

The Red Hill Valley Project Integrated Environmental Monitoring Plan



Joint Stewardship Board
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Presenters

- Kara Bunn, City of Hamilton
 - Current Project Manager for the RHVP IEMP at the City
- Jennifer DiDomenico, City of Hamilton
 - Previous Project Manager on both RHVP project and RHVP IEMP at the City
- Matt Senior, AMEC Environment & Infrastructure
 - Project Engineer for the lead consultant on the monitoring project



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Presentation Outline

1. Purpose
2. Project Background
3. Monitoring Requirements
4. Monitoring Components
5. Reporting and Deliverables



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1. Purpose

- The intent of the presentation is to provide an overview of the Red Hill Valley Project Integrated Environmental Monitoring Plan (RHVP IEMP)
 - Origins and requirements
 - What do we monitor?
 - How do we monitor it?
 - What are the deliverables?
- A follow-up presentation will be given to the JSB in the 2nd quarter of 2014 which will focus on results



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2. Project Background

- The idea of a highway through the Red Hill Valley was initially proposed in the 1950s
- Idea abandoned and resurrected many times during 1960s and 70s
- Approved by Provincial Joint Hearing board in 1985
- Provincial Cabinet approved subsidy funding to the Project in 1987
- Funding for Red Hill Valley section suspended by Province in 1990; focus on East-West Section (Linc)
- Funding restored in 1995
- Re-Design process re-initiated in 1997; focus on lessening environmental impacts



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2. Project Background

1997 - Design Team expanded to over 24 professional disciplines:

- Air Quality Assessment
- Archaeology
- Architecture (golf course, landscape, structures)
- Built Heritage
- Community Consultation/Facilitation
- Economic Assessment
- Engineering (highway, geotechnical, municipal, stormwater, traffic, electrical, mechanical)
- Environmental Law
- Environmental Management
- Environmental Science (fisheries, fluvial-geomorphology, soil contamination, terrestrial ecology, groundwater)
- Health effects
- Noise
- Planning (land use, environmental)

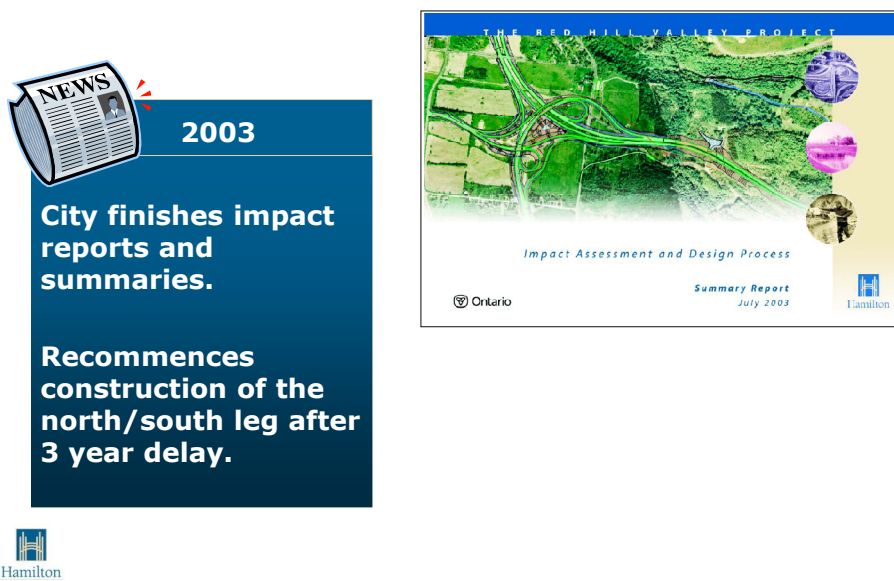


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2. Project Background



2. Project Background



2. Project Background

- Red Hill Valley Project – more than a road!



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2. Project Background

- The Red Hill Valley Project was an environmentally integrated infrastructure project with several parts including:
 - An 8 km four-lane, controlled access freeway
 - The realignment of 7 km of Red Hill Creek
 - 18 Stormwater Management (SWM) Facilities
 - A 2.9 km Combined Sewer Overflow Pipe
 - A Landscape Management Plan (trails, parks...)
- The final construction phase of the project ended in 2007 at which point the City started a multi-year environmental monitoring program to confirm the effectiveness of the new infrastructure.



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3. Monitoring Requirements

Environmental compliance monitoring for the Red Hill Valley Project was required as outlined in the following documentation:

- MOE Exemption Order, 1997
- Red Hill Creek Watershed Plan, 1998
- Impact Assessment Design Process, 2003
- Master Permit Application, 2004
- Various Permitting Compliance Reports, 2004 to 2011
- Permits and Authorization specific to the respective construction contract phases (both Federal and Provincial)



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3. Monitoring Requirements

The purpose of the Integrated Monitoring Plan is to:

1. Evaluate the performance of the Environmental Management System (i.e. design and mitigation techniques) constructed as part of the Red Hill Valley Project.
2. Provide the necessary information to adjust and/or optimize the plan recommendations through a process of Adaptive Management.

The Monitoring Plan is considered to be *integrated*, in that the intent is to assess the entirety of the environmental impacts of the project, rather than individual features of sub-disciplines



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3. Monitoring Requirements

- Specific monitoring requirements vary by sub-discipline
- Length of monitoring varies, but for most tasks 5 years required
- Annual reporting
- Reporting to be provided to the Government Agency Committee (GAC) for review
 - City of Hamilton
 - Hamilton Conservation Authority (HCA)
 - Department of Fisheries and Oceans (DFO)
 - Ministry of Natural Resources (MNR)
 - Ministry of Transportation (MTO)
 - Niagara Escarpment Commission (NEC)
 - Ministry of the Environment (MOE)



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4. Monitoring Components

- Primary Disciplines involved in RHVP IEMP
 - Groundwater
 - Surface water (Runoff and Flood Control)
 - Water Quality
 - Stream Morphology (Channel Design and Form)
 - Fisheries (Fish and Fish Habitat)
 - Terrestrial Ecology (Vegetation and Wildlife)
- AMEC is the primary consultant, with 4 sub-consultants for specific sub-disciplines
- Separate additional monitoring work conducted post-construction related to noise and air monitoring



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4. Monitoring Components

Groundwater (1)

- *Who does the monitoring?*
 - Blackport and Associates
- *Why do we monitor?*
 - To assess potential impacts from a reduction in groundwater recharge and potential of degraded stormwater infiltrating into the groundwater system
- *What do we monitor?*
 - Groundwater levels, baseflow, and groundwater quality
- *How do we monitor and when?*
 - Groundwater Levels are read twice annually (spring and fall)
 - Water chemistry done bi-annually
 - Baseflow analysis to be completed as part of Executive Summary
 - 10-year timeframe



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4. Monitoring Components

Groundwater (2)

- *Where do we monitor?*
 - Two groundwater well nests – one above the Escarpment and one below
 - Each nest contains three different wells at varying depths (shallow, intermediate, and deep)



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4. Monitoring Components

Surface Water (1)

- *Who does the monitoring?*
 - AMEC Environment & Infrastructure
- *Why do we monitor?*
 - Managing stormwater was a key component of the project; thus monitoring the effectiveness of these systems is important
- *What do we monitor?*
 - Water Levels and Flows within Red Hill Creek; primarily around constructed flood control facilities
 - Analysis of other related data (rainfall, CSO discharges)



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4. Monitoring Components

Surface Water (2)

- *How do we monitor and when?*
 - Temporary water level gauges are installed in April and left in place until freeze-up in early December
 - Periodic downloads of data (every 2-4 weeks, after major storms)
 - In-stream velocity measurements as required to develop rating curves (in combination with cross-section surveys)
 - 5-year timeframe

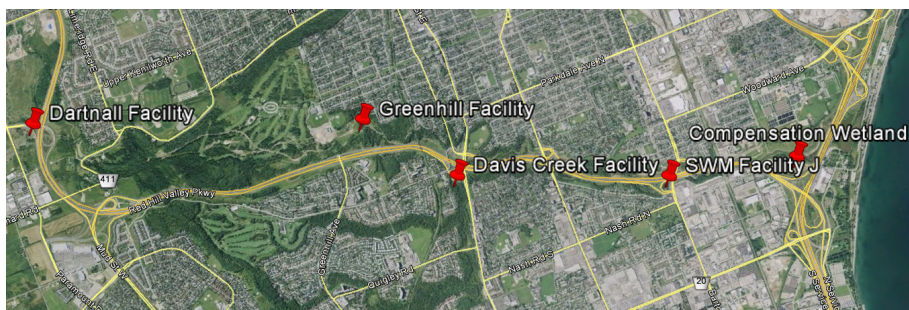


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4. Monitoring Components

Surface Water (3)

- *Where do we monitor?*
 - 3 Major Flood Control Facilities (2 operational) – typically 3 gauges per
 - Water Level Monitoring of a Water Quality Facility
 - Water Level Monitoring of the Compensation Wetland



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4. Monitoring Components

Water Quality

- *Who does the monitoring?*
 - AMEC Environment & Infrastructure
- *Why do we monitor?*
 - SWM Facilities were incorporated to provide water quality treatment of stormwater from the RHVP; important to ensure they are providing the intended level of treatment
- *What do we monitor?*
 - Water quality from SWM facilities
 - Sediment quality from SWM facilities
 - SWM Facility Inspections (condition, operation, etc.)



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4. Monitoring Components

Water Quality (2)

- *How do we monitor and when?*
 - Water quality grab sampling from SWM facility inlets during significant storm events to characterize influent; 3 times per year (Spring, Summer, Fall) over 2 separate years
 - Water quality sampling from SWM facility outlets during same event (approximately 12 hours after influent sample) to enable calculation of removal efficiency
 - Coincidental in-creek water quality sampling for comparative
 - Sediment quality sampling (both forebay and main cell)
 - Sediment gradation analysis (grain size)
 - Bathymetric surveys (sediment accumulation)
 - 5-Year timeframe

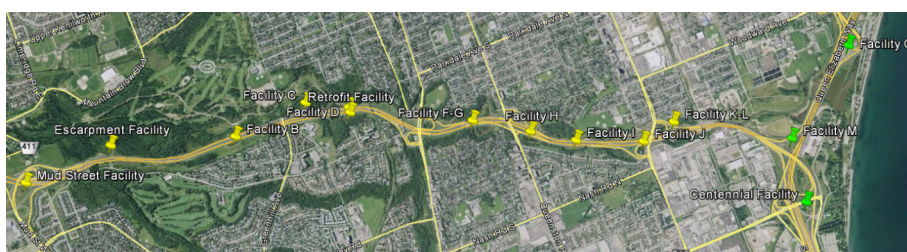


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4. Monitoring Components

Water Quality (3)

- *Where do we monitor?*
 - 14 total water quality SWM facilities (11 City-owned, 3 MTO-owned)
 - 2 in-creek sampling locations



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4. Monitoring Components

Stream Morphology (1)

- *Who does the monitoring?*
 - Water Regime Investigations and Simulations Ltd. (WRIS - Dr. Bill Annable of the University of Waterloo)
- *Why do we monitor?*
 - The project involved a substantial re-alignment and re-design of the creek; thus it is important to monitor the form and function of the channel
- *What do we monitor?*
 - Form and stability of channel (both longitudinally and laterally)
 - Rates of channel erosion and deposition
 - Channel substrate material



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4. Monitoring Components

Stream Morphology (2)

- *How do we monitor and when?*
 - Annual survey of the longitudinal profile of the creek to assess change
 - Annual survey of established cross-sections to assess change
 - Annual substrate analyses (grain size analysis)
 - Annual photo reconnaissance and aerial monitoring
 - 5-Year timeframe
- *Where do we monitor?*
 - The entire length of the re-constructed portion of the creek (7.1 km)
 - 118 cross-sections for both survey and substrate analysis (some re-located over monitoring period)



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4. Monitoring Components

Fish and Fish Habitat (1)

- *Who does the monitoring?*
 - C. Portt and Associates
- *Why do we monitor?*
 - To assess the effects of the project on fish and fish habitat
 - Have the changes in channel form (including removal of barriers) and water quality been beneficial in achieving a gain in fish production?
- *What do we monitor?*
 - Fish (numbers and diversity)
 - Benthic Invertebrates (small organisms within the creek bed – part of food chain)
 - Water Temperature
 - Fish passage and habitat

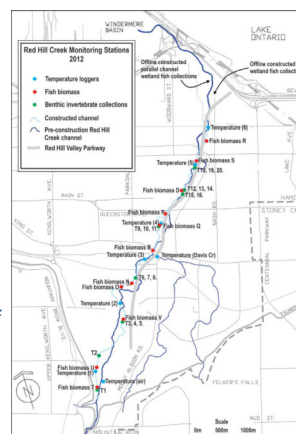


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4. Monitoring Components

Fish and Fish Habitat (2)

- *How do we monitor and when?*
 - Annual electro fishing to get fish counts by species (number, weight, length)
 - Annual benthic invertebrate sampling (counts by species)
 - Water temperature data loggers within the creek
 - Annual inspections of potential fish barriers
 - Assessment of habitat – measurements of riffles/pools
 - 5-year timeframe
- *Where do we monitor?*
 - The entire length of the re-constructed portion of the creek (7.1 km) as well as compensation wetland areas
 - 11 fish biomass sites along creek; 2 reference sites (external)
 - 19 benthic invertebrate sites
 - 7 temperature loggers in creek; 2 reference sites (external)



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4. Monitoring Components

Terrestrial Ecology (1)

- *Who does the monitoring?*
 - Dougan and Associates
- *Why do we monitor?*
 - Focus is upon three main requirements:
 - DFO Conditions of Approval (plantings along creek and wetlands)
 - Landscape Management Plan (habitat restoration and enhancement)
 - IADP Ecosystem Monitoring (ecosystem level diversity and function)
- *What do we monitor?*
 - Vegetation (flora)
 - Animal species (fauna)



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4. Monitoring Components

Terrestrial Ecology (2)

- *How do we monitor and when?*
 - Annual inspections of vegetation transects along the creek, combined with quadrats along the transects (quantitative and qualitative)
 - Annual inspections of additional vegetation plots within the valley and around SWM facilities
 - Ecological Land Classification Mapping
 - Monitoring of breeding birds and amphibians, review of special studies by others (Turtles, Flying Squirrel)
 - 5-year timeframe for most tasks, 20 years for ecosystem monitoring

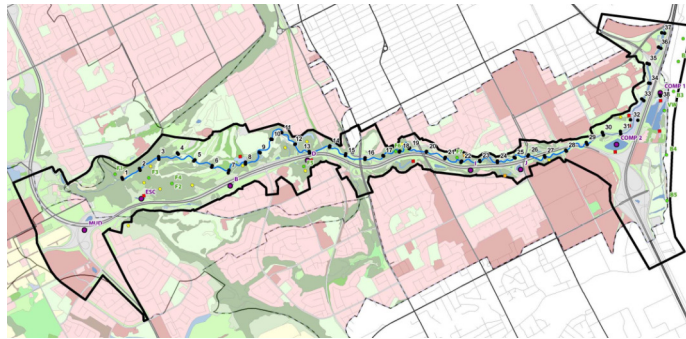


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4. Monitoring Components

Terrestrial Ecology (3)

- *Where do we monitor?*
 - 38 transects along Red Hill Creek and connected channels
 - Typically 6 quadrats per transect (3 on each side)
 - 6 SWM Facilities and 2 wetland compensation areas
 - Typically 4 transects per area
 - 13 additional vegetation monitoring plots
 - Various breeding bird and amphibian monitoring stations



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5. Reporting and Deliverables

- 5 Annual Reports (2008 – 2012 inclusive)
 - All completed; 2012 report undergoing some minor revisions
- Supplemental 2013 report (Water Quality only)
 - To be issued to the City for review within the next month
- 5-Year Executive Summary (Pending)
 - To be completed early April 2014
- Operations and Maintenance Manual (Pending)
 - To be completed once Executive Summary is completed (late Spring)



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5. Reporting and Deliverables

- 5-Year Executive Summary
 - Intended as a concise summary of previous annual reports
 - Major findings
 - Trending and Analysis
 - Lessons learned – what worked? What didn't? How can findings be applied to other City projects?
 - How does the system perform as a whole? What changes (if any) are recommended
 - What are the future monitoring and maintenance requirements going forward (both scoped and long-term)?
- Results of this document will be presented at a subsequent JSB meeting in the 2nd quarter of 2014 by all sub-disciplines



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5. Reporting and Deliverables

- Operations and Maintenance Manual
 - How do SWM facilities operate?
 - What should SWM facility inspections look for - what are the typical problems encountered?
 - What are the typical solutions\repair works to these issues?
 - Similar approach for the creek as well



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Questions?

