# COVER PAGE

**This Workshop Report is intended to be used as a reference only. Please refer to the requirements outlined in the IDP Facilitator Guide and the Green Schools Guide for a complete list of requirements.**

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ATTENDANCE
(To be provided with revised IDP Workshop Report for inclusion in the GSG-SD submission)

IDP WORKSHOP MEETING MINUTES

(To be provided with revised IDP Workshop Report for inclusion in the GSG-SD submission)

IDP WORKSHOP DESIGN IMPACTS (To be provided with revised IDP Workshop Report for inclusion in the GSG-SD submission). Consultant to indicate how each discovery from IDP workshop impacted scheme selection.

Discovery #1

Discovery #2

Discovery #3

Discovery #4

Discovery #5

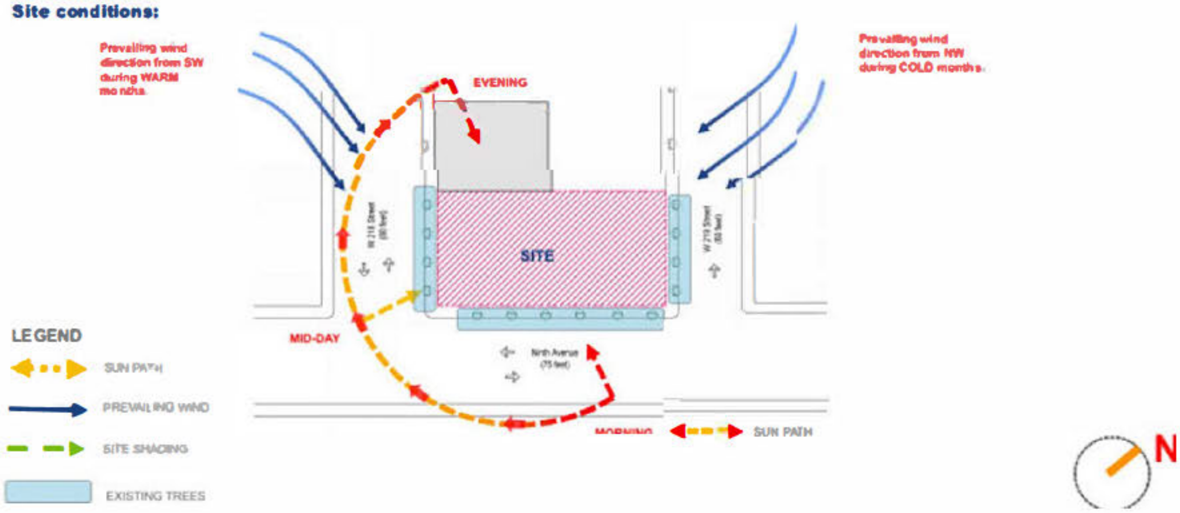
Discovery #6

# Integrative Design Report and Recommendations

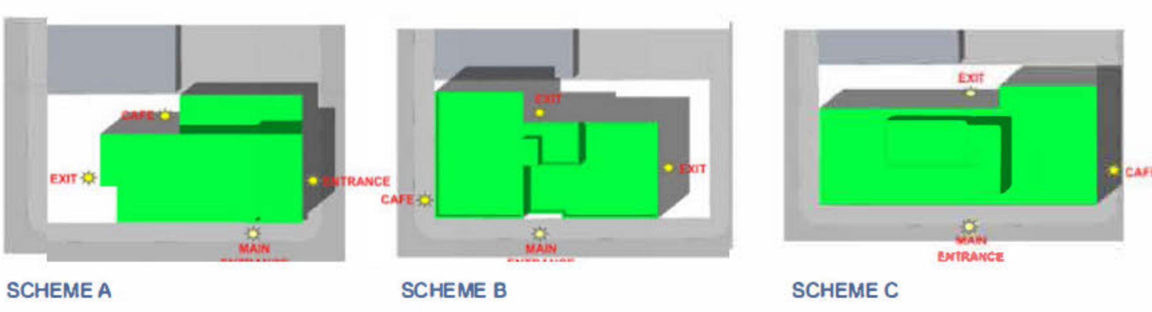
## 2.0 Discovery # 1 Energy and Daylight Related Systems\

### 2.1 Energy and Daylight Systems

**Site conditions:**




**Site conditions:** Exterior lighting at exit and entrance



# Integrative Design Report and Recommendations

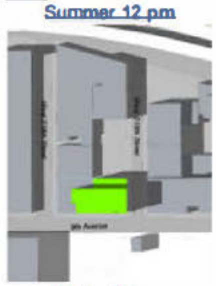
### Discovery #1 Scheme A
## Energy and Daylight Related System
**Site conditions:** Summer & winter solstice shadows


Summer 9 am


Summer 12 pm


Summer 3 pm


Winter 9 am

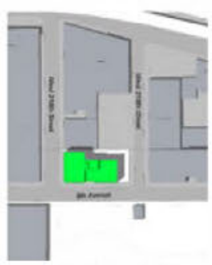

Winter 12 pm

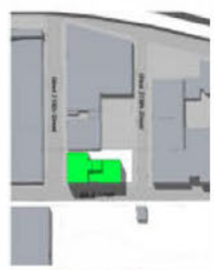

Winter 3 pm

N

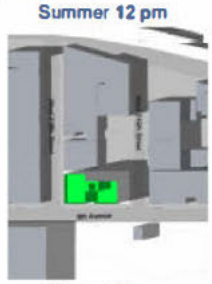
### Discovery #1 Scheme B
## Energy and Daylight Related System
**Site conditions:** Summer & winter solstice shadows

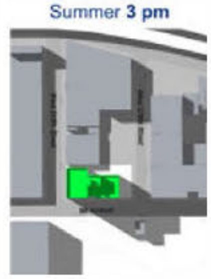

Summer 9 am


Summer 12 pm


Summer 3 pm


Winter 9 am

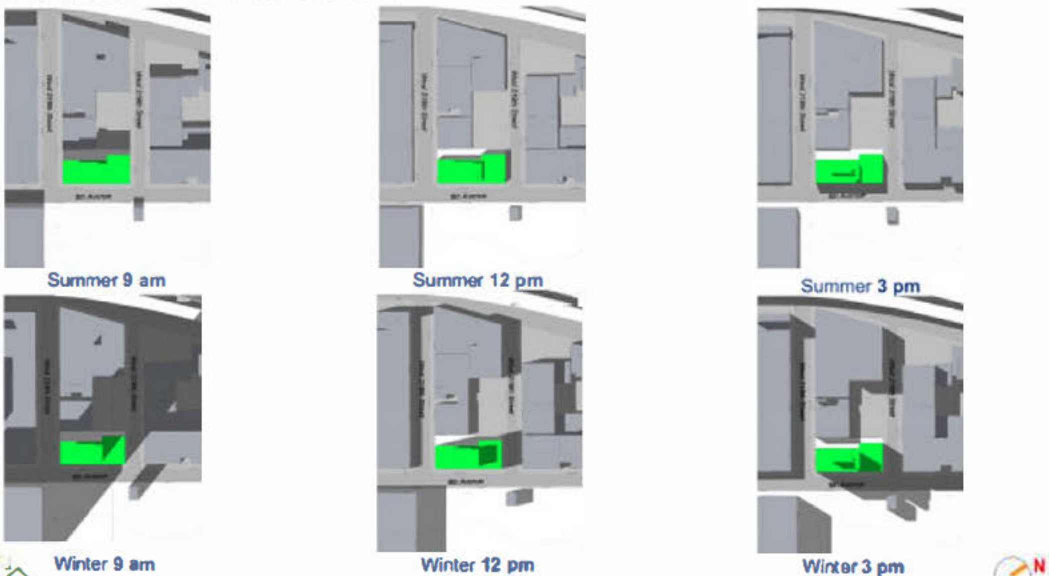

Winter 12 pm


Winter 3 pm

N

# Integrative Design Report and Recommendations

### Discovery #1 Scheme C
### Energy and Daylight Related System
**Site conditions:** Summer & winter solstice shadows



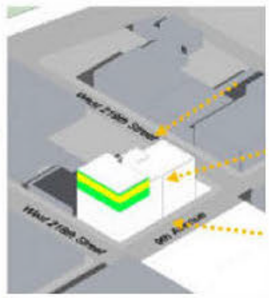

### Discovery #1 Scheme A, B, & C
### Energy and Daylight Related System
**Gymatorium Daylight**

# Integrative Design Report and Recommendations

### Discovery #1 Scheme A, B, & C
### Energy and Daylight Related System
**Gymatorium Daylight**

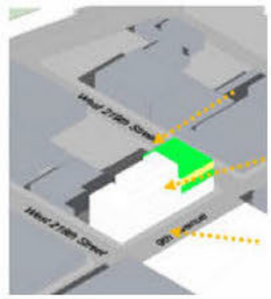
SCHEME A

- Minimum exposure to daylight
- Gymatorium is facing West
- Minimal building obstruction



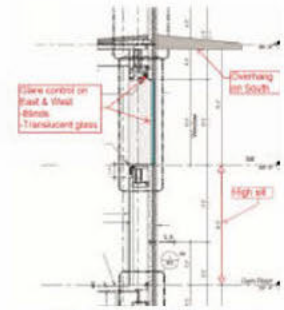
SCHEME B

- High exposure to daylight, volume is more exposed
- Part of Gymatorium is facing South and East
- Minimal building obstruction



SCHEME C

- Medium exposure to daylight
- Gymatorium is facing North
- No building obstructions



Window Example detail

## 2.2 Scheme 1 Energy box model

IDP Box Model Summary

| | |
|---|---|
| School Name | |

| | |
|---|---|
| How many schemes were explored? | 3 |
| If less than 3 schemes, explain | |

| | |
|---|---|
| Warnings | No Warnings |

### Basic Attributes

| Description | Scheme 1 | Scheme 2 | Scheme 3 |
|---|---|---|---|
| Building Area (ft2) | 63,909 | 63,991 | 63,548 |
| Wall Area (ft2) | 30,335 | 34,086 | 30,747 |
| Window Area | 7,555 | 8,537 | 7,711 |
| % Window Area | 20% | 20% | 20% |
| Roof Area (ft2) | 13,593 | 12,543 | 14,990 |

# Integrative Design Report and Recommendations

## Comparison to Scheme 1 (% increase/decrease)

| Description | Scheme 1 | Scheme 2 | Scheme 3 |
|---|---|---|---|
| **Source EUI (2.55 elec)** | 0% | 0% | -1% |
| **Carbon Emissions (tons)** | 0% | 1% | -1% |
| PV installation (kW) | 0% | -8% | 10% |
| PV Energy Production (kWh/yr) | 0% | -8% | 10% |
| Peak kW | 0% | 1% | -3% |
| Max Heating Demand (kBtu/hr) | 0% | -4% | -5% |
| Max Cooling Demand (kBtu/hr) | 0% | 4% | -3% |
| Annual Daylighting Reduction | 0% | 3% | -3% |

## Effects of Window Area- Scheme 1

All Results are compared to Scheme 1 with 20% glazing on all facades

| **Description** | **Whole Building** | | |
|---|---|---|---|
| Window-Wall Ratio (%) | 15% | 20% | 25% |
| **Source EUI (2.55 elec)** | 0% | 0% | 1% |
| **Carbon Emissions (tons)** | 0% | 0% | 1% |
| Peak kW | -1% | 0% | 1% |
| Max Heating Demand (kBtu/hr) | 1% | 0% | -1% |
| Max Cooling Demand (kBtu/hr) | -1% | 0% | 0% |
| Annual Daylighting Reduction | -5% | 0% | 3% |

## Effects of Window Area- Scheme 2

All Results are compared to Scheme 2 with 20% glazing on all facades

| **Description** | **Whole Building** | | |
|---|---|---|---|
| Other Façade Window % | 15% | 20% | 25% |
| **Source EUI (2.55 elec)** | 0% | 0% | 1% |
| **Carbon Emissions (tons)** | 0% | 0% | 1% |
| Peak kW | -1% | 0% | 1% |
| Max Heating Demand (kBtu/hr) | -1% | 0% | 1% |
| Max Cooling Demand (kBtu/hr) | -8% | 0% | -2% |
| Annual Daylighting Reduction | -3% | 0% | 3% |

## Effects of Window Area- Scheme 3

All Results are compared to Scheme 3 with 20% glazing on all facades

| **Description** | **Whole Building** |
|---|---|

| Other Façade Window % | 15% | 20% | 25% |
|---|---|---|---|
| **Source EUI (2.55 elec)** | 0% | 0% | 0% |
| **Carbon Emissions (tons)** | 0% | 0% | 0% |
| Peak kW | 0% | 0% | 1% |
| Max Heating Demand (kBtu/hr) | 1% | 0% | -7% |
| Max Cooling Demand (kBtu/hr) | 0% | 0% | 0% |
| Annual Daylighting Reduction | -3% | 0% | 3% |

## Scheme A

Information from LS-I

| Case | Annual Reduction by Daylight % |
|---|---|
| Building Orientation_ 0 | 37% |
| Building Orientation_90 | 37% |
| Building Orientation_180 | 37% |
| Building Orientation_270 | 37% |

Information from SS-D

| Case | Maximum Heating Load (kBtu/hr) | Maximum Cooling Load (kBtu/hr) |
|---|---|---|
| Building Orientation_ 0 | 1,258 | 1,726 |
| Building Orientation_90 | 1,252 | 1,728 |
| Building Orientation_180 | 1,231 | 1,728 |
| Building Orientation_270 | 1,247 | 1,728 |

Information from PS-E

| Case | Electric Use (kWh) | Fuel Use (MBTU) | Peak Demand (kW) |
|---|---|---|---|
| Building Orientation_ 0 | 348,617 | 876 | 222 |
| Building Orientation_90 | 348,894 | 895 | 222 |
| Building Orientation_180 | 347,793 | 890 | 222 |
| Building Orientation_270 | 347,634 | 886 | 222 |

## 2.3 IDP *Energy Summary*

### Site Conditions

#### Site Shading

Review the IDP Shading Study. **Rank the favorability of each scheme.**
Shading Table

| | | | | | | |
|---|---|---|---|---|---|---|
| Scheme A | Very Unfavorable | Somewhat Unfavorable | Neutral | Somewhat Favorable | Very Favorable | Not Feasible |
| Scheme B | Very Unfavorable | Somewhat Unfavorable | Neutral | Somewhat Favorable | Very Favorable | Not Feasible |
| Scheme C | Very Unfavorable | Somewhat Unfavorable | Neutral | Somewhat Favorable | Very Favorable | Not Feasible |

Site conditions does not provide a very favorable shading. Scheme C could improve favorability if the playground could be relocated.

#### Exterior Lighting

Describe any features that may have special lighting requirements. Describe opportunities to have single fixtures meet multiple lighting needs.

**Wall pack lighting will be provided no special requirement.**

#### Landscaping

Describe opportunities for deciduous shade plants/trees on the south side of the building, and evergreen trees on the north/west sides.

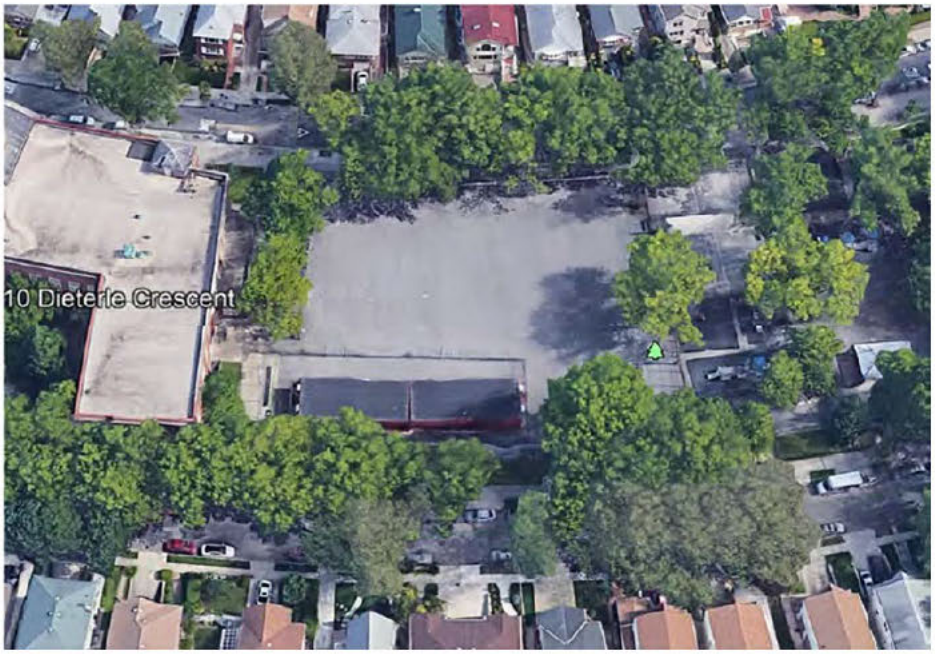
**Trees may be implemented on the design where it doesn't obstruct any entrances or exits. There will be more trees in the sidewalk to comply with the park department requirement. The goal is to maintain the existing nine trees on the sidewalk.**

#### Adjacent Site Conditions

Describe any existing built environment conditions and vegetation that can provide shelter from extreme weather or to deflect unwanted noise, if any.

**There is no protection from existing structures. The lot is located in a manufacture zone, the existing landscape responds to that use.**

## Landscaping




Existing Site Plan


Possible Landscaping with Deciduous Shade Trees

# Integrative Design Report and Recommendations

## Massing, Envelope and Façade Elements

Review the Shading Study and Box Model Information Summary. When determining the most favorable scheme, reduction in boiler capacity is preferable to reduction in chiller capacity. The box model only includes daylighting controls in a specific run, and higher chiller capacity indicates greater daylighting potential.

1.0 **List the preferred Scheme based on box model. More than one may be considered if results are similar. Options that are not feasible due to site constraints may be eliminated. Briefly describe the decision making process:**

Based on the results of the box model, the programmatic needs should be used to select the preferred scheme, not the energy use.

The box model shows that the overall energy use between the three options are similar:

| Scheme | Energy (MBTU) |
|---|---|
| A | 4,445.9 |
| B | 4,415.9 |
| C | 4,373.0 |

The overall energy use is similar in all three schemes, with Scheme C having lowest energy consumption and scheme B best daylighting opportunity. The main difference in the massing options is the locations of the kitchen/cafeteria and the gymatorium. The box model was developed and analyzed using eQuest

2.0 **Scheme for Design:**

To be determined as design is developed.

3.0 **If the Scheme selected for the design is not among the preferred options from the box model**

**a) Explain why the preferred box model scheme is not suitable**

NA- the site is constrained and both massing options are equally preferable

**b) Describe how the findings from the box model will influence the design.**

We learn a few energy saving items and less carbon emission from box model. We will consider to improve those items during the design development, such as install as many PV panel as possible, reduce wall openings, and reduce overall building envelop.

4.0 **Describe the strategies for limiting the vision glazing while maximizing daylighting. Provide proposed window wall ratio.**

- External shades should be considered on south facing windows.
- Framing should be minimized to the extent possible (fewer large windows preferred over more smaller windows)
- 20% WWR was modeled in the box model analysis
- The window head height should be as high as possible to maximize daylighting while maintaining views.
- The window-to-wall (WWR) ratio favored the north facing walls to maximize the daylight savings possible. The WWR of each orientation is as follows:

| | Scheme A | Scheme B | Scheme C |
|---|---|---|---|
| NE | 17.8% | 21.5% | 16.5% |
| SE | 29.0% | 25.1% | 27.3% |
| SW | 14.7% | 13.6% | 12.7% |
| NW | 38.5% | 39.8% | 43.5% |

5.0 **Describe the consideration of thermal breaks in the envelope assembly and the integration of details in the design process.**

Envelope Recommendations below are based on studies that were performed on prototypical buildings. The studies can be applied to all SCA buildings.

- The insulation values of the walls and roof should be maximized to the extent practical.
- Recommended Roof insulation is R-40 or greater
- Recommended effective wall U-value is R-15 or greater

# Integrative Design Report and Recommendations

## MEP Layout Optimization

6.0 **Do special circumstances advocate for consideration of HVAC alternates to the standard design?**

**a) If yes, describe the HVAC system(s) under consideration**
No alternate to standard design. HVAC design will follow agency standard SCA Design Requirements Section 6.2.

7.0 **Describe how the following will be addressed in the design. Both architectural and HVAC disciplines should be considered:**

**1. Reducing cooling loads**

- For building envelope load reduction, HVAC Engineer will account for load reductions as a result of any additional insulation and better building envelope components (windows etc.) the Architect will provide.
- For infiltration load reduction, HVAC Engineer will slightly pressurize interior spaces to reduce infiltration. In addition, the Architect will design air barriers and/or vapor barriers for the building envelope.
- For outside air load reduction, HVAC Engineer will provide Enthalpy Heat Recovery wheels on Rooftop Units serving classrooms and the gymnasium. CO2 based demand control ventilation to reduce outside air in response to space vacancies will also be provided for Rooftop Units serving classrooms and the gymnasium.
- For internal load reduction, HVAC Engineer will take into consideration the energy efficient lighting as designed.
- For air leakage load reduction, HVAC Engineer will provide air curtains at the main building entrances and provide Energy Code required Class 1 low leakage dampers integral to the building envelope.

**2. Reducing heating loads**
The same methodology which reduces cooling loads described above will also be utilized for heating load reductions.

**3. Limiting air duct pressure drop**
Air ducts will be designed according to acoustical guidelines which limits air duct velocities. Limiting air duct velocities automatically limits air duct pressure drop. In addition, a variable air volume (VAV) system will be designed. The VAV system reduces airflow during non-peak heating and cooling space load conditions. The reduction of airflow reduces air duct velocities in mild weathers, therefore also reduces air duct pressure drop in mild weathers.

**4. Limiting envelope penetrations**
Envelope penetrations by HVAC equipment (ductwork and piping through roof, louvers through walls) will be limited to necessary ones according to required equipment for the project, as well as code required shaft smoke vents as per 2014 NYCBC 708.12.1. Envelope penetrations by HVAC equipment and shaft smoke vents will be caulked and sealed per SCA specifications.

**5. Limiting piping pressure drop**
Engineer will limit piping pressure drop according to 2020 NYC ECC Appendix CA (aka, ASHRAE 90.1-2016 with NYC amendments) Section 6.5.4.6 Pipe Sizing Requirements with Table 6.5.4.6.

**6. Other**
N/A.

# Integrative Design Report and Recommendations

Architecture & Engineering - A&E In-House Design Studio

## 2.4 NYC Geothermal Screening Tool selection

### NYC Geothermal Webtool selection

This document contains the geothermal feasibility estimation, retrieved at:
Wed May 20 2020 15:07:47 GMT-0400 (Eastern Daylight Time)

| Selection | | | |
|---|---|---|---|
| Address | 400 WEST 219 STREET | | |
| Borough | Manhattan | | |
| Block | 2214 | | |
| Lot(s) | 24 | | |
| BBL(s) | 1022140024 | | |
| **Building** | | | ***Overrides** |
| Lot Area (SqFt) | 20,000 | | 20000 |
| Building Area (SqFt) | 63,909 | | 63909 |
| Building Footprint (SqFt) | 13,593 | | 13593 |
| Building Type | Other: W3 | | |
| **Calculation** | | | |
| Depth To Bedrock (Ft +-25 Ft) | 0 | | |
| Depth To Water (Ft +-25 Ft) | Data Not Available | | |
| Lloyd Aquifer (Present/Not Present) | Not Present | | |
| **Geothermal System** | **Standing Column Well** | **Closed Loop** | **Open Loop**** |
| Geological and Technical Suitability (Yes/No) | Yes | Yes | No |
| Potential Capacity (Tons) | 105 | 49 | |
| Full System Feasible (Yes/No) | Yes | Yes | Yes |
| Hybrid System Feasible (Yes/No) | No | No | No |
| Carbon Footprint Reduction (Tons CO2e) | | | |
| Annual Cost of Carbon ($) | 0 | 0 | 0 |
| Annual Potential Savings with Geothermal System ($) | 0 | 0 | 0 |
| Projected Incremental Payback with Carbon Credit (Years) | | | |
| Projected Incremental Payback without Carbon Credit (Years) | | | |

The Geothermal Feasibility Tool indicates that closed loop, open loop and standing column well are feasible for a Full system.

The SCA Geothermal Feasibility Report is required to be completed if either a standing column, closed loop or open loop system indicates "Yes" for full system feasibility.

NOTE: The City's critical infrastructure, such as water tunnels, shafts, or appurtenant facilities are regulated by the New York City Department of Environmental Protection ("DEP"). DEP is in the process of promulgating rules to require that any boring, drilling or excavation to a depth of 50 feet in the borough of the Bronx or north of 135th Street in the borough of Manhattan or to a depth of 100 feet in any other location / borough in New York City first be reported to DEP. Please send written notification of intention to drill or excavate to: Chief of Site Connection and Plan Review, Bureau of Water and Sewer Operations, 9605 Horace Harding Expy, 3rd Floor, Flushing, NY 11368-4100

Furthermore, sites that have contaminated land, are archeologically significant, and/or are located in protected marshland should not move forward with a full feasibility study due to an increased cost.

*. The override calculation assumes new construction with optimal building location to maximize geothermal capacity. In cases of renovation or re-purposing of an existing building, the calculation may over-estimate capacity.

**: For Open Loop systems in the Bronx and Manhattan, the information available from USGS is insufficient.

# Integrative Design Report and Recommendations

## 2.6 Renewable Energy

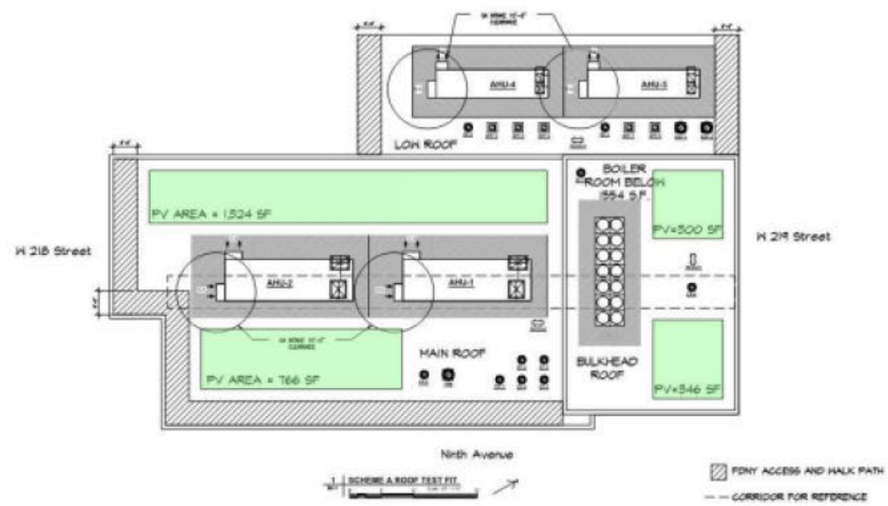
Summary

Each scheme was evaluated for photovoltaic (PV) capacity and generation. Scheme A has the most potential for PV capacity and energy generation. Scheme C has comparable capacity and generation if the area dedicated for the playground can be used for PV instead. Scheme B does not have a favorable building orientation to the southern sun exposure. The schemes have system capacities ranging from 26 kW to 53 kW, and energy generations ranging from 33,000 to 68,000 kWh annually depending on which scheme is chosen. Certain schemes have recommendations in the analysis below, based on shading and rooftop equipment design flexibility. The analysis is based on ballasted PV racking. This allows for the PV modules (weighed down by ballast, usually CMUs), to avoid roof penetrations and allow for flexible system layouts.

| Building Scheme | Scheme A | Scheme B | Scheme C |
|---|---|---|---|
| PV System Capacity | 52.9 kW | 41.7 kW | 25.9 kW |
| Annual Energy Generation | 68,319 kWh | 46,343 kWh | 33,437 kWh |

Scheme A

TOTAL SOLAR AREA= 1,324+766+346+300 = 2,736 SQFT
TOTAL DC SYSTEM SIZE KW= 2736/80= 34.20 KW
TOTAL GENERATED AMPs= 34,200/(1.73*208*0.8)=118.80A
TOTAL NUMBER OF PANEL= 34,200/372 = 91 PANELS




**AIR HANDLING UNITS**

| UNIT NO. | SERVICE |
|---|---|
| AHU-1 | CLASSROOMS |
| AHU-2 | CLASSROOMS |
| AHU-3 | CAFETERIA / KITCHEN |
| AHU-4 | GYMNASIUM |

**SPLIT A/C UNIT SCHEDULE**

| UNIT NO. | SERVICE |
|---|---|
| ACCU-1 | ELEVATOR MACHINE ROOM |
| ACCU-2 | MDF/IDF ROOM |
| ACCU-3 | FOOD STORAGE ROOM |

**FAN SCHEDULE**

| UNIT NO. | SERVICE |
|---|---|
| EF-1 | REFUSE ROOM |
| EF-2 | WATER METER, ELECT. SWITCH GEAR & ATS ROOM |
| EF-3 | GROUND EQUIPMENT ROOM |
| EF-4 | KITCHEN STAFF LOCKERS / MOP ROOM |
| EF-5 | CUSTD. LOCKER ROOMS |
| EF-6 | ART KILN HOOD |
| EF-7 | BOILER ROOM |
| EF-8 | ELEVATOR MACHINE ROOM |
| EF-9 | CAN WASH ROOM |
| KEF-1 | KITCHEN HOOD |
| KEF-2 | KITCHEN GENERAL EXHAUST |
| SPF-1 | GYM SMOKE PURGE |
| SPF-2 | GYM SMOKE PURGE |
| SPF-3 | CELLAR SMOKE PURGE |
| SPF-4 | KITCHEN SMOKE PURGE |
| SPF-5 | CAFE. SMOKE PURGE |
| TEF-1 | TOILETS |
| FHE | LAB HOOD EXHAUST |

**Solar PV systems generation potential is to be evaluated for each scheme, the below tool is a sample reference.**

PVWatts Calculator

## RESULTS

**226,976 kWh/Year***

*System output may range from 217,874 to 234,580 kWh per year near this location.*

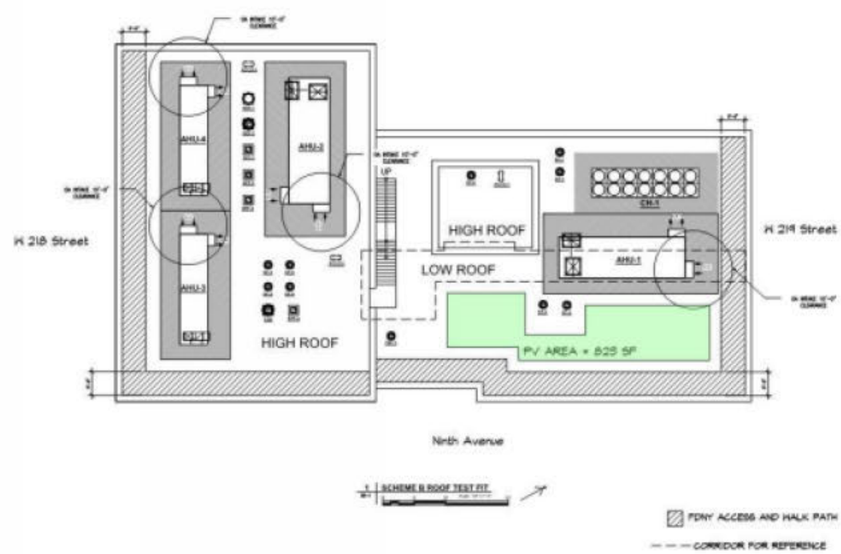
| Month | Solar Radiation ( kWh / m$^2$ / day ) | AC Energy ( kWh ) | Value ( $ ) |
|---|---|---|---|
| January | 3.76 | 15,916 | 1,448 |
| February | 4.51 | 17,055 | 1,552 |
| March | 4.80 | 19,642 | 1,787 |
| April | 5.46 | 20,822 | 1,895 |
| May | 5.32 | 20,509 | 1,866 |
| June | 5.77 | 21,030 | 1,914 |
| July | 5.87 | 21,706 | 1,975 |
| August | 5.80 | 21,489 | 1,955 |
| September | 5.58 | 20,668 | 1,881 |
| October | 4.43 | 17,704 | 1,611 |
| November | 3.95 | 15,782 | 1,436 |
| December | 3.42 | 14,653 | 1,333 |
| **Annual** | **4.89** | **226,976** | **$ 20,653** |

We evaluated the pre-schematic design schemes for solar PV potential. The following drawings consider HVAC equipment clearances (shown as dashed lines) and FDNY for rooftop access requirements for buildings less than 100 feet in height with roof slopes less than 20 degrees from horizontal. Mechanical equipment and solar PV panels are treated as obstructions per the Fire Code. All four exposures of each scheme are assumed to be accessible to fire apparatus. Requirements include:

- For each 12 linear feet of accessible perimeter, a minimum 6 foot by 6 foot landing clearance area. Such areas may be combined into areas up to 12 feet long, separated by no less than 12 feet.
- For each 100 linear feet of rooftop width and each 100 linear feet of length, a minimum 6 foot wide clear path from side to side or from front to back, providing reasonable access to all bulkhead doors.
- For each rooftop stairway or bulkhead access door, a minimum 6 foot clear area in all directions.

<u>Scheme B</u>

TOTAL SOLAR AREA = 823 SF
TOTAL DC SYSTEM SIZE KW=823/80=10.28 KW
TOTAL GENERATED AMPs= 10,280/(1.73*208*0.8)=35.71A
TOTAL NUMBER OF PANEL= 10,280/372 = 27 PANELS




**AIR HANDLING UNITS**

| UNIT NO. | SERVICE |
|---|---|
| AHU-1 | CLASSROOMS |
| AHU-2 | CLASSROOMS |
| AHU-3 | CAFETERIA / KITCHEN |
| AHU-4 | GYMNASIUM |

**SPLIT A/C UNIT SCHEDULE**

| UNIT NO. | SERVICE |
|---|---|
| ACCU-1 | ELEVATOR MACHINE ROOM |
| ACCU-2 | MDF/IDF ROOM |
| ACCU-3 | FOOD STORAGE ROOM |

**FAN SCHEDULE**

| UNIT NO. | SERVICE |
|---|---|
| EF-1 | REFUSE ROOM |
| EF-2 | WATER METER, ELECT. SWITCH GEAR & ATS ROOM |
| EF-3 | GROUND EQUIPMENT ROOM |
| EF-4 | KITCHEN STAFF LOCKERS / MOP ROOM |
| EF-5 | CUSTD. LOCKER ROOMS |
| EF-6 | ART KILN HOOD |
| EF-7 | BOILER ROOM |
| EF-8 | ELEVATOR MACHINE ROOM |
| EF-9 | CAN WASH ROOM |
| KEF-1 | KITCHEN HOOD |
| KEF-2 | KITCHEN GENERAL EXHAUST |
| SPF-1 | GYM SMOKE PURGE |
| SPF-2 | GYM SMOKE PURGE |
| SPF-3 | KITCHEN SMOKE PURGE |
| SPF-4 | CAFE. SMOKE PURGE |
| TEF-1 | TOILETS |
| FHE | LAB HOOD EXHAUST |

# RESULTS

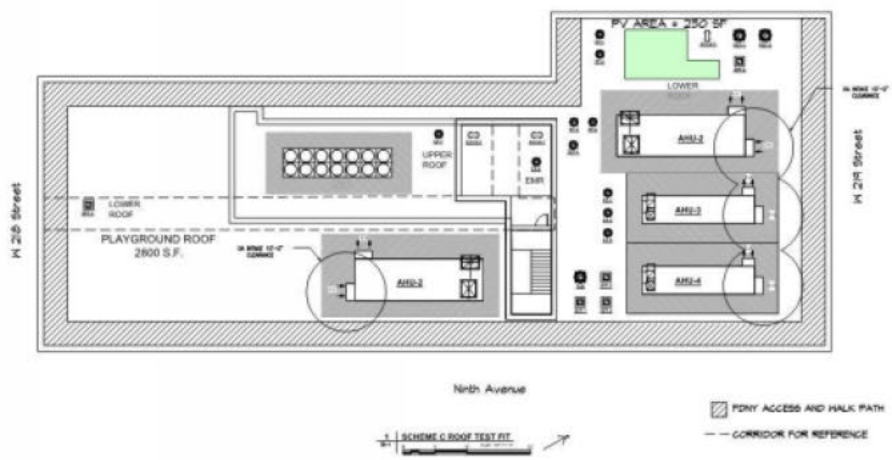
**105,642 kWh/Year***

*System output may range from 101,406 to 109,181 kWh per year near this location.*

| Month | Solar Radiation ( kWh / m$^2$ / day ) | AC Energy ( kWh ) | Value ( $ ) |
|---|---|---|---|
| January | 3.76 | 7,408 | 674 |
| February | 4.51 | 7,938 | 722 |
| March | 4.80 | 9,142 | 832 |
| April | 5.46 | 9,691 | 882 |
| May | 5.32 | 9,546 | 869 |
| June | 5.77 | 9,788 | 891 |
| July | 5.87 | 10,103 | 919 |
| August | 5.80 | 10,002 | 910 |
| September | 5.58 | 9,620 | 875 |
| October | 4.43 | 8,240 | 750 |
| November | 3.95 | 7,345 | 668 |
| December | 3.42 | 6,820 | 621 |
| **Annual** | **4.89** | **105,643** | **$ 9,613** |

Scheme C

TOTAL SOLAR AREA= 230 SF
TOTAL DC SYSTEM SIZE KW=230/80 = 7.6 KW
TOTAL GENERATED AMPs=7,666/(1.73*208*0.8)= 26.6A
TOTAL NUMBER OF PANEL= 7,666/372 = 20 PANEL




**AIR HANDLING UNITS**

| UNIT NO. | SERVICE |
|---|---|
| AHU-1 | CLASSROOMS |
| AHU-2 | CLASSROOMS |
| AHU-3 | CAFETERIA / KITCHEN |
| AHU-4 | GYMNASIUM |

**SPLIT A/C UNIT SCHEDULE**

| UNIT NO. | SERVICE |
|---|---|
| ACCU-1 | ELEVATOR MACHINE ROOM |
| ACCU-2 | MDF/IDF ROOM |
| ACCU-3 | FOOD STORAGE ROOM |

**FAN SCHEDULE**

| UNIT NO. | SERVICE |
|---|---|
| EF-1 | REFUSE ROOM |
| EF-2 | WATER METER, ELECT. SWITCH GEAR & ATS ROOM |
| EF-3 | GROUND EQUIPMENT ROOM |
| EF-4 | KITCHEN STAFF LOCKERS / MOP ROOM |
| EF-5 | CUSTD. LOCKER ROOMS |
| EF-6 | ART KILN HOOD |
| EF-7 | BOILER ROOM |
| EF-8 | ELEVATOR MACHINE ROOM |
| EF-9 | CAN WASH ROOM |
| KEF-1 | KITCHEN HOOD |
| KEF-2 | KITCHEN GENERAL EXHAUST |
| SPF-1 | GYM SMOKE PURGE |
| SPF-2 | GYM SMOKE PURGE |
| SPF-3 | CELLAR SMOKE PURGE |
| SPF-4 | KITCHEN SMOKE PURGE |
| SPF-5 | CAFE. SMOKE PURGE |
| TEF-1 | TOILETS |
| FHE | LAB HOOD EXHAUST |

# RESULTS

# 132,963 kWh/Year*

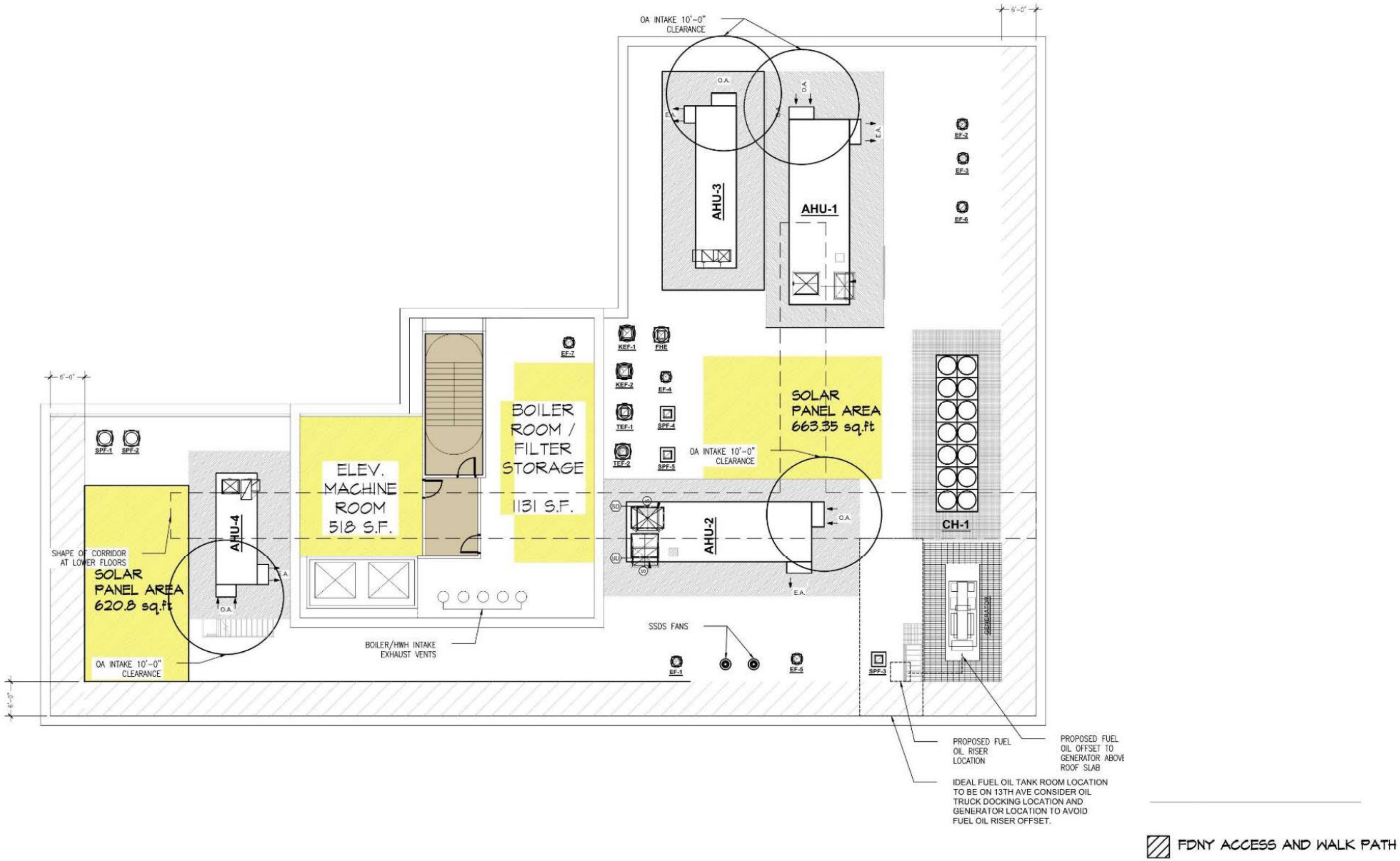
*System output may range from 127,631 to 137,417 kWh per year near this location.*

| Month | Solar Radiation ( kWh / m$^2$ / day ) | AC Energy ( kWh ) | Value ( $ ) |
|---|---|---|---|
| January | 3.76 | 9,324 | 2,164 |
| February | 4.51 | 9,991 | 2,319 |
| March | 4.80 | 11,507 | 2,671 |
| April | 5.46 | 12,198 | 2,831 |
| May | 5.32 | 12,014 | 2,788 |
| June | 5.77 | 12,320 | 2,859 |
| July | 5.87 | 12,715 | 2,951 |
| August | 5.80 | 12,588 | 2,922 |
| September | 5.58 | 12,107 | 2,810 |
| October | 4.43 | 10,371 | 2,407 |
| November | 3.95 | 9,245 | 2,146 |
| December | 3.42 | 8,584 | 1,992 |
| **Annual** | **4.89** | **132,964** | **$ 30,860** |

# Local Law 94 of 2019 – Sustainable Roofing Zone

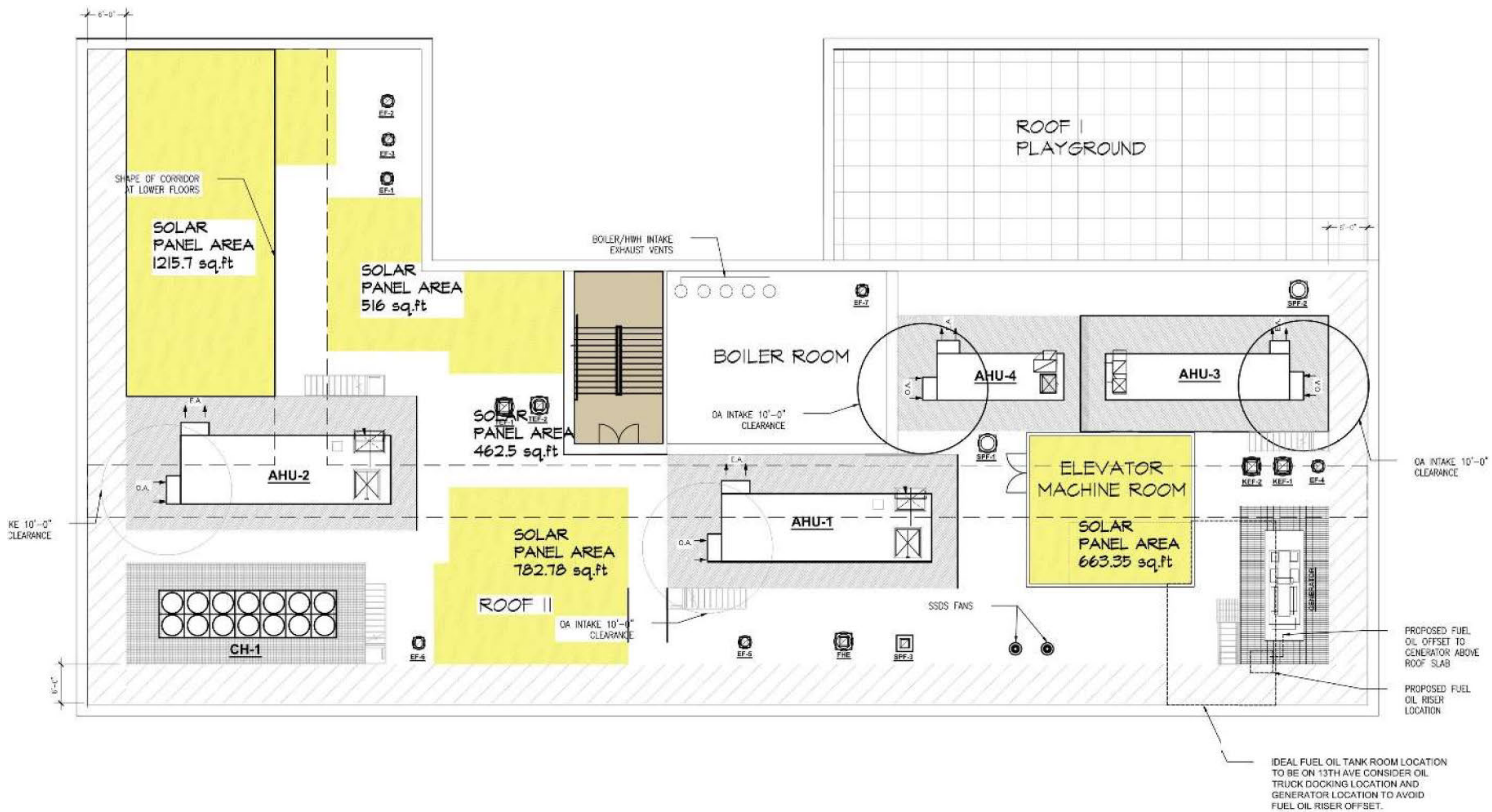
Refer to Sustainable Roofing Zone Diagrams below

# Discovery #1 Scheme A
# Energy and Daylight Related Systems
## Renewable Energy Analysis



# Energy and Daylight Related Systems

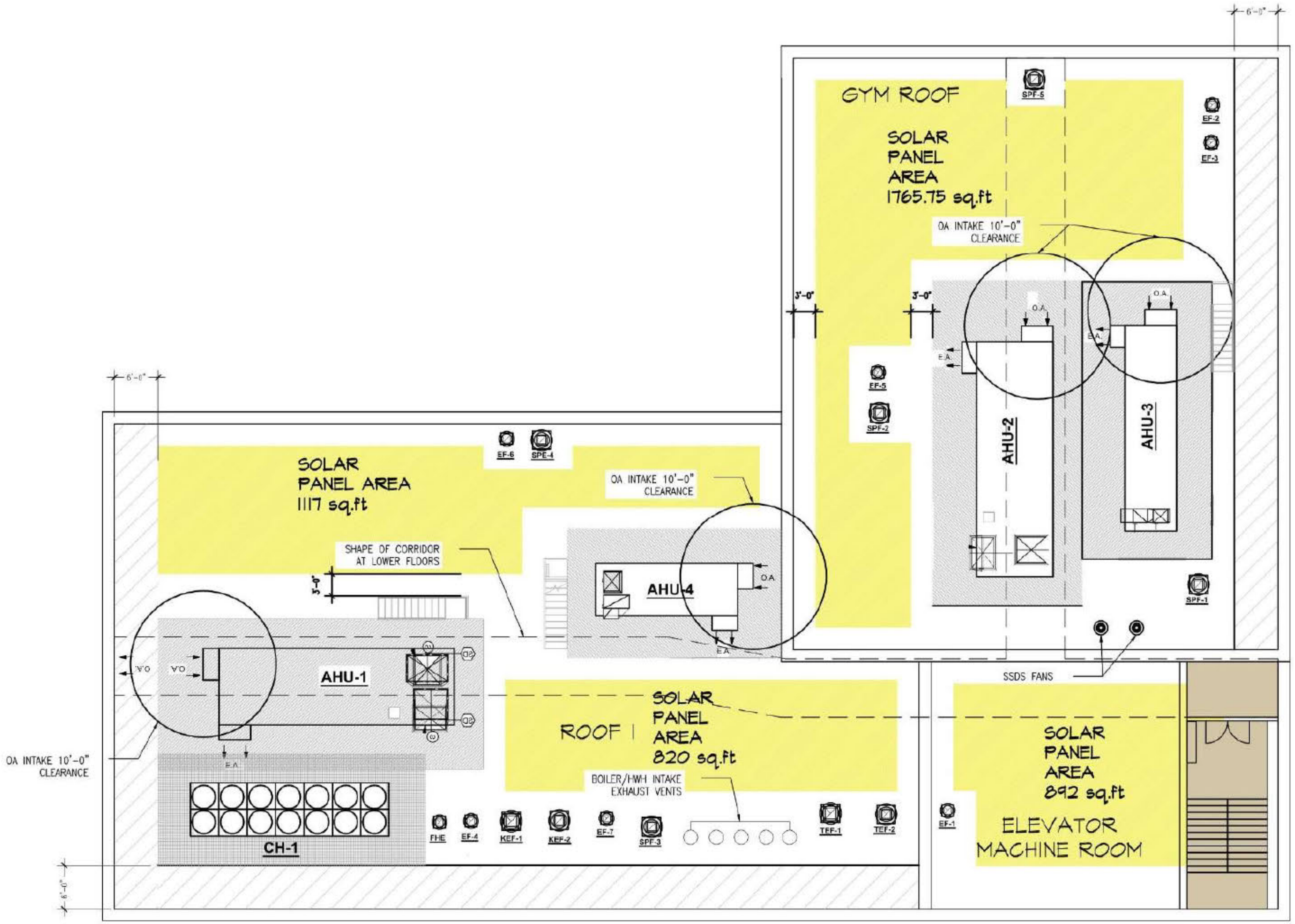
## Renewable Energy Analysis






SCA School Construction Authority

# Discovery #1 Scheme C
# Energy and Daylight Related Systems
## Renewable Energy Analysis






SCA School Construction Authority

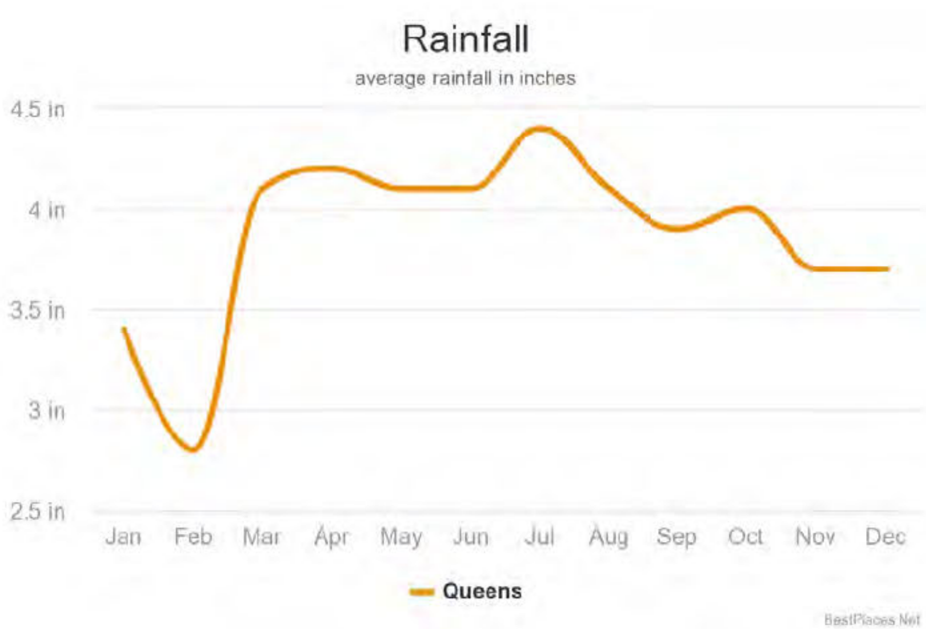
# Discovery #2 - Water-Related Systems

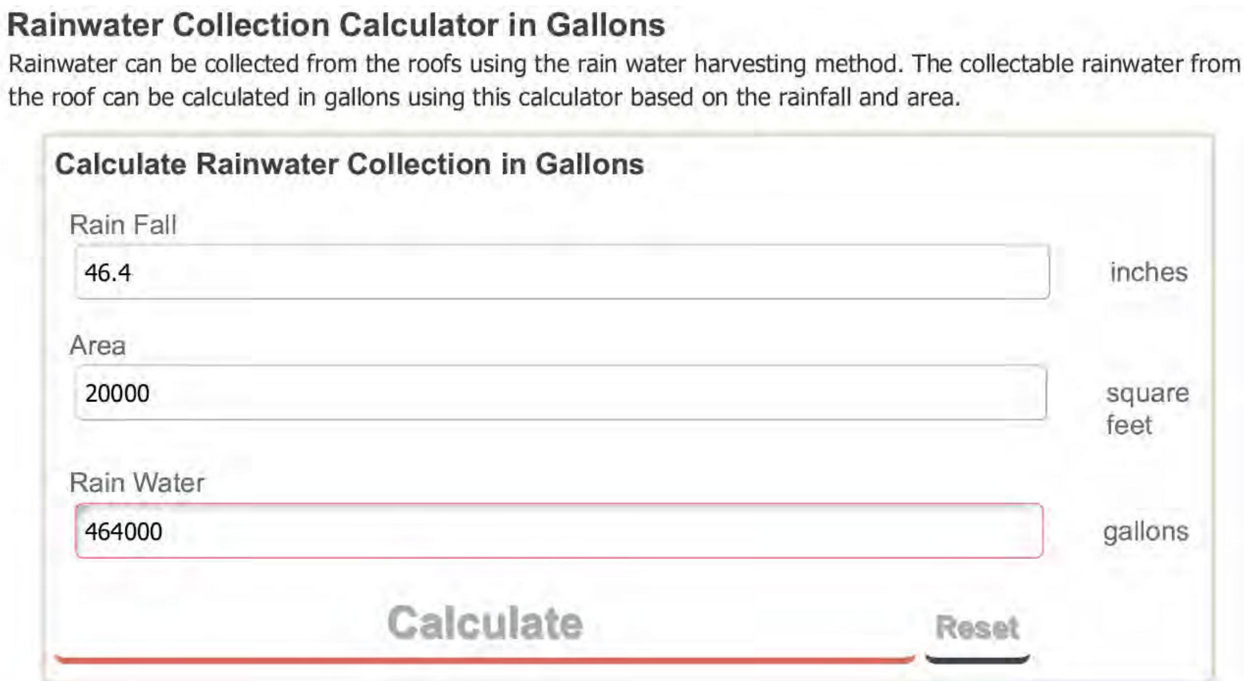
## Supply Sources

Test-Fit / Sketch Study report indicates groundwater was encountered at 30 feet based on 1944 borings. Groundwater cannot be used as a source of potable water.

Existing 8" lined cast iron pipe water supply lines are below Ellwell Crescent and Dieterle Crescent.

| | Queens, New York | United States |
|---|---|---|
| Annual Rainfall | 46.4 in. | 38.1 in. |





## Rainwater Collection Calculator in Gallons

Rainwater can be collected from the roofs using the rain water harvesting method. The collectable rainwater from the roof can be calculated in gallons using this calculator based on the rainfall and area.

### Calculate Rainwater Collection in Gallons

Rain Fall

46.4 inches

Area

20000 square feet

Rain Water

464000 gallons

Calculate Reset

**Formula:**

**$r = 0.5 * f * a$**

**Where,**

r = Rainwater Collection in Gallons
f = Rain Fall
a = Area

The 20,000sf area considered for rainwater collection includes the entire area carved out of Lot 1 for the new addition, not just the roof of the new building itself.

Average annual rainfall collected from this area can supply roughly 100% of the plumbing fixture use.

## Cost Impact

Rainwater collection: extensive filtering required by NYC DEP for use for irrigation and/or flushing toilets. Queens groundwater is not used as a source of potable water.

Graywater re-use: large increase in piping needed and extensive filtering required by NYC DEP for use for irrigation and/or flushing toilets.

HVAC equipment condensate (e.g. boilers, split heat pumps, kitchen equipment) re-use: extensive filtering required by NYC DEP.

Cooling tower condensate re-use: Standard SCA cooling system does not include cooling towers so condensate re-use in cooling towers is not available.

**NYC Green Schools Rating System**
**INDOOR WATER USE REDUCTION**
**CREDIT FORM**
**Credit W2.1P, W2.2R**

**SCA School Construction Authority**
RESPONSIBLE PARTY:
INITIAL SUBMISSION PHASE:

| | | | |
|---|---|---|---|
| Project: | | Submission Phase: | IDP |
| Address: | 65-10 Dieterle Crescent | Architect: | ( |
| LLW #: | | Preparer: | |
| Design #: | 0 | Form Revision Date: | 11-Dec-20 |

INSTRUCTIONS:
Step 1) Insert Occupancy Info:
Insert number of students in summer, number of staff in summer, number of D75 students with toilets in regular school year and number of D75 students with toilets in summer.
Step 2) Check compliance at bottom of form.
W2.2R is feasible if reduction from baseline is equal to or greater than 30%.
W2.3 is feasible if reduction from baseline is equal to or greater than 35%.
W2.3 is feasible if reduction from baseline is equal to or greater than 40%.

**Step 1: Insert Occupancy Info**

| | Regular | Summer |
|---|---|---|
| Total number students | 460 | 138 |
| Total number of staff | 73 | 22 |
| Number of D75 students in classrooms with toilets | 0 | 0 |
| Total students PK to K | 152 | 46 |
| Conventional Water Closet (male 1-12) | 154 | 46 |
| Conventional Urinal (male 1-12) | 154 | 46 |
| Conventional Water Closet (female 1 12) | 154 | 46 |

**Reference Table 1: Instructional Days**

| | |
|---|---|
| Annual Instruction Days School is in Full Operation | 180 |
| Annual Instructional Days School is in Summer Operation | 30 |

**Reference Table 2: Daily Sewage Volumes (gallons)**

| | | Base Case | | | | | Design Case | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Daily Uses | Flowrate (gpm or gpc) | Duration (Flush) | Regular Sewage Generated | Summer Sewage Generated | Daily Uses | Flowrate (gpm or gpc) | Duration (Flush) | Regular Sewage Generated | Summer Sewage Generated |
| Flow Fixtures | Conventional Lavatory (Student) (cycle) | 3.0 | 0.25 | 1 | 345 | 104 | 3.0 | 0.125 | 1 | 173 | 52 |
| | Conventional Lavatory (Adult) (cycle) | 3.0 | 0.25 | 1 | 55 | 17 | 3.0 | 0.125 | 1 | 27 | 8 |
| | Shower (gpm, seconds) | 0.1 | 2.50 | 1 | 18 | 18 | 0.1 | 1.80 | 1 | 13 | 13 |
| | Hand Sink (cycle) | 4.0 | 0.25 | 1 | 533 | 160 | 4.0 | 0.125 | 1 | 267 | 80 |
| Flush Fixtures | Conventional Water Closet (male 1 12) | 1.0 | 1.60 | 1 | 246 | 74 | 1.0 | 1.28 | 1 | 197 | 59 |
| | Conventional Urinal (male 1 12) | 2.0 | 1.00 | 1 | 308 | 92 | 2.0 | 0.125 | 1 | 39 | 12 |
| | Conventional Water Closet (female 1-12) | 3.0 | 1.60 | 1 | 739 | 221 | 3.0 | 1.28 | 1 | 591 | 177 |
| | Conventional Water Closet (PK, K classrm w/ toilet) | 3.0 | 1.60 | 1 | 730 | 221 | 3.0 | 1.28 | 1 | 584 | 177 |
| | Conventional Water Closet (D75 classrm w/ toilet) | 3.0 | 1.60 | 1 | - | - | 3.0 | 1.28 | 1 | - | - |
| | Conventional Water Closet (adult) | 3.0 | 1.60 | 1 | 350 | 106 | 3.0 | 1.28 | 1 | 280 | 84 |
| | | | | BASE CASE TOTALS | 3,325 | 1,011 | | | DESIGN CASE TOTALS | 2,170 | 661 |

**Regular Operation + Summer Operation Summary**

| | Base Case | Design Case |
|---|---|---|
| Total "Regular Operation" + Summer Operation" Annual Volume | 628,760 | 410,528 |
| Total: Water Use Reduction for "Regular Operation" + "Summer Operation" | | 35% |

**Notes**

1. Figures in shaded boxes are based on EPA 1992 as amended in 2005 with revisions as per LEED 2009 (base case), SCA standards (design case) or are calculated by this spreadsheet. No design team revision required.
2. Spreadsheet will calculate occupant users for water closets and urinals for design and base cases based on figures entered by Design Team for "Occupant Users" for "Conventional Lavatory" for students and adults, along with "% of Student Population by Grade". Distribution of male and female "Occupant Users" are based on assumption of 50-50 ratio of male and
3. Methodology to determine student population. Use unadjusted capacity from POR
Methodology to determine adult population. Follow DR 2.3.3-Bicycle Racks
4. Figure entered by Design Team for occupant users for showers should include all physical education staff, potential adult bike users (GSG credit S 2.2) and for high schools with showers in the student locker rooms, all students.
5. Figure entered by Design Team to determine occupant users for "Food Service Hand Sinks" is based on 1 staff for each 100 students. Student population based on unadjusted capacity from PCR is to be entered. (Minimum of 2 kitchen staff is required)
6. For "Summer Operation", occupant users is anticipated to be 30% of "Full Operation Population". If program is known to be different, actual summer population should be entered.
7. For "Annual Days of Summer Operation", revise anticipated number of days for regular summer operation, excluding weekends and days when school is closed, if program is known to be different than the default value of 30.
8. Modernization projects should include the actual fixture flow rate of fixtures to remain in the design case calculations and indicate assumptions about percentage of occupant users who will use those existing fixtures to remain.
9. Percentage of Student Population by Grade should be based on number of students in classrooms with toilets located within the classrooms. Dedicated classroom toilets would be applicable to PK and K and to first and second grade classrooms as indicated in the POR. Single user toilets are typically provided for staff use. If first and second grade don't have
10. For typical IS and HS, percentage of occupant users in the PK-K row should be equal to zero.
11. For typical PS and PS/IS, percentage of occupant users in the PK-K row should be based on occupants users in PK-K grade classrooms that have dedicated toilets.

## Green Infrastructure

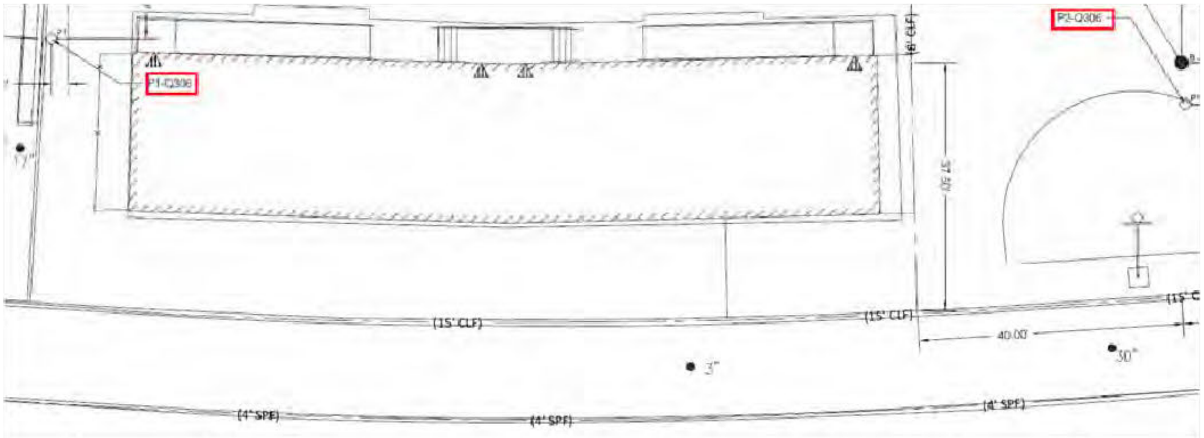
Test Fit / Sketch Study:

- Site slopes down from Northeast to Southwest, approximate 1.6% slope.
- Bedrock is approximately 434 feet below grade.
- Ground water level is below 30 feet below grade from borings of 1944.
- Not within a flood zone.
- Most of proposed site currently covered in asphalt.

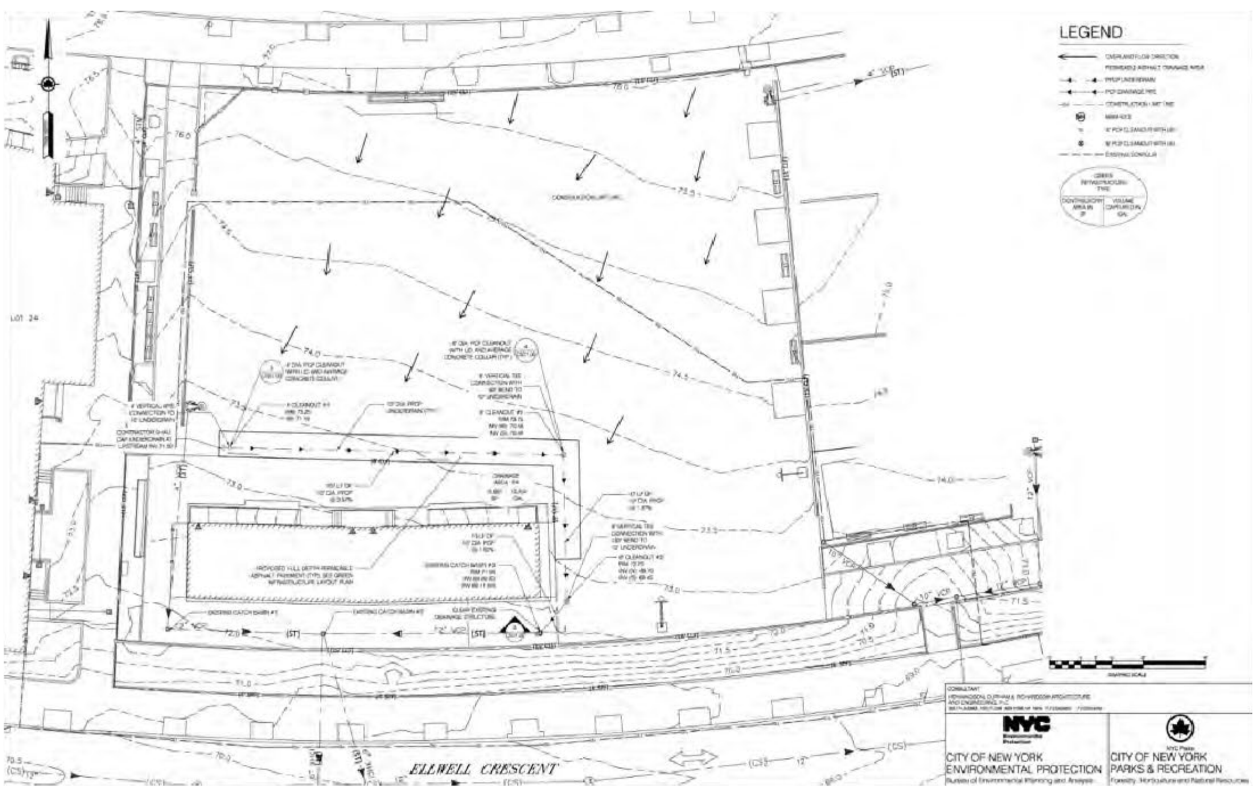

Documentation from DEP Green Infrastructure project Q306-2, previously planned for Painters Playground, is shown below.

- Borings found dry loose light brown f sand, trace silt, and trace f gravel (SP) to 15 feet below grade
- Borings found maximum soil permeability of 19.51 in/hr = 0.0138 cm/sec
- Per the SCA Green Infrastructure Assessment flow chart, soil type and soil permeability are not suitable for green infrastructure

Following the DEP documentation is a preliminary analysis of stormwater management options for the PS174Q addition by the project's civil engineer.




| No. | Nearest Boring ID No. | Laboratory Testing Data / Historical Boring Soil Description | | | Permeability Analysis | | | Groundwater Table Depth(ft) |
|---|---|---|---|---|---|---|---|---|
| | | Depth (ft) | USCS Symbol | % Passing No 200 Sieve | Nearest Permeability Test ID No. | Permeability Test Depth (ft) | Average Permeability Coef. (in/hr) | |
| 6-1 | B1-Q306 | 3 - 5 | SM | 22.1% | P1-Q306 | 3 | 1.59 | |
| .C) | | 5 - 7 | SM | 13.2% | | 6 | 0.40 | |
| | | 7 - 9 | SM | 12.4% | | 10 | 0.52 | N/A |
| | | 9 - 11 | SW-SM | 10.7% | | | | |
| | | 11 - 13 | SM | 16.7% | | | | |
| 6-2 | B2-Q306 | 3 - 5 | SM | 12.7% | P2-Q306 | 3 | 19.51 | |
| .C) | | 5 - 7 | SW-SM | 10.8% | | 6 | 0.13 | |
| | | 7 - 9 | SP-SM | 5.4% | | 10 | 2.70 | N/A |



**From:**
**Sent:** Tuesday, November 10, 2020 11:17 AM
**To:**
**Cc:**
**Subject:** Stormwater summary

Please see our outline for your schematic considerations.
The two concepts you are advancing (2 story v. 3 story) have little bearing on the rough sizing, so please consider this information universal.
SCA support with DEP and Parks to obtain information not available through record retrieval channels would be advantageous to stay on schedule.
For comparative purposes, we sized the stormwater mitigation as a pipe in a stone envelope.
You will see the inclusion of the JOP in the project introduces a multiplier of ~5 on the stormwater requirement.
Building design, survey, and geotechnical will be required to remove variables and allow us to refine the design.
Please let us know what level of additional information/documentation you would like us to prepare at this early juncture.

1. Point of discharge
    a. Ellwell Crescent
    b. Combined sewer
    c. Sewer ~11' below grade
    d. Survey to confirm elevations
2. Location of system
    a. Grade falls from Dieterle to Ellwell
    b. Subsurface system would lie generally below footprint of TCB to be removed
    c. Infiltration and borings required to confirm separation from rock/groundwater and infiltration rate
    d. Record drawings required from Parks. SCA should provide contact or request/circulate plans.
    e. DEP has a green infrastructure project (Q306-2) under design(OGI-DESIGN-2-OS14) in the Painter's Playground (permeable pavement)
        i. The location of the project is unknown and requires coordination design drawings required from DEP. SCA should request and circulate.
3. Approach to filing
    a. 2 theoretical possibilities:
        i. JOP = Site
            1. typical approach that requires stormwater mitigation be installed for the entire lot (SCA and Parks improvements)
            2. Existence of DEP green infrastructure project (Q306-2) may complicate the application
        ii. 20,000 SF "lease" = Site
            1. Deputy Chief, Site Connection & Application Review was hesitant, but did not rule out. Pre-application conference would be required to discuss any potential.
            2. Existence of DEP green infrastructure project (Q306-2) may complicate the discussion design drawings should be obtained before a meeting

        3. Direction required to proceed to Pre-application conference.

4. Schematic solutions
    a. Working assumptions:
        i. 15,000 SF building (max)
        ii. 5,000 SF exterior hardscape (walks, courtyards, plazas, ramps, and similar)
        iii. Painter's Playground improvements are unchanged under this project
        iv. <10,000 SF available for blue roof
        v. Structural verification of load-carrying capacity for blue roof will be provided
        vi. SCP application cannot be made without final design of roof
        vii. SWPPP will be provided on the detailed erosion and sediment control plans.
        viii. Green infrastructure feasibility will require subsurface investigation results.
    b. 20,000 SF "lease" = Site
        i. 1 perforated pipe in stone pack
        ii. 4' diameter
        iii. infiltration rate conservatively assumed
        iv. 121' of pipe required
        v. Rectangular footprint (ft) = 5x121, plus inlet & outlet structures
    c. JOP = Site
        i. 5 perforated pipes in stone pack
        ii. 4' diameter
        iii. infiltration rate conservatively assumed
        iv. 137' of pipe required in each row – 685' total
        v. Rectangular footprint (ft) = 25x137, plus inlet & outlet structures
        vi. The tributary area to the DEP green infrastructure project (Q306-2) can potentially offset a portion of this system size.
        vii. feasibility of capture of the eastern portion of the park is unknown until survey is completed, Parks record plans are reviewed, and DEP GI project Q306-2 is reviewed.
    d. Blue roof
        i. cannot mitigate stormwater alone
        ii. can be implemented in series before subsurface system
        iii. will provide a small but limited volume mitigation benefit – can be disregarded for schematic planning purposes
        iv. benefit is constrained by DEP limitations on depth, flow rate, roof slope, and percentage contribution to regulatory release rate

### 3.3 Detention Facility Design

## CRITERIA FOR DETENTION FACILITY DESIGN

## SD-1/SD-2 CALCULATION - MANHATTAN

**SCHEME A**

PREPARED BY: NYAN WIN AUNG, P.E. DATE: 5/21/2020

| | | | |
|---|---|---|---|
| PROJECT NAME: | | | |
| PROJECT ADDRESS: | 4 | | |
| BOROUGH: | MANHATTAN | | |
| BLOCK: | 2214 | | |
| LOT: | 24 | | |
| ZONE | M1-1 | MAP: | 3a |

**STORM FLOW CALCULATION**

| | AREA | RUNOFF COEFFICIENT | |
|---|---|---|---|
| | SQ.FT | C | AREA X C |
| LOT SIZE | 20,000.00 | | 20,000.00 |
| ROOF | 13,610.00 | 0.95 | 12,929.50 |
| SYNTHETIC TURF | | 0.70 | 0.00 |
| PAVED | 6,390.00 | 0.85 | 5,431.50 |
| GRASS | 0.00 | 0.20 | 0.00 |

| As = THE SITE AREA IN ft^2 | |
|---|---|
| ASxCw | 18,361.0 |

| Cwt = THE WEIGHTED RUNOFF COEFFICIENT FOR THE SITE AREA | |
|---|---|
| Cwt | 0.918 |

| Qall = THE ALLOWABLE FLOW RATE IN cfs<br>A Site in the Brooklyn | | | |
|---|---|---|---|
| Qall | Site Area | | Factor |
| 1.64 | 20,000.00 | | 12,200.00 |

| Qdev = THE DEVELOPED FLOW RATE IN cfs | | | |
|---|---|---|---|
| Qdev | AS | Factor | |
| 2.51 | 18,361.00 | 7,320.00 | |

| Qdrr= THE DETENTION FACILITY MAXIMUM RELEASE RATE IN cfs | |
|---|---|
| Qdrr | 0.25 |

| | | | |
|---|---|---|---|
| Qall | < | Qdev | Detention tank is required |

# Integrative Design Report and Recommendations

**OUTFLOW WILL BE CONTROLLED BY AN ORIFICE TUBE AND WILL VARY WITH THE DEPTH OF STORAGE.**

**tv = 0.27(Cwt At/Qdrr)^0.5-15**

Tv = THE DURATION OF THE STORM IN min WITH A 10YR. RETURN FREQUENCY REQUIRING THE MAXIMUM DETENTION VOLUME WITH A VARIABLE OUTFLOW

Cwt = THE WEIGHTED RNOFF COEFFICIENT FOR THE AREA TRIBUTARY TO THE DETENTION FACILITY

At= THE ARE TRIBUTARY TO THE DETENTION FACIUTY IN ft2

| Tv (min) | Factor | Cwt | At | Qdrr |
|---|---|---|---|---|
| 58.17 | 0.27 | 0.92 | 20,000.00 | 0.25 |

**Vv = THE MAXIMUM REQUIRED DETENTION VOLUME IN ft^3 WITH A VARIABLE OUTFLOW**

**Vv = [0.19CwtAt/(tv+15)-40Qdrr]tv**

| Vv (cu.ft.) | Factor | Cwt | At | Qdrr |
|---|---|---|---|---|
| 2,191.72 | 0.19 | 0.92 | 20,000.00 | 0.25 |

**TO MAXIMUMIZE THE STORAGE DEPTH, USE A 2.0 in Dia. WITH FLUSH ORIFICE TUBE OUTLET.**

Sdf = THE MAXIMUM STORAGE DEPTH IN FT. FOR FLUSH ORIFIC TUBE OUTLET

Sdf = 1400 (Qdrr)^2/(do)^4 + do/ 24

| Sdf (ft) | Factor | Qdrr | do | |
|---|---|---|---|---|
| 5.55 | 1400 | 0.25 | 2 | |

**TO MAXIMUMIZE THE STORAGE DEPTH, USE A 2.0 in Dia. WITH RE-ENTRANT ORIFICE TUBE OUTLET**

Sdr = THE MAXIMUM STORAGE DEPTH IN FT. FOR RE-ENTRANT ORIFICE TUBE OUTLET

Sdr = 1930 (Qdrr)^2/(do)^4 + do/24

| Sdr (ft) | Factor | Qdrr | dc | |
|---|---|---|---|---|
| 7.62 | 1930 | 0.25 | 2 | |

| USE FLUSH ORIFICE | ONE MODULE CAPACITY | | | |
|---|---|---|---|---|
| NO. OF MODULES REQUIREMENT | DEPTH (ft.) | WIDTH (ft.) | LENGTH (ft.) | VOLUME (cu.ft.) PER MODULE |
| 4 | 5.55 | 15.0 | 7.0 | 583.0 |

| TOTAL STORAGE VOLUME (cu.ft.) | | REQUIRED VOLUME (cu.ft.) | |
|---|---|---|---|
| 2,331.88 | > | 2,191.72 | SATISFY |

**SANITARY FLOW CALCULATION (Zone: M1-1)**

10,000 (gal./acre/day) x total site area (sq.ft/43,560) Acre x factor x peak flow factor

| Sanitary Flow (cfs) | Population Density per Acre | Site Area (sq ft.) | Gallons Per Person Per Day | Peak |
|---|---|---|---|---|
| 0.0142 | 10,000 | 20,000.00 | 1 | 2 |

# Integrative Design Report and Recommendations

## CRITERIA FOR DETENTION FACILITY DESIGN
### SD-1/SD-2 CALCULATION - MANHATTAN

**SCHEME B**

PREPARED BY: NYAN WIN AUNG, P.E. DATE: 5/21/2020

| | | | |
|---|---|---|---|
| PROJECT NAME: | | | |
| PROJECT ADDRESS: | | | |
| BOROUGH: | MANHATTAN | | |
| BLOCK: | 2214 | | |
| LOT: | 24 | | |
| ZONE | M1-1 | MAP: | 3a |

**STORM FLOW CALCULATION**

| | AREA | RUNOFF COEFFICIENT | |
|---|---|---|---|
| | SQ.FT | C | AREA X C |
| LOT SIZE | 20,000.00 | | 20,000.00 |
| ROOF | 12,872.00 | 0.95 | 12,228.40 |
| SYNTHETIC TURF | | 0.70 | 0.00 |
| PAVED | 7,128.00 | 0.85 | 6,058.80 |
| GRASS | 0.00 | 0.20 | 0.00 |

| As = THE SITE AREA IN ft^2 | |
|---|---|
| ASxCw | 18,287.2 |

| Cwt = THE WEIGHTED RUNOFF COEFFICIENT FOR THE SITE AREA | |
|---|---|
| Cwt | 0.914 |

| Qall = THE ALLOWABLE FLOW RATE IN cfs<br>A Site in the Brooklyn | | | |
|---|---|---|---|
| Qall | Site Area | | Factor |
| 1.64 | 20,000.00 | | 12,200.00 |

| Qdev = THE DEVELOPED FLOW RATE IN cfs | | | |
|---|---|---|---|
| Qdev | AS | Factor | |
| 2.50 | 18,287.20 | 7,320.00 | |

| Qdrr= THE DETENTION FACILITY MAXIMUM RELEASE RATE IN cfs | |
|---|---|
| Qdrr | 0.25 |

| | | | |
|---|---|---|---|
| Qall | < | Qdev | Detention tank is required |

**OUTFLOW WILL BE CONTROLLED BY AN ORIFICE TUBE AND WILL VARY WITH THE DEPTH OF STORAGE.**

**tv = 0.27(Cwt At/Qdrr)^0.5-15**

Tv = THE DURATION OF THE STORM IN min WITH A 10YR. RETURN FREQUENCY REQUIRING THE MAXIMUM DETENTION VOLUME WITH A VARIABLE OUTFLOW

Cwt= THE WEIGHTED RNOFF COEFFICIENT FOR THE AREA TRIBUTARY TO THE DETENTION FACILITY

At= THE ARE TRIBUTARY TO THE DETENTION FACILITY IN ft2

| Tv (min) | Factor | Cwt | At | Qdrr |
|---|---|---|---|---|
| 58.02 | 0.27 | 0.91 | 20,000.00 | 0.25 |

**Vv = THE MAXIMUM REQUIRED DETENTION VOLUME IN ft^3 WITH A VARIABLE OUTFLOW**
**Vv = [0.19CwtAt/(tv+15)-40Qdrr]tv**

| Vv (cu.ft.) | Factor | Cwt | At | Qdrr |
|---|---|---|---|---|
| 2,180.61 | 0.19 | 0.91 | 20,000.00 | 0.25 |

**TO MAXIMUMIZE THE STORAGE DEPTH, USE A 2.0 in Dia. WITH FLUSH ORIFICE TUBE OUTLET.**

Sdf = THE MAXIMUM STORAGE DEPTH IN FT. FOR FLUSH ORIFIC TUBE OUTLET

Sdf = 1400 (Qdrr)^2/(do)^4 + do/24

| Sdf (ft) | Factor | Qdrr | do | |
|---|---|---|---|---|
| 5.55 | 1400 | 0.25 | 2 | |

**TO MAXIMUMIZE THE STORAGE DEPTH, USE A 2.0 in Dia. WITH RE-ENTRANT ORIFICE TUBE OUTLET**

Sdr = THE MAXIMUM STORAGE DEPTH IN FT. FOR RE-ENTRANT ORIFICE TUBE OUTLET

Sdr = 1930 (Qdrr)^2/(do)^4 + do/24

| Sdr (ft) | Factor | Qdrr | do | |
|---|---|---|---|---|
| 7.62 | 1930 | 0.25 | 2 | |

| USE FLUSH ORIFICE | ONE MODULE CAPACITY | | | |
|---|---|---|---|---|
| NO. OF MODULES REQUIREMENT | DEPTH (ft.) | WIDTH (ft.) | LENGTH (ft.) | VOLUME (cu.ft.) PER MODULE |
| 4 | 5.55 | 15.0 | 7.0 | 583.0 |

| TOTAL STORAGE VOLUME (cu.ft.) | | REQUIRED VOLUME (cu.ft.) | |
|---|---|---|---|
| 2,331.88 | > | 2,180.61 | SATISFY |

**SANITARY FLOW CALCULATION (Zone: M1-1)**

10,000 (gal./acre/day) x total site area (sq.ft/43,560) Acre x factor x peak flow factor

| Sanitary Flow (cfs) | Population Density per Acre | Site Area (sq.ft.) | Gallons Per Person Per Day | Peak |
|---|---|---|---|---|
| 0.0142 | 10,000 | 20,000.00 | 1 | 2 |

# Integrative Design Report and Recommendations

## CRITERIA FOR DETENTION FACILITY DESIGN

### SD-1/SD-2 CALCULATION - MANHATTAN

**SCHEME C**

PREPARED BY: NYAN WIN AUNG, P.E.    DATE: 5/21/2020

| | | | |
|---|---|---|---|
| PROJECT NAME: | | | |
| PROJECT ADDRESS: | | | |
| BOROUGH: | MANHATTAN | | |
| BLOCK: | 2214 | | |
| LOT: | 24 | | |
| ZONE | M1-1 | MAP: | 3a |

**STORM FLOW CALCULATION**

| | AREA | RUNOFF COEFFICIENT | |
|---|---|---|---|
| | SQ.FT | C | AREA X C |
| LOT SIZE | 20,000.00 | | 20,000.00 |
| ROOF | 15,027.00 | 0.95 | 14,275.65 |
| SYNTHETIC TURF | | 0.70 | 0.00 |
| PAVED | 4,973.00 | 0.85 | 4,227.05 |
| GRASS | 0.00 | 0.20 | 0.00 |

| As = THE SITE AREA IN ft^2 | |
|---|---|
| ASxCw | 18,502.7 |

| Cwt = THE WEIGHTED RUNOFF COEFFICIENT FOR THE SITE AREA | |
|---|---|
| Cwt | 0.925 |

| Qall = THE ALLOWABLE FLOW RATE IN cfs<br>A Site in the Brooklyn | | | |
|---|---|---|---|
| Qall | Site Area | | Factor |
| 1.64 | 20,000.00 | | 12,200.00 |

| Qdev = THE DEVELOPED FLOW RATE IN cfs | | | |
|---|---|---|---|
| Qdev | AS | Factor | |
| 2.53 | 18,502.70 | 7,320.00 | |

| Qdrr= THE DETENTION FACILITY MAXIMUM RELEASE RATE IN cfs | |
|---|---|
| Qdrr | 0.25 |

| | | | |
|---|---|---|---|
| Qall | < | Qdev | Detention tank is required |

**OUTFLOW WILL BE CONTROLLED BY AN ORIFICE TUBE AND WILL VARY WITH THE DEPTH OF STORAGE.**

**tv = 0.27(Cwt At/Qdrr)^0.5-15**

Tv = THE DURATION OF THE STORM IN min WITH A 10YR. RETURN FREQUENCY REQUIRING THE MAXIMUM DETENTION VOLUME WITH A VARIABLE OUTFLOW

Cwt= THE WEIGHTED RNOFF COEFFICIENT FOR THE AREA TRIBUTARY TO THE DETENTION FACILITY

At= THE ARE TRIBUTARY TO THE DETENTION FACILITY IN ft2

| Tv (min) | Factor | Cwt | At | Qdrr |
|---|---|---|---|---|
| 58.45 | 0.27 | 0.93 | 20,000.00 | 0.25 |

**Vv = THE MAXIMUM REQUIRED DETENTION VOLUME IN ft^3 WITH A VARIABLE OUTFLOW**

**Vv = [0.19CwtAt/(tv+15)-40Qdrr]tv**

| Vv (cu. ft.) | Factor | Cwt | At | Qdrr |
|---|---|---|---|---|
| 2,213.07 | 0.19 | 0.93 | 20,000.00 | 0.25 |

**TO MAXIMUMIZE THE STORAGE DEPTH, USE A 2.0 in Dia. WITH FLUSH ORIFICE TUBE OUTLET.**

Sdf = THE MAXIMUM STORAGE DEPTH IN FT. FOR FLUSH ORIFIC TUBE OUTLET

Sdf = 1400 (Qdrr)^2/(do)^4 + do/24

| Sdf (ft) | Factor | Qdrr | do | |
|---|---|---|---|---|
| 5.55 | 1400 | 0.25 | 2 | |

**TO MAXIMUMIZE THE STORAGE DEPTH, USE A 2.0 in Dia. WITH RE-ENTRANT ORIFICE TUBE OUTLET**

Sdr = THE MAXIMUM STORAGE DEPTH IN FT. FOR RE ENTRANT ORIFICE TUBE OUTLET

Sdr = 1930 (Qdrr)^2/(do)^4 + do/24

| Sdr (ft) | Factor | Qdrr | do | |
|---|---|---|---|---|
| 7.62 | 1930 | 0.25 | 2 | |

| USE FLUSH ORIFICE | ONE MODULE CAPACITY | | | |
|---|---|---|---|---|
| NO. OF MODULES REQUIREMENT | DEPTH (ft.) | WIDTH (ft.) | LENGTH (ft.) | VOLUME (cu.ft.) PER MODULE |
| 4 | 5.55 | 15.0 | 7.0 | 583.0 |

| TOTAL STORAGE VOLUME (cu.ft.) | > | REQUIRED VOLUME (cu.ft.) | SATISFY |
|---|---|---|---|
| 2,331.88 | | 2,213.07 | |

**SANITARY FLOW CALCULATION (Zone: M1 1)**

10,000 (gal./acre/day) x total site area (sq.ft/43,560) Acre x factor x peak flow factor

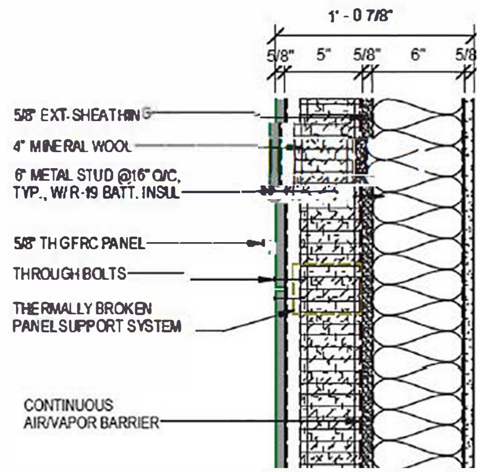
| Sanitary Flow (cfs) | Population Density per Acre | Site Area (sq.ft.) | Gallons Per Person Per Day | Peak |
|---|---|---|---|---|
| 0.0142 | 10,000 | 20,000.00 | 1 | 2 |

# DISCOVERY #3 PRELIMINARY LIFE-CYCLE IMPACTS

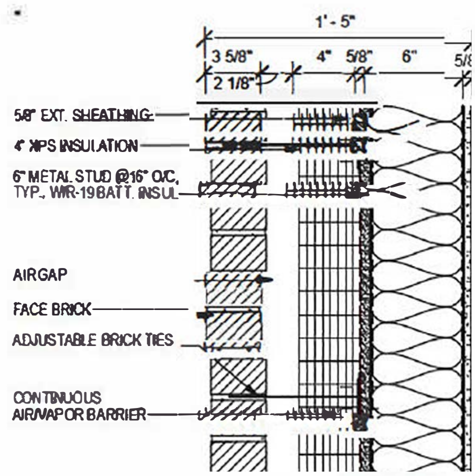
Comparative life-cycle assessment of potential wall systems was investigated in the Athena software.

The LCA comparison is between:

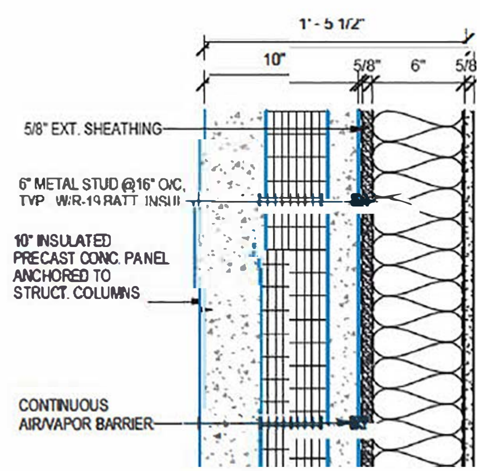
BASE: Brick/CMU Cavity wall
OPTION #1: Fiber Cement Panel On Metal Stud
OPTION #2: Modular Brick On Metal Stud
OPTION #3: Precast Concrete Panels On Metal Stud




**OPTION 1**
Fiber Cement Panel On Mtl Stud

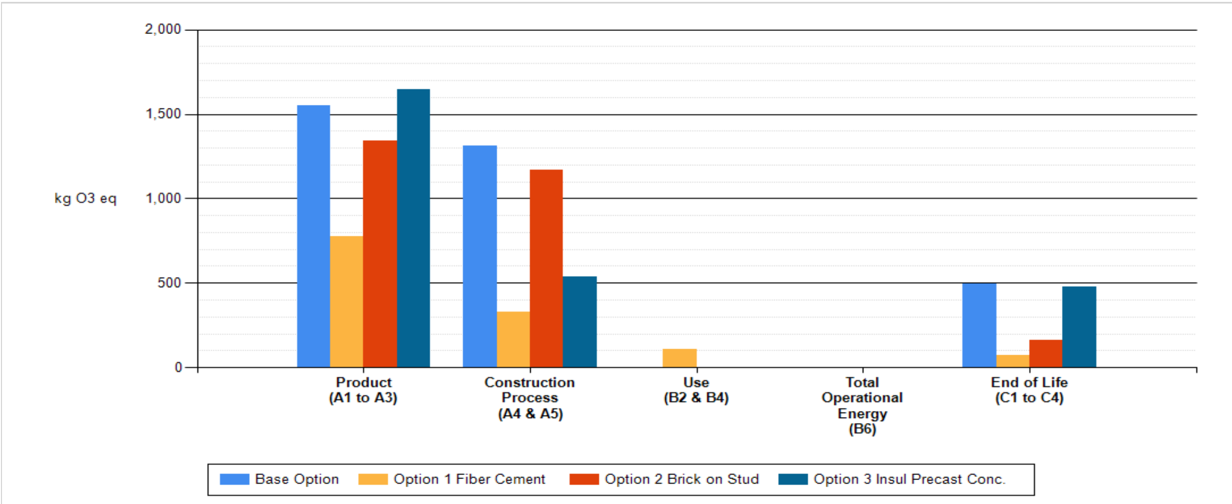



**OPTION 2**
Modular Brick On Mtl Stud



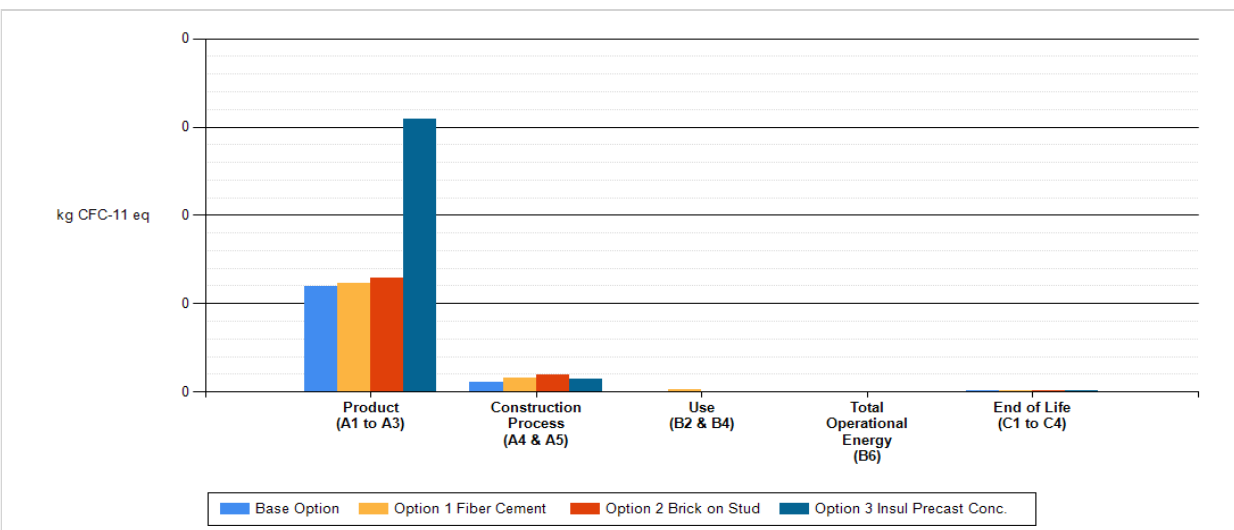

**OPTION 3**
Precast Concrete Panels On Mtl Stud

## Comparison of Smog Potential By Life Cycle Stage



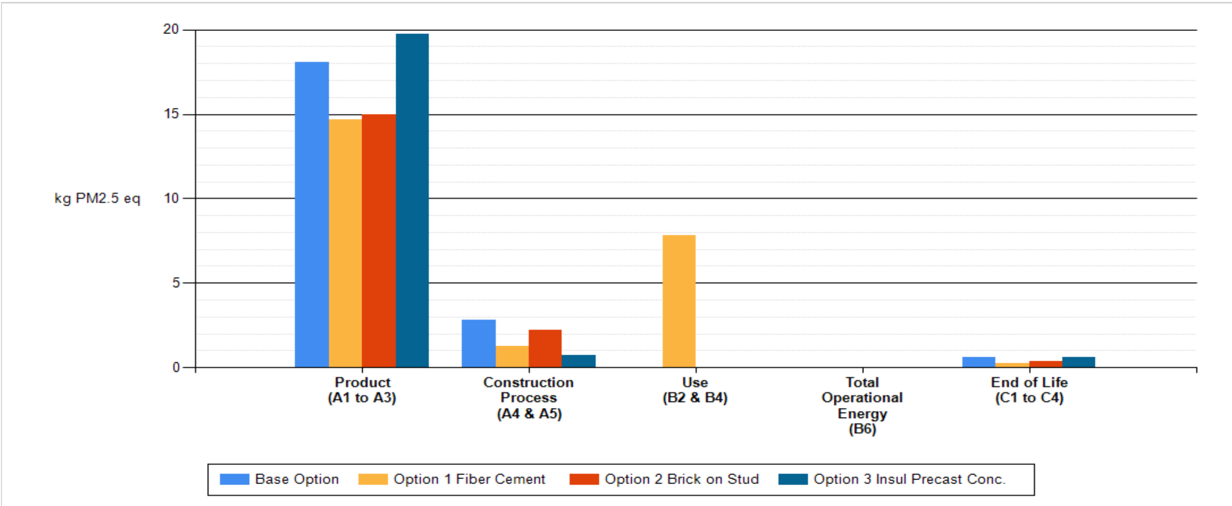

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg O3 eq | 1.55E+03 | 1.31E+03 | 0.00E+00 | 0.00E+00 | 4.94E+02 | **3.35E+03** |
| Option 1 Fiber Cement | kg O3 eq | 7.75E+02 | 3.30E+02 | 1.05E+02 | 0.00E+00 | 7.44E+01 | **1.28E+03** |
| Option 2 Brick on Stud | kg O3 eq | 1.34E+03 | 1.17E+03 | 0.00E+00 | 0.00E+00 | 1.60E+02 | **2.67E+03** |
| Option 3 Insul Precast Conc. | kg O3 eq | 1.65E+03 | 5.37E+02 | 0.00E+00 | 0.00E+00 | 4.75E+02 | **2.66E+03** |
| **Total** | **kg O3 eq** | **5.31E+03** | **3.35E+03** | **1.05E+02** | **0.00E+00** | **1.20E+03** | **9.97E+03** |

## Comparison of Ozone Depletion Potential By Life Cycle Stage



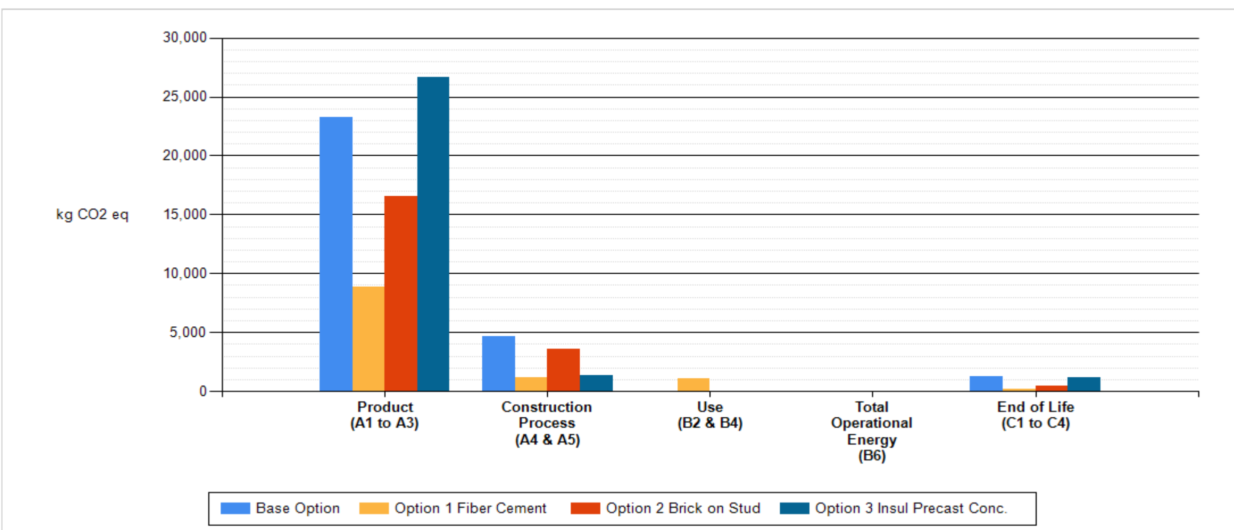

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg CFC-11 eq | 2.40E-04 | 2.28E-05 | 0.00E+00 | 0.00E+00 | 4.94E-08 | **2.63E-04** |
| Option 1 Fiber Cement | kg CFC-11 eq | 2.45E-04 | 3.20E-05 | 4.50E-06 | 0.00E+00 | 8.28E-09 | **2.82E-04** |
| Option 2 Brick on Stud | kg CFC-11 eq | 2.58E-04 | 3.78E-05 | 0.00E+00 | 0.00E+00 | 1.76E-08 | **2.96E-04** |
| Option 3 Insul Precast Conc. | kg CFC-11 eq | 6.18E-04 | 2.88E-05 | 0.00E+00 | 0.00E+00 | 4.68E-08 | **6.47E-04** |
| **Total** | **kg CFC-11 eq** | **1.36E-03** | **1.21E-04** | **4.50E-06** | **0.00E+00** | **1.22E-07** | **1.49E-03** |

## Comparison of HH Particulate By Life Cycle Stage



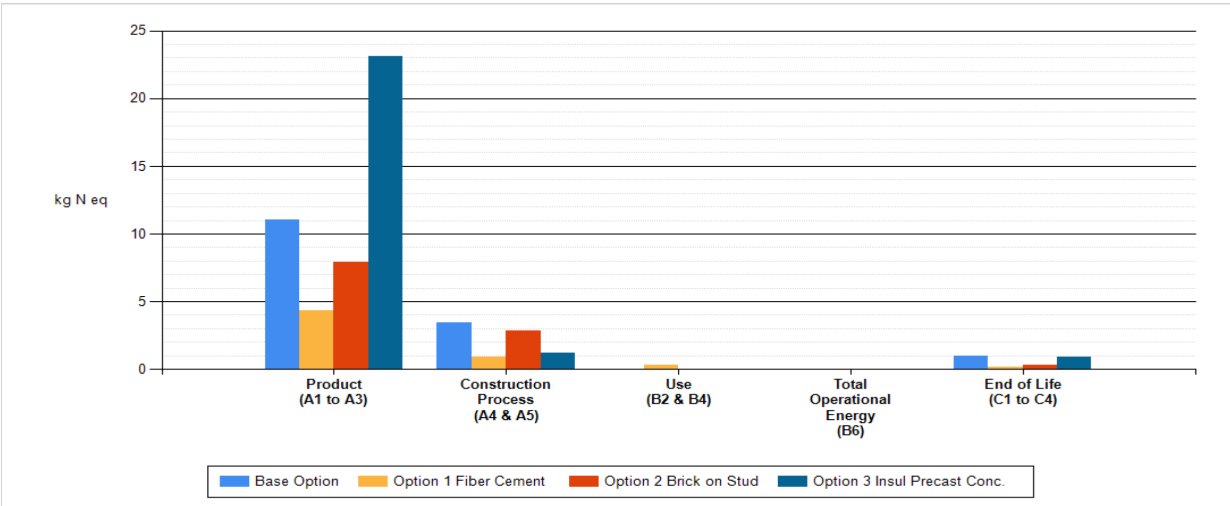

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg PM2.5 eq | 1.81E+01 | 2.82E+00 | 0.00E+00 | 0.00E+00 | 5.78E-01 | **2.15E+01** |
| Option 1 Fiber Cement | kg PM2.5 eq | 1.47E+01 | 1.28E+00 | 7.84E+00 | 0.00E+00 | 2.48E-01 | **2.40E+01** |
| Option 2 Brick on Stud | kg PM2.5 eq | 1.50E+01 | 2.20E+00 | 0.00E+00 | 0.00E+00 | 3.77E-01 | **1.75E+01** |
| Option 3 Insul Precast Conc. | kg PM2.5 eq | 1.97E+01 | 7.04E-01 | 0.00E+00 | 0.00E+00 | 6.17E-01 | **2.10E+01** |
| **Total** | **kg PM2.5 eq** | **6.74E+01** | **7.01E+00** | **7.84E+00** | **0.00E+00** | **1.82E+00** | **8.41E+01** |

## Comparison of Global Warming Potential By Life Cycle Stage



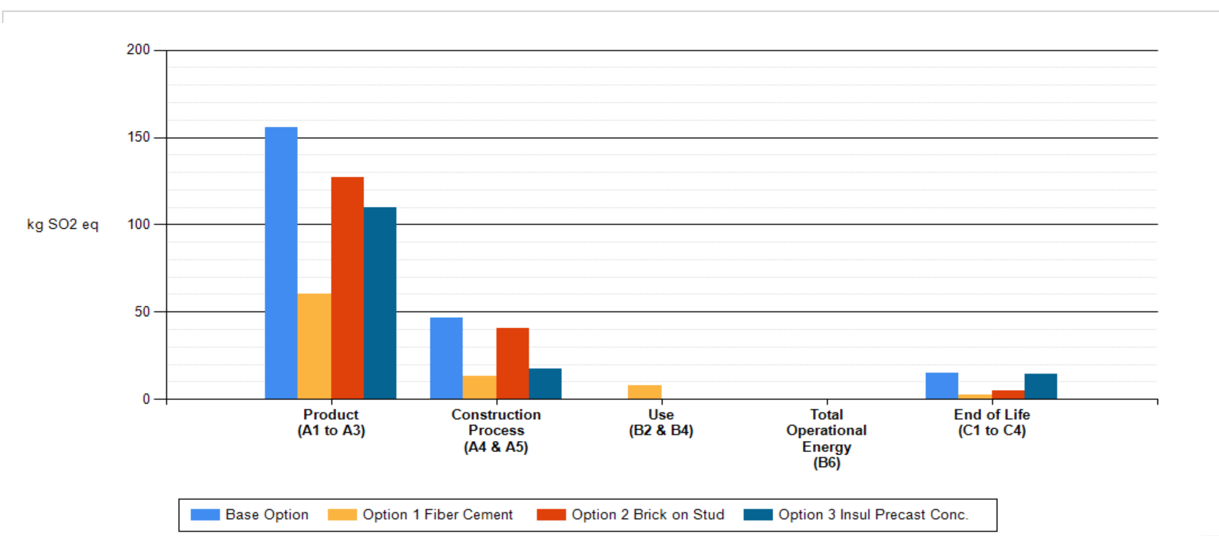

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg CO2 eq | 2.32E+04 | 4.67E+03 | 0.00E+00 | 0.00E+00 | 1.24E+03 | **2.91E+04** |
| Option 1 Fiber Cement | kg CO2 eq | 8.88E+03 | 1.22E+03 | 1.04E+03 | 0.00E+00 | 2.08E+02 | **1.13E+04** |
| Option 2 Brick on Stud | kg CO2 eq | 1.65E+04 | 3.57E+03 | 0.00E+00 | 0.00E+00 | 4.60E+02 | **2.06E+04** |
| Option 3 Insul Precast Conc. | kg CO2 eq | 2.66E+04 | 1.39E+03 | 0.00E+00 | 0.00E+00 | 1.14E+03 | **2.92E+04** |
| **Total** | **kg CO2 eq** | **7.53E+04** | **1.08E+04** | **1.04E+03** | **0.00E+00** | **3.04E+03** | **9.02E+04** |

## Comparison of Eutrophication Potential By Life Cycle Stage



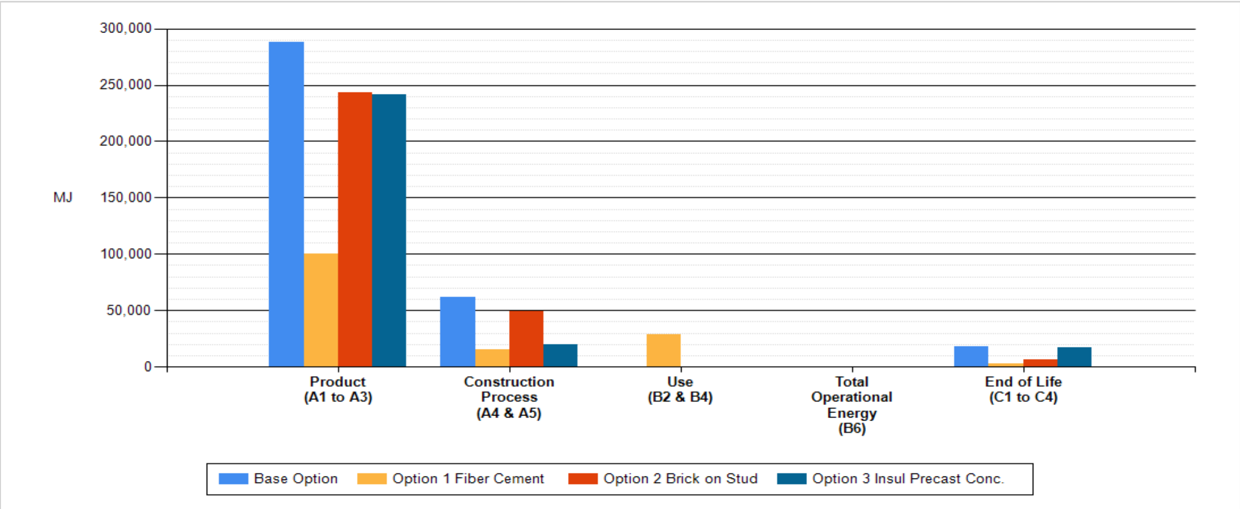

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg N eq | 1.10E+01 | 3.41E+00 | 0.00E+00 | 0.00E+00 | 9.44E-01 | **1.54E+01** |
| Option 1 Fiber Cement | kg N eq | 4.36E+00 | 8.73E-01 | 3.00E-01 | 0.00E+00 | 1.43E-01 | **5.68E+00** |
| Option 2 Brick on Stud | kg N eq | 7.92E+00 | 2.86E+00 | 0.00E+00 | 0.00E+00 | 3.10E-01 | **1.11E+01** |
| Option 3 Insul Precast Conc. | kg N eq | 2.31E+01 | 1.21E+00 | 0.00E+00 | 0.00E+00 | 9.02E-01 | **2.52E+01** |
| **Total** | **kg N eq** | **4.64E+01** | **8.35E+00** | **3.00E-01** | **0.00E+00** | **2.30E+00** | **5.73E+01** |

## Comparison of Acidification Potential By Life Cycle Stage



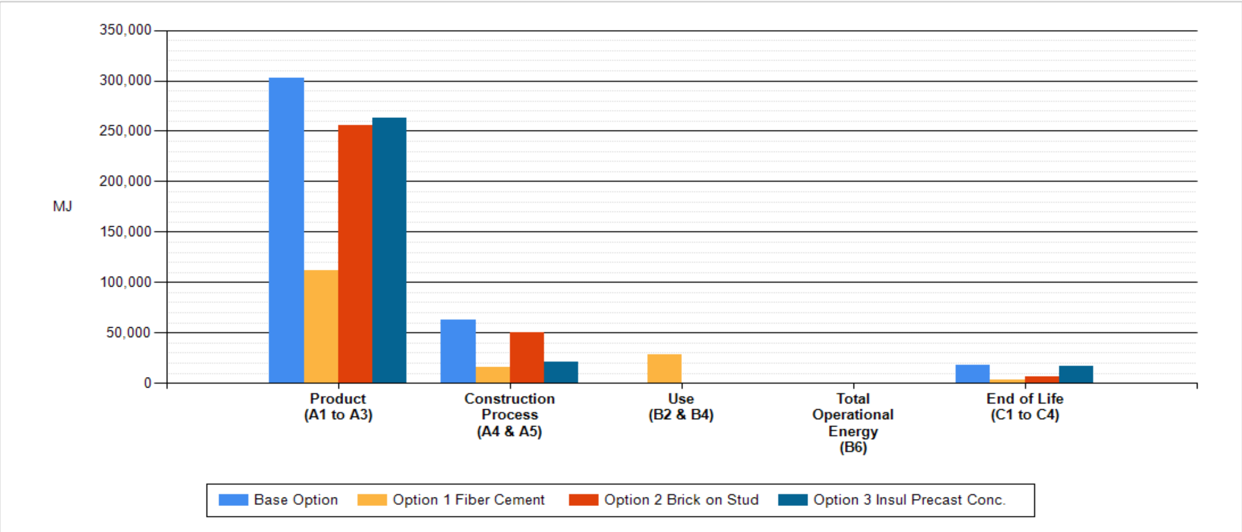

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg SO2 eq | 1.56E+02 | 4.64E+01 | 0.00E+00 | 0.00E+00 | 1.51E+01 | **2.17E+02** |
| Option 1 Fiber Cement | kg SO2 eq | 6.01E+01 | 1.29E+01 | 7.89E+00 | 0.00E+00 | 2.30E+00 | **8.32E+01** |
| Option 2 Brick on Stud | kg SO2 eq | 1.27E+02 | 4.09E+01 | 0.00E+00 | 0.00E+00 | 4.98E+00 | **1.73E+02** |
| Option 3 Insul Precast Conc. | kg SO2 eq | 1.10E+02 | 1.75E+01 | 0.00E+00 | 0.00E+00 | 1.45E+01 | **1.42E+02** |
| **Total** | **kg SO2 eq** | **4.53E+02** | **1.18E+02** | **7.89E+00** | **0.00E+00** | **3.69E+01** | **6.15E+02** |

## Comparison of Fossil Fuel Consumption By Life Cycle Stage



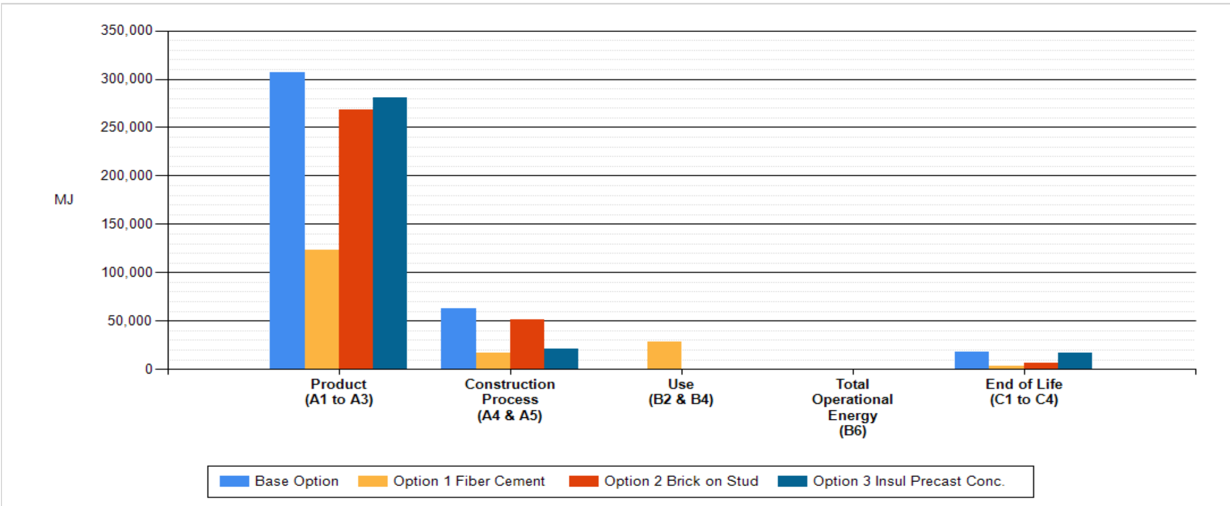

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | MJ | 2.88E+05 | 6.17E+04 | 0.00E+00 | 0.00E+00 | 1.82E+04 | **3.68E+05** |
| Option 1 Fiber Cement | MJ | 9.99E+04 | 1.52E+04 | 2.83E+04 | 0.00E+00 | 3.04E+03 | **1.46E+05** |
| Option 2 Brick on Stud | MJ | 2.43E+05 | 4.95E+04 | 0.00E+00 | 0.00E+00 | 6.73E+03 | **2.99E+05** |
| Option 3 Insul Precast Conc. | MJ | 2.42E+05 | 1.98E+04 | 0.00E+00 | 0.00E+00 | 1.68E+04 | **2.78E+05** |
| **Total** | **MJ** | **8.73E+05** | **1.46E+05** | **2.83E+04** | **0.00E+00** | **4.48E+04** | **1.09E+06** |

## Comparison of Non-Renewable Energy By Life Cycle Stage




| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | MJ | 3.02E+05 | 6.25E+04 | 0.00E+00 | 0.00E+00 | 1.82E+04 | **3.83E+05** |
| Option 1 Fiber Cement | MJ | 1.12E+05 | 1.61E+04 | 2.83E+04 | 0.00E+00 | 3.05E+03 | **1.59E+05** |
| Option 2 Brick on Stud | MJ | 2.56E+05 | 5.07E+04 | 0.00E+00 | 0.00E+00 | 6.74E+03 | **3.14E+05** |
| Option 3 Insul Precast Conc. | MJ | 2.63E+05 | 2.08E+04 | 0.00E+00 | 0.00E+00 | 1.68E+04 | **3.01E+05** |
| **Total** | **MJ** | **9.34E+05** | **1.50E+05** | **2.83E+04** | **0.00E+00** | **4.48E+04** | **1.16E+06** |

## Comparison of Total Primary Energy By Life Cycle Stage




| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | MJ | 3.07E+05 | 6.30E+04 | 0.00E+00 | 0.00E+00 | 1.82E+04 | **3.88E+05** |
| Option 1 Fiber Cement | MJ | 1.23E+05 | 1.69E+04 | 2.83E+04 | 0.00E+00 | 3.05E+03 | **1.71E+05** |
| Option 2 Brick on Stud | MJ | 2.68E+05 | 5.16E+04 | 0.00E+00 | 0.00E+00 | 6.74E+03 | **3.27E+05** |
| Option 3 Insul Precast Conc. | MJ | 2.80E+05 | 2.15E+04 | 0.00E+00 | 0.00E+00 | 1.68E+04 | **3.19E+05** |
| **Total** | **MJ** | **9.79E+05** | **1.53E+05** | **2.83E+04** | **0.00E+00** | **4.49E+04** | **1.20E+06** |

Project teams are to refer to the SCA LCA Impact Assessment Guidelines for instructions on correctly documenting the LCA considerations impacts for all wall and roof envelope assemblies.

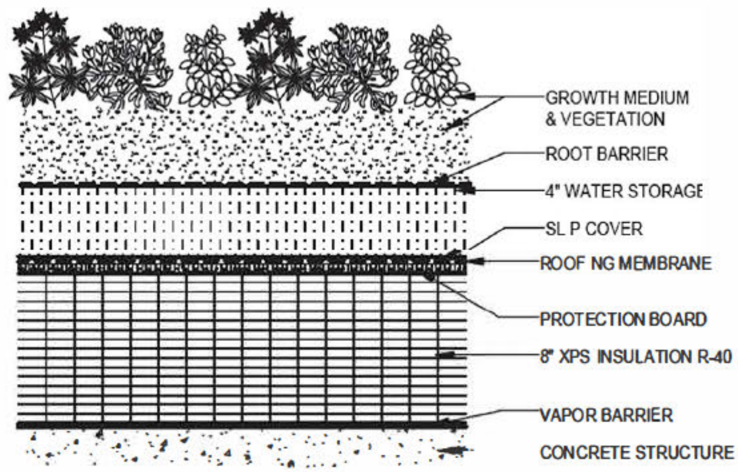


# DISCOVERY #3 PRELIMINARY LIFE-CYCLE IMPACTS

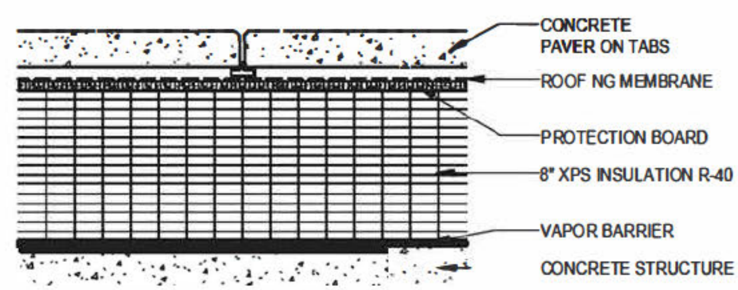
Comparative life-cycle assessment of potential roof systems was investigated in the Athena software.

The LCA comparison is between:

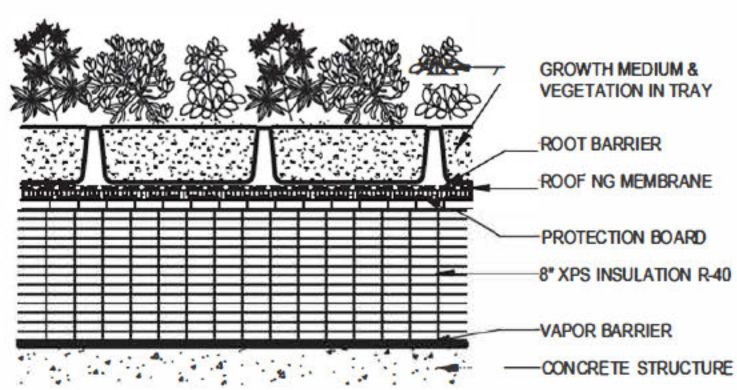
BASE Roof Option
OPTION #1: Blue Roof Seedums
OPTION #2: Green Roof Paver Area
OPTION #3: Green Roof Seedums




Blue Roof Seedums **OPTION 1**

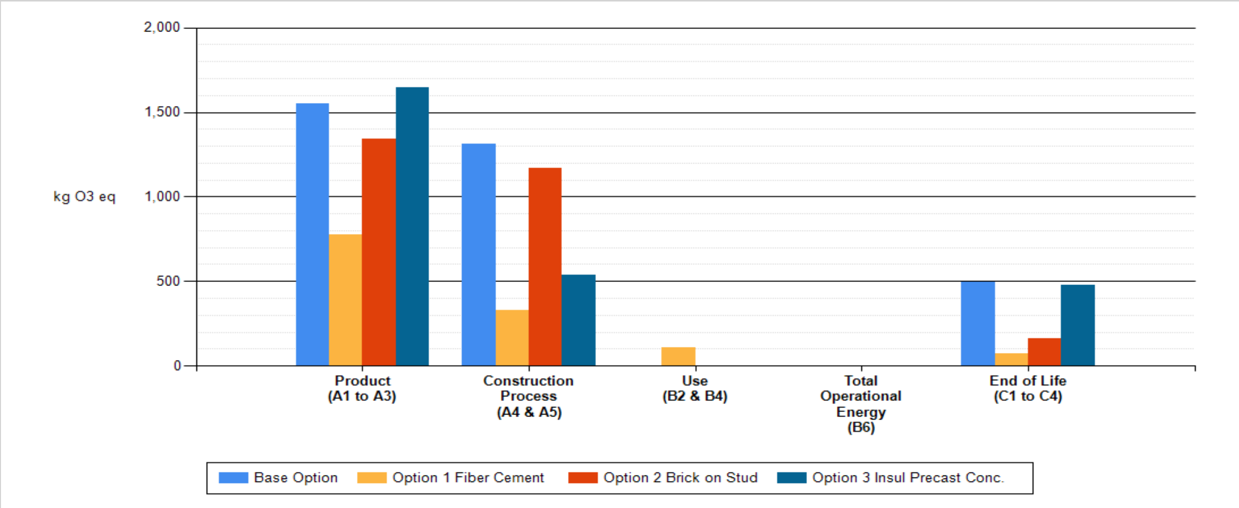



SCA Standard Roof **OPTION 2**



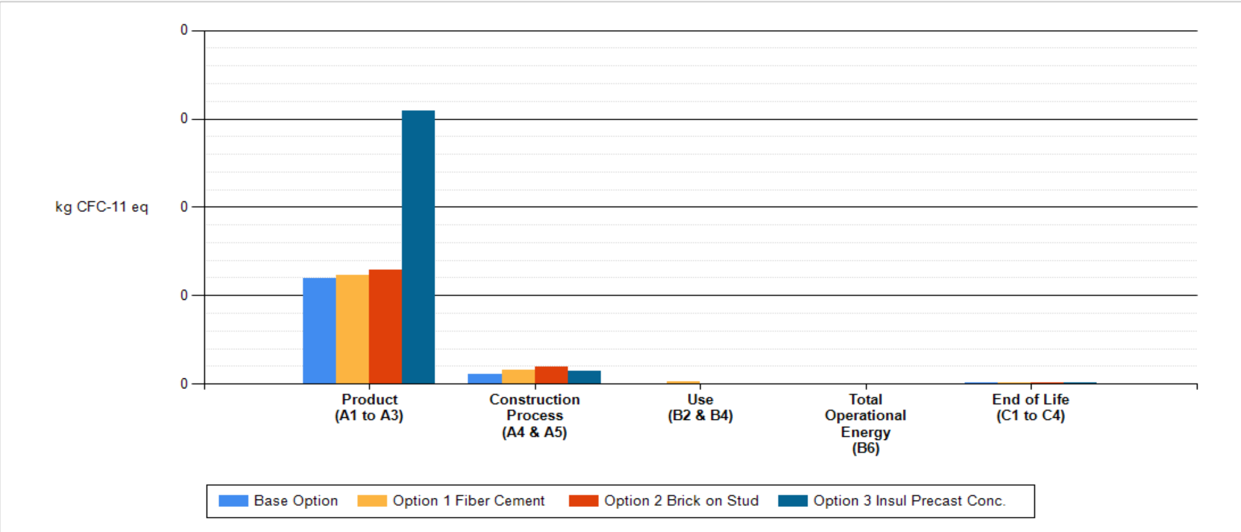

Green Roof Seedums **OPTION 3**

## Comparison of Smog Potential By Life Cycle Stage



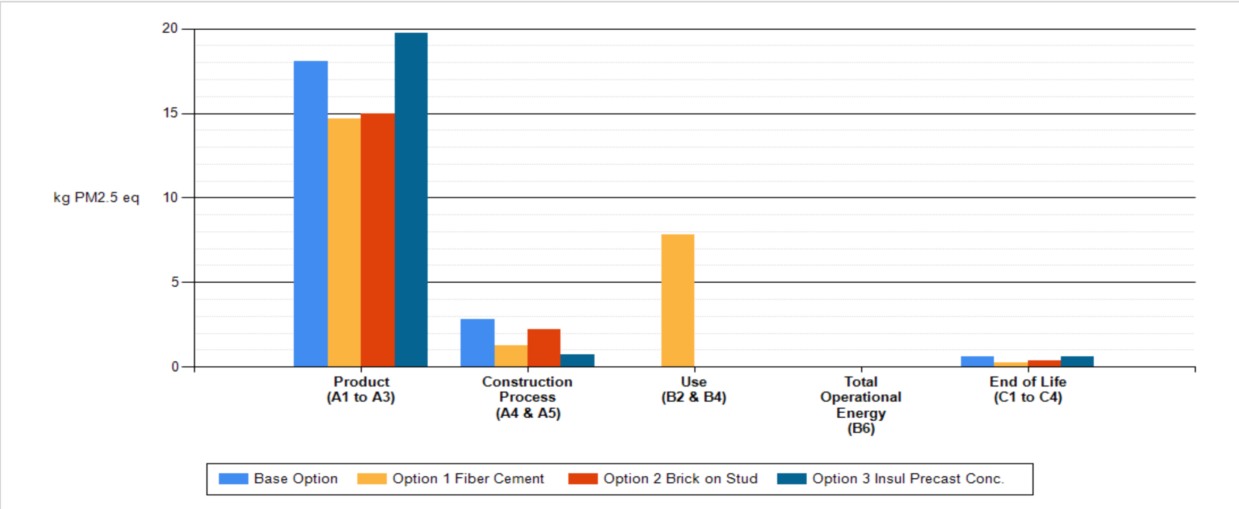

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg O3 eq | 1.55E+03 | 1.31E+03 | 0.00E+00 | 0.00E+00 | 4.94E+02 | **3.35E+03** |
| Option 1 Fiber Cement | kg O3 eq | 7.75E+02 | 3.30E+02 | 1.05E+02 | 0.00E+00 | 7.44E+01 | **1.28E+03** |
| Option 2 Brick on Stud | kg O3 eq | 1.34E+03 | 1.17E+03 | 0.00E+00 | 0.00E+00 | 1.60E+02 | **2.67E+03** |
| Option 3 Insul Precast Conc. | kg O3 eq | 1.65E+03 | 5.37E+02 | 0.00E+00 | 0.00E+00 | 4.75E+02 | **2.66E+03** |
| **Total** | **kg O3 eq** | **5.31E+03** | **3.35E+03** | **1.05E+02** | **0.00E+00** | **1.20E+03** | **9.97E+03** |

## Comparison of Ozone Depletion Potential By Life Cycle Stage



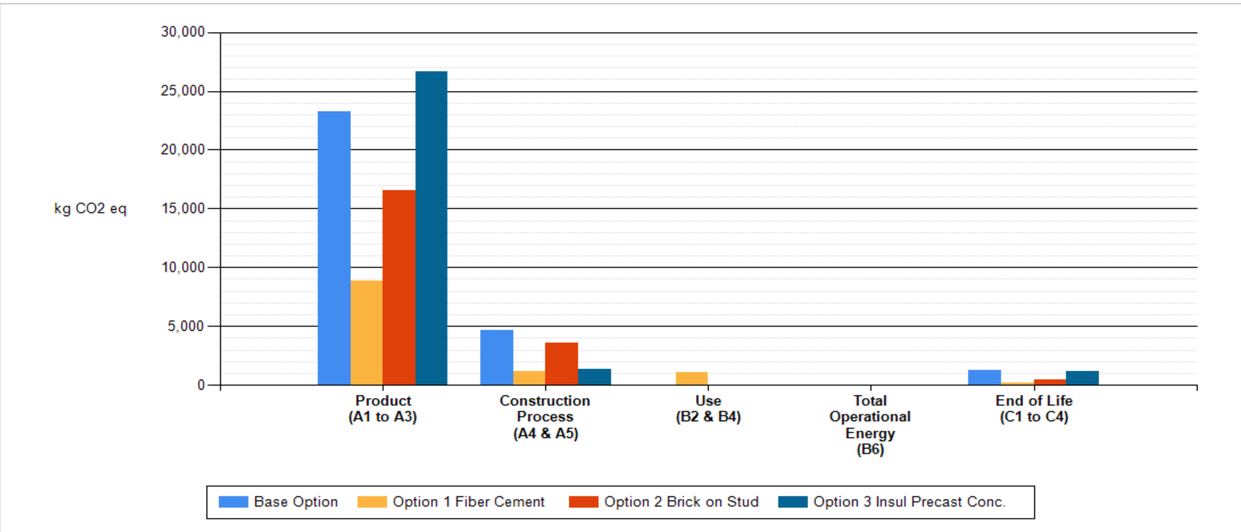

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg CFC-11 eq | 2.40E-04 | 2.28E-05 | 0.00E+00 | 0.00E+00 | 4.94E-08 | **2.63E-04** |
| Option 1 Fiber Cement | kg CFC-11 eq | 2.45E-04 | 3.20E-05 | 4.50E-06 | 0.00E+00 | 8.28E-09 | **2.82E-04** |
| Option 2 Brick on Stud | kg CFC-11 eq | 2.58E-04 | 3.78E-05 | 0.00E+00 | 0.00E+00 | 1.76E-08 | **2.96E-04** |
| Option 3 Insul Precast Conc. | kg CFC-11 eq | 6.18E-04 | 2.88E-05 | 0.00E+00 | 0.00E+00 | 4.68E-08 | **6.47E-04** |
| **Total** | **kg CFC-11 eq** | **1.36E-03** | **1.21E-04** | **4.50E-06** | **0.00E+00** | **1.22E-07** | **1.49E-03** |

## Comparison of HH Particulate By Life Cycle Stage



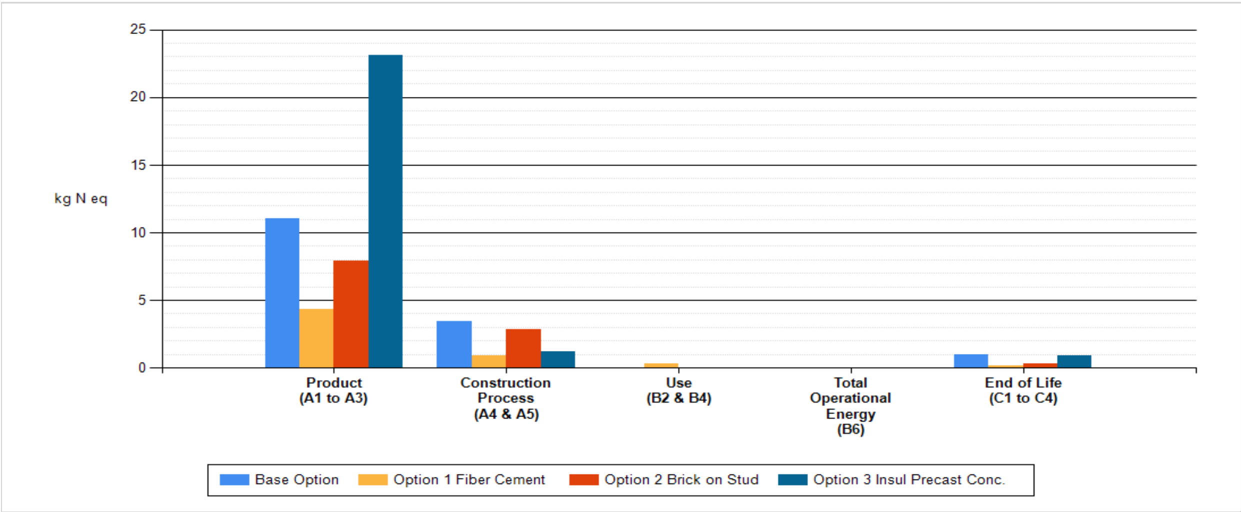

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg PM2.5 eq | 1.81E+01 | 2.82E+00 | 0.00E+00 | 0.00E+00 | 5.78E-01 | **2.15E+01** |
| Option 1 Fiber Cement | kg PM2.5 eq | 1.47E+01 | 1.28E+00 | 7.84E+00 | 0.00E+00 | 2.48E-01 | **2.40E+01** |
| Option 2 Brick on Stud | kg PM2.5 eq | 1.50E+01 | 2.20E+00 | 0.00E+00 | 0.00E+00 | 3.77E-01 | **1.75E+01** |
| Option 3 Insul Precast Conc. | kg PM2.5 eq | 1.97E+01 | 7.04E-01 | 0.00E+00 | 0.00E+00 | 6.17E-01 | **2.10E+01** |
| **Total** | **kg PM2.5 eq** | **6.74E+01** | **7.01E+00** | **7.84E+00** | **0.00E+00** | **1.82E+00** | **8.41E+01** |

## Comparison of Global Warming Potential By Life Cycle Stage



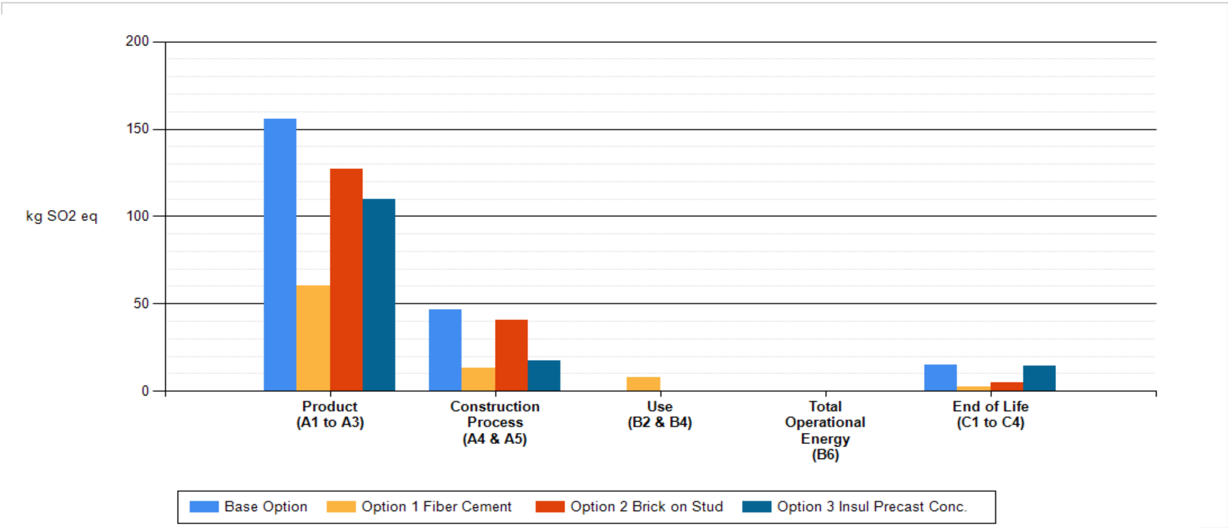

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg CO2 eq | 2.32E+04 | 4.67E+03 | 0.00E+00 | 0.00E+00 | 1.24E+03 | **2.91E+04** |
| Option 1 Fiber Cement | kg CO2 eq | 8.88E+03 | 1.22E+03 | 1.04E+03 | 0.00E+00 | 2.08E+02 | **1.13E+04** |
| Option 2 Brick on Stud | kg CO2 eq | 1.65E+04 | 3.57E+03 | 0.00E+00 | 0.00E+00 | 4.60E+02 | **2.06E+04** |
| Option 3 Insul Precast Conc. | kg CO2 eq | 2.66E+04 | 1.39E+03 | 0.00E+00 | 0.00E+00 | 1.14E+03 | **2.92E+04** |
| **Total** | **kg CO2 eq** | **7.53E+04** | **1.08E+04** | **1.04E+03** | **0.00E+00** | **3.04E+03** | **9.02E+04** |

## Comparison of Eutrophication Potential By Life Cycle Stage



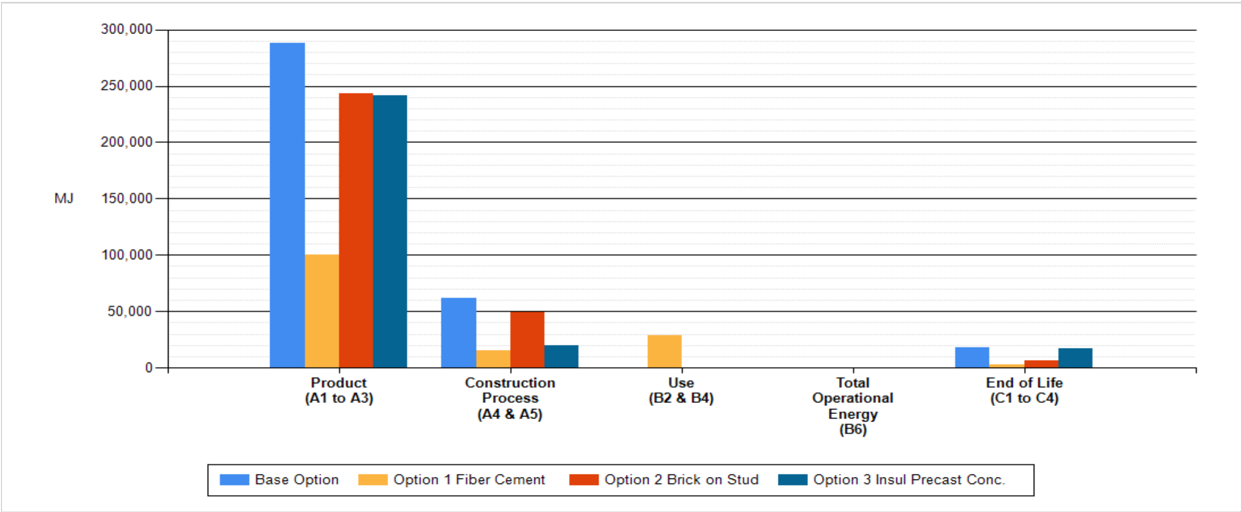

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg N eq | 1.10E+01 | 3.41E+00 | 0.00E+00 | 0.00E+00 | 9.44E-01 | **1.54E+01** |
| Option 1 Fiber Cement | kg N eq | 4.36E+00 | 8.73E-01 | 3.00E-01 | 0.00E+00 | 1.43E-01 | **5.68E+00** |
| Option 2 Brick on Stud | kg N eq | 7.92E+00 | 2.86E+00 | 0.00E+00 | 0.00E+00 | 3.10E-01 | **1.11E+01** |
| Option 3 Insul Precast Conc. | kg N eq | 2.31E+01 | 1.21E+00 | 0.00E+00 | 0.00E+00 | 9.02E-01 | **2.52E+01** |
| **Total** | **kg N eq** | **4.64E+01** | **8.35E+00** | **3.00E-01** | **0.00E+00** | **2.30E+00** | **5.73E+01** |

## Comparison of Acidification Potential By Life Cycle Stage



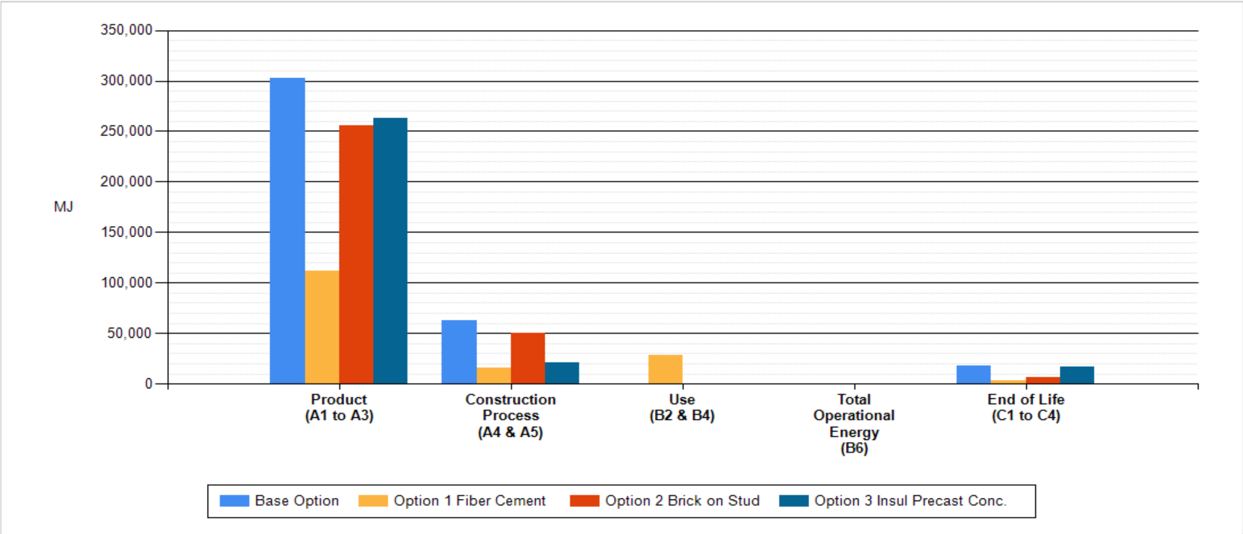

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | kg SO2 eq | 1.56E+02 | 4.64E+01 | 0.00E+00 | 0.00E+00 | 1.51E+01 | **2.17E+02** |
| Option 1 Fiber Cement | kg SO2 eq | 6.01E+01 | 1.29E+01 | 7.89E+00 | 0.00E+00 | 2.30E+00 | **8.32E+01** |
| Option 2 Brick on Stud | kg SO2 eq | 1.27E+02 | 4.09E+01 | 0.00E+00 | 0.00E+00 | 4.98E+00 | **1.73E+02** |
| Option 3 Insul Precast Conc. | kg SO2 eq | 1.10E+02 | 1.75E+01 | 0.00E+00 | 0.00E+00 | 1.45E+01 | **1.42E+02** |
| **Total** | **kg SO2 eq** | **4.53E+02** | **1.18E+02** | **7.89E+00** | **0.00E+00** | **3.69E+01** | **6.15E+02** |

## Comparison of Fossil Fuel Consumption By Life Cycle Stage



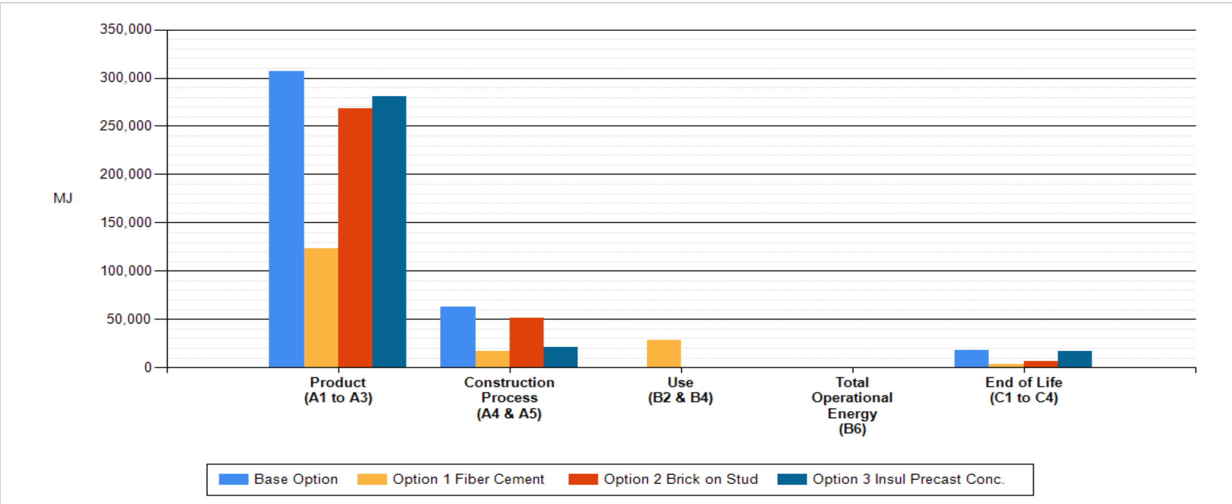

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | MJ | 2.88E+05 | 6.17E+04 | 0.00E+00 | 0.00E+00 | 1.82E+04 | **3.68E+05** |
| Option 1 Fiber Cement | MJ | 9.99E+04 | 1.52E+04 | 2.83E+04 | 0.00E+00 | 3.04E+03 | **1.46E+05** |
| Option 2 Brick on Stud | MJ | 2.43E+05 | 4.95E+04 | 0.00E+00 | 0.00E+00 | 6.73E+03 | **2.99E+05** |
| Option 3 Insul Precast Conc. | MJ | 2.42E+05 | 1.98E+04 | 0.00E+00 | 0.00E+00 | 1.68E+04 | **2.78E+05** |
| **Total** | **MJ** | **8.73E+05** | **1.46E+05** | **2.83E+04** | **0.00E+00** | **4.48E+04** | **1.09E+06** |

## Comparison of Non-Renewable Energy By Life Cycle Stage




| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | MJ | 3.02E+05 | 6.25E+04 | 0.00E+00 | 0.00E+00 | 1.82E+04 | **3.83E+05** |
| Option 1 Fiber Cement | MJ | 1.12E+05 | 1.61E+04 | 2.83E+04 | 0.00E+00 | 3.05E+03 | **1.59E+05** |
| Option 2 Brick on Stud | MJ | 2.56E+05 | 5.07E+04 | 0.00E+00 | 0.00E+00 | 6.74E+03 | **3.14E+05** |
| Option 3 Insul Precast Conc. | MJ | 2.63E+05 | 2.08E+04 | 0.00E+00 | 0.00E+00 | 1.68E+04 | **3.01E+05** |
| **Total** | **MJ** | **9.34E+05** | **1.50E+05** | **2.83E+04** | **0.00E+00** | **4.48E+04** | **1.16E+06** |

## Comparison of Total Primary Energy By Life Cycle Stage

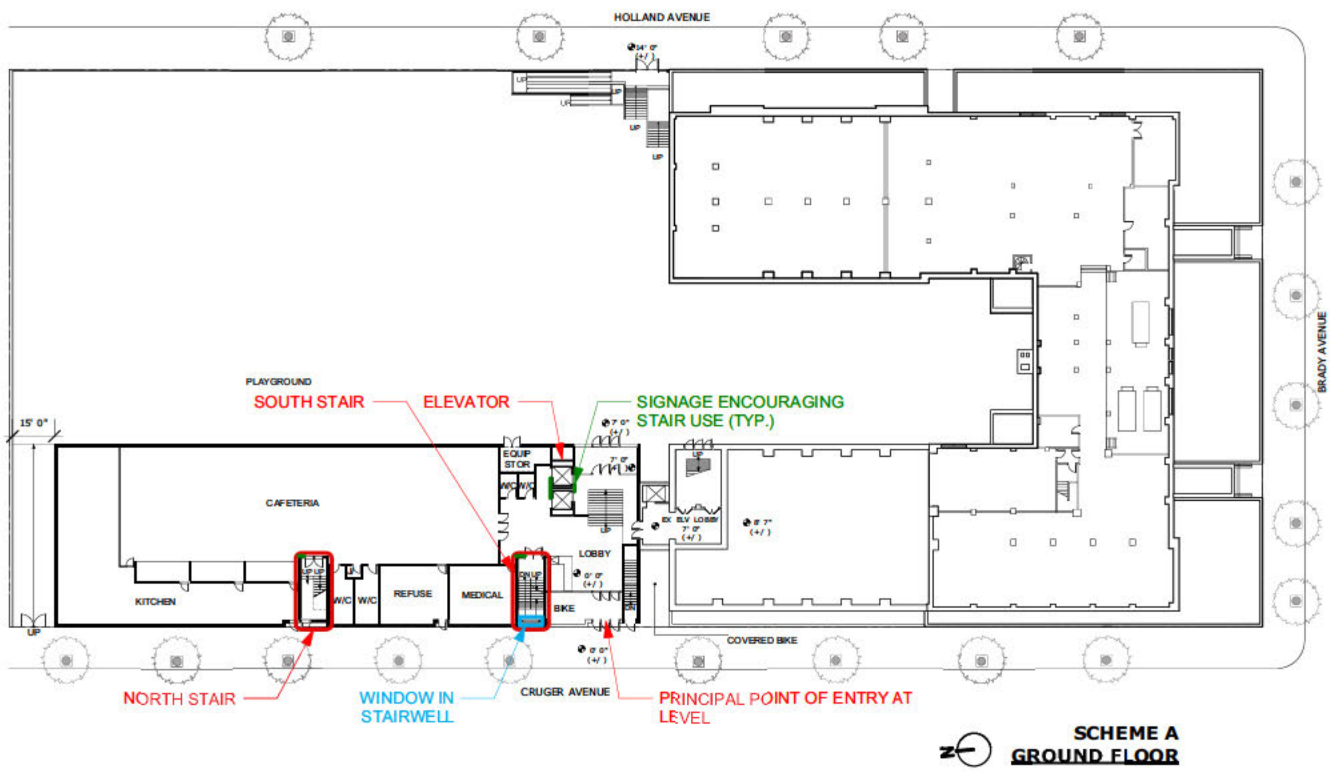


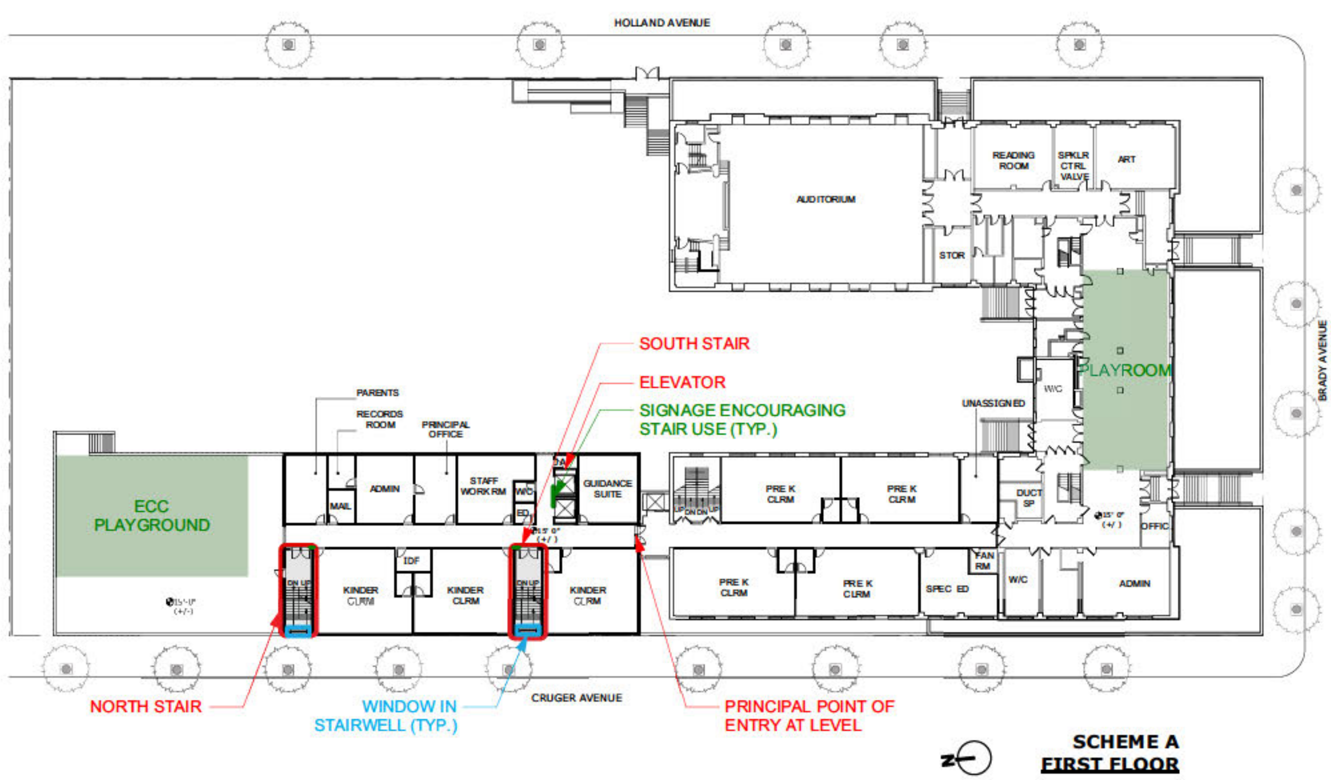

| Project Name | Unit | Product (A1 to A3) | Construction Process (A4 & A5) | Use (B2 & B4) | Total Operational Energy (B6) | End of Life (C1 to C4) | Total |
|---|---|---|---|---|---|---|---|
| Base Option | MJ | 3.07E+05 | 6.30E+04 | 0.00E+00 | 0.00E+00 | 1.82E+04 | **3.88E+05** |
| Option 1 Fiber Cement | MJ | 1.23E+05 | 1.69E+04 | 2.83E+04 | 0.00E+00 | 3.05E+03 | **1.71E+05** |
| Option 2 Brick on Stud | MJ | 2.68E+05 | 5.16E+04 | 0.00E+00 | 0.00E+00 | 6.74E+03 | **3.27E+05** |
| Option 3 Insul Precast Conc. | MJ | 2.80E+05 | 2.15E+04 | 0.00E+00 | 0.00E+00 | 1.68E+04 | **3.19E+05** |
| **Total** | **MJ** | **9.79E+05** | **1.53E+05** | **2.83E+04** | **0.00E+00** | **4.49E+04** | **1.20E+06** |

# DISCOVERY #4

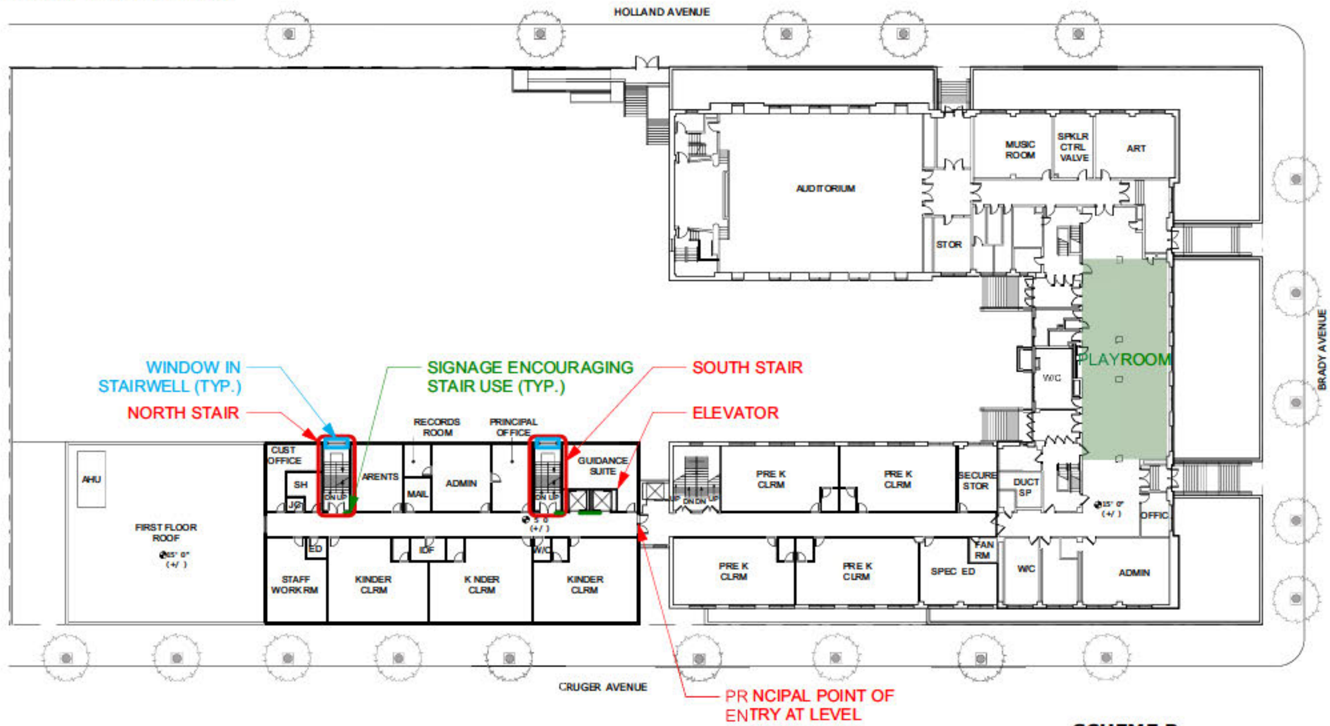
## ACTIVE DESIGN

## SCHEME A DIAGRAMS

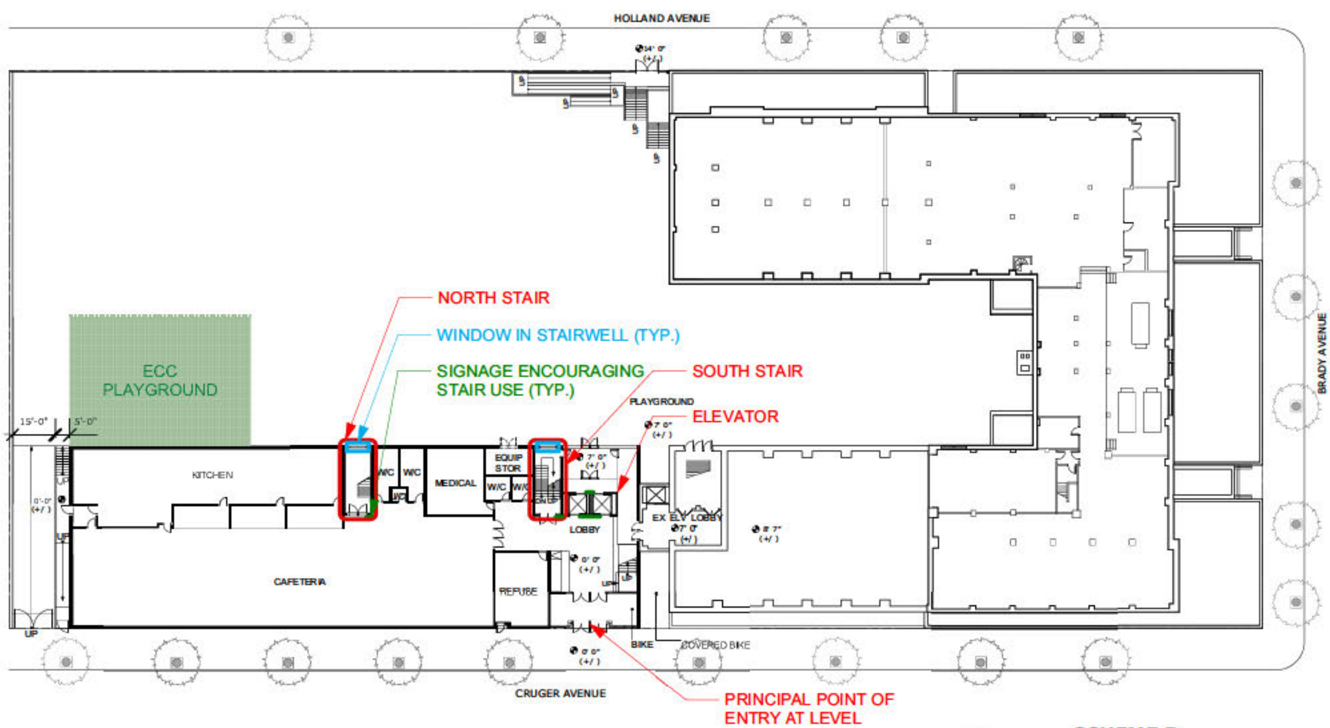


## SCHEME B DIAGRAMS

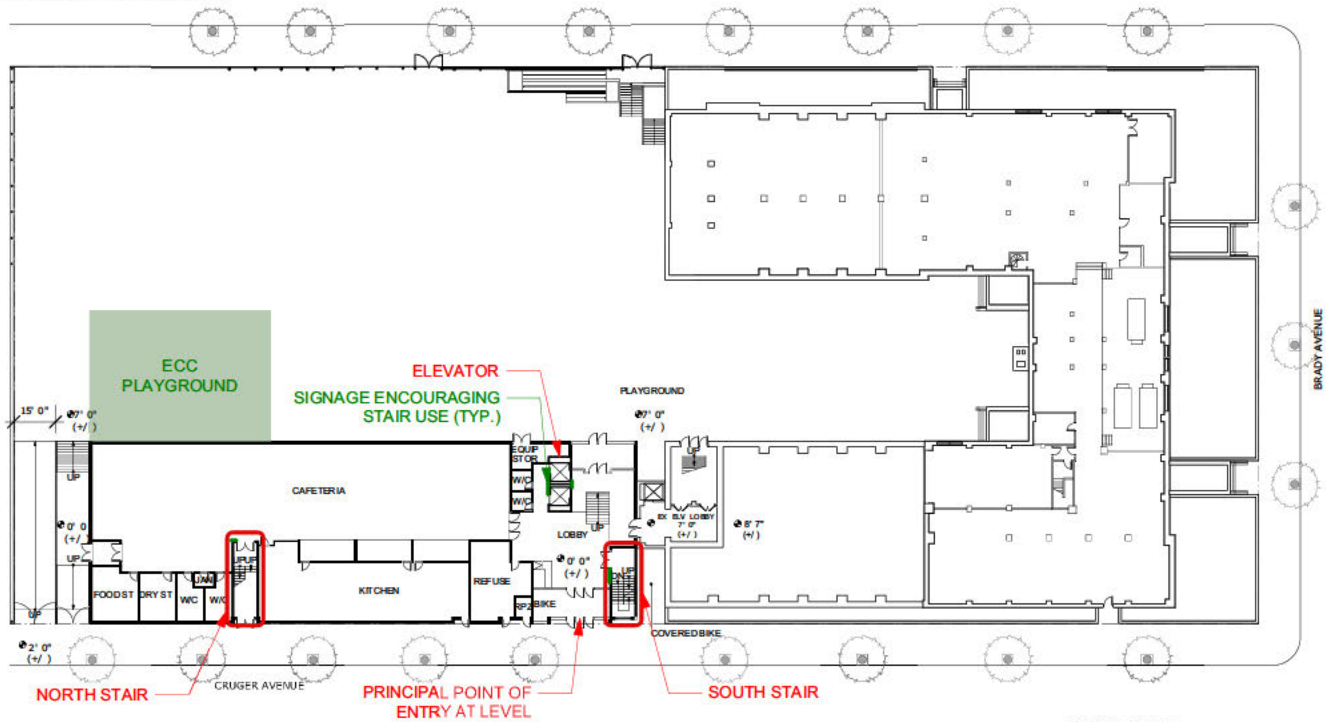



**SCHEME B**
**FIRST FLOOR**

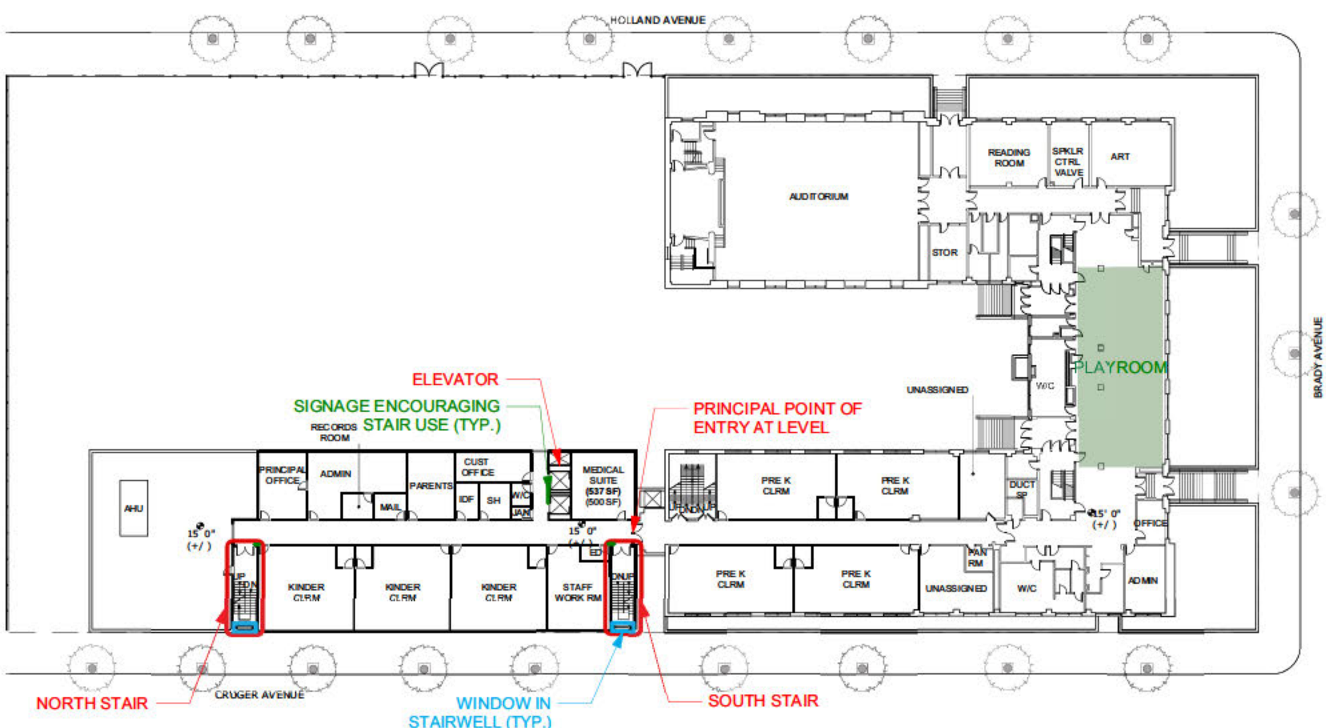



**SCHEME B**
**GROUND FLOOR**

## SCHEME C DIAGRAMS




**SCHEME C**
**GROUND FLOOR**




**SCHEME C**
**FIRST FLOOR**

## DISCOVERY SUMMARY

Active Design in a School Environment (S3.2) is a Green Schools Guide credit requirement. Assessment uses SCA's "Active Design in a School Environment Credit Form" to review scheme compliance. Each scheme must comply with Step 1 strategies and meet a minimum of 7 credits in Step 2. Scheme A and C comply, Scheme B does not meet the minimum 7 strategy requirement.

## ACTIVE DESIGN PLAN

<u>FINDINGS</u>

| Step 1: Comply with both of the following strategies | | | | | |
|---|---|---|---|---|---|
| # | Design Case | Base Case Code Minimum | Scheme A Complies? | Scheme B Complies? | Scheme C Complies? |
| R1 | Building occupants shall have access via at least one main active mode of vertical circulation to and from all common use floors, and occupant's own floor(s) | In schools, doors may be locked on the stair side except at intervals of 4 stories or less. | Yes | Yes | Yes |
| R2 | Provide an onsite recreation space that is open and accessible to all users. For schools that have more than 10 classrooms, the space must be at least 400 square feet. Include adult exercise and children's play equipment for a minimum of 5% of the building occupants. Gardening activity space and equipment may also count as adult active recreation space and equipment. | Not applicable | Yes | Yes | Yes |

| Step 2: Comply with seven of the following strategies | | | | | |
|---|---|---|---|---|---|
| DESIGN FOR INCREASED ACTIVE MODES OF VERTICAL CIRCULATION | | | | | |
| A | FOR THE MAIN STAIRCASE | | | | |
| 1 | Classify all regularly occupied floors for re-entry, allowing all building users to have access to and from these floors. Service floors do not need access for all users. | In schools, doors may be locked on the stair side except at intervals of 4 stories or less. | Yes | Yes | Yes |
| 2 | Provide transparent glazing of at least 10 square feet at all stair doors or at a side light. OR Provide magnetic door holds on all doors leading to the stairs. OR Provide unenclosed stairs. | Not applicable | No | No | No |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Provide accessibility to at least one open or interconnecting staircase to at least 50% of the tenant/occupant floors for convenient pedestrian vertical circulation. | Exact location not mandated | Yes | Yes | Yes |
| 4 | Locate a main staircase to be visible from main building lobby and within 25 foot walking distance from any edge of the lobby. Ensure that no turns or obstacles prevent visibility of or accessibility to the qualifying staircase from the lobby. | Exact location not mandated, follow SCA Design Requirements | Yes | Yes | Yes |
| 5 | Locate a main staircase to be visible before an occupant visually encounters any motorized vertical circulation (elevator/escalator). The staircase must be visible from the principal point of entry at each building floor. | Exact location not mandated, follow SCA Design Requirements | Yes | No | Yes |
| 6 | Install architectural light fixtures that provide a level of lighting in the staircase(s) consistent with or better than what is provided in the building corridor. | 200 lux recommended by IES. | Yes | Yes | Yes |
| 7 | Provide daylighting at each floor/roof level of the stair(s) using either windows and/or skylights of at least eight square feet in size. | Follow SCA Design Requirements | Yes | Yes | Yes |
| 8 | Place signage encouraging stair use for health and other benefits at all elevator call areas, next to escalators and outside stairwells on each floor. | Not applicable | Yes | Yes | Yes |
| 9 | Use inviting sensory stimulation such as artwork and/or music in stairwells. | Not applicable | No | No | No |
| B | ELSEWHERE WITHIN THE PROJECT | | | | |
| 10 | Provide exercise equipment or exercise opportunities for at least 5% of staff occupants that can be used at employee workstations to allow workers opportunities for physical activity while working at their desks. | Not applicable | No | No | No |
| 11 | Provide a dedicated or multi-use space to act as an on-site exercise room, which includes a variety of exercise equipment, for use by at least 5% of staff occupants. | Not applicable | No | No | No |

**Note:** In facilities where stairs are not the main active mode of vertical circulation, other active modes of vertical circulation that promote physical activity, such as ramps and ladders can be used in place of stairs

| | | | |
|---|---|---|---|
| Strategies Achieved | 7 | 6 | 7 |
| Project Complies | **Yes** | **No** | **Yes** |

# Integrative Design Process Discovery #5 Analysis - Acoustics

# Public School
# Jamaica, New York

**Prepared for:**

**March 10, 2020**

# INTRODUCTION

This report reviews the NYC Green Schools Guide 2019 requirements for Minimum (Q8.1P) and Enhanced (Q8.2) Acoustic Performance, in connection with three schemes proposed for the PS [redacted] Addition project, and identifies risks to achieving each credit. The three schemes are referred to as 7, 8a, and 8b as prepared by [redacted]

# Q8.1P - MINIMUM ACOUSTIC PERFORMANCE

## Requirements

1. **HVAC Background Noise:** Achieve a maximum background noise level of 40 dBA from heating, ventilating, and air-conditioning (HVAC) systems in classrooms and other core learning spaces.

2. **Exterior Noise:** For high-noise sites (peak-hour Leq above 60 dBA during school hours), implement acoustic treatment and other measures to minimize noise intrusion from exterior sources and control sound transmission between classrooms and other core learning spaces. Projects at least one-half mile from any significant noise sources are exempt.

3. **Reverberation Time:** Adhere to the following reverberation time requirements:

   a. For Classrooms and Core Learning Spaces < 20,000 cubic feet: Design classrooms and other core learning spaces to include sufficient sound-absorptive finishes for compliance with the reverberation time requirements specified in ANSI Standard S12.60-2010, Part 1: Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools.

   b. For Classrooms and Core Learning Spaces > 20,000 cubic feet: Meet the recommended reverberation times for classrooms and core learning spaces described in the NRC-CNRC Construction Technology Update No. 51: Acoustical Design of Rooms for Speech (2002).

## Analysis

1. **HVAC Background Noise**: It is expected that achieving a maximum background noise level of 40 dBA in classrooms and other core learning spaces will be feasible without the need to implement extraordinary noise control measures, based on use of multi-zone variable air volume (MZVAV) systems with roof mounted equipment. Special consideration will need to be given to potential unit noise break-out of supply and return ductwork if it will penetrate the roof directly above classrooms or other core learning spaces. In such cases it is often necessary to enclose initial ductwork runs in sound control lagging in order to sufficiently mitigate duct noise break-out.

   There are no significant differences among design schemes 7, 8a, and 8b with respect to achieving the HVAC background noise requirement.

2. **Exterior Noise:** The site is approximately 0.5 miles from the Belt Parkway and the boundary of the DNL 65 noise contour associated with Kennedy International Airport, and 0.25 miles away from the Van Wyck Expressway. These factors suggest that the new building addition may be

subject to higher-than-average exterior noise levels, and potentially higher than 60 dBA as referenced in the requirements.

An instrumented survey will be conducted in order to determine the peak-hour noise level at the site during school hours. Results will be utilized to determine measures that may be required to minimize noise intrusion to classrooms and other core learning spaces.

The Green Schools Guide does not specify to what level the exterior noise is to be reduced. However, SCA Design Requirements recommend that interior-transmitted noise levels be limited to NC (Noise Criterion) 45 for the $L_{10}$ condition (noise level exceeded 10% of the time).

Exterior noise transmitted to classrooms and other core learning spaces will be controlled by the glazing configuration of exterior windows. Given the possibility of elevated exterior noise levels at the site, as described above, there is some potential that non-standard glazing configurations will need to be employed in exterior windows of classrooms and other core learning spaces.

Except where the size of exterior windows may vary significantly among design schemes 7, 8a, and 8b, there are no differences among the design schemes with respect to exterior noise impact on classrooms and other core learning spaces.

3. **Reverberation Time** – Employing standard ceilings per SCA Design Requirements will achieve reverberation time requirements as specified. There are no differences among design schemes 7, 8a, and 8b with respect to achieving reverberation time requirements.

# Q8.2 – ENHANCED ACOUSTIC PERFORMANCE

## Requirements

1. **HVAC Background Noise:** Achieve a maximum background noise level of 35 dBA from heating, ventilating, and air-conditioning (HVAC) systems in classrooms and other core learning spaces.

2. **Sound Transmission:** Design classrooms and other core learning spaces to meet the sound transmission class (STC) requirements of ANSI Standard S12.60-2010, Part 1. Exterior windows must have an STC rating of at least 35, unless outdoor and indoor noise levels can be verified to justify a lower rating.

## Analysis

3. **HVAC Background Noise:** It is feasible to achieve a background noise level of 35 dBA from heating, ventilating, and air-conditioning (HVAC) systems in classrooms and other core learning spaces, although the requirement is considered to be stringent. Careful consideration will need to be given to equipment selection (particularly VAV terminal units), duct sizing, and selection of grilles, registers, and diffusers. Depending on the zoning and sizing of VAV terminal units, it may be necessary to locate the units outside the boundaries of classrooms and other core learning spaces.

4. **Sound Transmission:** The requirements specify minimum STC ratings of partitions separating classrooms and other core learning spaces from other adjacent spaces. Also specified are the STC and IIC (floor Impact Insulation Class) ratings of floor / ceiling assemblies separating classrooms and other core learning spaces from other vertically adjacent spaces.

   Employing standard partition types and floor / ceiling assemblies per SCA Design Requirements will satisfy specified STC and IIC ratings. There are no differences among design schemes 7, 8a, and 8b with respect to achieving these sound transmission requirements.

   There is one condition common to each of the schemes that will require non-standard construction in order to achieve specified STC and IIC ratings, and that is the Second Floor location of the Gymnasium directly above First Floor classrooms. SCA Design Guidelines prescribe that the Gymnasium shall have a 4 in. concrete slab supported 2 in. above the structural slab with resilient isolators.

## CONCLUSIONS

Except as noted below, requirements for Q8.1P (Minimum Acoustic Performance) and Q8.2 (Enhanced Acoustic Performance) can be satisfied by following SCA Design Requirements and utilizing SCA standard details. There are no significant differences among design schemes 7, 8a, and 8b with respect to achieving the specified requirements.

1. Given the proximity of the site to transportation noise sources, it may be necessary to utilize non-standard glazing configurations in exterior windows to achieve required interior-transmitted noise levels in classrooms and other core learning spaces. There are no differences among design schemes 7, 8a, and 8b in these respects except if the windows among the schemes are significantly different in size.

2. In all schemes, the Gymnasium locates directly above classrooms, which will require a secondary concrete slab that is isolated from the structural floor slab.

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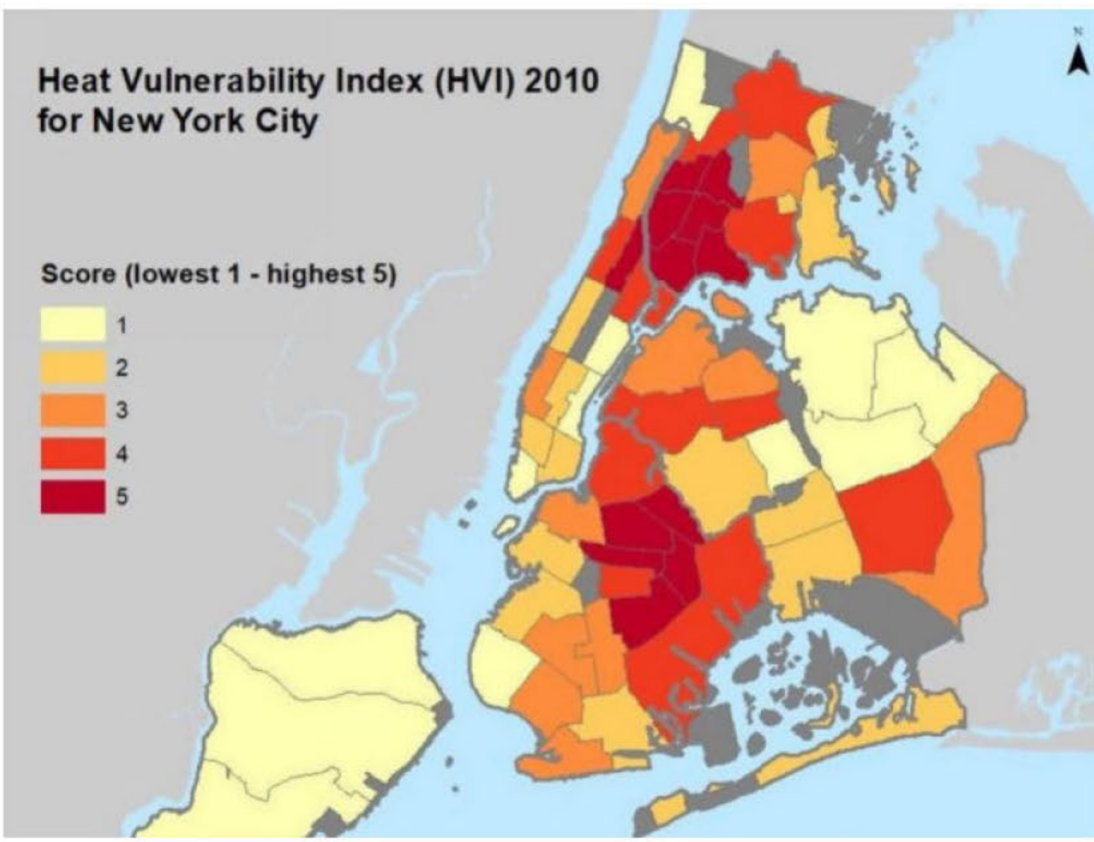
# Integrative Design Report and Recommendations

## 7.0 Discovery #6 Climate Resiliency

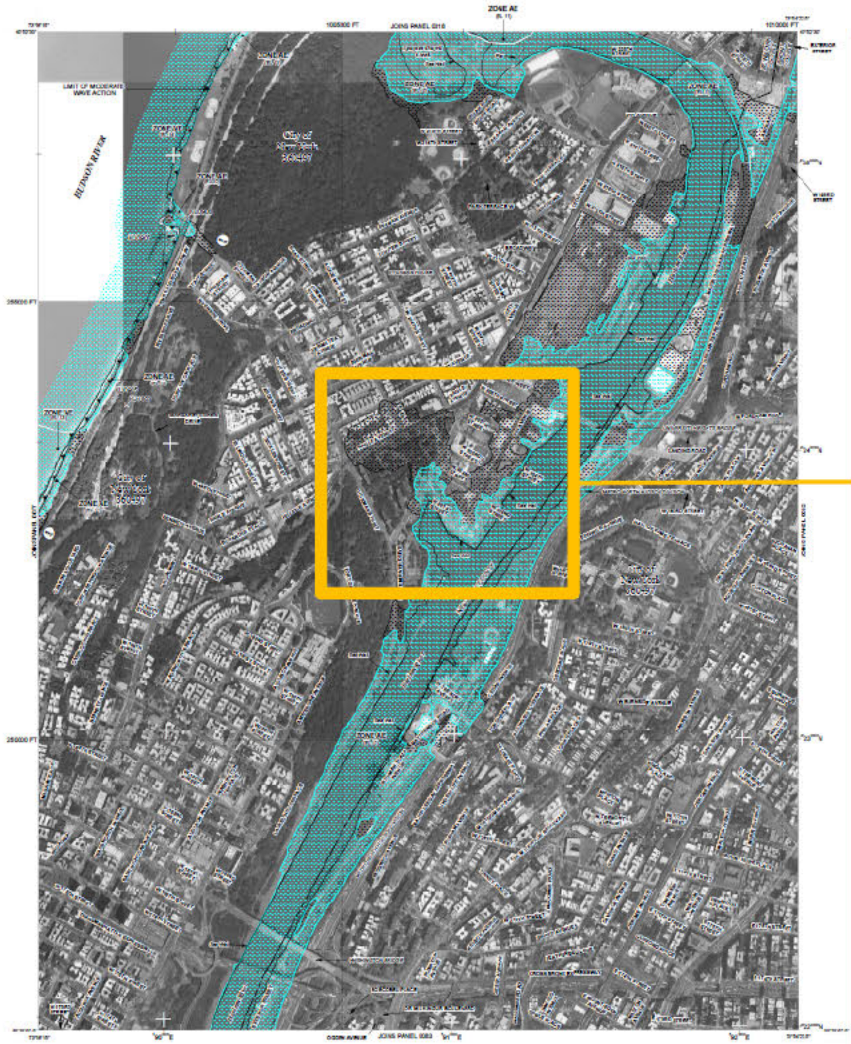
### 7.1 Narrative Summary

The purpose of the climate resiliency is to analyze the site risk in relation to heat, precipitation and sea level rise. This influence the design strategies as in program, material & equipment location. Our proposed Project site is located in a medium heat vulnerability index with a score of three. Based on the heat vulnerability index map and the heat risk screening questions we have a score of seven, given a result of medium exposure rating. The next section is precipitation risk and after the question answered from the screening tool the score came to a two given a medium exposure rating. Lastly we are not at any sea level risk since we are not near the coast and are at elevation above sea level

### . 7.2 Exposure Screening Tool



## Pre-FIRM and FEMA Maps:



# National Flood Hazard Layer FIRMette

FEMA

73°55'36"W 40°51'52"N


0 250 500 1,000 1,500 2,000 Feet

1:6,000

73°54'59"W 40°51'25"N

N

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

**SPECIAL FLOOD HAZARD AREAS**
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

**OTHER AREAS**
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**MAP PANELS**
- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/29/2020 at 8:34 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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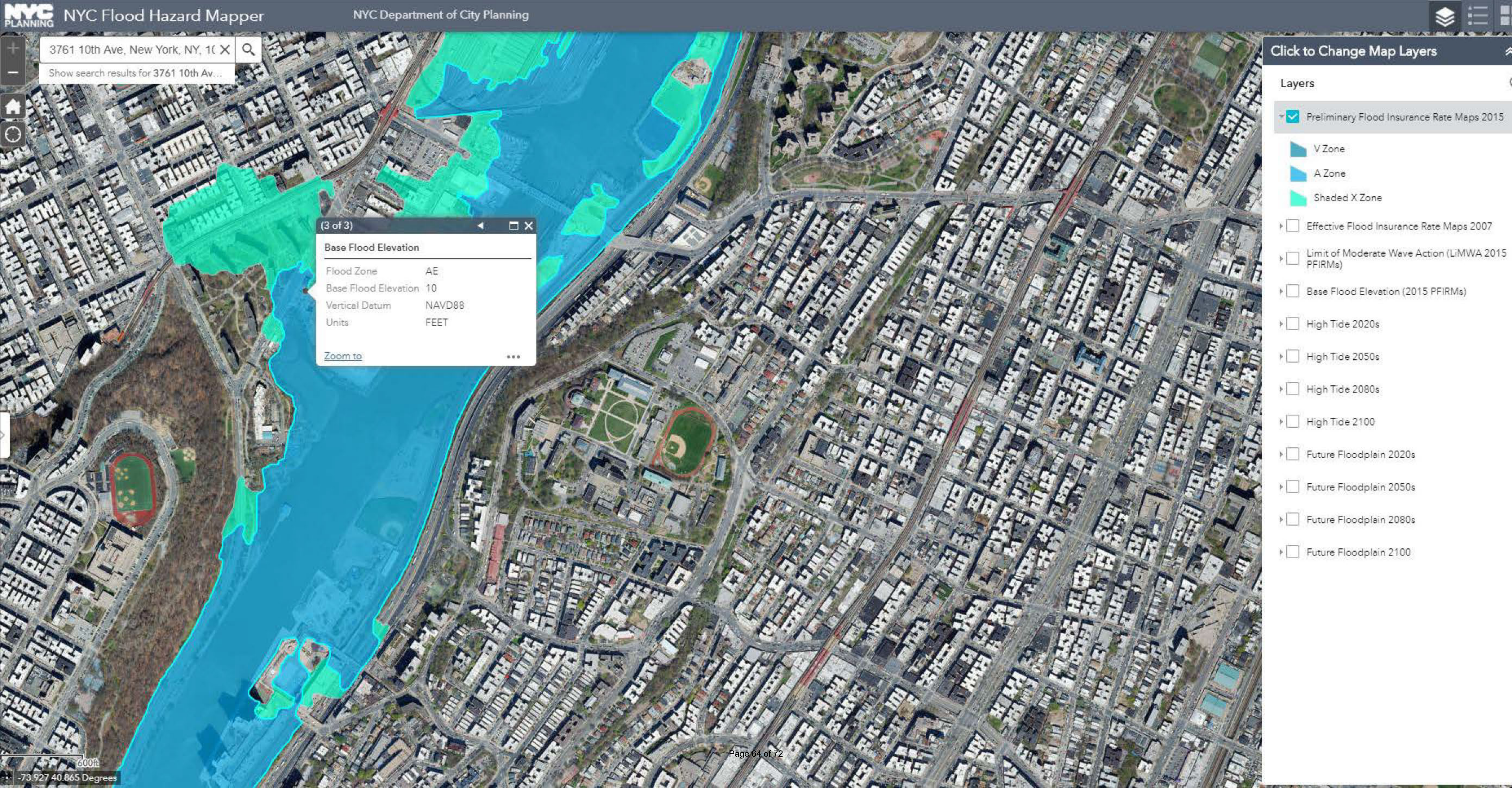
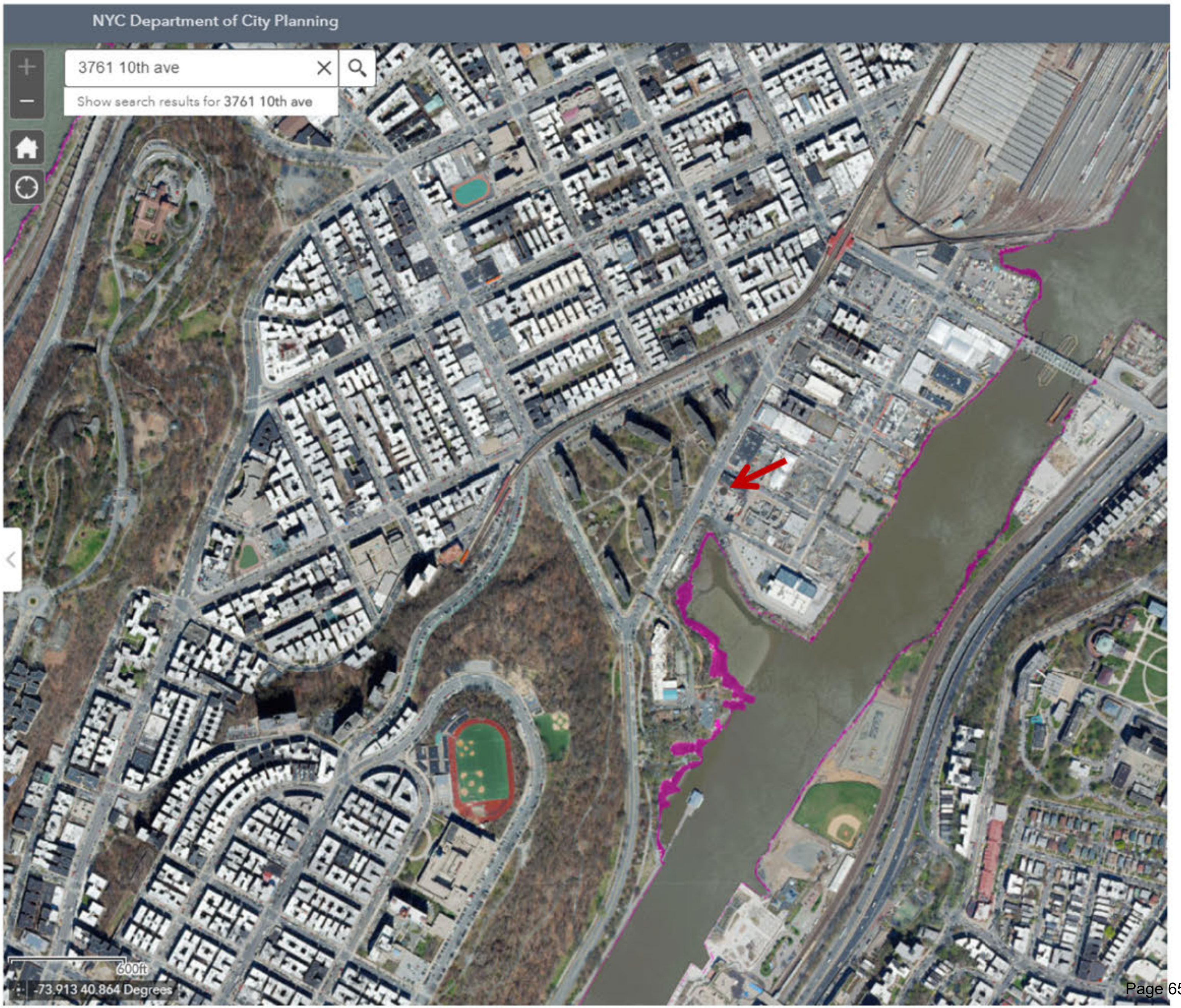
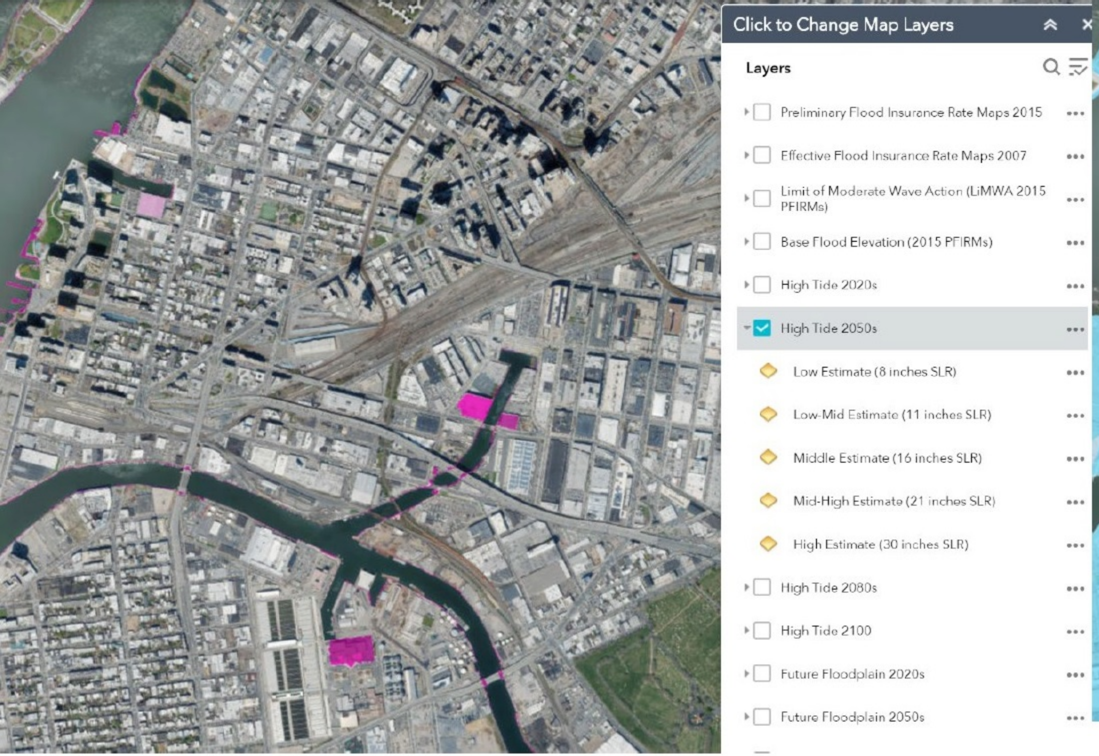
SCA School Construction Authority


NYC PLANNING
NYC Flood Hazard Mapper
NYC Department of City Planning
3761 10th Ave, New York, NY, 1(
Show search results for 3761 10th Av...
(3 of 3)
Base Flood Elevation
Flood Zone AE
Base Flood Elevation 10
Vertical Datum NAVD88
Units FEET
Zoom to
Click to Change Map Layers
Layers
Preliminary Flood Insurance Rate Maps 2015
V Zone
A Zone
Shaded X Zone
Effective Flood Insurance Rate Maps 2007
Limit of Moderate Wave Action (LiMWA 2015 PFIRMs)
Base Flood Elevation (2015 PFIRMs)
High Tide 2020s
High Tide 2050s
High Tide 2080s
High Tide 2100
Future Floodplain 2020s
Future Floodplain 2050s
Future Floodplain 2080s
Future Floodplain 2100
600ft
-73.927 40.865 Degrees

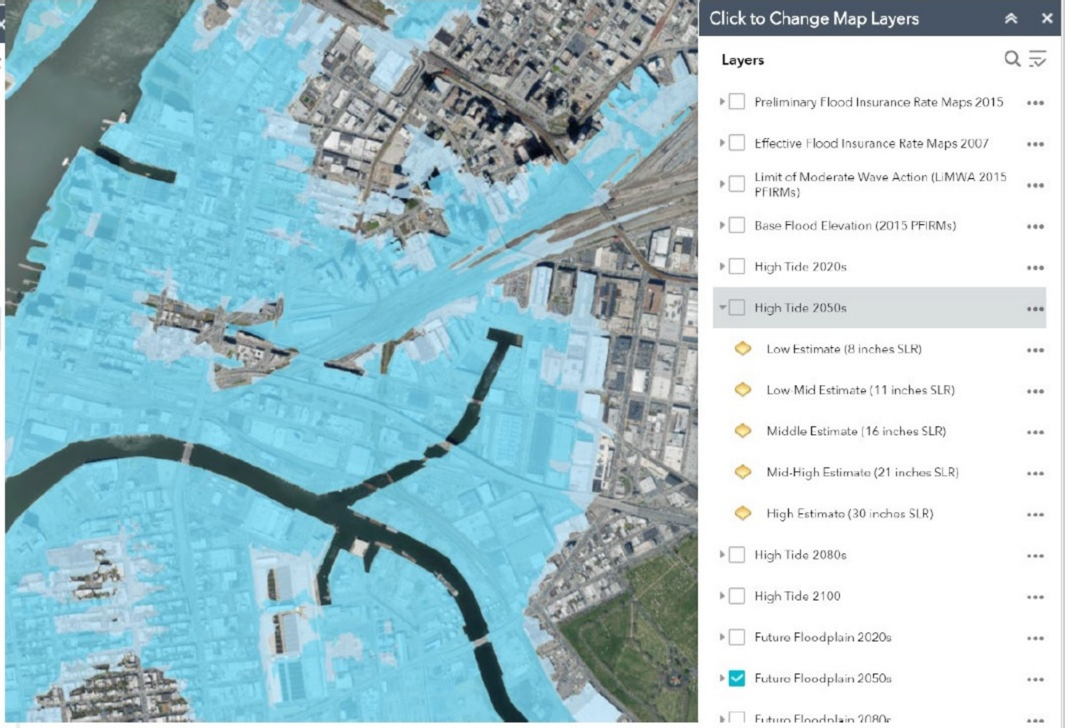



**High Tide – 2020s**

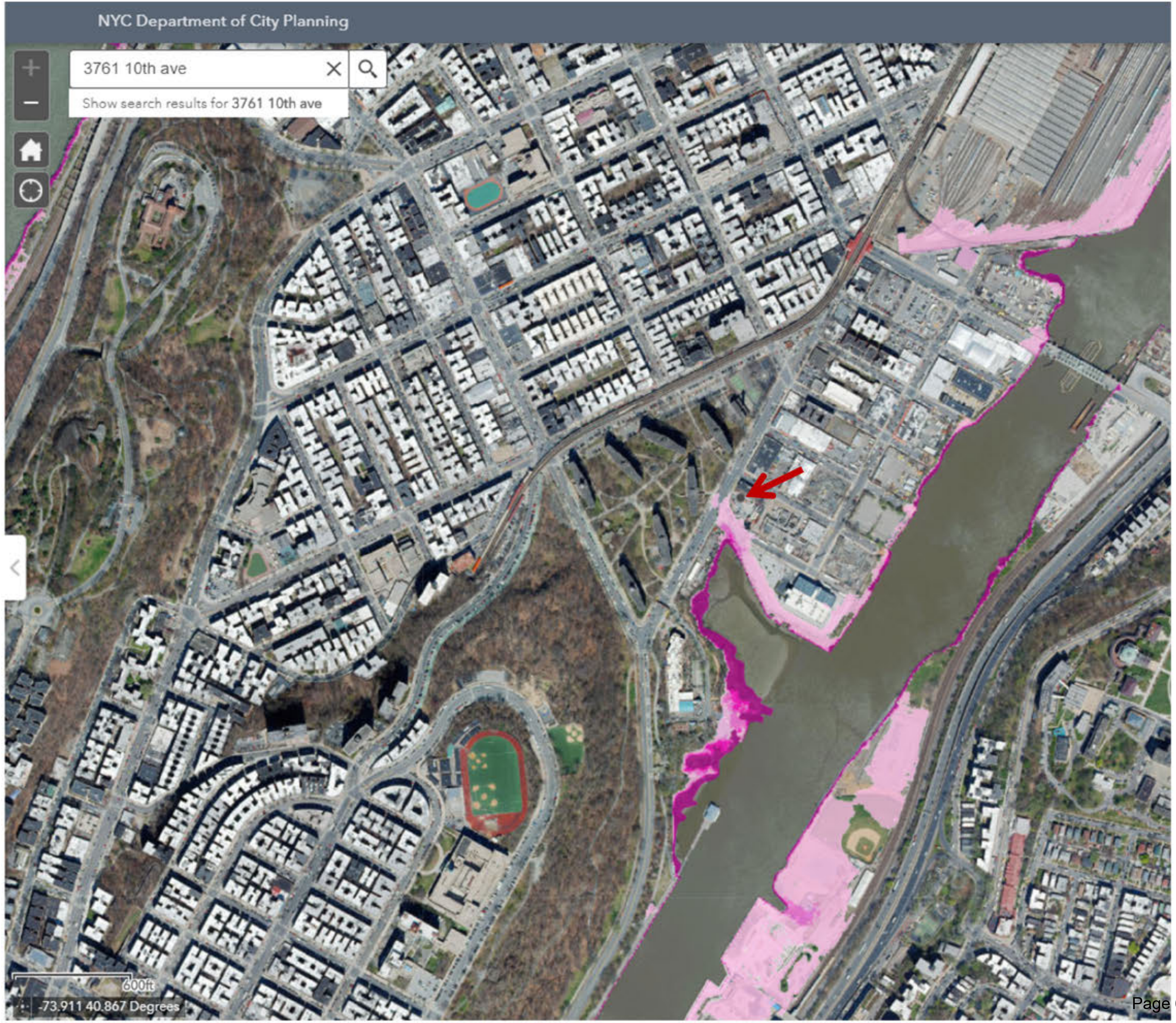

**Future Flood Plain 2020s**



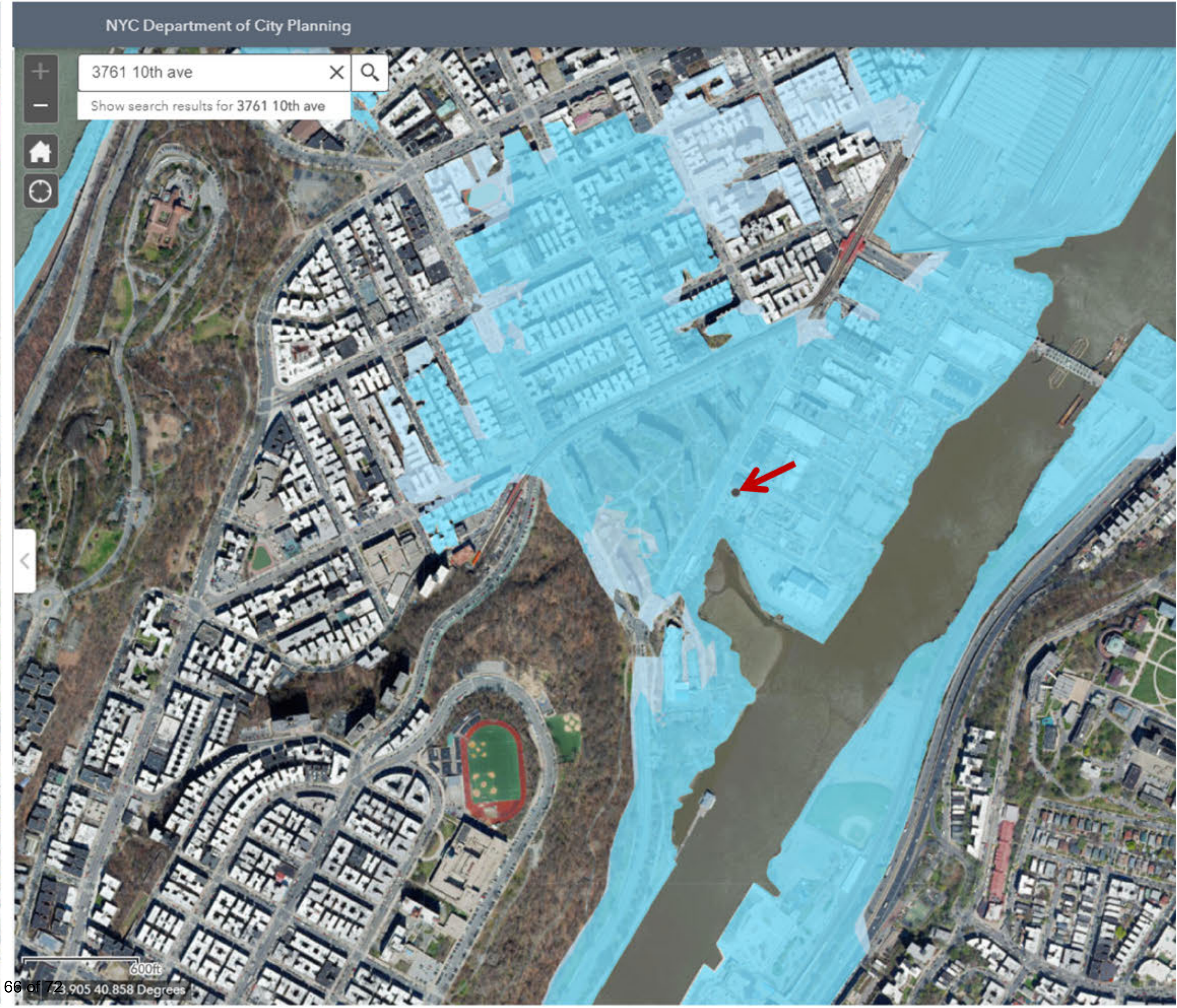

High Tide-2050s




Future FloodPlain 2050s

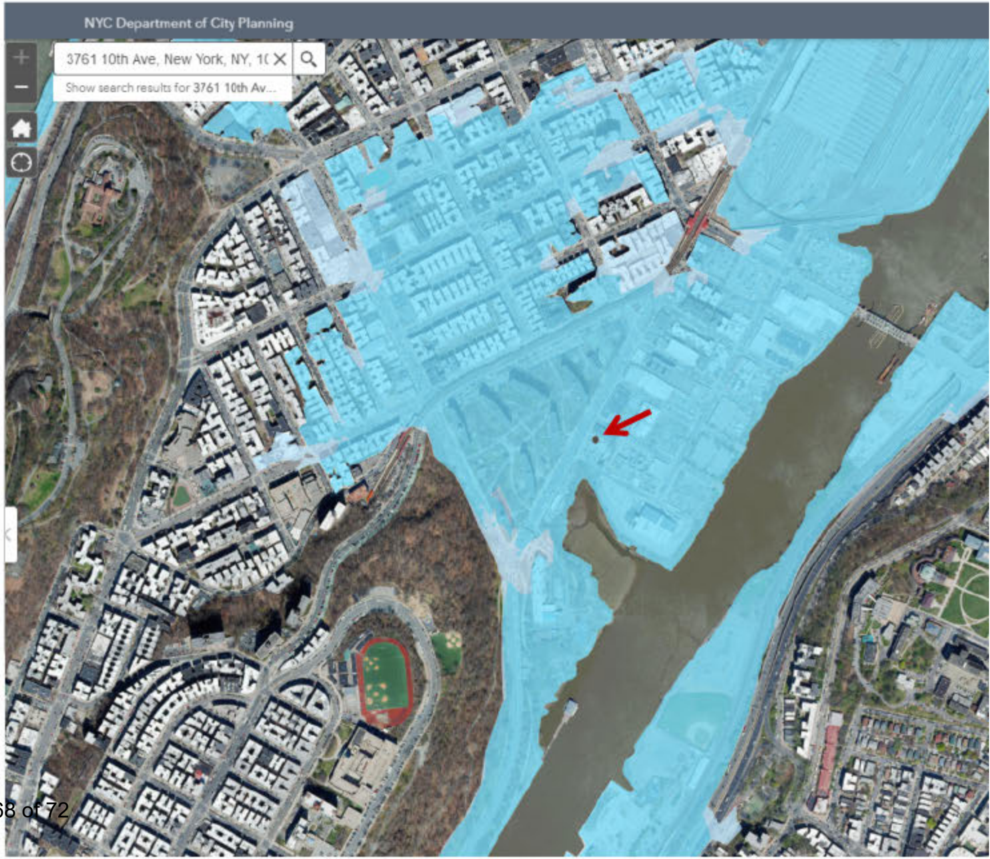



High Tide – 2080s




Future Flood Plain 2080s


High Tide – 2100s




Future Flood Plain 2100s

# Integrative Design Report and Recommendations

NYC Mayor's Office of Recovery and Resiliency — Climate Resiliency Design Guidelines - Version 3.0

## B. Exposure Screening Tool

Use the Exposure Screening Tool to identify and assess climate change-related hazards and risks. A capital project's exposure can be determined based on preliminary project information available at the earliest stages of project planning and/or design. Results from the screening tool can inform if to include the Guidelines in the project scope.

**Exposure Screening Tool**

| | Risk Screening Question | Directions | Answers and Score | Total Score and Next Steps |
|---|---|---|---|---|
| Heat | Does the facility include new construction of, or substantial improvements to, the landscape, hardscape, roof, HVAC, building envelope, ventilation system, or façade? | All parts of NYC are exposed to extreme heat. New construction projects or substantial improvements that include changes to the landscape, hardscape, roof, HVAC, building envelope, ventilation system, or façade could affect the material performance of a project, thermal comfort of occupants, and/or increase ambient temperatures.<br><br>If the project includes any of those components, answer 'yes.' | Yes=1 | Total Score / Exposure Rating:<br>2-5 Low<br>6-8 Medium<br>9-10 High |
| Heat | Is the facility in community district with high heat vulnerability? | Identify the community district your facility is located in. Locate that community district on the Heat Vulnerability Index map located in Section II.A of the Guidelines and note the area's vulnerability. Select the corresponding answer. | Heat Vulnerability Score<br><br>Moderate=3 | If project budget is more than $50 million: ...and scores "Medium" or "High" provide a list of recommendations for modifications to the current design to address the triggered climate risk. Include an order of magnitude cost for each recommended measure. |
| Heat | How many annual heat waves are projected to occur during the facility's useful life? | See Section II.A of the Guidelines and note the annual heat wave projection according to the useful life of the facility. Select the corresponding answer. | # of heat waves<br><br>7 days = 3 | Score 7 Medium |
| Precipitation | Does the facility require a new DEP site connection proposal, or a modification to the existing site connection plan? | The intensity and frequency of precipitation events are projected to increase across all parts of NYC, creating new challenges for stormwater management and impacts to the built environment. New construction projects provide opportunities to accommodate increased precipitation flow volumes, and typically require submitting a new site drainage connection proposal to DEP for review and approval. If a project is a substantial improvement, the scope of work of the substantial improvement would dictate if the previously approved DEP site connection plan will require modifications.<br><br>If a new site connection proposal or modifications are required, answer 'yes.' | Yes=1 | Total Score / Exposure Rating:<br>1 Low<br>2 Medium<br>3 High |
| Precipitation | Does the site have a history of flooding during precipitation events? | Consult institutional knowledge (for example, if this site flooded during Hurricane Irene) and 311 service requests for flooding at or near this site (see hyperlink below) and select "yes" if there is a history of flooding at the site.<br><br>https://data.cityofnewyork.us/Social-Services/Street-Flooding/wymi-u6i8 | No=0 | If project budget is more than $50 million: ...and scores "Medium" or "High" provide a list of recommendations for modifications to the current design to address the triggered climate risk. Include an order of magnitude cost for each recommended measure. |
| Precipitation | Will there be a net increase in impervious area on the site as a result of the project? | Refer to preliminary site plans (if they are part of the project scope) or consult with Capital Project Initiation team. Choose 'yes' if a net increase in impervious area is anticipated. | Yes=1 | Score 2 Medium |

# Integrative Design Report and Recommendations

NYC Mayor's Office of Recovery and Resiliency — Climate Resiliency Design Guidelines - Version 3.0

**Exposure Screening Tool** (Sea level rise)

| Risk Screening Question | Directions | Answers and Score | Total Score and Next Steps |
|---|---|---|---|
| Current Flood Risk<br>Is the facility in the current 1% annual chance floodplain (100-year)? | Visit NYC Flood Hazard Mapper.* Click on the Map Legend and select the 'Preliminary Flood Insurance Rate Maps 2015'. Search for or navigate to the site to see if it is located within the current effective floodplain. If the site is shown to be all or partly in the current floodplain, answer 'yes.'<br>http://www.nyc.gov/floodhazardmapper | No=0 | Total Score / Exposure Rating: 0 = Not Exposed; 1 = Low; 2 = Medium; >3 = High |
| Future Flood Risk<br>Is the facility in the future 1% annual chance floodplain (100-year) at any point during its useful life? | Visit NYC Flood Hazard Mapper.* Click on the Map Legend and select the 'Future Floodplain' that corresponds to the project useful life. Search for or navigate to the property to see if it is located within the future floodplain. If the site is shown to be all or partly in the future floodplain, answer 'yes.'<br>http://www.nyc.gov/floodhazardmapper | No=0 | |
| Current Tidal Inundation<br>Does this site have a history of flooding from high tide events? | Potential sources to answer this question include institutional knowledge (for example, if this site floods during regular high tides) or history of 311 service requests (see hyperlink below). If the site is shown to have a history of tidal flooding, answer 'yes.'<br>https://data.cityofnewyork.us/Social-Services/Street-Flooding/wymi-u6i8 | No=0 | If project budget is more than $50 million: ...and scores "Medium" or "High" provide a list of recommendations for modifications to the current design to address the triggered climate risk. Include an order of magnitude cost for each recommended measure. |
| Future Tidal Inundation<br>Are there any critical access roads to the site that will be inundated by future high tides? | Visit the NYC Flood Hazard Mapper.* Click on the Map Legend and select the "High Tide" scenario that corresponds to the project useful life. Identify if any primary access roads are inundated from high tide plus sea level rise. If the site is shown to have roads at risk of tidal inundation, answer 'yes.'<br>http://www.nyc.gov/floodhazardmapper | No=0 | **Score 0 Not Exposed** |

*For more information on how to use the Flood Hazard Mapper, see Section II.C

# Integrative Design Report and Recommendations

## 7.3 GSG checklist

### Exposure screening tool results

Heat: Project site is located at a medium heat Vulnerability Index area.

Precipitation: The site is at a medium range, site drainage will be provided

Sea Level Risk: Project site has no sea level risk based on the screening and flood maps

NYC Mayor's Office of Recovery and Resiliency

*Climate Resiliency Design Guidelines - Version 3.0*

**Design Strategies Checklist**

This appendix provides a template for identifying possible design strategies to address climate change hazards, as described throughout the Guidelines.

Project Title: K676

**Design Strategies Checklist (not exhaustive)**

| | Extreme Heat | Comments | | Extreme Precipitation | Comments | | Sea Level Rise & Storm Surge | Comments |
|---|---|---|---|---|---|---|---|---|
| ☐ | Select Site in Low Heat Vulnerability Index area | Site was given,no choice | ☑ | Select High Elevation Site | | ☑ | Select High Elevation Site | |
| ☑ | Building Cooling System | | ☐ | Green Roof | Hign structural and maintenance cost | ☐ | Raise Building Floor Elevation | Site limitation to have ramp or stairs |
| ☐ | Minimize East-West Building Orientation | Property size & orientation to fit program | ☑ | Protect Below Grade Areas from Flooding | | ☑ | Waterproof Building Envelope | |
| ☐ | Passive Solar Cooling and Ventilation Systems | Maintenance & available system limitation | ☐ | On-site Stormwater Management (gray) | Site limitation | ☑ | Elevate Critical Building Functions | |
| ☑ | Cool Roof (SRI appropriate) | | ☑ | Reduce Impervious Areas | | ☑ | Elevate Critical Equipment | |
| ☐ | Green Roof (extensive) | tural cost and maintena | ☐ | Permeable Pavement | Play ground safety concerns | ☐ | Perimeter Floodwall / Levee (passive or active) | Avoid building below water level, not appicable |
| ☐ | Vegetative Structures | Higher structural cost and maintenance | ☐ | Increase Green Spaces and Planted Areas | Site limitation | ☐ | Dry/Wet Floodproofing | |
| ☑ | Enhanced HVAC System, including space layout optimization and system scalability | | ☐ | Blue Roof | Not SCA standard roof type | ☐ | Utility Redundancy Design | Additional construction cost |
| ☑ | More Efficient Building Envelope | | ☐ | Bioswale | Site limitation | ☑ | Resilient Materials & Landscape Treatments | |
| ☐ | Parking Lot Shading | No parking space required | ☐ | Other: | | ☑ | Design for Storm Surge Outflow | |
| ☑ | Light Colored Pavements (appropriate SRI) | | | | | ☑ | Install Backwater Flow Prevention | |
| ☐ | Increase Planted Areas | Property size limitation | | | | ☐ | Design for Scour | Existing street storm line elevation fixed |
| ☐ | Permeable Surfaces and Open-grid Pavement | Not appropriate for playground | | | | ☐ | Raise Road Elevation | Not practical/ DOT control road design |
| ☐ | Other: | | | | | ☐ | Other: | |

Permanent perimeter flood walls are not permitted to meet floodproofing requirements in buildings with substantial improvements and/or damages.

Utility redundancy design should be pursued for critical systems, not all building systems.

Design Strategies Checklist

# Integrative Design Report and Recommendations

### 7.4 Cost for Heat and Precipitation for each potential measure

1) A SRI appropriate roof is a minimal method to reduce the heat island effect. There is no additional cost.
2) One of the most effective methods to reduce heat island effect. Initial cost for an extensive green roof is estimated at an extra $.[redacted] for a roof of appropriately 145,000 s.f. like this new school.
3) This can generally be translated to a thicker layer of insulation. Additional cost is estimated at $[redacted]/s.f. or $[redacted] for this new school.
4) Light colored asphalt (SRI appropriate) is a minimal method to reduce the heat island effect. There is no additional cost.
5) Cost for planting is estimated at $[redacted] per s.f. only slightly higher than the estimates $[redacted] per s.f. for concrete pavement. Planting in a school setting is not ideal.
6) Permeable pavers are an estimation cost increase of $ [redacted] per s.f. compared to concrete or asphalt pavement.
7) One of the most effective methods to reduce heat island effect. Initial cost for a (integrative) green roof is estimated at an extra $ [redacted] for a roof of appropriately 14,500 s.f. like this new school.
8) Installing an on-site gray water systems for a building of this size is estimated at $ [redacted]
9) Reducing impervious areas is a good method to manage runoff if percolation rate at the site is suited. There is only minimal additional cost of an estimated $[redacted] per s.f.
10) There is an additional cost of $[redacted] per s.f. for pervious concrete installation.
11) Cost for green areas and planting is estimated at $ [redacted] per s.f. only slightly higher than the estimated $[redacted] per s.f. for concrete pavement. Planting in a school setting is not ideal.
12) Blueroof is a very effective way to manage storm water. Cost is estimated at appropriately @[redacted] per s.f. or $ [redacted] for a roof of approx.. 14,500 s.f.
13) A bioswale can be another effective method to storm water. Cost of bioswale is estimated at $ [redacted] per s.f. or $ [redacted] for a bioswale of 1,000 s.f.