

# ***CLEANING BY GREENING***

## *ADAPTIVE REUSE OF AMERICA'S OPEN-PIT MINES*

*Master's Thesis Project by Jacob Edwards*



# PRESENTATION OVERVIEW

## 1 THESIS TOPIC OVERVIEW

## 2 HISTORY OF THE PROBLEM

## 3 MY SOLUTION



*Missabe Mountain Iron Mine, Virginia*



# 1 THESIS TOPIC OVERVIEW

## HOW THIS THESIS WAS CHOSEN



*Afton, Virginia, and BWCA in Minnesota*



*Virginia, Minnesota*



# 1 THESIS TOPIC OVERVIEW

## WHAT IS AN OPEN-PIT MINE?



*Fargo, Twin Cities, and mines*



*Thunderbird Mine - Virginia, Minnesota*



# 1 THESIS TOPIC OVERVIEW

## WHAT IS AN OPEN-PIT MINE?



*Thunderbird Mine Looking North*

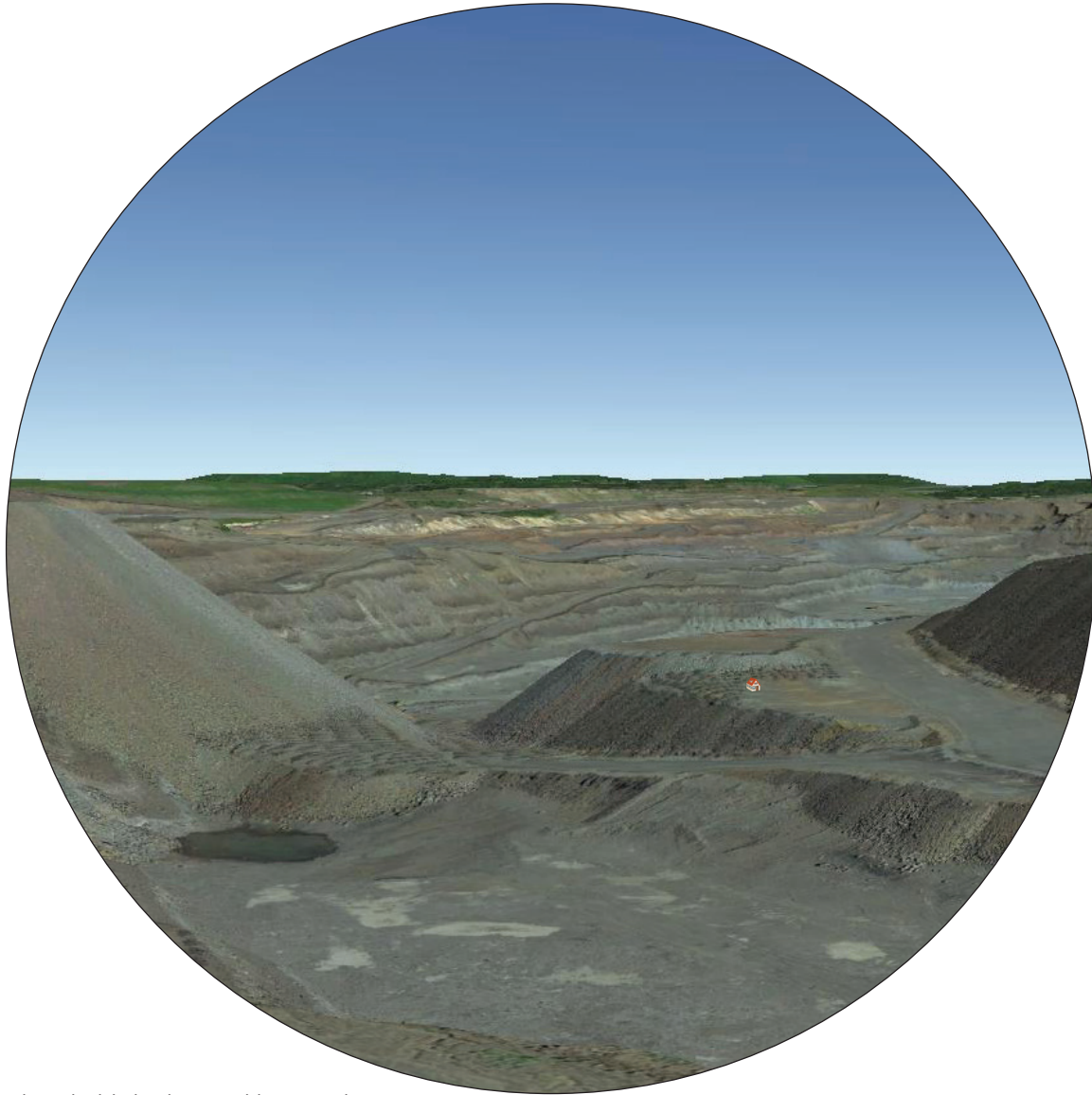


*Thunderbird Mine Looking South*

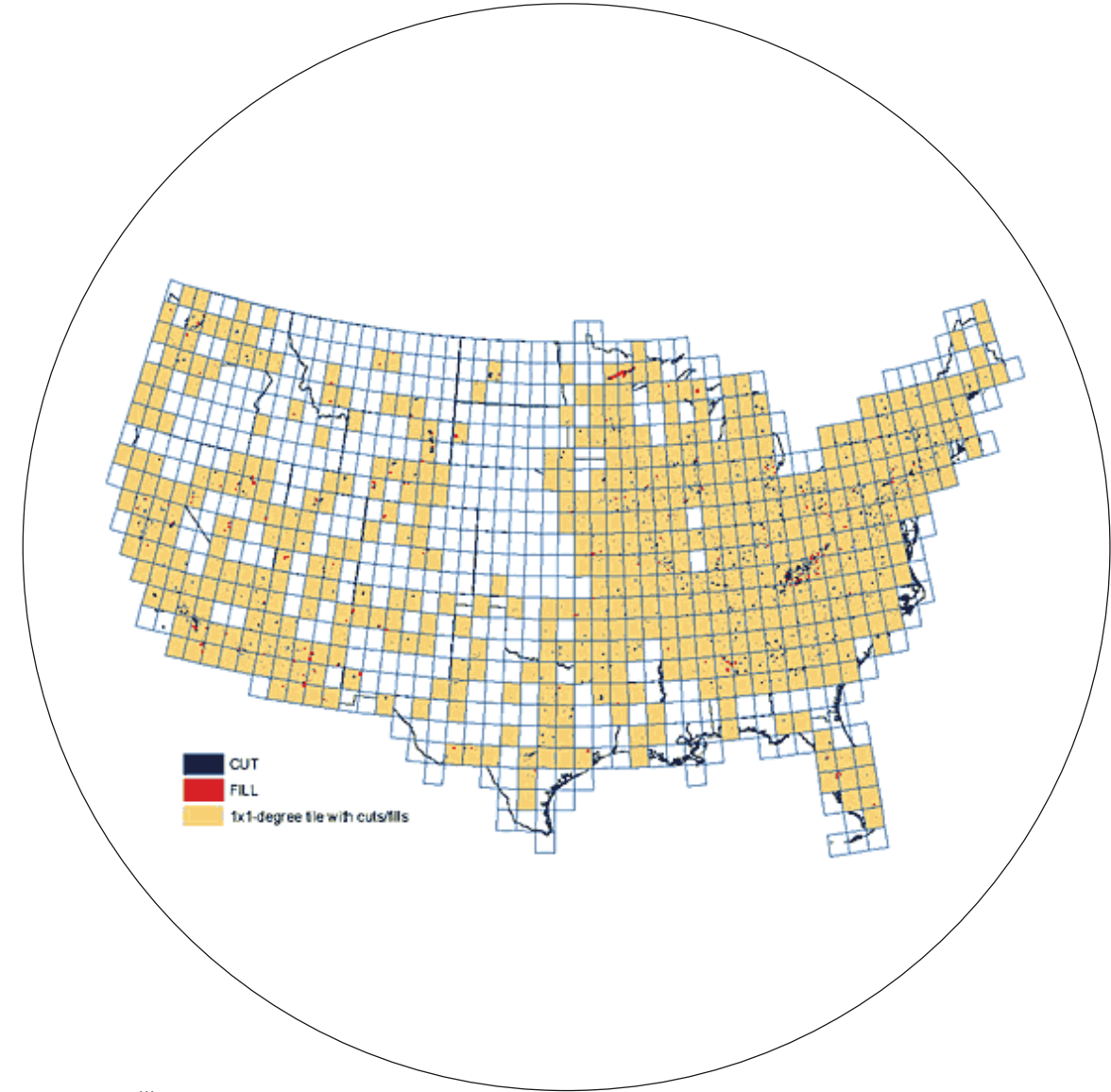


# 1 THESIS TOPIC OVERVIEW

## WHAT IS AN OPEN-PIT MINE?



Thunderbird Mine Looking North



USA Cut/Fill Map



# 1 THESIS TOPIC OVERVIEW

## DANGERS OF EXPOSED ROCK



*Acid Mine Drainage*

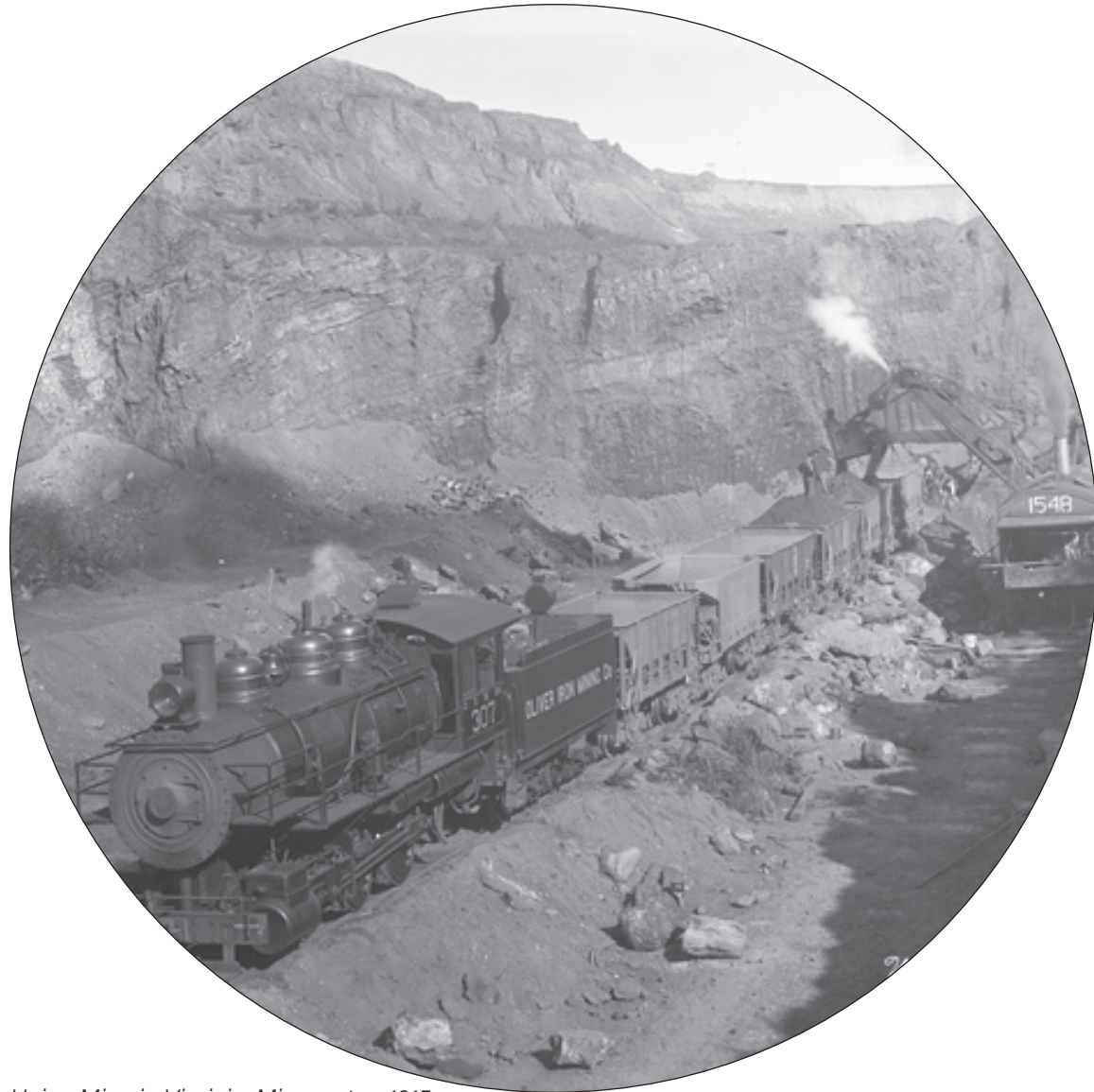


*Results of Acid Mine Drainage*



# 2 HISTORY OF THE PROBLEM

## HISTORY OF THE MINES



Union Mine in Virginia, Minnesota - 1915



New York Times Article - August 7, 1982





# 2 HISTORY OF THE PROBLEM

## HISTORY OF THE BUSINESSES



Virginia, Minnesota - 1893

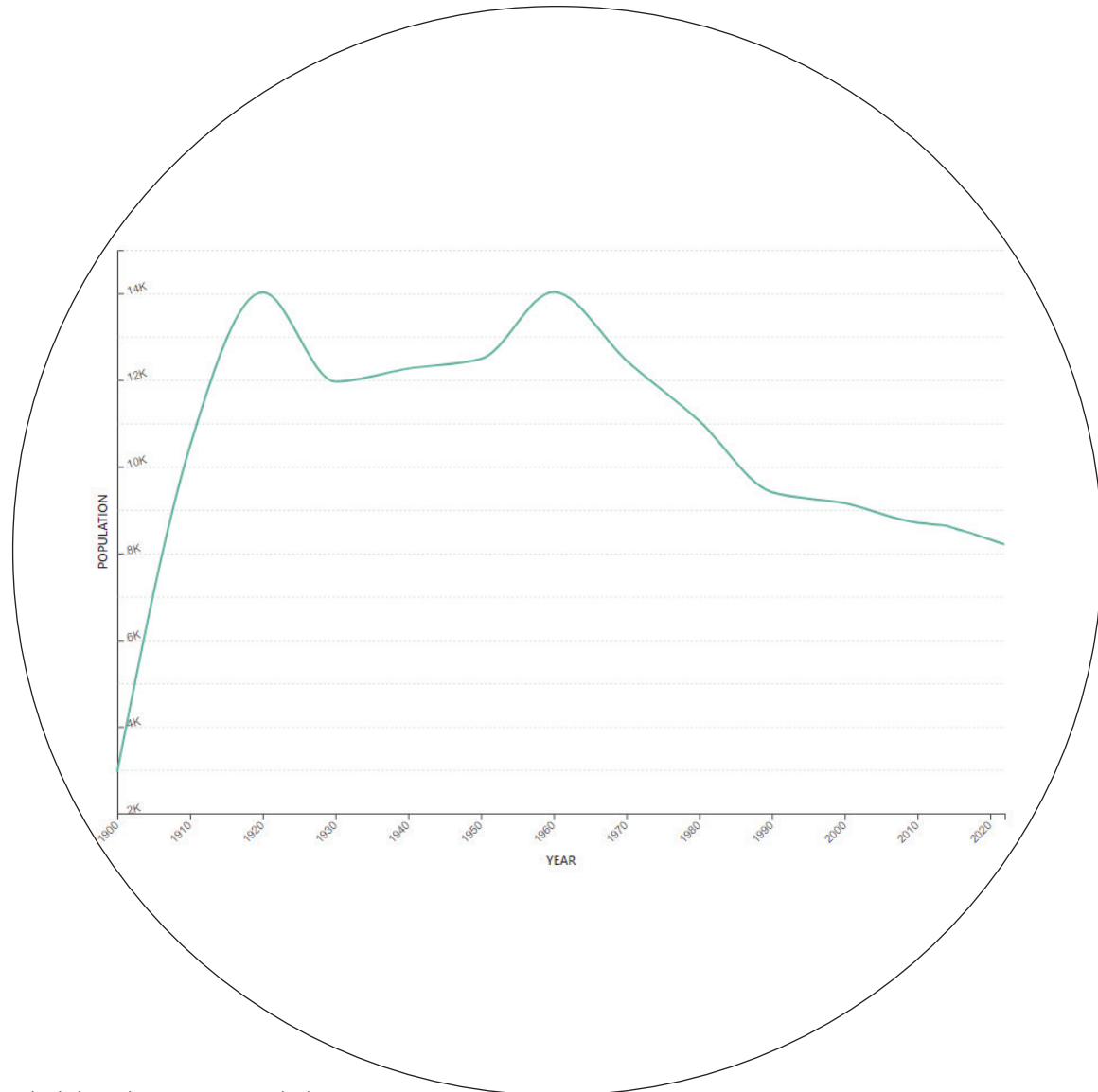


Virginia, Minnesota - Present Day



# 2 HISTORY OF THE PROBLEM

## HISTORY OF THE PEOPLE



Virginia, Minnesota Population



Virginia, Minnesota Economy



# 1 & 2 - SUMMARY

ECONOMY



POPULATION



MINING



# 2 HISTORY OF THE PROBLEM

WHAT IS THE CURRENT SOLUTION? - OPTION #1



*Leonidas Overlook*



*Old Mine Filled With Water*



# 2 HISTORY OF THE PROBLEM

WHAT IS THE CURRENT SOLUTION? - OPTION #2



*Barvue Mine, Quebec BEFORE*



*Barvue Mine, Quebec DURING*



*Barvue Mine, Quebec AFTER*

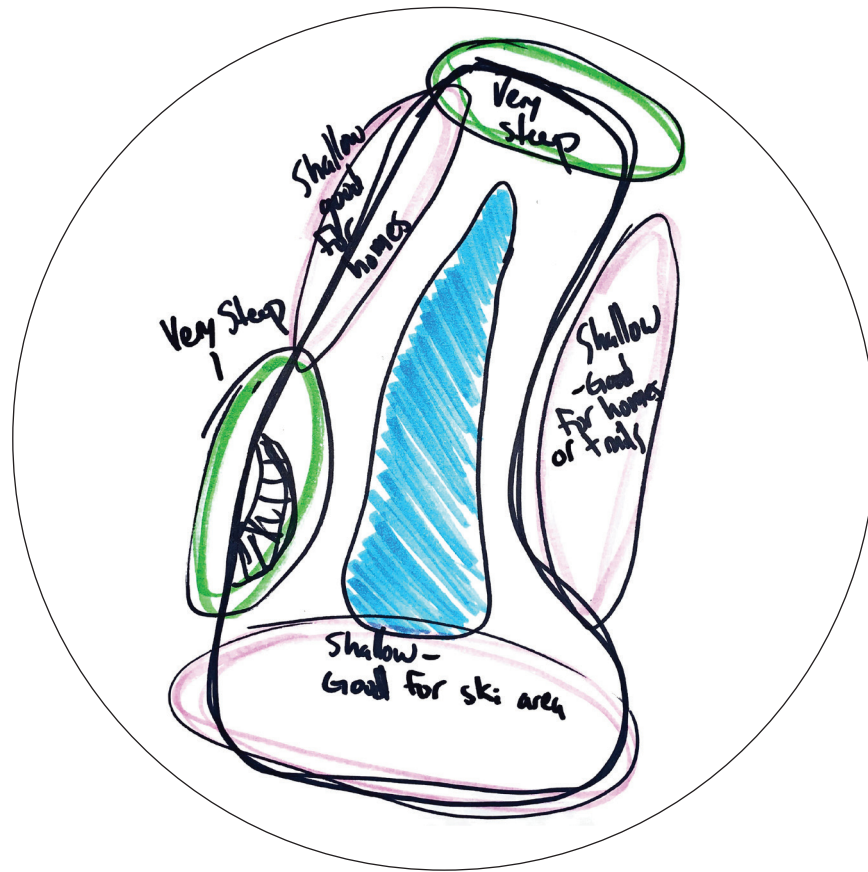


# 3 MY SOLUTION TO THE PROBLEM

COMBINE EXISTING SOLUTIONS WITH ARCHITECTURE INTO A NEW FRAMEWORK- OPTION #3

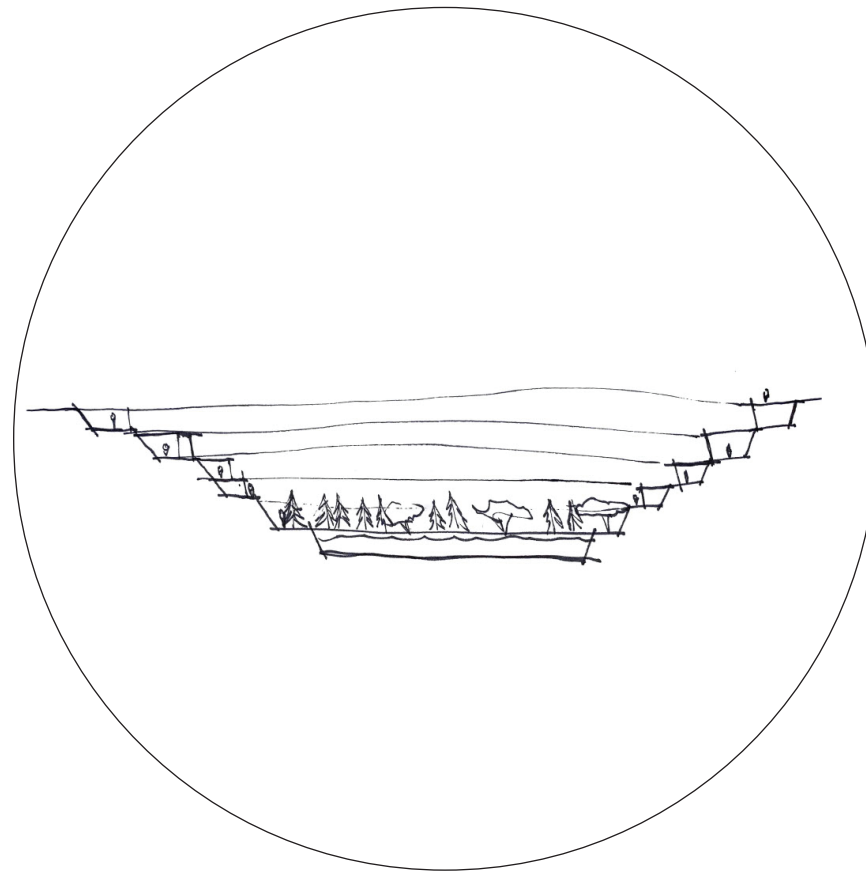
## ANALYZE

WHAT IS THE AREA LIKE?



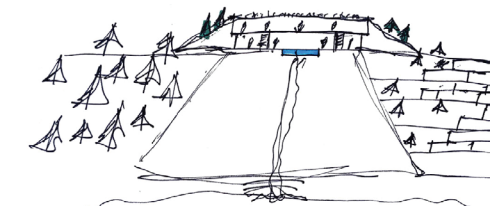
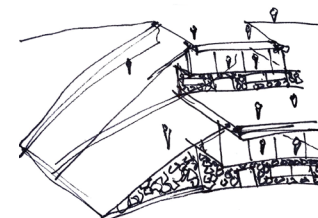
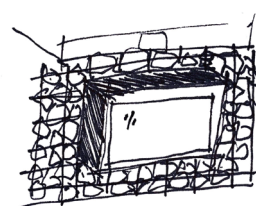
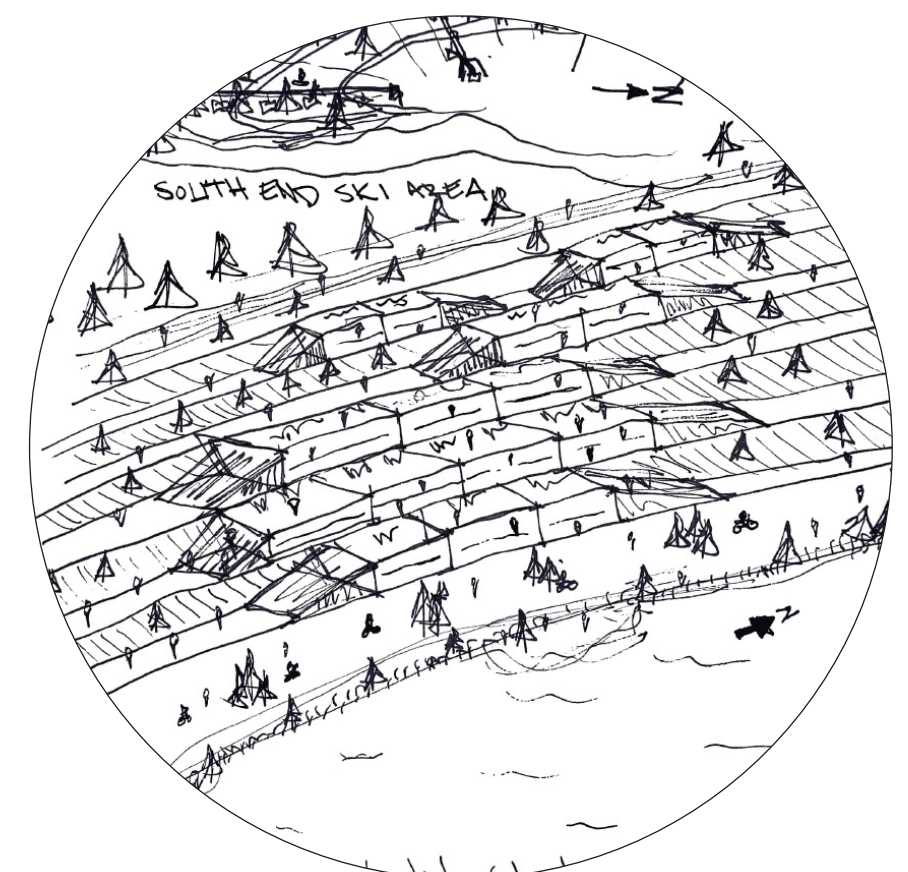
## EVALUATE

WHAT DOES THE AREA NEED?



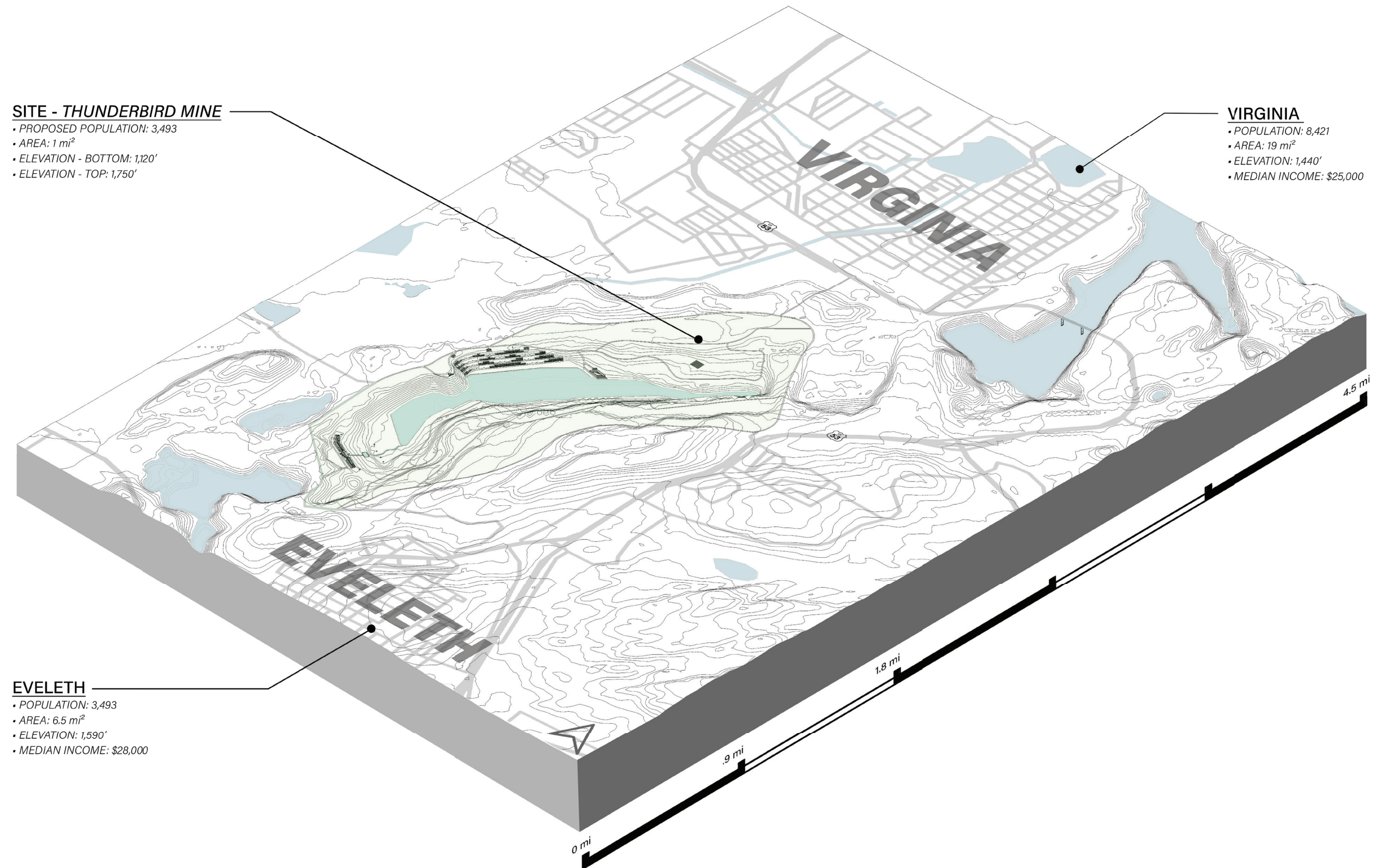
## IMPLEMENT

BUILD AND PLANT

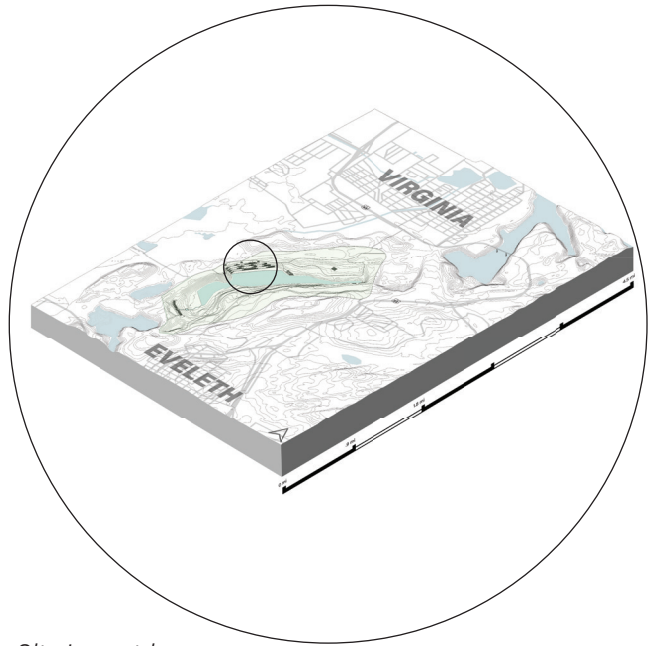


# 3 MY SOLUTION TO THE PROBLEM

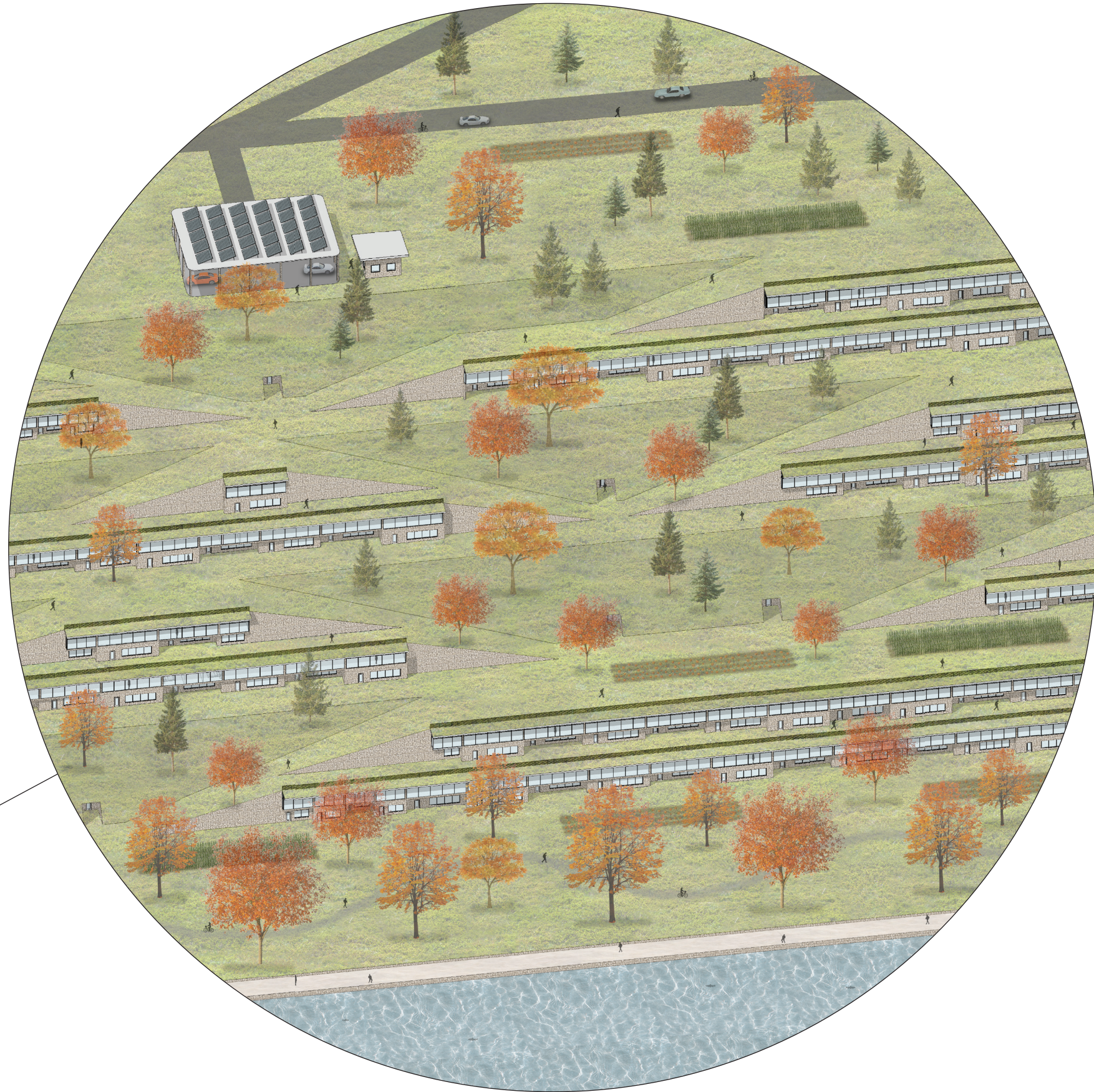
COMBINE EXISTING SOLUTIONS WITH ARCHITECTURE INTO A NEW FRAMEWORK- OPTION #3



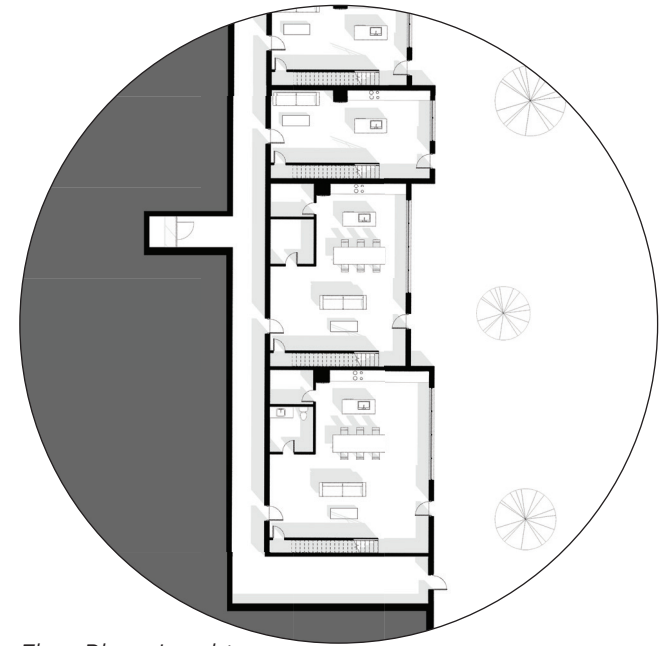
# 3 MY SOLUTION



Site Isometric



Isometric

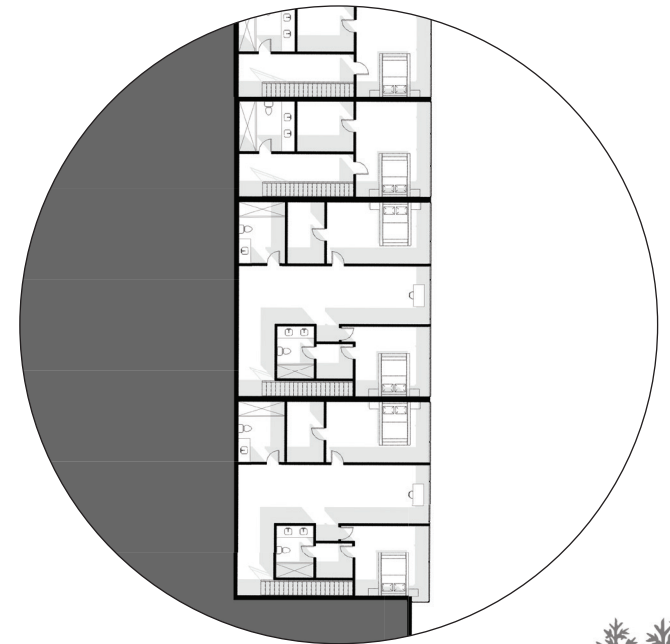


Floor Plan - Level 1

## HOUSING CLUSTERS



Current Conditions



Floor Plan - Level 2



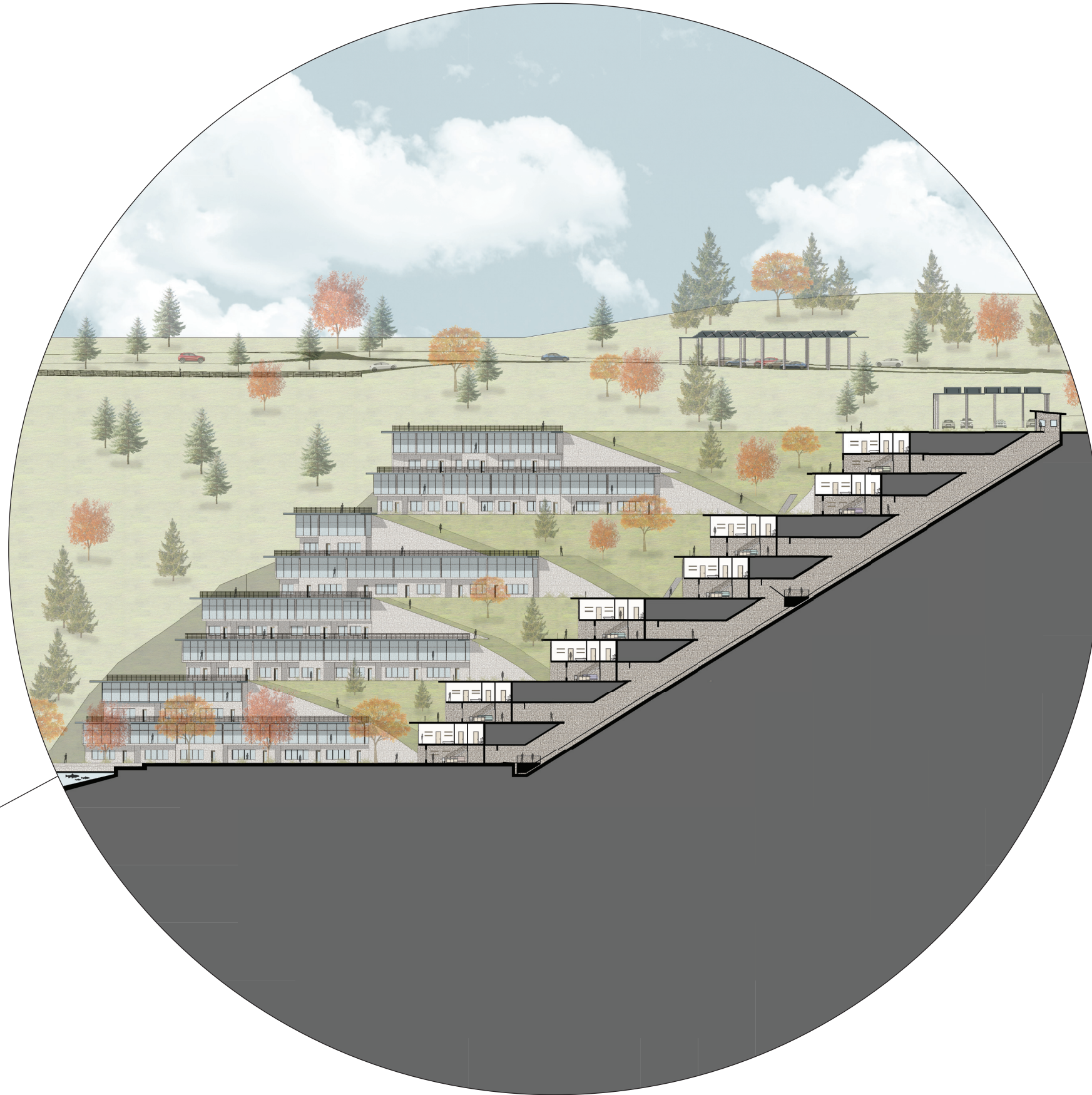


# 3 MY SOLUTION

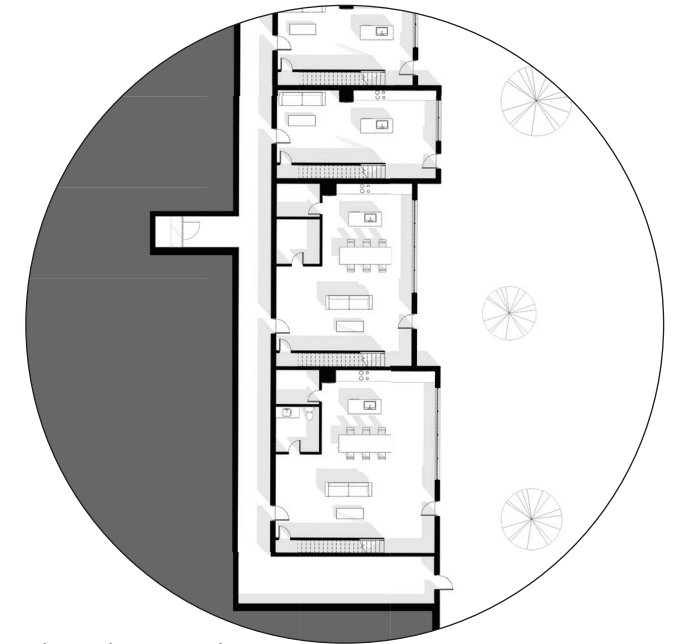


Site Isometric

## HOUSING CLUSTERS



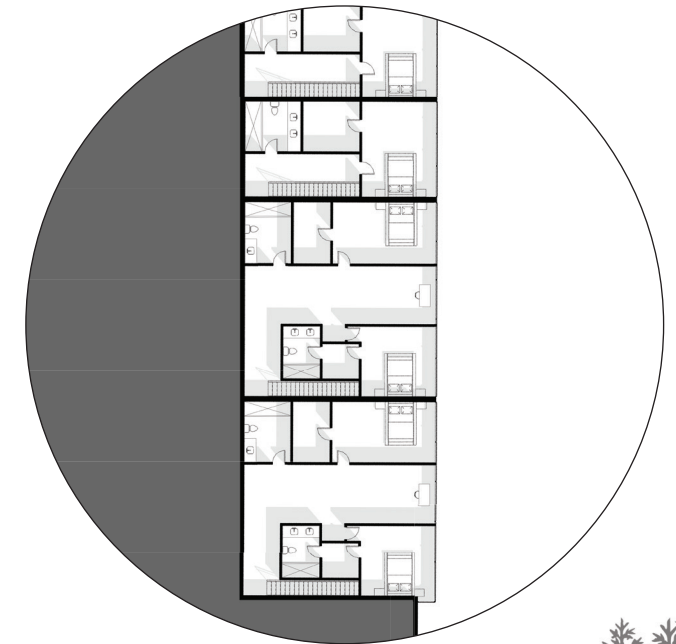
Section



Floor Plan - Level 1



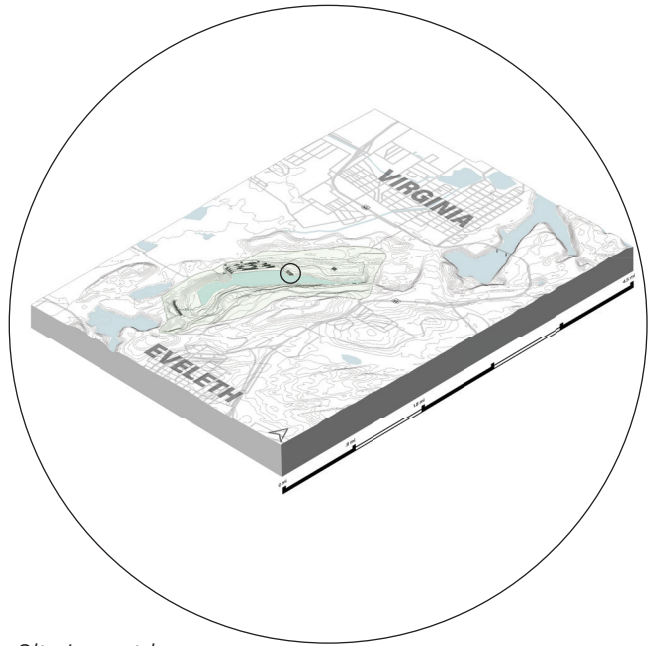
Current Conditions



Floor Plan - Level 2

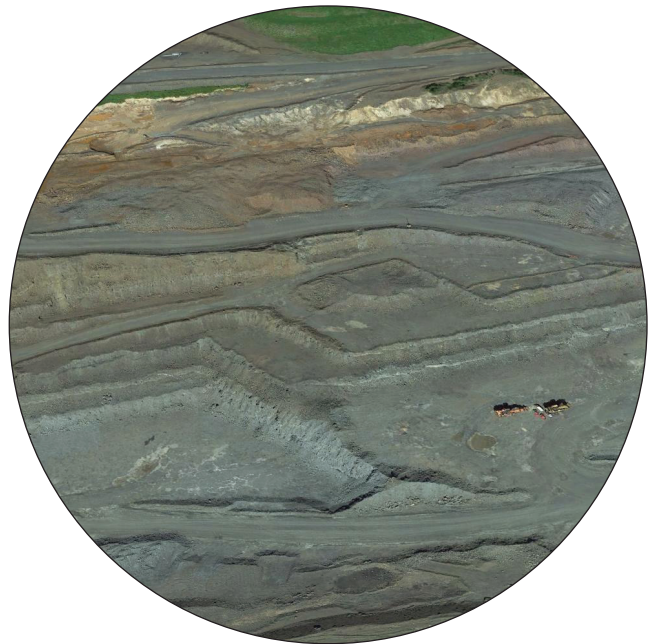


# 3 MY SOLUTION

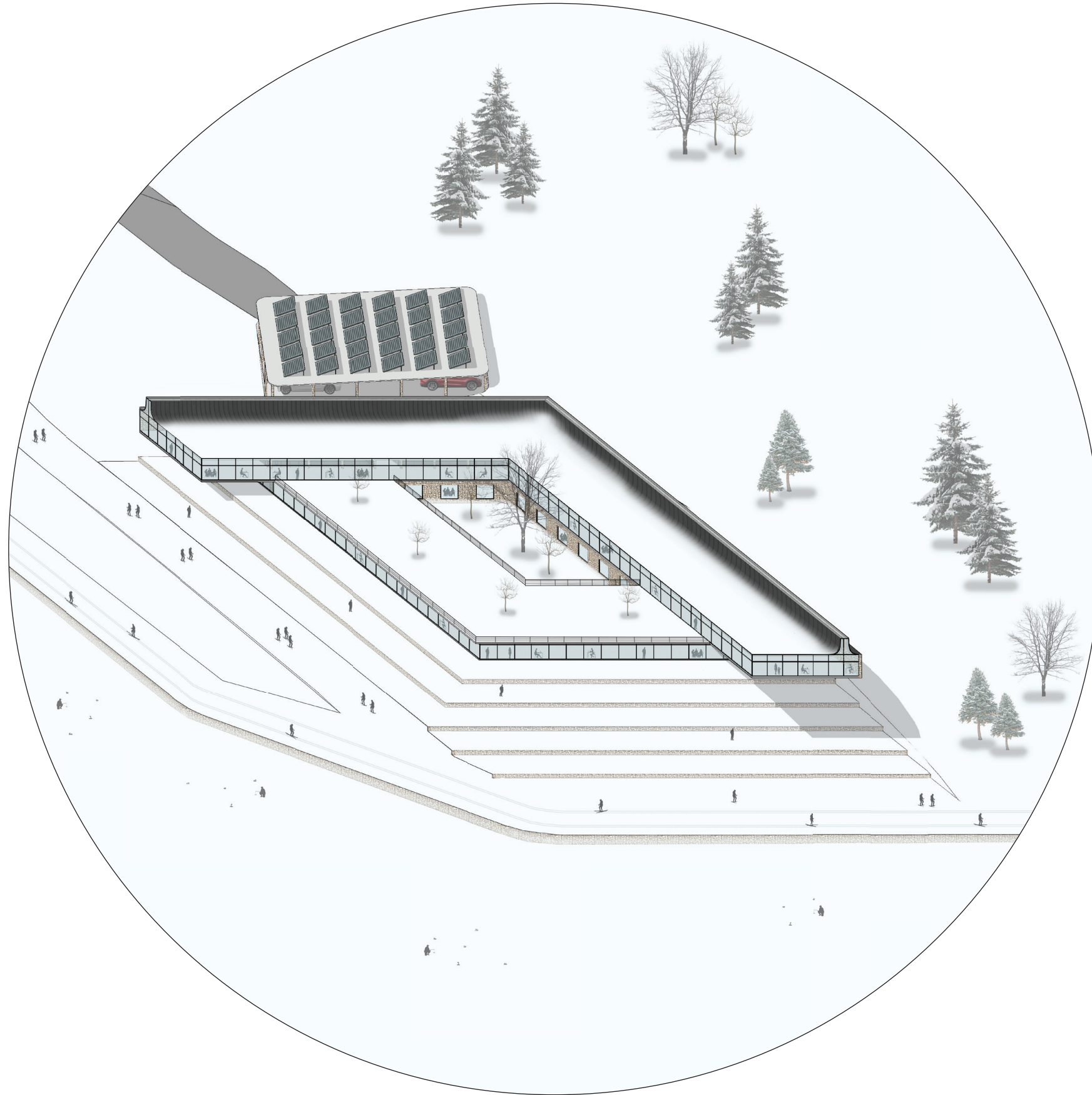


Site Isometric

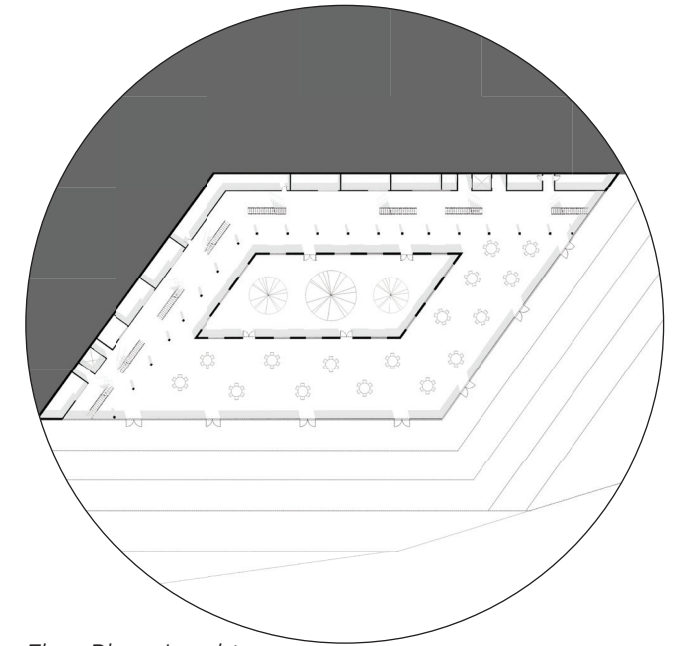
## COMMUNITY CENTER



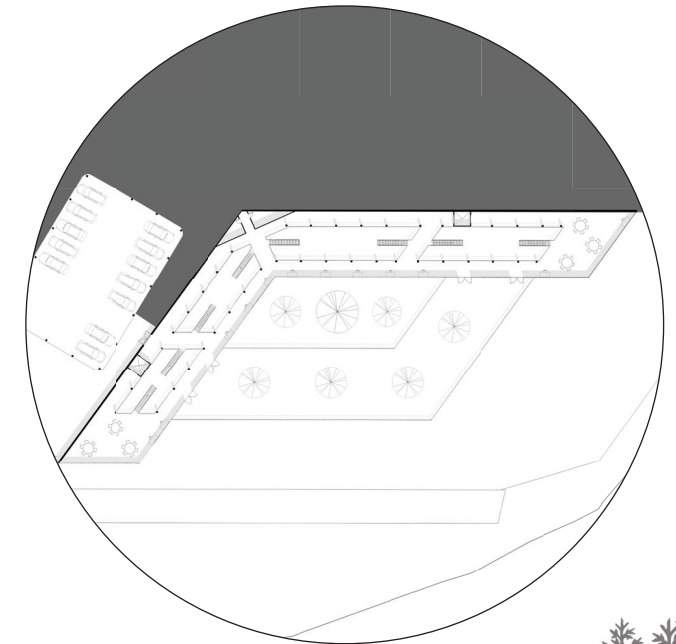
Current Conditions



Isometric



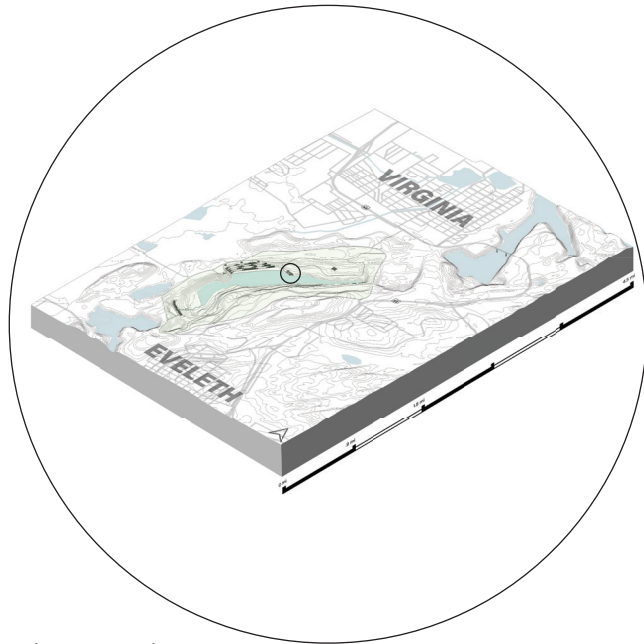
Floor Plan - Level 1



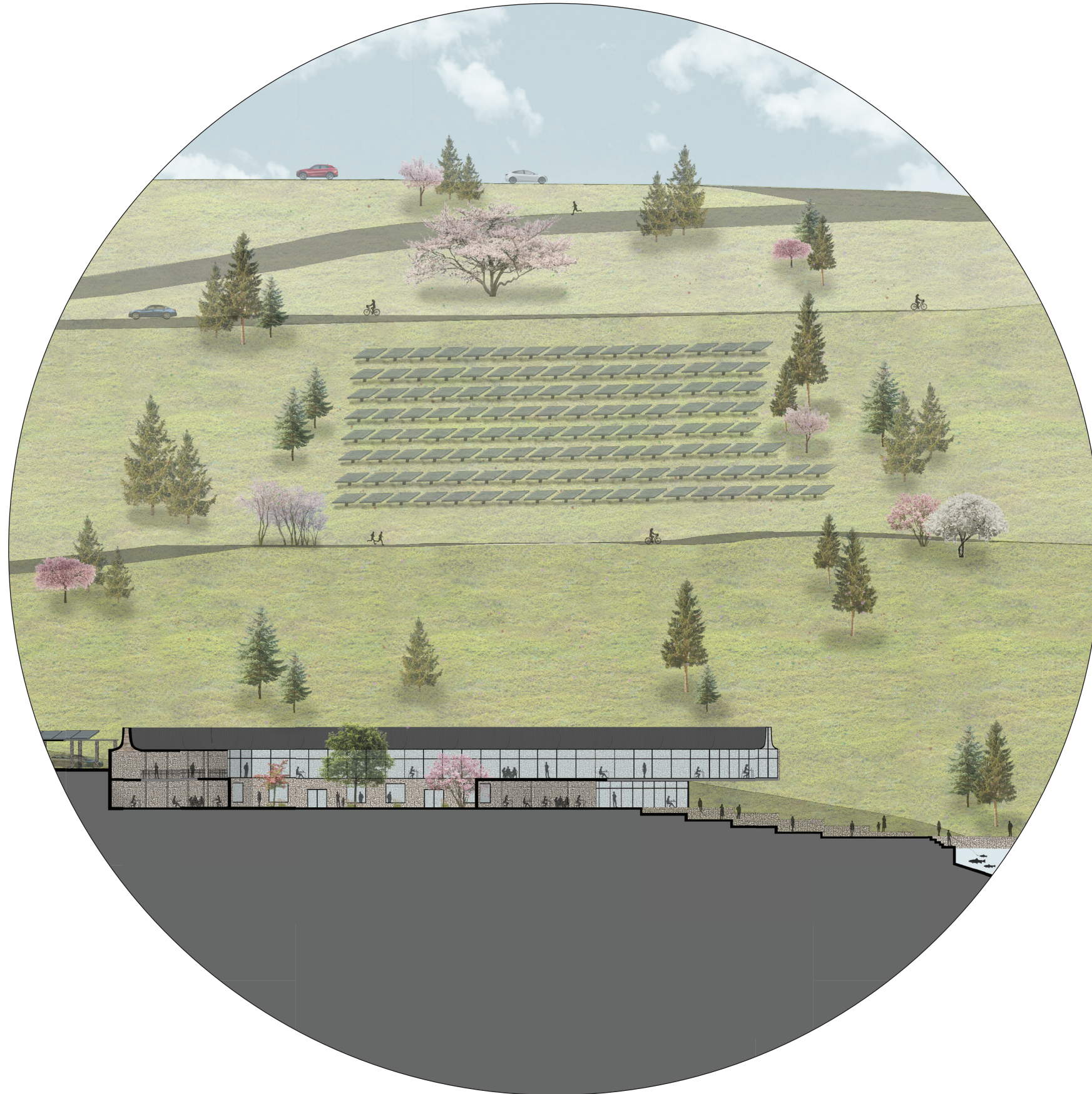
Floor Plan - Level 2



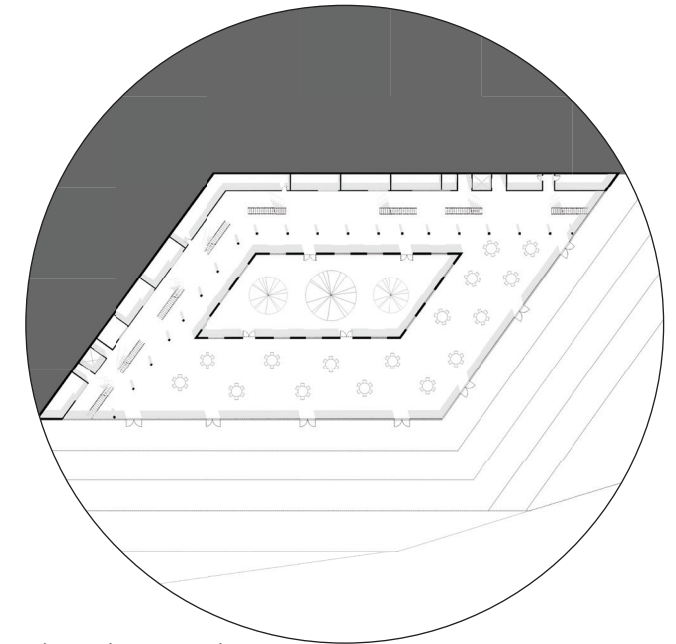
# 3 MY SOLUTION



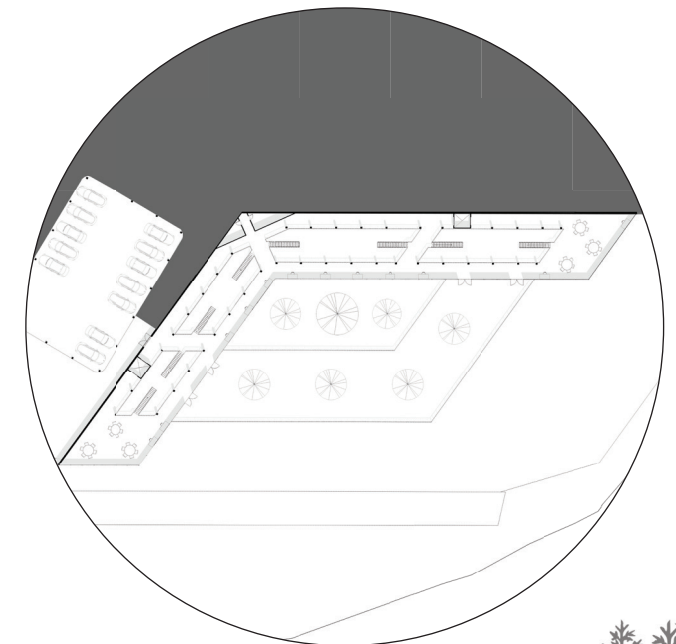
Site Isometric



Section

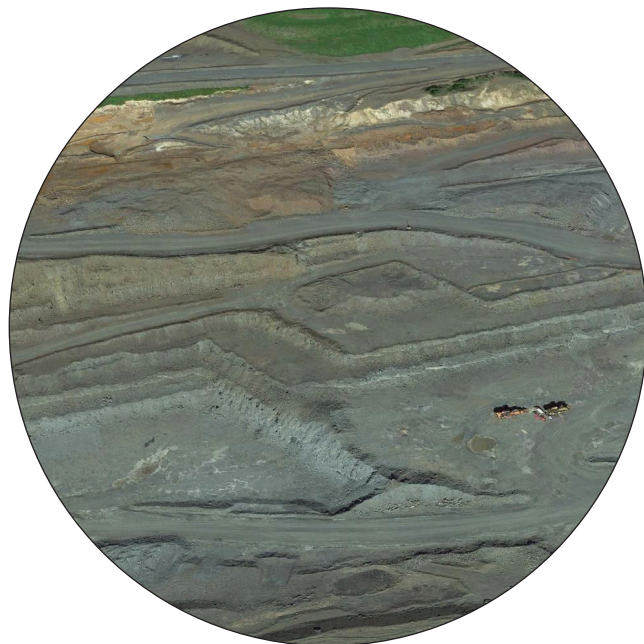


Floor Plan - Level 1



Floor Plan - Level 2

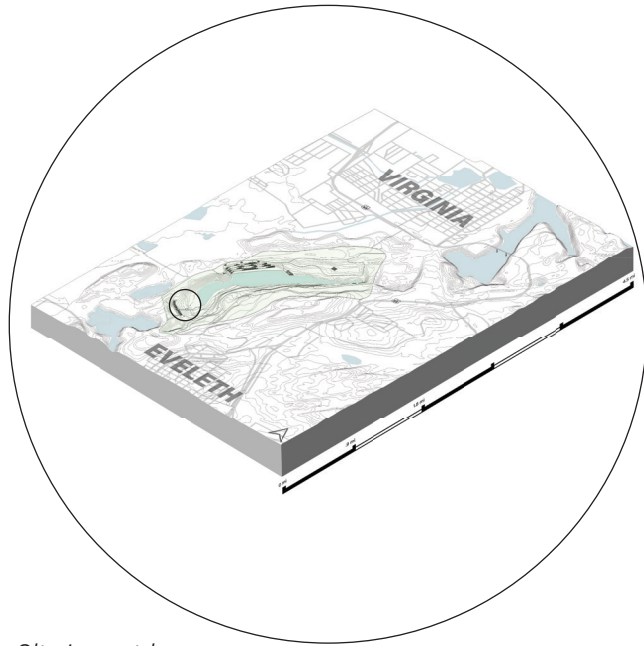
## COMMUNITY CENTER



Current Conditions



# 3 MY SOLUTION



Site Isometric

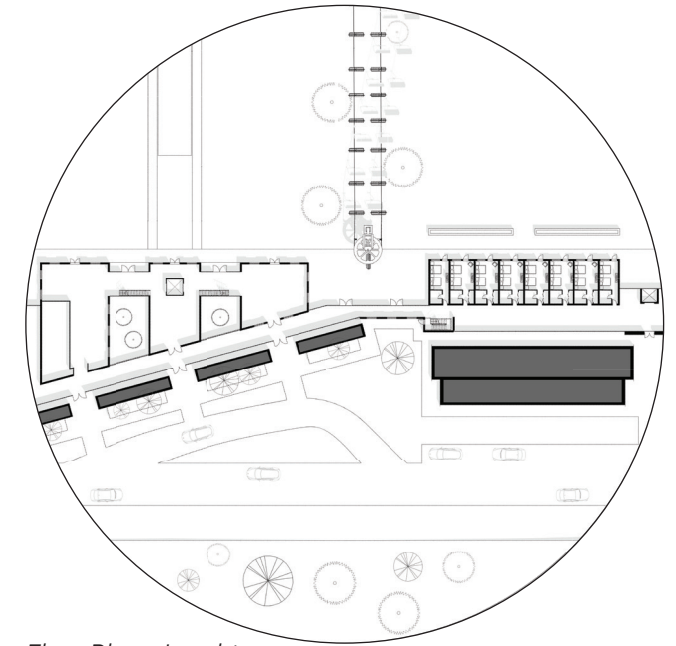
## SKI RESORT



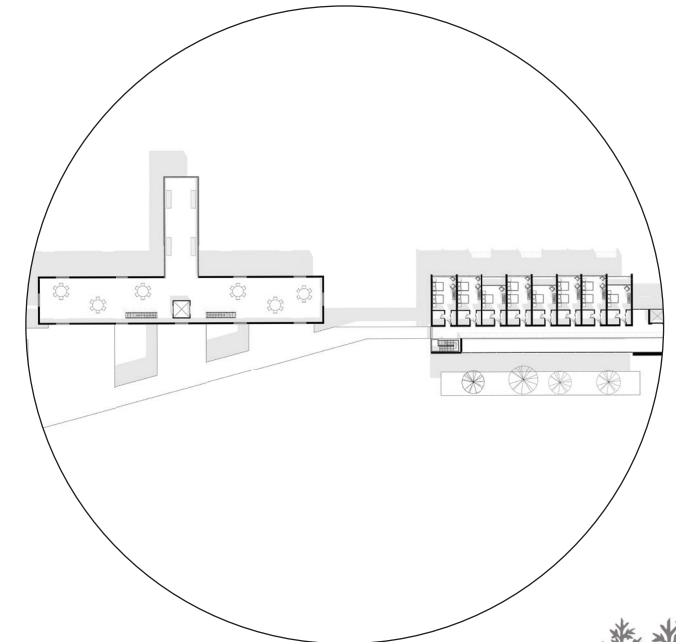
Isometric



Current Conditions



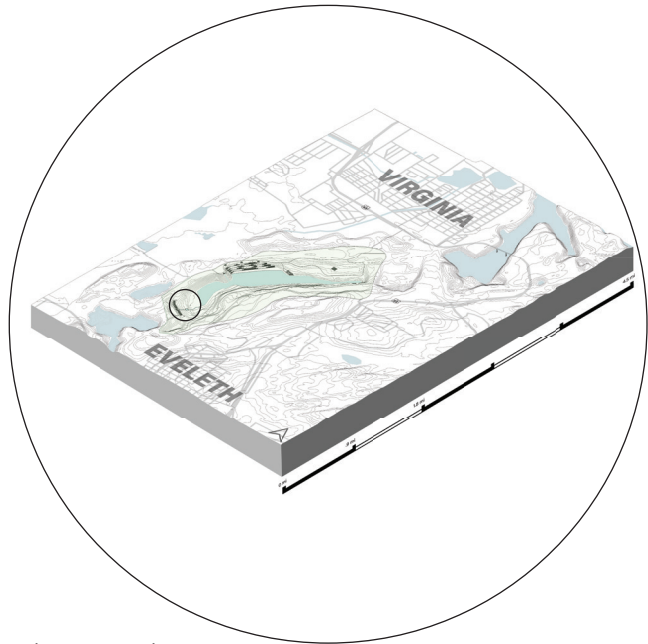
Floor Plan - Level 1



Floor Plan - Level 2



# 3 MY SOLUTION

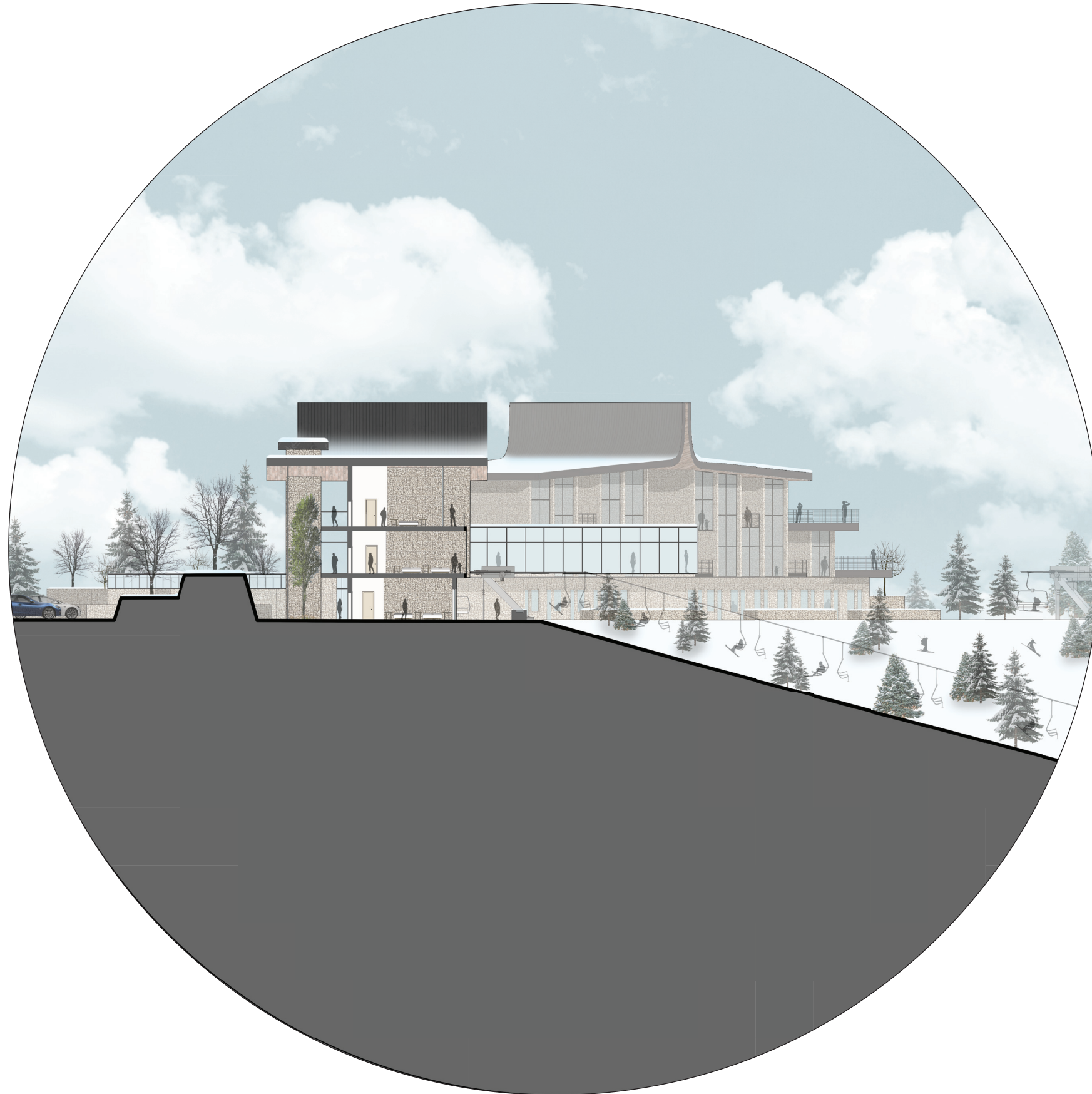


Site Isometric

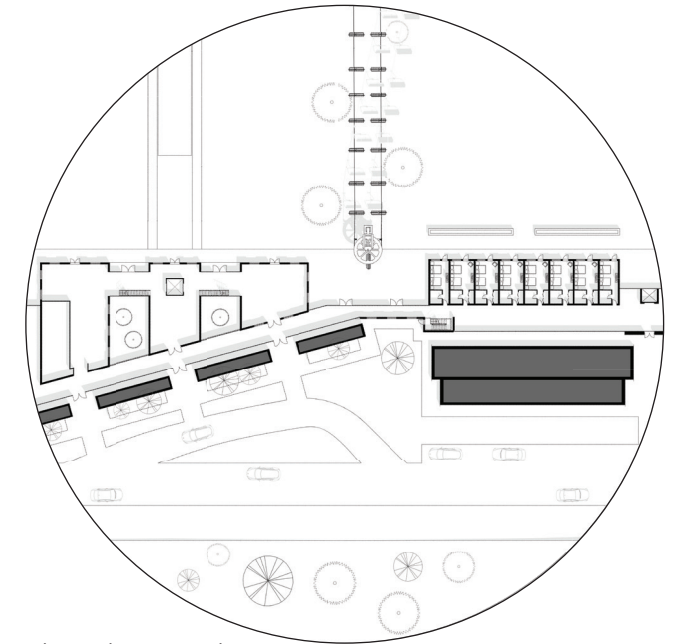
## SKI RESORT



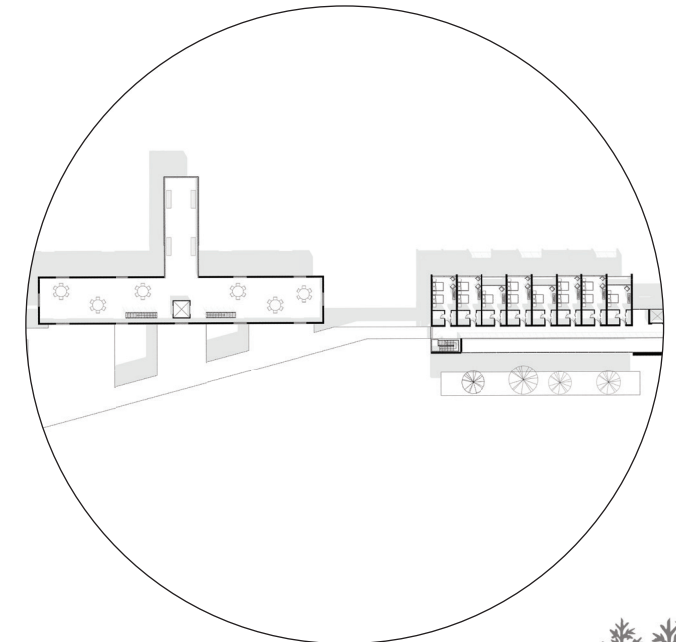
Current Conditions



Section



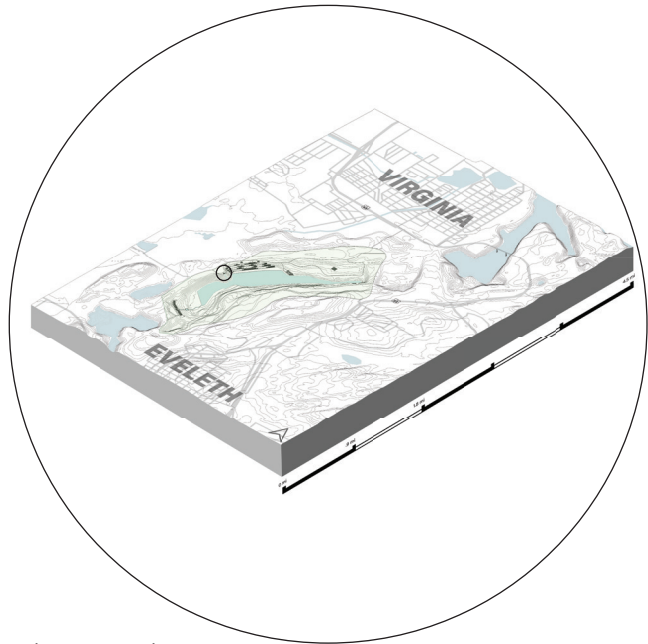
Floor Plan - Level 1



Floor Plan - Level 2



# 3 MY SOLUTION

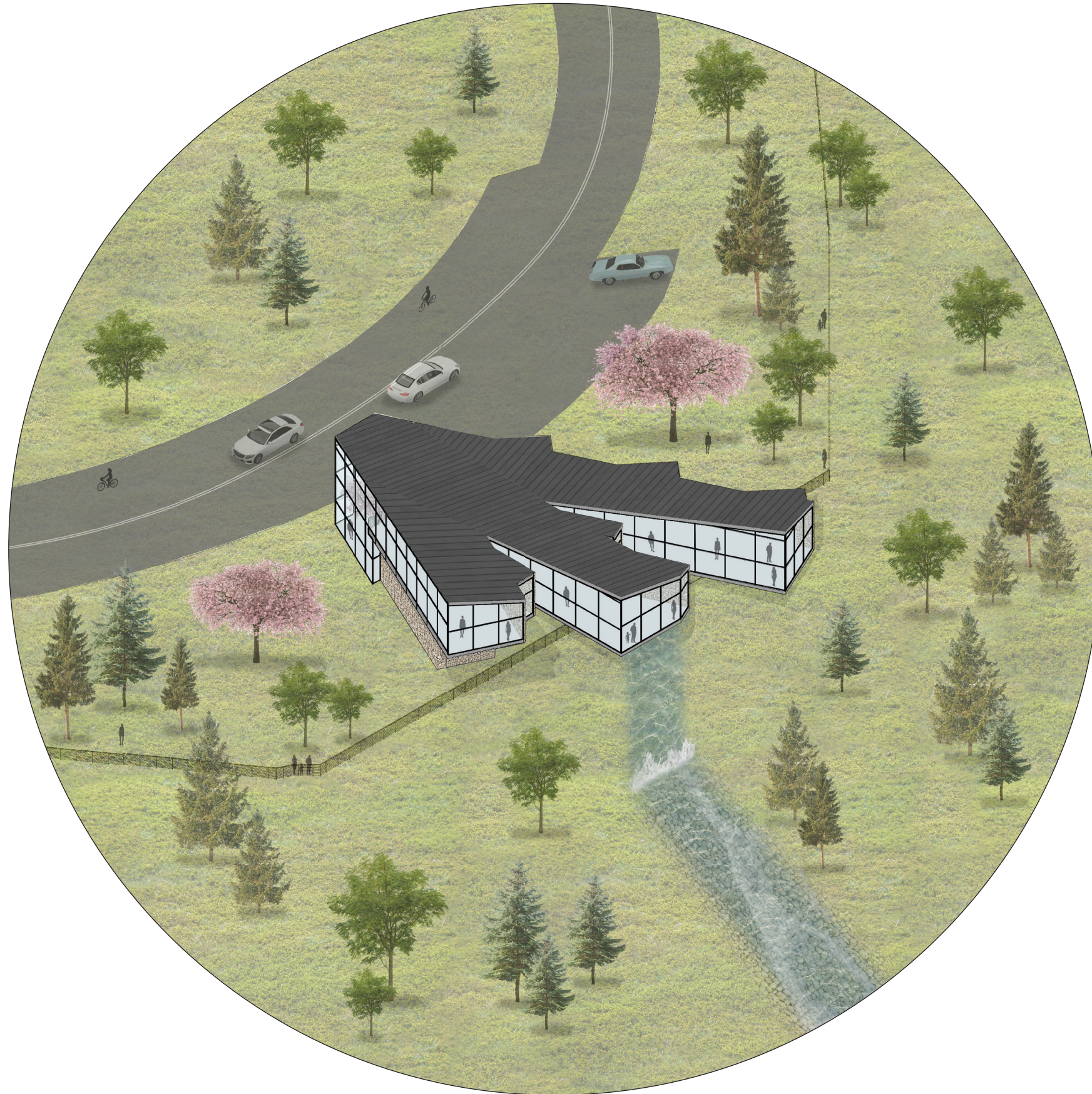


Site Isometric

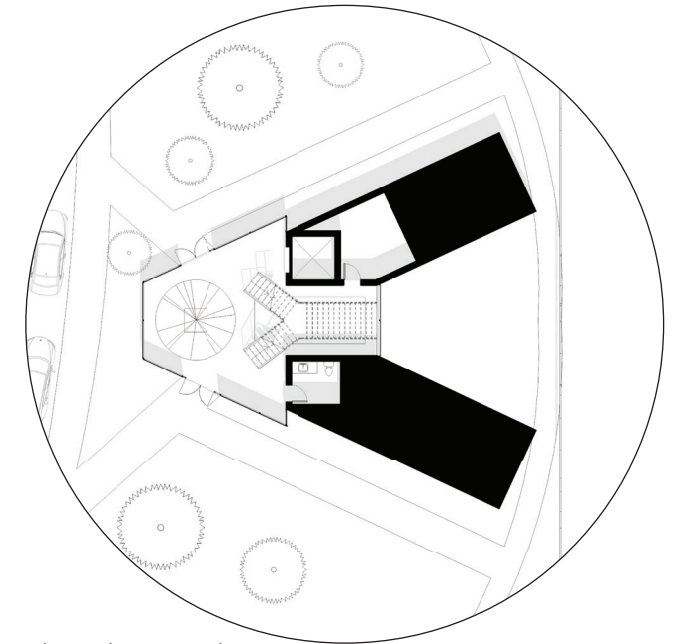
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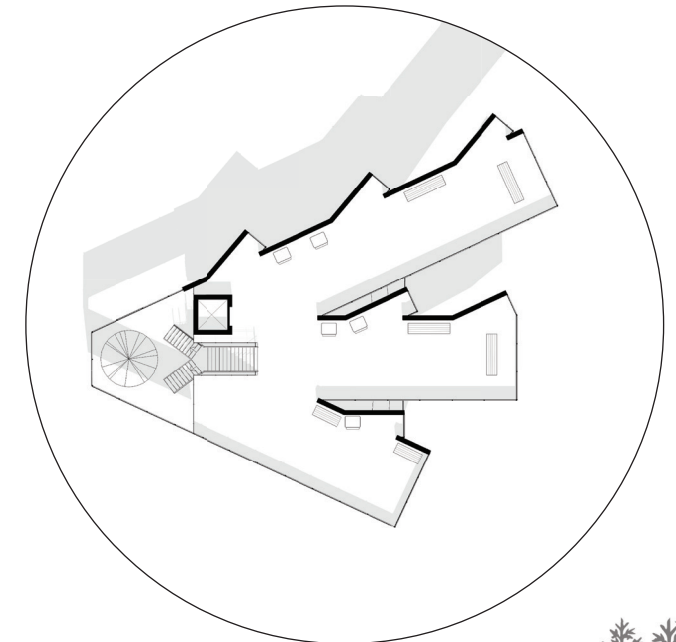
Current Conditions



Isometric



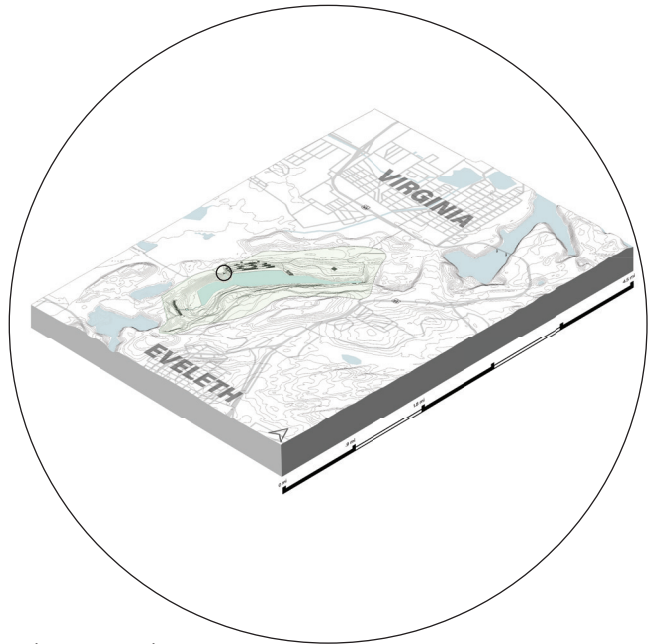
Floor Plan - Level 1



Floor Plan - Level 2



# 3 MY SOLUTION

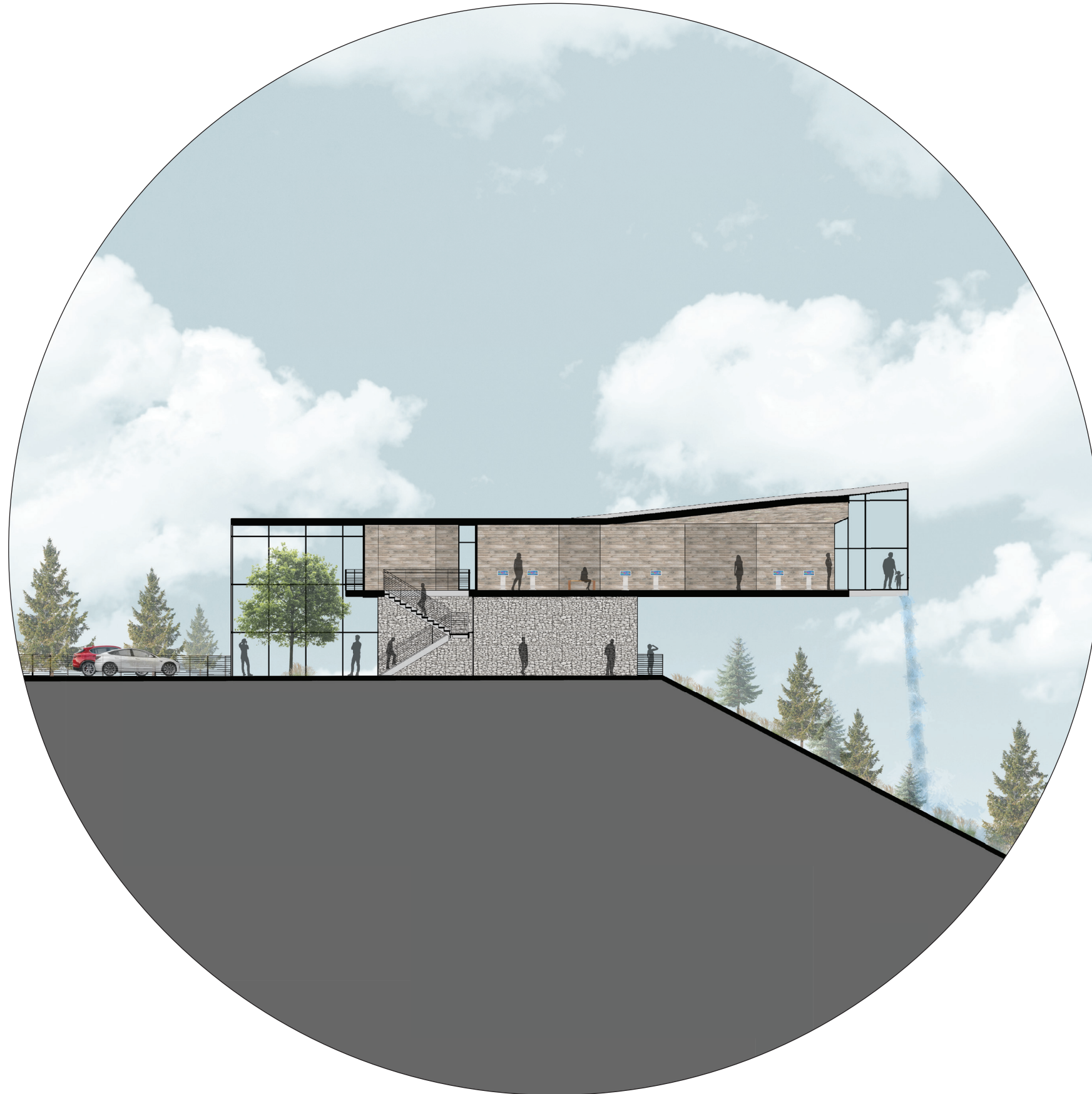


Site Isometric

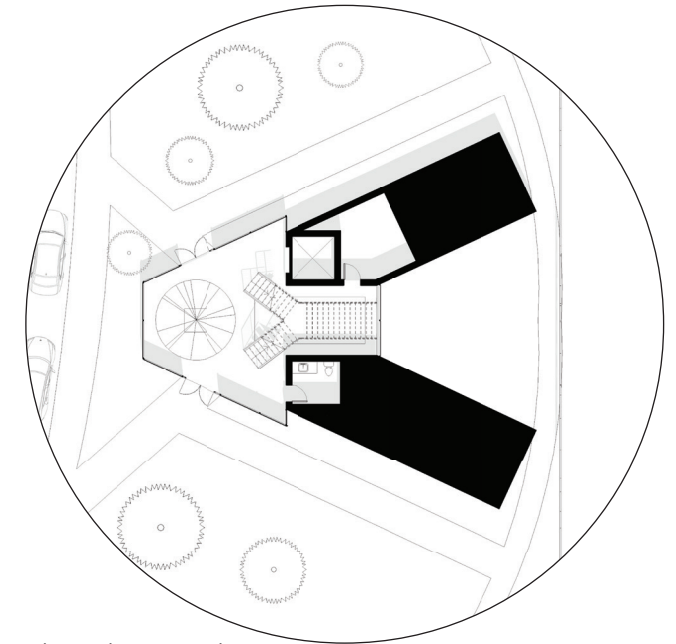
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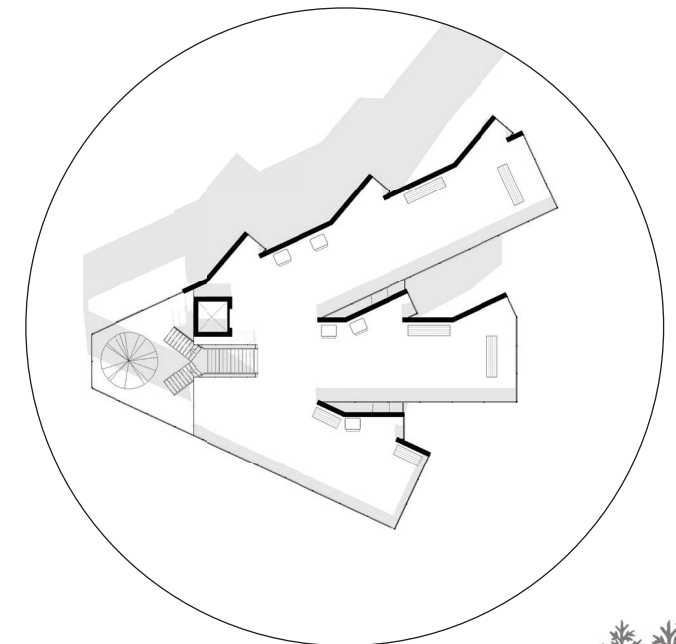
Current Conditions



Section



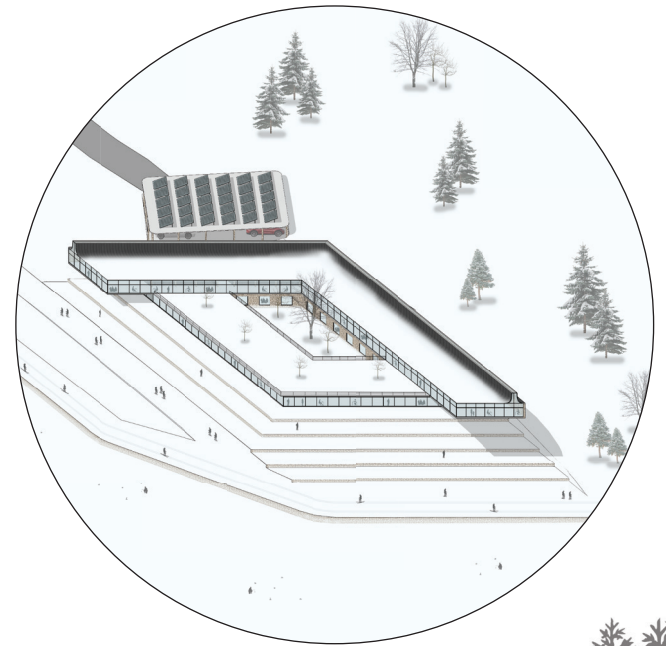
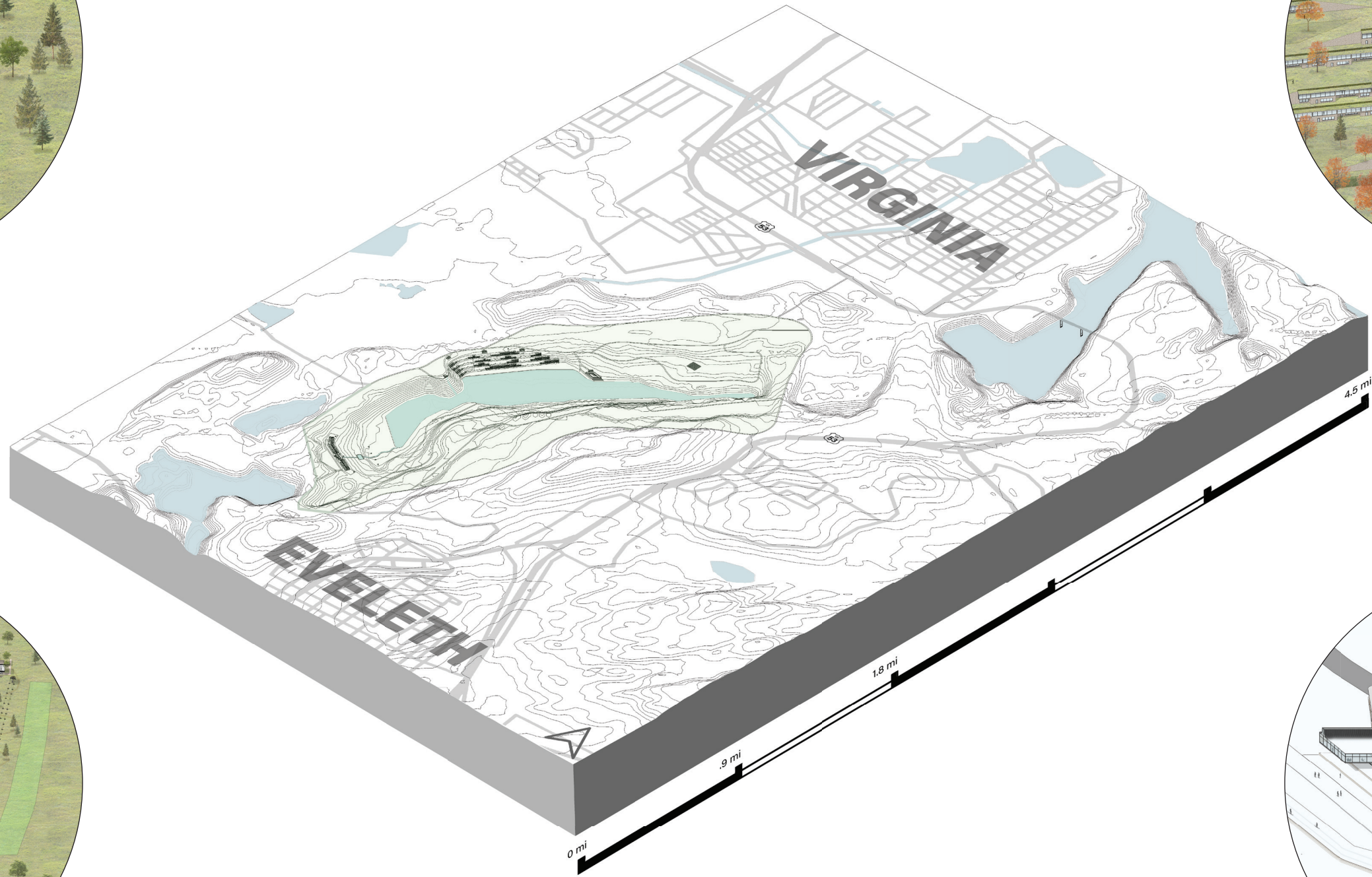
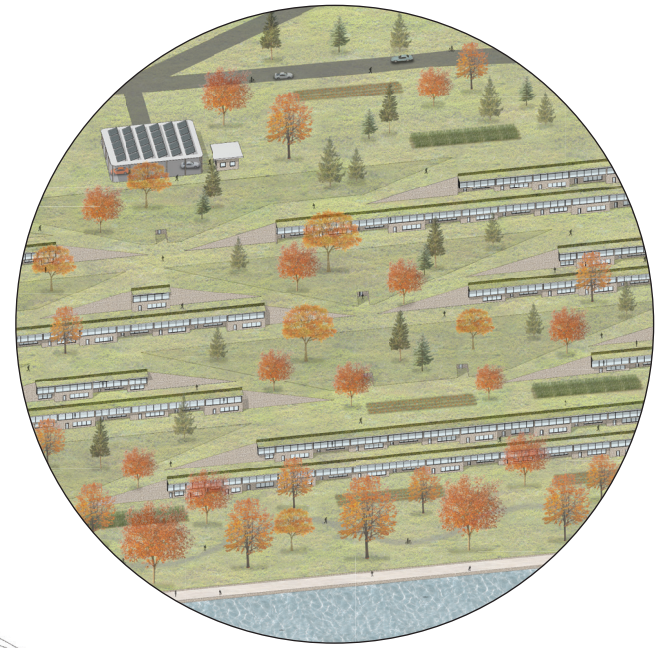
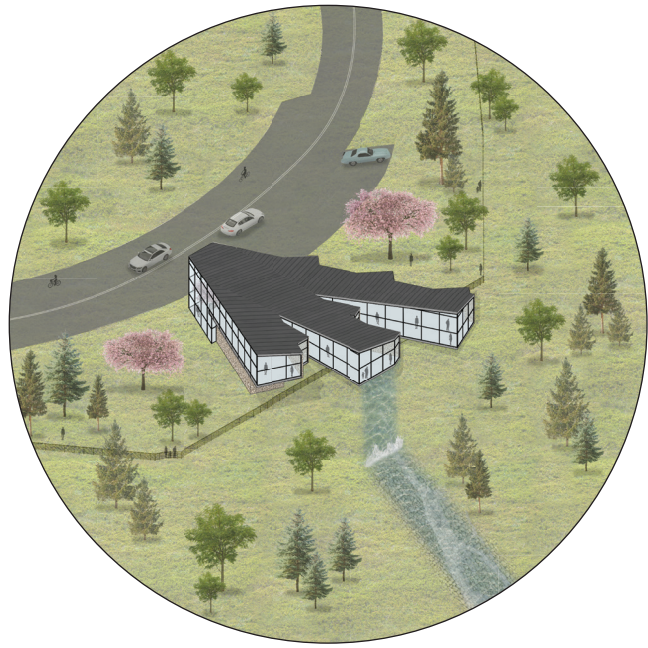
Floor Plan - Level 1



Floor Plan - Level 2



# 3 MY SOLUTION







# CLEANING BY GREENING

## ADAPTIVE REUSE OF AMERICA'S OPEN-PIT MINES

### PROJECT DESCRIPTION

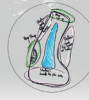
This Thesis aims to answer one overarching question: "What can we do with abandoned open-pit mines?" Open-pit mines are those that are on the surface of the earth - typically a large hole in the ground. Abandoned surface mines can be hazardous if they are allowed to erode, settle, or even collapse. The current practice to deal with abandoned open-pit mines is to add soil and grasses on top of the disturbed areas or let them fill with water. This thesis proposes a radically different approach - to create architecture within them.

The cities adjacent to these mines are typically on the decline - both in terms of economy and population. This thesis proposes a framework that can be applied to any open-pit mine and has been enacted in the Thunderbird Mine in Virginia, Minnesota. This framework guides the transformation of these barren holes in the ground into living, recreation, and attraction areas. This can be done by analyzing the mine using several different metrics, followed by creation of architecture, then injection of hundreds of people into new living accommodations within the mine. Creating attractions, such as a resort or educational visitor center (shown on boards below), will generate additional tourist traffic - thereby increasing the area's population, boosting the region's economy, and enhancing the barren environment.

This idea is not to create a separate city within the mine - rather it is the following: inject more people into the area by promise of seclusion, nature, novelty, and beauty to create a symbiotic relationship between the mine below and the cities above.

### FRAMEWORK FOR MINE RECLAMATION

This framework is created so that it may be applied to any open-pit mine on earth. In our region, they are most prevalent near the Mesabi Iron Range in northern Minnesota. However, abandoned open-pit mines exist throughout the globe. This thesis enacts the framework in the Thunderbird Mine in Virginia, Minnesota.



#### 1 - ANALYZE - WHAT IS THE AREA LIKE?

- Climate and economic trends?
- Population trends, current businesses and amenities?
- Mine size and shape?



#### 2 - EVALUATE - WHAT DOES THE AREA NEED?

- Quantity of people?
- Which amenities?
- What greenery?



#### 3 - IMPLEMENT - BUILD AND PLANT

- Remove or cover harmful material
- Implement all typologies needed: Ex. homes, attractions, museums, etc.
- Add greenery between each typology

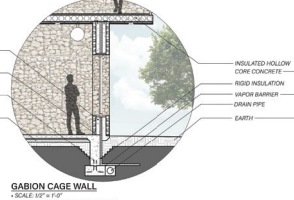


VIRGINIA LYNCH MINE  
- VIRGINIA, MINNESOTA

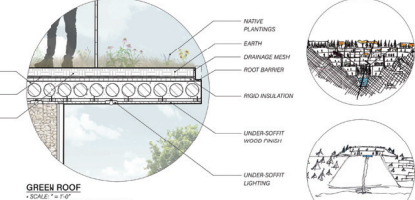


MESABI MOUNTAIN IRON MINE  
- VIRGINIA, MINNESOTA

### DETAILS & SKETCHES

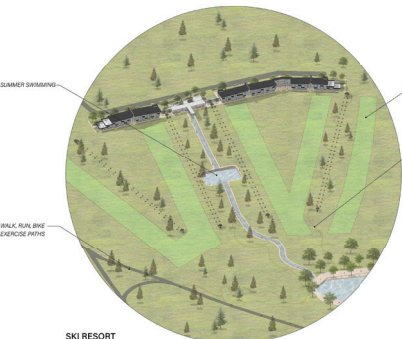


GABION CAGE WALL  
- SCALE: 1/2" = 1'-0"

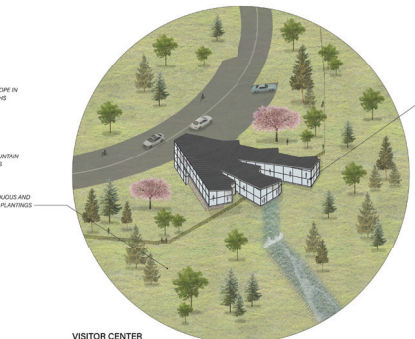


GREEN ROOF  
- PREVALENT IN RESIDENTIAL CLUSTERS

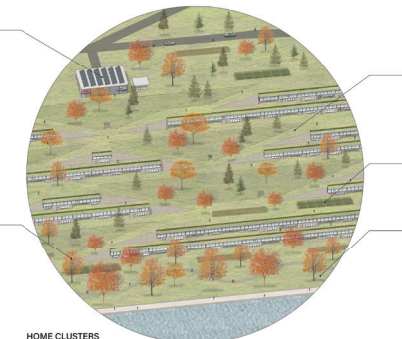
### ISOMETRICS, SECTIONS, & FLOOR PLANS



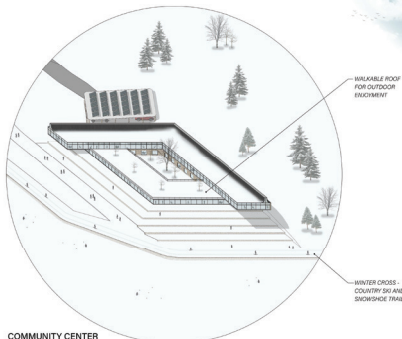
SKI RESORT  
- SUMMER



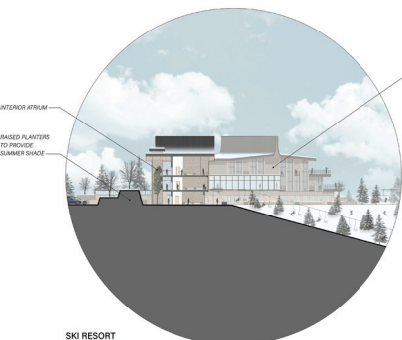
VISITOR CENTER  
- SPRING



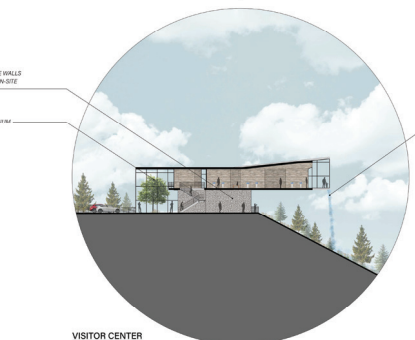
HOME CLUSTERS  
- AUTUMN



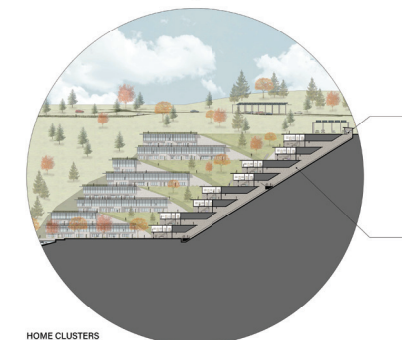
COMMUNITY CENTER  
- WINTER



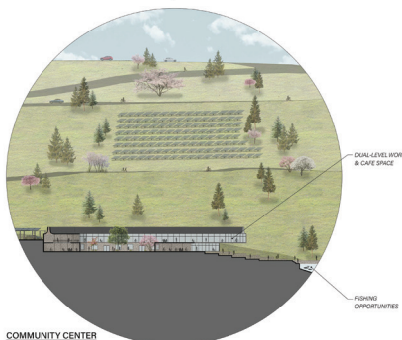
SKI RESORT  
- SECTION A



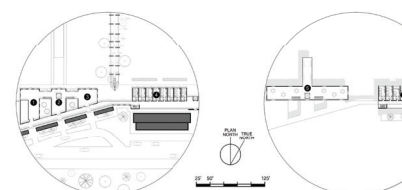
VISITOR CENTER  
- SECTION B



HOME CLUSTERS  
- SECTION C

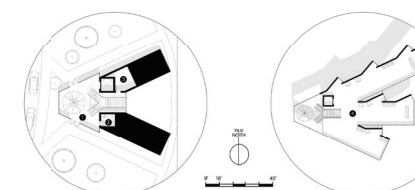


COMMUNITY CENTER  
- SECTION D



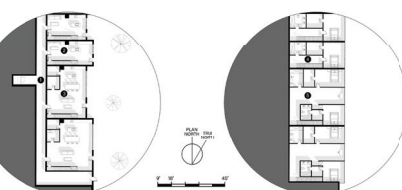
SKI RESORT - LEVEL 1

SKI RESORT - LEVEL 2



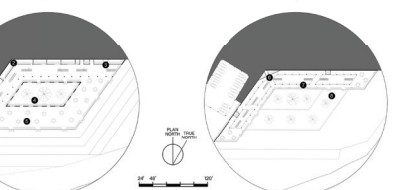
VISITOR CENTER - LEVEL 1

VISITOR CENTER - LEVEL 2



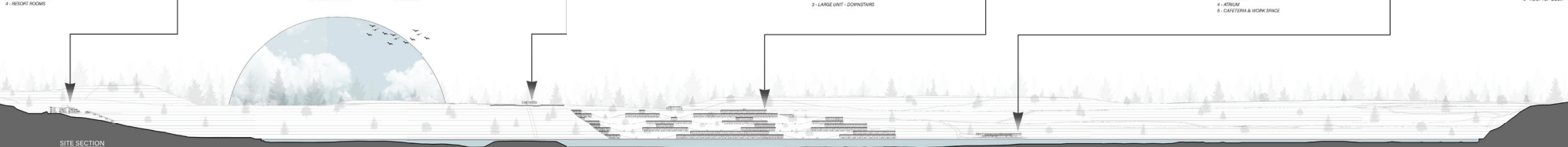
HOME CLUSTERS - LEVEL 1

HOME CLUSTERS - LEVEL 2

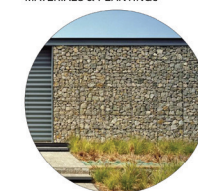


COMMUNITY CENTER - LEVEL 1

COMMUNITY CENTER - LEVEL 2



SITE SECTION



GABION CAGE WALLS

- CHEAP TO BUILD
- MINIMAL EROSION ENERGY
- IMPROVED DRAINAGE



WOOD GLADDING

- SOUNDS LIKE HEAVY, RESILIENT FORESTS
- MINIMAL EROSION ENERGY
- BEAUTIFUL APPEARANCE



MIXED FOREST

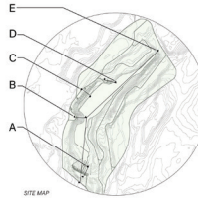
- MIXED DECIDUOUS/CONIFEROUS FOREST TYPE
- PLANTED THROUGHOUT THE SITE
- NEW FOREST TYPE CHANGING TO THE REGION



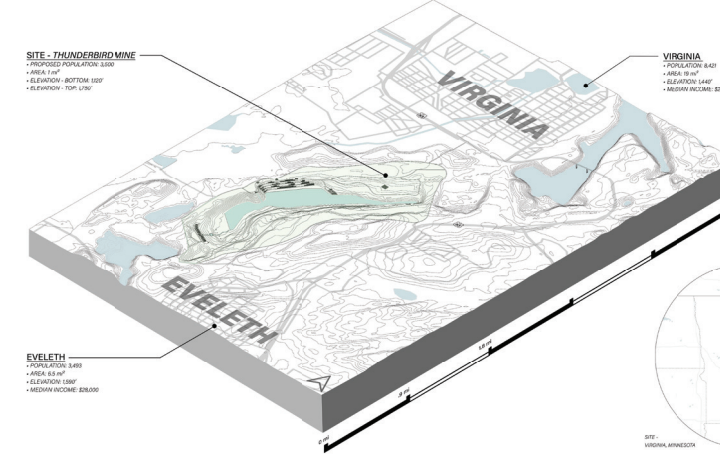
OPEN PRAIRIE

- HELPS TO GET TRENCH POCKETS OF FOREST
- HARDY FOR INSECTS, BIRDS, REPTILES AND MAMMALS OF ALL SIZES

### SITE INFORMATION



EXISTING SITE



SITE - THUNDERBIRD MINE

- PROPOSED POPULATION: 1,388
- AREA: 61.94 AC
- ELEVATION - BOTTOM: 1050'
- ELEVATION - TOP: 1100'

VIRGINIA

- POPULATION: 840
- AREA: 8.91 AC
- ELEVATION: 1440'
- RESIDENTS: 1000 (EST.)

EVELETH

- POPULATION: 3,488
- AREA: 61.94 AC
- ELEVATION: 1300'
- RESIDENTS: 1000 (EST.)

SITE - VIRGINIA, MINNESOTA

