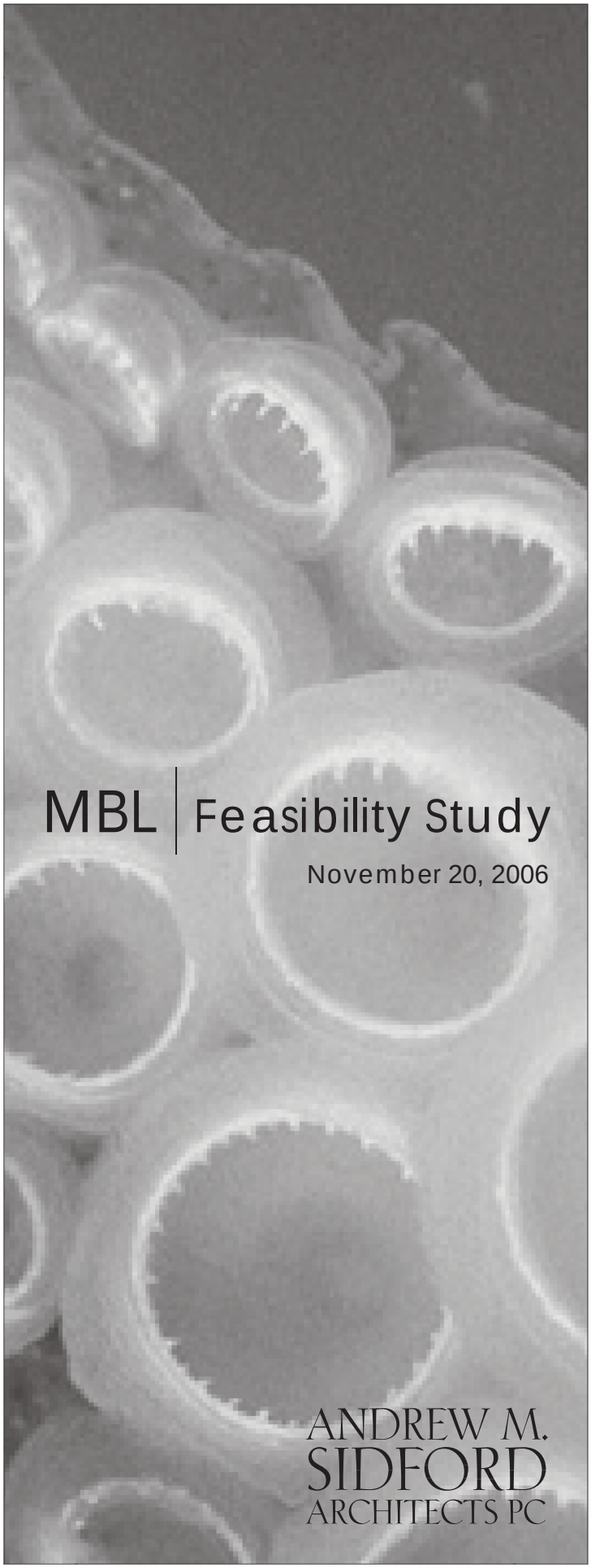

MBL | Feasibility Study

November 20, 2006

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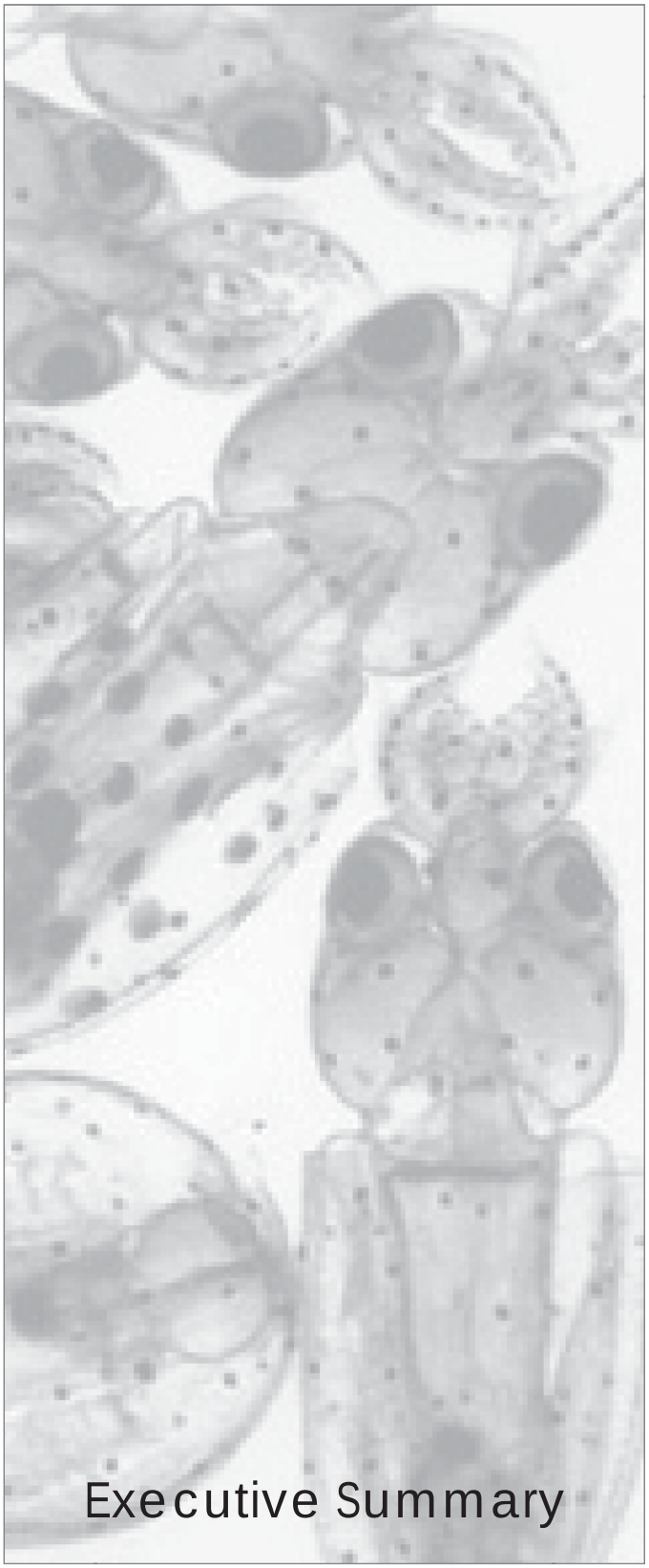


Executive Summary

EXISTING CONDITIONS

The Marshview Farm Field Station is located on a five acre lot within the watershed of the Parker, Ipswich, and Rowley river basins of the Plum Island Sound. The circa 1825 farmhouse on the property includes a main house with an ell of greater size to the northeast, a barn and accessory buildings. A 660 sf laboratory has recently been constructed in the basement of the main house.

The original two story farmhouse, with its northeast ell, totals 1900 sf in plan and includes six bedrooms, two kitchens, four bathrooms, two recreation rooms and unscreened exterior decks. It is noncompliant in regard to several building code issues, notably ADA, sprinklers, and egress. It currently accommodates thirteen people and serves both short term and long term researchers who qualify under the building code as two distinct use groups, R-1 and R-2 respectively.

The sloped grade of the site allows vehicular access to the basement laboratory. Boats and equipment are stored in the open lower level of the adjacent barn. The facilities are served by a well and an existing septic system located approximately 100’ from the house. The well water is not potable.

It is a site of rural character, historic structures and extensive wetlands, the 50’ buffer of which approaches the barn. The property is surrounded by over 125 acres of woods and marsh managed by the State Department of Fisheries and Wildlife.

In its current configuration, the farm house entangles living and working areas, and, within the living areas, mixes short term and long term residents. Kitchens and baths in particular are not adequate for consistent, intense use. Plumbing is at its limit. Privacy is an issue for long term residents and is exacerbated by poor sleeping conditions due to road noise from Route One. Recreational space is lacking; outdoor decks offer a leisure view of the landscape, but without screens, are left to the legions of bugs.

An outdoor faucet near the lab entrance minimally serves for cleanup after field trips. In reality, mud is tracked through the lab and living quarters as people, often carrying equipment requiring more thorough washing, transition from marsh to shower to lab work. Much of the equipment is quite large, eg. the Autosamplers which are 2’x3’ with 20’ of attached tubing, and will rust from salt water if not immediately, thoroughly cleaned.

Office space is separate from the lab area; current lab space also does not accommodate lecture/ classroom activities. Differentiation between “wet” and “dry” as well as “sitting” and “standing” lab work is indistinct, specialized and expensive equipment is shared, and water is currently unfiltered.

INTENT AND PROGRAM REQUIREMENTS

The specific intent of this study is to investigate renovation and addition solutions for improving the current work/live relationship at the Marshview Farm Field Station, as well as for accommodating new program elements including classroom/conference space, a computer room, storage for samples and equipment, and improved and expanded laboratory space. Other elements addressed include parking requirements, a new entry sequence, an elevator, handicapped bathrooms, improved HVAC systems, and state and federal code compliance.

A broader intent of this study is to set a course for the use of innovative and sustainable technologies so that the building complex is a model of environmental progress and MBL as a whole becomes a guide to the research and broader communities. Starting with a point of view towards conservation, as is possible, of existing structures and culminating with a goal of possible LEED accreditation, the proposed design stresses energy efficiency and reduced consumption through alternative means.

Of all the materials and resources that go into the construction of buildings, it is the long-term energy usage of the building that has the largest impact on the environment. The easiest and most cost effective method to reduce this impact is to use environmentally friendly blown-in insulation with a high R-value in all exterior walls, floors, ceilings and roofs. Another, more visible approach, will be the use of vegetated roofs over the lower level entrance and main lab space. Vegetated roofs reduce the amount of site run-off, diminish the heat island effect of a site and provide more insulation than typical roof assemblies. The lower level labs will use the earth's natural insulating properties to reduce energy requirements while the vegetated roof will help integrate the structure into the landscape and preserve the historic profile of the farm.

The Marshview Farm is a partial wetlands site and is not connected to the city sewer system. Consequently, green approaches to preemptive treatment of wastewater and reduction of waste creation are necessary. The civil engineering report sheds doubt on the ability of an on-site septic field to handle anticipated waste from the complex and labs. A potential future accord with a neighboring and fellow educational institution, Governor's Academy, may allow piping of MBL waste to the academy's new treatment facility. While this possibility is explored, innovative plumbing fixtures which reduce or eliminate grey water are proposed along side use of separate plumbing systems to route water from designated grey water fixtures for reuse in onstite irrigation.

A key element to reducing the negative impact of MBL on the Marshview property will be implementation of geo-thermal heat-pumps (for both heating and air-conditioning), supplemented by solar and wind power generation. Geo-thermal is an expensive system up-front but it assures lower annual energy costs and produces significantly less pollution over any given time. The wind and solar power will generate electricity to help power the heat-pumps and equipment.

DESIGN PROCESS & HISTORY

Analysis of the balance between conservation, renovation and addition progressed through three distinct schemes. The initial plan brought the lab out of the basement of the main house and created an enlarged, street level lab on the southside of the existing barn. Storage and office space ran along the east side of the barn and eventually connected with the main house. It was a concise plan which unfortunately required updating all areas of the existing barn and main house to meet current building code.

The second plan also required code compliance throughout an expanded footprint, but offered the benefit of ample space for growth to meet the 5-10 year planning goals for the Marshview Farm Field Station. Augmenting the rural historic profile of the property, this plan stylistically referred to the New England Connected Farmhouse. This plan fully integrated the two primary structures on the site. It created two new labs and placed additional sleeping quarters in an L-shaped connector between the main house and barn. A few of the highlights of the final plan, such as distinguished entrances for public and research use, were introduced in this second scheme.

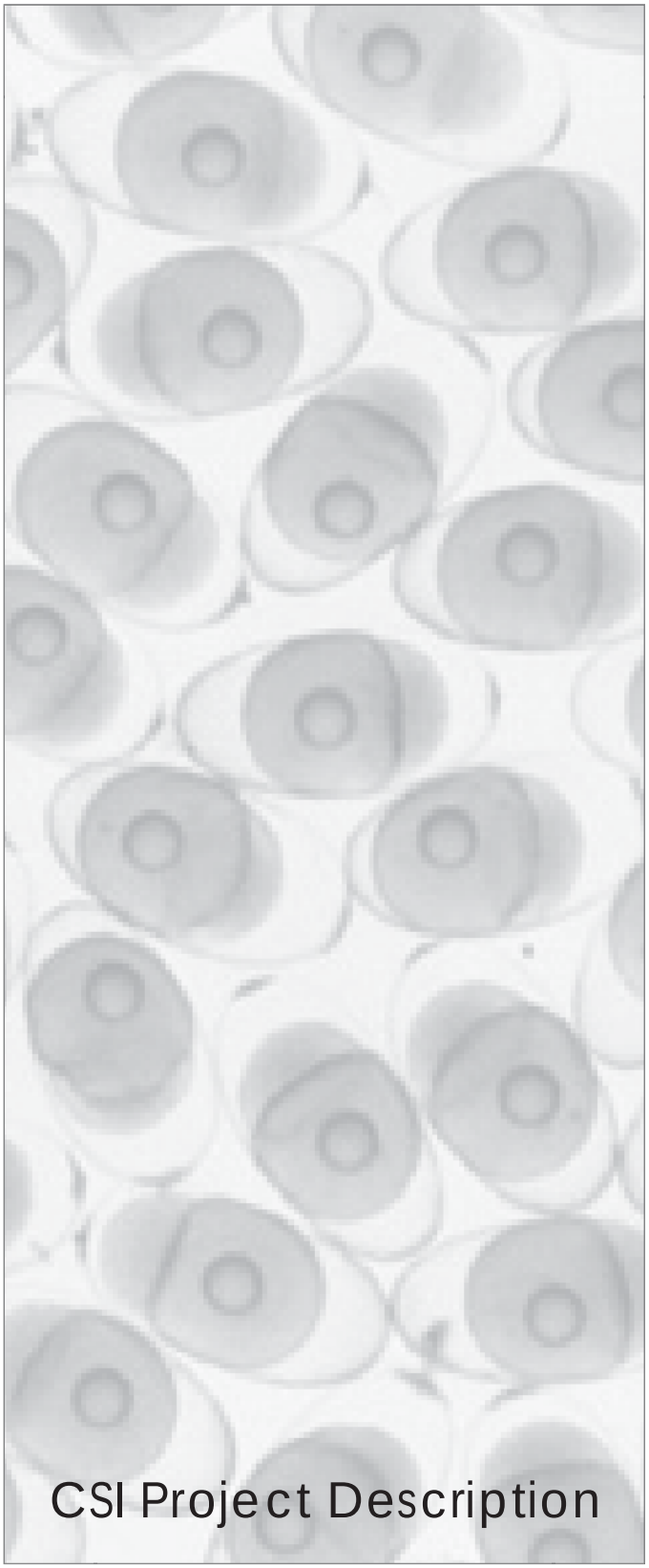
The third plan succeeds well beyond the others in terms of energy efficiency and phased growth. Described in detail below, this plan maintains the main house and its lab for use by short term researchers (building code use group R2) primarily. In this way, it avoids the renovations necessary to accommodate the R3 building code use group (long term researchers). By closing off the main house during the colder seasons, costly HVAC renovations are also avoided; energy consumption is consolidated in the high use areas of the complex. This plan also clearly separates the two groups of researchers and provides a balance of personal, communal and work space.

PROPOSED DESIGN

As mentioned above, the key feature of the proposed plan is a new lab tucked into the landscape under a vegetated roof. Exposed with almost continuous glazing to the east the lab offers views to the marsh and immediate proximity to the existing labs and lower level driveway. The lab has been sized to house new equipment including three hoods as well as a variety of workstations. A satellite screened porch beyond the lab is a sorting, washdown and storage station. Vehicular traffic can pass between the two buildings, facilitating transport of equipment from lab to field to cleanup.

In this scheme, the main house is untouched and is reserved for short term use. The consensus arrived at, with the help of the MBL scientists, is to concentrate the long term users of the facility in the renovated barn and new underground lab facility. This allocates the best facilities to the long term users, while allowing the existing farmhouse to be shut-down during low-use times such as the winter. The new facility will benefit from increased proximity to vehicular access on the east elevation as well as from improved separation from the highway.

A new two story structure is built adjacent to the barn on the footprint of the existing barn. It will house the new lower level public entrance, lower level storage, lecture space and a public lab on the second floor. Three stories of new construction connects the new structure and the original barn, enclosing a new egress stair and elevator, and providing handicapped access to all three levels of the renovated barn. The renovated barn contains several mixed uses: sleeping quarters for the long-term scientists, office and meeting spaces, construction shop, showers and locker space. The dorm style living quarters provide private kitchen, bedrooms and bathrooms for up to 4 pairs of long term researchers. Several opportunities are presented for communal space: a lounge, a reading room in the cupola, a conference room, and an ample triangular screened porch which adjoins an outdoor terrace and reaches out over the lab toward the marsh. The screened porch's significant location takes full advantage of the mass of the existing house and renovated barn to provide a quiet, outdoor, bug-free area for the scientists to congregate.



CSI Project Description

DIVISION 1: GENERAL REQUIREMENTS

The existing farm house will remain largely intact. The existing barn will be stripped down to the studs and structure. The driveway paving running between the barn and the farm house will be removed. The southern wing of the barn including the existing foundation will be demolished. The small accessory buildings east of the main barn will be demolished and removed. Reusable timber from the barn and accessory buildings will be salvaged and stored for use in the new construction. MBL will be responsible for all testing and removal of any hazardous material such as, but not limited to, lead paint and asbestos.

DIVISION 2: SITE CONSTRUCTION

The existing septic field will have to be expanded to accept the increased usage of the new facility. A new permeable driveway will be laid along a path beginning at Route 1, travelling along the south side of the new facility, connecting the new southern addition's basement level and ending with a circle at the existing farmhouse's east end. A new permeable parking area will be created along Route 1, connecting to the new driveway. New pathways will be created between the parking area and the lower level entry on the new southern addition. Pathways will also connect the new parking area with the existing barn and farmhouse. The first floor lab and entryway will be covered with vegetated roofs comprised of indigenous plants. The western face of the campus will be planted with a dense combination of trees, shrubs and vegetation to provide a visual and acoustic buffer from Route 1. A retaining wall will extend from the lower level entry to a new fence which will extend along Route 1 past the existing farmhouse. A bio-swale will be created on the south-eastern portion of the site to capture site drainage. A portion of the existing land further to the south will be restored as wetlands.

DIVISION 3: CONCRETE

A new stone and concrete retaining foundation wall will edge the new entrance to the lower level and connect to the new solid fence which extends across the front of the property. The new lower level lab, new southern wing containing the entrance, storage areas and the public lab will require new concrete footings, slabs and retaining foundation walls extending to 4 feet below finish grade. The new roof and floor systems will be concrete on steel decking. The new screened-in exterior sorting and wash down building will require new concrete footings and a concrete slab.

DIVISION 4: MASONRY

The new elevator tower will require a two-hour fire rated concrete block shaft for support and fire resistance capability. The retaining wall creating the entry will be a stone veneered concrete.

DIVISION 5: METALS

The new egress stairs will be steel framed with steel pan treads. The ceiling in the lower lab and southern entry will be framed with steel and use steel decking with a concrete slab. The new exterior curved egress stair in the tower will be steel. Exposed timber framing in the public lab and screen porch will be joined with steel connector plates and bolts, etc. The new roof of the renovated barn and new southern public lab and lecture space will be coated metal with matching metal gutters connected to an on site water storage tank. New interior partitions for the entire complex will be metal studs.

DIVISION 6: WOOD AND PLASTICS

The existing siding of the barn will be replaced with new plywood sheathing, 19 lb building felt, tyvek and new wood cedar shingles. The new exterior walls of the egress tower and southern public lab space will be sheathed in plywood and cedar shingles as well. The roof structure of the southern lab, screen porch and new screened-in work building on the lower east side of the site will be recycled timbers.

DIVISION 7: THERMAL AND MOISTURE PROTECTION

All interior walls and floors to receive 4” batt insulation for sound attenuation. New concrete slabs will have 2 inches of rigid, termite proof eps insulation below the slabs. New metal and concrete decks will receive 4 inches of rigid insulation and new exterior walls and roofs to be sprayed with icycene blown-in insulation with a minimum thickness of 4 inches for walls and 10 inches for roofs. Existing barn roof to be sheathed with stress-skin insulated panels on top of existing framing. New flat roofs to be covered with rubber roof membranes as well as drainage mats. Lower level lab foundation and slabs to be water-proofed with commercial grade membranes on all outside surfaces. All flashing to be lead-coated copper for all roof edges and valleys. Ice and water shields to be used for a continuous 4 feet at all intersections of roof surfaces as well as edges.. Exterior walls to receive both Tyvek and 18# roofing felt.

DIVISION 8: DOORS AND WINDOWS

All new windows in the existing barn are to be aluminum clad simulated divided-lite windows, Marvin or similar. New windows in the lower level public entry and lab spaces, and upper level public lab are to be extruded aluminum commercial grade or similar. All egress doors which are required to be fire-rated are to be metal with appropriate fire ratings. Interior non-rated doors for offices and living suites are to be two-panel wood doors. New lower level entry and main lab space to have skylights cut through the vegetated roofing.

DIVISION 9: FINISHES

New ceilings and walls in renovated barn to be 5/8” blue board and skim-coat plaster. New ceilings in lower level labs to be drop-in suspended ceilings. Ceiling in main-level public lab, screen porch and lower level screen work room to be exposed timber frame with tongue and groove wood boards. All new bathrooms to have tile floors and wainscoting. New living quads and main level offices to have solid wood flooring with a clear finish. Public lab and lower level public entry to have Marmoleum flooring. New lower level lab and exterior outdoor screen room to have sealed concrete floors. All new blue board and plaster walls and ceilings to be painted with one coat primer and two coats low VOC paints.

DIVISION 10: SPECIALTIES
All new rooms to have signage which complies with 521 CMR Mass Handicapped Code requirements. Lockers will be installed in lower level of barn as part of locker-room and shower room. Lower level lab and storage room will have lockable storage compartments. New complex to be fitted through-out with fire-extinguishers. New labs to have appropriate emergency wash facilities. All new bathrooms to be equipped with vanities, medicine cabinets, handicapped grab bars and approved H/C fixtures.

DIVISION 11: EQUIPMENT
All residential quads to have full-size refrigerators, range/oven combinations, and microwaves. Kitchens to have solid wood cabinetry with plastic laminate countertops with wood edges. Each floor of new complex to have two sets per floor of refuse and recycling collectors. The lab will have drying ovens and a refrigerator/freezer component.

DIVISION 12: FURNISHINGS
Public and lower level labs to be equipped with specialized lab casework and work tables. All labs to be equipped with louvered mini-blinds as are the remainder of windows in the residential sections and office interior walls.

DIVISION 13: SPECIAL CONSTRUCTION
New complex will be outfitted with a security system.

DIVISION 14: CONVEYING SYSTEMS
New elevator will be built with a standard size cab to accommodate handicapped requirements and will have a machine room on the lower level and three stops.

DIVISION: 15 MECHANICAL
The new complex containing the original barn, new residential quads and lower level entry and labs will have a dry fire-suppression system. New labs will have typical lab set-ups for sinks, dish washers etc. The new complex will have low-flow water fixtures with occupancy sensors and waterless urinals where possible. Grey water will be separately plumbed and stored on site to be used for watering of on-site landscaping. The remainder of the typical waste will be treated on site in an expanded septic system. Size limitations indicate the lab waste may have to be treated on site or stored on site for off-site treatment. A geo-thermal heat pump system for heating and air-conditioning will be implemented with three to four new wells for the water source for the heat-pumps. A hydo-air system will be used to distribute the warm and cool air. Three Fume hoods and corresponding exhaust systems will be installed in new lower lab area. Corresponding mechanical equipment will be installed in “mechanical space” at lower level and exhausted vertically through the stair tower.

DIVISION: 16 ELECTRICAL
The new complex will be equipped with fluorescent lighting throughout controlled by occupancy sensors. Site lighting will be at or below allowable levels by local ordinances and indirect in nature. The complex will have a hard wired smoke detector and fire alarm system as required by local inspectors. Telephone and wireless internet connection will be provided throughout. Two new 120 foot high windmills will be installed on the site to provide electricity. Solar panels will be installed on the roof of the public lab.


Civil Engineering Report

1.0 WASTEWATER

The project site is currently serviced by an on-site septic system. That system was constructed in 2002 and designed to service a 6-bedroom home for a total of 660 gallons per day (gpd). Since the existing facility is serviced by an on-site water supply well, there are no available records for actual water use or wastewater generation. Flows to the existing septic system include both sanitary and laboratory waste flows. Discharge of laboratory wastes to ground water is subject to permitting with the Massachusetts Department of Environmental Protection (MA DEP) regulations. It is not clear whether the necessary permits are in place.

The proposed project will result in an expansion of both sanitary and laboratory wastewater flows. There is no available data to estimate proposed laboratory water use but we understand that the water use will likely be substantial. A preliminary water use/wastewater generation estimate based on published flow rates under 310 CMR 15.000 State Environmental Code, Title 5, is as follows:

USE DESCRIPTION	TITLE 5 USE	QUANTITY	UNITS	RATE	TOTAL (GPD)
8 Full-Time Occupants	Family Dwelling	8	Bedrooms	110	880
20 Summer Occupants	Work or Construction Camp	20	Persons	50	1,000
Occasional Students	Factory w/o Cafeteria	20	Persons	15	300
			Total Sanitary Flow		**2,180**
Labs	(none)	1	Estimate	1,500	1,500
			Total Flow		**3,680**

From this data, it is apparent that the existing septic system is under-sized for the proposed project.

A review of septic system test-pit data and site observations indicate that available area surrounding the existing septic system is bounded to the east by the property line, south by a 50-foot bordering vegetated wetland (BVW) setback, and west by existing and proposed driveways. There appears to be some room for expansion to the north. Based on the flat topography and presence of wetlands surrounding the site, it is unlikely that other areas of the site will have sufficient depth to ground water to support a septic system. However, exploratory test pits would be required to confirm that assumption.

Based on the physical constraints presented above, there is an estimated 15,000 square feet of area potentially available for septic system construction as shown on Drawing C-1. Since the proposed uses would be an expansion of the existing use, full compliance with Title 5 will be

required, including designating a leach field reserve area equal to the required area of the leach field itself. Therefore, only half of the available area could be used for an expanded system. Based on the design rates of the existing system, the total septic system capacity for the site is estimated to be approximately 2,200 gpd. Test pits will be required to confirm the suitability of the expansion area and confirm this estimate; however, it appears that the site may have the capacity to support the additional sanitary flow but not the laboratory wastewater.

Since the site does not appear to have capacity to support subsurface disposal of laboratory wastewater, other alternatives should be considered. Possible wastewater disposal options are discussed in the paragraphs below and summarized in Table 1.

1.1 OPTION 1: SEPTIC SYSTEM/SURFACE WATER

Under this option, the existing septic system would be expanded to accommodate the additional sanitary flows. Laboratory wastewater would be discharged to surface water instead of a septic system. The likely receiving body for the laboratory wastewater would be the small pond located in the southern portion of the site. This pond drains by a brook which ultimately discharges to the Parker River.

A discharge of industrial wastewater to surface water would require an individual National Pollution Discharge Elimination System (NPDES) permit from the U.S. Environmental Protection Agency (EPA). The discharge would be subject to pretreatment and periodic monitoring and reporting. The frequency of the monitoring and scope of sampling parameters would be determined during the permitting process. Obtaining an individual NPDES permit requires comprehensive review and is generally a time-consuming process.

This approach may pose additional issues for permitting with the Newbury Conservation Commission since the receiving water body is most likely a resource area subject to protection under the Massachusetts Wetlands Protection Act.

1.2 OPTION 2: SEPTIC SYSTEM/HOLDING TANK

This option proposes to collect laboratory wastes in a holding tank for off-site disposal. Sanitary flows would be discharged to an expanded septic system consistent with Option 2. An industrial wastewater holding tank would require permitting with the MA DEP Bureau of Wetlands Protection (BWP). However, that permitting is relatively simple and would focus on the proposed tank itself and likely not require pretreatment or monitoring of laboratory wastewater.

This approach may be impractical if the volume of laboratory wastewater is high. At a minimum, the tank must be sized to hold 500 percent of the average daily flow. Based on the estimated laboratory flow of 1,500 gpd presented above, the minimum tank size would be 7,500 gallons. In addition to the burden of the tank itself, the facility could be subject to frequent and potentially costly pump-outs. An estimate of the unit price for wastewater disposal cannot be provided without additional information on its chemical composition.

1.3 OPTION 3: GOVERNOR'S ACADEMY TREATMENT PLANT

The Governor's Academy is an independent school located approximately 1 mile south of the site which operates a wastewater treatment plant. Recently, a gravity line was installed from the Old Newbury Golf Club, located south of the project site, to the treatment plant at the Governor's Academy. It may be feasible to construct a pump station and force main to convey sanitary and/or laboratory wastewater from the project site to the gravity main on the Old Newbury Golf Club site. The length of this force main would be approximately 2,000 feet.

As part of this investigation, we spoke with Richard Savage of the Governor's Academy regarding the feasibility of this approach. Mr. Savage indicated that the connection for the Old Newbury Golf Club was an exception since the club is located on land owned by the school. He added that a proposal to connect the project facility to that system would be subject to approval from both the MA DEP and the School. Considerations include setting a precedent for allowing connections from other sources in proximity to the school. However, the research nature of the proposed project could be viewed as an extension of the School's operation. Further discussion with the MA DEP would be required to determine the feasibility of this option.

TABLE 1: SUMMARY OF WASTEWATER DISPOSAL OPTIONS

OPTION	SANITARY	LABORATORY	PERMIT REQUIREMENTS	CONSTRUCTION COSTS	OPERATIONAL ISSUES
1	Septic System	Surface Water	Title 5 permitting for the sanitary system expansion through the Newbury Board of Health. Site may not have sufficient capacity to support all of the estimated sanitary flows from the site. NPDES permit from the U.S. EPA for discharge of laboratory wastewater to surface water. Newbury Conservation Commission for work within 100-foot wetlands setback	$120,000 to 170,000	Periodic monitoring and reporting for laboratory wastewater discharges
2	Septic System	Holding Tank	Title 5 permitting for the sanitary system expansion through the Newbury Board of Health Industrial Wastewater Holding Tank Permit from the MA DEP Newbury Conservation Commission for work within 100-foot wetlands setback	$120,000 to 170,000	Regular pump-out and disposal costs for laboratory wastewater
3	Governor's Academy		Permitting with MA DEP add to School's treatment plant Approval from the Governor's Academy Title 5 permitting for the sanitary system expansion through the Newbury Board of Health if sanitary remains on site	$225,000 to 275,000	Periodic monitoring and reporting of laboratory wastewater

NOTES:
1. Construction cost estimate for Option 2 assumes a 10,000-gallon holding tank.
2. Construction cost for Option 3 assumes both sanitary and laboratory wastewaters are pumped to the Governor's Academy. Overall costs for this option would increase if an expanded septic system is required to dispose of sanitary flows on site.
3. Construction cost estimates do not include permitting and operational costs

2.0 WATER SUPPLY

The facility is currently served by an on-site water supply well. The age, construction, and yield of this well are unknown. No records were available from the Town of Newbury. There is no public water supply in Newbury. Portions of Newbury are serviced by the City of Newburyport water; however, that service ends near the town line approximately 2.5 miles north of the site.

Based on the uncertain condition of existing well, we recommend that project plans include installation of a new well to service the facility. Based on the proximity of tidal waters, the well should be a deep bedrock well advanced to a suitable aquifer. Pump testing will be required to confirm the necessary yield.

Water use estimates discussed in the Wastewater section above total 3,680 gpd. That estimate is based on water consumption only and does not consider fire protection. Additional well yield may be necessary for fire protection purposes. However, measures for obtaining surface water from the on-site pond may be an acceptable alternative. Fire protection requirements will be determined by local officials based on the proposed construction and occupancy.

Construction costs for installing an new water supply well including the required pump tests are estimated to be approximately $25,000.

LEGEND OF SYMBOLS & ABBREVIATIONS:

EXISTING:		PROPOSED:
	PROPERTY LINE	N/A
	SETBACK LINE	N/A
	BORDERING VEGETATED WETLAND	N/A
	BUFFER ZONE TO RESOURCE AREA	N/A
	EDGE OF PAVEMENT	
	BUILDING	

Site:

MARSHVIEW ECOSYSTEMS
MARINE BIOLOGY LAB

297 NEWBURYPORT TURNPIKE
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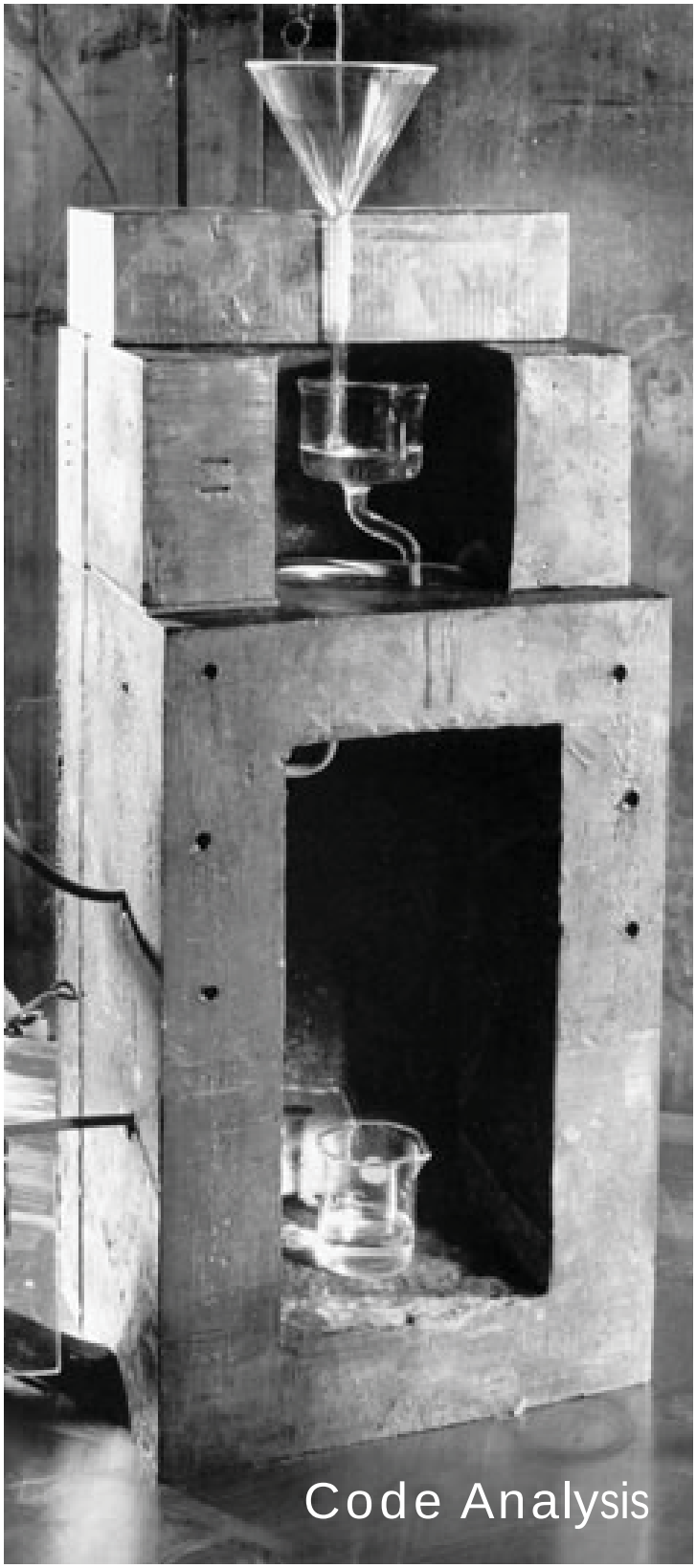
CONCEPTUAL SITE PLAN

No.	Revision/Issue	Date

Design by: DEG	Checked by: PFA
Drawn by: DEG	Approved by: PFA
Project: 034030	Date: NOVEMBER 13, 2006

Sheet: C1


Code Analysis

The design of the Marshview Farm Laboratory will be guided by the 780 CMR Sixth Edition Massachusetts State Building Code, the 521 CMR Massachusetts Architectural Access Board and the 28 CFR Part 36 Americans with Disabilities Act. The building code considers the different functions, hereafter called "Uses", that will be housed within the proposed building. These Uses determine allowable size, layout, construction, and fire protection. Both the Massachusetts Architectural Access Board (MAAB) and the Americans with Disabilities Act (ADA) provide requirements for the layout of spaces to ensure that these spaces are safe and accessible to persons with disabilities.

The state building code and the MAAB requirements take into consideration each project's scope of work in order to mitigate the degree to which full compliance with the most current standards is required. Generally, an alteration to an existing building that costs over 30% of that building's assessed value requires full compliance with both the 780 CMR and the 521 CMR. If alterations are less than 30% of the assessed value, only the new work undertaken must comply with these codes. Any alteration to the usability of a primary function area will trigger a requirement of access compliance for the path of travel to that space, including bathrooms, under the ADA requirements.

Essentially, the requested programmatic additions to the existing field station are sufficient to entail full compliance with all relevant code requirements. Hence the choice to leave the existing house untouched for the present. In so doing, focus is concentrated on code compliance and accessibility in the barn renovation and new laboratory, living quarters and learning center construction.

USE GROUPS

Because the determining factor for application of the 780 CMR Massachusetts State Building Code is Use, it is analysis of the program requirements that will identify the code driven design constraints including structure, egress, size, and fire separation. The program requirement of the new facility as related to Use Group designations under the 780 CMR, follow.

> Laboratory, research, and study components: Use Group B: Business.

> Dormitory style living accommodations: Use Group R-2: Multiple Dwelling Residential.

> Public lecture and classroom space: Use Group A-3: Assembly.

The proposed renovation and addition comprises three main areas of construction: a learning center with boat storage below in place of the existing barn addition; residential, study, and storage areas in place of the existing three-story barn shell and basement; and a new underground lab immediately adjacent to the existing lab in the basement of the main house. At its lowest level, the building footprint has a perimeter of 336 feet. This story is completely underground at the west side of the building and is open on the east side for access at grade. The north and south sides of the structure will be predominantly underground; less than half of the overall perimeter of this floor surfaces more than 6' above grade. This story, therefore, will count as a basement level, and, importantly, will not count toward the height and area limitations imposed by table 503 of the Massachusetts Building Code. The learning center will accordingly be only one story, and the residential and business components in the barn will occupy a space classified as three stories.

TYPE OF CONSTRUCTION

The existing barn is constructed from combustible materials and the learning center will be built to match. This construction is considered Type 5B, or Combustible Unprotected Construction. The applicable height and area limitations are described in table 503 and the required fire resistance ratings are within table 602.

Because various Uses are housed in this new building, it will be considered Mixed Use. This designation requires each individually classified portion of the building to be separated into distinct fire areas. The walls, floors, ceilings, doors etc., of each fire area must be capable of withstanding the duration of fire exposure outlined in the building code. Each separate Use Group zone will also need to comply with the height and area limitations from table 503, and the sum of the ratios of actual areas of each group to the allowable areas must be less than one at each floor.

BASEMENT FLOOR
A-3: 1048 actual/ 4200 allowable = .25
B: 3430 actual/ 7200 allowable = .48
Total: .25 + .48 = .73

FIRST FLOOR:
A-3: 963 actual/ 4200 allowable = .23
B: 2216 actual/ 7200 allowable = .31
Total: .23 + .31 = .54

SECOND FLOOR:
R-2: 1785 actual/ 4800 allowable = .37
Total: .37

THIRD FLOOR:
R-2: 1785 actual/ 4800 allowable = .37
Total: .37

The allowable floor areas are all compliant with the table 503 of the 780 CMR, but the height of the proposed Residential component exceeds the Code's limit by one story. It will, therefore, be necessary to supply the building throughout with an automatic sprinkler system. This will furnish an allowance of an additional story, as outlined in 780 CMR 504.2, and thus will legally permit the habitation of the second and third floors of the existing barn.

ACCESSIBILITY REQUIREMENTS

Accessibility in buildings in Massachusetts is governed by both the state code, or MAAB, and the federal code, or ADA. The list below compares the requirements of both codes for key features of the proposed design. While the requirements of the two codes are similar in some cases, in instances where they differ, the requirement for the greatest accessibility must be met.

Elevators:
> Both the ADA and MAAB require an elevator in a building of three or more stories.

Parking:
> Both the ADA and MAAB require at least one van accessible space in a lot of less than 25 total parking spaces.

Pedestrian Site Routes:
> ADA: Requires at least one accessible route on site that connects accessible parking, entrance, and the public street or sidewalk. If this route contains walkways, these must have a slope of no more than 5%.
> MAAB: Requires all public pedestrian routes on site to be accessible.

Entrance and Egress:
> ADA: Requires 50% of all public entrances to be accessible
> MAAB: Requires all public entrances to be accessible
> MAAB: Where more than one means of egress is required under 780 CMR from any accessible space, at least two accessible means of egress will be provided.

Assembly Classroom:
> MAAB: In the student laboratory portion of the public learning area, 5% of each element (including storage, countertops, and sinks) shall be accessible.

Laboratory Areas:
> ADA: All common areas such as cafeterias, restrooms, and employee lounges must be fully accessible. All other work areas must have an accessible approach, entry and exit to the area.
> MAAB: All spaces are public and need to be accessible. The MAAB has no requirements for employee only areas.

Bathrooms (public):
> ADA: All public toilet rooms must be accessible.
> MAAB: A separate, unisex toilet in proximity to the other restrooms is acceptable in lieu of accessible men's and women's rooms.

Dormitory Areas:
> ADA: An accessible route shall connect all accessible spaces and elements, including telephones with in the suite. The dwelling unit does not require an elevator provided that all the accessible areas are on an accessible level and the sleeping area is suitable for double occupancy.
> MAAB: Dormitories are considered to be transient lodging by the MAAB. All public and common use areas (including recreation areas, public toilets, public telephones, vending areas, and laundry rooms) are to be accessible. At least 5% of the sleeping rooms shall be accessible. If the facility consists of more than one building, all of the units in the entire facility must be added together.

780 CMR: STATE BOARD OF BUILDING REGULATIONS AND STANDARDS

THE MASSACHUSETTS STATE BUILDING CODE

Table 503

HEIGHT AND AREA LIMITATIONS OF BUILDINGS

Height limitations of buildings (shown in upper figure as stories and feet above grade plane)[n], and area limitations of one- or two-story buildings facing on one street or public space not less than 30 feet wide (shown in lower figure as area in square feet per floor[n]). See Note a.

Table notes appear immediately following table.
N.P. = Not Permitted: N.L. = Not Limited

USE GROUPS	Type of Construction									
	Noncombustible					Noncombustible/ Combustible			Combustible	
	Type 1		Type 2			Type 3		Type 4	Type 5	
	Protected Note b		Protected		Unprotected	Protected	Unprotected	Heavy timber	Protected	Unprotected
Note a	1A	1B	2A	2B	2C	3A	3B	4	5A	5B
A-1 Assembly; theaters	N.L.	N.L.	5 St. 65' 19,950	3 St. 40' 13,125	2 St. 30' 8,400	3 St. 40' 11,550	2 St. 30' 8,400	3 St. 40' 12,600	1 St. 20' 8,925	1 St. 20' 4,200
A-2 Assembly; night clubs and similar uses	N.L.	N.L. 7,200	3 St. 40' 5,700	2 St. 30' 3,750	1 St. 20' 2,400	2 St. 30' 3,300	1 St. 20' 2,400	2 St. 30' 3,600	1 St. 20' 2,550	1 St. 20' 1,200
A-3 Assembly; lecture halls, recreation centers, terminals, restaurants, other than night clubs	N.L.	N.L.	5 St. 65' 19,950	3 St. 40' 13,125	2 St. 30' 8,400	3 St. 40' 11,550	2 St. 30' 8,400	3 St. 40' 12,600	1 St. 20' 8,925	1 St. 20' 4,200
A-4 Assembly; churches Note c	N.L.	N.L.	5 St. 65' 34,200	3 St. 40' 22,500	2 St. 30' 14,400	3 St. 40' 19,800	2 St. 30' 14,400	3 St. 40' 21,600	1 St. 20' 15,300	1 St. 20' 7,200
B Business	N.L.	N.L.	7 St. 85' 34,200	5 St. 65' 22,500	3 St. 40' 14,400	4 St. 50' 19,800	3 St. 40' 14,400	5 St. 65' 21,600	3 St. 40' 15,300	2 St. 30' 7,200
E Educational Note c	N.L.	N.L.	5 St. 65' 34,200	3 St. 40' 22,500	2 St. 30' 14,400	3 St. 40' 19,800	2 St. 30' 14,400	3 St. 40' 21,600	1 St. 20' 15,300 Note d	1 St. 20' 7,200 Note d
F-1 Factory and industrial Moderate	N.L.	N.L.	6 St. 75' 22,800	4 St. 50' 15,000	2 St. 30' 9,600	3 St. 40' 13,200	2 St. 30' 9,600	4 St. 50' 14,400	2 St. 30' 10,200	1 St. 20' 4,800
F-2 Factory and Industrial low Note h	N.L.	N.L.	7 St. 85' 34,200	5 St. 65' 22,500	3 St. 40' 14,400	4 St. 50' 19,800	3 St. 40' 14,400	5 St. 65' 21,600	3 St. 40' 15,300	2 St. 30' 7,200
H-1 High hazard, detonaton hazards Notes e, i, k, l	1 St.20' 16,800	1 St. 20' 14,400	1 St. 20' 11,400	1 St. 20' 7,500	1 St. 20' 4,800	1 St. 20' 6,600	1 St. 20' 4,800	1 St. 20' 7,200	1 St. 20' 5,100	N.P.
H-2 High Hazard deflagration hazards Note e,i,j,l	5 St. 65' 16,800	3 St. 40' 14,400	3 St. 40' 11,400	2 St. 30' 7,500	1 St. 20' 4,800	2 St. 30' 6,600	1 St. 20' 4,800	2 St. 30' 7,200	1 St. 20' 5,100	N.P.
H-3 High Hazard physical hazards Note e,l	7 St. 85' 33,600	7 St. 85' 28,800	6 St. 75' 22,800	4 St. 50' 15,000	2 St. 30' 9,600	3 St. 40' 13,200	2 St. 30' 9,600	4 St. 50' 14,400	2 St. 30' 10,200	1 St.20' 4,800
H-4 High Hazard health hazards Note e,l	7 St. 85' N.L.	7 St. 85' N.L.	7 St. 85' 34,200	5 St. 65' 22,500	3 St. 40' 14,400	4 St. 50' 19,800	3 St. 40' 14,400	5 St. 65' 21,600	3 St. 40' 15,.00	2 St. 30' 7,200
I-1 Institutional, residential care	N.L.	N.L.	9 St.100' 19,950	4 St. 50' 13,125	3 St. 40' 8,200	4 St. 50' 11,550	3 St. 40' 8,400	4 St.50' 12,600	3 St. 40' 8,925	2 St. 35' 4,200
I-2 Institutional, incapacitated Note m	N.L.	N.L.	4 St. 50' 17,100	2 St. 30' 11,250	1 St. 20' 7,200	1 St. 20' 9,900	N.P.	1 St. 20' 10,800	1 St. 20' 7,650	N.P.
I-3 Institutional, restrained	N.L.	N.L.	4 St. 50' 14,250	2 St. 30' 9,375	1 St. 20' 6,000	2 St. 30' 8,250	1 St. 20' 6,000	2 St. 30' 9,000	1 St. 20' 6,375	N.P.
M Mercantile	N.L.	N.L.	6 St. 75' 22,800	4 St. 50' 15,000	2 St. 30' 9,600	3 St. 40' 13,200	2 St. 30' 9,600	4 St. 50' 14,400	2 St. 30' 10,200	1 St. 20' 4,800
R-1 Residential, hotels	N.L.	N.L.	9 St.100' 22,800	4 St. 50' 15,000	3 St. 40' 9,600	4 St. 50' 13,200	3 St 40' 9,600	4 St. 50' 14,400	3 St. 40' 10,200	2 St. 35' 4,800
R-2 Residential, multi-family	N.L.	N.L.	9 St.100' 22,800	4 St. 50' 15,000 Note f	3 St. 40' 9,600	4 St. 50' 13,200 Note f	3 St. 40' 9,600	4 St. 50' 14,400	3 St. 40' 10,200	2 St. 35' 4,800
R-3 Residential, multiple single family	N.L.	N.L.	4 St. 50' 22,800	4 St. 50' 15,000	3 St. 40' 9,600	4 St. 50' 13,200	3 St. 40' 9,600	4 St. 50' 14,400	3 St. 40' 10,200	2 St. 35' 4,800
S-1 Storage, moderate	N.L.	N.L.	5 St. 65' 19,950	4 St. 50' 13,125	2 St. 30' 8,400	3 St. 40' 11,550	2 St. 30' 8,400	4 St. 50' 12,600	2 St. 30' 8,925	1 St. 20' 4,200
S-2 Storage, low Note g	N.L.	N.L.	7 St. 85' 34,200	5 St. 65' 22,500	3 St. 40' 14,400	4 St. 50' 19,800	3 St. 40' 14,400	5 St. 65' 21,600	3 St. 40' 15,300	2 St. 30' 7,200
U Utility, miscellaneous	N.L.	N.L.								

Notes applicable to Table 503:

Note a. See the following sections for general exceptions to Table 503:
780 CMR 504.2 Allowable height increase due to automatic sprinkler system installation

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Table 602

FIREESISTANCE RATINGS OF STRUCTURE ELEMENTS[k]

Structure element		Type of construction 780 CMR 602.0									
		Noncombustible					Noncombustible/Combustible			Combustible	
		Type 1 780 CMR 603.0		Type 2 780 CMR 603.0			Type 3 780 CMR 604.0		Type 4 780 CMR 605.0	Type 5 780 CMR 606.0	
		Protected		Protected		Unprotected	Protected	Unprotected	Heavy timber Note c	Protected	Unprotected
Note a		1A	1B	2A	2B	2C	3A	3B	4	5A	5B
1 Exterior walls	Loadbearing	4	3	2	1	0	2	2	2	1	0
		← Not less than the rating based on fire separation distance (see 780 CMR 705.2) →									
	Nonloadbearing	← Not less than the rating based on fire separation distance (see 780 CMR 705.2) →									
2 Fire walls and party walls (780 CMR 707.0)		4	3	2	2	2	2	2	2	2	2
		← Not less than the fireresistance rating required by Table 707.1 →									
3 Fire separation assemblies (780 CMR 709.0)	Fire enclosure of exits (780 CMR 1014.11, 709.0 and Note b)	2	2	2	2	2	2	2	2	2	2
	Shafts (other than exits) & elevator hoistway (780 CMR 709, 710.0 & Note b)	2	2	2	2	2	2	2	2	1	1
	Mixed use & fire area separations (780 CMR 313.0)	← Not less than the fireresistance rating required by Table 313.1.2 →									
	Other Separation assemblies (Note i)	1	1	1	1	1	1	1	1	1	1
		← Note d →									
4 Smoke partitions (780 CMR 711.0)	Exit access corridors (Note g)	← Not less then the fireresistance rating required by 780 CMR 1011.4 →									
		← Note d →									
	Tenant spaces separations (Note f)	1	1	1	1	0	1	0	1	1	0
		← Note d →									
5 Dwelling unit separations (780 CMR 711.0, 713.0 & Notes f & j)		1	1	1	1	1	1	1	1	1	1
		← Note d →									
6 Smoke barriers (780CMR 712.0 & Note g)		1	1	1	1	1	1	1	1	1	1
7 Other nonloadbearing partitions		0	0	0	0	0	0	0	0	0	0
		← Note d →									
8 Interior load-bearing walls, loadbearing partitions, columns, girders, trusses (other than roof trusses) & framing (780 CMR 715.0)	Supporting more than one floor	4	3	2	1	0	1	0	See 780 CMR 605.0	1	0
	Supporting one floor only or a roof only	3	2	1½	1	0	1	0	See 780 CMR 605.0	1	0
9 Structural members supporting wall (780 CMR 715.0 & Note g)		3	2	1½	1	0	1	0	1	1	0
		← Not less than fireresistance rating of wall supported →									
10 Floor construction including beams (780 CMR 713.0 & Note h)		3	2	1½	1	0	1	0	See 780 CMR 605.0, Note c	1	0
11 Roof construction, including beams, trusses and framing, arches & roof deck (780 CMR 714.0 & Notes e, i)	15' or less in height to lowest member	2	1½	1	1	0	1	0	See 780 CMR 605.0, Note c	1	0
		← Note d →									
	More than 15' but less than 20' in height to lowest member	1	1	1	0	0	0	0	See 780 CMR 605.0	1	0
		← Note d →									
	20' or more in height to lowest member	0	0	0	0	0	0	0	See 780 CMR 605.0	0	0
		← Note d →									

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USE OR OCCUPANCY

Table 313.1.2
FIRERESISTANCE RATING REQUIREMENTS FOR FIRE SEPARATION ASSEMBLIES BETWEEN FIRE AREAS[a]

Use Group

NP- Not Permitted
NA - Not Applicable

		A-1	A-2	A-3	A-4	A-5	B	E	F-1	F-2	H-1	H-2	H-3	H-4	I-1	I-2	I-3	M	R-1	R-2	R-3	S-1	S-2	U
	A-1	2	3	2	2	2	2	2	2	2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
	A-2		3	3	3	3	3	3	3	3	NP	4	3	3	3	3	3	3	3	3	3	3	3	NA
	A-3			2	2	2	2	2	2	2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
	A-4				2	2	2	2	2	2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
	A-5					NA	2	2	2	2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
	B						2	2	2	2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
	E							2	2	2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
	F-1								2	2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
	F-2									2	NP	4	3	2	2	3	3	2	2	2	2	2	2	NA
U	H-1										NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NA
S	H-2											4	4	4	4	4	4	4	4	4	4	4	4	NA
E	H-3												3	3	3	3	3	3	3	3	3	3	3	NA
	H-4													2	2	2	2	2	2	2	2	2	2	NA
G	I-1														2	3	3	2	2	2	2	2	2	NA
R	I-2															3	3	3	3	3	3	3	3	NA
O	I-3																3	3	3	3	3	3	3	NA
U	M																	2	2	2	2	2	2	NA
P	R-1																		2	2	2	2	2	NA
	R-2																			2	2	2	2	NA
	R-3																				2	2	2	NA
	S-1																					2	2	NA
	S-2																						2	NA
	U																							NA

Note a. Fire resistance ratings are expressed in hours.


LEED

WHY LEED?

The Marshview Farm Lab Renovation presents a unique combination of challenges and opportunities that warrant sustainable solutions. Being located in the Parker River Great Marsh removes this building from the municipal water and sewer utilities traditionally required by a laboratory, while bringing it close to the very environment that its researchers study and protect. The public profile of this lab and educational center will allow it to function as an example of environmentally sensitive design to the community. The following is a LEED checklist and summary of the LEED rating system and the ways in which a wide range of building elements may be combined to form an efficient and responsible project.

LEED-NC Version 2.1 Registered Project Checklist

NKC High School

Yes	?	No			
9	**1**	**5**	**Sustainable Sites**		**14** Points
Y			Prereq 1	**Erosion & Sedimentation Control**	Required
		1	Credit 1	**Site Selection**	1
		1	Credit 2	**Development Density**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
		1	Credit 4.3	**Alternative Transportation**, Alternative Fuel Vehicles	1
1			Credit 4.4	**Alternative Transportation**, Parking Capacity and Carpooling	1
1			Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
1			Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
1			Credit 6.1	**Stormwater Management**, Rate and Quantity	1
1			Credit 6.2	**Stormwater Management**, Treatment	1
1			Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
1			Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
1			Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
4	**1**		**Water Efficiency**		**5** Points
1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
1			Credit 2	**Innovative Wastewater Technologies**	1
1			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	?		Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Yes	?	No			
6	**4**		**Energy & Atmosphere**		**17** Points
Y			Prereq 1	**Fundamental Building Systems Commissioning**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**CFC Reduction in HVAC&R Equipment**	Required
2	?		Credit 1	**Optimize Energy Performance**	1 to 10
1			Credit 2.1	**Renewable Energy**, 5%	1
1			Credit 2.2	**Renewable Energy**, 10%	1
	?		Credit 2.3	**Renewable Energy**, 20%	1
	?		Credit 3	**Additional Commissioning**	1
1			Credit 4	**Ozone Depletion**	1
	?		Credit 5	**Measurement & Verification**	1
1			Credit 6	**Green Power**	1

Yes	?	No			
7	**3**		**Materials & Resources**		**13** Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
	?		Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1
		1	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
	?		Credit 2.1	**Construction Waste Management**, Divert 50%	1
		1	Credit 2.2	**Construction Waste Management**, Divert 75%	1
1			Credit 3.1	**Resource Reuse**, Specify 5%	1
1			Credit 3.2	**Resource Reuse**, Specify 10%	1
1			Credit 4.1	**Recycled Content**, Specify 5% (post-consumer + ½ post-industrial)	1
	?		Credit 4.2	**Recycled Content**, Specify 10% (post-consumer + ½ post-industrial)	1
1			Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
1			Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
1			Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1

Yes	?	No			
12	**2**	**1**	**Indoor Environmental Quality**		**15** Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
1			Credit 2	**Ventilation Effectiveness**	1
	?		Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Perimeter	1
		1	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
1			Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	?		Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes	?	No			
1	**1**	**3**	**Innovation & Design Process**		**5** Points
	?		Credit 1.1	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	**LEED™ Accredited Professional**	1

This following LEED assessment of MBL and Marshview Farms is based upon LEED 2.1 standards. Outlined below are the credits that may be achieved by MBL and some strategies for achieving them.

SECTION 1: SITE SELECTION

Prerequisite 1: Erosion and Sedimentation Control
Prevent the loss of soil through erosion during construction. ***Mandatory for receiving SS credits.***

Credit 4.2: Alternative Transportation- Bicycle Storage and Changing Rooms
This credit is readily achievable considering the and number of showers already integrated into MBL's building. Bicycle storage will need to be covered because of the residential component of this building.

Credit 4.4: Alternative Transportation- Parking Capacity and Carpooling
Possible and readily achievable, as we are trying to minimize the number of parking spaces, as well as that carpooling will be a focus.

Credit 4.3: Alternative Transportation- Alternative Fuel Vehicles
Possible, but not feasible considering the nature of parking on site.

Credit 5.1: Reduced Site Disturbance-Protect or Restore Open Space
For previously developed sites, restore a minimum of 50% of the site area, excluding the building footprint, by replacing impervious surfaces with native or adapted vegetation. This credit is achievable since the size of the site is relatively large and the new development is limited. Further, the bulk of the new program will be housed partially underground.

Credit 5.2: Reduced Site Disturbance- Development Footprint
Reduce the development footprint to exceed the local zoning's open space requirement for the site by 25%. This credit is achievable as we will already be abiding by the Newbury zoning requirement for 50% open space.

Credit 6.1: Stormwater Management- Rate and Quantity
If existing imperviousness is less than or equal to 50%, implement a stormwater management plan that prevents the post-development 1.5 year, 24 hour peak discharge rate from exceeding the pre-development 24 hour peak discharge rate. This effectively requires that the new buildings on the site do not increase the quantity of stormwater runoff from the site.

Credit 6.2: Stormwater Management- Treatment
Construct site stormwater treatment systems designed to remove 80% of the post development total suspended solids and 40% of the average annual post-development total phosphorous from all storms less than or equal to the 2-year/ 24-hour storm. This credit is possible using the proposed constructed wetlands and swale

Credit 7.1: Heat Island Effect- Non-Roof
Provide shade and/ or use light-colored/high-albedo materials and/or open grid pavement for at least 30% of the site's non-roof impervious surfaces or use an open-grid pavement system for a minimum of 50% of the parking lot area. This credit is possible but accessibility compliance will need to be cross checked with impervious surfaces.

Credit 7.2: Heat Island Effect- Roof
Use high emissivity roofing for 75% of the roof or install a vegetated room for at least 50% of the roof. Combinations of both high albedo and vegetated roofs must equal 75% of the roof area. With the use of a vegetated roof on the new labs this credit is very achievable. However, the roof on top of the educational wing will be covered with solar panels, which does not qualify for this credit.

Credit 8: Light Pollution Reduction
Prevent light trespass beyond the boundaries of the site.

SECTION 2: WATER EFFICIENCY

Credit 1.1: Water Efficient Landscaping
Reduce potable water use for landscaping by 50%. This can be achieved by using native plants that require less irrigation and can survive naturally in the North Eastern climate.

Credit 1.2: Water Efficient Landscaping
Use no potable water for landscape irrigation. This can be achieved by using grey water systems for irrigation all.

Credit 2: Innovative Wastewater Technologies
Reduce the use of potable water for building sewage conveyance by a minimum of 50% or treat 100% of wastewater on site to tertiary standards. As this building does not have access to a municipal sewer system, it is, in fact, necessary that the sewage be treated on site. Meeting this requirement will involve both reducing the demand for potable water use in sewage conveyance by using high efficiency and waterless toilets and urinals where possible, and also by using treatment methods including constructed wetlands.

Credit 3.1: 20% Water Use Reduction
After calculating a baseline case for the building, reducing the demand for potable water on site by 20% is readily achievable with proper planning.

Credit 3.2: 30% Water Use Reduction
After calculating a baseline case for the building, reducing the demand for potable water on site by 20% is readily achievable with proper planning.

SECTION 3: ENERGY AND ATMOSPHERE

Prerequisite 1: Fundamental Building Systems Commissioning. ***Mandatory for receiving EA credits.***
Engage a commissioning authority, not directly responsible for the design of the project, to document the owner's requirements regarding energy efficiency, indoor air quality, occupant comfort, and operational performance, and oversee the project's compliance with these goals.

Prerequisite 2: Minimum Energy Performance. ***Mandatory for receiving EA credits.***
Design the building to comply with ASHRAE/IESNA Standard 90.1-1999 in order to establish a baseline minimum level of energy performance.

Prerequisite 3: CFC Reduction in HVAC&R Equipment. ***Mandatory for receiving EA credits.***

Use no CFC-based refrigerants in building systems.
Credit 1: (10 points available) Optimize Energy Performance
Each point in this credit is awarded for 10% reductions in the building's energy demand above 15% calculated in relation to the baseline building energy model. This can be achieved through reducing the demand for energy by using things such as passive lighting and ventilation and the earth's insulation, using free energy such as solar, wind, and geothermal, and increasing the energy efficiency of the building.

Credit 2.1: Renewable Energy 5%
Credit 2.2: Renewable Energy 10%
Credit 2.3: Renewable Energy 20%
These credits measure the amount of metered energy supplied by on-site renewable resources. The combination of solar panels and wind power will contribute to these credits.

Credit 3: Additional Commissioning
The commissioning authority shall provide additional services to the owner, including the review of the design through the construction documents phase as well as will implement measures to verify that the building is performing as desired.

Credit 4: Ozone Depletion
Use no HCFCs or Halon in the building HVAC and fire suppression systems.

Credit 5: Measurement and Verification
Provide equipment that measures the performance of building systems to ensure that they are functioning as intended and providing the desired efficiency and savings.

Credit 6: Green Power
This credit requires that the building owner signs a 2 year contract to provide Green-E certified power for 50% of the energy supplied to the site.

SECTION 4: MATERIALS AND RESOURCES

Prerequisite 1: Storage and Collection of Recyclables ***Mandatory for receiving MR credits.***
Provide an easily accessible area that serves the entire building and is dedicated to the separation, collection and storage of materials for recycling.

Credit 1.1: Building Reuse
This credit requires that 75% of the existing building and shell be reused in its original capacity. This credit may or may not be possible depending upon the strategy used for removing and replacing the existing addition to the barn which could potentially remove more than 25% from the overall structure. The wood, glass, and other materials salvaged from the addition will, however, be eligible for Credit 3: Resource Reuse.

Credit 2.1: Construction Waste Management- Divert 50% from Landfill
50% of the waste from construction, demolition, and land clearing (as measured by percentage of total weight or volume) must be reused on site or sent to appropriate recycling facilities. It is possible, but not likely that we will be able to attain this credit. Materials claimed for Credit 3 are not permitted to qualify for this credit, and therefore the weight or volume of salvaged portions of the addition and reused portions of the barn will not be included in the amount of material diverted from the landfill.

Credit 3.1: Resource Reuse- 5%
Use salvaged, refurbished, or reused materials. These can be the portions of the demolished addition, but cannot be the structural members of the original barn that continue to be used for their existing purpose.

Credit 3.2: Resource Reuse- 10%

Credit 4.1: Recycled Content- 5%
Use materials with recycled content such that the sum of the post-consumer recycled content plus one-half of the post-industrial content equals 5% of the total value of materials in the project.

Credit 4.2: Recycled Content- 10%

Credit 5.1: Regional Materials- 20% Manufactured Regionally
Materials that are salvaged from the site are considered to be manufactured locally, and therefore, the reused portions of the building can be applied to this credit.

Credit 5.2: Regional Materials- 50% Extracted Regionally
This requires that 50% of the materials used in Credit 5.1 are harvested within a 500 mile radius of the project site. This includes materials salvaged from the site.

Credit 6: Rapidly Renewable Resources
Use materials and products made from plants that are harvested within a ten-year cycle for 5% of the total value of all building materials. Examples of suitable materials for claiming this credit are bamboo surfaces, cotton batt insulation, linoleum, and wool carpet. The performance and cost of these materials should be weighed against the value of this credit.

Credit 7: Certified Wood
Use wood certified by the Forest Stewardship Council for 50% of wood-based materials in the project. Salvaged and refurbished wood is not included in this calculation, so only the remainder of the wood products used in the building would comprise the total.

SECTION 5: INDOOR ENVIRONMENTAL QUALITY

Prerequisite 1: Minimum IAQ Performance ***Mandatory for receiving IEQ credits.***
Design building to meet the air quality requirements of ASHRAE 62-1999.

Prerequisite 2: Environmental Tobacco Smoke Control ***Mandatory for receiving IEQ credits.***
Prevent exposure of non-smokers to environmental tobacco smoke by either prohibiting smoking within the building or providing a separately ventilated smoking room.

Credit 1: Carbon Dioxide Monitoring
Since the amount of carbon dioxide in the indoor environment is a good indicator of the ventilation in a space, a monitoring system that affords the opportunity for adjustment can help insure optimal air quality. Such a system is required for this credit.

Credit 2: Ventilation Effectiveness
For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness

greater than or equal to .9. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy.

Credit 3.1: Construction IAQ Management Plan- During Construction
Develop and implement a indoor air quality plan for the construction phase of the project that meets the requirements of referenced SMACNA and ASHRAE standards. Also protect all absorptive materials from moisture damage.

Credit 3.2: Construction IAQ Management Plan- After Construction/ Before Occupancy
Prior to occupancy, conduct a two-week building flush out and replace filtration media, or conduct a baseline indoor air quality test.

Credit 4.1: Low-Emitting Materials- Adhesives and Sealants
Ensure that the VOC emissions from adhesives and sealants used in the building is less than the limits outlined by the South Coast Air Quality Management District Rule #1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

Credit 4.2: Low-Emitting Materials- Paints and Coatings
Ensure that the VOC emissions from paints and coatings do not exceed the limits of Green Seal's GS-11 requirements.

Credit 4.3: Low-Emitting Materials- Carpet
Carpet systems must meet or exceed the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program

Credit 4.4: Low-Emitting Materials- Composite Wood
Composite wood products much contain no added urea-formaldehyde resins.

Credit 5: Indoor Chemical & Pollutant Source Control
The intent of this credit is to minimize cross-contamination of regularly occupied areas by employing means of containing pollutants. Some strategies are using architectural grilles at entries to capture dirt, physically separating and providing separate venting for spaces of chemical usage and high volume printing and copying, and appropriately plumbing drains to accommodate disposal of chemical waste where applicable. These strategies are especially important in this laboratory building, as the potential for bringing dirt into the building is high.

Credit 6.1: Controllability of Systems- Perimeter Spaces
Provide at least one operable window and one lighting control zone per 200 square feet of occupied areas within 15 feet of exterior walls. Due to the small footprint, most spaces will have access to a window.

Credit 6.2: Controllability of Systems- Non-Perimeter Spaces
Provide controls for each individual for airflow, temperature and lighting for at least 50% of the occupants in non-perimeter, regularly occupied spaces. This credit is possible, but the expense of these additional controls may not be efficient considering how few occupants will be in the non-perimeter spaces in this building.

Credit 7.1: Thermal Comfort- Compliance with ASHRAE 55-1992
This credit requires that the building be designed to operate within specified comfort ranges for temperature and humidity.

Credit 7.2: Thermal Comfort- Permanent Monitoring System
Install a permanent temperature and humidity monitoring system that allows for control of thermal and humidification performance. This is possible if the building has a mechanical ventilation system.

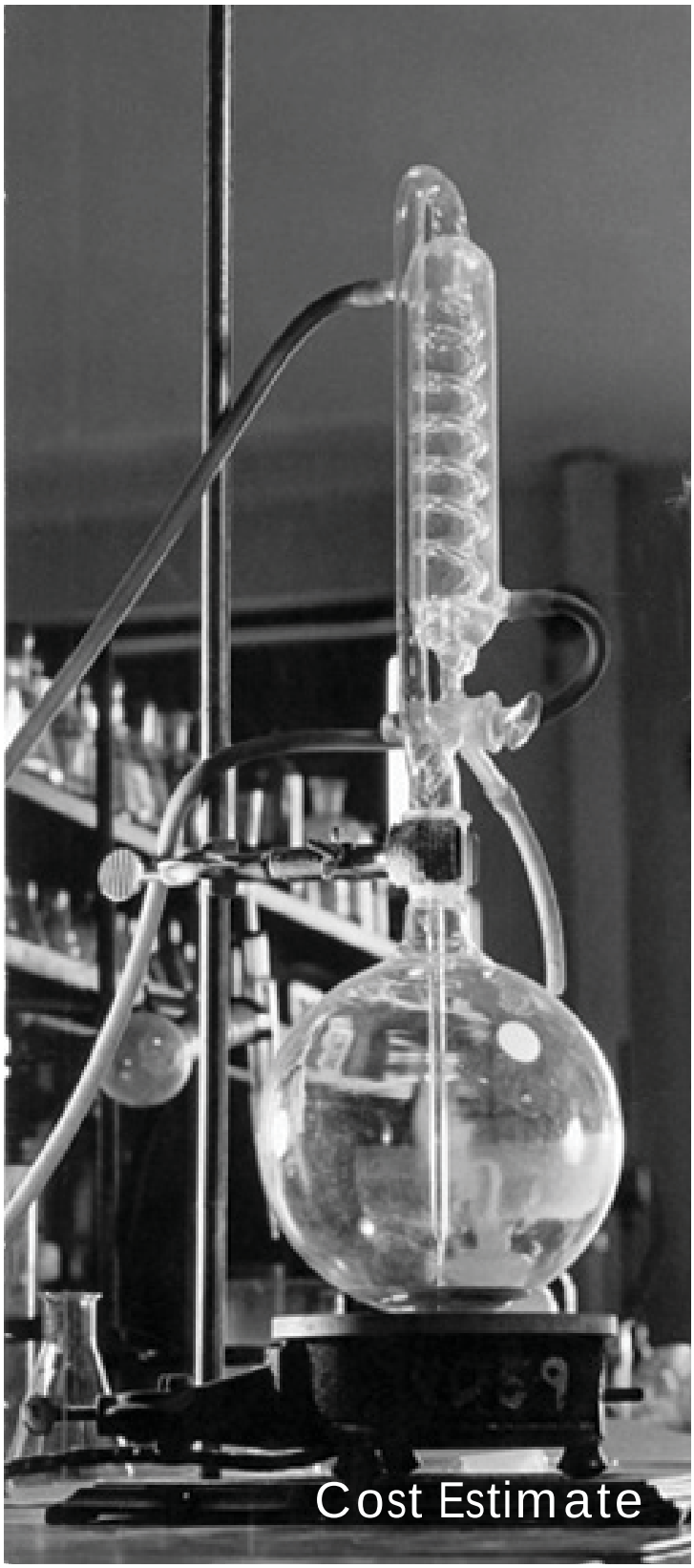
Credit 8.1: Daylight and Views- Daylight 75% of Spaces
Achieve a minimum daylight factor of 2% in 75% of all space occupied for critical visual tasks. This credit should be readily achievable considering the amount and orientation of windows in the design.

Credit 8.2: Daylight and Views- Views for 90% of Spaces
Provide a direct line of sight to vision glazing for building occupants in 90% of all regularly occupies spaces.

SECTION 6: INNOVATION AND DESIGN PROCESS

Credit 1.1 - 1.4: Innovation in Design
Up to four points may be earned for this credit by either greatly exceeding the requirements of an existing LEED credit in a given area or by implementing an innovative strategy not addressed by the LEED rating system that yields substantial environmental benefits. Further research would be needed to determine whether any of the strategies employed in this project could qualify for this credit.

Credit 2: LEED Accredited Professional
One credit will be earned for having a LEED Accredited Professional as a principal participant in the project design team.



Cost Estimate

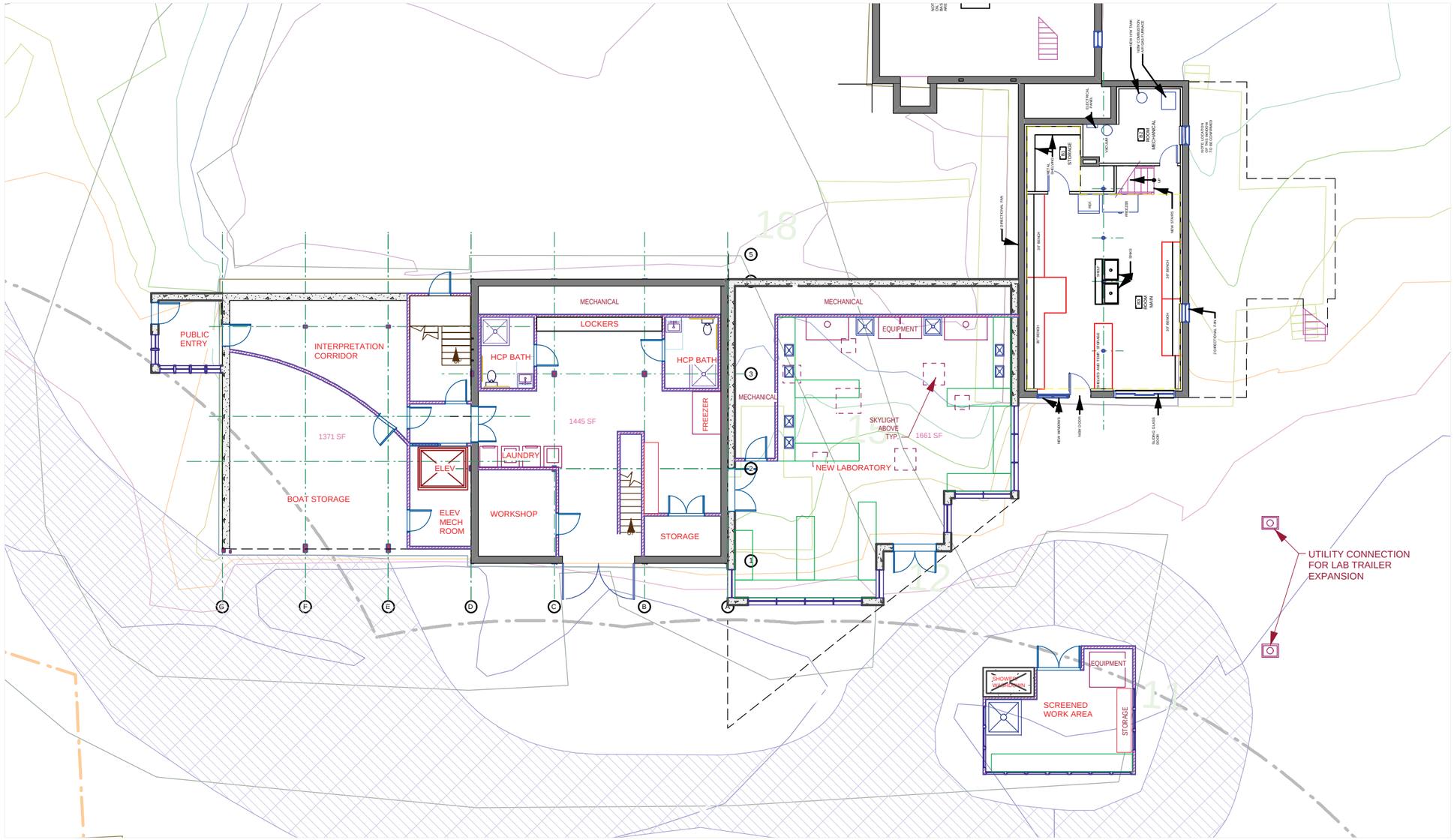
SPACE DESCRIPTION	AREA (sf)	COST (sf)	COST
Building Elements			
Lobby/ Foyer	1171	$150.00	$175,650.00
Lab: Equipment	902	$800.00	$721,600.00
Lab: Workspace	1101	$300.00	$330,300.00
Lecture Space	516	$200.00	$103,200.00
Conference	216	$175.00	$37,800.00
Office	662	$100.00	$66,200.00
Bathrooms	939	$200.00	$187,800.00
Kitchens	346	$150.00	$51,900.00
Bedrooms	698	$100.00	$69,800.00
Storage	1370	$75.00	$102,750.00
Screened Porch	755	$100.00	$75,500.00
Corridors	1000	$90.00	$90,000.00
Stairs	789	$100.00	$78,900.00
Elevator	240	$450.00	$108,000.00
Mechanical	1000	$750.00	$750,000.00
Windmills	500	$250.00	$125,000.00
Building Sub-Total			$3,074,400.00
Landscape Elements			
Green Roof	1772	$100.00	$177,200.00
Graded Walkway	1471	$50.00	$73,550.00
Parking and Driveway	11859	$40.00	$474,360.00
Retaining Wall (lf)	95	$400.00	$38,000.00
Noise Wall (lf)	137	$200.00	$27,400.00
Septic Field	1000	$100.00	$100,000.00
Wetland Recreation	3000	$100.00	$300,000.00
Wells	200	$650.00	$130,000.00
Landscape Sub-Total			$1,320,510.00
PROJECT TOTAL			$4,394,910.00

Architectural Drawings


MARINE BIOLOGICAL LABS
NEWBURY MA 1/8"=1'-0" NOV 2006
WEST ELEVATION
ANDREW M. SIDFORD
ARCHITECTS PC


MARINE BIOLOGICAL LABS
EAST ELEVATION 4/2006 1/8"=1'0"
NEWBURY, MA


MARINE BIOLOGICAL LABS
SOUTH ELEVATION 4/2006 1/8"=1'-0"
ANDREW M. SIDFORD
ARCHITECTS PC



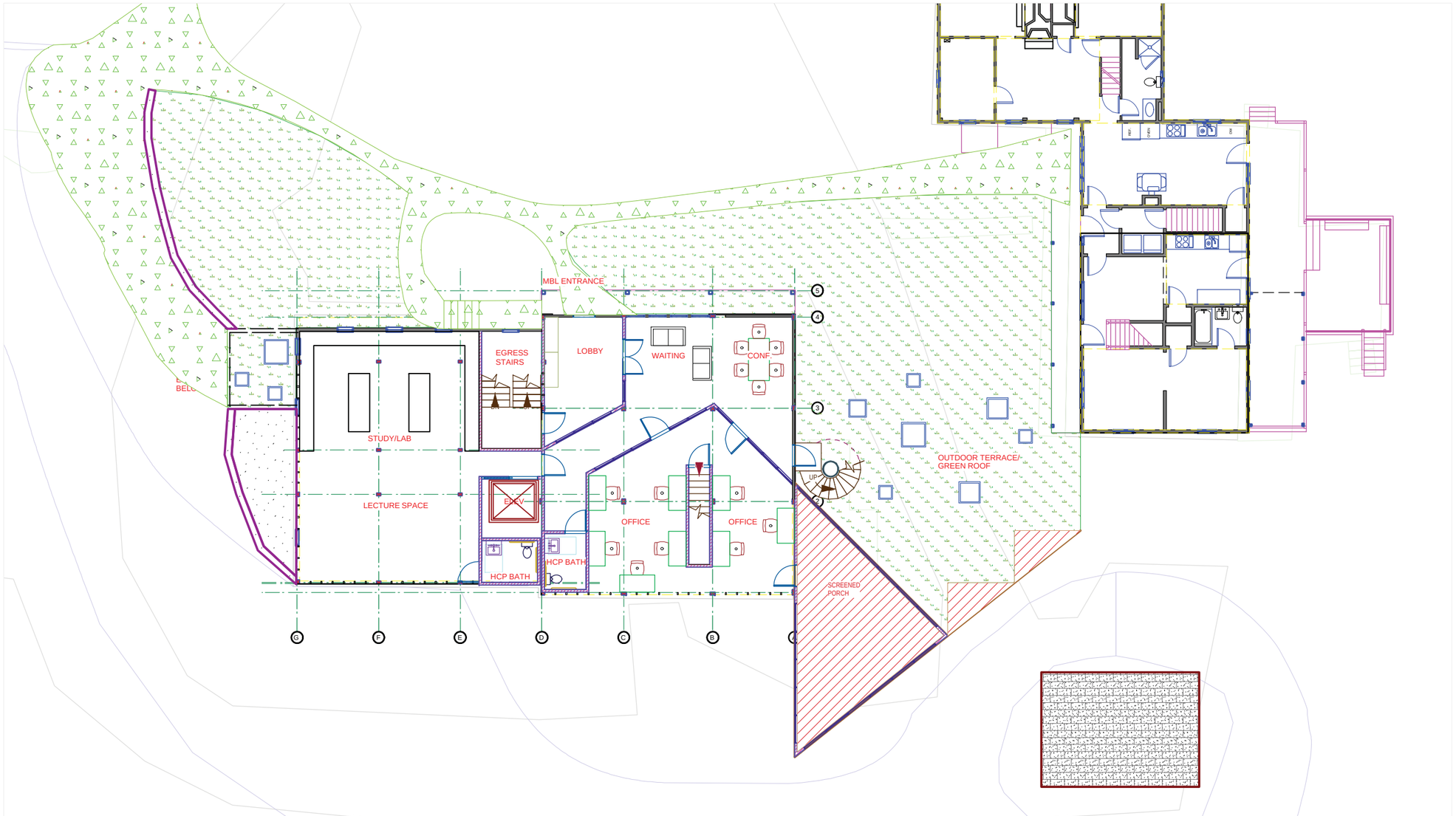
A BASEMENT PLAN
Scale: 1/16" = 1'-0"

ANDREW M. SIDFORD ARCHITECTS, PC
44 Merrimac Street
Newburyport, MA 01950
978 462 1657

DATE	REVISION
11/3/06	SCHEMATIC

MARINE BIOLOGICAL LABORATORY
MARSHVIEW FARM
NEWBURY, MA

A



B FIRST FLOOR PLAN
Scale: 1/16" = 1'-0"

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978 462 1657

REVISION	DATE
SCHEMATIC	11/3/06

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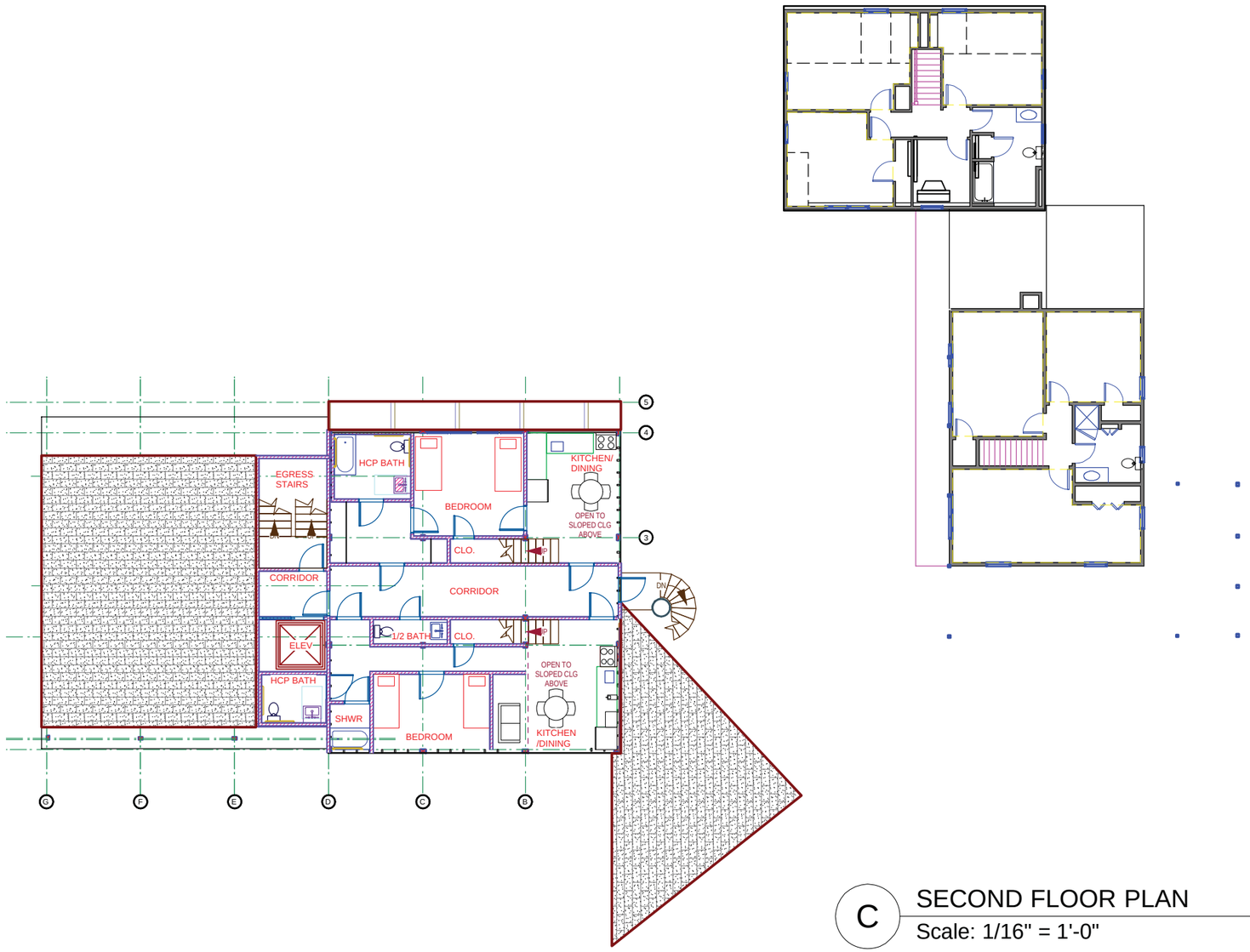

C SECOND FLOOR PLAN
Scale: 1/16" = 1'-0"

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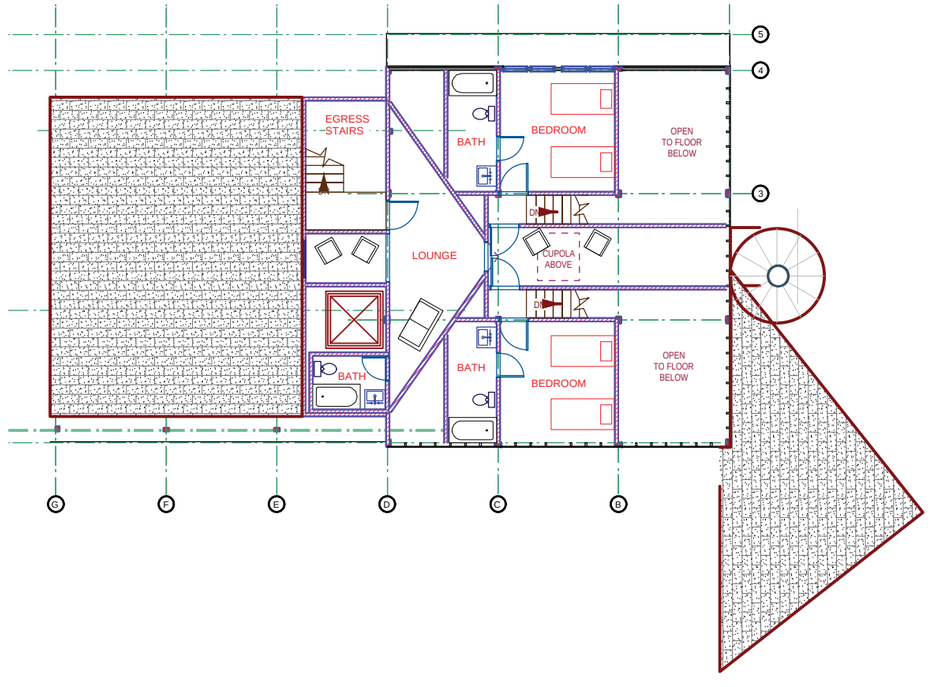

D THIRD FLOOR PLAN
Scale: 1/16" = 1'-0"

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MARSHVIEW FARM
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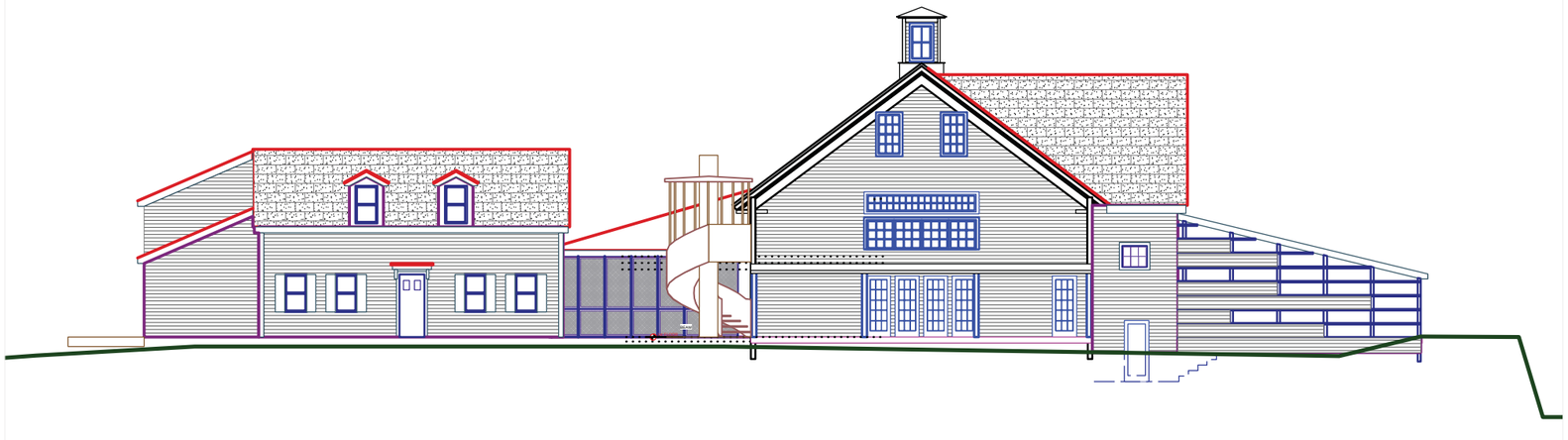

E EAST ELEVATION
Scale: 1/16" = 1'-0"

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F SOUTH ELEVATION
Scale: 1/16" = 1'-0"

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G WEST ELEVATION
Scale: 1/16" = 1'-0"

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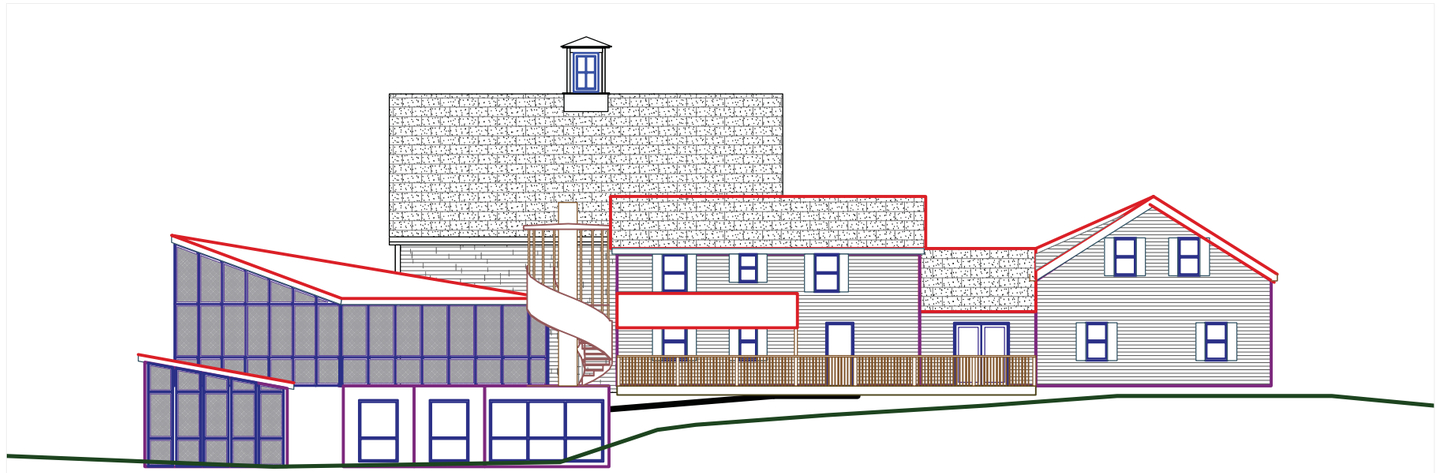

H NORTH ELEVATION
Scale: 1/16" = 1'-0"

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MARSHVIEW FARM
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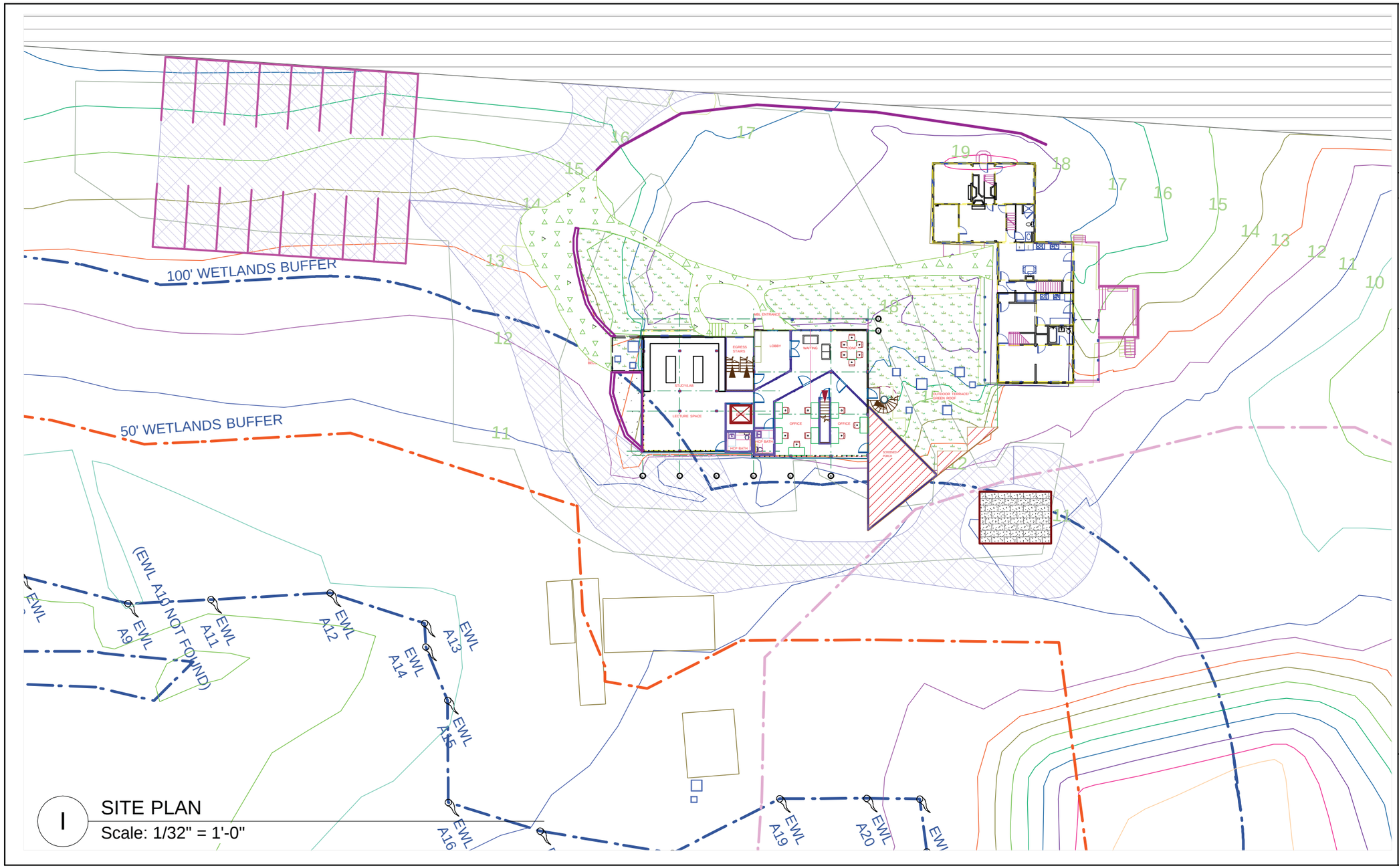

I SITE PLAN
Scale: 1/32" = 1'-0"

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