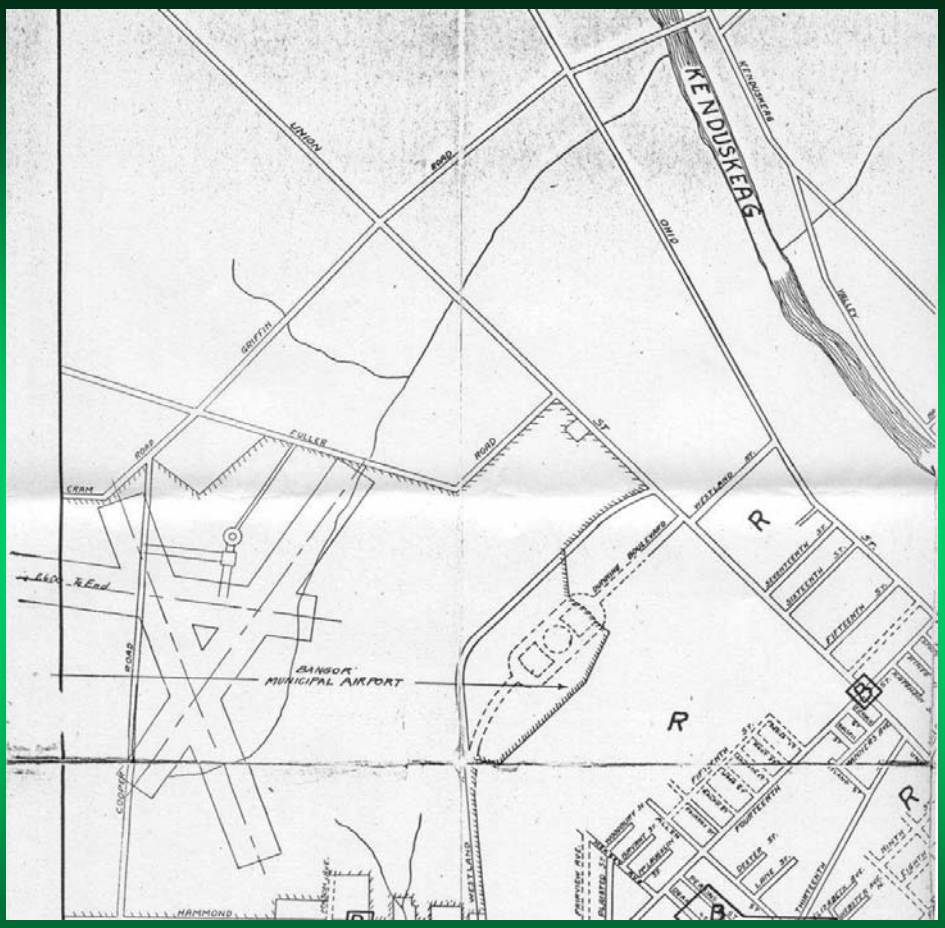
Birch Stream Total Maximum Daily Load (TMDL)
Report



Birch Stream
1930 Bangor Chamber of Commerce Map

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PART II: TMDL PLAN

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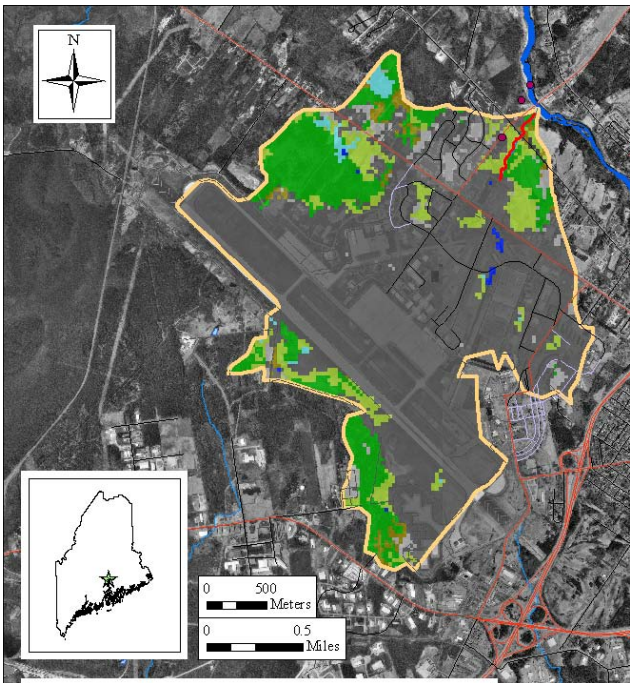
LIST OF ACRONYMS USED

BMP	Best Management Practice
CMC	Criteria Maximum Concentration(for toxic contaminants)
CSO	Combined Sewer Overflow
CWP	Center for Watershed Protection
ENSR	ENSR Corporation
GIS	Geographic Information System
IC	Impervious Cover
LA	Load Allocation
MDEP	Maine Department of Environmental Protection
MRSA	Maine Revised Statutes Annotated
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
PETE	Partnership for Environmental Technology Education
SI	Stressor Identification
SVOC	Semi-volatile organic compounds
SWAT	Surface Water Ambient Toxics
SWQC	(Maine's) Statewide Water Quality Criteria
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
US EPA	U.S. Environmental Protection Agency
WLA	Waste Load Allocation

Birch Stream TMDL Summary Fact Sheet



Why do a 'TMDL' on Birch Stream?

Birch Stream has multiple water quality problems; one problem is that the aquatic insect community does not statistically measure up to other streams in Maine. Waters, such as Birch, that do not meet Maine's water quality standards are called impaired and placed on the 303d list. These problems correspond to stormwater runoff and the stream violates Maine's standards for dissolved oxygen and metals. The Clean Water Act requires that all 303d listed waters to undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore the water. The goal of the Clean Water Act is for all waterbodies to comply with each state's water quality standards.

Description of the Watershed-

Birch Stream, in Bangor, Maine, originates in an area occupied by the Bangor International Airport and the Air National Guard where it is piped before exiting from a culvert into a short natural channel (~0.5 miles). The natural channel, which is subject to the TMDL assessment, comes from a moderately sized watershed (~1,900 acres) and is designated as Class B under Maine's water quality statutes.

Sampling Results & Stressor Identification-

The Birch Stream TMDL is based on sampling data collected from 1997 through 2004 which includes monitoring of the aquatic insect (macroinvertebrate) communities, physical habitat measurements and water chemistry. Sampling results and other existing data were compiled into a comprehensive report on Birch Stream entitled *'Urban Streams Nonpoint Source Assessments in Maine'*. Results were compared to Maine's Class B water quality standards to determine attainment.

Sampling Results

Parameter	Years	Sampling	Results
Macroinvertebrates	1997-2004	6 events	Never attained Class B, 3 samples met Class C
Dissolved Oxygen	2003	~20 days	>50% of samples did not meet 7mg/l standard
10 Different Metals	2003	4 events	Only exceeded aluminum Criteria in stormwater
Nutrients	2003	4 events	No WQ Criteria, but nitrogen & phosphorus were high compared to other Class B streams.
Deicer- Propylene Glycol	2002-2004	5 days	Air National Guard samples, No WQ Criteria, detected in 2 samples, high BOD indicate problems
Habitat Assessment	2003	Survey	Geomorphology identified problems with riparian buffer, entrenchment, channelization and bank stability (erosion).

Below Ohio Street (August 2003)

These results describe the impairments but do not necessarily indicate the source or reason for the problems. MDEP undertook the Stressor Identification (SI) process determine the cause of the observed problems and guide the TMDL model selection. The SI was a collaborative effort of many water quality professionals in which urban stormwater emerged as the underlying cause of impairment. As summarized below, increased flow off of impervious surfaces; carries toxics and nutrients, destabilizes the stream channel, alters habitat suitability and elevates water temperatures. Streams with greater than 10% impervious cover in the watersheds (Birch has >30%) have documented biological impairments (including loss of trout) in Maine and throughout the country. These impacts are attributed to changes in the stream environment due to the increased flow volume associated with stormwater runoff.

Stressor Identification Results

Stressor	Importance Rating	Stormwater Sources	Other Likely Sources
Toxics, and Propylene Glycol	**High**	• De-Icer from Airport Complex • Impervious Surfaces Runoff • Winter Road Sand/Road Dirt	• Documented Spills • Sewage System Leaks • Natural Sources
Habitat Alteration/ High Peak Flows	**Medium**	• Impervious Surfaces Runoff • Stormwater Drain Outfalls	
Elevated Water Temperature	**Medium**	• Impervious Surfaces • Detention Ponds	• Reduced Riparian Buffer
Elevated Nutrients	**Medium**	• Roads & Parking Lot Runoff • Pets & Wildlife Waste • Lawn/Landscaping Runoff • Detention Ponds	• Reduced Riparian Buffer • Sewage System Leaks • Atmospheric Deposition

TMDL Model Selection –

The next step was finding an appropriate model to connect water quality parameters to impervious cover. The % Impervious Cover Method was selected because it: connects stormwater runoff to instream effects, links TMDL targets to instream reductions, uses relatively easy calculation methods, and ties to engineered BMP solutions.

Required TMDL Elements & Impervious Cover Modeling Results –

The % Impervious model sets up targets and reductions for the runoff from existing impervious surfaces. The TMDL reports contains elements required by the Clean Water Act, which are summarized in the next table along with the model results. The target will be achieved, not through removal of pavement, but through the application of BMP's to create runoff conditions that resemble the characteristics of an 8% impervious area. Regardless of the target, the ultimate

goal is attainment of water quality standards, and the target provides technical guidance to initiate a strategy for BMP implementation. BMP implementation will be directed by a Watershed Management Plan that is developed by watershed stakeholders. The TMDL goal will be met once the existing stormwater pollution has been adequately addressed and the biological community is restored.

Below Airport Mall (May 2004)

Required TMDL Elements & Impervious Cover Modeling Results

TMDL Element	Clean Water Act Definitions	Birch Stream Findings
Goal	Achieve water quality consistent with Maine's Class B standards	A biological community consistent with Maine's Class B standards, attainment of the goal takes precedence over the target
Target	Loading capacity of pollutants that cause observed impairments or a means predicted to attain the goal	A watershed that resembles the stormwater runoff characteristics of a watershed with 8% Impervious Cover (%IC)
Margin of Safety (MOS)	Water quality targets are variable and the MOS adds a safety factor to increase the likelihood of attainment	Analysis of Maine's Biomonitoring data indicate that 9% IC would achieve the goal, therefore a 1% reduction was added to insure a MOS
Pollutant Loads	Estimate of the existing pollutant loads	33% IC (conservative estimate) and the associated components of stormwater runoff such as volume and nutrients
Load Allocation & Waste Load Allocations	Reductions in the pollutant loads that are required to achieve the water quality target	65% reduction in volume and stormwater constituents are needed to achieve the target
Implementation	Actions or engineered BMP solutions that will achieve the reductions and ultimately restore the stream	Reductions will be guided by a Watershed Management Plan developed by community stakeholders to determine the relative contributions of each subwatershed and the best approach to solutions

Definitions-

- **TMDL** *is an acronym for* ***Total Maximum Daily Load****, representing the total amount of a pollutant that a waterbody can receive annually and still meet water quality standards.*
- **Stressor** *refers to pollutants or altered habitat conditions responsible for a stressful or negative response in the resident biological community.*
- **Stressor Identification** *is a systematic review of accumulated data and knowledge, which then rate biological stressors to identify the cause of significant problems.*
- **Impervious Cover** *refers to landscape surfaces covered by pavement or buildings that no longer absorb rain and may direct large volumes of runoff into the stream.*
- **BMPs or Best Management Practices** *are engineered solutions or techniques designed to reduce the impacts of pollutants and the altered flow associated with stormwater runoff.*

PART I: WATERBODY DESCRIPTON, IMPAIRMENTS, TMDL TARGET, AND BMP IMPLEMENTATION PLAN

1. DESCRIPTION OF WATERBODY

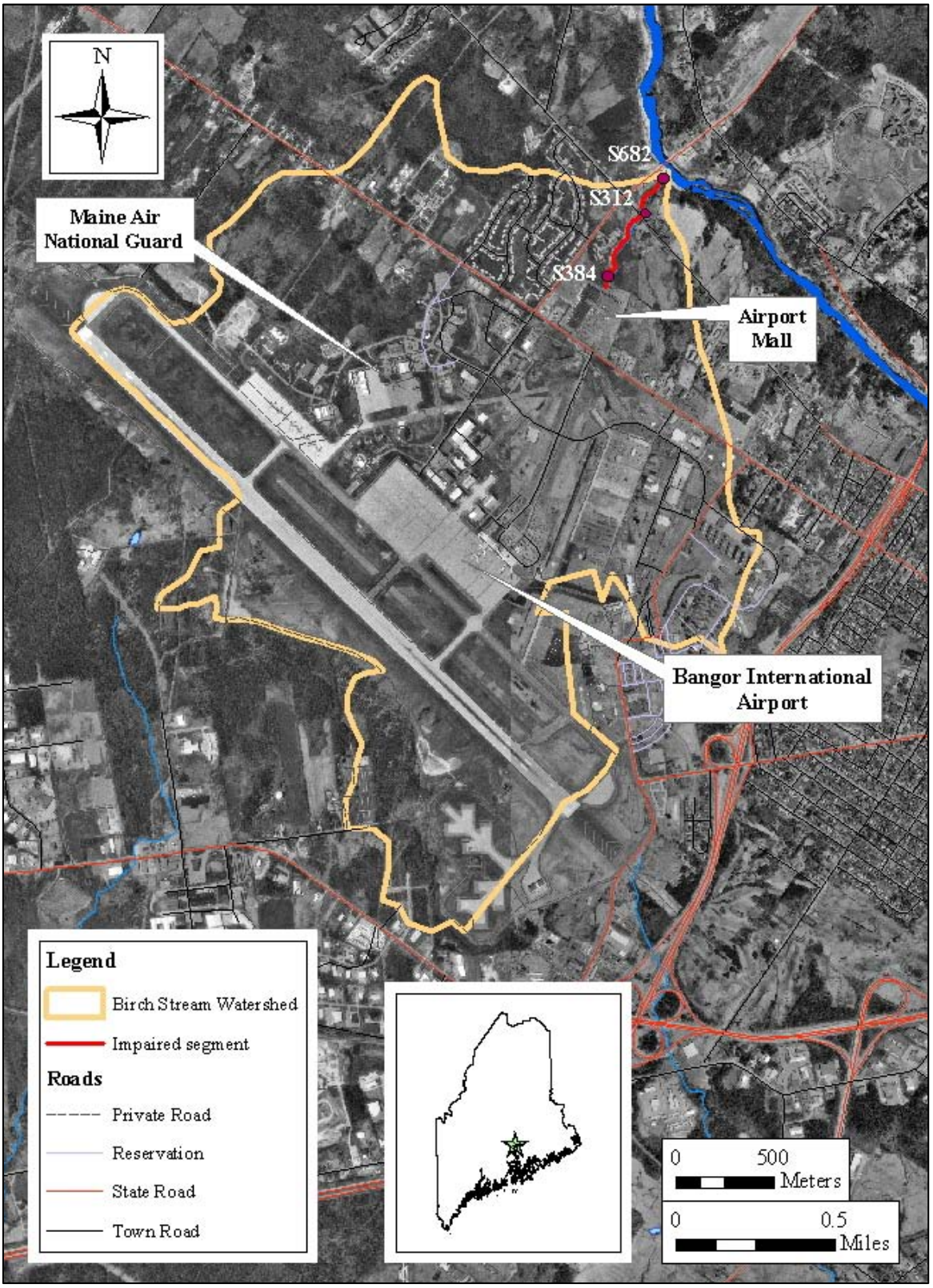
Description of Waterbody and Watershed

Birch Stream (Fig. 1) in Bangor (central Maine, 44°49'N, 68°48'W, HUC ME0102000510) is a short stream (~0.5 miles) with a moderate watershed size (~1,900 acres). The stream, which does not have any tributaries, originates in an area that is occupied by an airport complex made up by the Bangor International Airport and, to a much smaller extent, the Maine Air National Guard. Within the airport complex, Birch Stream is channelized, culverted, and portions of the stream bed are covered with concrete. As a result, the stream in this area does not function like a natural system. The stream then crosses underneath a road and the Airport Mall, and exits from a large culvert behind the Mall, where the stream proper begins. From here on, Birch Stream flows through a mostly residential area, crosses underneath another road, and then flows over a natural waterfall and into Kenduskeag Stream. For the purposes of this TMDL, "Birch Stream" refers to that portion of the stream that resembles a natural stream, i.e., the portion between the Airport Mall and the confluence with Kenduskeag Stream. Appendix E contains a set of photos of the stream.

During summer baseflow conditions, the stream has a wetted width of 3.5-5.5 m and a bankfull width of 5.5-17.1 m; water depth is generally 8-15 cm with a few deeper areas. The stream substrate consists of mixture of boulders, rubble, and gravel with little sand. Below the waterfall, some bedrock is present. The morphology of this medium-gradient stream is a mixture of riffles-runs and steps-pools. The riparian buffer along approximately half of the stream has been eliminated; along the remaining half, the buffer consists of trees with an understory of herbaceous plants, shrubs, and ferns, but in some areas invasive Japanese Knotweed (*Polygonum cuspidatum*) or lawn have replaced a natural buffer. Beavers (*Castor Canadensis)*, have periodically colonized the upper portions of the impaired segment and built dams, with various ecological consequences (PETE/MDEP, 2005). The hydrological impacts of the dams include; riffle habitat inundation, altered species suitability and sediment storage.

The upper part of the watershed (above Union Street) was first developed in the 1940s when the area became a military reservation (Dow Field). In the 1960s, the military base closed down and Bangor International Airport was created. In the lower part of the watershed, there was only minimal development until the 1960s, but development accelerated in the early 1970s when the Airport Mall opened. The half-mile segment of Birch Stream below the Airport Mall is visible from a city-owned housing complex (Griffin Park) and an assisted living facility (Sunbury). Approximately 2,000 people live within one-half mile of Birch Stream (based on 2000 Census data). The entire watershed is classified as a "regulated area" under the NPDES Phase II Stormwater Program.

Fig. 1. Birch Stream watershed, impaired segment, and location of biomonitoring stations



Impaired Stream Segment

A 0.5 mile segment of Birch Stream, which is classified as a Class B stream[1], was included in Maine's 2002 and 2004 303 (d) lists (MDEP 2002b, 2004b). There are a total of 737 miles of impaired (non-attainment) rivers and streams in Maine that require a TMDL assessment (2004 Maine Integrated Water Quality Report). The listing was based on a preliminary stream assessment and sampling results from the Biological Monitoring Program of the Maine Department of Environmental Protection (MDEP; see Description of Impairments, below). Additional data collected throughout the watershed in 2003 confirmed that the entire length of the natural stream (0.5 miles; from the Airport Mall to the confluence with Kenduskeag Stream) is impaired (PETE/MDEP 2005).

2. DESCRIPTION OF THE APPLICABLE WATER QUALITY STANDARDS

Maine State Water Quality Standards

Water quality classification and water quality standards of all surface waters of the State of Maine have been established by the Maine Legislature (Title 38 MRSA 464-468). According to Maine's Water Classification Program, Birch Stream is classified as Class B. Table 1 summarizes the water quality standards applicable to Birch Stream. The Maine Legislature also defined designated uses for all classified waters, which state that "Class B waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as unimpaired."

Table 1. Maine water quality criteria for classification of Class B streams (38 MRSA § 465).

Numeric Criterion	**Narrative Criteria**	
Dissolved Oxygen	**Habitat**	**Aquatic Life (Biological)**
7 ppm; 75% saturation	unimpaired	Discharges shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes to the resident biological community.

Through the use of macroinvertebrate sampling and associated community structure modeling, MDEP has implemented numeric tiered aquatic life criteria since 1992 as an interpretation of long-standing narrative criteria, and promulgated the numeric standards as rule in 2004. Maine's criteria are based on 20 years of data, from (currently) 768 river and stream and 126 wetland sampling locations, and over 1300 individual sampling events. The class B metrics from the statistical model are used as the numeric water quality compliance measure or TMDL end point for Birch Stream.

[1] See Part II, section 2., Maine State Water Quality Standards for further explanation.

Antidegradation Policy

Maine's anti-degradation policy requires that "existing in-stream water uses and the level of water quality necessary to sustain those uses, must be maintained and protected." (For designated uses of a Class B stream see previous section.) Additionally, MDEP must consider aquatic life, wildlife, recreational use, and social significance when determining "existing uses".

3. IMPAIRMENTS AND STRESSORS OF CONCERN

Detection of Impairments

Maine has an ongoing biological monitoring program within the MDEP, as well as biological criteria for the different classes of rivers and streams in Maine (38 MRSA § 465). The biomonitoring program uses a tiered approach to protecting aquatic life uses, and assesses the health of rivers and streams by evaluating the composition of resident biological communities (mainly benthic macroinvertebrates), rather than (or sometimes in conjunction with) directly measuring the chemical or physical qualities of the water (such as dissolved oxygen levels or concentrations of toxic contaminants)[1]. This biological assessment approach is extremely useful, especially for small streams impaired by stormwater runoff and the mix of associated pollutants, because benthic organisms integrate the full range of environmental influences and thus act as continuous monitors of environmental quality.

Description of Impairments

Maine's 2002 and 2004 303 (d) lists (MDEP 2002b, 2004b) note "Aquatic life" as the impaired use for Birch Stream with "Urban NPS (airport runoff, deicing[2])" as the potential source for the impairment. This assessment was based on data collected by the MDEP Biomonitoring unit on macroinvertebrate communities at one station in Birch Stream in 1997 and 2001 (station S312), and two stations in 1999 (S312 and S384) and 2003 (S312 and S682, see Fig. 1 and Appendix E, Figs. 2, 3 and 5). The aquatic life criteria set for a Class B stream (see Part II, Table 1) were not met in any sampling event, and in three out of six sampling events Maine's minimum aquatic life criteria (Class C) were not met. In addition, in 2004, samples collected at S312 did not meet Class C criteria but samples collected at S682 did. Monitoring results were documented in the MDEP's SWAT (Surface Water Ambient Toxics) Program Reports (MDEP 2000, 2001a, 2002a, 2004a) as well as in the Urban Streams Project Report (PETE/MDEP 2005).

It should be noted that data and testing that identifies impairment of Birch Stream is all very recent. Given the historical uses and activities in the watershed over the past 50 years, it is highly likely that impairment has existed for a very long time.

[1] Note that all of Maine's water quality standards have to be met for a waterbody to attain its classification.
[2] The 2002 303 (d) did not specify the types of Urban NPS sources.

Stressors of Concern and Their Sources

The 303 (d) lists (MDEP 2002b, 2004b) and SWAT reports (MDEP 2000, 2001a, 2002a, 2004a) indicated "Urban NPS (airport runoff, deicing)" as the potential source for the impairment of the macroinvertebrate community. To gain a better understanding of specific stressors and their sources responsible for Urban NPS pollution in Maine, the MDEP in 2003 launched a special project to collect a large amount of biological, chemical, and physical data throughout four urban watersheds, including the Birch Stream watershed. The data collected under the "Urban Streams Nonpoint Source Assessments in Maine" project, or Urban Streams Project (PETE/MDEP 2005), were analyzed during a series of Stressor Identification (SI) workshops held in May and June 2004. For Birch Stream, the SI analysis confirmed overall urban development as the primary factor responsible for stressors directly or indirectly linked to aquatic life impairments. No discreet non-stormwater point source of pollution was identified in the Birch Stream watershed although there are three stormwater outfalls in the stream [two at the outflow of the culvert underneath the Airport Mall (Appendix E, Fig. 9), one immediately above Ohio Street], two facilities (Bangor International Airport, Maine Air National Guard) with one stormwater detention pond each that discharges to the channelized portion of the stream, and one facility (Sunbury Village) with a stormwater detention pond that does not discharge directly to the stream (S. Beyer, MDEP, pers. comm.).

Following is a list of the five stressors that were identified in the stressor identification analysis as major factors causing the impairment, and the data this determination was based on. Extensive documentation of sampling results is provided in Chapter 3 of PETE/MDEP 2005; Chapter 2 of the report details sampling methods and provides information on the SI analysis.

Stressor 1: Propylene glycol

Propylene glycol (airplane deicer) discharge into the stream from the airport complex and the negative effects of its breakdown was indicated by observations [heavy mats of the bacterium *Sphaerotilus* (Appendix E, Fig. 11), anoxia on stream bottom, milky water, noxious odor], low DO concentrations in spring, and high levels of Biochemical Oxygen Demand (BOD). Propylene glycol has a low toxicity for biological organisms and is not a chemical listed under Maine's Statewide Water Quality Criteria (SWQC), therefore it separate from the toxics discussions.

Note that the propylene glycol input to the stream was much reduced when the Air National Guard (the main user of deicer) and Bangor International Airport completed remedial actions in the fall of 2003. Further improvements to the system were carried out in the fall of 2004. The airport properties are permitted under MDEP Site Location of Development Law (Title 38, Chapter 3, §§ 481-490) which has required deicer abatement projects to minimize environmental impacts. Propylene glycol is expected to be a less important stressor from 2005 onwards, and is therefore not included as a separate item in this TMDL.

Stressor 2: Presence of toxic contaminants

Various toxic contaminants were found to exceeded relevant criteria in a number of sampling events (for details see Chapter 3 of PETE/MDEP 2005). Aluminum exceeded Maine's Statewide Water Quality Criteria (SWQC) CMC (Criteria Maximum Concentration) during stormflow conditions in November 2003. Certain semi-volatile organic compounds (SVOCs;

PAHs and benzidine) exceeded Maine guidelines for remedial actions and/or EPA remediation goals during baseflow conditions in June 2003. The role of toxic contaminants as a stressor was also indicated by high conductivity levels in the stream and signals from the macroinvertebrate community.

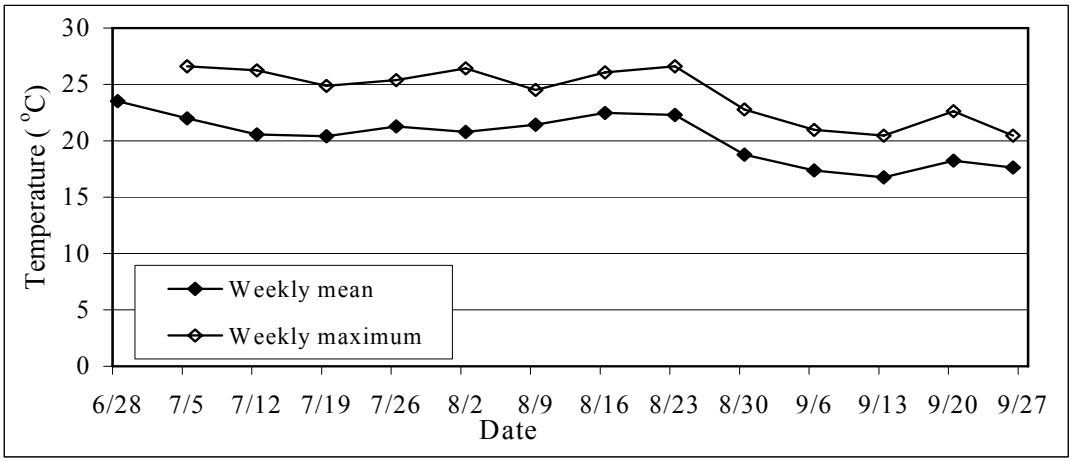
Stressor 3: High peak flows

A geomorphological survey found evidence of erosion attributable to increased peak flows related to impervious surfaces (Field 2003; Appendix E, Fig. 12). Personal observations after storm events also indicated the occurrence of high peak flows.

Stressor 4: Elevated water temperature

High weekly mean and maximum temperatures above 20 and 25 ºC, respectively, were recorded from early to mid-summer at biomonitoring station S312 (Fig. 2). A similar pattern was found at station S682, although temperatures there were only measured between July 30 and September 27, 2003 (PETE/MDEP 2005).

Fig. 2. Weekly mean and maximum temperatures at station S312 in 2003.



Stressor 5: Elevated nutrients

Total Phosphorus and Total Nitrogen exceeded EPA's recommended nutrient criteria for Ecoregion VIII in all baseflow and stormflow sampling events at both stations (Table 2).

Table 2. Nutrient sampling results (in mg/L) from stations S312 and S682 in 2003 and 2004. TP, Total Phosphorus; TN, Total Nitrogen. *, exceeds the EPA-recommended nutrient criterion for Ecoregion VIII.

Flow conditions	Date	S312		S682	
		TP	TN	TP	TN
Baseflow	7/16/03	0.100*	1.49*		
	8/13/2003	0.054*	0.75*		
	8/27/2003	0.028*	0.77*		0.64*
	9/10/2003	0.035*	0.78*		
	8/5/2004	0.021*	0.63*	0.021*	0.62*
	8/24/2004	0.020*	0.79*	0.022*	0.79*
Stormflow	11/20/2003	0.084*			
EPA Ecoregion VIII criterion		0.01	0.38	0.01	0.38

Table 3 lists the likely and possible sources responsible for the stressors identified during the stressor identification analysis. Some identified sources (italicized in Table 3) represent natural conditions, while several sources (highlighted in Table 3) are related to watershed imperviousness. For example, for the stressor Presence of toxicants, the sources Runoff from airport area, local roads, and parking lots, and winter road sand/road dirt are linked to impervious surfaces present in the watershed. These sources and the resulting stressor are generally absent, or of minor importance, in non-urbanized watersheds.

Stressor Discussion

The stressor identification process for Birch Stream provided documentation for the conclusion that biological impairments are due primarily to a combination of stressors related to stormwater runoff from developed areas. The major sources are stormwater from the City of Bangor (regulated by a MEPDES stormwater general permit), and overland runoff from a highly urbanized drainage area. Recent studies (as summarized in CWP 2003) have shown that the percentage of impervious cover (IC) in a watershed strongly effects the health of aquatic systems because land surfaces no longer infiltrate rainwater and therefore cause increased amounts of stormwater to runoff into receiving streams. In general, stream quality declines as imperviousness exceeds 10 % of watershed area, and may be severely compromised at greater than 25 % (Schueler 1994, CWP 2003). In Maine, existing local data indicate that an impervious cover of 7-9 % is the upper limit for attainment of Class B aquatic life criteria (MDEP 2005).

Table 3. Identified stressors and their sources in the Birch Stream watershed. Sources representing natural conditions are italicized, those that are related to impervious surfaces are highlighted.

Stressor	Importance	Sources	
		Likely	Possible
1) Propylene glycol	High	De-icer runoff from airport complex	
2) Presence of toxic contaminants	High	Runoff from airport area, local roads, and parking lots	Winter road sand/road dirt
		Documented spills	*Natural sources*
		Dumping of municipal solid or universal waste	Atmospheric deposition
			Sewage system leaks
3) High peak flows	Medium	High percentage of impervious surfaces	Stormwater outfalls
4) Elevated water temperature	Medium	Impervious surfaces	
		Locally reduced riparian shading	
		Detention ponds	
5) Elevated nutrient levels	Medium	Runoff from local roads and parking lots	Lawn/landscaping runoff
			Animal waste from pets and wildlife
			Detention ponds
			Reduced riparian buffer
			Sewer leaks
			Atmospheric deposition

4. PRIORITY RANKING, LISTING HISTORY, AND ATMOSPHERIC AND BACKGROUND LOADING

Priority Ranking and Listing History

The large number of streams listed for nonpoint source (NPS) pollution on the 303 (d) list requires Maine to set priority rankings based on a variety of factors. Factors include the severity of degradation, the time duration of the impairment, and opportunities for remediation. Maine has set priority rankings for 303 (d) listed streams by TMDL report completion date, and has designated Birch Stream for completion by 2005. Birch Stream‘s priority ranking was raised on the 2004 303 (d) list (MDEP 2004b) when the stream was included in the Urban Streams NPS Assessment Project (PETE/MDEP 2005).

Atmospheric Deposition

Atmospheric deposition of pollutants (metals) that occurs within a watershed will reach a stream through runoff containing material deposited on land, direct contact of the stream with rain, and the settling of dry, airborne material on the stream surface. As for contaminated runoff, it is assumed that in watersheds with a relatively low percent imperviousness enough soil remains that most atmospherically deposited metals are buffered and adsorbed before they can reach the stream (except in watersheds sensitive to acidification). Where imperviousness is quite high, as in the Birch Stream watershed (33 %), it is unknown whether (or how much) material deposited from the atmosphere reaches a stream with runoff. A reduction in the % impervious cover (IC) in the watershed would help in reducing any negative effects from pollutants derived from the atmosphere. However, because this type of pollution originates from very diffuse and potentially far-away and wide-spread sources, national action is required to deal with this issue effectively. Other potential sources (i.e., direct contact with rain, and deposition in the stream of airborne material) are considered to convey minimal loads to Birch Stream because of the small surface area of the stream channel itself.

Natural Background Levels

No part of Birch Stream is in what could be called a "natural setting" as the entire watershed has been strongly affected by human activities. As a result, no information on natural background levels of pollutants in this watershed is available. In general, it is difficult to separate natural background loads from the total nonpoint source load (US EPA 1999), and the information would not contribute significantly to the analysis for this TMDL.

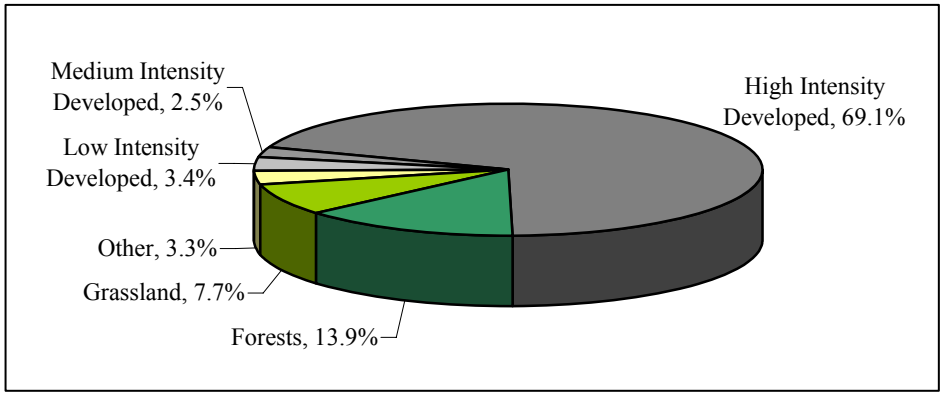
5. IMPERVIOUS COVER AND LANDUSE INFORMATION

Urban development primarily affects aquatic systems due to the high percentage of impervious cover (IC) present in urban areas. Effects include impairments in water quality, stream morphology, hydrology, and aquatic communities (CWP 2003). For Birch Stream, the relationship between IC and the stressors identified for this waterbody is shown in Table 3. The parameter "impervious cover" can serve as a surrogate for a variety of impairments that are related to stormwater runoff because it relates the primary causal factors to specific impairments (ENSR 2004). Stormwater runoff is water that does not soak into the ground during a rain storm but flows over the surface of the ground until it reaches a nearby waterbody. Stormwater runoff often picks up pollutants such as soil, fertilizers, pesticides, animal waste, and petroleum products. These pollutants may originate from driveways, roads, golf courses, and lawns located within a watershed[1]. The negative effects of urban stressors on overall stream quality can be much reduced by disconnecting impervious surfaces from the stream so that runoff does not reach a waterbody untreated or converting impervious surfaces to pervious surfaces. Implementation of other measures that address habitat restoration, flood plain recovery, and riparian recovery can be an effective and less costly first step in abatement. More information on these Best Management Practice (BMP) options is provided in section 7, Implementation Recommendations.

[1] For more information on stormwater issues visit the MDEP Nonpoint Source Pollution website at www.maine.gov/dep/blwq/doceducation/nps/background.htm

The % impervious cover in the Birch Stream watershed was determined from landuse data and a conversion of landuse to % IC. Details regarding this procedure are given in Part II, section 1. Analysis showed that landuse is dominated by high, low, and medium intensity development, which together account for 75 % of all landuses (Fig. 3). The majority of these developments are located within the airport complex. Forests and grasslands account for 14 and 8 %, respectively, while other smaller landuses make up the remaining 3 %. Converting landuse to % IC, imperviousness in the Birch Stream watershed was estimated to be 33 %. This percentage reflects the total amount of impervious cover in this watershed.

Fig. 3. Distribution of landuse types, with percentages, in the Birch Stream watershed.



6. TOTAL MAXIMUM DAILY LOAD (TMDL) TARGET

Details regarding the determination of the TMDL target set for Birch Stream are given in Part II of this document, and a brief summary is provided here. For further details please consult Part II.

The Stressor Identification (SI) analysis indicated that urban stressors have caused the impairment in the macroinvertebrate community and Birch Stream's failure to attain aquatic life criteria. "Urban stressors" is a catch-all term encompassing a wide variety of effects caused by urbanization, with the majority of the effects being related, directly or indirectly, to stormwater runoff from impervious surfaces. Because of the major effect stormwater runoff has on aquatic systems (CWP 2003), the "Impervious Cover Method" (IC method), as employed by ENSR in a pilot TMDL (ENSR 2005), is used here to estimate current extent of impervious cover for the Birch Stream watershed, and compare the results to a TMDL target % IC of 9%. The target % IC was determined in accordance with MDEP guidance (MDEP 2005) using MDEP data, information from the literature, and local conditions.

7. IMPLEMENTATION RECOMENDATIONS

This TMDL is based on the IC current conditions in the watershed. Future development activities have the potential to increase effective impervious cover and resulting stormwater runoff and associated pollutants. To ensure that the TMDL target is attained, future development

either will need to be constructed and operated in such a way that there is no net increase in stormwater runoff, or stormwater runoff from existing IC sites will need to be reduced to achieve the goal of meeting water quality standards. Implementation is best addressed through a watershed management plan designed by stakeholders, which designates a low impact development strategy. Stormwater effects can be lessened, water quality improved, and impairments curtailed by implementing best management practices (BMPs) and remedial actions in a cost-effective manner using the following adaptive management approach:

- Implement BMPs strategically through a phased program which focuses on getting the most reductions, for least cost, in sensitive areas first (for example, begin with habitat restoration, flood plain recovery, and treatment of smaller, more frequent storms);
- Monitor ambient water quality to assess stream improvement;
- Compare monitoring results to water quality standards (aquatic life criteria);
- Continue BMP implementation in a phased manner until water quality standards are attained.

Generally speaking, these abatement measures can take one of three forms: they can consist of general stream restoration techniques (including flood plain and habitat restoration), they can disconnect impervious surfaces from the stream, or they can convert impervious surfaces to pervious surfaces. In general, practices that achieve multiple goals are preferred over those that achieve only one goal (ENSR 2004). For example, installing a detention basin along with runoff treatment systems provides more effective abatement of stormwater pollution than installing detention BMPs alone.

Because of the effort and cost involved in implementing these BMPs, a long-term strategy can be used to achieve water quality standards. For example, lower cost stream restoration techniques that lessen stormwater effects immediately can be implemented in the short-term to initiate stream recovery.

The following three sections list the options available for BMPs aimed at stream restoration techniques, and disconnection and conversion of impervious surfaces. Because many factors must be considered when choosing specific structural BMPs (e.g., target pollutants, watershed size, soil type, cost, runoff amount, space considerations, depth of water table, traffic patterns, etc.), the sections below only suggest categories of BMPs, not particular types for particular situations. Implementation of any BMPs will require site-specific assessments and coordination among local authorities, industry and businesses, and the public. Advice on the selection, design, and implementation of any remedial measures can be obtained from the MDEP (Bureau of Land and Water Quality, Division of Watershed Management), the Penobscot County Soil and Water Conservation District, or web-based resources (see Appendix C for suggestions).

In summary, implementation of remedial measures will occur under an adaptive management approach in which certain measures are implemented, their outcome and effectiveness evaluated, and future measures selected so as to achieve maximum benefit based on new insights gained. The order in which measures are implemented should be determined with input from all concerned parties (e.g., city, airport authorities, businesses, industry, residents, regulatory agencies, watershed protection groups). It is suggested that parties develop an implementation plan by the end of 2006 and present it to the group and, if desired, the MDEP or

the Penobscot County Soil and Water Conservation District. Further details on the measures suggested below are provided in Chapter 3 of the Urban Streams Report (PETE/MDEP 2005). In addition, Appendix C lists BMPs in a matrix format in which traditional and newly developed ("Low Impact Development") BMP types are rated according to their ability to mitigate for impacts of impervious cover and applicability to certain urban situations (ENSR 2005). The matrix was developed by ENSR as a multi-use tool and thus contains some BMPs and IC impacts not directly applicable to Birch Stream.

General Stream Restoration Techniques

Following is a list of general BMPs and stream restoration techniques and how they can alleviate stressors and improve stream health. Short-term implementation of these measures will complement the long-term strategy of disconnecting or removing impervious surfaces suggested above. Web-based information resources that can aid with planning and implementing these measures are given in Appendix C.

- Maintaining the riparian buffer where it is adequate, i.e., has a width of at least 15 m (50 feet) and is composed of native plants, including mature trees. Enhancing or replanting the riparian buffer where it is inadequate. An adequate buffer will improve shading, large woody debris availability, and food input, and provide terrestrial and aquatic habitat for insects with aquatic life stages, thus enhancing recolonization potential of the macroinvertebrate community.
- Improving channel morphology (a narrower, less braided channel) by blocking secondary flow paths and adding roughness to the channel (see Field 2003, Fig. 9c, or PETE/MDEP 2005, Chapter 5, Fig. 26) will create a more stable and natural condition with improved habitat for macroinvertebrates. However, since channel morphology is degraded due to excessive erosion caused by high peak flows resulting from impervious surfaces, channel restoration activities need to be preceded by flow reductions to be successful (Field 2003; PETE/MEP 2005).
- Reclamation of flood plains by returning these areas to a natural state will naturally moderate floods; reduce stress on the stream channel; provide habitat for fish, wildlife, and plant resources; promote groundwater recharge; and help maintain water quality. Protection of intact flood plains should be a high priority.
- Reducing the incidence of spills (accidental and deliberate) for example by improving education and training will reduce toxic contaminant input. Documented spills were identified as a likely source for the presence of toxic contaminants in the stream.
- Reducing the input of winter road sand and road dirt by sweeping roads, parking areas or driveways will reduce excess sedimentation.
- Eliminating the potential for sewer system leaks will reduce toxic contaminant and nutrient input. A strong sewer smell near the downstream biological monitoring station (S682, see Fig. 1) was still observed in July 2005 (L. Tsomides, MDEP, pers. comm.). This suggests the continued possibility of sewage influx into the stream.
- Reducing the temperature of water discharged from a detention structure by redesigning and retrofitting existing detention with outlet structures that cool the discharge will reduce negative temperature effects on the stream.
- Minimizing lawn/landscaping runoff by minimizing fertilizer use and using more efficient application will reduce nutrient input.

- Minimizing waste input from pets by picking up waste will reduce bacteria and nutrient input.
- Eliminating illicit discharges by detecting and eliminating discharges will reduce toxic contaminant and nutrient input.
- Performing regular maintenance on detention ponds will reduce export of accumulated sediment and nutrients into the stream during large storms.
- Investing in education and outreach efforts will raise public awareness for the connections between urbanization, impervious cover, stormwater runoff, and overall stream health.
- Encouraging responsible development by promoting Smart Growth or Low-Impact Development guidelines will minimize overall effects of urbanization.
- Reducing new impervious cover by promoting shared parking areas between homes or between facilities that require parking at different times will reduce impacts related to impervious surfaces. Lowering minimum parking requirements for businesses and critically assessing the need for new impervious surfaces will have the same effect.

Mitigation of Impervious Surface Discharge

The purpose here is to prevent stormwater runoff from reaching the stream directly (via the storm drain system), thus reducing % effective IC. There are various options for achieving this goal:

- Channel runoff from large parking lots, airport runways or taxiways, roads or highways into
  - detention/retention BMPs (e.g., dry/wet pond, extended detention pond, created wetland), preferably one equipped with a treatment system;
  - vegetative BMPs (e.g., vegetated buffers or swales);
  - infiltration BMPs (e.g., dry wells, infiltration trenches/basins, bio-islands/cells);
  - underdrained soil filters (e.g., bioretention cells, dry swales).
- Redesign and retrofit existing detention to provide extended detention for 6 month and 1 year storms.
- Guide runoff from paved driveways and roofs towards pervious areas (grass, driveway drainage strip, decorative planters).
- Remove curbs on roads or parking lots.
- Collect roof runoff in rain barrels.

All of these options for disconnection of impervious surfaces provide for a virtual elimination of runoff during light rains (which account for the majority of runoff events but not the majority of pollutant or stormwater input), reduction in peak discharge rate and volume during heavy rains, sedimentation or filtration of some pollutants, and improvement in groundwater recharge. Disconnection of impervious surfaces can often be achieved at reasonable cost and, unlike the removal of impervious surfaces (below), does not generally create material for disposal. These BMPs cover most sizes of impervious surfaces (private driveways and small building roofs to large parking lots and highways), and many have been widely used in cold climates.

Two retention ponds within the airport complex, which occupies the majority of the watershed (Fig. 1), already exist (J. Murphy and M. Ward, City of Bangor; R. Madden, Bangor International Airport; Lt. Col. E. Johns, Maine Air National Guard; pers. comm.). However, the finding of the Urban Streams Project that stream impairments are to a large extent related to impervious surface runoff (see Table 3) suggests that the treatment provided by these BMPs may be insufficient to ensure adequate water quality in Birch Stream.

Conversion of Impervious Surfaces

This is achieved by replacing impervious surfaces with pervious surfaces, for example by using the following BMPs:

- Replace asphalt on little-used parking lots, driveways or other areas with light vehicular traffic with porous pavement blocks or grass/gravel pave.
- Replace small areas of asphalt on large parking lots with bioretention structures (bio-islands/cells).
- Replace existing parking lot expanses with more space-efficient multistory parking garages (i.e., go vertical).
- Replace conventional roofs with green roofs.

These options for conversion of impervious surfaces also provide for a virtual elimination of runoff during light rains (which account for the majority of runoff events), reduction in peak discharge rate and volume during heavy rains, filtration of some pollutants, and improvement in groundwater recharge. However, a number of problems exist with these options (e.g., removed asphalt or roofing shingles must be landfilled or recycled), and removal of existing impervious surfaces may be operationally unfeasible. Some of these BMPs are still in the experimental stage for cold climates and may not prove suitable for widespread implementation. In spite of these limitations, new construction or building projects should consider these and other possibilities for reducing impervious cover.

It should be noted that the capital investments (in excess of $3 Million) that have been made by both the commercial and military entities at the airport to capture and treat deicing runoff. This recent installation of BMPs will diminish the effects of Propylene Glycol in the future.

8. MONITORING PLAN

MDEP will evaluate the progress towards attainment of Maine's water quality standards by monitoring the macroinvertebrate community in Birch Stream under the Biomonitoring Unit's existing rotating basin sampling schedule. At the same time, the Streams TMDL unit will collect water chemistry samples during stormflow conditions to determine whether acute criteria of the Maine Statewide Water Quality Criteria for certain toxic contaminants or sediment are exceeded. Adaptive implementation of the remedial measures listed above should be pursued until aquatic life criteria are met. Once criteria have been met in at least two sampling events with normal summer conditions, no further remedial measures are required. If criteria continue to be violated once BMPs and restoration techniques have been implemented and the IC has been reduced to 8%, this TMDL will enter a secondary phase in which the approach proposed in this document will be reassessed.

The presence of Propylene Glycol in the watershed means that MDEP will continue to pursue abatement measures and require monitoring of BIA and MEANG. As previously stated, BIA and MEANG have installed containment systems to capture propylene glycol runoff and both are licensed under Maine's Site Location of Development Law. These containment systems were designed to operate effectively under frozen ground conditions and will not capture 100% of the deicer runoff. Their permits require periodic monitoring for propylene glycol and other runoff constituents to assess the effectiveness of containment systems. MDEP, BIA and MEANG are committed to managing airport runoff to minimize intrusion of propylene glycol into Birch Stream.

PART II: TMDL PLAN

1. TMDL TARGET: LOADING CAPACITY AND IMPERVIOUS COVER

Loading Capacity

Loading capacity is the mass of pollutants that Birch Stream can receive over time and still meet numerical or narrative water quality targets. Birch Stream currently does not meet Maine's aquatic life criteria for a Class B stream (Part I, Table 1), suggesting that its loading capacity is exceeded. For streams in urbanized areas, additional stressors affecting aquatic life exist in the form of non-pollutant impacts such as alterations in channel morphology and the flow regime, or elimination of the riparian buffer. In this TMDL, the extent of impervious cover (% IC) in the watershed is used as a surrogate for the complex mixture of pollutant and non-pollutant stressors attributable to urban development, especially stormwater effects. By reducing the % effective IC using the options listed above in Part I, section 7, Implementation Recommendations, a number of urban stressors and their sources can be addressed simultaneously (e.g., toxic load from airport/road runoff and road sand; high flows related to high imperviousness; elevated water temperature from impervious surfaces and detention pond outflow; elevated nutrient levels from road and lawn runoff).

The loading capacity of Birch Stream is set at 9% IC, which includes a 1% margin of safety. The target % IC for Birch Stream was selected by considering local conditions within the framework of the appropriate target range of 7-10% IC established by MDEP for Class B waterbodies (MDEP 2005, attached in Appendix D).). Given the local conditions (i.e., the presence of a substantial length of riparian buffer which serves to offset the impact of other factors listed in Table 1), a target %IC of 9% was set for Birch Stream.

Table 1. Conditions considered in selection of target % impervious cover for Birch Stream.

Ameliorating conditions	Exacerbating conditions
Presence of a riparian buffer >10 m in width along 57 % of the stream (PETE/MDEP 2005)	Absence of riparian buffer along 43 % of the stream (PETE/MDEP 2005)
Macroinvertebrate community met Class C criteria in 4 out of 8 sampling events (PETE/MDEP 2005 and MDEP unpublished data) indicating that it has a clear recovery potential.	Impermeable soils (clays and silts of glacial-marine origin) reducing infiltration potential
	Long-standing pollution potential in upper part of watershed (military reservation)
	Urban development is predominantly of transportation and industrial kind, not residential

Impervious Cover (IC) Method

The IC Method was developed by the Center for Watershed Protection (CWP) to assess the impacts of urbanization on small streams and receiving waters, and to document the linkage between the % impervious cover in watersheds and instream water quality. The IC Method was

used by ENSR in a pilot project to develop TMDLs for streams potentially impaired by urban nonpoint source pollution (ENSR 2005). ENSR selected the IC Method for their pilot project "primarily because it provides a strong and straightforward link between water quality impairment and causal factors" (ENSR 2005).

Impervious Cover and Landuse Information

As a first step for calculating the % impervious cover in the Birch Stream watershed, the watershed boundary (Part I, Fig. 1) was determined. This was done based on a drainage map obtained from the City of Bangor, on 10 m contour lines, and actual stormwater drainage systems. Watershed imperviousness was determined from landuse data and a conversion of landuse to % IC. Landuse data were derived from "Maine_Combo_Landcover", a GIS map layer developed by MDEP staff that combines data from Maine Gap Analysis Program (GAP) and USGS Multi Resolution Landcover Characterization (MRLC) coverages[1]. Both GAP and MRLC are based on 1992 Land-Sat TM satellite imagery. Metadata for Maine_Combo_ Landcover are maintained by the MDEP's GIS unit. Landuse information presented here includes the area above the confluence with Kenduskeag Stream, i.e., all areas draining into the impaired segment (Fig. 1). Within this area, landuse is dominated by high, low, and medium intensity development, which together account for 75 % of all landuses (Table 2, Fig. 1). Forests and grasslands account for 14 and 8 %, respectively, while other smaller landuses make up the remaining 3 %.

Table 2. Extent of various landuse types in the Birch Stream watershed. Letters b-f shown in the first column refer to the (urban) land cover types listed in Table 3. (Note: different terms are used here than in Table 3 for landuse types b-f to more accurately reflect actual landuse; also see footnote to Table 3.)

	Landuse Type	Acres	%
b, c	High Intensity Developed	1,307	69.1
-	Forests (Upland Woody Vegetation)	264	13.9
-	Grasslands	146	7.7
e, f	Low Intensity Developed	65	3.4
d	Medium Intensity Developed	47	2.5
-	Other[1]	62	3.3
-	Total watershed area	1,891	100

[1] "Other" landuse types are [in order of decreasing area (≤32 acres) or percentage (≤1.7 %)] Tilled Agriculture, Wetlands, Water, and Very High Intensity Developed.

The method used to convert landuse to % IC was developed by MDEP staff (MDEP 2001b) by applying a % imperviousness formula to the "Maine_Combo_Landcover" GIS layer. The resulting values for imperviousness of certain land cover types in Maine are presented in

[1] To minimize uncertainties in precise landuse type (e.g., different types of urban developments, forests or wetlands), the original 24 "Maine_Combo_Landcover" types present in the Birch Stream watershed were grouped into the nine generalized types shown in Fig. 1.

Table 3. Calibration (i.e., groundtruthing) of the method led to the addition of a multiplier to give a final formula for watershed % IC of:

$$\text{Watershed \% IC} = 0.85 * \left(\frac{\sum_{a}^{f} (\text{Acres of landuse type} * \text{Estimated \% IC})}{\text{Total watershed area}} \right)$$

Where Acres of landuse type a-f[1] = see Table 2
Estimated % IC for land cover type a-f[6] in Maine = see Table 3
Total watershed area = see Table 2

Using this formula, % IC for the Birch Stream watershed was estimated to be 33 %.

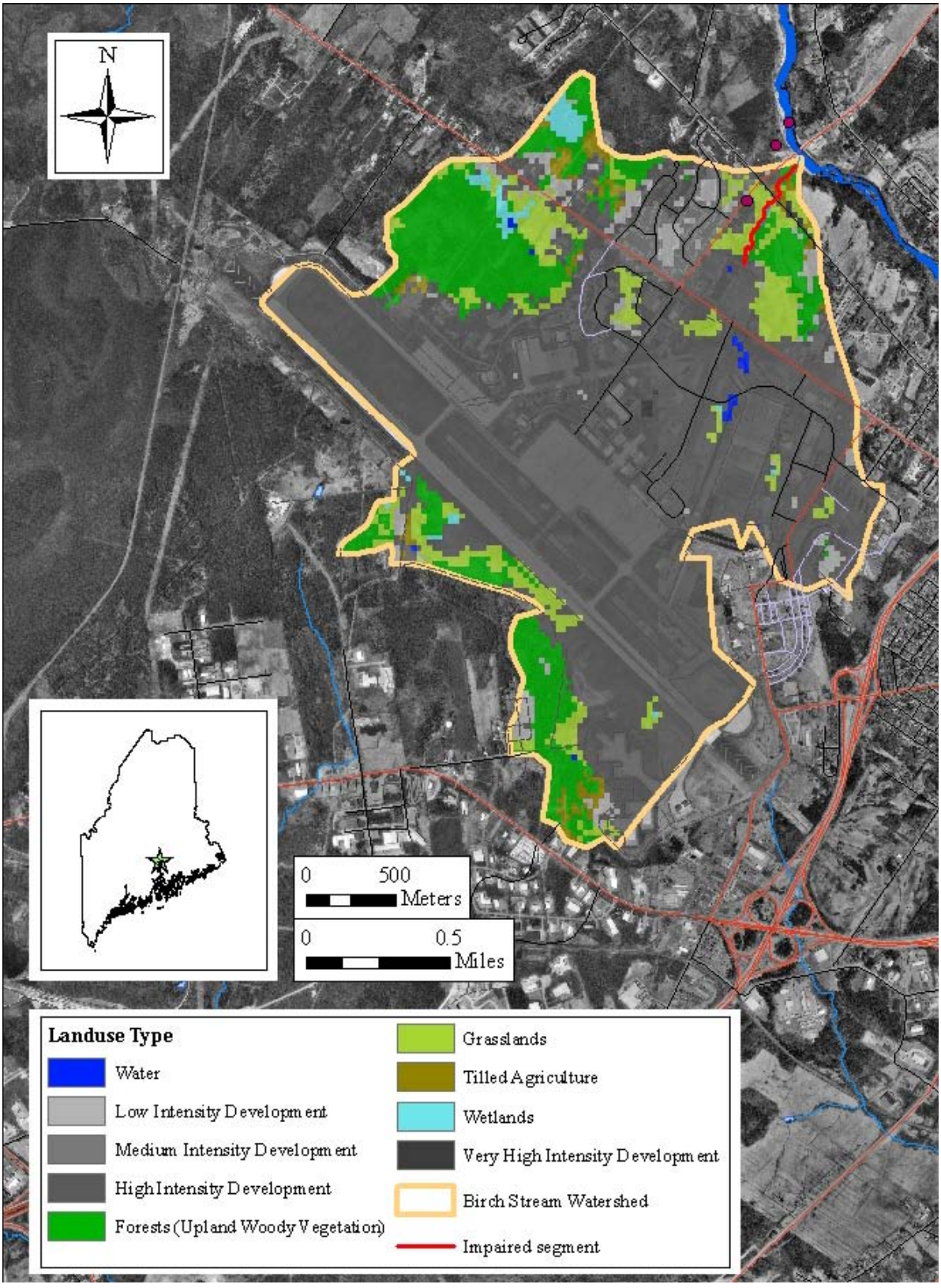
Table 3. Estimated % impervious cover (IC) for urban land cover[1] types in the "Maine_Combo_Landcover" GIS map layer (MDEP 2001b). Letters a-f shown in the first column refer to the landuse types listed in Table 2.

Land Cover Type		Estimated % IC
a	Urban Industrial	90.20
b	Dense Residential Developed	56.50
c	Commercial-Industrial-Transportation	54.04
d	High Intensity Residential	27.11
e	Low Intensity Residential	17.26
f	Sparse Residential Developed	11.98

[1] Because of the way land cover types were derived from two GIS datasets, terms used here do not necessarily reflect the actual landuse (e.g., residential). Land cover types do, however, accurately reflect the extent of imperviousness due to development associated with each category.

[1] Landuse type 'a' does not occur in this watershed.

Fig. 1. Landuse in the Birch Stream watershed.



Daily Pollutant Loads

Percent impervious cover (% IC) serves as a surrogate measure of the complex mixture of pollutants transported by stormwater. Maine's SWQC includes biological standards that respond not only to pollutant loads contributed by stormwater, but integrates additional environmental stressors such as flow and habitat alterations. Expression of the TMDL target in terms of % IC is especially useful for stormwater-impaired waters because the target is applicable at all times, whether the time step is instantaneous, hourly, daily, weekly, monthly, seasonal, or annual.

This TMDL also presents daily pollutant loads for two specific pollutants which serve as surrogates for the complex mix of pollutants commonly found in stormwater. Calculations of the total maximum daily loads for lead (Pb) and zinc (Zn) are presented in Appendix B. Pb and Zn are chosen as surrogate pollutants for the complex mixture of metals in stormwater because there are extensive data documenting their presence in stormwater. The CWP cites over 2,000 data points for each metal, and Pb and Zn are two metals most commonly detected at the highest concentrations in stormwater (CWP 2003). In addition to Pb and Zn being well documented in the stormwater data cited by CWP.

SWQC require water quality criteria be met for all streamflows of 7Q10 and above. Given the dynamic nature of stormwater run-off volume and resulting streamflows, the presentation of the daily loads in tabular and/or graphic form is used to express the daily maximum pollutant load which changes as daily streamflow varies.

The maximum daily load for NPDES-permitted sources (i.e., the wasteload allocation), the load for all other sources (i.e., the load allocation, which includes natural background and nonpoint sources), and a margin of safety are included in the TMDLs. The load allocation is included in the wasteload allocation because it is not possible to separate out the NPDES-permitted sources from all other sources, given the large number of regulated and unregulated sources and the variability of stormwater. A 5% explicit margin of safety was included by decreasing the applicable water criterion by 5% before calculating the allowable daily wasteload (which is also shown in Appendix B).

MDEP recommends the use of the imperious cover target to establish the implementation goals rather that the over pollutants specific TMDL loads because the % IC target will more effectively guide BMP's implementation to reduce stormwater impacts. Ultimate compliance with water quality standards for the TMDL will be determined by measuring instream water quality to determine when standards are attained.

Limitations of the Impervious Cover Method

The impervious cover (IC) method can be used to efficiently characterize water quality impairment and establish surrogate TMDL targets for % IC, or stormwater runoff volume, or pollutant reduction targets for watersheds that are impaired by stormwater (ENSR 2004). There are five limitations that affect the use of the method in Birch Stream as follows:

1. Limitation: The IC model applies to 1st through 3rd order streams.
   Effect: Birch Stream is a 1st order stream, i.e., use of the model is appropriate.

2. Limitation: This method does not account for non-stormwater pointsource pollutant loadings, so it would not be appropriate where these loadings are a significant source of impairment.
   Effect: There are no non-stormwater point sources of pollution in the watershed, and violation of aquatic life criteria in this watershed is believed to be caused by stormwater and/or nonpoint source pollution, and exacerbated by instream and riparian habitat disturbances.

3. Limitation: This method uses event mean concentrations for determination of pollutant loads. This will provide reasonable accuracy over long time periods (i.e., annual loads), but since concentrations vary significantly from storm to storm, this method should not be used for estimating loads for individual storm events.
   Effect: The method is used here only for estimating annual loads, not loads for individual storm events. In addition, it is emphasized that load estimates are primarily used for descriptive purposes (see Impervious Cover Method section).

4. Limitation: This method does not account for in-stream water quality processes.
   Effect: The magnitude and importance of in-stream water quality processes (e.g., contribution of the natural sources to the toxic load) is unknown and can therefore not be accounted for regardless of which method is used for load estimates.

5. Limitation: Additional site specific information is required for identification and specification of Best Management Practices (BMPs) to achieve TMDL goals.
   Effect: Suggestions for BMPs, remedial actions, and restoration techniques aimed at removing identified stressors, or mitigating their effects, are made in Part I, section 7. Implementation of these BMPs will aid substantially in reducing the % IC and its effects. However, a reduction of the IC by the full 25 % (from 33 % to 8 %) will require site specific information for optimal implementation of BMPs.

2. LOAD ALLOCATIONS

All Load Allocations (LAs) are given the same 8 % impervious cover allocation as the Waste Load Allocations (WLAs) (see next section). This approach was chosen because LAs must be accounted for but it was not feasible to separate the loading contributions from nonpoint sources, background, and stormwater. Adding a margin of safety of 1 % to the 8 % Load Allocation yields the Total Allocation of 9 % IC (see Table 4.).

3. WASTE LOAD ALLOCATIONS

The entire Birch Stream watershed is classified as a "regulated area" under the NPDES Phase II Stormwater Program. Under the stormwater program, municipal separate storm sewer system (MS4), construction, and industrial stormwater discharges are considered as point sources and are allocated as waste loads. Several NPDES permits have been issued to facilities in the watershed:

Permit holder Maine Air National Guard

- NPDES Phase I, multi-sector general purpose (MSGP) permit;
- NPDES Phase II, MS4 permit; and
- NPDES Phase II, Non-Traditional permit (federal facility with more than 50 employees within an urbanized area).

Permit holder Bangor International Airport (owned by the City of Bangor)

- NPDES Phase I, multi-sector general purpose (MSGP) permit; and
- NPDES Phase II, MS4 permit;

None of the permits issued to either facility has stipulations concerning flow and loads.

In this TMDL, the total extent of impervious cover (% IC) in the watershed is used as a surrogate for the complex mixture of pollutant and non-pollutant stressors attributable to stormwater runoff from developed areas. The total allocation is set at 9% IC. The 'WLAs' and 'LAs' are established at a % IC of 8 %, which allows for a margin of safety of 1 % IC, as shown in Table 4.

Table 4. Estimated target annual load and waste load allocations for Birch Stream

	Allocations (% IC)
Combined Sewer Overflow (WLA)	0
Waste Load Allocations, Load Allocations	8
Margin of Safety	1
Total Allocation (TMDL)	9

4. MARGIN OF SAFETY

The Birch Stream TMDLs provide an explicit margins of safety (MOS). The % IC TMDL includes an explicit margin of safety of 1 % impervious cover which is reserved from the total loading capacity of 9%. This implicit MOS is sufficient to accounts for the uncertainty in the selection of a numeric water quality target of 9 % IC (within the range of 7- 10% IC suitable for Class B streams) primarily because of the mitigating presence of a riparian buffer along a substantial portion of Birch Stream. Furthermore, the 1% IC translates to an actual 11% MOS when 1% IC is compared to the 9% TMDL (1% IC / 9% IC = 11%).

The pollutant-specific TMDLs for Pb and Zn provide an explicit 5% MOS which is applied to the appropriate SWQC before calculating the allowable daily wasteload allocations.

5. SEASONAL VARIATION

The TMDL was established to protect the stream during critical conditions throughout the year. The IC target will result in reductions in the effects of IC which will improve water quality for all flows and seasonal conditions (ranging from summer low flows, to high spring flows during snowmelt). The daily loads for Pb and Zn are expressed as a function of flow to assure SWQC are attained for all flows and seasonal conditions.

Critical conditions can occur for aquatic life and habitat in stormwater-impaired streams at both low and high flows. Frequent small storms can contribute large volumes of runoff and a mix of pollutants. High flows can cause channel alterations, increased pollutant loads from scouring and bank erosion, wash-out of biota, and high volume pollutant loading. Increased % impervious cover and the resulting increase in surface runoff reduces the amount of infiltrating rainfall that recharges groundwater. This diminished baseflow can further stress aquatic life and cause or contribute to aquatic life impairments through loss of aquatic habitat and increased susceptibility of pollutants at low flow. Furthermore, specific BMPs implemented will be designed to address loadings during all seasons.

6. PUBLIC PARTICIPATION

Public participation in the Birch Stream TMDL development will be ensured through several avenues. A preliminary review draft TMDL, which has been reviewed by MDEP staff (D. Courtemanch, J. Dennis, M. Evers, D. Miller, L. Tsomides, Bureau of Land and Water Quality; Logue, Director MDEP Eastern Maine Regional Office), were distributed to watershed stakeholder organizations including:

- John Murphy, City of Bangor
- Maj. Eric Johns, Maine Air National Guard, Bangor
- Rodney Madden, Bangor International Airport, Bangor
- Sara McCabe, Penobscot County Soil and Water Conservation District
- Naomi Schalit, Maine Rivers
- Ann Birmingham, Griffin Park Citizens Against Toxic Streams (CATS)

Paper and electronic forms of the *Birch Stream TMDL, Draft Report* were made available for public review in three ways: the report will be available for viewing at the Augusta office of the MDEP; it will be posted on the MDEP Internet Web site; and a notice will be placed in the 'legal' advertising of a local newspaper. The following ad will be printed in the Sunday editions of the Bangor Daily News during August of 2005. The U.S. Environmental Protection Agency (Region I) and interested public were provided an extended review period from August, 2005 through January, 2006 to respond with draft comments.

PUBLIC NOTICE FOR BIRCH STREAM -In accordance with Section 303(d) of the Clean Water Act, and implementation regulations in 40 CFR Part 130, the Maine Department of Environmental Protection has prepared a Total Maximum Daily Load (TMDL) report (DEPLW0715) for Birch Stream in Bangor, Penobscot County. This TMDL report estimates the current extent of impervious surfaces, and the reductions in

impervious surfaces and application of general stream restoration techniques required to enable the stream to meet Maine's Water Quality Criteria.

A Public Review draft of the report may be viewed at the Maine DEP Offices in Augusta (Ray Building, Hospital St., Rt. 9) or on-line at: http://www.maine.gov/dep/blwq/comment.htm.

Send all written comments by January 31, 2006 to Melissa Evers, Maine DEP, State House Station #17, Augusta, ME 04333, or email: Melissa.Evers@maine.gov

In addition to the notification and report distribution, MDEP held two meetings (September 26, 2005 and January 27, 2006) with the City of Bangor and other interested parties. These meetings provided a forum to review the TMDL findings and discuss concerns raised in the comments in Appendix A.

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Appendix A. – Public Comments and MDEP Response to Comments

September 29, 2005

Melissa Evers
Maine Department of Environmental Protection
Bureau of Land and Water Quality
State House Station 17
Augusta, ME 04333

RE: Birch Stream Draft TMDL
Review Comments from City of Bangor

Dear Melissa,

The City of Bangor is pleased to submit review comments on the Draft TMDL for Birch Stream. The comments contained herein are based on careful review by a number of City Departments.

We believe that the dialogue that was held at the September 26 meeting at the DEP Bangor Office was productive. We support continuing face to face communication as this process proceeds.

The City has a few general comments and several specific comments.

GENERAL COMMENTS

1. **The ultimate purpose of this document is unclear. Please clarify the ultimate intent in terms of what the document will be used for and how – guidance? Voluntary compliance? Regulation and enforcement?**

2. **There are a significant number of stakeholders in the Birch Stream watershed, yet it appears that only a very few have been responsive to the review process. For some reason, the "Public Participation" process appears to have been very incomplete at best.**

3. **There appears to be an urgency to the Birch Stream TMDL process that we do not understand. (We were first informed of an October deadline at the September 26 meeting). Because of this "urgency", there has been inadequate time for all stakeholders to make meaningful contributions to the process. The goal of improving water quality is much better served by developing the document carefully rather than quickly.**

4. **The implementation process beyond this document is not clear. Our questions include:**

   - **Who are the Stakeholders?**
   - **What is stakeholder liability?**
   - **What are the monitoring and enforcement mechanisms?**
   - **Who makes decisions?**
   - **Will there be required implementation projects?**
   - **Who pays?**

5. **There are references to testing to determine progress / compliance. Does "compliance" mean attainment of applicable water quality standards? Will there be a commitment from DEP to do annual or semi-annual testing of Birch Stream for this purpose?**

6. **The draft TMDL is not clear on the goal of the program. This was clarified at the September 26 meeting, but we wish to include it here for the record.**

   It is understood that the goal of this TMDL is as stated on Page 12,

   "The goal of this TMDL is to have Birch Stream meet applicable water quality criteria".

   It is further understood that the statement made on page 13, which states:

   "This TMDL sets a target of 8% impervious cover (IC)".

   is <u>not</u> the goal and should be deleted or reworded to clearly state that fact.

7. **The City recommends using this Document to clearly identify and define Birch Stream as follows:**

   Birch Stream begins at the outfall of the box culvert that traverses under Airport Mall, and flows as a more or less natural stream to the Kenduskeag Stream.

   Upstream of the box culvert outfall is a composition of man-made facilities that comprises a Municipal Separate Storm Sewer System (MS4) as defined by MEDEP in the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems, as follows:

   "Municipal separate storm sewer system" or ("MS4") means conveyances for stormwater, including, but not limited to, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels or storm drains (other than publicly owned treatment works and combined sewers) owned or operated by any municipality, sewer or sewage district, fire district, State agency or Federal agency or other public entity that discharges directly to surface waters of the State."

8. **We request that the following statements be added: (somewhere) "Birch Stream has a length of .5 miles. There are a total of 737 miles of impaired (non-attainment) streams in Maine."**

9. **With the recent adoption of the "Non-Stormwater Discharge" Ordinance by the City of Bangor, the City has established local regulatory authority and control over discharges to its storm drain system. A clear definition of the point that separates "Birch Stream" from the City's "Municipal Storm Sewer System" (MS4) will make future efforts to reduce impairments more practical to implement.**

10. **It is not clear why this stream is Class B.**

    For the past 50 years, it has been primarily the drainage ditch connecting the Airport Complex to the Kenduskeag Stream.

    Other than a short stretch at the lower end, the entire stream flows through private property. There is no public access and no public benefit.

    "Class B waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as unimpaired."

Birch Stream will never be used for drinking water, and is probably too shallow and too narrow to be used for recreational fishing or boating. It is not used for industrial process and cooling water, and is not used to generate hydroelectric power. Birch Stream might possibly support Brook Trout below the waterfall. Designated Uses are the basis of water quality criteria to support those uses, but there appears to be no defined designated use in Birch Stream to warrant class B.

11. It should be noted that Bangor and the Airport Entities have already been very active in addressing the Birch Stream impairment issues.

- **In November of 2003, a major cleanup of Birch Stream was undertaken. Over five tons of trash and debris were removed from the short section of stream directly behind Airport Mall. (This five tons of trash are unrelated to impervious area).**
- **There have been four major very expensive Deicing Fluid Runoff Control Projects undertaken by the commercial and military entities at the Airport, which are expected to address the major stressor of concern.**
- **The City has embarked on a significant mapping project to locate and identify all sanitary sewer and storm drain facilities within the Birch Stream watershed. This mapping is fundamental to all other BMPs to be undertaken.**
- **A considerable amount of sampling has been done by several parties to monitor the health of Birch Stream.**
- **An educational and outreach program has been implemented to raise awareness of stormwater issues.**
- **Several BMPs have been implemented, including employee training.**

12. It should be noted that data and testing that identifies impairment of Birch Stream is all very recent. Given the historical uses and activities in the watershed over the past 50 years, it is highly likely that impairment has existed for a very long time.

SPECIFIC COMMENTS

13. PAGE 7 Description of Impairments

Reference is made to tests conducted in 1997 and 1999, and the statement that airport deicing runoff is connected to the impairment of Birch Stream. During the 1997 and 1999 timeframes, deicing fluid use was below the 100,000 gallon threshold and was essentially a permitted discharge under the Airport NPDES Permit,

14. PAGE 8 Stressors of Concern

Reference is made to the document "Urban Streams Non Point Source Assessments in Maine" or "Urban Streams Project, PETE/MDEP, 2005). When this document was distributed to stakeholders in the Birch Stream Watershed, , it was not made clear that this was part of an "urgent" TMDL project with short-term deadlines and potential long term implications to stakeholders.

15. PAGE 8 Stressor 1 – Propylene Glycol.

It should be noted that testing done by the Airport since 11/23/03 does not support the allegation that Propylene Glycol is <u>currently</u> a significant stressor of Birch Stream.

It should be further noted that the capital investments ($3 Million +++) that have been made by both the commercial and military entities at the airport on deicing runoff capture and treatment will insure that Propylene Glycol will not be a stressor in the future.

16. PAGE 9 Stressor 3 – High Peak Flows.

We question that high peak flows caused by impervious area is a stressor. According to a former property owner adjacent to Birch Stream, the erosion below Ohio Street was caused primarily by a stream alteration resulting from filled land.

Furthermore, there needs to be more discussion regarding the listing of high percentage of impervious surfaces as a likely source, or the reduction of impervious area as a likely solution. By casually mentioning a high percentage of paved / roofed surfaces (33%) is somewhat misleading both here and elsewhere in the document.

This number also does not take into account the airport retention dam, which actually restricts flow to the stream during peak flow periods. This restriction eliminates the largest % of IC from even being a factor in the flow rate.

In Maine, we have frozen ground for 5-6 months of the year. All precipitation that occurs between November and April, generally, falls on frozen ground, which is 100% impervious. All runoff between November and April, including snowmelt, generally, occurs on frozen ground, which is 100% impervious. The highest sustained peak flows occur, generally, in the spring of the year, when the winter's accumulation of snow and the early spring rains run off over frozen ground. One of the worst conditions for erosion is during "Mud Season" when the conditions are a top layer of saturated soil over a deeper layer of frozen ground. In Bangor, over the past 8 years, 42% of the annual precipitation has occurred between November and April, when the ground is, generally, 100% impervious.

So, although man-made impervious areas are indeed a factor for those times of the year when the ground is not frozen, it is misleading to say that all of the high flow conditions, or even the worst high flow conditions, are a result of these man-made impervious surfaces.

17. PAGE 9 Stressor 4 –Elevated Water Temperature.

It is acknowledged that this is an issue. We believe that current BMP technologies can readily address the issue.

Is there data available on temperature readings of the Kenduskeag Stream just upstream of where Birch Stream enters? This might be useful for comparison purposes.

18. PAGE 9 Stressor 5 –Elevated Nutrient Levels.

The City reserves comment on this stressor, pending more thorough study and review of the appropriate EPA document for Ecoregion VIII Nutrient criteria for Rivers and Streams.

Was any evaluation conducted regarding the contribution of the beaver colony to the elevated nutrient levels?

Is there data available on nutrient readings of the Kenduskeag Stream just upstream of where Birch Stream enters? This might be useful for comparison purposes.

19. PAGE 12 SECTION 4 TOTAL MAXIMUM DAILY LOAD (TMDL) TARGET

It is noted that the narrative in this section relies predominantly on a 2004 TMDL Pilot Project **undertaken by ENSR. Is it correct for Bangor to interpret that there are no actual applications with full-scale results available?**

- **Is this Pilot TMDL the only "Wet Weather TMDL" that has ever been undertaken?**
- **Are the recommendations contained in this document solely based on this Pilot Project?**
- **Was this Pilot Project undertaken in an area similar to Bangor in size and climate? In a watershed comparable to Birch Stream?**

20. PAGE 12 IMPLEMENTATION RECOMMENDATIONS

The City agrees in principle with the four-bullet Adaptive Management approach with the stated goal of having Birch Stream meet applicable water quality criteria.

- **Implement BMPs strategically through a phased program which focuses on getting the most reductions, for least cost, in sensitive areas first (for example, begin with habitat and riparian buffer restoration, flood plain recovery, and treatment of smaller, more frequent storms);**
- **Monitor ambient water quality to assess stream improvement;**
- **Compare monitoring results to water quality standards (aquatic life criteria);**
- **Continue BMP implementation in a phased manner until water quality standards are attained.**

The Adaptive Management approach is the accepted method of addressing Urban Wet Weather Issues, and allows the application of sound science, tangible benefits, and cost-benefit analysis as a basis for activities on urban wet weather projects.

Having long known this as being the appropriate and accepted approach to addressing Urban Wet Weather issues, the City has already undertaken an extensive mapping project in the Birch Stream watershed as part of Bangor's Storm Water Phase II Management Program. There is a significant storm water / sanitary sewer infrastructure in this drainage area. Much of the Airport Infrastructure was constructed by the military, and records are vague or non-existent. The mapping project is intended to give the City accurate records and to be a tool and foundation upon which to base future appropriate Best Management Practices (BMPs).

The mapping project is approximately 70% completed at this time. The City considers this project second in priority of actions to be taken. (the Deicing Control Program is first).

The City's Adaptive Management Program to address water quality issues in Birch Stream will be prepared when the mapping project has been completed.

21. PAGE 13 Target of 8% impervious cover (IC)

As previously mentioned, the statement "This TMDL sets a Target of 8% impervious cover (IC). creates confusion and misunderstanding with the statement "The goal of this TMDL is to have Birch Stream meet applicable water quality criteria".

The use of 8% as a target impervious area is impractical and unattainable in a highly developed urban watershed. This is particularly true for small watershed containing a major airport. (For

comparative purposes, a typical residential neighborhood of quarter-acre lots in an urbanized area has an impervious area approaching 20%).

22. PAGE 13 Summary Paragraph

The Summary Paragraph on page 13 refers to the Adaptive Management approach and is, in principal, acceptable to the City.

The Summary Paragraph suggests that the City develop implementation recommendations by the end of 2006. Elsewhere in the document is a reference to a 10-year implementation period, ending in 2015. Why is this the sole responsibility of the City?

The City and ANG have already undertaken several major projects to address the deicing fluid runoff issue. This is expected to be completed in 2006.

The City has also undertaken a significant mapping project of the Birch Stream watershed. This is also expected to be completed in 2006.

The City believes that the development of an implementation plan for additional remediation of Birch Stream cannot and should not proceed until these two programs (or activities) have been completed and evaluated.

Furthermore, before a specific implementation program can be prepared, there needs to be a "Scope of Work" developed that outlines and prioritizes the appropriate BMPs to be utilized.

Therefore, it is premature for the City to commit to a specific date for the development of a remediation plan at this time.

23. PAGE 14 General Stream Restoration Techniques

The City acknowledges this list of BMPs. There are many other BMPs that Bangor is aware of and/or is implementing within the City in conjunction with the Combined Sewer Overflow Control Program.

A few things need to be recognized in regard to the subject:

- **Most of Birch Stream flows through private property, and any BMP activity adjacent to or within Birch Stream will require permission of and/or participation by private interests.**
- **Some portion of the developed watershed upstream of the box culvert outfall is owned or operated by private interests, and any BMP activity will require permission of and/or participation by private interests.**
- **Education and Training is already an implemented BMP.**
- **Application of winter sand on roads, parking lots, and runways is driven by safety considerations, not water quality concerns. There already are sweeping and catch basin cleaning programs in place.**
- **A sewer system evaluation is already being implemented. It is not clear when the sewer odors were observed. The City has replaced several vented manhole covers (the most likely source of odors) with solid covers. There are other sewer system vents that must remain for proper sewer system operation.**

- **The City questions that documented spills actually relate to water quality impairments of Birch Stream. Most documented spills are of a few gallons in quantity and are addressed immediately at the source, never leaving Airport property or reaching Birch Stream.**

24. PAGE 15 Disconnection of Impervious Surfaces

We believe that this is better described as "Mitigation of Impervious Surface Discharge"**. The City acknowledges this list of BMPs. There are many other BMPs that Bangor is aware of and/or is implementing within the City in conjunction with the Combined Sewer Overflow Control Program.**

25. PAGE 16 Conversion of Impervious Surfaces.

The City will NOT **accept widespread conversion of impervious surfaces as a goal of this TMDL Program. In fact this is** not **the goal-the stated goal is to meet applicable water quality standards.**

It is acknowledged that there may be selected locations where this is appropriate on a limited basis. Significant conversion of impervious surfaces is simply impractical in urban watersheds.

26. PAGE 16 Retention Ponds

Please provide data to substantiate allegations that the detention ponds may be inadequate. Also define any inadequacies that may be substantiated. It should be noted that ponds have been constructed to applicable standards and requirements. Any substantiated inadequacies are not due to negligence or irresponsibility, but rather, reflective to the historical lack of knowledge and understanding of stormwater impacts – particularly in urban watersheds.

27. PAGE 17 Monitoring Plan

There is a significant amount of monitoring being undertaken by numerous parties in the Birch Stream watershed. Sharing of monitoring results is expected.

Will there be a commitment by DEP to undertake annual or semi-annual monitoring to determine progress / compliance?

The reference to a mandated reduction of impervious cover to 8% is not **acceptable. Again, unrealistic and unattainable.**

28. PAGE 20 Impervious cover method

It is not clear why so much emphasis was placed on the Impervious Cover (IC) Method that was used for this TMDL.

Uniform consideration of stormwater impacts based on surface area alone is inaccurate. Factors such as uncontrolled vs. controlled discharge, location of impervious areas within the watershed, and use and activity all have significant importance to water quality impacts. This needs to be acknowledged in the document.

- It is unclear why 8% impervious cover is used. If this method were applied to a subdivision of one-acre houselots, 8% impervious cover would barely cover the paved roads – no houses or

driveways!!!! One-acre houselots are generally NOT considered urban. As previously mentioned, urban residential neighborhoods will approach a 20% impervious cover.

- **"Results are not appropriate for use in a permitting, enforcement, or monitoring context". (Pages 20 and 24.**
- **Some portion of the IC analysis was based on only "one data point from Birch Stream". Basing anything on just one data point is unsound.**
- **There is no mention of how the IC method addresses frozen / saturated ground, which is 100% impervious.**
- **There are five stressors listed for Birch Stream (Page 10,Table 2). Yet the IC method only addresses the "Elevated Nutrient Levels", assigned a "Medium" level of importance.**
- **The IC method addresses "Stormwater Runoff".(Page 25). It does not address Stressor #3 "High Peak flows".**

CONCLUSION

We understand that following the end of the Public Comment Period on September 29, the Birch Stream TMDL will be revised to incorporate stakeholder comments. The revised Birch Stream TMDL will then be sent to stakeholders, allowing a few days for final review and comment. The document will then be sent to EPA, probably in mid-October.

It was agreed that the stakeholders should meet again in mid-November to begin discussions regarding the implementation process.

The City of Bangor is very supportive of improving water quality in Birch Stream and committed to working cooperatively to achieve this. Our comments are focused on improving the final TMDL document to develop a practical approach with attainable objectives that will be successful in meeting the goal.

Respectfully submitted,

John L. Murphy, P.E.

Assistant City Engineer
207-992-4247
john.murphy@bgrme.org

December 28, 2005

John Murphy
Assistant City Engineer
City of Bangor
73 Harlow Street
Bangor, Maine 04401

RE: Response to City of Bangor Review Comments on Birch Stream Draft TMDL

Dear John,

Thank you for providing substantive, thoughtful comments that will help strengthen the final draft of the Birch Stream TMDL. I will address each comment (in italics) from your original submittal and will include both the comments and the response as an Appendix in the TMDL.

GENERAL COMMENTS

5. The ultimate purpose of this document is unclear. Please clarify the ultimate intent in terms of what the document will be used for and how – guidance? Voluntary compliance? Regulation and enforcement?

The ultimate intent is to provide information and guidance towards restoring the stream to meet Maine's water quality standards. The recommendations listed in the TMDL are not mandatory in and of themselves. However, where recommendations pertain to activities that are regulated under the MEPDES Stormwater program, through either the Municipal Separate Storm Sewer System (MS4) or industrial discharge (Multi-Sector) requirements, then the Department may revoke authorization for a discharge under either the MS4 or Multi-Sector General Permit, unless the discharge is found to be consistent with the TMDL. In other words, the Department may mandate changes in operations in order for the general permit to stay in effect. Or the Department may require an individual permit in place of the general permit. In addition, after the TMDL is approved, the Maine Stormwater Management Law includes a provision whereby the Department, through rule-making, may regulate existing stormwater discharges that are found to be causing or contributing to the impairment. The Department would prefer, however, to see existing sources addressed through development and implementation of a watershed management plan.

6. There are a significant number of stakeholders in the Birch Stream watershed, yet it appears that only a very few have been responsive to the review process. For some reason, the "Public Participation" process appears to have been very incomplete at best.

The TMDL "Public Participation" process has not inspired widespread community response. However, Birch Stream actually received more participation than any other Non-point Source Stream TMDL to date. The Bangor Daily News also highlighted the Birch Stream TMDL and the need for comments in an article and we still received little public response. We welcome any ideas or experience you have that could improve public participation and can be accomplished relatively simply.

7. There appears to be an urgency to the Birch Stream TMDL process that we do not understand. (We were first informed of an October deadline at the September 26 meeting). Because of this

"urgency", there has been inadequate time for all stakeholders to make meaningful contributions to the process. The goal of improving water quality is much better served by developing the document carefully rather than quickly.

Your point is noted and DEP has extended the deadlines, the revised deadline is January 31, 2006.

8. The implementation process beyond this document is not clear. Our questions include:

- **Who are the Stakeholders?**
- **What is stakeholder liability?**
- **What are the monitoring and enforcement mechanisms?**
- **Who makes decisions?**
- **Will there be required implementation projects?**
- **Who pays?**

The implementation process and information is presented to provide potential ideas that could be voluntarily put into action or used as a stimulus for development of a watershed management plan. Technically, the implementation plan is not an USEPA required element of the TMDL, so while these are all good questions, they are outside of the scope of the TMDL and need to be addressed through a further watershed planning process.

29. There are references to testing to determine progress / compliance. Does "compliance" mean attainment of applicable water quality standards? Will there be a commitment from DEP to do annual or semi-annual testing of Birch Stream for this purpose?

Does "compliance" mean attainment of applicable water quality standards?
Yes
Will there be a commitment from DEP to do annual or semi-annual testing of Birch Stream for this purpose?
No, the test will be adaptive, based on need. The need will be defined as either a discharge event or implementation of significant BMP's.

30. The draft TMDL is not clear on the goal of the program. This was clarified at the September 26 meeting, but we wish to include it here for the record.

It is understood that the goal of this TMDL is as stated on Page 12,

"The goal of this TMDL is to have Birch Stream meet applicable water quality criteria".

It is further understood that the statement made on page 13, which states:

"This TMDL sets a target of 8% impervious cover (IC)".

is <u>not</u> the goal and should be deleted or reworded to clearly state that fact.

The goal of every TMDL is attainment of water quality standards (as required by the Clean Water Act), while the TMDL target is a separate issue and required element. Quantitative targets are generally required in TMDL's and the 8% IC is the target in this TMDL. Wording to this effect has been added to the document, on pg 12. Although the 8% target is a required element, it is also intended to provide guidance for BMP implementation and it is possible that water quality standards to be reached before the 8% target is attained. Once water quality standards are attained, then BMP implementation on existing development in the watershed would be complete.

31. The City recommends using this Document to clearly identify and define Birch Stream as follows:

Birch Stream begins at the outfall of the box culvert that traverses under Airport Mall, and flows as a more or less natural stream to the Kenduskeag Stream.

Upstream of the box culvert outfall is a composition of man-made facilities that comprises a Municipal Separate Storm Sewer System (MS4) as defined by MEDEP in the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems, as follows:

"Municipal separate storm sewer system" or ("MS4") means conveyances for stormwater, including, but not limited to, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels or storm drains (other than publicly owned treatment works and combined sewers) owned or operated by any municipality, sewer or sewage district, fire district, State agency or Federal agency or other public entity that discharges directly to surface waters of the State."

The stream proper has been defined as requested on pg 5, paragraph 1. What value does the further definition of stormwater conveyances add to the TMDL?

32. We request that the following statements be added: (somewhere) "Birch Stream has a length of .5 miles. There are a total of 737 miles of impaired (non-attainment) streams in Maine."

Added to the 'Impaired Stream Segment' section, pg 7, paragraph 1.

33. With the recent adoption of the "Non-Stormwater Discharge" Ordinance by the City of Bangor, the City has established local regulatory authority and control over discharges to its storm drain system. A clear definition of the point that separates "Birch Stream" from the City's "Municipal Storm Sewer System" (MS4) will make future efforts to reduce impairments more practical to implement.

The natural stream considered for restoration under the TMDL is clearly defined on pg 5, paragraph 1. The defined impaired segment will be the only section of stream considered for restoration under this TMDL.

34. It is not clear why this stream is Class B.

For the past 50 years, it has been primarily the drainage ditch connecting the Airport Complex to the Kenduskeag Stream.

Other than a short stretch at the lower end, the entire stream flows through private property. There is no public access and no public benefit.

"Class B waters shall be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; and navigation; and as habitat for fish and other aquatic life. The habitat shall be characterized as unimpaired."

Birch Stream will never be used for drinking water, and is probably too shallow and too narrow to be used for recreational fishing or boating. It is not used for industrial process and cooling water, and is not used to generate hydroelectric power. Birch Stream might possibly support Brook Trout below the waterfall. Designated Uses are the basis of water quality criteria to support those uses, but there appears to be no defined designated use in Birch Stream to warrant class B.

The TMDL is not the proper forum to challenge the classification of Birch Stream. At this time the only way to legally downgrade the classification of Birch is through the Use Attainability Analysis (UAA) process, which requires all potential restoration efforts be completed before the stream can be reclassified as 'C'. This essentially means that the TMDL must be completely implemented before reclassification can be considered. Once the TMDL has been implemented through a comprehensive watershed management strategy, then reclassification may be an option worth pursuing.

35. It should be noted that Bangor and the Airport Entities have already been very active in addressing the Birch Stream impairment issues.

- **In November of 2003, a major cleanup of Birch Stream was undertaken. Over five tons of trash and debris were removed from the short section of stream directly behind Airport Mall. (This five tons of trash are unrelated to impervious area).**
- **There have been four major very expensive Deicing Fluid Runoff Control Projects undertaken by the commercial and military entities at the Airport, which are expected to address the major stressor of concern.**
- **The City has embarked on a significant mapping project to locate and identify all sanitary sewer and storm drain facilities within the Birch Stream watershed. This mapping is fundamental to all other BMPs to be undertaken.**
- **A considerable amount of sampling has been done by several parties to monitor the health of Birch Stream.**
- **An educational and outreach program has been implemented to raise awareness of stormwater issues.**
- **Several BMPs have been implemented, including employee training.**

All these efforts are valuable contributions towards the incremental restoration of Birch Stream and should be incorporated by the City of Bangor into a watershed management plan.

36. It should be noted that data and testing that identifies impairment of Birch Stream is all very recent. Given the historical uses and activities in the watershed over the past 50 years, it is highly likely that impairment has existed for a very long time.

Good point; it has been added to the 'Description of Impairments' on pg 8 .

SPECIFIC COMMENTS

37. PAGE 7 Description of Impairments

Reference is made to tests conducted in 1997 and 1999, and the statement that airport deicing runoff is connected to the impairment of Birch Stream. During the 1997 and 1999 timeframes, deicing fluid use was below the 100,000 gallon threshold and was essentially a permitted discharge under the Airport NPDES Permit,

38. PAGE 8 Stressors of Concern

Reference is made to the document "Urban Streams Non Point Source Assessments in Maine" or "Urban Streams Project, PETE/MDEP, 2005). When this document was distributed to stakeholders in the Birch Stream Watershed, , it was not made clear that this was part of an "urgent" TMDL project with short-term deadlines and potential long term implications to stakeholders.

The urgency point has been address previously. All TMDLs have the potential for long term implications to stakeholders. Restoring water quality in impaired waters is generally a challenging undertaking and Birch Stream is no exception.

39. PAGE 8 Stressor 1 – Propylene Glycol.

It should be noted that testing done by the Airport since 11/23/03 does not support the allegation that Propylene Glycol is <u>currently</u> a significant stressor of Birch Stream.

It should be further noted that the capital investments ($3 Million +++) that have been made by both the commercial and military entities at the airport on deicing runoff capture and treatment will insure that Propylene Glycol will not be a stressor in the future.

The TMDL needs to acknowledge the past problems that resulted from Propylene Glycol discharges to the stream. Detection of Propylene Glycol is one type of measurement, but the cumulative environmental effect of past discharges on sediments, biological oxygen demand and aquatic life may persist well past the detectable levels of the chemical in the stream. I have not actually seen the data that completely substantiates the claim that Propylene Glycol is no longer a significant stressor.

The effects of Propylene Glycol in the stream are an extreme concern for many of the community residents and the TMDL needs to acknowledge the role of chemicals in stream health. Community residents continue to detect the odor of Propylene Glycol emanating from the stream and this may be an indication that the chemical is sequestered in the sediments and periodically released. Additionally, residents detected and reported a discharge or spill to the stream sometime around December 12, 2005, which means that Propylene Glycol continues to be a significant stressor of concern.

The statement about capital improvements has been added to the end of the 'Implementation' section on pg 16.

40. PAGE 9 Stressor 3 – High Peak Flows.

We question that high peak flows caused by impervious area is a stressor. According to a former property owner adjacent to Birch Stream, the erosion below Ohio Street was caused primarily by a stream alteration resulting from filled land.

Furthermore, there needs to be more discussion regarding the listing of high percentage of impervious surfaces as a likely source, or the reduction of impervious area as a likely solution. By casually mentioning a high percentage of paved / roofed surfaces (33%) is somewhat misleading both here and elsewhere in the document.

This number also does not take into account the airport retention dam, which actually restricts flow to the stream during peak flow periods. This restriction eliminates the largest % of IC from even being a factor in the flow rate.

In Maine, we have frozen ground for 5-6 months of the year. All precipitation that occurs between November and April, generally, falls on frozen ground, which is 100% impervious. All runoff between November and April, including snowmelt, generally, occurs on frozen ground, which is 100% impervious. The highest sustained peak flows occur, generally, in the spring of the year, when the winter's accumulation of snow and the early spring rains run off over frozen ground. One of the worst conditions for erosion is during "Mud Season" when the conditions are a top layer of saturated soil over a deeper layer of frozen ground. In Bangor, over the past 8 years, 42% of the annual precipitation has occurred between November and April, when the ground is, generally, 100% impervious.

So, although man-made impervious areas are indeed a factor for those times of the year when the ground is not frozen, it is misleading to say that all of the high flow conditions, or even the worst high flow conditions, are a result of these man-made impervious surfaces.

The TMDL's contention that impervious surface is a stressor is based on peer reviewed literature and an extensive Stressor Identification process undertaken by a combination of Maine's water quality professionals and nationally recognized experts. The literature and evidence reviewed as part of the Stressor ID created a compelling case that impervious surface is the best surrogate for the array of chemical and hydrological stressors associated with alterations typical of the urban landscape. To change the use of impervious surface as the basis of the TMDL, the City of Bangor would need to create an equally compelling case that impervious surface is not responsible for the array of observed impacts.

It is likely true that filling land caused some of the observed stream alterations, but this does not negate the effects of upstream hydrological impacts. Frozen ground is highly impervious, but snow covering frozen ground has enormous absorptive capacity and has the capability for direct evapotranspiration. Snow cover and frozen conditions mean the hydrologic cycle is more complex than the statement that the watershed is 100% impervious for 5- 6 months of the year implies.

41. PAGE 9 Stressor 4 –Elevated Water Temperature.

It is acknowledged that this is an issue. We believe that current BMP technologies can readily address the issue.

Is there data available on temperature readings of the Kenduskeag Stream just upstream of where Birch Stream enters? This might be useful for comparison purposes.

This is something that should be considered during the restoration phase.

42. PAGE 9 Stressor 5 –Elevated Nutrient Levels.

The City reserves comment on this stressor, pending more thorough study and review of the appropriate EPA document for Ecoregion VIII Nutrient criteria for Rivers and Streams.

Was any evaluation conducted regarding the contribution of the beaver colony to the elevated nutrient levels?

Is there data available on nutrient readings of the Kenduskeag Stream just upstream of where Birch Stream enters? This might be useful for comparison purposes.

Was any evaluation conducted regarding the contribution of the beaver colony to the elevated nutrient levels?

Not specifically, but the elevated nutrient level is another urban stressor that should be addressed as watershed wide BMP measures are designed and implemented. Assigning beavers as the source of the nutrients will likely have little effect on the design and implementation of BMPs.

Is there data available on nutrient readings of the Kenduskeag Stream just upstream of where Birch Stream enters? This might be useful for comparison purposes.

This is something that should be considered during the restoration phase.

43. PAGE 12 SECTION 4 TOTAL MAXIMUM DAILY LOAD (TMDL) TARGET

It is noted that the narrative in this section relies predominantly on a 2004 TMDL Pilot Project undertaken by ENSR. Is it correct for Bangor to interpret that there are no actual applications with full-scale results available?

- **Is this Pilot TMDL the only "Wet Weather TMDL" that has ever been undertaken?**
- **Are the recommendations contained in this document solely based on this Pilot Project?**
- **Was this Pilot Project undertaken in an area similar to Bangor in size and climate? In a watershed comparable to Birch Stream?**

This is one of the first TMDLs to be submitted to the USEPA applying the 'percent impervious cover (% IC)' method, but it is a well documented and researched approach. Alternative modeling approaches do exist, but they are usually more costly and time consuming to develop. The implementation recommendations of other modeling approaches would not be any different from the recommendations of the '% IC method. We could have written a TMDL based on specific metals in-stream limits that would very difficult to attain as well and did not adequately address the cause. The result of an urban metals TMDL might be to place end of pipe metals and nutrient limits on every stormwater pipe. Maine DEP chose the '% IC ' method as way to expedite the TMDL modeling phase and move quickly into the implementation phase. Our goal is to find an effective and efficient mechanism to fix the stream.

As concerns the 'Pilot Project' designation, this is an innovative approach that will restore the stream. This is based on the research and experience of the Center for Watershed Protection, so it incorporates tested low impact methods,that had not been previously used in the TMDL format. This approach uses the best known methods to solve the problems identified in Birch Stream.

44. PAGE 12 IMPLEMENTATION RECOMMENDATIONS

The City agrees in principle with the four-bullet Adaptive Management approach with the stated goal of having Birch Stream meet applicable water quality criteria.

- **Implement BMPs strategically through a phased program which focuses on getting the most reductions, for least cost, in sensitive areas first (for example, begin with habitat and riparian buffer restoration, flood plain recovery, and treatment of smaller, more frequent storms);**
- **Monitor ambient water quality to assess stream improvement;**
- **Compare monitoring results to water quality standards (aquatic life criteria);**
- **Continue BMP implementation in a phased manner until water quality standards are attained.**

The Adaptive Management approach is the accepted method of addressing Urban Wet Weather Issues, and allows the application of sound science, tangible benefits, and cost-benefit analysis as a basis for activities on urban wet weather projects.

Having long known this as being the appropriate and accepted approach to addressing Urban Wet Weather issues, the City has already undertaken an extensive mapping project in the Birch Stream watershed as part of Bangor's Storm Water Phase II Management Program. There is a significant storm water / sanitary sewer infrastructure in this drainage area. Much of the Airport Infrastructure was constructed by the military, and records are vague or non-existent. The mapping project is intended to give the City accurate records and to be a tool and foundation upon which to base future appropriate Best Management Practices (BMPs).

The mapping project is approximately 70% completed at this time. The City considers this project second in priority of actions to be taken. (the Deicing Control Program is first).

The City's Adaptive Management Program to address water quality issues in Birch Stream will be prepared when the mapping project has been completed.

This information will be invaluable for the implementation and watershed management phase of the project.

45. PAGE 13 Target of 8% impervious cover (IC)

As previously mentioned, the statement "This TMDL sets a Target of 8% impervious cover (IC). creates confusion and misunderstanding with the statement "The goal of this TMDL is to have Birch Stream meet applicable water quality criteria".

The use of 8% as a target impervious area is impractical and unattainable in a highly developed urban watershed. This is particularly true for small watershed containing a major airport. (For comparative purposes, a typical residential neighborhood of quarter-acre lots in an urbanized area has an impervious area approaching 20%).

The TMDL must demonstrate that the target will insure attainment of water quality standards; otherwise the TMDL will not meet the legal requirements of the Clean Water Act. The use of 8% as the target is based on information that correlates attainment of Class B aquatic life standards with impervious surface in Maine watersheds. While 8% may seem impossible to attain in a highly developed watershed, through the implementation of well designed BMP's the impact of the impervious surface can reduced to levels approaching 8%. The target can also be viewed as setting a hydrograph target in the impaired stream segment that would approximate an 8% developed watershed. This work has been done in other urban watersheds and by using an adaptive approach to implement BMPs overtime, Birch can achieve Class B aquatic life standards.

46. PAGE 13 Summary Paragraph

The Summary Paragraph on page 13 refers to the Adaptive Management approach and is, in principal, acceptable to the City.

The Summary Paragraph suggests that the City develop implementation recommendations by the end of 2006. Elsewhere in the document is a reference to a 10-year implementation period, ending in 2015. Why is this the sole responsibility of the City?

The City and ANG have already undertaken several major projects to address the deicing fluid runoff issue. This is expected to be completed in 2006.

The City has also undertaken a significant mapping project of the Birch Stream watershed. This is also expected to be completed in 2006.

The City believes that the development of an implementation plan for additional remediation of Birch Stream cannot and should not proceed until these two programs (or activities) have been completed and evaluated.

Furthermore, before a specific implementation program can be prepared, there needs to be a "Scope of Work" developed that outlines and prioritizes the appropriate BMPs to be utilized.

Therefore, it is premature for the City to commit to a specific date for the development of a remediation plan at this time.

Why is this the sole responsibility of the City?
It is not in a legal sense, but given the City's large ownership in the watershed, and its status as a regulated MS4 with a industrial discharge regulated by MEPDES, it clearly needs to take a leadership role.

Completing the 2 projects in 2006 would be great, but this doesn't preclude many aspects of developing a watershed management plan, like working on the scope and increasing the participation of watershed stakeholders.

47. PAGE 14 General Stream Restoration Techniques

The City acknowledges this list of BMPs. There are many other BMPs that Bangor is aware of and/or is implementing within the City in conjunction with the Combined Sewer Overflow Control Program.

A few things need to be recognized in regard to the subject:

- **Most of Birch Stream flows through private property, and any BMP activity adjacent to or within Birch Stream will require permission of and/or participation by private interests.**
- **Some portion of the developed watershed upstream of the box culvert outfall is owned or operated by private interests, and any BMP activity will require permission of and/or participation by private interests.**
- **Education and Training is already an implemented BMP.**
- **Application of winter sand on roads, parking lots, and runways is driven by safety considerations, not water quality concerns. There already are sweeping and catch basin cleaning programs in place.**
- **A sewer system evaluation is already being implemented. It is not clear when the sewer odors were observed. The City has replaced several vented manhole covers (the most likely source of odors) with solid covers. There are other sewer system vents that must remain for proper sewer system operation.**
- **The City questions that documented spills actually relate to water quality impairments of Birch Stream. Most documented spills are of a few gallons in quantity and are addressed immediately at the source, never leaving Airport property or reaching Birch Stream.**

Most of these items pertain to the implementation phase of the project. The documented spills were considered as a major stressor, but there may be a cumulative effect of few gallons spilled frequently. After many years these spills may reach the stream via groundwater discharge and minimizing the occurrence of spills is reasonable protective action.

48. PAGE 15 Disconnection of Impervious Surfaces

We believe that this is better described as "Mitigation of Impervious Surface Discharge"**. The City acknowledges this list of BMPs. There are many other BMPs that Bangor is aware of and/or is implementing within the City in conjunction with the Combined Sewer Overflow Control Program.**

The wording was changed.

49. PAGE 16 Conversion of Impervious Surfaces.

The City will NOT accept widespread conversion of impervious surfaces as a goal of this TMDL Program. In fact this is not the goal-the stated goal is to meet applicable water quality standards.

It is acknowledged that there may be selected locations where this is appropriate on a limited basis. Significant conversion of impervious surfaces is simply impractical in urban watersheds.

These BMP's are only suggestions to consider in the development of a watershed management plan. They are not requirements of the TMDL.

50. PAGE 16 Retention Ponds

Please provide data to substantiate allegations that the detention ponds may be inadequate. Also define any inadequacies that may be substantiated. It should be noted that ponds have been constructed to applicable standards and requirements. Any substantiated inadequacies are not due to negligence or irresponsibility, but rather, reflective to the historical lack of knowledge and understanding of stormwater impacts – particularly in urban watersheds.

These statements are based on professional judgment using the current engineering practices. We acknowledge that the existing ponds were developed based on the standards at the time of permitting and are in compliance.

51. PAGE 17 Monitoring Plan

There is a significant amount of monitoring being undertaken by numerous parties in the Birch Stream watershed. Sharing of monitoring results is expected.

Will there be a commitment by DEP to undertake annual or semi-annual monitoring to determine progress / compliance?

The reference to a mandated reduction of impervious cover to 8% is not acceptable. Again, unrealistic and unattainable.

The monitoring commitments have already been addressed and remediating the watershed to meet an effective 8% runoff target or attainment of aquatic life standards. The TMDL basically requests that progress be made towards those goals with periodic retesting for compliance. DEP expects the water quality goals will achieved before the 8% target is reached.

52. PAGE 20 Impervious cover method

It is not clear why so much emphasis was placed on the Impervious Cover (IC) Method that was used for this TMDL.

Uniform consideration of stormwater impacts based on surface area alone is inaccurate. Factors such as uncontrolled vs. controlled discharge, location of impervious areas within the watershed, and use and activity all have significant importance to water quality impacts. This needs to be acknowledged in the document.

- It is unclear why 8% impervious cover is used. If this method were applied to a subdivision of one-acre houselots, 8% impervious cover would barely cover the paved roads – no houses or driveways!!!! One-acre houselots are generally NOT considered urban. As previously mentioned, urban residential neighborhoods will approach a 20% impervious cover.

- **"Results are not appropriate for use in a permitting, enforcement, or monitoring context". (Pages 20 and 24.**

- **Some portion of the IC analysis was based on only "one data point from Birch Stream". Basing anything on just one data point is unsound.**

- **There is no mention of how the IC method addresses frozen / saturated ground, which is 100% impervious.**

- **There are five stressors listed for Birch Stream (Page 10,Table 2). Yet the IC method only addresses the "Elevated Nutrient Levels", assigned a "Medium" level of importance.**

- **The IC method addresses "Stormwater Runoff".(Page 25). It does not address Stressor #3 "High Peak flows".**

Most of these items have been previously addressed and are applicable to the implementation phase.

I hope my response and revisions to the document have clarified your knowledge of the TMDL and the way water quality restoration is viewed through the provisions of the Clean Water Act.

Sincerely,

Melissa Evers
Environmental Specialist III
Maine DEP

Cc:
Don Witherill, DEP
MaryEllen Dennis, DEP
Jeff Dennis, DEP

September 28, 2005

Submitted by:
Ann Birmingham on behalf of Griffin Park Citizens Against Toxic Streams (CATS)
194 Griffin Park #404, Bangor, Maine 04401
207-990-5195

Griffin Park is an income sensitive housing for 50 families, all but a few apartments with children. Griffin Park is owned by the City of Bangor, and is run by Bangor Housing Authorities. Griffin Park Residents are the BULK of residents living closest to/on Birch Stream's edges. There are only three other families living on Birch Stream and they are privately owned homes, one of which recently sold and another that is up for sale and vacant, as they moved due to the family always being sick when living there. (Ohio St.) Then there are two small businesses (Ohio St.) and one other privately owned home that has a small carburetor business in his garage. (On Griffin Road)
Residents in the 50 apartments here in Griffin Park have been complaining for years that the stream is sick therefore making the residents sick.

Submitted to: Melissa Evers, DEP Environmental Specialist

RE: BIRCH STREAM TOTAL MAXIMUM DAILY LOAD (TMDL) REPORT COMMENTS

1. **Propylene Glycol not included as a separate item in this TMDL-it is expected to be a less important stressor from 2005 onwards, therefore not included as a separate item.**

   It would be a true injustice to the residents not to include Propylene Glycol as a separate item and consider Propylene Glycol as a stressor of Birch Stream in this TMDL report or any report noting the condition of Birch Stream.

   Propylene Glycol has been the largest pollutant in Birch Stream for decades and although actions have been taken, they have not completely solved the problem of PG not getting into Birch Stream. In fact, Propylene Glycol was in our air at the end of August this year-2005.

   Testing for PG needs to be performed in the winter months, and in the spring months, at various times, times not announced to anyone, and at various stations. We residents have asked for a trustworthy, first response person to contact when we smell the deicer and other chemicals in our air/stream, to come immediately and test Birch Stream, however since residents have started reporting the issues publicly about Birch Stream the smells are late at night or in the very early morning hours now, making any response more difficult.

   The airport is looking to expand, and with expansion more deicer is necessary. Is the WWTP able to accommodate the deicer with all the expected increase in traffic at BIA?

   Bangor International Airport has been predicted to be the nation's fastest-growing airport according to a recent report from the Boyd Group, and aviation consulting and forecasting firm. (Weekly 5-19-05)

   Jet traffic is up from 19% to 96% in just five years, and the busier BIA gets, the more flights and routes they add. (BIA ad in Bangor Daily News)

   RECOMMEND- DEP ASSIGN A FIRST RESPONSE PERSON THAT THE RESIDENTS CAN CALL—WHEN THE SMELLS ARE STRONGEST-DAY OR NIGHT OR EARLY MORNING—TO

COME AND TEST THE STREAM AT THESE TIMES- TO SEE JUST WHAT IS IN THE STREAM AT THESE TIMES-WHICH WOULD ASSIST IN DETERMINING WHAT IS GOING ON IN BIRCH STREAM-WHICH WOULD BENEFIT BOTH DEP WITH THE REPAIR OF BIRCH STREAM, NOT TO MENTION THE HEALTH/AIR OF THE LOCAL RESIDENTS.

Residents in Griffin Park see Birch Stream every day, we live with it. We could be valuable assets to DEP in documenting what is going on in the stream, if interested.

Propylene Glycol (PG)-(pg. 8 of report) PG input to the steam was much reduced, due to remedial actions in the fall of 2003 by Bangor International Airport (BIA) and Air National Guard (ANG), and it is questionable if both systems are up and running to prevent any PG from going into Birch Stream. Rebecca Hupp, director of the airport has not been clear if the ANG's system is completely diverting the deicer to the WWTP. Air National Guard uses 3 times the amount of deicer than the Airport uses, so it would be very important ANG's system is up and running to full capacity, at all times.

2. **Valves-**
   There was a valve installed in (Nov. 11, 2004 Bangor Daily News) BIA's closed de-icing fluid collection containment system. The tank that will allow for time controlled release of deicing fluid into the City's sewer system, which will reduce the impact of the Waste Water Treatment Plant in times of peak demand.

   ANG has a valve to turn to the stream in their de-icer holding tank, and BIA's valve was inadvertently turned to the stream in error by one employee (4-05-2004), so instead of going to the WWTP it went directly to Birch Stream.

   CONCERN/QUESTIONS:
   What actions will be taken if valves are turned to the stream? Why is the Airport's de-icing fluid collection system holding tank that is closed, being built with a valve to turn to Birch Stream? (BDN 11-11-04)

3. **Where does Birch stream originate?**
   As discussed at the meeting of September 26, 2005 we agree that it is important that we find out just where this stream begins. Nobody seems to know, and to get all sources to agree to cooperate in the cleanup, we need to know the boundaries and the sources.

4. **CLASS B TO CLASS C -BIRCH STREAM**
   As discussed at the meeting of Sept. 26, 2005, the City has contemplated on changing Birch Stream from a Class B Stream to a Class C Stream. This would not be in the best interest of the residents/citizens living along the banks of Birch Stream. This steam violates the Clean Water Act, and actually infringes on the Clean Air Act also, so if the City cannot meet the standards of a Class B stream then they should not be looking at how to lower the class, but ask why they can't seem to meet the Class B standards. A Class B would offer the residents in Griffin Park a better chance of cleaner air and environment.

5. **TREES AND SHRUBS:**
   We question the shrubs and trees recommended to plant along Birch Stream.
   Trees and shrubs to be planted along the stream should be for beauty, not to hide the smell as was recommended in the early part of our complaints about the fumes originating from Birch Stream.

   If you follow the Pine Tree Line at the airport, the trees will lead you to the sources coming into Birch Stream. To the right of Godfrey Blvd., behind DHS building and behind Unicel is the ANG's and to the left of Godfrey Blvd. behind Burger King on Union Street is

both the ANG and BIA's flow into Birch Stream. ANG's flow goes under Godfrey Blvd. and meets up with the one behind Burger King.

These locations all flow differently at different times. These small contributories flow and smell with or without rain, snow or any drainage, but more so in the late evenings or early mornings. But if you are not sure where to find these locations, just look for the lines of Pine Trees and they will lead you to the flows.

6. **BANGOR CITY WORKERS –SALT AND GRAVEL- Off Godfrey Blvd.**
   Used, stored and must be releasing into the ground-Birch Stream watershed-Oil, sand, salt. Should be looked into what is stored there and how they use the watershed.

7. **EROSION OF PROPERTY-**
   The area of great erosion in Birch Stream is in the Ohio Street - Scott Thomas's yard/home. I have talked with Scott, and he has had great concern for his property value and the illnesses he and his family have been experiencing. Scott has since put the home up for sale, and moved to another property he owns. Scott was not openly willing to come forward and voice his concern with his children and family being sick, however it is quite understandable—who would want to purchase a home on a polluted-perhaps health hazard stream? Scott was very open about his concerns on how the stream has taken with its rushing waters his land-erosion.

8. **NEW DEVELOPMENT AND NEW PARKING AREAS-**
   Union Street is under major expansion with buildings etc., being built.

   BIA is expanding there parking lot and it's a huge project.

   Question: These expansions are they being checked to see that they are meeting the impervious recommendations/concerns that you are requesting in the TMDL report?

   RECOMMEND:
   Any new construction that will add to the Watershed in the Birch Stream area should be scrutinized to make sure it is meeting all necessary requirements at the time of being built. The DEP, City should have a handle on this so that we will not add problems down the road to the already existing problems facing Birch Stream and its contributors.

9. **MAPPING OF BIRCH STREAM AREA**
   John Murphy mentioned at the Sept. 26th, 2005 meeting a few times how the City is putting together a map of the area around Birch Stream and I believe the airport area. This is wonderful. This map will show all pipes including sewerage pipes, like the three large sewer pipes near/in the stream. John Murphy told me the three sewer pipes may need covers so people won't smell the sewer odor that we smelled while standing along the steam talking on 10/11/2003. This map may be very helpful in determining what exactly is in Birch Stream. This steam should not be a "drainage ditch" as John referred to it, especially when it is in Griffin Park's back yard.

10. **TESTING- ANY TESTING**
    Question-will anyone, airport, ANG anyone know when you will test? And if anyone will know, why do they have to know?
    How much notice will they be given that you will be testing? Will they know exactly what you will be testing for?

    Reason- A big issue we have felt uneasy about here at Griffin Park is-- the polluters of the stream are also doing the testing of the steam. They know when to test-therefore not to release.

We feel release is the word to use. We watch this steam, and the weather, time, etc., and we know what we smell and the volume of that smell. Small runoff type releases into Birch Stream-small smell, large river running in our Birch Stream, little rain, strong smell, ---it's got to be coming from somewhere, and with no rain, no snow and the stream is rushing like a river…it has to be released, to get such pressure in such a small stream at various times…and we know what it has smelled like with the valves inadvertently turned our way-to the stream (.

11. **BIRCH STREAM—FROZEN-TESTS**
    Birch Stream does not totally freeze-ever, can always access the stream for testing. The largest pollutant that has been in the stream is propylene glycol-a de-icer…which would make it understandable that it does not usually freeze. Behind the Airport Mall does tend to freeze on the top, but it's not a solid freeze, and it is running underneath the ice.

RECOMMEND: Testing at the detention ponds (all of them) -in the steam, all different times, but especially when the smell is outside our homes, in the winter months and in April. April is unbearable to us, and the illnesses in the park are usually very high. We believe the releases are happening more frequently in April due to discarding the excess deicer/holding tanks.

December 22, 2005

Ann Birmingham, Griffin Park Citizens Against Toxic Streams (CATS)
194 Griffin Park #404
Bangor, Maine 04401

RE: BIRCH STREAM TOTAL MAXIMUM DAILY LOAD (TMDL) REPORT COMMENTS

Dear Ms Birmingham,

Thank you for providing comments that will help strengthen the final draft of the Birch Stream TMDL. Please note that much of the stream specific information you provided will be valuable for watershed management planning, but has little bearing on the technical aspects of the TMDL. I will address each comment according to the number assigned in your original submittal and will include both the comments and the response in an Appendix in the TMDL. Including your comments in the TMDL means they will become part of the public record regarding Birch Stream.

1. **Propylene glycol is listed as a stressor in the TMDL, because it affects the dissolved oxygen in the stream. The available toxicity literature does not list propylene glycol as toxic to aquatic organisms, but it does effect the streams environmental condition and the suitability of habitat for aquatic organisms. Loading propylene glycol creates an oxygen demand that means the stream does not support a community of aquatic organisms consistent with water quality standards.**

   This does not directly address your concerns for the health of nearby residents, but the issue of discharge of propylene glycol into the stream has been identified major problem, beyond the TMDL. Bangor International Airport (BIA) and Air National Guard (ANG), have spent about $3 million to control the problem and there is every indication that they are working to eliminate the discharge. The TMDL attempts to balance the issue by acknowledging the stressor and BIA and ANG's efforts to solve the problem.

   The recommendation is outside of the scope of the TMDL, but is worth pursuing with DEP's Bureau of Remediation in Bangor.

2. **The concerns raised about valves are specific operational concerns that may affect the stream in the future. These items could be addressed through the watershed management process. You could also refer your questions directly to the DEP's L&W licensing staff or BIA and ANG.**

3. **The stream covered by the TMDL has been defined as requested on pg 5, paragraph 1. All activities within the watershed that affect the stream will be considered during the watershed planning process. The headwaters of most streams begin as small runoff channels that combine to create a stream as the water moves down grade. The headwaters of Birch Stream have been channelized and piped through a series of development projects and the remaining natural channel is identified in the TMDL.**

4. **The City of Bangor has expressed the desire to change Birch Stream from a Class B to Class C, but does not have the legal authority to change water quality classification. A Use Attainability Analysis (UAA) process is the only way to legally downgrade the classification of Birch, and this must be initiated by DEP and needs to be approved by USEPA. This process requires all potential restoration efforts be completed before the stream can be reclassified as 'C', which means that the TMDL must be completely implemented before reclassification can be considered.**

5. **The recommendation in the TMDL to plant trees and shrubs is to create a riparian buffer, which treats overland runoff and has positive benefits for water quality.**

6. **This may warrant further investigation as the watershed management plan proceeds.**

7. **Erosion is a common consequence of hydrological impacts due to runoff from impervious surfaces. When the land cover is converted from forest and grassland to impenetrable pavement the stormwater that runs to stream increases in volume and frequency. Typically greater stormwater volume causes the banks to erode and changes the channel. Stream channels are dynamic and do change naturally, but stormwater from impervious surfaces has far reaching negative impacts on stream condition.**

8. **Adding more development and pavement in the watershed is a concern and needs to be addressed in the watershed management plan. New development can be constructed using 'low impact' design criteria and have virtually no noticeable impact on the stream, but you would have to ask the City of Bangor if low impact best management practices (BMP's) are being incorporated into the new development.**

9. **The mapping effort that the City described is an essential first step to developing a comprehensive management plan and it is my understanding that this is a priority for the City.**

10. **Monitoring as a result of the TMDL will focus on attainment of applicable water quality standards. DEP will be looking indicators of aquatic health, such as the condition of the macroinvertebrate community or dissolved oxygen. We use the macroinvertebrates as indicators of health because the community integrates environmental conditions over a long period of time, which should avoid the type of potential manipulation you described. DEP will conduct adaptive testing, based on need, which is defined as either a catastrophic event or implementation of significant BMP's.**

11. **These testing recommendation are noted and will be considered if DEP conducts further testing for propylene glycol.**

Unfortunately, the TMDL is not the proper forum for many of your concerns, but they have been noted and will influence the direction of future watershed planning efforts. Please don't be discouraged, your participation in the process helps to move stream restoration in a positive direction and improve the local environment for residents.

Sincerely,

Melissa Evers
Environmental Specialist III
Maine DEP

26 Sep 2005

MEMORANDUM FOR Maine Department of Environmental Protection

FROM: 101 ARW/EM
99 Glenn Avenue Suite 494
Bangor IAP, ME 04401-3054

SUBJECT: Maine Air National Guard Comments on Birch Stream Total Maximum Daily Load Draft Report Review

1. The Maine Air National Guard (MEANG) appreciates the opportunity to comment directly to the Maine Department of Environmental Protection (MDEP) regarding the Total Maximum Daily Load (TMDL) Draft Report developed by MDEP and their consultants. The MEANG continues to commit to improving water quality conditions in the Birch Stream Watershed and we will continue ongoing strategies to reduce pollutant runoff from our installation.

2. The draft report does not directly state, but does imply the existence of Birch Stream on the southerly side of Union Street. Though MEANG does not contest the idea that head waters historically existed somewhere on the current airport complex; various parties clearly altered the location *prior* to federal or state regulations regarding these types of activities. However, northerly of the Airport Mall MEANG believes Birch Stream is essentially in its natural location. There are at least three airport complex man-made major drainage ways that converge at or near Union Street where they flow under the Airport Mall (from south to north). Thus, on page 5 in the first paragraph of the draft report, we believe it is in the best interest of all concerned to remove location references to Birch Stream southerly of the northerly boundary of the Airport Mall.

3. The "Impervious Cover Method" (IC Method), used to estimate current and target annual volumes and annual pollutant loading from Birch Creek is a highly simplistic method. We feel this method is an overly simplistic approach for this TMDL; however, we agree with the overall implementation effort to identify potential "hot spots" and implement strategically-placed BMPs throughout the watershed. The IC Method approach is limited in that it does not produce accurate quantification of loadings from individually permitted entities and we agree with MDEP's decision to not translate reductions identified in the TMDL report to permit modifications or limits.

4. MEANG concurs with the draft report's conclusion that deicer run-off is a less important stressor now and in the future than it was historically. Since December 2003, both the airport and MEANG significantly reduced deicer run-off by capturing deicer and diverting it to the Bangor Wastewater Treatment Plant conveying it through the City sewer system.

5. MEANG does not believe it is viable source for the aluminum, semi-volatiles, and petroleum aromatic hydro carbons detected during November 2003. Soil sampling on the industrial complex in the storm water conveyance system does not even exhibit these characteristics. Sediment and water sampling by both the US EPA and the MEANG during June of 2005 in response to an April 3rd, 2005 petroleum release from an unknown source on the BIA complex resulted in either non-detection or very low detection levels of organics. Sediment and water sampling occurred at locations selected by US EPA officials starting near Union Street and following the storm water conveyance system back to the detention pond on the MEANG base. MEANG and the US EPA furnished the results to the MDEP.

6. Table 2 of the draft indicates documented spills and dumping as "likely sources" of toxic contaminants. "Dumping" is not defined anywhere and leads the reader to believe some sort of

illegal activity occurs by particular land users. There is no documented history of toxic dumping in the Birch Stream watershed by MEANG. MEANG closed its Installation Restoration Program (IRP) actions in the late 1990's. MEANG has an extensive history of cleaning up spills (substantial amounts of reported spills are below 10 gallons) before they've reached the storm water system. Typically, personnel from the Maine DEP or US EPA have been on hand to observe and guide the clean-up of those spills to high standards. In summary MEANG believes it is *unlikely* that spills on its site are a "likely source" of toxic contaminants.

7. MEANG established multiple sampling points to accomplish its NPDES Phase I permit requirements in addition to developing longer term data. During the summer of 2005, MEANG studied its run-off from the base as shown in the table below. NPDES 2 is the point run-off leaves the base at the detention pond by the airport Fire Department. Based on a review of various regulations and studies conducted nationwide, conductivity less than 500 µS/cm appears to be acceptable criteria for urban streams. Semi-weekly measurements made at the discharge point from the MEANG base found during the summer of 2005 indicated an average of 357 µS/cm with a maximum of 490 µS/cm (17 August 2005) and a minimum of 189 µS/cm (25 July 2005).

8. Both MEANG and BIA have site location of development permits and a high degree of control over the volume, duration, and intensity of run-off from their respective sites. Based on calculations by Maine licensed civil engineering consultants, MEANG has excess capacity over required flows during storm events and in fact, reduced flows compared to those in place when Dow Air Force Base was the occupant of the site. Related to flows, the IC method characterizes an impacted stream as:

> **"possessing a watershed impervious cover ranging from 11 to 25 percent, and showing clear signs of degradation due to watershed urbanization. The elevated storm flows begin to alter stream geometry. Both erosion and channel widening are clearly evident. Streams banks become unstable, and physical habitat in the stream declines noticeably."**

Birch Stream geometry is relatively constant with little or no bank erosion except in the case of the bank just below Ohio Street where the slope changes from relatively flat to steep including a transition to a small waterfall. Radical or constant changes in stream geometry for this site tend to result more from aquatic mammal habitat (i.e. beavers) development and less as a result of storm water run-off. The impact on flow control by wildlife has little or no mention in the draft report but is significant on the ground.

9. In addressing the fourth stressor, elevated water temperature, MEANG also evaluated temperature at NPDES 2. Semi-weekly measurements made at the discharge point from the MEANG base found during the summer of 2005 indicated an average of 17.5º C with a maximum of 21.1º C (15 August 2005) and a minimum of 11.1 ºC (6 June 2005). Sampling generally occurred around 0900 on the date listed. Note that 20º C is equivalent to 68º F which is suitable for cold water species such as Brook Trout.

10. With regard to the sixth stressor, elevated nutrient loading, MEANG does not have data to compare to MDEP data. However, MEANG will begin collecting total phosphorous and total nitrogen data later this year in an effort to more thoroughly analyze the timing and quality of these nutrient loads. However, based on discussions with many engineering consultants, impervious surfaces alone are not typically considered to be significant sources of these nutrients. Typical sources include intensive fertilizer use and lawn care practices along with poor erosion and sedimentation control practices on construction sites. Please more clearly define the degree of concern for phosphorous and nitrogen.

11. Table 4 (page 24) identifies Event Mean Concentration (EMC) values for Total Phosphorus and Total Nitrogen based on a Center for Watershed Protection (CWP) publication from 2003. Numerous EMC values are available in the literature and these values can vary widely

depending on such factors as soil type, land use type, the presence or absence of BMPs, percent impervious area, and others. The TMDL report does not specify why the CWP values were chosen, the origin of the study in which the EMC values were calculated, and if the site specific conditions of that study are similar to the conditions represented in the Birch Stream watershed. Table 4 also identifies a "Table 16" as a source for pollutant concentration information. Please more completely explain Table 16 of the CWP.

12. MEANG supports the MDEP's decision to use annual Total Nitrogen (TN) and Total Phosphorus (TP) Load estimates for descriptive purposes (Page 26, Paragraph 1). Storm flow monitoring on 11/20/03 at Station S312 revealed a TP concentration of 0.084 mg/L. While this single sample is not a full representation of storm flow conditions at this station, which are represented by multiple samples collected over an entire storm event, it is significantly less than the TP EMC value of 0.32 mg/L used to calculate the TMDL. Site specific EMC values may be appropriate if the MDEP anticipates using the EMCs for decisions other than descriptive purposes.

13. The report cites dumping as a likely source of major toxic pollutants. Historic use of Birch Stream as a dumping ground is well documented. Based on conversations at a stakeholder meeting on September 26th at the Maine Department of Environmental Protection, "dumping" apparently refers to the solid waste found during the fall 2003 clean-up. In the fall of 2003, MEANG, BIA, and City employees conducted a stream clean-up removing literally tons of universal and municipal solid waste. The waste included in excess of 200 shopping carts with the names of retailers no longer doing business in the area for in excess of 20 years. Shopping carts, typically coated with chrome as a corrosion inhibitor, cannot help but to undergo corrosion after this many years in an outdoor environment. Also removed were vehicle batteries, furniture, car parts, tires, and other trash. Please modify the TMDL Final Report to reflect use of appropriate technical terms (e.g., municipal solid waste, universal waste) to characterize the waste.

14. The Birch Stream TMDL calls for a watershed-wide 65% reduction in impervious area with a goal of 8% impervious area. It is unclear why Impervious Area is used to set the TMDL target when a significant effort was made to identify site-specific stressors. While a general correlation does exist between impervious area and stream degradation, reducing impervious area by 65% does not ensure biological habitat improvement or stream quality without also reducing stressors. Thus, rather than selecting a target that is likely unachievable and difficult to measure, it may be more appropriate to base the TMDL on parameter(s) which have a known affect on water quality and can be more easily quantified and reduced based on the implementation strategies outlined in Section 5. MEANG will not be able to make significant reductions in the impervious areas at the installation. Most of the implementation strategies outlined in Section 5 targeted reducing pollutant runoff from impervious areas and restoring stream uses and do not contribute toward the TMDL goal of 8% impervious area. Only one strategy, "Conversion of Impervious Surfaces," addresses the TMDL target of eliminating impervious area.

15. On page 8, in paragraph 1, MDEP mentions that a "large amount of biological, chemical, and physical data" was collected during 2003 as part of an effort to gain a better understanding of specific stressors in Birch Stream. This information is relevant to the TMDL and would be valuable to the reader as an appendix to the report. Please also consider including monitoring data used to identify Birch Stream as impaired on the 2002 and 2004 Integrated Water Quality Monitoring and Assessment Reports in an appendix.

16. From the photos, it appears that station S384 (below the Airport Mall) is located in a pool area. Aquatic insects, particularly Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa species used for looking at the "health" of a water body, would likely not survive in a pool habitat given their need for highly oxygenated and mostly flowing waters, regardless of other water quality constituents. In this area, benthic surveys may not be the best or appropriate indicators of

aquatic health. Based on the September 26th meeting, the station was in-fact relocated to an appropriate location after beavers stagnated the water at the first location. Please clear this fact up in the final report.

17. In terms of management and mitigation, MEANG wants to cooperate with BIA, the City, regulators, and the general public. MEANG is fully engaged as a partner in the Bangor Area Storm Water Working Group. MEANG has also been working under a NPDES Phase multi-sector general permit for over 5 years with a fully implemented storm water pollution prevention plan. The MEANG environmental manager, in coordination with BIA and City staff would be more than happy to provide valuable information to businesses and residents in the watershed regarding the importance of joint environmental stewardship roles and responsibilities shared by everyone.

D. ERIC JOHNS, LT COL, MeANG
Environmental Engineer

January 5, 2006

D. ERIC JOHNS, LT COL, MeANG
Environmental Engineer
101 ARW/EM
99 Glenn Avenue Suite 494
Bangor IAP, ME 04401-3054

RE: Response to Maine Air National Guard Comments on Birch Stream Total Maximum Daily Load Draft Report

Dear Eric,

Thank you for providing substantive comments that will help strengthen the final draft of the Birch Stream TMDL. I will address comments based on the numbers listed in your review and both will be included as an Appendix in the TMDL.

GENERAL COMMENTS

1. **MEANG's demonstrated commitment to water quality improvement will add value to future watershed management plans on Birch Stream.**
2. **For the purpose of the TMDL, the stream has been defined on pg 5, paragraph 1, and in Figure 1. It identifies a naturally flowing portion of the stream with an eroded base and meandering channel. It is unclear how this differs from your description, so please provide a marked map to clarify the discrepancy.**
3. **The Impervious Cover Method (%IC) is simplistic by design since more elaborate modeling approaches are more costly and time consuming to develop. Secondly, the recommended outcome of other modeling approaches would not be any different from the recommendations of the %IC method. MDEP could have written a TMDL based on in-stream metals limits that might place end of pipe metals and nutrient limits on every stormwater pipe. Maine DEP chose the %IC method as way to expedite the TMDL modeling phase and move quickly into the implementation phase. Our goal is to find an effective and efficient mechanism to fix the stream.**
4. **DEP knows the deicer runoff will be a continuing challenge for MEANG and Bangor International Airport (BIA) and both have demonstrated a commitment to control the problem.**
5. **Good information since identifying the original source of hydrocarbons is difficult.**
6. **The 'Dumping' listed in Table 2 is a general concept without pointing to any source in particular.**
7. **Maine has no specific water quality criteria for conductivity values, but the phrase, 'high conductivity levels', on page 9, refers to comparisons with conductivity levels generally found in Maine streams. Maine streams tend to be 'soft water' and have naturally low conductivity values, below 100 µS/cm, and a value of 500 µS/cm would be considered high in Maine (there are some naturally well buffered, high conductivity streams in Maine, but these are the exception). The average of 357 µS/cm measured on the MEANG base may be the result road salt runoff and associated salt accumulation in ground water. High conductivity levels are generally considered an indicator of unspecified contaminants that may warrant further investigation.**

8. **First, MEANG and BIA Site Location of Development Permits are designed to address specific projects, but do not address the impervious surfaces that existed before permits were required. This means that excess capacity for permitting purposes is not the same as adequate capacity based on the impacts to the receiving stream. The TMDL describes the need to define BMPs and storage capacity on the scale of the whole watershed. Next, the stream channel was described as having high levels of eroding banks and geomorphic instability in a fluvial geomorphic assessment conducted by the hydrogeomorphologist, John Fields. My observations in 2005 also indicate active sediment transport with on going deposition of fresh sandy material in the streambed. The point about wildlife, referring to beavers, is well taken and is included on pg 5.**
9. **Instantaneous measures of temperature at 9:00 am are valuable, but do not detect diurnal variation. Daily maximum temperatures that dictate habitat suitability tend to occur in the early evening. Continuous datalogger measurements are the most effective way to detect the daily maximum temperatures, and DEP's dataloggers consistently found temperatures on excess of 25 ºC in August, 2003. BMP's that reduce summer water temperatures should be considered during the watershed planning process.**
10. **Impervious surface is used as a surrogate for the suite of observed stressors and may be an indirect conduit for any of the stressors. The exact sources of nutrients are not identified in the TMDL, but the impact of nutrient enrichment has been observed through low dissolved oxygen (DO), diurnal DO fluctuations > 2mg/l and the occurrence of macro-algae. The respiration of excess algal communities produce diurnal DO fluctuations that exceed 2 mg/l and the observed algal growth is directly connected to nutrient enrichment in freshwater.**
11. **The Event Mean Values (EMC) were chosen from a Center for Watershed Protection (CWP) publication by Schueler, that defines the connection between impervious cover and water quality impacts. The methods used in the TMDL are based on the report 'Draft Pilot TMDL Applications Using the Impervious Cover Method', produced by engineering firm ENSR, under contact to USEPA. The term 'Table 16' will be eliminated, since it is simply a reference to EMC literature values. The 'C' value in the 'Annual Pollutant Load' equation could be derived from literature or observed EMC values and used to calculate pollutant loads for a variety of metals. The equation enables calculation of a variety of pollutant loads in lbs/year, but these are not actually calculated in the TMDL. These loads represent highly variable estimates that would be difficult to reproduce for the purposes of measurable target limits and the TMDL endpoint is attainment of water quality standards.**
12. **As MEANG suggests, the use of site specific EMC values would be ideal and MDEP will consider developing Maine specific values for use in future TMDL's.**
13. **The suggested terms have been added to Table 2 on page 10.**
14. **We could have written a TMDL based on specific metals in-stream limits that would very difficult to attain and would not adequately address the cause of the observed problems. MDEP chose the %IC method as way to expedite the TMDL modeling phase and move quickly into the implementation phase. Our goal is to find an effective and efficient mechanism to fix the stream. The TMDL must demonstrate that the target will insure attainment of water quality standards; otherwise the TMDL will not meet the legal requirements of the Clean Water Act. The use of 8% as the target is based on information that correlates attainment of Class B aquatic life standards with impervious surface in Maine watersheds. While 8% may seem impossible to attain in a highly developed watershed, through the implementation of well designed BMP's the impact of the impervious surface can reduced to levels approaching 8%. The target can also be viewed as setting a hydrograph target in the impaired stream segment that would approximate an 8% developed watershed. This work has been done in other urban watersheds and by using an adaptive approach to implement BMPs overtime Birch can achieve Class B aquatic life standards. MEANG site contributions towards restoration will be examined in**

the context of the entire watershed and success will be measured in the stream, not by site specific %IC.

15. **This information is in a report cited in the TMDL and can be found on MDEP's website at http://www.maine.gov/dep/blwq/docmonitoring/stream/urban/index.htm . It is not included in the TMDL since it is lengthy.**
16. **MEANG's observation on habitat requirements of aquatic insects is correct. The TMDL summarizes information collected by MDEP's Biomonitoirng Unit and does not provide details on sampling protocols, which is available on request.**
17. **Restoring Birch Stream will be challenging and MDEP looks forward to working with MEANG to implement strategies that will insure future compliance with the Clean Water Act.**

I hope my responses have added to your knowledge of the TMDL and how this TMDL contributes to the overall goal of attaining Maine's Water Quality Standards on Birch Stream..

Sincerely,

Melissa Evers
Environmental Specialist III
Maine DEP

Cc:
Don Witherill, DEP
MaryEllen Dennis, DEP
Jeff Dennis, DEP

January 25, 2006

Melissa Evers
Maine Department of Environmental Protection
Bureau of Land and Water Quality
State House Station 17
Augusta, ME 04333

RE: Birch Stream Draft TMDL
City of Bangor Comments to DEP Response Dated December 28, 2005

Dear Melissa,

The City agrees that Birch Stream is an impaired waterway. We also agree that it would be prudent to implement a Watershed Management Plan with the goal or restoring Birch Stream to an unimpaired status.

While the City agrees with DEP on these two points, we understand that the DEP has certain obligations to undertake an intermediate process called a Total Maximum Daily Load, or TMDL.

The City is willing to work with DEP in this process. To further the process, we offer the following general comments as a means to make sure that we are clear in our understanding of the TMDL process.

Goals and Targets

We understand the definition and relationship of goals and targets, but we are greatly concerned that the general public will not.

Following is our understanding of the goals and targets:

- **The GOAL of the Clean Water Act is for all water bodies to comply with established Water Quality Standards.**
- A developed area that has less than about 10% impervious cover causes minimal impairment of established Water Quality Standards from stormwater runoff.
- **To allow for a factor of safety (or margin of error), the recommendation is to say that a developed area that has less than 8% (rather than 10%) impervious cover causes minimal impairment of established Water Quality Standards from stormwater runoff.**
- **There is technical documentation that correlates certain sources of water quality impairment with impervious cover, with higher percentages of impervious cover mathematically related to higher degree of impairment.**
- **Stormwater runoff impacts from developed areas with impervious cover greater than 8% can be made to resemble developed areas with 8% impervious cover, (and presumably meet water quality standards) through the use of certain behavioral or physical modifications commonly called Best Management Practices, or BMPs.**
- **Making stormwater runoff impacts from a highly developed area resemble a developed area with 8% impervious cover therefore becomes a TARGET for the implementation of these BMPs in a watershed.**

- **It is NOT the intent to physically reduce impervious cover to 8%.**

If this understanding is correct, we ask that this language be included in the TMDL document, perhaps as an executive summary.

Stormwater Regulations

Stormwater regulations are multifaceted, often confusing, sometimes overlapping, and with different reporting requirements.

We are aware of a number of separate regulations regarding stormwater. Following is our understanding of current regulatory programs:

- **Stormwater Phase I, also known by the name of "Multi-sector General Permit", applies to certain industrial facilities, including Bangor International Airport, the Maine Air National Guard, and an unknown number of private entities in the watershed. The entities covered by this regulation must have Storm Water Pollution Prevention Plans and may be required to undertake monitoring and testing of stormwater leaving their facility. This program has recently been delegated to the State of Maine Department of Environmental Protection.**

- **Stormwater Phase II, applies to Municipal Separate Storm Sewer Systems (MS4) and certain governmental agencies, in Urbanized Areas greater than 50,000 population. It is also known as the "MS4 General Permit". It applies to the City of Bangor, the Maine Air National Guard, and the University College in Bangor. This regulation requires the implementation of six control measures that, when fully developed and implemented, is presumed to be sufficient to meet water quality standards.**

- **Chapter 500, The State's newly revised Stormwater Management regulations, apply to construction activities that disturb one or more acres of ground. Various levels of standards apply depending on the amount of impervious area in the development and the location of the development with respect to Urban Impaired Streams. Certain developments fall under other regulations such as the Site Location of Development Law, also known as SLODA. .**

- **Stormwater Management Law (Title 28, Chapter 3, Article 420-D) has stormwater language that applies to existing sources.**

- **The TMDL Program, which applies to impaired water bodies, is intended to identify causes of water quality impairment**

We wish to have the relationships and priority status of these various regulations made clear such that all stakeholders and the general public can fully understand.

Regulation Implementation and Maximum Extent Practicable

We are concerned that all of the above-mentioned regulatory programs addressing stormwater issues are seriously under-staffed and under-funded on the state level. This situation will create approval gridlock and will likely impose additional financial and staffing burdens on the regulated entities within the watershed.

We are concerned that there may be MSGP entities within the watershed that are unaware or unconcerned of the requirements and responsibilities under the MSGP program.

The Stormwater Phase II (MS4) program is only in its third year, with many aspects of the program

currently being addressed cooperatively on a statewide and/or a regional basis. We are concerned that there has not been enough implementation time to evaluate the effectiveness of that program with regard to improved water quality in Birch Stream.

We are concerned that the TMDL program could impose requirements that may be beyond the Maximum Extent Practicable to achieve desired results. The TMDL program for Birch Stream (and other Urban Streams throughout the state of Maine) has the goal of achieving water quality standards with no guarantee that the designated water quality standards are actually achievable in an urbanized area.

Are there any documented success stories of urban streams being restored to the levels anticipated here in a reasonable cost-effective manner?.

We are not suggesting a downgrade. We just want some assurance that this is not an expensive set-up for failure.

Impervious Cover Method

We continue to have reservations regarding the use of a very basic Impervious Cover (IC) approach to address issues of water quality impairment to Birch Stream.

We have carefully reviewed the report entitled "Pilot TMDL Applications using the Impervious Cover Method" by ENSR Corporation dated October 2005, ("The Report") and do have a few comments that apply to the Birch Stream TMDL.

Determination of Watershed Impervious Cover

"The Report" states that land use cover and impervious cover GIS data are required to support determination of watershed impervious cover. For the Birch Stream TMDL, land use data was derived from "Maine Combo Landcover", a GIS layer developed by MDEP staff that combines data from both Maine Gap Analysis Program (GAP) and USGS Multi-Resolution Landcover Characterization (MRLC) coverages, both based on 1992 Land=Sat TM satellite imagery.

For the Birch Stream watershed, the use of 1992 data raises questions as to the accuracy and reliability of the reported result of 33% impervious cover. Our analysis using more detailed mapping yields a different percentage.

It appears that this method of determining impervious cover does not consider position of impervious areas within the watershed. For instance, compare an area directly adjacent to a waterbody versus another similar area several thousand feet remote with no direct connection to the waterbody. The impacts of such areas on water quality are different.

It is not clear if or how this method of determining impervious cover considers BMPs already in place. Whereas the TMDL suggests that the implementation of various BMPs is the means of achieving the water quality standards associated with a lower percentage of impervious cover, there is no apparent recognition that many BMPs are already in place, such as detention ponds, the 38,000 evergreen trees planted in 1990-1991, berms constructed, catch basin sumps and traps, etc….. Stormwater runoff impact mitigation achieved from existing BMPS needs to be taken into account.

The Birch Stream TMDL Report suggests that Propylene Glycol is the stressor of significance. Yet, the use of Propylene Glycol by the Airport and Air National Guard for aircraft deicing operations has no relationship whatsoever to impervious cover of the Birch Stream Watershed.

"The Report" also looks at another drainage area in the City. It is noteworthy that the Arctic Brook drainage area has a higher IC percentage (38%) than the Birch Stream watershed (33%), even though it is predominantly a residential area. Residential land use is generally viewed as less intensive than commercial or industrial, which are fairly extensive in the Birch Stream watershed.

Target of 10% (or 8%) Impervious Cover

"The Report", states that "….research indicates that a decline in stream quality occurs when impervious cover (IC) for a watershed exceeds 10%….."

It is important to understand what degrees of impervious cover are associated with typical land use patterns:

For example, a typical rural **residential development of one acre houselots (43560 sq ft) plus the lot's share of street right of way (5128 sq ft) has a total land area per house lot of 48778 sq ft. A typical impervious area for this house lot would include half of the paved street frontage (3150 sq ft), paved driveway (480 sq ft), and a modest sized 30' x 40' house (1200 sq ft) plus a two car garage (576 sq ft) for a total impervious area of 5406 sq ft. The IC of this illustration is 11.1%.**
+
In contrast, a clustered development such as the residential complex adjacent to Birch Stream known as Griffin Park has an impervious cover of 39.03%, composed of buildings at 12.38% and paved areas at 26.65%.

"The Report" goes on to say "The 9% IC Metric is a target to attain water quality standards (WQSs) through implementation of BMPs".

It is unclear what the direct correlation is between a given BMP and a given amount of impervious area.

Improving the Process

Although the TMDL is a necessary process for DEP to undertake, we believe a more intensive approach is the most effective in achieving water quality improvement in Birch Stream.

Such an approach would involve developing a Watershed Management Plan following the guidance contained in the EPA document entitled "Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters" dated October 2005. Several of the steps contained in this handbook are actually very similar to an intensive TMDL. We believe this approach will provide a better understanding of the watershed and yield greater improvement in a shorter time. It will also focus resources on those BMPs that are most beneficial, and will recognize those BMPs that have already been implemented.

This Handbook includes the following procedures:

- **Build Partnerships.**

  Interest in the Public Participation process has historically been difficult to achieve except for the most controversial projects. Even Personal Letters to significant stakeholders have failed to generate much interest. This issue has been raised in workshops and seminars of water quality professionals, and no one seems to have an answer. We will need to make a significant effort here to identify all stakeholders within the watershed, both those who have been identified as sources of pollution and the remaining parties that

do not contribute any pollutants at this time. The City proposes that EPA and DEP be partners in this effort to restore Birch Stream.

- **Define Scope of Watershed Planning Effort.**

  The general Scope of Work is to implement the remaining steps of the Watershed Plan, including the application of sound science and. establish what other parties would be required to share in the clean-up of Birch Stream and what percentage of the clean-up efforts they would be accountable for.

- **Gather Existing Data and Create an Inventory.**

  Much data has been collected over the past few years by the DEP, the Airport, and the Air National Guard.

- **Identify Data Gaps and Collect Additional Data Needed.**

  Determine the source of all stressors, including wildlife and organisms and micro organisms if possible. Whereas the portion of the watershed upstream of the defined origin of Birch Stream is composed of pipes and channels, sampling and monitoring locations can be selected to determine the impairment fraction of various branches of the drainage system. The data collection would also include a determination as to whether or not organisms are native or non-native species to Birch Stream and the impact these organisms may have on overall water quality. There is also a lack of data on the flow patterns of Birch Stream, and flow gaging for several years may be warranted.

- **Analyze Data to Characterize the Watershed and Pollutant Sources. We believe that this step, if taken in its logical sequence, will be more acceptable to the watershed stakeholders than the characterization depicted by the Impervious Cover Method. If perchance the results are similar, then this effort by the Birch Stream stakeholders will provide further documentation regarding the IC method in a manner that is scientifically (and politically) defensible.**

- **Estimate Pollutant Loads.**

  This should be a straightforward procedure once the appropriate data has been gathered and characterized.

- **Set Goals and Identify Load Reductions.**

  Again, this should be a straightforward procedure. The goals are to achieve water quality standards. Load reductions are the difference between Actual loads and those loads that can comply with water quality standards.

- **Evaluate Options and Select Final Management Strategies.**

  This is a technical process that will quite possibly require the input from qualified professionals in Urban Wet Weather Practices, and will be accomplished following completion of the above procedures

- **Design Implementation Program and Develop Watershed Plan.**

  Again, this is a technical process that will quite possibly require the input from qualified professionals in Urban Wet Weather Practices, and will be accomplished following completion of the above procedures. The Watershed Plan would establish time periods at

which stakeholders and DEP staff would meet to assess clean-up progress and revise clean-up methodology if necessary based upon progress to date.

- **Implement Watershed Plan and Measure Progress.**

  A date will be established at which time there will be an assessment as to whether or not Class B water quality standards have been met or whether or not Class B water quality standards are attainable in Birch Stream and determine what future action, if any, is necessary. It is understood that this will be an adaptive management process, and that the evaluation process may well indicate the need for additional efforts.

We encourage and look forward to further dialogue.

Respectfully submitted,

John L. Murphy, P.E.
City of Bangor Engineering Department

March 1, 2006

John Murphy
Assistant City Engineer
City of Bangor
73 Harlow Street
Bangor, Maine 04401

RE: Response to City of Bangor Review Comments on Birch Stream Draft TMDL, Dated January 25, 2006

Dear John,

The attached draft of the TMDL reflects the changes and recommendations the City has requested. MDEP's response to each section of the City's comments is provided below, and both will be included in an Appendix of the TMDL.

Goals and Targets

Thank you for a clear restatement of the TMDL's goals and targets required by the Clean Water Act. The goal is compliance with water quality criteria in Birch Stream and 8% impervious cover is a target technically chosen to achieve compliance. The statement that '…developed areas with impervious cover greater than 8% can be made to resemble **developed areas with 8% impervious cover…' is correct. The resemblance is accomplished by incrementally applying watershed wide BMP's to achieve runoff characteristics approaching a watershed with 8% impervious cover, not by physically reducing pavement. One important point that is implied in the goal, but should be stated explicitly is that compliance with Maine's aquatic life water quality standards takes precedence over attaining the 8% target. MDEP believes that compliance can be attained well before the achieving the 8% target.**

As requested, this language is included in an executive summary on pages 6 and 7. These additions may help the general public distinguish the subtle differences and complex concepts described in the TMDL.

Stormwater Regulations

The TMDL Program focuses on developing assessment reports for impaired water bodies on Maine's 303d list, describing pollutants and listing the reductions needed to restore the waterbody. TMDL's on rivers with point source pollutants are part of a well established regulatory program; conversely recent TMDL's on small urban streams with stormwater impairments are not well established. Additionally, the fact that Stormwater Regulation is a new program means that the interaction between these two programs is evolving. The authority for regulating stormwater under the TMDL is defined by legal interpretations of the Clean Water Act and here is the list of the complex relationships that establish the authority:

- **Clean Water Act requires pollution to be limited through the Total Maximum Daily Load assessment**
- **Pollutant load allocations are a legally required element of the TMDL's**
- **The TMDL equation is defined as- TMDL= WLA + LA + MOS (Total Maximum Daily Load = Waste Load Allocation + Load Allocation + Margin of Safety)**
- **LA is the portion of the TMDL considered non-point source pollution and is not regulated under discharge licensing programs**
- **WLA is the portion of the TMDL equation that is regulated under existing point source or discharge licensing programs**

- **Stormwater from MS4s and regulated industrial activities (usually covered by the Multi-Sector General Permit) are now legally defined, by EPA, as WLA and therefore eligible for regulation under the discharge program.**

At this time, MDEP is working to clarify the relationship between Stormwater and TMDL's, while maintaining flexibility for the regulated communities and addressing concerns of the stakeholders.

Regulation Implementation and Maximum Extent Practicable

The City's raises a number of valid operational concerns that are duly noted, but most are outside the scope of the TMDL.

The concern that the Stormwater Phase II (MS4) program has not had enough time to improve water quality in Birch Stream raises issues about the intended scope of this program. The MS4 program is intended to educate on stormwater issues and implement BMP's that will address future stormwater impacts, not address existing sources. Birch Stream is impaired by historical stormwater impacts, therefore the TMDL is the most effective way to address the impairments. The 'Maximum Extent Practicable' is a standard that applies to the MS4 program and is superseded by the TMDL goal of achieving water quality standards.

MDEP understands the City is being asked to take on a significant investment in Birch Stream and investor's naturally seek to minimize risk and maximize success. The TMDL cannot absolutely guarantee attaining water quality standards since no one can completely control or predict all aspects of a complex ecological restoration. But the TMDL analysis is focused on assuring standards will be attained by dealing with the stressors identified through fieldwork and described in the report. Documented success stories of urban stream restoration can be found by typing, 'urban stream restoration success' into Google and a number of examples will come up.

MDEP understands that the City does not want to engage in, '…an expensive set-up for failure.', but if standards cannot be attained, then the next step is a UAA. The UAA means a reclassification to Class C which is probably within reach since Birch has met Class C in the recent past.

Impervious Cover Method

The City has correctly pointed out some of the limitations of the Impervious Cover Methods and the TMDL lists other limitations on page 28. The 1992 data source is a weak point, but it is the standard MRLC GIS coverage currently used in Maine and through out the United States. This coverage is due to be replaced this spring but it is a project outside of this TMDL. While using more current data would be ideal, it does not change the final recommendations to begin the process of a comprehensive watershed management planning and BMP implementation. The planning process is the time for updated landuse coverage and doing an inventory of existing BMP's to better understand specific contributions in the watershed.

The Propylene Glycol is a significant stressor that is not directly related to pollutants described in the Impervious Cover Methods and this chemical is treated differently. The TMDL identifies the Propylene Glycol as an immediate concern and it is being taken care of through control measures specifically designed to address this unique problem.

Target of 10% (or 8%) Impervious Cover

The relationship between a BMP and a given amount of impervious area is based on design criteria and the engineering specifications of each BMP.

Improving the Process

The TMDL can be viewed a tool or a step in the larger process of watershed restoration and MDEP agrees a Watershed Management Plan is the next critical step. For the most part, the items listed in this section could form the basis for a number of items needed to develop a comprehensive Watershed Management Plan and begin improving Birch Stream.

Outcomes from January 27, 2006 Meeting at Bangor City Hall-

Over the next 2 years-

- **The airports, MDEP and community residents will work together to resolve remaining issues with the presence of Propylene Glycol in the watershed.**
- **Air National Guard and the Bangor International Airports will continue to refine the deicer containment systems to minimize release into Birch Stream**
- **The City of Bangor will lead the development of a Watershed Management Plan, that will include an implementation plan and schedule consistent with the Birch Stream TMDL**

MDEP knows that the Watershed Management Planning process is a large commitment by all the stakeholders and we look forward to supporting the effort.

Sincerely,

Melissa Evers
ES III
Maine Dept. Environmental Protection

28 Jan 2006

MEMORANDUM FOR Maine Department of Environmental Protection

FROM: 101 ARW/EM
99 Glenn Avenue Suite 494
Bangor IAP, ME 04401-3054

SUBJECT: Maine Air National Guard Comments on Birch Stream Total Maximum Daily Load Draft Final Report Review (MDEP Document Name: TMDL Birch_RevsionB (2).doc)

1. The Maine Air National Guard (MEANG) appreciates the complete and detailed responses by the MDEP and the contractor on the August 2005 draft TMDL. The comments below continue to match by paragraph number the original comments submitted in September commencing with paragraph 3 below.

2. The Maine Air National Guard would like for all the comments received by the MDEP and their responses to become part of the final report in an appendix. This would provide the most complete record of the chain of events leading up to the decisions being made now and in the future. This would also provide other communities with information to make progress on the over 700 remaining miles of impaired water ways in our state.

3. We realize the MDEP is under a time constraint among other issues to implement the TMDL program. Even though we think the Impervious Cover Method (ICM) is technically weak for this watershed, we will work with the MDEP using this as a starting point. At the end of the day, we want the waterway to be removed from the "impaired water body" list as much as the community does.

4. MEANG recently completed Phase II of its deicer effluent control system and is in the process of developing models that account for the fate of deicer. Based on its own internal data, early information indicates significant improvements in management this season even over the previous seasons.

5. We appreciate MDEP's acceptance of this data.

6. We appreciate MDEP's edits with regard to this comment.

7. We intend to work with the City and our community to make every effort to reduce the conductivity. We would like to see MDEP put more effort into studying the local "norms" for the conductivity parameter as we move forward with improving the water quality.

8. Actually, in the case of land currently occupied by the Maine Air National Guard, most the site was undeveloped when the Site Location of Development law took effect. Initially, federal facilities were exempt from complying with state environmental laws. It was not until years after the law took effect that the MEANG obtained a permit. The calculations for our facility compare mostly farm and forest land to the currently developed site with our engineering controls still having some capacity based on state laws.

9. We concur that diurnal monitoring is preferred. We look forward to working with MDEP to reduce the thermal pollution of the affected water way.

10. We appreciate the additional information provided by MDEP. We will incorporate these ideas in our long term monitoring program.

11. In accepting the ICM for development of the TMDL, the MEANG wants to make clear that it intends to analyze existing structures in the storm water system against Maine Stormwater Best Management Practices Manual and take appropriate credit for removal of contaminants such as suspended solids and phosphorous. We will take additional action as warranted to meet goals and standards for discharges from our facility and conduct necessary sampling to support the efficacy of controls.

12. We appreciate MDEP's response with regard to this comment and look forward to helping develop local Event Mean Concentration (EMC) values.

13. We appreciate MDEP's willingness to accept this comment. We believe it significantly improves the intellectual quality of the material and removes inflammatory language that impedes cooperation.

14. As previously discussed, we will work with the MDEP using the existing model.

15. The report cited is quite lengthy and we concur the data may not significantly add to the final study. Please ensure the source of the methods is well referenced for future use and discussion.

16. We accept this comment from MDEP.

17. MEANG looks forward to working with the state, but most of all, we look forward to working with the local community and neighborhood to improve water quality. Not only do we work here, but, we live here raising our families and using resources like everyone else. We have several second and third generation families employed here making us true stakeholders in the final outcome. Environmental Stewardship is a commitment we fully intend to keep; we endeavor to sustain our community resources as we perform our national defense mission.

D. ERIC JOHNS, LT COL, MeANG
Environmental Engineer

March 7, 2006

D. ERIC JOHNS, LT COL, MeANG
Environmental Engineer
101 ARW/EM
99 Glenn Avenue Suite 494
Bangor IAP, ME 04401-3054

RE: Response to Maine Air National Guard Comments on Birch Stream Total Maximum Daily Load Draft Final Report Review (MDEP Document Name: TMDL Birch_RevsionB (2).doc)

Dear Eric,

Thank you for providing a clear reply to my letter dated January 5, 2006. Your reply did not require a detailed response by MDEP, but I wanted to acknowledge your letter and provide a brief update of the January 27 meeting on Birch Stream. I appreciate your participation at the meeting and share the sentiment that it would be great to move beyond the TMDL report and towards the next step in restoring Birch Stream, i.e. developing a Watershed Management Plan.

The attached Birch Stream TMDL reflects some changes requested by the City of Bangor, Maine Rivers and the Mitchell Center for Environmental & Watershed Research. So please review the changes on page 20 and note the addition of a summary fact sheet in the front of the report.

<u>Outcomes from January 27, 2006 Meeting at Bangor City Hall-</u>

Over the next 2 years-

- **The airports, MDEP and community residents will work together to resolve remaining issues with the presence of Propylene Glycol in the watershed.**
- **Air National Guard and the Bangor International Airports will continue to refine the deicer containment systems to minimize release into Birch Stream**
- **The City of Bangor will lead the development of a Watershed Management Plan, that will include an implementation plan and schedule consistent with the Birch Stream TMDL**

MDEP knows that the Watershed Management Planning process is a large commitment by all the stakeholders and we look forward to the participation of MeANG in the effort.

Sincerely,

Melissa Evers
Environmental Specialist III
Maine DEP

January 31, 2006

Melissa Evers
Maine Department of Environmental Protection
State House Station 17
Augusta, ME 04333

RE: Birch Stream Draft TMDL
Review comments

Dear Melissa,

We are pleased to submit comments on the draft TMDL for Birch Stream on behalf of Maine Rivers and the Senator George J. Mitchell Center for Environmental & Watershed Research.

These comments are in response to the draft TMDL; to comments on the TMDL by the City of Bangor and the Air National Guard (ANG); and to comments made by various parties during the January 27 meeting in Bangor.

We are gratified to see the cleanup of Birch Stream moving forward in a timely and cooperative manner, and hope these comments are helpful as you refine the TMDL, and move next into a watershed management plan.

1. We would like to see a demonstrated commitment on behalf of the State to meaningful community involvement, particularly during development of a watershed management plan and implementation phase of the TMDL. Concerned residents would like the opportunity for training on how to monitor the stream and air near their homes, so they do not need to rely on DEP response staff. Maine Rivers and the Mitchell Center look forward to working with the DEP to establish a citizen monitoring program for Birch Stream.

2. Birch Stream does not "originate" or "begin" at the outfall below the Airport Mall. Thus, we question the need to "clearly identify and define" Birch Stream as consisting only of the segment below the Airport Mall. This segment is the part of the stream that functions as a natural stream, and this is the segment that must meet water quality standards of the TMDL. However, historical maps show that Birch Stream originally began on the property now occupied by the airport, and the original stream channel was straightened and ditched to convey stormwater away from the airport property. The channelized and culverted portions eventually drain to the "natural" section of the stream. The lower "natural" section will never attain water quality standards if discharges to and contaminants in the upper, "man-made" section of the watershed are not addressed. Differentiating the stream from its headwaters does not contribute to the watershed approach required for this TMDL.

3. We question the City's requested insertion of the statement, "Birch Stream has a length of .5 miles. There are a total of 737 miles of impaired streams in Maine." This appears an attempt to make the half-mile section of Birch Stream seem insignificant. Birch Stream remains one-half mile of severely degraded aquatic habitat, it flows into a stream (the Kenduskeag) that supports Atlantic salmon, and is a potential resource to thousands of Bangor area residents.

4. The half-mile segment of Birch Stream below the Airport Mall flows behind, and is visible from, a city-owned housing complex (Griffin Park) and an assisted living facility (Sunbury). Approximately 2,000 people live within one-half mile of Birch Stream (based on 2000 Census data).

5. In their comments, the City questions why Birch Stream is Class B, citing the fact that it has been the "drainage ditch connecting the Airport Complex to the Kenduskeag Stream." It is the intent of the Clean Water Act to repair degradation of the nation's waterways. Birch Stream was

treated as a drainage ditch for the last 50 years, but that does not mean it is appropriate to continue treating it as such. To do so would be a violation of the Clean Water Act.

6. The City claims there is no public access and no public benefit because the stream flows through private property. We would argue that conveying stormwater and thus preventing flooding represents both a private and public benefit. The portion of the stream that flows behind Griffin Park is accessible (particularly to children or young adults who might find ways around fencing).

7. The City notes that capital investments made by the airport and ANG "will insure that propylene glycol will not be a stressor in the future." At the January 27 meeting, Ed Logue of the DEP stated that as airplanes leave the designated deicing area, drips of deicer fall to the ground and can wash into the stream. There is also likely drift from spraying the planes that also falls outside of the collection area. We would like the TMDL to include the statement by Logue, "This system will never capture 100 percent of the deicer." There are no standards for deicing mixtures that contain propylene glycol, and therefore it can not be said definitely that deicer will not be a stressor in the future.

8. We are not aware of any sampling of the sediments in the drainage ditches on the airport property. Since these channels have been in place for over 50 years, there is likely to be a significant legacy of contaminants, including deicer and its additives, which may be entering the stream during saturated, high flow, or other extreme conditions. We hope that the watershed management plan will address and if necessary remediate (dredge or retrofit) these drainage systems since they are the headwaters of Birch Stream. Similarly, it should be the responsibility of the City and the ANG to demonstrate on an annual basis that the retention ponds are effective and adequate and meet current stormwater standards.

9. While "adaptive management" has been mentioned as part of the TMDL implementation plan, there is no mention of planned and future expansion of the Airport, military, commercial, and residential development in the vicinity of Birch Stream. Expansion and increased traffic at the airport (recently reported in the Bangor Daily News) leads to increased use of deicer, increased chance for accidental spills and contaminated stormwater discharge. If possible, we would like the TMDL implementation to address new development and resulting increases in airplane and vehicle traffic.

10. At the January 27 meeting, the City cited the planting of 38,000 pine trees on the airport property during discussions of BMPs. These trees were planted in 1990-91 as part of a "beautification project," not to function as a riparian buffer or stormwater filtration. The trees were not planted to intercept the flowpath of stormwater runoff. However, the trees do provide shade and some degree of infiltration of rainwater and contribute to the perviousness of the watershed. Clearly, there will be more work needed to provide adequate stormwater filtration.

Thank you for the opportunity to comment. We commend the DEP for using the impervious cover method for the TMDL. This approach allows for creativity, flexibility, and cost-effectiveness in achieving the target. We look forward to working with the State, City, military, and Bangor residents to find solutions that will approximate 8% impervious cover. If successful, the Birch Stream TMDL could serve as a model and demonstration project for restoration of other highly degraded small urban streams.

Sincerely,

Catherine Schmitt
M.S. Ecology & Environmental Science
Senator George J. Mitchell Center for Environmental & Watershed Research
Naomi Schalit, Maine Rivers

March 2, 2006

Catherine Schmitt
Senator George J. Mitchell Center for Environmental & Watershed Research
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University of Maine
Orono, Maine 04469-5710

Naomi Schalit
Maine Rivers
9 Union Street
Hallowell, Maine 04347

RE: Birch Stream Draft TMDL-Review comments

Dear Catherine & Naomi,

Thank you for providing thoughtful comments that will help strengthen the final draft of the Birch Stream TMDL. I will address each numbered comment from your original submittal and will include both the comments and the response as an Appendix in the TMDL.

1. Community involvement is an essential component of the watershed management planning process and citizen participation will be encouraged by MDEP staff. MDEP is committed to assisting citizen monitoring on Birch Stream through the existing Stream Team program and will provide additional technical assistance as needed.

2. Your point on location of the historical stream channel is correct and well taken. The TMDL covers the natural stream channel that has existed for a number of decades and probably before the Clean Water Act was enacted. The contributing sources and conveyances in the entire watershed will be considered for control measures as restoration proceeds

3. The addition of the City's requested language did not change any of the determinations or recommendations of the TMDL. MDEP agrees that Birch is a valuable resource and is actively engaged in restoration efforts.

4. Thanks for providing the census information, which has been added to the first paragraph on page 8 of the TMDL.

5. Birch Stream will be eligible for a downgrade only after a Watershed Management Plan and all possible restoration efforts have been implemented. In all likelihood, Birch will meet Class B standards after the Watershed Management Plan has been implemented in the near future.

6. This issue has no significant bearing on the TMDL.

7. This information has been added on page 20 of the TMDL.

8. These are good suggestions and should be considered in the Watershed Management Plan. At this time it is impossible to predict how these concerns will be prioritized in light of limited governmental resources, but your participation may influence those priorities.

9. The TMDL is focused on identifying existing pollutant loads and sources, future development and growth issues will need to be addressed in the Watershed Management Plan. Concerns over future development pressure have been added to page 16 of the TMDL and should not be overlooked in the Watershed Management Plan.

10. The Watershed Management Plan will include an inventory of existing BMPs and determine the value the plantings to stormwater management in the watershed. There is little doubt that a comprehensive watershed assessment will call for more BMPs and the implementation of low impact development techniques.

Outcomes from January 27, 2006 Meeting at Bangor City Hall-

Over the next 2 years-

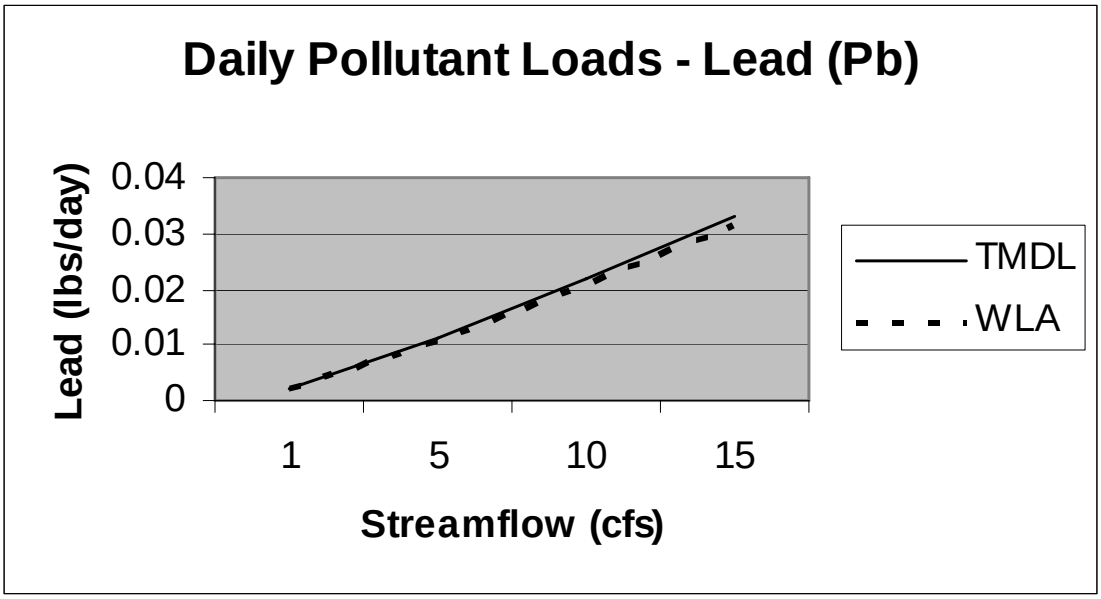
- **The airports, MDEP and community residents will work together to resolve remaining issues with the presence of Propylene Glycol in the watershed.**
- **Air National Guard and the Bangor International Airports will continue to refine the deicer containment systems to minimize release into Birch Stream**
- **The City of Bangor will lead the development of a Watershed Management Plan, that will include an implementation plan and schedule consistent with the Birch Stream TMDL**

Thank you for your support regarding the application of the Impervious Cover Method and please consider continuing your participation in the Watershed Management planning process.

Sincerely,

Melissa Evers
ES III
Maine Dept. Environmental Protection

Calculated Daily Pollutant Loads for Birch Stream

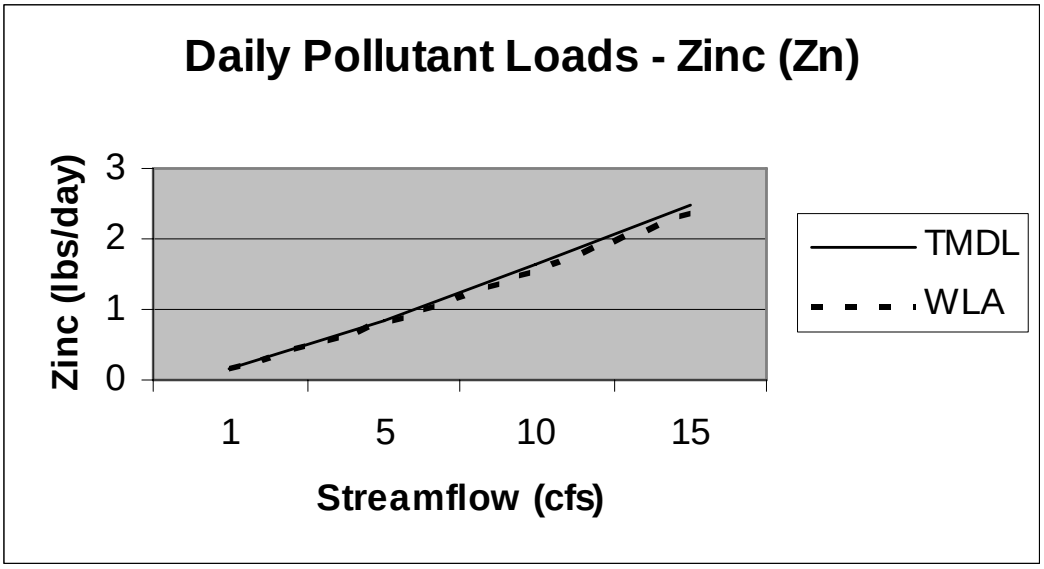


Calculated Daily Pollutant Loads for Lead in Birch Stream displayed on graph.

Daily Lead (Pb) Pollutant Loads	Based on Maine SWQC @ 20 mg/l hardness Pb Criteria Chronic Concentration **CCC = 0.41 (ug/l)**	
Stream Flow[1] ***(cfs)***	***TMDL[2]*** ***(lbs/day)***	***WLA (5%MOS)[3]*** ***(lbs/day)***
0.01	0.000022	0.000021
1	0.0022	0.0021
5	0.011	0.010
10	0.022	0.021
15	0.033	0.031

1. Stream Flow values based on the expected range of flows in Barberry Creek
2. TMDL = Total Maximum Daily Load calculated using flow and SWQC CCC
3. WLA = Waste Load Allocation is 95% of the TMDL or a 5% Margin of Safety calculated for the CCC

Calculated Daily Pollutant Loads for Birch Stream



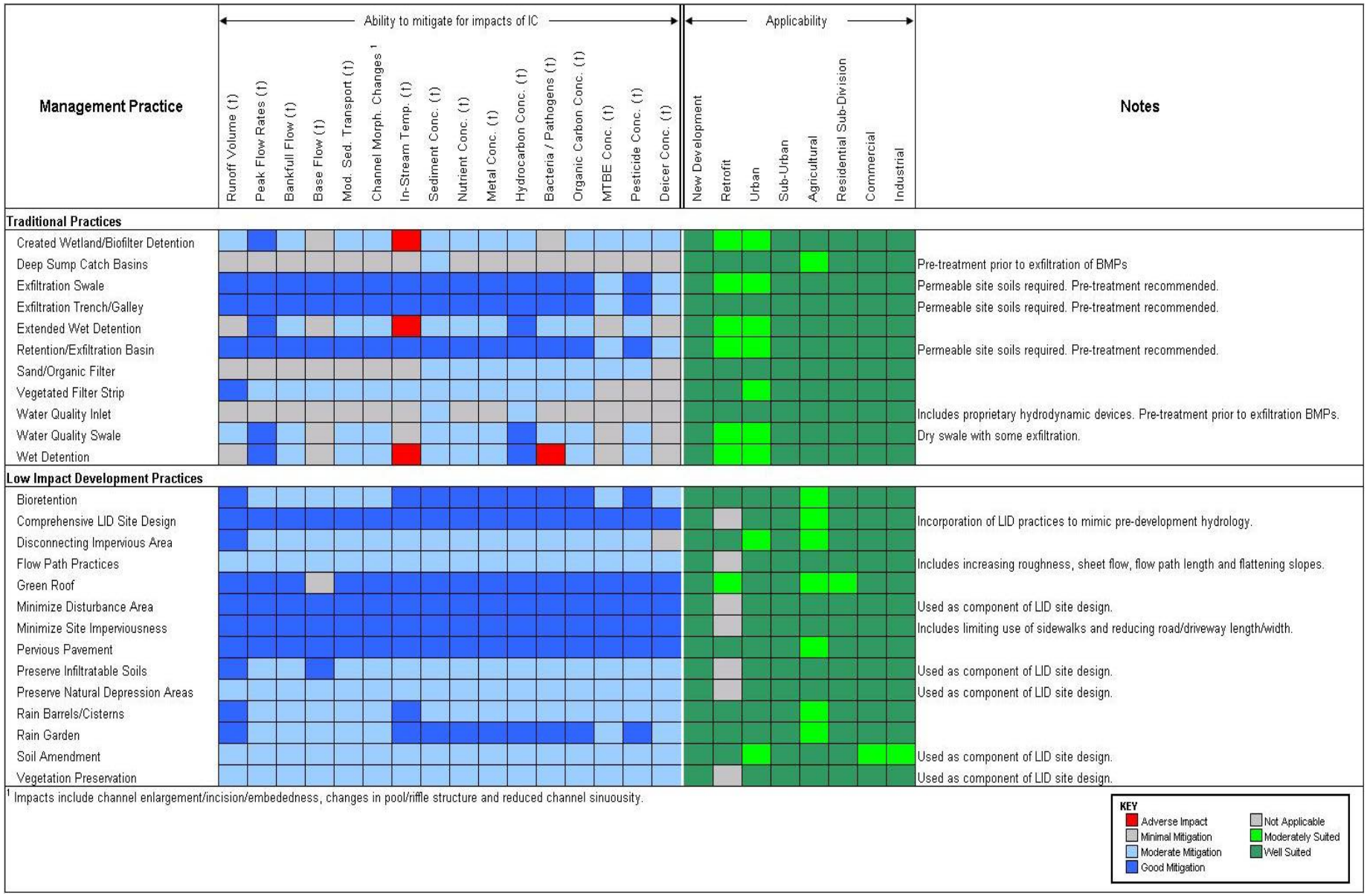
Calculated Daily Pollutant Loads for Zinc in Birch Stream displayed on graph.

Daily Zinc (Zn) Pollutant Loads	Based on Maine SWQC @ 20 mg/l hardness Zn Criteria Chronic Concentration **CCC = 30.6 (ug/l)**	
Stream Flow[1] ***(cfs)***	***TMDL[2]*** ***(lbs/day)***	***WLA (5%MOS)[3]*** ***(lbs/day)***
0.01	0.0016	0.0016
1	0.16	0.16
5	0.82	0.78
10	1.65	1.57
15	2.47	2.35

4. Stream Flow values based on the expected range of flows in Barberry Creek
5. TMDL = Total Maximum Daily Load calculated using flow and SWQC CCC
6. WLA = Waste Load Allocation is 95% of the TMDL or a 5% Margin of Safety calculated for the CCC

Best Management Practices for Mitigating Impacts of Impervious Cover

2005, ENSR Corporation, Westford, MA



WEB-BASED RESOURCES FOR INFORMATION ON STORMWATER ISSUES AND BEST MANAGEMENT PRACTICES

Note that this list is only a starting point and does not attempt to be comprehensive.

Center for Watershed Protection. Publications and Stormwater Management.
http://www.cwp.org/pubs_download.htm
http://www.cwp.org/stormwater_mgt.htm

City of Nashua, New Hampshire. 2003. Alternative Stormwater Management Methods. Part 2 – Designs and Specifications. City of Nashua, New Hampshire
http://ceiengineers.com/publications/nashuamanualpart2.pdf

Connecticut NEMO (Non-point Education for Municipal Officials). Reducing Runoff.
http://nemo.uconn.edu/reducing_runoff/index.htm

Connecticut River Joint Commissions (CRJC). 2000. Introduction to Riparian Buffers for the Connecticut River Watershed. CRJC, Charlestown, NH. 4 pp. www.crjc.org/buffers/Introduction.pdf

Cumberland County Soil and Water Conservation District. Technical Assistance.
http://www.cumberlandswcd.org/Technical%20Assistance.htm

Maine Department of Environmental Protection (MDEP). Stormwater Program, "think blue", Nonpoint Source Pollution education, and riparian buffer information.
http://www.maine.gov/dep/blwq/docstand/stormwater/
http://www.thinkbluemaine.org/
http://www.maine.gov/dep/blwq/doceducation/nps/background.htm
http://www.maine.gov/dep/blwq/docstream/team/riparian.htm

2003a. Maine Erosion and Sediment Control BMPs. Maine Department of Environmental Protection, BLWQ, Augusta, ME; DEPLW 0588.
http://www.maine.gov/dep/blwq/docstand/escbmps/

Maine NEMO (Non-point Education for Municipal Officials). Fact sheets.
http://www.mainenemo.org/publication.htm

Maine State Planning Office (MSPO). Sprawl & Smart Growth Resources.
http://www.state.me.us/spo/landuse/resources/sprawl.php

The Stormwater Manager's Resource Center.
http://www.stormwatercenter.net/

U.S. Department of Agriculture (US DA). US DA National Agroforestry Center, Visual Simulation for Resource Planning.
http://www.unl.edu/nac/simulation/

U.S. Environmental Protection Agency (US EPA). Stormwater Program, Low Impact Development (LID) page, and Encouraging Smart Growth.
http://cfpub.epa.gov/npdes/home.cfm?program_id=6
http://www.epa.gov/owow/nps/lid/
http://www.epa.gov/smartgrowth/

DRAFT
Maine Department of Environmental Protection

Percent Impervious Cover TMDL Guidance for Attainment of Tiered Aquatic Life Uses

This policy pertains to the innovative Impervious Cover Method (% IC) which was developed as one possible approach for Total Maximum Daily Load (TMDL) assessments in impaired rivers and streams (ENSR 2004). Many of these impaired waterbodies are located primarily in areas included in EPA's NPDES Phase 2 Stormwater Program maps for MS4s[1]. The guidelines in Table 1 apply biomonitoring data from the Maine Department of Environmental Protection (MDEP) to the % IC TMDL approach which links watershed impervious cover to stream quality. In a TMDL, the % IC method may be the sole method proposed to achieve the removal of impairments, or it may be supplemented by other abatement strategies designed to address distinct sources of stressors (such as effects of CSOs).

Table 1. Percent Impervious Cover (IC) Policy guidelines for expected attainment of Maine's designated aquatic life uses. TMDL (Loading Capacity), WLA, Waste Load Allocation; MOS, Margin of Safety.

Statutory Class	Class attainment demonstrated in MDEP data at % IC	TMDL Target Values for % IC (TMDL = WLA + MOS)		
		TMDL	WLA[1]	MOS
Class AA	~6 %[2]	Does not apply[3]		
Class A		<6 %	<5 %[4]	1 %
Class B	~8 %	7 - 10 %[4]	6 – 9 %[4]	1 %
Class C	~15 %	10 - 15 %[4]	8 – 13 %[4]	2 %

[1] Load allocation (LA) is included in the WLA because it is not feasible to calculate separately.

[2] For attainment determination, Classes AA and A are combined.

[3] Because of the high-priority, sensitive nature of Class AA streams, application of a generalized method such as the % IC method is not advised.

[4] Stream-specific targets will be chosen for each TMDL.

The goal of the TMDL is attainment of Maine's aquatic life criteria and the % IC target provides an engineering means to achieve that end. Target values represent the level of impervious cover that generally coexists with a biological community that meets aquatic life criteria as defined by Statutory Class. Achieving the % IC target requires the long-term implementation of Best Management Practices (BMPs) to effectively reduce stormwater

[1] For maps, see www.maine.gov/dep/blwq/docstand/stormwater/maps/index.htm

quantity and improve quality. Each TMDL will suggest stream-specific (if possible) BMPs and restoration techniques for short-term implementation to reduce urbanization impacts while long-term adaptive approaches are developed. No further reductions in % IC or implementation of BMPs will be required once aquatic life criteria are met (as determined by biological monitoring).

For each TMDL, MDEP staff will employ best professional judgment to set a single % IC value based on knowledge of site-specific conditions and aquatic life goals for the waterbody. These conditions can be either ameliorating or exacerbating, leading to a % IC recommendation near the upper or lower end of the range shown in Table 1 (column "TMDL"), respectively. Ameliorating conditions include existence of an adequate riparian buffer, demonstrated cold water input into the stream, an intact flood plain, or a highly permeable soil group. Exacerbating conditions include absence of an adequate riparian buffer, loss of the flood plain, an impermeable soil group, naturally stressful in-stream conditions (e.g., lower dissolved oxygen concentrations or elevated temperature due to an upstream wetland), a concentration of imperviousness in one reach of a stream, or a documented pollution legacy of the watershed (e.g., from long-established industrial site). Other ameliorating or exacerbating circumstances may be considered on a case by case basis.

The % IC guidelines in Table 1 are based on analysis of MDEP Biomonitoring Program data from 43 macroinvertebrate samples collected between 1994 and 2004 from 32 watersheds of first to third order in size[1] that were influenced by differing amounts of % IC (minimum 5 %) upstream of the sampled location (Appendix 1). Detectable changes in structural characteristics of aquatic assemblages (fish and benthic macroinvertebrates) are noted, in the scientific literature, to occur above ~10 % IC (Paul and Meyer 2001, CWP 2003). Analysis of Maine macroinvertebrate data supports this finding, with streams above 8 % IC rarely attaining Class B aquatic life numeric criteria (Code of Maine Rules 06-096, Chapter 579*: "Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams").* Class B criteria are designed to support the narrative standard of "no detrimental change in the resident biological community" (Title 38 MRSA §465). Class C is the lowest condition allowed for Maine rivers and streams, and "discharges to Class C waters may cause some changes to aquatic life". Class C criteria are designed to support the narrative standard of "maintenance of structure and function of the resident biological community." The Maine data also indicate that impervious cover of 15 % is adequate, in most cases, for attainment of Class C numeric aquatic life criteria. The % IC guideline ranges specified in Table 1, column "TMDL", were selected to cover % IC values found adequate to support water quality Classes B and C in Maine, while also accounting for the % IC quoted in the literature (10 %, CWP 2003) as impacting aquatic systems.

Tiered designated uses in Maine's water quality standards are designed to provide four levels of protection for rivers and streams. Waterbodies are assigned to a designated use class that represents the highest attainable goal condition, taking into account current environmental conditions (e.g., attainment status for dissolved oxygen, bacteria, and aquatic life standards)

Table 2. Percent of river and stream miles in Maine's designated use

Statutory Class	% of total miles
Class AA	6 %
Class A	45 %
Class B	47 %
Class C	2 %

[1] The % IC method for urban stream TMDLs is only appropriate for streams of 1st to 3rd order.

as well as socioeconomic factors. As shown in Table 2, most river and stream miles in the state are managed for Class AA/A[1] or Class B conditions and thus would require application of the <6 % or 7-10 % IC guidelines, respectively.

It is expected that an adaptive management approach to implementing stream restoration techniques and BMPs, including a reduction in % IC, will lead to an improvement in macroinvertebrate communities. If aquatic life criteria are not met after a first phase of implementation, the initial TMDL approach will be re-evaluated and further recommendations be made based on new insights gained.

References

Center for Watershed Protection (CWP). 2003. Impacts of Impervious Cover on Aquatic Systems. Watershed Protection Research Monograph No. 1. CWP, Ellicott City, MD. 142 pp.

ENSR Corporation. 2004. Draft, Pilot TMDL Applications using the Impervious Cover Method. Document # 10598-001-002.

Paul M.J., Meyer J.L. 2001. Streams in the Urban Landscape. Ann Rev Ecol Sys 32: 3

[1] Very few Class AA/A waterbodies are currently in urban areas so that the % IC policy will be applied only rarely to such streams. MDEP's 2004 303(d) list includes no Class AA/A streams with "Urban NPS" as the potential source of aquatic life impairment.

Locations along Birch Stream (upstream to downstream)

Fig. 1. Above Union Street (7/1999)

Fig. 2. Below Airport Mall, biological monitoring station S384 (11/2003)

Fig. 3. Below Ohio Street, biological monitoring station S312 (5/2003)

Fig. 4. Waterfall, below Ohio Street (11/2003)

Fig. 5. Below waterfall, biological monitoring station S682 (7/2003)

Fig. 6. At confluence with Kenduskeag Stream (7/2003)

Selected Problem Conditions (upstream to downstream)

Fig. 7. Unshaded ditch in airport

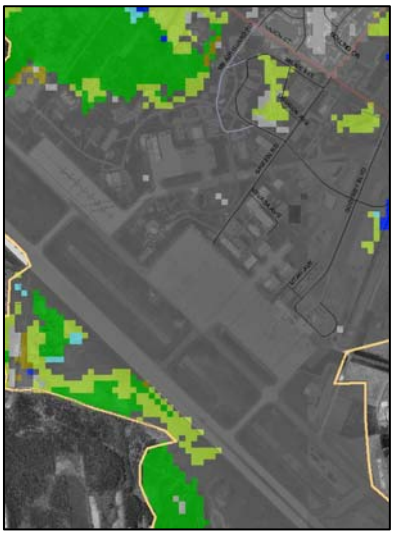


Fig. 8. Extensive impervious areas (gray) in upper

Fig. 9. Stormwater outfall below Airport Mall (8/2004)

Fig. 10. Trash in stream, below Airport Mall (5/2003)

Fig. 11. Bacteria (*Sphaerotilus*) mats in stream (5/2003)

Fig. 12. Major erosion below Ohio Street (11/2003)