GreenCare

Environmental Management Plan – Guidance Document

Land Acknowledgement

We acknowledge with respect and gratitude that this report was produced on the traditional, ancestral, and unceded territories of the Dãkelh Dené, Ktunaxa, Nlaka'pamux, Secwépemc, St'át'imc, Syilx, and Tŝilhqot'in Nations.

Health facilities in British Columbia are situated on the traditional, ancestral, and unceded territories of more than 200 First Nations across the province. There is systemic racism within and throughout our health system, and we have the responsibility and power to create more culturally safe and appropriate environments of care. This document, through a distinctions-based approach, is intended to listen to the expertise of First Nations, Métis, and Inuit Peoples, while privileging the voices of First Nations across the province on whose respective territories' health facilities operate. To understand and adapt to climate change, we centre Indigenous knowledge, particularly local First Nations' land-based expertise, on health facility projects in a way that strengthens both climate resilience and reconciliation.

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Disclaimer

This document is intended as a guidance document. It provides general examples and recommendations; however, Environmental Management Plans should aim to go beyond the practices outlined here. Rather than simply meeting the current status quo for similar facilities, the goal should be to implement progressive and innovative measures that push beyond these examples for improved environmental performance. The Environmental Management Plans should be developed considering historical, current and future context of the place, and this guidance document is not a one size fits all prescription.

Acknowledgment

This document was led and developed by Interior Health's Environmental Sustainability (ES) team, with support, review, and revisions from the Energy and Environmental Sustainability (EES) teams at Fraser Health, Providence Health Care, Provincial Health Services Authority, and Vancouver Coastal Health. This is a 'living' document and will be regularly updated to reflect best practices in health-care projects.

For any questions or further information for the Interior region of BC, please reach out to ES team at Sustainability@interiorhealth.ca. For inquiries related to the regions under the authority of Fraser Health, Providence Health Care, Provincial Health Services Authority, and Vancouver Coastal Health, please contact the EES team at info@bcgreencare.ca.

Revision History

DATE OF REVISION	NATURE OF REVISIONS	REVISIONS MADE BY
TBD	Original release.	

Executive Summary

The Environmental Management Plan (EMP) Guidance Document provides a framework to meet the sustainability criteria outlined in **Chapter 11 of the Ministry of Health's (MoH) Capital Policy** published in January 2024, ensuring alignment with the CleanBC Roadmap to 2030 and Provincial legislation such as the Environmental Management Act. This guidance is designed to help project teams integrate environmental best practices into the planning, design, construction, and operational phases of healthcare facility projects.

The purpose of the EMPs is to:

- Initiate early-stage conversations on environmental management during project planning and design.
- Define actionable strategies for water management, waste reduction, healthy materials, transportation, and biodiversity preservation, including Indigenous knowledge and practices.
- Ensure compliance with MoH Capital Policy 11 and support health facilities in achieving sustainable outcomes.

There are four specific EMPs, each addressing critical areas including:

- Water Management: Strategies to conserve resources, prevent pollution, and optimize water efficiency.
- Waste Management and Healthy Materials selection: Emphasis on waste reduction, reuse, recycling, hazardous waste disposal, promoting zero-waste practices, and selecting non-toxic, sustainable materials during construction and operations.
- Transportation: Promotion of low-emission vehicles, public transit, and alternative transportation to reduce environmental impact.
- Natural Environment: Strategies for protecting biodiversity, restoring natural habitats, and mitigating the impact of operations on ecosystems with the inclusion of indigenous knowledge and ways of being.

These plans are initially developed for the planning and construction phases but should be revisited upon project completion to integrate operational best practices. By embedding sustainability considerations from the outset, healthcare facilities can achieve greater synergy between environmental management, climate resilience, and low-carbon design strategies.

This document also offers a roadmap for tailoring plans to the unique needs of each project, equipping teams with the tools to mitigate environmental impacts and enhance sustainability outcomes.

Introduction to Environmental Management Plans

To meet the environmental sustainability criteria outlined in Chapter 11 of the Ministry of Health's Capital Policy, environmental management plans (EMP) are required for all new and replacement construction projects. In alignment with the "Clean BC Roadmap to 2030" and Provincial legislations, such as the Environmental Management Act, health capital assets, particularly facilities, must be environmentally sustainable. This involves reducing environmental deterioration and impacts by optimizing resource use and minimizing waste release into the environment.

This document serves as a guide for structuring EMPs, addressing challenges related to water, materials and waste, transportation, and the natural environment. Project teams should note that this framework can be customized to fit their project's specific needs. By tailoring the content provided, teams can address unique environmental aspects, ensuring the integration of environmental sustainability into project planning and implementation. This guide contains regulatory requirements, rationale for why information is required, how to find required information as well as guidelines and Best Management Practices (BMPs) for managing or mitigating adverse effects.

Purpose

Objectives of the Environmental Management Plan include:

- Identifying environmental impacts and risks in four key areas: water, materials, transportation and natural environments.
- Identifying mitigation/best practice strategies that should be considered within the EMP for the project
- Ensuring compliance with regulatory guidelines at local and provincial levels.
- Tracking environmental strategies in four key areas during project design, construction and operation supporting capacity to make changes as needed whilst remaining compliant.
- Providing feedback for continuous improvement in environmental performance by establishing a structured framework for monitoring, evaluation, and feedback.
- Inform capital and operational/maintenance costs
- Offering project teams a template with key components and expectations to guide EMP development and align with best practices.

Document Structure

The structure of the Environmental Management Plan (EMP) is provided in the following sequence: version control, general introduction to the project, policy landscape detailing applicable policies and guidelines, and considerations for environmental sustainability categorized into water, materials and waste, transportation, and the natural environment. The remainder of this document serves as a template and should be used as a starting point for developing project-specific EMPs. Sections include placeholders (e.g., [insert project name]) and version control examples to help guide customization for each project. The following subsections explore each aspect in detail, offering a proposed structure for plan development.

Environmental Management Plan Template

1.0 General Description

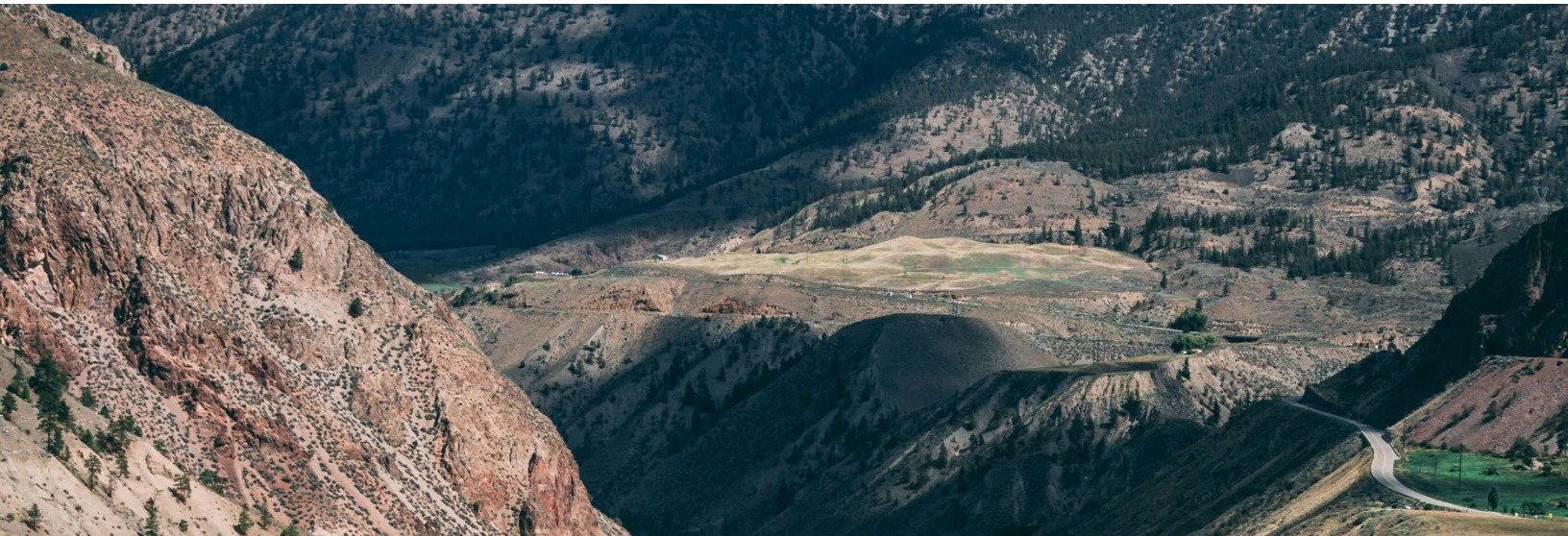
The Management Plan General Description should be written to include information on the purpose, services and main features of the project.

Version Control

It is essential to recognize this document as iterative, subject to revision throughout various project phases so a version control and distribution list is integrated into the framework.

Controlled Document			
Project name			
Project number			
Location			
Project manager	(Name)		(Number)
Issue date	(xx/xx/xx)	Next review	(xx/xx/xx)
Plan version			
Prepared by			

Distribution List				
Date of issue	Version no.	Issued to	Approved by	Control status



2.0 Background

The intent of Management Plans is to detail the strategies recommended to satisfy the various policy requirements applicable to the planning, design and eventual construction of the project. The expectation is that the report identifies key objectives for the purpose of pricing by identifying alignment between green building ratings systems, policy, and facility design. Primarily, this report addresses distinct policies outlined by the Ministry of Health (MoH), Ministry of Finance (MoF), and guidelines provided by regional energy and environmental sustainability (EES) team for FH, PHC, PHSA and VCH. These policies include the Health Capital Policy manual, specifically Chapter 11: Low Carbon, Climate Resilient, and Sustainable Health Facilities (Chapter 11), the Environmental, Social, and Governance Framework for Capital (ESGFC), and Climate Resilience Guidelines for BC Health Facility Planning & Design along with guidelines such as the Low Carbon Resilience and Environmental Sustainability Guidelines for Health-care New Construction (LCRES).

The report presents strategies and recommendations for the Sustainability Management Plan. However, it acknowledges that further refinement of the project sustainability strategy will be necessary in future phases of Design Development.

2.1 Project Overview

This section provides a detailed Project Description along with key associated environmental risks. It should be noted that the key associated environmental risks could be extracted form the Portfolio-Level Climate Exposure Screen and vulnerability assessment carried out by the health authority.

2.2 Plan Applicability

The EMPs apply to any person, subcontractor, or organization involved with the Project. The project team consists of all parties engaged by (Project Name) to execute the project work for the design, construction, operation, and maintenance of the Project.

2.3 Plan Development Team: Composition and Roles

The following roles will be essential for the successful implementation/ development of EMPS:

• Managers and Clinical Leads from the Facility: To ensure alignment with clinical needs and operations.

• Engineering Principals: These experts will provide technical insights and ensure that all engineering aspects align with sustainability goals.

Civil Engineering

Mechanical Engineering

Energy Engineering

Architectural disciplines

Landscape Architect

• Contract Managers for Environmental Services, Waste, Laundry, and Food: To oversee contracts and ensure compliance with environmental standards.

• Representative from the Indigenous Health Team: As recommended in the Health Facility Climate Resilience Guidelines, this role is crucial for applying Indigenous perspectives and ensuring culturally sensitive practicesas well as uplifting Indigenous voices, and learning from Indigenous ways of knowing.

• Traffic Demand Management Team: To develop and implement strategies that reduce the environmental impact of transportation to and from the facility.

• Facility Management Team: To ensure the smooth operation and maintenance of the facility, focusing on sustainability and resilience.

• Environmental Sustainability Team: To lead initiatives and track progress toward environmental goals.

• LEED Consultant: To provide expertise on achieving LEED certification and maintaining high environmental standards.

This list reflects our current understanding of the necessary roles.

3.0 Location

3.1 Project Map

Include a project location map in this section of the plan.

4.0 Policies and Guidelines

Development of the EMP is based on information presented throughout applicable legislation or regulations, and any relevant standards or guidelines. It's important to note that not all of these regulations are applicable in every project, and the applicability needs to be assessed based on the specific project requirements and constraints. The legislative and guidance documents listed below will guide the development and implementation of relevant EMP component plans.

4.1 Regulatory Requirements

EMPs will be developed prior to Project construction to provide performance-based requirements, standard protocols, and mitigation measures intended to reduce potential for adverse effects during construction and operation. The development of the environmental management program will draw upon various sources, including legislation, Best Management Practices (BMP) guidelines, industry standards, and other relevant documentation. Mitigation measures, as well as the following legislation, regulatory requirements, and guidance documents, will inform the development of the EMP:

Federal:

- Fisheries Act;
- Migratory Birds Convention Act;
- Species at Risk Act;
- Canadian Environmental Assessment Act;
- Canadian Environmental Protection Act;
- National Fire Code; and
- Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (2008)
- Canadian Ambient Air Quality Standards (effective 2015)

- Provincial:
- British Columbia Environmental Assessment Act;
- Environmental Management Act and Spill Reporting Regulation;
- BC Fire Code;
- Wildfire Act;
- Forest Act;
- Transportation of Dangerous Goods Act;
- Water Sustainability Act and regulations;
- Weed Control Act;
- Heritage Conservation Act;
- Occupational Health and Safety Regulation; and
- Workplace Hazardous Materials Information System (WHMIS);

4.2 Government of BC Requirements

Ministry of Health: Health Capital Policy Manual - Chapter 11 - Low Carbon, Climate Resilient and Sustainable Health Facilities

The Health Capital Policy Manual is a government of BC document which details rules for the financing of province projects. Chapter 11 specifically is one of key chapters which addressed facility sustainability. The latest version of Chapter 11 is a consolidation of what was once Chapter 11 and Chapter 12 of the Health Capital Policy Manual.

Ministry of Finance: Environmental, Social, and Governance Framework for Capital (ESGFC)

The ESGFC provides high level direction to capital ministries and public sector organizations on expectations for climate resilient design and greenhouse gas (GHG) emissions reduction in capital submissions for public sector buildings. The framework focuses on Labour, Mass Timber, Childcare, and the Clean BC 2030 strategy. The document includes a necessary expansion of climate objectives for public sector buildings to achieve commitments set out in the CleanBC Roadmap to 2030. Future project delivery teams should be careful to review and account for Mass Timber and Clean BC directives detailed in the Business Planning and Design and Procurement phases.

In Plain Sight Report

“In Plain Sight” is a report released in November 2020 by British Columbia's Office of the Human Rights Commissioner. The document outlines the prevalence of racism and discrimination faced by Indigenous peoples within the BC healthcare system. The document's main concern is the inequitable treatment and barriers to healthcare that Indigenous communities experience, and it provides recommendations for policy changes and actions to address these issues. The report emphasizes the importance of culturally safe and equitable healthcare practices that needs to be taken into consideration in the project design and planning.

4.3 Health Authority Guidelines/Requirements

Depending on the territory in which the project is being undertaken, the project team is required to follow the specific guidelines established by the respective health authority. For example, Interior Health provides the following resources:

IH's Climate Change and Sustainability Roadmap

The Interior Health's Climate Change and Environmental Sustainability Roadmap is a strategic framework designed to guide climate action and sustainability efforts across the organization. It aims to reduce greenhouse gas emissions, minimize environmental impacts, and strengthen the healthcare system's resilience to climate change, while supporting local and Aboriginal communities in their adaptation and mitigation efforts. The Roadmap outlines guiding principles, goals, and 20 comprehensive actions, providing a clear path forward.

Low Carbon Resilience and Environmental Sustainability Guidelines for Health-care New Construction (LCRES)

The LCRES is a guideline intended to consolidate identified best practices around sustainability and provide direction to project teams developing healthcare projects. The LCRES contains lots of optional guidance to be adopted and some key minimum requirements. The guidelines have undergone various evolutions intended to align with and support ongoing changes with the Health Capital Policy Manual and ESGFC.

IH's Indigenous Health and Wellness Strategy

The Interior Health's Indigenous Health & Wellness Strategy is a plan aimed at improving health outcomes for Indigenous populations by promoting culturally safe, equitable, and responsive healthcare services. Central to this effort is the Indigenous Partnerships Portfolio, focusing on addressing the health, wellness, and care needs of Indigenous people across the region, aligned with recommendations from significant reports and declarations such as the In Plain Sight Report, the Inquiry into Missing and Murdered Indigenous Women and Girls, the Truth and Reconciliation Commission's Calls to Action, and the B.C. Declaration on the Rights of Indigenous Peoples Act.

These documents serve as examples of the type of resources available to guide project teams in meeting environmental, social, and governance objectives.

5.0 Environmental Management

The Project [insert project name] involves several environmentally sensitive activities, such as [insert relevant sensitive activities] that require unique considerations and may require site-specific or discipline-specific EMPs. These EMPs detail the relevant BMPs, mitigation measures, monitoring requirements, and reporting. These plans will be developed in conjunction with the planning phase (initiated in Business Planning) and before construction begins, and they will be updated throughout the Project.

In accordance with the MoH Capital Policy 11, the following EMPs will be developed during business planning for the Project:

- Sustainable water management plan considering quality, use, and end use of all water either supplied to the facility or from precipitation.
- Sustainable materials management plan considering waste reduction and healthy materials in construction and ongoing building operation.
- Sustainable transportation management plan considering active and clean transportation modes with design measures relevant to user demand.
- Natural environment management plan considering site user health and wellbeing, incorporating Indigenous traditional ecological knowledge, and natural assets.

The process begins with an assessment of the current situation to identify gaps and opportunities. Then, management plans are developed, prioritizing these identified gaps and opportunities. The aim is to align these plans with the broader project objectives, the Health Authority's strategic priorities, and future-proofing needs. Environmental Sustainability Strategies have been developed to align principally with the criteria of Chapter 11. Further context and direction from the ESGFC and LCRES frameworks have been layered in where applicable to maximize alignment across the policies.

The Health Capital Policy Manual asks that buildings align with the complex framework of legislation and the Clean BC Roadmap to 2030 specifically focusing on addressing resource management outside of operational carbon. The policy manual includes a focus on water, waste, healthy materials, transportation, and natural environment.

Environmental Sustainability Strategies have been further supplemented with recommendations identified in the LCRES Guidelines, LEED principals and ESGFC.

The BMPs discussed below are intended to highlight what mitigations and strategies should be considered for the detailed design, construction and operation of the proposed facility. BMPs have been sourced from guidance documents and policies like the LCRES and LEED rating system.

It should be noted that all best practices must align with CSA and other applicable healthcare project standards, bylaws, and regulations, as this ensures compliance, enhances safety, and maintains the quality and effectiveness of healthcare facilities.

5.1 Water Management Plan

This section should detail BMPs (see Table 1 and the following subsections) for the management of water, aimed at optimizing water quality, utilization, and end-use for all water sources, including supply and precipitation.

5.1.1 Efficient Water Usage

This section should discuss strategies for optimized water usage while minimizing water wastage. Consider identifying water allocation and describe;

- Water availability for the project.
- The quantity of water allocated to different uses. Consider water grade (purity) needs and whether purification infrastructure should be considered (with plan for reject water use)
- Systems that are being employed for informed decision making to allocate water to different needs such as modelling, real-time Monitoring Systems, water meters etc.,

5.1.2 Identification and conservation of sensitive water resources

Conduct the assessment of the project's surrounding area and identify any wetlands and riparian zones on the project's property. If any water-sensitive zones are identified, provide a description of the management systems implemented to protect and conserve these areas.

5.1.3 Water Utilization Techniques

Explain the sustainable water utilization strategies adopted if applicable to the project. Describe the effective water management strategies considered to ensure optimal resource utilization and minimize waste of water. If these strategies are not applicable or feasible for the project, provide an explanation. These strategies include, but are not limited to, the following:

- Utilization of low-flow fixtures and fittings in plumbing systems to reduce water consumption where feasible. It might be considered not feasible due to recommended fixture flows for proper hygiene.
- Implementation of water-efficient landscaping practices, to minimize outdoor water usage.
- Adoption of water-recycling systems for processes like concrete mixing and dust suppression, thereby reducing overall water demand.
- Integration of rainwater harvesting systems to capture and store precipitation for non-potable uses like site cleaning and irrigation.
- Rainwater collection and reuse (indoor and outdoor)
- Consider creating bioswales and use permeable pavers where possible to allow water infiltration into soil potentially for any area, not just water sensitive zones (outdoor)
- Consider strategies to implement waste heat recovery, passive energy strategies, thermal energy loops, and geothermal heat pumps with collaborative multidisciplinary design teams - These strategies can contribute to water savings indirectly by reducing the overall energy demand and enhancing the efficiency of water-related systems.

5.1.4 Indoor Potable Water

Following the best practice guidance outlined in the LCRES, consider indoor water usage reduction strategies for potable water, including but not limited to:

- Installing low-flow plumbing fixtures with WaterSense certifications.
- Targeting specific fixture flows where it does not contradict best hygienic practice and continually refining fixture flows in consultation with staff- adjusting or limiting the water flow rate for individual fixtures to reduce water consumption. For example, installing low-flow faucets or toilets in areas where high water use is unnecessary.
- Using Laundry Machines, Ice Makers, and Food Steamers with EnergyStar certification.
- Utilizing Dishwashers equipped with load sensing technologies.
- Incorporating macerators and bedpan washers with dual-flush options.
- Implementing metering systems to monitor cold and Domestic Hot Water (DHW) consumption.

5.1.5 Outdoor Potable Water

Consider the following strategies to reduce outdoor potable water usage and explain what appropriate resilience measures are incorporated in the design:

- Design landscapes that do not necessitate irrigation beyond the establishment period.
- Utilize drip irrigation with moisture sensing technologies where irrigation is necessary, aiming to decrease water demand by at least 50%.
- Implement high efficiency irrigation system. This uses a subsurface drip irrigation method, where the drip lines are arranged in a grid pattern approximately 4 inches below the soil surface. The system delivers water directly to the plant roots throughout the year and is managed by a control system that provides the exact water needs based on the plant's hydrozoning requirements. Typically, the control system comes integrated with a weather monitoring system, allowing it to adjust water delivery in response to real time weather data, ensuring optimal water usage.
- Implement metering systems to monitor irrigation consumption.
- Choose low-maintenance exterior colours/materials that don't need a lot of washing
- Consider rain gardens _ a garden intended to slow water runoff. They capture and infiltrate water that typically would flow quickly over other manicured landscape types, such as lawns or paved areas. Their main purpose is to aid in storm water management including reducing flooding and removing water pollutants.

5.1.6 Process Water

Consider the following measures to reduce process water consumption and explain what appropriate resilience measures are incorporated in the design:

- Avoiding the use of open loop systems or evaporative cooling systems by voiding single-pass cooling and cooling towers
- Minimizing or eliminating unnecessary and significant water features.

5.1.7 Scheduling Water Usage

Consider the following strategies for water scheduling during the construction phase and explain what appropriate measures are incorporated in the design:

- Deploy scheduling systems to effectively coordinate water-intensive activities, such as concrete pouring and equipment cleaning, to minimize water usage during peak demand periods.
- Utilize real-time monitoring tools to track water consumption and adjust usage patterns accordingly, ensuring efficient resource allocation throughout the construction process.

5.1.5 Outdoor Potable Water

5.1.8 Monitoring and Prevention of Water Wastage

Consider the following strategies for preventing water wastage and explain what appropriate measures are incorporated in the design:

- Implement leak detection systems to promptly identify and address any water leaks within the construction site infrastructure.
- Conduct regular inspections of plumbing systems and equipment to identify potential inefficiencies and ensure proper maintenance practices are followed.
- Provide training for personnel to raise awareness about the importance of water conservation and encourage proactive measures to prevent wastage.

5.1.9 Integration of Technology for Water Conservation

Consider the following water conservation strategies and explain what appropriate measures are incorporated in the design:

- Utilize sensor-based systems, such as smart meters, flow technologies, and automated sensors, to optimize water usage by monitoring consumption in real-time.
- Incorporate water-efficient building design principles, including the use of high-performance building materials and rainwater harvesting systems, to minimize water demand throughout the building's lifecycle.

5.1.10 Pollution Prevention & Incidents

Consider evaluating the processes in the construction phase with the operation phase in mind for any potential sources of pollution and explain what appropriate measures are incorporated in the design. This includes:

- Forecast potential pollution sources during both phases – for example, runoff with oil/fuel from pavement going into storm drains.
- Outline necessary prevention measures to address identified sources.
- Discuss systems employed to prevent or minimize the impact of pollution.
- Propose corrective actions to be taken in response to each pollution incident.
- Proactively consider and addressing potential sources of pollution to mitigate environmental risks.
- Ensure compliance with regulatory requirements through effective pollution prevention measures.
- Conduct regular monitoring and evaluation of pollution prevention measures to maintain environmental integrity throughout the project's lifecycle.

5.1.11 Water Contingency Plan Development for Hospital Construction/ Operation

To ensure uninterrupted water supply during the construction and operation phases of the hospital, a comprehensive Water Contingency Plan should be developed. This plan will outline procedures for managing water supply disruptions, ensuring the facility's essential functions remain operational.

1. Assess Water Needs: Determine the hospital's critical water needs during both construction and operation phases, including potable water, sanitation, and cooling systems.

2. Identify Potential Disruptions: Identify risks to water supply, such as infrastructure failures, natural disasters, or supply chain issues.

3. Develop Response Strategies: Create protocols for short-term and long-term water supply interruptions, including alternative water sources, storage solutions, and emergency procurement procedures.

4. Establish Communication Protocols: Develop a communication plan to ensure all stakeholders are informed and prepared to act in the event of a water supply disruption.

5. Test and Review: Regularly test the contingency plan through drills and simulations, and update it as necessary to address emerging risks or changes in facility operations.

The standards and tools provided in the table below provides suggestions for best management practices for water management. It is important to perceive standards and tools as supplementary resources rather than the sole directive for environmental management practices within your project.

TABLE 1

Water Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Planning	Efficient Water Usage	Storm Water Management	Modeling for storm water, outdoor water use, and indoor water use for high water using fixtures, equipment and processes.	Consortium for Energy Efficiency – Design for efficiency
			Reducing reliance on external water sources and minimizing environmental impacts to enhance the long-term viability and reduce carbon footprint.	
	Outdoor Water Use Reduction	Reclaimed Water Management	Using captured rainwater, graywater and municipal reclaimed water sources for non potable water needs. [Water Efficiency LEED Credit]	Energy Policy Act (EPAct) of 1992 and as amended
				EPAct 2005
				IgCC/ASHRAE 189.1
		Cooling Tower	-Conducting a one-time potable water analysis, in order to optimize cooling tower cycles. -Opt for a thermal energy loop with heat pumps with a cooling tower as a backup system if needed	Reference [http://www.cti.org/whatis/coolingtowerdetail.shtml]
	Water Conservation	Develop Conservation strategies and measures that show improvements over the indicative design (baseline) and support key performance indicators.	Estimating whole building (indoor and outdoor) water use consumption (in m3/year)	International Code Council, International Plumbing Code 2006, Section 604, Design of Building Water Distribution System USGBC Indoor Water use calculator [http://www.usgbc.org/resources/indoor-water-use-calculator]
			Enabling ongoing tracking of water use relative to expected. System-level water meters for irrigation; domestic hot water; reclaimed water; boiler; other process water.	

TABLE 1 CONTINUED

Water Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Indicative Design	Efficient Water Usage	Plumbing and Fixtures	Where feasible considering the installation of metered faucets, foot pedals, and automatic motion sensors, particularly in clinical sinks, dirty utility sinks, and public washrooms.	CSA Z317.1-16 should be followed, which includes plumbing installation design, construction, commissioning, operation and maintenance requirements
			Review dual-flush features for macerators with bedpan washers.	International Association of Plumbing and Mechanical Officials, Uniform Plumbing Code (UPC)
			Select faucet and sink designs, subject to health organization guidance, that work effectively and efficiently for the cleaning of hands while restricting splashing and the spread of aerosols. [Water Efficiency LEED Credit]	
		Process Water	Prioritize closed-loop systems instead of open-loop systems in processes like cooling towers and steam boilers	•Energy Policy Act (EPAct) of 1992 and as amended •EPAct 2005 • IgCC/ASHRAE 189.1
			Recover non-potable condensate in expansion tanks for reuse in heating and cooling processes and other operations to reduce potable water make-up and water-tempering demand	
			Consider maintenance-free steam traps for steam systems.	
			Install water meters to support monitoring and identification of further process optimization opportunities	
			Consider alternative treatment systems that use less water in comparison to conventional water purification systems	
			Consider dialysis units that can recycle, treat and reject water through reverse osmosis for use in irrigation	
			Avoidance of once-through cooling (OTC) equipment that uses potable water in a single pass as a cooling medium	
			Utilize where possible dry and adiabatic coolers over cooling towers in order to reduce water consumption and reduced legionella risks	

TABLE 1 CONTINUED

Water Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Indicative Design	Irrigation	Outdoor Water Use Reduction	Install smart irrigation systems with automated controls to adjust based on weather	International Code Council, International Plumbing Code 2006, Section 604, Design of Building Water Distribution System
			Consider using non-potable sources for irrigation (Reclaimed Water, Graywater, Refrigeration system condensate, Captured Rainwater) [http://www.energystar.gov/buildings/about-us/how-can-we-help-you/benchmark-energy-use/useenergy-star-benchmarking-tools]	
	Landscape	Outdoor Water Use Reduction	No irrigation required Landscaping [Water Efficiency LEED]	-
			Landscape water requirement (LWR) must be reduced by at least 30% from the calculated baseline for the site's peak watering month. [Water Efficiency LEED]	EPA WaterSense Water Budget Tool. [http://www.epa.gov/WaterSense/water_budget/]
			Install native, adapted or draught tolerant landscaping that reduces or eliminates the need for irrigation. [Water Efficiency LEED Credit]	
Procurement	Purchasing	Equipment	Laundry Machines: Install front-loading	ENERGY STAR models, CEE Tier 3A
			Icemakers	ENERGY STAR models
			Dishwashers	ENERGY STAR models, Select conveyor-type with load sensors
			Food Steamers	ENERGY STAR models or boiler-less models[http://www.energystar.gov/buildings/about-us/how-can-we-help-you/benchmark-energy-use/useenergy-star-benchmarking-tools]

TABLE 1 CONTINUED

Water Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Procurement	Purchasing	Fixture and Fitting	Low flow and ultra low flow plumbing fixture (toilet, shower head, faucets and urinals)	Purchase Equipment with WaterSense label [http://www.epa.gov/watersense/] Healthcare sinks flow requirements as dictated by CSA Z800-18
			Dual Flush (toilet)	Purchase Equipment with WaterSense label
			Composting (toilet)	

5.2 Healthy Materials and Waste Management Plan

This section should detail BMPs for the management of waste and selection of healthy materials, aimed at optimizing the sustainability and safety of the project. This includes the design and implementation of accessible waste management infrastructure for construction and operation as well as the careful selection of material and control of construction waste materials. Both sections should encompass all considered and non-applicable strategies and controls that were under investigation for the project.

As part of the early design of the project, the following strategies should be considered for incorporating well-designed and accessible waste management infrastructure, and selection of healthy material for construction. This section is divided into two subdivisions: Waste Management and Healthy Materials.

5.2.1 Waste Management

Describe the overall BMPs as outlined in Table 2 to be implemented for sustainable waste practices, considering waste reduction in building demolition, construction, and ongoing operation of the project. General material and waste management strategies for healthcare building construction and planning include but not limited to:

5.2 Healthy Materials and Waste Management Plan

This section should detail BMPs for the management of waste and selection of healthy materials, aimed at optimizing the sustainability and safety of the project. This includes the design and implementation of accessible waste management infrastructure for construction and operation as well as the careful selection of material and control of construction waste materials. Both sections should encompass all considered and non-applicable strategies and controls that were under investigation for the project.
As part of the early design of the project, the following strategies should be considered for incorporating well-designed and accessible waste management infrastructure, and selection of healthy material for construction. This section is divided into two subdivisions: Waste Management and Healthy Materials.

5.2.1 Waste Management

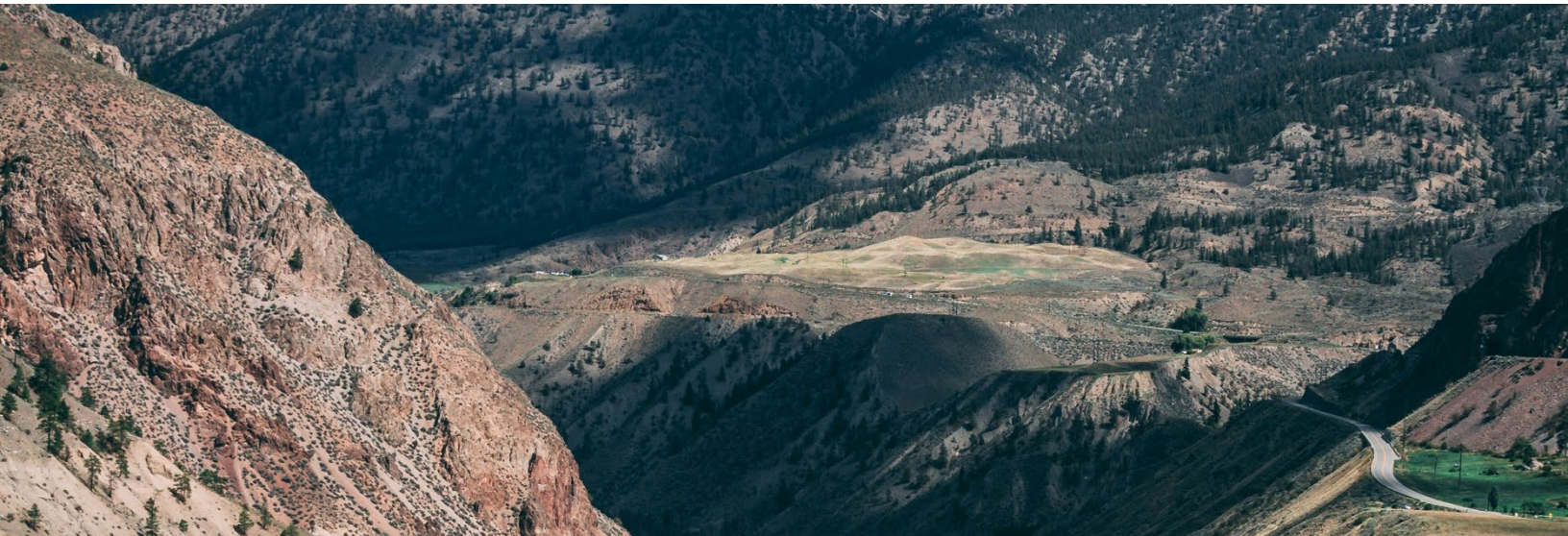
Describe the overall BMPs as outlined in Table 2 to be implemented for sustainable waste practices, considering waste reduction in building demolition, construction, and ongoing operation of the project. General material and waste management strategies for healthcare building construction and planning include but not limited to:

5.2.1.1 Develop a Target Specific (ex. >50% reduction) or Zero Waste Plan

Consider developing a Zero Waste Plan aiming to minimize waste generation, maximize resource recovery, and foster a culture of sustainability within the target campus/facility. Waste reduction goals are to be achieved through assessment, planning, and proactive execution, ensuring compliance with relevant regulations and adoption of best practices in waste management. Management, staff, contractors, and suppliers should be encouraged to explore ways to minimize the amount of waste generated at the work site. The following practices could be employed to reduce the amount of waste produced on site:

- Operational waste flow modeling for hazardous and non-hazardous waste types, including
- Estimate kilogram waste generated, Waste Intensity (kg/m^2, kg/FTE, kg/Total Inpatient), Waste Cost Intensity ($/m^2, etc.), and Waste Diversion rate (%)
- Model movement through collection points and final disposal before hauling from the facility.
- Model waste flow generation to identify reduction strategies according to the waste hierarchy.

Developing Zero Waste Plan has 4 stages. Explain the measures taken and provide documentation for each stages as applicable to the project. Further details are provided below.



Assess Baseline Zero Waste

Conduct a Zero Waste analysis of the target facility to understand and inform Zero Waste Plan development. During the process;

- Identify relevant regulations
- Incorporate the regulations into the Zero Waste Plan
- Identify Waste Diversion Goals

Identify Zero Waste Best Practices

All project phases (e.g. design, deconstruction, construction, commissioning and operations) should be considered for each best practice. Develop and deliver best-practices for:

- Environmentally Preferable Procurement
- LEED credit option identification: The project needs to achieve a minimum of 75% diversion rate in construction and demolition waste.
- Deconstruction / Salvage
- Diversion of Recyclable Materials
- Greenhouse Gas Reduction Initiatives
- Investing into Circular Economic Principles (Reusable Alternatives & Solutions)

Construction Waste Diversion: Develop Construction waste reduction strategies for both demolition/deconstruction of any existing facility and building for deconstruction at the end of life should also be considered. The goal is to design in such a way to maximize material recovery, reuse and minimize consumption of raw materials (Additional information on this concept is available in section 5.2.1.2).

Develop Reporting Requirements and Waste Diversion Goals

Explore practices on how waste streams are being recorded. Support this description with proof of the analysis. Record keeping should be aimed at;

- Identification of Waste Sources including Biomedical waste
- Quantification of Waste
- Analysis for Improvement
- Compliance Monitoring
- Accountability and Responsibility

For example, the construction Waste Diversion report must contain the calculated amount of the following:

- Total Waste Generation
  - Construction
  - Operations
- Waste Intensity
  - Operations
- Waste Diversion
  - Construction
  - Operations
- GHG Emissions and Savings from Waste
  - Construction
  - Operations

Design the Waste Management System

Identify the gross area of the facility and the anticipated number of staff, patients and visitors per day.

- Identify potential future innovations and be mindful of space for future waste management innovation i.e. bio-digesters in kitchens, additional compactors/totes in loading doc.
- Identify space-use guidelines for interior waste bins and loading area equipment (e.g. biomedical/pharmaceutical waste, cardboard, paper, organics, garbage compactors, front load bins and totes). As well as safety cabinets for storage of sealed hazardous liquid wastes awaiting pickup.
- Identify the space requirements for holding stock of reusable and recyclables. Including Reusable masks, sharps bins and refrigerators for anatomical waste if held on site for a period of time.
- Identify the interim waste storage on each floor and transport logistics throughout the campus.
- Calculate estimated costing for recommended equipment for inclusion in the Business Case

5.2.1.2 Design for Deconstruction/Disassembly

Consider the principles of Designing for Deconstruction. Designing for deconstruction is a principle that emphasizes creating products, structures, or systems with the intention of facilitating their disassembly and reuse of components or materials at the end of their lifecycle. Appropriate strategies include but not limited to:

- Using modular components: This strategy emphasizes the use of interchangeable components in product design, which allows for repairs instead of replacements.
- Standardizing connections and fasteners
- Choosing durable, recyclable, and non-toxic materials
- Maintaining detailed records and documentation
- Simplifying designs
- Minimizing use of permanent adhesives consider mechanical fastening if possible
- Designing flexible/upgradable building systems
- Employing layered construction techniques: One key strategy to maximize asset utilization in buildings is by leveraging the concept of shearing layers (see Figure 1). This concept, developed by architect Frank Duffy, describes how buildings are composed of various layers that evolve at different paces over time. Shearing layers is a concept used in architecture to describe how buildings are made up of several layers that change at different rates over time by understanding how different parts of a building age and need replacement at different times. The concept divides a building into six layers, each with a different lifespan and likelihood of needing changes.

5.2.1.3 Use of Recycled Materials

Consider the use of recycled materials in all phases of construction and operation. The innovative use of recycled materials in the design and construction of healthcare facilities not only promotes sustainability but also enhances environmental stewardship, creating healing environments that prioritize both patient well-being and the planet's health. Appropriate strategies include:

- Use recycled content in building materials
- Incorporate reclaimed materials
- Source materials from sustainable suppliers
- Prioritize materials with high post-consumer content
- Utilize recycled materials for landscaping and site features
- Implement closed-loop recycling processes on-site
- Choose materials certified for environmental sustainability
- Design for future recyclability/disassembly
- Use materials which are multi functional serving multiple functions or structural materials that do not require applied finishes.
- Standardize waste containers across the facility for each applicable waste streams

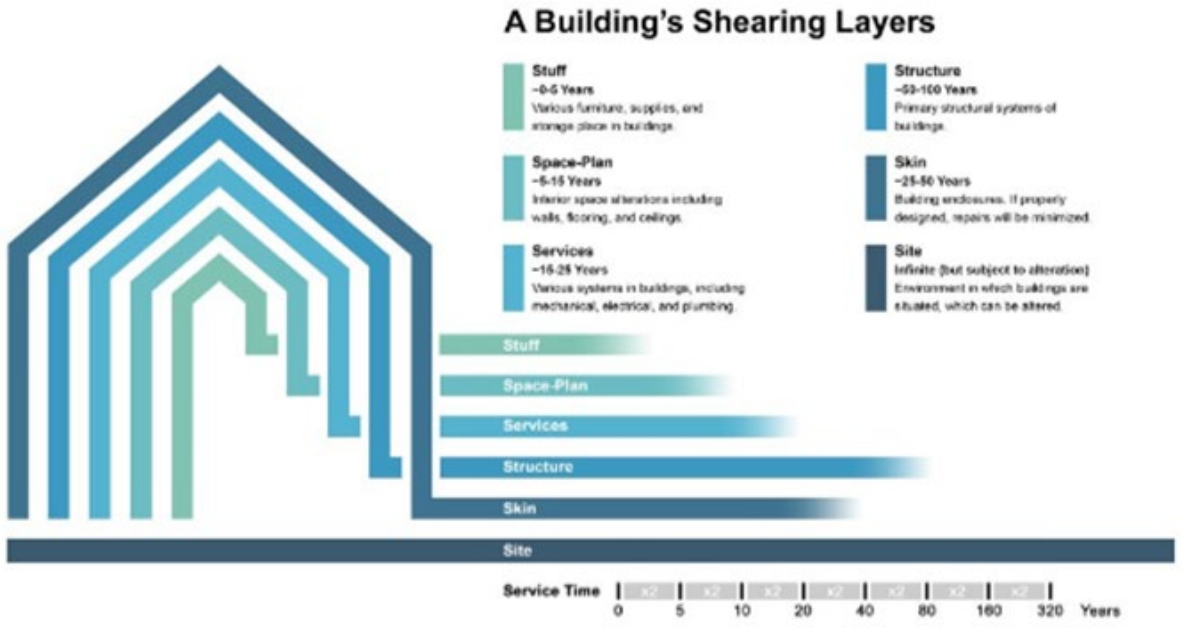


Figure 1: Building element service time from building enclosure, Feb.22, Daniel Overbey[4]

[4] https://www.buildingenclosureonline.com/

5.2.1.4 Materials Reprocessing

Consider employing strategies in the early planning stages that include transforming waste into new resources. These strategies may be limited by space constraints in the facility's design. Despite this, alternative waste management strategies should be explored to minimize environmental impact, such as recycling or waste-to-energy processes. Continuous evaluation should seek opportunities to integrate reprocessing in the future, ensuring sustainable resource recovery. For further information refer to Appendix J of LCRES guideline. Appropriate strategies to be explored for the project include:
It should be noted that waste to energy is at the bottom of the waste solution hierarchy (see Figure 2), with recycling midway. It is important to understand different approaches to waste management but while waste-to-energy has its place, it is not the primary goal of a zero waste strategy.

- Implementing recycling programs – consider allocating space for different recycling bins throughout the facility and a centralized storage/collection area
- Exploring waste-to-energy processes
- Conducting continuous evaluation of waste management practices
- Prioritize reprocessing opportunities as if space allows as hospital practices are moving away from single-use consumables to more reusable. Space considerations is an important factor.
- Optimizing storage and processing areas required to store the reusable stock within space constraints
- Developing partnerships with external recycling and reprocessing facilities which align with organizational values and can provide support that the waste is managed ethically.
- Utilizing compact waste treatment technologies
- Regularly updating waste management plans based on space availability and technological advances

Figure 2: The waste solution hierarchy[5]

[5] https://www.buildingenclosureonline.com/

5.2.1.5 Prefabrication and Modular Construction

Consider Prefabrication and Modular Construction for the Project. These methods involve manufacturing building components off-site before transporting them for assembly. They offer advantages such as reduced construction time, improved quality control, and minimized waste generation.

5.2.1.6 Waste Recovery, Reprocessing and Recycling Spaces:

Consider identifying opportunities for waste reduction and recycling, including:

- Identifying reusable medical devices and food service ware, potentially requiring additional spaces for reprocessing and storage.
- Ensuring waste rooms are adequately sized and equipped to collect various waste streams like garbage, glass, mixed containers, mixed paper, organics, batteries, mercury-containing lamps, and large items and biomedical and PPE recycling waste streams.
- Incorporating provisions for anesthetic gas scavenging in trauma/resuscitation rooms and labor, delivery, recovery, and postpartum (LDRP) suites.
- Considering onsite organics management to handle organic waste generated within the healthcare facility. Note that this may require additional kitchen space for organic waste management infrastructure and consideration must be taken for on-site processing that may not be able to handle "compostable" plastics which need sufficient residence time and heat
- Promoting resource recovery and reducing environmental impact.
- Providing necessary infrastructure for reprocessing and recycling various materials such as reusable linens, glass, paper/cardboard, metal, and wet waste onsite and encouraging participation.
- Ensuring bins are clearly labelled and site employees educated on the segregation requirements.
- Managing construction waste effectively across demolition and construction phases.
- Allocating funds for shipping materials to appropriate receiving facilities equipped for recycling processes. Consider the travel related emissions when choosing these facilities.
- Scaling or extending collection and storage facilities to accommodate specific requirements based on the project's location.

Construction waste management is detailed across demolition and construction phases as described in the following subsections.

5.2.1.7 Develop Demolition Plan

This section should describe plans for environmental impacts of demolition. The environmental impact of demolition and deconstruction of the project should be considered with the following objectives;

- Better understand and calculate the environmental impact of the demolition and deconstruction of the buildings associated with the construction of this phase of the project.
- Recommend environmental impact reduction measures to reduce the impact compared to business-as-usual.
- Calculate the improvement if reduction measures are included.
- Better understand implementation steps, requirements, and potential issues.
- Provide numerical data to enable analytical decisions and comparisons.
- Include considerations for the Circular Economy, Business as Usual practices, and Emission Reduction strategies.
- Outline specific Next Steps tailored to the site, producing plans for deconstruction or demolition where applicable.

5.2.2.8 Construction Waste

Describe how construction waste will be managed. Consider reducing the construction and demolition waste disposed of in landfills and incineration facilities and describe the policies and practices that are being used during the disposal and transportation of waste. Construction should consider guidance outlined in the LCRES including;

- Seeking to reduce materials through consideration of prefabrication
- Designing for disassembly wherever feasible.
    - Design for easy refurbishment of isolated materials. Consider materials that can be easily replaced or refurbished individually i.e. floor tiles that can be replaced without having to lift the entire floor.
    - When designing for disassembly design components to be fixed together with reversible means such as mechanical fixings avoiding permanent bonding methods such as gluing or composite materials.
    - Consider services over products. i.e. lighting as a service rather than buying individual light fixtures. Suppliers providing services are more likely to manage end-of-life materials and equipment, extending their lifespan and minimizing waste.
- Developing a Demolition/Deconstruction Waste Management Plan (CDMW); more information regarding CDMW - A comprehensive CDWM plan is required to enable the efficient sorting, storage, and logistics of demolition waste. The plan should aim for a 90% diversion rate, meaning that 90% of the waste generated should be diverted from landfill through recycling or reuse.
- Penalties for Non-Compliance in tender documents
- Penalties can be explored as a deterrent for not complying with the construction demolition waste management plan as an incentive for goals to be met.

The CDWM plan should include:

- Assessment of the quantity of the different materials.
- Type of management (reuse, recycle, disposal) for each material in order to achieve the targeted diversion rate.
- Sorting: Waste materials should be sorted into different categories (e.g., concrete, asphalt, granular materials, etc.) to facilitate recycling or reuse.
- Storage: Sorted materials should be stored safely and efficiently to prevent contamination or degradation.
- Logistics: The transportation of waste materials should be planned to minimize environmental impact.
- Diversion Goals: The plan should clearly state the goal of achieving a 90% diversion rate and outline the strategies to achieve this goal.
- Education plan for workers which include reusable options for on-site materials, C&D waste segregations, this education plan should be integrated like partnership with the workers.

5.2.2 Healthy Materials

Choosing healthy materials for healthcare facility construction, operation and maintenance is essential for promoting patient well-being, controlling infections, safeguarding staff health, minimizing environmental impact, ensuring regulatory compliance, and achieving long-term cost savings. By selecting materials that are free from harmful chemicals, easy to clean and disinfect, and environmentally sustainable, Long lasting, healthcare facilities can create safer, healthier environments for patients and staff, while also reducing their ecological footprint and long-term operational costs.

5.2.2.1 Planning Based on Best Practices

Consider following the best practice guidance outlined in the LCRES including the following:

- Interior finishes and furnishings free of the following chemicals:
    - Formaldehydes
    - Per- and poly-fluorinated compounds (PFAs)
    - Polyvinyl chloride (PVC) (where avoidable)
    - Halogenated flame retardants
    - Mercury, lead, cadmium, copper (where avoidable)
- Avoid (where avoidable) the use of chemicals listed in Appendix K of LCRES guideline: Construction Safe Chemicals Resource of the LCRES Guidelines.
- Interior paints, coatings, adhesives, sealants, composite woods, roofing and waterproofing materials, wall coverings, flooring, and furnishings should meet the applicable LEED version for Healthcare Low Emitting materials Credit in line with LCRES Guidelines.
- Consider Other Best Practices such as LBC Red List: The International Living Future Institute (ILFI) has developed a materials 'red list' through the Living Building Challenge (LBC) which goes one step further than LEED and prohibits the use of certain known carcinogens in any product used within the building, with some certain exceptions for lifesafety or unavailability. Particularly in a healthcare setting, FHA may wish to familiarize themselves with the Red List and consider incorporating certain categories or requirements as appropriate.

5.2.2.2 Avoid Health and Environmental Risks

Consideration should be given to the usage and purchase of identified Health and Environmental Risks. Health and environmental risks include but not limited to the following:

- Carcinogen
- Endocrine disruption (EDC)
- Reproductive/development/neurological dysfunction
- Skin and respiratory sensitivity (S&R)
- Persistent, bio accumulative and toxic (PBT)
- Red-list free materials- Considered too inflexible for remote project where materials may need to be sourced based on availability and maintainability.
- Pre-occupancy air quality testing

5.2.2.3 Product Disclosure and Optimization

Consider using products and materials that have life-cycle information available and are environmentally, economically and socially preferred. Choose products verified to have been extracted or sourced in a responsible manner.

- Select products for which the environmental impacts are well known because of industry standard-life cycle information and reporting protocols.
- Use Environmental Product Declarations (EPDs) that come from program operators who follow the ISO standards.

5.2.3.5 Low Carbon Materials

Considering using low carbon materials in healthcare facilities that can significantly contribute to waste reduction efforts by minimizing the environmental impact of construction and operations. Prioritize materials with lower embodied carbon emissions throughout the facility's lifecycle, such as sustainable building materials and energy-efficient equipment, healthcare facilities can mitigate greenhouse gas emissions and resource depletion while promoting sustainable practices.

Low carbon material goals can be achieve by the following strategies.

5.2.2.4 Decarbonisation

Consider including the following design actions as a means of reducing carbon:

- Consider utilizing mass timber construction wherever feasible in line with ESGFC objectives
- Consider utilizing locally milled wood cladding
- Consider utilizing metal roofs due to their durability, low maintenance, fire resistance, and potential for energy savings through high reflectivity.
- Avoid the use of XPS insulation and consider utilizing Rockwool or poly-iso insulations as lower carbon alternatives

5.2.2.5 Life Cycle Assessment (LCA)

Whole Building Life Cycle Assessment (WBLCA) should be taken place to continually evaluate strategies for reducing GHG emission as well as embodied carbon by a minimum of 10% according to LCRES best practices. Different alternative design strategies will be considered in WBLCA to support decision making and minimum emission reduction target are to be supported by LCA results. Consider

- Developing LCA at Design Development, Construction Document, and Post-Tender/ Issued for Construction (IFC) stages to validate performance. LCA procedure and proposed scope should follow Appendix I of LCRES Guideline.
- Committing to early concept optimization and LEAN detailed design is critical.
- Efficient structural use of concrete.

5.2.2.6 Reduce Embodied Carbon

Consider the following strategies for reducing embodied carbon for construction of the health facility.

- Prevent
  - Consider alternative strategies for delivering the desired function, such as increasing utilization of existing assets through renovation or reuse or eliminating entirely.
- Reduce and Optimize
  - Apply design approaches that minimize the quantity of new material required to deliver the desired function, including reusing building elements or materials.
  - Prioritize materials which are low or zero carbon, responsibly sourced, and which have low lifecycle impact in other areas, including the health of the occupant, as determined through a product specific environmental product declaration where available.
  - Choose low or zero carbon construction techniques having maximum efficiency and minimum waste on site.
- Plan for Future
  - Consider future use scenarios and end of life, maximizing the potential for maintenance, repair and renovation, and ensure flexibility for future adaptation.
  - Choose durable products that last for the service life and beyond. Design for disassembly and deconstruction to facilitate future reuse, selecting materials which can be recycled and which can be extracted and separated easily for processing.

5.2.2.7 Long Term Durability and Sustainability

Long-term durability and sustainability of the building would decrease future costs and carbon footprint of the building and operation. Consider the following:

- Resilient finishes (polished concrete vs. carpet tiles) to support long-term interior finish durability.
- Prioritize reparability, utilizing materials and assemblies that are easy to source and maintain without requiring extensive disassembly.

The standards and tools provided in the table below provides suggestions for best management practices in their respective fields. It is important to perceive standards and tools as supplementary resources rather than the sole directive for environmental management practices within your project.

TABLE 2

Waste Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Planning and Design	Zero waste planning	Implement the Zero Waste Solution Hierarchy. Minimize waste generation, maximize resource recovery, and foster a culture of sustainability within the target campus/facility.	Operational waste flow modeling for hazardous and non-hazardous waste types, including estimates of kilograms generated, movement through collection points, and final disposal before hauling from the facility.	Whole Building Design Guide (WBDG), EPA Waste Hierarchy
			Waste flow and generation modelling to identify reduction strategies according to the waste hierarchy.	
			Assess Baseline Zero Waste	
			Identify Zero Waste Best Practices	
			Develop Reporting Requirements and Waste Diversion Goals	
		Design the Waste Management System	Identify space-use guidelines for interior waste bins and loading area equipment (e.g. Biomedical waste / cardboard / paper / organics/ garbage compactors, front load bins and totes).	
			Identify the interim waste storage on each floor and transport logistics throughout the campus.	
			Calculate estimated costing for recommended equipment for inclusion in the Business Case	

TABLE 2 CONTINUED

Waste Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Planning and Design	Waste Prevention	Source reduction strategies during design and construction phases: Design for Deconstruction	Incorporate well-designed and accessible waste management infrastructure	U.S. EPA Recycling[http://www2.epa.gov/recycle/recycling-basics]
		Use of Recycled Materials	Identify storage areas, recycling facilities, haulers	
		Prefabrication and Modular Construction	Have disposal procedures for hazardous materials	
		Waste Sorting and Recycling	On-site infrastructure, practices, and policies for off-site sorting:	
		Construction and demolition Waste Management Plan	Reduce construction and demolition waste disposed of in landfills and incineration facilities: At least 3-4 material streams	European Committee for Standardization, and European Commission Waste Framework Directive 2008/98/EC
			Recover, reuse, and recycle materials :Reuse on site, salvage, donate to charities etc.	
			waste management pan	
	Decarbonisation	Life Cycle Assessment (LCA)	Design team should include Life Cycle Assessment process to continually evaluate strategies for reducing embodied carbon by a minimum of 10% [reference: LCRES best practices].	ISO 14044, National Register of Historic Places, Secretary of Interior's Standards for the Treatment of Historic Properties
			LCA should be developed at Design Development, Construction Document, and Post-Tender/ IFC stages to validate performance.	Appendix I of LCRES Guideline

TABLE 2 CONTINUED

Waste Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Planning and Design	Decarbonisation	Reducing carbon: Low Carbon Materials	Utilize mass timber construction wherever feasible in line with ESGFC objectives	A cradle-to-grave Life-Cycle Assessment for new construction projects -
			Utilize locally milled wood cladding	
			Avoid the use of XPS insulation (utilize Rockwool or poly-iso insulations as lower carbon alternatives)	
			prioritizing materials with lower embodied carbon emissions throughout the facility's lifecycle	
		Composting Organic Waste	Have organic waste management available throughout the facility with supportive logistics, pest and odor control in place. Consider on-sire organic waste management.	
Procurement	Healthy material	Environmentally Preferable Purchasing	All finishes and furnishings should be free of the following chemicals: Formaldehydes, Per- and poly-fluorinated compounds (PFAs), Polyvinyl chloride (PVC) (where avoidable), Halogenated flame retardants, Mercury, lead, cadmium, copper (where avoidable)	U.S. EPA Environmentally Preferable Purchasing (EPP):[http://www.epa.gov/epp/] Appendix K: Construction Safe Chemicals Resource of the LCRES Guidelines.
			Interior paints, coatings, adhesives, sealants, Composite woods, Roofing and waterproofing materials, wall coverings, flooring, and furnishings should meet the LEED v4 for Healthcare Low Emitting materials Credit in lone with LCRES Guidelines	
			Project team should review and consciously avoid (where avoidable) the use of chemicals listed in Appendix K.	

TABLE 2 CONTINUED

Waste Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
	Product Disclosure and Optimization	Sourcing of Raw Materials	Use of responsibly sourced and extracted materials through reporting and demonstration of responsible extraction practices. Check corporate sustainability reports (CSRs). Choose reused and recycled materials. Encourage local sourcing.	Global Reporting Initiative, Corporate Sustainability Report (CSR)
				OECD Guidelines for Multinational Enterprises
				U.N. Global Compact, Communication of Progress
				ISO 26000 -2010; 14021-1999; ASTM Test Method D6866
				Forest Stewardship Council; The Rainforest Alliance
				Sustainable Agriculture Network
			Encourage use of products and materials that have life-cycle information available and are environmentally, economically and socially preferred. Choose products for which the chemical ingredients in the product are inventoried and verified to minimize the use and generation of harmful substances. Reward raw material manufacturers who produce products verified to have improved life-cycle impacts.	ISO 14021-1999; 14025-2006; 14040-2006; 14044-2006; 21930-2007,
		Environmental Product Declarations (EPD)	Encourage use of products and materials that have life-cycle information available and are environmentally, economically and socially preferred	Cradle-to-Cradle Certified TM; REACH; Green Screen
				ISO 14021-1999; 14025-2006; 14040-2006; 14044-2006; 21930-2007,
			Reward project team for using products with verified improved environmental impacts	CEN EN 15804-2012
			Use EPDs that come from program operators who follow the ISO standards	FTC, Guides for the Use of Environmental Marketing claims

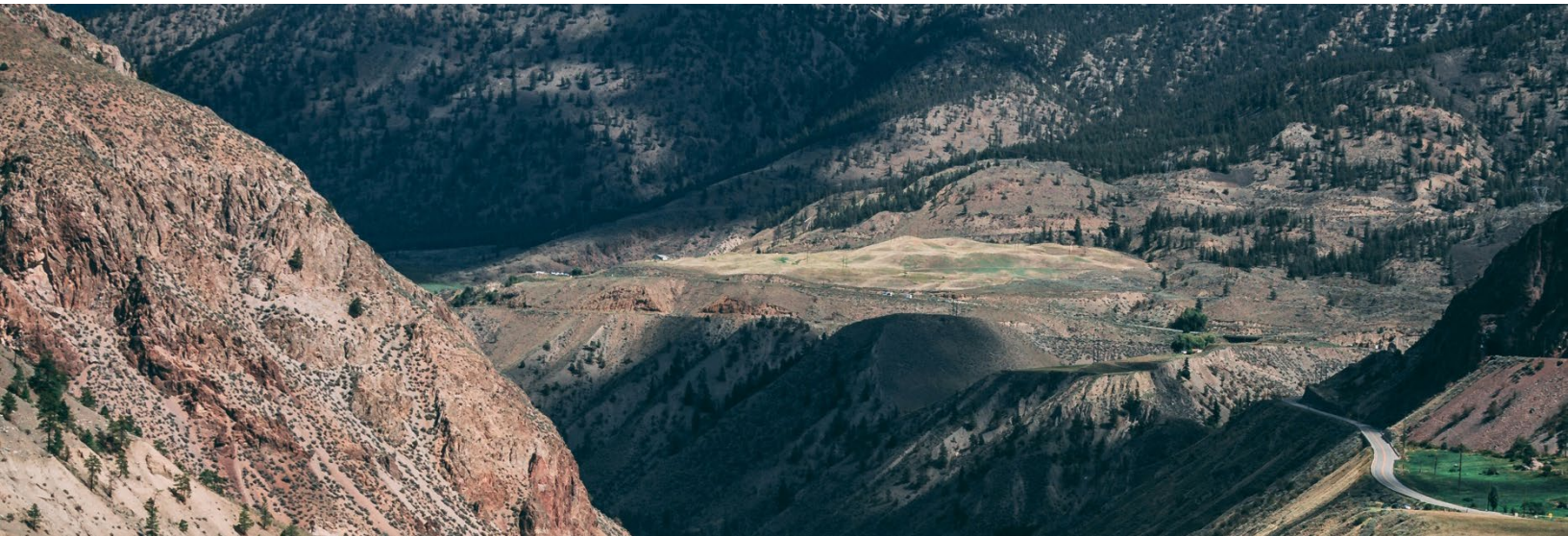
5.3 Transportation Management Plan

This section should include the strategies considered for incorporating a well-designed and accessible transportation system as part of the early design of the project. The purpose of the following sub-sections is to provide recommendations for a sustainable transportation system, emphasizing active and clean transportation modes, and incorporating design measures tailored to user demand and site.
The transportation plan should prioritize active and low-emitting modes of transportation and be pushing in this direction (rather than just providing what is necessary for the current status quo). In addition, transportation includes staff, visitor and patient travel, as well as travel associated with health care operations, such as courier and transport, fleet vehicle use, and staff travel for business purposes.

5.3.1 High-Priority Site

It is strongly advised that the project be situated within an infill location in a historic district, a priority-designated area, or a brownfield site to accomplish the following objectives:

- Enhanced Surrounding Density and Diverse Uses
- Foster walkability and optimize transportation efficiency, thereby minimizing vehicle miles traveled
- Promote public health through the encouragement of daily physical activity
- Preserve land resources and safeguard farmland and wildlife habitats by favoring development in areas with existing infrastructure
- Promote development in areas with proven multimodal transportation options
- Mitigate greenhouse gas emissions, air pollution, and other environmental and public health risks



5.3.2 Promote Active Transportation: Bicycle Facilities

Consider the following strategies to promote Protected and Active transportation in the project:

- Designing a Bicycle network connecting to:
  - 10 diverse uses;
  - A school or employment center; or
  - Transit system
  - Bicycle Storage and Shower Rooms - Secure and covered (ideally inside and not visible from outside)
    - Bike storage + Showers for building occupants
    - Bicycle storage should include outlets to facilitate charging of E-bikes.
    - Prioritizing horizontal storage to
    - Designing based on the needs for visitor bicycle storage.
    - Including considerations for storage and charging of e-mobility (E-scooters, e-bikes, etc.)

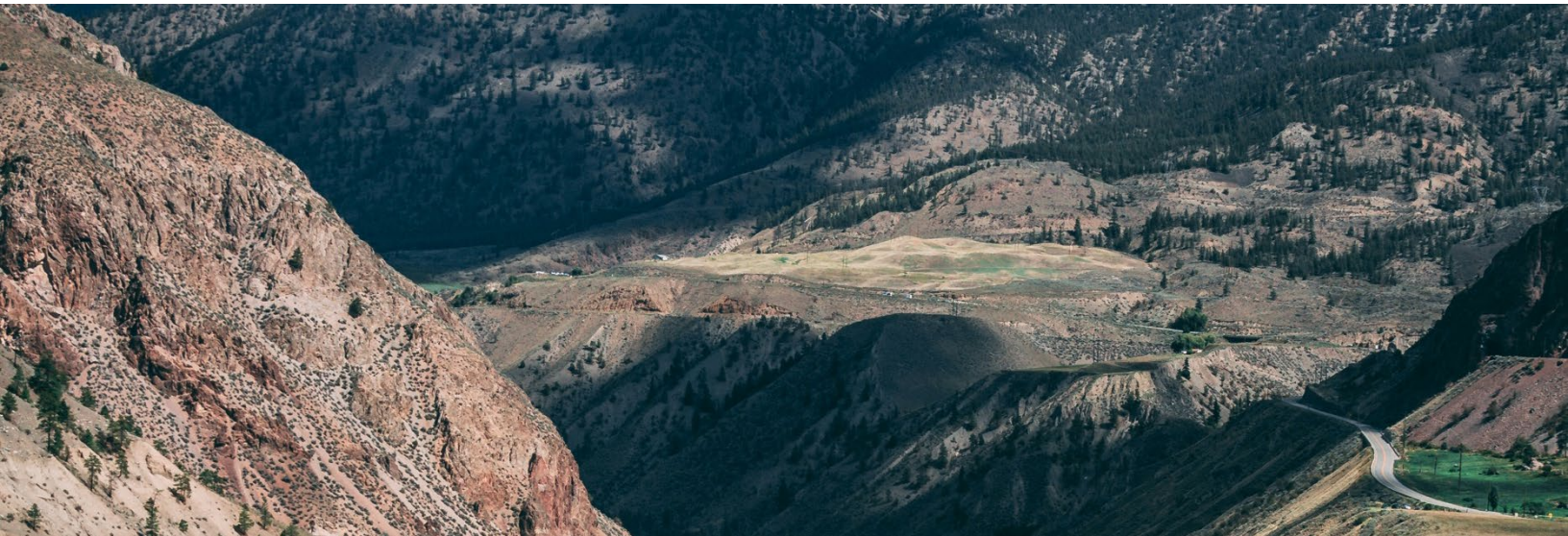
Further information can be in Appendix L of LCRES guidelines.

It should be noted that the transportation needs are dependant on site location and are going to be unique. Transportation Management Plan must pay attention to the sites where active transportation is NOT accessible (i.e. due to location and connectivity), and focus on how the greater emphasis could be put on low-emitting/electric modes of transportation.

5.3.3 Reduce Parking Footprint

Consider minimizing the parking footprint to reduce the environmental harms associated with parking facilities. Strategies and associated environmental impacts include but not limit to;

- Evaluate project parking needs to avoid “oversupply” of parking
- Land consumption: By minimizing the space allocated to parking, there is less pressure to convert natural or undeveloped land into paved surfaces, helping to conserve ecosystems and prevent habitat loss.
- Rainwater runoff: By minimizing the size of parking lots, there is less impervious surface area, which reduces storm water runoff and helps prevent water pollution.
- Preservation of Green Space: Minimizing parking footprint allows for the preservation of green space, which supports biodiversity, provides habitat for wildlife, and enhances air quality by absorbing carbon dioxide and producing oxygen.
- Less Heat Island Effect: Large expanses of asphalt in parking lots contribute to the urban heat island effect, where cities are significantly warmer than surrounding rural areas. Minimizing parking footprint reduces this effect, mitigating heat-related issues and lowering energy demands for cooling.
- Lower Energy Use: Smaller parking facilities require less lighting and ventilation, leading to reduced energy consumption and lower greenhouse gas emissions.
- Promotion of Alternative Transportation: With limited parking space, there is greater incentive for people to use alternative modes of transportation such as walking, cycling, or public transit, which further reduces carbon emissions and traffic congestion.
- Orientation of site building: close to curb rather than behind parking lot to promote walkability and pedestrian safety



5.3.4 Reduce Single Occupancy Vehicle (SOV) Use

Consider strategies to reduce single occupancy vehicle (SOV) use by encouraging people to use alternative modes of transportation or to share rides. Here are some effective approaches to consider:

- Designate “preferable” parking spaces for use as Carpooling spaces.
- Consult with site TDM partners to know if a carpool program will be available at that site
- Consult with staff to identify any current or future plans for fleet vehicles.
- Explore oversizing of space for future potential parking of community shuttles (large van or otherwise).
- Explore available carshare programs such as mobile applications that helps encourage carpooling in the area (Won't necessarily impact design, but will impact reliance on other transportation modes)

5.3.5 Vehicle Electrification

Consider reducing air pollution and GHG emission by promoting alternative to conventionally fueled automobiles. Project should meet ESGFC EV Readiness Guidelines requiring 25% of parking spaces to be EV Ready.

- If fleet vehicles provided with parking, 50% of fleet vehicle must be EV Ready.
- All accessible stalls must be EV Ready.

5.3.6 Consider Future Transit Infrastructure

Consider the future transit infrastructure needs in the design and planning by;

- Developing a robust Transportation Demand Management (TDM) plan
- Consider analyzing WHERE staff will be commuting from. This is pivotal in the understanding of travel needs.
- Assessing the population threshold required to support expanded transit services and infrastructure, including the immediate necessity for bus shelters and future considerations.
- Expanding Pedestrian Networks
- Evaluate the need for new sidewalks based on project population and prioritize the development of pedestrian-friendly infrastructure.

The standards and tools provided in the table below provides suggestions for best management practices in their respective fields. It is important to perceive standards and tools as supplementary resources rather than the sole directive for environmental management practices within your project.

TABLE 3

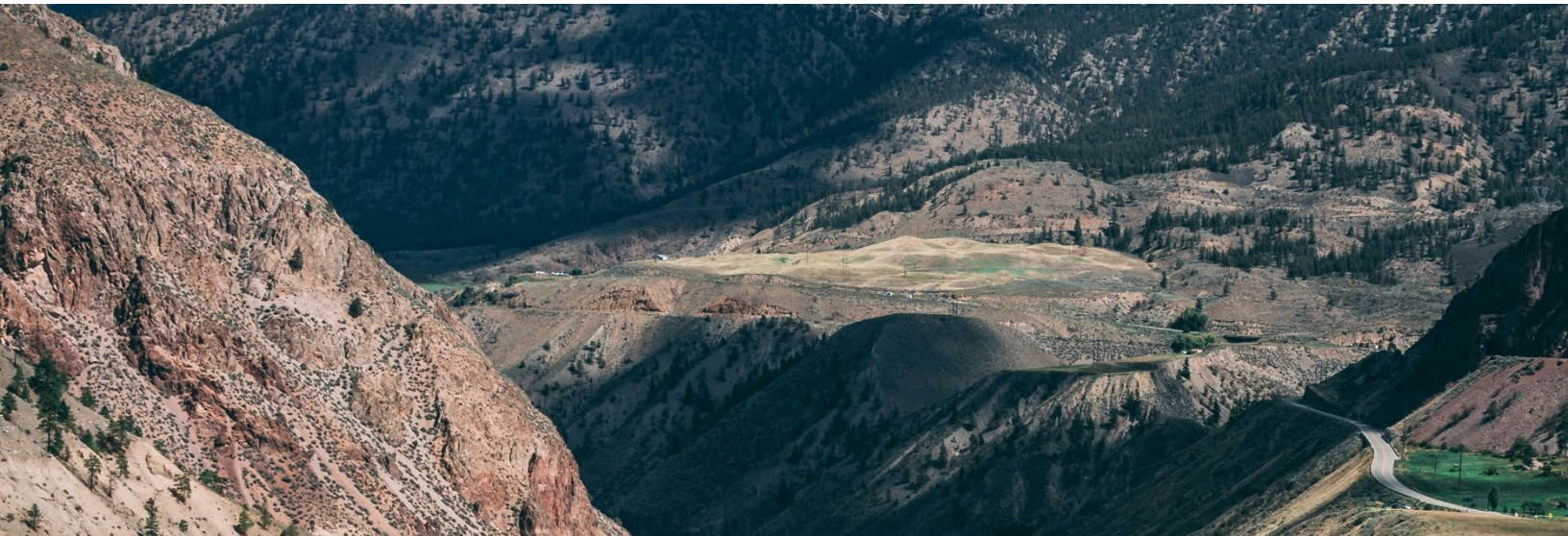
Transportation Management Plan BMP References and Standards

Stage	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Planning and Design	Site Selection	It is recommended that the project be located on Infill location with Priority designation	Infill location in a historic district	-
			Infill brownfield site	
	Electrification	Encourage electrification	Electric vehicle charging OR Liquid, Gas, or Battery Facilities	American Council for an Energy Efficient Economy (ACEEE)
			For 5% of all parking spaces used by the project	Society of Automotive Engineers, SAE Surface
			Project should meet ESGFC EV Readiness Guidelines requiring 25% of parking spaces to be EV Ready.	International Electrical Commission
			If fleet vehicles provided with parking, 50% of fleet vehicle must be EV Ready.	
			All accessible stalls must be EV Ready.	
			Examples of alternative fuels and advanced vehicles from the Alternative Fuels Data Center	
			Reduce pollution by promoting alternatives to conventionally fueled automobiles	

TABLE 3 CONTINUED

Transportation Management Plan BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Planning and Design	Access to Quality Transit	Multimodal transportation choices	Bicycle Facilities	Institute of Transportation Engineers, Transportation Planning Workbook, 3rd edition
			Reduce vehicle distance travelled	
			Encourage utilitarian and recreational physical activity	
			Bicycle Storage and Shower Rooms	
			Bike storage + Showers for building occupants	
			facilitate charging of E-bikes	
			Future Transit Infrastructure	
			Transport inside: make staircases visible and friendly looking	
		Minimize the environmental harms associated with parking facilities	Reduce automobile dependence	
			Reduce land consumption	
			Evaluate project parking needs to avoid “oversupply” of parking	



5.4 Natural Environment Management

This section should be developed to guide project teams in integrating natural environment considerations into the planning and execution processes, ensuring a sustainable and respectful approach to environmental management. This is crucial for applying Indigenous perspectives as well as uplifting Indigenous voices, and learning from Indigenous ways of knowing.

This plan will focus on three critical aspects:

- Incorporation of Indigenous Knowledge
- Preservation of Natural Assets
- Site User Health and Wellbeing

5.4.1 Indigenous Knowledge

One of the primary objectives of the natural environment management plan is to recognize Indigenous Traditional and Ecological Knowledge and apply them into the project design for both human and natural systems.

Consider conscientiously factoring in reconciliation efforts during the planning and design phases, ensuring that the project does not disturb Indigenous values and practices. Incorporating Indigenous knowledge into project planning and design can be achieved by:

5.4.1.1 Early Assessments

Conduct an initial assessment of nature-related impacts with the consideration of indigenous communities including:

- Engaging with local communities and Indigenous Peoples to gather information and data
- Seeking guidance from Indigenous leadership to ensure that the project respects and integrates cultural practices and values
- Conducting thorough site assessments with an Indigenous representative to understand the project's potential impacts

5.4.1.2 Seek Guidance from Indigenous Leadership

Encourage the project team to collaborate with local Indigenous leadership to inform them of building programming and landscape strategy. Facility design considerations could support the health and wellness of Indigenous Peoples by considering:

- Spaces for cultural healing practices, such as smudging rooms and access to natural spaces.
- Raising awareness within the organization and throughout the supply chain.
- Exploring recommendations and guidance from the Task Force on Nature-Related Financial Disclosures (TNFD). This tool recognizes the importance of nature's health and resilience for societies, economies, business and finance
- Establishing long-term partnerships to enhance organizational capacity and promote sustainability

5.4.1.3 Capacity Building

Projects should prioritize increasing public awareness and honoring Indigenous worldviews in climate-related decision-making. Strategies include but not limited to;

- Simplifying biodiversity concepts for business leaders by distilling scientific technicalities and data.
- Conducting capacity-building workshops for all project stakeholders.
- Leveraging external expertise and collaborating with experts from diverse fields to enrich project development and implementation.

5.4.1.4 Accelerate Investments

Consider supporting Indigenous-led perspectives. Funding resources should directly reach First Nations, Inuit, and Métis communities at all levels. Decision makers should consider:

- Advocating for long-term sustainable funding streams dedicated to nature conservation and restoration efforts.
- Staying informed about best practices, research, and trends in Indigenous-led project development.
- Creating mechanisms to incentivize and promote nature-positive actions within project frameworks.

5.4.1.5 Foster Collaboration

Describe actions made/considered to foster collaboration and facilitate partnerships with local Indigenous leaderships during the design and planning stages of projects, it is essential to:

- Incorporate Indigenous design principles, focused on meaningful engagement to create culturally inclusive approaches
- Integrating traditional burning practices into patient spaces
- Commissioning art from local Indigenous artists
- Incorporating language into signage, and designing spaces that respect and support local cultural beliefs
- showcase the territorial acknowledgement recognizing the ancestral lands
- Identify connections between organizations to leverage expertise and resources effectively.
- Engage with the project's supply chain to integrate nature considerations into procurement processes and ensure sustainability throughout the project lifecycle.

5.3.1.6 Incorporate Indigenous and Inuit languages in hospital architecture

Consult with indigenous communities and consider:

- Engaging with local indigenous and Inuit communities to identify appropriate languages, symbols, and narratives that can be included in the facility's design.
- Incorporating language in key design elements: applying Indigenous and Inuit languages into signage, murals, and other architectural features, ensuring these elements are prominent and meaningful.
- Highlighting cultural significance: Including cultural stories, symbols, and teachings within the design to educate and create a welcoming environment for all community members.
- Collaborating with indigenous artists and designers: Working with indigenous and Inuit artists and designers to create authentic and culturally resonant artwork that reflects the community's heritage.
- Maintaining an ongoing dialogue with Indigenous and Inuit communities to ensure the architectural elements continue to align with their evolving cultural values and needs.

5.4.2 Natural Assets Preservation and Restoration

In this section careful consideration of natural systems preservation, restoration, and protection is sought. The following sub-sections should outline strategies aimed at minimizing ecological disturbance, enhancing biodiversity, and safeguarding sensitive lands throughout the project's lifecycle.

5.4.2.1 Natural Systems Preservation

Consider incorporating natural system preservation considerations into the construction activities, prioritizing limiting construction within the existing developed area's footprint to avoid unnecessary land clearing. The design team should:

- Conduct a comprehensive assessment to identify and safeguard high-ecological value trees on the project site.
- Evaluate the site to detect and eliminate invasive species that could disrupt the local ecosystem.
- Review the landscape requirements for irrigation to ensure efficient water usage and minimize environmental impact.
- Consider implementing measures to shield exterior lighting, reducing light spillage into adjacent ecological spaces and preserving natural habitats. Note that Indoor lightbulbs shouldn't be visible from outside

5.4.2.2 Natural Systems Restoration

The design team should identify and increase biodiversity by selecting native planting species supportive of local and imperilled species. Project design should consider;

- Limiting long-term landscape maintenance
- Integrating rainwater management into existing site and natural hydrological condition.
- Mitigating heat island effects with vegetated roofing and promote passive cooling strategies
- Incorporate targeted green or open spaces in design
- Limiting further impact to established ecosystems over targeting additional green or open spaces

5.4.2.3 Biodiversity Inventory (Rare and Endangered Species)

The risk potential to rare and endangered species should be carefully evaluated and managed to ensure their conservation and protection. If there is potential, the assessment should be considered for developing an inventory and management plan for natural assets such as forests, soils, and waterbodies. This plan should aim to connect the ecosystem value with essential climate change mitigation and adaptation strategies.

5.4.2.5 Sensitive Land Protection

To mitigate environmental impact, construction should refrain from occurring on prime farmland, floodplains, sites harboring threatened or endangered species, and within specified distances from water bodies and wetlands. Conservation practices to avoid environmental degradation and enhance restoration include:

- Avoiding development on environmentally sensitive lands. Consider creating habitat for local creatures either on-site or restoring another area as a type of offset.
- Minimizing the environmental impact resulting from the building's location to prevent degradation of pristine natural areas such as river areas, wetlands, and seep-zones

5.4.3 Site user health and wellbeing

In this section describe the considerations given to factors affecting the site user health and wellbeing and archaeological studies to protect heritage sites. Additionally, urban greening strategies align with Indigenous knowledge, should be considered fostering healing environments through diverse green spaces and sustainable infrastructure. Note that strategies could expand to interior design such as staircase placement and design in order to make stairs easy to find.

5.4.3.1 Landscape Planting

To ensure climate resilience of landscaping project, careful consideration should be given to various factors when selecting new planting materials. These factors include;

- Genetic diversity
- Potential impacts on neighboring cultivated areas,
- Disease resistance
- Being originated from reputable sources

5.4.3.2 Archaeological and Heritage Resources Management

Archaeological studies must be conducted for projects to ensure compliance with regulations and preserve cultural heritage. Archaeological sites in British Columbia are protected under the Heritage Conservation Act (HCA).

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5.4.3.3 Urban Greening Strategies

Green spaces inside and outside the facility are designed to align with Indigenous traditional ecological knowledge and stewardship of the land, enhancing climate resilience, and fostering patient healing and staff wellbeing. This should be achieved through:

- Indoor and outdoor green spaces for healing and wellbeing (green roof and green walls).
- Welcoming plant-filled entrances.
- Integration of nature nearby.
- Preservation of existing mature vegetation.
- Promotion of plant diversity.
- Creation of tranquil refuges.
- Facilitation of meaningful nature experiences.
- Implementation of sustainable green infrastructure
- Sensory Gardens with a focus on stimulating the senses such as sight, smell, touch, sound, and even taste. Thoughtful plant selection can benefit local insects and wildlife while also providing an engaging and interactive landscape for people.
- Therapeutic Gardens (Horticultural Therapy) accessible and used by patients, staff, or residents in healthcare in order to benefit from actively gardening. A therapeutic garden may include raised beds so that they are wheelchair accessible and have associated programming.
- Indigenous Healing / Medicine Gardens by Indigenous consultancy
- Adding a circular preferably green path around the facility to maximize human benefits of these green spaces considering accessible pathways throughout the site

5.4.3.4 Biophilia and Health and Well-being

Consider the principals of Biophilic design as it has been linked to improvements and benefits to health and well-being. For patients, access to green spaces can reduce stress, lower blood pressure, and improve overall mood, resulting in faster recovery and improved mental health. For workers, green spaces offer space of respite from what may at times be a demanding health care environment, reducing burnout and improving mental wellbeing.

The standards and tools provided in the table below provides suggestions for best management practices in their respective fields. It is important to perceive standards and tools as supplementary resources rather than the sole directive for environmental management practices within your project.

TABLE 4

Natural Environment Management BMP References and Standards

Stage	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Design	Incorporate Indigenous Knowledge	Capacity Building	Build awareness	FOR OUR FUTURE: Indigenous Resilience Report
		Foster Collaboration	Leveraging external expertise	
			Facilitate long-term partnerships	
			Collect nature-related data	
			Support for First Nations, Inuit and Métis governments and organizations to lead their own climate change assessments and strategies in order to develop their own evidence-base for making climate informed decisions. This includes respect for Indigenous data sovereignty in line with their respective policies and protocols.	
			Exploration of the required steps to decolonize climate research, assessments and actions to open space for First Nations, Inuit and Métis to advance our own climate governance and policy	
		Accelerate Investments	Indigenous-led research on the development and exploration of new funding models that are available directly to First Nations, Inuit and Métis at all levels to develop and lead Indigenous-led research.	

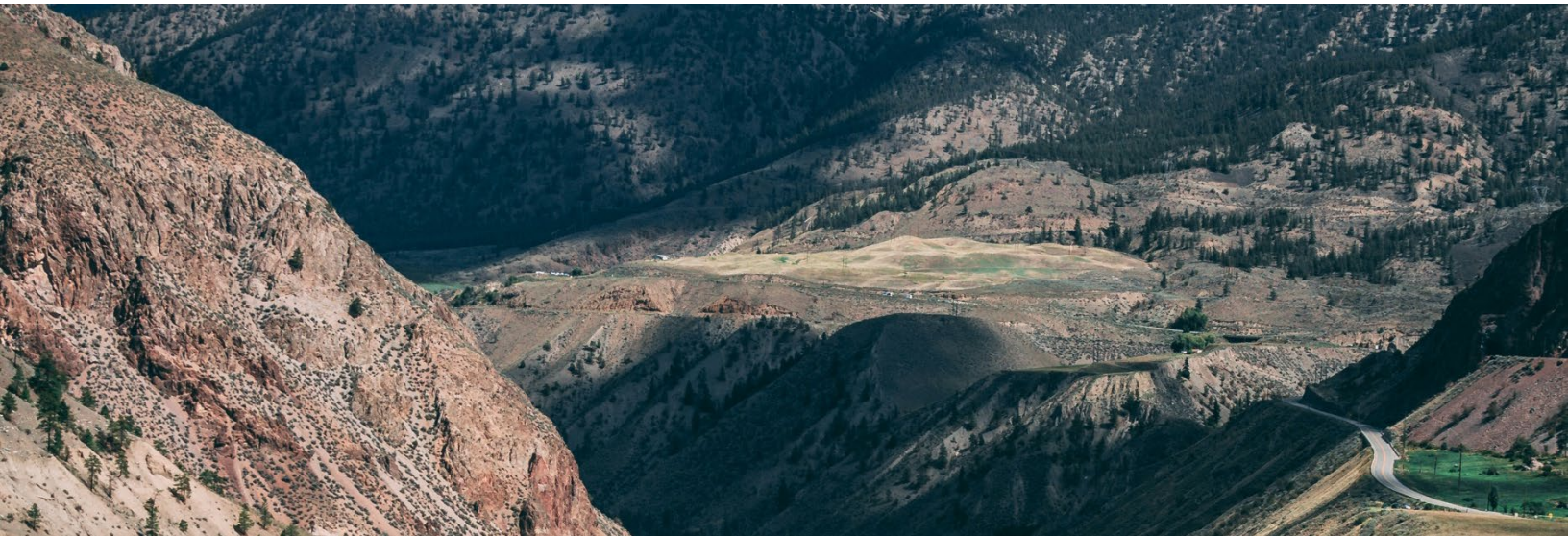
TABLE 4 CONTINUED

Natural Environment Management BMP References and Standards

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Design	Natural Systems Preservation		Construction activities should seek to limit construction activity to within footprint of developed area (i.e. do not exceed building and parking footprint) to avoid clearing of more land).	The TNFD Recommendations: help organisations to report and act on evolving nature-related issues with the ultimate aim of supporting a shift in global financial flows away from nature-negative outcomes and toward nature-positive outcomes. [The Taskforce on Nature-related Financial Disclosures (tnfd.global)]
			Design team should conduct detailed arborist assessment to identify and protect high-ecological value trees.	
			Landscape team should assess site to identify and remove invasive species.	
			Landscape design should review site landscape needs around irrigation (see Section 2.3.3.1.2).	
			Exterior lighting should be shielded to reduce light spillage into adjacent ecological spaces.	
			Biodiversity Inventory	
	Natural assets	Sensitive Land Protection	Avoid construction on Prime farmland, Floodplains, Sites that have threatened or endangered species, Development within 30 m of water bodies and 15 m of wetlands.	US Department of Agriculture, US CFR Title 7 (Prime Farmland Designation)
				FEMA Flood Zone Designations
				US Fish and Wildlife Service, Threatened and Endangered Species
				Nature Serve Heritage Program (species habitat)

TABLE 4 CONTINUED

STAGE	TOPIC	APPROACH	BEST MANAGEMENT PRACTICE	STANDARDS & TOOLS
Design	Natural assets	Archaeological and Heritage Resources Management	Archaeological sites in British Columbia are protected under the Heritage Conservation Act (HCA)	US EPA National Priority List
				US HUD Federal Empowerment Zone, Federal Enterprise Community, and Federal Renewal Community
				US Dept. of Treasury, Community Development Financial Institutions Fund
				US HUD Qualified Census Tracts and Difficult Development Areas
	site user health and wellbeing	Urban greening strategies	Encourage Green Spaces inside and outside of the facility that align with Indigenous traditional ecological knowledge and stewardship of the land, improve climate resilience and support patient healing and staff wellbeing.	LEED



6.0 Summary and Synergy Analysis

To ensure clarity and alignment across all EMPs, we recommend developing a consolidated Action Table and Synergy Analysis. This table serves as a tool to:

Summarize Key Actions: Clearly outline the actions required under each EMP category, such as water, waste, materials, transportation, and natural environment.

Link to EMPs: Specify which management plan each action relates to, ensuring transparency and accountability.

Identify Synergies: Highlight shared strategies and interconnected outcomes across different EMPs to maximize efficiency and effectiveness.

For guidance, refer to the example table below:

TABLE 5 SUMMARY OF ENVIRONMENT MANAGEMENT PLANS

RECOMMENDATION	EMP RELATED	SUMMARY	WILL IT BE A PART OF DESIGN?
1	Water	Provide a summary of the actions to betaken	Yes or No
2	Waste and Material	Provide a summary of the actions to betaken	Yes or No
3	Transportation	Provide a summary of the actions to betaken	Yes or No
4	Natural Environment	Provide a summary of the actions to betaken	Yes or No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