



HALIFAX REGIONAL MUNICIPALITY

Repurposing Burnside Composting Facility Assessment – Final

Solid Waste Strategy Review – T3



May 2024 – 23-6547

Table of Contents

1.0	Introduction	1
1.1	Purpose	1
1.2	Building, Site, and Reporting.....	1
1.3	Definitions.....	2
2.0	Review of Similar Facilities	4
2.1	Reuse Centres	4
2.1.1	Recommended Functions of the Reuse Centre	9
2.2	Living Labs.....	9
2.2.1	Recommended Functions of the Living Lab.....	16
3.0	High Level Function of the Site Design	17
3.1	Household Special Waste Depot	17
3.2	Reuse Centre.....	21
3.3	Living Lab	24
4.0	Conceptual Site Design	29
4.1	Flow of Traffic.....	29
4.1.1	Parking Lot	29
4.1.2	HSW Depot.....	29
4.1.3	Living Lab	30
4.1.4	Reuse Centre	30
4.2	Additional Site Considerations.....	30
5.0	Cost Estimates	31
5.1	Capital Cost Estimates	33
5.2	Annual Operating Budget Estimate.....	36
5.3	Net Present Value.....	38
6.0	Analysis	40

7.0 Optimization of Existing Property 42

7.1	Cart Storage	42
7.2	Equipment Storage.....	42
7.3	Excess Snow Management	42
7.4	Christmas Tree Mulching and Shredding.....	42
7.5	Infected Tree Storage	42
7.6	Recycling Material Drop-off	43

8.0 Conclusions/Recommendations 44

Tables

Table 1: General Definitions Used for the Purposes of this Report	2
Table 2: Reuse Centre Case Study 1	4
Table 3: Reuse Centre Case Study 2	5
Table 4: Reuse Centre Case Study 3	6
Table 5: Reuse Centre Case Study 4	7
Table 6: Reuse Centre Case Study 5	8
Table 7: Living Lab Case Study 1	10
Table 8: Living Lab Case Study 2	11
Table 9: Living Lab Case Study 3	12
Table 10: Living Lab Case Study 4	13
Table 11: Living Lab Case Study 5	14
Table 12: Living Lab Case Study 6	15
Table 13: Potential Activities of the Living Lab	27
Table 14: Reuse Centre Cost	33
Table 15: Living Lab Cost	35
Table 16: HSW Depot Cost Estimates.....	36
Table 17: Reuse Centre Annual Operating Budget	37
Table 18: Living Lab Annual Operating Budget	38
Table 19: NPV Results.....	39
Table 20: Recommendations for the Development of the Site	40

Figures

Figure 1: HSW Depot Layout.....	19
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Appendices

A	Conceptual Design Figures
B	List of Reuse Centres
C	List of Living Labs

1.0 Introduction

Dillon Consulting Limited (Dillon) was retained by Halifax Regional Municipality (HRM) in July 2023 to support a review of HRM's Solid Waste Strategy (Strategy). As part of the Strategy, Dillon completed an assessment to repurpose the Burnside Compositing Facility (Facility) and the associated Site (refer to Figure A-1 in Appendix A). This builds upon the findings of the Burnside Composting Facility Closure Plan Report, which recommends that the composting facility building be decommissioned and demolished.

1.1 Purpose

The purpose of this report is to assess opportunities for repurposing the Facility to establish the following:

- Reuse Centre that allows for the capturing of goods that may have otherwise been destined for landfill disposal;
- Living Lab to help foster innovation and develop and promote the circular economy; and
- Household Special Waste (HSW) Depot that could operate up to 35 to 40 hours per week up to five days a week.

As part of this review, the following tasks were completed:

- Review of similar facilities with Reuse Centres and Living Labs;
- Development of conceptual design drawings;
- Descriptions of the facility layout, setup and equipment;
- Description of operations;
- Class 5 cost estimates, which include annual capital, life cycle and operating costs over 25 years;
- Net-present value over 25 years; and
- Discussion regarding optimizing property use and identifying other potential uses.

The findings as a result of these reviews are presented in the proceeding sections of this document.

1.2 Building, Site, and Reporting

The site is located in the Burnside Industrial Park at 80 Gloria McCluskey Avenue, Dartmouth, Nova Scotia. The Facility and surrounding site were evaluated through past technical reports (2018 to 2023) as part of the Burnside Composting Facility Closure Plan Report. The findings of this work suggested the Facility be decommissioned and demolished due to the number of repairs or replacements needed to large elements of the structure. The decommissioning and demolition work would reinstate the site to allow for future development. The existing monitoring program will be maintained as required after decommissioning. Any future plans for the site will need to account for these monitoring requirements.

1.3

Definitions

To consider the development of a Reuse Centre, Living Lab, and/or a HSW Depot on the site, a common understanding of how these uses are defined and envisioned for this report are presented in Table 1.

Table 1: General Definitions Used for the Purposes of this Report

Activity	Definition, Vision & Additional Notes
Reuse Centre	Definition: A building where products that are in a usable, working condition can be disposed of and salvaged. It facilitates capturing, repairing and reselling materials rescued from curbside collection, landfill and donation by the public. Vision: The vision for a Reuse Centre could involve a not-for-profit partner and consider diversity and inclusion in the operations. The space will promote a repair culture, a lending library and possibly space for sales of upcycled items. Notes: Reuse Centres are typically defined by the region that implements them. The materials contained can range from small, crafting-related items to construction and demolition (C&D) materials. Typically, the materials shared are those extracted from regular municipal waste. The definition presented in this report encompasses all these nuances. Sources: https://www.lawinsider.com/dictionary/reuse-centre
Living Lab	Definition: Open innovation ecosystems in real-life environments using iterative feedback processes throughout a lifecycle approach of innovation to create sustainable impact. Living Labs focus on co-creation, rapid prototyping and testing and scaling-up innovations and businesses, providing different types of joint value to the involved stakeholders. Vision: The focus for a Living Lab on the site would be to bring people together from different backgrounds to allow innovation and testing of new ideas in real-world settings. The aim of this space would be to promote collaboration between entrepreneurs, not-for-profits, government, industry, academia and citizens for the purpose of reimagining and remaking potential waste items. The building would include flexible working space such as meeting rooms, collaboration areas, workshops and studios, as well as storage and other use-appropriate zones such as a commercial kitchen and gardens. Notes: There is a diversity of Living Lab types and some misalignment in the understanding of their purpose. For example, some Living Labs occupy a physical space, while others are virtual in nature. The vision described by HRM in the Request for Proposal aligns with the definition given by the European Network of Living Labs. Sources: https://enoll.org/about-us/what-are-living-labs/

Activity	Definition, Vision & Additional Notes
Household Special Waste Depot	Definition: Accepts chemical waste generated from households. Business waste is not accepted at a HSW facility. Vision: This facility could operate up to 5 days per week and assist in the diversion of waste from households. Notes: HRM currently operates one HSW depot, located at 20 Horseshoe Lake Drive, Bayer's Lake Business Park, Halifax. Sources: https://www.halifax.ca/home-property/garbage-recycling-green-cart/household-special-waste

There is an overlap between the definitions and functions of a Reuse Centre and a Living Lab. This is particularly evident when considering the desire for a circular approach to the development on site. A Reuse Centre promotes some level of diversion by redirecting products away from landfill. A Living Lab, as part of a circular approach, also facilitates waste diversion. A Living Lab goes further than a Reuse Centre by bringing together more collaborators, such as academics, businesses and citizens, and asks them to innovate together. These concepts can certainly be complementary, or elements of each can be incorporated during conception and design of an approach for repurposing of the site.

The size of the site and aligned goals of each of the facilities allows for a site development option that includes all three facilities. The proceeding sections outline the site layout including a Reuse Centre, Living Lab and HSW Depot.

2.0 Review of Similar Facilities

To inform decisions regarding repurposing of the site, Dillon reviewed Reuse Centres and Living Labs from different parts of the world to understand how they are being used and to draw lessons and examples that may be applicable to HRM's site. Reuse Centres have less diversity in apparent definition and understanding of functionality, while Living Labs show a much wider diversity in both areas. There are developments that have functions of both a Living Lab and a Reuse Centre and do not necessarily define themselves as one or the other. The following sections present several examples of each.

2.1 Reuse Centres

The examples presented in Table 2 to Table 6 are based on those that were deemed either innovative or interesting, could be useful to learn from and emulate and/or were geographically proximate to HRM. The conceptual layout of the Reuse Centre can be found in Figure A-2 in Appendix A. Additional research, not included in this report, on Reuse Centres in Canada can be found in Appendix B.

Table 2: Reuse Centre Case Study 1

Reuse Store and Product Reuse Shed¹

Location	Hamilton, Ontario
Established	2007
Description	The Reuse Store is located at one of Hamilton's three Community Recycling Centres (Hamilton Mountain Community Recycling Centre). Residents can drop off unwanted household items free of charge to the Reuse Store, also referred to by its operator as Drop 'N' Shop. The Reuse Store then sells these items back to the community. There is a Product Reuse Shed located at each of the three Community Recycling Centres. The Product Reuse Shed is similar to a lending library where defined materials left by other residents such as leftover paint, wood stain, fertilizer and household cleaners can be taken for free by community members. The Reuse Store is well used by residents and can experience high volumes of material cycling through. Benefits of being located on a site with multiple waste programs with high traffic is that the Reuse Store will likely receive higher quality materials; an independent Reuse Store with low traffic may experience lower quality materials. This may cause higher disposal rates of materials that are unable to be sold. The site is only accessible by car, which may create challenges for residents who do not have access to a vehicle.

¹ <https://www.hamilton.ca/home-neighbourhood/garbage-recycling/waste-recycling-facilities/community-recycling-centres>

Reuse Store and Product Reuse Shed¹

Facility set up	Each of Hamilton's three Community Recycling Centres has various depots such as a Product Reuse Shed, Hazardous Waste Depot and Garbage Dropoff Area. Only the Hamilton Mountain Community Recycling Centre has a Reuse Store. The Reuse Store is set up similarly to a typical thrift store, with shelving and racks to display items.
Operations	The Reuse Store is currently operated by Community Living Hamilton, a non-profit organization which supports community members with developmental disabilities. Hours of operation are: • Store front: Mondays to Saturdays open from 9:00 am to 5:00 pm; and • Drop off: Monday to Saturday 8:00 am to 6:00 pm.
Equipment in use	As the Community Recycling Centres serve multiple purposes for waste drop off and management in addition to reuse activities, there is a lot of equipment onsite. However, not all of it is necessary for activities related to reuse. Equipment onsite includes, but is not limited to: • Loader(s); • Bins/totes for accepting materials; • Scale; • Roll-off bins; • Product Reuse Shed (eight by eleven-foot water-resistant shed with shelving inside); • Transport trailers; and • Collection trucks.
Processes	The Reuse Centre accepts donations. Staff and/or volunteers at the Reuse Centre must approve of the donated reusable items to replenish the store. The Reuse Centre prices items based on their estimated value.
Impact	The Reuse Store is well-used by the community, with more than 50 community reviews through Google, Facebook and Yellow Pages, as well as several resident-created YouTube videos totalling more than 1,000 views. The Facebook page for the Reuse Store has more than 850 likes. Community Living Hamilton benefits from sales at the Reuse Store, which positively impacts the community. All money generated from sales at the Reuse Store are reinvested in Community Living Hamilton programs and services, which support 1,400 people with developmental disabilities in the community.

Table 3: Reuse Centre Case Study 2

Valley Waste Last ReSort Reuse Centre²

Location	Kentville, Nova Scotia
Established	2012
Description	The Reuse Centre supports diversion from the landfill by selling items to the community. Reusable items such as furniture, tools, toys, wood, vintage items and housewares are rotated in the store on a weekly basis.
Facility set up	Storefront with shelves, bins and signs for materials.

² <https://www.vworm.com/services/the-last-resort-reuse-centre/>

Valley Waste Last ReSort Reuse Centre²

Operations	The store is open on Saturday mornings (9:00 am to 12:00 pm). Sales from the store support a paid position and the overhead necessary to run the operation. Staff run a Facebook page to promote the store and advertise the items available to drive interest and bring people to the site. Staff have also run contests in the community, getting residents to share photos of items they have upcycled. Residents vote on their favourites and the winners receive gift cards to the store. This also helps to drive community interest and market the Reuse Centre.
Equipment in use	Minimal equipment required, other than to sort, store and display materials, such as shelving and bins.
Processes	The Reuse Centre does not accept donations. Staff and/or volunteers at the Reuse Centre pick up reusable items from the landfill once per week to replenish the store. The Centre prices items based on their estimated value.
Impact	The Centre is popular in the community, with more than 1,400 likes on Facebook and good engagement on their posts through likes, comments and shares. Annually, the Reuse Centre diverts between 70 to 80 tonnes of waste from the landfill.

Table 4: Reuse Centre Case Study 3**Reuse Centre³**

Location	Edmonton, Alberta
Established	2007
Description	The Reuse Centre offers individuals and organizations reusable items free of charge. The Reuse Centre hosts workshops, repair cafes, swap events and is available for rent to the community for waste reduction and reuse events. The focus of the Reuse Centre is recovery of arts and craft supplies, office supplies, sports equipment, packaging materials and home décor. The Centre also hosts workshops and events including repair cafes and swaps and offers their workshop for rental free of charge to the community for waste reduction and reuse events.
Facility set up	Large space with shelves, bins and signs for materials.
Operations	Open Tuesday to Saturdays, hours vary.
Equipment in use	Minimal equipment required, other than to sort, store and display materials, such as shelving and bins, as well as a weigh scale.
Processes	Residents drop off materials at the Reuse Centre or at any Eco Station in the City (Eco Stations are hubs for other types of waste drop off as well, including hazardous waste, batteries, and electronics). Materials are then sorted and accepted materials will go into the designated area at the Reuse Centre. The Reuse Centre has a specific list of acceptable materials, with a focus on arts and craft supplies, party supplies, home décor and sporting goods. The Centre does not accept furniture, clothing, construction materials or toys.

³ https://www.edmonton.ca/programs_services/garbage_waste/reuse-centre

Reuse Centre³

Impact	The Centre has high engagement from the public; it has more than 150 reviews on Google (many 5 star), almost 6,000 likes on Facebook and almost 3,000 followers on Instagram. The Reuse Centre diverts material from the landfill and serves as a circular economy hub for education, including upcycling workshops for the community and school group tours. It serves many individuals in the community with low-income as the items are provided free of charge.
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Table 5: Reuse Centre Case Study 4

HodgePodge Lodge⁴

Location	Strathcona County, Alberta
Established	2018
Description	The HodgePodge Lodge is a Reuse Centre located at the Enviroservice Station which is a one-stop eco-friendly shop accepting various materials. The Centre had a new building constructed for its reopening in 2023 after the pandemic, and the new building made use of donated and repurposed materials. The Centre collects a variety of items to be reused or repurposed which are not typically easily recycled or reused, including household goods, home décor, craft materials, holiday supplies, garden items, games, lighting and more.
Facility set up	Originally a small shack-like building, a new building was erected for the Centre for reopening in 2023. The new building is an approximately 1,500 square foot heated building with shelves, bins and signs for materials. There is also an outdoor area to collect outdoor items that can be reused.
Operations	Materials accepted at the Centre are outlined on the website along with items not accepted. Residents drop off items directly to the Centre. The Centre is primarily run by 12 volunteers. Staff or volunteers may turn away donated materials dependent on the capacity of the Centre or the quality of the items. Its hours of operation are Wednesday to Sunday from 10:00 am to 6:00 pm. Volunteers sort and organize donated materials, assist customers and complete other daily tasks to keep the Centre running.
Equipment in use	Minimal equipment required, other than to sort, store and display materials such as shelving and bins.
Processes	Residents drop off acceptable materials which are then put onto shelves. Residents are asked to weigh their items for donation, and then weigh items that they take with them from the Reuse Centre in order to track the diversion.
Impact	The Centre has high engagement within the community. Its Facebook group has more than 3,000 members. Community members were thankful to have the Centre reopen in 2023 after it had to be closed during the pandemic. The Centre is popular with seniors, newcomers to Canada and young people moving out on their own. As of September 2023, approximately 280,000 lbs of materials have been recovered through the Centre.

⁴ <https://www.strathcona.ca/your-property-utilities/garbage-and-recycling/broadview-enviroservice-station/hodgepodge-lodge/>

Table 6: Reuse Centre Case Study 5**Baddeck ReUse Centre ⁵**

Location	Baddeck Transfer Station
Established	2018
Description	The Baddeck ReUse Centre operates seasonally (May to October) on Saturdays and takes in public donations of items in working or near working condition for redistribution. The goal of the Centre is to divert waste away from landfill, while supporting local not-for-profit organizations, as it is operated on a rotating basis by not-for-profit organizations who keep the proceeds from the sale of items. The guidelines for items that can be donated include items that are: • Gently used; • Not beyond repair; • Clean; • In good working condition; • Still usable; and • Going to sell and have lots of life left in them.
Facility set up	The facility is a simple, garage-like structure that has items for reuse displayed throughout.
Operations	Most of the items sold at the Centre are collected through donations, while a small proportion are materials diverted from the transfer station. Donations are organized and sold during seasonal operations. The Reuse Centre is operated by charities or not-for-profit organizations for a period of three consecutive Saturdays to raise money from the sale of donated items. The facility is only open on Saturdays. The Centre operates on a pay-what-you-can system. Items that cannot be sold are directed to landfill or recycling, as appropriate. Materials appear to be limited to light C&D items as the Centre does not have the infrastructure in place to handle large or complex items.
Equipment in use	There is minimal equipment in use. The facility appears to be run mainly through the manual effort of the volunteers and staff from local not-for-profits who apply to operate it.
Processes	Not-for-profit organizations submit applications to the County to operate the Centre and are selected by random draw. The not-for-profit organization provides their own volunteers for the operations and set their own prices for the goods to be sold. Volunteers manually sort materials and display them for sale. Items that cannot be sold are transferred to landfill or recycling as appropriate.
Impact	The Reuse Centre has a positive impact on the community, raising money for local not-for-profit organizations, while providing reusable materials back to the community at a price that is accessible to them (pay-what-you-can). There appears to be enough demand by not-for-profit organizations to run the Centre, as applications are closed for the year and the selected organizations must be chosen by random draw.

⁵ <https://victoriacounty.com/residents/waste-management-services/reuse-centres/>

2.1.1 Recommended Functions of the Reuse Centre

It is recommended that HRM set up a Reuse Centre with similar functions as the Reuse Store and Repair Shed in Hamilton based on HRM's similarities with Hamilton's site. A wide range of materials (size and type) should be considered for acceptance, as the site is further away from the city centre and therefore most residents will be visiting by vehicle. The Reuse Centre may consider promoting itself as a hub for larger materials, specifically C&D materials and could include having a lending library on site that focuses on tools and equipment to support renovation projects. As well as accepting construction and renovation materials, the Reuse Centre could accept commonly donated items such as furniture, clothing, kitchenware and appliances, toys and books. Due to the location these items may be less favourable for resale when other charitable organizations selling similar items are closer to the city and more convenient for residents.

2.2 Living Labs

Examples of existing Living Labs are outlined in **Table 7** to **Table 12** as case studies. Several examples of Living Labs in Nova Scotia are presented as an opportunity to review operating models in the region, avoid duplication and maximize potential synergies in these existing efforts. Living Labs are more effective when they align with existing community efforts and expertise. The two notable local Living Lab examples presented include the Nova Scotia Federation of Agriculture (NSFA) Living Lab and the PIER, Centre for Port Innovation, Planning and Strategy in Halifax. Both examples are working to bring a diverse number of stakeholders together to innovate. The NSFA Living Lab focuses on agricultural climate solutions by bringing together innovative technologies, farmers and researchers. Conversely, the PIER is a Living Lab for the maritime transportation sector, bringing together organizations to aid in port innovation, sustainability, planning and strategy.

Other Living Lab case studies are presented from Canada and Europe to offer examples of Labs either facilitated by municipalities or focused on circularity, waste or sustainability. The Center for Intersectoral Studies and Research on the Circular Economy (CERIEC) is a notable example of a Living Lab focused on advancing the circular economy in Québec. Additionally, a food waste Living Lab at the University of Leeds in the United Kingdom is presented, along with the City of Calgary's municipal Living Lab program. More examples of Living Labs are presented in **Appendix C**. A conceptual layout for a Living Lab can be found in **Figure A-3** in **Appendix A**.

Table 7: Living Lab Case Study 1**Nova Scotia Federation of Agriculture⁶**

Location	7 Atlantic Central Drive, East Mountain, Nova Scotia, B6L 2Z2
Established	2023
Description	The Agricultural Climate Solutions (ACS) is a Living Lab, funded by Agriculture and Agri-Food Canada, with the Nova Scotia Federation of Agriculture (NSFA) to establish a Nova Scotia based Living Lab. The NSFA Living Labs focus on key activities and identifying innovations that can be adopted by farmers to tackle climate change. Activities look at management practices including cover crops, the establishment of riparian zones and shelterbelts and a land swapping initiative to incorporate livestock grazing into annual cropping systems. Each activity focuses on different techniques to increase soil carbon sequestration and reduce greenhouse gas emissions.
Facility set up	There is no single facility for this Living lab, rather this lab involves on-farm testing and research across many geographic parcels of provincial land and works to bring together key industry participants to share knowledge and encourage collaboration and communication of findings and information. Initiation of this Living Lab is still underway; however, there appears to be an emphasis on virtual connections and meeting spaces to discuss data gathered from agricultural test sites.
Operations	The host group, NSFA, acts as a facilitator to connect key stakeholders such as farmers, researchers and industry participants, and encourages development of techniques, strategies and innovations that meet the objectives of the overall program: sequestering carbon, reducing greenhouse gas emissions and providing other environmental benefits.
Equipment in use	Usual farming equipment on test sites, information technology infrastructure to facilitate virtual connections.
Processes	Facilitation of the connections between key stakeholders to encourage collaboration, idea transfer and information sharing.
Impact	This Living Lab is very new (established in 2023); therefore, it is too early to comment extensively on the impact. However, it is based upon the Living Lab Initiative, an agricultural Living Lab model launched in Canada in 2019, which has received international acclaim and inspired similar projects and approaches across the world.

⁶ <https://nsfa-fane.ca/livinglabs/>

Table 8: Living Lab Case Study 2**PIER, Centre for Port Innovation, Planning and Strategy ⁷**

Location	1209 Marginal Road, Halifax, Nova Scotia, B3H 4P8
Established	2021
Description	The PIER enables collaboration among global partners in marine transportation, supply chain and logistics. These collaborations focus on three key areas: supply chain and logistics, supporting an interconnected Port City and maritime policy development with sustainability as a core function and outcome in each. This lab allows stakeholders to work closely across fields and disciplines to connect partners, entrepreneurs, researchers, academia and regulatory partners to solve “wicked” industry problems (such as decarbonization and standardized data) and uncover new commercial opportunities. It is Canada's first Living Lab for the transportation sector.
Facility set up	This Living Lab operates out of a physical location while also encouraging virtual connections with a vast array of stakeholders.
Operations	PIER offers physical space to member organizations working to advance the key areas of focus for the Lab. Additionally, staff offer events, workforce development, research, innovation challenges, networking and virtual hub connection to its members. PIER has also been working to develop an international network of innovation hubs in ports, alongside the Port of Hamburg, Germany (homePORT) and the Port of Valencia (Opentop) to facilitate innovation and best practices.
Equipment in use	A physical office space that provides meeting and collaboration spaces as well as the virtual hosting capabilities to facilitate connections between parties. It provides the option of dedicated workspaces for members that is within the physical office space, to provide access to key equipment as well as to other members and visitors.
Processes	This Living Lab operates through a membership model, where organizations purchase a level of membership based on their desired level of interaction with the lab.
Impact	The PIER has a large membership base which includes representation from industry (from start-ups to established companies), government, associations, non-profits and academia. The lab has advanced notable initiatives in several areas of focus including workforce development, innovation and sustainability. PIER has ongoing research in partnership with Dalhousie University to evaluate greenhouse gas emissions in the marine sector, an open challenge to post-secondary students to support linking Point Pleasant Park to the Port and is working with other ports internationally to develop a maritime innovation network platform.

⁷ <https://www.thepierhfx.com/>

Table 9: Living Lab Case Study 3**CERIEC – Center for Intersectoral Studies and Research on the Circular Economy⁸**

Location	1100, Notre Dame Street West, Room A-0916, Montreal, Québec
Established	2020
Description	CERIEC is located at École de Technologie Supérieure (ÉTS) at the Université du Québec. The aim of the Lab is to advance the circular economy in Québec by providing an important space for researchers and students to test innovations to facilitate the transition to a sustainable future. CERIEC serves as a hub and catalyst for circular economy initiatives in the province, with a specific focus on research and innovation, education and training, outreach and communication, and valorization and transfer. In July 2021, with the support of the Fonds de recherche du Québec, the Québec Circular Economy Research Network (RRECQ) was established, coordinated by CERIEC to build capacity to deploy circular economy strategies at the scale of industrial sectors and territories, supported by government policies, to facilitate a sustainable transition for society.
Facility set up	Based out of Université du Québec, CERIEC operates primarily as a virtual Living Lab. The initiative is linked with other universities in the province as well, and therefore has access to various research facilities through these arrangements.
Operations	CERIEC has staff members that are housed at Université du Québec and are supported by both a Scientific Committee consisting of professors in various relevant departments at the University and a Steering Committee made up of professionals from government (provincial and municipal), academia and industry. The organization offers education, training and communication on the topic of circular economy, and supports virtual Living Labs in priority sectors, beginning with the construction sector. The virtual Labs facilitate communication between actors involved in the sector, support co-creation of solutions and technologies, encourage experimentation and supporting training and knowledge transfer.
Equipment in use	The Living Lab uses resources at the university, as well as virtual tools for collaboration and knowledge sharing.
Processes	CERIEC has several distinct processes for supporting advancement of a circular economy. The Lab has developed education and training programs, including open courses designed for the public and summer schools, to advance circular economy in the region. They also facilitate research, innovation and pilot implementation through their coordination of the Québec Circular Economy Research Network.
Impact	The Lab has engaged a significant number of stakeholders and expert participants from a range of sectors in the province. They have secured support from multiple government agencies, universities and the private sector. Their education programs (summer school and open course on circular economy) have been held several times and they have an established virtual lab for the construction sector. Montréal Circulaire recently launched, which is a project of this network, with many upcoming events and initiatives across disciplines to build awareness of the circular economy and support entrepreneurs.

⁸ <https://www.etsmtl.ca/en/research/chairs-and-labs/ceriec>

Table 10: Living Lab Case Study 4**University of Leeds – Leeds Living Lab for Food Waste⁹**

Location	Leeds, England
Established	2014
Description	The University of Leeds uses the Living Lab model to bring their students together with staff and city partners to test sustainable solutions, enhance their curriculum and tackle global challenges, using the university as a test bed. Among other types of Living Labs, they host the Living Lab for Food Waste, which brings together staff and students to explore, research and trial innovative solutions to food waste, packaging waste and behaviour change.
Facility set up	The Living Lab uses existing University resources and does not have a dedicated facility. Engagement with various facilities at the University is dependent on the innovation or technological solution being tested.
Operations	The Living Lab is facilitated through the Sustainability Service at the University of Leeds, with a mandate to advance sustainability on campus. The Office has staff tasked with developing and implementing sustainability goals and hires students on a part-time basis to advance the initiatives across the campus. The Living Labs are an initiative of the Sustainability Service, where students are encouraged to pitch their Living Lab ideas, which the Sustainability Service can provide facilitation, guidance and funding to support. The Living Lab facilitates virtual connections and enables them with existing spaces available on the University campus to allow for testing ideas and general knowledge transfer.
Equipment in use	The equipment used is dependent on the innovation being trialed. Some examples include: • ‘Hot Bin’ composting bins are being used in a trial to use biochar in composting; • Hydrogen injections into anaerobic digestors are being modeled to predict methane production from food waste; and • An app was developed to allow cafes to sell leftover meals at a reduced price before they go to waste at the end of the day.
Processes	Interested parties on campus can reach out to the Lab and connections are facilitated to other stakeholders or to resources needed to test innovations.
Impact	The Living Lab has had several successful projects including introducing an app to university cafes which reduced food waste and saved money, the trialling of behaviour change strategies leading to 13% reduction in food waste in the university canteens and efforts to reduce single use plastic food packaging in food service across campus.

⁹ <https://sustainability.leeds.ac.uk/news/food-waste-living-lab/>

Table 11: Living Lab Case Study 5

City of Calgary¹⁰	
Location	Calgary, Alberta
Established	2018
Description	The City of Calgary aims to support innovation through the offering of City infrastructure and assets for companies, researchers and individuals to test their products and try out their ideas in a real-life environment. The goal of the program is to enable innovators to test and validate their designed product or service before it is released to the public to confirm it will be feasible and provide utility for global users' daily lives.
Facility set up	There is no dedicated facility space for the Living Lab, rather the City offers its existing infrastructure and assets to be used for proposed Living Lab concepts. The use of facilities or assets depends on the application being tested.
Operations	The City has an established framework for facilitating the Living Lab and allows interested parties to apply to the program through an online intake system. Successful applicants will work with City to further define the project. The program is not funded by the City, and the project initiators are responsible for all costs outside of the use of City assets.
Equipment in use	In the Living Lab intake phase, the need for equipment is established, and coordinated between City staff and the successful project initiator if the project is successful. The Living Lab offers the City's existing physical, digital and data assets where possible.
Processes	Innovators apply through a Living Lab Intake Form which is then assessed to see if the City has suitable and available assets for the project. Successful applicants then work with the City's subject matter experts to define requirements, research needs, establish roles and responsibilities, and plan the pilot(s).
Impact	The program has supported the advancement of several technologies or products: • Autonomous vehicle testing – Electronic Autonomous vehicle shuttle testing between two Calgary tourist destinations; • LiDAR testing – Lux Modus tested their advanced mobile light detection and ranging technology (LiDAR) with data from C-Train traffic; and • High accuracy indoor positioning system – Takemetuit developed a prototype system to help detect people and materials within retail, warehouses and unmanned systems.

¹⁰ <https://www.calgary.ca/major-projects/smart-city/living-labs.html>

Table 12: Living Lab Case Study 6**COIL, Circular Opportunity Innovation Launchpad ¹¹**

Location	Guelph, Ontario
Established	2021
Description	COIL is an initiative of the City of Guelph and County of Wellington's Smart Cities Office to launch programs, test beds and platforms designed to mobilize organizations towards circularity. COIL was co-developed and managed by the City of Guelph/County of Wellington, 10C Social Enterprise and Boundless Accelerator (formerly Innovation Guelph), with funding from the Federal Economic Development Agency for Southern Ontario (Fed Dev). In addition, private funding was secured from Desjardins, Scotiabank and the Cooperators to fund projects within COIL to advance circularity and climate action in several sectors. This initial round of funding from Fed Dev provided resourcing from 2021 to the closure of the Smart Cities Office at the end of 2023. Funding is currently being sought to continue COIL with new delivery partners.
Facility set up	This Living Lab is virtual, providing networking, funding, a data hub, collaborations, challenges and connections to other partners with physical space needs for resourcing. Through delivery partners and a large network, the program supported organizations in accessing resources by extension where possible (i.e., commercial kitchen, meeting rooms, business incubation programs and coaching, etc.).
Operations	Several full-time staff delivered programming (challenges, funding, networking opportunities, developed a data hub, resource exchange platform (virtual)), with support from delivery partners and in-kind support from various other sources (academia, local business community, etc.).
Equipment in use	A physical office space was provided for several staff members operating the programs, as part of the overall Smart Cities Initiative. Through delivery partners, opportunities to access their resources (commercial kitchen, meeting space) were facilitated through the network.
Processes	The main mechanism of delivery was through funding or resourcing challenges with different requirements. Some examples include: • Circulate CoLab Challenge: Required teams of two to five organizations to pitch an idea to reduce waste and emissions; • Activate Accelerator: Businesses were eligible if they had a circular project they wanted to initiate and needed funding; and • REPurpose Incubator: To support food and beverage companies to reduce waste and find alternative uses for by products. Other tools were also provided including access to circular economy courses, business mentorship, access to networks and data platforms, and additional loan financing.

¹¹ <https://coil.eco/>

COIL, Circular Opportunity Innovation Launchpad ¹¹

Impact	This Living Lab is considered a success for several reasons. It supported more than 160 organizations with circular funding, mentorship, resources, and networks, supporting more than 130 jobs and developing more than 80 new services, products or intellectual property. It drew attention from the private sector, receiving more than \$1 million in private funding to support circular initiatives. It received national and international attention, and there are currently efforts underway to obtain additional funding to continue and grow the initiative. Additional details of the impact and program successes can be found at https://coil.eco/stories/ .
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2.2.1

Recommended Functions of the Living Lab

The vision for the Living Lab as stated by HRM is to bring people together from different backgrounds to allow for innovation and testing of new ideas in real-world settings. Additionally, the Living Lab should promote collaboration between entrepreneurs, not-for-profits, government, industry, academia and citizens for the purpose of reimagining and remaking potential waste items. When reflecting on this vision statement, the ideal location for such a Living Lab would be close or accessible to the municipal centre to allow for residents without access to vehicles to easily access the space. Consideration for public transit to the site should be given.

It was noted in earlier discussions and work completed with HRM that food waste is a high priority to address. It is recommended to focus the Living Lab at the Burnside location on addressing food security issues and the reduction of food waste. The Burnside location is not near educational facilities or food banks which often partner well with Living Labs; however, consideration can be given for making it accessible to these organizations through public transportation or other means. It is recommended that in the development of a Living Lab which focuses on food waste, HRM consider the development and facilitation of programs and workshops on site for residents to provide skill building and enhancement and community connection around food. Given the multi-purpose nature of the space, the Living Lab can still offer significant value to advance circularity in other sectors in addition to food.

3.0 High Level Function of the Site Design

This section outlines how the site will function, specifically detailing the operations for each of three areas: HSW Depot, Reuse Centre and the Living Lab.

3.1 Household Special Waste Depot

HRM currently owns and operates a permanent HSW Depot located adjacent to the Materials Recovery Facility in the Bayers Lake Business Park. The HSW Depot accepts a full range of materials from residents only. The depot is scheduled to be open 44 weeks per year but due to weather and unforeseen circumstances typically operates 42 weeks per year on Saturdays throughout the year from 9 am to 4 pm. Collections at this site is complemented by the provision of a comprehensive mobile community event collections program. These events typically take place between April and October at seventeen sites per year throughout the region.

It is understood that the types and quantities of HSW generated by residents will change over the planning period of this study with shifts in consumer purchasing habits and demographics. The full impact of these changes on HRM's HSW program cannot be reliably predicted. Therefore, the demand requirements for the program are based on the current collected quantities and traffic counts adjusted for population growth. It is also possible that the province may expand the current product stewardship programs for paint and used motor oil to include full extended producer responsibility (EPR) for HSW. Such legislative action could affect demand for HRM's HSW services.

The popularity of HRM's HSW program has continued to grow over time. Collected quantities have been inconsistent over the past five years, ranging from 512 tonnes to 904 tonnes per annum. This variance is largely due to impact of the Covid-19 pandemic which forced temporary closure of the HSW program. The following assumptions have been made for the HSW program:

- Population growth to 734,275 by 2051 which represents the moderate growth scenario as detailed in *Solid Waste Strategy Review: P2-Benchmarking* report;
- Proportionate increase in waste generation with population growth;
- No significant change in material mix or consumer behaviour; and
- No change in related legislation.

As noted, HRM's population is assumed to grow to 734,275 residents by 2051 utilizing the median growth scenario. In 2022, the HSW program collected 706 tonnes of HSW from a total of 15,129 vehicles. Of the vehicles involved, a total of 8,990 dropped off HSW at the depot and the balance attended one of HRM's mobile events. Assuming the proportion of residents using the depot to one of the mobile events remains unchanged, the number of cars using the depot is projected to increase to 13,736 by 2051. Assuming that the depot is open 7 hours per day and 42 weeks per year, an average of

47 vehicles per hour would arrive. As this traffic count is an average, traffic would be expected to double during peak times of the day. The quantity of HSW is also projected to increase to 1,079 tonnes during the same timeframe assuming no significant change in program participation or generation rates.

Assuming an optimal traffic volume of 200 vehicles per day and continued 42 weeks of operations per year, the Bayers Lake depot can comfortably manage 8,400 vehicles per year. Extending the operations to two days per week over 42 weeks of operations per year would allow the facility to manage 16,800 vehicles per year and exceed the projected requirements of residents through to 2051, though the distribution of vehicles would not necessarily be even across both days of operation. Participation levels have been inconsistent in recent years. Consequently, determining the exact timing of when HRM would need to increase their hours of operation, such as increasing to two days per week, is challenging. Based on feedback from the current program operator, it is reasonable to expect that the depot hours of operations may need to be increased within the next three years to meet projected demand from residents.

Extending the hours of operations to a 35 to 40 hour, Monday to Friday operation would allow the facility to manage 45,500 to 52,000 vehicles per year, which would significantly exceed projected demand. The current average daily car count would be reduced to about 43 cars per day (assuming 5 days/week, 42 weeks/per year) leaving the depot potentially underutilized and potentially increasing operating costs unnecessarily. This approach would help to reduce overall peak traffic onsite but is not recommended given the possible cost implications.

HSW program usage is not constant throughout the year. Experience with year-round operations shows it tends to peak when residents are cleaning out their homes in the spring and fall and drops significantly in the winter months. Similarly, traffic at depots tends to ebb and flow throughout the week and day very much like retail operations. Due to this, it is recommended that HRM consider a two day per week operation. Consideration should be given to remaining open for eight hours on Saturdays and a second day during the week from 10am to 4pm or 12pm to 6pm. This approach is intended to balance customer convenience (i.e., accessible hours and acceptable service wait times) with operational cost and avoidance of traffic line ups on site. Additional combinations are also possible, such as opening Saturday combined with two weekdays for four hours each day.

Convenience is an important factor for residents in properly disposing of HSW. HRM currently only has one permanent HSW depot at Bayers Lake. The repurposing of the Burnside facility offers an opportunity to provide another permanent HSW depot. High rates of housing development and population growth are expected in the area of the Burnside facility, so this offers a valuable opportunity to HRM to provide another HSW depot to meet these future needs. Consideration could also be given to operating depots at both sites two days per week to better service the needs of the community. The requirement for mobile depot events would also be reduced with an expansion of the Bayers Lake Depot operational hours and the establishment of a Dartmouth Depot.

Regional governments tend to construct purpose-built depots to meet their long-term needs and building standards. While more costly, this approach allows municipalities to customize operations and provides a better working environment for staff. Based on the quantities projected to be generated over the planning period of this report, a minimum floor space of 500 m² is recommended to accommodate safe sorting and material storage. Appendix A, Figure A-4 provides a model schematic of such a facility.

The recommended facility would include the following key features:

- Processing space to accommodate daily needs;
- Storage for packaged and separated materials;
- Storage for sorting supplies;
- A conveyor system to accommodate peak hourly needs;
- Bulking stations for large quantity flammable and inflammable liquids;
- Spill containment;
- Personal safety and first aid systems;
- Lighting and fire suppression systems to code; and
- Security system.

Residents would be received under the canopy to protect them from the elements. This space would also be used to deliver materials collected from special events. Sorting and packaging would occur within the space behind the receiving area shown in Figure 1. A separate area is provided to allow for bulking of materials such as motor oils. Storage area is provided to accommodate supplies and provide for interim storage of received materials from special events. Staff amenities have been assumed to be available at the existing scale house.

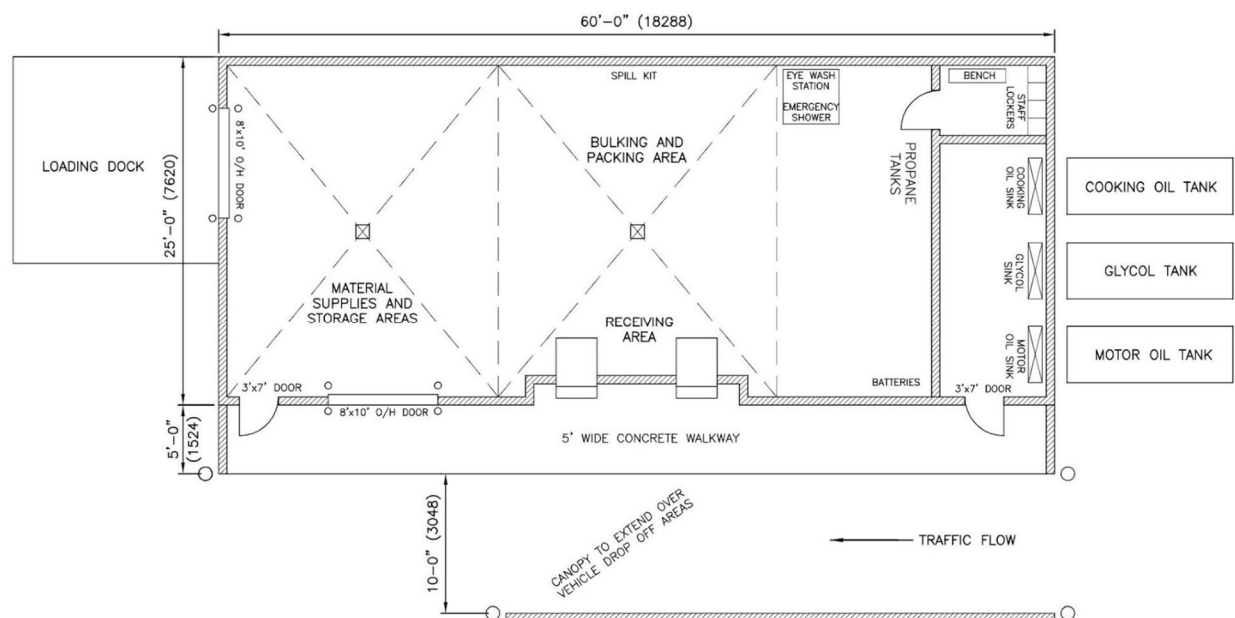


Figure 1: HSW Depot Layout

The building type can vary. Pre-engineered steel structures, as costed in this report and presented in Photo 1, require larger pier foundations at the columns and are typically a less expensive structural framing system and pre-engineered steel buildings are erected in less time than conventional steel framing. They typically have exterior metal cladding and interior metal liner panels on the exterior walls and ceiling with interior steel stud partitions. Masonry construction as illustrated in Photo 2 offers more design flexibility and customization options compared to pre-engineered buildings. With masonry, builders have greater freedom to create unique structures with various materials, textures and architectural details. Pre-engineered buildings, while versatile, are often limited in terms of design flexibility since they rely on standardized components. Prefabricated, explosion proof storage units, as shown in Photo 3, are common and cost-effective option for many smaller municipalities. They can be used as-is or built into larger building designs to provide additional working space for staff with loading/unloading areas for residents. These additional structures can range from simple seasonal shelters to coverall and permanent buildings subject to municipal building standards and relevant safety and fire codes.



Photo 1: Pre-Engineered Steel Structure: Halton, Ontario HHW Depot



Photo 2: Masonry Construction Structure: Region of Waterloo, Ontario HHW Facility



Photo 3: Typical Prefabricated Hazardous Waste Storage Depot

(Picture Credit - Herbert Williams Fire Protection)

3.2 Reuse Centre

The purpose of the Reuse Centre is to accept a wide range of materials and have opportunities to repair and sell reusable materials. Photo 4 and Photo 5 show examples of the frontage of some Reuse Centres.



Photo 4: Ithaca, New York ReUse Centre



Photo 5: Reuse Centre, Edmonton Alberta

The Reuse Centre that HRM is considering could be operated by a charitable organization, with a mix of paid and volunteer staff. Residents would drive up to the Reuse Centre and be greeted by a staff member or volunteer who help unload the donated materials. A visual inspection of the materials would occur to assess which items can be accepted and which should not be. Staff would be trained and have a list of accepted items and quality standards that need to be met. When identifying what materials to accept at the Reuse Centre, considerations include items accepted at neighbouring reuse organizations so that an environment of collaboration, instead of competition, with the aim to divert as much material as possible, occurs. HRM may also consider developing a relationship with other reuse organizations to actively communicate desired items as well as items that are being stockpiled and are temporarily not being accepted; this will help foster a community of mutual benefit and improved diversion. Having open communication with neighbouring reuse organizations may also allow sharing of information to residents on where to drop off materials, if not accepted at the Reuse Centre.

Materials would be loaded into designated bins and once residents have finished unloading, the bins will be pushed into the unloading zone where items either are placed in storage or onto shelves at the storefront. Materials such as C&D waste could be stored in a larger storage room and organized into material types. Materials for the storefront would be priced and logged into inventory. Items could also be weighed in order to track the weight of materials diverted through the Reuse Centre.

The Reuse Centre could have space for a repair café/workshop for residents to fix their materials. Workshops may be scheduled to support residents with specific repairs; otherwise, a lending library with useful, commonly required tools could be made available for use. The conceptual layout of the Reuse Centre can be found in Figure A-2 in Appendix A.

The Reuse Centre could include the following:

- Material reception area;
- Construction and demolition storage areas;
- Storefront (to display clothing, furniture, houseware, books, etc.) including shelves, sales desk, etc., as illustrated in **Photo 6**;
- Repair Café/Workshop;
- Lending Library;
- Staff and volunteer office space; and
- Washrooms.



Photo 6: HodgePodge Lodge, Strathcona County, Alberta

3.3

Living Lab

The purpose of the Living Lab is to foster innovation and develop and promote the circular economy. HRM envisions a physical Living Lab that consists of flexible working space (e.g., meeting rooms, collaboration areas such as in Photo 7, workshops and studios), storage (warehouse and cold), a commercial kitchen and demonstration gardens.



Photo 7: Typical Collaborative Zone

Given that the Living Lab has physical space for utilization, there are many possible functions for the site to support the advancement of a circular economy in the region. The Living Lab could facilitate new circular economy programming and support existing community groups and organizations working in this area. The conceptual layout of a Living Lab can be found in Figure A-3 in Appendix A. The Living Lab consists of ancillary areas such as washrooms, locker rooms, a lunchroom and a storage closet; several workspaces such as a board room, workstations, an office and collaborative space; food related infrastructure such as a preparation and cooking area, shelving, commercial fridge and freezer and wash area, as presented in Photo 8; and miscellaneous spaces such as storage and a loading dock. There is also a proposed garden area between the Living Lab and Reuse Centre (example in Photo 9). These areas offer a mix of spaces for work, collaboration and storage, which could be in use by different groups at the same time.



Photo 8: Sheffield Hallam University Commercial and Test Kitchen



Photo 9: Typical Demonstration Garden

An important benefit of the physical Living Lab space is the opportunity for it to serve as a collaboration space for its users. To fully utilize the space and achieve the purpose of advancing a circular economy through the Living Lab model, a facilitator of some type is required.

The Living Lab could be coordinated by a staff member from HRM to animate the lab and facilitate use of the space by community partners. Alternatively, the Living Lab could be operated by a community partner with an agreement from HRM. Several municipalities in Canada take the approach of partnership with existing community organizations to deliver programming or initiatives (e.g., York Region & York Region Food Network, City of Guelph & Guelph Tool Library and City of Hamilton & Community Living Hamilton). There are several examples of Living Labs (see Appendix C) that are operated with collaboration from academic partners; therefore, it could also be possible to pursue partnership with local academic institutions.

The conceptual design for the physical space allows for a flexible range of uses, which can be for HRM-led activities and can also help support the existing ecosystem of community groups and organizations working in circular economy in the region. There are many possible activities and functions that would serve to develop and promote a circular economy in the region. Some options for consideration are presented in Table 13.

Table 13: Potential Activities of the Living Lab

Space	Activities
General	• Programming or training to support non-profits or community groups working to advance the circular economy (skills building, networking, etc.); • Facilitating partnerships for research, funding or business opportunities between the user groups; • Collaboration with academic institutions for research projects; • Creation of challenges to organizations or the public on circular economy topics; • Opportunity to capture materials from HRM's waste stream for innovative uses at the Living Lab (i.e., repurposing, upcycling, repair); • Focused innovation efforts on priority sectors (food, C&D, textiles, plastics, electronics); • Collaboration with other Living Labs or networks; • Education through workshops, skill building (public, children, marginalized individuals); • Incubation of social enterprises; and • Facilitation of the inclusion of arts and culture into circular economy work (i.e., artist-in-residence program or similar).

Space	Activities
Kitchen/Cold Storage/Storage Space	• Rental of space by start-ups, small businesses or social enterprises addressing food waste innovations; • Use of space for research purposes in collaboration with academic institution; • Use of space by non-profits addressing food insecurity through innovations in the recovery/repurposing of edible food waste; and • Facilitation of a community fridge program.
Meeting Rooms/ Working Space	• Rental of space by start-ups or small businesses in the circular economy to support business growth; and • Use of space by community groups working in circular economy for meeting or working.
Collaboration Space/ Workshops	• Use of space for repair/upcycling/repurposing workshops, skills training; and • Use of space for material swaps and events.
Outdoor Space	• Community garden or community-supported agriculture in partnership with existing organizations (if applicable); and • Small scale demonstration composting to support kitchen activities and facilitate skill building (could include vermicomposting), use of compost on community garden/agriculture plots.

Organization types to collaborate with could include the following:

- Food Security (e.g., JustFOOD, Feed Nova Scotia);
- Social Purpose (e.g., organizations supporting individuals experiencing poverty, new Canadians, or those with disabilities);
- Circular Economy (e.g., Halifax Tool Library & Workshop);
- Academia;
- For-Profit Companies; and
- Associations (e.g., Chamber of Commerce, Halifax Partnership).

Funding Options: If HRM is looking at funding options outside of existing capital and operating budgets of the municipality, various options are available including:

- User fees for the facility space (could be sliding scale, or dependant upon user type such as for-profit businesses);
- Fees for workshops/events (could be sliding scale, or based upon user type);
- Innovative fundraising approaches tied to the overall mission of the Living Lab (i.e., purchase products from the kitchen or workshop space);
- Sponsorship or donations; and
- Application to provincial, federal, or private grants.

4.0 Conceptual Site Design

When completing the conceptual designs, Dillon chose a focus for the facilities under consideration. This allowed Dillon to make realistic assumptions regarding the type of layout and size of space needed. Dillon selected a Reuse Centre design with the capability to accept a wide range of materials and a Living Lab design that incorporated requirements for food waste diversion (i.e., commercial kitchen, cold storage). This is based on Dillon's knowledge of where waste could be readily diverted, current interest in the subject, involvement of not-for-profits and potential benefits these facilities could offer to the wider community. A more detailed review of the needs of the community is recommended prior to proceeding with development, including stakeholder engagement and solicitation of feedback from the public and potential partner organizations. The conceptual designs for each facility are presented in the figures in Appendix A. They are anticipated to provide a starting point and provide inspiration for whatever focus area is selected following additional data gathering and public consultation by HRM. The concept designs provided are open and flexible so they may be used for a variety of possible programs.

4.1 Flow of Traffic

A loop road has been added to allow traffic to flow in one direction on the site while accessing either the HSW Depot, the Living Lab or the Reuse Centre. This flow of traffic should reduce instances of vehicle conflict and keep traffic moving more efficiently.

4.1.1 Parking Lot

Upon entering the site, the first turn off point encountered will take a driver to the parking lot for both the Living Lab (located at the east side of the parking lot) or the Reuse Centre (located at the west side of the parking lot). The parking lot is designed to be used by passenger vehicles. Users of this area are expected to be those who anticipate acquiring materials from the Reuse Centre or Living Lab or are looking to meet and collaborate with other users of the space. From the parking lot area there will be access to loading bays for visitors who acquire large items that are not easily carried to their vehicle by hand.

For vehicles that do not take the first turn off point they will continue down the road to the HSW Depot or Living Lab. Clear signage will direct them where they can drop off materials and an attendant should be employed to confirm material acceptability/sorting compliance as well as accept any required payments.

4.1.2 HSW Depot

From the HSW Depot, traffic can continue to the back side of the site. In this area there will be a laneway that leads off to bulk storage of disaster debris that is anticipated to be used as required by

HRM when storms and other debris-generating events occur. Access to this laneway will be restricted and only HRM vehicles and other approved vehicles will be permitted.

4.1.3 Living Lab

Vehicles that are delivering bulk food (or other) items will be provided with a turnoff point into a loading bay for the Living Lab. There will be a loading bay for both larger, commercial size trucks and smaller passenger sized vehicles. Space for both types is required as bulk deliveries are anticipated when, for example, an order of produce is deemed aesthetically unfit for sale but is still fit for consumption. The refused order could be diverted directly to the Living Lab. Space for passenger vehicle food drop off is also required as leftover catering products and other food service leftovers is a common occurrence and these companies often use smaller, passenger sized vehicles.

4.1.4 Reuse Centre

A driver that continues past the Living Lab loading turn off will encounter the facilities associated with the Reuse Centre. The Reuse Centre will also have loading bays connected to the facility for both large, commercial trucks and smaller passenger sized trucks. In addition, on the north side of the laneway, across from the Reuse Centre building there will be storage bunkers to accommodate large, irregular, and overflow material. Two storage bunkers will be covered for items that require protection from the weather such as household items, furniture and C&D materials. The remaining bunkers will be made from concrete blocks, to allow the bunkers to be adjusted in size and confirmation, and are expected to house materials such as aggregate, soil and loose, lower quality lumber. Once past the Reuse Centre, vehicles will travel towards the exit from the property and rejoin traffic on Gloria McCluskey Avenue.

4.2 Additional Site Considerations

Additional site considerations include providing a space to establish raised garden plots between the Living Lab and Reuse Centre. Raised beds are suggested to increase the accessibility and diversity of participants who can enjoy the space. Soil used to fill the raised beds should be taken from a source on the property or external to the property that is tested and deemed suitable for food growth. Further, it is suggested that cover trees and vegetation be planted flanking the front and back of these garden plots. These would be useful as wind breaks and to provide separation from the roadway where heavy vehicles carrying C&D products will be traveling. Further, once established, their root systems will help protect against soil erosion and attract pollinators, which will benefit the gardens.

5.0

Cost Estimates

Class 5 cost estimates ($\pm 50\%$) were generated for the Living Lab, Reuse Centre and the HSW Depot operating including the initial capital investment needed, annual capital for maintenance and operating costs, and capital requirements for anticipated lifecycle replacements.

The following risks should be noted regarding the Class 5 cost estimates:

1. Inflation rates are currently unstable potentially leading to underestimating industry cost escalation for labour and construction costs; and
2. Operating costs may vary from projections due to being contingent on tonnage, material composition, regulatory requirements and labour rates.

The following assumptions are used to develop the cost estimates presented in Table 13, Table 14 and Table 15.

- **Civil:** The design assumes that the existing building and associated infrastructure has been decommissioned and demolished:
 - Roadways up to the existing gate will remain, additional roadways will be required to provide access for commercial and public access to the proposed facilities; and
 - The scale and Administration Building may remain and be repurposed at the discretion of HRM.
- **Electrical:**
 - The electrical systems design is based on a 600A for the Reuse Centre and 800A for the Living Lab 120/208V 3 phase – 4 wire service fed overhead from the Nova Scotia Power Distribution system. Lighting is based on LED technology lamps listed for harsh locations, where applicable; and
 - Class A single stage fire alarm system would be required be provided to meet the requirements of the National Building Code, the CEC, CAN/ULC S524.
- **Mechanical:**
 - A water entrance room would be provided adjacent to an exterior wall to accommodate the domestic water and fire protection service entrances entering the building from the municipal utilities;
 - The sanitary drainage and vent system would service all plumbing fixtures with integral drains;
 - The HVAC system would be designed to meet the requirements of the National Building Code of Canada and ASHRAE standards; and
 - Fire dampers or fire and smoke dampers would be provided at all interior fire-rated duct penetrations as necessary to meet the Codes and regulations.
- **Structural:** Buildings would be a pre-engineered as presented in **Photos 10 and 11**, steel structures with exterior metal cladding and interior panels of metal or metal studs and drywall depending on the location within the building or occupancy. Concrete footings and foundation walls would be

required to frost depth. The building would be designed to the National Building Code of Canada and would be comprised of concrete floor with vinyl floor tiles.



Photo 10: Typical Pre-engineered Building - ReUSE Centre Building, Chikasa Nation, Oklahoma



Photo 11: Typical Pre-engineered Building - Closed Loop Partners and Balcones Resources, New York

5.1

Capital Cost Estimates

Table 14, Table 15 and Table 16 provide the cost estimates for the Reuse Centre, Living Lab and HSW Depot.

Table 14: Reuse Centre Cost

No.	Description	Units	Estimated Quantity	Unit Rate	Budget
1	Mob and Demob (5%)	lump sum	1	\$190,000	\$190,000
2	Survey and Geotechnical	lump sum	1	\$20,000	\$20,000
3	Clear and Grub	m ²	2,800	\$8	\$22,000
4	Site Grading	m ²	2,800	\$5	\$14,000
5	Granulars (Type 2)	m ²	3,000	\$50	\$150,000
6	Water	m	100	\$300	\$30,000
7	Sewer	m	100	\$450	\$45,000
8	Concrete	m ³	250	\$800	\$200,000
9	Pre-Eng Steel Building	m ²	1,840	\$750	\$1,380,000
10	Interior partitions, walls, finishes	m ²	1,840	\$188	\$346,000
11	Plumbing	lump sum	1	\$140,000	\$140,000
12	HVAC	lump sum	1	\$450,000	\$450,000
13	Fire Protection	lump sum	1	\$125,000	\$125,000
14	Electrical Service/Distribution	lump sum	1	\$50,000	\$50,000
15	Lighting and Branch Wiring	lump sum	1	\$290,000	\$290,000
16	Communications and Security	lump sum	1	\$52,000	\$52,000
17	Exterior Electrical Systems	lump sum	1	\$55,000	\$55,000
18	Parking Lot Granulars (450 mm)	m ³	225	\$75	\$17,000
19	Asphalt (100 mm)	tonne	115	\$1,000	\$115,000
20	Miscellaneous	lump sum	1	\$25,000	\$25,000
21	Sediment Control	lump sum	1	\$5,000	\$5,000
Subtotal					\$3,721,000
Contingency (25%)					\$930,000
Engineering (15%)					\$558,000
Total Budget					\$5,209,000

Assumptions

- Dillon has generally assumed that each building is a separate project for the purposes of costing;
- The Reuse Centre building is a single stop for visitors;
- Allocation has been included for survey and geotechnical work, as HRM may tender this work separately from the design of the facility;
- The building is a single storey, pre-engineered warehouse style building with a windowed front;
- The customer area would be one large room with movable shelving units, tables, and pallets;
- The interior roof would be visible open web joists;
- Clearing and grubbing work may include some rock removal and includes grubbing for the building;
- Granulars for grading will be Type 2;
- All parking costs for the site included in the capital cost for the Reuse Centre. Granulars used for parking lot will be 300 Type 2 NS 150 Type 1;
- NSTIR price for asphalt is approximately \$1,000/tonne; and
- Miscellaneous costs have been estimated and included based upon assumption that HRM may tender this work separately from the design of the facility.

Table 15: Living Lab Cost

No.	Description	Units	Estimated Quantity	Unit Rate	Budget
1	Mob and Demob (5%)	lump sum	1	\$149,000	\$149,000
2	Survey and Geotechnical	lump sum	1	\$20,000	\$20,000
3	Clear and Grub	m ²	2,052	\$8	\$16,000
4	Site Grading	m ²	2,052	\$5	\$10,000
5	Granulars (Type 2)	m ²	3,000	\$50	\$150,000
6	Water	m	250	\$300	\$75,000
7	Sewer	m	250	\$450	\$113,000
8	Concrete	m ³	200	\$800	\$160,000
9	Pre-Eng Steel Building	m ²	1,292	\$938	\$1,211,000
10	Interior partition, walls, finishes	m ²	1,292	\$234	\$303,000
11	Plumbing	lump sum	1	\$130,000	\$130,000
12	HVAC	lump sum	1	\$320,000	\$320,000
13	Fire Protection	lump sum	1	\$85,000	\$85,000
14	Electrical Service/Distribution	lump sum	1	\$50,000	\$50,000
15	Lighting & Branch Wiring	lump sum	1	\$215,000	\$215,000
16	Communications & Security	lump sum	1	\$45,000	\$45,000
17	Local Computer Network	lump sum	1	\$11,000	\$11,000
18	Road Granulars (450 mm)	m ³	540	\$75	\$41,000
19	Asphalt (100 mm)	tonne	278	\$1,000	\$278,000
20	Miscellaneous including kitchen equipment	lump sum	1	\$100,000	\$100,000
21	Sediment Control	lump sum	1	\$5,000	\$5,000
Subtotal					\$3,487,000
Contingency (25%)					\$872,000
Engineering (15%)					\$523,000
Total Budget					\$4,882,000

Assumptions

- Allocation included for survey and geotechnical work, as HRM may tender this work separately from the design of the facility;
- Clearing and grubbing work may include some rock removal and includes grubbing for the building;
- The building is a pre-engineered warehouse style building with a windowed front;
- The interior roof would be visible open web joists;
- The area where food is prepared would be prepared requires separation from viewers;
- The building was assumed to have a mezzanine and be approximately 1.5 stories tall;
- The finish for the building will be similar to a general office setting; and
- Road granulars and asphalt for roadways included in the capital cost for the Living Lab.

Table 16: HSW Depot Cost Estimates

No.	Description	Units	Estimated Quantity	Unit Rate	Budget
1	Engineering - Finalize Design and Stamped Engineered Drawings	lump sum	1	\$40,000	\$40,000
2	Surveys and Layout	lump sum	1	\$7,500	\$7,500
3	Earthwork - Grading	lump sum	1	\$45,000	\$45,000
4	HSW Building (25ft. X 60ft. = 1,500sq.ft.)	lump sum	1	\$525,000	\$525,000
5	HSW Unloading Canopy (15ft. X 60ft. = 900sq.ft.)	lump sum	1	\$135,000	\$135,000
6	Furniture - Lockers, Benches	lump sum	1	\$3,500	\$3,500
7	Process Equipment - Tanks, Sinks, Pumps, Roller Conveyors	lump sum	1	\$75,000	\$75,000
8	Fire Protection System	lump sum	1	\$45,000	\$45,000
9	Emergency Shower & Eyewash (freeze protected)	lump sum	1	\$18,000	\$18,000
10	Building & Site Signage	lump sum	1	\$7,500	\$7,500
11	Racking and Cabinetry	lump sum	1	\$30,000	\$30,000
12	Packing Equipment (excluding consumables)	lump sum	1	\$10,000	\$10,000
Subtotal					\$941,500
Contingency (25%)					\$235,375
Engineering (15%)					\$141,225
TOTAL:					\$1,318,100

Assumptions

The costs estimate is for a building design with basic operating equipment as shown in Figure 1. This design is based on an estimate of \$3,875 per square metre (i.e., excluding Processing and Packing Equipment and Road Development costs). An initial budget of \$75,000 has been allocated for the purchase of basic processing equipment and \$10,000 for packing equipment. No budget has been included for specialty sorting or processing activities. Construction Management costs represent the overhead project management cost of prime contractors.

5.2 Annual Operating Budget Estimate

The following assumptions were made for estimating annual operating budgets for the Reuse Centre and Living Lab in Table 17 and Table 18, respectively:

- **Electrical:** The facilities are anticipated to operate on a 600A for the Reuse Centre and 800A for the Living Lab service under the General Tariff for Nova Scotia power; this contributes to both demand

and energy charges. Based on historic information associated with buildings, the service is anticipated to operate around 35% capacity with seasonal fluctuations. In addition to these costs, the facility would be expected to maintain and replace lights as they fail. The life spans of lights 70% lifespan are between 7,000-100,000 hours of operation; and

- **Mechanical:** The mechanical systems proposed designs are based on high-efficiency mechanical equipment and generally accepted “green” technologies such as heat pumps, variable volume ventilation systems and adequate zoning with suitable temperature control based on occupancy and space programming. Due to limited detailed equipment and system information needed to develop an appropriate material takeoff, the annual operation and maintenance cost estimate has been developed on an area- or daily-basis (i.e., Canadian Dollars per Square Meter; Canadian Dollars per Calendar Day) and based on generally accepted industry values and known municipality fees based on the current facility’s footprint.

The current annual operations budget for the Bayers Lake HSW Depot is approximately \$1,480,000 and is expected to increase by approximately \$210,000 if site operations are increased to two days per week at both sites. Dillon assumes that this operational budget includes all operational costs, including building maintenance, electricity, water/wastewater/sewer, fire and staffing.

Table 17: Reuse Centre Annual Operating Budget

No.	Description	Estimated Quantity	Unit Rate	Budget
1	Electrical			
a	Demand Charge	1	\$31,762.38	\$32,000.00
b	Energy Charge	1	\$270,600.34	\$271,000.00
c	Lighting	1	\$11,000.00	\$11,000.00
2	General Maintenance	1	\$104,107.70	\$104,000.00
3	Equipment - 85 Hp loader	1	\$162,120.00	\$162,000.00
4	Staff	1	\$100,000.00	\$100,000.00
5	Supplies	1	\$3,000.00	\$3,000.00
6	Water/Wastewater/Fire	1	\$4,280.00	\$4,000.00
Total				\$687,000.00

Assumptions

- Energy charges based upon the assumed 600A services and on historic information associated with building energy use (electrical service/distribution, lighting and branch systems, communications and security and other); and
- Staffing based upon operation of Reuse Centre by a not-for-profit.

Table 18: Living Lab Annual Operating Budget

No.	Description	Estimated Quantity	Unit Rate	Budget
1	Electrical			
a	Demand Charge	1	\$40,000	\$40,000
b	Energy Charge	1	\$338,000	\$338,000
c	Lighting	1	\$16,000	\$16,000
2	General Maintenance	1	\$100,000	\$100,000
3	Equipment - Maintenance	1	\$25,000	\$25,000
4	Staff	1	\$125,000	\$125,000
5	Supplies	1	\$25,000	\$25,000
6	Water/Wastewater/Fire	1	\$4,000	\$4,000
Total:				\$673,000

Assumptions

- Energy charge based upon 800A servicing and historical information on building energy use (electrical service/distribution, lighting and branch systems, communications and security and other). Also includes the energy demands required for freezers, cold storage and pilot programming.

5.3 Net Present Value

Net Present Value (NPV) is a fundamental financial metric used to evaluate the profitability of an investment by comparing the present value of its expected cash inflows to the initial investment outlay. It accounts for the time value of money, indicating the difference between the present value of cash inflows and outflows over a specific period, usually discounted at a predetermined rate.

The NPV is calculated using the following equation where n = the number of periods of time (i.e., 25 for a 25-year projection), r = the discount rate (assumed at 5%), and cash flow = the sum of money spent and earned on the project for a given period:

$$NPV = \frac{Cash\ Flow_1}{(1+r)^1} + \frac{Cash\ Flow_2}{(1+r)^2} + \frac{Cash\ Flow_n}{(1+r)^n} - Initial\ Investment$$

Outflows include the initial required investment estimated for each of the three facilities and the remainder of the costs outlined in the Class 5 cost estimates including annual maintenance costs, annual operating costs, and lifecycle replacement costs.

Table 19 provides a summary of the NPV calculation for each Facility in 2023 dollars. Revenues have not been estimated. A HSW Depot does not generate revenue. Potential approaches to revenue generation for a Reuse Centre and Living Lab are so broad in scope and without more information from HRM as to

preferred operating and revenue models, they are difficult to estimate. As a result, they have been excluded at this time.

Table 19: NPV Results

Facility	NPV
Reuse Centre	-\$14,757,500
Living Lab	-\$14,364,500
HSW Depot	-\$21,157,500

Dillon notes that NPV is an important tool in decision-making due to several reasons:

1. **Time Value of Money:** NPV considers the opportunity cost of capital and inflation, reflecting the true value of future cash flows in present terms;
2. **Objective Comparison:** It allows for the comparison of different investment opportunities by quantifying their profitability in a common monetary unit;
3. **Risk Assessment:** By incorporating discount rates, NPV accounts for risk preferences, helping decision-makers assess the risk-adjusted profitability of projects; and
4. **Long-Term Viability:** NPV helps in selecting projects with positive NPV (or the least negative NPV), to make sure that impacts to the organization's value over the long term are considered.

6.0 Analysis

The preceding sections outline the potential development options for a Reuse Centre, Living Lab and HSW Depot. The key features of the options for the site are summarized and weighted in Table 20 to help inform the final recommendation on the development of the site. Low, medium and high is based on a comparative analysis of specific parameters among the four options. The option with the least favourable or least advantageous values for the given parameters is designated as low, while the one with the intermediate values is categorized as medium. The option with the most favourable or highest values across the specified parameters is classified as high, establishing a hierarchy based on the observed parameter values among the four options.

Table 20: Recommendations for the Development of the Site

Parameters	Reuse Centre	Living Lab	HSW Depot	Combination of Options
Cost	Medium: Middle cost	Medium: Middle cost	High: Lowest cost	Low: Highest cost
Potential for Increasing Circularity	Medium: One time redistribution of products but will provide a consistent place for specific materials to be redistributed.	High: High potential for the development of new businesses that offer long term ways to redistribute products away from waste.	Low: Redirects potentially hazardous waste away from landfill but does not necessarily increase circularity.	High: Combining all three options would allow the site to maximize the diversion potential possible.
Complexity of Operation	High/Medium: The materials would be non-hazardous and relatively stable making handling and storage more straight forward. Staff will require some specialized knowledge associated with operating lifts and loaders.	Medium: The presence of a kitchen space and coolers adds additional complexity to the operations and will require more highly trained staff. Maintaining high food safety standards will also require care.	High: On site staff will require safe handling of hazardous material training but minimal staffing would be necessary, and the small size of the facility would make it easier to manage.	Medium: Staffing synergies could allow for operation of all three facilities, but the increased size of the operation would increase the overall complexity.

Parameters	Reuse Centre	Living Lab	HSW Depot	Combination of Options
Operating Cost	High: Low cost. This Centre will require some regular attention from staff. Staff will need to be trained in using some equipment like lifts and loaders, but the cleaning requirements will be less rigorous than that of a food handling facility. Energy costs will be minimal as the material is not expected to be particularly sensitive to fluctuations.	Medium: A facility that handles food will need to maintain a higher level of hygiene which will require investment in skilled regular staff. Further, operating a kitchen and large coolers will result in higher energy costs.	Medium: Low cost. Staff of 4 will be required to confirm that the materials being dropped off are being correctly sorted. Energy costs will be minimal.	Low: Highest cost. Staff could likely be shared across the three facilities meaning the number required is not additive. Overall, more staff with varying levels of expertise, would be required to maintain the three facilities.

7.0

Optimization of Existing Property

Optimization of public land involves managing and using these spaces judiciously to maximize social, economic, and environmental benefits for the community. The following are examples of potential additional uses of the property.

7.1

Cart Storage

Cart storage facilities are crucial for maintaining the efficiency of waste collection services. Storage solutions can support the protection of carts from damage and theft while also facilitating easy access for collection crews.

7.2

Equipment Storage

Equipment storage facilities can maintain the functionality and longevity of waste management equipment. This could include roll-off containers or other Public Works equipment to support municipal operations (e.g., vehicles, emergency response). A sea can for smaller pieces of equipment could also be stored on site to protect equipment from the elements.

7.3

Excess Snow Management

Snow storage facilities provide temporary storage for excess snow until it can be safely melted or removed. This area could serve as a dedicated snow storage facility or a back-up in the event of an extreme snowfall.

7.4

Christmas Tree Mulching and Shredding

During the holiday season, the space could serve as a central collection point for Christmas trees. Mulching and shredding operations could also occur on site to convert the trees into valuable mulch or wood chips for landscaping, soil enrichment and/or composting.

7.5

Infected Tree Storage

Storage facilities for infected trees, such as those affected by the Emerald Ash Borer, are essential for preventing the spread of invasive pests or diseases. These facilities can isolate and contain infected trees until they can be safely disposed of or treated. Considerations for using the site for infected tree storage will require containment measures, protocols and regulatory compliance.

7.6 Recycling Material Drop-off

In addition to its primary functions, the site holds the potential for further community engagement about resource utilization. Residents could be encouraged to utilize the site as a convenient drop-off point for various recyclable materials. This could include excess blue bag materials, cardboard or e-waste. By expanding the site's usage to accommodate these recyclables, the facility could contribute to broader waste diversion efforts within the community. Allowing for the drop-off of a wider range of materials at the site provides convenience to residents, which is a significant factor in participation rates in various recycling, recovery and reuse programs.

8.0

Conclusions/Recommendations

The recommended options of repurposing the Burnside Facility to develop a Reuse Centre, Living Lab and HSW Depot on site offers significant opportunity to optimize usage of the property. The combination of all three services offered at the same site fills multiple needs for residents and HRM, offers economies of scale in capital and operating costs, and facilitates additional use of the site due to convenience.

Case studies of other Reuse Centres and Living Labs offer opportunities to assess other operating models and determine an approach which best meets the needs and resources of HRM. Additional stakeholder engagement is recommended to further develop and refine potential operating approaches for the Reuse Centre and Living Lab.

Further refinement of operating hours and requirements for a potential HSW depot at the Burnside Facility should consider operations at the Bayer's Lake depot, public demand for HSW depot drop off and potential future changes to residential HSW generation. Repurposing part of the Burnside Facility into an HSW depot offers the potential to capture more HSW by providing additional operating hours and convenience to residents in the area, which is projected to see high rates of housing development. The requirement for mobile depot events would also be reduced with an expansion of the Bayers Lake Depot operational hours and the establishment of a Dartmouth Depot.

Additional site uses which could be implemented along with the proposed Reuse Centre, Living Lab and HSW depot to further maximize site utility include cart storage, equipment storage, excess snow management, Christmas tree mulching and storage, infected tree storage and recycling material drop off.

Appendix A

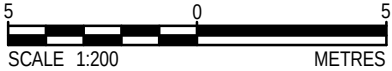
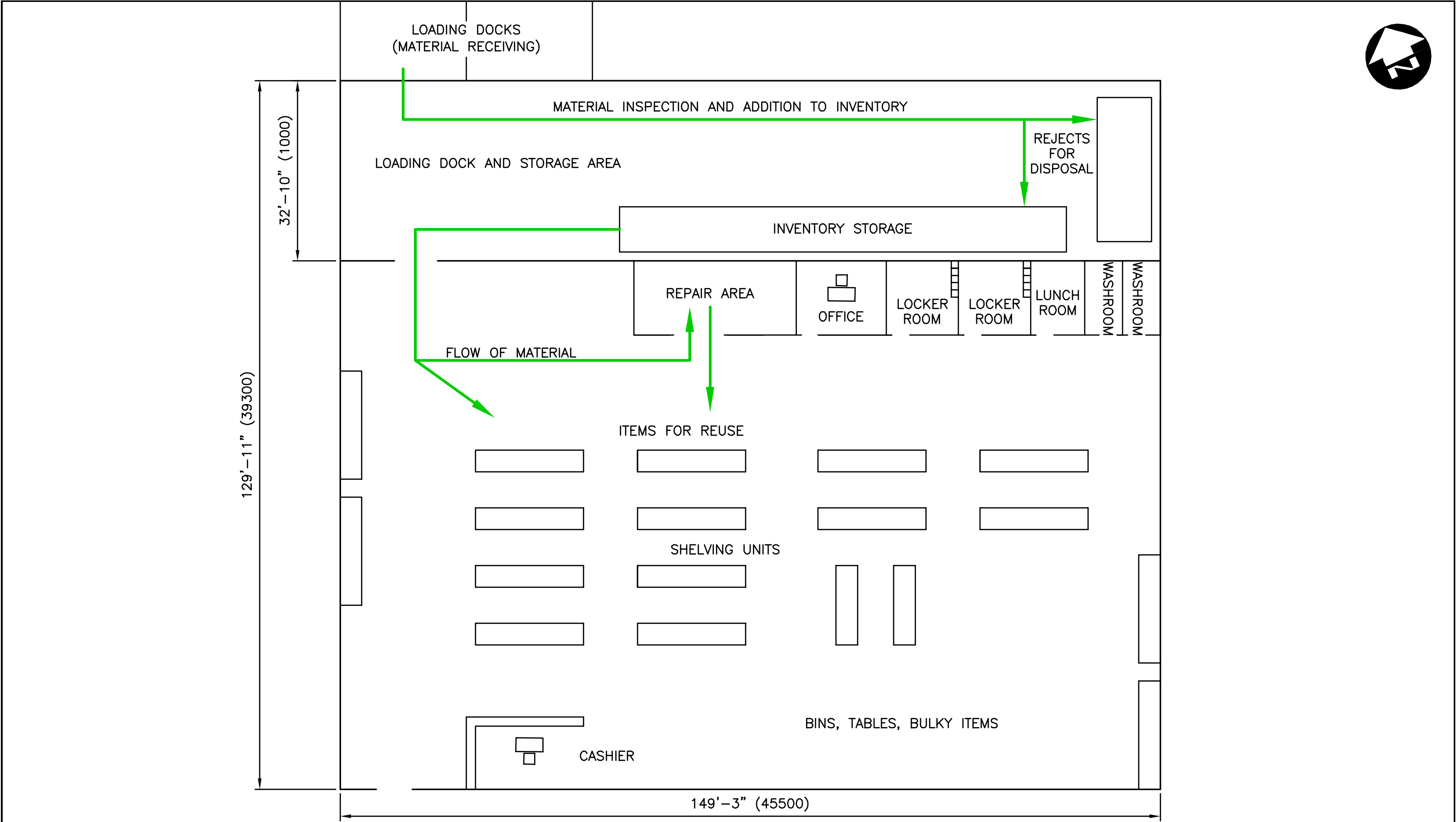
Conceptual Design Figures

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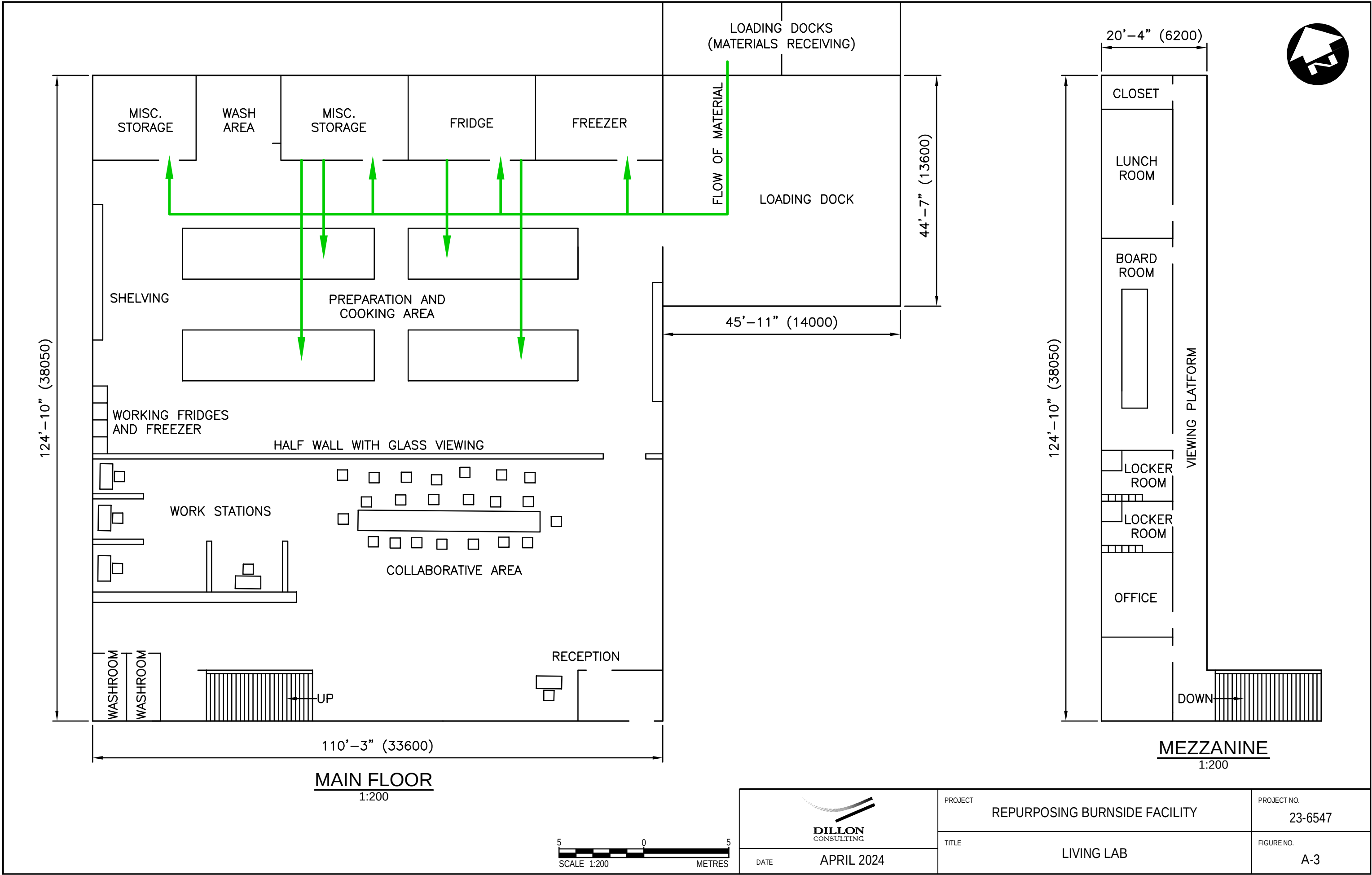
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	DATE	APRIL 2024	TITLE	CONCEPTUAL SITE PLAN
			FIGURE NO.	A-1

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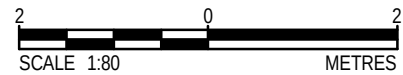
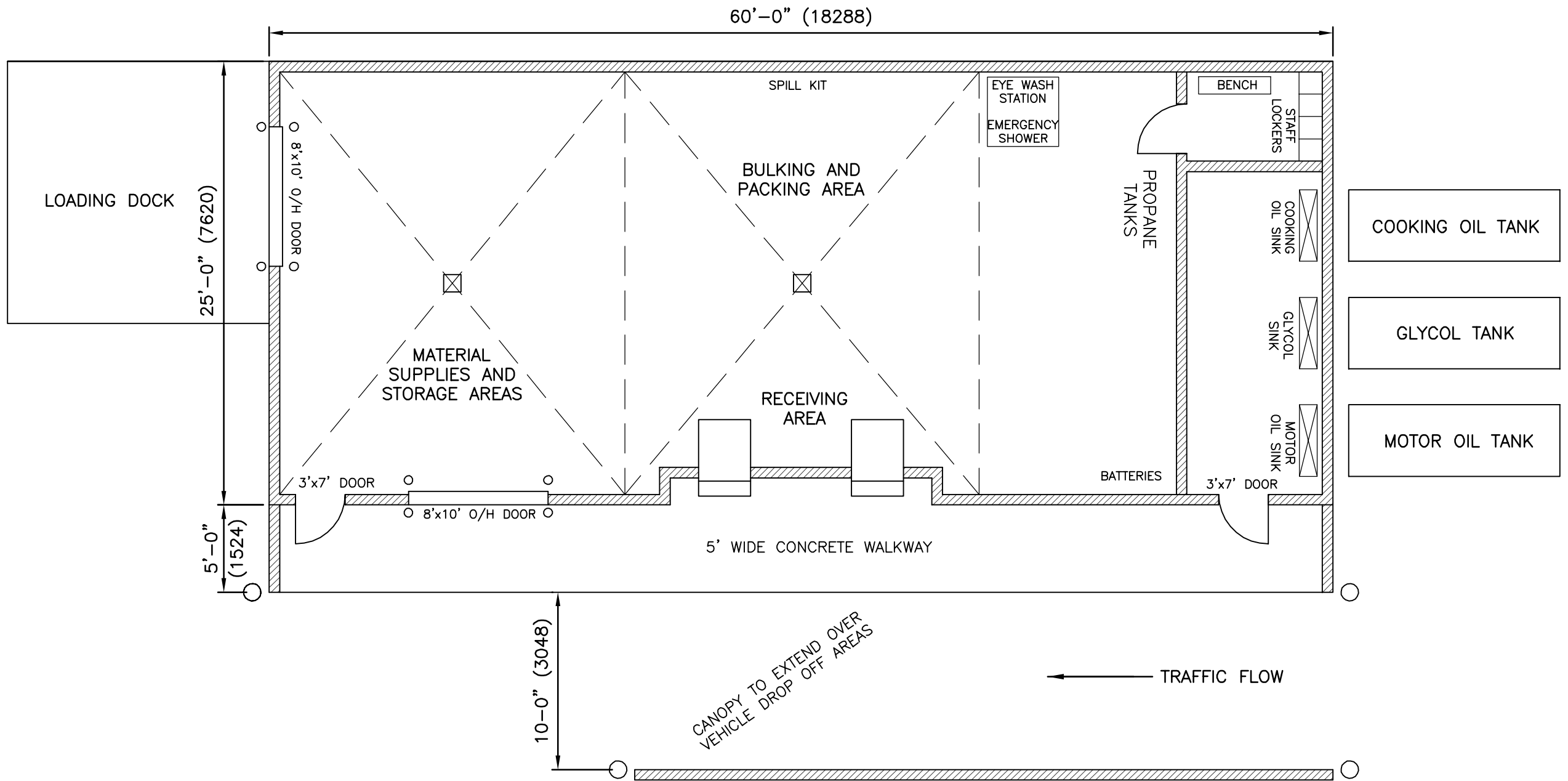


 DILLON CONSULTING	PROJECT REPURPOSING BURNSIDE FACILITY	PROJECT NO. 23-6547
	TITLE REUSE CENTRE	FIGURE NO. A-2
DATE APRIL 2024		

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 DILLON CONSULTING	PROJECT REPURPOSING BURNSIDE FACILITY	PROJECT NO. 23-6547
	TITLE HSW DEPOT	FIGURE NO. A-4

DATE
APRIL 2024

Appendix B

List of Reuse Centres

Jurisdiction	Program or Center	Program Description	Diverted Materials	Repair Culture	Lending Library	Resale of Items	Partnerships with other Local Organizations	Employment of Marginalized, Underrepresented or People with Disabilities
Various locations in Canada	ReStore, Habitat for Humanity	Home improvement retail store that offers new and used affordable merchandise to the general public at a discounted rate of up to 75% off and free of tax.	Household items			X	X	
Hamilton, Ontario	Hamilton Community Recycling Centre, Reuse Store	Drop-off Depot, Reuse center that accepts and sells reusable materials.	Various			x	X	x
Montreal, Quebec	Eco Centre(s)	Drop-off Depot	Appliances, recyclables, tires, construction & demolition waste, household hazardous waste					
Edmonton, Alberta	Reuse Centre	Education programs and activities teach children how to repurpose items. Reuse Centre accepts materials that are available to residents free of charge.	Art supplies, office and school supplies, home décor and media supplies				X	
Toronto, Ontario	Sewing Repair Hub	Workshop space to encourage repair and reuse of clothing. Access to tools, equipment, and supplies to repair clothing.	Textiles	X	X			
Toronto, Ontario	Bicycle Repair Hub(s)	Workshop space to train residents in bike assembly, repair, maintenance, and safety. Access to tools, equipment and supplies to repair bikes.	Bike Equipment	X	X			

Jurisdiction	Program or Center	Program Description	Diverted Materials	Repair Culture	Lending Library	Resale of Items	Partnerships with other Local Organizations	Employment of Marginalized, Underrepresented or People with Disabilities
York Region, Ontario	Reuse Transfer Facilities, Community Environmental Centres	Drop-off Depot	New and gently used donations, including clothing, housewares, books, textiles, electronics, and small appliances, as well as renovation and household materials such as lumber, cabinetry, windows, doors, hardware and plumbing, and lighting fixtures.			X	X	
Sudbury, Ontario	Reuse Store	Accepts and sells reusable materials	Various			X		
Valley Waste Resource Management	Last ReSort ReUse Centre	Accepts and sells reusable materials	Various			X		
Baddeck, Nova Scotia	Reuse Center	Accepts and sells reusable materials	Various			X	X	
North Vancouver, British Columbia	Lendable Tech Program	City Library has lendable tech, like Chromebooks and iPads, that residents can try out.	Action cameras, birding backpacks, hiking backpacks, CD/DVD drives, chargers, Chromebook, sewing machines, reading glasses, etc.		X			
Vancouver Public Library	Musical Instrument Lending Library	Musical instruments are available to sign out for a designated time period.	Various instruments		X			
Vancouver, British Columbia	Zero Waste Centre	Accepts materials and provides items to residents free of charge.	Various			Free		
Toronto, Ontario	Toronto Tool Library	Shares a wide variety of tools for home renovations, gardening and lawn maintenance	Various		X			

Jurisdiction	Program or Center	Program Description	Diverted Materials	Repair Culture	Lending Library	Resale of Items	Partnerships with other Local Organizations	Employment of Marginalized, Underrepresented or People with Disabilities
Toronto, Ontario	Kitchen Library	Non-profit lending library of kitchen appliances (inside of the Toronto Tool Library)	Kitchen appliances		X			
Toronto Region Conservation Authority, Partners in Green Project	Materials Exchange Program	Matches and connects organizations looking to sustainably dispose of materials and facilitates exchanges between them. The Materials Exchange Network is an online platform that facilitates the exchange of materials between organizations, companies and service providers to divert waste from landfill.	Various				X	
Strathcona County, Alberta	HodgePodge Lodge	Accepts materials and provides items to residents free of charge.	Various			Free		
London, Ontario	ReUse Shop	Accepts and sells reusable materials.	Furniture, toys, bicycles, garden tools and knickknacks			X		
North London Community Fund Groups	Forest Fixers Repair Club	Events run twice a month and offer a space to fix something of your own, or to go along and fix something provided.	Various	X				
North London Community Fund Groups	Sewing Repair Workshops	Workshops teaching residents how to sew, mend, and repair textiles.	Textiles	X				
Cornwall, New Brunswick	fRee Store	Accepts materials and provides items to residents free of charge.	Various			Free		

Jurisdiction	Program or Center	Program Description	Diverted Materials	Repair Culture	Lending Library	Resale of Items	Partnerships with other Local Organizations	Employment of Marginalized, Underrepresented or People with Disabilities
Guelph, Ontario	Guelph Tool Library	Loan specialized tools for repair, maintenance, food preparation, entertainment, arts, and crafts. Members share knowledge, skills and resources to help build community resilience.	Various	X	X	X	X	

Appendix C

List of Living Labs

Jurisdiction	Living Lab/Program Program Partners	Type of Living Lab Type According to TIM Review ¹²	Focus of Program	Description of Living Lab
Included in Report				
Nova Scotia	Agricultural Climate Solutions Nova Scotia Federation of Agriculture	Network of on-farm field trials Enabler-Driven	To test and advance climate-smart agricultural practices.	This is a regional living lab, funded by Agriculture and Agri-Food Canada's Living Lab initiative, which brings together farmers, scientists, and other collaborators to co-develop and test innovative practices and technologies to address agri-environmental issues, including: mitigating and adapting to climate change, protecting soil and water quality, and maximizing biodiversity in agricultural landscapes.
Halifax, Nova Scotia	PIER Centre for Port Innovation, Planning and Strategy Halifax Port Authority	Marine transportation innovation Provider-driven	To advance supply chain & logistics, support an interconnected Port City, and maritime policy development with sustainability as a core to each.	PIER is a physical space which provides opportunities to interact directly with end users, receive actionable insights, and for solutions to be visible to industry specific investors. The PIER provides a landing space for companies with expertise in maritime transportation and logistics who see opportunity to develop solutions alongside global industry leaders.
Québec	CERIEC – Center for Intersectoral Studies and Research on the Circular Economy Université du Québec	Circular economy facilitation Provider-driven	To advance the circular economy in Quebec by providing an important space for researchers and students to test innovations to facilitate the transition to a sustainable future.	CERIEC provides an important space to create a dialogue between researchers, members and non members as well as with enterprises, governments, NGOs, citizens, etc., to co-construct solutions, technologies, deployment tools and methodologies to generate knowledge, to experiment with these innovations on a pilot scale with a feedback mechanism to stakeholders and to ensure the valorization and transfer of knowledge, in particular by training users and enriching post-secondary education programs across priority circular economy sectors (starting with construction).
Leeds, United Kingdom	Leeds Living Lab for Food Waste University of Leeds	Food waste reduction Provider-driven	To lead in innovative approaches to reducing waste from our catering, cafes and restaurants and explore, research and trial innovative solutions to food waste, packaging waste and behaviour change.	Drives the University's commitment to embed sustainability through knowledge, engagement, collaboration and innovation. By bringing together students, staff and our city partners, the Leeds Living Lab can research and test sustainable solutions, enhance our curriculum and tackle global challenges using the University and our communities as a testbed.

¹² <https://timreview.ca/article/602#:~:text=Our%20empirical%20analysis%20shows%20that,and%20user%2Ddriven%20living%20labs.>

Jurisdiction	Living Lab/Program Program Partners	Type of Living Lab Type According to TIM Review ¹²	Focus of Program	Description of Living Lab
Calgary, Alberta	City of Calgary Living Lab City of Calgary	The City as a living lab Utilizer-driven	To facilitate the use of their existing infrastructure and assets for users to test their product or service before being released to the public.	The lab offers the use of City assets and infrastructure for companies, researchers and individuals to test their products and try out their ideas in a real-life environment. The end goal is to enable innovators to test and validate their designed product or service before it is released to the public to help ensure it will be generally feasible and provide utility for global users' daily lives.
Guelph, Ontario	COIL - Circular Opportunity Innovation Launchpad City of Guelph, County of Wellington, Our Food Future	Circular business activation Enabler-driven	To leverage its extensive network of researchers, post-secondary institutions, industry experts, not-for-profit organizations, business-accelerator organizations, and public-sector enterprises to increase circularity.	An innovation platform and activation network aimed at creating, proving and scaling transformative solutions that will move Canada toward a more sustainable, circular economy. COIL facilitates business incubation, acceleration, ecosystem development, and funding programs to support the advancement of circular organizations and practices in priority sectors (food, construction, renovation and demolition and textiles, to date).
North America				
Montréal, Québec	AcadieLab – Living laboratory in an agricultural environment Maison de l'innovation Sociale (MIS), Université du Québec, Pleine Terre	Agroecosystem rehabilitation Provider-driven	To experiment with agroecosystem rehabilitation solutions along L'Acadie River.	AcadieLab is a collective integrated development project that has been deploying co-creation and experimentation processes for agroecosystem rehabilitation solutions adapted to farmers in the L'Acadie River watershed in Montérégie since 2015. These innovations are implemented directly on farms by agricultural producers, with all stakeholders in the process. It is the only living laboratory in an agricultural environment certified by the European Network of Living Labs (ENOLL) in Canada. The lab brings together scientists and agricultural producers to bring about agri-environmental solutions that are both sustainable and adapted to farms and operators.
Edmonton, Alberta	The Public City of Edmonton (start up funding)	Food business incubator and developer User-driven	To connect new and prospective food businesses to resources and each other as well as markets to move products to points of sale and try new products.	This organization does not refer to itself as a living lab but it has many of the features of a user-driven living lab. Specifically, it was developed by/in collaboration with users, has spaces to collaborate and tactics to move their products to points of sale.
Vancouver, British Columbia	Circular Food Innovation Lab Emily Carr University, City of Vancouver	Food business circularity acceleration program (completed) Enabler-driven	Supported prototyping of food waste reduction pilots within the existing food business ecosystem.	The project considered the Lab to be a space to question, experiment, learn and collaborate around complex challenges with many different possible solutions with the food business ecosystem in the region. Pilot projects were developed and implemented

Jurisdiction	Living Lab/Program Program Partners	Type of Living Lab Type According to TIM Review ¹²	Focus of Program	Description of Living Lab
International				
Almere, The Netherlands	Upcycle Centrum Royal Institute of Dutch Architects	Upcycling and circular building concept demonstration Enabler-driven	To offer space for advancing the circular economy. The building itself is a demonstration of circularity and upcycling. It also offers space to entrepreneurs to make and sell products.	A combination of reuse center and living lab. Upcycle centrum offers startups the opportunity to develop their business cases by providing them with a workshop and giving them access to the flow of 'waste' brought in by our residents.
Amsterdam, The Netherlands	De Ceuveel Metabolic, various architecture, planning organizations.	Circular community and buildings Utilizer-driven	A sustainable planned workplace for creative and social enterprises on a former shipyard.	The Municipality of Amsterdam offered a 10-year lease on a former industrial shipyard, and a group of urban designers and consultants developed a circular office park, building workspaces, a cultural venue, a café, rental spaces and a floating bed and breakfast. De Ceuveel is a cultural urban hub, and a demonstration of the social transition to a contemporary circular lifestyle. It is a demonstration of circular building and sustainable community development. The hub also hosts workshops, lectures, music and art innovations that support culture and green innovation.
Turin, Italy	Torino City Lab City of Turin	Urban innovation space Enabler-driven	To foster innovation between more than 90 public and private partners - in response to open challenges (transportation, culture, tourism, citizen services, environmental sustainability, urban security).	The lab offers a platform for testing innovative ideas for the future can be easier and accessible, where the social impact can be analysed and where it is possible to monitor their acceptability and feasibility at community level. There are various challenges issued by the City in priority areas to support innovation in the community to offer solutions to advance climate neutrality commitments and the digital transformation.
Phoenix, Arizona	Circular Living Lab Metro Phoenix, Arizona State University	Sustainability living lab to address complex problems Provider-driven	To make the future more sustainable for all through 3 main areas of concern: equity, resilience, circularity.	A partnership between Metro Phoenix and ASU to apply creative solutions to real-world problems, delivering sustainable solutions to benefit everyone, partnering with local organizations to innovative and launch new initiatives, and creating green jobs. Currently, the lab hosts a plastics microfactory at the university, using low-tech solutions to make new products from recycled plastic.

Jurisdiction	Living Lab/Program Program Partners	Type of Living Lab Type According to TIM Review ¹²	Focus of Program	Description of Living Lab
Oxford, UK	Regenerative and Circular Economy Lab University of Oxford	University-based circular economy living lab Provider-driven	To educate students and foster opportunities for research in the circular economy.	The Regenerative and Circular Economy Lab is an initiative incubating at Saïd Business School, with three main goals: to deepen awareness and understanding of the circular economy, to create a bridge between academics and practitioners who are working in the Regenerative and Circular Economy (R&CE) space, and finally to highlight opportunities for students to devote their careers to circularity after their time at Oxford.
Virtual - Europe	Digital Circular Economy Lab TU Delft, ETH Zurich	Knowledge hub for connecting research with practice Provider-driven	To provide accessible education and foster connections in the circular economy and digital transformation.	A knowledge sharing and networking platform, initiated to bring academia, practice, and policy together to discuss societal challenges. The aim is to bring stakeholders across industries together to combine digital technologies with circular principles to tackle challenges posed by the linear economy.
Finland	Laurea Circular Economy Living Lab Laurea University of Applied Science	University-based circular economy living lab Provider-driven	To promote circular economy initiatives of organizations in the region by offering co-creation opportunities, training and research.	Laurea Circular Economy Living Lab is a hub of education, RD and regional development associated with the circular economy. The Living Lab serves as a cooperation platform and a learning and development environment for students, partners and international networks, both online and on the campus.
Switzerland	Smart Living Lab Swiss Federal Institute of Technology Lausanne, School of Engineering and Architecture of Fribourg	Physical living lab for the built environment Provider-driven	To facilitate interdisciplinary research and real life experimentation to advance the future of the built environment.	The Smart Living Lab is a research and development center for the future of the built environment whose aim is to achieve energy efficiency, digital transformation, and the well-being of its users. Here, interdisciplinary research projects are pursued with experiments carried out in real-life conditions. These activities involve scientists and companies.
Australia	CELL – Circular Economy Living Lab Lake Macquarie City Council, University of Newcastle, Lake Macquarie Economic Development	Municipal and university living lab for advancing a regional circular economy Enabler-driven	To support and advance regional circular economy initiatives.	CELL focuses on projects that could generate new employment within Lake Macquarie by taking waste from within the region, converting these into new or alternate materials, and assisting with transitioning away from a carbon and extractive-based economy. The lab offers strategic advice and resources to address barriers that and provides an environment to test, learn and validate leading-edge ideas with the potential to transform the economy and enhance resilience.