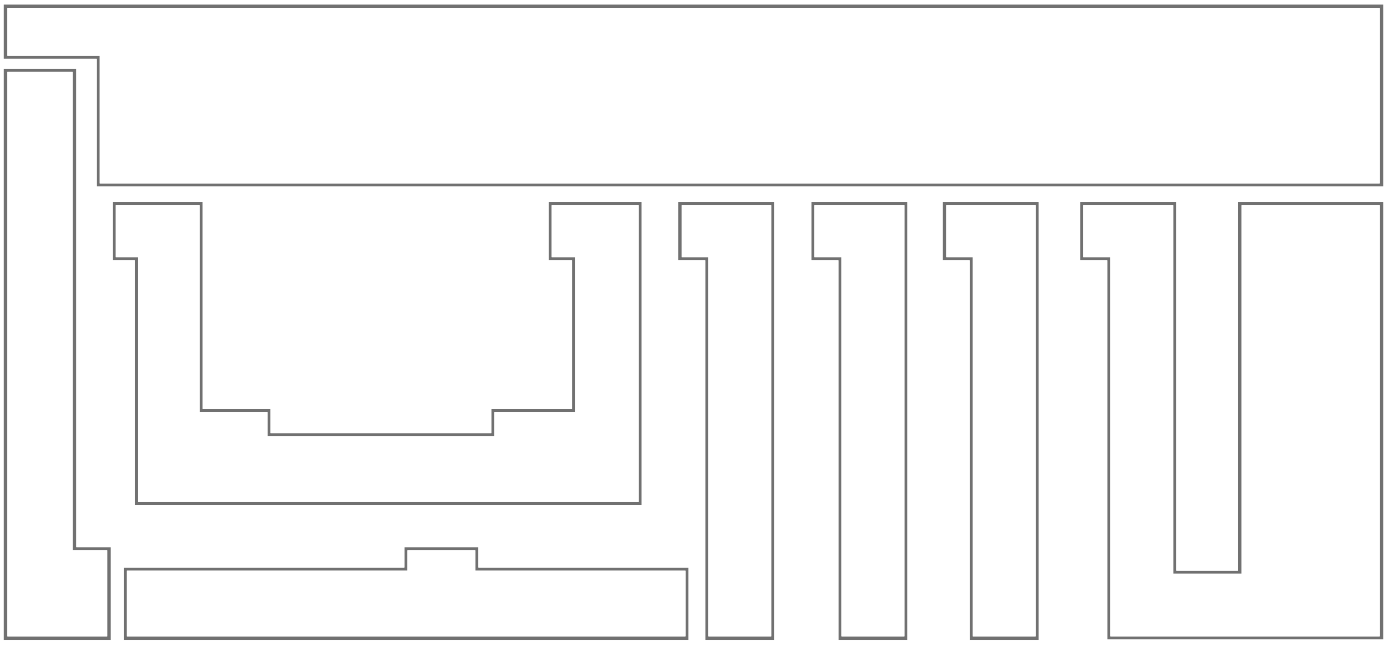
Restoring Forgotten Land

Landscape Architecture Master's Thesis
North Dakota State University

Thesis Design By: Matthew Jacobson



RESTORING FORGOTTEN LAND

Degraded Land Restoration

A Design Thesis Submitted to the
Department of Landscape Architecture of
North Dakota State University

By

Matthew Timothy Jacobson

In Partial Fulfillment of the Requirements
For the Degree of
Master of Landscape Architecture

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Fargo , North Dakota

Thesis Archival Note

The following thesis project, entitled Restoring Forgotten Land: Degraded Land Restoration in downtown Detroit, was composed over the course of the 2022 - 2023 academic school year. The Thesis Program, as contained here, was initiated and completed in the fall semester as a part of the LA 763: Landscape Architecture Thesis Research and Programming course. Supplemental material, including the Thesis Boards and the Thesis Presentation documents, were generated in the spring semester as a part of the LA 772: Landscape Architecture Graduate Thesis Design Studio studio. Any inconsistencies between the different documents, in terms of research and design, should be excused per the evolution of the project across the two semesters

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Thesis Abstract

This thesis will explore the potential of using phytoremediation techniques to reduce PM2.5 pollution in Detroit. The city of Detroit has a long history of industrialization and, as a result, faces significant air pollution challenges. PM2.5 pollution, in particular, has been linked to numerous health problems, including heart and lung diseases. Phytoremediation offers a promising solution to this problem, using plants and their associated microorganisms to remove pollutants from the air and soil. This thesis also includes a design proposal for a community center at the abandoned Packard Plant in Detroit. The design incorporates phytoremediation elements, such as phyto walks and integrated green roof gardens. These elements help to improve air quality and provide aesthetic and functional benefits to the community center. Utilizing various elements of the existing building, this addition will provide structural integrity improvements to the existing building. This thesis will provide new insights into the potential of phytoremediation to reduce PM2.5 pollution in urban environments, with a focus on the city of Detroit. The research and design proposal offer valuable information for landscape architects and urban planners working to address air pollution in Detroit and other cities.

Thesis Narrative

Phytoremediation is a type of environmental remediation that uses plants to remove, neutralize, or stabilize contaminants in soil and groundwater. This approach has the potential to be a cost-effective and sustainable solution for addressing pollution in urban areas, such as Detroit. Detroit is a city with a long history of industrialization and pollution. The city's industries, including automotive manufacturing and heavy industry, have contributed to air and water pollutions, as well as soil contamination. Phytoremediation offers a promising solution for addressing pollution in Detroit. This approach uses plants to absorb, break down, and stabilize contaminants in soil and water. Different plants have different abilities to re mediate different types of contaminants, making phytoremediation a versatile and adaptable approach. This thesis has identified a location in Detroit MI, that offers a unique opportunity to create a cultural green zone that focuses around the community while also passively impacting the PM2.5 pollution rates. One potential application of phytoremediation within post industrial design is the use of green roofs. Green roofs, also known as living roofs or vegetated roofs, are roofs that are covered in vegetation. These roofs can provide a number of benefits, including improved insulation, storm water management, and air quality. In addition, they can be designed to include plants that can re mediate pollutants in the soil and water that collects on the roof.

Thesis Justification

The design of our built environment has a profound impact on the health and well-being of the communities that inhabit it. This is particularly true in the case of PM2.5 pollution, which has been linked to a range of serious health problems, including respiratory and cardiovascular disease, as well as premature death. In Detroit, where air quality is a significant concern, the design of a new green zone at Packard Plant presents an opportunity to address this issue. By incorporating strategies to reduce PM2.5 pollution into the design of the landscape, this thesis can help to improve the health and quality of life of the community that has been connected with Packard Plant for decades. The integration of phytoremediation into the design of this thesis in presents a unique opportunity to improve air quality and public health, while also enhancing the aesthetic and recreational value of the space.

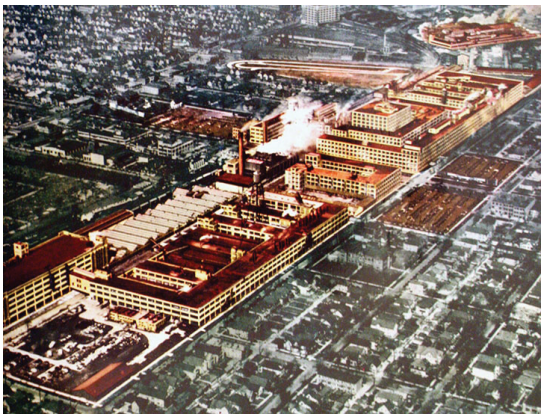
Thesis Emphasis

Phytoremediation is a potential solution for addressing pollution at the Packard Plant in Detroit. By incorporating phytoremediation into the remediation efforts at Packard Plant, this will provide a more sustainable and cost-effective solution for addressing pollution at this site. Packard Plant is a former automotive manufacturing facility in Detroit that has been abandoned for many years. The site is contaminated with pollutants, including heavy metals and volatile organic compounds, that pose a threat to the health of the surrounding community. Traditional remediation approaches, such as excavation and disposal, are expensive and can be disruptive to the environment and the community. This thesis explores reduction techniques for PM2.5 pollution. Using phytoremediation will reduce both existing site faults and have a big impact on the PM2.5 pollution levels year after year. This will be achieved through the development of complex green roofs. Packard Plant is essentially a large building that is strewn with trash and debris. Attempting to utilize all the space, all levels of the building will be restored and the roofs will be converted into a garden. A design will be implemented that cleans up the buildings and transforms the surrounding land into a public park. This park will compliment Packard Plant and will feature multiple flexible spaces and other amenities that will be decided on jointly with Detroits

Packard Plant

About Packard Plant

Location: Detroit , Michigan
Size: 40 acres
Thesis Size: 17 acres
Architect: Albert Kahn
Owner: Fernando Palazuelo
Purpose: Abandoned Industrial Plant
Contamination Level: EPA Superfund



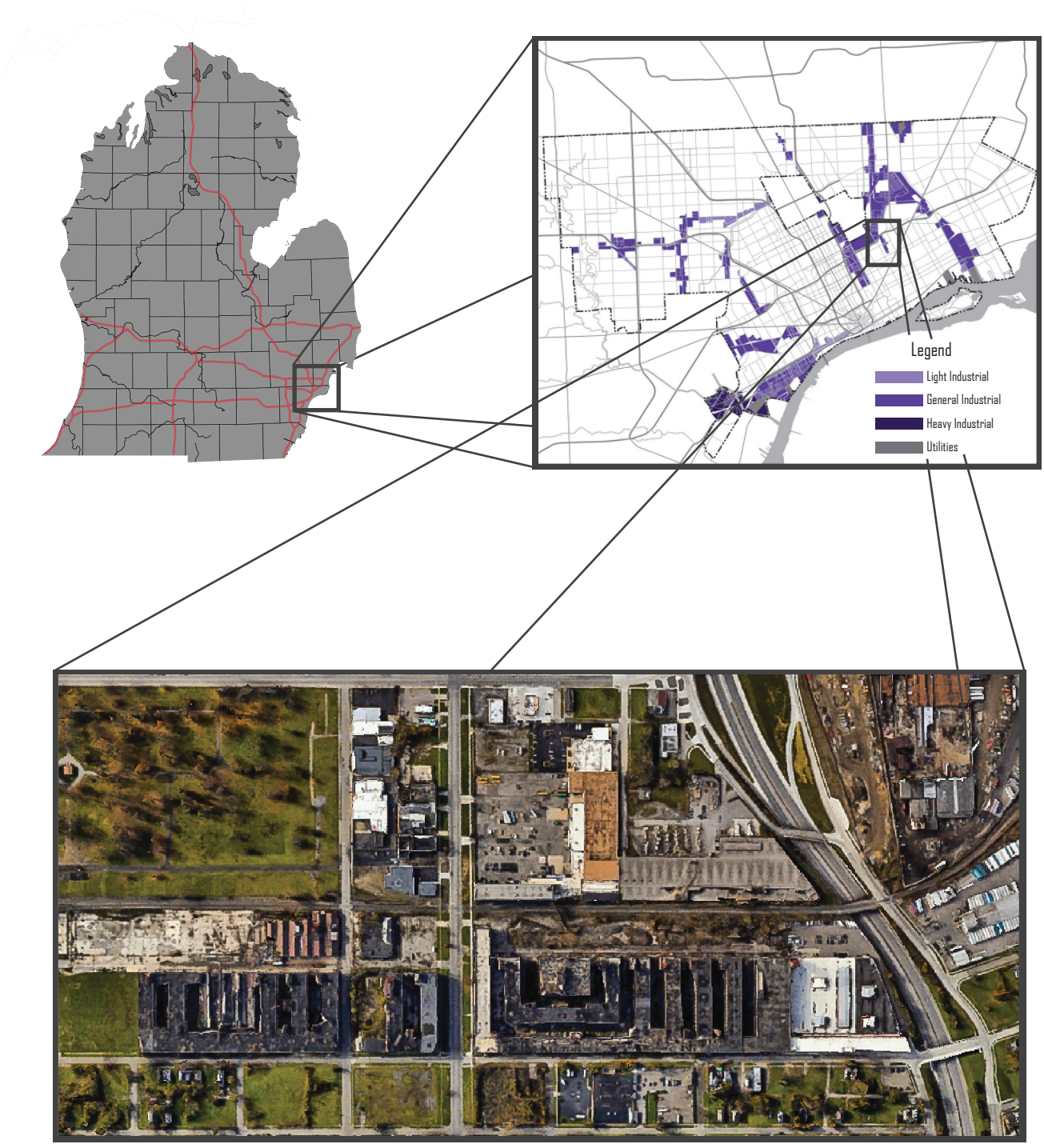
About Packard Plant

Detroit is the largest city in the state of Michigan, and is known for its rich history and vibrant culture. Located on the Detroit River, the city was founded in 1701 by French settlers and was an important center of trade and industry throughout the 19th and 20th centuries. In the early 1900s, Detroit became a major hub of the automotive industry, and was home to some of the most famous car manufacturers in the world, including Ford, General Motors, and Chrysler.

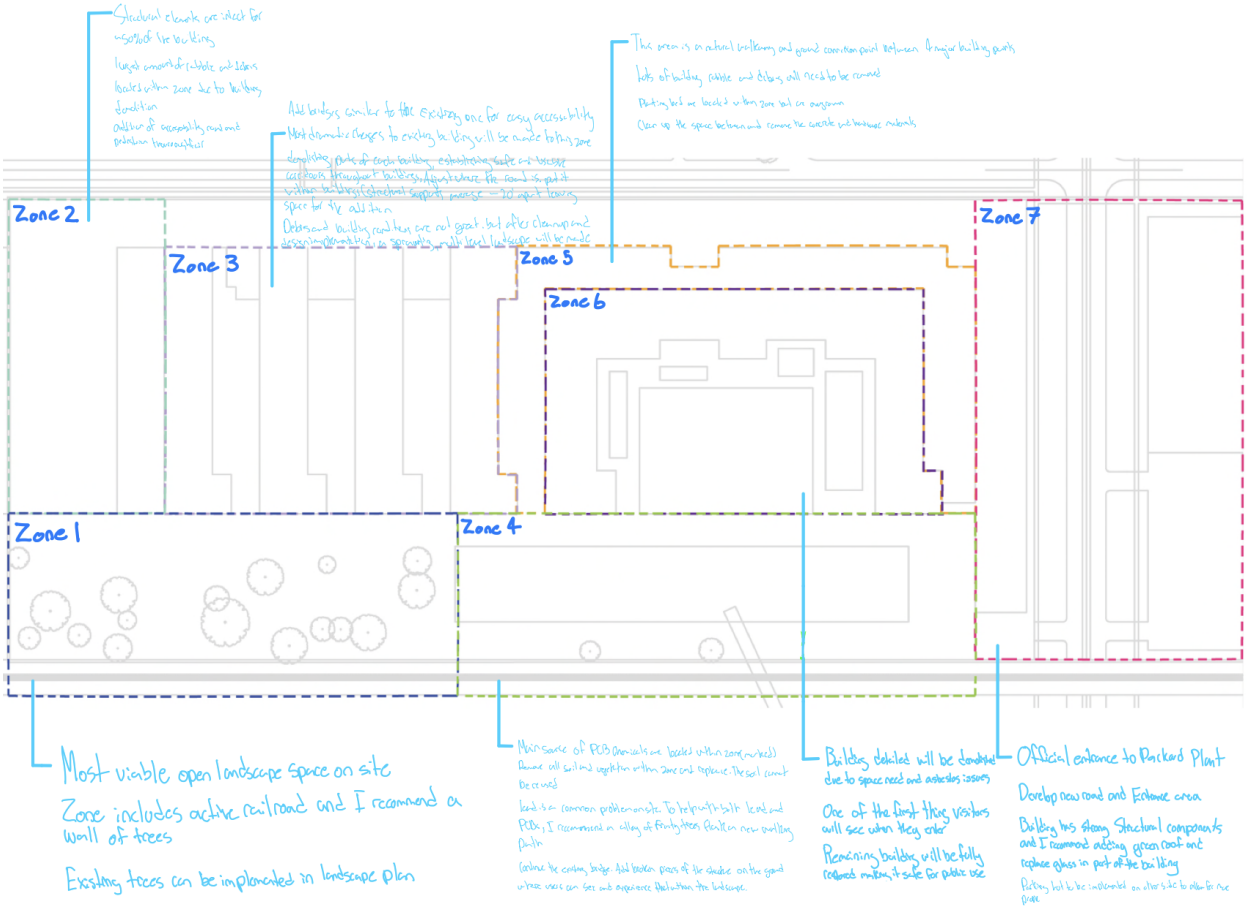
Packard Plant is a abandoned automotive factory in Detroit, Michigan, United States. It was built in 1903 by the Packard Motor Car Company, and was one of the first factories in the world to use assembly line production techniques. The plant was designed by architect Albert Kahn, and is known for its innovative design and impressive size, covering over 3.5 million square feet.

Packard Plant was in operation until 1958, when the Packard Motor Car Company went bankrupt. After its closure, the plant was used for a variety of purposes, including storage and manufacturing. In recent years, the plant has fallen into disrepair and has become a symbol of the decline of the automotive industry in Detroit. Packard Plant still remains a significant historical and architectural landmark.

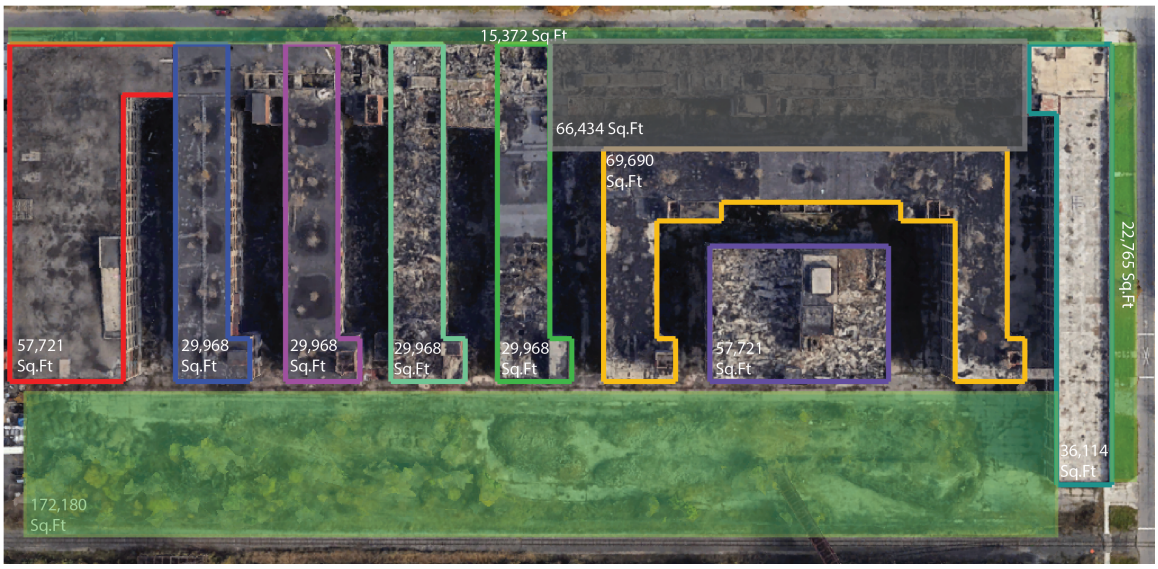
Site Location



Site Analysis



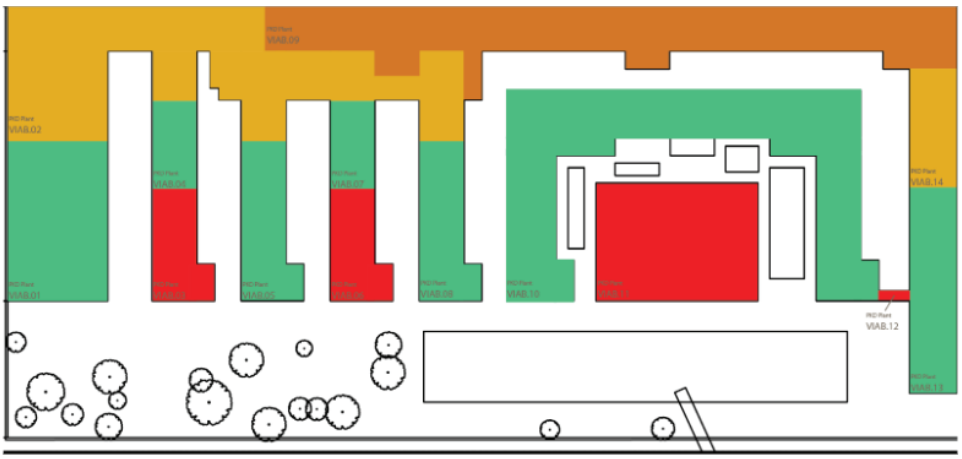
Building Analysis

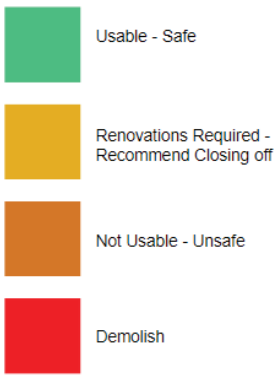


- Rooftop Building #1 57,721 Sq.Ft I 8%
- Rooftop Building #2 29,968 Sq.Ft I 5%
- Rooftop Building #3 29,968 Sq.Ft I 5%
- Rooftop Building #4 29,968 Sq.Ft I 5%
- Rooftop Building #5 29,968 Sq.Ft I 5%
- Rooftop Building #6 69,690 Sq.Ft I 10%
- Rooftop Building #7 57,721 Sq.Ft I 8%
- Rooftop Building #8 33,114 Sq.Ft I 6%
- Usable Space 210,317 Sq.Ft I 5%
- Unusable Space 66,434 Sq.Ft I 10%

Space Remaining 72,193 Sq.Ft I 9%

Building Viability





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PKD Plant - VIAB.13
PKD Plant - VIAB.14

Demographics

Local Roads ~20 Vehicles / Day

Rural Arterial ~60 Vehicles / Day

Interstate <168,000 Vehicles / Day

Active Railroad ~4 Trains / Month

Parking Lots

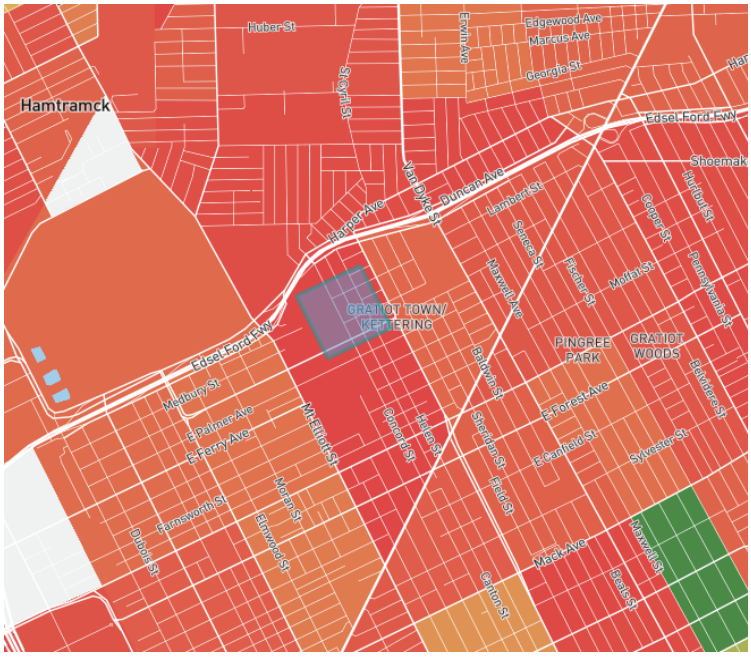
Thesis Location

Detroit Demographics

Population: 632,464
Poverty Rate: 30.6 %
Racial and Ethnic Makeup:

- African American 79.2 %
- White 14.1 %
- Hispanic or Latino 6.1 %

Median Household Income: EPA Superfund



High Income I $ 60,250

Average Income I $ 32,500

Low Income I $ 16,800

Thesis Location

Case Study Matrix

In order to effectively analyze a case study, a performance matrix unique to this thesis needed to be created. This thesis should create a sustainable, integrated landscape that effectively cleans the environment and enhances the quality of life for the surrounding community. The analysis of these case studies using the matrix below has yielded key insights and elements that will drive the design and methodology of this thesis. Each of the case studies offer a new perspective into post industrial design and re mediation techniques.

Each case study, with regards to this thesis, were graded on 4 factors

Environmental Impact

Relevance / Usability

Plant Diversity

Space Allocation

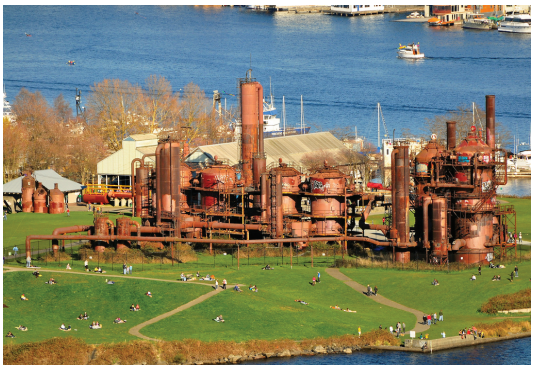
Below are the stipulations for the Matrix

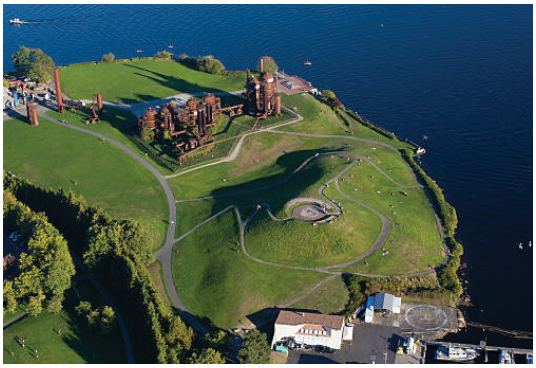
	1	2	3	4	5
Environmental Impact	The Case Study Site does not use bio remediation techniques. No intent for environmental impact within design. Not properly cleaned and maintained.	The Case Study shows some intent in the design for bio remediation. Doesn't apply these techniques properly. Maintained and Cleaned 3-4 times a year	The Case study shows intent in the design for bio remediation. Design for environmental impacts are implemented. Maintained and Cleaned 1-2 a month.	The Case study shows clear intent in the design for positive environmental impacts by way of multiple bio remediation techniques. Maintained and Cleaned regularly.	The case study is designed with environmental impacts first, building landscape second. Has led to drastically reduced rates of harmful chemicals. Consistently maintained and cleaned.
Relevance Usability	The case study had little to no community involvement in design. Limited seasonal availability.	The case study involved community development but did not utilize it efficiently. Available ¼ months of the year for consistent use.	The case study involved the community using different involvement techniques. Community influence was present. Available ½ months of the year for consistent use.	The case study works with the community to build the methodology for the project. Available ¾ months of the year for consistent use.	The case study was developed with the local community side by side with the designers. Site plays host to several community themes / run events Multi-seasonal, all year amenities
Plant Diversity	Limited number of plant diversity leading to a weaker landscape	A couple plant cultivars are present but are not growing well due to poor conditions / direct interference with other plants	Multiple plant cultivars present offering a formidable landscape. Plant selection was in part designed for air purification.	Several plant cultivars are present in good growing conditions leading to optimal growth. Plant selection has clear intent for air purification qualities in majority of selection	The case study has high expanse of cultivated plant species and cultivars leading to a very strong and diverse landscape. Offers plant selection that increases air cleanliness.
Space Allocation	The case study offers no clear space allocation plan or design intent to offer flexible spaces	The case study has a basic space allocation plan is presented with limited impact on design	The case study has a space allocation plan that offers various spaces that work together to create a unique experience	The case study has a space allocation plan that is present in all aspects of the design. Some of the spaces are being underutilized but overall produces multiple spaces for smaller groups.	The case study has several spaces allocated for flexible mixed use. A clear space allocation plan was developed and executed.

Gas Works Park

About Gas Works Park

Location: Seattle , United States
Landscape Architect: Richard Haag
Year(s) Designed: 1965 - 1975
Construction Completed: 1975
Typology: Post Industrial Design - Park - Modern
Awards: “Award for Design Excellence”





Design Narrative

Gas Works Park is a public park in Seattle, USA, on the site of a former coal gasification plant that operated from 1906 to 1956. Designed by Richard Haag and completed in 1975, the park incorporates the remaining structures and machinery from the plant, such as the towers and the boiler house. The park includes grassy areas, a children's play area, and a picnic area. The park is known for its innovative use of industrial remnants in its design, and its restoration techniques that clean up the site and restore the natural habitat.

Design Elements

- The boiler house, a central feature, was converted to a picnic shelter complete with tables and grills.
- The former exhauster-compressor building was transformed into an open-air play barn for all ages.
- Introduced educational elements with interactive mazes and machines left on site.
- Shifted public perception of post-industrial landscapes.
- Secondary reclamation project into the polluted soils was implemented and has now been nationally respected for revolutionizing the bio-remediation process.
- Seven zones in the design: North Meadow, Play Barn, Prow, Towers, Great Mound, Swale, and North Field

Gas Works Park

Environmental Impact

Gas Works Park was a key component in the research and application of restoration techniques with an abandoned industrial zone. Cleaning up the site was no small task with chemical waste being spilled onto the site for years. In just 10 years from being built. Gas Works Park was restored back to its natural habitat. These techniques have been applied to this thesis and will lead to a similar result.

5

Relevance / Usability

This site is commonly hosting large events and hundreds of people can be seen using it throughout the year, Gas Works Park has become a Seattle destination.

4

Plant Diversity

Gas Works Park has used soil solution techniques to restore the original environment. Allowing for plantings that benefit phytoremediation. While there aren't many plantings on the site. The grass has restored the soil structure.

5

Space Allocation

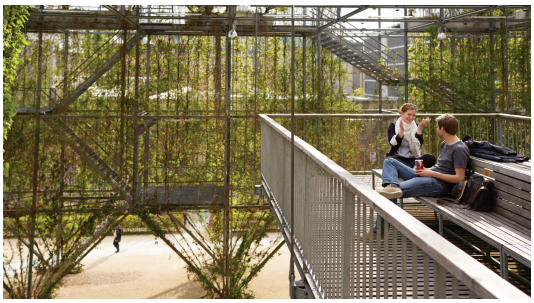
Focusing more on large open spaces rather than a forest of trees. Gas Works Park uses its massive size effectively. Creating a general path throughout the park connecting each location while also allowing users to explore the space. Gas Works Park is an ongoing project that is looking to expand and include more industrial elements on site.

4

MFO Park

About MFO Park

Location: Zurich , Switzerland
Landscape Architect: Raderschall
Year(s) Designed: 1998 - 2002
Construction Completed: 2002
Typology: Post Industrial Design - Park
Awards: 2010 “Most Innovative Contemporary Park”



Design Narrative

The green atrium was designed to be a public, flexible, multi-use space. Its large area is appropriate for individual activities, sports and games. MFO park was designed to have no limitations in comparison to regular parks. Collective events, tournaments, open-air cinema, theater, concerts and variety shows are among the possible uses. Small, quiet rooms are created by the interstices, with a view into the atrium promoting user interaction.

Design Elements

- The climbing plants are planted at different levels, in the ground and on irrigated troughs on upper levels and roof. They used strong plants like wisteria, grapevine, ampelopsis, and Parthenocissus that complement the architecture.
- By using different plant types, the colors of the space change throughout the year. In winter, the construction is visible, but in growing periods, it's covered in green. In fall, wild vine adds red color. The summer heat is reduced. At night, the structures in the square and atrium are lit from within, creating a 3D effect.

MFO Park

Environmental Impact

MFO Park used its plants to mediate the air and clean it increasing the quality. This park is also fully self-sufficient including a complex greenhouse system with accommodating water system to closely monitor and treat the vegetation.

5

Relevance / Usability

MFO Park is frequented daily, and the building can be used for most of the year. While some of the vegetation falls to the cold. Strategically places between an existing pedestrian thoroughfare, this enhances that space and includes a new flexible space for the users.

4

Plant Diversity

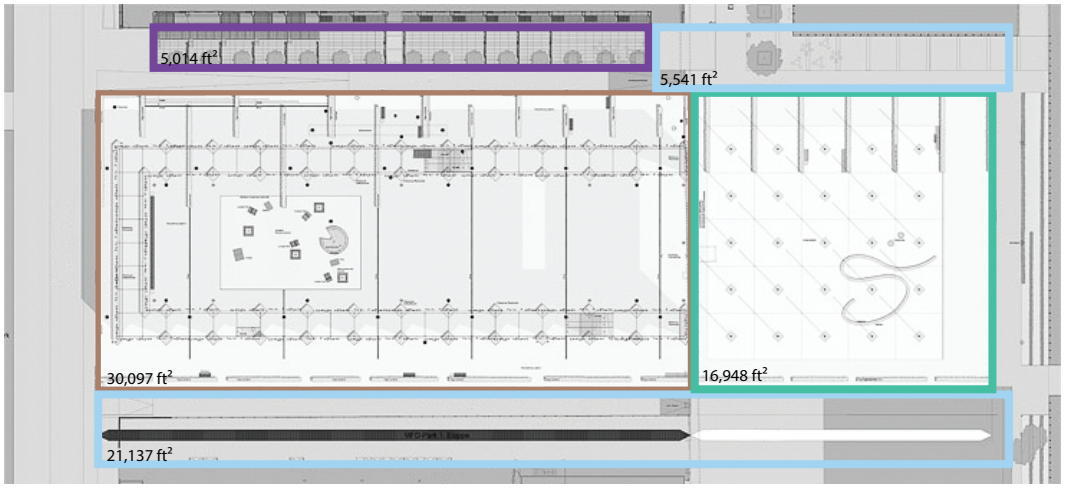
MFO Park is known for having a vast diversity of plants and vegetation within the park's borders, Using design elements that include a level concept offers more space for the vegetation to grow. The increased variety of plants compliments a strong plant diversity system.

5

Space Allocation

MFO Park is a different look at a traditional greenhouse. Utilizing a level concept to better compliment the space given. Offering dozens of seating options and a lush environmental feel. MFO Parks creates a whole new ecosystem once inside

3



Uferpark Attisholz Süd

About Uferpark Attisholz Süd

Location: Luterback , Switzerland
Landscape Architect: Mavo Landschaften
Year(s) Designed: 2016 - 2019
Construction Completed: 2019
Typology: Post Industrial Design - Park
Awards: 2022 Public Landscape

Design Narrative

The Attisholz Süd riverside park provides a possible answer to the question regarding the contemporary shape of this type of cultural landscape between former and future industrial areas, between nature conservancy and pressure from recreational needs, and between infrastructural and ecological connections. This creates a unique perspective between the park and the landscape.

Design Elements

- An intervention strategy was implemented due to the pragmatism of the existing industrial buildings. This strategy was oriented towards pragmatism and directness in the use of on-site resources.
- Details a new approach to experience the park from an aesthetic point of view.
- Degree of visible design will interplay with the familiar landscape.

Uferpark Attisholz Süd

Environmental Impact

Closing the factory has helped the environment by reducing chemical release. The site has been redesigned to further improve the environment and benefit the local community. Techniques like hydroponics are used to clean the soil and make it good for growing crops. The space is now used for a food market and public gardens.

4

Relevance / Usability

Before redevelopment, this location was industrial and caused pollution. Despite this, it was important to the community. The existing structures were used, and new open spaces were added with lots of plants and activity. The site is popular with locals and tourists, bringing more people and money to the city. It's open all year and encourages people to use it.

3

Plant Diversity

The existing industrial site has been completely converted into a public icon park that is frequented yearly. Using an intervention plan to implement hundreds of trees and shrubs throughout the location. While plenty of vegetation was added in the design of this park. Many of the trees are the same or within the same family, This leads to a weaker plant diversity.

2

Space Allocation

The existing industrial buildings serve as the basis for a pragmatic and cost-effective intervention strategy to address high utilization pressures. Targeted interventions, such as providing bicycle connections and opening up streams and drainage in the rear plots, create multiple attractive spatial qualities while maintaining the existing structures. These interventions also enhance the Aare space, create a promenade along the edge of the park, revitalize the river space, and define the Attisholzplatz.

5

Concrete Plant Park

About Concrete Plant Park

Location: The Bronx NY , United States
Landscape Architect: Jum Mituzas - Bronx Capital
Year(s) Designed: 2000 - 2009
Construction Completed: 2009
Typology: Post Industrial Design - Multi Use - Pedestrian Greenway
Awards: 2010 “Designing the Parks”

Design Narrative

Focused on renewing this body of water. Alongside its concrete silos, Concrete Plant Park invites visitors to use its boat launch, waterfront promenade, chess tables, and a busy bike path. The park is located between several busy bridges and is cut off from the mainland by an Amtrak line and the Sheridan Expressway. Offering a peaceful and isolated park.

Design Elements

- Develop a framework for planning and designing public parks that are innovative, responsive, respectful, sustainable and inclusive
- Introduced a dynamic interactive process, including reverence for place, engagement of all people, expansion beyond traditional boundaries, advancement of sustainability
- Plans to eventually use the silos as “green machines,” as water cisterns or power generators with attached photovoltaics. (Have not been implemented)

Concrete Plant Park

Environmental Impact

Concrete Plant Park aimed to clean up the industrial area and the water it sits on. Concrete Plant Park had lots of old industrial structures and was covered with concrete, which was contaminated. Despite these challenges, they recognized the potential of the land and made efforts to realize it. They cleaned up the environment, but the current design doesn't have an environmental impact.

2

Relevance / Usability

The Bronx community initially opposed the Concrete Plant Park project, but now they embrace it along with community groups and visitors. This shows involving the community in the design process can lead to success. The park is now popular, and hundreds of visitors enjoy it every day.

5

Plant Diversity

While offering hundreds of plantings throughout the park. The plant diversity experienced in this park is minimal. This does not take away from the park being a local hotspot. Offering flexible open spaces lends to more random activities.

1

Space Allocation

Concrete Plant Park has three sections, with the industrial part in the middle and open fields around it. There are paths leading back to the city. This case study shows how to design for the community's needs. It's a big park with trees that reduce noise and offers a break from busy life.

5

Former Industrial Space

Public Park Space

Matrix Results

The analysis of these case studies using the matrix designed has yielded key insights and elements that will drive the design and methodology of this thesis. Each of the case offers a new perspective into post industrial design and re mediation techniques. The rankings for the case studies according to the landscape performance matrix (in Order) can be seen below

	Environmental Impact	Relevance / Usability	Plant Diversity	Space Allocation	Total XX / 20
Gas Works Park	5	4	5	4	18 / 20
MFO Park	5	4	5	3	17 / 20
Uferpark Attisholz Süd	4	3	2	5	14 / 20
Concrete Plant Park	2	5	1	5	13 / 20

Matrix Relevance

Gas Works Park 18 / 20

Gas Works Park is an excellent case study that showcases a combination of natural and industrial elements in a visually striking environment. The park's innovative use of industrial remnants in its design is notable. Additionally, the park uses natural restoration techniques to restore the natural habitat of the area. The park's design also includes complex phytoremediation techniques to enhance plant diversity while not using a large amount of vegetation throughout the park. It is a great example of how to involve the community in the design process.

MFO Park 17 / 20

MFO Park stands out as it is not a renovated industrial building but built in an industrial district. The park has the most plant diversity, achieved by using many trees and shrubs both inside and outside the greenhouse. Its large atrium space inside the greenhouse creates a unique view and encourages community events.

Uferpark Attisholz Süd 14 / 20

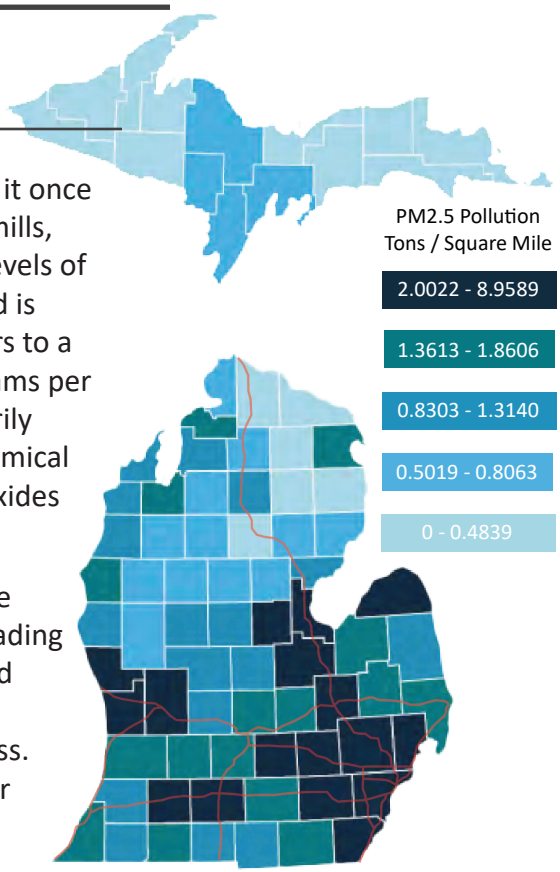
Uferpark Attisholz Süd demonstrates how contaminated sites can be transformed into thriving community centers and parks. The case study emphasizes the significance of a well-thought-out planting plan, particularly with respect to the placement of trees and the spaces they create.

Concrete Plant Park 13 / 20

Although Concrete Plant Park received a low score in the matrix developed for this thesis, it still provides valuable insights into community involvement in the design process and creating flexible spaces.

PM2.5 Pollution

What is this Pollution?

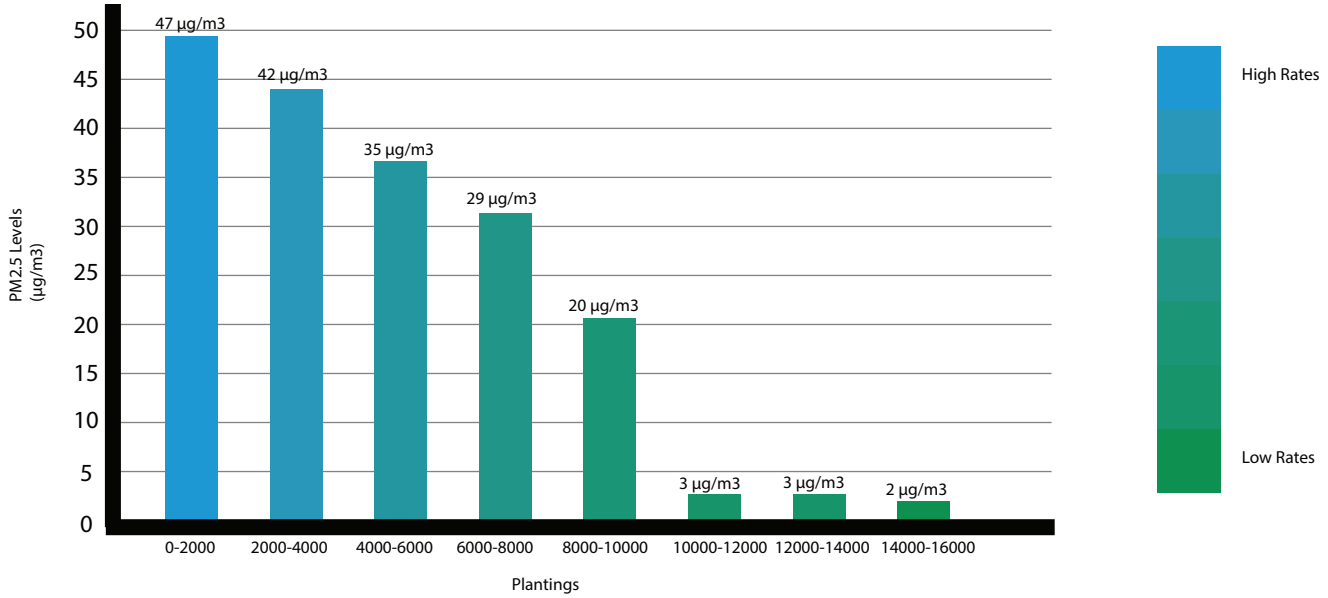


While Detroit may not have the production capability it once had, there is still production happening in dozens of mills, foundries, warehouses etc. As a result of the higher levels of chemicals in the air, PM2.5 pollution has emerged and is now spreading in the surrounding region. PM2.5 refers to a kind of pollution particle that is measured in micrograms per cubic meter of air (µg/m3). These particles are primarily formed in the atmosphere through a complicated chemical reaction between sulfur dioxide (SO2) and nitrogen oxides (NO).

PM2.5 pollution can have serious health effects on the respiratory and cardiovascular systems, potentially leading to conditions such as COPD, heart attacks, strokes, and premature death. Inhaling these particles can cause symptoms like coughing, wheezing, and chest tightness. Studies suggest that PM2.5 pollution is responsible for millions of deaths worldwide annually.

Solutions

A natural solution presents itself as being an active opponent to the spread of this pollution. Plants, shrubs, and trees all have natural abilities to filter out pollution along with other oxidants from the air and clean it. Due to the increased amount of toxic chemicals in the air specific vegetation will need to be selected to combat it. Using abandoned sites such as Packard plant offers a unique design to both help the environment around it passively. While also offering a new community and local hotspot in an already historic location.



PM2.5 Pollution Creation

What is SO2

Sulfur dioxide (SO2) is a colorless gas with a strong and irritating odor. It is a chemical compound composed of sulfur and oxygen molecules. Sulfur is a common impurity found in industrial fuel. When those materials are burned, the sulfur combines with the oxygen to form sulfur dioxide.

Companies that Produce SO2

What is N2O

Nitrous oxide (N2O) is a colorless and odorless gas that occurs naturally in the Earth's atmosphere as well as being emitted by human activities. It is a greenhouse gas that has a warming effect on the atmosphere. The largest source of nitrous oxide emissions in the city is the burning of fossil fuels, such as coal and oil, in power plants and vehicles. Nitrous oxide is also produced by fertilizers in agriculture.

Industries that Produce N2O

It is difficult to say what companies specifically produce nitrous oxide in Detroit, as the pollutant is produced by a variety of industries including:
- Power utilities
- Transportation and logistics firms
- Agricultural companies
- Chemical manufacturers.

Chemical Solutions

Solutions for PCB Contamination

Remedial Options Plant-mediated bioremediation. Anaerobic dehalogenation an:d aerobic degradation

Solutions for PAH Contamination

Remedial Options: solvent extraction, bioremediation, phytoremediation, chemical oxidation, photocatalytic degradation, electrokinetic remediation, thermal treatment and integrated remediation technologies

Solutions for Lead Contamination

There are a dozen solutions for lead contaminant remediation that vary by cost and effectiveness. The most common would be replacing the existing soil with new, clean, soil and plant native grasses. Fruity trees should be used rather than leafy trees with deep root systems. Fruity trees have a natural remedy for removing lead particles from the air and soil.

Fighting a Battle

Located 12.3 miles south sits the Marathon Petroleum Cooperation. This petroleum plant produces 430 tons of nitrous oxide, 83 tons of PM2.5, and 211 tons of sulfur dioxide yearly.

Phytoremediation

What is Phytoremediation?

Research into controlling pollution in urban environments. Yielded an approach known as phytoremediation. This approach takes advantage of the natural ability of certain plants to absorb, break down, and/or remove pollutants from the air, water, and soil. By carefully selecting and strategically planting a diversity of species, green spaces can be created that not only provide aesthetic and recreational benefits, but also actively clean the environment and improve the health of the surrounding community. Phytoremediation offers a sustainable and cost-effective solution to the problem of pollution, and has the potential to transform the built environment into a more resilient and livable place.

Using selected plants will lead to increased filtration of PM2.5 pollution from the air, and will greatly improve daily air quality. Using green roofs can help reduce sulfur dioxide and nitroius oxide levels in urban areas. Green infrastructure can also help mitigate the urban heat island effect, which can exacerbate PM2.5 pollution spread. It is important to choose the right plants for the climate and soil conditions in Detroit, and to properly maintain them to ensure their effectiveness in reducing sulfur dioxide levels. Using abandoned sites such as Packard plant offers a unique design to both help the environment around it passively. While also offering a new community and local destination in an already historic location.

Phytostabilization

One potential application of phytoremediation at Packard Plant is the use of phytostabilization. This approach uses plants to stabilize contaminants in the soil, preventing them from leaching into groundwater or being released into the air. This can be accomplished by growing plants that have a high affinity for the contaminants, or by adding amendments to the soil that bind the contaminants and prevent them from moving.

Phytovolatilization

Another potential application of phytoremediation at Packard Plant is the use of phytovolatilization. This approach uses plants to break down organic contaminants in the soil and convert them into gases that are released into the air. This can be accomplished by growing plants that have a high capacity for biodegradation, or by adding microorganisms to the soil that can break down the contaminants.

Green Roofs

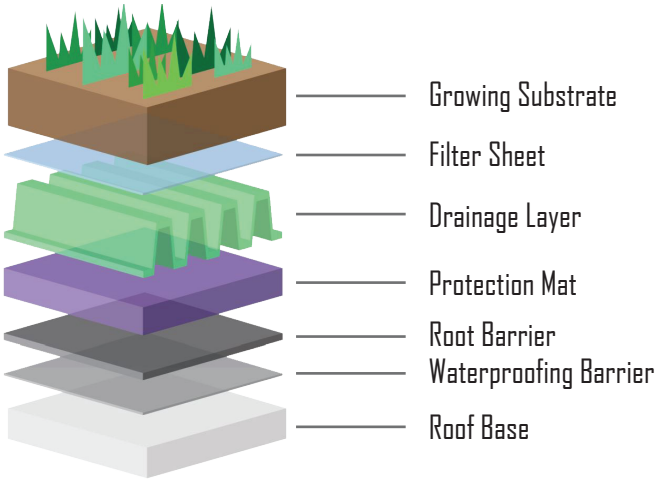
Green roofs, also known as living roofs or vegetated roofs, are a type of roofing system that incorporates vegetation and soil over a waterproof membrane. These roofs can provide a variety of benefits to the building and its surrounding environment.

Green roofs are often used to bring nature into the built environment and to create a more sustainable and resilient urban landscape. This thesis has identified a complex system that includes irrigation, drainage, and soil layers of varying depths to support a wider variety of plant life.

One of the primary benefits of green roofs is their ability to improve a building's energy efficiency. The vegetation and soil layers act as insulation, helping to regulate the temperature inside the building. This can reduce the need for heating and cooling, which can save energy and reduce greenhouse gas emissions. In addition, the vegetation on the roof can absorb and evaporate water, helping to cool the air and reduce the "heat island" effect in urban areas.

The vegetation and soil layers on a green roof can absorb and filter rainwater, reducing the amount of storm water that flows into sewer systems. This can help to prevent sewer overflows and reduce the risk of water pollution. In addition, green roofs can help to reduce the risk of flooding by providing additional storage for storm water.

Green roofs can also provide habitat for a variety of plants and animals, including birds, insects, and small mammals. In urban areas, where natural habitat is often limited, green roofs can provide important food and shelter for these species. This can help to increase biodiversity and support healthy ecosystems within the city. They can also provide social and economic benefits. Green roofs can create additional outdoor space for building occupants, providing a place to relax and enjoy nature. They can also increase the value of a building and improve its aesthetic appeal.



Memory Strategies

Disruption

Disruption memory strategy involves creating design elements that are intended to disrupt the viewer's typical perception of a space, in order to provoke a more memorable and lasting impression. This can be done through the use of unexpected materials, unconventional arrangements, or the incorporation of elements that challenge the viewer's expectations. By disrupting the viewer's memory of a space, this technique can create a sense of novelty and interest, as well as a deeper emotional connection to the design

Centralization

Centralization memory strategy involves creating a focal point or central element that anchors and organizes the design. This centralization can be done through the use of a prominent object or feature, such as a statue, sculpture, or through the arrangement of design elements to draw the viewer's attention to a particular area. By centralizing the design, this technique can create a sense of coherence and order, as well as a clear hierarchy of spaces.

Storytelling & Interpretation

One of the main ways that memory can be incorporated into landscape design is through the preservation of historical structures and artifacts. This can include buildings, machinery, and other physical elements that have played a role in the site's history. By preserving these elements and using them as a starting point for the design, spaces can be created that tell a story and help connect the community with the site's history.

Memory Theories

Landscapes as a site of Renewal

The landscape is viewed as a space of rejuvenation and renewal, where visitors can connect with nature and their inner selves. It seeks to create a harmonious and restorative environment by utilizing elements such as water, vegetation, and natural materials.

Landscapes as Reinterpretation

The landscape is viewed as a blank canvas that can be reinterpreted to reflect new stories, memories, and experiences. It involves the use of elements such as physical structures, visual and sensory cues, and community engagement to create a new narrative for the site.

Landscapes as a site of Contemplation

The landscape is viewed as a place of reflection, contemplation, and introspection. Where visitors can reflect on the past, present, and future. It seeks to create a serene and contemplative environment by implementing physical and sensory elements that encourage reflection and introspection.

Funding & Publication

One potential source of funding for this thesis would be government grants. Federal, state, and local agencies often provide funding for research and projects that align with their priorities and goals. The Environmental Protection Agency (EPA) offers grants for projects that aim to improve air quality and protect public health. The Michigan Department of Environmental Quality (MDEQ) provides funding for projects that promote environmental protection and conservation.

It may also be possible to secure funding from private foundations or organizations that support research and projects related to environmental protection and public health. Other potential funding sources could include philanthropic organizations. In order to secure funding from these or other sources, a compelling proposal that clearly outlines the goals and objectives of the project, as well as the methods and approaches that will be used will need to be created. The proposal should also include a detailed budget and a timeline for the project, as well as a plan for how the results of the research will be disseminated and used.

It will be important to effectively communicate the value and importance of the project to potential funding sources. This can be done through meetings and discussions with representatives from the funding organizations, as well as through presentations and other outreach efforts. It will be important to highlight the significance of the research, as well as the potential benefits to the community and the environment.

- Submit thesis to a peer-reviewed academic journal such as Journal of Landscape Architecture or Landscape and Urban Planning.

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- Present thesis at a relevant conference or symposium to discuss your research with experts and seek potential collaborations.

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- Publish thesis as a book or monograph through an academic publishing house like NDSU.
- Share it online through a personal website or institutional repository to increase its accessibility and impact.

Funding Interests

Government Funding

There are dozens of ways to get funding for projects. Many of them go unassigned and are then passed on. Grants.gov is the best way to find a federal grant. Playing host to grants for every directive.

- Revolving Loan Fund Grant
- Environmental Protection Agency
- Multipurpose Grants

Non-Profit Board Funding

The Greening of Detroit is a non profit organization that is focused on enhancing the quality of life for residents of Detroit. Coining the phrase “Growing Tomorrow’s Detroit!” This organization prides itself on providing sustainability, community, and progress for Detroit.
The Michigan Environmental Council (MEC) is a nonprofit organization that provides funding for projects that promote environmental justice and protect natural resources.

Local Business Funding

Packard Plant has a unique characteristic that involves all motor based companies throughout the years. Packard Plant produced dozens of products that were used in all car models when it was in operation. Involving each company or business in the design and sharing thoughts and ideas. This achieves two things, a large aspect of this thesis is community involvement and interaction. This funding option satisfies that. This will also give the project a clear direction and an identity to design towards.

City Funding

The city of Detroit has historically had a focus on community involvement and improvement. There is already a good relationship between them and the people that make Detroit home. Utilizing Packard plant, an already historic site for the city, funding through the city can be assessed and approved. Detroit grant funds are a critical revenue stream. The Office of Development and Grants supports the city by ensuring each department has the resources and tools needed to operate efficiently and effectively.

Project Retrospective

Reduce PM2.5 Pollution Rates

Utilizing the research from this thesis, a plant table was created and different combinations of strong phytoremediation enhancing vegetation was planted at Packard Park. Utilizing more than 10,000 plantings throughout the site will lead to drastically reduced PM2.5 pollution rates as well as a continuous supply for soil cleaning for the other chemicals found on site and throughout Detroit.

Develop flexible Memory Evoking Spaces

Developing an identity for the site early on I was able to take the concept of different combining environmental elements and built upon it. The product was a thriving green zone that can set an example for the rest of the city. Creating a multi level design, multiple spaces were created by way of existing buildings, spaces defined by vegetation, and designated locations throughout the park. These design interventions look to trigger people's emotions through related memories of what the site was. While creating new memories and connection points. Playing host to re created structures and entrances that were historically where the average worker arrived. The food truck plaza symbolizes the food that Packard Plant employees would receive often from a food cart.

Incorporate Existing Features

Choosing a site that had both deep cultural and historical connection with a community was the most important aspect. The post industrial typology encourages designers to recycle as much of the existing material as possible. Research was conducted into the safety and usability of the buildings. It was determined that heavy structural reinforcement was required for sections of the buildings deemed safe and usable. The multi level concept incorperated these buildings interiors and roofs into the landscape below.

What did I Learn?

As I reflect on this whole process I find it astonishing how much this thesis has changed since the beginning, I quickly realized that I was in a marathon.. not a sprint. Over the past year + I have learned a lot about my own work ethic, persistance, and procrastination. I've always been interested in the post industrial design typology because of how much of a challenge is can be to combine existing materials / structures (ect.) with new landscapes. I did not think that it would be my masters thesis, but I am happy that it was.

I was able to locate the abandonded Packard Plant early in the process and began developing the identity for the park in the background. As I continued site analysis, it was clear that PM2.5 pollution was a rising issue in Detroit. While also discovering other soil and air contaminants on or near Packard Plant that were concerning.

The research portion of my thesis was uncovered in the site analysis phase and I began the process of understanding the where, what, why, and solution for these chemicals and pollutants found at Packard Plant. The research for this thesis was a long and detailed process, and involved developing a Matrix to analyze case studies based on certain criteria.

My research discovered a cost effective and efficient solution for soil / air / water remediation, this was known as phytoremediation and became the backbone to my thesis. I have found a new appreciation and respect for plants, shrubs, and trees.

Finally, to conclude this reflection, I find myself surprised and proud. It seems like just yesterday that I was walking into 2nd year studio for my first class in landscape architecture. Over my time at NDSU I have developed skills in: hand drawing, concept work, autocad, sketchup, lumion, adobe applications, and board design. This process involved all my knowledge and skill up to this point and I am proud of my finished work.

Sources

https://landezine.com/uferpark-attisholz-sud-luterbach-by-mavo-landschaften/

https://landezine-award.com/uferpark-attisholz-sud-2/

https://www.archpaper.com/2008/09/concrete-plant-park/

https://www.nycgovparks.org/park-features/concrete-plant-park/planyc

https://courses.washington.edu/gehlstud/gehl-studio/wp-content/themes/gehl-studio/downloads/Winter2010/MFOpark.pdf

https://urbannext.net/mfo-park/

https://www.historylink.org/File/20978

https://www.tclf.org/landscapes/gas-works-park

https://www.arts.gov/grants/grants-for-arts-projects/design

https://www.grants.gov/

https://www.greeningofdetroit.com/

https://www.dcdc-udm.org/our-studio

https://detroitmi.gov/departments/office-chief-financial-officer/ocfo-divisions/office-development-and-grants/looking-grant

https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Reports/AQD/monitoring/2020-air-quality-annual-report.pdf?rev=b7594c12b795412b9e98253a461c38e6

https://www.iqair.com/us/usa/michigan/detroit

https://www.arabamericannews.com/2018/02/02/pollution-and-southwest-detroit/

Sources

https://pubmed.ncbi.nlm.nih.gov/36365300/

https://mitechnews.com/update/dte-energy-to-bring-additional-renewable-energy-to-more-customers-in-michigan/

https://www.frontiersin.org/articles/10.3389/fenvs.2018.00079/full

https://www.epa.gov/sites/production/files/2016-03/documents/phyto.pdf

https://pubs.acs.org/doi/10.1021/es201297e

https://www.routledge.com/Post-Industrial-Landscapes-Constructed-Reclaimed-and-Redeveloped/Moore/p/book/9780367144056

https://www.asla.org/ContentDetail.aspx?id=28795

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4540561/

https://www.routledge.com/Landscape-Architecture-and-Environmental-Sustainability-Creating-Positive/Zeunert/p/book/9780415818785

https://www.gsd.harvard.edu/2014/10/peter-latz-mining-the-industrial-landscape/

https://link.springer.com/article/10.1007/s13762-018-1941-6

https://www.nytimes.com/2018/03/28/t-magazine/design/post-industrial-landscapes-art.html