Appendix B:
Quality Assurance Project Plan

Quality Assurance Project Plan
for
Irasville Growth Center
Stormwater Quality Monitoring

Prepared for: The Town of Waitsfield, Vermont *and*
The Mad River Valley Planning District

Prepared by: Lamoureux & Dickinson Consulting Engineers, Inc.
14 Morse Drive, Essex Junction, VT 05452

December 2001

Approvals:

Roger Dickinson, *Project Manager* — 12-19-01 Date

Brian Tremback, *Project QA Officer* — 12-19-01 Date

Rosemary Monahan, *USEPA Project Manager* — 12/27/01 Date

Steve DiMattei, *USEPA QA Officer* — 12-26-01 Date

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November 15, 2001

Approvals:

Roger Dickinson, *Project Manager* Date

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2. Table of Contents

3. Distribution List

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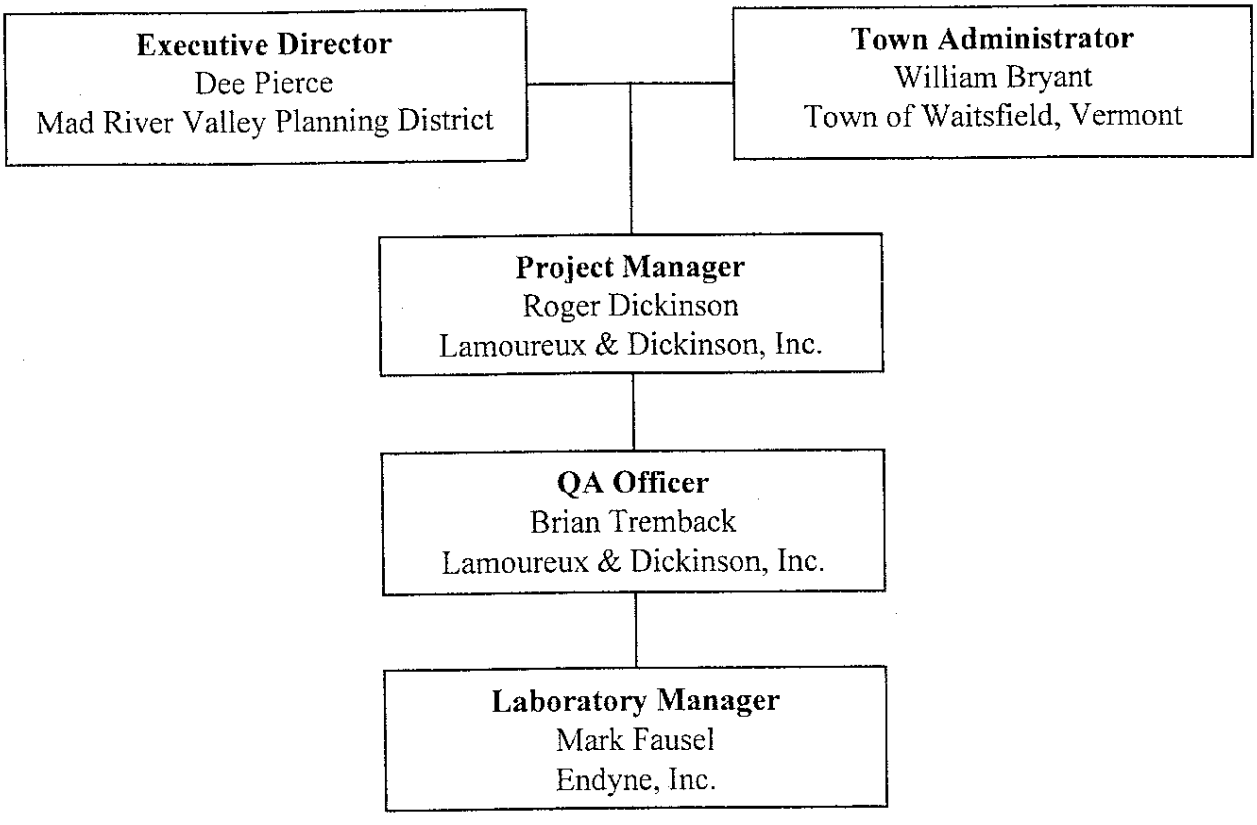
4. Project/Task Organization



5. Problem Identification/Background

The Waitsfield Town Plan has designated Irasville and Waitsfield villages as growth centers. The focus of the current planning effort is on Irasville where development pressures are greatest. The intent is to cluster retail, office, and residential uses near existing services to reduce environmental, social, and economic costs. This type of development will also simplify collection, detention, and treatment of stormwater before discharge to the Mad River.

Currently the easiest type of development to get permitted is a single-use, low-density project on an individual small (one acre) parcel of land. This type of development avoids the need for large septic capacity or innovative treatment, stormwater management review, Vermont's Act 250 land use permit process, and simplifies wetlands permitting.

The Town of Waitsfield, Vermont and the Mad River Valley Planning District completed the first phase of the Irasville Master Development Planning Project and identified the most significant physical, economic, institutional, financial, social and regulatory problems that are discouraging desirable growth center development. Taken together, these problems are leading to environmental degradation, and favoring undesirable land use patterns in the Town and Valley:

1. The lack of a comprehensive approach to managing stormwater for the area has resulted in degradation of water quality, caused permitting problems, and discouraged compact growth.
2. There is a significant acreage of low-value wetland areas in the Growth Center that, because of the required permitting, forces scattered, low-density development.
3. Existing zoning regulations provide no incentives for mixed-use development, do not address design or other permitting issues, such as stormwater, wetlands and wastewater.
4. Irasville lacks municipal water and sewer infrastructure, leading to low-density development and degraded surface and groundwater quality.

The goal of the Irasville Master Development Planning Project is to make desirable development the path of least resistance, through a joint Master Development Planning process, master wetlands and stormwater planning, comprehensive stormwater management, improved zoning, and public outreach on these complex issues.

The objectives of the Irasville Growth Center Stormwater Quality Monitoring are to:

- identify and quantify pollutants carried in stormwater runoff
- enable informed design of stormwater treatment systems
- provide guidance for the creation of a Stormwater Management Plan
- continued monitoring to provide feedback on the effectiveness of the Stormwater Management Plan, the existing stormwater infrastructure, and identify water quality trends
- assist in the evaluation of existing wetland functions
- encourage citizen involvement and awareness of watershed issues

Refinements in methods or additional testing parameters may be incorporated in the future. Any such changes will be submitted for EPA approval.

6. Project/Task Description

The Irasville Growth Center is located in the Town of Waitsfield in the Mad River valley. Vermont Route 100 runs through the Growth Center. To the northwest of Route 100, the terrain slopes gently to the east or northeast. The Growth Center on this side of Route 100 is bounded by the Waitsfield-Fayston town line which runs along the toe of steeper slopes to the northwest.

To the southeast of Route 100, the Growth Center is bounded by the Mad River. A steep 20 to 35-foot high terrace escarpment runs through this portion of the Growth Center, but above and below the escarpment, slopes are moderate to gentle.

Surface water from the Irasville Growth Center northwest of Route 100 is collected by a small stream that has its headwaters on the steep hillside to the northwest of the town line. Near the intersection of Carroll Road and Route 100, an artificial pond receives streamflow. The pond overflows into the natural stream channel that then continues northeastward to its confluence with the Mad River at the southwestern edge of Waitsfield village.

Southeast of Route 100, numerous groundwater seeps issue from the terrace escarpment and, combined with surface water flow draining down over the face of the escarpment, enters the Mad River through two small streams.

Substantial areas of wetlands occur on both sides of Route 100 in the Growth Center. Wetlands northwest of Route 100 are dominated by wet meadows and riparian wetlands. To the southeast of Route 100, there are marshes, wet meadows, forested, and scrub-shrub wetlands.

To characterize stormwater runoff quality, water will be sampled at two locations upstream of,

and five locations downstream of, the Irasville Growth Center area. Samples will be collected four times per year, during precipitation or thaw events in the Winter, Spring, Summer, and Fall. Parameters have been selected that are meaningful and will increase understanding of the effects of development on stormwater quality. They will include total suspended solids, total phosphorous, and E. coli. Informal measurements of water temperature and streamflow will be part of the characterization of ambient conditions during sampling. Carried out over a long period of time, it could also provide information on the effectiveness of stormwater management practices.

7. Data Quality Objectives for Measurement Data

The table below shows quality objective for the parameters to be evaluated under this monitoring program.

MATRIX	PARAMETER	PRECISION	ACCURACY	RANGE
water	Total Suspended Solids	±20%	80 to 120%	2 to 1000 mg/l
water	Total Phosphorous	±20%	80 to 120%	2 ppb to ∞
water	*Escherichia coli*	±20%	66 to 180%	< 1 to > 2000 MPN

Representativeness. Representativeness is the extent to which measurements represent the actual condition. Obtaining representative data for specific portions of the watershed was considered in program design and sampling site selection. Obviously, water flowing past the sampling locations is constantly changing in response to conditions in the watershed and weather events. But regular sampling and accurate characterization of the ambient site conditions will build toward a better understanding of stormwater quality.

Comparability. Comparability is the degree to which data can be compared directly to similar studies. This monitoring program ensures comparability by analyzing for parameters commonly tested for in stormwater and using standardized sampling and analytical methods.

Completeness. Completeness is a measure of the amount of usable data collected compared to the amount specified in the sampling plan. This monitoring plan was designed so that all locations could be sampled within half a day. Sampling procedures are similar for all parameters. However, the sampler will need to ensure that samples are taken during runoff events. To synchronize sampling with significant precipitation or thaw, the sampler will use

weather reports and verify actual conditions with Waitsfield town staff before travel to the site.

8. Training Requirements/Certification

The sampler shall be thoroughly familiar with the sample collection and chain of custody procedures contained in this document. The testing laboratory shall be capable of attaining the accuracy shown in the table in Item 7 for each of the parameters.

9. Documentation and Records

Sample bottles will be labeled at the time of collection. A data form has been developed for recording conditions at each of the sampling locations. At the release of samples to testing lab personnel, a chain-of-custody form will be completed. These forms plus the laboratory results will comprise the data set for each sampling event. The original set of documents will be kept by the organization carrying out the sampling.

10. Sampling Process Design

The purpose of this monitoring program is to evaluate the quality of stormwater runoff leaving the Irasville Growth Center. Stormwater runoff at the sampling locations is to be sampled during, or immediately after, a runoff event – either rainfall or snow melt. Sampling will take place four times per year, once per season. In the Winter this may mean either an actual thaw where temperatures are above freezing, or with colder conditions where the sun is able to melt snow off paved areas. Because this is a stormwater quality monitoring program, it is of great importance that runoff be occurring from pavement and other developed areas. If there is no visible runoff, the sample may end up being dominated by surface and groundwater from the watershed above Irasville. On the other hand, extended heavy rainfalls will have washed away contaminants early in the storm resulting in better water quality later in the storm. Therefore, sampling should be restricted to times when runoff is observed from the developed areas, but before 1 inch of rain has fallen.

In order to characterize the stormwater that is released from the Irasville area, the sampling locations have been positioned at critical points in the watershed. North of Route 100, runoff is picked up by a stream and its tributaries, making collection straightforward. A sampling location at the storm sewer outfall provides an opportunity to evaluate runoff that comes almost exclusively from parking lots, buildings, and roads. South of Route 100, most runoff sheet flows over the escarpment and into two receiving wetlands that have channelized outlets to the Mad River. To accurately evaluate stormwater quality in the Irasville Growth Center, seven sampling

locations have been selected at critical points in the watershed. These sampling locations are on the three main drainageways that conduct runoff to the Mad River:

Site #1 (North Tributary): The small stream to the northeast of Mad River Canoe near the Waitsfield - Fayston town line. This is one of the tributaries to the small stream that flows across Irasville and empties into the Cinema Pond. This location is upstream of Irasville and will provide a background sample.
Site #2 (South Tributary): The small stream to the southwest of Mad River Canoe near the Waitsfield - Fayston town line. This is one of the tributaries to the small stream that flows across Irasville and empties into the Cinema Pond. This location is upstream of Irasville and will provide a background sample.
Site #3 (Storm Sewer Outfall): The Mad River Green storm sewer outfall northeast of the Grand Union parking lot. This storm sewer receives runoff from the Grand Union parking lot and some of the adjacent roadways.
Site #4 (Main Stream): The small stream just above the culvert leading under Carroll Road and into Cinema Pond. This stream receives flow from the two tributaries at Sites #1 and 2, and includes runoff from most of Irasville north of Route 100.
Site #5 (Cinema Pond Outlet): The outlet of Cinema Pond (at times when there is no discharge from the pond, sampling will be done in the pond near the outlet structure overflow). This sampling location will provide a measurement of the treatment provided by the pond.
Site #6 (North Wetland): The small stream that drains a wetland area southeast of the shopping center. Runoff from the shopping center sheets over the escarpment into the wetland. Many groundwater seeps occur along the face of the escarpment.
Site #7 (South Wetland): The small stream that drains a wetland area south of the cemetery. The wetland receives some runoff from above the escarpment and from a condominium development to the south.

11. Sampling Methods Requirements

Collection of surface water samples shall be in accordance with the following Standard Operating Procedures:

- ❑ Sample bottles shall be obtained directly from the laboratory. If any other collection containers are used, they shall be shall be cleaned to laboratory standards.
- ❑ Sampling shall only take place during a weather event, such as rainfall or snow melt, that can produce significant runoff. Check weather reports and verify with Waitsfield Town Staff before travel to the site.
- ❑ Mobilize equipment and materials to the sampling location.

- ❑ Samples shall be taken by dipping the sample bottle directly into the surface water, taking care to lower the lip of the sample bottle just to the water surface, resulting in a smooth, single filling operation.
- ❑ Each sample bottle shall be labeled using an indelible fine point marker using the laboratory labels. Entries shall include, at a minimum, the sample date, time, location, unique sample identification number, analytical protocol and the sampler's name. The label shall be sealed to the bottle using clear packing tape.
- ❑ Sample bottles shall be immediately placed in a cooler and iced down to a temperature of 4° C. Bubble pack or other inert materials may be used to prevent breakage.
- ❑ All samples shall be transported by the sampler directly to the lab. Samples must be delivered to the laboratory within 6 hours of sampling.
- ❑ The sampler shall fill out the chain of custody form provided by the laboratory, indicating sample ID, number of bottles, sample type (grab/composite), date/time of collection, analyses to be performed and other pertinent information. When the samples are delivered to the laboratory, the sampler shall transfer sample custody to the laboratory representative by signing and dating the form, including the time of custody transfer.
- ❑ With respect to surface water sampling events, the following information, at a minimum, will be included in the field data log for each sample location:
  - ♦ Project name, project number, job location, field personnel name(s), weather conditions
  - ♦ Surface water sampling station number and location
  - ♦ Air temperature
  - ♦ Water temperature
  - ♦ Description of precipitation or thaw event that has caused runoff
  - ♦ Approximate width, depth, velocity, and temperature of water
  - ♦ Analytical protocol(s), number and types of bottles for each
  - ♦ Number and types of QA/QC samples such as duplicate or equipment blank, as appropriate
  - ♦ Any other findings, unusual conditions or departures from the SOP which may be pertinent

The following parameters shall be tested for each of the sampling locations:

PARAMETER	METHOD	CONTAINER	PRESERVATIVE	HOLDING TIME
Total Suspended Solids	EPA Method 160.3	Plastic or glass	Cool to 4°C	7 days

PARAMETER	METHOD	CONTAINER	PRESERVATIVE	HOLDING TIME
Total Phosphorous	EPA Method 365.2		Cool to 4°C, H_2SO_4	28 days
Escherichia coli	NA	Sterile plastic	Cool to 4°C	6 hours

12. Sample Handling and Custody Requirements

All parameters will be tested by an EPA-approved laboratory. These samples will be handled using the following chain of custody procedure:

- Samples shall be labeled and logged on a field data sheet at the time of collection.
- Samples shall be stored in a cooler at temperatures between 4° and 10° C.
- Samples shall be delivered to the testing laboratory the same day as collected, with the sampler completing a chain of custody form.

The chain of custody describes the samples submitted for testing and identifies all persons who have had the sample in their possession. A chain of custody record shall be completed for each sampling event. The chain of custody record shall include at least the following information:

- Project name and location
- Sample description and source
- Sampler's identification
- Reporting address and telephone number
- Time and date of sampling
- Sample method
- Sample preservatives
- Sample container
- Analysis requested
- Laboratory performing the analysis
- Signature of the sampler upon delivery to the laboratory
- Signature of the person receiving the sample at the laboratory
- Date and time sample delivered to the laboratory

The sampler should complete the chain of custody record, sign the form upon delivery to the laboratory, and obtain the signature of the person receiving the samples at the laboratory. The sampler should retain one copy of the form and the laboratory will retain the other. When the results are received from the laboratory, a copy of the chain of custody record shall be kept with

the sample results.

13. Analytical Methods Requirements

All parameters will be tested by an EPA-approved laboratory using their sample bottle and collection specifications. Water will be collected as a grab sample using a clean sampling device or the collection container supplied by the lab. The sample collected for this analysis shall be representative of water being sampled. The collection container shall be filled to the level specified by the lab, shall not be overfilled, and shall be tightly sealed with the cap provided.

Ambient conditions that will be recorded on field data sheets include:

- Description of precipitation or thaw event that has caused runoff
- Air temperature
- Water temperature
- Dimensions and velocity of channelized flow of water

14. Quality Control Requirements

In order to verify the accuracy of the testing results, specific quality assurance and quality control (QA/QC) procedures must be followed during sampling and testing. QA/QC procedures for this monitoring program require that **duplicate samples** and **equipment blanks** be included in the sampling regimen.

A **duplicate sample** will be collected at one location during each sampling event. The duplicate is collected by using a clean container large enough to hold at least two sample bottles' volumes, and then alternately filling the two sample containers. The duplicate sample provides a check on the results of the first sample and should be run "blind" by the lab. Therefore, in labeling the sample and completing the chain-of-custody form, the duplicate sample shall simply be given a number, both on the bottle label and on the chain of custody form. The field data form, which is not submitted to the lab, will have identifying data as to sampling location and time.

The sampler will prepare one **equipment blank** per sampling event. Equipment blanks are used to check that the equipment being used to collect the samples does not contribute to the concentration of contaminants in the sample. The equipment blank is collect by pouring de-ionized water supplied by the lab over the field sampling equipment after it has been washed and rinsed using the standard procedures. The sample is then preserved and stored in a manner similar to the other samples and delivered to the laboratory for analysis. As with the duplicate

sample, the equipment blank should be run "blind" by the lab. Therefore, in labeling the sample and completing the chain-of-custody form, the equipment blank shall simply be given a number, both on the bottle label and on the chain of custody form. The field data form, which is not submitted to the lab, will have identifying data as to sampling location and time.

A copy of the testing laboratory's QA/QC Plan is included in Appendix B.

15. Instrument/Equipment Testing, Inspection, and Maintenance Requirements

All testing will be carried out by a laboratory. The selected laboratory's Standard Operating Procedures and QA/QC Plan can be found in Appendix B.

16. Instrument Calibration and Frequency

All testing will be carried out by a laboratory. The selected laboratory's Standard Operating Procedures and QA/QC Plan can be found in Appendix B.

17. Inspection/Acceptance Requirements for Supplies

All testing will be carried out by a laboratory. The selected laboratory's Standard Operating Procedures and QA/QC Plan can be found in Appendix B.

18. Data Acquisition Requirements

Sampling locations have been designated based on a topographic survey of the project area but are typically also based on prominent landmarks. Where this is not the case, locations shall be marked by installing in the ground a section of iron pipe, spray-painted orange, at the sampling location. This program is otherwise based on data collected in the field by the sampler and analyzed by the testing laboratory.

19. Data Management

The sampler will collect water samples and record information about ambient conditions at the time of sampling. The sampler will also complete and retain one copy of the chain of custody form. These forms will be signed by the sampler and kept together with the field data sheets in the project folder. When laboratory results are received, copies of the field data forms, chain of

custody form, and results will be reviewed by the Project Manager and QA Officer.

20. Assessment and Response Actions

Review of field and laboratory data is the responsibility of the Project Manager and QA Officer. Inconsistent or unexpected results will be subject to review of sampling technique, conditions at the time of sampling, and laboratory procedure. The designated testing laboratory has its own QA/QC Plan and Standard Operating Procedures, included in Appendix B.

21. Reports

A report detailing project status, testing results, interpretation of data, and results of QC audits and internal assessments will be prepared annually in January for sampling completed in the preceding year. Copies of the annual report will be sent to all parties on the Distribution List, shown in Section 3 of this document.

22. Data Review, Validations, and Verification Requirements

All data collected by this monitoring program is subject to review by the Project Manager and the QA Officer to determine if the data meet the QAPP objectives. Decisions to reject or qualify data are made by the Project Manager or QA Officer.

23. Validation and Verification Methods

A field data sheet will be filled out completely at each sampling location and signed by the sampler. The QA Officer will check each field data sheet for precision, missing or illegible information, or errors in calculation. The QA Officer will also review the laboratory analytical results and examine values outside the expected range. The results from the duplicate sample and equipment blank, taken during each sampling event, will be used as additional verification of testing and sampling procedures.

24. Reconciliation with Data Quality Objectives

As soon as possible after each sampling event when both field data and laboratory analyses are available, the QA Manager will review the information for precision and completeness. If data quality does not meet program specifications (see Item 7), the cause of failure will be investigated and sampling and analysis procedures will be reassessed and improved. Any data

not meeting program specifications will be clearly designated in the annual report and explanations given.