

IPRO 314 Final Proposal

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# **Greening and Reuse of Queen of Peace High School Facilities**

Advisors: Jim Braband & Nancy Governale-Hamill

## Executive Summary

The problem posed at Queen of Peace (QoP) High School is one of sustainability. Queen of Peace, a private, all-girl high school in the southern suburb of Burbank, has experienced a decline in enrollment in the past 3-5 years. At its peak, QoP was comprised of 1500 students but has decreased over the years to a current population of approximately 650 students. Reasons for this decline include a competing school turning co-educational as well as many schools overlapping into Peace's drawing radius. The Illinois Institute of Technology IPRO 314 class decided, after consideration of the scope of the problem, to focus their efforts on integrating the principles of "reduce, reuse, recycle, and reputation" into the QoP environment. The overall proposal following this summary is comprised of three sub-proposals designed to utilize the four principles with the intent of potentially: increasing revenue, decreasing costs and strengthening the schools status for the purpose of attracting new enrollment.

The initial area of interest is the under-utilization of school facilities. The first area identified for reuse is the school's library. With the school providing a laptop to every student and wireless internet throughout the building, the usefulness of a centralized library on school grounds has diminished. The idea proposed is to reuse the square footage of the library by converting it into a multi-media communications center equipped with internet classrooms, conference meeting capability and additional multi-media. The purpose of the communications center is to provide the students and faculty with additional educational venues in addition to accelerating the reputation of the school as being a technologically-advanced teaching establishment also potentially attracting additional enrollment. An additional space currently under-utilized but holding great potential is the school's largest courtyard. Currently the space only has two uses: a place to barbeque as well as hold their annual sin burning ceremony. Being the largest courtyard on the campus provides the school many opportunities to turn the space into a good learning environment while becoming a desirable place for students to spend their free time/study halls, weather permitting. Also, the courtyard is directly off of the biology department which causes the space to become an even more valuable learning environment. In addition to the space reuse concept, the team also directed its focus to reducing the schools utilities spend and their carbon footprint on the environment. The last spaces identified for space reuse also hold potential for cost savings. The intention of these advancements is to provide thermal transfer reduction through new windows and an added sustainability wall. After additional visits to the school, the windows were determined to be inefficient, allowing excessive thermal transfer during the cold months and insufficient shading during the warm months. The proposal to replace the current windows with more proficient double-paned windows is intended to reduce the schools utilities spend thus saving money month over month by decreasing their energy consumption used to heat the building. Additionally, the team was then asked to come up with a different way to heat the space during the winter time. From this request the idea of a thermal storage wall that utilizes glauber salts was then researched.

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## Communications Center Proposal



### 1. Background

One of the major spaces currently holding latent potential at Queen of Peace High School is the library; however, it can become a catalyst for positive change. Given its current isolated position, the proposal is to transform the current library space into a communications center. This space will also hold a few conference rooms for faculty and staff. The center will help increase the reputation of the school as being a technologically advanced teaching establishment as well as aid in the school's curriculum. With the inclusion of the laptop program already sponsored by the school, it will be beneficial to use this communication center to broaden the student's education by incorporating outside media including video and audio conferencing with other schools and resources on a local, national and international level. The center can be utilized as a teaching venue, a location for student research and study, as well as, a forum for the school to host meetings, presentations and lectures to both the physical and virtual community.

### 2. Goals

A. To provide the opportunity for independent study: The communication rooms allow for a small or large number of students to take additional classes currently not offered at the school. The small classrooms are intended to consist of up to 6 students and the larger classrooms up to 20 students. While creating new classes could require additional staff, it is instead proposed that the new classrooms connect, via media, to other high schools and teaching establishments with similar communication centers. The classes can be conducted live or run like internet-based or televised replay courses and teachers are "shared." If a course is being taught live at one school, it can be shown live, via the internet, to classrooms in other schools. Additionally, it can be recorded and viewed at later time based on the student's schedule. Homework and exams can be taken and submitted electronically. Using this method, more classes can be offered using fewer

teachers. This allows more freedom and opportunity for the students at QoP without requiring additional staff.

- B. Enhance the technology of the curriculum: The communications center allows for students to access classes online and go beyond what the campus currently has to offer as well as go national and international with the curriculum. Additionally, by learning how to use the new equipment, the school is preparing students for college and future careers where this equipment is more widely used.
- C. To provide the opportunity for networking: This communication center would allow the students and faculty to develop a network community on a local, national and international basis. This network can be used to promote the school, allow students to connect with colleges, allow the faculty and staff to connect with alumni and the military families in the city of Burbank to talk to their loved ones far away (and possibly make a profit out of this).
- D. To create formal conference rooms: The free rooms allow for student clubs to meet in a more formal setting. Also, they are available for faculty and staff to meet together in a formal and specialized space. These conference rooms are also available to become communications rooms due to the portability of the equipment.
- E. To make it a more usable space: The library space is not being used to its full potential in its current state. The goal is to create a more usable space and attract students by creating study spaces, meeting rooms, lounge areas, and new media options.

### 3. Methodology

- A. Visiting Queen of Peace in February gave us a better understanding of what resources they currently have, as well as, what the faculty and students are looking for in place of the current unused library space. Pictures of the library as well as the school floor plans were used to find various ways in which the space could be split to make the most use of it. During last semester's IPRO, an extensive amount of research was done on the technology that would be incorporated into the space. For that reason it was decided to concentrate more on the layout this semester. While speaking with Queen of Peace, they had mentioned that they wanted to be able to use the room for large meetings as well as incorporate different sized classrooms. In order to accomplish both of those goals, the idea of a movable wall was integrated into the final layout designs. Research was conducted on various materials for the wall and was narrowed down to six different types. Since Queen of Peace would like to host more community events, the library needed to become more accessible to the public. In order to accomplish this, it is proposed to add a new entrance to the west wall. While researching different furniture options, a trip to the merchandise mart was made. After meeting with various office furniture companies, 3D renderings were made with chosen furniture in order to give the client a clearer idea of what the final space would like look.

#### B. Schematic

Two possible schematics are proposed in this section. For clarity purposes, the following definitions are provided:

- A. Large Classroom: Meant to hold up to 20 students; classes QoP would like to conduct using their instructors and offer other schools visibility can be held in this space and broadcast to outside classrooms via the communications equipment.

- B. Small Classroom: Meant to hold up to 10 Students; students can use these classrooms to view courses being broadcasted from other schools and therefore do not need an instructor.
- C. Conference Room: Meant to hold up to 6 people; to provide a more formal meeting area for faculty or small student organizations.
- D. Entry/Study Area: Main desk to reserve classrooms and conference rooms; computer stations for use by the students and faculty; lounge areas for use by the students and faculty for studying or informal meetings.

Schematic 1



Interior Perspectives of Schema 1:

A. Entry

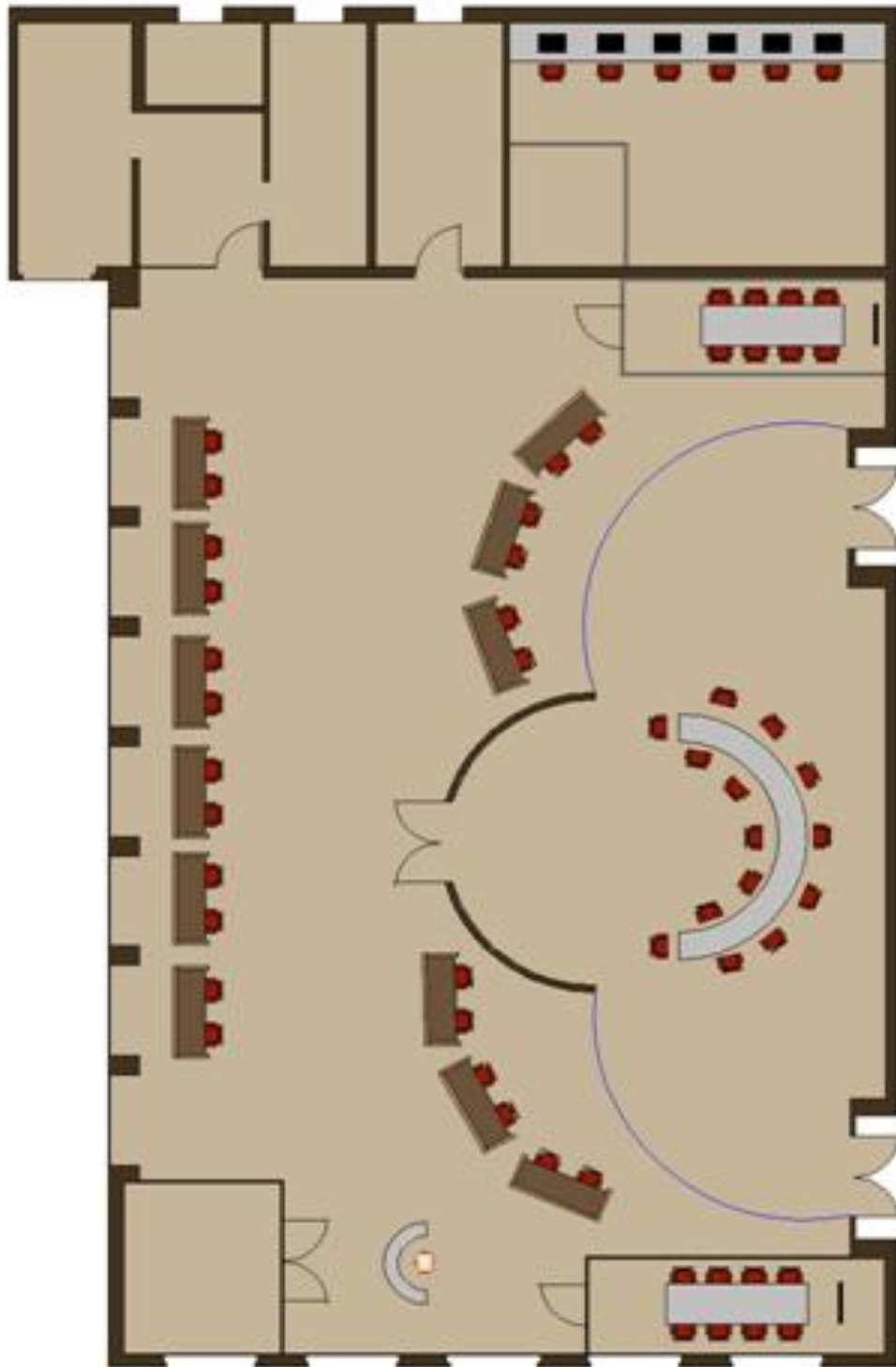




B. Large Study Area



Schematic 2



## 1. Costs

• Video Conferencing Package	\$14,000
• Furniture	\$30,000
• Wall Partitions	\$5,000
• Movable Glass Partition	\$12,000
• New Entrance	\$20,000
• <u>Contingency</u>	<u>\$20,000</u>
• Total Cost	\$101,000

### **Cost Analysis**

- A. The lowest costing videoconferencing package is approximately **\$7,000**. This includes the LifeSize High Definition Camera, High Definition Audio and Wireless Remote Control plus the Best Buy 42" Panasonic Plasma Television. The proposed layouts include two of these packages
- B. The cost of the furniture package with existing furniture and new furniture is approximately **\$30,000**.
- C. The lowest cost of wall partitions is roughly **\$5,000**. This includes 2 x 4 studs with sheetrock.
- D. The cost of a new entrance would be approximately **\$20,000**. This quote includes:
- Demolition of the current wall
  - Dumpster costs
  - New glazing and doors
  - All necessary hardware
- E. Contingency costs are estimated by taking 25% of the net cost. This comes out to be **\$20,000**.
- F. The grand total for this proposal is **\$101,000**.

## **Sustainability Wall Proposal**

### 1. Background

Currently Queen of Peace houses inefficient, single-paned windows. Since the windows are only single paned, they cause a significant heat loss in the winter as well as a huge heat gain during the summer months. For this reason Queen of Peace has been losing a hefty amount of money paying for their current utilities. In order to solve this problem, both a sustainable wall and new windows are being proposed. The wall would be a thermal storage wall that uses the properties of glauber salt to heat the space in the winter time. During the day the heat of the sun would heat the glauber salts, which are placed inside of the wall, and cause them to melt. As the sun goes down and the temperature cools, the glauber salts would begin to harden and would then release the necessary amount of energy that would heat the space and eliminate the need for their current radiator system. The new windows would solve the problem of heat gain. Three different window solutions are being proposed: a new ventilated double façade wall, replacing the glazing on the current windows with a double glaze, and planting tall shrubbery in front of the current windows. These solutions are discussed in greater detail in the "methodology" section.

2. Goals
  - A. Market science and technology to potential students and the community
  - B. Decrease heating and cooling costs for the library space
    - i. Sustainability wall will prevent heat loss in the winter
    - ii. A new window system will prevent heat gain in the summer
  - C. Reduce greenhouse gasses
  - D. To be able to teach students about sustainability with the wall
3. Methodology
  - A. Initial research for the sustainable wall had led to multiple ideas on how to decrease Queen of Peace's costs. The proposals were then narrowed down to one wall idea for heating the space and three window ideas that would be used to cool the space. A fairly new system of heating was found, glauber salts (PCM), and researched extensively. The glauber salts are the perfect phase change material because of their low melting points and the small volume needed to heat the space.

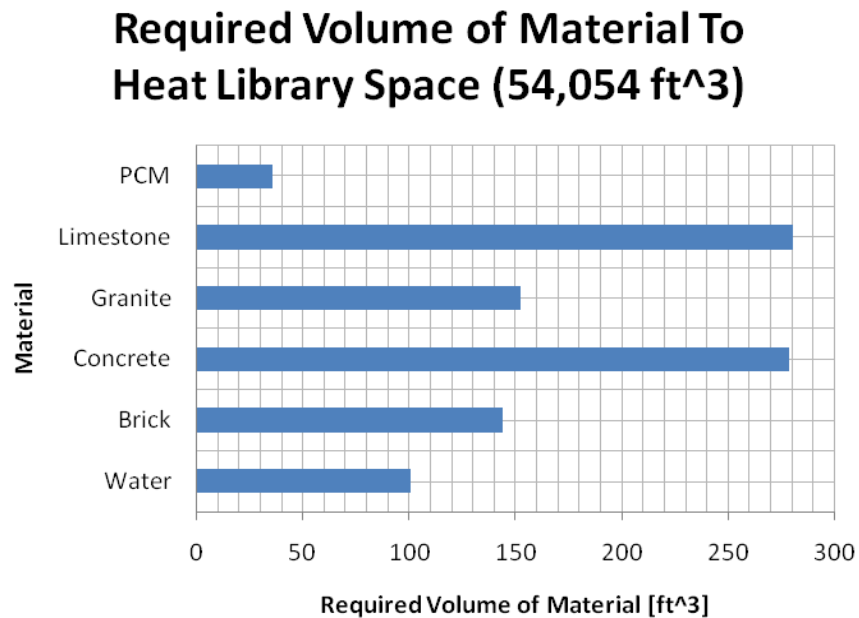


Figure 1: Required volumes of different phase change materials

B. As stated before, three different solutions to the heat gain problem are being proposed: a ventilated double façade wall, replacing the glazing on the current windows with a double glaze, and planting tall shrubbery in front of the west wall in order to block direct sunlight.

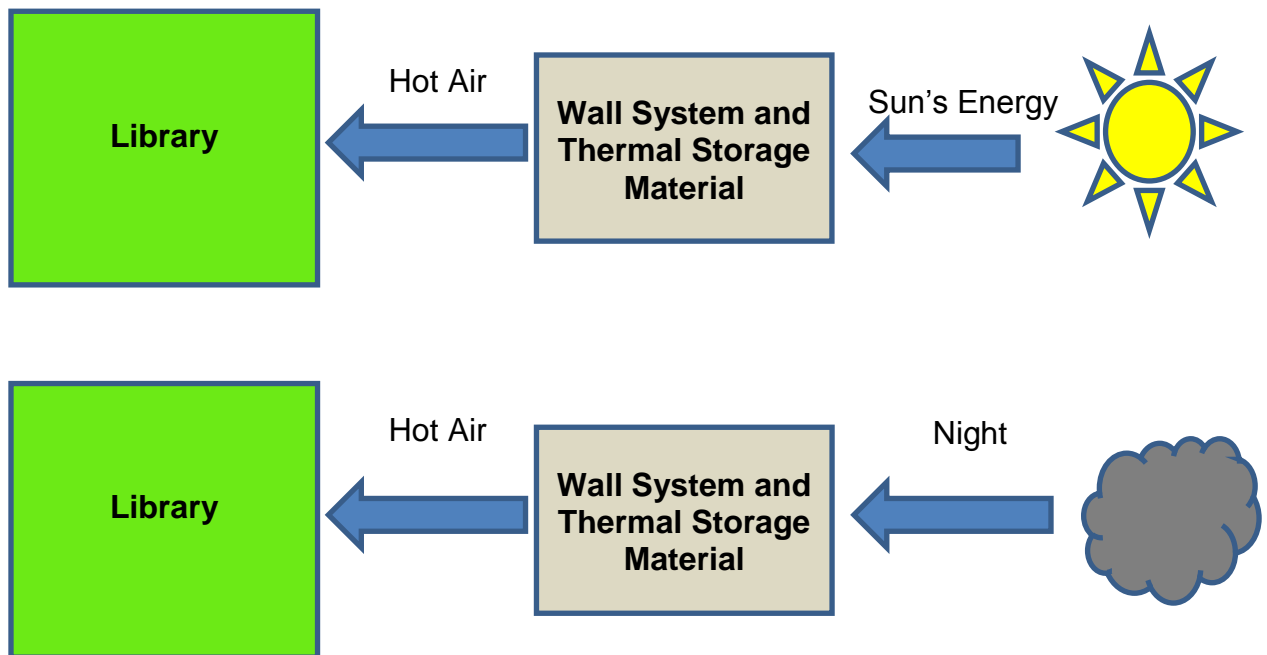
Options	Cost including Construction	Approximate Temperature Decrease
1) Replacing the Current Window Walls with a Ventiladed Double Façade Wall	\$28,000 for West wall \$15,000 for South wall	20-22°F Decrease in Temperature during Summer months
2) Replacing the Glazing on Current Windows with Double Glazing	\$15,000 for Both walls	10-15°F Decrease in Temperature during Summer months
3) Planting Tall Shrubby in front of the West Wall to block direct sunlight	\$3,000 for plants and labor	2-3°F Decrease in Temperature during Summer months

Figure 2: Comparison of Different Cooling Options

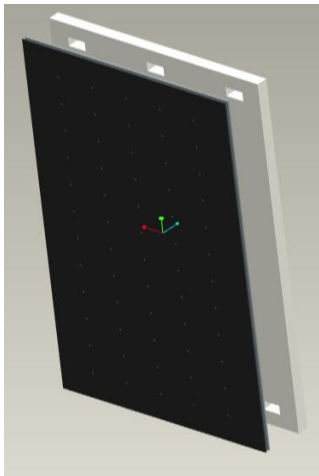
As it can be seen from the above table, the best solution for cooling the library space would be to add the ventilated double façade wall. However, after much consideration, it was decided that the recommended solution would be to replace the glazing. It would be the most cost effective option for Queen of Peace that provides a significant decrease in temperature at a 10-15°F decrease.

4. Schematics

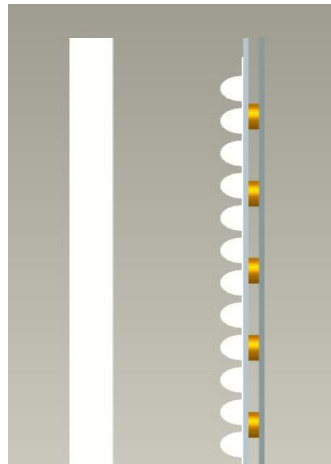
Basic Operation of the Wall System



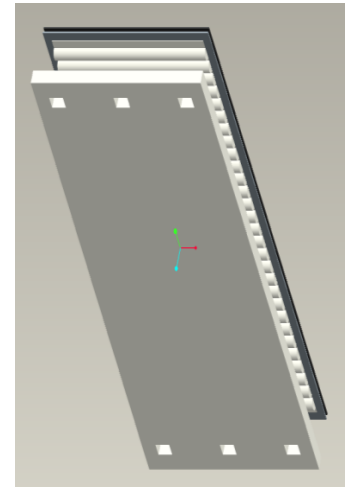
Components of the Wall System



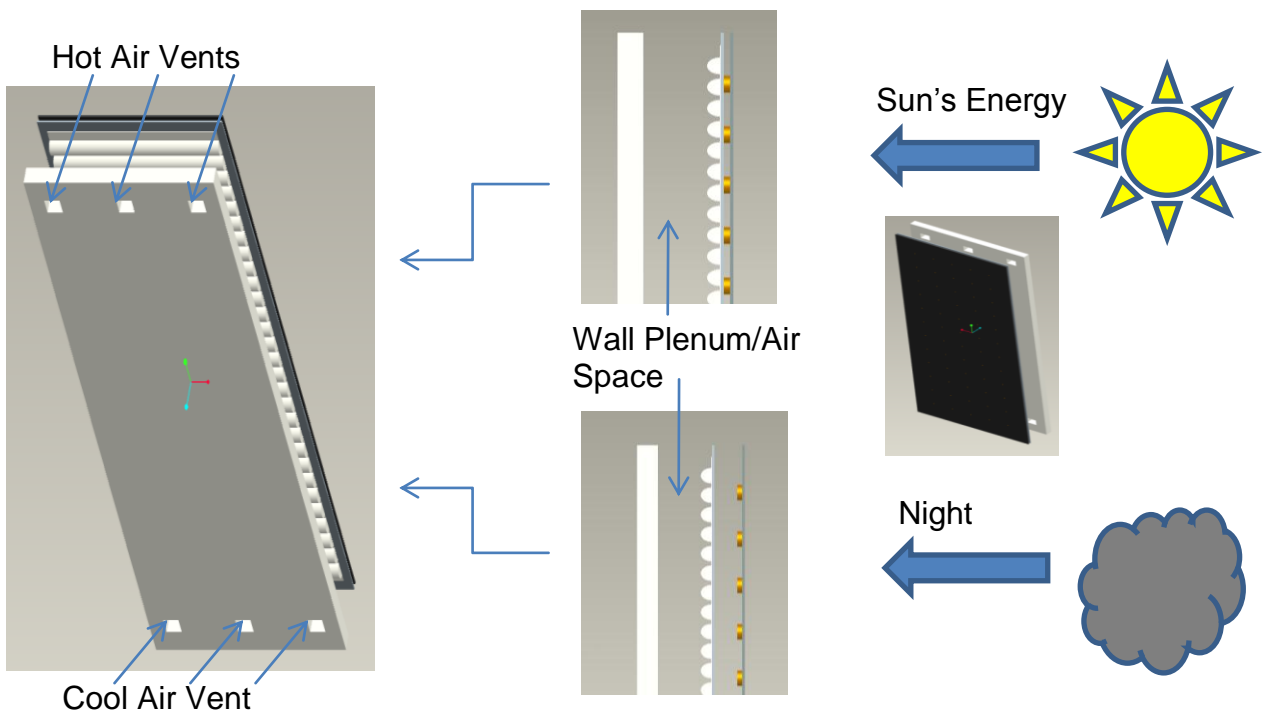
Outside View



Side View



Interior View



## 5. Cost of Materials for the South Wall (54' X 13')

Phase Change Material	\$150
Insulation	\$300
Copper Cylinders	\$700
<u>Aluminum Plates</u>	<u>\$28,000</u>
Final Cost	\$29,150

## Courtyard Proposal

### 1. Background

Aside from the library, Queen of Peace's largest courtyard is another space that holds great potential for change. The plan is to redesign the existing courtyard so that it could be more appealing to the students as well as to provide Queen of Peace with a variety of ways to use the outdoor space to its fullest advantage. At the moment the courtyard is just open space with trees and grass. The new design will make better use of this open space while at the same time making it greener.

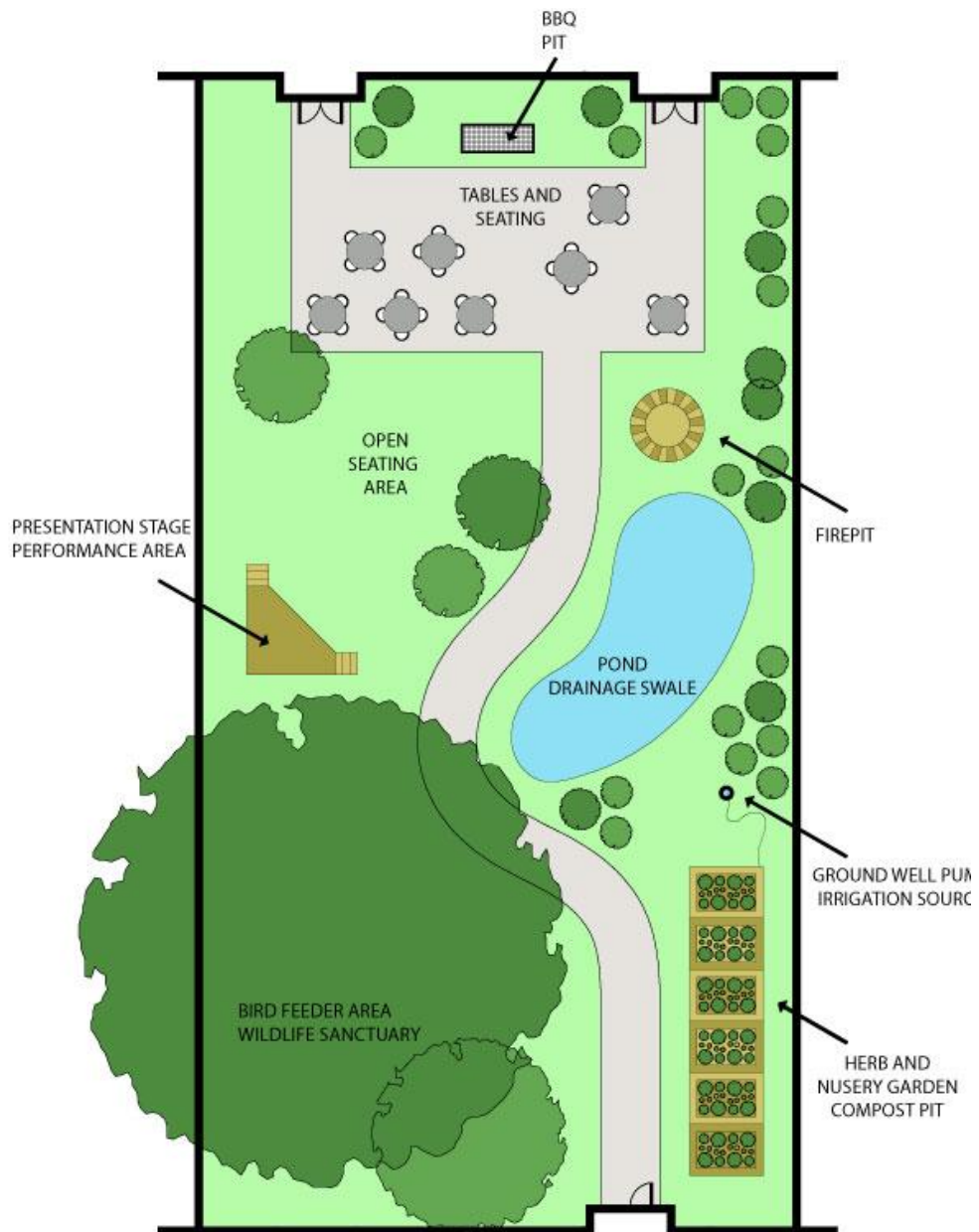
### 2. Goals

- A. To keep costs down by reusing existing bushes and trees and replanting them in different locations if needed. Also, the pathway from the library to the biology side of the school will be recycled. A small modification will be done to the pathway to make it more appealing.
- B. A garden will be made on the biology side of the courtyard in which students can plant different types of plants and run experiments.
- C. Make a barbeque pit area where the students and staff can have a cookout and eat outside in the summer. This area will include a barbeque, chairs and tables.
- D. Create a small pond, which will circulate rain water and possibly have fish.
- E. Make an outdoor classroom, which could be used all year around.
- F. Incorporate activities that would allow outdoor education experiences.
- G. Creates desirable atmosphere for students to spend free time/study hall, weather permitting.
- H. Orient spaces so that area for studying and areas to spend free time intertwine.
- I. Create an outdoor space that appeals to teachers and students alike.

### 3. Methodology

Having visited queen of peace and meeting with the staff we obtained ideas not only for the library space but also for the courtyard. The first thing we did was come up with a list of ideas for things that could be put into the courtyard. These things would not only make the courtyard look better but they will attract the students to make use of the space. Once a list was made, the best ideas were chosen and a layout was made.

Proposed Layout





## 4. Cost

• BBQ Pit	\$3,500
• Fire Pit	\$2,500
• Tables and Chair (x8)	\$5,500
• Pond Excavation (\$85-\$125 per hour)	\$1,000
• Performance Stage (\$20-\$30 per sq ft)	\$2,500
• Herb Garden	\$3,000
• Irrigation System	\$1,000
• Misc. Vegetation	\$3,000
• <u>Concrete Sidewalk</u>	<u>\$3,500</u>
Total Cost	\$31,500