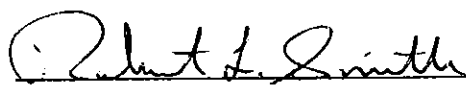


CCT 10/12/99
SWS 10/12/99 GWS

A Total Maximum Daily Load Analysis for Rainbow Brook and Seymour Hollow Brook Windsor and Windsor Locks, Connecticut

This document has been prepared and adopted
pursuant to the requirements of Section 303(d)
of the Federal Clean Water Act

 10/12/99

Robert L. Smith, Chief
Bureau of Water Management

 10/15/99

Jane Stahl, Deputy Commissioner
Air, Waste & Water Programs



STATE OF CONNECTICUT
DEPARTMENT OF
ENVIRONMENTAL PROTECTION
79 Elm Street
Hartford, CT 06106-5127
(860) 424-3020

Arthur J. Rocque, Jr., Commissioner

This TMDL analysis is required by the Federal Clean Water Act because Rainbow Brook and Seymour Hollow Brook have been found to be impaired. A TMDL, which is an acronym for "Total Maximum Daily Load" is a professional determination of the largest amount of a pollutant that can go into a waterbody without damaging the natural ecosystem. Usually, the TMDL analysis is a fairly straightforward calculation based upon the volume of water available for dilution in the receiving stream, and the aquatic life criteria for the pollutant that have been adopted by the State of Connecticut. In this case, Connecticut does not have criteria for the pollutants causing the problems, nor is there sufficient information to develop criteria. We believe that a small amount of these pollutants can enter the brooks without causing trouble, but we don't know how much is too much. Consequently, the clean-up plan we have all agreed to will try to prevent any of these pollutants from reaching the water. While we will be monitoring for the pollutants specifically, the more important measure will be restored health of the brooks.

If you have questions, or would like more information on Connecticut's TMDL Program, please don't hesitate to contact us.

Elizabeth N. Wikfors. Senior Environmental Analyst
telephone: (860) 424-3737
e-mail: elizabeth.wikfors@po.state.ct.us

Christopher J. Bellucci. Environmental Analyst
telephone: (860) 424-3735
e-mail: Christopher.bellucci@po.state.ct.us

COVER SHEET FOR TMDL

8/31/1999

I. INTRODUCTION

- A. Impaired waterbody segment:
RAINBOW BROOK and SEYMOUR HOLLOW BROOK
- B. Classification:
B/A
- C. Use(s) not supported:
Aquatic Life Use Support and Aesthetics
- D. Cause (pollutant or stressor):
Deicing and anti-icing agents containing ethylene glycol or propylene glycol
- E. Source(s) of pollutant or stressor:
Aircraft facilities at Bradley International Airport

II. $TMDL = WLA + LA + MOS$

- A. For each pollutant or stressor:
 - 1. **TMDL: Loading capacity** (criteria times 7Q10)
Connecticut has not adopted numeric aquatic life criteria for ethylene or propylene glycol, nor is there federal guidance for these chemicals. Therefore, "no toxics in toxic amounts" becomes the pertinent Water Quality Standard.
 - 2. **WLA: Wasteload allocations**
Ethylene Glycol: zero
Propylene Glycol: zero
 - 3. **LA: Load allocations**
Ethylene Glycol: zero is allocated, as none is expected from natural sources.
Propylene Glycol: zero is allocated, as none is expected from natural sources.
 - 4. **MOS: Margin of Safety**
Toxicity, in Connecticut regulations, is measured by means of laboratory tests using EPA-specified protocols to expose sensitive test organisms to the water being tested. For freshwater systems, daphnids and fathead minnows are specified. Pure ethylene or propylene glycol is acutely toxic to these organisms at concentrations in the range of 40,000 - 50,000 mg/L.

The formulated compounds are more variably toxic, with LC_{50} s of total glycols in stormwater samples ranging from 1750-10,000 mg/L for these test organisms. However, glycols can be detected in surface waters in the neighborhood of 10 mg/L, much lower than the concentration found to be toxic in laboratory tests.

Following implementation of the control actions specified in the Consent Order (see section III of this Cover Sheet), results of monitoring for glycols in surface waters are expected to be negligible, and quite probably below the analytical detection level. By establishing a goal of zero discharge of glycols in these surface waters, efforts to achieve this goal are expected to result in full attainment of the designated uses, and will satisfy the Water Quality Standard of "No toxics in toxic amounts".

B. Seasonality

Use of deicing and anti-icing compounds at Bradley International Airport occurs only during the colder months. However, the TMDL goal of zero discharge will apply year-round.

One concern that was addressed during the development of this TMDL analysis was the effects of the biological oxygen demand caused by the rapid breakdown of deicing and anti-icing compounds. Impairment resulting from higher levels of oxygen demand would be most pronounced during warmer weather. In Connecticut, the warming weather of springtime is accompanied by higher frequency and rates of precipitation, higher and more rapid streamflows and increased groundwater inflow; all of which would offset the affects of glycol compounds reaching surface waters.

III. IMPLEMENTATION

Remediation and prevention of impacts to the brooks is mandated under the terms of a signed Consent Order (WC5257) between the Connecticut Department of Transportation and the Connecticut Department of Environmental Protection.

IV. REASONABLE ASSURANCE

Although TMDLs are not in, and of themselves enforceable, and adoption of TMDLs by a state proffers no additional authorities, TMDLs are used as the technical basis for developing effluent discharge limitations that may be enforced through permits or orders. Unless and until Aquatic Life Protection Criteria are established for ethylene glycol and propylene glycol, traditional water quality-based discharge requirements can not be developed. The more stringent Best Achievable Engineering Technology will be required to continue toward the goal of zero discharge of these compounds to surface waters.

Impairments to surface waters caused by deicing and anti-icing operations at Bradley International Airport will not occur when the planned BMPs and technological remedies are fully in place.

Connecticut Department of Transportation has reached agreement with operators of the facilities located at Bradley International Airport to discontinue use of compounds containing ethylene glycol.

Use of propylene glycol-based formulations is being regulated under the terms of the signed and enforceable Consent Order.

Extensive monitoring is required by the Consent Order, and will be supplemented by additional monitoring by DEP personnel.

V. STATUS OF TMDL DEVELOPMENT

Public comment on the final draft is being solicited in the Public Notice scheduled for publication on September 1, 1999. Final draft was sent to EPA Region I on August 31, 1999. Following the conclusion of the 30-day Public Comment Period, revisions to the draft TMDL will be made as needed, and the TMDL will be submitted as a final document for EPA approval. It is our intent to prepare a written response to any comments received on the draft TMDL which will be included with the final submission.

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I. *Introduction*

The Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), requires that each state monitor and assess the condition of surface waters within its boundaries and adopt water quality standards that support designated uses such as drinking water supply, fish and wildlife habitat, recreation, and others. Section 303 (d) of CWA requires that each state: (1) submit a biennial list of waterbodies that do not meet water quality standards after technology-based controls have been implemented; (2) prioritize the listed waterbodies according to the severity of pollution and their designated use; and (3) establish a total maximum daily load (TMDL) for each impairment at levels necessary to achieve water quality standards and support designated uses.

The overall goal of the TMDL process is to achieve the water quality standard that is not currently being met in a particular waterbody. A TMDL achieves this goal by establishing the maximum loading, or load capacity for a specific pollutant and allocating that capacity or load to the contributors of the pollutant. Any amount of a pollutant above the load capacity risks violating water quality standards. TMDLs consider pollution from point sources, nonpoint sources, and natural background levels, and incorporate a margin of safety to reflect the inherent uncertainty about pollutant discharges and water quality. TMDL allocations to point source discharges can be incorporated into the National Pollutant Discharge Elimination System (NPDES) numerical permit requirements. Allocations to nonpoint sources of pollution can be expressed using narrative criteria or by some other appropriate measure.

A TMDL can be expressed as the mathematical equation: **TMDL = WLA + LA + MOS** where:

TMDL is the Total Maximum Daily Load of a pollutant that a waterbody can receive without violating water quality standards; and

WLA is Wasteload Allocation, or, the portion of the receiving water's loading capacity that can be allocated to existing or future point sources of the pollutant; and

LA is Load Allocation, or, the portion of the receiving water's loading capacity that can be allocated to natural background, or to existing or future nonpoint sources of the pollutant; and

MOS is Margin Of Safety, or, the variable that accounts for the uncertainty of the relationship between pollutant loads and their affect on the receiving waterbody. A MOS can be incorporated into the TMDL implicitly by using conservative estimates to develop WLA and LA, or may be added as a separate allocation.

The process of developing a TMDL for water quality limited waterbodies involves participation from all levels of government, and the general public. Public participation is strongly emphasized early in the process of developing plans for implementing the TMDL. Following the state's adoption of the TMDL, it must be submitted to the United States Environmental Protection Agency (EPA) for approval. Control measures such as updating NPDES permits based on the TMDL can be implemented for point source pollutants. Best management practices for nonpoint pollutants must provide a reasonable assurance that the controls will be implemented. Measurable endpoints are defined so that the effectiveness of the TMDL to achieve the WQS and support designated uses can be evaluated through results of a monitoring program

Rainbow Brook and Seymour Hollow Brook have been identified by the Connecticut Department of Environmental Protection (CTDEP) as impaired and are listed in the 1998 303(d) list of impaired waterbodies (CTDEP, 1998). They were designated "T" to mean that these brooks are a top priority for the development of a TMDL by the year 2000. Aquatic life use was only partially supported, and aesthetics were fully non-supported. The major cause of the impairments in Rainbow Brook and Seymour Hollow Brook has been identified as deicing activities at Bradley International Airport (BIA).

The Rainbow Brook watershed is located in the northern section of the central Connecticut valley, approximately 19.3 kilometers north of Hartford, Connecticut (Figure 1). It has a long history of development resulting from its proximity to a major international airport. The BIA property was a United States Army Base in the 1940's during World War II. The State of Connecticut acquired the property in 1948 and began plans to convert the Army Base to a civilian airport. Today, BIA covers approximately 9.5 square kilometers (of which 52.5% is impervious surface) and is the second largest airport in New England, serving Connecticut, western Massachusetts, eastern New York, southern Vermont, and western New Hampshire. The BIA property is owned and operated by the State of Connecticut Department of Transportation (CTDOT), Bureau of Aviation and Ports.

While the BIA property is located in the Connecticut towns of Windsor, Windsor Locks, East Granby, and Suffield, the Rainbow Brook watershed is located in Windsor and Windsor Locks. Windsor, the oldest town in Connecticut, has a long history of industry including power generation, aerospace, medical technology, and manufacturing of electronics, adhesives and auto parts. The principal industries in Windsor Locks center around the importance of BIA, and include manufacturing aerospace products, electronics, and machinery. The combined population estimate for Windsor and Windsor Locks is 30,000 according to 1997 census.

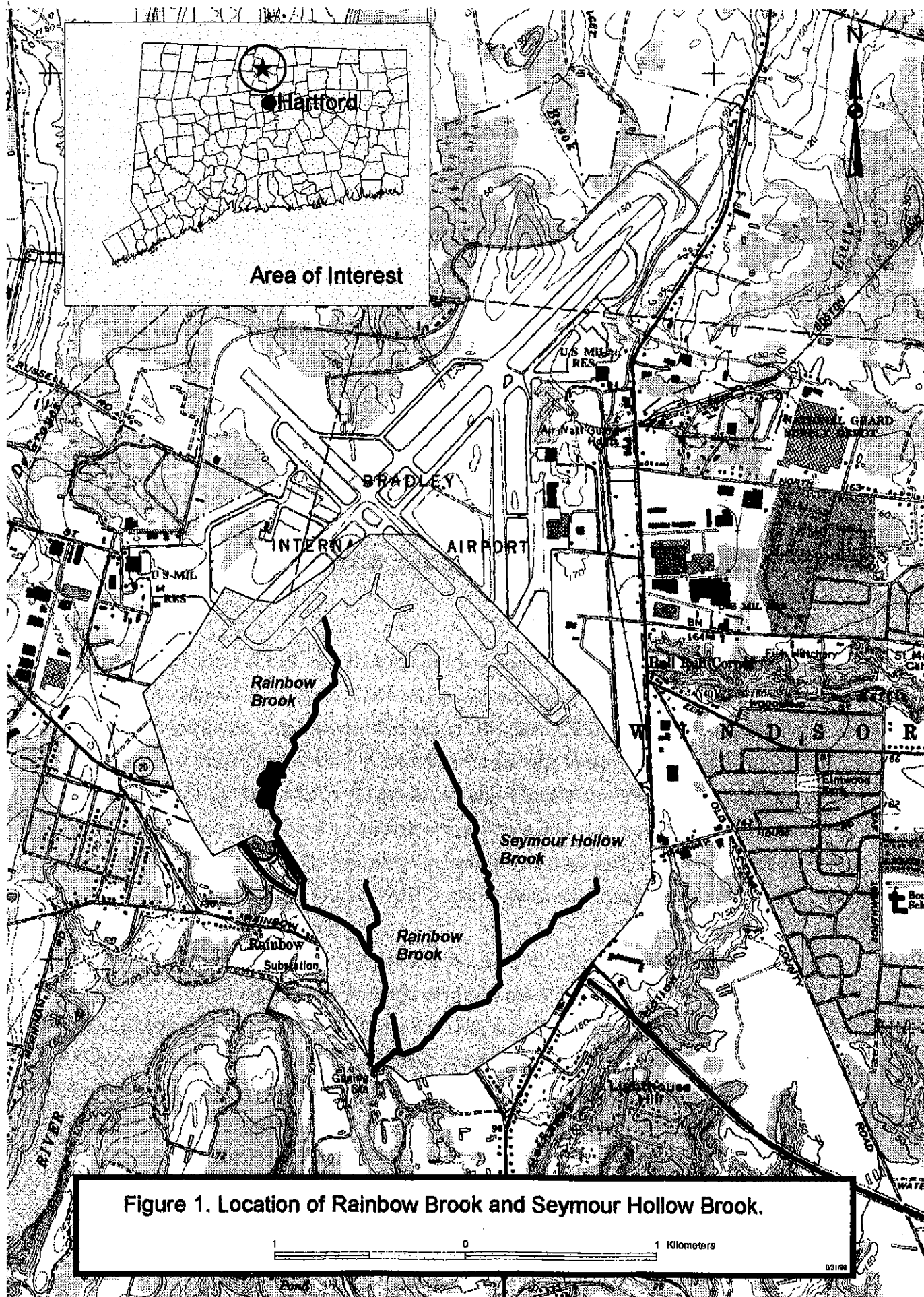


Figure 1. Location of Rainbow Brook and Seymour Hollow Brook.

Rainbow Brook and Seymour Hollow Brook are tributary to the Farmington River, and drain the south side of the BIA property. Rainbow Brook originates on the southern extent of BIA property, drains an area of 4.7 square kilometers, and enters the Farmington River immediately below Rainbow Reservoir in the town of Windsor. Seymour Hollow Brook drains an area of 2.3 square kilometers, and enters the Farmington River just east of Rainbow Brook (south of Stevens Mill Road.) These are small, shallow, moderate gradient brooks with average depths of 15-30 cm for most of the season. The headwaters originated in wetlands, that were, for the most part, filled and graded for airport construction. Further disruptions to the watercourses resulted from activities associated with several major industrial sites which include groundwater recovery and remediation projects, and construction of major highway and access roads. The brooks meander through areas of mixed land use, including disturbed wetlands, residential developments, along busy roads, and patchy deciduous forest. Much of the brooks' lengths are well shaded, although the riparian areas are as variable as the land use. Typically, the banks of the brooks are very steep and of erodible soil types for long sections, but then ponding into wetlands or shallow gradient areas where the natural hydrology has been disturbed. At best, the brooks offer only moderate habitat for aquatic organisms.

Pollution problems in Rainbow Brook and Seymour Hollow Brook were first reported to the CTDEP by citizens of Windsor sometime during late 1987, early 1988. Windsor residents reported conditions such as a "green" color and "highly offensive odors" in Rainbow Brook and Seymour Hollow Brook. The general appearance and odor of these brooks were so noxious that there were concerns that real estate values might be affected in communities surrounding the problem areas. It was known at the time that seasonal deicing of aircraft was a necessary safety requirement at BIA, but the effect on the environment of deicing chemicals such as the ethylene glycol and propylene glycol-based chemicals in use at BIA was not well understood.

CTDEP began sampling storm water runoff from BIA and receiving water sites in the fall of 1988. Initial findings showed elevated levels of ethylene glycol and indications of toxic runoff from storm water areas draining to Rainbow Brook and Seymour Hollow Brook. For example, during a storm event in February 1989, ethylene glycol levels were measured in concentrations as high as 55,000 mg/l. Concurrent laboratory bioassay tests indicated that water from the Rainbow Brook was moderately toxic. Samples from other areas that drain the BIA property including Spencer Brook, Stony Brook, and DeGraves Brook did not have elevated glycol levels. This is mainly because of the configuration of drainage patterns on BIA and location of deicing activities (see Section III. *Pollutants of concern and relative significance*).

Around this same time period, negotiations began between CTDEP and CTDOT staff at BIA to assess the storm water runoff problem and develop potential solutions. At that time, there was little technology available to address the problem of collecting deicing fluids and runoff. The lack of available technology prolonged negotiations and was a major obstacle in developing a timely resolution to the deicing problem.

As a result of negotiations between CTDOT and CTDEP, CTDOT contracted an environmental consulting firm to further investigate the storm water runoff and impact on receiving streams and to develop a more effective solution to the deicing problem. Sixteen storm water stations and seven receiving water sites were sampled by Metcalf and Eddy. Results of sampling concurred with CTDEP findings and identified high concentrations of glycols in storm water areas draining to Rainbow Brook and Seymour Hollow Brook and in the brooks themselves. Additional samples from the Farmington River, Stony Brook, and Degrayes Brook did not exhibit elevated glycol levels.

In August 1990, residents of the Town of Windsor filed a citizen's lawsuit against the CTDOT under Section 505 of the CWA for discharging pollutants into surface waters without a permit, a violation of Section 301 (a) of the CWA. A settlement was reached in August 1991 which required CTDOT to apply for a permit to discharge storm water to surface waters, implement an interim glycol control program, and allowed the Town of Windsor to comment on any future environmental permitting.

The interim glycol collection program began during the winter season of 1991/1992. The short term plan involved using two vacuum trucks to intercept the flow of ethylene and propylene glycol to Rainbow and Seymour Hollow Brooks. The vacuum trucks, similar to a street sweeper, moved over areas where deicing/anti-icing had occurred and collected fluids that accumulated on the pavement. When the vacuum trucks were full, they unloaded to a 5,000 gallon tanker truck which hauled the runoff to a municipal sewage treatment plant in Hartford, CT under a CTDEP permit. This was a common solution to treating deicing wastewater during this time period, but only captured an estimated 12-15% of total glycols applied to aircraft at BIA.

During the 1992/1993 winter season, BIA established a temporary central deicing/anti-icing location to concentrate the flow of glycols to one area and facilitate glycol recovery. In addition, BIA instituted a formal glycol recovery monthly report to evaluate control measures. Improvements were made to the deicing practices and collection system each year from 1993-1996 (Appendix I)

The glycol recovery improved to an estimated 50% collection rate during the winter season of 1995 /1996. However, glycols were still adversely impacting Rainbow Brook and Seymour Hollow Brook.

EPA Region I began an enforcement initiative targeted at public works facilities, including airports in the New England Region in 1997. This investigation resulted in fines to CTDOT for violating environmental regulations and included plans for CTDOT to address the storm water pollution caused by deicing activities at BIA. This action led to development of the formal Consent Order between CTDOT and CTDEP to completely eliminate surface water impairments caused by deicing at BIA. Several aggressive control measures are being developed under Consent Order WC5257, issued in September 1998 (Appendix II). These include constructing a new remote de-icing facility with an improved storm water collection system and improvements to deicing activities that occur at the terminal gates. When all control actions outlined in Consent Order WC5257 are implemented, it is expected that no glycol will be discharged to Rainbow or Seymour Hollow Brook

II. *Applicable Water Quality Standard*

Rainbow Brook and Seymour Hollow Brook are classified as B/A by the Water Quality Standards adopted by the State of Connecticut. Under the B/A designation for surface waters, the water quality goal is the achievement of the Class A criteria and attainment of designated uses. Specific criteria and designated uses for Class A surface waters are outlined in the State of Connecticut Department of Environmental Protection Water Quality Standards (CTDEP, 1997). Currently, there are no specific aquatic life criteria for ethylene glycol or propylene glycol. However, chemical constituents are not allowed in concentrations which would be harmful to the aquatic environment. Connecticut surface water standards state that:

"surface waters and sediments shall be free from chemical constituents in concentrations or combinations which will or can be reasonably be expected to result in acute or chronic toxicity to aquatic organisms or impair the biological integrity of aquatic or marine ecosystems outside of any allocated zone of influence or which will or can be reasonably expected to bioconcentrate or bioaccumulate in tissues of fish, shellfish, and other aquatic organisms to levels which will impair the health of aquatic organisms or wildlife or result in unacceptable tastes, odors, or health risks to human consumers of aquatic life."

or, simply stated: **"no toxics in toxic amounts."**

III. *Pollutants of concern and relative significance*

Sources of ethylene glycol and propylene glycol in Rainbow Brook and Seymour Hollow Brook originate from deicing/anti-icing activities at BIA. It is feasible that illegal discharges of automotive antifreeze from vehicle service areas or by individual homeowners could also contribute glycols to the watershed. There is no evidence to suggest this, and it can be assumed that these discharges, if they were to occur, would be sporadic and small volume; well beyond the scope of this analysis. Non-point sources of glycols are not known to exist. The drainage pattern on BIA dictates which receiving stream will receive uncollected deicing fluids and storm water runoff. There are a total of 16 drainage areas and associated outfalls located on the BIA property (Table 1). The majority of deicing/anti-icing activities occur on the south side of BIA in drainage areas two (#2) and three (#3) which drain to Rainbow Brook and Seymour Hollow Brook. Drainage areas #2 and #3 include the temporary remote deicing facility, deicing at the terminal gates, and Signature Flight Service in the northwest corner of drainage area #3 (Figure 2).

TABLE 1. Storm water discharge points on Bradley International Airport, Connecticut.

Outfall Number	Area of Impervious Surface (ha)	Total Area Drained (ha)	Receiving Water
1A	3.9	13.0	Seymour Hollow Brook
1B	3.6	9.1	Seymour Hollow Brook
2	70.8	101.1	Seymour Hollow Brook
3	6.2	88.8	Rainbow Brook
4	23.9	39.8	Rainbow Brook
5	0	11.5	Rainbow Brook
6	0	11.1	Unnamed Brook
7	2.1	8.5	DeGraves Brook
8	19.6	49.0	DeGraves Brook via wetland
9	0.6	14.5	DeGraves Brook via wetland
10	14.8	105.5	Stony Brook via wetland
11	8.3	27.5	Stony Brook via wetland
12	0.8	26.7	Spencer Brook
13	27.1	135.3	Spencer Brook
13A	0.1	13.8	Spencer Brook
14	0.3	15.6	Kettle Brook

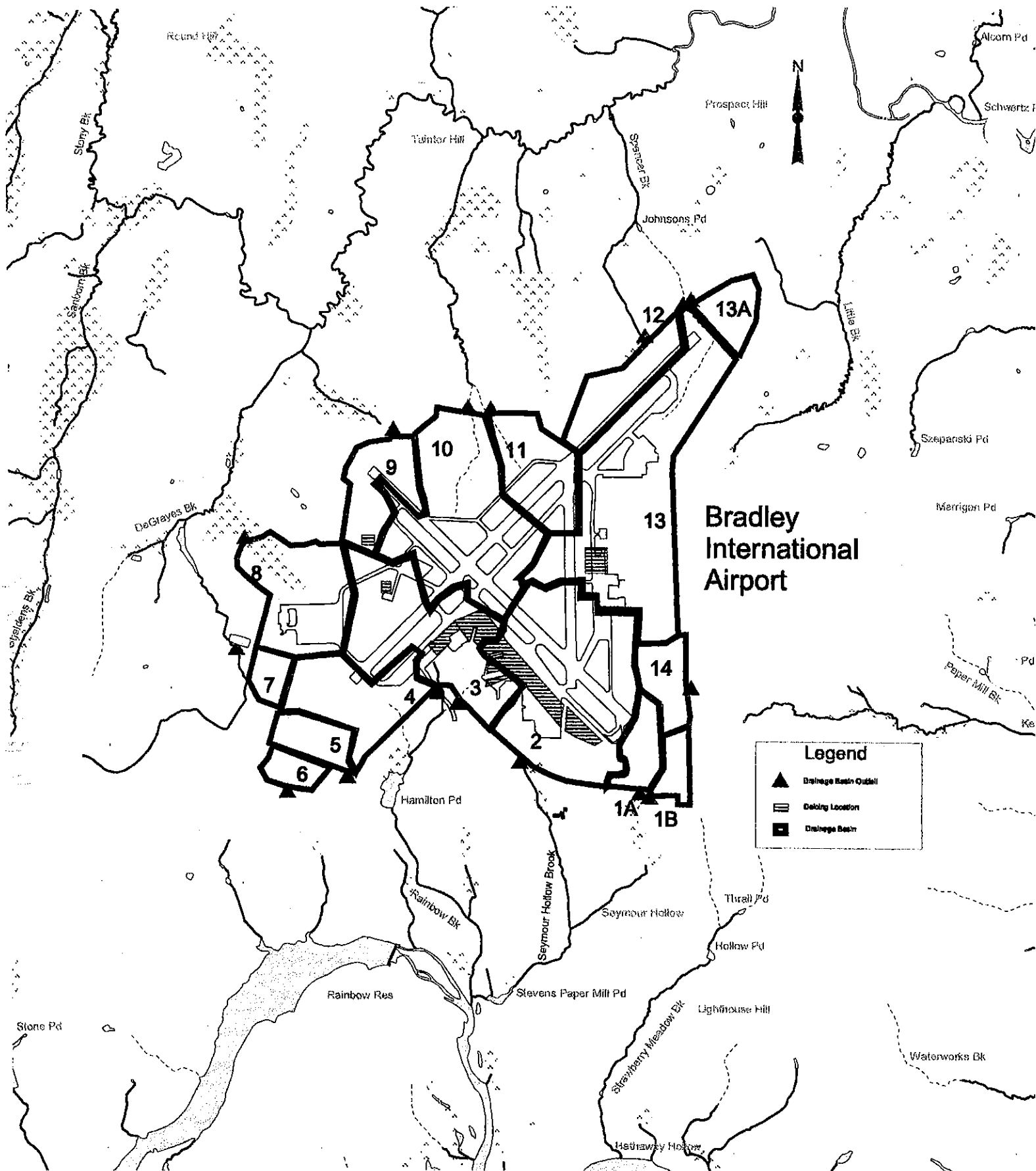


Figure 2.
Location of delcing activities and drainage patterns at Bradley International Airport.

CTDOT is responsible for spent deicing fluid collection at the remote deicing facility, terminal gates, and Cargo East area. CTDOT has hired a private contractor to process and recycle all deicing wastewater. CTDOT oversees the glycol collection activities of other airport tenants. Signature Flight Service maintains their own deicing pad and is responsible for collection of spent deicing fluid on their ramp. The current configuration of their deicing collection system is a dual system that leads to storm drain and a 10,000 gallon holding tank. During deicing events, the drain is directed to the holding tank and during non-deicing periods runoff is directed to the storm drain. The construction improvement plans for the Remote Deicing Facility and terminals will incorporate a similar dual drainage design to effectively separate ordinary stormwater from glycol-contaminated stormwater.

Additionally, there are two outlying locations where deicing/anti-icing occurs at BIA: US Airports; and United Parcel Service (UPS). US Airports deices in drainage area nine which drains to a tributary to Stony Brook. US Airports has submitted a Deicing Fluid Collection Plan which addresses deicing activity and glycol collection, as well as storm water monitoring (US Airports, 1998). Negotiations between CTDOT and US Airports are ongoing to develop Best Management Practices (BMPs) for this location and to formalize the resultant plan. UPS deices in drainage area 13 which discharges to a small tributary to Spencer Brook. On March 2, 1998, UPS was issued a Notice of Violation (NOV) by CTDEP Permitting and Enforcement staff. The NOV resulted from discharging ethylene glycol into surface water without a permit, a violation of section 22a-430 of the Connecticut General Statutes. UPS has a collection tank, but improvements are needed and negotiations between CTDEP and UPS are ongoing to develop BMPs for this location and to formalize a glycol control plan.

There are a total of 33 separate wastewater discharge permits issued by CTDEP in the Rainbow Brook watershed (Table 2). The permit application for deicing activities at BIA (CT0028738) has been submitted by CTDOT and is currently under review by CTDEP. In the interim, Consent Order WC5257 is acting as the control document for deicing activities. There are two other permits that discharge to the Rainbow Brook watershed - GCW010035 and GSI000388. Glycols are not known to occur in either of these discharges.

Ethylene glycol and propylene glycol are the primary components of aircraft deicing/anti-icing fluids. During freezing weather, ethylene glycol and propylene glycol based chemicals have historically been used at BIA for deicing/anti-icing aircraft. Deicing is defined as removal of snow, ice, and frost from aircraft, and anti-icing is the prevention of ice from reforming on aircraft. Pure forms of ethylene glycol and propylene glycol are relatively non-toxic to aquatic organisms.

Table 2 - List of permits issued by Connecticut Department of Environmental Protection Bureau of Water Management in the Rainbow Brook Watershed.

Facility	Permit Type	Permit Number	Discharges To
Aetna/Cigna Flight Operations	Storm water Industrial	GSI000171	Spencer Brook
Airport Shell	Vehicle Washing	GVW000381	Sanitary Sewer
Airways Rent-A-Car	Vehicle Washing	GVW000298	Sanitary Sewer
AMR Combs	Vehicle Service	GVS000279	Sanitary Sewer
Army Aviation Support Facility	Vehicle Washing	GVW000158	Sanitary Sewer
Aviation Support Facility	Storm water Industrial	GSI000281	Spencer Brook
Aviation Support Facility	Storm water Construction	GSN000082	Spencer Brook
Aviation Support Facility	Vehicle Service	GVS000258	Sanitary Sewer
Budget Rent-A-Car	Vehicle Service	GVS000854	Sanitary Sewer
CTDOT BIA	State Permit	SP0001505	Sanitary Sewer
CTDOT BIA	NPDES	CT0028738	Under Review
Emery Worldwide	Storm water Industrial	GSI000324	Sanitary Sewer
Hamilton Standard	Vehicle Washing	GVW000175	Sanitary Sewer
Hamilton Standard	Cooling Water	GCW010035	Rainbow Brook, Seymour Hollow Brook
Hamilton Standard	NPDES	CT0000582	Farmington River
Hamilton Standard	Domestic Sewage	GDS000057	Sanitary Sewer
Hamilton Standard	State Permit	SP0000574	Sanitary Sewer
Hamilton Standard	Photographic Processing	GPH000223	Sanitary Sewer
Hamilton Standard	Water Treatment	GWT000019	Sanitary Sewer
Hamilton Standard	Storm water Industrial	GSI000388	Rainbow Brook, Seymour Hollow Brook

Table 2 (continued) - List of permits issued by Connecticut Department of Environmental Protection Bureau of Water Management in the Rainbow Brook Watershed

Facility	Permit Type	Permit Number	Discharges To
Military Maintenance Facility	Vehicle Service	GVS000548	Sanitary Sewer
Military Maintenance Facility	Vehicle Washing	GVW000290	Sanitary Sewer
Military Maintenance Facility	Vehicle Washing	GVW000291	Sanitary Sewer
Roncari Express	Vehicle Washing	GVW000303	Sanitary Sewer
Shell Oil Company	State Permit	SP0000876	Sanitary Sewer
Thrifty Car Rental	Vehicle Service	GVS000841	Sanitary Sewer
United Parcel Service	Vehicle Service	GVS000145 GVS000862	Sanitary Sewer
United Parcel Service	Vehicle Washing	GVW000113 GVW000379	Sanitary Sewer
United Parcel Service	Storm water Industrial	GSI000241	Stony Brook
Windsor Stevens	NPDES	CT0003441	Farmington River
Windsor Stevens	Storm water Industrial	GSI000416	Farmington River

Laboratory studies using daphnia (*Ceriodaphnia dubia*) have shown 48 h LC₅₀ values of 34,000 mg/l in pure ethylene glycol and 18,340 mg/l in pure propylene glycol (Pillard 1995).

Montgomery (1995) provided a summary of glycol toxicity and reported LC₅₀ values in the range of 50,000 mg/l using the fathead minnow (*Pimephales promelas*) as a test organism. EC₅₀ values of 55,000 mg/l and 43,000 mg/l were reported with *Daphnia magna* as the test organism.

There are data to suggest that formulated ethylene and propylene glycol deicers are more toxic than pure glycol. In laboratory tests, Pillard (1995) found that formulated mixtures of ethylene and propylene glycol were substantially more toxic than pure glycols. UCAR® Runway Deicer, an ethylene glycol based product, exhibited an LC₅₀ of 6,700 mg/l after a 96 h static acute test with fathead minnows as the test organism (Union Carbide, 1985). Fisher et al. (1995) found

similar results from storm water sampled from discharges draining Baltimore-Washington International Airport. Deicing/anti-icing chemicals often contain additives such as corrosion inhibitors, buffers, polymers, and surfactants that contribute to the toxicity of these chemicals. Determining the amount and ratios of these chemicals has been difficult because deicer components are proprietary information. Therefore, the actual additive that is responsible for the increased toxicity has been difficult to establish.

Ethylene and propylene glycol are highly soluble in water and degrade rapidly in the environment. Glycols can break down within several days to a week in surface waters (United States Department of Health and Human Services, 1997). Biodegradability of glycols can result in high biochemical oxygen demand (BOD₅) values that may cause oxygen depletion in receiving waters. Values of BOD₅ have been reported from 400,000 to 800,000 mg/l for ethylene glycol and 800,000 to 1,000,000 mg/l for propylene glycol (HNTB Corporation, 1995a). BOD₅ values from samples taken in Rainbow Brook were as high as 22,000 mg/l during a storm event on February 14, 1991 (Metcalf and Eddy, 1992). Breakdown of glycols in surface water occurs at slower rates during colder weather, when deicing is taking place.

Several agencies regulate the use of ethylene glycol and propylene glycol. Ethylene glycol has been placed on three federal regulatory program lists: (1) Hazardous Air Pollutants under Section 112 of the EPA Clean Air Act; (2) Hazardous Substances under Section 101 of the Comprehensive Environmental Response Compensation and Liability Act created by the Superfund Program; and (3) Toxic Release Inventory Chemicals under Section 303 of the Emergency Planning and Community Right-to-Know Act. Propylene glycol is currently not listed as a toxic substance and is considered a safe food additive by the federal Food and Drug Administration. The Federal Aviation Administration (FAA) regulations pertain to glycol application to aircraft in order to maintain public safety. These include procedures for applying deicing/anti-icing chemicals, employee training, methodology to assure that glycols adhere to the aircraft, and holdover time limitations. Type I deicing fluids and SAE Type IV anti-icing fluids are most commonly used at BIA. These fluids are typically composed of glycols, water, buffers, surfactants, and corrosive inhibitors (Montgomery, 1995).

At BIA, American Airlines and Business Express have historically used propylene glycol-based chemicals for deicing/anti-icing activities while all other carriers and CTDOT have used ethylene glycol based chemicals. As a result of more stringent regulations imposed on ethylene glycol over the years, BIA has changed its policy regarding deicing/anti-icing chemicals. On May

12, 1997, CTDOT administration at BIA issued a memorandum to all tenants to announce its plan to prohibit the use of ethylene glycol for deicing/anti-icing at BIA as of January 1, 1998. Tenants were allowed to use the ethylene glycol based chemicals in their inventories but only propylene glycol based chemicals could be purchased for future use at BIA. By the winter season of 1998/1999, all tenants had phased out their use of ethylene glycol, used propylene glycol exclusively for deicing/anti-icing activities.

In the past, CTDOT had used an ethylene glycol based product called UCAR® for runway and taxiway deicing. Typically, UCAR® was applied to the runway prior to a precipitation event followed by a layer of sand. Since the winter of 1996/97, the use of glycol based UCAR® has been eliminated and replaced by an acetate-based product for deicing runways and taxiways. This action by CTDOT has completely eliminated the use of ethylene glycol as a deicer at BIA.

IV. *Control Actions*

When fully implemented, control actions outlined in Consent Order WC5257 provide assurance that deicing activities at BIA will no longer impair Rainbow Brook and Seymour Hollow Brook. Section B.1.f of the Consent Order states that , "Within 60 days of DEP approval of Phase II report, DOT shall submit contract plans and specifications for the Remote Deicing Facility (RDF)." The improvements contained within the Phase II Plans occur in two steps: (1) RDF construction and (2) Improvements to the "at-gate" deicing. It is anticipated that RDF construction is scheduled to be completed in 2001.

1. Construction of a new RDF will include the following features:

- grading with catch basins that will allow separation of deicing runoff and storm water runoff to optimize recycling of glycol
- 2 million gallon underground storage tanks for collecting deicing runoff
- upgrade drainage piping system with sedimentation treatment chambers and a system of swales to manage runoff during non-deicing periods
- develop separate drainage systems to capture runoff from deicing areas. During deicing events, flow will be directed to either the underground storage tank or glycol recycling vendor. Runoff will be directed to storm drain outfalls during non-deicing periods.
- existing temporary RDF will continue to be used but only to deice propeller aircraft following modifications to the drainage system that will tie into the deicing runoff collection system

- a control building to monitor deicing activities
- additional bituminous pavement for apron, shoulder, and access road areas
- a wetland mitigation site on the west side of the airport to compensate for filling in wetlands for this project

Proposed Schedule for RDF work

Completion of Design:	9/2/1998
Advertising	11/11/1998
Begin Construction:	3/17/1999
Complete Construction	1/31/2001

2. Improvements to the "at-gate" deicing

Plans to construct a new terminal and concourse to the southeast of the existing terminal A and Concourse C. The new concourse will replace the existing gates at Terminal B and Concourses A and B. When the new terminal is completed, Concourse A+B will be demolished. This project will be completed in 3 phases:

Phase I- Build new terminal and concourse. Plans include:

- new concrete apron
- force main and pump station to move deicing fluid at terminal site to storage tanks at RDF

Proposed Schedule for New Terminal and Concourse

Completion of Design:	12/1999
Advertising	3/2000
Begin Construction:	7/2000
Complete Construction	12/2002

Phase II- Retrofit Terminal A and Concourse C with deicing fluid collection system

Proposed Schedule for Retrofit work

Completion of Design:	12/1999
Advertising	3/2000
Begin Construction:	7/2000
Complete Construction	12/2002

Phase III- Existing International Arrivals Building to remain as is with no improvements to

current apron. Current deicing practice of blocked catch basin and recovery with vacuum truck will be kept. Phase III plans are not finalized and are currently being discussed by CTDEP staff and CTDOT staff.

V. *Implementation and Monitoring*

Attachment A of Consent Order WC5257 has outlined specific storm water and receiving water monitoring requirements at BIA (see Appendix II). Eight locations in Rainbow Brook and Seymour Hollow Brook will be monitored for nine parameters shown in Table 3 during each of two winter storm events. In addition, eight storm water locations will be monitored during four storm events each year, two of which must occur when deicing is taking place. The specific parameters to be monitored at each of the storm water sampling locations are outlined in Table 4. An annual acute toxicity test will be performed at Discharge Serial Numbers 2 and 3 during one storm event. In addition to sites draining to the Rainbow Brook Watershed, the Consent Order requires monitoring of storm water sites draining to DeGraves Brook, Stony Brook, and Spencer Brook. Monitoring is required until all actions of Consent Order WC5257 are completed.

TABLE 3. Monitoring parameters required by Consent Order from 8 locations in Seymour Hollow Brook and Rainbow Brook.

Parameter	Units	Minimum Frequency of Sampling
Ammonia	mg/l	2 Winter Events/Year
BOD ₅	mg/l	2 Winter Events/Year
Ethylene Glycol	mg/l	2 Winter Events/Year
Propylene Glycol	mg/l	2 Winter Events/Year
Ethyl Alcohol	mg/l	2 Winter Events/Year
Formaldehyde	mg/l	2 Winter Events/Year
Isopropyl Alcohol	mg/l	2 Winter Events/Year
Dissolved Oxygen	mg/l	2 Winter Events/Year
pH	S.U.	2 Winter Events/Year

TABLE 4. Monitoring parameters required by Consent Order from 8 storm water monitoring locations on BIA property.

Parameter	Units	Minimum Frequency of Sampling
Total Oil and Grease	mg/l	4 Events/Year
pH	S.U.	4 Events/Year
Chemical Oxygen Demand	mg/l	4 Events/Year
Chloride	mg/l	4 Events/Year
Total Suspended Solids	mg/l	4 Events/Year
Total Phosphorus	mg/l	4 Events/Year
Total Kjeldahl Nitrogen	mg/l	4 Events/Year
Nitrate	mg/l	4 Events/Year
Total Copper	mg/l	4 Events/Year
Total Chromium	mg/l	4 Events/Year
Total Lead	mg/l	4 Events/Year
Total Nickel	mg/l	4 Events/Year
Total Zinc	mg/l	4 Events/Year
Fecal Coliform	#/100 ml	4 Events/Year
BOD ₅	mg/l	4 Events/Year
Acute Aquatic Toxicity	LC ₅₀	1 Winter Event/Year
Ammonia	mg/l	2 Winter Events/Year
Ethylene Glycol	mg/l	2 Winter Events/Year
Formaldehyde	mg/l	2 Winter Events/Year
Propylene Glycol	mg/l	2 Winter Events/Year
Ethyl Alcohol	mg/l	2 Winter Events/Year
Propyl Alcohol	mg/l	2 Winter Events/Year
Isopropyl Alcohol	mg/l	2 Winter Events/Year
Dissolved Oxygen	mg/l	2 Winter Events/Year

The CTDEP Bureau of Water Management has recently implemented a statewide rotating basin program which includes collecting data on benthic macroinvertebrates, water chemistry, and indicator bacteria. The Rainbow Brook watershed is contained within the Connecticut River unit in which monitoring began during the fall of 1998. Benthic invertebrates, water chemistry data, and bacteria data were collected during October 1998. Water chemistry and bacteria data will be collected during winter, spring, and summer of 1999. Monitoring by the CTDEP Bureau of Water Management will continue using the scheduled rotating basin approach or with greater frequency, if monitoring results warrant.

Results from the fall 1998 samples indicated that Rainbow Brook and Seymour Hollow Brook had marginal habitat to support the targeted indicator organisms. CTDEP uses benthic macroinvertebrates as indicators of surface water quality following bioassessment criteria outlined in Plafkin et. al. (1989). The macroinvertebrate criteria were developed to assess riffle dwelling organisms which are typically found in streams with higher gradient than exists in either Rainbow Brook or Seymour Hollow Brook. A qualitative sample of macroinvertebrates taken from the best available habitat was collected to determine baseline conditions from both brooks. A total of 10 taxa were collected in Seymour Hollow Brook and 20 taxa were collected from Rainbow Brook. The majority of taxa in both brooks were considered pollution tolerant.

Fish community structure provides a more useful benchmark to measure changes in water quality in situations where habitat is less than optimal to support a riffle dwelling benthic invertebrate community. Little fisheries information exists for Rainbow Brook or Seymour Hollow Brook. During site visits by CTDEP Bureau of Water Management in October and December 1998, no fish were observed in either Rainbow Brook or Seymour Hollow Brook. Typical fish assemblages in streams of similar size in the Connecticut River Basin consist of American eel (*Anguilla rostrata*), white sucker (*Catostomus commersoni*), blacknose dace (*Rhinichthys atratulus*), tessellated darter (*Etheostoma olmstedii*), and brook trout (*Salvelinus fontinalis*) (Hagstrom et. al., 1995). CTDEP Bureau of Water Management staff have begun discussions with CTDEP Division of Fisheries personnel to assist in obtaining more reliable baseline information on fish community structure, which is anticipated to provide the primary metric to measure progress towards attaining aquatic life use support, and achieving water quality standards.

VI. TMDL

The development of TMDLs under Section 303(d) of the CWA require pollutants to be identified and allocated among sources. In the case of Rainbow Brook and Seymour Hollow Brook, ethylene glycol and propylene glycol were initially identified as pollutants of concern. Since the initial discovery of the glycol contamination in Rainbow Brook and Seymour Hollow Brook, the use of ethylene glycol has been eliminated as a deicing/anti-icing agent and runway deicer by BIA administration. While no longer expected to be a pollutant of concern in Rainbow Brook and Seymour Hollow Brook, it will be continually monitored under the sampling requirements mandated under the Consent Order. Since the ban of ethylene glycol as a deicing chemical at BIA, propylene glycol has become the main pollutant of concern in Rainbow Brook and Seymour Hollow Brook.

Loading Capacity: Ethylene Glycol: zero
Propylene Glycol: zero

The State of Connecticut has not adopted numeric aquatic life criteria for ethylene glycol or propylene glycol, and there is no federal guidance regarding the protection of aquatic life for these chemicals. The applicable Water Quality Standard is the narrative criterion "no toxics in toxic amounts." Therefore the loading capacity was set to zero for ethylene glycol and propylene glycol.

Wasteload Allocation (WLA): Ethylene Glycol: zero
Propylene Glycol: zero

Point sources of propylene glycol originate only from deicing/anti-icing practices at BIA. It is fully expected that all point sources of propylene glycol will be eliminated under the mandates contained in Consent Order WC 5357. The extensive plans by CTDOT to develop a centralized remote deicing facility and a separate collection system designed to collect all propylene glycol will provide reasonable assurance that no propylene glycol will enter Rainbow Brook or Seymour Hollow Brook. Therefore, for propylene glycol, the TMDL portion allocated to WLA is zero. Since ethylene glycol is no longer used as a deicing chemical at BIA, it is expected that ethylene glycol will not enter Rainbow Brook or Seymour Hollow Brook. Therefore, for ethylene glycol, the TMDL portion allocated to WLA is zero.

Load Allocation (LA): Ethylene Glycol: zero
Propylene Glycol: zero

No non point source of ethylene glycol or propylene glycol is known or suspected to occur in the natural environment. Therefore, the LA is equal to zero for both ethylene glycol and propylene glycol.

Margin of Safety (MOS): Ethylene Glycol: implicit
Propylene Glycol: implicit

The TMDL for both propylene glycol and ethylene glycol uses an implicit MOS. That is, no separate amount is allocated to MOS due to the conservative nature of the TMDL analysis. Allocating zero amount of either propylene glycol or ethylene glycol to both WLA and LA applies the most stringent controls possible. Further, the uncertainty regarding the toxicity of unknown additives in deicing fluids is addressed by not allowing any amount of fluids, and therefore other additives, to enter the brooks.

Using the equation for TMDL as outlined in Section I:

TMDL for Propylene Glycol

$$\begin{aligned}\text{TMDL} &= \text{WLA} + \text{LA} + \text{MOS} \\ 0 &= 0 + 0 + \text{implicit}\end{aligned}$$

TMDL for Ethylene Glycol

$$\begin{aligned}\text{TMDL} &= \text{WLA} + \text{LA} + \text{MOS} \\ 0 &= 0 + 0 + \text{implicit}\end{aligned}$$

The Water Quality Standard narrative criterion “no toxics in toxic amounts” will be accomplished by the removal of glycols and all associated pollutants from the brooks. CTDOT staff have been aggressively implementing storm water pollution prevention measures, and are working closely with CTDEP. The sampling program outlined in the Consent Order gives us a reasonable measure to monitor the success of the new collection system and remote deicing facility, and measures of fish community structure will be used to gauge achievement of water quality standards.

Seasonality

Deicing is a cold weather event that occurs most often during the "winter season" from October-April. Rather than limit the seasonal application of each TMDL, the TMDL for propylene glycol and ethylene glycol will be zero for the entire year. This will provide a more conservative safeguard by extending the MOS to account for variations in weather patterns from year to year.

Public Participation

The Citizens Action Lawsuit initiated by the town of Windsor against CTDOT in 1990 advanced the cooperation between local citizens, CTDOT, CTDEP, and EPA Region I. This early involvement by the citizens of Windsor served as a catalyst to developing the agreement which eventually resulted in a signed consent order between CTDOT and CTDEP. Draft versions of this TMDL analysis have been distributed to interested parties for review.

Public comment on the final draft is being solicited in the Public Notice scheduled for publication on September 1, 1999. Following the conclusion of the 30-day Public Comment Period, revisions to the draft TMDL will be made as needed, and the TMDL will be submitted as a final document for EPA approval. It is our intent to prepare a written response to any comments received on the draft TMDL which will be included with the final submission.

VII. References

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VIII. *Appendices*

Appendix I. Chronology of events documenting the glycol problem at BIA.

Fall 1987, CTDEP begins to get reports of pollution problems in Rainbow Brook and Seymour Hollow Brook from residents of the town of Windsor.

February 1989, CTDEP begins investigating pollution problems in Rainbow Brook and Seymour Hollow Brook to document cause and extent of problem. CTDEP collected water chemistry and ran acute toxicity tests from sampling stations along the BIA property. High levels of glycols were found in storm water sites draining to Rainbow and Seymour Hollow Brook.

February 1990, For the second year, CTDEP collected water chemistry and ran acute toxicity tests from sampling stations along the BIA property. High levels of glycols were again found in storm water sites draining to Rainbow and Seymour Hollow Brook

August 1990, Town of Windsor filed a Citizens Action Lawsuit against CTDOT for discharging into Rainbow Brook and Seymour Hollow Brook without a permit.

March 1991, BIA proposed a short term plan to use 2 vacuum trucks (Tennant Model 550) to reduce the flow of ethylene and propylene glycol into Rainbow and Seymour Hollow Brooks. Briefly, each vacuum truck has a capacity of 510 gallons. Trucks move about areas where deicing/anti-icing has occurred. When trucks are full, they unload to a 7,000 gallon tanker truck which hauls the run off to the MDC treatment facility in Hartford.

November 1990-August 1991, A study was conducted from November 1990-August 1991 to investigate storm water flows and the potential impacts to receiving waters (Metcalf & Eddy, 1992). Initially sampled 16 storm water locations along the perimeter of BIA as well as 7 sites in receiving waters, including 4 sampling stations at Rainbow Brook and 4 sampling stations on Seymour Hollow Brook. High levels of glycols were found in storm water sites draining to Rainbow and Seymour Hollow Brook.

August 1991, Citizens action lawsuit, Town of Windsor vs. CTDOT, settled resulting in CTDOT submitting a permit application to CTDEP to discharge stormwaters into Rainbow Brook and Seymour Hollow Brook and for CTDOT to implement an interim glycol control program.

October 1990-January 1991, Town of Windsor collected water chemistry data from three sites in Seymour Hollow watershed and three on Rainbow Brook Watershed.

92/93 Winter Season

- Formalized monthly reporting of glycol recovery initiated at BIA.
- Temporary central deicing/anti-icing location southwest of Terminal B near the approach of runway 6 created. Site could process up to 5 aircraft at once and was selected due to favorable gradient which promoted flow of glycol to one area. Two 21,000 gallon storage tanks put on central deicing/anti-icing site and pump to feed glycol into tanks. Drain mats purchased for use in central deicing/anti-icing facility to prevent glycol from entering drains other than the one being used for the pumping operation.
- BIA Adopts a policy whereby only aircraft remaining overnight permitted to deice at gates. All supplemental deicing/anti-icing to take place at central area.
- Team approach to recovery problem adopted by BIA with establishment of formal goal and objectives.

93/94 Winter Season

Glycol Recovery team focused on improvements to drain system. Stainless steel "drain blockers" constructed with many modifications throughout the season to improve performance. Drain blockers were valved to allow for opening during periods when no glycol recovery was necessary. Drain blockers are used primarily in the areas of "at gate" deicing of aircraft that are staying overnight.

94/95 Winter Season

With the success of the final version of the 93/94 "drain blockers", additional units installed. A total of 38 drain blockers were used which managed 18 drains. Improvements to the central deicing area included a modification of fence line to promote more efficient use of deicing collection equipment, and better traffic control to increase safety. A better version of glycol recovery vehicle was discovered. BIA ordered the Ramp Ranger in December 1995 and recovery collection improved significantly (nearly twice as efficient as older models). The Ramp Ranger is capable of collecting 1100 gallons of fluid in its own tank and can work at higher collection speed.

December 1994 Baystate Environmental Consultants did a Wetlands Functional Assessment and identified two small wetland parcels near the headwaters of Rainbow Brook.

June 1995 *Bradley International Airport Glycol Recovery System Report* issued to CTDOT by HNTB Corporation, consultants. This is the phase I or preliminary design phase of a long term glycol

recovery effort by BIA. Recommendations include a design for a Remote Deicing Facility, and solutions for glycol disposal. Basically, once the RDF is constructed, the amount of water needing treatment will increase, the cost of trucking would become impractical, so they will need an alternative. HNTB recommends treatment and disposal of glycol contaminated storm water by an outside firm. During construction of RDF, recommend continue to truck to Hartford MDC.

95/96 Winter Season

Improvements made to gasket materials for drain blockers. Two additional 5,000 gallon tanker trailers were procured to increase storage capacity. Installed a bituminous curb to control flow.

96/97 Winter Season

- Drainage pipe added to central deicing location to improve the flow with less dilution to the collection pit
- Installed a new collection basin for the pumping operation at the central site and constructed a head wall to prevent infiltration of non contaminated storm water in the collection pit
- Constructed a slush dump in the central deicing area to off-load glycol contaminated slush that will drain to collection pit
- Two additional Ramp Rangers purchase with the water blast capability for stripping residual glycol from the pavement.
- May 12, 1997 BIA administration issues a memorandum to all air carriers to announce its plan to prohibit the use of ethylene glycol for deicing at BIA as of January 1, 1998. After January 1, 1998, only propylene glycol will be used at BIA.
- Negotiations with AR Plus Site Services, Inc. for processing and recycling of collected fluids
- BIA switches from UCAR® (ethylene glycol based + urea) to potassium acetate for anti-icing and deicing of runways

February 19-20, 1997 EPA region I staff conducted a Compliance Evaluation Inspection of BIA facility.

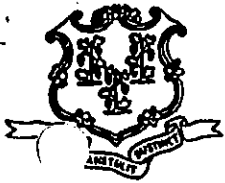
March 3-4, 1997 EPA Region I staff collected samples from selected outfalls during a deicing event.

97/98 Winter Season

- Contract signed with AR Plus Site Services for glycol processing on 12/29/97
- February 9, 1998 BIA hires a full time Environmental Analyst [Mr. Daniel F. Reynolds, Environmental Analyst, Connecticut Department of Transportation, Bradley International Airport, Terminal B, Administrative Office Building , Windsor Locks, CT 06096]
- February 1998 CTDEP issues an Emergency Authorization to CTDOT to discharge wastewater generated during the process of recycling propylene glycol from spent aircraft deicing fluid to the sanitary sewer (MDC Poquonock).
- May 1998 *Bradley International Airport Storm Water Pollution Prevention Plan* by Metcalf and Eddy submitted to CTDOT approved by CTDEP.
- June 11, 1998 A glycol/storm water management seminar hosted by BIA. As a result of demonstrations given at this seminar, BIA purchased a Glycol Interceptor (GI) during the 1997/98 winter season. The GI pumps the contaminated storm water to the receiving tank and has the capability of sensing the glycol content in the water and can redirect the flow to different tanks based on content. Other technology demonstrated at this conference was a reverse osmosis unit which yields processed wastewater with < 100ppm of glycol and recovers clean propylene glycol ready for return to commercial use.
- August 1998 Letter sent out by CTDOT Environmental Analyst to all airport tenants involved with deicing to establish their own recovery efforts, record keeping, and storm water monitoring. A follow up meeting was held Sept 15, 1998. All tenants involved with deicing were informed that they are required to file monthly reports on glycol used and amount recovered and provide operational procedure documents on their recovery process.
- BIA, in conjunction with AR Plus Site Services, increases storage capacity of glycol from 55,000 gallons to 200,000 gallons. To take advantage of increased storage, BIA will increase the use of bituminous curbing in the deicing area to redirect as much water as possible to the collection pit.
- September 1998, Consent Order Number WC 5257 State of Connecticut, Department of Environmental Protection v. State Of Connecticut, Department of Transportation issued.

- October 6, 1998 A meeting was held with all BIA tenants on the operational procedures for the central deicing area. Two topics discussed were aircraft safety and procedures to maximize the glycol collection.
- Consulting Environment Engineers assigned as the on-call environmental consultant for storm water monitoring and sampling. To facilitate sampling, BIA is purchasing a portable glycol collection unit for in-house Environmental Analyst use.
- CTDOT will be shifting from a "prill type" urea to sodium acetate as a solid runway deicing agent during the 1999/2000 storm season.

Appendix II. Consent Order WC5257, State of Connecticut, Department of Environmental Protection
v. State of Connecticut, Department of Transportation.



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION



STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

V.

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

CONSENT ORDER

A. With the agreement of the State of Connecticut, Department of Transportation ("Respondent"), the Commissioner of Environmental Protection ("the Commissioner") finds:

1. Respondent is and has been engaged in the management of activities associated with the operation of Bradley International Airport ("the Airport") located in the towns of Windsor, Windsor Locks, East Granby and Suffield, Connecticut.
2. Respondent, as owner and operator of the Airport, oversees the activities of air carriers and other Airport tenants which may contribute to the contamination of stormwater runoff from the Airport. These activities include aircraft fueling and defueling, chemical deicing of aircraft and paved surfaces, use of above and underground fuel and chemical storage facilities, and aircraft and service vehicle washing and maintenance.
3. Stormwater runoff from the Airport is directed to small tributary streams within the Farmington River and Stony Brook watersheds, including but not limited to Rainbow and Seymour Hollow Brooks. This runoff may at times be contaminated with pollutants associated with Airport activities such as aircraft and service vehicle fuels and deicing chemicals, including but not limited to ethylene and propylene glycols and urea as documented in "Draft Stormwater Quality Control Study for Bradley International Airport", Metcalf and Eddy Engineers, April 1992. Respondent does not have a permit to discharge such pollutants in accordance with Section 22a-430 CGS.
4. Respondent has implemented a plan for the interim collection of deicing chemical contaminated stormwater runoff at the Airport, and has prepared a plan for the long-term elimination of deicing chemical contaminated runoff at the Airport including the design and construction of structural collection, treatment, reuse and/or recycle facilities as described in the document entitled "Bradley International Airport Glycol Recovery System Plan", HTNB Corporation, September, 1995.

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5. Respondent has submitted an application for a permit to discharge stormwater pursuant to CGS Section 22a-430 on December 4, 1990, with addendums dated November 29, 1993, December 17, 1993 and January 10, 1994.
 6. By virtue of the above, Respondent has polluted the waters of the state and has created or is maintaining a facility which reasonably can be expected to create a source of pollution to the waters of the state and has maintained a discharge to the waters of the state without obtaining a permit as required by section 22a-430 of the Connecticut General Statutes.
 7. By agreeing to the issuance of this consent order, Respondent makes no admission of fact or law with respect to the matters addressed herein, other than the facts asserted in paragraphs A.1, A.4 and A.5.
- B. With the agreement of Respondent, the Commissioner, acting under Sections 22a-6, 22a-424, 22a-425, 22a-427, 22a-430, 22a-431 and 22a-432 of the Connecticut General Statutes, orders Respondent as follows:
1.
 - a. On May 22, 1998 Respondent submitted for the review and written approval of the Commissioner a Stormwater Pollution Prevention Plan which describes the sources of, and the recommended means to control or eliminate pollutants entering stormwater runoff associated with Airport operations. The report includes proposals for the design and construction of any necessary new or modified control facilities, and for the development of management systems, corrective measures and controls and other actions needed to implement the approved plan. Within thirty (30) days after the Commissioner approves such plan, Respondent shall carry out the plan in accordance with an approved schedule and maintain it in full effect thereafter.
 - b. On or before June 30, 1999 and continuing annually every July thereafter until all actions required by this consent order have been completed as approved and to the satisfaction of the Commissioner, Respondent shall submit for the review and written approval of the Commissioner a summary report which describes the effectiveness of the interim deicing chemical collection/control program for each past winter season including any proposed measures to further improve the program's performance.
 - c. On or before thirty (30) days after the date of issuance of this consent order, submit for the review and written approval of the Commissioner a

Scope of Study for an Environmental Management Plan (hereinafter "the Plan") which defines and outlines a comprehensive program to address all areas of environmental concern at the Airport including but not limited to all air, water, and waste issues associated with past and present activities. The Scope of Study shall include a proposed schedule for the development of the Plan and Respondent shall implement the recommendations of the Plan as approved by the Commissioner and maintain it in full effect thereafter.

- d. On or before thirty (30) days after the date of issuance of this consent order, Respondent shall submit for the review and written approval of the Commissioner a revised engineering report (hereinafter "the Phase I Report") which describes the existing means of collection, treatment, reuse, recycling and/or disposal of deicing chemical wastewaters and any modifications to the "Bradley International Airport Glycol Recovery System Report" prepared by HNTB Corporation, September 1995. The Report shall include a detailed description of the current method of collection of deicing chemical wastewaters at all areas of the Airport, including but not limited to existing terminal gate areas and any remote locations. Within thirty (30) days of the date of the Commissioner's approval of the Phase I Report, Respondent shall verify in writing that all Phase I facilities have been constructed as approved and are fully operational.
- e. On or before thirty (30) days after the date of issuance of this consent order, Respondent shall submit for the review and written approval of the Commissioner a proposed plan and schedule for design and construction of all improvements to existing deicing chemical wastewater collection facilities (hereinafter "the Phase II Report"), including but not limited to the Remote Deicing Facility (RDF), any new terminal stormwater collection system(s) and any Terminal A stormwater collection system modifications developed in conjunction with Airport Master Plan implementation. Respondent shall perform all tasks identified in the approved plan in accordance with the approved schedule.
- f. Within sixty (60) days of the date of the Commissioner's approval of the Phase II Report, Respondent shall submit for the review and approval of the Commissioner contract plans and specifications for the RDF and associated work as described in the approved Report.
- g. In accordance with the schedule approved by the Commissioner in Section B.1.e. above, Respondent shall complete construction of the RDF and associated work as identified in the Phase II Report and verify in writing

to the Commissioner that such facilities have been constructed as approved and are fully operational.

- h. In accordance with the schedule approved by the Commissioner in Section B.1.e. above, Respondent shall complete all remaining Phase II construction as identified in the Report and verify in writing that such facilities have been constructed as approved and are fully operational.
 - i. Following issuance of this consent order and continuing until all actions required by this consent order have been completed as approved and to the satisfaction of the Commissioner, Respondent shall monitor and report on stormwater runoff from the Airport in accordance with the terms and conditions specified in Attachment A.
2. Penalty for past violations/Supplemental Environmental Project. On or before thirty (30) days after the date of issuance of this consent order, Respondent shall pay a civil penalty of forty-thousand (\$40,000) for the past violations alleged in this consent order. In addition to the civil penalty, Respondent shall provide funding of not less than sixty-thousand (\$60,000) for a supplemental environmental project (SEP) consisting of a study designed to determine the source(s) of aquatic toxicity in stormwater. Such study shall be in accordance with a plan approved by the Commissioner and as specified in Attachment B to this consent order. Respondent agrees to make such SEP funding available in two (2) equal installments to an agent designated by the Commissioner to perform the SEP. Each installment shall be paid to said agent within thirty (30) days of written notification by the Commissioner to Respondent.
- If and when Respondent disseminates publicity regarding its funding of the SEP, Respondent shall include a statement that such funding is in partial settlement of an enforcement action brought by the Commissioner.
3. Payment of Penalties. Payment of civil penalties under this consent order shall be mailed or personally delivered to the Department of Environmental Protection, Bureau of Administrative Accounts Receivable Office, 79 Elm St., Hartford, Connecticut, 06106-5127, and shall be by Treasurer's check payable to the Connecticut Department of Environmental Protection. The check shall state on its face, "Water management civil penalty -- Permitting, Enforcement, & Remediation Division, Consent Order No. WC0005257." A copy of the check and any transmittal letter shall also be sent to James Grier in the Bureau of Water Management at the same address.
4. Progress reports. On or before the last day of June and December of each year after issuance of this consent order and continuing until all actions required by

this consent order have been completed as approved and to the satisfaction of the Commissioner, Respondent shall submit a progress report to the Commissioner, describing the actions which Respondent has taken to comply with this consent order to date, and describing any anticipated problems in meeting the requirements of this consent order.

5. Full compliance. Respondent shall not be considered in full compliance with this consent order until all actions required by this consent order have been completed as approved and to the satisfaction of the Commissioner.
6. Approvals. Respondent shall use best efforts to submit to the Commissioner all documents required by this consent order in a complete and approvable form. If the Commissioner notifies the Respondent that any document or other action is deficient, and does not approve it with conditions or modifications, it is deemed disapproved, and Respondent shall correct the deficiencies and resubmit it within the time specified by the Commissioner or, if no time is specified by the Commissioner, within thirty days of the Commissioner's notice of deficiencies. In approving any document or other action under this consent order, the Commissioner may approve the document or other action as submitted or performed or with such conditions or modifications as the Commissioner deems necessary to carry out the purposes of this consent order. Nothing in this paragraph shall excuse noncompliance or delay.
7. Definitions. As used in the consent order, "Commissioner" means the Commissioner or an agent of the Commissioner.
8. Dates. The date of submission to the Commissioner of any document required by this consent order shall be the date such document is received by the Commissioner. The date of any notice by the Commissioner under this consent order, including but not limited to notice of approval or disapproval of any document or other action, shall be the date such notice is personally delivered or the date three days after it is mailed by the Commissioner, whichever is earlier. Except as otherwise specified in this consent order, the word "day" as used in this consent order means calendar day. Any document or action which is required by this consent order to be submitted or performed by a date which falls on a Saturday, Sunday or a Connecticut or federal holiday shall be submitted or performed on or before the next day which is not a Saturday, Sunday, or Connecticut or federal holiday.
9. Notification of noncompliance. In the event that Respondent becomes aware that it did not or may not comply, or did not or may not comply on time, with any requirement of this consent order or of any document required hereunder, Respondent shall immediately notify the Commissioner and shall take all

reasonable steps to ensure that any noncompliance or delay is avoided or, if unavoidable, is minimized to the greatest extent possible. In so notifying the Commissioner, Respondent shall state in writing the reasons for the noncompliance or delay and propose, for the review and written approval of the Commissioner, dates by which compliance will be achieved, and Respondent shall comply with any dates which may be approved in writing by the Commissioner. Notification by Respondent shall not excuse noncompliance or delay, and the Commissioner's approval of any compliance dates proposed shall not excuse noncompliance or delay unless specifically so stated by the Commissioner in writing.

10. Certification of Documents. Any document, including but not limited to any notice, which is required to be submitted to the Commissioner under this consent order shall be signed by the Respondent, as those terms are defined in section 22a-430-3(b)(2) of the Regulations of Connecticut State Agencies and by the individual or individuals responsible for actually preparing such document, each of whom shall certify in writing as follows: "I have personally examined and am familiar with the information submitted in this document and all attachments and certify that based on reasonable investigation, including my inquiry of those individuals responsible for obtaining the information, the submitted information is true, accurate and complete to the best of my knowledge and belief, and I understand that any false statement made in this document or its attachments may be punishable as a criminal offense."
11. Noncompliance. This consent order is a final order of the Commissioner with respect to the matters addressed herein, and is nonappealable and immediately enforceable. Failure to comply with this consent order may subject Respondent to an injunction and penalties under Chapters 439, and 445 or 446k of the Connecticut General Statutes.
12. False statements. Any false statement in any information submitted pursuant to this consent order may be punishable as a criminal offense under Section 22a-438 or 22a-131a of the Connecticut General Statutes or, in accordance with Section 22a-6, under Section 53a-157 of the Connecticut General Statutes.
13. Commissioner's powers. Nothing in this consent order shall affect the Commissioner's authority to institute any proceeding or take any other action to prevent or abate violations of law, prevent or abate pollution, recover costs and natural resource damages, and to impose penalties for violations of law which are willful or criminally negligent or for which penalties have not been specifically provided in this consent order, including but not limited to violations of any permit issued by the Commissioner. If at any time the Commissioner determines

that the actions taken by Respondent pursuant to this consent order have not fully characterized the extent and degree of pollution or have not successfully abated or prevented pollution, the Commissioner may institute any proceeding to require Respondent to undertake further investigation or further action to prevent or abate pollution.

14. **Respondent's obligations under law.** Nothing in this consent order shall release Respondent of other obligations under applicable federal, state and local law.

15. **Remediation by Respondent.** In compliance with the provisions of this consent order and no other action initiated by the Commissioner shall be considered a consent order or agreement to any future consent order. The actions taken by Respondent pursuant to this consent order shall not constitute or prevent or abate pollution.

16. **Access to site.** Any representative of the Department of Environmental Protection may enter the site without prior notice for the purposes of monitoring or enforcement of the provisions of this consent order.

17. **Notification of interested parties.** This consent order shall not constitute a release of any rights of persons who own or participate in the site, and are not certified that they are not interested parties to the consent order.

18. **Provision of information.** Within a reasonable period of time, Respondent shall provide the Commissioner with any information submitted to the Commissioner or any other agency, or any other person, in connection with this consent order, or any other relevant information was omitted. Respondent shall submit the correct or omitted information to the Commissioner.

19. **Retention of documents.** Any document requested to be submitted to the Commissioner under this consent order shall, unless otherwise specified in writing, be retained by the Respondent.

Mr. James Grier
Department of Environmental Protection
Water Management Bureau
Permits, Enforcement & Site Remediation Division
75 Elm Street
Hartford, Connecticut 06106-5127

Any approval or document issued by the Commissioner to Respondent under this consent order shall be directed to:

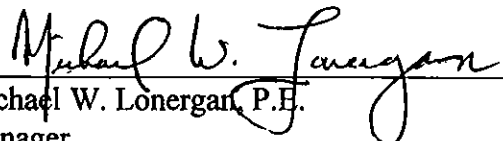
Mr. Michael Lonergan

Department of Transportation
Bureau of Engineering & Highway Operations
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546

Respondent consents to the issuance of this consent order without further notice. The undersigned certifies that he is fully authorized to enter into this consent order and to legally bind the Respondent to the terms and conditions contained herein.

Connecticut Department of Transportation

BY:


Michael W. Lonergan, P.E.
Manager
Division of Environmental Compliance

9/15/98

Date

Issued as a final order of the Commissioner of Environmental Protection on September 23, 1998.


Arthur J. Roque, Jr.
Commissioner

ORDER NO. WC 5257
DEP/WPC NO. 165-018
DISCHARGE CODE A

TOWN OF WINDSOR, WINDSOR LOCKS, EAST GRANBY, SUFFIELD LAND RECORDS

ATTACHMENT A

Interim Stormwater Monitoring Program

1. Bradley International Airport ("the Airport") is situated approximately 12 miles north of Hartford and is located (in part) in the towns of Windsor, Windsor Locks, East Granby, and Suffield. The Connecticut Department of Transportation, Bureau of Aviation and Ports operates the Airport which covers an area of approximately 2,360 acres, of which approximately 1,290 are paved. Sixteen major stormwater discharge outfall locations have been identified and are described in Table 1, and shown along with their associated drainage areas in Figure 1. Most of these drainage areas are within small watersheds of feeder streams to the Farmington River, primarily Rainbow and Seymour Hollow Brooks which receive stormwater runoff from the terminal and gate areas of the Airport.

For purposes of monitoring stormwater quality, the sixteen storm water discharge outfalls have been consolidated into eight locations with similar drainage area characteristics. These sampling locations have been selected to be representative of the impacts of Airport activities on local receiving waters and are depicted in Figure 1.

2. All stormwater discharges listed in Table 1 shall not exceed and shall otherwise conform to specific terms and conditions listed below. Those stormwater outfalls designated as sampling locations in Figure 1 shall be monitored and results reported to the Water Management Bureau (Attn: DMR Processing) and to the Town of Windsor Community Health Services Department by the end of the month after the month in which samples are taken according to the following schedule:

- A. Discharge Serial No. 1A, 1B, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13A, 14 (Table 1)
 Sampling Location: 1A, 2, 3-1, 3-2, 7, 8, 9, 10, 13-1 (Reference: Figure 2, Site Map; BIA Stormwater Pollution Plan, March 1998, by Metcalf & Eddy, Inc.)
 Description: Stormwater Runoff (Discharge Code 1080000)
 Receiving Streams: as per Table 1 (Basin Code 4300)
 Present/Future Water Quality Standard: Class A
 Average Daily Flow: Intermittent and variable, depending upon storm event

- (1) The pH of the discharge shall not be less than 6.0 or greater than 9.0 (Code 00400-012) unless samples of rainfall collected during the precipitation event which produced the runoff have a pH of less than 6.0 or greater than 9.0. In these cases the pH limit shall be that of the rainfall.
- (2) The discharge shall not contain or cause in the receiving stream a visible oil sheen or floating solids.

- (3) The discharge shall not cause visible discoloration or foaming in the receiving waters.

<u>Parameter</u>	<u>Units</u>	<u>Minimum Frequency of Sampling</u>	<u>Sample Type</u>
Total Oil and Grease	mg/l	4 Events/Year	Grab
pH	S.U.	4 Events/Year	Grab
Chemical Oxygen Demand	mg/l	4 Events/Year	Grab
Chloride	mg/l	4 Events/Year	Grab
Total Suspended Solids	mg/l	4 Events/Year	Grab
Total Phosphorous	mg/l	4 Events/Year	Grab
Total Kjeldhal Nitrogen	mg/l	4 Events/Year	Grab
Nitrate as Nitrogen	mg/l	4 Events/Year	Grab
Total Copper	mg/l	4 Events/Year	Grab
Total Chromium	mg/l	4 Events/Year	Grab
Total Lead	mg/l	4 Events/Year	Grab
Total Nickel	mg/l	4 Events/Year	Grab
Total Zinc	mg/l	4 Events/Year	Grab
Fecal Coliform	#/100ml	4 Events/Year	Grab
BOD 5-Day	mg/l	4 Events/Year	Grab
Acute Aquatic Toxicity	LC50	1 Winter Event/Year	Grab
Ammonia	mg/l	2 Winter Events/Year	Grab
Ethylene Glycol	mg/l	2 Winter Events/Year	Grab
Formaldehyde	mg/l	2 Winter Events/year	Grab
Propylene Glycol	mg/l	2 Winter Events/Year	Grab
Ethyl Alcohol	mg/l	2 Winter Events/Year	Grab
Propyl Alcohol	mg/l	2 Winter Events/Year	Grab
Isopropyl Alcohol	mg/l	2 Winter Events/Year	Grab
Dissolved Oxygen	mg/l	2 Winter Events/Year	Grab

- (4) Acute toxicity tests shall be conducted on undiluted samples of stormwater (specified NOAEL concentration 100%) according to the procedures specified in 22a-430-3 (j) (7)(A)(I) of the Regulations of Connecticut State Agencies. The following specific conditions shall apply:
- (a) Acute Toxicity biomonitoring tests shall be conducted no later than 365 days after the date of issuance of this consent order and annually thereafter and in accordance with the requirements of Paragraph 4(A) below.

- (I) Tests shall employ neonatal (less than 24 hour old) Daphnia pulex and juvenile (1-14 days old) Pimephales promelas as test organisms.
 - (ii) Tests shall be conducted at 20+/-1 degrees Centigrade.
 - (iii) Tests shall be 24 hours in duration.
 - (iv) Synthetic dilution water adjusted to an approximate hardness of 50 mg/l as CaCO₃, shall be used as control water in all tests.
 - (v) Test organisms shall not be fed during the test period.
 - (vi) A test determined to be invalid as a result of inadequate survival of test organisms or failure to conduct the test in accordance with the protocol and conditions specified above shall be repeated as soon as practicable.
 - (vii) Stormwater which exhibits a hardness of less than 50 mg/l as CaCO₃ may be adjusted to an approximate hardness of 50 mg/l CaCO₃ prior to testing in accordance with the methodology specified in Methods for Measuring the Acute Toxicity of Effluent and Receiving Waters to Freshwater and Marine Organisms, 4th edition (EPA/600/4-90/027F).
- (b) If the results of any acute toxicity test indicate greater than 50 percent mortality to either test species has occurred during a valid test as a result of exposure to undiluted stormwater, the discharger shall submit a report to the Commissioner which includes as a minimum the following information:
- (I) The complete results of the acute toxicity test, including the percent survival in each replicate test chamber and any physical/chemical monitoring of test solutions conducted prior to, during, or upon completion of the test.
 - (ii) Results of any chemical analyses conducted on samples of stormwater believed to be representative of the samples used in the acute toxicity biomonitoring test.

- (c) Reports prepared in accordance with Paragraph 5(b) above shall be submitted within 90 days of the date of sampling to:

Department of Environmental Protection
Bureau of Water Management
79 Elm Street
Hartford, Connecticut 06106-5127
Attention: Water Toxics Program Coordinator

- (d) The report shall include a detailed explanation of any violations of the limitations specified above.

- B. In addition to the monitoring of stormwater outfalls required in Paragraph 2(A) above, receiving water quality shall be monitored during winter storm deicing events at the Airport as follows:

Monitoring Location: T1, T2, T3, T4, T5, T6, E, F (Figure 1)

Description: Receiving Water Sampling Locations (winter storm events)

Receiving Streams: Rainbow Brook and Seymour Hollow Brook as per Figure 1 (Basin Code 4300)

Present/Future Water Quality Standard: Class A

<u>Parameter</u>	<u>Units</u>	<u>Minimum Frequency of Sampling</u>	<u>Sample Type</u>
Ammonia	mg/l	2 Winter Events/Year	Grab
BOD 5-Day	mg/l	2 Winter Events/Year	Grab
Ethylene Glycol	mg/l	2 Winter Events/Year	Grab
Propylene Glycol	mg/l	2 Winter Events/Year	Grab
Ethyl Alcohol	mg/l	2 Winter Events/Year	Grab
Formaldehyde	mg/l	2 Winter Events/Year	Grab
Isopropyl Alcohol	mg/l	2 Winter Events/Year	Grab
Dissolved Oxygen	mg/l	2 Winter Events/Year	Grab
pH	S.U.	2 Winter Events/Year	Grab

3. Information Required on Monitoring Report: The discharge monitoring reports shall include but not be limited to the following information:

- A. The total precipitation (Code 79777-061) at the time of grab sample collection.
- B. The date, temperature, time of sampling of each monitoring location, and length in hours of the storm event sampled.
- C. The magnitude (in inches) of the storm event sampled.
- D. The duration between the storm event sampled and the end of the previous measurable (greater than 0.1 inch rainfall) storm event.

4. Storm Event Sampling Protocol:

- A. Frequency of sampling: All stormwater outfalls (as designated in Paragraph 2(A) above) shall be sampled during four storm events each year, two of which must occur during winter operations when significant aircraft deicing activity is taking place. Receiving water sampling shall be conducted at all specified locations during the two winter storm events selected. The annual requirement for acute toxicity biomonitoring shall be conducted on undiluted samples of stormwater obtained from stormwater outfall Discharge Serial Nos 2 and 3 during one of the winter storm events.
- B. Type and timing of sampling: Grab samples shall be obtained at each specified stormwater outfall location during the first 30 minutes of a storm event. During the two winter stormwater monitoring events, hourly grab samples shall be collected at outfalls 2 and 3 until the end of the precipitation event or for a maximum of 6 hours. For receiving water sampling during winter storm events, grab samples shall be collected from each designated location within the first 60 minutes of each storm event, and continue hourly until the end of the precipitation event or for a maximum of 8 hours. All pollutant parameters are to be determined according to methods described in 40 CFR Part 136.
- C. Precipitation event to be sampled: Samples from each monitoring location shall be collected from discharges resulting from a storm that is greater than 0.1 inch (1.0 inch of snowfall) in magnitude and that occurs at least 72 hours after any previous storm event of 0.1 inch or greater. Where feasible, the difference between the sampled event and the event average or median rainfall event in the area (in terms of the rainfall intensity during the first 30 minutes of the storm event) shall not exceed 50 percent.



STATE OF CONNECTICUT

DEPARTMENT OF ENVIRONMENTAL PROTECTION



RESEARCH PROJECT PROPOSAL

Identification of Pollutants Responsible for Toxicity in Stormwater Runoff

Point of Contact:

Lee E. Dunbar
Water Toxics Program
Bureau of Water Management
79 Elm Street
Hartford, CT 06106

Funding Required:

\$60,000

Project Description:

Over half of the 1,014 sites covered by Connecticut's General Permit for Stormwater Associated with Industrial Activity reported acute toxicity in stormwater samples collected during 1996 (reference). Approximately 20% reported the discharge of highly toxic stormwater (LC50 < 20%). These data suggest that stormwater runoff is a potentially significant factor with respect to maintaining aquatic life uses in heavily developed watersheds.

Annual stormwater monitoring (1996, 1997) has included chemical analysis for 10 water quality parameters in addition to whole effluent toxicity. Extensive analysis of this data has not resulted in a clear understanding of the causes of stormwater toxicity. Identification of the specific causes of stormwater toxicity is critical to the development and evaluation of Best Management Practices (BMP) and Pollution Prevention (P2) initiatives. Better knowledge of the specific causes of toxicity in stormwater runoff will allow BMP and P2 development efforts to be focussed on reducing the specific contaminants responsible for wet weather toxic impairments.

The proposed project would involve identification of the specific chemical contaminants responsible for stormwater toxicity in a minimum of 20 stormwater samples collected during the 1998 sampling season. Toxicity Identification Evaluations would be performed using EPA recommended Phase I TIE Characterization protocols. DEP Water Toxics Program staff, in cooperation with the Connecticut Business and Industry Association and the contract laboratory selected to perform the testing, would identify candidate sites. Samples would be collected by facilities volunteering to participate in the research program in accordance with established protocols for annual monitoring with the exception that additional sample volume would be collected for conducting the TIE.

(Printed on Recycled Paper)

79 Elm Street • Hartford, CT 06106 - 5127

<http://dep.state.ct.us>

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Stormwater samples collected by participating facilities will be screened for toxicity upon receipt by the testing laboratory and, if confirmed toxic, subjected to TIE procedures. *Daphnia pulex* will be used as the test species for all TIE's. All samples will be analyzed for Hardness, pH, Oil & Grease, Chemical Oxygen Demand, Total Phosphorus, Total Kjeldahl Nitrogen, Nitrate, Total Copper, Total Lead, Total Zinc, as required by the General Permit. Analysis for additional parameters will be performed as needed to successfully complete the TIE (e.g. dissolved metals, PAHs, pesticides). Supporting data relating to the nature of the industrial activity such as SIC Code, size, and geographic location and storm event information including storm date, rainfall amount and pH, time interval since previous storm event will also be recorded for each sample.

A final report which provides a summary of the TIE results for all facilities tested and highlights any observed similarities between facilities with respect to the causes of toxicity will be prepared jointly by DEP and the contractor. The report will contain recommendations for priority BMP development as well as recommendations for modifications to the TIE EPA Phase I protocol for routine use for stormwater toxicity characterization.

Project Schedule:

Data collection	April-October 1998
TIE Analysis	May-November 1998
Preliminary Draft	January 1999
Final Report	March 1999

Relationship to Clean Water Act criteria:

This project directly benefits regulatory efforts to reduce pollution caused by wet weather flows. Identifying the specific chemical contaminants responsible for wet weather runoff toxicity will allow BMP and P2 development efforts to be focussed on reducing the concentrations of these contaminants in stormwater or mitigating their effects in-stream. Implementation of these targeted BMPs and P2 measures by regulated facilities are more likely to be effective in reducing the toxicity and potential impacts associated with stormwater runoff than actions taken without prior knowledge of the contaminants causing toxicity. Demonstrating the effectiveness of this "performance-based" approach to stormwater regulation will reduce the perceived need for a more traditional and State resource intensive regulatory program involving end-of-pipe numerical limits.

The project will aid in the assessment of wet weather impacts on resident aquatic communities. Knowledge of the contaminants responsible for toxicity in stormwater will enhance regulator's ability to predict potential for in-stream impairments and help evaluate exposure / duration criteria for wet weather numeric criteria development.

Reference: *Stormwater Monitoring at Industrial Sites in Connecticut*, Paper presented at the 1997 EPA National Water Quality Meeting, Providence, RI .



STATE OF CONNECTICUT

DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546

NEWINGTON, CONNECTICUT 06131-7546

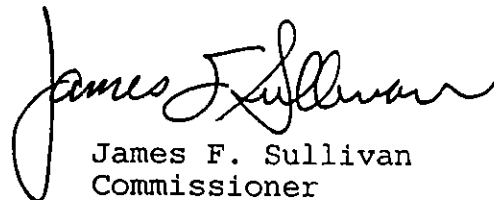


Office of the
Commissioner

An Equal Opportunity Employer

Delegation of Authority to Sign Documents,
Authorized by Section 13b-17 of the
Connecticut General Statutes, As Amended

Know All Ye Persons By These Presents, That I, James F. Sullivan, Commissioner of Transportation, as authorized by Section 13b-17 of the Connecticut General Statutes, as amended, do hereby delegate to Michael W. Lonergan, Manager of the Division of Environmental Compliance, Department of Transportation, Bureau of Engineering and Highway Operations, the authority to sign consent orders for all Department of Transportation operations.


James F. Sullivan
Commissioner

Date: *September 15, 1998*

LEGEND

13

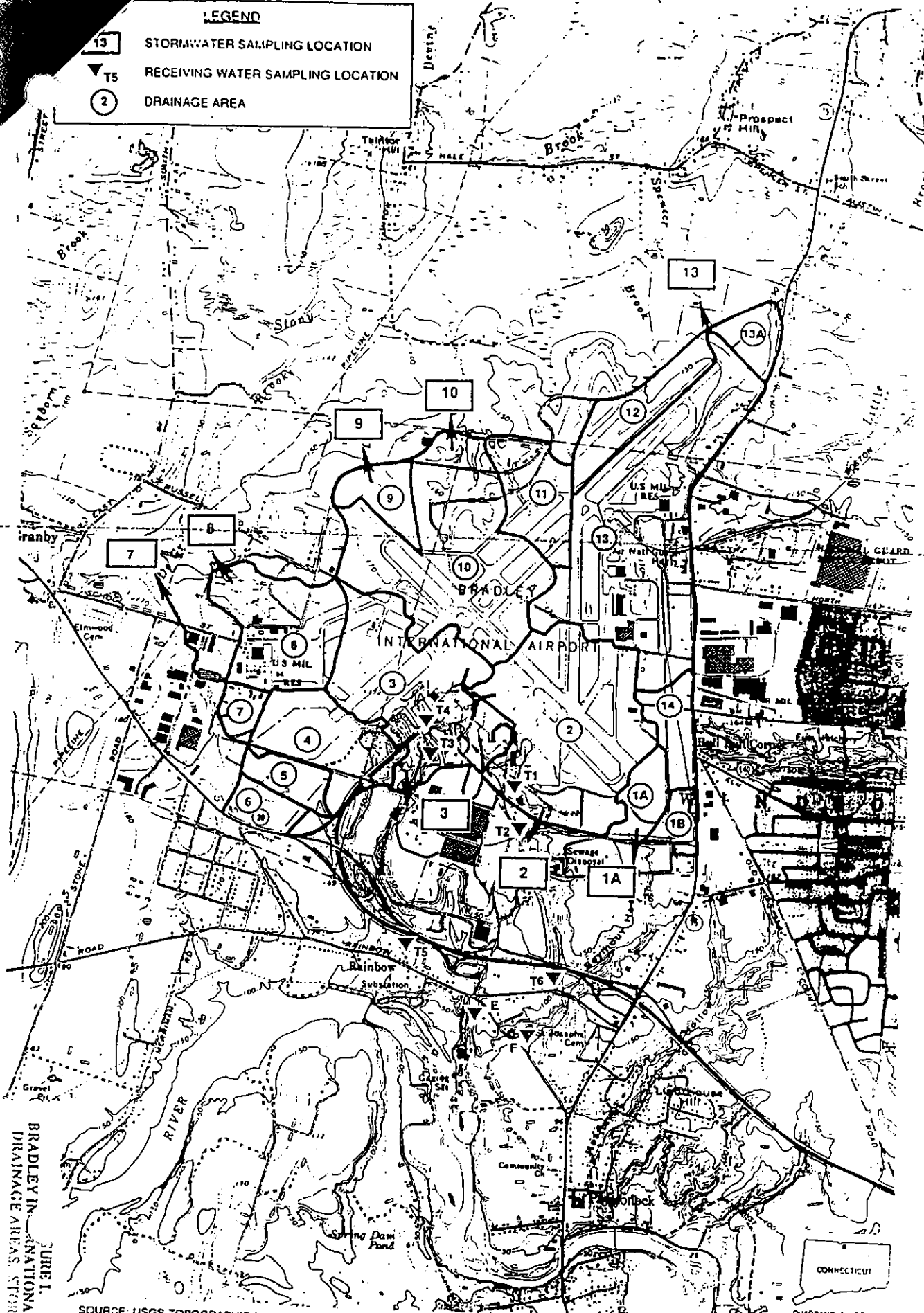
STORMWATER SAMPLING LOCATION

T5

RECEIVING WATER SAMPLING LOCATION

2

DRAINAGE AREA



SOURCE: USGS TOPOGRAPHIC MAP
WINDSOR LOCKS, CT, 1964
PHOTOREVISED 1984

CONNECTICUT

QUADRANGLE LOCATION

2000 0 2000

TABLE 1. SUMMARY OF STORM WATER DISCHARGES FOR BRADLEY INTERNATIONAL AIRPORT; WINDSOR LOCKS, CT.

Outfall Number	Area of Impervious Surface (Acres)	Total Area Drained (Acres)	Receiving Water
1A	9.6	32.1	Seymour Hollow Brook
1B	9.0	22.4	Seymour Hollow Brook
2	174.9	249.8	Seymour Hollow Brook
3	15.3	219.5	Rainbow Brook
4	59.0	98.3	Rainbow Brook
5	0	28.5	Rainbow Brook
6	0	27.5	Unnamed Brook
7	5.3	21.1	DeGraves Brook
8	48.5	121.2	DeGraves Brook via Wetlands
9	1.4	35.8	DeGraves Brook via Wetlands
10	36.5	260.8	Stoney Brook via Wetlands
11	20.4	68.0	Stoney Brook via Wetlands
12	2.0	66.1	Spencer Brook
13	66.9	334.3	Spencer Brook
13A	0.3	34.0	Spencer Brook
14	0.8	38.6	Kettle Brook