-absorbing insulation batts in both stud cavities.
6. Reduce the pressure of the supply water as much as possible and employ trapped-air water-hammer arrestors for water supply pipes serving flush or solenoid valve fixtures to reduce water hammer noise.
7. Use water siphon jet fixtures instead of blowout fixtures.
8. Inspect all plumbing installations for conformance to the noise control features before sealing the walls.

VIRGINIA DEPARTMENT OF EDUCATION GUIDELINES FOR SCHOOL FACILITIES

Section 14.1 Noise Reduction:

In new construction and in remodeling or renovations of existing media center, cafeterias, corridors, and space for large groups, including gymnasiums, one of the following should be in place:

1. Unducted systems should not be employed since the sound they produce is inherently unable to conform to the background noise level criteria [specified].
2. All grilles and diffusers (air devices) should be selected to have a catalog Noise Criteria (NC) rating of NC 18 or less for a single diffuser, providing the NC catalog ratings are based on a correction of 10 dB for sound absorption in the room.
3. attenuation should be sufficient to preserve the noise isolation between the adjacent learning spaces.
4. To minimize HVAC noise transmission into core learning spaces, variable air volume (VAV) boxes and fan-powered boxes should not be located in these spaces. Instead, the elements should be located over less sensitive spaces, which may include corridors, storage rooms and restrooms.

Section 14.2 Sound Enhancement:

Consider sound enhancement (voice amplification) in all instructional areas which would include wireless microphones and speakers.

Section 14.3 Rehearsal Rooms:

Sound insulation of music rehearsal rooms should be provided so that normal rehearsal room sound will not produce a noise level of more than 35 db in adjacent classrooms, libraries, other music rehearsal rooms, and auditoriums.

Section 14.4 Special Education:

At least one room for speech training and hearing testing should be isolated from outside sound and have an ambient noise level of less than 25 db.

Dunbar High School
Washington, DC

7.3 T.C. WILLIAMS ATHLETIC PROGRAMS

The following T.C. Williams Athletic Programs information was provided by ACPS and demonstrates the variety of locations in which the high school sports practices and games are currently held.

2020-2021 SEASON

FALL SPORTS:
Football - Varsity/JV will practice @ Hammond Turf Field M-F 3:30pm-6:30pm & Sat. 8:00am-12:00pm
Freshman Football will practice @ Chinquapin Circle Field M-F 3:30pm-6:30pm

Fr/JV Football will each play 3 Home Games @ George Washington (Field w/ Goal Posts) 5pm-6:30pm

Field Hockey will practice @ Minnie Howard M-F 3:30pm-6:00pm & will also play games there 6pm-9:30pm

Volleyball will practice and play their games @ T.C. Main Gym

Cross Country will practice @ Chinquapin (Field by the Rocks) M-F 3:30pm-6:30pm & Sat 8am-12pm

Cheer will practice @ T.C. Small Gym M-F 3:30pm-6:30pm

Golf will practice and play their matches off site

WINTER SPORTS:
Swim/Dive: will practice @ Chinquapin M-F 3:30-5:30pm
*All Meets will be scheduled off site

Boys and Girls Basketball:
Will practice @ T.C. Main Gym & George Washington (FR Boys) M-F 3:30pm-8:30pm *GW will only require 3:30pm-6:00pm practice time!
*All Home Games will be played @ T.C. Main Gym 4pm-10pm

Gymnastics - practice & meets off site

Wrestling : practice will be held in T.C. Wrestling Room M-F 3:30pm-6:30pm & Sat 8am-12pm
Home Matches will be in T.C Main Gym 5:30pm-9:30pm

Indoor Track: will Practice in T.C. Small Gym & outside if weather permits

Cheer: will practice in T.C. Dance Room M-F 3:30pm-6:30pm

SPRING SPORTS:
Boys Lacrosse: will practice @ Hammond Turf Field M-F 3:30pm-6:30pm & Play their games @ Minnie Howard 5pm-9:30pm

Girls Lacrosse: will practice M-F 3:30pm-6:00pm & play their games 6:00pm-9:00pm at Minnie Howard

Boys & Girls Soccer will Require 2 Fields @ Witter Field to Practice M-F 3:30pm-6:00pm and also play their scheduled home games on 1 Field @ Witter Field 4pm-9pm (Normally they play games at T.C. Main Field)

Baseball: will practice and play their games @ Simpson Field M-F 3:30pm-6:30pm & Sat 8am-12pm

Softball: will practice & play their games @ Witter M-F 3:30pm-6:30pm & Sat 8am-12pm

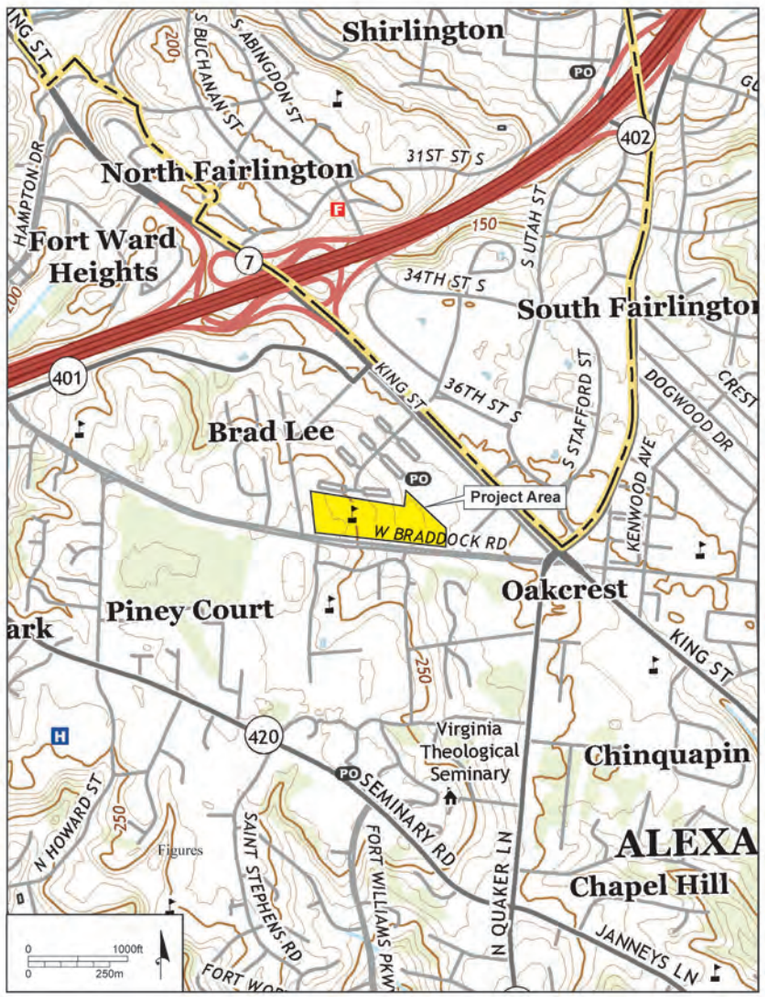
Boys and Girls Rugby: will practice at Chinquapin Circle Field M-F 3:30pm-6:30pm & Sat 8am-12pm
They will play their home games @ GW (Field w/ goal posts) 5pm-7pm

Outdoor Track is TBA - hoping to be able to practice @ Episcopal HS & Wakefield HS
*All Meets will be scheduled off site.(Normally they practice and have meets at T.C. Main Field)

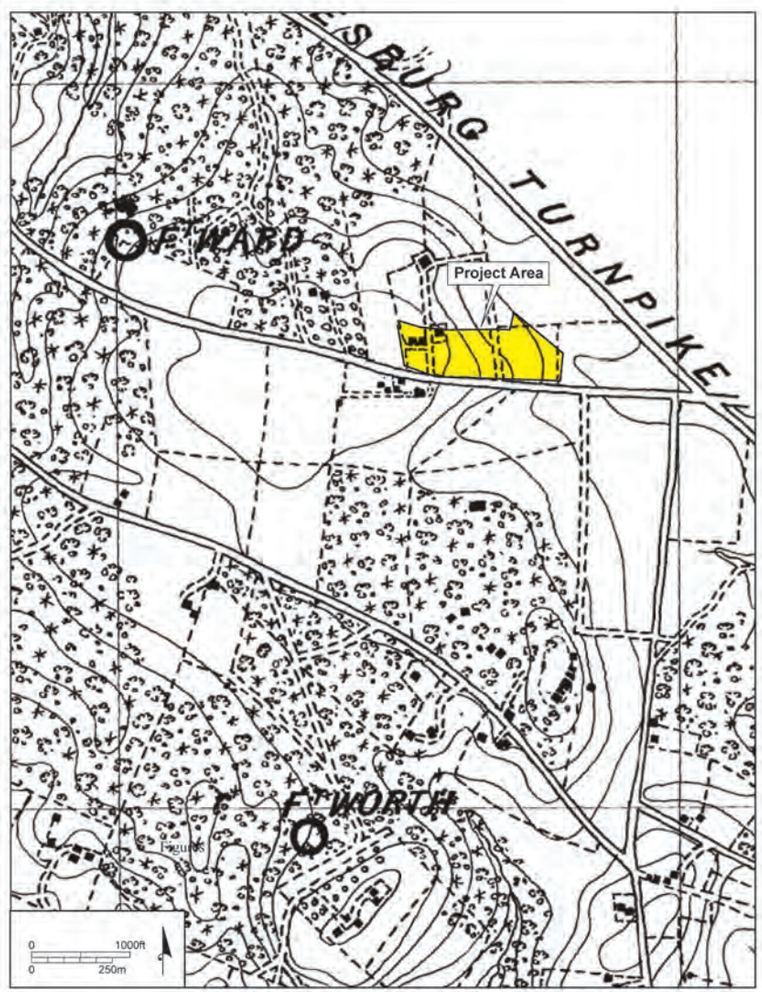
7.4 ARCHAEOLOGICAL STUDY

The full Documentary Study and Archaeological Assessments by Commonwealth Heritage Group will be provided during Schematic Design phase under separate cover. The following pages include images from the study.

2019 USGS Map with school site overlayed.
(USGS 2019), Provided by Commonwealth Heritage Group

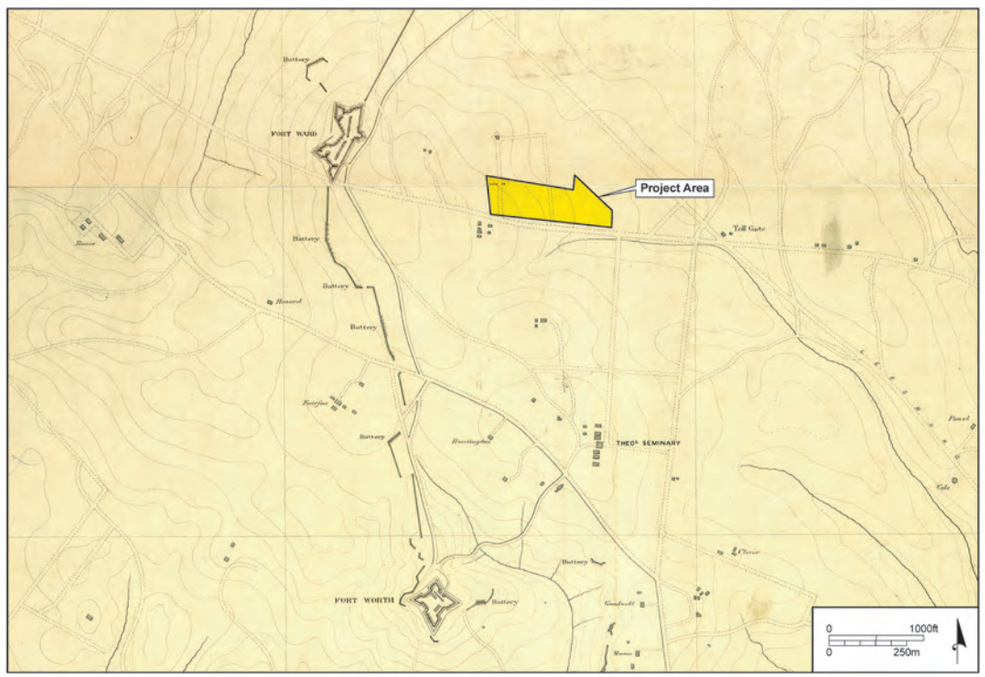


1862 U.S. Coast Survey Sketch of the Battlefield and Confederate Works with school site overlayed.
(U.S. Coast Survey 1862), Provided by Commonwealth Heritage Group

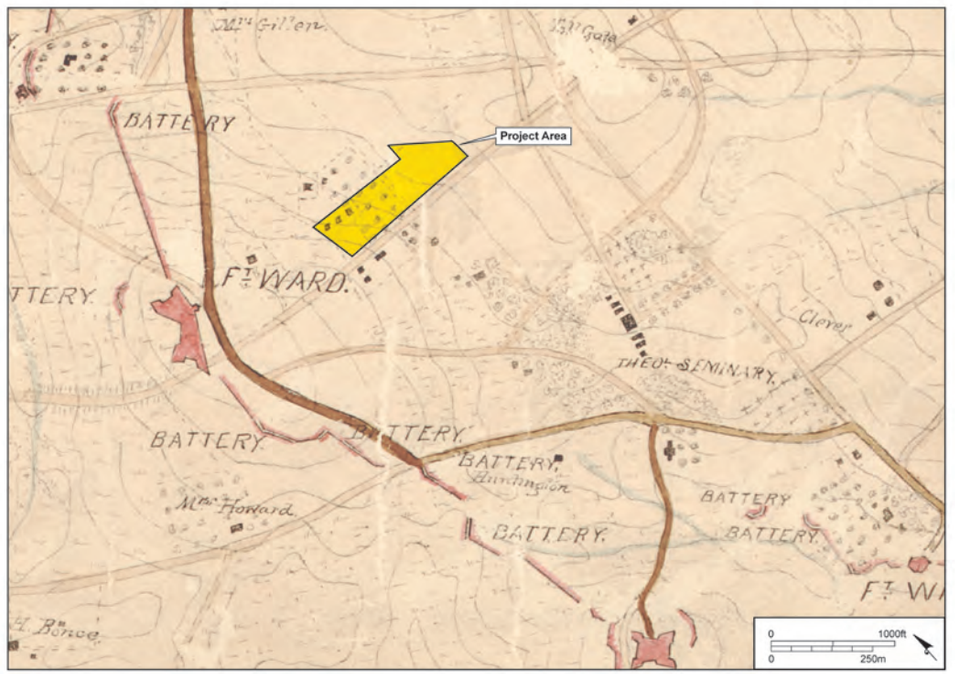


7.4 ARCHAEOLOGICAL STUDY

1865 Defenses of Washington Plates 3 and 4 Map with school site overlayed.
(U.S. Engineers Bureau 1865), Provided by Commonwealth Heritage Group

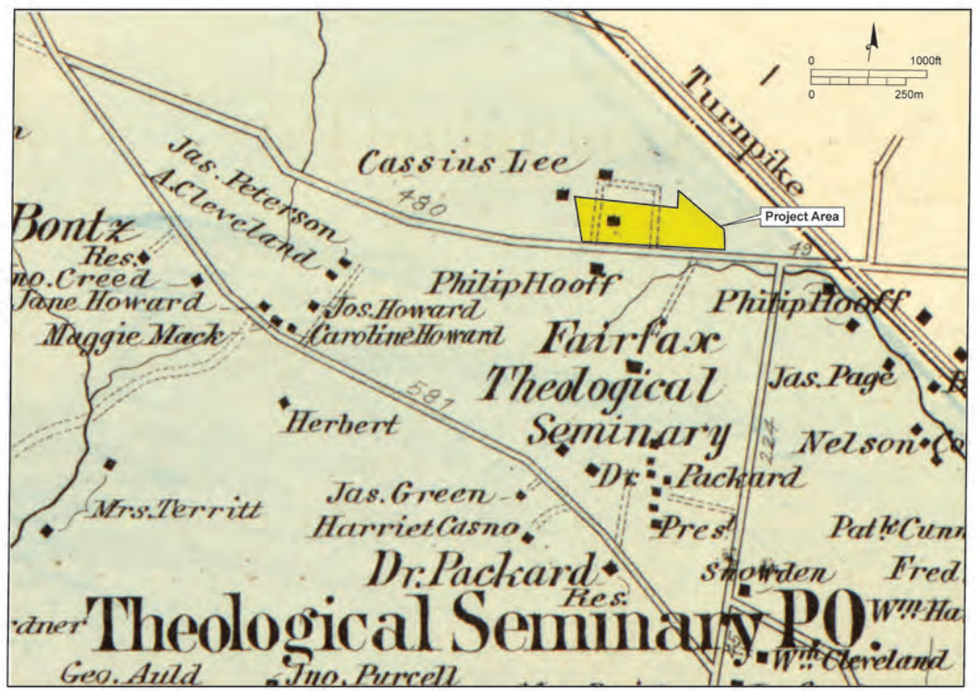


1865 Map of the Environs of Washington with school site overlayed.
(U.S. Coast Survey 1865), Provided by Commonwealth Heritage Group

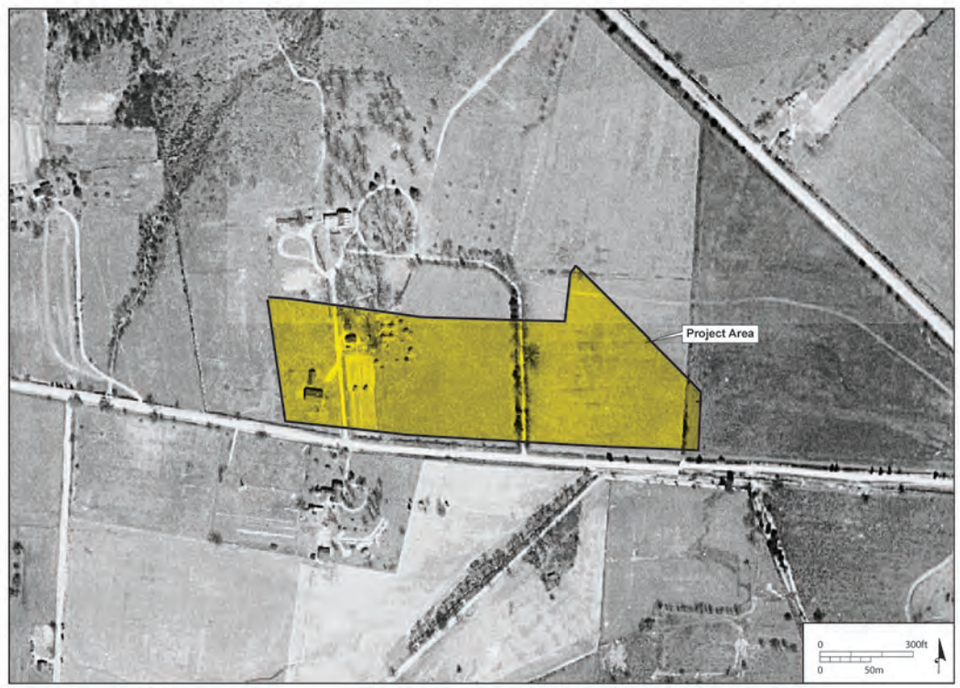


7.4 ARCHAEOLOGICAL STUDY

Hopkins' 1878 Map with school site overlayed.
(Falls Church Dist., No. 4, Fairfax Co., from his Atlas of 15 mi. around Washington, D.C., including the county of Prince George, MD), Provided by Commonwealth Heritage Group

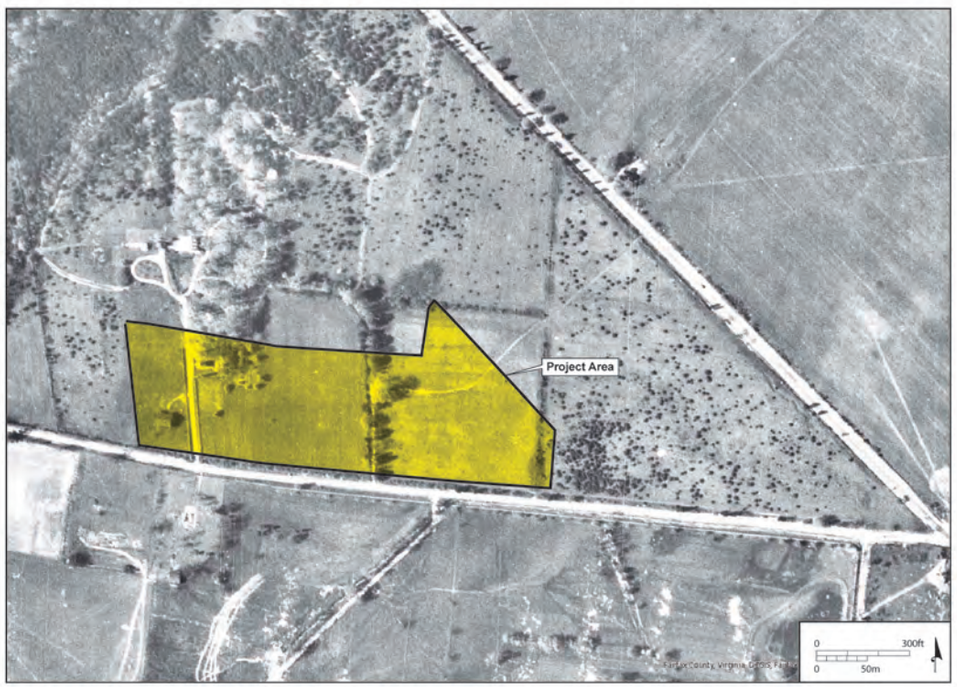


1927 Aerial Photograph with school site overlayed.
(Alexandria Archaeology 2021), Provided by Commonwealth Heritage Group

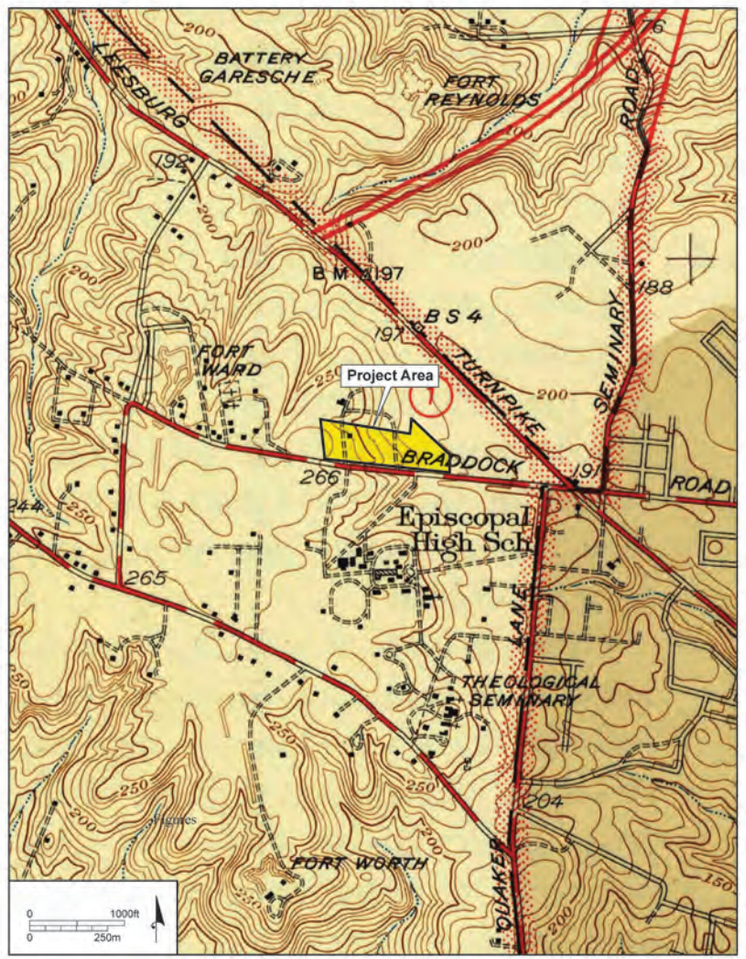


7.4 ARCHAEOLOGICAL STUDY

1937 Aerial Photograph with school site overlayed.
(Fairfax County Historical Imagery Viewer 2021), Provided by Commonwealth Heritage Group



1945 USGS Map with school site overlayed.
Provided by Commonwealth Heritage Group



ACPS Stakeholder Engagement

7.5 MEETINGS

PROJECT MEETINGS

The following is a list of meetings that have occurred with ACPS Leadership, stakeholders, and City Agencies since our design team began this project through March 26, 2021. Internal A/E design team meetings (including design, programming, A/E team, budget, schedule, and daily architectural team meetings) are not included.

NOVEMBER 2020

11/23 EDT and THSP Space and Site Program Overview

11/24 EDT and THSP Space and Site Program Overview

DECEMBER 2020

12/4 Design Contract Kick Off Status and Planning

12/7 THSP - Core Team Project Weekly Progress Meeting

12/8 School Space Team A/E Kick Off Prep

12/8 School Space Team A/E Team Orientation and Kick Off

12/9 Affordable Housing Site Planning and Design Assumptions

12/9 Zoning Informal Meeting

12/9 THSP Design and DSUP Schedule Meeting

12/9 EDT Meeting – SLC's

12/10 School Scheduling Meeting w/ ACPS Leadership-School Scheduling Associates

12/14 THSP - Core Team Project Weekly Progress Meeting

12/15 Program Verification Status and Outstanding Questions

12/16 Fields and Athletic Spaces Requirements Confirmation

12/16 Planning & Zoning/ACPS Bi-Weekly Meeting

12/16 Focus Group Meeting - Big Picture Questions

12/17 School Scheduling Meeting w/ TCW - School Scheduling Associates

12/18 Focus Group Meeting

12/18 THSP CTE Programs and Spaces

12/18 Project Progress Meeting

12/21 School Scheduling Meeting w/ TCW - School Scheduling Associates

JANUARY 2021

1/4 THSP - Core Team Project Weekly Progress Meeting

1/4 School Scheduling Meeting w/ TCW Admin - School Scheduling Associates

1/5 ACPS - Arch Weekly Design Coordination Meeting

1/5 Energy Savings Performance Contract (ESPC) Meeting

1/6 Public Open Space (POS) Meeting

1/6 Test Fits Meeting w/ P&Z, T&ES, RPCA, and Housing

1/7 P&Z CIDR Introduction Meeting

1/7 School Scheduling Meeting w/ TCW - School Scheduling Associates

7.5 MEETINGS

1/8 Project Schedule Meeting

1/8 School Scheduling Meeting w/ TCW LT-School Scheduling Associates

1/8 School Scheduling Meeting w/ TCW LT-School Scheduling Associates

1/8 School Scheduling Meeting w/ TCW LT-School Scheduling Associates

1/8 Budget Meeting

1/11 THSP - Core Team Project Weekly Progress Meeting

1/11 EDT Strategy Meeting

1/12 ACPS - Arch Weekly Design Coordination Meeting

1/13 Planning & Zoning/ACPS Weekly Meeting

1/13 Contract-Consultant Meeting

1/13 EDT Meeting (group 1-design patterns, group 2-school scheduling)

1/14 School Scheduling Meeting w/ TCW - School Scheduling Associates

1/15 EDT Recap and Next Steps Meeting

1/15 King Street Campus – Site Visit/Tour

1/19 ACPS - Arch Weekly Design Coordination Meeting

1/20 EDT Full Group Meeting

1/20 Alexandria Health Department Meeting

1/20 EDT Focus Group Meeting

1/21 Senior Leadership Team (SLT) Meeting

1/21 EUI, PV, Roof Area, and Housing Meeting

1/21 School Board Work Session (Information on colocation)

1/25 THSP - Core Team Project Weekly Progress Meeting

1/25 THSP Community Meeting

1/26 ACPS - Arch Weekly Design Coordination Meeting

1/26 School Scheduling Meeting w/ TCW - School Scheduling Associates

1/27 Planning & Zoning/ACPS Weekly Meeting

1/28 Special Education Requirements for THSP Meeting

1/28 Library Requirements for THSP Meeting

1/28 Counselor/College Career Center/Scholarship Fund of Alexandria for THSP Meeting

1/29 Department of Community and Human Services (DCHS) Space Requirements Meeting

1/29 International Academy Space Requirements Meeting

FEBRUARY 2021

2/1 THSP - Core Team Project Weekly Progress Meeting

2/2 ACPS - Arch Weekly Design Coordination Meeting

2/3 Planning & Zoning/ACPS Weekly Meeting

2/4 School Board Meeting – Co-location Decision on Housing

7.5 MEETINGS

2/5 THSP Prep for Staff Meetings w ACPS

2/5 Review of ACPS' comments on Comprehensive Program/Ed Spec Draft

2/8 THSP - Core Team Project Weekly Progress Meeting

2/9 Prep/Sync for EDT Meeting

2/9 Parking Requirements Meeting w/ TCW and RPCA

2/9 ACPS - Arch Weekly Design Coordination Meeting

2/10 Planning & Zoning/ACPS Weekly Meeting

2/10 Budget Review Meeting

2/10 EDT Meeting

2/16 ACPS - Arch Weekly Design Coordination Meeting

2/17 Planning & Zoning/ACPS Weekly Meeting

2/17 Planning & Zoning/ACPS Weekly Meeting

2/17 THSP Prep for School Board Work Session

2/18 Prep for EDT Meeting

2/18 ACPS Review of Ed Spec Updated Submission 2 and School Scheduling

2/18 Dry Run for School Board Work Session

2/18 School Board Work Session (Inform Ed Spec)

2/19 Prep for Teacher and Student Feb 22 Meetings

2/22 THSP - Core Team Project Weekly Progress Meeting

2/22 T.C. Williams Teacher Feedback on Ed Spec - Session 1

2/22 T.C. Williams Teacher Feedback on Ed Spec - Session 2

2/22 T.C. Williams Teacher Feedback on Ed Spec - Session 3

2/22 T.C. Williams Student Feedback Session

2/22 Prep for EDT Meeting

2/22 Student Participation Planning

2/23 EDT Meeting Preparation/Dry-Run

2/23 ACPS - Arch Weekly Design Coordination Meeting

2/23 Science Classroom Inventory and Feedback on Adequacy

2/24 IT Services Focus Group Meeting

2/24 P&Z Weekly Design Coordination Meeting

2/24 Maintenance and Custodial Services Focus Group Meeting

2/24 EDT Meeting

2/25 Food Service/Dining Commons Focus Group Meeting

2/25 Fairlington Town Association Meeting – Project Update

2/26 Science Focus Group Meeting

2/26 Check-In School Board 2x2 Feedback for Ed Spec Submission

7.5 MEETINGS

MARCH 2021

3/1 THSP - Core Team Project Weekly Progress Meeting

3/2 ACPS - Arch Weekly Design Coordination Meeting

3/2 CTE Labs Focus Group Meeting

3/3 P&Z Weekly Design Coordination Meeting

3/3 Arts and Assembly Focus Group Meeting

3/3 Planning for EDT 3/10 Meeting

3/3 Administration Spaces Focus Group Meeting

3/3 Physical Education Focus Group Meeting

3/3 School Board Work Session (Ed Spec)

3/4 Peer Review Meeting

3/4 Safety & Security Focus Group Meeting

3/4 School Board Meeting (Ed Spec Decision)

3/5 March 8 Community Meeting Presentation Review

3/5 Cost Estimates for Concept Designs

3/8 THSP - Core Team Project Weekly Progress Meeting

3/8 March 8 Meetings Sync

3/8 Kick-Off Webinar Dry Run

3/8 THSP Superintendent's Advisory Team Meeting

3/8 Community Design Kick Off Meeting

3/9 ACPS - Arch Weekly Design Coordination Meeting

3/10 P&Z Weekly Design Coordination Meeting

3/10 EDT Meeting

3/11 Concept Design Submittal Review and SB Presentation Draft

3/11 Contract Comments Review Meeting

3/11 Aquatic Facility Program Requirements

3/12 DCHS Co-located Space Programming and Funding Meeting

3/15 THSP - Core Team Project Weekly Progress Meeting

3/15 Community & Superintendent's Advisory Team Presentations and Formats Prep

3/16 Green Building Meeting

3/16 Safety & Security and Transportation Meeting – Design Concepts Review

3/16 ACPS-Arch Weekly Design Coordination Meeting

3/16 School Space Team Meeting – Design Concepts Review

3/16 Community & Superintendent's Advisory Team Presentations Prep

3/16 Community Meeting – Design Concepts Presentation

3/16 Superintendent's Advisory Team Meeting - Design Concepts Review

7.5 MEETINGS

3/17 P&Z Weekly Design Coordination Meeting

3/18 School Board Work Session Meeting (Inform - Design Concepts)

3/19 Planning for 3/23 CTE Advisory Committee Meeting

3/22 THSP - Core Team Project Weekly Progress Meeting

3/23 ACPS-Arch Weekly Design Coordination Meeting

3/23 CTE Advisory Committee Meeting Prep

3/23 CTE Advisory Committee Meeting

3/23 Peer Review Meeting #2

3/24 EDT Meeting Prep

3/24 P&Z Weekly Design Coordination Meeting – Design Concepts Review

3/24 EDT Meeting – Design Concepts Review

3/25 Community and Superintendent's Advisory Team Meeting Prep

3/25 School Space Team Meeting – Design Concepts Review

3/25 Community and Superintendent's Advisory Team Meeting Dry Run

3/25 Community Meeting – Design Concepts Presentation

3/25 Superintendent's Advisory Team Meeting – Design Concepts Review

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