BEYOND FORTRESS MENTALITY:
ENVISIONING WATER AND WASTE MANAGEMENT FACILITIES
AS A CATALYST FOR PLACE-BASED SUSTAINABILITY
EDUCATION IN METRO VANCOUVER

By

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ABSTRACT

This paper provides rationale and strategies for Metro Vancouver to develop and implement tours of water, wastewater and waste management facilities as part of its ongoing efforts to educate residents and advance sustainability. A review of place-based education, environmental education and learning in informal environments literature will reveal that community-embedded facility tours contribute to effective teaching and learning about sustainability. An overview of existing Metro Vancouver facility tours and education programs and established facility tour programs offered by the cities of Perth, Australia, Christchurch, New Zealand and Edmonton, Canada, illustrate numerous opportunities to enhance and improve facility tour education programs at Metro Vancouver. Recommendations and strategies for Metro Vancouver to advance sustainability by utilizing facilities as places for learning as part of a broader sustainability education strategy will be provided. Many of these recommendations are relevant to other cities interested in engaging residents through meaningful place-based sustainability education programs in their communities.
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CHAPTER ONE
INTRODUCTION

Prologue

Where does my drinking water come from? What happens when I flush? Where does my garbage go? As an Education Coordinator for Metro Vancouver and a former classroom teacher, I have witnessed teachers and students discover the answers to these questions through participation in tours of watersheds, wastewater treatment facilities and solid waste management facilities. Such experiences provide the basis for learners to explore the connections between their daily lives and the natural world – as the source for their drinking water and receiving environment for their waste.

Facility tours provide unique, direct and local learning experiences that can act as a catalyst to engage residents and enrich curriculum-connected teaching and learning about sustainability in the region. Such unique, direct and local experiences are central to environmental learning and experience as identified by the British Columbia (B.C.) Ministry of Education (2007).

Problem

Many people in urban centres, such as Metro Vancouver, do not know where their drinking water comes from, where their garbage goes or what happens when they flush. As city dwellers, they are unaware of the complex systems they depend on everyday. They are disconnected from the impact their daily lives have on the place they live and the ways they depend upon nature. These disconnects underlie a broader challenge.
Human behavior contributing to pollution, climate change, habitat loss and other forms of environmental degradation are not sustainable. Currently, 50 percent of the world’s population and 80 percent of North America’s population live in cities, and the trend towards urbanization continues (United Nation Population Fund, 2007). How can urban residents be reconnected and engaged with local environment and sustainability issues? What role can utility service providers, such as Metro Vancouver, play in developing awareness, understanding of local sustainability issues and advancing environmentally responsible and sustainable behavior?

Metro Vancouver is both a geographic location and a regional governing body. It is located on the southwest coast of mainland British Columbia, Canada and is comprised of 22 municipalities and one electoral area. It is home to 2.3 million residents. Metro Vancouver’s Sustainability Framework (Metro Vancouver, 2008) outlines its vision to advance sustainability and provides an overarching framework for all of its activities. In addition to its core utility services, which include the delivery of drinking water, wastewater collection and treatment and waste disposal, education and outreach are also identified as priorities - providing a call for educational leadership to engage citizens with sustainability in unprecedented ways.

As keepers of the arteries and veins which sustain life (and lifestyle) in cities, utility service providers like Metro Vancouver are uniquely situated to lead a transition to sustainability by directly educating residents who depend upon them everyday. Despite increased calls for sustainability and demand management, very few utility service
providers have embraced the unique opportunity to utilize facilities as places for educating the communities they serve. The cities of Perth, Australia, Christchurch, New Zealand and Edmonton, Canada have implemented facility tour education programs. These cities provide good examples of existing programs that Metro Vancouver or other regional or municipal utility service providers may wish to emulate.

The Sustainable Region Initiative provides Metro Vancouver with the opportunity and the framework to challenge the “ever-present pressure to operate as they have always done” (Walker & Quong, 1998, p. 82). Incorporating facility tours as part of a sustainability education strategy will require a culture shift within the organization. It will require Metro Vancouver as a utility service provider to incorporate public education to its core function – managing water, wastewater and waste management facilities. Incorporating facility tours as an experiential component of Metro Vancouver sustainability education programs will be the focus of this paper. Recommendations and strategies for integrating effective facility tours to enhance Metro Vancouver K-12 sustainability education programs will be provided.

Education for sustainability can support reconnecting city life to our intimate connection with nature and the true costs of our everyday choices or any learning which promotes the idea of “meeting the needs of the present without compromising the ability of future generations to meet their needs” (World Commission on Environment and Development, 1987).
**Organization of this paper**

This paper is presented in five chapters which culminate in Chapter 5 with recommended strategies for Metro Vancouver to implement water and waste management facility tours as a catalyst for place-based sustainability education. The preceding chapters set the stage. In Chapter One, I provide an introduction to the paper as well as my personal and professional interest and observations of sustainability education in action through facility tours. In Chapter Two, I provide a review of literature that informs and supports the recommendations of this paper from the field of experiential education, environmental education, learning in informal environments. In Chapter Three, I provide the context for subsequent recommendations by providing an overview of Metro Vancouver, its existing programs and commitments to education. In Chapter Four, I provide an overview of three established facility tour programs from Perth, Australia, Christchurch New Zealand, and Edmonton Canada. Each program offers inspiration and insight into the numerous opportunities, challenges and considerations associated with implementing innovative programs as part of a Metro Vancouver sustainability education and outreach strategy. In Chapter Five, I provide guiding principles and recommendations for Metro Vancouver to develop a facility tour education program to support its goal of advancing sustainability in the region.
CHAPTER TWO
LITERATURE REVIEW

As a former classroom teacher, and as an environment and sustainability educator and K-12 Education Coordinator at Metro Vancouver, I have witnessed teachers and learners discover personal and local connections between their lives and the natural world through direct on-site learning experiences at water and waste management facilities. In this chapter, I will situate this paper within the context of relevant literature from the field of experiential education, place-based education, environmental education, learning in informal environments, and a conceptual framework for Environmental Learning and Experience provided by the B.C. Ministry of Education (2007). This review will illustrate that the literature supports the notion that community-embedded facility tours can enhance a broader Metro Vancouver sustainability education and outreach strategy. It will also provide the basis for subsequent recommendations.

John Dewey (1938), a champion of experiential education, suggested that student learning should be rooted in society and in social experiences. He argued that learners should be in touch with the realities being studied to facilitate clear education-life-society connections and personal relevance. Dewey suggested the knowledge and skill acquired by a learner in one situation, becomes an instrument of understanding and dealing effectively in subsequent situations. He reiterated experiences are educative if they do not distort or restrict future, cumulative learning. experience that provide learners with a positive association with as central and connecting experiences.
In the context of experiential education, as described by Dewey, facility tours can provide real, personal and locally relevant learning experiences that can form the basis for subsequent wider and deeper classroom learning and exploration of related topics.

Studies by Falk and Balling (1980), Falk and Dierking (1997), and Nundy (1999) reiterate that field experiences in unique settings are capable of generating positive cognitive and affective learning amongst students compared to that achievable in a classroom setting. Falk and Dierking (1997, p. 216) asserted that

learning is the process of applying prior knowledge and experience to new experiences, usually played out within a physical context and is mediated in the actions of other individuals. In addition, learning always involves some element of emotion and feeling.

Such assertions reinforce the value of fun and interactive field learning both to educators and facility tour education program service providers.

A study by Lieberman and Hoody (1998) found that using the Environment as an Integrating Context (EIC) for learning improved student achievement, increased engagement and enthusiasm for learning, and student pride and ownership in accomplishments. The study characterized EIC-based learning as learning that uses the school surroundings and the community as an integrated and interdisciplinary framework. EIC-based learning develops student awareness about the social, economic and environmental context of the school community. It helps students to make sense of their world by exploring interdisciplinary links between theory and reality, and between their
school and the community surrounding the school. Public facility tours provide a community-embedded venue for real world experiences and learning, which can be integrated into further study classroom study of sustainability concepts and topics.

A meta-analysis of 128 preceding studies of behavior research in environmental education (Hines et al., 1987) found that environmental education influenced environmentally responsible behavior – a desired outcome for Metro Vancouver K-12 outreach and education activities. Hines et al. made the following inferences:

- Individuals who express an intention to take (environmentally responsible) action will be more likely to engage in the action;
- Individuals must be cognizant of an environmental problem to intentionally take action, therefore knowledge is deemed a prerequisite; and
- Knowledge and skill in applying courses of action are also necessary.

A range of variables in environmental education, including knowledge, attitudes, locus of control, personality factors and situational factors influence environmentally responsible behavior. Subsequent analysis of this study by Hungerford and Volk (1990) revealed instruction that goes beyond providing ‘awareness’ and ‘knowledge’ to give learners a sense of ‘ownership’ and ‘empowerment’ can maximize opportunities for learning and environmentally responsible behavior. A facility tour education program provides students with numerous opportunities to explore and apply new ideas and concepts and how they are connected to their homes, the place they live and how they can make informed conservation choices to reduce impacts on the receiving environment or even the system itself.
Zint, Kraemer, Northway and Lim’s (2002) evaluation of the Chesapeake Bay Foundation’s conservation education program draws correlations between participation in field conservation education and increased environmentally responsible behavior amongst student and teacher participants. Pre and post-tests revealed improvements in characteristics associated with environmentally responsible behavior, including increased perceived knowledge of issues, perceived knowledge of actions and intention to act responsibly. In addition, teacher education programs were found to facilitate increased classroom teaching about Chesapeake Bay (a goal of the program.). This study points to the significance of designing and evaluating programs to support teaching and learning (amongst teachers and students) before, during and following the field experience. It also reiterates the value of measuring behavior and knowledge through pre and post-testing, a model for evaluating facility tour education program effectiveness.

David Orr (1999) argues that most buildings and classrooms in our communities miss the opportunity to promote ecological connections for their users, offering no visible story about the origins of the materials used to build it, its specific location, or the energy used to provide heat or light. By contrast, public facilities tell the visitor much about how they function and how they are connected to the community. Influent channels at wastewater treatment facilities, for example, provide a graphic link to the outside world. Exposed bar screens, pumps, pipes, aeration and sediment tanks, motors, scum-removers, digesters, effluent channels, smells and sights combine to provide visitors with numerous opportunities to experience how the building works and how it is connected as an
essential part of the community. Orr’s perspective supports the notion of using facilities as places for learning, as an extension of the classroom to engage and inspire integrated and community-connected learning.

Hart (1997) suggests children’s participation can contribute to developing a genuine appreciation of democracy and a sense of their own competence and responsibility to participate. Hart illustrates key ingredients for success: encouraging children to become highly reflective, even critical participants in environmental issues in their own communities; and exploring how such learning experiences can contribute to the goal of “learner conscientization” (p. 26). Participation in facility tours can introduce students to the implications of their daily choices on facilities and the receiving environment and can prompt interest and responsible action.

Place-based education, as defined by Sobel (2004), is “the process of using the local community and environment, including both the natural and the built environment, as a starting point to teach concepts across the curriculum” (p. 7). It emphasizes hands-on, experiential and real world learning experiences. Place-based education can increase academic achievement, help students to develop stronger ties to their community, enhance student appreciation for the natural world, and create a heightened commitment to serving as active contributing citizens (p. 7). A waste management facility tour can provide unique and place-based experiences as visitors make connections between themselves and the implications of their everyday choices upon on the receiving environment, the community and beyond.
The BC Ministry of Education’s *Environmental Learning and Experience; An interdisciplinary guide for teachers* (2007) provides an overview of the principles central to environmental learning. It suggests that environmental teaching and learning should:

- provide opportunities for direct experience, critical reflection and negotiation as illustrated in the Experiential Learning Cycle Model (see Figure 2.1); and
- provide opportunities to explore the following organizing principles for learning environmental concepts (see Figure 2.2):
  1. A consideration of complexity (complex systems);
  2. Aesthetics (or aesthetic appreciation);
  3. Responsibility (responsible action and consequences of action); and

The Experiential Learning Cycle and the key principles of Complexity, Aesthetics, Responsibility, and Ethics (CARE) combine to offer a conceptual framework for organizing environmental learning. Tours of water and waste management facilities provide many opportunities for students to participate in learning that addresses these key principles of environmental learning and experience.
Figure 2.1 - Experiential Learning Cycle Model

(B.C. Ministry of Education, 2007)


Figure 2.2 – CARE as an organizer for environmental learning

(B.C. Ministry of Education, 2007)

CHAPTER THREE
CONTEXT

In this chapter, I provide an overview of existing Metro Vancouver utility functions, management plans, outreach and education objectives, existing Metro Vancouver Kindergarten to Grade 12 (K-12) education programs and facility tour offerings. This overview will provide the context and basis for discussion and recommendations.

What is Metro Vancouver?

Metro Vancouver is a utility service provider and a federation of 22 municipalities and one electoral area located on the southwest coast of mainland British Columbia, Canada (see Figure 3.1). Each member municipality appoints representatives to sit on the Metro Vancouver Board of Directors. Formerly the Greater Vancouver Regional District, Metro Vancouver is presently home to more than 2.3 million residents. Metro Vancouver is frequently recognized as one of the world’s most livable cities.
What does Metro Vancouver have to do with sustainability?

Metro Vancouver aspires to advance sustainability in the region through its Sustainable Region Initiative (SRI). The SRI provides an overarching Sustainability Framework for all Metro Vancouver’s primary responsibilities, including service delivery, planning and political leadership (See Figure 3.2).
Metro Vancouver’s core utility services include the provision of drinking water, sewerage and drainage, and solid waste management. These services are provided to member municipalities. These functions are essential for all residents and therefore are a key consideration for achieving sustainability in a growing and changing region.
Metro Vancouver’s three main areas of planning and regulatory responsibility are regional growth and land use, waste management (solid and liquid), and air quality management.

Metro Vancouver serves as a primary political forum for discussion of significant community issues at the regional level, acting as a facilitator, convenor, partner, advocate and a significant instrument for providing information and education to residents.

Metro Vancouver’s Sustainability Framework (Metro Vancouver, 2008) identifies collaborative governance and outreach programs as a priority. This includes developing and delivering communications and education to engage and inspire public involvement to achieve a sustainable region.

Metro Vancouver’s Sustainability Framework identifies the following three operating principles:

- Protect and enhance the natural environment;
- Provide for ongoing prosperity; and
- Build community capacity and social cohesion.

Metro Vancouver’s outreach and education objectives are to engage residents and promote understanding, awareness, values and actions to reflect these principles; and conserve and develop natural, economic and social capital (Metro Vancouver, 2008). Promoting an ethic of care and environmentally responsible behavior is also a primary objective.
Metro Vancouver Management Plans and Commitment to Education

The SRI provides an overarching framework for all Metro Vancouver management plans. Each management plan outlines long-term objectives and commitments regarding core utility functions, infrastructure improvements, planning and regulation. Metro Vancouver management plans include the Regional Growth Strategy (1996), the Drinking Water Management Plan (2005), the Air Quality Management Plan (2005), the Liquid Waste Management Plan (2001), and the Solid Waste Management Plan (1995). The Metro Vancouver Board of Directors approves each management plan before it is adopted. An overview of commitments to public education and conservation is provided in Table 3.1
### Table 3.1 – Metro Vancouver Management Plan Education Commitments

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<thead>
<tr>
<th>Management Plan</th>
<th>Education / Outreach Commitments</th>
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<td>Drinking Water Management Plan (2005)</td>
<td>Deliver an education program promoting behavior change and sustainable use of water</td>
</tr>
<tr>
<td>Liquid Waste Management Plan (2001)</td>
<td>Develop and implement an educational program for resident-specific practices that have pollution prevention or demand management benefits</td>
</tr>
<tr>
<td>Solid Waste Management Plan (1995)</td>
<td>Educate and promote waste reduction and 3R’s</td>
</tr>
<tr>
<td>Air Quality Management Plan (2005)</td>
<td>Outreach on air quality and greenhouse gas emission reductions; Promote actions for residents, including trip reduction</td>
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Demand management benefits are an additional driver for education programs. A waste reduction education program, for example, contributes to reducing per capita waste by promoting voluntary behavior change and deferring the need and capital cost of building increased infrastructure capacity to accommodate waste (e.g. landfill or waste to energy facilities).

### Metro Vancouver Infrastructure

Metro Vancouver is responsible for managing and operating a wide variety of facilities and infrastructure in the areas of drinking water, wastewater and solid waste. These include three watersheds, six water storage dams, three primary drinking water treatment facilities, 22 distribution system reservoirs, 15 drinking water pump stations, five wastewater treatment facilities, 33 wastewater pump stations, five waste transfer stations, two landfills, one incinerator (Waste-to-Energy) and 27 air quality monitoring stations. Metro Vancouver water, wastewater and waste management facilities are located strategically throughout the region to meet operational demands.
Metro Vancouver facilities have traditionally operated behind the fences and walls that surround them. Very few efforts to engage the surrounding communities have been undertaken. While the decision to minimize unsightly buildings or odours from these facilities within communities is obvious, the unintended result has been hiding the reality of waste management and water treatment from the people who depend on these services every day. The walls and fences surrounding facilities, combined with the traditional focus of facilities to operate, as opposed to educate, has effectively established facilities as fortresses of disconnect. These facilities and their location within communities throughout the region (see Figure 3.3) offer great potential for Metro Vancouver to engage, educate and reconnect residents through on-site education programs.
Figure 3.3 – Metro Vancouver Drinking Water & Wastewater Treatment Facilities

Metro Vancouver facilities are located throughout the region.

(Metro Vancouver, 2008)
Existing Metro Vancouver Outreach and Education Programs

Metro Vancouver conducts a range of outreach and education activities through a variety of programs and departments, including Metro Vancouver’s Corporate Relations, Public Involvement, Parks, and the Watershed Management Divisions. On-site tours, or facility tour education programs, are currently offered in a limited or informal capacity. At present, outreach and education activities account for approximately one percent of Metro Vancouver’s annual operating budget (P. Trotzuk, personal communication, July 25, 2008). An overview of Metro Vancouver on-site education programs and facility tour offerings (see Table 3.2) will provide the context and basis for recommendations to enhance sustainability education programs (see Chapter Five).
### Table 3.2: Metro Vancouver Facility Tour Offerings

<table>
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<th>Facility Tours (or onsite education programs)</th>
<th>Management Plans supported by facility tours</th>
<th>Tour facilitators</th>
<th>Programs supporting K-12</th>
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<td>Watershed tours (seasonal)</td>
<td>Watershed, Drinking Water, Lower Seymour Conservation Reserve, Regional Growth Strategy</td>
<td>Watershed Tour Coordinator (FTT) Operations Staff Volunteers Contractors (Interpreters)</td>
<td>Corporate Relations K-12 Education LSCR Watershed Education Parks</td>
</tr>
<tr>
<td>Wastewater Treatment Tours</td>
<td>Liquid Waste, Regional Growth Strategy</td>
<td>Operations staff or managers</td>
<td>Corporate Relations K-12 Education LSCR Watershed Education Parks</td>
</tr>
<tr>
<td>Waste to Energy Facility Tours (on demand)</td>
<td>Solid Waste, Regional Growth Strategy</td>
<td>Operations staff or managers.</td>
<td>Corporate Relations K-12 Education LSCR Watershed Education Parks</td>
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<tr>
<td>Vancouver Landfill Tour (annual event)</td>
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Watershed Education

Metro Vancouver manages three watersheds that are closed to the public. Metro Vancouver educates residents about these watersheds, water quality, water supply and watershed management education programs offered by the Corporate Relations Department and the Watershed Management Division. On-site education programs, provided by the Watershed Management Division, include the Watershed Tour Program and the Lower Conservation Reserve (LSCR) Education Program.

Watershed Tours

Watershed facility tours are currently Metro Vancouver’s most significant commitment to public education through facility tours. These behind-the-scenes tours into the closed watershed were established in 1993 in response to public concern about water quality and logging in the watersheds. The tours provide an on-location overview of watershed management practices and drinking water treatment and supply infrastructure. These tours are offered four days a week from June to September.

The Watershed Education Coordinator is responsible for the delivery of the tours. This seasonal full-time position requires experience and training in either education or interpretation. Currently this position is held by a professional teacher. Watershed tours are facilitated by the coordinator or by staff volunteers from watershed operations and management. Staff volunteers are provided with basic training to deliver watershed tours.
The Watershed Management Division of Operations and Maintenance is responsible for managing the watershed tour program. The watershed tour program receives an annual operating budget of approximately $85,000 (M. Mayers, personal communication, July 25, 2008). More than 100 watershed tours are delivered to approximately 3000 participants annually. In 2007, ten watershed tours were delivered to students as class fieldtrips (T. Scaman, personal communication, July 25, 2008).

**The Lower Seymour Conservation Reserve - Education Program**

Onsite watershed education programs also take place at the Lower Seymour Conservation Reserve (LSCR). LSCR Education Program objectives include providing an experience and an opportunity to learn how the LSCR is managed as a water reserve using sustainability principles.

The Watershed Education Coordinator, a professional educator, coordinates the delivery of onsite watershed education programs for schools. Approximately 3500 students attend LSCR Education Programs annually. LSCR school programs are delivered by interpreters on a contract basis. The annual operating budget for this program is approximately $150,000 (M. Mayers, personal communication, July 25, 2008).

Watershed tours and LSCR education programs provide examples of existing Metro Vancouver experiential education programs. These programs provide site-specific opportunities for learning about drinking water, watershed management, water quality and water supply. While these programs are well attended by teachers and their students,
opportunities to improve these programs exist. These include improving integration and alignment with a broader corporate sustainability messages and improving linkages to other Metro Vancouver education programs as part of an integrated corporate strategy for school education programs.

Solid Waste Management Facilities
Metro Vancouver is responsible for the long range planning of recycling and disposal of garbage (solid waste) in the region. Metro Vancouver funds and operates the Waste-to-Energy facility, waste transfer stations and landfills (includes the Cache Creek Landfill and Vancouver Landfill). Tours of solid waste management facilities, including the Waste-to-Energy Facility, the Vancouver Landfill and the waste transfer stations are provided informally on a request basis.

Solid waste management facility tours are currently delivered by facility operations staff. These staff members do not receive any formal training for effective tour delivery. Solid waste management facility tours are not designed to meet the needs or interests of the audience or the sustainability education objectives of Metro Vancouver in mind. In practice solid waste facility tours focus upon how the facility works providing few connections to broader sustainability concepts and topics.

Waste-to-Energy Facility
Tours of the Waste-to-Energy Facility are available in a limited capacity. The contract to operate the Waste-to-Energy Facility contains a clause requiring that demand for tours from schools, the public, and technical audiences and delegations is met. The operations
contract stipulates that a minimum of 50 tours be provided each year, but does not
provide information about how to deliver these tours (D. Ranahan, personal
communication, July 25, 2008). While Waste-to-Energy tours are acknowledged as a
component of the facility operations contract, no formal efforts have been made to
advertise or promote their availability. As a result, very few people are aware of the
tours.

Waste-to-Energy Facility tours offer a rich opportunity for Metro Vancouver to
strengthen existing sustainability education activities. Amongst these are opportunities
for learning about waste as a resource and creating energy from waste. As the existing
Cache Creek Landfill is scheduled to reach its capacity in 2009, new Waste-to-Energy
facilities are being explored as an option for processing the region’s waste. Tours of the
existing Waste-to-Energy facility could be part of a strategy to engage residents in
discovering viable options for processing future waste from the region.

The Vancouver Landfill
The Vancouver Landfill currently provides tours to school groups and the general public
by request or via its Annual Vancouver Landfill Open House. Most requests for tours of
the landfill are directed to the open house event, held annually in early June. The timing
of the open house is not ideal for teachers as the event occurs near the end of the school
year. Annual participation in the Open House is approximately 22 elementary classes
and more than 1,000 residents per year (N. Steglich, personal communication, June 15,
2008).
The development of improved waste management facility tours as part of a broader sustainability education strategy targeting specific audiences, such as K-12 students and teachers, would provide a significant opportunity to support curriculum-connected teaching and learning about the challenges associated with waste management, waste reduction and sustainability in Metro Vancouver.

**Wastewater Treatment Facilities**

Metro Vancouver manages five wastewater treatment facilities located throughout the region. The secondary wastewater treatment facilities include Annacis Island (Delta), Lulu Island (Richmond) and Northwest Langley. The primary wastewater treatment facilities include Iona Island (Richmond) and Lions Gate (North Vancouver). Metro Vancouver’s budget for liquid waste management accounts for the largest portion of its annual operating budget. In 2007, liquid waste management accounted for $155.7 million, approximately 36 percent of the total annual budget expenditures (P. Trotzuk, personal communication, July 25, 2008). No portion of this budget has been formally allocated to the delivery (or improvement) of wastewater treatment facility tours.

Despite the fact that no wastewater facility tour program exists, each facility offers a limited number of tours upon request. Like the solid waste facility tours, wastewater treatment facility tours are technical in nature, emphasizing the mechanical processes and functions of the facility. The facility tours are led by wastewater treatment facility operators and managers. No formal training regarding effective tour delivery is provided or required.
Teachers continue to request wastewater treatment facility tours despite a limited effort to promote or enhance them. Ongoing requests suggest that teachers recognize the value of incorporating such a learning opportunity into their classroom study. Since 2003, the Annacis Island Wastewater Treatment Plant (one of five facilities) has provided tours to more than 400 students each year (C. Jacob, personal communication, July 25, 2007). The other wastewater treatment plants also offer and accommodate facility tours, but have been inconsistent in tracking tour requests. Many teachers bring their classes on an annual basis, suggesting that facility tours provide a unique and valuable field experience even if the tour is not specifically designed for the audience or curriculum requirements.

**Metro Vancouver Facility Tours**

Facility tours remain in demand despite limited efforts to promote or improve them. Ongoing demand for facility tours suggest that if Metro Vancouver were to develop an audience-targeted facility tour program, it would be well received. Such a program would also provide an effective way for Metro Vancouver to engage and educate residents about sustainability issues, concepts, topics and environmentally responsible behavior.

Facility tours have the potential to be an experience-based component of a broader education and outreach strategy to advance sustainability in Metro Vancouver. An overview of successful and established facility tour programs in Christchurch, New Zealand; Perth, Australia; and Edmonton, Canada, illustrate educational leadership for sustainability and provide unique models worthy of consideration and implementation by
Metro Vancouver (see Chapter 4).
CHAPTER 4

FACILITIES AS PLACES FOR LEARNING (SUCCESS STORIES)

In this chapter, I provide an overview of facility tour programs I visited and observed in Perth, Australia and Christchurch, New Zealand in March 2005. In addition, I provide an overview of a facility tour program from Edmonton, Canada.¹ I will illustrate how each facility provides place-based learning for sustainability, and practical illustrations of facility tour program design worthy of consideration by Metro Vancouver.

These three programs share the common objective of raising awareness and understanding about sustainability, and inspiring environmentally responsible behavior. Each program targets students and teachers in the communities it serves. An overview of the scope of each program, goals, staff resources, operating budgets, reach, and other unique aspects are summarized and discussed (see Table 4.1) in this chapter.

¹ Information regarding Facility Tour Education Programs in Edmonton was retrieved online and through personal communication with Larry George, City of Edmonton, Environmental Education Officer (June 16, 2007).
### Table 4.1 - Facility Tour Programs – Comparative Profile

<table>
<thead>
<tr>
<th>Location</th>
<th>Christchurch, New Zealand</th>
<th>Perth, Australia</th>
<th>Edmonton, Alberta</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facility Tour / Education Program</strong></td>
<td>Learning Through Action</td>
<td>Waterwise Education</td>
<td>Edmonton Waste Management Centre Education</td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td>350,000</td>
<td>1.5 million</td>
<td>1.1 million</td>
</tr>
<tr>
<td><strong>Coordinator</strong></td>
<td>Environmental Education Coordinator</td>
<td>Facility Tour Program Coordinator</td>
<td>Environment Education Officer</td>
</tr>
<tr>
<td><strong>Facility tours offered</strong></td>
<td>Wastewater Treatment Plants Water Treatment Landfill Refuse Station Water Pumping Station</td>
<td>Groundwater Treatment Plants No. 1 Pump Station Wastewater Treatment Plants Water Catchment Area Tour</td>
<td>Edmonton Waste Management Centre</td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td>Encourage young people to show concern and take responsibility for their own actions A real and local context for learning</td>
<td>Educate students, families, wider communities about the need to value, protect and conserve Tackle real issues facing the community Influence behavior change and conservation</td>
<td>Learn how the facility works Reducing waste helps</td>
</tr>
<tr>
<td><strong>Target audience</strong></td>
<td>Teachers Students (mostly Elementary)</td>
<td>Teachers Students (mostly Elementary)</td>
<td>Teachers Students (grades 4-12)</td>
</tr>
<tr>
<td><strong>Tour facilitators</strong></td>
<td>Trained Education Officers, teachers, environmental educators, park rangers, or council staff.</td>
<td>Trained tour facilitators (not teachers)</td>
<td>Two full-time Environment Education Officers (both former classroom teachers), plus 3 program assistants</td>
</tr>
<tr>
<td><strong>Support material resources</strong></td>
<td>Teacher – tour specific Student – not tour specific (concept)</td>
<td>Teacher – not tour specific Student – not tour specific (concept)</td>
<td>Teacher – tour specific Student activity booklet (online)</td>
</tr>
<tr>
<td><strong>Additional services</strong></td>
<td>Pre-tour Classroom presentations (direct delivery) Comprehensive tour booking / info for teachers.</td>
<td>Classroom presentations (direct delivery) Basic tour booking / info for teachers.</td>
<td>Classroom presentations (direct delivery) Basic tour booking / info for teachers</td>
</tr>
<tr>
<td><strong>Registration</strong></td>
<td>Phone / online (Centralized booking)</td>
<td>Phone (Centralized)</td>
<td>Phone (via facility receptionist)</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>Free</td>
<td>Free</td>
<td>Free (to Edmonton Public Schools)</td>
</tr>
<tr>
<td><strong>Curriculum links</strong></td>
<td>Yes (curriculum connected resources) Science, Social Studies, Technology Health and Physical Education, Environmental Education Guidelines (NZ Ministry of Education)</td>
<td>Yes (curriculum connected resources) (West Australian Curriculum Framework.)</td>
<td>Yes (curriculum connected resources) Science (&quot;Waste &amp; Our World&quot; Unit – Grade 4) Social Studies (Alberta Ministry of Education)</td>
</tr>
<tr>
<td><strong>Evaluation</strong></td>
<td>Teacher Evaluation Forms Student Evaluation Forms</td>
<td>Facility Superintendent evaluates tour</td>
<td>Teacher Evaluation Forms</td>
</tr>
<tr>
<td><strong>Reach</strong></td>
<td>10,500 students / year</td>
<td>3,500-4,000 students / year</td>
<td>8,000+ students/year</td>
</tr>
<tr>
<td><strong>Annual Budget</strong></td>
<td>$120,000+ / year (including staff time)</td>
<td>$70,000+ / year (including staff time)</td>
<td>$90,000+ / year (including staff time)</td>
</tr>
<tr>
<td><strong>External Funding</strong></td>
<td>Ministry Education, Learning Experience Outside the Classroom (LEOTC)</td>
<td>None</td>
<td>Edmonton School Board</td>
</tr>
<tr>
<td><strong>Demand</strong></td>
<td>Increasing annually</td>
<td>Increasing annually</td>
<td>Increasing annually</td>
</tr>
</tbody>
</table>
The Learning Through Action Program in Christchurch, New Zealand

The City of Christchurch, located on the east coast of New Zealand’s south island, is home to approximately 350,000 residents. The Christchurch City Council is responsible for the operation and management of the drinking water, waste management, recycling, wastewater collection and treatment facilities. The City Council also manages the Learning Through Action program. This program invites teachers to get their students “out of the classroom and into the wonderful, wild and wasteful real world with a series of packaged visits and experiences” (Christchurch City Council, 2007).

The Christchurch City Council’s Learning Through Action program features twenty learning sites, which support a variety of place-based field experiences. With an annual operating budget of $120,000 ($90,000 Canadian), The Learning Through Action program provides direct field learning experiences to over 10,000 students in Christchurch (A. Taylor, personal communication, May 16, 2007). Learning Through Action programs explore a range of local environment and sustainability topics via learning experiences on location at facilities or in the natural environment. Programs are available to primary and secondary classes.

Key program objectives for the Learning Through Action program include:

- Providing issues-based environmental education programs – raising awareness of real issues in our own environment;
- Providing programs that are linked to the New Zealand curriculum through the Environmental Education Guidelines New Zealand schools;
- Providing field trips and outdoor experiences that are an easy and safe option for teachers;
- Providing a very real context for learning experiences – the local environment;
- Providing hands-on activities;
- Encouraging young people to show concern and take responsibility for their actions; and
- Encouraging teachers to build upon the on-site learning experiences at school through the provision of resource materials for pre and post teaching activities (Christchurch City Council, 2008)


These key objectives illustrate a wide range of priorities that were considered in the development of a successful and audience-oriented facility tour education program. Developing some key objectives and linking these to the B.C. Ministry of Education is one way Metro Vancouver could strengthen its facility tour education programs.

The Learning Through Action website (http://www.ccc.govt.nz/Education/LearningThroughAction/) is well organized and easy to navigate. An online map of Christchurch features the twenty learning sites (places). Programs are available for both primary and secondary classes on topics such as Biodiversity and Geology, Estuary and Coastline, Waterways and Wetlands, Heritage and History, and Water and Waste (See Figure 4.1). While online, visitors can click on each facility icon to view Learning Through Action program details for each location. For example, visitors can click on a “garbage can” icon representing a
landfill or a “drop of water” that represents a pump station. The website also provides a list of program details, including age, grade, class size limits, availability, duration, key concepts, learning outcomes, learning areas and descriptions of the lessons for each program offered at each facility. This comprehensive list of facility tour program details enables teachers to prepare for their class visit.

Figure 4.1: Learning Through Action – Learning Sites Map

Using this online map, teachers can view more details about programs by clicking on the facility icons. Source: http://www.ccc.govt.nz/Education/LearningThroughAction/SecondaryProgrammes/Map/
In addition to the experience-based Learning Through Action programs, the Christchurch City Council also provides locally focused curriculum resource materials to support teaching and learning about topics such as waste, water and wastewater. These resources are available to download for free through the Resource Catalogue for Schools section of the Christchurch City Council website. One drawback, however, is that the available curriculum resources do not directly connect to the Learning Through Action programs covering similar topics. For example, the teacher resource guide, *Waste* (Christchurch City Council, 2005), which provides numerous classroom strategies for teaching about waste and waste reduction, does not point teachers to Learning Through Action programs that are offered on location at solid waste management facilities. Similarly, the online Learning Through Action program descriptions do not provide links to available curriculum resources. By better connecting the Learning Through Action programs to available curriculum resources and recommended pre-tour and post-tour activities, the Christchurch City Council could improve this otherwise comprehensive program.

A full-time Environmental Education Coordinator employed by Christchurch City Council is responsible for overseeing and coordinating the Learning Through Action program. Facility tours are delivered by Education Officers who work on a contract basis to deliver tours at all facilities (A. Taylor, personal communication, May 16, 2007). An Education Officer is seen leading a group of students on tour at the Christchurch Wastewater Treatment Facility in Figure 4.2.
The Learning Through Action program is funded by the New Zealand Ministry of Education’s Learning Experiences Outside the Classroom (LEOTC) Project. Service providers within communities throughout New Zealand can apply to receive LEOTC funding every three years. A three-year funding commitment is provided to successful program applicants. The LEOTC program is described on the Ministry of Education website (New Zealand Ministry of Education, 2007) as follows:

The Learning Experiences Outside the Classroom (LEOTC) Project provides support for quality teaching and learning experiences for primary and secondary students enrolled in state, integrated and registered private schools. LEOTC programs are hands-on and interactive, and enhance and enrich the curriculum in keeping with the New Zealand Curriculum Framework. Learning experiences provided via this project complement student’s in-school learning and provide experiences which could not be made available in the immediate school environment. Resource material development per se is not the focus of LEOTC, nor is LEOTC a teacher professional development program.
LEOTC illustrates a unique commitment by the Ministry of Education to directly support and fund community-based organizations to provide meaningful learning experiences for students in the community. Student learning was found to be enhanced when LEOTC programs were implemented as part of their study (New Zealand Ministry of Education, 2006).

The Learning Through Action program illustrates that a comprehensive facility tour program can be developed and implemented in a strategic and cost effective manner. Using trained facilitators on an as-needed basis, the Christchurch Council is able to reduce the need to take facility operators away from their regular operations and maintenance duties, while also ensuring that facility tours are delivered by personnel with experience and training to lead and interpret for students and teachers.
The Waterwise Education Program in Perth, Australia

The Water Corporation is responsible for providing water, wastewater, drainage and irrigation services to the City of Perth. Perth is located on the west coast of Australia and is home to 1.5 million people. The Water Corporation directly funds the Waterwise Education Program which offers facility tours and education resources and services to support teaching and learning about water and conservation.

The Waterwise Education Program offers tours of water treatment facilities, a water pump station, a wastewater treatment facility and a water catchment area. These facility tours support and reinforce teaching and learning about the need to value, protect and conserve water and how the water supply system works. Facility tours offered as a component of the Waterwise Education program reach more than 3,500 students per year, at an approximate annual cost of $70,000 ($66,000 Canadian) (D. Ericson, personal communication, June 17, 2007).

School facility tours are available to upper primary through to secondary-level students (Equivalent to grades 4 to 12 in B.C.). Tours are booked in advance and are subject to availability. While most tour programs are offered free of charge, some programs charge a per student fee.

are available, the name of the facility, a picture of the facility and a phone number are provided. Teachers are required to book facility tours for their class by contacting each facility directly. A detailed description of the facility tour, including curriculum connections or key concepts is not provided. Figures 4.3 and 4.4 provide photos of two of Perth’s water facility tour venues.

Figure 4.3: Ground Water Treatment Facility in Perth Figure 4.4: The Golden Pipeline Pump Station # 1 in Perth

Facility tours are delivered by one of four Education Officers. Education Officers are trained to deliver tours at a variety of facilities and to adapt their delivery to meet the needs of the teachers and the students. Education Officers are required to have experience working with students and must undergo a criminal records check. These officers work on contract, on an as-needed basis, in order to meet demand for facility tours and to minimize the impact on facility operations staff.

Where facility tours are not possible, classroom presentations about water supply, water conservation and wastewater are available. Free classroom presentations or lectures are
offered as an option for school groups that find the cost of programs and transportation to be prohibitive.

The Water Corporation also offers curriculum resources to support teaching and learning about water, water supply and conservation at schools. Schools can register to become a Waterwise School. As an incentive to register, schools receive a free copy of *Water is Our Future* (Water Corporation, 2002), a comprehensive teacher resource package linked to the Western Australia Curriculum Framework valued at $264. Waterwise Schools can also order additional copies of the resource for a reduced rate of $99 (Water Corporation, 2007).

The *Water is Our Future* contains 24 topic booklets. Five to seven topic booklets are provided for each of the early childhood, middle childhood, early adolescence and late adolescence age groups. Each topic booklet provides a range of links to learning outcomes, provides teacher background notes, terminology, student activities and worksheets, along with information on resources, tours and lectures specific to the age group (Water Corporation, 2007). A sample page from a topic booklet for the middle childhood level on Perth’s Water Supply is provided in Figure 4.2.
### MIDDLE CHILDHOOD

#### TOPIC BOOKLET

**PERTH’S WATER SUPPLY**

**MY CLASS FOCUS:**

<table>
<thead>
<tr>
<th>WATER LEARNING OBJECTIVES</th>
<th>CURRICULUM FRAMEWORK LEARNING AREA OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>The students should:</td>
<td>The focus in this unit is on developing student outcomes in the following sections of the Society and Environment Learning Area:</td>
</tr>
<tr>
<td>- understand the need for a reliable water supply for the metropolitan area</td>
<td>- Investigation, Communication and Participation</td>
</tr>
<tr>
<td>- understand the history of Perth’s water supply</td>
<td>- Place and Space</td>
</tr>
<tr>
<td>- understand where Perth obtains its current water supplies</td>
<td>- Resources</td>
</tr>
<tr>
<td>- understand the processes and infrastructure required to get water to their home</td>
<td>- Culture</td>
</tr>
<tr>
<td>- realise that in future our water resources will need to come from different sources</td>
<td>- Natural and Social Systems</td>
</tr>
<tr>
<td>- understand what can pollute our water resources and what we can do to protect them</td>
<td>- Active Citizenship</td>
</tr>
</tbody>
</table>

*It can also be used for developing outcomes in English, Mathematics and Science Learning Areas.*

#### SUPPORTING RESOURCES

**WATER CORPORATION RESOURCES**

- Water Education Topic Booklet: Perth’s Water Supply
- Suggested Activities:
  - Water Treatment
  - Importance of a Good Water Supply
  - History of Perth’s Water Supply
  - Perth’s Distribution System
  - Supply Water to Your Home
  - Making a Model
  - Mapping the Distribution System
  - Water Supply Infrastructure
  - Metropolitan Dams
  - Class Mural on Our Water Supply
  - Future Water Supplies
  - What Happens in a Catchment Area?
  - Protecting Our Water Resources
- Posters:
  - The Water Cycle
  - Water in the Community
  - Perth Region Water Sources
  - Clean Groundwater
- Videos:
  - What is Groundwater
  - Living on Groundwater: Country WA
  - Living on Groundwater: Urban WA
- Stickers:
  - The Future of Water is in Our Hands
  - Drinking Water Needs our Protection
- Water Education Topic Booklets:
  - Groundwater
  - Water Down the Drain
  - Catchments in Our Community
  - Groundwater in Western Australia
  - Goldfields and Agricultural Water Supply
  - Water, More Precious than Gold
- Web Site Resources:

**TOURS AND LECTURES**

**EXCURSIONS**

**INCURSIONS**

#### OTHER RESOURCES

**Department of Education (Previous Syllabus References)**

**Social Studies**

**Year 4:**
- Water Resources Obj 2.1 (ground and surface water resources in Australia, groundwater in Perth, use of private bores, groundwater expert, artesian basins and groundwater supplies); Obj 2.2 (ground and surface water resources in Australia, average annual rainfall in WA towns); Obj 3.1 (water sources in the city and country, water on farms, dams and reservoirs in the world, where water comes from for our homes); Obj 3.2 (water supply for a house, water for hygiene, water for survival); Obj 3.3 (desalination)

**Year 7:**
- Sharing the Environment Obj 2.2 (water supply); Obj 3.2 (dams and the environment)

**School Resources**

**Books** (list books and other resources)

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Also available on the Water Corporation website is a student section titled “Fun Stuff” (http://www.watercorporation.com.au/education/index_funstuff.cfm). The “Fun Stuff” section provides information to students about water and water conservation. Content is presented in a student-friendly manner. It is not text-heavy and it uses simple graphics that are appealing to students. The Fun Stuff section provides information for students to explore as part of a unit of study or independently (Water Corporation, 2008).

The Waterwise Education facility tours and the Waterwise Education Program target students and teachers in Perth. The programs and supporting resources provide several entry points to engage teachers, students and others in the school community. The facility tours, teacher resource materials, student activities, web interface and direct-delivery classroom presentations combine to provide a flexible menu of options for teachers to select and implement according to their teaching style and needs of their students.
The Waste Management Centre Education Program in Edmonton, Canada

The Waste Management Centre (EWMC) in Edmonton, Alberta, is North America’s largest collection of modern and sustainable waste processing and research facilities. EWMC handles the waste from the City of Edmonton. The population of Edmonton is 800,000 residents (City of Edmonton, 2008). Operated by the City of Edmonton, the EWMC is home to a facility tour education program that aims to increase community awareness about waste management and waste reduction. In addition to facility tours, the City of Edmonton offers classroom presentations and an interactive and a student-friendly website.

Unlike most operations facilities the EWMC has incorporated components for public education into the design of the facility. The facility includes a theatre, classrooms and a built-in viewing area for visitors (see Figure 4.6) to safely observe the Materials Recovery Facility in action. The EWMC demonstrates a commitment to managing waste and public education. A diagram of the entire EWMC is shown in Figure 4.7.
Figure 4.6: Materials Recovery Facility viewing area

![Image of Materials Recovery Facility]

Each year more than 10,000 students tour the recycling facility and EWMC.


Figure 4.7: Diagram of Edmonton Waste Management Centre

![Diagram of Edmonton Waste Management Centre]


In partnership with local school authorities, the city of Edmonton provides classroom presentations, resources and facility tours to more than 15,000 students, parents and teachers each year (L. George, personal communication, July 16, 2008). Tours of the Edmonton Waste Management Centre are available for free to grades 4 to 12 classes.
Each year, more than 10,000 students participate in the EWMC facility tours (L. George, personal communication, July 16, 2007).

The facility tour program targets Grade 4 classes as Alberta’s Grade 4 science curriculum requires a unit of study called "Waste and Our World". The EWMC facility tours are adjusted to meet the interests, needs and learning objectives associated with the age and grade of the students. The tour and supporting resources for teachers and students are recognized and recommended as an environmental education resource by the Alberta Ministry of Education.

The Edmonton Waste Management Centre facility tour bookings and classroom presentations are scheduled by phone. Teachers are encouraged to schedule a classroom presentation prior to the facility tour, in order to best prepare students. Classroom presentations may also be delivered without the facility tour.

Classroom presentations offered by the City of Edmonton are listed online. The “Waste and Our World” presentation is recommended in advance of the facility tour. This session explores Edmonton’s waste management practices and challenges in the past, present and future, and connects to the Alberta Provincial Science and Social Studies curriculum. Other classroom waste and waste reduction presentation topics offered by the City of Edmonton include: “Choose to Reuse” (3R’s), “Squirmy Wormy” (Worm Composting), and “Garbage In, Compost Out” (3R’s).
Two former classroom teachers coordinate and facilitate the EMWC tours and the classroom presentations. One Environmental Education Officer position is a secondment from the Edmonton School District and is co-sponsored by the school district and the City of Edmonton. The second position is funded entirely by the City of Edmonton. The second position evolved over time to meet increased demand for the program which has grown in popularity since its inception (L. George, personal communication, June 16, 2007).

The Environmental Education Officers also develop curriculum support materials to assist classroom teaching and learning associated with EWMC facility tours, waste management and waste reduction in the City of Edmonton. These resources include background information, a comprehensive overview of the EWMC facility, student activity books and online student activities. “Sort-it-Out” is a collection of student-friendly online activities (http://www.sortitout.ca/) introducing key waste and waste reduction concepts, which can be used pre-tour and post-tour in the classroom.

Several aspects of the Edmonton Waste Management Centre and its facility tour program illustrate the City of Edmonton’s commitment to education about waste, waste management and waste reduction. The classrooms, theatre and viewing areas are evidence that the EWMC was designed with public education in mind. The interactive and student-friendly “Sort-it-Out” activities and the ongoing delivery of programs by professional educators provide excellent examples of the city’s commitment to meet the needs and interests of students as learners as well as the needs of the teachers. Public
education is identified as part of its long-term commitment to waste reduction in
Edmonton’s Solid Waste Management Plan.
Summary – How Facilities Can Educate and Operate

The facility tours and associated education programs offered by the cities of Perth, Christchurch and Edmonton provide examples of established programs that have made a commitment to using operations facilities as community-embedded places for learning. Through these respective facility tour education programs residents of Edmonton, Perth and Christchurch are engaged in learning about how where their waste goes, where their water comes from and how they are connected. These residents are also provided with numerous opportunities to explore and develop an understanding of how and why they can act as responsible stewards of the environment through waste reduction, water conservation and other forms of environmentally responsible and sustainable behavior.

Common features of these facility tour education programs are financial support, dedicated and trained facilitators, schools as a target audience (including students and teachers), and curriculum connected resources and materials to support teaching and learning before, during and after the facility tours. These key ingredients form the basis of recommendations to guide Metro Vancouver in developing and implementing of facility tours as an integrated and experiential component of an improved sustainability education strategy (see Chapter 5).
CHAPTER 5

FACILITY TOURS AS AN INTEGRATED EXPERIENTIAL COMPONENT OF A SUSTAINABILITY EDUCATION STRATEGY– GUIDING PRINCIPLES AND RECOMMENDATIONS FOR METRO VANCOUVER

In this chapter, I will provide recommendations and strategies for Metro Vancouver to advance sustainability in the region by utilizing facilities as places for experiential learning. The following recommendations and strategies will support Metro Vancouver to realize its commitments to advance sustainability in the region through education. Metro Vancouver’s outreach and education objectives include promoting understanding, awareness, values and actions to conserve and develop natural, economic and social capital.

The recommendations and strategies provided are based upon the preceding review of relevant literature (Chapter 2), Metro Vancouver’s commitment to advance sustainability and existing Metro Vancouver education programs and efforts to accommodate facility tours (Chapter 3), and an overview and analysis of established facility tour programs in Perth, Christchurch and Edmonton (Chapter 4).

Given Metro Vancouver’s interest in expanding and advancing sustainability through improved education and outreach programs, the following guiding principles will form the basis for recommendations to guide the development and implementation of facility
tour programs as an integrated and experiential component of a Metro Vancouver sustainability education strategy. The guiding principles are:

1. Effective facility tour education programs require long-term financial support
2. Effective facility tour education programs require skilled and trained facilitators, coordinators, and professional education program developers
3. Effective facility tour education programs target strategic audiences
4. Effective facility tour education programs support meaningful experiential learning

The rationale and context for these guiding principles, along with recommended strategies for Metro Vancouver will be provided in the remainder of this chapter. While these guiding principles apply to the development of effective tour education programs for any target audience, the examples and recommended strategies provided will pertain to the development of effective Metro Vancouver facility tour education programs for school audiences. Recommendations and suggested strategies will align with *Environmental Learning and Experience; An interdisciplinary guide for teachers* (B.C. Ministry of Education, 2007).
**Guiding Principle 1: Effective facility tour education programs require long-term financial support**

The development and delivery of an effective facility tour education program requires both financial support and organizational support. Adequate funding support allows for effective coordination and involvement of professional staff members who possess the necessary skills and experience to design, develop and deliver facility tour education programs.

The cities of Perth, Christchurch and Edmonton provide examples of facility tour education programs with financial and organizational support in place. For each program, dedicated staff members are in place to coordinate facility tours. Education officers are contracted to deliver facility tour programs on an as needed basis.

The benefits of financial support are well illustrated by Metro Vancouver’s Lower Seymour Conservation Reserve (LSCR) Education Programs. The LSCR provides both financial and staff resources to the delivery of on-site education programs. The LSCR has a dedicated professional teacher who coordinates a team of skilled interpreters to deliver on-site programs (see Chapter 3). As a result, the program is well coordinated and organized, and meets the needs of the audience. The program operates without negatively impacting watershed management operations.

LSCR education program provides a useful model for financing and supporting an on-site facility tour education program. Moderate program fees of $3 per student generate some
revenue through which a portion of the program operation cost is recovered. To ensure programs are accessible to all Metro Vancouver classes, the LSCR is able to waive the program fee for inner-city schools. It is recommended that Metro Vancouver consider a similar cost-recovery model for the development of broader facility tour education programs.

Funding and support for the development of a coordinated facility tour program that is similar to Christchurch’s Learning Through Action program is recommended as part of an integrated sustainability education program for Metro Vancouver. The coordination of such a program would enable Metro Vancouver to realize numerous benefits. Experienced and professional staff could collaborate to develop, coordinate and implement effective tours of water, waste and wastewater facilities to support Metro Vancouver sustainability education objectives. Support materials could be developed to provide teachers and students with information and activities to further explore each unique facility tour experience and explore connections to broader sustainability concepts. Registration for Metro Vancouver facility tour education programs could be undertaken through a shared and central registration centre. Promotion and advertising could also be undertaken collectively.
Guiding Principle 2: Effective facility tour education programs require skilled and trained facilitators, coordinators, and professional education program developers

The success of a facility tour program is largely dependent on the effectiveness of the tour facilitators, the quality of support materials, and the level of support provided to teachers before, during and after facility tours. For this reason, it is recommended that Metro Vancouver ensure staff members with the appropriate level of professional training, skill and experience are responsible for these important roles.

Facilitator

The primary goal of a tour facilitator is well stated in Tilden’s (1977) *Interpreting Our Heritage*. “To spark an interest, interpreters must relate the subject to the lives of visitors” (p. 190). An effective facilitator ensures visitors are actively engaged in learning about the facility and its relevance to their lives, the community and broader sustainability and demand management objectives. A facilitator who understands the needs of both learners and teachers can ensure these needs are met.

A skilled and trained tour facilitator ensures visitors are actively engaged in learning about the facility and its relevance to their lives, the community and the broader sustainability objectives. An effective tour facilitator needs to be familiar with schools and the realities facing classroom teachers in order to best support and meet their needs. A tour facilitator must be careful to ensure that the learning experience is positive, engaging and relevant for all participants and suitable for a variety of learning styles. It
is recommended that tour facilitators with teaching or interpretation experience, a sound knowledge of sustainability and a passion to meaningfully engage others deliver and develop Metro Vancouver facility tours and associated educational support materials.

**Education program developer**

A professional educator with experience in the classroom, experience developing curriculum resource materials and experience developing and delivering facility tours is ideally suited to develop curriculum resources and support materials. This person should possess a knowledge and understanding of the goals and objectives of Metro Vancouver, as well demonstrate knowledge of the needs of classroom teachers and students. This educator would be able to design curriculum resources to support classroom teachers to adequately prepare their students for the facility tour by providing ideas and strategies for teachers to engage and support student learning before, during and after the facility tour. (Further discussion on this topic is provided in the following section.)

**Facility tour coordinator**

An effective facility tour coordinator is a readily accessible liaison (or coordinator) with whom teachers can coordinate the tour time and logistics. The coordinator is able to provide information, support and advice to teachers to aid their preparation for an effective learning experience. Having an accessible liaison with whom teachers could relate to was identified by Metro Vancouver teachers as a significant priority to support fieldtrip planning (Anderson and Zhang, 2003). It is recommended that facility tour coordinators be familiar with the needs and interests of teachers and the available facility
tour programs. It is also recommended that facility tour coordinators possess the skills to
establish and maintain a partnership and dialogue with the classroom teachers so they are
acquainted with the students, aware of the intended learning objectives and can advise
teachers accordingly. The coordinator must be able to clearly communicate the activity,
timelines, expected learning outcomes, and behavior and safety expectations of the
facility to the teacher. The teacher will then be able to design in-class activities to
enhance the student experience before, during and after the facility tour (more discussion
about supporting the experience will be found in the next section). The tour coordinator is
also responsible for communicating the needs of each class to the tour facilitator in
advance. It may be necessary for the tour coordinator to have the tour facilitator contact
the classroom teacher directly in advance of the tour.

The facility tour programs from Perth, Christchurch and Edmonton provide examples of
programs involving qualified staff in the development and delivery of facility tours and
development of support materials and resources. In Edmonton, facility tours are provided
by professional teachers. In Perth and Christchurch, education officers, with experience
working with students, are hired on a contract basis to deliver facility tours. The
curriculum support materials for these programs were developed and designed by
teachers. These full-time employees or contractors possess the relevant skills, interest
and proficiency in the design and development of facility tours and education programs
to ensure the needs of students and teachers were met (Further discussion about targeting
programs to meet audience needs follows in the next section.).
Ongoing and effective communication, orientation and training is needed and recommended to ensure facilitators are equipped with the ideas, strategies and knowledge to accommodate shifting audience needs, current events and corporate priorities. For example, changes in the B.C. Ministry of Education’s Prescribed Learning Outcomes, or new Metro Vancouver capitol projects, communications priorities or safety procedures, need to be conveyed to tour facilitators and integrated or reflected in facility tour programs and materials.

Involving existing Metro Vancouver expertise in the development and delivery of an effective and integrated facility tour program and internal staff training is recommended. Metro Vancouver currently employs qualified professional educators and interpreters. In the Lower Seymour Conservation Reserve and Metro Vancouver Regional Parks, staff members have extensive experience working in the classroom and developing and delivering engaging and experiential interpretive programs. In the Corporate Relations Department, the education coordinator has extensive experience developing and delivering curriculum connected resources and programs to support K-12 teaching and learning about local sustainability topics. By working together as an integrated team, Metro Vancouver staff members could develop a new and integrated facility tour program as part of a broader Metro Vancouver education strategy to advance sustainability in the region.

In summary, it is recommended that Metro Vancouver utilize qualified professionals from the fields of education and interpretation to develop and deliver integrated facility
tour education programs to support the needs of teachers and students. These include professional tour facilitators, trained coordinators and professional tour program developers and curriculum designers. Utilizing staff expertise to develop an integrated facility tour education program would provide Metro Vancouver with numerous opportunities to engage and educate students about local sustainability topics through a unique and expanded program. A program such as this would extend beyond the bounds of traditional Metro Vancouver education programs.
Guiding Principle 3: Effective facility tour education programs should target strategic audiences

An effective facility tour program needs to be relevant, interesting and engaging to resonate with its target audience. For facility tours to provide a unique, real, local, relevant and memorable learning experience, it is important to work from the premise that the same approach does not work for all audiences.

To develop a Metro Vancouver facility tour education program for schools similar to the programs established in Perth, Christchurch and Edmonton, it is important that they are designed to meet the needs of Metro Vancouver and as well as the teachers and students it will be targeting. It is recommended that programs are designed based upon input sought and received from the target audience (students and teachers) and Metro Vancouver employees or contractors who are familiar with the facilities, existing education programs (see Chapter 3), audience needs and corporate objectives.

Seek input from target audience (students and teachers)

Receiving input and feedback from potential target audiences can help to test assumptions and provide new ideas about the design and delivery of facility tours and support materials. Input should be sought and collected from teachers and students using questionnaires, surveys, advisory committees and focus group studies. Using key information identified by students and teachers, Metro Vancouver facility tour education
programs can be designed to meet the needs of school audiences. Key audience information includes:

- Specific target groups;
- Visitor motivations and perceptions;
- Demographic characteristics;
- Visitor orientation systems;
- Visitor use patterns; and

Using key information for audiences, existing programs can be improved and new programs can be developed to meet the expressed needs and interests of the target audience and the desired objectives of Metro Vancouver.

**Pilot test and evaluate**

Pilot testing and ongoing evaluation of tour programs and support materials are also recommended to ensure that tours and tour support materials are improving. Feedback from teachers, students, facility operators and tour facilitators should be collected to identify areas needing improvement and areas of success to build upon. Feedback will help tour facilitators to identify adaptations that ensure programs and delivery are both responsive to the audience and improving over time. Tour agendas and curriculum support materials can also be adjusted accordingly to meet the specific needs of student groups.
Seek input from the Metro Vancouver Education Advisory Committee

It is also recommended that the Metro Vancouver Education Advisory Committee (EAC) provide input and direction regarding the development of integrated facility tour education programs. The EAC is comprised of practicing elementary and secondary teachers, informal educators, administrators and post-secondary educators who represent a cross-section of the school community from the eleven school districts in Metro Vancouver. Traditionally, the EAC has provided valuable input and strategic direction to support the Corporate Relations K-12 Education Program to meet the changing needs of teachers, students and school districts.

By extending the scope of its traditional role, the EAC could provide strategic advice and direction to all Metro Vancouver school programs, including Corporate Relations, Parks, the LSCR, and facility tour education programs. An expanded cross-departmental EAC purview is recommended to support Metro Vancouver to develop an integrated sustainability education program of which facility tours could be an integral part.

Seek input from Metro Vancouver staff

Seeking input from Metro Vancouver employees who are professional educators or interpreters familiar with the needs of classroom teachers, students and existing Metro Vancouver education programs, goals and objectives is also recommended. Many of the full-time employees and contracted staff who work with Metro Vancouver Parks, the LSCR and the Corporate Relations education programs have extensive experience developing and delivering engaging and experiential interpretation and education programs and support materials for schools, teachers and students. Forming team of
Metro Vancouver employees familiar with the diverse needs of teachers and students is recommended to further envision, steer, and develop an integrated facility tour education program in a manner that can advance sustainability in the region.

**Target teachers and students**

Teachers select field trips for their classes. As a result, teachers are an essential target audience for facility tour education programs. By appealing to the needs of teachers and helping them to address curriculum requirements, Metro Vancouver can create a program that addresses the needs of both teachers and students of various age groups. The cities of Perth, Christchurch and Edmonton provide examples of facility tour programs that target teachers and students as the strategic audience. These programs provide facility tours and support materials that are connected to the locally mandated curriculum to reinforce, apply and extend student learning through in class exploration. A successful facility tour may take less than two hours, but student exploration of the central and associated concepts using tour support materials and the tour experience as a catalyst may equate to many more hours of classroom exploration.

A recent study of Metro Vancouver teachers found that both logistical factors and learning environment factors were of primary concern when selecting and planning potential fieldtrips (Hargreaves, 2005). The top four factors influencing field trip selection were integration, preparation and organization, interactive environment and teacher supportiveness. In the same study, these factors were also identified as the top four attributes of an ideal field trip. This study indicates that an effective facility tour
education program requires a commitment to supporting the teachers’ and students’ needs before, during and following the tour itself.

In another recent study, 93 teachers from the Vancouver, Richmond and Surrey school districts, identified curriculum fit as one of the most prominent factors they consider when planning and implementing fieldtrips (Anderson & Zhang, 2003). Curriculum fit was defined as the degree to which the field trip experience fit the school-based curriculum. Perceived value of the learning experience for students and venue entry cost were identified as the next most important factors.

The findings of these two studies suggest that facility tour education programs that are curriculum-connected, high quality for students and teachers, and accessible and affordable should attract participation by Metro Vancouver teachers. It is recommended that Metro Vancouver develop facility tour education programs that address these factors to encourage teacher selection of these programs and the integration of local sustainability learning experiences into ongoing classroom teaching and learning.

**Curriculum fit**

It is also recommended that Metro Vancouver facility tour education programs link to the school curriculum. Prescribed Learning Outcomes (PLO’s) across all grade levels and subject areas provide numerous opportunities for Metro Vancouver to encourage and support teachers who wish to engage students with sustainability topics, such as air, water, waste and wastewater, through participation in facility tour education programs.
The most prominent curriculum connections should be identified for each available facility tour program. For example, a solid waste management facility tour and supporting resource materials could be positioned as supporting the Grade 5 Social Studies curricula and assisting teachers to address the following PLO: “The student will be able to apply critical thinking skills, explain why sustainability is important, and identify an action plan to address a school or community problem or issues” (B.C. Ministry of Education, 2006, p. 30).

It is also recommended that Metro Vancouver curriculum support materials or lesson plans be provided. By identifying facility tours and support materials as explicitly connected to prescribed learning outcomes, programs can be targeted to teachers and students of varying grade levels. If a program is designed to support teachers and students in achieving curriculum requirements, it is more likely to be used by teachers.

The B.C. Ministry of Education publication titled *Environmental Learning and Experience; An interdisciplinary guide for teachers* (B.C. Ministry of Education, 2007) provides further rationale to educators to entertain facility tours as pedagogically sound teaching and learning experience for students. Facility tours provide many opportunities for experiential and interdisciplinary teaching and learning about local environment and sustainability topics. This publication provides a conceptual framework that is helpful for both teachers and informal educators to envision and support meaningful environmental learning (see next section). To complement *Environmental Learning and*
Experience, the B.C. Ministry of Education is developing a curriculum map that provides teachers with an outline of PLO’s from a variety of core subject areas.
Guiding Principle 4: Effective facility tour education programs support experiential environmental learning

Effective facility tour education programs provide unique, direct, local and personally relevant experiences, and numerous opportunities to introduce visitors to how they are dependent on and connected to the built and natural environment. As part of a broader sustainability education strategy, an integrated facility tour program should support experiential learning before, during and after the tour experience.

Recommendations to support pre-tour experiential learning

Supporting students and teachers to prepare in advance for facility tours is highly recommended. Pre-tour preparation includes providing information to orient, prepare and assist the teacher with orienting, preparing and engaging their students to make the most of the field experience.

Research indicates that students visiting unique, or out-of-school, learning environments, who have previously undergone pre-orientation, learn more than those who have not (Orion, 1993, and Anderson, 1997). The job of preparing students for the field experience falls largely upon the teacher. Supporting the teacher to prepare for the field experience by providing information, consultation, and resource materials and activities to orient students in advance of the field experience is highly recommended.

Pre-tour orientation should set the stage for the tour. It should introduce students to the rationale for the field experience, the unique features of the setting, behavior and safety
expectations, new and relevant vocabulary, and student roles and responsibilities. The goal of orienting students in advance of a fieldtrip is to provide students with increased opportunities to focus on the experiences provided by the facility tour.

A pre-tour package for teachers should include an outline of the tour agenda, overview what they will see and do while on the facility tour, description of the facility and its purpose, site map, logistical considerations, key learning points, curriculum connections, key vocabulary, directions, safety and behavior expectations, and pre-tour student activities. By supporting classroom teachers to address logistical details in advance of the tour, less time will be required to review these logistics while on the tour.

Provide pre-tour activities to support teacher and student preparation.

Providing a pre-tour package for teachers is a strategy recommended to support teacher planning and preparation for the fieldtrip. This package would contain pre-tour student activities that would support teachers in guiding, inspiring, and focusing student learning. Pre-tour engagement strategies and activities that explore students’ prior knowledge, understanding, interests and expectations will help to ensure an effective field experience for all.

The pre-tour activities should introduce the students to new concepts and ideas. These can take many forms. For example, asking students to consider and predict the purpose, processes and connections to the community prior to the tour will promote interest and curiosity. Opportunities for students to exercise their critical thinking skills and explore
personal relevance and the relationship between the facility, the community and their
daily lives and choices should also be provided.

Activities which introduce students to key concepts and enables them to develop an
understanding of content and how it is connected to their lives are particularly
recommended. A home waste audit, for example, would be an excellent activity to
conduct with students prior to a waste management facility tour. Students would identify
renewable versus non-renewable resources found in their home waste stream. This may
lead students to be mindful of their contribution to the mountain of waste they observed
on the tour. Asking students to generate a list of questions reflecting their interests, prior
knowledge and curiosity is another recommended activity.

Providing tools to teachers to introduce students to methods for data collection and
capturing observations, questions and ideas in advance of the facility tour is
recommended. If teachers introduce students to strategies for collecting data or recording
observations in advance, students are not burdened with learning this while on the tour.
Ideas and observations collected via journal entries, note taking, or sketching can be
revisited, shared and expanded upon following the facility tour. Pre-tour activities can
also set the stage for anticipated post-tour activities. A teacher may wish to have students
undertake a particular project following the facility tour. Student observations or data
collection can then be used to support students revisiting the experience through post-tour
activities.
Provide a pre-tour teacher orientation. A pre-tour teacher workshop is recommended to orient the teachers on how to best prepare their class for a facility tour. The pre-tour workshop could provide teachers with the opportunity to explore key concepts, curriculum connections, student engagement strategies and resources to enhance the tour experience and associated student learning. A range of pre- and post-tour activities that connect to curriculum and Metro Vancouver sustainability education objectives could be introduced and explored with teacher participants. Teaching strategies and ideas for connecting to students’ everyday lives, choices and community, along with environmentally responsible behavior, could be explored. As it is also a good practice for teachers to be familiar with fieldtrip venues prior to fieldtrips, teacher workshops could be held at the facility tour venue as a professional development offering. A facility tour then could be provided as part of this orientation, enabling the teachers to experience the tour and explore opportunities to prepare students and connect to classroom teaching and learning.

Provide on-site orientation for students. Providing students with an on-site orientation and a review or overview of the purpose of tour, the agenda, and the behavior and safety expectations is another recommended strategy. During an on-site orientation, students should be informed of where they are, where they will go, what they will see and do and other important details, such as where the toilets are, etc. Providing such an orientation will help to focus student interest on the tour experience. Interacting with the students and teachers on-site before a tour also provides an opportunity for the facilitator to get to know the group and get a sense of their prior knowledge and level of
preparedness. Using this information the tour facilitator can adjust the tour accordingly to suit the students’ needs.

Reviewing safety expectations and emergency procedures as part of the introduction is absolutely necessary. While on tour, students must stay with the group and under the supervision of the facilitator, teacher and adult chaperones. The students must be reminded not to touch anything unless they are invited to do so.

**Recommendations to support experiential learning during facility tours**

An effective facility tour engages learners in a variety of cognitive and affective learning experiences. Falk and Dierking’s (1997) study reinforces how the personal, social and physical contexts for learning are strongly interconnected, suggesting:

> Learning is the process of applying prior knowledge and experience to new experiences; this effort is normally played out within a physical context and is mediated in the actions of other individuals. In addition, learning always involves some element of emotion and feeling (p. 216).

The quality of learning during a facility tour experience is largely contingent on the skill and ability of the facilitator to use appropriate and effective instructional strategies to engage the students and to meet their needs as learners. A tour experience will be more effective if it is relevant, engaging, interactive, hands-on and well organized.

Based upon the principles of constructivism, Brooks and Brooks (1993) offer a set of instructional strategies to foster meaningful student learning:
• Posing problems of emerging relevance to learners;
• Structuring learning around primary concepts;
• Seeking and valuing students’ point of view;
• Adapting to address students’ suppositions; and
• Assessing student learning in the context of teaching (p. 53).

Planning the facility tour with these strategies will help on-site educators and students to engage in the learning process together, using inquiry and experiential learning to guide the process of building knowledge and making sense of the world (Jacobsen & McDuff, 2006).

Thus, it is recommended that Metro Vancouver facility tour programs adopt the following principles when designing facility tour education programs to be effective:

• Provide opportunities for students to ask and answer questions;
• Provide opportunities for interaction;
• Provide active and hands-on learning;
• Provide support for a variety of learning styles;
• Provide structure – but not too much; and
• Provide time for reflection.

**Provide opportunities for students to ask and answer questions.** Asking questions to engage students provides opportunities for them to consider connections between their everyday lives and the facility. To engage students, a wastewater treatment tour facilitator could ask “How many times have you flushed the toilet today?” Allowing
time for the students to respond, the facilitator might then ask “What happens to the dirty water once it goes down the drain?” The student responses can help the facilitator identify the current level of understanding and interests of the students. Questions can also be used to encourage students to focus and inspire curiosity.

Tour guides should draw upon information they receive from the students and structure the tour accordingly. The dialogue with the students can serve as a gauge to determine their prior knowledge and level of interest.

**Provide opportunities for interaction.** It is recommended that facility tours provide opportunities for students to interact and share their ideas. This strategy offers students the opportunity to participate, articulate their perspective, make connections to their prior experience, consider perspectives other than their own and ask questions as part of building their understanding. Tour facilitators should strive to create a successful learning setting where all individuals are respected, student learning is supported and opportunities for collaboration are provided. A skilled facilitator is sensitive to the social cues and potential for meaningful interaction, along with knowing when to listen, when to offer encouragement and guidance, and when to suggest an idea or strategy to facilitate student engagement and reflection in the learning environment (Piscitelli & Weier, 2002).

To make learning engaging and interactive, the facilitator and tour program should provide opportunities for students to work in groups to share ideas and observations, identify solutions or challenges, and ask questions. To support student learning, a variety
of interactive teaching-learning behaviors, including non-directive, scaffolding, and directive behaviors, are recommended. Non-directive behaviors are the least intrusive. These may include listening, commenting, praising and encouraging. The aim is to create a comfortable, secure level of interaction and to sustain participation and interest without overly directing the learning. Facilitators can support student learning by providing scaffolding or teaching-learning behaviors which challenge children to a deeper level of understanding. Scaffolding may include focusing their attention, posing questions, clarifying, describing, suggesting or prompting. Directive behaviors may include the facilitator demonstrating and directing to support student learning, understanding or completion of a task.

**Provide opportunities for active and hands-on learning.** Active and hands-on learning activities that are safe, fun and connected to the tour experience are recommended. Hands-on activities provide a process through which young learners interpret and make sense of their world. Hands-on activities also provide opportunities for visual and kinesthetic learners to be engaged. Examples of hands-on activities include opportunities for students to use the tools of the facility. This may include using a skimmer at a wastewater treatment facility, or trying on safety equipment such as a hard hat, gloves or a harness, or operating simple and safe equipment or machinery under the supervision of the tour facilitator. These hands-on activities are direct experiences that make the tour active, personal, fun and memorable for the learner.
Provide support for a variety of learning styles. It is important for the facility tour program to accommodate a variety of learning styles in the delivery of an effective tour. Where possible, the tour facilitator should address key learning objectives and key concepts using a variety of approaches to support visual learners, auditory learners, and tactile-kinesthetic learners.

Teaching and learning that adheres to the Experiential Learning Cycle (see Figure 1.1) provides opportunities to engage all learning styles. Information received from books, charts, maps and pictures appeal to visual learners. Auditory learners tend to grasp spoken information. Group work often suits auditory learners as they are provided with opportunities to listen and talk. Physically-engaging activities such as building, manipulating, tracing and note-taking tend to support tactile-kinesthetic learners.

Providing teaching aids, such as models, maps, pictures, video footage or hands-on activities to support a variety of learning styles, to reinforce learning before, during and after a facility tour is recommended. For example, a diagram or brief flash media presentation could help to illustrate what an anaerobic digester looks like on the inside or how a sediment tank works. A wastewater treatment and collection system map can illustrate the path wastewater travels from school to the treatment facility – demonstrating the physical connection between the students and the facility.

Provide structure – but not too much. Design tasks for students that are meaningful and require thinking about what they have seen. Ensure students have time to
make observations and connections rather than simply copy facts. It is important to provide students with opportunities to focus and observe the unique environment they are experiencing and to make connections without over-programming or distracting them from the experience.

**Provide time for student reflection.** Providing time for students to safely and independently reflect and record their observations during a facility tour is recommended. During this time, students can capture aspects of their experience by drawing pictures and recording their personal observations, questions or ideas. A safe and quiet location for reflection is recommended, if possible. Student observations can be used as the basis for further exploration, discussion, research, and extended learning in the classroom.

**Recommendations to support experiential learning after the tour**

Supporting post-tour teaching and learning is recommended to reinforce desired learning and behavior outcomes. The facility tour provides the real world experience that can be used as the basis for a variety of post-tour activities where students are able to make sense of their facility tour experience.

A variety of post-tour strategies can be used to support teachers and students to further explore and develop understanding following the facility tour. Students can be supported
to organize, assess, discuss, relate, apply and share their data, observations and findings stemming from their experience.

Post-tour activities provide opportunities to explore social, economic and environmental topics and concepts that are central to sustainability. Post-tour activities also provide many opportunities to exercise critical thinking and problem solving skills, and explore relationships, connections and inter-connections related to ideas or concepts introduced during the facility tour. These activities may include exploring the role of technology, the role of people, careers, use of resources, costs, environmental degradation, responsibility and conservation.

Providing teachers with tour follow-up activities will support and reinforce desired student learning and behavior outcomes. Post-tour activities, like pre-tour activities, are more likely to be implemented by teachers if they are curriculum-connected and practical, building upon aspects of the experience and pre-experience activities. Given that teachers decide how to incorporate classroom activities, post-tour materials should provide several options and a range of suggested strategies for teachers to apply in the classroom. The facility tour education programs from Perth, Christchurch and Edmonton provide examples of curriculum-connected materials that can support extended teaching and learning about key concepts related to the facility tour.

Post-tour activities support the constructivist notion that learning is a cumulative process where the learner develops and builds knowledge based upon their previous experience.
and understanding (Dewey, 1938). Given Metro Vancouver’s interest in advancing sustainability, it is recommended that Metro Vancouver provide post-tour activities to support extended classroom exploration of the facility tour experience and the associated local sustainability issues and topics.
Summary of guiding principles and recommendations for developing Metro Vancouver facility tour programs

A facility tour experience, including the pre-tour, tour and post-tour components, provides students with real and experiential context to enrich teaching and learning. Because learning is cumulative, education programs need to provide multiple experiences over extended periods of time and be coordinated with other interventions, to reach their full potential in promoting and reinforcing learning and environmentally responsible behavior (Gardner & Stern, 1996, Zint et al., 2002). A facility tour provides a starting point for discussing and exploring local student-relevant issues, challenges, problems, opportunities, ideas and solutions such as those associated with managing waste or water. A facility tour education program provides teachers and students with a wide variety of opportunities to explore the social, economic and environmental topics and concepts central to sustainability. This may include exploring the role of technology, the role of people, careers, the use of resources, costs, environmental degradation, responsibility and conservation.

By investing in the development and design of a facility tour education program that adheres to the above guiding principles and recommended strategies, Metro Vancouver would take a significant step towards advancing sustainability in the region. Research has shown that education and outreach can foster sustainable behavior, including improving public support for conservation and compliance with environmental policies and decisions that affect the receiving environment (Knudsen et al., 1995, Jacobsen,
1999; Day & Monroe, 2000). A facility tour program targeting schools and supporting teachers and students is recommended as a key component of a broader Metro Vancouver sustainability education and outreach strategy.
CONCLUSION

Utility service providers, such as Metro Vancouver, are uniquely positioned to lead a transition to sustainability by expanding traditional operational practices to include place-based, sustainability education and facility tours. Tours of public waste management or drinking water treatment facilities offer a rich learning opportunity to all members of the community.

A shift in how we live in and educate our communities and a transition to sustainability is required. Residents must understand the implications of their daily choices and the real limits of the Earth’s carrying capacity. Through facility tour education programs Metro Vancouver can play a significant role in influencing the awareness, knowledge, attitudes, skills and environmentally responsible citizenship and participation necessary to influence culture shift and to advance sustainability. A long term commitment and investment in education will be required.

The City of Edmonton’s commitment to education and facility tours, as a component of its Solid Waste Management Plan, provides an excellent model of a strategic and long-term commitment to advancing sustainability through education. The very real potential for public facilities to operate and educate to advance change within the communities
they serve, is further illustrated by the facility tour education programs offered in Perth and Christchurch.

As part of a broader sustainability education strategy, Metro Vancouver facility tour education programs should provide direct experiences that challenge the cultural assumptions and ecological disconnects which exist within communities – a notion strongly supported by literature on sustainability, environmental education and learning in informal environments. Because learning is cumulative, facility tour education programs should support student engagement before, during and after the facility tours in order to reinforce learning and promote environmentally responsible behavior. Further, Metro Vancouver facility tour education programs should be supported and reinforced by other communications or social marketing initiatives to promote sustainability and sustainable behavior.

Established sustainability education and facility tour program success stories coupled with existing management plan commitments and unprecedented public and political interest in advancing sustainability in our communities, offer both a mandate and a model for community leaders and facility managers to rethink the role of community resources as places for learning. Community-embedded public facilities, such as water, wastewater, and waste management facilities, are uniquely situated to become integral parts of a new recipe to advance sustainability through education in the Metro Vancouver and beyond.
Visionary and effective leadership will be required for Metro Vancouver to become the world’s most livable and sustainable region. To support this vision, this report provides recommendations, a rationale and strategies for Metro Vancouver to re-think and re-define water, wastewater, and waste management facilities as place-based centers for teaching and learning about sustainability – to reconnect people to the impact their daily lives have on the place they live.
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