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GREEN BUILDING DESIGNS AND RENOVATIONS FOR THE WORCESTER YOUTH CENTER

An Interactive Qualifying Project Report

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by

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Abstract

This group worked with the Worcester Youth Center to devise a plan for their derelict warehouse. The space is a safety burden to the Center and the youth. Through surveys and research analysis the group developed two designs to implement a recreation center that sets an example to the community by incorporating green aspects into its construction. This project has inspired the Board of Directors to create a committee dedicated to accomplish this task.

Authorship

Acknowledgements

The successful completion of this project would not have been possible without the contributions of several people. First and foremost we would like to express gratitude to our sponsor, the Worcester Youth Center, for allowing us to undertake this project. This project helped us gain experience resolving real world issues. Conducting this project has made us better researchers, writers, planners, and project team members. This experience will benefit us greatly in future endeavors.

We would like to thank Professor Robert Krueger for arranging this project. We would also like to thank Professor Nancy Burnham, our project advisor, for her guidance which has been central to the success of this project. In addition, we would like to thank Professor Verna DeLauer for her comments and criticisms on the initial proposal of this project. We would also like to thank Ms. Hilda Ramirez, Worcester Youth Center Executive Director, for taking the time to provide us information and answering many of our questions.

Finally, we would like to express gratitude to the Worcester Youth Center staff and youths who participated in surveys and interviews. We would also like to express appreciation to those who took the time out of their busy schedules to meet with our team or help further our investigation:

Professor Leonard D. Albano, WPI Civil & Environmental Engineering Associate Professor

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Executive Summary

The sponsor of this project is the Worcester Youth Center (WYC); a non-profit organization established to better the lives of urban youths in Worcester. The mission of the Center has four parts: to provide a place for youth to build positive changes in their lives; to provide resources and opportunities to sharpen skills and help youth realize their potential as well as making them contributing members of the community; to provide security and health to youth that come from poverty; and to help reduce violence, unemployment and drug abuse. The Center offers a variety of programs which are used to build confidence and other skills.

The main issue associated with the WYC is the current deteriorating condition of the warehouse, which is directly attached to the Center, causing safety concerns. The warehouse is a dark and dangerous place; there are holes in the floors and outside walls of the building, electrical problems, flooding, and difficult areas to walk. Overall, the warehouse is an unstable structure due to its rotting wood. As a result of the problems already mentioned, firefighters will not go into the building in the case of a fire. This fact is indicated by the red and white "X" on the front of the warehouse. The X's began to be put on buildings deemed extremely unsafe after the Worcester Cold Storage and Warehouse Fire of 1999, in which six Worcester firefighters died in the building due to its unsafe conditions.

There are also ecological problems that are caused by the warehouse. For example, the burning of fossil fuels destroys the ozone layer which allows for harmful radiation to reach the earth. This leads to a rise in temperature which will eventually cause an increase in natural disasters. It is important for everyone to do their part and limit their use of energy. The warehouse is directly involved in this societal issue because of the energy it wastes. Adding

green features to the new building could have a great impact on the environment by lowering energy consumption. Also, it could greatly help the Center's economic concerns.

The economic problem comes from the fact that the warehouse is useless due to the safety conditions. Although the space does not play a role in the functioning of the Center, it is still heated so that the water pipes running through it do not freeze. The result is an annual utilities bill of $21,000, which is unreasonable for a building of its size. Building a new area means two things. First, the addition of a functioning part of the Center justifies the utilities. Second, designing a building which brings something new and exciting to the Center, the youth, and the community could mean a new source of revenue to be put back into the Center, leading to growth.

The group used three different guiding questions to determine the direction of the research. These questions focused on the feasibility of an inner space that could offer something new to the youth and community while also bringing revenue to the Center; the consideration of different building solutions which are cost efficient but also green; and, the investigation of successful youth organizations and what sets them apart from the others.

For this project, the group's design approach was three-fold: youth-inspired, revenue generating, and green. In order to determine a solution, three data collection techniques were used in different settings. Interviews were conducted with a Youth Center staff member at the WYC, as well as Civil and Environmental Engineers at Worcester Polytechnic Institute (WPI). Surveys were given to the youth and staff at the WYC, and research was done on cost analysis and green technologies.

To decide what top ideas moved forward in the decision making process, the data were analyzed. The input from the staff and youth was used to decide what should be included in the

new building. The input from engineers as well as cost analysis helped to determine the type of structure to be used. Lastly, a market analysis was performed to include ideas which will create extra income. Considering these three areas helped to produce some possible designs.

The data collection process was the true core of this project, and it allowed for the establishment of suitable designs. The most significant data were the youth surveys. The WYC believes it is very important for the youth to feel a sense of ownership at the Center, and that they are involved in decisions. Surveys were given to 47 youth at the WYC to find out what they thought was needed for the new space. They suggested that there needed to be more recreational activities, and they provided rankings on a few examples. Also, they insisted that there be more space for some of the current activities. Some also stated that there should be more space for studying. One staff member was then interviewed and seven were surveyed. The main points taken from their input was that the warehouse caused the WYC to be cold in the winter, the flooding caused the WYC to be smelly during the summer, and there was a lot of distraction with the current layout of the WYC due to the mixture of athletic and academic activities.

To learn more about different building structures, the group also interviewed civil and environmental engineering professors from WPI. Possible green building technologies were then assessed for the new building. By researching the Londonderry School that implements many green features, it was determined that green technology could be utilized for the same price as non-green features. Adding these features could save energy consumption and allow money to be used elsewhere in the budget.

From the beginning, the group believed that a recreation center could enhance the WYC for the youths. When this was introduced to the staff, it was apparent that they were in favor of the idea. This, along with the input from the youth, justified building a recreation center. The

group decided it was best to propose two possible designs to the WYC Board. These are in Figure 1 and Figure 2

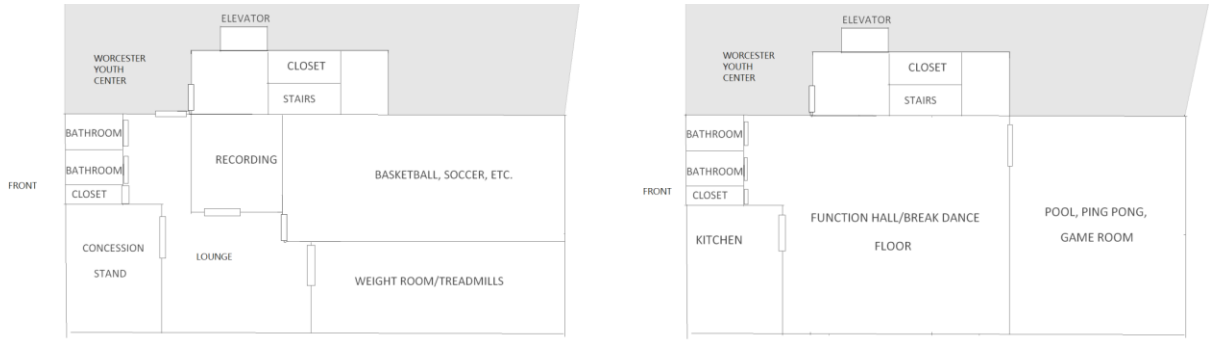

Figure 1: Design Plan 1 (1st and 2nd floor)

This first design offers more space for current activities such as basketball, weight lifting, break dancing, and recording music. It also adds new spaces including a game room, a function hall and an indoor/outdoor concession stand. The benefit of this design is that the entire upstairs could be rented out for any type of function. The kitchen was added on the second floor for this reason. The downside to this plan is that the basketball court may not be large enough for a full game of basketball, floor hockey, kickball or other such activities. Design 2 offers an alternative.

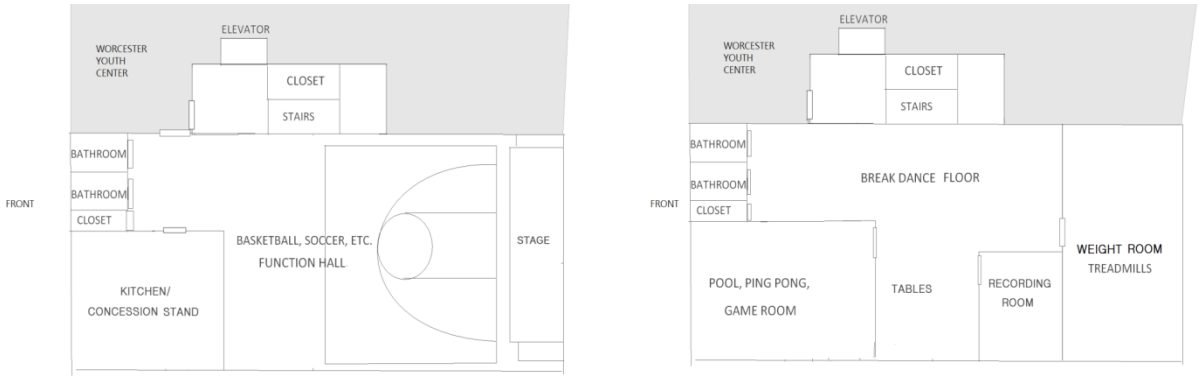

Figure 2: Design Plan 2 (1st and 2nd floor)

The most significant difference with this design is the first floor. The group thought it would be nice to offer a larger space in the basketball area for any number of activities previously mentioned. For this reason, that area and the function hall were combined. A stage was also added for performances run by the youth. The recording room and weight room were moved to the second floor, meaning stronger support for that floor. Another disadvantage of this design is that the areas for parties and events are on separate floors, making coordination more difficult.

By using one of these designs for a new building, the WYC can also be rearranged as well. All of the athletic activities, music and games will be in the new building. This allows the existing Center to be used for only classes, offices, and studying. So, academic and recreational activities will be completely separated, eliminating all distraction.

Building a recreation center in this location will make it the only one on the west side of Worcester. This will not only be a new and exciting building for the youth and the community, but it will act as a new source of income for the Center. The outdoor part of the concession stand will attract all of the events in the park behind it, as well as the stadium crowd across the street. Also, many of the rooms could be rented out for parties and different functions. Lastly, the building could charge a membership fee from the community. This new source of revenue will allow the Center to grow and provide for more youth in the future.

It will be important for there to be future research. The Center will need to look into what equipment they want in the building and how much it will cost. Also, it will be necessary to look at how many people around the area are interested in membership and renting out space so that the Center can get an idea of what to charge. This will allow them to know how much extra revenue they could create and will help lead to the construction of this building.

Chapter 1: Introduction

The sponsor of this Interactive Qualifying Project (IQP) is the Worcester Youth Center, which is a non-profit organization established to better the lives of urban youths in Worcester. The main issue identified at the Youth Center is that the current state of the warehouse is very unsafe and not in use. The problems that stem from this issue are that the warehouse is an economic burden, and there is no plan on what to do with the space once the warehouse is torn down. This group will create a solution to design a new building that will use the warehouse space to address the main issue and problem. This solution will create the following benefits: a safe and friendly environment for the youth, a source of income for the Center, and lower monthly cost of building operation.

Making the warehouse a sustainable building is the desired goal of the Worcester Youth Center. There are three large societal issues associated with the building if it is not renovated. First, the unused space in the warehouse is a health concern due to its deteriorating condition. It is located lower than the floodplain and the underground water often rises up to the first floor. This leaves stagnant water sitting for weeks at a time, a great environment for bacteria, mold and other unwanted growth. If these stagnant pools house some sort of disease causing organism, the youth and others within the building would be largely at risk of infection. Secondly, the condition of the warehouse causes safety concerns among the people who live in the area. It is often seen on the news how fires in the City quickly spread from building to building. Because of the warehouse's current condition, the Worcester Fire Department has given the building a large red "X" on its front exterior wall. This means that if there was a fire, the fire department would not come to put it out, as it would put the fire fighters in great risk to do so. The third issue is that due to the building's degradation, there are holes in its floors and walls. This allows animals and

possibly unwanted people to have open access to the building. This can also be dangerous due to the possibility of diseases carried by animals which could be transmitted if they attacked someone.

Although the motivations and efforts to develop the Youth Center are high, the Center is very limited in funding and monetary support, and the cost of improving the building is very expensive. The Center has been supported and is still being supported by many other organizations. However, the funds that the Center receives from these organizations cannot be used only on the building. They need to continue to support their youth activities and contribute to the general expense in the Center. The Worcester Youth Center also faces problems regarding building permissions. As mentioned above, the warehouse has received the fire warning symbol. In order to conduct and make renovations, the Youth Center will need to abide by the city's codes and possibly lobby for special permits and permissions.

The warehouse does not immediately pose a direct threat to the youth or people around the Center, however, the building's condition could clearly be the cause of some accidents and problems to the people around it in the future. The planning to improve the warehouse should be undertaken with some considerations. Some possible actions to be taken with regard to this building would be to completely demolish the warehouse space, demolish the space and then rebuild on it, or renovate the existing building keeping its existing structure. However, the sponsor mentioned that the cost to tear the building down would be about $300,000. Therefore, the recommendations that the group will likely suggest is going to be a couple of plans for the renovation of the warehouse. This is going to include the cost in the short term, long term, and other suggestions to the Youth Center about the space.

It has been discussed and determined that the main problem that needs to be addressed is the future of the warehouse. It is clear that this piece of real estate could cause some very dangerous situations. Also, as seen in Figure 3 and Figure 4, it is in terrible condition and is costing the Youth Center a lot of money in this state. This property is owned by the Youth Center, and letting the warehouse remain the way it is, is a waste. The truly underlying problem is that the Center would like to use this space to generate an income, which could improve the entire Youth Center. The Youth Center is a non-profit organization, but using the space as a separate institute could really help to improve the Center, which is vital to the youth of the community. This project will not only help to answer the problem at hand, but it will also help others to understand the problem. Understanding the importance of the Youth Center, the concerns associated with the warehouse, and the good that could come from renovating are topics that will be discussed further.

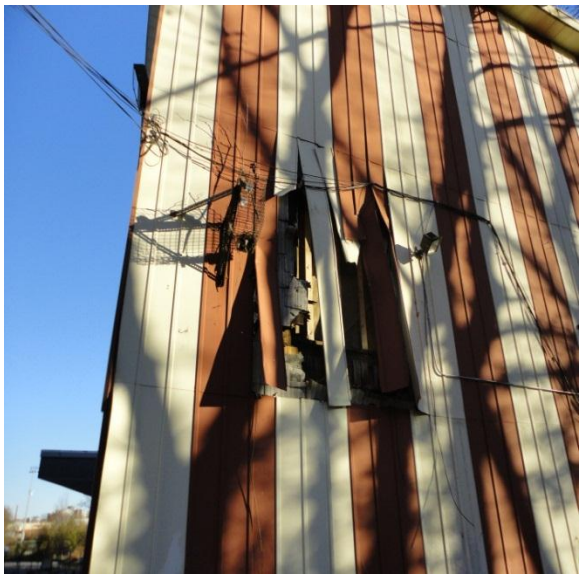

Figure 3: Exterior conditions of the warehouse

Figure 4: Outer wall conditions of the warehouse

Our goal is to propose to the Youth Center Board the best way to renovate the warehouse. Even though the warehouse will not be a direct part of the Youth Center, the proposal will help to improve the Center in the long run. There are a number of questions which will be answered with further research into the problem. First, in what ways can the Youth Center renovate the warehouse by not only using money wisely, but also setting a good example for the community? What are some of the best ways in which the space can be utilized to better the Youth Center? Lastly, what are the most successful youth organizations in the United States, and in what ways do they use their space to be so successful?

There will be three different ways in which this information will be researched. The group will talk to experts in the fields on construction and renovations. Also, discussing ideas with the youth who are part of the Center, as well as members of the community will be very useful. Because the youth who utilize the Center will be using the new space, it is very important to hear from them and consider their ideas and thoughts on what to do during the renovations. This will help to give them a sense of accomplishment and ownership in the space that they occupy at the Youth Center. Lastly, case studies on other warehouses or buildings will be done. This approach is the appropriate one because successful solutions will be established, the affected party will be a vital part of the process, and the best way to go about implementing the solution will be found.

Chapter 2: Background

2.1 Purpose

In this chapter, we will present information about Worcester, the Worcester Youth Center, and reasons for building green and renovating the warehouse. We will also cover other information needed to understand the project in order to move forward with the methodology.

2.2 Information about Worcester

Next we discuss key points about Worcester as a city to put later parts of the proposal into context. Worcester is the third largest city in Massachusetts; its current population is just over 182,000, and it is the home to ten colleges and universities (Worcester Massachusetts, 2010). With this being said, being such a big city, the poverty level in Worcester is about twice the average of the entire state of Massachusetts. According to Pellino (2007), poverty levels tend to affect the relationships in families, especially the relationship between the youth and adults. When parents are not involved in a child's life, they tend to lose direction in life and lose focus on education. This leads to many youth not completing high school. Also in many cases, due to the family struggles, many children are forced to work early in their lives to help their family. By doing so, they put education aside and their future in jeopardy.

The performance of youth in the lower class compared to youth in the middle and higher classes is also evident. Youth in the middle and upper classes tend to perform better in school then youth in the lower class. This is due to the environment in which poor children live and their family relationships. Another problem the youth is faced with is motivation. One of the social problems children face is emotional trauma due to their family issues. The lack of attention given to youth can lead to depression and many other issues. Often, children lack self-esteem and emotional security. Once again, this causes a lack of motivation to learn. The social

environment that is present in conditions of poverty affects the development of these children by limiting the ways they learn to live in social groups. Youth in the lower class have less opportunity to improve certain skills that are very important to learning. Poverty leads to many issues which affect the youth and their education (Pellino, 2007). Worcester has a high poverty level leading to many youth drop outs, and is a great example for many of these issues. The Worcester Youth Center is a great place to try to solve some of these issues and help the youth to improve their lives by connecting with education.

2.3 History of the Worcester Youth Center

The idea of creating the Worcester Youth Center came about in 1991. A group of teenagers were arrested on July 29, 1991 due to loitering, disturbing the peace, and being a public nuisance. This group of youth was ethnically diverse and some of them were coming from the Worcester area and others from surrounding areas. This issue brought Lynne Simonds, chair of the City Manager's Village, and Anne Moriarity, Director of Program Development at Plumley Village, to start the process of creating the Worcester Youth Center (History and Accomplishment, 2005). They had weekly meetings to talk about problems and finally came up with the idea of Teen Action Group (TAG). At the beginning, Youth Council members, arrested youth and others participated in this group. This group succeeded in helping members to realize that they were not alone. They moved beyond complaining to their friends in the street and started to channel their energy into collective action. The Teen Action Group's progress continued moving on until 1994 (History and Accomplishment, 2005). The TAG group opened the first Youth Center for teenagers in the Worcester area. The Worcester Youth Center became a place where youth were involved in managing the Center by planning programs, delivering

activities, and also voting for members of the Board of Directors. Today, the Youth Center currently works with approximately 3000 youth (About Us, 2005)

2.4 Mission of the Worcester Youth Center

The mission of the Worcester Youth Center is four-fold (Mission, 2005)

- To provide a place where youth can build lasting, positive changes in their lives;
- To provide resources and opportunities for helping youth to realize their potential, sharpen skills and also to enable them to become vital, responsible and contributing members of society;
- To provide security and to help the youth that come from areas of high concentration of poverty in Worcester; and,
- To reduce violence, unemployment and drugs by helping those youth in need

2.5 Programs in the Worcester Youth Center

The Worcester Youth Center works on youth development and empowerment. The goals of the programs are to build youth confidence and other skills. Also, the programs help to improve the health of the youth and the relationships between peers and staff. In order to develop strong youth, the programs of the Center are built on the theory of social change and belief. As seen in Figure 5, the Worcester Youth Center has four main programs; health and wellness, education, employability and leadership.

Figure 5: Worcester Youth Center Programs (Programs, 2005)

There are a number of different programs offered for health and wellness; a recreational center, a nail salon, physical training, counseling, and RISE. RISE is a co-ed group which meets weekly to discuss topics relevant to the youth. This group provides the opportunity to discuss issues that are important to the youth in a supportive atmosphere. These programs improve the youth's health and also help to develop their life style.

There are also three programs to improve youth education which are PRE-GED (Basic Skills) Preparation, the after school enrichment program, and college bound. These three programs help youth to get more knowledge, complete homework, and plan for college (Programs, 2005).

The Worcester Youth Center creates programs concentrating on employment. These programs help youth prepare for employment and to find jobs. Activities such as interviewing, resume creation, and pre-employment skills are taught using a model that combines mentoring and on-the-job training.

To help youth improve their leadership and personal skills, the Center provides the following programs: Urban Community Action Planning for Teens (UCAPT), Teen Action group (TAG), Youth on Board, and Recording Artists Production Program (RAPP) (Programs, 2005).

2.6 Worcester Youth Center Partnership with High Schools

The Worcester Youth Center currently works with youth from two different high schools in the area (Annual high school dropout rates from Mass. School district, 2009). They work with youth from Doherty Memorial High and South High Community. A report published in the Boston Globe showed that the dropout rates for Doherty in the 2008-2009 academic year was 62

students, and for South High Community was 109 students. The Worcester Youth Center currently takes youth from these two high schools because they are the closest to them.

In the past, the Worcester Youth Center has tried to come up with ideas of picking up youth around other Worcester High Schools, however according to our sponsor, these ideas were not very successful due to the fact that all schools around Worcester get out at 1:43PM. Also, due to the fact that many youth participate in after school activities, many of them need to be picked up at different times. The Worcester Youth Center provides a place where youth can surf the internet, interact with one another, and learn from the programs offered. The Worcester Youth Center provides a safe place to keep the youth off the streets and learn to improve their lives. The Worcester Youth Center also provides transportation to the youth at the end of each day; they want to make sure they get home safely. Also many of the youth do not have a transportation method, so by providing transportation they attract them to the Center.

2.7 Case Studies: Youth Centers in Other Areas

To be able to make an educated proposal to the Youth Center, other youth facilities need to be examined and analyzed. By looking into what successful youth organizations offer, and comparing that to the Worcester Youth Center, ideas for the warehouse space will emerge. The main goal is for the space to be utilized to enhance the actual Worcester Youth Center, and allow it to expand in the future.

To compare the Worcester Youth Center with a similar organization, the Milford Youth Center was researched. This youth center offers many different types of programs and events. However, these programs are not offered at the Worcester Youth Center, and could be a great possibility for the warehouse space. Fitness and Athletics, which are lacking at the Worcester Youth Center, are a main theme to most of these activities. At this point, the Worcester Youth

Center does not have a large enough space needed to house programs such as boxing, yoga classes, kickball, tennis, wiffleball and many others. Other than this, annual events are offered at the Milford Youth Center as well (Youth Commission and Youth Center, 2010). Some events include dinners, fashion shows, dances, and a variety of drives. Looking at a successful youth center has brought about many thoughts and ideas that could be useful in moving forward.

Besides the Milford Youth Center, other extremely successful youth organizations were researched. These include nationally known names such as the YMCA and the Boys and Girls Club. These are the most successful in the country. In trying to propose ideas of what space could be used for in a youth center, there is no better model than to look at these two programs. They run programs which make them unique and put them above all other organizations. For example, the YMCA offers many camps for youth (About us, 2010). Also, something that the Boys and Girls Club offers that others do not is programs in the arts (What We Do, 2010). Further research into these organizations will prove to be very helpful and insightful.

2.8 Worcester Cold Storage and Warehouse Fire in Connection to the Youth Center

Figure 6: Front view of the warehouse

We have discussed what the Worcester Youth Center is about, and the importance that is has to the youth. Now we will address the current problems with the warehouse which have a negative impact on the future prosperity of the Center, which also affects the youth. One of the main problems with this building is the safety concerns that arise. It is very important that the Center gives youth a feeling of empowerment. The staff likes the youth to feel that they run the Center and are part of decisions. This allows the youth to call this place a home away from home. For these feeling to occur, the entire Center must first be a safe place. This is one of the issues that need to be addressed with the warehouse.

With a tour through the warehouse at the Worcester Youth Center, it is easy to identify a number of different safety issues which stress a need for renovation. The wood, from the inside to the outside, is not only rotting away, but there are a number of holes. There are a number of electrical issues and not all rooms have the ability to be lit. With the darkness, holes in the floor, and obstacles on the floor, each room is very hard to navigate. There is also flooding that takes place due to being built over a swamp. With all of these things considered, it is obvious why this space is considered a safety hazard to the youth at the Center. Simply, there is no telling when the building will collapse. It is very dangerous to step foot in the warehouse at its present state.

The next safety hazard with this building comes from the previously mentioned conditions. As seen in Figure 6, when looking at the outside of the building, one can see a big red and white X. The meaning of this X is that the building has been deemed extremely unsafe, and firefighters will not go inside in the case of a fire. These X's started being put on dangerous buildings after the Worcester Cold Storage and Warehouse fire took the lives of six Worcester firefighters in 1999. The reasons were believed to be that the building was very tough to see in and walk through. The firefighters ran out of oxygen trying to search for homeless people who

were believed to be in the building. Due to the terrible conditions of the warehouse, the firefighters never made it out, and it took eight days for their bodies to be discovered (6 Firefighters a Presence at Station, 2009). For this reason, when a building is inspected and an X is put on it, firefighters will not go inside in the case of a fire. This presents a great danger to the youth because they will not be saved if a fire occurs while they are in the building. Also, since the warehouse is directly connected to the main part of the building (Figure 7), the people of the youth Center have concerns that if a fire takes place at the warehouse, they may not be helped. It is clear that these issues of safety are a big problem and need to be addressed.

Figure 7: Front view of the Worcester Youth Center and the warehouse

2.9 Global Situation and Energy Consumption

The Youth Center's warehouse is in need of renovation because of the dangers previously mentioned. In addition to those renovations, the topic of ecological awareness and how these renovations can dampen negative human impact on the earth should be addressed. Climate change and the negative impact humans are having on the earth as a whole is a very widespread and well known issue. The influence we have on climate change starts with the burning of fossil fuels such as coal, oil and natural gasses for energy. These substances release carbon emissions as well as other greenhouse gases when burned. Greenhouse gases are gases that act as barrier between the earth's atmosphere and space. They let the radiation from the sun in, which is reflected as heat, and keeps the heat in our atmosphere. They are also damaging to the ozone layer of our atmosphere. This layer acts as a barrier from the more harmful forms of radiation emitted by the sun. As the Ozone is depleted it will start to let more harmful radiation reach earth's surface which will cause serious health issues to its populations. Since the preindustrial age to the present, global carbon dioxide concentrations have risen by 36% (Environmental Protection Agency, 2010). As the Earth's temperature climbs, the extreme possibility of disasters increases as well. One of the more minor changes would be the increased amount of precipitation. This would cause soil erosion and flooding. This would disrupt agriculture, contaminate much of the groundwater we use as drinking water and also lead to deaths and injuries. Also, flooding and more stagnant water leads to more disease. These are examples of the impact and effect the human race is having on this planet (Environmental Protection Agency, 2010).

Also, the human population continues to grow. This means more land needs to be cleared for housing and development. This will inevitably cause a reduction in trees on the earth's

surface. This is a negative effect because plants can convert carbon dioxide, a greenhouse gas, into oxygen. They also can use nitrogen which is also causing atmospheric issues. This has helped keep the balance in the atmosphere very stable in the past. In the past 200 years, atmospheric nitrous oxide has increased 18% (Environmental Protection Agency, 2010). Because of these issues, many people are trying to limit their impact on the earth. Implementing green energy sources and technologies into our building is one great way to do that.

The condition of the warehouse we are looking to renovate is very much related to this societal issue. The Worcester Youth Center's heating and electrical utilities run through the entire building. This includes the very much unused warehouse space. In the winter, heat leaks out of the active Youth Center into the cold warehouse space. This is essentially draining money directly, because the used space then needs to be reheated. Also, there is unused electrical circuitry running throughout the warehouse as well. Without these two wastes of power and electricity, less energy would need to be consumed to power and run the Worcester Youth Center. This reduction in the use of fuels is small when looking at the overall scheme of the world, but when everyone starts to contribute to global energy reduction, the results will be noticeable and our planet will be healthier. Therefore, when looking at the Worcester Youth Center specifically, their costs will be reduced and will then have more money for other projects and prospective programs.

2.10 Benefits of Implementing Green Technologies

Green building technologies are applications that have been designed for a variety of functions in construction. They are any application that can be utilized to diminish the expenditure of energy or reduce negative environmental impacts, through controlled heating and cooling, energy efficient lighting fixtures, proper wall and ceiling insulation, green rooftops and

gardens, and much more (Snow, Holmes, Galligan, & Downey, 2009). Green technologies also enhance quality of life and work performance. Most important of all, implementing green technologies could help save money on energy.

Most people are interested in the cost benefits of building green and how much it will cost them to achieve a certain level of sustainability. This is because they can actually predict and quantify expected results. The most widely used measure is the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system consisting of four levels—Certified, Silver, Gold, and Platinum—that can be achieved by earning a series of points from five categories. These categories are the following: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality; points can also be earned for Innovation and Design Process (Morris, 2007). These categories help to predict and measure actual use of resources and cost benefits of building green.

Economic savings in energy use is not the only benefit of building green. Usually momentum builds for additional buildings after the inception of green technologies into a community. The States News Service reported that green building retrofits that promote efficient energy usage are anticipated to increase substantially through 2015 (Green Building Renovations to Increase Through 2015, 2010). Furthermore, in a released report called *Global Green Building Materials and Construction, 2nd Edition* by leading market research firm SBI Energy, green building will emerge as the "new normal" in the building industry (2010).

2.11 Case Study of the Londonderry School

Several institutions have invested in the construction of new sustainable structures in the past few years. The most advanced state of the art structures have been built by large companies. However, small independent community leaders have also worked to build green buildings. For example, the Londonderry School in Harrisburg, PA was built with a green design in mind and it now is LEED Certified (Paladino Consulting LLC, 2006). It was completed in 2004 after ten years of fundraising, planning, and construction (Take a Tour of Our Green School Environment, 2010). It serves as an example for what the Worcester Youth Center might consider doing in the warehouse space in terms of techniques of building green.

The Londonderry School committed their project to show that green building construction did not need to cost more than traditional construction. The school building was constructed at about $100/sq. ft., and the typical central Pennsylvania school construction cost is $130/sq. ft. This demonstrated that green design can be cost effective and within reach for any construction project (Take a Tour of Our Green School Environment, 2010). This is an important piece of information because the Worcester Youth Center does not have funds to build and it will greatly benefit from the construction techniques used by the Londonderry School. Also, the Londonderry school modeled their spaces for multiple uses and this is of interest to our project sponsor.

2.12 Summary

The information included in this Background Chapter provides a setting for, and insight to the project site and reasons to build green. The presented information will be used to do further research to identify and suggest a plan about what to build in the warehouse space. The procedure for our research will be shown in the next chapter: Methodology.

Chapter 3: Methodology

3.1 Guiding Questions

1. What are the best possible solutions for renovating the Worcester Youth Center warehouse, which will combine the idea of spending money wisely with the idea of setting a good example for the community by using green renovations? (linked to data source of *Data Analysis* and *Interviewing*)

2. What are the best possible ways in which the inner space of the warehouse could be constructed to not only offer something different to the surrounding community, but to directly benefit the Youth Center as well? (linked to the data source of *Interviewing and Surveying*)

3. What are the greatest examples of successful youth organizations in the United States, and in what ways have they utilized their space to separate themselves from other organizations? (linked to data source of *Interviewing, Data Analysis,* and *Surveying*)

3.2 Overall Approach & Rationale

The project this group is faced with has monetary, ecological and societal concerns. In order to measure the aspects of these concerns the group will need to use qualitative as well as quantitative research. It is going to be very costly to tear down the space so monetary efficiency is critical to the Youth Center's goal with regard to this solution. This can be achieved partially through the ecologic aspect of this project. With green technologies the new construction would not only be friendly and beneficial to the earth but also save money for the Youth Center. This information would be effectively obtained through interviews of professionals and case studies of preexisting buildings with similar green guidelines. Overall, however the Worcester Youth Center wants this space to be useful. This means creating a space that the community and the Center will be able to fully utilize. For the group to learn the community's opinion, surveys and interviews will be the most effective means. Once this is established, and the societal aspects are met, the Center could find effective ways to lease or rent space out to other groups, tying in to

the monetary goals as well. With all this in mind, and after careful analysis, this group will be able to effectively advise the Youth Center in its future actions.

3.3 Case Study Method & Data Collection Techniques

Case Study Selection

The Londonderry School was built from the ground up with a green plan in mind. Since the warehouse of the Worcester Youth Center will have to be demolished and rebuilt from the ground up, the Londonderry School will serve as a case study to investigate long and short term costs of building green. The Londonderry School believes that less is more when it comes to the interior layout of the spaces; the building was designed so that spaces could have multiple uses. This helps our project because we can research how they have applied the technique of simplicity and how it has improved the operation of the spaces.

Data Collection and Techniques

1. *Interviews*

In order to obtain data, we can contact representatives of the Londonderry School to ask them a series of questions to find out about the benefits they have experienced due to building green and the overall process of building green. We can also ask them about how they feel the community has changed due to having a green school and how the green building has an effect in how the youth think about the environment. We will also interview engineers from Worcester Polytechnic Institute to obtain information about green technologies, building structures, and other aspects of our project.

2. *Surveying*

We will conduct surveys at the Worcester Youth Center asking the youth, volunteers and staff about their thoughts on the warehouse and how they would like to

renovate the space. The questions will have to contain a mix of direct and open ended questions in order to get some loose data for analytical analysis and some concrete data for specific data tabulation of graphs or charts.

3. Assessing Energy Bills

In order to obtain numerical data about energy savings for building green, we can ask the Londonderry School if they can collaborate and share their energy bills since the first day of operation. This way we would have numerical data that could help us see how much they spend compared to what a regular school spends. This will require us to ask the same of another school. The choice of the other school is yet to be determined. We will also assess the energy consumption at the Worcester Youth Center to see how much energy they use.

3.4 Protocols

Setting: Youth that live in Worcester attend the Youth Center. Surveys and meetings with youths, staff and sponsor will take place in the Youth Center. Phone interviews will be conducted with the Londonderry school. Interviews with engineers will occur at Worcester Polytechnic Institute.

Subject Selection Criteria: All Youth who currently attend the Youth Center along with the staff members will be asked to fill out a voluntary survey. The goal of this survey is to find out what both the staff and the youth would like to do with the empty space of the warehouse. With such a diversity of youth, it will be interesting to hear their ideas and how they think they can help improve the Youth Center. The phone interview with the Londonderry School will help us understand new and effective ways to implement green technologies and the impact they have on building operations. The interviews with the

engineers at Worcester Polytechnic Institute will help to gain knowledge about building structures, green technologies, and other important aspects of a building. After receiving feedback from the surveys and interviews, we will conduct meetings with Ms. Hilda Ramirez, the WYC Director. These meetings will be conducted in order to let Ms. Ramirez know how the youth and staff felt they could help the Youth Center. We also hope that it will help both the sponsor and our group decide what the best ideas were and how we can approach these ideas to help the Center.

Triangulation: This is critical to our qualitative research. We will use the surveys, interviews and the meetings to decide what will be the best one or two solutions for the Youth Center warehouse. It will help us determine what the youth would like to see and give us new ideas on how to design the new space. The meeting with the sponsor will also be important to determine which ideas are the best and require the least amount of money because the Youth Center has no money to invest in the warehouse.

3.5 Analysis

As previously mentioned above, there will be a number of different techniques used to collect data. Along with researching statistics and costs on the web and other sources or information, interviews and surveys will be the main methods to gather data. The groups that will be targeted are engineers, the community, and the staff and participating youth at the Center. Data analysis is also important. Our approach is two-fold. First, the most common ideas and suggestions will be examined further. If there are some responses that appear a number of times within one group or from all groups, they will be strongly considered. Secondly, the ideas that are found to be the most unique and intelligent ideas will be examined further. These suggestions do not necessarily have to be recurring, but if it is a

quality idea that is only suggested once, it is still worth a deeper look. After all these thoughts are sifted out, they will be compared along with some cost analysis. At this point, it is believed that the best plan of action for moving forward will be found.

Table 1: Research Agenda

Data Collection Tool	**Amount**	**Additional Info.**	**Assessment Tool**
Interview using recorder - Professional civil engineers - Professional environmental engineers -Staff at Worcester Youth Center	1 or 2 one hour interviews; however, more interviews might be needed depending on the data	Semi –structure	Undecided
Survey - Youth at the Center - Community	Surveys will be conducted until enough information is gathered	Survey sheet about the information needed	Undecided

Chapter 4: Findings and Discussion

4.1 Purpose

In order to make an educated decision about the possible designs of the new building in the warehouse space, data were collected and analyzed, and research was conducted. Collected information includes surveys of the youth, an interview and surveys of the staff, and interviews of civil and environmental engineers. Since we only had seven weeks to conduct our methodology, we made sure to do everything in a timely manner following our project milestones found in Appendix A: Project Milestones. In this chapter, we discuss our findings on the new building design, market analysis, assessment of green building technologies, and cost analysis of constructing the new building.

4.2 Youth Survey Results and Discussion

The purpose of conducting the youth survey at the Worcester Youth Center was to get suggestions from youth. Understanding what the target users wanted from the Center was essential for making the right design. To meet this goal, we used the questionnaire shown in Appendix B: WYC Youth Survey Questionnaire to obtain more information about the current problems at the Worcester Youth Center as well as youth ideas for the new building design. The data were then utilized to create a plan which was not only practical, but met their needs as well.

The youth surveys turned out to be successful as well as helpful. The staff at the Center helped the group to introduce the survey to the youth, and more importantly, the youth were excited with the project and happy to share their thoughts. Thus, 47 youths at the center participated in the survey and provided the group with results. All of the youth agreed that the Worcester Youth Center is an excellent place for both studying and recreation. Nevertheless, the

youth also gave their suggestions on how the Youth Center could be improved. These responses are shown in Table 2.

Table 2: Youth's Opinion about Improvement in the WYC

Things that Need to Improve	Frequency
Activities	19
Outside Look	1
Number of Youth	2
Number of Mentors and Staff	4
College Help Programs	1
More Space/New Building	14
Food Services	1
Computers at the WYC	1
Bathrooms	1

Activities and space were the top two areas where they would like improvements. Next were more mentors and staff, and a greater number of youth respectively. Since our project will be adding useful space, all of these problems justify the building of a recreation center. A larger space could lead to more activities which creates opportunities for new staff members.

We asked the youth to rank the possible ideas that might be included in the new space with the options being a recreation center, bowling alley, general food vendor, function hall, and theater. To analyze the popularity of each building design, the average rank of each option was found, and the results are shown in Figure 8.

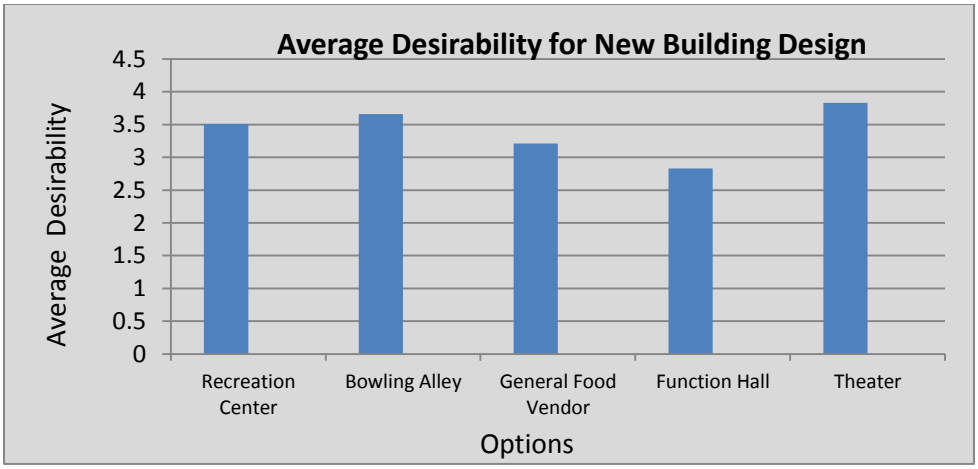

Figure 8: Graph of Ideas for New Building Design Ratings

According to Figure 8, the order of rank from highest to lowest was the theater, bowling alley, recreation center, general food vendor, and function hall. The top three ideas were quite close, which was a good sign since a recreation center was one of the main ideas of the group. The group then asked the youth to write down any other ideas. The results of these suggestions are shown in Table 4 in Appendix C: Results of the Youth SurveysAppendix C: Results of the Youth Survey. The most popular response was an auto mechanics shop. After a discussion with the sponsor, it was concluded that this idea was not practical. It would require too much space as well as be too expensive. Also, the space would only be used when the instructor was present, which means a couple of hours a day at most. There were other ideas which could serve the Center better.

The group asked the youths to rank their enthusiasm for eight different activities. After completing the survey and analyzing the data, the average score for the game room ranked the highest, followed by the dance studio, pool, basketball court, weight room, treadmill, concession stand, and indoor soccer. Figure 9 shows the results of the average score for each idea.

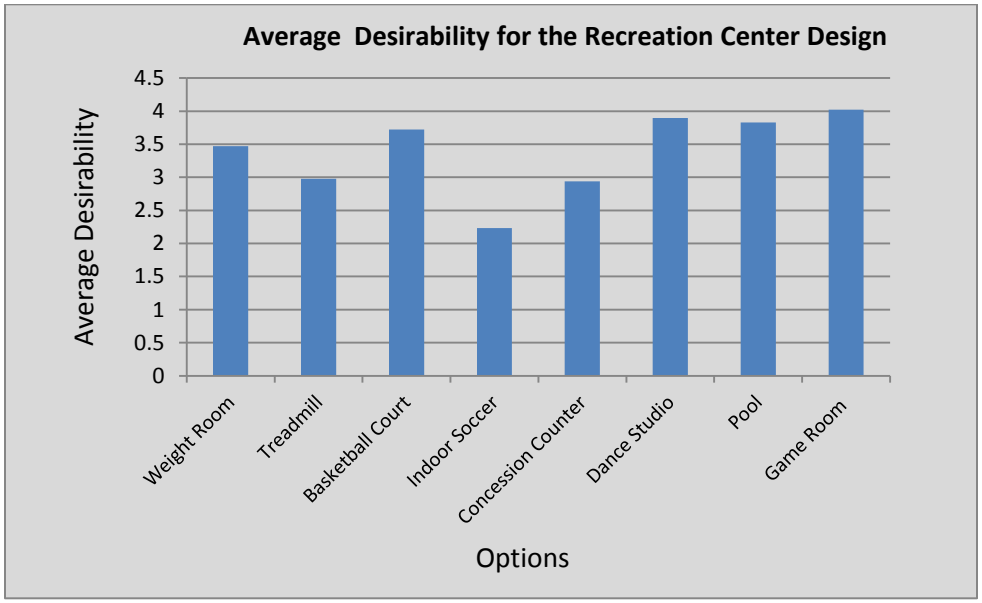

Figure 9: Graph of Ideas for the Recreation Center Building Design

Many of the highest ranked ideas are very close in score. The group discussed how a recreation facility could be successful. Instead of just including one or two of the top ideas, a superior alternative was to try to incorporate as many of these activities as possible.

Another opportunity for the youth to suggest other ideas was given, and the results are shown in the Table 5 in Appendix C: Results of the Youth Surveys. According to Table 5, the youth at the Center would like to focus on activities which are more athletic and interactive such as boxing, working out, and an auto mechanics shop. However, some of them also suggested having a place to work on academics such as a library or study lounge.

After analyzing the youth surveys, it was obvious that the youth had many great ideas for the new space. Since different activities are important to different groups of youth, it was decided to include as many of these ideas in the new building design. For a recreation center, ideas such as a basketball court, dance floor, recording studio, and game room will be added. The youth surveys were very important for identifying great ideas and helping the group to create strong design plans.

4.3 Staff Interview and Survey Results and Discussion

The purpose of the staff interview and surveys was to get a better feel of what the staff thought about the warehouse and how the Youth Center could be improved. In order to create a suitable plan for the warehouse, we had to consider what both the youth and staff had to say about the current conditions. As a group, an interview/survey was created for the staff with a couple of key questions as seen in Appendix D: WYC Staff Interview/Survey Questionnaire.

The interview/survey started with a general question. The staff members were asked to tell a little bit about themselves and their duties at the Worcester Youth Center. This helped to

get a better feel of who each staff member was and what exactly their responsibilities are at the Youth Center.

After learning about each staff's responsibilities, the group wanted to see how the warehouse affected each of them individually. Many of the staff members said that the current state of the warehouse did not affect their work environment in anyway; however, the staff members that had this response currently work on the other side of the building, which is not near the warehouse. The second response received was that the warehouse makes the Youth Center cold during the winter. The heating system is not used to bring the warehouse to room temperature. The heat has to be on to avoid frozen pipes, but the space is not used so the Center wants to keep the gas bill as low as possible. Also, since there are many holes in the exterior walls of the warehouse and not much insulation, the winter temperatures cause the warehouse to be very cold. Any time the door connecting the warehouse to the Center is open, the cold air flows to the Center.

It was also important to hear some of their ideas on what to do with the warehouse space. Most responses included creating a recreational center. A couple of responses suggested the warehouse should have more office space; however, this idea was disregarded due to the unused office spaces currently around Worcester (LoopNet, Inc. , 2011).

The group obtained a better feel for the current floor plan of the Worcester Youth Center and the areas which needed improvement. Many felt that the current setup works well. The staff loves the current floor plan; however, some activities should be moved. For example, many feel that the music distracts the youth who are trying to get homework done. They also would like to see more staff members hired.

Many of the responses obtained from the staff justify building a recreation center for the youth. Refer to Appendix E: WYC Staff Interview Questionnaire Findings and Appendix F: WYC Staff Survey Questionnaire Findings for more details. After conducting the one interview and seven surveys, the staffs' input was used in implementing designs for the new building in the warehouse space. After conducting the staff interview and surveys, we also interviewed engineers following the questionnaire found in Appendix G: Engineers Interview Questionnaire. The interviews with the engineers helped us get a general idea about constructing a new building and green building technologies. Following our findings from the staff, the interviews with the engineers helped us shape our research for the remainder of our project.

4.4 Worcester Youth Center Finances

It has been established that the main issue associated with the Worcester Youth Center warehouse is the safety hazard affecting the staff and youth on an everyday basis. However, another severe problem that stems from this issue is economic burden. The warehouse is simply taking up space and is not serving any purpose to the Youth Center. There are a few financial problems which arise from this fact.

The first problem is that the warehouse continues to cost the Center money on a monthly basis. It has already been established that the heating, electric, and water systems originate in the warehouse. In the winter, the warehouse needs to remain heated so that the water pipes do not freeze. Since the building is not being used throughout the day and since there are holes in its walls, the result is wasted energy and an extremely high gas bill at the end of each month.

After inspecting the financial statements that were provided by the Youth Center, it is interesting to see that for a building which is not extremely large, the utility expenses resemble that of a mortgage payment. When looking at the budget for the Center, which can be seen in

Appendix H, one can see that the expected monthly payment is over $1700. Annually, the utilities have a budget of about $21,000. This is really a significant bill to pay. Looking at the entire budget in Appendix H, the total expenses for the year is $568,886. So, the utilities bill even becomes more noticeable when it accounts for 3.7% of the total expenses. Designing a new building means two solutions for the Center. First, by having a usable space which is used every day, the expensive bills are justified and even decreased by green features. Secondly, a new building could bring something exciting to the youth and community and create a new source of revenue to be put back into the Center.

Another issue with the Youth Center finances is that there is no extra money to help the organization expand. They are a non-profit organization, so there is only enough finances and revenue to support the expenses of the Center. Examining the budget, it can be seen that the net income is expected to be around $3,000. The Center has to make sure they have a small income in case there is an unexpected problem or situation that needs to be dealt with. At times, they do not have enough money for all their extra necessities and the result is them owing money at the end of the year.

A main goal of this project is to design the space so that it acts as a source of revenue for the Center, while also bringing something new to the community. In the annual budget, the gross income is $571,733. If the new design is successful and the Center can create more revenue, the net income at the end of every year will be large enough for the Center to grow. However, to be able to create this space, the Youth Center must get additional grants and funding to help in the building process. The group hopes that the new design can allow the Center to grow and provide for more youth in the future.

The net income is simply not high enough for the Youth Center to grow and fulfill all its needs. The first solution to this problem is lowering expenses. The warehouse is not used, yet it is causing the Center to spend more money on utilities. A newer building will not only validate spending that amount of money on utilities, but green renovations could also lower the costs tremendously. The second solution for the net income is that the total revenue must increase. A new building designed to add something new to the community means adding a source of income to the Center, allowing it to grow and flourish for many years to come. With this proposal, it is expected both of these solutions will occur. This means that the youth of Worcester will continue to be helped and will always have a place where they can go. The well-being of the youth is the most important thing to the Center and is the true reason why a new building design of the warehouse space is being proposed.

4.5 Discussion of Building Design Plans

Although this group did not create the actual blueprints and plans for the Youth Center's new building, they created a visual representation of two possibilities that greatly strengthen the proposal made to the board. Many things were considered to reach these plans. The ideas of the youth and the practicality of these ideas were taken into account. The need to bring revenue to the Center was also another main component for the design plans. The list of the most desired elements of the new building is as follows: a basketball court/soccer court, a weight room and treadmills, a game room, a kitchen, a concession stand, a function hall, a space for the dancers, a recording room, and storage space.

In both designs there are two exits: an emergency exit as well as the exit/entrance attached to the Youth Center. Also, the stairs to the second floor are positioned in such a way that the first floor would not be interfered with if the youths want to reach the second floor

during a function on the first floor, or vice versa. Also, pre-existing rooms in the Youth Center, such as the recording room and weight room, are relocated into the new space. This opens up room in the existing building for new development. Because of this, the Youth Center will be able to separate educational activities and functions from leisure and recreational ones. This promotes a more productive atmosphere for studying and education in the existing building, and allows the recreational activities to be less disruptive because they are now in the new space.

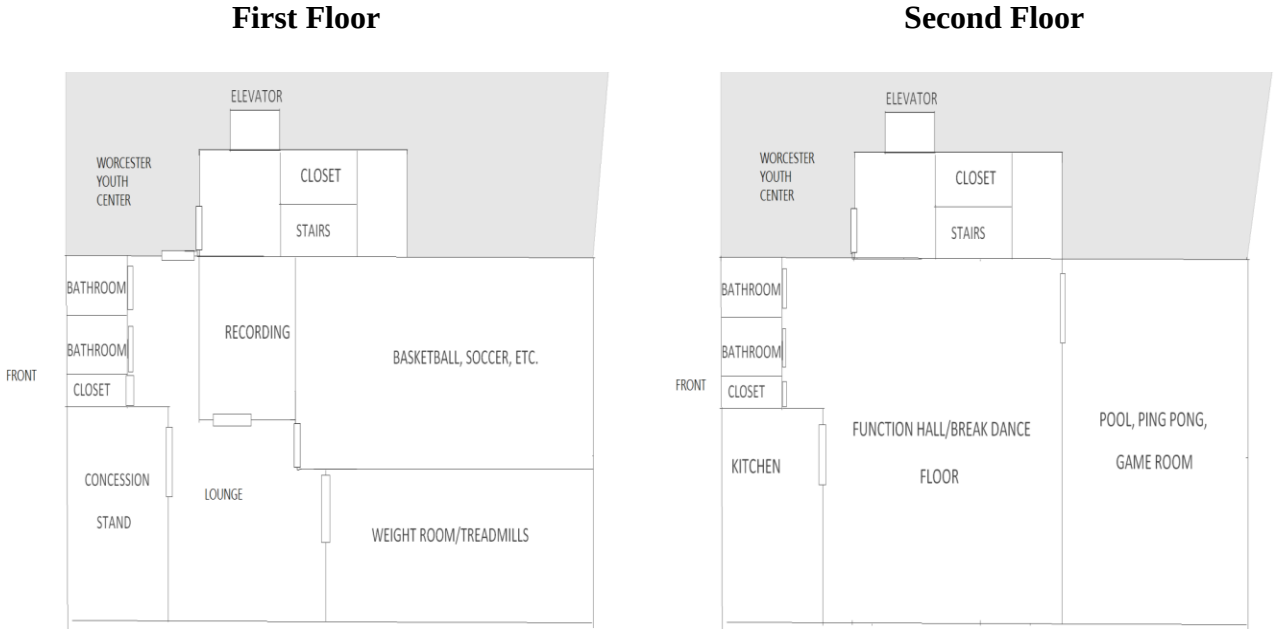

Figure 10: Design Plan 1 (1st and 2nd floor)

When designing the first floor of the first plan, the first element that needed placement was the concession stand, as it needed to be in a place that could serve the outside-front of the building as well as the inside. The idea was also to make the basketball and soccer court on the first floor as well. If it was on the second floor the noise would easily filter down to the first floor. The weight room was also imagined to be on the first floor for similar reasons, plus the fact that the extra weight of the equipment would mean the second floor would need to be made more structurally sound, which may increase building cost. For both floors the bathrooms were placed in the same relative area for reducing piping costs. The recording room was also placed

on the first floor. This was done in order to make room on the second floor for the function hall. The walls of the recording room will be made to ensure good sound quality and to block out stray sounds from other activities.

On the second floor, because the concession area is like a kitchen, it made sense to put the kitchen above it for piping reasons. The bathrooms on the second floor were already placed above the ones on the first floor for the same reason. Because the function hall and the game room could be used simultaneously for events such as birthday parties and other gatherings involving children and teens, they were placed in proximity to each other. As in all other rooms, it was determined that there were to be a lot of windows, to promote the transparent nature that the Youth Center encourages and demands. With this in mind it was decided to make the whole dividing wall between the function hall and game room glass so that parents could easily see their children, as well as the afore mentioned reason. The function hall in this design was envisioned to be a wood floor, to double as the dancing floor for the youth at the Center.

There are also two closets on the first floor, one near the bathrooms and one under the stairs to the second floor. There is also a third closet on the second floor near the bathrooms. An elevator or ramp will also be included in the design to allow handicap access to the second floor.

First Floor **Second Floor**

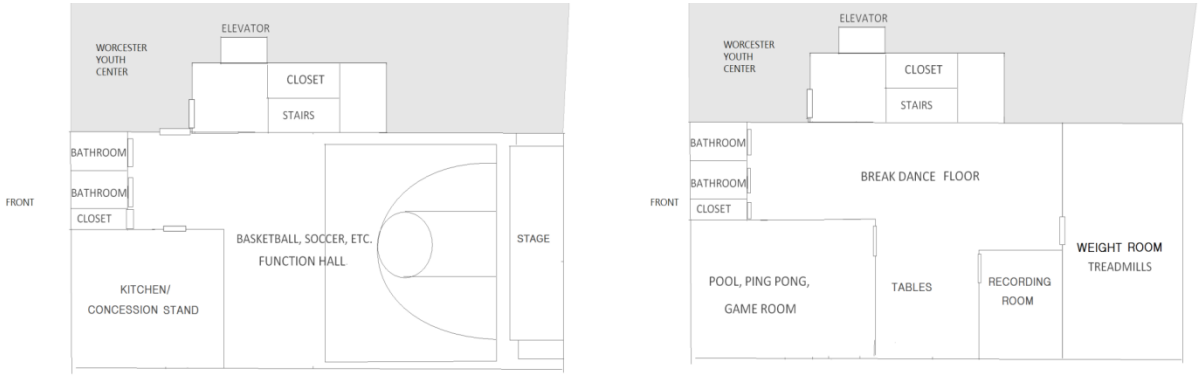

Figure 11: Design Plan 2 (1st and 2nd floor)

Similarly to the first floor of the first plan, the concession stand was placed in the same location on the first floor of the second plan. To try to eliminate expensive kitchen equipment, it was decided to enlarge the concession stand and include the full kitchen in it as well. This would make more space for other rooms as the kitchen and concession stand occupies the same space. Because there would now be more room on this floor, it would also be possible for a small stage to be put in for performances and other uses. Also because of the kitchen and concession combination, the basketball and soccer court could be made bigger. It was also decided to move the function hall to the first floor with no walls dividing it from the basketball court. This would mean that the first floor is essentially one big room. This could accommodate larger groups into the space. The flooring here would be a very durable and low maintenance synthetic flooring. However this flooring is much rougher and more abrasive than wood, meaning the dancers would not be able to use its surface.

For this reason a separate room was designed on the second floor with them solely in mind. Also on the second floor would be the weight room, recording room, and game room. All of these rooms would also have walls with large window spaces as mentioned before. All of the bathrooms and closets are in the same areas as in the first design. However for this design, because the heavy weight equipment would be upstairs, a stronger elevator would need to be implemented to move the equipment. This may be more expensive, however, necessary for this design.

Both of these designs were filled with areas which can bring in extra revenue for the Center in a number of different ways. They were also designed to as many features as possible to try to satisfy the needs of all the youth. Besides the floor plan for the new building, a new layout for the old section of the Youth Center was created (Figure 12).

Figure 12: Current and Possible Building Layout

Since there are areas from the Center which are being moved to the new building for extra space, there will be available space in the old section. This space will be used for offices, classroom and study areas. The main goal of this design is to create a better flow. The old section will be the academic side which will be more relaxed and quiet for students who need to do schoolwork. The new building will include all of the recreational activities that cause all the noise. This way, there will be no distractions between athletic and academic activities.

4.6 Possible Green Technologies

This section discusses the findings on how to make the new building green in order for it to qualify for LEED Certification from the United States Green Building Council (USGBC). LEED, Leadership in Energy and Environmental Design, is an internationally recognized green building certification system**,** providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts (U.S. Green Building Council, 2011). According to the LEED for New Construction Rating System Version

2.2, there are four levels of certification that can be achieved based on the credits earned as seen in Figure 13.

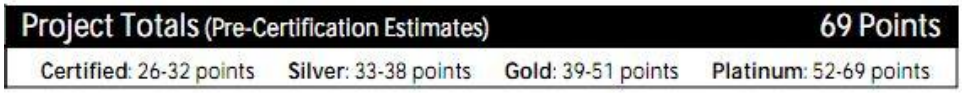

Figure 13: Project Totals (Pre-Certification Estimates)

There are six categories in which the new building can be made green: Sustainable Site, Water Efficiency, Energy and Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation & Design Process. In each category there are different credits that need to be met, some of which are prerequisites and others which are optional. All projects seeking LEED certification of any level must perform all prerequisites in every category (Leffers, 2010).

An entire LEED Certification assessment of the possibility of making the new building green was completed and can be seen in Appendix I: LEED Assessment. The group used the LEED for New Construction Rating System Version 2.2 to make the assessment. Based on the assessment, it was concluded that some categories are easier to achieve than others. The Energy and Atmosphere category is the hardest to achieve because the credits call for technologies that are very expensive to implement. The easiest categories where the Center can achieve the most credits are in the Materials & Resources category and the Water Efficiency category. It was also concluded that the Worcester Youth Center might already qualify for some credits. Based on the group's assessment, it is very possible to make the new building green and to get it at least LEED Certified.

It is important to keep in mind that the research was carried out in less than seven full weeks. Due to these time constraints, the group was not able to comprehensively asses all of the underlying factors that go into getting LEED Certification from the United States Green Building Council (USGBC). While these circumstances did not take away from proper execution of the

project goal; to design a plan for a new building for the warehouse space, it suggests that further study is appropriate in the implementation of green technologies.

4.7 Londonderry School Case Study Findings

The group had originally planned to use the Londonderry School, a LEED Certified institution in Harrisburg, P.A., as a case study. The case study was going to investigate the long and short term costs of building green by asking the school to share their energy bills since their first day of operations. We contacted the school, but were unable to speak with someone who could disclose this kind of information. However, the case study of the Londonderry School showed that building green does not need to cost more than traditional construction. For instance, it was constructed at about $100/sq. ft., and the typical central Pennsylvania school construction cost is $130/sq. ft. The Londonderry School is 25,000 sq. ft. and the overall cost of construction was $2.5 million (Take a Tour of Our Green School Environment, 2010).

In identifying the feasibility of getting LEED Certification, as discussed in Section 4.7, the Londonderry School served to see a parallel between the LEED Certification assessment of the Youth Center found in Appendix I. By looking at the Londonderry School LEED Certification Checklist, we found that they were able to achieve the most points in the Materials & Resources category, see Appendix L: Londonderry School LEED Certification Checklist. This indicates that the Youth Center could potentially achieve the same points without having to spend extra money during the construction of the new building.

4.8 Massachusetts Building Green Financial Incentives

A motivator for building green is the financial incentives available for implementing green technologies. The Database of State Incentives for Renewable & Efficiency (DSIRE) website has a complete database of financial incentives available. DSIRE is a comprehensive source of information on state, local, utility and federal incentives and policies that promote renewable energy and energy efficiency (The Database of State Incentives for Renewables & Efficiency, 2011). There are thirteen possible financial incentives available based on the projects pursued by the various organizations or individuals. Some of these incentives are federal or state specific incentives. In general, this is the list of the financial incentives available:

Figure 14: List of Financial Incentives

The Worcester Youth Center could greatly benefit from the Grant Programs and Loan Programs to be able to implement certain green technologies. Most of the grants for the State of Massachusetts found in the DSIRE database are for implementing wind or solar technologies. Further, there are loans which could be used to implement: water heaters, furnaces, boilers, heat pumps, programmable thermostats, duct/air sealing, building insulation, windows, and other technologies depending on the loan. These loans could help the Center build a green building.

For a thorough list of financial incentives, it will be helpful for the Center to browse the DSIRE Database to identify which ones they may qualify for. It is important to keep in mind that grants are very competitive and it is not certain that the Center might be able to get them.

4.9 Cost Analysis of Building Plan

In designing the building, it is important for the planner to provide cost estimation for the customer. The estimate cost analysis is one of the many factors that influence a customer's decision making. However, the estimated cost varies throughout time as the economy is constantly changing. There may also be wage increases, an increase in the cost of building materials, and many other variables that may change the cost estimation. For this project, the group used a program called RSMeans CostWorks 2010.

4.9.1 RSMeans CostWorks 2010

RSMeans CostWorks is North America's leading supplier of construction cost information. This program supplies accurate and current cost information that helps planners to precisely control the cost of new building constructions (RSMeans, About RSMeans, 2010). The program provides several tools that can calculate data for building construction cost, green building cost, facilities cost, plumbing cost, cost per square foot, metric construction costs, and many more. In this project, the team decided to estimate the cost in square foot. Therefore, RSMeans CostWorks in term of Square Foot Cost 2010 is used to analyze the cost of a new building at Worcester Youth Center.

4.9.2 The Method to Estimate the Cost of New Building

In this project, the group decided to estimate cost per square foot by using RSMeans CostWorks. The feature of this program is shown in Figure 15. In the first step, standard labor was chosen and Worcester, M.A. was filled as the location. Next, the type of building had to be

selected. In this case, it was agreed that a high school of two stories with decorative concrete block/steel frame is the most appropriate type for the new building to be constructed due to the age of the facility and activities that take place at the Worcester Youth Center.

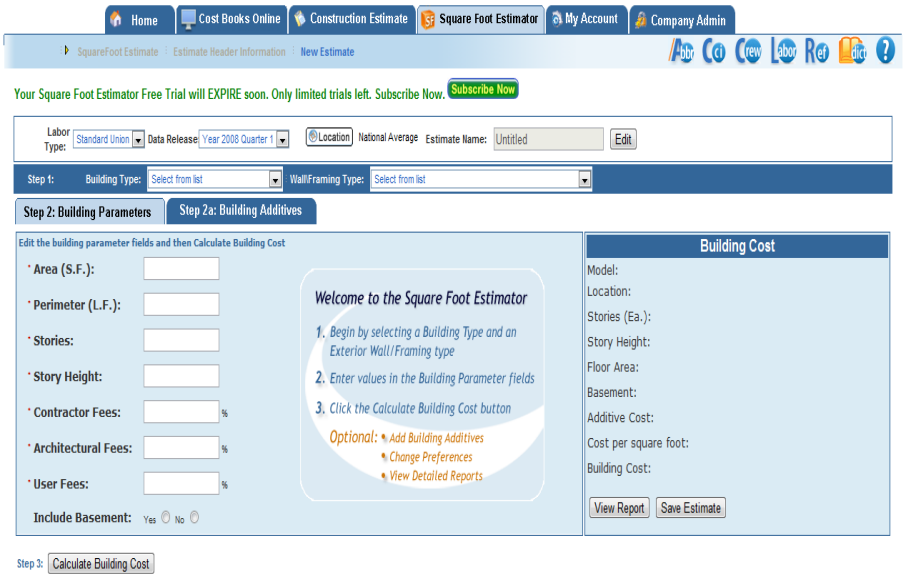

Figure 15: Square Foot Cost 2010 by using RSMeans 2010

After that, the approximate area and perimeter of the new building had to be estimated. With this problem, the group utilized the blueprints provided by the Worcester Town Hall, which is located in Appendix M: Worcester Youth Center Information from Worcester Town Hall, to estimate the perimeter and area which are 300 feet and 5000 square feet respectively.

The maximum height was chosen for this type of building, which is 18 feet. In terms of fees, it was assumed that there were possible fees of up to 25% of the total project cost for the contractor and 7% for the architecture. Moreover, due to the building requirements of a two floor building, the building needs to support a disabled person; thus, at least one elevator must be set up.

4.9.3 The Possible Cost of the New Building

After all the required information has been filled out, the program will show the final report. As shown in Appendix N: Square Foot Cost Estimate Report, the estimated cost of the building is 2,578,000 US dollars or 515.60 US dollars per square foot. The report distributes the total cost into 7 parts.

Table 3: Types of Work in the New Building

Types of Work	Details	Estimated Cost (US dollars)
Substructure	Standard foundation, Slab on Grade, Basement Excavation, Basement Walls	106,000
Shell	Floor Construction, Roof Construction, Exterior Wall, Exterior Windows, Exterior Doors, Roof Coverings, Roof Opening	1,003,500
Interiors	Partitions, Interior Doors, Fittings, Stair Construction, Wall Finished, Floor Finished, Ceiling Finished	168,000
Services	Elevators, Plumbing Fixtures, Domestic Water Distribution, Rain Water Drainage, Energy Supply, Cooling Generating Systems, Sprinklers, Electrical Service/Distribution, Lighting and Branch Wiring, Communications and Security, Other Electrical Systems	608,500
Equipment & Furnishings	Institution Equipment, Other Equipment	11,000
Special Construction		0
Building Sitework	Site development	500

The report also provides the possible materials, percentage of total cost, and cost per square foot. These data can be found in more detail in Appendix N: Square Foot Cost Estimate Report.

4.9.4 Discussion of Estimated Cost

Before constructing the new building, Worcester Youth Center needs to demolish the warehouse first. As shown in Appendix O: Demo of Existing Wood Structure, to demolish the warehouse in 2007 was 327,942 US dollars. Therefore, the estimated total cost in this project is

approximately 3,000,000 US dollars. It is extremely likely that the actual price will be different from the estimation of the program. However, it will be a major factor for the board members of the Worcester Youth Center in their decision for this project.

4.10 Worcester Youth Center Market Analysis

After taking the youth, staff, and sponsors' input for the new building in the warehouse space along with many other factors, it was decided that the best suitable plan for the warehouse was to build a recreational center. The first factor taken into account was that the nearest recreational center is about two miles away. The map below gives a better view of how close five other recreational centers are to the Worcester Youth Center.

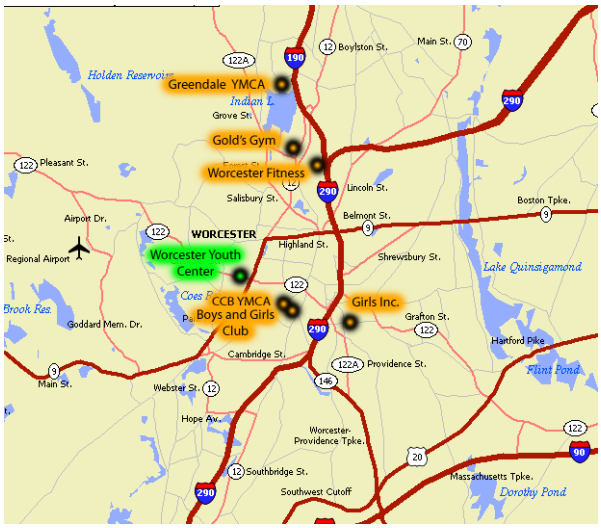

Figure 16: Map of the recreation centers around WYC

After looking at how close the nearest recreational center is to the Worcester Youth Center as well as taking to our sponsor, it was concluded that it would be a good idea to build a recreational center not only for the youth but also for the community around the Worcester Youth Center. The idea not only involves around the youth, staff, and sponsor but it also involves in creating a source of income for the Worcester Youth Center.

After analyzing the surveys and interviews, it was decided to include a theater, concession stand, basketball court, break dance floor, game room, function hall, weight room and a recording room studio in the recreational center. Please refer to the Figure 10 and Figure 11 in Section 4.5 for more details.

Not only will these ideas be good for the youth, but they will also create a source of income for the WYC. The Center currently has limited money to work with; however the recreational center will help with that issue. By having a recreational center, the WYC will be able to act like a YMCA. In doing so, the WYC will be able to charge the community for a monthly membership to use the recreational center; this is one of the suggested ideas to generate money. The group has also thought of a few other ideas as well: the WYC could rent out a lot of the space.

The WYC would be able to rent out the function hall and the game room for weekend parties and community events. In the function hall, they could also have performances in the weekend for the community and charge admission. They also would be able to rent out the recording studio to the community. The concession stand will also be built so it can operate in the summer time. It can be accessed from the inside and outside, so it will serve the youth as well as the community members around the area. There is a park right behind the Center and a stadium across the street so there are vast numbers of customers that can be served during the summer. These are just a couple of ideas on how the WYC can generate revenue; however, there are sure to be other ideas that will be thought of along the way.

4.11 Summary

Most parts of the design ideas came from the input from the youth and staff at the Center. Their thoughts were important because they are the ones who will be affected by the new space every day, and they are the ones who know the current problems associated with the Youth Center more than anyone else. After analyzing the surveys and interviews, it was determined that a space filled with recreational activities was most needed at the Center. There is a large enough space that many of the ideas of the youth could be included. There are new features which are not currently at the Center, as well as old features which were given a larger space. It was also decided that since some space from the Center will be moved to the new building, all of that space could be used for classrooms, offices and studying areas. In this way, the old section of the building will be strictly academic and more relaxed, while the new building will have all the noise and activity. For the final designs, every area was included because it is capable of producing revenue.

The final findings discuss the ways in which the new space could include new technology. The different LEED Certifications were identified and discussed. The more green features that are included, the more money the Center will be able to save in the long run. However, the Center has to spend their money wisely and include features which will decrease energy consumption while also spending money reasonably. The green technology section identifies many possibilities and analysis to help the Center decide what is best for them. Lastly, the incentives for building green were discussed.

In the end, all of the research helped to create a plan which will help the Youth Center to thrive. It will create a building which will first bring something new and exciting to the community. Secondly, it will be a great help to the finances of the Center by decreasing total

spending and increasing total revenue. With a greater net income, the Center will be able to constantly add more features and become larger. Lastly, the Youth Center will set a great example for society by going green. Satisfying all three of these areas in this one project was extremely important to this group when forming this proposal. The two final designs were proposed to the Board of the Youth Center in a PowerPoint presentation which can be seen in Appendix P: Project PowerPoint Presentation . Useful sources are provided in Appendix Q: Useful Sources to help the Board further this project. If the Worcester Youth Center Board decides to put one of these plans into action, the Center will flourish in the long run. Due to the three benefits discussed, the Center will continue to grow and provide a place to better the lives of more youth of Worcester. This has always been the most important goal.

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Appendix A: Project Milestones

Date		Tasks	Type
Week 1			
Sun	17-Jan	Draft milestones	Writing
Thurs	20-Jan	Youth survey and community interview questionnaire	Data
		Research other community centers in Massachusetts area	Data
		Visit the MLK Center (Afternoon as a group)	Meeting
Fri	21-Jan	Complete preparation for interviews and surveys	Data
		Research Commercial Real Estate	Data
Week 2			
Sun	23-Jan	Complete revised milestones	Writing
Mon	24-Jan	Complete preparation for interviews and surveys	Data
		Revise chapter 1 of proposal	Writing
		Research chamber of commerce	Data
Tue-Thurs	25-27 Jan	Conduct interviews and surveys	Data
Wed	26-Jan	Revise chapter 2 of proposal	Writing
		Research recreation facilities	Data
Fri	28-Jan	Complete analysis of data from surveys and interviews	Data
		Revise chapter 3 of proposal	Writing
		First half of final presentations	Presentation
Week 3			
Sun	30-Jan	Chaps. 1-3	Writing
		Brainstorm our ideas and email the sponsor	Data
Mon	31-Jan	Determine whether or not additional surveys/interviews need to be conducted	Data
		Summary of Background Chapter	Writing
		Decide top idea proposals	Data
Tues	1-Feb	Meet with sponsor and talk about ideas for the warehouse	Meeting
Wed	2-Feb	Prepare outline for Chapter 4 (Findings Chapter)	Writing
		Summary of Introduction Chapter	Writing
Thurs	3-Feb	Prepare some cost analysis of top proposals	Data
Fri	4-Feb	Summary of Methodology Chapter	Writing
Week 4			
Sun	6-Feb	Draft executive summary, outline findings chapter	Writing
Mon	7-Feb	Gather information for Chapter 4 (Findings Chapter) and start writing	Data
Tue	8-Feb	Continue writing Chapter 4	Writing
Wed	9-Feb	Gather information for Chapter 5 (Discussion Chapter) and start writing	Data
Thurs	10-Feb	Continue writing Chapter 5	Writing
		Compile rough draft of Chapter 4 and 5	Writing
		Prepare for findings Presentations	Presentation
Fri	11-Feb	Findings presentations	Presentation
Week 5			
Sun	13-Feb	Draft findings and discussion chapter	Writing
Mon-Fri	14-18 Feb	Put all pieces of Complete Draft together and revise necessary parts	Writing
Week 6			
Sun	20-Feb	Complete draft	Writing
Thurs	24-Feb	Rehearse final presentation	Presentation
		Revise Complete Draft and all necessary parts	Writing
Fri	25-Feb	Practice final presentations	Presentation
Week 7			
Sun	27-Feb	Revised Complete draft	Writing
Tue	1-Mar	Revise first final presentation	Presentation
Wed	2-Mar	Final presentations this week	Presentation

Appendix B: WYC Youth Survey Questionnaire

Worcester Youth Center Project Group
Youth Survey Questionnaire
326 Chandler St. Worcester, MA 01602

1. What is good about the Worcester Youth Center?

2. What could be improved at the Worcester Youth Center?

3. We are currently thinking about designing a new building in the warehouse space. Please rate these options on a scale of 1 to 5, 1 being the least desired, and 5 being the most desired.

	1	2	3	4	5
Recreation Center:	☐	☐	☐	☐	☐
Bowling Alley:	☐	☐	☐	☐	☐
General Food Vendor:	☐	☐	☐	☐	☐
Function Hall:	☐	☐	☐	☐	☐
Theater:	☐	☐	☐	☐	☐

4. Are there any ideas that you would want the Youth Center to include in the new space, which are not on that list?

5. One idea that is being considered for the new space is a recreational facility. Please rate these recreational ideas on a scale of 1 to 5, 1 being the least desired, and 5 being the most desired.

	1	2	3	4	5
Weight Room:	☐	☐	☐	☐	☐
Treadmill:	☐	☐	☐	☐	☐
Basketball Court:	☐	☐	☐	☐	☐
Indoor Soccer:	☐	☐	☐	☐	☐
Concession Counter:	☐	☐	☐	☐	☐
Dance Studio:	☐	☐	☐	☐	☐
Pool:	☐	☐	☐	☐	☐
Game Room (arcade & pool/ping pong table):	☐	☐	☐	☐	☐

6. Other than the ideas listed in the previous question, what else would you like to have access to in a recreational facility?

Appendix C: Results of the Youth Surveys

Table 4: Alternative Ideas of New Building Design

Alternative Ideas	Frequency
Auto Mechanics Shop	6
Laser Tag	2
Salon/Barber Shop	1
Special School	1
Library	1

Table 5: Alternative Ideas to Put in the Recreation Center

More ideas	Frequency
Squat	2
Art Room	1
Food Court	1
Indoor Football	1
Book Room/ Library	1
Study Lounge	3
Boxing Area	4
Auto Mechanics Shop	4

Appendix D: WYC Staff Interview/Survey Questionnaire

Worcester Youth Center Project Group
Staff Interview Questionnaire
326 Chandler St. Worcester, MA 01602

Date:
Time:
IQP Interview
Attendees:

1. How long have you worked at the WYC and can you tell us about your current duties and responsibilities?

2. In what ways does the current state of the warehouse affect your work environment?

3. What do you think should be done with the warehouse?

4. What are your thoughts on putting a fitness center/gym in the warehouse space?

5. What are your thoughts on using the space for commercial purposes or real estate?

6. How do you feel about the current floor set up of the WYC?

7. What are some areas of the WYC that could use improvement?

8. What are some of the needs of the Youth Center?

9. What would you like to see offered by the WYC to the youth?

10. What would you like to see offered by the WYC to the community?

Appendix E: WYC Staff Interview Questionnaire Findings

Worcester Youth Center Project Group
Staff Survey Interview
326 Chandler St. Worcester, MA 01602

Date: Friday, January 28, 2011
Time: 1:35p-1:53p
IQP Interview
Attendees: Ms. Lucia Alfaro, Mariela Lizet Castillo, Tanawit Permsuk, Eduardo Pizzini, Daniel Thomas, Daniel Valerio

1. How long have you worked at the WYC and can you tell us about your current duties and responsibilities?
    - Has worked one year at MSPCC
    - Counselor- Conflict resolution, deals with any crisis, talks to youth and spends time with them
    - Is part of Sisterhood-girls discussion group and deals with topics such as bullying, conflict resolution, and teen pregnancy
    - Rise- similar but with both boys and girls
    - She works as a "middle man" between MSPCC and WYC

2. In what ways does the current state of the warehouse affect your work environment?
    - The cold air from the warehouse takes away from the work environment

3. What do you think should be done with the warehouse?
    - It should at least be used for something rather than nothing
    - There are too many multipurpose spaces right now, people have to share offices, computers and class rooms
    - More classrooms and gym space
    - A school atmosphere-too many youth are "slipping through the cracks"

4. What are your thoughts on putting a fitness center/gym in the warehouse space?
    - It is a good idea, exercise is a form of stress relief which improves physical and mental health
    - Also promotes healthy lifestyles
    - Would need to be sound proofed to keep the noise out of other aspects of the building

5. What are your thoughts on using the space for commercial purposes or real estate?
    - Any source of income would be beneficial, if offices did that then it would be worth it
    - Could put in some sort of affordable food (pizza)

6. How do you feel about the current floor set up of the WYC?

- Needs more offices, when youth need to meet one on one, it is hard to find a quite space
- Everything is combined, the music is very distracting and makes working hard
- Relaxation programs are not very effective with angry music playing

7. What are some areas of the WYC that could use improvement?
    - There is only one conference room
    - Would like to see a "space for learning" like set aside spaces for school activities

8. What are some of the needs of the Youth Center?
    - Pretty much covered in other questions

9. What would you like to see offered by the WYC to the youth?
    - Substance abuse and awareness programs
    - Better teen pregnancy programs
    - Improved youth counseling program
    - A physical trainer/nurse for dance/sport injuries and other health issues that come up

10. What would you like to see offered by the WYC to the community?
    - A space that can be used by the community and get them into the center as well
    - Whether it is renting gym space or offices or function space

Appendix F: WYC Staff Survey Questionnaire Findings

1. **How long have you worked at the WYC and can you tell us about your current duties and responsibilities?**
    - Various answer
2. **In what ways does the current state of the warehouse affect your work environment?**
    - It's always so cold.
    - It is so cold, and it lets in a lot of cold air if the door is opened. It was also a huge inconvenience when the water pipe out there froze, and we had no water. The condemned sign is also an eyesore.
    - It smells and it is very unsafe and is moldy. A breeding ground for rats and walls continue to weaken.
    - It is not empowering working in a building that is condemned.
    - Everything we do leads us back to the warehouse. Equipment water is back there. It is also a problem area. Last week some pipes froze so I spent a lot of time back there last week which tool away from regular duties.
    - To be honest, I have never given it much thought. My work has mainly been with the youth and issues that they might be struggling with.
    - It is a constant reminder of what it could be. Health wise I know there are concerns about chemicals etc. that still might be in the building. On top of it all our air conditioning and heat come from there. Furthermore, it is hard to come about a location for youth when half of it is condemned.
    - It does not affect it.

- It is very cold during the winter and the constant need to open the door lets in a very cold draft. This space can be used for greater purposes.
- Unheated/cold space makes finished part of building cold too.

3. **What do you think should be done with the warehouse?**
    - It should be turned into a space that we can send people that want to come and practice. Need a place to dance or etc.
    - I think more office space and a larger classroom for programs would be great.
    - The warehouse is not repairable should be demolished and rebuilt for youths related activities like bigger recreation room, trade classes, etc.
    - Events hall, office space for employees, conference rooms for group meetings and a recreation space.
    - I feel that a space that separates us from other non-profits space to give youth training with certifications (auto workshop), (professional kitchen), dance and music area.
    - Develop it into offices and cubicles so more one on one learning can occur.
    - It would do great as a multiuse facility for alternative school after school programming, martial arts, and boxing areas. A space to provide entrepreneurship and small business startup.
    - Used for extra facility space.
    - It should be used as different comfortable and safe environment in which counseling groups can take place.
    - No ideas, it never developed, at least insulate better.

4. **What are your thoughts on putting a fitness center/gym in the warehouse space?**
    - That's fine or also we can make it into another recreation room space that can be used for multiple purpose area.
    - That would be awesome.
    - It would be a great idea, but the warehouse is big enough for a lot more.
    - As long as it is not the entire space.
    - A gym is something other non-profits have. Only way it would work is if it was multipurpose basketball gym.
    - That is a good idea.
    - Most definitely. It would be a separate entity to Limitless Fitness Club which already exists as a small business at the Center.
    - Anything is better that its current use.
    - I think that would be a great idea! This would promote healthy living and give easy access to those that cannot afford membership.
    - Make sure project is sustainable past development stages-supervision, equipment, etc.
5. **What are your thoughts on using the space for commercial purposes or real state?**
    - I rather it be used for youth more.
    - I would rather not use it for commercial purposes unless it was for work readiness/development for youth (like a business with WYC working it to learn/develop).
    - We shouldn't think about "profit" rather charging for services to be self-sufficient.
    - No!
    - As long as it gives youth jobs and training it would work.

- Possibly create a small restaurant/snack bar.
- I think that would be good for small portion of it to provide internships for youth if they were business/office space.
- If it pays the bills. Otherwise I would vote to use the space for more youth purposes.
- I do not think that would benefit our center. I think that we could use the space for more youth activities.
- Would generate income, parking would be a concern.

6. How do you feel about the current floor set up of the WYC?

- I love it.
- It works okay – more office space would be great, or if my office was reconfigured.
- The space between the entrance and the kitchen has nice flooring; the recreation room needs a makeover.
- We need more space for acts to happen in.
- We have a lot of underutilized space. It doesn't work. Loud music is homework time.
- Okay.
- The ceiling is completely open. The floor plan is fine but it needs more seclusion for the offices and classrooms but with working space around them.
- It works for the most part.
- I like the current floor set up but I feel it can have a more professional look to it.

7. What are some areas of the WYC that could use improvement?

- Recreation room needs to be livened up.
- Offices.

- The music studio could use sound proofing, the recreation ceiling could also benefit from sound insulation.
- Recreation room needs a bigger area for dancers and basketball. In addition more office space.
- The support of the most popular programs need more space, dancing, leadership, computer lab, music studio all need more space.
- More office space.
- Close in the office spaces/classrooms to make them more conclusive for their use. Re-organization and better use of the recreation room. Micro-enterprises could use more funding as well to make improvements.
- In my opinion, the organization of recreational activities at the center can be improved.
- Making the GED classes and computer lab more enclosed. It gets very loud sometimes making it hard to concentrate.
- Common area outside of classrooms of often a gathering spot, it distracts students. Otherwise it is okay.

8. **What are some of the needs of the WYC?**
    - More staff.
    - More money obviously. We need to market ourselves better.
    - Space.
    - Space for acts.
    - Computer lab and diversified funding sources.
    - Funding.

- Funding, space away from recreation to conduct academics, office space, better kitchen.
- That all depends on what needs to be done. As a dance teacher, I would say if we had the opportunity for something to ask for it would be a stereo system for dance room.
- More funding and more organization including help from the community.
- Supervision in all areas-many spaces.

9. What would you like to see offered by the WYC to the youth?

- Just for them to have a place to enjoy everything.
- More stipend programs. More dinners (some kids go hungry).
- Recreation trades/hobbies that youth can enjoy and possibly pursue a career in.
- Nothing new, just more space to better the acts we offer.
- Programming with certifications attached to them. Computer training, more arts and humanities (voice coach, playing musical instruments).
- One and one programming/mentoring.
- More of what we are already offering. More recreation opportunities.
- More self-help education.
- I would like to see more counseling type programs like sex education, crisis and domestic violence support groups.
- Structure, consistent programming.

10. What would you like to see offered by the WYC to the community?

- More visible community involvement – get our youth and our name out there.
- Not sure.
- Community dinners, space for meetings, large yearly events.

- More outreach.
- Block parties! A place to have good concerts. Additional work/internship opportunities for the youth/young parents.
- The same things the WYC offers to its youth.
- I would like to see the community offer their time for mentor purposes.

Appendix G: Engineers Interview Questionnaire

Worcester Youth Center Project Group
Engineers Interview Questionnaire
100 Institute Road Worcester, MA 01609

Date:
Time:
IQP Interview
Attendees:

Civil Engineers:

1. How long have you been a civil engineer?
2. What is the standard procedure to start a building project?
3. What are some of the most popular green features being used in buildings and how are they implemented?
4. Do you have any knowledge in terms of building a recreation center, its process and any complications that may arise?
5. Do you know about any sound proof architecture or technology that can be implemented in the building spaces, such as the gym or recording studio?
6. We will be demolishing the warehouse space, is there a way to reuse any of the material?

Environmental Engineers:

1. How long have you been an environmental engineer?
2. Based on your experience, what are some of the most cost efficient green features being used today?
3. What can you tell us about green roof tops?
4. What sort of green features are there for building a recreation center?
5. What sort of recycled materials you recommend we use to build?
6. Are you aware of any environmental specifications that new buildings can meet in order to reduce the amount of taxes or other payments?

Appendix H: The Worcester Youth Center Budgets

	Nov 10	Budget	Jan - Nov 10	YTD Budget	Annual Budget
Ordinary Income/Expense					
Income					
4000 · Government					
4005 · Federal	0.00	0.00	0.00	0.00	0.00
4010 · State	7,614.54	2,534.58	75,039.49	27,880.42	30,415.00
4015 · City	6,599.15	5,303.00	62,069.54	58,333.00	63,636.00
4000 · Government - Other	0.00	0.00	0.00	0.00	0.00
Total 4000 · Government	14,213.69	7,837.58	137,109.03	86,213.42	94,051.00
4020 · Private					
4025 · Annual Appeals	2,369.45	3,333.33	13,081.70	36,666.67	40,000.00
4030 · Corporations	2,500.00	6,020.84	11,500.00	66,229.16	72,250.00
4035 · Foundations	0.00	12,583.32	97,450.00	138,416.68	151,000.00
4020 · Private - Other	0.00	0.00	0.00	0.00	0.00
Total 4020 · Private	4,869.45	21,937.49	122,031.70	241,312.51	263,250.00
4040 · Inkind					
4045 · UMASS	4,643.04	4,642.98	51,073.44	51,073.02	55,716.00
4050 · Charter Communications	50.00	50.00	550.00	550.00	600.00
4055 · UMASS Benefits	2,259.70	2,259.65	24,856.70	24,856.35	27,116.00
4040 · Inkind - Other	0.00	0.00	0.00	0.00	0.00
Total 4040 · Inkind	6,952.74	6,952.63	76,480.14	76,479.37	83,432.00
4060 · Other Income					
4065 · Rental Income	0.00	500.00	4,200.00	5,500.00	6,000.00
4070 · Fundraising	250.00	1,583.33	14,382.83	17,416.67	19,000.00
4075 · Interest Income	0.48	0.00	3.17	0.00	0.00
4076 · Dividend Income	278.73	0.00	8,695.33	0.00	0.00
4080 · Y.O.U. Inc.	0.00	2,333.33	875.00	25,666.67	28,000.00
4085 · Miscellaneous Income	0.00	0.00	0.00	0.00	0.00
4090 · Hope Income	0.00	2,333.33	19,580.36	25,666.67	28,000.00
4060 · Other Income - Other	0.00	0.00	0.00	0.00	0.00
Total 4060 · Other Income	529.21	6,749.99	47,736.69	74,250.01	81,000.00
4110 · Wells Fargo Transfers	0.00	0.00	0.00	0.00	0.00
Total Income	26,565.09	43,477.69	383,357.56	478,255.31	521,733.00

Expense					
5000 · Advertising	-200.00	25.00	0.00	275.00	300.00
5005 · Bank Charges	206.95	83.33	1,101.34	916.67	1,000.00
5006 · Investment Fee	0.00		6,990.92		
5015 · Consulting Services					
5016 · Accountant	1,195.83	1,300.00	14,679.13	14,300.00	15,600.00
5017 · Legal	0.00	0.00	0.00	0.00	0.00
5018 · Subcontractors	2,083.33	2,083.33	27,522.48	22,916.67	25,000.00
5019 · IT Support	315.00	450.00	2,385.00	4,950.00	5,400.00
5024 · SylvanTtype Tutors/Math Instr.	0.00		65.00		
5015 · Consulting Services - Other	0.00	0.00	12,844.00	0.00	0.00
Total 5015 · Consulting Services	3,594.16	3,833.33	57,495.61	42,166.67	46,000.00
5025 · Dues and Subscriptions	0.00	10.00	0.00	110.00	120.00
5030 · InKind Expenses	50.00	49.98	550.00	550.02	600.00
5035 · Insurance					
5036 · Worker's Compensation	205.44	208.33	2,158.84	2,291.67	2,500.00
5037 · Commercial Insurance	118.58	977.43	1,304.38	10,751.57	11,729.00
5038 · Automobile Insurance	332.33	375.00	3,655.63	4,125.00	4,500.00
5039 · General Liability	901.50	0.00	9,916.50	0.00	0.00
5035 · Insurance - Other	0.00	0.00	0.00	0.00	0.00
Total 5035 · Insurance	1,557.85	1,560.76	17,035.35	17,168.24	18,729.00
5040 · Internet	-99.00	33.33	230.30	366.67	400.00
5045 · Licenses, Fees and Permits	126.20	83.35	1,941.95	916.65	1,000.00
5050 · Office Equipment/Maintenance	274.20	363.00	3,903.92	3,993.00	4,356.00
5055 · Office Expense	503.08	500.00	6,407.06	5,500.00	6,000.00
5060 · Payroll Expenses					
5061 · Payroll Fees	139.33	208.33	2,113.58	2,291.67	2,500.00
5062 · Payroll Taxes	4,057.99	1,947.16	25,595.11	21,418.84	23,366.00
5060 · Payroll Expenses - Other	0.00	0.00	0.00	0.00	0.00
Total 5060 · Payroll Expenses	4,197.32	2,155.49	27,708.69	23,710.51	25,866.00
5065 · Printing & Publication	0.00	16.66	65.00	183.34	200.00
5070 · Repairs and Maintenance					
5071 · Contingency Expenses	0.00	0.00	0.00	0.00	0.00
5070 · Repairs and Maintenance - Other	1,181.12	1,166.68	12,850.71	12,833.32	14,000.00
Total 5070 · Repairs and Maintenance	1,181.12	1,166.68	12,850.71	12,833.32	14,000.00
5075 · Rubbish Removal	216.88	233.33	1,983.74	2,566.67	2,800.00
5080 · Salaries & Wages					

5078 · Non-Harper	1,469.60	0.00	8,633.90	0.00	0.00
5225 · InKind - Salaries	4,643.04	4,642.98	51,073.44	51,073.02	55,716.00
5240 · Youthnet	0.00	1,986.08	0.00	21,846.92	23,833.00
5080 · Salaries & Wages - Other	16,351.15	17,529.00	160,244.12	192,819.00	210,348.00
Total 5080 · Salaries & Wages	22,463.79	24,158.06	219,951.46	265,738.94	289,897.00
5110 · Service Contracts & Leases	0.00	0.00	0.00	0.00	0.00
5115 · Stipends					
5114 · Non-Harper	0.00	0.00	0.00	0.00	0.00
5123 · Stipends - HOPE					
5129 · Non-Harper	0.00	0.00	0.00	0.00	0.00
5123 · Stipends - HOPE - Other	1,174.00	2,064.33	20,232.00	22,707.67	24,772.00
Total 5123 · Stipends - HOPE	1,174.00	2,064.33	20,232.00	22,707.67	24,772.00
5115 · Stipends - Other	2,334.00	655.00	37,391.84	7,205.00	7,860.00
Total 5115 · Stipends	3,508.00	2,719.33	57,623.84	29,912.67	32,632.00
5130 · Program Expenses					
5131 · Field Trips	225.69	325.00	524.84	3,575.00	3,900.00
5132 · Food Cooking Literacy	120.00	74.99	1,481.97	825.01	900.00
5133 · Incentives/Snacks	309.00	208.35	4,466.55	2,291.65	2,500.00
5134 · Program Supplies	666.72	696.69	6,209.71	7,663.31	8,360.00
5135 · Fundraising	400.00	0.00	910.00	0.00	0.00
5130 · Program Expenses - Other	264.19	41.67	24,630.36	458.33	500.00
Total 5130 · Program Expenses	1,985.60	1,346.70	38,223.43	14,813.30	16,160.00
5140 · Telephone	274.99	333.32	2,613.91	3,666.68	4,000.00
5150 · Transportation					
5151 · Auto Gas	84.12	124.98	2,093.60	1,375.02	1,500.00
5153 · Auto Repairs and Maintenance	-250.00	124.98	494.87	1,375.02	1,500.00
5154 · Bus Passes	-85.00	334.17	1,395.00	3,675.83	4,010.00
5150 · Transportation - Other	0.00	0.00	381.20	0.00	0.00
Total 5150 · Transportation	-250.88	584.13	4,364.67	6,425.87	7,010.00
5155 · Utilities					
5156 · Electric	659.20	1,000.02	8,017.06	10,999.98	12,000.00
5157 · Gas	298.32	649.98	5,001.62	7,150.02	7,800.00
5158 · Water and Sewer	0.00	83.35	460.82	916.65	1,000.00
5155 · Utilities - Other	-533.67	0.00	3,802.33	0.00	0.00
Total 5155 · Utilities	423.85	1,733.35	17,281.83	19,066.65	20,800.00
5160 · Professional Development	0.00	75.00	1,500.00	825.00	900.00

5164 · Employee Benefits					
5165 · Inkind Benefits	2,259.70	2,259.65	24,856.70	24,856.35	27,116.00
5164 · Employee Benefits - Other	0.00	0.00	0.00	0.00	0.00
Total 5164 · Employee Benefits	2,259.70	2,259.65	24,856.70	24,856.35	27,116.00
5210 · Depreciation Expense	3,533.49	4,083.34	38,868.39	44,916.66	49,000.00
5215 · Scholarship Expense	0.00	0.00	0.00	0.00	0.00
5220 · Bad Debt Expense	0.00	0.00	0.00	0.00	0.00
5250 · Void	0.00	0.00	0.00	0.00	0.00
6999 · Unknown	0.00	0.00	0.00	0.00	0.00
Total Expense	45,807.30	47,407.12	543,548.82	521,478.88	568,886.00
	-		-		
Net Ordinary Income	19,242.21	-3,929.43	160,191.26	-43,223.57	-47,153.00
Other Income/Expense					
Other Income					
6000 · Interest Income	0.04		0.50		
6005 · Gain on Sale of Investments	0.00	4,166.67	0.00	45,833.33	50,000.00
Total Other Income	0.04	4,166.67	0.50	45,833.33	50,000.00
Other Expense					
6006 · Loss Disposal of Assets	0.00	0.00	0.00	0.00	0.00
6007 · Unrealized Gain in Investments	11,327.70	0.00	-28,759.02	0.00	0.00
6008 · Realized Gain in Investments	0.00	0.00	0.00	0.00	0.00
Total Other Expense	11,327.70	0.00	-28,759.02	0.00	0.00
	-				
Net Other Income	11,327.66	4,166.67	28,759.52	45,833.33	50,000.00
	-		-		
Net Income	**30,569.87**	**237.24**	**131,431.74**	**2,609.76**	**2,847.00**

Appendix I: LEED Assessment

Sustainable Sites (14 Possible Points)

For this category; Sustainable Sites (SS), there is one prerequisite and fourteen credits as seen in Appendix J: LEED-NC Version 2.2 Registered Project Checklist. According to M. Regina Leffers (2010), Director of the Center for the Built Environment, the SS Prerequisite 1 *Construction Activity Pollution Prevention* is intended to control erosion, sedimentation, and dust from construction activities. One way to accomplish this prerequisite is by creating an ESC plan to identify what the Center is going to do to prevent soil loss, prevent sedimentation from moving into streambeds or storm sewer, and prevent air pollution from occurring due to particulate matter being released during the warehouse demolition and construction of new building. The Center could use silt fences to prevent soil from running off of the land in order to meet this prerequisite.

SS Credit 1 *Site Selection* is worth one point and its intention is to avoid development of inappropriate sites. This means that the building cannot be built on any of the following areas:

- Prime farmland.
- Land that has never been developed *and* that is lower than 5 feet above the 100-year flood elevation.
- Land that is habitat for threatened or endangered species and identified as such on federal or state lists.
- Land that is within 100 feet of any wetlands, or state or local setbacks, whichever is more stringent.
- Land that has never been developed and is within 50 feet of a body of water.
- Land that was parkland prior to purchase.

Since the new building will be built in a previously developed site, the WYC will have no trouble achieving this credit (Leffers, 2010).

For SS Credit 2 *Development Density and Community Connectivity*, there is one possible point. The purpose of this credit is to encourage development in urban areas that already have municipal service infrastructure available (Leffers, 2010). Since the new building is a renovation project of a previously developed site. According to M. Regina Leffers, this credit can be fulfilled by emphasizing the development density aspect. The Worcester Youth Center would only have to investigate if the property is located in an area with a density of 60,000 square foot per acre net.

For SS Credit 3 *Brownfield Redevelopment*, there is one possible point. The intention of this credit is to encourage development of sites that may have environmental contamination by prior occupants (Leffers, 2010). It could be that the warehouse space is or is not a designated brown field, as sometimes the contamination is only a perceived possibility, rather than an actuality. In other to achieve this credit, the Center would have to use an ASTM E1903-97 Phase II Environmental Site Assessment to document whether the warehouse has contamination. If the warehouse is not designated as a brown field, then the Center cannot achieve this credit.

SS Credit 4.1 *Alternative Transportation: Public Transportation Access* is worth one point, and its purpose is to encourage the use of public transportation in order to reduce the environmental impact from cars. In order to achieve this credit, the Youth Center must be within a quarter mile of two bus stops or within a half a mile of a mass transit rail system (Leffers, 2010). There is no access to the Center through a rail system, but there is a bus route that passes right in front of the Center. It is route 6 going from City Hall to West Tatnuck via Chandler

Street; see Appendix K: Route 6 going from City Hall-West Tatnuck via Chandler St.. This means that the Center already qualifies for this credit.

The following credits: SS Credit 4.2 *Alternative Storage Transportation: Bicycle Storage and Changing Rooms,* SS Credit 4.3 *Alternative Transportation: Low-Emitting and Fuel-Efficient Vehicles*, and SS Credit 4.4 *Alternative Transportation: Parking Capacity*, have the intension of reducing the impact of environmental pollution by cars and are worth one point each. According to M. Regina Leffers (2010), SS Credit 4.2 required that secure bike racks or storage is provided within 200 yards of the building entrance for a least 5 percent of all building users, and shower and changing facilities must be provided for 0.5 percent of full-time equivalent users. The Center already has a bike rack with a capacity to store nine bicycles. SS Credit 4.3 can be achieved by proving fuel-efficient and low-emitting, WYC-owned vehicles with preferred parking, or provide preferred parking for fuel-efficient vehicles, or install alternative fuel refilling stations. SS Credit 4.4 can be fulfilled by providing preferred parking for carpools and vanpools, and in addition, the total parking spaces for the building should be no more than local zoning indicates are necessary. The Worcester Youth Center is in no condition of providing fuel-efficient and low-emitting vehicles. Out of these three credits aimed to reduce the impact of environmental pollution by cars, SS Credit 4.2 and SS Credit 4.4 are the only ones that can be achieved by the Center.

SS Credit 5.1 *Site Development: Protect or Restore Habitat* is intended to retain and restore as much natural green space as possible, so that habitat continues to be provided, or is restored for the creatures who share the land space with us. Since the new building will be constructed in a previously developed site, at least 50 percent of the site must be restored or protected with plants that are native to the area (Leffers, 2010). This could be achieved by

making a green landscape to plant flowers and trees, or by building a green roof. This credit is worth one point.

For SS Credit 5.2 *Site Development: Maximize Space*, there is one possible point and its purpose is to increase the ratio of open space to develop space beyond that which is mandated by local code. There are three ways to achieve this credit. The first is to exceed the open space required by local zoning code by 25 percent (Leffers, 2010). In the case where there are no zoning laws that govern the site, the second way to achieve this credit is to keep open green space that is equal to the square footage to the building footprint. The third method is available for sited that have no local code requirements for open space retention. In this case, 20 percent of the site should be designated as green, open space. The Center has no open green space so it might or might not be able to achieve this credit; it would all depend on Worcester local zoning codes.

SS Credit 6.1 *Stormwater: Design: Quantity Control* aims to keep water on site that falls there, so the natural hydrology of the site is undisrupted. According to M. Regina Leffers (2010), in order to achieve this credit, the Worcester Youth Center would have to two cases to examine. The first case exists if the site has an area less than or equal to 50 percent that is impervious surface, and the second exists if there is greater than 50 percent impervious surface on the site. In the first case, the Center would have to create and implement a plan that will ensure the post-development discharge rate is not greater than it had been before development, or that the Center protects any receiving streambeds by creating and implementing quality controls. In the second case, the Center would have to develop a stormwater management plan that ensures a 25 percent reduction in runoff. This credit requites a lot of investigation and it would be up to the Center to

do the investigation in order to come up with a plan to achieve this credit. It might be worth overlooking this credit in order to focus on other credits that are more feasible.

SS Credit 6.2 *Stormwater Design: Quality Control* is worth one point and its intension is to maintain the quality of the natural hydrology on the site by preventing pollution in the form of stormwater runoff from occurring (Leffers, 2010). In order to achieve this credit, the Center would have to implement a stormwater management plan that captures at least 90 percent of the average yearly rainfall. There are other specifications to achieve this credit, but it would require a lot of planning. Like for Credit 6.1, it might be worth overlooking this credit in order to focus on other credits that are more feasible in terms of available budget.

SS Credit 7.1 *Heat Island Effect: Non-Roof*; worth one point, is aimed to reduce the effect of heat islands, which are caused by dark surfaces on roofs, pavement, and parking lots (Leffers, 2010). This is because these dark surfaces absorb the heat from the sun and elevate the temperature in the surrounding area. According to M. Regina Leffers (2010), there are two possible ways to achieve this credit. One is to supply at least 50 percent of the hard surfaces with trees sized to provide shade within five years, and/or utilize paving materials that have a high solar reflection index (at least 29), and/or utilize an open grid pavement system. The Worcester Youth Center already has an existing parking lot, and rebuilding it to incorporate the suggested paving material or an open grid system could cost a lot of money. This is something the Center should consider when there are funds available for such a project. Also, planting trees might be of benefit in achieving this credit; however, the Center does not have open green landscape for such a project. This means that the Center would have to remodel the entire parking which could cost a lot of money.

SS Credit 7.2 *Heat Island Effect: Roof* is intended to do the same as SS Credit 7.1, to reduce the effect of heat islands, and it is worth one point. To achieve this credit, the Center could do so in three possible ways. The first is by using roofing materials, or at least 75 percent of the roof surface, that supply a high solar reflective index: a minimum of 78 percent for roofs with a slope of greater than 2:12 (low slope), and a minimum of 29 for roofs with a slope of greater than 2:12. The second method is covering at least 50 percent of the roof area with a green, vegetable roof. The third method is to install a combination of the two (Leffers, 2010).

A green roof is an advanced roof style which is covered with growing plants over a waterproofing membrane. There are many purposes to make a green roof, for instance providing insulation, absorbing rainwater, creating habitat wildlife, helping to lower urban air temperatures and combat the heat island effect (Green Living Technologies, 2011). There are two types of green roofs: intensive roofs and extensive roofs. The purpose to build an intensive roof is to support a wider variety of plants which means it would be heavy. Thus, roofs of this type have to be thicker than usual. Extensive green roofs, on the other hand, are designed to be virtually self-sustaining and should require only a minimum of maintenance, perhaps a once-yearly weeding or an application of slow-release fertilizer to boost growth. Extensive roofs are usually only accessed for maintenance (City of Seatle, 2011).

For the new building at the Worcester Youth Center, a green roof should be considered. To estimate the cost of a building green roof for the center, we have to calculate the possible area. By utilizing the blueprint from the Worcester City Town Hall, we approximated the roofing area to be about 5,000 square foot. Costs for green roofs in the United States are estimated to average $15 to $20 per square foot (Low Impact Development Center, 2007). These costs include all aspects of green roof development, from the waterproofing membrane to soil

substrate creation to planting. By far the highest costs associated with green roofs are the soil substrate and growth medium and the plant components associated with it. Therefore, the estimated cost to build a green roof for the new building is about $75,000 to $100,000. However, green roof retrofit projects may have increased cost associated with traffic and resource scheduling concerns as well as the on-site availability of equipment and materials. The cost of planting can also increase if plants are placed individually rather than pre-grown on vegetation mats. Based on the cost of green roofs, the Center might consider making a roof top that allows development of a green roof in the future as funds become available.

SS Credit 8 *Light Pollution Reduction*, worth one point, is intended to maintain or, in any many cases, to begin to recover the visibility to the night skyscape (Leffers, 2010). It also intends to protect land surrounding the site from light trespass for inhabitants of those areas. Leffers suggests that attention must be paid to both interior and exterior lighting. She says that there are two ways of addressing interior lighting. Either the interior lighting must be on an automatic control that turns the lights off during hours when the building is not used, with a manual override capacity, or the maximum candela of the interior light does not exit through windows. As for exterior light, Leffers says that the Exterior Lighting Section of ASHRAE/IESNA Standard 90.1-2004 should be followed.

Water Efficiency (5 Possible Points)

For the Water Efficiency (WE) category, there are five credits. WE Credit 1.1 *Water Efficient Landscaping: Reduce by 50 percent* is worth one point and its intention is to create landscaping is a way that it does not need augmentation with water to survive and thrive. This credit calls for a 50 percent reduction of potable water utilized for irrigation purposes, measuring against a baseline case of mid-summer usage (Leffers, 2010). The Center has minimum grass

land, and do not have to maintain large areas, it could be that the Center already qualifies for this credit. They only have a few flower beds which are only maintained in the spring and summer season. However, if the Center chooses to take some of the parking space for grass land, then one strategy to achieve this credit would be to plant species that are native to the area. This is because they develop root systems that help the plants to thrive in the soil and weather conditions natural to the area. According to M. Regina Leffers, another helpful strategy would be to utilize methods of irrigation that are efficient: capturing rainwater in cisterns or rain barrels to use for irrigation, and using gray water effluent from the building for irrigation.

For WE Credit 1.2 *Water Efficient Landscaping: No Potable Water Use or No Irrigation* there is one possible point. The intention of this credit is to entirely remove the need to use potable or other water resources for irrigation purposes. To attain this credit, the Center can make sure that no potable water is used at all for landscaping irrigation and to use only rainwater or recycled water (Leffers, 2010). Since the Center only had a few flower beds, this credit might be achieved through the same methods discussed for Credit 1.1 *Water Efficient Landscaping: Reduce by 50 percent*.

For WE Credit 2 *Innovation Wastewater Technologies*, there is one possible point. The intension if this credit is to create ways to recharge the local aquifer, and at the same time, reduce the use of potable water and reduce the amount of wastewater that gets generated. M. Regina Leffers suggests that one way to achieve this credit is to reduce the use of potable water by 50 percent for flushing toilets or urinals, and another way is to treat and use wastewater on-site. To achieve this in the first method mentioned above, the Center can choose to use waterless urinals and water conserving toilets or create rainwater or gray water catchment systems and plumb the non-potable water to water closets. To achieve this credit using the second method, the Center

would have to create a method of treating at least 50 percent of the wastewater on-site. This can be done by constructing a filtering system and wetlands that would remove the biological nutrients and allow the cleaned water to make its way back to the water table.

WE Credit 3.1 *Water Use Reduction: 20 Percent Reduction* and WE Credit 3.2 *Water Use Reduction: 30 Percent Reduction* are worth one point each (Leffers, 2010). The intention of these two credits is to create additional ways to relieve city infrastructure and water supply systems. One way to achieve both of these credits is by using high-efficiency toilets, urinals, and sink faucets. The Youth Center could use water and energy efficient plumbing from Sloan Valve Company such as the UPPERCUT® manual dual-flush toilet. This toilet allows using less water for liquid waste by flushing up and using more water for solid waste by flushing down as seen in Figure 17 (Sloan Valve Company, 2010).

Figure 17: The UPPERCUT® manual dual-flush toilet .Copyright © 2010 Sloan Valve Company

Energy and Atmosphere (17 Possible Points)

For the Energy and Atmosphere (EA) category, there are three prerequisites and 17 possible points. EA Prerequisite 1 *Fundamental Commissioning of the Building Energy System*,

required to get any LEED Certification, is intended to make certain that HVAC systems function as they are meant to do (Leffers, 2010). The commissioning agent must see to it that these systems are installed, calibrated, and perform according to the owner's specifications. Leffers says that commissioning is one of the most important things than can be done to make certain that a building will perform at its absolute best in terms of the energy efficiency. In order to gain this prerequisite, the Center must perform four tasks. First, the Center has to find a qualified commissioning agent (CxA). This CxA must have experience in at least two projects, must be solely responsible to report all findings to the owner, and must be independent of the project management and design team. For the new building at the Worcester Youth Center, the CxA can be chosen from the project management and design team due to the fact that the project area will be less than 50,000 square feet. Second, the CxA has to review the project requirements (OPRs) and the basis of design (BOD) documents to ensure they are both clear and complete. Third, the CxA has to write the commissioning requirements and make sure they are incorporated into the construction documents. And finally, the CxA has to develop and implement a commissioning plan, and to verify that the system perform correctly (Leffers, 2010).

EA Prerequisite 2 *Minimum Energy Performance*, required to get LEED certified, aims to set the minimum level of energy efficiency that is acceptable for the building's systems. To achieve this prerequisite, the Center needs to design the building envelope and all energy-related systems to achieve the highest possible energy performance. The User's Manual for ASIRAE 90.1-2004 can be used to help get this prerequisite (Leffers, 2010). For example, the Center can optimize the efficiency of energy performance in the building envelope, HVAC system (boilers, chillers, and air handlers), and by harvesting site energy in the form of daylight.

EA Prerequisite 3 *Fundamental Refrigerant Management*; also required to get LEED certification, is intended to reduce ozone depletion (Leffers, 2010). According to M. Regina Leffers, to pass this prerequisite, the building should not have chlorofluorocarbon (CFC) in HVAC system. Moreover, if the new construction is being added to an existing building that uses CFC-based system, the owner needs to convert the CFC before the project is completed. For instance the Center could use non-CFC refrigerants in the new building.

EA Credit 1 *Optimize Energy Performance 10.5 percent* is worth one to ten points, two points are required for LEED-NC projects registered after June 26, 2007, and its intention is to improve energy efficiency beyond the baseline established in Prerequisite 2 (Leffers, 2010). According to M. Regina Leffers (2010), the basic way to get the two required points for this credit is to conduct a whole building energy simulation by following the ASHRAE Advanced Energy Design Guide for Small Office Buildings 2004.

EA Credit 2 *On-Site Renewable Energy*, worth one to three points, is intended to reduce our automatic reliance on fossil fuels to provide energy for buildings, and to increase the use of renewable energy (Leffers, 2010). In order to obtain points in this credit, adequate renewable energy must be used to supply from 2.5 percent to 12.5 percent of the building's projected yearly energy use. The Center can use the calculation of the buildings' projected annual energy cost from EA Credit 1, or use a survey from the Department of Energy database. The Center can choose to install a wind mill or solar panels to help achieve this credit, but these technologies are expensive and the Center might be able to afford it.

EA Credit 3 *Enhanced Commissioning* is intended to expand the amount of commissioning that is accomplished (Leffers, 2010). To gain the point, the following tasks must be added to the requirements in EA prerequisite 1. First, the CxA have to conduct the design

review of OPR, the BOD, and all design documents before the mid-construction. Second, the CxA should review all of commissioned systems' contractor submittals to ensure they comply with the OPR and BOD. Third, the systems manual should be developed for the operating staff. Fourth, the CxA have to make sure that the operating staff and occupants of the project receive the needed training in order to operate commissioned building systems to the maximum efficiency level. Finally, the CxA needs to review the project operation with the operations and management staff within ten months of substantial completion. Any unresolved commissioning issues have to be written plan for resolving them. The Center could achieve this credit, but it is one of those credits that require extra money and the Center might not be able to afford it.

EA Credit 4 *Enhanced Refrigerant Management*, worth one point, is aimed to comply with the Montreal Protocol, to stop depleting the ozone layer in our Earth's atmosphere, and thereby, stop contributing to global warming (Leffers, 2010). Reffers says that there are two simple ways to gain the point in this credit. First, the building should not have any refrigerants. Another way, if the building has any refrigerant or installing a fire-suppression system, the building owner must not use those which can emit CFC that deplete the ozone layer. The credit will require some investigation on the energy usage of the Center, and it might not be worth achieving this credit based on the investigation results.

EA Credit 5 *Measurement and Verification*, worth one point, is intended to make sure that the building continues to operate at its original level of energy efficiency (Leffers, 2010). In order to achieve this credit, M. Regina Leffers says that a measurement and verification plan should be developed and implemented which covers at least one year of occupancy following construction. The plan should be consistent with Option B or D in *the International Performance Measurement & Verification Protocol Volume II: Concepts and Options for Determining Energy*

Saving in the New Construction, April, 2003. The Center can achieve this credit by installing metering equipment that measures energy use and compare the actual use with the predicted use to determine whether it is operating at the expected level of energy efficiency.

EA Credit 6 *Green Power*, worth one point, is intended to encourage us to develop and use renewable energy that is available from the grid (Leffers, 2010). To get the point in this credit, Leffers says that a minimum of 35 percent of the electricity supplied to the building must come from renewable energy sources. Further, the contract with the providing utility must be for at least two years. The Center can achieve this credit by purchasing renewable energy that supplies 35 percent of the total electricity consumption at the Center.

Material & Resources (13 Possible Points)

For this category, Material & Resources (MR), there is one prerequisite and thirteen possible credits as seen in Table 6 in Appendix J. MR Prerequisite 1 *Storage & Collection of Recyclables*, required to get LEED certified, is intended to reduce the land filled waste that is generated by the occupants of the building (Leffers, 2010). The Center can achieve this credit by establishing an area that is easily accessible to building occupants for the collection of recyclable materials. For instance, the Center could provide recycling bins for the various rooms.

MR Credit 1.1 *Building Reuse, 75% of Existing Walls, Roofs, Floors*, worth one point, is intended to conserve material resources by extending the life of existing building. According to M. Regina Leffers, at least 75 percent of the surface area of the existing structure must be retained. Since the new building will be constructed in a previously developed site, the Worcester Youth Center should have no trouble achieving this credit.

MR Credit 1.2 *Building Reuse, 95% of Existing Walls, Roofs, Floors*, worth one point, is intended to simply add 20 percent to the total square foot or surface area retained and reused in

the existing building (Leffers, 2010). The warehouse space has a lot of wood that could be reused in the new building. Therefore, it might be possible for the Center to achieve this credit.

MR Credit 1.3 *Building Reuse, 50% of Interior Non-Structural Elements* has the same intention of the two prior credits – to extend the life of existing buildings and thereby conserve material resources (Leffers, 2010). Leffers says that this credit can be achieved by maintaining and reusing at least 50 percent of all existing building elements that are not structural. For instance, this applies to items like floor coverings, ceiling systems, and interior walls and doors. It is very possible for the Center to achieve this credit because a lot of the material that could be reused is the wood. Also, the new building is not going to be more than two times the size of the warehouse. It is just a matter of assessing the available material for reuse at the warehouse in order to achieve this credit.

MR Credit 2.1 *Construction Waste Management, Divert 50%*, worth one point, is intended to dramatically reduce the amount of construction "waste" that goes to the landfill. M. Regina Leffers says that nearly everything that gets thrown into a dumpster on a jobsite that would be headed for the local landfill is a material that can be reused for another purpose. For instance, cardboard, metals, plastics, and so on can all be recycled. She recommends developing a plan to manage the construction waste on the jobsite; which details the materials to be salvaged and whether they will be sorted at the jobsite, or co-mingles and sorted elsewhere. The Center can achieve this credit very easily by making sure to put into action a plan to manage the construction waste.

MR Credit 2.2 *Construction Waste Management, Divert 75 percent*, worth one point, is intended for the same at Credit 2.1, the difference is that is call for an additional 25 percent of construction waste to be recycled. This credit can be achieved by the same means as Credit 2.1.

The Center can achieve this credit by putting into action a strong plan to manage the construction waste and achieve Credit 2.1 and 2.2 at the same time.

MR Credit 3.1 *Materials Reuse, Specify 5%*, worth one point, is aimed to encourage the reuse of any building material that is considered to be permanently installed in the project – things like beams, posts, cabinetry, and the alike (Leffers, 2010). Credit 3.2 *Materials Reuse, Specify 10%* is also worth one point and is the same as Credit 3.1, but it calls for a 10 percent instead. The calculation for these two credits is based on the total value of all project materials. The Center might not be able to achieve these credits if the value of reused project materials does not come anywhere near to 5 percent or 10 percent of the total value of all project materials.

MR Credit 4.1 *Materials Content, Specify 10 percent* is worth one point and is intended to expand the use of building products that are made with recycled material content. MR Credit 4.2 *Materials Content, Specify 20 percent* is intended for the same things as MR Credit 4.1, but is calls for an additional 10 percent. The Center can achieve this credit by purchasing all finish materials with recycle content. The materials can be steel, carpets, drywalls, ceiling tiles, concrete, and many more (Leffers, 2010).

MR Credit 5.1 *Regional Materials, 10% Manufactured regionally* is worth one point and is intended to reduce the need to move materials over great distances, thereby reducing the environmental consequences wreaked by transportation (Leffers, 2010). The Center can achieve this credit by making sure that at least 10 percent of the total value of materials used for the new building originate, whether extracted or manufactured, regionally (defined as within 500 miles from the building site). MR Credit 5.2 *Regional Materials, 20% Extracted Regionally* is worth 1 point. The intention of this credit is the same as MR Credit 5.1 and it can be achieved by the same means (Leffers, 2010).

MR Credit 6 *Rapidly Renewable Materials worth* is worth one point. This credit is intended to promote using raw materials that take ten years or less to regrow. M. Regina Leffers (2010) says that to achieve this credit, 2.5 percent of the total value of all building materials must be rapidly renewable. She recommends considering materials like linoleum, cork, wheatboard, wool, and cotton insulation in fulfilling this credit.

MR Credit 7 *Certified* Wood, worth one point, encourages forest management practices that are responsible to the environment. According M. Regina Leffers (2010), in order to achieve this credit, 50 percent of all wood and wood products that are permanently installed in the building must be Forest Stewardship Council (FSC) certified. For instance, this would include things like structural wood members, wood doors, flooring, and finishes. It can also include furniture as long as it has been included consistently in MR Credits 3-7. The Center can choose to purchase wood materials that are FSC certifies. However, this might cost the Center more money since the FSC-certified wood costs 2 percent more than regular wood (Leffers, 2010)

Indoor Environment Quality (15 Possible Points)

For this category; Indoor Environmental Quality (EQ), there are two prerequisites and fifteen possible credits as seen in Appendix J. EQ Prerequisite 1 *Minimum IAQ Performance* is intended to ensure that the quality of the air inside of a building complies with a minimum standard established in ASHRAE Standard 62.1 – 2004 (Leffers, 2010). The Worcester Youth Center can meet this prerequisite by making sure to comply with the ASHRAE Standard 62.1 – 2004.

EQ Prerequisite 2 *Environmental Tobacco Smoke (ETS) Control* is intended to protect building occupants from air contamination with tobacco smoke (Leffers, 2010). The Center can achieve this prerequisite by not allowing smoking inside of the building at all.

EQ Credit 1 *Outdoor Air Delivery Monitoring*, worth one point, is intended to ensure the safety of building occupants by monitoring ventilation systems to make certain they are working properly (Leffers, 2010). To achieve this credit, M. Regina Leffers says that a permanent monitoring system must be installed that will set an alarm off if the ventilation carried by 10 percent or more. The Center would have to look into the installation of ventilation systems in order to achieve this credit.

EQ Credit 2 *Increase Ventilation* is worth one point, and it requires the building to increase the amount of air ventilated into interior spaces by at least a 30 percent improvement over the minimum requirements of ASHRAE Standard 62.1-2004 (Leffers, 2010). This credit required a lot of documentation, so the Center will have to hire an expert in the field in order to pursue this credit.

EQ Credit 3.1 *Construction IAQ Mgmt Plan, During Construction*, worth one point, is intended to make sure that the quality of the air during construction is not detrimental to the people working in the building (Leffers, 2010). To achieve this credit, the Center can develop and implement an Indoor Air Quality Management Plan for all stages of the building process prior to its being occupied.

According to M. Regina Leffers (2010), EQ Credit 3.2 *Construction IAQ Mgmt Plan, Before Occupancy*, worth one point, is intended to ensure that the quality of air is problem-free before the building is occupied. The Center can achieve this credit by conducting an IAQ Management Plan. It can also conduct a complete flush-out of the building after construction is completed and before it is occupied. Another way to achieve this credit is to test the IAQ to ensure that concentration levels of various contaminants do not exceed the guidelines established by the U.S. Environmental Protection Agency.

EQ Credit 4.1 *Low-Emitting Materials, Adhesives & Sealants*, worth one point, aims to ensure the high quality of indoor air by reducing contaminants emitted from adhesives and sealants that are set up inside of the weatherproofing system of the building (Leffers, 2010). To get this credit, the Center will have to comply with the volatile organic compounds (VOC) limits established in the South Coast Air Quality Management District Rule 1168. They will also have to comply with the Green Seal Standard for Commercial Adhesives GS-36 requirements for aerosol adhesives.

EQ Credit 4.2 *Low-Emitting Materials, Paints & Coatings*, worth one point, is intended to ensure high quality of indoor air by reducing contaminants emitted from paints and coatings that are set up inside of weatherproofing system of the building. The Center can achieve this credit by purchasing paints, wood finished, sealants, and other materials of the like that are compliant with the Green Seal Standard and SCAQMD Rule 1113 (Leffers, 2010).

According to M. Regina Leffers (2010), EQ Credit 4.3 *Low-Emitting Materials*, worth one point, is intended to ensure the high quality of indoor air by reducing contaminants emitted from carpet systems that are set up inside of the building. The Center can achieve this credit by purchasing all carpet systems and cushion that are compliant with the Carpet and Rug Institute's Green Label Plus program. Purchased adhesives used for carpet installation must also comply with EQ Credit 4.1.

EQ Credit 4.4 *Low-Emitting Materials, Composite Wood & Agrifiber Products*, worth one point, aims to ensure the high quality of indoor air by reducing the contaminants emitted from composite wood and agrifiber products that are installed in the building (Leffers, 2010). The Center can achieve this credit by ensuring not to purchase any wood material containing urea – formaldehyde resins like plywood, wheat board, particleboard, and door cores.

EQ Credit 5 *Indoor Chemical & Pollutant Source Control*, worth one point; is intended to ensure the high quality of indoor air by controlling chemicals and pollutants from entering the building and/or from cross contaminating occupied building areas (Leffers, 2010). The Center can achieve this credit by purchasing a 6-feet-long walk-off mat that gets changed weekly by a contracted mat service in order to prevent contaminants coming into the building from walking in. Another alternative would be to purchase a 6 feet of grate/grill system that is permanently installed and can be cleaned underneath. For a grate/grill system, Kadee Industries, INC is one of the companies that offer this product. This grating is a combination of stainless steel surface wires, which create a cleaning/scraping process, along with carpet or vinyl inserts spaced every 4" on center, to clean and dry shoe traffic (McGraw Hill Construction).

Figure 18: Grate/Grill System

EQ Credit 6.1 *Controllability of Systems, Lighting*, worth one point, is intended to ensure that people have the ability to control the light they need for their work. According to M. Regina Leffers (2010), this credit can be achieved installing task lighting that allows building occupants to adjust the amount of lighting they need. However, achieving this credit will all extra expenses to the initial cost of the building construction.

EQ Credit 6.2 *Controllability of Systems, Thermal Comfort*, worth one point, is intended to ensure that people have the ability to control the thermal comfort they need for their work (Leffers, 2010). Since the Worcester Youth Center is open to the public, it is probably not recommendable to give visitors this kind of control. Therefore, the Center might consider not pursuing this credit.

EQ Credit 7.1 *Thermal Comfort, Design*, worth one point, is intended to ensure comfort for those who occupy the building (Leffers, 2010). In order to achieve this credit, the HVAC systems and the building envelope have to comply with ASHRAE Standard 55-2004, Thermal Comfort Conditions for Human Occupancy. This must also be documented in order to gain the credit (Leffers, 2010).

According to M. Regina Leffers (2010), EQ Credit 7.2 *Thermal Comfort, Verification*, worth one point, is intended to ensure that the buildings HVAC systems continue to provide thermal comfort for building occupants over time. In other to achieve this credit, the Worcester Youth Center must survey all building occupants anonymously, within 6-18 months post occupancy, to gage their satisfaction with the thermal comfort of their working environment. If 20 percent or more of the survey results indicate thermal discomfort, then the Center must agree to develop and implement a plan to correct the problem areas.

EQ Credit 8.1 *Daylight, 75% of Spaces*, worth one point is intended to ensure that those who work inside of the building have access to both daylight and views (Leffers, 2010). To achieve this credit, the Center can make sure that all spaces have windows and to get both the daylight and view. The Center can easily achieve this credit by making sure the building blueprints include a great amount of open clear spaces and windows. Further, the Center wants to maintain transparency is all area, so pursuing this credit will be very beneficial.

According to M. Regina Leffers (2010), EQ Credit 8.2 *Views, 90% of Spaces*, worth one point, is intended to ensure that those who work inside of the building have access to both daylight and views. In order to achieve this credit, the Center can make sure that 90 percent of all work spaces have a direct line of sight through windows located between 2.5 and 7.5 feet above the floor. No real additional cost is associated with this credit, the Center just has to show that the direct line of sight is available in both plan and section drawings.

Innovation & Design Process (5 Possible Points)

According to M. Regina Leffers (2010), or this category, Innovation & Design (ID), there are five possible credits as seen in Appendix J. The credits ID Credit 1.1 to ID Credit 1.4 are intended to encourage design teams to exceed the building performance required to fulfill the LEED prerequisites and credits (Leffers, 2010). These credits simply invite the design team to go above and beyond what is required, to be creative, and to be innovative. Therefore, it will be up to the Center to push the contracted professionals who will be in charge of the building process to give their best effort.

ID Credit 2 *LEED Accredited Professional*, worth one point, is intended to encourage and facilitate the process of the registration, application, and certification of the project (Leffers, 2010). To achieve this credit, the Center must hire a LEED Accredited Professional to be part of the design team of the new building.

Appendix J: LEED-NC Version 2.2 Registered Project Checklist

Table 6: LEED-NC Version 2.2 Registered Project Checklist. Adapted from Sustainable Construction& Design, by M.R. Leffers, 2010, New Jersey: Prentice Hall. Copyright 2010 by Prentice Hall

			LEED-NC Version 2.2 Registered Project Checklist						
Yes	**?**	**No**							
			Sustainable Site						**14 Points**
Y			**Prereq**	**1**	**Construction Activity Pollution Prevention**				**Required**
			Credit	**1**	**Site Selection**				**1**
			Credit	**2**	**Development Density & Community Connectivity**				**1**
			Credit	**3**	**Brownfield Redevelopment**				**1**
			Credit	**4.1**	**Public Transportation Access**				**1**
			Credit	**4.2**	**Bicycle Storage & Changing Rooms**				**1**
			Credit	**4.3**	**Low-Emitting & Fuel Efficient Vehicles**				**1**
			Credit	**4.4**	**Parking Capacity**				**1**
			Credit	**5.1**	**Site Development, Project 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**
			Credit	**7.2**	**Heat Island Effect, Roof**				**1**
			Credit	**8**	**Light Pollution Reduction**				**1**
			Water Efficiency						**5 Points**
			Credit	**1.1**	**Efficient Landscaping, Reduce by 50%**				**1**
			Credit	**1.2**	**Efficient Landscaping, No Portable Use and No Irrigation**				**1**
			Credit	**2**	**Innovation Wastewater Technologies**				**1**
			Credit	**3.1**	**Water Use Reduction, 20% Reduction**				**1**
			Credit	**3.1**	**Water Use Reduction, 30% Reduction**				**1**
			Energy and Atmosphere						**17 Points**
Y			**Prereq**	**1**	**Fundamental Commissioning**				**Required**
Y			**Prereq**	**2**	**Minimum Energy Performance**				**Required**
Y			**Prereq**	**3**	**Fundamental Refrigerant Management**				**Required**
			Credit	**1**	**Optimize Energy Performance 10.5%**				**1 to 10**
			Credit	**2**	**On-Site Renewable energy**				**1 to 3**
			Credit	**3**	**Enhanced Commissioning**				**1**
			Credit	**4**	**Enhanced Refrigerant Management**				**1**
			Credit	**5**	**Measurement & Verification**				**1**
			Credit	**6**	**Green Power**				**1**
			Material & Resources						**13 Points**
Y			**Prereq**	**1**	**Storage & Collection of Recyclables**				**Required**
			Credit	**1.1**	**Building Reuse, 75% of Existing Walls, Roofs, Floors**				**1**
			Credit	**1.2**	**Building Reuse, 95% of Existing Walls, Roofs, Floors**				**1**
			Credit	**1.3**	**Building Reuse, 50% of Interior Non-Structural Elements**				**1**
			Credit	**2.1**	**Construction Waste Management, Divert 50%**				**1**
			Credit	**2.2**	**Construction Waste Management, Divert 75%**				**1**
			Credit	**3.1**	**Materials Reuse, Specify 5%**				**1**
			Credit	**3.2**	**Materials Reuse, Specify 10%**				**1**
			Credit	**4.1**	**Materials Content, Specify 10%**				**1**
			Credit	**4.2**	**Materials Content, Specify 20%**				**1**
			Credit	**5.1**	**Regional Materials, 10% Manufactured Regionally**				**1**
			Credit	**5.2**	**Regional Materials, 20% Extracted Regionally**				**1**
			Credit	**6**	**Rapidly Renewable Materials**				**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**
			Credit	**1**	**Outdoor Air Delivery Monitoring**				**1**
			Credit	**2**	**Increase Ventilation**				**1**
			Credit	**3.1**	**Construction IAQ Mgmt Plan, During Construction**				**1**
			Credit	**3.2**	**Construction IAQ Mgmt Plan, Before Occupancy**				**1**
			Credit	**4.1**	**Low-Emitting Materials, Adhesives & Sealants**				**1**
			Credit	**4.2**	**Low-Emitting Materials, Paints & Coatings**				**1**
			Credit	**4.3**	**Low-Emitting Materials, Carpet Systems**				**1**
			Credit	**4.4**	**Low-Emitting Materials, Composite Wood & Agrifiber Products**				**1**
			Credit	**5**	**Indoor Chemical & Pollutant Source Control**				**1**
			Credit	**6.1**	**Controllability of Systems, Lighting**				**1**
			Credit	**6.2**	**Controllability of Systems, Thermal Comfort**				**1**
			Credit	**7.1**	**Thermal Comfort, Design**				**1**
			Credit	**7.2**	**Thermal Comfort, Verification**				**1**
			Credit	**8.1**	**Daylight, 75% of Spaces**				**1**
			Credit	**8.2**	**Views, 90% of Spaces**				**1**
			Innovation & Design Process						**5 Points**
			Credit	**1.1**	**Innovation in Design: Ice Storage/reduce peak elec. usage**				**1**
			Credit	**1.2**	**Innovation In Design: Educational Building**				**1**
			Credit	**1.3**	**Innovation in Design: Water use reduction 40%**				**1**
			Credit	**1.4**	**Innovation in Design: Heat island effect roof**				**1**
			Credit	**2**	**LEED Accredited Professional**				**1**
			Project Totals		**(pre-certification estimates)**				**69 Points**
			Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 to 69 points						

Appendix K: Route 6 going from City Hall-West Tatnuck via Chandler St.

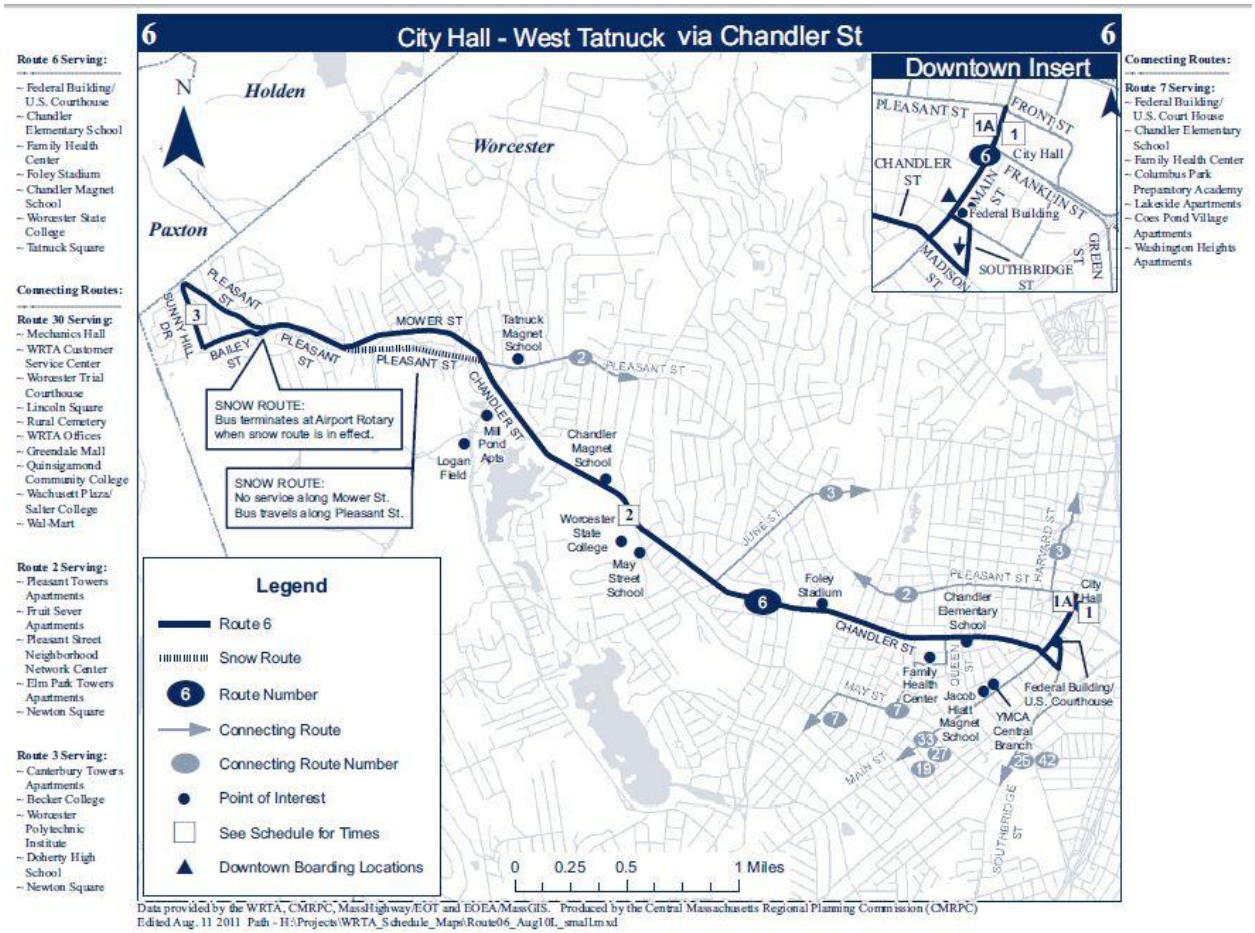
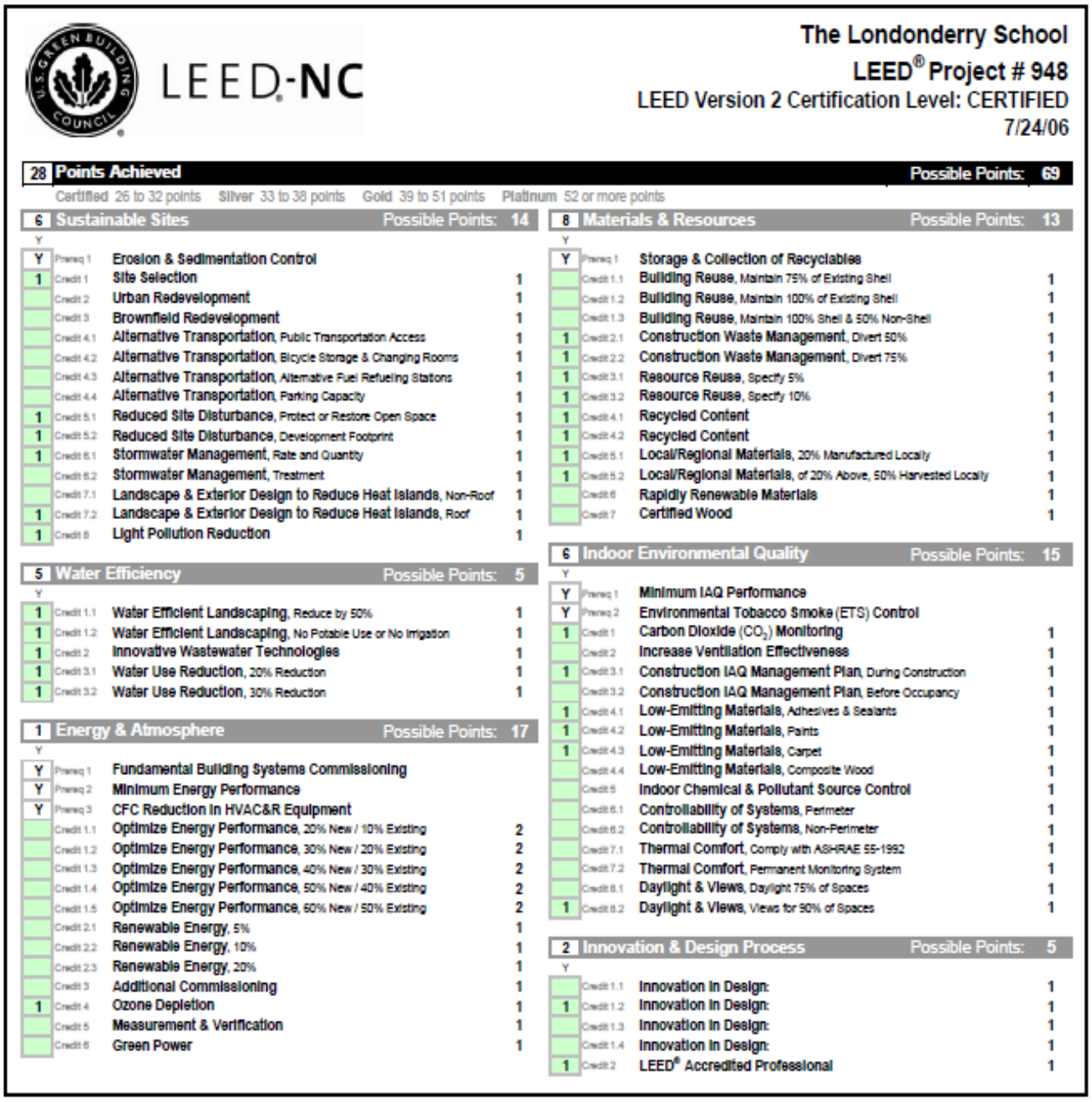


Figure 19: Route 6 going from City Hall-West Tatnuck via Chandler St. WRTA: Schedules & Route Maps. (2011)

Appendix L: Londonderry School LEED Certification Checklist



LEED-NC

The Londonderry School
LEED® Project # 948
LEED Version 2 Certification Level: CERTIFIED
7/24/06

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

6 Sustainable Sites — Possible Points: 14

Y			
Y	Prereq 1	Erosion & Sedimentation Control	
1	Credit 1	Site Selection	1
	Credit 2	Urban Redevelopment	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 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
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
1	Credit 8	Light Pollution Reduction	1

5 Water Efficiency — Possible Points: 5

Y			
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

1 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	
	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

8 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
1	Credit 3.1	Resource Reuse, Specify 5%	1
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

6 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
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	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
	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

Y			
	Credit 1.1	Innovation in Design:	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

Appendix M: Worcester Youth Center Information from Worcester Town Hall

Property Location: 0326 CHANDLER ST | **MAP ID:** 14/ 033/ 00006/ / | **Bldg Name:** | **State Use:** 9050

Vision ID: 54341 | **Account #** 14-033-00006 | **Bldg #:** 1 of 1 | **Sec #:** 1 of 1 | **Card** 1 of 1 | **Print Date:** 11/15/2010 13:21

CURRENT OWNER	TOPO.	UTILITIES	STRT./ROAD	LOCATION
WORCESTER YOUTH CENTER INC	L Level	A All Utilities	P Paved Drive	P Paved Street
0326 CHANDLER ST				
WORCESTER, MA 01609				
Additional Owners:				

SUPPLEMENTAL DATA

Other ID: 1403300006

GIS ID: 14-033-00006 | ASSOC PID#

CURRENT ASSESSMENT

Description	Code	Appraised Value	Assessed Value
EXEMPT	9050	221,600	221,600
EXM LAND	9050	232,000	232,000
Total		453,600	453,600

360
WORCESTER, MA

VISION

RECORD OF OWNERSHIP

Owner	BK-VOL/PAGE	SALE DATE	q/u	v/i	SALE PRICE	V.C.
WORCESTER YOUTH CENTER INC	34012/ 86	06/30/2004	U	I		
PYLE,RICHARD L	32425/ 299	12/10/2003	U	I	300,000	1N
PYLE,RICHARD L TRUSTEE	32425/ 299	12/10/2003	U	I	300,000	1N

PREVIOUS ASSESSMENTS (HISTORY)

Yr.	Code	Assessed Value	Yr.	Code	Assessed Value	Yr.	Code	Assessed Value
2010	9050	295,600	2009	9050	310,300	2008	9050	319,700
2010	9050	232,000	2009	9050	290,300	2008	9050	290,300
Total:		527,600	Total:		600,600	Total:		610,000

This signature acknowledges a visit by a Data Collector or Assessor

EXEMPTIONS

Year	Type	Description	Amount
		Total:	

OTHER ASSESSMENTS

Code	Description	Number	Amount	Comm. Int.

APPRAISED VALUE SUMMARY

Appraised Bldg. Value (Card)	221,600
Appraised XF (B) Value (Bldg)	0
Appraised OB (L) Value (Bldg)	0
Appraised Land Value (Bldg)	232,000
Special Land Value	0
Total Appraised Parcel Value	453,600
Valuation Method:	C
Adjustment:	0
Net Total Appraised Parcel Value	453,600

ASSESSING NEIGHBORHOOD

NBHD/ SUB	NBHD NAME	STREET INDEX NAME	TRACING	BATCH
2/A		40		

NOTES

BUILDING PERMIT RECORD

Permit ID	Issue Date	Type	Description	Amount	Insp. Date	% Comp.	Date Comp.	Comments

VISIT/ CHANGE HISTORY

Date	Type	IS	ID	Cd.	Purpose/Result

LAND LINE VALUATION SECTION

B #	Use Code	Use Description	Zone	D	Frontage	Depth	Units		Unit Price	I. Factor	S.A.	C. Factor	ST. Idx	Adj.	Notes- Adj	Special Pricing	Adj. Unit Price	Land Value
1	9050	P/HOS CHAR MDL-94	ML05				36,720	SF	5.27	1.00	5	1.00	2	1.20				232,000

Total Card Land Units: 0.84 AC | Parcel Total Land Area: 0.84 AC | Total Land Value: 232,000

Property Location: 0326 CHANDLER ST **MAP ID:** 14/ 033/ 00006/ / **Bldg Name:** **State Use:** 9050

Vision ID: 54341 **Account #** 14-033-00006 **Bldg #:** 1 of 1 **Sec #:** 1 of 1 **Card** 1 of 1 **Print Date:** 11/15/2010 13:21

CONSTRUCTION DETAIL

Element	Cd.	Ch.	Description
Style	WLT		Warehouse Lofts
Model	94		Commercial
Grade	C		AVE MASONRY
Stories	3		
Occupancy			
Exterior Wall 1	GS		Glass
Exterior Wall 2	SC		Stucco
Roof Structure	01		Flat
Roof Cover	12		Rubber Roofing
Interior Wall 1	05		Drywall/Shtrk
Interior Wall 2			
Interior Floor 1	14		Ww/Carpet
Interior Floor 2	01		Dirt/None
Ext. Qual.	A		
Int. Qual.	A		
Bldg Use	9050		P/HOS CHAR MDL-94
Elevator	0		
Sprinkler	0		
Heat/AC	11		
Frame Type			
Baths/Plumbing			
Ceiling/Wall			
Rooms/Prtns			
Wall Height	10		
% Comn Wall			

CONSTRUCTION DETAIL (CONTINUED)

Element	Cd.	Ch.	Description

MIXED USE

Code	Description	Percentage
9050	P/HOS CHAR MDL-94	100

COST/MARKET VALUATION

Adj. Base Rate:	49.89
Replace Cost	1,166,328
AYB	1960
Dep Code	A
Remodel Rating	
Year Remodeled	
Dep %	40
Functional Obslnc	41
External Obslnc	0
Cost Trend Factor	
Condition	
% Complete	
Overall % Cond	19
Apprais Val	221,600
Dep % Ovr	0
Dep Ovr Comment	
Misc Imp Ovr	0
Misc Imp Ovr Comment	
Cost to Cure Ovr	0
Cost to Cure Ovr Comment	

GLA[23378]

OB-OUTBUILDING & YARD ITEMS(L) / XF-BUILDING EXTRA FEATURES(B)

Code	Description	Sub	Sub Descript	L/B	Units	Unit Price	Yr	Gde	Dp Rt	Cnd	%Cnd	Apr Value

BUILDING SUB-AREA SUMMARY SECTION

Code	Description	Living Area	Gross Area	Eff. Area	Unit Cost	Undeprec. Value
GLA	Gross Leasable Area	23,378	23,378	23,378	49.89	1,166,328
	Ttl. Gross Liv/Lease Area:	23,378	23,378	23,378		1,166,328


21.3
76.0
2.1
62.8
7.0
59.3
8.5
55.3
29.3
121.5
40.2
10.9
11.5
7.1
6.0
60.7
BASE

QUERY: PROPERTY CURRENT RECORD EXIT

10

PROPERTY ID 1403300006 PRIOR ID 12532000
ADDRESS 0326 CHANDLER ST

CURRENT OWNER OWNER OF RECORD
EFFECTIVE DATE 06/30/2004
WORCESTER YOUTH CENTE WORCESTER YOUTH CENTE
0326 CHANDLER ST 0326 CHANDLER ST

WORCESTER MA WORCESTER MA
01609 01609

DEED BK/PG 34012 86 PLAT BK/PG 88 8729

TAX YEAR 2011 TAX STATUS A TAX EXEMPT Y

PROPERTY CLASS 905 CML FEE 150.00
ASSESSED VALUE 527600.00 LAND AREA 36720.00 F

Appendix N: Square Foot Cost Estimate Report

	Worcester Youth Center Worcester , MA , 01609
Building Type:	**School, High, 2-3 Story with Decorative Concrete Block / Steel Frame**
Location:	**National Average**
Story Count:	**2**
Story Height (L.F.):	**18**
Floor Area (S.F.):	**5000**
Labor Type:	**Union**
Basement Included:	**No**
Data Release:	**Year 2008 Quarter 1**
Cost Per Square Foot:	**$515.60**
Building Cost:	**$2,578,000**

Costs are derived from a building model with basic components.

Scope differences and market conditions can cause costs to vary significantly.

Parameters are not within the ranges recommended by RSMeans.

		% of Total	Cost Per S.F.	Cost
A Substructure		**5.50%**	**$21.20**	**$106,000**
A1010	**Standard Foundations** Strip footing, concrete, reinforced, load 5.1 KLF, soil bearing capacity 3 KSF, 12" deep x 24" wide Spread footings, 3000 PSI concrete, load 100K, soil bearing capacity 6 KSF, 4' - 6" square x 15" deep Spread footings, 3000 PSI concrete, load 150K, soil bearing capacity 6 KSF, 5' - 6" square x 18" deep		**$7.00**	**$35,000**
A1030	**Slab on Grade** Slab on grade, 4" thick, non industrial, reinforced		**$2.30**	**$11,500**
A2010	**Basement Excavation** Excavate and fill, 30,000 SF, 4' deep, sand, gravel, or common earth, on site storage		**$0.10**	**$500**
A2020	**Basement Walls** Foundation wall, CIP, 4' wall height, direct chute, .148 CY/LF, 7.2 PLF, 12" thick		**$11.80**	**$59,000**

B Shell		52.10%	$200.70	$1,003,500
B1010	**Floor Construction** Steel column, W8, 100 KIPS, 16' unsupported height, 31 PLF Steel column, W10, 150 KIPS, 16' unsupported height, 45 PLF Floor, concrete, slab form, open web bar joist @ 2' OC, on W beam and column, 25'x25' bay, 29" deep, 100 PSF superimposed load, 145 PSF total load Fireproofing, gypsum board, fire rated, 2 layers, 1" thick, 8" steel column, 3 hour rating, 14 PLF		**$10.50**	**$52,500**
B1020	**Roof Construction** Floor, steel joists, beams, 1.5" 22 ga metal deck, on columns, 25'x25' bay, 20" deep, 40 PSF superimposed load, 60 PSF total load		**$3.70**	**$18,500**
B2010	**Exterior Walls** Concrete block (CMU) wall, split rib, 8 ribs, hollow, regular weight, 12x8x16, reinforced, vertical #5@32", grouted		**$80.30**	**$401,500**
B2020	**Exterior Windows** Aluminum flush tube frame, thermo-break frame, 2.25" x 4.5", 5'x6' opening, 2 intermediate horizontals Glazing panel, insulating, 1/2" thick, 2 lites 1/8" float glass, tinted		**$93.70**	**$468,500**
B2030	**Exterior Doors** Door, aluminum & glass, with transom, narrow stile, double door, hardware, 6'-0" x 10'-0" opening Door, steel 18 gauge, hollow metal, 1 door with frame, no label, 3'-0" x 7'-0" opening Door, steel 24 gauge, overhead, sectional, manual operation, 8'-0" x 8'-0" opening		**$0.40**	**$2,000**
B3010	**Roof Coverings** Roofing, single ply membrane, EPDM, 60 mils, fully adhered Formed roofing, zinc-copper alloy, standing seam, 2-1/2" min slope, .020" thick, 0.87 PSF Insulation, rigid, roof deck, polyisocyanurate, 2#/CF, 2" thick, R14.29 Insulation, rigid, roof deck, polyisocyanurate, tapered for drainage Base flashing, aluminum, .016" thick, fabric 2 sides, .025" aluminum reglet, .032" counter flashing Roof edges, aluminum, duranodic, .050" thick, 6" face		**$10.60**	**$53,000**
B3020	**Roof Openings** Roof hatch, with curb, 1" fiberglass insulation, 2'-6" x 3'-0", galvanized steel, 165 lbs		**$1.50**	**$7,500**

C Interiors		10.30%	$39.60	$198,000
C1010	**Partitions** Concrete block (CMU) partition, light weight, hollow, 6" thick, no finish 1/2" fire rated gypsum board, taped & finished, painted on metal furring		**$21.40**	**$107,000**
C1020	**Interior Doors** Door, single leaf, kd steel frame, hollow metal, commercial quality, flush, 3'-0" x 7'-0" x 1-3/8"		**$1.20**	**$6,000**
C1030	**Fittings** Toilet partitions, cubicles, ceiling hung, stainless steel Chalkboards, liquid chalk type, aluminum frame & chalk trough		**$1.40**	**$7,000**
C2010	**Stair Construction** Stairs, steel, cement filled metal pan & picket rail, 16 risers, with landing		**$0.60**	**$3,000**
C3010	**Wall Finishes** Painting, masonry or concrete, latex, brushwork, primer & 2 coats Painting, masonry or concrete, latex, brushwork, addition for block filler Wall coatings, acrylic glazed coatings, maximum Ceramic tile, thin set, 4-1/4" x 4-1/4"		**$2.90**	**$14,500**
C3020	**Floor Finishes** Carpet, tufted, nylon, roll goods, 12' wide, 36 oz Carpet, padding, add to above, minimum Terrazzo, maximum Vinyl, composition tile, maximum		**$6.20**	**$31,000**
C3030	**Ceiling Finishes** Acoustic ceilings, 3/4"mineral fiber, 12" x 12" tile, concealed 2" bar & channel grid, suspended support		**$5.90**	**$29,500**

D Services		31.60%	$121.70	$608,500
D1010	**Elevators and Lifts**		**$11.50**	**$57,500**
	1 - Hydraulic, passenger elevator, 1500 lb, 2 floors, 100 FPM			
	Hydraulic passenger elevator, 2500 lb., 2 floor, 125 FPM			
D2010	**Plumbing Fixtures**		**$4.40**	**$22,000**
	Water closet, vitreous china, bowl only with flush valve, floor mount			
	Urinal, vitreous china, wall hung			
	Lavatory w/trim, wall hung, PE on CI, 20" x 18"			
	Kitchen sink w/trim, countertop, stainless steel, 44" x 22" triple bowl			
	Service sink w/trim, PE on CI, corner floor, wall hung w/rim guard, 24" x 20"			
	Shower, stall, baked enamel, terrazzo receptor, 36" square			
	Water cooler, electric, wall hung, wheelchair type, 7.5 GPH			
D2020	**Domestic Water Distribution**		**$24.30**	**$121,500**
	Gas fired water heater, commercial, 100< F rise, 600 MBH input, 576 GPH			
D2040	**Rain Water Drainage**		**$14.70**	**$73,500**
	Roof drain, CI, soil, single hub, 4" diam, 10' high			
	Roof drain, CI, soil, single hub, 4" diam, for each additional foot add			
	Roof drain, CI, soil, single hub, 5" diam, 10' high			
	Roof drain, CI, soil, single hub, 5" diam, for each additional foot add			
D3010	**Energy Supply**		**$4.20**	**$21,000**
	Commercial building heating system, fin tube radiation, forced hot water, 100,000 SF, 1mil CF, total 3 floors			
D3030	**Cooling Generating Systems**		**$13.90**	**$69,500**
	Packaged chiller, water cooled, with fan coil unit, schools and colleges, 60,000 SF, 230.00 ton			
D4010	**Sprinklers**		**$2.00**	**$10,000**
	Wet pipe sprinkler systems, steel, light hazard, 1 floor, 50,000 SF			
	Wet pipe sprinkler systems, steel, light hazard, each additional floor, 50,000 SF			
	Electrical			
D5010	**Service/Distribution**		**$33.00**	**$165,000**
	Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 2000 A			
	Feeder installation 600 V, including RGS conduit and XHHW wire, 2000 A			
	Switchgear installation, include switchboard, panels & circuit breaker, 2000 A			

D5020	**Lighting and Branch Wiring** Receptacles include plate, box, conduit, wire, 8 per 1000 SF, .9 W per SF, with transformer Wall switches, 2.0 per 1000 SF Miscellaneous power, 1.2 watts Central air conditioning power, 4 watts Motor installation, three phase, 460 V, 15 HP motor size Motor feeder systems, three phase, feed to 200 V 5 HP, 230 V 7.5 HP, 460 V 15 HP, 575 V 20 HP Fluorescent fixtures recess mounted in ceiling, 2 watt per SF, 40 FC, 10 fixtures @40 watt per 1000 SF		**$9.80**	**$49,000**
D5030	**Communications and Security** Communication and alarm systems, includes outlets, boxes, conduit and wire, sound systems, 100 outlets Communication and alarm systems, includes outlets, boxes, conduit and wire, fire detection systems, 50 detectors Communication and alarm systems, includes outlets, boxes, conduit and wire, master clock systems, 50 rooms Communication and alarm systems, includes outlets, boxes, conduit and wire, master TV antenna systems,100 outlets Internet wiring, 2 data/voice outlets per 1000 S.F.		**$3.40**	**$17,000**
D5090	**Other Electrical Systems** Generator sets, w/battery, charger, muffler and transfer switch, diesel engine with fuel tank, 250 kW		**$0.50**	**$2,500**
E Equipment & Furnishings		**0.60%**	**$2.20**	**$11,000**
E1020	**Institutional Equipment** Architectural equipment, laboratory equipment, counter tops, acid proof, economy Architectural equipment, laboratory equipment, counter tops, stainless steel Architectural equipment, laboratory equipment, cabinets, wall, open Architectural equipment, laboratory equipment, cabinets, base, drawer units		**$1.50**	**$7,500**
E1090	**Other Equipment** Architectural equipment, school equipment basketball backstops, suspended type, electrically operated Architectural equipment, school equipment bleachers-telescoping, manual operation, 15 tier, economy (per seat) Architectural equipment, school equipment, weight lifting gym, universal, economy		**$0.70**	**$3,500**

F Special Construction		**0.00%**	**$0.00**	**$0**
G Building Sitework		**0.00%**	**$0.10**	**$500**
G2040	**Site Development** Specialties, flagpole, on grade, aluminum, tapered, 59' high		**$0.10**	**$500**
Subtotal		**100%**	**$385.50**	**$1,927,500**
Contractor Fees (General Conditions, Overhead, Profit)		**25.00%**	**$96.40**	**$482,000**
Architectural Fees		**7.00%**	**$33.70**	**$168,500**
User Fees		**0.00%**	**$0.00**	**$0**
Total Building Cost			**$515.60**	**$2,578,000**

Appendix O: Demo of Existing Wood Structure

Cutler

Associates

May 1, 2008

Mr. Allen Fletcher
Worcester Youth Center
326 Chandler Street
Worcester, MA 01602

Re: Worcester Youth Center
326 Chandler Street, Worcester, MA
Proposal - Demo of Existing Wood Structure

Dear Allen,

Pursuant to our meeting, we are pleased to offer our Lump Sum proposal for the Work described herein.

SCOPE OF WORK:

Division 1: General Conditions

- Safety & OSHA
- Temporary barriers
- Rubbish removal
- Daily cleaning
- Supervision
- Permit

Division 2: Site

- Demolition and disposal of existing three-story 17,000 sq. ft. wood structure
- Demolition and removal of existing foundations and slab structure is built on
- Site prep and backfill to grade after foundation is removed with new material
- Enclose and protect existing building from weather conditions at demo area with plywood and plastic
- Abatement of 3,000 sq. ft. of VAT flooring *Allowance $18,000*
- Excavate trenches for relocation of existing utilities to side of demo building to remain (approx. 90 ln. ft. x 5 ft. depth)

Cutler Associates, Inc 43 Harvard Street PO Box 15049 Worcester, MA 508 757-7500 508 799-2068 Fax www.cutlerassociatesinc.com

Division 15: Mechanical

- Furnish and install gas and water piping to relocated services to allow for demo of existing structure
- Gas and water meter by others per attached sketch *Allowance $20,000*

Division 15: Fire Protection

- Relocate the existing dry pipe valve, back flow preventer and gate valves and reconnect to new six inch fire service main installed by others
- Replace existing air compressor with new compressor and air maintenance device
- Replace existing water motor gong with new gong
- Install new four inch sprinkler main to reconnect Youth Center to relocated dry pipe valve
- Install new fire department connection
- All necessary pipe, fittings and hangers to insure a complete installation
- Permit
- New water line *Allowance $10,000*

Division 16: Electric

- Supply and install one (1) 400 amp underground 3 phase 4 wire 120/208 volt temporary service to be located next to front entrance (approx. 150')
- Supply and install one (1) 200 amp underground 3 phase 120/208 volt temporary service for the fire pump
- Supply and install one (1) 50 amp 3 phase feeder to temporarily re-feed the existing sump pump controller
- Supply and install one (1) 200 amp 3 phase 4 wire 120/208 volt feeder to temporarily re-feed the existing panel in the closet at the reception desk
- Supply and install two (2) 40 amp 3 phase 120/208 volt feeders to temporarily re-feed the two roof top unit contactors in the closet at the reception desk
- Supply and install one (1) 25 pair underground telephone service cable from existing pole to closet at reception desk. Supply one (1) 25 pair indoor cable from closet to data switch room
- Contingency for two (2) additional 100 amp feeders and miscellaneous fire alarm work
- Supply and install one (1) 600 amp underground 3 phase 4 wire 120/208 volt permanent service to be located in larger existing electric room

Exclusions

- Paving
- Any backcharges for utilities
- Phone panel and lines
- Transformer
- Computer lines or cabling
- Fire alarm work or devices

- Motors or starters
- Premium time

COMPENSATION:

The Compensation for this Work shall be **Three Hundred Twenty-seven Four Hundred Ninety-two Dollars ($327.942)** subject to adjustments made by written mutual agreement by Worcester Youth Center. and Cutler Associates. Inc. This proposal and the stated Compensation are good for thirty (30) days from the date of this proposal.

Unless otherwise described in the Scope of Work. Worcester Youth Center is responsible for securing and executing all necessary agreements with adjacent land or property owners that are necessary to enable Cutler Associates. Inc. to perform the Work.

PAYMENTS:

Worcester Youth Center shall make payment to Cutler Associates. Inc. within ten (10) calendar days after the Application for Payment has been submitted. Payments due and unpaid by the Owner to Cutler Associates. Inc. shall bear interest commencing when payment is due at the rate of one and one-half percent (1 ½ %) per month above the prime rate of interest quoted by Sovereign Bank (MA) on the first of each month during the term of this Agreement. Worcester Youth Center shall not make direct payments to Cutler Associates' subcontractors.

INSURANCE:

During this project. Worcester Youth Center shall purchase and maintain liability and property insurance in an amount to cover the Owner's existing property and the Work described herein.

Cutler Associates. Inc. will purchase and maintain insurance for General Liability. Automobile Liability. Worker's Compensation and Employers' Liability. meeting statutory limits mandated by state and federal laws.

Please indicate your acceptance of this proposal by signing the Approval Signature below.

Sincerely,

David A. Guertin

Approval:

_____ _____

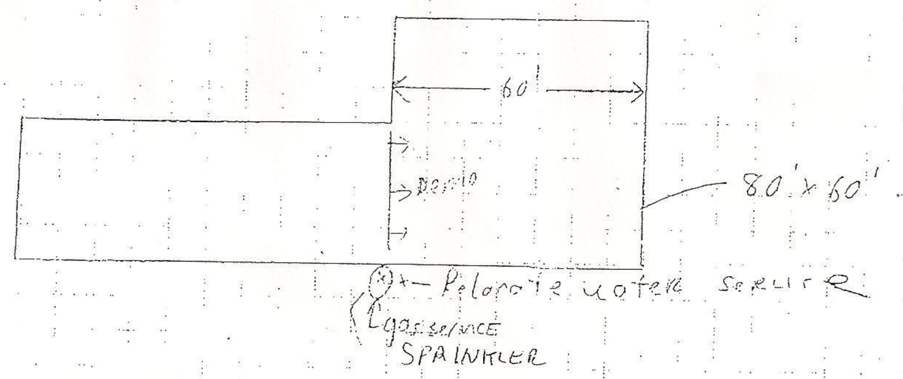
Signature Date

J.J. BAFARO, INC.
MECHANICAL CONTRACTORS
9-13 WINTER STREET
P.O. BOX 943
WORCESTER, MASSACHUSETTS 01613-0943
TEL: (508) 757-7429 FAX: (508) 757-0173

JOB Capital 107
SHEET NO ______ OF ______
CALCULATED BY ______ DATE 12-11-07
CHECKED BY ______ DATE ______
Cutler - SITE VISIT

Remove (1) gas unit heater

3" gas line



ENT BY: JJ BAFARO INC; 5087993922; FEB-6-08 12:38PM; PAGE 2

Appendix P: Project PowerPoint Presentation

Slide 1

Mission Statement

To create a suitable design for the warehouse space inspired by the youth of the Worcester Youth Center, and add green features to the new building, enabling an environmentally and socially responsible, healthy and prosperous environment that improves the quality of life for youth at the Center.

Slide 2

Slide 3

Motivations for the Project

Safety burden due to deteriorating condition

Slide 4

Slide 5

Motivations for the Project

Economic cost

- Utility expenses

	Monthly	Annually
Electric	$1000	$12,000
Gas	$650	$7,800
Total	**$1,733**	**$20,800**

- Revenue and expenses

Total Income	$571,733
Total Expenses	$568,886
Net Income	**$2,847**

Slide 6

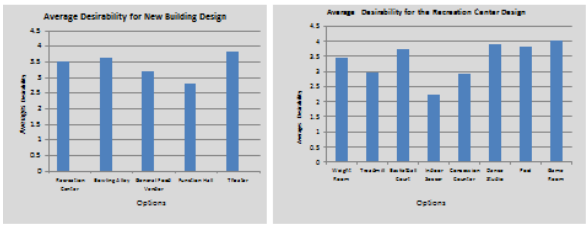
Slide 7

Methods

- Approach
  - Youth-inspired
  - Revenue generating
  - Green
- Data collection techniques
  - Surveying
  - Interviewing
  - Assessing energy bills
- Analysis
  - Design
  - Cost
  - Revenue

Slide 8

Youth Survey Results



47 youth participated

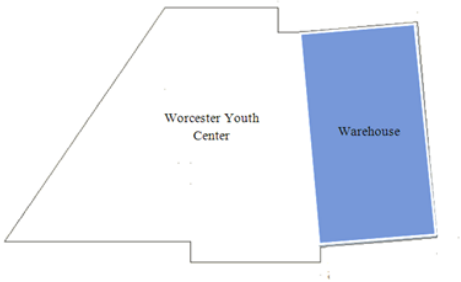
Slide 9

Staff Interview and Surveys Results & Discussion

- Developed questionnaire
- Disseminated questionnaire
- Analyzed data
- Implemented staff's input

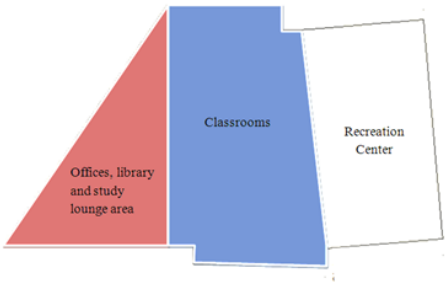
Slide 10

Current Building Layout



Slide 11

Possible Building Layout

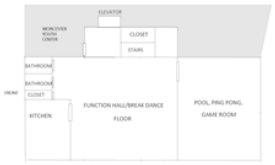


Slide 12

Building Design Plan 1

First floor

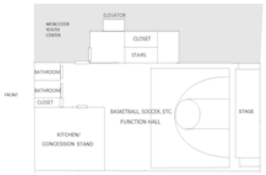
Second Floor



Slide 13

Building Design Plan 2

First floor



Second Floor

Slide 14

Cost Analysis of Building Plan

	Worcester Youth Center Worcester , MA , 01609	
Building Type:	School, High, 2-3 Story with Decorative Concrete Block / Steel Frame	
Location:	National Average	
Story Count:	2	
Story Height (L.F.):	18	
Floor Area (S.F.):	5000	
Labor Type:	Union	
Basement Included:	No	
Data Release:	Year 2008 Quarter 1	Costs are derived from a building model with basic components.
Cost Per Square Foot:	$515.60	Scope differences and market conditions can cause costs to vary significantly.
Building Cost:	$2,578,000	**Parameters are not within the ranges recommended by RSMeans.**

*Demolishing Cost $300,000

Total Cost $2,878,000

*From a report by Cutler Associates

Slide 15

Youth Center Market Analysis

- Help create a source of income
  - Concession stand
  - Rent spaces
    - Parties
    - Performances
    - Other community events
  - Create a membership

Slide 16

Future Areas of Research

- Details and cost of equipment
- Recreation center marketing
  - Ideas of membership
  - Community's needs

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On-Site Liaison: Ms. Hilda Ramirez, Executive Director

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Questions

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Appendix Q: Useful Sources

- Building Green
- Londonderry School Green Tour
- Whole Building Design Guide
- Massachusetts Building Green Financial Incentives
- CDFA Green Building Finance
- Green Roof
- Sound Proof Technology
    - Overly
    - Sound Solutions for the Future
    - High Performance Absorptive Noise Barriers
    - Zero International