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OTTOSON MIDDLE SCHOOL
STUDY FOR ADDITION
ARLINGTON, MA

APRIL 25, 2016

HMFH ARCHITECTS

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Acknowledgement

Study Team

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McPhail Associates, LLC Geotechnical Engineer

Introduction

The Ottoson Middle School is located at 63 Acton Street on a 7.15-acre parcel of land. It is located in a residential neighborhood, adjacent to Town-owned woods (Cusher Lot) and St. Athanasius Greek Orthodox Church. The school is accessed from both Acton Street and Appleton Place. The building was originally constructed in 1921 and expanded in 1996 and is approximately 154,380 square feet in total. The school currently accommodates just over 1,100 students in grades six through eight. The building is constructed into the hillside, with the main entry and parking lot off of Acton Street and a second parking lot and play field accessed from Appleton Place. There is a 52-foot grade change from one side of the property to the other. There are four occupied floor levels (one of which is double-story), the upper parking accommodates 51 cars (3 of which are accessible spaces) and the lower parking lot accommodates 25 cars for a total of 76 parking spaces on site.

The middle school is currently crowded and its student population is projected to increase. The intent of this study is to define an educational program for an addition to Ottoson, develop addition floor plan diagrams, review the existing building condition and identify code and program-related renovation scope of the existing school. This report includes floor plan diagrams and scope narratives used together by a cost estimator to develop a study-level cost estimate.

Educational Program

The proposed addition accommodates the core academic spaces for the sixth grade population (a maximum of 500 students). The proposed space program and layout was developed with the School Administration and for this study purpose includes four academic pods, specialist spaces, break out areas, and support spaces. Refer to **Appendix A** for the Addition Space Program and **Appendix B** for the Addition Floor Plan diagrams.

Addition Architectural Scope

Two addition options were initially developed, one located on the upper parking lot (off Acton Street) and the other on the sports field near Appleton Place. In both, the addition proposed is approximately 40,000 square feet, mostly on two floors with a partial lower floor level for vertical circulation and mechanical space. In both instances the lowest academic floor level is located a floor (or more) above grade to allow for, in the case of the upper lot, parking and the bus drop-off loop to be maintained, and in the case of the Appleton Place location, to align the addition with an occupied floor of the existing school to create the required physical connection. In the instance of the Appleton Place Addition, the raised building would allow for a multipurpose, alternative PE space and increased parking (17 additional spaces) underneath in lieu of the sports field currently in this location.

After thoughtful review by the School Building Task Force it was deemed best to focus the study on one option, the one located on the Appleton Place side of the building. The reasons cited to eliminate the upper parking lot location option from consideration were:
-it encroaches on the upper ballfield, which is not school property
-it needs to be two-plus stories high above the ground to accommodate buses and to meet an existing floor level
-it would require demolishing and rebuilding an existing stair to allow for an accessible connection
-it would create a long and convoluted walking route for a student to reach the three main shared use spaces (Gym, Library, and Cafeteria) in the existing building

Addition Floor Plan diagrams are located in **Appendix B** along with a Building Section diagram showing the top floor of the addition connecting to the lowest level of the existing school at two locations to either side of the Blue Gym. The addition needs to be constructed a minimum of 30'-0" away from the existing building, which places the addition near the property line.

The proposed addition requires lowering the grade by approximately 4'-0" so it is in line with Appleton Street, increasing the need for retaining walls between the existing building and the new addition. The existing parking lot is to be regraded to align with the new, and it is likely that either a low retaining wall along the existing parking lot area or full regrading of the sloped earth is required. Refer to **Appendix C** for the Structural Narrative. All other scope for the addition is presumed (and estimated) to be in line with new construction practices and similar to the recently constructed school in Town.

Renovation Architectural Scope

Educational Program-Related:
In order to accommodate the anticipated increased enrollment, the shared use program spaces within the existing Ottoson building were assessed to determine if they are large enough and/or that there are enough program spaces available for teaching and learning to occur for the nearly 1,500 projected students. Working with the School Administration, it is determined that the following spaces need to be enlarged:

-Cafeteria – remove the wall between the Cafeteria and the adjacent Music Classroom to enlarge the Cafeteria by 1,250 square feet, increasing the total Cafeteria (not including the entry and serving line area) to approximately 5,700 square feet. At this size, four (4) lunch periods are required to serve the student population. Note: existing deteriorating handrails are to be replaced.

-Library – removal of some if not all of the interior partitions to either side of the library, thereby extending not only the circulation but the whole Library space from corridor to corridor to create a Library of approximately 8,500 square feet. (For reference, MSBA (Massachusetts School Building Authority) Guidelines would recommend a 9,000-square foot Library for this size student population). Revisions to the lighting and power/data layouts, and new carpeting are required.

In this Study the addition is assumed to be for the sixth grade population and the seventh and eighth grades are to remain in the existing school. Each grade requires four academic pods, each made up of three general Classrooms and one Science Classroom. The following shared use program spaces are required:
-3 Music Classrooms
-3 Art Classrooms
-3 Technology Classrooms
-3 Family & Consumer Science Classrooms
-7 World Language Classrooms
-2 Computer Classrooms

There are many other specialist and support spaces that may stay in their current location and others that relocate to newly vacated spaces. These spaces include: teacher workrooms, offices, specialist spaces, conference rooms, transition rooms, METCO, LABBB, in-house suspension, administration, guidance, and nurse.

Renovation scope required to create the following program spaces:
-1 Music Classroom: remove walls, revise lighting layout
-1 Art Classroom: add sinks and casework
-2 Science Classrooms: add sinks, casework, fume hood, eyewash/shower station, and utility connections
-2 Computer Classrooms: add power/data connections

Refer to **Appendix D** for floor plan Renovation Diagrams identifying a proposed program layout and reconfiguration for Ottoson.

As proposed, the addition with an accessible entry, toilet facilities, and circulation, is considered a separate building from the existing school and therefore no access-related renovations are required in the existing school.

Other:
The operable walls in the Blue Gymnasium do not function properly. Having functioning operable walls allow for simultaneous use of the Gym and therefore supports scheduling and multi-purpose activities. The renovation estimate includes two new operable walls at the Blue Gym.

Conclusion

A feasibility study level estimate developed from the information and scope provided in this report is included in **Appendix E**. The construction cost equals $19.0 million, applying a 20% factor for soft costs (design, investigation, testing, etc.), the estimated total project cost is $22.8 million.

Appendix A

Space Program

Addition Space Program

Room Type	SF	# of Rms	Area	Notes
General Classroom	850	12	10,200	
Science Classroom	1,300	4	5,200	
Break out	540	4	2,160	
ELL	850	1	850	
Specialist Room	1,060	2	2,120	
Specialist Room	850	1	850	
Specialist Room/Small Group	190	4	760	
Multipurpose Room/ Alt PE	2,000	1	2,000	
Administration/Nurse	850	1	850	
Guidance/Social Worker	850	1	850	
Teacher Workroom	190	2	380	
Building Storage	100	4	400	
TOTAL NET SQUARE FEET			26,620	
Net-to-Gross Factor			1.49	
TOTAL GROSS SQUARE FEET			39,580	

Appendix B

Floor Plan Diagrams &
Building Section

OTTOSON SCHOOL
PARKING LEVEL

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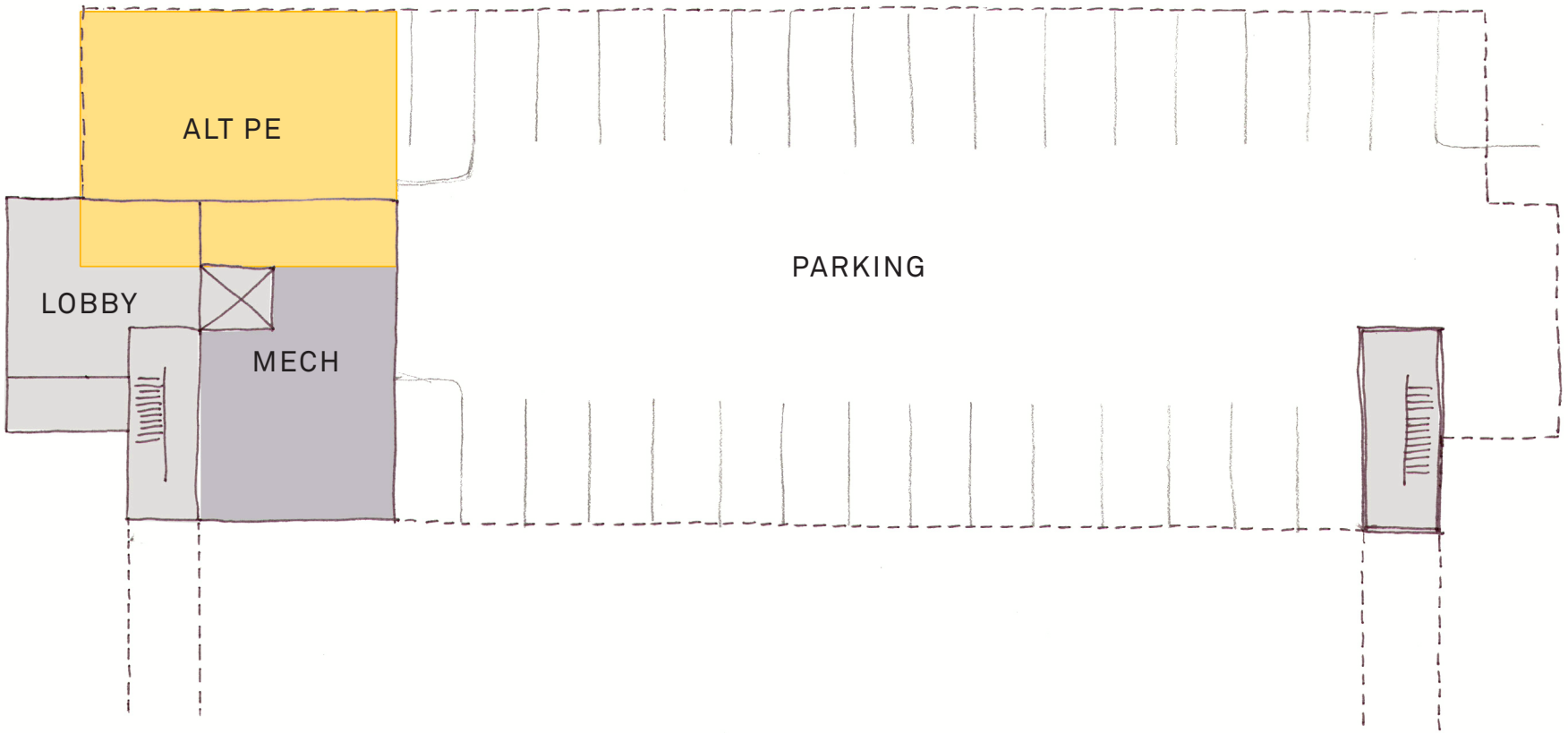

OTTOSON SCHOOL
FIRST FLOOR

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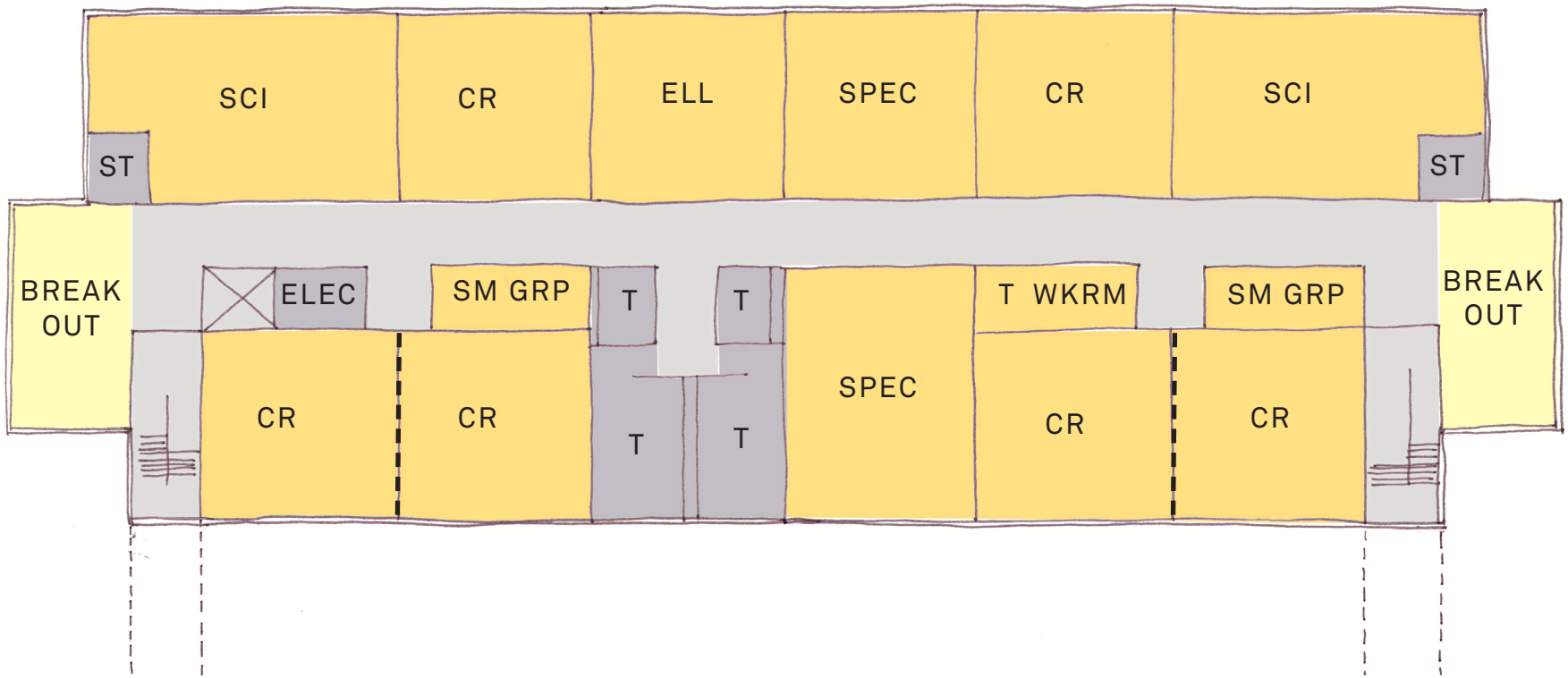

OTTOSON SCHOOL
SECOND FLOOR

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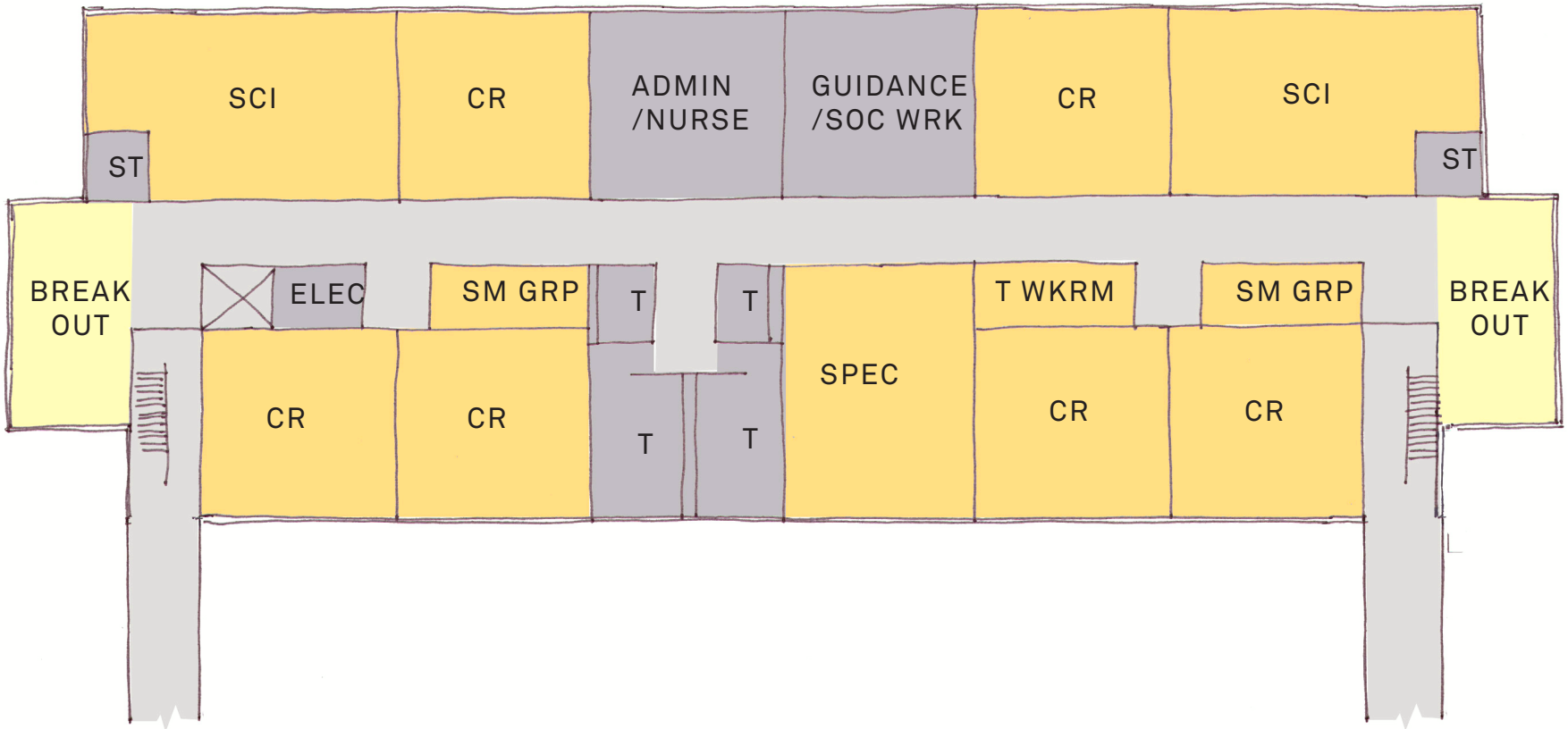
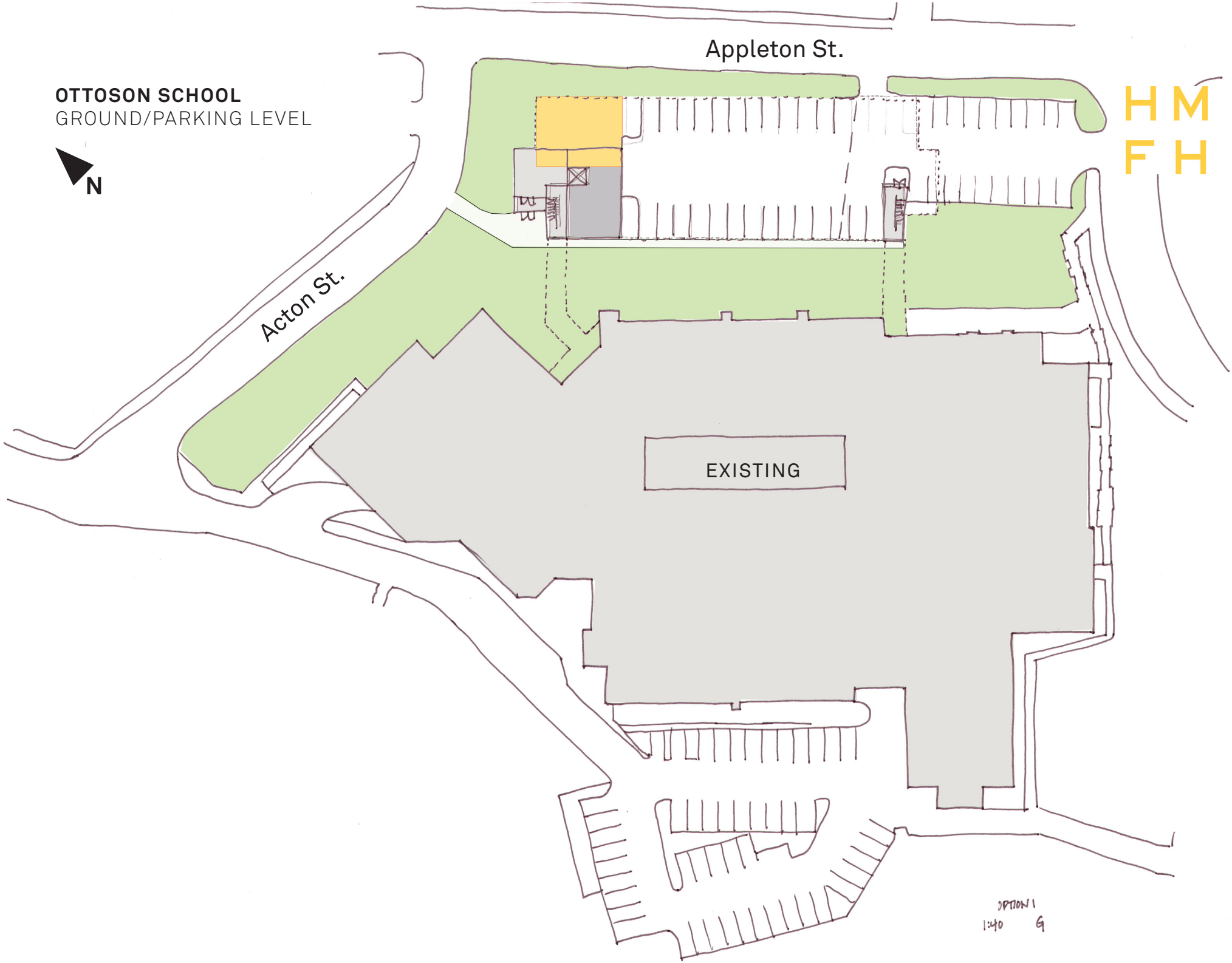


OTTOSON SCHOOL
GROUND/PARKING LEVEL



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FIRST FLOOR

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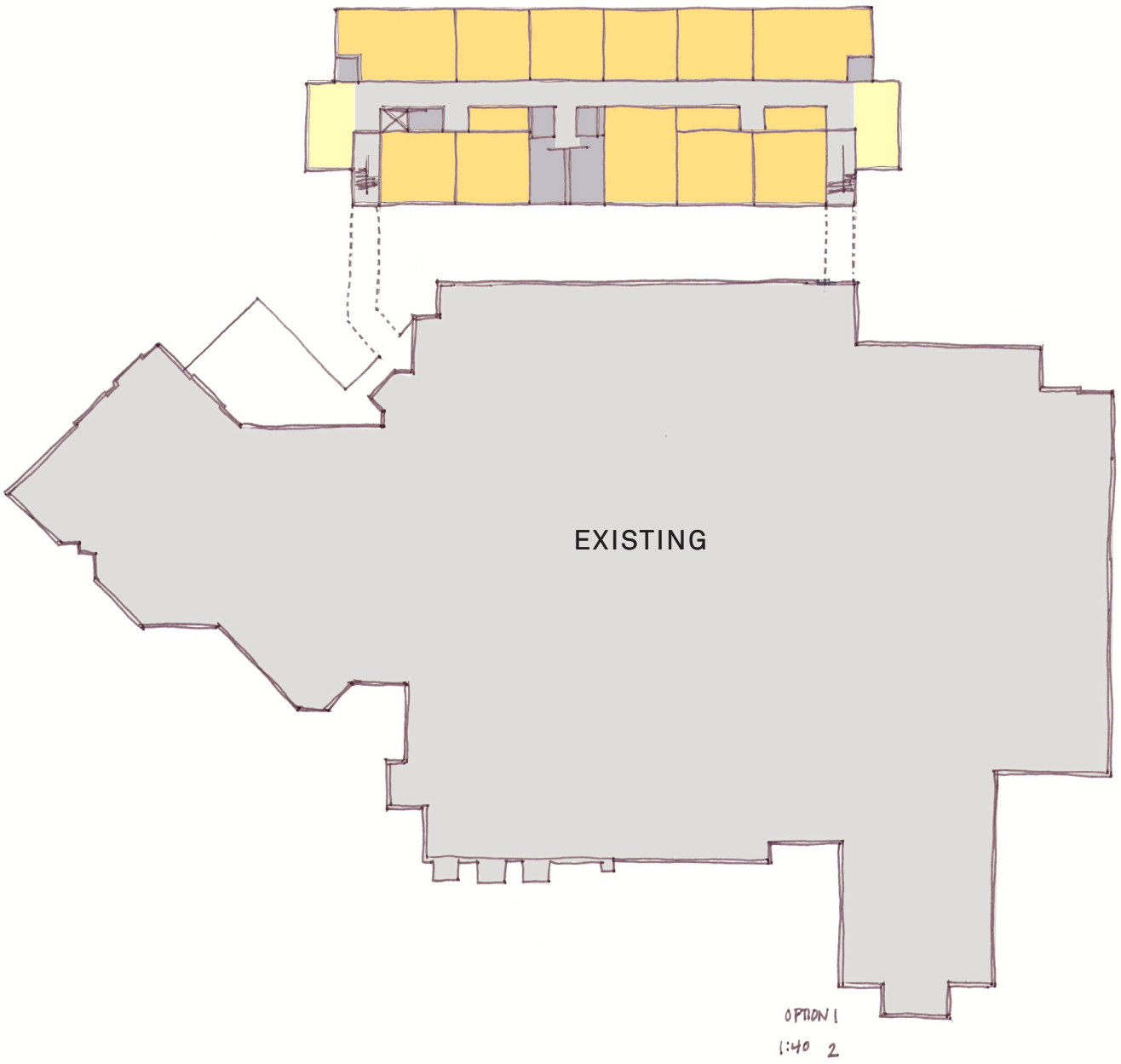

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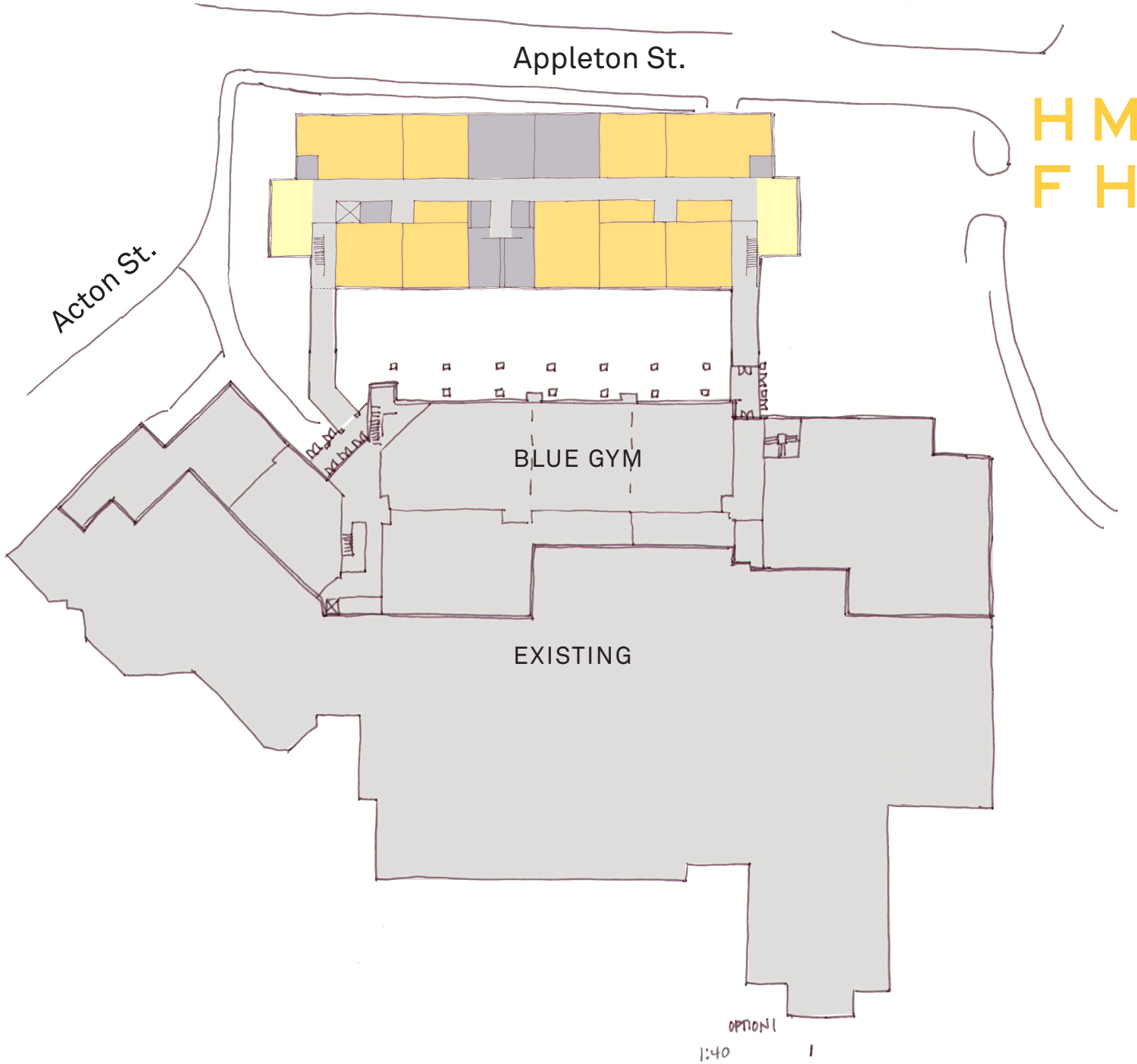

OTTOSON SCHOOL
SECTION

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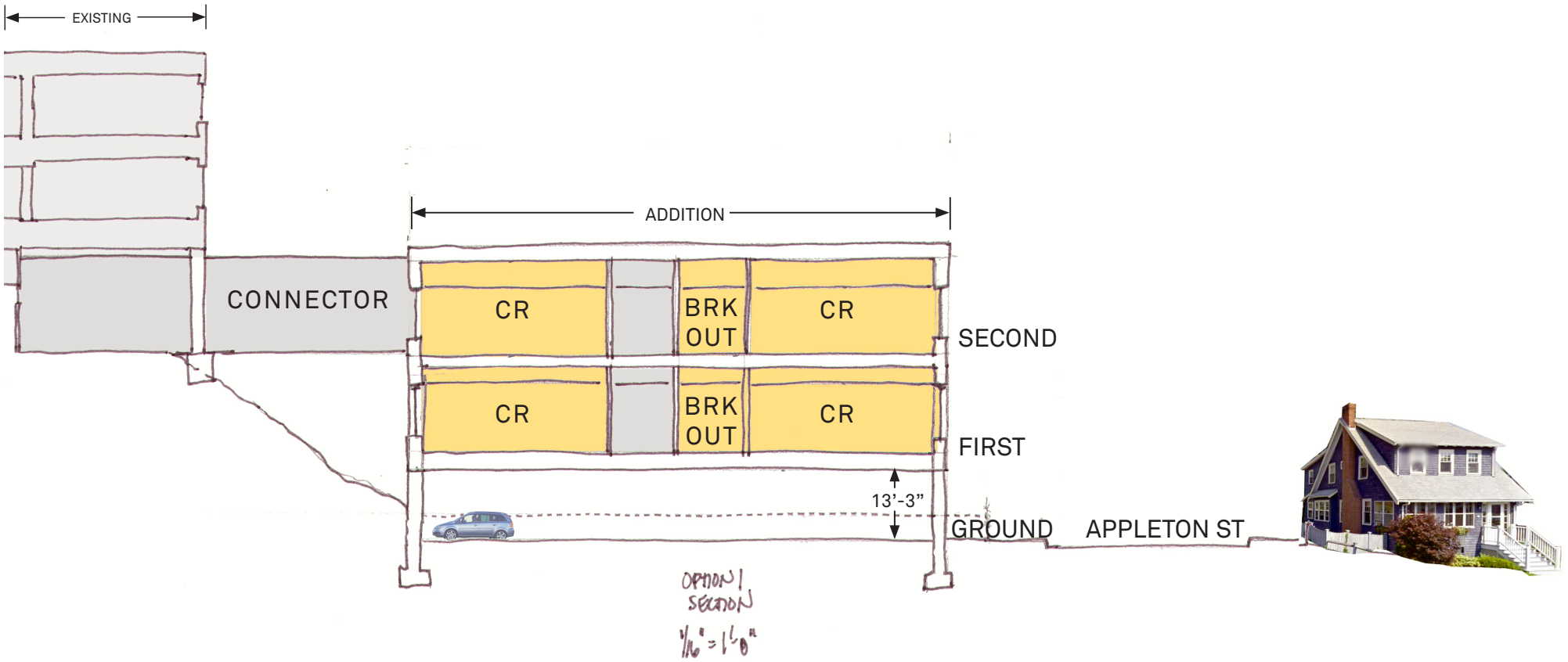

Appendix C

Addition Study –
Structural Narrative

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OTTOSON MIDDLE SCHOOL ADDITION STUDY
Arlington, Massachusetts

Structural Narrative
April 7, 2016

INTRODUCTION

Foley Buhl Roberts & Associates, Inc. (FBRA) is collaborating with *HMFH Architects, Inc. (HMFH)* and their consultants in the study of a potential addition to the Ottoson Middle School in Arlington, MA. The purpose of this narrative is to summarize the basis of the structural design, describe the primary structural systems of the potential, new addition and provide preliminary structural quantities for cost estimating purposes. Outline Structural Specification sections have also been included. The new addition would be designed and constructed under the provisions of the Massachusetts State Building Code (780 CMR – Eighth Edition).

I. GENERAL DESCRIPTION

The Ottoson Middle School, located at 63 Acton Street in Arlington, is a three-story building, constructed on a sloping site (downwards southwest to northeast). The potential, two-story (plus a Parking Level), flat roof addition would be constructed on the northeast (back) side of the existing building on a level playing field area located on Appleton Place.

Program elements for the addition would include a surface Parking Level (Elevation 146.25'+/-), serviced by two stairways and an elevator. An Entry Lobby and a small Mechanical Room would also be located at this level. Classrooms with Breakout Areas would be located at the First Floor (Elevation 150.25'+/-); Classrooms, Breakout Areas and Admin/Nurse/Guidance Offices would be located at the Second Floor (Elevation 174.25'+/-). The total floor area of the addition is approximately 40,000 square feet (gross; excluding parking areas), with a building footprint of approximately 17,600 square feet. Two, one-story, elevated walkway/bridges will be constructed at the east and west ends of the addition (stair locations), linking the Second Floor of the addition to the lowest level of the existing building (Elevation 174.25'+/-).

The addition would be steel framed, for reasons of economy, performance, flexibility, and speed of construction. Typical floor construction would be a concrete slab on composite steel deck, supported by composite, structural wide flange steel beams and girders. Shear studs would be field welded to the beam/girder flanges to achieve composite action with the floor slab. Typical flat roof areas would be framed with steel roof deck supported by structural steel beams and girders. A concrete slab on composite steel floor deck would be provided at rooftop equipment areas (for acoustic purposes).

Typical columns would be rectangular hollow steel tube (HSS) sections. Lateral stability for wind and seismic loads would be provided by steel bracing in each direction at each level (including the Parking Level as well). Structural bays would be approximately 30 feet square.

The new, steel framed construction would be classified as Type IIB (Noncombustible, Unprotected); floor and roof construction would not require fire protection. Typical, non-exposed floor and roof steel framing would be surface prepped and be left unprimed. Structural steel exposed to view in the finished work (limited areas; potentially the Entry Lobby) would be classified as Exposed to View Structural Steel (E.V.S.S.) and would be shop primed with primer compatible with the finish paint.

No subsurface soils information was available; however, based on recent discussions with the Geotechnical Engineer (McPhail Associates, LLC) rock is present at the site. Foundations for the 1996 addition (adjacent to the potential new addition) consist of caissons bearing on rock at Elevation 140.0'+/-. It is expected that the top of rock elevation slopes downwards towards Appleton Place and will not impact the foundation construction of the addition. Accordingly, foundations are expected to be conventional, shallow spread footing construction; typically bearing on undisturbed natural soils overlying the rock. The current grade at the addition site is Elevation 150.0'+/-, which is approximately 4 feet above Appleton Place. The existing fill in this area will need to be removed to accommodate the Parking Level and the building foundations, which will be located at Elevation 42.0'+/-. Parking Level construction will be a bituminous concrete slab. A conventional concrete slab on grade, underlain by a polyethylene vapor barrier and rigid insulation on a compacted slab base fill, will be constructed in the occupied areas at this Level (Entry Lobby, Mechanical Room, Stairwells, etc.). Existing utilities, if present within the addition footprint, will be removed and relocated to accommodate the new construction.

Exterior wall construction will be a mixture of glazing and steel stud cavity wall construction with a masonry veneer. Galvanized steel loose lintels will be provided at the heads of typical, punched window openings in the masonry veneer. Galvanized relieving angles will be required at larger and/or multiple, minimally separated window openings, and at locations where the height of masonry exceeds 30 feet.

II. BASIS OF STRUCTURAL DESIGN

Codes and Design Standards

Building Code: Massachusetts State Building Code (780 CMR) – 8th Edition.

Materials: ASTM; applicable standards

Concrete: ACI 318 and ACI 301; latest editions.

Structural Steel: AISC "Specification for Structural Steel Buildings" and AISC "Code of Standard Practice"; latest editions.

Steel Deck: Steel Deck Institute (SDI) – Referenced Standards.

Design Loads/Parameters

Live Loads:

Classrooms (with partition allowance):	70 PSF
Corridors (Second Floor):	80 PSF
Open Plan Areas:	100 PSF
Stairs:	100 PSF
Mechanical Areas:	150 PSF

Snow Loads (Arlington):

Basic Ground Snow Load:	40 PSF
Minimum Flat Roof Snow Load:	30 PSF

Future Photovoltaic Panel (PV) Loads:

Flat Roof:	10 PSF

Wind Loads (Arlington):

Wind Speed:	105 MPH

Seismic Parameters (Arlington):

Spectral Response – Short Periods:	S_S = 0.290g
Spectral Response – 1-Second Periods:	S_D = 0.069g
Seismic Use Group:	III
Seismic Design Category:	B
Site Class:	C (Assumed)
Structural System:	Building Frame System
Lateral Load Resisting System:	Steel Braced Frames (*Not Specifically Detailed for Seismic Resistance*)
Response Modification Factor (R):	3.0
System Overstrength Factor (Ω_0):	3.0
Deflection Amplification Factor (C_d):	3.0

Foundations:

The preliminary foundation design is based on an assumed allowable bearing capacity of 4.0 kips per square foot (2.0 tons per square foot) on undisturbed natural soils or on compacted structural fill (to be confirmed). All fill and unsuitable soils (fill, organics and loose silts, if present) will be removed and replaced with compacted structural fill, prior to constructing the foundations and the slab on grade.

Construction Classification:

New construction will be Type IIB Construction (Noncombustible, Unprotected). Floor and roof construction will typically not require applied fireproofing, except those members supporting rated enclosures. The addition will be fully sprinklered.

Sustainable Design Considerations:

Sustainable design considerations will be incorporated in the building design; the new addition will be designed and constructed in accordance with LEED (Silver) standards.

III. STRUCTURAL SYSTEMS DESCRIPTION

A. SUBSTRUCTURE

A10: Foundations

Foundations for the addition will consist of individual spread footings (at columns) and continuous strip footings (at walls). All foundation walls and footings will be cast-in-place, reinforced concrete. The preliminary foundation design is based on 4.0 kips per square foot (2.0 TSF) on undisturbed natural soils or on structural fill.

Prior to placing footings or compacted structural fill, all unsuitable soils will be removed and the natural soil layer will be proof-rolled. Any soft/unsuitable areas will be removed and replaced by compacted structural fill. If subgrades become wet, unstable, and/or difficult to proof-roll, a layer of crushed stone, underlain by a geotextile separation fabric, may be necessary. Following footing excavation, provide a 4" thick layer of ¾" crushed stone to protect the subgrade.

Due to the existing site topography, a reinforced concrete retaining wall will be required along the south (back) side of the addition, returning around the corners on the east and west ends. The existing (stepped) retaining walls to the north of the 1996 addition will be removed and a temporary lateral earth retention system (e.g. soldier piles and lagging) will be installed to facilitate the construction of the foundations. Landscaping between the addition and the existing building will need to be restored after construction is completed.

Temporary dewatering may be required during construction.

It is not expected that rock will be encountered during foundation or utility excavation.

A perimeter foundation drain will be required along the south (back) wall of the addition. Underslab drainage will be installed below the occupied areas of the Parking Level.

A1010 – Standard Foundations

- Typical perimeter frost wall: *14" thick with an 8" wide masonry shelf with horizontal and vertical reinforcing each face (4.5+/- psf). The outside surface of the perimeter foundation walls will receive a troweled-on bituminous mastic.*

- Typical perimeter frost wall continuous footing: *2'-0" wide, by 12" deep, with continuous reinforcing bars, plus dowels to the foundation wall (10.0+/- plf). The bottom of footing will be placed 4'-0" minimum below the exterior finish grade for frost protection.*

- Cantilever retaining walls (along the south/back side of the addition): *16" thick, with horizontal and vertical reinforcing each face (9.5 +/- psf). The outside surface of the cantilever foundation walls will receive a troweled-on bituminous mastic.*

- Cantilever retaining wall continuous footing: *8'-6" wide, by 1'-6" deep, with 9.5 psf reinforcing. The bottom of the footing will be approximately 4'-0" below the Parking Level bituminous concrete slab on grade.*

- Typical, average interior column footing: *10'- 0" x 10'- 0" x 2'- 4" deep, with 1000 pounds of reinforcing. The bottom of the footing will be approximately 4'-0" below the Parking Level bituminous concrete slab on grade.*

- Typical, average perimeter column footing: *8'- 0" x 8'- 0" x 2'- 0" deep, with 560 pounds of reinforcing. The bottom of the footing will be approximately 4'-0" below the Parking Level bituminous concrete slab on grade.*

- Typical piers/pilasters at interior/perimeter columns: *22 inches square, reinforced concrete with 45 plf reinforcing.*

- Typical grade beams interconnecting footings in bracing bays: *2'-0" wide by 2'-0" deep with 50 plf reinforcing (assume 240 linear feet required).*

- Foundation Wall Dampproofing: *ASTM D1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; Type II, Class I, non-asbestos fibers.*

- Anchor Bolts: Anchor bolts at column base plates shall conform to ASTM F1554 – Grade 36 and shall be headed type. Provide a minimum of four (4), ¾" diameter anchor bolts at all columns; additional bolts and/or larger diameter bolts will be required at bracing locations.

A1020 – Special Foundations

- Elevator pit: Elevator pit construction will consist of 12" thick, reinforced concrete walls and an 18" thick, reinforced concrete foundation mat, with an integral sump pit. Waterstops will be provided at all construction joints and all interior surfaces of the elevator pit will be waterproofed. Elevator shaft walls will be 100% solid grouted, reinforced CMU construction (8" thick).

A1030 – Slabs on Grade

Parking Level floor construction in occupied/enclosed areas will typically be a 5" thick concrete slab on grade, reinforced with welded wire fabric. The slab will be underlain by a heavy duty (16-mil) vapor barrier, rigid insulation, and 6" of compacted slab base fill. Saw cut control joints (1¼" deep) will be provided in each direction at each column line. Full depth isolation joints will be constructed around columns. The Mechanical Room will be similar construction, with a 6" thick concrete slab on grade. A bituminous concrete slab on grade will be provided at parking areas.

- Welded wire fabric for concrete slabs on grade: *6x6-W2.9xW2.9*

B. SHELL

B10: Superstructure

Structural Bays/Spans: The typical structural bay will be approximately 30'-0" x 30'-0".

Story Heights: Story heights will be approximately 14'-0; the Second Floor of the addition will match the lowest level floor level of the existing building (Elevation 174.25'+/-).

Steel Framing Connections: Type 2 simple framing connections (shear only); double clip angles typically.

Columns: Typical columns will be rectangular steel tube (HSS) sections.

Lateral Force Resisting System: Lateral (wind and seismic) forces will be resisted by steel bracing, for reasons of economy, stiffness, reduced structural depth and smaller column sizes. Bracing members will be square or rectangular HSS sections. Brace configurations may include chevrons, inverted chevrons ("V"), or single diagonals in short bays, as required by architectural considerations.

Expansion (Seismic) Joints: There will be no internal expansion joints in the addition; however, expansion joints will be required at the interface of the two links/bridges and the existing building.

Fire Protection: As previously noted, addition will be classified at Type IIB Construction (Noncombustible, Unprotected). The addition will be fully sprinklered. Typical floor and roof construction will not require fire protection, except those members supporting rated enclosures. All steel framed construction is considered to be *restrained*.

B1010 – Floor Construction

First and Second Floor Construction: Composite structural steel framing: 3½" thick (minimum), normal weight concrete topping slab with welded wire fabric on 2" deep, 18 gauge, composite type, galvanized steel floor deck (5½" minimum total slab thickness), supported by composite wide flange steel beams, spaced at 7+/- feet to 8+/- feet o.c. Steel beams are supported by composite wide flange steel girders. Steel girders span to HSS (tubular) steel columns. Slabs on steel deck will be placed at the required elevation, adding concrete to compensate for the deflection of the (unshored) steel framing (approximately ¾" average additional concrete in each structural bay). In all areas, composite action between the steel beams/girders and the concrete slab on steel deck will be achieved by field welding ¾" diameter, 4" long headed shear connectors to the top flanges. Floor finishing will be coordinated with flooring requirements.

- Welded wire fabric for slabs on steel form deck and slabs on composite steel deck: *6x6-W2.9xW2.9.*

- The estimated weight of structural steel at the First and Second Floors of the addition including beams, columns, bracing, plates, relieving angles, miscellaneous frames, connections, etc. is as follows:

Structural Steel Weight: 13.5 psf

- Shear Studs: Assume 25, ¾" diameter, 4" long headed shear studs per 100 square feet of composite steel framed floor area.

B1020 – Roof Construction

Typical Roof Construction: Typical roof construction consists of a 1½" deep, 18 gauge, Type WR galvanized steel roof deck spanning to wide flange steel beams. Steel beams are typically supported by wide flange steel girders, which span to HSS (tube) steel columns.

Rooftop Mechanical Equipment Areas: Concrete slabs on composite steel deck will be provided below rooftop mechanical units, for acoustical purposes (similar to floor construction, described above).

Drainage: Roof drainage will be achieved by tapered insulation, or by pitching structural steel where practical.

- The estimated weight of structural steel at the Roof Level of the addition (including beams, columns, bracing, girts, plates, angles, relieving angles, miscellaneous frames and connections; but excluding entry canopies, loose lintels, etc.) is as follows:

Structural Steel Weight: 13.0 psf

B20: Exterior Enclosure

B2010 – Exterior Walls

Exterior wall construction will be a mixture of masonry veneer/steel stud cavity wall construction, along with areas of glazed curtainwall and architectural panels. Galvanized steel loose lintels will be provided at the heads of typical, punched window openings. Continuous galvanized relieving angles will be provided at larger and/or multiple, minimally separated window openings, and at locations where the height of masonry exceeds 30 feet.

The steel stud backup will be 16 gauge minimum studs, designed for an H/600 deflection limitation. Vertical slip joints will be provided in the metal stud backup system at each level. Ties to the masonry veneer will be installed at 16" o.c. horizontally and vertically.

IV. OUTLINE SPECIFICATION

Concrete:

- All concrete shall be normal weight, 4,000 psi at 28 days, except foundation walls and footings, which shall be normal weight, 3,000 psi and exterior (exposed) concrete (paving) which shall be normal weight, 4,500 psi.
- Portland Cement: ASTM C150, Type I or II.
- Fly Ash: ASTM C618, Class F. Replacement of cement content with fly ash is limited to 20% (by weight). Fly ash is not permitted in exterior, exposed concrete, slabs on grade or slabs on steel deck.
- All concrete shall be proportioned with 3/4" maximum aggregate, ASTM C 33, except 3/8" maximum aggregate shall be used at toppings less than 2" thick (e.g. metal pan stairs).
- All reinforcing shall be ASTM A 615 deformed bars, Grade 60.
- All welded wire fabric shall conform to ASTM A 185.
- Reinforcing bars, steel wire, welded wire fabric, and miscellaneous steel accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.
- Concrete products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.
- Cure all concrete by moisture retention methods, approved by Architect; curing compounds shall not be used.

Reinforced Concrete Masonry (Elevator Shaft):

- Masonry construction shall conform to ACI 530/ASCE 5/TMS 402 "Building Code Requirements for Masonry Structures", latest edition.
- Masonry strength, f'm shall not be less than 1350 psi.
- Requirements for load bearing block strength shall be as required for specified masonry strength (f'm) but shall not be less than 2000 psi on the net area of the block.
- Grout shall conform to ASTM C476, Type Fine, and shall be of strength required for specified masonry strength (F'm) but not less than 3000 psi.
- Mortar for reinforced masonry shall conform to ASTM C 270 Type S and shall be of strength required for specified masonry strength (f'm) but not less than 1800 psi.
- Reinforcing bars shall conform to ASTM A 615 Grade 60 deformed bars. Lap all continuous bars 48 diameters and provide bar positioners. Assume No. 5 bars at 2'-8" o.c. vertically and horizontal bond beams with 2 – No. 5 continuous at 4'-0" o.c.
- Joint reinforcing shall be 9 gauge ladder type conforming to ASTM A 82. Provide prefabricated corners and tees. Walls shall be reinforced horizontally with joint reinforcing at 16 inches on centers unless otherwise noted.
- Reinforcing bars, steel wire and miscellaneous accessories shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with Submittal Requirements.
- Elevator shaft walls shall be 100% solid grouted (all cores); low lift grouting.
- Masonry products manufactured within 500 miles (by air) of the project site shall be documented in accordance with Submittal Requirements.

Structural Steel:

- Structural steel shapes shall conform to ASTM A 992, Fy = 50 ksi.
- Steel tubes (HSS) shall conform to ASTM A 500, Grade B/C, Fy=50 ksi.
- Structural steel plates and bars shall conform to ASTM A 36, Fy = 36 ksi.
- Steel members shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.
- Steel manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.
- Anchor Bolts: Anchor bolts at column base plates shall conform to ASTM F1554 – Grade 36 and shall be headed type. Provide a minimum of four (4), ¾" diameter anchor

bolts at all columns; additional bolts and/or larger diameter will be required at bracing locations.

- Bolted connections shall be ASTM A 325, Type N (bearing) bolts, except slip-critical bolts shall be used at lateral brace beam connections.
- Shear connectors shall be ¾" diameter, 4" long, headed Nelson studs conforming to ASTM A 108.
- Shop and field welding shall be AWS D1.1 E70XX electrodes.
- Surface treatment for typical structural steel: SSPC Surface Preparation No. 3 (Power Tool Cleaning). Structural steel shall be left unprimed.
- Surface treatment for Exposed to View Structural Steel (E.V.S.S.) in the Gymnasium and the Cafetorium shall be SSPC Surface Preparation No. 6 (Commercial Blast Cleaning). Structural steel shall receive one coat of shop primer that is compatible with the finish paint.
- All exterior, exposed structural steel shall be hot-dipped galvanized.

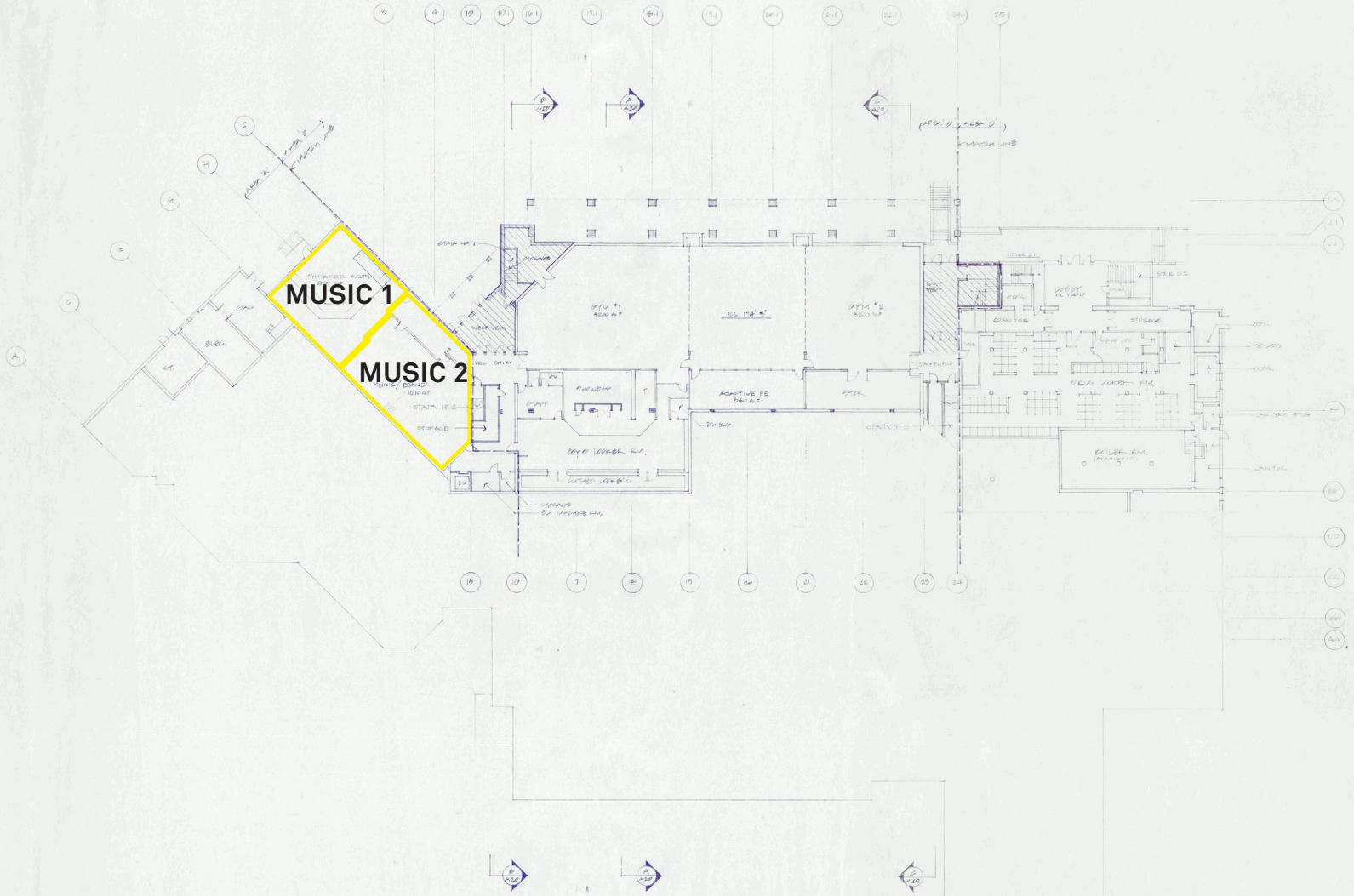
Steel Deck:

- Typical steel roof deck shall be 1½" deep, 18 gauge, Type WR, conforming to ASTM A653, Grade 33 (minimum), galvanized in accordance with ASTM A 653, coating class G-60.
- Typical steel floor deck shall be 2" deep, 18 Gauge, composite type, conforming to ASTM A 653, Grade 33, galvanized in accordance with ASTM A 653, coating class G-60.
- All steel floor deck and roof deck accessories (pour stops, finish strips, closures, etc.) shall be the same finish as the deck; 18 gauge minimum.
- Steel deck shall contain a minimum of 25% (combined) post-industrial/post-consumer recycled content (the percentage of recycled content is based on the weight of the component materials). Certification of recycled content shall be in accordance with the Submittal Requirements.
- Steel deck manufactured within 500 miles (by air) of the project site shall be documented in accordance with the Submittal Requirements.
- Provide 14 gauge sump pans at roof drains.

End of Structural Narrative

Appendix D

Renovation Diagrams



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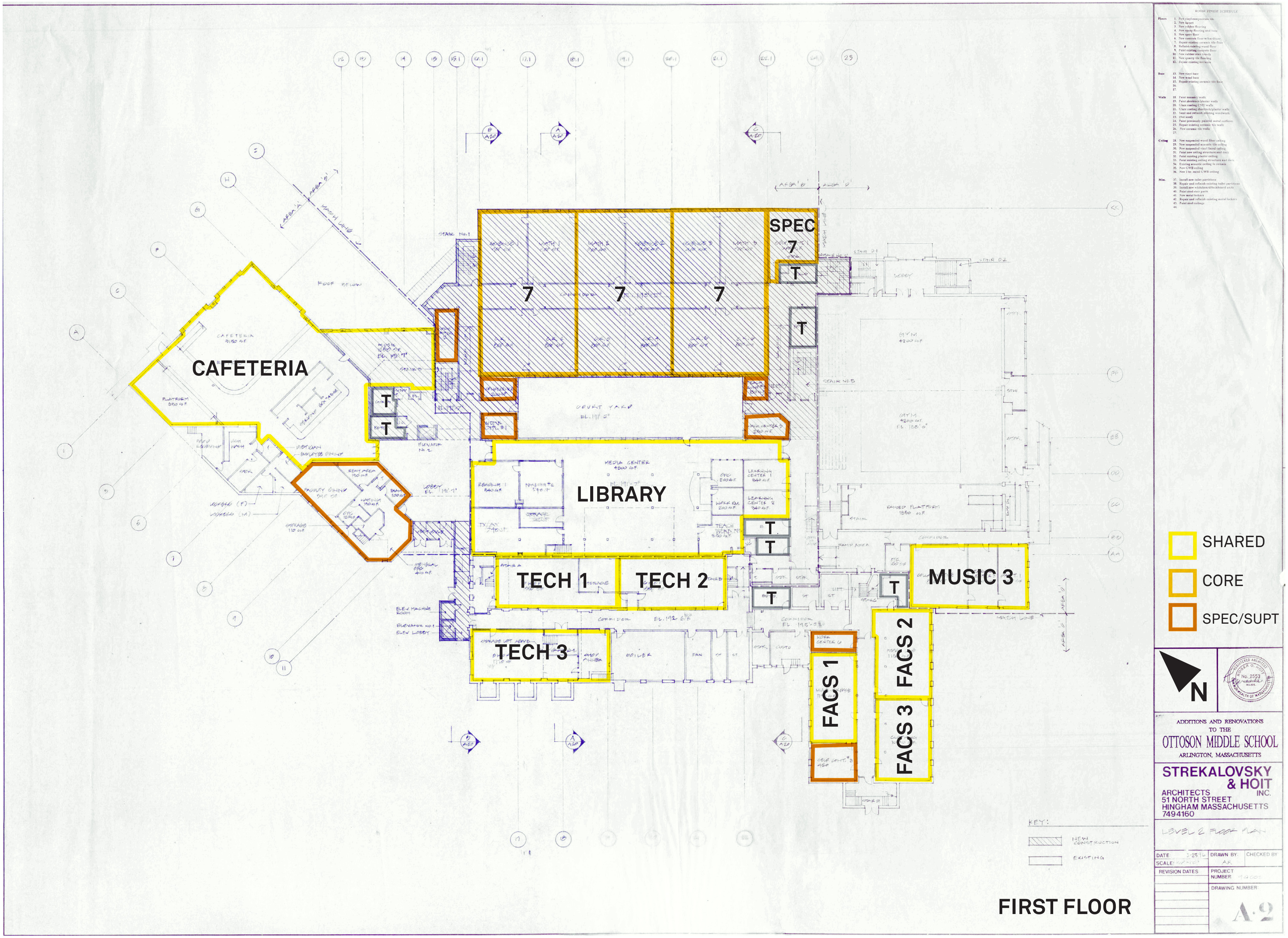
ADDITIONS AND RENOVATIONS
TO THE
OTTOSON MIDDLE SCHOOL
ARLINGTON, MASSACHUSETTS

STREKALOVSKY
& HOIT
INC.
ARCHITECTS
51 NORTH STREET
HINGHAM MASSACHUSETTS
749 4160

DATE: 5.27.16 | DRAWN BY: | CHECKED BY:
SCALE: | REVISION DATES | PROJECT NUMBER:
DRAWING NUMBER: A-1

LOWER LEVEL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TECH 2
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SHARED
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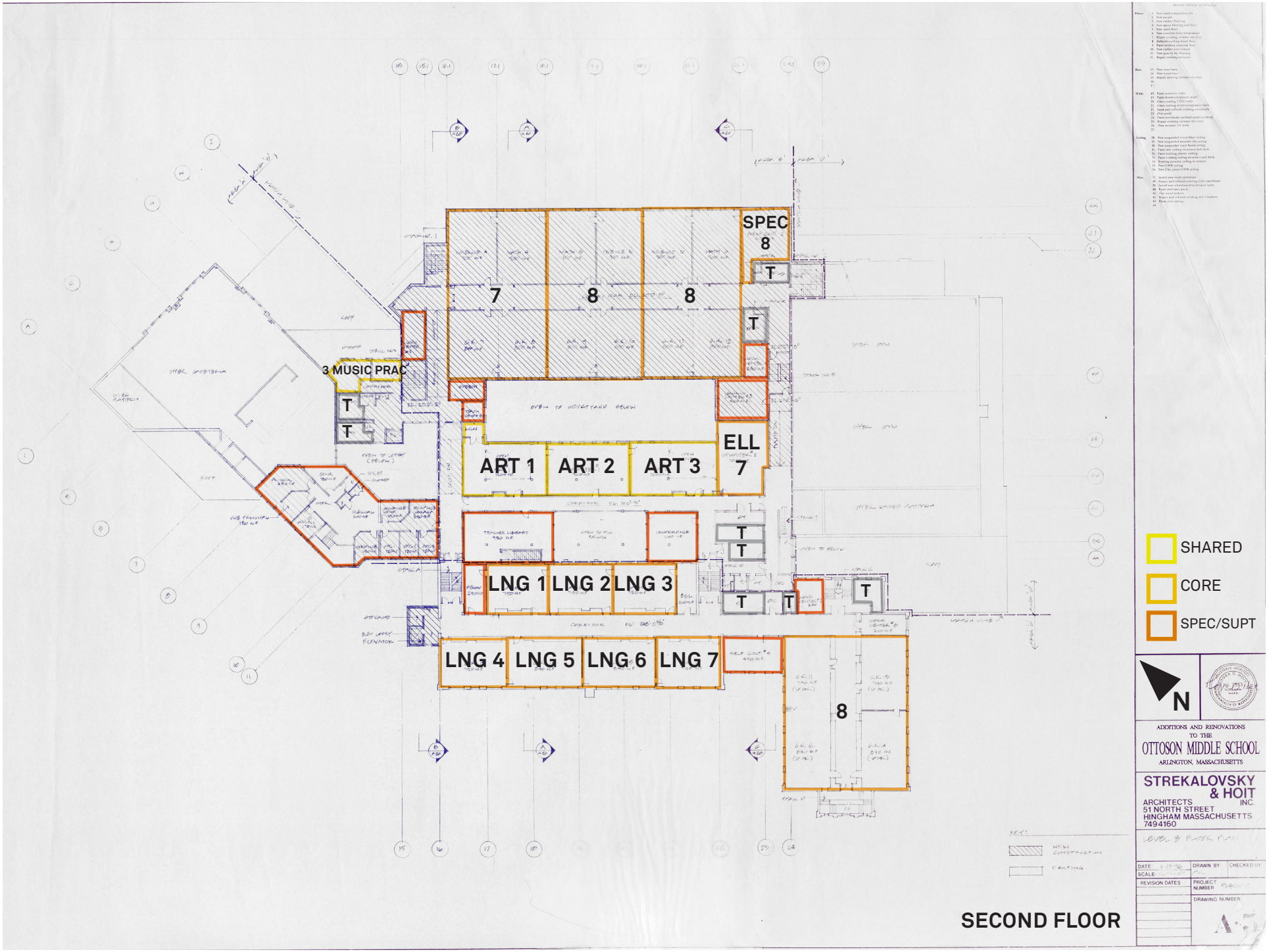
ADDITIONS AND RENOVATIONS TO THE
OTTOSON MIDDLE SCHOOL
ARLINGTON, MASSACHUSETTS
STREKALOVSKY & HOIT INC.
ARCHITECTS
51 NORTH STREET
HINGHAM MASSACHUSETTS
7494160
FIRST FLOOR
A-2



ADDITIONS AND RENOVATIONS
TO THE
OTTOSON MIDDLE SCHOOL
ARLINGTON, MASSACHUSETTS

STREKALOVSKY & HOIT
ARCHITECTS INC.
51 NORTH STREET
HINGHAM MASSACHUSETTS
7494160

LEVEL 2 FLOOR PLAN

DATE | DRAWN BY | CHECKED BY
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REVISION DATES | PROJECT NUMBER
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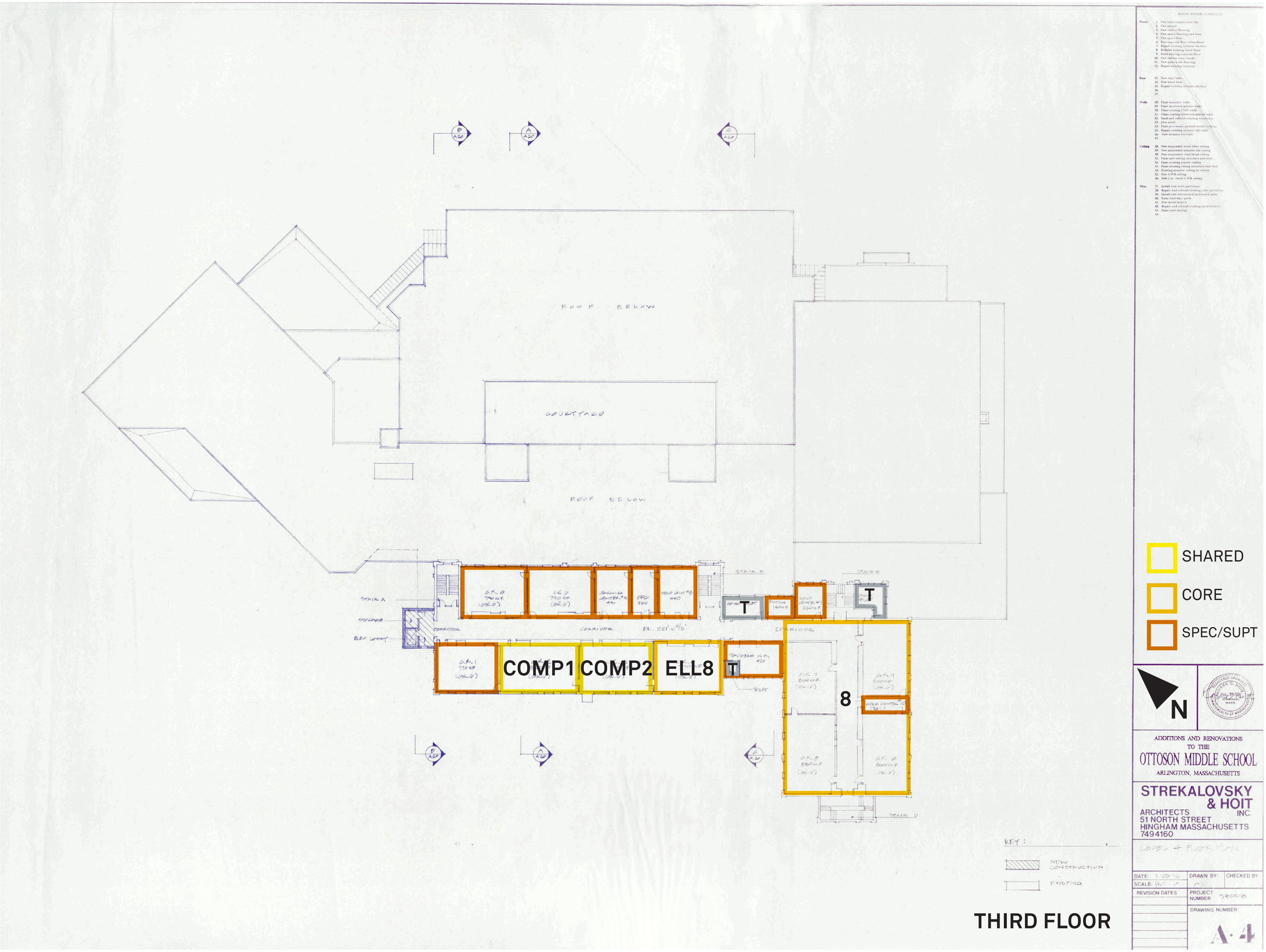
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COURTYARD
ROOF BELOW
COMP1
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ADDITIONS AND RENOVATIONS TO THE
OTTOSON MIDDLE SCHOOL
ARLINGTON, MASSACHUSETTS
STREKALOVSKY & HOIT INC.
ARCHITECTS
51 NORTH STREET
HINGHAM MASSACHUSETTS
7494160
DATE:
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PROJECT NUMBER
DRAWING NUMBER:
A-4
KEY:
NEW CONSTRUCTION
EXISTING
THIRD FLOOR

Appendix E

Feasibility Study
Design Estimate

Feasibility Design Estimate

Ottoson Middle School
RENOVATIONS + ADDITION

Arlington, MA

PM&C LLC
20 Downer Avenue, Suite 1c
Hingham, MA 02043
(T) 781-740-8007
(F) 781-740-1012

Prepared for:

HMFH Architects, Inc

April 25, 2016

PM&C

Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

MAIN CONSTRUCTION COST SUMMARY

	Construction Start	Gross Floor Area	$/sf	Estimated Construction Cost
RENOVATION + ADDITION				
RENOVATE EXISTING SCHOOL		154,380	$9.46	$1,460,681
ADDITION		39,580	$294.31	$11,648,810
SITEWORK				$646,659
SUB-TOTAL	Apr-17	193,960	$70.92	$13,756,150
ESCALATION TO START - (assumed 4% PA)	4.0%			$550,246
DESIGN AND PRICING CONTINGENCY	12%			$1,650,738
SUB-TOTAL		193,960	$82.27	$15,957,134
GENERAL CONDITIONS				$1,276,571
GENERAL REQUIREMENTS	3.00%			$478,714
BONDS	1.00%			$159,571
INSURANCE	1.25%			$199,464
PERMIT				NIC
OVERHEAD AND FEE	3.00%			$478,714
GMP CONTINGENCY				$478,714
TOTAL OF ALL CONSTRUCTION	Apr-17	193,960	$98.11	**$19,028,882**

ALTERNATES

ADDED MULTIPURPOSE ROOM TO NEW ADDITION	ADD	**$609,225**
ALTERNATE HVAC -1		
Add DX partial cooling for New Addition classrooms	ADD	**$191,171**
ALTERNATE HVAC -2		
Add displacement ventilation with partial cooling and dehumidification to new addition	ADD	**$245,792**

PMC - Project Management Cost

Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

This Feasibility Design cost estimate was produced from drawings, narratives, outline specifications and other documentation prepared by HMFH Architects Inc. and their design team dated April 6, 2016. Design and engineering changes occurring subsequent to the issue of these documents have not been incorporated in this estimate.

This estimate includes all direct construction costs, construction manager's overhead, fee and design contingency. Cost escalation assumes start dates indicated.

Bidding conditions are expected to be public bidding under Chapter 149a of the Massachusetts General Laws to pre-qualified construction managers, and pre-qualified sub-contractors, open specifications for materials and manufactures.

The estimate is based on prevailing wage rates for construction in this market and represents a reasonable opinion of cost. It is not a prediction of the successful bid from a contractor as bids will vary due to fluctuating market conditions, errors and omissions, proprietary specifications, lack or surplus of bidders, perception of risk, etc. Consequently the estimate is expected to fall within the range of bids from a number of competitive contractors or subcontractors, however we do not warrant that bids or negotiated prices will not vary from the final construction cost estimate.

ITEMS NOT CONSIDERED IN THIS ESTIMATE

Items not included in this estimate are:

- Land acquisition, feasibility, and financing costs
- All professional fees and insurance
- Site or existing conditions surveys investigations costs, including to determine subsoil conditions
- All Furnishings, Fixtures and Equipment
- Items identified in the design as Not In Contract (NIC)
- Items identified in the design as by others
- Owner supplied and/or installed items as indicated in the estimate
- Utility company back charges, including work required off-site
- Work to City streets and sidewalks, (except as noted in this estimate)
- Construction contingency

PM&C

Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

GFA 154,380

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
RENOVATION TO EXISTING BUILDING						
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$0			
	A1020	Special Foundations	$0			
	A1030	Lowest Floor Construction	$15,260	**$15,260**	$0.10	1.0%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$5,000			
	B1020	Roof Construction	$0	**$5,000**	$0.03	0.3%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$0			
	B2020	Windows/Curtainwall	$0			
	B2030	Exterior Doors	$0	**$0**	$0.00	0.0%
B30	**ROOFING**					
	B3010	Roof Coverings	$0			
	B3020	Roof Openings	$0	**$0**	$0.00	0.0%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$218,400			
	C1020	Interior Doors	$0			
	C1030	Specialties/Millwork	$25,438	**$243,838**	$1.58	16.7%
C20	**STAIRCASES**					
	C2010	Stair Construction	$2,400			
	C2020	Stair Finishes	$0	**$2,400**	$0.02	0.2%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$302,850			
	C3020	Floor Finishes	$170,050			
	C3030	Ceiling Finishes	$96,293	**$569,193**	$3.69	39.0%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$0	**$0**	$0.00	0.0%
D20	**PLUMBING**					
	D20	Plumbing	$78,000	**$78,000**	$0.51	5.3%
D30	**HVAC**					
	D30	HVAC	$167,500	**$167,500**	$1.08	11.5%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$0	**$0**	$0.00	0.0%
D50	**ELECTRICAL**					
	D5010	Electrical Systems	$121,600	**$121,600**	$0.79	8.3%
E10	**EQUIPMENT**					

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Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

GFA 154,380

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
RENOVATION TO EXISTING BUILDING						
	E10	Equipment	$52,000	**$52,000**	$0.34	3.6%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$110,560			
	E2020	Movable Furnishings	NIC	**$110,560**	$0.72	7.6%
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**SELECTIVE BUILDING DEMOLITION**					
	F2010	Building Elements Demolition	$95,330			
	F2020	Hazardous Components Abatement	$0	**$95,330**	$0.62	6.5%
TOTAL DIRECT COST (Trade Costs)				***$1,460,681***	*$9.46*	*100.0%*

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Ottoson Middle School 25-Apr-16
RENOVATIONS + ADDITION
Arlington, MA

Feasibility Design Estimate **GFA** 154,380

	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	RENOVATION TO EXISTING BUILDING						
	TOTAL GROSS FLOOR AREA (GFA)				**154,380** ***GSF***		
	A10 FOUNDATIONS						
A1010	**STANDARD FOUNDATIONS**						
	No work in this section						
	SUBTOTAL					-	
A1020	**SPECIAL FOUNDATIONS**						
	No work in this section						
	SUBTOTAL						
A1030	**LOWEST FLOOR CONSTRUCTION**						
	Cutting and patching for new plumbing	**763**	sf	20.00	15,260		
	SUBTOTAL					15,260	
	TOTAL - FOUNDATIONS						**$15,260**
	B10 SUPERSTRUCTURE						
B1010	**FLOOR CONSTRUCTION**						
	Fire stopping floors	**1**	ls	5,000.00	5,000		
	SUBTOTAL					5,000	
B1020	**ROOF CONSTRUCTION**						
	No work in this section						
	SUBTOTAL					-	
	TOTAL - SUPERSTRUCTURE						**$5,000**
	B20 EXTERIOR CLOSURE						
B2010	**EXTERIOR WALLS**						
	No work assumed to existing exterior						
	SUBTOTAL					-	
B2020	**WINDOWS/CURTAINWALL**						
	No work assumed to existing exterior						
	SUBTOTAL					-	
B2030	**EXTERIOR DOORS**						
	No work assumed to existing exterior						
	SUBTOTAL					-	
	TOTAL - EXTERIOR CLOSURE						
	B30 ROOFING						
B3010	**ROOF COVERINGS**						
	No work assumed to existing exterior						
	SUBTOTAL					-	
B3020	**ROOF OPENINGS**						
	No work in this section						
	SUBTOTAL					-	
	TOTAL - ROOFING						

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Ottoson Middle School 25-Apr-16
RENOVATIONS + ADDITION
Arlington, MA

Feasibility Design Estimate **GFA** 154,380

	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	RENOVATION TO EXISTING BUILDING						
	C10 INTERIOR CONSTRUCTION						
	C1010 PARTITIONS						
	Operable partitions at blue gym	**2,912**	sf	75.00	218,400		
	SUBTOTAL					218,400	
	C1020 INTERIOR DOORS						
	No work in this section						
	SUBTOTAL					-	
	C1030 SPECIALTIES / MILLWORK						
	Room Signs	**1**	ls	10,000.00	10,000		
	Miscellaneous sealants throughout building	**154,380**	sf	0.10	15,438		
	SUBTOTAL					25,438	
	TOTAL - INTERIOR CONSTRUCTION						**$243,838**
	C20 STAIRCASES						
	C2010 STAIR CONSTRUCTION						
	New handrails at cafeteria	**8**	loc	300.00	2,400		
	SUBTOTAL					2,400	
	C2020 STAIR FINISHES						
	No work in this section						
	SUBTOTAL					-	
	TOTAL - STAIRCASES						**$2,400**
	C30 INTERIOR FINISHES						
	C3010 WALL FINISHES						
	Paint to walls etc.	**154,380**	gfa	1.50	231,570		
	Ceramic tile, full height	**3,240**	sf	22.00	71,280		
	SUBTOTAL					302,850	
	C3020 FLOOR FINISHES						
	Carpet to library	**8,500**	sf	4.33	36,805		
	LFT at music classroom and science classrooms	**3,600**	sf	4.00	14,400		
	Ceramic tile to toilets	**763**	sf	20.00	15,260		
	Patch existing floors at removed walls	**310**	lf	30.00	9,300		
	Rubber base	**25,730**	lf	2.50	64,325		
	Ceramic tile base	**360**	lf	16.00	5,760		
	Floor prep	**12,100**	sf	2.00	24,200		
	SUBTOTAL					170,050	
	C3030 CEILING FINISHES						
	ACT, 2x2	**12,100**	sf	5.00	60,500		
	GWB ceiling	**763**	sf	10.00	7,630		
	Patch existing ceilings at removed walls	**310**	lf	40.00	12,400		
	Paint GWB	**763**	sf	1.00	763		
	Soffits	**1**	ls	15,000.00	15,000		
	SUBTOTAL					96,293	
	TOTAL - INTERIOR FINISHES						**$569,193**

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Ottoson Middle School 25-Apr-16
RENOVATIONS + ADDITION
Arlington, MA

Feasibility Design Estimate **GFA** 154,380

	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	RENOVATION TO EXISTING BUILDING						
	D10 CONVEYING SYSTEMS						
	No work in this section						
	SUBTOTAL					-	
	TOTAL - CONVEYING SYSTEMS						
	D20 PLUMBING						
	D20 PLUMBING, GENERALLY						
	New sinks at science/art rooms	**14**	fxt	5,000.00	70,000		
	Eye wash station	**2**	loc	4,000.00	8,000		
	SUBTOTAL					78,000	
	TOTAL - PLUMBING						**$78,000**
	D30 HVAC						
	D30 HVAC, GENERALLY						
	HVAC modifications at library modifications	**8,500**	sf	15.00	127,500		
	HVAC modifications at music room modifications	**1,200**	sf	15.00	18,000		
	Exhaust modifications at bathrooms	**11**	loc	2,000.00	22,000		
	SUBTOTAL					167,500	
	TOTAL - HVAC						**$167,500**
	D40 FIRE PROTECTION						
	D40 FIRE PROTECTION, GENERALLY						
	New sprinkler system - assumed not required				ETR		
	SUBTOTAL					-	
	TOTAL - FIRE PROTECTION						
	D50 ELECTRICAL						
	D5010 COMPLETE ELECTRICAL SYSTEMS						
	Lighting, power and Tele/Data at library modifications	**8,500**	sf	12.00	102,000		
	Power/Data at computer classrooms	**2**	rms	5,000.00	10,000		
	Lighting at music room modifications	**1,200**	sf	8.00	9,600		
	SUBTOTAL					121,600	
	TOTAL - ELECTRICAL						**$121,600**
	E10 EQUIPMENT						
	E10 EQUIPMENT, GENERALLY						
	New fume hoods	**2**	ea	11,000.00	22,000		
	Replace gym bleachers	**1**	ls	30,000.00	30,000		
	SUBTOTAL					52,000	
	TOTAL - EQUIPMENT						**$52,000**
	E20 FURNISHINGS						

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Ottoson Middle School 25-Apr-16
RENOVATIONS + ADDITION
Arlington, MA

Feasibility Design Estimate **GFA** 154,380

	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
	RENOVATION TO EXISTING BUILDING						
	E2010 FIXED FURNISHINGS						
	Science Classrooms	*2*	*rms*				
	Base cabinets and Epoxy counters	**112**	lf	450.00	50,400		
	Wall cabinets	**112**	lf	300.00	33,600		
	Tall storage	**4**	ea	1,400.00	5,600		
	FACS/Art	*2*	*rms*				
	Base cabinets and plam counters	**32**	lf	300.00	9,600		
	Wall cabinets	**32**	lf	180.00	5,760		
	Tall storage	**4**	ea	1,400.00	5,600		
	SUBTOTAL					110,560	
	E2020 MOVABLE FURNISHINGS						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$110,560**
	F10 SPECIAL CONSTRUCTION						
	F10 SPECIAL CONSTRUCTION						
	No items in this section						
	SUBTOTAL						
	TOTAL - SPECIAL CONSTRUCTION						
	F20 SELECTIVE BUILDING DEMOLITION						
	F2010 BUILDING ELEMENTS DEMOLITION						
	Remove existing GWB walls	**4,340**	sf	2.00	8,680		
	Demolish existing floor slab	**763**	sf	12.00	9,156		
	Remove floor finishes	**12,863**	sf	2.00	25,726		
	Remove ceilings	**13,173**	sf	1.00	13,173		
	Miscellaneous demo/protection	**154,380**	gfa	0.25	38,595		
	SUBTOTAL					95,330	
	F2020 HAZARDOUS COMPONENTS ABATEMENT						
	None Included						
	SUBTOTAL						
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$95,330**

PM&C

Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

GFA 39,580

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
ADDITION						
A10	**FOUNDATIONS**					
	A1010	Standard Foundations	$503,120			
	A1020	Special Foundations	$0			
	A1030	Lowest Floor Construction	$66,562	**$569,682**	$14.39	4.9%
A20	**BASEMENT CONSTRUCTION**					
	A2010	Basement Excavation	$0			
	A2020	Basement Walls	$0	**$0**	$0.00	0.0%
B10	**SUPERSTRUCTURE**					
	B1010	Upper Floor Construction	$1,361,452			
	B1020	Roof Construction	$701,882	**$2,063,334**	$52.13	17.7%
B20	**EXTERIOR CLOSURE**					
	B2010	Exterior Walls	$1,013,860			
	B2020	Windows	$941,857			
	B2030	Exterior Doors	$30,121	**$1,985,838**	$50.17	17.0%
B30	**ROOFING**					
	B3010	Roof Coverings	$511,568			
	B3020	Roof Openings	$2,500	**$514,068**	$12.99	4.4%
C10	**INTERIOR CONSTRUCTION**					
	C1010	Partitions	$863,042			
	C1020	Interior Doors	$197,900			
	C1030	Specialties/Millwork	$262,572	**$1,323,514**	$33.44	11.4%
C20	**STAIRCASES**					
	C2010	Stair Construction	$128,000			
	C2020	Stair Finishes	$29,320	**$157,320**	$3.97	1.4%
C30	**INTERIOR FINISHES**					
	C3010	Wall Finishes	$237,480			
	C3020	Floor Finishes	$316,640			
	C3030	Ceiling Finishes	$398,180	**$952,300**	$24.06	8.2%
D10	**CONVEYING SYSTEMS**					
	D1010	Elevator	$120,000	**$120,000**	$3.03	1.0%
D20	**PLUMBING**					
	D20	Plumbing	$554,120	**$554,120**	$14.00	4.8%

PM&C

Ottoson Middle School 25-Apr-16
RENOVATIONS + ADDITION
Arlington, MA

Feasibility Design Estimate GFA 39,580

CONSTRUCTION COST SUMMARY

	BUILDING SYSTEM		*SUB-TOTAL*	*TOTAL*	*$/SF*	*%*
ADDITION						
D30	**HVAC**					
	D30	HVAC	$1,424,880	**$1,424,880**	$36.00	12.2%
D40	**FIRE PROTECTION**					
	D40	Fire Protection	$253,810	**$253,810**	$6.41	2.2%
D50	**ELECTRICAL**					
	D5010	Complete System	$1,369,080	**$1,369,080**	$34.59	11.8%
E10	**EQUIPMENT**					
	E10	Equipment	$0	**$0**	$0.00	0.0%
E20	**FURNISHINGS**					
	E2010	Fixed Furnishings	$340,864			
	E2020	Movable Furnishings	NIC	**$340,864**	$8.61	2.9%
F10	**SPECIAL CONSTRUCTION**					
	F10	Special Construction	$0	**$0**	$0.00	0.0%
F20	**HAZMAT REMOVALS**					
	F2010	Building Elements Demolition	$20,000			
	F2020	Hazardous Components Abatement	$0	**$20,000**	$0.51	0.2%
	TOTAL DIRECT COST (Trade Costs)			***$11,648,810***	*$294.31*	*100.0%*

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
ADDITION							
	GROSS FLOOR AREA CALCULATION						
	Parking Level			3,100			
	First Floor			18,240			
	Second Floor			18,240			
	TOTAL GROSS FLOOR AREA (GFA)					**39,580**	***sf***
	A10 FOUNDATIONS						
A1010	**STANDARD FOUNDATIONS**						
	Strip footings - 2'-0" x 1'-0"						
	Excavation	**282**	cy	12.00	3,384		
	Store on site for reuse	**282**	cy	14.00	3,948		
	Backfill with new fill	**262**	cy	16.00	4,192		
	Formwork	**508**	sf	11.00	5,588		
	Re-bar, 10#/lf	**2,540**	lbs	1.20	3,048		
	Concrete material; 3,000 psi	**20**	cy	125.00	2,500		
	Placing concrete	**20**	cy	55.00	1,100		
	Foundation walls at exterior - 14" thick						
	Formwork	**2,032**	sf	12.50	25,400		
	Re-bar, 4.5#/sf	**4,572**	lbs	1.20	5,486		
	Concrete material; 4,000 psi	**46**	cy	135.00	6,210		
	Placing concrete	**46**	cy	65.00	2,990		
	Dampproofing foundation wall and footing	**1,524**	sf	1.90	NIC		
	Insulation to foundation walls; 2" thick	**1,016**	sf	2.50	2,540		
	Form shelf	**254**	lf	8.00	2,032		
	Strip footings at retaining walls - 8'-6" x 1'-6"						
	Excavation	**472**	cy	12.00	5,664		
	Store on site for reuse	**472**	cy	14.00	6,608		
	Backfill with new fill	**371**	cy	16.00	5,936		
	Formwork	**612**	sf	11.00	6,732		
	Re-bar	**16,473**	lbs	1.20	19,768		
	Concrete material; 3,000 psi	**101**	cy	125.00	12,625		
	Placing concrete	**101**	cy	55.00	5,555		
	Retaining walls at exterior - 16" thick						
	Formwork	**5,712**	sf	16.00	91,392		
	Re-bar, 9.5#/sf	**27,132**	lbs	1.20	32,558		
	Concrete material; 4,000 psi	**148**	cy	135.00	19,980		
	Placing concrete	**148**	cy	65.00	9,620		
	Waterproofing foundation wall and footing	**2,448**	sf	8.00	19,584		
	Insulation to foundation walls; 2" thick	**2,448**	sf	2.50	6,120		
	Form shelf	**204**	lf	8.00	1,632		
	Grade Beams						
	Excavation	**267**	cy	12.00	3,204		
	Store on site for reuse	**267**	cy	14.00	3,738		
	Backfill with new fill	**230**	cy	16.00	3,680		
	Formwork	**960**	sf	11.00	10,560		
	Re-bar, 50#/lf	**12,000**	lbs	1.20	14,400		
	Concrete material; 3,000 psi	**37**	cy	125.00	4,625		
	Placing concrete	**37**	cy	55.00	2,035		
	Exterior column footings, typical, 8' x 8' x 2'-0"						
	Excavation	**372**	cy	15.00	5,580		

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
ADDITION							
	Store on site for reuse	**372**	cy	14.00	5,208		
	Backfill with new fill	**262**	cy	16.00	4,192		
	Formwork	**1,408**	sf	11.00	15,488		
	Re-bar	**12,320**	lbs	1.20	14,784		
	Concrete material; 3,000 psi	**110**	cy	125.00	13,750		
	Placing concrete	**110**	cy	55.00	6,050		
	Set anchor bolts grout plates	**22**	ea	150.00	3,300		
	Interior column footings, typical, 10' x 10' x 2'-4"						
	Excavation	**276**	cy	15.00	4,140		
	Store on site for reuse	**276**	cy	14.00	3,864		
	Backfill with new fill	**167**	cy	16.00	2,672		
	Formwork	**1,118**	sf	11.00	12,298		
	Re-bar	**12,000**	lbs	1.20	14,400		
	Concrete material; 3,000 psi	**109**	cy	125.00	13,625		
	Placing concrete	**109**	cy	55.00	5,995		
	Set anchor bolts grout plates	**12**	ea	150.00	1,800		
	Interior pilasters						
	Formwork	**996**	sf	11.00	10,956		
	Re-bar	**6,120**	lbs	1.20	7,344		
	Concrete material; 3,000 psi	**18**	cy	125.00	2,250		
	Placing concrete	**18**	cy	55.00	990		
	SUBTOTAL					503,120	
A1020	**SPECIAL FOUNDATIONS**						
	No Work in this section						
	SUBTOTAL						
A1030	**LOWEST FLOOR CONSTRUCTION**						
	New Slab on grade, 5" thick						
	Structural gravel fill, 8"	**77**	cy	30.00	2,310		
	Base course, 8" gravel	**77**	cy	35.00	2,695		
	Rigid insulation	**3,100**	sf	2.25	6,975		
	Vapor barrier	**3,100**	sf	1.00	3,100		
	Mesh reinforcing 15% lap	**3,565**	sf	0.80	2,852		
	Concrete - 5" thick	**51**	cy	125.00	6,375		
	Placing concrete	**51**	cy	45.00	2,295		
	Finishing and curing concrete	**3,100**	sf	1.50	4,650		
	Control joints - saw cut	**3,100**	sf	0.10	310		
	Miscellaneous						
	New Elevator pits	**1**	ea	30,000.00	30,000		
	Equipment pads - allow	**1**	ls	5,000.00	5,000		
	SUBTOTAL					66,562	
	TOTAL - FOUNDATIONS						**$569,682**
A20	***BASEMENT CONSTRUCTION***						
A2010	**BASEMENT EXCAVATION**						
	No items in this section						
	SUBTOTAL					-	
A2020	**BASEMENT WALLS**						
	No items in this section						
	SUBTOTAL					-	

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
ADDITION							
	TOTAL - BASEMENT CONSTRUCTION						
B10	***SUPERSTRUCTURE***						
		18	lbs/sf				
B1010	**FLOOR CONSTRUCTION**	365	tns				
	Floor Structure - Steel:						
	Steel beams and columns; 13.5/SF; including garage level structure	**246**	tns	3,800.00	934,800		
	Shear studs	**7,296**	ea	2.50	18,240		
	Floor Structure						
	2" Metal floor Deck	**36,480**	sf	3.00	109,440		
	WWF reinforcement	**41,952**	sf	0.80	33,562		
	Concrete Fill to metal deck; 5 1/2" Normal weight	**650**	cy	125.00	81,250		
	Place and finish concrete	**36,480**	sf	2.00	72,960		
	Miscellaneous						
	Exposed steel premium	**1**	ls	10,000.00	10,000		
	Fire proofing to columns and beams	**36,480**	sf	2.50	91,200		
	Fire stopping floors	**2**	flrs	5,000.00	10,000		
	SUBTOTAL					1,361,452	
B1020	**ROOF CONSTRUCTION**						
	Roof Structure - Steel:						
	Steel beams/Joists; 13#/SF	**119**	tns	3,800.00	452,200		
	Roof Structure						
	1-1/2" Metal floor Deck @ roof	**18,240**	sf	3.00	54,720		
	Roof Structure @ Mech Equipment/Low roof						
	WWF reinforcement	**9,315**	sf	0.80	7,452		
	Concrete Fill to metal deck; 5 1/4" Light weight	**129**	cy	170.00	21,930		
	Place and finish concrete	**8,100**	sf	3.00	24,300		
	Miscellaneous						
	Premium for bridge framing	**1**	ls	60,000.00	60,000		
	Roof screen framing - allow	**1,100**	sf	20.00	22,000		
	Fire proofing to columns, beams and deck	**18,240**	sf	3.25	59,280		
	SUBTOTAL					701,882	
	TOTAL - SUPERSTRUCTURE						**$2,063,334**
B20	***EXTERIOR CLOSURE***						
B2010	**EXTERIOR WALLS; 60% solid/40% glass**	*13,768*	sf				
	Interior skin						
	6" metal stud backup	**11,634**	sf	7.50	87,255		
	Batt insulation in stud	**11,634**	sf	2.25	26,177		
	2 1/2" Rigid Insulation	**11,634**	sf	3.00	34,902		
	Air barrier	**11,634**	sf	6.00	69,804		
	Air barrier/flashing at windows	**2,272**	lf	7.00	15,904		
	Gypsum Sheathing	**11,634**	sf	2.75	31,994		
	Drywall lining to interior face of stud backup	**11,634**	sf	3.00	34,902		
	Interior skin @ garage level						
	8" CMU backup	**2,134**	sf	22.00	46,948		
	2 1/2" Rigid Insulation	**2,134**	sf	3.00	6,402		

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Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

GFA 39,580

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
ADDITION							
	Air barrier	**2,134**	sf	6.00	12,804		
	Exterior skin						
	Brick veneer; 75% of exterior wall	**10,326**	sf	35.00	361,410		
	Metal panels; 25% of exterior wall	**3,442**	sf	60.00	206,520		
	Miscellaneous						
	Aluminum sign at main entrance	**1**	ls	10,000.00	10,000		
	Staging to exterior wall	**22,946**	sf	3.00	68,838		
	SUBTOTAL					1,013,860	
B2020	**WINDOWS**	*9,178*	sf				
	Curtainwall; 25% of glazed area	**2,294**	sf	110.00	252,340		
	Premium for sunscreen and light shelf elements	**1**	ls	50,000.00	50,000		
	Windows/storefront; 75% of glazed area	**6,884**	sf	85.00	585,140		
	Louvers (allowance)	**250**	sf	60.00	15,000		
	Backer rod & double sealant	**3,029**	lf	9.00	27,261		
	Wood blocking at openings	**3,029**	lf	4.00	12,116		
	SUBTOTAL					941,857	
B2030	**EXTERIOR DOORS**						
	Glazed entrance doors including frame and hardware; double door	**2**	pr	8,000.00	16,000		
	HM doors, frames and hardware- Double	**3**	pr	3,600.00	10,800		
	HM doors, frames and hardware- Single	**1**	ea	1,800.00	1,800		
	Backer rod & double sealant	**117**	lf	9.00	1,053		
	Wood blocking at openings	**117**	lf	4.00	468		
	SUBTOTAL					30,121	
	TOTAL - EXTERIOR CLOSURE						**$1,985,838**
B30	***ROOFING***						
B3010	**ROOF COVERINGS**						
	Flat roofing						
	PVC roof membrane fully adhered	18,240	sf	7.50	136,800		
	Insulation	18,240	sf	6.00	109,440		
	1/2" dens-deck protection board	18,240	sf	2.00	36,480		
	Reinforced vapor barrier	18,240	sf	1.00	18,240		
	Rough blocking	2,976	lf	6.00	17,856		
	Miscellaneous Roofing						
	Metal panels to underside of bridge connector	**672**	sf	86.00	57,792		
	Roof screens - allow	**1,100**	sf	50.00	55,000		
	Roof fascia/cornice	**744**	lf	90.00	66,960		
	Roof ladders	**1**	ls	3,000.00	3,000		
	Walk pads	**1**	ls	10,000.00	10,000		
	SUBTOTAL					511,568	
B3020	**ROOF OPENINGS**						
	Skylights, allow				NIC		
	Roof hatch	**1**	loc	2,500.00	2,500		
	SUBTOTAL					2,500	
	TOTAL - ROOFING						**$514,068**
C10	***INTERIOR CONSTRUCTION***						
C1010	**PARTITIONS**						

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
ADDITION							
	Reinforced masonry shear walls at elevator	**1,764**	sf	25.00	44,100		
	Stairs; 2 HR rated	**3,948**	sf	16.00	63,168		
	Corridors; GWB with 2 lyrs corridor side	**13,216**	sf	15.55	205,509		
	Demising; Metal stud w/ 2 layers gwb	**8,988**	sf	17.35	155,942		
	Partitions at Admin spaces, back of house etc.	**1,554**	sf	15.85	24,631		
	Plumbing walls	**1,316**	sf	16.00	21,056		
	Sealants & caulking at partitions	**29,470**	sf	0.50	14,735		
	Rough blocking to partitions	**2,267**	lf	3.00	6,801		
	Operable partitions	**1,056**	sf	75.00	79,200		
	Glazed partitions/borrowed lights - allowance	**1**	ls	50,000.00	50,000		
	Miscellaneous GWB	**39,580**	gsf	5.00	197,900		
	SUBTOTAL					863,042	
C1020	**INTERIOR DOORS**						
	Allowance for specialty doors, doors and hardware	**39,580**	gsf	5.00	197,900		
	SUBTOTAL					197,900	
C1030	**SPECIALTIES / MILLWORK**						
	Toilet Partitions and accessories	**39,580**	gsf	1.25	49,475		
	Backer panels in electrical closets	**1**	ls	1,000.00	1,000		
	Marker boards/tackboards in classrooms, offices, conference rooms, library and MP rooms; 20' tackboard w/ 8' markerboard in each Educational space	**39,580**	sf	1.00	39,580		
	Building directory	**1**	loc	3,000.00	3,000		
	Bronze dedication plaque	**1**	loc	2,500.00	2,500		
	Room Signs	**39,580**	gsf	0.40	15,832		
	Fire extinguisher cabinets	**13**	ea	350.00	4,550		
	Lockers	**39,580**	gsf	1.00	39,580		
	Janitors Closet Accessories	**1**	ls	1,000.00	1,000		
	Shelving in storage rooms	**1**	ls	10,000.00	10,000		
	Expansion joints	**1**	ls	7,000.00	7,000		
	Miscellaneous metals throughout building	**39,580**	sf	1.25	49,475		
	Miscellaneous sealants throughout building	**39,580**	sf	1.00	39,580		
	SUBTOTAL					262,572	
	TOTAL - INTERIOR CONSTRUCTION						**$1,323,514**
C20	***STAIRCASES***						
C2010	**STAIR CONSTRUCTION**						
	Metal pan stair; egress stair	**4**	flt	30,000.00	120,000		
	Concrete fill to stairs	**4**	flt	2,000.00	8,000		
	SUBTOTAL					128,000	
C2020	**STAIR FINISHES**						
	High performance coating to stairs including all railings etc.	**4**	flt	3,000.00	12,000		
	Rubber tile at stairs - landings	**600**	sf	12.00	7,200		
	Rubber tile at stairs - treads & risers	**460**	lft	22.00	10,120		
	SUBTOTAL					29,320	
	TOTAL - STAIRCASES						**$157,320**
C30	***INTERIOR FINISHES***						
C3010	**WALL FINISHES**						

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Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

GFA 39,580

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
ADDITION							
	Allowance for wall finishes	**39,580**	gsf	6.00	237,480		
	SUBTOTAL					237,480	
C3020	**FLOOR FINISHES**						
	Allowance for floor finishes	**39,580**	gsf	8.00	316,640		
	SUBTOTAL					316,640	
C3030	**CEILING FINISHES**						
	Allowance for ceiling finishes/insulation underneath parking area	**15,140**	sf	8.00	121,120		
	Allowance for ceiling finishes	**39,580**	sf	7.00	277,060		
	SUBTOTAL					398,180	
	TOTAL - INTERIOR FINISHES						**$952,300**
D10	***CONVEYING SYSTEMS***						
D1010	**ELEVATOR**						
	New elevator; 3 stop	**1**	ea	120,000.00	120,000		
	SUBTOTAL					120,000	
	TOTAL - CONVEYING SYSTEMS						**$120,000**
D20	***PLUMBING***						
D20	**PLUMBING, GENERALLY**						
	Plumbing; complete system	**39,580**	gsf	14.00	554,120		
	SUBTOTAL					554,120	
	TOTAL - PLUMBING						**$554,120**
D30	***HVAC***						
D30	**HVAC, GENERALLY**						
	HVAC complete system	**39,580**	gsf	36.00	1,424,880		
	SUBTOTAL					1,424,880	
	TOTAL - HVAC						**$1,424,880**
D40	***FIRE PROTECTION***						
D40	**FIRE PROTECTION, GENERALLY**						
	Sprinkler system at parking area; dry system	**15,140**	gsf	5.00	75,700		
	Sprinkler system	**39,580**	gsf	4.50	178,110		
	SUBTOTAL					253,810	
	TOTAL - FIRE PROTECTION						**$253,810**
D50	***ELECTRICAL***						
D5010	**COMPLETE ELECTRICAL SYSTEM**						
	Lighting and FA at parking area	**15,140**	gsf	12.00	181,680		
	Electrical system; complete	**39,580**	gsf	30.00	1,187,400		
	SUBTOTAL					1,369,080	
	TOTAL - ELECTRICAL						**$1,369,080**
E10	***EQUIPMENT***						

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Ottoson Middle School
RENOVATIONS + ADDITION
Arlington, MA

25-Apr-16

Feasibility Design Estimate

GFA 39,580

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
ADDITION							
E10	**EQUIPMENT, GENERALLY**						
	AV Equipment (including Smartboards, Projectors, LED monitors, Digital information displays etc.)				FF+E		
	SUBTOTAL					-	
	TOTAL - EQUIPMENT						
E20	***FURNISHINGS***						
E2010	**FIXED FURNISHINGS**						
	Entry mats & frames - recessed with carpet/rubber strips	**500**	sf	45.00	22,500		
	Manual operated roller shades	**6,884**	sf	6.00	41,304		
	Counters, base cabinets, tall storage in classrooms and other rooms	**39,580**	gsf	7.00	277,060		
	SUBTOTAL					340,864	
E2020	**MOVABLE FURNISHINGS**						
	All movable furnishings to be provided and installed by owner						
	SUBTOTAL					NIC	
	TOTAL - FURNISHINGS						**$340,864**
F10	***SPECIAL CONSTRUCTION***						
F10	**SPECIAL CONSTRUCTION**						
	No Work in this section						
	SUBTOTAL						
	TOTAL - SPECIAL CONSTRUCTION						
F20	***SELECTIVE BUILDING DEMOLITION***						
F2010	**BUILDING ELEMENTS DEMOLITION**						
	Create openings to existing façade for new connections	**2**	loc	10,000.00	20,000		
	SUBTOTAL					20,000	
F2020	**HAZARDOUS COMPONENTS ABATEMENT**						
	None Included						
	SUBTOTAL						
	TOTAL - SELECTIVE BUILDING DEMOLITION						**$20,000**

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Edward Devotion School
Addition & Renovations
Brookline, MA

30-Mar-15

Schematic Design Estimate

CSI CODE	DESCRIPTION	QTY	UNIT	UNIT COST	EST'D COST	SUB TOTAL	TOTAL COST
SITEWORK							
	G SITEWORK						
G10	**SITE PREPARATION & DEMOLITION**						
	Site construction fence/barricades	**700**	lf	14.00	9,800		
	Remove existing paving	**9,000**	sf	1.50	13,500		
	Remove existing retaining walls	**1**	ls	10,000.00	10,000		
	Miscellaneous demolition	**1**	ls	25,000	25,000		
	Site Earthwork						
	Allowance to alter grading at main entrance	**1**	ls	50,000.00	50,000		
	Reduce existing grade by 4ft	**3,111**	cy	40.00	124,440		
	Silt fence/erosion control, wash bays, stock piles	**700**	lf	15.00	10,500		
	Construction entrance	**1**	ls	10,000.00	10,000		
	SUBTOTAL					253,240	
G20	**SITE IMPROVEMENTS**						
	Asphalt Paving	*18,440*					
	gravel base; 12" thick	**683**	cy	35.00	23,905		
	asphalt; 4" thick	**2,049**	sy	26.00	53,274		
	VGC	**770**	lf	32.00	24,640		
	Add for accessible parking spots	**1**	ls	10,000.00	10,000		
	Enlarge exterior concrete landings	**4**	loc	5,000.00	20,000		
	New concrete paving	**900**	sf	10.00	9,000		
	New retaining walls	**320**	lf	280.00	89,600		
	Landscaping						
	Miscellaneous landscape repairs/upgrades	**1**	ls	30,000.00	30,000		
	SUBTOTAL					260,419	
G30	**CIVIL MECHANICAL UTILITIES**						
	Water supply						
	New DI piping; 6"	**150**	lf	100.00	15,000		
	FD connection	**1**	loc	2,000.00	2,000		
	Gate valves	**2**	loc	750.00	1,500		
	Connect to existing line (Wet Taps)	**1**	loc	10,000.00	10,000		
	Storm water						
	Allowance miscellaneous stormwater improvements	**1**	ls	40,000.00	40,000		
	SUBTOTAL					$68,500	
G40	**ELECTRICAL UTILITIES**						
	Power						
	Manhole, new	**1**	ea	9,000.00	9,000		
	Primary ductbank						
	Ductbank AA 2-4" PVC conduits	**150**	lf	60.00	9,000		
	Primary cabling	**150**	lf		Utility company		
	Pad mounted transformer	**1**	ea		Utility company		
	Transformer pad	**1**	ea	2,500.00	2,500		
	Communications						
	Manhole, new	**1**	ea	9,000.00	9,000		
	Communications ductbank CC						
	4-4" PVC conduits	**150**	lf	100.00	15,000		
	Cabling	**150**	lf		Utility company		
	Site Lighting						
	Lighting allowance	**1**	ls	20,000.00	20,000		
	SUBTOTAL					64,500	
	TOTAL - SITE DEVELOPMENT						***$646,659***