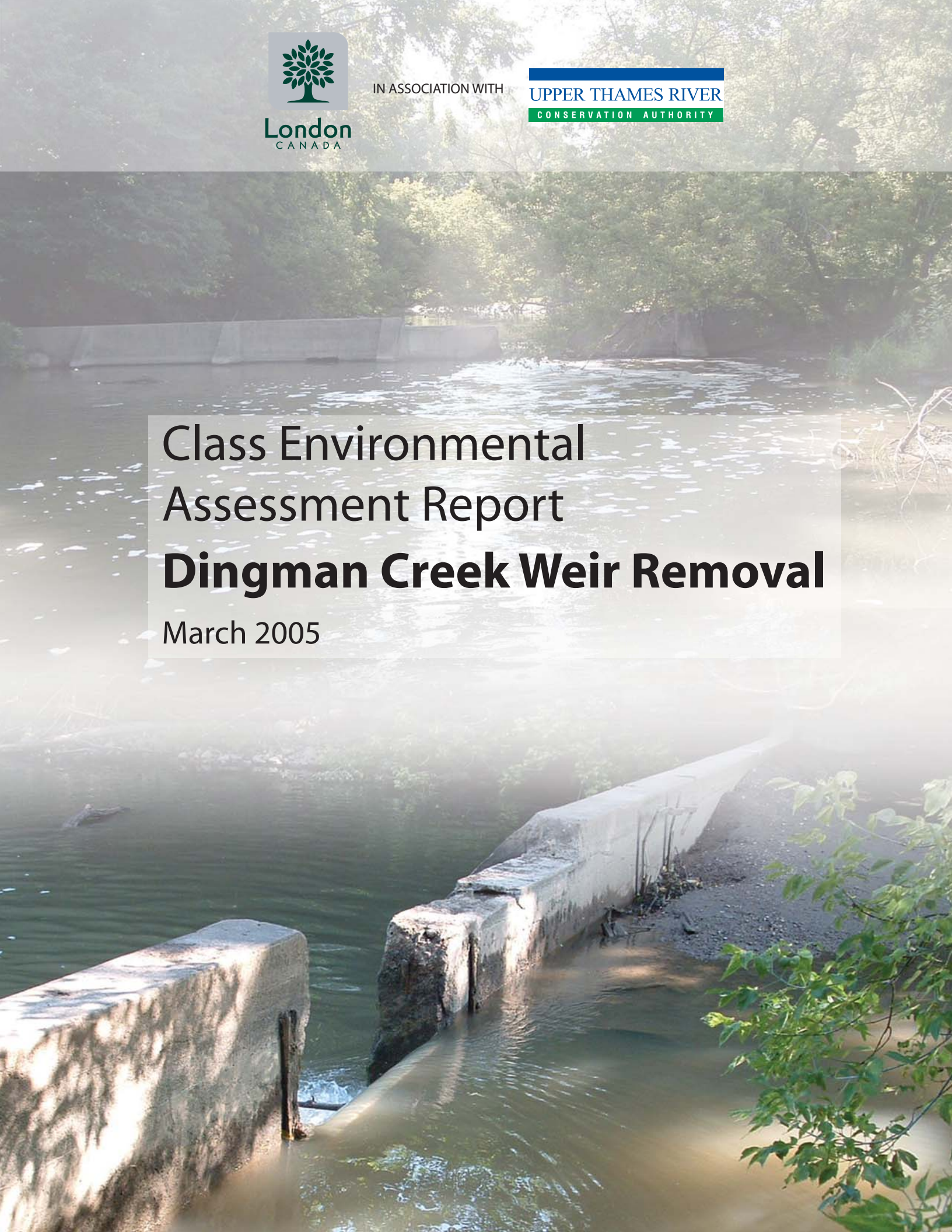
London
CANADA

IN ASSOCIATION WITH

UPPER THAMES RIVER
CONSERVATION AUTHORITY



Class Environmental Assessment Report

Dingman Creek Weir Removal

March 2005

Dingman Creek Weir Environmental Assessment Report

Table of Contents

1 Introduction

1.1 Project Overview

The Corporation of the City of London (City), as the proponent is proposing to carry out a Class Environmental Assessment to determine the future of the Dingman Creek Weir.

Dingman Creek Weir and the surrounding lands are owned by the City of London. This weir is a vertical concrete structure with width of 16.4 metres plus headwall extensions. The overall structure is approximately 1.6 metres in height from top of weir to concrete apron. The structure appears to have been modified over time and has notch cut into it about 4 metres from the south bank. This notch is 0.2 metres deep and extends about 3 metres in length. Within this notch, there has been a further cut out of about 1 metre width. The weir was constructed in the early 1940's by local landowners, the Alsops. The exact date of construction of the weir is unknown however, the weir appears to be present in 1942 aerial photography.

This undertaking follows a defined environmental planning process described in the document entitled *Municipal Class Environmental Assessment* (Municipal Engineers Association (MEA), 2001). This Class EA provides a means of ensuring that municipal infrastructure projects, for which the Class EA is applicable, are undertaken in accordance with an approved procedure designed to take environmental and public concerns into account. The purpose of this report is to document the required Class EA planning and design activities, including public and agency consultation, and it was subsequently confirmed that a Schedule B approach would be used as defined by the Municipal Class EA (MEA, 2001) to arrive at a preferred solution for the Dingman Weir.

1.2 Background and Need for the Project

For almost 200 years, dams and weirs were built throughout Ontario for several purposes, from flood control to power generation. While many dams still serve the original purpose, many dams have been abandoned or are no longer maintained. This neglect is becoming an issue as dams deteriorate and create hazards to ecosystem health, property, and people. Many dam and weir owners are looking more closely at their responsibilities and needs and making decisions regarding the future of some small dams. The Dingman Creek Weir, located within the Dingman Conservation Area is one of more than the 180 watercourse barriers in the Upper Thames River watershed.

Presently, the weir serves no known practical function however, it is expected that the weir does holds some local cultural and recreational value. These values will be identified during the EA process and incorporated into determining an appropriate course of action.

The Dingman Creek Weir Assessment was initiated as part of a larger project where the Upper Thames River Conservation Authority (UTRCA) partnered with the Ontario Ministry of Natural Resources (OMNR) under the *Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem* (COA) to conduct assessment, monitoring, rehabilitation and/or restoration projects in the Lake Erie Basin. The Thames River is considered to be part of the Lake Erie Basin by way its drainage path to Lake St. Clair.

Specifically, three projects were developed in order to meet Lake Erie Basin ecosystem objectives as outlined below:

Project # 1. Thames River Demonstration Subwatershed
The Dingman Creek Subwatershed has been selected as the Demonstration Subwatershed for a number of reasons. First, during the UTRCA Watershed Report Card program, Dingman Creek was recognized as being a degraded ecosystem that deserved a special focus for ecological enhancement and restoration work. Secondly, there is a substantial amount of background information and direction provided by the 1995 Dingman Creek Subwatershed Study (DCSS) and the subsequent 2003 Dingman Creek Subwatershed Study Update (DCSSU). Lastly, there is a strong interest in the community, through groups like Friends of Dingman Creek, to improve the health of the Dingman Creek.

The Demonstration Subwatershed project will target actions to improve the health of the Dingman Creek watershed including:

a) reforestation;
b) facilitating the preparation of environmental farm plans and implementing Best Management Practices; and
c) **investigating the possibility for removal of a concrete weir and subsequent channel restoration**. This investigation will include assessing the benefits associated with removing the barrier as well as the potential adverse impacts such as invasion by exotic species and sediment release.

Project # 2. Thames River Watershed Barriers Assessment
Approximately 230 watercourse barriers have been identified in the Thames River watershed (180 in the Upper Thames River and 50 in the Lower Thames). These impact water quality, water flow and fish movement and migration. This project will assess impacts and prioritize barriers for removal. The project will be implemented over a three year period.

Project # 3. Habitat and Water Quality Monitoring
This project will assess and monitor the thermal and flow regimes, habitat, sediment, macrophytes and benthic community of the Thames River. The project will build on several existing monitoring initiatives conducted by both the Upper Thames River Conservation Authority and the City of London and will augment historical data on water

flow, habitat availability, benthos and municipal drains. The project will be implemented over a three year period.

1.3 Class Environmental Process

The planning process that has been selected for the Dingman Creek Weir barrier assessment is the Municipal Class Environmental Assessment (MEA, 2000). During the preparation of this project, and in support of the broader Thames River Barrier Assessment project, a discussion paper entitled *Thames River Watershed Barrier Assessment Project Proposed Planning Framework Discussion Paper* was developed that examined the appropriateness and applicability of various Class EA planning processes to watercourse barrier assessment. The discussion paper outlines how the decision was made to apply the Municipal Class EA. This discussion paper is found in Appendix A.

The Municipal Class Environmental Assessment (MEA, 2000) provides an approved planning process whereby municipal infrastructure projects can be planned, designed, constructed, operated, maintained, rehabilitated and retired without having to obtain project specific approval under the *Environmental Assessment Act* (EAA) provided the approved process is followed. The Municipal Class EA applies to municipal infrastructure projects undertaken by a municipality, Public Utilities Commission, Ontario Clean Water Agency or private sector developer or landowner acting as the proponent.

Figure 1 depicts the Municipal Class EA Planning and Design Process that consists of up to five phases, depending on the Class of Undertaking (i.e. Schedule A, B or C projects). Phase 1 consists of identifying the problem or opportunity that serves as the impetus for project implementation, while Phase 2 identifies alternative solutions to the problem or opportunity. Completion of Phase 2 allows for the identification of the Schedule that the project falls under and provides guidance on the further Class EA study requirements. For example, Schedule B projects, which generally include improvements and minor expansions to existing facilities, may be considered approved following completion of Phase 2 requirements. This requires a screening of alternative solutions and mandatory public and agency consultation.

1.3.1 Purpose of the Environmental Assessment

The purpose of the EA is to investigate options for the weir in order to meet the following objectives:

1. Address public safety and liability issues

The public has access to the weir which presents safety concerns if people attempt to use the structure to cross the creek. As is the case with all City-owned properties, there are questions of liability associated with the use of the site and, specifically, use of the weir. The weir is not designed or intended as a pedestrian crossing, nor is this activity

encouraged. Liability issues also relate to any failure of the dam, if allowed to deteriorate further.

2. Minimize long-term maintenance requirements of the site

Most small dams and weirs have a life-expectancy of about 50 years. While the Dingman Creek Weir shows no obvious signs of severe destabilization, the structure has undergone various alterations and the surrounding area has also experienced some changes as a result of the weir. Overtopping during flood flows has resulted in some scouring of the banks around the weir.

3. Enhance the aquatic health of Dingman Creek by restoring and enhancing fish habitat and providing fish passage

Dams and weirs are barriers to both seasonal migration and daily movement of fish and other aquatic species. The Dingman Creek Weir is a barrier for resident fish within the downstream reaches of the Dingman Creek and prevents passage for migratory species that originate from Lake St. Clair and the Thames River.

4. Maintain the site's value to the community

Current uses of the Conservation Area and weir area include walking, fishing and horseback riding. While the weir serves no economic value, the cultural and recreational uses in and around the area should be a consideration in the long term.

1.3.2 Identification of Alternative Solutions

The identification of alternative solutions was based on the requirements to address the issues identified in *Section 1.2 Background and Need for the Project.* The alterative solutions can reasonably be expected to achieve some improvement, giving consideration to the environmental and socioeconomic aspects of the study area.

The following alternative solutions were identified for the Dingman Creek Weir:

- Maintain the status quo (do nothing)
- Rehabilitation of the existing weir structure with no mitigation for fish movement.
- Partially remove the weir, widen the outfall notch and create a rock drop structure.
- Decommissioning and removal of the weir and rehabilitation of the bank and stream channel with natural channel design (i.e. rocky ramp).
- Rehabilitation of the existing weir structure with installation of a fishway.
- Installation of a fishway only with no rehabilitation of the weir.

A complete description of these alternatives is provided in Section 3.

Insert figure 1

1.3.3 Selection of Class EA Project Schedule

Following the identification of alternative solutions for the Dingman Creek Weir, a decision regarding the appropriate Municipal Class EA Schedule can be made. The Municipal Class EA provides the following guidance on the assignment of dam-related projects to a particular schedule:

Schedule A - Reconstruct an existing dam or weir at the same location and for the same purpose, use and capacity.

Schedule B - Reconstruct an existing dam or weir at the same location where the purpose, use and capacity are changed. Also identified are works undertaken in a watercourse for the purpose of flood or erosion control, which may include bank or slope regarding, channelization of a watercourse and/or revetment works, among others.

Schedule C - Construct a new dam in a watercourse.

It is interesting to note that none of the schedules specifically discuss the removal of a dam or weir.

For the Dingman Creek Weir, the Schedule C classification is not applicable since none of the alternatives propose construction of a new dam or structure.

The Schedule A classification could be applicable if the weir is simply reconstructed (repaired or improved) and remains at the same location and the same dimension. However, with the possibility for removal, the range of environmental effects may be more complex than a simple reconstruction. Also, given the potential for in stream works associated with habitat restoration, Schedule A may not be entirely appropriate.

For the Dingman Creek Weir, the Schedule B classification is considered to be most appropriate since it includes dam or weir reconstruction where the capacity may change and it also applies to works undertaken in and around the watercourse. In the case of Dingman Creek Weir, these works could include in-stream habitat restoration and riparian restoration and enhancement. In the case where weir removal is deemed the preferred solution, the size and setting of the Dingman Creek Weir is such that potential impacts could be identified and addressed through the Schedule B process.

Overall, given the project's moderate level of complexity and the potential for environmental impacts associated with some of the alternative solutions, a Schedule B classification is deemed the most appropriate project Class EA category for the Dingman Creek Weir assessment.

2 Existing Environment

The following section documents the physical description of the study area in the vicinity of the Dingman Creek Weir and provides a general description of existing natural and socioeconomic features with this defined study area.

2.1 Project Study Area

The Dingman Creek Weir is located on the lower reaches of Dingman Creek, in the south west corner of the City of London (Figure 2). The weir structure and 48.56 acres of land adjacent to the weir site are owned by the City of London. The area is known as the Dingman Conservation Area and is accessible via Westdel Bourne Road to Deadman's Lane to Homewood Lane. An access point and parking lot are located on Homewood Lane.

A study area has been defined on two levels. First, the immediate study area is defined by a 300 m circle from the weir and subsequent upstream and downstream corridor area that will be considered. This is based on the weir location approximately mid-way in an east/west direction within the City owned property. This study area includes the access trail to the parking lot at Homewood Lane because this trail will be used as a temporary access road to the weir site during construction.

A second level of investigation is along the stream corridor that extends from upstream of the weir, downstream to the confluence with the Thames River to determine long term benefits and impacts of works at the weir. This length of watercourse will be defined by the type of investigation work (i.e. fish migration, hydraulics, sediment transport etc.)

2.2 Natural Environment

2.2.1 Dingman Creek Subwatershed - General

A subwatershed study was prepared for the Dingman Creek in 1995 (DCSS), in association with a broader City of London planning initiative termed "Vision 96". The purpose of the study was to "*develop a long term management strategy to protect, enhance and restore environmental quality in light of current and future demands on the resources*". The study provided a baseline of natural environment information and a series of recommendations for implementation.

In 2003, a Dingman Creek Subwatershed Study Update (DCSSU) was initiated to incorporate new information on land use, natural environment studies and conservation measures that had been implemented since 1995. The DCSSU seeks to confirm or refine subwatershed

objectives and targets and ensure that subwatershed enhancement strategies are still relevant and achievable.

The Dingman Creek Subwatershed drains an area of approximately 170 km^2. The watershed extends east to west from Highway 73 to its confluence with the Thames River, near the village of Delaware, south and west of London. The subwatershed is long and relatively narrow consisting of a main stream flowing some 45 km through a glacial spillway between two interlobate moraines: the Ingersoll Moraine to the north and the Westminster Moraine to the south. About 30 small, second order tributaries with drainage areas generally less than 25 km^2 join the main channel along its length (DCSS 1995).

Land uses are about 21% urban and 65% rural and agriculture and 14% vegetation cover. Row crops including soybeans, corn and mixed grain are the dominant use of agriculture. About 35 km of Highways 401 and 402 pass through the subwatershed (DCSSU 2003). Tile drainage networks are extensive and the majority of the tributaries and also the main stream upstream of Wellington Road, have been altered by municipal drainage practices to facilitate agricultural crop production. Livestock access to streams is common and as a result, substantial accumulations of fine sediment are evident in the stream beds of the middle and upper subwatershed (DCSS 1995).

Urban areas occur in the middle and northern portion of the subwatershed. One pumping station and two sewage treatment plants discharge into Dingman Creek. Most tributaries in urban areas have been channelized for part of their length and hardened with materials such as gabion baskets or concrete. Despite a number of stormwater management facilities that provide flood control benefits, there are numerous stream bank erosion sites along the watercourse. This watercourse is considered susceptible to erosion due to the predominance of fine textured soils and fine grained bed materials. The main stream west of Lambeth shows considerable evidence of channel instability in the form of braiding, abandoned channels, erosion scars and bed scouring (DCSS 1995).

The subwatershed lies in the Niagara section of the Great Lakes Deciduous Forest region, roughly corresponding to Site District 7-6 (Hilts, 1959) and falls within the northern limit of the Carolinian vegetation zone (DCSS 1995).

Dingman Creek is a warmwater stream supporting such fish species as bass, sunfish, darters, chub, suckers and minnows. Migratory runs of suckers, walleye, rainbow trout and Chinook salmon occur in the lower reaches. Aquatic and terrestrial species considered at risk that are present in the subwatershed include greenside darter, spotted turtle, eastern spiny softshell turtle eastern hognose snake, American chestnut, blue ash, broad beech fern, and false hop sedge.

More detailed information about various physical and biological features of the Dingman Creek are discussed in the Section below.

Insert fig 2 site location

2.2.2 Physiography, Geology and Soils

The subwatershed is characterized by a broad flat till plain of glacial origin that extends from the headwaters near Mossley, terminating in clay and sand plains at the west end of the subwatershed near Delaware. The dominant till plain is dissected by an east-west oriented glacial spillway and surrounded by gently rolling terrain of two distinct moraine formations. The clay plains occur in association with sand plains as they represent the sediment that was deposited in deeper water farther off-shore than the alluvial/beach deposits (sand plains) (DCSS 1995).

The fine grained clay and silt were deposited in a relatively flat, quiet water basin, resulting in the development of a somewhat featureless topography. These clay plains often represent regional aquitards, which may overlie important aquifers. The till plains are regions where glacial till is the surficial soil type. Till is a heterogeneous mixture of clay, silt, sand, and pebbles. They often display surface features such as prominent moraines, terrace escarpments, and beach/bar/spit deposits. Till soils are very dense, stiff materials that are often covered by a thin veneer of topsoil (MEGS 2004).

The lands immediately adjacent to the Dingman Creek Weir are Port Stanley silty clay till and clayey silt till, covered by thin patches of lacustrine silt; ground moraine plains and end moraine ridges; slightly undulating topography, except for the more hilly slopes of the Ingersoll end moraine (Preliminary Geological Map No. 238, Ontario Geological Survey, 1963).

2.2.3 Stream Morphology

Dingman Creek progresses through three major physiographic units from its source to the confluence with the Thames River at Delaware:

- Caradoc Sand Plain - downstream of Concession Road 2 to its confluence with the Thames River;
- Ekfrid Clay Plain – from Westdel Bourne Road to Concession 2; and
- Mount Elgin Till Plain – from its source near Mossley to Westdel Bourne Road.

The topographic and soils characterizing these units are major factors influencing channel form and erosion potential.

Stream gradients are low, generally less than 0.5% and the gradient gradually increases from east to west. Average annual stream flow is about 1.5 m^3/s at the Water Survey of Canada (WSC) gauge located just west of Lambeth. Baseflows are generally low and permanent streams are found only draining the Ingersoll Moraine in the urbanized areas. Important recharge areas are uncommon and appear to contribute to the regional aquifer system, rather than supporting stream baseflows. Areas of discharge seem to be restricted to the main watercourse.

2.2.4 Surface Water Quantity

Water Survey of Canada (WSC) maintains a network of hydrometric station used to record stream flows at various locations through the Thames River Watershed. The closest WSC station to the Dingman Creek Weir is located at the Westdel Bourne Road crossing of the Dingman Creek, approximately 1.8 km downstream of the weir. At this location, the station records Dingman Creek flows associated with a 146 km^2 upstream drainage area.

Table 1 summarizes the mean monthly and maximum instantaneous flows recorded at the Dingman station based on long-term WSC flow records from 1965 to 2001. The mean annual flow of the stream at this location is 1.49 m^3/s, with a maximum instantaneous flow of 64 m^3/s and a minimum monthly flow of 0 m^3/s. Flood events for Dingman Creek generally occur during the period of January to April.

Table 1 Summary of Dingman Creek Flow Data (Station 02GE005)

Month	Mean Flow (m^3/s)	Maximum Instantaneous Flow (m^3/s)	Minimum Flow (m^3/s)
January	1.65	30	0.039
February	2.27	64	0.042
March	3.75	34.9	0.11
April	2.5	40.1	0.227
May	1.05	17.7	0
June	0.744	21.5	0.042
July	0.492	15.3	0.01
August	0.363	17.2	0
September	0.603	19.4	0
October	0.727	25.7	0
November	1.68	35.7	0.01
December	1.97	33.5	0

Spring floods are generally a result of snowmelt, rainfall or a combination of both and runoff is rapid with major peaks occurring within a day of extreme warm temperatures or heavy rainfall. During flood events, flow in the Dingman Creek often overtops the weir structure and cuts into the banks, around the wing walls.

Flow measurements made up and downstream of the Dingman Creek Weir on July 16, 2004 indicated a flow in the range of 0.250 m^3/s (0.257 m^3/s was measured downstream and 0.250 m^3/s was measured upstream of the weir).

As part of the investigation into the possible removal of the Dingman Weir it was necessary to determine the weir's effects on flooding and flood control both upstream and downstream of the structure. This was accomplished by modeling both the pre and post-removal scenarios using HEC-RAS, a hydraulic computation software package. This

report summarizes the methods used for this modeling, the results of the modeling and the interpretation of the results.

Methodology - Dingman Creek HEC-RAS Model

The HEC-RAS model of Dingman Creek that was used in this study was created by Aquafor Beech as part of the 1995 Dingman Creek Sub-Watershed Study (Aquafor Beech 1995). The model geometry from the DCSS included the Dingman Weir which had been modeled using stream cross-sections and not by using the HEC-RAS inline structure routine. The use of the cross-section routine in place of the in-line structure routine causes very little deviation in modeling results because the presence of the weir is still reflected in the cross section geometry. To create the post-removal scenario these cross sections were simply removed from the model.

For the analysis the steady peak flows for the 250 and 5 year return periods were run through the model in an effort to observe the changes from the removal under both frequent and infrequent events.

Results

- To determine the effects of the weir removal it was necessary to analyze the changes in both the upstream water surface elevations and the downstream storage volume. A summary spreadsheet of the modeling results is provided in the attached table 2. The highlighted values in the spreadsheet are the resulting values of interest. River stations refer to cross section locations. The weir is represented in the model by two cross sections, one on the immediate upstream side of the weir and one on the immediate downstream side of the weir. The river stations in the vicinity of the weir are shown in Figure 3 however, given the close proximity of the two stations at the weir, these are shown as a single station on the attached figure.

- With respect to flood control it was found that the existing weir provides 0.271 ha·m of storage under the 250 year event and 0.249 ha·m of storage under the 5 year event. However, this volume is probably overestimated due to the volume of sediment that has accumulated behind the weir. Recent field surveys of the channel cross section reflect a channel width upstream of the weir that is likely narrower than what is incorporated into the Aquafor Beech model.

- The results show that the removal of the weir will have little to no effect on local flood elevations upstream. The existing weir raises the flood elevations approximately 6 cm higher than if it was not there.

- Comparing flood storage offered by the Dingman Weir to the magnitude of storm flows (total volume), for 250 and 5 year return period storm events, the storage volume of the Dingman Weir may represent between .01% to less than 0.1 % respectively of the event total runoff volumes.

Insert fig 3 – HEC-RAS stations

Discussion - Flood Storage Capacity

In determining the significance of change in flood storage capacity, both physical and cultural characteristics of the subwatershed need to be considered with respect to flooding and erosion. The 1995 Dingman Creek Subwatershed Study (DCSS) and the 2003 Dingman Creek Subwatershed Study Update (DCSSU) suggest that downstream flood control and consequently storage is least desirable at the Dingman Weir location because of flood peak timing concerns in the system. The 2003 DCSSU has developed a system-wide optimization strategy to meet regulatory flood control requirements. This strategy focuses on flood control through timing and storage in the upper parts of the subwatershed, where quantity control will have maximum benefit. Therefore there is very little (or insignificant) flood control benefit to the Dingman Creek system from this weir being present at its current location. In addition, there are no structures or land uses downstream that would be sensitive to such minor changes in flood storage capacity.

Erosion Control - Through the DCSSU optimization strategy, it has been identified that the maximum erosion control benefit will be realized with erosion control facilities installed in the upstream portions of Dingman Creek. The strategy relies on managing the timing of flows by controlling quantity more in the upstream reaches with less control in the downstream reaches (to maintain conveyance in the downstream reaches). In terms of geomorphology, Dingman Creek is a highly unstable non-alluvial system, particularly in the downstream reaches due to a combination of high gradient and down cutting into till beds. Although it is important not to exacerbate this with human influence (issues relating to rural and urban land use), the *natural* state of the Dingman Creek is one of erosion and instability. Therefore, overall the Dingman Creek weir plays a negligible role in influencing (positively or negatively) the erosion regime of this system.

The Dingman Creek weir creates local erosion concerns particularly around the headwalls during flood flows and immediately downstream due to the hydraulic changes the structure creates locally. These local concerns do not disappear immediately with weir removal but must also be managed with some sensitivity during a stabilizing transition period when the channel adjusts. Therefore, some of the drop structure will remain in place to help reduce the chance of erosion.

To put the results in perspective, the storage capacity removed is the equivalent to the erosion or flood control storage requirements for about 10 - 15 ha of residential development. The weir is therefore not a significant structure considering the substantial total storage quantity requirements for future developments in the Dingman subwatershed and the consideration that not all development in the Dingman is required to implement stormwater storage. Small enhancements in subwatershed vegetation cover could easily make up this storage volume change and with greater overall environmental benefit as well.

Summary of Results

The hydrologic effects of removing the weir are:

- Storage capacity decreases are marginal with flood storage objective best achieved farther upstream in the watershed.

- Flood control benefit of the structure is insignificant considering the downstream watershed characteristics.
- Hazard management policy has been effective in controlling land use and structures downstream to the extent that minor changes to the storage capacity and flood levels will not have any adverse impact – the sensitivity to these changes is very low.
- Downstream erosion experienced at existing specific "hot spots" will not experience an increased sensitivity to erosion as a result of the weir being removed.

Table 2. Summary of HEC-RAS Modeling Results

River Station	With Weir				Without Weir				Change from Weir Removal			
	Water Surface Elevation [m]		Storage Volume [1000s m^3]		Water Surface Elevation [m]		Storage Volume [1000s m^3]		Water Surface Elevation [m]		Storage Volume [1000s m^3]	
	250y	**5y**	**250y**	**5y**	**250y**	**5y**	**250y**	**5y**	**250y**	**5y**	**250y**	**5y**
18.4571	249.91	248.95	611.11	404.01	249.9	248.94	608.4	401.52	-0.01	-0.01	-2.71	-2.49
18.427	249.52	248.83	607.72	401.87	249.52	248.82	605.02	399.38	0	-0.01	-2.7	-2.49
18.4132	249.5	248.82	606.95	401.26	249.5	248.82	604.24	398.78	0	0	-2.71	-2.48
18.4131	249.5	248.82	606.83	401.17	249.5	248.81	604.13	398.69	0	-0.01	-2.7	-2.48
18.3651	249.48	248.79	602.8	398.35	249.48	248.79	600.1	395.87	0	0	-2.7	-2.48
18.2571	249.41	248.72	588.58	389.8	249.41	248.72	585.93	387.35	0	0	-2.65	-2.45
18.1421	249.38	248.65	569.75	380.5	249.37	248.65	567.18	378.11	-0.01	0	-2.57	-2.39
17.9471	249.31	248.58	529.75	360.48	249.31	248.57	527.37	358.26	0	-0.01	-2.38	-2.22
17.7991	249.16	248.48	503.48	345.69	249.16	248.48	501.23	343.59	0	0	-2.25	-2.1
17.6391	249.05	248.38	481.44	332.98	249.04	248.37	479.34	330.99	-0.01	-0.01	-2.1	-1.99
17.4951	248.94	248.24	459.69	321.94	248.93	248.23	457.81	320.15	-0.01	-0.01	-1.88	-1.79
17.2251	248.62	247.96	428.46	306.51	248.58	247.93	427.1	305.13	-0.04	-0.03	-1.36	-1.38
17.0531	248.56	247.91	403.64	292.17	248.52	247.86	402.89	291.34	-0.04	-0.05	-0.75	-0.83
16.8611	248.42	247.81	377.41	275.41	248.37	247.75	377.31	275.3	-0.05	-0.06	-0.1	-0.11
16.8353	248.43	247.81	373.21	272.6	248.38	247.76	373.22	272.61	-0.05	-0.05	0.01	0.01
16.8352	248.28	247.65	373.21	272.6	Weir Removed							
16.8351	248.28	247.65	373.2	272.6								
16.835	248.35	247.74	373.2	272.59	248.35	247.74	373.2	272.59	0	0	0	0
16.767	248.22	247.65	364.21	266.89	248.22	247.65	364.21	266.89	0	0	0	0
16.593	248.14	247.59	339.38	250.63	248.14	247.59	339.38	250.63	0	0	0	0
16.383	247.94	247.39	309.74	231.75	247.94	247.39	309.74	231.75	0	0	0	0
16.178	247.66	246.92	278.96	217.94	247.66	246.92	278.96	217.94	0	0	0	0
15.993	247.42	246.69	256.21	207.95	247.42	246.69	256.21	207.95	0	0	0	0
15.721	246.9	246.27	226.39	192.58	246.9	246.27	226.39	192.58	0	0	0	0
15.529	246.77	246.02	202.65	180.79	246.77	246.02	202.65	180.79	0	0	0	0
15.409	246.69	245.93	182.2	170.79	246.69	245.93	182.2	170.79	0	0	0	0

2.2.5 Surface Water Quality

Overall, surface water quality for the Dingman Creek is fair and reflects the dominant agricultural land use in the subwatershed. Phosphorous and faecal coliform concentrations are much higher than the Provincial Water Quality Objectives (PWQO). The DCSSU (2003) suggests that there have been marginal reductions in phosphorous, faecal coliform and ammonia concentrations from 1994 to 2003.

The phosphorus concentration, based on a 10 yr average (1990 to 2000), was found to be 0.11 mg/L, almost six times higher than the safe swimming guideline. Some key limiting factors include highly erodible, fine textured soils, extensive riverbank erosion (mainly in the downstream section), lack of baseflow, lack of riparian cover, degraded stream structure, rural runoff, urban development impacts, and spills. Specifically there have been 27 spills reported since 1988, the majority urban/industrial based. This number is high relative to most other subwatersheds (UTRCA, 2001).

Phosphorous concentrations have decreased from pre-development conditions likely due to urbanization, the removal of phosphorous from fertilizers and the recent reductions in phosphorous in cleaning compounds. The observations suggest that phosphorous concentrations will continue to decrease during urbanization.

Ten years (1990 to 2000) of monitoring has indicated average fecal coliform bacterial concentrations of 591 organisms per 100 mL, which is six times the allowable amount for recreational swimming. Average bacterial concentrations throughout the Upper Thames River watershed over this same time period were 304 organisms per 100 mL.

Conductivity, used as an indicator of the level of dissolved solids and pollutants in the river, measured 762 µs/cm, compared to the watershed average of 642 µs/cm.

The DCSSU notes that copper and zinc levels have decreased since 1994. In 1995, the DCSS reported that copper concentrations are generally highest in the middle (urban) reaches of Dingman Creek and lowest in the east end (where little urban development exists) and in the west end (where flows are most dilute). This indicated that urban flows were likely the primary source of heavy metals such as copper (DCSS 1995). In the DCSSU (2003) reports that while it was not possible to make a geographic comparison in 2003 (because data were not available for the upper and lower reaches), it does appear as though trace metal loadings have decreased in the middle reaches.

Chloride levels have continued to increase throughout the record of monitoring. Chloride is attributed almost completely to the use road salt.

The 1995 DCSS indicated that pesticides were generally not present in the surface water at levels that could be detected. At that time, more than 100 pesticides were scanned for including atrazine and metalachlor. However, more recently, trace amounts of pesticides have been detected (see UTRCA Water Report on Turning Information into Action).

There is a Provincial Water Quality Monitoring Network (PWQMN) sampling site on Dingman Creek, located at the Westdel Bourne Road Bridge. UTRCA undertakes sampling at this site as part of the PWQMN partnership with MOE. A summary of PWQMN results is provided in Appendix B.

Local water quality testing was undertaken in the vicinity of the weir on July 16, 2004. Ambient air temperature was approximately 24 degrees Celsius. Results are as follows:

Above the weir:

- Water temperature: 18.11C
- Conductivity (µms): 529
- Total Dissolved Solids: 0.344
- Salinity: 0.26
- Dissolved Oxygen (mg/l): 6.85

Directly below the weir

- Water temperature: 18.06C
- Conductivity (µms): 532
- Total Dissolved Solids: 0.346
- Salinity: 0.26
- Dissolved Oxygen (mg/l): 7.54

Further downstream of the weir (45 meters)

- Water temperature: 18.08C
- Conductivity (µms): 531
- Total Dissolved Solids: 0.345
- Salinity: 0.26
- Dissolved Oxygen (mg/l): 8.52

The data is consistent with other small weirs showing Dissolved Oxygen to be slightly higher due to turbulence caused by the weir.

2.2.6 Aquatic Ecology

Aquatic habitat communities and general stream morphology were characterized as part of the 1995 DCSS and the Dingman Creek was divided into 4 zones based on permanence of flow, stream order, habitat conditions and the structure and diversity of the fish and benthic community. The weir location is within Zone 1 which includes the lower Dingman Creek from the confluence of the Murray-Marr tributary to the mouth of the Dingman Creek at the Thames River, near Delaware.

Index of Biotic Integrity (IBI) scores indicated a good quality, warmwater fish community with warmwater migrants downstream of the Dingman Creek Weir that included smallmouth and rock bass, northern hogsucker, greenside darter, redhorse and

rainbow trout. Water Quality Index (WQI) scores generally indicated a stable warmwater benthic community.

2.2.6.1 Fisheries Resources

Sampling of the fish community has been undertaken by OMNR (1975), during the DCSS (1993) and on an ongoing basis as part of the UTRCA watershed monitoring program.

The fish community based on the 1993 DCSS survey showed little change from the OMNR (1975) survey in terms of dominant species, although northern pike, common and Blacknose shiners, northern redbelly dace, brook stickleback, least darter, longear sunfish, bluegill and black and brown bullheads were not found, however present in 1975. Central stoneroller, iowa darter, rainbow trout, Chinook salmon, gizzard shad, rock bass, largemouth bass, carp, blacknose dace, tadpole madtom and stonecat were found in the 1993 survey but not in the 1975 survey.

A comprehensive listing of all fish species recorded in the Dingman Creek during the UTRCA watershed monitoring program and the Municipal Drain Classification project is provided in Appendix C. The following species have been recorded by UTRCA in the vicinity of the weir: black crappie, blackside darter, bluntnose minnow, brook stickleback brown trout, central stoneroller, common shiner, creek chub, greater redhorse, greenside darter, Johnny darter, northern hog sucker, pumpkinseed, rock bass, stonecat and white sucker.

On Thursday April 8, 2004, a routine electrofishing survey was conducted with the intent of observing walleye in the lower reaches of Dingman Creek (Zone 1). Walleye were not observed on that day however, a total of three brown trout were observed. A single Brown trout was observed immediately below the Dingman weir at the outflow. Two Brown trout were observed approximately 250 -300 m upstream of Carriage Road when that area was electroshocked. Two of the fish were 8 to 10 inches in length. One fish was slightly larger at approximately 12 inches. The small size of the fish suggests that these are resident to Dingman Creek as opposed to being lake-run (migratory from Lake Erie or other water body). The presence of brown trout and the likelihood that these fish are resident in Dingman Creek suggests that Dingman Creek does offer suitable habitat for coolwater species.

2.2.6.2 Benthic Resources

The 1995 DCSS calculated Habitat Suitability Index values (HSI) for several fish species and Water Quality Index scores were calculated based on the benthic community. For Zone 1, the DCSS acknowledged that the "*dam* [Dingman Creek Weir] *is a barrier to all migratory fish except rainbow trout and Chinook salmon. Stream temperatures, which are moderated by the extensive riparian cover, are marginal to support rainbow trout but baseflow is too low. Riffle and pool habitat is adequate below the dam but insufficient upstream of the dam. The channel shows considerable evidence of flow instability. Bank*

erosion, scouring of the stream bed and materials, braiding, channel cuts and abandoned channel typify the lower reaches. As a result, in stream cover in the form of cobbles and boulders, woody debris and overhanging banks is poor in some reaches. Overall however, 60-70% of the stream has good stream cover. This combination of habitat conditions produces good habitat for small mouth bass and darters, although scouring of the stream bed is reducing instream habitat for both of these species".

UTRCA has conducted benthic community sampling for a number of years in order to monitor water quality conditions throughout the Thames River Watershed. A comprehensive listing of all benthic sampling performed by UTRCA at various locations within the Dingman Creek is provided in Appendix D. The overall Benthic Score for Dingman Creek was 6.7, compared to the overall watershed score of 5.66 (on a scale from 1 to 10, with 1 indicating a pollution sensitive benthic community and 10 indicating a pollution tolerant benthic community), indicating the presence of invertebrate species tolerant of polluted conditions.

Benthic samples were gathered just downstream of the Dingman Creek Weir in 1999, 2000, and 2001. In 1999 the Family Biotic Index (FBI) was 6.258 which results in a rating of fairly poor water quality. In 2000 the FBI was 6.982 which corresponds to poor water quality. In 2001 the FBI was 5.725 was corresponds to a fair rating. The trend shows no real change.

2.2.7 Terrestrial Ecology

2.2.7.1 Riparian Vegetation and Habitat

The Thames River valley is situated within the biologically rich Carolinian forest area of southwestern Ontario and is home to many floral species rarely found elsewhere in Canada. The extent of natural vegetation cover in the Dingman Creek Subwatershed is 14% which is slightly above the average for the Upper Thames watershed, but still low compared to the recommended 30% required to maintain sustainability (Riley and Mohr 1994). Forest density is fair indicating some woodlots are located close enough to each other to allow seeds to be transported and wildlife to move between them. The amount of forest interior (1.2%) is quite low indicating that most of the woodlots are too small and narrow to support sensitive species that need to live in large habitats with significant central areas. In fact, 79% of the woodlots are less than 10 hectares in size.

The following features have been recognized as being key natural heritage system in the Dingman Creek Subwatershed:

- 91 potentially significant woodlots
- 7 provincially significant wetlands
- 3 locally significant wetlands
- 5 Areas of Natural and Scientific Interest
- 8 Environmentally Significant Areas
- Carolinian Canada Big Picture Corridor (not necessarily protected)

The Dingman Conservation Area is an environmentally significant area (ESA). The whole of the Dingman Corridor ESA was designated because of the presence of rare community types, such as fen, prairie and savannah, presence of a provincially significant wetland, representation of mature and relatively rich floodplain and slope forests, presence of forest interior and area sensitive bird species, presence of areas of groundwater recharge, high diversity of community types and of species, linkage and corridor functions and the presence of provincially and regionally rare plant species. This description applies to the entire area of the Lower Dingman ESA, not specifically to the conservation area.

The 2003 DCSSU has developed a series of strategies or recommendations for protecting and enhancing natural heritage features. Please refer to Table 9.1 Terrestrial Natural Heritage Strategy in the DCSSU Main Report for more detail.

A vegetation survey of the Dingman Conservation Area, in the immediate vicinity of the Dingman Creek Weir, was conducted on July 21, 2004. The natural vegetation cover around the weir was divided into two communities. *Community 1* was located on the west side of the creek and the portion along the east side of the creek was considered *Community 2*. Riparian vegetation adjacent to the weir and up and downstream from the weir was also surveyed.

Community 1 abuts a plantation. The plantation consists mainly of white pine (*Pinus strobes*), white spruce (*Picea glauca*) and black walnut (*Juglans nigra*). *Community 1* consisted of Manitoba maple, red osier and grey dogwood, ninebark, Virginia creeper, garlic mustard, giant ragweed, goldenrod, spotted touch-me-not, White and Yellow avens. Species observed in *Community 2* were the same as *Community 1* however, *Community 2* was adjacent to a natural woodland and had slightly wetter soil conditions. Both areas have been disturbed due to past flooding (eg. Sedimentation, floating debris) and foot traffic. A full listing of plant species observed in the vicinity of Dingman Creek Weir is found in Appendix E.

In the area surveyed, a total of 64 species were found; 46 species were native and 18 species were not considered indigenous to the area. The coefficient of conservatism is an index that relates the relative level of disturbance of a site based on the vegetation species present. The higher the conservatism coefficient the less disturbed the site is considered to be. At the Dingman Creek Weir, the average conservatism coefficient (cc) for this area was almost 3.2. A conservatism coefficient in the London area greater than 4.5 is considered high, a score between 4.0 and 4.5 is in the medium range and a score of less then 4.0 is considered low. The average score for London woodlots is between 3.0 to 4.8. The conservatism coefficient at Dingman Creek Weir is therefore considered in the low range.

2.3 Cultural

2.3.1 History of Study area

The area that comprises the current Dingman Creek Conservation Area was historically privately owned by several families in the area prior to being purchased by the Upper Thames River Conservation Authority, the Township of Westminster and eventually, turned over to the City of London when the Township was annexed in 1996. A summary of the chronology is as follows:

- The weir was constructed in the early 1940's by Alsop (landowner). The weir was known locally as Alsop's Dam. Local residents recall that the landowner built the weir to generate and supply electricity to the house. A year after it was built, the weir structure failed and was altered but never repaired or used for waterpower after that.
- In November, 1955, Reginald Mott Blay and Vivian C. Blay sold 18 acres of land to the Upper Thames River CA for $4,250.
- In 1860 George Sharpe and William Sanagen sold property to the Taylors.
- In April 1964, Sydney and Elma Taylor sold 32 acres of land to UTRCA for $6,500. These two pieces of land is what makes up the Dingman Conservation Area today.
- When the 32 acres was owned by the Taylor family, they leased 4 of the 32 acres to the 31st Scout Group Committee of the Calvery United Church. The Scouts constructed a bridge to get over to their 4 acres where they built a Long House (NE of the Dingman Creek).
- The UTRCA purchased land parcels around the weir site in 1955 and 1964 with the intent that the site would become a conservation area and a destination for picnickers and anglers. However, the seclusion of the site resulted in safety concerns and vandalism and the potential of the area as a recreational destination was never fully realized.
- In December of 1992, UTRCA sold the land to the Township of Westminster for $50,000.
- Ownership of the Conservation Area was transferred to the City of London in 1996, when Township of Westminster was annexed.

2.3.2 Current Recreational Use

Access to the site is gained via a parking lot, located off Homewood Lane. A trail runs from the parking lot, along the edge of the plantation to the weir site. There is a trail network through the plantation to other access points along the creek, up and downstream of the weir. Long term plans are to expand the trail system in both directions along the creek to connect the Lambeth area (Lambeth Community Centre) with the developing residential area to the north.

Current use of the Conservation Area and weir include horseback riding (by user of local boarding stables), fishing, and walking. Local users often cross the weir on foot to gain access to the other side of Dingman Creek. The water levels behind and below the weir are too shallow for most water activities. Most of the day use appears to be by local residents. Because the weir is so secluded, the area is susceptible to weekend parties and vandalism.

For a period of time, the west side of the creek was maintained (grass cutting and garbage pick up) by the Conservation Authority, on behalf of the City of London. However, with the continued occurrence of vandalism, the Conservation Authority has abandoned maintenance activities and allowed the site to overgrow with vegetation.

3 Alternative Solutions and Evaluation

The identification of alternative solutions for the Dingman Creek Weir was based on the issues discussed in Section 1.2. This includes the need to establish corrective solutions to (1) the deteriorating condition of the weir and address risk associated with public safety and liability, (2) issues associated with presence of the weir and impacts to fish movement and migration and (3) the opportunity to undertake stream restoration and rehabilitation in a stressed riparian system.

The following sections discuss the identification and evaluation of alternative solutions.

3.1 Identification of Alternative Solutions

The following alternative solutions have been developed for the Dingman Creek Weir:

Option 1 Maintain the status quo (do nothing)
Leave the weir in its current condition, with the expectation that the structure will continue to deteriorate. This option provides a baseline condition with which to compare the other options and also considers the potential impact of not undertaking any substantive rehabilitation of the dam structure.

Option 2 Rehabilitate the existing weir structure, but do not mitigate for fish passage
Undertake structural rehabilitation and repair of the weir with no significant changes to its dimensions or design. Do not incorporate any additional design or construction to address aquatic habitat issues.

Option 3 Partially remove the weir, widen the outfall notch and create a rock drop structure
Partially remove the structure by removing concrete through the centre portion of the weir, widening the outfall. Install a rock drop structure below the outfall as a means of partial stream restoration, leaving the concrete apron that extends about 6 feet out from the weir intact.

This option was originally developed by the project team (see meeting minutes in appendix to see who sat on the project team) to present an alternative to full removal of the weir. However, the team recommends taking Option 3 off the list of options to be evaluated for the following reasons:

- A preliminary cost analysis indicated very little cost difference between partial removal (Option 3) and full removal (Option 4), because most costs are associated with equipment time and, given the weir's small size, full removal would only have a marginal impact on the working time.
- The ecological benefits of partially removing the weir, rather than leaving it intact, are minimal.

Option 4 Decommission and remove the weir, rehabilitate the stream channel with natural channel design (e.g. rock riffle), restore the channel and bank

Decommission and remove the existing weir structure. Removing the weir would eliminate the small upstream pond and the site would revert to its natural 'pre-weir' riverine state. Restore the stream channel using natural channel design techniques such as installation of a riffle. Restore/rehabilitate the banks to stabilize and encourage natural revegetation. Riparian plantings could enhance the revegetation process.

Option 5 Rehabilitate the existing weir structure and install a fishway (e.g. fish ladder or bypass channel)

Undertake structural rehabilitation and repair of the weir with no significant changes to its dimension or design. To ensure that fish could migrate upstream past the weir, incorporate a design that includes a fish ladder or bypass channel.

Option 6 Install a fishway with no structural improvements or other work performed on the weir

Similar to the status quo (Option 1), do not undertake any work on the weir structure with the expectation that the structure will continue to degrade with time. Construct a fishway (e.g. fish ladder or bypass channel) to ensure that fish could migrate upstream past the weir.

3.2 Evaluation of Alternative Solutions

In order to identify the most appropriate solution for the Dingman Creek Weir, the alternative solutions are compared in terms overall effectiveness, estimated cost and net environmental effects. To facilitate this process, an environmental screening was performed to ensure that a full range of potential impacts was considered. Based on the environmental screening, net environmental effects were identified for each option. These are presented in Table 3.

The list of alternative solutions and the table of net environmental effects were among the information presented at the Public Open House on September 23, 2004. The public had

an opportunity to scrutinize the net environmental effects that had been identified by the project team and identify any others that may have been overlooked.

Table 3. Dingman Creek Weir Evaluation of Alternative Solutions						
Alternative Solution	**Effectiveness**		**Estimated Cost**	**Net Environmental Effects**		**Required Mitigative Measures**
	Advantages	**Disadvantages**		**Natural Environment**	**Social Environment**	
Option 1 Maintain the status quo (do nothing).	• No immediate costs or work. Postpones decision with regard to removing or repairing the weir and other site remediation work.	• Postpones assessment of the weir and potential removal/repair/remediation work, when funding is currently available to perform this work. • Continued deterioration of the weir would increase risk associated with public use and activity. • Continued erosion of banks around the wing walls during high flow events. • Does not address the issue of fish passage and general ecosystem health.	N/A	• Weir acts as a barrier to most fish passage (including species at risk) through the area. • Continued erosion and scouring around the wing walls contributes to transport of sediment into the river, negatively affecting fish habitat and water quality. • Weir would continue to disrupt natural sediment transport regime (sediment and deposition) and impact local instream water quality and temperature. • Weir may act as a barrier to stream flow during periods of drought or low flow (i.e. notch may not be deep enough to allow low flows to pass). • Weir may facilitate wildlife crossing and act as a corridor across Dingman Creek.	• Weir would continue to be used as a pedestrian creek crossing with a continued risk to public safety as the structure is left to deteriorate. • Would not address concerns of local residents regarding ecosystem health and the opportunity to enhance ecosystem. • Dingman Creek would remain unnavigable through this reach. • Aesthetic and cultural values associated with the weir are mixed.	• Future maintenance or remediation work may be required to address structural and erosion issues as they develop.
Option 2 Rehabilitate the existing weir structure with no mitigation for fish passage. Assumes no change in dimensions of the weir structure.	• Addresses issues related to the safety and stability of the structure. • Weir would need to be reconstructed to current dam safety standards.	• Does not address the issue of fish passage and general ecosystem health. • Continued erosion around wing walls is likely if remediation work is not incorporated into structural rehabilitation works. • On going maintenance requirements for the structure. • Investment of funds into a structure that currently serves no purpose or function.	$35,000 (estimate) Actual costs would be determined through a structural assessment of the weir	• Weir is a barrier to most fish (including species at risk) through the area. • Continued erosion and scouring around the wing walls contributes to transport of sediment into the river, negatively affecting fish habitat and water quality. • Weir would continue to disrupt natural sediment transport regime (sediment and deposition) and impact local instream water quality and temperature. • Weir may act as a barrier to stream flow during periods of drought or low flow (i.e. notch may not be deep enough to allow low flows to pass). • Weir may facilitate wildlife crossing and act as a corridor across Dingman Creek. • Public access to site may be reduced with the application of new dam safety standards.	• Weir would continue to be used as a pedestrian crossing for the river. • Would not address concerns of local residents regarding ecosystem health and the opportunity to enhance ecosystem. • Dingman Creek would remain unnavigable through this reach. • Aesthetic and cultural values associated with the weir are mixed.	• Mitigation required for general construction impacts. • Construct and maintain sediment and erosion control. • Restore temporary access road to ensure that the roadway does not become a route for ATVs and other motorized vehicles. • Observe appropriate fisheries construction timing windows for instream work to minimize impact to aquatic species. • Implement construction site best management practices to minimize impacts on local community (e.g. limit construction to daytime hours, install warning signs and safety fencing around the work site). • Involve local landowners in monitoring the site to reduce vandalism during construction phase.
Option 3 Partially remove the weir, widen the outfall notch and create a rock drop structure.		• Preliminary cost analysis indicating minimal cost difference between Options 3 (partial removal) and 4 (full removal).		• The ecological benefits of partially removing the weir, rather than leaving it intact, are minimal.		

Option 4 Completely remove the weir, rehabilitate the stream channel with natural channel design (e.g. rock riffle), and restore channel and bank.	• Addresses concerns regarding fish passage, stream bank erosion and risk to public using the weir as a pedestrian crossing. • Capitalizes on opportunity to implement stream restoration or enhancement. • Future opportunity to restore pedestrian crossing upstream of site with other trail work that could be undertaken by the City of London.	• Temporary local impacts associated with physical removal of the weir and restoration of the site. • May impact local patterns of cultural and recreational use of the weir.	$15,000-20,000	• Removes barrier to fish passage and results in the broader enhancement of aquatic habitat (and species at risk habitat) by creating a new riffle area and stabilizing the channel and bank. • Adjustment period for sediment dynamics – possible short term sediment transport and deposition as sediment is redistributed. • Impacts to terrestrial vegetation along existing pathway associated with creating equipment access to the weir site. Some trees and shrubs along the existing pathway would be removed and the pathway widened for equipment access. • Long term improvement to water quality and low flow or baseflow conditions as creek is no longer impounded.	• Addresses the public safety risk associated with present and continued use of the weir. • Possible temporary noise impacts to surrounding residents due to construction activities (removal of weir, site restoration). • Local patterns of use have established some recreational/cultural value in the weir as a pedestrian crossing. • Aesthetic value of the sound of the creek will be maintained by creating the riffle. • Navigability of the Dingman Creek can be restored through the construction of a low flow route through the riffle. However, low baseflows in Dingman Creek will likely not accommodate navigability throughout the entire season. • Construction activities at the weir site may temporarily impact recreational usage of the immediate area due to public safety concerns, construction equipment, noise, etc.	• Mitigation required for general construction impacts. • Construct and maintain sediment and erosion control during weir removal. • Conduct general site restoration after weir is removed including riparian areas. Restore temporary access road to ensure that the roadway does not become a route for ATVs or other motorized vehicles. • Observe appropriate fisheries construction timing windows for in-water work to minimize impact to aquatic species. • Implement construction site best management practices to minimize impacts on local community (e.g. limit construction to daytime hours, install warning signs and safety fencing around the work site). • Involve local landowners in monitoring the site to reduce vandalism during construction phase.
Option 5 Rehabilitate the existing weir structure and install a fishway (e.g. fish ladder or channel).	• Addresses issues related to the safety and stability of the structure. • Addresses concerns associated with fish passage.	• Does not address broader issues of aquatic ecosystem health including water quality, low flow conditions, natural sediment dynamics, etc. • Installing a fishway does not meet the goal of broader scale restoration of fish habitat at the site. • Continued erosion of banks around the wing walls during high flow events. • On going maintenance requirements for the both the weir and the fishway. • Potential major impact on use of the property because access would be limited by installation of fencing to protect the fishway from vandalism. • Investment of funds into the weir structure that currently serves no purpose or function. • Long term maintenance costs for the fishway.	$50,000 + (estimate, does not include budget for fencing and maintenance) Actual cost would be determined through a structural assessment of the weir.	• Addresses concerns associated with fish passage. • Continued erosion and scour around the wing walls contributes to transport of sediment into the river, negatively affecting fish habitat and water quality. • Weir would continue to disrupt natural sediment transport regime (sediment and deposition) and impact local instream water quality and temperature. • Weir may act as a barrier to stream flow during periods of drought or low flow (i.e. notch may not be deep enough to allow low flows to pass). • Weir may facilitate wildlife crossing and act as a corridor across Dingman Creek. • Fish ladder would not be appropriate for most smaller fish species including Species at Risk (greenside darter). Fish ladders have proven not to be successful in warmwater fish communities.	• Potential major impact on use of the property because access would be limited by installation of fencing to protect the fishway from vandalism. • Weir would continue to be used as a pedestrian crossing for the river with a continued risk to public safety as the structure is left to deteriorate. • Concerns of local residents regarding general ecosystem health and opportunity to perform ecosystem enhancement would not be addressed. • Dingman Creek remains unnavigable through this reach. • Aesthetic and cultural values associated with the weir are mixed. • Possible temporary noise impacts to surrounding residents due to construction activities.	• Mitigation required for general construction impacts. • Construct and maintain sediment and erosion control • Restore temporary access road to ensure that the roadway does not become a route for ATVs or other motorized vehicles. • Observe appropriate fisheries construction timing windows for in-water work to minimize impact to aquatic species. • Implement construction site best management practices to minimize impacts on local community (e.g. limit construction to daytime hours, install warning signs and safety fencing around the work site). • Involve local landowners in monitoring the site to reduce vandalism during construction phase.

Option 6 Install a fishway but do not undertake structural improvements or other work on the weir.	• Addresses concerns associated with fish passage.	• Does not address broader issues of aquatic ecosystem health including water quality, low flow conditions, natural sediment dynamics, etc. • Installation of a fishway does not meet the goal of broader scale restoration of fish habitat at the site. • Continued deterioration of the dam structure would continue increase risk associated with public use and activity. • Continued erosion of banks around the wing walls during high flow events. • On going maintenance requirements for the both the weir and the fishway. • Fishway becomes a target for vandalism. • Investment of funds into a structure that currently serves no purpose or function.	$10,000	• Addresses concerns associated with fish passage. • Continued erosion and scour around the wing walls contributes to transport of sediment into the river, negatively affecting fish habitat and water quality. • Weir would continue to disrupt natural sediment transport regime (sediment and deposition) and impact local instream water quality and temperature. • Weir may act as a barrier to stream flow during periods of drought or low flow (i.e. notch may not be deep enough to allow low flows to pass). • Weir may facilitate wildlife crossing and act as a corridor across Dingman Creek.	• Weir would continue to be used as a pedestrian crossing for the river with a continued risk to public safety as the structure is left to deteriorate. • Concerns of local residents regarding general ecosystem health and opportunity to perform ecosystem enhancement would not be addressed. • Dingman Creek remains unnavigable through this reach. • Possible temporary noise impacts to surrounding residents due to construction activities.	• Mitigation required for general construction impacts. • Construct and maintain sediment and erosion control. • Restore temporary access road to ensure that the roadway does not become a route for ATVs or other motorized vehicles. • Observe appropriate fisheries construction timing windows for in-water work to minimize impact to aquatic species. • Implement construction site best management practices to minimize impacts on local community (e.g. limit construction to daytime hours, install warning signs and safety fencing around the work site). • Involve local landowners in monitoring the site to reduce vandalism during construction phase.

3.3 Selection of the Preferred Solution

Based on the analysis of net environmental effects, advantages and disadvantages of the various management options for Dingman Creek Weir, described in the preceding text, as well as having given due consideration to the various comments, input and concerns expressed by members of the public, stakeholders and government agencies, the following option was selected as the preferred solution for Dingman Creek Weir:

Option 4 Decommission and remove the weir, rehabilitate the stream channel with natural channel design (e.g. rock riffle), restore the channel and bank

Decommission and remove the existing weir structure. Removing the weir would eliminate the small upstream pond and the site would revert to its natural 'pre-weir' riverine state. Restore the stream channel using natural channel design techniques such as installation of a riffle. Restore/rehabilitate the banks to stabilize and encourage natural revegetation. Riparian plantings could enhance the revegetation process.

This option is consistent with recommendations of previous studies (eg. DCSS 1995 and DCSSU 2003) and with current aquatic restoration research (UTRCA barrier assessment project).

3.4 Confirmation of Project Category

Based on the analysis of the net environmental effects of the alternative solutions, public comments and the selection of *Option 4 Decommission and remove the weir, rehabilitate the stream channel with natural channel design*, as the preferred solution, the status of the project was confirmed to be a Schedule B project pursuant to the Municipal Class EA (MEA, 2000).

4 Preferred Solution: Project Details

This section describes the project-specific details associated with implementing the preferred solution for the removal of Dingman Creek Weir and subsequent aquatic habitat restoration/enhancement through the creation of a rock riffle feature. Generally the implementation will involve site preparation activities to secure the site for work, the removal of the weir and habitat restoration/enhancement and finally site clean-up and access road rehabilitation. Cross-sections and details of the preferred solution are provided in Figures 4 a and b.

4.1 Pre-Construction Activities

4.1.1 Equipment & Materials Required

- Large tracked excavator
- Dump trucks (tri-axle or tandem as recommended by contractor)
- Concrete saw and supply of blades
- Vibrating jack hammer head for excavator or backhoe (optional)
- Loader and /or bulldozer (optional depending on truck access ability)
- Chainsaw and certified operator
- Labour
- Hand tools including sledge hammers, pruning saws, handsaw, shovels, etc.
- Silt fence
- Non-woven geotextile
- River stone (mixed, up to 24 inches)

4.1.2 Site Access

Road access to the Dingman Creek Weir is available from Homewood Lane via Deadman's Lane (off Westdel Bourne Road). These roads are subject to local traffic only as Homewood Lane dead ends just north of the Dingman Creek Conservation Area entrance. The Dingman Creek Conservation Area is used by local residents and caution must be exercised when construction vehicles are entering the site.

There is an existing access route to the weir site from a parking lot, located just off Homewood Lane. Much of the access route is a former road bed that has grown in over the past 30 years. Closer to the weir site, the access route narrows. Along it's length, the current access route varies in width from 1m to 3m. The width that will be required to accommodate construction equipment is approximately 5m.

To prepare the route for construction site access by heavy equipment, an arborist will selectively trim and/or cut trees along the existing path to widen the access for larger equipment. The access route will need be wide enough to accommodate a tracked excavator and either tandem/tri-axle

dump trucks.

Large woody material will be left on the lane (to discourage vehicular access) and smaller cuttings will be moved by hand into brush piles, or chipped and either spread out on the trail or used to mulch any proposed tree/shrub plantings.

At the time of weir decommissioning, the excavator will be used to push the large woody material aside to allow truck access. Note that woody material may be pulled back onto the lane following construction to reduce non-approved traffic such as ATV's. The concrete barriers located around the parking lot perimeter will also be temporarily moved aside to allow access for large equipment.

4.1.3 Work Areas

A specified work area will be established adjacent to the weir on the west side of the creek. It is proposed that the entire Conservation Area be signed as a construction site and closed to the public. Fencing may be used to confined construction activities to a specified area and prevent encroachment into surrounding areas will be avoided.

4.1.4 Construction Site Management

Measures to minimize environmental disturbance at the weir site during construction and demolition activities include:

- Establishment of defined work areas for staging and construction.
- Proper storage of equipment, construction material, debris and fuel away from sensitive areas and open water.
- In-water works occur only during authorized times, according to Department of Fisheries and Oceans requirements.
- Proper disposal of all construction debris, rubble and stockpiles.
- Maintenance and/or restoration of site construction, staging and work areas and access road following the completion of the works.

4.1.5 Sediment and Erosion Control Plan

Since there will be in-water work associated with almost all aspects of this project, erosion and sediment control will be undertaken. These control measures will minimize erosion at the site and contain any releases of sediment or debris. The following strategies should contribute to managing issues related to sediment and erosion:

- Due to the nature of the work, in-stream activities will be limited to periods of low-flow. Working in low flow conditions will provide greater certainty in terms of sediment and erosion control and the success mitigation of measures.
- Rather than creating a coffer dam or other diversion structure, the river stone that is to be used as part of the stream enhancement/restoration will be used to construct a dry access and staging platform. Stone will be placed in the creek, on the immediate downstream side of the

weir, to a level that allows the excavator to sit above the water. This will prevent oil residue, gas and particulates from being transferred from equipment into the creek. The temporary staging platform will be dismantled following the removal of the weir and the river stone material will be used to construct a riffle area. It is expected that the platform will be in place only while the weir is being dismantled; estimated to be one day.

- A natural pool area located immediately below the weir structure will be used for in-stream sediment control. A survey of the pool will be conducted before and after construction activities and the pool will be cleaned out if necessary. Any sediment collected from the pool will be spread at a suitable location away from the creek.
- A prefabricated silt-fence will be installed below the pool on a naturally occurring riffle, to control the movement of coarser material.
- Silt fencing may be used in and around the creek for sediment control. Depending on the quantity of flow, the silt fence may be installed in-stream as baffles or simply perpendicular to flow.

4.2 Construction Activities

4.2.1 Modification of Existing Weir

A detailed survey of the existing weir structure will be carried out and a series of survey benchmarks established around the construction site. This will assist in final design implementation, clean-up and restoration of the site following construction.

Any wooden stop logs remaining in the existing weir will be removed manually (when flows are low). The weir outlet will be notched at roughly twice the existing size using a concrete saw/hand-labour. Widening the notch will allow any backwater stored behind the weir to be released slowly. It is anticipated that the difference in water elevation upstream and downstream of the weir will be negligible in low flow conditions.

An assessment of the steel reinforcement rod within the weir structure will determine if the concrete that constitutes the weir can be recycled. If the concrete can be salvaged, this material could be incorporated into the stream restoration works as a base/platform for the riffle.

4.2.2 Weir Removal

The main portion of the concrete weir will be removed however, the headwall extensions that continue into the bank on either side of the creek will be left in place as a cultural remnant of the weir. The submerged concrete sill/apron that extends in front of the weir will be removed if necessary. Removal of the sill is preferable however, the sill may be left in place if the grading and in-stream elevations are compatible with the desired final elevations. If this is the case, the riffle will be constructed on top of the sill. A tracked excavator will be used to break away the weir and, if necessary, a jack hammer (excavator/backhoe attachment) will be used to break up the concrete sill.

River stone will be delivered to the site and stock-piled as close to the weir as possible. The quantity of stone required will be based on the suitability of the existing concrete for use in the habitat enhancement design. If concrete from the weir structure can be recycled as a base/platform for the riffle, the quantity of river stone required for the stream restoration will be reduced. Impacts to area vegetation will be minimized by storing the river stone on grass areas, avoiding trees and shrubs. Delivery of the stones will be timed to coincide with the restoration activities in order to minimize the time that the stones sit on the site.

If the density of the steel reinforcement rods is too high, the concrete may not be salvageable and will be removed by the excavator. The weir refuse will be disposed of at an acceptable location.

As described above, to facilitate the removal of the weir from a dry location, a temporary platform, comprised of river stone, could be laid at the edge of the creek, adjacent to the weir site. This platform could be used to stage the removal of the weir and sill and allow equipment to get close to the structure without being in the flow of the creek. Once the entire weir is removed, the platform would be dismantled and the river stone would be incorporated into the riffle.

4.3 Site Restoration

4.3.1 Shoreline Stabilization and Access Route Restoration

It is not anticipated that significant disturbance of shoreline areas outside of the immediate weir site will occur. However, should such disturbance occur these areas will be stabilized and restored by ensuring that erosion protection is in place and by seeding banks and shoreline areas with a fast-growing native seed mix (may include a mulch or seed mat) and using shoreline stabilization techniques that are appropriate for the slope and by allowing natural regeneration of all areas.

In terms of the access route, the pathway into the site will be left in a state acceptable to the City of London staff. The excavator will pull tree trunks/logs back onto the path if this is deemed desirable. Planting of native trees and shrubs in areas along the path may be considered, particularly in areas that have been more heavily disturbed. The concrete barriers surrounding the parking lot will be placed back in their original location.

4.3.2 Site Restoration/Habitat Enhancement

- The riffle design is based on design principle. The riffle will be a vortex style with a parabolic shape that forces water through the middle of the riffle, creating a run and pool downstream of the riffle. This design minimizes the backup of water behind the feature and direct stream energy into the middle of the creek, away from the banks.
- Sediment that has accumulated behind the weir will be incorporated into the design of the

riffle to form a matrix for the river stone. If the quantity of sediment is excessive it will be removed from the creek and either relocated on the property or taken off-site for disposal. If dewatering is necessary, a woven geotextile lined settling basin will be constructed as far as possible from the creek.

- Disturbed banks will be restored and will be shaped no steeper than 2 horizontal:1 vertical. These areas may be protected with a biodegradable mulch blanket, stone with non-woven geotextile underlay, or they may receive bioengineering treatments (to be carried out during plant dormancy period).

4.4 Scheduling of Works

Two scheduling options for the implementation of the preferred option are presented. Option 1 presents a timeline based on authorization by DFO to work outside of the construction timing window. If authorization is granted, all construction activities can be completed in the fall of 2004. If authorization is not granted, implementation of the preferred option will occur over the 2004-05. These options are presented below:

Option 1 – Fall 2004 (Work was not completed at this time)
Roughly three weeks of 'good' weather would complete the project.

Week 1 would include:

- establishment of signage
- creation of access route
- modification of existing weir
- delivery of river stone

Week 2 would be an idle period unless dry weather persists

Week 3 (or sooner) would include:

- weir removal
- site clean up
- bioengineering (if necessary)

Option 2 – Fall 2004 & Spring/Summer 2005

Fall 2004 (as soon as possible)

- establishment of signage
- creation of access route (leaving large material on lane way for spring removal)
- modification of existing weir

Spring/Summer 2005 (to begin when weather is suitable)

- delivery of river stone
- weir removal
- site clean up

Fall 2005

- bioengineering and other site stabilization techniques as necessary

The final decision on scheduling will be made during the application for permits and approvals. Agency input during this consultation will contribute to making the final decision on the construction schedule.

4.5 Net Environmental Effects and Mitigation

The negative environmental effects associated with the removal of the Dingman Creek Weir and the in-stream rehabilitation was discussed in Section 3 and Table 1. These are summarized as follows:

- If the installation of a temporary platform is implemented as part of the construction staging activities it will result in the temporary loss of fish habitat during the construction period. No mitigation is identified other than the observance of fisheries timing window since the area immediately surround the weir is not assessed as providing any specialized fish habitat. The in-stream timing window for Dingman Creek is identified as October 1st to May 31st . Although Dingman Creek is classified as a warmwater stream, the presence of brown trout suggests that it has the potential to support a coolwater fishery and therefore the timing window is selected to protect these species. Should DFO authorize work to occur outside of the fisheries timing window, in stream construction could start in the fall of 2004.

- The placement of river stone on the stream bed may be considered alteration to fish habitat. No mitigation is identified because the installation of a riffle feature is part of the habitat enhancement plan.

- In-water construction works could result in potentially harmful releases of sediment and/or other materials to sensitive downstream fish/invertebrate habitats. Mitigation by means of an approved sediment and erosion control plan should be prepared and implemented to minimize excessive sediment releases to downstream areas. In addition, standard construction site best management practices with respect to work in/around water should be implemented.

- Construction activities will require that the current access route to the weir be widened through the selective cutting of vegetation. With this trail widening comes the possible use of the trail by ATVs and other motorized vehicles. In order to discourage vehicular access, large woody vegetation will be left on the trail. Smaller cuttings will be moved by hand into brush piles, or chipped and either spread out (laneway/trail) or used to mulch any proposed

tree/shrub plantings. At the time of decommissioning, the excavator will be used to push the large woody material aside to allow truck access. This material may be pulled back onto the lane following construction to reduce non-approved traffic.

- Construction activities may disturb a small area of natural vegetation in the vicinity of the weir. Every effort will be made to minimize the area impacted by construction activities. Mitigation by means of general site restoration should be conducted following construction and should include the replanting of any vegetation removed or disturbed at the weir site.

- Construction at the weir site will temporarily impact land-based recreational usage of the surrounding area. The Conservation Area will be closed during the construction period to avoid potential conflicts between recreational users and heavy equipment and construction activities. The magnitude of this impact is expected to be minimal since usage of the area is very low.

- Construction at the weir site will temporarily displace water-based recreational usage through the area. This would be a very short term impact. No mitigation is identified since water-based recreation of the Dingman Creek is limited almost exclusively to spring high flows. Throughout most of the year, the Dingman Creek would not offer a navigable route (canoe), particularly in the vicinity of the weir. The impact of construction activities on water-based recreation is considered negligible.

4.6 Environmental Monitoring

Environmental monitoring will be comprised of two components: construction monitoring during project implementation, including the removal of the weir, installation of the rock riffle and in-stream rehabilitation; and operational monitoring, which will evaluate the post-construction and longer term effects associated with the removal of the weir and stream restoration work.

4.6.1 Construction Monitoring

Construction will be undertaken in accordance with current provincial guidelines for construction activities impacting on water resources and current best management practices.

The project works manager (engineer), or designate, will be responsible for supervising and/or direct monitoring of the construction activities and associated mitigation measures through all aspects of the project implementation.

Some of the mitigation measures previously identified that will require monitoring through the construction phase include:

- Establishment of defined working areas for construction staging
- Proper storage of equipment, construction material, debris and fuel away from sensitive areas and open water

- Water control, erosion and sediment control
- Proper construction practices, disposal of all construction debris, rubble and stockpiles
- Shoreline/bank stabilization and fish habitat restoration

Specific construction monitoring requirements for in-stream works include monitoring downstream water quality for signs of increased turbidity and/or suspended solids during construction.

4.6.2 Operational Monitoring

The objective of the operation monitoring is to track the success of the site restoration activities and identify any effects that were not anticipated and undertake corrective measures. For Dingman Creek, residual environmental effects are not likely to be long term because of the relatively small influence the weir had on stream hydrology. However, it is anticipated that a period of geomorphic adjustment will follow the removal of the weir. Operational monitoring will focus largely on those areas disturbed during construction. For the Dingman Creek Weir site, operational monitoring will largely focus on:

- The integrity/stability of the rock riffle and other in-stream restoration works.
- The ongoing process of natural regeneration and growth along the stream banks and long term bank stabilization.
- Fish passage – Are fish migrating upstream? How far up the Dingman Creek are fish now traveling?
- Benthic community – Has a benthic community become established on the new rock riffle? If so, what does the species assemblage indicate about water quality?
- Have there been any measurable impacts (negative or positive) downstream as a result of the weir removal.
- Rehabilitation of the temporary access road.

Operational monitoring will be carried out through regular site visits, fish, benthic and water chemistry sampling upstream and downstream of the weir site. UTRCA already has established aquatic monitoring stations in the vicinity of the Dingman Creek Weir, as part of an overall watershed health monitoring program. The results of all field site visits, sampling etc. should be recorded in the project file.

4.7 Environmental Approvals, Authorizations and Permitting

The implementation of this project is based on the premise that all necessary federal and provincial approvals and/or authorizations will be obtained by the City of London (and/or it agency) prior to initiating the project works. This section identifies the anticipated agency-specific environmental approvals that will likely be required. These will be reviewed in detail with the agencies during the permit application process.

4.7.1 Department of Fisheries and Oceans

Construction activities at the weir site, specifically the removal of the weir and the natural channel design and habitat restoration may result in minor and temporary impacts to fish habitat. This area of the Dingman Creek is not known to represent critical fish habitat (i.e. spawning or nursery habitat). In-stream works can be scheduled to mitigate impacts to fish and fish habitat by complying with the fisheries restriction for no in-water work. DFO will be consulted to provide an assessment of the proposed works to determine if the project will constitute a Harmful Alteration Disruption or Destruction (HADD) of fish habitat. If so, an authorization from DFO under Section 35(2) of the Federal Fisheries Act would be required.

4.7.2 Ministry of Natural resources

The Ministry of Natural Resources (MNR) should be consulted to ensure that their requirements under the Lakes and Rivers Improvement Act (LRIA) are being met for the proposed weir removal and in-stream rehabilitation. MNR will be consulted and will have an opportunity to review project plans and specifications to determine if the in-stream works will require LRIA approval.

4.7.3 Transport Canada

Implementation of the Dingman Creek Weir works may require approval under the Navigable Waters Protection Act. The Act prohibits the construction of placement of any “works” in navigable waters without obtaining a permit. Although the project will involve the removal of a barrier to navigation, the installation of a rock riffle, as a component of the stream rehabilitation, may require approval if the riffle is considered a “structure” that will impact navigability.

4.7.4 Upper Thames River Conservation Authority

In-stream works at the Dingman Creek Weir will require an Application of Consent be obtained from the UTRCA pursuant to their administration of the Fill, Construction and Alteration to Waterways Regulation pursuant to the Conservation Authorities Act.

4.7.5 Canadian Environmental Assessment Agency

The federal approval that may be required for this project under the Navigable Waters Protection Act and the Federal Fisheries Act will necessitate CEAA screening. It is anticipated that DFO

will be identified as the Responsible Authority to conduct an internal CEAA screening based on the information in this document. This process is expected to occur in early 2005.

5 Public and Agency Consultation

Public and agency consultation activities were conducted as part of the Class EA process. Consultation activities were coordinated by the UTRCA and the City of London. During the process, agency and public contact points included a Notice of Study Commencement Letter to adjacent landowners and Newspaper Advertisement, a Stakeholder and Agency Letter Mail Out, Kitchen Table discussions with local residents, posting of information on the City of London's website, stakeholder meetings, an Open House.

Notice of Study Commencement Letter to Residents along with a questionnaire
The Notice of Study Commencement Letter and a questionnaire went to the adjacent landowners of the Dingman Creek weir on July 9, 2004. The purpose of the letter was to notify the landowners of the study. The purpose of the questionnaire was to receive input from the landowners and to gather further cultural background information on the study area. A copy of the letter and questionnaire is provided in Appendix F.

Notice of Study Commencement Newspaper Advertisement
The Notice of Study Commencement to the public was published in the London Free Press on July 31 and in the Lambeth Village News in the August 2004 issue. The purpose of the notice was to notify the public of the study, including its purpose and status under the Environmental Assessment Act. A copy of the notice is provided in Appendix F.

Stakeholder and Agency Letter Mailout
A direct letter mailing was completed during the week of July 26, 2004 to local community groups and to all relevant federal, provincial and municipal government ministries and agencies. This letter was to inform all relevant stakeholders and agencies of the Study Commencement. A total of 21 letters were mailed. A sample copy of the mail out letter, as well as the stakeholder and agency mailing list, is provided in Appendix F.

Information Postings on City's Website
During the Class EA process study information was posted on the City of London website at www.london.ca.

Kitchen Table discussion
The UTRCA organized a Kitchen Table discussion with local residents and the City on September 8, 2004. The purpose of this meeting was to further explain to the local community how the Class EA process works and what the options surrounding the Dingman Creek Weir were. Input was sought from these members and some further cultural history was gathered.

Technical Advisory Committee Meeting

During the Class EA process, the UTRCA met with representatives from several relevant agencies on August 27, 2004. The purpose of this meeting was to review selection criteria for the Barrier Assessment Project and to discuss all options for the Dingman Creek Weir. The further purpose of this meeting was to answer questions and identify issues and concerns. Comments raised during the meeting are summarized in Appendix F.

Notice of Public Open House
A notice of a Public Open house was published in the London Free Press on September, 18 2004 to inform the public of this event. Further notices went out to all stakeholders and relevant agencies. The Open House invitation is provided in Appendix F.

Notice of Study Completion Newspaper Advertisement
The Notice of Study Commencement was published in the London Free Press on April 2, 2005. The purpose of the notice was to notify the public and agencies of the selection of the preferred option and to inform them of a 30-day review period for interested parties to review the Environmental Assessment Report and associated file information at the City of London or the UTRCA. A copy of this Notice is included in Appendix F.

Stakeholder and Agency Letter Mailout
A direct letter mailing was completed during the week of March 21, 2005 to local community groups and to all relevant federal, provincial and municipal government ministries and agencies, and to members of the public that responded to the first notice and/or attended the public open house. The letter included a copy of the Notice of Completion. A sample copy of the letter(s) is provided in Appendix F.

6 Conclusion

It is recommended that Option 4, Completely remove the weir, rehabilitate the stream channel with natural channel design (e.g. rock riffle) and restore channel and bank, be implemented. This option addresses concerns regarding fish passage, stream bank erosion and risk to public using the weir as a pedestrian crossing. It also capitalizes on opportunity to implement stream restoration or enhancement. Lastly, there is a future opportunity to restore pedestrian crossing upstream of site with other trail work that could be undertaken by the City of London.

7 Bibliography

City of London. 1995. *Dingman Creek Subwatershed Study*.

City of London. 1995. *Dingman Creek Subwatershed Study*. RAS Model.
Note: RAS Model – Modifications by UTRCA included: 1. Imported from HEC-2 to HEC-RAS; 2. Starting water surfaces changed from known water surfaces to junctions; some bridges corrected after importing.

City of London. 2003. *Dingman Creek Subwatershed Study Update*.

Dillon Consulting Ltd., Golder Assoc., 2004. *Middlesex-Elgin Groundwater Study Final Report. File 02-0394*. Unpublished report.

Dreinmanis, A., 1964. *Pleistocene geology of the St.Thomas area (west half).* Ontario Dept. of Mines, Preliminary Geology Map, P. 238

Hills, G.A. 1959. *A ready reference to the description of the land of Ontario and its productivity. Ontario Department of Lands and Forests, Research Division Preliminary Report*, 141 pp.

Middlesex-London Health Unit. 2002. *The Walking Trails of Middlesex County*.

Municipal Engineers Association. 2001. *Municipal Class Environmental Assessment.* Mississauga, Ontario.

Riley, J. And P. Mohr. 1994. *The Natural Heritage of Southern Ontario's Settled Landscapes. Technical Report TR-001*. Ontario Ministry of Natural Resources. Southern Region, Aurora. 78 pp.

UTRCA. 2001. *Upper Thames River Watershed Report Cards 2001*. Upper Thames River Conservation Authority.