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A study was completed at UW-Madison in 2010 that reviewed the energy consumption of US Navy buildings which earned Leadership in Energy and Environmental Design (LEED) certification by the United States Green Building Council (USGBC). The research compared LEED certified buildings to a commercial counterpart within the US Navy inventory against Executive Order (EO) 13423. The EO mandated that all federal agencies meet a 30 percent reduction of electricity and water consumption. This research expands on the 2010 study to analyze the construction costs associated with LEED certification in US Navy owned buildings with the goal of identifying the costs associated with LEED construction to determine the economic feasibility of LEED certification. The objectives of the study are met by comparing the building construction costs between the LEED certified and comparison building, as well as, the calculation of a simple payback period for the US Navy LEED certified buildings. The results indicate that although some of the building had satisfactory results, half would not be considered economically feasible. Furthermore, neither the level of LEED certification nor the amount of LEED points earned correlate to successfully meeting EO 13423's mandate.

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COST ANALYSIS OF LEED CERTIFIED

UNITED STATES NAVY BUILDLINGS

by

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A thesis submitted in partial fulfillment of

the requirements for the degree of

Master of Science

(Civil and Environmental Engineering)

at the

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This thesis is dedicated to my wife, Heidi Joy Kirar, and our daughters Giada and Ruby. Without their love, patience, understanding, and support this work could not have been completed.

Abstract

A study was completed at the University of Wisconsin – Madison in 2010 that reviewed the energy consumption of United States (US) Navy buildings that earned Leadership in Energy and Environmental Design (LEED) certification by the United States Green Building Council (USGBC). The research compared LEED certified buildings to a commercial counterpart within the US Navy inventory against Executive Order (EO) 13423. The EO mandated that all federal agencies meet a 30 percent reduction of electricity and water consumption. In 2008, the US Navy chose to adopt LEED Silver certification as the minimum design standard for new construction and major renovation project in order to meet the EO mandate. The results of the 2010 study indicated that LEED certification alone could not guarantee energy savings as directed by EO 13423. This research expands on the previous study to analyze the construction costs associated with LEED certification in US Navy owned buildings. The goal of this research is to identify the costs associated with LEED construction to determine the economic feasibility of LEED certification versus anticipated energy savings, if any. The objectives of the study are met by comparing the building construction costs between the LEED certified and comparison building, as well as, the calculation of a simple payback period for the US Navy LEED certified buildings. The results indicate that although some of the building had satisfactory results, half would not be considered economically feasible when looking at either the total cost of construction or the costs associated with the LEED scoring category “Energy and Atmosphere”. Furthermore, neither the level of LEED certification nor the amount of points earned in “Energy and Atmosphere” correlate to successfully meeting EO 13423’s mandate to reduce electricity and water consumption costs.

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Chapter 1: Introduction

The United Nations Environmental Program Sustainable Construction and Building Initiative (UNEP-SBCI 2007) found that 80 percent of the energy consumed by a building during its life-cycle occurs when the building is in actual use or what is typically referred to as the maintenance and operation phase of the building. Additionally, commercial buildings consume 19 percent of all energy in the United States each year (Center for Sustainable Buildings, 2009). As energy costs go up, there is an increasing emphasis on energy conservation through policies and programs to promote sustainable design and construction. There are multiple guidelines available for property owners to achieve sustainable building design, construction, and operation. These options include the Green Building Initiative (GBI), Build It Green, and the National Green Building Certification, but none are as recognized and accepted as the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED).

In 2007, Executive Order (EO) 13423 was issued calling for the adoption of the "Federal Leadership in High Performance and Sustainable Buildings" with particular focus on reducing the life-cycle costs associated with environmental and energy attributes of federal owned building facilities by implementing the general guidelines of the Energy Policy Act (EPAct) 2005 (EO 13423 2007). The policy breaks down the requirements for existing and new buildings owned and operated by federal agencies into eight distinct areas, three of which are applicable to this research: (1) Improve energy efficiency and reduce greenhouse gas emissions; (2) Reduce water consumption intensity for all federal agencies; and (3) Incorporate sustainable practices on all new construction and 15 percent of existing facilities' retrofits. The remaining five requirements are also centered on the reduction of energy consumption, but discuss details such as purchasing electronic equipment and transportation requirements (e.g., hybrid vehicles) (EO

13423 2007). The policy further provides guidance to all federal agencies to reduce the energy cost budget by 30 percent for new construction projects as compared to the baseline performance per the American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc. (ASHRAE) and the Illuminating Engineering Society of North America (IESNA) Standard 90.1-2004, and by at least 20 percent for major renovations as compared to the pre-renovation 2003 baseline (Mangasarian, 2010).

Prior to EO 13423, Naval Facilities Engineering Command (NAVFAC), the construction agency of the United States Navy, initiated a policy to require LEED certification of all newly constructed facilities (NAVFACINST 9830.1 2003). As a result of EO 13423, NAVFAC amended the policy in 2008 to require LEED Silver certification on all new Military Construction (MILCON) and major renovation projects in the US Navy and Marine Corps building inventory.

The 2010 University of Wisconsin – Madison (UW) study compared the energy consumption of US Navy LEED certified buildings and a commercial counterpart against EO 13423's mandate to meet a 30 percent energy consumption reduction. Additionally, the study compared the LEED certified buildings against the national average from the 2003 Commercial Building Energy Consumption Survey (CBECS). The results of the research indicated that LEED certification alone could not guarantee the 30 percent savings for electricity and water as directed by EO 13423. Furthermore, the data showed that energy savings were not closely related to the number of points received in the "Energy and Atmosphere" category of the LEED certification process.

This research expands on the 2010 UW study identifying the construction costs associated with LEED certification, determining the simple payback of those costs, and

evaluating the electricity and water consumptions costs to verify if EO 13423's mandated 30 percent cost reductions were met. The results of the simple payback period analysis indicate that although some of the buildings had satisfactory results, half would not be considered economically feasible when looking at either the total cost of construction or the costs associated with the LEED certification category "Energy and Atmosphere". Furthermore, neither the level of LEED certification nor the amount of points earned in "Energy and Atmosphere" correlate to successfully meeting EO 13423's mandate to reduce electricity and water consumption costs.

Chapter 2: Literature Review

2.1 – Leadership in Energy and Environmental Design (LEED) as Primary Certification Process

Researchers have studied the motivations of public and private building owners in their pursuit of green and sustainable building design initiatives. An example to illustrate this increase in interest is the growth of the USGBC's LEED certification process. The number of certifications have grown tremendously since it was first developed in March 2000 with more than 40,000 commercial and industrial projects either certified or in the certification process, representing 7.9 billion square feet of construction space in 50 states and 117 countries (Christ and Furness, 2011). Nelson et al. (2010) discussed multiple reasons why these building owners and operators are utilizing these guidelines to develop eco-friendly (energy efficient and sustainable) designs in their buildings. The primary factors they found include growing tenant demand in order to lower operating costs associated with electricity, fuel, and water consumption, higher employee productivity, investors seeking more socially conscious investments, and reputational issues that have been forcing the real estate sector towards more efficient building techniques.

In addition to these owner driven reasons, public policy has pushed building construction towards sustainable and green design through stricter building codes and regulations. For example, having recognized the advantages of green buildings, national governments and the European Union (EU) have mandated higher efficiency standards for new construction and renovations with the EU Energy Performance of Buildings Directive of 2002 (EPBD 2002). EPBD 2010, the follow-up directive, is likely to make "near-zero" energy buildings mandatory by 2021 (Nelson et al., 2010).

Fuerst and McAllister (2009) also researched the rational to pursue green and sustainable building design. Their study discovered a rental premium and/or lower vacancy rates for environmental and sustainable certified buildings. They also determined that investors were able to receive higher net operating income due to increased demand from tenants, lower costs of ownership primarily associated with energy and other utilities savings, as well as an element of protection from future regulatory changes. In fact, their empirical analysis confirmed that there is a rental premium (cost per square foot) of approximately five percent for LEED certification and four percent for Energy Star, while sales found a premium (cost per square foot) of 25 percent for LEED-certified buildings and 26 percent for Energy Star.

There are numerous national and international approaches that landowners and building operators are utilizing for environmental and sustainable design, construction and operation of buildings, although the LEED program has become the industry standard in the United States. An alternative to LEED include the International Federation of Consulting Engineers (FIDIC), whose Project Sustainability Method (PSM) assists project engineers and other stakeholders in setting sustainable development goals for their projects that are recognized and accepted, as being in the interests of society as a whole (FIDIC 2005). Other efforts include those by the Green Building Initiative (GBI), Build It Green, and the National Green Building Certification (GBI 2009). The GBI approach to sustainability utilizes the Green Globes System, which is an environmental design and management tool. Similar to LEED, which utilizes a commissioning agent to assist with certification through the USGBC, Green Globes provides environmental assessment through a third-party (GBI, 2009). In the residential sector, Build It Green promotes resourceful energy conserving homes in California through sustainable building efforts. Another certification, the National Green Building Certification, is similar to LEED with multiple levels of certification (Gold, Silver, and Bronze) for residential homes (Built It Green 2010).

In 2009, Retzlaff reported in the *Journal of Education and Research* that some jurisdictions in the United States have enacted green building policies and incentives that use a building assessment system to rate their sustainability. She further offered several observations about some of the problems with properly implementing LEED into public policies and regulations. Her research reviewed LEED policies from fifty-six cities and counties through questionnaires and telephone interviews. The results indicate that LEED has been used in green building policies not for its substantive content, but because of administration preference, convenience, or a lack of knowledge about other systems. The results also indicated that the LEED system is not without its flaws, such as the certification cost, lack of flexibility in the criteria, and general lack of knowledge by developers, planners, and others. She concluded that planning departments must have a role in the green building policies and that public agencies should look outside of the LEED system to other building assessment systems to learn the best practices to fit their specific needs and requirements.

2.2 – Energy Performance of LEED for New Construction Buildings

A study by Fowler et. al. (2005) developed cost and performance metrics as part of the data collection protocol to be used for basic information about a building's comparative performance with respect to sustainable design (Fowler et al. 2005). The study broke down the metrics for each building to identify specific characteristics for sustainable design. These metrics were chosen based on ease of collection, relevance of the information to sustainability, and expected quality of the data and were determined by their relative associated benefits to sustainability within the design of new construction. Examples provided by the study included total building potable water use, storm water management, total building energy use (with respect to electricity consumption), source energy use, maintenance (with respect to hazardous chemicals distributed), and waste generation. Each aspect of these metrics was broken down to

its component parts to provide an understanding of building consumption as a whole. These quantitative aspects of building operations were measured over a period of twelve months with the majority of the data collected monthly and aggregated to provide annual values for comparative analysis (Fowler et al. 2005). A list of the metrics used in the study can be seen below in Figure 1.

Metric	Required	Optional
Water	Total Building Water Use	Indoor Potable Water Outdoor Water Use Total Storm Sewer Output
Energy	Total Building Energy Use	Source Energy Peak Electricity Demand
Maintenance & Operations	Building Maintenance Requests	Grounds Maintenance Churn Cost
Waste Generation	Solid Sanitary Waste	Recycled Materials
Purchasing		Environmentally Preferable Purchasing
Occupant Health & Productivity	Occupant Turnover Rate Absenteeism Building Occupant Satisfaction Self-Rated Productivity	
Transportation	Regular Commute	

Figure 1 - Summary of Building Cost and Performance Metrics (Fowler et al. 2005)

Potable water consumption is a building utility cost second only to energy use, therefore there is a direct monetary incentive to track and decrease water consumption. Total building potable water use is the required metric because not only does it represent costs and resource use, but it is also a local government issue in many places (Fowler et al. 2005).

 **Water**	
Metric	**Collection Units**
Required	
Total Building Potable Water Use	$\frac{gal}{month}$ $\frac{\$}{month}$
Optional	
Indoor Potable Water Use	$\frac{gal}{month}$ $\frac{\$}{month}$
Outdoor Water Use	$\frac{gal}{month}$ $\frac{\$}{month}$
Total Storm Sewer Output	$\frac{gal}{month}$ $\frac{\$}{month}$

Figure 2 - Water Metric (Fowler et al. 2005)

Figure 2 illustrates the metric building water use and includes all indoor and outdoor water consumption, but does not include captured storm-water or reused gray water. Potable water use cost can include costs assessed for sewage treatment as long as both buildings in a set are measured the same way. Varying regional price structuring and metering may alter what data are readily available via utility bills (Fowler et al. 2005).

Energy consumption and reduction is a widely studied category of building performance. Total Building Energy Use is the required metric because it is typically the highest building cost and has an environmental impact based on the energy sources used. The optional metrics, peak electricity demand, and source energy are important as they provide increased detail on the resource use and environmental impact analysis (Fowler et al. 2005). Figure 3 below illustrates the collection units required in measuring the total building energy use.

 **Energy**			
Metric	**Collection Units**		
Required			
Total Building Energy Use	$\frac{kWh_{delivered}}{month}$	$\frac{\$}{month}$	$\frac{Btu}{month}$
Optional			
Source Energy	$\frac{kWh_{source}}{month}$	$\frac{kg_{CO_2}}{kWh_{source}}$	
Peak Electricity Demand	kW		

Figure 3 - Energy Use Metric (Fowler et al. 2005)

The purpose for Fowler et al. developing this protocol was so that measured data could be communicated to key stakeholders. Their study made note that the U.S. Navy was using the protocol to measure the performance on seven building sets (14 buildings). Each building set included one sustainably designed building and a similar building on the same Navy site designed in a more 'typical' fashion; i.e. without green certification as a design standard. In addition to using the typically designed building for comparison, industry benchmarks and existing Navy data were used when available. The protocol was also being considered for use on other comparative analysis of Federal sustainably designed buildings (Fowler et. al., 2005). However, there was no indication that this protocol was effective for these public buildings. During the collection of data for this research, the authors noted that, initially, the largest consideration for the US Navy's implementation of sustainable design was cost. Personal experience and interviews with Department of Defense contracting personnel indicates that the US Navy still considers cost as a primary consideration.

Turner and Frankel (2008) performed a study to measure the post-occupancy energy performance of the LEED buildings against (1) commercial counterparts, and (2) the Commercial Building Energy Consumption Survey national averages (CBECS 2003). Their

study incorporated all 552 LEED buildings certified through 2006. Of these, 121 participated and were further reduced by Turner and Frankel to 100, eliminating those with excessively high-energy consumption. Turner and Frankel used the Energy Use Index (EUI) measured in kBtu/sf/yr, the Energy Star Rating, and actual measured performance versus modeled design performance as the basis for comparison. Their results indicate that:

- The LEED buildings median EUI measured 69 kBtu/sf; 24% below (better than) the CBECS national average for all commercial building stock (Figure 4).

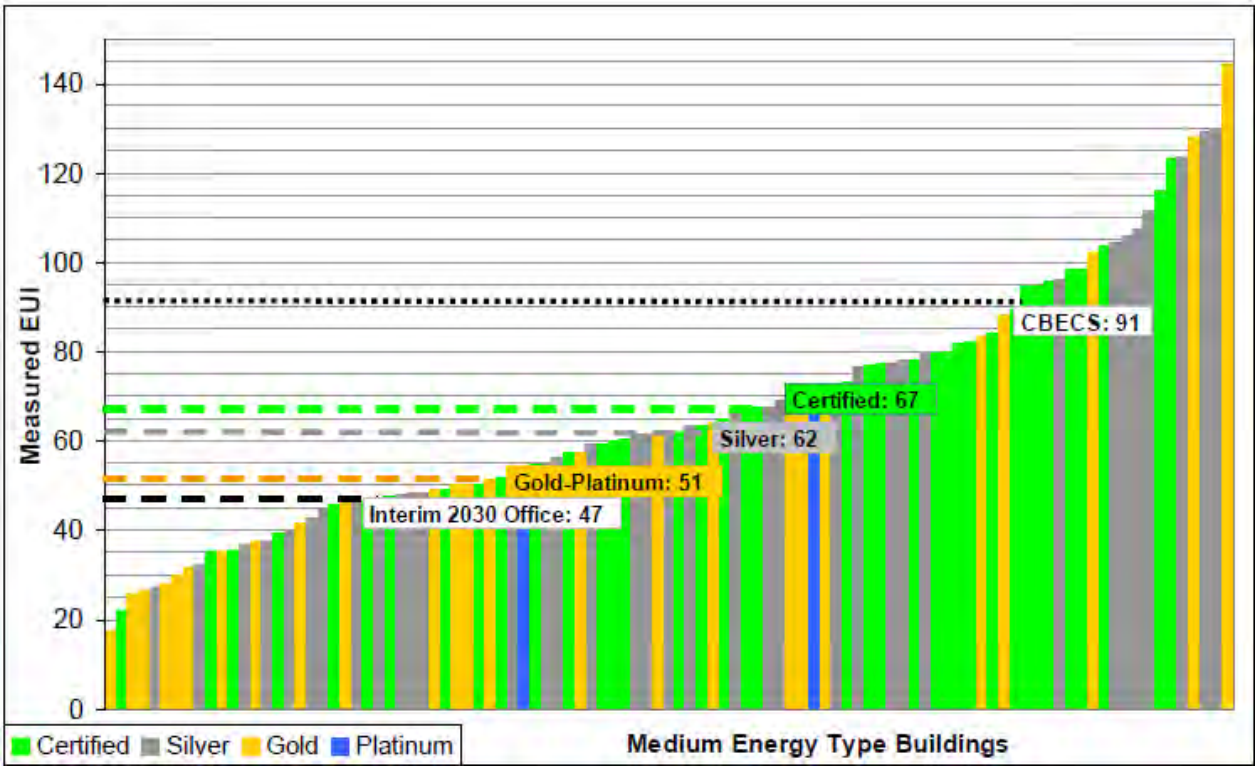

Figure 4 - EUI (kBtu/sf) Distribution (Turner and Frankel 2008)

- The average Energy Star rating of LEED buildings was 68% better than similar buildings. Half of LEED buildings had Energy Star ratings of at least 75, meeting the qualification level for an EPA-certified Energy Star building (Figure 5).

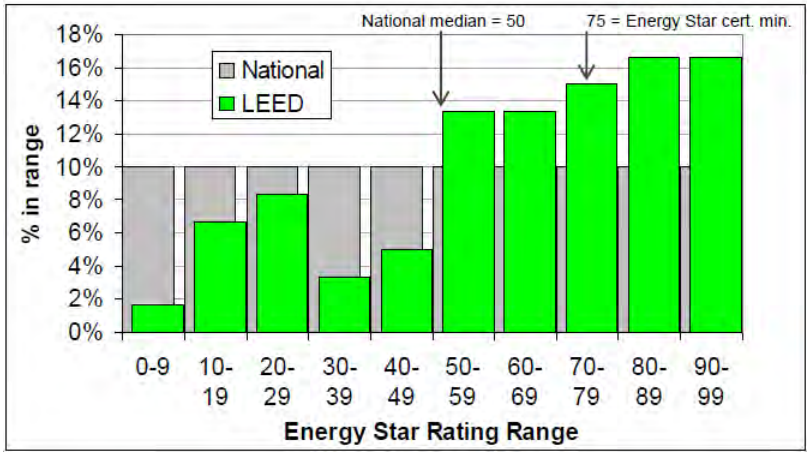

Figure 5 - Distribution of Energy Star Ratings (Turner and Frankel (2008)

- The measured performance in relation to modeling is shown in Figure 6. The scatter diagram shows the design EUI versus the measured EUI for the 100 buildings within they Turner and Frankel 2008 study. The measured energy saved equated to 28%, which was close to the 25% predicted.

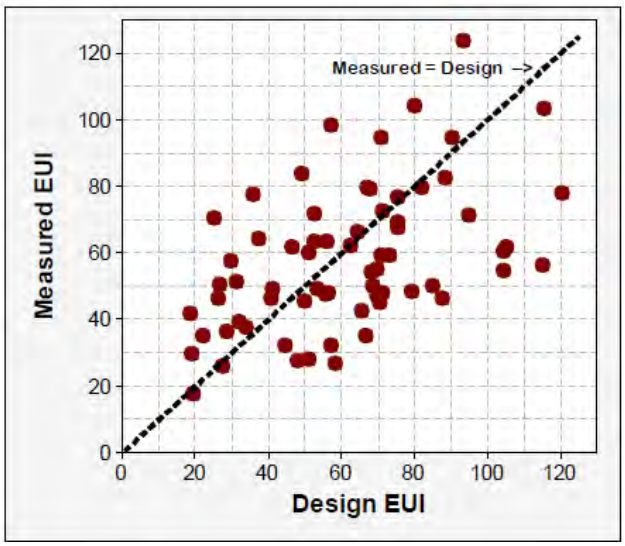

Figure 6 - Measured versus Design EUI's (Turner and Frankel 2008)

Turner and Frankel concluded that on average, LEED buildings delivered the anticipated savings. Each of the three measures of building performance indicated average LEED energy

use was 25-30 percent better than the national average, a level similar to that anticipated by LEED modeling. Additionally, average savings increased for the higher LEED levels, with Gold/Platinum buildings approaching the interim goal of the environmental advocacy group Architecture 2030. As a corollary to the above finding, Turner and Frankel concluded that although energy modeling is a good indicator of program-wide performance, individual project modeling predictions vary widely from actual project performance outcomes. This variability between predicted and measured performance has significant implications for the accuracy of prospective life cycle cost evaluations for any given building. Better feedback to the design community is needed to help calibrate energy-modeling results to actual performance outcomes. (Turner and Frankel 2008).

A study performed by Torcellini et al. (2004) illustrates the difference between modeled and actual performance. In the Torcellini et al. study they looked at six sustainable buildings in the United States and peformed extensive monitoring of energy flows, including lighting loads, HVAC loads and electrical loads, for a minimum of one year. The data was logged every 15 minutes and used to calibrate energy simulation models. Analysis showed that all buildings performed worse than predicted, but all managed a substantial saving (either energy cost or energy use) compared to a comparable building (Figure 7 below). The authors concluded that the lower performance is mainly due to higher than expected occupant loads and systems not performing together in an ideal fashion (Torcellini et al. 2004).

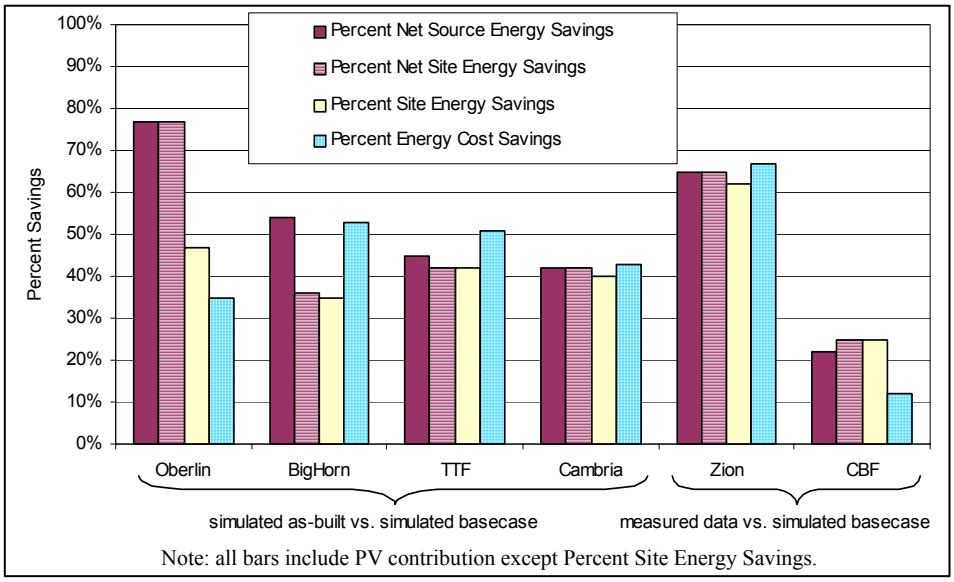

Figure 7 - Summary of Building Energy Savings (Torcellini et al. 2004)

In 2009, Newsham et al. analyzed the same building data as Turner and Frankel (2008) but provided results similar to Torcellini et al. (2004). Newsham et al. illustrated that the LEED buildings used 18 to 39 percent less energy per floor than the conventional buildings compared to the CBECS. However, when looking at energy consumption from a whole building perspective, the same LEED buildings showed a 28 to 35 percent increase over the same period of time. Another important finding of the Newsham et al. research was that the energy consumption achieved in all of the 100 buildings had no correlation to the LEED certification level. Newsham et al. concluded that at a societal level, green buildings can contribute substantial energy savings, but further work needs to be done to define green building rating schemes to ensure more consistent success at the individual building level.

2.3 – Energy Performance of LEED for US Navy Buildings

The US Navy, along with many other local, state, and federal governmental organizations, chose LEED certification in order to achieve the requirements under Executive Order (EO) 13423, and has been implementing design strategies to ensure that all new buildings

achieve LEED Silver as a minimum level of certification. There has been a lack of research related to assessing LEED certified buildings within the Department of Defense and, more specifically, addressing the US Navy LEED certified building inventory. Mangasarian (2010) performed a study to fill in this gap and his research assessed whether the performance metrics set forth by the 2008 US Navy policy and EO 13423 were achieved, as well as to determine if the US Navy LEED certified buildings achieved the required 30 percent reduction in energy consumption. Mangasarian first identified the US Navy's LEED certified buildings then pulled a comparable building from the Navy's inventory based upon location, size in square feet, and comparable function. He then compared these buildings electrical and water consumption directly and used a paired t-test statistical analysis for each of the comparisons utilizing the R Project for Statistical Computing. The results can be seen in Table 1.

Table 1 - Summary of Results as Compared to non-LEED Certified Counterparts (Mangasarian 2010)

LEED Building (Number and Title)	Counterpart	Average Electricity per year (% Savings)	Electricity p-value	Average Water per year (% Savings)	Water p-value
1. Atlantic Fleet Drill Hall	Pacific Fleet Drill Hall	6.2	0.001424	60.37	0.9973
2. Airborne Mine Countermeasures Facility (SP 36)	Aircraft Maintenance Hangar (LP 33)	59.72	1	71.55	1
3. Aircraft Maintenance Hangar (SP 37)	Aircraft Maintenance Hangar (LP 33)	7	7.13E-06	-285.76	3.33E-06
4. Child Development Center (Oceana)	Child Development Center (Norfolk)	8.84	1.83E-08	60.59	1
5. Bachelor Enlisted Quarters (Yorktown)	Bachelor Enlisted Quarters (Norfolk)	-84.19	1.99E-09	N/A	N/A
6. Personnel Support Facility	Morale, Welfare, and Recreation Facility	-127.75	8.62E-07	21.95	0.5
7. Police and Special Operations Facility (Little Creek)	Police Station (Norfolk)	2.92	1.39E-05	17.49	0.3633
8. Marine Corps Bachelor Enlisted Quarters	Marine Corps Bachelor Enlisted Quarters	-10.3	4.47E-06	N/A	N/A
9. Public Works Department (NBVC)	Public Works Department (Point Magu)	14.66	7.34E-05	56.44	1
10. Naval Facilities Engineering Service Command	NAVSEA Laboratory	48.88	0.9993	57.49	1
11. Memorial Golf Course Clubhouse (Miramar)	Golf Course Clubhouse (NBVC)	-209.55	0.001482	-89.45	0.005422

The electricity consumption results in Table 1 indicate that 7 of 11 LEED certified buildings have electric energy savings when compared to their non-LEED counterparts. However, only two of the seven buildings had savings in excess of 30 percent per year with the remainder showing electric energy savings of less that 15 percent when compared to their non-LEED counterparts. The water consumption results indicate that 7 of 9 LEED certified buildings have achieved water savings in excess of 15 percent when compared to their non-LEED counterparts with four of those buildings showing savings in the range of 50 to 75 percent.

The results of the Mangasarian (2010) study show that LEED certification alone cannot guarantee the 30 percent reduction of electricity consumption or the 16 percent reduction of water consumption as directed by EO 13423. Furthermore, the data shows that energy savings are not closely related to the number of points received in the "Energy and Atmosphere" section of the LEED certification process. For example, Figure 8 indicates that two buildings achieved the electrical consumption savings and scored 2 and 11 LEED points respectively for "Energy and Atmosphere" out of the total 17 possible points. The results for the remaining buildings indicate that although some earned up to 14 LEED points for "Energy and Atmosphere", they either failed to meet the 30 percent reductions or actually consumed more than their counterpart.

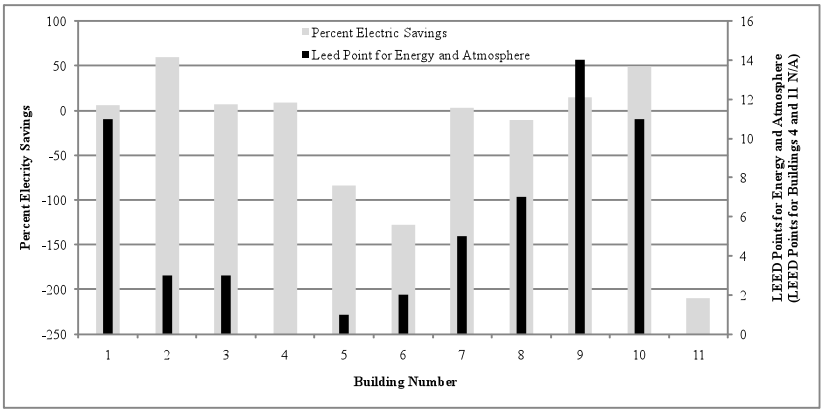

Figure 8 - Percent Savings versus LEED Points for "Energy and Atmosphere" (Menassa et al. 2011)

2.4 – Simple Payback Period

The National Institute of Standards and Technology (NIST) manual, *Life-Cycle Costing (LCC) Manual for the Federal Energy Management Program (FEMP),* provides an excellent description on the use of simple payback as a tool for economic analysis. The handbook describes two methods, the Simple Payback (SPB) and the Discounted Payback (DPB). The DPB method requires cash flows occurring each year be discounted to present value before accumulating them as savings and costs. If the SPB or the DPB is less than the length of the service period used in the analysis, the project is generally cost effective (NIST 1995).

Payback is often used as a "first screening method". By this, it is meant that when a capital investment project is being considered, the first question to ask is: 'How long will it take to pay back its cost?' The organization might have a target payback, and so it would reject a capital project unless its payback period was less than a certain number of years (Macdonald and Cheng 1997). There are limitations to the SPB and DPB methods as neither accounts for the time value of money, risk, financing, or the fluctuation of both energy and maintenance costs over time. However, the calculation of the SPB and DPB is generally used as a screening method for identifying single project alternatives that are so clearly economical that the time and expense of a full Life Cycle Cost Analysis (LCCA) is not warranted (NIST 1995).

The NIST handbook provides a formula for the calculation of both the SPB and DPB. The payback period is the minimum number of years, y, for which:

EQ. 1 - NIST Simple and Discounted Payback Equation

$$\sum_{t-1}^{y} \frac{(S_t - \Delta I_t)}{(1 + d)^t} \geq \Delta I_o$$

where:

- y = Minimum length of time (usually years) over which future net cash flows have to be accumulated in order to offset initial investment costs
- St = Savings in operational costs in year t associated with a given alternative
- ΔI_0 = Initial investment costs associated with the project alternative
- ΔI_t = Additional investment-related costs in year t, other than initial investment costs
- d = Discount rate

2.5 – Lifecycle Cost Savings of LEED

The NIST handbook defines LCCA as "an economic method of project evaluation in which all costs arising from owning, operating, maintaining, and ultimately disposing of a project are considered to be potentially important to that decision." Kats et. al. (2003) provided a report on the issue of green building costs and benefits and looked across the United States at 33 green buildings to determine the cost of building green compared to conventional design. Kats et al. defined the cost difference of building green compared to conventional design as the 'Green Premium'. The researchers found that the average total construction cost premium for these green buildings was slightly less than two percent, or $3-5 per square foot (Figure 9). While some of the green premium costs are associated with materials, the majority of the increase in total construction cost was due to the increased architectural and engineering (A&E) design time, modeling costs, and time necessary to integrate sustainable building practices into projects, such as advanced daylighting, thermal technologies, and photovoltaic systems. Generally, the earlier green building features are incorporated into the design process, the lower the cost (Kats et al. 2003).

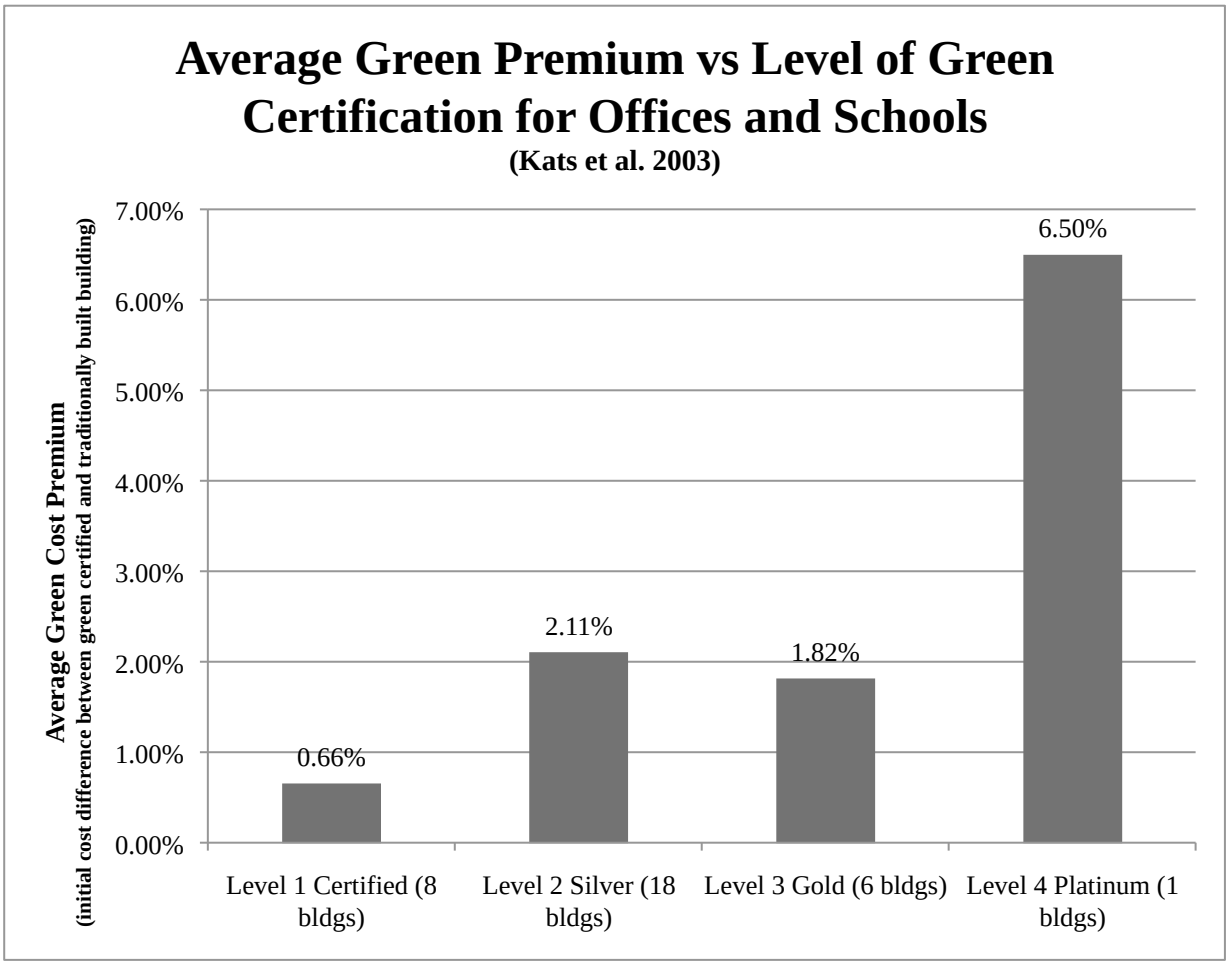

Figure 9 - Average Green Premium versus Level of Green Certification for Offices and Schools (Kats et al. 2003)

Kats et. al. (2003) further stated that Green Buildings provide financial benefits that conventional buildings do not, including energy and water savings, reduced waste, improved indoor environmental quality, greater employee comfort/productivity, reduced employee health costs and lower operations and maintenance costs. Of these benefits, the primary energy savings came from reduced electricity purchases and from reduced peak energy demand. On average, green buildings are 28 percent more efficient than conventional buildings and generate 2 percent of their power on-site from photovoltaics (PV) (Figure 10). The financial benefits of 30 percent reduced consumption at an electricity price of $0.08 per kilowatt hour are about $0.30 per square foot per year, with a 20-year Net Present Value (NPV) of over $5 per square foot (Figure 11),

equal to or more than the average additional cost associated with building green (Kats et al. 2003).

	Certified	Silver	Gold	Average
Energy Efficiency (above standard code)	18%	30%	37%	28%
On-Site Renewable Energy	0%	0%	4%	2%
Green Power	10%	0%	7%	6%
Total	28%	30%	48%	36%

Figure 10 - Reduced Energy Use in Green Buildings as Compared with Conventional Buildings (Kats et al. 2003)

Category	20-year Net Present Value
Energy Savings	$5.80
Emissions Savings	$1.20
Water Savings	$0.50
Operations and Maintenance Savings	$8.50
Productivity and Health Benefits	$36.90 to $55.30
Subtotal	$52.90 to $71.30
Average Extra Cost of Building Green	(-3.00 to -$5.00)
Total 20-year Net Benefit	$50 to $65

Figure 11 - Financial Benefits of Green Buildings, Summary of Findings per Square foot (Kats et al. 2003)

Kats (2010) performed additional research where he surveyed 170 U.S. buildings and found that more than three-quarters of the buildings in the data set had costs associated with sustainable and environmentally conscience design and construction, or green premiums, between zero and four percent; the largest concentration (69 buildings) was between zero and one percent. The median cost increase was 1.5 percent, and the mean cost increase was 2.8

percent before public incentives or government grants were used in evaluating the total cost of construction. These figures translate into a typical cost premium for green certification of about $3 to $9 per square foot (Figure 12) (Kats 2010).

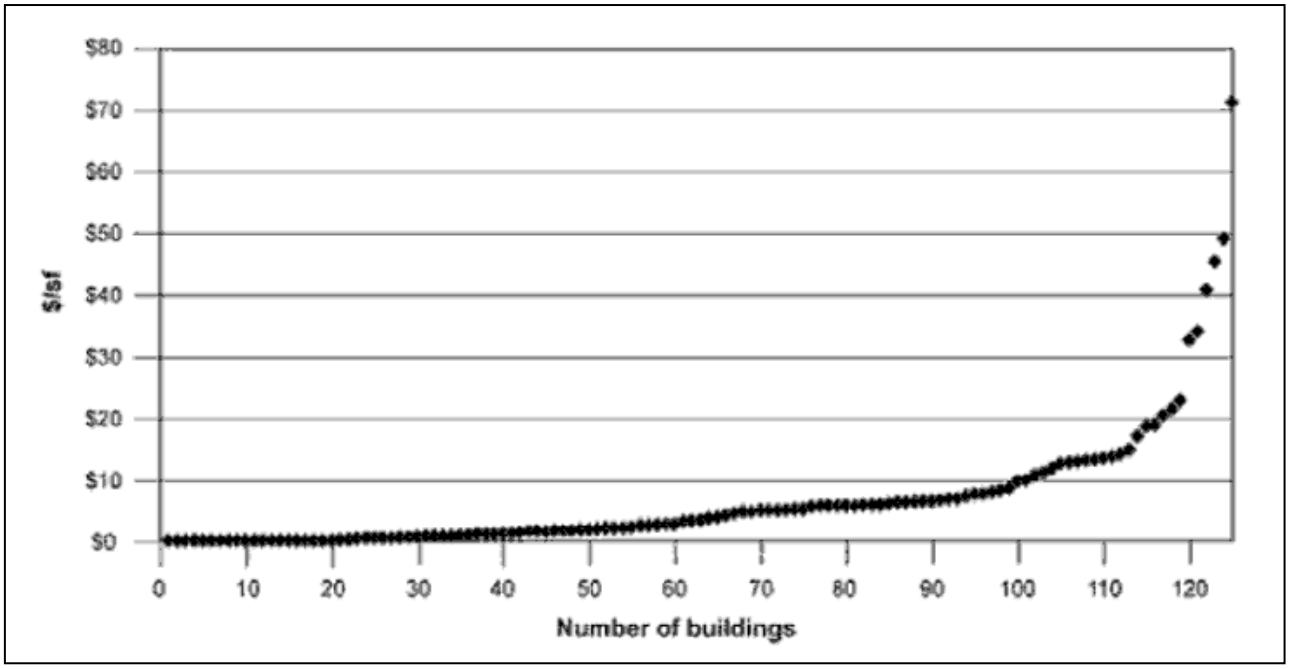

Figure 12 - Green Premiums for Buildings in the Dataset (Kats 2010)

Kats then compared these results against the 2007 survey by the World Business Council for Sustainable Development (WBCSD). In the WBCSD survey, key players in real estate and construction overestimated the costs and benefits of "green" buildings by 300 percent, creating a major barrier to more energy efficiency in the building sector. Additionally, respondents to a 1400 person global survey estimated the additional cost of building green at 17 percent above conventional construction, more than triple the true cost difference of about 5 percent (Figures 13 and 14) (WBCSD 2007).

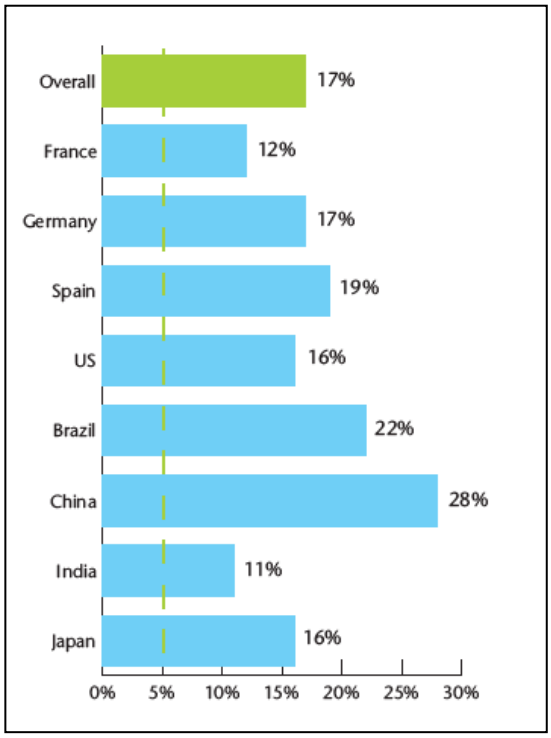

Figure 13 - Estimates of Cost Premium for "A Certified Sustainable Building (WBCSD 2007)

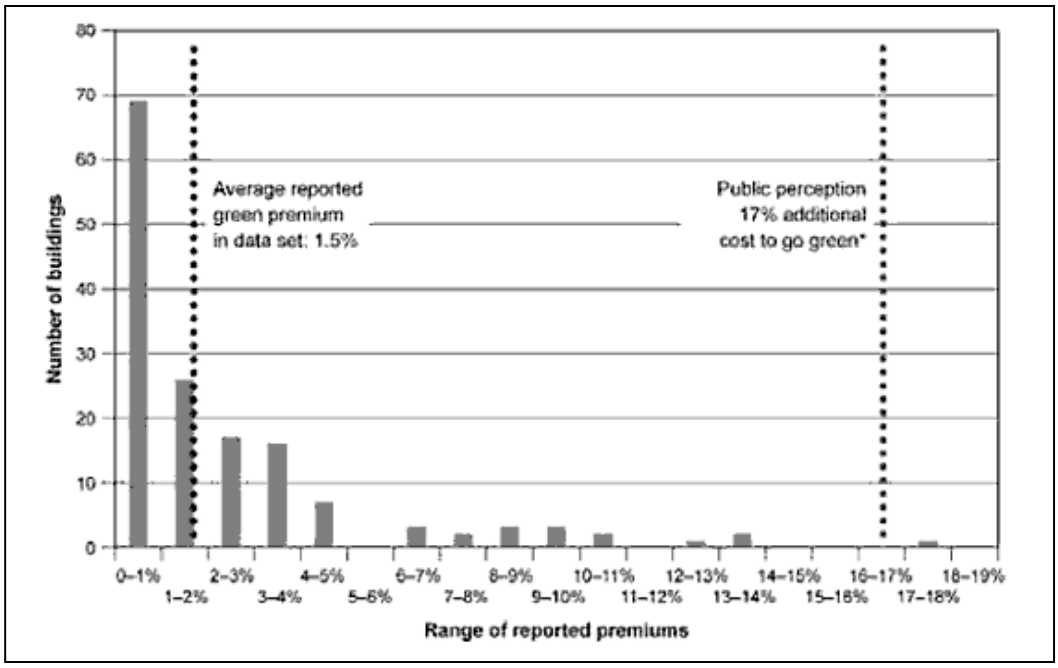

Figure 14 - Green Premium for Buildings in the Dataset (Kats 2010)

Kats (2010) also found that the projected energy savings generally increased with the level of certification, and there is a range of projected savings at each LEED level (Figure 15). When compared with the ASHRAE 90.1 baseline building, the dataset reported median savings of 23 percent for LEED-Certified buildings, 31 percent for LEED-Silver; 40 percent for LEED-Gold; and 50 percent for LEED-Platinum.

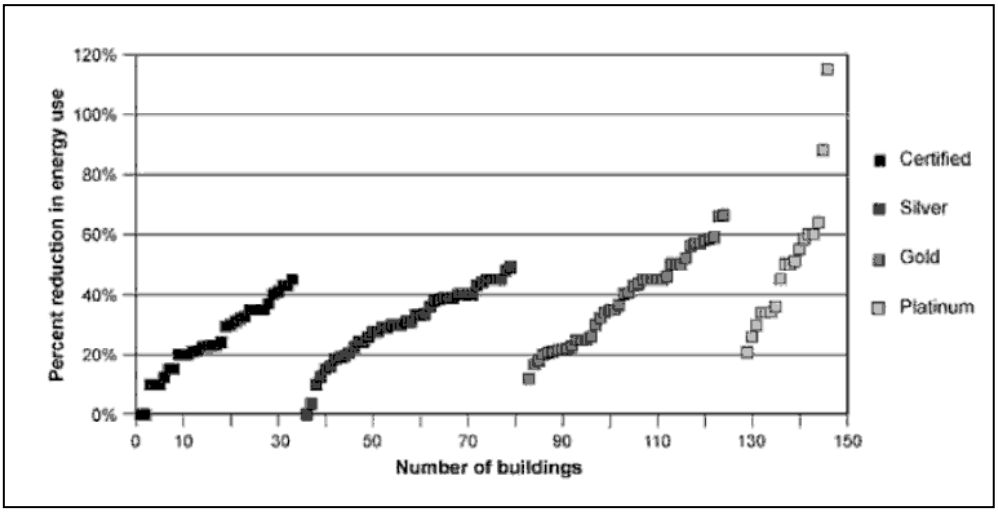

Figure 15 - Reported Reductions in Energy Use by LEED Level (Kats 2010)

Langdon (2007) performed similar research on the cost of green construction and examined a large sampling of buildings with multiple building types that included academic, laboratory, library, community, and ambulatory buildings. Of a total of 221 buildings, 83 buildings were selected which were designed with a goal of meeting some level of the USGBC's LEED certification (the other 138 projects were buildings of similar program types which did not have a goal of sustainable design). Two examples of Langdon's research, Academic (Figure 16) and Ambulatory Care (Figure 17) show that the cost per square foot for LEED certified buildings match consistently with those non-LEED certified buildings.

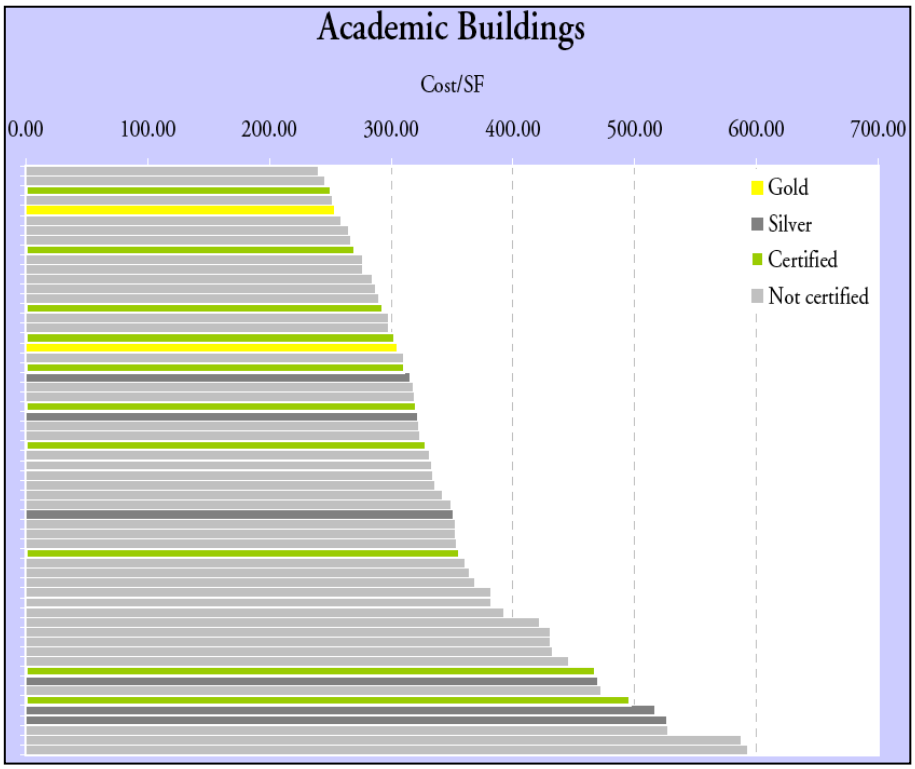

Figure 16 - Cost/sf of Academic Buildings (Langdon 2007)

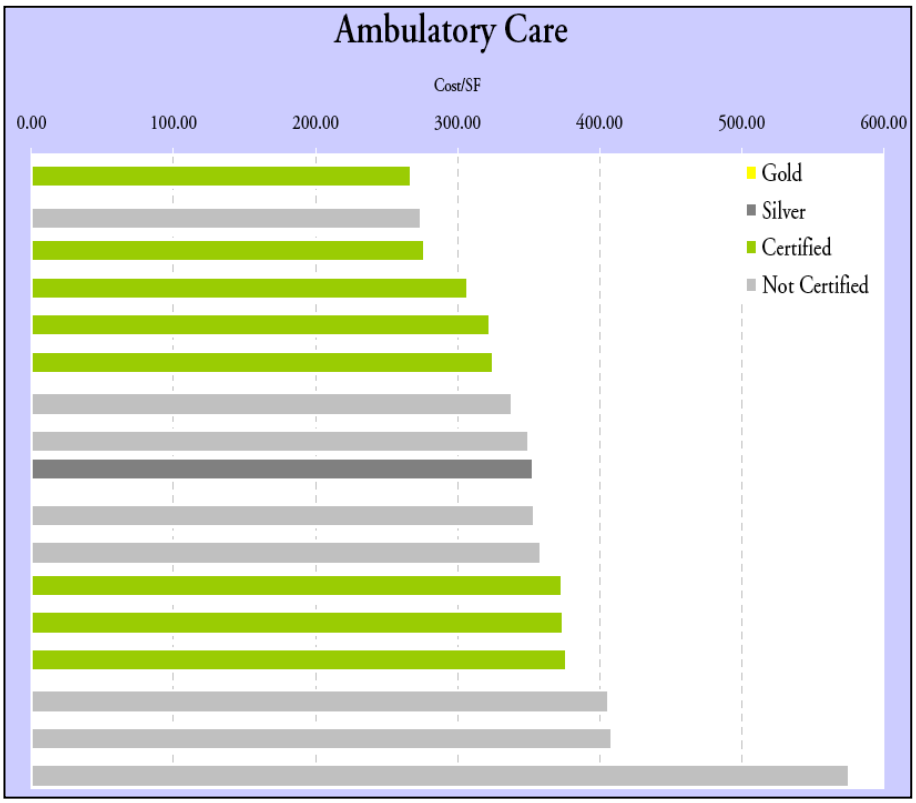

Figure 17 - Cost/sf for Ambulatory Care Buildings (Langdon 2007)

The results of the Langdon (2007) study indicate that the majority of the buildings were able to achieve their goals for LEED certification without any additional funding and that the cost per square foot for buildings seeking LEED certification falls into the existing range of costs for buildings of similar program type. From this analysis we can conclude that many projects can achieve sustainable design within their initial budget, or with very small supplemental funding. This suggests that owners are finding ways to incorporate the elements important to the goals and values of the project, regardless of budget, by making choices and value decisions (Langdon 2007).

2.6 – Summary of Literature Review

There are multiple reasons why building owners and operators are developing and utilizing guidelines to develop eco-friendly (energy efficient and sustainable) designs in their buildings. The primary factors include growing tenant demand in order to lower operating costs associated with electricity, fuel, and water consumption, higher employee productivity, investors seeking more socially conscious investments, and reputational issues that have been forcing the real estate sector towards more efficient building techniques. LEED has become the primary source of this energy efficient and sustainable design certification. Research has been mixed on the actual energy saving performance of LEED certified buildings; there are some that show savings (Turner and Frankel 2008) and others that only show moderate savings (Torcellini et al. 2004). Research was recently completed that compared the electricity and water consumption data between US Navy LEED certified and non-LEED certified buildings, which concluded that LEED certification alone cannot guarantee the mandated electricity and water consumption reductions. Additional research has shown that the actual investment required to obtain LEED certification on construction projects is much lower than perceived construction costs. Simple

payback in one method that can be used to provide a quick determination if an investment such as that required to achieve LEED certification is warranted for a construction project.

The above literature has guided and formed the research objectives that come in the following section. US Navy LEED certified buildings will be reviewed to determine what LEED scoring categories show the largest associated construction cost, if these additional costs can be paid back through energy savings, and if the electricity and water consumption costs meet EO 13423's mandated reductions.

Chapter 3: Research Objectives

3.1 – Objectives

Since its inception in 1993 by the USGBC, LEED has become the primary certification process for environmental design and construction. There are substantial amount of studies completed concerning the energy performance of commercial and residential LEED certified buildings, but only a small amount of research on the actual cost benefits of LEED certification and sustainable design post-construction. Through review of the pertinent research on how LEED became the primary design initiative, how LEED certified buildings performed in relation to energy consumption in both the private and governmental sectors, and what financial construction costs are related to LEED certification, the following objectives for this study were defined:

- Determine what percentage of building construction costs are associated with each LEED certification category and if the energy savings offsets these costs.
- Determine if certifying US Navy buildings with LEED helped to achieve an energy cost savings as expected by EO 13423.
- Determine the simple payback period of the total construction cost difference between LEED certified and its non-LEED certified comparison building.
- Determine the simple payback period for the interpolated costs associated with the LEED scoring category “Energy and Atmosphere.”

Chapter 4: Methodology

The methodology followed for this research consisted of three primary steps: (1) Gather construction cost and LEED certification data on a selection of US Navy LEED certified buildings; (2) Find suitable US Navy commercial comparison buildings within the same region, comparable size, and similar usage, obtaining the cost of construction for each building, and; (3) Evaluate the data by escalating the cost of construction for each building comparison to calculate the cost difference between LEED certified buildings and their counterparts, determine the costs associated with LEED certification for each LEED scoring category, calculate the simple payback period for the total cost of construction and costs only associated with the LEED scoring category "Energy and Atmosphere", and, lastly, determine if the LEED certified buildings were able to comply with EO 13423's mandate to reduce electricity and water consumption costs.

4.1 – Data Gathering: United States Navy LEED Buildings

Data gathering began with contacting installation Public Works Officers (PWO) and Officers in Charge of Construction (OICC) at US Navy and Marine Corps installations to request the schedule of pricing and LEED scoring sheets for all of their LEED certified construction projects. At this point the data was sorted by location, building number, total LEED score, LEED certification level, and LEED points scored in each of the seven LEED scoring categories.

The next step was to review the schedule of pricing for each building and pull out the costs associated with LEED certification. A line item review was performed for 18 projects to identify the items that were clearly marked as LEED certification costs; to be known as Direct LEED Costs. Additionally, data that appeared to be above and beyond what would normally be

done in traditional construction were identified; to be known as Interpolated LEED Costs (a summary of these costs are provided in Section 5.1). These interpolated costs were then verified with each point of contact to ensure their concurrence that the costs were above and beyond traditional construction methods and could be attributed to the LEED certification.

Figure 18 shows the geographical disbursement of the 28 buildings under review as part of this study. The list of LEED certified buildings used for this project, shown in Table 2, was taken from the Mangasarian 2010 study and added to by the PWO's and OICC's participating in this study.

Figure 18 - Locations of LEED Certified Buildings

Table 2 - LEED Certified Buildings Included in Study

Building #	Location	Installation	Title	LEED Certification
1	Jacksonville, NC	Marine Corps Base Camp Lejeune	Academic Instruction Facility, Camp Geiger	Certified
2	Jacksonville, NC	Marine Corps Base Camp Lejeune	Reserve Training Center and Vehicle Maintenance Facility	Certified
3	Jacksonville, NC	Marine Corps Base Camp Lejeune	Aircraft Maintenance Hangar Ph I & II	Certified
4	Jacksonville, NC	Marine Corps Base Camp Lejeune	New Gymnasium and Music Room, MCAS	Certified
5	Jacksonville, NC	Marine Corps Base Camp Lejeune	EOD Operations Facility, MCB, CLNC	Certified
6	Jacksonville, NC	Marine Corps Base Camp Lejeune	Enlisted Dining Facility, Courthouse Bay	Certified
7	Jacksonville, NC	Marine Corps Base Camp Lejeune	Armories II MEF at French Creek	Certified
8	Jacksonville, NC	Marine Corps Base Camp Lejeune	MARSOC Dining Facility	Certified
9	Jacksonville, NC	Marine Corps Base Camp Lejeune	MP Company Operations Complex, MCB	Silver
10	Jacksonville, NC	Marine Corps Base Camp Lejeune	EOD Building FC292 Addition	Certified
11	Norfolk, VA	Naval Amphibious Base Little Creek	EODOSU 10 Ordnance Operations Facility	Silver
12	Norfolk, VA	Naval Amphibious Base Little Creek	Child Development Center	Platinum
13	Norfolk, VA	Naval Amphibious Base Little Creek	Police and Security Operations	Silver
14	Norfolk, VA	Naval Amphibious Base Little Creek	Seal Team Operations Support Facility	Silver
15	Beaufort, SC	Marine Corps Air Station Beaufort	Enlisted Dining Facility, MCAS Beaufort	Certified
16	Beaufort, SC	Marine Corps Air Station Beaufort	Explosive Ordnance Facility	Silver
17	Beaufort, SC	Marine Corps Air Station Beaufort	Training and Simulator Facility	Silver
18	Beaufort, SC	Marine Corps Air Station Beaufort	Aircraft Hangar MCAS Beaufort	Silver
19	Chicago, IL	Naval Training Center Great Lakes	Atlantic Fleet Drill Hall	Gold
20	Norfolk, VA	Naval Station Norfolk	Airborne Mine Countermeasures Facility	Certified
21	Norfolk, VA	Naval Station Norfolk	Aircraft Maintenance Hangar (HM14)	Certified
22	Virginia Beach, VA	Naval Air Station Oceana	Child Development Center (450)	Silver
23	Yorktown, VA	Yorktown Naval Weapons Station	Bachelor Quarters (2075)	Certified
24	Norfolk, VA	Naval Amphibious Base Little Creek	Personnel Support Facility	Silver
25	Jacksonville, NC	Marine Corps Base Camp Lejeune	Bachelor Enlisted Quarters (FC507)	Certified
26	Port Hueneme, CA	Naval Base Ventura County	NBVC Public Works Department	Gold
27	Port Hueneme, CA	Naval Base Ventura County	Naval Facilities Engineering Service Command	Silver
28	Miramar, CA	Marine Corps Air Station Miramar	Memorial Golf Course Clubhouse (3750)	Gold

Once these buildings were identified, a US Navy real property manager was interviewed to obtain information from the US Navy's Internet Naval Facilities Assets Data Store (iNFADS). This was necessary to find the acquisitions basic cost (cost of construction), the year built, building number, and building size in square feet. This data was essential to compare the LEED certified building with its commercial counterpart later in the study.

Finally, the 2010 UW study provided the electricity and water consumption data for buildings 19 through 28 from October 2008 to September 2009. In order to find the total consumption cost, utility rates were researched via the city and community near the military installation of each building and normalized by calculating the building's utilities cost per square foot for the year.

4.2 – Non-LEED Certified United States Navy Comparison Building

This research concentrated on the US Navy's building inventory and specifically looked within this inventory to select buildings that were within the same region, of comparable size, and usage. In the event that a suitable comparison building to the LEED certified building was not located on the same installation, one was identified within the same region to ensure as close a comparison as possible.

Table 3 below provides the list of LEED buildings and their commercial comparison buildings. For some building comparisons, it was indeed necessary to look outside of the immediate area to find a suitable comparison, such as the building #23, the Police and Special Operations Facility on Little Creek, VA; the nearest building of comparable usage and size was a Police Station at Norfolk, VA. This was also the case in Beaufort, SC with building #14, the Enlisted Dining Facility, MCAS Beaufort; the comparison building was located within the region

at Parris Island, SC. In each case the buildings were located within the same region and separated by less than 20 miles.

Another issue that was taken into consideration was the size difference between some of the comparison buildings. The average square foot difference was 24 percent with the largest between MP Company Operations Complex and Troop Emergency Housing; a difference of over 800 percent. The review of the data took this into consideration and compared the buildings as a cost per square foot.

Table 3 - LEED Certified and non-LEED Certified Comparable Building

Building #	LEED Certified Building	non-LEED Certified Building
1	Academic Instruction Facility, Camp Geiger	Academic Instruction Facility CCN:171-10
2	Reserve Training Center and Vehicle Maintenance Facility	Vehicle Maintenance Facility: 214-10
3	Aircraft Maintenance Hangar Ph I & II	Intermediate Maint Hangar CCN: 211-05
4	New Gymnasium and Music Room, MCAS	Tarawa Terrace I School CCN: 730-55
5	EOD Operations Facility, MCB, CLNC	EOD Building Geiger CCN: 143-24
6	Enlisted Dining Facility, Courthouse Bay	Enlisted Dining Facility CCN: 722-10
7	Armories II MEF at French Creek	Armory
8	MARSOC Dining Facility	EM Dining Facility CCN: 722-10
9	MP Company Operations Complex, MCB	Troop Emergency Housing CCN: 610-73
10	EOD Building FC292 Addition	EOD Building Geiger CCN: 143-24
11	EODOSU 10 Ordnance Operations Facility	SEAL Team TEN Building
12	Child Development Center	Child Development Center
13	Police and Security Operations	Police Station
14	Seal Team Operations Support Facility	SEAL Team TEN Building
15	Enlisted Dining Facility, MCAS Beaufort	Mess and Galley - H&S Battalion
16	Explosive Ordnance Facility	Aircraft Engine Shop
17	Training and Simulator Facility	Admin Building 1049 Simulator Building
18	Aircraft Hangar MCAS Beaufort	Aircraft Hangar
19	Atlantic Fleet Drill Hall	Pacific Fleet Drill Hall
20	Airborne Mine Countermeasures Facility	Aircraft Maintenance Hangar (HSC-22/C12)
21	Aircraft Maintenance Hangar (HM14)	Aircraft Maintenance Hangar (HSC-22/C12)
22	Child Development Center (450)	Child Development Center (SDA332)
23	Bachelor Enlisted Quarters (2075)	Bachelor Enlisted Quarters (R61)
24	Personnel Support Facility	Morale, Welfare, and Recreation Facility
25	Bachelor Enlisted Quarters (FC507)	Bachelor Enlisted Quarters (FC504)
26	NBVC Public Works Department	Point Magu Public Works Department
27	Naval Facilities Engineering Service Command	NAVSEA Laboratory
28	Memorial Golf Course Clubhouse (3750)	Golf Course Clubhouse (1537)

4.3 – LEED Certified versus Non-LEED Certified US Navy Building Comparison

The next step was to evaluate the data by escalating the cost of construction for each building comparison to calculate the cost difference between LEED certified buildings and their counterparts. The construction costs were then reviewed to determine the line item costs associated with LEED certification for each LEED scoring category. The ENR Construction Cost Index was then used to escalate the building construction costs to the end of year (EOY) 2010 to find the adjusted construction cost per square foot of both the LEED certified and its comparable non-LEED certified building. Next, the simple payback period (SPB) for the total cost of construction and costs only associated with the LEED scoring category "Energy and Atmosphere" is calculated. Lastly, the electricity and water consumption cost data is reviewed to determine if the LEED certified buildings were able to comply with EO 13423's mandate when compared against the non-LEED certified counterparts.

The data received had limitations that required a review of the LEED certified buildings by different means. Buildings #1 through #18 in the dataset included construction cost data and LEED scoring sheets, but did not have energy consumption data available at the time of data collection. The LEED certified buildings #19 through #28, which were used in the Mangasarian 2010 study, had electricity and water consumption data and LEED scoring data, but no construction cost information. This is due to the fact NAVFAC archives project data shortly after building acceptance, and building construction cost data was not located during the course of this study.

Although this study had two separable datasets, the information was used together to accomplish the research goals. The verified construction cost data collected from buildings #1

through #17 was used to compile the average percent cost per LEED point earned in each LEED scoring category. These averages per LEED scoring category were then applied to buildings #18 though #28 by multiplying the calculated averages by the points earned by each building per LEED scoring category to calculate the estimated cost per scoring category and estimated cost to achieve LEED certification.

Once these estimated costs to achieve LEED certification were calculated for both the whole building and for each LEED scoring category, a simple payback period analysis was performed. This was completed in order to determine the time required to pay back any additional construction costs associated with LEED certification. The simple payback period was accomplished in two ways: (1) Calculated using the total construction cost difference between the LEED and non-LEED certified buildings; (2) Calculated using the costs associated with the LEED scoring category "Energy and Atmosphere." Equation 1 was modified for use in this study to calculate a Simple Payback (SPB). Equations 2 and 3 are provided below:

EQ. 2 - Simple Payback (years) for Total Construction Cost Difference Between LEED and non-LEED Certified Buildings

$$SPB = \frac{\text{2010 Building Construction Cost Delta (\$/sf)}}{\text{Utilities Savings per Year (\$/sf per year)}} \qquad \text{EQ. (2)}$$

EQ. 3 - Simple Payback (years) for "Energy and Atmosphere" Associated Costs

$$SPB = \frac{\text{Energy and Atmosphere Associated Costs (\$)}}{\text{(Building Size (sf) x Utilies Savings per Year (\$/sf per year)}} \qquad \text{EQ. (3)}$$

where:

- 2010 Building Construction Cost Delta is the difference between the escalated construction costs of the LEED certified versus the non-LEED certified building.

- Utilities Savings per Year is the calculated cost difference between the LEED certified and non-LEED certified buildings. The consumption data was compiled for electricity (kWh) and water (kGal) as part of the Managasarian 2010 study. The data was then multiplied by the utility rate (either $/kWh and $/kGal) as listed by each location's municipality. Savings were then calculated by subtracting the total utility dollars per square foot of the non-LEED certified building from the LEED certified buildings.
- "Energy and Atmosphere" Associated Cost is the construction costs for the LEED scoring category "Energy and Atmosphere" as described above.
- Building Size is the area in square feet of each building.

The next portion of the comparison reviewed the electricity and water consumption costs of the LEED certified building versus its non-LEED certified counterpart. Electricity and water consumption data, received in kilowatt-hours (KWH) and kilo-gallons (KGal) respectively, was collected from the US Navy for the 2009 fiscal year (October 2008 to September 2009). Electricity rates were then taken from the US Energy Information Administration and are listed in Table 4. The rates were surveyed and compiled as an average by region and state.

Table 4 - US Energy Information Administration, Table 5.6.A, Average Retail Price of Electricity

Census Division and State	Commercial (Cents per KWH)		Industrial (Cents per KWH)	
	Jan-11	Jan-10	Jan-11	Jan-10
East North Central	**9.03**	**9.01**	**6.37**	**6.41**
Illinois	8.08	8.49	6.33	6.85
South Atlantic	**9.35**	**8.57**	**6.58**	**6.54**
North Carolina	7.75	7.9	5.77	5.94
Virginia	7.51	7.76	6.59	6.91
Pacific Contiguous	**10.81**	**10.68**	**8.88**	**7.16**
California	12.26	12.18	9.42	9.5
U.S. Total	**9.88**	**9.63**	**6.73**	**6.53**
US Energy Information Administration				
Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, January 2011 and 2010				

Water rates can be seen in Table 5 and were collected from the local municipalities to estimate the actual costs associated with water consumption. The only municipality that had 2009 utility rates was Chicago, IL, all others were 2010 utility rates.

Table 5 – 2010 Municipality Water Utility Rates

Water Utility Rate				
Municipality	**Water ($/kGAL)**	**Sewer ($/kGAL)**	**Treatment ($kGAL)**	**Total ($/kGAL)**
Norfolk, VA	$5.17	$4.18	$3.77	**$13.13**
Port Hueneme, CA	$3.69	$6.22	$0	**$9.91**
San Diego, CA	$5.02	$5.35	$0	**$10.38**
	Water ($/kGAL)	**Sewer ($/kGAL)**		**Total ($/kGAL)**
Cape Fear, NC	$5.28	$3.59		**$8.87**
	Water ($/kGAL)	**Sewer (% of Water)**		**Total ($/kGAL)**
Chicago, IL (2009)	$2.01	86%		**$3.74**

The fiscal year 2009 electricity and water consumption data was then multiplied by the above municipality utility rates and divided by the area of the building to calculate the electrical and water consumption costs per square foot per building. The next step compared the total electricity and water consumption cost (electricity plus water cost for the 2009 fiscal year) of the LEED certified versus the non-LEED certified building to calculate the percentage difference between them. This amount was then compared against the EO 13423 to see if the building achieved the mandated energy cost reductions. The Mangasarian 2010 study reviewed the electricity and water data and concentrated on the consumption in terms of kWH and kGAL. EO 13423 section 2 mandates the decrease of energy intensity and water consumption by 30 percent and 16 percent respectfully by fiscal year 2015 (EO 13423 2007). Section 1 of the EO states that "the policy of the United States that Federal agencies conduct their environmental,

transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner." The slight difference between the EO's policy statement and the goals is why this study compares the electricity and water consumption costs against EO 13423's energy reduction goals.

The last step in this evaluation reviewed the overall construction cost difference between the US Navy's LEED certified and non-LEED certified comparable building. Using the escalated costs as calculated with the ENR cost indices, the adjusted construction cost per square foot of the LEED certified versus the non-LEED certified buildings is compared. This construction cost,information was used to provide an overall comparison between LEED certified buildings and a commercial counterpart, what Kats called the Green Premium (Kats 2010).

Chapter 5: Results

With the building cost data received, the next step was to analyze the data and the findings. This review took five steps: (1) Review of the LEED building dataset with verified construction costs associated with LEED scoring categories; (2) Compile the average percent cost per LEED point earned for the scoring category; (3) Apply that percent cost per LEED point to the 2010 UW study LEED building dataset to calculate the estimated cost per scoring category; (4) Perform a simple payback period analysis of the "Energy and Atmosphere" scoring category utilizing the electricity and water consumption data, received in kilowatt-hours (KWH) and kilo-gallons (KGal) respectively; (5) Perform an overall comparison between LEED certified and comparable buildings to obtain the green premium (construction cost difference per square foot).

As stated previously, the goal of this research was to compare the cost of construction associated with obtaining LEED certification against the cost of construction for a comparable non-LEED certified building. Additional goals include finding the construction costs associated with each LEED certification category, determining the LEED certified building's ability to meet EO 13423's energy reduction mandate, and determining if additional construction costs were economically feasible after a simple payback (SPB) calculation. The data collected and results presented in this section meet these objectives.

5.1 – Verify Construction Costs Associated With LEED Scoring Categories

LEED scoring sheets and schedule of pricing were provided for each building in the dataset by US Navy points of contact. This data was reviewed for any line items that could be attributed to the building's ability to achieve LEED certification in LEED version 2.1. After this

review, the direct and interpolated costs were verified with the point of contact to ensure their concurrence with the associated costs.

Buildings #1 through #18 contain LEED scoring and construction cost data and will be used in this section. Table 6 displays the buildings reviewed, their LEED certification level and LEED points received, the contract cost, the direct and interpolated LEED certification costs, and the building size in square feet. As described earlier, Direct LEED Costs are those items on each project clearly identified as LEED certification costs. Interpolated LEED Costs are those verified costs that were interpolated to be above and beyond what would normally be done in traditional construction.

Table 6 - LEED Building Certification Level and Cost Data

Building #	Installation	Title	LEED Certification	Total Points	Total Value of Contract	Direct Costs of LEED Certification	Interpolated LEED Costs	Total Associated LEED Certification Costs	Building Size (sf)
1	Marine Corps Base Camp Lejeune	Academic Instruction Facility, Camp Geiger	Certified	28	$17,341,345	$-	$-	$-	73,227
2	Marine Corps Base Camp Lejeune	Reserve Training Center and Vehicle Maintenance Facility	Certified	34	$3,700,145	$-	$9,930	$9,930	10,476
3	Marine Corps Base Camp Lejeune	Aircraft Maintenance Hangar Ph I & II	Certified	27	$36,519,868	$-	$115,400	$115,400	96,404
4	Marine Corps Base Camp Lejeune	New Gymnasium and Music Room, MCAS	Certified	26	$1,826,000	$21,000		$21,000	43,013
5	Marine Corps Base Camp Lejeune	EOD Operations Facility, MCB, CLNC	Certified	25	$3,851,000	$-	$-	$-	15,381
6	Marine Corps Base Camp Lejeune	Enlisted Dining Facility, Courthouse Bay	Certified	27	$11,684,202	$-	$-	$-	20,600
7	Marine Corps Base Camp Lejeune	Armories II MEF at French Creek	Certified	24	$1,846,255	$-	$-	$-	6,789
8	Marine Corps Base Camp Lejeune	MARSOC Dining Facility	Certified	27	$12,063,954	$-	$18,678	$18,678	20,881
9	Marine Corps Base Camp Lejeune	MP Company Operations Complex, MCB	Silver	35	$1,103,525	$-	$-	$-	3,521
10	Marine Corps Base Camp Lejeune	EOD Building FC292 Addition	Certified	29	$2,256,375	$-	$19,200	$19,200	7,887
11	Naval Amphibious Base Little Creek	EODOSU 10 Ordnance Operations Facility	Silver	35	$6,853,830	$800	$100,000	$100,800	24,677
12	Naval Amphibious Base Little Creek	Child Development Center	Platinum	53	$9,375,000	$83,000	$147,536	$230,536	34,316
13	Naval Amphibious Base Little Creek	Police and Security Operations	Silver	34	$6,847,600	$88,775	$3,300	$92,075	25,000
14	Naval Amphibious Base Little Creek	Seal Team Operations Support Facility	Silver	35	$27,058,406	$67,840	$-	$67,840	139,300
15	Marine Corps Air Station Beaufort	Enlisted Dining Facility, MCAS Beaufort	Certified	30	$13,689,500	$-	$-	$-	36,866
16	Marine Corps Air Station Beaufort	Explosive Ordnance Facility	Silver	33	$6,736,495	$25,000	$1,531,677	$1,556,677	22,813
17	Marine Corps Air Station Beaufort	Training and Simulator Facility	Silver	34	$37,351,000	$1,938,021	$67,856	$2,005,877	101,789
18	Marine Corps Air Station Beaufort	Aircraft Hangar MCAS Beaufort	Silver	33	$48,253,000	$916,158	$90,796	$1,006,954	60,902

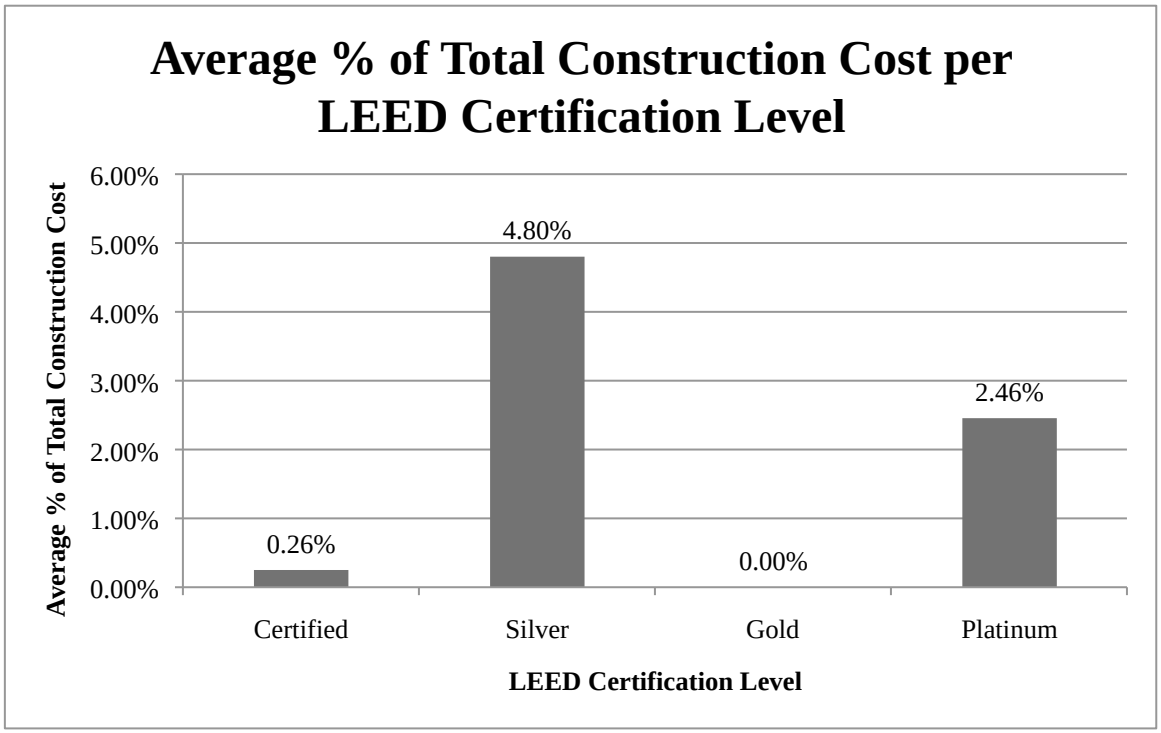

Figure 19 - Average % of Total Construction Cost per LEED Scoring Category

The information in Table 6 and Figure 19 does not appear to show a direct relationship between LEED certification level and the direct and interpolated LEED construction costs. In fact, the highest rated building, Building 12 (Child Development Center), which achieved LEED Platinum, only indicated $100,800 in LEED associated construction costs, while buildings 16, 17, and 18 have costs associated with LEED certification of over $1 million each and are only rated to LEED Silver. Table 7 below lists the total construction cost per square foot, the total costs associated with LEED certification per square foot, and the percentage LEED construction costs to total construction costs.

Table 7 - Cost per sf, Costs to Achieve LEED Certification per sf, and % of LEED Costs to Total Costs

Building #	Title	LEED Certification	Total Construction Cost per square foot ($/sf)	Costs Associated with LEED Certification ($/sf)	% LEED Costs to Total Construction Costs
1	Academic Instruction Facility, Camp Geiger	Certified	$236.82	$-	0.00%
2	Reserve Training Center and Vehicle Maintenance Facility	Certified	$353.20	$0.95	0.27%
3	Aircraft Maintenance Hangar Ph I & II	Certified	$378.82	$1.20	0.32%
4	New Gymnasium and Music Room, MCAS	Certified	$42.45	$0.49	1.15%
5	EOD Operations Facility, MCB, CLNC	Certified	$250.37	$-	0.00%
6	Enlisted Dining Facility, Courthouse Bay	Certified	$567.19	$-	0.00%
7	Armories II MEF at French Creek	Certified	$271.95	$-	0.00%
8	MARSOC Dining Facility	Certified	$577.75	$0.89	0.15%
9	MP Company Operations Complex, MCB	Silver	$313.41	$-	0.00%
10	EOD Building FC292 Addition	Certified	$286.09	$2.43	0.85%
11	EODOSU 10 Ordnance Operations Facility	Silver	$277.74	$4.08	1.47%
12	Child Development Center	Platinum	$273.20	$6.72	2.46%
13	Police and Security Operations	Silver	$273.90	$3.68	1.34%
14	Seal Team Operations Support Facility	Silver	$194.25	$0.49	0.25%
15	Enlisted Dining Facility, MCAS Beaufort	Certified	$371.33	$-	0.00%
16	Explosive Ordnance Facility	Silver	$295.29	$68.24	23.11%
17	Training and Simulator Facility	Silver	$366.95	$19.71	5.37%
18	Aircraft Hangar MCAS Beaufort	Silver	$792.31	$16.53	2.09%
			Average =	$6.97	2.16%

Once again, Building 12 was able to reach LEED Platinum certification with 1.47 percent of the costs being directly attributed, while Building 16 (Explosive Ordinance Facility) invested

23.11 percent of the construction costs to achieve LEED Silver certification. The data also indicated that some of the buildings reported no costs associated with LEED certification (5 of 18 surveyed), and as shown below in Figure 20, the majority of the buildings (11 of 18) only reported 0 to 1 percent of their total costs to be associated with LEED certification.

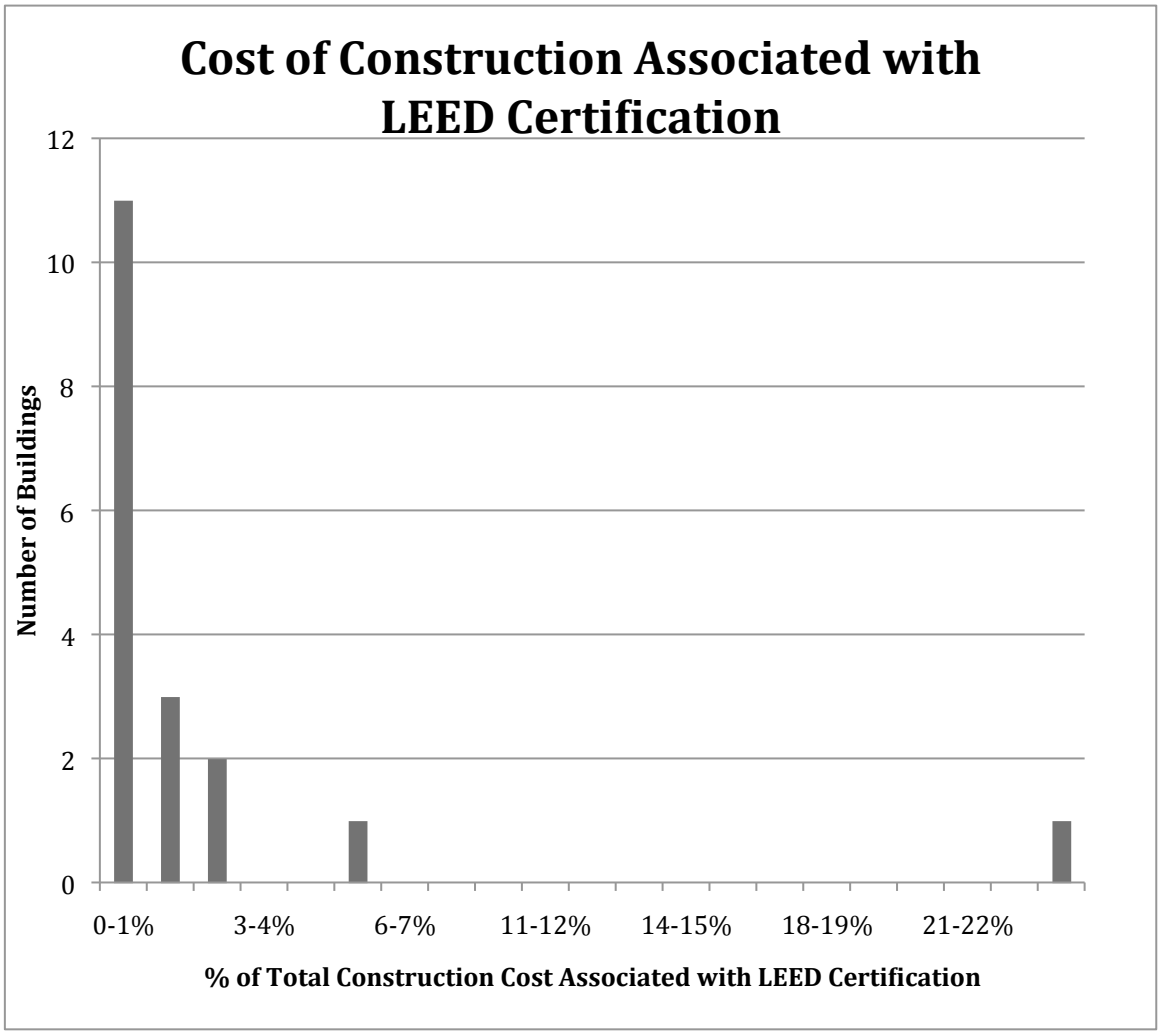

Figure 20 - Green Premium for Buildings in the Dataset

Another review of the data is provided below in Figure 21. The information indicates a substantial increase in cost per square foot to move from LEED Certified to LEED Silver certified; $15.50/sf. The information only indicates a $6.11/sf increase to move from LEED

Certified to LEED Platinum. There were no LEED Gold certified buildings part of this study so no results could be calculated.

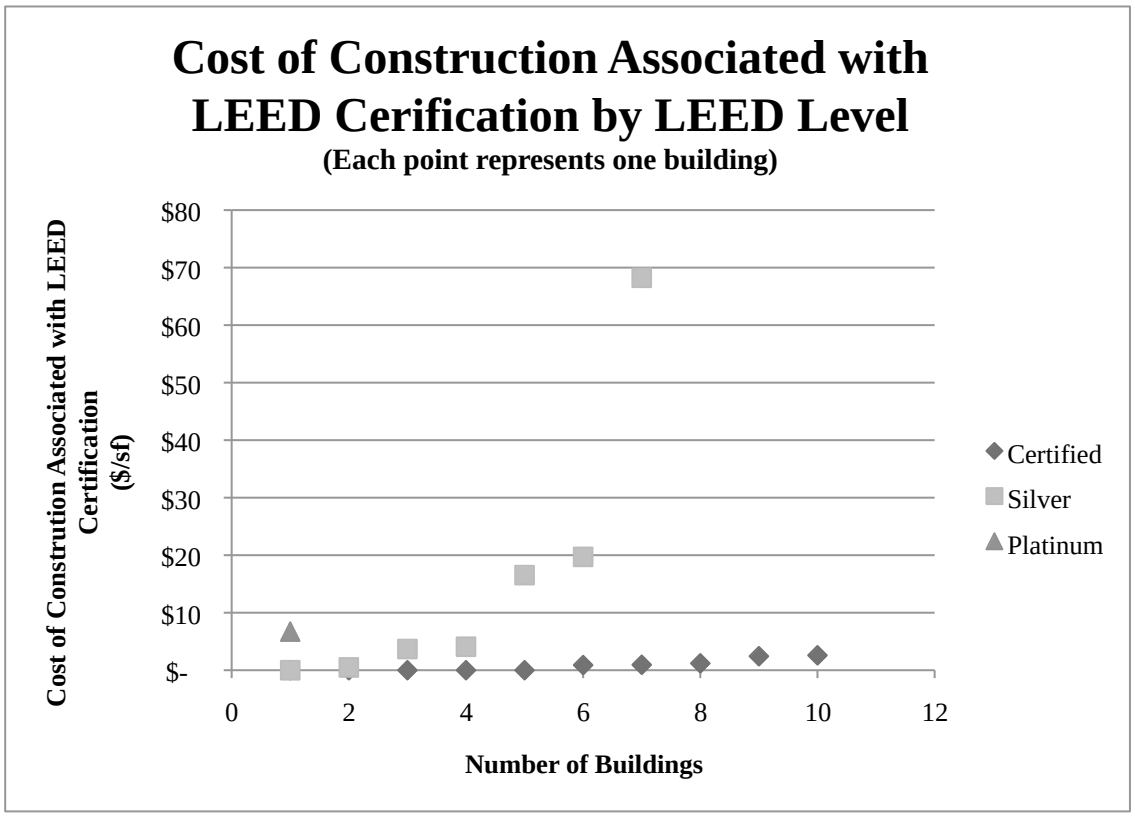

Figure 21 - Green Premiums for Buildings in the Dataset by LEED Level

5.2 – Average Percent Cost per LEED Point Earned for the Scoring Category

Please note that the schedule of pricing provided by the US Navy points of contact only provides pricing data to the government and is not intended to provide the detail required to perform a complete analysis of the costs tied to LEED certification. Additionally, the US Navy point of contacts routinely mentioned during interviews that much of the costs associated with LEED certification "would have been done anyway." Based on the data provided and their statements, the following data is in all likelihood only a portion of the actual costs associated with LEED certification.

After verification with the US Navy point of contact, the costs were separated into the LEED scoring categories based upon LEED version 2.1 rating system. The categories are as follows: “Sustainable Sites”; “Water Efficiency”; “Energy and Atmosphere”; “Materials and Resources”; “Indoor Environmental Quality”; “Innovation and Design Process”. The LEED scoring sheets provided the points earned per LEED scoring category, and a line item review of the schedule of pricing identifying the construction costs associated with each LEED scoring category. A percentage of the total construction cost was then calculated per LEED scoring category and then divided by the number points earned in each category to provide the percent construction cost per LEED scoring point per category. An overall average across the buildings in the data set was then calculated to provide the average percent cost per LEED scoring point for that category. This average will be used later in this study as a basis to evaluate the buildings that have energy consumption data available.

5.2.1 – Sustainable Sites

The first category under review is “Sustainable Sites” with the information provided in Table 8. The table presents the LEED certification level, total points earned, points earned for the specific category, costs associated with the category, and the percent of category costs (compared to total construction cost) per category point.

In order to better illustrate the calculations, please see the following as the process used throughout this section. Building #11, the EODOSU 10 Ordnance Operations Facility will be used as an example. This building earned 35 total LEED points and six for the ‘Sustainable Sites’ category. $100,000 was associated costs with this LEED category and was divided by the total cost of $6,853,830 to provide the percent of LEED cost for this category, or 1.46 percent. This percentage is then divided by the number of points scored by this building in this category,

six, to provide the percent cost per LEED point for this category, or 0.24 percent. A summary is provided as follows: $\frac{\text{Construction Costs Associated with Sustainable Sites}}{\text{Total Construction Costs}} = \frac{\left(\frac{\$100,000}{\$6,853,830}\right)}{6} = 0.24\%$

This percentage was calculated for the other 17 buildings in the dataset and averaged to provide the average percent cost per LEED scoring point for this category. Only two buildings, 11 and 18, had LEED certification costs attributable to "Sustainable Sites". The calculation is 0.24 plus 0.02 percent divided by 18 to provide the average of 0.01 percent total cost per LEED scoring point for the 'Sustainable Sites' category. Table 8 is provided as a summary of the LEED points earned, the associated construction costs, and the percent of total construction cost per LEED point in the category.

Table 8 - Sustainable Sites Associated Costs and Percent per LEED Point

Building #	Title	LEED Certification	Total LEED Points Earned	Sustainable Sites LEED Points Earned	Sustainable Sites Associated Costs	% Total Cost/Factor LEED Point
1	Academic Instruction Facility, Camp Geiger	Certified	28	3	$-	0.00%
2	Reserve Training Center and Vehicle Maintenance Facility	Certified	34	9	$-	0.00%
3	Aircraft Maintenance Hangar Ph I & II	Certified	27	4	$-	0.00%
4	New Gymnasium and Music Room, MCAS	Certified	26	9	$-	0.00%
5	EOD Operations Facility, MCB, CLNC	Certified	25	6	$-	0.00%
6	Enlisted Dining Facility, Courthouse Bay	Certified	27	7	$-	0.00%
7	Armories II MEF at French Creek	Certified	24	7	$-	0.00%
8	MARSOC Dining Facility	Certified	27	8	$-	0.00%
9	MP Company Operations Complex, MCB	Silver	35	9	$-	0.00%
10	EOD Building FC292 Addition	Certified	29	5	$-	0.00%
11	EODOSU 10 Ordnance Operations Facility	Silver	35	6	$100,000	0.24%
12	Child Development Center	Platinum	53	10	$-	0.00%
13	Police and Security Operations	Silver	34	8	$-	0.00%
14	Seal Team Operations Support Facility	Silver	35	7	$-	0.00%
15	Enlisted Dining Facility, MCAS Beaufort	Certified	30	9	$-	0.00%
16	Explosive Ordnance Facility	Silver	33	8	$-	0.00%
17	Training and Simulator Facility	Silver	34	9	$-	0.00%
18	Aircraft Hangar MCAS Beaufort	Silver	33	8	$64,045	0.02%
					Ave %/pt =	0.01%

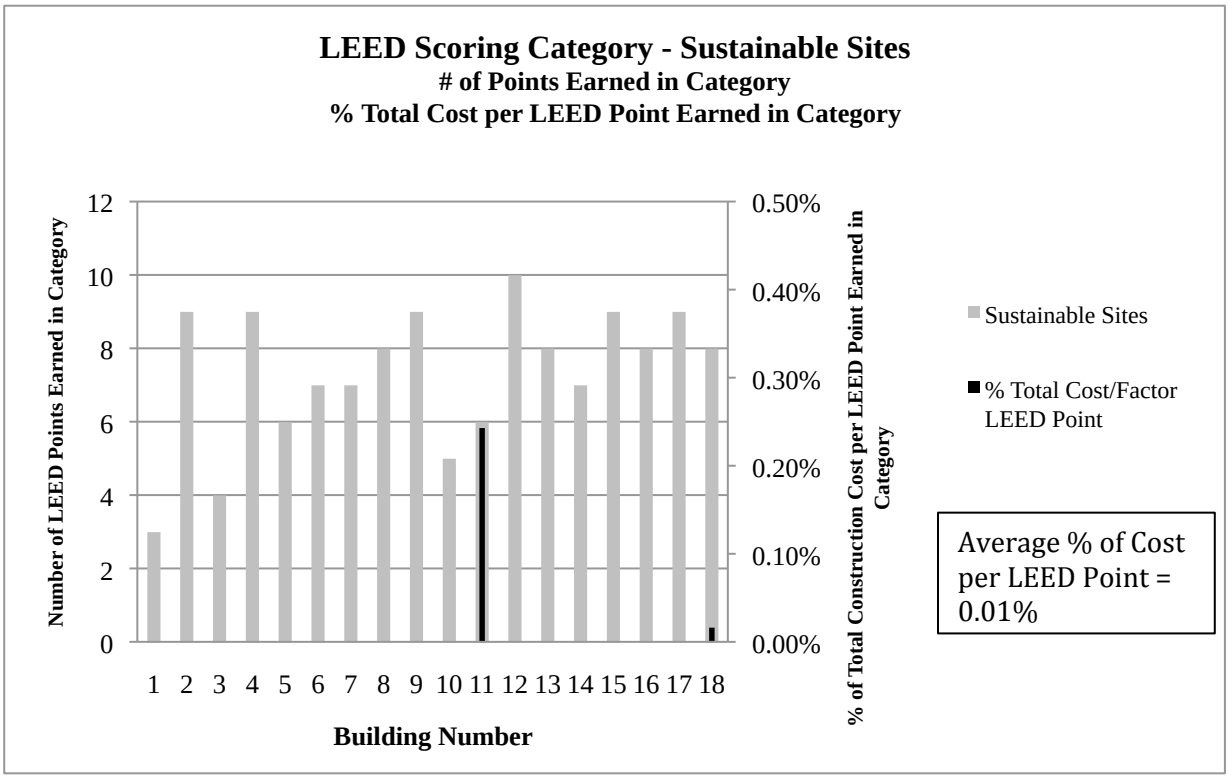

Figure 22 - LEED Scoring Category - Sustainable Sites

Figure 22 shows the relationship between the number of LEED points earned for this category and the percent total of the cost of construction. There does not appear to be a direct tie between LEED points earned and cost associated with construction.

5.2.2 – Water Efficiency

The next LEED scoring category under review is "Water Efficiency." Using the procedure in the section 5.2.1, the data is provided in Table 9. The table presents the LEED certification level, total points earned, points earned for the specific category, costs associated with the category, and the percent of category costs (compared to total construction cost) per category point. There were four buildings (2, 10, 17, and 18) that had LEED certification costs attributable to "Water Efficiency". The average percent of the total cost of construction per LEED point earned is 0.02 percent.

Table 9 - Water Efficiency Associated Cost and Percent of Total Cost per LEED Point

Building #	Title	LEED Certification	Total LEED Points Earned	Water Efficiency LEED Points Earned	Water Efficiency Associated Costs	% Total Cost/Factor LEED Point
1	Academic Instruction Facility, Camp Geiger	Certified	28	4	$-	0.00%
2	Reserve Training Center and Vehicle Maintenance Facility	Certified	34	4	$6,853	0.05%
3	Aircraft Maintenance Hangar Ph I & II	Certified	27	3	$-	0.00%
4	New Gymnasium and Music Room, MCAS	Certified	26	4	$-	0.00%
5	EOD Operations Facility, MCB, CLNC	Certified	25	3	$-	0.00%
6	Enlisted Dining Facility, Courthouse Bay	Certified	27	4	$-	0.00%
7	Armories II MEF at French Creek	Certified	24	3	$-	0.00%
8	MARSOC Dining Facility	Certified	27	4	$-	0.00%
9	MP Company Operations Complex, MCB	Silver	35	4	$-	0.00%
10	EOD Building FC292 Addition	Certified	29	3	$19,200	0.28%
11	EODOSU 10 Ordnance Operations Facility	Silver	35	4	$-	0.00%
12	Child Development Center	Platinum	53	4	$-	0.00%
13	Police and Security Operations	Silver	34	4	$-	0.00%
14	Seal Team Operations Support Facility	Silver	35	4	$-	0.00%
15	Enlisted Dining Facility, MCAS Beaufort	Certified	30	2	$-	0.00%
16	Explosive Ordnance Facility	Silver	33	4	$-	0.00%
17	Training and Simulator Facility	Silver	34	4	$67,856	0.05%
18	Aircraft Hangar MCAS Beaufort	Silver	33	4	$20,650	0.01%
					Ave %/pt =	0.02%

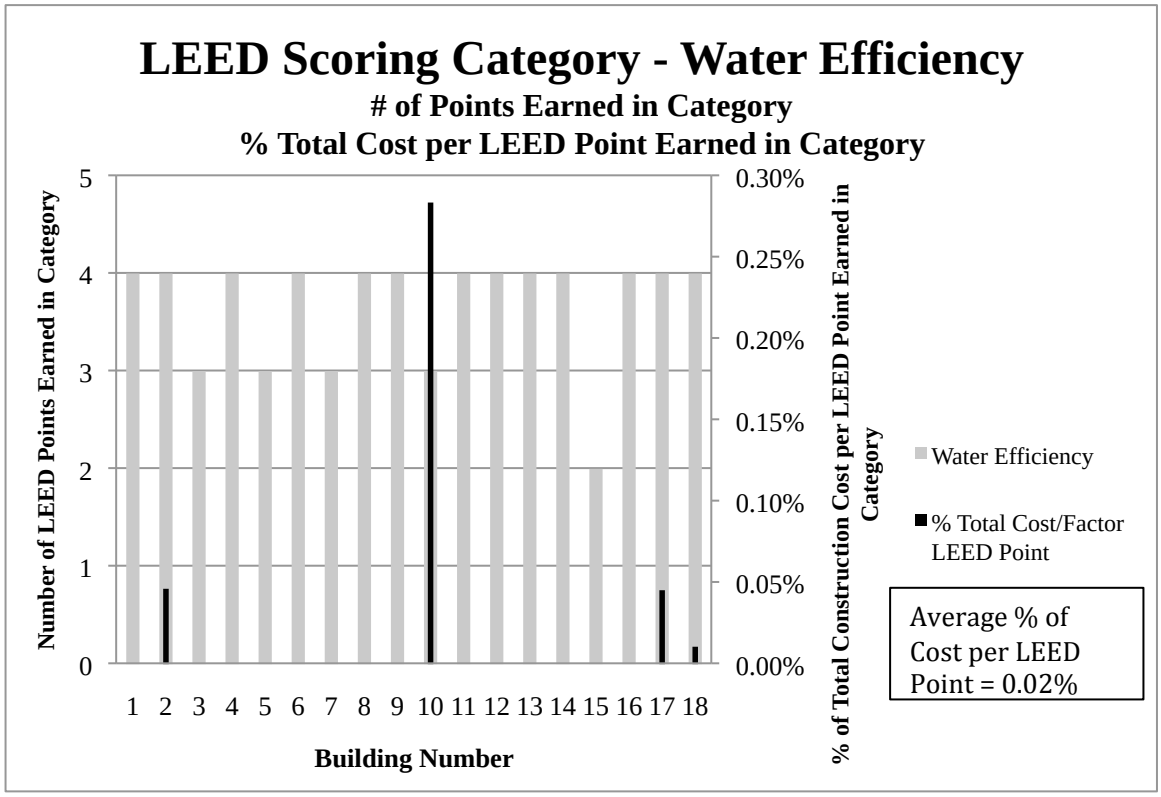

Figure 23 - LEED Scoring Category - Water Efficiency

Figure 23 shows the relationship between the number of LEED points earned for this section and the percent total of the total cost of construction. The data does not appear to indicate a correlation between LEED points earned and construction costs.

5.2.3 – Energy and Atmosphere

The next LEED scoring category to review is "Energy and Atmosphere." Using the procedure in the section 5.2.1, the data is provided in Table 10. The table presents the LEED certification level, total points earned, points earned for the specific category, costs associated with the category, and the percent of category costs (compared to total construction cost) per category point. There were five buildings (3, 12, 16, 17, and 18) that had LEED certification costs attributable to "Energy and Atmosphere". The average percent of the total cost of construction per LEED point earned is 0.28 percent.

Table 10 - "Energy and Atmosphere" Associated Costs and Percent of Total Cost per LEED Point

Building #	Title	LEED Certification	Total LEED Points Earned	Energy and Atmosphere LEED Points Earned		% Total Cost/Factor LEED Point
1	Academic Instruction Facility, Camp Geiger	Certified	28	8	$-	0.00%
2	Reserve Training Center and Vehicle Maintenance Facility	Certified	34	2	$-	0.00%
3	Aircraft Maintenance Hangar Ph I & II	Certified	27	7	$65,000	0.03%
4	New Gymnasium and Music Room, MCAS	Certified	26	0	$-	0.00%
5	EOD Operations Facility, MCB, CLNC	Certified	25	4	$-	0.00%
6	Enlisted Dining Facility, Courthouse Bay	Certified	27	5	$-	0.00%
7	Armories II MEF at French Creek	Certified	24	2	$-	0.00%
8	MARSOC Dining Facility	Certified	27	5	$-	0.00%
9	MP Company Operations Complex, MCB	Silver	35	7	$-	0.00%
10	EOD Building FC292 Addition	Certified	29	6	$-	0.00%
11	EODOSU 10 Ordnance Operations Facility	Silver	35	7	$-	0.00%
12	Child Development Center	Platinum	53	16	$28,786	0.02%
13	Police and Security Operations	Silver	34	5	$-	0.00%
14	Seal Team Operations Support Facility	Silver	35	5	$-	0.00%
15	Enlisted Dining Facility, MCAS Beaufort	Certified	30	9	$-	0.00%
16	Explosive Ordnance Facility	Silver	33	7	$1,531,677	3.25%
17	Training and Simulator Facility	Silver	34	4	$1,938,021	1.30%
18	Aircraft Hangar MCAS Beaufort	Silver	33	5	$916,158	0.38%
					Ave %/pt =	0.28%

Buildings 16, 17, and 18 make up the majority of the costs associated with this category. Building 16 costs are related with geothermal and solar heating and cooling, building 17 included costs for a photovoltaic roof system, and building 18 costs included a solar water heating system to be used in hangar bay for radiant heat. It should be noted that without the inclusion of these buildings, the average percent per LEED point drops from 0.28 to 0.003 percent.

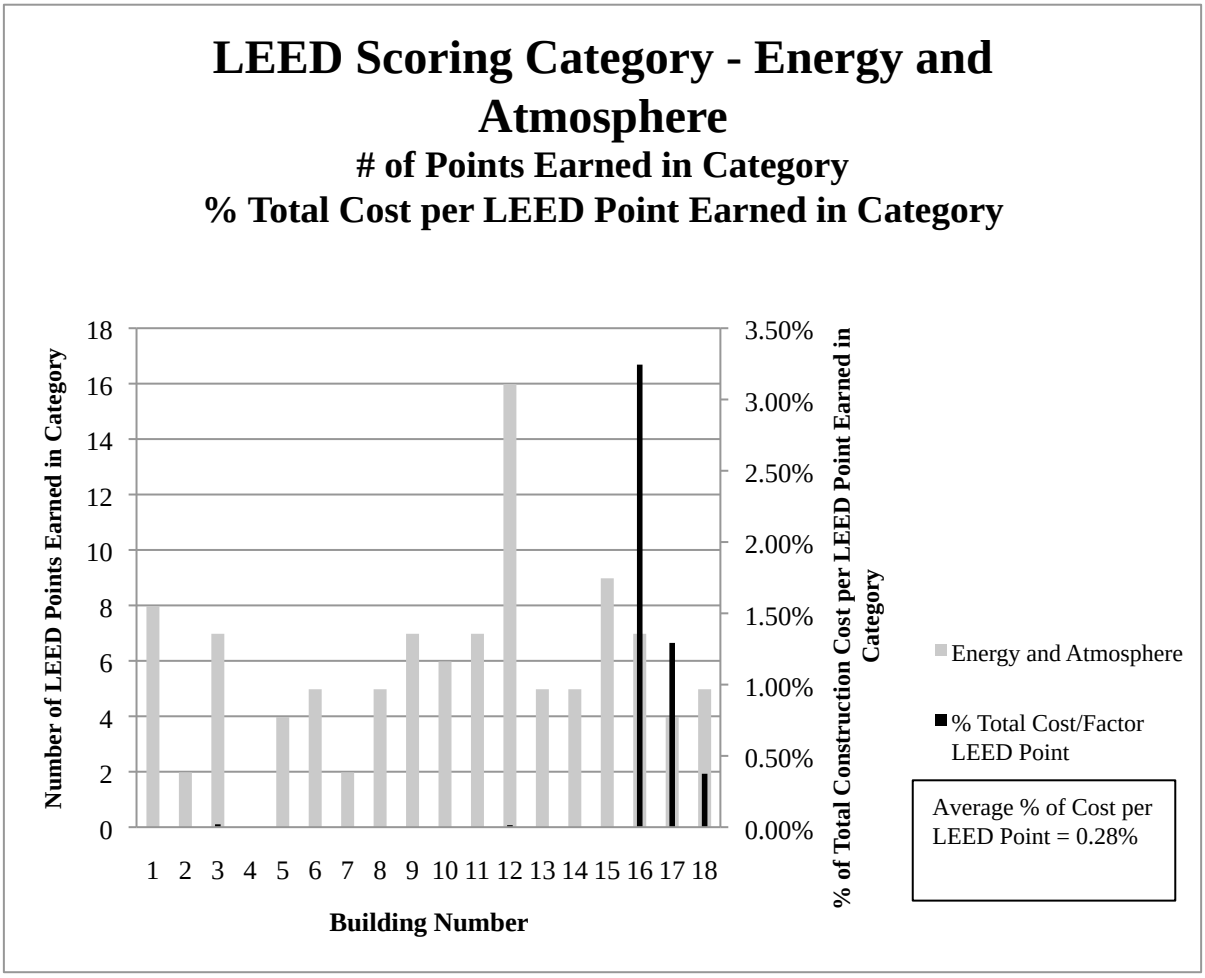

Figure 24 - LEED Scoring Category - Energy and Atmosphere

Figure 24 shows the relationship between the number of LEED points earned for this section and the percent total of the total cost of construction. The majority of the buildings indicate little or no direct costs associated with LEED certification. Further, the building that

had the largest percentage of the total cost associated to LEED certification only received seven points for the "Energy and Atmosphere" section. Building 12 earned 16 total points but did not have any verified LEED costs associated with this section. Based on the above information, there does not appear to be a correlation between LEED points earned and construction costs.

5.2.4 – Materials and Resources

The next LEED scoring category to review is "Materials and Resources." Using the procedure in the section 5.2.1, the data is provided below in Table 11. The below table presents the LEED certification level, total points earned, points earned for the specific category, costs associated with the category, and the percent of category costs (compared to total construction cost) per category point. There were no costs reported by any of the buildings associated with this section.

Table 11 - Materials and Resources Associated Costs and Percent of Total Cost per LEED Point

Building #	Title	LEED Certification	Total LEED Points Earned	Materials and Resources LEED Points Earned	Materials and Resources Associated Costs	% Total Cost/Factor LEED Point
1	Academic Instruction Facility, Camp Geiger	Certified	28	5	$-	0.00%
2	Reserve Training Center and Vehicle Maintenance Facility	Certified	34	5	$-	0.00%
3	Aircraft Maintenance Hangar Ph I & II	Certified	27	2	$-	0.00%
4	New Gymnasium and Music Room, MCAS	Certified	26	3	$-	0.00%
5	EOD Operations Facility, MCB, CLNC	Certified	25	4	$-	0.00%
6	Enlisted Dining Facility, Courthouse Bay	Certified	27	3	$-	0.00%
7	Armories II MEF at French Creek	Certified	24	4	$-	0.00%
8	MARSOC Dining Facility	Certified	27	3	$-	0.00%
9	MP Company Operations Complex, MCB	Silver	35	5	$-	0.00%
10	EOD Building FC292 Addition	Certified	29	7	$-	0.00%
11	EODOSU 10 Ordnance Operations Facility	Silver	35	4	$-	0.00%
12	Child Development Center	Platinum	53	6	$-	0.00%
13	Police and Security Operations	Silver	34	4	$-	0.00%
14	Seal Team Operations Support Facility	Silver	35	5	$-	0.00%
15	Enlisted Dining Facility, MCAS Beaufort	Certified	30	2	$-	0.00%
16	Explosive Ordnance Facility	Silver	33	3	$-	0.00%
17	Training and Simulator Facility	Silver	34	4	$-	0.00%
18	Aircraft Hangar MCAS Beaufort	Silver	33	4	$-	0.00%
					Ave %/pt =	0.00%

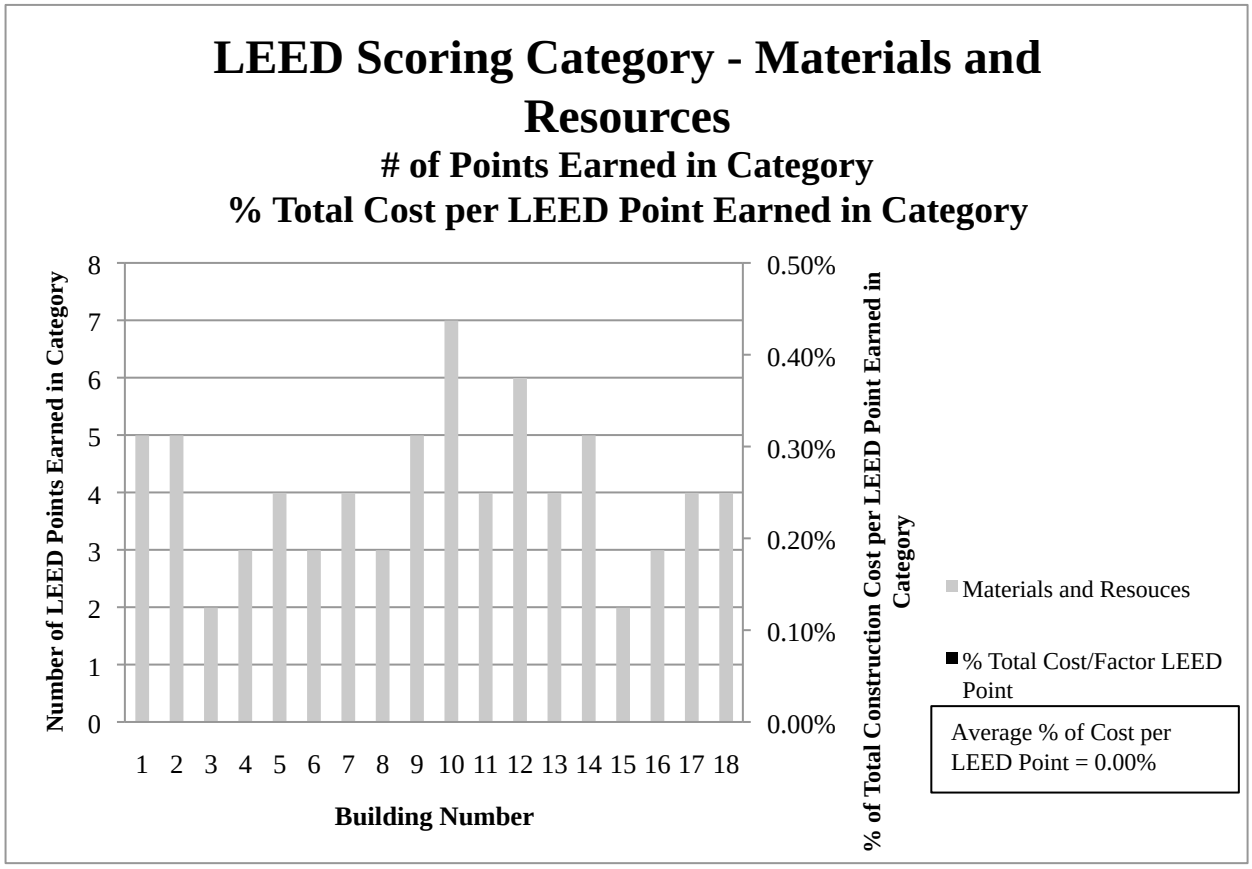

Figure 25 - LEED Scoring Category - Materials and Resources

Figure 25 shows the relationship between the number of LEED points earned for this section and the percent total of the total cost of construction. As there were no costs reported for this section, there does not appear to be a correlation between LEED points earned and construction costs.

5.2.5 – Indoor Environmental Quality

The next LEED scoring category to review is "Indoor Environmental." Using the procedure in the section 5.2.1, the data is provided in Table 12. The table presents the LEED

certification level, total points earned, points earned for the specific category, costs associated with the category, and the percent of category costs (compared to total construction cost) per category point. There were three buildings (2, 12, and 13) that had LEED certification costs attributable to this LEED scoring category. The average percent of the total cost of construction per LEED point earned is 0.01 percent. Building 12 makes up the majority of the costs associated with this category and the costs were related with design and construction of dormers for daylight harvesting.

Table 12 - Indoor Environmental Quality Associated Costs and Percent of Total Costs per LEED Point

Building #	Title	LEED Certification	Total LEED Points Earned	Indoor Environmental Quality LEED Points Earned	Indoor Environmental Quality Associated Costs	% Total Cost/Factor LEED Point
1	Academic Instruction Facility, Camp Geiger	Certified	28	7	$-	0.00%
2	Reserve Training Center and Vehicle Maintenance Facility	Certified	34	11	$3,077	0.01%
3	Aircraft Maintenance Hangar Ph I & II	Certified	27	9	$-	0.00%
4	New Gymnasium and Music Room, MCAS	Certified	26	9	$-	0.00%
5	EOD Operations Facility, MCB, CLNC	Certified	25	7	$-	0.00%
6	Enlisted Dining Facility, Courthouse Bay	Certified	27	7	$-	0.00%
7	Armories II MEF at French Creek	Certified	24	7	$-	0.00%
8	MARSOC Dining Facility	Certified	27	6	$-	0.00%
9	MP Company Operations Complex, MCB	Silver	35	7	$-	0.00%
10	EOD Building FC292 Addition	Certified	29	7	$-	0.00%
11	EODOSU 10 Ordnance Operations Facility	Silver	35	11	$-	0.00%
12	Child Development Center	Platinum	53	14	$118,750	0.09%
13	Police and Security Operations	Silver	34	12	$3,300	0.00%
14	Seal Team Operations Support Facility	Silver	35	11	$-	0.00%
15	Enlisted Dining Facility, MCAS Beaufort	Certified	30	7	$-	0.00%
16	Explosive Ordnance Facility	Silver	33	9	$-	0.00%
17	Training and Simulator Facility	Silver	34	10	$-	0.00%
18	Aircraft Hangar MCAS Beaufort	Silver	33	9	$-	0.00%
					Ave %/pt =	0.01%

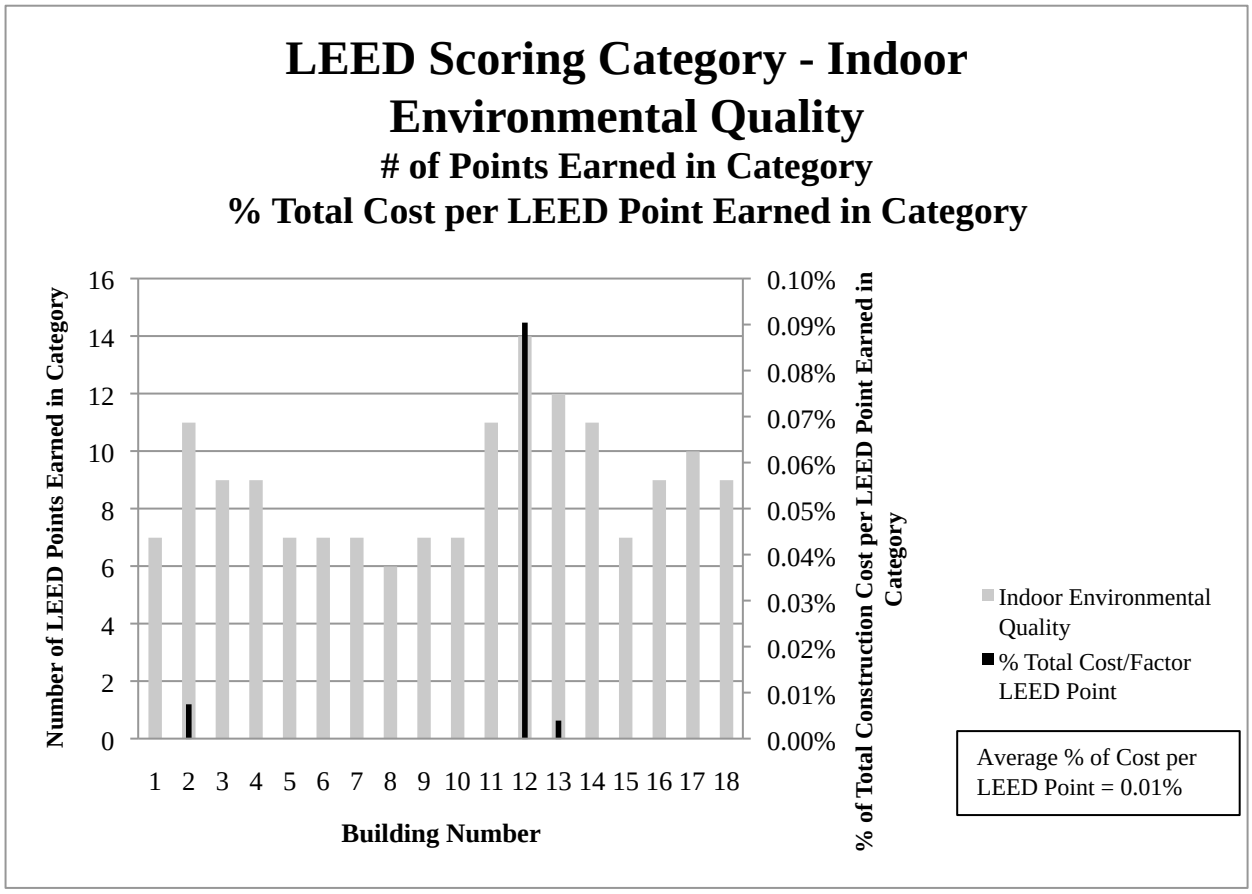

Figure 26 - LEED Scoring Category - Indoor Environmental Quality

Figure 26 shows the relationship between the number of LEED points earned for this section and the percent total of the total cost of construction. The majority of the buildings indicate little or no direct costs associated with LEED certification. Building 12 has both the largest number of LEED points earned for this section and the highest percentage of costs per LEED point, but based on the remainder of the information, there does not appear to be a correlation between LEED points earned and construction costs.

5.2.6 – Innovation and Design Process

The next LEED scoring category to review is "Innovation and Design Process." Using the procedure in the section 5.2.1, the data is provided in Table 13. The table presents the LEED certification level, total points earned, points earned for the specific category, costs associated with the category, and the percent of category costs (compared to total construction cost) per category point. Half of the buildings reported LEED certification costs attributable to this LEED scoring category. The average percent of the total cost of construction per LEED point earned is 0.18 percent. The buildings in the dataset had costs attributed to design, testing, reporting, GIS surveying, and LEED documentation.

Table 13 - Innovation and Design Process Associated Costs and Percent of Total Cost per LEED Point

Building #	Title	LEED Certification	Total LEED Points Earned	Innovation and Design Process LEED Points Earned	Innovation and Design Process Associated Costs	% Total Cost/Factor LEED Point
1	Academic Instruction Facility, Camp Geiger	Certified	28	1	$-	0.00%
2	Reserve Training Center and Vehicle Maintenance Facility	Certified	34	3	$-	0.00%
3	Aircraft Maintenance Hangar Ph I & II	Certified	27	2	$50,400	0.07%
4	New Gymnasium and Music Room, MCAS	Certified	26	1	$21,000	1.15%
5	EOD Operations Facility, MCB, CLNC	Certified	25	1	$-	0.00%
6	Enlisted Dining Facility, Courthouse Bay	Certified	27	1	$-	0.00%
7	Armories II MEF at French Creek	Certified	24	1	$-	0.00%
8	MARSOC Dining Facility	Certified	27	1	$18,678	0.15%
9	MP Company Operations Complex, MCB	Silver	35	3	$-	0.00%
10	EOD Building FC292 Addition	Certified	29	1	$-	0.00%
11	EODOSU 10 Ordnance Operations Facility	Silver	35	3	$800	0.00%
12	Child Development Center	Platinum	53	3	$83,000	0.30%
13	Police and Security Operations	Silver	34	1	$88,775	1.30%
14	Seal Team Operations Support Facility	Silver	35	3	$67,840	0.08%
15	Enlisted Dining Facility, MCAS Beaufort	Certified	30	1	$-	0.00%
16	Explosive Ordnance Facility	Silver	33	2	$25,000	0.19%
17	Training and Simulator Facility	Silver	34	3	$-	0.00%
18	Aircraft Hangar MCAS Beaufort	Silver	33	3	$6,101	0.00%
					Ave %/pt =	0.18%

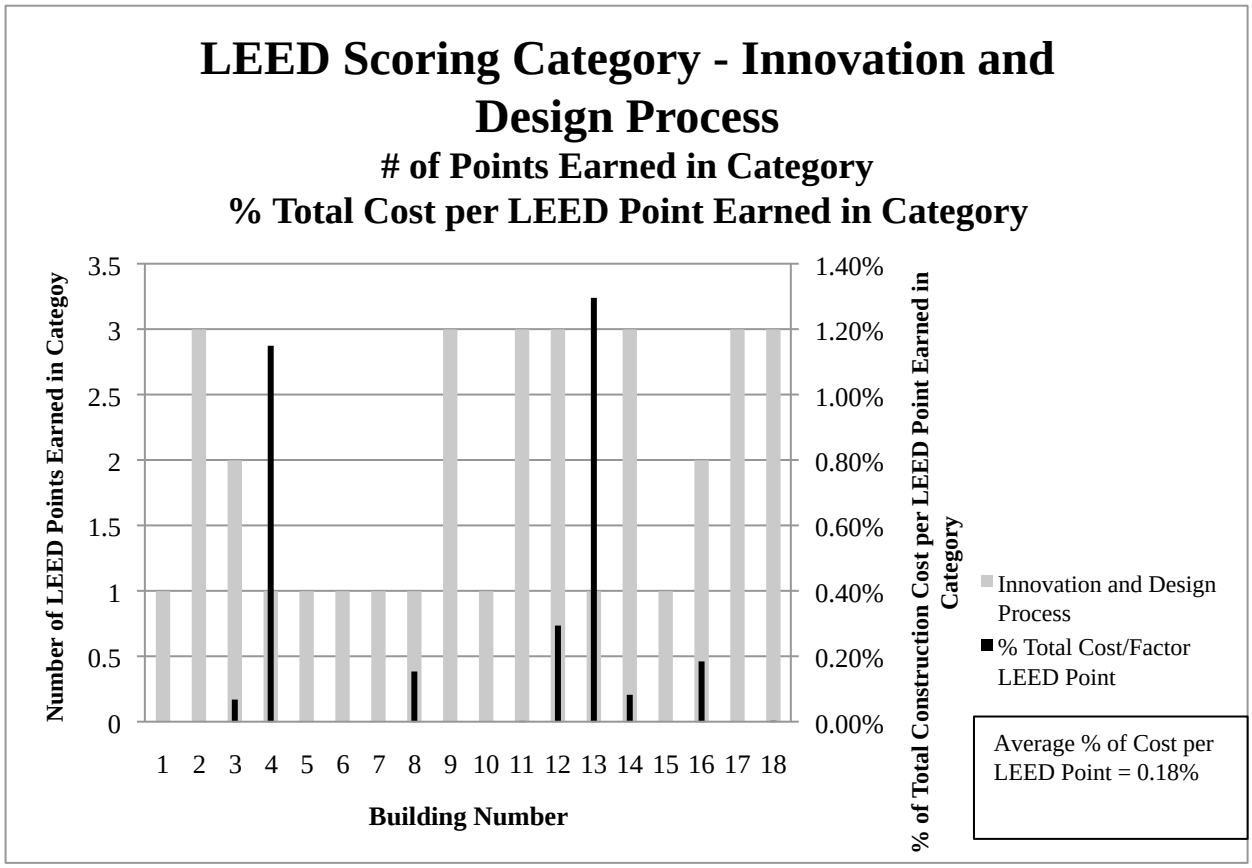

Figure 27 - LEED Scoring Category - Innovation and Design Process

Figure 27 shows the relationship between the number of LEED points earned for this section and the percent total of the total cost of construction. Buildings 4 and 13 had the largest percentage of their cost per LEED point, but only earned one point in this section. Buildings 2, 9, 11, 12, 14, 17, and 18 each earned three points in this section, but had no costs associated with LEED certification. Based on this information there does not appear to be a correlation between LEED points earned and construction costs.

5.2.7 – Summary

Figure 28 is provided below to summarize the data presented in section 5.2. The "Energy and Atmosphere" and "Innovation and Design" categories had the largest percentage per LEED point earned of the six categories at 0.28 percent and 0.18 percent respectfully.

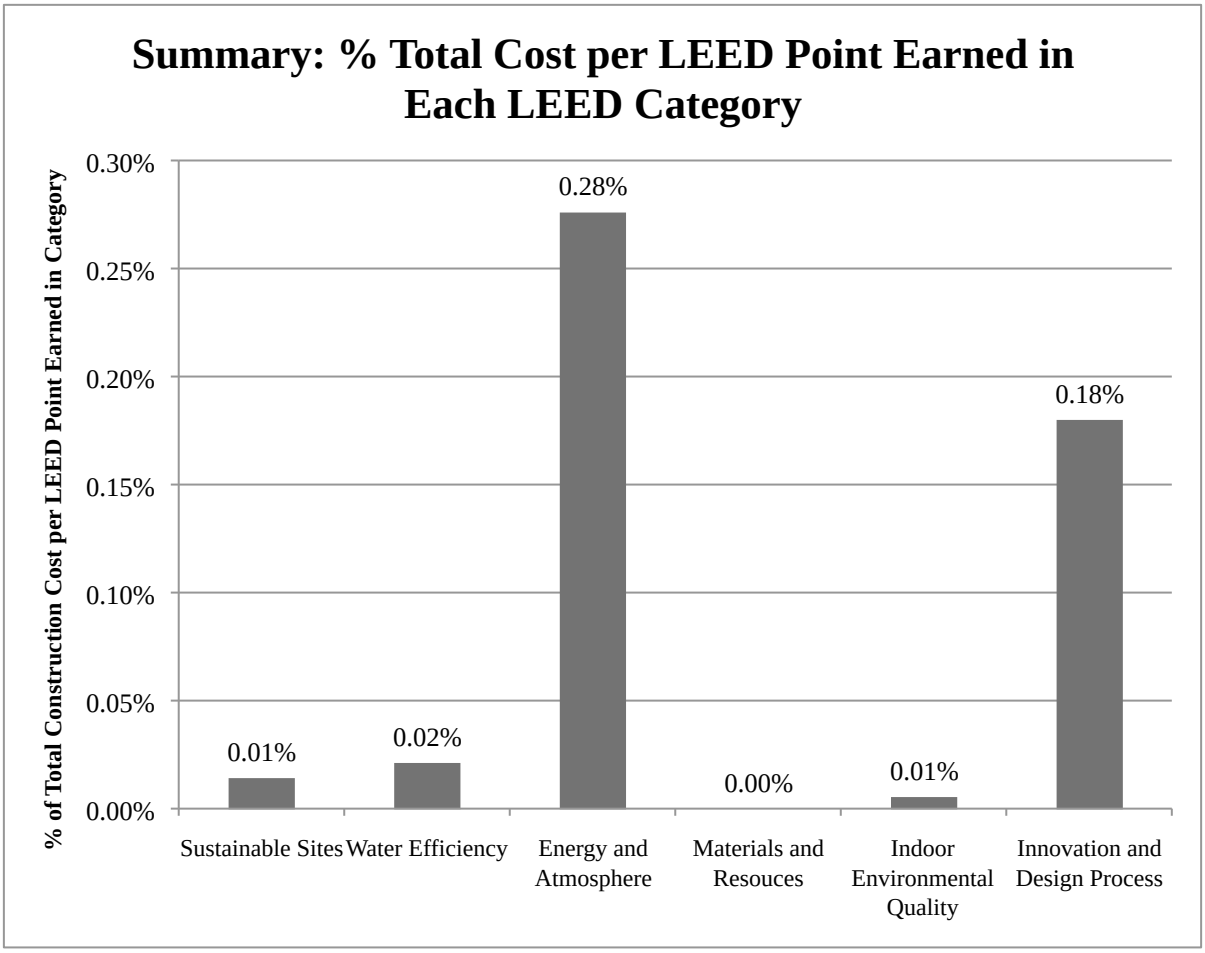

Figure 28 - Summary: % of Total Construction Cost per LEED Point Earned in Each LEED Category

Figure 29 summarizes the average construction costs associated for each LEED category. The "Energy and Atmosphere" section had the largest average construction cost associated with it at $248,869 and is primarily due to three buildings (16, 17, and 18). All other categories had $20,000 or less construction cost associated with them.

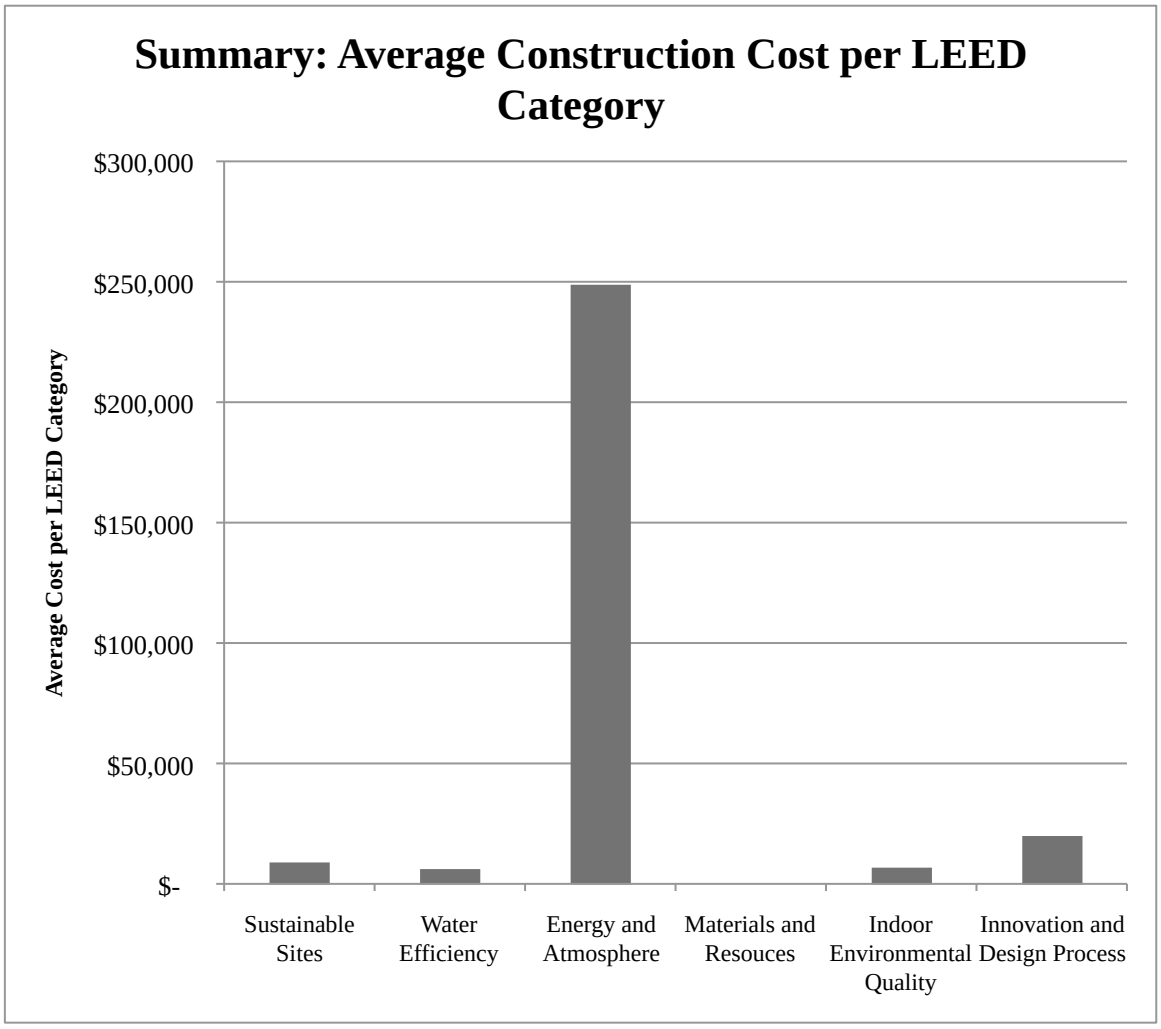

Figure 29 - Summary: Average Construction Cost per LEED Category

There does not appear to be a correlation between percent cost of construction and LEED certification point earned for any of the categories.

5.3 – Application of Percent Cost per LEED Point to 2010 Study LEED Dataset

The next step in the review of the data applied the average percentage of cost per LEED category point earned to the LEED dataset from the 2010 UW study. This dataset, which had environmental data, came directly from the Energy Consumption Evaluation of United States Navy LEED Certified Buildings for Fiscal Year 2009 report (Mangasarian, 2010). Due to the lack of financial data that was part of the 2010 UW study, it was not possible to perform a line

item review to pull out verifiable costs associated with LEED certification. It was therefore necessary to use the averages calculated in section 5.2 and then apply them to the LEED points earned by the 2010 study LEED dataset.

Table 14 indicates the buildings included in the 2010 UW study and includes the total LEED points earned by LEED scoring categories and the total cost of construction. Please note that building 23, the Personnel Support Facility located at Little Creek, VA, did not have any financial or contractual data available and will be removed from further review.

Table 14 - US Navy LEED Certified Buildings for Fiscal Year 2009, LEED Points Earned and Total Construction Cost

Building #	Title	LEED Certification Level	Total LEED Points Earned	Sustainable Sites LEED Points Earned	Water Efficiency LEED Points Earned	Energy and Atmosphere LEED Points Earned	Materials and Resources LEED Points Earned	Indoor Environmental Quality LEED Points Earned	Innovation and Design Process LEED Points Earned	Total Cost of Construction
18	Atlantic Fleet Drill Hall	Gold	41	8	4	11	7	9	2	$13,429,336
19	Airborne Mine Countermeasures Facility	Certified	28	3	4	3	5	7	4	$5,000,000
20	Aircraft Maintenance Hangar (HM14)	Certified	28	3	4	3	5	7	4	$9,000,000
21	Child Development Center (450)	Silver	34	6	2	7	6	11	2	$6,320,000
22	Bachelor Quarters (2075)	Certified	29	7	4	1	6	9	2	$11,900,000
23	Personnel Support Facility	Silver	33	4	4	2	8	13	4	$-
24	Police and Security Operations	Silver	34	8	4	5	4	12	1	$6,600,000
25	Bachelor Enlisted Quarters (FC507)	Certified	27	3	3	7	4	8	2	$13,745,097
26	NBVC Public Works Department	Gold	40	8	3	14	2	8	5	$490,000
27	Naval Facilities Engineering Service Command	Silver	41	6	3	11	9	7	5	$20,651,426
28	Memorial Golf Course Clubhouse (3750)	Gold	39	6	4	7	5	13	4	$6,682,897

Using the points earned for each LEED category and multiplying them by the averages calculated in section 5.2, an estimated cost to achieve LEED certification was interpolated. Table 15 provides the results of this review and shows the total associated LEED certification

costs, the cost per square foot of these measures, and the percent LEED cost of total construction cost for each building.

Table 15 - Interpolated Cost of LEED Certification to the 2010 Study Dataset

Building #	Title	Total Construction Cost	Total Associated LEED Certification Costs	Building Size (sf)	Cost per sf	Total Associated LEED Cost per square foot ($/sf)	% LEED Cost of Total Cost of Construction
18	Atlantic Fleet Drill Hall	$13,429,336	$490,114	64,194	$209.20	$7.63	3.65%
19	Airborne Mine Countermeasures Facility	$5,000,000	$85,882	40,376	$123.84	$2.13	1.72%
20	Aircraft Maintenance Hangar (HM14)	$9,000,000	$154,588	51,367	$175.21	$3.01	1.72%
21	Child Development Center (450)	$6,320,000	$157,039	29,106	$217.14	$5.40	2.48%
22	Bachelor Quarters (2075)	$11,900,000	$104,033	54,319	$219.08	$1.92	0.87%
23	Personnel Support Facility	$-	$-	37,800	$-	$-	0.00%
24	Police and Security Operations	$6,600,000	$120,772	20,424	$323.15	$5.91	1.83%
25	Bachelor Enlisted Quarters (FC507)	$13,745,097	$336,196	90,948	$151.13	$3.70	2.45%
26	NBVC Public Works Department	$490,000	$24,457	16,920	$28.96	$1.45	4.99%
27	Naval Facilities Engineering Service Command	$20,651,426	$852,568	193,818	$106.55	$4.40	4.13%
28	Memorial Golf Course Clubhouse (3750)	$6,682,897	$193,759	16,390	$407.74	$11.82	2.90%

As was described in section 5.2, the data does not appear to provide a direct correlation between LEED points earned and costs associated with each LEED scoring category. Therefore, it must be noted that the above costs are based solely on the averages of a relatively small dataset and would be better suited to a much larger source of data.

The 2010 UW study provided water and electricity consumption data and was directly compared and attributed to the LEED certification category “Energy and Atmosphere”. This study will expand on the 2010 UW study by calculating the costs associated with the “Energy

and Atmosphere" category. Table 16 shows the calculated associated cost by using the average from section 5.2 and multiplying it by the number of LEED points earned in that category. An example calculation is provided as follows: Building 18's total cost of construction is $133,429,336, it has 11 points in Energy Atmosphere and the average percent of total cost per LEED point is 0.28 percent. Therefore, the costs associated with "Energy and Atmosphere" is calculated as:

$$(11 \text{ pts x } 0.28\%) \text{ x } (\$13,429,336) = \$407,851$$

Table 16 - Energy and Atmosphere Associated Costs for the 2010 Study Dataset

				Average =	0.28%		
Building #	Title	LEED Certification	Total Points	LEED Points Associated with Energy and Atmosphere	% of Cost = Ave %/pt x factor pt	Energy and Atmosphere Associated Costs	Total Cost of Construction
18	Atlantic Fleet Drill Hall	Gold	41	11	3.04%	$407,851	$13,429,336
19	Airborne Mine Countermeasures Facility	Certified	28	3	0.83%	$41,414	$5,000,000
20	Aircraft Maintenance Hangar (HM14)	Certified	28	3	0.83%	$74,545	$9,000,000
21	Child Development Center (450)	Silver	34	7	1.93%	$122,143	$6,320,000
22	Bachelor Quarters (2075)	Certified	29	1	0.28%	$32,855	$11,900,000
23	Personnel Support Facility	Silver	33	2	0.55%	$-	$-
24	Police and Security Operations	Silver	34	5	1.38%	$91,110	$6,600,000
25	Bachelor Enlisted Quarters (FC507)	Certified	27	7	1.93%	$265,644	$13,745,097
26	NBVC Public Works Department	Gold	40	14	3.87%	$18,940	$490,000
27	Naval Facilities Engineering Service Command	Silver	41	11	3.04%	$627,187	$20,651,426
28	Memorial Golf Course Clubhouse (3750)	Gold	39	7	1.93%	$129,157	$6,682,897

5.4 – Perform Simple Payback Period Analysis

With the cost to achieve LEED certification estimated for the "Energy and Atmosphere" category, a simple payback period analysis was performed for each of the buildings from the 2010 UW study dataset. Electricity and water consumption data, received in kilowatt-hours (KWH) and kilo-gallons (KGal) respectively, was collected from the US Navy for the 2009 fiscal year (October 2008 to September 2009). Electricity and water utility rates were then taken from the US Energy Information Administration and are listed in Tables 4 and 5 in section 4.3.

5.4.1 – Atlantic Fleet Drill Hall vs. Pacific Fleet Drill Hall

The first building to be reviewed was the Atlantic Fleet Drill Hall. Located at Naval Station Great Lakes, onboard Recruit Training Command, the Atlantic Fleet drill hall (Atlantic) was compared to the Pacific Fleet Drill Hall (Pacific). Both are similar in size, same location (Naval Station Great Lakes), and architectural design. The Pacific was constructed in 2002 for an acquisition basic cost of $11,820,000. The Atlantic was constructed in 2007 for an acquisition basic cost of $13,429,336 and received the LEED Gold certification by the USGBC.

Table 17 illustrates the building construction and electricity and water consumption costs. Utilizing the ENR Construction Cost Index, the building costs were escalated to the end of year (EOY) 2010 to find the adjusted cost per square foot. This was calculated by multiplying the Acquisition Basic Cost by the ENR Construction Cost Index for 2010 (4883) and divided by the index for the year that the building was constructed. The Adjusted Cost calculation for the Atlantic Fleet Drill Hall is illustrated as follows:

$$\text{Adjusted Cost} = \$13{,}429{,}336 \text{ x } \left(\frac{4883}{4485}\right) = \$14{,}621{,}059$$

The Adjusted Cost is then divided by the area to provide the cost per square foot for each building. The construction costs associated with the LEED category, "Energy and Atmosphere" was then brought in from Table 14. The next step is the calculation of the electricity and water consumption costs for fiscal year 2009. Using the rates from Tables 4 and 5 in section 4.3, the electricity and water consumption costs are calculated by multiplying the rate by the consumption and dividing by the area of the building. The calculation is illustrated as follows:

$$\text{Electricity/Water Consumpation Costs} = \frac{\text{Rate (\$ per kWH or kGAL) x Consumption (kWH or kGAL)}}{\text{Area of Building (sf)}}$$

The following step calculates the percent decrease in electricity and water consumption cost. This is done by subtracting the LEED certified building energy cost (electricity or water) from the non-LEED certified building energy cost and dividing by the non-LEED certified building energy cost. The calculation is illustrated as follows:

$$\text{\% Decrease in Electricity/Water Consumption Cost} = \frac{\text{non-LEED Energy Cost (\$/sf) - LEED Energy Cost (\$/sf)}}{\text{non-LEED Energy Cost (\$/sf)}}$$

The final calculation is the simple payback for the total adjusted cost per square foot difference between the LEED certified and non-LEED certified buildings, as well as, for the construction costs associated with the LEED scoring category "Energy and Atmosphere".

Table 17 - Drill Halls Building Construction Cost and Electricity and Water Consumption Data for Atlantic Fleet and Pacific Fleet Drill Halls

	LEED Certified	Non-LEED Certified
	Atlantic Fleet Drill Hall	Pacific Fleet Drill Hall
Building Construction Cost		
Acquisition Basic Cost	$13,429,336	$11,820,000
Building Size (sf)	64,194	64,914
Year Constructed	2007	2002
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4485	3623
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.089	1.348
Adjusted Cost	$14,621,059	$15,930,737
Adjusted Cost per square foot	$227.76	$245.41
Energy and Atmosphere Associated Costs (from table 14)	$407,850.82	
Utilities Consumption		
Electricity Consumption (kWh)	533.44	582.12
Water Consumption (kGal)	144.3	393
Electricity Costs per square foot ($/sf)	$0.58	$0.64
Water Costs per sf ($/sf)	$0.01	$0.03
Total Electricity and Water Consumption Cost per sf	$0.59	$0.66
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	8.36%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	63.28%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	n/a	
Energy and Atmosphere Costs (years)	91.87	

The LEED Gold certified Atlantic had an adjusted cost per square foot $17.65 less than the non-LEED certified Pacific. Additionally, Atlantic realized a $0.07 per square foot cost savings per year in electricity and water consumption costs. Based upon this information, the data does not warrant calculating a simple payback period (SPB) for the construction cost delta, but a SPB will be calculated for the associated costs to earn the LEED points in “Energy and

Atmosphere". Using Equation 3, the SPB for the "Energy and Atmosphere" associated costs is 91.9 years.

The Atlantic was not able to meet the 30 percent electricity consumption cost reduction only saving 8.36 percent as compared to the Pacific. The Atlantic was able to meet the water consumption cost reduction, reducing the costs by 63.28 percent. Based on these results, the Atlantic building partially meets EO 13423's mandate.

5.4.2 – Airborne Mine Countermeasures Facility vs. Aircraft Maintenance Hangar

At Naval Station Norfolk, the Airborne Mine Countermeasures Facility (SP 36) and the Aircraft Maintenance Hangar (HSC-22/C12) are both at the same location (Naval Station Norfolk), have similar architectural design, but vary in size with the Airborne Mine Countermeasures Facility being approximately 73% larger. The Aircraft Maintenance Hangar was constructed in 1998 for an acquisition basic cost of $7,300,000. The Airborne Mine Countermeasures was constructed in 2005 for an acquisition basic cost of $5,000,000 and received LEED certification by the USGBC.

Table 18 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 18 - Building Construction Cost and Electricity and Water Consumption for Airborne Mine Countermeasures Facility and Aircraft Maintenance Hangar (HSC-22/C12)

	LEED Certified	Non-LEED Certified
	Airborne Mine Countermeasures Facility	Aircraft Maintenance Hangar (HSC-22/C12)
Building Construction Cost		
Acquisition Basic Cost	$5,000,000	$7,300,000
Building Size (sf)	40,376	52,610
Year Constructed	2005	1998
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4205	3391
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.161	1.440
Adjusted Cost	$5,806,183	$10,511,914
Adjusted Cost per square foot	$143.80	$199.81
Energy and Atmosphere Associated Costs (from table 14)	$41,413.83	
Utilities Consumption		
Electricity Consumption (kWh)	513.7	743.2
Water Consumption (kGal)	148	966
Electricity Costs per square foot ($/sf)	$0.84	$2.10
Water Costs per sf ($/sf)	$0.05	$0.54
Total Electricity and Water Consumption Cost per sf	$0.89	$2.65
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	60.12%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	91.16%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	31.82	
Energy and Atmosphere Costs (years)	0.58	

The LEED certified Airborne Mine Countermeasures Facility had an adjusted cost per square foot $56.01 less than the non-LEED certified Aircraft Maintenance Hangar. Additionally, Airborne Mine Countermeasures Facility realized a $1.76 per square foot cost savings per year in electricity and water consumption costs. Based upon this information, the data does not warrant calculating a SPB for the construction cost delta, but will be calculated for the associated costs to

earn the LEED points in “Energy and Atmosphere”. Using Equation 3, the SPB for the “Energy and Atmosphere” associated costs is 0.6 years.

The Airborne Mine Countermeasures Facility was able to meet the 30 percent electricity consumption cost reduction, saving 60.12 percent as compared to the non-LEED certified Aircraft Maintenance Hangar. The Airborne Mine Countermeasures Facility was also able to meet the water consumption cost reduction, reducing the costs by 91.16 percent. Based on these results, the building therefore fully meets EO 13423’s mandate.

5.4.3 – Aircraft Maintenance Hangar (HM-14) vs. Aircraft Maintenance Hangar (HSC-22/C12)

Also at Naval Station Norfolk, the Aircraft Maintenance Hangar (HM-14) was compared to the Aircraft Maintenance Hangar (HSC-22/C12). They are both similar in size and architectural design. HSC-22/C12 was constructed in 1998 for an acquisition basic cost of $7,300,000. HM-14 was constructed in 2006 for an acquisition basic cost of $9,000,000 and received LEED certification by the USGBC.

Table 19 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 19 - Building Construction Cost and Electricity and Water Consumption Data for Aircraft Maintenance Hangar (HM14) and Aircraft Maintenance Hangar (HAS-22/C12)

	LEED Certified	Non-LEED Certified
	Aircraft Maintenance Hangar (HM14)	Aircraft Maintenance Hangar (HSC-22/C12)
Building Construction Cost		
Acquisition Basic Cost	$9,000,000	$7,300,000
Building Size (sf)	51,367	52,610
Year Constructed	2006	1998
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4369	3391
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.118	1.440
Adjusted Cost	$10,058,824	$10,511,914
Adjusted Cost per square foot	$195.82	$199.81
Energy and Atmosphere Associated Costs (from table 14)	$74,544.89	
Utilities Consumption		
Electricity Consumption (kWh)	838.2	743.2
Water Consumption (kGal)	1430	966
Electricity Costs per square foot ($/sf)	$1.95	$2.10
Water Costs per sf ($/sf)	$0.66	$0.54
Total Electricity and Water Consumption Cost per sf	$2.61	$2.65
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	7.41%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	-21.52%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	102.99	
Energy and Atmosphere Costs (years)	37.50	

The similarities between these buildings are within two percent for both building construction and electricity and water consumption costs. The LEED certified Aircraft Maintenance Hangar (HM-14) had an adjusted cost per square foot $3.99 less than the non-LEED certified Aircraft Maintenance Hangar (HSC-22/C12). Additionally, the Aircraft Maintenance Hangar (HM-14) realized a $0.04 per square foot cost savings per year in electricity and water consumption costs. Based upon this information, the data does not warrant calculating a SPB for the construction cost delta, but will be calculated for the associated costs to earn the

LEED points in “Energy and Atmosphere”. Using Equation 3, the SPB for the “Energy and Atmosphere” associated costs is 37.5 years.

The Aircraft Maintenance Hangar (HM-14) was not able to meet the 30 percent electricity consumption cost reduction, saving 7.41 percent as compared to the non-LEED certified Aircraft Maintenance Hangar (HSC-22/C12). HM-14 also did not meet the water consumption cost reduction, using more water at a cost of 21.52 percent more. Based on these results, the building does not meet EO 13423’s mandate.

5.4.4 – Oceana Child Development Center vs. Norfolk Child Development Center

At Naval Air Station (NAS) Oceana in Virginia Beach, Virginia, the Oceana Child Development Center (CDC) building was compared to the Norfolk CDC building at Naval Station Norfolk in Norfolk, Virginia. These two buildings are comparable in usage, with the differences being that the NAS Oceana CDC is 35% larger and they have different architectural designs. The Child Development Center Norfolk was constructed in 2000 for an acquisition basic cost of $1,604,924. The Child Development Center Oceana was constructed in 2006 for an acquisition basic cost of $6,320,000 and received LEED Silver certification by the USGBC.

Table 20 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 20 - Building Construction Cost and Electricity and Water Consumption Data for Oceana Child Development Center and Norfolk Child Development Center

	LEED Certified	Non-LEED Certified
	Oceana Child Development Center	Norfolk Child Development Center
Building Construction Cost		
Acquisition Basic Cost	$6,320,000	$1,604,924
Building Size (sf)	29,106	21,420
Year Constructed	2006	2000
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4369	3539
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.118	1.380
Adjusted Cost	$7,063,529	$2,214,423
Adjusted Cost per square foot	$242.68	$103.38
Energy and Atmosphere Associated Costs (from table 14)	$122,143.18	
Utilities Consumption		
Electricity Consumption (kWh)	489.99	397
Water Consumption (kGal)	812.1	1522
Electricity Costs per square foot ($/sf)	$1.11	$1.22
Water Costs per sf ($/sf)	$0.37	$0.93
Total Electricity and Water Consumption Cost per sf	$1.48	$2.15
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	8.84%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	60.59%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	206.95	
Energy and Atmosphere Costs (years)	6.23	

The LEED Silver certified building Oceana CDC had an adjusted cost per square foot $139.30 more than the non-LEED certified Norfolk CDC. Additionally, the Oceana CDC had $0.67 per square foot less cost per year in electricity and water consumption costs. The data dictates that a SPB calculation can be completed. Using equations 2 and 3, the SPB for the total

construction cost delta of the Oceana CDC is 207.7 years, while the SPB for the "Energy and Atmosphere" associated costs is 6.2 years.

The Oceana CDC was not able to meet the 30 percent electricity consumption cost reduction, only saving 8.84 percent as compared to the non-LEED certified Norfolk CDC. The Oceana CDC was able to meet the water consumption cost reduction, reducing the costs by 60.59 percent. Based on these results, the building partially meets EO 13423's mandate.

5.4.5 – Bachelor Enlisted Quarters (2075) vs. Bachelor Enlisted Quarters (R61)

The Bachelor Enlisted Quarters (2075) at Naval Weapons Station Yorktown and the Bachelor Enlisted Quarters (R61) at Naval Station Norfolk are both within the same region, although separated by 35 miles, have similar architectural design, but vary in size, with the R61 approximately 36% larger. R61 was constructed in 1984 for an acquisition basic cost of $5,370,000. 2075 was constructed in 2005 for an acquisition basic cost of $11,900,000 and received LEED certification by the USGBC.

Table 21 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 21 - Building Construction Cost and Electricity and Water Consumption for Bachelor Quarters (2075) and Bachelor Enlisted Quarters (R61)

	LEED Certified	Non-LEED Certified
	Bachelor Enlisted Quarters (2075)	Bachelor Enlisted Quarters (R61)
Building Construction Cost		
Acquisition Basic Cost	$11,900,000	$5,370,000
Building Size (sf)	54,319	84,315
Year Constructed	2005	1984
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4205	2417
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.161	2.020
Adjusted Cost	$13,818,716	$10,848,866
Adjusted Cost per square foot	$254.40	$128.67
Energy and Atmosphere Associated Costs (from table 14)	$32,854.97	
Utilities Consumption		
Electricity Consumption (kWh)	770.8	906.8
Water Consumption (kGal)	1665	0
Electricity Costs per square foot ($/sf)	$1.04	$0.59
Water Costs per sf ($/sf)	$0.45	$-
Total Electricity and Water Consumption Cost per sf	$1.49	$0.59
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	-77.75%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	n/a	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	n/a	
Energy and Atmosphere Costs (years)	n/a	

The LEED certified building 2075 had an adjusted cost per square foot $125.70 more than the non-LEED certified R61. Additionally, 2075 used $0.91 per square foot more per year in electricity and water consumption costs. Based upon this information, the data does not support calculating a SPB for the construction cost delta or for the associated costs to earn the LEED points in “Energy and Atmosphere”. As there were no electricity or water consumption

cost savings, the LEED certified building will not be able to pay back the additional costs based on the current data.

Building 2075 was not able to meet the 30 percent electricity consumption cost reduction, actually using 77.75 percent more in electrical costs as compared to the non-LEED certified building R61. There was no water consumption data available for building R61, so there was no comparison possible. Based on the results available, the building fails to meet EO 13423's mandate.

5.4.6 – Police and Special Operations Facility vs. Police Station

At Naval Amphibious Base Little Creek, the Police and Special Operations Facility (PSOF) is being compared to the Police Station (PS) at Naval Station Norfolk . These buildings are comparable in usage, are separated by 18 miles, have similar architectural designs, and the PS is 18 percent larger in size. The Police Station was constructed in 1974 for an acquisition basic cost of $514,350. The PSOF was constructed in 2007 for an acquisition basic cost of $6,600,000 and received LEED Silver certification by the USGBC.

Table 22 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 22 - Building Construction Cost and Electricity and Water Consumption Data for Police and Security Operations and Police Station

	LEED Certified	Non-LEED Certified
	Police and Security Operations	Police Station
Building Construction Cost		
Acquisition Basic Cost	$6,600,000	$514,350
Building Size (sf)	20,424	24,909
Year Constructed	2007	1974
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4485	1205
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.089	4.052
Adjusted Cost	$7,185,686	$2,084,291
Adjusted Cost per square foot	$351.83	$83.68
Energy and Atmosphere Associated Costs (from table 14)	$91,110.42	
Utilities Consumption		
Electricity Consumption (kWh)	559.7	579.6
Water Consumption (kGal)	523	670
Electricity Costs per square foot ($/sf)	$1.48	$1.53
Water Costs per sf ($/sf)	$0.27	$0.35
Total Electricity and Water Consumption Cost per sf	$1.75	$1.89
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	3.78%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	22.22%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	1,964.20	
Energy and Atmosphere Costs (years)	32.68	

The LEED Silver certified building PSOF had an adjusted cost per square foot $268.15 more than the non-LEED certified PS. The PSOF realized a $0.14 per square foot cost savings per year in electricity and water consumption costs. The data dictates that a SPB calculation can be completed. Using equations 2 and 3, the SPB for the total construction cost delta of the PSOF is 1,964.2 years, while the SPB for the "Energy and Atmosphere" associated costs is 32.7 years.

The PSOF was not able to meet the 30 percent electricity consumption cost reduction, only saving 3.78 percent as compared to the non-LEED certified PS. The PSOF was able to meet the water consumption cost reduction, reducing the costs by 22.22 percent. Based on these results, the building partially meets EO 13423's mandate.

5.4.7 – Marine Bachelor Enlisted Quarters (FC507) vs. Marine Bachelor Enlisted Quarters (FC504)

At Marine Corps Base Camp Lejeune, two Bachelor Enlisted Quarters for Marines were compared, buildings FC 507 and FC 504. These two buildings are comparable in usage, size, and architectural design, with the major difference being the LEED Certified certification for FC 507. Both buildings were constructed in 2008 for the same acquisition basic cost of $13,785,097. FC 507 received LEED Silver certification by the USGBC.

Table 23 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 23 - Building Construction Cost and Electricity and Water Consumption Data for Bachelor Enlisted Quarters FC507 and FC504

	LEED Certified Bachelor Enlisted Quarters (FC507)	Non-LEED Certified Bachelor Enlisted Quarters (FC504)
Building Construction Cost		
Acquisition Basic Cost	$13,745,097	$13,745,097
Building Size (sf)	90,948	90,948
Year Constructed	2008	2008
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4691	4691
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.041	1.041
Adjusted Cost	$14,307,676	$14,307,676
Adjusted Cost per square foot	$157.32	$157.32
Energy and Atmosphere Associated Costs (from table 14)	$265,643.97	
Utilities Consumption		
Electricity Consumption (kWh)	639.2	582.8
Water Consumption (kGal)	0	0
Electricity Costs per square foot ($/sf)	$0.41	$0.37
Water Costs per sf ($/sf)	$-	$-
Total Electricity and Water Consumption Cost per sf	$0.41	$0.37
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	-9.68%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	n/a	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	0.00	
Energy and Atmosphere Costs (years)	n/a	

The LEED certified building FC507 had the same acquisition basic cost as the non-LEED certified FC504. Additionally, FC507 used $0.04 per square foot more per year in electricity and water consumption costs. Based upon this information, the data does not support calculating a SPB for the construction cost delta or for the associated costs to earn the LEED points in

"Energy and Atmosphere". As there are no electricity or water consumption cost savings, the LEED certified building would not be able to pay back the additional costs.

Building FC507 was not able to meet the 30 percent electricity consumption cost reduction, actually using 9.68 percent more in electrical costs as compared to the non-LEED certified building FC504. There was no water consumption data available for either building, so there was no comparison possible. Based on these results available, the building does not meet EO 13423's mandate.

5.4.8 – Naval Base Ventura County Public Works Department vs. Point Magu Public Works Department

In Port Hueneme, California, the Naval Base Ventura County (NBVC) Public Works Department (PWD) is being compared to the Point Magu PWD building at Point Magu. These two buildings are comparable in usage, with the differences being the NBVC PWD building is 36% larger, as well as they have different architectural designs. The Point Magu PWD was constructed in 2001 for an acquisition basic cost of $294,316. The NBVC PWD was constructed in 2001 for an acquisition basic cost of $490,000 and received LEED Gold certification by the USGBC.

Table 24 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 24 - Building Construction Cost and Electricity and Water Consumption Data for NBVC Public Works Department and Point Magu Public Works Department

	LEED Certified	Non-LEED Certified
	NBVC Public Works Department	Point Magu Public Works Department
Building Construction Cost		
Acquisition Basic Cost	$490,000	$294,316
Building Size (sf)	16,920	12,435
Year Constructed	2001	2001
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	3574	3574
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.366	1.366
Adjusted Cost	$669,466	$402,111
Adjusted Cost per square foot	$39.57	$32.34
Energy and Atmosphere Associated Costs (from table 14)	$18,939.92	
Utilities Consumption		
Electricity Consumption (kWh)	144.9	129.1
Water Consumption (kGal)	679.9	1201.3
Electricity Costs per square foot ($/sf)	$0.83	$0.98
Water Costs per sf ($/sf)	$0.41	$0.96
Total Electricity and Water Consumption Cost per sf	$1.24	$1.94
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	15.12%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	57.20%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	10.40	
Energy and Atmosphere Costs (years)	1.61	

The LEED Gold certified building NBVC PWD facility had an adjusted cost per square foot $7.23 more than the non-LEED certified Point Magu PWD. Additionally, the NBVC PWD realized a $0.70 per square foot cost savings per year in electricity and water consumption costs. The data dictates that a SPB calculation can be completed. Using equations 2 and 3, the simSPB for the total construction cost delta of the NBVC PWD facility is 10.4 years, while the SPB for the "Energy and Atmosphere" associated costs is 1.6 years.

The NBVC PWD was not able to meet the 30 percent electricity consumption cost reduction, only saving 15.12 percent as compared to the non-LEED certified Point Magu PWD. The NBVC PWD was able to meet the water consumption cost reduction, reducing the costs by 57.20 percent. Based on these results, the building partially meets EO 13423's mandate.

5.4.9 – Naval Facilities Engineering Service Command vs. Naval Sea Systems Command Lab

Also in California at Naval Base Ventura County in Port Hueneme, California, the Naval Facilities Engineering Service Command (NFESC) building was compared to the Naval Sea Systems Command (NAVSEA) Lab. These two buildings are comparable in usage with laboratory and office space, with the differences being that the NFESC building is 71% larger and has a different architectural design. The NAVSEA building was constructed in 1988 for an acquisition basic cost of $8,596,805. The NFESC building was constructed in 2001 for an acquisition basic cost of $20,651,426 and received LEED for Existing Buildings (EB) certification from the USGBC.

Table 25 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 25 - Building Construction Cost and Electricity and Water Consumption Data for Naval Facilities Service Command and NAVSEA Laboratory

	LEED Certified	Non-LEED Certified
	Naval Facilities Engineering Service Command	NAVSEA Laboratory
Building Construction Cost		
Acquisition Basic Cost	$20,651,426	$8,596,805
Building Size (sf)	193,818	112,184
Year Constructed	2001	1988
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	3574	2598
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.366	1.880
Adjusted Cost	$28,215,141	$16,157,890
Adjusted Cost per square foot	$145.58	$144.03
Energy and Atmosphere Associated Costs (from table 14)	$627,186.71	
Utilities Consumption		
Electricity Consumption (kWh)	1288.5	1542.9
Water Consumption (kGal)	432.7	603.9
Electricity Costs per square foot ($/sf)	$0.63	$1.30
Water Costs per sf ($/sf)	$0.02	$0.05
Total Electricity and Water Consumption Cost per sf	$0.65	$1.35
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	51.21%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	58.14%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	2.22	
Energy and Atmosphere Costs (years)	4.66	

The LEED-EB Silver certified NFESC building had an adjusted cost per square foot $1.55 more than the non-LEED certified NAVSEA building. Additionally, the NFESC building realized a $0.69 per square foot cost savings per year in electricity and water consumption costs. The data dictates that a SPB calculation can be completed. Using equations 2 and 3, the SPB for the total construction cost delta of the NFESC building is 2.2 years, while the SPB for the "Energy and Atmosphere" associated costs is 4.7 years.

The NFESC was able to meet the 30 percent electricity consumption cost reduction, saving 51.21 percent as compared to the non-LEED certified NAVSEA building. The NFESC building was also able to meet the water consumption cost reduction, reducing the costs by 58.14 percent. Based on these results, the building therefore fully meets EO 13423's mandate.

5.4.10 – Memorial Golf Course Clubhouse vs. Naval Base Ventura County Golf Course Clubhouse

In California, at Marine Corps Air Station Miramar, the Memorial Golf Course Clubhouse was compared to the Naval Base Ventura County (NBVC) Golf Course Clubhouse. These two buildings are comparable in usage and architectural design, but the Memorial Golf Course Clubhouse is 145 percent larger and is separated by 171 miles from the NBVC Golf Course Clubhouse. The NBVC Golf Course Clubhouse was constructed in 2001 for an acquisition basic cost of $1,246,127. The Memorial Golf Course Clubhouse was constructed in 2009 for an acquisition basic cost of $6,682,897 and received the LEED Gold certification from the USGBC. As the Memorial Golf Course Clubhouse project was completed and turned over to the Marine Course Air Station in February of 2009, all utility data will be compared from March through September 2009.

Table 26 illustrates the building construction and electricity and water consumption costs. Utilizing calculations as illustrated above in section 5.4.1, the adjusted cost per square foot, electricity and water consumption costs per square foot, percent decrease in electricity and water consumption cost, and SPB were calculated.

Table 26 - Building Construction Cost and Electricity and Water Consumption Data for Memorial Golf Course Clubhouse and Golf Course Clubhouse

	LEED Certified	Non-LEED Certified
	Memorial Golf Course Clubhouse (3750)	Golf Course Clubhouse (1537)
Building Construction Cost		
Acquisition Basic Cost	$6,682,897	$1,246,127
Building Size (sf)	16,390	6,688
Year Constructed	2009	2001
ENR Construction Cost Index for Constructed Year (ENR 2010 = 4883)	4769	3574
Adjusted Cost Factor (ENR 2010/ENR Constructed Year)	1.024	1.366
Adjusted Cost	$6,842,648	$1,702,529
Adjusted Cost per square foot	$417.49	$254.56
Energy and Atmosphere Associated Costs (from table 14)	$129,156.70	
Utilities Consumption		
Electricity Consumption (kWh)	487.4	147.6
Water Consumption (kGal)	474.9	163.1
Electricity Costs per square foot ($/sf)	$3.42	$1.18
Water Costs per sf ($/sf)	$0.37	$0.14
Total Electricity and Water Consumption Cost per sf	$3.78	$1.33
% Decrease in Electricity Consumption Costs (EO 13432 mandate is 30%)	-189.00%	
% Decrease in Water Consumption Costs (EO 13432 mandate is 16%)	-154.83%	
Simple Payback		
Total Adjusted Cost per square foot difference (LEED Certified - nonLEED Certified) (years)	n/a	
Energy and Atmosphere Costs (years)	n/a	

The LEED Gold certified Memorial Golf Course Clubhouse had an adjusted cost per square foot $162.92 more than the non-LEED certified Golf Course Clubhouse. Additionally, the Memorial Golf Course Clubhouse used $2.46 per square foot more per year in electricity and water consumption costs. Based upon this information, the data does not support calculating a SPB for the construction cost delta or for the associated costs to earn the LEED points in

"Energy and Atmosphere". As there are no electricity or water consumption cost savings, the LEED certified building will not be able to pay back the additional costs.

The Memorial Golf Course Clubhouse was not able to meet the 30 percent electricity consumption cost reduction, actually using 189 percent more in electrical costs as compared to the non-LEED certified building Golf Course Clubhouse. Also, the Memorial Golf Course Clubhouse used 154.83 percent more in water consumption costs as compared to the non-LEED certified. Based on these results, the building therefore fails to meet EO 13423's mandate.

5.5 – Overall Comparison Between LEED Certified and non-LEED Certified Buildings

The last portion of the data to be reviewed is the overall comparison between the US Navy's LEED certified and non-LEED certified comparable buildings. The dataset was compiled through the US Navy points of contact where LEED buildings were identified along with a comparable building of similar size, activity, and architectural design. The 21 building pairs, LEED certified and non-LEED certified, were then cross referenced with the US Navy's Internet Naval Facilities Assets Data Store (iNFADS) to find the acquisitions basic cost (cost of construction), the year built, building number, and building size in square feet. The ENR Construction Cost Index was then utilized to escalate the building costs to the end of year (EOY) 2010 to find the adjusted cost per square foot of both the LEED certified and its comparable building. Table 30 is provided to show the buildings being compared in this study, the acquisition basic cost, year constructed, adjusted costs to end of year (EOY) 2010, and the adjusted cost per square foot. 21 LEED certified buildings were compared against buildings either on the same installation or within the same region.

Table 27 - Adjusted Construction Cost per Square Foot; LEED Certified versus non-LEED Certified Comparable Building

	LEED Certified Building					non-LEED Certified Comparable Building				
Building Pair #	Title	Acquisition Basic Cost	Year Built	Adjusted Cost (EOY 2010 = 4883/CCI))	Adjusted Cost per SF	Title	Acquisition Basic Cost	Year Built	Adjusted Cost (EOY 2010 = 4883/CCI)	Adjusted Cost per SF
1	Reserve Training Center and Vehicle Maintenance Facility	$3,700,145	2009	$3,788,595	$361.65	Vehicle Maintenance Facility: 214-10	$1,255,314	2008	$1,306,693	$411.17
2	EOD Operations Facility, MCB, CLNC	$3,851,000	2006	$4,304,059	$279.83	EOD Building Geiger CCN: 143-24	$340,392	2001	$465,063	$153.18
3	Enlisted Dining Facility, Courthouse Bay	$11,684,202	2008	$12,162,430	$590.41	Enlisted Dining Facility CCN: 722-10	$4,345,229	1993	$7,082,027	$227.49
4	Armories II MEF at French Creek	$1,846,255	2009	$1,890,389	$278.45	Armory	$155,383	1968	$1,052,337	$116.93
5	MARSOC Dining Facility	$12,063,954	2009	$12,352,335	$591.56	EM Dining Facility CCN: 722-10	$715,913	1942	$15,746,861	$682.48
6	MP Company Operations Complex, MCB	$1,103,525	2010	$1,103,525	$313.41	Troop Emergency Housing HSG CCN: 610-73	$2,102,496	1968	$14,239,234	$429.37
7	EOD Building FC292 Addition	$2,256,375	2009	$2,310,312	$292.93	EOD Building Geiger CCN: 143-24	$340,392	2001	$478,450	$157.59
8	Child Development Center	$9,375,000	2011	$9,137,350	$266.27	Child Development Center	$1,604,924	2000	$2,214,423	$103.38
9	SOF Seal Delivery Vehicle (SDVT-2) Maintenance and Engineering Facility	$21,439,363	2009	$21,951,858	$325.21	SEAL Team TEN Building	$8,462,605	2004	$10,372,214	$151.05
10	Enlisted Dining Facility, MCAS Beaufort	$14,185,269	2009	$14,524,359	$393.98	Mess and Galley - H&S Battalion	$666,490	1941	$15,424,032	$543.58
11	Explosive Ordnance Facility	$6,736,495	2011	$6,565,730	$287.81	Aircraft Engine Shop	$2,839,905	1998	$4,089,430	$180.95
12	Atlantic Fleet Drill Hall	$13,429,336	2007	$14,621,059	$227.76	Pacific Fleet Drill Hall	$11,820,000	2002	$15,930,737	$245.41
13	Airborne Mine Countermeasures Facility	$5,000,000	2005	$5,806,183	$143.80	Aircraft Maintenance Hangar (HSC-22/C12)	$7,300,000	1998	$10,511,914	$199.81
14	Aircraft Maintenance Hangar (HM14)	$9,000,000	2006	$10,058,824	$195.82	Aircraft Maintenance Hangar (HSC-22/C12)	$7,300,000	1998	$10,511,914	$199.81
15	Child Development Center (450)	$6,320,000	2006	$7,063,529	$242.68	Child Development Center (SDA332)	$1,604,924	2000	$2,214,423	$103.38
16	Bachelor Enlisted Quarters (2075)	$11,900,000	2005	$13,818,716	$254.40	Bachelor Enlisted Quarters (R61)	$5,370,000	1984	$10,848,866	$128.67
17	Police and Security Operations	$6,600,000	2007	$7,185,686	$351.83	Police Station	$514,350	1974	$2,084,291	$83.68
18	Bachelor Enlisted Quarters (FC507)	$13,745,097	2008	$14,307,676	$157.32	Bachelor Enlisted Quarters (FC504)	$13,745,097	2008	$14,307,676	$157.32
19	NBVC Public Works Department	$490,000	2001	$669,466	$39.57	Point Magu Public Works Department	$294,316	2001	$402,111	$32.34
20	Naval Facilities Engineering Service Command	$20,651,426	2001	$28,215,141	$145.58	NAVSEA Laboratory	$8,596,805	1988	$16,157,890	$144.03
21	Memorial Golf Course Clubhouse (3750)	$6,682,897	2009	$6,842,648	$417.49	Golf Course Clubhouse (1537)	$1,246,127	2001	$1,702,529	$254.56

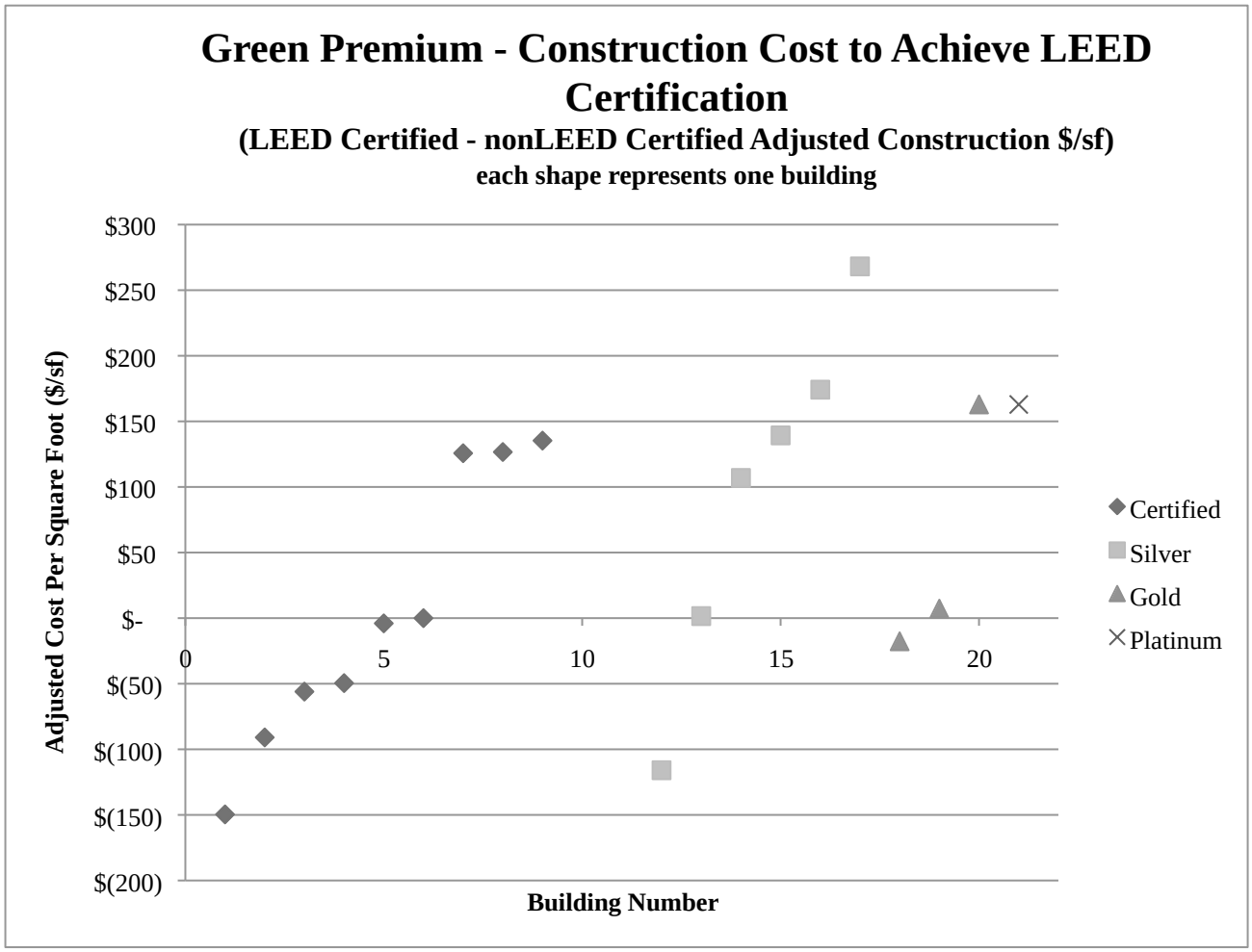

Figure 30 - Green Premium - Actual Costs of LEED Certified versus non-LEED Certified Comparable Buildings by Certification Level

Figure 30 is provided to show the cost difference per square foot between the LEED certified and its comparable building. As can be seen, there is wide range between cost savings and additional costs of the LEED building and the identified comparable building. There are nine identified buildings that show equal or less adjusted construction cost per square foot than their non-LEED certified counterpart. Over half of the buildings (11 of 21) show greater costs per square foot ranging from $106 to $363 per square foot. LEED Certified buildings performed the best with six of the nine buildings being less expensive than their non-LEED certified counterparts. LEED Silver certified buildings had the largest variance between buildings with

five of the six buildings more expensive than their non-LEED certified counterpart. Additionally, the LEED Silver certification had the two greatest cost differences between buildings at $268/sf and $174/sf. There was only a small number of LEED Gold (three) and LEED Silver (one) certified buildings in this study, so a comparison will not be made at these certification levels.

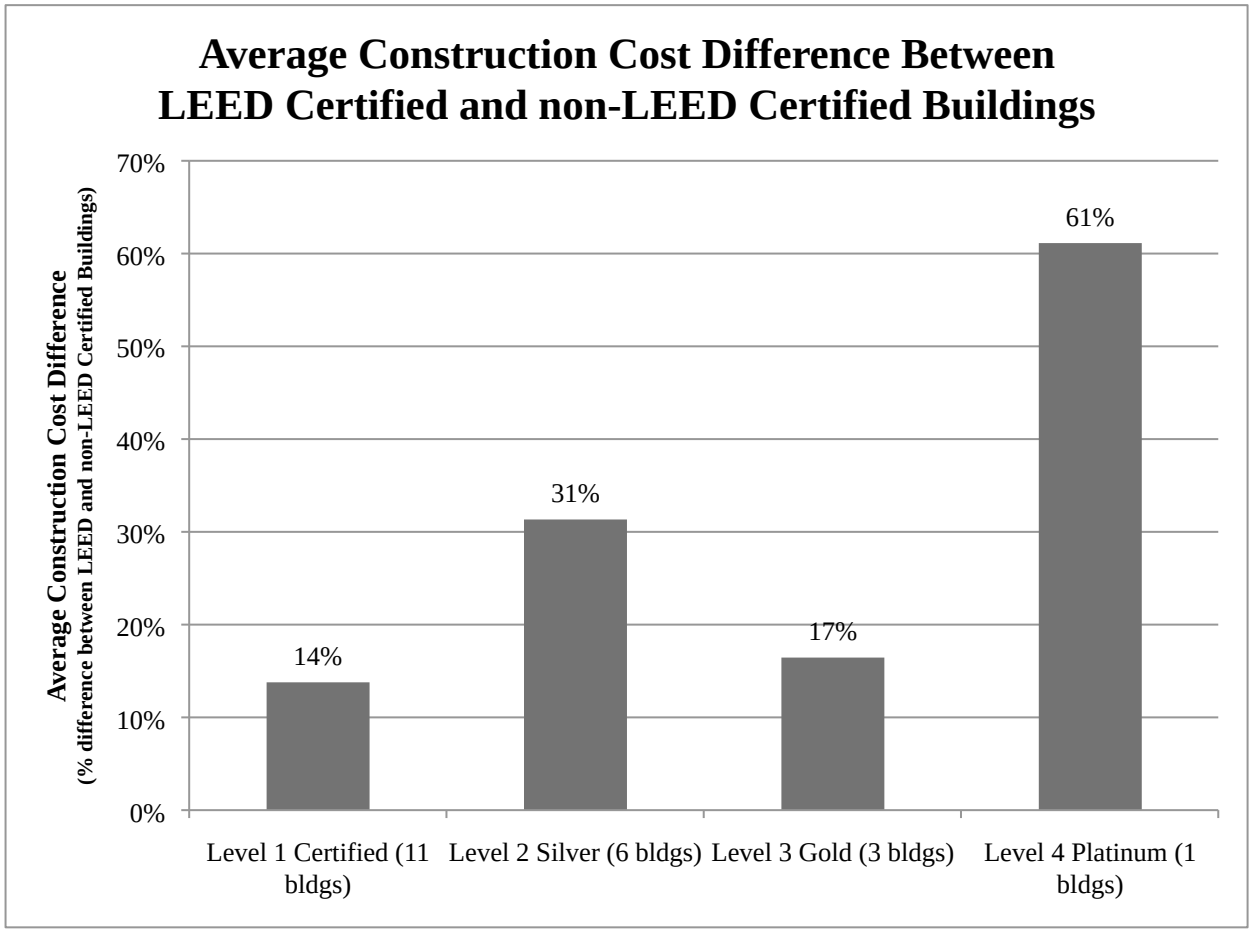

Figure 31 - Average Construction Cost Difference Between LEED Certified and non-LEED Certified Buildings

Figure 31 shows the average construction cost difference to achieve LEED certification. There were 11 LEED Certified buildings that averaged a 14 percent increase in cost and six LEED Silver certified buildings that indicated a 31 percent increase in cost. The three LEED Gold certified buildings only indicated a 17 percent increase in cost while the single LEED Platinum certified building had a 61 percent cost difference.

5.6 – Limitations of the Data

The above results must now be put into context in how they were derived from the collected construction cost, LEED certification, and energy consumption data. It was necessary to work within the limitations of the data to pull out information that satisfied the objectives of the study so it could be used by the US Navy. This section of the results will discuss the constraints and assumptions made over the course of this study, as well as explain an influential portion of the results directly leading to the results seen in section 5.

There were certain constraints of the collection data that will be discussed first. Construction cost and LEED certification data was collected for each building pair from the US Navy points of contact. The construction cost information were gathered from the successfully construction contractor's line item bid submissions. These line items only provided enough detail to price the project for bid and were not in sufficient enough detail to fully clarify all costs associated with LEED certification. For instance, the line items did not list items such as water efficient faucets and/or high efficiency lighting. Therefore, the reviewed and verified direct and interpolate construction costs may not have included all of the items contributing to LEED certification. In addition, the points of contact stated that some of the construction costs "would have been done anyway," whether LEED certified or not, and were therefore not counted as contributory costs. These statements, taken along with the inability to achieve the required detail to fully evaluate the line items, mean that the results may only indicate partial construction costs associated with LEED certification.

An additional constraint to discuss is the number of LEED certified buildings studied. The US Navy now requires LEED Silver certification on all new construction and major renovation projects. While this greatly increases the number of LEED Silver certified, there are

a limited number of LEED Gold and LEED Platinum certified buildings in the US Navy's inventory. The research results in section 5.1 reflect this information clearly; there are seven LEED Silver, zero LEED Gold, and one LEED Platinum certified buildings included in this study. While the seven LEED Silver certified buildings reported 4.80 percent of the total construction cost associated with LEED certification, the single LEED Platinum only reported 2.46 percent. These results may not accurately illustrate the true investment required to reach a certain LEED certification level. Section 5.5 illustrates this as well; 11 LEED Certified buildings averaged a 14 percent increase, six LEED Silver certified buildings indicated a 31 percent increase, three LEED Gold certified buildings indicated a 17 percent increase, and the single LEED Platinum certified building had a 61 percent construction cost difference between the LEED Certified and non-LEED certified comparable building. While there is an increase between LEED Certified and LEED Silver, the data seems to indicate a drop in price to achieve LEED Gold certification. This may not be an accurate assessment and additional LEED Gold and Platinum certified buildings are required to perform a better data comparison.

A third, and perhaps the most influential, constraint was the different data available for the buildings being studied. Not every building had construction cost and energy (electricity and water) consumption cost data available. The data collected was therefore separated into two categories; the newly LEED certified buildings with construction cost data and the 2010 UW Study dataset with electricity and water consumption data. The newly LEED certified buildings did not have energy (electricity and water) consumption data because the buildings were recently accepted by the US Navy and did not have enough time to collect usable energy consumption information. The buildings in the 2010 UW Study did not have construction cost data because the US Navy's Naval Facilities Engineering Command (NAVFAC) archives this information and the data could not be retrieve during the course of this study. This fact is important to note

because the data from the newly LEED certified buildings was extrapolated and applied to the 2010 UW Study dataset to provide the results seen in section 5.4.

In addition to the constraints of the data collection and review, assumptions were taken during the study that directly led to the results section. The first assumption was made during data collection. Great emphasis was placed on the technical expertise of the US Navy points of contact. They provided their review of the direct and interpolated construction costs associated with LEED certification and provided the comparable buildings for each LEED certified building based on their knowledge of the installation and the activities in each building. The inability to travel to each installation to review the LEED certified building's construction documentation files and personally survey each building pair required relying on the US Navy points of contact's knowledge of construction projects and their assigned installations. Another assumption that should be taken into consideration was that no locality price adjustment was performed for the building pairs. This was because the LEED certified buildings were compared against a non-LEED certified building either on the same installation or within the same region (20 miles or under).

In addition to the constraints and assumptions made during the collection and review of the data, an important portion of the results must be expounded upon. The calculation of the percentage of construction cost associated with the LEED scoring category "Energy and Atmosphere" had a direct and important impact to the results of the entire study. Three buildings (16, 17, and 18) make up the majority of the costs associated with this category and raised the percentage of total construction cost used in sections 5.3 and 5.4. Building 16 had $1,531,677 in costs related with geothermal and solar heating and cooling, building 17 included $1,938,021 in costs for a photovoltaic roof system, and building 18 had $916,158 in costs for a solar water

heating system. Without the inclusion of these buildings, the average percent per LEED point in "Energy and Atmosphere" drops from 0.28 to 0.003 percent, which would affect the entire study.

The constraints and assumptions made over the course of this study influenced the results of this study. While there these limitations were unavoidable with the quality of the data collected, they were overcome with the technical evaluation and calculations as presented throughout section 5. The constraints and assumptions impacted the conclusions and recommendations of this thesis and are presented in the following section.

Chapter 6: Conclusions and Recommendations

6.1 – Conclusions

The results of this study indicate that although some of the buildings had satisfactory results, half would not be considered economically feasible when looking at either the total cost of construction or the costs associated with the LEED category "Energy and Atmosphere." Furthermore, neither the level of LEED certification nor the amount of points earned in the "Energy and Atmosphere" category correlate to successfully meeting EO 13423's mandate to reduce electricity consumption costs by 30% or water consumption costs by 16% by 2015.

Table 28 is provided below to illustrate the SPB of the 2010 UW study LEED certified and comparable buildings. The SPB calculation is being used in this study to provide a quick determination at the economic feasibility of the investment. With that premise in mind, the data in Table 28 indicates six of the buildings would be considered economically possible when looking at the total cost of construction, but only four buildings that would be considered economically feasible if looking at the construction costs associated with "Energy and Atmosphere".

Table 28 - LEED Certified versus non-LEED Certified Comparable Building; Simple Payback

LEED Certified Building	non-LEED Certified Comparable Building	Simple Payback	
Title	Title	Total Adjusted Construction Cost (years)	Costs Associated with Energy and Atmosphere (years)
Atlantic Fleet Drill Hall	Pacific Fleet Drill Hall	*	91.9
Airborne Mine Countermeasures Facility	Aircraft Maintenance Hangar (HSC-22/C12)	*	0.6
Aircraft Maintenance Hangar (HM14)	Aircraft Maintenance Hangar (HSC-22/C12)	*	37.5
Child Development Center (450)	Child Development Center (SDA332)	206.9	6.2
Bachelor Enlisted Quarters (2075)	Bachelor Enlisted Quarters (R61)	**	**
Police and Security Operations	Police Station	1,964.2	32.7
Bachelor Enlisted Quarters (FC507)	Bachelor Enlisted Quarters (FC504)	0.0	**
NBVC Public Works Department	Point Magu Public Works Department	10.4	1.6
Naval Facilities Engineering Service Command	NAVSEA Laboratory	2.2	4.7
Memorial Golf Course Clubhouse (3750)	Golf Course Clubhouse (1537)	**	**

* - LEED certified building had lower construction cost, so simple payback for the Total Adjusted Construction Cost was not required.

** - LEED certified building had higher electricity and water consumption costs, so the building would never be able to pay back an additional investment.

Further analysis of the data indicates that four of the building pairs did not require a SPB for the total adjusted costs as they were calculated to be either equal or less expensive than their non-LEED certified comparable building. Two additional LEED certified buildings could not have a SPB calculated because their electricity and water consumption costs were higher and would therefore never be able to offset the additional cost of construction. Of the four building pairs able to have a SPB calculated for the total cost, the Oceana Child Development Center (CDC) and Police and Security Operations (PSO) buildings are determined to not be economically feasible due to the long duration to payback the costs; 206.9 and 1,964.2 years

respectfully. This long payback duration is due to the relative cost difference versus energy savings; the Oceana CDC was two times and the PSO building was over four times as expensive per square foot to construct. Only the NBVC Public Works Department (PWD) and the Naval Facilities Engineering Service Command (NFESC) were determined to be economically feasible with SPB calculated to be 10.4 and 2.2 years respectfully.

The results of the SPB analysis for costs associated with the "Energy and Atmosphere" category indicate that only four of the ten buildings were economically feasible. Three of the building that failed, the Bachelor Enlisted Quarters (2075), Bachelor Enlisted Quarters (FC507), and Memorial Golf Course Clubhouse (3750), had higher electricity and water consumption costs than their comparable building and therefore could never payback the addition costs. The Atlantic Fleet Drill Hall, Aircraft Maintenance Hangar (HM14), and PSO were determined to not be economically feasible because of the long payback period. This is attributed to the low electricity and water consumption savings per square foot of each building; 7, 4, and 14 cents per square foot respectfully.

There does not appear to be a direct correlation between LEED points earned in the "Energy and Atmosphere" category (Table 28) and the building's ability to economically payback the additional costs associated with the certification. For example, the Atlantic Fleet Drill Hall earned 11 points and the NFESC building earned 14 points in this category. While the Drill Hall had an over 90 year SPB, the NFESC building needed less than five years, although the NFESC building was larger and more expensive to construct.

Table 29 - LEED Certified Building; Certification Level, Total Points, Energy and Atmosphere Points

Title	LEED Certification	Total LEED Points	LEED Points in the Energy and Atmosphere Category	Simple Payback for Construction Costs Associated with Energy and Atmosphere (years)
Atlantic Fleet Drill Hall	Gold	41	11	91.9
Airborne Mine Countermeasures Facility	Certified	28	3	0.6
Aircraft Maintenance Hangar (HM14)	Certified	28	3	37.5
Child Development Center (450)	Silver	34	7	6.2
Bachelor Enlisted Quarters (2075)	Certified	29	1	**
Police and Security Operations	Silver	34	2	32.7
Bachelor Enlisted Quarters (FC507)	Certified	27	5	**
NBVC Public Works Department	Gold	40	7	1.6
Naval Facilities Engineering Service Command	Silver	41	14	4.7
Memorial Golf Course Clubhouse (3750)	Gold	39	11	**

** - LEED certified building had higher electricity and water consumption costs, so the building would never be able to pay back the additional construction costs.

In addition to the SPB, it can be determined that LEED certification alone does not guarantee meeting EO 13423 mandate to reduce consumption costs of electricity by 30 percent and water by 16 percent. Table 29 illustrates the percentage reduction achieved by the LEED certified buildings that are part of this study. A third of the LEED certified buildings in the dataset had more expensive utility costs than their non-LEED certified counterpart. Additionally, over half of the LEED certified buildings either failed or partially met EO 13423's mandated electricity and water consumption reductions. In fact, only two buildings, the

Airborne Mine Countermeasures Facility and NFESC buildings, were able to fully meet the mandate.

Table 30 - LEED Certified Performance Against EO 13423 Mandate

LEED Certified Building	EO 13432 Mandate	
Title	Electricity Consumption Cost Reduction (30% mandated)	Water Consumption Cost Reduction (16% mandated)
Atlantic Fleet Drill Hall	8.36%	63.28%
Airborne Mine Countermeasures Facility	60.12%	91.16%
Aircraft Maintenance Hangar (HM14)	7.41%	-21.52%
Child Development Center (450)	8.84%	60.59%
Bachelor Enlisted Quarters (2075)	-77.75%	n/a
Police and Security Operations	3.78%	22.22%
Bachelor Enlisted Quarters (FC507)	-9.68%	n/a
NBVC Public Works Department	15.12%	57.20%
Naval Facilities Engineering Service Command	51.21%	58.14%
Memorial Golf Course Clubhouse (3750)	-189.00%	-154.83%

As seen above, neither the level of LEED certification nor the amount of points earned in the “Energy and Atmosphere” category correlate to successfully meeting the mandated cost reductions in energy consumption. The Atlantic Fleet Drill Hall illustrates this point exactly; the building earned LEED Gold certification, scored 11 points in “Energy and Atmosphere”, and showed energy reductions against the comparable non-LEED certified building, yet it failed to meet EO 13423 electricity cost reductions by only reducing costs by 8.36 percent. While this

building did not meet the mandated 30 percent reduction, the Airborne Mine Countermeasures Facility was able to fully meet the electricity and water consumption reductions while only earning three points in the “Energy and Atmosphere” category.

6.2 – Recommendations

During the course of this study it became clear that there is a lack of data on the construction costs associated with LEED certification. Additionally, no energy modeling of the constructed buildings appears to be either required or provided by the designer and contractor. Performance cannot be improved without first observing, measuring, and tracking what is happening in the field. In order to improve the performance of the LEED certified buildings the following needs to measured: (1) A line item comparison of construction costs to reach LEED certification versus what has been installed in other buildings; (2) A comprehensive database of actual costs of construction for each LEED certification category; (3) A comparison of the design energy model versus post construction energy consumption.

What could be seen during the data collection phase of this study was the lack of information regarding the materials installed and their relation to the costs necessary to reach LEED certification. This can be attributed to the manner in which the US Navy’s construction agency, Naval Facilities Engineering Command (NAVFAC), requires project documentation prior to and during construction; NAVFAC requires a schedule of pricing to measure construction progress and work in place, but does not require the granularity necessary to perform a detailed assessment. Material costs to reach LEED certification are essential so that they may be compared to the materials installed in other buildings. By properly tracking these costs, trends can be mapped and compared against energy consumption data so that successful products can be identified. This information can then be used across the US Navy to ensure

future construction and renovations projects benefit from proven technologies and design innovations.

Another gap in the data collection phase of this study includes the lack of actual construction cost information for both LEED certification and for each LEED scoring category. This can again be attributed to the lack of detail that is part of the contractually required schedule of prices. While the intent should not be to inundate the construction management team with too much detail, there should be enough information provided by the designer and contractor to adequately indicate what construction costs are associated with LEED certification. This information is important to NAVFAC and the US Navy because it can be used to track where best to invest funding to achieve energy savings.

The third gap seen in the data collection is the lack of energy modeling data. Energy performance cannot be truly measured and compared against another building (as each construction project is unique), but it can be measured against itself. Neither NAVFAC nor the USGBC require certified buildings provide building energy modeling as part of the construction and LEED certification process. Policy and practice must be changed to require designers and contractors to perform energy model of future LEED certified projects so that it can be used as a basis to measure the actual energy performance of the building later on. Once again, the information taken from these comparisons can be used across the organization to track best practices, make improvements to future building design, and improve the manner in which building energy usage is modeled and tracked.

Information gaps seen during the course of this research included a lack of material data, actual construction cost to achieve LEED certification, and modeling data. NAVFAC can greatly improve the effectiveness of their policy in requiring LEED Silver certification by

closing these gaps through policy and practice. NAVFAC is a large organization made up of ten Field Engineering Commands (FEC) spread across the world. They have the capability and engineering management capacity to enact policies and procedures to truly affect change. An example of a process NAVFAC could initiate is Lean and the Lean Project Delivery System. The Lean management principle is maximizing customer value while minimizing waste (Lean Construction Institute, 2011). Performance must be observed, measured, and tracked in order to affect change and enact Lean. Following the Lean procedure of Plan, Do, Check, Act, NAVFAC can implement potential policy changes on a trial basis at any of their ten FECs, track the effectiveness, make improvements, and then implement across the rest of the organization once the process has been standardized.

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Appendix A – Building Utility Information

Table 31 - Building Utility Information (Mangasarian 2010)

Region	Building Number	LEED Buildings	LEED Rating	Base	Square Footage	Utilities			
						MWH	KGal	KCF	MBtu
Midwest	7230	Atlantic Fleet Drill Hall	Gold	Naval Station Great Lakes, IL	58,000	533.44	144.3		5908
Mid-Atlantic	450	Child Development Center	Silver	Naval Air Station Oceana, VA	29,000	489.99	812.1		
Mid-Atlantic	SP37	Airborne Mine Countermeasures Facility	Certified	Naval Station, Norfolk, VA	40,376	513.7	148	2575	
Mid-Atlantic	SP36	Aircraft Maintenance Hangar (HM14)	Certified	Naval Station, Norfolk, VA	28,379	838.2	1430	1984.2	
Mid-Atlantic	2075	Bachelor Enlisted Quarters	Certified	Naval Weapons Station, Yorktown, VA	48,700	770.8	1665	1261.6	
Mid-Atlantic	3016	Personnel Support Facility	Silver	Naval Amphibious Base Little Creek (NABLC), VA	37,800	737.9	189		17
Mid-Atlantic	3537	Police and Special Operations Facility	Silver	Naval Amphibious Base Little Creek (NABLC), VA	25,000	559.7	523		
Mid-Atlantic	FC507	Marine Corps Bachelor Enlisted Quarters	Certified	MCB Camp Lejeune, Jacksonville, NC	90,948	639.2			
Mid-Atlantic	SR72	Reserve Training Center & Vehicle Maintenance Facility	Silver	MCB Camp Lejeune, Jacksonville, NC	12,000	202.32			
Southwest	850	NBVC Public Works Department	Gold	Naval Base Ventura County, Port Hueneme, CA	16,443	144.9	679.9		
Southwest	1100	Naval Facilities Engineering Service Command	Silver	Naval Base Ventura County, Port Hueneme, CA	192,028	1288.5	432.7		
Southwest		Child Development Center	Silver	Marine Corps Air Station (MCAS) Miramar, CA	17,500				
Southwest	3750	Memorial Golf Course Clubhouse	Gold	Marine Corps Air Station (MCAS) Miramar, CA	13,437	487.4	474.9	1345.3	
		Commercial Buildings							
Midwest	7210	Pacific Fleet Drill Hall		Naval Station Great Lakes, IL	58,000	582.12	393		3209
Southwest	1487	Child Development Center		Naval Base Ventura County, Port Hueneme, CA	11,520	64.8	1485		
Southwest	1537	NBVC Golf Course Clubhouse		Naval Base Ventura County, Port Hueneme, CA	11,760	147.6	163.1		
Southwest	66	PWD Point Magu		Naval Base Ventura County, Port Hueneme, CA	12,435	129.1	1201.3		
Southwest	475	Warehouse		Naval Base Ventura County, Port Hueneme, CA	103,826	254.6	133.9		
Southwest	1387	NAVSEA Lab		Naval Base Ventura County, Port Hueneme, CA	112,184	1542.9	603.9		
Southwest	4472	Officer's Club		Marine Corps Air Station (MCAS) Miramar, CA	23,514	763.3	331	3268.8	
Mid-Atlantic	LP33	Aircraft Maintenance Hangar (HSC-22/C12)		Naval Station, Norfolk, VA	23,297	743.2	966	1401.8	
Mid-Atlantic	SDA332	Child Development Center		Naval Station, Norfolk, VA	21,420	397	1522	1182.1	
Mid-Atlantic	CEP161	Police Station		Naval Station, Norfolk, VA	24,909	579.6	670	587.7	
Mid-Atlantic	CA290	Moral, Welfare, and Recreation Facility		Naval Station, Norfolk, VA	2,520	21.6	18	531.9	
Mid-Atlantic	R61	Bachelor Enlisted Quarters		Naval Station, Norfolk, VA	101,837	906.8			2205

Appendix B – LEED Project Descriptions

Atlantic Fleet Drill Hall

The Atlantic Fleet Drill Hall at Recruit Training Command, which is part of Naval Station Great Lakes, is a multi-functional space utilized for training the United States Navy recruits. The building space allows for classroom training, recruit drilling, administration offices, and most importantly, recruit graduation ceremonies. As part of the ten year plan to completely renovate the Navy's only Recruit Training Command, the $13M design-build project, which is the first LEED building for Naval Station Great Lakes, is an exact architectural duplicate to its counter-part, which was completed two years earlier.

Figure 32 – Atlantic Fleet Drill Hall

Though the project was completed in 2007, it did not achieve its LEED Gold certification until 2009. To accomplish the goal of achieving a LEED Gold certification, according to the design team, they utilized the information gathered from the recently completed Pacific Fleet Drill Hall to enhance energy efficiency and performance. Also included in this project was a five-year maintenance plan, which was to be accomplished by the contractor.

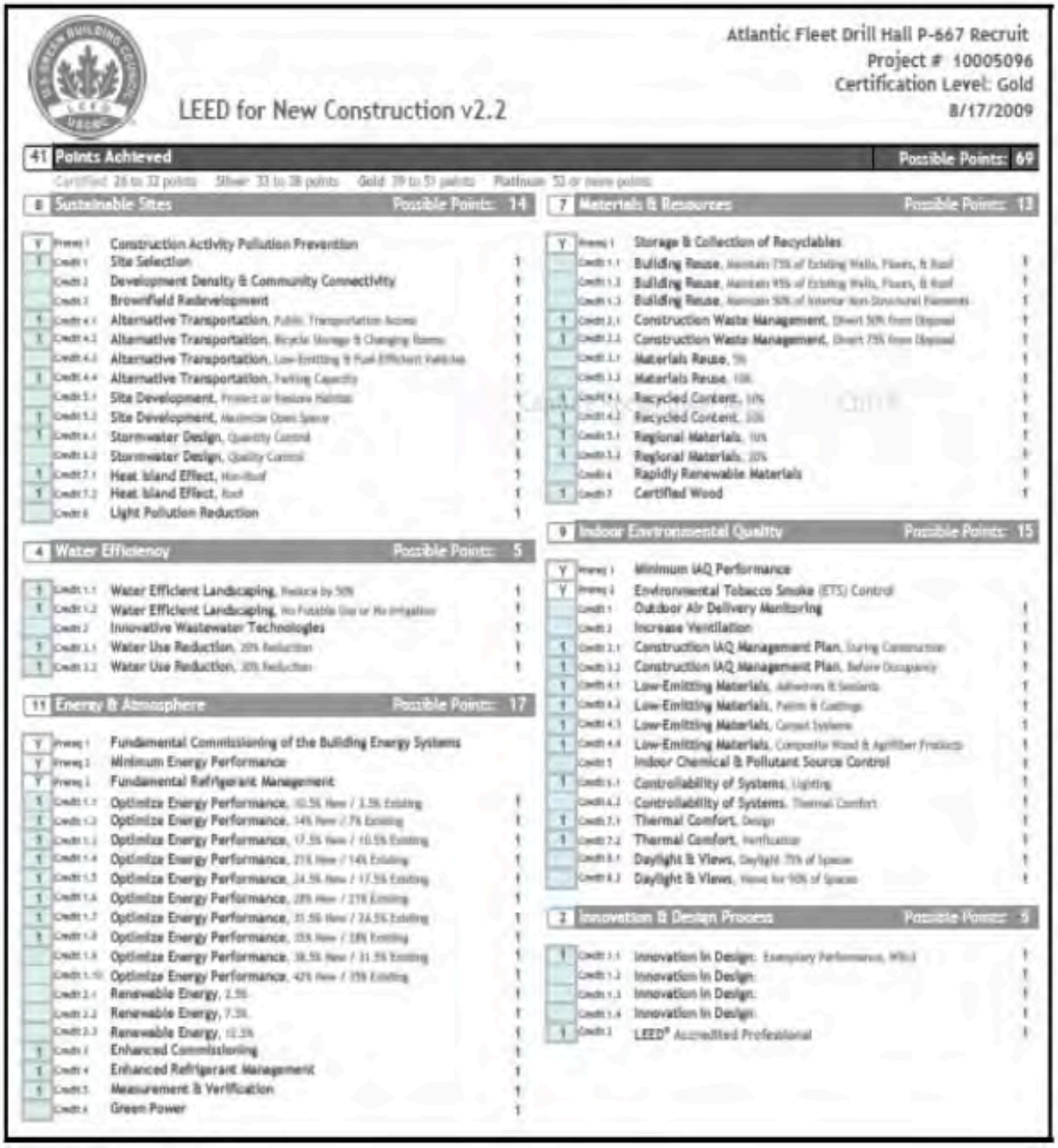
The project team also focused on using local materials and resources and helped to support businesses in the area, selecting a small, minority-owned business for the construction of the building. They also maximized the value of the spaces by making the building multi-functional, allowing for variable occupancy, and maximizing the day-lighting throughout the building. This was accomplished by installing the controls that would adjust the artificial light based on the amount of day light available.

As part of their efforts to achieve LEED Gold, the group incorporated many unique design competencies as compared to the buildings counterpart built just two years earlier. In the area of heating and cooling of the building as compared to its architectural counterpart, they minimized heating and cooling loads by insulating thermal breaks, and preventing thermal bridging into the perimeter of the grade-level floor slabs. The designers also installed a building automation system to ensure maximum efficiency for the variable speed HVAC drives. For materials, the team utilized recycled content, local resources, and tried to maximize efficiency to accommodate all of the necessary needs for LEED Gold.

In looking at the design for the landscape, the team addressed the environmental concerns by incorporating an underground water storage system and a retention pond for stormwater management, which exceeded the expectations for the LEED Gold certification.

The construction team also utilized stock-piled existing topsoil for the future planting areas and beautification.

As a comparison for modeling this building, I chose the Pacific Fleet Drill Hall at the same location. The Pacific Fleet Drill Hall is a duplicate in size, utilization, and location.



LEED for New Construction v2.2

Atlantic Fleet Drill Hall P-667 Recruit
Project # 10005096
Certification Level: Gold
8/17/2009

41 Points Achieved — Possible Points: 69

Certified 26 to 32 points; Silver 33 to 38 points; Gold 39 to 51 points; Platinum 52 or more points

8 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Construction Activity Pollution Prevention	
1	Credit 1	Site Selection	1
	Credit 2	Development Density & Community Connectivity	1
	Credit 3	Brownfield Redevelopment	1
1	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	1
1	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Site Development, Protect or Restore Habitat	1
1	Credit 5.2	Site Development, Maximize Open Space	1
1	Credit 6.1	Stormwater Design, Quantity Control	1
	Credit 6.2	Stormwater Design, Quality Control	1
1	Credit 7.1	Heat Island Effect, Non-Roof	1
1	Credit 7.2	Heat Island Effect, Roof	1
	Credit 8	Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

11 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Commissioning of the Building Energy Systems	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	Fundamental Refrigerant Management	
1	Credit 1.1	Optimize Energy Performance, 10.5% New / 3.5% Existing	1
1	Credit 1.2	Optimize Energy Performance, 14% New / 7% Existing	1
1	Credit 1.3	Optimize Energy Performance, 17.5% New / 10.5% Existing	1
1	Credit 1.4	Optimize Energy Performance, 21% New / 14% Existing	1
1	Credit 1.5	Optimize Energy Performance, 24.5% New / 17.5% Existing	1
1	Credit 1.6	Optimize Energy Performance, 28% New / 21% Existing	1
1	Credit 1.7	Optimize Energy Performance, 31.5% New / 24.5% Existing	1
1	Credit 1.8	Optimize Energy Performance, 35% New / 28% Existing	1
	Credit 1.9	Optimize Energy Performance, 38.5% New / 31.5% Existing	1
	Credit 1.10	Optimize Energy Performance, 42% New / 35% Existing	1
	Credit 2.1	Renewable Energy, 2.5%	1
	Credit 2.2	Renewable Energy, 7.5%	1
	Credit 2.3	Renewable Energy, 12.5%	1
1	Credit 3	Enhanced Commissioning	1
1	Credit 4	Enhanced Refrigerant Management	1
1	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

7 Materials & Resources — Possible Points: 13

Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors, & Roof	1
	Credit 1.2	Building Reuse, Maintain 95% of Existing Walls, Floors, & Roof	1
	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1
1	Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1
	Credit 3.1	Materials Reuse, 5%	1
	Credit 3.2	Materials Reuse, 10%	1
1	Credit 4.1	Recycled Content, 10%	1
1	Credit 4.2	Recycled Content, 20%	1
1	Credit 5.1	Regional Materials, 10%	1
1	Credit 5.2	Regional Materials, 20%	1
	Credit 6	Rapidly Renewable Materials	1
1	Credit 7	Certified Wood	1

9 Indoor Environmental Quality — Possible Points: 15

Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 2	Increase Ventilation	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
1	Credit 4.3	Low-Emitting Materials, Carpet Systems	1
1	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Lighting	1
	Credit 6.2	Controllability of Systems, Thermal Comfort	1
1	Credit 7.1	Thermal Comfort, Design	1
1	Credit 7.2	Thermal Comfort, Verification	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

2 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design: Exemplary Performance, Wbl-1	1
	Credit 1.2	Innovation in Design	1
	Credit 1.3	Innovation in Design	1
	Credit 1.4	Innovation in Design	1
1	Credit 2	LEED® Accredited Professional	1

Figure 33 – Atlantic Fleet Drill Hall LEED Checklist

Yorktown Bachelor Enlisted Quarters

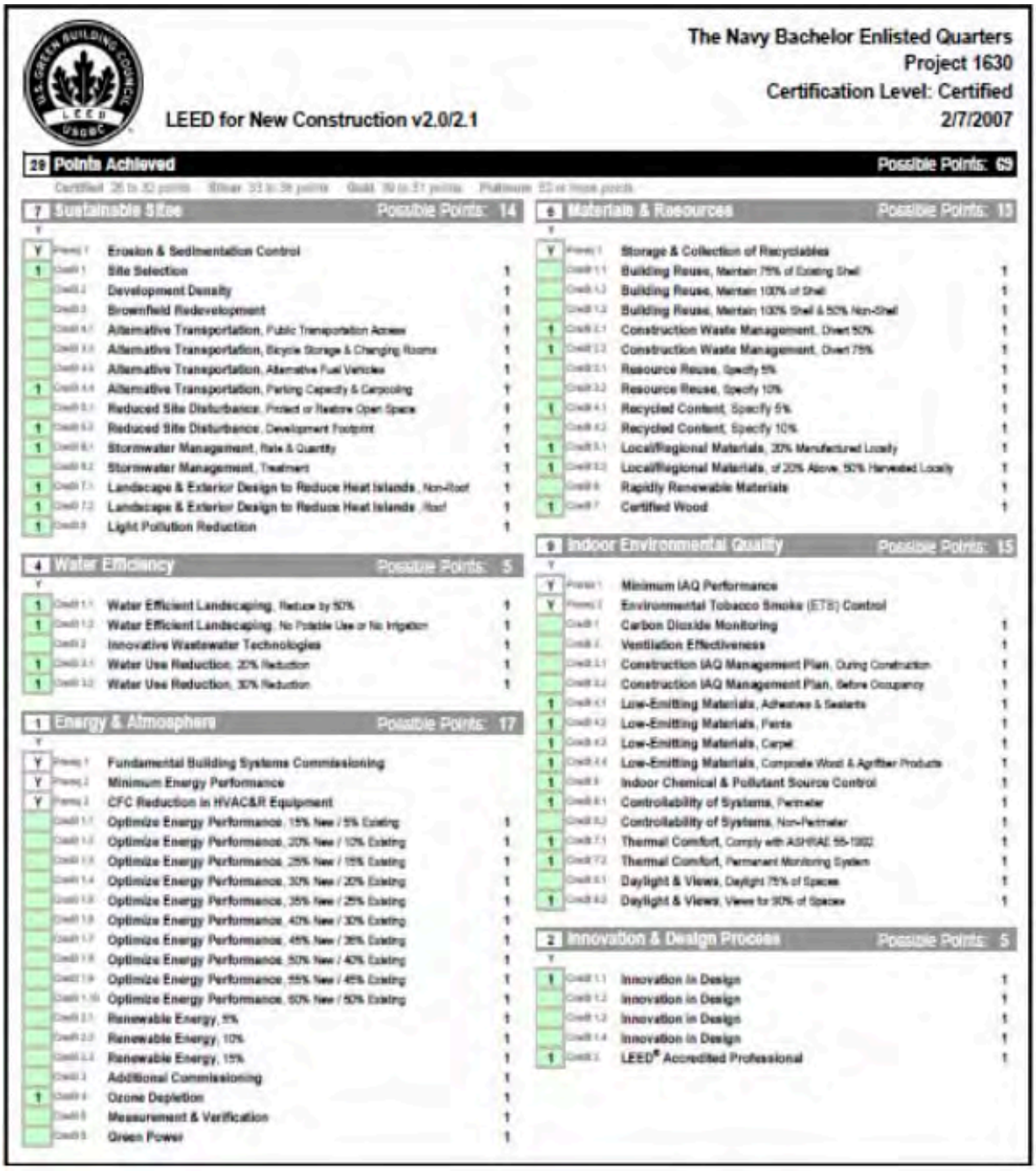
Figure 34 – Yorktown Bachelor Enlisted

The $11.5M Bachelor Enlisted Quarters built on Naval Weapons Station Yorktown in Virginia was constructed by the Hensel Phelps Construction Company. The building was built on the same location as a previous housing unit and provides housing for local sailors, stationed at Yorktown, VA. The footprint for the new building, as compared to its predecessor, only utilized 10% of the total available space.

To also achieve the Certified LEED certification, the project team covered the landscape surrounding the disturbed area outside of the new building with native grasses. This limited the need for additional irrigation and helped to control the stormwater runoff and erosion for the area. Since this building is a housing unit for multiple personnel, the design allowed for each occupant to have individual controls for lighting, heating and air conditioning. They also installed sensors that would shut off the systems, when personnel are not present. To complement this system and also assist with the LEED certification, the design team utilized non-ozone depleting refrigerants for the building's conditioning systems. Also assisting in gaining the LEED certification, the team used interior finishes with low levels of volatile organic compounds. One of the largest contributors to the LEED certification was diverting more than 90% of the construction waste to recycling.

As one of the first of the United States Navy's housing units to receive a LEED certification in 2007, the team utilized many of the same techniques seen in many commercial buildings to reduce energy costs. Low flow toilet fixtures, stormwater management, and lighting controls throughout the facility are but a few of the items that helped to contribute to the building's reduced energy footprint.

As a comparison for modeling this building, I was provided data from Naval Station Norfolk, VA on another Bachelor Enlisted Quarters. Though the Bachelor Enlisted Quarters (Building R61) at Naval Station Norfolk is larger than its LEED counterpart at Naval Station Yorktown, it is located within the same region and has the same comparable use on a square footage basis.



The Navy Bachelor Enlisted Quarters
Project 1630
Certification Level: Certified
2/7/2007

LEED for New Construction v2.0/2.1

29 Points Achieved — Possible Points: 69

Certified 26 to 32 points; Silver 33 to 38 points; Gold 39 to 51 points; Platinum 52 or more points

7 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
	Credit 2	Development Density	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Vehicles	1
1	Credit 4.4	Alternative Transportation, Parking Capacity & Carpooling	1
	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1	Credit 6.1	Stormwater Management, Rate & Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
1	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Credit 8	Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

1 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
	Credit 1.1	Optimize Energy Performance, 15% New / 5% Existing	1
	Credit 1.2	Optimize Energy Performance, 20% New / 10% Existing	1
	Credit 1.3	Optimize Energy Performance, 25% New / 15% Existing	1
	Credit 1.4	Optimize Energy Performance, 30% New / 20% Existing	1
	Credit 1.5	Optimize Energy Performance, 35% New / 25% Existing	1
	Credit 1.6	Optimize Energy Performance, 40% New / 30% Existing	1
	Credit 1.7	Optimize Energy Performance, 45% New / 35% Existing	1
	Credit 1.8	Optimize Energy Performance, 50% New / 40% Existing	1
	Credit 1.9	Optimize Energy Performance, 55% New / 45% Existing	1
	Credit 1.10	Optimize Energy Performance, 60% New / 50% Existing	1
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 15%	1
	Credit 3	Additional Commissioning	1
1	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

6 Materials & Resources — Possible Points: 13

Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content, Specify 5%	1
	Credit 4.2	Recycled Content, Specify 10%	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
1	Credit 7	Certified Wood	1

9 Indoor Environmental Quality — Possible Points: 15

Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 1	Carbon Dioxide Monitoring	1
	Credit 2	Ventilation Effectiveness	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
1	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Perimeter	1
	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

2 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design	1
	Credit 1.2	Innovation in Design	1
	Credit 1.3	Innovation in Design	1
	Credit 1.4	Innovation in Design	1
1	Credit 2	LEED® Accredited Professional	1

Figure 35 – Yorktown Bachelor Enlisted Quarters LEED Checklist

Port Hueneme Public Works Department (Building 850)

Figure 36 – Port Hueneme Public Works

The Public Works Department building in Port Hueneme, CA, completed in 2001, is labeled as the "energy showcase centerpiece" of sustainability in the United States Navy's Southwestern Region. The 17,000 square-foot facility, which achieved a LEED Gold certification, was designed utilizing 41% new construction on the same grounds, with the remaining 59% accomplished as renovation. One of the most interesting parts of this project lies in the parking area. The design team incorporated accommodations for five electric charging stations for fleet vehicles, and only created a parking area that would accommodate 73% of the building's capacity.

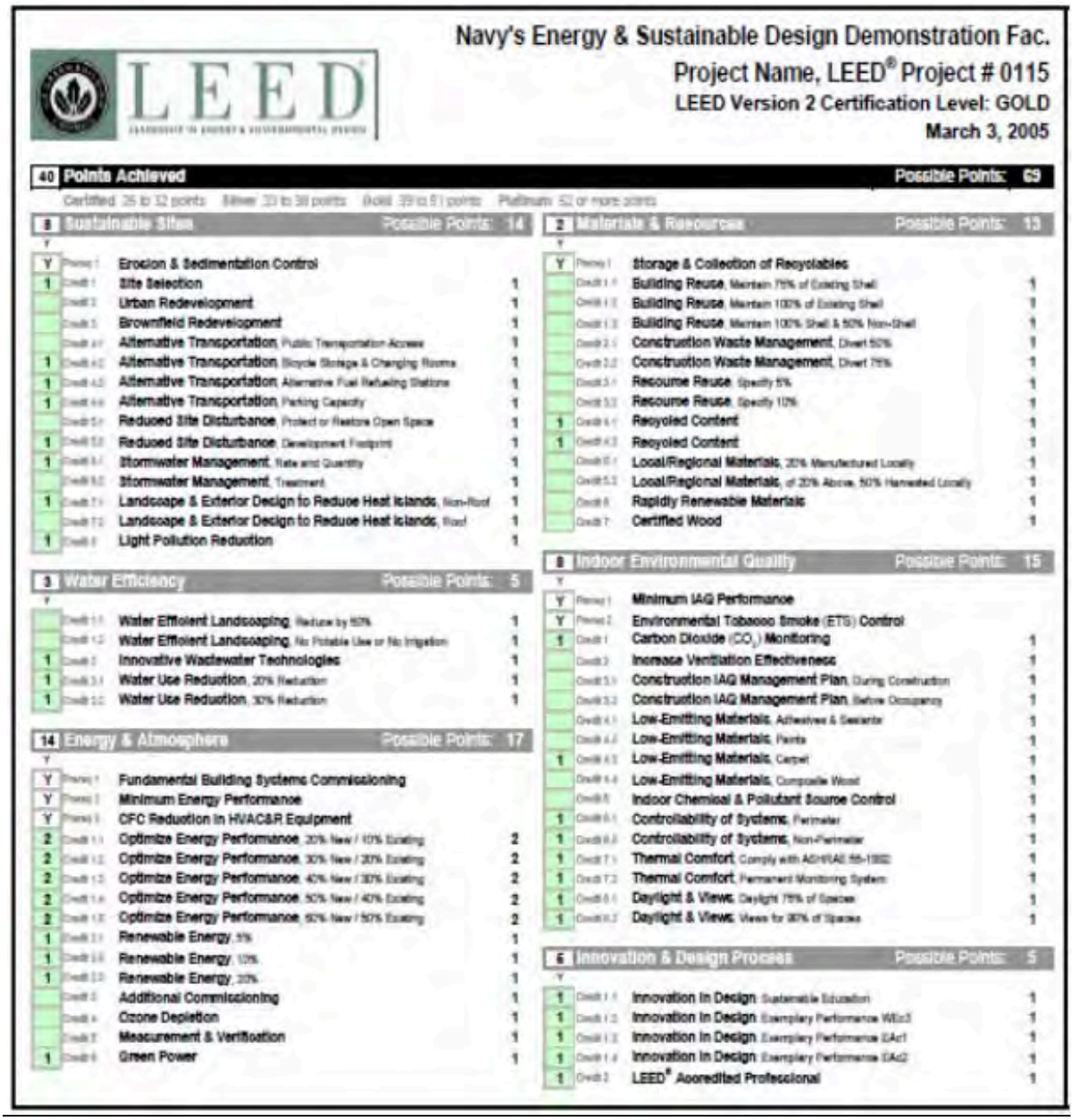
The team engaged in a series of meetings to establish goals and strategies, and conducted an iterative design process. Models of daylighting, energy use and air quality were used to analyze the impact of alternative designs and equipment. Partnerships were formed with research organizations such as California Polytechnic Institute at Pomona and the Lawrence Berkeley Laboratory to conduct detailed analyses of building systems and materials. The results of these analyses were then folded back into the design process until an optimal set of strategies was determined.

Located in the mild climate of southern California, the Public Works Department building was designed to make use of passive systems, which have been integrated into all of the functioning systems within the building. The design team hoped to achieve maximum energy efficiency and indoor environmental quality for the occupants. The team also hoped to test and validate new sustainable features that could one-day be replicated in other Navy buildings worldwide. The last goal for this project was to utilize this opportunity as a teaching tool for other Navy projects.

To address water efficiency on the site, the team addressed multiple areas to accomplish their goal. All non-native plants were removed, stormwater run-off is collected and reused in the building, and porous paving was used in the parking area to allow for groundwater recharge and stormwater runoff reduction. The team additionally designed the building to collect stormwater from the roof, which is reutilized for the toilet flushing throughout the building. Lastly they added an integrated control system to limit watering the exterior plants during rainy weather.

With the number of sustainable technologies introduced to this project, the team completed the effort with a strong internal recycling program. This compliment to the other features like natural ventilation and an enhanced day-lighting design, complete the link to the "Navy's showcase centerpiece".

As a comparison model for the Public Works Department on Naval Base Ventura County, I was able to receive comparable data for the Public Works Department building at Point Magu. The Public Works Department building at Point Magu is comparable in size, utilization, and regional area.



Navy's Energy & Sustainable Design Demonstration Fac.
Project Name, LEED® Project # 0115
LEED Version 2 Certification Level: GOLD
March 3, 2005

40 Points Achieved — Possible Points: 69

Certified: 26 to 32 points; Silver: 33 to 38 points; Gold: 39 to 51 points; Platinum: 52 or more points

8 Sustainable Sites — Possible Points: 14

Y	Erosion & Sedimentation Control	
1	Site Selection	1
	Urban Redevelopment	1
	Brownfield Redevelopment	1
	Alternative Transportation, Public Transportation Access	1
1	Alternative Transportation, Bicycle Storage & Changing Rooms	1
1	Alternative Transportation, Alternative Fuel Refueling Stations	1
1	Alternative Transportation, Parking Capacity	1
	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Reduced Site Disturbance, Development Footprint	1
1	Stormwater Management, Rate and Quantity	1
	Stormwater Management, Treatment	1
1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Light Pollution Reduction	1

3 Water Efficiency — Possible Points: 5

	Water Efficient Landscaping, Reduce by 50%	1
	Water Efficient Landscaping, No Potable Use or No Irrigation	1
1	Innovative Wastewater Technologies	1
1	Water Use Reduction, 20% Reduction	1
1	Water Use Reduction, 30% Reduction	1

14 Energy & Atmosphere — Possible Points: 17

Y	Fundamental Building Systems Commissioning	
Y	Minimum Energy Performance	
Y	CFC Reduction in HVAC&R Equipment	
2	Optimize Energy Performance, 20% New / 10% Existing	2
2	Optimize Energy Performance, 30% New / 20% Existing	2
2	Optimize Energy Performance, 40% New / 30% Existing	2
2	Optimize Energy Performance, 50% New / 40% Existing	2
2	Optimize Energy Performance, 60% New / 50% Existing	2
1	Renewable Energy, 5%	1
1	Renewable Energy, 10%	1
1	Renewable Energy, 20%	1
	Additional Commissioning	1
	Ozone Depletion	1
	Measurement & Verification	1
1	Green Power	1

2 Materials & Resources — Possible Points: 13

Y	Storage & Collection of Recyclables	
	Building Reuse, Maintain 75% of Existing Shell	1
	Building Reuse, Maintain 100% of Existing Shell	1
	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
	Construction Waste Management, Divert 50%	1
	Construction Waste Management, Divert 75%	1
	Resource Reuse, Specify 5%	1
	Resource Reuse, Specify 10%	1
1	Recycled Content	1
1	Recycled Content	1
	Local/Regional Materials, 20% Manufactured Locally	1
	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Rapidly Renewable Materials	1
	Certified Wood	1

8 Indoor Environmental Quality — Possible Points: 15

Y	Minimum IAQ Performance	
Y	Environmental Tobacco Smoke (ETS) Control	
1	Carbon Dioxide (CO_2) Monitoring	1
	Increase Ventilation Effectiveness	1
	Construction IAQ Management Plan, During Construction	1
	Construction IAQ Management Plan, Before Occupancy	1
	Low-Emitting Materials, Adhesives & Sealants	1
	Low-Emitting Materials, Paints	1
1	Low-Emitting Materials, Carpet	1
	Low-Emitting Materials, Composite Wood	1
	Indoor Chemical & Pollutant Source Control	1
1	Controllability of Systems, Perimeter	1
1	Controllability of Systems, Non-Perimeter	1
1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Thermal Comfort, Permanent Monitoring System	1
1	Daylight & Views, Daylight 75% of Spaces	1
1	Daylight & Views, Views for 90% of Spaces	1

5 Innovation & Design Process — Possible Points: 5

1	Innovation in Design, Sustainable Education	1
1	Innovation in Design, Exemplary Performance WEc3	1
1	Innovation in Design, Exemplary Performance EAc1	1
1	Innovation in Design, Exemplary Performance EAc2	1
1	LEED® Accredited Professional	1

Figure 37 – Port Hueneme Public Works Department LEED Checklist

Virginia Beach Personnel Support Facility

Figure 38 – Personnel Support

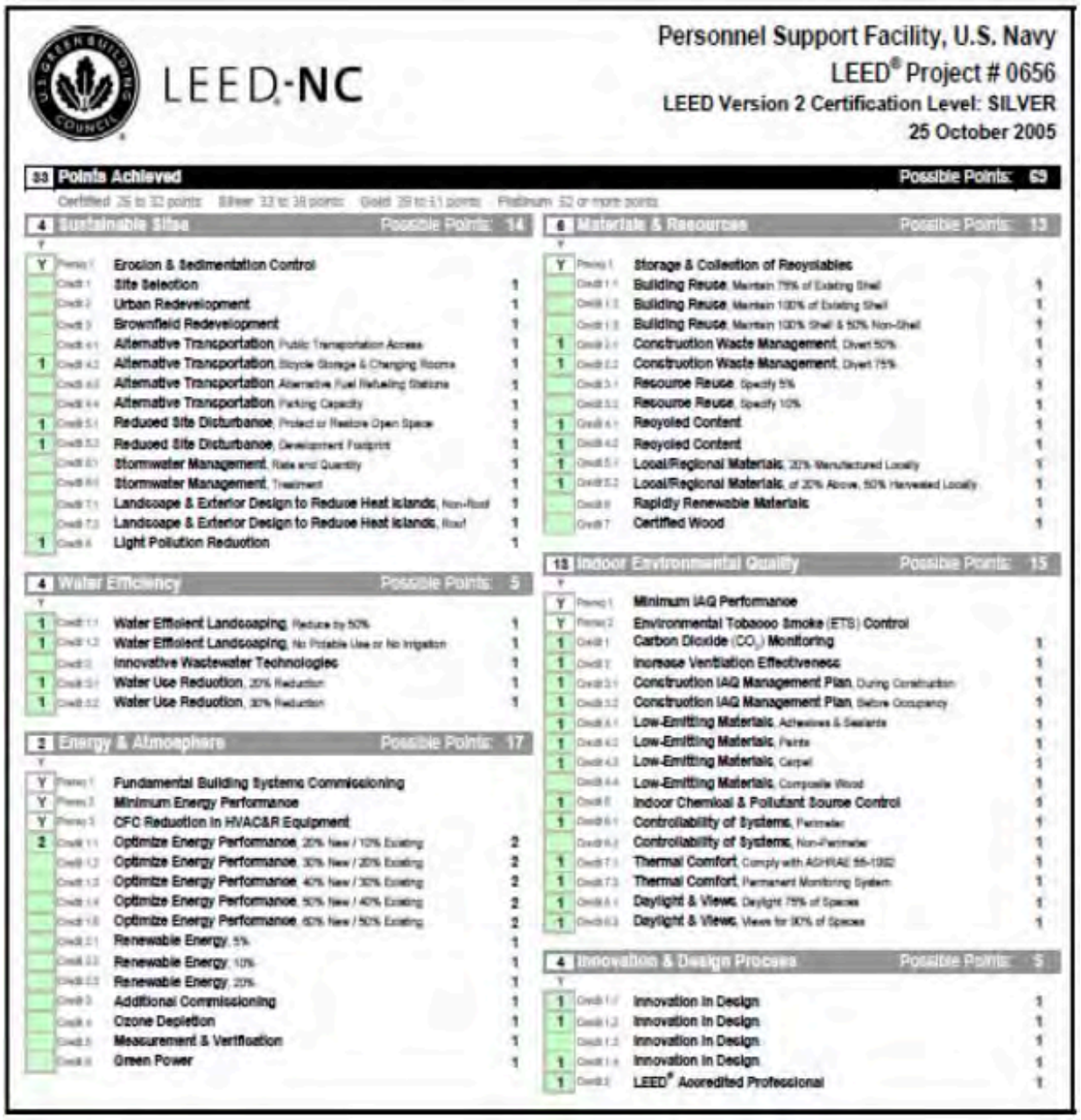
The Personnel Support Facility located at Naval Amphibious Base Little Creek, was constructed for $7.22M in 2004 and achieved a LEED Silver certification. The building is utilized as a commercial office, library, and classroom space for Naval Sailors to support the administration requirements of the base.

For the location of the building, the design team chose to demolish three older facilities and reutilize part of the waste from these buildings into the new structure. They also used much of the waste from the demolition, which was diverted from the landfill, at other construction locations for the General Contractor, Hourigan Construction Company. The team also made use of recycled, rapidly renewable, and local materials, ensuring a lack of volatile organic compounds.

For the exterior landscaping of the building, the design team utilized native and drought-tolerant plant species to limit the need for excessive irrigation and pesticides. The project team also incorporated their sustainable approach into the stormwater management plan, which utilized low impact development techniques to maximize the efficiency of water gathered from the site. Interior to the building, the team used waterless urinals and low-flow toilets, sinks and showers to also reduce the overall amount of potable water consumed.

To adjust for the energy consumption from lighting, which is normally a great deal of the consumed portion of electricity in an office environment, the team created a uniform lighting scheme that optimized light levels throughout the building. They also installed occupancy sensors to reduce the amount of lighting that stayed on in unoccupied classrooms and offices. The team also hoped to take advantage of natural lighting to account for the lighting load of the building.

As a comparison model for the Naval Amphibious Base Little Creek Personnel Support Facility, I was provided data on the Moral, Welfare, and Recreation facility building at Naval Station Norfolk. Though these buildings are not comparable in size, they provide much of the same basic services, needs, and utilization within the same region.



LEED-NC

Personnel Support Facility, U.S. Navy
LEED® Project # 0656
LEED Version 2 Certification Level: SILVER
25 October 2005

33 Points Achieved — Possible Points: 69

Certified 26 to 32 points; Silver 33 to 38 points; Gold 39 to 51 points; Platinum 52 or more points

4 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	Erosion & Sedimentation Control	
	Credit 1	Site Selection	1
	Credit 2	Urban Redevelopment	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
	Credit 4.4	Alternative Transportation, Parking Capacity	1
1	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
	Credit 6.1	Stormwater Management, Rate and Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Credit 8	Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

2 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
2	Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
	Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 20%	1
	Credit 3	Additional Commissioning	1
	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

6 Materials & Resources — Possible Points: 13

Y			
Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content	1
1	Credit 4.2	Recycled Content	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

13 Indoor Environmental Quality — Possible Points: 15

Y			
Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Carbon Dioxide (CO_2) Monitoring	1
1	Credit 2	Increase Ventilation Effectiveness	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
	Credit 4.4	Low-Emitting Materials, Composite Wood	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Perimeter	1
	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
1	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

4 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design	1
1	Credit 1.2	Innovation in Design	1
	Credit 1.3	Innovation in Design	1
1	Credit 1.4	Innovation in Design	1
1	Credit 2	LEED® Accredited Professional	1

Figure 39 – Personnel Support Facility LEED Checklist

Norfolk Police and Security Operations Facility

Figure 40 – Police and Security Operations

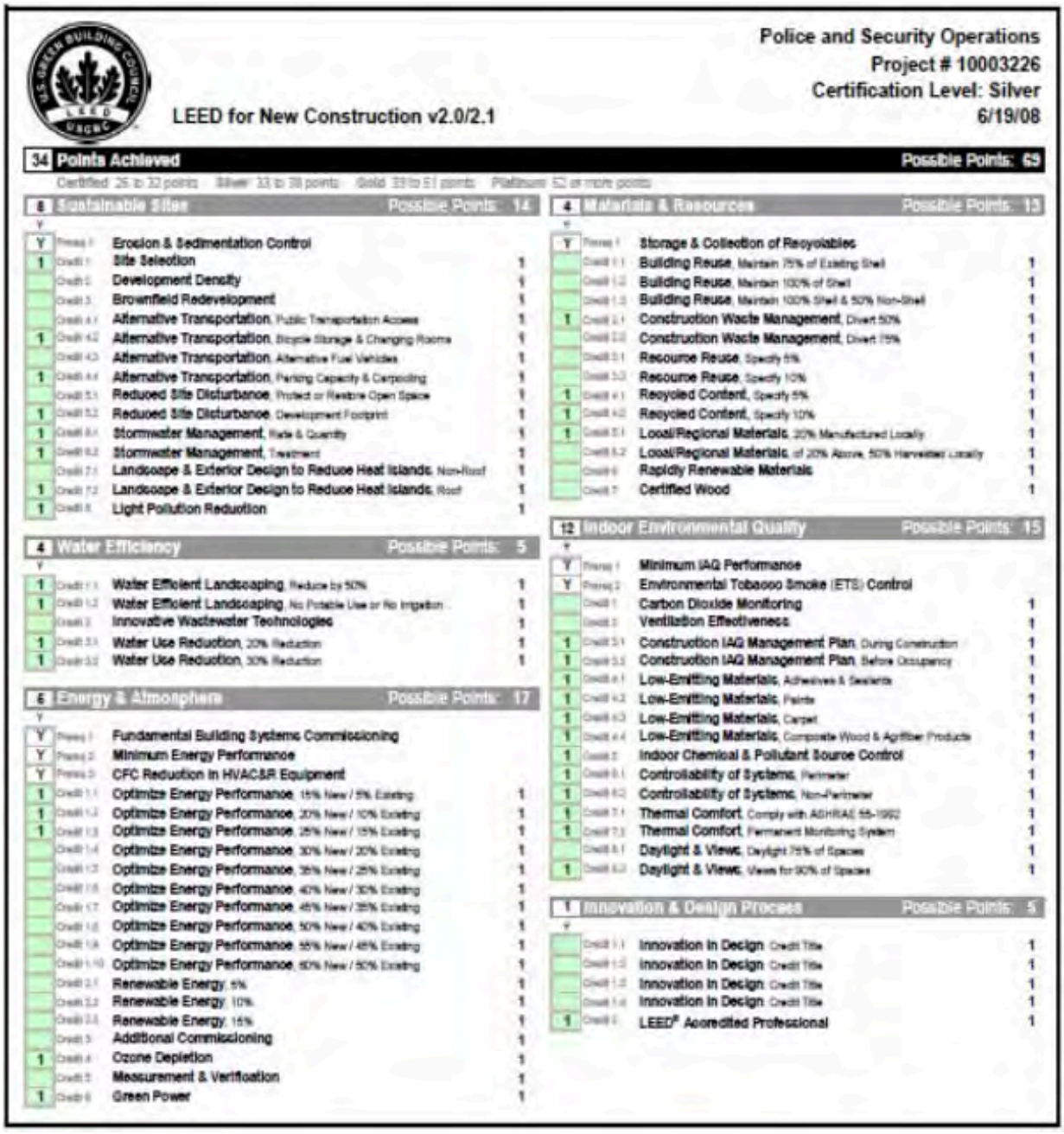
Completed in 2008 for $6.85M, the Police and Security O perations Facility achieved a LEED Silver certification for its efforts in sustainability according to the United States Green Building Council. The VIRTEXCO Company, contracted by the local construction field office, constructed the building for not only Police Operations, but also for administration functions, classroom training, laboratory functions, personnel detention, and a fully functioning dog kennel on the exterior of the building.

Unlike many of the other buildings completed and analyzed in this study, the Police and Security Operations Facility budgeted allocation for this project did not include as many environmentally friendly materials. To account for this difference, the design-build team found several areas to increase the project's environmental performance without adding significant cost to the project. Energy saving features included an efficient boiler and chiller, a highly reflective roof, a high performance building envelope, and occupancy sensor controls for the electric lighting. Some of the points to achieve the LEED Silver certification additionally came from the use of locally procured materials and the use of recycled content from the demolished building where the new one lies. Additional points for the certification came from the use of built-in walk off mats to limit the introduction of pollutants to the interior environment, and bicycle racks for commuters.

The design team also took advantage of natural lighting for much of the offices and other spaces, and reduced the overall lighting requirement for the building. With the addition of the occupancy lighting sensors, the team was able to reduce the overall electric requirements for this building. Other conservation for the building came in the form of utilizing waterless urinals, low flow toilets, and other low flow fixtures throughout the building. With the irrigation for the landscaping at a minimum due to the use of indigenous plant species, the team was able to reduce the overall water consumption for the buildings spaces.

As this is a high value facility for the base, there was an additional requirement for a generator. To maintain the constant power requirement for this building the design team procured and installed a natural gas generator to only be used for emergency purposes.

As a comparison model for the Police and Security Operations Facility at Naval Amphibious Base Little Creek, I was provided data on the Police Station at Naval Station Norfolk. Comparable in size, utilization, and regional location, this facility provided a useful match for comparing the energy data collected.



Police and Security Operations
Project # 10003226
Certification Level: Silver
6/19/08

LEED for New Construction v2.0/2.1

34 Points Achieved — Possible Points: 69

Certified: 26 to 32 points; Silver: 33 to 38 points; Gold: 39 to 51 points; Platinum: 52 or more points

8 Sustainable Sites — Possible Points: 14

Y	Erosion & Sedimentation Control	
1	Site Selection	1
	Development Density	1
	Brownfield Redevelopment	1
	Alternative Transportation, Public Transportation Access	1
1	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Alternative Transportation, Alternative Fuel Vehicles	1
1	Alternative Transportation, Parking Capacity & Carpooling	1
	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Reduced Site Disturbance, Development Footprint	1
1	Stormwater Management, Rate & Quantity	1
1	Stormwater Management, Treatment	1
	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Light Pollution Reduction	1

5 Water Efficiency — Possible Points: 5

1	Water Efficient Landscaping, Reduce by 50%	1
1	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Innovative Wastewater Technologies	1
1	Water Use Reduction, 20% Reduction	1
1	Water Use Reduction, 30% Reduction	1

6 Energy & Atmosphere — Possible Points: 17

Y	Fundamental Building Systems Commissioning	
Y	Minimum Energy Performance	
Y	CFC Reduction in HVAC&R Equipment	
1	Optimize Energy Performance, 15% New / 5% Existing	1
1	Optimize Energy Performance, 20% New / 10% Existing	1
1	Optimize Energy Performance, 25% New / 15% Existing	1
	Optimize Energy Performance, 30% New / 20% Existing	1
	Optimize Energy Performance, 35% New / 25% Existing	1
	Optimize Energy Performance, 40% New / 30% Existing	1
	Optimize Energy Performance, 45% New / 35% Existing	1
	Optimize Energy Performance, 50% New / 40% Existing	1
	Optimize Energy Performance, 55% New / 45% Existing	1
	Optimize Energy Performance, 60% New / 50% Existing	1
	Renewable Energy, 5%	1
	Renewable Energy, 10%	1
	Renewable Energy, 15%	1
	Additional Commissioning	1
1	Ozone Depletion	1
	Measurement & Verification	1
1	Green Power	1

4 Materials & Resources — Possible Points: 13

Y	Storage & Collection of Recyclables	
	Building Reuse, Maintain 75% of Existing Shell	1
	Building Reuse, Maintain 100% of Shell	1
	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Construction Waste Management, Divert 50%	1
	Construction Waste Management, Divert 75%	1
	Resource Reuse, Specify 5%	1
	Resource Reuse, Specify 10%	1
1	Recycled Content, Specify 5%	1
1	Recycled Content, Specify 10%	1
1	Local/Regional Materials, 20% Manufactured Locally	1
	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Rapidly Renewable Materials	1
	Certified Wood	1

12 Indoor Environmental Quality — Possible Points: 15

Y	Minimum IAQ Performance	
Y	Environmental Tobacco Smoke (ETS) Control	
	Carbon Dioxide Monitoring	1
	Ventilation Effectiveness	1
1	Construction IAQ Management Plan, During Construction	1
1	Construction IAQ Management Plan, Before Occupancy	1
1	Low-Emitting Materials, Adhesives & Sealants	1
1	Low-Emitting Materials, Paints	1
1	Low-Emitting Materials, Carpet	1
1	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1	Indoor Chemical & Pollutant Source Control	1
1	Controllability of Systems, Perimeter	1
1	Controllability of Systems, Non-Perimeter	1
1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Thermal Comfort, Permanent Monitoring System	1
	Daylight & Views, Daylight 75% of Spaces	1
1	Daylight & Views, Views for 90% of Spaces	1

1 Innovation & Design Process — Possible Points: 5

	Innovation in Design, Credit Title	1
	Innovation in Design, Credit Title	1
	Innovation in Design, Credit Title	1
	Innovation in Design, Credit Title	1
1	LEED® Accredited Professional	1

Figure 41 – Police and Security Operations Facility LEED Checklist

Naval Facilities Engineering Service Command

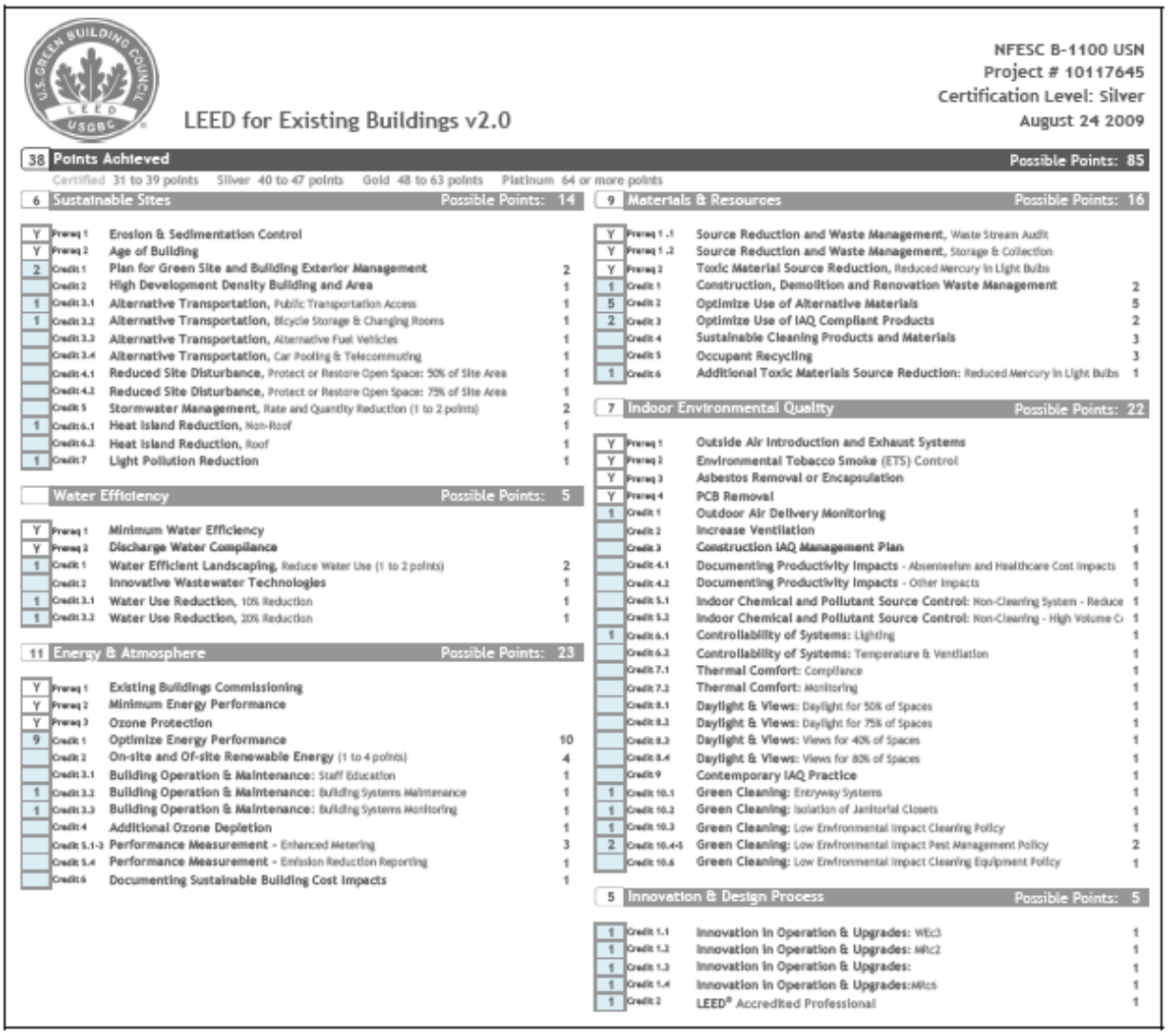
Figure 42 – NFESC

The Naval Facilities Engineering Service Command (NFESC) Center building, constructed in 1994, is a unique operations facility, providing specialized facilities engineering, technology, and facilities expertise. Upon completion of their new facility, the team achieved the LEED-EB Silver certification. The team took ad vantage of the opportunity to achieve a LEED-EB certification by utilizing over 40 opportunities for credits. The implementation of these sustainable features was the key to the success of the project, which was completed for $131,700.

Utilized as a combination of office space, laboratories, and warehouse space, building 1100 at Naval Base Ventura County planned the LEED certification through the renovation process for the facility. The team at NFESC incorporated the use of a bike rack, spaces for alternative fueled vehicles, low-flow efficient plumbing fixtures throughout the facility, occupant motion sensors for lighting, entryway mats to enhance indoor air quality, and a highly reflective roof.

The team actively monitored the indoor air quality to ensure maximum health and comfort for the building occupants. By performing this service for the building the team also was able to add to their efforts for sustainability on the LEED front. The project team also had a new low environmental impact detergent mixing station. The new mixing station reduced the costs by applying the proper concentration of cleaning solution and less harsh chemicals to accomplish the job. For the site erosion control, the project team added new groundcover plants to reduce the loss of topsoil and prevent the potential for stormwater pollution runoff.

As a comparison model for the NFESC building, I was provided data for building 1387 on Naval Base Ventura County, which is utilized as a NAVSEA Lab. Comparable in location, size and utilization, this building provided an opportunity for a useful match in comparing the energy data.



LEED for Existing Buildings v2.0

NFESC B-1100 USN
Project # 10117645
Certification Level: Silver
August 24 2009

38 Points Achieved — Possible Points: 85

Certified 31 to 39 points | Silver 40 to 47 points | Gold 48 to 63 points | Platinum 64 or more points

6 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Erosion & Sedimentation Control	
Y	Prereq 2	Age of Building	
2	Credit 1	Plan for Green Site and Building Exterior Management	2
	Credit 2	High Development Density Building and Area	1
1	Credit 3.1	Alternative Transportation, Public Transportation Access	1
1	Credit 3.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 3.3	Alternative Transportation, Alternative Fuel Vehicles	1
	Credit 3.4	Alternative Transportation, Car Pooling & Telecommuting	1
	Credit 4.1	Reduced Site Disturbance, Protect or Restore Open Space: 50% of Site Area	1
	Credit 4.2	Reduced Site Disturbance, Protect or Restore Open Space: 75% of Site Area	1
	Credit 5	Stormwater Management, Rate and Quantity Reduction (1 to 2 points)	2
1	Credit 6.1	Heat Island Reduction, Non-Roof	1
	Credit 6.2	Heat Island Reduction, Roof	1
1	Credit 7	Light Pollution Reduction	1

Water Efficiency — Possible Points: 5

Y	Prereq 1	Minimum Water Efficiency	
Y	Prereq 2	Discharge Water Compliance	
1	Credit 1	Water Efficient Landscaping, Reduce Water Use (1 to 2 points)	2
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 10% Reduction	1
1	Credit 3.2	Water Use Reduction, 20% Reduction	1

11 Energy & Atmosphere — Possible Points: 23

Y	Prereq 1	Existing Buildings Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	Ozone Protection	
9	Credit 1	Optimize Energy Performance	10
	Credit 2	On-site and Off-site Renewable Energy (1 to 4 points)	4
	Credit 3.1	Building Operation & Maintenance: Staff Education	1
1	Credit 3.2	Building Operation & Maintenance: Building Systems Maintenance	1
1	Credit 3.3	Building Operation & Maintenance: Building Systems Monitoring	1
	Credit 4	Additional Ozone Depletion	1
	Credit 5.1-3	Performance Measurement - Enhanced Metering	3
	Credit 5.4	Performance Measurement - Emission Reduction Reporting	1
	Credit 6	Documenting Sustainable Building Cost Impacts	1

9 Materials & Resources — Possible Points: 16

Y	Prereq 1.1	Source Reduction and Waste Management, Waste Stream Audit	
Y	Prereq 1.2	Source Reduction and Waste Management, Storage & Collection	
Y	Prereq 2	Toxic Material Source Reduction, Reduced Mercury in Light Bulbs	
1	Credit 1	Construction, Demolition and Renovation Waste Management	2
5	Credit 2	Optimize Use of Alternative Materials	5
2	Credit 3	Optimize Use of IAQ Compliant Products	2
	Credit 4	Sustainable Cleaning Products and Materials	3
	Credit 5	Occupant Recycling	3
1	Credit 6	Additional Toxic Materials Source Reduction: Reduced Mercury in Light Bulbs	1

7 Indoor Environmental Quality — Possible Points: 22

Y	Prereq 1	Outside Air Introduction and Exhaust Systems	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y	Prereq 3	Asbestos Removal or Encapsulation	
Y	Prereq 4	PCB Removal	
1	Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 2	Increase Ventilation	1
	Credit 3	Construction IAQ Management Plan	1
	Credit 4.1	Documenting Productivity Impacts - Absenteeism and Healthcare Cost Impacts	1
	Credit 4.2	Documenting Productivity Impacts - Other Impacts	1
	Credit 5.1	Indoor Chemical and Pollutant Source Control: Non-Cleaning System - Reduce	1
	Credit 5.2	Indoor Chemical and Pollutant Source Control: Non-Cleaning - High Volume C	1
1	Credit 6.1	Controllability of Systems: Lighting	1
	Credit 6.2	Controllability of Systems: Temperature & Ventilation	1
	Credit 7.1	Thermal Comfort: Compliance	1
	Credit 7.2	Thermal Comfort: Monitoring	1
	Credit 8.1	Daylight & Views: Daylight for 50% of Spaces	1
	Credit 8.2	Daylight & Views: Daylight for 75% of Spaces	1
	Credit 8.3	Daylight & Views: Views for 40% of Spaces	1
	Credit 8.4	Daylight & Views: Views for 80% of Spaces	1
	Credit 9	Contemporary IAQ Practice	1
1	Credit 10.1	Green Cleaning: Entryway Systems	1
1	Credit 10.2	Green Cleaning: Isolation of Janitorial Closets	1
1	Credit 10.3	Green Cleaning: Low Environmental Impact Cleaning Policy	1
2	Credit 10.4-5	Green Cleaning: Low Environmental Impact Pest Management Policy	2
	Credit 10.6	Green Cleaning: Low Environmental Impact Cleaning Equipment Policy	1

5 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Operation & Upgrades: WEc3	1
1	Credit 1.2	Innovation in Operation & Upgrades: MRc2	1
1	Credit 1.3	Innovation in Operation & Upgrades:	1
1	Credit 1.4	Innovation in Operation & Upgrades:MRc6	1
1	Credit 2	LEED® Accredited Professional	1

Figure 43 - NFESC LEED Scoring Sheet

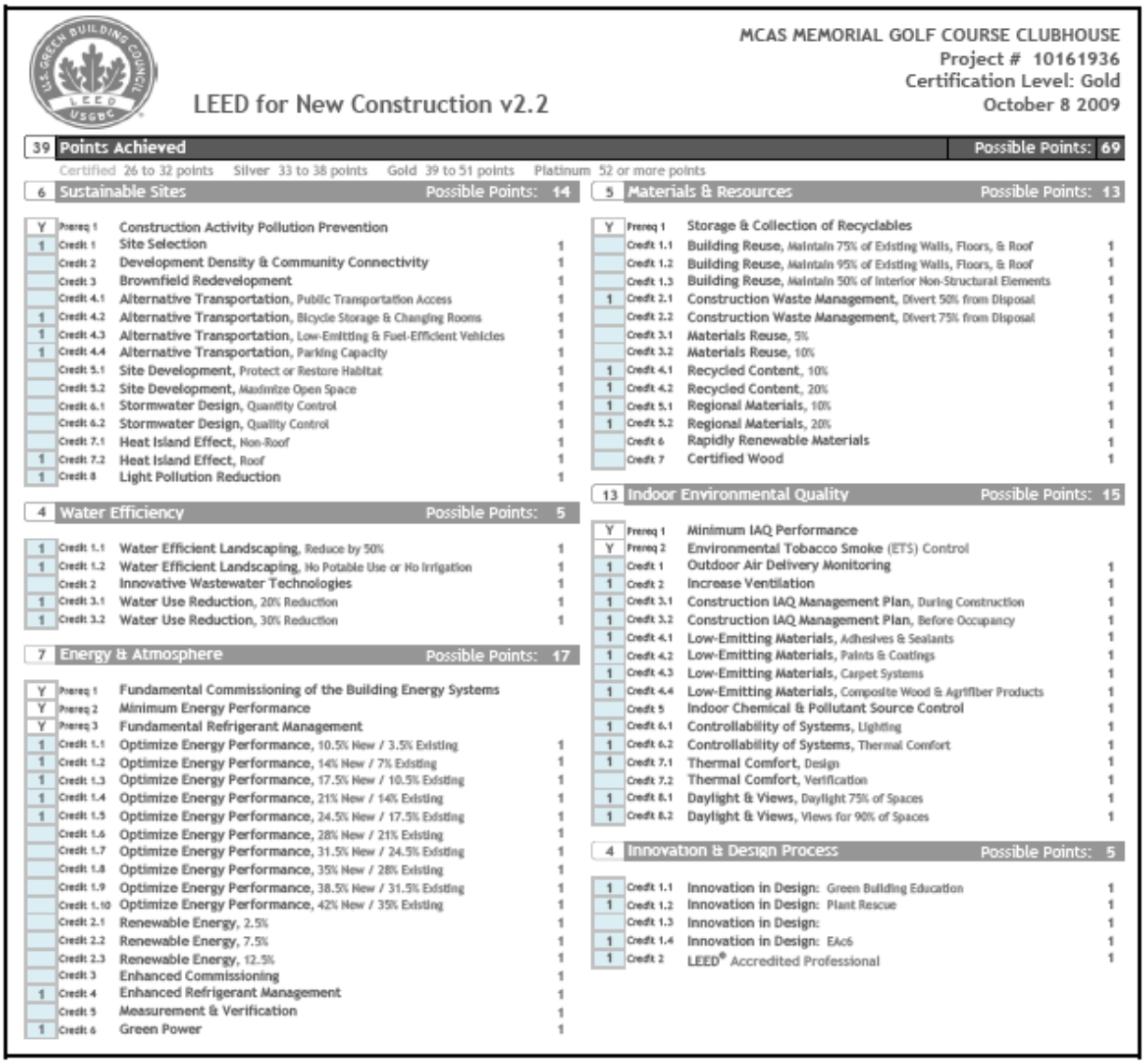
Miramar Memorial Golf Course Clubhouse

Figure 44 – Memorial Golf Course Clubhouse

The Marine Corps Air Station Miramar Golf Course is ranked as one of the top eight military golf courses in the United States by Trave l and Leisure magazine. The new clubhouse, which was completed $6.6M in 2009, is one of the first Marine Corps facilities to receive a LEED certification.

Constructed by Stronghold Engineering, Inc., the project team incorporated many sustainable features into the 16,000 square-foot facility, which housed the clubhouse, a catering pavilion, an indoor/outdoor dining area, and the Senior Non-Commissioned Officers Club. The major portion of the sustainable features seen in this project included low-flow plumbing fixtures and recycled materials. The project team was able to use recycled building materials and reclaimed non-potable water, which was essential for the golf course sprinkler system.

As a comparison model for the Marine Corps Air Station Miramar Golf Course Clubhouse, I was provided data for the Naval Base Ventura County Golf Course Clubhouse. Comparable in location, size and utilization, this building provided an opportunity for a useful match in comparing the energy data.



MCAS MEMORIAL GOLF COURSE CLUBHOUSE
Project # 10161936
Certification Level: Gold
October 8 2009

LEED for New Construction v2.2

39 Points Achieved — Possible Points: 69

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

6 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Construction Activity Pollution Prevention	
1	Credit 1	Site Selection	1
	Credit 2	Development Density & Community Connectivity	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
1	Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	1
1	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Site Development, Protect or Restore Habitat	1
	Credit 5.2	Site Development, Maximize Open Space	1
	Credit 6.1	Stormwater Design, Quantity Control	1
	Credit 6.2	Stormwater Design, Quality Control	1
	Credit 7.1	Heat Island Effect, Non-Roof	1
1	Credit 7.2	Heat Island Effect, Roof	1
1	Credit 8	Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

7 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Commissioning of the Building Energy Systems	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	Fundamental Refrigerant Management	
1	Credit 1.1	Optimize Energy Performance, 10.5% New / 3.5% Existing	1
1	Credit 1.2	Optimize Energy Performance, 14% New / 7% Existing	1
1	Credit 1.3	Optimize Energy Performance, 17.5% New / 10.5% Existing	1
1	Credit 1.4	Optimize Energy Performance, 21% New / 14% Existing	1
1	Credit 1.5	Optimize Energy Performance, 24.5% New / 17.5% Existing	1
	Credit 1.6	Optimize Energy Performance, 28% New / 21% Existing	1
	Credit 1.7	Optimize Energy Performance, 31.5% New / 24.5% Existing	1
	Credit 1.8	Optimize Energy Performance, 35% New / 28% Existing	1
	Credit 1.9	Optimize Energy Performance, 38.5% New / 31.5% Existing	1
	Credit 1.10	Optimize Energy Performance, 42% New / 35% Existing	1
	Credit 2.1	Renewable Energy, 2.5%	1
	Credit 2.2	Renewable Energy, 7.5%	1
	Credit 2.3	Renewable Energy, 12.5%	1
	Credit 3	Enhanced Commissioning	1
1	Credit 4	Enhanced Refrigerant Management	1
	Credit 5	Measurement & Verification	1
1	Credit 6	Green Power	1

5 Materials & Resources — Possible Points: 13

Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors, & Roof	1
	Credit 1.2	Building Reuse, Maintain 95% of Existing Walls, Floors, & Roof	1
	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1
	Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1
	Credit 3.1	Materials Reuse, 5%	1
	Credit 3.2	Materials Reuse, 10%	1
1	Credit 4.1	Recycled Content, 10%	1
1	Credit 4.2	Recycled Content, 20%	1
1	Credit 5.1	Regional Materials, 10%	1
1	Credit 5.2	Regional Materials, 20%	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

13 Indoor Environmental Quality — Possible Points: 15

Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Outdoor Air Delivery Monitoring	1
1	Credit 2	Increase Ventilation	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
1	Credit 4.3	Low-Emitting Materials, Carpet Systems	1
1	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Lighting	1
1	Credit 6.2	Controllability of Systems, Thermal Comfort	1
1	Credit 7.1	Thermal Comfort, Design	1
	Credit 7.2	Thermal Comfort, Verification	1
1	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

4 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design: Green Building Education	1
1	Credit 1.2	Innovation in Design: Plant Rescue	1
	Credit 1.3	Innovation in Design:	1
1	Credit 1.4	Innovation in Design: EAc6	1
1	Credit 2	LEED® Accredited Professional	1

Figure 45 - MCAS Memorial Golf Course Clubhouse LEED Scoring Sheet

Oceana Child Development Center

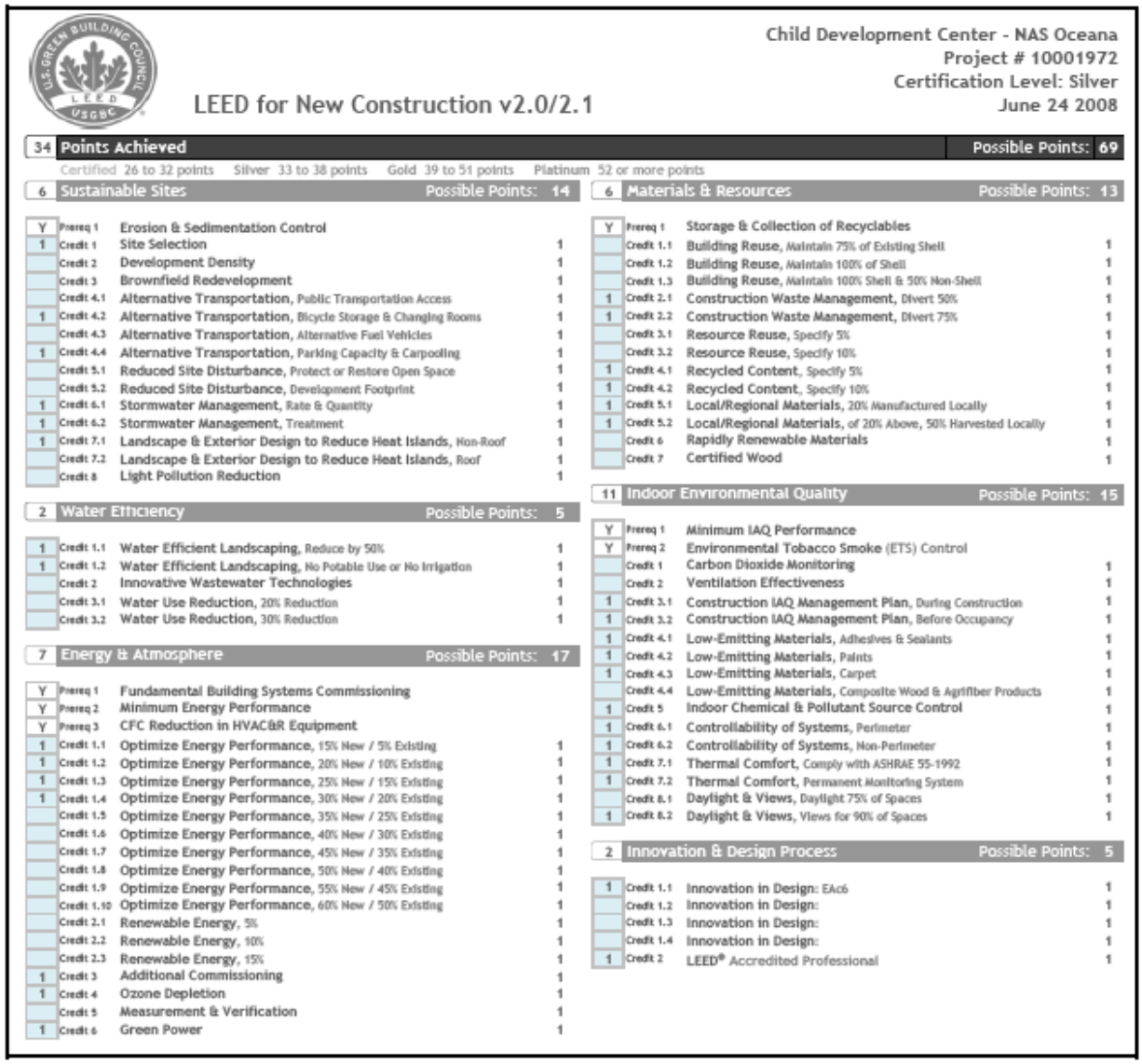
The Naval Air Station Oceana Child Development Center was the first of its kind to receive a LEED certification within the Department of Defense. The 29,000 square-foot facility completed in 2005 by the Dick Corporation, utilized the services of CJL Engineering as the commissioning agent for the LEED certification.

Figure 46 – Oceana Child Development Center

The new facility will accommodate up to 280 children, which is a significant increase from 88 that the previous facility held. The complex includes training and curriculum offices, five infant activity rooms, four pre-toddler rooms, four toddler activity rooms, six pre-school rooms, a kitchen, laundry, and reception area.

The sustainable features incorporated into this facility included water efficient landscaping that required zero potable water use, diverting over 75% of the construction waste from the landfill, utilizing more than 20% of local manufactured materials during construction to minimize transportation costs, and enhanced daylighting for the entire facility. Occupant sensor controls were also installed for lighting and energy efficient heated hardwood flooring added to the interior comfort and environment for the facilities personnel.

As a comparison model for the Oceana Child Development Center, I was provided data for building SDA 332, the Child Development Center at Naval Station Norfolk. With no other Child Development Center available at Naval Air Station Oceana, the Norfolk facility was comparable in location, size and utilization, providing an opportunity for a useful match in comparing the energy data.



Child Development Center - NAS Oceana
Project # 10001972
Certification Level: Silver
June 24 2008

LEED for New Construction v2.0/2.1

34 Points Achieved — Possible Points: 69

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

6 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
	Credit 2	Development Density	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Vehicles	1
1	Credit 4.4	Alternative Transportation, Parking Capacity & Carpooling	1
	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1	Credit 6.1	Stormwater Management, Rate & Quantity	1
1	Credit 6.2	Stormwater Management, Treatment	1
1	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
	Credit 8	Light Pollution Reduction	1

2 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
	Credit 3.1	Water Use Reduction, 20% Reduction	1
	Credit 3.2	Water Use Reduction, 30% Reduction	1

7 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
1	Credit 1.1	Optimize Energy Performance, 15% New / 5% Existing	1
1	Credit 1.2	Optimize Energy Performance, 20% New / 10% Existing	1
1	Credit 1.3	Optimize Energy Performance, 25% New / 15% Existing	1
1	Credit 1.4	Optimize Energy Performance, 30% New / 20% Existing	1
	Credit 1.5	Optimize Energy Performance, 35% New / 25% Existing	1
	Credit 1.6	Optimize Energy Performance, 40% New / 30% Existing	1
	Credit 1.7	Optimize Energy Performance, 45% New / 35% Existing	1
	Credit 1.8	Optimize Energy Performance, 50% New / 40% Existing	1
	Credit 1.9	Optimize Energy Performance, 55% New / 45% Existing	1
	Credit 1.10	Optimize Energy Performance, 60% New / 50% Existing	1
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 15%	1
1	Credit 3	Additional Commissioning	1
1	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
1	Credit 6	Green Power	1

6 Materials & Resources — Possible Points: 13

Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content, Specify 5%	1
1	Credit 4.2	Recycled Content, Specify 10%	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

11 Indoor Environmental Quality — Possible Points: 15

Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 1	Carbon Dioxide Monitoring	1
	Credit 2	Ventilation Effectiveness	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Perimeter	1
1	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

2 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design: EAc6	1
	Credit 1.2	Innovation in Design:	1
	Credit 1.3	Innovation in Design:	1
	Credit 1.4	Innovation in Design:	1
1	Credit 2	LEED® Accredited Professional	1

Figure 47 - Oceana Child Development Center LEED Scoring Sheet

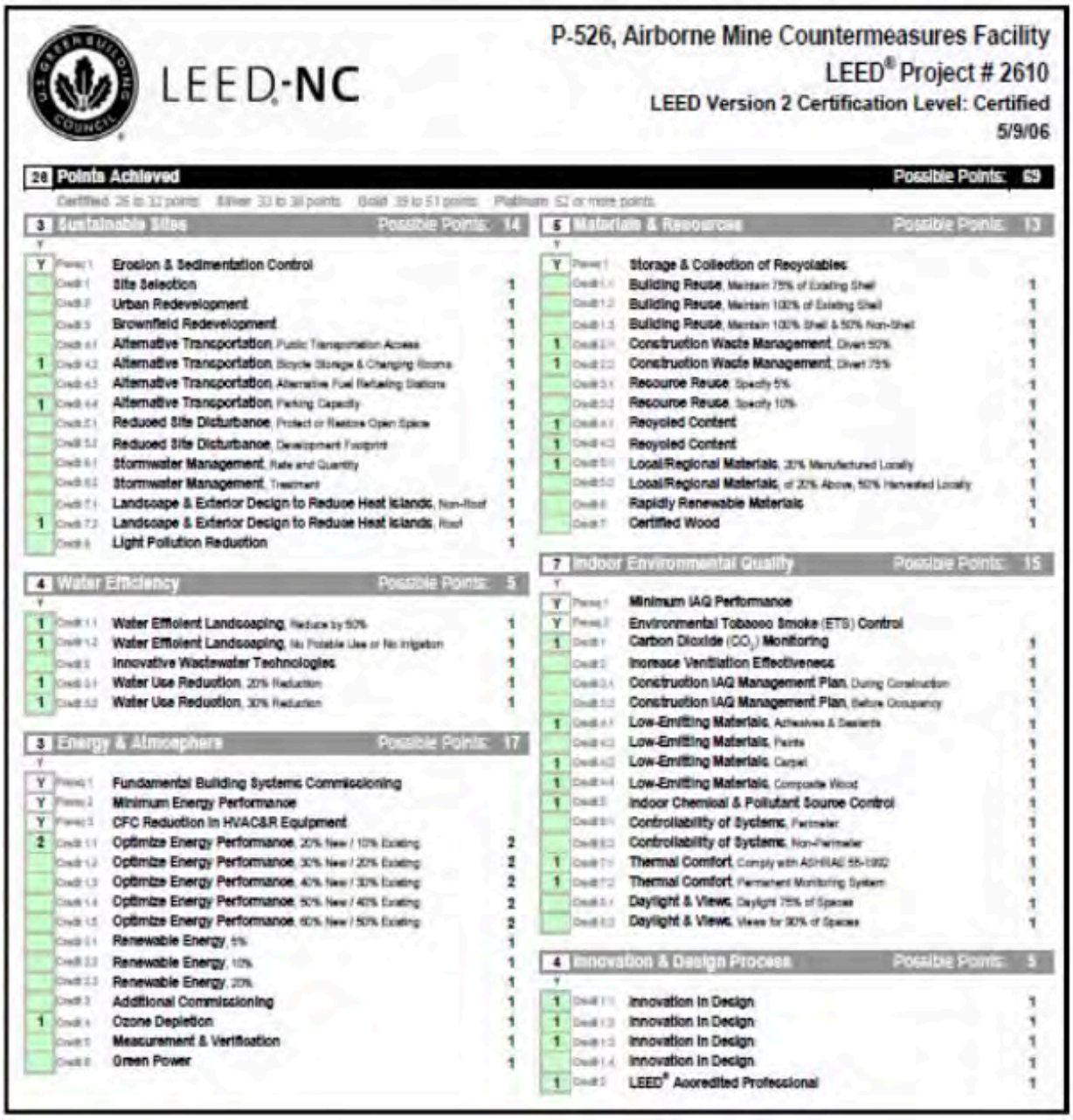
Airborne Mine Countermeasures Facility

The Airborne Mine Countermeasures Facility at Naval Station Norfolk was completed for helicopter minesweeping squadron HM-14. The $22.3M design-build 93,000 square-foot facility was constructed by Mortenson Construction, through their Federal Government division. The work included a 54,000 square-foot Module Aircraft Maintenance Hangar (next project on this listing) and a 38,890 square-foot Airborne Mine Countermeasures Facility, including airfield paving, vehicle parking, security fencing, and site development.

Figure 48 – Airborne Mine Countermeasures

The project team delivered the LEED certification with 75% of the construction waste diverted from the landfill; utilizing 20% recycled materials; 20% regionally procured materials; low-emitting materials for adhesives, sealants, carpet and composite wood. They also maximized saving stormwater runoff through the site development and area management plan. The point distribution for this project was achieved by water efficiency, materials and resources utilized, indoor environmental quality and innovation and design process.

As a comparison model for this project, I was provided data for building LP 33, an Aircraft Maintenance Hangar at Naval Station Norfolk. Though the hangar provided was not the same size as this project, it does provide a useful match for both location and utilization to compare the energy data.



LEED-NC

P-526, Airborne Mine Countermeasures Facility
LEED® Project # 2610
LEED Version 2 Certification Level: Certified
5/9/06

28 Points Achieved — Possible Points: 69

Certified: 26 to 32 points; Silver: 33 to 38 points; Gold: 39 to 51 points; Platinum: 52 or more points

3 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	Erosion & Sedimentation Control	
	Credit 1	Site Selection	1
	Credit 2	Urban Redevelopment	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
1	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
	Credit 6.1	Stormwater Management, Rate and Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
	Credit 8	Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

3 Energy & Atmosphere — Possible Points: 17

Y			
Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
2	Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
	Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
	Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
	Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 20%	1
	Credit 3	Additional Commissioning	1
1	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

5 Materials & Resources — Possible Points: 13

Y			
Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Existing Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content	1
1	Credit 4.2	Recycled Content	1
1	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

7 Indoor Environmental Quality — Possible Points: 15

Y			
Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Carbon Dioxide (CO_2) Monitoring	1
	Credit 2	Increase Ventilation Effectiveness	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
1	Credit 4.4	Low-Emitting Materials, Composite Wood	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
	Credit 6.1	Controllability of Systems, Perimeter	1
	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

4 Innovation & Design Process — Possible Points: 5

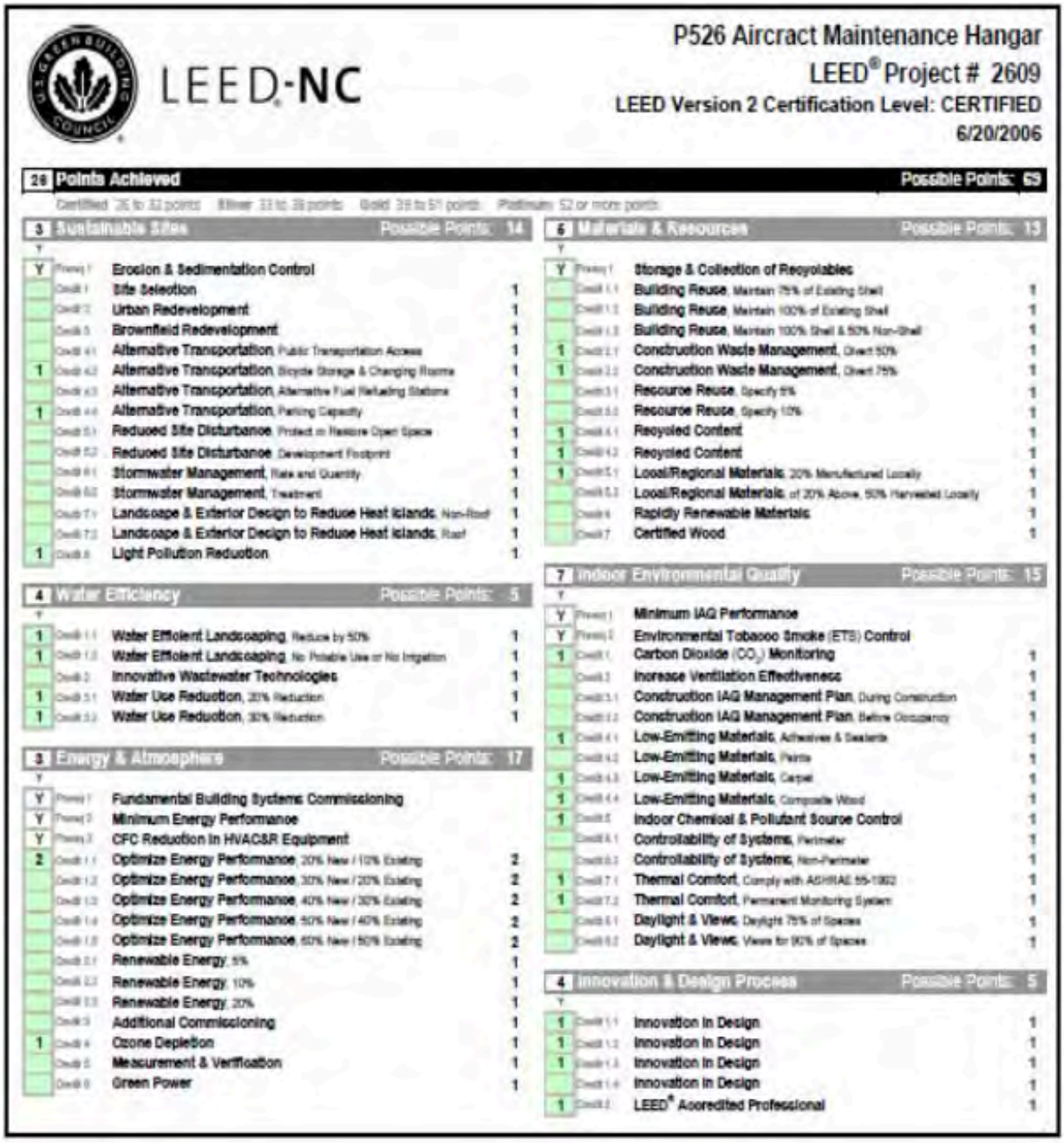
1	Credit 1.1	Innovation in Design	1
1	Credit 1.2	Innovation in Design	1
1	Credit 1.3	Innovation in Design	1
	Credit 1.4	Innovation in Design	1
1	Credit 2	LEED® Accredited Professional	1

Figure 49 – Airborne Mine Countermeasures Facility LEED Checklist

Aircraft Maintenance Hangar

Completed under the same project as the Airborne Mine Countermeasures Facility by Mortenson Construction, the Aircraft Maintenance Hangar at Naval Station Norfolk was constructed for $34.7M. It also achieved a LEED certification by the United States Green Building Council, receiving the exact same points given for the Airborne Mine Countermeasures Facility.

Figure 50 – Aircraft Maintenance Hangar



LEED-NC

P526 Aircract Maintenance Hangar
LEED® Project # 2609
LEED Version 2 Certification Level: CERTIFIED
6/20/2006

26 Points Achieved — Possible Points: 69

Certified: 26 to 32 points; Silver: 33 to 38 points; Gold: 39 to 51 points; Platinum: 52 or more points

3 Sustainable Sites — Possible Points: 14

Y		Erosion & Sedimentation Control	
		Site Selection	1
		Urban Redevelopment	1
		Brownfield Redevelopment	1
		Alternative Transportation, Public Transportation Access	1
1		Alternative Transportation, Bicycle Storage & Changing Rooms	1
		Alternative Transportation, Alternative Fuel Refueling Stations	1
1		Alternative Transportation, Parking Capacity	1
		Reduced Site Disturbance, Protect or Restore Open Space	1
		Reduced Site Disturbance, Development Footprint	1
		Stormwater Management, Rate and Quantity	1
		Stormwater Management, Treatment	1
		Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
		Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1		Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1		Water Efficient Landscaping, Reduce by 50%	1
1		Water Efficient Landscaping, No Potable Use or No Irrigation	1
		Innovative Wastewater Technologies	1
1		Water Use Reduction, 20% Reduction	1
1		Water Use Reduction, 30% Reduction	1

3 Energy & Atmosphere — Possible Points: 17

Y		Fundamental Building Systems Commissioning	
Y		Minimum Energy Performance	
Y		CFC Reduction in HVAC&R Equipment	
2		Optimize Energy Performance, 20% New / 10% Existing	2
		Optimize Energy Performance, 30% New / 20% Existing	2
		Optimize Energy Performance, 40% New / 30% Existing	2
		Optimize Energy Performance, 50% New / 40% Existing	2
		Optimize Energy Performance, 60% New / 50% Existing	2
		Renewable Energy, 5%	1
		Renewable Energy, 10%	1
		Renewable Energy, 20%	1
		Additional Commissioning	1
1		Ozone Depletion	1
		Measurement & Verification	1
		Green Power	1

6 Materials & Resources — Possible Points: 13

Y		Storage & Collection of Recyclables	
		Building Reuse, Maintain 75% of Existing Shell	1
		Building Reuse, Maintain 100% of Existing Shell	1
		Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1		Construction Waste Management, Divert 50%	1
1		Construction Waste Management, Divert 75%	1
		Resource Reuse, Specify 5%	1
		Resource Reuse, Specify 10%	1
1		Recycled Content	1
1		Recycled Content	1
1		Local/Regional Materials, 20% Manufactured Locally	1
		Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
		Rapidly Renewable Materials	1
		Certified Wood	1

7 Indoor Environmental Quality — Possible Points: 15

Y		Minimum IAQ Performance	
Y		Environmental Tobacco Smoke (ETS) Control	
1		Carbon Dioxide (CO_2) Monitoring	1
		Increase Ventilation Effectiveness	1
		Construction IAQ Management Plan, During Construction	1
		Construction IAQ Management Plan, Before Occupancy	1
1		Low-Emitting Materials, Adhesives & Sealants	1
		Low-Emitting Materials, Paints	1
1		Low-Emitting Materials, Carpet	1
1		Low-Emitting Materials, Composite Wood	1
1		Indoor Chemical & Pollutant Source Control	1
		Controllability of Systems, Perimeter	1
		Controllability of Systems, Non-Perimeter	1
1		Thermal Comfort, Comply with ASHRAE 55-1992	1
1		Thermal Comfort, Permanent Monitoring System	1
		Daylight & Views, Daylight 75% of Spaces	1
		Daylight & Views, Views for 90% of Spaces	1

4 Innovation & Design Process — Possible Points: 5

1		Innovation in Design	1
1		Innovation in Design	1
1		Innovation in Design	1
		Innovation in Design	1
1		LEED® Accredited Professional	1

B-Figure 51 – Aircraft Maintenance Hangar (HM 14) LEED Checklist

Camp Lejeune Bachelor Enlisted Quarters (French Creek)

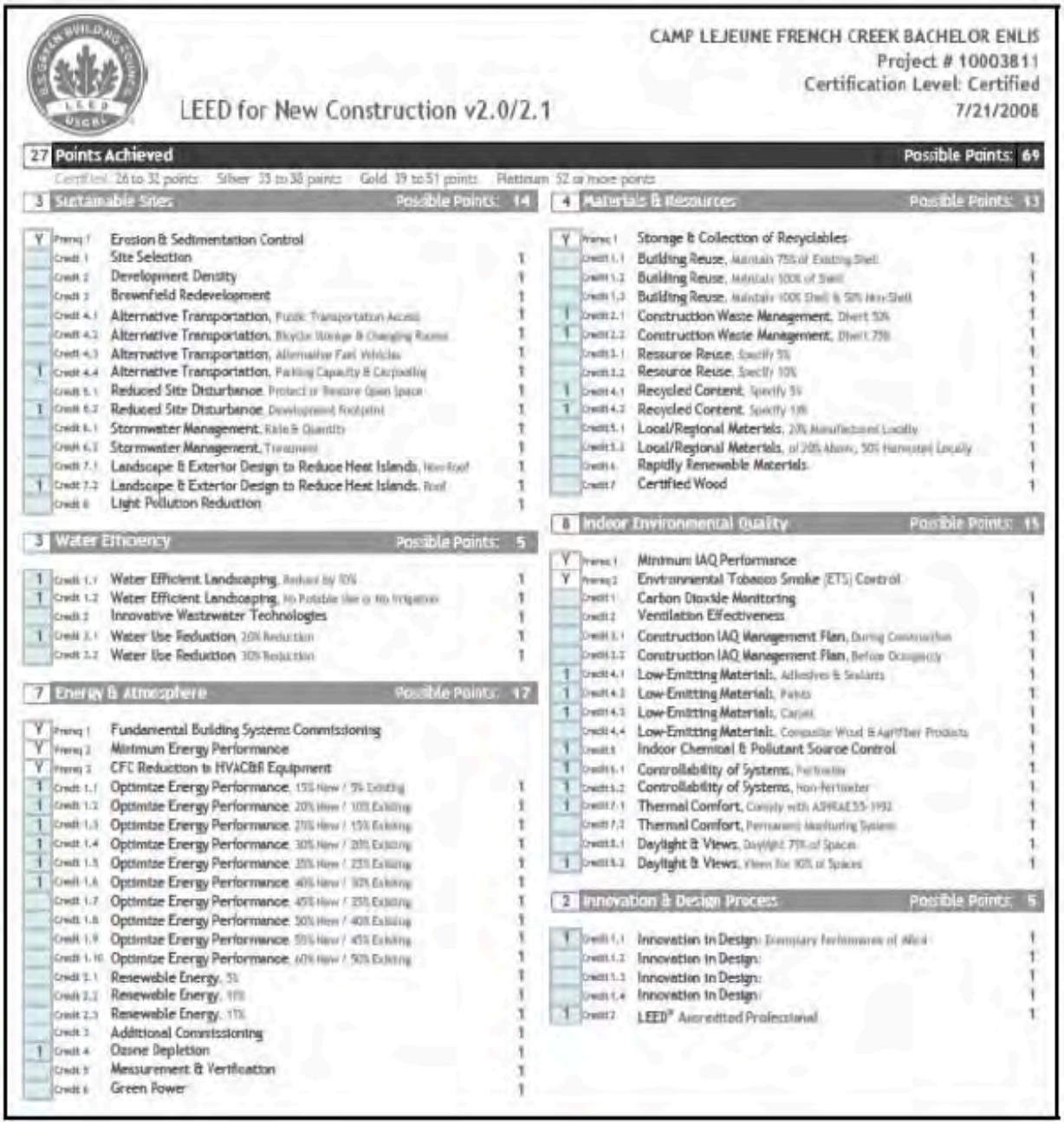
The design-build project completed by Whiting-Turner Construction achieved a LEED certification in 2008. The 90,948 square-foot housing facility is placed in the center of an entire bachelor quarters complex.

Figure 52 – Camp Lejeune Bachelor Enlisted

The 100 BEQ rooms in the new four story building will add to the quality of life for Marines by providing them with semi-private bathrooms, individual storage closets and shelving, shared microwave and refrigerator appliances with a food preparation niche, and an individual wall unit with desk. Each BEQ room will accommodate two Marines and is essential to the increase of Marine Corps forces occurring in the next few years.

The housing complex was designed for maximum energy and water conservation, with auto sensing interior room lighting and a low maintenance landscape with plant materials chosen on the basis of drought resistance and their ability to thrive on minimal maintenance. The majority of the points received for this project came from the Energy and Atmosphere and Indoor Environmental Quality areas required by the United States Green Building Council for LEED certification.

As a comparison model for the LEED certified Camp Lejeune Bachelor Enlisted Quarters, I was provided data for a neighboring Bachelor Enlisted Quarters that was not certified. An exact duplicate in size, location, and utilization by the personnel of Camp Lejeune, this model provided a useful match for comparing the data presented. Unfortunately, water consumption data was not available for either facility, due to a lack of metering.



CAMP LEJEUNE FRENCH CREEK BACHELOR ENLIS
Project # 10003811
Certification Level: Certified
7/21/2008

LEED for New Construction v2.0/2.1

27 Points Achieved — Possible Points: 69

Certified: 26 to 32 points; Silver: 33 to 38 points; Gold: 39 to 51 points; Platinum: 52 or more points

3 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Erosion & Sedimentation Control	
	Credit 1	Site Selection	1
	Credit 2	Development Density	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 4.3	Alternative Transportation, Alternative Fuel Vehicles	1
1	Credit 4.4	Alternative Transportation, Parking Capacity & Carpooling	1
	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
	Credit 6.1	Stormwater Management, Rate & Quantity	1
	Credit 6.2	Stormwater Management, Treatment	1
	Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1	Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
	Credit 8	Light Pollution Reduction	1

3 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
	Credit 3.2	Water Use Reduction, 30% Reduction	1

7 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Building Systems Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	CFC Reduction in HVAC&R Equipment	
1	Credit 1.1	Optimize Energy Performance, 15% New / 5% Existing	1
1	Credit 1.2	Optimize Energy Performance, 20% New / 10% Existing	1
1	Credit 1.3	Optimize Energy Performance, 25% New / 15% Existing	1
1	Credit 1.4	Optimize Energy Performance, 30% New / 20% Existing	1
1	Credit 1.5	Optimize Energy Performance, 35% New / 25% Existing	1
1	Credit 1.6	Optimize Energy Performance, 40% New / 30% Existing	1
	Credit 1.7	Optimize Energy Performance, 45% New / 35% Existing	1
	Credit 1.8	Optimize Energy Performance, 50% New / 40% Existing	1
	Credit 1.9	Optimize Energy Performance, 55% New / 45% Existing	1
	Credit 1.10	Optimize Energy Performance, 60% New / 50% Existing	1
	Credit 2.1	Renewable Energy, 5%	1
	Credit 2.2	Renewable Energy, 10%	1
	Credit 2.3	Renewable Energy, 15%	1
	Credit 3	Additional Commissioning	1
1	Credit 4	Ozone Depletion	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

4 Materials & Resources — Possible Points: 13

Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
	Credit 1.2	Building Reuse, Maintain 100% of Shell	1
	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Credit 2.1	Construction Waste Management, Divert 50%	1
1	Credit 2.2	Construction Waste Management, Divert 75%	1
	Credit 3.1	Resource Reuse, Specify 5%	1
	Credit 3.2	Resource Reuse, Specify 10%	1
1	Credit 4.1	Recycled Content, Specify 5%	1
1	Credit 4.2	Recycled Content, Specify 10%	1
	Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
	Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Credit 6	Rapidly Renewable Materials	1
	Credit 7	Certified Wood	1

8 Indoor Environmental Quality — Possible Points: 15

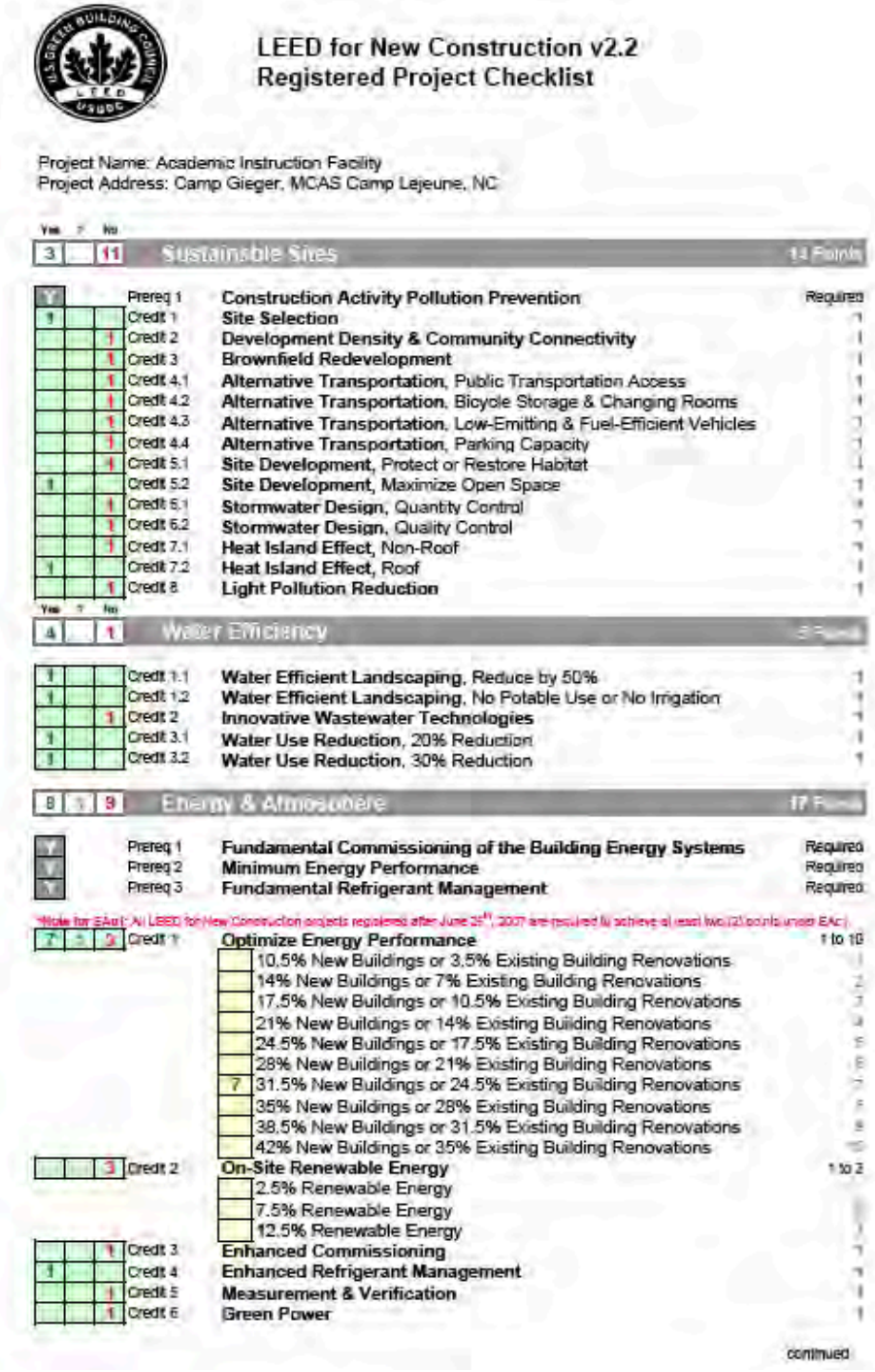
Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
	Credit 1	Carbon Dioxide Monitoring	1
	Credit 2	Ventilation Effectiveness	1
	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints	1
1	Credit 4.3	Low-Emitting Materials, Carpet	1
	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Perimeter	1
1	Credit 6.2	Controllability of Systems, Non-Perimeter	1
1	Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
	Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

2 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design: Exemplary Performance of Alkali	1
	Credit 1.2	Innovation in Design:	1
	Credit 1.3	Innovation in Design:	1
	Credit 1.4	Innovation in Design:	1
1	Credit 2	LEED® Accredited Professional	1

Figure 53 – Camp Lejeune Bachelor Enlisted Quarters LEED Checklist

USMC Base Camp Lejeune Academic Instruction Facility



LEED for New Construction v2.2
Registered Project Checklist

Project Name: Academic Instruction Facility
Project Address: Camp Gieger, MCAS Camp Lejeune, NC

Yes	?	No			
3		11	**Sustainable Sites**		14 Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
1			Credit 1	**Site Selection**	1
		1	Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
		1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
		1	Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles	1
		1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
		1	Credit 5.1	**Site Development**, Protect or Restore Habitat	1
1			Credit 5.2	**Site Development**, Maximize Open Space	1
		1	Credit 6.1	**Stormwater Design**, Quantity Control	1
		1	Credit 6.2	**Stormwater Design**, Quality Control	1
		1	Credit 7.1	**Heat Island Effect**, Non-Roof	1
1			Credit 7.2	**Heat Island Effect**, Roof	1
		1	Credit 8	**Light Pollution Reduction**	1

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

Yes	?	No			
8	1	9	**Energy & Atmosphere**		17 Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
			*Note for EAc1: All LEED for New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1		
7	1	3	Credit 1	**Optimize Energy Performance**	1 to 10
				10.5% New Buildings or 3.5% Existing Building Renovations	1
				14% New Buildings or 7% Existing Building Renovations	2
				17.5% New Buildings or 10.5% Existing Building Renovations	3
				21% New Buildings or 14% Existing Building Renovations	4
				24.5% New Buildings or 17.5% Existing Building Renovations	5
				28% New Buildings or 21% Existing Building Renovations	6
			7	31.5% New Buildings or 24.5% Existing Building Renovations	7
				35% New Buildings or 28% Existing Building Renovations	8
				38.5% New Buildings or 31.5% Existing Building Renovations	9
				42% New Buildings or 35% Existing Building Renovations	10
		3	Credit 2	**On-Site Renewable Energy**	1 to 3
				2.5% Renewable Energy	1
				7.5% Renewable Energy	2
				12.5% Renewable Energy	3
		1	Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
		1	Credit 5	**Measurement & Verification**	1
		1	Credit 6	**Green Power**	1

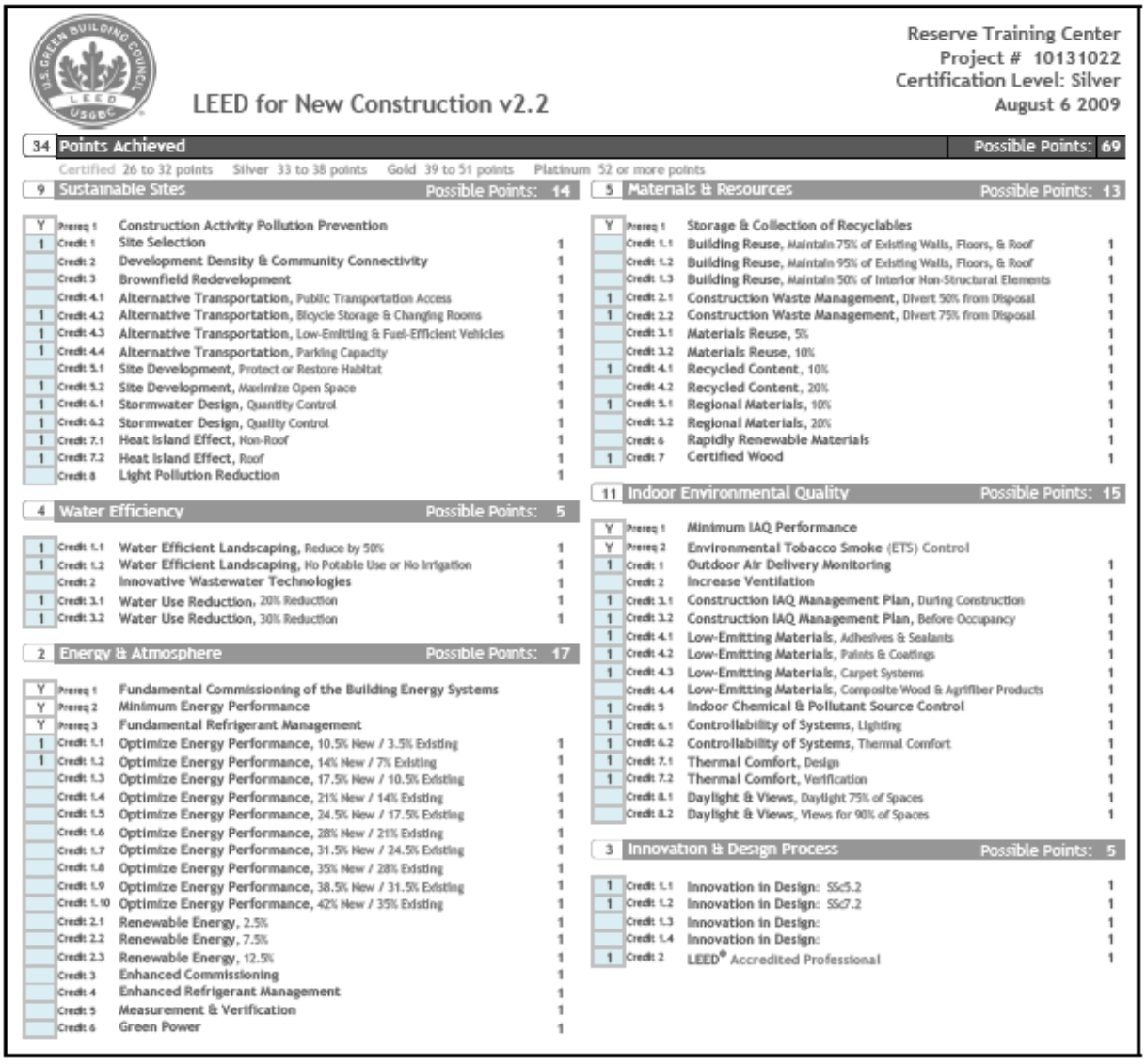
continued

Figure 54 - USMC Base Camp Lejeune Academic Instruction Facility LEED Scoring Sheet

Yes	?	No			
5		9	**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1		1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
		1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1			Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
		1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regio	1
		1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regio	1
		1	Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1
Yes	?	No			
7		8	**Indoor Environmental Quality**		15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
		1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
		1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
		1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
		1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
		1	Credit 7.2	**Thermal Comfort**, Verification	1
		1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
		1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1
Yes	?	No			
1			**Innovation & Design Process**		5 Points
			Credit 1.1	**Innovation in Design**: Provide Specific Title	1
			Credit 1.2	**Innovation in Design**: Provide Specific Title	1
			Credit 1.3	**Innovation in Design**: Provide Specific Title	1
			Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	**LEED® Accredited Professional**	1
Yes	?	No			
28	1	38	**Project Totals** (pre-certification estimates)		69 Points

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 pc

USMC Base Camp Lejeune Reserve Training Center and Vehicle Maintenance Facility



LEED for New Construction v2.2

Reserve Training Center
Project # 10131022
Certification Level: Silver
August 6 2009

34 Points Achieved — Possible Points: 69

Certified 26 to 32 points | Silver 33 to 38 points | Gold 39 to 51 points | Platinum 52 or more points

9 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Construction Activity Pollution Prevention	
1	Credit 1	Site Selection	1
	Credit 2	Development Density & Community Connectivity	1
	Credit 3	Brownfield Redevelopment	1
	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1	Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
1	Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	1
1	Credit 4.4	Alternative Transportation, Parking Capacity	1
	Credit 5.1	Site Development, Protect or Restore Habitat	1
1	Credit 5.2	Site Development, Maximize Open Space	1
1	Credit 6.1	Stormwater Design, Quantity Control	1
1	Credit 6.2	Stormwater Design, Quality Control	1
1	Credit 7.1	Heat Island Effect, Non-Roof	1
1	Credit 7.2	Heat Island Effect, Roof	1
	Credit 8	Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1	Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1	Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 20% Reduction	1
1	Credit 3.2	Water Use Reduction, 30% Reduction	1

2 Energy & Atmosphere — Possible Points: 17

Y	Prereq 1	Fundamental Commissioning of the Building Energy Systems	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	Fundamental Refrigerant Management	
1	Credit 1.1	Optimize Energy Performance, 10.5% New / 3.5% Existing	1
1	Credit 1.2	Optimize Energy Performance, 14% New / 7% Existing	1
	Credit 1.3	Optimize Energy Performance, 17.5% New / 10.5% Existing	1
	Credit 1.4	Optimize Energy Performance, 21% New / 14% Existing	1
	Credit 1.5	Optimize Energy Performance, 24.5% New / 17.5% Existing	1
	Credit 1.6	Optimize Energy Performance, 28% New / 21% Existing	1
	Credit 1.7	Optimize Energy Performance, 31.5% New / 24.5% Existing	1
	Credit 1.8	Optimize Energy Performance, 35% New / 28% Existing	1
	Credit 1.9	Optimize Energy Performance, 38.5% New / 31.5% Existing	1
	Credit 1.10	Optimize Energy Performance, 42% New / 35% Existing	1
	Credit 2.1	Renewable Energy, 2.5%	1
	Credit 2.2	Renewable Energy, 7.5%	1
	Credit 2.3	Renewable Energy, 12.5%	1
	Credit 3	Enhanced Commissioning	1
	Credit 4	Enhanced Refrigerant Management	1
	Credit 5	Measurement & Verification	1
	Credit 6	Green Power	1

5 Materials & Resources — Possible Points: 13

Y	Prereq 1	Storage & Collection of Recyclables	
	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls, Floors, & Roof	1
	Credit 1.2	Building Reuse, Maintain 95% of Existing Walls, Floors, & Roof	1
	Credit 1.3	Building Reuse, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1
1	Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1
	Credit 3.1	Materials Reuse, 5%	1
	Credit 3.2	Materials Reuse, 10%	1
1	Credit 4.1	Recycled Content, 10%	1
	Credit 4.2	Recycled Content, 20%	1
1	Credit 5.1	Regional Materials, 10%	1
	Credit 5.2	Regional Materials, 20%	1
	Credit 6	Rapidly Renewable Materials	1
1	Credit 7	Certified Wood	1

11 Indoor Environmental Quality — Possible Points: 15

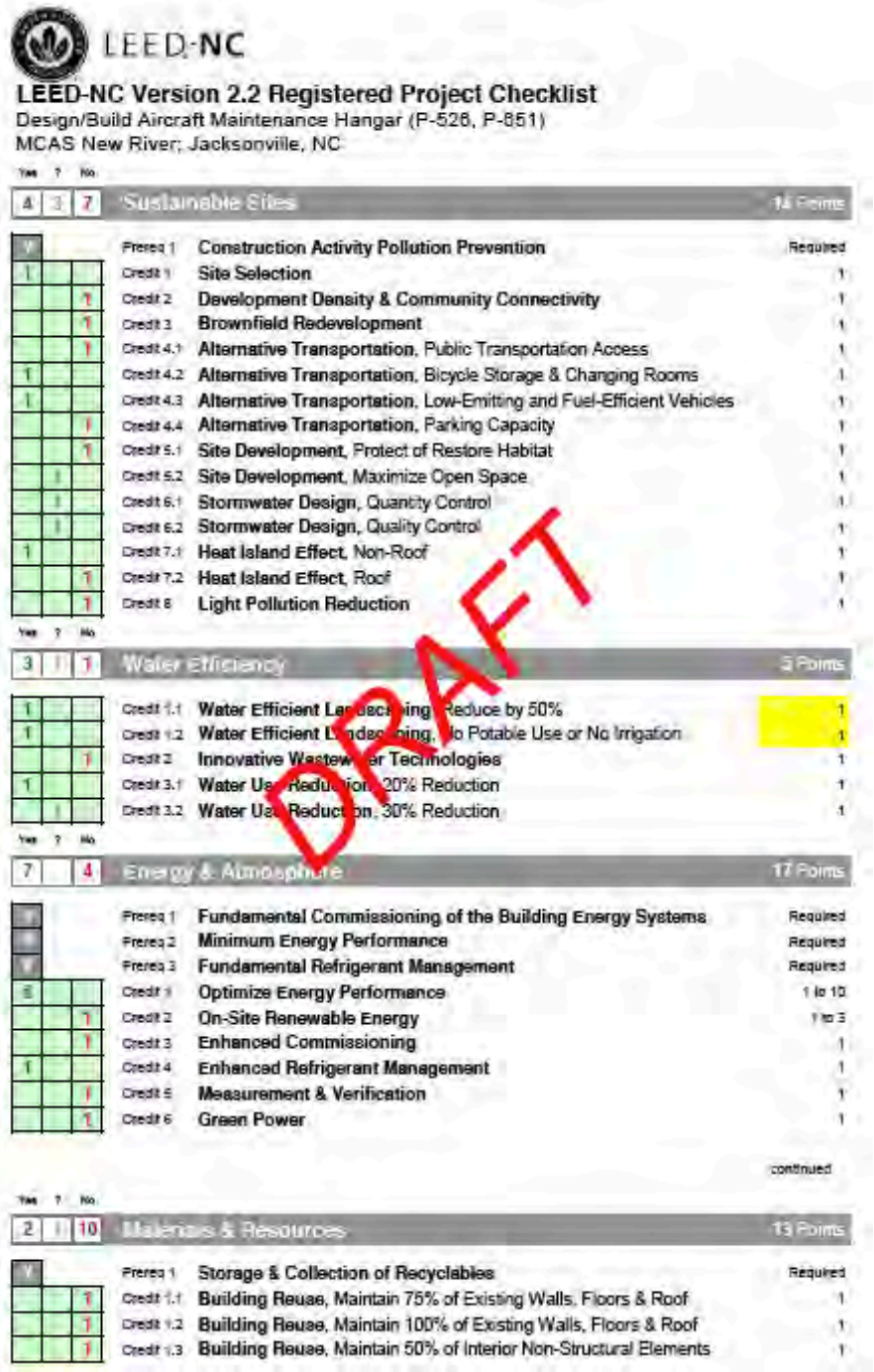
Y	Prereq 1	Minimum IAQ Performance	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1	Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 2	Increase Ventilation	1
1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
1	Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1	Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1	Credit 4.2	Low-Emitting Materials, Paints & Coatings	1
1	Credit 4.3	Low-Emitting Materials, Carpet Systems	1
	Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1	Credit 5	Indoor Chemical & Pollutant Source Control	1
1	Credit 6.1	Controllability of Systems, Lighting	1
1	Credit 6.2	Controllability of Systems, Thermal Comfort	1
1	Credit 7.1	Thermal Comfort, Design	1
1	Credit 7.2	Thermal Comfort, Verification	1
	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

3 Innovation & Design Process — Possible Points: 5

1	Credit 1.1	Innovation in Design: SSc5.2	1
1	Credit 1.2	Innovation in Design: SSc7.2	1
	Credit 1.3	Innovation in Design:	1
	Credit 1.4	Innovation in Design:	1
1	Credit 2	LEED® Accredited Professional	1

Figure 55 - USMC Base Camp Lejeune Reserve Training Center and Vehicle Maintenance Facility LEED Scoring Sheet

USMC Base Camp Lejeune Aircraft Maintenance Hangar



LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

Design/Build Aircraft Maintenance Hangar (P-526, P-851)

MCAS New River; Jacksonville, NC

Yes	?	No			
4	3	7	**Sustainable Sites**		14 Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
1			Credit 1	**Site Selection**	1
		1	Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1			Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
		1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
		1	Credit 5.1	**Site Development**, Protect or Restore Habitat	1
	1		Credit 5.2	**Site Development**, Maximize Open Space	1
	1		Credit 6.1	**Stormwater Design**, Quantity Control	1
	1		Credit 6.2	**Stormwater Design**, Quality Control	1
1			Credit 7.1	**Heat Island Effect**, Non-Roof	1
		1	Credit 7.2	**Heat Island Effect**, Roof	1
		1	Credit 8	**Light Pollution Reduction**	1
Yes	?	No			
3	1	1	**Water Efficiency**		5 Points
1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
		1	Credit 2	**Innovative Wastewater Technologies**	1
1			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	1		Credit 3.2	**Water Use Reduction**, 30% Reduction	1
Yes	?	No			
7		4	**Energy & Atmosphere**		17 Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
5			Credit 1	**Optimize Energy Performance**	1 to 10
		1	Credit 2	**On-Site Renewable Energy**	1 to 3
		1	Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
		1	Credit 5	**Measurement & Verification**	1
		1	Credit 6	**Green Power**	1
					continued
Yes	?	No			
2	1	10	**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1

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Figure 56 - USMC Base Camp Lejeune Aircraft Maintenance Hangar LEED Scoring Sheet

Yes	?	No			
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
		1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
		1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
		1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regiona	1
		1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regiona	1
		1	Credit 6	**Rapidly Renewable Materials**	1
	1		Credit 7	**Certified Wood**	1

Yes	?	No		
9	1	5	**Indoor Environmental Quality**	15 Points

Yes	?	No			
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
		1	Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
		1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
1			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
		1	Credit 7.2	**Thermal Comfort**, Verification	1
		1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	1		Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

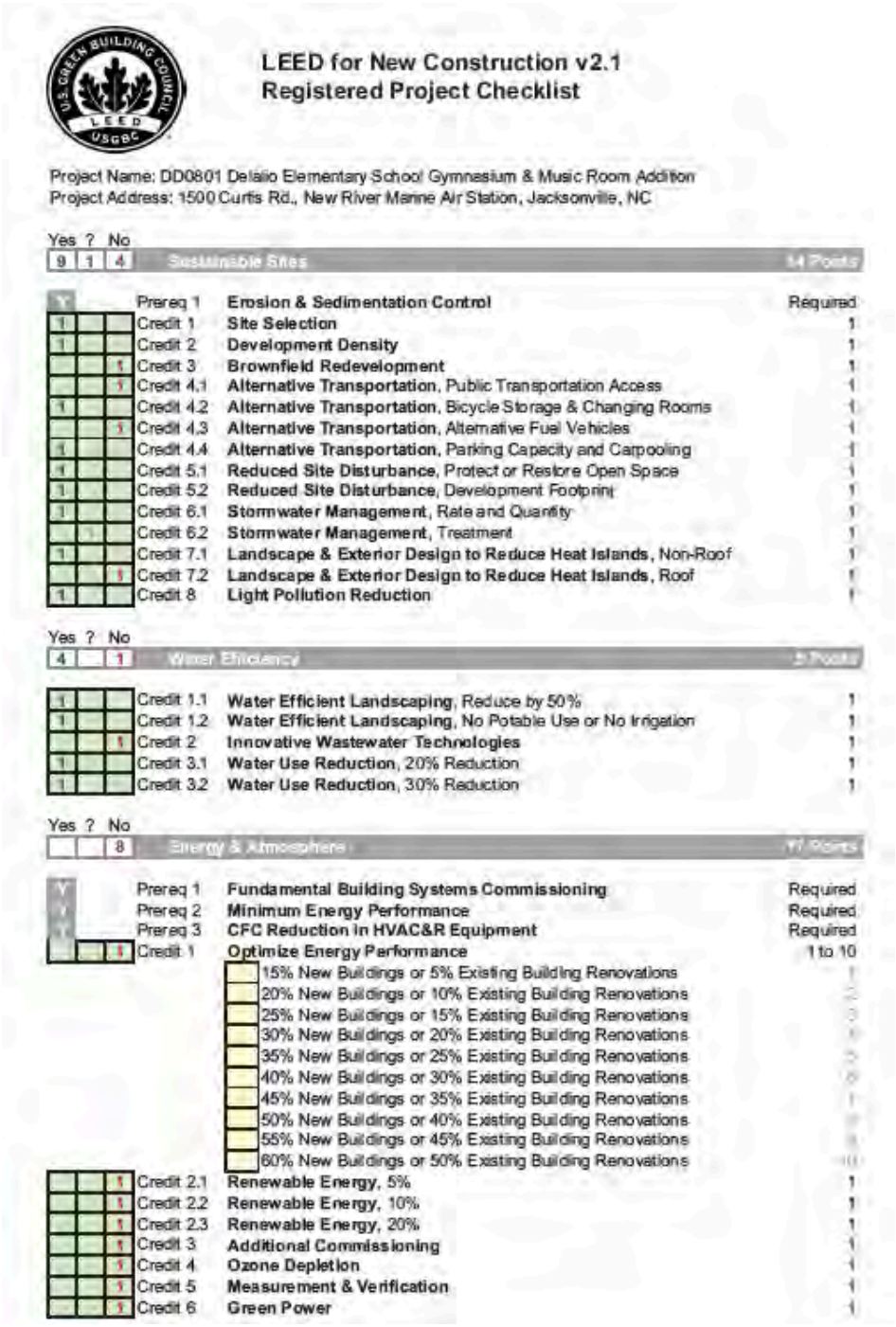
Yes	?	No		
2	3		**Innovation & Design Process**	5 Points

Yes	?	No			
1			Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	1		Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	1		Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	1		Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	**LEED® Accredited Professional**	1

Yes	?	No		
27	9		**Project Totals** (pre-certification estimates)	69 Points

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

USMC Base Camp Lejeune New Gymnasium and Music Room, MCAS



LEED for New Construction v2.1
Registered Project Checklist

Project Name: DD0801 Delalio Elementary School Gymnasium & Music Room Addition
Project Address: 1500 Curtis Rd., New River Marine Air Station, Jacksonville, NC

Yes	?	No			
9	1	4	**Sustainable Sites**		14 Points
Y			Prereq 1	**Erosion & Sedimentation Control**	Required
1			Credit 1	**Site Selection**	1
1			Credit 2	**Development Density**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
		1	Credit 4.3	**Alternative Transportation**, Alternative Fuel Vehicles	1
1			Credit 4.4	**Alternative Transportation**, Parking Capacity and Carpooling	1
1			Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
1			Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
1			Credit 6.1	**Stormwater Management**, Rate and Quantity	1
	1		Credit 6.2	**Stormwater Management**, Treatment	1
1			Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
		1	Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
1			Credit 8	**Light Pollution Reduction**	1

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

Yes	?	No			
		8	**Energy & Atmosphere**		17 Points
Y			Prereq 1	**Fundamental Building Systems Commissioning**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**CFC Reduction in HVAC&R Equipment**	Required
		1	Credit 1	**Optimize Energy Performance**	1 to 10
				15% New Buildings or 5% Existing Building Renovations	1
				20% New Buildings or 10% Existing Building Renovations	2
				25% New Buildings or 15% Existing Building Renovations	3
				30% New Buildings or 20% Existing Building Renovations	4
				35% New Buildings or 25% Existing Building Renovations	5
				40% New Buildings or 30% Existing Building Renovations	6
				45% New Buildings or 35% Existing Building Renovations	7
				50% New Buildings or 40% Existing Building Renovations	8
				55% New Buildings or 45% Existing Building Renovations	9
				60% New Buildings or 50% Existing Building Renovations	10
		1	Credit 2.1	**Renewable Energy**, 5%	1
		1	Credit 2.2	**Renewable Energy**, 10%	1
		1	Credit 2.3	**Renewable Energy**, 20%	1
		1	Credit 3	**Additional Commissioning**	1
		1	Credit 4	**Ozone Depletion**	1
		1	Credit 5	**Measurement & Verification**	1
		1	Credit 6	**Green Power**	1

Figure 57 - USMC Base Camp Lejeune New Gymnasium and Music Room, MCAS LEED Scoring Sheet

Yes	?	No			
3	4	6	**Materials & Resources**		**13** Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1
		1	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
1			Credit 2.1	**Construction Waste Management**, Divert 50%	1
	1		Credit 2.2	**Construction Waste Management**, Divert 75%	1
	1		Credit 3.1	**Resource Reuse**, Specify 5%	1
		1	Credit 3.2	**Resource Reuse**, Specify 10%	1
1			Credit 4.1	**Recycled Content**, Specify 5% (post-consumer + ½ post-industrial)	1
	1		Credit 4.2	**Recycled Content**, Specify 10% (post-consumer + ½ post-industrial)	1
1			Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
	1		Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
		1	Credit 6	**Rapidly Renewable Materials**	1
		1	Credit 7	**Certified Wood**	1

Yes	?	No			
9	5	1	**Indoor Environmental Quality**		**15** Points
Y			Prereq	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	1		Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
		1	Credit 2	**Ventilation Effectiveness**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet	1
	1		Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber	1
	1		Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Perimeter	1
1			Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
	1		Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	1		Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes	?	No			
1		4	**Innovation & Design Process**		**5** Points
		1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	**LEED™ Accredited Professional**	1

Yes	?	No		
26	10	24	**Project Totals (pre-certification estimates)**	**69** Points

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 points

Yes	?	No			
3	4	6	**Materials & Resources**		13 Points

Y					
			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1
		1	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
1			Credit 2.1	**Construction Waste Management**, Divert 50%	1
	1		Credit 2.2	**Construction Waste Management**, Divert 75%	1
	1		Credit 3.1	**Resource Reuse**, Specify 5%	1
		1	Credit 3.2	**Resource Reuse**, Specify 10%	1
1			Credit 4.1	**Recycled Content**, Specify 5% (post-consumer + ½ post-industrial)	1
	1		Credit 4.2	**Recycled Content**, Specify 10% (post-consumer + ½ post-industrial)	1
1			Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
	1		Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
		1	Credit 6	**Rapidly Renewable Materials**	1
		1	Credit 7	**Certified Wood**	1

Yes	?	No			
9	5	1	**Indoor Environmental Quality**		15 Points

Y					
Y			Prereq	**Minimum IAQ Performance**	Required
			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	1		Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
		1	Credit 2	**Ventilation Effectiveness**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet	1
	1		Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber	1
	1		Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Perimeter	1
1			Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
	1		Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	1		Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

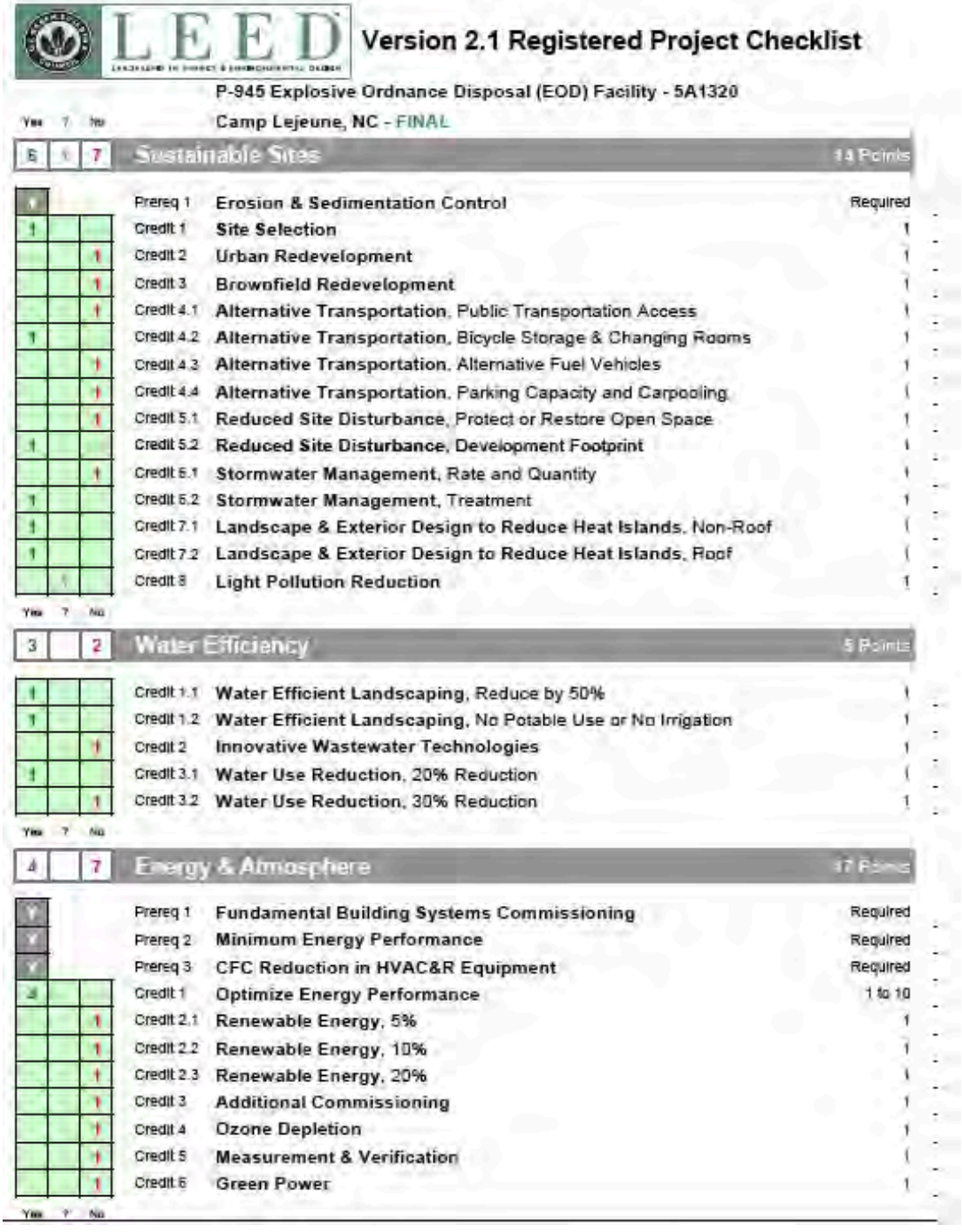
Yes	?	No			
1		4	**Innovation & Design Process**		5 Points

		1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	**LEED™ Accredited Professional**	1

Yes	?	No			
26	10	24	**Project Totals (pre-certification estimates)**		69 Points

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 points

USMC Base Camp Lejeune EOD Operations Facility, MCB



LEED Version 2.1 Registered Project Checklist

P-945 Explosive Ordnance Disposal (EOD) Facility - 5A1320

Camp Lejeune, NC - FINAL

Yes	?	No			
6	1	7	**Sustainable Sites**		14 Points
Y			Prereq 1	Erosion & Sedimentation Control	Required
1			Credit 1	Site Selection	1
		1	Credit 2	Urban Redevelopment	1
		1	Credit 3	Brownfield Redevelopment	1
		1	Credit 4.1	Alternative Transportation, Public Transportation Access	1
1			Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
		1	Credit 4.3	Alternative Transportation, Alternative Fuel Vehicles	1
		1	Credit 4.4	Alternative Transportation, Parking Capacity and Carpooling	1
		1	Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
1			Credit 5.2	Reduced Site Disturbance, Development Footprint	1
		1	Credit 6.1	Stormwater Management, Rate and Quantity	1
1			Credit 6.2	Stormwater Management, Treatment	1
1			Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1			Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
	1		Credit 8	Light Pollution Reduction	1
Yes	?	No			
3		2	**Water Efficiency**		5 Points
1			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1			Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
		1	Credit 2	Innovative Wastewater Technologies	1
1			Credit 3.1	Water Use Reduction, 20% Reduction	1
		1	Credit 3.2	Water Use Reduction, 30% Reduction	1
Yes	?	No			
4		7	**Energy & Atmosphere**		17 Points
Y			Prereq 1	Fundamental Building Systems Commissioning	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	CFC Reduction in HVAC&R Equipment	Required
3			Credit 1	Optimize Energy Performance	1 to 10
		1	Credit 2.1	Renewable Energy, 5%	1
		1	Credit 2.2	Renewable Energy, 10%	1
		1	Credit 2.3	Renewable Energy, 20%	1
		1	Credit 3	Additional Commissioning	1
		1	Credit 4	Ozone Depletion	1
		1	Credit 5	Measurement & Verification	1
		1	Credit 6	Green Power	1
Yes	?	No			

Figure 58 - USMC Base Camp Lejeune EOD Operations Facility, MCB LEED Scoring Sheet

Materials & Resources — 13 Points

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

Yes 4 ? 3 No 6

Indoor Environmental Quality — 15 Points

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

Yes 7 ? 7 No 1

Innovation & Design Process — 5 Points

Yes	?	No				
	1		Credit 1.1	**Innovation in Design**: LEV/ZEV Parking Spaces	1	
			Credit 1.2	**Innovation in Design**: Provide Specific Title	1	
			Credit 1.3	**Innovation in Design**: Provide Specific Title	1	
			Credit 1.4	**Innovation in Design**: Provide Specific Title	1	
1			Credit 2	**LEED™ Accredited Professional**	1	

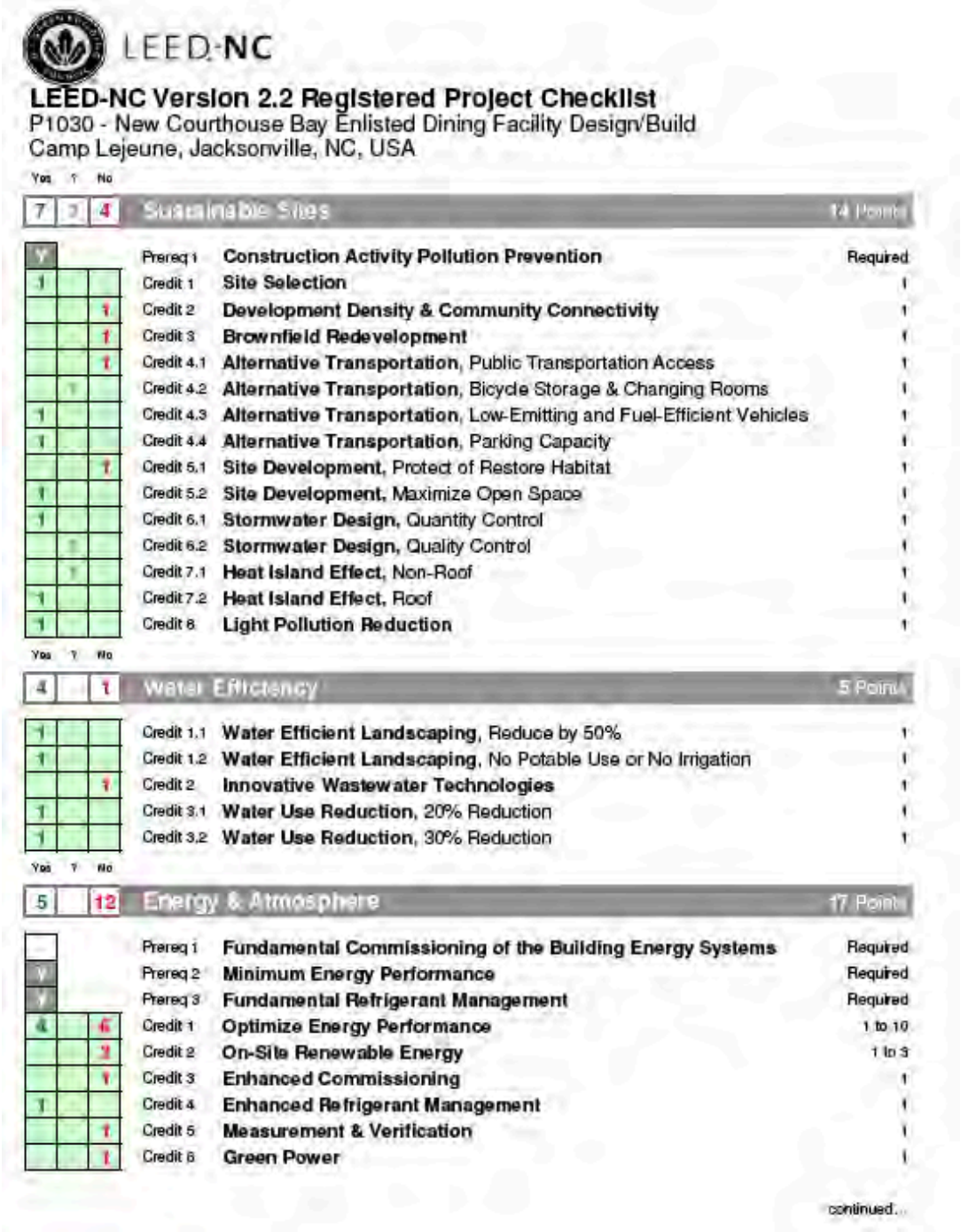
Yes 1 ? 1 No

Project Totals (pre-certification estimates) — 69 Points

25 | 12 | 23

Certified 26-32 points Silver 33-38 points Gold 39-51 points Platinum 52-69 points

USMC Base Camp Lejeune Enlisted Dining Facility



LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

P1030 - New Courthouse Bay Enlisted Dining Facility Design/Build
Camp Lejeune, Jacksonville, NC, USA

Yes	?	No			
7	3	4	**Sustainable Sites**		14 Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
1			Credit 1	**Site Selection**	1
		1	Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	?		Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1			Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1			Credit 4.4	**Alternative Transportation**, Parking Capacity	1
		1	Credit 5.1	**Site Development**, Protect of Restore Habitat	1
1			Credit 5.2	**Site Development**, Maximize Open Space	1
1			Credit 6.1	**Stormwater Design**, Quantity Control	1
	?		Credit 6.2	**Stormwater Design**, Quality Control	1
	?		Credit 7.1	**Heat Island Effect**, Non-Roof	1
1			Credit 7.2	**Heat Island Effect**, Roof	1
1			Credit 8	**Light Pollution Reduction**	1

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

Yes	?	No			
5		12	**Energy & Atmosphere**		17 Points
			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
4		6	Credit 1	**Optimize Energy Performance**	1 to 10
		2	Credit 2	**On-Site Renewable Energy**	1 to 3
		1	Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
		1	Credit 5	**Measurement & Verification**	1
		1	Credit 6	**Green Power**	1

continued...

Figure 59 - USMC Base Camp Lejeune Enlisted Dining Facility LEED Scoring Sheet

Yes	?	No			
3	3	7	**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	1		Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	1		Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regic	1
	1		Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regic	1
		1	Credit 6	**Rapidly Renewable Materials**	1
		1	Credit 7	**Certified Wood**	1

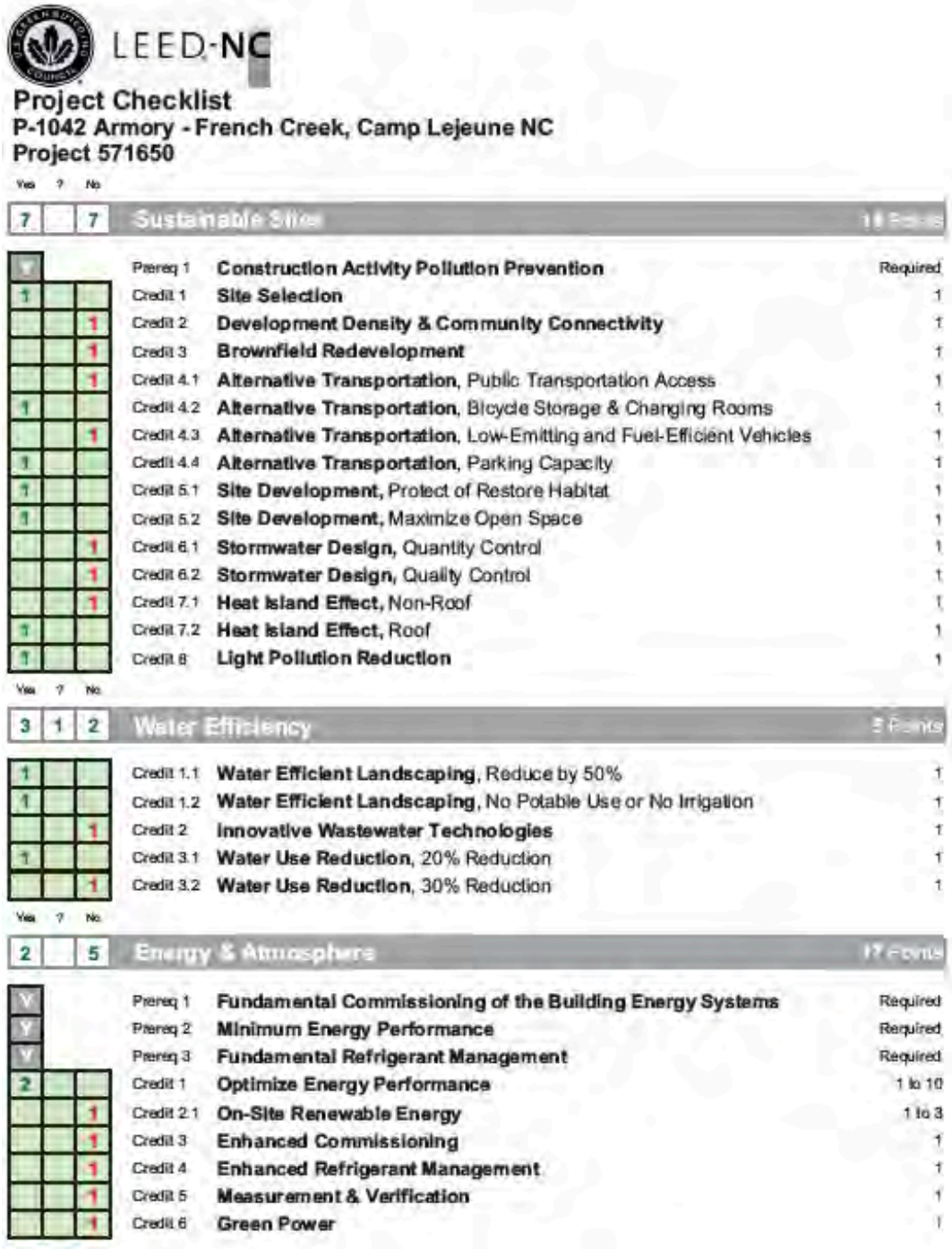
Yes	?	No			
7	1	7	**Indoor Environmental Quality**		15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
		1	Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
		1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
		1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	1		Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
1			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
		1	Credit 7.2	**Thermal Comfort**, Verification	1
		1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
		1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

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

Yes	?	No		
27	10	32	**Project Totals** (pre-certification estimates)	69 Points

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

USMC Base Camp Lejeune Armories II MEF at French Creek



LEED-NC

Project Checklist
P-1042 Armory - French Creek, Camp Lejeune NC
Project 571650

Yes	?	No				
7		7	**Sustainable Sites**			14 Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required	
1			Credit 1	**Site Selection**	1	
		1	Credit 2	**Development Density & Community Connectivity**	1	
		1	Credit 3	**Brownfield Redevelopment**	1	
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1	
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1	
		1	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1	
1			Credit 4.4	**Alternative Transportation**, Parking Capacity	1	
1			Credit 5.1	**Site Development**, Protect of Restore Habitat	1	
1			Credit 5.2	**Site Development**, Maximize Open Space	1	
		1	Credit 6.1	**Stormwater Design**, Quantity Control	1	
		1	Credit 6.2	**Stormwater Design**, Quality Control	1	
		1	Credit 7.1	**Heat Island Effect**, Non-Roof	1	
1			Credit 7.2	**Heat Island Effect**, Roof	1	
1			Credit 8	**Light Pollution Reduction**	1	

Yes	?	No				
3	1	2	**Water Efficiency**			5 Points
1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1	
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1	
		1	Credit 2	**Innovative Wastewater Technologies**	1	
1			Credit 3.1	**Water Use Reduction**, 20% Reduction	1	
		1	Credit 3.2	**Water Use Reduction**, 30% Reduction	1	

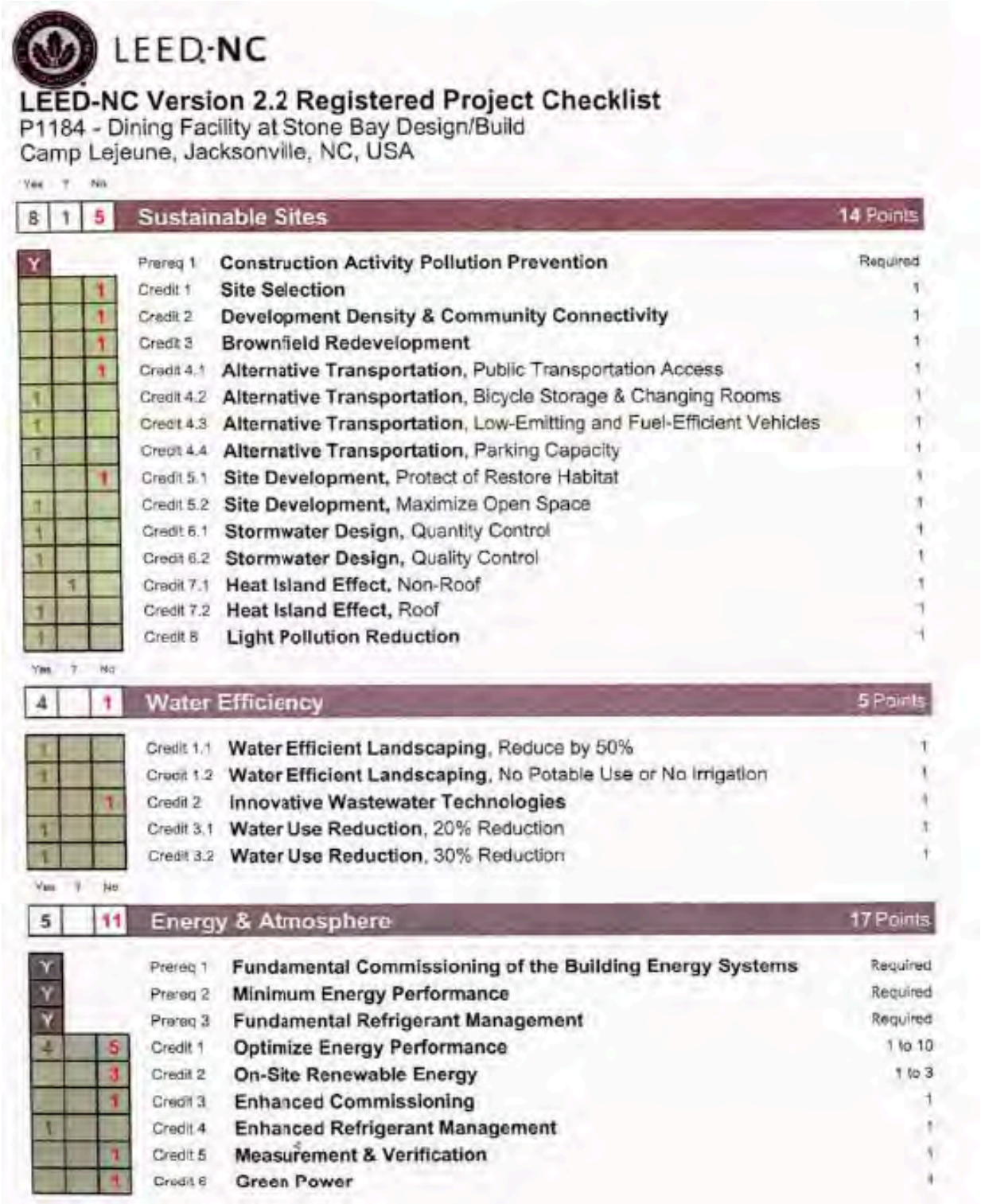
Yes	?	No				
2		5	**Energy & Atmosphere**			17 Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required	
Y			Prereq 2	**Minimum Energy Performance**	Required	
Y			Prereq 3	**Fundamental Refrigerant Management**	Required	
2			Credit 1	**Optimize Energy Performance**	1 to 10	
		1	Credit 2.1	**On-Site Renewable Energy**	1 to 3	
		1	Credit 3	**Enhanced Commissioning**	1	
		1	Credit 4	**Enhanced Refrigerant Management**	1	
		1	Credit 5	**Measurement & Verification**	1	
		1	Credit 6	**Green Power**	1	

Figure 60 - USMC Camp Lejeune Armories II MEF at French Creek LEED Scoring Sheet

Yes	?	No			
4			**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
		1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1			Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regional	1
		1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regional	1
		1	Credit 6	**Rapidly Renewable Materials**	1
		1	Credit 7	**Certified Wood**	1
Yes	?	No			
7		8	**Indoor Environmental Quality**		15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
		1	Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
		1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
		1	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
		1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
		1	Credit 7.2	**Thermal Comfort**, Verification	1
		1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
		1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1
Yes	?	No			
1		4	**Innovation & Design Process**		5 Points
		1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
		1	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	**LEED® Accredited Professional**	1
Yes	?	No			
24	1	26	**Project Totals** (pre-certification estimates)		69 Points

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

USMC Base Camp Lejeune MARSOC Dining Facility



LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

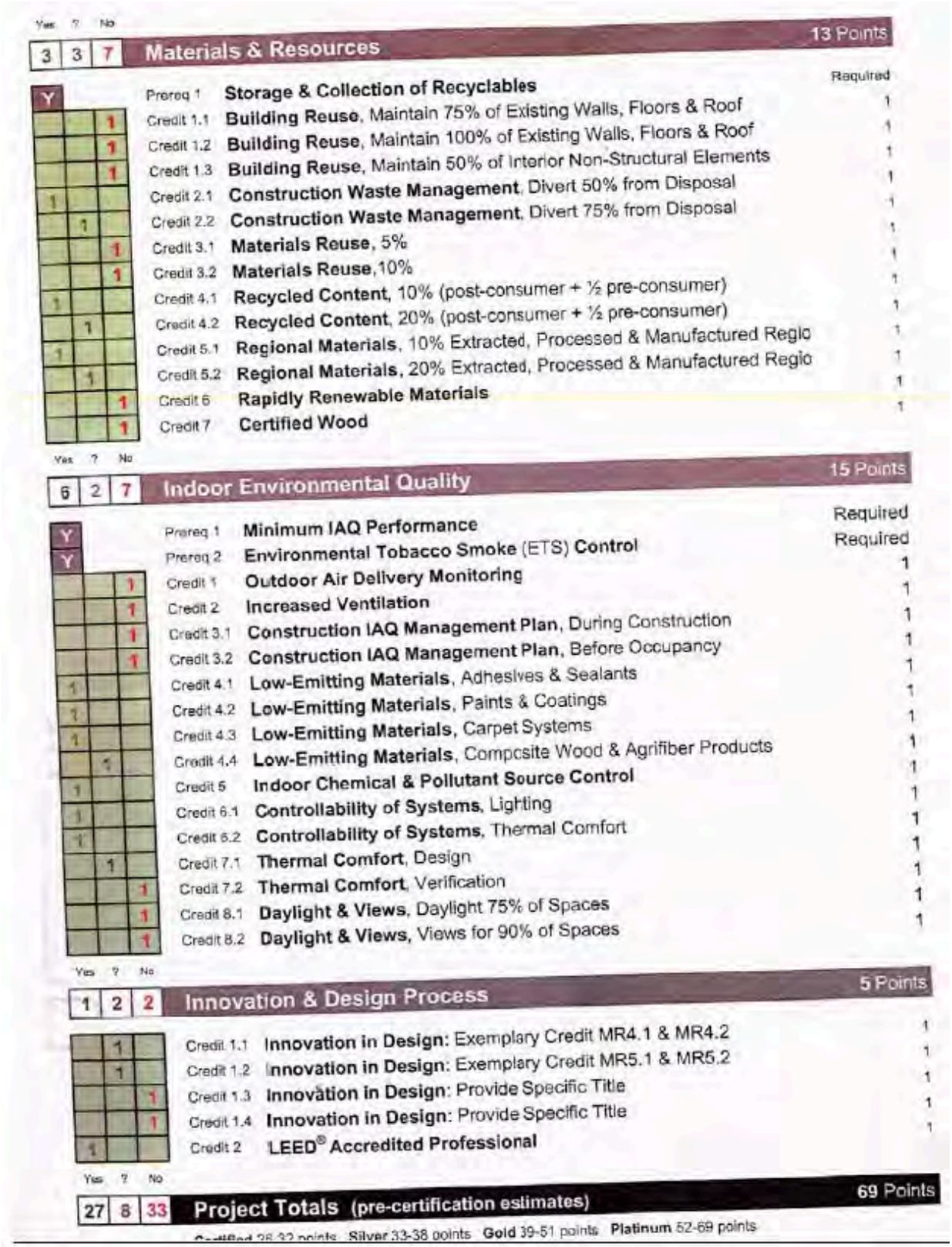
P1184 - Dining Facility at Stone Bay Design/Build
Camp Lejeune, Jacksonville, NC, USA

Yes	?	No		
8	1	5	**Sustainable Sites**	14 Points
Y			Prereq 1 **Construction Activity Pollution Prevention**	Required
		1	Credit 1 **Site Selection**	1
		1	Credit 2 **Development Density & Community Connectivity**	1
		1	Credit 3 **Brownfield Redevelopment**	1
		1	Credit 4.1 **Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2 **Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1			Credit 4.3 **Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1			Credit 4.4 **Alternative Transportation**, Parking Capacity	1
		1	Credit 5.1 **Site Development,** Protect of Restore Habitat	1
1			Credit 5.2 **Site Development,** Maximize Open Space	1
1			Credit 6.1 **Stormwater Design,** Quantity Control	1
1			Credit 6.2 **Stormwater Design,** Quality Control	1
	1		Credit 7.1 **Heat Island Effect,** Non-Roof	1
1			Credit 7.2 **Heat Island Effect,** Roof	1
1			Credit 8 **Light Pollution Reduction**	1

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

Yes	?	No		
5		11	**Energy & Atmosphere**	17 Points
Y			Prereq 1 **Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2 **Minimum Energy Performance**	Required
Y			Prereq 3 **Fundamental Refrigerant Management**	Required
		5	Credit 1 **Optimize Energy Performance**	1 to 10
		3	Credit 2 **On-Site Renewable Energy**	1 to 3
		1	Credit 3 **Enhanced Commissioning**	1
1			Credit 4 **Enhanced Refrigerant Management**	1
		1	Credit 5 **Measurement & Verification**	1
		1	Credit 6 **Green Power**	1

Figure 61 - USMC Base Camp Lejeune MARSOC Dining Facility LEED Scoring Sheet



Yes ? No

3 3 7 **Materials & Resources** 13 Points

			Required
Y	Prereq 1	**Storage & Collection of Recyclables**	
1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regio	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regio	1
1	Credit 6	**Rapidly Renewable Materials**	1
1	Credit 7	**Certified Wood**	1

Yes ? No

6 2 7 **Indoor Environmental Quality** 15 Points

			Required
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes ? No

1 2 2 **Innovation & Design Process** 5 Points

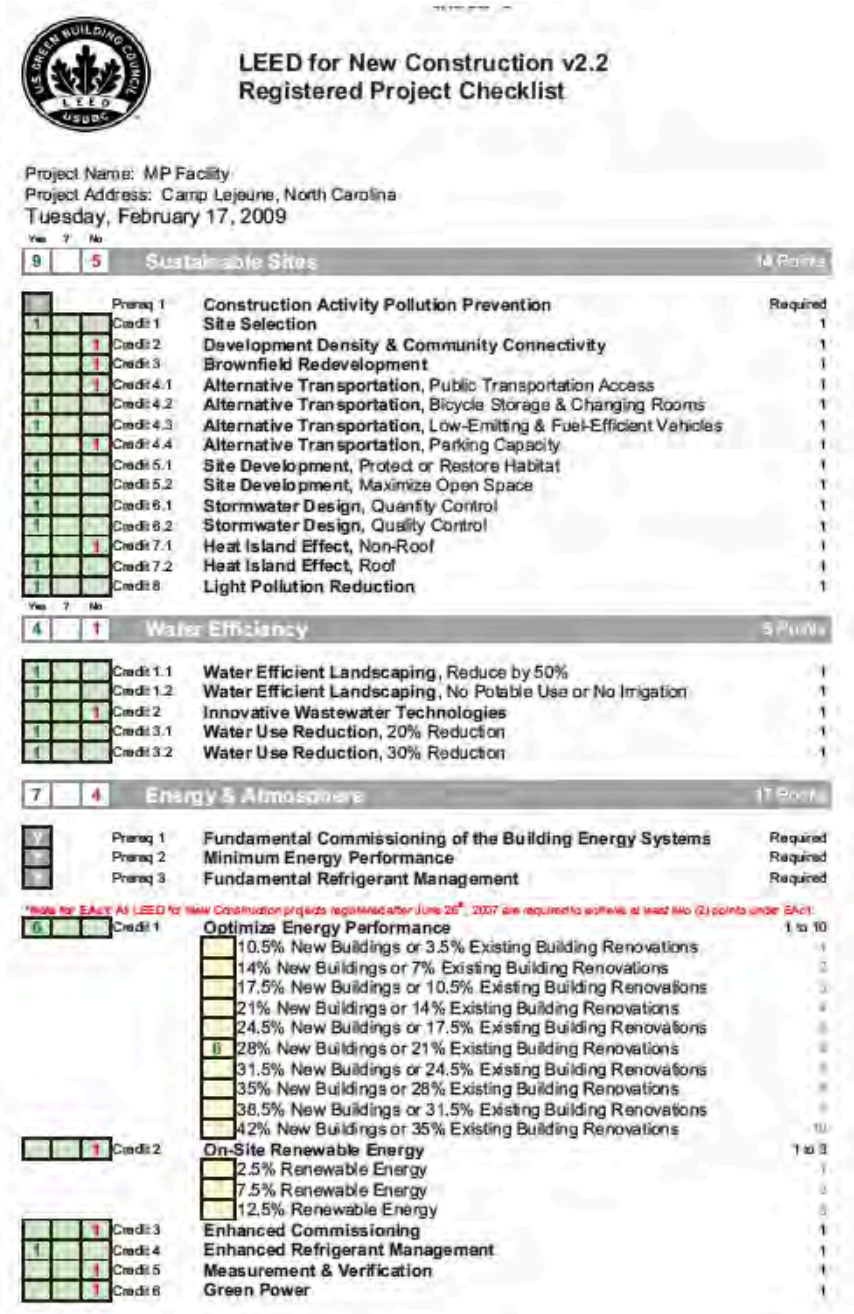
1	Credit 1.1	**Innovation in Design:** Exemplary Credit MR4.1 & MR4.2	1
1	Credit 1.2	**Innovation in Design:** Exemplary Credit MR5.1 & MR5.2	1
1	Credit 1.3	**Innovation in Design:** Provide Specific Title	1
1	Credit 1.4	**Innovation in Design:** Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes ? No

27 8 33 **Project Totals (pre-certification estimates)** 69 Points

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

USMC Base Camp Lejeune MP Company Operations Facility MCB



LEED for New Construction v2.2
Registered Project Checklist

Project Name: MP Facility
Project Address: Camp Lejeune, North Carolina
Tuesday, February 17, 2009

Yes	?	No			
9		5	**Sustainable Sites**		14 Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
1			Credit 1	**Site Selection**	1
		1	Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1			Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles	1
		1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1			Credit 5.1	**Site Development**, Protect or Restore Habitat	1
1			Credit 5.2	**Site Development**, Maximize Open Space	1
1			Credit 6.1	**Stormwater Design**, Quantity Control	1
1			Credit 6.2	**Stormwater Design**, Quality Control	1
		1	Credit 7.1	**Heat Island Effect**, Non-Roof	1
1			Credit 7.2	**Heat Island Effect**, Roof	1
1			Credit 8	**Light Pollution Reduction**	1

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

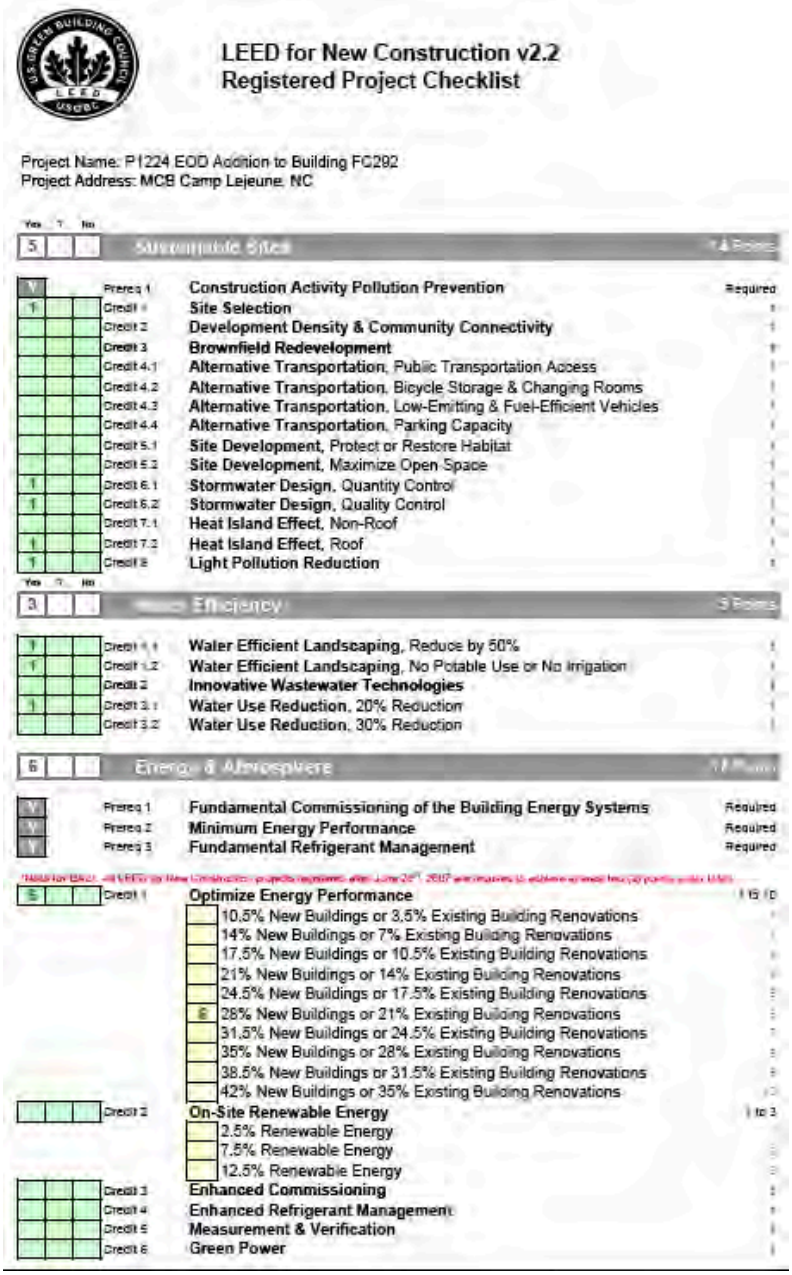
7		4	**Energy & Atmosphere**		17 Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
6			Credit 1	**Optimize Energy Performance**	1 to 10
				10.5% New Buildings or 3.5% Existing Building Renovations	1
				14% New Buildings or 7% Existing Building Renovations	2
				17.5% New Buildings or 10.5% Existing Building Renovations	3
				21% New Buildings or 14% Existing Building Renovations	4
				24.5% New Buildings or 17.5% Existing Building Renovations	5
				28% New Buildings or 21% Existing Building Renovations	6
				31.5% New Buildings or 24.5% Existing Building Renovations	7
				35% New Buildings or 28% Existing Building Renovations	8
				38.5% New Buildings or 31.5% Existing Building Renovations	9
				42% New Buildings or 35% Existing Building Renovations	10
		1	Credit 2	**On-Site Renewable Energy**	1 to 3
				2.5% Renewable Energy	1
				7.5% Renewable Energy	2
				12.5% Renewable Energy	3
		1	Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
		1	Credit 5	**Measurement & Verification**	1
		1	Credit 6	**Green Power**	1

Figure 62 - USMC Camp Lejeune MP Company Operations Facility MCB LEED Scoring Sheet

Yes	?	No			
5	2	6	**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse, Maintain 75% of Existing Walls, Floors & Roof**	1
		1	Credit 1.2	**Building Reuse, Maintain 100% of Existing Walls, Floors & Roof**	1
		1	Credit 1.3	**Building Reuse, Maintain 50% of Interior Non-Structural Elements**	1
1			Credit 2.1	**Construction Waste Management, Divert 50% from Disposal**	1
	1		Credit 2.2	**Construction Waste Management, Divert 75% from Disposal**	1
		1	Credit 3.1	**Materials Reuse, 5%**	1
		1	Credit 3.2	**Materials Reuse,10%**	1
1			Credit 4.1	**Recycled Content, 10% (post-consumer + ½ pre-consumer)**	1
1			Credit 4.2	**Recycled Content, 20% (post-consumer + ½ pre-consumer)**	1
1			Credit 5.1	**Regional Materials, 10% Extracted, Processed & Manufactured Regio**	1
	1		Credit 5.2	**Regional Materials, 20% Extracted, Processed & Manufactured Regio**	1
		1	Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1
Yes	?	No			
7	1	7	**Indoor Environmental Quality**		15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan, During Construction**	1
	1		Credit 3.2	**Construction IAQ Management Plan, Before Occupancy**	1
1			Credit 4.1	**Low-Emitting Materials, Adhesives & Sealants**	1
1			Credit 4.2	**Low-Emitting Materials, Paints & Coatings**	1
1			Credit 4.3	**Low-Emitting Materials, Carpet Systems**	1
1			Credit 4.4	**Low-Emitting Materials, Composite Wood & Agrifiber Products**	1
		1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems, Lighting**	1
		1	Credit 6.2	**Controllability of Systems, Thermal Comfort**	1
		1	Credit 7.1	**Thermal Comfort, Design**	1
		1	Credit 7.2	**Thermal Comfort, Verification**	1
		1	Credit 8.1	**Daylight & Views, Daylight 75% of Spaces**	1
		1	Credit 8.2	**Daylight & Views, Views for 90% of Spaces**	1
Yes	?	No			
3	1	1	**Innovation & Design Process**		5 Points
1			Credit 1.1	**Innovation in Design: Provide Specific Title**	1
1			Credit 1.2	**Innovation in Design: Provide Specific Title**	1
	1		Credit 1.3	**Innovation in Design: Provide Specific Title**	1
		1	Credit 1.4	**Innovation in Design: Provide Specific Title**	1
1			Credit 2	**LEED® Accredited Professional**	1
Yes	?	No			
35	4	24	**Project Totals** (pre-certification estimates)		69 Points

Certified: 26-32 points, Silver: 33-38 points, Gold: 39-51 points, Platinum: 52-69 pc

USMC Base Camp Lejeune EOD Building FC292 Addition



LEED for New Construction v2.2
Registered Project Checklist

Project Name: P1224 EOD Addition to Building FC292
Project Address: MCB Camp Lejeune, NC

Yes	?	No			
5			Sustainable Sites		14 Points
Y			Prereq 1	Construction Activity Pollution Prevention	Required
1			Credit 1	Site Selection	1
			Credit 2	Development Density & Community Connectivity	1
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation, Public Transportation Access	1
			Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
			Credit 4.3	Alternative Transportation, Low-Emitting & Fuel-Efficient Vehicles	1
			Credit 4.4	Alternative Transportation, Parking Capacity	1
			Credit 5.1	Site Development, Protect or Restore Habitat	1
			Credit 5.2	Site Development, Maximize Open Space	1
1			Credit 6.1	Stormwater Design, Quantity Control	1
1			Credit 6.2	Stormwater Design, Quality Control	1
			Credit 7.1	Heat Island Effect, Non-Roof	1
1			Credit 7.2	Heat Island Effect, Roof	1
1			Credit 8	Light Pollution Reduction	1
Yes	?	No			
3			Water Efficiency		5 Points
1			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1			Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
			Credit 2	Innovative Wastewater Technologies	1
1			Credit 3.1	Water Use Reduction, 20% Reduction	1
			Credit 3.2	Water Use Reduction, 30% Reduction	1
6			Energy & Atmosphere		17 Points
Y			Prereq 1	Fundamental Commissioning of the Building Energy Systems	Required
Y			Prereq 2	Minimum Energy Performance	Required
Y			Prereq 3	Fundamental Refrigerant Management	Required
5			Credit 1	Optimize Energy Performance	1 to 10
				10.5% New Buildings or 3.5% Existing Building Renovations	1
				14% New Buildings or 7% Existing Building Renovations	2
				17.5% New Buildings or 10.5% Existing Building Renovations	3
				21% New Buildings or 14% Existing Building Renovations	4
				24.5% New Buildings or 17.5% Existing Building Renovations	5
			X	28% New Buildings or 21% Existing Building Renovations	6
				31.5% New Buildings or 24.5% Existing Building Renovations	7
				35% New Buildings or 28% Existing Building Renovations	8
				38.5% New Buildings or 31.5% Existing Building Renovations	9
				42% New Buildings or 35% Existing Building Renovations	10
			Credit 2	On-Site Renewable Energy	1 to 3
				2.5% Renewable Energy	1
				7.5% Renewable Energy	2
				12.5% Renewable Energy	3
			Credit 3	Enhanced Commissioning	1
			Credit 4	Enhanced Refrigerant Management	1
			Credit 5	Measurement & Verification	1
			Credit 6	Green Power	1

Figure 63 - USMC Base Camp Lejeune EOD Building FC292 Addition LEED Scoring Sheet

Yes	?	No			
7			**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
			Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
			Credit 1.2	**Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof	1
			Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1			Credit 3.1	**Materials Reuse**, 5%	1
			Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
			Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regional	1
1			Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regional	1
1			Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1

Yes	?	No			
7			**Indoor Environmental Quality**		15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
			Credit 1	**Outdoor Air Delivery Monitoring**	1
1			Credit 2	**Increased Ventilation**	1
			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
			Credit 7.2	**Thermal Comfort**, Verification	1
			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

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

Yes	?	No		
29			**Project Totals** (pre-certification estimates)	69 Points

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 points

NAB Little Creek EODSU 10 Ordnance Operations Facility

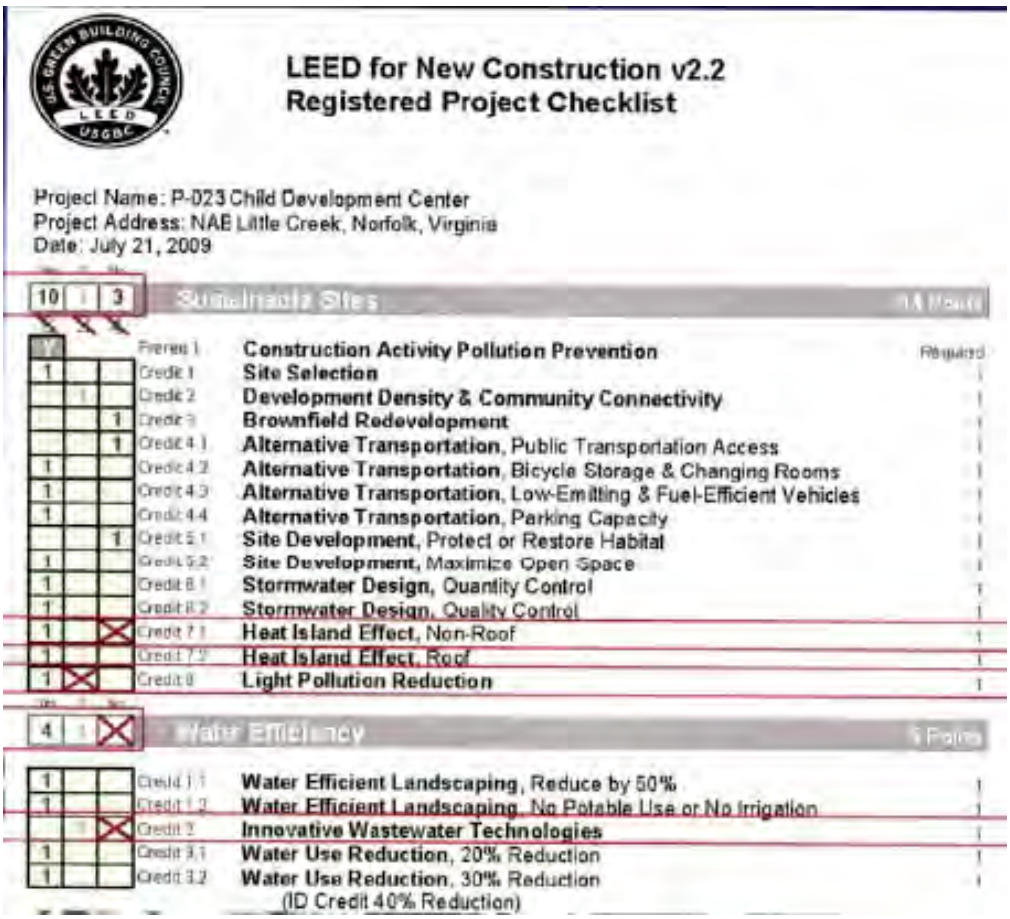
LEED™ Scorecard (Un-Official 2.2 Version)
Leed Administrator: RDB, PE, LEED AP J:\jobs\3047-DB
Proposal EODOSU 10 Ordnance Operation Facilty

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

Y	?	N			Points	Significant Change from LEED-NC v2.1	Design Submittal	Construction Submittal	Owner Decision-Making	Design Team Decision Making	Contractor Decision Making
36	2	27	**Total Project Score**								
6		8	**Sustainable Sites**	Possible Points	14						
Y	?	N									
Y			Prereq 1	Construction Activity Pollution Prevention		*		*		*	*
Y			Credit 1	Site Selection	1		*		*		
		N	Credit 2	Development Density & Community Connectivity	1	*	*		*	*	
		N	Credit 3	Brownfield Redevelopment	1		*		*		
		N	Credit 4.1	Alternative Transportation, Public Transportation Access	1		*		*		
Y			Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1		*		*		
Y			Credit 4.3	Alternative Transportation, Low Emitting & Fuel-Efficient Vehicles	1	*	*		*	*	
Y			Credit 4.4	Alternative Transportation, Parking Capacity	1		*		*	*	
		N	Credit 5.1	Site Development, Protect or Restore Habitat	1			*	*	*	*
		N	Credit 5.2	Site Development, Maximize Open Space	1		*		*	*	
		N	Credit 6.1	Stormwater Management, Quantity Control	1	*	*			*	
		N	Credit 6.2	Stormwater Management, Quality Control	1	*	*			*	
		N	Credit 7.1	Heat Island Effect, Non-Roof	1	*		*		*	*
Y			Credit 7.2	Heat Island Effect, Roof	1	*	*			*	*
Y			Credit 8	Light Pollution Reduction	1	*	*			*	
4		1	**Water Efficiency**	Possible Points	5						
Y	?	N									
Y			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1	*	*			*	
Y			Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1		*		*	*	
		N	Credit 2	Innovative Wastewater Technologies	1		*			*	
Y			Credit 3.1	Water Use Reduction, 20% Reduction	1		*			*	
Y			Credit 3.2	Water Use Reduction, 30% Reduction	1		*			*	
7		4	**Energy & Atmosphere**	Possible Points	17						
Y	?	N									
Y			Prereq 1	Fundamental Commissioning of the Building Energy Systems		*		*	*	*	*
Y			Prereq 2	Minimum Energy Performance		*	*			*	
Y			Prereq 3	Fundamental Refrigerant Management			*		*		
6			Credit 1	Optimize Energy Performance	1-10	*	*			*	
		N	Credit 2	On Site Renewable Energy	1-3	*	*			*	
		N	Credit 3	Enhanced Commissioning	1	*			*	*	*
Y			Credit 4	Enhanced Refrigerant Management	1	*	*			*	
		N	Credit 5	Measurement & Verification	1	*		*		*	
		N	Credit 6	Green Power	1	*		*	*		
4	2	7	**Materials & Resources**	Possible Points	13						
Y	?	N									
Y			Prereq 1	Storage & Collection of Recyclables			*		*	*	
		N	Credit 1.1	Building Reuse, Maintain 75% of Existing Walls,Floors and Roof	1			*	*	*	
		N	Credit 1.2	Building Reuse, Maintain 100% of Existing Walls,Floors and Roof	1			*	*	*	
		N	Credit 1.3	Building Reuse, Maintain 50% Interior Non-Structural Elements	1	*		*	*	*	
Y			Credit 2.1	Construction Waste Management, Divert 50% from Disposal	1			*			*
	?		Credit 2.2	Construction Waste Management, Divert 75% from Disposal	1			*			*
		N	Credit 3.1	Materials Reuse, 5%	1			*		*	*
		N	Credit 3.2	Materials Reuse, 10%	1			*		*	*
Y			Credit 4.1	Recycled Content, 10% (post consumer + 1/2 pre-consumer)	1	*		*		*	*
	?		Credit 4.2	Recycled Content, 20% (post consumer + 1/2 pre-consumer)	1	*		*		*	*
Y			Credit 5.1	Regional Materials, 10% Extracted,Processed & Manufactured Regionally	1	*		*		*	*
		N	Credit 5.2	Regional Materials, 20% Extracted,Processed & Manufactured Regionally	1	*		*		*	*
		N	Credit 6	Rapidly Renewable Materials	1			*		*	*
Y			Credit 7	Certified Wood	1			*		*	*
11		4	**Indoor Environmental Quality**	Possible Points	15						
Y	?	N									
Y			Prereq 1	Minimum IAQ Performance		*	*			*	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control			*		*	*	
Y			Credit 1	Outdoor Air Delivery Monitoring	1	*	*			*	
		N	Credit 2	Increased Ventilation	1	*	*			*	
Y			Credit 3.1	Construction IAQ Management Plan, During Construction	1	*		*			*
Y			Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1	*		*			*
Y			Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1			*		*	*
Y			Credit 4.2	Low-Emitting Materials, Paints & Coatings	1			*		*	*
Y			Credit 4.3	Low-Emitting Materials, Carpet Systems	1	*		*		*	
Y			Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	1			*		*	*
Y			Credit 5	Indoor Chemical & Pollutant Source Control	1	*	*			*	
Y			Credit 6.1	Controllability of Systems, Lighting	1	*	*			*	
Y			Credit 6.2	Controllability of Systems, Thermal Comfort	1	*	*			*	
Y			Credit 7.1	Thermal Comfort, Design	1	*	*			*	
		N	Credit 7.2	Thermal Comfort, Verification	1	*	*		*	*	
		N	Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1	*	*			*	
		N	Credit 8.2	Daylight & Views, Views for 90% of Spaces	1	*	*			*	
3		3	**Innovation & Design Process**	Possible Points	5						
Y	?	N									
		N	Credit 1.1	Innovation in Design: Green Housekeeping	1		*	*	*	*	*
Y		N	Credit 1.2	Innovation in Design: Water Use Reduction of 40%	1		*	*	*	*	*
Y			Credit 1.3	Innovation in Design: green educational building	1		*	*	*	*	*
		N	Credit 1.4	Innovation in Design: Provide Specific Title	1		*	*	*	*	*
Y			Credit 2	LEED™ Accredited Professional	1			*	*	*	*

Figure 64 - NAB Little Creek EODSU 10 Ordinance Operations Facility LEED Scoring Sheet

NAB Little Creek Child Development Center

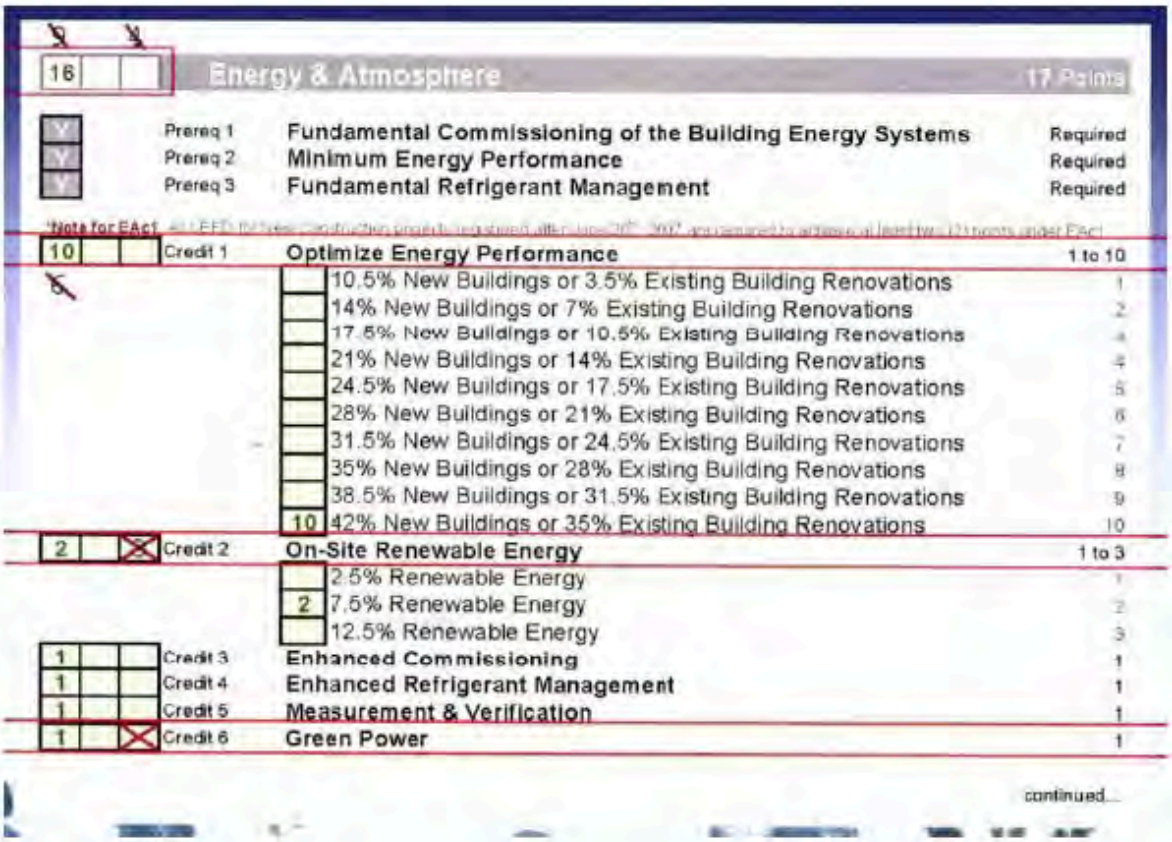


LEED for New Construction v2.2
Registered Project Checklist

Project Name: P-023 Child Development Center
Project Address: NAB Little Creek, Norfolk, Virginia
Date: July 21, 2009

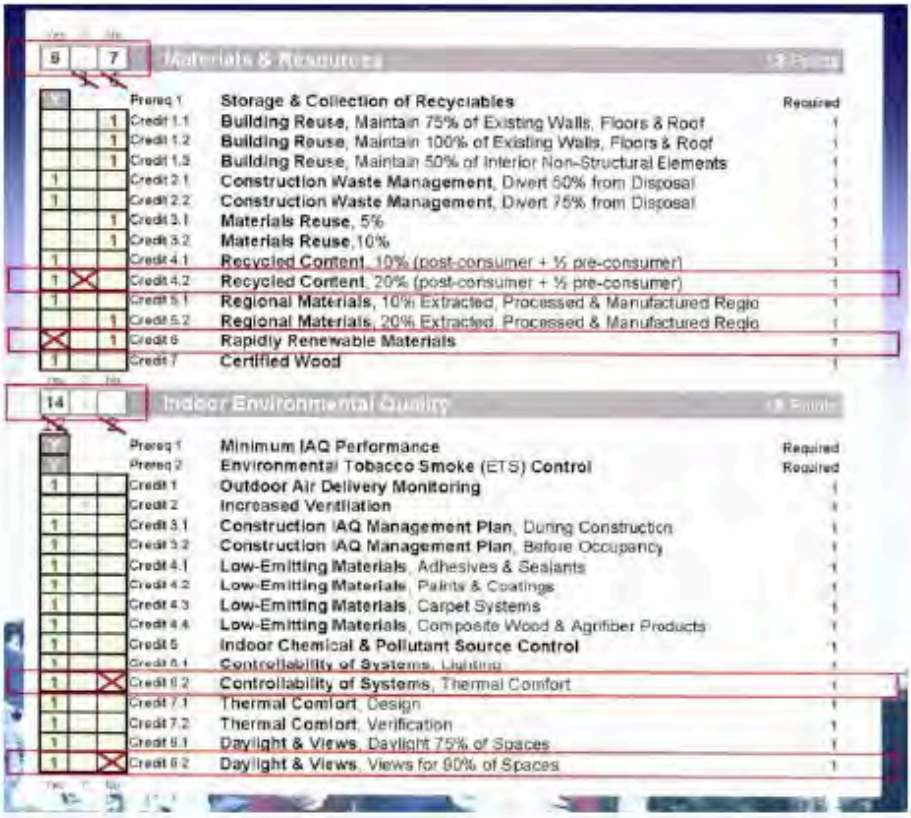
10		3	Sustainable Sites	14 Points
Y				
1			Prereq 1	**Construction Activity Pollution Prevention**
1			Credit 1	**Site Selection**
	1		Credit 2	**Development Density & Community Connectivity**
		1	Credit 3	**Brownfield Redevelopment**
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms
1			Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles
1			Credit 4.4	**Alternative Transportation**, Parking Capacity
		1	Credit 5.1	**Site Development**, Protect or Restore Habitat
1			Credit 5.2	**Site Development**, Maximize Open Space
1			Credit 6.1	**Stormwater Design**, Quantity Control
1			Credit 6.2	**Stormwater Design**, Quality Control
1		X	Credit 7.1	**Heat Island Effect**, Non-Roof
1			Credit 7.2	**Heat Island Effect**, Roof
1	X		Credit 8	**Light Pollution Reduction**
4	1	X	Water Efficiency	5 Points
1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation
	1	X	Credit 2	**Innovative Wastewater Technologies**
1			Credit 3.1	**Water Use Reduction**, 20% Reduction
1			Credit 3.2	**Water Use Reduction**, 30% Reduction (ID Credit 40% Reduction)

Figure 65 - NAB Little Creek Child Development Center LEED Scoring Sheet



16			**Energy & Atmosphere**		17 Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
				Note for EAc1: All EEB (New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1	
10			Credit 1	**Optimize Energy Performance**	1 to 10
				10.5% New Buildings or 3.5% Existing Building Renovations	1
				14% New Buildings or 7% Existing Building Renovations	2
				17.5% New Buildings or 10.5% Existing Building Renovations	3
				21% New Buildings or 14% Existing Building Renovations	4
				24.5% New Buildings or 17.5% Existing Building Renovations	5
				28% New Buildings or 21% Existing Building Renovations	6
				31.5% New Buildings or 24.5% Existing Building Renovations	7
				35% New Buildings or 28% Existing Building Renovations	8
				38.5% New Buildings or 31.5% Existing Building Renovations	9
			10	42% New Buildings or 35% Existing Building Renovations	10
2		X	Credit 2	**On-Site Renewable Energy**	1 to 3
				2.5% Renewable Energy	1
			2	7.5% Renewable Energy	2
				12.5% Renewable Energy	3
1			Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
1			Credit 5	**Measurement & Verification**	1
1		X	Credit 6	**Green Power**	1

continued...



8		7	**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	X		Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regio	1
		1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regio	1
X		1	Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1
14			**Indoor Environmental Quality**		15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
			Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
1	X		Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
1			Credit 7.2	**Thermal Comfort**, Verification	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	X		Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

3	?	1	**Innovation & Design Process**	5 Points
			Credit 1.1 **Innovation in Design**: SS7.2 Heat Island Effect - Non-Roof 100%	1
1			Credit 1.2 **Innovation in Design**: MR2 Construction Waste Management 95%	1
1			Credit 1.3 **Innovation in Design (WE 3 - 40% Reduction)**	1
		1	Credit 1.4 **Innovation in Design**	1
1			Credit 2 **LEED® Accredited Professional**	1

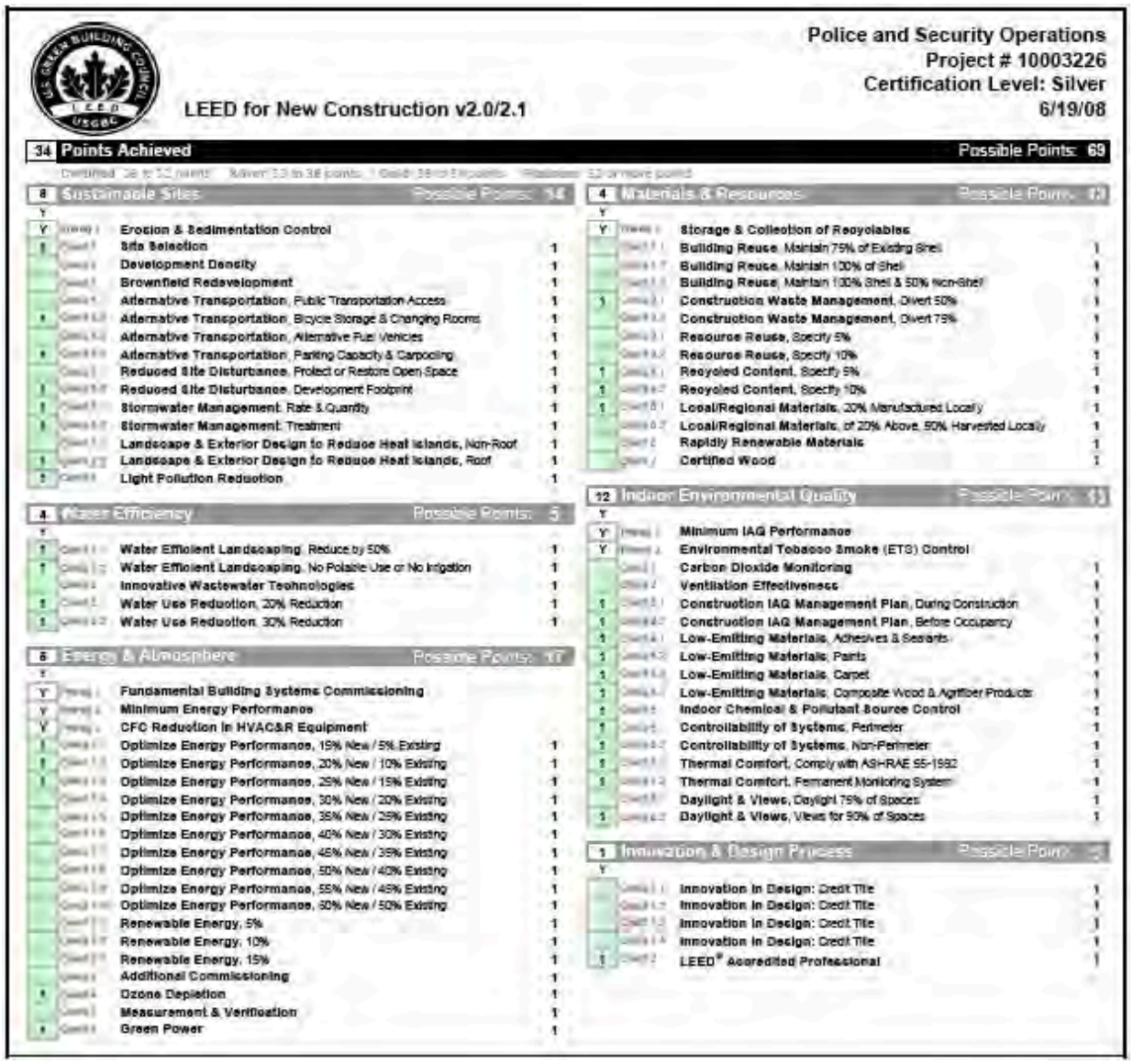
Yes	?	No	
40		28	**Project Totals (pre-certification estimates)** 69 Points

Certified: 26-32 points, **Silver**: 33-38 points, **Gold**: 39-51 points, **Platinum**: 52-69 points

Yes	?	No	
53	4	11	**Project Totals (pre-certification estimates)** 69 Points

Certified: 26-32 points, **Silver**: 33-38 points, **Gold**: 39-51 points, **Platinum**: 52-69 points

NAB Little Creek Police and Security Operations



Police and Security Operations
Project # 10003226
Certification Level: Silver
6/19/08

LEED for New Construction v2.0/2.1

34 Points Achieved — Possible Points: 69

8 Sustainable Sites — Possible Points: 14

Y	Erosion & Sedimentation Control	
1	Site Selection	1
	Development Density	1
	Brownfield Redevelopment	1
	Alternative Transportation, Public Transportation Access	1
1	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Alternative Transportation, Alternative Fuel Vehicles	1
1	Alternative Transportation, Parking Capacity & Carpooling	1
	Reduced Site Disturbance, Protect or Restore Open Space	1
1	Reduced Site Disturbance, Development Footprint	1
1	Stormwater Management, Rate & Quantity	1
1	Stormwater Management, Treatment	1
	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
1	Light Pollution Reduction	1

4 Water Efficiency — Possible Points: 5

1	Water Efficient Landscaping, Reduce by 50%	1
1	Water Efficient Landscaping, No Potable Use or No Irrigation	1
	Innovative Wastewater Technologies	1
1	Water Use Reduction, 20% Reduction	1
1	Water Use Reduction, 30% Reduction	1

6 Energy & Atmosphere — Possible Points: 17

Y	Fundamental Building Systems Commissioning	
Y	Minimum Energy Performance	
Y	CFC Reduction in HVAC&R Equipment	
1	Optimize Energy Performance, 15% New / 5% Existing	1
1	Optimize Energy Performance, 20% New / 10% Existing	1
1	Optimize Energy Performance, 25% New / 15% Existing	1
	Optimize Energy Performance, 30% New / 20% Existing	1
	Optimize Energy Performance, 35% New / 25% Existing	1
	Optimize Energy Performance, 40% New / 30% Existing	1
	Optimize Energy Performance, 45% New / 35% Existing	1
	Optimize Energy Performance, 50% New / 40% Existing	1
	Optimize Energy Performance, 55% New / 45% Existing	1
	Optimize Energy Performance, 60% New / 50% Existing	1
	Renewable Energy, 5%	1
	Renewable Energy, 10%	1
	Renewable Energy, 15%	1
	Additional Commissioning	1
1	Ozone Depletion	1
	Measurement & Verification	1
1	Green Power	1

4 Materials & Resources — Possible Points: 13

Y	Storage & Collection of Recyclables	
	Building Reuse, Maintain 75% of Existing Shell	1
	Building Reuse, Maintain 100% of Shell	1
	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1	Construction Waste Management, Divert 50%	1
	Construction Waste Management, Divert 75%	1
	Resource Reuse, Specify 5%	1
	Resource Reuse, Specify 10%	1
1	Recycled Content, Specify 5%	1
1	Recycled Content, Specify 10%	1
1	Local/Regional Materials, 20% Manufactured Locally	1
	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	Rapidly Renewable Materials	1
	Certified Wood	1

12 Indoor Environmental Quality — Possible Points: 15

Y	Minimum IAQ Performance	
Y	Environmental Tobacco Smoke (ETS) Control	
	Carbon Dioxide Monitoring	1
	Ventilation Effectiveness	1
1	Construction IAQ Management Plan, During Construction	1
1	Construction IAQ Management Plan, Before Occupancy	1
1	Low-Emitting Materials, Adhesives & Sealants	1
1	Low-Emitting Materials, Paints	1
1	Low-Emitting Materials, Carpet	1
1	Low-Emitting Materials, Composite Wood & Agrifiber Products	1
1	Indoor Chemical & Pollutant Source Control	1
1	Controllability of Systems, Perimeter	1
1	Controllability of Systems, Non-Perimeter	1
1	Thermal Comfort, Comply with ASHRAE 55-1992	1
1	Thermal Comfort, Permanent Monitoring System	1
	Daylight & Views, Daylight 75% of Spaces	1
1	Daylight & Views, Views for 90% of Spaces	1

5 Innovation & Design Process — Possible Points: 5

	Innovation in Design: Credit Title	1
	Innovation in Design: Credit Title	1
	Innovation in Design: Credit Title	1
	Innovation in Design: Credit Title	1
1	LEED® Accredited Professional	1

Figure 66 - NAB Little Creek Police and Security Operations LEED Scoring Sheet

NAB Little Creek SOF Operations Facility

Project Name: P-471 SOF Operations Facility, Bldg 3842

Project Address: NAB Little Creek, Norfolk, Virginia

Date: July 2, 2009

Yes	?	No			
7	0	7		**Sustainable Sites**	14 Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
		1	Credit 1	**Site Selection**	1
		1	Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1			Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles	1
1			Credit 4.4	**Alternative Transportation**, Parking Capacity	1
		1	Credit 5.1	**Site Development,** Protect or Restore Habitat	1
		1	Credit 5.2	**Site Development,** Maximize Open Space	1
1			Credit 6.1	**Stormwater Design,** Quantity Control	1
1			Credit 6.2	**Stormwater Design,** Quality Control	1
		1	Credit 7.1	**Heat Island Effect,** Non-Roof	1
1			Credit 7.2	**Heat Island Effect,** Roof	1
1			Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
4	0	1		**Water Efficiency**	5 Points
1			Credit 1.1	**Water Efficient Landscaping,** Reduce by 50%	1
1			Credit 1.2	**Water Efficient Landscaping,** No Potable Use or No Irrigation	1
		1	Credit 2	**Innovative Wastewater Technologies**	1
1			Credit 3.1	**Water Use Reduction,** 20% Reduction	1
1			Credit 3.2	**Water Use Reduction,** 30% Reduction	1

5	1	11		**Energy & Atmosphere**	17 Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
4		6	Credit 1	**Optimize Energy Performance**	1 to 10
					1
					2
					3
				4	4
					5
					6
					7
					8
					9
					10
		3	Credit 2	**On-Site Renewable Energy**	1 to 3
					1
					2

Figure 67 - NAB Little Creek SOF Operations Facility LEED Scoring Sheet

					3
		1	Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
		1	Credit 5	**Measurement & Verification**	1
	1		Credit 6	**Green Power**	1

continued

Yes	?	No			
5	2	6		**Materials & Resources**	13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	1		Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Region	1
	1		Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Region	1
		1	Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1

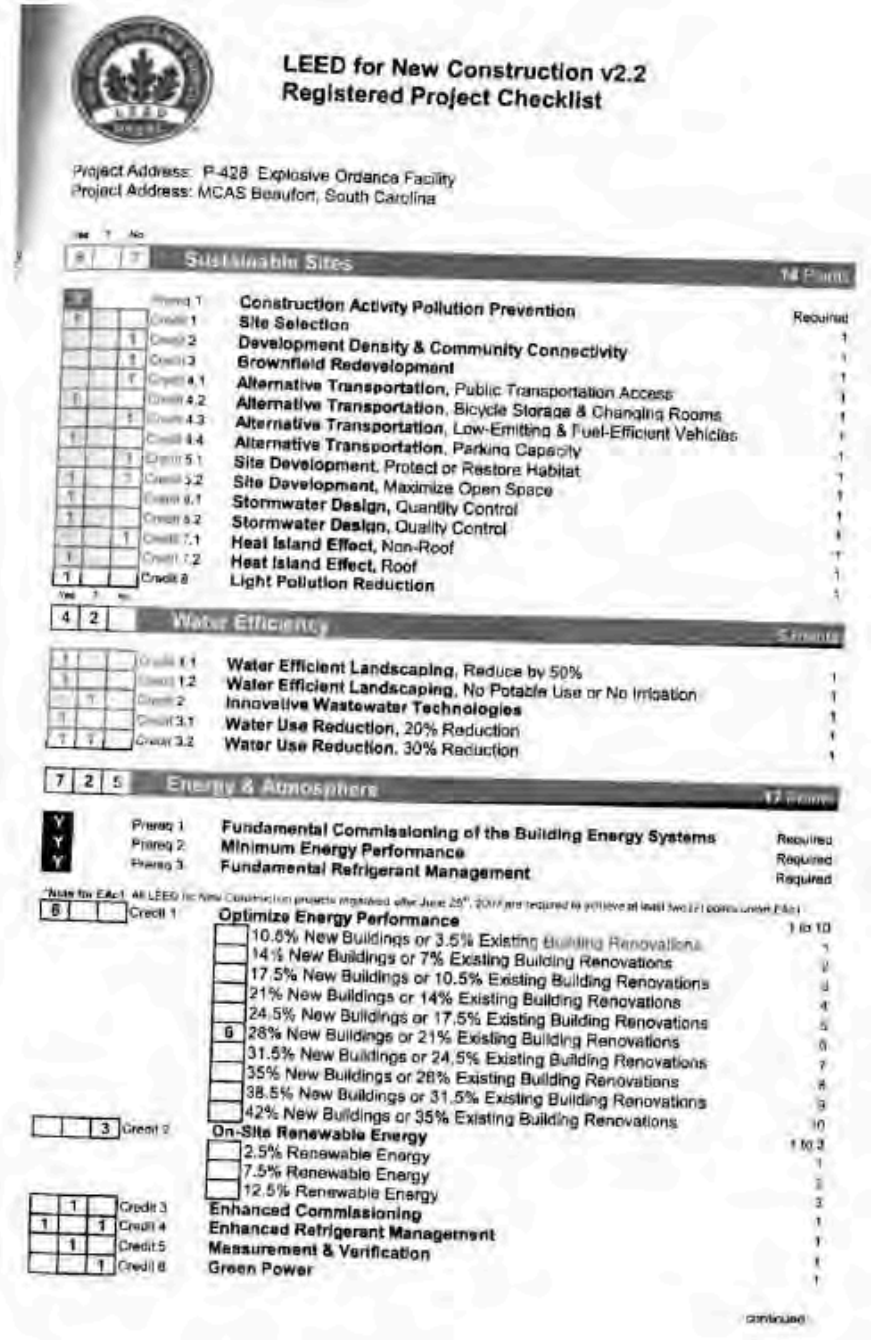
Yes	?	No			
11	1	3		**Indoor Environmental Quality**	15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
1			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
	1		Credit 7.2	**Thermal Comfort**, Verification	1
		1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
		1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes	?	No			
3	1	1		**Innovation & Design Process**	5 Points
1			Credit 1.1	**Innovation in Design**: UV IN AIR HANDLERS	1
1			Credit 1.2	**Innovation in Design**: GREEN CLEANING PROGRAM	1
	1		Credit 1.3	**Innovation in Design**: EXEMP PERFORMANCE > MRc7 - 95%	1
		1	Credit 1.4	**Innovation in Design**:	1
1			Credit 2	**LEED® Accredited Professional**	1

Yes	?	No		
35	5	29	**Project Totals** (pre-certification estimates)	69 Points

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 points

MCAS Beaufort Explosive Ordnance Facility



LEED for New Construction v2.2
Registered Project Checklist

Project Address: P-428 Explosive Ordance Facility
Project Address: MCAS Beaufort, South Carolina

Sustainable Sites — 14 Points

Y			Prereq 1	**Construction Activity Pollution Prevention** — Required
1			Credit 1	**Site Selection** — 1
		1	Credit 2	**Development Density & Community Connectivity** — 1
		1	Credit 3	**Brownfield Redevelopment** — 1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access — 1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms — 1
		1	Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles — 1
1			Credit 4.4	**Alternative Transportation**, Parking Capacity — 1
		1	Credit 5.1	**Site Development**, Protect or Restore Habitat — 1
1			Credit 5.2	**Site Development**, Maximize Open Space — 1
1			Credit 6.1	**Stormwater Design**, Quantity Control — 1
1			Credit 6.2	**Stormwater Design**, Quality Control — 1
		1	Credit 7.1	**Heat Island Effect**, Non-Roof — 1
1			Credit 7.2	**Heat Island Effect**, Roof — 1
1			Credit 8	**Light Pollution Reduction** — 1

Water Efficiency — 5 Points

1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50% — 1
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation — 1
	1		Credit 2	**Innovative Wastewater Technologies** — 1
1			Credit 3.1	**Water Use Reduction**, 20% Reduction — 1
1	1		Credit 3.2	**Water Use Reduction**, 30% Reduction — 1

Energy & Atmosphere — 17 Points

Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems** — Required
Y			Prereq 2	**Minimum Energy Performance** — Required
Y			Prereq 3	**Fundamental Refrigerant Management** — Required

*Note for EAc1: All LEED for New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1.

6			Credit 1	**Optimize Energy Performance** — 1 to 10
				☐ 10.5% New Buildings or 3.5% Existing Building Renovations — 1
				☐ 14% New Buildings or 7% Existing Building Renovations — 2
				☐ 17.5% New Buildings or 10.5% Existing Building Renovations — 3
				☐ 21% New Buildings or 14% Existing Building Renovations — 4
				☐ 24.5% New Buildings or 17.5% Existing Building Renovations — 5
				☒ 28% New Buildings or 21% Existing Building Renovations — 6
				☐ 31.5% New Buildings or 24.5% Existing Building Renovations — 7
				☐ 35% New Buildings or 28% Existing Building Renovations — 8
				☐ 38.5% New Buildings or 31.5% Existing Building Renovations — 9
				☐ 42% New Buildings or 35% Existing Building Renovations — 10
		3	Credit 2	**On-Site Renewable Energy** — 1 to 3
				☐ 2.5% Renewable Energy — 1
				☐ 7.5% Renewable Energy — 2
				☐ 12.5% Renewable Energy — 3
	1		Credit 3	**Enhanced Commissioning** — 1
1		1	Credit 4	**Enhanced Refrigerant Management** — 1
	1		Credit 5	**Measurement & Verification** — 1
		1	Credit 6	**Green Power** — 1

(continued)

Figure 68 - MCAS Beaufort Explosive Ordance Facility LEED Scoring Sheet

Materials & Resources — 13 Points

Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	1		Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	1		Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	Regional Materials, 10% Extracted, Processed & Manufactured Regio	1
	1		Credit 5.2	Regional Materials, 20% Extracted, Processed & Manufactured Regio	1
		1	Credit 6	Rapidly Renewable **Materials**	1
		1	Credit 7	**Certified Wood**	1

Indoor Environmental Quality — 15 Points

Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	1		Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
		1	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems**, Lighting	1
		1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
	1		Credit 7.2	**Thermal Comfort**, Verification	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	1		Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Innovation & Design Process — 5 Points

1			Credit 1.1	**Innovation in Design**: Provide Specific Title	1
			Credit 1.2	**Innovation in Design**: Provide Specific Title	1
			Credit 1.3	**Innovation in Design**: Provide Specific Title	1
			Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1			Credit 2	LEED® Accredited Professional	1

Project Totals (pre-certification estimates) — 69 Points

23	10	22

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, ***Platinum:*** 52-69 po

MCAS Beaufort Enlisted Dining Facility

LEED®-NC v2.2 Checklist Worksheet - COMPLETION STATUS

VOA

Project Name: Dining Facility
Date: April 1, 2009

		Points			Documentation									
		Attempt	Verify	Confirmed	Form	Reviewed	Sent	Returned	Checked	Complete	Primary Responsibility	Remarks/ Tasks
Sustainable Sites														
Prereq 1	Construction Activity Pollution Prevention		Req'd	Req'd	Req'd	SSP1							Civil	Prerequisite Template Completed. Documentation submitted to LEED Online
Credit 1	Site Selection		1		1	SSC1							Civil	Point Template Completed. Documentation submitted to LEED-Online
Credit 2	Development Density & Community Connectivity		1		1	SSC2								Point Template Completed. Documentation submitted to LEED-Online
Credit 3	Brownfield Redevelopment		1		1	SSC3								Point Template Completed. Documentation submitted to LEED-Online
Credit 4.1	Alternative Transportation: Public Transportation Access		1			SSC41								Will not pursue this point.
Credit 4.2	Alternative Transportation: Bicycle Storage & Changing Rooms		1		1	SSC42								Point Template Completed. Documentation submitted to LEED-Online
Credit 4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles		1		1	SSC43								Point Template Completed. Documentation submitted to LEED-Online
Credit 4.4	Alternative Transportation: Parking Capacity		1		1	SSC44								Point Template Completed. Documentation submitted to LEED-Online
Credit 5.1	Site Development: Protect or Restore Habitat		1			SSC51								Will not pursue this point.
Credit 5.2	Site Development: Maximize Open Space		1		1	SSC52								Point Template Completed. Documentation submitted to LEED-Online
Credit 6.1	Stormwater Design: Quantity Control		1		1	SSC61							Civil	Point Template Completed. Documentation submitted to LEED-Online
Credit 6.2	Stormwater Design: Quality Control		1		1	SSC62							Civil	Point Template Completed. Documentation submitted to LEED-Online
Credit 7.1	Heat Island Effect: Non-Roof		1			SSC71								Will not pursue this point.
Credit 7.2	Heat Island Effect: Roof		1			SSC72								Will not pursue this point.
Credit 8	Light Pollution Reduction		1			SSC8								Will not pursue this point.
		Subtotal	14	0	5									
Water Efficiency														
Credit 1.1 and 1.2	Water Efficient Landscaping: Reduce by 50% or 100% (No Potable Water Use or No Irrigation) 50% = 1 pt, 100% = 2 pts		2		2	WEC1						X	Landscape	Point Template Completed. Documentation submitted to LEED-Online
Credit 2	Innovative Wastewater Technologies		1			WEC2								Will not pursue this point.
Credit 3.1 and 3.2	Water Use Reduction: 20% or 30% Reduction 20% = 1 point, 30% = 2 pts		2			WEC3	X	W						Will not pursue this point.
		Subtotal	5	0	2									
Energy & Atmosphere														
Prereq 1	Fundamental Commissioning of the Building Energy Systems		Req'd	Req'd	Req'd	EAP1							Mechanical	Prerequisite Template Complete. Documentation submitted to LEED-Online
Prereq 2	Minimum Energy Performance		Req'd	Req'd	Req'd	EAP2							Mechanical	Prerequisite Template Complete. Documentation submitted to LEED-Online
Prereq 3	Fundamental Refrigerant Management		Req'd	Req'd	Req'd	EAP3							Mechanical	Prerequisite Template Complete. Documentation submitted to LEED-Online
Credit 1.1 through 1.10	Optimize Energy Performance (various) 1 New building: 10.5% = 1 pt, 14% = 2 pts, 17.5% = 3 pts, 21% = 4 pts, 24.5% = 5 pts, 28% = 6 pts, 31.5% = 7 pts, 35% = 8 pts, 38.5% = 9 pts, 42% = 10 pts Existing building: 3.5% = 1 pt, 7% = 2 pts, 10.5% = 3 pts, 14% = 4 pts, 17.5% = 5 pts, 21% = 6 pts, 24.5% = 7 pts, 28% = 8 pts, 31.5% = 9 pts, 35% = 10 pts		10		9	EAC1							Mechanical	Point Template Completed. Documentation submitted to LEED-Online
Credit 2.1 through 2.3	On-Site Renewable Energy: 2.5%, 7.5% or 12.5% 2.5% = 1 pt, 7.5% = 2 pts, 12.5% = 3 pts		3			EAC2								Will not pursue this point.
Credit 3	Enhanced Commissioning		1			EAC3								Will not pursue this point.
Credit 4	Enhanced Refrigerant Management		1			EAC4								Will not pursue this point.
Credit 5	Measurement & Verification		1			EAC5								Will not pursue this point.
Credit 6	Green Power		1											Will not pursue this point.
		Subtotal	17	0	9									
Materials & Resources														
Prereq 1	Storage & Collection of Recyclables		Req'd	Req'd	Req'd	MRP1							Architect/ Owner	Prerequisite Template Complete. Documentation submitted to LEED-Online
Credit 1.1 and 1.2	Building Reuse: Maintain 75% or 95% of Existing Walls, Floors & Roof 75% = 1 point, 95% = 2 pts		2			MRC11								Will not pursue this point.
Credit 1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements		1			MRC13								Will not pursue this point.

Figure 69 - MCAS Beaufort Enlisted Dining Facility LEED Scoring Sheet

VOA

LEED®-NC v2.2 Checklist Worksheet - COMPLETION STATUS

Project Name: Dining Facility
Date: April. 1. 2009

			Points:			Documentation:							
			Available	Pending	Confirmed	Form	Completed	Filed	Returned	Checked	Complete	Primary Responsibility	Remarks/ Tasks
Credit 2.1 and 2.2 Constr.	**Construction Waste Management** Divert 50% or 75% From Disposal 50% = 1 point, 75% = 2 pts		2			MRC2	X						Will not pursue this point.
Credit 5.1 and 5.2 Constr.	**Materials Reuse**, 5% or 10% 5% = 1 point, 10% = 2 points		2										Will not pursue this point.
Credit 4.1 and 4.2 Constr.	**Recycled Content**, 10% or 20% (post-c + 1/2 pre-c) 10% = 1 point, 20% = 2 pts		2		1	MRC4	X					Contractor	Point Template Completed. Documentation submitted to LEED-Online
Credit 5.1 and 5.2 Constr.	**Regional Materials**, 10% or 20% Extracted, Processed & Manufactured Regionally 10% = 1 point, 20% = 2 points		2		1	MRC5	X					Contractor	Point Template Completed. Documentation submitted to LEED-Online
Credit 6 Constr.	**Rapidly Renewable Materials**		1			MRC6							Will not pursue this point.
Credit 7 Constr.	**Certified Wood**		1			MRC7							Will not pursue this point.
		Subtotal	13	0	2								

Indoor Environmental Quality

Prereq 1 Design	**Minimum IAQ Performance**		Prereq	Prereq	Prereq	EQP1						Mechanical	Prerequisite Template Complete. Documentation submitted to LEED-Online.
Prereq 2 Design	**Environmental Tobacco Smoke (ETS) Control**		Prereq	Prereq	Prereq	EQP2						Owner	Prerequisite Template Complete. Documentation submitted to LEED-Online.
Credit 1 Design	**Outdoor Air Delivery Monitoring**		1			EQC1							Will not pursue this point.
Credit 2 Design	**Increased Ventilation**		1			EQC2							Will not pursue this point.
Credit 3.1 Constr.	**Construction IAQ Management Plan:** During Construction		1			EQC31							Will not pursue this point.
Credit 3.2 Constr.	**Construction IAQ Management Plan:** Before Occupancy		1		1	EQC32							Point Template Completed. Documentation submitted to LEED-Online
Credit 4.1 Constr.	**Low-Emitting Materials:** Adhesives & Sealants		1		1	EQC41	X					Contractor	Point Template Completed. Documentation submitted to LEED-Online
Credit 4.2 Constr.	**Low-Emitting Materials:** Paints & Coatings		1		1	EQC42						Contractor	Point Template Completed. Documentation submitted to LEED-Online
Credit 4.3 Constr.	**Low-Emitting Materials:** Carpet Systems		1		1	EQC43						Contractor	Point Template Completed. Documentation submitted to LEED-Online
Credit 4.4 Constr.	**Low-Emitting Materials:** Composite Wood & Agrifiber Products		1		1	EQC44						Contractor	Point Template Completed. Documentation submitted to LEED-Online
Credit 5 Design (Constr.)	**Indoor Chemical & Pollutant Source Control**		1			EQC5							Will not pursue this point.
Credit 6.1 Design	**Controllability of Systems:** Lighting		1			EQC61						Electrical	Will not pursue this point.
Credit 6.2 Design	**Controllability of Systems:** Thermal Comfort		1		1	EQC62							Point Template Completed. Documentation submitted to LEED-Online
Credit 7.1 Design	**Thermal Comfort:** Design		1		1	EQC71						Mechanical	Point Template Completed. Documentation submitted to LEED-Online
Credit 7.2 Design	**Thermal Comfort:** Verification		1			EQC72						Mechanical	Will not pursue this point.
Credit 8.1 Design	**Daylight & Views:** Daylight 75% of Spaces		1			EQC81							Will not pursue this point.
Credit 8.2 Design	**Daylight & Views:** Views for 90% of Spaces		1			EQC82						Architect	Will not pursue this point.
		Subtotal	15	0	7								

Innovation & Design Process

Credit 1.1	**Innovation in Design:**		1			IDC11							Will not pursue this point.
Credit 1.2	**Innovation in Design:**		1			IDC12							Will not pursue this point.
Credit 1.3	**Innovation in Design:**		1			IDC13							Will not pursue this point.
Credit 1.4	**Innovation in Design:**		1			IDC14							Will not pursue this point.
Credit 2 Constr.	**LEED Accredited Professional**		1		1	IDC2						Architect	Point Template Completed. Documentation submitted to LEED-Online
		Subtotal	5	0	1								

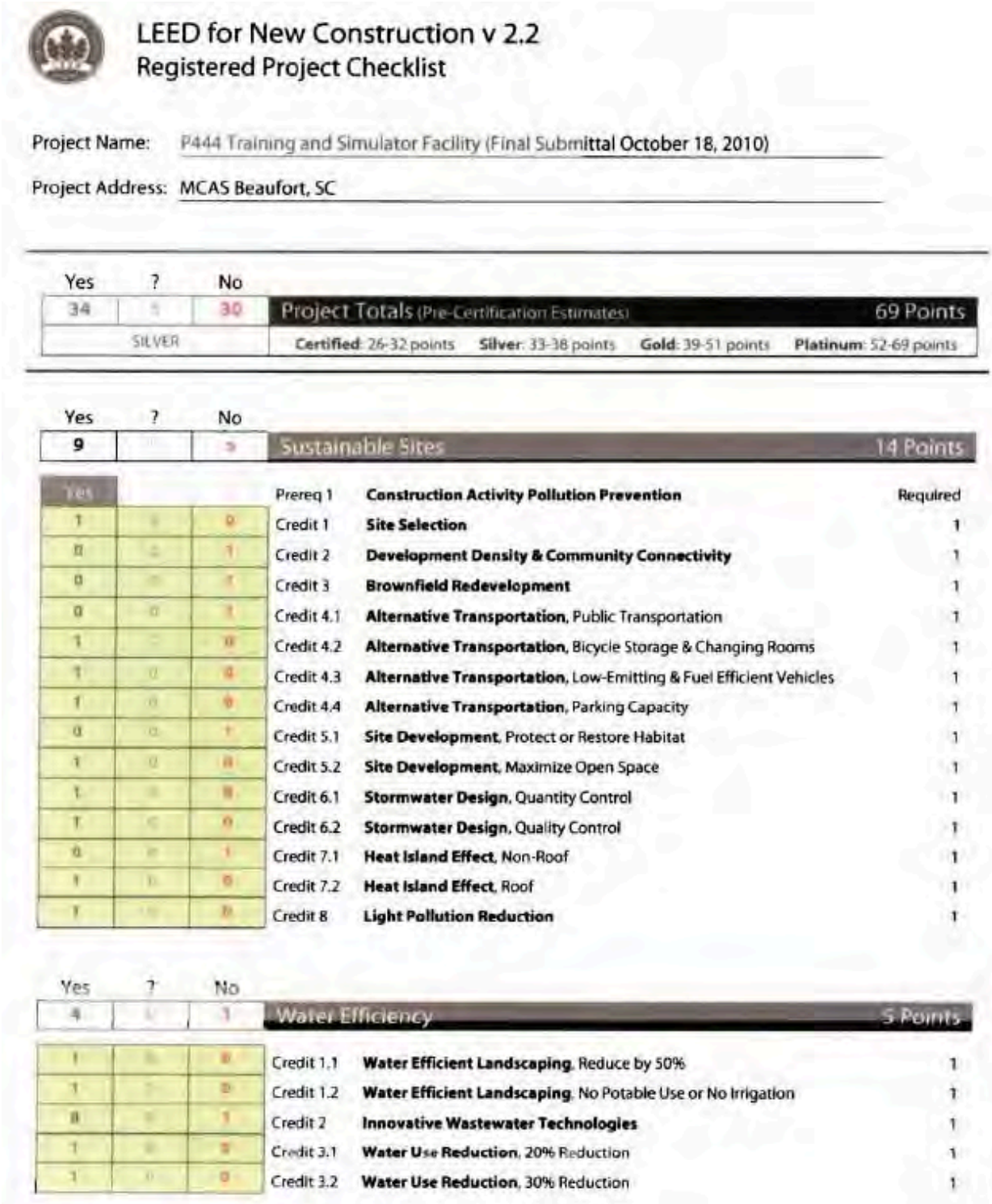
POINT TOTALS:

Available	Pending	Confirmed
69	0	30

Goal 26 Points "Certified"
Credits identified in yellow yet to be confirmed, data is being collected during construction phase

	TARGET
X	Certified 26-32 points
	Silver 33-38 points
	Gold 39-51 points
	Platinum 52-69 points

MCAS Beaufort Training and Simulator Facility



LEED for New Construction v 2.2
Registered Project Checklist

Project Name: P444 Training and Simulator Facility (Final Submittal October 18, 2010)

Project Address: MCAS Beaufort, SC

Yes	?	No	Project Totals (Pre-Certification Estimates)	69 Points
34	5	30		
SILVER			Certified: 26-32 points Silver: 33-38 points Gold: 39-51 points Platinum: 52-69 points	

Yes	?	No	Sustainable Sites	14 Points
9		5		

Yes			Prereq 1	**Construction Activity Pollution Prevention**	Required
1		0	Credit 1	**Site Selection**	1
0		1	Credit 2	**Development Density & Community Connectivity**	1
0		1	Credit 3	**Brownfield Redevelopment**	1
0		1	Credit 4.1	**Alternative Transportation**, Public Transportation	1
1		0	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1		0	Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel Efficient Vehicles	1
1		0	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
0		1	Credit 5.1	**Site Development**, Protect or Restore Habitat	1
1		0	Credit 5.2	**Site Development**, Maximize Open Space	1
1		0	Credit 6.1	**Stormwater Design**, Quantity Control	1
1		0	Credit 6.2	**Stormwater Design**, Quality Control	1
0		1	Credit 7.1	**Heat Island Effect**, Non-Roof	1
1		0	Credit 7.2	**Heat Island Effect**, Roof	1
1		0	Credit 8	**Light Pollution Reduction**	1

Yes	?	No	Water Efficiency	5 Points
4		1		

1		0	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1		0	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
0		1	Credit 2	**Innovative Wastewater Technologies**	1
1		0	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
1		0	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Figure 70 - MCAS Beaufort Training and Simulator Facility LEED Scoring Sheet

Yes	?	No			
4		13	**Energy & Atmosphere**		17 Points
Yes			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Yes			Prereq 1	**Minimum Energy Performance**	Required
Yes			Prereq 1	**Fundamental Refrigerant Management**	Required
2	0	8	Credit 1	**Optimize Energy Performance**	1 to 10
				Credit 1.1 10.5% New Buildings / 3.5% Existing Building Renovations	1
			-->	Credit 1.2 14% New Buildings / 7% Existing Building Renovations	2
				Credit 1.3 17.5% New Buildings / 10.5% Existing Building Renovations	3
				Credit 1.4 21% New Buildings / 14% Existing Building Renovations	4
				Credit 1.5 24.5% New Buildings / 17.5% Existing Building Renovations	5
				Credit 1.6 28% New Buildings / 21% Existing Building Renovations	6
				Credit 1.7 31.5% New Buildings / 24.5% Existing Building Renovations	7
				Credit 1.8 35% New Buildings / 28% Existing Building Renovations	8
				Credit 1.9 38.5% New Buildings / 31.5% Existing Building Renovations	9
				Credit 1.10 42% New Buildings / 35% Existing Building Renovations	10
0	0	3	Credit 2	**On-Site Renewable Energy**	1 to 3
				Credit 2.1 2.5% Renewable Energy	1
				Credit 2.2 7.5% Renewable Energy	2
				Credit 2.3 12.5% Renewable Energy	3
0	0	1	Credit 3	**Enhanced Commissioning**	1
1	0	0	Credit 4	**Enhanced Refrigerant Management**	1
1	0	0	Credit 5	**Measurement & Verification**	1
0	0	1	Credit 6	**Green Power**	1

Yes	?	No	Materials & Resources	13 Points
4				

Yes			Prereq 1	**Storage & Collection of Recyclables**	Required
0		1	Credit 1.1	**Building Reuse,** Maintain 75% of Existing Walls, Floors & Roof	1
0		1	Credit 1.2	**Building Reuse,** Maintain 95% of Existing Walls, Floors & Roof	1
0		1	Credit 1.3	**Building Reuse,** Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management,** Divert 50% from Disposal	1
0			Credit 2.2	**Construction Waste Management,** Divert 75% from Disposal	1
0		1	Credit 3.1	**Materials Reuse,** 5%	1
0		1	Credit 3.2	**Materials Reuse,** 10%	1
1			Credit 4.1	**Recycled Content,** 10% (post-consumer + 1/2 pre-consumer)	1
0			Credit 4.2	**Recycled Content,** 20% (post-consumer + 1/2 pre-consumer)	1
1			Credit 5.1	**Regional Materials,** 10% Extracted, Processed & Manufactured	1
0			Credit 5.2	**Regional Materials,** 20% Extracted, Processed & Manufactured	1
0		1	Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1

Yes	?	No	Indoor Environmental Quality	15 Points
10				

Yes			Prereq 1	**Minimum IAQ Performance**	Required
Yes			Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
0		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan,** During Construction	1
0			Credit 3.2	**Construction IAQ Management Plan,** Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials,** Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials,** Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials,** Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials,** Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems,** Lighting	1
0			Credit 6.2	**Controllability of Systems,** Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort,** Design	1
1			Credit 7.2	**Thermal Comfort,** Verification	1
0		1	Credit 8.1	**Daylight & Views,** Daylight 75% of Spaces	1
0		1	Credit 8.2	**Daylight & Views,** Views for 90% of Spaces	1

LEED for New Construction v 2.2
Registered Project Checklist

Yes	?	No	Innovation & Design Process	5 Points
3		0		

1			Credit 1.1	**Innovation in Design:** Water Use Reduction, 40% Reduction	1
1			Credit 1.2	**Innovation in Design:** Maximize Open Space, Double Bldg Footprint	1
0	1		Credit 1.3	**Innovation in Design:** Enhanced recycling program	1
0			Credit 1.4	**Innovation in Design:** Low mercury lighting	1
1			Credit 2	**LEED® Accredited Professional**	1

MCAS Beaufort Aircraft Hangar

LEED for New Construction v 2.2
Registered Project Checklist

Project Name: P454 Aircraft Hangar (Final Submittal October 18, 2010)

Project Address: MCAS Beaufort, SC

Yes	?	No		
33		30	**Project Totals** (Pre-Certification Estimates)	69 Points
SILVER			**Certified**: 26-32 points **Silver**: 33-38 points **Gold**: 39-51 points **Platinum**: 52-69 points	

Yes	?	No			
8		6	**Sustainable Sites**		14 Points
Yes			Prereq 1	**Construction Activity Pollution Prevention**	Required
0		1	Credit 1	**Site Selection**	1
0		1	Credit 2	**Development Density & Community Connectivity**	1
0		1	Credit 3	**Brownfield Redevelopment**	1
0		1	Credit 4.1	**Alternative Transportation**, Public Transportation	1
1		0	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1		0	Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel Efficient Vehicles	1
0		1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
0		1	Credit 5.1	**Site Development**, Protect or Restore Habitat	1
1		0	Credit 5.2	**Site Development**, Maximize Open Space	1
1		0	Credit 6.1	**Stormwater Design**, Quantity Control	1
1		0	Credit 6.2	**Stormwater Design**, Quality Control	1
1		0	Credit 7.1	**Heat Island Effect**, Non-Roof	1
1		0	Credit 7.2	**Heat Island Effect**, Roof	1
1		0	Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
4		1	**Water Efficiency**		5 Points
1		0	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1		0	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
0		1	Credit 2	**Innovative Wastewater Technologies**	1
1		0	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
1		0	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Figure 71 - MCAS Beaufort Aircraft Hangar LEED Scoring Sheet

Energy & Atmosphere — 17 Points

Yes	?	No				
5						
Yes			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**		Required
Yes			Prereq 1	**Minimum Energy Performance**		Required
Yes			Prereq 1	**Fundamental Refrigerant Management**		Required
			Credit 1	**Optimize Energy Performance**		1 to 10
				Credit 1.1	10.5% New Buildings / 3.5% Existing Building Renovations	1
				Credit 1.2	14% New Buildings / 7% Existing Building Renovations	2
			-->	Credit 1.3	17.5% New Buildings / 10.5% Existing Building Renovations	3
				Credit 1.4	21% New Buildings / 14% Existing Building Renovations	4
				Credit 1.5	24.5% New Buildings / 17.5% Existing Building Renovations	5
				Credit 1.6	28% New Buildings / 21% Existing Building Renovations	6
				Credit 1.7	31.5% New Buildings / 24.5% Existing Building Renovations	7
				Credit 1.8	35% New Buildings / 28% Existing Building Renovations	8
				Credit 1.9	38.5% New Buildings / 31.5% Existing Building Renovations	9
				Credit 1.10	42% New Buildings / 35% Existing Building Renovations	10
			Credit 2	**On-Site Renewable Energy**		1 to 3
					2.5% Renewable Energy	1
					7.5% Renewable Energy	2
					12.5% Renewable Energy	3
			Credit 3	**Enhanced Commissioning**		1
			Credit 4	**Enhanced Refrigerant Management**		1
			Credit 5	**Measurement & Verification**		1
			Credit 6	**Green Power**		1

Materials & Resources — 13 Points

Yes	?	No			
4					
Yes			Prereq 1	**Storage & Collection of Recyclables**	Required
			Credit 1.1	**Building Reuse,** Maintain 75% of Existing Walls, Floors & Roof	1
			Credit 1.2	**Building Reuse,** Maintain 95% of Existing Walls, Floors & Roof	1
			Credit 1.3	**Building Reuse,** Maintain 50% of Interior Non-Structural Elements	1
			Credit 2.1	**Construction Waste Management,** Divert 50% from Disposal	1
			Credit 2.2	**Construction Waste Management,** Divert 75% from Disposal	1
			Credit 3.1	**Materials Reuse,** 5%	1
			Credit 3.2	**Materials Reuse,** 10%	1
			Credit 4.1	**Recycled Content,** 10% (post-consumer + 1/2 pre-consumer)	1
			Credit 4.2	**Recycled Content,** 20% (post-consumer + 1/2 pre-consumer)	1
			Credit 5.1	**Regional Materials,** 10% Extracted, Processed & Manufactured	1
			Credit 5.2	**Regional Materials,** 20% Extracted, Processed & Manufactured	1
			Credit 6	**Rapidly Renewable Materials**	1
			Credit 7	**Certified Wood**	1

Yes	?	No	Indoor Environmental Quality	15 Points
9				

Yes			Prereq 1	**Minimum IAQ Performance**	Required
Yes			Prereq 2	**Environmental Tobacco Smoke (ETS) Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
0			Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan,** During Construction	1
0			Credit 3.2	**Construction IAQ Management Plan,** Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
0			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1			Credit 6.1	**Controllability of Systems,** Lighting	1
0			Credit 6.2	**Controllability of Systems,** Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort,** Design	1
1			Credit 7.2	**Thermal Comfort,** Verification	1
0			Credit 8.1	**Daylight & Views,** Daylight 75% of Spaces	1
0			Credit 8.2	**Daylight & Views,** Views for 90% of Spaces	1

Yes	?	No	Innovation & Design Process	5 Points
3		0		

1		0	Credit 1.1	**Innovation in Design:** Water Use Reduction, 40% Reduction	1
1		0	Credit 1.2	**Innovation in Design:** Maximize Open Space, Double Bldg Footprint	1
0		0	Credit 1.3	**Innovation in Design:** Enhanced recycling program	1
0		0	Credit 1.4	**Innovation in Design:** Low mercury lighting	1
1		0	Credit 2	**LEED® Accredited Professional**	1

Acknowledgements

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