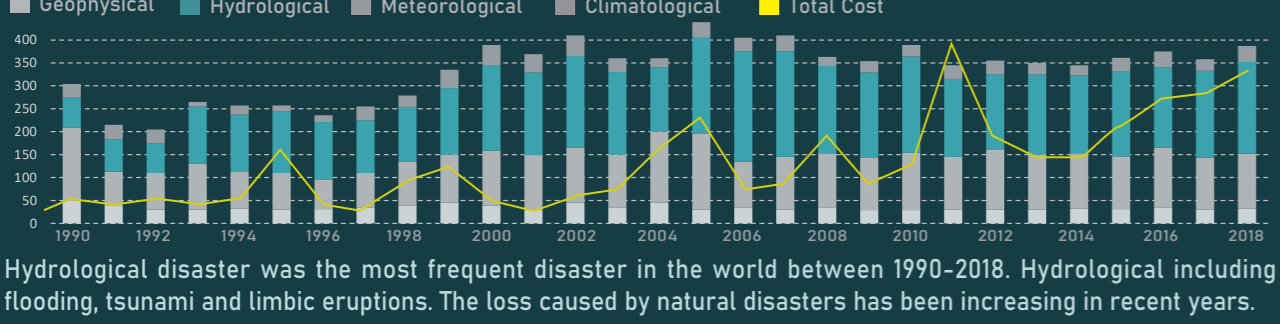


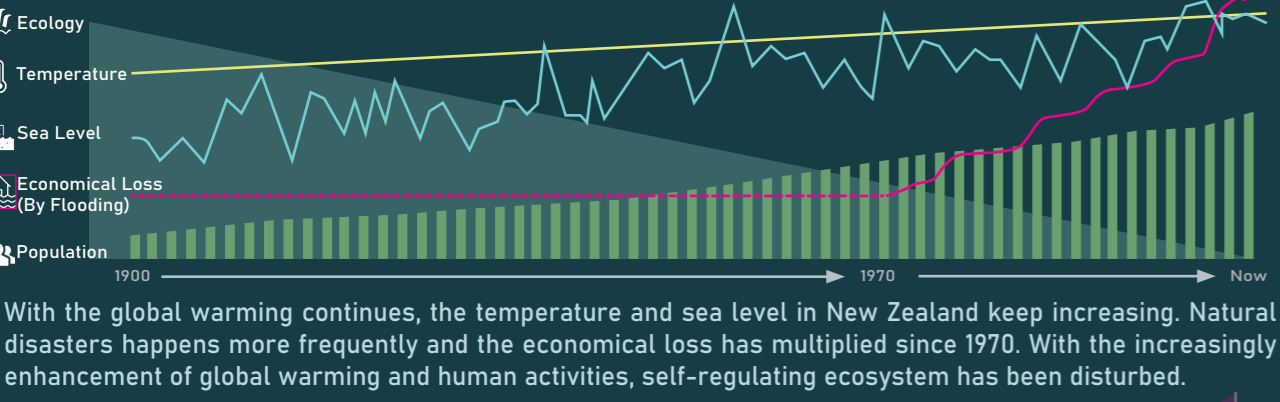
BACKGROUND & CONTEXT

Number of Disasters Triggered by Natural Hazards Worldwide



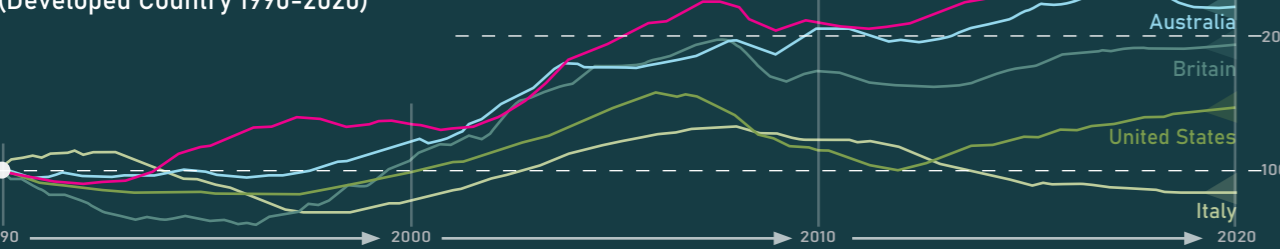
Hydrological disaster was the most frequent disaster in the world between 1990-2018. Hydrological including flooding, tsunami and limbic eruptions. The loss caused by natural disasters has been increasing in recent years.

New Zealand Social & Ecological Development Trends



With the global warming continues, the temperature and sea level in New Zealand keep increasing. Natural disasters happens more frequently and the economical loss has multiplied since 1970. With the increasingly enhancement of global warming and human activities, self-regulating ecosystem has been disturbed.

Global Housing Price Trends (Developed Country 1990-2020)



New Zealand housing price keeps increasing after financial crisis and has become higher than other developed countries. The houses are vastly over-valued and New Zealand is in bubble territory.

LOCATION New Zealand - Christchurch - Avon River - Red Zone



Avon River

Christchurch is the city built on a flood plain. It has temperate climate with moderate rainfall. Because of the climate change, the annual precipitation will increase, the lower Avon river will face increased flooding. The largest flood-prone land in Christchurch is called Red Zone.

Christchurch Median Household Income

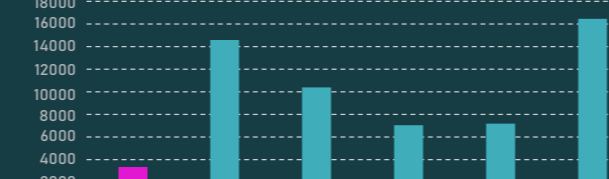


In Christchurch, most of the annual family incomes are high enough to afford a house. There are still 20% of the family household incomes are lower than \$33,310; they can't afford to buy any house in the main city in New Zealand.

Christchurch Red Zone

Christchurch Red Zone is about 600-hectares along the Avon River. The land in the red zone area has high flooding and soil liquefaction potential because of its high water table. Nearly 7000 homes were forced to move. Land use is the major issue of the Red Zone area. Vitalize the Red Zone would have a massive impact on the eastern suburbs.

Median House Income Required



TRAVISING THE RED ZONE

LASC 409 JIAYUAN LI (AIMILY) 1127668



REGIONAL PLAN

PROBLEMS

Natural Problems

Christchurch Red Zone is a flood-prone land with a high water table. The flooding issue will affect surrounding communities if not solved in 50 years. The water quality gets worse, and natural habitats are threatened at the same time.

Social Problems

With the housing bubble gets more serious and New Zealand gap of wealth is wider, poor people can't afford buying a house. Renting house is their only option but will increase their living pressure. The need of that 20% of the people should be considered.

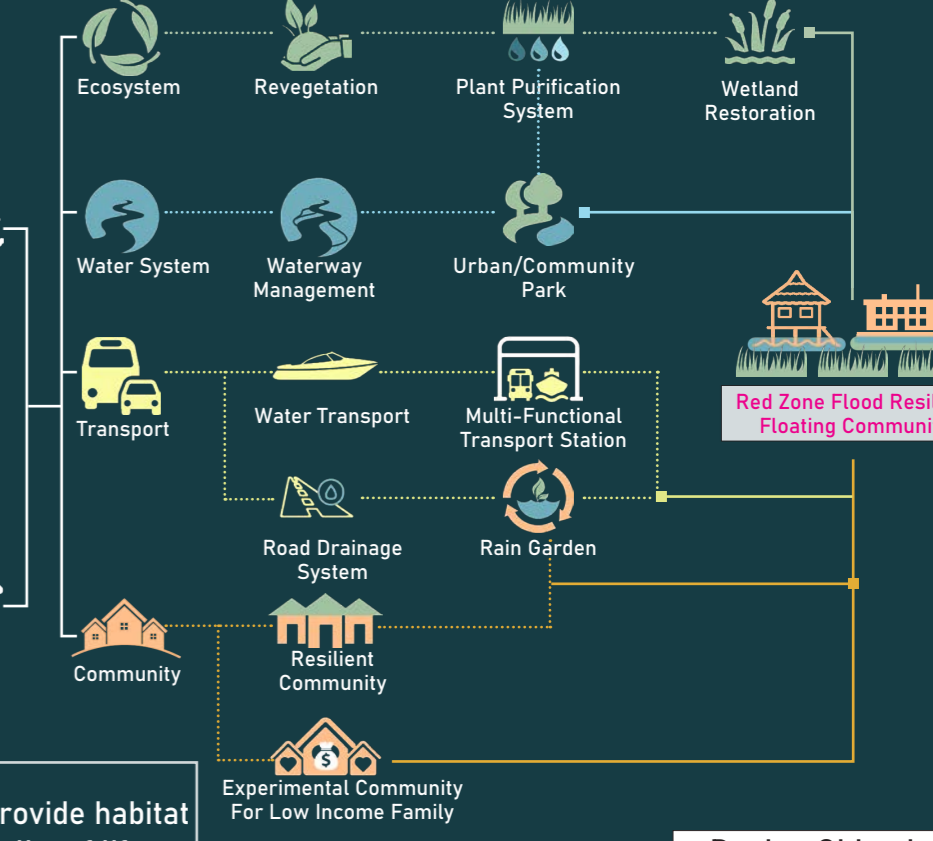
Design Goal

To design resilient into flood-prone land. To provide habitat and recreation. To increase land value and quality of life.

- Improve downstream water quality
- Increase storage capacity in facing sea-level rise
- Creating a resilient community for low-income people
- Achieve natural habitat restoration
- Design high connected transportation network
- Improve connection between Red Zone communities

SOLUTION

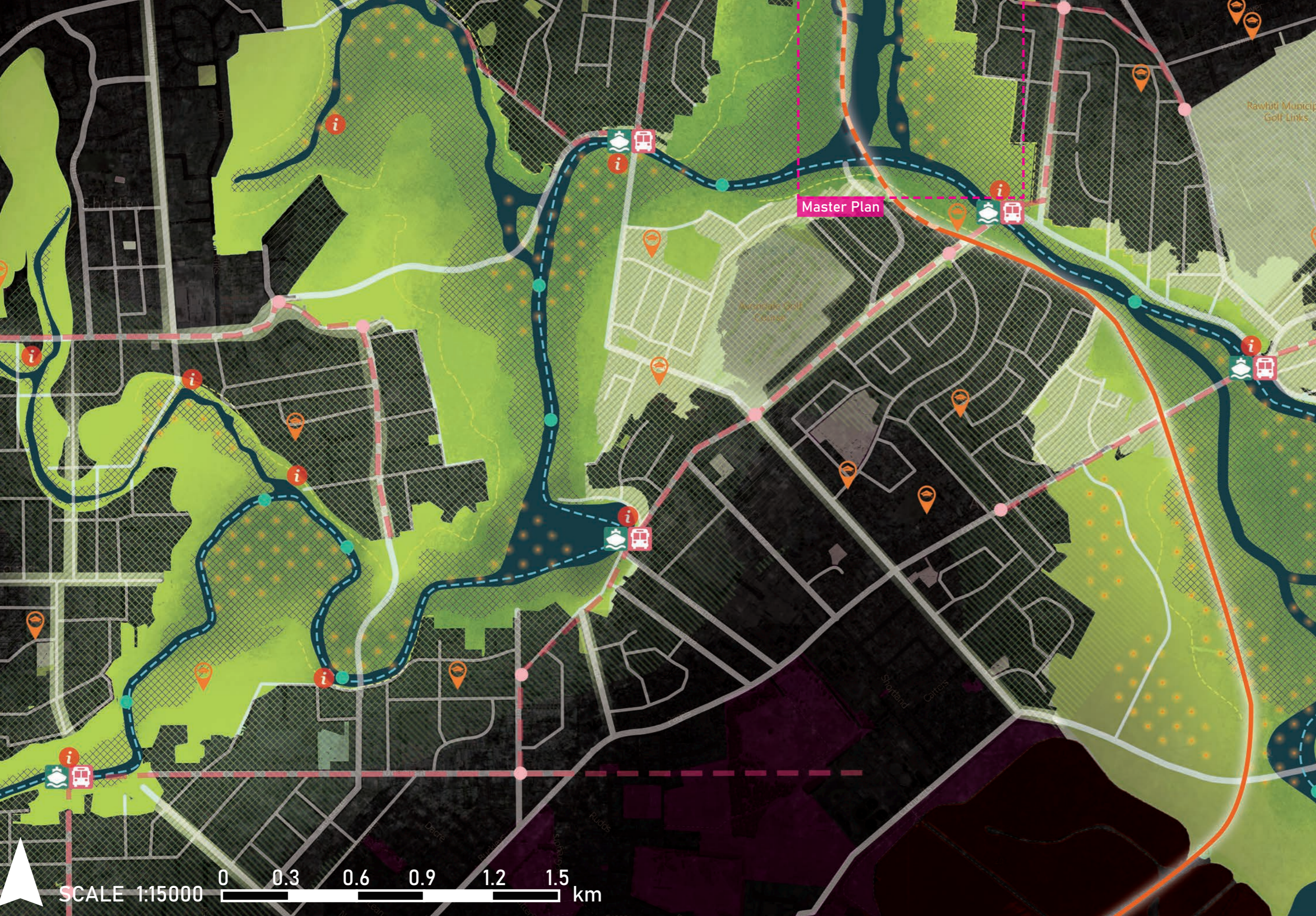
Adaption Design



Design Objectives

LEGEND

- Proposed Wetland Community
- State Highway 74
- Proposed Overpass Highway
- Green Space (Revegetation Zone)
- Wetland Reserved Zone
- Avon River Waterway
- Flood Division Area
- Community Stormwater System
- Flooding Buffer (Stopbank)
- Bus Lane
- Ship Lane
- Bus Station
- Ship Station
- Bus & Ship Station
- Information Center
- School



Design Vision

This design is a pilot project, aiming to show a new type of community cooperating with sea-level rise. The design uses the landscape as a safety backbone to protect the Christchurch city. Also, it provides a suitable living environment for flora and fauna. The red zone flood-prone land will be revitalized into a multi-functional natural wetland combined with ecological conservation, tourism, living and transportation.

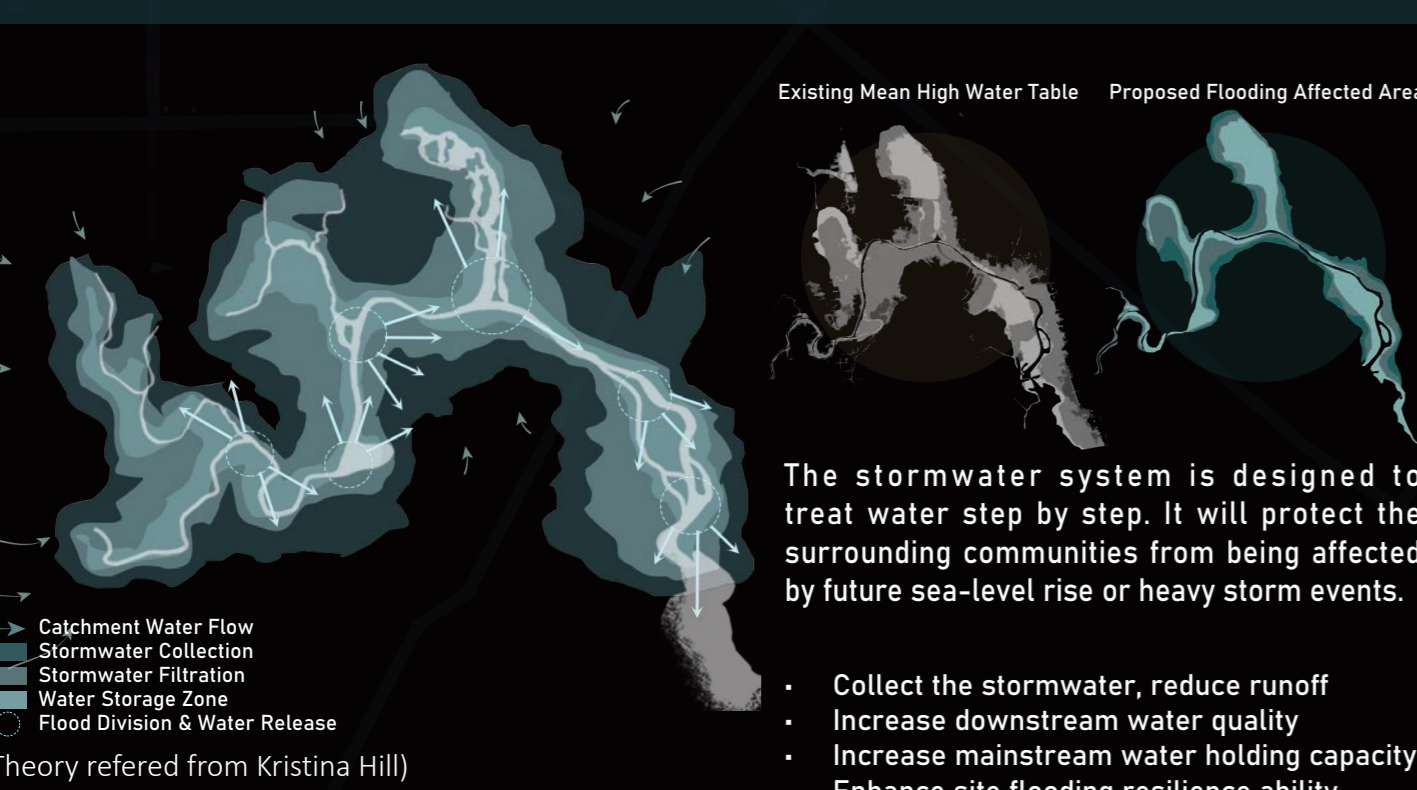
Strategies

Ecology

Hydrology

Social

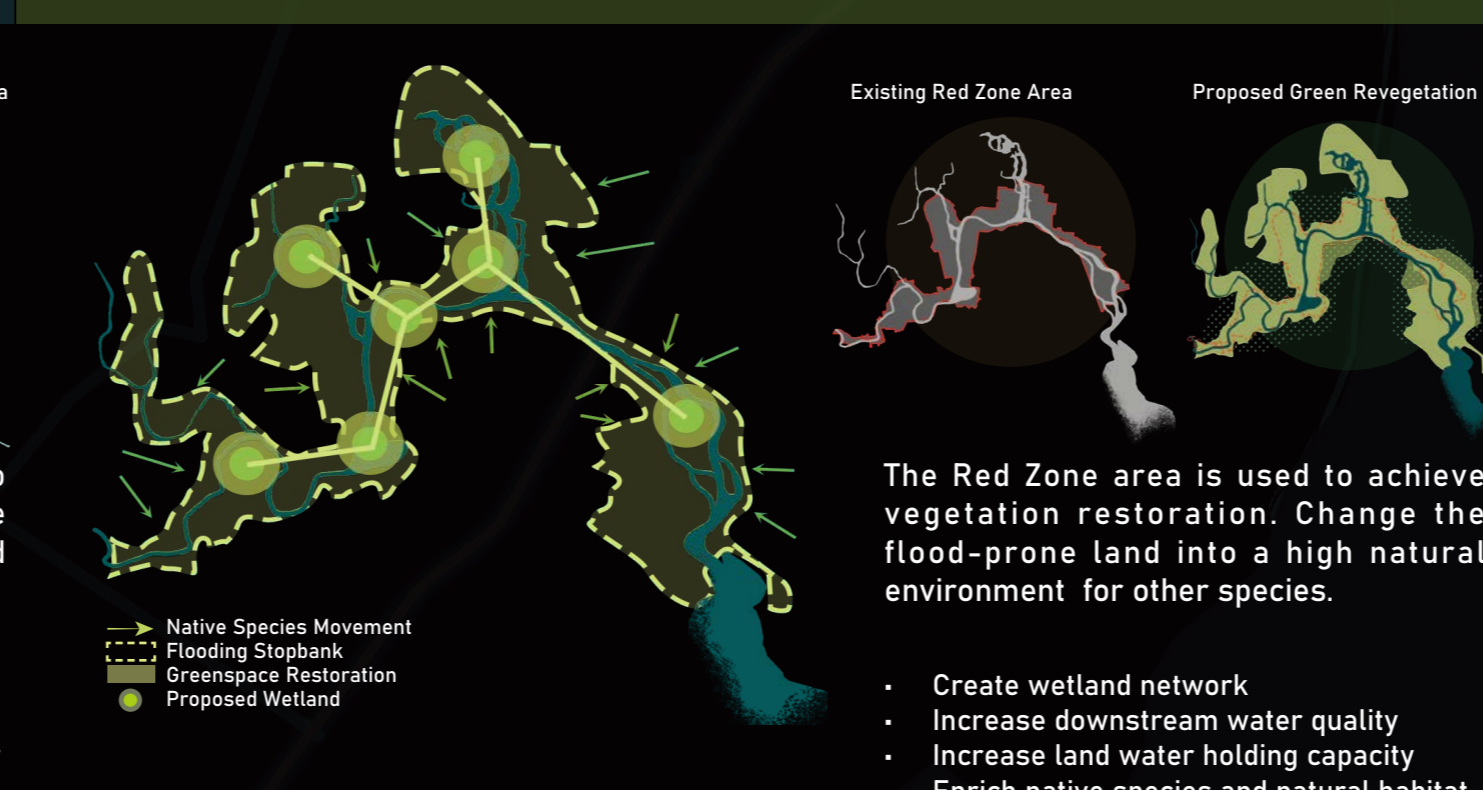
Blue Infrastructure



The stormwater system is designed to treat water step by step. It will protect the surrounding communities from being affected by future sea-level rise or heavy storm events.

- Collect the stormwater, reduce runoff
- Increase downstream water quality
- Increase mainstream water holding capacity
- Enhance site flooding resilience ability

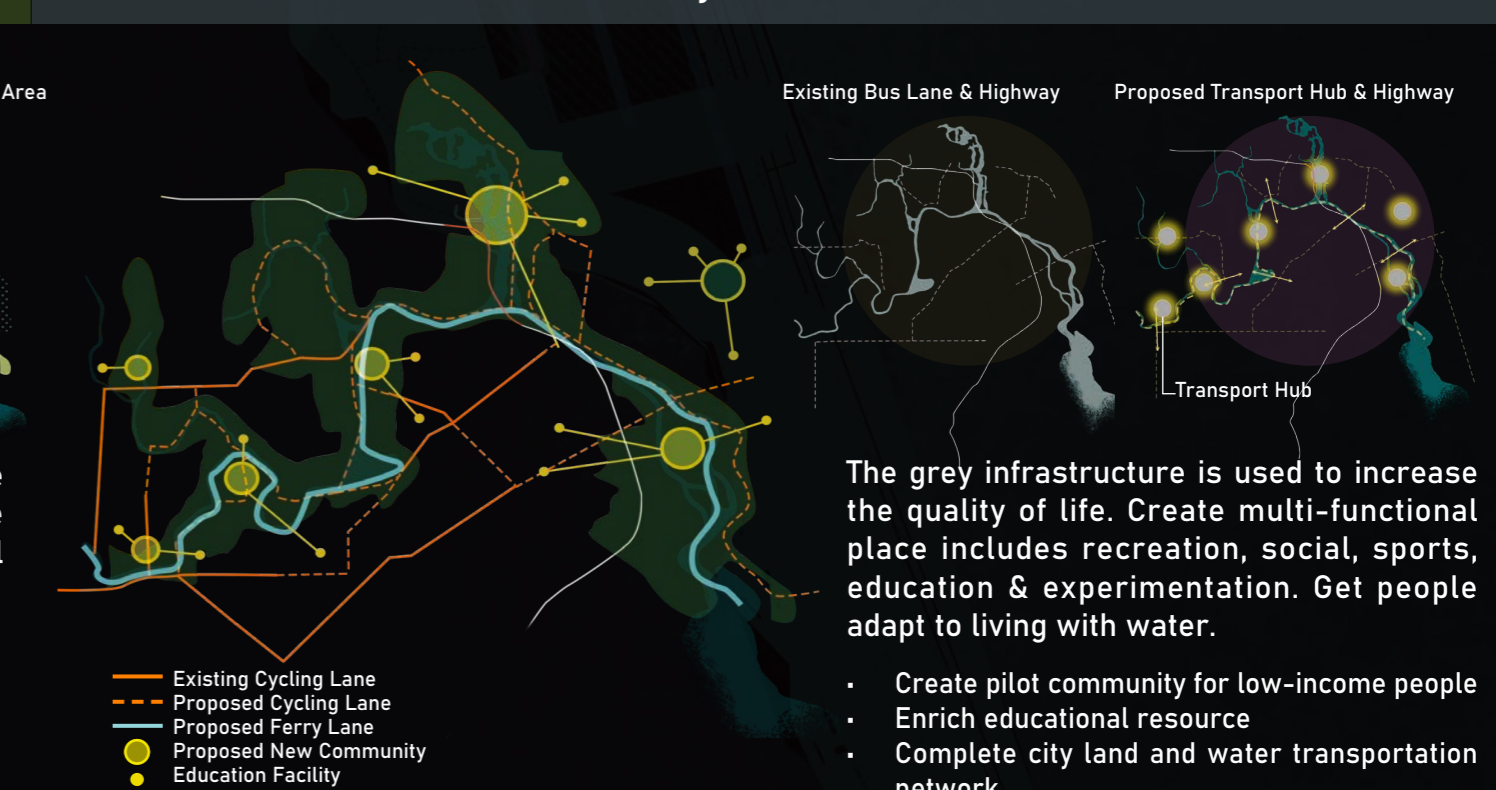
Green Infrastructure



The Red Zone area is used to achieve vegetation restoration. Change the flood-prone land into a high natural environment for other species.

- Create wetland network
- Increase downstream water quality
- Increase land water holding capacity
- Enrich native species and natural habitat
- Reducing wave energy, decrease soil erosion

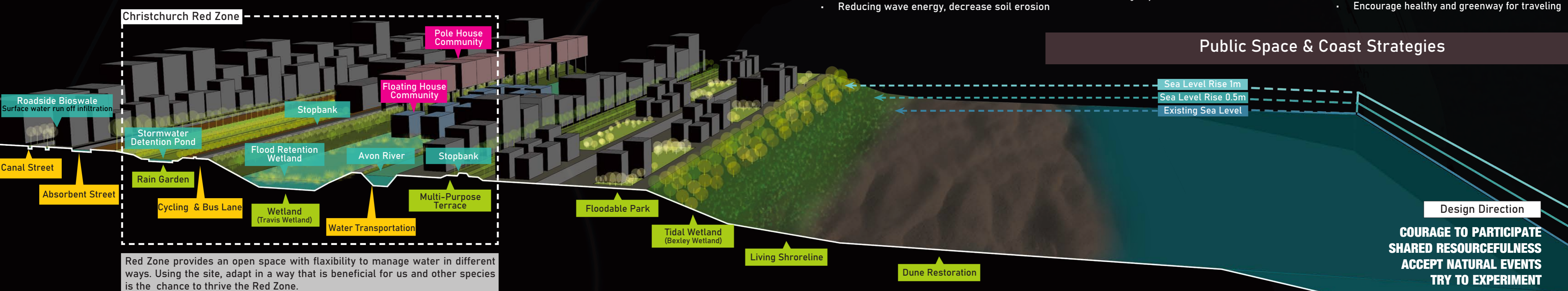
Grey Infrastructure



The grey infrastructure is used to increase the quality of life. Create multi-functional place includes recreation, social, sports, education & experimentation. Get people adapt to living with water.

- Create pilot community for low-income people
- Enrich educational resource
- Complete city land and water transportation network
- Encourage healthy and greenway for traveling

Public Space & Coast Strategies



Design Direction

COURAGE TO PARTICIPATE
SHARED RESOURCEFULNESS
ACCEPT NATURAL EVENTS
TRY TO EXPERIMENT

Red Zone provides an open space with flexibility to manage water in different ways. Using the site, adapt in a way that is beneficial for us and other species is the chance to thrive the Red Zone.

MASTER PLAN

Design Statement

The Master Plan shows the relationship between land, social and water. Aiming to achieve a multi-functional space for plants, water, animals, and people. With the cooperation of each function zone, the value of the site and the degree of site resilient in facing of disaster will be shown and sublimed.

Ecology

The land is designed to achieve natural restoration by changing the existing Red Zone open space into wetland habitat. Grow edible plants to encourage participation. Using plants to increase water infiltration rate, changing the water quality and protecting the Travis Wetland ecosystem.

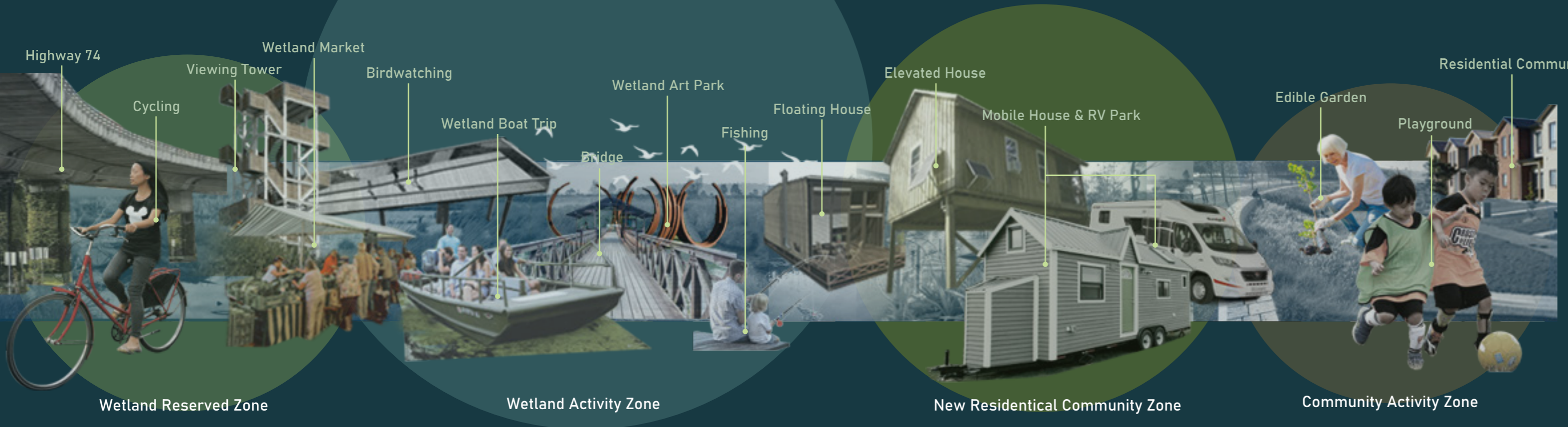
Hydrology

The design selects three ways to control flooding-Catching/Slowing down/Stop the water in the Red Zone. By widening the water channel, increasing the water catchment area to enhance site water capacity. Designing stepwise water channel to reduce the effect of sea-level rise. Using stopbank and land buffer to reduce the water speed, stopping the water affecting the community around the Red Zone area.

Social

The design aims to provide a comfortable social space for people. Also, ensure the new community is close to natural wetland but doesn't disturb it. The design selects cycling, boating and driving as major transport mode, aiming to provide multiple choice for people to enhance site experience. The design changes the existing highway into overpass to keep the natural integrity of the site, decrease disturbance of traffic to the landscape and habitat and ensure the connection between the districts.

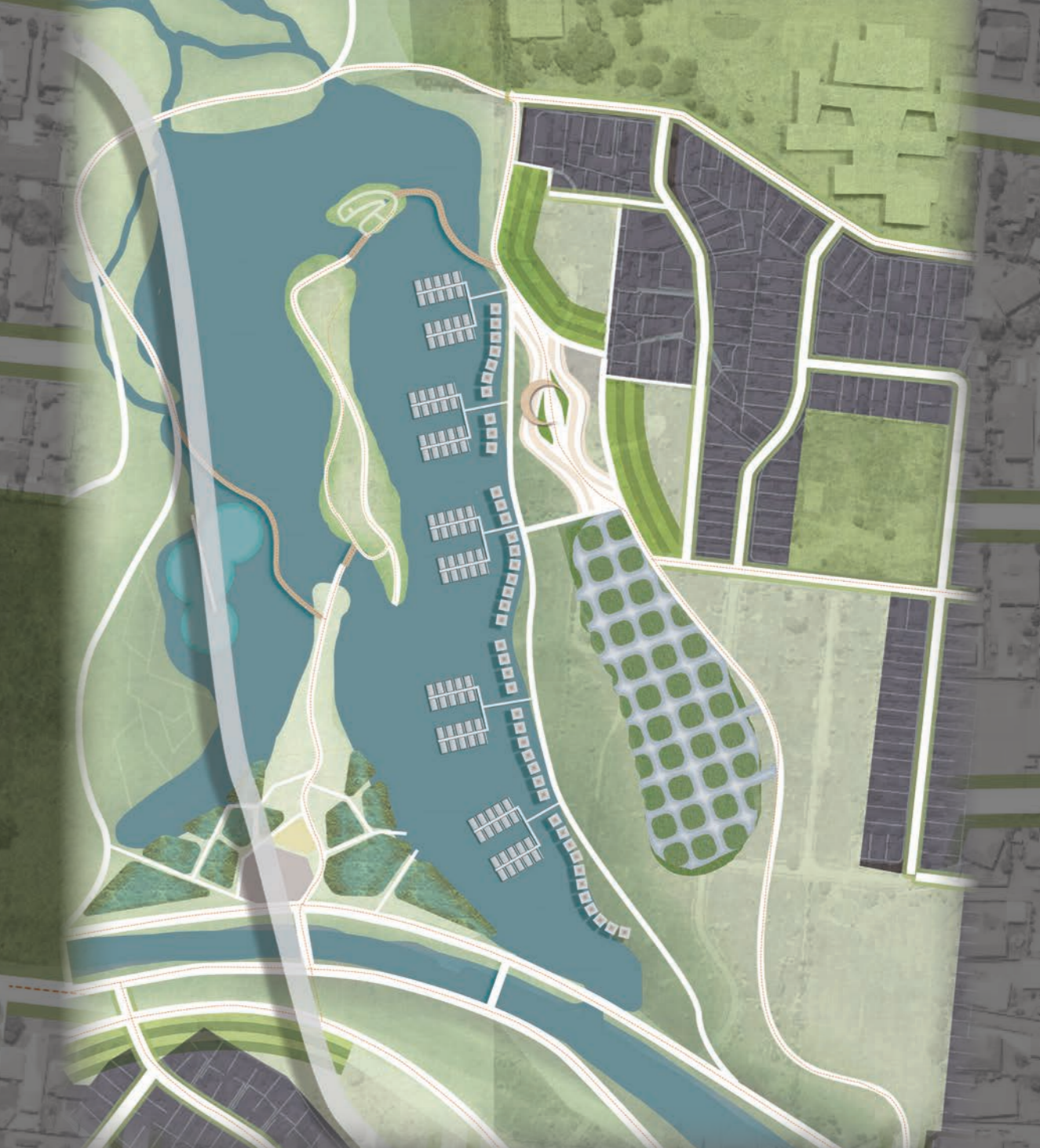
This design can provide 100 floating houses, 42 pole houses and over 300 mobile house & RV cars parking place. Providing an affordable way for low-income people to buy their own house. Reducing their living pressure, improve happiness index as improving environment.



Highway No.74 & Vertical Garden

This is the biggest change of the existing road system. To keep the integrity of the natural wetland, the highway on the site will be uplifted and become overpass. This overpass will go through the whole wetland from south to north. The vertical garden will be designed on the bridge structure. It can produce oxygen, filter harmful gas as well as capture, process heavy metals and dust. This design will minimize the disturbance of the highway to the wetland habitat.

1- IN-50 YEAR FLOOD



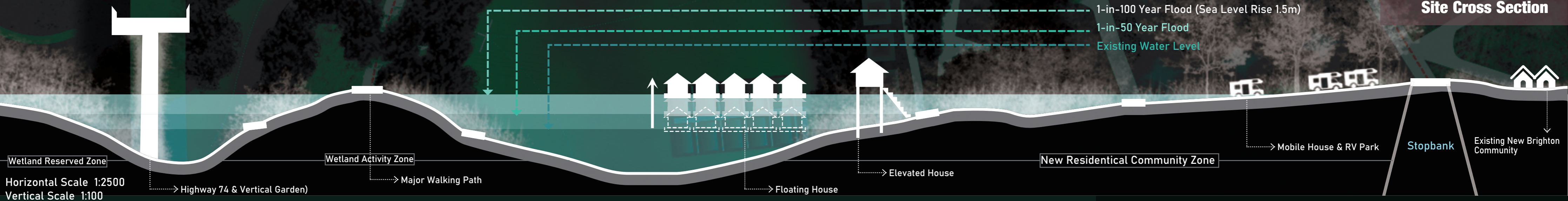
When sea level rises to 0.5-0.7m, or in 1-in-50 year flood, the water bank will be submerged. The floating house foundation will increase follow the water table while the function of the site are rarely influenced. For the wetland activity zone, the main road in the middle and bridges are still functional, people can feel and see the process of sea level rise directly. The increasing sea level will change the site into a new feeling.

1- IN-100 YEAR FLOOD



When sea level rises to 1-1.5m, or in 1-in-100 year flood, the water covered most of the wetland activity zone while the main road in the middle are still walkable. For new community, the floating houses and pole houses are not affected by the high water table. Part of the mobile house and RV parking lot will be covered by water. People can evacuate or park on the nearest open space. The stopbank will protect the east communities.

SCALE 1:2000 0 50 100 150 200 250 m



Horizontal Scale 1:2500
Vertical Scale 1:100



Floating House Community

The floating house community is designed on the open water in the wetland environment. It selects light wood material as building structure and floating walking paths. Each floating house has the sanitary system at the bottom, the pipe under the floating path will deliver it out which can avoid pollution goes into the wetland. Each house is 72 m² which is enough space for a family with 3-4 people living in. Each house is equipped with boat berth which ensures the normal for people living in a floating house in flood events or other disasters.



Pole House Community

The pole house community is built along the edge of the wetland water bank, which is the perfect location with the most beautiful view. Each house is 3m above the ground which is higher than floating house community. The people living there can overlook the whole wetland. Also, when the sea level rise, the pole house will not be affected for its high foundation. The pole structure selects steel material for its excellent tenacity which can resist ground shaking caused by the earthquake. Like a normal house yard, each pole house has front yard with parking lot.



Mobile House & RV Car Park

The mobile house and RV parking lot are the most flexible living community of the site. This parking lot is mainly designed for people traveling or living in Christchurch for a short time. The parking lot has fully equipped infrastructure like toilet, pantry, coffee shop and supermarket. When flood events or some emergency events happen, the people living there can evacuate quickly following the reticular road network to its nearest public road in a short time. The maximum capacity of the parking lot is 60 mobile houses and RV cars in the Intermediate Plan.

TRAVISING THE RED ZONE

LASC 409 JIAYUAN LI (AIMILY) 1127668

INTERMEDIATE PLAN

Design Statement

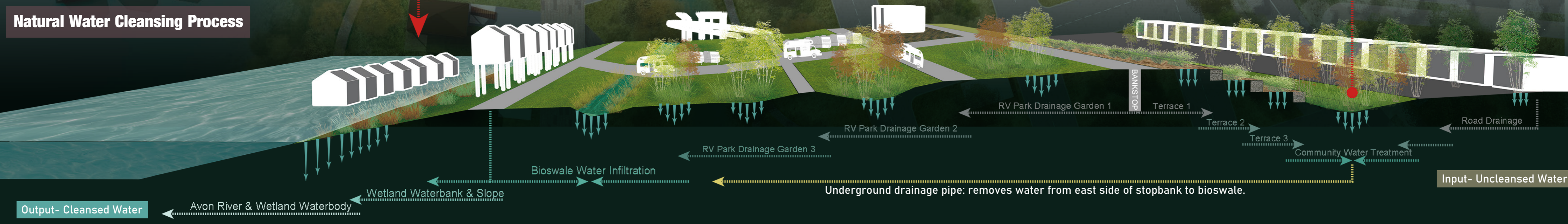
The intermediate plan selects the site which includes all the design objectives. As the design direction mentioned, this design encourages the willingness to experiment. The three housing types provided are aiming to test which is the best housing type to accept natural events.

- Ecology** Wetland revegetation, habitat restoration, erosion control.
- Hydrology** Natural water infiltration system, community flooding control system.
- Social** Different housing types, activity zone for all ages, social center, high connective transportation system



Detail Plan

Water pump for heavy storm event to quickly remove the flood water.

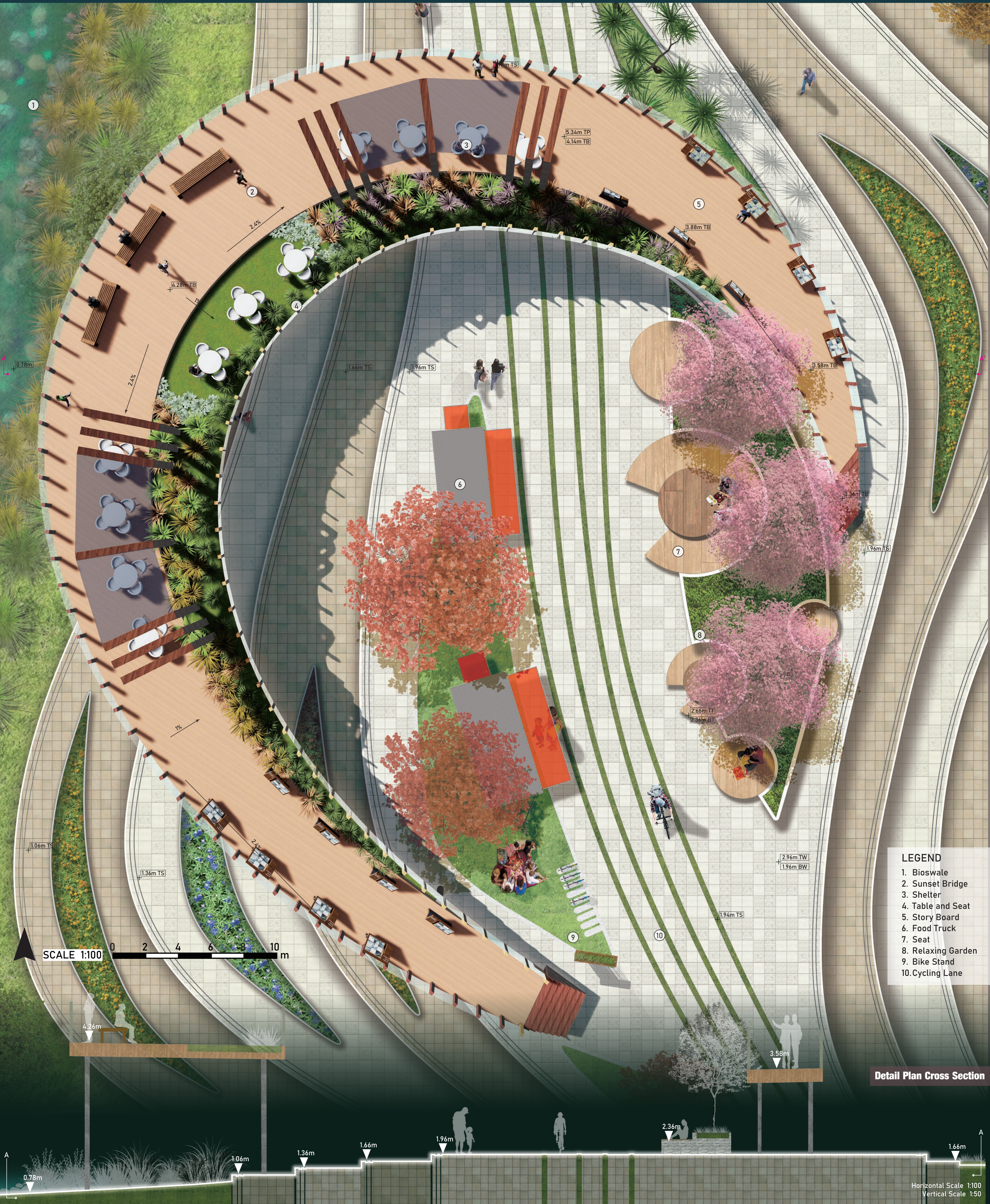




Design Statement

The detail plan selects the community center as design focus. This is a social gathering place for people to relaxing, eating, sightseeing and holding events.

Sunset Bridge: Design light spot. The bridge is like a landmark facing to west with beautiful view when sunset. The bridge connects people and wetland, natural and artificial, before, now and future. Standing on the bridge, people can see the shining water, lush and green wetland, hear the song of birds and feel the gentle breeze. The bridge contains the memory of the site and sharing it with people to inherit it. The tilted platform can deliver the water into the bridge garden, the infiltrated water will goes down into bioswale through pipe.



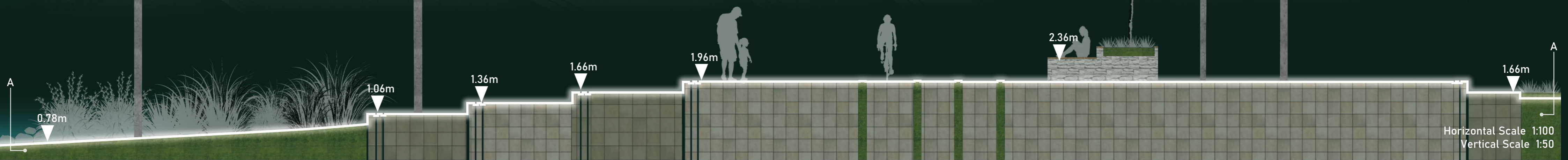
LEGEND

- 1. Bioswale
- 2. Sunset Bridge
- 3. Shelter
- 4. Table and Seat
- 5. Story Board
- 6. Food Truck
- 7. Seat
- 8. Relaxing Garden
- 9. Bike Stand
- 10. Cycling Lane

SCALE 1:100



Detail Plan Cross Section



NATIVE WETLAND

BIOSWALE

TERRACE

COMMUNITY WATER TREATMENT

PLANTING STRATEGY

Design Statement

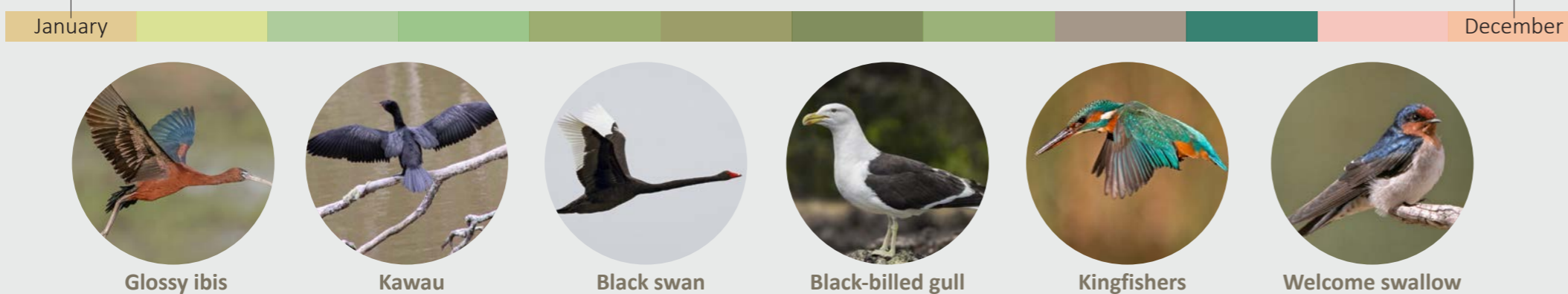
In order to achieve natural habitat restoration, the site will select the native plants from the Travis Wetland or Baxley Wetland so that the plants can adjust the soil condition and grow well. The plants will help changing water quality, providing habitat for birds and insects, achieving food production, and controlling water bank soil erosion. The plants will be divided into four major zones with different functions.

- Native Wetland - Habitat restoration, erosion control
- Bioswale - Water infiltration, flooding buffer
- Terrace - Food production
- Community water treatment - Stormwater drainage system, protect community

Wetland

To achieve Red Zone plant restoration. Breaking the boundary of Travis Wetland to create a systematic and functional ecosystem around Avon River. Improve the water quality. Control waterbank soil erosion. Create multiple planting groups to face upstream tidal salinity. Provide health habitat for native birds and other wetland fauna.

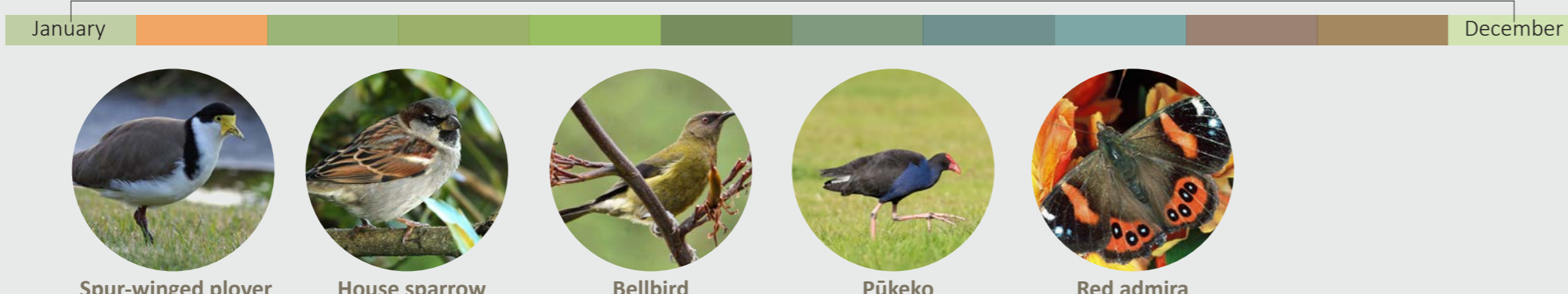
Open Water	Floating Plants -Native Plant/ Floating/ Absorb Heavy Metal Ion, Nitrogen and Phosphorus (Require regular Management) Common Water Milfoil <i>Myriophyllum prospinquum</i> 0.1-0.25m Slow streams surface White yellow flower	Red Pondweed <i>Potamogeton cheesemanii</i> 10-40mm Slow streams surface Cream, red/pink flower	B: This plant provides good cover for birds F: This plant provides food for birds
Shallow Standing Water	Standing Water Plants -Native Plant/ Absorb Heavy Metal Ion, Nitrogen and Phosphorus/ Protect Bank from Flood Erosion Raupō <i>Typha orientalis</i> 2-4m Water-logged soils Distinctive flower spikes	Lake Club Rush <i>Schoenoplectus abernaemontani</i> 1-1.5m Water-logged soils Yellow little flower	Pūrei/Makura B,F <i>Carex secta</i> 2m Shallow water/boggy margin Yellow little flower spikes
Boggy	Marginal Plant/ Shrubs -Native Plant/ Protect Bank from Flood Erosion/ Tolerate Temporary Flood/ Intermittent Tidal Rise Toetoe <i>Austroderia spp.</i> 2m Stream banks, open area Distinctive fluffy spikes	Joint Wire Rush <i>Apodasmia similis</i> 1m Saline tolerant species Delicate green leaves	Mingimingi F <i>Coprosma propinqua</i> 3m Boggy to dry soil White/blue fruit in spring
Damp	Riparian Shrubland -Native Plant/ Protect Bank from Flood Erosion/ Tolerate Temporary Flood/ Tolerate Dry Season/ Shelter for Birds Round Leaved Coprosma <i>Coprosma rotundifolia</i> 4m Alluvial soils Distinctive red fruit	Wheki-ponga <i>Melictyus ramiflorus</i> 6m Grow in hardy shaded site Fibrous roots, reduce erosion	Māhoe/whitehood B,F <i>Melictyus ramiflorus</i> 7m Fast growing plant Blue berries
	Patē B,F <i>Schefflera digitata</i> 6m Prefer moisture site Attract birds		



Bioswale

The transition buffer from community to wetland environment. The swale must be able to handle rapid inundation and drought. Planting to store and clean rainwater. Provide health habitat for birds, butterflies and other creatures.

Ponding Area	Short Groundcovers & Trees -Native Plant/ Wet & Dry Tolerant/ Flooding Tolerant/ Dense Root System Proliferous Rush <i>Isolepis prolifera</i> 0.3m Fast spreading & poltic Light bright green sedge	Brass Buttons <i>Leptinella dioica</i> 10mm Fast growing, moist soil Small green fern-like leaf	Turutu F <i>Dianella haemata</i> 0.5m Moist soil Blue-purple berries	B: This plant provides good cover for birds F: This plant provides food for birds
Depression Area	Tall grasses and Shrubs -Native Plant/ Erosion Control/ Protect Bank from Flood Erosion/ Pollutant Filter Wiwi <i>Juncus edgarae</i> 1m Seasonally damp soils Bright-green stems, light clumps	NZ Iris <i>Libertia chilensis</i> 0.5m Semi-shade, moist soil White iris-like flowers	Mingimingi F <i>Coprosma propinqua</i> 3m Boggy to dry soil Orange fruit, birds food	Pūrei/Makura <i>Carex secta</i> 2m Shallow water/boggy margins Yellow little flower spikes
Upland Area	Large Shrubs -Drought Tolerant/ Avoid Impeding Flow/ Enhance Biodiversity Houhere <i>Hoheria populnea</i> 6m Fast growing Abundant scented flowers	Swamp astelia <i>Astelia grandis</i> 2m Dry & wet tolerant Orange green flax-like leaves	Karamu F <i>Coprosma robusta</i> 5m Hardy, prefer full sun Tolerant short-term flood	Wiwi F <i>Ficinia nodosa</i> 1m Thrives in dry rocky situation Fine green-orange sedge
Mown Edge	Grass -Native Plant/Dry Tolerant/ Hardy Blue Dune Sedge <i>Carex pumila</i> 0.3m Well drained soil Vigorous rhizome spreading	Rice Grass <i>Microlaena stipoides</i> 0.3m Grow for dry edge of swale Turf forming		



Community Terrace

To encourage community people involve into this healthy activity for people at all ages. To provide a social opportunity for people. Provide an opportunity to understand the food and their growing process. Get people experience planting and harvesting. Grow the crops or fruits which is suitable to grow on moisture soil.

Vegetables & Food Crops	Cereal Crops (Suggest planting species) 9,10,11,12 Corn <i>Zea mays L.</i> 2-3m Prefer well-drained soil 90 days to harvest	Vegetables (Suggest planting species) 1,9,10,11,12 Potato <i>Solanum tuberosum</i> Easy grow plant 90-160 days to harvest	Broccoli 2,3,4,9,10,11 <i>Brassica oleracea</i> Prefer growing below 25°C 60-120 days to harvest Full sun, sheltered position	Carrot 1,2,9,10,11,12 <i>Daucus carota subsp. sativus</i> Easy grow plant 50-60 days to harvest Full sun, well drained soil
Fruits & Herbs	Fruits (Suggest planting species) 8,9,10,11 Clementina Orange <i>Citrus x clementina</i> Prune to improve air circulation Have fruit in winter Cold and warm tolerant	Apple 5,6,7,8,9 <i>Astelia grandis</i> Harvest in 2 years Have fruit in Autumn Need mulch and water	Blueberry Can grow year-round <i>Cyanococcus</i> 1m, bushy shrub Full sun, sheltered position Well-drained organic soil	Herb (Suggest planting species) Can grow year-round Parsley <i>Petroselinum crispum</i> Water regularly 9-19 weeks to harvest Avoid growing close to potatoes



Community Water Treatment

The detention pond besides the community, aiming to capture and store stormwater to protect the community being affected by rain events or flooding. Collect the water from community road to purify, increase the run-off quality. Provide native health habitat for birds and insects, create a natural and functional "front yard" for community people.

Wet Zone	Short Groundcovers & Trees -Native Plant/ Wet & Dry Tolerant/ Pollutant Filter Sharp Spike Rush <i>Eleocharis acuta</i> 0.1-0.6m Prefer shallow water ponds Dense stand form	Raupō <i>Typha orientalis</i> 2-4m Water-logged soils Distinctive flower spikes	Cabbage Tree <i>Cordyline australis</i> 8m Classic New Zealand Icon Clusters of flowers Plant in the middle of swale to limit spread of leaves
Marginal Zone	Sedges -Erosion Control/ Drought & Wet Tolerant/ Pollutant Filter Jointed twig-rush <i>Baumea articulata</i> 1.8m Best in moist, drought tolerant Brown seed heads in summer	Wiwi F <i>Ficinia nodosa</i> 1m Thrives in dry rocky situation Fine green-orange sedge	Kuta <i>Eleocharis sphacelata</i> 1.5m Rapid growth Upright green sedge
Bank Zone	Large Shrubs & Tree -Drought Tolerant/ Enhance Biodiversity/ Reduce Flush Speed/ Prevent Erosion/ Pollutant Filter Wineberry F <i>Aristotelia serrata</i> 4-6m Shade tolerant, hardy Pink flowers & black berries	Mahoe F <i>Melictyus ramiflorus</i> 6m Good filter for shady site, hardy Scented flowers & purple berries	Toetoe <i>Austroderia spp.</i> 2m Stream banks, open area Distinctive fluffy spikes



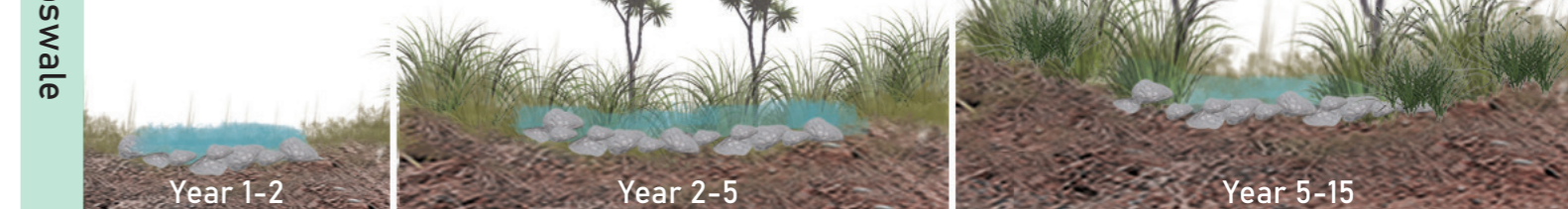
Planting Process



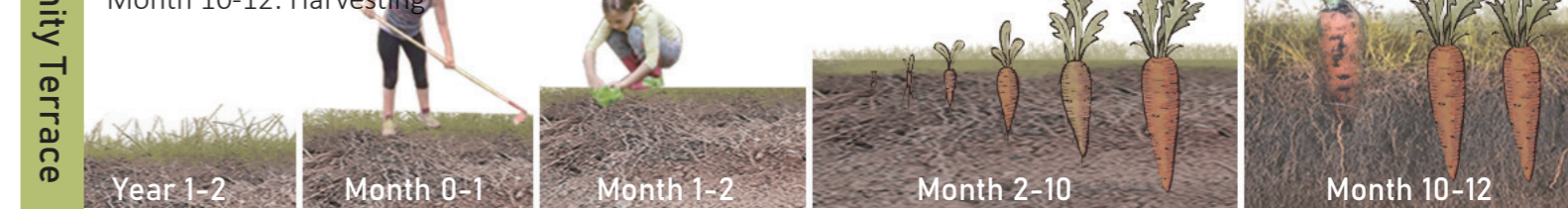
Year 1-2: Earthwork, site preparation, soil restoration
Year 2-10: Seeding and planting, plant health monitoring
Year 10-30: Site maintenance, invasive species control
Year 30-50: Natural succession, mixed salt and freshwater plant associations



Year 1-2: Earthwork, site preparation, site revegetation
Year 2-5: Seeding and Planting
Year 5-15: Clean up swale pollutant, excavate and replant every 10 years



Year 1-2: Earthwork, site preparation, improve soil nutrient status
Month 0-1: ploughing
Month 1-2: Seeding, planting
Month 2-10: Growing, watering regularly
Month 10-12: Harvesting



Year 1-2: Earthwork, site preparation
Year 2-10: Planting, plant health monitoring
Year 10-15: Natural succession, clean up pollutant, replant every 15 years

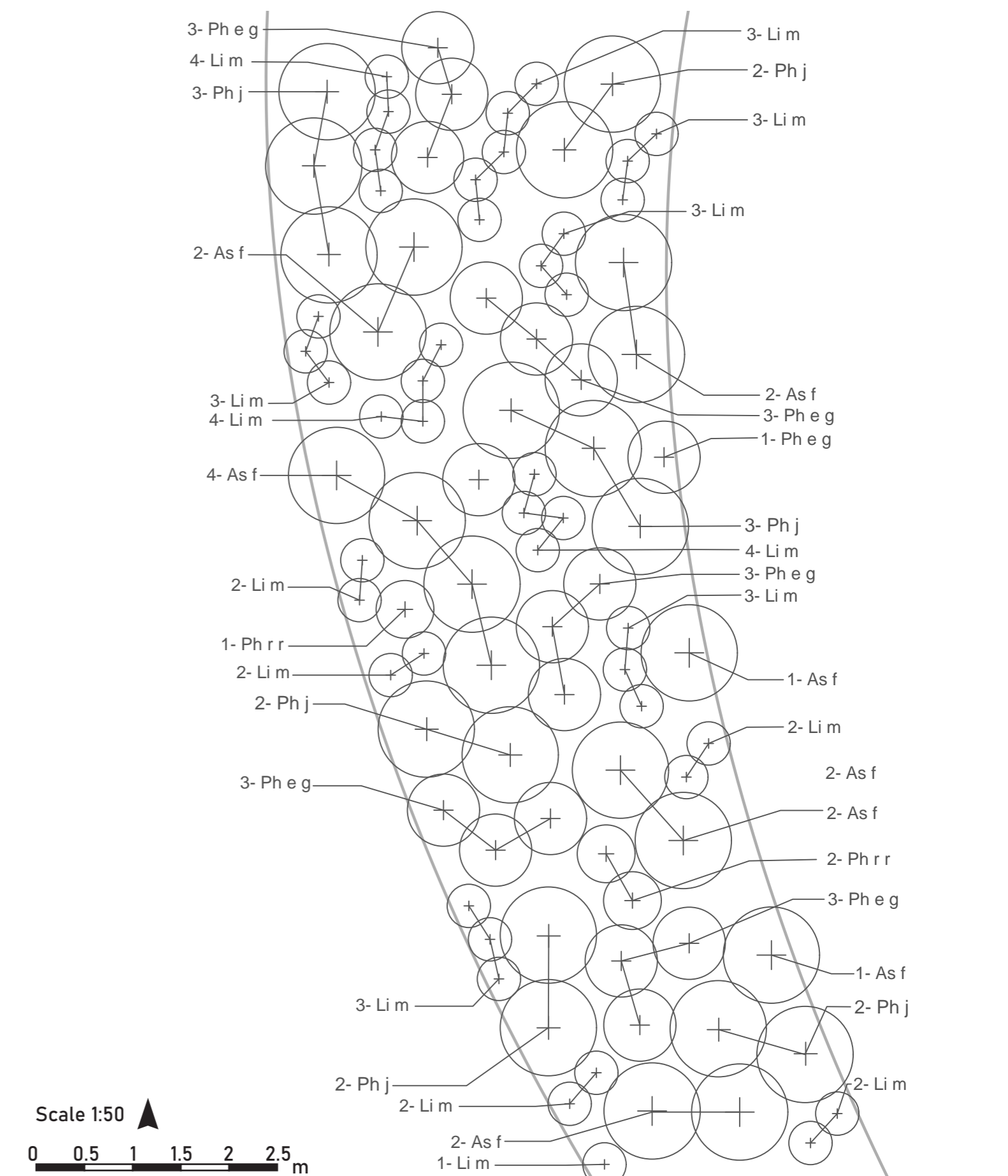


Planting Plan for Sunset Bridge

The Sunset Bridge is a landmark structure of the site, providing a place for people social and relax in the community center. The plant is next to the seating area where people will eat and drink.

Plant Selection Criteria:

- Selecting plants can tolerate wet and dry conditions.
- Selecting the plants have different colours.
- Selecting the plants have fragrant in summer.
- Select low shrubs that are able to withstand periods of soil waterlogging.
- Select plants are eco-sourced from Red Zone or surrounding parks and gardens that minimize potential mortality rates.



ID	Qty	Botanical Name	Common Name	Size	Remarks
Ph j	14	<i>Phormium jester</i>	Ornamental Flax	1.3L	A clump-forming flax. Upright bright pink leaves with lime green margins with lime green margins. Evergreen. Hardy. Thrives in a wide range of conditions. Prefers full sun.
Li m	43	<i>Liriope muscari 'Monroe White'</i>	Liriope	1.0L	Dark green leaves with white flowers in summer. Prefers dry soil. Hardy. Deep shade to full sun.
As f	16	<i>Astelia fragrans</i>	Bush Flax	2.5L	Light green long leaves flax. Prefers good drainage soil. Keep it dry. Colour range from green to reddish. Has green and yellowish flower.
Ph e g	17	<i>Phormium 'Evening Glow'</i>	Evening Glow Flax	2.5L	Attractive flax with bright pink and bronze red colour foliage. Has contrast with other plants especially in winter. Hardy. Evergreen. Has reddish colour foliage. Hardy plant. Tolerates heat, salt and drought.
Ph r r	3	<i>Phormium 'Rainbow-Red'</i>	Ornamental Flax	2L	

MATERIAL STRATEGY

Design Statement

Material is the thing people can touch directly. The wetland community aims to select recycled or recyclable material to protect the natural environment, reduce wasting of resources. Also, this design focuses on the combination of material with plants in a harmonious way. Select the material with natural texture or colour to mix into natural environment. Selecting contrast colour or texture to extinct the function or feeling of the place. The design did some research on material suppliers, aiming to select the best local material with minimum cost. For the structures design, this design focuses on the detail of the furniture. Selecting meaningful material to express the theme of the site, make each furniture tell the story of the site.

MATERIAL PALETTE

TIMBER

Australian Hardwood Sleeper
Use: Wetland boardwalk / Wetland Bridge / Bioswale
Grooved boards with no treatment. Durable and long lasting in harsh weather and moist area. H4 treated. Insect resistant
Resource: Bunnings Warehouse

Radiata Pine
Use: Sunset Bridge / Fishing Platform Decking
Recycled material. Grooved boards. H3.2 treated. Ideal for creating outdoor entertainment areas.
Resource: Musgroves Ltd.

Hardwood Benchtop Panel
Use: Bench / Picnic Table / Outdoor Furnitures
Contemporary wood look. Non structural timber. Finished with a base coat of oil to give a natural surface treatment.
Resource: Bunnings Warehouse

Recycled Cobble
Use: Shared path
Recycled material. Natural granite sets perfect for driveway. Slip resistance. Permeable material. Easy to maintain.
Resource: Musgroves Ltd.

Turf Clinkers
Use: Car park / Bioswale Pathway
Porous and permeable material. Absorb ground water. 80%-100% infiltration rate.
Resource: Firth

Recycled Cobble
Use: Community centre walking path / Visitor Centre
Recycled and permeable material. High durable with low maintenance. Noise control. Low transport impacts.
Resource: Firth

Concrete Road
Use: Driveway / Mobile house & RV car park
Long service life of 40 years. Resistant to excess rain or extreme heat. Low fuel consumption by vehicle, low CO2 emission.
Resource: Smith & Smith Contracting

Concrete Slab
Use: Walking path / Children playground
Recycled material. Smooth grey paver, easy to cut and shape to cater the requirement of design. Can be finished with paint.
Resource: Musgroves Ltd.

Exposed Aggregate Concrete
Use: Grass Edge / Children playground
Exposed aggregates showcase the natural element to the area. Low maintenance. Slip resistant surface.
Resource: Urban Paving

WAITAHA Stones
Use: Stepping stone / Walking path / Water Fountain
West Coast Stone. Circular shape. Used next to natural features like wetland bush or open grass. Natural material.
Resource: Westland Schist

Gabion Basket
Use: Terrace Retaining walls
Recycled material. Cheap block construction used for slope stability and erosion protection. High permeability and durability.
Resource: Handy Hire

River Stones
Use: Bioswale
Recyclable material. Reduce flow speed, increase water quality. Creating habitat between the gaps of stones.
Resource: Handy Hire

Dual-pour Rubber Surface System
Use: Children Playground Paving / Sports Field
Recycled material. High durable surface, low maintenance. RV resistant rubber, high protection level.
Resource: Nutmat

Certified Playground Mulch
Use: Children Playground High Traffic Area Paving
Recycled material. Rumbled material the material less sharp. Provide protection against fall. High permeable material.
Resource: Zeager

Glass Barrier
Use: Sunset Bridge Railing System
Offer a modern & natural stylish and secure barrier by using clear glass and pine timber material. Giving a clear view of wetland.
Resource: Grand Glass

CONCRETE

BRICK PAVING



SIGNAGE BOARD

The signage board is located at the entrance of each activity. Like a name card of the site, the signage board expresses the theme of the site directly which is harmonious of nature and people. Select the material which includes the elements represents either natural or cultural symbol of the site. Also, the signage board should be able to show the involvement of community people.

- Wood Log:** Treated wood used as flower pot on top of the signage board. Select the wood cut from Red Zone when construction. The wood and the plants represent the natural elements of the wetland. Like the memory of the site, the wood is kept on the site in another way.
- Knit Rope:** Select rope as a bounding of nature and community which connects the log and concrete. Different to normal rope, these ropes are community people's knitting. They can knit in the way they like, expressing their own feeling towards the wetland and Red Zone.
- Corten Steel:** Use as the panel of the signage board. Use low reflection corten steel with natural colour, low maintenance, and cost effective. Its colour and texture blends well in natural environment.
- Rubble Concrete:** Christchurch Red Zone house used to have rubble concrete foundation. Those concrete are still in Red Zone underground now. Recycle the concrete foundation and reuse it in signage board.

STORY BOARD

The story board is located on the Sunset Bridge. This is a furniture that includes the history, story and memory of the site and family as interpretation. Selects the material similar to the signage board which includes the elements represents either natural or cultural symbol of the site. Also, the signage board should be able to show the involvement of community people.

Slide Puzzle: The photo in the made by photo showing the story or the Red Zone or the photo of the family. Using puzzle as a highlight to attract people. Enhancing visitors' participation.

Knit Rope: Select rope as a bounding of nature and community which connects the log and concrete. Different to normal rope, these ropes are community people's knitting. They can knit in the way they like, expressing their own feeling towards the wetland and Red Zone.

Interpretation Board: The interpretation board is designed to tell the story behind the photo of slide puzzle. words are formed using raised areas of paper which blind people feel with their fingers.

Rubble Concrete: Christchurch Red Zone house used to have rubble concrete foundation. Those concrete are still in Red Zone underground now. Recycle the concrete foundation and reuse it in story board.

BENCH & PICNIC TABLE

The sitting area is located in the community centre opposite to the food truck. Providing a place for people to have rest and eat food. Design bench and flower bed into one, getting people be able to interact with nature when eating or relaxing. Selecting recycled material to achieve environmental friendly design goal.

- Macrocarpa Timber:** A recycled material. a naturally durable timber and with the addition of three coats of a timber preservative that protects the table and seat from the inside out.
- Turf Platform:** Selecting natural turf material to enhance water drainage of the bench. Instead of sitting on the bench, people can also lying on the lawn below the cherry tree. Providing an excellent place for people to relax and enjoy the flower.
- Moroccan Stone Brick:** Recycled material. Protect the inner soil against extreme weather. Low maintenance material with aesthetics style. The material colour and texture can connect with cobble paving smoothly.
- Rubble Concrete:** Christchurch Red Zone house used to have rubble concrete foundation. Those concrete are still in Red Zone underground now. Recycle the concrete foundation and reuse it in bench.



Community Terrace



SEEK OPPORTUNITIES IN HAZARDS - REVITALIZE CHRISTCHURCH FLOOD-PRONE LAND

LASC 406 PROJECT 1 AIMILY LI 1127668

CITY SCALE MAP - SITE SELECTION & FLOODING POTENTIAL ASSESSMENT

CITY SCALE SITE ANALYSIS

BACKGROUND RESEARCH



Climate change in coastal cities is leading to sea level rise, increased frequency and intensity of storm events (Climate Central, 2018). Christchurch as a developed city in New Zealand, has high flooding potential due to earthquake and soil liquefaction. Around 440 hectares of residential Red Zone are set for vacant to minimize the affect of flooding temporary. This project focuses on how to reduce the affect of flooding to its surrounding communities while developing the value of flood-prone land at the same time.

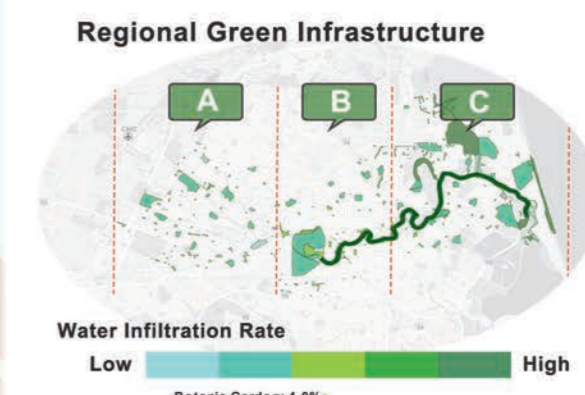
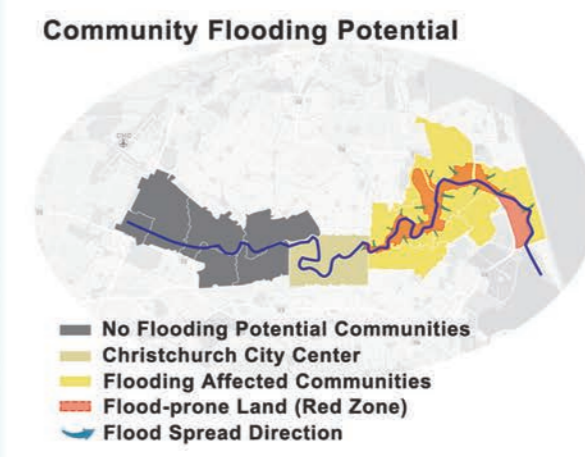
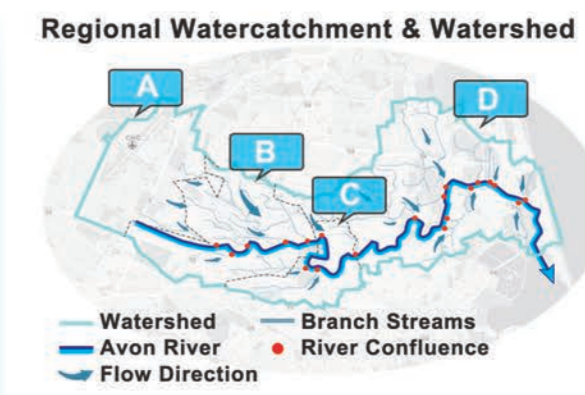
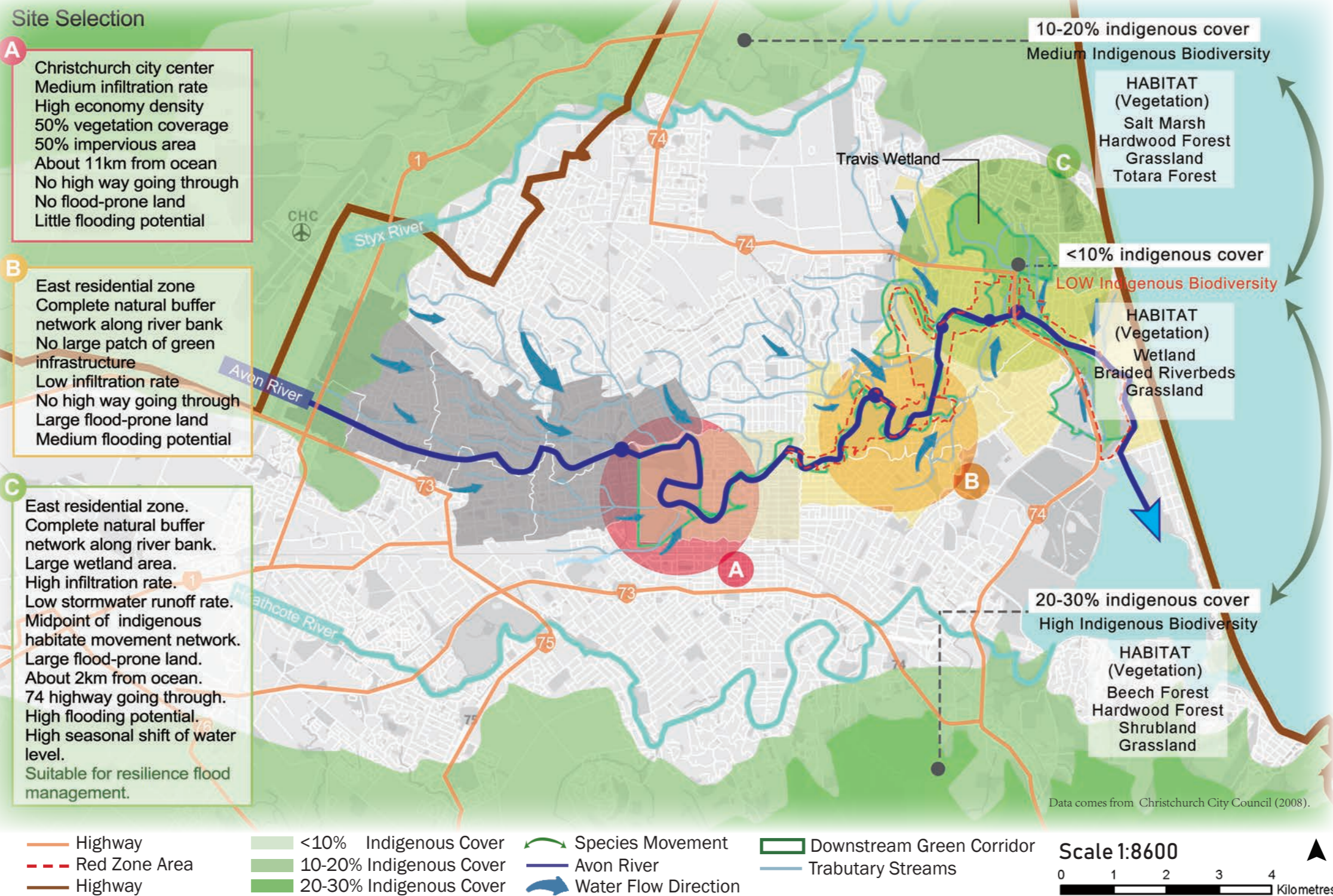
GOAL & OBJECTIVES

GOAL

To reduce the impact of flooding while increasing the benefits of its surrounding communities.

OBJECTIVES

- To reduce amount of water flooding into community.
- To provide more higher quality ecosystem services through wetland
- To maximize indigenous biodiversity in wetland



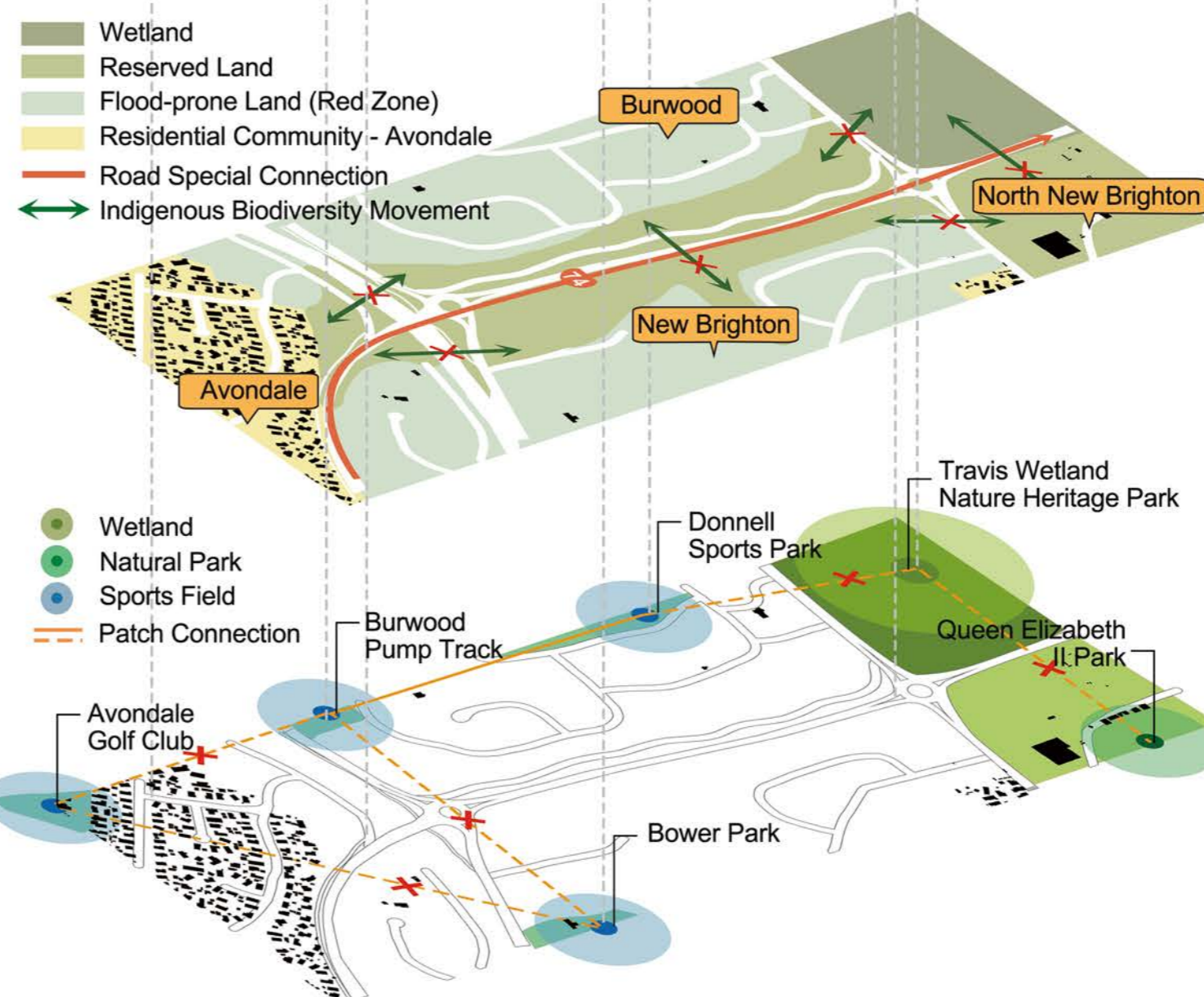
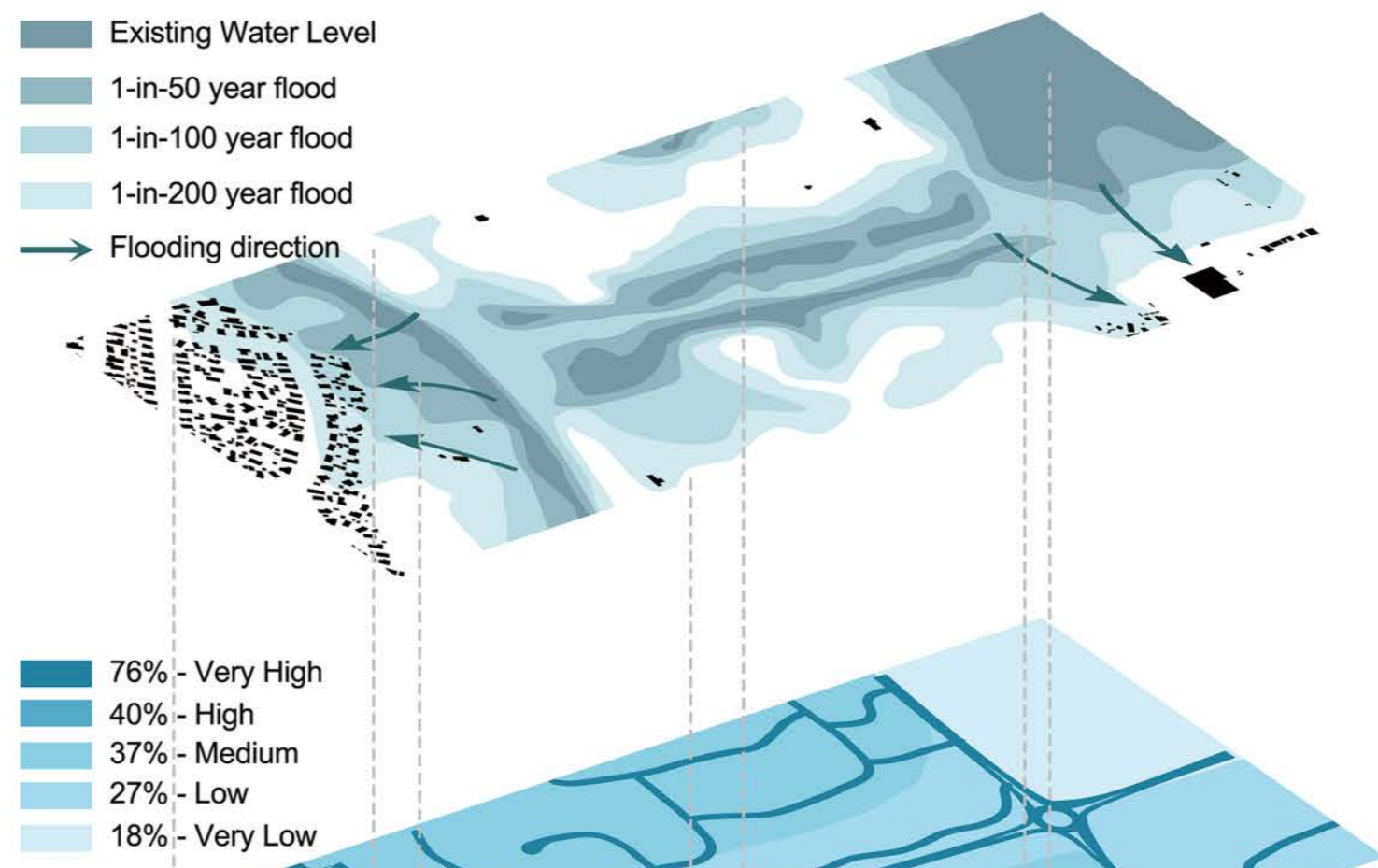
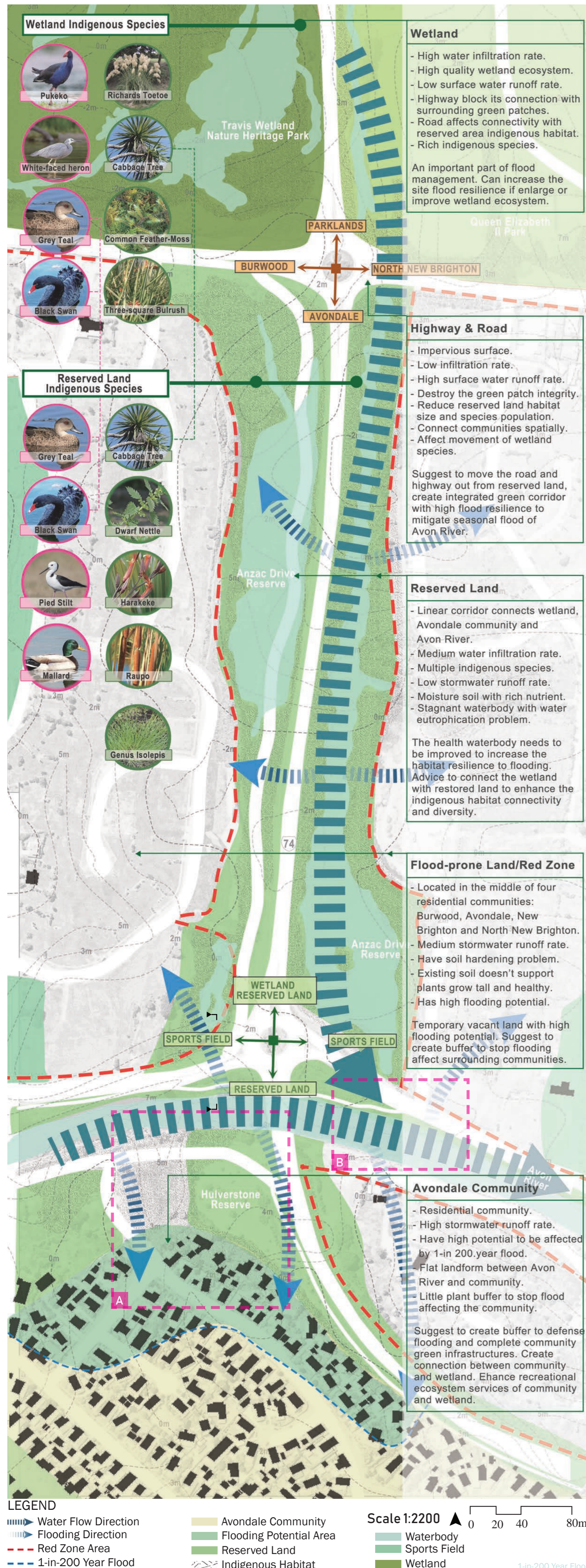
- A- Headwaters**
 - Water start merging into Avon River Catchment. No flooding potential.
- B- West Area (Upstream)**
 - Most branch streams, increase main stream volume and pressure.
- C- City Area**
 - Little branch streams, flow through city center in Christchurch.
- D- East Area (Downstream)**
 - Connect inland waterway and ocean, most river confluence, high seasonal change and high flooding potential.

- Avon River flows through 15 districts in total.
- Grey districts located at headwater and the upstream area of the main stream, nearly no flooding potential.
 - Dark yellow city center is located at the head of red zone, little flooding potential.
 - Bright yellow residential districts are close to marine, suffer from tidal change and upstream seasonal change. The red zone is in this area which have high potential to affect surrounding communities.

- A- Scattered Parks**
 - Community parks and playground located along upstreams. Low infiltration rate.
- B- Central Parks and bank natural buffer**
 - Large area of sports ground and botanic garden. Natural buffer along the bank to reduce the affect of flood to its surrounding central city environments.
- C- Wetland and Reserved area**
 - Largest area of green infrastructure located along downstream Avon River. Large area of Wetland reserved land.
 - High infiltration rate, high flood resilience potential.

REGIONAL SCALE MAP - CHALLENGE AND POTENTIAL

REGIONAL SCALE SITE ANALYSIS



WATER LEVEL & COMMUNITY FLOOD POTENTIAL

- Existing waterbody collect in natural habitat
- 1-in-100 year flood will affect surrounding urban landscape.
- 1-in-200 year flood affected area will be 5 times larger than existing water body.
- Landform affects the waterflow direction.
- 1-in-200 year flood will affect residential communities in Avondale and North New Brighton.

STORMWATER RUNOFF RATE

- Travis Wetland Nature Heritage Park has the lowest water runoff rate.
- Wetland has high water storage rate, reduce downstream flood peaks and maintain seasonal flow distribution.
- Red Zone area has medium water runoff rate. The soil hardening problem decreases water infiltration rate.
- Residential area has high water runoff rate. The community has low resilience of flood events.

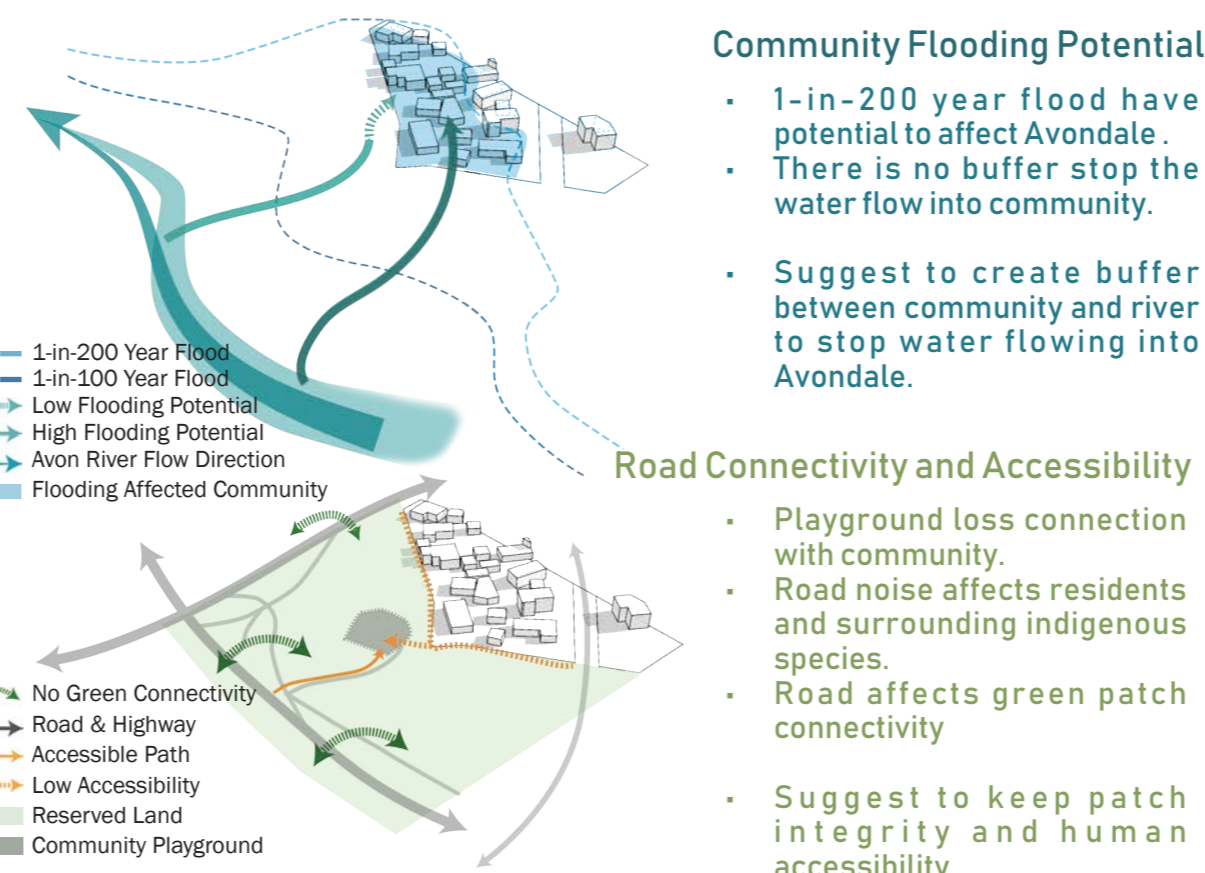
ROAD IMPACTS NATURAL & SOCIAL

- Road Social Impact:**
- Create spatial connection between surrounding communities.
 - Enhance surrounding residents' social connectivity.
 - Central spine of the site.
- Road Environmental Impact:**
- Disturb wetland connectivity.
 - Disturb the movement of indigenous biodiversity.
 - Reduce connectivity of reserved land.

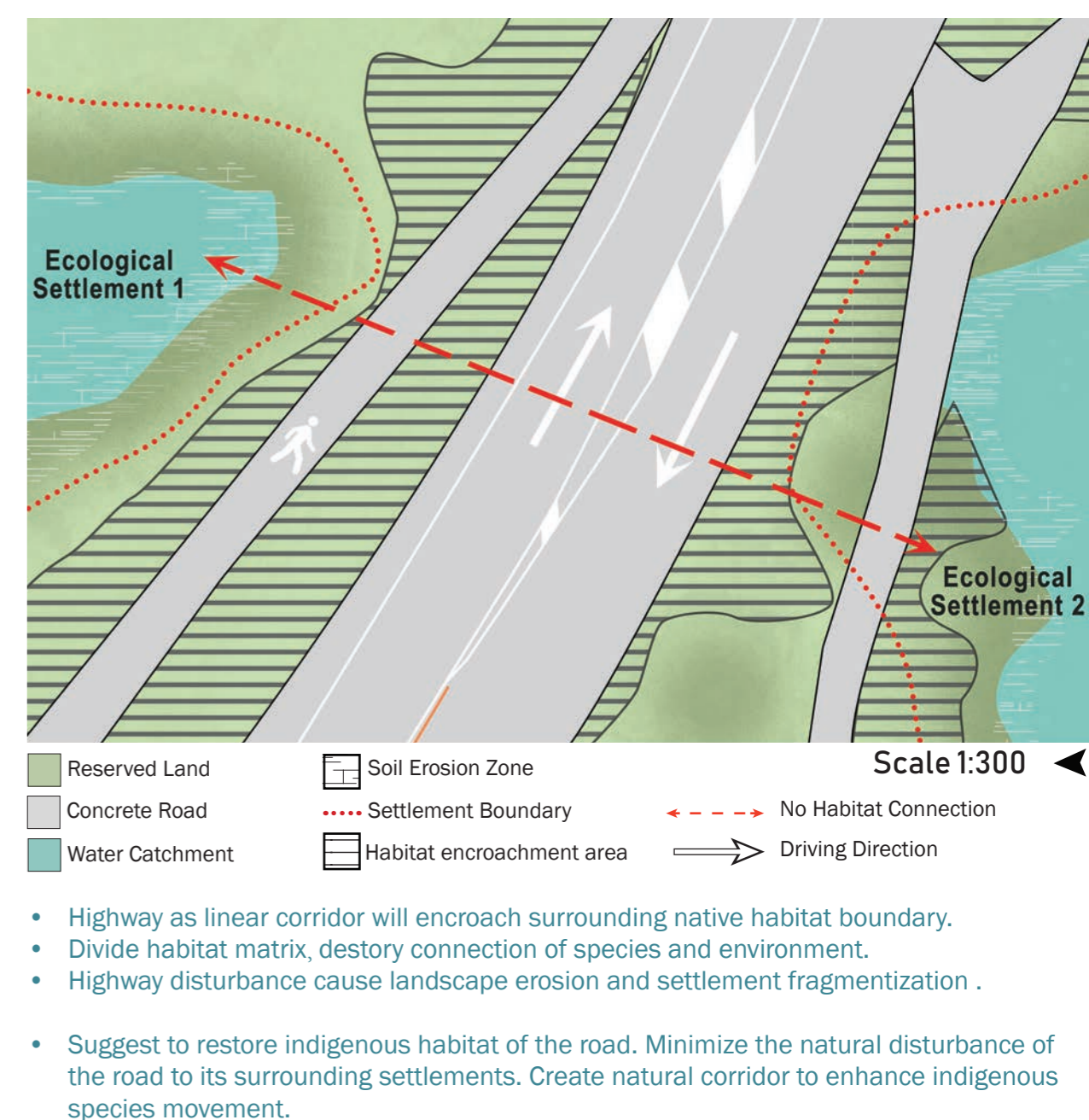
RECREATION FACILITY TYPE & CONNECTIVITY

- Three major recreation facility types: wetland, natural park and sports field.
- Each facilities are isolate, no natural habitat connection.
- The middle of the site has no recreation facilities.
- Wetland and reserved land has high potential to increase high quality ecosystem services and creating connectivity between surrounding recreation facilities.

A AVONDALE COMMUNITY FLOODING POTENTIAL ANALYSIS



B AFFECT OF ROAD TO NATURAL ENVIRONMENT



SEEK OPPORTUNITIES IN HAZARDS - REVITALIZE CHRISTCHURCH FLOOD-PRONE LAND

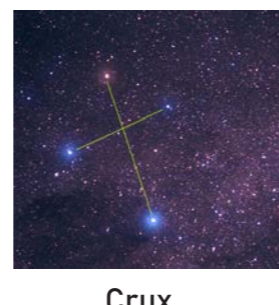
LASC 406 PROJECT 1 AIMILY LI 1127668

DESIGN VISION

This design will provide direction for solving Christchurch river channel flooding and Red Zone area land use value problems. Using river branch and its surrounding natural environment to separate and reduce Avon River pressure and its affect to the surrounding communities especially in flooding season. Meanwhile, this design will enhance the integrity of wetland and fully exert its advantage of water like protecting water quality, erosion prevention as well as flood storage to provide multi-functional ecosystem service for surrounding communities and the whole Christchurch. Also, the design will provide perfect natural habitat for native species through connecting Travis Wetland ecosystem. This design will create an ecological protection, leisure sightseeing, science education, wetland research in one of the largest ecological wetland corridor.

DESIGN CONCEPT - CRUX (SOUTHERN CROSS)

As one of the most important constellation in the southern sky, crux is used to indicate directions for people in the southern hemisphere. Each star in Crux has unique colour which is fascinating and unique. Also, this constellation is designed into New Zealand national flag. The inspiration of this design concept comes from Crux. Spatially, each scenic spot on the plan represents a star, each of them has their own function and characteristics. Those spots are independent but relatively connected and keep the balance of the site. The cross shape also represents the overpass. Like Crux, the design will be a constellation on the ground, indicates direction of solving red zone flooding problem in Christchurch.



SOURCE OF INSPIRATION



Sponge Spaces & Safe Failure

Yanweizhou Park- Jinhua, Zhejiang, China

Jinhua suffers from annual flooding due to its monsoon climate. The design "make friends" with flooding by using cut-and-fill strategy and by designing a water-resilient river embankment which covered with flood-adapted native vegetation. Also, it mixed with local culture by designing dragon shape pedestrian bridge to ensure connectivity and walkability in flood season.

Design for Variability

Billancourt Park- Paris, France

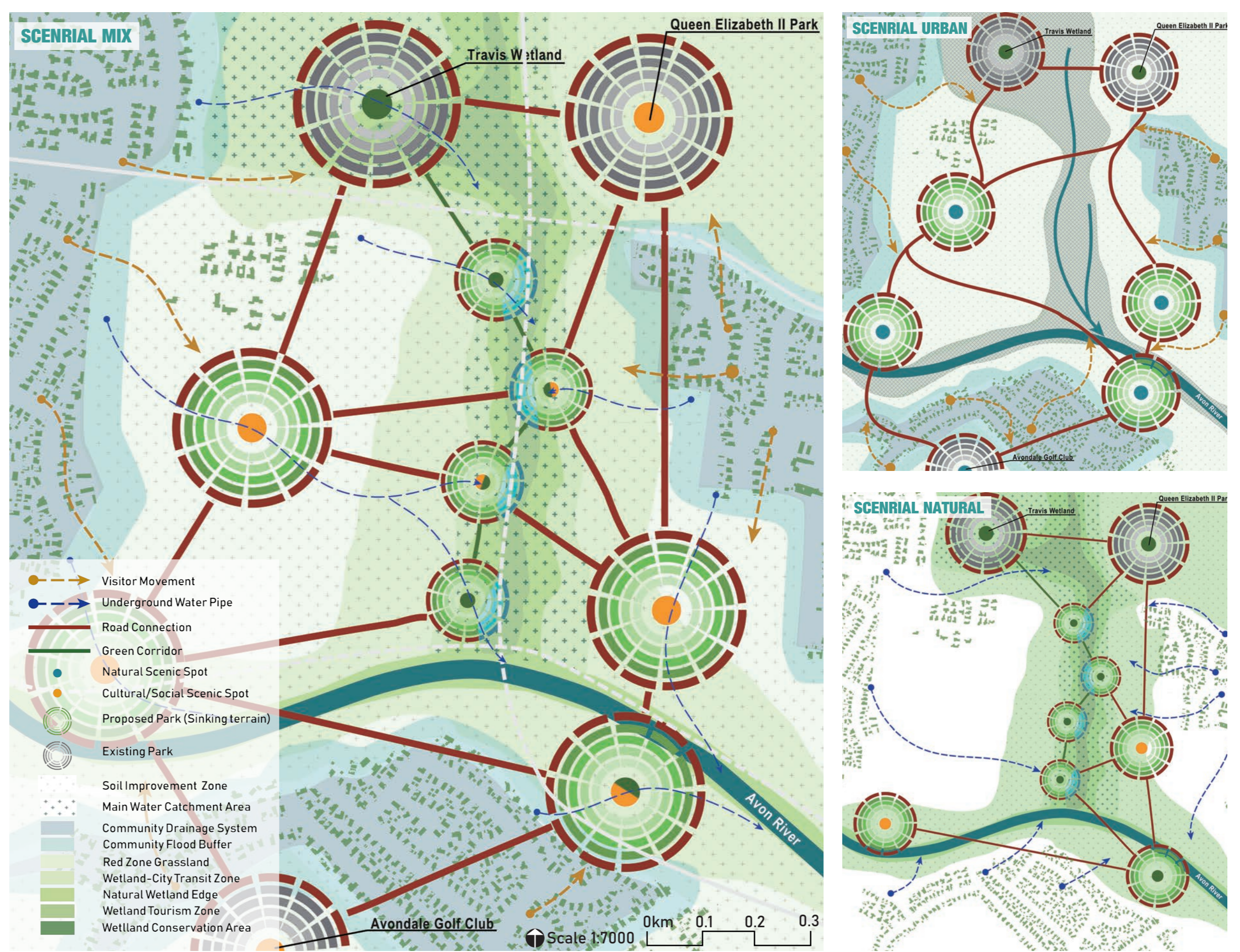
The park has a linear form and sunken configuration, its landform allows it collect water in flood season. There are several playgrounds in the park while the multifunctional grass fields allow for occasional pick flood. The water defines the constantly changing of the field. When sitting on the concrete steps on the edges, people can overlook the seasonal or dynamic variations of water level.

Collective Effort

Climate Tile- Copenhagen, Denmark

This design focuses on reducing flooding across public and private space. Since flood management is a top-down process, a capillary-type network of water system is needed. The Climate Tile reintroduced water circuit into cities. This design collects the water from road and roof, delivering it into the raingarden and water tank which provides a innovated way of treating water.

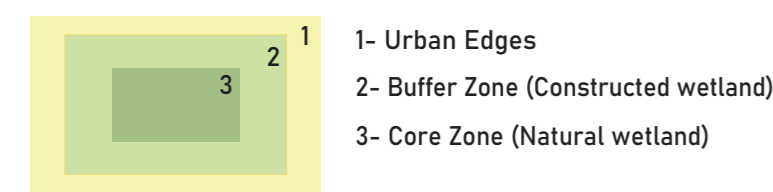
POSSIBLE SCENARIOS



ECOLOGICAL DESIGN STRATEGIES

Wetland Layer Protection Mode

Building layer protection mode like "core zone- buffer zone-urban". Using existing site reserved land to create core area, changing it into natural wetland. The buffer zone is to design constructed wetland, aims to create transition from the urban environment to natural wetland while protecting the natural wetland from the negative effects by urban disturbance.



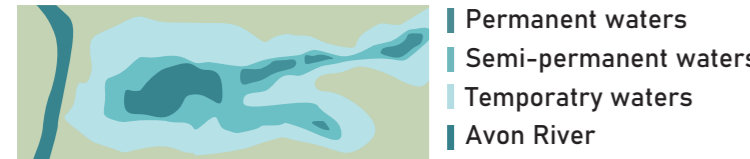
Ecological Water Network

City-Wetland external water network
Connect city drainage system, water channel and interior site together, include wetland into city water drainage system. Disperse Avon River pressure when flooding comes.



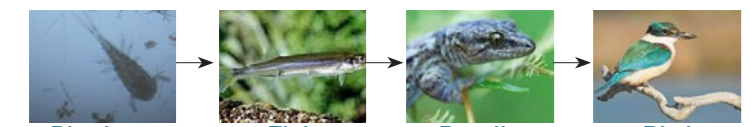
Wetland internal water network

Based on existing landform and surface runoff data, divide three aquatorium types - permanent waters, semi-permanent waters, and temporary waters.



Enrich Wetland Biodiversity

Fauna Diversity
Improving wetland environment to provide perfect habitat for native species. Launch animals step by step, ensure the food chain is closed and systematic.



Flora Diversity

To restore natural wetland ecosystem, try to avoid the exotic dominant plant invasion. Select native species and import Travis Wetland species to achieve integrity of wetland plant community.



DESIGN PROCESS

Step 1- Year 1

The first step aims to prepare the site to the best state before changing and real construction.

- Change the highway into overpass which is uplifted from the ground to leave an integrate land for further design.
- In the community, the first year aims to complete a flood control and water management network inside the community.
- Change the soil structure of flood-prone land (red zone), plant grass to awaken soil vitality.
- Start social activity playground earthwork.

Step 2- Year 2-5

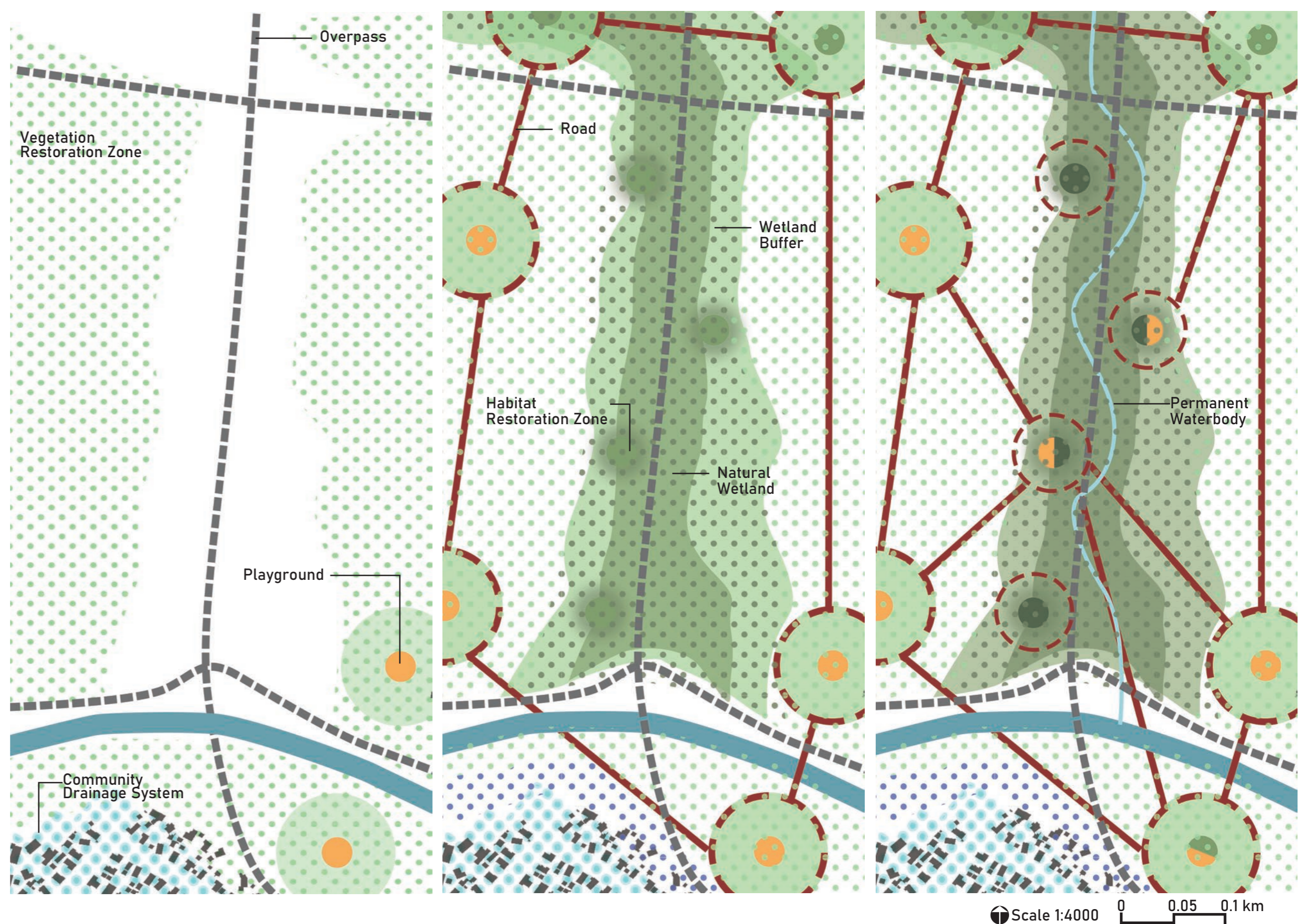
The second step aims focus on wetland reconstruction and wetland environment management.

- Connect the Travis Wetland and the reserved land along the highway to create a wetland corridor.
- Wetland ecosystem restoration. Monitor wetland health condition to provide health habitat for native species.
- Complete wetland buffer earthwork, flood control.
- Complete social activity playground earthwork, complete road network with other activities.
- Community edge raingarden & pipeline design.

Step 3- Year 5-10

The third step aims create more opportunity for people to get involved in experiencing wetland ecosystem through different activities.

- Wetland ecosystem and species fixation.
- Create specific wetland scenic spot and wetland research and education base.
- Complete wetland walkway and its surrounding road network.
- Create mature multi-functional wetland park with complete public facilities.
- Focus on wetland landscape maintenance, control the effect of human activity to the environment.



DETAIL PLAN SITE SELECTION



Existing Problem:

- Soil Liquefaction:** This site is in the high water table zone with moisture soil. The soil liquefaction problem is serious in grass land. The ground is very soft and when standing on the soil, the water will be squeezed out.
- Water Eutrophication:** The existing waterbody is high polluted with water eutrophication problem. The water quality threatens the biodiversity in the waterbody. The main reason of this problem is the water in the reserved area does not flow.
- Soil Hardening:** The red zone area used to be a residential community which the soil underground is highly compressed which is not suitable for root of plant to grow deeply. Also, the site has seriously uneven drainage rate.

Site Potential:

- Location Potential:** This site is next to the highway No.74 which is close to the traffic centre. The reserved land is connected with Travis land next to the New Brighton Community which is a unique site between natural environment and living environment.
- Land Use Potential:** The site is a flood-prone land located on the Red Zone, the land has high tourism development potential.

SITE VERTICAL EVOLUTION

Phase 1- Site Preparation



Connect the roof pipe with rain garden and deal with underground pipe system to avoid the flooding potential inside the community. Ensure the soil and transport situations are in the best state.

Phase 2- Site Revegetation

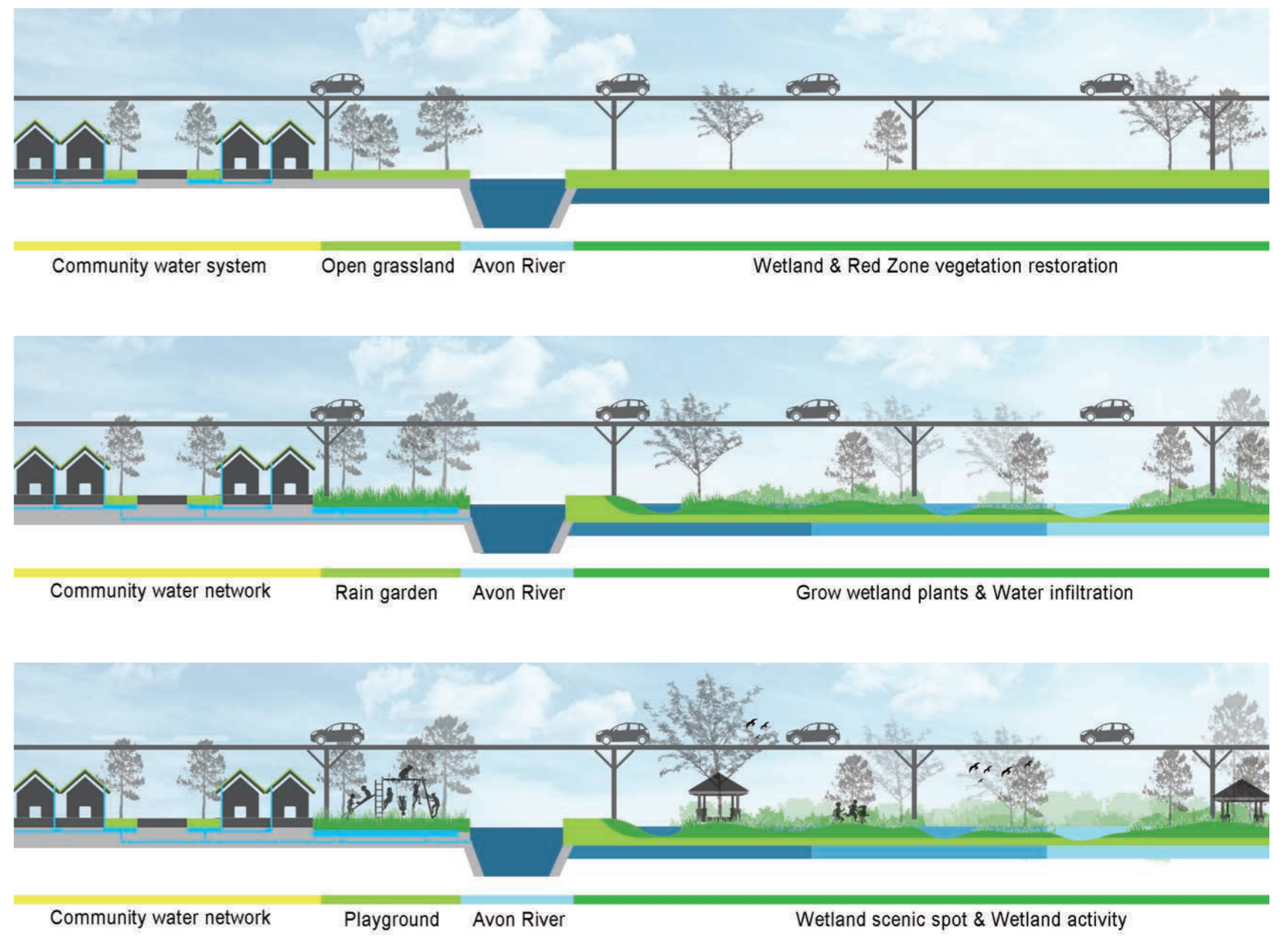


Wetland restoration. Plant functional plants to infiltrate water quality and regulate water amount. Revegetate the space around the community to create rain garden to protect the community from being affected by flood.

Phase 3- Site Value Development



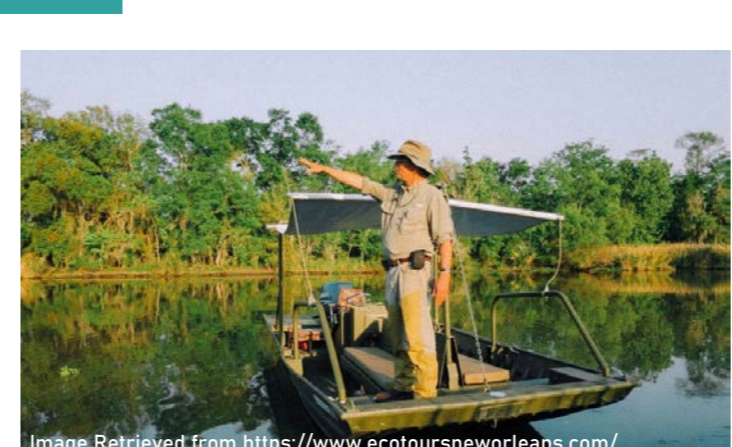
Start developing the regarden with more functions like providing social space for residents. Discovering the economic, education or social value of the wetland, design activities and scenic spot.



Design Direction



Wetland Restoration
Using the function of wetland to achieve water purification, water detention and providing habitat for native species. Changing Red Zone area into the biggest water detention pond.



Wetland Research
Building Wetland Research Center in the Wetland area. Aiming to do research on Christchurch soil and wetland plants in facing the soil liquefaction and sea level rise. The research center can provide a more scientific and accurate solution for Christchurch.



Wetland Tourism
To create economical value of the flood-prone land, providing different wetland activities to attract visitors. This project can change the red zone open space into Tourist Holiday Resort



Wetland Education
Children is our future hope. The best way to protect our city in the future is teaching our children how to do when they are young. The knowledges are came from real experience and feeling. This place provides an outdoor environment for children to communicate with nature.