Western Michigan University
Facility Asset Reinvestment
General Fund
2013 - 2014
Facility Asset Reinvestment
2013 - 2014

Recommendations:

I. Building Systems
   A. Building Envelope
   B. Elevators
   C. Building Interior
   D. Building Mechanical
   E. Building Electrical
   F. Direct Digital Controls

II. Grounds/Landscape

III. Risk Management/Life Safety
   A. Fire Systems
   B. Emergency Notification
   C. Emergency/Exit Lights
   D. Generator

IV. Roads/Infrastructure

V. Utilities
   A. Chilled Water
   B. Electrical
   C. Steam/Condensate
   D. Sanitary
   E. Storm

VI. Energy Conservation
   A. Energy Management
   B. Commissioning
Building Systems

Building Envelope
- Elevators
- Building Interior
- Building Mechanical
- Building Electrical
- Direct Digital Control
Building Envelope
Roof Analysis

S.F. by Age and Type GF Fall 2013
Total Sq. Ft. 2,115,161

Age (years)
- 0 to 5
- 6 to 10
- 11 to 15
- 16 to 20
- 21 to 25
- 26 to 30
- 31+

Square Footage
- Other (Glass, Shingles, Concrete, etc.)
- Slate
- Metal
- BUR, Coal Tar Pitch, Mod Bit

Total Square Footage: 2,115,161
Critical Areas
- AT Building – West wing
- EWB – East section
- Physical Plant – area over the shops

Critical Area – Deferred
- East Hall – connector
- McCracken Hall – old, upper section
Building Envelope
Public Safety – All Sections

Recommendation: $125,000
Building Envelope
Ernest Wilbur Building – All Sections

Recommendation: $225,000
Building Envelope

Parking Structure 1 – Stair Tower Roof

Recommendation: $35,000
Building Envelope
Parking Structure 2 – Stair Tower Roof

Recommendation: $50,000
## Building Envelope

### Roof Recommendation Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Safety – All Sections</td>
<td>$125,000</td>
</tr>
<tr>
<td>Ernest Wilbur Building – All Sections</td>
<td>$225,000</td>
</tr>
<tr>
<td>Parking Structure 1 – Stair Tower Roofs</td>
<td>$35,000</td>
</tr>
<tr>
<td>Parking Structure 2 – Stair Tower Roofs</td>
<td>$50,000</td>
</tr>
<tr>
<td>AT Building – Section C/ROTC</td>
<td>$95,000</td>
</tr>
<tr>
<td>Power Plant – Sections D, E, F, G, K</td>
<td>$75,000</td>
</tr>
<tr>
<td>Lawson Ice Arena – Pool Roof</td>
<td>$200,000</td>
</tr>
<tr>
<td>Physical Plant – All Sections</td>
<td>$300,000</td>
</tr>
<tr>
<td>AT Building – Section A</td>
<td>$95,000</td>
</tr>
<tr>
<td>AT Building – Sections B</td>
<td>$95,000</td>
</tr>
<tr>
<td>Antenna Farm Building</td>
<td>$20,000</td>
</tr>
<tr>
<td>Salt Dome – Repair Exterior Coating</td>
<td>$35,000</td>
</tr>
<tr>
<td>McCracken Hall – Sections C&amp;E</td>
<td>$100,000</td>
</tr>
</tbody>
</table>

**Recommendation: $1,450,000**
Building Envelope
Administration Building – Exterior Caulk

Phase 1 of 2

Recommendation: $85,000
# Building Envelope

**CEAS – Exterior Caulking Repairs**

Phase 4 (Final Phase)

| Recommendation: $50,000 |
Building Envelope
Waldo Stadium – MISC Concrete Repairs

Recommendation: $25,000
**Building Envelope**

**Miscellaneous Repairs**

Library and Computer Center Walls  
Howard Street Pedestrian Bridge

**Recommendation:** $15,000
Building Envelope

Miscellaneous Repairs

Recommendation: $25,000
# Building Envelope

## Structural Integrity Recommendation Summary

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration Bldg – Exterior Caulk</td>
<td>$85,000</td>
</tr>
<tr>
<td>CEAS - exterior caulk repair 1/4 of building</td>
<td>$50,000</td>
</tr>
<tr>
<td>Waldo Stadium – Misc Concrete Repair</td>
<td>$25,000</td>
</tr>
<tr>
<td>Misc Annual Repairs – Pedestrian Bridge/UCC Planter Walls</td>
<td>$15,000</td>
</tr>
<tr>
<td>Moore Hall – Entrance #7 Masonry Repairs</td>
<td>$25,000</td>
</tr>
<tr>
<td>Wood/Haenicke – Connecting Tunnel Repairs</td>
<td>$80,000</td>
</tr>
<tr>
<td>Computer Center – Exterior Caulk/Tile Repair</td>
<td>$50,000</td>
</tr>
<tr>
<td>Waldo Library – Exterior Caulk/Tile Repair</td>
<td>$100,000</td>
</tr>
<tr>
<td>Paper Plant – Exterior Caulk</td>
<td>$50,000</td>
</tr>
<tr>
<td>Seelye Center – Paint Exterior Trim</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $530,000
Building Envelope

Gilmore Theater – Main Entrance Wind Screen

Recommendation: $20,000
Building Envelope
Haenicke Hall – Replace Entrance 2

Recommendation: $10,000
Building Envelope
Wood/Haenicke – Bridge Flashing

Recommendation: $15,000
**Building Envelope**

**Henry Hall – ADA Access**

Entrance #3

Entrance #4

**Recommendation:** $15,000
# Building Envelope

## Window & Door Recommendation Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gilmore Theater Complex – Main Entrance Wind Screen</td>
<td>$20,000</td>
</tr>
<tr>
<td>Haenicke Hall – Replace entrance #2</td>
<td>$10,000</td>
</tr>
<tr>
<td>Haenicke/Wood – Bridge flashing</td>
<td>$15,000</td>
</tr>
<tr>
<td>Henry Hall – ADA ramps at entrances #3 &amp; #4</td>
<td>$15,000</td>
</tr>
<tr>
<td>EWB - Replace windows</td>
<td>$320,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $380,000
Building Systems

Elevator

Building Envelope
Elevators
Building Interior
Building Mechanical
Building Electrical
Direct Digital Control
Elevator
Age of Elevators

![Bar Chart showing age distribution of elevators over different years (1995, 2004, 2013).]
**Elevator**

**Passenger Elevator Age Analysis**

### 2013 Age of Elevator Analysis

<table>
<thead>
<tr>
<th>Years</th>
<th>Elevator</th>
<th>General Fund</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5</td>
<td>16</td>
<td>11</td>
<td>10%</td>
</tr>
<tr>
<td>6 to 10</td>
<td>19</td>
<td>12</td>
<td>18%</td>
</tr>
<tr>
<td>11 to 15</td>
<td>29</td>
<td>25</td>
<td>27%</td>
</tr>
<tr>
<td>16 to 20</td>
<td>11</td>
<td>11</td>
<td>10%</td>
</tr>
<tr>
<td>21 to 25</td>
<td>7</td>
<td>7</td>
<td>7%</td>
</tr>
<tr>
<td>OVER 25</td>
<td>11</td>
<td>5</td>
<td>23%</td>
</tr>
</tbody>
</table>

### General Fund Over 25 Years Old

<table>
<thead>
<tr>
<th>Buildings</th>
<th>Year Inst.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity Therapy Freight</td>
<td>1954</td>
</tr>
<tr>
<td>McCracken Hall East</td>
<td>1969</td>
</tr>
<tr>
<td>EWB Freight</td>
<td>1961</td>
</tr>
<tr>
<td>Fetzer Sidewalk Lift</td>
<td>1983</td>
</tr>
<tr>
<td>1219 Short (Gilmore)</td>
<td>1968</td>
</tr>
</tbody>
</table>
ELEVATOR
Passenger Elevators Analysis

![Graph showing the number of calls placed and legitimate calls from 2005 to 2013. The bars for the number of calls placed are in black, and the bars for legitimate calls are in brown. The x-axis represents the years from 2005 to 2013, and the y-axis represents the number of calls. The graph shows a trend of increasing calls over the years, with a peak in 2008.]
Sprau Tower EV-1 Replacement Drive Machine with Additional Safety Added

- Traction Machine
- Brake
- Motor Assembly
- Ropes
- Rope Gripper

Recommendation: $85,000
**Elevator**

**Miscellaneous**

- Haenicke Hall EV-1 Door Operator Upgrade
  - Price $29,000
- Wood Hall EV-1 Door Operator Upgrade
  - Price $43,000
- COE – Door Operator Controller Drive Kits
  - Price $10,000

**Recommendation:** $82,000
# Elevator Recommendation Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprau EV-1 Driver Replacement</td>
<td>$85,000</td>
</tr>
<tr>
<td>Haenicke EV-1 Door Operator Upgrade</td>
<td>$29,000</td>
</tr>
<tr>
<td>Wood EV-1 Door Operator Upgrade</td>
<td>$43,000</td>
</tr>
<tr>
<td>COE Door Operator Controller Kits</td>
<td>$10,000</td>
</tr>
<tr>
<td>Waldo Library EV-1</td>
<td>$213,000</td>
</tr>
<tr>
<td>Miller Parking</td>
<td>$210,000</td>
</tr>
<tr>
<td>Computer Center EV-2</td>
<td>$230,000</td>
</tr>
<tr>
<td>Walwood Union EV-1</td>
<td>$195,000</td>
</tr>
<tr>
<td>Waldo Library EV-3</td>
<td>$91,000</td>
</tr>
<tr>
<td>Sprau EV-1 &amp; EV-2 Ceiling Replacement</td>
<td>$14,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $1,120,000
Building Systems

Building Interior

- Building Envelope
- Elevators
- Building Interior
- Building Mechanical
- Building Electrical
- Direct Digital Control
Building Interior
Classroom Recommendation

Rood Hall Classrooms Various Improvements: 3391, 3395, 3393, 1107, & 1192 Flooring, Painting, Furniture Replacement
Total Cost: $100,000

Painting – Various Classroom Across Campus
Total Cost: $50,000

Recommendation: $150,000
Building Interior
Public Space Recommendation

- Painting & Ceiling Pad Replacement in Various Locations
  - Total Cost: $25,000

- Interior Building Directories
  - Dalton, Friedmann – Total 13
  - Total Cost: $20,000

- Waste Receptacles – Rood & Dunbar Hall
  - Main Floors
  - Total Cost: $50,000

- Flooring Replacement in Lounge Spaces
  - COEAS 2nd floor, Chemistry rm. 3401
  - Total Cost: $62,000

Recommendation: $157,000
Building Interior
Toilet Room Recommendation

Faucet, Fixture Improvements
Walwood, Sindecuse
Total Cost: $10,000

ADA Bathroom Renovation
Moore Hall: Toilet Room 1046 (Men’s)
Note: Circle noted on floorplan indicates 5’ turn radius required.
Total Cost: $100,000

Recommendation: $110,000
## Building Interior

### Recommendation Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rood Hall Classroom Improvements (3391, 3395, 3393, 1107, &amp; 1192)</td>
<td>$100,000</td>
</tr>
<tr>
<td>Painting of Classrooms Across Campus</td>
<td>$50,000</td>
</tr>
<tr>
<td>Painting &amp; Ceiling Pad Replacement</td>
<td>$25,000</td>
</tr>
<tr>
<td>Interior Building Directories (Dalton, Friedmann)</td>
<td>$20,000</td>
</tr>
<tr>
<td>Rood &amp; Dunbar Waste Receptacles</td>
<td>$50,000</td>
</tr>
<tr>
<td>Floor Replacement in Lounge Spaces (COEAS, Chemistry)</td>
<td>$62,000</td>
</tr>
<tr>
<td>Faucet/Fixture Replacement</td>
<td>$10,000</td>
</tr>
<tr>
<td>Moore Hall ADA Bathroom Renovation</td>
<td>$100,000</td>
</tr>
<tr>
<td>Rood Hall Classroom Improvements (1120, 1122, &amp; 1117)</td>
<td>$155,000</td>
</tr>
</tbody>
</table>

**Recommendation**: $572,000
Building Mechanical
Rood Hall Steam Relief Valve Replacement

Recommendation: $40,000
Building Mechanical
Rood Hall SF-4 Cooling Coil and (5) Condensate Pans Replacement

Recommendation: $60,000
Building Mechanical
Kohrmann/Miller Domestic Water Heater Refurbishment

Recommendation: $20,000
Building Mechanical
Sprau Tower AHU Repair

Recommendation: $60,000
## Building Mechanical Recommendation Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rood Hall – Replace Steam Relief Valve (Mech Room)</td>
<td>$40,000</td>
</tr>
<tr>
<td>Rood Hall – Replace SF-4 Cooling Coil &amp; (5) Condensate Pans</td>
<td>$60,000</td>
</tr>
<tr>
<td>Kohrman/Miller – Domestic Water Heater Replacement</td>
<td>$20,000</td>
</tr>
<tr>
<td>Sprau Tower – Air Handler Repair</td>
<td>$60,000</td>
</tr>
<tr>
<td>Kohrman Hall – Air Separator Replacement</td>
<td>$100,000</td>
</tr>
<tr>
<td>Haenicke Hall – Replace Control Air Dryer</td>
<td>$5,000</td>
</tr>
<tr>
<td>Haenicke Hall – RO/DI System Upgrades</td>
<td>$50,000</td>
</tr>
<tr>
<td>SRC – Humidification for Racquet Ball</td>
<td>$27,000</td>
</tr>
<tr>
<td>Moore Hall – Unit Ventilators</td>
<td>$40,000</td>
</tr>
<tr>
<td>Trimpe – Unit Ventilators</td>
<td>$15,000</td>
</tr>
<tr>
<td>Walwood – Heat Pumps</td>
<td>$400,000</td>
</tr>
<tr>
<td>Sindecuse AC-2 – Refurbish Air Handler</td>
<td>$15,000</td>
</tr>
</tbody>
</table>

**Recommendation: $832,000**
Building Systems

Building Electrical

- Building Envelope
- Elevators
- Building Interior
- Building Mechanical
- Building Electrical
- Direct Digital Control

Grounds/Landscape
Risk Management
Roads/Infrastructure
Utilities
Energy Conservation
Building Electrical

Waldo Library Substation B Replacement

Replace the existing 4.8kv PCB older substation with a new 13.8kv substation

Recommendation: $260,000
Building Electrical
Building Arc Flash Studies

Start a 10 year plan to do Arc Flash studies and labeling at buildings
- Brown Hall
- Fetzer Center
- Walwood Union

Recommendation: $45,000
## Building Electrical

### Recommendation Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waldo Library Substation B Replacement</td>
<td>$260,000</td>
</tr>
<tr>
<td>Building Arc Flash Studies</td>
<td>$45,000</td>
</tr>
<tr>
<td>Moore Hall Substation Replacement</td>
<td>$350,000</td>
</tr>
<tr>
<td>Engineer IF 1 Substation Replacement (PCB Contaminated)</td>
<td>$60,000</td>
</tr>
<tr>
<td>Replace/Upgrade Kohrman Hall Protection Relays</td>
<td>$18,000</td>
</tr>
<tr>
<td>Replace/Upgrade Haenicke Hall Protection Relays</td>
<td>$18,000</td>
</tr>
<tr>
<td>Engineer Faunce Substation Equipment Replacement</td>
<td>$60,000</td>
</tr>
<tr>
<td>Replace IF-1 Substation</td>
<td>$600,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $1,411,000
Building Systems

- Building Envelope
- Elevators
- Building Interior
- Building Mechanical
- Building Electrical

Direct Digital Control
**Direct Digital Control**

**BAS - Upgrade BAS in SRC**

- BAS Controllers
  - Product Availability
  - 7 systems left to do
    - Includes SRC

**Recommendation:** $120,000
Direct Digital Control
Waldo Library – Replace Dampers

- Replace dampers on four large AHU’s in Waldo Library
- Dampers are at least 40 years old. They leak and don’t control well. Lots of low temperature fan trips in winter

Recommendation: $107,000
Direct Digital Control
Seibert Administration – Replace Radiant Valves

Recommendation: $46,000
# Direct Digital Control

## Recommendation Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAS – Upgrade SRC</td>
<td>$120,000</td>
</tr>
<tr>
<td>Waldo Library – Replace dampers (AHU)</td>
<td>$107,000</td>
</tr>
<tr>
<td>Seibert Administration – Replace Radiant Valves</td>
<td>$46,000</td>
</tr>
<tr>
<td>Waldo Library – Upgrade Pneumatic VAV Controls to DDC</td>
<td>$100,000</td>
</tr>
<tr>
<td>Bill Brown – Upgrade/Replace Heat Pump Controls</td>
<td>$110,000</td>
</tr>
<tr>
<td>Faunce – BAS Upgrade</td>
<td>$40,000</td>
</tr>
<tr>
<td>Everett Tower – Complete BAS Control</td>
<td>$5,000</td>
</tr>
<tr>
<td>Fetzer – Complete BAS Control</td>
<td>$25,000</td>
</tr>
<tr>
<td>Campus Services - Upgrade Pneumatic VAV Controls to DDC</td>
<td>$100,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $653,000
Landscape Services
Landscape
Tree Replacement Program

Recommendation: $15,000
169.7 mobile acres on campus

85 of those acres are irrigated

Recommendation: $50,000
Landscape

Refurbish Plexus Baskets and Benches

Recommendation: $43,000
Lot 16 Traffic Island Re-Landscape

- Lot 16 is located adjacent to Zimmerman Hall and University Arena

Recommendation: $15,000
Landscape
Core of Campus Walk Replacement

Can be implemented in phases

Recommendation: $510,000
Recommendation: $25,000
## Landscape Recommendation Summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Replacement Program</td>
<td>$15,000</td>
</tr>
<tr>
<td>Campus Wide Irrigation Upgrades</td>
<td>$50,000</td>
</tr>
<tr>
<td>Refurbish Plexus Baskets and Benches</td>
<td>$43,000</td>
</tr>
<tr>
<td>Lot 16 Traffic Island Re-Landscape</td>
<td>$15,000</td>
</tr>
<tr>
<td>Core of Campus Walk Replacement</td>
<td>$510,000</td>
</tr>
<tr>
<td>Campus Wide Curb Cuts</td>
<td>$25,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $658,000
Risk Management

Life Safety

- Emergency Notification
- Emergency/Exit Lights
- Generators

Life Safety
Life Safety
Central Monitoring System Analysis

- Graphics available for 55 of the 76 buildings being monitored
- Emergency Notification messages available at 56 building locations
- Exterior speakers located on 14 buildings providing coverage of 80% of Campus
### Life Safety

**Fire suppression System Analysis**

#### Residence Halls & Apartments
- Total Sq Ft Sprinkled: 249,416
- Total Sq Ft: 2,273,538

#### Conference Centers & Places of Assembly
- Total Sq Ft Sprinkled: 949,377
- Total Sq Ft: 1,345,924

#### Office & Classroom
- Total Sq Ft Sprinkled: 2,430,576.4
- Total Sq Ft: 4,105,131.4

Sprinkled: [Image]

Not Sprinkled: [Image]
**Life Safety**

*Fire Alarm System Analysis*

### 2013 Data Analysis

<table>
<thead>
<tr>
<th>Years</th>
<th>Fire Panels</th>
<th>GF</th>
<th>Percent</th>
</tr>
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<tbody>
<tr>
<td>0 to 5</td>
<td>20</td>
<td>13</td>
<td>16%</td>
</tr>
<tr>
<td>6 to 10</td>
<td>12</td>
<td>12</td>
<td>15%</td>
</tr>
<tr>
<td>11 to 15</td>
<td>10</td>
<td>10</td>
<td>13%</td>
</tr>
<tr>
<td>16 to 20</td>
<td>14</td>
<td>12</td>
<td>15%</td>
</tr>
<tr>
<td>21 to 25</td>
<td>2</td>
<td>1</td>
<td>1%</td>
</tr>
<tr>
<td>OVER 25</td>
<td>22</td>
<td>12</td>
<td>15%</td>
</tr>
</tbody>
</table>

### GF Over 25 Years Old

<table>
<thead>
<tr>
<th>Buildings</th>
<th>Year Inst.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moore Hall</td>
<td>1983/1962</td>
</tr>
<tr>
<td>Ellsworth Hall</td>
<td></td>
</tr>
<tr>
<td>Recommend upgrade</td>
<td>1956</td>
</tr>
<tr>
<td>Friedmann Hall</td>
<td></td>
</tr>
<tr>
<td>Recommend upgrade</td>
<td>1970</td>
</tr>
<tr>
<td>Knauss Hall</td>
<td></td>
</tr>
<tr>
<td>Recommend upgrade</td>
<td>1971</td>
</tr>
<tr>
<td>Aviation Facility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1960</td>
</tr>
</tbody>
</table>
### Life Safety Master Plan Update

#### Year 1 (2014)

<table>
<thead>
<tr>
<th>Building</th>
<th>Sq. Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moore Hall</td>
<td>66,356</td>
</tr>
<tr>
<td>Ellsworth Hall</td>
<td>89,925</td>
</tr>
<tr>
<td>West Hills</td>
<td>114,740</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>271,021</strong></td>
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</tbody>
</table>

#### Year 2 (2015)

<table>
<thead>
<tr>
<th>Building</th>
<th>Sq. Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunbar</td>
<td>78,170</td>
</tr>
<tr>
<td>Knauss</td>
<td>25,924</td>
</tr>
<tr>
<td>Friedman Hall</td>
<td>67,187</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>183,871</strong></td>
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</table>

#### Year 3 (2016)

<table>
<thead>
<tr>
<th>Building</th>
<th>Sq. Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>EWB</td>
<td>35,697</td>
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<tr>
<td>Campus Services</td>
<td>34,148</td>
</tr>
<tr>
<td>John Gill</td>
<td>20,065</td>
</tr>
<tr>
<td>Walwood Union</td>
<td>61,224</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>151,134</strong></td>
</tr>
</tbody>
</table>

#### Year 4 (2017)

<table>
<thead>
<tr>
<th>Building</th>
<th>Sq. Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanley Chapel</td>
<td>15,590</td>
</tr>
<tr>
<td>511 Monroe</td>
<td>18,123</td>
</tr>
<tr>
<td>Power Plant</td>
<td>49,001</td>
</tr>
<tr>
<td>Parking Services</td>
<td>2,938</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>85,652</strong></td>
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</tbody>
</table>
## Life Safety

### System Upgrade Recommendation

<table>
<thead>
<tr>
<th>Description</th>
<th>Square Footage</th>
<th>Total Budget</th>
<th>Design Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friedmann/Dunbar/Knuass</td>
<td>183,781</td>
<td>$308,000</td>
<td>$14,000</td>
</tr>
<tr>
<td>Moore Hall</td>
<td>66,356</td>
<td>$122,000</td>
<td>$5,500</td>
</tr>
<tr>
<td>West Hills</td>
<td>114,740</td>
<td>$62,000</td>
<td>$5,500</td>
</tr>
<tr>
<td>Ellsworth</td>
<td>89,925</td>
<td>$124,000</td>
<td>$5,500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,400,620</strong></td>
<td><strong>$616,000</strong></td>
<td><strong>$30,500</strong></td>
</tr>
</tbody>
</table>

**Recommendation:** $616,000
**Life Safety**

**Panel Upgrade Only Recommendation**

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sindecuse</td>
<td>$30,000</td>
</tr>
<tr>
<td>Student Recreation Center</td>
<td>$30,000</td>
</tr>
<tr>
<td>*SRC – Panel Relocation</td>
<td>$88,000</td>
</tr>
</tbody>
</table>

* Includes cost of new panel. Would be relocating panel from 2nd floor main office to loading dock. The loading dock would allow fire emergency personnel direct access to the panel in the event of an emergency.

**Recommendation:** $148,000
Emergency Notification
System Software Upgrades

Waldo Library
• Fire panel upgrade and speaker install to provide emergency notification messages – no voice system on existing fire panel – library announces emergencies over P.A.
• Cost: $117,000

Service Gateway Software
• Provide TSW software in DPS control cars allowing for quicker response
• $3500 per software license
• Supports 10 licenses
• Cost: $35,000

NOAA Weather Alert
• Tied into TSW Emergency Notification
• Email to blackberry when emergency message is activated at DPS
• Cost: $15,000

Recommendation: $167,000
# Emergency Notification

## Recommendation Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Waldo Library</td>
<td>$117,000</td>
</tr>
<tr>
<td>Service Gateway Software</td>
<td>$35,000</td>
</tr>
<tr>
<td>NOAA Weather Alert</td>
<td>$15,000</td>
</tr>
</tbody>
</table>

*Devices (Interior Speaker)*

**Recommendation: $167,000**
Risk Management

Emergency/Exit Lights

- Life Safety
- Emergency Notification
- Emergency/Exit Lights
- Generators
Emergency/Exit Lights

Light Upgrade Recommendation

Bill Brown
• Replace exit signs
• Repair emergency fixtures
• Equipment is 14 years old

Recommendation: $30,000
Emergency/Exit Lights

Emergency/Exit Light Campus Audit

Campus Wide
- Audit all exit lights
- Audit all emergency lights

Recommendation: $
# Emergency/Exit Lights

## Recommendation Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bill Brown – Replace Exit Signs and Repair Emergency Fixtures</td>
<td>$30,000</td>
</tr>
<tr>
<td>Campus Wide – Emergency/Exit Light Audit</td>
<td></td>
</tr>
</tbody>
</table>

**Recommendation:** $30,000
Risk Management

Life Safety
Emergency Notification
Emergency/Exit Lights
Generators

Generators
Emergency Generators
Analysis

Criteria:
• Housing Buildings
• Assembly Buildings
• Classroom Buildings
• Office/Administration Buildings

42 Buildings Covered
17 Buildings Need Generators
**Emergency Generators**

**Generator Recommendation**

- Read Arena Generator
  - Cost: $222,000

- SRC Emergency Generator
  - Cost: $282,000

- Lawson Ice Arena
  - Cost: $147,000

- Sindreuse Generator
  - Cost: $182,000

- Schneider Hall Generator
  - Cost: $172,000

**Recommendation:** $1,005,000
# Emergency Generators

## Recommendation Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Arena Generator</td>
<td>$222,000</td>
</tr>
<tr>
<td>SRC Emergency Generator</td>
<td>$282,000</td>
</tr>
<tr>
<td>Lawson Ice Arena Emergency Generator</td>
<td>$147,000</td>
</tr>
<tr>
<td>Sindecuse Emergency Generator</td>
<td>$182,000</td>
</tr>
<tr>
<td>Schneider Hall Emergency Generator</td>
<td>$172,000</td>
</tr>
</tbody>
</table>

**Recommendation: $1,005,000**
Rocks/Infrastructure
Utilities

Chilled Water

- Electrical
- Steam/Condensate
- Sanitary Sewer
- Storm Sewer
## Chilled Water

### Cooling Tower by Age and Location

<table>
<thead>
<tr>
<th>Building</th>
<th>Age</th>
<th>Installed</th>
<th>Ground/Roof Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>McCracken</td>
<td>29</td>
<td>1984</td>
<td>Ground (Decommissioned)</td>
</tr>
<tr>
<td>Miller Auditorium</td>
<td>23</td>
<td>1990</td>
<td>Ground</td>
</tr>
<tr>
<td>Waldo Library</td>
<td>22</td>
<td>1991</td>
<td>Roof</td>
</tr>
<tr>
<td>Lawson Ice Arena</td>
<td>20</td>
<td>1993</td>
<td>Ground</td>
</tr>
<tr>
<td>Walwood Union</td>
<td>17</td>
<td>1996</td>
<td>Ground</td>
</tr>
<tr>
<td>Kohrman Hall</td>
<td>16</td>
<td>1997</td>
<td>Ground</td>
</tr>
<tr>
<td>Health &amp; Human</td>
<td>8</td>
<td>2005</td>
<td>Ground</td>
</tr>
<tr>
<td>Rood Hall</td>
<td>5</td>
<td>2008</td>
<td>Roof</td>
</tr>
<tr>
<td>Bernhard Center</td>
<td>5</td>
<td>2008</td>
<td>Roof</td>
</tr>
<tr>
<td>Friedmann Hall</td>
<td>1</td>
<td>1997 (Refurbished 2013)</td>
<td>Ground</td>
</tr>
<tr>
<td>Schneider Hall</td>
<td>1</td>
<td>2012</td>
<td>Ground</td>
</tr>
<tr>
<td>Student Recreation Center</td>
<td>1</td>
<td>1993 (Refurbished 2013)</td>
<td>Roof</td>
</tr>
</tbody>
</table>

*Life Expectancy – 25 years*
Chilled Water
Age of Chiller Plants

*Life Expectancy – 25 years
Chilled Water

Miller Cooling Tower and Enclosure Replacement

- Precast Enclosure Replacement
  - Cost: $220,000

- Cooling Tower
  - Existing Funding: $100,000
  - Additional Cost: $130,000

Recommendation: $350,000
<table>
<thead>
<tr>
<th>Building</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miller Cooling Tower Enclosure Replacement</td>
<td>$220,000</td>
</tr>
<tr>
<td>Miller Cooling Tower Replacement</td>
<td>$130,000</td>
</tr>
</tbody>
</table>

**Recommendation: $350,000**
Utilities

- Chilled Water
- Electrical
- Steam/Condensate
- Sanitary Sewer
- Storm Sewer

Electrical
Electrical
Criteria for Evaluation

Criteria for Conditional Analysis
- Age
- Location
- Capacity
- Past Operational Issues
17.75 Miles of Primary Cable

105 Substations

- 45% of cable is in good condition
- 38% of substations are in good condition
- 46% of cable is in fair condition
- 50% of substations are in fair condition
- 9% of cable is in poor condition or overhead
- 12% of substations are in poor condition
Electrical
Primary Electric Recommendations

Recommendations:
• Goldsworth Valley Overhead Line Replacement
• Elmwood Overhead Line Replacement
• Electrical Vault Maintenance
• Engineer NE Duct Bank under Stadium Drive
• Exterior Lighting

Additional Recommendations:
• Exterior Lighting Upgrades
• Main Campus Device Coordination Study
• Medium Voltage Switchgear Maintenance
Electrical Vault Maintenance

Make repairs to existing Electrical Vaults on main campus

225 Electrical Vaults

Recommendation: $50,000
**Electrical**

*Exterior Lighting Upgrades*

Continue to replace exterior lighting to LED

**Recommendation:** $50,000
**Electrical**

Medium Voltage Equipment Maintenance

“SwitchGear”

- Continue five year plan to maintain and test medium voltage equipment in our system
- 48 switchgears in our system

**Recommendation: $50,000**
Electrical

Replace Goldsworth Valley Apartments overhead Electric

- Refeed buildings with underground

Recommendation: $165,000
Update the Device Coordination Study with new loop configuration and additional buildings and add the Arc Flash Study for the primary gear and vaults

Recommendation: $30,000
Building Systems

Roads/Infrastructure

Utilities

Energy Conservation

Electrical

Elmwood Overhead Electric Upgrade

- Relocate the existing overhead electrical lines, transformers, and drops to underground feed
- Also replace the street lights along Western Ave to underground feeds and LED fixtures
- Upgrade 2.4 KVA to 13.8KVA

Recommendation: $400,000
**Electrical**

**Engineer New Duct Bank Under Stadium Drive**

- Develop Plan to cross Stadium Drive with four main feeders
- Existing is detraining or not expandable

**Recommendation: $60,000**
# Electrical

## Recommendation Summary

<table>
<thead>
<tr>
<th>Building</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Vault Maintenance</td>
<td>$50,000</td>
</tr>
<tr>
<td>Exterior Lighting Upgrade</td>
<td>$50,000</td>
</tr>
<tr>
<td>Medium Voltage Switch Gear Maintenance</td>
<td>$50,000</td>
</tr>
<tr>
<td>Repair GV Apartments Overhead Electric</td>
<td>$165,000</td>
</tr>
<tr>
<td>Elmwood Overhead Electric Upgrade</td>
<td>$400,000</td>
</tr>
<tr>
<td>Main Campus Device Coordination Study</td>
<td>$30,000</td>
</tr>
<tr>
<td>Engineer New Duct Bank Under Stadium Drive</td>
<td>$60,000</td>
</tr>
<tr>
<td>Complete “C” Loop to Power Plant</td>
<td>$750,000</td>
</tr>
<tr>
<td>Complete “D” Loop from CHHS to Legacy</td>
<td>$690,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $2,245,000
Utilities

- Chilled Water
- Electrical
- Steam/Condensate
- Sanitary Sewer
- Storm Sewer

Steam/Condensate
Steam/Condensate Analysis

- 7.5 miles of steam mains
  - 5 Cross Tied Zones
- Total Asset Value - $60M
Steam/Condensate Analysis

- Good – 42%
Steam/Condensate Analysis

- Fair 33%
Steam/Condensate Analysis

- Poor – 25%
Replace Steam and Condensate from Tunnel to Sindecuse
• Existing Funding: $450,000
• Cost: $150,000

Recommendation: $150,000
Steam/Condensate
North Pump House

Infrastructure Upgrade

Recommendation: $35,000
**Recommendation: $40,000**

Burnhams – Replace Condensate
Steam/Condensate
Steam Vault Repairs

- Waterproofing from roadway
- Water/Salt Infiltration
- Structural Repairs
- Replace Corroded Piping

Recommendation: $100,000
Steam/Condensate
East Campus

East Campus Options for Steam

Options range from abandonment to complete reconstruction

Recommendation: $330,000 - $1.12M
<table>
<thead>
<tr>
<th>Building</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sindecuse Feed Replacement</td>
<td>$150,000</td>
</tr>
<tr>
<td>North Pump House Infrastructure Upgrade</td>
<td>$35,000</td>
</tr>
<tr>
<td>Burnhams – Replace Condensate</td>
<td>$40,000</td>
</tr>
<tr>
<td>Steam Vault Repairs</td>
<td>$100,000</td>
</tr>
<tr>
<td>East Campus</td>
<td>$330,000 - $1.12M*</td>
</tr>
</tbody>
</table>

Recommendation: $655,000 *
Utilities

Sanitary Sewer

Chilled Water
Electrical
Steam/Condensate
Sanitary Sewer
Storm Sewer
Sanitary Sewer Analysis

11.5 miles owned by WMU
Sanitary Sewer Recommendation

- Video a selection of the lines completed 5+ years ago to review for any significant deterioration
  - Cost: $15,000

Recommendation: $25,000
## Sanitary Sewer Recommendation Summary

<table>
<thead>
<tr>
<th>Building</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video of Lines</td>
<td>$15,000</td>
</tr>
</tbody>
</table>

**Recommendation: $15,000**
Utilities

Storm Sewer

- Chilled Water
- Electrical
- Steam/Condensate
- Sanitary Sewer
- Storm Sewer
Storm Sewer Analysis

- 40 Miles of Storm Sewer Lines
- 5 BMP sites from 2013
  - Lawson – 3 areas
  - Power Plant
  - Schneider Hall
**Storm Sewer**

**Goldsworth Valley Pond**

- MDEQ 319 Grant Opportunity
- MDEQ Review WMU’s preliminary proposal and approved our plan to apply
- Construction costs and matching funds are being determined

**Recommendation:** Pending Grant Opportunity
Storm Sewer
SAW Grant Opportunity

- MDEQ – SAW Grant
  - Storm & Sanitary Sewer
- Match 10% - 50%
- End of Goal of creating a budget plan for renewal based on system life cycle
  - Any work done to obtain condition data since Jan 2013 is match eligible (Video work on Sewers)
  - Construction cost and match requirements are yet to be finalized

Recommendation: Pending Grant Opportunity
# Storm Sewer Recommendation Summary

<table>
<thead>
<tr>
<th>Building</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goldworth Valley Pond</td>
<td>Pending Grant Opportunity</td>
</tr>
<tr>
<td>MDEQ – Saw Grant Opportunity</td>
<td>Pending Grant Opportunity</td>
</tr>
</tbody>
</table>
Energy Conservation

Energy Management

Commissioning
Energy Management
Seelye Center – Lighting Upgrade

- Upgrade traditional metal halide lighting to T9 ceramic metal halide
- 84 Fixtures
- 6.5 Year Payback

Recommendation: $75,000
**Energy Management**

**University Arena – Lighting Upgrade**

- Upgrade traditional metal halide lighting to T9 ceramic metal halide
- 27 Fixtures
- 6.5 Year Payback

**Recommendation:** $25,000
**Energy Management**

*Campus Wide – Incandescent Phase Out*

- Upgrade reaming halogen and incandescent lamps to LED on a targeted basis.
- 500 Fixtures
- 4 Year Payback

**Recommendation:** $25,000
**Energy Management**

**Campus Wide - Various ECM's**

- Lighting Controls
- Occupancy
- Daylight
- Lighting Upgrades
- T-12 Conversion
- BAS Integration
- HVAC
- Occupancy

**Recommendation**: $25,000
## Energy Management

### Recommendation Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeley Center – Lighting Upgrade</td>
<td>$75,000</td>
</tr>
<tr>
<td>University Arena – Lighting Upgrade</td>
<td>$25,000</td>
</tr>
<tr>
<td>Campus Wide – Incandescent Phase Out</td>
<td>$25,000</td>
</tr>
<tr>
<td>Campus Wide – Various ECM’s</td>
<td>$25,000</td>
</tr>
<tr>
<td>Campus Wide – Street Light Upgrade</td>
<td>$100,000</td>
</tr>
<tr>
<td>Campus Wide – Stairwell Lighting Upgrade</td>
<td>$25,000</td>
</tr>
<tr>
<td>CHHS – Metal Halide Replacement</td>
<td>$25,000</td>
</tr>
<tr>
<td>Lawson – Ice Resurfacing Machine Room Door</td>
<td>$25,000</td>
</tr>
<tr>
<td>Haenicke – Water Upgrades</td>
<td>$25,000</td>
</tr>
</tbody>
</table>

**Recommendation:** $350,000
Energy Conservation

Energy Management

Commissioning

Commissioning
Commissioning

History of Commissioning at WMU

• Building Performance Team started by Greg Roseboom in 1994, Retro-Cx
• Commissioning for new buildings started in 1996, Wood & Haenicke Halls
• Continuous Commissioning started in 2009 utilized building technology to maintain proper operation
New building commissioning ensures that buildings are:

- Designed with needs in mind
- Built to specifications
- Tested with performance documented
- In-house maintenance properly trained
- 14 buildings to date
Building Commissioned

- Haenicke/Wood
- CEAS, Paper Pilot, ERC
- Health & Human Services
- Brown Hall
- New Chemistry
- RCVA
- South/Central Kohrman
- Lee Honors
- Sangren Hall
- Western View Apartments – Phase 1

Buildings currently undergoing commissioning

- Zhang Legacy Collection Center
- Western View Apartments – Phase 2
Commissioning
Continuous Commissioning

- Ensures that buildings continue to operate properly throughout their life time
- Ensures that major changes in use of a building are accounted for
- Example of Continuous Commissioning efforts:
  - AHU Runtime
  - Chiller Optimization
  - Outside Air Accuracy
  - Exhaust Fan Schedules
**Commissioning**

**Continuous Commissioning Analysis**

<table>
<thead>
<tr>
<th>Project</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed AHU &amp; EF Runtime Monitoring</td>
<td>Complete, Ongoing Management</td>
</tr>
<tr>
<td>Defective Occupancy Sensors</td>
<td></td>
</tr>
<tr>
<td>Review/trend chiller plant efficiencies</td>
<td>Expanding</td>
</tr>
<tr>
<td>Review/trend outside air intake for air handlers</td>
<td>In-progress</td>
</tr>
</tbody>
</table>
• Systematic process applied to existing buildings for identifying and implementing O&M improvements and for ensuring their continued performance over time

• Objectives:
  • Improve equipment performance
  • Improve comfort level
  • Reduce energy and operational costs
  • Increase equipment life expectancy
  • Improve IAQ
  • Improve O&M
  • Reduce maintenance service calls
Retro-commissioning existing buildings can produce significant cost savings, which are depended on the following:

- Building Type
- Location
- Scope

In accordance to a comprehensive study conducted by Lawrence Berkeley National Laboratory energy cost savings ranges from $0.11 - $0.72/sq. ft.
Commissioning
Building Selection Criteria

- Selection process is primarily based on building age and EUI (Energy Use Intensity)
  - EUI is a measuring factor used in comparing buildings of similar square-footage

<table>
<thead>
<tr>
<th>Building</th>
<th>Year Built</th>
<th>EUI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dalton Center</td>
<td>1982</td>
<td>69 kbtu/sq. ft.</td>
</tr>
<tr>
<td>Schneider Hall</td>
<td>1990</td>
<td>71 kbtu/sq. ft.</td>
</tr>
<tr>
<td>Dunbar Hall</td>
<td>1971</td>
<td>146 kbtu/sq. ft.</td>
</tr>
<tr>
<td>North Kohrman Hall</td>
<td>1966</td>
<td>101 kbtu/sq. ft.</td>
</tr>
</tbody>
</table>
## Summary of Recommendations

**Recommendation:** $100,000

<table>
<thead>
<tr>
<th>Project</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA Continuous Commissioning</td>
<td>$50,000</td>
</tr>
<tr>
<td>Retro-Commissioning</td>
<td>$50,000</td>
</tr>
</tbody>
</table>
Facility asset Reinvestment

Summary of Recommendations

Building Envelope: $6,948,000

Grounds/Landscape: $658,000

Risk Management: $1,966,000

Roads/Infrastructure:

Utilities: $3,265,000

Energy Conservation: $450,000

Total Recommendations: $13,287,000