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***The Rockefeller Institute of Government***

***Analyzing SUNY Facility Renewal and Backlog Needs***

***Final Report***

***September 28, 2007***

## Executive Summary

### Purpose and Scope of Study

This study was commissioned by the Rockefeller Institute of Government, on behalf of the State University of New York (SUNY) and the State University Construction Fund (SUCF), to conduct the research and analysis needed to provide a conceptual framework for uniformly and systematically assessing a major portion of the University's ongoing capital facility renewal needs. Capital renewal generally refers to those activities essential to maintaining existing facilities and their supporting infrastructure in a state of good repair. Thus, this study is not undertaken as a one-time effort; instead, it is intended to establish the basis for a continuing, interactive process of informed analysis and methodological refinement over time. Accordingly, the report that follows provides both research conducted to determine available benchmarking and the results of specific analyses performed to identify the annual facility renewal and backlog (i.e. deferred maintenance) needs of the University's State-operated academic facilities. By contrast, the study does not include residential or hospital facilities, which are funded under separate self-sustaining capital investment models. Nor does it include Community Colleges and other enterprise organizations, such as college foundations or auxiliary service corporations.

The study's key objectives were to:

- Identify and analyze prevailing industry standards for annual capital reinvestment and deferred maintenance for public higher education facilities. This analysis will assess the use and validity of Current Replacement Value (CRV) models and comment on its application for higher education systems;
- Assess SUNY academic facilities utilizing available campus and State University of New York Construction Fund (SUCF) data and available records and recommend a model to serve as a standard for annual capital reinvestment for SUNY academic facilities to maintain facilities in a good state of repair;
- Assess SUNY Academic facilities backlog and renewal needs utilizing available campus and SUCF data and available records;
- Benchmark SUNY needs against those of other higher education systems; and
- Provide a final report of research findings and recommendations, which includes an independent, objective proposal for an ongoing annual level of capital reinvestment in SUNY Academic facilities, based on the Current Replacement Value methodology.

## Study Participants

The Rockefeller Institute organized and supervised the study conducted by Pacific Partners Consulting Group, Inc. (PPCG), headquartered in Stanford, California. PPCG specializes in analytic and policy studies. Frederick Biedenweg, President of PPCG, has over twenty-five years experience with public and private higher education facilities management. Dr. Biedenweg has published a number of articles on higher education management including: *A Robust Faculty Planning Model*, (published by the Stanford University Press); *Before the Roof Caves In: A Predictive Model for Physical Plant Renewal*, published by the National Association of College University Business Officers (NACUBO) (co-authored by Robert Hutson); *Planning in an Era of Change* (published by the Stanford Faculty Senate) and *Planning for Capital Reinvestment: Alternatives for Facilities Renewal Budgeting* (co-authored with Catherine Gardner and Lynda Weisburg-Swanson), published by NACUBO.

PPCG's system clients, which utilize its Facility Renewal Model methodology include: The University of Texas, The California State University System, Stanford University, Minnesota State Colleges and Universities, Oregon University System, The University of California, The National University of Singapore, The Smithsonian Institution, and The Getty Center and Villa.

PPCG worked in close conjunction with SUCF staff involved in the collection of current building and infrastructure data. SUCF staff knowledgeable with campus facility conditions worked with campus facility and plant staff for each SUNY campus to facilitate the completion of the 2007 Building Condition Assessment Survey (BCAS), a web-based system designed to assign a condition rating to building, site and infrastructure components. The effort included all major buildings (i.e., buildings with 5,000 or more gross square feet) for all State-operated campuses. Infrastructure systems for each campus were similarly reviewed and rated. The BCAS data were provided to verify life cycle and timing of renewal needs for SUNY's building and infrastructure subsystems. This information was analyzed, reconfigured, and entered into PPCG's Facility Renewal Resource Model (FRRM™). The study analyzed the BCAS subsystem condition ratings (excellent, good, fair, poor) and projected renewal and backlog needs.

## Study Process: Methodology & Benchmarking

### Methodology

In the course of its prior efforts, PPCG has examined the strengths and weaknesses of several differing approaches to planning for capital reinvestment, including: 1) Physical Plant Auditing, 2) Plant Depreciation as a Model for Renewal, 3) Inventory of Components, 4) Fixed Percentage of Current Replacement Value (CRV), and 5) the Life Cycle Model Based on CRV. Based on these efforts, PPCG advocates the use of the latter, the Life Cycle Model Based on CRV, the approach chosen to undertake this study. This method was developed in 1980 at Stanford University, and is currently in use by five higher education systems with over 108 campuses and over 150 million gross square feet of space.

The Life Cycle Model Based on CRV approach was chosen because it provided a tested, comprehensive, cost effective method to size the total current replacement value; identify current backlog and project capital renewal needs in the most reasonable period of time using available SUCF and SUNY data.

This methodology has also been recognized by the National Association for College and University Business Officers (NACUBO), the Association of Physical Plant Administrators (APPA) and the Society for College and University Planners (SCUP) as the “best method” for projecting capital renewal needs.

In general, the Life Cycle Model Based on CRV approach generates a high-level statistical overview of current facility renewal needs and any accumulated backlog based on institution-specific information, including: the age and type of building and its current condition; average building sub-system life cycles; related infrastructure support requirements; and the current cost of replacement – adjusted for regional cost differentials within the state. The Model uses building system life cycles, current replacement values and condition assessment information to develop a 50 year forecast of estimated backlog and renewal costs.

The model is not designed to address facility utilization-related variables such as enrollment levels or projected enrollment growth, or the extent of capital renovations needed to address changing academic mission goals. In addition, it may not account for other costs related to the University’s ability to progress capital maintenance projects, such as the creation of “surge” space to allow sequenced access to buildings under rehabilitation or for costs related to modernization of facilities wherein components that are not pre-existing are added, such as adding elevators as part of ADA compliance efforts.

The overall results of this modeling are cost forecasts for current capital renewal needs and capital maintenance backlog, generated by the relative condition and known life cycle of major building components and sub-systems, over a 50-year renewal schedule for each campus and system-wide.

## **Benchmarking**

There is a wealth of reliable sources for higher education statistics related to demographics, enrollments, educational attainment, teacher levels, graduation rates, etc. However, there is not a corresponding availability of tested statistics related to higher education capital facilities. Consistent capital facilities data collection is still in its early stages of development. Respected higher education capital facility advocacy organizations, such as The Association of Physical Plant Administrators (APPA), The National Association for College and University Business Officers (NACUBO) and The Society for College and University Planners (SCUP) are still struggling with the need to develop uniform standards for the reporting and collection of this information. What data is available is often not uniformly reported by each higher education institution, may not be subjected to verification or vetted to assure comparability. As a result, there is little available data to benchmark SUNY’s capital facilities against.

PPCG has worked closely with several public higher education systems using the Life Cycle Model Based on CRV approach which include: University of Texas (15 campuses), the California State University System (24 campuses), the Oregon University System

(seven campuses), the University of California (nine campuses), and the Minnesota State Colleges and Universities System (53 campuses).

Due to the limited availability of any other reliable, uniformly-collected, industry-recognized, higher education facility data to serve as a benchmark for SUNY, PPCG relied upon data drawn from its pool of public higher education system clients (cited above) to serve that function (see Section 7). As a result, the benchmark data being compared to SUNY's experience benefits from uniformity in the definitions used in PPCG's prior analyses, including consistency in the methods of data collection and subsequent reviews for accuracy. PPCG applied those same conventions in the collection, review and analysis of SUNY's data. This assures that SUNY is objectively compared against five recognized and respected peer higher education systems.

### **SUNY: General Overview & Summary Findings**

SUNY educational facilities consist of 32 state-operated campuses, two contract colleges (Cornell and Alfred Ceramics), along with System Administration, which includes the recent acquisition of Levin Institute. The total SUNY academic system is comprised of 1,800+ buildings with a total of 54.6 million gross square feet. Its infrastructure systems includes 160 miles of electrical distribution, 31 million square feet of parking, 50 miles of steam distribution and 450 athletic fields. Figure 3.2 is a system-wide histogram showing GSF (gross square feet) by construction date for the educational facility buildings. This chart demonstrates that substantial portions of SUNY buildings were constructed during the late 1960's and early 1970's. Figure 7.1 reveals that 73% of SUNY's Buildings are in excess of 30 years old.

SUNY system-wide educational facilities have a total Current Replacement Value (CRV) of \$25.7 billion, including \$22.9 billion for buildings, and \$2.8 billion for supporting infrastructure. (Figure 8.1) Further, the SUNY State-operated system as a whole currently has a \$3.2 billion backlog of deferred capital maintenance, including \$2.5 billion for building system renovations and \$0.7 billion for renewal of supporting infrastructure. The largest contributors to the building backlog are renovations or replacements related to 1) HVAC Controls/Equipment/Distribution Systems (\$1.2 billion); 2) Exterior Walls, Roofs, Doors and Windows (\$544 million); 3) Electrical Equipment/Power Wiring and Lighting (\$253 million); 4) Built-in Equipment and Specialties - primarily found in "complex" facilities such as science labs or clinical space (\$131 million) and 5) Interior Finishes (\$130 million). Major backlog categories for infrastructure components include 1) Utility Distribution and Generation (primarily steam systems) and 2) Hardscape (surface parking, plazas, sidewalks, etc.)

An additional \$2.0 billion in capital reinvestment is required over the next five years to avoid the accumulation of additional backlog. It is important to note that this estimate, like the above estimate of total renewal backlog, is expressed in 2007 dollars only; no adjustments have been made to anticipate future annual cost inflation or escalation amounts.

The most serious need identified by the study, in both backlog and annual renewal needs, involves infrastructure subsystems which support facility operations, especially in the area of aging underground distribution systems (Figure 6.1). Persisting problems with these systems at the levels currently evidenced is likely to lead to more expensive emergency repairs occasioned by major system failures.

## **SUNY: Comparisons to Other Systems**

In Section 7, Benchmark Data, the SUNY System is compared to that of the five higher education peer systems mentioned previously. In Figures 7.1 through 7.5, the following benchmarks are compared:

- Facility Condition Index (FCI) – Simply stated the FCI is the percent of a System’s current replacement value (CRV) that is beyond its useful life, in other words, it’s already in “backlog”. Figure 7.1 reflects:
  - On average, 11% of SUNY’s building systems are in backlog, compared to an optimum level of 5% or under.
  - SUNY’s system-wide average FCI is in middle range of six public systems compared (range is 6% to 23%)
- Percentage of Buildings Over 30-years Old – Figure 7.3 demonstrates that SUNY has the second highest system-wide average (73%) Percentage of Buildings Over 30-years Old.
- Buildings with Complex Systems – Figure 7.2 reflects that SUNY’s system-wide average of buildings with complex systems is 11%. SUNY is comparable to the California State University System (by State-mandate the CSU system’s primary focus is teaching), which also reports 11%. Those systems with a medical and/or research focus are 28% or higher (University of Texas, Oregon State University and University of California are 28% or higher).
- Annual Renewal Requirements as a Percent of CRV – Figure 7.4 reveals that SUNY statewide systems require an average annual renewal investment of 1.6% of its total building CRV. By comparison, California State University and the Minnesota State College & University System, the two state-mandated teaching college systems have a lower percentage of 1.4%. The other three systems, which are predominantly tier-one research universities, all have a higher Annual Renewal percentage of 1.7%. SUNY has a blending of teaching and research facilities.
- Average Annual Infrastructure as a Percent of Average Annual Building Renewal – Figure 7.5 reflects that SUNY requires an additional 14% added to average annual building renewal for infrastructure renewal. The average of all systems is 16.5%.

## Study Findings and Recommendations

A few key charts are highlighted here which describe the range of findings applicable to SUNY capital planning and needs forecasting.

*Buildings:* Figure 5.1 illustrates the major building systems or components driving SUNY's current backlog of \$2.5 billion for academic buildings. This chart also shows that another \$1.7 billion will be needed to address upcoming building renewal needs between 2008 and 2012.

*Infrastructure:* Figure 6.1 arrays the estimated \$0.7 billion in current statewide infrastructure backlog by major component, and Figure 6.2 shows that an additional \$0.3 billion is needed between 2008 and 2012 just to stay current (\$53 million per year).

*Combined:* the building and infrastructure backlog total \$3.2 billion. In addition, SUNY needs to invest approximately \$2.0 billion (\$400 million annually) in new renewal over the next five years to assure that SUNY's backlog does not continue to grow.

*It is recommended that SUNY develop and implement an investment strategy to fully fund the Annual Renewal needs and reduce the backlog over time.*

Scenarios are provided in Section 8 of the study that illustrate how the backlog will grow or diminish depending upon how quickly SUNY and the State wish to act. SUNY will require a Total Annual Renewal and Backlog Reduction Investment range of \$400 million just to prevent the backlog from growing, and up to \$700 million to virtually eliminate the backlog over the next ten years. Please note that all cost figures here are expressed in 2007 dollars; for simplicity of analysis and comparison, no further adjustments to anticipate future inflation or cost escalation are included.

### **Total Annual Renewal & Backlog Reduction Investment**

\$200 Million

\$400 Million

\$560 Million

\$700 Million

### **Net Impact on Backlog**

Backlog grows to a minimum of \$4 billion in five years; and in excess of \$5 billion in 10 years.

Backlog remains relatively constant

Backlog reduced by 50% in 10 years

Backlog almost eliminated in 10 years

# Table of Contents

	<u>Page</u>
<b>EXECUTIVE SUMMARY</b> .....	<b>i</b>
<b>1. INTRODUCTION</b> .....	<b>1</b>
1.1 Project Approach and Organization of Report.....	2
1.2 Methodologies Reviewed.....	3
1.3 Organization of Report.....	5
<b>2. ASSUMPTIONS</b> .....	<b>7</b>
2.1 Building Sub-system Categories and Component Examples.....	9
2.2 Renewal Cost Assumptions.....	14
2.3 Regional Index Factors.....	15
2.4 SUNY Buildings used for Cost Assumptions.....	16
2.5 Special Consideration Definitions.....	17
2.6 Special Consideration Costs.....	18
2.7 Infrastructure Assumptions.....	19
2.8 Infrastructure Cost Assumptions.....	21
<b>3. VALIDATION DATA</b> .....	<b>22</b>
3.1 Gross Square Feet Summary by Building Type.....	23
3.2 Histogram of GSF by Construction Date.....	24
<b>4. BUILDING BACKLOG</b> .....	<b>25</b>
4.1 Building Backlog Costs by Campus and Subsystem.....	26
4.2 Building Backlog, CRV, and Facility Condition Index by Campus.....	28
<b>5. BUILDING RENEWAL PROJECTIONS</b> .....	<b>29</b>
5.1 Backlog and 5-Year Renewal Needs by Subsystem.....	30
5.2 Backlog and 10-year Forecast by Campus.....	31
5.3 Average Annual Renewal Needs as a fraction of CRV by Campus.....	32
5.4 SUNY 50-year Renewal Graph.....	33
<b>6. INFRASTRUCTURE</b> .....	<b>34</b>
6.1 Infrastructure Backlog by Campus – Systems Rated Poor.....	36
6.2 Average Annual Infrastructure Renewal Needs by Category and Campus.....	37
6.3 Infrastructure Summary.....	38



<b>7. BENCHMARK DATA</b> .....	<b>39</b>
7.1 Facilities Condition Index.....	42
7.2 Percentage of Buildings with Complex Systems.....	42
7.3 Percentage of Buildings over 30 Years Old.....	43
7.4 Average Annual Renewal as a Percentage of CRV.....	43
7.5 Average Annual Infrastructure as a Percentage of Average Annual Building Renewal.....	44
<b>8. SUNY BACKLOG AND RENEWAL-FUNDING NEEDS AND OPTIONS</b> .....	<b>45</b>
8.1 System-wide Summary – CRV, Backlog, and FCI.....	46
8.2 System-wide Summary – CRV, Renewal and %.....	47
8.3 System-wide Summary – 5 Year FCI.....	48
8.4 Backlog Growth at \$200 Million Investment.....	49
8.5 Backlog Growth at \$400 Million Investment.....	50
8.6 Backlog Reduction at \$560 Million Investment.....	51
8.7 Backlog Reduction at \$700 Million Investment.....	52
<b>9. CONCLUDING SUMMARY</b> .....	<b>53</b>
<b>10. GLOSSARY OF TERMS AND ACRONYMS USED</b> .....	<b>56</b>

## 1. Introduction

The following report presents the results of a research study to analyze the facility renewal and backlog needs of the State University of New York (SUNY) academic facilities (residential, hospital, enterprise and Community College facilities are not included), as commissioned by The Rockefeller Institute of Government. The findings of the study are based upon an analytical approach developed by The Pacific Partners Consulting Group, Inc. (PPCG). The approach combines a high level statistical view of facilities renewal with institution specific information on buildings, system life cycles, infrastructure, and costs.

The study used data provided by SUNY and the State University Construction Fund (SUCF) on facility inventory and component conditions for each of the 1,815 SUNY academic buildings. The study also analyzed the web-based system condition ratings (excellent, good, fair, poor) and projected renewal and backlog needs identified by the SUNY and SUCF 2007 Building Condition Assessment Survey (BCAS), conducted for all State-operated campuses including all major buildings (i.e. buildings with 5,000 or more gross square feet). SUCF staff knowledgeable with campus facility conditions worked in conjunction with campus facility and plant staff to rate 29 components for each building. Infrastructure systems for each campus were similarly reviewed and rated. The BCAS effort included the majority of the System's 1,815 academic buildings with 54.6 million gross square feet, 160 miles of electrical distribution, 31 million square feet of parking, 50 miles of steam lines and 450 athletic fields. In addition, cost data were collected on actual construction and major renovation projects, throughout the SUNY system, over the past several years. This information was analyzed, reconfigured, and entered into PPCG's Facility Renewal Resource Model (FRRM™).

The FRRM™ model uses building system Life Cycles and Current Replacement Value (CRV) costs<sup>1</sup> on a system-by-system basis to produce profiles for each building with estimated dates for renovation based upon the conditions information provided by the SUNY campuses. From this data, a 50-year forecast of estimated backlog and renewal costs was developed for each building, campus, and the SUNY system overall. Model results were reviewed by the SUCF staff for validity prior to finalizing this report. The model is not designed to address facility utilization-related variables, such as enrollment levels, projected enrollment growth, or the extent of capital renovations needed to address changing academic mission goals. In addition, it may not account for other costs related to the University's ability to progress capital maintenance projects, such as the creation of "surge" space to allow sequencing access to buildings under rehabilitation or for costs related to modernization of facilities to add components that are not pre-existing, such as adding elevators as part of ADA compliance efforts.

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<sup>1</sup> These costs were derived from actual SUNY projects and benchmarked against higher education construction and renovation projects as well as industry-based standards.

The objectives of the study were to:

- Identify and analyze prevailing industry standards for annual capital reinvestment in and deferred maintenance for public higher education facilities. This analysis will determine the use and validity of Current Replacement Value (CRV) models and comment on their application for higher education systems.
- Assess SUNY academic facilities utilizing available State University of New York Construction Fund (SUCF) data and available records and recommend a model to serve as a standard for annual capital reinvestment for SUNY academic facilities to maintain facilities in a good state of repair.
- Assess SUNY Academic facilities backlog and renewal needs utilizing available SUCF data and available records.
- Benchmark SUNY needs against those of other higher education systems.
- Provide a final report of research findings and recommendations, which include an independent, objective proposal for an ongoing annual level of capital reinvestment in SUNY Academic facilities, based on the Current Replacement Value methodology.

## 1.1 Project Approach

Working with a “Working Group” of State University Construction Fund (SUCF) and Rockefeller Institute staff, Pacific Partners led a process to tailor the study to meet the unique requirements of the Rockefeller Institute, SUCF and SUNY.

A comprehensive review of the Life Cycle/CRV approach and methodology was conducted to provide an understanding of both the mechanics of developing a Life Cycle/CRV model and to contrast it with other methods of projecting renewal costs. Specifications for the FRRM™ model including: building types; sub-systems; infrastructure categories; life cycles; and costs for the SUNY facilities were developed with the Working Group based on industry standards, PPCG’s experience with over 120 higher education clients, and SUNY actual facility projects. The cost data used to estimate renewal requirements were derived from a database developed by Pacific Partners, which includes actual project costs for more than ten million gross square feet of educational space. These costs are benchmarked against industry standards, adjusted for regional costs and evaluated against actual new construction and renovation experience at SUNY. The research approach was tailored to accommodate the types of buildings and special construction factors specific to SUNY.

SUCF provided data on each building that included the campus, the building name, the construction date, and the gross square feet (GSF) of the building, as well as other information. SUCF also provided campus ratings for each component in each building of poor, fair, good, or excellent. PPCG took these ratings and assigned an expected remaining life to each component based on the rating,

the overall life cycle of the component and the construction year of the building. As an example, components rated poor were assigned either to the backlog (needing immediate renewal) or to needing renewal in 2008 or 2009. Components were then aggregated into subsystems using a weighted average based on the renewal cost of the various components.

**A Note about Costs:** ALL costs in this report are in 2007 dollars. That is, there are NO escalation factors for one year to the next.

## 1.2 Methodologies Reviewed

During the course of this study, five methodologies for analyzing capital reinvestment in and deferred maintenance for public higher education facilities were examined:

### The Physical Plant Audit

Entails building by building physical inspection to document the condition of campus facilities and identify deferred maintenance in such areas as: structures; foundations and substructures; roofing and exterior walls; heating, ventilation, and air conditioning (HVAC); plumbing, electrical, safety systems; and ceilings, floors, interior walls and conveying systems.

*Strengths:* Provides detailed and specific lists of buildings and components in need of maintenance; clearly identifies degree of deterioration; provides immediate estimates of cost to repair or replace; allows priorities to be set based on levels of degradation and other factors.

*Weaknesses:* Identifies only today's maintenance needs; it does not distinguish between current renewal needs versus deferred (or backlogged) needs; does not provide long-term planning information; and the cost for SUNY would be substantial.

### Inventory of Components

Each component is identified along with installation date and cost. Components past their theoretical life are considered as being in backlog.

*Strengths:* Every component is tracked; actual component costs are used; and Renewal Curves can be generated.

*Weaknesses:* Every component is tracked; costs are not based on current installations; maintenance is significant; implementation cost is substantial; and backlog is frequently over estimated.

### **Plant Depreciation as a Model for Renewal**

A “Depreciation Reserve” can be established and funded based upon annual depreciation calculations, which are determined by spreading the cost of original construction and improvements over the useful life of the facility.

*Strengths:* Recognizes the depletion of assets; is based upon commonly accepted accounting principles; and is easy to implement if depreciation accounting is already in place.

*Weaknesses:* Does not estimate deferred maintenance; does not predict annual renewal needs; is based on historical costs not expected current replacement costs; and does not provide adequate funding for renewal.

### **Fixed Percentage of Current Replacement Value (CRV)**

Total current campus replacement value calculated based on published construction costs. An annual allocation of 1.5%-2.5% for plant renewal recommended by the Society of College and University Planning (SCUP), Association of Physical Plant Auditors (APPA), and National Association of College and Business University Business Officers (NACUBO).

*Strengths:* It is easy to understand; easy to adjust the percentage; is analogous to endowment management; and is inexpensive to implement.

*Weaknesses:* There is no commonly accepted standard to define the “right” percentage and little connection with actual need.

### **Life Cycle Model Based on Current Replacement Value (CRV) of Facility Subsystems**

Long-term renewal and deferred maintenance needs are estimated using facility types, gross square feet (GSF), and construction dates. Life cycle and replacement costs are predicted for each subsystem category based on standards and recent institutional experience.

- Predicts when to replace or renovate building subsystems;
- Projects renewal cost by year;
- Estimates the magnitude of deferred maintenance;
- Targets facilities and/or subsystems most likely in need of a physical audit; and
- Provides many different ways of looking at the information and data.

*Strengths:* Tailored to individual systems; accommodates cyclical nature of facilities wear-out; benchmarked against industry standards; estimates both facility renewal needs and deferred maintenance (backlog).

*Weaknesses:* Lacks the specificity of a physical plant audit; and lacks the simplicity of formula driven funding solutions.

PPCG recommended using the latter, the life cycle model based on CRV, as the approach chosen for this study. This method was developed in 1980 at Stanford University, and is recognized by NACUBO, APPA and SCUP as the “best method” for projecting capital renewal needs. It has been validated in multiple higher education environments and is currently in use by over 108 campuses in five higher education systems. Several factors support the use of the Life cycle Model Based on CRV for SUNY:

- Model has worked well for other higher education systems;
- SUNY can be benchmarked against national data;
- Currently in use by clients with over 150M GSF of space;
- Utilizes SUNY’s existing building inventory data;
- SUNY’s 2007 Building Condition Assessment Survey (BCAS) data can be cross-walked and incorporated;
- Draws from a database of life cycles and costs developed from actual construction and renovation projects; and
- Model may be tailored to address SUNY building types, subsystems site factors and unique experience.

Additional advantages to using the life cycle model based on CRV:

- Provides immediate and long term view of both deferred maintenance (DM) and on-going capital renewal needs;
- A living forecast, not a snapshot in time;
- Provides a consistent methodology across multiple buildings and/or sites; and
- Recognizes and identifies SUNY renewal cycles.

### **1.3 Organization of the Report**

This report presents the methodology, assumptions, and findings of the analysis of SUNY’s facilities renewal and backlog needs. It contains a subset of the actual FRRM™ reports reviewed by SUCF and Rockefeller Institute staff. They are presented in six sections: Assumptions, Validation Data, Backlog of Deferred Maintenance, Renewal Projections, Infrastructure, and Summary.

#### **Assumptions**

The Assumptions section lists each of the subsystem categories defined for the SUNY buildings and infrastructure, and provides estimated replacement or renewal costs for each subsystem. It also provides sample components for each subsystem. The cost

data were developed using detailed building project costs provided by SUCF, cost data from other academic institutions, and industry standards. A complete list of the SUCF buildings included in the cost analysis can be found in this section.

## **Validation Data**

The Validation Data section consists of a gross square footage (GSF) summary table for each building type and campus, and a histogram showing GSF of construction by construction date for the education facility buildings. The purpose of the validation data is to assure that all building data received from SUCF have been entered into the FRRM™ model correctly and that buildings have been assigned the appropriate building type.

## **Building Backlog**

The Backlog of Deferred Maintenance (DM) section details the backlog and five-year renewal needs by subsystem and ten-year estimates by campus. (Building Backlog does not include infrastructure.) A Facilities Conditions Index (FCI) is provided for each campus. (FCI is calculated by dividing the total building backlog by the current replacement value.)

## **Building Renewal Projections**

This section provides a graph showing projections of annual facility reinvestment needs for the SUNY system over a period of 50 years (the graph does not include infrastructure). The average annual renewal calculation dampens the effect of year-to-year swings by applying a five-year smoothing to the actual model results. Backlog of deferred maintenance (DM) and 5-year forecast totals by campus are provided, as well as a backlog and 10-year forecast by subsystem. These reports provide both a near-term perspective for each institution's needs, as well as a longer view.

## **Infrastructure**

This section provides details of the infrastructure costs by major components (e.g. roads, landscape and hardscape, utility distribution systems, and utility generation systems) for each campus.

## **Benchmarks**

Benchmarks are provided that compare the SUNY system to other Higher Education Systems.

## **Summary**

Included in this section are summary reports for each campus, benchmark data, and estimated investment required to bring down the backlog of deferred maintenance.

## 2. Assumptions

The following section includes all of the detailed definitions, costs, and methodologies used in configuring the FRRM™ model for the SUNY analysis. These assumptions were developed with assistance from SUCF staff.

### Building Subsystems, Life Cycles and Example Components

Please note that a number of subsystems have life cycles that are listed as “lifetime.” In these instances, the subsystem is assumed to last as long as the building – and therefore no renewal is assumed. Other subsystems, such as connecting the building to the campus electrical system, are included under infrastructure rather than as a building system. The sample components provided for each subsystem are not meant to be all inclusive, only illustrative.

### Subsystem Cost Assumptions

The costs in this section were derived from actual SUNY new construction and major renovation projects. In each case, the detailed project costs were adjusted for inflation (based on the years of construction to adjust to 2007 dollars). Further adjustments address regional index factors and special considerations. Buildings with basic systems were then separated from buildings with complex systems. Weighted averages<sup>2</sup> were then used to calculate renewal costs per gross square feet (GSF) of the building project. The resulting weighted average costs were then compared to a PPCG database of more than 10 million GSF of higher education construction projects. The cost numbers on these assumption pages reflect this information as well as the judgment of PPCG staff<sup>3</sup>. A list of 39 SUNY building projects, totaling almost two million gross square feet, that were used for this analysis is included as Figure 2.4.

### Regional Index Factors<sup>4</sup>

These factors adjust the costs based on the physical location of the campus within New York State and were provided by SUCF.

### Special Consideration Definitions and Costs

Special Considerations reflect systematic increased (or decreased) costs due to a special characteristic of the building. These increases (or decreases) are listed, by subsystem, in Figure 2.6.

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<sup>2</sup> Costs that were more than two standard deviations from the mean were excluded from these weighted averages.

<sup>3</sup> These numbers were also subject to detailed reviews by SUCF staff – who made numerous useful suggestions that have been incorporated into these numbers.

<sup>4</sup> Syracuse is given a factor of 1.0 and the campuses’ regional index factors are relative to Syracuse



**Infrastructure Assumptions and Costs**

For the purpose of this report, infrastructure includes essential non-building structures that support the campus. Examples include roads, surface parking, utility generation systems, utility distribution systems and athletic fields.

## 2.1 Building Sub-system Categories

<u>Sub-system<sup>5</sup></u>	<u>Average Life Cycle</u>
1. Roofing – SUNY Standard	25 years
2. Building Exteriors, Doors and Windows	70 years
3. Building Exteriors – Walls	30 years
4. Elevators and Conveying Systems	25 years
5. HVAC – Controls	20 years
6. HVAC – Equipment	25 years
7. HVAC - Distribution Systems	50 years
8. Electrical Equipment	30 years
9. Lighting	20 years
10. Power Wiring	70 years
11. Plumbing Fixtures	25 years
12. Plumbing -Rough-in	50 years
13. Fire Protection Systems	40 years
14. Fire Detection Systems	20 years
15. Built-in Specialties and Equipment	25 years
16. Interior Finishes	15 years
<u>Other Categories Not Included</u>	
17. Foundations	Lifetime
18. Sub-grade Drainage and Waterproofing	As needed
19. Vertical Elements	Lifetime
20. Horizontal Elements	Lifetime
21. Interior Partitions	As needed
22. Site Preparation	Lifetime
<u>Costs Included in Above Categories</u>	
23. Mark Ups	Included
24. Removal Costs	Included in above @ 15 %
25. Soft Costs	Included in above @ 25 %

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<sup>5</sup> IT Equipment is not included.

## 2.1.a Building Subsystem Component Examples

- 1. Roofing** **Life Cycle: 25 Years**
  - Sheet metal flashing
  - Rigid insulation at roof
  - Roof hatches
  - Skylights
  - Applied membranes at roofs and decks
  
- 2. Building Exteriors, Doors And Windows** **Life Cycle: 70 Years**

Renewable items include:

  - Exterior doors and door hardware
  - Exterior windows, frames, glass and glazing
  
- 3. Building Exteriors – Walls And Stairs** **Life Cycle: 30 Years**

Exteriors include pre-stressed concrete, brick, cinderblock, metal, etc.  
Renewable items include

  - Re-caulking, sealing, sandblasting, replacing plaster, etc
  - Brick pointing, caulking, sealing, railings
  
- 4. Elevators And Conveying Systems** **Life Cycle: 25 Years**
  - Elevators, escalators, and dumbwaiters
  - Cables
  - Control Systems
  - Any vertical, motorized transportation
  
- 5. HVAC – Controls** **Life Cycle: 20 Years**
  - Control Systems
  
- 6. HVAC – Equipment** **Life Cycle: 25 Years**
  - Exchangers and circulating pumps
  - Fan coil units
  - Condensing units
  - Exhaust and ventilation units
  - Local chillers and boilers
  - Rooftop AC and heating units, window units
  
- 7. HVAC – Distribution Systems** **Life Cycle: 50 Years**
  - Ductwork
  - Grilles, diffusers, piping, storage and insulation

## 2.1.a Building Subsystem Component Examples continued

- |   |                                    |
|---|------------------------------------|
| <b>8. Electrical Equipment</b> <ul style="list-style-type: none"><li>• Building transformers, service panels and fuses</li><li>• Emergency power within the building</li><li>• Light fixtures, power receptacles</li></ul>  | <b>Life Cycle: <u>30 Years</u></b> |
| <b>9. Lighting</b> <ul style="list-style-type: none"><li>• Building lighting systems</li></ul>  | <b>Life Cycle: <u>20 Years</u></b> |
| <b>10. Power Wiring</b> <ul style="list-style-type: none"><li>• Conduit and wire</li></ul>  | <b>Life Cycle: <u>70 Years</u></b> |
| <b>11. Plumbing Fixtures</b> <ul style="list-style-type: none"><li>• Floor and roof drains</li><li>• Condensate drain piping</li><li>• Water closets, lavatories, service sinks (in non-public areas)</li></ul>   | <b>Life Cycle: <u>25 Years</u></b> |
| <b>12. Plumbing Rough-In</b> <ul style="list-style-type: none"><li>• Sanitary sewer waste and vent piping</li><li>• Domestic and industrial water supply</li><li>• Air, gas and vacuum piping</li><li>• All building service piping within 5' of building</li></ul>   | <b>Life Cycle: <u>50 Years</u></b> |
| <b>13. Fire Protection Systems</b> <ul style="list-style-type: none"><li>• Fire sprinkler systems</li><li>• Gas or halon systems</li></ul>  | <b>Life Cycle: <u>40 Years</u></b> |
| <b>14. Fire Detection Systems</b> <ul style="list-style-type: none"><li>• Fire alarm detection devices, horns, strobes, heat detectors, pull stations</li></ul>   | <b>Life Cycle: <u>20 Years</u></b> |
| <b>15. Built-In Specialties &amp; Equipment</b> <ul style="list-style-type: none"><li>• Casework, shelving, and bench-tops</li><li>• Chalk boards, marker boards and tackable wall surfaces</li><li>• Operable partitions</li><li>• Fume Hoods</li><li>• Autoclaves, glassware washers, cold rooms, dark room equipment</li></ul> | <b>Life Cycle: <u>25 Years</u></b> |

## 2.1.a Building Subsystem Component Examples continued

### 16. Interior Finishes

Life Cycle: 15 Years

- Interior doors and hardware
- Carpet, resilient flooring and floor covering
- Vinyl wall covering
- Ceilings

### Other Categories Not Included:

### 17. Foundations

Life Cycle: Lifetime

- Basement excavation and disposal of excavated material
- Temporary or permanent shoring for support of excavation at below grade structure
- Concrete piles, piers, footings, grade beams, caissons
- Sub-grade drainage and waterproofing required at foundation system

### 18. Sub-Grade Drainage And Waterproofing

Life Cycle: As Needed

### 19. Vertical Elements

Life Cycle: Lifetime

- All columns and pilasters
- All exterior wall framing including plaster, gypsum board and insulation
- Applied fire proofing
- Stairs with at least one story height

### 20. Horizontal Elements

Life Cycle: Lifetime

- Grade and non grade floors
- Beams, girders, trusses, joists and decking
- Concrete topping slabs
- All roof and ceiling framing
- Applied fire proofing
- Ceiling insulation

### 21. Interior Partitions

Life Cycle: As Needed

- Interior wall framing including gypsum wall board
- Insulation
- Non wear finishes such as gypsum board, acoustical tiles, plaster soffits and ceramic tile
- Interior windows, glass and glazing

## 2.1.a Building Subsystem Component Examples continued

### 22. Site Preparation

- Site clearing and grading
- Site demolition
- Hazardous material abatement

Life Cycle: Lifetime

### 23. Mark Ups

- General conditions, contractor's administration costs
- Overhead and profit, fee for profit of performing work
- Insurance and bonds
- Escalation (to establish 2007 base costs)
- Contingency or market factor

Included

### 24. Removal Costs

- Cost allowance associated with removing old and worn out system prior to renewal
- Does not include removal of associated systems in the vicinity of system to be removed

Included In Above @ 15%

### 25. Soft Costs

- Costs associated with design, management and inspection of renewal project
- Planning and design
- Management and inspection
- Specifications and bidding
- Change Orders (assumed to average 6.5%)

Included In Above @ 25%

## 2.2 Renewal Cost Assumptions

(Costs are per GSF and include 25% soft and 15% Removal)				
<b>Subsystem</b>	<b>Building Type</b>			
	<b>Complex</b>	<b>Basic</b>	<b>Simple</b>	<b>Small</b>
1. Roofing - SUNY Standard	\$10.00	\$10.00	\$10.00	
2. Building Exteriors, Doors and Windows	\$23.50	\$23.50	\$1.00	
3. Building Exteriors - Walls	\$11.50	\$11.50	\$7.00	
4. Elevators and Conveying Systems	\$4.00	\$4.00	\$3.00	
5. HVAC - Controls	\$11.50	\$9.00	\$0.50	
6. HVAC - Equipment	\$17.50	\$13.00	\$1.00	
7. HVAC - Distribution Systems	\$35.00	\$22.00	\$4.50	
8. Electrical - Equipment	\$20.00	\$13.00	\$1.00	
9. Lighting	\$4.00	\$4.00	\$2.50	
10. Power Wiring	\$10.00	\$7.00	\$1.00	
11. Plumbing Fixtures	\$8.00	\$4.50	\$0.50	
12. Plumbing Rough-In	\$17.50	\$11.00	\$2.50	
13. Fire Protection	\$6.00	\$6.00	\$2.50	
14. Fire Detection	\$4.00	\$4.00	\$1.50	
15. Built-in Equipment & Specialties	\$30.00	\$6.00	\$0.00	
16. Interior Finishes	\$14.00	\$14.00	\$0.00	
17. Small Buildings (one subsystem)				\$87.75

### 2.3 Regional Cost Index Factors\*

<u>Campus</u>	<u>Regional Index Factor</u>	<u>Campus</u>	<u>Regional Index Factor</u>
Albany	1.04	Envir Sci/For	1
Alfred Ceramics	1	Farmingdale	1.43
Alfred State Col	1	Fredonia	0.97
Binghamton	1	Geneseo	1.03
Brockport	1.05	Maritime	1.47
Buffalo College	1.09	Morrisville	1
Buffalo Univ	1.09	New Paltz	1.2
Canton	1	Old Westbury	1.4
Cobleskill	1.03	Oneonta	1.03
Cornell - AG	1.02	Optometry	1.47
Cornell - Gen AG	1.02	Oswego	1.03
Cornell - Gen SVS	1.02	Plattsburgh	1
Cornell - I&LR	1.02	Potsdam	1
Cornell - Vet	1.02	Purchase	1.32
Cortland	1.01	Stony Brook	1.43
Delhi	1.06	SUNY IT	0.99
Downstate	1.47	Sys Adm	1.04
Empire State	1.04	Upstate	1

\*Source: SUCF



## 2.4 SUNY Buildings Used for Cost Assumptions

<u>Buildings with Basic Systems</u>		<u>GSF</u>	<u>Buildings with Complex Systems</u>		<u>GSF</u>
1	New Paltz Athletic Center	61,262	1	Albany Life Sciences	194,369
2	Utica/Rome Library/Communication	66,045	2	Albany Husted Hall Rehab	50,175
3	Cobleskill Dairy Complex	42,410	3	Brooklyn Anatomy Relocate	19,590
4	Albany Art/Studio	22,927	4	Farmingdale Bioscience	37,427
5	Binghamton Classroom	13,723	5	Farmingdale Luptin Rehab	27,121
6	Binghamton Field House	156,436	6	Geneseo Science Rehab	104,681
7	Cortland Stadium	32,850	7	HSC Labs Rehab	25,640
8	Cornell MVR Rehab Expansion	35,347	8	Stony Brook Plaza Repairs	56,693
9	Albany Public Safety	10,042	9	Oneonta Science Rehab	78,370
10	Cobleskill Salt Storage	1,304			
11	Bufalo-North Math	33,629		<b>Total</b>	<b>594,066</b>
12	Oneonta Field House	94,035			
13	Ag & Life Sci Research Greenhouse	13,346			
14	Cobleskill Day Care	15,418			
15	Empire 2 Union Ave	51,309			
16	Syracuse Academic Building	46,725			
17	Oswego Rec Ctr	115,421			
18	Purchase Academic	48,461			
19	Albany Admin	56,237			
20	Morrisville Academic	38,300			
21	Buffalo College Campus Center-Phase 1	25,469	12559(new)/12910(Rehab)		
22	Morrisville Rehab/Addition, Horticulure Bldg	9,782	7670(new)/2112(rehab)		
23	Fredonia Renovate/Addition-Cranston Hall	93,546	75403(new)/18143(renov)		
24	Canton Student Union	54,400			
25	Oswego Rich Hall	53,742			
26	Fredonia Steele Hall Natatorium	36,500			
27	Morrisville Auto Tech	50,250			
28	Empire State Rehab 28 Union	12,642			
29	Cortland Brockway Hall	36,870			
30	Utica/Rome Kunsela Hall	40,635			
	<b>Total</b>	<b>1,369,063</b>			

## 2.5 Special Consideration Definitions<sup>6</sup>

### 1. Parking Structures

Joint use parking buildings, such as a joint office and parking building, should be split into two buildings and entered appropriately.

### 2. Buildings with 5 to 8 Levels

A floor is counted as a level if it has assignable square feet – regardless of whether the assignable square feet are located above or below grade. Not included (as a level) is the lowest floor (i.e. basement) or highest floor (penthouse) if that floor contains only mechanical equipment or control rooms.

### 3. Buildings with Chillers

A building is assigned a “chiller” special consideration if there are chillers within the building that are the primary source of cooling for that building. (Central chillers are considered part of the infrastructure and not included in the building subsystems.)

### 4. Historic Buildings

A building is considered Historic if it is on a National, State, or Local Registry.

### 5. Back-up Generators

Buildings that have Back-up Generators dedicated to that building should be labeled “Back-up Generator.”

### 6. Libraries

### 7. Environmental Remediation

Buildings constructed prior to 1973 are assumed to have environmental remediation needs. The cost of environmental remediation is assumed to occur when the HVAC Distributions System needs replacement.

### 8. Increment for Major Rehab

A building is labeled “Major Rehab” when the intention is to gut-and-replace the building. The costs for this sort of project are significantly higher than for just renewing the systems.

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<sup>6</sup> Special Consideration applies only to specific buildings.

## 2.6 Special Consideration Costs

Sub-system	Historic Buildings	Building Levels		Boiler or Chiller	Back-up Generator	Library	Environmental Remediation	Major Rehab	Parking (relative to Simple)
		5 to 8 levels	9 or more						
1. Roofing - SUNY Standard	+ 12%								
2. Building Exteriors, Drs and Wndw	+ 22%	+15%	+25%						(\$0.50)
3. Building Exteriors - Walls	+ 22%	+15%	+25%						(\$5.00)
4. Elevators and Conveying Systems		+15%	+25%						
5. HVAC - Controls		+15%	+25%						
6. HVAC - Equipment		+15%	+25%	+ \$6.00	+ \$3.50				
7. HVAC - Distribution Systems	+17%	+15%	+25%				+ \$10.00		(\$2.75)
8. Electrical - Equipment		+15%	+25%						
9. Lighting	+ 7%	+15%	+25%						
10. Power Wiring	+17%	+15%	+25%						
11. Plumbing Fixtures	+17%	+15%	+25%						
12. Plumbing Rough-In	+17%	+15%	+25%						(\$1.50)
13. Fire Protection	+17%	+15%	+25%						(\$2.00)
14. Fire Detection		+15%	+25%						(\$1.00)
15. Built-in Equip & Specialties	+ 7%	+15%	+25%			+ \$18.00			\$1.00
16. Interior Finishes	+17%	+15%	+25%						
<b>* Applied to GSF Building Costs</b>								+ \$62/gsf to bldg costs	

\* Environmental Remediation- limited to HVAC Distribution Systems for buildings constructed prior to 1973.

## 2.7 Infrastructure Assumptions

### Inclusions and Method of Measurement

The unit of measurement is intended to capture the majority of the cost and be easy to measure. The unit rates have been adjusted for peripheral or secondary issues.

#### 1. Roads

Unit of measurement is Lane-Linear Feet (LLF)

- A four lane road would have 4 LLF per linear foot, a two lane road 2 LLF per linear foot and so on.

#### 2. Landscape and Hardscape

**Courtyard** areas are intended to be the central or signature spaces that have hard surfaces, built-in planters, furniture and lighting. Landscaping should not be counted as part of the courtyard space.

Unit of measurement is square foot surface area.

**Sidewalks** include pedestrian walkways adjacent to roads and structures.

Unit of measurement is square foot of surface area.

**Maintained landscape** covers areas of mature planting and irrigation including median strips.

Unit of measurement is square foot of surface area.

**Pedestrian pathways/bikeways** 6'-8' wide shall be measured per linear foot.

**Surface Parking** (multi story parking structures are included as buildings) is measured in square feet.

### 3. Utilities - Distribution

Utility Distribution refers to the distribution of utilities outside of the buildings.

**Gas service:** Unit of measurement is linear feet.

**Chilled water:** Unit of measurement is linear feet.

**Steam service:** Unit of measurement is linear feet.

**Water supply:** will include potable, fire and domestic.

The unit of measurement is the combined linear footage greater than 6" diameter.

**Sanitary Sewers:** Unit of measurement is linear feet of sewer pipes.

**Storm Drainage:** Unit of measurement is linear feet of drainage pipes.

**Site Lighting:** Unit of measurement is the number of light poles.

### 4. Utilities - Generation

#### Electrical

- Switchgear capacity: This is the total campus capacity based on the high/medium voltage switchgear KVA rating. Include all switchgear maintained by the campus. Unit of measurement is total KVA.
- Transformers: There are two units of measurement. (1) is total KVA to transform higher level KV (greater than 15 KV) to medium (5 – 15KV) level KV. (2) is total KVA of transformers required to convert medium voltage (5 – 15 KV) to lower voltage (600V). Please note that building transformers are included in buildings as a part of the “electrical equipment” and therefore should not be counted here.

#### HVAC Equipment

- Unit of measurement for cooling will be total central capacity in tons.
- Unit of measurement for heating will be the total central capacity in MBTUH.
- Pumping units will be total capacity in gallons per minute (G.P.M.).

### 5. Athletic Fields

**Baseball/Softball Fields:** Unit of measurement is the number of fields.

**Football/Soccer/Lacrosse Fields:** Unit of measurement is the number of fields.

**Basketball/Tennis Courts:** Unit of measurement is the number of courts.

## 2.8 Infrastructure Cost Assumptions

	UoM	\$ per Unit	Life Cycle	\$/Year
<b>1 Roads</b>	LLF	\$155.00	25	\$6.20
<b>2 Landscape and Hardscape</b>				
a. Surface parking	SF	\$3.75	25	\$0.15
b. Signature Courtyard Areas	SF	\$21.00	50	\$0.42
c. Sidewalks	SF	\$5.50	40	\$0.14
d. Maintained Landscape Area	SF	\$0.70	20	\$0.04
e. Sidewalks	SF	\$5.50	40	\$0.14
<b>3 Utilities Distribution</b>				
a. Power Cabling (in duct banks)				
Primary Main Loop (15kV)	LF	\$84.00	50	\$1.68
b. Water Supply (fire and domestic)	LF	\$70.00	50	\$1.40
c. Gas Service to Buildings	LF	\$42.00	50	\$0.84
d. Steam (insulated)				
greater than 6" diameter	LF	\$281.00	40	\$7.03
e. Chilled Water (not insulated) [2 pipe system]	LF	\$372.00	50	\$7.44
f. Sanitary Sewers	LF	\$70.00	100	\$0.70
g. Storm Sewers	LF	\$105.00	100	\$1.05
h. Site Lighting	count	\$10,000.00	20	\$500
<b>4 Utilities Generation</b>				
a. Electrical				
Campus Switchgear Capacity	KVA	\$211.00	50	\$4.22
Campus Transformers	KVA	\$126.00	50	\$2.52
b. HVAC Equipment (CEF)				
Cooling	tons	\$1,053.00	25	\$42.12
Heating	Mbtu/hr	\$35.00	20	\$1.75
<b>5 Athletic Fields</b>				
a. Baseball/Softball Fields	count	\$790,000.00	25	\$31,600.00
b. Football/Soccer/Lacrosse Fields	count	\$1,140,000.00	25	\$45,600.00
c. Tennis/Basketball Courts	count	\$34,000.00	30	\$1,133.00

### 3. Validation Data

The Validation Data section that follows includes information about the buildings in the SUNY system that was imported to the FRRM™ for the renewal analysis. The purpose of the validation reports is to verify that the information about the buildings is correct and reasonable.

Buildings with **complex** systems include wet-labs, research and animal care facilities.

Buildings with **basic** systems are offices, classrooms and libraries. These represent the bulk of the SUNY buildings.

Buildings with **simple** systems consist of warehouses and parking structures.

**Small** Buildings are buildings under 5,000 gsf.

**Figure 3.1** *GSF Summary by Building Type*, shows the gross square footage (gsf) by building type for each campus. Across the system, buildings with Basic systems (or Basic buildings) account for almost 80% of the square footage, complex buildings account for a little over 16% with the remaining 4% split between simple and small buildings. Small buildings, which account for only 2.5% of the total gross square feet of the system,<sup>7</sup> are 48% of the SUNY buildings by count (876 buildings are “small”).

These percentages vary significantly among individual campuses, with Downstate and Upstate having a considerably higher percentage of complex buildings.

**Figure 3.2** *SUNY GSF of Buildings by Construction Year*, is a system-wide histogram showing gsf of buildings by construction date (for the educational facility buildings). This chart demonstrates that a substantial portion of the SUNY buildings were constructed during the late 1960’s and early 1970’s. Please note that the 1970 bar reflects construction from 1966 to 1970.

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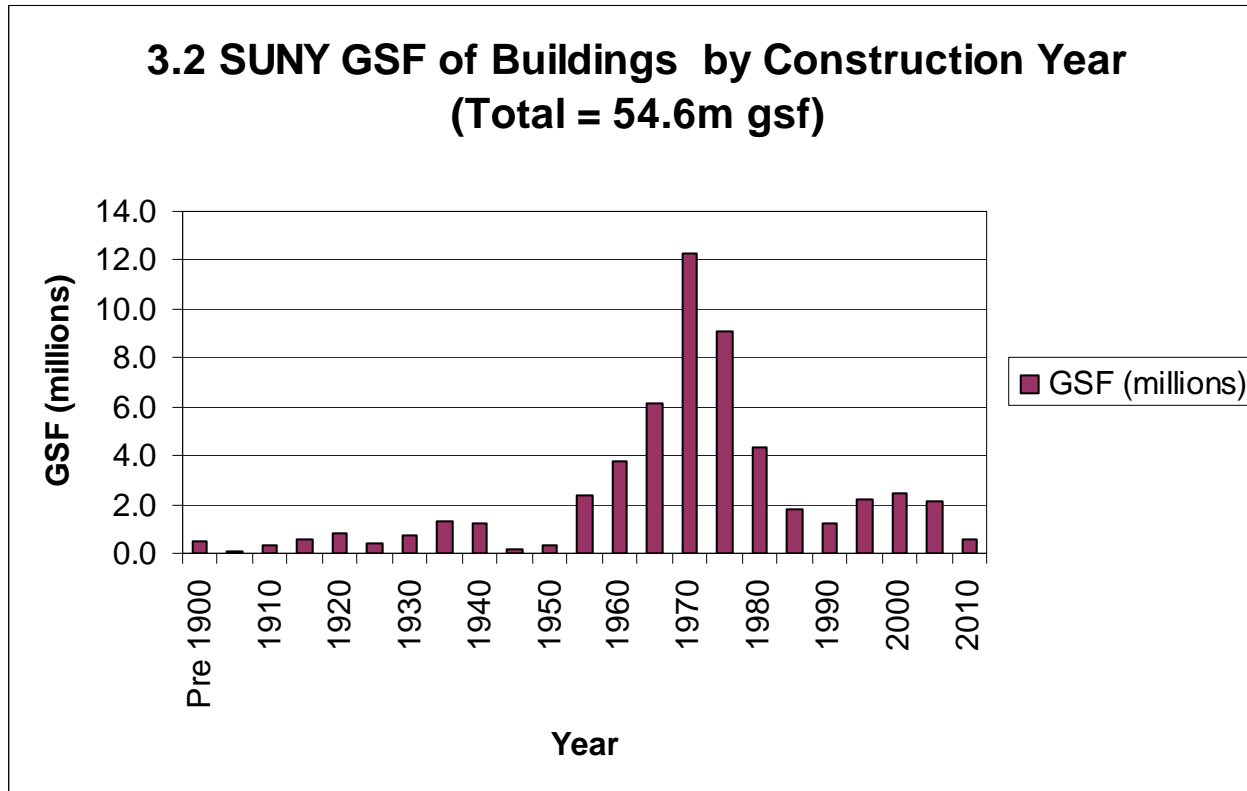
<sup>7</sup> These small buildings are included in the analysis, with appropriate life cycle costs. However, individual component assessment information for each building was not provided nor do these small buildings have detailed information by subsystem.

### 3.1 Gross Square Feet Summary by Building Type

<u>Campus</u>	<u>BASIC</u>	<u>COMPLEX</u>	<u>SIMPLE</u>	<u>SMALL</u>	<u>TOTAL</u>
Albany	2,681,439	497,443		7,821	<b>3,186,703</b>
Alfred Ceramics	239,032	148,036		9,189	<b>396,257</b>
Alfred State Col	568,621	132,834	10,560	65,066	<b>777,081</b>
Binghamton	2,795,294	511,799	18,330	12,528	<b>3,337,951</b>
Brockport	1,730,170	76,470		24,300	<b>1,830,940</b>
Buffalo College	2,043,650	178,094		5,285	<b>2,227,029</b>
Buffalo Univ	5,428,658	1,703,419	75,574	44,170	<b>7,251,821</b>
Canton	488,862	12,054		15,030	<b>515,946</b>
Cobleskill	647,923	35,450	7,254	74,067	<b>764,694</b>
Cornell - AG	2,074,982	391,875	16,114	291,546	<b>2,774,517</b>
Cornell - Gen AG	280,746	173,886	48,257	103,066	<b>605,955</b>
Cornell - Gen SVS	451,828			4,988	<b>456,816</b>
Cornell - I&LR	264,265				<b>264,265</b>
Cornell - Vet	172,780	655,243	55,238	108,249	<b>991,510</b>
Cortland	1,534,616	1,423		57,302	<b>1,593,341</b>
Delhi	668,700	9,588		20,571	<b>698,859</b>
Downstate	228,913	873,258	274,000	5,220	<b>1,381,391</b>
Empire State	33,595				<b>33,595</b>
Envir Sci/For	550,400	302,379	5,979	190,445	<b>1,049,203</b>
Farmingdale	942,839	250,559		32,551	<b>1,225,949</b>
Fredonia	1,167,570	61,973		14,814	<b>1,244,357</b>
Geneseo	1,232,789	179,204	6,200	2,811	<b>1,421,004</b>
Maritime	414,759		12,312	24,498	<b>451,569</b>
Morrisville	908,106	43,368	44,427	52,993	<b>1,048,894</b>
New Paltz	1,078,607	238,537		29,373	<b>1,346,517</b>
Old Westbury	711,478	69,386	10,360	35,336	<b>826,560</b>
Oneonta	1,334,022	78,388		21,139	<b>1,433,549</b>
Optometry		298,000			<b>298,000</b>
Oswego	2,089,042	115,421		14,370	<b>2,218,833</b>
Plattsburgh	1,333,701		29,237	13,100	<b>1,376,038</b>
Potsdam	1,410,319	101,400	5,009	1,073	<b>1,517,801</b>
Purchase	1,674,812	89,035		16,434	<b>1,780,281</b>
Stony Brook	4,988,000	1,071,090	82,380	63,014	<b>6,204,484</b>
SUNY IT	478,231		6,569	10,128	<b>494,928</b>
Sys Adm	377,437		255,000	2,023	<b>634,460</b>
Upstate	331,012	650,701		6,426	<b>988,139</b>
<b>Grand Total</b>	<b>43,357,198</b>	<b>8,950,313</b>	<b>962,800</b>	<b>1,378,926</b>	<b>54,649,237</b>
Percent	79.3%	16.4%	1.8%	2.5%	100.0%



### 3.2 Histogram of GSF by Construction Year



Please note that each bar reflects a five year cohort (e.g. 1970 includes construction from 1966 to 1970).

## 4. Building Backlog

The building backlog of deferred maintenance section details the backlog of renewal needs and costs by campus and subsystem along with the Facilities Condition Index for each campus. The Facilities Condition Index or FCI is defined as the backlog divided by the building current replacement value (CRV). The ideal is to maintain an FCI under .05 (i.e. a backlog of less than 5% of CRV).

**Figure 4.1, *Building Backlog Costs by Campus and Subsystem***, shows the building backlog by subsystem and campus. The largest contributions to the backlog are: exterior doors and windows (\$388m); HVAC controls, equipment and distribution (\$1.2 billion); electrical equipment (\$138m); built-in equipment and specialties [primarily in complex buildings] (\$131m); and interior finishes (\$130m). These systems represent over 80% of the identified backlog.

**Figure 4.2, *Building Backlog, Current Replacement Value and FCI by Campus***, provides the FCI for each campus. Downstate, Maritime, Brockport and Cornell Gen SVS all have FCI's of above .15. FCI's of .2 and higher frequently indicate a deteriorating situation where the backlog rapidly cascades into additional systems resulting in expensive emergency repairs.

(Infrastructure backlog is included in Section 6.)

### 4.1 Building Backlog Costs by Campus and Subsystem (\$ 000's)

Subsystem	Roofing	Exterior Walls	Ext. Doors & Windows	Elevators	HVAC Controls	HVAC Equip	HVAC Distrib.	Electrical Equip.	Lighting	Power Wiring
<b>Campus</b>										
Albany	\$4,418	\$3,602	\$32,489	\$370	\$6,951	\$11,350	\$41,377	\$1,335	\$338	\$2,167
Alfred Ceramics	\$27	\$862	\$3,550						\$109	\$153
Alfred State Col	\$781	\$94	\$2,143		\$330	\$252	\$449	\$325	\$90	\$197
Binghamton	\$281	\$1,717	\$15,107	\$3,732	\$6,224	\$16,667	\$30,354	\$6,444	\$3,853	\$5,533
Brockport	\$2,417	\$5,861	\$24,217	\$482	\$1,142	\$10,355	\$32,105	\$10,733	\$3,458	\$5,147
Buffalo College	\$1,737	\$1,568	\$7,963	\$299	\$2,263	\$10,091	\$31,899	\$1,663	\$1,434	\$6,244
Buffalo Univ	\$4,767	\$15,687	\$21,969	\$5,019	\$19,816	\$61,207	\$122,162	\$21,118	\$6,434	\$12,594
Canton	\$836	\$645	\$4,535		\$1,658	\$255			\$125	
Cobleskill	\$1,240	\$2,639	\$7,532		\$763	\$1,954	\$3,312	\$3,804	\$432	\$2,021
Cornell - AG	\$1,847	\$1,776	\$7,920	\$1,162	\$3,124	\$5,808	\$23,147	\$4,142	\$407	\$2,082
Cornell - Gen AG	\$613	\$769	\$1,919	\$211	\$1,896	\$2,128	\$1,613	\$2,678	\$581	\$1,121
Cornell - Gen SVS	\$463	\$623	\$5,828	\$954	\$1,638	\$3,099	\$7,954	\$3,099	\$1,176	\$1,618
Cornell - I&LR	\$188	\$885		\$179	\$391		\$1,564		\$125	
Cornell - Vet	\$367	\$998	\$3,868	\$377	\$4,134	\$7,096	\$16,132	\$1,027	\$216	\$7
Cortland	\$180	\$323	\$5,684	\$116	\$2,890	\$7,997	\$15,904	\$280	\$585	\$889
Delhi	\$931	\$1,348	\$4,674	\$81	\$1,884	\$1,137	\$2,019	\$329	\$77	\$292
Downstate	\$669	\$6,349	\$30,686	\$6,447	\$11,109	\$22,400	\$54,771	\$16,632	\$924	\$11,467
Empire State					\$120		\$842		\$18	
Envir Sci/For	\$466	\$1,379	\$4,197	\$815	\$2,122	\$7,977	\$19,049	\$4,393	\$348	\$217
Farmingdale	\$2,984	\$2,632	\$14,917	\$2,818	\$2,937	\$7,492	\$10,677	\$2,214	\$1,703	\$1,699
Fredonia	\$508	\$1,590	\$8,495	\$1,050	\$4,246	\$2,260	\$5,044	\$3,074	\$591	
Geneseo	\$915		\$7,385	\$247	\$3,590	\$8,849	\$22,537	\$2,384	\$2,042	\$2,700
Maritime	\$1,251	\$439	\$4,012	\$1,074	\$1,893	\$3,034	\$9,586	\$6,343	\$1,103	\$3,858
Morrisville	\$420	\$1,393	\$5,749	\$278	\$1,306	\$2,598	\$6,311	\$2,126	\$266	\$1,103
New Paltz	\$1,483	\$1,504	\$6,143	\$1,013	\$3,068	\$5,478	\$14,075	\$4,658	\$692	\$2,454
Old Westbury	\$719	\$5,262	\$13,922	\$2,125	\$2,805	\$6,142	\$7,195	\$5,954	\$850	\$2,403
Oneonta	\$403	\$482	\$3,622	\$197	\$3,535	\$12,187	\$16,313	\$2,005	\$193	\$1,488
Optometry			\$1,609	\$2,190	\$4,723	\$7,187	\$14,374			\$1,369
Oswego	\$1,826	\$10,971	\$16,028	\$2,442	\$9,259	\$15,647	\$32,415	\$736	\$371	
Plattsburgh	\$1,581	\$880	\$5,822	\$180	\$2,851	\$5,974	\$10,716	\$1,428	\$599	\$863
Potsdam		\$224	\$6,901		\$3,523	\$3,574	\$14,400	\$1,044	\$1,239	\$1,494
Purchase	\$1,536	\$9,531	\$20,396	\$4,165	\$8,118	\$19,295	\$24,742	\$1,135	\$84	\$322
SUNY IT	\$455								\$241	
Stony Brook	\$4,749	\$29,980	\$86,910	\$9,221	\$21,632	\$52,469	\$112,515	\$24,982	\$5,558	\$4,227
Sys Adm	\$218	\$1,166	\$966	\$688	\$1,784	\$4,849	\$8,249	\$180	\$469	\$110
Upstate	\$166	\$758	\$1,203	\$124	\$1,785	\$3,580	\$8,659	\$1,405	\$374	\$1,940
<b>Total</b>	<b>\$41,442</b>	<b>\$113,937</b>	<b>\$388,361</b>	<b>\$48,056</b>	<b>\$145,510</b>	<b>\$330,388</b>	<b>\$722,461</b>	<b>\$137,670</b>	<b>\$37,105</b>	<b>\$77,779</b>
Percent	1.7%	4.6%	15.8%	2.0%	5.9%	13.4%	29.4%	5.6%	1.5%	3.2%

**4.1 Building Backlog Costs by Campus and Subsystem (\$ 000's) – Continued**

Subsystem	Plumbing	Plumbing	Fire	Fire	Built-in/	Interior		Major	Total	Percent
	Fixtures	Rough-in	Protection	Detection	Specialties	Finishes	Small	Rehab		
<b>Campus</b>										
Albany	\$3,556		\$111	\$878	\$7,194	\$3,791			\$119,929	4.9%
Alfred Ceramics	\$9				\$1,634	\$565			\$6,908	0.3%
Alfred State Col	\$131				\$592	\$117			\$5,499	0.2%
Binghamton	\$4,078		\$292	\$3,341	\$5,155	\$2,849			\$105,627	4.3%
Brockport	\$3,635		\$498	\$2,022	\$1,161	\$4,241			\$107,475	4.4%
Buffalo College	\$2,703			\$1,943	\$8,544	\$5,118			\$83,467	3.4%
Buffalo Univ	\$11,795	\$1,772	\$5,681	\$21,870	\$43,026	\$12,903		\$9,988	\$397,808	16.2%
Canton	\$772				\$3,044	\$287			\$12,156	0.5%
Cobleskill	\$587	\$259	\$141	\$331	\$282	\$1,640		\$834	\$27,771	1.1%
Cornell - AG	\$1,570				\$6,841	\$1,189			\$61,015	2.5%
Cornell - Gen AG	\$921		\$196	\$756	\$2,772	\$1,065	\$264		\$19,504	0.8%
Cornell - Gen SVS	\$1,110				\$1,282	\$2,293			\$31,136	1.3%
Cornell - I&LR	\$230					\$215			\$3,777	0.2%
Cornell - Vet	\$1,034	\$62	\$24		\$7,240	\$1,080			\$43,662	1.8%
Cortland	\$590			\$545	\$5,715	\$3,633			\$45,330	1.8%
Delhi	\$1,581		\$328	\$294	\$590	\$948			\$16,515	0.7%
Downstate	\$2,716		\$4,966	\$480	\$4,160	\$8,587			\$182,364	7.4%
Empire State	\$56					\$100			\$1,136	0.0%
Envir Sci/For	\$245				\$1,040	\$1,410			\$43,658	1.8%
Farmingdale	\$3,182	\$1,404	\$1,955	\$1,053	\$1,854	\$5,863			\$65,382	2.7%
Fredonia	\$599		\$194	\$1,975	\$1,571	\$1,493			\$32,689	1.3%
Geneseo	\$2,791			\$3,638	\$2,810	\$2,718			\$62,606	2.5%
Maritime	\$1,817				\$1,395	\$2,507			\$38,312	1.6%
Morrisville	\$595		\$823		\$341	\$1,139			\$24,449	1.0%
New Paltz	\$2,224	\$1,346	\$734	\$434	\$1,189	\$4,648		\$115	\$51,258	2.1%
Old Westbury	\$953			\$22	\$1,457	\$4,659			\$54,468	2.2%
Oneonta	\$1,865	\$151	\$528	\$55	\$2,696	\$1,399		\$2,338	\$49,457	2.0%
Optometry	\$3,285		\$1,643			\$1,150			\$37,529	1.5%
Oswego	\$3,936		\$944		\$2,112	\$6,743			\$103,432	4.2%
Plattsburgh	\$394		\$73		\$863	\$1,768			\$33,992	1.4%
Potsdam	\$790			\$438	\$489	\$2,561			\$36,677	1.5%
Purchase	\$1,484				\$3,577	\$8,238			\$102,624	4.2%
SUNY IT	\$279								\$975	0.0%
Stony Brook	\$9,148		\$838	\$909	\$7,260	\$31,203			\$401,600	16.3%
Sys Adm	\$1,333				\$1,835	\$219			\$22,068	0.9%
Upstate	\$1,222				\$1,189	\$2,049			\$24,455	1.0%
<b>Total</b>	<b>\$73,216</b>	<b>\$4,994</b>	<b>\$19,969</b>	<b>\$40,984</b>	<b>\$130,910</b>	<b>\$130,388</b>	<b>\$264</b>	<b>\$13,275</b>	<b>\$2,456,709</b>	<b>100.0%</b>
Percent	3.0%	0.2%	0.8%	1.7%	5.3%	5.3%	0.0%	0.5%	100.0%	

#### 4.2 SUNY Backlog, Current Replacement Value and FCI by Campus

<b>Campus</b>	<b>Backlog</b>	<b>CRV</b>	<b>FCI (*)</b>
Albany	\$119.9	\$1,225	0.10
Alfred Ceramics	\$6.9	\$167	0.04
Alfred State Col	\$5.5	\$262	0.02
Binghamton	\$105.6	\$1,283	0.08
Brockport	\$107.5	\$660	0.16
Buffalo College	\$83.5	\$866	0.10
Buffalo Univ	\$397.8	\$3,120	0.13
Canton	\$12.2	\$170	0.07
Cobleskill	\$27.8	\$250	0.11
Cornell - AG	\$61.0	\$1,025	0.06
Cornell - Gen AG	\$19.5	\$214	0.09
Cornell - Vet	\$43.7	\$450	0.10
Cornell Gen SVS	\$31.1	\$192	0.16
Cornell I&LR	\$3.8	\$100	0.04
Cortland	\$45.3	\$544	0.08
Delhi	\$16.5	\$243	0.07
Downstate	\$182.4	\$923	0.20
Empire State	\$1.1	\$14	0.08
Envir Sci/For	\$43.7	\$406	0.11
Farmingdale	\$65.4	\$635	0.10
Fredonia	\$32.7	\$430	0.08
Geneseo	\$62.6	\$526	0.12
Maritime	\$38.3	\$222	0.17
Morrisville	\$24.4	\$335	0.07
New Paltz	\$51.3	\$611	0.08
Old Westbury	\$54.5	\$402	0.14
Oneonta	\$49.5	\$508	0.10
Optometry	\$37.5	\$263	0.14
Oswego	\$103.4	\$769	0.13
Plattsburgh	\$34.0	\$454	0.07
Potsdam	\$36.7	\$523	0.07
Purchase	\$102.6	\$832	0.12
Stony Brook	\$401.6	\$3,457	0.12
SUNYIT	\$1.0	\$160	0.01
Sys Adm	\$22.1	\$197	0.11
Upstate	\$24.5	\$504	0.05
<b>Total</b>	<b>\$2,456.7</b>	<b>\$22,942</b>	<b>0.11</b>

(\*) FCI is calculated by the Backlog divided by the CRV

## 5. Building Backlog and Renewal Projections

This section provides five and ten-year forecasts of building backlog and renewal needs, along with the average annual amount of investment required for renewal costs in 2007 dollars.

**Figure 5.1, *Building Backlog and 5-year Renewal Needs by Subsystem***; shows those systems which are driving the renewal needs over the next five years. (The next five years of renewal will add an additional \$1.7 billion in building renewal needs to the \$2.5 billion in backlog.)

**Figure 5.2, *Building Backlog and 10-year Renewal Forecast by Campus***; shows the 10-year renewal forecast by campus. The total 10-year need is \$6.0 billion dollars.

**Figure 5.3, *Average Annual Renewal Needs vs. Current Replacement Value by Campus***; demonstrates that the average annual need varies between 1.4% and 1.7%. This, however, is an average value and does not reflect the year-by-year variances that occur for an individual campus.

**Figure 5.4, *System-wide Renewal Curve For 50-Years***; shows how the annual renewal needs for the system vary by year. The dotted line is the actual year-by-year numbers. These vary from a low of \$220 million (in 2009 and 2020) to a high of \$540 million in 2021. The heavy solid line dampens the effect of the year-to-year swings by applying a five-year running average (smoothing) to the actual model results. Renewal curves for individual campuses are likely to have wider variances.

**5.1 Building Backlog and 5-Year Renewal Needs by Subsystem (\$,000's)**

<b>Subsystem</b>	<b><u>Backlog</u></b>	<b><u>2008</u></b>	<b><u>2009</u></b>	<b><u>2010</u></b>	<b><u>2011</u></b>	<b><u>2012</u></b>	<b><u>Total</u></b>
1. Roofing - SUNY Standard	\$41,442	\$4,073	\$2,731	\$6,903	\$6,036	\$7,837	\$69,022
2. Exteriors - Doors, Windows	\$388,361	\$26,437	\$20,054	\$3,380	\$0	\$0	\$438,232
3. Building Exteriors - Walls	\$113,937	\$10,088	\$15,085	\$38,977	\$26,725	\$23,603	\$228,415
4. Elevators and Conveying Systems	\$48,056	\$8,250	\$3,491	\$4,202	\$7,592	\$6,379	\$77,970
5. HVAC -Controls	\$145,510	\$18,685	\$16,558	\$31,163	\$28,409	\$36,589	\$276,914
6. HVAC - Equipment	\$330,388	\$41,702	\$21,188	\$42,027	\$53,185	\$32,659	\$521,149
7. HVAC - Distribution Systems	\$722,461	\$51,630	\$39,039	\$10,560	\$1,578	\$14,967	\$840,235
8. Electrical - Equipment	\$137,670	\$23,432	\$8,117	\$27,751	\$25,027	\$36,764	\$258,761
9. Lighting	\$37,105	\$6,933	\$13,564	\$16,571	\$15,999	\$18,284	\$108,456
10. Power Wiring	\$77,779	\$4,743	\$6,144	\$0	\$0	\$272	\$88,938
11. Plumbing Fixtures	\$73,216	\$10,717	\$12,004	\$19,354	\$21,515	\$13,312	\$150,118
12. Plumbing Rough-in	\$4,994	\$15,707	\$6,390	\$18,614	\$9,917	\$21,287	\$76,909
13. Fire Protection Systems	\$19,969	\$2,332	\$1,739	\$0	\$0	\$0	\$24,040
14. Fire Detection Sytems	\$40,984	\$8,728	\$11,068	\$9,561	\$12,170	\$18,157	\$100,668
15. Built-in Equipment and Specialties	\$130,910	\$49,435	\$10,533	\$20,910	\$31,479	\$33,400	\$276,667
17. Interior Finishes	\$130,388	\$28,246	\$25,177	\$113,684	\$134,831	\$142,048	\$574,374
18. All Renewal - SMALL	\$264	\$9,174	\$6,446	\$8,360	\$4,700	\$8,849	\$37,793
19. Major Rehab Increment	\$13,279	\$410	\$0	\$0	\$0	\$0	\$13,689
<b>Total</b>	<b>\$2,456,713</b>	<b>\$320,722</b>	<b>\$219,328</b>	<b>\$372,017</b>	<b>\$379,163</b>	<b>\$414,407</b>	<b>\$4,162,350</b>

Note: only subsystems with backlog or renewal needs in the next five years are included in this report.

**5.2 SUNY Building Backlog and 10-Year Renewal Forecast by Campus (\$ millions)**

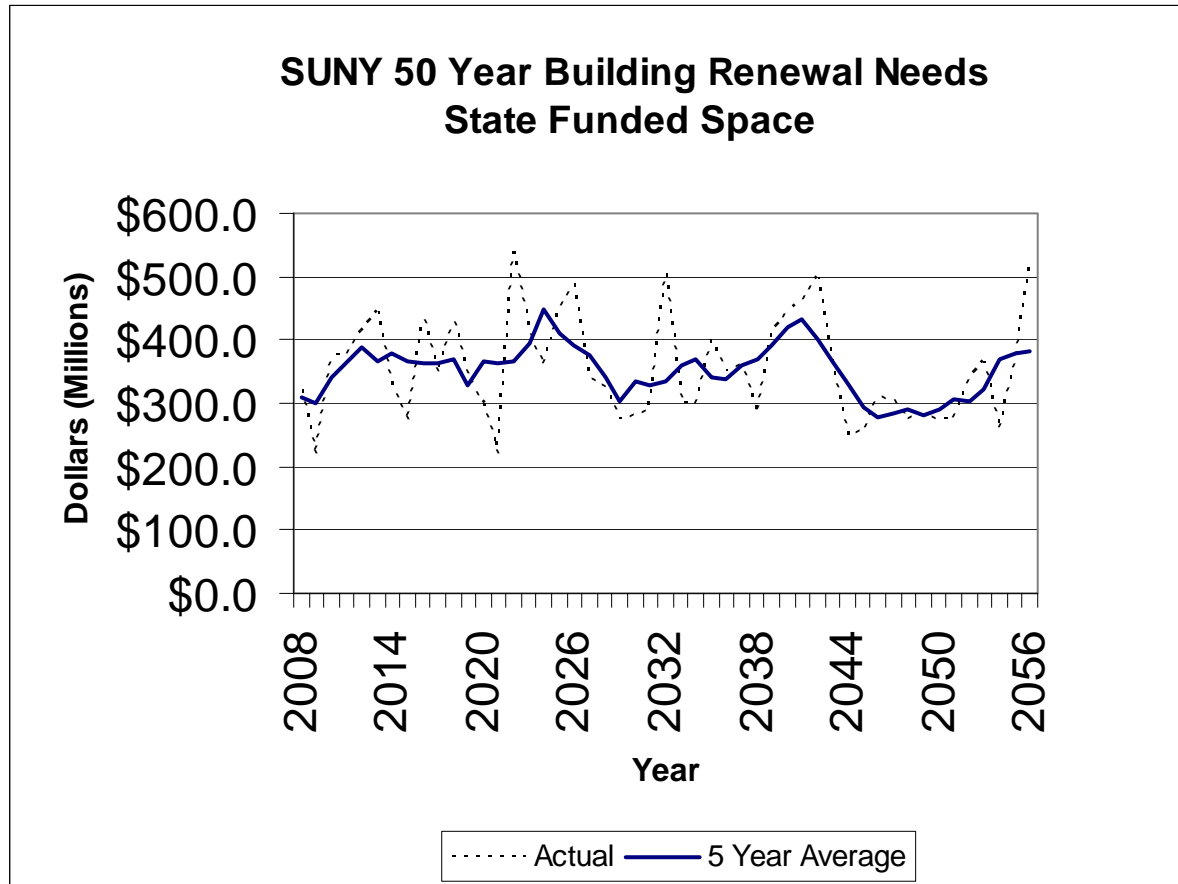
<b>Campus</b>	<b>Backlog</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>Total</b>
Albany	\$119.9	\$14.7	\$15.3	\$16.5	\$21.8	\$10.8	\$11.9	\$19.3	\$12.4	\$56.5	\$17.6	\$316.7
Alfred Ceramics	\$6.9	\$0.4	\$0.2	\$4.1	\$1.4	\$1.8	\$8.0	\$5.1	\$1.2	\$1.5	\$0.3	\$30.9
Alfred State Col	\$5.5	\$2.0	\$3.6	\$4.4	\$3.4	\$4.4	\$4.2	\$6.2	\$4.9	\$9.9	\$3.5	\$52.0
Binghamton	\$105.6	\$13.2	\$6.1	\$40.0	\$16.9	\$6.0	\$22.0	\$21.2	\$12.9	\$14.8	\$14.9	\$273.6
Brockport	\$107.5	\$16.1	\$8.8	\$7.6	\$10.7	\$10.5	\$13.6	\$15.1	\$18.7	\$8.6	\$8.0	\$225.2
Buffalo College	\$83.5	\$10.1	\$12.2	\$9.9	\$32.7	\$19.6	\$16.0	\$5.2	\$8.9	\$31.5	\$11.3	\$240.9
Buffalo Univ	\$397.8	\$39.7	\$26.2	\$40.4	\$47.8	\$60.1	\$50.5	\$32.5	\$29.7	\$41.6	\$27.1	\$793.4
Canton	\$12.2	\$1.2	\$1.8	\$1.7	\$4.3	\$7.4	\$1.3	\$1.3	\$1.1	\$3.0	\$20.2	\$55.5
Cobleskill	\$27.8	\$2.2	\$2.8	\$5.4	\$3.9	\$4.8	\$4.5	\$7.4	\$11.5	\$4.9	\$2.5	\$77.7
Cornell - AG	\$61.0	\$15.4	\$6.6	\$26.4	\$17.6	\$15.8	\$30.9	\$7.7	\$21.3	\$12.0	\$9.2	\$223.9
Cornell - Gen AG	\$19.5	\$1.8	\$6.3	\$9.6	\$2.2	\$5.3	\$2.3	\$2.3	\$3.9	\$0.8	\$3.5	\$57.5
Cornell Gen SVS	\$31.1	\$1.5	\$0.0	\$1.7	\$0.0	\$2.4	\$6.1	\$0.6	\$1.5	\$4.3	\$13.8	\$63.0
Cornell I&LR	\$3.8	\$0.4	\$0.6	\$0.0	\$0.1	\$4.6	\$2.6	\$0.0	\$0.4	\$0.2	\$1.0	\$13.7
Cornell - Vet	\$43.7	\$8.1	\$3.1	\$5.2	\$5.4	\$7.5	\$3.1	\$1.2	\$1.4	\$1.8	\$14.7	\$95.2
Cortland	\$45.3	\$7.9	\$4.3	\$10.1	\$12.7	\$28.3	\$6.1	\$7.5	\$2.5	\$5.1	\$27.2	\$157.0
Delhi	\$16.5	\$2.2	\$1.6	\$2.3	\$3.5	\$2.7	\$3.5	\$9.4	\$4.1	\$1.9	\$4.7	\$52.4
Downstate	\$182.4	\$29.9	\$14.9	\$13.9	\$14.8	\$6.0	\$1.3	\$4.9	\$8.9	\$35.6	\$4.3	\$316.9
Empire State	\$1.1	\$0.0	\$0.8	\$0.8	\$0.0	\$0.2	\$0.1	\$0.0	\$0.2	\$0.0	\$0.0	\$3.2
Envir Sci/For	\$43.7	\$13.1	\$2.0	\$5.8	\$7.8	\$5.2	\$3.5	\$2.8	\$6.6	\$2.3	\$14.2	\$107.0
Farmingdale	\$65.4	\$4.2	\$8.3	\$7.7	\$8.8	\$19.2	\$10.5	\$11.0	\$6.2	\$7.8	\$8.5	\$157.6
Fredonia	\$32.7	\$4.9	\$1.3	\$8.1	\$4.1	\$5.7	\$14.4	\$1.7	\$2.4	\$4.7	\$14.1	\$94.1
Geneseo	\$62.6	\$5.8	\$10.0	\$6.0	\$11.4	\$7.4	\$5.1	\$8.3	\$8.6	\$10.2	\$16.3	\$151.7
Maritime	\$38.3	\$4.4	\$5.6	\$2.1	\$4.5	\$13.0	\$4.3	\$4.0	\$0.9	\$1.0	\$9.2	\$87.3
Morrisville	\$24.4	\$1.6	\$2.9	\$2.1	\$6.6	\$7.6	\$5.4	\$8.0	\$4.5	\$6.0	\$5.6	\$74.7
New Paltz	\$51.3	\$10.2	\$6.1	\$13.0	\$9.7	\$9.0	\$8.4	\$19.9	\$5.7	\$10.3	\$2.9	\$146.5
Old Westbury	\$54.5	\$6.1	\$5.7	\$17.1	\$16.2	\$10.8	\$1.2	\$6.0	\$9.1	\$6.8	\$4.6	\$138.1
Oneonta	\$49.5	\$3.8	\$11.4	\$5.3	\$8.1	\$10.5	\$7.7	\$10.4	\$2.6	\$13.3	\$6.8	\$129.4
Optometry	\$37.5	\$8.2	\$0.0	\$1.3	\$4.0	\$0.0	\$5.2	\$0.0	\$11.3	\$0.0	\$2.7	\$70.2
Oswego	\$103.4	\$15.8	\$10.1	\$7.1	\$10.6	\$12.3	\$10.7	\$5.5	\$4.5	\$15.0	\$18.9	\$213.9
Plattsburgh	\$34.0	\$16.4	\$3.9	\$12.8	\$7.6	\$11.1	\$9.8	\$8.7	\$3.4	\$13.6	\$6.2	\$127.5
Potsdam	\$36.7	\$1.8	\$4.0	\$5.5	\$13.6	\$14.1	\$9.0	\$13.0	\$4.8	\$20.9	\$10.8	\$134.2
Purchase	\$102.6	\$16.3	\$8.3	\$12.1	\$10.7	\$12.6	\$30.2	\$11.7	\$9.1	\$15.2	\$12.7	\$241.5
Stony Brook	\$401.6	\$35.4	\$19.5	\$54.2	\$38.5	\$70.5	\$126.7	\$60.9	\$32.6	\$51.0	\$28.5	\$919.4
SUNYIT	\$1.0	\$0.8	\$0.1	\$5.8	\$0.0	\$1.9	\$3.1	\$0.1	\$7.9	\$0.8	\$1.2	\$22.7
Sys Adm	\$22.1	\$4.4	\$2.3	\$4.4	\$2.7	\$1.6	\$1.4	\$0.1	\$1.5	\$11.3	\$0.2	\$52.0
Upstate	\$24.5	\$0.6	\$2.7	\$1.8	\$15.2	\$3.6	\$1.4	\$7.8	\$3.9	\$9.0	\$0.5	\$71.0
<b>Total</b>	<b>\$2,456.7</b>	<b>\$320.7</b>	<b>\$219.4</b>	<b>\$372.2</b>	<b>\$379.3</b>	<b>\$414.3</b>	<b>\$446.0</b>	<b>\$326.8</b>	<b>\$271.1</b>	<b>\$433.2</b>	<b>\$347.7</b>	<b>\$5,987.5</b>



### 5.3 Average Annual Renewal Needs as a Fraction of CRV by Campus

<b>Campus</b>	<b>CRV (\$ millions)</b>	<b>Average Annual Renewal (\$ millions)</b>	<b>Average Annual Renewal/ CRV</b>
Albany	\$1,225	\$19.2	0.016
Alfred Ceramics	\$167	\$2.7	0.016
Alfred State Col	\$262	\$4.2	0.016
Binghamton	\$1,283	\$20.5	0.016
Brockport	\$660	\$11.3	0.017
Buffalo College	\$866	\$14.7	0.017
Buffalo Univ	\$3,120	\$50.3	0.016
Canton	\$170	\$2.9	0.017
Cobleskill	\$250	\$4.2	0.017
Cornell - AG	\$1,025	\$16.4	0.016
Cornell - Gen AG	\$214	\$3.4	0.016
Cornell Gen SVS	\$192	\$2.8	0.015
Cornell I&LR	\$100	\$1.4	0.014
Cornell - Vet	\$450	\$6.3	0.014
Cortland	\$544	\$9.5	0.017
Delhi	\$243	\$4.0	0.016
Downstate	\$923	\$14.4	0.016
Empire State	\$14	\$0.2	0.016
Envir Sci/For	\$406	\$6.4	0.016
Farmingdale	\$635	\$10.3	0.016
Fredonia	\$430	\$6.9	0.016
Geneseo	\$526	\$8.5	0.016
Maritime	\$222	\$3.6	0.016
Morrisville	\$335	\$5.3	0.016
New Paltz	\$611	\$9.8	0.016
Old Westbury	\$402	\$6.7	0.017
Oneonta	\$508	\$8.3	0.016
Optometry	\$263	\$3.7	0.014
Oswego	\$769	\$12.3	0.016
Plattsburgh	\$454	\$7.7	0.017
Potsdam	\$523	\$8.6	0.017
Purchase	\$832	\$14.0	0.017
Stony Brook	\$3,457	\$55.7	0.016
SUNYIT	\$160	\$2.5	0.015
Sys Adm	\$197	\$3.1	0.016
Upstate	\$504	\$7.8	0.015
<b>Total</b>	<b>\$22,942</b>	<b>\$369.6</b>	<b>0.016</b>

### 5.4 SUNY 50-Year Renewal Graph



## 6. Infrastructure

This section provides details of the infrastructure costs by major components (e.g., roads, landscape and hardscape, utility distribution systems, and utility generation systems). PPCG data were used to estimate average annual renewal needs for infrastructure by campus as well as to estimate the Current Replacement Value of the infrastructure.

SUCF cost data and condition assessment data were used to estimate backlog for infrastructure. If an infrastructure component was assessed to be in poor condition, then it was assigned to the backlog.

Infrastructure, as a whole, is harder to measure, harder to assess, and harder to assign a remaining useful life to than building systems. For this reason, PPCG knows of no campus that has created renewal curves that include their entire infrastructure<sup>8</sup>. Instead, campuses create three to five-year infrastructure renewal plans and use the average annual renewal need to approximate long term renewal needs.

**Figure 6.1**, *Backlog of Infrastructure Report*, comes from data supplied by SUCF and BCAS. The SUCF staff estimates the infrastructure backlog to be approximately \$700 million. The majority of this is in the Utility Distribution and Generation (primarily steam systems) [\$420 million] and Landscape and Hardscape (surface parking, plazas and sidewalks) [\$138 million].

**Figure 6.2**, *Infrastructure Renewal Summary by Category*, shows the average annual infrastructure need by campus and by major category (Roads, Landscape & Hardscape, Utility Distribution, Utility Generation, and Athletic Fields.) Note that the Utility Distribution category has the highest annual renewal needs.

**Figure 6.3**, *Infrastructure Summary*, lists the Infrastructure Current Replacement Value, Backlog, and Average Annual Renewal for each campus. Infrastructure Renewal divided by Infrastructure CRV shows approximately what share of the campus infrastructure needs renewal each year. The numbers are generally in the 2% range, reflecting the long life cycles for many infrastructure items.

The Infra FCI column (backlog divided by CRV) ranges from .67 to .00, with an average across the system of 0.25.

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<sup>8</sup> The one exception to this is the Getty Museum, which was constructed from scratch in 1997.

**Campuses with Infrastructure FCI over 0.3 include<sup>9</sup>**

Alfred Ceramics	.37
Buffalo College	.48
Cornell – AG	.62
Cornell – Gen AG	.39
Cornell – Gen SVS	.67
Delhi	.30
Envir Science/Forestry	.59
Fredonia	.62
Maritime	.44
New Paltz	.44
Oneonta	.30
Oswego	.33
Sys Adm	.62

These ratios are unusually high. This may reflect a cause for concern and should be examined carefully to determine a) why the infrastructure backlog is so high and b) what should be done to reduce this backlog to minimize campus-wide infrastructure failures (especially in campus heating systems).

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<sup>9</sup> Downstate also has a large FCI number, but this is the result of a large fuel storage problem that extends well beyond typical renewal and backlog needs.

**6.1 Infrastructure Backlog by Campus (\$ 000's) – Systems Rated Poor by SUCF**

<u>Campus</u>	<u>Athletic Fields</u>	<u>Site Lighting</u>	<u>Utility Distribution</u>	<u>Utility Generation</u>	<u>Roads</u>	<u>Landscape &amp; Hardscape</u>	<u>Telephone &amp; Data</u>	<u>Misc.</u>	<u>Total</u>	<u>Percent</u>
Albany			\$12,136	\$8,066	\$626	\$6,996	\$3,850	\$3,448	\$35,121	5.0%
Alfred Ceramics		\$163	\$628	\$325		\$178		\$25	\$1,318	0.2%
Alfred State Col			\$6,203			\$4		\$20	\$6,227	0.9%
Binghamton		\$5,680	\$6,385	\$15,101	\$2,014	\$3,850	\$5,189	\$182	\$38,400	5.5%
Brockport	\$5,214	\$1,700	\$12,621	\$5,000	\$718	\$5,693	\$6,000	\$1,374	\$38,320	5.5%
Buffalo College		\$1,213	\$12,765	\$12,559	\$1,035	\$3,503	\$1,573	\$8,172	\$40,819	5.9%
Buffalo Univ		\$14,700	\$24,268	\$7,063	\$2,263	\$34,507	\$3,000	\$549	\$86,350	12.4%
Canton	\$105	\$750	\$1,031		\$481	\$497		\$149	\$3,013	0.4%
Cobleskill	\$368	\$458	\$1,529	\$1,918	\$1,265	\$2,358	\$1,253	\$105	\$9,253	1.3%
Cornell - AG		\$450	\$4,720	\$0	\$996	\$123	\$0	\$0	\$6,290	0.9%
Cornell - Gen AG		\$252	\$2,697	\$1,915	\$140	\$105	\$600	\$17	\$5,726	0.8%
Cornell Gen SVS			\$12,397	\$12,635	\$0	\$125			\$25,157	3.6%
Cornell I&LR						\$1,250			\$1,250	0.2%
Cornell - Vet									\$0	0.0%
Cortland			\$3,251	\$2,485		\$1,706	\$1,031	\$116	\$8,590	1.2%
Delhi	\$1,823		\$6,567		\$410	\$2,783	\$1,483	\$101	\$13,165	1.9%
Downstate			\$1,103		\$1,000	\$1,513		\$4,695	\$8,311	1.2%
Empire State									\$0	0.0%
Envir Sci/For			\$806	\$3,500	\$81	\$121	\$399	\$111	\$5,017	0.7%
Farmingdale	\$437	\$1,181	\$5,102	\$1,651	\$1,080	\$8,760	\$10,500	\$536	\$29,246	4.2%
Fredonia			\$28,047	\$13,129		\$3,206	\$2,500	\$1,000	\$47,882	6.9%
Geneseo	\$2,188		\$9,839		\$271	\$3,900		\$763	\$16,961	2.4%
Maritime		\$669	\$9,129		\$375	\$834	\$731	\$4,700	\$16,438	2.4%
Morrisville									\$0	0.0%
New Paltz	\$207		\$22,671	\$9,187		\$5,582	\$3,112	\$6,624	\$47,382	6.8%
Oneonta			\$10,602		\$132	\$509		\$13	\$11,255	1.6%
Optometry									\$0	0.0%
Oswego	\$2,100		\$8,537		\$21	\$3,446		\$22	\$14,126	2.0%
Old Westbury		\$1,664	\$18,900	\$5,500		\$746	\$2,360	\$1,151	\$30,321	4.4%
Plattsburgh	\$228		\$5,404	\$81	\$722	\$2,878		\$385	\$9,697	1.4%
Pottsdam			\$137		\$26	\$2,159		\$38	\$2,359	0.3%
Purchase		\$906	\$6,794	\$1,980	\$1,107	\$19,263	\$855	\$410	\$31,314	4.5%
Stony Brook			\$59,550	\$23,782		\$18,700	\$0	\$424	\$102,455	14.7%
SUNYIT						\$2,505	\$0	\$27	\$2,532	0.4%
Sys Adm		\$500	\$741			\$200	\$0	\$33	\$1,474	0.2%
Upstate			\$225			\$2			\$227	0.0%
<b>Total</b>	<b>\$12,668</b>	<b>\$30,285</b>	<b>\$294,784</b>	<b>\$125,877</b>	<b>\$14,763</b>	<b>\$137,999</b>	<b>\$44,435</b>	<b>\$35,186</b>	<b>\$695,995</b>	<b>100.0%</b>
Percentage	1.8%	4.4%	42.4%	18.1%	2.1%	19.8%	6.4%	5.1%	100.0%	

**6.2 Average Annual Infrastructure Needs by Category and Campus (\$ 000's)**

<b>Campus</b>	<b><u>Roads</u></b>	<b><u>Landscape &amp; Hardscape</u></b>	<b><u>Utility Distribution</u></b>	<b><u>Utility Generation</u></b>	<b><u>Athletic Fields</u></b>	<b><u>Total</u></b>
Albany	\$383	\$595	\$437	\$2,623	\$219	\$4,257
Alfred Ceramics	\$0	\$8	\$57	\$0	\$0	\$65
Alfred State Col	\$141	\$122	\$230	\$59	\$111	\$663
Binghamton	\$1,185	\$449	\$942	\$286	\$595	\$3,457
Brockport	\$443	\$391	\$1,739	\$126	\$848	\$3,547
Buffalo College	\$318	\$392	\$507	\$112	\$141	\$1,471
Buffalo Univ	\$1,392	\$1,583	\$1,795	\$2,663	\$205	\$7,638
Canton	\$283	\$117	\$220	\$0	\$84	\$705
Cobleskill	\$383	\$129	\$222	\$65	\$151	\$950
Cornell - AG	\$199	\$7	\$0	\$0	\$0	\$206
Cornell - Gen AG	\$84	\$39	\$70	\$20	\$32	\$246
Cornell - Gen SVS	\$0	\$1	\$1,207	\$351	\$0	\$1,559
Cornell - I&LR	\$0	\$43	\$0	\$0	\$0	\$43
Cornell - Vet	\$0	\$0	\$0	\$0	\$0	\$0
Cortland	\$175	\$194	\$430	\$329	\$356	\$1,484
Delhi	\$128	\$175	\$283	\$25	\$202	\$812
Downstate	\$0	\$24	\$58	\$8	\$0	\$89
Empire State	\$0	\$3	\$1	\$0	\$0	\$4
Envir Sci/For	\$48	\$24	\$36	\$25	\$0	\$133
Farmingdale	\$636	\$453	\$681	\$26	\$285	\$2,082
Fredonia	\$265	\$295	\$494	\$65	\$249	\$1,367
Geneseo	\$164	\$192	\$366	\$122	\$373	\$1,218
Maritime	\$227	\$71	\$184	\$164	\$115	\$762
Morrisville	\$5	\$96	\$266	\$167	\$393	\$927
New Paltz	\$266	\$298	\$888	\$121	\$610	\$2,183
Old Westbury	\$454	\$127	\$656	\$6	\$238	\$1,481
Oneonta	\$80	\$114	\$614	\$0	\$243	\$1,051
Optometry	\$0	\$1	\$0	\$0	\$0	\$1
Oswego	\$13	\$392	\$563	\$299	\$474	\$1,740
Plattsburgh	\$142	\$189	\$392	\$120	\$215	\$1,057
Potsdam	\$8	\$177	\$143	\$229	\$182	\$739
Purchase	\$669	\$350	\$413	\$596	\$222	\$2,249
Stony Brook	\$1,547	\$1,112	\$2,935	\$913	\$772	\$7,278
SUNY IT	\$321	\$125	\$260	\$0	\$116	\$822
Sys Adm	\$8	\$7	\$34	\$0	\$0	\$49
Upstate	\$32	\$30	\$98	\$195	\$0	\$355
<b>Total</b>	<b>\$10,001</b>	<b>\$8,323</b>	<b>\$17,220</b>	<b>\$9,714</b>	<b>\$7,432</b>	<b>\$52,689</b>

### 6.3 Infrastructure Summary (\$ 000's)

<b>Campus</b>	<b>Infrastructure Current Replacement Value</b>	<b>Infra. Backlog</b>	<b>Infrastructure Average Annual Renewal</b>	<b>Building Average Annual Renewal</b>	<b>Infra FCI (Bkl/CRV)</b>	<b>Infra renewal/ Infra CRV</b>	<b>infra renewal/ building renewal</b>
Albany	\$251,952	\$35,121	\$4,257	\$19,169	0.14	0.017	22%
Alfred Ceramics	\$3,555	\$1,318	\$65	\$2,692	0.37	0.018	2%
Alfred State Col	\$36,825	\$6,227	\$663	\$4,189	0.17	0.018	16%
Binghamton	\$173,799	\$38,400	\$3,457	\$20,540	0.22	0.020	17%
Brockport	\$211,523	\$38,320	\$3,547	\$11,272	0.18	0.017	31%
Buffalo College	\$84,716	\$40,819	\$1,471	\$14,749	0.48	0.017	10%
Buffalo Univ	\$439,155	\$86,350	\$7,638	\$50,271	0.20	0.017	15%
Canton	\$37,780	\$3,013	\$705	\$2,894	0.08	0.019	24%
Cobleskill	\$49,381	\$9,253	\$950	\$4,167	0.19	0.019	23%
Cornell - AG	\$10,145	\$6,290	\$206	\$16,365	0.62	0.020	1%
Cornell - Gen AG	\$14,796	\$5,726	\$246	\$3,405	0.39	0.017	7%
Cornell - Gen SVS	\$37,778	\$25,157	\$1,559	\$2,832	0.67	0.041	55%
Cornell - I&LR	\$5,100	\$1,250	\$43	\$1,443	0.25	0.008	3%
Cornell - Vet	\$0	\$0	\$0	\$6,313	0.00	0.000	
Cortland	\$74,812	\$8,590	\$1,484	\$9,476	0.11	0.020	16%
Delhi	\$43,731	\$13,165	\$812	\$3,995	0.30	0.019	20%
Downstate	\$3,699	\$8,311	\$89	\$14,443	**	0.024	1%
Empire State	\$307	\$0	\$4	\$219	0.00	0.013	2%
Envir Sci/For	\$8,552	\$5,017	\$133	\$6,371	0.59	0.016	2%
Farmingdale	\$110,802	\$29,246	\$2,082	\$10,272	0.26	0.019	20%
Fredonia	\$76,654	\$47,882	\$1,367	\$6,912	0.62	0.018	20%
Geneseo	\$71,643	\$16,961	\$1,218	\$8,513	0.24	0.017	14%
Maritime	\$37,629	\$16,438	\$762	\$3,557	0.44	0.020	21%
Morrisville	\$41,130	\$0	\$927	\$5,338	0.00	0.023	17%
New Paltz	\$108,130	\$47,382	\$2,183	\$9,813	0.44	0.020	22%
Old Westbury	\$64,551	\$11,255	\$1,481	\$6,689	0.17	0.023	22%
Oneonta	\$46,520	\$14,126	\$1,051	\$8,264	0.30	0.023	13%
Optometry	\$44	\$0	\$1	\$3,658	0.00	0.023	0%
Oswego	\$90,681	\$30,321	\$1,740	\$12,313	0.33	0.019	14%
Plattsburgh	\$59,311	\$9,697	\$1,057	\$7,706	0.16	0.018	14%
Potsdam	\$34,937	\$2,359	\$739	\$8,643	0.07	0.021	9%
Purchase	\$123,110	\$31,314	\$2,249	\$14,019	0.25	0.018	16%
Stony Brook	\$384,420	\$102,455	\$7,278	\$55,688	0.27	0.019	13%
SUNY IT	\$46,797	\$2,532	\$822	\$2,475	0.05	0.018	33%
Sys Adm	\$2,368	\$1,474	\$49	\$3,110	0.62	0.021	2%
Upstate	\$19,609	\$227	\$355	\$7,778	**	0.018	5%
<b>Total</b>	<b>\$2,805,942</b>	<b>\$695,996</b>	<b>\$52,689</b>	<b>\$369,553</b>	<b>0.25</b>	<b>0.019</b>	<b>14%</b>

\*\* These data are anomalous and will be given further review.

## 7. Benchmark Data

One of the objectives of this study is to benchmark SUNY academic facility needs against those of other higher education systems. Despite a wealth of reliable sources for higher education statistics related to demographics, enrollments, educational attainment, teacher levels, graduation rates, etc., higher education benchmark data on capital facilities renewal, backlog, and infrastructure are difficult to find. Various higher education organizations, such as APPA (the Association of Physical Plant Administrators), SCUP (The Society for College and University Planners) and NACUBO (the National Association for College and University Business Officers) have collected capital facility related data, but much of it has been self-reported and not subject to verification. This has resulted in incomplete data and inconsistent results. Even major studies have resorted to estimates, based on back-of-the-envelope analysis by experts.

The benchmark data presented in this section are from PPCG system clients. The data have been collected in a consistent manner, reviewed for accuracy by each campus and system and are among the best higher education facilities benchmarking data available. PPCG has worked closely with several public higher education systems using the Life Cycle Model Based on CRV approach. Among these client systems included for this study are two systems, that by State-mandate, focus on teaching and three systems that have a substantial medical and/or research focus:

The two State-mandated teaching systems are:

- California State University System (24 campuses); and
- Minnesota State Colleges and Universities (53 campuses)

The three medical and/or research facilities include:

- University of Texas (15 campuses);
- Oregon University System (7 campuses); and
- University of California (9 campuses).

Correspondingly, SUNY, with its 35 campuses, has a blend of teaching and research campuses. In the following analyses, the SUNY capital facilities are compared to those of the above-cited PPCG system clients in the five following areas:

- Facility Condition Index (FCI);
- Percent of Buildings with Complex Systems;
- Percentage of Buildings over 30-years Old;
- Average Annual Renewal as a Percent of CRV; and
- Average Annual Infrastructure as a Percent of Average Annual Building Renewal.



## Facilities Condition Index (FCI)

The Facility Condition Index (FCI) is an industry recognized standard for measuring the general condition of capital facilities. It may be calculated at the building, campus and system levels. This section focuses on the building FCI at the system level (infrastructure is excluded). The building FCI is calculated taking the total cost of the system's building backlog (deferred maintenance) divided by the total current replacement value of the system. An FCI of .05 or below generally reflects that the overall system is in reasonably good condition. Stated more plainly, an FCI of .05 would mean that 5% of the overall system is in need of repair.

SUNY has a total building backlog of \$2,457 million (See Figure 4.2). By dividing SUNY's backlog by its total current replacement value of \$22.9 billion, the result reveals that SUNY has a building FCI of .11. This means that 11% of the SUNY system academic buildings are beyond their useful life and are in a state of backlog.

SUNY's FCI of .11 is in the lower end of the range when compared against five peer higher education systems in Figure 7.1. Only the University of Texas has a lower FCI (.06)<sup>10</sup>. SUNY's FCI is comparable to the two State-mandated teaching systems: California State University (.11) and the Minnesota State Colleges and Universities (.12). The remaining research systems: The Oregon University System and the University of California report higher FCIs (.18 and .23, respectively).

There are several factors that influence a system's FCI. Two prominent factors include the percentage of buildings with complex systems and the age of the facilities.

## Percentage of Buildings with Complex Systems

Figure 7.2, reveals that about 11% of the SUNY buildings have complex systems. As noted in the FCI analysis, SUNY is again in the same range as the two State-mandated teaching systems (California State University (11%) and the Minnesota State Colleges and Universities (7%). SUNY is significantly below the medical and/or research systems, which report a Percent of Buildings with Complex Systems in the range of 29% to 43%. Two systems included in the latter group also have the highest FCIs: the University of California and Oregon University System. Since complex buildings are significantly more expensive to maintain and renew (even more so than the difference in the replacement values) it is not surprising that these two systems have higher FCIs.

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<sup>10</sup> Figure 7.3 reveals that the University of Texas also has the lowest percentage of buildings over 30-years old (32%).

### **Percentage of Buildings over 30-years old**

Figure 7.3, indicates that 73% of SUNY buildings are over 30-years old. Only the University of California has a higher rate (75%). As noted above, the University of Texas (UT), which has the lowest FCI, also has the lowest percentage of buildings over 30-years old (32%).

### **Average Annual Renewal as a Percent of CRV**

Figure 7.4, *Average Annual Renewal as a Percent of CRV*, shows what percentage of the building Current Replacement Value (CRV) should, on average, be spent each year on renewal. The two teaching systems: California State University and the Minnesota State Colleges and Universities require an average 1.4%. The three medical/and or research systems: University of Texas, University of California and the Oregon University System each require an average 1.7%. SUNY requires an average 1.6%. SUNY has both Tier-1 Research Universities and colleges that focus exclusively on teaching. This difference in mission (along with the percent of the systems that are complex buildings) help explain these differences in average annual renewal as a percent of CRV.

### **Average Annual Infrastructure as a Percentage of Average Annual Building Renewal**

In addition to identifying an annual level of support for building renewal, each system must also address infrastructure<sup>11</sup> renewal. The Infrastructure Summary, Figure 6.3, shows that SUNY requires an annual infrastructure investment equal to 14% of its annual investment for building renewal. This is calculated by dividing the Infrastructure Average Annual Renewal of \$52.5 million by the Building Average Annual Renewal of \$369.6 million.

Figure 7.5 demonstrates that SUNY infrastructure needs fall in the middle of the range of systems. Infrastructure can vary widely based upon a number of factors including the size of the campus and the percentage of utility services provided by the local community or city. In the SUNY experience, a single building campus, like Optometry, has far less infrastructure than does Albany and likewise requires far less Average Annual Infrastructure Renewal.

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<sup>11</sup> See Section 6 for a definition of what is included in Infrastructure

### 7.1 Benchmark Data – Facilities Condition Index

<u>System</u>	<u>Low</u>	<u>Average</u>	<u>High</u>
University of Texas (15)	0.00	<b>0.06</b>	0.11
California State University (24)	0.03	<b>0.11</b>	0.36
<b>SUNY (36)</b>	<b>0.02</b>	<b>0.11</b>	<b>0.20</b>
Minnesota State Colleges and Universities (53)	0.01	<b>0.12</b>	0.27
Oregon University System (7)	0.06	<b>0.18</b>	0.24
University of California	0.07	<b>0.23</b>	0.32

These variances are high because of the age of the campuses, the types of buildings and special considerations.

### 7.2 Benchmark Data – Percentage of Buildings with Complex Systems

<u>System</u>	<u>Low</u>	<u>Average</u>	<u>High</u>
Minnesota State Colleges and Universities (53)	0%	<b>7%</b>	21%
California State University (24)	0%	<b>11%</b>	24%
<b>SUNY (36)</b>	<b>2%</b>	<b>11%</b>	<b>20%</b>
University of Texas (15)	0%	<b>29%</b>	56%
Oregon University System (7)	0%	<b>32%</b>	42%
University of California	26%	<b>43%</b>	68%

### 7.3 Benchmark Data- Percentage of Buildings Over 30 Years Old

System	Low	Average	High
University of Texas (15)	2%	32%	47%
California State University (24)	8%	56%	100%
Minnesota State Colleges and Universities (53)	0%	63%	98%
Oregon University System (7)	2%	66%	2%
<b>SUNY (36)</b>	<b>0%</b>	<b>73%</b>	<b>100%</b>
University of California	44%	75%	92%

### 7.4 Benchmark Data – Average Annual Renewal as a Percentage of CRV

System	Low	Average	High
California State University (24)	1.2%	1.4%	1.5%
Minnesota State Colleges and Universities (53)	1.1%	1.4%	1.9%
<b>SUNY (36)</b>	<b>1.4%</b>	<b>1.6%</b>	<b>1.7%</b>
University of Texas (15)	1.5%	1.7%	1.8%
Oregon University System (7)	1.6%	1.7%	1.8%
University of California	1.6%	1.7%	1.8%

**7.5 Benchmark Data – Average Annual Infrastructure as a Percentage of Average Annual Building Renewal**

<u>System</u>	<u>Low</u>	<u>Average</u>	<u>High</u>
Minnesota State Colleges and Universities (53)	1.0%	<b>9.0%</b>	71.0%
Oregon University System (7)	8.0%	<b>13.0%</b>	30.0%
<b>SUNY (36)</b>	<b>1.0%</b>	<b>14.0%</b>	<b>55.0%</b>
University of Texas (15)	1.0%	<b>16.0%</b>	52.0%
University of California	6.0%	<b>19.0%</b>	28.0%
California State University (24)	14.0%	<b>28.0%</b>	100.0%

## 8. SUNY Backlog and Renewal - Funding Needs and Options

Included in this section are summary reports for each campus and estimated investment required to bring down the backlog of deferred maintenance.

**Figure 8.1, *System-wide Summary - CRV, Backlog and FCI***, shows the building, infrastructure and total Facilities Condition Index for each campus. The system-wide average FCI, including buildings and infrastructure, is 0.12. This means that 12% of SUNY's building and infrastructure systems are in backlog. However, there are a number of campuses that are substantially above this level. This is especially true in the infrastructure category, where 13 campuses have FCIs above 0.30 (i.e. backlog greater than 30% of total CRV). These require thorough examination as well as a multi-year plan to reduce the backlog. Otherwise, these campuses should expect infrastructure failures requiring emergency repairs.

**Figure 8.2, *System-wide Summary – CRV, Average Annual Renewal and Average Renewal as a percentage of CRV***; show the building, infrastructure and total average annual renewal needs as a percentage of CRV. The system-wide total is 1.6%. This number is in line with experience at other systems.

**Figure 8.3, *System-wide Summary – 5-year FCI***, shows the five-year FCI for buildings and infrastructure. The five-year FCI is the sum of the backlog, plus 2008, 2009, 2010, 2011 and 2012 (five years) renewal needs. This index is growing in popularity because it shows the five-year renewal and backlog needs instead of the more traditional FCI which only shows the backlog.

**Figure 8.4, *Backlog Growth at \$200 Million Investment***, shows what will happen to the SUNY system if the investment in backlog and renewal is \$200 million per year. In this scenario, the SUNY backlog will grow to slightly over \$4 billion by the year 2012 and \$5 billion by the year 2016. [Note: all dollars in this report are expressed as 2007 dollars.]

**Figure 8.5, *Backlog Growth at \$400 Million Investment***, shows that if the annual investment in backlog and renewal is \$400 million the backlog will essentially remain flat over the next ten years.

**Figure 8.6, *Backlog Reduction at \$560 Million Investment***, shows that the backlog will be cut in half in the next ten years.

**Figure 8.7 *Backlog Reduction at \$700 Million Investment***, shows that the backlog is almost eliminated by 2017. Thereafter, only funding for buildings and infrastructure annual renewal will be required.

### 8.1 SUNY System-wide Summary – CRV, Backlog, and FCI

Campus	CRV (millions of dollars)			Backlog (millions)			FCI		
	Building CRV	Infra CRV	Total CRV	Building Backlog	Infra Backlog	Total Backlog	Building FCI	Infra FCI	Total FCI
Albany	\$1,225	\$252	\$1,477	\$120	\$35	\$155	0.10	0.14	0.10
Alfred Ceramics	\$167	\$4	\$171	\$7	\$1	\$8	0.04	0.37	0.05
Alfred State Col	\$262	\$37	\$299	\$6	\$6	\$12	0.02	0.17	0.04
Binghamton	\$1,283	\$174	\$1,457	\$106	\$38	\$144	0.08	0.22	0.10
Brockport	\$660	\$212	\$872	\$108	\$38	\$146	0.16	0.18	0.17
Buffalo College	\$866	\$85	\$951	\$84	\$41	\$124	0.10	0.48	0.13
Buffalo Univ	\$3,120	\$439	\$3,559	\$398	\$86	\$484	0.13	0.20	0.14
Canton	\$170	\$38	\$208	\$12	\$3	\$15	0.07	0.08	0.07
Cobleskill	\$250	\$49	\$299	\$28	\$9	\$37	0.11	0.19	0.12
Cornell - AG	\$1,025	\$11	\$1,036	\$61	\$6	\$67	0.06	0.62	0.06
Cornell - Gen AG	\$214	\$14	\$228	\$20	\$6	\$25	0.09	0.39	0.11
Cornell Gen SVS	\$192	\$38	\$230	\$31	\$25	\$56	0.16	0.67	0.24
Cornell I&LR	\$100	\$5	\$105	\$4	\$1	\$5	0.04	0.25	0.05
Cornell - Vet	\$450	\$0	\$450	\$44	\$0	\$44	0.10	0.00	0.10
Cortland	\$544	\$75	\$619	\$45	\$9	\$54	0.08	0.11	0.09
Delhi	\$243	\$44	\$287	\$17	\$13	\$30	0.07	0.30	0.10
Downstate	\$923	\$4	\$927	\$182	\$8	\$191	0.20	**	0.21
Empire State	\$14	\$0	\$14	\$1	\$0	\$1	0.08	0.00	0.08
Envir Sci/For	\$406	\$9	\$415	\$44	\$5	\$49	0.11	0.59	0.12
Farmingdale	\$635	\$111	\$746	\$65	\$29	\$95	0.10	0.26	0.13
Fredonia	\$430	\$77	\$507	\$33	\$48	\$81	0.08	0.62	0.16
Geneseo	\$526	\$72	\$598	\$63	\$17	\$80	0.12	0.24	0.13
Maritime	\$222	\$38	\$260	\$38	\$16	\$55	0.17	0.44	0.21
Morrisville	\$335	\$41	\$376	\$24	\$0	\$24	0.07	0.00	0.06
New Paltz	\$611	\$108	\$719	\$51	\$47	\$99	0.08	0.44	0.14
Old Westbury	\$402	\$65	\$467	\$55	\$11	\$66	0.14	0.17	0.14
Oneonta	\$508	\$47	\$555	\$50	\$14	\$64	0.10	0.30	0.11
Optometry	\$263	\$0	\$263	\$38	\$0	\$38	0.14	0.00	0.14
Oswego	\$769	\$91	\$860	\$103	\$30	\$134	0.13	0.33	0.16
Plattsburgh	\$454	\$59	\$513	\$34	\$10	\$44	0.07	0.16	0.09
Potsdam	\$523	\$35	\$558	\$37	\$2	\$39	0.07	0.07	0.07
Purchase	\$832	\$123	\$955	\$103	\$31	\$134	0.12	0.25	0.14
Stony Brook	\$3,457	\$384	\$3,841	\$402	\$102	\$504	0.12	0.27	0.13
SUNYIT	\$160	\$47	\$207	\$1	\$3	\$4	0.01	0.05	0.02
Sys Adm	\$197	\$2	\$199	\$22	\$1	\$24	0.11	0.62	0.12
Upstate	\$504	\$20	\$524	\$25	\$0	\$25	0.05	**	0.05
<b>Total</b>	<b>\$22,942</b>	<b>\$2,806</b>	<b>\$25,748</b>	<b>\$2,457</b>	<b>\$696</b>	<b>\$3,153</b>	<b>0.11</b>	<b>0.25</b>	<b>0.12</b>

\*\* These data are anomalous and will be given further review.

## 8.2 System-wide Summary – CRV, Average Annual Renewal and Average Renewal as a Percentage of CRV

Campus	CRV (millions of dollars)			Average Annual Renewal			Renewal as a percent of CRV		
	Building CRV	Infra CRV	Total CRV	Building Renewal	Infra Renewal	Total Renewal	Building	Infra	Total
Albany	\$1,225	\$252	\$1,477	\$19.2	\$4.3	\$23.4	1.6%	1.7%	1.6%
Alfred Ceramics	\$167	\$4	\$171	\$2.7	\$0.1	\$2.8	1.6%	1.8%	1.6%
Alfred State Col	\$262	\$37	\$299	\$4.2	\$0.7	\$4.9	1.6%	1.8%	1.6%
Binghamton	\$1,283	\$174	\$1,457	\$20.5	\$3.5	\$24.0	1.6%	2.0%	1.6%
Brockport	\$660	\$212	\$872	\$11.3	\$3.5	\$14.8	1.7%	1.7%	1.7%
Buffalo College	\$866	\$85	\$951	\$14.7	\$1.5	\$16.2	1.7%	1.7%	1.7%
Buffalo Univ	\$3,120	\$439	\$3,559	\$50.3	\$7.6	\$57.9	1.6%	1.7%	1.6%
Canton	\$170	\$38	\$208	\$2.9	\$0.7	\$3.6	1.7%	1.9%	1.7%
Cobleskill	\$250	\$49	\$299	\$4.2	\$1.0	\$5.1	1.7%	1.9%	1.7%
Cornell - AG	\$1,025	\$11	\$1,036	\$16.4	\$0.2	\$16.6	1.6%	2.0%	1.6%
Cornell - Gen AG	\$214	\$14	\$228	\$3.4	\$0.2	\$3.7	1.6%	1.7%	1.6%
Cornell Gen SVS	\$192	\$38	\$230	\$2.8	\$1.6	\$4.4	1.5%	4.1%	1.9%
Cornell I&LR	\$100	\$5	\$105	\$1.4	\$0.0	\$1.5	1.4%	0.8%	1.4%
Cornell - Vet	\$450	\$0	\$450	\$6.3	\$0.0	\$6.3	1.4%	0.0%	1.4%
Cortland	\$544	\$75	\$619	\$9.5	\$1.5	\$11.0	1.7%	2.0%	1.8%
Delhi	\$243	\$44	\$287	\$4.0	\$0.8	\$4.8	1.6%	1.9%	1.7%
Downstate	\$923	\$4	\$927	\$14.4	\$0.1	\$14.5	1.6%	2.4%	1.6%
Empire State	\$14	\$0	\$14	\$0.2	\$0.0	\$0.2	1.6%	1.3%	1.6%
Envir Sci/For	\$406	\$9	\$415	\$6.4	\$0.1	\$6.5	1.6%	1.6%	1.6%
Farmingdale	\$635	\$111	\$746	\$10.3	\$2.1	\$12.4	1.6%	1.9%	1.7%
Fredonia	\$430	\$77	\$507	\$6.9	\$1.4	\$8.3	1.6%	1.8%	1.6%
Geneseo	\$526	\$72	\$598	\$8.5	\$1.2	\$9.7	1.6%	1.7%	1.6%
Maritime	\$222	\$38	\$260	\$3.6	\$0.8	\$4.3	1.6%	2.0%	1.7%
Morrisville	\$335	\$41	\$376	\$5.3	\$0.9	\$6.3	1.6%	2.3%	1.7%
New Paltz	\$611	\$108	\$719	\$9.8	\$2.2	\$12.0	1.6%	2.0%	1.7%
Old Westbury	\$402	\$65	\$467	\$6.7	\$1.5	\$8.2	1.7%	2.3%	1.7%
Oneonta	\$508	\$47	\$555	\$8.3	\$1.1	\$9.3	1.6%	2.3%	1.7%
Optometry	\$263	\$0	\$263	\$3.7	\$0.0	\$3.7	1.4%	2.3%	1.4%
Oswego	\$769	\$91	\$860	\$12.3	\$1.7	\$14.1	1.6%	1.9%	1.6%
Plattsburgh	\$454	\$59	\$513	\$7.7	\$1.1	\$8.8	1.7%	1.8%	1.7%
Potsdam	\$523	\$35	\$558	\$8.6	\$0.7	\$9.4	1.7%	2.1%	1.7%
Purchase	\$832	\$123	\$955	\$14.0	\$2.2	\$16.2	1.7%	1.8%	1.7%
Stony Brook	\$3,457	\$384	\$3,841	\$55.7	\$7.3	\$63.0	1.6%	1.9%	1.6%
SUNYIT	\$160	\$47	\$207	\$2.5	\$0.8	\$3.3	1.5%	1.8%	1.6%
Sys Adm	\$197	\$2	\$199	\$3.1	\$0.0	\$3.2	1.6%	2.1%	1.6%
Upstate	\$504	\$20	\$524	\$7.8	\$0.4	\$8.1	1.5%	1.8%	1.6%
Total	\$22,942	\$2,806	\$25,748	\$369.6	\$52.7	\$422.3	1.6%	1.9%	1.6%



### 8.3 SUNY System-wide Summary Five-Year FCI

Campus	CRV (millions of dollars)			Backlog and 5-year Renewal Needs (\$ millions)			5-year FCI		
	Building CRV	Infra CRV	Total CRV	Building	Infra	Total	Building	Infra	Total
Albany	\$1,225	\$252	\$1,477	\$199	\$56	\$255	0.16	0.22	0.17
Alfred Ceramics	\$167	\$4	\$171	\$15	\$2	\$16	0.09	0.41	0.10
Alfred State Col	\$262	\$37	\$299	\$23	\$10	\$33	0.09	0.26	0.11
Binghamton	\$1,283	\$174	\$1,457	\$188	\$56	\$243	0.15	0.32	0.17
Brockport	\$660	\$212	\$872	\$161	\$56	\$217	0.24	0.26	0.25
Buffalo College	\$866	\$85	\$951	\$168	\$48	\$216	0.19	0.57	0.23
Buffalo Univ	\$3,120	\$439	\$3,559	\$612	\$125	\$737	0.20	0.28	0.21
Canton	\$170	\$38	\$208	\$29	\$7	\$35	0.17	0.17	0.17
Cobleskill	\$250	\$49	\$299	\$47	\$14	\$61	0.19	0.29	0.20
Cornell - AG	\$1,025	\$11	\$1,036	\$143	\$7	\$150	0.14	0.67	0.14
Cornell - Gen AG	\$214	\$14	\$228	\$45	\$7	\$52	0.21	0.50	0.23
Cornell Gen SVS	\$192	\$38	\$230	\$37	\$33	\$70	0.19	0.87	0.30
Cornell I&LR	\$100	\$5	\$105	\$10	\$1	\$11	0.10	0.29	0.10
Cornell - Vet	\$450	\$70	\$520	\$73	\$0	\$73	0.16	0.00	0.14
Cortland	\$544	\$75	\$619	\$109	\$16	\$125	0.20	0.21	0.20
Delhi	\$243	\$44	\$287	\$29	\$17	\$46	0.12	0.39	0.16
Downstate	\$923	\$4	\$927	\$262	\$9	\$271	0.28	n/a	0.29
Empire State	\$14	\$0	\$14	\$3	\$0	\$3	0.21	0.07	0.20
Envir Sci/For	\$406	\$9	\$415	\$78	\$6	\$83	0.19	0.63	0.20
Farmingdale	\$635	\$111	\$746	\$114	\$40	\$153	0.18	0.36	0.21
Fredonia	\$430	\$77	\$507	\$57	\$55	\$112	0.13	0.71	0.22
Geneseo	\$526	\$72	\$598	\$103	\$23	\$126	0.20	0.32	0.21
Maritime	\$222	\$38	\$260	\$68	\$20	\$88	0.31	0.53	0.34
Morrisville	\$335	\$41	\$376	\$45	\$5	\$50	0.13	0.11	0.13
New Paltz	\$611	\$108	\$719	\$99	\$58	\$158	0.16	0.54	0.22
Old Westbury	\$402	\$65	\$467	\$110	\$19	\$129	0.27	0.29	0.28
Oneonta	\$508	\$47	\$555	\$89	\$19	\$108	0.17	0.41	0.19
Optometry	\$263	\$0	\$263	\$51	\$0	\$51	0.19	0.00	0.19
Oswego	\$769	\$91	\$860	\$159	\$39	\$198	0.21	0.43	0.23
Plattsburgh	\$454	\$59	\$513	\$86	\$15	\$101	0.19	0.25	0.20
Potsdam	\$523	\$35	\$558	\$76	\$6	\$82	0.14	0.17	0.15
Purchase	\$832	\$123	\$955	\$163	\$42	\$205	0.20	0.34	0.21
Stony Brook	\$3,457	\$384	\$3,841	\$620	\$139	\$759	0.18	0.36	0.20
SUNYIT	\$160	\$47	\$207	\$10	\$7	\$16	0.06	0.14	0.08
Sys Adm	\$197	\$2	\$199	\$38	\$2	\$39	0.19	0.86	0.20
Upstate	\$504	\$20	\$524	\$48	\$2	\$50	0.10	0.10	0.10
Total	\$22,942	\$2,806	\$25,748	\$4,163	\$959	\$5,122	0.18	0.34	0.20

### 8.4 Backlog Growth at \$200 Million Investment (\$ millions)

<b>Needs</b>											
	<u>Start</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>
<b>Buildings</b>	\$2,457	\$321	\$219	\$372	\$379	\$414	\$446	\$327	\$271	\$433	\$348
<b>Infrastructure</b>	\$696	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53
<b>Total</b>	\$3,153	\$374	\$272	\$425	\$432	\$467	\$499	\$380	\$324	\$486	\$401
<b>Investment</b>		\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
<b>Backlog</b>	\$3,153	\$3,326	\$3,399	\$3,624	\$3,856	\$4,124	\$4,423	\$4,602	\$4,727	\$5,013	\$5,213

**Backlog Growth at \$200m/yr Investment**

Year	Investment (millions)	Backlog (millions)
Start	0	3,153
2008	200	3,326
2009	200	3,399
2010	200	3,624
2011	200	3,856
2012	200	4,124
2013	200	4,423
2014	200	4,602
2015	200	4,727
2016	200	5,013
2017	200	5,213

This scenario causes the backlog to grow from \$3B to \$5B in ten years.

### 8.5 Backlog Growth at \$400 million Investment (\$ millions)

<b>Needs</b>											
	<u>Start</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>
<b>Buildings</b>	\$2,457	\$321	\$219	\$372	\$379	\$414	\$446	\$327	\$271	\$433	\$348
<b>Infrastructure</b>	\$696	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53
<b>Total</b>	\$3,153	\$374	\$272	\$425	\$432	\$467	\$499	\$380	\$324	\$486	\$401
<b>Investment</b>		\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400
<b>Backlog</b>	\$3,153	\$3,126	\$2,999	\$3,024	\$3,056	\$3,124	\$3,223	\$3,202	\$3,127	\$3,213	\$3,213

**Backlog Growth at \$400m/yr Investment**

Year	Investment (\$ millions)	Backlog (\$ millions)
Start	0	3,153
2008	400	3,126
2009	400	2,999
2010	400	3,024
2011	400	3,056
2012	400	3,124
2013	400	3,223
2014	400	3,202
2015	400	3,127
2016	400	3,213
2017	400	3,213

In this scenario, the backlog remains relatively constant.

**8.6 Backlog Reduction at \$560 Million Investment (\$ millions)**

<b>Needs</b>											
	<u>Start</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>
<b>Buildings</b>	\$2,457	\$321	\$219	\$372	\$379	\$414	\$446	\$327	\$271	\$433	\$348
<b>Infrastructure</b>	\$696	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53
<b>Total</b>	\$3,153	\$374	\$272	\$425	\$432	\$467	\$499	\$380	\$324	\$486	\$401
<b>Investment</b>		\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560
<b>Backlog</b>	\$3,153	\$2,966	\$2,679	\$2,544	\$2,416	\$2,324	\$2,263	\$2,082	\$1,847	\$1,773	\$1,613

**Backlog Growth at \$560m/yr Investment**

Year	Investment (\$ millions)	Backlog (\$ millions)
Start	0	3,153
2008	560	2,966
2009	560	2,679
2010	560	2,544
2011	560	2,416
2012	560	2,324
2013	560	2,263
2014	560	2,082
2015	560	1,847
2016	560	1,773
2017	560	1,613

In this scenario, the backlog is reduced by 50% in ten years.

**8.7 Backlog Reduction at \$700 Million Investment (\$ millions)**

<b>Needs</b>											
	<u>Start</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>
<b>Buildings</b>	\$2,457	\$321	\$219	\$372	\$379	\$414	\$446	\$327	\$271	\$433	\$348
<b>Infrastructure</b>	\$696	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53	\$53
<b>Total</b>	\$3,153	\$374	\$272	\$425	\$432	\$467	\$499	\$380	\$324	\$486	\$401
<b>Investment</b>		\$700	\$700	\$700	\$700	\$700	\$700	\$700	\$700	\$700	\$700
<b>Backlog</b>	\$3,153	\$2,826	\$2,399	\$2,124	\$1,856	\$1,624	\$1,423	\$1,102	\$727	\$513	\$213

**Backlog Reduction at \$700m/yr Investment**

Year	Investment (\$ millions)	Backlog (\$ millions)
Start	0	3,153
2008	700	2,826
2009	700	2,399
2010	700	2,124
2011	700	1,856
2012	700	1,624
2013	700	1,423
2014	700	1,102
2015	700	727
2016	700	513
2017	700	213

In this scenario, the backlog is almost eliminated in ten years.

## **9. Concluding Summary**

### **Purpose & Scope of Study**

The study was commissioned by the Rockefeller Institute of Government, on behalf of the State University of New York (SUNY) and the State University Construction Fund (SUCF), to conduct the research and analysis needed to provide a conceptual framework for uniformly and systematically assessing a major portion of the University's ongoing capital facility renewal needs. It is intended to establish the basis for a continuing, interactive process of informed analysis and methodological refinement over time. The report provides: research conducted to determine available benchmarking; analyses identifying the annual facility renewal and backlog (i.e., deferred maintenance) needs of the University's State-operated academic facilities; and an independent, objective proposal for an ongoing annual level of capital reinvestment in SUNY Academic facilities, based on the Current Replacement Value methodology.

### **Study Participants**

Rockefeller Institute organized and supervised the study conducted by The Pacific Partners Consulting Group, Inc. (PPCG), headquartered in Stanford, California. PPCG worked in close conjunction with SUCF staff involved in the collection of current SUNY building and infrastructure data.

### **Study Process: Methodology & Benchmarking**

#### **Methodology**

The study examined the strengths and weakness of several differing approaches to planning for capital reinvestment, including: 1) Physical Plant Auditing, 2) Plant Depreciation as a Model for Renewal, 3) Inventory of Components, 4) Fixed Percentage of Current Replacement Value (CRV) to calculate Annual Renewal, and 5) the Life Cycle Model Based on CRV.

The latter approach, the Life Cycle Model Based on CRV, was chosen to undertake this study. This model generates a high-level statistical overview of current facility renewal needs and any accumulated backlog based on institution-specific information, including: the age and type of building and its current condition; average building sub-system life cycles; related infrastructure support requirements; and the current cost of replacement – adjusted for regional cost differentials within the state.

## **Benchmarking**

Due to the limited availability of any other reliable, uniformly-collected, industry-recognized higher education facility data to serve as a benchmark for SUNY, PPCG relied upon data drawn from its pool of public higher education system clients to serve that function: University of Texas (15 campuses), the California State University System (24 campuses), the Oregon University System (7 campuses), the University of California (9 campuses), and the Minnesota State College and University System (53 campuses).

## **SUNY: General Overview & Summary Findings**

SUNY consists of 32 State-operated campuses, two contract colleges (Cornell and Alfred Ceramics), along with System Administration, which includes the recent acquisition of Levin Institute. The total SUNY academic system is comprised of 1,800+ buildings with a total of 54.6 million gross square feet. Substantial portions of SUNY buildings were constructed during the late 1960's and early 1970's.

The study shows that SUNY system-wide academic facilities have a total Current Replacement Value (CRV) of \$25.7 billion, including \$22.9 billion CRV for buildings alone, and \$2.8 billion in the CRV for supporting infrastructure. Further, the SUNY State-operated system as a whole currently has a \$3.2 billion backlog of deferred capital maintenance, including \$2.5 billion for building system renovations and \$0.7 billion for renewal of supporting infrastructure. The largest contributors to the building backlog are renovations or replacements related to 1) HVAC Controls/Equipment/Distribution Systems (\$1.2 billion); 2) Exterior Walls, Roofs, Doors and Windows (\$544 million); and 3) Electrical Equipment/Power Wiring and Lighting (\$253 million). Major backlog categories for infrastructure components include 1) Utility Distribution and Generation (primarily steam systems) and 2) Hardscape (surface parking, plazas, sidewalks, etc.)

Pursuant to the CRV methodology, the study also estimates the need for an additional \$2.0 billion in capital reinvestment over the next five years to avoid the accumulation of additional backlog. It is important to note that this estimate, and the above estimate of total renewal backlog, is expressed in 2007 dollars only; no adjustments have been made to anticipate future annual cost inflation or escalation amounts.

The most serious concern identified by the study involves the level of need currently identified for the infrastructure supporting facility operations – especially in the area of aging underground distribution systems. Persisting problems in this area could lead to more expensive emergency repairs occasioned by major system failures.

## SUNY: Comparisons to Other Systems

- 11% of SUNY’s building systems are in *backlog* (vs. optimum level of 5% or under).
  - Advanced age of facilities serve to increase Facility Condition Index (FCI).
  - SUNY’s system-wide average FCI is in middle range of 6 public systems.
- SUNY has a high *Percentage of Buildings over 30-years Old* (73%).
- SUNY’s system-wide average of *buildings with complex systems* is 11%.
  - SUNY is comparable to the California State University System, who also reports 11%.
  - University of Texas, Oregon State University and University of California are 28% or higher.
- SUNY requires an average annual renewal investment of 1.6% of its total building CRV.
  - Range of all systems benchmarked: 1.4% to 1.7% of total building CRV.
  - The two state-mandated teaching college systems have a lower percentage of 1.4%.
  - The research institution systems have a higher percentage of 1.7%.
  - SUNY has a blending of teaching and research facilities.
- SUNY requires an additional 14% added to average annual building renewal for infrastructure renewal.
  - The average of all systems benchmarked is 16.5%.

### Study Findings and Recommendations:

Over the next five years, SUNY academic facilities will require an investment of \$2.0 billion to adequately renew its capital facilities. This includes \$1.7 billion for building renewal, and \$0.3 billion for infrastructure.

The \$2.0 billion over the next five years does not address the reduction of the current \$3.2 billion backlog. Depending on how quickly SUNY and the State wish to reduce the backlog, SUNY will require a Total Renewal and Backlog Reduction Investment in the range of \$400 million to \$700 million *per year*. The following table illustrates the net impact on backlog utilizing four progressive capital investment levels:

#### Total Annual Renewal & Backlog Reduction Investment

\$200 Million  
 \$400 Million  
 \$560 Million  
 \$700 Million

#### Net Impact on Backlog

Backlog grows to a minimum of \$4 billion in 5 years; or excess of \$5 billion in 10 years  
 Backlog remains relatively constant  
 Backlog reduced by 50% in 10 years  
 Backlog almost eliminated in 10 years

*Please note that all cost figures cited here are expressed in 2007 dollars.*



## 10. Glossary of Terms and Acronyms Used

<b>APPA</b>	The Association of Physical Plant Administrators.
<b>Average Annual Renewal</b>	The average cost per year to keep up with facility renewal needs.
<b>Backlog</b>	The Backlog includes all subsystems that have no remaining useful life and need immediate replacement. (See Deferred Maintenance)
<b>BCAS</b>	Building Condition Assessment Survey.
<b>Basic (Building Type)</b>	Buildings with <i>basic</i> systems include offices, classrooms and libraries. These represent the bulk of the SUNY buildings.
<b>Complex (Building Type)</b>	Buildings with <i>complex</i> systems include wet-labs, patient care, and animal care facilities.
<b>Simple (Building Type)</b>	Buildings with <i>simple</i> systems consist of warehouses and parking structures.
<b>Small (Building Type)</b>	<i>Small</i> Buildings include buildings under 5,000 GSF.
<b>CSU</b>	California State University System (24 campuses).
<b>Component</b>	Sub-systems are made up of building components (e.g. motors, fans, condensing units).
<b>CRV</b>	Current Replacement Value - the cost to replace (in kind).
<b>Deferred Maintenance</b>	A system is in deferred maintenance if it is past its useful life and needs immediate replacement. (See Backlog)
<b>Escalation</b>	Inflation.
<b>FCI</b>	Facility Condition Index - The backlog divided by the Current Replacement Value.
<b>FRRM™</b>	Facility Renewal Resource Model (FRRM™) - a web-based software application to track renewal and backlog needs.
<b>GPM</b>	Gallons per minute.
<b>GSF</b>	Gross square footage.
<b>Infrastructure</b>	Facilities that support the campus but are not buildings. Examples include roads, courtyards, utility distribution systems, utility generation systems and athletic fields.
<b>Infrastructure Renewal</b>	The cost to renew infrastructure systems.
<b>KV</b>	Kilovolt.
<b>KVA</b>	Kilovolt Amps.
<b>LF</b>	Linear Foot.
<b>Life Cycle</b>	The expected useful life of a subsystem as determined by industry standards.
<b>LLF</b>	Lane linear foot.
<b>Mark Ups</b>	Construction overhead costs that include insurance, escalation fees, overhead, and profit.
<b>MBTUH</b>	One thousand British thermal units per hour.
<b>MnSCU</b>	Minnesota State College and University System (53 campuses).
<b>NACUBO</b>	The National Association for College and University Business Officers.
<b>OUS</b>	Oregon University System (7 campuses).
<b>PPCG</b>	Pacific Partners Consulting Group, Inc.
<b>Ratings</b>	Criteria provided by SUCF for evaluating building conditions – Excellent, Good, Fair, Poor.
<b>Regional Index</b>	Regional Index Factors are adjustments based on the location of the campus.
<b>Removal Costs</b>	Removal Costs are the cost of removing the old system, prior to installing or upgrading a new system.
<b>Renewal</b>	Renewal is replacement or renovation of systems (usually when the system is past its useful life).
<b>Renewal Curve</b>	A renewal curve is a 50 year forecast of renewal needs by campus or by system.
<b>SCUP</b>	The Society for College and University Planners.
<b>Soft Costs</b>	Soft Costs include design, inspection, specifications, bidding, and change orders.
<b>Subsystems</b>	Buildings are made up of Systems (HVAC) and Sub-systems (HVAC Distribution, HVAC Equipment, HVAC Controls, etc).
<b>SUCF</b>	State University Construction Fund.
<b>SUNY</b>	State University of New York System (35 campuses).
<b>UC</b>	University of California System (9 campuses plus field stations).
<b>UT</b>	University of Texas System (15 campuses).