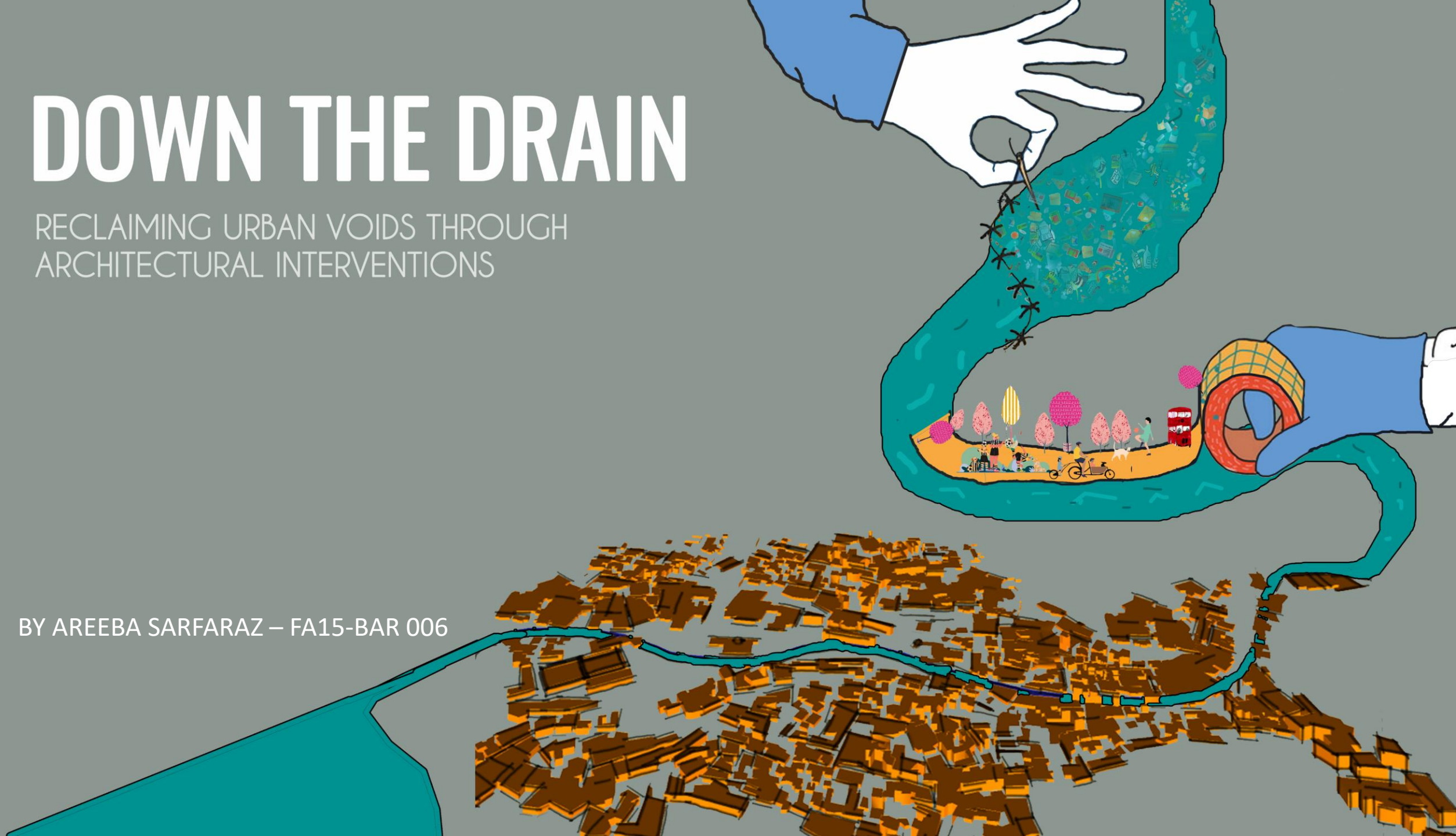


# DOWN THE DRAIN

RECLAIMING URBAN VOIDS THROUGH  
ARCHITECTURAL INTERVENTIONS

BY AREEBA SARFARAZ – FA15-BAR 006

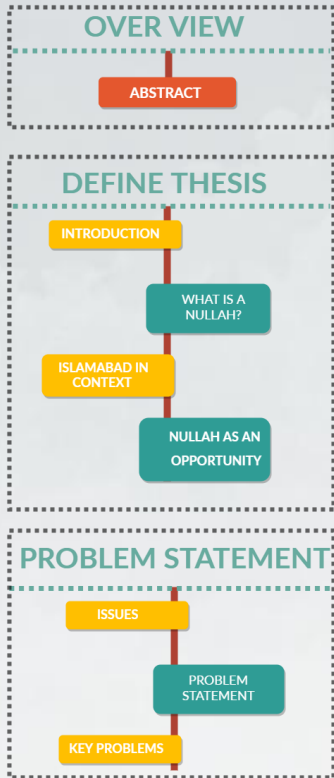


# DEFINE

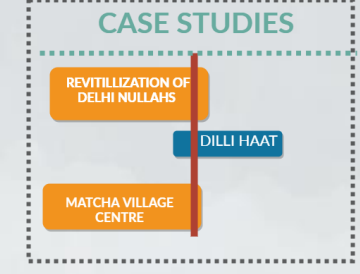
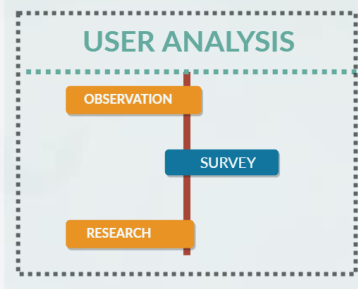
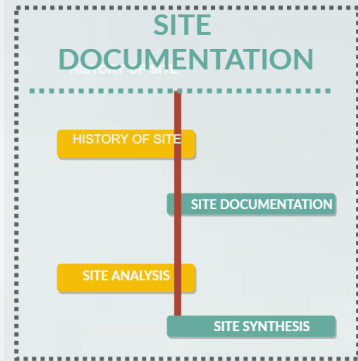
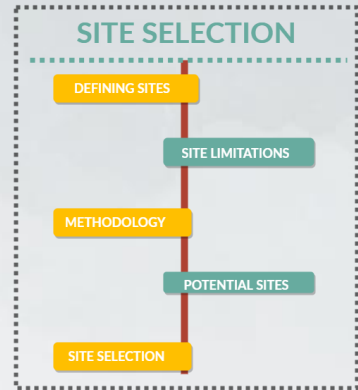
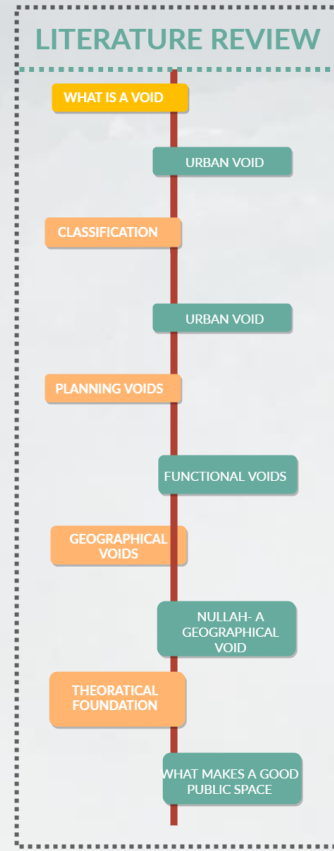
# EXPLORE

# ANALYSE

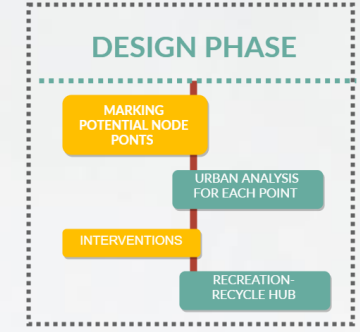
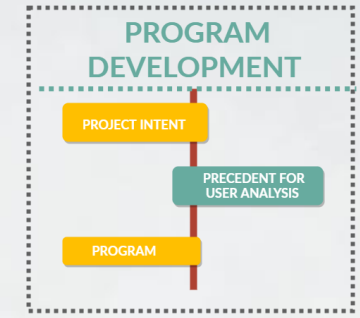
# DESIGN



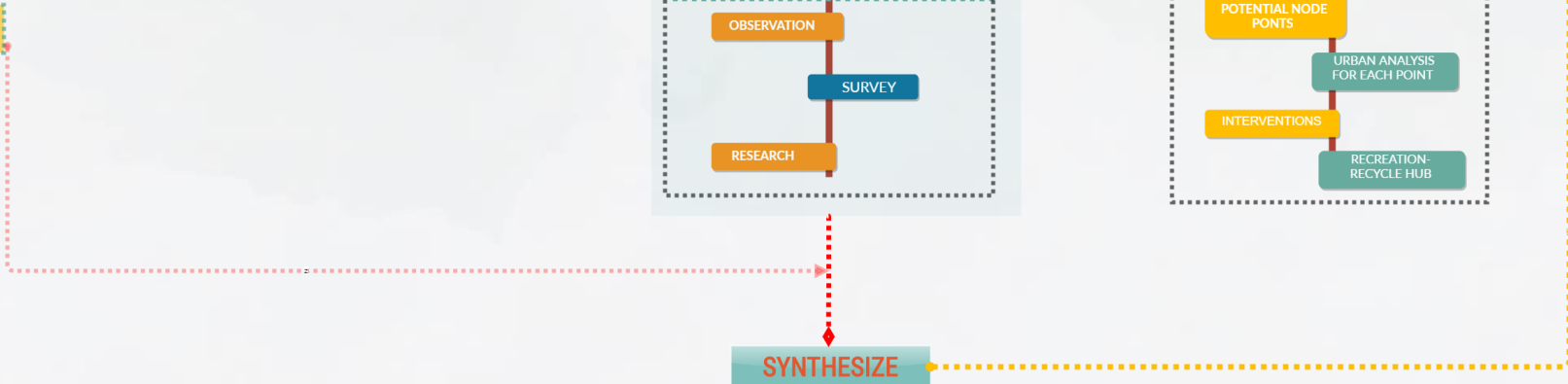
THESIS VISION



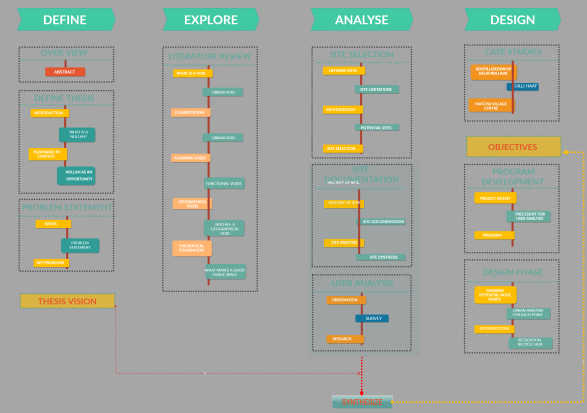
OBJECTIVES



SYNTHESIZE



# DEFINE



# OPPORTUNITY

## NULLAH



- NALLA
- A CHANNEL
- RAVERINE
- CANAL



DRAINAGE SYSTEM THAT IS MADE TO ALLOW RAPID DRAINAGE OF STORM PRECIPITATION

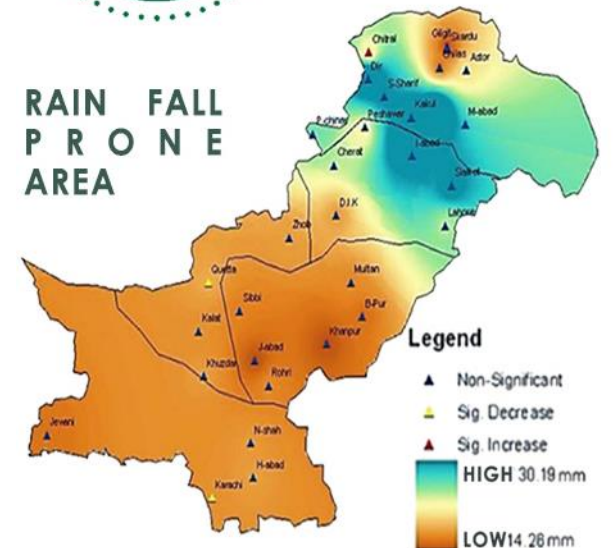


PREVENTS FLOODING OF CITIES.

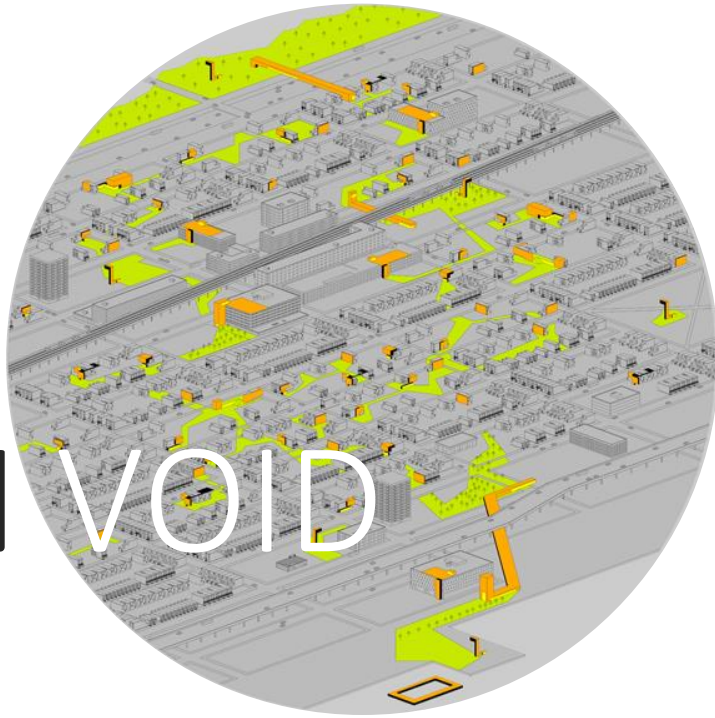
## ISLAMABAD IN CONTEXT



NATURALLY FORMED NULLAS THAT HAS BEEN IN USE FOR DECADES.



# URBAN VOID

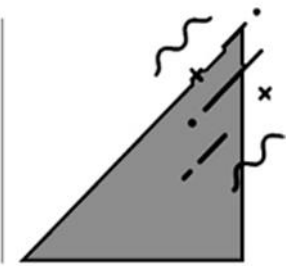


- The urban fabric of cities is changing at a fast pace.
- The Urban Voids are a vital component in the context of the built environment.
- It has the capacity of becoming the corner stone of the city of tomorrow.

# THESIS VISION

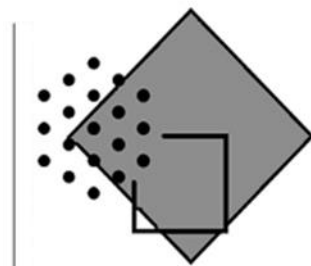


Utilizing nullahs as a productive space in urban fabric, through architectural interventions



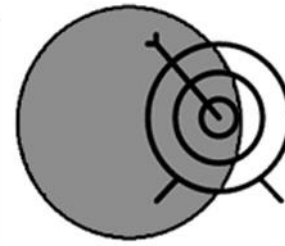
## ROLE

Understanding how the role and dynamics of the nullah changes across various sections



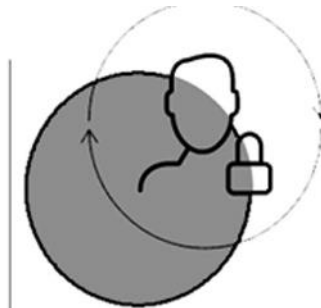
## POTENTIAL AREAS

Finding potential areas that can be converted into a focal point. Acting as catalysts in improving the urban fabric.



## COMMUNITY ORIENTED

Architectural intervention must be based on the facilitation towards the user for community.





# KEY PROBLEMS

## VOID

Void covers so much of the urban fabric, yet it remains empty- Blank. A Negative space.

## POLICIES IMPLICATION

Government policies have resulted in neglect of these spaces. Hence are left unattended.

## ILLEGAL SETTLEMENTS

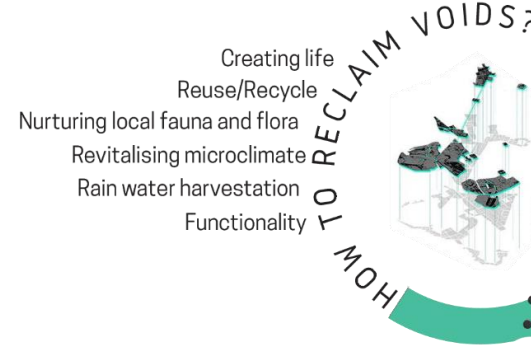
Unattended spaces give way to illegal settlements and slums. spaces like G-7 / G-6 are a example.

## DUMPING GROUND

Empty space often becomes the dumping ground for waste- Unfiltered drainage is also disposed.

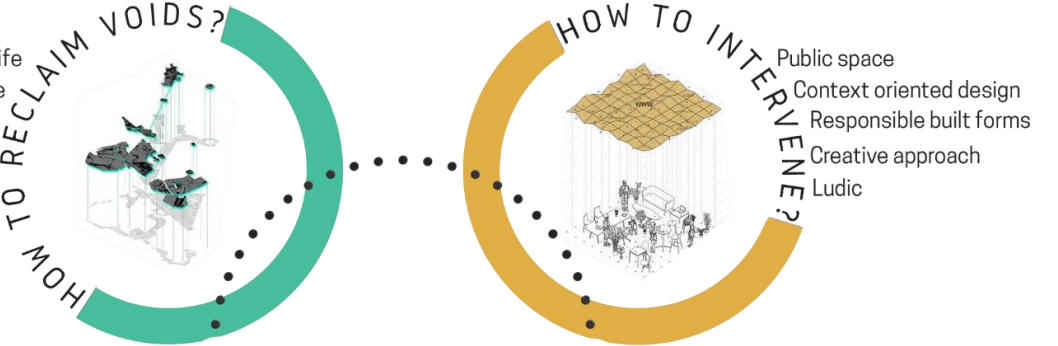
## KEY WORDS (FROM LIT REVIEW)

### RECLAIM

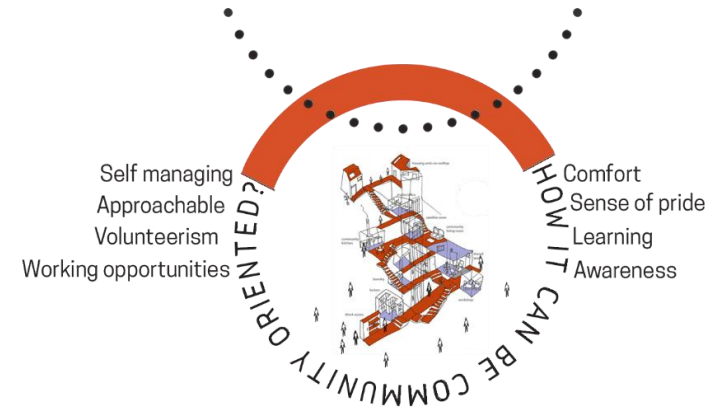


### INTERVENE

### COMMUNAL



## RESEARCH PARAMETERS



## CONCEPT

LUDIC ⇒ PLAYFUL INTERVENTIONS ⇒ CREATING SPACE ⇒ THEN BUILD

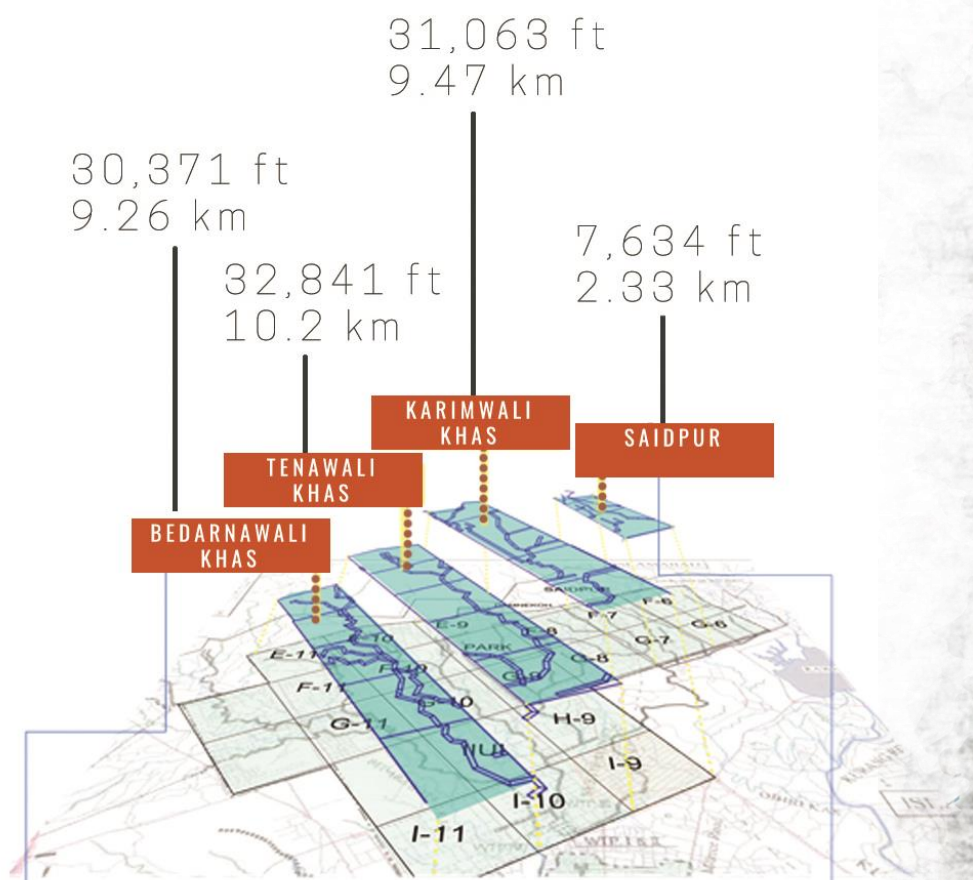
3

PARAMETERS OF INTERVENTION

PERCEIVE INTERACT GENERATE

# SITE SELECTION

There are about 12 nullahs in Islamabad.



## SITE A



## SITE B



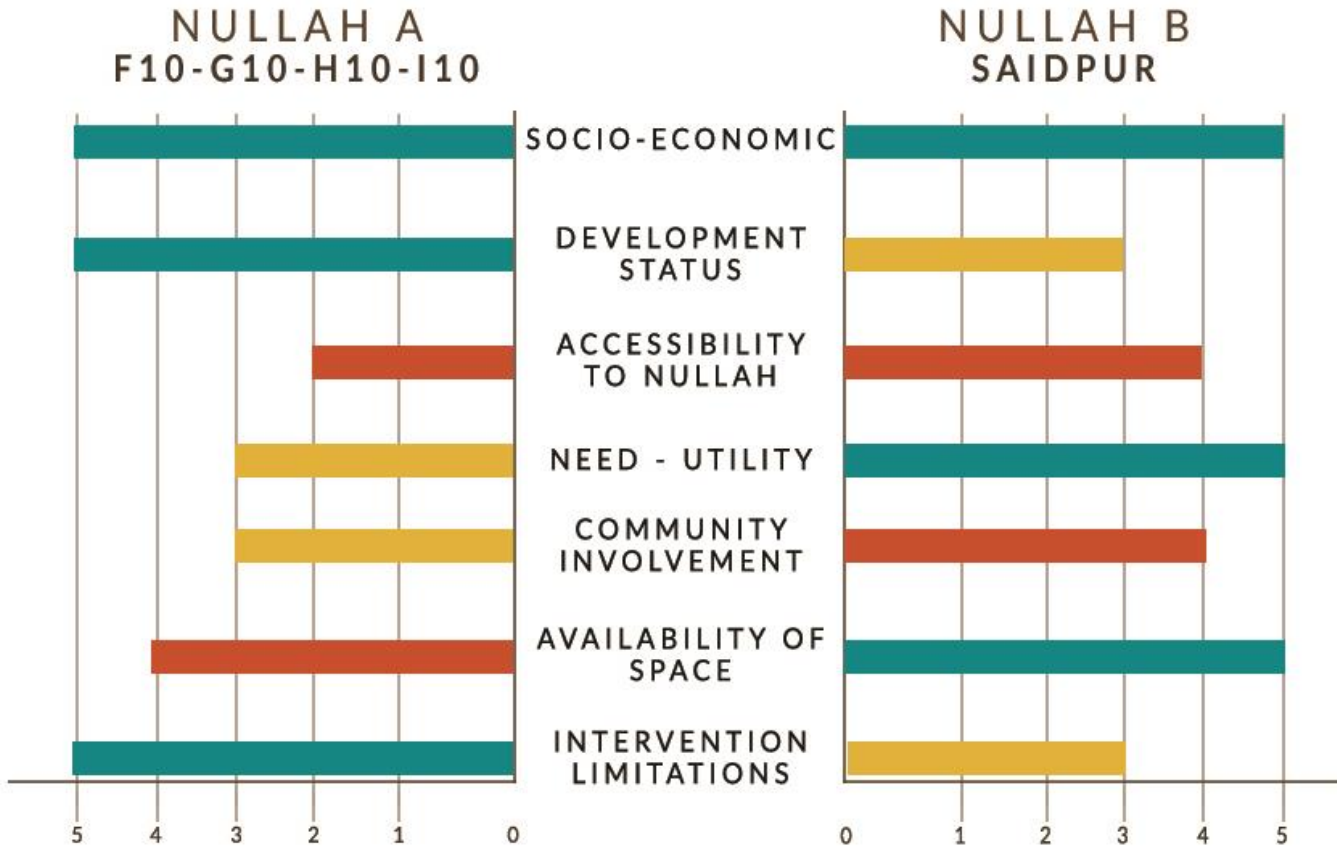
→ SITE A

→ SITE B

**Common typology**  
Same as tenawali , karimwali khas  
Surrounded by Grid plan

**Unusual typology**  
Surrounded by Organic growth

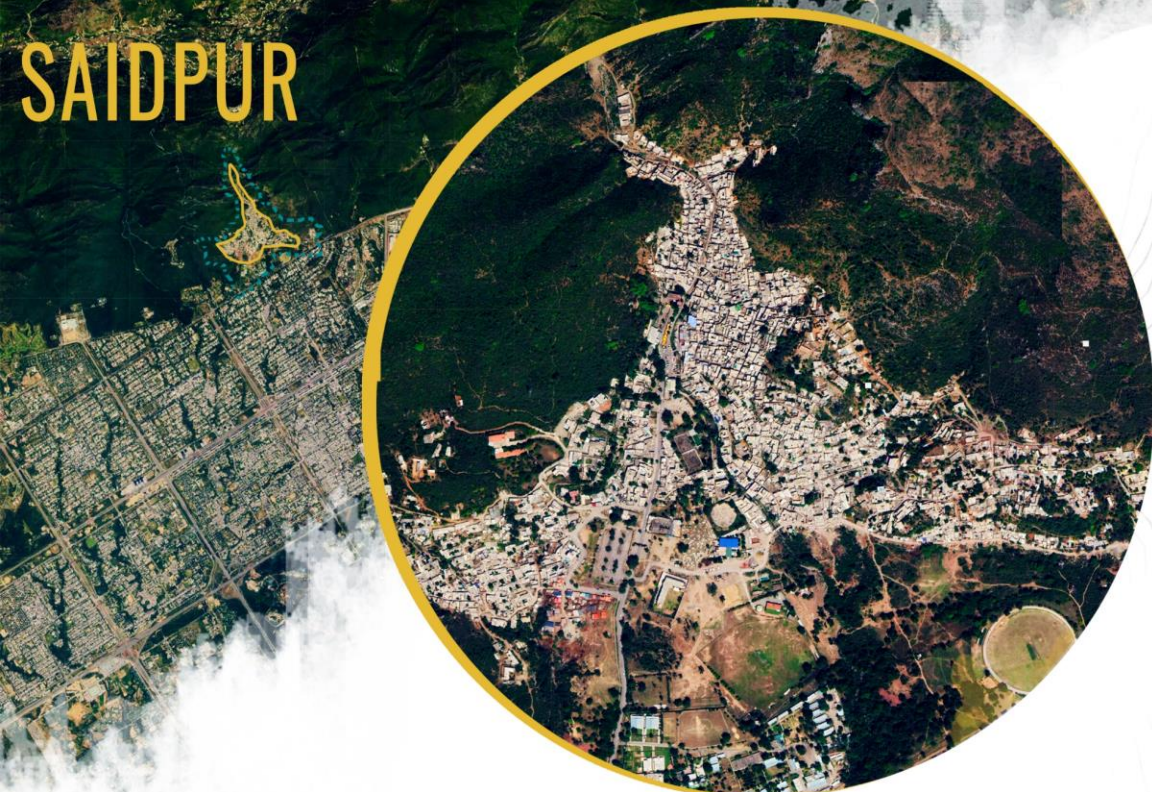
# Why Saidpur ?



- Most of the issues are a common in all of the Nullahs –
- But this site can implement my ideas. and at a larger scale they can be implemented.
- The community of Saidpur is more engaged to the Nullah. Hence more challenging / diversity.
- It can act as a kind of a prototype for other Nullahs.
- Manageable scale.



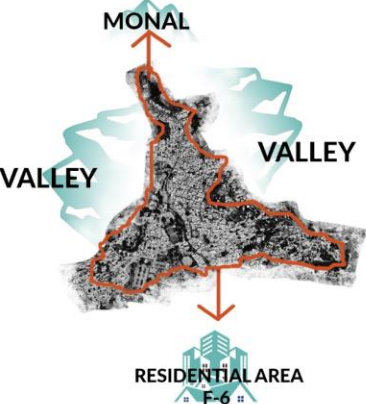
# SAIDPUR



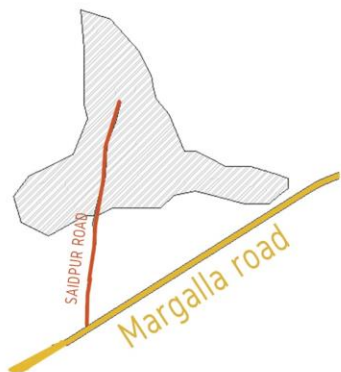
AREA: 6,000,000 sqft

LOCATION: ZONE 3-ISLAMABAD

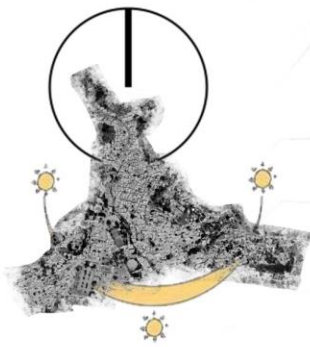
## SITE SETTING MAP



## ACCESS

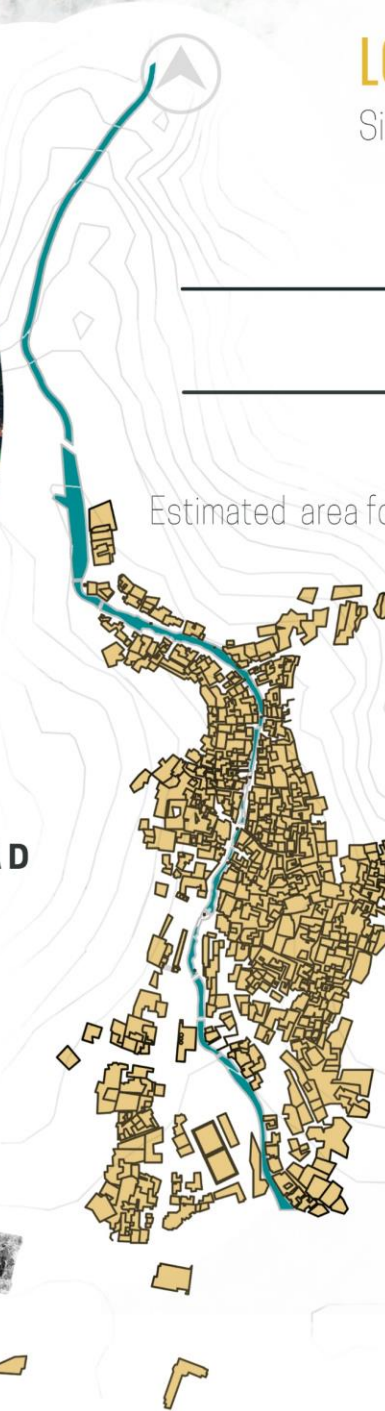


## SOLAR PATH



## LOCATING THE SITE

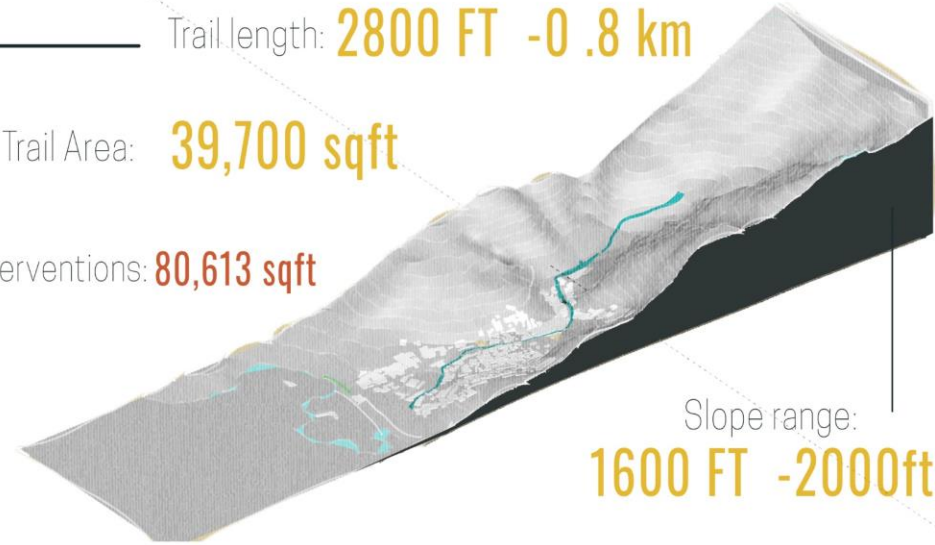
Site is the main nullah trail that runs along saidpur.



Trail length: 2800 FT - 0.8 km

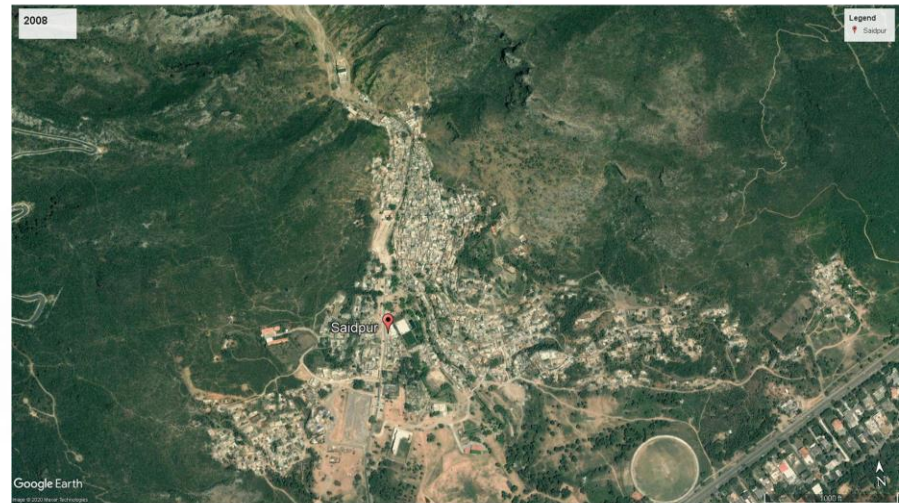
Trail Area: 39,700 sqft

Estimated area for Interventions: 80,613 sqft



Slope range:  
1600 FT - 2000ft

## Historical evolution of Saidpur Nullah 2008 - 2020





# MACRO SITE ANALYSIS

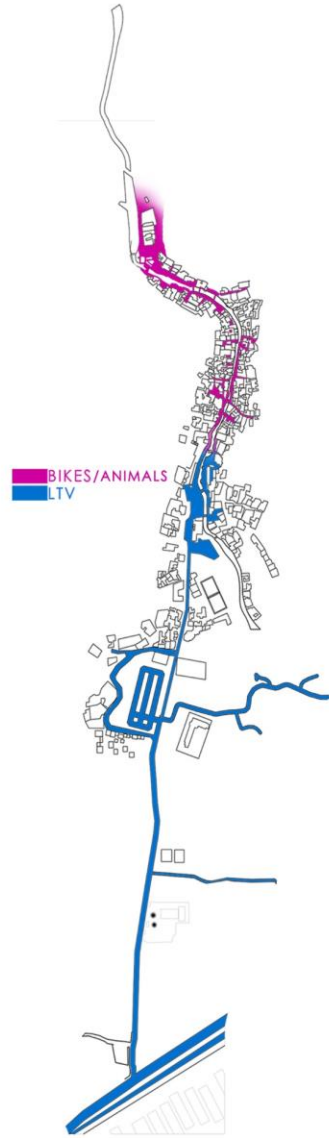
## NOLLI



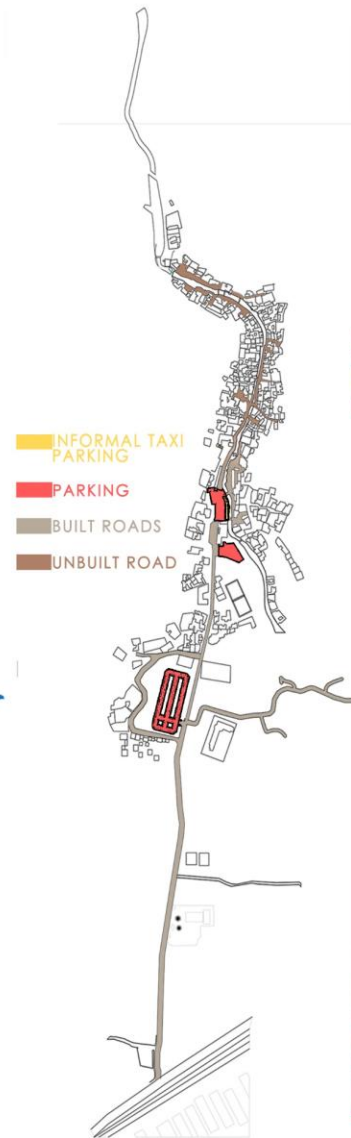
## CONTOURS



## VEHICULAR ACCESS



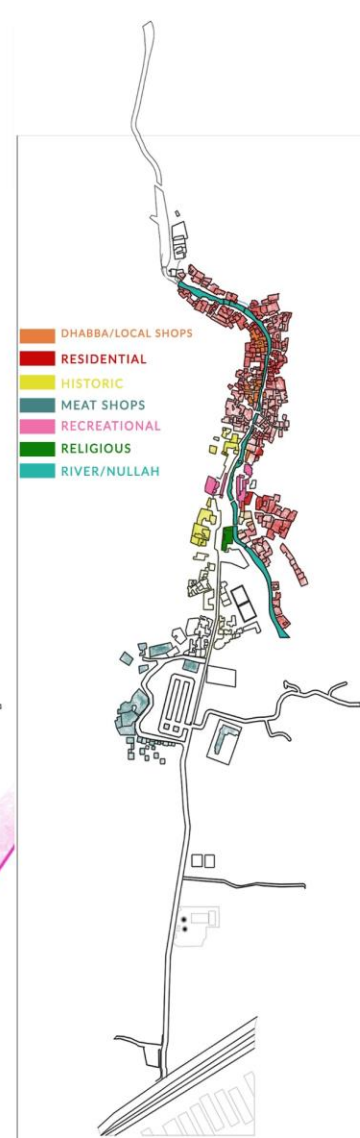
## PARKING



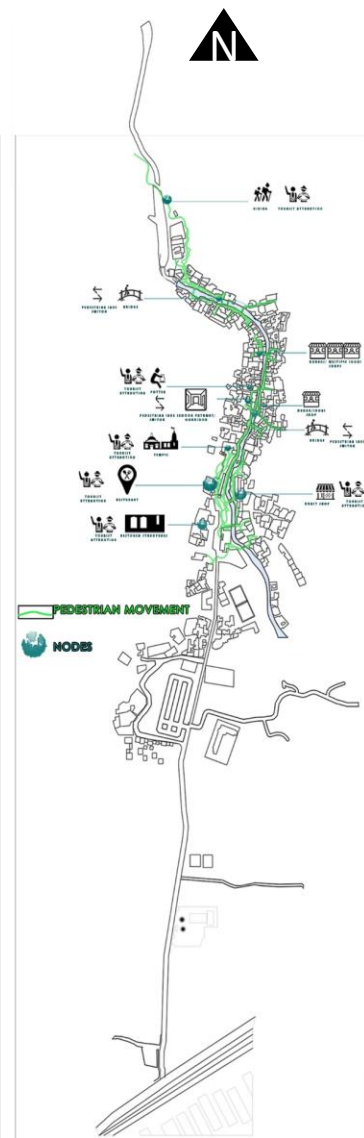
## EDGES



## LANDUSE



## LANDMARKS



# DOCUMENTATION & SYNTHESIS

MARKING POINTS AND DEFINING USER GROUPS

# OBSERVING AND MARKING

walking around - taking pictures and analysing them

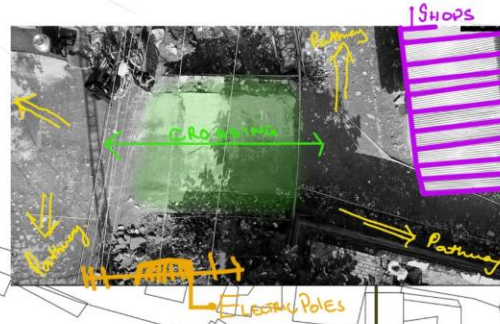
## .Rush hour



- Major restaurant chains.
- Provides space for parking
- Nullah in this area is Reinforced.
- Light facilities are present the ground is paved for movement.
- No outdoor sitting-area.

## . Intersection

- Last Point where cars can reach.
- Small "sauda" Shops are present.
- Connects to different pathways.
- Has secondary spaces where people can sit.



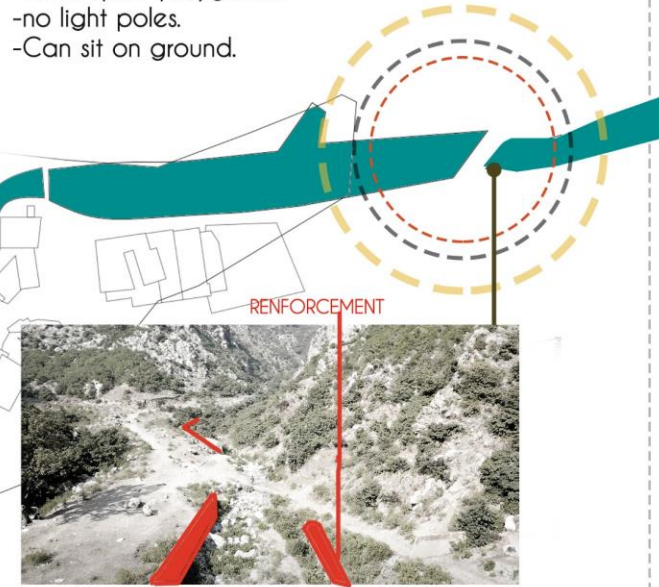
## . Transition

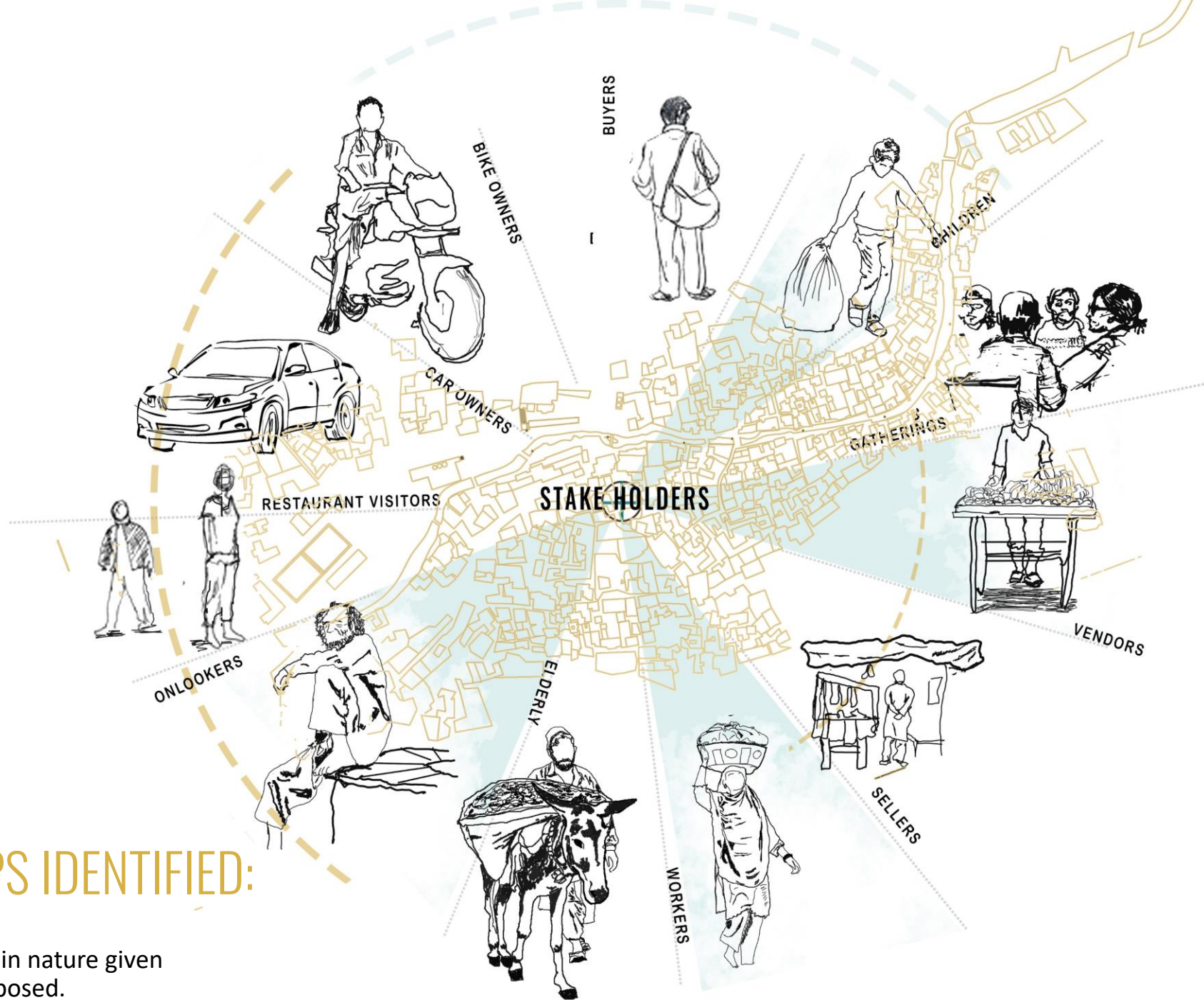


- Height increase to 10 feet.
- Reinforced wall.
- narrow pathway allows bikes to cross.
- Connects to the other side of nalla.
- no sitting spaces.
- no light poles.

## . Breathing

- Open space.
- Great landscape
- Reinforced walls.
- Hikers spot/ playground
- no light poles.
- Can sit on ground.





## USER GROUPS IDENTIFIED:

Users would be varied in nature given the kind of spaces proposed.

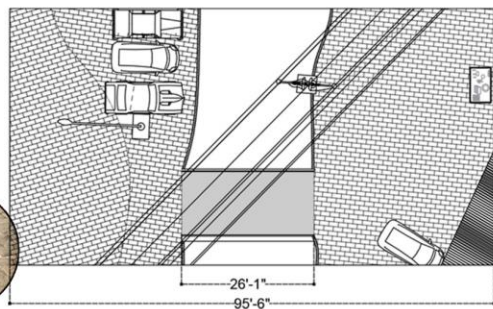
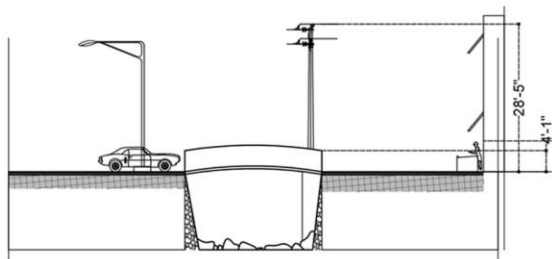
# PEDESTRIAN REALM

Opportunities to walk, stand, and stay. Opportunities to sit and interact with others - talk and listen. Opportunities to see from a reasonable distance and opportunities to play and exercise.

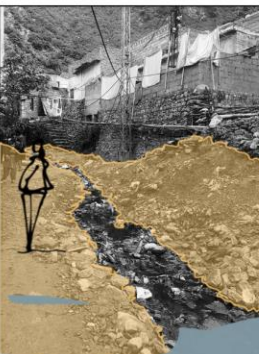
## Pedestrian Movement



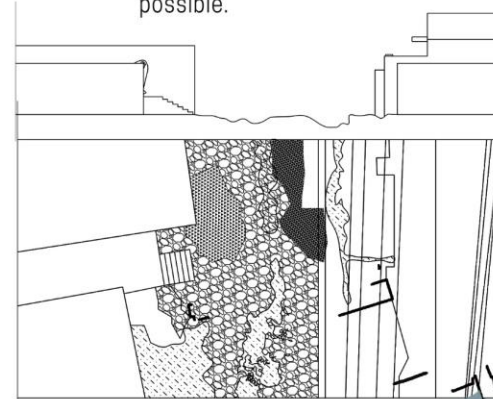
- Paved pathway present near the commercial zone.
- Pedestrian and car friendly zone.



- Lack of Paved pathways
- Allowing more damage during rainy days.



- Not comfortable to walk on.
- Access of cars no longer possible.



## Places To Linger



- Places to linger are ONLY Seen near vendors and shops.
- NO proper spaces for vendors
- Aids to Sociability factor -



## Seating Spaces

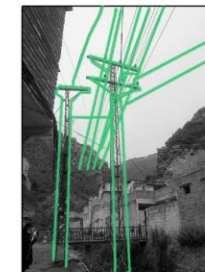


- NO primary seating spaces.
- SECONDARY seating spaces are observed at multiple spots

## Street Scene



- Some landscape elements can be seen near the restaurant area.
- Bougainvillea trees are seen near the same space.



- No Street lights
- Exposed wires on poles.

TYPES OF MATERIAL USED



# ARCHITECTURAL PROGRAM DEVELOPMENT

# The KEY Words Can Be Translated Into Architectural Program

## RECLAIM

PERFORMATIVE POTENTIAL

Defining Nullah borders  
Landscaping with local flora and fauna  
Reclaiming land from waste pollution  
Functionality

TACTICS

Walk trails  
Bike trails  
Reinforcement of borders  
Plantation spots  
Kabhaar dhaba (recycle stop)

## INTERVENE

PERFORMATIVE POTENTIAL

Meeting  
Connectivity  
Learning  
Gathering  
Crossing  
Scene

TACTICS

Street play equipment  
Bridges  
Bike trails  
Vendors  
Seating  
Shading  
Plantation spots

Water collection spots  
Kabhaar dhaba (recycle stop)

## COMMUNAL

PERFORMATIVE POTENTIAL

Training/skills  
Exercising  
Learning  
Gathering  
Showcasing  
Improving

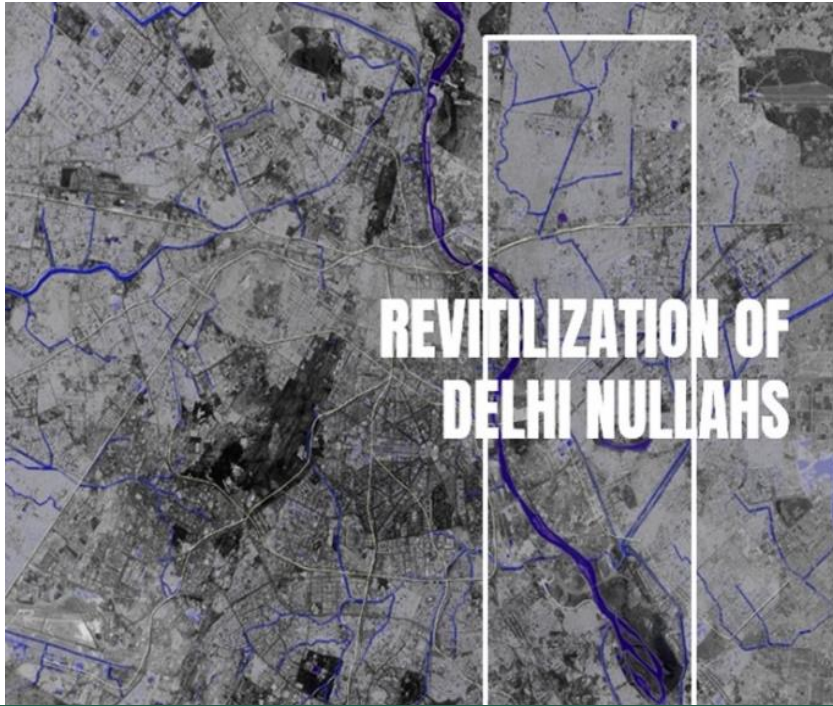
Enterprise Meeting

TACTICS

Community training  
Workshop  
Recycle  
Pedestrian trails  
Restaurant  
Community Art projects  
Exhibition  
Management

	SQFT PER PERSON	QUANTITY	AREA sqft	COVERED AREA	TOTAL AREA	Learning hub					11190	
SAIDPUR POPULATION		12000				Forum			1700			
TOURIST VISTIORS			300			Studio	3		750			
TRAIL AREA			39,649 ft²			openspaces/circulation						
<b>PARKING SPACE</b>			<b>60,000</b>		<b>60,000</b>	<b>WORKSHOP AREA</b>			<b>50</b>	<b>2500</b>	<b>2500</b>	
solar car garage			600			Reception	100		250	250		
Cars	162	36	5940			Bathroom			250	250		
						kitchnet			120	120		
<b>POINT 1 - PUBLIC PIATZA</b>			<b>12,600</b>		<b>12,600</b>	<b>POTTERY WORKSHOP</b>						<b>3650</b>
PARKING			360			STUDIO	1200	1	1200	1200		
Cars	162	10	1620			washing area (sink)			50	50		
Bikes	36	12	432			Dry room	1200		1200	1200		
Seating / stairs			0			(attached) learning studio	120	10	1200	1200		
Bridge			1000			(attached) learning studio						
<b>POINT 2 - PIT STOP</b>			<b>3400</b>		<b>3400</b>	<b>UP CYCLE</b>						<b>8500</b>
CROSSING						Sorting area						1000
DHABA / café			50	50		Storage area						800
UPCYCLE HUB						Washing area						800
<b>POINT 3</b>						Plastic grinding area						1000
UPCYCLE HUB			100	100	100	<b>ZONE 1 (PLASTIC)</b>						
Bridge						one work station + storage	174	2				
<b>ADMIN</b>					<b>3800</b>	Workstations for 150 kids	174	75				13050
Waiting area			260			Completed work storage	500					500
Head		1	256			toilets						200
Administrator		1	144			<b>ZONE 2 (PAPER CRAFT)</b>						
Clerical staff	48	3	144			Paper craft studio						2500
Staff room	20	10	200			Reading space	100					4000
Common room women	6.4	40	256			Medical room						300
Common room men	6.4	40	256			Bathroom						200
Accounts	72	2	144			<b>OPEN THEATER</b>	13		300	3900		
Staff washrooms male	50	2	100			<b>RESTAURANT</b>				2000	2000	
Staff washrooms female	50	2	100			Entry and Waiting Area						
Senior staff	100	4	400			Dining Room						
Security room	70	2	140			Bar or Lounge						
Cafeteria	18		1000			Walk-up Service or Take Out Counter						
Toilets male			200			Restrooms (ADA compliant)						
Toilets female			200			Kitchen						
<b>EXIBITION SPACE</b>	<b>16</b>	<b>300</b>	<b>4800</b>		<b>4800</b>	Hostess and Wait Stations						
Orientation gallery			1500	1500		Dry and Refrigerated Storage						
Reception			200	200		Office and Employee Amenities						
Storage	500	2	1000	1000								
Toilets female	1	100	500	500								
Toilets male	1	100	300	300								
						<b>CAFÉ</b>				1000	1000	
						<b>TOTAL COVERED AREA</b>						<b>48960</b>
						<b>TOTAL AREA</b>				112172		

# PRECEDENT STUDIES



## REVITALIZATION OF DELHI NULLAHS

URBAN

VOID

INTERVENTIONS

Morphogenesis Plans to Revitalize Delhi by Rejuvenating its Polluted Waterways.

• "Even a small intervention can turn the nullahs into valuable asset for the common citizen"

### PROBLEMS

- TRANSPORT
- OVERCROWDED
- NOISE POLLUTION
- HEALTH ISSUES
- CONTAMINATION
- DISEASES AND UNHYGENIC.

### AIMS

- Walking and cycling paths along nullahs with connectivity to public transport, while enhancing social and cultural networks of city.
- Restoration project: system of organic reed beds and aerators to clean the sewerage entering the nullahs.
- Dramatic improve in health.
- Help replenish aquifers and alleviate the extreme pollution.

WALKABLE CITY



connectivity to public transport



Cultural corridors



Location in the Core central area (Delhi) is a great advantage due to ease of access



Central linear main axis, connects visually, gives sense of place.

Spaces that adheres to all types of people, adult, teens, children,



### FEATURES

(as told by locals)



Expansion constraint due to many open spaces converted to exhibition spaces

Contrasting village feel, giving new different experiences.



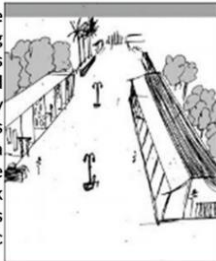
Parking issues during weekends and festive days

Well connected transportation link to access the area. This enables various types of commuters to easily access.



Changing exhibit spaces, first hand-made products, cultural nights, attracts crowd.

The shops are aligned along central linear axis but are grouped and placed organically with varying levels which creates a staggered village "bazaar-like" look. This in turn creates smaller dynamic functional spaces.



Dilli Haat is very culturally active hub due to the reason that people, customize their spaces and the spaces are very flexible. These dynamic spaces tend to comfort and increase relatability for the user.



VOID

LOCAL

TOURISM



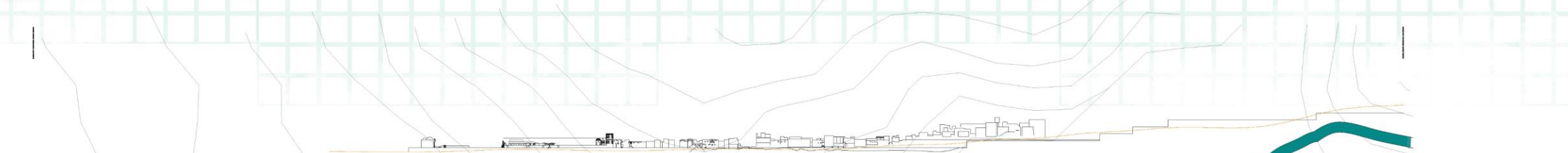
## DILLI HAAT

EXISTING SAIDPUR

**PROFILE**



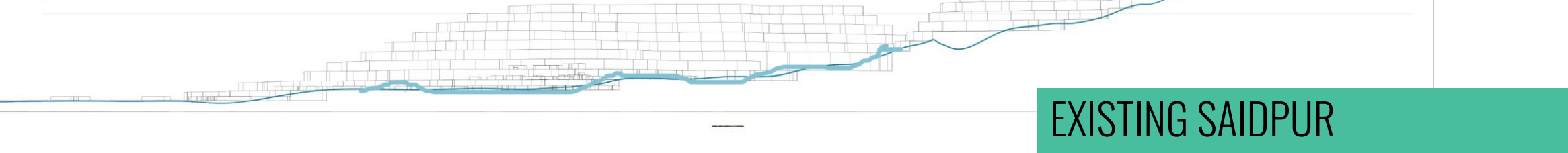
**SECTION**



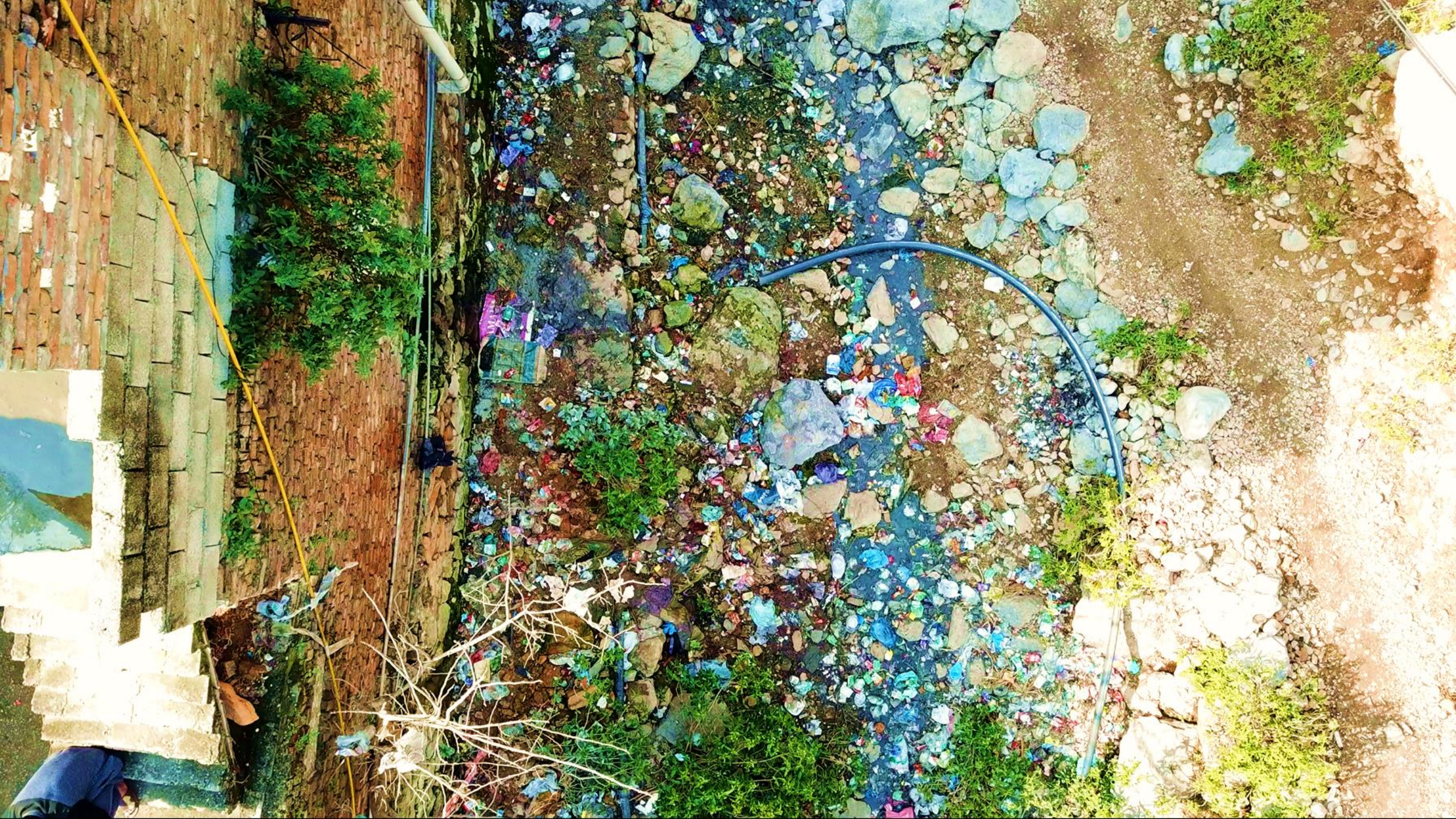
**PLAN**



**CONTOUR**



**EXISTING SAIDPUR**



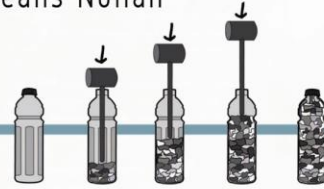
# HOW TO CLEAN NULLAH? AN ECO SOLUTION



**ACTION 1 : Municipal commitee  
Cleans Nullah**



**ACTION 2 : Sorting out waste**



**ACTION 3 : Recycling by adding  
waste into plastic bottles.**



**ACTION 4: Making eco  
bricks.  
Community Involement**

*How to  
make an  
Eco Brick...*

**1** Take a used or found plastic drinking bottle, water or soda (or 2 litres)

**2** Use a stick or the back of a long wooden spoon to compress the plastic down

**3** It's easier if you heat the plastic first and then tuck and tuck it in

**4** Squash all soft plastic deep into the bottom of the bottle

**5** Add toilet, tooth, soap, compress, crush...

**6** It's IMPORTANT to be compacted the whole way through otherwise you will run into trouble

**7** WHAT DOES IT? ...all about dry soft plastics (bread and sugar paper), chip packs, insect repellent, wet socks, chewing gum, tin foil, glad wrap ...etc small unrecyclable bits and pieces

**8** WHAT STAYS OUT? ... food, batteries, paper, whatever can be recycled

**9** Final test, stand on the bottle - should be solid as a brick and not leak ... if it does keep squishing more plastic in

**10** Well done! Put the lid on and your eco brick is finished and ready for building



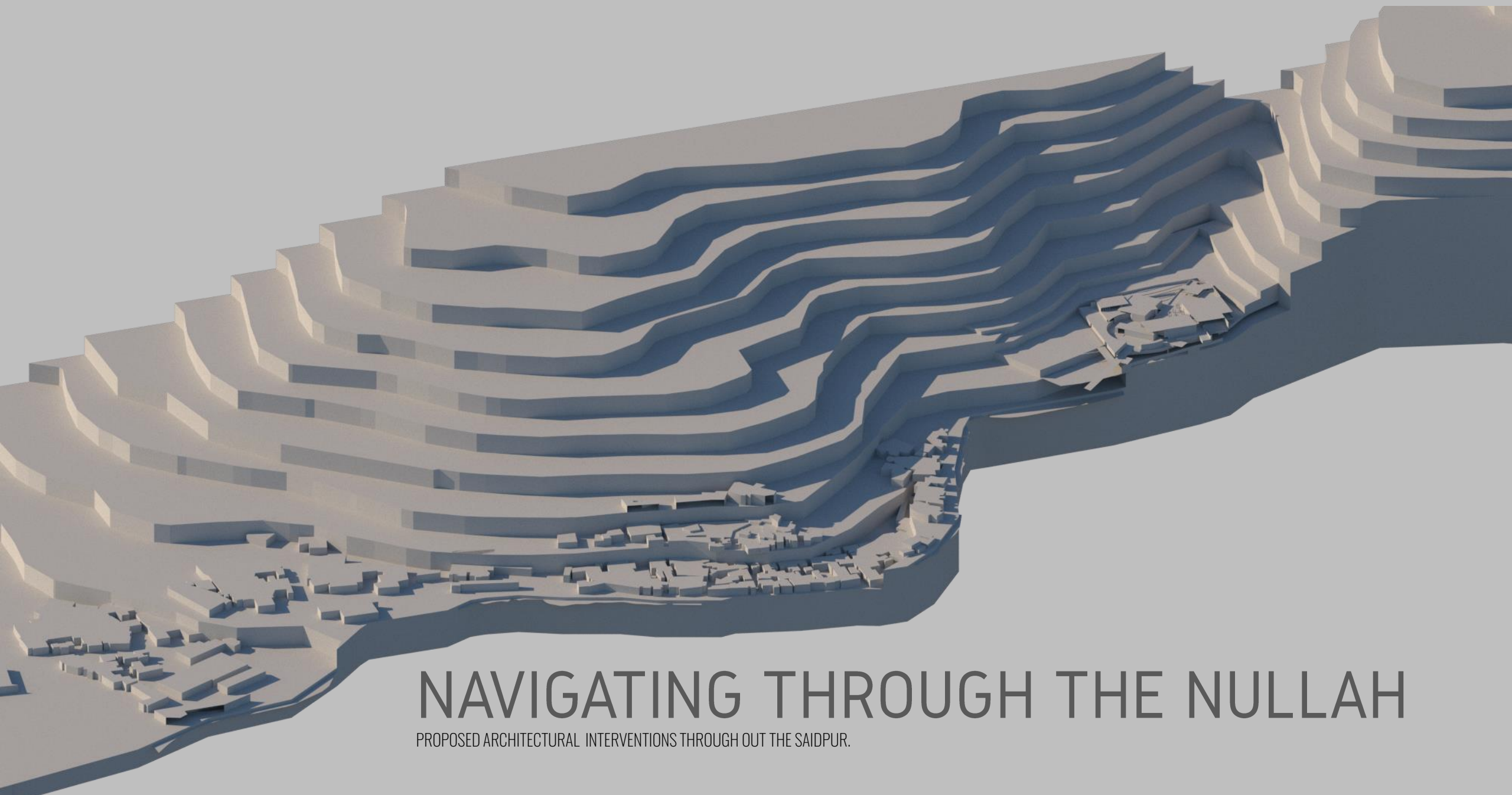
**ACTION 5 : Implimenting  
iterations.**



**ACTION 6 : Enjoy.**

**ACTION 7 : Implement on  
other Nullahs.**





# NAVIGATING THROUGH THE NULLAH

PROPOSED ARCHITECTURAL INTERVENTIONS THROUGH OUT THE SAIDPUR.

**PROPOSED MASTER PLAN AND WEST SIDE SECTION**

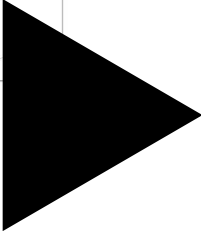


Point 1

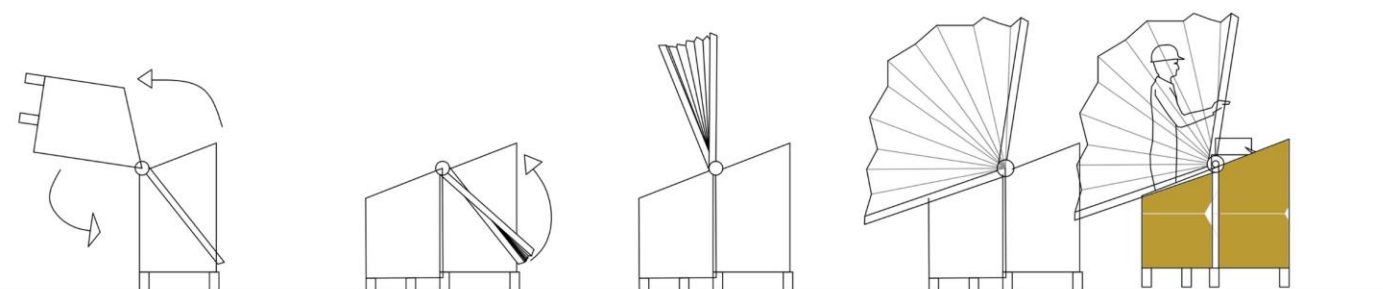
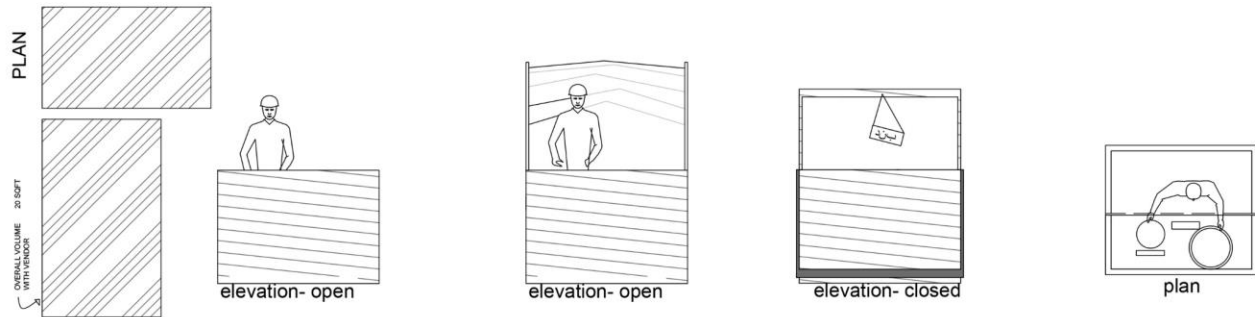
Point 2

Point 3

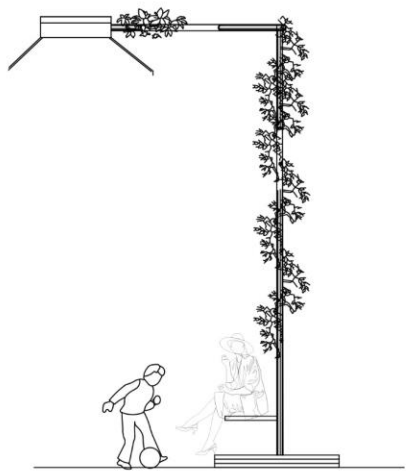
Point 4



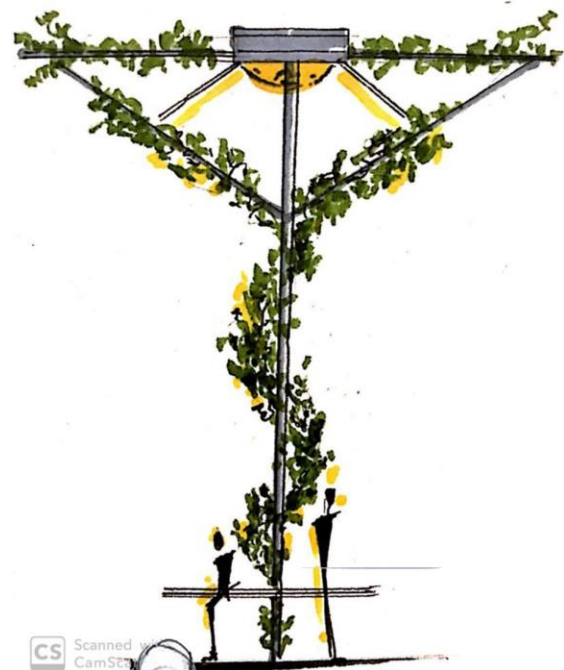
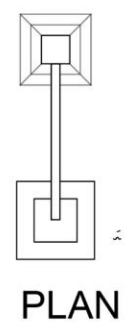
# ARCHITECTURAL ELEMENTS THROUGHOUT THE TRAIL



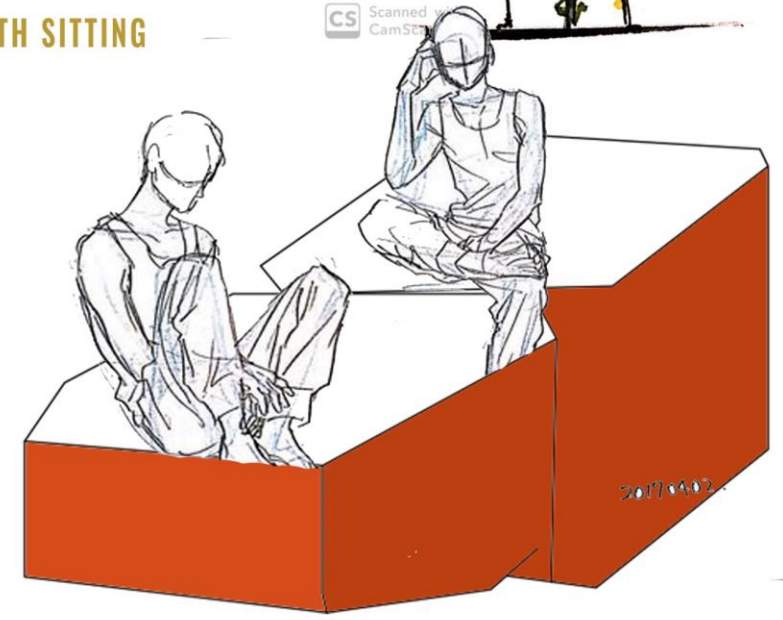
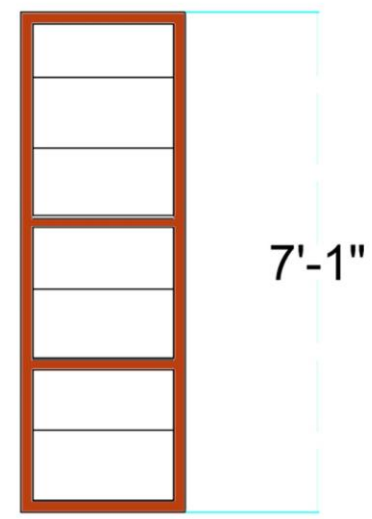
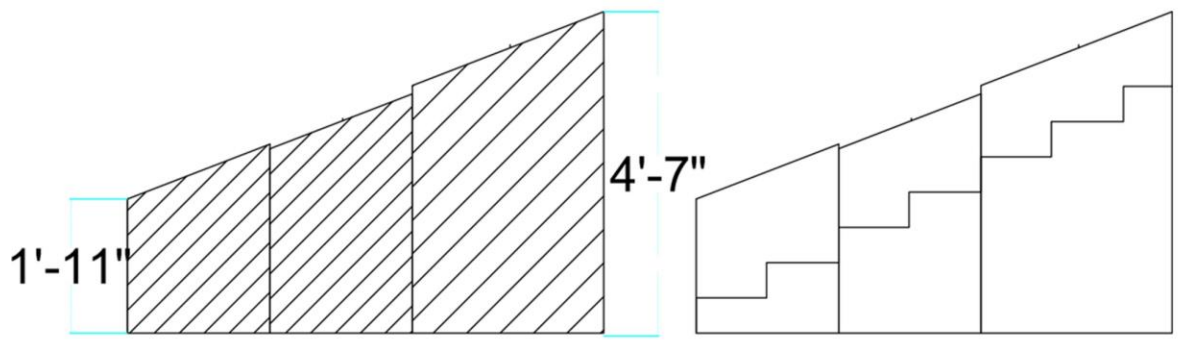
PLAY BOX - VENDOR SPACE



LIGHT WITH SITTING

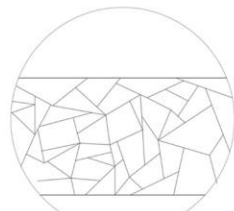


## SEATING MOUDLE - PLAY

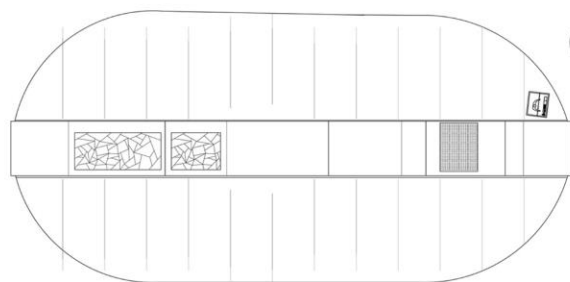
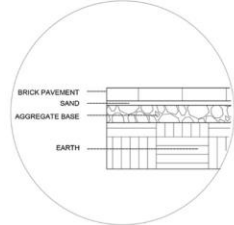




AREA: 18,818 ft<sup>2</sup>  
PERIMETER : 583 ft

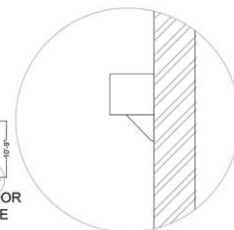
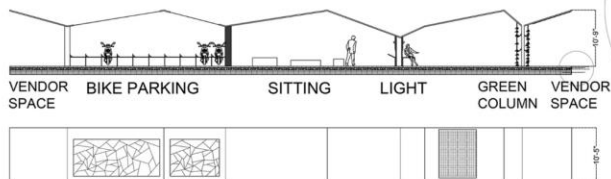


Recycled glass mosaic art-creating coloured shadows underneath



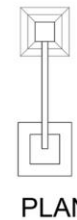
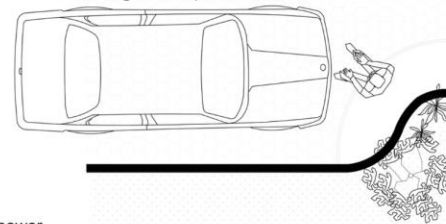
Car parking

Multi- purpose  
Shade

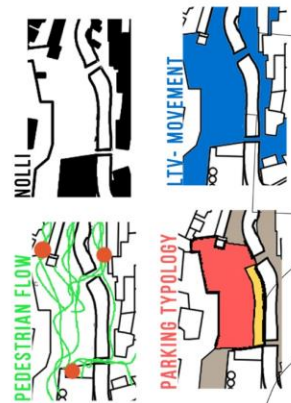
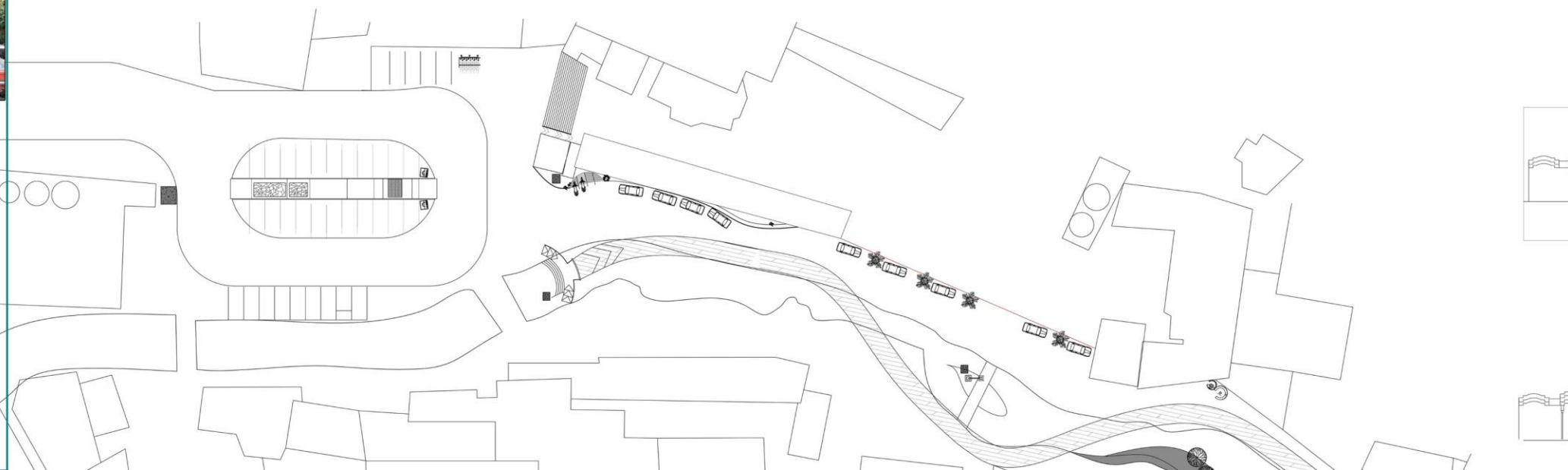
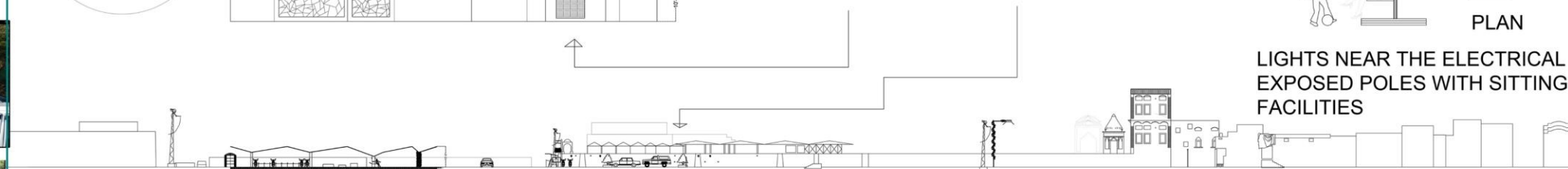


Wall light powered by solar power

Parallel parking- with secondary seating and plantation



LIGHTS NEAR THE ELECTRICAL EXPOSED POLES WITH SITTING FACILITIES



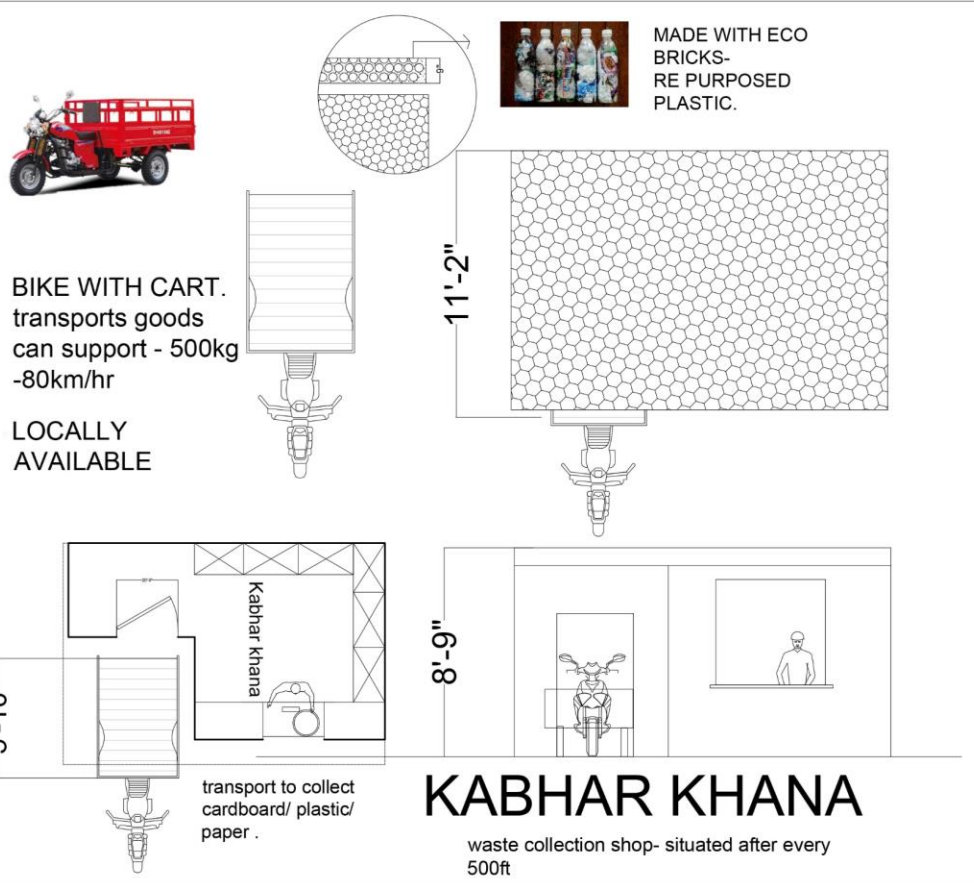
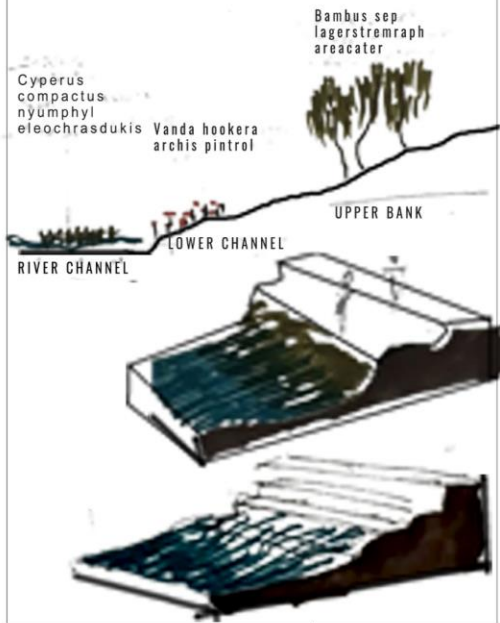
EXISTING SENARIO



AREA: 18,818 ft<sup>2</sup>  
PERIMETER : 583 ft



THE PLANTING STRATEGY  
20 YEAR PLAN

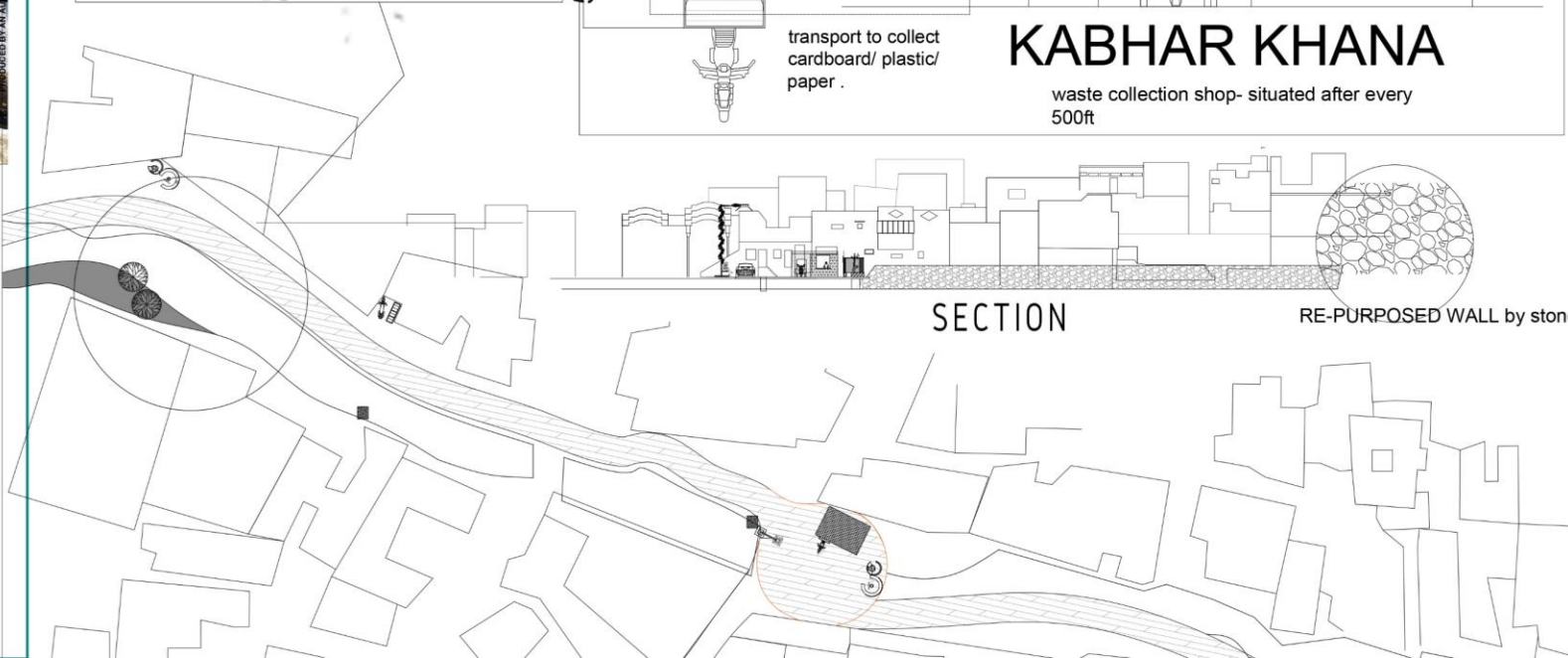


BIKE WITH CART.  
transports goods  
can support - 500kg  
-80km/hr

LOCALLY  
AVAILABLE

KABHAR KHANA

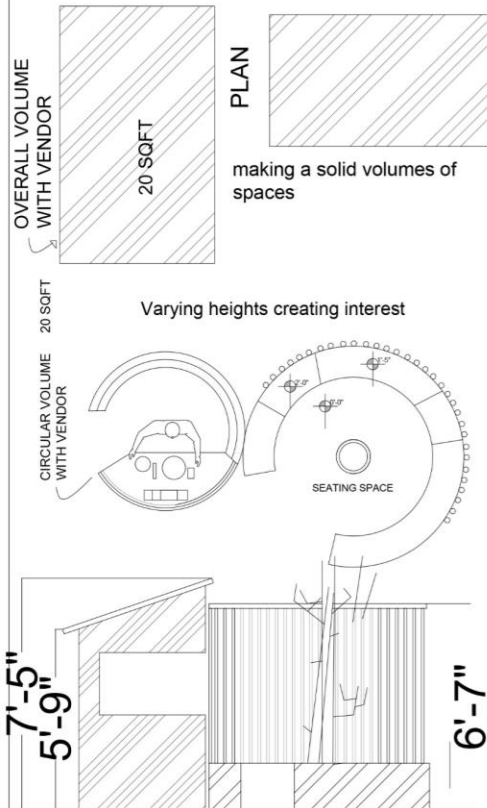
waste collection shop- situated after every  
500ft



SECTION

RE-PURPOSED WALL by stone

VENDOR MODULE 2



OVERALL VOLUME  
WITH VENDOR  
20 SQFT

PLAN

making a solid volumes of  
spaces

Varying heights creating interest

CIRCULAR VOLUME  
WITH VENDOR  
20 SQFT

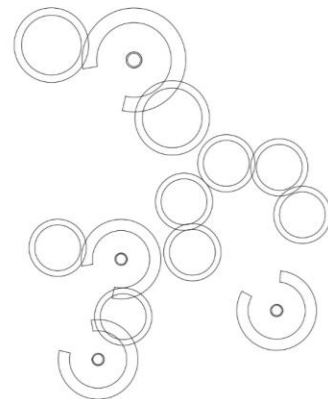
SEATING SPACE

7'-5"

5'-9"

6'-7"

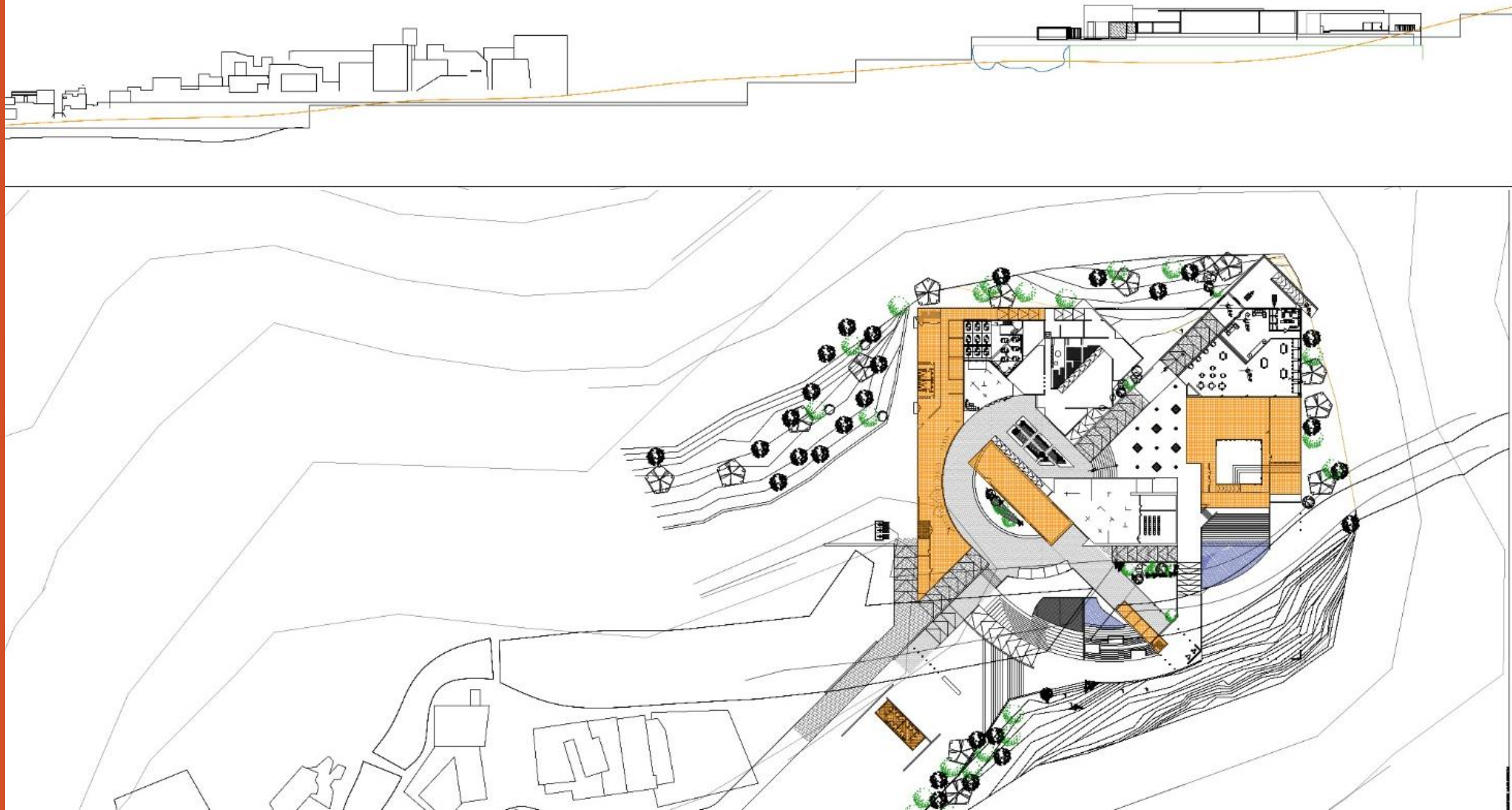
Different modules



POINT 3



POINT 4

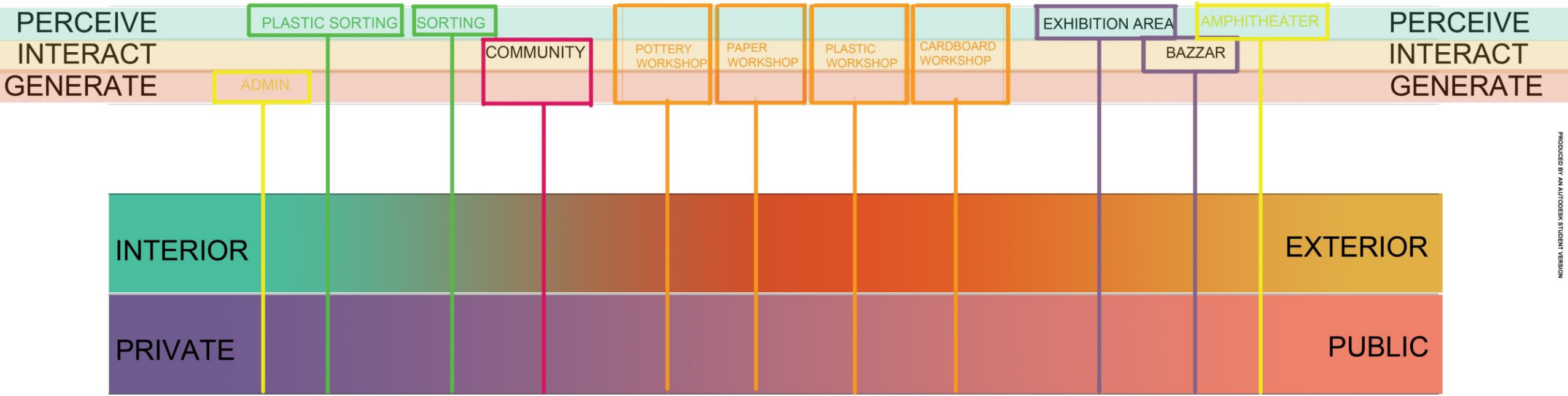




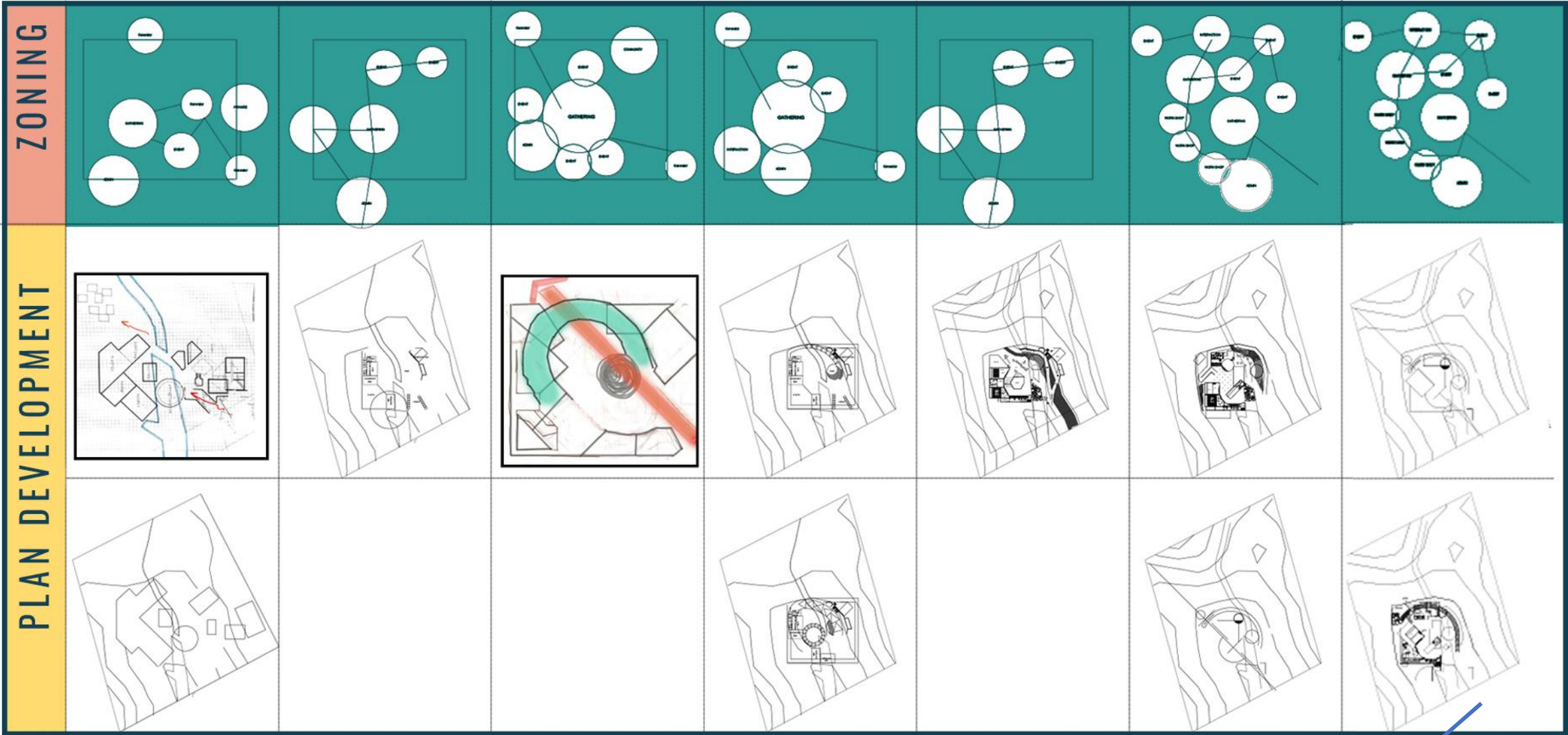
VOLUMETRIC  
STUDY  
FOR POINT 4  
INTERVENTION



# PROGRAM ZONING ANALYSIS



The zoning of public spaces/ generators are done first and later the buildings are placed accordingly

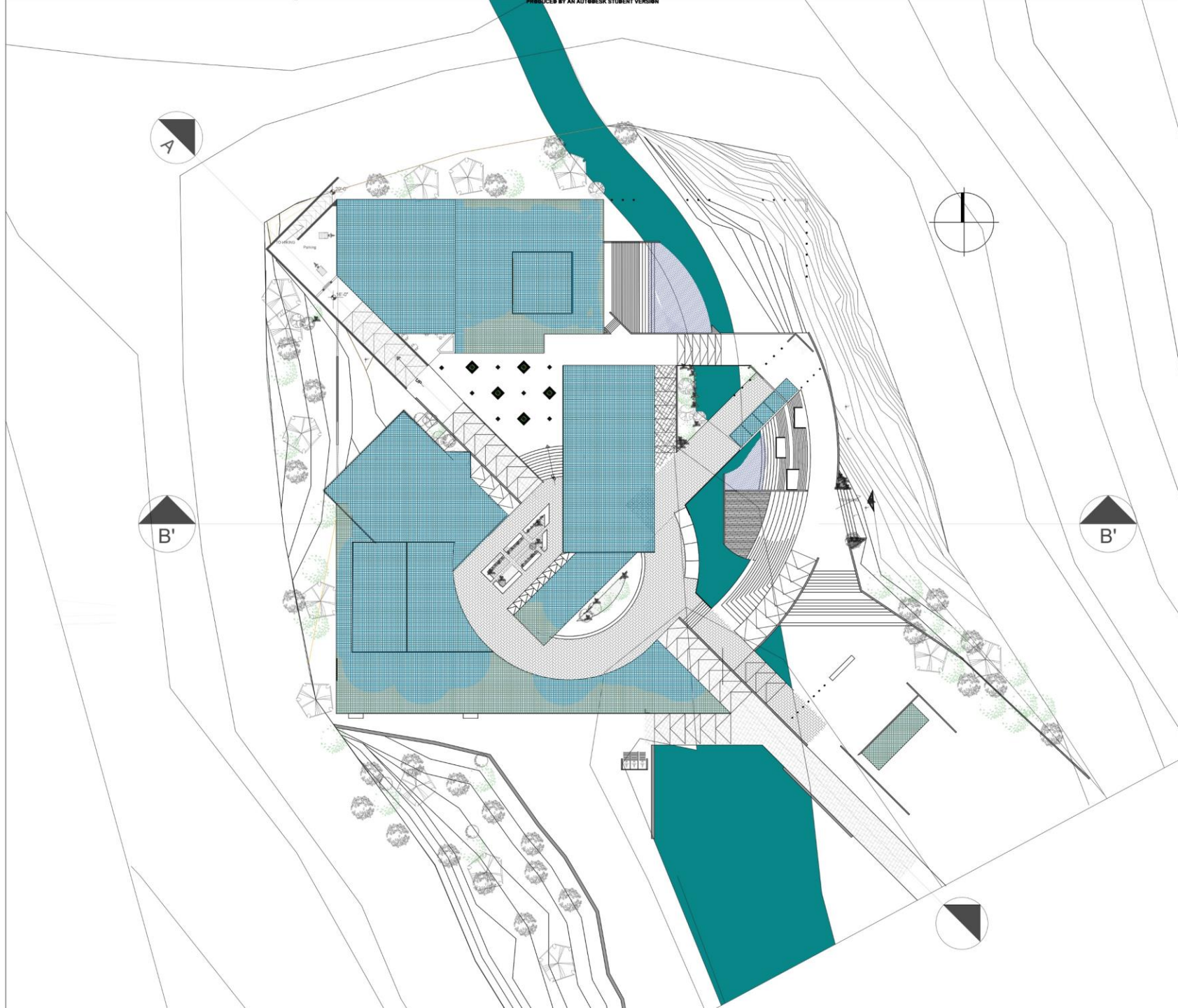


Current stage



# MASTER PLAN

PRODUCED BY AN AUTODESK STUDENT VERSION

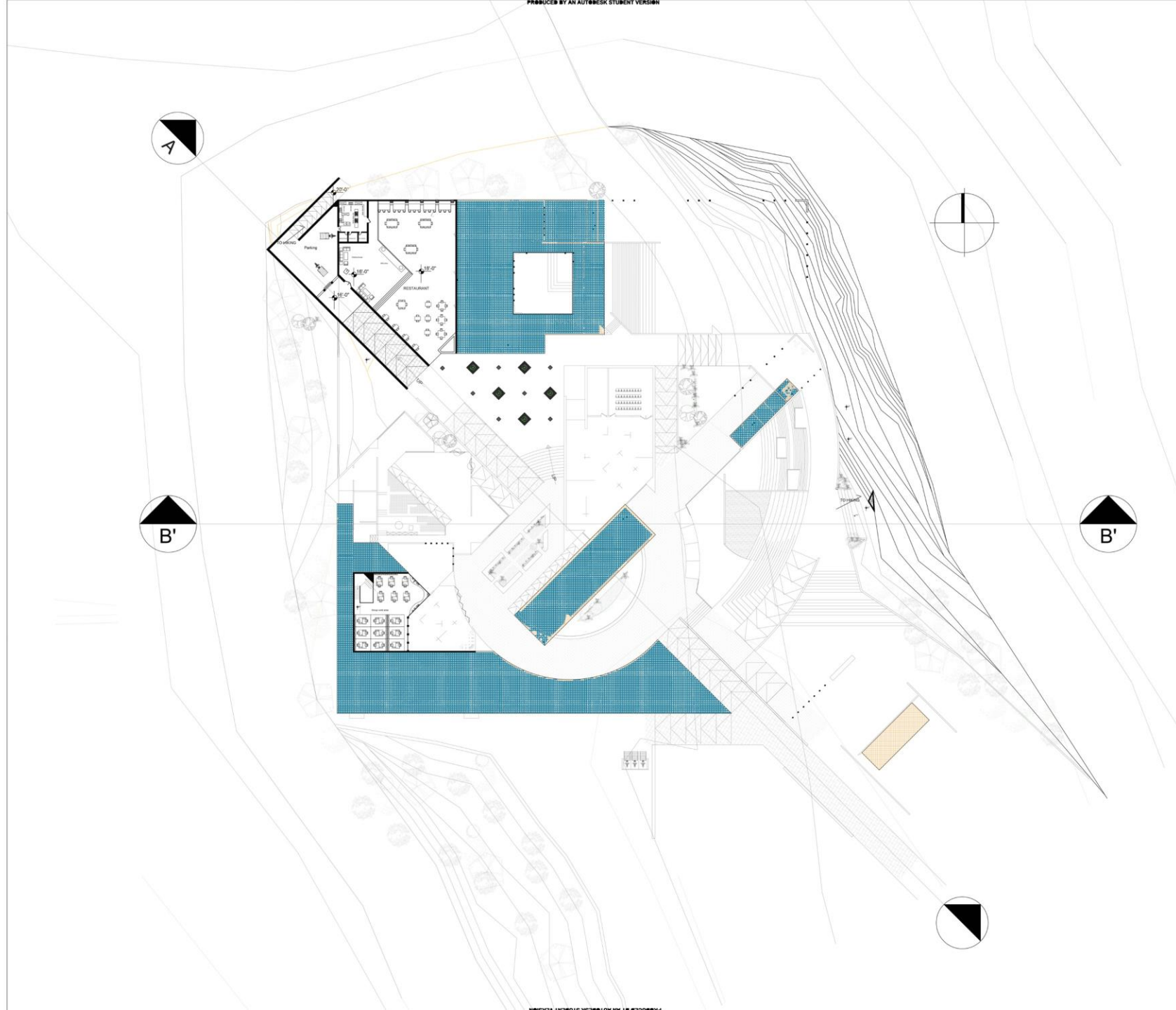


PRODUCED BY AN AUTODESK STUDENT VERSION



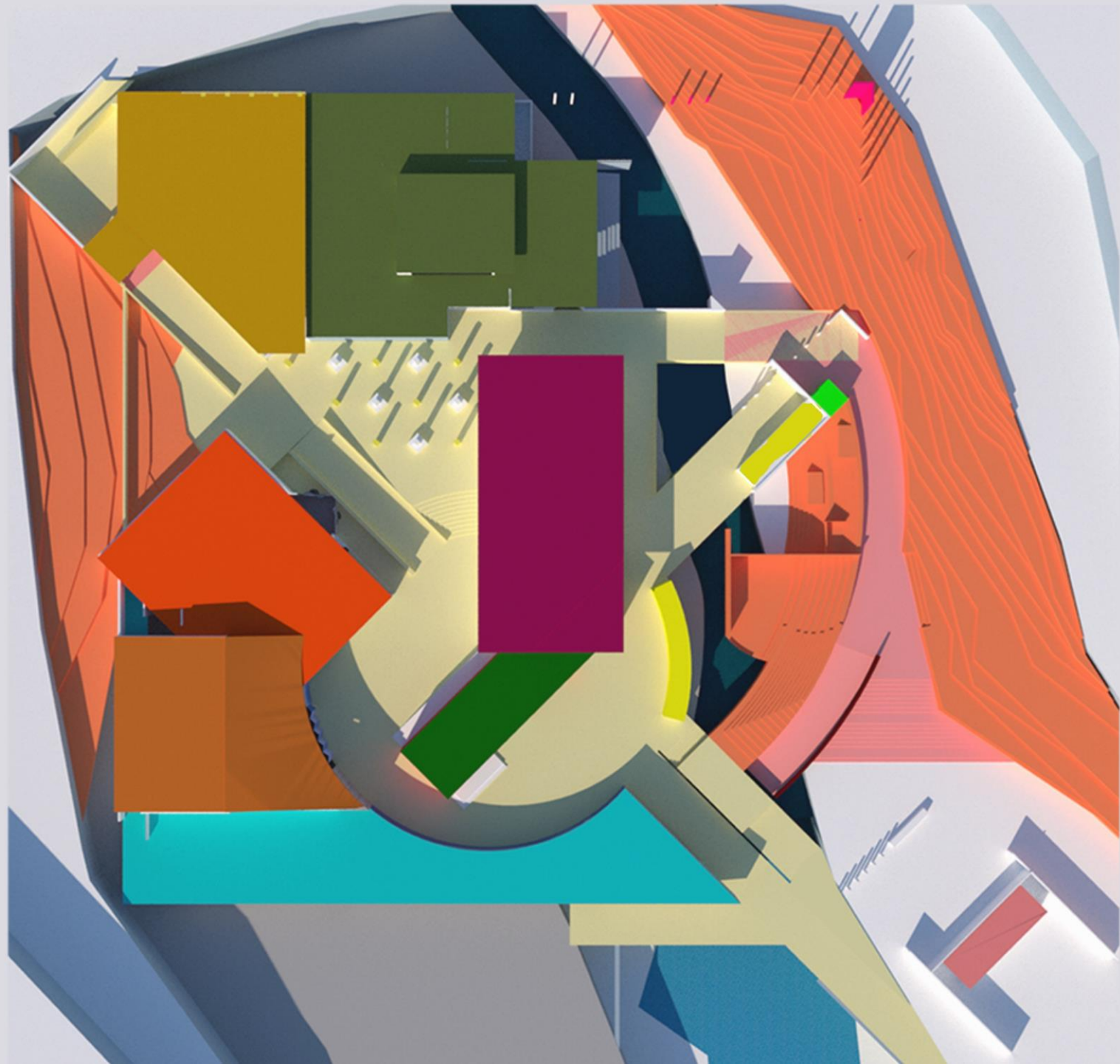
# FIRST FLOOR

PRODUCED BY AN AUTODESK STUDENT VERSION



PRODUCED BY AN AUTODESK STUDENT VERSION

- POTTERY
- RECYCLE HUB
- PLASTIC WORKSHOP
- PAPER / CARDBOARD WORKSHOP
- EXIBITION
- RESTAURANT
- COMMUNITY CENTRE
- KISOSKS
- DHABBA
- MULTIPURPOSE STAIRS
- BATHROOM



# LINKAGES BETWEEN SPACES



Window in west side to link exhibition space with pottery- it will act as a live performance

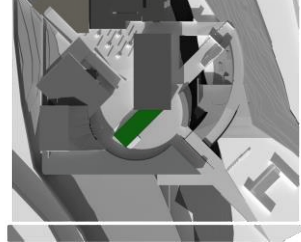
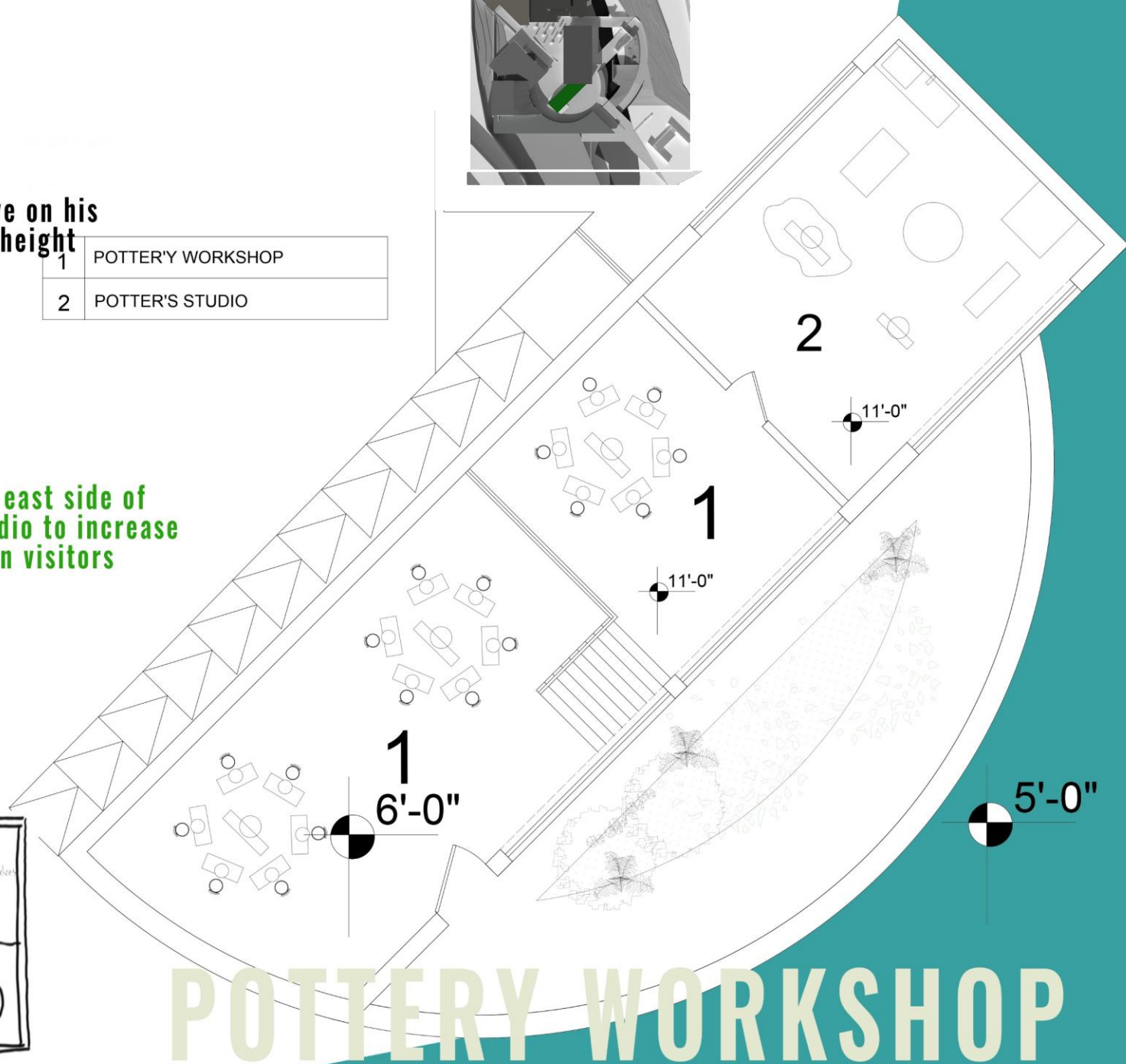
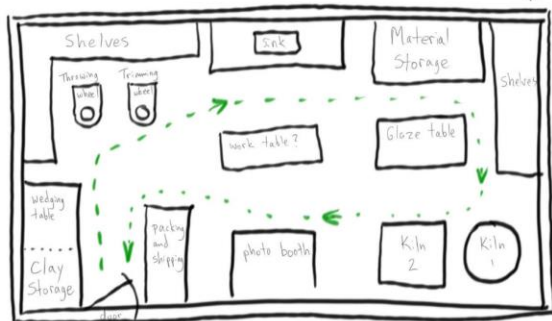
Potter can keep eye on his students from the height

Window in east side of potter studio to increase curiosity in visitors

**ENTRY**

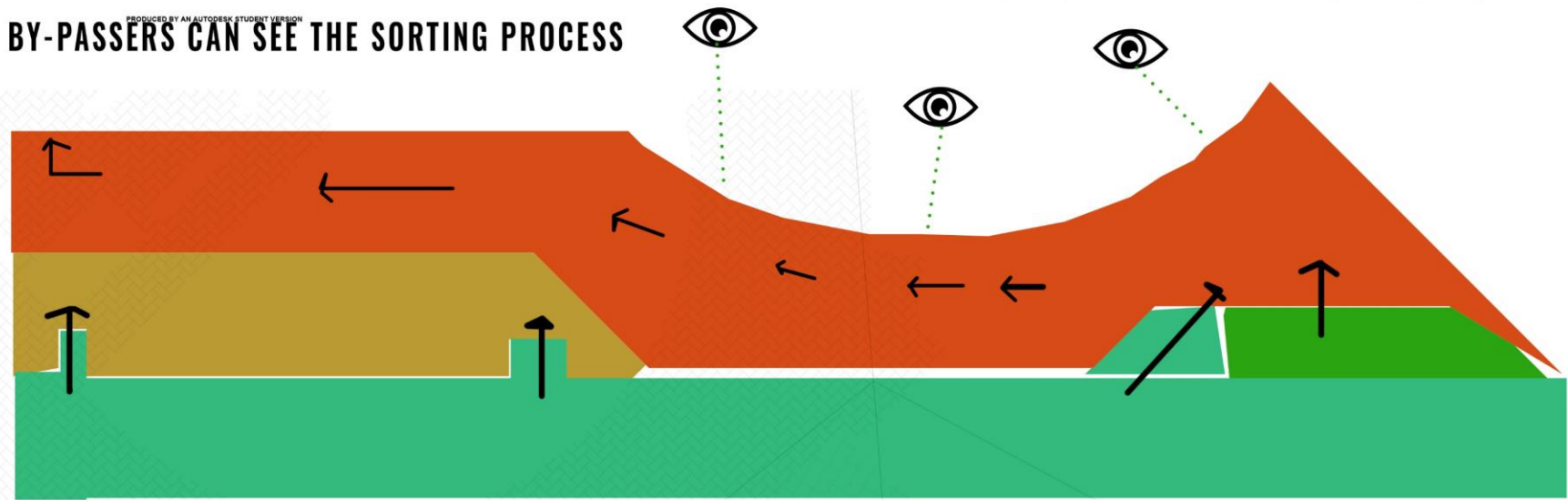
flow of potter in studio

1	POTTERY WORKSHOP
2	POTTER'S STUDIO

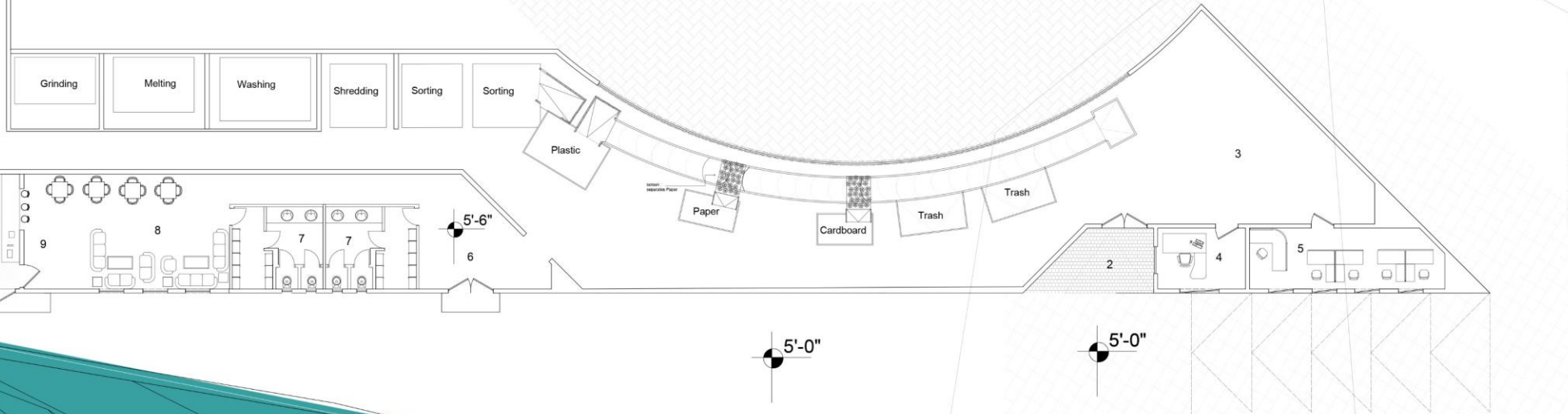


# LINKAGES BETWEEN SPACES

BY-PASSERS CAN SEE THE SORTING PROCESS



- 1 parking
- 2 UNLOADING DOCK
- 3 TIPPING FLOOR
- 4 SECURITY
- 5 Management office
- 6 STAFF ENTRANCE
- 7 Rest rooms
- 8 STAFF ROOM
- 9 CAFE

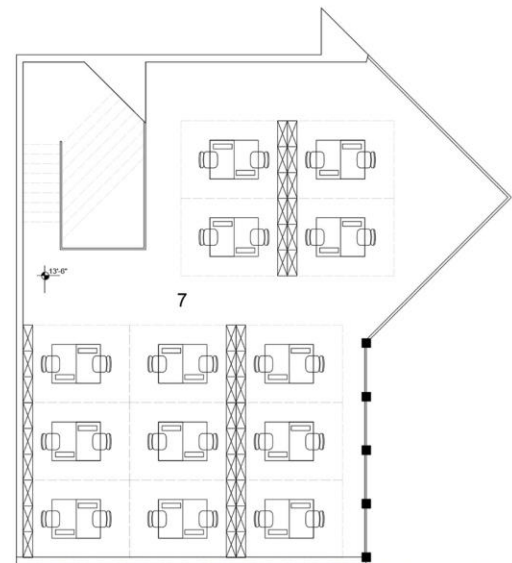
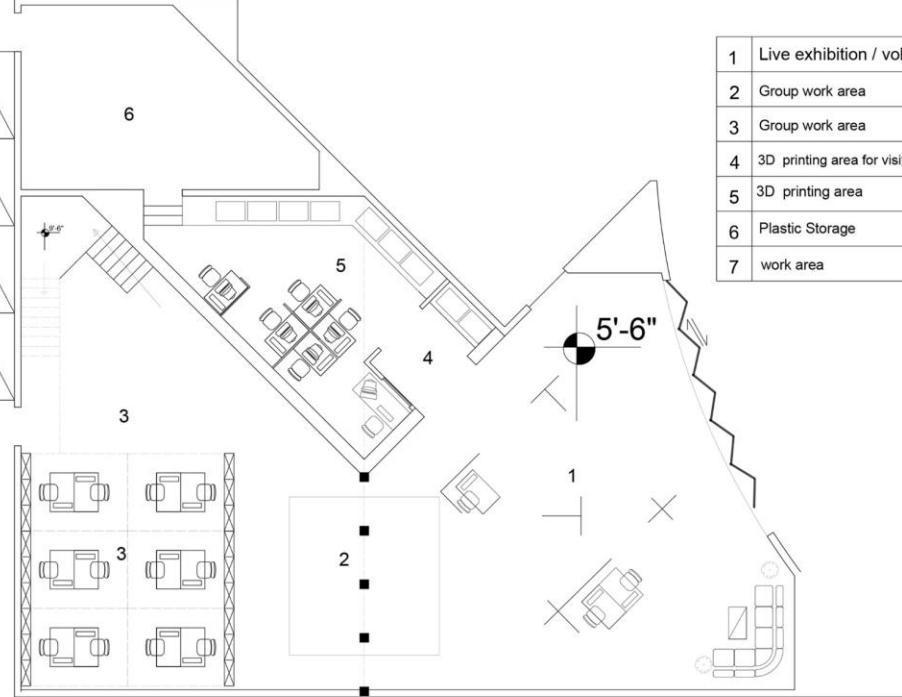
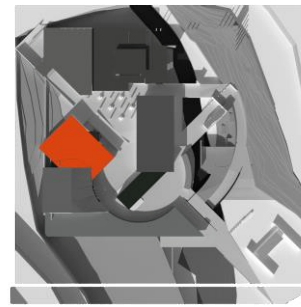


# SORTING AND ADMIN

PRODUCED BY AN AUTODESK STUDENT VERSION

# LINKAGES BETWEEN SPACES

1	Live exhibition / volunteer area
2	Group work area
3	Group work area
4	3D printing area for visitors
5	3D printing area
6	Plastic Storage
7	work area

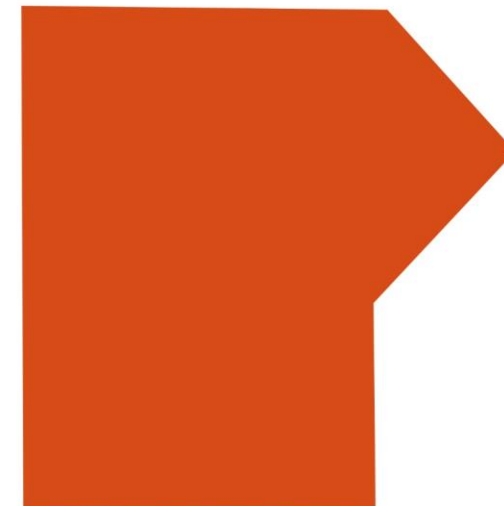
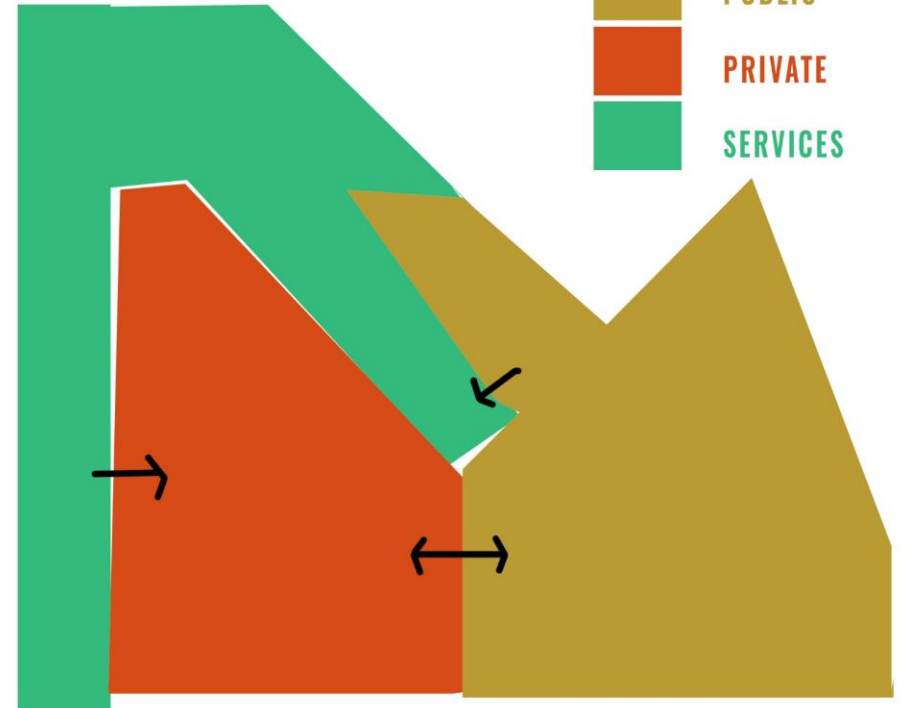


The plastic workshop diffuses to public zone to private zone

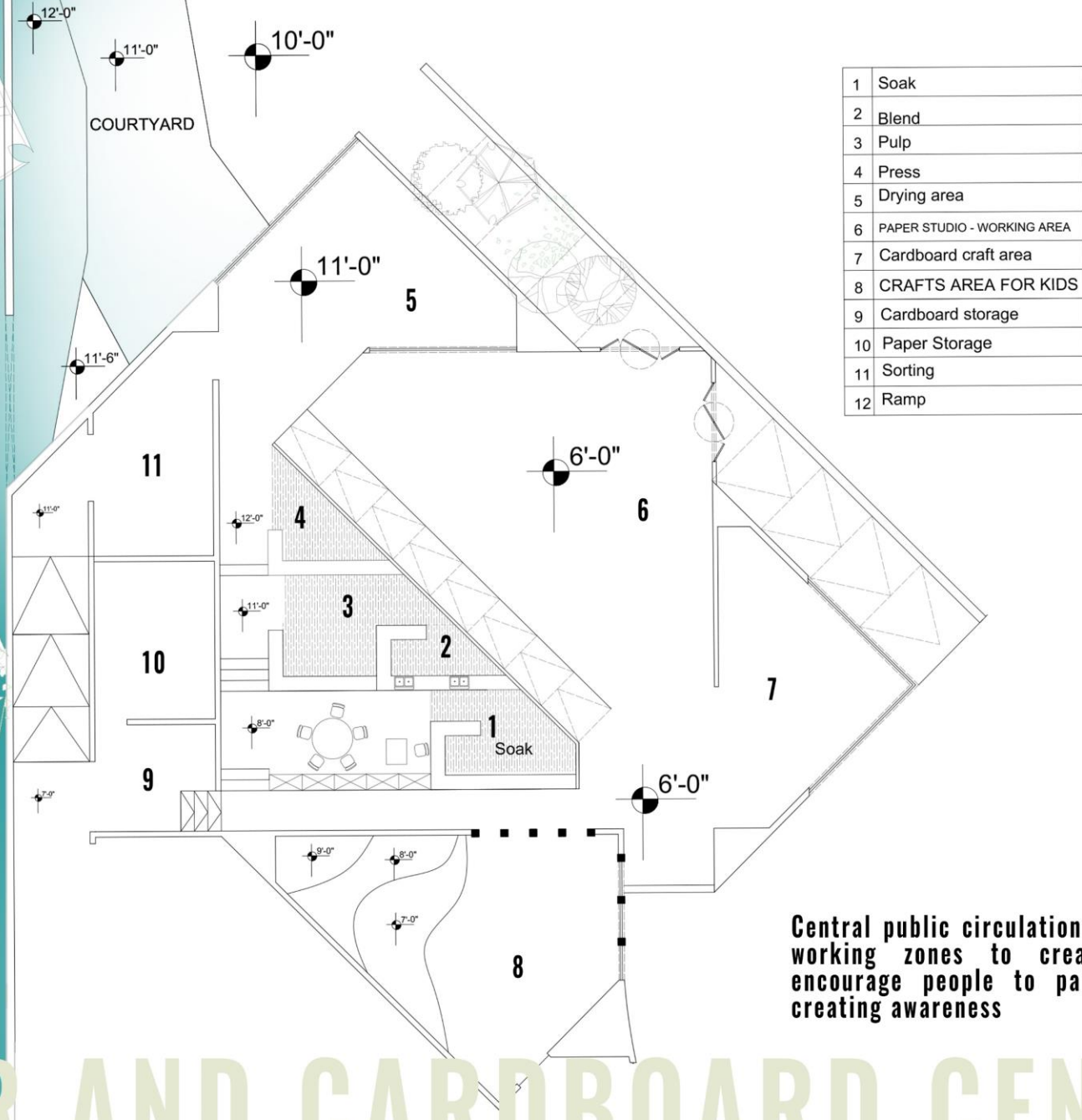
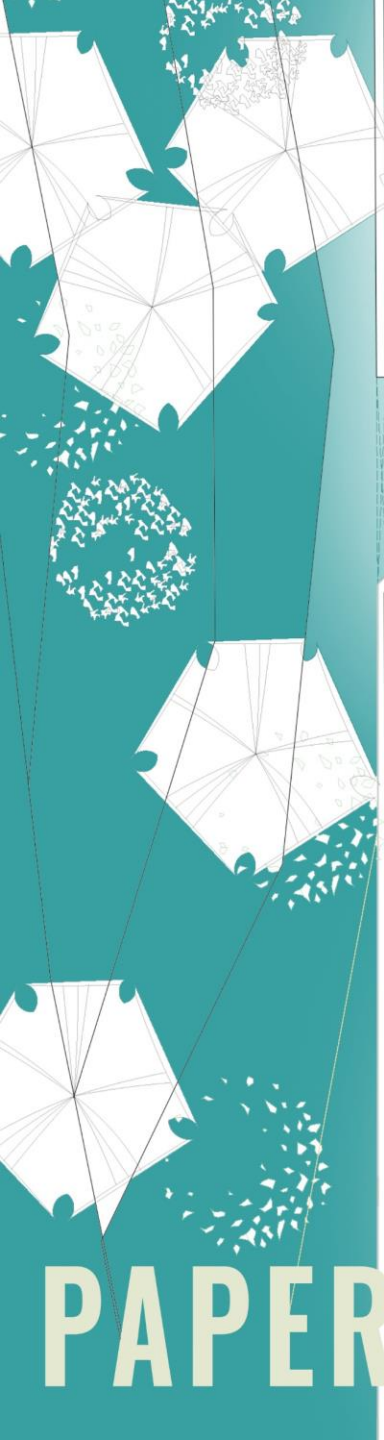
Ground floor is more participatory:  
 -people can help with the process  
 -They can get souvenirs in return from their plastic waste-

A fun solution to peak interest in people.

Blurs the line between tourists and workers

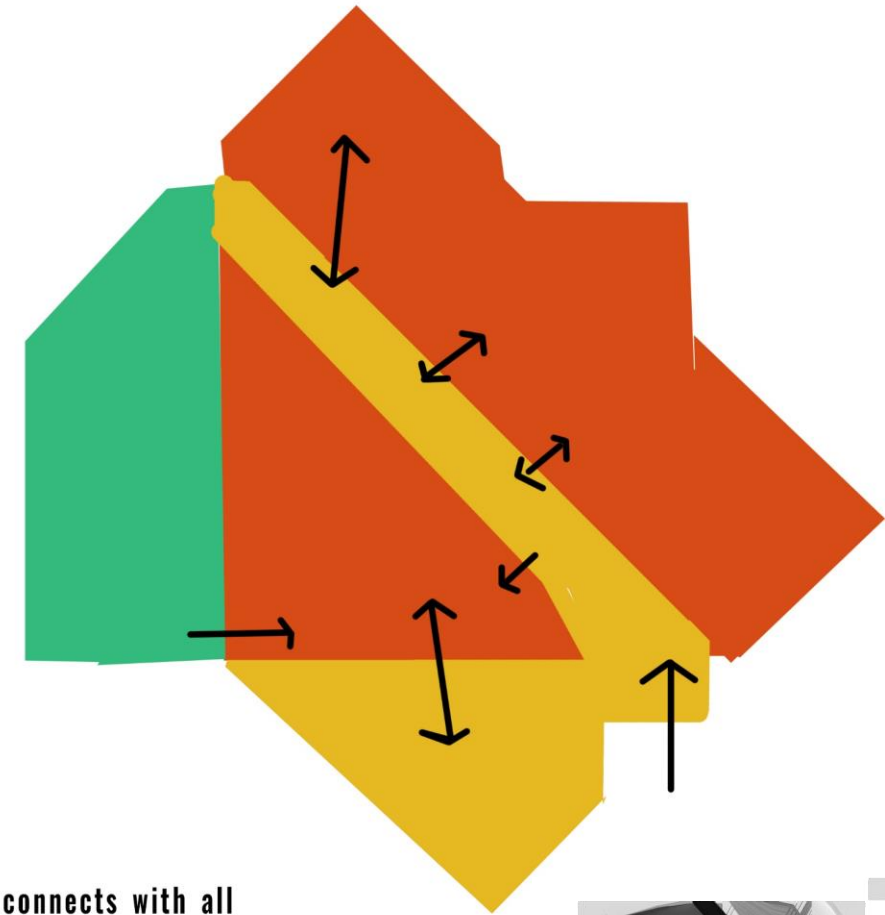


# PLASTIC WORKSHOP

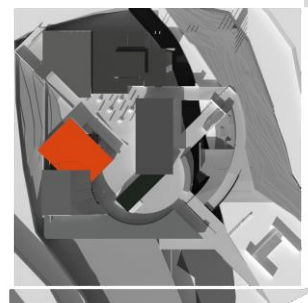


1	Soak
2	Blend
3	Pulp
4	Press
5	Drying area
6	PAPER STUDIO - WORKING AREA
7	Cardboard craft area
8	CRAFTS AREA FOR KIDS
9	Cardboard storage
10	Paper Storage
11	Sorting
12	Ramp

# LINKAGES BETWEEN SPACES

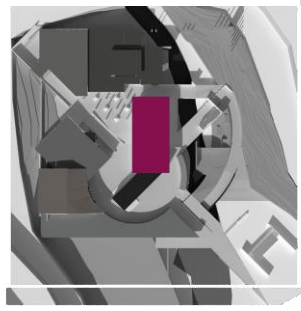


Central public circulation connects with all working zones to create openness and encourage people to participate . hence creating awareness



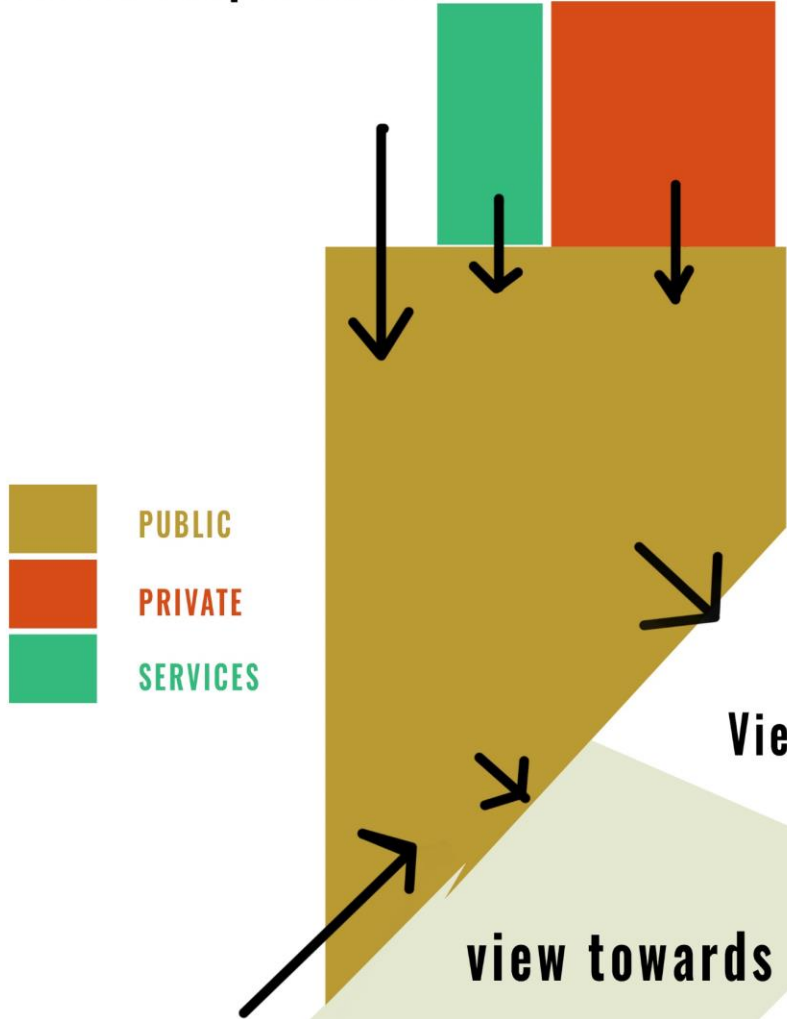
# PAPER AND CARDBOARD CENTRE

# LINKAGES BETWEEN SPACES



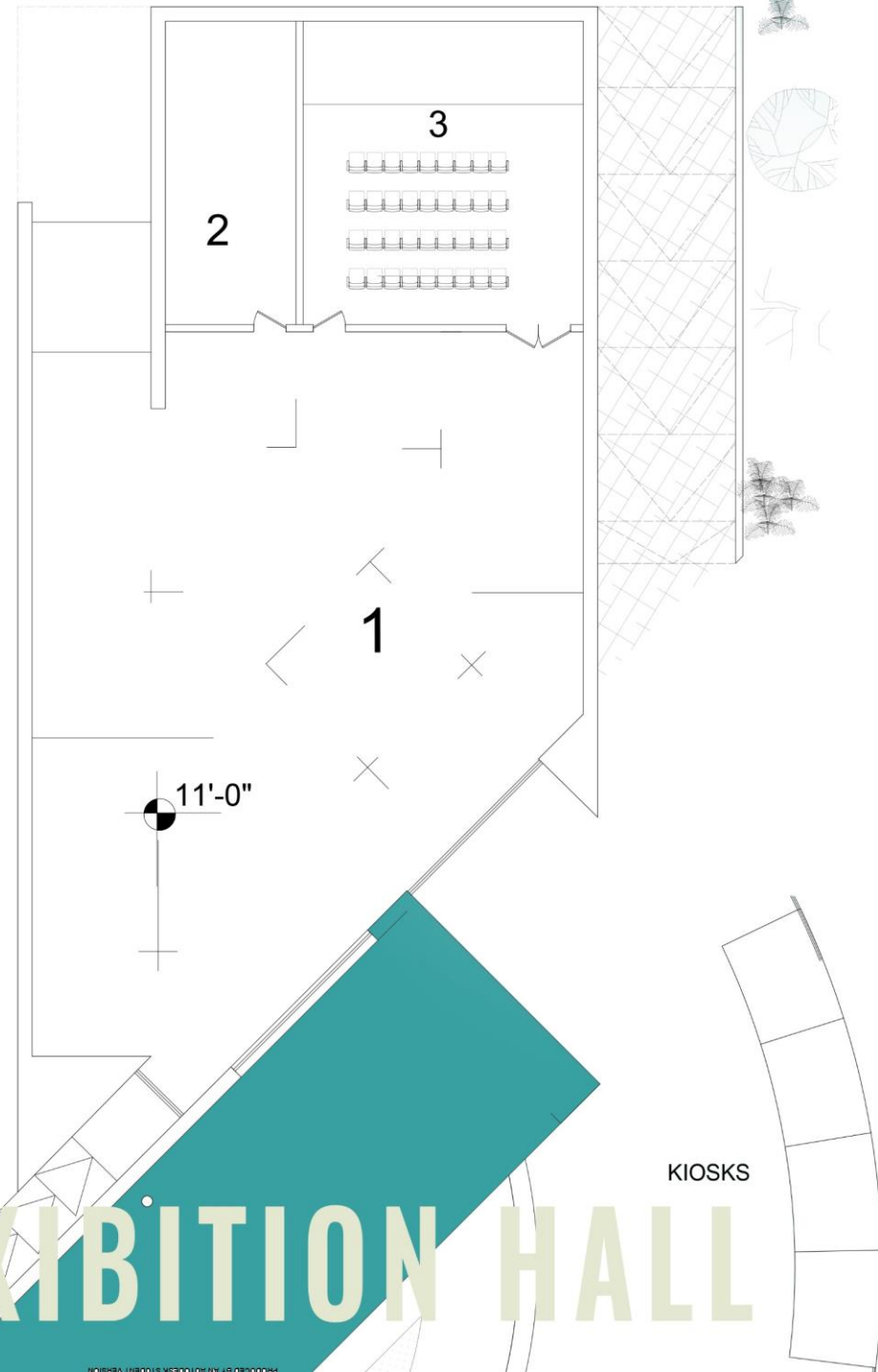
- |   |                 |
|---|-----------------|
| 1 | EXHIBITION HALL |
| 2 | Storage         |
| 3 | Seminar hall    |

Entrances from two locations- provide different experiences



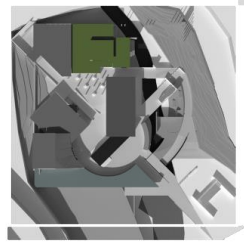
View towards outdoor kiosks

view towards Live pottery

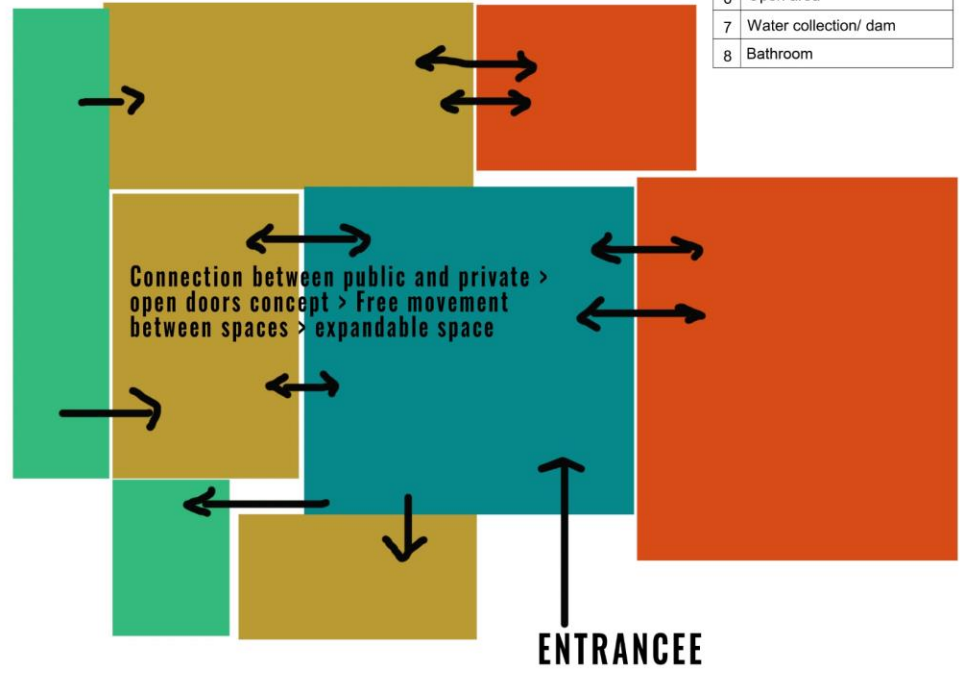


# LINKAGES BETWEEN SPACES

- PRIVATE
- OUTDOOR
- PRIVATE
- COURTYARD

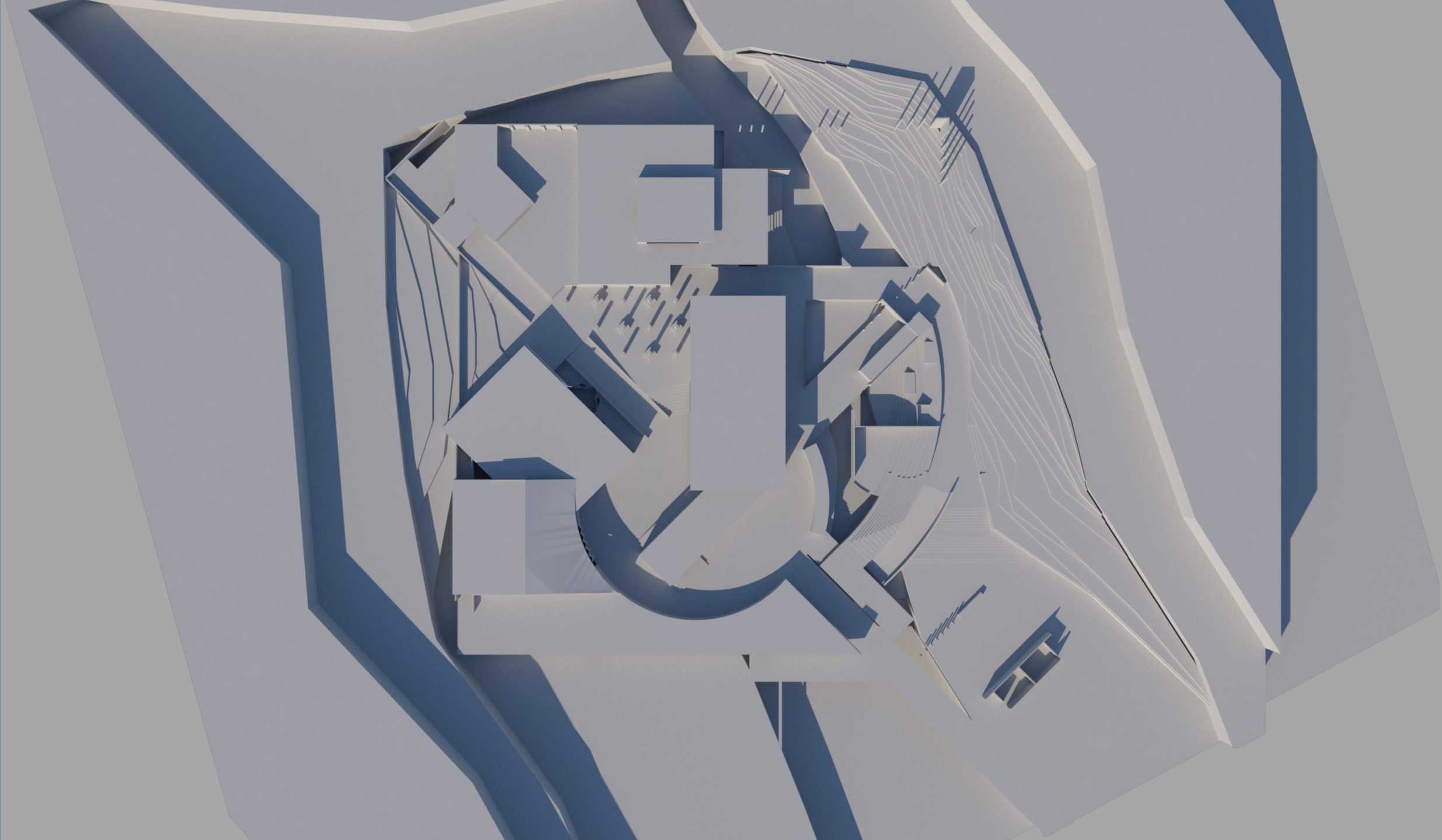


1	Open learning area/ courtyard
2	Computer lab
3	Training Studio
4	Storage
5	Forum
6	Open area
7	Water collection/ dam
8	Bathroom



# COMMUNITY TRAINING CENTRE

TOP VIEW 3D



# CIRCULATION: The ludic element of curiosity- Exploration

TYPES OF USERS:

LOCALS



TOURISTS



SERVICES



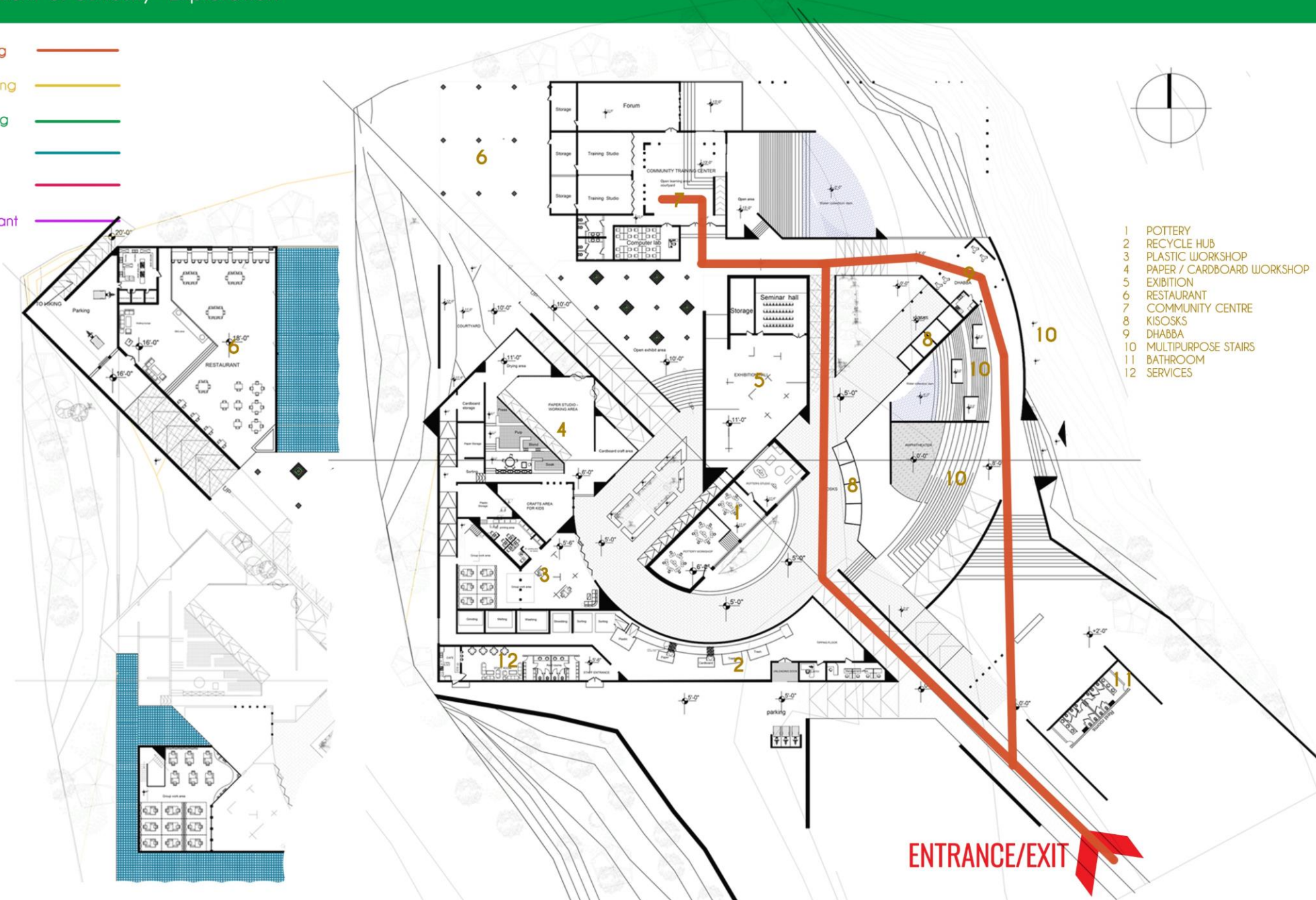
- Learning ———
- Gathering ———
- Creating ———
- Explore ———
- Hiking ———
- Restaurant ———

MULTIPLE CIRCULATION CREATES CHOICES FOR THE USER TO EXPLORE THROUGH THE INTERVENTION.

SMALL PATHWAYS / RAMPS AND STAIRS OPEN UP TO NEW PLACES/VIEWS AND EXPERIENCES.

THE MOVEMENT INTENTS TO BLUR THE LINES BETWEEN LOCALS AND TOURISTS.

TOURISTS CAN BE PART OF WHAT LOCALS ARE SHOWCASING.



- 1 POTTERY
- 2 RECYCLE HUB
- 3 PLASTIC WORKSHOP
- 4 PAPER / CARDBOARD WORKSHOP
- 5 EXHIBITION
- 6 RESTAURANT
- 7 COMMUNITY CENTRE
- 8 KIOSKS
- 9 DHABBA
- 10 MULTIPURPOSE STAIRS
- 11 BATHROOM
- 12 SERVICES

ENTRANCE/EXIT

# CIRCULATION: The ludic element of curiosity- Exploration

TYPES OF USERS:

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TOURISTS



SERVICES



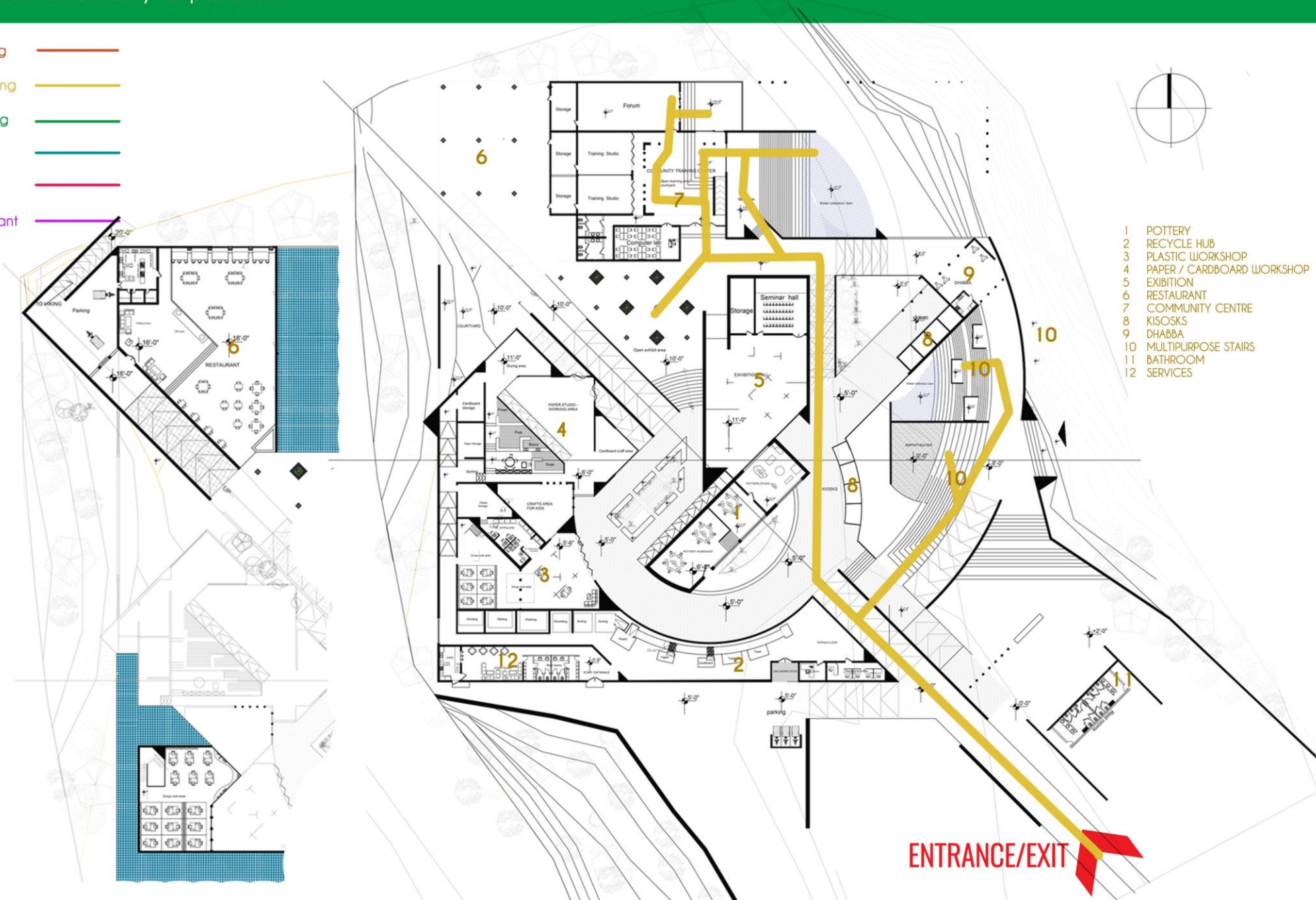
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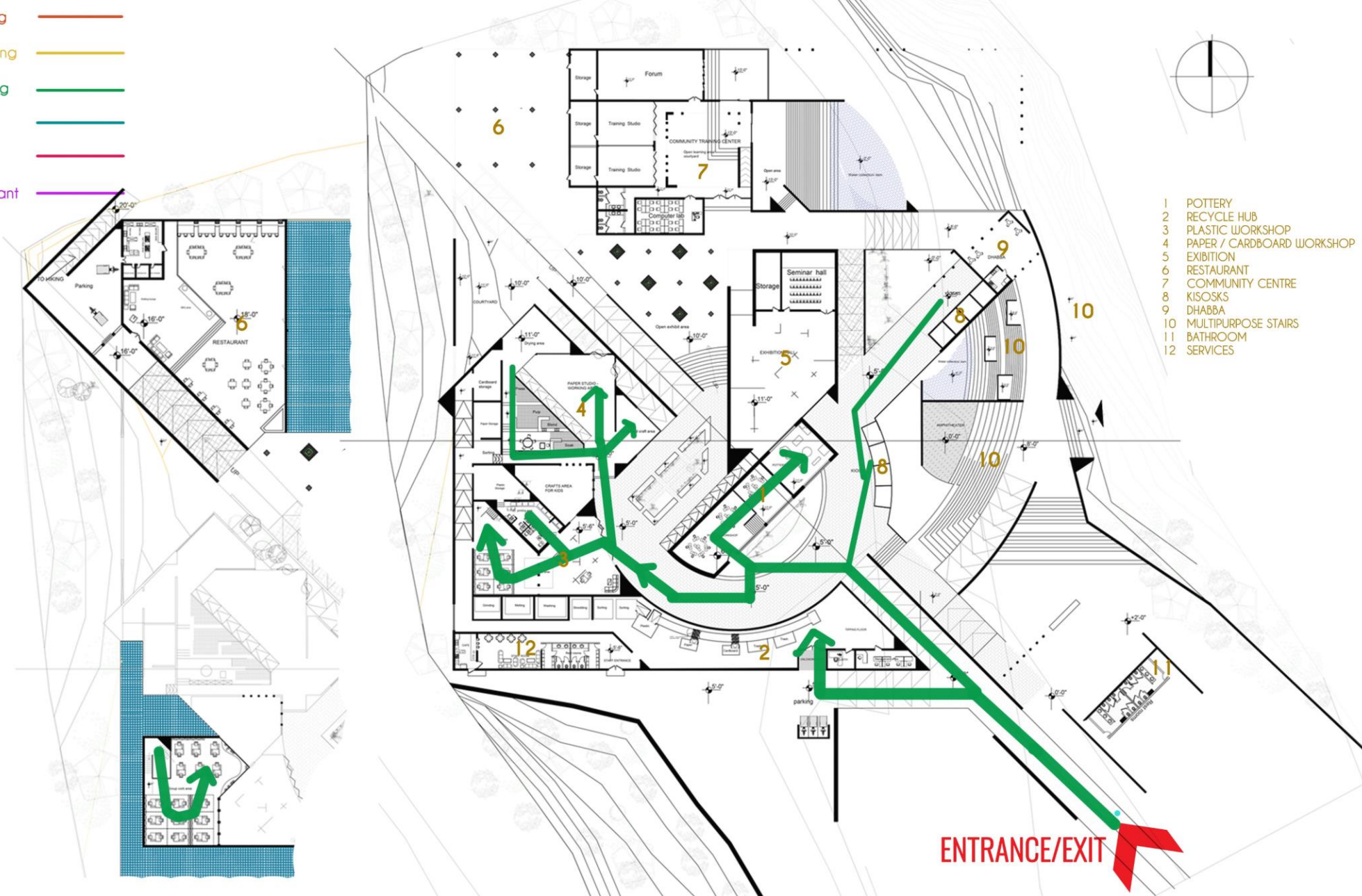
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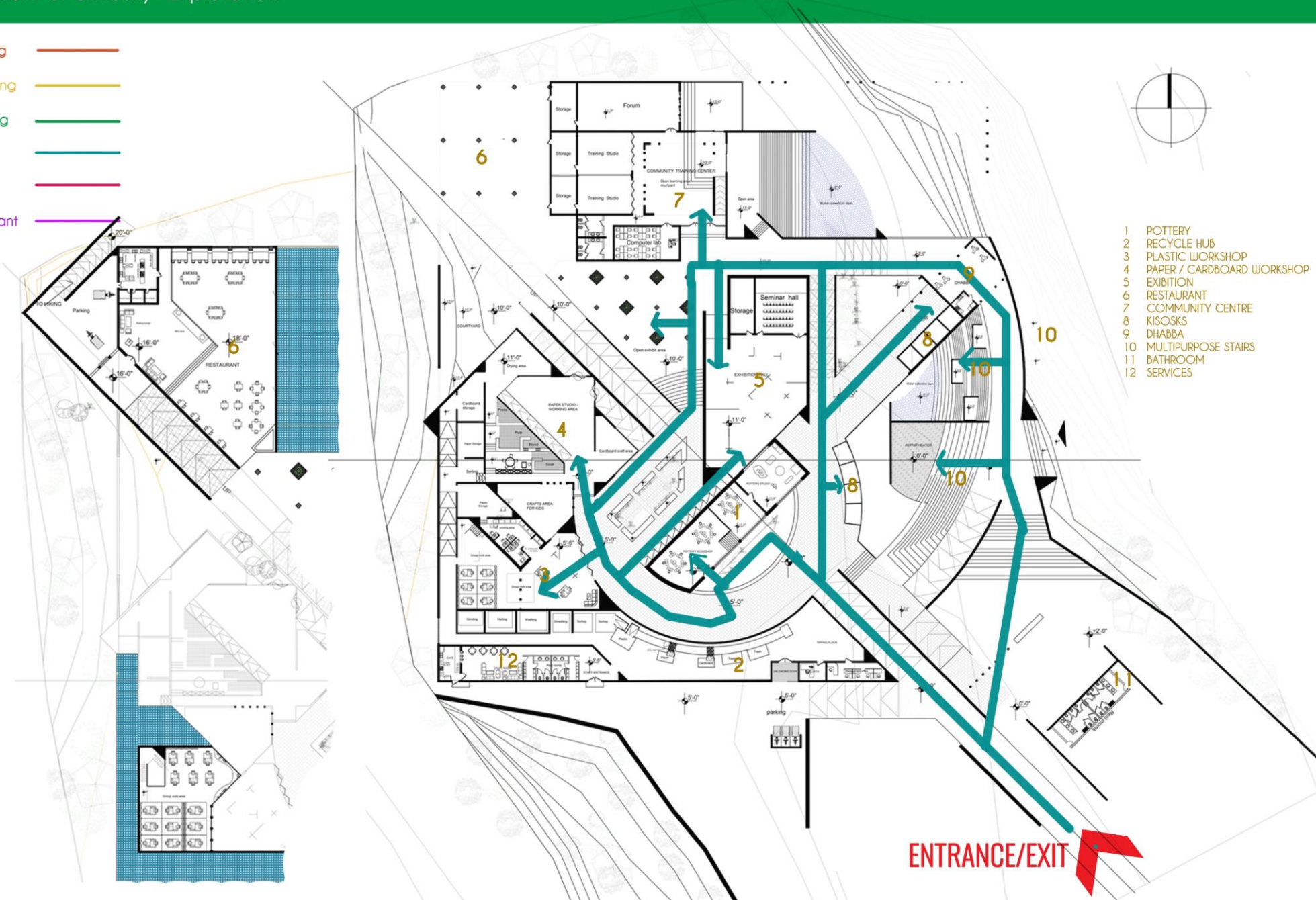
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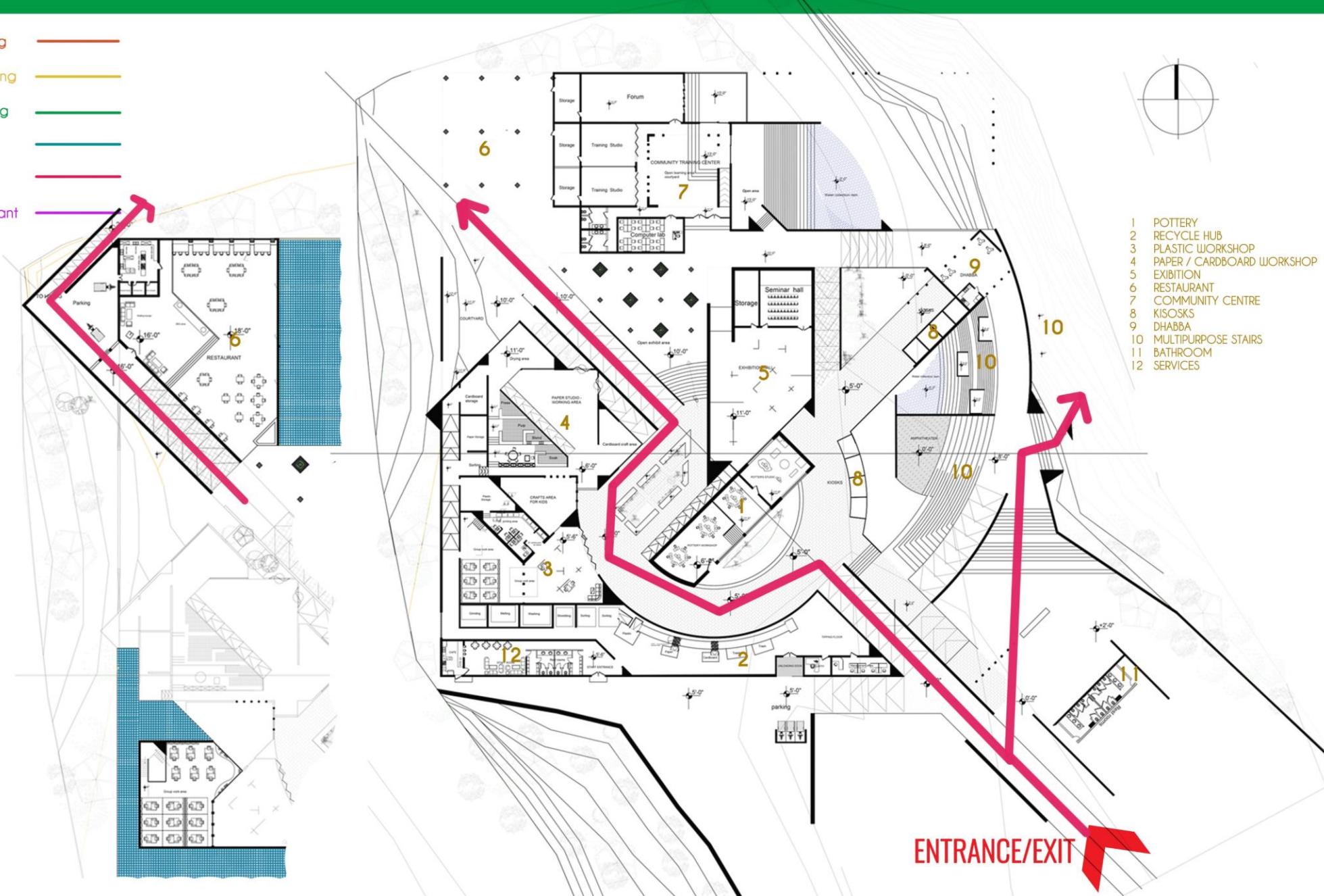
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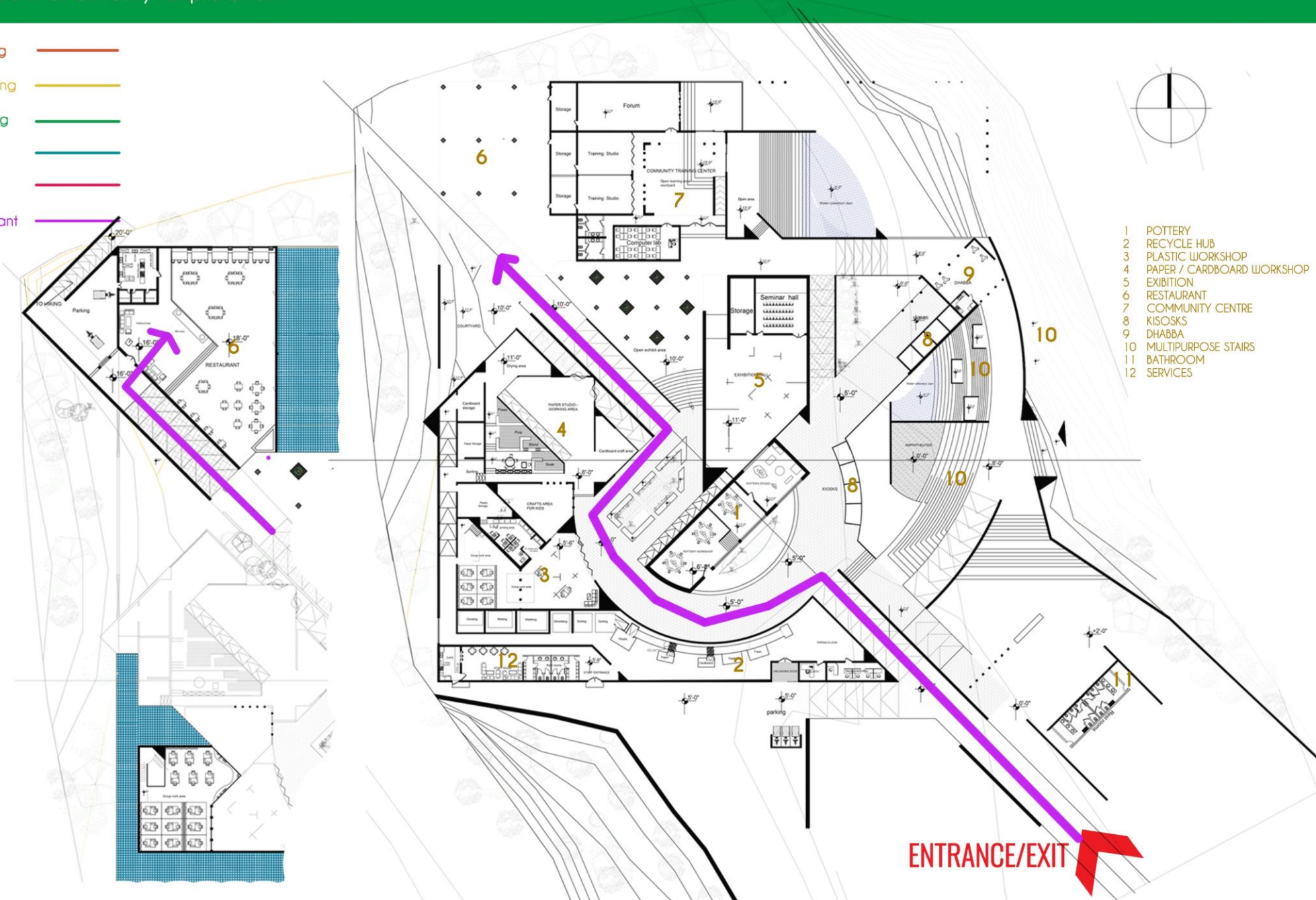
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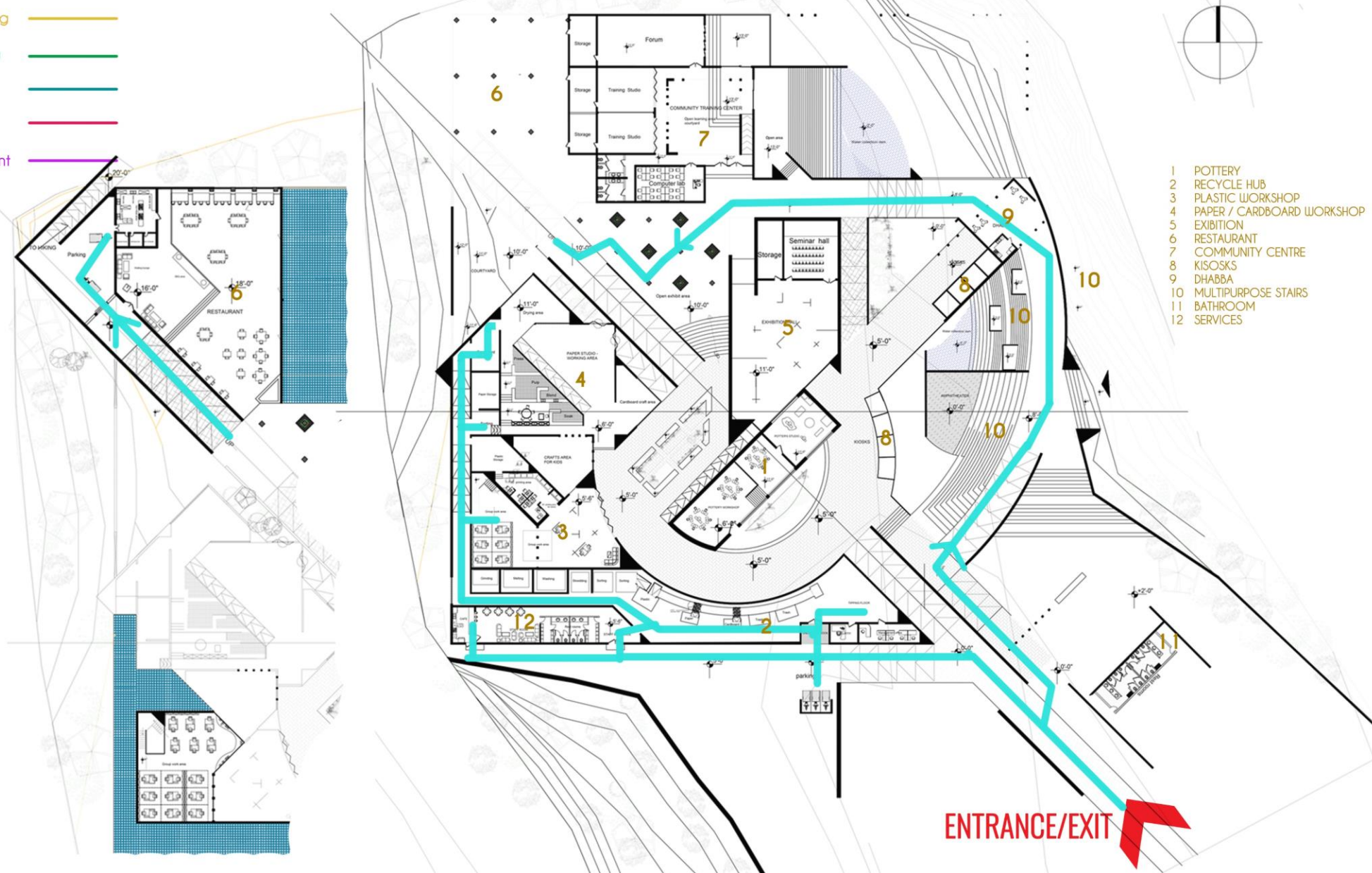
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SMALL PATHWAYS / RAMPS AND STAIRS OPEN UP TO NEW PLACES/VIEWS AND EXPERIENCES.

THE MOVEMENT INTENTS TO BLUR THE LINES BETWEEN LOCALS AND TOURISTS.

TOURISTS CAN BE PART OF WHAT LOCALS ARE SHOWCASING.

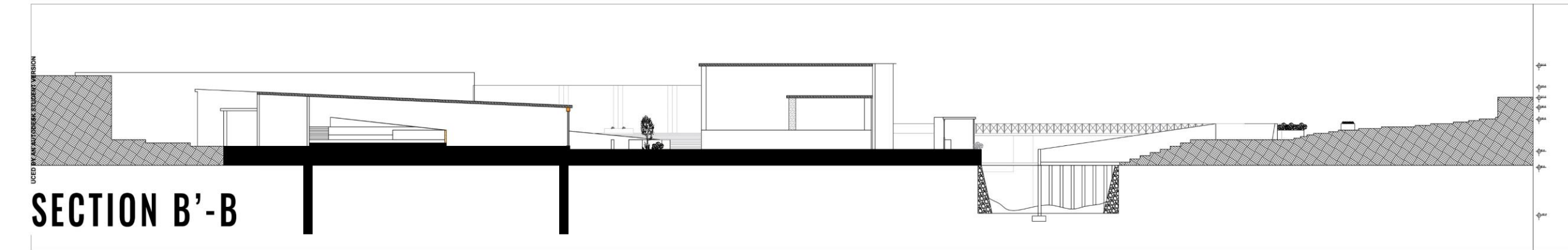
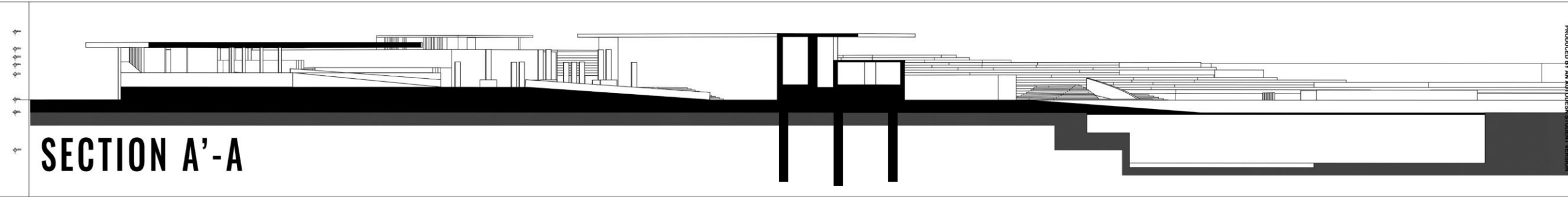


- 1 POTTERY
- 2 RECYCLE HUB
- 3 PLASTIC WORKSHOP
- 4 PAPER / CARDBOARD WORKSHOP
- 5 EXHIBITION
- 6 RESTAURANT
- 7 COMMUNITY CENTRE
- 8 KIOSKS
- 9 DHABBA
- 10 MULTIPURPOSE STAIRS
- 11 BATHROOM
- 12 SERVICES

ENTRANCE/EXIT

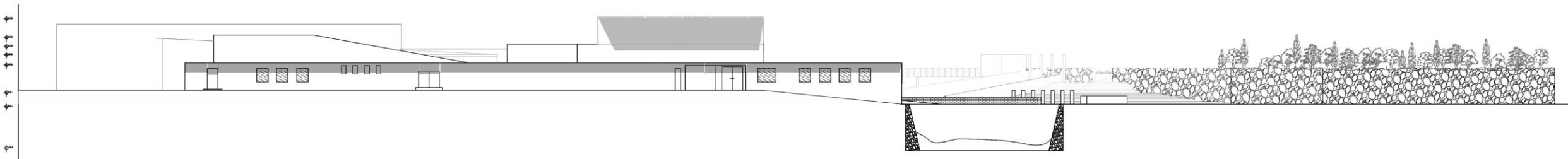
# SECTIONS

PRODUCED BY AN AUTODESK STUDENT VERSION

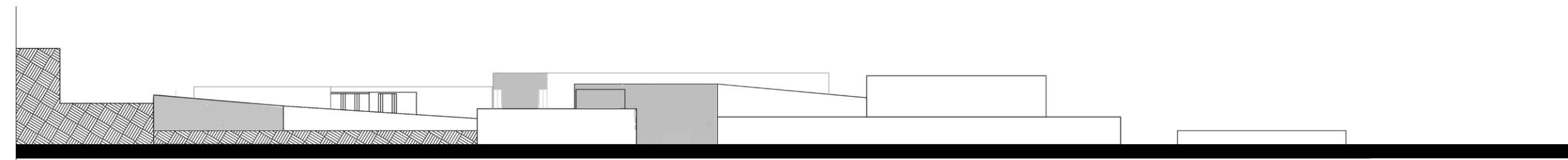


PRODUCED BY AN AUTODESK STUDENT VERSION

# ELEVATIONS



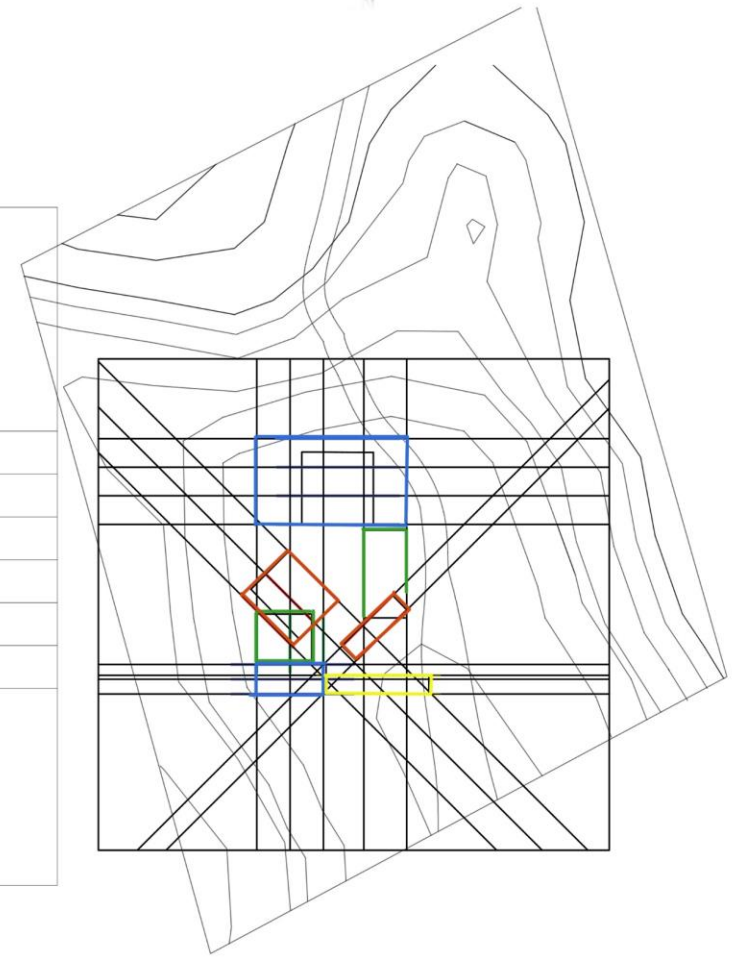
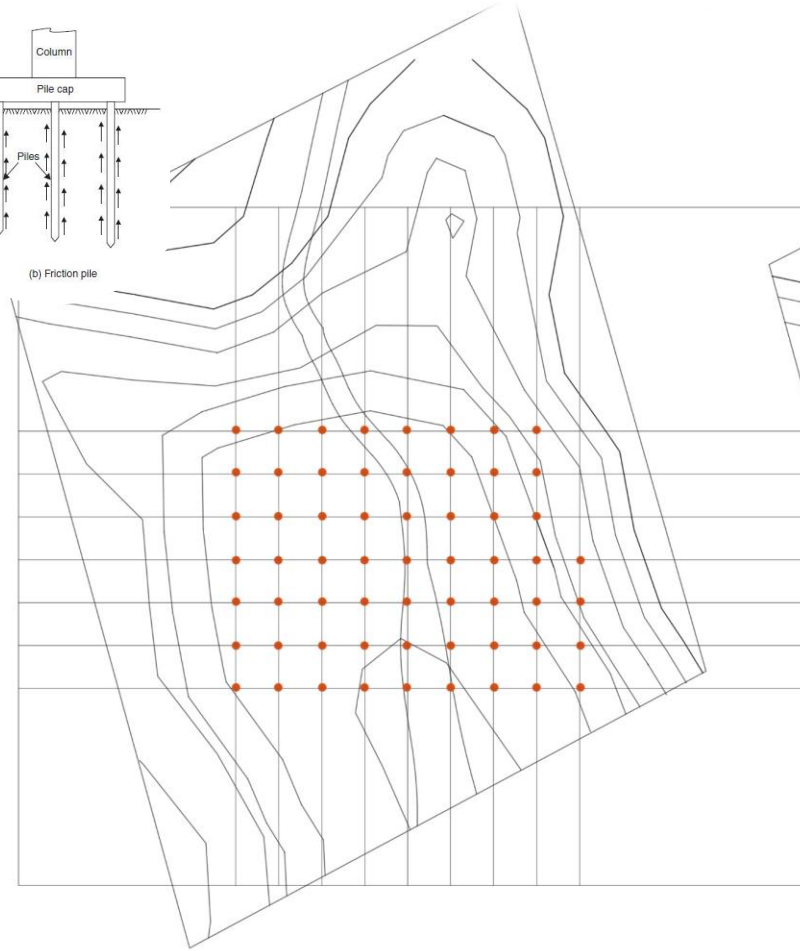
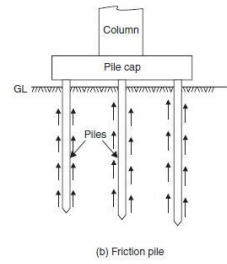
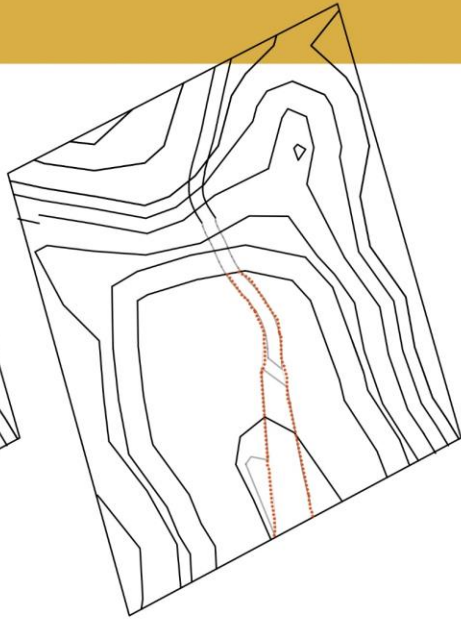
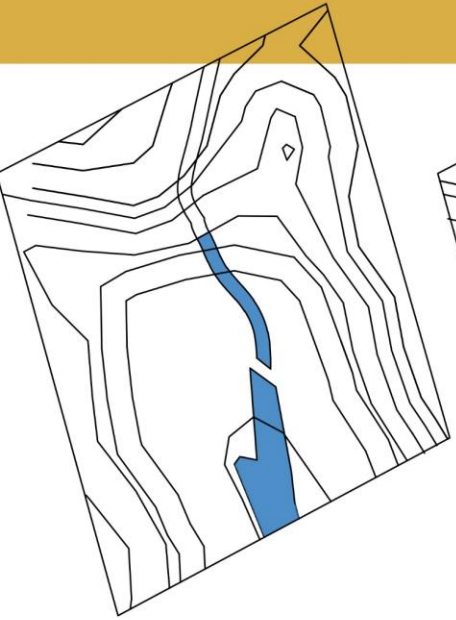
ELEVATION C-C'



ELEVATION D-D'

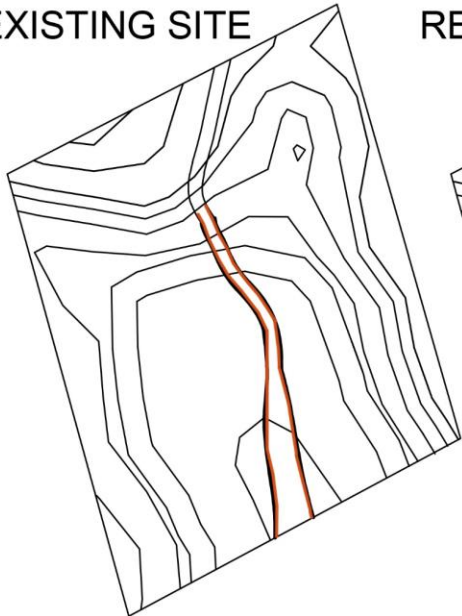


# STRUCTURAL DEVELOPMENT



EXISTING SITE

RE-Defining Nullah



Existing Contours

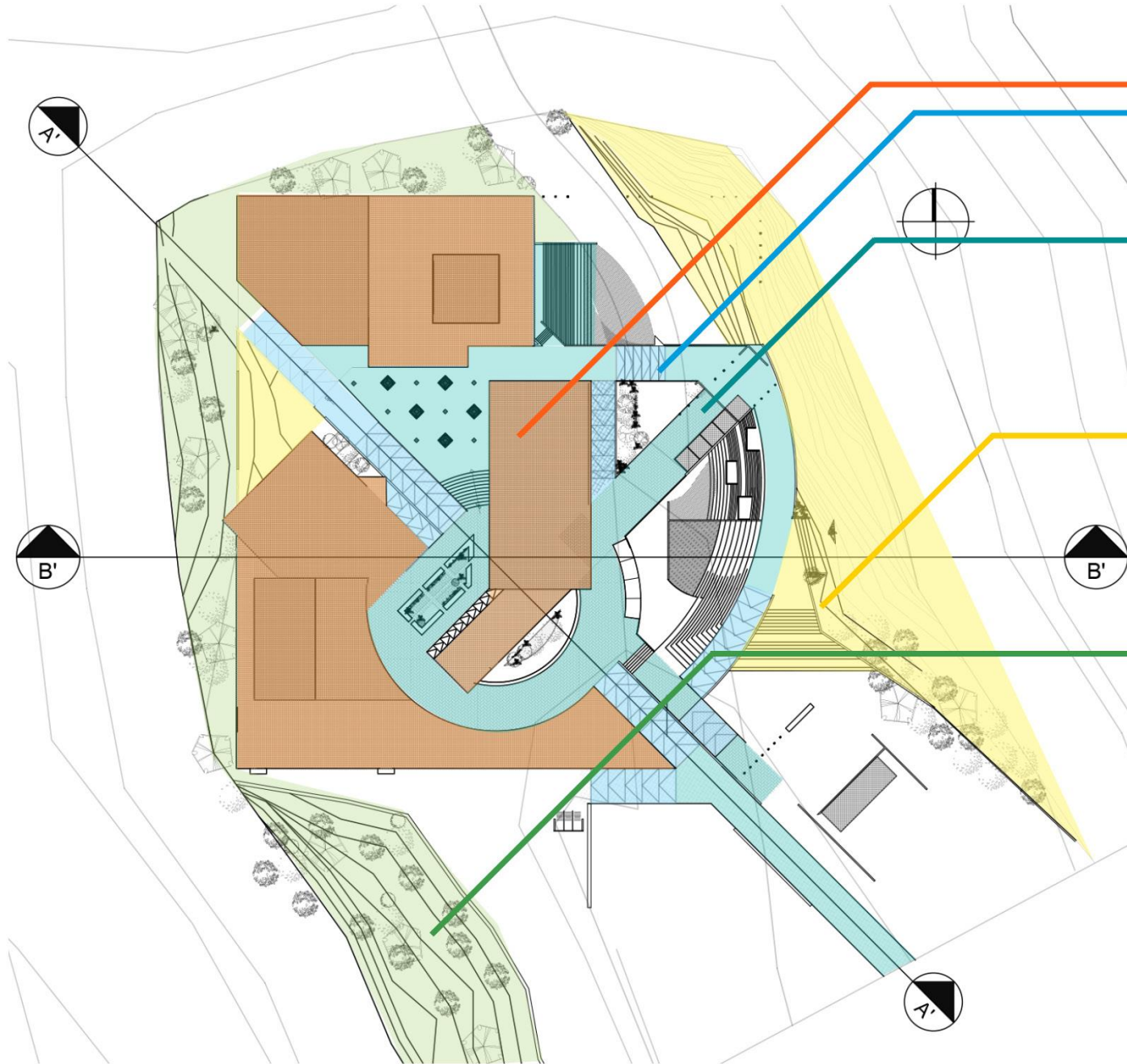
Re-enforced contours

PILES GRID STRUCTURE

GRID MODIFIED ACCORDING TO THE BUILDING POSITION



# WATER RETENTION AREA CALCULATION



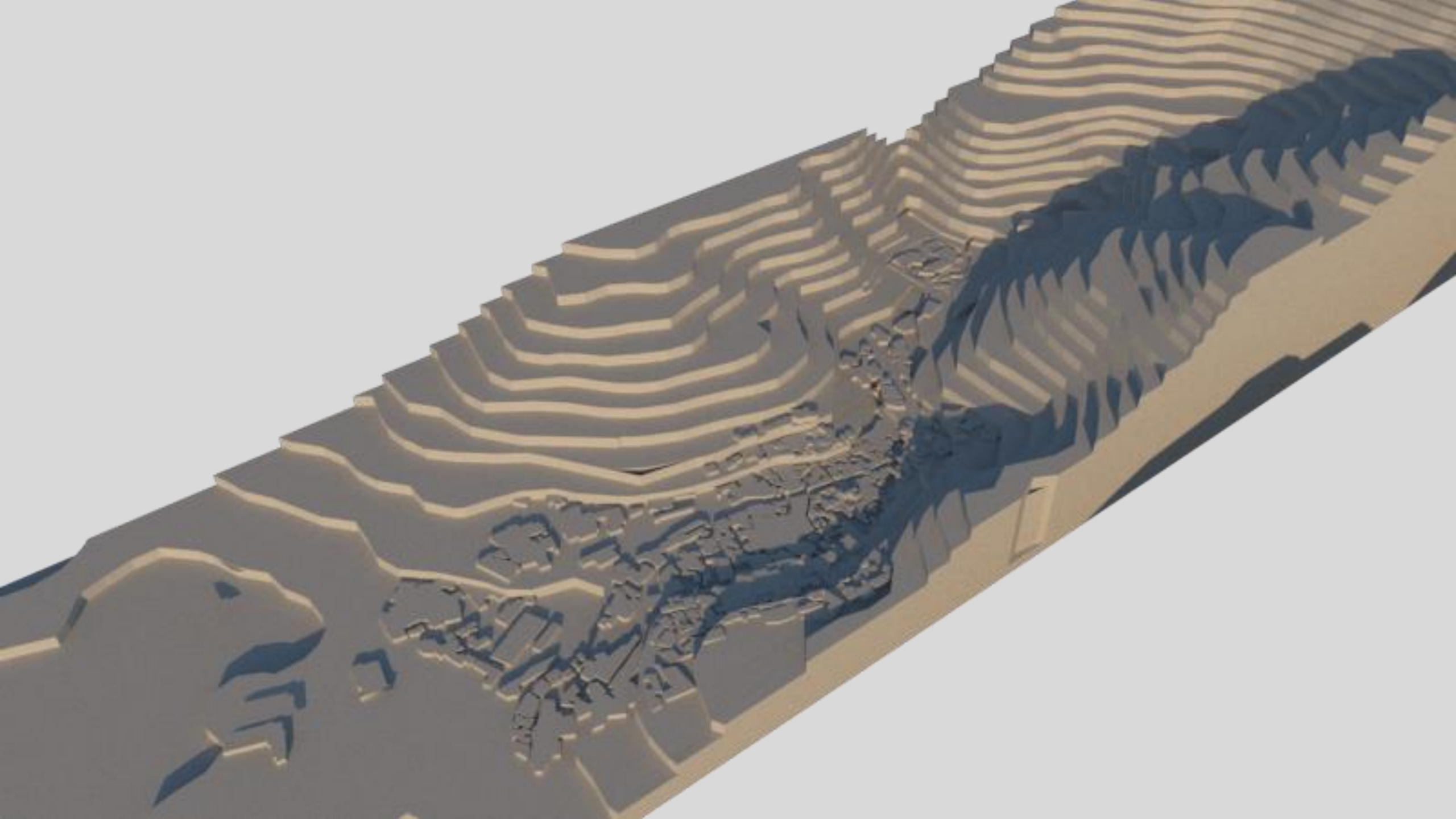
**TOTAL ROOF STORM WATER RUN OFF (Q1) -**  
 $Q1 = (C \cdot I \cdot A) / 96.23$   
 $A \text{ (total)} = 52,680$   
 roofs - 21,100 + 9,500 + 15,500 sqft = 46,100 sqft  
 ramps + stairs - 1,250 + 3,890 + 850 + 590 + 5,500 = 12,080 sqft  
 $I = 4''$   
 $C = 1$   
 = 2,420 GALLONS PER MINUTE

**TOTAL HARD LANDSCAPE AREA (pavers) STORM WATER RUN OFF (Q2) -**  
 $Q2 = (C \cdot I \cdot A) / 96.23$   
 $A = 6,200 + 11,400 \text{ sqft} = 17,600 + 8,700 + 8,760 + 2120$   
 $I = 4''$   
 $C = 0.65$   
 = 1,480 GALLONS PER MINUTE

**TOTAL SOFT LANDSCAPE AREA (stairs in loam) STORM WATER RUN OFF (Q3) -**  
 $Q3 = (C \cdot I \cdot A) / 96.23$   
 $A = 4,430 + 3164 + 18,000 + 2865$   
 $I = 4''$   
 $C = 0.45$   
 = 532 GALLONS PER MINUTE

**TOTAL SOFT LANDSCAPE AREA (grass) STORM WATER RUN OFF (Q3) -**  
 $Q3 = (C \cdot I \cdot A) / 96.23$   
 $A = 37,228 \text{ SQFT}$   
 $I = 4''$   
 $C = 0.35$   
 = 542 GALLONS PER MINUTE

**VOLUME OF STORM WATER RUN OFF FOR DRAINAGE SYSTEM (USING RATIONALE METHOD)**  
 $V = Q \cdot T$   
 $V = \text{VOLUME (GALLONS)}$   
 $Q = \text{STORM WATER RUN OFF (TOTAL)} = 4,974 \text{ GPM}$   
 $T = \text{TIME (15 MINUTES)}$   
 = 74,610 GALLONS PER MINUTE (GPM)  
 NALLAH DEPTH - 15 FT  
 NALLAH AREA - 13,000 + 9000 SQFT = 21,000 SQFT APPROX  
**WATER RETENTION AREA NEEDED MAXIMUM 4 FT DEPTH**



**THANKYOU**