STANLEY BEAMAN & SEARS

SBS Project No. 11260

WEST VIRGINIA UNIVERSITY
ROBERT C. BYRD HEALTH SCIENCE CENTER
Infrastructure Upgrade Master Plan

May 31, 2013

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INTRODUCTION, GOALS & OBJECTIVES

INTRODUCTION

West Virginia University has initiated a study of architectural, structural, mechanical, electrical, plumbing and fire protection disciplines to assess the current Robert C. Byrd Health Science Center's (WVU HSC) building systems serviceable life expectancies. The architectural and engineering consultant team of Stanley Beaman & Sears and McHenry & Associates have documented this effort with diagrams, photographs and verbiage based on field observations, resourcing the available archive information, reviews with applicable vendors and in-house engineering trades and end user interviews.

Due to the urgency of appropriately maintaining and supporting the infrastructure for the Health Sciences Center the project team adhered to a rigorous schedule to accomplish the survey, review, analysis. Subsequent to the investigatory work recommendations are provided herein.

Goals /Objectives and Parameters

The WVU HSC's Senior Administration recognized that the advancing age and scale of the existing facility, the current annual maintenance budget and available in-house facility management staff are incongruent with current maintenance requirements. Without supplementary funds and staff Facilities Management will not be able to keep pace with the needs of the engineering infrastructure. It is not prudent to allow the engineering infrastructure to fall out of compliance with the requirements of the activities and programs housed in the HSC. The engineering infrastructure must be maintained to keep the facility competitive with its academic peers.

This study was authorized to produce recommendations for the execution of critical engineering infrastructure upgrades. This is the first phase of an effort to identify, assess, design and implement prospective upgrades. This report enumerates a list these projects; some of which will be carried forward into a design and implementation phase thereby upgrading the HSC's engineering infrastructure. These prospective projects shall be supported by infusing funding in addition to the normal annual maintenance budget with a master plan of prioritized infrastructure upgrades.

The existing buildings and associated systems were surveyed and analyzed. The consulting team's findings were reviewed with HSC Facilities Management and Administration. Included herein are assessments of all of the buildings administered by the HSC including, the Health Sciences Center North, Health Sciences Center South, the ground floor of the Biomedical Research Center (BMRC), the Chiller Plant, the Basic Sciences Addition and shell areas of the Blanchett Rockefeller Neurosciences Institute (BRNI). The needs and priorities of the Health Sciences Center were studied and reviewed during facilitated work sessions with appropriate HSC representatives. This process has resulted in a list of conceptually defined projects. The recommendations organize the list of prospective projects to those of the highest priority, falling within a prescribed target budget of +/- $30,000,000, and an additional list of projects that are of lesser importance. The prioritization is constructed to address sequence of operations.

This report is the foundation for a second phase. It will include the design and implementation of the recommendations provided herein. The second phase of this effort will see the production of Designs and bid proposals generated and submitted with the intent to provide full Professional Design Services, including Schematic Design, Design Development, Construction Documents, Bid and Award services and Construction Contract Administration for the prospective projects as each is taken up for execution. Each proposal shall be responsive to issues identified in this report including but not limited to construction delivery methods, logistics, and phasing.

METHODOLGY

Surveys / Work Sessions / Budgeting

Information gathering was initiated with a series of information gathering exercises kicked off by a comprehensive work session with the architectural and engineering consultants, In-house WVU HSC engineering trade representatives and Steering Committee members. In these sessions the consultant team gleaned the perceived current status of each of a series of defined campus infrastructural systems. From the information gained in these work sessions, site surveys were then organized and scheduled, per discipline, to vet, enhance and expand on the particulars of the building systems and the scope and logistics relative to each prospective project.

From this effort stand-alone executable projects were identified. The prospective projects have been organized into disciplinary categories. This is based on the building system that is to be upgraded, and projects may include associated work from other disciplines. Each project was holistically assessed reviewing any associated work, including but not limited to mechanical, plumbing, electrical, fire protection, special systems and architectural. Over and above the general scope, each project's constructability, phasing and basic cost parameters were assessed. In light of this each project was further developed during the analysis phase of the study.

Analysis / Work Sessions / Costing

After additional information was gathered a review work session with the WVU HSC in-house engineering trade representatives and Steering Committee was held to review the findings. The crafted executable prospective projects were discussed and reviewed. General scope of these projects was confirmed and they were prioritized relative to other projects falling under each discipline heading.

The prospective projects were combined into an interdisciplinary prioritized list. A following up work session was held with WVU HSC to review and confirm the prospective projects and prioritization.

The existing building systems and prospective projects were assessed by an independent cost consultant. Due to the complexities of the existing facility and building systems, an onsite tour by the cost consultant, led by the A/E team with assistance from the in-house WVU-HSC engineering representatives, was performed. This effort afforded their substantive review, and resulted in recommendations to scope and budget. Conclusions from this effort were integrated into the scope of the prospective projects, their costs estimates. Summary and detailed conceptual estimates were created. The results of this effort were folded into the prioritization efforts.

These projects were grouped in response to WVU HSC targeted budget of $30,000,000, including soft costs as follows:

Tier 1 - Infrastructure upgrades listed in descending priority. These projects are intended for implementation under the initial proposed $30,000,000 funding.

Tier 2 - Infrastructure upgrades listed in descending priority. These projects are beyond the initial proposed $30,000,000 funding. They are deemed essential and are recommended to be addressed in the order proposed when additional funding is available.

Tier 3 - Upgrades that shall be tracked, of lesser importance, beyond the initial proposed $30,000,000 funding. These projects differed from Tier 2 items because they are systemic in nature and of an expansive scope. Examples of these items are as follows:

1. ADA / Accessibility
2. Life safety upgrades
3. Hazardous materials removal
4. Issues in sustainability
5. Campus master plan coordination

To remedy each issue, it was proposed that these be defined and funded, outside the scope of this study. Future analysis is required to develop a comprehensive understanding of the scope, scale and implementation strategy to remedy each issue. Any future efforts shall be crafted to coordinate with HSC Facilities Management policies that mandate current and future renovations be brought up to current standards and remedied as part of a HSC renovation master plan policy.

"Whiteboard" Issues-Per Discipline

These items have been identified by WVU HSC Facilities Management as desired capital improvement projects. Generally, the nature of these prospective projects involves program improvements. These are not building infrastructure but rather renovations, replacement of end use equipment, build-out of existing shell space and new construction. They have been included, to provide a snap-shot of possible parallel efforts to afford potential coordination with the conceptually defined, estimated and prioritized prospective projects that are the bulk of this report.

INFRASTRUCTURE UPGRADE NARRATIVE LISTING BY DISCIPLINE

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A1 BUILDING SYSTEMS - TIER 1

A1A REPLACE EXISTING HSC NORTH AND SOUTH ROOFS

DEFINE PROBLEM:
All of the HSC roofs, with the exception of the recent re-roofing of wind damaged sections, are no longer under warranty and are in various stages of deterioration. A review by an outside contractor, Kalkreuth Roofing and Sheetmetal Inc., has been completed and partial information from their survey of the existing roofs is contained in this report.

HSC South Roof showing the condition of the roof membrane and parapet cap flashing in need of replacement.

HSC North Roof showing the condition of the roof membrane that is in need of replacement.

PROPOSED SCOPE OF WORK:
Based upon Kalkreuth's review of the roofs, the design team recommends vetting their initial inspections with an independent building envelope consultant. If that independent review concurs with Kalkreuth's assessment, we believe it is in the Owner's best interest to replace roofs that need immediate and short term replacement and shift the remaining acceptable roofs into long term projects. Where
new equipment is to be placed on existing rooftops, coordinate with the schedule of the roof replacement project. Where heavy traffic is expected on existing roofs to be re-roofed as part of this scope of work, roof replacement shall follow to minimize traffic on new roof systems. Proposed rooftop equipment should be installed on roofs, where possible, that are scheduled for replacement. Roof replacement is defined as: demolition of the existing EPDM roof sheet, insulation cover board and the roof insulation. After demolition of the EPDM Roof, cover board and insulation underlayment, replace the existing roof with new rigid insulation, cover board and EPDM roof with a minimum of R20 and a warranty of 20 years. The existing roof drains are to be replaced with retrofit drains allowing adjustment of the height of the drains above the existing roof slab, for roof insulation to be tucked in between the concrete roof slab and the drain. This would meet the requirements for a R20 insulated roof. The basis of design is a Firestone fully-adhered EPDM System consisting of ½" Isoguard HD coverboard and their .060 mil black non-reinforced EPDM membrane. A possible value engineering option is to review the rigid insulation beneath the cover board and replace all insulation that has been water damaged. If the insulation is in very good shape, proceed with the installation of a fully adhered EPDM roof with a new cover board, hammer drilled through the existing insulation into the concrete roof deck below (hammer drilling restricted to before 8:00am). Survey all parapet cap flashing and precast concrete parapet caps, inspect for damage, and repair and/or replace as needed. A list of roofs broken down by floor and building: (see the attached roof plan for corresponding list of roof sections; i.e. N60)

HSC NORTH

6th Flr (N60)	864 sq. ft.	$25,920	($30 per sq. ft.)
5th Flr (N50-N53)	26,948 sq. ft.	$808,440	($30 per sq. ft.)

HSC North Total: $834,360

HSC SOUTH

10th Flr(S100)	3,114 sq. ft.	$93,420	($30 per sq. ft.)
9th Flr (S90)	6,320 sq. ft.	$189,600	($30 per sq. ft.)
(S91)	3,115 sq. ft.	$93,450	($30 per sq. ft.)
8th Flr (S81)	1,791 sq. ft.	$53,730	($30 per sq. ft.)
(S83)	5,033 sq. ft.	$150,990	($30 per sq. ft.)
4th Flr (S40)	17,380 sq. ft.	$521,400	($30 per sq. ft.)
(S41)	2,415 sq. ft.	$72,450	($30 per sq. ft.)
(S42)	864 sq. ft.	$25,920	($30 per sq. ft.)

HSC South Total: $1,200,960

BENEFITS:
Replacing roofs, flashing, and damaged parapet caps will provide a new, warrantied, roof system. Roof system replacement will reduce costs due to leaks, including but not limited to, disruption of normal work activities, temporary loss of use of programmed rooms, equipment damage, and those incurred to clean, repair and/or replace damaged interiors. HSC roof replacement projects in the near past have exposed deteriorated, damaged insulation with reduced R-values. New roof systems will provide a consistent R-value therefore controlling heat gain, loss and potentially yielding HVAC cost savings (to be determined).

COST: $2,035,320

HSC South Roof showing the condition of the roof membrane that is in need of replacement.

HSC North Roof showing the condition of the roof membrane that is in need of replacement.

HSC North Roof showing the condition of the roof membrane that is in need of replacement.

A1A HSC CAMPUS ROOF DIAGRAM

A1B FREIGHT ELEVATOR UPGRADE

DEFINE PROBLEM:
The existing service elevator does not directly access the roof and it is no longer as reliable as Facilities Management requires. It is original to the building and has reached the end of its useful life. In addition, the load capacity is less than similar sized contemporary elevators.

Freight Elevator
Corridor Door
Opening

PROPOSED SCOPE OF WORK:
Provide a structural review of hoistway beam and all other existing building elements affected by increased loading. The service elevator will be modernized by installation of the following:

New Freight Cab
New Microprocessor Control System
New Wiring Complete
New Rope Gripper
New Car Gate Assemblies
New Hoistway Door Panel Assemblies
New Car Button Panels
New Car Digital Position Indicators
New ADA Hands-off Phone
New Emergency Call Lights
New Hall Button Stations
New Digital Pos. Indicator Main Floor
New Overspeed Governor
New Tail Sheave
New Modified Platform for Increased Capacity
New Top Car Inspection Station
New Car and Counterweight Guides
New Hoistway Limit Switches
New Hoist Cables
New Basement Set Machine
New AC Drive Motor
New AC VVVF Drive

New counterweights will be installed to increase the load capacity by 1,000 lbs. from 5,000 to 6,000 lbs. At the fifth floor a new opening in the exterior wall will allow the elevator into a new rooftop vestibule on the 4th floor roof in order to provide rooftop access. In order to install the new elevator vestibule, existing ductwork along the exterior wall will be reconfigured to clear the exterior wall for the vestibule. A davit arm will be installed on the 5th floor roof to lift items from the 4th floor roof up to the 5th floor roof. The proposed scope of work shall be reviewed with the State Fire Marshal and the State Elevator Inspector.

ELEVATOR $300,000

Note: The current basis of design for modernizing the freight elevator is a custom freight elevator by OTIS Elevators. Another option to be considered is a standard OTIS Gen 2 Service Elevator from OTIS, offering the benefits of greater reliability and ease of maintenance. The drawback to the Gen 2 Service Elevator is its limitation of a 5,000 lb. load capacity and a door opening of 48" versus the existing elevators larger door opening.

MEP&FP COORDINATION	$50,000
LIFE SAFETY UPGRADE	$20,000

Note: OTIS has verbally notified the design team that a review by the West Virginia State Elevator Inspector has indicated the existing glazed 8" masonry block shaft wall meets the 2 hour fire rating requirement. A re-analysis is to be completed by the West Virginia State Elevator Inspector prior to starting any work. All penetrations to be UL rated fire caulked and the roof structure of the elevator shaft should be spray fire proofed with 1 hour protection. Each of these items is to be verified for their applicability.

VESTIBULE

Exterior Wall	560 sq. ft.	$168,000	($300 per sq. ft.)
Double Hold Open Doors	2 Doors	$10,000	($5,000 each)
Vestibule Total		$178,000	

The Vestibule is to match the existing adjacent structure of the 5th Floor Penthouse. The structural column bay is19'-4" x 29'-0" spacing and a structural engineer is to be engaged to review the vestibule column load on existing columns BT/31, BR/31, BT/32 and BR/32, in order to support a bar joist and metal deck roof structure and the masonry exterior wall. The hold open doors would open to the North & South.

For the new elevator door opening in the existing penthouse exterior wall, a new steel lintel angel is to be installed with the existing brick above the new lintel angle removed and saved for re-installation after the new vestibule roof is flashed against the existing back up wall. Drain the vestibule roof to roof scuppers and downspouts out onto the 4th floor roof with splash blocks to protect the existing roof.

5TH FLOOR ROOF DAVIT ARM	$54,000

BENEFITS:
The renovated elevator with a new cab and full original load capacity, reliability and roof access will allow for easier access to the rooftops and inside the building greater loads can be carried to support the operations of the HSC.

COST: $602,000

A1C LIBRARY ELEVATOR

DEFINE PROBLEM:
The existing cage elevator is original to the building and has reached the end of its useful life.

PROPOSED SCOPE OF WORK:
A structural review of the hoistway beam and all other existing building elements affected by the new elevator and/or dumbwaiter will be performed. The project will modernize by installating a new hoistway beam (based on structural review & recommendation), cables (railslung), counterweights, sheaves, etc. A new wall partition enclosure to be provided around the new elevator /dumbwaiter. For the new elevator, an elevator machine room would need to be located, exact location to be determined. The proposed scope of work shall be reviewed with the State Fire Marshal and State Elevator Inspector.

BENEFITS:
Replacing the existing cage elevator with a new elevator and/or dumbwaiter will help to meet the functional needs of the Library.

COST: $150,000

A1E BASIC SCIENCE ADDITION BRIDGE RENOVATION

DEFINE PROBLEM:
The curtainwall and roof of the Bridge are leaking water and air, having an adverse effect on the thermal comfort and appearance of the space.

PROPOSED SCOPE OF WORK:
The existing curtainwall will be replaced with a new curtainwall. The roof of the bridge will be replaced per the direction given in the replace the HSC roofs section of this report. The interior ceiling and floor finishes of the bridge will have all damage repaired by replacing the finishes with HSC standard finishes. The new glazing systems will be double-paned with thermally broken frames.

BRIDGE

Curtainwall	4,270 sq. ft.	$362,950	($85 per sq. ft.)
Roof (A10)	155 sq. ft.	$3,100	($20 per sq. ft.)
Ceiling	170 sq. ft.	$2,040	($12 per sq. ft.)
Floor	170 sq. ft.	$850	($5 per sq. ft.)

BENEFITS:
Replacing the curtainwall will provide new sealed thermally broken units that will provide much greater resistance to the passage of air and water, and resulting in an improvement of thermal comfort. Replacing roofs, perimeter flashing and repairing parapet flashing will provide a new, warrantied, roof system. The curtainwall system and roof replacement will reduce costs due to leaks, including but not limited to, disruption of normal work activities, temporary loss of use of programmed rooms, equipment damage, and those incurred to clean, repair and/or replace damaged interiors. New ceiling and floor tiles would provide a completely new interior of the bridge, updating the appearance.

COST: $368,940

A2 BUILDING SYSTEMS - TIER 2

A2A REPLACE EXISTING ROOFS NOT INCLUDED IN TIER 1

DEFINE PROBLEM:
All of the HSC roofs, with the exception of the recent re-roofing of wind damaged sections, are no longer under warranty and are in various stages of deterioration. A review by an outside contractor, Kalkreuth Roofing and Sheetmetal Inc., has been completed and partial information from their survey of the existing roofs is contained in this report.

PROPOSED SCOPE OF WORK:
Based upon Kalkreuth's review of the roofs, the design team recommends vetting their initial inspections with an independent building envelope consultant. If that independent review concurs with Kalkreuth's assessment, we believe it is in the Owner's best interest to replace roofs that do not need immediate and short term replacement outside of the Tier 1 projects. Roof replacement is defined as: demolition of the existing EPDM roof sheet, insulation cover board and the roof insulation. After demolition of the EPDM Roof, cover board and insulation underlayment, replace the existing roof with new rigid insulation, cover board and EPDM roof with a minimum of R20 and a warranty of 20 years. The existing roof drains are to be replaced with retrofit drains allowing adjustment of the height of the drains above the existing roof slab, allowing for roof insulation to be tucked in between the concrete roof slab and the drain. This would meet the code requirements for a minimum R20 insulation. The basis of design is a Firestone fully-adhered EPDM System consisting of ½" Isoguard HD coverboard and their .060 mil black non-reinforced EPDM membrane.

A possible value engineering option is to review the rigid insulation beneath the cover board and replace all insulation that has been water damaged. If the insulation is in very good shape, proceed with the installation of a fully adhered EPDM roof with a new cover board, hammer drilled through the existing insulation into the concrete roof deck below (hammer drilling restricted to before 8:00am). Survey all parapet cap flashing and precast concrete parapet caps, inspect for damage, and repair and/or replace as needed. A list of roofs broken down by floor and building: (see the attached roof plan for corresponding list of roof sections, i.e. N40)

HSC NORTH

4th Floor	(N40-N43)	5,361 sq. ft.	$160,830	($30 per sq. ft.)
	N44)	17,120 sq. ft.	$513,600	($30 per sq. ft.)
	(N45)	3,739 sq. ft.	$112,170	($30 per sq. ft.)
	(N46)	1,038 sq. ft.	$31,140	($30 per sq. ft.)
3rd Floor	(N30)	3,242 sq. ft.	$97,260	($30 per sq. ft.)
	(N31)	6,391 sq. ft.	$191,730	($30 per sq. ft.)
	(N32)	5,156 sq. ft.	$154,680	($30 per sq. ft.)
	(N33-N35)	13,402 sq. ft.	$402,060	($30 per sq. ft.)
2nd Floor	(N20)	17,341 sq. ft.	$520,230	($30 per sq. ft.)
1st Floor	(N10, N11)	7,846 sq. ft.	$235,380	($30 per sq. ft.)
	(N13)	607 sq. ft.	$18,210	($30 per sq. ft.)
	(N14)	1,190 sq. ft.	$35,700	($30 per sq. ft.)
Ground Flr	(NG1)	1,339 sq. ft.	$40,170	($30 per sq. ft.)
	(NG2)	811 sq. ft.	N/A	(Demolished)
	(NG3–NG5)	4,437 sq. ft.	$133,110	($30 per sq. ft.)
HSC North Total:			$2,646,270	

BASIC SCIENCE ADDITION

3rd Floor	(A30)	290 sq. ft.	$8,700	($30 per sq. ft.)
2nd Floor	(A20)	6,220 sq. ft.	$186,600	($30 per sq. ft.)
Breezeway	(AG1)	555 sq. ft.	$16,650	($30 per sq. ft.)
Ground Flr	(AG2)	46 sq. ft.	$1,380	($30 per sq. ft.)

Basic Science Addition Total: $213,330

Note: The Bridge (A10) roof is included in the BSA Bridge Renovation.

LEARNING CENTER

Note: The Learning Center roof is less than 10 years old and will be reviewed for the need of any repairs, but replacement is not anticipated at this time.

CHILLER PLANT

2nd Floor	(CH2)	4,303 sq. ft.	$129,090	($30 per sq. ft.)
1st Floor	(CH1)	7,441 sq. ft.	$223,230	($30 per sq. ft.)

Chiller Plant Total: $352,320

HSC SOUTH

3rd Floor	(S30)	409 sq. ft.	$12,270	($30 per sq. ft.)
	(S31)	3,750 sq. ft.	$112,500	($30 per sq. ft.)
	(S32)	1,985 sq. ft.	$59,550	($30 per sq. ft.)
	(S33, S34)	2,982 sq. ft.	$89,460	($30 per sq. ft.)
2nd Floor	(S20)	3,143 sq. ft.	$94,290	($30 per sq. ft.)
1st Floor	(S10)	716 sq. ft.	$21,480	($30 per sq. ft.)
	(S11)	1,605 sq. ft.	$48,150	($30 per sq. ft.)
	(S12)	3,452 sq. ft.	$103,560	($30 per sq. ft.)
	(S13–S18)	15,061 sq. ft.	$451,830	($30 per sq. ft.)
Ground Flr	(SG1)	2,938 sq. ft.	$88,140	($30 per sq. ft.)
	(SG2, SG3)	9,800 sq. ft.	$294,000	($30 per sq. ft.)
	(SG4–SG8)	3,542 sq. ft.	$106,260	($30 per sq. ft.)

HSC South Total: $1,481,490

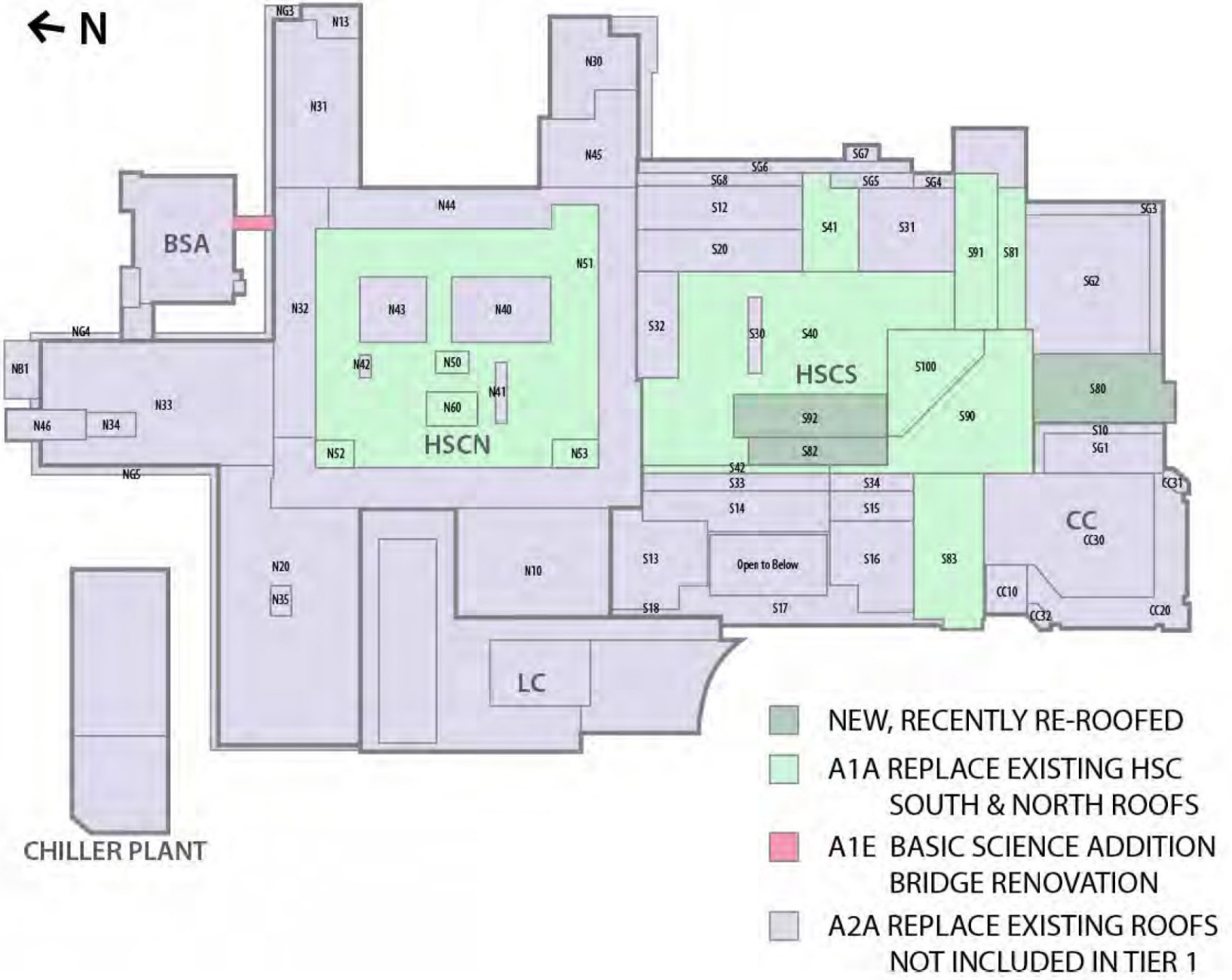
CANCER CENTER

The Cancer Center roof is less than 10 years old and will be reviewed for the need of any repairs, but replacement is not anticipated at this time.

BENEFITS:
Replacing roofs, flashing, and damaged parapet caps will provide a new, warrantied, roof system. Roof system replacement will reduce costs due to leaks, including but not limited to, disruption of normal work activities, temporary loss of use of programmed rooms, equipment damage, and those incurred to clean, repair and/or replace damaged interiors. HSC roof replacement projects in the near past have exposed deteriorated, damaged insulation with reduced R-values. New roof systems will provide a consistent R-value therefore controlling heat gain, loss and potentially yielding HVAC cost savings (to be determined).

COST: $4,693,410

A2A HSC CAMPUS ROOF DIAGRAM



A2B ASBESTOS ABATEMENT IN HSC NORTH CORRIDORS

DEFINE PROBLEM:
There are existing finishes in the HSC North corridors on the ground, first, second, third and fourth floors original to the building that contain asbestos in the plaster ceilings, floor tiles and mastic floor adhesive.

PROPOSED SCOPE OF WORK:
In order to abate these spaces and all additional abatement not specified here, the spaces will need to be sealed off and separate ventilation installed for abatement purposes. Swing space will be required to stage relocated program from areas temporarily rendered inaccessible by corridor closings and will comply with HSC ICRA Standards. Once abatement is completed, new ceiling grids, tiles and new VCT flooring will be installed. The new ceiling will be the HSC Standard, US Gypsum Touchstone Clima Plus, white, in a Chicago Metallic 250 fire snap grid 15/16" wide in white. There are about 41,245 square feet of new ceilings and about 40,435 square feet of new HSC Standard VCT floor tiles.

GROUND FLOOR ABATEMENT

Ceiling	7,110 sq. ft.	$106,650	($15 per sq. ft.)

Note: 1,240 sq. ft. of the ceiling abatement on the ground floor is plaster ceilings that are suspected of having asbestos and should be tested prior to demolition to determine the plaster composition.

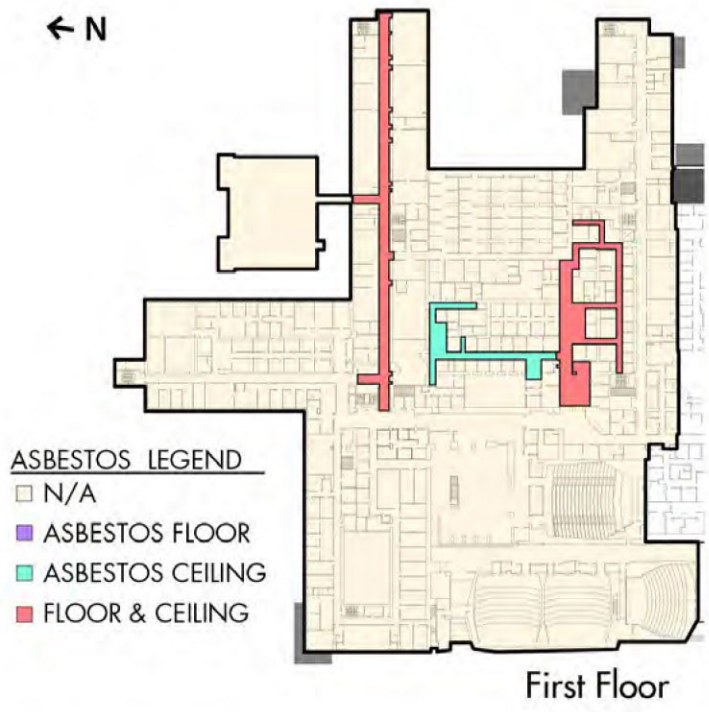
Flooring	6,730 sq. ft.	$40,380	($6 per sq. ft.)
TOTAL		$147,030	

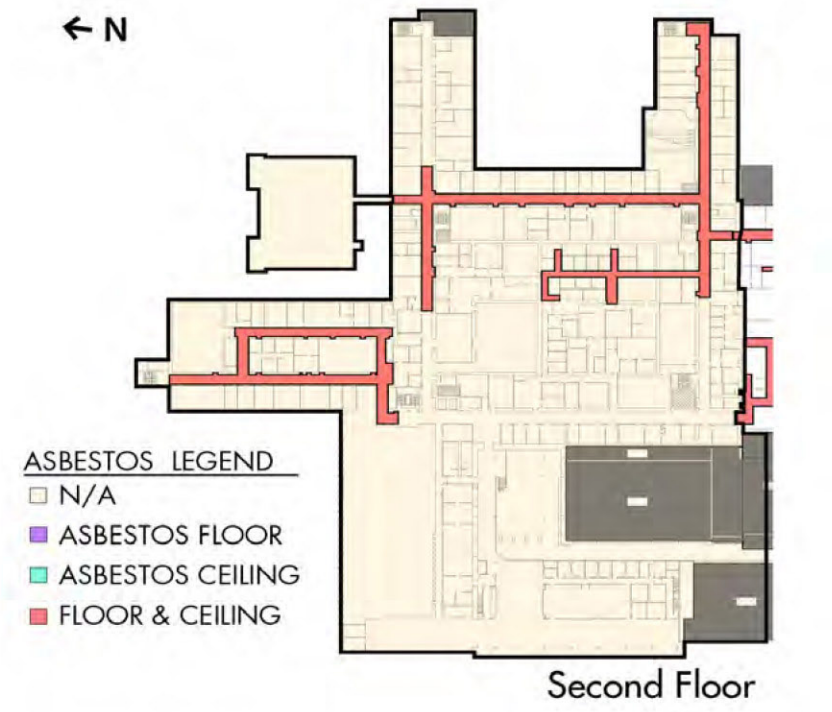
FIRST FLOOR ABATEMENT

Ceiling	7,850 sq. ft.	$117,750	($15 per sq. ft.)
Flooring	6,280 sq. ft.	$37,680	($6 per sq. ft.)
TOTAL		$155,430	

SECOND FLOOR ABATEMENT

Ceiling	10,000 sq. ft.	$150,000	($15 per sq. ft.)
Flooring	10,000 sq. ft.	$60,000	($6 per sq. ft.)
TOTAL		$210,000	





THIRD FLOOR ABATEMENT

Ceiling	11,920 sq. ft.	$178,800	($15 per sq. ft.)

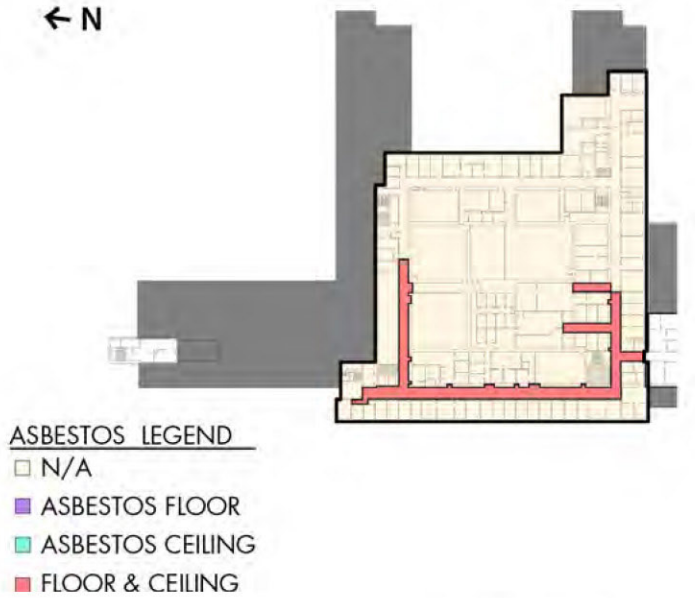
Note: 2,805 sq. ft. of the ceiling abatement on the third floor is plaster ceilings that are suspected of having asbestos and should be tested prior to demolition to determine the plaster composition.

Flooring	13,060 sq. ft.	$78,360	($6 per sq. ft.)
TOTAL		$257,160	

FOURTH FLOOR ABATEMENT

Ceiling	4,365 sq. ft.	$65,475	($15 per sq. ft.)
Flooring	4,365 sq. ft.	$26,190	($6 per sq. ft.)
TOTAL		$91,665	

Third Floor



Fourth Floor

BENEFITS:
The removal of hazardous materials and the installation of tile ceilings provides easy access to the plenum for maintenance and support.

COST: $861,285

NOTE:
Cost estimated using $6 per square foot for plaster ceiling abatement, $9 per square foot for installed acoustical grid and tile ceilings, $3 per square foot for VAT floor tiles and mastic adhesive abatement, and $3 per square foot for installed VCT flooring. Abatement costs are listed in this estimate, but the costs associated with abatement may be picked up by the Owner under a separate contract.

A3A BUILDING ACCESSIBILITY

DEFINE PROBLEM:
The oldest structures, a circa 1955 monumental building and interior outfit, originally designed as a Health Sciences teaching center, at the north sector and teaching hospital at the south sector, were constructed prior to the adoption of the federal civil rights legislation regarding accessibility. Since the original construction the complex has experienced multiple significant renovations. The first major conversion was to the Health Sciences Center South. After Ruby Memorial Hospital was completed in 1988, it was transitioned to support the Health Science Center's program. Less significant but continuing renovations of varied scales have been accomplished as programs and curricula were created, developed, changed and/or phased out. Due to this process the HSC's facilities exist in various states of compliance with contemporary requirements and enacted legislation. The facilities and associated grounds would benefit from a comprehensive accessibility study whose final goal is to incorporate modern concepts in accessibility (post Americans with Disabilities Act of 1990) per current standards (2010 ADA Standards for Accessible Design).

PROPOSED SCOPE OF WORK:
Survey the HSC North, HSC South and associated grounds to develop a comprehensive understanding of the current status of accessibility issues relative to the requirements. Using that survey as a benchmark, provide an analysis and prioritized recommendations with the intent of benefiting the largest census of occupants, then subsequently addressing areas of declining benefit that may not necessarily be unilaterally upgraded in due course as a result of routine departmental renovations. This effort shall be crafted to additively coordinate with HSC Facility policies that mandate current and future renovations to be brought up to current accessibility standards. The result rendered from this coordinated effort would be to facilitate the development of a barrier free environment in the buildings and grounds administered by the Health Science Center.

IMPLICATIONS:
The overarching goal is to provide a barrier free environment in the buildings, parking areas, and hardscape administered by the Health Sciences Center. The intent of this effort is to provide a timeline for targeted renovations whose scheduling shall coordinated with an initial bold initiative and renovations executed as part of the normal course of maintaining, renovating and upgrading departmental facilities.

NOTE:
Building accessibility issues are exemplary of a Tier 3 item whose scope is pervasive and therefore is best addressed as a long term phased initiative.

A3B LIFE SAFETY

DEFINE PROBLEM:
The oldest structures, a circa 1955 monumental building and interior outfit, originally designed as a Health Sciences teaching center, at the north sector and teaching hospital at the south sector, were constructed under previous standards of life safety and for occupancies other than those they house today. Since the original construction the complex has experienced multiple significant renovations. The first major conversion was to the Health Sciences Center South. After Ruby Memorial Hospital was completed in 1988, it was transitioned to support the Health Science Center's program. Less significant but continuing renovations of varied scales have been accomplished as programs and curricula were created, developed, changed and/or phased out. These renovations, additions and new building projects were done under various life safety codes. Due to this process the HSC's facilities exist in various states of compliance with the legislation. The facilities and associated grounds would benefit from a comprehensive assessment followed by remedial action to ensure an appropriate life safety environment.

PROPOSED SCOPE OF WORK:
Survey the HSC North, HSC South and associated grounds to develop a comprehensive understanding of the current status of life safety environment and associated systems. This survey shall be executed in coordination with the Robert C. Byrd Health Sciences Center Safety Office, and the Office of the State Fire Marshal. Remedial actions shall be defined and prioritized based on the survey, applicable code requirements, and input from the Office of the State Fire Marshal. A report shall be produced that enumerates the Life Safety issues in hierarchal priority for work that may not be upgraded in routine departmental renovations. The result rendered from this coordinated effort would be to facilitate the development of an acceptable, code compliant life safety environment acceptable to the Office of the state Fire Marshal.

IMPLICATIONS:
Accomplish providing a Life Safety Environment in a monumental structure over the normal course of maintaining, renovating and upgrading the facilities that would not be financially feasible in a single comprehensive exercise

NOTE:
Life safety issues are exemplary of a Tier 3 item whose scope is pervasive and therefore is best addressed as a long term phased initiative. This initiative is to be kick started by a significant seed effort with funding that is crafted to initiate, facilitate and perpetuate the goal of compliance with life safety requirements throughout the buildings and associated spaces administered by the Health Sciences Center.

A3C HAZARDOUS MATERIALS

DEFINE PROBLEM:
Some existing materials, including but not limited to pipe lagging, HVAC and plumbing insulation, and architectural finishes contain hazardous materials. These efforts are expected to be limited to the original HSC North, HSC South, and other work completed prior to 1978. Some materials have been assessed and addressed, others identified for abatement. It is expected that unforeseen conditions exist where hazardous materials have been installed in areas yet to be identified.

Comprehensively address, define and institute a phased plan for the abatement of known Hazardous Materials along with exploratory efforts to search and discover currently unforeseen Hazardous Material Conditions to a circa 1955 monumental building structure and interior outfit, originally designed as a Health Sciences Teaching Center at the North Sector and Teaching Hospital at the South Sector. This large complex has subsequently experienced multiple significant renovations. The First major effort, converting the Hospital Sector to the Health Science Center after Ruby Memorial Hospital opened, responsive to the introduction of the Hospital Complex completed in 1988. Less significant but continuing piecemeal renovations have been accomplished on an as needed basis through the present. The Facility would benefit from a comprehensive Hazardous Material abatement initiative.

PROPOSED SCOPE OF WORK:
Survey the HSC North and South to develop a comprehensive understanding of the location and extent hazardous materials. Execute surveys of additional buildings administered by the HSC similarly. From these surveys provide an analysis with prioritized recommendations to define a course of action to abate hazardous material. Public areas are more likely to need attention as they may not necessarily be upgraded in routine departmental renovations. The result of this effort is facilities free from danger due to known hazardous materials.

A3D SUSTAINABILITY

DEFINE PROBLEM:
Comprehensively address, define and institute modern concepts in Sustainability to a circa 1955 monumental building structure and interior outfit, originally designed as a Health Sciences Teaching Center at the North Sector and Teaching Hospital at the South Sector. This large complex has subsequently experienced multiple significant renovations. The First major effort, converting the Hospital Sector to the Health Science Center after Ruby Memorial Hospital opened, responsive to the introduction of the Hospital Complex completed in 1988. Less significant but continuing piecemeal renovations have been accomplished on an as needed basis through the present. The Facility would benefit from a comprehensive Sustainability initiative.

PROPOSED SCOPE OF WORK:
Accomplish a survey of the HSC North and South to develop a comprehensive understanding of the current status of Life Safety issues. From that survey provide an analysis and recommendations in hierarchal priority of public areas that need attention that may not necessarily be unilaterally upgraded in routine departmental renovations. This effort shall be crafted to additively coordinate with HSC Facility policies that mandate current and future renovations bringing the areas impacted up to current Life Safety requirements. The result rendered from this coordinated effort would be to facilitate the development, over time, of a current Life Safety compliant environment.

A3E CAMPUS MASTERPLAN COORDINATION

DEFINE PROBLEM:
The Health Sciences Center has grown up around the original structures; in doing so it has generally address future development but no specific master plan for future development is currently in place. Expansion of current programs, growth of the university and town around the HSC would be best served with a comprehensive document to determine the forces at play and their proposed resolution.

PROPOSED SCOPE OF WORK:

Survey the HSC North, HSC South, associated buildings, topography, underground utilities, site access and transportation infrastructure to develop a comprehensive understanding of the current master plan issues. From that survey provide prioritized recommendations for future development including but not limited to transportation systems, site access, site circulation, utility corridors, building plates for future expansion, landscape development, hardscape development and rainwater management. The result rendered from this effort would is a basis for a master plan to steer future development of the Health Sciences Center.

A4 WHITEBOARD ISSUES - NON TIERED

A4A HSC NORTH WEST FACING WINDOW REPLACEMENT

DEFINE PROBLEM:
The HSC North is experiencing leaking at and around the windows along the West face of the building. The leaking is most evident at the Pharmacy.

PROPOSED SCOPE OF WORK:
Replace the curtainwall and associated flashings. New systems shall be a double-pane thermally broken curtainwall system. When this work is executed, adjacent materials uncovered by demolition shall be inspected to ascertain their condition. Remedial action to repair adjacent materials will be enacted, if required. This prospective project does not include costs for amendments required due to unforeseen conditions. There is an estimated 22,525 square feet of storefront and curtainwall along the west face of the HSC North building.

Storefront

Library Ground Floor	375 sq. ft.
Library 1st Floor	285 sq. ft.

Note: An additional 40 square feet has been added to the Library first floor storefront as the two storefront doors would not be replaced. See additional information at the end of this project listing.

Main Entry 1st Floor	665 sq. ft.
Total Storefront	1,285 sq. ft.

Storefront with decorative glass

North Patio	1,045 sq. ft.

Curtainwall

Strip at Main Entry	760 sq. ft.
Southwest	4,430 sq. ft.
Northwest	3,595 sq. ft.
North Stair Tower "L"	345 sq. ft.
North Stair Enclosure	305 sq. ft.
Total Curtainwall	9,435 sq. ft.

Storefront Doors 11 doors

Note: The estimate for storefront doors does not include replacing the two storefront doors at the West Virginia Room. The West Virginia Room storefront glass opens onto the deteriorating concrete balcony referenced as a separate project in this report. In the balcony project, the design team is pricing cutting back the balcony and closing it off to create a canopy, not a new balcony. The storefront doors leading onto the existing balcony would no longer be needed. It is recommended that both the replacement of the West Virginia Room storefront and the balcony repair be included in the same project scope due to their proximity.

BENEFITS:
Replacing the curtainwall and flashing will provide a dry and more thermally comfortable space for the occupants.

A4B BASIC SCIENCE ADDITION WINDOW REPLACEMENT

DEFINE PROBLEM:
The windows and curtainwall in the Basic Science Addition are leaking water and air and have an effect on the thermal comfort of the space.

PROPOSED SCOPE OF WORK:
For the curtainwalls, they will be replaced with new curtainwall. The roof of the breezeway will be replaced per the direction given in the replace the HSC roofs section within this report. The interior ceiling and floor finishes of the breezeway will have all damage repaired by replacing the finishes. All windows and curtainwalls shall be replaced with new perimeter flashing that wraps the opening on all sides of the exterior sheathing or bock back up wall behind the brick veneer. The new systems will be double-paned with thermally broken frames.

Breezeway

Storefront	4,200 sq. ft.
Ceiling	435 sq. ft.
Floor	435 sq. ft.
Breezeway Total	5,070 sq. ft.

Punched Windows 14 windows

Note: The punched windows are 4'-0" wide and 4'-8" tall.

Hostler Entry

Storefront	230 sq. ft.
Storefront Doors	4 doors

Exit Doors 2 doors

Note: The Exit Door estimate covers the two exit doors on the ground level on either side of the bridge.

BSA Curtainwall

North	785 sq. ft.
East	1,010 sq. ft.
Curtainwall Total	1,795 sq. ft.

BSA Interior Finishes Repair To Be Determined

Note: Repair would include all ceiling, floor and wall finishes that require replacement at punched windows and curtainwall that is not listed at the breezeway, a survey of existing conditions would be required.

BENEFITS:
Replacing the windows and curtainwall will provide new sealed thermally broken units that will provide much greater resistance to the passage of air and water through the windows and curtainwalls, resulting in an improvement in thermal comfort. This will reduce the risk of leaks, which can lead to reduced performance of the window system and damaged interiors. The glazing system replacement will reduce costs due to leaks, including but not limited to, disruption of normal work activities, temporary loss of use of programmed rooms, equipment damage, and those incurred to clean, repair and/or replace damaged interiors. New ceiling and floor tiles would provide a completely new interior of the breezeway, updating the appearance. Replacing the terrazzo floor of the breezeway is included in the cost.

A4C BALCONY REPAIR AT WEST VIRGINIA ROOM

DEFINE PROBLEM:
The front edge of the balcony outside of the West Virginia Room is crumbling and dropping debris onto public spaces below.

PROPOSED SCOPE OF WORK:
An assessment of the concrete will be done by a registered structural engineer to determine the cause of the concrete deterioration on the balcony and a recommendation shall be provided for remedial work. Before engaging a registered structural engineer in Phase 2, a preliminary analysis suggests the primary problem is that the canopy above the balcony is shorter than the balcony allowing water runoff from the canopy to strike the balcony concrete surface, causing weathering over the years, accelerated by the freeze/thaw process.

The existing railing will be removed and the concrete balcony will be cut back 18 inches as confirmed by a registered structural engineer and a new drip edge is to be cut into the perimeter of the underside of the balcony to match the existing drip edge. Coordinate the cutting back of the balcony with the existing light fixtures on the underside of the balcony, they are to remain operational. After cutting the rebar and concrete, grind the steel rebar back 2 inches from the face of the balcony and epoxy grout the opening in the face of the concrete to protect the exposed rebar. The color of the epoxy grout is to match the adjacent concrete, although the epoxy grout will not match the concrete color exactly and will weather differently. However, the epoxy grout will hold in place and protect the existing rebar better than a concrete patch. At the exterior approach to the balcony from a sidewalk, a permanent guard is to be installed, configuration and type to be determined.

BENEFITS:
By removing the deteriorated edge of the balcony, further deterioration should be limited.

A4D GROSS ANATOMY LAB BODY COOLER

DEFINE PROBLEM:
The existing gross anatomy body cooler is in poor condition and has had a temporary fix applied to it in the last 12-16 months and the Owner does not want any additional capital budget spent on maintaining the cooler. The gross anatomy lab is scheduled to relocate to the ground floor to occupy the space currently occupied by the morgue. The morgue relocation is within a project being completed by Ruby Memorial Hospital and scheduled to complete in 2 to 3 years.

PROPOSED SCOPE OF WORK:
Either replace the existing cooler with a new cooler that would be relocated to the Ground Floor when the Morgue moves to the Hospital (A new cooler is to be a rack system to replace the existing cooler's hanging system), or maintain the existing body cooler until the Morgue is relocated and the Gross Anatomy Lab is relocated to the Ground Floor.

BENEFITS:
With a new cooler, maintenance costs are reduced and better operational functionality is provided with the rack system.

A4E ANIMAL QUARTERS RENOVATION

DEFINE PROBLEM:
The original animal quarters is outdated and does not meet current industry accreditation standards. The facility shall be upgraded in order to be accredited to current standards to support research, by modernizing MEP&FP systems and architectural components and finishes. Association for the Assessment and Accreditation of Laboratory Animal Care (AAALAC) accreditation is the goal for the facility and its management. Significant upgrades through the trends in research, the urgency of the current faculty and current standards have rendered the existing layout, equipment, HVAC and support systems obsolete. Additionally, the facility was originally designed for large animal housing.

PROPOSED SCOPE OF WORK:
The renovation shall target current industry standards, specifically, AAALAC accreditation standards. The renovation shall include modernized HVAC systems to provide the required airflows in holding rooms. Environmental controls, including but not limited to lighting and relative humidity shall be implemented to meet the most current standards set forth in the National Research Council's Guide for the Care and Use of Laboratory Animals, Eighth Edition. Specific program species census shall be defined and addressed in a programming study that is outside of the scope of this report. For the purpose of this report we have assumed the renovation is based on a facility designed for small rodent holding utilizing ventilated cage racks. This is consistent with recent building projects undertaken to expand the animal holding capacity of animal holding at the HSC. HVAC ductwork connections shall be made at the basement mechanical room. New HVAC supply main and branch supply and return ductwork shall be provided throughout the renovated space. Holding rooms shall be supported with an automated animal drinking water system. Fire protection systems are present and shall be revised to accommodate the new layout. Fire alarm systems shall be designed to tie into existing fire alarm system. Interior finishes shall be consistent with the Phase I and Phase II expansion renovations. High performance epoxy wall coatings shall be utilized on all interior partitions. Hard ceiling shall be installed in animal holding rooms and finished with the same high performance coatings used on the interior partitions. Ceiling in less sensitive areas shall be with gasketed, coated fiberglass grid with clip-down coated aluminum faced composite sandwich panels. Doors shall be 7'-6"x3'6" fiberglass reinforced plastic (FRP) with FRP frames to match.

BENEFITS:
The renovation shall provide additional space for program growth with updated interior finishes and environmental controls design to meet industry standards and attain AAALAC accreditation.

A4F CAFETERIA UPGRADE IN HSC SOUTH

DEFINE PROBLEM:
The cafeteria is in need of upgrades and renovation, with three large walk-in coolers adjacent to the Cafeteria that are in poor condition and need to be replaced. The West Virginia Health Department has issues with floor drains and air handling in the Cafeteria, and there is an outstanding question regarding how independent vendors are accommodated in the Cafeteria. The Cafeteria is about 7,200 square feet.

PROPOSED SCOPE OF WORK:
The three walk-in coolers will be replaced. The kitchen grease traps and air handling renovations for the Cafeteria will be included in the Cafeteria Renovation. See the MEP sections of this report for additional information and cost estimates. The wall, ceiling and floor finishes will be renovated in the Cafeteria and accommodating independent vendors will be reviewed as part of renovating the spaces.

BENEFITS:
Replacing the coolers prior to failure of the equipment would give the Kitchen brand new coolers and minimize down time for replacement. Renovating the finishes of the Cafeteria would provide a new look to the space and potentially provide space for independent vendors.

A4G CAFE UPGRADE IN HSC NORTH

DEFINE PROBLEM:
The cafe is in need of upgrades and renovation.

PROPOSED SCOPE OF WORK:
The wall, ceiling and floor finishes will be renovated in the Cafe. The square footage of the Café is about 3,500 square feet.

BENEFITS:
Renovating the finishes of the Cafe would provide a new look to the space.

A4H GROSS ANATOMY LAB RELOCATION

DEFINE PROBLEM:
The existing gross anatomy lab is original to the HSC North, the existing mechanical and cadaver storage equipment are outdated and the lab is in need of upgrade to current standards. Additionally, the gross anatomy department needs to be relocated to the ground floor closer to the loading dock to accommodate cadaver delivery. Currently cadavers are delivered to the gross anatomy lab through public corridors from the ground floor to the fourth floor of the HSC North.

PROPOSED SCOPE OF WORK:
The current gross anatomy lab is 4,000 square feet and the existing morgue space is 3,200 square feet, a difference of 800 square feet. The existing file storage space west of the existing morgue is an 800 square foot space and would provide additional space for the Gross Anatomy Lab program. A programming exercise, outside the scope of this study will be required to provide a more precise assessment of the renovation requirements and associated cost. The morgue is slated for relocation to Ruby Memorial. After the morgue has vacated its existing space shall be demolished. The areas vacated shall be programmed and build-out to accommodate the gross anatomy lab. The build out will entail the following: Utility installation below grade requiring demolition of portions of the existing concrete slab, re-pouring concrete in those sections of the floor that have been demolished, fireproofing as needed, interior wall partitions, doors, windows, floors and ceilings, furnishings, stainless steel lab casework, mechanical air distribution, plumbing for lab services and restrooms, electrical and data systems, medical gas, existing sprinkler adjustment to provide coverage for new clinical spaces, fire alarm systems and security systems. All of the Gross Anatomy Lab finishes are to be seamless and able to handle thorough cleaning. Moving costs for the morgue and the gross anatomy lab are outside of the scope of this study and the estimate provided.

BENEFITS:
A new laboratory realized at the proposed location shall meet functional and operations requirements of the gross anatomy lab. New cadaver storage cooler, HVAC systems and interior finishes shall bring the work environment up to current standards.

A4J CANCER CENTER BUILD-OUT

DEFINE PROBLEM:
The second floor of the Mary Babb Randolph Cancer Center is currently an underutilized 15,360 square foot shelled space.

PROPOSED SCOPE OF WORK:
Build-out the shelled second floor of the cancer center and provide clinical space as determined by the Owner's program. The build out will entail the following: Utility installation in the first floor plenum, requiring demolition of portions of the existing concrete slab, re-pouring concrete in those sections of the floor that have been demolished, fireproofing as needed, interior wall partitions, doors, windows, floors and ceilings, furnishings, lab casework, mechanical air distribution, plumbing for lab services and restrooms, electrical and data systems, medical gas, existing sprinkler adjustment to provide coverage for new clinical spaces, fire alarm systems and security systems.

BENEFITS:
Building out the second floor provides additional clinical space with associated offices and support space designed to contemporary standards of environment, and safety to support the HSCs mission.

A4K GROUND FLOOR BIOMEDICAL RESEARCH CENTER (BMRC)

DEFINE PROBLEM:
Many labs in the HSC are not operating at current laboratory standards, especially for vibration control, and HVAC service. The BMRC was designed to house laboratory and associated office space. The ground floor of the BMRC is available shell space and can be built-out to accommodate laboratory space with contemporary standards of environment, and safety. The ground floor is about 22,000 square feet.

PROPOSED SCOPE OF WORK:
Build out the shelled Ground Floor of the BMRC as an extension of the laboratory and office space on the upper floors. The build out will entail the following: Utility installation below grade requiring demolition of portions of the existing concrete slab, re-pouring concrete in those sections of the floor that have been demolished, fireproofing as needed, interior wall partitions, doors, windows, floors and ceilings, furnishings, lab casework, mechanical air distribution, plumbing for lab services and restrooms, electrical and data systems, medical gas, existing sprinkler adjustment to provide coverage for new clinical spaces, fire alarm systems and security systems.

BENEFITS:
When this floor is built-out it will provide additional laboratory space designed and constructed to contemporary standards of safety, and physical environment. Substandard laboratory space in the HSC can be renovated and used for less sensitive program.

A4L HSC NORTH NE WING GROUND FLOOR BUILD OUT

DEFINE PROBLEM:
Existing space on the ground floor of the HSC North northeast wing was demolished to make way for the AFA. The AFA inhabits about 45% of the northeast wing. The remaining 55% of the northeast wing (about 4,000 square feet) was shelled for future build out. The demolition of the northeast wing also took out the Men's Locker Room G211 and Janitor's Closet G212. As shell space, this area in not currently utilized to support the HSC's mission. A previous renovation project on the first floor above this space required the utilities and data that previously served this space for operating capacity. New power and data feeds need to be established for this space.

PROPOSED SCOPE OF WORK:
Available shell space shall be built out to support office functions. This will reestablish the public corridor and extend the exit access to the outside of the HSC. The occupants for the office suite shall be determined and the areas shall be programmed accordingly. Power and data services lost to the space above on the first floor will be brought over from the main ground floor electrical panels and telecommunications room. The build-out will include running new branch distribution from existing systems to provide fire alarm, fire protection, electrical, telecommunications, data, heating, ventilation, air conditioning and plumbing. The Men's Locker Room G211 and Janitor's Closet G212 will be restored. Asbestos abatement at existing piping insulation is required; this shall be accomplished by the Owner and is not addressed in the narrative of this prospective project.

BENEFITS:
Renovating the available shell space will expand available office space within the HSC North.

A4M HOSTLER AUDITORIUM (IN BASIC SCIENCE ADDITION)

DEFINE PROBLEM:
The auditorium needs to be renovated. While IT work is in progress to meet the current needs of the HSC, the AV systems should be upgraded, the interior finishes of the auditorium renovated and the acoustics of the space improved.

PROPOSED SCOPE OF WORK:
For the interior finishes, new flooring, upholstery on the auditorium seats and wall and ceiling paint. The acoustics of the space are to be reviewed and adjustments made to improve the auditorium acoustics.

BENEFITS:
With new interior finishes and acoustic adjustments to the space, the project will improve the sound quality and intelligibility of the presenters and aid in visitor comfort.

A4N FACILITIES MANAGEMENT BUILDING

DEFINE PROBLEM:
The Facilities department requires proximity but does not require direct operation adjacency to other programs within the HSC. The space currently occupied by the facilities management department could be occupied by program that directly supports the HSC's mission. The facilities management department would benefit from being consolidated. Ancillary functions, equipment and material storage, sheet metal shop and paint shop should be housed with facilities management offices. Leased space is a potential option aside with continuous space and ample parking could consolidate the department effectively, but would mostly likely be some distance from the facilities being managed.

PROPOSED SCOPE OF WORK:
The new two-story building would provide a garage for equipment storage (i.e. vehicles, snow removal equipment) on the first floor and on the second floor space for a paint shop, sheet metal shop and offices in a 22,000 square feet facility. The design will respond to a programming effort that is outside of the scope of this report.

BENEFITS:
A consolidated facilities building in proximity to the HSC would allow for significant equipment delivery and storage space and eliminate the need for offsite storage downtown and the costs associated.

MECHANICAL PROJECT INDEX

M1 AIR HANDLING UNITS

ISSUES:
Original Air Handling Systems throughout the building are 58 years old and in extremely poor condition. The following is a list of common deficiencies found at any of the original air handling units:

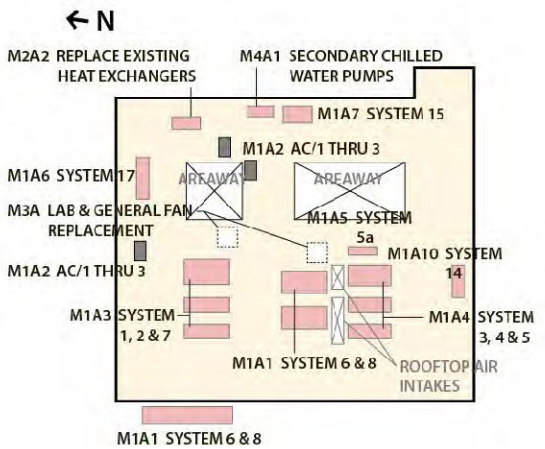
- Cooling coil casings, drain pans, associated piping and valves are rusted, unreliable and no longer serviceable. In some cases there is evidence of mold growth in these sections due to pooling water, which can be seen in the picture below.
- Water damage has occurred within areas below the air handling units due to the condition of coils, piping, drain pans, etc., located within mechanical rooms.
- AHU casing insulation is exposed and deteriorating which introduces dirt and airside contamination.
- Outdoor air ductwork is deteriorated and leaks water. This issue is mainly seen within the 5th floor mechanical room as a direct result of snow build up within depressed roof wells which serve as a path for outdoor air. Snow trapped in these wells is pulled in through the outdoor air ducts, melts and leaks through the deterio rated ductwork.
- In many cases systems are operating well below the original de sign capacity. This is likely due to the internal condition of the unit and years of dirt accumulation within the ductwork and on reheat coils which adds pressure drop to the system. In addition, access for service is difficult due to their location within the center of the mechanical room.

Examples of the unit condition can be seen in the following pictures:

Typical condition of cooling coil within system 6 & 8 and the associated drain pan. This one has deteriorated to the point where condensate can no longer drain out of the unit, causing it to pool within the unit and increasing the potential for leakage through the base of the unit into the 4th floor below.

Typical condition of fan within system 6 & 8 – note the abandoned controls and inlet guide veins which increase system pressure drops and reduce overall performance.

Depressed roof well currently used as an outdoor air intake for several 5th floor air handling units.



M1A1 SYSTEM 6 & 8

System 6 serves the east portion of the 3rd floor core area with an original design capacity of 40,000 CFM. System 8 serves the core areas of the North Tower with an original design capacity of 48,800 CFM.

ISSUES:
System 6 & 8 are 58 years old and in extremely poor condition. In addition to the common items noted above, these two units are located in the core area of the 5th floor mechanical room, making them very difficult to access for service. Replacement of any major component within these units, such as a cooling coil, fan motor, etc., would be an extremely difficult and costly task.

PROPOSED SCOPE:
Propose design and installation of a new penthouse air handling system located on the west, 4th floor roof adjacent to the 5th floor mechanical room. This system would consist of two new 60,000 CFM air handling units to replace Systems 6 & 8. Supporting infrastructure serving the air handling units will also be addressed. These items include the following:

- Duct cleaning/replacement
- Respective reheat coil replacement including piping, valves and controls.
- Chilled & Hot Water Piping, Valves & Controls
- Demolition of existing Systems 6 & 8
- Upgrade pneumatic smoke damper actuators to DDC located within ductwork served by this equipment.

IMPLICATIONS:
Replacing these units is the first step to addressing the systems locat ed within the 5th floor mechanical room and should be considered high priority. Addressing Systems 6 & 8 first will create space within the mechanical room (where existing units are to be demolished) for subsequent air handling unit replacements. The increased capacity of the replacement units would provide surplus capacity for use as temporary service while other 5th floor air handling units are being replaced.

BENEFITS:
Benefits include improved air quality to occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls. Installation of the proposed units within a new roof mounted penthouse will eliminate the potential for leaks and snow carry-over associated with the depressed outdoor air intake systems 6 & 8 are currently connected to.

COST: $3,775,200

M1A2 AC/1 THRU 3

Existing packaged rooftop AC units are 100% outdoor air units with heating & cooling serving the Gross Anatomy Space.

ISSUES:
Existing units are in poor condition and only partially operational. They currently require excessive maintenance and are not appropriate for the application. The result is unreliable service to Gross Anatomy and poor air change rates.

PROPOSED SCOPE:
Remove existing units, including roof curbs. Existing roof openings would be in-filled and patched to match the existing roof. Intercept supply ductwork located within the 5th floor mechanical room, serving the Gross Anatomy space, to served from either System 6 or 8, which will need to be replaced prior to this project. To meet the air change rates for the space, approximately 10,000 CFM would be required.

IMPLICATIONS:
Replacement of this equipment should be considered high priority and can be addressed any time after System 6 & 8 have been replaced.

BENEFITS:
Eliminating the existing units and serving this area off the central system will reduce service calls, eliminate an immediate problem, improve air quality/reliability and result in a more flexible space. If the Gross Anatomy area is moved from this location, practical infrastructure would be in place for a variety of occupancies.

COST: $234,500

M1A3 SYSTEMS 1, 2 & 7

Systems 1, 2 & 7 are custom air handling units located on the 5th floor. The units serve the following areas:

- System 1: Serves North Perimeter – Ground to Fourth Floor, Induction System – 23,000 CFM
- System 2: Serves East Perimeter – Ground to Fourth Floor, Induction System – 7,000 CFM
- System 7: Serves 2nd Floor Core – 38,000 CFM

ISSUES:
Existing units are 58 years old and in extremely poor condition. In addition to the common items noted above, these units are located in the core area of the 5th floor mechanical room, making them very difficult to access for service. Replacement of any major component within these units, such as a cooling coil, fan motor, etc., would be an extremely difficult and costly task.

System 7 Piping showing extensive rusting of the piping and the need for replacement.

PROPOSED SCOPE:
Propose removing all three systems and installing one new 70,000 CFM unit in the vacated area remaining from the removal of these air handling units as well as Systems 6 & 8 demolished under a previous phase. Demolition of existing units will be phased with the installation of the new air handling unit to provide some level of temporary service to the existing areas served from systems 1, 2 & 7. Supporting infrastructure serving the air handling units will also be addressed. These items include the following:

- Duct cleaning/replacement
- Respective reheat coil replacement including piping, valves & ctrl.
- Chilled & Hot Water Piping, Valves & Controls
- Upgrades to the existing depressed, outdoor air intake well to minimize potential for weather penetration and leakage.
- Upgrade pneumatic smoke damper actuators to DDC located within ductwork served by this equipment.

IMPLICATIONS:
Consolidation of three existing systems into one large air handling unit will help to simplify ductwork within the 5th floor mechanical room resulting in improved service access to the new equipment. In addition, the replacement of the two induction units will lay the groundwork for removal of the perimeter induction units located throughout the ground through fourth floors under future renovations. At such time, existing ductwork will be used for code ventilation air and supplemental VRF systems will be installed for cooling within these areas.

BENEFITS:
Benefits include improved air quality to occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls.

COST: $1,874,500

M1A4 SYSTEMS 3, 4 & 5

Systems 3, 4 & 5 are custom air handling units located on the 5th floor. The units serve the following areas:

- System 3: Serves South Perimeter – Ground to Fourth Floor, Induction System – 15,200 CFM
- System 4: Serves West Perimeter – Ground to Fourth Floor, Induction System – 8,700 CFM
- System 5: Serves 4th Floor Core – 26,600 CFM

ISSUES:
Existing units are 58 years old and in extremely poor condition. In addition to the common items noted above, these units are located in the core area of the 5th floor mechanical room, making them very difficult to access for service. Replacement of any major component within these units, such as a cooling coil, fan motor, etc., would be an extremely difficult and costly task.

PROPOSED SCOPE:
Remove all three systems and install one new 70,000 CFM unit in the vacated area remaining from the removal of these air handling units and Systems 6 & 8 demolished under a previous phase. Demolition of existing units will be phased with the installation of the new air handling unit to provide some level of temporary service to the existing areas served from systems 3, 4 & 5. Supporting infrastructure serving the air handling units will also be addressed. These items include the following:

- Duct cleaning/replacement
- Respective reheat coil replacement including piping,valves & control
- Chilled & Hot Water Piping, Valves & Controls
- Upgrades to the existing depressed, outdoor air intake well to minimize potential for weather penetration and leakage.
- Upgrade pneumatic smoke damper actuators to DDC located within ductwork served by this equipment.

IMPLICATIONS:
Consolidation of three existing systems into one large air handling unit will help to simplify ductwork within the 5th floor mechanical room resulting in improved service access to the new equipment. In addition, the replacement of the two induction units will lay the groundwork for removal of the perimeter induction units located throughout the ground through fourth floors under future renovations. At such time, existing ductwork will be used for code ventilation air and supplemental VRF systems will be installed for cooling within these areas.

BENEFITS:
Benefits include improved air quality to occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls.

COST: $1,813,300

M1A5 SYSTEMS 5A

System 5A is located in the 5th floor mechanical room near existing System 5, the unit is approximately 4,000 CFM and serves the Maxillofacial Department.

ISSUES:
Unit is suspended in the mechanical room, is inaccessible and has deteriorated beyond repair. Unit casing has deteriorated to the point that the structural integrity of the unit and the associated support system is in jeopardy.

PROPOSED SCOPE:
Demolish existing unit, extend ductwork to one of the new central 5th floor systems replaced under a previous phase of work. The following scope of work would be included as a part of this project:

- Duct cleaning/replacement
- Installation of new reheat coil, including piping, valves & controls.
- Demolition of existing steam & chilled water piping back to active mains.
- Upgrade pneumatic smoke damper actuators to DDC located within ductwork served by this equipment.

IMPLICATIONS:
This system needs to be removed for safety concerns.

BENEFITS:
Elimination of an unsafe piece of equipment which cannot be serviced, improved air quality and reliability to the Maxillofacial Department.

COST: $111,000

M1A6 SYSTEM 17

System 17 is located in the 5th floor mechanical room, serves the 1st floor dentistry area and is approximately 14,400 CFM.

ISSUES:
Existing unit is 58 years old and in extremely poor condition. Unit exhibits many of the common issues related to the original equipment.

PROPOSED SCOPE:
Demolish existing unit and install new 18,000 CFM unit in place. Supporting infrastructure serving the air handling units will also be addressed. These items include the following:

- Duct cleaning/replacement
- Respective reheat coil replacement including piping,valves & control
- Chilled & Hot Water Piping, Valves & Controls
- Upgrade pneumatic smoke damper actuators to DDC located within ductwork served by this equipment.

IMPLICATIONS:
Unit is too large for permanent service from any of the newly replaced air handling units and should be addressed as a stand-alone project.

BENEFITS:
Benefits include improved air quality to occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls.

COST: $572,440

M1A7 SYSTEM 15

Located in the 5th floor mech room, supplemental air conditioning for classrooms located on the 3rd & 4th floors. Approximately 3,900 CFM.

System 15 with supporting ductwork and controls – note the condition of unit casing and piping.

ISSUES:
Existing unit is 23 years old in poor condition resulting in increased maintenance and reduced reliability.

PROPOSED SCOPE: Demolish existing unit, extend ductwork to one of the new central 5th floor systems replaced under a previous phase of work. The following scope of work would be included:

- Duct cleaning/replacement
- Installation of four new reheat coils, including piping, valves and controls.
- Demolition of existing steam and chilled water piping back to active mains.
- Upgrade pneumatic smoke damper actuators to DDC located within ductwork served by this equipment.

IMPLICATIONS: Removing this unit will increase access in the 5th floor mechanical room.

BENEFITS: Benefits include improved air quality to occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls.

COST: $112,975

M1A8 SYSTEM 14

System 14 is a custom built up air handling unit serving the South East wing of the 3rd floor and is approximately 8,000 CFM.

ISSUES:
This unit was installed in 1980 and is still in good condition; however, it is in need of control upgrades to convert from pneumatic to DDC. Existing controls are obsolete.

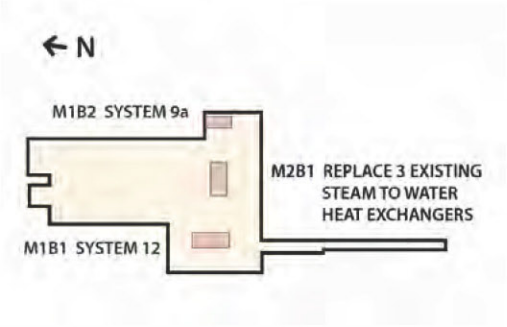
PROPOSED SCOPE:
Upgrade controls from pneumatic to DDC and tie into BMS system.

IMPLICATIONS:
Once upgraded, System 14 will have controls that match new systems installed throughout the 5th floor.

BENEFITS:
Improved reliability reduced service, common replacement parts and improved temperature control.

COST: $27,600

M1B Basement Units



M1B1 SYSTEM 12

System 12 is located in the North Basement, due to multiple renovations further study will be required to determine all areas served from this unit, the original design capacity was 27,500 CFM; however, the current connected load is approximately 21,000 CFM.

ISSUES:
Existing unit is 58 years old and in extremely poor condition. Unit exhibits many of the common issues related to the original building equipment.

PROPOSED SCOPE:
Demolish existing unit and install new 28,000 CFM unit in place. Supporting infrastructure serving the air handling unit will also be addressed. These items include the following:

- Duct cleaning/replacement
- Installation of new reheat coils, including piping, valves & controls.
- Demolition of existing steam and chilled water piping back to active mains and installation of new branch mains to serve new unit.
- Upgrade pneumatic smoke damper actuators to DDC located within ductwork served by this equipment.

IMPLICATIONS:
Unit has reached the end of its useful life, which correlates to increased service/repairs and reduced reliability.

BENEFITS:
Benefits include improved air quality to occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls.

COST: $652,200

M1B2 SYSTEM 9A

System 9A is located in the basement mechanical room and serves ground floor labs around animal quarters and morgue. The existing capacity is 8,600 CFM with 10,400 CFM connected load.

ISSUES:
Existing unit is 26 years old, in poor condition and undersized for the connected load.

PROPOSED SCOPE:
Demolish existing unit and install new 11,000 CFM unit in place. Supporting infrastructure serving the air handling unit will also be addressed. These items include the following:

- Duct cleaning/replacement
- Addition of new duct mains to support increased airflow – with rework of air distribution serving occupied areas.
- Installation of new reheat coils, including piping, valves & controls.
- Demolition of existing steam and chilled water piping back to active mains and installation of new branch mains to serve new unit.

IMPLICATIONS:
Unit is undersized, has reached the end of its useful life, which correlates to increased service/repairs and reduced reliability.

BENEFITS:
Benefits include improved air quality and temperature control in occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls.

COST: $341,360

M1C Ground Floor Units

M1C1 SYSTEM 16

System 16 is located on the ground floor and serves the original buildings 1st floor auditorium, total capacity is 12,700.

ISSUES:
Existing unit is 58 years old and in extremely poor condition. Unit exhibits many of the common issues related to the original building equipment.

PROPOSED SCOPE:
Demolish existing unit and install new 15,000 CFM unit in place. Supporting infrastructure serving the air handling unit will also be addressed. These items include the following:

- Duct cleaning/replacement
- New reheat coils, including piping, valves & controls.
- Demolition of existing steam and chilled water piping back to active mains and installatio

IMPLICATIONS:
Unit has reached the end of its useful life, which correlates to increased service/repairs and reduced reliability.

BENEFITS:
Benefits include improved air quality to occupied spaces, increased reliability, reduced maintenance costs, increase in serviceability and the flexibility of improved equipment controls.

COST: $422,700

M2 HYDRONIC HEATING SYSTEMS

M2A 5th Floor Hydronic Heating Systems

M2A1 NEW GLYCOL HEATING SYSTEM FOR AHU'S

ISSUES:
To facilitate the replacement of the 5th floor air handling units a new steam to glycol heat exchanger will be required. New air handling units will utilize glycol heating coils in lieu of steam heating coils which have a history of freezing and failure in existing air handling units located on the 5th floor.

PROPOSED SCOPE:
Install a steam to glycol heat exchanger in the North West corner of the 5th floor mechanical room with associated piping to serve each of the new central air handling units slated for the 5th floor. The system will consist of operating and standby variable speed pumps, circulating glycol through two heat exchangers piped in parallel. The approximate capacity is 10,000 MBH.

IMPLICATIONS:
This system is required to support glycol heating coils within new 5th floor air handling units.

BENEFITS:
Eliminate freezing of heating coils, elimination of multiple steam control stations and related appurtenances by centralizing steam control for all units to one location, improved control on in mild weather.

COST: $179,500

M2A2 EXIST. HEAT EXCH. SERVING REHEAT & INDUCTION ZONES

ISSUES:
To support reheat coil replacement for approximately 120 zone coils located within the 5th floor mechanical room and replacement of induction systems 1 thru 4, this system will need to be replaced with a system having increased capacity. The existing system is 58 years old and in need of replacement.

Typical condition of 5th floor heat exchanger, associated piping and pumps.

PROPOSED SCOPE:
Demolition of the existing system to be phased and replaced with a new system having increased capacity. The system will consist of operating and standby variable speed pumps, circulating glycol through two heat exchangers piped in parallel. In addition, new reheat risers will be extended down to the ground floor in the four corners of the building. New risers will have valved and capped connections for extension during future renovations. The approximate capacity is 19,000 MBH.

IMPLICATIONS:
The existing, antiquated system serves a portion of the ground floor animal quarters is system is required to support glycol heating coils within new 5th floor air handling units. Existing reheat piping throughout the building is in poor condition and in need of replacement. Installing four new vertical risers creates a means to replace deteriorated piping during future renovations.

BENEFITS:
Critical areas which rely on this system, such as the Animal Quarters, will be served from new, more reliable equipment. Facilities will have a means to connect to and replace deteriorated piping during renovations and in emergency situations. Improved temperature control, reduced service, increased reliability and a reduction in pump energy (over constant speed pumping systems) are all added benefits.

COST: $584,500

M2B Basement Hydronic Heating Systems

M2B1 3 EXISTING STEAM TO WATER HEAT EXCHANGE SYSTEMS

ISSUES:
There are three 58 year old steam to water heat exchangers located in the basement which serve Induction System Heating Coils, Reheat Coil Heating System and Radiation Heating Systems. All three systems are original equipment and in poor condition.

PROPOSED SCOPE:
Demolition of the existing system and replacement to be phased will have increased capacity. The system will consist of operating & standby variable speed pumps, circulating glycol through two heat exchangers piped in parallel. The approx. capacity of each is as follows:

Note the condition of existing heat exchangers and pump sets as well as an indication of system leakage on the floor.

- Radiation Loop: 1,500 MBH
- Reheat Coils: 2,025 MBH
- Induction: 1,100 MBH

IMPLICATIONS:
In addition to providing radiant and induction heating at the exposed perimeters of the north tower, the reheat system provides temperature control for zones served from the basement air handlers.

BENEFITS:
Improved temperature control, reduced service, increased reliability and a reduction in pump energy (over constant speed pumping systems) are all added benefits.

COST: $345,625

M3 EXHAUST SYSTEMS

M3A LAB & GENERAL EXHAUST FAN REPLACEMENT

ISSUES:
Existing roof mounted utility set exhaust systems discharge contaminated air close to roof, which is carried by prevailing winds to the outdoor air intakes serving the 5th floor air handling systems.

Typical exhaust fan arrangement.

Outdoor air intake serving 5th floor air handling units.

Typical exhaust fan arrangement.

PROPOSED SCOPE:
Remove existing roof fans and replace them with vertical discharge, high-velocity (Strobic Type) fans with variable exhaust volume controls and individual exhaust system dampers. There are three sets of systems that need to be addressed:

- General Exhaust System 43 – 20,000 CFM
- Utility Set Fans Serving Pharmacology-Toxicology Dept. – 2 @ 10,000 CFM Each.
- Three 10,000 CFM systems west of System 6A, on roof.

IMPLICATIONS:
Replacing these systems with new variable flow systems will assist in improving the building air balance (which has an impact on a variety of spaces throughout the building) and is a critical component to addressing the indoor air quality in areas served by 5th floor units utilizing the depressed roof well for outdoor air.

BENEFITS:
Improved indoor air quality and reliability, reduced service by centralizing equipment, improved building air balance and reduction in energy consumption by using variable flow systems and only exhausting spaces when they are in use.

COST: $500,500

M4A 5th Floor Systems

M4A1 SECONDARY CHILLED WATER PUMPS

ISSUES:
Existing pumps are in serviceable condition, however they are not large enough to support the proposed increased load once all fifth floor air handling units have been replaced.

PROPOSED SCOPE:
Replace existing pumps with three new chilled water pumps having variable frequency drives – two operating, one standby. Each pump will be approximately 1,800 GPM.

IMPLICATIONS:
To take full advantage of the increased air handling unit capacity new chilled water pumps will be required to accommodate the increased flow.

BENEFITS:
Full capacity of replacement air handling units can be utilized. In addition, variable frequency drives will offer an energy savings by providing only the required flow at any given time.

COST: $199,800

M4B Central Plant

M4B1 REPLACE THREE CENTRAL PLANT CHILLERS

ISSUES:
The existing chillers located in the central plant are nearing the end of their useful life and their maintenance costs are increasing. In addition, each of these machines use CFC based refrigerants which are no longer manufactured, which increases the cost of service. Furthermore, LEED projects pursued on campus that are connected to the central plant will need to show proof of a phase out plan to eliminate CFC based central equipment. Other methods to obtain the pre-requisite required for LEED certification require substantial justification to maintain CFC based equipment, leaving LEED certification subject to refusal by the reviewer. Ideally, a CFC phase out plan which replaces the chillers in the next 5 years is the straightforward way to meet this prerequisite.

PROPOSED SCOPE:
Replace three existing chillers with three new 1300 Ton machines, one of the three machines to be replaced will be increased in capacity as a part of this project. Chilled water and condenser water pumps, piping and valves associated with this machine will also need to be replaced. Existing cooling towers have sufficient capacity for the increased tonnage and are less than two years old.

IMPLICATIONS:
May be required to achieve LEED certification on new projects connected to the central chilled water plant.

BENEFITS:
Increase chilled water capacity, reduced maintenance, improved energy efficiency, environmentally friendly refrigerants, increased reliability and a reduction in service.

COST: $2,354,000

M5 WHITEBOARD, SURVEY & WORK SESSION ISSUES

M5A BODY COOLERS

ISSUES:
Existing body coolers have been a continual maintenance problem for the facilities staff. The system is antiquated and repairs are difficult, costly and are typically performed on an emergency basis.

PROPOSED SCOPE:
The best possible solution would be to install new, conventional body coolers in a new space which would permit the demolition of the existing coolers with no down-time. The new facility would have provisions for the storage of 100 bodies.

IMPLICATIONS:
Appropriate space may become available if existing morgue operations are relocated.

BENEFITS:
Significant reduction in maintenance, more conventional – user friendly rack type body storage and increased reliability.

COST: $100,000

M5B ASBESTOS ABATEMENT

ISSUES:
Insulation found on piping and equipment within mechanical rooms contains asbestos.

PROPOSED SCOPE:
Abate all asbestos within mechanical equipment rooms. Abatement should be phased with the replacement of the associated piping and equipment to ensure that active systems remain insulated.

IMPLICATIONS:
Abatement will be required prior to the replacement of piping and equipment located within the mechanical rooms.

BENEFITS:
Provides an opportunity to expose piping and replace sections that may be deteriorated as well as repair/replace damaged or missing insulation. Also eliminates asbestos in the building.

COST: $350,000

M5C DEMOLISH ABANDONED EQUIPMENT

ISSUES:
Abandoned equipment located throughout the 5th floor mechanical room is taking up valuable space and in some cases limiting access for service.

PROPOSED SCOPE:
Identify and remove all abandoned equipment including associated piping, ductwork, wiring, controls, equipment pads, etc.

IMPLICATIONS:
May be required to facilitate replacement of 5th floor mechanical systems.

BENEFITS:
Elimination of abandoned equipment, increased service access and space for new system upgrades.

COST: $60,000

M5D MECHANICAL LIFE SAFETY UPGRADES

ISSUES:
A number of life safety issues exist as a result of the current HVAC system configuration. Currently the building is served from central air handlers with multiple zone ducts branching off within mechanical spaces. Each duct has a reheat coil that extends from the mechanical room down to the zone it serves. These ducts extend up or down in shafts which do not meet the requirements of a rated shaft. In addition, many corridor walls do not extend to the deck and are open to this "shaft". Past projects have helped to improve the condition, however, a multitude of issues still exist and correcting them all at once is cost prohibitive.

PROPOSED SCOPE:
Due to the magnitude of this issue, we suggest addressing each area as spaces are remodeled, bringing that section up to current codes. This includes extending walls to deck where required, adding fire dampers or combination fire smoke dampers in existing ductwork as required to achieve the appropriate fire ratings for that section of the building.

IMPLICATIONS:
This component has the potential to add significant costs to small remodels throughout the facility.

BENEFITS:
Improved life safety and compliance with current codes.

COST: TBD

M5E WALK-IN COOLERS AND FREEZERS

ISSUES:
Three walk-in coolers/freezers serving food operations within the building are in poor condition. Recent repairs have been performed on an emergency basis to prolong equipment for 1-2 years. Failure within this time-frame is probable.

PROPOSED SCOPE:
Replace all three units, including insulated walls, evaporators, condensers and refrigerant piping. Install new lighting and refurbish associated drains.

IMPLICATIONS:
The largest implication will result from failure of one or more of the coolers. Existing product will be lost as well as storage for new product until the coolers are back on line which will have a significant impact on food service operations.

BENEFITS:
Increased reliability as well as a reduction in required service and costly repairs.

COST: TBD

M5F VIVARIUM STAIRWELL ODOR

ISSUES:
An objectionable odor, emanating from the Vivarium, exists in the stairwell adjacent to that area. Depending on the condition, the odor can be very strong and will travel to other occupied areas of the building.

PROPOSED SCOPE:
At this time the source is known, but we do not fully understand the reason for odor carry over into the stairwell. A study would have to be performed to evaluate the problem and develop a solution.

IMPLICATIONS:
Objectionable odors can be strong creating an uncomfortable environment for building occupants.

BENEFITS:
Resolution to an on-going issue that has absorbed significant troubleshooting time, increased comfort and improved air quality for occupants.

COST: TBD

M5G STRUCTURAL VIBRATION FROM CANCER CENTER

ISSUES:
Since the Cancer Center was built, the staff has identified structural vibration resonating through the building.

PROPOSED SCOPE:
At this time the cause of the problem is unknown and a study would be required to determine the source of the problem and identify a means of correcting it.

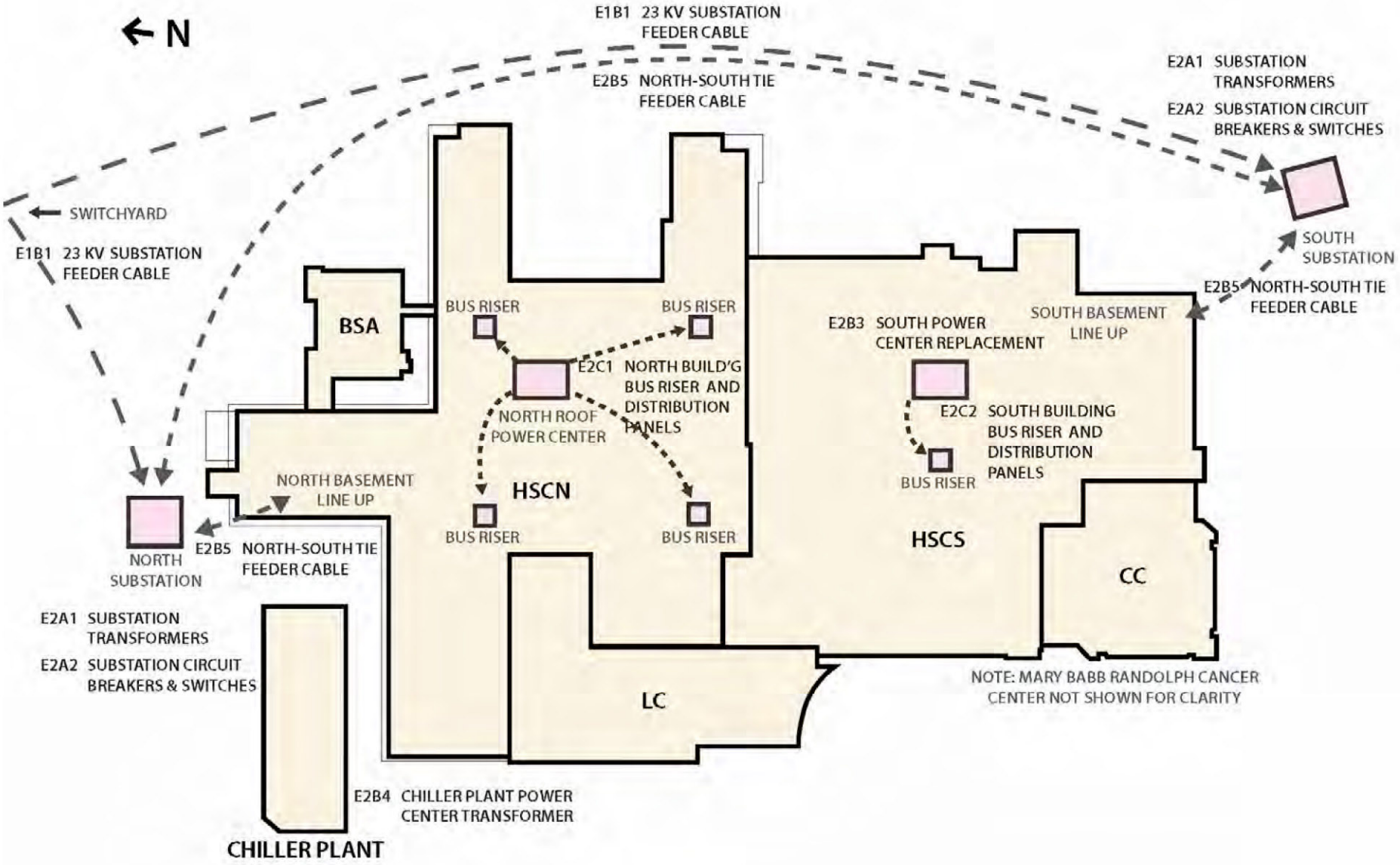
IMPLICATIONS:
Slight vibrations in the building can effect sensitive lab equipment creating a nuisance for building occupants.

BENEFITS:
An ongoing problem is identified and a plan can be put into place to rectify it resulting in an improved environment for building occupants.

COST: TBD

ELECTRICAL PROJECT INDEX

E1 ELECTRICAL SITE PLAN DIAGRAM



E1A Site Lighting

ISSUES:
The existing site lighting at the facility has been designed and provided over time, with each of the various construction projects on the site. There are portions of the campus which have 24-hour operations, which are not adequately illuminated.

PROPOSED SCOPE:
We recommend that a study of the site lighting be performed to verify illumination levels and controls in all areas. The measurements should be taken to verify that current illumination levels meet the Illuminating Engineering Society (IES) standards for site lighting to verify that light levels provide a safe environment during occupied times. Existing fixtures should be replaced and repaired and controls calibrated to provide compliant light levels and proper operations.

IMPLICATIONS:
This project is a stand-alone project that could be performed independent of the other items in this study. Improvement of the site lighting will enhance the safety and security of the occupants of the site. Calibrations and controls and replacement of inefficient lighting fixtures will provide energy conservation. Specific areas that are known to be problems are noted in items below.

BENEFITS:
Enhanced security and safety.

COST: $45,000

E1B Electrical Utilities

E1B1 23 KV SUBSTATION FEEDER REPLACEMENT

ISSUES:
The existing 23 KV distribution system is partially owned by the University. There is equipment in the substation yard that is owned by the facility, which has been upgraded and modified as projects have occurred over the years. The initial installation is 1950's vintage equipment. The feeders to the main utility connection points, for both the Health Sciences Center and the Hospital Complex, are approximately 60 years of age and have exceeded the normal life for this type of cable. The existing switching equipment is in serviceable condition. However, routine maintenance is not performed.

PROPOSED SCOPE:
Provide a preventive maintenance plan for new switchgear and replace the feeder cables from the switchyard to the North and South Sub.

IMPLICATIONS:
This system replacement will be extremely difficult because it will require downtime in operating facilities. Scheduling and performing some of this work may require the replacement of North-to-South Substation tie feeders prior to beginning. In order to reduce the downtime impact, the North and South Buildings may have to be served from one feeder breaker for a period of time under an emergency condition. Those system improvements should occur prior to the replacement of the feeders between the switchyard and the North and South Sub to improve the ability to switch loads when the main feeders from the switchyard to the substations are replaced.

BENEFITS:
Continued operation of the facility without unscheduled disruptions and expensive emergency repairs and replacements.

COST: $905,000

E1B2 MASTER SITE UTILITY PLAN

ISSUES:
There is no existing master site electrical utility plan which shows where the existing feeders are relative to the structures and to future portions of the site which might potentially have buildings connected.

PROPOSED SCOPE:
Investigate and add the existing site electrical information to the campus master plan.

IMPLICATIONS:
Providing an up-to-date electrical utility site plan should be performed prior to beginning any planning for new construction. This will help to identify significant cost impacts of relocating existing electrical utility infrastructure as further development of the campus occurs.

BENEFITS:
Benefits include improved system reliability and reduced downtime from unplanned outages which may occur when utilities are discovered during excavation.

COST: $20,000

E2A SUBSTATIONS

ISSUES:
Substations on the campus are defined by equipment that converts the 23,000 volt utility feed to the distribution voltage of 4160 volts. This equipment generally consists of high-voltage switchgear serving distribution grade, oil-filled, pad-mounted transformers in the North and South Substation switchyards. These transformers then feed 4160 volt circuit breaker lineups, which in turn distribute 4160 volts into the buildings. The North and South Substations were generally installed in the 1950s and have had repairs or replacements done as needed when equipment has failed or was reconfigured for renovation projects. The North 2 Sub was installed in approximately 2005 and is of a newer class of equipment. However, the general configuration is the same as the older equipment. The proposed work scope for the substations is described below.

E2A1 SUBSTATION TRANSFORMERS PM

ISSUES:
The substation transformers are over 60 years old and are generally operating properly. There was an oil leak in one of the North Substation transformers, which was aggravated by the extreme loading of the transformer. When the Main Chiller Plant was refed with the South 2 Sub, some of this loading was relieved on the North Substation, and the transformer leaking has been corrected. The transformers in the North 2 Sub are relatively new and appear to be in good operating condition. There are no known problems with the South Substat transformers.

PROPOSED SCOPE:
There are two work scopes associated with these transformers. The first is to institute a preventive maintenance plan. This should include an oil sample and testing for each transformer to determine its operating status and potential for failure. Additionally, load monitoring of these transformers should be verified to establish their current normal operating load and future capacity. Once this is determined, the need for repair or replacement can be established. Additionally, the potential for rebuilding the existing transformers versus replacement can be verified.

IMPLICATIONS:
Testing these transformers should be scheduled as soon as possible due to the age and condition of the equipment. By performing preventive maintenance, the life of these transformers can be significantly extended, and the cost of replacement reduced by the cost of maintaining the transformers in good condition. Equipment of this type has a significant lifespan. Reduction in the lifespan is typically caused by operation outside of its original design parameters and degraded or low oil in the transformer enclosure, which increases the internal operating temperature and breaks down the insulation over time.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $10,000

E2A2 SUBSTATION CIRCUIT BREAKERS AND SWITCHES PM

ISSUES:
The 23 KV and 4160 volt outdoor circuit breakers at the substation require preventive maintenance to improve their operation and extend the life of the equipment. There is at least one switch which is known to be nonoperational, and no preventive maintenance records are available.

PROPOSED SCOPE:
Schedule and perform preventive maintenance on all of the 23 KV and 4160 volt equipment in the North, South and North 2 Substations.

IMPLICATIONS:
Scheduling and performing maintenance on this equipment will extend its life. Generally speaking, this type of equipment is made to be rebuilt and upgraded. When a problem is identified, it can be corrected and, in some cases, new components provided (such as digital relays as replacement for mechanical relays) which can update and significantly extend the life of this equipment. Preventive maintenance can identify system components which cannot be rebuilt or corrected, which may require system replacements, before there is a catastrophic failure that creates significant downtime and unplanned cost to the facility.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $124,000

E2B Medium Voltage Distribution

E2B1 NORTH AND SOUTH DISTRIBUTION LINEUPS

North Distribution Lineup

ISSUES:
The North & South distribution lineups consist of the indoor 4160 volt switchgear which is the same type but different generations in terms of age of equipment. The North 4160 volt lineup was installed in 2005 and consists of power circuit breakers with digital relays. The South 4160 volt lineup is from the 80s and consists of power circuit breakers with mechanical relays. Both of these lineups are in operating condition. Preventive maintenance became an issue on this equipment when it was discovered during the Phase 2 Power Project that one of the relays on the main incoming devices on the North lineup was not operating. The main circuit breaker feeding half of the North addition would not have tripped during an overcurrent condition, potentially creating a fault causing significant damage to the distribution system.

PROPOSED SCOPE:
The two lineups should be scheduled for preventive maintenance for all circuit breakers.

IMPLICATIONS:
The arrangement of both lineups allows switching of load so that breakers can be racked out and preventive maintenance performed without significant shutdowns to the various parts of the facility. The South Building will require some shutdowns as the arrangement of that equipment does not allow feeding the entire building from half the switchgear. However, the shutdowns needed for the preventive maintenance should be scheduled and performed to reduce the possibility of long-term unplanned outages that create additional costs and disruption of the facility.

BENEFITS: Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $92,000

E2B2 NORTH POWER CENTERS

ISSUES:
Power centers are the indoor electrical equipment that converts the 4160 volt distribution to 480 and 208/120 volt systems. The North Power Centers have been replaced under the Phase I and Phase 2 North Power System Upgrade projects. There are no known issues with this equipment. However, the Phase 1 switchgear, which was installed in 2005, should be scheduled for preventive maintenance. We believe that the circuit breakers and transformers are currently operating correctly and that preventive maintenance has been performed. This should be verified and the preventive maintenance schedule continued. The 4160 volt feeders that connect the power centers to the lineups were replaced under these projects.

Phase 2 North Power Upgrade installed new power centers. This makes the Fifth Floor ready for HVAC upgrades

PROPOSED SCOPE:
Maintain a preventive maintenance schedule as recommended by the manufacturer.

IMPLICATIONS:
This should be ongoing work performed on a schedule determined by the manufacturer's recommendation.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $124,000

E2B3 SOUTH POWER CENTER REPLACEMENT

ISSUES:
The South Power Centers are original to the building construction and have not been replaced or upgraded as have been the North Substations. There are no current known operational deficiencies with this equipment. The 4160 volt feeders from the south lineup to the power centers are mostly original conductors and should be replaced.

South Power Center PC-4 from the 1970's. This equipment feeds the Cancer Center and is in poor condition.

PROPOSED SCOPE:
The South Power Centers should be planned for replacement similar to the North Building Power Centers' replacement projected over last several years. The existing South Power Centers consist of 4160 volt primary, with dry-type transformation to the various utilization voltages distributed throughout the facility. The circuit breakers on the secondary side of these power centers are 1950 vintage power circuit breakers and have not had preventive maintenance performed.

IMPLICATIONS:
The existing power centers have exceeded their normal life. In 2004, one of the power centers' transformers in the North Building failed, which created a significant impact on the facility and created significant costs for emergency replacement. We feel it is a long-term benefit to the facility to plan the replacement of this equipment, identify locations for new equipment to be installed, and refeed existing distribution systems to maintain this equipment.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $3,617,000

E2B4 CHILLER PLANT POWER CENTER TRANSFORMER

ISSUES:
The existing Chiller Plant power center was designed with (2) 4160 volt feeds and (2) transformers in order to improve the system reliability and be able to feed all of the chiller loads if one of the transformers is down. One of the transformers has been inoperable for an extended period of time and needs to be repaired and put back in operation. If the second transformer fails, there will be no power to the Chiller Plant which feeds the entire facility with cooling. The 4160 volt feeders to the chiller power centers were replaced under the 2005 Chiller Plant expansion and should be in good condition.

PROPOSED SCOPE:
Repair and/or replace the transformer in the existing Chiller Center Power Center.

IMPLICATIONS:
If this transformer is not repaired, the system reliability is reduced. Currently, if the second transformer fails, there will be no power to the Chiller Plant without some significant costs for temporary installation and emergency repairs or replacement of transformers.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $30,000

E2B5 NORTH-SOUTH TIE FEEDERS

ISSUES:
The North-South Tie Feeders are 4160 volt feeders which can be used to connect the loads of the North or South Building to the other substation. These feeders essentially constitute a loop feed from the North to South Building's substations, which significantly enhances the ability of the power system to be switched to isolate failures or to provide a means to de-energize equipment and perform preventive maintenance. At least one section of the feeders for the North-South Substation was installed in the 1950s and should be replaced. Replacement of this feeder was included in an alternate bid under the Phase 2 Power Project but was not accepted due to budget restrictions.

Existing 4160V tie feeders in tunnel at North Building.
Feeders are 57 years old +/-.

PROPOSED SCOPE:
Replace the section of feeder for the North-to-South Substation tie which was installed in the 1950s. Install the North Lineup-to-South Lineup tie which allows a second backup feeder for connecting the North and South Building.

IMPLICATIONS:
This work should be performed prior to replacing the 23 KV circuits from the switchyard to the substations. Relying on a feeder that is 65 years old and well past its normal lifespan as a backup feeder could create a failure during normal switching for preventive maintenance and replacement of other component parts.

BENEFITS:
Replacing the sub-to-sub tie feeder and installing the lineup-to-lineup feeder will significantly improve the capability of the facility to isolate faults and to provide other system replacements.

COST: $365,000

E2C Utilization Voltage Distribution (480/280/120V)

E2C1 NORTH BUILDING BUS RISERS AND DISTRIBUTION

ISSUES:
Under the Phase 2 power upgrades, the main 4160 volt distribution system and power centers were upgraded. The power centers refed the existing vertical bus risers which occur at the four quadrants of the building and serve all of the 208/120 volt systems throughout the building. At each floor on each quadrant there is a bus connection device which consists of a fused tap box, which feeds a main distribution panel in the closet. The bus from the connections to the new power centers through the building is from the 1950s and should be replaced. Additionally, the main distribution panels in each of the riser closets are also from the original installation and should be replaced. The circuit breakers are available to install in these panels; however, there are a number of code violations relative to working clearance about electrical equipment which should be addressed as these riser closets are replaced with new and current equipment.

PROPOSED SCOPE:
Replace the bus risers at the four quadrants to the building and the main distribution panels in those closets. The replacement of this should include refeeding all existing downstream equipment and providing spare circuit breaker capacity for future loads.

IMPLICATIONS:
The age of the equipment and the clearance violations have dictated that the work in these closets is only performed by facility staff during construction projects. As plans are developed to renovate portions of the building, these riser closet renovations should be included. Updating the system prior to beginning renovations will significantly improve the ability of the electrical distribution system to serve new loads and renovation projects. In addition, where projects are bid and awarded to outside contractors, it will reduce the amount of owner-provided work that will be necessary.

BENEFITS:
This will significantly improve the electrical distribution system and provide future flexibility for renovations of the building as they occur.

COST: $2,347,000

E2C2 SOUTH BUILDING BUS RISERS AND DISTRIBUTION

ISSUES:
The south bus riser distribution systems are the same age and arrangement as the north bus risers. With the exception of the space available from each floor, the problems and concerns with the South Building are similar to the North.

PROPOSED SCOPE:
As part of the upgrade of the South Building distribution system, the bus risers and main distribution panels on each floor should be replaced.

IMPLICATIONS:
Replacement of the electrical system will reduce unplanned outages created by component failure and improve the future flexibility of the building for renovations.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $1,214,000

E2C3 NORTH AND SOUTH PANELBOARDS

ISSUES:
The facility has a program of replacing panelboards when renovations occur. In general, the areas where renovations have occurred in the past 20 years have new and suitable panelboards which have appropriate circuit breaker devices and spares spaces for future loads. In areas where renovations have not occurred, the panelboards are generally original to the building. Replacement component parts are only available by salvage of other equipment that has been replaced in the past, and there are minimal spare circuit breakers for new loads.

PROPOSED SCOPE:
Wherever areas are renovated, replace panelboards with new and current equipment.

IMPLICATIONS:
There are no infrastructure projects necessary for this item. The replacement of these panelboards should be an ongoing project during renovations.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: TBD

E2C4 NORTH & SOUTH BUILDING MOTOR CONTROL CENTERS

ISSUES:
The motor control centers in both the North and South Buildings are of a similar vintage and were primarily constructed and installed in the original building construction in the 1950s. Replacement components for these motor control centers are very expensive and increasingly difficult to obtain. In addition, over the years, as variable frequency drives have come down in cost, more and more mechanical systems for pumping and air distribution have been provided with variable frequency drives, which are not installed in the motor control centers. The motor control centers have generally been cannibalized for parts or reduced to circuit breaker distribution boards, which are generally confusing and in poor condition.

PROPOSED SCOPE:
Replace all existing motor control centers in the North and South Buildings with new MCCs or distribution panelboards as appropriate.

IMPLICATIONS:

Typical MCC from original construction. Note new VFD which is a typical HVAC upgrade installation.

These motor control centers should be replaced when significant mechanical system renovations are undertaken. As the replacement of air handlers, heat exchanging systems and chiller water pumps is undertaken, the motor control centers should be replaced with distribution circuit panelboards, and motor starters and/or variable frequency drives provided in new and current equipment.

BENEFITS:
Replacement of these old motor control centers will reduce the cost of serving large mechanical loads and improve the ability of the facility staff to maintain and operate mechanical systems.

COST: $322,000

E2C5 FACILITY ONE-LINE DIAGRAMS

ISSUES:
There are no current up-to-date electrical one-line diagrams for the facility. There have been significant renovations over the past several years to these systems in the North Building, and there have been panelboards added over the years to both the North and South Building. The preparation of an overall facility one-line power diagram would significantly improve the ability of the staff to maintain the electrical system. In addition, it would serve to document that system so that as personnel change, significant knowledge is not lost.

PROPOSED SCOPE:
Prepare a record one-line power distribution diagram of the existing electrical facilities of both the North and the South Building from the 23 KV equipment in the switchyard to the branch circuit panelboards on each floor.

IMPLICATIONS:
This record one-line should be provided prior to beginning significant electrical infrastructure replacement projects. This will help to identify where outages will be needed for replacement of infrastructure. Additionally, it will provide the basis for design and pricing of various projects and will aid facility staff in troubleshooting failures and planning for future renovations that are self-performed.

BENEFITS:
Improved electrical system reliability and reduced exposure to unplanned outages and the cost of emergency repairs.

COST: $30,000

E3 ELECTRICAL DISTRIBUTION SYSTEM - EMERGENCY POWER

E3A NORTH GENERATOR

ISSUES:
The North generator was installed in approximately 2004. The North emergency distribution system has been extended since then throughout the North Building. Additionally, the North generator serves the IT riser closets in the South Building, which provide the main backup to the phone (VOIP) and data systems throughout the Health Sciences Center. The generator was constructed in a building addition with new distribution equipment and an underground diesel fuel storage tank of approximately 5,000 gallons. This system has no known issues.

PROPOSED SCOPE:
Preventive maintenance and service for all equipment.

IMPLICATIONS:
Preventive maintenance should be performed to continue the system's operation. The system should be adequate for future renovations. Facility staff is currently devising a system for building occupants to request emergency power for research or other critical equipment. Additionally, as HVAC system renovations occur, system components such as fume exhaust hood fans should be connected to the emergency power system.

BENEFITS:
The emergency power system, if properly maintained, should be adequate for the future needs of the North Building.

COST: No immediate project costs are needed.

E3B SOUTH GENERATOR GARAGE

ISSUES:
The South generator was installed in approximately 1993. This generator primarily feeds loads in the Lower Level Radiology Department. The generator was installed in the existing garage with new distribution equipment and an aboveground diesel storage tank of approximately 750 gallons. This system has no known issues.

PROPOSED SCOPE:
Preventive maintenance and service for all equipment.

IMPLICATIONS:
Preventive maintenance should be performed to continue the system's operation. The system should be adequate for future renovations.

BENEFITS:
The emergency power system, if properly maintained, should be adequate for the future needs of the building.

COST: No immediate project costs are needed.

E3C SOUTH GENERATOR - ICU

ISSUES:
The ICU generator was installed in the early 70s in the HSC South 4th floor mechanical room. It is served by a power center which has reached the end of its useful life. The main power transfer switch for the distribution equipment is from 1970 and does not meet current codes and may or may not be operational. Additionally, a new transfer switch was installed to serve the Cancer Center expansion. The distribution system in the Cancer Center is minimal, and requests to expand this system to serve additional loads cannot be met. This generator is installed in a room which is extremely tight, and normal maintenance & operation are difficult. Replacement is not practical.

The south ICU generator is operable. Due to its age it should be scheduled for replacement. A study of loading and need for emergency power in the Cancer Center is needed.

PROPOSED SCOPE:
Identify the existing loads served by this generator and design a new backup power generator for the South Building and Cancer Center which has adequate capacity for existing and future needs. The new generator should be installed in a location which is closer to the load that it serves and is in a serviceable and accessible location. The existing generator is fueled by natural gas. It may be that the replacement generator would use a diesel fuel source to provide a more economical installation & be consistent with the other power generators at the site.

IMPLICATIONS:
This generator is serving some patient care areas and should be updated and replaced.

BENEFITS:
The failure of this generator will create significant impacts on the facility operation and provide significant costs for returning it to operation. Replacing this in a planned project will improve the emergency system distribution and provide additional capacity while at the same time potentially reducing future costs.

COST: $750,000

E4A POWER MONITORING SYSTEM

ISSUES:
There are a number of metering systems installed in the existing facility with a variety of generations and various communication capabilities. There is a definite need for the facility to install an organized metering system to monitor power usage in the distribution system. The need for this system will be increased as renovations occur in the various areas. Data on load usage in the various portions of the facility is inadequate. The Siemens Building Management System that is in use throughout the facility has the ability to create a monitoring system from various types of meters and systems. This would allow a central location where power usage in the various branches of both the normal and emergency power distribution could be tracked so that as renovations occur or requests for new connections to the emergency power system are reviewed, the capacity available would be more easily determined.

PROPOSED SCOPE:
Install approximately (30) new power meters at various locations throughout the power distribution system. Connect the new and existing meters on the new power centers in the North addition to the Siemens Building Management System. Replace the existing meters on the South lineup and connect these meters into the Siemens Building Management System. The final determination of new meter locations will be determined after additional discussions with facility personnel.

IMPLICATIONS:
Both the normal and the emergency power systems have need for this system. First and foremost is the need to add loads to the emergency power system. Without knowing what the connected loads are, the potential to overload the generator exists. By providing an ongoing tracking system to record maximum peak demand, facility staff can easily determine if new requests for generator capacity can be satisfied. In the normal power distribution system, as areas are renovated, it can be easily determined if the electrical system has capacity for increased loads where those renovations occur. Additionally, the monitoring of the normal power system can verify that the new loads are connected so that the transformers are not loaded to the point where the redundancy that was designed into the system is lost. For example, in any given power center, the total load on the power center should only equal the capacity of one transformer. If the total system load exceeds the rating of either transformer in a double-ended power center, the capacity to put the entire load on one transformer, allowing preventive maintenance and/or isolating faults, is lost in the system.

BENEFITS:
This metering will improve the ability of the facility staff to satisfy the needs of the building occupants without overloading systems beyond the intent of their design.

COST: $105,000

E4B ACCESS CONTROL

ISSUES:
The existing access control system is being expanded throughout the building as areas are renovated. The access control system is a proprietary system. This system is no longer supported by the current company that owns the technology. Upgrading the existing system to the newest technology owned by the company that has purchased the existing technology may not be the most economical option. It may be that a completely new system of hardware and software will be more economical than upgrading the existing system. It is highly probable that existing wiring will support new devices and replacing the system with a new system will allow the use of proximity readers & other identity verification devices beside the swipe cards that are currently in use.

PROPOSED SCOPE:
Replace the existing system with a new access control system, including front-end hardware and software and card readers. Include the ability to make proximity cards or fobs as determined and to program them as the owners of the devices change. The system should be fully licensed, functional and upgradable to a new and current system. There is no need to match any other systems that are facility wide at the campus.

IMPLICATIONS:
Replacement of this existing system should be done as soon as possible. If this system is no longer supported and there is a main system failure, the current access control that is throughout the building will no longer be functional. Because of the nature of many of the areas of the building, it is important that access control be maintained at all times.

BENEFITS:
By entertaining a completely new system, competitive bids can be obtained for the replacement. By upgrading the existing system, there is very little potential to obtain competitive bids.

COST: $400,000

E4C CLOSED CIRCUIT TV

ISSUES:
There is a need in various areas of the facility to monitor sensitive mechanical and electrical systems for security purposes and to monitor certain lab facilities where hazardous materials are used to improve the safety of the building personnel.

PROPOSED SCOPE:
Install closed circuit TV cameras in locations to be identified by staff. Cameras should be IP addressable devices and be connected to the nearest network closet. IT staff is assumed to be able to program these IP addressable cameras into a data storage server location with access to be available to personnel with password access. The amount of data storage space available would limit the recording of each camera. Occupancy sensors could be installed on the cameras to limit their time of operation for when someone is in the area.

IMPLICATIONS:
Cameras would help to eliminate some problems that occur at this facility to improve the safety of the occupants & employees in the building.

BENEFITS: Improved safety and security.

COST: $150,000

E4D STRUCTURED CABLING

ISSUES:
The structured cabling system throughout both the North and South Building has been updated and improved as the technologies have changed. There currently exists a fiber backbone connecting various closets as well as high-capacity copper from the riser closets on each floor horizontally to the various connection points. Wireless access is being extended throughout the facility under current projects.

PROPOSED SCOPE: There is no project required at this time.

IMPLICATIONS:
The system is in good working condition and is appropriate for systems of this type in this type of facility.

BENEFITS: There is no benefit for a system upgrade.

COST: None

E5A BUILDING GROUNDING ELECTRODE SYSTEM

ISSUES:
The building grounding electrode system (specifically building steel) has differential voltages between the North and South Buildings. This indicates that there is current flow on the grounding electrode system that should not be there during normal conditions. Locating the source of this stray current will be difficult, and a complete investigation of the existing building grounding electrode system should be initiated. Additional test and measurement could help to isolate this type of problem, however, many times the only way to actually identify the source is to begin disconnecting loads and monitoring the system. When something is turned off that eliminates the problem, you have identified the source. Finding this in a building the size of the Health Sciences Center will be extremely difficult.

PROPOSED SCOPE:
Initiate improvements to the grounding electrode system in an attempt to identify that the building and grounding electrode system is intact and in good condition. Additionally, all grounding of transformers throughout the facility should be verified that they are properly grounded and bonded. At the first overcurrent protective device downstream of a transformer, the neutral and ground bond should be confirmed. No neutral ground bonds downstream of the first point of overcurrent protection are permitted by code. This is very often the source of the stray current in the grounding electrode system which can create these differential voltages. Additionally, connecting the building steel from building to building and across expansion joints will eliminate this problem. It will not eliminate stray current but should help to eliminate differential voltages between buildings.

IMPLICATIONS:
This item should be investigated and improved. There are potential safety implications as well as problems that could be created by sensitive electronic systems which reference their electronics to ground.

BENEFITS:
Grounding and bonding systems provide reliable and safe electrical systems. This known problem should be corrected.

COST: $30,000

E5B LIGHTNING PROTECTION

ISSUES:
The Animal Facilities Addition was provided with a lightning protection system as required by the funding source. The remainder of the facility does not have a lightning protection system. Based on analysis provided by National Fire Protection Association Standard 780, which is the standard for the installation of lightning protection systems, it should be determined if the facility should have a lightning protection system. Lighting protection systems are typically furnished and installed by specialty contractors familiar with the design, operation and installation of these systems. There is significant debate in the industry on what is the best means of protection. Whether active or passive systems are used and whether the conventional Benjamin Franklin lightning rod provides better protection than other means should be explored. Additionally, it should be verified at what level the existing facility experiences problems potentially caused by lightning strikes and whether this is a cost effective installation.

PROPOSED SCOPE:
Furnish and install UL master label lightning protection system by a UL-listed lightning protection contractor. Final nature and scope of the system is to be determined by review of the existing facility and recommendations by a specialty lightning protection contractor.

IMPLICATIONS:
The existing building has functioned for 60 years without a lightning protection system. Unless there is significant damage being experienced in various parts of the building, it may be that this system is not a high priority installation. It is highly unlikely that the AFA System will provide improved protection for any other components of the building. In fact, adding lightning protection to the remainder of the building may improve the protection of the Animal Facility Addition.

BENEFITS:
Improved protection from lighting strikes, damage caused to building structures and electronic equipment.

COST: $350,000

E5C SURGE PROTECTIVE DEVICES (SPDS)

ISSUES:
Surge protection is included in several areas of the building which have been recently modified. The new power centers installed under the Phase 1 and Phase 2 power upgrade have lightning arrestors on the 4160 volt incoming equipment and have secondary transient voltage surge suppression (TVSS or SPD) on the main device downstream of the transformers. These SPDs can reduce the incidence of equipment damage caused by both lighting strikes (see above) and/or switching of high-voltage equipment. Additionally, when installed downstream of transformers, these devices can help to reduce the impact of transient voltages in the electrical system caused by switching large loads. For example, starting and stopping large motors, elevators, etc.

PROPOSED SCOPE:
Add surge protective devices of a rating consistent with the level in the distribution system to panels that have equipment exposed on the roof and to panels which serve large switching loads.

IMPLICATIONS:
The installation of these devices can be ongoing as renovations are made or systems upgraded. For example, they can be added to new distribution panels that serve renovated air handling units and to other panels that feed exhaust fans exposed to roof areas. As power centers are replaced, the new power center should include both lightning arrestors on the primary voltage side of transformers and secondary surge protected devices on the utilization side of these transformers.

BENEFITS: Improved equipment life and operation.

COST: $81,000

PLUMBING / FIRE PROTECTION PROJECT INDEX

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- FP2A General Piping and Valves
- FP2B Sprinkler Heads
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P1 DOMESTIC WATER SYSTEMS

P1A Domestic Hot Water System

ISSUES:
The existing domestic hot water system is antiquated and in disrepair. A replacement project is currently underway.

PROPOSED SCOPE: No project at this time.

IMPLICATIONS:
The proposed system is appropriate for this type of facility and will resolve current reliability issues.

BENEFITS:
Replacing this system will provide increased reliability and reduced maintenance.

COST: None

P1A1 DOMESTIC HOT WATER – SUPPORTING SYSTEMS

ISSUES:
A good portion of the supporting systems are original to the building and have exceeded their useful life. Piping throughout the building is showing signs of deterioration and is prone to leaks which are very disruptive to the facility. Valves are inoperable or insufficient to isolate portions of the system for repairs without a major shutdown. Insulation is missing or damaged on some sections of piping.

PROPOSED SCOPE:
To minimize downtime and disruption to the occupied building, a new domestic hot water piping system should be installed parallel to the existing distribution. Once in place, valved taps installed on the new piping can be cut over to re-feed branch mains throughout the building. At such time, new isolation valves would be strategically placed to permit future, isolated shutdowns of the system for extension or repair. Branch piping within chase walls and occupied spaces would have to be addressed as areas are renovated.

IMPLICATIONS:
An in-depth study of the existing pipe routing and distribution would have to be performed in order to identify the complete scope of work and required downtime to perform the work. The required downtime may prohibit moving forward with this project.

BENEFITS:
Improved reliability, reduction in facility resources currently spent chasing and repairing leaks and avoidance of inevitable piping failure resulting in major disruption and potential water damage.

COST: TBD

P1B Domestic Cold Water System

P1B1 DOMESTIC COLD WATER – SUPPORTING SYSTEMS

Domestic Cold Water piping showing the condition of the existing piping with rusting, leaking pipes insulated in asbestos insulation.

ISSUES:
A good portion of the supporting systems are original to the building and have exceeded their useful life. Piping mains throughout the building are galvanized steel and are showing signs of deterioration resulting in leaks which are very disruptive to the facility and difficult to repair. Valves are inoperable or insufficient to isolate portions of the system for repairs without a major shutdown. Insulation is missing or damaged on some sections of piping.

PROPOSED SCOPE:
To minimize downtime and disruption to the occupied building, a new domestic hot cold water distribution system should be installed parallel to the existing piping. Once in place, valved taps installed on the new piping can be cut over to re-feed branch mains throughout the building. At such time, new isolation valves would be strategically placed to permit future, isolated shutdowns of the system for extension or repair. Branch piping within chase walls and occupied spaces would have to be addressed as areas are renovated. Domestic water booster pumps are currently in serviceable condition; however, consideration should be given to installing new pumps to support the new piping and minimize disruption to the facility during changeover.

IMPLICATIONS:
An in-depth study of the existing pipe routing and distribution would have to be performed in order to identify the complete scope of work and required downtime to perform the work. The required downtime may prohibit moving forward with this project.

BENEFITS:
Improved reliability, reduction in facility resources currently spent chasing and repairing leaks and avoidance of inevitable piping failure resulting in major disruption and potential water damage.

COST: TBD

P2 PLUMBING FIXTURES

ISSUES:
Existing fixtures and trim throughout the facility have begun to reach the end of their useful life. This has been recognized by the facilities staff and fixture/trim projects have been completed or are in place to upgrade to current technology.

PROPOSED SCOPE:
No new project required at this time, facilities to continue with current replacements and maintenance.

IMPLICATIONS:
Low flow fixtures will reduce water usage, aide in LEED certification and promote campus sustainability awareness to the end users.

BENEFITS:
Reduction in water consumption, improved reliability.

COST: None

P3 SANITARY SEWER

ISSUES:
Existing above and below grade sanitary sewers throughout the building are original to the building construction and have deteriorated to the point where leaks are becoming more prevalent.

PROPOSED SCOPE:
A comprehensive study of the existing sewers should be performed to confirm the overall integrity of the system. This includes selective camera work in some areas of below grade sewer as well as inaccessible areas above grade. Once the internal integrity of the piping is known and any major issues are identified, a comprehensive replacement plan should be implemented to repair and or replace portions of the sewer based on condition.

IMPLICATIONS:
Where piping is visible and/or has been exposed through renovation work, its condition has been assessed and issues have been addressed; however, a good portion of the piping is inaccessible and its condition is unknown. If major issues are identified they can be addressed before failure and damage occurs.

BENEFITS: Ability to schedule shutdowns, eliminate emergency repair.

COST: To Be Determined

P4 ACID WASTE

ISSUES: Existing in good condition, no known issues at this time.

PROPOSED SCOPE: No project at this time.

IMPLICATIONS: None

BENEFITS: None

COST: None

P5 GREASE WASTE

ISSUES:
The existing kitchen and snack bar areas utilize point of use grease interceptors to capture grease waste in accordance with code. Existing interceptors are in poor condition and in need of repair/replacement. In addition, having the interceptors located within occupied space that's rarely sitting idle, makes maintenance difficult, mainly due to access and objectionable odors given off when interceptors are opened for cleaning.

PROPOSED SCOPE:
Remove point of use interceptors and install a dedicated grease waste to serve these areas. The dedicated grease waste would extend to two new, central (1500 gallon), below grade grease interceptor(s) located on the exterior of the building.

IMPLICATIONS:
Significant disruption to both food service areas to install the grease waste.

BENEFITS:
Reduction in equipment requiring service and maintenance, improved serviceability and access allowing for routine service during operation without scheduling around kitchen hours of operation. In addition, this would provide greater flexibility for future renovations.

COST: $145,000

P6 STORM SEWER

ISSUES:
Existing above and below grade sanitary sewers throughout the building are original to the building construction and have deteriorated to the point where leaks are becoming more prevalent.

PROPOSED SCOPE:
A comprehensive study of the existing sewers should be performed to confirm the overall integrity of the system. This includes selective camera work in some areas of below grade sewer as well as inaccessible areas above grade. Once the internal integrity of the piping is known and any major issues are identified, a comprehensive replacement plan should be implemented to repair and or replace portions of the sewer based on condition.

IMPLICATIONS:
Where piping is visible and/or has been exposed through renovation work, its condition has been assessed and issues have been addressed; however, a good portion of the piping is inaccessible and its condition is unknown. If major issues are identified they can be addressed before failure and damage occurs.

BENEFITS:
Ability to schedule shutdowns and eliminate emergency repair.

COST: To Be Determined

P6A MAIN ELECTRICAL ROOM STORM SEWER

ISSUES:
Existing floor drains located within the main electrical room periodically back up, flooding the area with standing water. This creates a hazardous environment for occupants and increases the potential for damage to the equipment in the space.

Standing water in Man Electrical Room beneath the Battery storage shelves creating a very hazardous condition.

PROPOSED SCOPE:
A study should be performed to determine the source of the problem and then it should be repaired. As an interim measure the drain should be temporarily plugged to improve safety in the area.

IMPLICATIONS:
Correcting the problem will avoid injury and equipment failure.

BENEFITS: A dry electrical room.

COST: To Be Determined

P7 NATURAL GAS SYSTEMS

ISSUES:
Existing systems are in good condition and there are no known issues at this time.

PROPOSED SCOPE: No project at this time.

IMPLICATIONS: None

BENEFITS: None

COST: None

P8 MEDICAL GAS SYSTEMS

P8A DENTAL VACUUM SYSTEM

ISSUES:
Existing dental vacuum pumps are operational and have adequate capacity but are obsolete, resulting in costly repairs and potential long term shutdowns to obtain parts.

PROPOSED SCOPE:
Replace existing pumps in place with new pumps of the same size. Explore the feasibility of adding a third, standby pump to reduce run-time and prolong equipment life.

IMPLICATIONS:
Dental vacuum system will be down for a period of time to allow for replacement.

BENEFITS:
Improved reliability, higher efficiencies, improved parts availability for service, a redundant pump in place to minimize downtime.

COST: $90,000

Existing Dental Vacuum Pumps

P8B MEDICAL & LAB GASES

ISSUES: Existing in good condition, no known issues at this time.

PROPOSED SCOPE: No project at this time.

IMPLICATIONS: None

BENEFITS: None

COST: None

FP1 FIRE ALARM SYSTEM

ISSUES:
The fire alarm system in the building is in a continuing state of improvement by facility staff as renovations occur. At this time, the main system front-end cabinets, power supplies and processors have been upgraded in all areas of both the North & South Building. The panels are currently serving existing devices in all areas of the facility, some of these devices are new and current equipment and some are old components from previous generations of equipment. The main infrastructure is in place to install new addressable smoke detectors and horn/strobes into areas of the building as they are renovated to meet current code. A single project to replace the fire alarm system throughout a facility of this size would have significant cost impacts. Because the installation would occur in occupied areas and existing construction, the cost of installing new smoke detectors and horn/strobes throughout the existing facility would potentially be significantly more expensive than updating systems as renovations occurs. We recommend that the fire alarm system be updated as renovations occur and that no single project be presented.

PROPOSED SCOPE: None

IMPLICATIONS:
The system is ready to be expanded as renovations are completed. Duct smoke detectors should be replaced and installed in accessible locations as mechanical systems are updated.

BENEFITS:
The improved life safety system & operation of the new addressable system will benefit the staff and the occupants of the building.

COST: No significant cost at this time.

FP2 FIRE SPRINKLER SYSTEM

FP2A GENERAL PIPING AND VALVES

ISSUES:
The fire protection piping and valves within the building are in good condition with no known issues at this time.

PROPOSED SCOPE: None

IMPLICATIONS:
The system is in place and should continue to be modified for conformance with new ceiling and partition layouts as renovations are completed.

BENEFITS:
Continued improvement of life safety systems for building occupants.

COST: None

FP2B SPRINKLER HEADS

ISSUES:
Some areas of the building have obsolete sprinkler heads which need to be upgraded.

PROPOSED SCOPE:
Upgrade obsolete heads as areas are renovated.

IMPLICATIONS:
Upgrading of heads will improve the existing life safety systems and are easy to address during renovation work.

BENEFITS:
Continued improvement of life safety systems for building occupants.

COST:
Cost to be incurred during renovation work and is will be an insignificant add to the total project cost.

FP2C FIRE PUMP

ISSUES:
The fire pump has undergone a recent upgrade, is in good condition with no known issues at this time. During the upgrade additional space was allocated for a redundant pump, which has not been installed.

PROPOSED SCOPE:
Install new redundant fire pump in the allocated space and continue routine maintenance and service on both pumps to prolong the life of the equipment.

IMPLICATIONS:
The existing arrangement does not have any provisions for service if the main fire pump fails.

BENEFITS:
Improved reliability, increased flexibility for service.

COST: None

3 DISCIPLINE PRIORITIZATION LISTS
MULTI-DISCIPLINE PRIORITIZATION LISTS

DISCIPLINE PRIORITIZATION LISTS
MULTI-DISCIPLINE PRIORITIZATION LISTS

3

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN
Current as of May 21, 2013

A	ARCHITECTURAL ITEMS		HARD COSTS		SOFT COSTS		TOTAL COST	COMMENTS
A1	**Building Systems - Tier 1**							
A1A	Replace Existing HSC South & North Roofs		$2,035,320	35%	$712,362		$2,747,682	Based on review of each roof status
A1B	Freight Elevator Upgrade		$602,000	45%	$270,900		$872,900	Load capacity increase, roof access
A1C	Library Elevator		$150,000	45%	$67,500		$217,500	Replace existing cage elevator
A1E	Basic Science Addition Bridge Renovation		$368,940	50%	$184,470		$553,410	Replace exterior & interior
TOTALS			$3,156,260		$1,235,232		**$4,391,492**	
A2	**Building Systems - Tier 2**							
A2A	Replace Existing Roofs Not Included Tier 1		$4,693,410	35%	$1,642,694		$6,336,104	Based on review of each roof status
A2B	Asbestos Abatement HSC North Corridors		$861,285	50%	$430,643		$1,291,928	Abatement of ceilings & floors
A3	**HSC Campus Wide Issues - Tier 3**							
A3A	Building Accessibility						TBD	
A3B	Life Safety						TBD	
A3C	Hazardous Materials						TBD	
A3D	Sustainability						TBD	
A3E	Campus Masterplan Coordination						TBD	
A4	**WHITEBOARD ISSUES**							
A4A	HSC North West Facing Window Replacement							
A4B	Basic Science Addition Window Replacement							
A4C	Balcony Repair at West Virginia Room							
A4D	Gross Anatomy Lab Body Cooler							
A4E	Animal Quarters Renovation							
A4F	Cafeteria Upgrade in HSC South							
A4G	Café Upgrade in HSC North							
A4H	Gross Anatomy Lab Relocation to Morgue							
A4J	Cancer Center Build Out							
A4K	Ground Floor Biomedical Research Center							
A4L	HSC North NE Wing Ground Floor Build Out							
A4M	Hostler Auditorium (in Basic Science Addition)							
A4N	Facilities Management Building							

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN
Current as of May 21, 2013

M	MECHANICAL ITEMS		HARD COSTS		SOFT COSTS		TOTAL COST	COMMENTS
M1	**Air Handling Units**							
M1A	5th Floor Units							
M1A1	Systems 6 & 8		$3,775,200	35%	$1,321,320		$5,096,520	New units installed on roof
M1A2	AC/1 thru 3		$234,500	35%	$82,075		$316,575	Demo, Serve From New System
M1A3	Systems 1, 2 & 7		$1,874,500	35%	$656,075		$2,530,575	Demo, Serve From New System
M1A4	Systems 3, 4 & 5		$1,813,300	35%	$634,655		$2,447,955	Demo, Serve From New System
M1A5	System 5a		$111,000	35%	$38,850		$149,850	Demo, Serve From New System
M1A6	System 17		$572,440	35%	$200,354		$772,794	Replace
M1A7	System 15		$112,975	35%	$39,541		$152,517	Demo, Serve From New System
M1A10	System 14		$27,600	35%	$9,660		$37,260	Upgrade Controls
M1B	Basement Units							
M1B1	System 12		$652,200	35%	$228,270		$880,470	Replace
M1B2	System 9a		$341,360	35%	$119,476		$460,836	Unit in poor condition & undersized
M1C	Ground Floor Units							
M1C1	System 16		$422,070	35%	$147,725		$569,795	Replace
M2	**Hydronic Heating Systems**							
M2A	5th Floor Hydronic Heating Systems							
M2A1	New Glycol Heating Sys for 5th Floor AHU's		$179,500	35%	$62,825		$242,325	Needs to be in place before AHU's
M2A2	Replace Existing Heat Exchangers		$584,500	35%	$204,575		$789,075	Zone reheat coils & Induction 1-4
M2B	Basement Hydronic Heating Systems							
M2B1	Replace 3 Exist. Steam to Water Heat Exch.		$345,625	35%	$120,969		$466,594	N Bldg Reheat Coils & Induction
M3	**Exhaust Systems**							
M3A	Lab & General Exhaust Fan Replacement		$500,500	35%	$175,175		$675,675	New Strobic/Vector Fans
M4	**Chilled Water Systems**							
M4A	5th Floor Systems							

M4A1	Secondary Chilled Water Pumps - 5th Floor		$199,800	35%	$69,930		$269,730	Pumps not large enough for AHU's
M4B	Central Plant							
M4B1	Replace Three Central Plant Chillers		$2,354,000	35%	$823,900		$3,177,900	Exsiting end of useful life & LEED
M5	**Whiteboard, Survey & Work Session Issues**							
M5A	Body Coolers			35%			TBD	
M5B	Asbestos Abatement		$350,000	35%	$122,500		$472,500	Abate asbestos in mech. rooms
M5C	Demolish Abandoned Equipment		$60,000	35%	$21,000		$81,000	Equipment in 5th floor penthouse
M5D	Mechanical Life Safety Issues			35%			TBD	
M5E	Walk-In Coolers and Freezers			35%			TBD	
M5F	Vivarium Stariwell Odor			35%			TBD	
M5G	Structural Vibration from Cancer Center			35%			TBD	
TOTALS			**$14,511,070**		**$5,078,875**		**$19,589,945**	

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN
Current as of May 21, 2013

E	ELECTRICAL ITEMS	HARD COSTS		SOFT COSTS	TOTAL COST	COMMENTS
E1	**Electrical Site Plan**					
E1A	**Site Lighting**	$45,000	45%	$20,250	$65,250	
E1B	**Electrcial Utilities**					
E1B1	23KV Substation Feeder Replacement	$905,000	45%	$407,250	$1,312,250	Switchgear maint. & feeder cables
E1B2	Master Site Utility Plan	$20,000	45%	$9,000	$29,000	Electrical site plan to show feeders
E2	**Electrical Distribution System - Normal**					
E2A	**Substations**					
E2A1	Substation Transformers PM	$10,000	45%	$4,500	$14,500	Preventative maint. & cond. analysis
E2A2	Substat Circuit Breakers, Switches PM	$124,000	45%	$55,800	$179,800	Preventative maint. & repair switch
E2B	**Medium Voltage Distribution**					
E2B1	North & South Distribution Lineups	$92,000	45%	$41,400	$133,400	Preventative maint. & repair N lineup
E2B2	North Power Centers		45%		TBD	Preventative maintenance program
E2B3	South Power Center Replacement	$3,617,000	45%	$1,627,650	$5,244,650	Replace similar to N power centers
E2B4	Chiller Plant Power Center Transformer	$30,000	45%	$13,500	$43,500	Repair/replace transformer
E2B5	North-South Tie Feeders	$365,000	45%	$164,250	$529,250	Replace tie feeders
E2C	**Utilization Voltage Distribution**					
E2C1	North Building Bus Risers and Distribution	$2,347,000	45%	$1,056,150	$3,403,150	Replace the HSC North bus risers
E2C2	South Building Bus Risers and Distribution	$1,214,000	45%	$546,300	$1,760,300	Replace the HSC South bus risers
E2C3	North and South Panelboards		45%		TBD	Replace panelboards in renovations
E2C4	N & S Building Motor Control Centers (MCC)	$322,000	45%	$144,900	$466,900	Replace MCC's along with AHU's
E2C5	Facility One-Line Diagrams	$30,000	45%	$13,500	$43,500	Provide current one-line diagrams
E3	**Electrical Distribution System - Emergency**					
E3A	North Generator		45%		TBD	Preventative maintenance program

E3B	South Generator Garage			45%			TBD	Preventative maintenance program
E3C	South Generator - ICU		$750,000	45%	$337,500		$1,087,500	Leave exist. in place & replace
E4	**Electrical Special Systems**							
E4A	Power Monitoring System		$105,000	45%	$47,250		$152,250	Install power meters for BMS Sys.
E4B	Access Control		$400,000	45%	$180,000		$580,000	Replace access control system
E4C	Closed Circuit TV		$150,000	45%	$67,500		$217,500	Monitor sensitive & hazardous sys.
E4D	Structured Cabling			45%			TBD	No benefit for a system upgrade
E5	**Grounding and Surge Protection**							
E5A	Building Grounding Electrode System		$30,000	45%	$13,500		$43,500	Identify cause of differential voltage
E5B	Lightning Protection		$350,000	45%	$157,500		$507,500	Verify need for lightning protection
E5C	Surge Protective Devices (SPD's)		$81,000	45%	$36,450		$117,450	Add SPD's in future renovations
TOTALS			**$10,987,000**		**$4,944,150**		**$15,931,150**	
SS	**SPECIAL SYSTEMS ITEMS**							
SS1	Cell Service w/ Signal Booster Stations			45%			TBD	To be decided
SS2	WiFi Service w/ Clng Mtd Booster Distribution			45%			TBD	To be decided
SS3	Data Wiring Backbone Proliferation (Fiber)			45%			TBD	See E4D Structured Cabling
SS4	Distribution Data Wiring Proliferation (CAT 6?)			45%			TBD	See E4D Structured Cabling
SS5	Wall / Floor Data Box Standardization			45%			TBD	Facility standard
SS6	Cable Tray Standardization and Extensions			45%			TBD	See E4D Structured Cabling
SS7	CCTV? And or Video Feed Concepts			45%			TBD	See E4C Closed Circuit TV
SS8	Security/Card Access, Reader Hardware			45%			TBD	See E4B Access Control
SS9	Security Cam access in HSC Main Security			45%			TBD	See E4C Closed Circuit TV
SS10	AV-Monitors/Projection Screen Standards			45%			TBD	To be decided
SS11	AV-Controls, Webaccess, Video Conferencing			45%			TBD	To be decided
SS12	AV/IT/IS Coordination			45%			TBD	To be decided
SS13	Paging assumed to be part of FA System			45%			TBD	Not applicable

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN
Current as of May 21, 2013

P	PLUMBING ITEMS	HARD COSTS		SOFT COSTS	TOTAL COST	COMMENTS
P1	**Domestic Water System**					
P1A	Domestic Hot Water System		45%		TBD	deteriorating, replacement underway
P1A1	Domestic Hot Water - Support Systems		45%		TBD	pipe & insulation deterioration,valves
P1B	Domestic Cold Water System		45%		TBD	deteriorating, replacement underway
P1B1	Domestic Cold Water - Support Systems		45%		TBD	pipe & insulation deterioration,valves
P2	**Plumbing Fixtures**		45%		TBD	replacement underway
P3	**Sanitary Sewer**		45%		TBD	deteriorating, survey and repair
P4	**Acid Waste**		45%		TBD	exsiting systems in good condition
P5	**Grease Waste**		45%		TBD	deteriorating, replace with central
P6	**Storm Sewer**		45%		TBD	deteriorating, survey and repair
P6A	Main Electrical Room Storm Sewer		45%		TBD	backs up, determine cause & repair
P7	**Natural Gas Systems**		45%		TBD	exsiting systems in good condition
P8	**Medical Gas Systems**		45%		TBD	
P8A	Dental Vacuum System	$90,000	45%	$40,500	$130,500	obsolete, costly repairs, replace
P8B	Medical & Lab Gases		45%		TBD	exsiting systems in good condition
TOTALS		**$90,000**		**$40,500**	**$130,500**	

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN

Current as of May 21, 2013

FP	FIRE PROTECTION ITEMS		HARD COSTS		SOFT COSTS		TOTAL COST	COMMENTS
FP1	**Fire Alarm System**			45%			TBD	upgrade fire alarm sys. in renovation
FP2	**Fire Sprinkler System**							
FP2A	General Piping and Valves			45%			TBD	exsiting systems in good condition
FP2B	Sprinkler Heads			45%			TBD	existing to be replaced in renovation
FP2C	Fire Pump		$110,000	45%	$49,500		$159,500	existing systems in good condition
TOTALS			**$110,000**		**$49,500**		**$159,500**	

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN

Current as of May 21, 2013

MULTI-DISCIPLINE LISTING ITEMS

TIER 1	LIST BY PRIORITY	TOTAL COST	YEAR	COMMENTS
M1A1	Systems 6 & 8	$5,096,520	2014	Kick off project for 5th Floor equipment rehab
M5C	Demolish Abandoned Equipment	$81,000	2014	has been initiated
M2A1	New Glycol Heating Sys for 5th Floor AHU's	$242,325	2014	Associated with 5th floor to replace the steam coils
M2A2	Replace Existing Heat Exchangers	$789,075	2014	
M3A	Lab & General Exhaust Fan Replacement	$675,675	2014	Located on general exhaust fans, fume hoods
M4B1	Replace Three Central Plant Chillers	$3,177,900	2014	1500 tons and 600 tons replace with 1500 tons
M1A4	Systems 3, 4 & 5	$2,447,955	2014	See notes 3,4,5,6&7 that apply
M1A3	Systems 1, 2 & 7	$2,530,575	2014	See notes 3,4,5,6&7 that apply
M1A6	System 17	$772,794	2014	See notes 3,4,5,6&7 that apply
M1A10	System 14	$37,260	2014	Place holder for future capacity and efficiency
M1C1	System 16	$569,795	2014	Learning Center HVAC Partial support..problematic
M1B1	System 12	$880,470	2014	
M1A2	AC/1 thru 3	$316,575	2014	Units to be demolished and served from larger system
M1A5	System 5a	$149,850	2014	Unit to be demolished and served from larger system
M1A7	System 15	$152,517	2014	Unit to be demolished and served from larger system
E2C4	N & S Building Motor Control Centers (MCC)	$466,900	2014	
M2B1	Replace 3 Exist. Steam to Water Heat Exch.	$466,594	2014	
M4A1	Secondary Chilled Water Pumps - 5th Floor	$269,730	2014	Pump replacement required to support new AHU's
A1B	Freight Elevator Upgrade	$872,900	2014	Increase load capacity, modernize, roof access
A1C	Library Elevator	$217,500	2014	New elevator or dumbwaiter
E4B	Access Control	$580,000	2015	Swipe card blocks 350-500stations ... in progress
A1A	Replace Existing HSC South & North Roofs	$2,747,682	2015	Includes flashing, drains, refit parapet caps & repointing
E2A2	Substat Circuit Breakers, Switches PM	$179,800	2015	Includes testing the equipment for problems only
E2B5	North-South Tie Feeders	$529,250	2015	
E1B1	23KV Substation Feeder Replacement	$1,312,250	2015	Feeder replacement
E2A1	Substation Transformers PM	$14,500	2015	Includes testing the equipment for problems only
E2C1	North Building Bus Risers and Distribution	$3,403,150	2015	
E2C2	South Building Bus Risers and Distribution	$1,760,300	2015	
TIER 1	**TOTAL**	**$30,740,850**		

TIER 2	LIST BY PRIORITY						
M5B	Asbestos Abatement		$472,500				This effort specific to 5th Floor Equipment Room
E2B4	Chiller Plant Power Center Transformer		$43,500				
A2B	Asbestos Abatement HSC North Corridors		$1,291,928				
A1E	Basic Science Addition Bridge Renovation		$553,410				
FP2C	Fire Pump		$159,500				
E2B3	South Power Center Replacement		$5,244,650				
E3C	South Generator - ICU		$1,087,500				Has servicable life... to be confirmed by visual inspection
P8A	Dental Vacuum System		$130,500				Syetem is obsolete, with limited part availability
E2B1	North & South Distribution Lineups		$133,400				Includes testing the equipment for problems only
A2A	Replace Existing Roofs Not Included Tier 1		$6,336,104				
M1B2	System 9a		$460,836				Serves ground floor animal quarters
E1B2	Master Site Utility Plan		$29,000				
E2C5	Facility One-Line Diagrams		$43,500				
E4A	Power Monitoring System		$152,250				
E4C	Closed Circuit TV		$217,500				
E5A	Building Grounding Electrode System		$43,500				
E5B	Lightning Protection		$507,500				
E5C	Surge Protective Devices (SPD's)		$117,450				
TIER 2	**TOTAL**		**$17,024,534**				
TIER 1	**TOTAL**		**$30,740,850**				
TIER 2	**TOTAL**		**$17,024,534**				
TIERS	**COMBINED TOTAL**		**$47,765,384**				

TIER 3	LIST						
E2B2	North Power Centers		TBD				Preventative maintenance needed
E2C3	North and South Panelboards		TBD				
E3A	North Generator		TBD				
E3B	South Generator Garage		TBD				
E4D	Structured Cabling		TBD				
M5A	Body Coolers		TBD				
M5D	Mechanical Life Safety Issues		TBD				
M5E	Walk-In Coolers and Freezers		TBD				
M5F	Vivarium Stariwell Odor		TBD				
M5G	Structural Vibration from Cancer Center		TBD				
P1A	Domestic Hot Water System		TBD				Replacement in progress
P1A1	Domestic Hot Water - Support Systems		TBD				Piping throughout facility is in poor condition
P1B	Domestic Cold Water System		TBD				
P1B1	Domestic Cold Water - Support Systems		TBD				Piping throughout facility is in poor condition
P2	Plumbing Fixtures		TBD				Replacement complete/in progress
P3	Sanitary Sewer		TBD				Existing sewers original; study to determine condition
P4	Acid Waste		TBD				System in good condition, no known issues
P5	Grease Waste		TBD				Hospital Issue, replace with a central grease interceptor
P6	Storm Sewer		TBD				Sewers are original; study to determine condition
P6A	Main Electrical Room Storm Sewer		TBD				Storm sewer floods electrical room
P7	Natural Gas Systems		TBD				System in good condition, no known issues
P8	Medical Gas Systems		TBD				System in good condition, no known issues
P8B	Medical & Lab Gases		TBD				System in good condition, no known issues
FP1	Fire Alarm System		TBD				
FP2A	General Piping and Valves		TBD				System in good condition, no known issues
FP2B	Sprinkler Heads		TBD				Some areas require head upgrades
A3A	Building Accessibility		TBD				
A3B	Life Safety		TBD				
A3C	Hazardous Materials		TBD				
A3D	Sustainability		TBD				
A3E	Campus Masterplan Coordination		TBD				
TIER 3	**TOTAL**		**TBD**				

4 CONCEPTUAL COST ESTIMATE
Summary Tier 1 and 2

CONCEPTUAL COST ESTIMATE
Summary Tier 1 and 2

CONCEPTUAL COST ESTIMATE TIER 1

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN									
TIER 1	LIST BY PRIORITY	SUBTRADE BUDGET $	GC % MARK UP	GC $ MARK UP	OWNER'S % CONTIN-GENCY	OWNER'S $ CONTIN-GENCY	OTHER MISC SOFT COSTS %	OTHER MISC SOFT COSTS $	CATEGORY TOTALS
M1A1	Replace AHU Systems #6 and #8	$3,775,200	5%	$188,760	10%	$377,520	20%	$755,040	$5,096,520
M5C	Demolish Abandoned Equipment	$60,000	5%	$3,000	10%	$6,000	20%	$12,000	$81,000
M2A1	Replace AHU Glycol Heating System	$179,500	5%	$8,975	10%	$17,950	20%	$35,900	$242,325
M2A2	Replace Reheat Heating System	$584,500	5%	$29,225	10%	$58,450	20%	$116,900	$789,075
M3A	Replace Rooftop Exhaust Systems	$500,500	5%	$25,025	10%	$50,050	20%	$100,100	$675,675
M4B1	Replace Three Chillers	$2,354,000	5%	$117,700	10%	$235,400	20%	$470,800	$3,177,900
M1A4	Replace AHU Systems #3, #4 and #5	$1,813,300	5%	$90,665	10%	$181,330	20%	$362,660	$2,447,955
M1A3	Replace AHU Systems #1, #2 and #7	$1,874,500	5%	$93,725	10%	$187,450	20%	$374,900	$2,530,575
M1A6	Replace AHU System #17	$572,440	5%	$28,622	10%	$57,244	20%	$114,488	$772,794
M1A10	Upgrade AHU System #14	$27,600	5%	$1,380	10%	$2,760	20%	$5,520	$37,260
M1C1	Replace AHU System #16 (Ground Flr MER)	$422,070	5%	$21,104	10%	$42,207	20%	$84,414	$569,795
M1B1	Replace AHU System #12 (Basement MER)	$652,200	5%	$32,610	10%	$65,220	20%	$130,440	$880,470
M1A2	Replace AC Units #1 - #3	$234,500	5%	$11,725	10%	$23,450	20%	$46,900	$316,575
M1A5	Remove AHU System #5A	$111,000	5%	$5,550	10%	$11,100	20%	$22,200	$149,850
M1A7	Remove AHU System #15	$112,975	5%	$5,649	10%	$11,298	20%	$22,595	$152,516
E2C4	North & South Bldgs. MCC's	$322,000	15%	$48,300	10%	$32,200	20%	$64,400	$466,900
M2B1	Replace Stm-HW System (Basement MER)	$345,625	5%	$17,281	10%	$34,563	20%	$69,125	$466,594
M4A1	Replace Secondary CHW Pumps	$199,800	5%	$9,990	10%	$19,980	20%	$39,960	$269,730
A1B	Freight Elevator Upgrade	$602,000	15%	$90,300	10%	$60,200	20%	$120,400	$872,900
A1C	Library Elevator Replacement	$150,000	15%	$22,500	10%	$15,000	20%	$30,000	$217,500
E4B	Access Control	$400,000	15%	$60,000	10%	$40,000	20%	$80,000	$580,000
A1A	Replace Existing Roofs, Partial	$2,035,320	5%	$101,766	10%	$203,532	20%	$407,064	$2,747,682
E2A2	Substat Circuit Breakers and Switches	$124,000	15%	$18,600	10%	$12,400	20%	$24,800	$179,800
E2B5	North-South Tie Feeders	$365,000	15%	$54,750	10%	$36,500	20%	$73,000	$529,250
E1B1	23 KV Distribution System	$905,000	15%	$135,750	10%	$90,500	20%	$181,000	$1,312,250
E2A1	Substation Transformers	$10,000	15%	$1,500	10%	$1,000	20%	$2,000	$14,500
E2C1	North Bldg Distribution System	$2,347,000	15%	$352,050	10%	$234,700	20%	$469,400	$3,403,150
E2C2	South Bus Risers	$1,214,000	15%	$182,100	10%	$121,400	20%	$242,800	$1,760,300
TIER 1	**TOTAL**	**$22,294,030**		**$1,758,602**		**$2,229,403**		**$4,458,806**	**$30,740,841**

CONCEPTUAL COST ESTIMATE TIER 2

WVU HSC INFRASTRUCTURE UPGRADE MASTER PLAN									
TIER 2	LIST BY PRIORITY	SUBTRADE BUDGET $	GC % MARK UP	GC $ MARK UP	OWNER'S % CONTIN-GENCY	OWNER'S $ CONTI-GENCY	OTHER MISC SOFT COSTS %	OTHER MISC SOFT COSTS $	CATEGORY TOTALS
M5B	Asbestos Abatement within All MER's	$350,000	5%	$17,500	10%	$35,000	20%	$70,000	$472,500
E2B4	Chiller Plant Power Center	$30,000	15%	$4,500	10%	$3,000	20%	$6,000	$43,500
A2B	Asbestos Abatement HSC North Corridors	$861,285	20%	$172,257	10%	$86,129	20%	$172,257	$1,291,928
A1E	Basic Science Addition Bridge Renovation	$368,940	20%	$73,788	10%	$36,894	20%	$73,788	$553,410
FP2C	Redundant Fire Pump	$110,000	15%	$16,500	10%	$11,000	20%	$22,000	$159,500
E2B3	South Power Centers	$3,617,000	15%	$542,550	10%	$361,700	20%	$723,400	$5,244,650
E3C	South Generator, ICU	$750,000	15%	$112,500	10%	$75,000	20%	$150,000	$1,087,500
P8A	Dental Vacuum Pump Replacement	$90,000	15%	$13,500	10%	$9,000	20%	$18,000	$130,500
E2B1	North & South Distribution Lineups	$92,000	15%	$13,800	10%	$9,200	20%	$18,400	$133,400
A2A	Replace Existing Roofs Not Included Tier 1	$4,693,410	5%	$234,671	10%	$469,341	20%	$938,682	$6,336,104
M1B2	Replace AHU System #9A (Bsmnt MER)	$341,360	5%	$17,068	10%	$34,136	20%	$68,272	$460,836
E1B2	Master Site Utility Plan	$20,000	15%	$3,000	10%	$2,000	20%	$4,000	$29,000
E2C5	Facility One-Line Diagrams	$30,000	15%	$4,500	10%	$3,000	20%	$6,000	$43,500
E4A	Power Monitoring System	$105,000	15%	$15,750	10%	$10,500	20%	$21,000	$152,250
E4C	Closed Circuit TV	$150,000	15%	$22,500	10%	$15,000	20%	$30,000	$217,500
E5A	Bldg Grounding Electrode System	$30,000	15%	$4,500	10%	$3,000	20%	$6,000	$43,500
E5B	Lightning Protection	$350,000	15%	$52,500	10%	$35,000	20%	$70,000	$507,500
E5C	Surge Protective Devices	$81,000	15%	$12,150	10%	$8,100	20%	$16,200	$117,450
TIER 2	**TOTAL**	**$12,069,995**		**$1,333,534**		**$1,207,000**		**$2,413,999**	**$17,024,527**
TIER 1	**TOTAL**	**$22,294,030**		**$1,758,602**		**$2,229,403**		**$4,458,806**	**$30,740,841**
TIER 2	**TOTAL**	**$12,069,995**		**$1,333,534**		**$1,207,000**		**$2,413,999**	**$17,024,527**
TIERS	**COMBINED TOTAL**	**$34,364,025**		**$3,092,135**		**$3,436,403**		**$6,872,805**	**$47,765,368**

SUMMARY OF BENEFITS
PHASE 2 LOOK AHEAD

SUMMARY OF BENEFITS

ARCHITECTURAL

ROOF REPLACEMENT TIER 1

Reroofing existing roof areas that require immediate attention will provide upgraded insulating capacity and avoid water damage in currently occupied and conditioned HSC Space.

FREIGHT ELEVATOR

Provide temporary upgrade / stabilization of the freight to afford reliable use during the execution of other prospective projects identified herein. In response to the long lead time required to procure, fabricate and install a permanent upgrade after the other Tier 1 prospective projects are complete.

BASIC SCIENCE ADDITION BRIDGE RENOVATION

Reroofing existing roof areas that require immediate attention will provide upgraded insulating capacity and avoid water damage in currently occupied conditioned space.

ROOF REPLACEMENT TIER 2

Reroofing existing roof areas that require attention will provide upgraded insulating capacity and avoid water damage in currently occupied and conditioned HSC Space.

ASBESTOS ABATEMENT

Abating existing asbestos containing materials will provide a safer environment for subsequent work. Corridor ceilings affected will be replaced with a fire rated suspended acoustical tile ceiling system. New ceilings will afford easier access for maintenance.

MECHANICAL

AIR SYSTEMS

Systems 5-8, 12 &16

System 5 serves the interior core area of the 4th floor, System 6 serves the interior core area of the 3rd floor, System 7 serves the interior core area of the 2nd floor, and System 8 serves the interior core area of the 1st floor. System 16 serves the Learning Center original building 1st floor Auditorium, and System 12 serves the original Library Wing.

When these systems are replaced, the central interior core areas of the 1st through 4th floors will benefit from improved temperature control and indoor air quality because recirculation of exhaust air at the 5th floor roof will be minimized. A secondary benefit will be improved system reliability, lower maintenance cost and improved system efficiency.

System 17

System 17 serves the 1st floor Dental Clinic. In addition to improving temperature control throughout the Dental Clinic, (4) additional zones of temperature control will be added to the Clinic area in order to improve comfort conditions.

System 14

System 14 serves the 3rd floor Anatomy Department in the southeast wing. Occupant comfort will be improved by upgrading the temperature control system on the existing air handling unit and the individual zone temperature control systems.

AC1, 2 and 3

AC-1, 2 and 3 serve the 4th floor Gross Anatomy area. These (3) HVAC systems have been a continuing maintenance problem and, therefore, temperature control reliability in the Gross Anatomy Labs has suffered. By connecting them to new central air handling systems, the system reliability will be improved and air conditioning capacity and temperature control will be improved in the Gross Anatomy Labs.

CENTRAL PLANT CHILLERS

Replace (3) Central Plant Chillers

Reliability of the Central Chiller Plant will be improved and the capacity increased by approximately 900 tons by replacing (3) old chillers, which are at the end of their useful life and utilize CFC-based refrigerants, which are no longer manufactured because they are ozone-depleting refrigerants.

PERIMETER SYSTEMS

Systems 1-4

System 1 serves the perimeter areas of the north exposure on all floors. System 2 serves the perimeter areas of the east exposure on all floors. System 3 serves the perimeter areas with a south exposure on all floors, and System 4 serves the perimeter areas with a west exposure on all floors.

New air handling systems will provide better system reliability and slightly improved temperature control capability in the perimeter areas of the building. While new air handling equipment will improve reliability and, to some extent, temperature control around the perimeter of the building, the existing induction systems utilized in the original building construction, coupled with structural constraints within the facility, limit the degree of improvement which will achieved by replacement of the existing 5th floor systems.

The existing perimeter induction systems have never operated at their designed capacity and, therefore, most perimeter areas are warm during summer weather. As perimeter areas are remodeled, the limited supply air from the existing induction systems can be utilized to provide ventilation air to the perimeter areas. However, individual smaller supplemental HVAC systems will have to be installed to significantly improve perimeter area temperature control primarily because of structural limitations and space constraints within the building.

SYSTEM	AREA SERVED		BENEFITS
	FLOOR	DESCRIPTION	
5	4TH	INTERIOR CORE AREA	-IMPROVED TEMPERATURE CONTROL -IMPROVED INDOOR AIR QUALITY -IMPROVED RELIABILITY -REDUCTION IN MAINTENANCE
6	3RD	INTERIOR CORE AREA	
7	2ND	INTERIOR CORE AREA	
8	1ST	INTERIOR CORE AREA	
16	1ST	LEARNING CENTER - ORIGINAL BUILDING AUDITORIUM	
12	1ST	Original Library Wing	
17	1ST	DENTAL CLINIC	-IMPROVED TEMPERATURE CONTROL -FOUR (4) ADDITIONAL ZONES TO BE ADDED
14	3RD	SOUTHEAST ANATOMY WING	-IMPROVED TEMPERATURE CONTROL
AC-1,2,3	4TH	GROSS ANATOMY	-IMPROVED TEMPERATURE CONTROL -IMPROVED INDOOR AIR QUALITY -IMPROVED RELIABILITY -REDUCTION IN MAINTENANCE
CHILLERS	ALL	SERVES COOLING COILS IN ALL AIR HANDLING UNITS	-IMPROVED RELIABILITY -REDUCTION IN MAINTENANCE -INCREASED CAPACITY -ELIMINATION OF CFC-BASED REFRIGERANTS
1	ALL	NORTH PERIMETER	-SLIGHTLY IMPROVED TEMPERATURE CONTROL -IMPROVED INDOOR AIR QUALITY -IMPROVED RELIABILITY -REDUCTION IN MAINTENANCE
2	ALL	EAST PERIMETER	
3	ALL	SOUTH PERIMETER	
4	ALL	WEST PERIMETER	

ELECTRICAL

MAIN FEEDERS

Replace the main feeders from the electrical substation to the North & South Substation and the cross connect between these substations that have exceeded their serviceable life expectancy consistent with current electrical design standards but also consistent with the original "Hospital Design Standard" to maintain the current redundancy.

NORTH / SOUTH SUBSTATION TRANSFORMER REPLACEMENT / UPGRADE

Replace / Refurbish the transformers at the North & South Substations and "Line Ups" that have exceeded their serviceable life expectancy consistent with the current "Electrical Design Standards".

MAIN RISERS

Replace / Refurbish the vertical riser at the North & South electrical rooms and that have exceeded their serviceable life expectancy consistent with the current "Electrical Design Standards".

PHASE 2 LOOK AHEAD

CONSIDERATIONS FOR BIDDING THE PROJECTS

Because a majority of the mechanical, electrical and plumbing projects only involve incidental work of other trades, we recommend that they be bid as stand-alone mechanical or electrical projects. Our experience on the cooling tower replacement, replacement of System 11, and the Phase 2 electrical project was very good when bid as a single prime contract to mechanical and electrical contractors. Bidding in this manner will avoid the markup and overhead of a general contractor or construction manager. Project coordination will be improved because the prime contractor who is most familiar with the majority of the work scope will be responsible for coordination.

- Design time will be shorter if there are smaller MEP bid packages. In particular, Systems 6 and 8 must be completed before System 7 is replaced, followed by System 5 replacement.

- Smaller bid packages will allow smaller local contractors, who may not have bonding capacities, to bid a large project.

- Project phasing will also allow the designs to take advantage of conditions uncovered or included in previous projects. This will help to reduce the quantities of field condition change orders and allow the design to take full advantage of space made available by demolition of previous systems.

- Disruption to existing building operations can be reduced by project phasing.

PROJECT PHASING

(See detailed proposed bid packages following this narrative)
Based on our preliminary studies, it is our recommendation that a minimum of (3) bid packages and a maximum of (5) bid packages be prepared for the HVAC system upgrades at the facility. Attached is a recommendation for work to be included in each phase of the project. Since the (3) major air handling system replacements on the 5th floor are linked, in order to minimize disruption to various areas of the building while their primary air handling system is replaced, the project requires a minimum of (3) phases. Phase 4, the work in the HSC North Basement, and Phase 5, chiller system replacement, can be bid as concurrent projects or combined with any Phase 1, 2 or 3 bid package.

ELECTRICAL PROJECTS

The electrical projects which have been identified thus far should be separate projects bid to electrical contractors capable of doing the work. The high voltage and preventive maintenance projects require specialty contractors skilled in those areas. These projects are generally separate from the mechanical projects. The existing Phase 2 power renovation will allow all electric work for the mechanical systems to be bid as a sub trade for the phasing as required.

PHASING SEQUENCE FOR HVAC MECHANICAL PROJECTS

BID PACKAGE #1

Location: 5th Floor Mechanical Room

Duration: 9 Months - Extensive Exterior 4th Floor Roof Work

Tier #	Description	
M1AI	Construct replacement Systems 6 and 8 and connect to existing duct mains. Provide temporary connections to serve Systems 5, 7, 14 and 17 to be replaced under Bid Packages 2 and 3. Clean existing ductwork.Replace zone reheat coils and upgrade existing smoke dampers to DDC controls on all zones connected to Systems 6 and 8.	**$5,096,520**
M5C	Demolish existing abandoned equipment in 5th floor mechanical room	**$81,000**

Tier # Description

M2A1 Provide new heat exchanger for heating coil systems in 5th floor mechanical room after demolition of Systems 6 and 8. **$242,325**

M3A Replace 5th floor roof-mounted lab exhaust systems with Strobic vertical discharge fan systems. **$675,675**

M5B Perform asbestos abatement, primarily on piping in the 5th floor mechanical room and reinsulate as required. **$472,500**

Total $6,568,020

BID PACKAGE #2

Location: 5th Floor Mechanical Room

Duration: 9 Months - After Completion of Bid Package #1

Tier # Description

MIA3 Replace System 7 serving the 2nd floor core and east and north perimeter Systems 1 and 2. Provide temporary HVAC from new Systems 6 and 8. Clean all ductwork.

Replace zone reheat coils for Systems 1, 2, 7 and 14 and convert zone smoke dampers to DDC control.

Construct outside air intake penthouses to replace existing 5th floor roof depressed outside air intake wells. **$2, 530,575**

MI6A Replace the Dental Clinic System 17.

Clean existing ductwork.

Install zone reheat coils and convert existing smoke dampers to DDC control. **$772,794**

M4A1 Replace (3) 5th floor chilled water distribution pumps. **$269,730**

M2A2 Replace existing heat exchangers serving perimeter induction units and zone reheat coils. **$789,075**

M1A2 Connect 4th floor Gross Anatomy Units AC1, 2 and 3 to new Systems 6, 8 and 17. Clean ductwork and demolish AC1, 2 and 3. **$316,575**

Total $4,678,749

BID PACKAGE #3

Location: 5th Floor Mechanical Room

Duration: 9 Months - After Completion of Bid Package #2

Tier # Description

M1A4 Replace System 5 serving the 4th floor core area and perimeter and the south and west perimeter Systems 3 and 4.

Clean ductwork.

Provide temporary HVAC from Systems 6, 7 and 8.

Replace zone reheat coils and convert zone smoke dampers to DDC control. **$2,447,955**

M15A Remove System 5A, which serves the Maxillofacial Department and connect it to new System 5. **$149,850**

Tier #	Description	
M1A10	Upgrade controls on System 14 serving the Pathology Department in the southeast wing of the 3rd floor.	**$37,260**
M1A7	Replace System 15 and connect its zones to new Systems 5, 6, 7 and 8.	**$152,517**
	Total	**$2,787,582**

BID PACKAGE #4

Location: North Basement Mechanical Room

Duration: 9 Months - Can be concurrent or combined with other bid packages.

Tier #	Description	
M1C1	Replace System 16 which serves the original Auditorium in the 1st floor Learning Center. Clean existing ductwork.	**$569,795**
M1B1	Replace System 12 serving the Library Wing and clean ductwork.	**$880,740**
M2B1	Replace (3) existing heat exchanger systems serving building heat, induction units and zone reheat coils on Ground and 1st floor	**$466,594**
	Total	**$1,917,129**

BID PACKAGE #5

Location: Central Chiller Plant

Duration: Winter Work - 6 Months - Can be concurrent or combined with other bid packages.

Tier #	Description	
M4B1	Replace (3) Central Plant chillers.	**$3,177,900**
	Total	**$3,177,900**

6 EXECUTIVE SUMMARY / RECOMMENDATIONS

EXECUTIVE SUMMARY / RECOMMENDATIONS

As a result of the Phase 1 efforts recommendations have been provided and prioritized. These have been provided in a spreadsheet format for simple digestion of the Tier 1 prospective projects. This list enumerates the projects recommended for immediate implementation under Phase 2 efforts. This subsequent phase will include design, procurement, and construction.

The Phase 1 study determined that annual maintenance, scheduled retirement of equipment or technology upgrades could not be fully supported by the limited annual budget and available staff. The existing HSC infrastructure systems have already been challenged to operate beyond their expected serviceable lives. Due to the quality and robust nature of the existing systems they are operating within design tolerances, but as WVU HSC Administration and Facilities Management have recognized, a targeted intervention is required. Without the implementation of the prospective project defined herein a potential for significant interruption of service remains. The fallout from any such interruption would adversely affect the ability of the Health Sciences Center to effectively operate and must avoided.

The Tier 1 listing outlines an approach that focuses initially on 5th floor HVAC upgrades. Specifically, the comprehensive phased replacement of air handling units, exhaust fans, chillers, heat exchangers, and motor controls. Replacement systems shall be integrated into a direct digital controls system. Demolition, hazardous material mitigation, and installation of new ductwork and mechanical piping and plumbing piping is associated with this work. Subsequent to these upgrades, the next priority is to address the freight and library elevators

The final Tier 1 efforts include the comprehensive replacement of main electrical site and building distribution lines. The existing electrical infrastructure to be replaced has been in use for over 50 years and has exceeded its serviceable life. The service gear that manages these main feeders is of similar vintage and condition and is proposed to be replaced. Associated with this gear replacement north and south sector bus risers and distribution panels are to be replaced or comprehensively refurbished and modernized.

The Tier 2 items are essential elements, but fall beyond the in $30 million funding threshold. The Tier 2 listing outlines an approach that focuses initially on miscellaneous upgrades, but most notably on hazardous material abatement enabling projects and power center replacements and roofing replacements.

The Tier 3 items are enumerated to note that there are a number of systemic, pervasive and idiosyncratic items that need addressed in one form or another. These have included but have been noted as being, a lower in priority, having a far reaching scope, or are very difficult to access without destructive measures. Consequently, these items are difficult to define, provide accurate costs for and prioritize without the benefit of a targeted study of each.

The next steps are directly linked to the order of magnitude and timing of the potential funding. The project team has provided a draft schedule (see attached exhibit iii) that anticipates a three month review, approval and procurement phase for available funding; followed by an 18, 24 to 30 month design, procurement, construction phase to accomplish the Phase 1 tier 1 prospective projects. The Phase 2 efforts will be coordinated into grouped efforts, as required, for bid packages based on the funding and preferred construction delivery method.

Stanley Beaman & Sears and McHenry & Associates greatly appreciate the opportunity to work as a project team member with the WVU HSC Executive, Steering and In-house Engineering Trade Representatives to assemble, vet and develop the proposed scope and priorities thereby ensuring the continued successful operations and maintenance of the infrastructure systems for the Robert C. Byrd Health Sciences Center. We welcome follow up comments and/or questions to this report and look forward to assisting you in Phase 2 implementation efforts.

EXHIBITS

PROJECT: **WVU-HSC Infrastructure Upgrade Master Plan**
Job # 11260-00

PHASE: Preliminary Budget
DATE OF BUDGET: May 7, 2013
PREPARED BY:
Rodgers Construction Consultants
Atlanta, Georgia

LOCATION: **Morgantown, West VIrginia**

Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013

TIER ONE INFRASTRUCTURE UPGRADE PROJECTS:

M1A1 Replace AHU Systems #6 and #8 (5th Floor MER)

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
1001	Demo Existing AHU, MER Ductwork, Piping, Controls	88,800	CFM	$0.50	$44,400
1002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	2	EA	10,000.00	20,000
1003	Clean Existing Ductwork to Remain	88,800	CFM	1.00	88,800
1004	Temporary Construction & Utilities	1	LS	100,000.00	100,000
1005	New Rooftop RTU (Enclosed), w Roof Prep & Wall Penetrations	120,000	CFM	22.00	2,640,000
1006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	20	EA	2,500.00	50,000
1007	Extend Existing Duct to New RTU Location	25,000	LB	18.00	450,000
1008	Extend Existing HVAC Piping to New RTU Location	800	LF	100.00	80,000
1009	Extend Existing HVAC Piping top New Terminal Box Locations	500	LF	60.00	30,000
1010	New RTU Piping Hookups, Glycol HW & CHW	4	EA	12,500.00	50,000
1011	Test & Balance	120,000	CFM	0.10	12,000
1012	Temperature Controls for RTU's and Terminal Boxes	120,000	CFM	1.25	150,000
1013	Mechanical Wiring	120,000	CFM	0.50	60,000
	REPLACE AHU's #6 and #8 SUBTOTAL				$3,775,200

PROJECT: **WVU-HSC Infrastructure Upgrade Master Plan**
Job # 11260-00

PHASE: Preliminary Budget
DATE OF BUDGET: May 7, 2013
PREPARED BY:
Rodgers Construction Consultants
Atlanta, Georgia

LOCATION: **Morgantown, West VIrginia**

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
M5B	**Demo Abandoned Equipment in 5th Flr MER**				
2001	Allowance	1	LS	$60,000.00	$60,000
	DEMO ABANDONED EQUIPMENT SUBTOTAL				$60,000
M2A1	**Replace Glycol Heating System (5th Floor MER)**				
3001	Demo Existing HW Heat Exchanger System	1	LS	$10,000.00	$10,000
3002	Temporary Construction & Utilities	1	LS	10,000.00	10,000
3003	New Stm-to-HW Heat Exchanger, 10K MBH, w/ Piping Hookup	2	EA	30,000.00	60,000
3004	New HW Pumps, w/ Piping Hookups	4	EA	10,000.00	40,000
3005	Extend HW Piping to General Location of New Equipment	400	LF	90.00	36,000
3006	Test & Balance	1	LS	3,500.00	3,500
3007	Temperature Controls	1	LS	15,000.00	15,000
3008	Mechanical Wiring	1	LS	5,000.00	5,000
	REPLACE GLYCOL HEATING SYSTEM SUBTOTAL				$179,500

PROJECT: **WVU-HSC Infrastructure Upgrade Master Plan**
Job # 11260-00

PHASE: Preliminary Budget
DATE OF BUDGET: May 7, 2013
PREPARED BY:
Rodgers Construction Consultants
Atlanta, Georgia

LOCATION: **Morgantown, West VIrginia**

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
M2A2	**Replace Reheat Heating System (5th Floor MER)**				
4001	Demo Existing HW Heat Exchanger System	1	LS	$15,000.00	$15,000
4002	Temporary Construction & Utilities	1	LS	25,000.00	25,000
4003	New Stm-to-HW Heat Exchanger, 18K MBH, w/ Piping Hookup	2	EA	60,000.00	120,000
4004	New HW Pumps, w/ Piping Hookups	2	EA	15,000.00	30,000
4005	Extend HW & Steam Piping to Location of New Equipment	400	LF	90.00	36,000
4006	Replace Existing HW Distribution Risers - Allowance	2,500	LF	125.00	312,500
4007	Test & Balance	1	LS	3,500.00	3,500
4008	Temperature Controls	1	LS	35,000.00	35,000
4009	Mechanical Wiring	1	LS	7,500.00	7,500
	REPLACE REHEAT HEATING SYSTEM SUBTOTAL				$584,500
M3A	**Replace Rooftop Exhaust Systems (5th Floor MER Roof)**				
5001	Demo Existing Roof-Mtd Fans and Ductwork	6	EA	$2,000.00	$12,000
5002	Temporary Construction & Utilities	1	LS	25,000.00	25,000
5003	New Roof-Mtd High-Velocity Fan System	60,000	CFM	7.00	420,000
5004	Test & Balance	1	LS	3,500.00	3,500

PROJECT: **WVU-HSC Infrastructure Upgrade Master Plan**
Job # 11260-00

PHASE: Preliminary Budget
DATE OF BUDGET: May 7, 2013
PREPARED BY:
Rodgers Construction Consultants
Atlanta, Georgia

LOCATION: **Morgantown, West VIrginia**

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
5005	Temperature Controls	1	LS	30,000.00	30,000
5006	Mechanical Wiring	1	LS	10,000.00	10,000
	REPLACE ROOFTOP EXHAUST SYSTEMS SUBTOTAL				$500,500

M4B1 Replace Chillers (Central Plant)

6001	Demo Existing Chiller & Piping Hookup	3	EA	$35,000.00	$105,000
6002	Demo Existing Chiller Piping Back to Main Header	1	EA	20,000.00	20,000
6003	Demo Undersized CHW Pumps, Hookups & Accessories	4	EA	5,000.00	20,000
6004	Temporary Construction & Utilities	1	LS	30,000.00	30,000
6005	New Chillers	3,900	TNS	475.00	1,852,500
6006	Chiller Piping Hookup	3	EA	30,000.00	90,000
6007	New CHW/ CW Pumps, w/ Hookups (Replace Undersized)	4	EA	25,000.00	100,000
6008	Test & Balance	3,900	TNS	5.00	19,500
6009	Temperature Controls	3,900	TNS	20.00	78,000
6010	Mechanical Wiring	3,900	TNS	10.00	39,000
	REPLACE CHILLERS SUBTOTAL				$2,354,000

PROJECT: **WVU-HSC Infrastructure Upgrade Master Plan**
Job # 11260-00

PHASE: Preliminary Budget
DATE OF BUDGET: May 7, 2013
PREPARED BY:
Rodgers Construction Consultants
Atlanta, Georgia

LOCATION: **Morgantown, West VIrginia**

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
M1A4	**Replace AHU Systems #3, #4 and #5 (5th Floor MER)**				
7001	Demo Existing AHU, MER Ductwork, Piping, Controls	50,500	CFM	$0.60	$30,300
7002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	3	EA	10,000.00	30,000
7003	Clean Existing Ductwork to Remain	50,500	CFM	1.00	50,500
7004	Temporary Construction & Utilities	1	LS	60,000.00	60,000
7005	New MER AHU	70,000	CFM	15.00	1,050,000
7006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	20	EA	2,500.00	50,000
7007	Extend Existing Duct to New AHU Location	15,000	LB	18.00	270,000
7008	Extend Existing HVAC Piping to New AHU Location	600	LF	100.00	60,000
7009	Extend Existing HVAC Piping top New Terminal Box Locations	500	LF	60.00	30,000
7010	New AHU Piping Hookups, Glycol HW & CHW	2	EA	12,500.00	25,000
7011	Test & Balance	70,000	CFM	0.15	10,500
7012	Temperature Controls for AHU's and Terminal Boxes	70,000	CFM	1.50	105,000
7013	Mechanical Wiring	70,000	CFM	0.60	42,000
	REPLACE AHU SYSTEMS #3, #4 & #5 SUBTOTAL				$1,813,300

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Atlanta, Georgia

LOCATION: **Morgantown, West VIrginia**

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
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M1A3	**Replace AHU Systems #1, #2 and #7 (5th Floor MER)**				
8001	Demo Existing AHU, MER Ductwork, Piping, Controls	68,000	CFM	$0.50	$34,000
8002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	3	EA	10,000.00	30,000
8003	Clean Existing Ductwork to Remain	68,000	CFM	1.00	68,000
8004	Temporary Construction & Utilities	1	LS	75,000.00	75,000
8005	New MER AHU	70,000	CFM	15.00	1,050,000
8006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	30	EA	2,500.00	75,000
8007	Extend Existing Duct to New AHU Location	15,000	LB	18.00	270,000
8008	Extend Existing HVAC Piping to New AHU Location	600	LF	100.00	60,000
8009	Extend Existing HVAC Piping top New Terminal Box Locations	500	LF	60.00	30,000
8010	New AHU Piping Hookups, Glycol HW & CHW	2	EA	12,500.00	25,000
8011	Test & Balance	70,000	CFM	0.15	10,500
8012	Temperature Controls for AHU's and Terminal Boxes	70,000	CFM	1.50	105,000
8013	Mechanical Wiring	70,000	CFM	0.60	42,000
	REPLACE AHU SYSTEMS #1, #2 & #7 SUBTOTAL				$1,874,500

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	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
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M1A6	**Replace AHU System #17 (5th Floor MER)**				
9001	Demo Existing AHU, MER Ductwork, Piping, Controls	14,400	CFM	$0.60	$8,640
9002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	1	EA	7,500.00	7,500
9003	Clean Existing Ductwork to Remain	14,400	CFM	1.50	21,600
9004	Temporary Construction & Utilities	1	LS	35,000.00	35,000
9005	New MER AHU	18,000	CFM	15.00	270,000
9006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	12	EA	2,500.00	30,000
9007	Extend Existing Duct to New AHU Location	5,000	LB	18.00	90,000
9008	Extend Existing HVAC Piping to New AHU Location	300	LF	100.00	30,000
9009	Extend Existing HVAC Piping top New Terminal Box Locations	200	LF	60.00	12,000
9010	New AHU Piping Hookups, Glycol HW & CHW	2	EA	10,000.00	20,000
9011	Test & Balance	18,000	CFM	0.15	2,700
9012	Temperature Controls for AHU's and Terminal Boxes	18,000	CFM	2.00	36,000
9013	Mechanical Wiring	18,000	CFM	0.50	9,000
	REPLACE AHU SYSTEM #17 SUBTOTAL				$572,440

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	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
M1A10	**Upgrade Controls AHU System #14**				
10001	Demo Existing AHU Controls	8,000	CFM	$0.25	$2,000
10002	Test & Balance	8,000	CFM	0.20	1,600
10003	Temperature Controls for AHU's and Terminal Boxes	8,000	CFM	2.50	20,000
10004	Mechanical Wiring	8,000	CFM	0.50	4,000
	UPGRADE AHU SYSTEM #14 SUBTOTAL				$27,600
M1C1	**Replace AHU System #16 (Ground Floor MER)**				
11001	Demo Existing AHU, MER Ductwork, Piping, Controls	12,700	CFM	$0.60	$7,620
11002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	1	EA	10,000.00	10,000
11003	Clean Existing Ductwork to Remain	12,700	CFM	1.00	12,700
11004	Temporary Construction & Utilities	1	LS	20,000.00	20,000
11005	New MER AHU	15,000	CFM	14.00	210,000
11006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	12	EA	2,500.00	30,000
11007	Extend Existing Duct to New AHU Location	2,500	LB	18.00	45,000
11008	Extend Existing HVAC Piping to New AHU Location	150	LF	100.00	15,000
11009	Extend Existing HVAC Piping top New Terminal Box Locations	200	LF	60.00	12,000

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11010	New AHU Piping Hookups, Steam & CHW	2	EA	10,000.00	20,000
11011	Test & Balance	15,000	CFM	0.15	2,250
11012	Temperature Controls for RTU's and Terminal Boxes	15,000	CFM	2.00	30,000
11013	Mechanical Wiring	15,000	CFM	0.50	7,500
	REPLACE AHU SYSTEM #16 SUBTOTAL				$422,070

M1B1 Replace AHU System #12 (Basement Floor MER)

12001	Demo Existing AHU, MER Ductwork, Piping, Controls	27,500	CFM	$0.60	$16,500
12002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	1	EA	10,000.00	10,000
12003	Clean Existing Ductwork to Remain	27,500	CFM	1.00	27,500
12004	Temporary Construction & Utilities	1	LS	30,000.00	30,000
12005	New MER AHU	28,000	CFM	12.00	336,000
12006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	15	EA	2,500.00	37,500
12007	Extend Existing Duct to New AHU Location	3,500	LB	18.00	63,000
12008	Extend Existing HVAC Piping to New AHU Location	300	LF	100.00	30,000
12009	Extend Existing HVAC Piping top New Terminal Box Locations	250	LF	60.00	15,000
12010	New AHU Piping Hookups, Steam & CHW	1	EA	12,500.00	12,500
12011	Test & Balance	28,000	CFM	0.15	4,200

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	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
12012	Temperature Controls for RTU's and Terminal Boxes	28,000	CFM	2.00	56,000
12013	Mechanical Wiring	28,000	CFM	0.50	14,000
	REPLACE AHU SYSTEM #12 SUBTOTAL				$652,200

M1A2 Replace AC #1 - #4 (5th Floor MER & Nearby Roof)

13001	Demo Existing Roof-Mtd AC Units, MER Ductwork, Piping, Controls	10,000	CFM	$0.50	$5,000
13002	Fill in Existing Roof Openings	4	EA	7,500.00	30,000
13003	Clean Existing Ductwork to Remain	10,000	CFM	1.00	10,000
13004	Temporary Construction & Utilities	1	LS	5,000.00	5,000
13005	New Terminal Reheat Box, w/ Piping Hookup	4	EA	2,500.00	10,000
13006	Extend New Ductwork to Connect to New AHU #6/ 8 Duct	7,500	LB	18.00	135,000
13007	Extend Existing HVAC Piping top New Terminal Box Locations	200	LF	60.00	12,000
13008	Test & Balance	10,000	CFM	0.15	1,500
13009	Temperature Controls for Terminal Boxes	10,000	CFM	2.00	20,000
13010	Mechanical Wiring	10,000	CFM	0.60	6,000
	REPLACE AC UNITS #1 - #4 SUBTOTAL				$234,500

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M1A5 Remove AHU System #5A (5th Floor MER)

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
14001	Demo Existing AHU, MER Ductwork, Piping, Controls	4,000	CFM	$0.75	$3,000
14002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	1	EA	5,000.00	5,000
14003	Clean Existing Ductwork to Remain	4,000	CFM	1.50	6,000
14004	Temporary Construction & Utilities	1	LS	10,000.00	10,000
14005	New MER AHU, w/ New Structural Supports	0	CFM	18.00	0
14006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	2	EA	2,500.00	5,000
14007	Extend New Duct to New AHU Location from Previous Project	3,500	LB	18.00	63,000
14008	Extend Existing HVAC Piping to New AHU Location	0	LF	100.00	0
14009	Extend Existing HVAC Piping top New Terminal Box Locations	100	LF	60.00	6,000
14010	New AHU Piping Hookups, Glycol HW & CHW	0	EA	12,500.00	0
14011	Test & Balance	4,000	CFM	0.15	600
14012	Temperature Controls for AHU's and Terminal Boxes	4,000	CFM	2.50	10,000
14013	Mechanical Wiring	4,000	CFM	0.60	2,400
	REMOVE AHU SYSTEM #5A SUBTOTAL				$111,000

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M1A7	**Remove AHU System #15 (5th Floor MER)**				
15001	Demo Existing AHU, MER Ductwork, Piping, Controls	3,900	CFM	$1.00	$3,900
15002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	1	EA	3,500.00	3,500
15003	Clean Existing Ductwork to Remain	3,900	CFM	1.50	5,850
15004	Temporary Construction & Utilities	1	LS	10,000.00	10,000
15005	New MER AHU, w/ New Structural Supports	0	CFM	15.00	0
15006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	4	EA	2,500.00	10,000
15007	Extend New Duct to New AHU Location from Previous Project	3,500	LB	18.00	63,000
15008	Extend Existing HVAC Piping to New AHU Location	0	LF	100.00	0
15009	Extend Existing HVAC Piping top New Terminal Box Locations	100	LF	60.00	6,000
15010	New RTU Piping Hookups, Glycol HW & CHW	0	EA	12,500.00	0
15011	Test & Balance	3,900	CFM	0.15	585
15012	Temperature Controls for RTU's and Terminal Boxes	3,900	CFM	2.00	7,800
15013	Mechanical Wiring	3,900	CFM	0.60	2,340
	REMOVE AHU SYSTEM #15 SUBTOTAL				$112,975

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	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
E2C4	**North & South Building MCC's**				
16001	New Distribution Panel	8	EA	$6,000.00	$48,000
16002	New Feeder For Distribution Panels	1,200	LF	220.00	264,000
16003	Demolition	1	LS	10,000.00	10,000
	NORTH & SOUTH BUILDING MCC'S SUBTOTAL				$322,000
M2B1	**Replace Steam-to-HW Heating System (Basement MER)**				
17001	Demo Existing HW Heat Exchanger Systems	3	LS	$10,000.00	$30,000
17002	Temporary Construction & Utilities	1	LS	25,000.00	25,000
17003	New Stm-to-HW Heat Exchangers, w/ Piping Hookup	9,250	MBH	12.00	111,000
17004	New HW Pumps, w/ Piping Hookups	6	EA	10,000.00	60,000
17005	Extend HW & Steam Piping to Location of New Equipment	250	LF	90.00	22,500
17006	Test & Balance	9,250	MBH	1.00	9,250
17007	Temperature Controls	9,250	MBH	7.00	64,750
17008	Mechanical Wiring	9,250	MBH	2.50	23,125
	REPLACE STM-TO-HW HEATING SYSTEM SUBTOTAL				$345,625

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	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
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M4A1	**Replace Secondary CHW Pump Systems (5th Floor MER)**				
18001	Demo Existing Pumps and Piping Hookup	3	EA	$2,500.00	$7,500
18002	Temporary Construction & Utilities	1	LS	20,000.00	20,000
18003	New CHW Pump w/ VFD & Piping Hookup	5,400	GPM	22.00	118,800
18004	Test & Balance	1	LS	3,500.00	3,500
18005	Temperature Controls	1	LS	35,000.00	35,000
18006	Mechanical Wiring	1	LS	15,000.00	15,000
	REPLACE CHW PUMP SYSTEMS SUBTOTAL				$199,800
A1B	**Freight Elevator Upgrade**				
19001	Elevator Upgrade	1	LS	$300,000.00	$300,000
19002	MEP/ FP Coordination	1	LS	50,000.00	50,000
19003	Life Safety Upgrades	1	LS	20,000.00	20,000
19004	Vestibule Improvements & Addition	560	SF	325.00	182,000
19005	5th Floor Roof Davit Arm	1	LS	50,000.00	50,000
	FREIGHT ELEVATOR SUBTOTAL				$602,000

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A1C	**Library Elevator Replacement**				
20001	Replace Existing Library Elevator (? Stops)	1	LS	$150,000.00	$150,000
	LIBRARY ELEVATOR SUBTOTAL				$150,000
E4B	**Access Control**				
21001	Access Control	1	LS	$400,000.00	$400,000
	ACCESS CONTROL SUBTOTAL				$400,000
A1A	**Replace Existing Roofs, Tier 1 Priority**				
22001	HSC North Roof & Insulation Replacement (See Narrative)	27,812	SF	$30.00	$834,360
22002	HSC South Roof & Insulation Replacement (See Narrative)	40,032	SF	30.00	1,200,960
	ROOF REPLACEMENT SUBTOTAL				$2,035,320

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E2A2	**Substation Circuit Breakers & Switches**				
23001	23KV Circuit Breaker Preventive Maintenance	10	EA	$4,000.00	$40,000
23002	5KV Circuit Breaker Preventive Maintenance	21	EA	4,000.00	84,000
	SUBSTATION CIRCUIT BREAKERS & SWITCHES SUBTOTAL				$124,000
E2B5	**North-South Tie Feeders**				
24001	New 5KV Switch	1	EA	$35,000.00	$35,000
24002	Connect To Existing Switch	1	LS	1,500.00	1,500
24003	Disconnect & Reconnect Existing Switches	1	LS	5,800.00	5,800
24004	Remove Existing 15KV Cable	2,000	LF	7.50	15,000
24005	New 15KV Cable	3,400	LF	45.00	153,000
24006	New 600V Ground Cable	1,130	LF	10.00	11,300
24007	High Voltage Terminations	1	LS	15,000.00	15,000
24008	4" PVC	2,300	LF	22.00	50,600
24009	Cut & Patch	460	LF	50.00	23,000
24010	Hand Trench	460	LF	65.00	29,900
24011	Trench Large	600	LF	10.00	6,000

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24012	Concrete	105	CY	180.00	18,900
	NORTH-SOUTH TIE FEEDERS SUBTOTAL				$365,000

E1B1 23KV Distribution System

25001	Disconnect & Reconnect Existing Switches	1	LS	$60,000.00	$60,000
25002	Remove Existing 35KV Cable	12,000	LF	7.00	84,000
25003	New 35KV Cable	12,000	LF	50.00	600,000
25004	Remove Existing 15KV Cable	400	LF	7.50	3,000
25005	New 15KV Cable	400	LF	45.00	18,000
25006	New 600V Ground Cable	4,000	LF	10.00	40,000
25007	High Voltage Terminations	1	LS	100,000.00	100,000
	23KV DISTRIBUTION SYSTEM SUBTOTAL				$905,000

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E2A1	**Substation Transformers**				
26001	Oil Sample & Load Monitoring	1	LS	$10,000.00	$10,000
	SUBSTATION TRANSFORMERS SUBTOTAL				$10,000
E2C1	**North Building Bus Risers & Distribution System**				
27001	3P4W Bus Duct, Copper	300	LF	$530.00	$159,000
27002	Bus Duct Service Head / Tap Box	4	EA	2,000.00	8,000
27003	Bus Plug	20	EA	8,000.00	160,000
27004	New Feeder Extension For Bus Duct	200	LF	550.00	110,000
27005	New Distribution Panel	20	EA	6,000.00	120,000
27006	New Feeder For Distribution Panels	1,500	LF	220.00	330,000
27007	Misc. Sub-Panels	60	EA	3,000.00	180,000
27008	New Feeder For Sub-Panels	3,000	LF	60.00	180,000
27009	Refeed Existing Loads	1	LS	**********	1,000,000
27010	Demolition	1	LS	100,000.00	100,000
	NORTH BUILDING DISTRIBUTION SYSTEM SUBTOTAL				$2,347,000

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E2C2	**South Bldg Bus Risers & Distribution System**				
28001	3P4W Bus Duct Cu.	330	LF	$670.00	$221,100
28002	Bus Duct Service Head / Tap Box	4	EA	2,000.00	8,000
28003	Bus Plug	11	EA	8,000.00	88,000
28004	New Feeder Extension For Bus Duct	200	LF	550.00	110,000
28005	New Distribution Panel	11	EA	6,000.00	66,000
28006	New Feeder For Distribution Panels	550	LF	220.00	121,000
28007	Refeed Existing Loads	1	LS	550,000.00	550,000
28008	Demolition	1	LS	49,900.00	49,900
	SOUTH BUS RISERS SUBTOTAL				$1,214,000

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TIER TWO INFRASTRUCTURE UPGRADE PROJECTS:

M5A Asbestos Abatement within 5th Floor Mech Equip Room

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
30001	Allowance	1	LS	$350,000.00	$350,000
	ASBESTOS ABATEMENT at 5th Floor MER SUBTOTAL				$350,000

E2B4 Chiller Plant Power Center Transformer

31001	1500KVA Transformer Replacement	1	EA	$30,000.00	$30,000
	CHILLER PLANT POWER CENTER SUBTOTAL				$30,000

A2B Asbestos Abatement in HSC North Corridors

32001	Asbestos Abatement & Replacement Lay-in Ceiling (Grd Flr)	7,110	SF	$15.00	$106,650
32002	Asbestos Abatement & Replacement Floor Tile (Grd Flr)	6,730	SF	6.00	40,380
32003	Asbestos Abatement & Replacement Lay-in Ceiling (1st Flr)	7,850	SF	15.00	117,750

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32004	Asbestos Abatement & Replacement Floor Tile (1st Flr)	6,280	SF	6.00	37,680
32005	Asbestos Abatement & Replacement Lay-in Ceiling (2nd Flr)	10,000	SF	15.00	150,000
32006	Asbestos Abatement & Replacement Floor Tile (2nd Flr)	10,000	SF	6.00	60,000
32007	Asbestos Abatement & Replacement Lay-in Ceiling (3rd Flr)	11,920	SF	15.00	178,800
32008	Asbestos Abatement & Replacement Floor Tile (3rd Flr)	13,060	SF	6.00	78,360
32009	Asbestos Abatement & Replacement Lay-in Ceiling (4th Flr)	4,365	SF	15.00	65,475
32010	Asbestos Abatement & Replacement Floor Tile (4th Flr)	4,365	SF	6.00	26,190
	ASBESTOS ABATEMENT in HSC NORTH CORRIDORS SUBTOTAL				$861,285

A1E Basic Science Bldg Bridge Renovation

33001	Curtainwall Replacement	4,270	SF	$85.00	$362,950
33002	Roof Replacement	155	SF	20.00	3,100
33003	Ceiling Replacement	170	SF	12.00	2,040
33004	Floor Replacement	170	SF	5.00	850
	BASIC SCIENCE BLDG BRIDGE RENOVATION SUBTOTAL				$368,940

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Job # 11260-00

PHASE: Preliminary Budget
DATE OF BUDGET: May 7, 2013
PREPARED BY:
Rodgers Construction Consultants
Atlanta, Georgia

LOCATION: **Morgantown, West VIrginia**

	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
	Prepared from Information Contained in the SBS/ McHenry Master Plan List, Dated April 10, 2013				
FP2C	**Redundant Fire Pump @ AFA Pumphouse**				
34001	Install New Fire & Piping, 2000 GPM, 200 HP	1	LS	$110,000.00	$110,000
	REDUNDANT FIRE PUMP SUBTOTAL				$110,000
E2B3	**South Power Centers**				
35001	Remove Existing 15KV Cable	6,000	LF	$7.00	$42,000
35002	New 15KV Cable	6,000	LF	45.00	270,000
35003	New 600V Ground Cable	2,000	LF	10.00	20,000
35004	Replace Power Center	5	EA	350,000.00	1,750,000
35005	Relocate & Temporary Wiring	1	LS	**********	1,500,000
35006	High Voltage Terminations	1	LS	35,000.00	35,000
	SOUTH POWER CENTERS SUBTOTAL				$3,617,000

PROJECT: **WVU-HSC Infrastructure Upgrade Master Plan**
Job # 11260-00

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E3C	**South Generator - ICU**				
36001	New Generator	1	LS	$750,000.00	$750,000
	SOUTH GENERATOR - ICU SUBTOTAL				$750,000
P8A	**Replace Existing Dental Vacuum Pumps**				
37001	Replace Existing Dental Vacuum Pumps & Piping Hookup	3	EA	$30,000.00	$90,000
	DENTAL VACUUM PUMP REPLACEMENT SUBTOTAL				$90,000
E2B1	**North & South Distribution Lineups**				
38001	5KV Circuit Breaker Preventive Maintenance	23	EA	$4,000.00	$92,000
	NORTH & SOUTH DISTRIBUTION LINEUPS SUBTOTAL				$92,000

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A2A	**Replace Existing Roofs, Tier 2 Priority**				
39001	HSC North Roof & Insulation Replacement (See Narrative)	88,209	SF	$30.00	$2,646,270
39002	Basic Science Roof & Insulation Replacement (See Narrative)	6,556	SF	30.00	196,680
39003	Chiller PlantRoof & Insulation Replacement (See Narrative)	11,744	SF	30.00	352,320
39004	HSC South Roof & Insulation Replacement (See Narrative)	49,383	SF	30.00	1,481,490
	ROOF REPLACEMENT SUBTOTAL				$4,676,760
M1B2	**Replace AHU System #9A (Basement MER)**				
40001	Demo Existing AHU, MER Ductwork, Piping, Controls	8,600	CFM	$0.60	$5,160
40002	Demo Existing Reheat Coils, Piping, Controls (Per AHU)	1	EA	10,000.00	10,000
40003	Clean Existing Ductwork to Remain	10,400	CFM	1.50	15,600
40004	Temporary Construction & Utilities	1	LS	20,000.00	20,000
40005	New MER AHU	11,000	CFM	14.00	154,000
40006	New Reheat Terminal Boxes, w/ Piping Hookup - Allowance	10	EA	2,500.00	25,000
40007	Extend Existing Duct to New AHU Location	2,000	LB	18.00	36,000
40008	Extend Existing HVAC Piping to New AHU Location	150	LF	100.00	15,000
40009	Extend Existing HVAC Piping top New Terminal Box Locations	200	LF	60.00	12,000

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LOCATION: **Morgantown, West VIrginia**

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40010	New AHU Piping Hookups, Steam & CHW	2	EA	10,000.00	20,000
40011	Test & Balance	11,000	CFM	0.10	1,100
40012	Temperature Controls for RTU's and Terminal Boxes	11,000	CFM	2.00	22,000
40013	Mechanical Wiring	11,000	CFM	0.50	5,500
	REPLACE AHU SYSTEM #9A SUBTOTAL				$341,360

E1B2 Master Site Utility Plan

41001	Master Plan Design	1	LS	$20,000.00	$20,000
	MASTER SITE UTILITY PLAN SUBTOTAL				$20,000

E2C5 Facility One Line Diagrams

42001	Facility One Line Diagrams	1	LS	$30,000.00	$30,000
	FACILITY ONE LINE DIAGRAMS SUBTOTAL				$30,000

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	DESCRIPTION	QTY	UNIT	Unit Cost	Total Cost
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E4A	**Power Monitoring System**				
43001	Power Monitor	30	EA	$3,500.00	$105,000
	POWER MONITORING SYSTEM SUBTOTAL				$105,000
E4C	**Closed Circuit TV**				
44001	CCTV Cameras	30	EA	$5,000.00	$150,000
	CLOSED CIRCUIT TV SUBTOTAL				$150,000
E5A	**Building Grounding Electrode System**				
45001	Grounding System Upgrade	1	LS	$30,000.00	$30,000
	BUILDING GROUNDING ELECTRODE SYSTEM SUBTOTAL				$30,000

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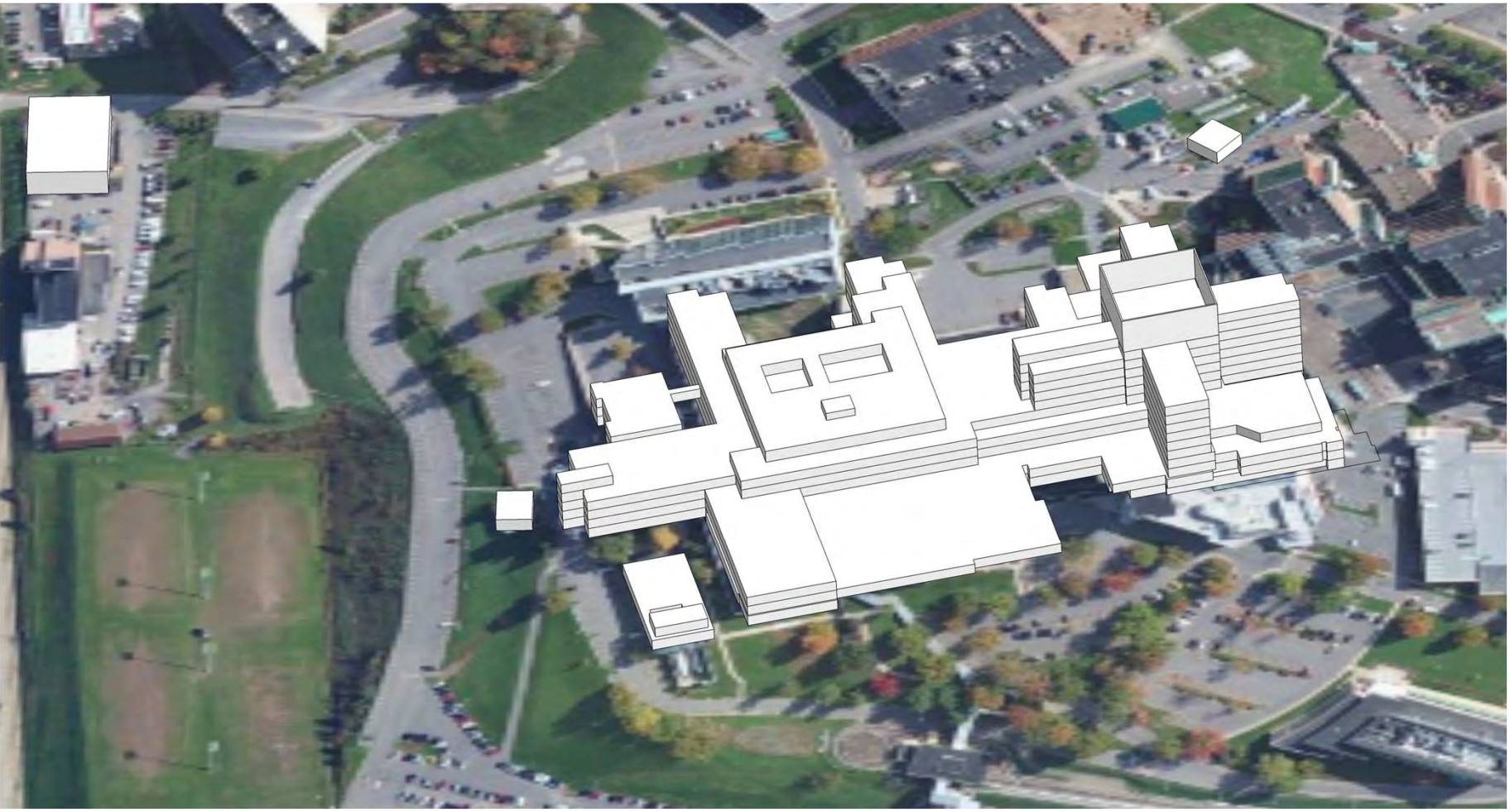
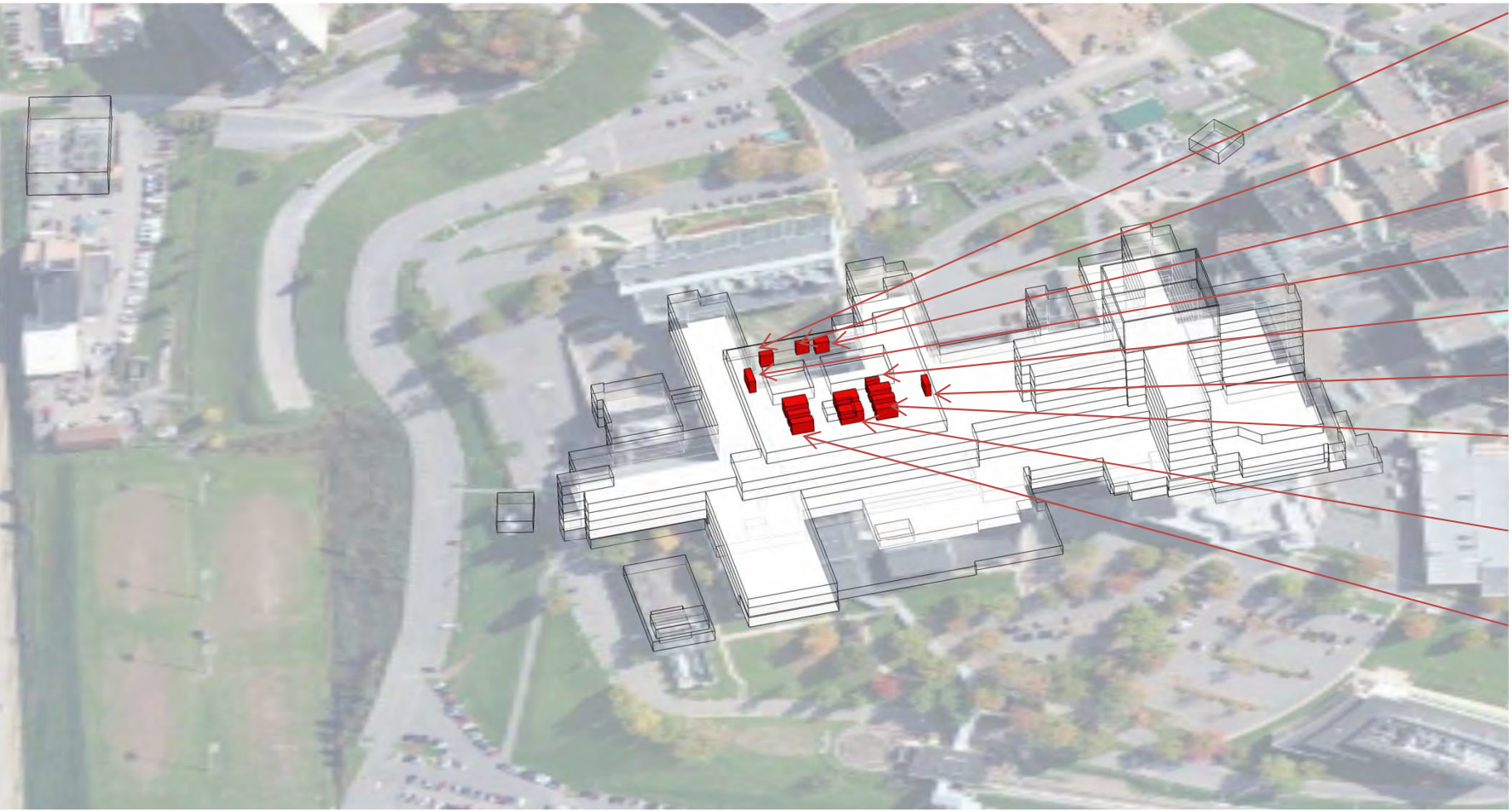
E5B	**Lightning Protection**				
46001	Lightning Protection	1	LS	$350,000.00	$350,000
	LIGHTNING PROTECTION SUBTOTAL				$350,000
E5C	**Surge Protection Devices (SPD's)**				
47001	TVSS	30	EA	$2,700.00	$81,000
	SURGE PROTECTION DEVICES (SPD'S) SUBTOTAL				$81,000

HSC Campus Aerial Photograph

HSC Building Mass



5th Floor Penthouse – Infrastructure Upgrades



Replace Existing Heat Exchangers

Secondary Chilled Water Pumps

Replace System 15

Replace System 17

Replace System 5a

Replace System 14

Replace Systems 3,4 & 5

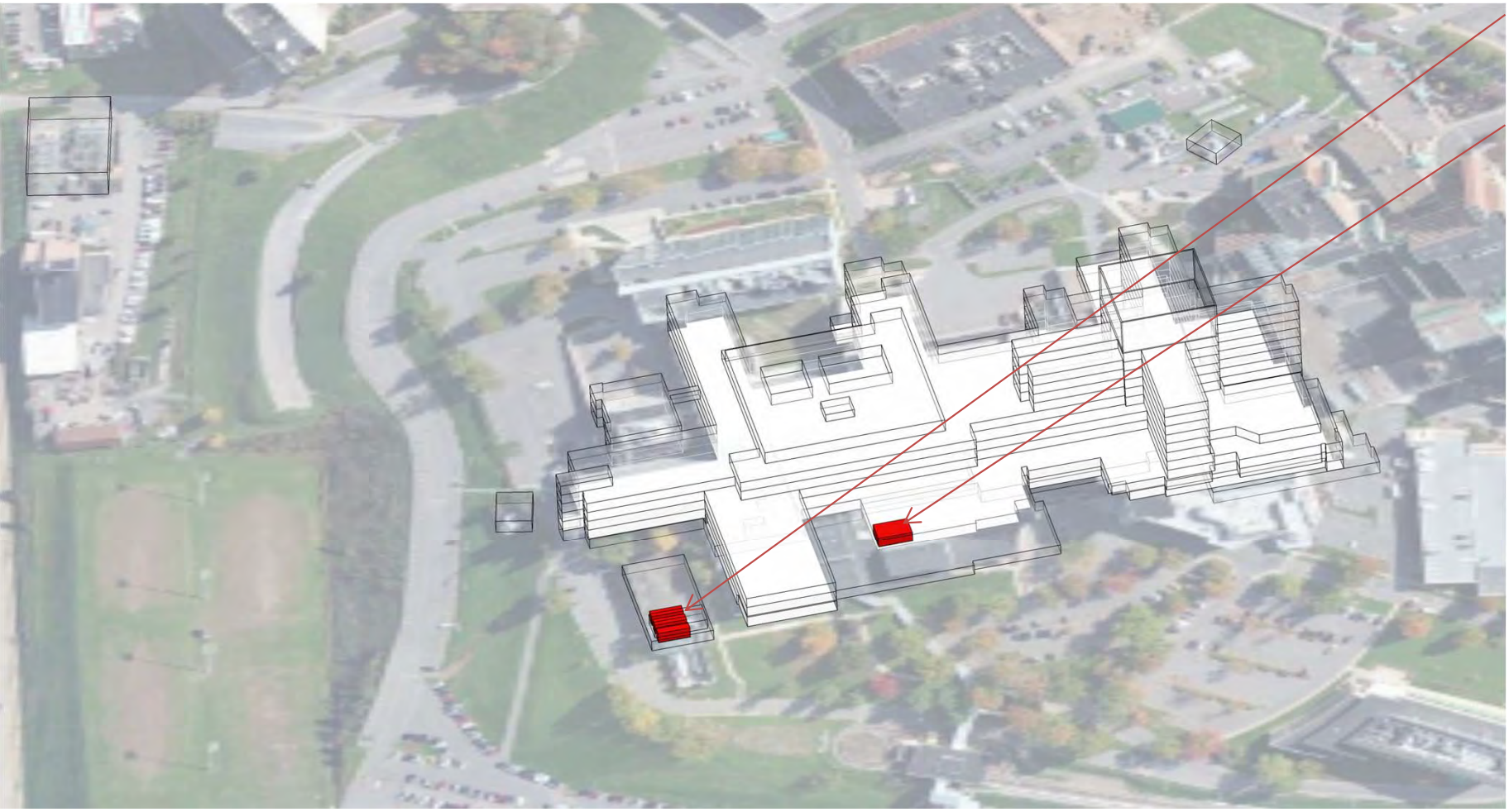
Replace Systems 6 & 8

Replace Systems 1, 2 & 7

Replace AC/1–3

Lab & General Fan Replacement

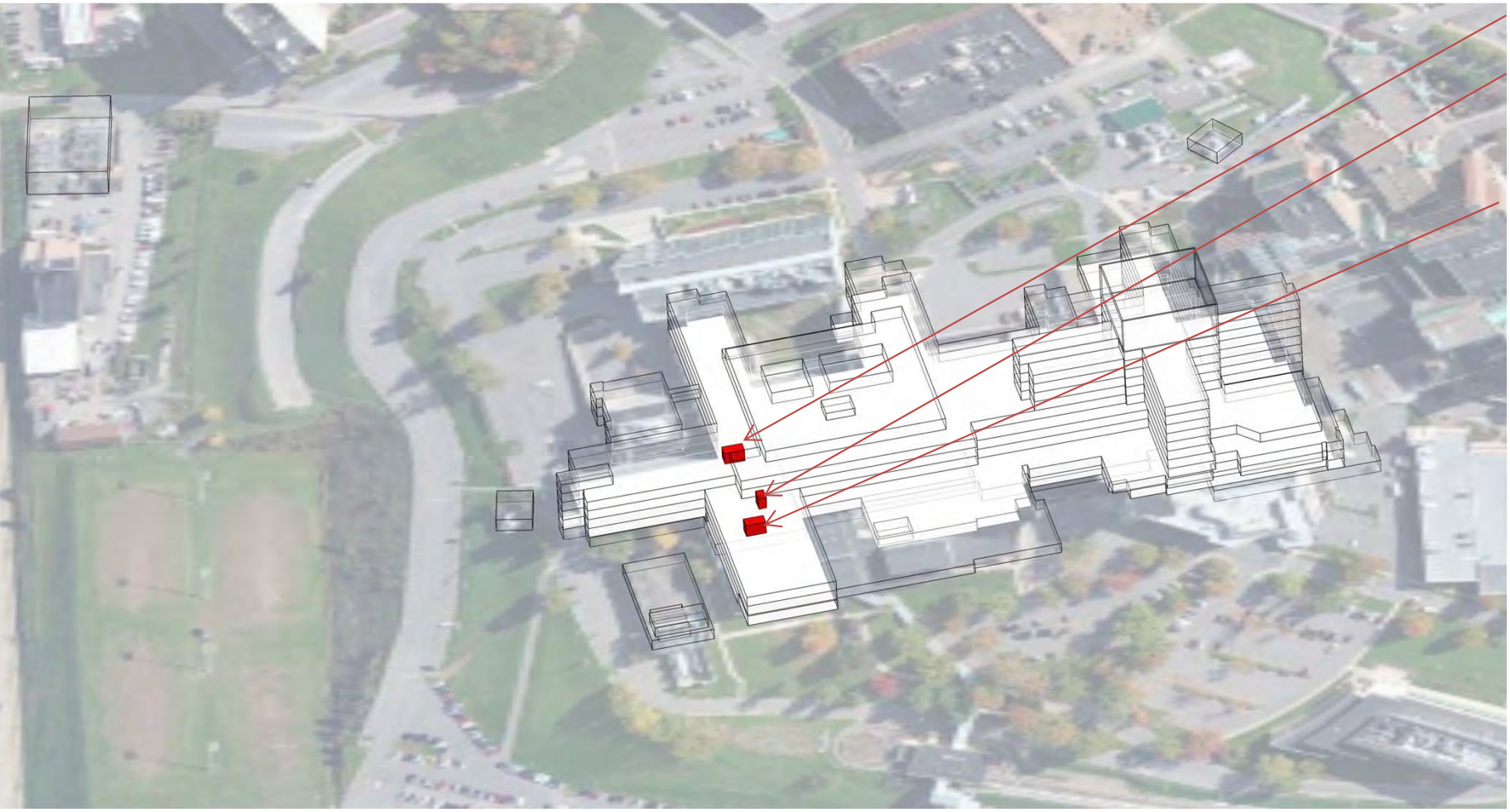
Ground Floor - Infrastructure Upgrades



Replace Three Central Plant Chillers

Replace System 16

Basement Floor – Infrastructure Upgrades

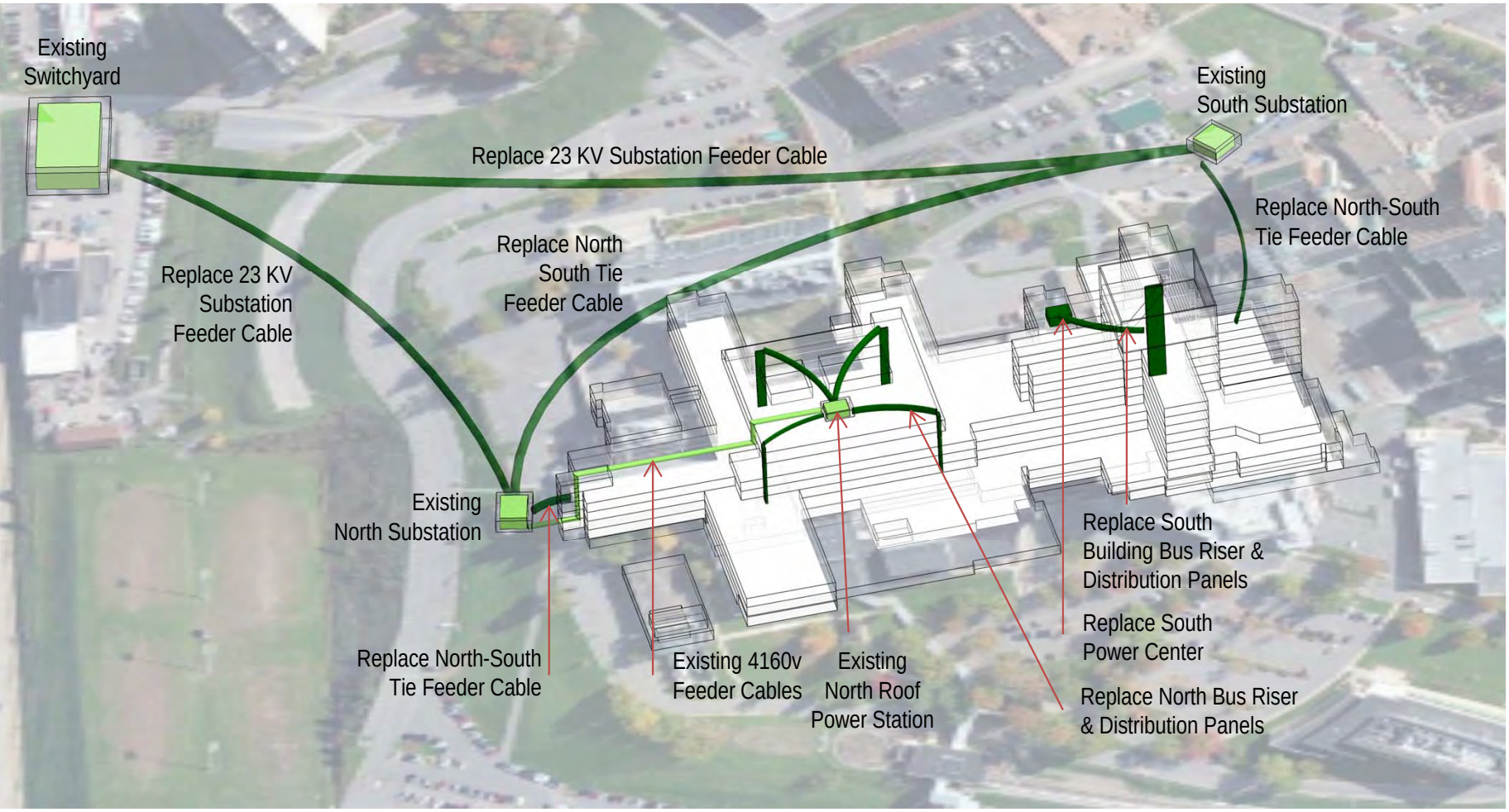


Replace System 9a

Replace 3 Existing Steam to Water Heat Exchangers

Replace System 12

HSC Campus & Building - Infrastructure Upgrades



Color Legend

- To be Replaced
- Existing to Remain

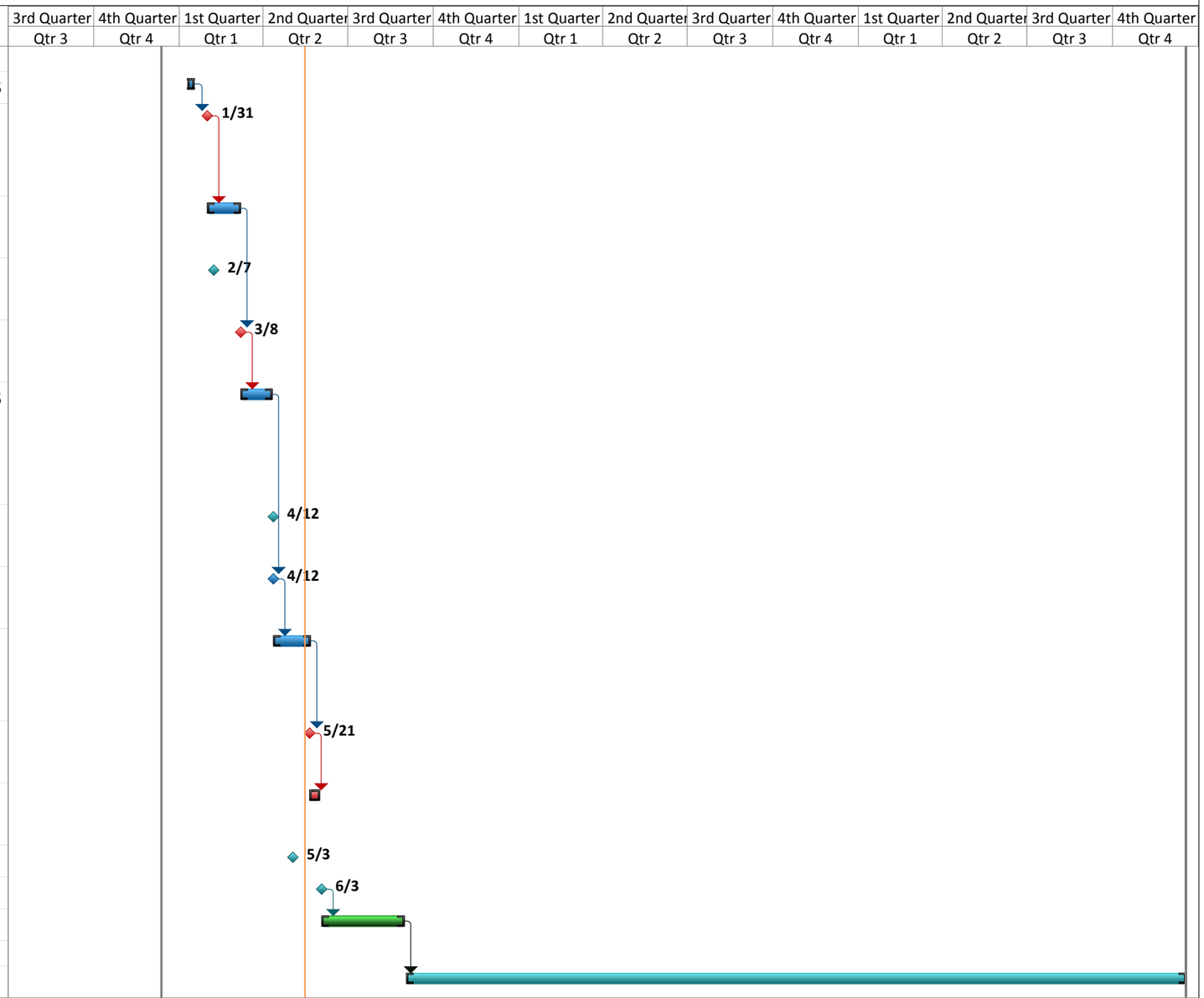
WVU HEALTH SCIENCES CENTER

INFRASTRUCTURE UPGRADES

PHASE 1 & 2 (Projected)

May 21, 2013

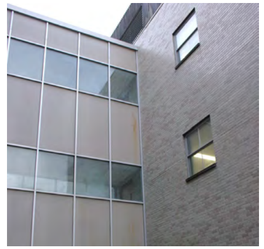
ID	Task Name	Duration	Start	Finish
1				
2	**Owner & A/E Prep for Phase 1 Kick off**	**5 days**	**Thu 1/10/13**	**Wed 1/16/13**
3	**OAE-Phase 1 Kick off Meeting Goals/Objectives, Project Approach, Initial thoughts and observations**	**0 days**	**Thu 1/31/13**	**Thu 1/31/13**
4	**A/E Information Gathering / Web Interviews & A/E Site Surveys**	**26 days**	**Thu 1/31/13**	**Thu 3/7/13**
5	*Site Observations and Information Gathering as req'd*	0 days	Thu 2/7/13	Thu 2/7/13
6	**OAE Phase 1 Engineering Trades Priorites and Sequencing Work Session**	**0 days**	**Fri 3/8/13**	**Fri 3/8/13**
7	**A/E Architecture/Engineering Analysis, Pre Design, Budgetary Costing, Preliminary Scheduling all for vetting & coordination of upgrade initiatives**	**24 days**	**Fri 3/8/13**	**Wed 4/10/13**
8	*Site Observations and Information Gathering as req'd*	0 days	Fri 4/12/13	Fri 4/12/13
9	**OAE Phase 1 Engineering Final Review / Comments**	**0 days**	**Fri 4/12/13**	**Fri 4/12/13**
10	**A/E Complete Report incorporating comments from Final Review for Executive Approval**	**28 days**	**Fri 4/12/13**	**Tue 5/21/13**
11	**A/E Submitt Report to Executive Committee**	**0 days**	**Tue 5/21/13**	**Tue 5/21/13**
12	**Executive Committee Review, Recommendations and Approvals**	**9 days**	**Tue 5/21/13**	**Fri 5/31/13**
13	*FUNDING SUMMITTAL*	0 days	Fri 5/3/13	Fri 5/3/13
14	*FUNDING ADDENDUM*	0 days	Mon 6/3/13	Mon 6/3/13
15	FUNDING PROCUREMENT (Educated Guess)	65 days	Mon 6/3/13	Fri 8/30/13
16				
17	PHASE 2 START/DURATION (Educated Guess	600 days?	Mon 9/2/13	Fri 12/18/15



Project: 130521 WVU HSC Infrast
Date: Thu 5/16/13

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

STANLEY BEAMAN & SEARS



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