Status Report
RIB Site
Wolfeboro, New Hampshire

Submitted to:
New Hampshire Department of Environmental Services
29 Hazen Drive
Concord, NH 03301

December 6, 2010

Town of
Wolfeboro

DEPARTMENT OF
WATER AND SEWER UTILITIES

December 6, 2010

Mr. Mitchell Locker
New Hampshire Department of Environmental Services
Water Division, Groundwater Discharge Permits Coordinator
29 Hazen Drive
Concord, NH 03302-0095

Subject: Status Report
Rapid Infiltration Basin (RIB) Site
GWP-200707014-W-001
Town of Wolfeboro

Dear Mr. Locker:

The Town of Wolfeboro ("Wolfeboro") has prepared the attached report which documents the operation and current status of the Rapid Infiltration Basin (RIB) Site GWP-200707014-W-001.

To start, I would like to acknowledge the excellent working relationship which Wolfeboro and its consultant team have with NHDES. The collaborative effort between Wolfeboro and the DES began back in 2006 when an agreement was reached in a December 2006 Wright-Pierce letter to study the treated effluent disposal options available to Wolfeboro and to review Wolfeboro's existing WWTP Facilities. This process identified a RIB site (known as Wolf 1A) as the best effluent disposal option available to Wolfeboro. This RIB site was the subject of further study by Wolfeboro and its consultants and was ultimately permitted for Groundwater Discharge by NHDES in July 2007. Wolfeboro's consulting engineer, Wright-Pierce subsequently prepared and obtained NHDES' approval of construction drawings for the RIB site later in 2007. Construction of the RIBs began in 2008 and was completed in 2009. Operation of the RIBs commenced on March 3, 2009.

In addition to Wolfeboro's efforts to satisfy its effluent disposal needs, we also took aggressive steps to upgrade our secondary WWTP. This upgrade included over $400,000 of improvements which were implemented in 2007 & 2008 and allowed Wolfeboro to make process control changes (cyclic aeration leading to BNR) resulting in a much improved treated effluent quality. Treated effluent discharged at the RIB site since March of 2009 has on the average been about 3 mg/l of Total Nitrogen and 0.7 mg/l of Total Phosphorus, which is outstanding and well below permit limits and what was originally expected to be discharge as the basis of design. In addition,

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Wolfeboro also voluntarily took proactive steps to develop a more rigorous and detailed water quality monitoring program, to obtain a better understanding of Nineteen Mile Brook both prior to and following the start up of the RIBs.

As you are aware, after six (6) weeks of operation of the RIBs, including a site performance test performed by Wright–Pierce on April 2, 2009 and April 3, 2009, which concluded that "everything looked good", the first "unexpected issue" was documented at the RIB site. On April 20, 2009, a slope failure and groundwater seeps were found above and around the Central Groundwater Discharge Area.

A second "unexpected issue" occurred during the weekend of June 6, 2009. During that weekend a sink hole developed along the northwest side of the Central Groundwater Discharge Area and fine sands migrated from the hillside down slope. Wolfeboro promptly reported both of these "unexpected issues" to the NHDES. Wolfeboro also prepared a report which was provided to NHDES on August 12, 2009. This report included an Action Plan which proposed a more detailed study of the RIB site. The follow-up report is attached to this letter and includes all the data collected prior to and since the RIB went into service.

Based on: Wright-Pierce's engineering and permitting work in 2006 & 2007; NHDES approval of the Groundwater Permit and RIB Project in 2007; surface and groundwater data collected to date and appended in the enclosed report; Wolfeboro is confident that the RIB site is compliant with its Groundwater Permit. That being said, Wolfeboro remains concerned about the "unexpected issues' and resulting impacts on Nineteen Mile Brook and remains proactive in its management of the RIB site. These "unexpected issues" and impacts are discussed in detail in the attached report, as well as Wolfeboro's response to mitigate these impacts.

The attached report provides the data and analysis which shows that nutrients entering Nineteen Mile Brook from the Western and Central Groundwater areas are much less than predicted in the Wright-Pierce RIB Permit documents (1 mg/l or less of Nitrogen vs. a prediction of 7 mg/l). At this time Wolfeboro and its consultant team finds that while there are impacts, they have not risen to the level of being environmentally significant, however, they do warrant further observation.

In an effort to maintain its resources, Wolfeboro has requested NHDES approval to renew our Groundwater Spray Irrigation Permit, submitted on November 10, 2010. This permit application submitted by Wolfeboro reduces the existing spray area by over 50%, removes all spray piping from the Mirror Lake Watershed and removes piping and spray heads from surface water locations. Also, with a different strategy of spraying (intermittent) Wolfeboro is confident that if the need arises, we can operate the Spray Irrigation system without runoff and remain permit compliant.

Wolfeboro further proposes to continue an enhanced sampling and analytical plan at the RIB site to monitor compliance with its Groundwater Permit and to assess the sites ability to handle

existing and potential future RIB discharge flows. To that end, Wolfeboro will provide NHDES with an updated status report next year prior to December 1, 2011.

Wolfeboro respectfully submits this report and looks forward to meeting with NHDES to discuss any comments and concerns you may have. We are open to any suggestions as to better operate our RIB site or to make future changes.

Sincerely,

David W. Ford, P.E.
Director of Public Works and Water & Sewer Utilities

cc: David Owen, Town Manager
Paul Heirtzler, P.E., Esq. - NHDES
Rene J. Pelletier, P.E. - NHDES
David Dedian - Woodard & Curran
Peter Atherton, P.E. - Wright-Pierce
Blake Martin – Weston & Sampson

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1. EVALUATION OF RIB OPERATION ON NINETEEN MILE BROOK

1.1. CONSULTANT TEAM

1.1.1. Wright-Pierce (W-P)

The Town of Wolfeboro contracted with W-P of Topsham, Maine in 2005 to assist the Town in resolving its Treated Effluent Disposal issues. Since then, W-P has been the Engineer of Record and responsible for the study, permitting and design of the Rapid Infiltration Basins (RIB) project. Our main point of contact with W-P is Peter Atherton, P.E. Vice –President.

1.1.2. Woodard & Curran, Inc. (W&C)

W&C has been the Towns Contracted Wastewater Treatment Plant Operator since 1997, W&C has operated the Spray Irrigation and RIB systems for the Town under the direction of Water and Sewer Department Director and has assisted the Town with recent Treatment Plant upgrades and has performed the bulk of data gathering at the RIB site. The Plant Manager is Russ Howe and our main point of contact is Dave Dedian, Vice President/Area Manger. W&C was also contracted to perform a study on environmental impacts that the RIB operation is having on Nineteen Mile Brook based on flow evaluations and water quality monitoring conducted by W&C. Josh Bowe was the lead W&C scientist responsible for installation of piezometers, weirs and stream gauging; his findings are detailed in Section 2 of this report. Janet Robinson was the lead W&C scientist on studying environmental impacts and her findings are also detailed in Section 2.

1.1.3. Weston & Sampson (W-S)

W-S was contracted by the Town to have a geotechnical engineer make visual inspections of the RIB site and unexpected issues, with bi-monthly reports. These reports are discussed in Section 4 with the copies of the reports in the Appendix. W-S was subcontracted by W-P for the hydrogeologic work in support of the design and construction of RIBs 4 and 5 and has been involved in reviewing data and operation of RIBs. Our main point of contact has been Blake Martin.

1.1.4. Town of Wolfeboro

David Ford, P.E., Director of Public Works/Water & Sewer Utilities Departments is the Town representative and responsible for overseeing and directing the Consultant Team. Bill Boornazian, an engineering intern with the Town assisted with data collection and processing, field observations and preparing this report.

1.2. RAPID INFILTRATION BASIN (RIB) SITE

1.2.1. The RIB site location

The RIB site (aka Wolf 1A or Whitten West) was recommended by W-P as the preferred Rapid Infiltration site and best long term solution for the Town in their Wastewater Effluent Disposal Alternatives Evaluation report. The Site is a 35 acre parcel purchased by the Town of Wolfeboro in 2007 for the specific purpose of being developed for the disposal of treated effluent in RIBs. The RIB site is primarily underlain by glacial sand and gravel Kame deposits. It

is bordered on the: northwest by the Wolfeboro Tuftonboro Town line; southwest by Nineteen Mile Brook; north around to the east and southeast by an unnamed tributary to Nineteen Mile Brook which is referred to as the Unnamed Brook. The Site is bisected by a Power line and 100 foot utility easement that runs from the Wolfeboro-Tuftonboro Town line in a southerly direction for 2.2 miles where it passes through the WWTP spray irrigation site and just south of the Treated Effluent Storage Pond (ESP).

1.2.2. The RIB Site Study and Permitting

The site was studied in detail by W-P in 2006 and 2007, with a detailed Hydrogeologic Phase 3 report prepared and submitted to NHDES for review in March of 2007. W-P prepared and obtained NHDES approval of a Groundwater Discharge Permit for the site for the disposal of up to 600,000 gallons per day (monthly average) of treated effluent in accordance with permit number GWP-200707014-W-001. W-P prepared and obtained NHDES approval in 2007 for the construction of RIBs 1, 2 and 3, which are located on the west side of the power line and obtained NHDES approval in 2009 for construction of RIBs 4 & 5, which are located to the east side of the power line.

1.3 RIB START-UP AND OPERATION

1.3.1 RIB Start Up

RIBs 1, 2 & 3 were scheduled to be completed late in 2008. In anticipation of the RIBs coming on line late in 2008, the Town did its best to mitigate runoff from the Spray Irrigation System and significantly reduced spraying in 2008. At the end of 2008 the Effluent Storage Pond (ESP) contained 42 million gallons. The RIB construction project was delayed due to new pump station issues, delaying substantial completion until March 3, 2010. By the beginning of March the ESP had risen to 60 million gallons (Note: maximum capacity is 88 million gallons) and the Town was concerned about the rising level. The Town placed RIBs in operation on March 3, 2009.

At that time the Town started at a discharge rate of 500 gpm and ran the pump 16.6 hours from Tuesday afternoon to Wednesday morning, the next 2 days the pumps ran for 24 hours at the 500 gpm rate. The pump rate was increased on March 6th to 550 gpm and run 24 hours a day until March 25. It should be noted that at this time, while the pump was set at a specific flow rate the actual flow fluctuated up and down. As noted in the RIB flow log (Appendix K) the Town discovered an error in the pump flow totalizer on June 24, 2010 and had been reporting flows about 21% high up to that time. The Town had contracted with A & D Instruments to calibrate the flow meter and they found and corrected the problem. It should be noted that the flow meter was found to be accurate, but it was a program in the programmable logic controller (PLC) that had the error.

On March 26, 2009, the Town had installed a Mission Alarm system that was monitoring the pump station, pumps and flow. That system was found to be accurate and is what has been used to develop the correct flow discharge and is what is shown in the RIB flow log. Prior to the Mission Alarm system coming on line (March 3 to March 26) the flow was estimated by multiplying the run time by the set rate.

1.3.2 RIB Testing

The Town's intent in running the RIBs during the first month was to maximize flow to reduce the elevation in the ESP, while remaining within its permit limit of 600,000 gpd. The Groundwater Permit requirement for flow discharge was based on a monthly average. W-P was scheduled to perform a performance test on April 3 and 4 and wanted

the initial operation to run at a steady stead (24/7) for 3 weeks. That was done and then the system was basically shut down for 7 days. The average monthly flow for March was about 585,000 gpd. W-P came on site to perform their testing on April 3 and 4. On February 20, 2009 groundwater data loggers were installed in monitoring wells around the RIB site and they were removed on April 3. The W-P test concluded that actual ground water levels match very closely with the computer modeled predicted groundwater elevations.

1.3.3 RIB Operation

RIBs 1, 2 and 3 were run at different lengths (dosing periods) during the first few months. On June 15, 2009, the Town settled on fixed 14 day dosing schedule: 2 days for RIB 1; 7 days for RIB 2 and 5 days for RIB 3. In between, individual RIBs were allowed to dry and were raked to break up the surface. Also, RIB pumps were run intermittently, that is, pump on for about an hour, and then off for about an hour, with a flow rate set to meet the daily flow discharge. This system of rotation, raking and intermittent dosing worked well and there have been no problems with treated effluent going into the ground or fouling of the RIB surface. Starting in mid-November the 14 day schedule was modified for winter operations. RIB 1 was taken out of service and RIBs 2 & 3 ran at longer durations, up to 50 days, without any noted surface loading problems. On April 28, 2010 we returned to the 14 day rotation schedule. See the RIB flow discharge log, which also shows which RIBs were on for each day.

1.3.4 RIB 4 & 5 Operation

Based on the Groundwater Discharge Permit and the Towns agreement with NHDES the Town went forward with the construction of RIBs 4 and 5. These basins were constructed in 2010 and were placed on line June 1, 2010. Additional monitoring wells were installed around these basins and start up was monitored very closely. RIBs 4 and 5 were rotated and started with a flow on 25,000 gpd. Flow rate was measure by a bucket test and is checked each time RIB 4 or 5 are changed. The RIB flow discharge log (Appendix K), shows the total flow, which is measure at the RIB pump house and reported in the Daily Flow column. The column to the far right shows flow going to RIB 4 or 5 (based on bucket test), the difference is the flow to RIBs 1, 2 or 3. Flows were increased to 50,000 gpd, then 75,000gpd and groundwater levels were elevated slightly, but there were no visible signs of groundwater seeps above the Unnamed Brook. On August 15 the flow was increased to 100,000 gpd in RIB 5, during this same period, RIB 3 was taking 400,000 gpd for a total daily flow of just over 500,000 gpd. During the first week of September, groundwater seeps were observed about 100 feet south of MW 23. On September 2, flow was reduced to the East side RIBs (4 & 5) to 75,000 gpd and to the West side RIBs (1, 2 & 3) to 325,000 gpd. The total daily flow has remained at the 400,000 gpd rate since that time.

1.4 "UNEXPECTED ISSUES"

1.4.1 "Unexpected Issues"

On April 20, 2009 Town staff noticed groundwater coming to the surface above and around the Central Groundwater Discharge Area and the beginning of what has become a slope failure area just north of the Central Groundwater Discharge Area. These areas were staked out and surveyed. W-P was brought in to review these "unexpected issues" and NHDES was notified by phone call. RIB flow was reduced to below 200,000 gpd on April 20th and then to below 140,000 gpd on April 24th and remained at these low levels until May 11th. Flow was then increased to the 300,000 gpd to 330,000 gpd range.

1.4.2 Additional "Unexpected Issues"

On June 8, 2009 W&C staff discovered a significant sink hole to the west of the Central Groundwater Discharge Area and a quantity of fine sand which had migrated from the hillside down slope to cover approximately 1,600 square feet. Flow to the RIBs was stopped on June 9, 2009 and NHDES and consultants were brought in to review site. Discharge flow to RIBs was resumed on June 15, 2009. This issue was reported to NHDES and all "unexpected issues" were detailed in the August 12, 2009 Letter/Report to NHDES. The impacts of the RIB system and the "unexpected issues" are discussed in Sections 2 and 3 of this report.

1.4.3 Spray Irrigation in 2009

In July of 2009 the Effluent Storage Pond (ESP) had increased to about 76 million gallons and the Town decided to reduce RIB flow to less than 400,000 gpd and to start the Spray Irrigation System. The Spray System was run from August 1 through October and helped bring the ESP down to a level of 34 million gallon by October 28, 2009. The ESP elevations from 2005 through this year are shown in Appendix L.

1.4.4 Meeting with NHDES, August 2009

A meeting was held on August 28 with the Town, its consultants and NHDES to discuss the "unexpected issues", the Towns August 12, 2009 Action Plan and response to NHDES questions. Based on this meeting the Town went forward with the design and construction of RIBs 4 & 5 as well as a commitment to continue its detailed site testing and monitoring plan. The Town also committed to a follow up report providing all data collected from the site and an overall status of the RIB project. This report and appendices are a fulfillment of that commitment.

2. EVALUATION OF RIB OPERATION ON NINETEEN MILE BROOK

2.1. INTRODUCTION

This section provides a description of the stream flow and water quality evaluation completed for the Town of Wolfeboro (the Town) by Woodard & Curran (W&C). Woodard & Curran was contracted by the Town to conduct flow and water quality monitoring at the Whitten West Rapid Infiltration Basin Site and along Nineteen Mile Brook in Wolfeboro, NH (Whitten Site). W&C established four stream flow monitoring locations along Nineteen Mile Brook and its unnamed tributary downgradient of the Town's Rapid Infiltration Basins (RIBs). In addition, weirs and wetland piezometers were installed and monitored to provide a better understanding of the groundwater – surface water interaction near the RIB site and the relationship between the RIB discharge and surface water and groundwater contributions to Nineteen Mile Brook. Finally, algal transects were established and water quality data were monitored to obtain information about relationships between nutrient levels, and algal growth along the reach of Nineteen Mile Brook subject to RIB contributions. From these activities, an assessment of both stream flow and potential ecological effects of RIB operation could be conducted, and the results of these efforts are described in this section.

This section is organized as follows:

Section 2.2: Summarizes the site background and area soils and geology;

Section 2.3: Summarizes the stream flow monitoring plan and describes the methods used in the stream flow study;

Section 2.4: Discusses the stream flow study results;

Section 2.5: Describes the piezometer installations;

Section 2.6: Discusses the groundwater discharge areas and the measurement of flow from a portion of those discharges;

Section 2.7: Presents the calculations for groundwater and discharge water dilution factors;

Section 2.8: Provides a summary and conclusions for the stream flow investigation of the site;

Section 2.9: Presents the methods and results of a stream chemistry and algal study conducted to evaluate potential changes in Nineteen Mile Brook since RIB startup. Key sections include the following:

2.9.1: Stream Evaluation Methods
2.9.2: Stream Monitoring and Chemistry Results;
2.9.3: Conclusions of the Algal Study: Potential for Adverse Effect
2.9.4: Sand Migration: Potential for Adverse Effect;
2.9.5: Summary and Conclusions.

Sections 2.2 through 2.8 describe site hydrology, while Section 2.9 focuses on potential ecological effects of RIB operation on Nineteen Mile Brook, as reflected by the growth of nuisance algae. Taken together, these studies provide a robust assessment of the current conditions in Nineteen Mile Brook.

2.2 SITE BACKGROUND

In March of 2009, the Town began discharging treated wastewater to a Rapid Infiltration Basin Site (Whitten Site) permitted by the State of New Hampshire. The Whitten Site was hydrogeologically evaluated and designed by Wright Pierce Engineers. In 2009, the Town of Wolfeboro contracted Woodard & Curran to complete stream flow and water quality monitoring in order to quantify and qualify the relationship between RIB discharge and Nineteen Mile Brook. In response to an on-site meeting on May 14th 2009 between Woodard & Curran and David Ford (Wolfeboro Public Works Director), stream flow monitoring locations were established in June 2009 and stream flow and surface water levels were monitored for a 12-month period. This flow data was used in conjunction with both surface and groundwater quality data to evaluate the relationship between the operation of the RIBs and potential changes in Nineteen Mile Brook.

2.2.1. Site Area

Nineteen Mile Brook is an unclassified stream located in the Towns of Wolfeboro and Tuftonboro and is shown on Figure 1. The stream is approximately 5.5 miles in length and has a watershed primarily located in Tuftonboro, with the headwaters and approximately 1,200 acres of watershed located in Wolfeboro. The stream primarily flows east to west and passes by the Wolfeboro RIB site approximately 1,000 feet to the south. An unnamed tributary that borders the RIBs to the northeast and southeast flows from north to south and discharges into Nineteen Mile Brook. Figure 2 depicts topographically interpreted drainage basin boundaries (areas of contribution) in relation to established stream flow monitoring stations. At approximately 1,100 feet southwest and downstream of the site, Nineteen Mile Brook flows into a wetland area before flowing into Whitten Pond and intersecting Route 109A. Nineteen Mile Brook then flows northwest, intersecting Route 109 and discharges into Nineteen Mile Bay in Lake Winnipesaukee.

Three RIBs (RIBs one through three, west of the powerline crossing) were constructed in 2008 and went on-line in March of 2009. Two additional RIBs (RIBs four and five, east of the powerline crossing) were constructed in early 2010 and went on-line in June of 2010. These five RIBs were installed at approximately 662 feet above mean sea level near the top of the ridge. Downgradient of the RIBs to the south-southwest, there are three main groundwater discharge areas, referred to as the Eastern, Central, and Western Groundwater Discharge areas (Figure 3).These areas were mapped as wetlands and groundwater discharge areas by Wright Pierce in the March 2007, Phase 3, Hydrogeologic Report, in Figure 2. Currently there are numerous seeps (groundwater discharge areas) at approximately 560-585 feet above mean sea level along the base of the slope below the RIBs. These seeps are discharging to the ground surface and then flow over land through, and adjacent to, wetland areas before discharging into Nineteen Mile Brook. The Central and Western Groundwater Discharge areas account for the majority of the volume of groundwater discharge through seeps. This discharge becomes channelized and flows to the southwest through two site road culverts and into Nineteen Mile Brook. These culvert locations are flow measurement locations (Section 2.6) and water quality testing sites (Section 2.9).

2.2.2. Site Geology and Soils

The Wolfeboro RIB site is shown on the Site Plan included as Figure 3. A desktop review of surficial geology maps, field reconnaissance, and boring logs completed as part of the Wright Pierce hydrogeologic evaluation indicates that the RIB site is primarily underlain by glacial sand and gravel Kame deposits. Borings completed by Wright Pierce in 2006 indicate that subsurface materials are primarily comprised of fine to coarse sands and gravel with layers of very fine to medium silty sands. Dense glacial till, silts, and clays were noted underlying the glacial sand deposits at depths immediately overlying bedrock. The site bedrock, exposed north and southeast of the site, consists of primarily schist and gneiss.

The SSURGO soil survey database available through the NH GRANIT GIS for New Hampshire indicates that the site is bordered to the north and east by bedrock outcrops and glacial till. The RIB area is depicted as Boscawen gravelly loamy sand with 15 to 60 percent slopes and is described as an excessively drained unsaturated soil. This soil accounts for an approximate 55 acre area on the uplands of the site and extending west of the site. These soils terminate approximately 150 feet east of RIBS 4 and 5. Immediately south-southwest of the RIB area, the northern portion of the wetlands and groundwater discharge areas are located within an area of Champlain loamy sand running northwest to southeast with 8 to 15 percent slopes. The Champlain sands are described as unsaturated and excessively drained glacial outwash sand and are spread over an approximate area of 14 acres along the slope of the site. Nineteen Mile Brook is bordered to the north and south by the Naumburg loamy sand consisting of poorly drained glacial outwash soils and saturated wetlands. The Naumburg sand is depicted as an approximate 17-acre area of soils located from the Whitten Pond wetland to the west of the site extending east and upstream to the power-line crossing on Nineteen Mile Brook.[1]

2.3. STREAM FLOW MONITORING SUMMARY

The goal of the Nineteen Mile Brook stream flow evaluation was to quantify the hydraulic relationship between the RIB discharge and Nineteen Mile Brook flow. This study was designed to meet these needs and establish the monitoring locations and stage–discharge curves that will allow the Town to continue to monitor the stream during RIB operation. The installation of staff gauges at stream gauging locations along Nineteen Mile Brook and the unnamed tributary allows the Town the opportunity to estimate flow at the time of their ongoing water quality evaluation. In order to meet the stream flow objectives, the Town and Woodard & Curran jointly undertook monitoring of gauge levels and flows in Nineteen Mile Brook. After field reconnaissance along Nineteen Mile Brook, the following open-channel locations were selected for monitoring and are shown on the attached Site Plan (Figure 3):

- SG-10 – A stream gauging location at the Route 109A crossing with Nineteen Mile Brook was established off the eastern side of the bridge. Staff gauge # 10 (SG-10) was installed at this location to monitor discharge downstream of the site on Nineteen Mile Brook at the outlet of Whitten Pond. As shown on the Drainage Basin map, the total watershed area above SG-10 is approximately 1,600 acres.
- SG-11 – Woodard & Curran selected a location on Nineteen Mile Brook approximately 200 feet downstream of the western groundwater discharge confluence with Nineteen Mile Brook. This location is used to measure the total stream flow immediately downstream of the site. As shown on the Drainage Basin map, the total watershed area above SG-11 is approximately 1,300 acres.
- SG-12 – A stream gauging location was established upstream on Nineteen Mile Brook and underneath the power line crossing. This location was setup to represent flow east of the site and to provide a baseline for stream flow in the brook upstream of the primary groundwater discharge areas. The total watershed area contributing water to the upstream gauging station is approximately 910 acres.
- SG-13 – Woodard & Curran selected a location on the unnamed tributary upstream of its confluence with Nineteen Mile Brook. This gauging station is located approximately 200-250 feet upstream of the confluence. Under low flow conditions, the majority of the flow through this tributary is likely RIB discharge contribution. The total watershed area contributing water to the unnamed tributary above SG-13 is approximately 168 acres.

The stream gauging program involved installation of staff gauges, stream gauging, and stage-discharge relationship development. The methodology used for each of these steps is discussed below.

1 Natural Resources Conservation Service, NH GRANIT: Soil Survey Geographic (SSURGO) Database for New Hampshire, January 2009.

2.3.1. Staff Gauge Installation

In June 2009, a staff gauge was installed at each of the four stream gauging locations previously described. Gauges were bolted to 7 foot steel fence posts driven approximately 4 feet below the streambed to inhibit movement. The staff gauges are 3.33 feet in length by 4 inches wide and are graduated and marked every 0.02 feet. The staff gauges were installed near to the cross-section to be stream gauged and were installed in a deeper portion of the channel or in a pool if present.

The staff gauge readings were recorded during each stream gauging event and used to correlate gauge readings to stream flow volume for the development of stage-discharge rating curves.

2.3.2. Stream Gauging

Stream gauging was performed by a W&C field geologist. Gauging was completed at transects perpendicular to the stream channel and flow in accordance with USGS stream gauging protocol. A stream gauging location was selected by visually inspecting the stream channel and choosing a location at which the velocity is generally uniform, and where the stream bottom is flat and solid across the width of the channel without obstruction.

First, the width of the stream was measured by a tape measure. Wooden stakes were driven into the ground of the bank on either side of the stream to identify and gauge the same location during gauging events. The tape measure was secured to the stakes on both sides of the stream. Measurements of the left and right bank were recorded to establish the left and right hand limits of measurement locations in the water. Between twenty-five and thirty depth and velocity readings across the width of the stream were made. The interval of measurement was selected to accomplish the necessary total number of readings across the width of the stream based on the initial stream-width measurement. Each measurement was recorded in a field book including; location and name of the stream, date and time of gauging, staff gauge reading, the gauging point on the tape measure, and the depth and flow at each point.

At each predetermined point on the tape, depth of the stream was measured using the depth marks on the top-set wading rod as a guide. The transducer attached to the bottom of the top-set wading rod on the Marsh McBirney portable flow meter was adjusted according to the measured depth in accordance with USGS protocol. Typical readings are collected at 60% of the total depth. For depths greater than 2.50 feet, velocity was measured at both 20 and 80% of the depth. The portable flow meter has a Fixed Point Averaging Mode (FPA) which was adjusted to a 10 second interval. Stream flow measurements were recorded after at least 2-3 FPA cycles in order to allow the instrument to equilibrate.

Obstructions in the stream such as a rock or log upstream from the stream gauging location can alter stream flow. To the extent practicable, the flow meter was placed in direct stream flow, avoiding obstacles that could restrict flow upstream from the gauging location.

2.3.3 Rating Curve Development

During each gauging event, the staff gauge reading was recorded. The flow and corresponding staff gauge reading were tabulated and archived in a spreadsheet. The stream flow and gauge readings were plotted for each location to establish a stream rating curve. The rating curve was developed using a best fit regression for each graph. The equation of the curve resulting from the best fit to the staff gauge-discharge data was then used to convert the staff gauge readings to stream flow.

2.4. STREAM FLOW MONITORING RESULTS

Stream flow monitoring results and a stream flow comparison to predicted flows are described in the sections below.

2.4.1. Measured Flows

Table 2-1 below summarizes the results of the manual stream gauging for the four stream flow monitoring stations. To establish stream rating curves, the open channel locations were gauged multiple times during a wide range of flows to develop the stage-discharge relationship in accordance with the following:

- Gauging was completed during seasonal low flow times of year, which typically occur in the July to September and/or the late winter timeframe. Staff gauge readings were recorded weekly and/or monthly by W&C or Town employees. W&C mobilized to the site during low flow conditions to measure stream flow.

- Stream gauging was also completed during a high flow event. These events were triggered in response to spring snow melt and/or heavy rainfall events.

- Mid-range flows were measured when possible as the stage of Nineteen Mile Brook was either decreasing or increasing in response to a moderate or heavy flow event. Limited mid-range data was collected for SG-10 and SG-13. However, due to their locations, SG-11 and SG-12 are the critical points for estimating groundwater contribution to Nineteen Mile Brook and two mid-flow events were measured on October 15, 2010 at these two points.

Table 2-1: Nineteen Mile Brook Stream Gauging Summary

	RT 109A Bridge (SG-10)		NINETEEN MILE BROOK Downstream (SG-11)		NINETEEN MILE BROOK Upstream (SG-12)		Unnamed Tributary (SG-13)		NINETEEN MILE BROOK Net Stream Gain (cfs)
Date	**Stage (ft)**	**Flow (cfs)**	**Stage(ft)**	**Flow (cfs)**	**Stage (ft)**	**Flow (cfs)**	**Stage (ft)**	**Flow (cfs)**	**Flow (cfs)**
6/4/2009	0.98	3.24	0.98	2.68	1.24	1.74	NMS	0.15	0.94
6/25/2009	1.12	5.71	1.2	4.83	1.53	3.31	1.18	0.39	1.52
7/21/2009	0.98	2.88	1.01	2.59	1.35	1.55	1.07	0.11	1.04
9/11/2009	0.91	2.15	0.99	1.77	1.23	0.99	1	0.12	0.78
11/18/2009	1.04	3.66	1.15	3.35	1.57	2.21	1.14	0.3	1.14
12/18/2009	1.02	3.76	1.1	3.32	Frozen	Frozen	Frozen	Frozen	-
2/26/2010	2.98	53.26	3.14	49.88	3.4	35.36	2.44	5.83	14.52
7/8/2010	0.86	1.45	0.88	1.2	1.18	0.44	0.86	0.09	0.76
10/15/2010* 9:00	1.28	2.68	1.47	6.78	2.27	3.88	1.25	0.95	*
10/15/2010* 10:30	1.5	7.25	2.09	14.88	2.48	10.6	1.25	NMS	-

NMS: Not Measured

*The 10/15/2010 gauging events were completed as levels and flows were increasing in the brook. Due to increasing levels and higher flows measured upstream than downstream, this gauging data was used for rating curve development only and does not provide a reasonable approximation of net stream gain.

The stream gauging summary depicts a range of flows measured at each gauging station The peak surface water stage in Nineteen Mile Brook during February of 2010 produced a corresponding runoff in flow of 53.3 cfs at SG-10 (Route 109A), 49.9 cfs (downstream of site), 35.4 cfs (upstream of site), and 5.8 cfs through the unnamed tributary. This high flow event resulted from a heavy rain and snowmelt event. Flow in Nineteen Mile Brook decreased to approximately 1.45 cfs at SG-10, 1.20 cfs at SG-11, 0.44 cfs at SG-12, and approximately 0.10 cfs at SG-13, during seasonal low flows in the July-September 2010 timeframe after periods of low precipitation and reduced recharge during the third quarter of 2010. On October 15, 2010, two stream gauging events were completed as the flow was increasing in the brook after the area received approximately 1.75 inches of rainfall on October 14th and 15th. Flows increased to approximately 7.3 cfs at SG-10, 14.9 cfs at SG-11, 10.6 cfs at SG-12, and the unnamed tributary flow peaked at 0.95 cfs. As noted in Table 2-1, flow in the brook was increasing during the October 15, 2010 gauging events and more flow was measured at gauging stations SG-11 and SG-12 than at the Whitten Pond outlet (SG-10). This data was used exclusively for rating curve development and not as an estimation of the net gain in stream flow.

During the summer of 2009, higher stream flows were observed than in 2010 in response to significant precipitation and associated recharge events during June and July 2009. Historical monthly precipitation data reported by the Northeast Regional Climate Center for Tamworth, NH beginning in 1955 are included as Appendix A. This data summarizes historical precipitation for the summer months of June through September. The lowest flows for 2009 were measured in September during a relatively dry month when the area received 1.46 inches of precipitation. However, this dry month followed above average rainfall in June 2009 followed by a record setting rainfall of 8.4 inches in July 2009, and above average rainfall in August.

The lowest stream flows and surface water stages were measured during the summer to early fall months of 2010. These low flows occurred in response to periods of dry conditions in July and below average precipitation in August and September with the area receiving a total of approximately 15.1 inches of precipitation, approximately 1.49 inches below average (June through September). August and September 2010 precipitation was approximately 2.8 inches below average and resulted in observed low flows during the mid-summer to early fall months of 2010.

Nineteen Mile Brook appeared to have a base-flow condition from July to mid-September 2010. During May and June, surface water stage and resulting flow decreased and stabilized at its lowest point in early July 2010. This surface water stage and resulting low flow remained consistent and continued through mid to late September. Therefore, the Nineteen Mile Brook flow of 0.44 cfs upstream and 1.20 cfs measured downstream on July 8th 2010 likely represents a low flow condition.

As discussed above, the lowest set of stream flows were recorded on July 8, 2010 with a flow at SG-12 of 0.44 cfs, a flow of 1.2 cfs at SG-11, and a flow of 0.09 cfs measured at SG-13 at the unnamed tributary. These flows were collected when Nineteen Mile Brook was near, or at, base-flow conditions from July through September 2010, and subsequently the gain in stream flow (base-flow) was likely most representative of groundwater contribution to the brook. Table 2-1 depicts the net gain in stream flow from the upstream gauging station (SG-12) to the downstream station (SG-11). During this period, the net gain in stream flow between SG-12 and SG-11 was approximately 0.76 cfs. Based on the stream flow data collected upstream and downstream of the RIB site, and the subtraction of surface water input including groundwater discharge area flow (Weirs 6 and 7) and unnamed tributary flow, the groundwater contribution (base-flow increase) between SG-12 and SG-11 on Nineteen Mile Brook from July to September 2010 appears to be approximately 0.24 cfs.

Open channel stream locations were gauged multiple times to develop the stage discharge relationship. The stage/discharge graphs, best fit lines, and resulting equations for SG-10, SG-11, SG-12, and SG-13 gauging stations are included in Appendix B. These curves will allow the Town and field personnel to continue to monitor the stream stage and approximate flow during RIB site operation and water quality monitoring activities.

Stage discharge relationships were used to convert the manual staff gauge readings collected by Woodard & Curran and Town personnel to stream flows. A table summarizing the manual staff gauge readings and subsequent flows is included as Appendix C. Limited mid-range data was captured for the stream gauging locations. Stream flow calculations presented in the staff gauge reading summary are approximations based on the curves fit to the flow data measured at the gauges. Data collected for SG-13 on 10/25/2010 were not utilized in rating curve production. Debris downstream resulted in an increase in water level depths and produced an inconsistent discharge volume.

2.4.2. Comparison to Predicted Flows

Previous studies completed in New Hampshire and neighboring states have used various models to predict annual low flows and 7-Day, 10 year low flows (7Q10) in ungaged streams. However, some of these models combine a variety of watersheds and do not account for the percentage of sand and gravel in the watershed. Therefore, the calculated and predicted low flow (7Q10) is not necessarily representative of stream base-flow for a particular watershed. Woodard & Curran compared the July 2010 Nineteen Mile Brook flow to those for natural and rural watersheds containing sand and gravel. Surficial geology maps of the Wolfeboro and Tuftonboro Quadrangle (Goldwaith 1967) were used to determine the approximate percent of sand and gravel in the watershed. These maps indicate an approximate 177 acre area of sand and gravel Kame deposits extending from Route 109A to the west of the site and extending approximately 4,000 feet east-southeast to SG-12, including the RIB site area. The watershed area above SG-10 is underlain primarily by glaciomarine deposits with approximately 11% sand and gravel. These

deposits would naturally have lower base-flow conditions due to their relatively impermeable nature compared to sand and gravel materials. Utilizing USGS equations developed for rural watersheds in Maine[2], mean monthly flow was calculated for July for the watersheds contributing water to SG-11, 12, and 13. Table 2-2 summarizes predicted mean monthly stream flows for SG-11, SG-12, and SG-13 and compares the predicted flows to actual flows measured low flow in July 2010.

This comparison suggests that during July, Nineteen Mile Brook was flowing at approximately 4% below what is predicted downstream at the Whitten Pond outlet (SG-10), 7% above what is predicted downstream of the site at SG-11, 37% below the predicted discharge upstream at SG-12, and approximately 40% below what is predicted for the unnamed tributary. On July 8th 2010, groundwater discharge was also measured with the use of v-notch weirs (Weirs 6 and 7) and accounted for approximately 0.435 cfs (approximately 281,000 gallons per day) of flow measured downstream. During the month of July, the discharge into the RIBs was 450,000 gallons per day and Western and Central Groundwater Discharge area (Weirs 6 and 7) flow averaged approximately 261,000 gallons per day or approximately 58% of this RIB discharge. The measured stream flow downstream at the Whitten Pond outlet at SG-10 closely matched the predicted flow of 1.51 cfs for July. At SG-12 and SG-13 upstream of the site, measured flows were lower than predicted and can be attributed to below average summer precipitation and resulting lower base-flow conditions in the relatively impermeable watershed glaciomarine deposits. Measured flow at SG-11 downstream of the site was above the predicted mean flow for July by 7%. This above average flow downstream of the site may be attributed to site-induced discharge through the Central and Western Groundwater Discharge areas and groundwater contribution through Kame sand and gravel deposits aiding in the maintenance of flow downstream of the site during dry summer periods.

Table 2-2: Summary of Predicted versus Measured Low Flows for July

Site	Flow type	Watershed (ac)	Watershed (sq. miles)	% Watershed Sand & Gravel (Decimal)	Predicted Flow (cfs)	Measured Low Flow (cfs)
SG-10	Mean July	1596	2.49	0.11	1.51	1.45
SG-11	Mean July	1308	2.04	0.05	1.12	1.2
SG-12	Mean July	911	1.42	0.00	0.70	0.44
SG-13	Mean July	168	0.26	0.19	0.15	0.09

2.5 PIEZOMETER INSTALLATIONS

On June 2, 2009, six piezometers (PZ-1 through 6) were installed in the western, central, and eastern groundwater discharge areas. Two piezometers were installed per groundwater discharge area to provide a way of monitoring groundwater quality conditions approximately 600-700 feet downgradient of the site before groundwater confluence with Nineteen Mile Brook. The locations of the piezometers were chosen based on the observed groundwater discharge flow patterns (seep channels) in the associated wetlands, and in general accordance with Wright Pierce's simulated particle tracking map. Piezometer locations are shown on Figure 3. These points were set back from the

2 United States Geological Survey, Robert W. Dudley: Estimating Monthly, Annual, and Low 7-Day, 10-Year Streamflows for Ungaged Rivers in Maine, 2004.

brook approximately 100-150' to avoid possible surface water interaction and dilution. On average, these points were driven to a depth of approximately 3-4 feet until refusal on a hard subsurface material. These piezometers were installed intersecting a very tight fine sand and silt layer noted immediately beneath the upper wetland topsoils and were developed by pumping and surging to move and wash finer sands and silts from out and around the piezometer well screen. The piezometer construction details are presented in the table below. These piezometers were sampled in November 2009, August 2010, and October 2010. This water quality data was used in conjunction with stream flow data to understand groundwater parameter concentrations and resulting dilution from the brook.

Table 2-3: Piezometer Construction Summary

Piezometer ID	Location	Diameter/Material	Drive Point Well Screen Length (ft)	Well Point Slot Size	Stick-up (ft. above ground surface)
PZ-1	Western GW Discharge Area	1.25" Galvanized Steel, 1.25" SS Well Point	1	10-slot	3.0
PZ-2	Western GW Discharge Area	1.25" Galvanized Steel, 1.25" SS Well Point	2	10-slot	3.0
PZ-3	Central GW Discharge Area	1.25" Galvanized Steel, 1.25" SS Well Point	2	10-slot	3.36
PZ-4	Central GW Discharge Area	1.25" Galvanized Steel, 1.25" SS Well Point	1	10-slot	3.0
PZ-5	Eastern GW Discharge Area	1.25" Galvanized Steel, 1.25" SS Well Point	1	10-slot	3.98
PZ-6	Eastern GW Discharge Area	1.25" Galvanized Steel, 1.25" SS Well Point	1	10-slot	3.98

2.6 WEIR FLOW DATA

In March 2010, Woodard and Curran and the Town jointly undertook the installation of weirs at locations within the Western and Central Groundwater Discharge areas. A total of seven V-Notch weirs were installed to quantify the volume of groundwater discharging as surface water and flowing overland to Nineteen Mile Brook. Weirs are shown on Figure 3. Weirs 1 through 5 were constructed with 30 degree v-notches and weirs 6 and 7 were constructed with 45 degree v-notches. Weirs 6 and 7 capture the overland groundwater discharge flow from the Central and Western Groundwater Discharge areas, respectively. Weir flows were monitored weekly between March and September 2010.

This flow data was used in conjunction with both surface and groundwater quality data, and Nineteen Mile Brook flow data to establish dilution factors (Section 2.7). A weir flow summary table is included as Appendix D.

Weirs 1, 2, and 3 were installed in the Central Groundwater Discharge area to quantify and monitor individual groundwater discharge (breakout) flows. During the period of record from March through July 2010, Weir 1 averaged 28 gpm, Weir 2 averaged approximately 3.8 gpm, and Weir 3 averaged 6.1 gpm. Weirs 4 and 5 were installed in the Western Groundwater Discharge area and averaged approximately 34 gpm and 46 gpm, respectively. Monitoring of Weirs 1 through 5 was discontinued in July 2010 after sand buildup behind the weir plate was affecting the accuracy of the flow readings. For the purposes of this report, Weirs 6 and 7 were the main focus for estimating the total Groundwater Discharge volumes from the Central and Western areas.
Weirs 6 and 7 were taken off-line on September 13, 2010 to install sediment basins at the Central and Western Groundwater discharge points at the two culverts. Weirs 6 and 7 were rebuilt using the same 45 degree construction as the originals, and were completed on October 22, 2010 and November 2, 2010, respectively. It should be noted that during the original construction of Weir 6, an old four inch PVC culvert was observed adjacent to Weir 6. An attempt was made to plug this culvert to ensure that Weir 6 captured the total flow without flow bypassing the weir. However, Town and field personnel noted flow bypassing Weir 6 intermittently through the pipe. When the four inch culvert was flowing, the volume of flow was estimated at approximately 2 to 3 gpm. Therefore, Weir 6 flows presented in Appendix D and dated before the final construction on October 22nd, may be underestimated, though this slight bypass of flow is not expected to significantly influence the groundwater discharge calculations.

Weir flow data indicates that on average from July 8th through September 9th 2010 the combined groundwater discharge area flow from the Central and Western Groundwater Discharge areas averaged approximately 192 gpm, or 276,000 gallons per day (GPD). Treated wastewater was discharged to the RIBs at a rate of 250,000 GPD in February, increased to 350,000 GPD on April 15th, and increased to 450,000 on May 15th. In general, under low flow conditions, Central and Western groundwater discharge appears to account for approximately 61% of the RIB discharge and approximately 36% of Nineteen Mile Brook flow.

2.7. GROUNDWATER AND DISCHARGE WATER DILUTION

Dilution factors were calculated based on the low flow data collected in July 2010. The dilution factors presented in the table below represent the least dilution occurring during the stream flow monitoring period. Dilution factors were calculated based on the principle that the sub-volume of water being added (aliquot) and a diluent (Nineteen Mile Brook Surface Water) are first totaled together and then divided by the aliquot to calculate the dilution factor. Dilution ratios shown below represent the dilution at their respective point of confluence on Nineteen Mile Brook and are calculated based on the flows measured upstream (SG-12) and downstream of the site (SG-11).

Table 2-4: Low-Flow Dilution Summary

Total Volume / Aliquot Volume	*Dilution Ratio*
Groundwater vs. Nineteen Mile Brook Surface Water (SG-11)	1:5.1
Unnamed Tributary vs. Nineteen Mile Brook Flow Upstream (SG-12)	1:5.9
Central Discharge Flow (Weir 6) vs. Nineteen Mile Brook Flow at Point of Confluence	1:5.3
Western Discharge Flow (Weir 7) vs. Nineteen Mile Brook Flow at Point of Confluence	1:4.7
Total Groundwater + Discharge Flow + Unnamed Trib vs. Nineteen Mile Brook Flow	1:1.6

Based on Nineteen Mile Brook low flow readings, the Central and Western Groundwater discharge flow dilution ranged from an estimated factor of 4.7 to a factor of 5.3 at the Western and Central Groundwater Discharge area confluences with Nineteen Mile Brook, respectively. The greatest dilution occurs upstream when comparing unnamed tributary discharge to Nineteen Mile Brook flow. This comparison produces an estimated dilution factor of 5.9. The groundwater contribution (base-flow increase) of 0.24 cfs under low flow conditions is diluted by an approximate factor of 5.1. The combined total of groundwater contribution to Nineteen Mile Brook, discharge area flow, and unnamed tributary flow, produces an estimated dilution factor of 1.6.

2.8. STREAM FLOW SUMMARY AND CONCLUSIONS

Based on the data presented in this Nineteen Mile Brook stream flow summary report, the following conclusions were made with respect to the Wolfeboro Rapid Infiltration Basin site:

- Flow rating curves were developed for Nineteen Mile Brook based on data collected from ten separate stream gauging events and provide an approximation of stage-discharge relationships;

- Rating curve accuracy is limited due to a lack of mid-range flow events measured during the study period, and the timing of these gauging rounds to coincide with heavy precipitation events. Additional stream gauging events would further refine the rating curves;

- Nineteen Mile Brook stream flows decreased to near, or at, base-flow conditions during the July through September timeframe of 2010 in response to periods of limited recharge;

- Based on the flow data collected upstream and downstream of the RIB site, groundwater discharge area flow measurements, and the unnamed tributary flow, the groundwater contribution (base-flow increase) to Nineteen Mile Brook under low flow conditions from the upstream gauge (SG-12) to the downstream gauge (SG-11) was approximately 0.24 cfs.

- According to historical precipitation records for Tamworth, NH. Summer precipitation (June through September 2010) was approximately 15.1 inches, or 1.5 inches below average, over this four month period. August and September 2010 precipitation was approximately 2.8 inches below average.

- Current RIB operation appears to produce surface discharge flows from the Western and Central Groundwater Discharge areas as quantified with v-notch weirs 6 and 7, and contributes approximately 36% of Nineteen Mile Brook flow at low flow conditions.

- Based on Nineteen Mile Brook low flow readings, the combined total of groundwater, discharge area flow, and unnamed tributary flow correlates to an approximate dilution factor of 1.6 under low flow conditions.

These data are useful for interpreting the chemical composition of Nineteen Mile Brook, as described in the following section.

2.9. EFFECTS ON STREAM CHEMISTRY AND ALGAL GROWTH

As described in the previous sections, treated effluent in the RIBs reaches Nineteen Mile Brook via two mechanisms. The first is site groundwater: in accord with the original design, treated effluent is discharged to two of five RIBs,

where it infiltrates the natural sandy soil and travels vertically down through 30 to 40 feet of unsaturated sand[3]. The discharge reaches the groundwater mound that has developed under the RIBs, where it mixes with the regional water table and flows in a southwesterly direction downslope and discharges to Nineteen Mile Brook about three to six months later. During this period, a partial removal of nitrogen compounds along with significant removal of phosphorus was anticipated as the groundwater encountered wetland soils closer to the brook.

The second mechanism is site groundwater that comes to the surface in and around the Central and Western Groundwater Discharge areas and reaches Nineteen Mile Brook as surface water. The groundwater flow which historically had come to the surface in these areas as seeps or breakouts created the natural wetlands that existed prior to the construction and operation of the RIB, and these seep areas and channels are now seeing increased flow as a result of RIB operation. The increase groundwater flow coming to the surface has been observed as high as elevation 585 ft. msl at about 300 horizontal feet from the edge of RIB 3. At the upper, middle and lower area of the Western and Central Groundwater Discharge Areas these seeps are evident and transport flow as surface water through the natural wetlands, under the service road and monitoring points (19MB-7 and - 9) to surface waters of Nineteen Mile Brook. In this section, the points at which the flow intersects Nineteen Mile Brook are referred to as the Central and Western Discharges. As described previously, groundwater that emerges upslope in the Discharge Areas has a much shorter subsurface travel time, so is expected to have a different chemical composition than groundwater near the stream. Both of these sources, in addition to upstream flow and natural groundwater from the south side of the stream channel, influence the composition of Nineteen Mile Brook through the reach downgradient of the RIBs.

As part of the comprehensive monitoring program initiated by the Town of Wolfeboro in association with RIB operations, specific sampling was conducted to understand the response of Nineteen Mile Brook to RIB discharges and to determine if RIB discharges are adversely affecting the ecology of Nineteen Mile Brook. The specific ecological effect investigated by the study was the growth of algae, and specifically the potential for excessive algal growth to adversely affect the quality or availability of stream habitat. This sampling consisted of additional water quality sampling of Nineteen Mile Brook surface water and documentation of algae growth at key locations along the stream channel. The methods and results of this investigation are described below. Data summary sheets providing sample data referenced in the Sections below are provided in Appendices E, G, and H.

2.9.1. Stream Evaluation Methods

As the initial step in the evaluation of stream chemistry, the composition of groundwater reaching the Central Discharge, which is the most upgradient groundwater discharge point, was reviewed to confirm the type and form of nutrients potentially reaching the stream. As shown by Figure 3, two groundwater monitoring wells, MW-8 and MW-15, exist between the RIBs and the discharge areas. Of these, MW-8, which is upgradient of both discharge areas, is positioned to most accurately represent groundwater enroute to the wetlands and stream.

Because both nitrogen and, more typically, phosphorus, can be the cause of unwanted algae growth, the historical concentrations of each were reviewed in RIB effluent, MW-8, MW-15, and upgradient reference well MW-1. Plots of historical RIB effluent is shown in Figure 4, while historical results for total and orthophosphate in MWs 1, 8, and 15 are shown in Table 2-5.

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3 The RIB bed bottom is at an elevation of 662 ft. The highest recorded groundwater elevation under the RIBs at MW-19a is 632 ft, but has been as low as 622 ft. It is currently at approximately 624 ft. Nineteen Mile Brook is at an elevation of about 550 ft, approximately 100 ft. lower than the RIBs.

As shown by Figure 4, phosphorus in RIB effluent has declined significantly since discharge began in March 2009. The orthophosphate and total phosphorus levels of MW-8 and MW-15 are well below concentrations in RIB effluent (see data in Appendix E) and are generally similar (orthophosphate) or less than (total phosphorus) concentrations detected in upgradient well MW-1. These comparisons suggest that phosphorus removal is occurring as anticipated, and that this constituent is unlikely to be of significant concern for Nineteen Mile Brook.

However, as shown by Figure 4, total nitrogen (which includes nitrates) in RIB effluent averages between 1 and 4 mg/L (see Appendix E for specific data). While improvements in the treatment plant operation have reduced nitrate concentrations from the 9 mg/L originally anticipated to be discharged to the RIBs and the 7 mg/L originally anticipated at Nineteen Mile Brook (values subsequently included in the groundwater permit), these total nitrogen concentrations suggest that nitrogen is the nutrient most likely to exist in waters reaching Nineteen Mile Brook. Furthermore, a review of the forms of nitrate found in MW-8, just above the Central Discharge, show that nitrogen in groundwater is dominated by nitrate, a highly soluble form that exists under aerobic conditions and is readily utilized by plants (Table 2-6). Ammonia and total Kjeldahl nitrogen (TKN) which includes ammonium and other organic amino forms, are much less frequently detected.

Table 2-5: Orthophosphate and Total Phosphorus in Key Downslope Monitoring Wells

Sample ID	Parameter	Result	Unit	Date Sampled
MW-1	Orthophosphate	< 0.05	mg/L	12/21/2007
MW-1	Orthophosphate	< 0.05	mg/L	1/17/2008
MW-1	Orthophosphate	< 0.01	mg/L	3/14/2008
MW-1	Orthophosphate	< 0.01	mg/L	3/14/2008
MW-1	Orthophosphate	< 0.01	mg/L	5/14/2008
MW-1	Orthophosphate	< 0.01	mg/L	8/7/2008
MW-1	Orthophosphate	0.02	mg/L	11/5/2008
MW-1	Orthophosphate	< 0.01	mg/L	2/20/2009
MW-1	Orthophosphate	< 0.01	mg/L	5/13/2009
MW-1	Orthophosphate	0.02	mg/L	8/12/2009
MW-1	Orthophosphate	0.007	mg/L	11/18/2009
MW-1	Orthophosphate	0.005	mg/L	2/10/2010
MW-1	Orthophosphate	0.007	mg/L	5/4/2010
MW-1	Orthophosphate	< 0.01	mg/L	8/11/2010
MW-1	Orthophosphate	< 0.01	mg/L	10/20/2010
MW-15	Orthophosphate	< 0.05	mg/L	1/2/2008
MW-15	Orthophosphate	< 0.05	mg/L	1/23/2008
MW-15	Orthophosphate	< 0.01	mg/L	4/18/2008
MW-15	Orthophosphate	0.03	mg/L	4/18/2008
MW-15	Orthophosphate	< 0.01	mg/L	5/15/2008
MW-15	Orthophosphate	< 0.01	mg/L	8/7/2008
MW-15	Orthophosphate	0.03	mg/L	11/5/2008
MW-15	Orthophosphate	< 0.01	mg/L	2/20/2009
MW-15	Orthophosphate	< 0.01	mg/L	5/13/2009
MW-15	Orthophosphate	0.05	mg/L	8/12/2009
MW-15	Orthophosphate	0.004	mg/L	11/18/2009
MW-15	Orthophosphate	0.008	mg/L	2/10/2010
MW-15	Orthophosphate	0.014	mg/L	5/4/2010
MW-15	Orthophosphate	< 0.01	mg/L	8/11/2010
MW-15	Orthophosphate	< 0.01	mg/L	10/20/2010
MW-8	Orthophosphate	< 0.05	mg/L	12/27/2007
MW-8	Orthophosphate	< 0.05	mg/L	1/17/2008
MW-8	Orthophosphate	< 0.01	mg/L	4/16/2008
MW-8	Orthophosphate	0.01	mg/L	4/16/2008
MW-8	Orthophosphate	< 0.01	mg/L	5/14/2008
MW-8	Orthophosphate	< 0.01	mg/L	8/7/2008
MW-8	Orthophosphate	0.04	mg/L	11/5/2008
MW-8	Orthophosphate	< 0.01	mg/L	5/13/2009
MW-8	Orthophosphate	0.06	mg/L	8/12/2009
MW-8	Orthophosphate	0.009	mg/L	11/18/2009
MW-8	Orthophosphate	0.005	mg/L	2/10/2010
MW-8	Orthophosphate	0.022	mg/L	5/4/2010
MW-8	Orthophosphate	< 0.01	mg/L	8/11/2010
MW-8	Orthophosphate	< 0.01	mg/L	10/20/2010

Sample ID	Parameter	Result	Unit	Date Sampled
MW-1	Total Phosphorus	1.1	mg/L	1/17/2008
MW-1	Total Phosphorus	< 0.01	mg/L	3/14/2008
MW-1	Total Phosphorus	1.9	mg/L	3/14/2008
MW-1	Total Phosphorus	0.06	mg/L	5/14/2008
MW-1	Total Phosphorus	1.4	mg/L	5/14/2008
MW-1	Total Phosphorus	0.86	mg/L	8/7/2008
MW-1	Total Phosphorus	0.02	mg/L	8/7/2008
MW-1	Total Phosphorus	0.97	mg/L	11/5/2008
MW-1	Total Phosphorus	0.02	mg/L	11/5/2008
MW-1	Total Phosphorus	1.9	mg/L	2/20/2009
MW-1	Total Phosphorus	0.2	mg/L	5/13/2009
MW-1	Total Phosphorus	0.14	mg/L	5/13/2009
MW-1	Total Phosphorus	< 0.05	mg/L	5/13/2009
MW-1	Total Phosphorus	< 0.01	mg/L	8/12/2009
MW-1	Total Phosphorus	< 0.01	mg/L	8/12/2009
MW-1	Total Phosphorus	4.7	mg/L	11/18/2009
MW-1	Total Phosphorus	< 0.002	mg/L	11/18/2009
MW-1	Total Phosphorus	0.1	mg/L	2/10/2010
MW-1	Total Phosphorus	0.28	mg/L	5/4/2010
MW-1	Total Phosphorus	0.26	mg/L	8/11/2010
MW-1	Total Phosphorus	0.22	mg/L	10/20/2010
MW-15	Total Phosphorus	0.45	mg/L	1/2/2008
MW-15	Total Phosphorus	0.7	mg/L	1/23/2008
MW-15	Total Phosphorus	0.02	mg/L	4/18/2008
MW-15	Total Phosphorus	0.72	mg/L	4/18/2008
MW-15	Total Phosphorus	0.04	mg/L	5/15/2008
MW-15	Total Phosphorus	0.19	mg/L	5/15/2008
MW-15	Total Phosphorus	0.27	mg/L	8/7/2008
MW-15	Total Phosphorus	< 0.01	mg/L	8/7/2008
MW-15	Total Phosphorus	0.24	mg/L	11/5/2008
MW-15	Total Phosphorus	0.32	mg/L	5/13/2009
MW-15	Total Phosphorus	< 0.05	mg/L	5/13/2009
MW-15	Total Phosphorus	0.06	mg/L	8/12/2009
MW-15	Total Phosphorus	< 0.01	mg/L	8/12/2009
MW-15	Total Phosphorus	0.053	mg/L	11/18/2009
MW-15	Total Phosphorus	0.01	mg/L	11/18/2009
MW-15	Total Phosphorus	0.045	mg/L	2/10/2010
MW-15	Total Phosphorus	0.69	mg/L	5/4/2010
MW-15	Total Phosphorus	0.011	mg/L	8/11/2010
MW-15	Total Phosphorus	1.6	mg/L	10/20/2010
MW-8	Total Phosphorus	0.8	mg/L	1/17/2008
MW-8	Total Phosphorus	0.03	mg/L	4/16/2008
MW-8	Total Phosphorus	0.9	mg/L	4/16/2008
MW-8	Total Phosphorus	0.04	mg/L	5/14/2008
MW-8	Total Phosphorus	0.52	mg/L	5/14/2008
MW-8	Total Phosphorus	0.35	mg/L	8/7/2008
MW-8	Total Phosphorus	0.02	mg/L	8/7/2008
MW-8	Total Phosphorus	0.16	mg/L	11/5/2008
MW-8	Total Phosphorus	0.04	mg/L	11/5/2008
MW-8	Total Phosphorus	0.03	mg/L	5/13/2009
MW-8	Total Phosphorus	0.03	mg/L	5/13/2009
MW-8	Total Phosphorus	< 0.05	mg/L	5/13/2009
MW-8	Total Phosphorus	0.08	mg/L	8/12/2009
MW-8	Total Phosphorus	< 0.01	mg/L	8/12/2009
MW-8	Total Phosphorus	0.038	mg/L	11/18/2009
MW-8	Total Phosphorus	0.008	mg/L	11/18/2009
MW-8	Total Phosphorus	0.032	mg/L	2/10/2010
MW-8	Total Phosphorus	0.024	mg/L	5/4/2010
MW-8	Total Phosphorus	0.013	mg/L	8/11/2010
MW-8	Total Phosphorus	0.097	mg/L	10/20/2010

Table 2-6: Nitrogen Results Summary for Monitoring Well (MW-8)

Date Sampled	Well No.	Constituent	Result	Units	Method
1/17/2008	MW-8	Nitrate-N	< 0.5	mg/L	353.2
1/17/2008	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
1/17/2008	MW-8	TKN	< 0.5	mg/L	4500NorgC/NH3D
5/14/2008	MW-8	Nitrate-N	< 0.5	mg/L	353.2
5/14/2008	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
5/14/2008	MW-8	TKN	0.5	mg/L	4500NorgC/NH3D
8/7/2008	MW-8	Nitrate-N	0.17	mg/L	353.2
8/7/2008	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
8/7/2008	MW-8	TKN	< 0.5	mg/L	4500NorgC/NH3D
11/5/2008	MW-8	Nitrate-N	0.19	mg/L	353.2
11/5/2008	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
11/5/2008	MW-8	TKN	< 0.5	mg/L	4500NorgC/NH3D
5/13/2009	MW-8	Nitrate-N	1.4	mg/L	353.2
5/13/2009	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
5/13/2009	MW-8	TKN	< 0.5	mg/L	4500NorgC/NH3D
8/12/2009	MW-8	Nitrate-N	1.1	mg/L	353.2
8/12/2009	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
8/12/2009	MW-8	TKN	< 0.5	mg/L	4500NorgC/NH3D
11/18/2009	MW-8	Nitrate-N	1.0	mg/L	353.2
11/18/2009	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
11/18/2009	MW-8	TKN	< 0.5	mg/L	4500NorgC/NH3D
2/10/2010	MW-8	Nitrate-N	2.0	mg/L	353.2
2/10/2010	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
2/10/2010	MW-8	TKN	1.0	mg/L	4500NorgC/NH3D
5/4/2010	MW-8	Nitrate/Nitrite-N	1.9	mg/L	353.2
5/4/2010	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
5/4/2010	MW-8	TKN	0.5	mg/L	4500NorgC/NH3D
5/4/2010	MW-8	Total Nitrogen	2.4	mg/L	4500NorgC/NO3
8/11/2010	MW-8	Nitrate/Nitrite-N	1.3	mg/L	353.2
8/11/2010	MW-8	Ammonia-N	< 0.05	mg/L	4500NH3D
8/11/2010	MW-8	TKN	< 0.5	mg/L	4500NorgC/NH3D
8/11/2010	MW-8	Total Nitrogen	1.3	mg/L	4500NorgC/NO3

Total nitrogen measurements can be obtained either by direct analysis or by adding together nitrate and TKN concentrations or (for conservative estimates) reporting limits. However, the TKN method, and the resulting total nitrogen value based on it, has a reporting limit of 0.5 mg/L, which is above the range of many nitrate fluctuations.
Thus, because nitrate is the form most likely to cause algae growth, and because the higher reporting limits of total nitrogen analysis limit the ability of this method to detect low-concentration changes, nitrate was the form of nitrogen that was the primary focus of this study.

2.9.1.1. Water Sampling Program

Throughout the course of the RIB operation, monitoring wells and surface water have been sampled both at permit-required monitoring points as well as at additional points that more fully portray subsurface and surface water conditions. The array and progression of the sampling program is shown in Table 2-7, and sampling points are shown in Figure 3.

As shown by Figure 3, many of the sampling points are at locations close to the RIB and groundwater discharge points, and were initially installed to identify in general the characteristics of subsurface and surface water around the site. While useful for general site understanding, many of these sampling points are located relatively close to the RIBs or seeps, and do not reflect the full effect of natural processes that occur during the travel time between the RIB and Nineteen Mile Brook. Thus, for the purposes of evaluating effects on Nineteen Mile Brook, the sampling program was expanded to provide additional data on conditions close to and within Nineteen Mile Brook itself. These sampling points added specifically for this study are as follows:

- six piezometers, added as close to the stream as rocky substrate conditions would allow, without risking effects from surface water interactions. These provide better information about the groundwater that is actually discharging to Nineteen Mile Brook than do the monitoring wells located further upgradient. As discussed in Section 2.5, piezometers were installed by hand-driving in November 2009, and since July 2010 have been sampled quarterly.

- four additional surface water sampling points were added in July 2010 and were sampled monthly since then. These consist of the following:

19MB-18 – Located in the Unnamed Tributary, just above the confluence with Nineteen Mile Brook. This location provides accurate information about the constituents added by this tributary to Nineteen Mile Brook.

19MB-19 – Located in Nineteen Mile Brook downstream of the confluence of the Unnamed Tributary to document conditions after these two watercourses have mixed.

19MB-20 – Located in Nineteen Mile Brook downstream of the Central Discharge confluence to document the effects of the Central Discharge on stream conditions.

19MB-21 – Located in Nineteen Mile Brook downstream of the Western Discharge confluence to document the effects of the Western Discharge on stream conditions.

Sampling of these four additional stream locations was initiated in July 2010 and is continuing. Samples were analyzed for the constituents identified in Table 2-6. This report provides the results of the first four months of sampling, from July through October 2010, and documents conditions during mid-summer low-flow conditions when the stream is most likely to be affected by RIB operations. Data from these studies are provided in Appendix E.

Table 2-7: Summary of Nineteen Mile Brook Monitoring Program

Sample Location Type	Date Sampling Began	Sampling Frequency	Media	Sampling Points	Analytes	Notes
	March-09	***RIB Discharge initiated***				
Piezometers	November-09	August, 2010 and then **Quarterly** beginning in October 2010	GW	PZ-1	Total Nitrogen, Nitrate/Nitrite-N, Total Phosphorus, Ortho-Phosphorus, Chloride, TKN, Specific Conductance, Total Hardness	
	November-09		GW	PZ-2		
	November-09		GW	PZ-3		
	November-09		GW	PZ-4		
	November-09		GW	PZ-5		
	November-09		GW	PZ-6		PZ-6 not sampled in 8/2010 and 10/2010
Nineteen Mile Brook Surface Water	August-07	**Monthly**	SW	NMB#1	Total Nitrogen, Nitrate/Nitrite-N, Total Phosphorus, Chloride, TKN, Specific Conductance, Ammonia-N, Chloroform, Bromodichloromethane, Dibromochloromethane, Bromoform, Total Hardness	
	August-07		SW	NMB#2		
	August-07		SW	~~NMB#3~~		NMB#3 no longer monitored as of 2/2010
	August-07		SW	NMB#4		
	August-07		SW	NMB#5	Nitrate-N, Total Phosphorus, Chloride, Specific Conductance, Ammonia-N	NMB#5 - NMB#16 were analyzed for TN in 8/2010 only.
	September-07		SW	NMB#6		
	May-09		SW	NMB#7		
	May-09		SW	NMB#8		
	May-09		SW	NMB#9		
	May-09		SW	NMB#10		
	September-09		SW	NMB#11		
	October-09		SW	NMB#12		
	October-09		SW	NMB#13		
	May-10		SW	NMB#14		
	May-10		SW	NMB#15		Location listed as dry
	May-10		SW	NMB#16		NMB#16 not sampled in 9/2010
	May-10		SW	NMB#17		Location listed as dry
	July-10		SW	NMB#18	Total Nitrogen, Nitrate/Nitrite-N, Total Phosphorus, Chloride, TKN, Specific Conductance	
	July-10		SW	NMB#19		
	July-10		SW	NMB#20		
	July-10		SW	NMB#21		
Monitoring Wells	December-07	**Quarterly**	GW	MW-1	Total Nitrogen*, Nitrate/Nitrite-N**, Total Phosphorus, Ortho-Phosphorus, Chloride, TKN, Specific Conductance, Ammonia-N, CBOD, pH, E.Coli, Metals, VOCs	*Total Nitrogen was a calculated figure through February 2010; sampling for TN began in May 2010.
	December-07		GW	MW-2		**All MWs were sampled for Nitrate-N through February 2010; sampling changed to Nitrate/Nitrite-N in May 2010
	May-08		GW	MW-6		
	December-07		GW	MW-8		
	December-07		GW	MW-15		
	December-07		GW	~~MW-16~~		MW-16 no longer monitored as of 8/2008
	May-09		GW	MW-16B		
	May-09		GW	MW-19		Sampling for TN began in February 2010 for MW-19
	May-10		GW	MW-22		
	May-10		GW	MW-23		
	May-10		GW	MW-24		
	May-10		GW	MW-25		

Last Updated 11/15/2010

2.9.1.2. Algae Monitoring Methods

To help understand the relationship between algae growth and stream chemistry, a semi-quantitative algae monitoring program was initiated concurrent with the enhanced stream sampling in July 2010. The objective of the study was to document changes in algae growth relative to stream chemistry to determine the relationship between the two, and to estimate whether observed algae levels are likely to adversely affect stream ecology. The focus of the study was a green filamentous alga, which has been documented in the stream previously and which grows in strands that can reach several feet in length.

The growth of algae in Nineteen Mile Brook was evaluated by two separate methods. Both methods were completed on five transects established on the stream at locations downstream of confluence of the Central and Western Discharges with Nineteen Mile Brook. Transects were established by stretching a survey tape laterally across the stream at selected locations, which were used each month of the survey. Important to note is that transects were intentionally located in areas of both existing algae growth and suitable substrate for additional growth, so that any changes could be readily discerned and measured. However, these locations were not necessarily typical of the stream channel in general, so results should not be extrapolated to the stream as a whole.

Transects were positioned at the following locations (Figure 3):

Transect ALG-1 – Located 173 ft. downstream of SG-11, in an area of filamentous algae growth approximately 110 ft. upstream from the shrub wetland of Whitten Pond. This location was approximately 12 feet upstream of a log jam across the stream. The transect was shaded, and substrate consisted of sand and woody debris.

Transect ALG-2 – Located 80 ft. downstream of SG-11, and in mixed water downstream of the Western Discharge confluence. Substrate was sand and a large partially submerged log.

Transect ALG-3 – Located downstream from the confluence of the Central Wetland and Nineteen Mile Brook. Substrate consists of sand and woody debris. Freshwater mussels were also common, and provided substrate for algae growth. This location is about 4 ft. downstream from transect TCC-3 used by the Tuftonboro Conservation Commission.

Transect ALG-4 – Located 93 ft. south of the Central Discharge confluence, at the bottom of a large pool that exists at the end of a long cascade downstream of the confluence. The transect is primarily a sand substrate with algae present on roots and mussels.

Transect ALG-5 – Located at the wide point of a cascade approximately 53 – 55 ft. downriver of the Central Discharge confluence. This rocky substrate is largely covered by moss, but has filamentous growth in and around boulders. This location is concurrent with transect TCC-4 used by the Tuftonboro Conservation Commission.

At each location, algae were quantified by two methods. The first method was the "Field –Based Rapid Periphyton Survey" method of EPA's Rapid Bioassessment Protocol for periphyton (EPA, 1999). This is an areal coverage approach. At three specific points along each transect, the stream substrate was viewed through a clear-bottomed 5-gallon viewing bucket, the viewing surface of which had been divided into a grid of one hundred 2 cm x 2 cm squares. Each square had a dot in the middle. Investigators observing the substrate through the bucket and counted the number of squares under which algae were present, as determined by the presence of algae under the dot in the middle of each square. By returning to the same location each month, changes in the areal coverage could be quantified. The sampled viewing area of the bucket was 400 cm^2.

This method was used for measurements from August through October. Due to the dark substrate and the full pine canopy over most of Nineteen Mile Brook, the field of view through the 5-gallon viewing bucket was too dark for accurate measurement during the first July event. Thus, the linear method below was utilized in July, and the viewing bucket modified (by reducing the height of the bucket sides) for use in subsequent months.

The second method was a linear method. In this approach, the bottom cover along the length of the transect tape was documented on an inch-by-inch basis across the width of the stream. Substrate covered by green filamentous algae was distinguished from that covered by moss, and the nature of uncovered substrate (gravel, sand, logs) was noted. By this method, the total number of feet covered by green filamentous algae at each transect was documented. The results produced by this method reflect in part the width of the stream at each transect, but still effectively show relative changes over time. This method was used from July through October.

Of the two methods, the areal method recommended by EPA is considered to be more accurate, since it reflects a consistent sample area each month, and is less affected by borderline conditions, such as very thin bands of algae. Results from both methods are used in the final analysis.

2.9.2 Stream Chemistry and Algae Monitoring Results

To evaluate potential effects of RIB operation on Nineteen Mile Brook, site data were evaluated in a three-step fashion designed to first explore the linkage between RIB operation and Nineteen Mile Brook conditions, and then to qualitatively estimate whether observed changes are likely to result in adverse effects on the stream. First, the extent to which groundwater and tributaries influence Nineteen Mile Brook surface water was investigated by comparing specific conductivity and chlorides concentrations in groundwater and surface water. Second, relative effects of surface water and groundwater on Nineteen Mile Brook water chemistry were evaluated by reviewing nitrate concentrations in the stream and contributing sources over time. Third, effects of nitrate on algal growth were considered by reviewing concurrent surface water and algae data. Following these assessments, the potential for the observed levels of algal growth to significantly impair habitat quality in Nineteen Mile Brook is qualitatively evaluated.

2.9.2.1. Groundwater Influences on Stream Parameters

The original design of the RIB anticipated that the treated effluent discharged into the RIBs would flow vertically down through 30 to 40 ft. of unsaturated sands, create a groundwater mound, mix with the regional water table, and flow with the bedrock contours in a southwesterly direction to the Unnamed Tributary, the two wetland areas, and ultimately to Nineteen Mile Brook. The travel time in groundwater between the RIB basins was estimated by Wright-Pierce Engineers to be at least three months to Nineteen Mile Brook and one month to the Unnamed Tributary through groundwater seeps and wetland areas (Wright Pierce Phase 2 Hydrogrologic Report, Appendix O, March 2007). Because treated effluent is typically higher in chlorides and specific conductance than natural waters, these two parameters can be used as a chemical “signature”, to confirm that the flow-path of RIB effluent is consistent with the design expectations and illustrate the relative contribution from surface water (via seep discharges) and groundwater migration pathways.

Figures 5 and 6 show specific conductivity and chloride concentrations respectively in groundwater piezometers, surface water tributaries, and the surface water of Nineteen Mile Brook in both August 2010 and October 2010, the two months in 2010 when the piezometers were sampled. Concentrations in MW-8, which was sampled concurrently in August 2010, are also shown in text on the side of each figure. These figures show monitoring points as they occur along the stream reach, from upstream to downstream.

As shown by these figures, surface water and groundwater both show concentrations similar to, but somewhat lower than that of representative well MW-8, and the concentrations in the stream show a steady increase through the reach. In August, 2010, MW-8 specific conductance was 470 mS/cm. For the August and October months combined, tributary (19MB-7, -9, and -18) specific conductance ranged from 300 to 460 mS/cm; piezometer groundwater specific conductance (except for PZ-1) ranged from 180 to 360 mS/cm, and the conductance of Nineteen Mile Brook surface water increased from 52 and 48 mS/cm, respectively, to 250 and 200 mS/cm, respectively (see Appendices E, G, and H for data).

In relative terms, the results for chloride show a similar relationship for concentrations in surface water. MW-8 chloride concentrations in August 2010 were 91 mg/L. For August and October, chloride concentrations in the tributaries ranged from 67 to 100 mg/L, and concentrations in groundwater piezometers ranged from 41 to 88 mg/L, excluding anomalous PZ-1. The chloride concentrations in Nineteen Mile Brook surface water increased from 5 and 4 mg/L, respectively, to 59 and 43 mg/L, respectively, across the zone of groundwater discharge (Appendices E, G, and H).

For both parameters, concentrations are slightly lower in the groundwater piezometers than in the tributaries. This likely reflects their location further downgradient from the discharge points, with some attenuation of characteristics as RIB discharge water mixes with natural groundwater. Further attenuation is likely closer to the stream. The unusually low values for both specific conductance and chlorides found in PZ-1 suggest that this piezometer is located just beyond the flowpath for RIB constituents.

In summary, these results confirm the response of the stream to surface water and groundwater influences, and indicate that tributary concentrations, particularly of the Central and Western Discharge, are likely to be higher than near-shore groundwater. These results also confirm the usefulness of piezometer data as a conservative representation of groundwater conditions close to Nineteen Mile Brook. Actual near-shore concentrations are likely to be lower, because of increased attenuation.

2.9.2.2. Nitrate Concentrations in Nineteen Mile Brook

Concentrations of nitrates in Nineteen Mile Brook surface water as compared to tributary surface water and (when available) piezometer groundwater data is shown in Figure 7. This figure shows results for November 2009 (seven months after RIB startup), and July through October 2010. On these figures, nitrate data points from all sources are arranged as they occur in the field, from upstream (19MB-1) to downstream (19MB-21). Piezometer data is available for November 2009, August 2010, and October 2010 only. Also shown on these figures (in text) is stream flow, as measured at SG-11 near the downstream edge of the study area. Chemical data is provided in Appendices E and H.

Several points can be observed in these figures, as discussed below.

- Under all streamflow conditions, the highest nitrate concentrations were present in the Central and Western Discharge (19MB-9 and -7), while piezometer groundwater concentrations were essentially consistent with upriver concentrations. Across all five months, concentrations in these two discharge channels ranged from 0.31 to 0.98 mg/L, while piezometer groundwater concentrations are equal to or within 0.03 mg/L of the upriver (19MB -1) concentration (or reporting limit) in the three months in which they were measured (Appendix H). This suggests that nitrates are naturally attenuating in groundwater, as originally anticipated, and that the most significant contribution of nitrates to Nineteen Mile Brook currently comes from the surface water tributaries, particularly the Central and Western Discharges.

- Nitrate concentrations increase in the stream from upriver concentrations of 0.08 mg/L or less (19MB-1) to from 0.28 mg/L to 0.47 mg/L (19MB-21) during low-flow summer months of July through September 2010. During these months, the stream was essentially at base-flow, with flows ranging from approximately 1.17 to 1.38 cfs. As described in previous sections, less dilution from natural streamflow is available at these times. As noted in Section 2.4, groundwater base-flow for the stream is estimated at 0.24 cfs.

- During periods of higher flow, nitrate levels remain consistent with upriver concentrations. At a flow of approximately 3.35 cfs in November 2009, stream concentrations of nitrates stayed essentially equal to upstream concentrations. This likely reflects the effects of dilution at higher flow volumes.

- Nineteen Mile Brook nitrate concentrations typically increase downstream of each Discharge area confluence.

- Relatively low stream nitrate concentrations on October 2010 may result from both the lower concentrations in the Central and Western Discharge, as well as slightly increased flow in Nineteen Mile Brook. These nitrate values may also reflect the reduction in discharge to RIBs 1, 2, and 3 from 400,000 gpd in August to 325,000 gpd in September 2010. The measurement of approximately 1.7 cfs at SG-11 was taken on October 21, 2010, six days after a large storm event on October 15, 2010, where a flow of 14.88 cfs was measured.

Taken together, these observations indicate that RIB operations contribute nitrate to the surface water of Nineteen Mile Brook, but that the primary migration pathway is through the surface waters of the Central and Western Discharge, and to a lesser extent, the Unnamed Tributary.

2.9.2.3. Nitrate Concentrations and Algal Growth

As part of the algae monitoring program, algae presence was both measured at locations of existing growth (transects) as well as observed generally by walking the stream channel from transect ALG-1 to ALG-5, and further upstream in July. Walking the stream channel provided important qualitative information about algal growth along the entire reach under study. The qualitative information obtained by field observations is provided first below, followed by the quantitative results of the transect measurements. A photo log of algal observations is provided in Appendix F.

<u>Field Observations of Algae Growth</u>

Algae growth in Nineteen Mile Brook occurs in a non-continuous fashion that reflects channel characteristics such as substrate type, flow, and amount of incident sunlight. In July 2010, a review of the entire channel length from Whitten Pond to the Unnamed Tributary showed algae growth to be in general light and infrequent, with distinct growth limited to isolated places with good substrate or some level of sunlight, which is where the transects were typically located. Most algae consisted of green filamentous algae. Little algae was present in the stream above the Western Discharge (until near ALG-3) or above the Central Discharge. Several round colonies of algae were present in a large beaver-dam-created pool area at the confluence of the Unnamed Tributary and Nineteen Mile Brook, an area subject to beaver use. Photo documentation of these algae is included in Appendix F.

In August 2010, algae growth had increased markedly downstream of the Western Discharge confluence. Both in length and coverage, algae growth had increased throughout the reach, both at and between transect locations. However, little growth of algae was present upstream of the Western Discharge confluence, except for a short sunny patch at the intersection of the stream with a small wooden bridge at surface water sampling location (19MB-2). Elsewhere in this reach the watercourse is heavily shaded with a gravel/cobble substrate, and while moss was present on larger cobbles, green filamentous algae was largely absent until near the area of the Central Discharge

where transects ALG-3, 2, and 1 were located. Green algae, along with a blanket of moss, cover the sunny area of the cascade below the confluence of the Central Discharge and Nineteen Mile Brook.

In September 2010, algae growth downstream of the Western Discharge appeared somewhat less, although several round colonies of algae were present. Little new algae growth was observed elsewhere, and coverage in general seemed lower. In the October event, algae growth was significantly reduced, with algae largely absent from places of former significant coverage.

In general, qualitative field observations of the Nineteen Mile Brook channel indicate that algae growth occurred primarily in the reach downstream of the Western Discharge, where significant and maximum growth was observed in the August monitoring event. Non-filamentous, round algae colonies were infrequent, but somewhat higher in number at the time of the September monitoring event (Appendix F). Algae were either absent or present in significantly reduced quantities in the October event.

Quantitative Measurements of Algae Growth

Transect studies are in general consistent with qualitative observations. Because algae growth occurs over time, nitrate concentrations and algae quantities, as determined by both the linear and areal method described previously, are shown for the study period of July through October on Figure 8. Figure 8 is a conceptual representation of Nineteen Mile Brook, with sampling locations, tributaries, and algal transects shown in the order in which they occur, starting with upstream sampling location (19MB -1). Actual locations of transects are depicted on Figure 3. For comparison, the same chart is shown in Figure 9 using the more limited total nitrogen data, which has a higher reporting limit and so is less sensitive to changes. Total nitrogen data shows the contribution of ammonia and organic forms of nitrogen, in addition to nitrate.

Figure 8 shows the extent to which Nineteen Mile Brook surface water concentrations downstream of confluence mixing zones reflect the influence of tributary concentrations. Stream concentrations parallel those of the tributaries, but at a lower concentration, reflecting the effects of dilution within the main channel. At all locations, stream concentrations were highest in July, followed by September, and at all locations nitrate concentrations had returned to essentially upstream conditions in October. These results were also shown on Figure 7.

Algae patterns reflect a growth lag and a slightly different pattern. Algae were present at the stream at the beginning of the study primarily in widely separated areas where suitable substrate was present. Algae consisted almost entirely of long green filamentous algae, which were attached to logs, rocks, and other suitable habitat. At the beginning of the study, this growth was infrequent in the stream, and transects were located where such growth occurred.

Under the areal method of algae measurement, algae growth generally increased in August, and decreased in the months following, a result that is consistent with the observations of field staff. Both methods show a dramatic decrease in October, when relatively little algae was observed in most locations. Actual values for both the linear and areal algal measurements depicted on the Figure 8 are shown below.

Table 2-8. Algae Transect Sampling Results

	Linear Algae Coverage, ft. per Transect				
Date	ALG-1	ALG-2	ALG-3	ALG-4	ALG-5
7/8/2010	3.8	5.7	0.1	2.4	7
8/13/2010	5.3	6.2	1.8	4.7	5.9
9/16/2010	4.2	10	1.5	5.7	10.9
10/22/2010	0	0	0.3	1	1.2

	Areal Coverage, % of Sample Area per Transect				
Date	ALG-1	ALG-2	ALG-3	ALG-4	ALG-5
7/8/2010	NS	NS	NS	NS	NS
8/13/2010	35	45	25	42	6
9/16/2010	16	28	21	35	8
10/22/2010	0.3	0	4	1	4

NS = not sampled

Photographs of each transect area during each sampling event are shown in the photo log of Appendix F.

While algae growth results do not compare precisely with nitrate or total nitrogen concentrations, they do suggest that algae growth is stimulated downstream of the Western Discharge, where concentrations of nitrate ranged from 0.28 to 0.47 mg/L (19MB-21) from July through September. As shown on Figure 9, total nitrogen values peaked at 1.1 mg/L in September and may have contributed to algae growth in this area as well, depending on the timing of the nitrogen influx. Algae growth at all locations declined significantly in October, when nitrate was measured at around 0.1 mg/L or less.

2.9.3. Conclusions of Algae Study: Potential for Adverse Effect

As described in the previous sections, algae growth was observed to increase most noticeably in the lower reaches of Nineteen Mile Brook, below the Western Discharge. This is generally an area of fine to coarse sand substrate and woody debris, with some gravel and cobble in center bar locations. While this reach of the stream provides habitat and forage areas for a variety of aquatic species, it does not likely provide many suitable spawning areas for brook trout, a signature cold water species that has been documented in Nineteen Mile Brook.

Algae growth is often associated with the, eutrophication (over-fertilization) of waterbodies. Adverse effects of eutrophication are the result of several factors in addition to algae growth, and these typically include decreased dissolved oxygen and increased water turbidity, among others. However, in small, swiftly flowing streams such as Nineteen Mile Brook, these characteristics rarely change unless the area of effect is large, due to the constant aeration of the water and the transport of suspended solids away from source areas.

The primary adverse effect that growth of algae is likely to cause is a decrease in the quality of the aquatic habitat in the area of algae colonization. This effect would be in direct proportion to the amount of algae present. These effects may include the following:

- shading of substrate, leading to a reduction of periphyton, a food source for grazing benthic organisms
- loss of attachment places for benthic organisms, who can be crowded out by attached algae
- physical blockage of travel and foraging areas for fish
- potential local effects on dissolved oxygen, if heavy growth (and associated decay) occurs in quiescent areas of the stream channel.

In Nineteen Mile Brook, the observed growth of algae in most of the brook was below levels at which these kinds of adverse effects would be expected. In most of the reach potentially affected by RIB groundwater, the growth of algae was neither dense nor extensive, so little or no loss of stream function is anticipated. In particular, dissolved oxygen, as measured at 19MB-21 downstream of the Western Discharge, remained high during the course of the study, as shown below in Table 2-9:

Table 2-9. Dissolved Oxygen Summary

Date	19MB-1 (Upstream)		19MB-21 (Below Western Discharge)	
	DO, mg/L	Temperature, °F	DO, mg/L	Temperature, °F
7/8/2010	9.73	20.2	9.51	18.6
8/4/2010	8.96	20.6	9.79	16.8
9/14/2010	10.44	15.1	10.43	13.8
10/21/2010	12.18	7.7	11.79	7.5
11/18/2010	12.84	6.8	11.69	8.4

The primary place where a potential may exist for a temporary adverse effect through loss of habitat quality is the reach downstream of the Western Discharge, during the period of low flow in the August – September time period. Based on observations in the summer of 2010, this area has the potential to develop algae to the level where loss or diminution of habitat quality may be a concern. Levels observed in 2010 were considered to be border-line for this effect.

Secondarily, the area of the cascade below the Central Discharge may be vulnerable. This area, which receives direct sunlight, is heavily vegetated with moss, a natural colonizer of rock surfaces in coldwater streams. Filamentous algae is present in chutes and flow channels in and around the boulders, reducing habitat access to benthic species and potentially inhibiting the drift of benthic species at low water.

However, these two areas are limited in size, so the overall impact to stream function is likewise expected to be limited. As noted previously, the sandy channel downstream of the Western Discharge is unlikely to provide spawning habitat for the stream's documented population of brook trout, which require loose gravel beds for spawning.

In summary, little evidence of adverse effects from the growth of algae was observed in most of Nineteen Mile Brook. A potential for effect, due to loss or diminution of habitat quality, may exist in the reach downstream of the Western Discharge and the cascade area below the Central Discharge. Conditions at both areas in 2010 were considered to be border-line. However, because these areas are limited in size, effects on overall stream function are likely to be limited, based on the conditions observed in 2010.

2.9.4. Sand Migration: Potential for Adverse Effect

As discussed later in this report, the increased groundwater discharge flow from the Western Discharge carried with it a load of fine sand from the hillside formation. This fine sand lined the channel of the Western Discharge and eventually reached the stream, where it covered an estimated 40 – 50 ft of stream channel, to a depth of approximately 4 - 6 inches. A similar phenomenon is occurring at the Central Discharge, although the amount of sand is less. This sand is dispersed by the fast moving current in the area to downstream reaches of the stream.

Although fine sand is the natural underlying substrate in the stream, the addition of a layer of sand of this quantity has the potential to reduce the habitat quality of downstream areas by either increasing the embeddedness of downstream gravel and cobble substrate areas, or by burying the substrate entirely. Embeddedness refers to the degree to which cobbles are "embedded" into or buried by the substrate, and consequently have lost the interstitial spaces that provide important refuge habitat for many benthic species. Thus, in addition to the direct habitat loss by the presence of the sand in the stream near the confluence, further habitat effects would occur when large quantities of sand are distributed downstream by large flood events.

Because of this potential effect, the majority of the sand downstream of the Central and Western Discharge was removed by vacuuming in October 2010. Also at that time, upstream basins were constructed to provide a settling area for sand, and the discharge to the RIB was reduced to prevent or reduce the transport of sand out the seep areas. To date this effort appears to have been successful in significantly reducing the discharge of sand to Nineteen Mile Brook, although monitoring is continuing.

Currently, about two inches of sand remain in the stream. This sand could not be removed without disturbing the underlying sediment and fauna, so was left in place at the time of stream remediation. While this sand will eventually be dispersed and will distribute among the existing substrates, the effects of this quantity will be considerably less than the original volume.

2.9.5. Summary and Conclusions: Changes in Stream Chemistry and Algal Growth

In this study, a comprehensive stream and algae monitoring program was conducted to evaluate the effects of RIB discharges on nutrient composition and algal growth in Nineteen Mile Brook. While water monitoring is on-going, the study focused on a four-month period from July to October 2010, during which groundwater and surface water were sampled, and algae growth was monitored at five transects along the stream channel. Transects were located in areas of existing algae growth downstream of the confluences of the Central and Western Wetland with Nineteen Mile Brook. Water quality was monitored at similar locations, as well as in the Central and Western Discharge and Unnamed Tributary.

The key findings of the study are as follows:

- Under all streamflow conditions, the Central and Western Discharges contributed the highest concentrations of nitrates to the surface waters of Nineteen Mile Brook. Groundwater reaching the brook is at or close to background concentrations of nitrates. Nitrate concentrations in Nineteen Mile Brook mirror those of the two Discharges, minus the effects of dilution.

- Concentrations in Nineteen Mile Brook surface water increase with distance downstream during summer periods of low flow, reaching concentrations of 0.47 mg/L in July 2010. In periods of higher flow, dilution effects maintain nitrate concentrations at or near background levels.

- Measured nitrate levels were highest in July at all locations, followed by September. Nitrate levels had decreased to background levels by October.

- Algae growth, as determined by the areal method and visual field assessments, was at a maximum in August and was greatly reduced or absent by October. Green filamentous algae were the most common form.

- Algae growth was greatest downstream of the Western Discharge.

- Little evidence of adverse effects from the growth of algae was observed in most of Nineteen Mile Brook, due to relatively light algal growth over most of the reach. A potential for effect, due to loss or diminution of habitat quality, may exist in the reach downstream of the Western Discharge and the cascade area below the Central Discharge. Conditions at both areas in 2010 were considered to be border-line. However, because these areas are limited in size, effects on overall stream function are likely to be limited, under the conditions observed in 2010.

Based on these findings, continued monitoring of piezometers, tributary outlets, and Nineteen Mile Brook is recommended.

References

USEPA, 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthics, Macroinvertebrates, and Fish. 2nd Ed.

3. RIB IMPACTS ON GROUNDWATER DISCHARGE AREAS

3.1. GROUNDWATER LEVELS VERSUS RIB FLOW

Groundwater levels were monitored prior to RIB operation, starting in February 20, 2009 through April 4, 2009. At that time W-P had performed some site tests and concluded that the groundwater elevations match very closely with the computer modeled predicted groundwater elevations. Following the "unexpected issues" the Town purchased and placed into service on 6-18-09 four (4) data loggers to monitor groundwater elevations in the following monitoring wells: MW-8; MW-13; MW-16 & MW-19. The Town purchased an additional 5 data loggers and placed them into service on April 26, 2010 (MW-22, MW-23, MW-24, MW-25 and MW-1). The location of these monitoring wells is shown on the RIB site plan, Figure 3. Appendix I, Groundwater Levels, show the groundwater levels for all these monitoring wells on a graph and shows which RIB was on line on a specific date and what the flow was to that RIB.

MW-19: MW-19 is located between RIBs 2 and 3 about midway along the length. The bedrock elevation is 615 and prior to RIB start up was dry with an unsaturated sand depth of 60 feet. The groundwater elevation in MW-19 rose 21 feet during the first 20 days to a high of 636.2. That elevation dropped to 630 on April 20, 2009 responding to decreased loading and to 622 by May 5, 2009. On July 19, 2009, with an RIB flow of just under 500,000 gpd going to Bed 2 the elevation went back up to a high of 631. During this time the groundwater mound was steadily increasing when RIBs 1 & 2 were on line, then drop down about 4 feet when flow was switched to RIB 3. This was expected as the groundwater flow was expected to follow the bedrock slop, which it does in a southwesterly direction.

When flows were reduced to around 400,000 gpd around August 1, 2009 the GW elevations in MW-19 ranged between 620 and 626. Beginning in November of 2009 RIB flows were dropped to just under 300,000 gpd and GW levels dropped to a range of 619 to 625, depending on which bed was on line. On March 11, 2010 RIB flows were dropped to about 210,000 gpd, in anticipation of higher regional groundwater from spring melt. A small drop in GW elevations occurred in March than a rise in April. In May, flows were increased to about 400,000 gpd and GW elevations got as high as 628 on May 21. Since then flows to RIBs 1, 2 & 3 were increased to as high as 425,000gpd, but GW elevations dropped to a range of 620 to 625. Beginning in September flows were decreased to 325,000 gpd, GW elevations dropped to a range of 618 to 623. Since October 13, we have been seeing an increase in this range by a couple of feet without any change in RIB flow and attribute this to the increase in the regional groundwater as it is increasing, as seen in MW-1, which is the sites background well.

Based on this data, GW elevations respond directly to RIB flows; with RIBs 1 & 2 having a greater impact on GW mound (in the 3 to 4 foot range) than RIB 3. GW is also influenced by the regional water table as seen in the past few months. Also GW elevations trended downward when RIBs 4 & 5 came on line. An unsaturated sand thickness below RIBs is now in the range of 39 feet, with the minimum unsaturated depth occurring during March of 2009 when it was, for a short period, about 26 feet.

MW-8: MW-8 is located 360 feet from the center of RIBs 2 & 3 and 140 feet above the Central Groundwater Discharge Area. Bedrock elevation is 558 and the GW elevation prior to RIB start up was 584. The GW elevation raised to just above 600 on March 28, 2009 then increased to 602 on April 20, 2009, at which time flow to RIBs was decreased and the GW elevation dropped to 598 on May 5, 2009. When RIB flows were increased from 330,000 gpd +/-, in late June of 2009 to almost 500,000 gpd in July, the GW levels were measured as high as 604. GW elevations and RIB flow only remained at these high numbers for a few days. Upon reducing flows to the 400,000 gpd range, GW elevations dropped back down to 599. When flows were reduced to just less than 300,000 gpd in November of 2009, the responding GW elevation was just above 596.

Based on charting the fluctuations in GW levels it can be seen that MW-8 does respond a little more to RIB 3 than RIBs 1 & 2, by about 1 foot, not as significant as MW-19. In the spring of 2010, there was a slight increase in GW elevations, with relatively steady flows and assume these increases are a result of increased regional groundwater. From May of 2010 through August, GW levels remained relatively constant at 600. In August of 2010, with decreased flows to RIBs 1, 2 & 3 to about 325,000 gpd, (a reduction of 100,000 gpd) GW levels dropped to between 595 and 596.

The unsaturated sand thickness at MW-8 prior to RIB operations fluctuated with the groundwater table and was 36 feet in late February 2009. During the first 5 months of operation the highest GW elevation measured was 604 and only remained at that elevation for a few days. Currently with the GW elevation around 596 there is 24 feet of unsaturated sand thickness around MW-8. The groundwater mound that developed from RIB operations was as high as high as 20 feet and is now about 12 feet.

MW13: MW-13 is located about 520 feet west of MW-19 and the center of RIBs 2 & 3 and 70 +/- feet above the Western Groundwater Discharge Area. Bedrock in MW-13 is at elevation 574, with a GW elevation of 581 and unsaturated thickness of 16 feet prior on December 12, 2007. On April 20, 2009 the GW elevation was above 594 and just about the same on May 5, 2009. Upon installation of data logger in MW-13, the highest GW elevation was just after July 20, 2009 when it almost reached 595. Reduced flows from the summer of 2009 to the fall resulted in a steady decline and GW elevations bottomed out between 590 and 591 from November to the end of the year. During this time frame MW-13 showed about a 1 foot higher impact from RIB 1 and 2 than RIB 3. This impact although slight is consistent throughout the overall monitoring program.

In March of 2010, with a decrease in RIB flow from just below 300,000 gpd to just above 200,000 gpd, there was a slight increase in GW elevations from 591 to 593 and is attributed to an increase in the regional groundwater from January rains and the spring thaw. With increased RIB flows in May and June, GW elevations increased to a high of 593 late in May, then began to drop slowly, even with increased RIBs flow. Again this trend is attributed to the drop in regional groundwater (as it was a relatively dry summer). Upon dropping RIBs flows beginning in September from over 400,000 gpd to 325,000 gpd GW elevations dropped to 589 and have remained in that range since.

The groundwater mound around MW-13, which developed as a result of RIB flows, was as high as 13 feet during March of 2009 and again in July of 2010. Currently the GW mound is in the 8 foot range, but expected to rise with the annual increase in the regional ground water.

3.2. GROUNDWATER SEEPS AND GROUNDWATER DISCHARGE AREA FLOWS

Groundwater seeps develop shortly after operations of the RIB site in March of 2009. These seeps were not notice until mid April as there was a significant snow pack on the site until that time. These seeps were noticed at elevations as high as elevation 604 above and around the Central Groundwater Discharge Area. These locations were staked out on April 20, 2009 and subsequently surveyed. During the spring of 2009, there was a significant amount of snow pack on the RIB site and higher regional water elevations.

Eastern Groundwater Discharge Area: The specific area where groundwater was surfacing above elevation 600 was along the toe of the “fill slope” above the woods road and about 300 feet south of RIB 3. With reduced RIB flows and regional groundwater, these seeps have dried up and not been seen since the early summer of 2009.

In an area 300 feet south of RIB 3 and 400 feet west of the power line the GW seeps were most notable. The area had been used as a logging landing with a small cut and fill. The cut area was about elevation 595 and as stated

above was the most notable GW seep. This area became saturated and developed a significant algae growth. The old woods road also became saturated and collected GW seep flow. Ten water bars were installed along the woods road to allow GW seepage to flow across the road and infiltrate back into the ground south of the road. The water bar directly below the old logging landing became a surface water sampling site (19MB-11) and has been monitored since September of 2009. The area above surface water sampling site 19 MB-11 and extending east to the power line does respond to both increased regional groundwater and to RIB flows. In 2010 with it being a relatively dry summer and with reduced flows to RIBs 1, 2 & 3 the area appears much dryer than it was in 2009. In 2009 and 2010, based on field walks all GW seeps in this area crossed the old woods road and infiltrated back into the ground.

Central Groundwater Discharge Area: On April 20, 2009 the GW seeps around the top of the Central Groundwater Discharge Area were at an elevation range of 582 to 594. At this time the seeps could be defined as saturated soil, such that, if you made a small hole, water would accumulate in the hole. There is no record of groundwater bubbling out of the ground at this time.

On June 5 or 6, 2009 a sink hole developed at about elevation 585 +/- and located approximately 60 feet east of the paved access road. About 30 feet below the sink hole, 3 significant springs developed and a quantity of fine sands had migrated from the hill side down slope and covered 1,600 square feet. These groundwater springs were visually estimated at less than 5 gpm. At this time GW seeps were flowing within the Central Groundwater Discharge Area and surface water flows within this area were increasing with decreasing elevations. In March of 2010, Weirs were installed within the area to obtain an idea of surface water flows.

Weirs 2 and 3 were installed around elevations 565 and located to pick up individual springs that developed after the sink hole "unexpected Issue" in June of 2009. Weir 1 was installed at around elevation 555 and was collecting the majority of flow from the Central Area. Weir 6 was installed at elevation 548 and just upstream of the culvert that crossed the old woods road and collects all surface runoff from the Central Area. Based on these weir flow readings and other visual observations it is estimated in March of 2010, when the RIBs were flowing at 300,000 gpd at the beginning of the month and 200,000 at the end of the month, that the Central Groundwater Discharge Area was flowing at about:

- 28,000 gpd was surfacing at elevation 565 (25% of total)
- 57,000 gpd was surfacing at elevation 555 (50% of total)
- 116,000 gpd was surfacing at elevation 548 (100% of total)

During this time period the regional groundwater table was high and impacted this areas base flow, weir readings increased after rainfalls and quickly receded. Weir readings for W-2, W-3 & W-1 were discontinued in July; Weir 6 (W-6) data was recorded through September 13, 2010 until it was removed to make way for the Sand Trap. W-6 was reestablished on October 22, 2010; all Weir flows are shown in Appendix D.
During the dry summer Weirs 6 was monitored and had an average flow of about 120,000 gpd during August when the RIB 1, 2 & 3 flows were about 400,000. Estimated surface water flows from RIB discharge were calculated by W-P and are shown in Appendix O, of the Phase 3 Hydro Report. Extrapolating that data for a RIB flow of 400,000 gpd provides a theoretical flow of 42,500 gpd from the Central Groundwater Discharge Area, the measured average flow from W-6 was significantly higher than predicted. While the Central Groundwater Discharge Area is constantly undergoing physical changes from the seasons, regional groundwater and RIB induced groundwater the quantity of flow at elevations within the Area remain as estimated above.

Western Groundwater Discharge Area: GW seeps were not noticed in the Western Groundwater Discharge Area in the spring of 2009. Flows were observed in April of 2009 from a preexisting natural spring (now surface water

sampling site 19MB-8); however no GW seeps were observed above or around this location. Note the upper section of the Western Groundwater Discharge Area was shown at the natural spring (19MB-8) and is at elevation 583. Towards the end of 2009 the areas around and especially areas below the natural spring became more saturated. GW seeps began to appear just below the path leading to the spring around elevation 575.

During the January 2010 surface water sampling of site 19MB-8, it was reported by W&C that surface water flows appeared higher and there was a noticeable flow of fine sand migrating down slope from the spring. Since that time the area has been more closely observed. GW seep flows were increasing and by the spring of 2010, the path that leads to 19MB-8, was saturated. As flows increased to RIBs 1, 2 & 3 during the summer, GW seeps increased around this area and above the spring to about elevation 593. Water from the toe of slope above the spring was flowing along the ground and into the spring. Following the decrease in flow to 325,000 to RIBs 1, 2 & 3, the areas above the spring have dried up, but areas below remain saturated.

Weir 4 was located about 70 feet below the spring and collected most of the flow from above this area, W-4 is at about elevation 573. Weir 5 is located about 230 feet down slope of the spring at about elevation 558. Weir 7 was located just upstream of the woods road culvert at elevation 543 and captures all the surface water from the Western Groundwater Discharge Area. In March of 2010 the average flows measured were about:

- 7,200 gpd was surfacing at spring or elevation 583 (5% of total)
- 39,000 gpd was surfacing at W-4 or elevation 573 (28% of total)
- 62,000 gpd was flowing at W-5 or elevation 558 (65% of total)
- 137,000 gpd was surfacing at elevation 548 (100% of total)

During this time period the regional groundwater table was high and impacted this areas base flow, weir readings increased after rainfalls and quickly receded. Weir readings for W-4 & W-5 were discontinued in July; Weir 7 (W-7) data was recorded through September 13, 2010 until it was removed to make way for the Sand Trap. W-7 was reestablished on November 2, 2010.

During the summer Weir 7 was monitored and had an average flow of about 156,000 gpd during August when the RIB 1, 2 & 3 flows were about 400,000. Estimated surface water flows from RIB discharge were calculated by W-P and are shown in Appendix O, of the Phase 3 Hydro Report. Extrapolating that data for a RIB flow of 400,000 gpd provides a theoretical flow of 147,600 gpd from the Western Groundwater Discharge Area, the measured average flow from W-7 was close to what was predicted. The observed flows within the Western Groundwater Discharge Area vary in response to RIB flow, precipitation and regional groundwater, but as a percentage of the flow at elevations within the area they remain as estimated above.

3.3. SAND MIGRATION WITHIN GROUNDWATER DISCHARGE AREAS

Eastern Groundwater Discharge Area: There have been no observations of sand migration in the Eastern Groundwater Discharge Area. Although there was GW seeps above the woods road and below the fill slope at high RIB flows there were no signs of sand migrating from the hill side. There are signs of GW seeps below the woods road and north of Nineteen Mile Brook between elevations 550 and 600, but these GW seeps fill low areas, around uprooted trees or in small depressions, no visible signs of surface water running or sand migration. In this area the slopes (8% +/-) are not as steep as they are in the Western and Central Groundwater Discharge Areas (10% to 30%) where we have observed the “unexpected issues”.

Central Groundwater Discharge Area: The "unexpected issues" first observed on April 20, 2009 included the U shaped slope failure above the Central Groundwater Discharge Area. This crack in the hill began at elevation 591 on the east side, ran on a northwesterly direction to top of slope to elevation 600, ran across top of slope for about 40 feet, then went down the slope in a southwesterly direction for about 80 feet to an elevation of 577. This issue, which first developed as a crack, has very slowly developed into a slope failure, where the land below the crack at top of slope has separated and has been moving downhill since. The trees in this area were cut down to prevent them from falling down and exposing their roots. While this disturbed area of land continued to change in 2009, there were no signs of soil migration in 2009.

Sand migration was first observed on June 8, 2009 when a sink hole developed just to the west of the Central Groundwater Discharge Area. On Friday June 5, 2009, Town staff had walked by this area and there were no signs of GW seeps or sand migration. During the weekend, the sink hole and sand migration developed. It was reported on June 8 and was first measured at about 4 feet wide, by 12 feet long and about 4 to 5 feet deep. The migrating sand had covered an area of about 1,600 square feet. This area was reviewed by various geotechnical companies and was determined to be a one-time event, resulting from a build up groundwater pressure, which relieved itself at the break in slope, where previously there were no natural springs observed. Based on visual observations it appeared that the sand was no longer migrating out of the hillside following this event.

In March of 2010, Weirs 2 and 3 were installed just below 2 of the springs that developed to measure surface water flows. Weir -1 was installed down slope of W-2 & W-3 and it received flows from the upper weirs as well as a stream that was developing from the east side of the area below the slope failure. After about a month of operation, sand started to fill in behind all of the upper V-notch weirs. Sand was removed from these weirs from April thru May, then cleaning stopped and weirs filled in and weir readings were discontinued by mid July.
Since June of 2009, the area appears to have stabilized with wetland vegetation and the springs that developed have not increased in flow, but have changed their course. Weir 3 no longer flows toward Weir-1, but travels east then goes back into the ground. The spring above Weir-2 still flows but prior to reaching Weir 2, the flow goes back into ground (Note: Surface Water Sampling site 19MB-10 is just upstream of Weir-2). It does not appear that the original sand migration associated with the June 8th "unexpected issue" has reached Nineteen Mile Brook.

In 2010 this Slope Failure area continue to change, with more GW seeps and the land below the slope failure being impacted, however the area was heavily vegetated and it was difficult to see the ground surface. During the spring and summer of 2010 the GW seeps developed into a small stream below elevation 570 which feed into Weir-1. Weir-1 started collecting fine sand in April. In late August, land below the slope failure was observed to be deformed. The area was cleared of brush and a 20 foot by 30 foot sink hole had developed about 1 to 2 feet deep. GW seeps were observed to appear on the surface then infiltrate back into ground, in and around this area. It is believed that a small quantity of sand migrated from this area in the spring and summer filling Weir-1, then in late in August became more significant and worked its way through the Central Area and ended up in Nineteen Mile Brook.

Western Groundwater Discharge Area: During the first cited "unexpected issues" there was no sand migration observed in the Western Groundwater Discharge Area. However, in the fall of 2009, GW seeps and the natural spring appeared to increase in flow. As stated above, during the January 2010 surface water sampling, it was reported by W&C that sand was migrating down slope from the spring and surface water sampling site 19MB-8. Follow up field inspections did reveal fine sands moving downstream through the Western Groundwater Discharge Area. Weirs 4 and 5 were installed and monitored from March to July. Sand build up behind each of these weirs was evident in April and required regular cleaning. Significant quantities of sand can be found from the spring, through Weir 4 & 5 all the way to culvert crossing woods road.

In June of 2010 a sink hole was observed about 30 feet north northeast of the natural spring and measured about 10 feet by 3 feet by 3-4 feet deep. The area was staked out and is observed during each site visit. It does not appear to be growing and it is not clear when this event occurred because of the dense vegetation, leaf ground cover and that it was located in a non-travelled area. It was reported to NHDES when it was first discovered.

In the area just above Weir 7 (woods road culvert and surface water sampling site 19MB-7) the brook was flowing with a steady velocity and sand migration was not observed, however, sand was flowing through the culvert and getting to Nineteen Mile Brook unnoticed. It has been difficult to determine where all the sand has come from, that is, is it coming from the subsurface and GW seeps/springs or is some of it being eroded from the brook channel that has developed within this area. In any case there is a significant quantity of fine sands all along the channel from the original natural spring to the woods road culvert.

3.4. SAND TRAPS AND NINETEEN MILE BROOK CLEAN UP

In late August of 2010, signs of sand migration reaching Nineteen Mile Brook were observed at the outlet of the Central Groundwater Discharge Area. This observation lead to an inspection of the Western Groundwater Discharge Area outlet to Nineteen Mile Brook and it was also observed that significant quantities of sand had reached the Nineteen Mile Brook, covering the bed bottom for 50 plus feet. This event was reported to NHDES and was followed up with a NHDES inspection. NHDES estimated the impacts as follows: upstream or Central area outlet, 35 feet by 11.5 feet with an average depth of .85 feet; downstream or the Western area outlet, 57 feet by 12 feet with an average depth of just over 1 foot.

This issue was reported to NHDES in a September 1 letter and was followed up with an emergency permit to install "Sand Traps" upstream of woods road to collect any sand migrating though the Groundwater Discharge Areas. The emergency permit was approved on September 14, 2010 and "Sand Traps" were installed shortly thereafter. The "Sand Traps" are simple drop inlet drainage structures that created a small pond above the woods road culvert, reducing the velocity of the brook and allowing fine sands to settle out prior to water flowing over structure, through road culvert and to Nineteen Mile Brook. Both of these "Sand Traps" have been successful in stopping sand from migrating to Nineteen Mile Brook. Sand is settling along the interface of brook to the "Sand Trap" and slowing migrating to the sump area, where it can be removed.

The Town also requested guidance from NHDES on how to respond to the sand that had reached Nineteen Mile Brook. Following NHDES site inspection, it was recommended that the Town attempt to remove the sand, while mitigating impacts to the Brook. The Town requested and was granted an amendment to its Emergency Wetland Permit and contracted with a Vactor Truck Company (Catch Basin Cleaners, Meredith, NH) to assist the Town with clean up operations. The cleanup operation began early in October and after a week of significant effort was completed. Not all sand was removed, because it was determined that more damage might have been done by removing the natural bed bottom with sand. Sand accumulation was reduced to less than two inches in most areas, however, signs of fine sand can still be observed. Also, some residual sand from the culvert outlets to Nineteen Mile Brook has migrated to the Brook but appear to be minor in comparison to the original event.

3.5. WESTON & SAMPSON PHOTO LOG REPORTS

In an effort to document the original "unexpected issues" and the RIBs response to these events, Weston & Sampson (W-S) was contracted to perform visual inspections. Their narrative reports are in Appendix J, however their detailed Photo Logs were too large to include in this report, however, can be seen through an ftp site. To view all W-S reports including the Photo Logs follow these instructions to the ftp site:

Site Name = Weston&Sampson-BenGreen

The client's access info...

- Site Address = ftp://ftp.wseinc.com/Weston&Sampson-BenGreen
- Username = BGreenGuest
- Password = BGguest# (the password is case sensitive)

Folder Name= Wolfeboro, NH

Once the site has been opened using Internet Explorer, expand the 'Page' menu, select the 'Open FTP Site in Windows Explorer' option, and re-enter your username and password info when prompted. Use of the Windows Explorer mode simplifies the transfer of data to and from the site.

4. SPRAY IRRIGATION

4.1. SPRAY IRRIGATION SITE

The Town of Wolfeboro owns a 300 acre parcel of land adjacent to the WWTP; this site has been used as the Spray Irrigation Site to dispose of its treated effluent from the mid 1970's to 2009. This site was required to take over 140 million gallons every year over a 6 month seasonal irrigation period and some areas within the 100 acre spray fields had become saturated in many low lying areas. However much of the site is at higher elevations with unsaturated soils and has the ability to take treated effluent without runoff. Improvements to the WWTP over the past few years has improved the effluent quality and combined with the reduced spray application volumes applied (during the past few years of operation) have reduced the loading on the spray irrigation site.

4.2. REQUEST FOR RENEWAL OF GROUNDWATER DISCHARGE PERMIT

The Town has submitted a request to renew its Groundwater Discharge Permit for this site with the following stipulations: the spray area be reduced to approximately 42 acres; all spray piping be removed from the Mirror Lake Watershed and in areas where the soil is saturated year round; the treated effluent be sprayed intermittently so as to allow treated effluent to percolate into the ground; to increase the site monitoring to assure that there is no visible runoff from any of the spray areas, resulting from the spray operation.

4.3. USE OF THE SPRAY IRRIGATION SITE

The Spray Irrigation Site is currently being worked on to remove piping from areas as described above, as well as having brush and other vegetation removed from spray head areas. Spray pumps have been tested and are still in working condition. In 2011 the Town proposes to continue its maintenance of the spray pumps and selected spray areas and use the site for disposal of treated effluent on an as needed basis. Having this resource allows the Town to be much more conservative with RIB discharge flows.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. CONCLUSIONS

5.1.1. RIB Site Remains Permit Compliant

The Groundwater Discharge Permit for the RIB site lists several criteria for testing and discharge limits. Wolfeboro has undertaken a proactive approach to permit compliance by increasing the quantity and frequency of sampling and testing. Efforts to date have been more than required by the discharge permit. Results indicate that the Total Nitrogen reaching Nineteen Mile Brook is 1.2 mg/l or less, compared to a predicted level of 7 mg/l. Total Phosphorus is being discharged to the RIBs at levels below 1 mg/l and test from MW-19 indicate that 99% of it is removed prior to reaching the groundwater mound below the RIBs. Monthly average flows, while approaching the 600,000 gpd limit in March of 2009, were not exceeded. Currently, RIB flows have been at 400,000 gpd since September 3, 2010.

5.1.2. Treatment Plant Upgrades

Upgrades at the WWTP and process control changes have greatly improved the quality of its treated effluent resulting in a significantly reduced nutrient load on the RIB site. These levels are much less than anticipated in the original basis of design.

5.1.3. "Unexpected Issues"

Sink holes, slope failures and sand migration have been classified as "unexpected issues" and are cause for concern. While GW seeps within the groundwater discharge areas were anticipated, the resulting "unexpected issues" were not. In the Wright-Pierce Phase 3 Hydro Report it was calculated that the groundwater flow to surface water would be distributed between Nineteen Mile Brook; the Unnamed Brook and the Western, Central and Eastern Groundwater Discharge Areas. Measured flow at outlets to the GW discharge areas indicate that actual flows in the Western Groundwater Discharge Zone are about what was predicted. Based on the degree of accuracy in calculating and measuring these flows this difference is not significant. However, in the Central Groundwater Discharge Area the flows were about twice what was predicted.

Wolfeboro has acted proactively by reporting these issues to NHDES, studying the impacts and making corrective action as required. These actions included installation of "Sand Traps" and the removal of sand from Nineteen Mile Brook. Based on the data collected to date, it is concluded that the initial "unexpected issues" may have been a result of the increased loading in March and April even though the discharge flows were in compliance with the GW permit and Basis of Design. Upon decreased flows to RIBs, there are corresponding decreases in GW levels and GW seeps.

It is believed; based on subjective observations, that increased total flows to the RIB site in early August of 500,000 gpd, may have lead to additional sink holes in the Central Groundwater Discharge Area, increased sand migration through both groundwater discharge areas and deposition of sand in Nineteen Mile Brook.

5.1.4. RIB Flows and Contributions to Nineteen Mile Brook

Based on stream gauge readings in Nineteen Mile Brook, RIB contributions (as a proportion of total stream flow) are significant during low flow periods, however, much less at normal or high Brook flow periods. Flow measurements of Nineteen Mile Brook and GW discharge areas will continue so that we can further understand their relationship.

5.1.5. Sand Impacts on Nineteen Mile Brook

The majority of sand that had migrated to Nineteen Mile Brook was removed; however, remaining sand did and may have further impact on the stream ecology as it distributes through the channel. However this impact is limited to a few hundred feet of the Brook downstream of the GW discharge areas and is not considered significant in relation to the Brook as a whole.

5.1.6. Algae Growth in Nineteen Mile Brook

Algae growth downstream of the GW discharge areas was studied in detail in 2010 and while there was increased algae growth, there was little evidence that there were significant adverse impacts as a result of this growth. Areas of most algae growth were limited to the area downstream of the Western Discharge. While this reports documents nitrogen levels coming from the RIB site, there have been other activities within the watershed that could be contributing to these levels. These activities include site disturbance from the construction of the RIBs and possible impacts from logging operations.

5.2. RECOMMENDATIONS

- Wolfeboro will continue an enhanced sampling and analytical plan for the RIB site, including groundwater and surface water testing; weir 6 & 7 monitoring; Nineteen Mile Brook Stream Gauging; and periodic RIB site walks of all “unexpected issues” and areas of concern.
- Wolfeboro has voluntarily limited the total RIB flow to no more than 405,000 gpd, with 325,000 going to the west side RIBs (1, 2 & 3) and about 75,000 gpd going to the east side RIBs (4 & 5). This voluntary practice will continue until further notice.
- Wolfeboro has requested to renew its “Spray Irrigation” Groundwater Permit and will maintain this site now and in the future for possible use if necessary.
- Wolfeboro will continue to work with NHDES and its consultants to improve RIB operations and mitigate “unexpected issue” impacts.

Figures

Figure 1 - Site Location Map

Figure 2 - Interpreted Drainage Basin Map

Figure 3 - Site Map

Figure 4 - Total Nitrogen and Total Phosphorus in RIB Effluent

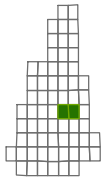
Figure 5 - Specific Conductance in Piezometers, Tributaries, and 19-Mile Brook Surface Water

Figure 6 - Chlorides in Piezometers, Tributaries, and 19-Mile Brook Surface Water

Figure 7 - Nitrates in Streams and Piezometers

Figure 8 - Nitrates and Algae in 19-Mile Brook

Figure 9 - Total Nitrogen and Algae in 19-Mile Brook



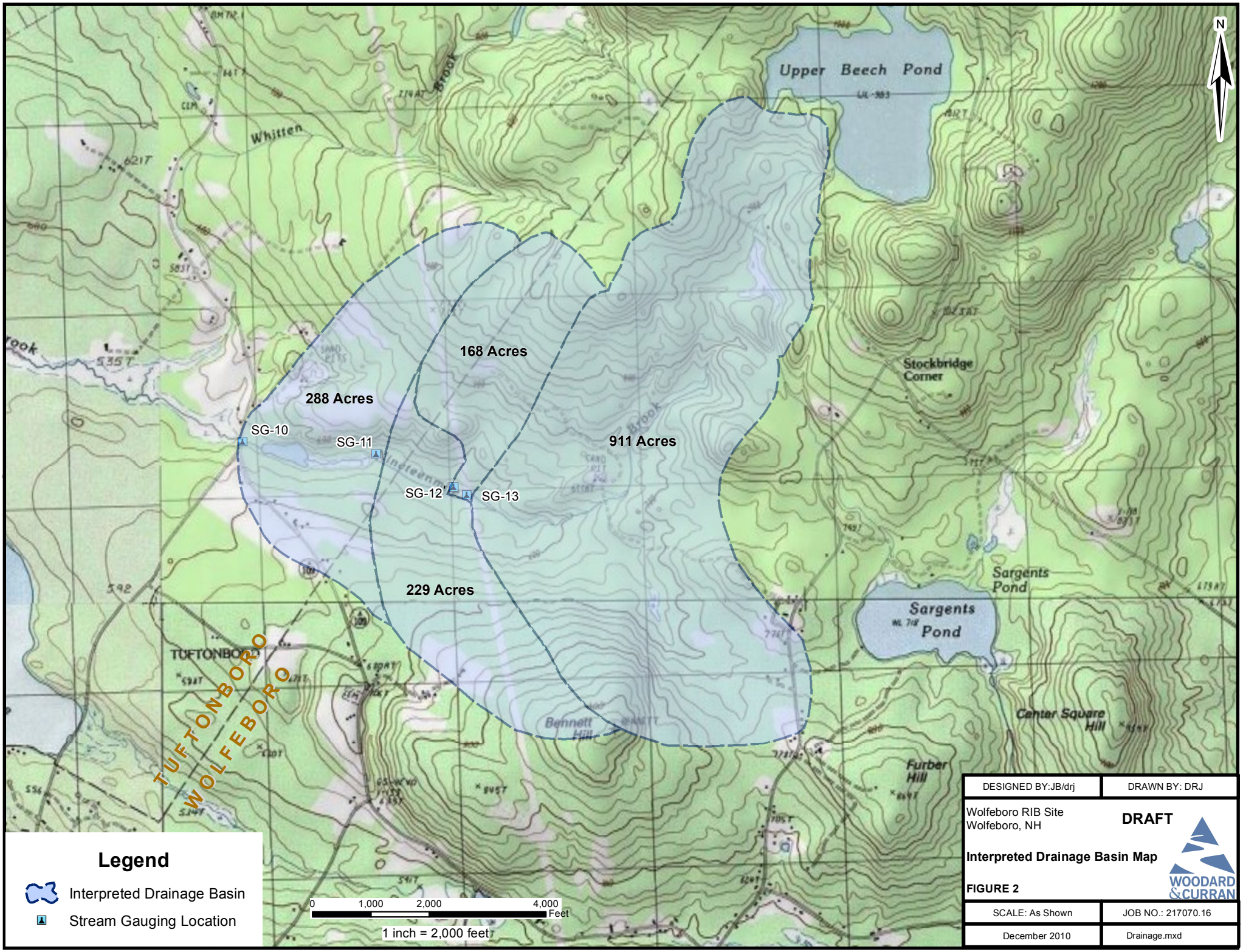
Source: ESRI Arc-GIS On-Line.

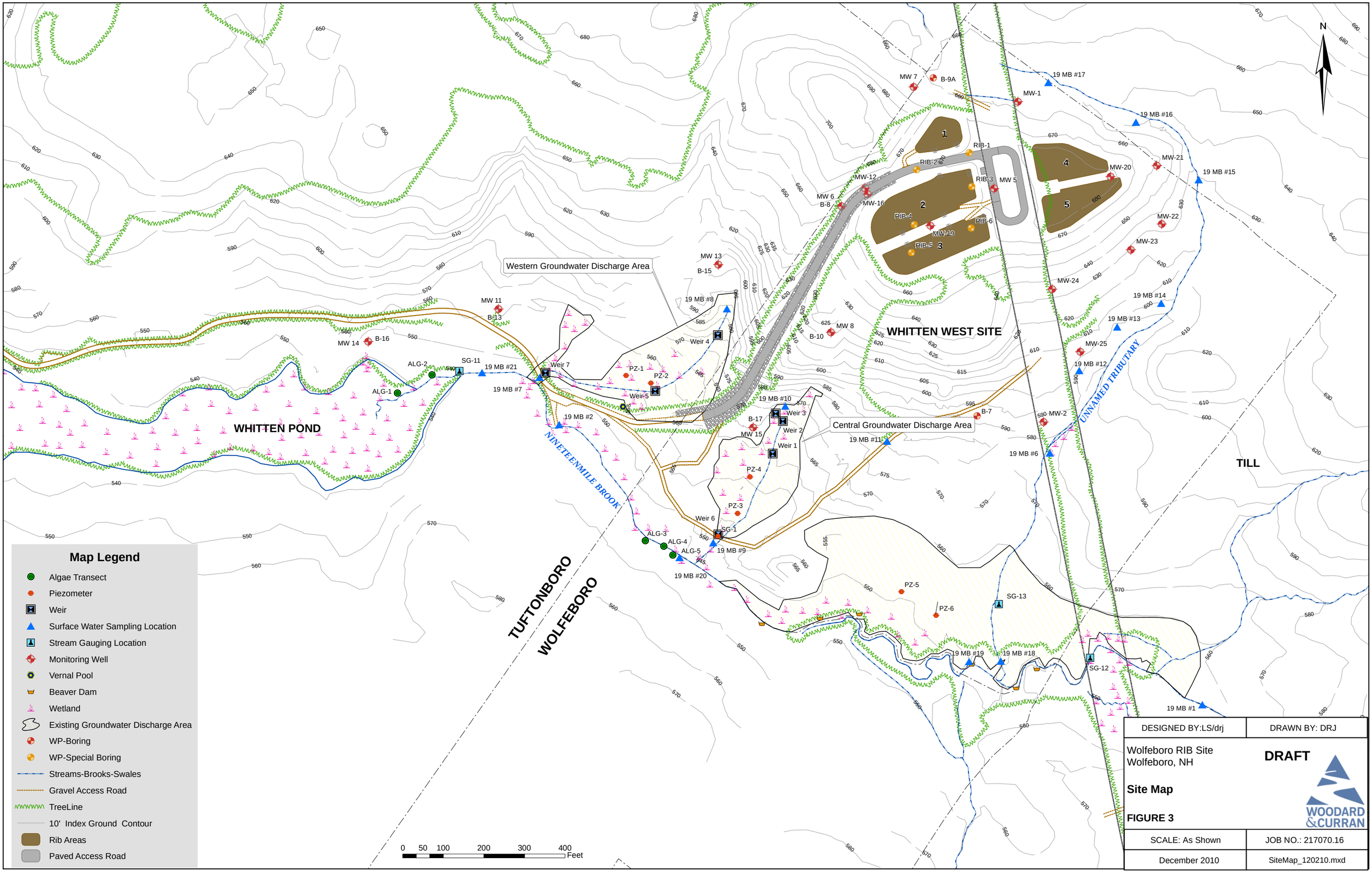
0 1,500 3,000 6,000 Feet

1 inch = 3,000 feet

Figure 1
Site Location Map
Nineteen Mile Brook Location Map
Wolfeboro RIB Site
Wolfeboro, NH

WOODARD & CURRAN

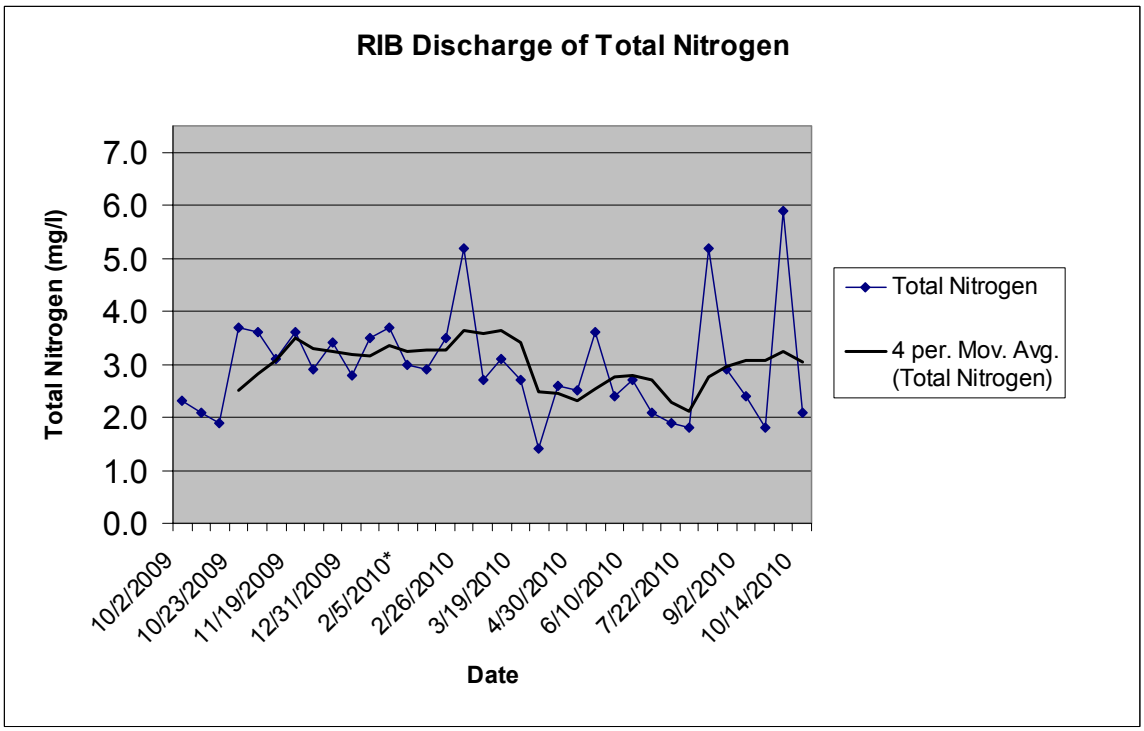

Upper Beech Pond
Whitten
Brook
168 Acres
288 Acres
911 Acres
229 Acres
SG-10
SG-11
SG-12
SG-13
Stockbridge Corner
Sargents Pond
Sargents Pond
Center Square Hill
Furber Hill
Bennett Hill
TUFTONBORO
WOLFEBORO
N
Legend
Interpreted Drainage Basin
Stream Gauging Location
0
1,000
2,000
4,000
Feet
1 inch = 2,000 feet
DESIGNED BY:JB/drj
DRAWN BY: DRJ
Wolfeboro RIB Site
Wolfeboro, NH
DRAFT
Interpreted Drainage Basin Map
FIGURE 2
WOODARD &CURRAN
SCALE: As Shown
JOB NO.: 217070.16
December 2010
Drainage.mxd



DESIGNED BY:LS/drj	DRAWN BY: DRJ
Wolfeboro RIB Site Wolfeboro, NH	**DRAFT**
Site Map	
FIGURE 3	
SCALE: As Shown	JOB NO.: 217070.16
December 2010	SiteMap_120210.mxd

WOODARD &CURRAN

Figure 4. Total Nitrogen and Total Phosphorus in RIB Effluent



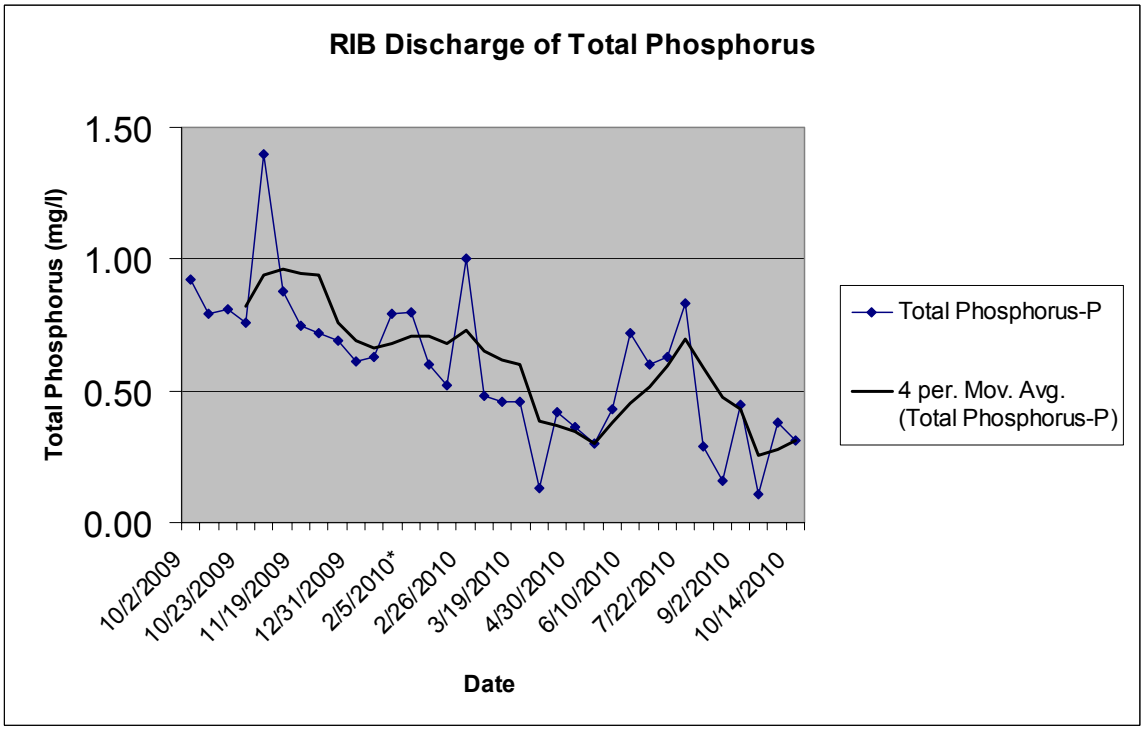
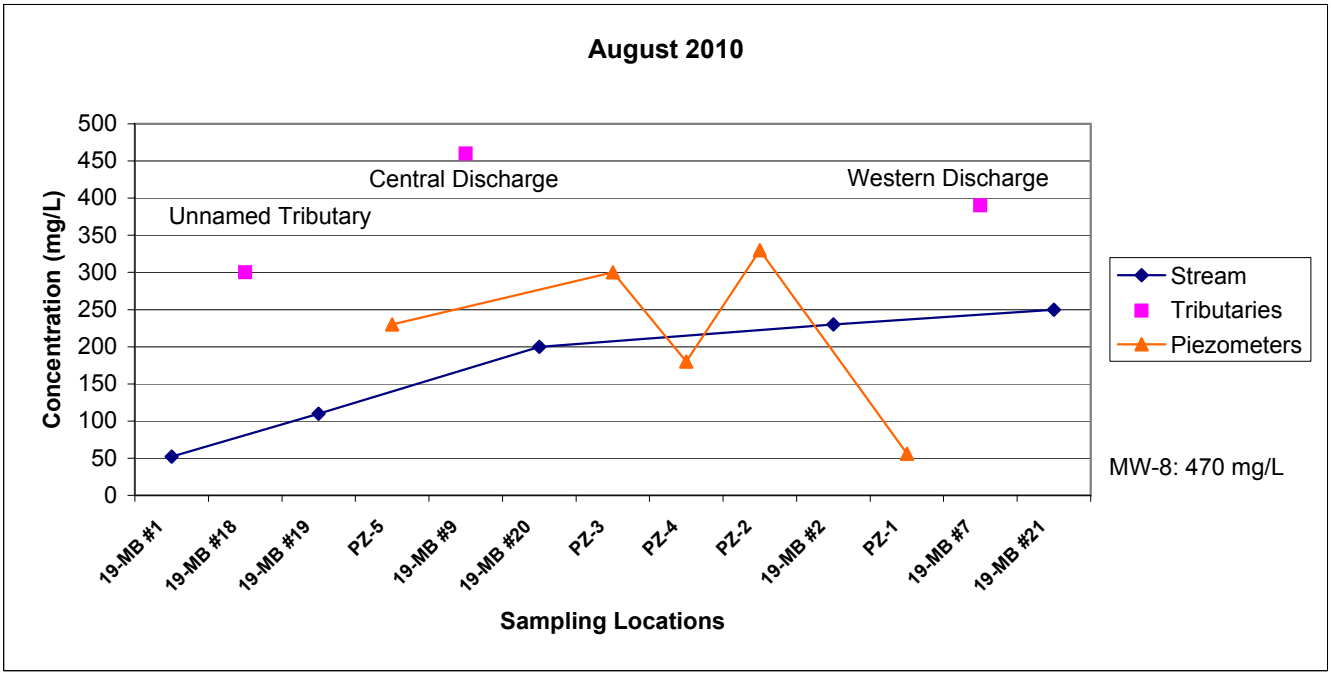
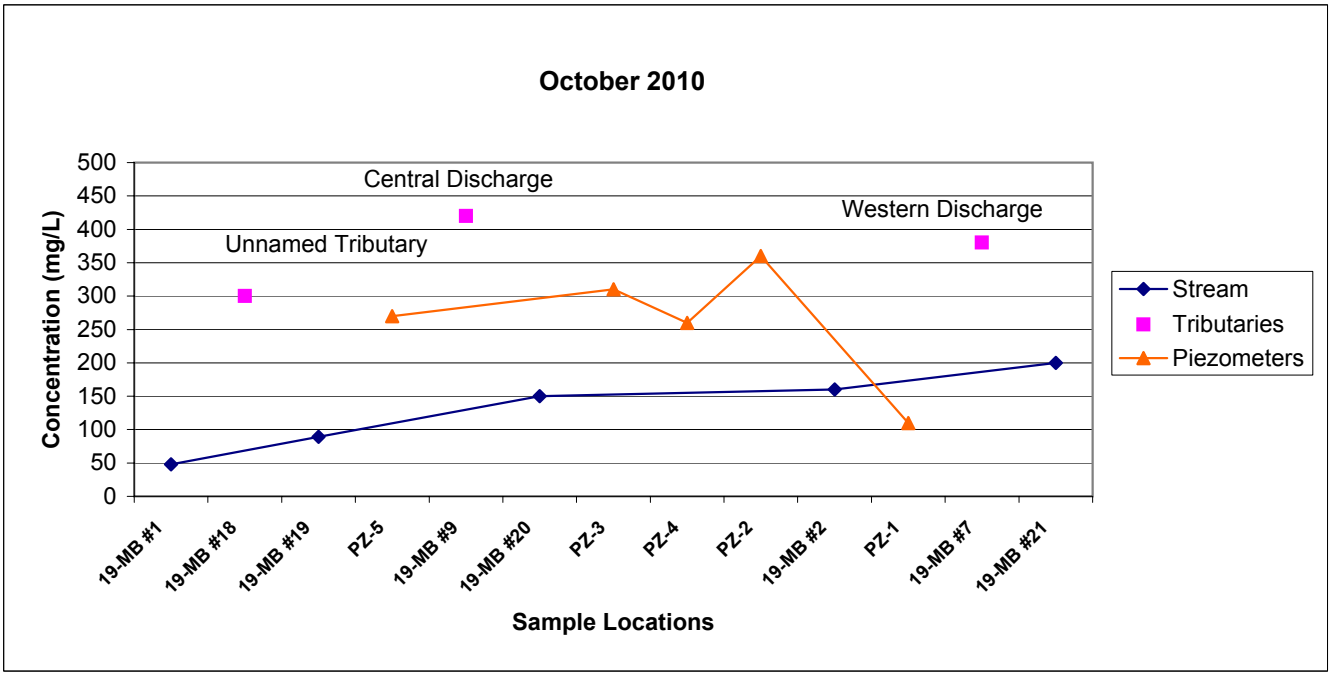


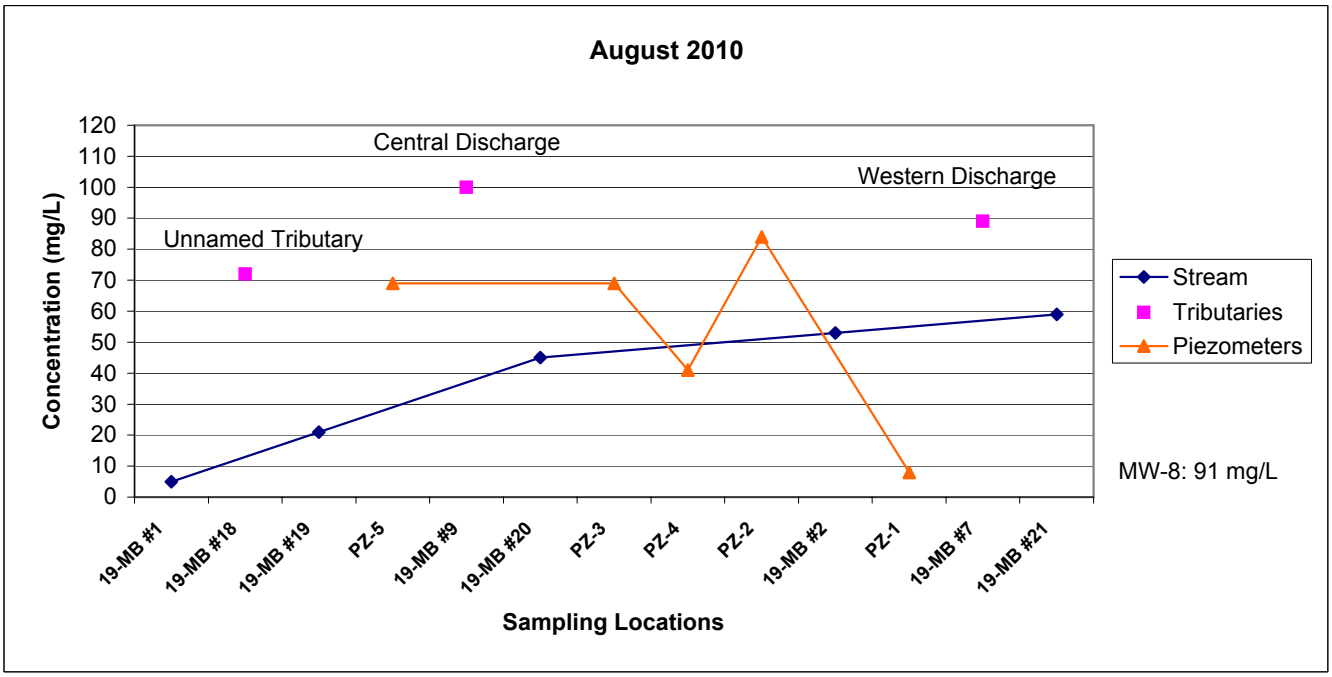
Figure 5. Specific Conductance in Piezometers, Tributaries, and 19-Mile Brook Surface Water





O:\217070 Wolfeboro\wip\19-mile Brook Nitrate Evaluation\December 6 Report\report figures\Figure 5 spec conductance in gw.xlsFigure 5 spec conductance in gw.xlsFigure 5 spec conductance in gw.xlsBoth

Figure 6. Chlorides in Piezometers, Tributaries, and 19-Mile Brook Surface Water



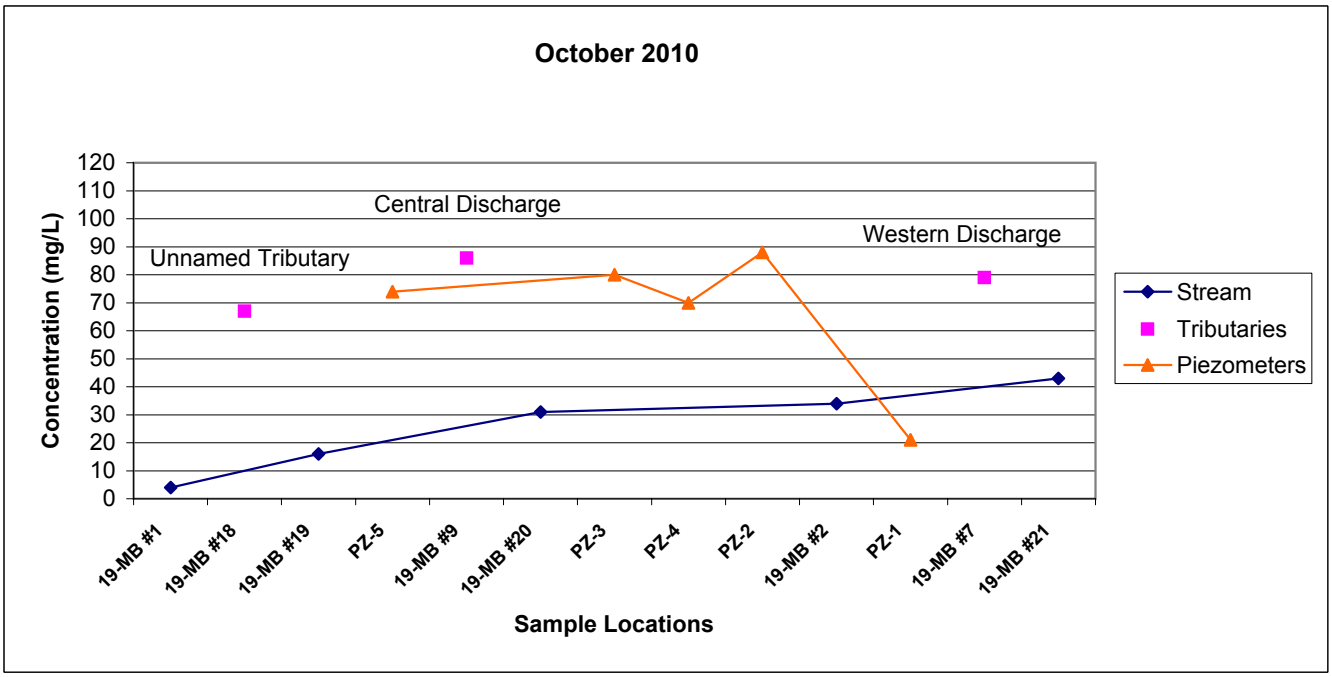
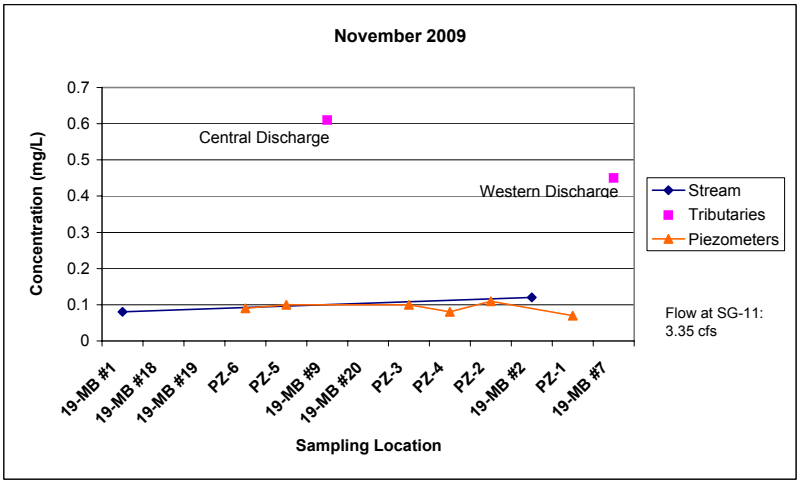
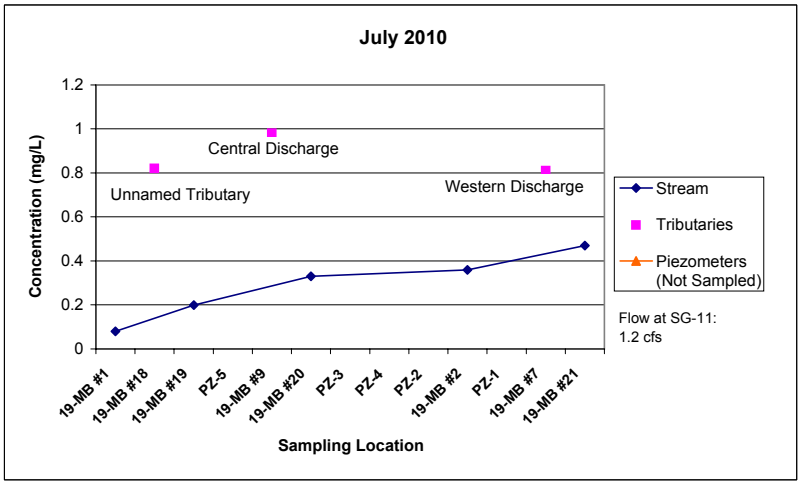


Figure 7. Nitrates in Streams and Piezometers





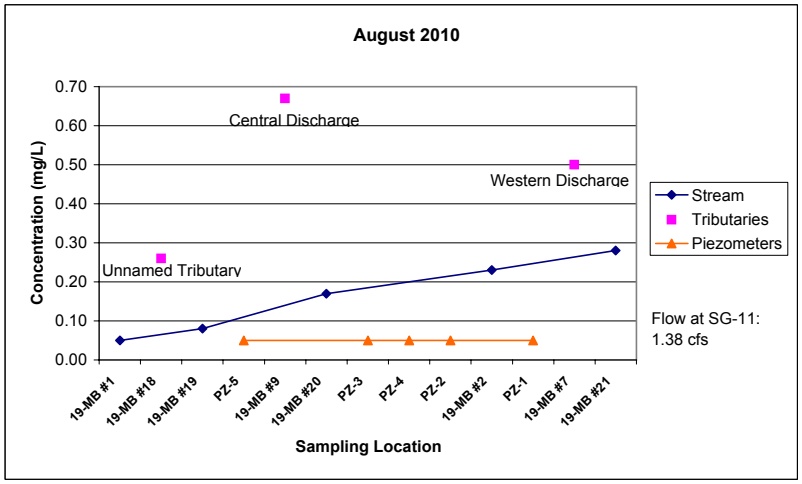
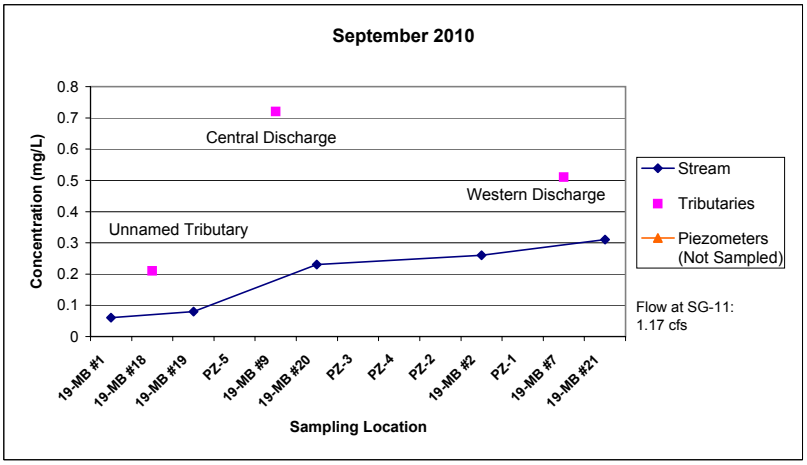


Figure 7. Nitrates in Streams and Piezometers (cont'd)



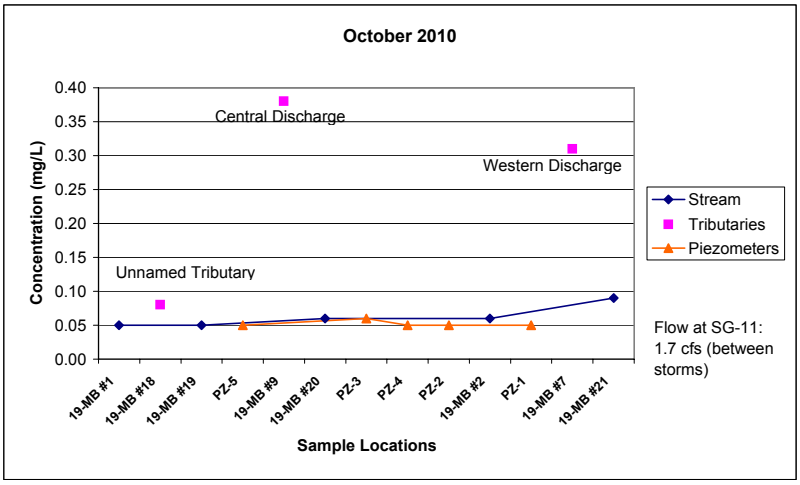


Figure 8. Nitrates and Algae in Nineteen Mile Brook
July – October 2010

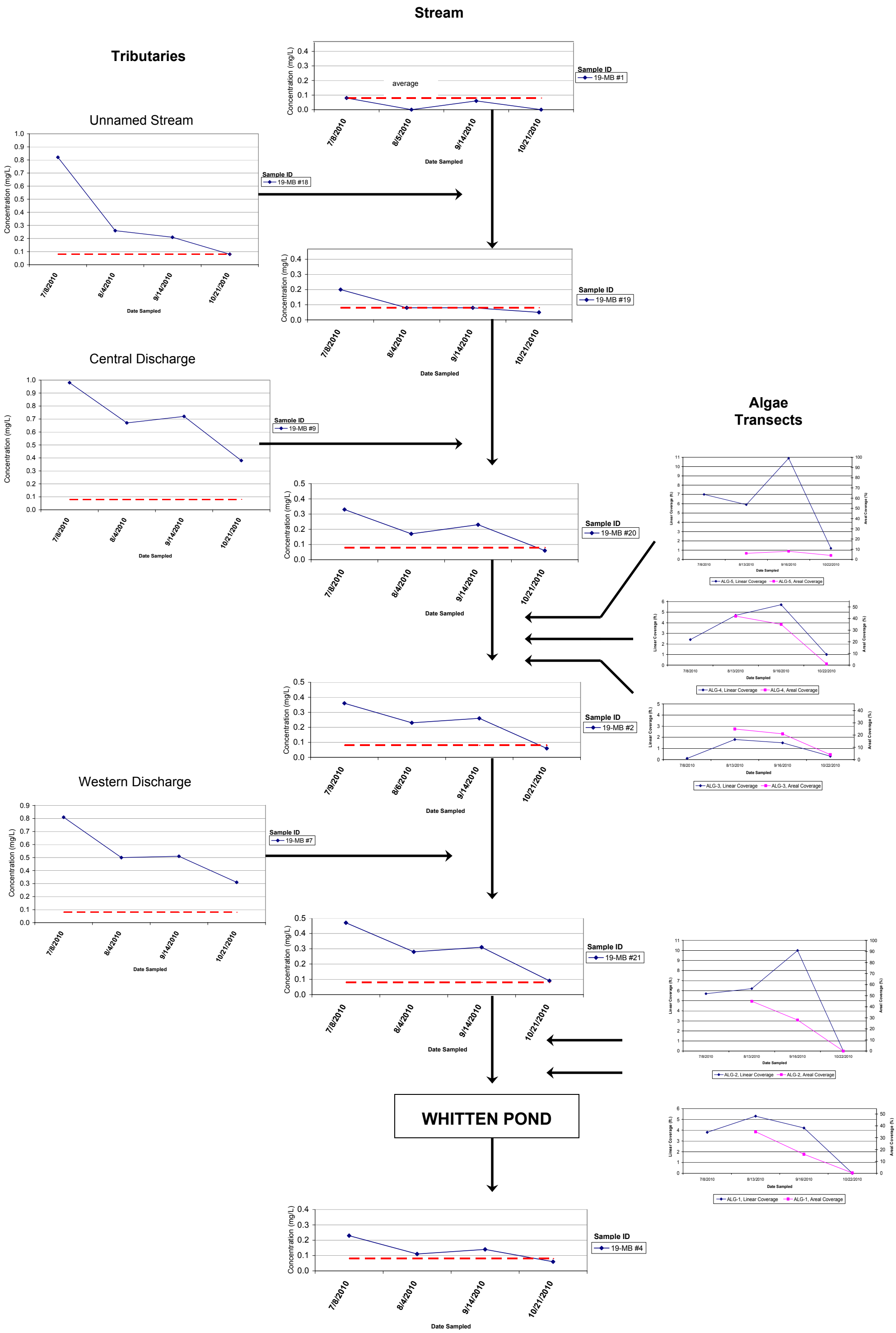
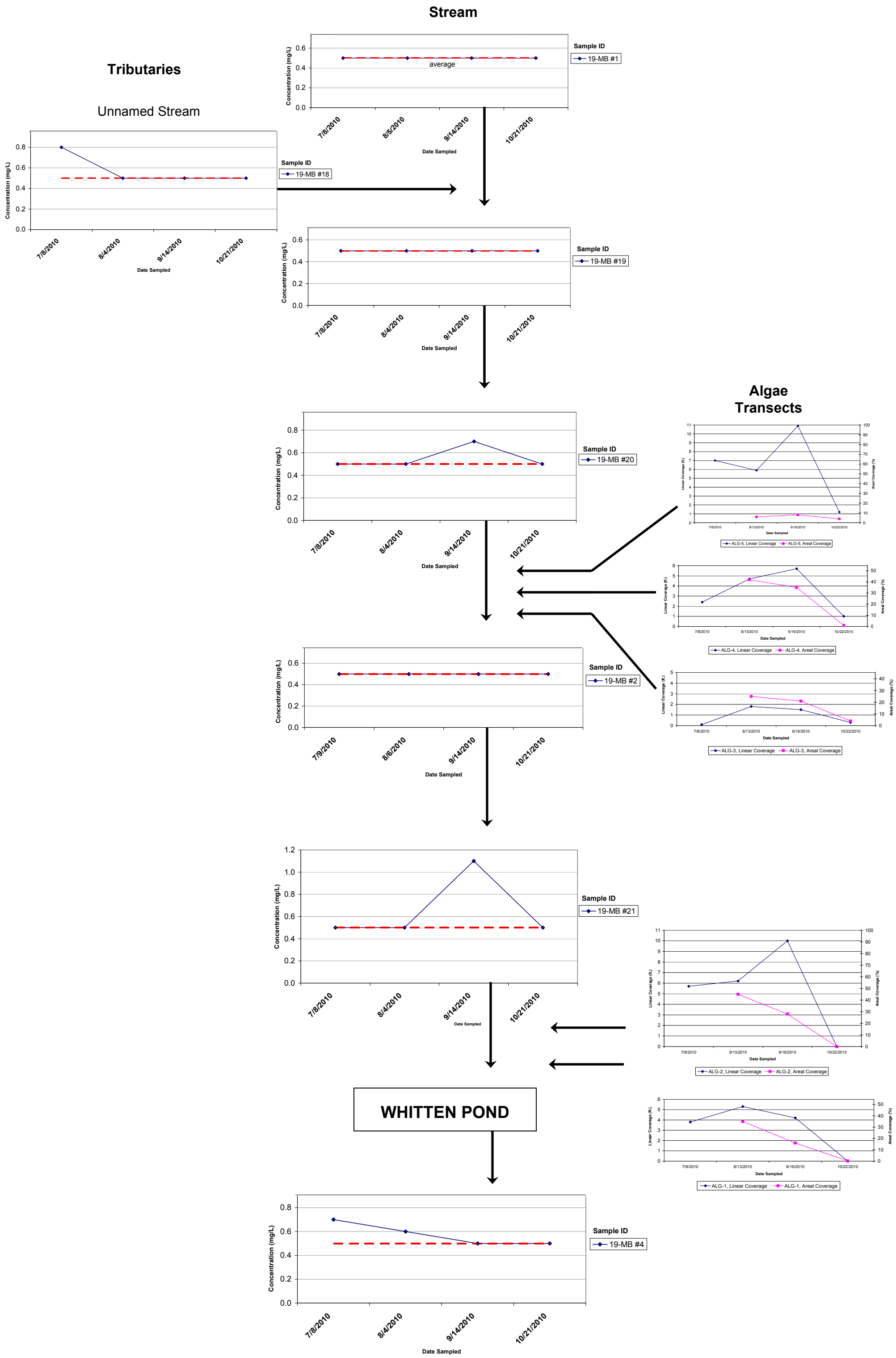


Figure 9. Total Nitrogen and Algae in Nineteen Mile Brook
July – October 2010



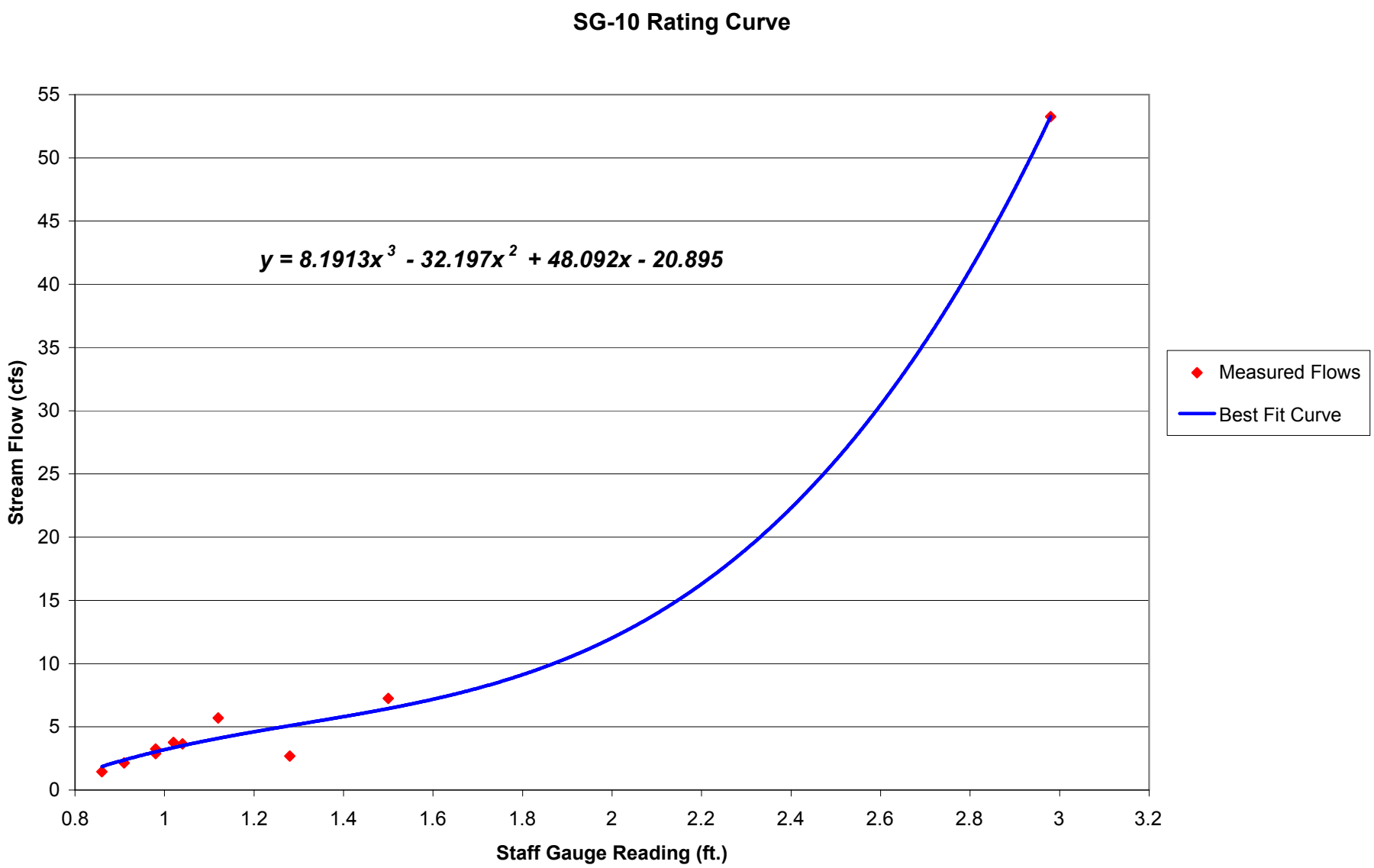
Appendix A

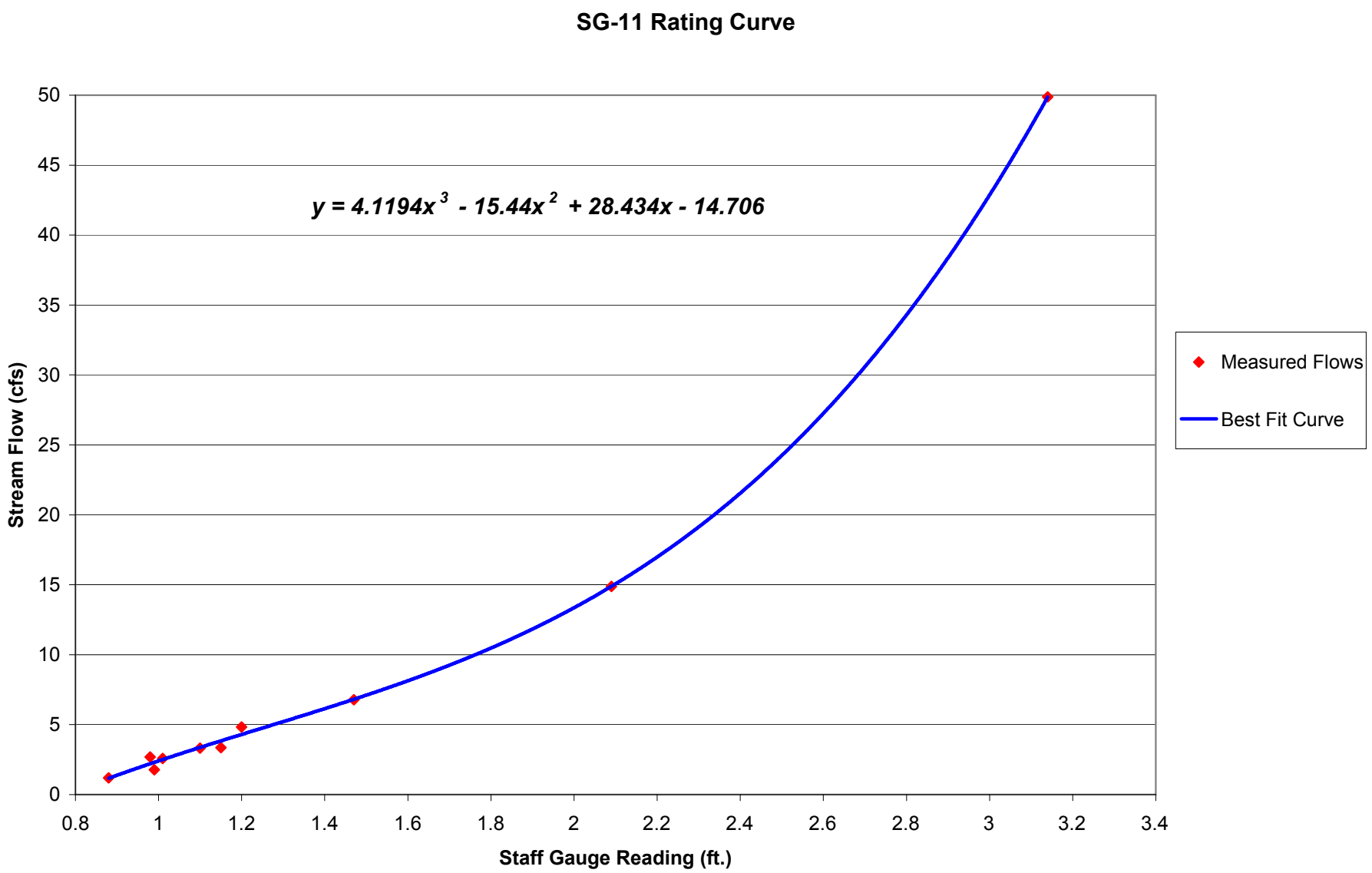
Precipitation Summary

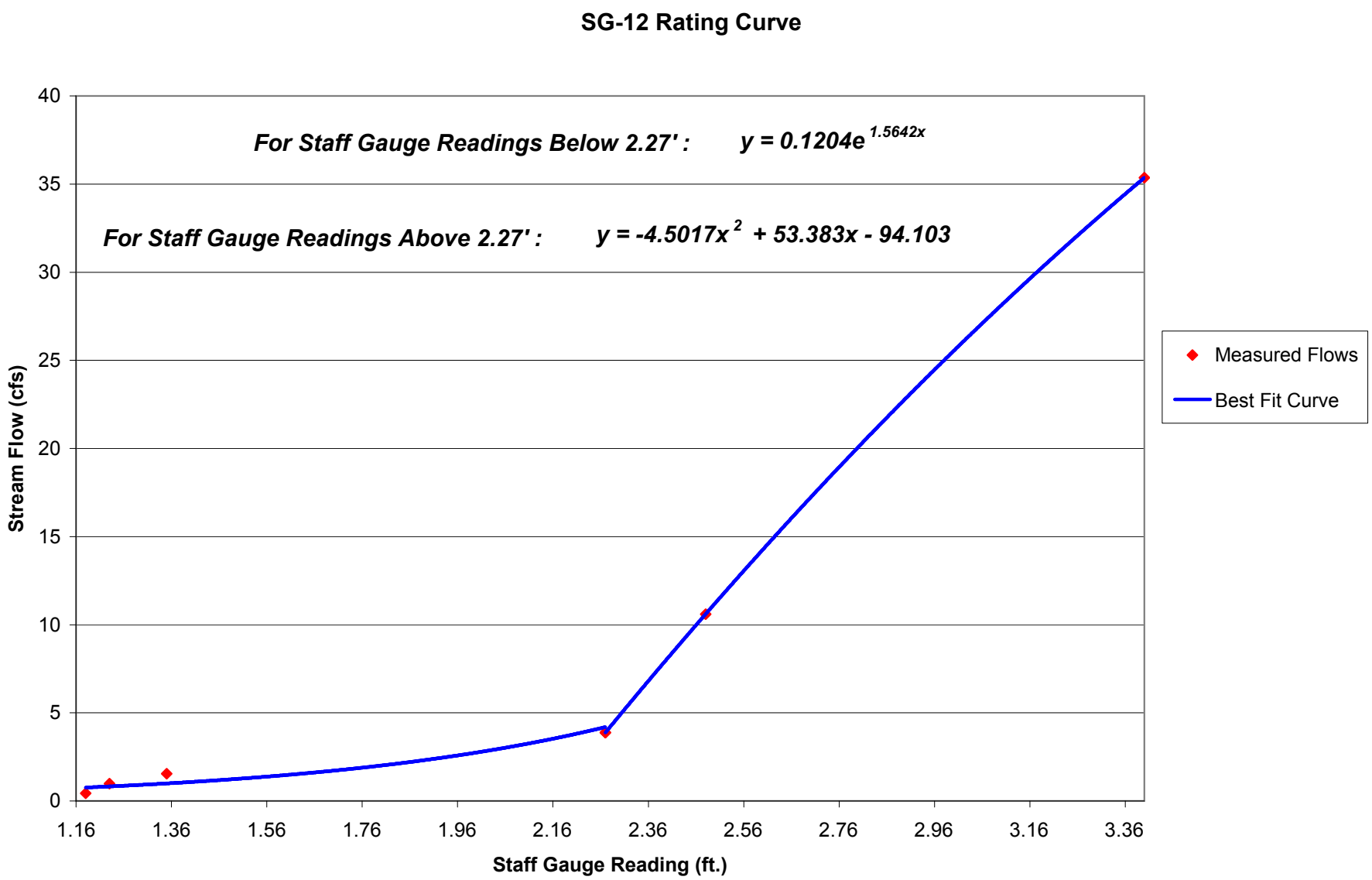
PRECIPITATION SUMMARY (TAMWORTH, NH)					
Year(s)	***Jun***	***Jul***	***Aug***	***Sep***	***Jun through Sept***
1955	7.87	1.52	8.36	1.34	19.09
1956	2.91	4.92	1.52	5.73	15.08
1963	1.59	1.59	5.98	2.03	11.19
1964	1.48	4.86	4.61	0.7	11.65
1965	3.66	2.53	1.56	2.46	10.21
1966	3.65	1.38	4.42	4.96	14.41
1967	4.14	3.26	1.47	3.16	12.03
1968	5.73	1.8	-	2.76	-
1969	4.57	4.81	3.79	2.79	15.96
1975	5.08	5.64	2.67	5.47	18.86
1976	2.9	6.4	4.77	4.74	18.81
1977	5.73	3.34	4.16	7.32	20.55
1978	5.47	1.89	2.45	0.41	10.22
1979	1.64	3.75	5.39	3.53	14.31
1980	2.64	5.2	1.92	5.09	14.85
1981	3.32	7.83	4.35	4.96	20.46
1982	6.52	2.66	4.93	2.82	16.93
1983	1.56	2.19	6.26	1.76	11.77
1984	3.38	6.85	1.83	1.33	13.39
1985	3.56	1.36	4.64	5.17	14.73
1986	3.39	7.89	7.86	3.21	22.35
1987	8.16	2.96	3.5	5.38	20
1988	1.45	4.54	4.32	2.03	12.34
1989	6.53	3.16	3.62	5.6	18.91
1990	5.55	2.44	11.15	3.53	22.67
1991	1.6	2.46	10.88	5.05	19.99
1992	4.01	5.98	4.89	3.83	18.71
1993	3.72	4.7	5.28	4.1	17.8
1994	3.48	5.27	3.39	5.32	17.46
1995	1.25	3.37	2.71	2.55	9.88
1996	3.86	7.03	1.93	3.25	16.07
1997	3.09	7.01	7.1	3.22	20.42
1998	15.61	3.04	4.2	2.92	25.77
1999	4.72	4.33	3.57	9.14	21.76
2000	3.5	6.07	1.36	-	-
2001	3.57	3.97	1.15	4.68	13.37
2001	3.83	3.97	1.2	4.82	13.82
2002	5.41	1.74	1.87	4.9	13.92
2003	2.58	3.62	6.3	6.4	18.9
2004	1.65	4.37	4.47	3.76	14.25
2005	4.83	3.86	3.94	4.27	16.9
2006	7.18	7.15	4.72	2.48	21.53
2007	4.25	4.3	3.25	3.42	15.22
2008	6.72	6.01	6.45	8.49	27.67
2009	7.96	8.4	6.16	1.46	23.98
2010	4.68	5.1	2.62	2.74	15.14
Average Precipitation	**4.35**	**4.27**	**4.29**	**3.89**	**16.89**

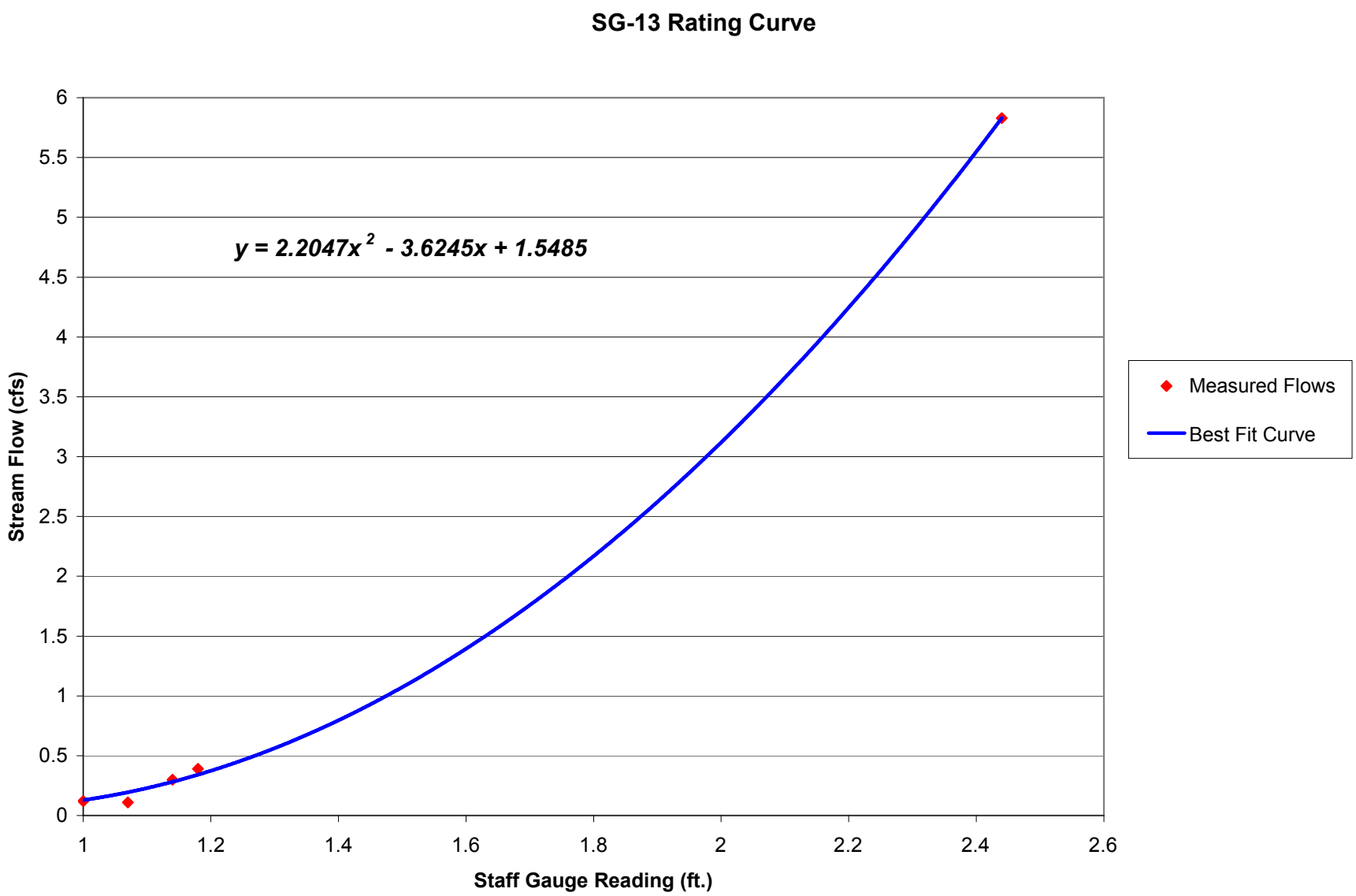
Appendix B

Stream Rating Curves


SG-10 Rating Curve
y = 8.1913x 3 - 32.197x 2 + 48.092x - 20.895
Stream Flow (cfs)
Staff Gauge Reading (ft.)
0
5
10
15
20
25
30
35
40
45
50
55
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
Measured Flows
Best Fit Curve


SG-11 Rating Curve
y = 4.1194x 3 - 15.44x 2 + 28.434x - 14.706
Stream Flow (cfs)
Staff Gauge Reading (ft.)
0
5
10
15
20
25
30
35
40
45
50
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
Measured Flows
Best Fit Curve


SG-12 Rating Curve
For Staff Gauge Readings Below 2.27' : y = 0.1204e 1.5642x
For Staff Gauge Readings Above 2.27' : y = -4.5017x 2 + 53.383x - 94.103
Stream Flow (cfs)
0
5
10
15
20
25
30
35
40
1.16
1.36
1.56
1.76
1.96
2.16
2.36
2.56
2.76
2.96
3.16
3.36
Staff Gauge Reading (ft.)
Measured Flows
Best Fit Curve


SG-13 Rating Curve
y = 2.2047x 2 - 3.6245x + 1.5485
Stream Flow (cfs)
Staff Gauge Reading (ft.)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
Measured Flows
Best Fit Curve

Appendix C

Staff Gauge Reading Summary

Nineteen Mile Brook Staff Gauge Reading Summary

	RT 109A Bridge (SG-10)		NMB Downstream (SG-11)		NMB Upstream (SG-12)		NMB Unnamed Tributary (SG-13)	
Date	Staff Gauge Reading	~Flow (cfs)	Staff Gauge Reading	~Flow (cfs)	Staff Gauge Reading	~Flow (cfs)	Staff Gauge Reading	~Flow (cfs)
6/4/2009	0.98	3.24	0.98	2.68	1.24	1.74	Not Installed	0.15
6/25/2009	1.12	5.71	1.2	4.83	1.53	3.31	1.18	0.39
7/21/2009	0.98	2.88	1.01	2.59	1.35	1.55	1.07	0.11
9/11/2009	0.91	2.15	0.99	1.77	1.23	0.99	1	0.12
11/18/2009	1.04	3.66	1.15	3.35	1.57	2.21	1.14	0.3
12/18/2009	1.02	3.76	1.1	3.32	Frozen	-	Frozen	-
2/26/2010	2.98	53.26	3.14	49.88	3.4	35.36	2.44	5.83
3/16/2010	1.96	11.35	-	-	-	-	-	-
3/15/2010	3.5	104.22	-	-	-	-	-	-
3/17/2010	1.74	8.46	-	-	-	-	-	-
3/22/2010	1.34	5.44	-	-	-	-	-	-
3/23/2010	2.9	47.57	-	-	-	-	-	-
3/24/2010	2.04	12.76	-	-	-	-	-	-
3/29/2010	2.7	35.47	-	-	-	-	-	-
3/30/2010	2.6	30.46	-	-	-	-	-	-
4/1/2010	1.76	8.67	-	-	-	-	-	-
4/5/2010	1.28	5.09	-	-	-	-	-	-
4/7/2010	1.22	4.73	-	-	-	-	-	-
4/9/2010	1.26	4.97	-	-	-	-	-	-
4/16/2010	1.18	4.48	-	-	-	-	-	-
4/20/2010	1.2	4.61	-	-	-	-	-	-
4/22/2010	1.12	4.09	-	-	-	-	-	-
4/27/2010	1.08	3.81	-	-	-	-	-	-
4/28/2010	1.18	4.48	-	-	-	-	-	-
4/30/2010	1.08	3.81	-	-	-	-	-	-
5/4/2010	1.04	3.51	-	-	-	-	-	-
5/7/2010	1	3.19	-	-	-	-	-	-
5/13/2010	1.01	3.27	1.01	2.51	1.65	1.59	1.03	0.15
5/18/2010	0.98	3.02	-	-	-	-	-	-
5/20/2010	1	3.19	-	-	-	-	-	-
5/26/2010	0.92	2.48	-	-	-	-	-	-
5/28/2010	0.91	2.38	-	-	-	-	-	-
6/1/2010	0.92	2.48	-	-	-	-	-	-
6/3/2010	0.92	2.48	-	-	-	-	-	-
6/6/2010	0.96	2.85	-	-	-	-	-	-
6/9/2010	0.93	2.57	0.97	2.11	1.42	1.11	0.92	0.08
7/8/2010	0.86	1.45	0.88	1.20	1.18	0.44	0.86	0.09
7/19/2010	0.86	1.86	-	-	-	-	-	-
7/23/2010	0.96	2.85	-	-	-	-	-	-
7/26/2010	0.91	2.38	-	-	-	-	-	-
7/30/2010	0.88	2.07	-	-	-	-	-	-
8/3/2010	0.87	1.97	-	-	-	-	-	-
8/4/2010	0.87	1.97	0.90	1.38	1.28	0.89	0.88	0.07
8/12/2010	0.84	1.64	-	-	-	-	-	-
8/20/2010	0.84	1.64	-	-	-	-	-	-
8/23/2010	0.86	1.86	-	-	-	-	-	-
8/24/2010	0.85	1.75	-	-	-	-	-	-
8/28/2010	1	3.19	-	-	-	-	-	-
8/30/2010	0.85	1.75	-	-	-	-	-	-
9/3/2010	0.84	1.64	-	-	-	-	-	-
9/8/2010	0.85	1.75	0.90	1.38	-	-	-	-
9/9/2010	0.85	1.75	0.89	1.27	-	-	-	-
9/13/2010	0.83	1.52	-	-	-	-	-	-
9/14/2010	0.84	1.64	0.88	1.17	1.25	0.85	0.80	0.06
9/16/2010	0.84	1.64	-	-	-	-	-	-
9/17/2010	0.98	3.02	-	-	-	-	-	-
9/30/2010	-	-	0.90	1.38	1.29	0.91	0.90	0.07
10/15/2010	2.06	13.15	-	-	-	-	-	-
10/15/2010	1.28	2.68	1.47	6.78	2.27	3.88	1.25	0.95
10/15/2010	1.5	7.25	2.09	14.88	2.48	10.6	1.25	-
10/21/2010	1.3	5.21	0.93	1.70	1.40	1.08	0.94	0.09
10/26/2010	1.62	7.34	-	-	-	-	-	-
10/27/2010	1.4	5.80	1.47	6.81	-	-	-	-
10/27/2010	1.45	6.12	-	-	-	-	-	-
10/28/2010	1.28	5.09	-	-	-	-	-	-
11/2/2010	1.08	3.81	-	-	-	-	-	-

"-": Not Measured

Appendix D

Weir Flow Summary Table

Weir Flow Summary

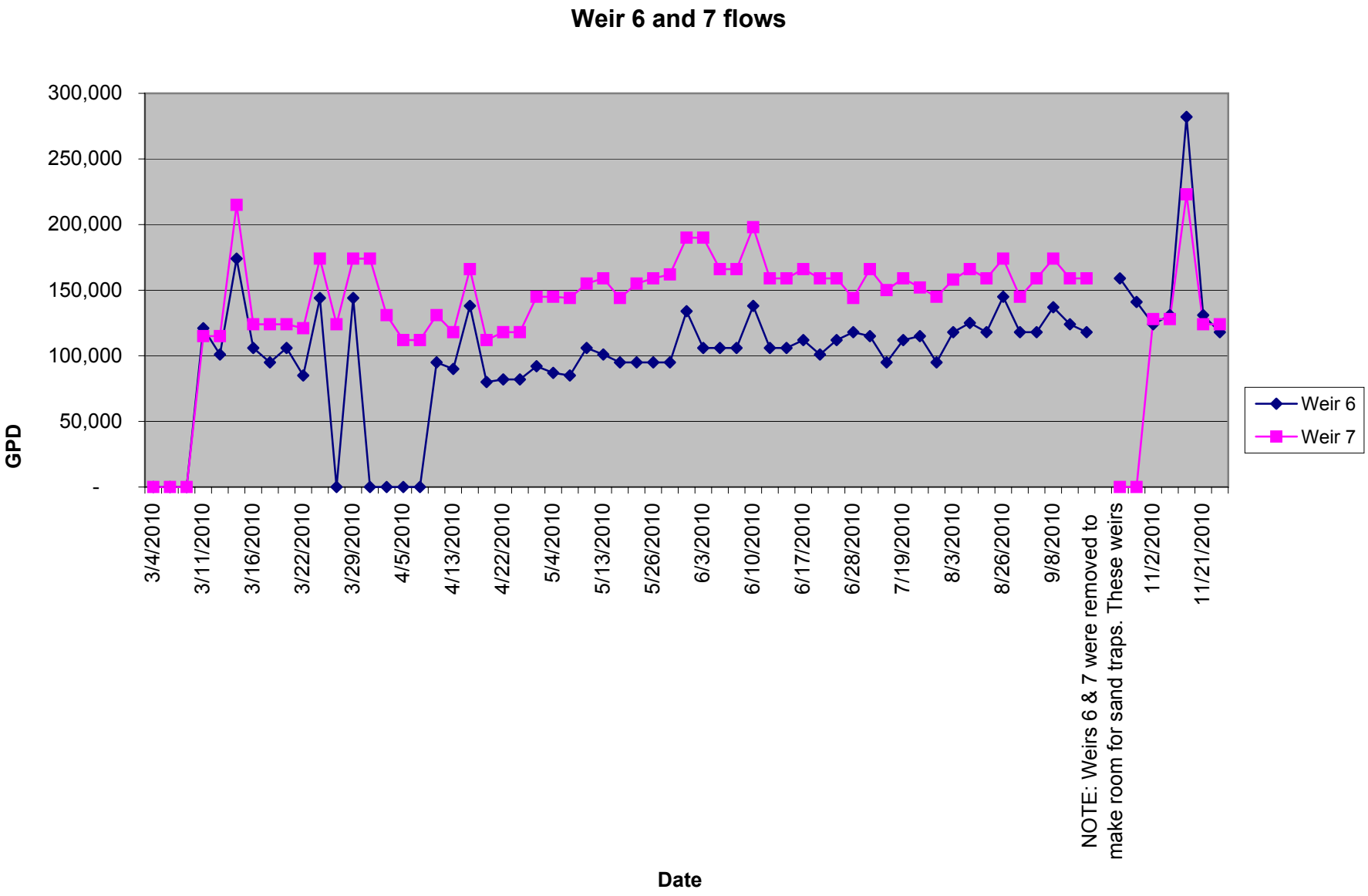
NOTE: In the Central Wetland Area, flow goes from 2 and 3 to 1 then to 6. In the Western Wetland Area, flow goes from 4 to 5 to 7.

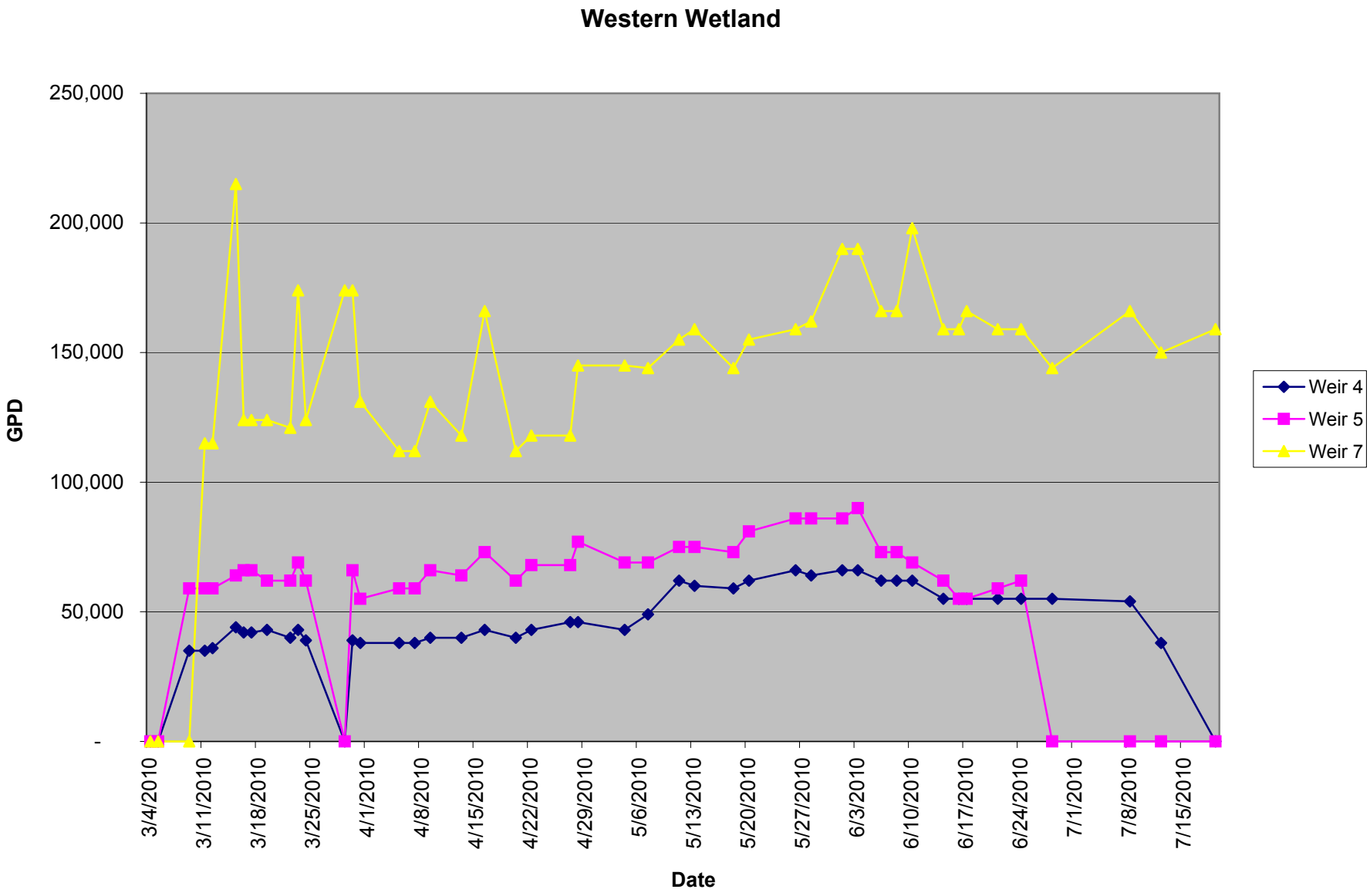
	Central Wetland Area	Central Wetland Area	Central Wetland Area	Western Wetland Area	Western Wetland Area	Central Wetland Area	Western Wetland Area
Date	**Weir 1 Flow (GPD)**	**Weir 2 Flow (GPD)**	**Weir 3 Flow (GPD)**	**Weir 4 Flow (GPD)**	**Weir 5 Flow (GPD)**	**Weir 6 Flow (GPD)**	**Weir 7 Flow (GPD)**
3/4/2010	52,000	8,000	6,000	N/A	N/A	N/A	N/A
3/5/2010	52,000	8,000	7,000	N/A	N/A	N/A	N/A
3/9/2010	49,000	8,000	7,000	35,000	59,000	N/A	N/A
3/11/2010	52,000	7,000	7,000	35,000	59,000	121,000	115,000
3/12/2010	54,000	7,000	7,000	36,000	59,000	101,000	115,000
3/15/2010	77,000	9,000	11,000	44,000	64,000	174,000	215,000
3/16/2010	59,000	8,000	8,000	42,000	66,000	106,000	124,000
3/17/2010	59,000	7,000	9,000	42,000	66,000	95,000	124,000
3/19/2010	55,000	7,000	8,000	43,000	62,000	106,000	124,000
3/22/2010	59,000	6,000	8,000	40,000	62,000	85,000	121,000
3/23/2010	67,000	9,000	10,000	43,000	69,000	144,000	174,000
3/24/2010	52,000	7,000	8,000	39,000	62,000	N/A	124,000
3/29/2010	N/A	N/A	N/A	N/A	N/A	144,000	174,000
3/30/2010	59,000	6,000	7,000	39,000	66,000	N/A	174,000
3/31/2010	46,000	6,000	7,000	38,000	55,000	N/A	131,000
4/5/2010	38,000	6,000	6,000	38,000	59,000	N/A	112,000
4/7/2010	39,000	6,000	6,000	38,000	59,000	N/A	112,000
4/9/2010	38,000	6,000	6,000	40,000	66,000	95,000	131,000
4/13/2010	39,000	6,000	8,000	40,000	64,000	90,000	118,000
4/16/2010	49,000	8,000	9,000	43,000	73,000	138,000	166,000
4/20/2010	28,000	5,000	8,000	40,000	62,000	80,000	112,000
4/22/2010	30,000	5,000	8,000	43,000	68,000	82,000	118,000
4/27/2010	28,000	5,000	9,000	46,000	68,000	82,000	118,000
4/28/2010	29,000	5,000	9,000	46,000	77,000	92,000	145,000
5/4/2010	28,000	7,000	9,000	43,000	69,000	87,000	145,000
5/7/2010	29,000	4,000	9,000	49,000	69,000	85,000	144,000
5/11/2010	30,000	4,000	10,000	62,000	75,000	106,000	155,000
5/13/2010	30,000	4,000	10,000	60,000	75,000	101,000	159,000
5/18/2010	29,000	4,000	10,000	59,000	73,000	95,000	144,000
5/20/2010	29,000	4,000	11,000	62,000	81,000	95,000	155,000
5/26/2010	33,000	4,000	11,000	66,000	86,000	95,000	159,000
5/28/2010	35,000	4,000	11,000	64,000	86,000	95,000	162,000
6/1/2010	40,000	6,000	11,000	66,000	86,000	134,000	190,000

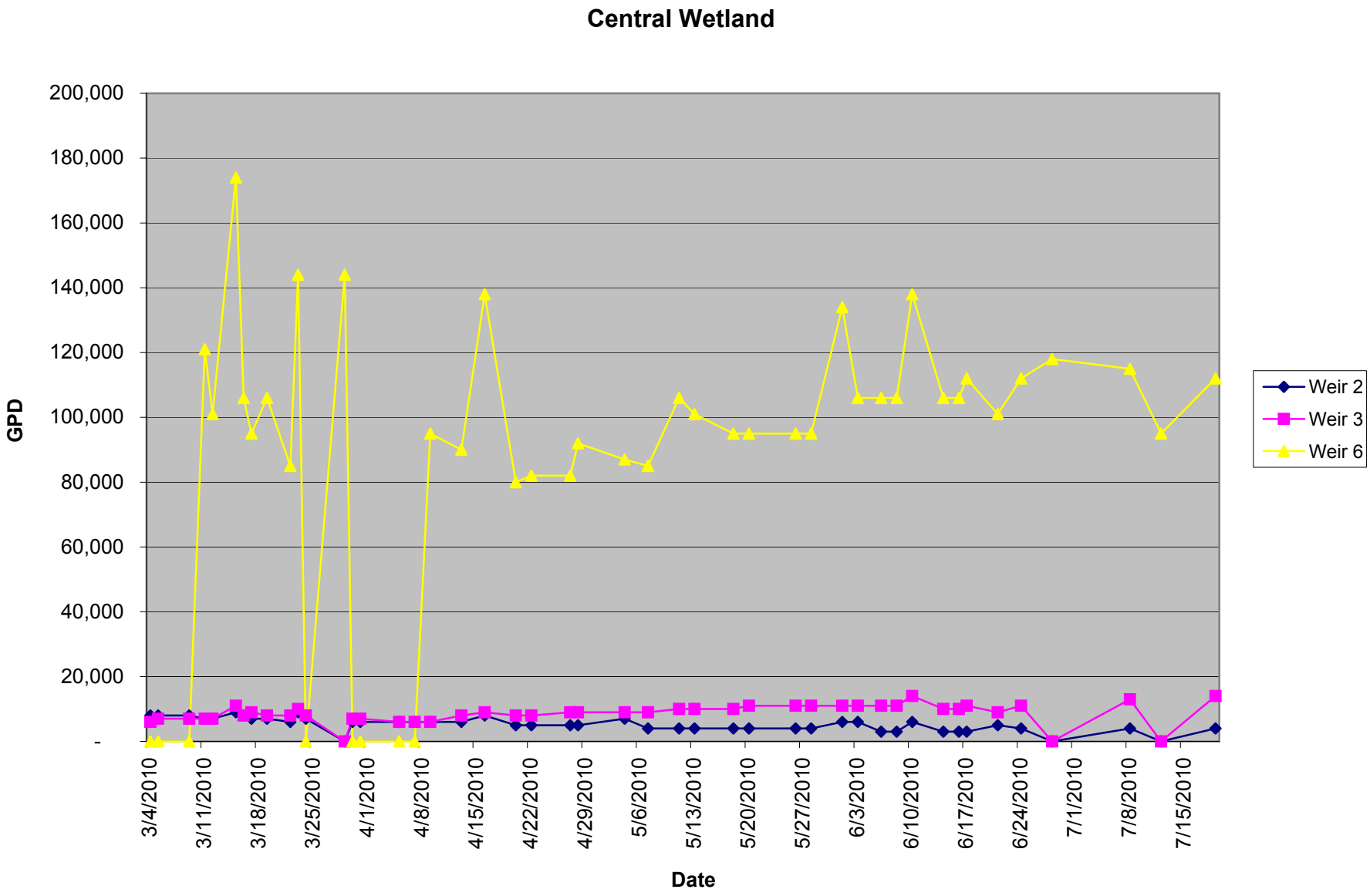
Weir Flow Summary

6/3/2010	34,000	6,000	11,000	66,000	90,000	106,000	190,000
6/6/2010	30,000	3,000	11,000	62,000	73,000	106,000	166,000
6/8/2010	30,000	3,000	11,000	62,000	73,000	106,000	166,000
6/10/2010	31,000	6,000	14,000	62,000	69,000	138,000	198,000
6/14/2010	26,000	3,000	10,000	55,000	62,000	106,000	159,000
6/16/2010	28,000	3,000	10,000	55,000	55,000	106,000	159,000
6/17/2010	28,000	3,000	11,000	55,000	55,000	112,000	166,000
6/21/2010	28,000	5,000	9,000	55,000	59,000	101,000	159,000
6/24/2010	28,000	4,000	11,000	55,000	62,000	112,000	159,000
6/28/2010	N/A	N/A	N/A	55,000	N/A	118,000	144,000
7/8/2010	59,000	4,000	13,000	54,000	N/A	115,000	166,000
7/12/2010	N/A	N/A	N/A	38,000	N/A	95,000	150,000
7/19/2010	N/A	4,000	14,000	N/A	N/A	112,000	159,000
7/23/2010	NOTE: Weirs 1, 2, 3, 4 & 5 were discontinued after July 19, 2010, because they had filled with sand and were providing questionable data.					115,000	152,000
7/26/2010						95,000	145,000
8/3/2010						118,000	158,000
8/20/2010						125,000	166,000
8/24/2010						118,000	159,000
8/26/2010						145,000	174,000
8/30/2010						118,000	145,000
9/3/2010						118,000	159,000
9/8/2010						137,000	174,000
9/9/2010						124,000	159,000
9/13/2010						118,000	159,000
NOTE: Weirs 6 & 7 were removed to make room for sand traps. These weirs were rebuilt downstream of road culverts, thus no data between 9/13 and 10/28 were collected.							
10/22/2010						159,000	N/A
10/28/2010						141,000	N/A
11/2/2010						124,000	128,000
11/15/2010						131,000	128,000
11/17/2010						282,000	223,000
11/21/2010						131,000	124,000
11/23/2010						118,000	124,000
11/29/2010						124,000	118,000
11/30/2010						124,000	124,000

NOTE: Prior to the relocation of Weir 6, staff believes that some flow was bypassing Weir 6 and that actual flows were higher then recorded. The intent of these weir measurements was to obtain an order of magnitude and to see if we could corrolate increase RIB flow with flow from the groundwater discharge areas, as well as, to obtain an idea of the flow of groundwater seeps at higher elevations compared to lower elevations.


Weir 6 and 7 flows
300,000
250,000
200,000
150,000
100,000
50,000
-
GPD
3/4/2010
3/11/2010
3/16/2010
3/22/2010
3/29/2010
4/5/2010
4/13/2010
4/22/2010
5/4/2010
5/13/2010
5/26/2010
6/3/2010
6/10/2010
6/17/2010
6/28/2010
7/19/2010
8/3/2010
8/26/2010
9/8/2010
NOTE: Weirs 6 & 7 were removed to make room for sand traps. These weirs
11/2/2010
11/21/2010
Date
Weir 6
Weir 7


Western Wetland
250,000
200,000
150,000
100,000
50,000
-
GPD
3/4/2010
3/11/2010
3/18/2010
3/25/2010
4/1/2010
4/8/2010
4/15/2010
4/22/2010
4/29/2010
5/6/2010
5/13/2010
5/20/2010
5/27/2010
6/3/2010
6/10/2010
6/17/2010
6/24/2010
7/1/2010
7/8/2010
7/15/2010
Date
Weir 4
Weir 5
Weir 7


Central Wetland
GPD
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
3/4/2010
3/11/2010
3/18/2010
3/25/2010
4/1/2010
4/8/2010
4/15/2010
4/22/2010
4/29/2010
5/6/2010
5/13/2010
5/20/2010
5/27/2010
6/3/2010
6/10/2010
6/17/2010
6/24/2010
7/1/2010
7/8/2010
7/15/2010
Date
Weir 2
Weir 3
Weir 6

Appendix E

Surface Water Data (19MB-1 thru 19MB-22)

Surface Water Site 19MB-1

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/5/2007	NT	< 0.5	NT	< 0.05	NT	NT
8/8/2007	NT	< 0.5	NT	< 0.05	NT	NT
9/26/2007	3	0.07	< 0.05	0.02	46	NT
10/10/2007	4	0.09	< 0.05	0.02	49	NT
10/24/2007	4	< 0.05	< 0.05	0.05	49	NT
11/7/2007	5	0.12	< 0.05	0.04	48	NT
11/21/2007	4	0.07	< 0.05	0.04	46	NT
1/16/2008	3	< 0.05	< 0.05	< 0.01	38	NT
2/15/2008	4	0.07	< 0.05	0.01	36	NT
3/12/2008	4	0.06	< 0.05	< 0.01	36	NT
4/16/2008	4	< 0.05	< 0.05	0.02	30	NT
5/15/2008	4	0.06	< 0.05	0.05	NT	NT
6/10/2008	4	0.08	< 0.05	0.03	42	NT
7/10/2008	4	0.10	< 0.05	0.04	45	NT
8/5/2008	5	0.06	< 0.05	0.02	NT	NT
9/9/2008	3	< 0.05	< 0.05	0.01	NT	NT
10/7/2008	3	< 0.05	< 0.05	0.02	NT	NT
11/5/2008	3	< 0.05	< 0.05	< 0.01	40	NT
12/9/2008	3	0.13	< 0.05	0.07	41	NT
1/2009	NT	NT	NT	NT	NT	NT
2/6/2009	3	0.09	< 0.05	0.07	40	NT
3/20/2009	3	< 0.05	< 0.05	< 0.01	36	NT
4/10/2009	3	0.05	< 0.05	< 0.01	33	NT
5/8/2009	7	0.07	< 0.05	0.01	NT	NT
5/29/2009	4	< 0.05	< 0.05	0.17	39	NT
6/12/2009	11	0.13	< 0.05	0.07	71	NT
6/26/2009	9	0.08	< 0.05	0.01	67	NT
7/10/2009	9	0.08	< 0.05	< 0.01	63	NT
7/24/2009	19	0.12	< 0.05	0.03	99	NT
8/6/2009	18	0.08	< 0.05	0.03	89	< 0.5
9/10/2009	25	0.12	< 0.05	0.006	120	< 0.5
10/8/2009	10	0.07	< 0.05	0.030	68	< 0.5
11/17/2009	114	0.15	< 0.05	0.013	74	< 0.5
12/10/2009	11	0.11	< 0.05	0.014	65	< 0.5
1/6/2010	11	0.20	0.06	0.010	74	< 0.5
2/11/2010	15	0.29	< 0.05	0.018	90	< 0.5
3/11/2010	8	0.10	< 0.05	< 0.05	54	< 0.5
4/13/2010	8	0.14	< 0.05	0.011	61	< 0.5
5/13/2010	14	< 0.05	0.05	0.008	77	< 0.5
6/9/2010	19	0.2	< 0.05	0.014	100	< 0.5
7/8/2010	39	0.23	< 0.05	0.02	180	0.7
8/5/2010	42	0.11	< 0.05	0.013	200	0.6
9/14/2010	48	0.14	< 0.05	0.009	240	< 0.5
10/21/2010	35	0.06	< 0.05	0.012	160	< 0.5

Surface Water Site 19MB-2

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/5/2007	NT	NT	NT	NT	NT	NT
8/8/2007	NT	< 0.5	NT	< 0.05	NT	NT
9/26/2007	3	0.09	< 0.05	0.02	45	NT
10/10/2007	3	0.07	< 0.05	0.02	48	NT
10/24/2007	4	0.05	< 0.05	0.01	47	NT
11/7/2007	4	0.06	< 0.05	0.06	44	NT
11/21/2007	4	0.05	< 0.05	0.03	42	NT
1/16/2008	3	0.06	< 0.05	0.01	35	NT
2/15/2008	3	0.06	< 0.05	< 0.01	34	NT
3/12/2008	4	0.07	< 0.05	< 0.01	33	NT
4/16/2008	2	< 0.05	< 0.05	0.01	26	NT
5/15/2008	3	< 0.05	0.05	0.04	NT	NT
6/10/2008	4	0.10	< 0.05	0.02	39	NT
7/10/2008	4	0.09	< 0.05	0.03	41	NT
8/5/2008	4	0.07	< 0.05	0.04	NT	NT
9/9/2008	3	< 0.05	< 0.05	0.10	NT	NT
10/7/2008	3	< 0.05	< 0.05	0.04	NT	NT
11/5/2008	3	< 0.05	< 0.05	0.01	37	NT
12/9/2008	3	0.07	< 0.05	0.08	36	NT
1/2009	NT	NT	NT	NT	NT	NT
2/6/2009	3	0.07	< 0.05	0.05	36	NT
3/20/2009	2	< 0.05	< 0.05	< 0.01	32	NT
4/10/2009	3	0.06	< 0.05	< 0.01	29	NT
5/8/2009	6	0.07	< 0.05	0.01	NT	NT
5/29/2009	4	< 0.05	< 0.05	0.19	36	NT
6/12/2009	5	0.08	< 0.05	0.09	37	NT
6/26/2009	7	0.10	< 0.05	0.02	50	NT
7/10/2009	8	0.11	< 0.05	< 0.01	53	NT
7/24/2009	5	0.06	< 0.05	0.09	34	NT
8/6/2009	14	0.09	< 0.05	0.02	74	< 0.5
9/10/2009	23	0.18	< 0.05	0.023	120	< 0.5
10/8/2009	12	0.09	< 0.05	0.023	74	< 0.5
11/17/2009	12	0.12	< 0.05	0.011	67	< 0.5
12/10/2009	9	0.10	< 0.05	0.016	57	< 0.5
1/6/2010	9	0.15	< 0.05	0.011	63	< 0.5
2/11/2010	13	0.25	< 0.05	0.020	80	< 0.5
3/11/2010	7	0.09	< 0.05	0.016	48	0.5
4/13/2010	7	0.13	< 0.05	0.008	52	< 0.5
5/13/2010	13	< 0.05	< 0.05	0.007	77	< 0.5
5/19/2010	NT	NT	NT	NT	NT	NT
6/9/2010	21	0.26	< 0.05	0.01	110	< 0.5
7/8/2010	45	0.36	< 0.05	0.01	200	< 0.5
8/5/2010	53	0.23	< 0.05	0.021	230	< 0.5
9/14/2010	56	0.26	< 0.05	0.006	250	< 0.5
10/21/2010	34	0.06	0.1	0.009	160	< 0.5

Surface Water Site 19MB-3

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/5/2007	NT	< 0.5	NT	< 0.05	NT	NT
8/8/2007	NT	< 0.5	NT	< 0.05	NT	NT
9/26/2007	3	0.06	< 0.05	0.02	45	NT
10/10/2007	4	< 0.05	< 0.05	0.03	49	NT
10/24/2007	4	< 0.05	< 0.05	0.05	49	NT
11/7/2007	6	0.08	< 0.05	0.04	50	NT
11/21/2007	4	0.05	< 0.05	0.04	45	NT
1/16/2008	4	0.07	< 0.05	< 0.01	40	NT
2/15/2008	5	0.07	< 0.05	0.02	40	NT
3/12/2008	4	0.06	< 0.05	< 0.01	35	NT
4/16/2008	3	< 0.05	< 0.05	0.02	30	NT
5/15/2008	3	< 0.05	< 0.05	0.06	NT	NT
6/10/2008	3	< 0.05	< 0.05	0.06	41	NT
7/10/2008	4	< 0.05	< 0.05	0.04	45	NT
8/5/2008	4	< 0.05	< 0.05	0.02	NT	NT
9/9/2008	3	< 0.05	< 0.05	0.01	NT	NT
10/7/2008	4	< 0.05	< 0.05	0.04	NT	NT
11/5/2008	3	< 0.05	< 0.05	0.01	39	NT
12/9/2008	3	0.08	< 0.05	0.07	40	NT
1/2009	NT	NT	NT	NT	NT	NT
2/6/2009	3	0.09	< 0.05	0.07	41	NT
3/20/2009	2	< 0.05	< 0.05	0.01	33	NT
4/10/2009	3	0.05	< 0.05	0.01	31	NT
5/8/2009	8	0.08	< 0.05	0.01	NT	NT
5/29/2009	NT	NT	NT	NT	NT	NT
6/12/2009	10	0.12	< 0.05	0.06	61	NT
6/26/2009	NT	NT	NT	NT	NT	NT
7/10/2009	10	0.08	< 0.05	<0.01	64	NT
7/24/2009	NT	NT	NT	NT	NT	NT
8/6/2009	18	0.07	< 0.05	0.03	90	NT
9/10/2009	26	NT	< 0.05	0.026	130	NT
10/8/2009	11	0.07	< 0.05	0.028	70	NT
11/17/2009	14	NT	< 0.05	0.012	73	NT
12/10/2009	10	NT	< 0.05	0.028	64	NT
1/6/2010	11	NT	< 0.05	0.018	73	NT

Surface Water Site 19MB-4

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/5/2007	NT	< 0.5	NT	< 0.05	NT	NT
8/8/2007	NT	< 0.5	NT	< 0.05	NT	NT
9/26/2007	3	0.07	< 0.05	0.02	46	NT
10/10/2007	4	0.09	< 0.05	0.02	49	NT
10/24/2007	4	< 0.05	< 0.05	0.05	49	NT
11/7/2007	5	0.12	< 0.05	0.04	48	NT
11/21/2007	4	0.07	< 0.05	0.04	46	NT
1/16/2008	3	< 0.05	< 0.05	< 0.01	38	NT
2/15/2008	4	0.07	< 0.05	0.01	36	NT
3/12/2008	4	0.06	< 0.05	< 0.01	36	NT
4/16/2008	4	< 0.05	< 0.05	0.02	30	NT
5/15/2008	4	0.06	< 0.05	0.05	NT	NT
6/10/2008	4	0.08	< 0.05	0.03	42	NT
7/10/2008	4	0.10	< 0.05	0.04	45	NT
8/5/2008	5	0.06	< 0.05	0.02	NT	NT
9/9/2008	3	< 0.05	< 0.05	0.01	NT	NT
10/7/2008	3	< 0.05	< 0.05	0.02	NT	NT
11/5/2008	3	< 0.05	< 0.05	< 0.01	40	NT
12/9/2008	3	0.13	< 0.05	0.07	41	NT
1/2009	NT	NT	NT	NT	NT	NT
2/6/2009	3	0.09	< 0.05	0.07	40	NT
3/20/2009	3	< 0.05	< 0.05	< 0.01	36	NT
4/10/2009	3	0.05	< 0.05	< 0.01	33	NT
5/8/2009	7	0.07	< 0.05	0.01	NT	NT
5/29/2009	4	< 0.05	< 0.05	0.17	39	NT
6/12/2009	11	0.13	< 0.05	0.07	71	NT
6/26/2009	9	0.08	< 0.05	0.01	67	NT
7/10/2009	9	0.08	< 0.05	< 0.01	63	NT
7/24/2009	19	0.12	< 0.05	0.03	99	NT
8/6/2009	18	0.08	< 0.05	0.03	89	< 0.5
9/10/2009	25	0.12	< 0.05	0.006	120	< 0.5
10/8/2009	10	0.07	< 0.05	0.030	68	< 0.5
11/17/2009	114	0.15	< 0.05	0.013	74	< 0.5
12/10/2009	11	0.11	< 0.05	0.014	65	< 0.5
1/6/2010	11	0.20	0.06	0.010	74	< 0.5
2/11/2010	15	0.29	< 0.05	0.018	90	< 0.5
3/11/2010	8	0.10	< 0.05	< 0.05	54	< 0.5
4/13/2010	8	0.14	< 0.05	0.011	61	< 0.5
5/13/2010	14	< 0.05	0.05	0.008	77	< 0.5
6/9/2010	19	0.2	< 0.05	0.014	100	< 0.5
7/8/2010	39	0.23	< 0.05	0.02	180	0.7
8/5/2010	42	0.11	< 0.05	0.013	200	0.6
9/14/2010	48	0.14	< 0.05	0.009	240	< 0.5
10/21/2010	35	0.06	< 0.05	0.012	160	< 0.5

Surface Water Site 19MB-5

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/5/2007	NT	< 0.5	NT	< 0.05	NT	NT
8/8/2007	NT	< 0.5	NT	< 0.05	NT	NT
9/26/2007	7	< 0.05	< 0.05	< 0.01	59	NT
10/10/2007	6	< 0.05	< 0.05	0.04	64	NT
10/24/2007	5	< 0.05	< 0.05	0.08	56	NT
11/7/2007	6	0.07	< 0.05	0.05	55	NT
11/21/2007	6	< 0.05	< 0.05	0.04	56	NT
1/16/2008	9	0.06	< 0.05	0.01	58	NT
2/15/2008	NT	NT	NT	NT	NT	NT
3/12/2008	NT	NT	NT	NT	NT	NT
4/16/2008	4	< 0.05	< 0.05	0.02	30	NT
5/15/2008	5	< 0.05	< 0.05	0.02	NT	NT
6/10/2008	6	0.10	< 0.05	0.03	52	NT
7/10/2008	7	0.06	< 0.05	0.03	56	NT
8/5/2008	5	0.06	< 0.05	0.07	NT	NT
9/9/2008	7	0.07	< 0.05	0.02	NT	NT
10/7/2008	6	< 0.05	< 0.05	0.03	NT	NT
11/5/2008	8	< 0.05	< 0.05	< 0.01	58	NT
12/9/2008	NT	NT	NT	NT	NT	NT
1/2009	NT	NT	NT	NT	NT	NT
2/6/2009	NT	NT	NT	NT	NT	NT
3/20/2009	5	< 0.05	< 0.05	0.01	42	NT
4/10/2009	3	< 0.05	< 0.05	< 0.01	33	NT
5/8/2009	10	0.06	< 0.05	0.02	NT	NT
5/29/2009	NT	NT	NT	NT	NT	NT
6/12/2009	12	0.09	< 0.05	0.07	64	NT
6/26/2009	NT	NT	NT	NT	NT	NT
7/10/2009	7	0.08	< 0.05	0.01	51	NT
7/24/2009	NT	NT	NT	NT	NT	NT
8/6/2009	11	< 0.05	< 0.05	0.03	62	NT
9/10/2009	16	< 0.05	< 0.05	0.027	92	NT
10/8/2009	13	0.06	< 0.05	0.030	77	NT
11/17/2009	8	0.11	< 0.05	0.020	52	NT
12/10/2009	8	0.09	< 0.05	0.013	57	NT
1/6/2010	NT	NT	NT	NT	NT	NT
2/11/2010	NT	NT	NT	NT	NT	NT
3/11/2010	7	0.06	< 0.05	0.009	50	NT
4/13/2010	6	0.11	< 0.05	0.017	52	NT
5/13/2010	10	< 0.05	0.05	0.01	61	NT
6/9/2010	10	0.08	< 0.05	0.009	61	NT
7/8/2010	20	0.06	< 0.05	0.01	110	NT
8/5/2010	14	< 0.05	< 0.05	0.011	89	< 0.5
9/14/2010	14	< 0.05	< 0.05	0.005	78	NT
10/21/2010	17	< 0.05	< 0.05	0.016	96	NT

Surface Water Site 19MB-6

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/5/2007	NT	NT	NT	NT	NT	NT
8/8/2007	NT	NT	NT	NT	NT	NT
9/26/2007	1	0.06	< 0.05	< 0.01	34	NT
10/10/2007	1	< 0.05	< 0.05	0.03	35	NT
10/24/2007	1	< 0.05	< 0.05	0.06	38	NT
11/7/2007	2	< 0.05	< 0.05	< 0.01	40	NT
11/21/2007	2	0.05	< 0.05	0.03	37	NT
1/16/2008	NT	NT	NT	NT	NT	NT
2/15/2008	NT	NT	NT	NT	NT	NT
3/12/2008	NT	NT	NT	NT	NT	NT
4/16/2008	NT	NT	NT	NT	NT	NT
5/15/2008	< 1	< 0.05	< 0.05	0.05	NT	NT
6/10/2008	1	0.08	< 0.05	0.03	30	NT
7/10/2008	< 1	0.09	< 0.05	0.03	28	NT
8/5/2008	2	0.07	< 0.05	0.02	NT	NT
9/9/2008	1	0.07	< 0.05	< 0.01	NT	NT
10/7/2008	1	< 0.05	< 0.05	0.04	NT	NT
11/5/2008	< 1	< 0.05	< 0.05	0.02	24	NT
12/9/2008	NT	NT	NT	NT	NT	NT
1/2009	NT	NT	NT	NT	NT	NT
2/6/2009	< 1	0.07	< 0.05	0.06	24	NT
3/20/2009	< 1	< 0.05	< 0.05	< 0.01	21	NT
4/10/2009	1	< 0.05	< 0.05	< 0.01	22	NT
5/8/2009	9	0.13	< 0.05	< 0.01	NT	NT
5/29/2009	5	0.08	< 0.05	0.13	40	NT
6/12/2009	6	0.13	< 0.05	0.06	41	NT
6/26/2009	10	0.14	< 0.05	< 0.01	69	NT
7/10/2009	10	0.14	< 0.05	< 0.01	66	NT
7/24/2009	2	< 0.05	< 0.05	0.04	21	NT
8/6/2009	23	0.23	< 0.05	0.01	110	NT
9/10/2009	63	0.85	< 0.05	0.020	260	NT
10/8/2009	45	0.43	< 0.05	0.017	200	NT
11/17/2009	18	0.26	< 0.05	0.007	89	NT
12/10/2009	9	0.11	< 0.05	0.006	60	NT
1/6/2010	10	0.18	< 0.05	0.004	72	NT
2/11/2010	19	0.39	< 0.05	< 0.002	110	NT
3/11/2010	6	0.11	< 0.05	0.005	47	NT
4/13/2010	8	0.21	< 0.05	0.006	59	NT
5/13/2010	18	0.09	0.05	0.003	97	NT
6/9/2010	41	0.75	< 0.05	0.004	190	NT
7/8/2010	66	0.93	< 0.05	0.01	300	NT
8/5/2010	74	0.29	< 0.05	0.005	310	0.9
9/14/2010	77	0.23	< 0.05	0.003	330	NT
10/21/2010	67	0.09	< 0.05	0.005	300	NT

Surface Water Site 19MB-7

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/29/2009	52	0.25	< 0.05	0.21	210	NT
6/12/2009	52	0.27	< 0.05	0.05	220	NT
6/26/2009	64	0.24	< 0.05	<0.01	270	NT
7/10/2009	69	0.40	< 0.05	<0.01	310	NT
7/24/2009	38	0.23	< 0.05	0.04	170	NT
8/6/2009	82	0.42	< 0.05	0.01	330	NT
9/10/2009	83	0.47	< 0.05	0.016	340	NT
10/8/2009	83	0.51	< 0.05	0.015	320	NT
11/17/2009	75	0.45	< 0.05	0.010	310	NT
12/10/2009	73	0.64	< 0.05	0.010	320	NT
1/6/2010	74	1.30	< 0.05	0.009	330	NT
2/11/2010	70	1.20	< 0.05	0.033	320	NT
3/11/2010	66	1.00	< 0.05	0.009	300	NT
4/13/2010	66	1	< 0.05	0.009	300	NT
5/13/2010	60	0.65	< 0.05	0.008	280	NT
6/9/2010	75	1	< 0.05	0.011	310	NT
7/8/2010	82	0.81	< 0.05	0.06	360	NT
8/5/2010	89	0.5	0.05	0.014	390	1.1
9/14/2010	85	0.51	< 0.05	0.013	390	NT
10/21/2010	79	0.31	< 0.05	0.012	380	NT

Surface Water Site 19MB-8

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/29/2009	85	0.85	< 0.05	0.18	370	NT
6/12/2009	88	0.87	< 0.05	0.06	390	NT
6/26/2009	97	0.68	< 0.05	0.02	420	NT
7/10/2009	90	1.00	< 0.05	<0.01	430	NT
7/24/2009	82	1.00	< 0.05	0.02	350	NT
8/6/2009	96	1.10	< 0.05	< 0.01	400	NT
9/10/2009	100	0.96	< 0.05	0.008	420	NT
10/8/2009	100	1.10	< 0.05	0.010	400	NT
11/17/2009	92	0.70	< 0.05	0.007	410	NT
12/10/2009	88	1.70	< 0.05	0.026	390	NT
1/6/2010	83	2.20	< 0.05	0.016	410	NT
2/11/2010	84	2.00	< 0.05	0.008	410	NT
3/11/2010	88	1.80	< 0.05	0.005	400	NT
4/13/2010	91	1.7	< 0.05	0.009	430	NT
5/13/2010	76	1.6	< 0.05	0.008	380	NT
6/9/2010	110	1.9	< 0.05	0.009	510	NT
7/8/2010	90	1.5	< 0.05	0.03	500	NT
8/5/2010	95	1	< 0.05	0	480	0.8
9/14/2010	93	1	< 0.05	0.018	460	NT
10/21/2010	85	1	< 0.05	0.016	440	NT

Surface Water Site 19MB-9

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/29/2009	63	0.29	< 0.05	0.13	260	NT
6/12/2009	69	0.26	< 0.05	0.04	290	NT
6/26/2009	85	0.31	< 0.05	0.01	350	NT
7/10/2009	82	0.35	< 0.05	<0.01	360	NT
7/24/2009	62	0.16	< 0.05	0.02	250	NT
8/6/2009	100	0.60	< 0.05	< 0.01	400	NT
9/10/2009	100	0.56	< 0.05	0.014	410	NT
10/8/2009	100	0.64	< 0.05	0.013	390	NT
11/17/2009	89	0.61	< 0.05	0.014	390	NT
12/10/2009	87	0.59	< 0.05	0.031	420	NT
1/6/2010	88	1.60	< 0.05	0.023	380	NT
2/11/2010	85	1.50	< 0.05	0.027	380	NT
3/11/2010	84	1.30	< 0.05	0.016	360	NT
4/13/2010	88	1.2	< 0.05	0.009	380	NT
5/13/2010	92	0.97	< 0.05	0.011	410	NT
6/9/2010	100	1.3	< 0.05	0.012	430	NT
7/8/2010	110	0.98	< 0.05	0.02	460	NT
8/5/2010	100	0.67	< 0.05	0.022	460	1.2
9/14/2010	95	0.72	< 0.05	0.033	460	NT
10/21/2010	86	0.38	0.05	0.021	420	NT

Surface Water Site 19MB-10

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/29/2009	64	0.40	0.09	0.31	260	NT
6/12/2009	84	0.50	< 0.05	0.06	350	NT
6/26/2009	86	0.36	< 0.05	0.02	360	NT
7/10/2009	93	0.96	< 0.05	<0.01	430	NT
7/24/2009	84	0.72	< 0.05	0.16	360	NT
8/6/2009	100	1.00	< 0.05	< 0.01	420	NT
9/10/2009	110	1.00	< 0.05	0.009	430	NT
10/8/2009	100	1.20	< 0.05	0.015	410	NT
11/17/2009	93	0.88	< 0.05	0.010	400	NT
12/10/2009	92	0.94	< 0.05	0.007	410	NT
1/6/2010	89	2.30	< 0.05	0.012	390	NT
2/11/2010	83	2.10	< 0.05	0.005	390	NT
3/11/2010	83	1.90	< 0.05	< 0.004	380	NT
4/13/2010	87	1.8	< 0.05	0.005	400	NT
5/13/2010	93	1.6	< 0.05	0.005	440	NT
6/9/2010	110	2.3	< 0.05	0.006	460	NT
7/8/2010	110	1.5	< 0.05	0.02	490	NT
8/5/2010	100	1.3	< 0.05	0.005	490	2
9/14/2010	94	1.3	< 0.05	0.006	480	NT
10/21/2010	85	1	0.05	0.007	440	NT

Surface Water Site 19MB-11

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
9/10/2009	90	0.31	< 0.05	0.015	440	NT
10/8/2009	110	0.34	< 0.05	0.023	400	NT
11/17/2009	96	0.68	< 0.05	0.017	400	NT
12/10/2009	88	0.68	0.05	0.023	380	NT
1/6/2010	93	1.20	< 0.05	0.062	390	NT
2/11/2010	74	1.40	< 0.05	0.028	330	NT
3/11/2010	72	0.79	< 0.05	< 0.004	310	NT
4/13/2010	76	0.55	< 0.05	0.03	320	NT
5/13/2010	71	0.11	< 0.05	0.009	310	NT
6/9/2010	88	0.45	< 0.05	0.009	360	NT
7/8/2010	99	0.3	< 0.05	0.01	420	NT
8/5/2010	100	0.09	< 0.05	0.012	420	0.90
9/14/2010	96	0.64	< 0.05	0.009	460	NT
10/21/2010	88	0.59	0.11	0.015	430	NT

Surface Water Site 19MB-12

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
10/8/2009	100	0.82	< 0.05	0.017	420	NT
11/17/2009	NT	NT	NT	NT	NT	NT
12/10/2009	NT	NT	NT	NT	NT	NT
Not Tested from January through April 2010						
5/13/2010	76	1.2	< 0.05	0.011	350	NT
6/9/2010	85	2.1	< 0.05	0.008	380	NT
7/8/2010	100	1.8	< 0.05	0.03	470	NT
8/5/2010	96	0.77	< 0.05	0.022	420	1.5
9/14/2010	91	0.65	< 0.05	0.003	410	NT
10/21/2010	77	0.14	0.06	0.006	390	NT

Surface Water Site 19MB-13

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
10/9/2009	94	NT	< 0.05	0.051	430	NT
11/17/2009	NT	NT	NT	NT	NT	NT
12/10/2009	NT	N	NT	NT	NT	NT
Not Tested from January through April 2010						
5/13/2010	56	0.82	< 0.05	0.13	280	NT
6/9/2010	68	1.5	< 0.05	0.01	330	NT
7/8/2010	86	1.4	< 0.05	0.07	390	NT
8/5/2010	83	0.16	< 0.05	0.12	370	1.5
9/14/2010	88	0.16	< 0.05	0.023	360	NT
10/21/2010	81	0.1	0.05	0.034	380	NT

Surface Water Site 19MB-14

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/13/2010	< 1	< 0.05	< 0.05	0.004	21	NT
6/9/2010	< 1	0.07	< 0.05	0.004	25	NT
7/8/2010	1	0.08	< 0.05	0.03	34	NT
8/5/2010	< 1	< 0.05	< 0.05	0.019	35	< 0.5
9/14/2010	< 1	0.05	< 0.05	0.007	33	NT
10/21/2010	< 1	< 0.05	< 0.05	< 0.002	37	NT

Surface Water Site 19MB-15

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/13/2010	< 1	< 0.05	< 0.05	0.005	21	NT
6/9/2010	< 1	0.06	< 0.05	0.007	25	NT
7/8/2010	Note that location is listed as dry					
9/14/2010	Note that location is listed as dry					
10/21/2010	1	< 0.05	< 0.05	0.017	43	NT

Surface Water Site 19MB-16

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/13/2010	< 1	< 0.05	< 0.05	0.004	19	NT
6/9/2010	< 1	0.06	< 0.05	0.007	26	NT
7/8/2010	2	0.06	0.09	0.02	45	NT
8/5/2010	2	< 0.05	0.26	0.03	35	0.7
10/21/2010	3	< 0.05	< 0.05	0.014	37	NT

Surface Water Site 19MB-17

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
5/13/2010	<1	< 0.05	< 0.05	0.006	20	NT
6/9/2010	1	0.05	< 0.05	0.021	27	NT
7/8/2010	Note that location is listed as dry					
9/14/2010	Note that location is listed as dry					
10/21/2010	Note that location is listed as dry					

Surface Water Site 19MB-18

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/8/2010	67	0.82	NT	0.009	98	< 0.5
8/5/2010	72	0.26	NT	0.007	110	< 0.5
9/14/2010	74	0.21	NT	0.002	140	< 0.5
10/21/2010	67	0.08	NT	0.005	89	< 0.5

Surface Water Site 19MB-19

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/8/2010	17	0.2	NT	0.02	98	< 0.5
8/5/2010	21	0.08	NT	0.011	110	< 0.5
9/14/2010	29	0.08	NT	0.007	140	< 0.5
10/21/2010	16	0.05	NT	0.008	89	< 0.5

Surface Water Site 19MB-20

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/8/2010	42	0.33	NT	0.01	190	< 0.5
8/5/2010	45	0.17	NT	0.012	200	< 0.5
9/14/2010	53	0.23	NT	0.009	240	0.7
10/21/2010	31	0.06	NT	0.011	150	< 0.5

Surface Water Site 19MB-21

Date	Chloride mg/L	Nitrate-N mg/L	Ammonia-N mg/L	Total Phosphorus-P mg/L	Specific Cond. uS	Total Nitrogen mg/L
7/8/2010	42	0.33	NT	0.01	190	< 0.5
8/5/2010	45	0.17	NT	0.012	200	< 0.5
9/14/2010	53	0.23	NT	0.009	240	0.7
10/21/2010	31	0.06	NT	0.011	150	< 0.5

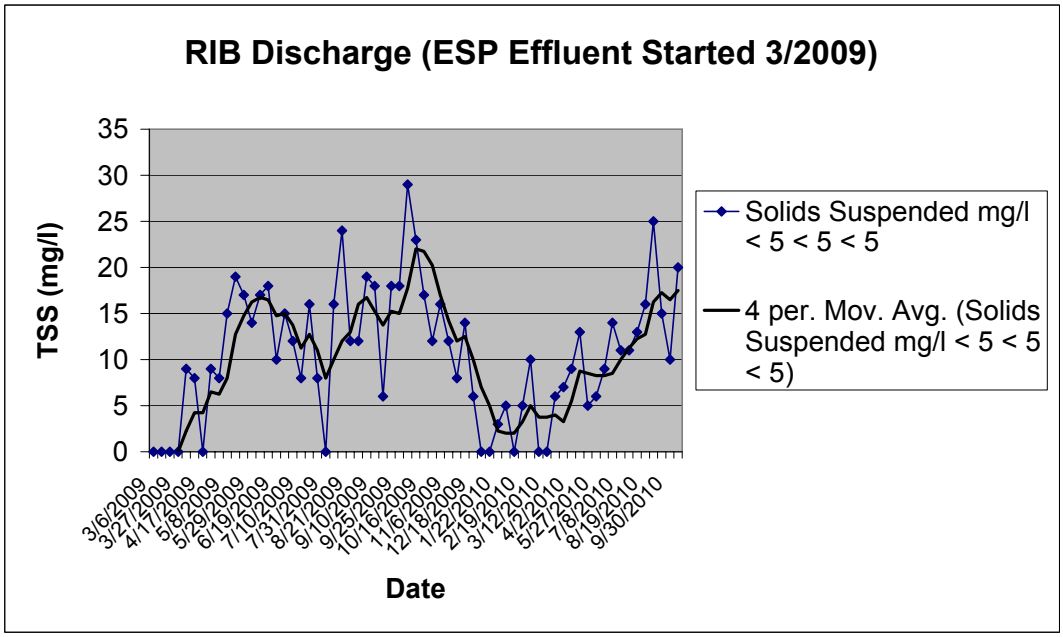
WOLFEBORO, NEW HAMPSHIRE
EFFFLUENT STORAGE POND WATER QUALITY
ESP Discharge to RIBs
Discharge Initiated March 2009
EAI Sampling Results

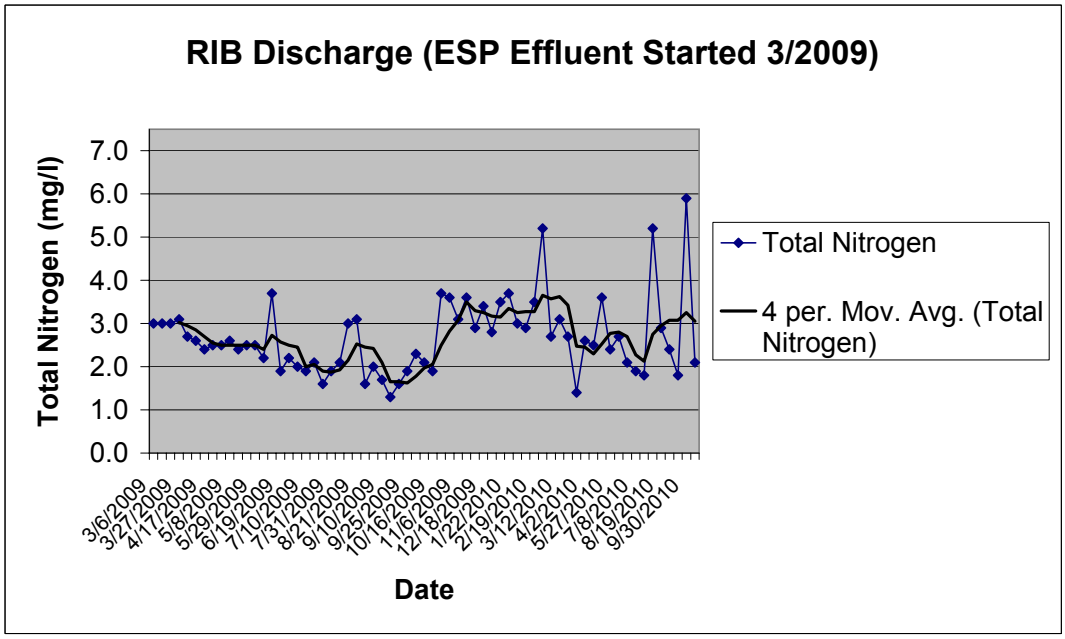
Sample Date	Solids Suspended mg/l	Solids Dissolved mg/l	Nitrate/Nitrite-N mg/l	Ammonia-N mg/l	TKN mg/l	Total Nitrogen mg/l	Total Phosphorus-P mg/l	Ortho Phosphate-P mg/l	CBOD mg/l	Chloride mg/l	Specific Conductance uS/cm
3/6/2009	< 5	290	1.40	0.93	1.6	3.0	0.79	0.73	< 6	NT	NT
3/13/2009	< 5	240	1.30	0.59	1.7	3.0	0.76	0.68	< 6	NT	NT
3/20/2009	< 5	270	1.60	0.76	1.4	3.0	0.76	0.72	< 3	NT	NT
3/27/2009	< 5	320	1.80	0.27	1.3	3.1	0.74	0.66	< 6	NT	NT
4/3/2009	9	270	1.60	< 0.05	1.1	2.7	0.65	0.51	< 6	NT	NT
4/10/2009	8	270	1.10	0.23	1.5	2.6	0.72	0.44	7	NT	NT
4/17/2009	< 5	250	1.00	0.22	1.4	2.4	0.66	0.51	< 6	NT	NT
4/24/2009	9	270	1.00	0.27	1.5	2.5	0.85	0.69	< 6	80	540
5/1/2009	8	280	1.30	0.50	1.2	2.5	0.90	0.81	< 6	NT	NT
5/8/2009	15	NT	0.52	0.78	2.1	2.6	NT	NT	< 6	NT	NT
5/15/2009	19	280	0.67	0.63	1.7	2.4	1.00	0.70	< 6	NT	NT
5/22/2009	17	NT	0.64	0.37	1.9	2.5	NT	NT	< 6	NT	NT
5/29/2009	14	330	0.74	< 0.05	1.8	2.5	0.62	0.61	< 6	NT	NT
6/5/2009	17	NT	0.72	0.20	1.5	2.2	0.72	0.53	< 6	NT	NT
6/12/2009	18	NT	0.62	0.20	3.1	3.7	NT	0.38	13	110	540
6/19/2009	10	270	0.40	0.30	1.5	1.9	NT	NT	< 6	110	520
6/26/2009	15	260	0.40	0.65	1.8	2.2	1.00	0.65	< 6	110	530
7/2/2009	12	270	0.41	0.22	1.6	2.0	NT	NT	4	97	510
7/10/2009	8	250	0.42	0.37	1.5	1.9	0.90	0.70	< 6	93	510
7/17/2009	16	260	0.50	0.32	1.7	2.1	NT	NT	< 6	90	510
7/24/2009	8	260	0.25	0.20	1.3	1.6	0.64	0.52	< 6	90	520
7/31/2009	< 5	NT	0.30	0.05	1.6	1.9	NT	NT	< 6	NT	NT
8/7/2009	16	NT	0.32	0.53	1.8	2.1	NT	NT	< 6	NT	NT
8/14/2009	24	NT	0.27	0.42	2.7	3.0	NT	NT	5	NT	NT
8/21/2009	12	NT	0.31	1.10	2.8	3.1	NT	NT	< 6	NT	NT
8/28/2009	12	NT	0.13	0.43	1.5	1.6	NT	NT	< 6	NT	NT
9/4/2009	19	260	0.20	0.13	1.8	2.0	0.76	0.55	< 6	100	480
9/10/2009	18	210	0.11	0.49	1.6	1.7	0.75	0.50	< 6	89	480
9/11/2009	6	210	0.12	0.12	1.2	1.3	0.79	0.51	< 6	100	480
9/18/2009	18	250	0.19	0.11	1.4	1.6	0.73	0.54	< 6	100	480
9/25/2009	18	270	0.18	0.13	1.7	1.9	0.70	0.50	< 6	98	480
10/2/2009	29	270	0.16	0.06	2.1	2.3	0.92	0.59	< 6	98	480
10/9/2009	23	240	0.26	0.14	1.8	2.1	0.79	0.60	< 6	87	470
10/16/2009	17	250	0.40	0.08	1.5	1.9	0.81	0.55	< 6	97	470
10/23/2009	12	250	0.58	1.10	3.1	3.7	0.76	0.58	< 6	96	490
10/30/2009	16	240	0.93	1.10	2.7	3.6	1.40	1.00	< 6	96	NT
11/6/2009	12	250	1.20	0.44	1.9	3.1	0.88	0.68	< 6	85	460
11/19/2009	8	240	1.50	0.90	2.1	3.6	0.75	0.50	11	87	460
12/4/2009	14	210	1.60	0.14	1.3	2.9	0.72	0.49	< 6	82	440
12/18/2009	6	240	1.60	0.34	1.8	3.4	0.69	0.55	< 6	84	440
12/31/2009	< 5	240	1.60	0.30	1.2	2.8	0.61	0.56	< 6	78	470

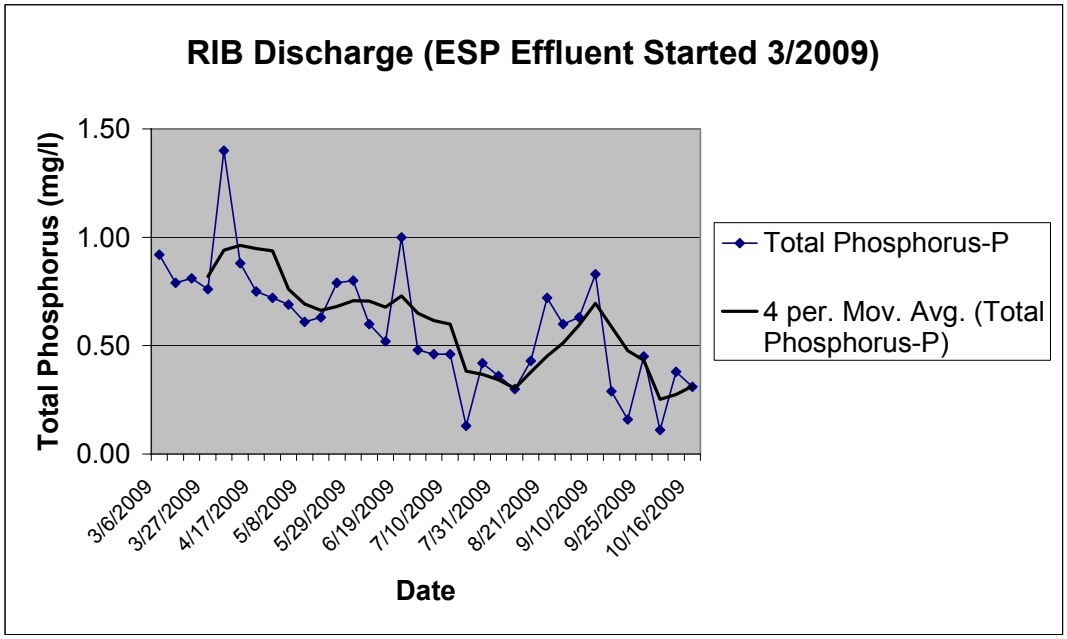
WOLFEBORO, NEW HAMPSHIRE
EFFFLUENT STORAGE POND WATER QUALITY
ESP Discharge to RIBs
Discharge Initiated March 2009
EAI Sampling Results

Sample Date	Solids Suspended mg/l	Solids Dissolved mg/l	Nitrate/Nitrite-N mg/l	Ammonia-N mg/l	TKN mg/l	Total Nitrogen mg/l	Total Phosphorus-P mg/l	Ortho Phosphate-P mg/l	CBOD mg/l	Chloride mg/l	Specific Conductance uS/cm
1/8/2010	< 5	250	2.10	0.42	1.4	3.5	0.63	0.52	< 6	92	470
1/22/2010	3	260	1.50	0.70	2.2	3.7	0.79	0.65	< 6	82	480
2/5/2010*	5	260	1.70	0.39	1.3	3.0	0.80	0.52	< 6	82	490
2/10/2010	< 5	450	1.60	0.30	1.3	2.9	0.60	0.53	< 6	93	490
2/19/2010	5	260	1.60	0.42	1.9	3.5	0.52	0.40	< 6	88	500
2/26/2010	10	240	2.40	0.90	2.8	5.2	1.00	1.00	< 6	90	500
3/5/2010	< 5	300	1.40	0.28	1.3	2.7	0.48	0.44	< 6	110	550
3/12/2010	< 5	280	1.60	0.23	1.5	3.1	0.46	0.45	< 6	94	510
3/19/2010	6	290	1.50	0.33	1.2	2.7	0.46	0.38	< 6	110	550
3/26/2010	7	390	0.43	0.05	1.0	1.4	0.13	0.09	< 6	150	700
4/2/2010	9	270	1.2	0.24	1.4	2.6	0.42	0.36	< 6	110	530
4/30/2010	13	280	0.68	0.06	1.8	2.5	0.36	0.28	< 6	90	510
5/14/2010	5	260	1.2	1.4	2.4	3.6	0.3	0.21	< 6	89	480
5/27/2010	6	290	0.6	0.4	1.8	2.4	0.43	0.38	< 6	100	490
6/10/2010	9	250	0.5	0.48	2.2	2.7	0.72	0.62	6	100	500
6/24/2010	14	250	0.06	0.10	2.00	2.10	0.60	0.51	< 6	96	500
7/8/2010	11	270	0.20	0.19	1.70	1.90	0.63	0.56	< 6	97	490
7/22/2010	11	250	0.25	0.37	1.80	1.80	0.83	0.68	< 6	100	480
8/5/2010	13	220	1.00	1.50	4.20	5.20	0.29	0.15	< 6	65	420
8/19/2010	16	230	0.17	0.07	2.7	2.9	0.16	0.09	< 6	88	380
9/2/2010	25	250	0.15	< 0.05	2.2	2.4	0.45	0.03	< 6	88	400
9/16/2010	15	260	0.16	< 0.05	1.6	1.8	0.11	< 0.01	< 6	92	300
9/30/2010	10	230	1.4	1.7	4.5	5.9	0.38	0.19	< 6	76	360
10/14/2010	20	330	0.31	0.05	1.8	2.1	0.31	0.21	< 6	78	420

Note: *On 2/5/2010 testing was performed for Fe and Mg with results reported as 0.15 and 0.049 mg/l, respectively


RIB Discharge (ESP Effluent Started 3/2009)
TSS (mg/l)
35
30
25
20
15
10
5
0
3/6/2009
3/27/2009
4/17/2009
5/8/2009
5/29/2009
6/19/2009
7/10/2009
7/31/2009
8/21/2009
9/10/2009
9/25/2009
10/16/2009
11/6/2009
12/18/2009
1/22/2010
2/19/2010
3/12/2010
4/2/2010
5/27/2010
7/8/2010
8/19/2010
9/30/2010
Date
Solids Suspended mg/l < 5 < 5 < 5
4 per. Mov. Avg. (Solids Suspended mg/l < 5 < 5 < 5)


RIB Discharge (ESP Effluent Started 3/2009)
Total Nitrogen (mg/l)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
3/6/2009
3/27/2009
4/17/2009
5/8/2009
5/29/2009
6/19/2009
7/10/2009
7/31/2009
8/21/2009
9/10/2009
9/25/2009
10/16/2009
11/6/2009
12/18/2009
1/22/2010
2/19/2010
3/12/2010
4/2/2010
5/27/2010
7/8/2010
8/19/2010
9/30/2010
Date
Total Nitrogen
4 per. Mov. Avg. (Total Nitrogen)

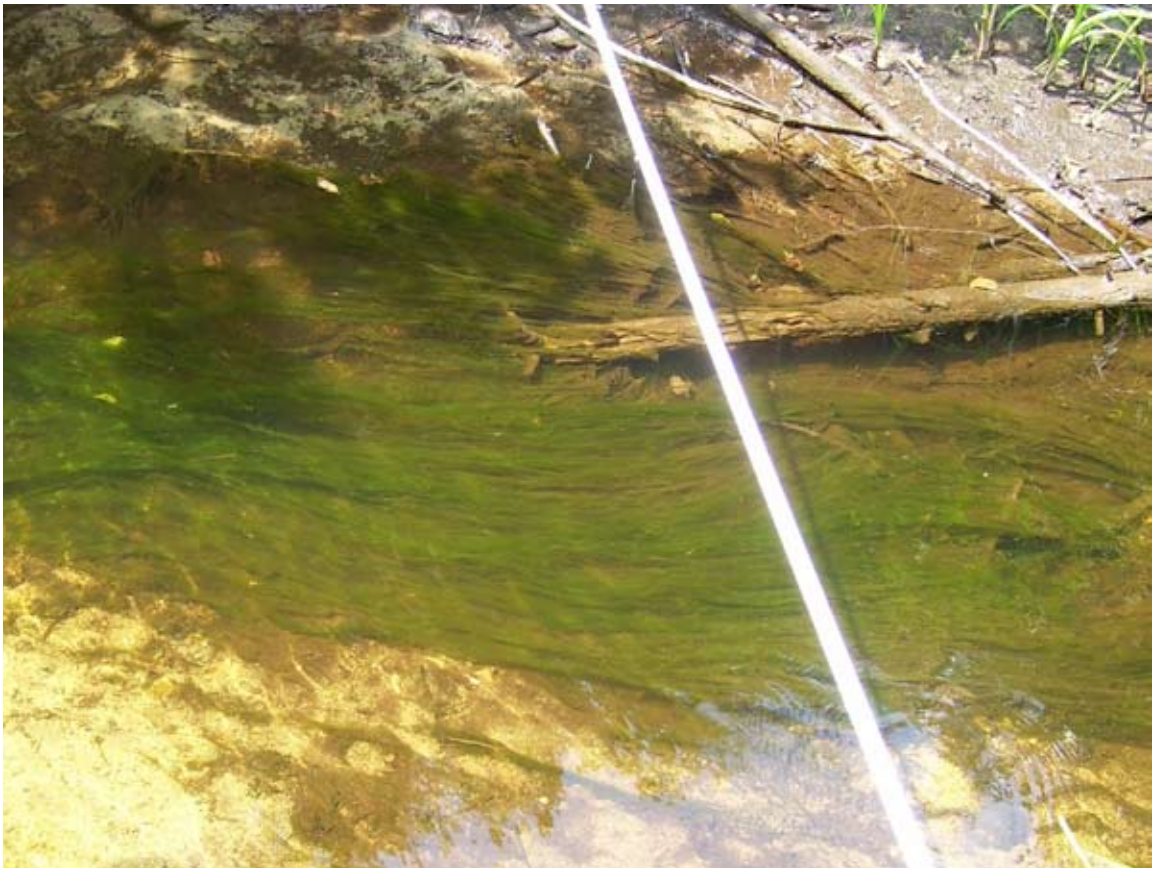

RIB Discharge (ESP Effluent Started 3/2009)
Total Phosphorus (mg/l)
1.50
1.00
0.50
0.00
3/6/2009
3/27/2009
4/17/2009
5/8/2009
5/29/2009
6/19/2009
7/10/2009
7/31/2009
8/21/2009
9/10/2009
9/25/2009
10/16/2009
Date
Total Phosphorus-P
4 per. Mov. Avg. (Total Phosphorus-P)

Appendix F

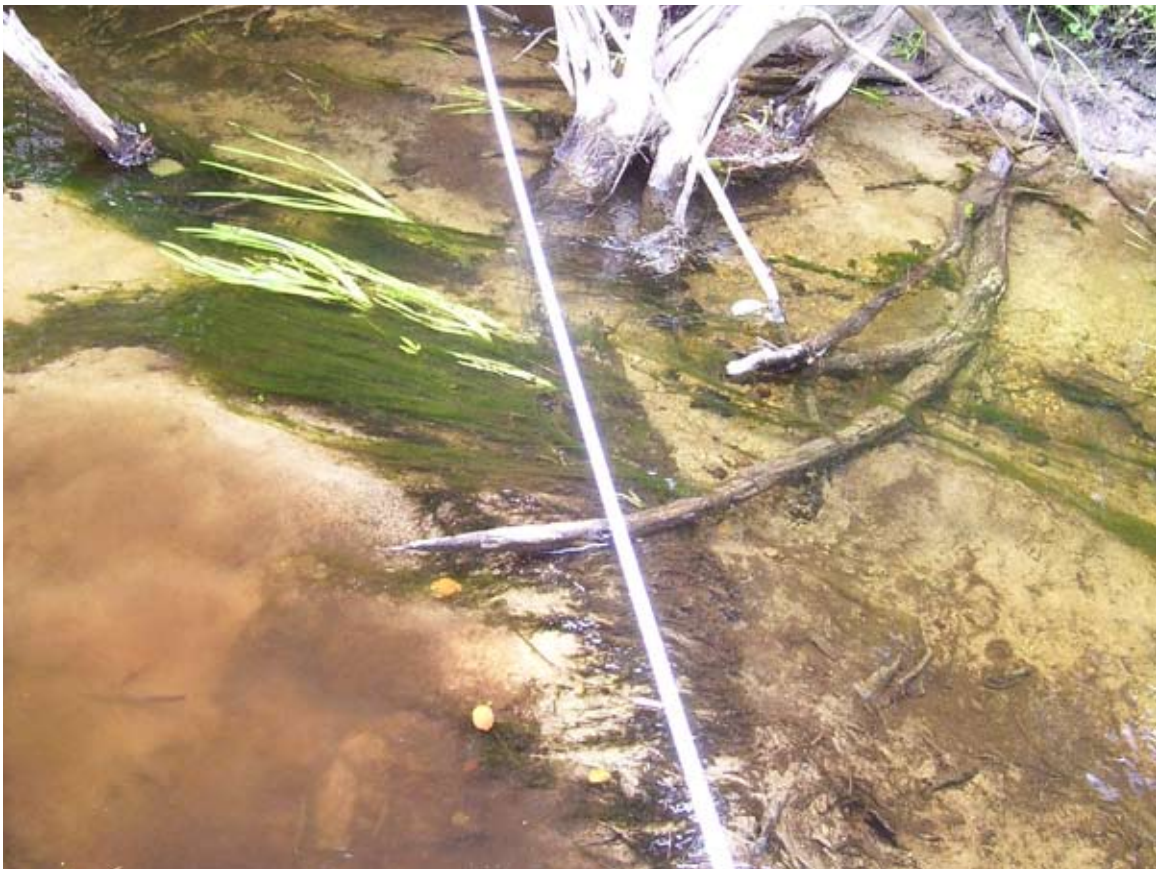
Algae Monitoring Photo Log

Algae View Bucket

Algae Transect (ALG-1) July 2010



Algae Transect (ALG-2) July 2010



Algae Transect (ALG-3) July 2010

Algae Transect (ALG-4) July 2010

Algae Transect (ALG-4) July 2010

Algae Transect (ALG-5) July 2010

Unnamed Tributary July 2010

Algae in at Confluence with Nineteen Mile Brook July 2010

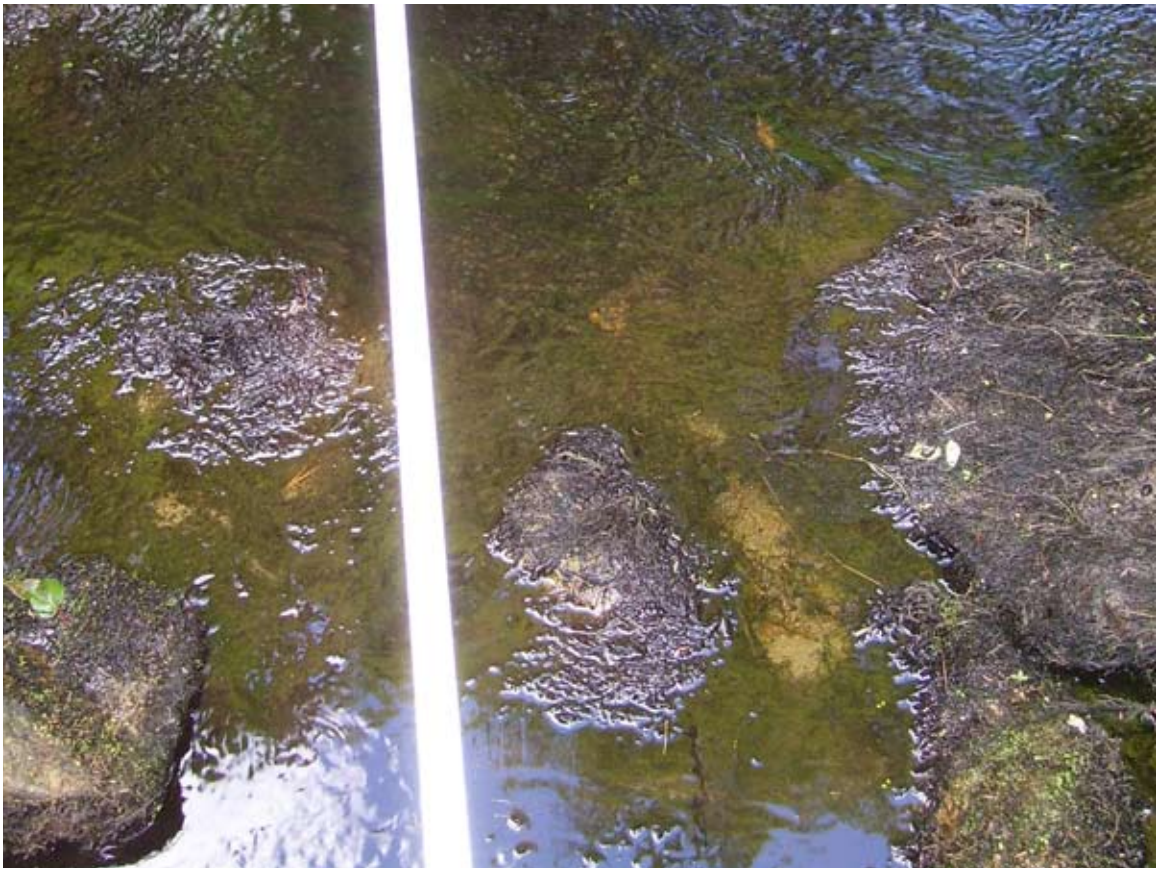
Round Algae Colony Western Discharge Confluence

Algae Transect (ALG-3)August 2010

Algae Transect (ALG -4) August 2010

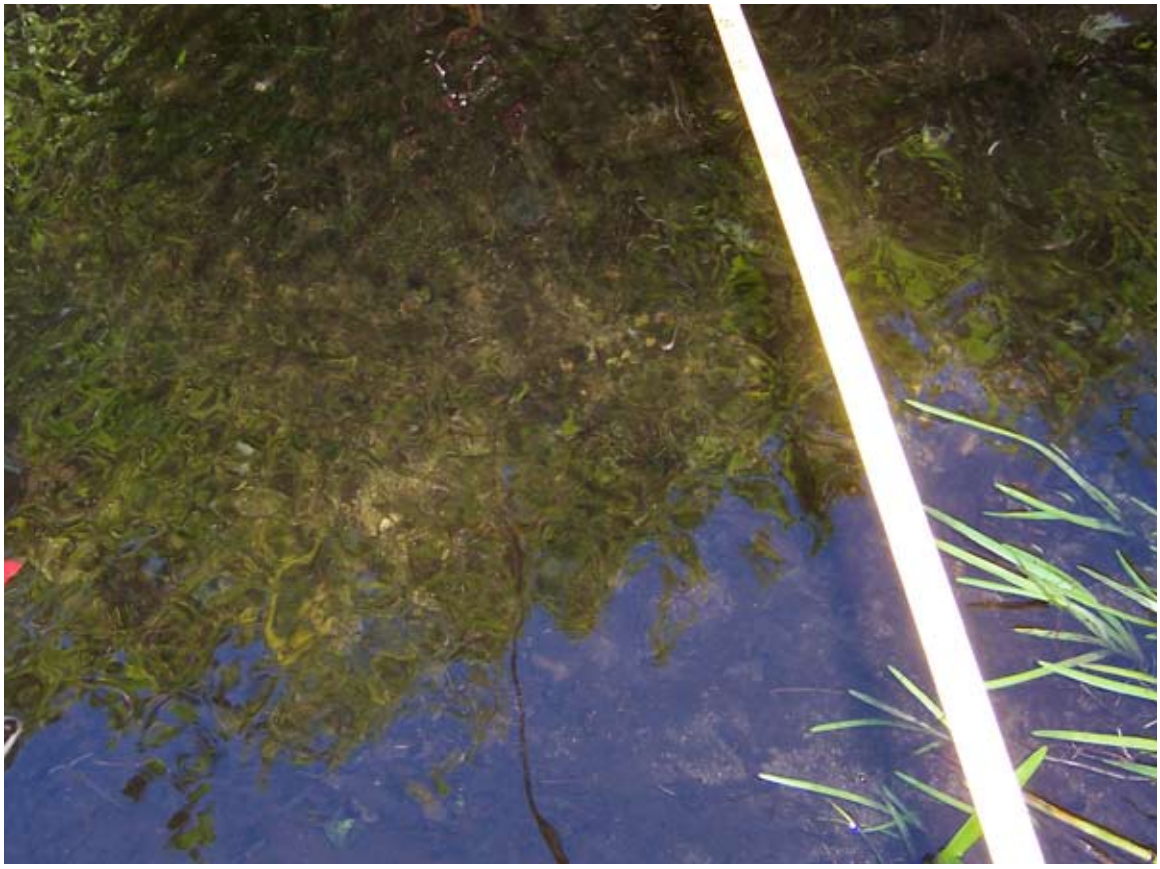
Algae Transect (ALG-4) August 2010

Algae Transect (ALG-5) August 2010



Algae Transect (ALG-5) August 2010

Algae Transect (ALG-1) September 2010



Algae Transect Upstream (ALG-1) September 2010

Algae Transect Downstream (ALG-1) September 2010

Algae Transect Stream Bed (ALG-1) October 2010

Algae Transect Stream Bed (ALG-2) September 2010

Algae Transect Upstream (ALG-2) September 2010

Algae Transect Upstream (ALG-4) September 2010

Algae Transect Upstream (ALG-5) September 2010

Algae Transect Stream Bed with Green Filamentous Algae Strands (ALG-5) September 2010

Algae Transect Upstream (ALG-1) October 2010

Algae Transect Upstream (ALG-2) October 2010

Algae Transect Upstream (ALG-3) October 2010

Algae Transect Downstream (ALG-3) October 2010

Algae Transect Upstream (ALG-4) October 2010

Algae Transect Stream Bed (ALG-4) October 2010

Algae Transect Downstream (ALG-4) October 2010

Algae Transect Upstream (ALG-5) October 2010

Appendix G

Groundwater Data

WOLFEBORO, NH WWTF
WHITTEN RIB SITE MONITORING WELL SAMPLING DATA
RIB PERMIT MONITORING WELL SUMMARY TABLE
Metals Summary Table
Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
12/21/2007*														
Dissolved	Aluminum	mg/L	0.09	< 0.05	NS	< 0.05	< 0.05	NS	NS	NS	NS	NS	NS	NS
	Arsenic	mg/L	< 0.001	< 0.001	NS	< 0.001	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Barium	mg/L	0.019	0.006	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Cadmium	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Chromium	mg/L	0.001	0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Copper	mg/L	< 0.001	< 0.001	NS	< 0.001	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Lead	mg/L	< 0.001	< 0.001	NS	< 0.001	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Mercury	mg/L	< 0.0001	< 0.0001	NS	NT	< 0.0001	NS	NS	NS	NS	NS	NS	NS
	Selenium	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Silver	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Zinc	mg/L	0.045	0.056	NS	< 0.005	< 0.005	NS	NS	NS	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
5/14/2008**														
	Aluminum	mg/L	27	21	79	17	5.8	25	NS	NS	NS	NS	NS	NS
	Arsenic	mg/L	0.028	0.014	0.039	0.01	0.009	0.011	NS	NS	NS	NS	NS	NS
	Barium	mg/L	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Cadmium	mg/L	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Chromium	mg/L	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Copper	mg/L	0.021	0.017	0.074	0.013	0.022	0.018	NS	NS	NS	NS	NS	NS
	Lead	mg/L	0.016	0.011	0.05	0.008	0.006	0.009	NS	NS	NS	NS	NS	NS
	Mercury	mg/L	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Selenium	mg/L	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Silver	mg/L	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Zinc	mg/L	0.11	0.049	0.21	0.053	0.044	0.17	NS	NS	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS

WOLFEBORO, NH WWTF
WHITTEN RIB SITE MONITORING WELL SAMPLING DATA
RIB PERMIT MONITORING WELL SUMMARY TABLE
Metals Summary Table
Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
8/7/2008														
	Aluminum	mg/L	7.6	7.4	NS	6.5	2.6	NS	NS	NS	NS	NS	NS	NS
	Arsenic	mg/L	0.012	0.009	NS	0.007	0.004	NS	NS	NS	NS	NS	NS	NS
	Barium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Cadmium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Chromium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Copper	mg/L	0.005	0.005	NS	0.006	0.002	NS	NS	NS	NS	NS	NS	NS
	Lead	mg/L	0.006	0.005	NS	0.005	0.002	NS	NS	NS	NS	NS	NS	NS
	Mercury	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Selenium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Silver	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Zinc	mg/L	0.016	0.014	NS	0.023	0.007	NS	NS	NS	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
11/5/2008														
	Aluminum	mg/L	16	6.9	NS	2.2	2.3	NS	NS	NS	NS	NS	NS	NS
	Arsenic	mg/L	0.024	0.007	NS	< 0.001	0.003	NS	NS	NS	NS	NS	NS	NS
	Barium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Cadmium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Chromium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Copper	mg/L	0.033	0.023	NS	0.012	0.013	NS	NS	NS	NS	NS	NS	NS
	Lead	mg/L	0.013	0.007	NS	0.002	0.002	NS	NS	NS	NS	NS	NS	NS
	Mercury	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Selenium	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Silver	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Zinc	mg/L	0.045	0.025	NS	0.018	0.014	NS	NS	NS	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
2/20/2009														
Dissolved	Aluminum	mg/L	< 0.05	< 0.05	NS	NT	< 0.05	NS	NS	NS	NS	NS	NS	NS
	Arsenic	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Barium	mg/L	0.004	0.002	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Cadmium	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Chromium	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Copper	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Lead	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Mercury	mg/L	< 0.0001	< 0.0001	NS	NT	< 0.0001	NS	NS	NS	NS	NS	NS	NS
	Selenium	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Silver	mg/L	< 0.001	< 0.001	NS	NT	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Zinc	mg/L	0.02	0.006	NS	NT	0.008	NS	NS	NS	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS

WOLFEBORO, NH WWTF
WHITTEN RIB SITE MONITORING WELL SAMPLING DATA
RIB PERMIT MONITORING WELL SUMMARY TABLE
Metals Summary Table
Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/13/2009														
	Aluminum	mg/L	2.9	1.9	1.1	0.07	3.4	NS	1.7	NT	NS	NS	NS	NS
	Arsenic	mg/L	0.004	0.001	0.001	< 0.001	0.004	NS	0.002	< 0.001	NS	NS	NS	NS
	Barium	mg/L	NT	NT	NT	NT	NT	NS	NT	NT	NS	NS	NS	NS
	Cadmium	mg/L	NT	NT	NT	NT	NT	NS	NT	NT	NS	NS	NS	NS
	Chromium	mg/L	NT	NT	NT	NT	NT	NS	NT	NT	NS	NS	NS	NS
	Copper	mg/L	0.002	0.002	0.006	< 0.001	0.002	NS	0.007	NT	NS	NS	NS	NS
	Lead	mg/L	0.002	0.001	0.001	< 0.001	0.002	NS	< 0.001	NT	NS	NS	NS	NS
	Mercury	mg/L	NT	NT	NT	NT	NT	NS	NT	NT	NS	NS	NS	NS
	Selenium	mg/L	NT	NT	NT	NT	NT	NS	NT	NT	NS	NS	NS	NS
	Silver	mg/L	NT	NT	NT	NT	NT	NS	NT	NT	NS	NS	NS	NS
	Zinc	mg/L	0.009	0.005	0.006	< 0.005	0.011	NS	0.007	NT	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NT	NT	NT	NS	NT	0.12	NS	NS	NS	NS
8/12/2009														
	Aluminum	mg/L	0.19	0.14	1.0	0.83	0.42	NS	0.96	NS	NS	NS	NS	NS
	Arsenic	mg/L	< 0.001	< 0.001	0.001	0.001	0.001	NS	0.002	NS	NS	NS	NS	NS
	Barium	mg/L	NT	NT	NT	NT	NT	NS	NT	NS	NS	NS	NS	NS
	Cadmium	mg/L	NT	NT	NT	NT	NT	NS	NT	NS	NS	NS	NS	NS
	Chromium	mg/L	NT	NT	NT	NT	NT	NS	NT	NS	NS	NS	NS	NS
	Copper	mg/L	< 0.001	< 0.001	0.004	0.002	< 0.001	NS	0.006	NS	NS	NS	NS	NS
	Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	NS	< 0.001	NS	NS	NS	NS	NS
	Mercury	mg/L	NT	NT	NT	NT	NT	NS	NT	NS	NS	NS	NS	NS
	Selenium	mg/L	NT	NT	NT	NT	NT	NS	NT	NS	NS	NS	NS	NS
	Silver	mg/L	NT	NT	NT	NT	NT	NS	NT	NS	NS	NS	NS	NS
	Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	NS	0.011	NS	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NT	NT	NT	NS	NT	NS	NS	NS	NS	NS
11/18/2009														
	Aluminum	mg/L	0.22	0.24	0.42	0.37	0.6	NS	NS	NS	NS	NS	NS	NS
	Arsenic	mg/L	< 0.001	< 0.001	0.001	< 0.001	0.001	NS	NS	NS	NS	NS	NS	NS
	Barium	mg/L	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Cadmium	mg/L	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Chromium	mg/L	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Copper	mg/L	< 0.001	< 0.001	0.005	0.001	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Lead	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	NS	NS	NS	NS	NS	NS	NS
	Mercury	mg/L	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Selenium	mg/L	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Silver	mg/L	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Zinc	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	NS	NS	NS	NS	NS	NS	NS
	Iron*	mg/L	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS	NS

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WHITTEN RIB SITE MONITORING WELL SAMPLING DATA
RIB PERMIT MONITORING WELL SUMMARY TABLE
Metals Summary Table
Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/4/2010														
	Aluminum	mg/L	3	0.62	0.12	0.32	3.1	NS	0.12	0.06	0.16	23	0.26	3.9
	Arsenic	mg/L	0	< 0.001	< 0.001	< 0.001	0.003	NS	< 0.001	< 0.001	< 0.001	0.022	< 0.001	0.005
	Barium	mg/L	0	0.058	NT	NT	0.030	NS	0.022	NT	0.004	0.085	0.021	0.084
	Cadmium	mg/L	< 0.001	< 0.001	NT	NT	< 0.001	NS	< 0.001	NT	< 0.001	< 0.001	< 0.001	< 0.001
	Chromium	mg/L	0	< 0.001	NT	NT	0.002	NS	0.001	NT	< 0.001	0.081	< 0.001	0.005
	Copper	mg/L	0	< 0.001	0.001	0.004	0.001	NS	0.002	0.006	< 0.001	0.015	0.002	0.003
	Lead	mg/L	0	< 0.001	< 0.001	< 0.001	0.001	NS	< 0.001	< 0.001	< 0.001	0.015	< 0.001	0.004
	Mercury	mg/L	< 0.0001	< 0.0001	NT	NT	< 0.0001	NS	< 0.0001	NT	< 0.0001	< 0.0001	< 0.0001	< 0.0001
	Selenium	mg/L	< 0.001	< 0.001	NT	NT	< 0.001	NS	< 0.001	NT	< 0.001	< 0.001	< 0.001	< 0.001
	Silver	mg/L	< 0.001	< 0.001	NT	NT	< 0.001	NS	< 0.001	NT	< 0.001	< 0.001	< 0.001	< 0.001
	Zinc	mg/L	0	< 0.005	< 0.005	< 0.005	0.006	NS	< 0.005	< 0.005	< 0.005	0.054	< 0.005	0.015
	Iron*	mg/L	NT	NT	NT	NT	NT	NT	NS	NT	NT	NT	NT	NT
10/20/2010														
	Aluminum	mg/L	1.1	0.27	4.1	2	6	NS	13	0.99	NS	NS	NS	NS
	Arsenic	mg/L	0.002	< 0.001	0.005	0.002	0.006	NS	0.016	0.001	NS	NS	NS	NS
	Copper	mg/L	0.002	< 0.001	0.008	0.004	0.005	NS	0.023	0.008	NS	NS	NS	NS
	Lead	mg/L	0.001	< 0.001	0.003	0.001	0.005	NS	0.008	< 0.001	NS	NS	NS	NS
	Zinc	mg/L	0.006	< 0.005	0.013	0.007	0.019	NS	0.047	0.005	NS	NS	NS	NS

Note: Al, As, Cu, Pb & Zn included with semi-annual monitoring at RIB MWs; Drinking water metals required in Fall 2007 and Spring 2010.
Note: MW-6 and 16 typically dry and could not be sampled
Note: All metals sampled as total, except as marked
* MW-15/16 were sampled on 1/2/08
** MW-15 was sampled on 5/15/08

WOLFEBORO, NH WWTF

WHITTEN RIB SITE MONITORING WELL SAMPLING DATA

RIB PERMIT MONITORING WELL SUMMARY TABLE

Conventional Parameter Summary Table

Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-7	MW-8	MW-14	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
12/21/2007*																
	Chloride	mg/L	1	1	NS	NS	2	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	Nitrate-N	mg/L	1.2	< 0.5	NS	NS	< 0.5	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	NS	NS	< 0.05	NS	< 0.05	NS	NS	NS	NS	NS	NS	NS
	TKN	mg/L	0.5	0.6	NS	NS	< 0.5	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Total Nitrogen	mg/L	1.7†	0.6†	NS	NS	< 0.5†	NS	< 0.5†	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	0.56	2	NS	NS	0.43	NS	0.45	NS	NS	NS	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	< 0.05	< 0.05	NS	NS	< 0.05	NS	< 0.05	NS	NS	NS	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	NS	NS	< 6	NS	< 6	NS	NS	NS	NS	NS	NS	NS
	pH	SU	5.3	6.1	NS	NS	6.3	NS	6.2	NS	NS	NS	NS	NS	NS	NS
	SpecificáConductance	uS	48	24	NS	NS	39	NS	41	NS	NS	NS	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	NS	NS	< 1	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	BOD		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	TOC		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
1/17/2008**																
	Chloride	mg/L	1	1	NS	NS	1	3	2	2	NS	NS	NS	NS	NS	NS
	Nitrate-N	mg/L	< 0.5	< 0.5	NS	NS	< 0.5	< 0.5	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	NS	NS	< 0.05	< 0.05	< 0.05	< 0.05	NS	NS	NS	NS	NS	NS
	TKN	mg/L	0.5	< 0.5	NS	NS	< 0.5	< 0.5	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS
	Total Nitrogen	mg/L	0.5†	< 0.5†	NS	NS	< 0.5†	< 0.5†	< 0.5†	< 0.5†	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	NT	< 0.05	NS	NS	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	1.1	0.63	NS	NS	0.8	0.2	0.7	6.3	NS	NS	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	< 0.05	< 0.05	NS	NS	< 0.05	< 0.05	< 0.05	< 0.05	NS	NS	NS	NS	NS	NS
	BOD / CBOD	mg/L	NT	N	NS	NS	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	pH	SU	5.5	6.2	NS	NS	6.3	6.6	6.4	6.9	NS	NS	NS	NS	NS	NS
	SpecificáConductance	uS	42	21	NS	NS	38	60	42	54	NS	NS	NS	NS	NS	NS
	E.coli	MPN/100ml	NT	NT	NS	NS	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NS	NS	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	BOD		NT	NT	NS	NS	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	TOC		NT	NT	NS	NS	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NS	NS	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS

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WHITTEN RIB SITE MONITORING WELL SAMPLING DATA

RIB PERMIT MONITORING WELL SUMMARY TABLE

Conventional Parameter Summary Table

Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-7	MW-8	MW-14	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/14/2008* **																
	Chloride	mg/L	1	1	2	NS	2	NS	1	1	NS	NS	NS	NS	NS	NS
	Nitrate-N	mg/L	< 0.5	< 0.5	< 0.5	NS	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	< 0.05	NS	< 0.05	NS	< 0.05	< 0.05	NS	NS	NS	NS	NS	NS
	TKN	mg/L	0.7	< 0.5	< 0.5	NS	0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS
	Total Nitrogen	mg/L	0.7†	< 0.5†	< 0.5†	NS	0.5†	NS	< 0.5†	< 0.5†	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	0.06	0.03	0.04	NS	0.04	NS	0.04	0.04	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	1.4	1.1	1.5	NS	0.52	NS	0.19	2.2	NS	NS	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	< 0.01	< 0.01	< 0.01	NS	< 0.01	NS	< 0.01	< 0.01	NS	NS	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	< 6	NS	< 6	NS	< 6	< 6	NS	NS	NS	NS	NS	NS
	pH	SU	NT	NT	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS
	SpecificáConductance	uS	NT	NT	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	< 1	NS	< 1	NS	< 1	< 1	NS	NS	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS
	BOD		NT	NT	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS
	TOC		NT	NT	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS
8/7/2008																
	Chloride	mg/L	< 1	1	NS	NS	1	NS	2	NS	NS	NS	NS	NS	NS	NS
	Nitrate-N	mg/L	0.92	< 0.05	NS	NS	0.17	NS	0.14	NS	NS	NS	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	NS	NS	< 0.05	NS	< 0.05	NS	NS	NS	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	NS	NS	< 0.5	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Total Nitrogen	mg/L	0.92†	< 0.5†	NS	NS	0.17†	NS	0.14†	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	0.02	0.01	NS	NS	0.02	NS	< 0.01	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	0.86	0.62	NS	NS	0.35	NS	0.27	NS	NS	NS	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	< 0.01	< 0.01	NS	NS	< 0.01	NS	< 0.01	NS	NS	NS	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	NS	NS	< 6	NS	< 6	NS	NS	NS	NS	NS	NS	NS
	pH	SU	NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	SpecificáConductance	uS	NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	NS	NS	< 1	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	BOD		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	TOC		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS

WOLFEBORO, NH WWTF

WHITTEN RIB SITE MONITORING WELL SAMPLING DATA

RIB PERMIT MONITORING WELL SUMMARY TABLE

Conventional Parameter Summary Table

Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-7	MW-8	MW-14	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
11/5/2008																
	Chloride	mg/L	1	< 1	NS	NS	1	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	Nitrate-N	mg/L	0.12	< 0.05	NS	NS	0.19	NS	0.19	NS	NS	NS	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	NS	NS	< 0.05	NS	< 0.05	NS	NS	NS	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	NS	NS	< 0.5	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Total Nitrogen	mg/L	0.12†	< 0.5†	NS	NS	0.19†	NS	0.19†	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	0.02	0.02	NS	NS	0.04	NS	0.04	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	0.97	1.2	NS	NS	0.16	NS	0.24	NS	NS	NS	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	0.02	0.02	NS	NS	0.04	NS	0.03	NS	NS	NS	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	NS	NS	< 6	NS	< 6	NS	NS	NS	NS	NS	NS	NS
	pH	SU	5.3	5.9	NS	NS	6	NS	5.9	NS	NS	NS	NS	NS	NS	NS
	SpecificáConductance	uS	34	26	NS	NS	41	NS	44	NS	NS	NS	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	NS	NS	80	NS	3	NS	NS	NS	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	BOD		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	TOC		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NS	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
2/20/2009																
	Chloride	mg/L	2	2	NS	NS	NS	NS	2	NS	NS	NS	NS	NS	NS	NS
	Nitrate-N	mg/L	< 0.5	< 0.5	NS	NS	NS	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Ammonia-N	mg/L	0.05	< 0.05	NS	NS	NS	NS	< 0.05	NS	NS	NS	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	NS	NS	NS	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Total Nitrogen	mg/L	< 0.5†	< 0.5†	NS	NS	NS	NS	< 0.5†	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	NA	NA	NS	NS	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	1.9	0.4	NS	NS	NS	NS	0.35	NS	NS	NS	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	< 0.01	< 0.01	NS	NS	NS	NS	< 0.01	NS	NS	NS	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	NS	NS	NS	NS	< 6	NS	NS	NS	NS	NS	NS	NS
	pH	SU	5.6	6.2	NS	NS	NS	NS	6.3	NS	NS	NS	NS	NS	NS	NS
	SpecificáConductance	uS	22	22	NS	NS	NS	NS	43	NS	NS	NS	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	NS	NS	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NS	NS	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	BOD		NT	NT	NS	NS	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	TOC		NT	NT	NS	NS	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NS	NS	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS

WOLFEBORO, NH WWTF

WHITTEN RIB SITE MONITORING WELL SAMPLING DATA

RIB PERMIT MONITORING WELL SUMMARY TABLE

Conventional Parameter Summary Table

Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-7	MW-8	MW-14	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/13/2009																
	Chloride	mg/L	1	2	100	NS	98	NS	2	NS	94	NT	NS	NS	NS	NS
	Nitrate-N	mg/L	< 0.5	< 0.5	1.2	NS	1.4	NS	< 0.5	NS	1	1.6	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	< 0.05	NS	< 0.05	NS	< 0.05	NS	< 0.05	NT	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	< 0.5	NS	< 0.5	NS	< 0.5	NS	< 0.5	0.7	NS	NS	NS	NS
	Total Nitrogen	mg/L	< 0.5†	< 0.5†	1.2†	NS	1.4†	NS	< 0.5†	NS	1†	2.3†	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	0.14	0.13	0.05	NS	0.03	NS	0.32	NS	0.07	< 0.05	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	0.2	0.2	0.11	NS	0.03	NS	0.39	NS	0.11	< 0.05	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	< 0.01	< 0.01	< 0.01	NS	< 0.01	NS	< 0.01	NS	< 0.01	NT	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	< 6	NS	< 6	NS	< 6	NS	< 6	NT	NS	NS	NS	NS
	pH	SU	5.4	5.6	6.3	NS	5.8	NS	6.2	NS	6.4	NT	NS	NS	NS	NS
	SpecificáConductance	uS	26	39	530	NS	460	NS	49	NS	510	NT	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	< 1	NS	< 1	NS	< 1	NS	< 1	NT	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		< 0.05	< 0.05	0.07	NS	< 0.05	NS	< 0.05	NS	< 0.05	NT	NS	NS	NS	NS
	BOD		< 6	< 6	< 6	NS	< 6	NS	< 6	NS	< 6	< 6	NS	NS	NS	NS
	TOC		1.8	0.6	2.3	NS	1.6	NS	< 0.5	NS	2.1	2.4	NS	NS	NS	NS
	Dissolved Organic Carbon		1.6	0.6	2.3	NS	1.8	NS	< 0.5	NS	2.5	2.6	NS	NS	NS	NS
8/12/2009																
	Chloride	mg/L	1	83	100	NS	100	NS	86	NS	98	100	NS	NS	NS	NS
	Nitrate-N	mg/L	< 0.5	< 0.5	0.8	NS	1.1	NS	0.9	NS	0.7	NT	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	< 0.05	NS	< 0.05	NS	< 0.05	NS	< 0.05	NT	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	< 0.5	NS	< 0.5	NS	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS
	Total Nitrogen	mg/L	< 0.5†	< 0.5†	0.8†	NS	1.1†	NS	0.9†	NS	0.7†	< 0.5†	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	< 0.01	< 0.01	< 0.01	NS	< 0.01	NS	< 0.01	NS	< 0.01	NT	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	< 0.01	< 0.01	0.04	NS	0.08	NS	0.06	NS	0.08	< 0.01	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	0.02	< 0.01	0.02	NS	0.06	NS	0.05	NS	0.04	NT	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	< 6	NS	< 6	NS	< 6	NS	< 6	NT	NS	NS	NS	NS
	pH	SU	NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS
	SpecificáConductance	uS	27	310	470	NS	460	NS	350	NS	460	460	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	< 1	NS	< 1	NS	< 1	NS	< 1	NT	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS
	BOD		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS
	TOC		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NS	NS	NS	NS

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WHITTEN RIB SITE MONITORING WELL SAMPLING DATA

RIB PERMIT MONITORING WELL SUMMARY TABLE

Conventional Parameter Summary Table

Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-7	MW-8	MW-14	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
11/18/2009																
	Chloride	mg/L	2	96	84	NS	90	NS	95	NS	NS	NS	NS	NS	NS	NS
	Nitrate-N	mg/L	0.13	0.71	1.9	NS	1	NS	1.6	NS	NS	NS	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	< 0.05	NS	< 0.05	NS	< 0.05	NS	NS	NS	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	< 0.5	NS	< 0.5	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Total Nitrogen	mg/L	0.13†	0.71†	1.9†	NS	1†	NS	1.6†	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (filtered)	mg/L	< 0.002	< 0.002	0.012	NS	0.008	NS	0.01	NS	NS	NS	NS	NS	NS	NS
	Total Phosphorus-P (un-filtered)	mg/L	4.7	0.024	0.063	NS	0.038	NS	0.053	NS	NS	NS	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	0.007	0.004	0.011	NS	0.009	NS	0.004	NS	NS	NS	NS	NS	NS	NS
	BOD / CBOD	mg/L	< 6	< 6	< 6	NS	< 6	NS	< 6	NS	NS	NS	NS	NS	NS	NS
	pH	SU	5.6	5.6	6.8	NS	6.2	NS	5.9	NS	NS	NS	NS	NS	NS	NS
	SpecificáConductance	uS	34	360	430	NS	390	NS	400	NS	NS	NS	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	< 1	NS	< 1	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NT	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	BOD		NT	NT	NT	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	TOC		NT	NT	NT	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NT	NS	NT	NS	NT	NS	NS	NS	NS	NS	NS	NS
2/10/2010																
	Chloride	mg/L	< 1	94	70	NS	84	NS	86	NS	NS	89	NS	NS	NS	NS
	Nitrate-N	mg/L	< 0.05	1	2	NS	2	NS	1	NS	NS	2	NS	NS	NS	NS
	Ammonia-N	mg/L	< 0.05	< 0.05	< 0.05	NS	< 0.05	NS	< 0.05	NS	NS	< 0.05	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	< 0.5	NS	1	NS	< 0.5	NS	NS	1	NS	NS	NS	NS
	Total Nitrogen	mg/L	< 0.5†	1†	2†	NS	3†	NS	1†	NS	NS	3.20	NS	NS	NS	NS
	TotaláPhosphorus-P	mg/L	0	0	0	NS	0	NS	0	NS	NS	0	NS	NS	NS	NS
	OrthoáPhosphate-P	mg/L	0	0	0	NS	0	NS	0	NS	NS	0	NS	NS	NS	NS
	CBOD	mg/L	< 6	< 6	< 6	NS	< 6	NS	< 6	NS	NS	< 6	NS	NS	NS	NS
	pH	SU	5	6	7	NS	6	NS	6	NS	NS	7	NS	NS	NS	NS
	SpecificáConductance	uS/cm	23	380	380	NS	390	NS	380	NS	NS	470	NS	NS	NS	NS
	E.coli	MPN/100ml	< 1	< 1	< 1	NS	< 1	NS	< 1	NS	NS	< 1	NS	NS	NS	NS
	TotaláPhosphorus-P (filtered)		NT	NT	NT	NS	NT	NS	NT	NS	NS	NT	NS	NS	NS	NS
	BOD		NT	NT	NT	NS	NT	NS	NT	NS	NS	NT	NS	NS	NS	NS
	TOC		NT	NT	NT	NS	NT	NS	NT	NS	NS	NT	NS	NS	NS	NS
	Dissolved Organic Carbon		NT	NT	NT	NS	NT	NS	NT	NS	NS	NT	NS	NS	NS	NS
5/4/2010																
	Chloride	mg/L	2	79	12	NS	90	NS	81	NS	40	99	< 1	1	93	94
	Nitrate/Nitrite-N	mg/L	< 0.05	1.2	0.27	NS	1.9	NS	1.6	NS	0.87	1.4	< 0.05	< 0.05	1.7	1.5
	Ammonia-N	mg/L	0.07	< 0.05	0.05	NS	< 0.05	NS	0.05	NS	0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05
	TKN	mg/L	< 0.5	< 0.5	< 0.5	NS	0.5	NS	< 0.5	NS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	Total Nitrogen	mg/L	< 0.5	1.2	< 0.5	NS	2.4	NS	1.6	NS	0.9	1.4	< 0.5	< 0.5	1.7	1.5
	TotaláPhosphorus-P	mg/L	0.28	0.11	0.02	NS	0.024	NS	0.69	NS	0.010	0.03	0.007	1.4	0.02	0.30
	OrthoáPhosphate-P	mg/L	0.007	0.016	0.016	NS	0.022	NS	0.014	NS	0.009	0.019	0.004	0.004	0.016	0.014
	CBOD	mg/L	< 6	< 6	< 6	NS	< 6	NS	< 6	NS	< 6	< 6	< 6	< 6	< 6	< 6
	pH	SU	5.4	5.5	6.8	NS	6.6	NS	5.9	NS	6.7	6.8	5.8	6.1	6.4	6.1
	SpecificáConductance	uS/cm	24	360	130	NS	480	NS	380	NS	230	510	29	33	430	400
	E.coli	MPN/100ml	< 1	< 1	< 1	NS	< 1	NS	< 1	NS	< 1	< 1	< 1	< 1	< 1	< 1
	TotaláPhosphorus-P (filtered)		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NT	NT	NT	NT
	BOD		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NT	NT	NT	NT
	TOC		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NT	NT	NT	NT
	Dissolved Organic Carbon		NT	NT	NT	NS	NT	NS	NT	NS	NT	NT	NT	NT	NT	NT

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RIB PERMIT MONITORING WELL SUMMARY TABLE

Conventional Parameter Summary Table

Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-7	MW-8	MW-14	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
8/11/2010 -	Chloride	mg/L	< 1	90	87	< 1	91	NS	97	NS	97	89	< 1	1	96	80
8/12/2010	Nitrate/Nitrite-N	mg/L	< 0.5	1.4	1.1	< 0.5	1.3	NS	2	NS	0.5	< 0.5	< 0.05	0.16	0.44	0.65
	Ammonia-N	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	NS	0.05	NS	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05
	TKN	mg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NS	< 0.5	NS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
	Total Nitrogen	mg/L	< 0.5	1.4	1.1	< 0.5	1.3	NS	2	NS	0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.7
	TotaláPhosphorus-P	mg/L	0.26	0.031	0.026	0.14	0.013	NS	0.011	NS	0.067	0.06	0.016	0.68	0.031	0.2
	OrthoáPhosphate-P	mg/L	< 0.01	< 0.01	0.01	< 0.01	< 0.01	NS	< 0.01	NS	0.01	0.06	< 0.01	< 0.01	0.01	< 0.01
	CBOD	mg/L	< 6	< 6	< 6	< 6	< 6	NS	< 6	NS	< 6	< 6	< 6	< 6	< 6	< 6
	pH	SU	6	5.9	7	6	6.9	NS	6.2	NS	6.9	6.9	5.7	5.9	6.3	6.2
	SpecificáConductance	uS/cm	32	390	460	28	470	NS	430	NS	450	460	34	26	330	310
	E.coli	MPN/100ml	< 1	< 1	< 1	< 1	< 1	NS	< 1	NS	3.1	< 1	< 1	< 1	< 1	< 1
10/20/2010	Chloride	mg/L	1	92	80	NS	86	NS	89	NS	82	77	NS	NS	NS	NS
	Nitrate/Nitrite-N	mg/L	0.51	0.27	1	< 0.05	1	NS	1.1	NS	0.96	1.9	0.05	0.07	0.19	0.16
	Ammonia-N	mg/L	0.05	< 0.05	< 0.05	NS	< 0.05	NS	< 0.05	NS	< 0.05	< 0.05	NS	NS	NS	NS
	TKN	mg/L	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NS	0.7	NS	< 0.5	< 0.5	< 0.5	< 0.5	0.7	< 0.5
	Total Nitrogen	mg/L	0.51	0.27	1	< 0.5	1	NS	1.8	NS	0.96	1.9	< 0.5	< 0.5	0.9	< 0.5
	TotaláPhosphorus-P	mg/L	0.22	0.023	0.19	0.1	0.097	NS	1.6	NS	0.75	0.046	0.13	0.43	0.32	0.24
	OrthoáPhosphate-P	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	NS	< 0.01	NS	< 0.01	0.01	< 0.01	< 0.01	0.02	< 0.01
	CBOD	mg/L	< 6	< 6	< 6	NS	< 6	NS	< 6	NS	< 6	< 6	NS	NS	NS	NS
	pH	SU	5.4	5.7	6.6	5.5	6.6	NS	6	NS	6.7	6.9	5.6	5.6	6.3	6.2
	SpecificáConductance	uS/cm	42	430	420	27	450	NS	440	NS	450	470	24	220	350	340
	E.coli	MPN/100ml	< 1	< 1	< 1	NS	< 1	NS	3.1	NS	< 1	< 1	NS	NS	NS	NS

Note: MW-6 and 16 typically dry and could not be sampled

* MW-15 1/02/08

**MW-14,15 1/23/08

***MW-15,16 5/15/08

† Total Nitrogen is calculated from Nitrate-N and TKN

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RIB PERMIT MONITORING WELL SUMMARY TABLE
VOC Summary Table - Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
12/21/2007**	***THM Analyses***													
	Chloroform	ug/l	< 0.5	< 0.5	NS	0.6	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 0.5	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 0.5	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	104 %R	106 %R	NS	118 %R	99 %R	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	117 %R	119 %R	NS	116 %R	99 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	Volatile Organic Compounds (EPA 8260)													
	Dichlorodifluoromethane	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Chloromethane	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Vinyl chloride	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromomethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Chloroethane	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Trichlorofluoromethane	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Diethyl Ether	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Acetone	ug/l	< 10	< 10	NS	NT	< 10	NS	NS	NS	NS	NS	NS	NS
	1,1-Dichloroethene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	tert-Butyl Alcohol (TBA)	ug/l	< 30	< 30	NS	NT	< 30	NS	NS	NS	NS	NS	NS	NS
	Methylene chloride	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Carbon disulfide	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Methyl-t-butyl ether(MTBE)	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Ethyl-t-butyl ether(ETBE)	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	Isopropyl ether(DIPE)	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	tert-amyl methyl ether(TAME)	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	trans-1,2-Dichloroethene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1-Dichloroethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	2,2-Dichloropropane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	cis-1,2-Dichloroethene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	2-Butanone(MEK)	ug/l	< 10	< 10	NS	NT	< 10	NS	NS	NS	NS	NS	NS	NS
	Bromochloromethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Tetrahydrofuran(THF)	ug/l	< 10	< 10	NS	NT	< 10	NS	NS	NS	NS	NS	NS	NS
	Chloroform	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1,1-Trichloroethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Carbon tetrachloride	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1-Dichloropropene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS

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12/21/2007	***Volatile Organic Compounds (EPA 8260)***													
	Benzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichloroethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Trichloroethene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichloropropane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Dibromomethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	4-Methyl-2-pentanone(MIBK)	ug/l	< 10	< 10	NS	NT	< 10	NS	NS	NS	NS	NS	NS	NS
	cis-1,3-Dichloropropene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Toluene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	trans-1,3-Dichloropropene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1,2-Trichloroethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	2-Hexanone	ug/l	< 10	< 10	NS	NT	< 10	NS	NS	NS	NS	NS	NS	NS
	Tetrachloroethene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,3-Dichloropropane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,2-Dibromoethane(EDB)	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Chlorobenzene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1,1,2-Tetrachloroethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	Ethylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	mp-Xylene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	o-Xylene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	Styrene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	IsoPropylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	Bromobenzene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1,2,2-Tetrachloroethane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,2,3-Trichloropropane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	n-Propylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	2-Chlorotoluene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	4-Chlorotoluene	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,3,5-Trimethylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	tert-Butylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2,4-Trimethylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	sec-Butylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	1,3-Dichlorobenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	p-Isopropyltoluene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	1,4-Dichlorobenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	n-Butylbenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2-Dibromo-3-chloropropane	ug/l	< 2	< 2	NS	NT	< 2	NS	NS	NS	NS	NS	NS	NS
	1,3,5-Trichlorobenzene	ug/l	NA	NA	NS	NA	NA	NS	NS	NS	NS	NS	NS	NS
	1,2,4-Trichlorobenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	Hexachlorobutadiene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	Naphthalene	ug/l	< 5	< 5	NS	NT	< 5	NS	NS	NS	NS	NS	NS	NS
	1,2,3-Trichlorobenzene	ug/l	< 1	< 1	NS	NT	< 1	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	104 %R	106 %R	NS	NA	97 %R	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	117 %R	119 %R	NS	NA	101 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS

WOLFEBORO, NH WWTF
WHITTEN RIB SITE MONITORING WELL SAMPLING DATA
RIB PERMIT MONITORING WELL SUMMARY TABLE
VOC Summary Table - Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/14/2008***	***THM Analyses***													
	Chloroform	ug/l	< 2	< 2	< 2	< 2	< 2	< 2	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	< 2	< 2	< 2	< 2	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	< 2	< 2	< 2	< 2	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	95 %R	96 %R	95 %R	95 %R	97 %R	96 %R	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	110 %R	111 %R	108 %R	110 %R	110 %R	110 %R	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NT	NT	NT	NT	NT	NT	NS	NS	NS	NS	NS	NS
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	< 1	< 1	< 1	< 1	< 1	< 1	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	95 %R	101 %R	102 %R	104 %R	103 %R	105 %R	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	103 %R	102 %R	99 %R	100 %R	108 %R	101 %R	NS	NS	NS	NS	NS	NS
8/7/2008	***THM Analyses***													
	Chloroform	ug/l	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	98 %R	95 %R	NS	96 %R	98 %R	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	103 %R	105 %R	NS	102 %R	102 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	< 1	< 1	NS	< 1	< 1	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	101 %R	101 %R	NS	102 %R	101 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	83 %R	84 %R	NS	84 %R	85 %R	NS	NS	NS	NS	NS	NS	NS
11/5/2008	***THM Analyses***													
	Chloroform	ug/l	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	89 %R	92 %R	NS	90 %R	91 %R	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	103 %R	106 %R	NS	107 %R	105 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NT	NT	NS	NT	NT	NS	NS	NS	NS	NS	NS	NS
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	< 1	< 1	NS	< 1	< 1	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	92 %R	92 %R	NS	92 %R	91 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	89 %R	89 %R	NS	88 %R	88 %R	NS	NS	NS	NS	NS	NS	NS
2/20/2009	***THM Analyses***													
	Chloroform	ug/l	NT	NT	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	NT	NT	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	NT	NT	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	NT	NT	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	NA	NA	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	NA	NA	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NA	NA	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	NT	NT	NS	NS	NT	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	NA	NA	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	NA	NA	NS	NS	NA	NS	NS	NS	NS	NS	NS	NS

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WHITTEN RIB SITE MONITORING WELL SAMPLING DATA
RIB PERMIT MONITORING WELL SUMMARY TABLE
VOC Summary Table - Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
2/20/2009	***Volatile Organic Compounds (EPA 8260)***													
	Dichlorodifluoromethane	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Chloromethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Vinyl chloride	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromomethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Chloroethane	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Trichlorofluoromethane	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Diethyl Ether	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Acetone	ug/l	< 10	< 10	NS	NS	< 10	NS	NS	NS	NS	NS	NS	NS
	1,1-Dichloroethene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	tert-Butyl Alcohol (TBA)	ug/l	< 30	< 30	NS	NS	< 30	NS	NS	NS	NS	NS	NS	NS
	Methylene chloride	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Carbon disulfide	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Methyl-t-butyl ether(MTBE)	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Ethyl-t-butyl ether(ETBE)	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	Isopropyl ether(DIPE)	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	tert-amyl methyl ether(TAME)	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	trans-1,2-Dichloroethene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1-Dichloroethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	2,2-Dichloropropane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	cis-1,2-Dichloroethene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	2-Butanone(MEK)	ug/l	< 10	< 10	NS	NS	< 10	NS	NS	NS	NS	NS	NS	NS
	Bromochloromethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Tetrahydrofuran(THF)	ug/l	< 10	< 10	NS	NS	< 10	NS	NS	NS	NS	NS	NS	NS
	Chloroform	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1,1-Trichloroethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Carbon tetrachloride	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1-Dichloropropene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Benzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichloroethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Trichloroethene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichloropropane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Dibromomethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	NS	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	4-Methyl-2-pentanone(MIBK)	ug/l	< 10	< 10	NS	NS	< 10	NS	NS	NS	NS	NS	NS	NS
	cis-1,3-Dichloropropene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Toluene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	trans-1,3-Dichloropropene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1,2-Trichloroethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	2-Hexanone	ug/l	< 10	< 10	NS	NS	< 10	NS	NS	NS	NS	NS	NS	NS
	Tetrachloroethene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,3-Dichloropropane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,2-Dibromoethane(EDB)	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Chlorobenzene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS

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RIB PERMIT MONITORING WELL SUMMARY TABLE
VOC Summary Table - Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
2/20/2009	***Volatile Organic Compounds (EPA 8260)***													
	1,1,1,2-Tetrachloroethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	Ethylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	mp-Xylene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	o-Xylene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	Styrene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	IsoPropylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	Bromobenzene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,1,2,2-Tetrachloroethane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,2,3-Trichloropropane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	n-Propylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	2-Chlorotoluene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	4-Chlorotoluene	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,3,5-Trimethylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	tert-Butylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2,4-Trimethylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	sec-Butylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	1,3-Dichlorobenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	p-Isopropyltoluene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	1,4-Dichlorobenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	n-Butylbenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2-Dibromo-3-chloropropane	ug/l	< 2	< 2	NS	NS	< 2	NS	NS	NS	NS	NS	NS	NS
	1,3,5-Trichlorobenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	1,2,4-Trichlorobenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	Hexachlorobutadiene	ug/l	< 0.5	< 0.5	NS	NS	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Naphthalene	ug/l	< 5	< 5	NS	NS	< 5	NS	NS	NS	NS	NS	NS	NS
	1,2,3-Trichlorobenzene	ug/l	< 1	< 1	NS	NS	< 1	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	96 %R	98 %R	NS	NS	96 %R	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	103 %R	102 %R	NS	NS	101 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	98 %R	98 %R	NS	NS	98 %R	NS	NS	NS	NS	NS	NS	NS

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	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/13/2009	***THM Analyses***													
	Chloroform	ug/l	< 2	< 2	< 2	< 2	< 2	NS	< 2	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NS	< 0.5	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	< 2	< 2	< 2	NS	< 2	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	< 2	< 2	< 2	NS	< 2	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	94 %R	96 %R	94 %R	95 %R	93 %R	NS	93 %R	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	103 %R	105 %R	101 %R	105 %R	102 %R	NS	101 %R	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	98 %R	97 %R	97 %R	97 %R	94 %R	NS	95 %R	NS	NS	NS	NS	NS
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	< 1	< 1	< 1	< 1	< 1	NS	< 1	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	123 %R	122 %R	123 %R	122 %R	104 %R	NS	104 %R	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	108 %R	111 %R	109 %R	109 %R	100 %R	NS	100 %R	NS	NS	NS	NS	NS
11/18/2009	***THM Analyses***													
	Chloroform	ug/l	< 2	< 2	< 2	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NS	NS	NS	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	< 2	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	< 2	< 2	< 2	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	95 %R	99 %R	104 %R	100 %R	100 %R	NS	NS	NS	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	95 %R	98 %R	100 %R	100 %R	99 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)		108 %R	97 %R	102 %R	100 %R	96 %R	NS	NS	NS	NS	NS	NS	NS
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	< 1	< 1	< 1	< 1	< 1	NS	NS	NS	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	116 %R	117 %R	116 %R	115 %R	118 %R	NS	NS	NS	NS	NS	NS	NS
	Toluene-d8 (surr)	%	108 %R	108 %R	107 %R	107 %R	108 %R	NS	NS	NS	NS	NS	NS	NS
5/4/2010	***THM Analyses***													
	Chloroform	ug/l	NT	NT	< 2	< 2	NT	NS	NT	< 2	NT	NT	NT	NT
	Bromodichloromethane	ug/l	NT	NT	< 0.5	< 0.5	NT	NS	NT	< 0.5	NT	NT	NT	NT
	Dibromochloromethane	ug/l	NT	NT	< 2	< 2	NT	NS	NT	< 2	NT	NT	NT	NT
	Bromoform	ug/l	NT	NT	< 2	< 2	NT	NS	NT	< 2	NT	NT	NT	NT
	4-Bromofluorobenzene (surr)	%	NT	NT	92 %R	92 %R	NT	NS	NT	88 %R	NT	NT	NT	NT
	1,2-Dichlorobenzene-d4 (surr)	%	NT	NT	102 %R	110 %R	NT	NS	NT	106 %R	NT	NT	NT	NT
	Toluene-d8 (surr)	%	NT	NT	105 %R	102 %R	NT	NS	NT	105 %R	NT	NT	NT	NT
	1,4-Dioxane/VOCs													
	1,4-Dioxane	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	4-Bromofluorobenzene (surr)	%	86 %R	84 %R	NT	NT	87 %R	NS	88 %R	NT	91 %R	90 %R	92 %R	91 %R
	Toluene-d8 (surr)	%	95 %R	95 %R	NT	NT	94 %R	NS	97 %R	NT	97 %R	96 %R	97 %R	97 %R

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	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/4/2010	***Volatile Organic Compounds (EPA 8260)***													
	Dichlorodifluoromethane	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Chloromethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Vinyl chloride	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Bromomethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Chloroethane	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Trichlorofluoromethane	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Diethyl Ether	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Acetone	ug/l	< 10	< 10	NT	NT	< 10	NS	< 10	NT	< 10	< 10	< 10	< 10
	1,1-Dichloroethene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	tert-Butyl Alcohol (TBA)	ug/l	< 30	< 30	NT	NT	< 30	NS	< 30	NT	< 30	< 30	< 30	< 30
	Methylene chloride	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Carbon disulfide	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Methyl-t-butyl ether(MTBE)	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Ethyl-t-butyl ether(ETBE)	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	Isopropyl ether(DIPE)	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	tert-amyl methyl ether(TAME)	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	trans-1,2-Dichloroethene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,1-Dichloroethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	2,2-Dichloropropane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	cis-1,2-Dichloroethene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	2-Butanone(MEK)	ug/l	< 10	< 10	NT	NT	< 10	NS	< 10	NT	< 10	< 10	< 10	< 10
	Bromochloromethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Tetrahydrofuran(THF)	ug/l	< 10	< 10	NT	NT	< 10	NS	< 10	NT	< 10	< 10	< 10	< 10
	Chloroform	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,1,1-Trichloroethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Carbon tetrachloride	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,1-Dichloropropene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Benzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	1,2-Dichloroethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Trichloroethene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,2-Dichloropropane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Dibromomethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Bromodichloromethane	ug/l	< 0.5	< 0.5	NT	NT	< 0.5	NS	< 0.5	NT	< 0.5	< 0.5	< 0.5	< 0.5
	4-Methyl-2-pentanone(MIBK)	ug/l	< 10	< 10	NT	NT	< 10	NS	< 10	NT	< 10	< 10	< 10	< 10
	cis-1,3-Dichloropropene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Toluene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	trans-1,3-Dichloropropene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,1,2-Trichloroethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	2-Hexanone	ug/l	< 10	< 10	NT	NT	< 10	NS	< 10	NT	< 10	< 10	< 10	< 10
	Tetrachloroethene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2

WOLFEBORO, NH WWTF
WHITTEN RIB SITE MONITORING WELL SAMPLING DATA
RIB PERMIT MONITORING WELL SUMMARY TABLE
VOC Summary Table - Background Testing Through October 2010 (RIB Discharge Initiated in March 2009)

	PARAMETER NAME	UNITS	MW-1	MW-2	MW-6	MW-8	MW-15	MW-16	MW-16B	MW-19	MW-22	MW-23	MW-24	MW-25
5/4/2010	***Volatile Organic Compounds (EPA 8260)***													
	1,3-Dichloropropane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Dibromochloromethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,2-Dibromoethane(EDB)	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Chlorobenzene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,1,1,2-Tetrachloroethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	Ethylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	mp-Xylene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	o-Xylene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	Styrene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	Bromoform	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	IsoPropylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	Bromobenzene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,1,2,2-Tetrachloroethane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,2,3-Trichloropropane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	n-Propylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	2-Chlorotoluene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	4-Chlorotoluene	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,3,5-Trimethylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	tert-Butylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	1,2,4-Trimethylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	sec-Butylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	1,3-Dichlorobenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	p-Isopropyltoluene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	1,4-Dichlorobenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	1,2-Dichlorobenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	n-Butylbenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	1,2-Dibromo-3-chloropropane	ug/l	< 2	< 2	NT	NT	< 2	NS	< 2	NT	< 2	< 2	< 2	< 2
	1,3,5-Trichlorobenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	1,2,4-Trichlorobenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	Hexachlorobutadiene	ug/l	< 0.5	< 0.5	NT	NT	< 0.5	NS	< 0.5	NT	< 0.5	< 0.5	< 0.5	< 0.5
	Naphthalene	ug/l	< 5	< 5	NT	NT	< 5	NS	< 5	NT	< 5	< 5	< 5	< 5
	1,2,3-Trichlorobenzene	ug/l	< 1	< 1	NT	NT	< 1	NS	< 1	NT	< 1	< 1	< 1	< 1
	4-Bromofluorobenzene (surr)	%	93 %R	93 %R	NT	NT	92 %R	NS	91 %R	NT	90 %R	94 %R	91 %R	90 %R
	1,2-Dichlorobenzene-d4 (surr)	%	106 %R	104 %R	NT	NT	106 %R	NS	103 %R	NT	107 %R	106 %R	106 %R	108 %R
	Toluene-d8 (surr)	%	103 %R	107 %R	NT	NT	103 %R	NS	102 %R	NT	104 %R	106 %R	102 %R	102 %R
10/20/2010	***THM Analyses***													
	Chloroform	ug/l	< 2	< 2	< 2	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS
	Bromodichloromethane	ug/l	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NS	< 0.5	< 0.5	NS	NS	NS	NS
	Dibromochloromethane	ug/l	< 2	< 2	< 2	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS
	Bromoform	ug/l	< 2	< 2	< 2	< 2	< 2	NS	< 2	< 2	NS	NS	NS	NS
	Total Trihalomethanes	ug/l	< 6.5	< 6.5	< 6.5	< 6.5	< 6.5	NS	< 6.5	< 6.5	NS	NS	NS	NS
	4-Bromofluorobenzene (surr)	%	92 %R	92 %R	92 %R	91 %R	92 %R	NS	92 %R	91 %R	NS	NS	NS	NS
	1,2-Dichlorobenzene-d4 (surr)	%	101 %R	101 %R	103 %R	103 %R	103 %R	NS	102 %R	103 %R	NS	NS	NS	NS
	Toluene-d8 (surr)	%	98 %R	97 %R	98 %R	96 %R	97 %R	NS	97 %R	97 %R	NS	NS	NS	NS

Notes: MW's-6 and 16 were dry and could not be sampled during Round 1, 3 & 4
MW-16 was found to be damaged and replaced with 16B prior to the May 2009 sampling
** MW-15/16 were sampled on 1/2/08
*** MW-15 was sampled on 5/15/08

Appendix H

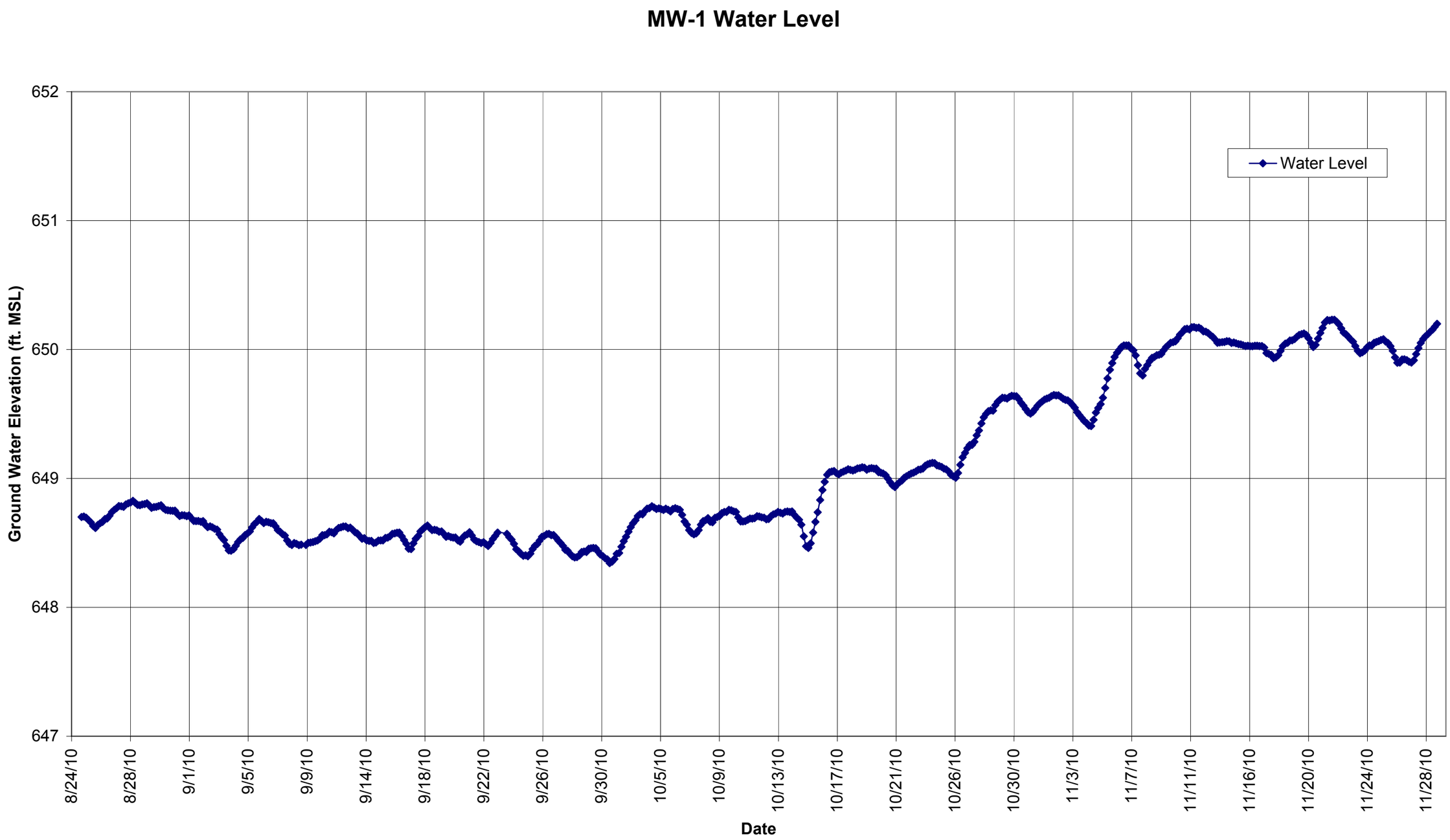
Piezometer Data

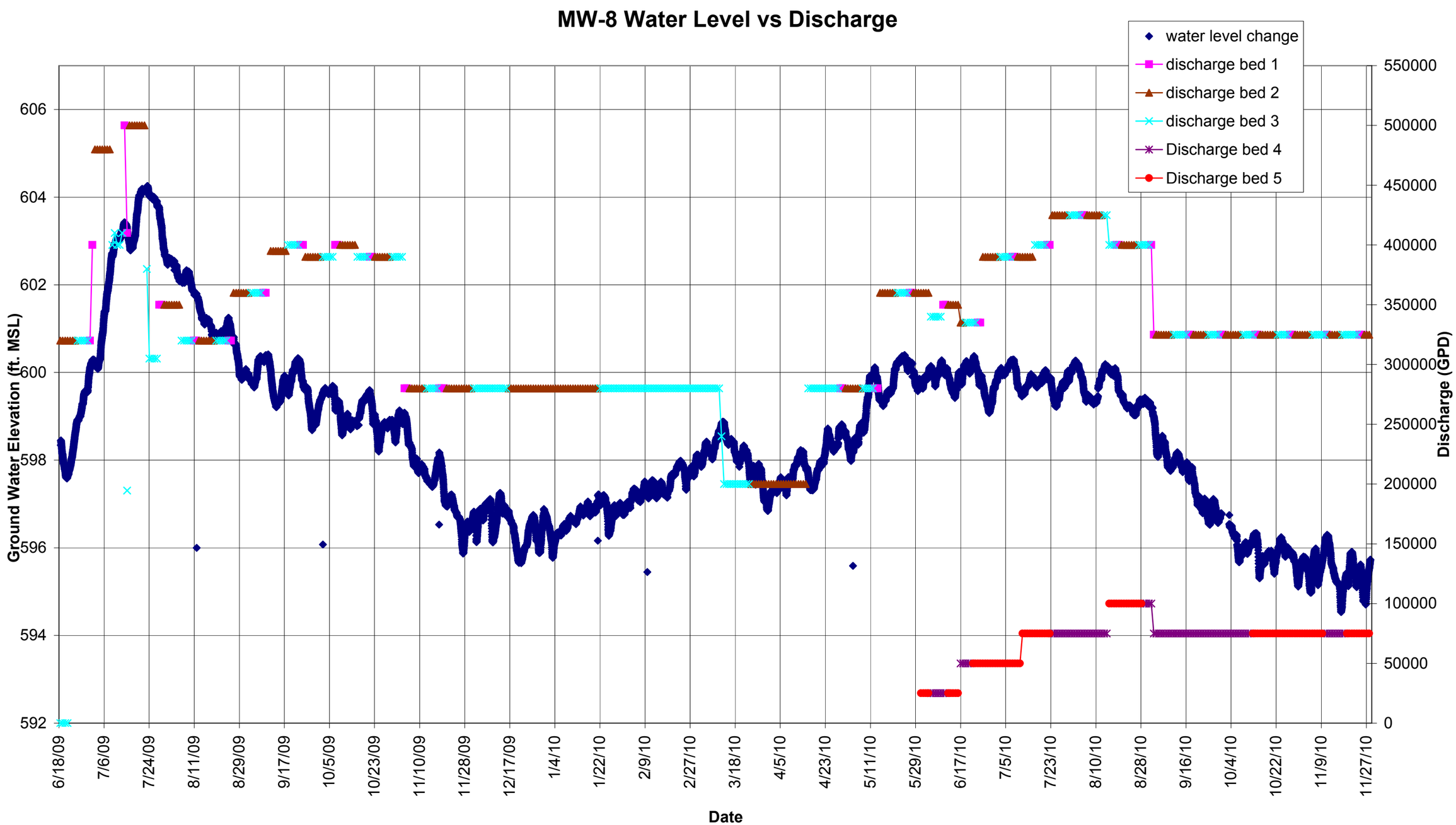
Piezometer Water Quality Data

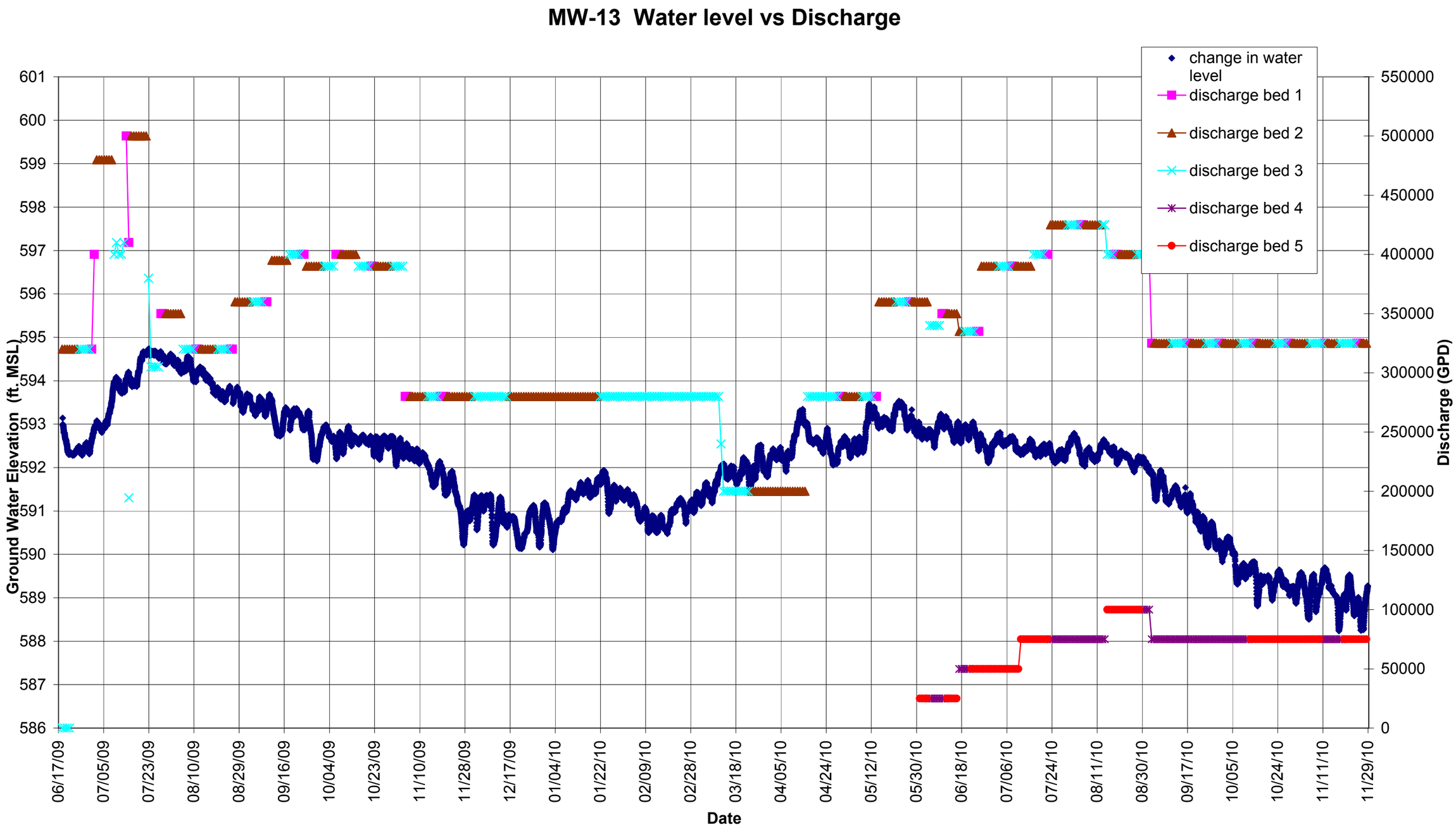
		Chloride	Nitrate/ Nitrite-N	TKN	Total Nitrogen	Total Phosphorus-P	Total Phosphorus-P (dissolved)	Ortho-Phosphate-P	Specific Conductance
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	uS/cm
11/17/2009	PZ-1	1.000	0.070	0.230	0.300	0.052	0.006	NS	44.000
	PZ-2	84.000	0.110	0.560	0.670	0.220	0.008	NS	300.000
	PZ-3	91.000	0.100	0.150	0.250	0.027	0.018	NS	360.000
	PZ-4	37.000	0.080	0.390	0.470	0.023	0.005	NS	150.000
	PZ-5	6.000	0.100	0.120	0.220	0.054	0.003	NS	59.000
	PZ-6	11.000	0.090	0.560	0.650	0.052	0.004	NS	110.000
8/12/2010	PZ-1	8	< 0.05	< 0.5	< 0.5	0.005	NS	< 0.01	56
	PZ-2	84	< 0.05	< 0.5	< 0.5	0.13	NS	< 0.01	330
	PZ-3	69	< 0.05	< 0.5	< 0.5	0.01	NS	< 0.01	300
	PZ-4	41	< 0.05	1	1	0.075	NS	< 0.01	180
	PZ-5	69	< 0.05	< 0.5	< 0.5	0.024	NS	< 0.01	230
	PZ-6	NS	NS	NS	NS	NS	NS	NS	NS
10/21/2010	PZ-1	21	< 0.05	< 0.5	< 0.5	0.075	NS	< 0.01	110
	PZ-2	88	< 0.05	< 0.5	< 0.5	0.072	NS	< 0.01	360
	PZ-3	80	0.06	1.1	1.2	0.029	NS	< 0.01	310
	PZ-4	70	< 0.05	0.9	0.9	0.15	NS	< 0.01	260
	PZ-5	74	< 0.05	< 0.5	< 0.5	0.02	NS	< 0.01	270
	PZ-6	NS	NS	NS	NS	NS	NS	NS	NS

Appendix I

Groundwater Levels


MW-1 Water Level
Water Level
Ground Water Elevation (ft. MSL)
652
651
650
649
648
647
8/24/10
8/28/10
9/1/10
9/5/10
9/9/10
9/14/10
9/18/10
9/22/10
9/26/10
9/30/10
10/5/10
10/9/10
10/13/10
10/17/10
10/21/10
10/26/10
10/30/10
11/3/10
11/7/10
11/11/10
11/16/10
11/20/10
11/24/10
11/28/10
Date


MW-8 Water Level vs Discharge
water level change
discharge bed 1
discharge bed 2
discharge bed 3
Discharge bed 4
Discharge bed 5
Ground Water Elevation (ft. MSL)
606
604
602
600
598
596
594
592
Discharge (GPD)
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
6/18/09
7/6/09
7/24/09
8/11/09
8/29/09
9/17/09
10/5/09
10/23/09
11/10/09
11/28/09
12/17/09
1/4/10
1/22/10
2/9/10
2/27/10
3/18/10
4/5/10
4/23/10
5/11/10
5/29/10
6/17/10
7/5/10
7/23/10
8/10/10
8/28/10
9/16/10
10/4/10
10/22/10
11/9/10
11/27/10
Date


MW-13 Water level vs Discharge
change in water level
discharge bed 1
discharge bed 2
discharge bed 3
discharge bed 4
discharge bed 5
Ground Water Elevation (ft. MSL)
Discharge (GPD)
Date
601
600
599
598
597
596
595
594
593
592
591
590
589
588
587
586
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
06/17/09
07/05/09
07/23/09
08/10/09
08/29/09
09/16/09
10/04/09
10/23/09
11/10/09
11/28/09
12/17/09
01/04/10
01/22/10
02/09/10
02/28/10
03/18/10
04/05/10
04/24/10
05/12/10
05/30/10
06/18/10
07/06/10
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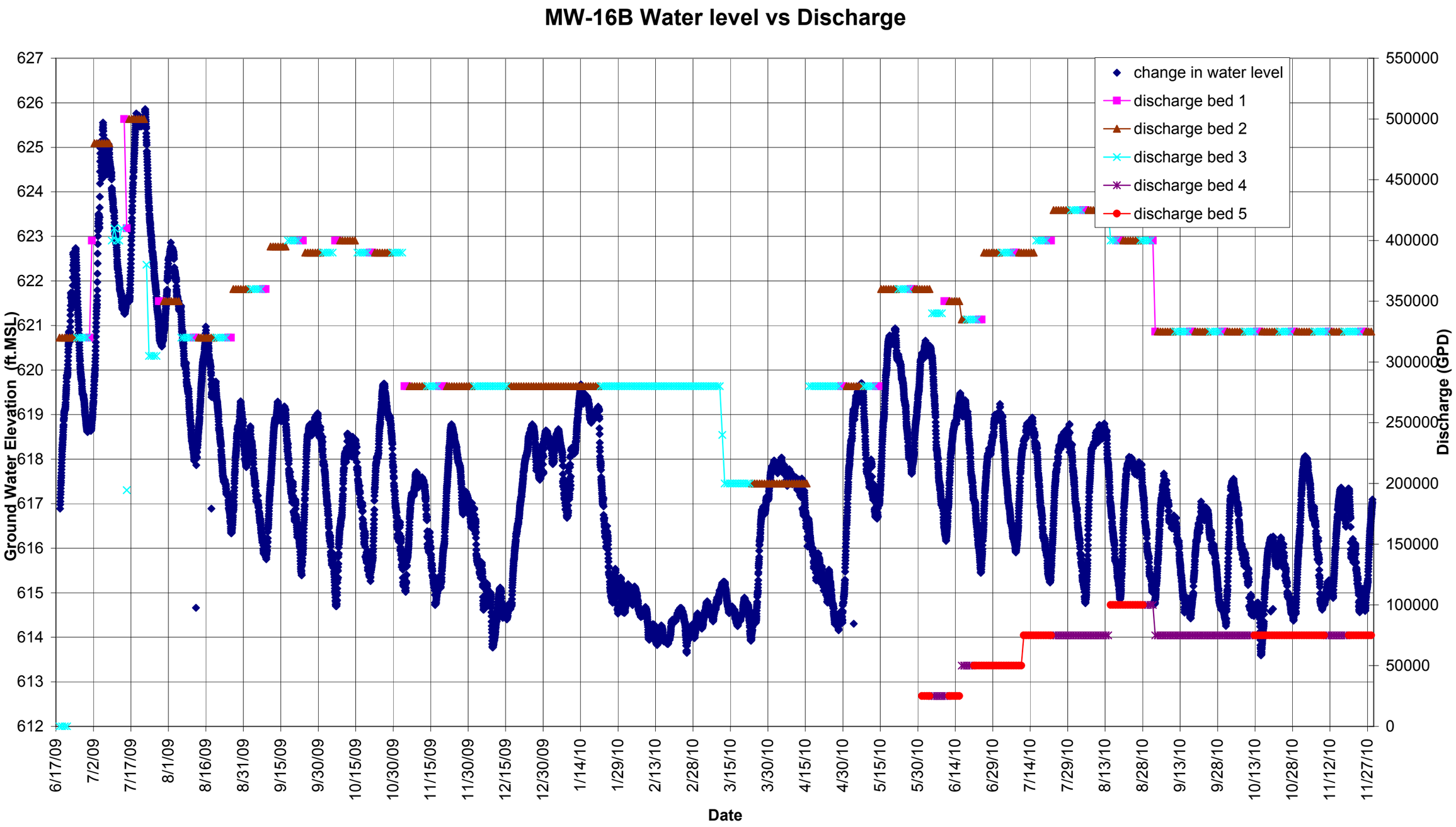
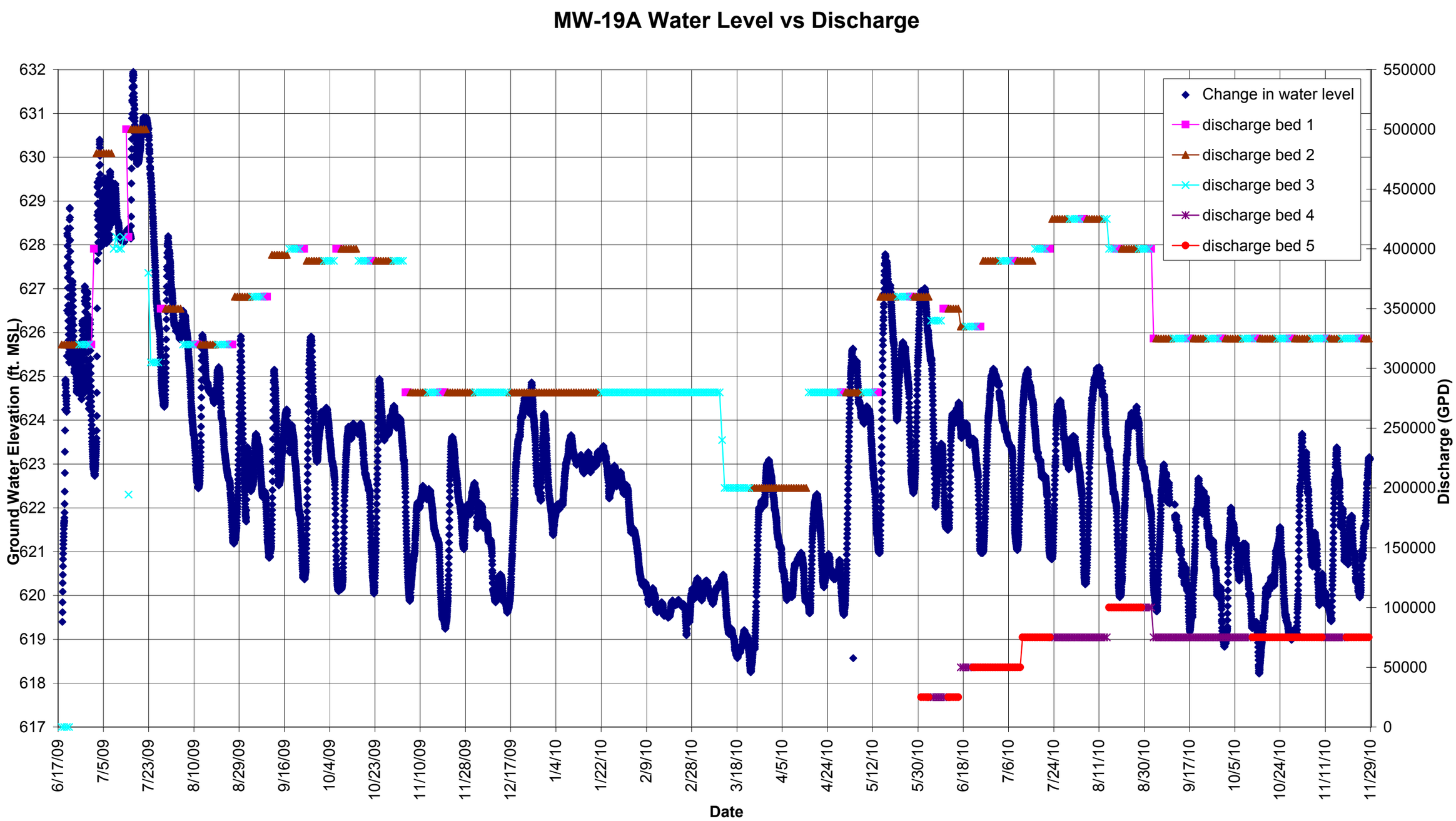
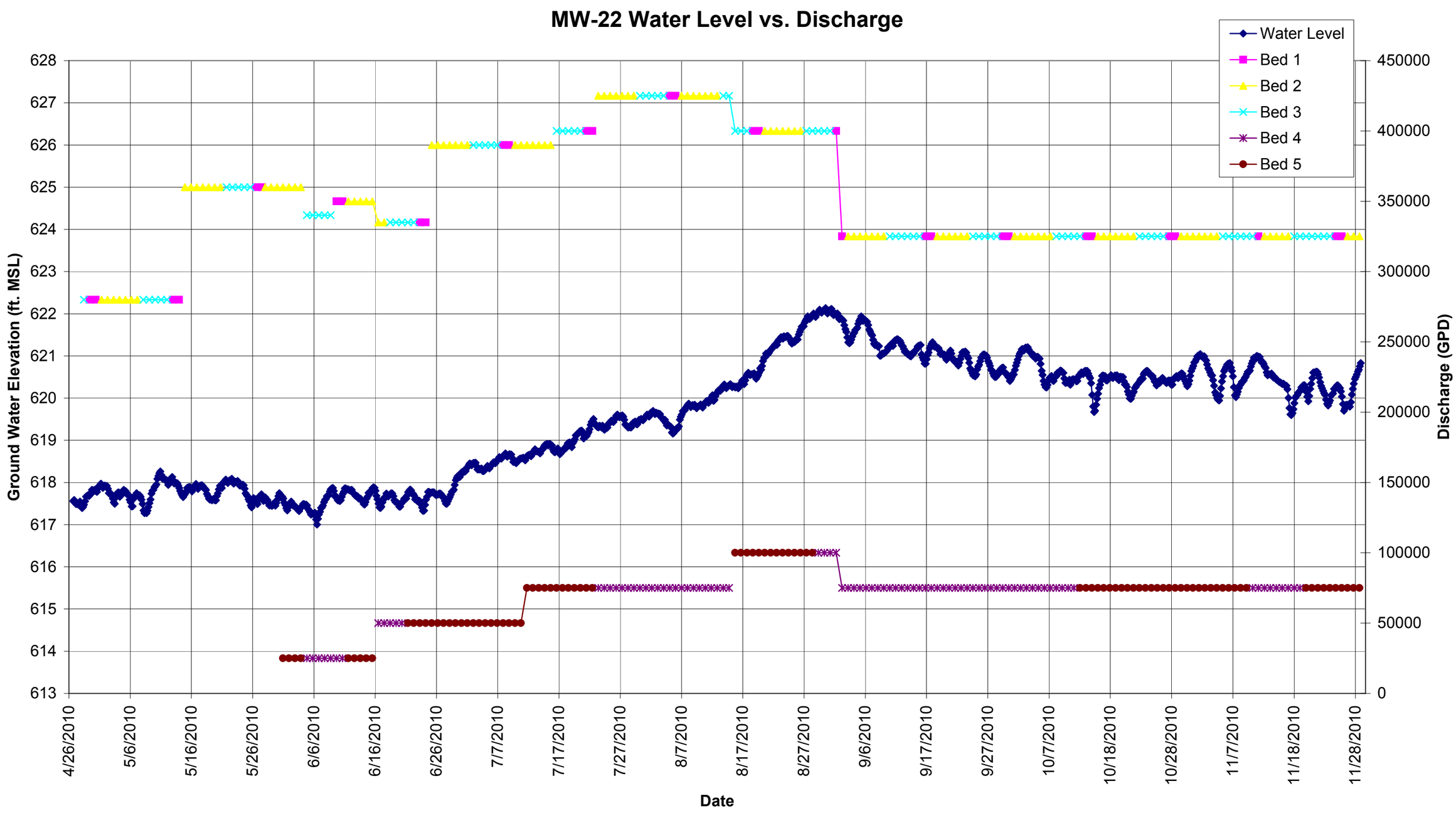
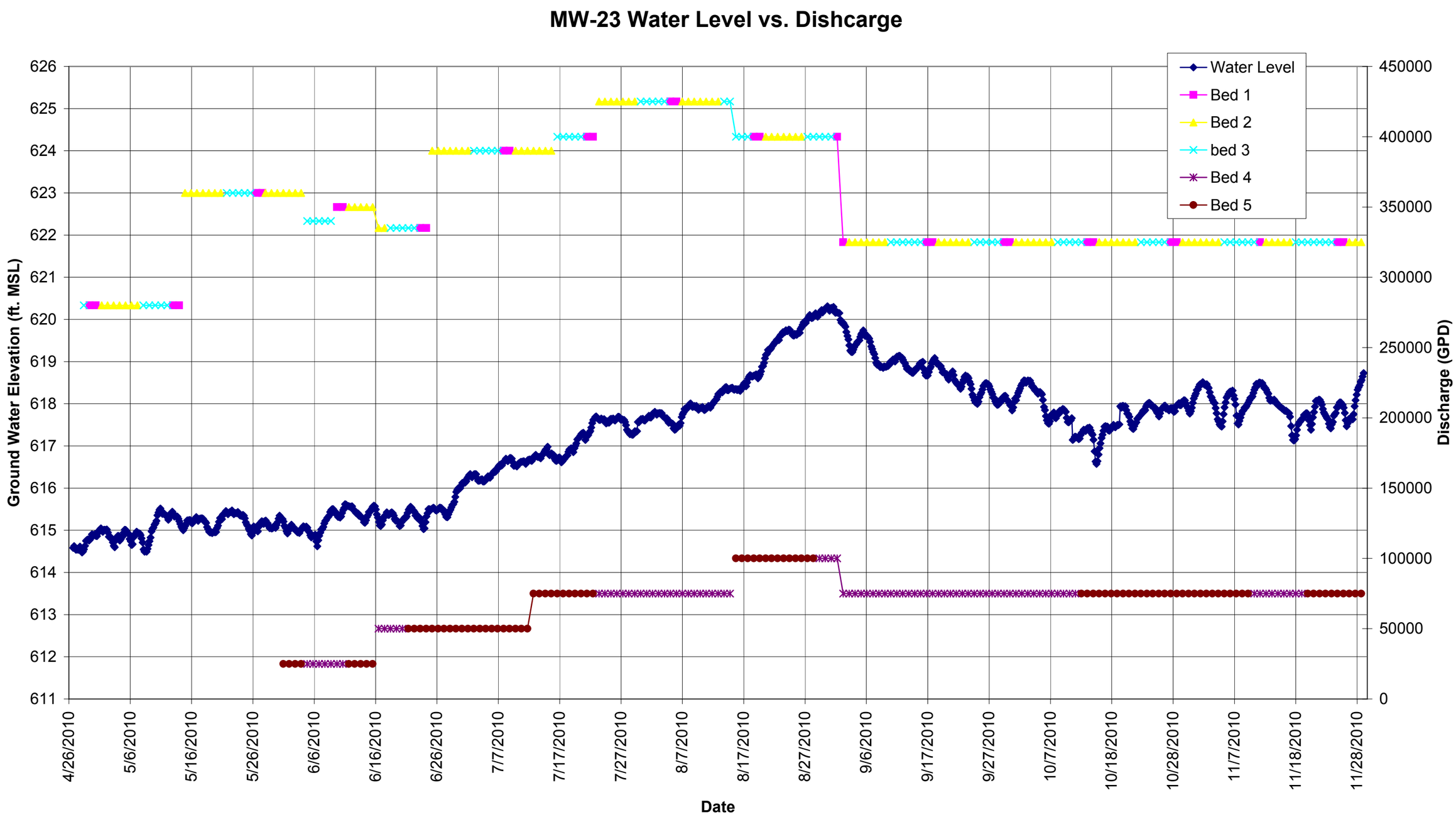
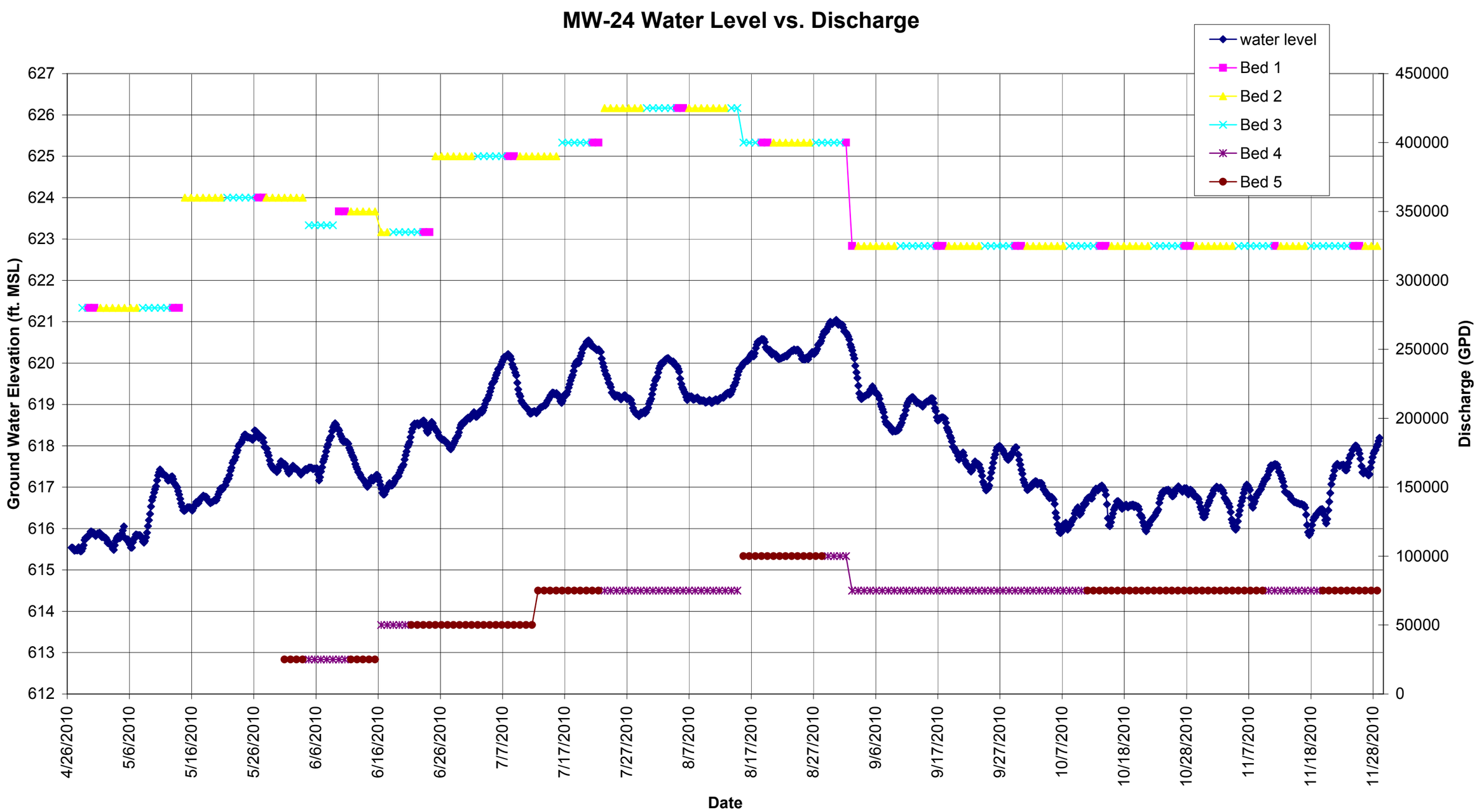
08/30/10
09/17/10
10/05/10
10/24/10
11/11/10
11/29/10

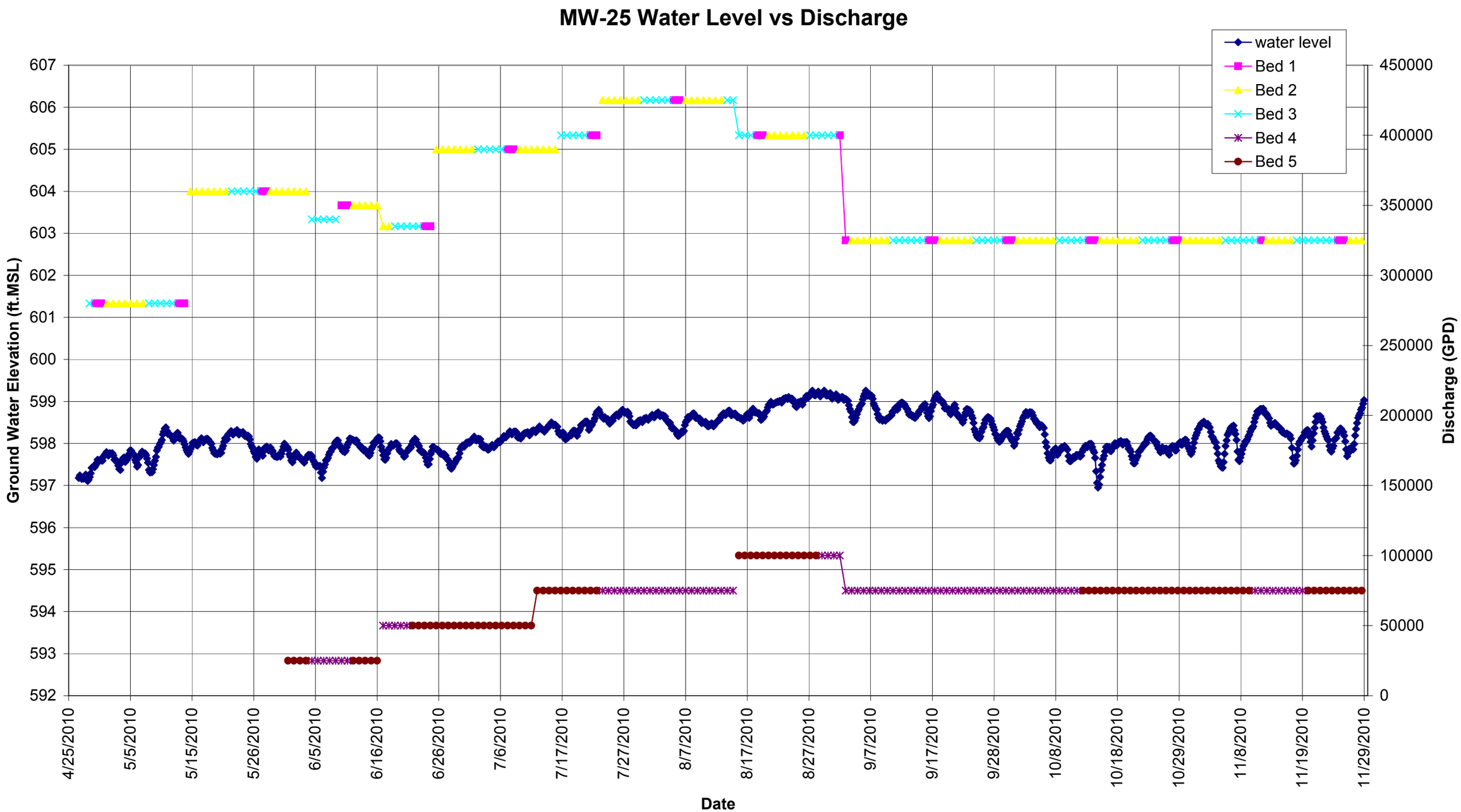

MW-16B Water level vs Discharge
Ground Water Elevation (ft.MSL)
Discharge (GPD)
Date
change in water level
discharge bed 1
discharge bed 2
discharge bed 3
discharge bed 4
discharge bed 5
627
626
625
624
623
622
621
620
619
618
617
616
615
614
613
612
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
6/17/09
7/2/09
7/17/09
8/1/09
8/16/09
8/31/09
9/15/09
9/30/09
10/15/09
10/30/09
11/15/09
11/30/09
12/15/09
12/30/09
1/14/10
1/29/10
2/13/10
2/28/10
3/15/10
3/30/10
4/15/10
4/30/10
5/15/10
5/30/10
6/14/10
6/29/10
7/14/10
7/29/10
8/13/10
8/28/10
9/13/10
9/28/10
10/13/10
10/28/10
11/12/10
11/27/10


MW-19A Water Level vs Discharge
Ground Water Elevation (ft. MSL)
632
631
630
629
628
627
626
625
624
623
622
621
620
619
618
617
Discharge (GPD)
550000
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
Change in water level
discharge bed 1
discharge bed 2
discharge bed 3
discharge bed 4
discharge bed 5
6/17/09
7/5/09
7/23/09
8/10/09
8/29/09
9/16/09
10/4/09
10/23/09
11/10/09
11/28/09
12/17/09
1/4/10
1/22/10
2/9/10
2/28/10
3/18/10
4/5/10
4/24/10
5/12/10
5/30/10
6/18/10
7/6/10
7/24/10
8/11/10
8/30/10
9/17/10
10/5/10
10/24/10
11/11/10
11/29/10
Date


MW-22 Water Level vs. Discharge
Water Level
Bed 1
Bed 2
Bed 3
Bed 4
Bed 5
Ground Water Elevation (ft. MSL)
Discharge (GPD)
Date
628
627
626
625
624
623
622
621
620
619
618
617
616
615
614
613
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
4/26/2010
5/6/2010
5/16/2010
5/26/2010
6/6/2010
6/16/2010
6/26/2010
7/7/2010
7/17/2010
7/27/2010
8/7/2010
8/17/2010
8/27/2010
9/6/2010
9/17/2010
9/27/2010
10/7/2010
10/18/2010
10/28/2010
11/7/2010
11/18/2010
11/28/2010


MW-23 Water Level vs. Dishcarge
Water Level
Bed 1
Bed 2
bed 3
Bed 4
Bed 5
Ground Water Elevation (ft. MSL)
626
625
624
623
622
621
620
619
618
617
616
615
614
613
612
611
Discharge (GPD)
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
4/26/2010
5/6/2010
5/16/2010
5/26/2010
6/6/2010
6/16/2010
6/26/2010
7/7/2010
7/17/2010
7/27/2010
8/7/2010
8/17/2010
8/27/2010
9/6/2010
9/17/2010
9/27/2010
10/7/2010
10/18/2010
10/28/2010
11/7/2010
11/18/2010
11/28/2010
Date


MW-24 Water Level vs. Discharge
water level
Bed 1
Bed 2
Bed 3
Bed 4
Bed 5
Ground Water Elevation (ft. MSL)
627
626
625
624
623
622
621
620
619
618
617
616
615
614
613
612
Discharge (GPD)
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
4/26/2010
5/6/2010
5/16/2010
5/26/2010
6/6/2010
6/16/2010
6/26/2010
7/7/2010
7/17/2010
7/27/2010
8/7/2010
8/17/2010
8/27/2010
9/6/2010
9/17/2010
9/27/2010
10/7/2010
10/18/2010
10/28/2010
11/7/2010
11/18/2010
11/28/2010
Date


MW-25 Water Level vs Discharge
water level
Bed 1
Bed 2
Bed 3
Bed 4
Bed 5
Ground Water Elevation (ft.MSL)
Discharge (GPD)
Date
607
606
605
604
603
602
601
600
599
598
597
596
595
594
593
592
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
4/25/2010
5/5/2010
5/15/2010
5/26/2010
6/5/2010
6/16/2010
6/26/2010
7/6/2010
7/17/2010
7/27/2010
8/7/2010
8/17/2010
8/27/2010
9/7/2010
9/17/2010
9/28/2010
10/8/2010
10/18/2010
10/29/2010
11/8/2010
11/19/2010
11/29/2010

Appendix J

Weston & Sampson Site Visit Report

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MEMORANDUM

TO: Blake A. Martin

FROM: Benjamin T. Green, P.E.

DATE: January 14, 2010

SUBJECT: Wolfeboro – Rapid Infiltration Basin Site – "Unexpected Issue"

The following is a description of the site visit to the Town of Wolfeboro Rapid Infiltration Basin (RIB) Site performed on January 13, 2010. The site visit was performed in response to the email sent out by David Ford, P.E., Public Works Director, requesting a site visit to observe increased seepage volumes at the location of 19 MB#8 located to the west of the site access road. Refer to the attached site map and photographs for more information.

- I arrived onsite at 1200 and started the inspection (by myself) by walking up and down the paved portion of the site access road that ascends up to the RIBs. Since the location of the increased seepage at 19 MB#8 is located to the west of the access road, the discharge from the RIBs is flowing underneath the roadway as groundwater. The pavement is in good condition, no signs of cracking, settlement, or damage were noted. The swales on each side of the road were filled with snow preventing detection of any apparent damage. The increased seepage appears to be causing no structural damage to the access road.
- I walked over the hill side to the west of the access road up gradient of the 19 MB#8. I traversed down the slope and observed no signs of slope instability or sinkholes. At the toe of the slope up gradient of the active seepage, wetness and standing water was observed. No active seepage in this area was detected.
- At the location of 19 MB#8, seepage from two areas was observed. Seepage from the left area (facing downstream) appeared to be issuing from the erosion scarp from a 3 in. diameter soil pipe at approximately 15 to 20 gpm. Seepage from the right area appeared to be issuing upwards from the ground surface at the toe of the scarp. Flow of approximately 10 to 15 gpm was estimated. Between the two seepage exit points, a pile of fine sand was observed. See photos 1 through 4.
- Downstream of the seepage exit points, the seepage becomes overland sheet flow. Green algae growth was observed at one location. Approximately 80 ft. downstream from the exit points, a 15 in. deep nick point was observed. At this location, the seepage becomes channelized flow. See photos 5 through 9.
- Located to the left (east) of the channelized seepage flow, standing water was observed along the toe of the slope near the nick point. Immediately downstream of the standing water, a seepage exit point was observed. Approximately 3 to 5 gpm of flow from this area was estimated. There may be some hydraulic connection between this seepage point and the overland flow. The second seepage exit point flows overland parallel to the

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channelized flow, eventually merging together. At this location, the standing water is up to 6 in. deep and green wetland vegetation was observed. See photos 10 through 13.

- Downstream of the merging of flow, the channelized water splits briefly before rejoining and flowing along former skidder ruts. Downstream of this location, the flow joins a natural/drainage channel and eventually flows through a drainage structure underneath the access road.
- Cursory field measurements of total flow were made at several points in the channelized flow. Based on the field measurements, estimates of total flow were approximately 50 gpm. It is unclear if all of this water is seepage or some is surface drainage or due to melting in the wet areas. Therefore, I estimate a range of seepage volumes of 25 to 50 gpm.

- I next hiked across the access road to the east and observed the area of the existing slope failure. The area appeared to be largely unchanged as similar seepage volumes and slope geometry to that previously observed was noted. “Tell tale” grade stakes were observed in the failure area. According to Mr. Ford, no movement in this area has been observed in approximately 1 month.
- I hiked further to the east to the soil stockpile area from the construction of the first three RIBs. I observed that silt fence has been installed along the construction area of RIBs 4 and 5. Construction activities were underway by A.J. Coleman & Son, Inc. General Contractor (Coleman). Equipment onsite included a CAT 345 B Excavator (with root grapple), a CAT D5 Dozer, and multiple 10 wheel dump trucks. The trees have been cleared from the site and Coleman was actively grubbing, stripping topsoil, and performing site grading. The grubbed material was being transported offsite.
- I observed that flow was being conveyed into RIB 2 (the center RIB) on the day of this visit. RIBs 1 and 3 were dry and it appeared as though they have not been used in sometime as they were filled with snow.

- The conditions of the access road and existing RIBs appear unchanged from our last site visit. It does not appear as though the increased seepage at 19 MB#8 is causing any threat to these engineered structures at this time. Based on a cursory review of the “Water Level versus Discharge” plots for the site groundwater monitoring wells, it appears as though site groundwater levels have decreased in line with decreasing discharge into the RIBs.
- At 1330 hours, I left the site.

Attachments:
-Site Map with Photo Locations
-Site Photographs

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MEMORANDUM

TO: David W. Ford, P.E., Director of Public Works and Water & Sewer Utilities

FROM: Mark P. Mitsch, P.E., Weston & Sampson

DATE: April 28, 2010

SUBJECT: Wolfeboro – Rapid Infiltration Basin Site – "Unexpected Issue"

C.C. Blake A. Martin, Weston & Sampson

The following is a description of the site visit to the Town of Wolfeboro Rapid Infiltration Basin (RIB) Site performed on April 28, 2010. The site visit was performed as a follow-up to the January 13, 2010 site visit to identify changes in conditions at the "West Seepage Area" since that site visit and to document existing conditions at the "East Seepage Area" as well as downslope from RIBs 4 and 5. Refer to the attached photograph logs and site map for more information.

WEST SEEPAGE AREA

- I arrived onsite at 0900 and met with Dave Ford, Peter Goodwin and Chris Perkins for a brief orientation of the area west of the main paved access road where seepage was observed and documented during the January 13, 2010 site visit by Ben Green (West Seepage Area). The weather was in the 30's with intermittent snow flurries and rain.
- I attempted to follow the observation sequence of the January 13, 2010 site visit and documented observed conditions in the attached Photos 1 through 16. The attached photos document conditions at specific locations including conditions at Weirs 4, 5 and 7 that were constructed subsequent to the January 13 site visit. Accordingly, some of the photos are different from those in the January 13 site visit memo.

  Comments: In general, the amount of overland flow observed through the West Seepage Area is greater than observed during the January 13 site visit. The volume of seepage appears to be increasing but the condition of the "soil pipe" and "upward flow" from the 19 MB#8 scarp area does not appear to be significantly different from the conditions observed during the January 13 site visit. The next site visit should include taking photos showing the conditions of the same areas documented in the attached "Photolog of 4.28.10 Site Visit – West Seepage Area," including Photos 1 through 16 to establish either consistency of conditions or changes in conditions over time.

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EAST SEEPAGE AREA

The East Seepage Area consists of the "sinkhole" and "slope failure" areas east of the access road and the Weirs that have been established downslope of these features. The attached "Photolog of 4.28.10 Site Visit – East Seepage Area," Photos 17 through 34 document the observed conditions during the April 28 site visit.

RIB 4/5 DOWNSLOPE AREA

I walked the uphill slopes of the Unnamed Brook beginning where the stream meets the power line easement heading east, turning north, then west around the newly constructed RIB 4/5 Area. The attached "Photolog of 4.28.10 Site Visit – RIB 4/5 Downslope Area," Photos 35 through 52 document the observed conditions during the April 28 site visit.

Attachments:

- Photolog of 4.28.10 Site Visit – West Seepage Area, Photos 1 through 16
- Photolog of 4.28.10 Site Visit – East Seepage Area, Photos 17 through 34
- Photolog of 4.28.10 Site Visit – RIB 4/5 Downslope Area, Photos 35 through 52

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MEMORANDUM

TO: David W. Ford, P.E., Director of Public Works and Water & Sewer Utilities

FROM: Mark P. Mitsch, P.E., Benjamin T. Green, P.E., Weston & Sampson

DATE: June 17, 2010

SUBJECT: Wolfeboro – Rapid Infiltration Basin Site – "Unexpected Issue"

C.C. Blake A. Martin, Weston & Sampson

The following is a description of the site visit to the Town of Wolfeboro Rapid Infiltration Basin (RIB) Site performed on June 17, 2010. The site visit was performed as a follow-up to the January 13, 2010 and the April 29, 2010 site visits to identify changes in conditions at the "West Seepage Area," "East Seepage Area," and RIBs 4/5 Downslope Area. This site visit is part of a bi-monthly inspection program to observe the abovementioned areas and note any changes in conditions over time. Refer to the attached Photograph Logs and Site Visit Photo Location Plan for more information.

BACKGROUND

At the time of this site visit, the Town of Wolfeboro was diverting approximately 425,000 GPD to RIBs 1 through 3 on a rotating schedule and conducting the startup of RIBs 4 and 5. Accordingly, approximately 25,000 GPD are being diverted to RIBs 4 or 5, and the conditions at the site are being monitored to see the effects of this loading. The plan is to increase the flow to RIBs 4 and 5 at 25,000 GPD increments until the total site capacity is 550,000 GPD.

SITE VISIT

Mark P. Mitsch, P.E. and Benjamin T. Green, P.E. of Weston & Sampson, arrived onsite at 1015 hours following a brief meeting with David W. Ford, P.E. and Bill Boornazian of Wolfeboro Public Works. The weather was 65 degrees F and overcast. We attempted to follow the observation sequence of the April 28, 2010 site visit and document observed conditions through the attached Photologs. The site visit was broken into the four distinct areas at the site including the West Seepage Area, East Seepage Area, RIBs 4/5 Downslope Area, and the Access Roads – RIBS 1/2/3. At approximately 1230 hours, we left the site.

WEST SEEPAGE AREA

In general, the amount of overland flow observed through the West Seepage Area appeared greater than observed during the previous visits. The vegetation partially masked some of the overland flow making a direct comparison to previous inspections difficult. Additional sand

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accumulation was observed behind Weir 7 near the roadway culvert. It is unclear from previous photographs if additional dark fine sand or silt has accumulated at this location.

A sinkhole has developed upstream of 19 MB#8 which was discovered by Town of Wolfeboro personnel. The sinkhole appears to be hydraulically connected to the soil pipe located at 19 MB#8. At the time of this inspection, the sinkhole is approximately 12 ft. long measured upslope to downslope, and approximately 6 ft. wide. Two open cavities were observed at each of the upstream and downstream ends of the area. It appears there is additional ongoing undermining of the slope uphill of the sinkholes. No audible or visual flow of water through the sinkholes was observed.

Explorations of the sinkhole were conducted using a hand auger. The hand auger was inserted to approximately 5 ft. below grade (length of auger handle) in the upper and lower cavity. In the upper cavity, the soils consisted of tan, silty fine SAND, trace to little medium sand. In the lower cavity, the soils consisted of tan, coarse to fine SAND, little silt. More fine sand was encountered with depth at this location. Both soil samples were saturated. An additional auger hole was performed approximately half way between the sinkhole and the soil pipe. At 3.5 ft. below ground surface, the auger struck little resistance to advancement. The soils consisted of saturated silty fine SAND, little medium sand.

Refer to the attached photolog for more information.

EAST SEEPAGE AREA

The East Seepage Area consists of the “sinkhole” and “slope failure” areas east of the access road and the Weirs that have been established downslope of these features. In general, no major changes were observed in this area as flow and conditions appear relatively unchanged. Continued, minor erosion was noted.

Refer to the attached photolog for more information.

RIB 4/5 DOWNSLOPE AREA

This area consists of the Unnamed Brook and the slope to the north, west, and east of the brook adjacent to RIBs 4 & 5. We walked the same path as during the April 28, 2010 site walk beginning where Unnamed Brook meets the power line easement heading east, turning north, then west around the newly constructed RIB 4/5 Area. Despite the startup level use of RIBs 4 and 5, no notable changes from the previous inspection were observed.

Refer to the attached photolog for more information.

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Attachments:

-Site Visit Photo Location Plan
- Photolog of 6.17.10 Site Visit – West Seepage Area
  Existing Photos 1 through 16
  New Developments A through E
- Photolog of 6.17.10 Site Visit – East Seepage Area
  Existing Photos 17 through 34
- Photolog of 6.17.10 Site Visit – RIB 4/5 Down Slope Area
  Existing Photos 35 through 52
  Additional Photos 53 and 54
- Photolog of 6.17.10 Site Visit – Access Road and RIBs
  New Photos 101 through 103

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MEMORANDUM

TO: David W. Ford, P.E., Director of Public Works and Water & Sewer Utilities

FROM: Mark P. Mitsch, P.E., Benjamin T. Green, P.E., Weston & Sampson

DATE: August 17, 2010

SUBJECT: Wolfeboro – Rapid Infiltration Basin Site – "Unexpected Issue"

C.C. Blake A. Martin, Weston & Sampson

The following is a description of the site visit to the Town of Wolfeboro Rapid Infiltration Basin (RIB) Site performed on August 17, 2010. The site visit was performed as a follow-up to the January 13, 2010, April 29, 2010, and June 17, 2010 site visits to identify changes in conditions at the "West Seepage Area," "East Seepage Area," and RIBs 4/5 Downslope Area. This site visit is part of a bi-monthly inspection program to observe the abovementioned areas and note any changes in conditions over time. Refer to the attached Photograph Logs and Site Visit Photo Location Plan while reviewing this memorandum.

BACKGROUND

At the time of this site visit, the Town of Wolfeboro was diverting approximately 500,000 GPD to the overall site. 400,000 GPD are being diverted to RIBs 1 through 3 on a 14 day rotating schedule and 100,000 GPD are being diverted to RIB 5. The plan is to increase the flow to RIBs 4 and 5 at 25,000 GPD increments until the total site capacity is 550,000 GPD.

SITE VISIT

Benjamin T. Green, P.E. of Weston & Sampson arrived onsite at 0830 hours to begin the site walk. The weather was 70 to 80 degrees F and clear with a light wind. This site visit followed the observation sequence of the June 17, 2010 site visit and documented observed conditions through the attached Photologs. The site visit was broken into the four distinct areas at the site including the West Seepage Area, East Seepage Area, RIBs 4/5 Downslope Area, and the Access Roads – RIBS. At approximately 1230 hours, I left the site.

Please note that the number sequencing of the photographs were changed during this inspection in order to allow for more flexibility and better organization. The photo numbering was altered so that each distinct area is a series of photographs. The West Seepage Area is 100 series photographs (i.e. numbered 101 to 120), the East Seepage Area is 200 series photographs (i.e. numbered 201 to 218), RIBs 4/5 Downslope Area is 300 series photographs (i.e. numbered 301 to 325), and the Access Roads – RIBS is the 400 series photographs (i.e. numbered 401 to 406). The previous designation of the photos are provided in the photologs to allow for comparison

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with previous inspection photographs. Also, orange flags were hung at some photo locations in the field to aid finding and repeating difficult to find photographs.

WEST SEEPAGE AREA

In general, the amount of overland flow observed through the West Seepage Area appeared to be similar to that observed during the prior visit. The vegetation partially masked some of the overland flow making a direct comparison to previous inspections difficult.

A boil has developed just downstream of the soil pipe at 19MB #8. The boil and the soil pipe appeared to be hydraulically connected. A 2 in. diameter boil was also observed several feet downstream of the soil pipe. In addition, iron staining and light seepage was observed downstream and to the right (looking downstream) of the soil pipe. Overland flow from upland seeps was observed flowing into the area of 19MB #8.

Weir 4 was in poor condition as flow was circumventing the weir along the left side (looking downstream). The weir is bulged in the downstream direction. Sand accumulation was observed in Weir 5, where similar flow rates to previous inspections (approximately 60 to 70 gpm) were observed. It appeared sand had recently been removed from behind Weir 7.

The sinkhole that developed upstream of 19 MB#8 appeared to be largely unchanged. It appeared as though continued loss of soil in this area was observed. No audible or visual flow of water through the sinkholes was detectable. No additional sinkholes along the upstream slope were observed.

Refer to the attached photolog for more information.

EAST SEEPAGE AREA

The East Seepage Area consists of the “sinkhole” and “slope failure” areas east of the access road and the Weirs that have been established downslope of these features. In general, no major changes were observed in this area as flow and conditions appear relatively unchanged. Weir 1 was blocked by accumulated sand and it being bypassed by flow. Continued, minor erosion was noted.

Refer to the attached photolog for more information.

RIB 4/5 DOWNSLOPE AREA

This area consists of the Unnamed Brook and the slope to the north, west, and east of the brook adjacent to RIBs 4 & 5. We walked the same path as during previous visits, beginning where Unnamed Brook meets the power line easement heading east, turning north, then west around RIB 4/5 Area.

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Slightly more ponded water and active seepage of approximately 1 gpm was observed near 19MB #12 along the Unnamed Brook. Slight accumulation of fine sand was observed in this area. At the location of 19MB #13, significant new sand deposition and a boil of approximately 2 to 4 gpm was observed. The upper portion of the Unnamed Brook reach was dry with no flow on the day of this site visit.

Refer to the attached photolog for more information.

ACCESS ROAD AND RIBs

The access road and swales on both sides of the road appear to be in good condition. On the day of the site visit, flow was being diverted to RIBs 3 and 5. The remaining RIBs were dry. The condition of the RIBs appeared unchanged from previous inspections.

Refer to the attached photolog for more information.

Attachments:

-Site Visit Photo Location Plan
- Photolog of 8.17.10 Site Visit – West Seepage Area
  100 Series Photos, 101 through 120
- Photolog of 8.17.10 Site Visit – East Seepage Area
  200 Series Photos, 201 through 218
- Photolog of 8.17.10 Site Visit – RIB 4/5 Down Slope Area
  300 Series Photos, 301 through 325
- Photolog of 8.17.10 Site Visit – Access Road and RIBs
  400 Series Photos, 401 through 406

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MEMORANDUM

TO: David W. Ford, P.E., Director of Public Works and Water & Sewer Utilities

FROM: Mark P. Mitsch, P.E., Benjamin T. Green, P.E., Weston & Sampson

DATE: October 14, 2010

SUBJECT: Wolfeboro – Rapid Infiltration Basin Site – "Unexpected Issue"

C.C. Blake A. Martin, Weston & Sampson

The following is a description of the site visit to the Town of Wolfeboro Rapid Infiltration Basin (RIB) Site performed on October 14, 2010. The site visit was performed as a follow-up to the January 13, 2010, April 29, 2010, June 17, 2010, and the August 17, 2010 site visits to identify changes in conditions at the "West Seepage Area," "East Seepage Area," and RIBs 4/5 Downslope Area. This site visit is part of a bi-monthly inspection program to observe the abovementioned areas and note any changes in conditions over time. Refer to the attached Photograph Logs and Site Visit Photo Location Plan while reviewing this memorandum.

BACKGROUND

At the time of this site visit, the Town of Wolfeboro was diverting approximately 400,000 GPD to the overall site. 325,000 GPD are being diverted to RIBs 1 through 3 on a 14 day rotating schedule and 75,000 GPD are being diverted to RIBs 4 and 5. The New Hampshire Department of Environmental Services (NHDES) is in the process of downgrading the discharge permit at the RIB site to 400,000 GPD.

SITE VISIT

Benjamin T. Green, P.E. of Weston & Sampson met with Mr. Ford prior to performing the site walk to discuss the performance of the site since the last visit. Mr. Ford indicated that additional seepage discharge and sinkholes/unraveling of the terrain occurred near the bottom of the slope in the East Seepage Area. The Town of Wolfeboro personnel cleared the brush and debris in this area to allow for a better inspection. Mr. Ford also indicated that the seepage observed in the RIBs 4/5 Downslope Area appears to have been reduced or stopped in response to lower flows into the RIBs.

Mr. Green arrived at the RIB site at 1315 hours to begin the site walk. The weather was 60 degrees F and overcast. This site visit followed the observation sequence of the August 17, 2010 site visit and documented observed conditions through the attached Photologs. During the site visit in the East Seepage Area, Mr. Green helped Mr. Ford set five grade stakes to be used as monitoring points across the unraveled portion of the slope. The site visit was broken into the

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four distinct areas at the site including the West Seepage Area, East Seepage Area, RIBs 4/5 Downslope Area, and the Access Roads – RIBS.

Mr. Green left the site at approximately 1630 hours.

The photo numbering follows the same sequence as the August 17, 2010 Memorandum. The West Seepage Area is 100 series photographs (i.e. numbered 101 to 121), the East Seepage Area is 200 series photographs (i.e. numbered 201 to 233), RIBs 4/5 Downslope Area is 300 series photographs (i.e. numbered 301 to 325), and the Access Roads – RIBS is the 400 series photographs (i.e. numbered 401 to 406).

WEST SEEPAGE AREA

In general, the amount of overland flow observed through the West Seepage Area appeared to be slightly less than that observed during the prior visit. The vegetation partially masked some of the overland flow making a direct comparison to previous site visits difficult.

Seepage was observed flowing from the area of 19MB#8 from approximately five locations. The majority of the flow is from a 3 in. diameter soil pipe/boil. Several other minor seeps including several small sand boils less than 1 in. in diameter were observed. The seep along the western side of 19MB#8 appears to be emitting more flow than previously observed and additional iron staining was observed in this area. Upstream of 19MB#8, no active seepage or water movement was observed. The ground was generally moist underfoot with several areas of ponded, standing water.

Weir 4 was in poor condition as flow was circumventing the weir along the left side (looking downstream). The weir is bulged in the downstream direction. Sand accumulation was observed in Weir 5, where slightly lower flow rates of 45 gpm to 55 gpm were observed compared to previous site visits (approximately 60 to 70 gpm). Weir 7 was removed, replaced with Sand Trap Pond #1 to collect/reduce the transport of sediments into the downstream wetlands. Flow from the Sediment Trap Pond #1 was estimated at 65 to 75 gpm.

The sinkhole that developed upstream of 19 MB#8 appeared to be largely unchanged. It appeared as though continued loss of soil in this area was observed. No audible or visual flow of water through the sinkholes was detectable. A small depression appears to be developing approximately 6 ft. downslope of the lower portion of the sinkhole. The depression is approximately 8 in. deep at this time.

Refer to the attached photolog for more information.

EAST/CENTRAL SEEPAGE AREA

The East Seepage Area consists of the “sinkhole” and “slope failure” areas east of the access road and the Weirs that have been established downslope of these features. Since the last

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inspection, slumping, sinkhole cavities, and channelized seepage flow was observed near the toe of the slope in this area. It appears as though seepage has undermined this area causing differential ground movements, shifting, and erosion. Seepage and overland flow was observed to the east of the failure area. Sand accumulation was observed in the channels downstream of this area. The sinkhole locations have been staked by the Town of Wolfeboro for monitoring purposes. During this site visit, five grade stakes were installed across the area to monitor ground movements.

Weir 1 was being overwhelmed by flow and was partially being bypassed by additional flow. The reservoir of the weir was full of sand and leaves, etc. No flow was observed over Weir 2.The flow has channelized upstream of the weir and is bypassing the weir through channels around and under the root masses and forest mat. Weir 1 appeared to be functioning similarly to that noted in previous inspections, although the reservoir is partially full with sand.

Downstream of the slope failure area at the woods road crossing, Sand Trap Pond #2 was installed to collect/reduce the transport of sediments into the downstream wetlands. Flow from the Sediment Trap Pond #2 was estimated at 65 to 85 gpm.

Refer to the attached photolog for more information.

RIB 4/5 DOWNSLOPE AREA

This area consists of the Unnamed Brook and the slope to the north, west, and east of the brook adjacent to RIBs 4 & 5. We walked the same path as during previous visits, beginning where Unnamed Brook meets the power line easement heading east, turning north, then west around RIB 4/5 Area.

Slightly less ponded water and active seepage of approximately ¼ gpm (barely detectable, compared to approximately 1 gpm in the previous inspection) was observed near 19MB #12 along the Unnamed Brook. Slight accumulation of fine sand was observed in this area. Sand accumulation was also noted in Unnamed Brook downstream of 19MB #12. Visual flow into brook was noted. It was difficult to determine source of the flow.

At the location of 19MB #13, significant sand deposition and a boil of approximately 2 gpm was observed. It appears as though more standing water but less flow from the boil was observed in this area than during previous site visits. The upper portion of the Unnamed Brook reach was dry with no flow on the day of this site visit.

Refer to the attached photolog for more information.

ACCESS ROAD AND RIBs

The access road and swales on both sides of the road appear to be in good condition. The condition of the access road and swales appeared unchanged from previous inspections. On the

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day of the site visit, flow was being diverted to RIBs 1, 2, and 5. The remaining RIBs were dry. The condition of the RIBs appeared unchanged from previous inspections.

Refer to the attached photolog for more information.

Attachments:

-Site Visit Photo Location Plan
- Photolog of 10.14.10 Site Visit – West Seepage Area
  100 Series Photos, 101 through 121
- Photolog of 10.14.10 Site Visit – East Seepage Area
  200 Series Photos, 201 through 233
- Photolog of 10.14.10 Site Visit – RIB 4/5 Down Slope Area
  300 Series Photos, 301 through 325
- Photolog of 10.14.10 Site Visit – Access Road and RIBs
  400 Series Photos, 401 through 406

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Appendix K

RIB Discharge Flows

Date	Daily Flow Gal/day	Primary RIB	RIB Total	2nd RIB	RIB Total
Tuesday, June 01, 2010	349,250	2		5	25,000
Wednesday, June 02, 2010	363,500	2		5	
Thursday, June 03, 2010	398,500	2		5	
Friday, June 04, 2010	363,750	2	1,375,000	5	100,000
Saturday, June 05, 2010	52,500	3		4	25,000
Sunday, June 06, 2010	217,750	3		4	
Monday, June 07, 2010	348,000	3		4	
Tuesday, June 08, 2010	363,750	3		4	
Wednesday, June 09, 2010	365,750	3	1,222,750	4	
Thursday, June 10, 2010	353,714	1		4	
Friday, June 11, 2010	353,714	1	657,429	4	175,000
Saturday, June 12, 2010	353,714	2		5	25,000
Sunday, June 13, 2010	353,714	2		5	
Monday, June 14, 2010	353,714	2		5	
Tuesday, June 15, 2010	353,714	2		5	
Wednesday, June 16, 2010	353,714	2		5	
Thursday, June 17, 2010	399,250	2		5	150,000
Friday, June 18, 2010	389,000	2	2,356,821	4	50,000
Saturday, June 19, 2010	381,250	3		4	
Sunday, June 20, 2010	398,250	3		4	
Monday, June 21, 2010	401,000	3		4	
Tuesday, June 22, 2010	382,250	3		4	250,000
Wednesday, June 23, 2010	389,250	3	1,702,000	5	50,000
Thursday, June 24, 2010	394,250	1		5	
Friday, June 25, 2010	401,500	1	695,750	5	
Saturday, June 26, 2010	385,250	2		5	
Sunday, June 27, 2010	381,750	2		5	
Monday, June 28, 2010	392,500	2		5	
Tuesday, June 29, 2010	401,750	2		5	
Wednesday, June 30, 2010	388,750	2		5	
Total Flow for June	10,784,750				
Thursday, July 01, 2010	391,250	2		5	
Friday, July 02, 2010	382,000	2	2,373,250	5	
Saturday, July 03, 2010	400,000	3		5	
Sunday, July 04, 2010	409,000	3		5	
Monday, July 05, 2010	381,500	3		5	
Tuesday, July 06, 2010	388,750	3		5	
Wednesday, July 07, 2010	402,000	3	1,731,250	5	
Thursday, July 08, 2010	402,500	1		5	
Friday, July 09, 2010	408,000	1	710,500	5	
Saturday, July 10, 2010	424,000	2		5	
Sunday, July 11, 2010	424,000	2		5	
Monday, July 12, 2010	442,250	2		5	1,000,000
Tuesday, July 13, 2010	452,250	2		5	75,000
Wednesday, July 14, 2010	446,000	2		5	
Thursday, July 15, 2010	446,000	2		5	
Friday, July 16, 2010	446,000	2	2,630,500	5	
Saturday, July 17, 2010	446,000	3		5	
Sunday, July 18, 2010	446,000	3		5	
Monday, July 19, 2010	451,750	3		5	
Tuesday, July 20, 2010	470,900	3		5	
Wednesday, July 21, 2010	474,500	3	1,914,150	5	
Thursday, July 22, 2010	469,500	1		5	

Friday, July 23, 2010	475,100	1	794,600	5	825,000
Saturday, July 24, 2010	475,100	2		4	75,000
Sunday, July 25, 2010	475,100	2		4	
Monday, July 26, 2010	500,400	2		4	
Tuesday, July 27, 2010	500,400	2		4	
Wednesday, July 28, 2010	500,100	2		4	
Thursday, July 29, 2010	500,100	2		4	
Friday, July 30, 2010	500,100	2	2,925,700	4	
Saturday, July 31, 2010	500,100	3		4	
Total Flow for July	13,830,650				
Sunday, August 01, 2010	500,100	3		4	
Monday, August 02, 2010	500,100	3		4	
Tuesday, August 03, 2010	500,100	3		4	
Wednesday, August 04, 2010	500,100	3	2,125,500	4	
Thursday, August 05, 2010	500,100	1		4	
Friday, August 06, 2010	500,100	1	850,200	4	
Saturday, August 07, 2010	500,100	2		4	
Sunday, August 08, 2010	500,100	2		4	
Monday, August 09, 2010	500,100	2		4	
Tuesday, August 10, 2010	500,100	2		4	
Wednesday, August 11, 2010	500,100	2		4	
Thursday, August 12, 2010	500,100	2		4	
Friday, August 13, 2010	500,200	2	2,975,700	4	
Saturday, August 14, 2010	500,100	3		4	
Sunday, August 15, 2010	500,200	3		4	1,650,000
Monday, August 16, 2010	500,100	3		5	100,000
Tuesday, August 17, 2010	500,100	3		5	
Wednesday, August 18, 2010	500,100	3	2,050,500	5	
Thursday, August 19, 2010	500,100	1		5	
Friday, August 20, 2010	500,200	1	800,200	5	
Saturday, August 21, 2010	500,100	2		5	
Sunday, August 22, 2010	500,100	2		5	
Monday, August 23, 2010	500,400	2		5	
Tuesday, August 24, 2010	500,100	2		5	
Wednesday, August 25, 2010	500,200	2		5	
Thursday, August 26, 2010	500,100	2		5	
Friday, August 27, 2010	500,100	2	2,800,700	5	
Saturday, August 28, 2010	500,100	3		5	
Sunday, August 29, 2010	500,100	3		5	
Monday, August 30, 2010	500,100	3		5	1,100,000
Tuesday, August 31, 2010	500,200	3		4	100,000
Total Flow for August	15,503,900				
Wednesday, September 01, 2010	500,200	3	2,000,500	4	
Thursday, September 02, 2010	500,100	1		4	
Friday, September 03, 2010	400,100	1	725,200	4	75,000
Saturday, September 04, 2010	400,200	2		4	
Sunday, September 05, 2010	400,100	2		4	
Monday, September 06, 2010	400,200	2		4	
Tuesday, September 07, 2010	400,100	2		4	
Wednesday, September 08, 2010	400,100	2		4	
Thursday, September 09, 2010	400,100	2		4	
Friday, September 10, 2010	400,100	2	2,275,700	4	
Saturday, September 11, 2010	400,100	3		4	
Sunday, September 12, 2010	400,100	3		4	
Monday, September 13, 2010	400,100	3		4	
Tuesday, September 14, 2010	400,100	3		4	
Wednesday, September 15, 2010	400,100	3		4	

Thursday, September 16, 2010	400,100	3	1,950,600	4	
Friday, September 17, 2010	400,100	1	325,100	4	
Saturday, September 18, 2010	400,100	2		4	
Sunday, September 19, 2010	400,100	2		4	
Monday, September 20, 2010	400,100	2		4	
Tuesday, September 21, 2010	400,100	2		4	
Wednesday, September 22, 2010	400,100	2		4	
Thursday, September 23, 2010	400,100	2		4	
Friday, September 24, 2010	400,100	2	2,275,700	4	
Saturday, September 25, 2010	400,100	3		4	
Sunday, September 26, 2010	400,100	3		4	
Monday, September 27, 2010	400,100	3		4	
Tuesday, September 28, 2010	400,100	3		4	
Wednesday, September 29, 2010	400,100	3	1,625,500	4	
Thursday, September 30, 2010	400,200	1		4	
Total Flow for September	12,203,400				
Friday, October 01, 2010	400,100	1	650,200	4	
Saturday, October 02, 2010	400,300	2		4	
Sunday, October 03, 2010	400,100	2		4	
Monday, October 04, 2010	400,100	2		4	
Tuesday, October 05, 2010	400,100	2		4	
Wednesday, October 06, 2010	400,200	2		4	
Thursday, October 07, 2010	400,100	2		4	
Friday, October 08, 2010	400,100	2	2,275,700	4	
Saturday, October 09, 2010	400,100	3		4	
Sunday, October 10, 2010	400,100	3		4	
Monday, October 11, 2010	400,100	3		4	
Tuesday, October 12, 2010	400,100	3		4	3,300,000
Wednesday, October 13, 2010	400,100	3	1,625,500	5	*75,000*
Thursday, October 14, 2010	400,100	1		5	
Friday, October 15, 2010	400,100	1	650,200	5	
Saturday, October 16, 2010	400,100	2		5	
Sunday, October 17, 2010	400,100	2		5	
Monday, October 18, 2010	400,100	2		5	
Tuesday, October 19, 2010	400,100	2		5	
Wednesday, October 20, 2010	400,100	2		5	
Thursday, October 21, 2010	400,100	2		5	
Friday, October 22, 2010	400,100	2	2,275,700	5	
Saturday, October 23, 2010	400,100	3		5	
Sunday, October 24, 2010	400,100	3		5	
Monday, October 25, 2010	400,100	3		5	
Tuesday, October 26, 2010	400,100	3		5	
Wednesday, October 27, 2010	400,200	3	1,625,500	5	
Thursday, October 28, 2010	400,100	1		5	
Friday, October 29, 2010	400,100	1	650,200	5	
Saturday, October 30, 2010	400,100	2		5	
Sunday, October 31, 2010	400,100	2		5	
Total Flow for October	12,403,500				
Monday, November 01, 2010	400,100	2		5	
Tuesday, November 02, 2010	400,100	2		5	
Wednesday, November 03, 2010	400,100	2		5	
Thursday, November 04, 2010	400,100	2		5	
Friday, November 05, 2010	400,100	2	1,950,600	5	
Saturday, November 06, 2010	400,100	3		5	
Sunday, November 07, 2010	400,100	3		5	
Monday, November 08, 2010	281,600	3		5	
Tuesday, November 09, 2010	400,000	3		5	

Wednesday, November 10, 2010	400,100	3			5	2,175,000
Thursday, November 11, 2010	400,100	3	1,832,000		4	75,000
Friday, November 12, 2010	400,100	1	325,100		4	
Saturday, November 13, 2010	400,100	2			4	
Sunday, November 14, 2010	400,100	2			4	
Monday, November 15, 2010	400,100	2			4	
Tuesday, November 16, 2010	400,100	2			4	
Wednesday, November 17, 2010	369,300	2			4	
Thursday, November 18, 2010	374,200	2			4	
Friday, November 19, 2010	400,100	2	2,218,900		4	675,000
Saturday, November 20, 2010	400,100	3			5	75,000
Sunday, November 21, 2010	400,100	3			5	
Monday, November 22, 2010	408,200	3			5	
Tuesday, November 23, 2010	408,400	3			5	
Wednesday, November 24, 2010	400,100	3	1,625,500		5	
Thursday, November 25, 2010	400,100	2			5	
Friday, November 26, 2010	400,200	2			5	
Saturday, November 27, 2010	400,100	2			5	
Sunday, November 28, 2010	400,100	2			5	
Monday, November 29, 2010	388,900	2			5	
Tuesday, November 30, 2010	411,300	2	1,950,600		5	825,000
Total Flow for November	11,844,200					
Wednesday, December 01, 2010						
Thursday, December 02, 2010						
Friday, December 03, 2010						
Saturday, December 04, 2010						

RIB Flows

NOTE: This sheet shows discharge flows to RIBs from 3/3/09 to 11/30/10. On 6/24/10 when calibrating the RIB pump flow meter an error was found in the flow totalizer plc program. Totalizer was reporting flows about 21% higher than actual. The flows shown from 3/26/09 to 11/30/10 are based on the Mission Alarm system which was installed & placed in operation on 3/26/09 and its data has been check and is considered most accurate. Flow data from 3/3/09 to 3/25/09 is based on pump run times and the programmed rate.

Date	Daily Flow Gallons per Day	Active RIB
Sunday, March 01, 2009		
Monday, March 02, 2009		
Tuesday, March 03, 2009		
Wednesday, March 04, 2009	**498,000**	**1, 2, 3**
Thursday, March 05, 2009	**720,000**	**1, 2, 3**
Friday, March 06, 2009	**720,000**	**1, 2, 3**
Saturday, March 07, 2009	**792,000**	**1, 2, 3**
Sunday, March 08, 2009	**759,000**	**1, 2, 3**
Monday, March 09, 2009	**792,000**	**1, 2, 3**
Tuesday, March 10, 2009	**792,000**	**1, 2, 3**
Wednesday, March 11, 2009	**792,000**	**1, 2, 3**
Thursday, March 12, 2009	**792,000**	**1, 2, 3**
Friday, March 13, 2009	**792,000**	**1, 2, 3**
Saturday, March 14, 2009	**792,000**	**1, 2, 3**
Sunday, March 15, 2009	**792,000**	**1, 2, 3**
Monday, March 16, 2009	**792,000**	**1, 2, 3**
Tuesday, March 17, 2009	**792,000**	**1, 2, 3**
Wednesday, March 18, 2009	**792,000**	**1, 2, 3**
Thursday, March 19, 2009	**792,000**	**1, 2, 3**
Friday, March 20, 2009	**792,000**	**1, 2, 3**
Saturday, March 21, 2009	**792,000**	**1, 2, 3**
Sunday, March 22, 2009	**792,000**	**1, 2, 3**
Monday, March 23, 2009	**792,000**	**1, 2, 3**
Tuesday, March 24, 2009	**792,000**	**1, 2, 3**
Wednesday, March 25, 2009	**792,000**	**1, 2, 3**
Thursday, March 26, 2009	**5,500**	**1, 2, 3**
Friday, March 27, 2009	**4,750**	**1, 2, 3**
Saturday, March 28, 2009	**4,500**	**1, 2, 3**
Sunday, March 29, 2009	**4,750**	**1, 2, 3**
Monday, March 30, 2009	**4,750**	**1, 2, 3**
Tuesday, March 31, 2009	**4,750**	**1, 2, 3**
Total Flow for April	**16,982,000**	
Wednesday, April 01, 2009	**4,750**	**2, 3**
Thursday, April 02, 2009	**402,500**	**2, 3**
Friday, April 03, 2009	**322,250**	**2, 3**
Saturday, April 04, 2009	**4,750**	**2, 3**
Sunday, April 05, 2009	**4,750**	**2, 3**
Monday, April 06, 2009	**4,750**	**2, 3**
Tuesday, April 07, 2009	**514,250**	**2,**
Wednesday, April 08, 2009	**658,000**	**2,**
Thursday, April 09, 2009	**702,000**	**2,**
Friday, April 10, 2009	**652,000**	**2,**
Saturday, April 11, 2009	**4,750**	**2,**
Sunday, April 12, 2009	**4,750**	**2,**
Monday, April 13, 2009	**523,250**	**2,**

RIB Flows

Tuesday, April 14, 2009	666,250	2,			
Wednesday, April 15, 2009	639,750	2,			
Thursday, April 16, 2009	697,000	2,			
Friday, April 17, 2009	685,000	2,			
Saturday, April 18, 2009	4,500	2,			
Sunday, April 19, 2009	4,500	2,			
Monday, April 20, 2009	196,000	2,			
Tuesday, April 21, 2009	187,250	1			
Wednesday, April 22, 2009	184,750	1			
Thursday, April 23, 2009	186,500	1			
Friday, April 24, 2009	135,500	1			
Saturday, April 25, 2009	139,250	1			
Sunday, April 26, 2009	138,750	1			
Monday, April 27, 2009	139,000	1			
Tuesday, April 28, 2009	139,000	1			
Wednesday, April 29, 2009	139,000	1			
Thursday, April 30, 2009	139,000	1			
Total Flow for April	**8,223,750**				
Friday, May 01, 2009	139,500	1			
Saturday, May 02, 2009	139,250	1			
Sunday, May 03, 2009	139,000	1			
Monday, May 04, 2009	139,250	1			
Tuesday, May 05, 2009	140,250	1			
Wednesday, May 06, 2009	153,250	1			
Thursday, May 07, 2009	0	1			
Friday, May 08, 2009	18,250	2,			
Saturday, May 09, 2009	0	2,			
Sunday, May 10, 2009	0	2,			
Monday, May 11, 2009	198,750	2 & 3			
Tuesday, May 12, 2009	315,250	2 & 3			
Wednesday, May 13, 2009	287,000	2 & 3			
Thursday, May 14, 2009	294,500	2 & 3			
Friday, May 15, 2009	275,500	2 & 3			
Saturday, May 16, 2009	345,750	2 & 3			
Sunday, May 17, 2009	252,250	2 & 3			
Monday, May 18, 2009	267,250	2 & 3			
Tuesday, May 19, 2009	336,500	2 & 3			
Wednesday, May 20, 2009	332,000	2 & 3			
Thursday, May 21, 2009	331,500	1 & 3			
Friday, May 22, 2009	332,500	1 & 3			
Saturday, May 23, 2009	332,250	1 & 3			
Sunday, May 24, 2009	293,500	1 & 3			
Monday, May 25, 2009	333,500	1 & 3			
Tuesday, May 26, 2009	332,250	1 & 3			
Wednesday, May 27, 2009	153,500	3			
Thursday, May 28, 2009	332,000	3			
Friday, May 29, 2009	333,000	3			
Saturday, May 30, 2009	331,750	3			
Sunday, May 31, 2009	332,250	3			
Total Flow for May	**7,211,500**				
Monday, June 01, 2009	331,750	3			
Tuesday, June 02, 2009	332,000	3			
Wednesday, June 03, 2009	331,750	3			
Thursday, June 04, 2009	333,000	3			
Friday, June 05, 2009	333,000	3			
Saturday, June 06, 2009	333,000	3			
Sunday, June 07, 2009	333,250	3			

RIB Flows

Monday, June 08, 2009	**333,250**	**3**			
Tuesday, June 09, 2009	**46,250**	**3**			
Wednesday, June 10, 2009	**2,000**	3			
Thursday, June 11, 2009	**0**				
Friday, June 12, 2009	**0**				
Saturday, June 13, 2009	**0**				
Sunday, June 14, 2009	**0**				
Monday, June 15, 2009	**9,250**	1			
Tuesday, June 16, 2009	**332,000**	**1**			
Wednesday, June 17, 2009	**364,750**	**1**			
Thursday, June 18, 2009	**331,750**	**2**			
Friday, June 19, 2009	**331,750**	**2**			
Saturday, June 20, 2009	**332,000**	**2**			
Sunday, June 21, 2009	**329,000**	**2**			
Monday, June 22, 2009	**342,500**	**2**			
Tuesday, June 23, 2009	**328,750**	**2**			
Wednesday, June 24, 2009	**331,250**	**2**			
Thursday, June 25, 2009	**328,500**	**3**			
Friday, June 26, 2009	**331,000**	**3**			
Saturday, June 27, 2009	**340,000**	**3**			
Sunday, June 28, 2009	**0**	**3**			
Monday, June 29, 2009	**659,750**	**3**			
Tuesday, June 30, 2009	**331,000**	**1**			
Total Flow for June	**7,732,500**				
Wednesday, July 01, 2009	**437,500**	**1**			
Thursday, July 02, 2009	**492,500**	**2**			
Friday, July 03, 2009	**496,500**	**2**			
Saturday, July 04, 2009	**492,750**	**2**			
Sunday, July 05, 2009	**497,000**	**2**			
Monday, July 06, 2009	**492,500**	**2**			
Tuesday, July 07, 2009	**497,500**	**2**			
Wednesday, July 08, 2009	**371,500**	**3**			
Thursday, July 09, 2009	**418,250**	**3**			
Friday, July 10, 2009	**443,250**	**3**			
Saturday, July 11, 2009	**415,250**	**3**			
Sunday, July 12, 2009	**427,000**	**3**			
Monday, July 13, 2009	**443,250**	**1**			
Tuesday, July 14, 2009	**487,500**	**1, 3**			
Wednesday, July 15, 2009	**487,250**	**2**			
Thursday, July 16, 2009	**487,500**	**2**			
Friday, July 17, 2009	**487,500**	**2**			
Saturday, July 18, 2009	**487,500**	**2**			
Sunday, July 19, 2009	**493,250**	**2**			
Monday, July 20, 2009	**493,250**	**2**			
Tuesday, July 21, 2009	**493,250**	**2**			
Wednesday, July 22, 2009	**427,250**	**3**			
Thursday, July 23, 2009	**354,500**	**3**			
Friday, July 24, 2009	**310,000**	**3**			
Saturday, July 25, 2009	**317,250**	**3**			
Sunday, July 26, 2009	**347,500**	**3**			
Monday, July 27, 2009	**310,000**	**3**			
Tuesday, July 28, 2009	**329,500**	**1**			
Wednesday, July 29, 2009	**337,250**	**1**			
Thursday, July 30, 2009	**320,500**	**2**			
Friday, July 31, 2009	**347,500**	**2**			
Total Flow for July	**12,805,500**				
Saturday, August 01, 2009	**340,500**	**2**			

RIB Flows

Sunday, August 02, 2009	**350,000**	**2**			
Monday, August 03, 2009	**310,000**	**2**			
Tuesday, August 04, 2009	**353,250**	**2**			
Wednesday, August 05, 2009	**313,500**	**2**			
Thursday, August 06, 2009	**332,000**	**3**			
Friday, August 07, 2009	**332,500**	**3**			
Saturday, August 08, 2009	**310,000**	**3**			
Sunday, August 09, 2009	**344,750**	**3**			
Monday, August 10, 2009	**319,500**	**3**			
Tuesday, August 11, 2009	**324,750**	**1**			
Wednesday, August 12, 2009	**346,000**	**1**			
Thursday, August 13, 2009	**310,000**	**2**			
Friday, August 14, 2009	**337,250**	**2**			
Saturday, August 15, 2009	**327,250**	**2**			
Sunday, August 16, 2009	**310,000**	**2**			
Monday, August 17, 2009	**361,250**	**2**			
Tuesday, August 18, 2009	**314,750**	**2**			
Wednesday, August 19, 2009	**310,000**	**2**			
Thursday, August 20, 2009	**354,250**	**3**			
Friday, August 21, 2009	**265,750**	**3**			
Saturday, August 22, 2009	**321,250**	**3**			
Sunday, August 23, 2009	**344,500**	**3**			
Monday, August 24, 2009	**320,000**	**3**			
Tuesday, August 25, 2009	**320,000**	**3**			
Wednesday, August 26, 2009	**320,000**	**1**			
Thursday, August 27, 2009	**320,000**	**1**			
Friday, August 28, 2009	**320,000**	**2**			
Saturday, August 29, 2009	**320,000**	**2**			
Sunday, August 30, 2009	**0**	**2**			
Monday, August 31, 2009	**320,000**	**2**			
Total Flow for August	**9,773,000**				
Tuesday, September 01, 2009	**320,000**	**2**			
Wednesday, September 02, 2009	**317,000**	**2**			
Thursday, September 03, 2009	**300,000**	**2**			
***Due to a malfunction, the specific flows from 8-24 thru 9-3 were not recorded, but the total flow was accurately recorded. Specific flows for these dates have been estimated based on the total flow over that period.**					
Friday, September 04, 2009	**354,500**	**3**			
Saturday, September 05, 2009	**355,750**	**3**			
Sunday, September 06, 2009	**390,500**	**3**			
Monday, September 07, 2009	**361,750**	**3**			
Tuesday, September 08, 2009	**354,250**	**3**			
Wednesday, September 09, 2009	**369,250**	**1**			
Thursday, September 10, 2009	**385,750**	**1**			
Friday, September 11, 2009	**354,500**	**2**			
Saturday, September 12, 2009	**354,250**	**2**			
Sunday, September 13, 2009	**290,500**	**2**			
Monday, September 14, 2009	**370,250**	**2**			
Tuesday, September 15, 2009	**354,500**	**2**			
Wednesday, September 16, 2009	**360,000**	**2**			
Thursday, September 17, 2009	**331,250**	**2**			
Friday, September 18, 2009	**268,000**	**3**			
Saturday, September 19, 2009	**354,250**	**3**			
Sunday, September 20, 2009	**373,250**	**3**			
Monday, September 21, 2009	**379,000**	**3**			

RIB Flows

Tuesday, September 22, 2009	354,250	3			
Wednesday, September 23, 2009	354,000	1			
Thursday, September 24, 2009	386,500	1			
Friday, September 25, 2009	365,750	2			
Saturday, September 26, 2009	354,000	2			
Sunday, September 27, 2009	364,250	2			
Monday, September 28, 2009	387,750	2			
Tuesday, September 29, 2009	354,000	2			
Wednesday, September 30, 2009	355,250	2			
Total Flow for September	**10,574,250**				
Thursday, October 01, 2009	377,500	2			
Friday, October 02, 2009	374,500	3			
Saturday, October 03, 2009	354,000	3			
Sunday, October 04, 2009	355,000	3			
Monday, October 05, 2009	389,750	3			
Tuesday, October 06, 2009	361,250	3			
Wednesday, October 07, 2009	353,750	1			
Thursday, October 08, 2009	368,500	1			
Friday, October 09, 2009	383,500	2			
Saturday, October 10, 2009	354,000	2			
Sunday, October 11, 2009	354,000	2			
Monday, October 12, 2009	382,250	2			
Tuesday, October 13, 2009	370,250	2			
Wednesday, October 14, 2009	353,750	2			
Thursday, October 15, 2009	359,500	2			
Friday, October 16, 2009	389,750	3			
Saturday, October 17, 2009	356,500	3			
Sunday, October 18, 2009	354,000	3			
Monday, October 19, 2009	372,750	3			
Tuesday, October 20, 2009	379,500	3			
Wednesday, October 21, 2009	353,750	1			
Thursday, October 22, 2009	353,750	1			
Friday, October 23, 2009	386,250	2			
Saturday, October 24, 2009	365,500	2			
Sunday, October 25, 2009	353,750	2			
Monday, October 26, 2009	363,750	2			
Tuesday, October 27, 2009	388,250	2			
Wednesday, October 28, 2009	354,000	2			
Thursday, October 29, 2009	353,750	2			
Friday, October 30, 2009	380,000	3			
Saturday, October 31, 2009	354,500	3			
Total Flow for October	**10,973,750**				
Sunday, November 01, 2009	379,250	3			
Monday, November 02, 2009	355,000	3			
Tuesday, November 03, 2009	332,750	3			
Wednesday, November 04, 2009	257,750	1			
Thursday, November 05, 2009	298,500	1			
Friday, November 06, 2009	280,250	2			
Saturday, November 07, 2009	294,500	2			
Sunday, November 08, 2009	286,250	2			
Monday, November 09, 2009	289,000	2			
Tuesday, November 10, 2009	292,000	2			
Wednesday, November 11, 2009	283,000	2			
Thursday, November 12, 2009	298,000	2			
Friday, November 13, 2009	278,750	3			
Saturday, November 14, 2009	296,750	3			
Sunday, November 15, 2009	284,000	3			

RIB Flows

Monday, November 16, 2009	290,750	3			
Tuesday, November 17, 2009	290,000	3			
Wednesday, November 18, 2009	285,000	1			
Thursday, November 19, 2009	297,000	1			
Friday, November 20, 2009	295,750	1			
Saturday, November 21, 2009	292,750	2			
Sunday, November 22, 2009	282,750	2			
Monday, November 23, 2009	298,500	2			
Tuesday, November 24, 2009	279,000	2			
Wednesday, November 25, 2009	296,500	2			
Thursday, November 26, 2009	284,500	2			
Friday, November 27, 2009	290,750	2			
Saturday, November 28, 2009	290,000	2			
Sunday, November 29, 2009	284,750	2			
Monday, November 30, 2009	296,500	2			
Total Flow for November	**8,860,250**				
Tuesday, December 01, 2009	284,500	2			
Wednesday, December 02, 2009	303,500	3			
Thursday, December 03, 2009	282,250	3			
Friday, December 04, 2009	298,000	3			
Saturday, December 05, 2009	279,000	3			
Sunday, December 06, 2009	297,000	3			
Monday, December 07, 2009	284,250	3			
Tuesday, December 08, 2009	291,000	3			
Wednesday, December 09, 2009	291,250	3			
Thursday, December 10, 2009	298,500	3			
Friday, December 11, 2009	290,500	3			
Saturday, December 12, 2009	294,750	3			
Sunday, December 13, 2009	280,500	3			
Monday, December 14, 2009	298,750	3			
Tuesday, December 15, 2009	280,750	3			
Wednesday, December 16, 2009	294,500	2			
Thursday, December 17, 2009	286,750	2			
Friday, December 18, 2009	303,750	2			
Saturday, December 19, 2009	278,750	2			
Sunday, December 20, 2009	298,000	2			
Monday, December 21, 2009	283,250	2			
Tuesday, December 22, 2009	304,250	2			
Wednesday, December 23, 2009	283,500	2			
Thursday, December 24, 2009	297,750	2			
Friday, December 25, 2009	279,000	2			
Saturday, December 26, 2009	297,250	2			
Sunday, December 27, 2009	290,000	2			
Monday, December 28, 2009	297,000	2			
Tuesday, December 29, 2009	290,000	2			
Wednesday, December 30, 2009	285,500	2			
Thursday, December 31, 2009	295,750	2			
Total Flow for December	**9,019,500**				
Total Flow Since March 3, 2009	**102,156,000**				
Friday, January 01, 2010	279,500	2			
Saturday, January 02, 2010	298,750	2			
Sunday, January 03, 2010	282,000	2			
Monday, January 04, 2010	293,500	2			
Tuesday, January 05, 2010	287,750	2			
Wednesday, January 06, 2010	292,000	2			
Thursday, January 07, 2010	291,500	2			
Friday, January 08, 2010	283,750	2			

RIB Flows

Saturday, January 09, 2010	**297,500**	**2**			
Sunday, January 10, 2010	**279,000**	**2**			
Monday, January 11, 2010	**297,750**	**2**			
Tuesday, January 12, 2010	**283,500**	**2**			
Wednesday, January 13, 2010	**294,250**	**2**			
Thursday, January 14, 2010	**290,750**	**2**			
Friday, January 15, 2010	**307,000**	**2**			
Saturday, January 16, 2010	**279,000**	**2**			
Sunday, January 17, 2010	**298,000**	**2**			
Monday, January 18, 2010	**283,000**	**2**			
Tuesday, January 19, 2010	**292,750**	**2**			
Wednesday, January 20, 2010	**288,500**	**2**			
Thursday, January 21, 2010	**388,500**	**2**			
Friday, January 22, 2010	**286,500**	**3**			
Saturday, January 23, 2010	**296,250**	**3**			
Sunday, January 24, 2010	**279,250**	**3**			
Monday, January 25, 2010	**298,500**	**3**			
Tuesday, January 26, 2010	**282,500**	**3**			
Wednesday, January 27, 2010	**298,750**	**3**			
Thursday, January 28, 2010	**284,250**	**3**			
Friday, January 29, 2010	**290,750**	**3**			
Saturday, January 30, 2010	**290,250**	**3**			
Sunday, January 31, 2010	**285,000**	**3**			
Total Flow for January	**9,080,250**				
Monday, February 01, 2010	**296,250**	**3**			
Tuesday, February 02, 2010	**279,250**	**3**			
Wednesday, February 03, 2010	**299,000**	**3**			
Thursday, February 04, 2010	**282,000**	**3**			
Friday, February 05, 2010	**301,000**	**3**			
Saturday, February 06, 2010	**284,500**	**3**			
Sunday, February 07, 2010	**291,000**	**3**			
Monday, February 08, 2010	**290,750**	**3**			
Tuesday, February 09, 2010	**285,750**	**3**			
Wednesday, February 10, 2010	**297,000**	**3**			
Thursday, February 11, 2010	**280,250**	**3**			
Friday, February 12, 2010	**299,000**	**3**			
Saturday, February 13, 2010	**283,500**	**3**			
Sunday, February 14, 2010	**293,500**	**3**			
Monday, February 15, 2010	**289,000**	**3**			
Tuesday, February 16, 2010	**288,000**	**3**			
Wednesday, February 17, 2010	**292,250**	**3**			
Thursday, February 18, 2010	**281,750**	**3**			
Friday, February 19, 2010	**300,250**	**3**			
Saturday, February 20, 2010	**281,750**	**3**			
Sunday, February 21, 2010	**299,250**	**3**			
Monday, February 22, 2010	**284,500**	**3**			
Tuesday, February 23, 2010	**293,750**	**3**			
Wednesday, February 24, 2010	**291,750**	**3**			
Thursday, February 25, 2010	**299,750**	**3**			
Friday, February 26, 2010	**287,500**	**3**			
Saturday, February 27, 2010	**293,750**	**3**			
Sunday, February 28, 2010	**289,000**	**3**			
Total Flow for February	**8,135,000**				
Monday, March 01, 2010	**286,750**	**3**			
Tuesday, March 02, 2010	**294,750**	**3**			
Wednesday, March 03, 2010	**284,750**	**3**			
Thursday, March 04, 2010	**300,500**	**3**			
Friday, March 05, 2010	**289,500**	**3**			

RIB Flows

Saturday, March 06, 2010	**298,000**	**3**			
Sunday, March 07, 2010	**283,500**	**3**			
Monday, March 08, 2010	**292,250**	**3**			
Tuesday, March 09, 2010	**290,000**	**3**			
Wednesday, March 10, 2010	**287,000**	**3**			
Thursday, March 11, 2010	**296,250**	**3**			
Friday, March 12, 2010	**260,000**	**3**			
Saturday, March 13, 2010	**210,500**	**3**			
Sunday, March 14, 2010	**199,750**	**3**			
Monday, March 15, 2010	**199,250**	**3**			
Tuesday, March 16, 2010	**205,000**	**3**			
Wednesday, March 17, 2010	**211,000**	**3**			
Thursday, March 18, 2010	**212,500**	**3**			
Friday, March 19, 2010	**211,750**	**3**			
Saturday, March 20, 2010	**210,000**	**3**			
Sunday, March 21, 2010	**208,750**	**3**			
Monday, March 22, 2010	**208,000**	**3**			
Tuesday, March 23, 2010	**206,750**	**3**			
Wednesday, March 24, 2010	**209,500**	**2**			
Thursday, March 25, 2010	**207,250**	**2**			
Friday, March 26, 2010	**208,250**	**2**			
Saturday, March 27, 2010	**199,000**	**2**			
Sunday, March 28, 2010	**198,250**	**2**			
Monday, March 29, 2010	**202,500**	**2**			
Tuesday, March 30, 2010	**202,500**	**2**			
Wednesday, March 31, 2010	**207,000**	**2**			
Total Flow for March	**7,380,750**				
Thursday, April 01, 2010	**206,250**	**2**			
Friday, April 02, 2010	**220,750**	**2**			
Saturday, April 03, 2010	**193,000**	**2**			
Sunday, April 04, 2010	**193,500**	**2**			
Monday, April 05, 2010	**202,000**	**2**			
Tuesday, April 06, 2010	**202,250**	**2**			
Wednesday, April 07, 2010	**201,500**	**2**			
Thursday, April 08, 2010	**201,250**	**2**			
Friday, April 09, 2010	**205,000**	**2**			
Saturday, April 10, 2010	**201,000**	**2**			
Sunday, April 11, 2010	**201,000**	**2**			
Monday, April 12, 2010	**200,500**	**2**			
Tuesday, April 13, 2010	**113,500**	**2**			
Wednesday, April 14, 2010	**156,000**	**2**			
Thursday, April 15, 2010	**185,500**	**2**			
Friday, April 16, 2010	**265,750**	**3**			
Saturday, April 17, 2010	**312,500**	**3**			
Sunday, April 18, 2010	**328,000**	**3**			
Monday, April 19, 2010	**313,000**	**3**			
Tuesday, April 20, 2010	**303,500**	**3**			
Wednesday, April 21, 2010	**203,250**	**3**			
Thursday, April 22, 2010	**316,000**	**3**			
Friday, April 23, 2010	**304,250**	**3**			
Saturday, April 24, 2010	**324,250**	**3**			
Sunday, April 25, 2010	**300,750**	**3**			
Monday, April 26, 2010	**320,750**	**3**			
Tuesday, April 27, 2010	**307,750**	**3**			
Wednesday, April 28, 2010	**312,500**	**3**			
Thursday, April 29, 2010	**315,750**	**1**			
Friday, April 30, 2010	**304,250**	**1**			
Total Flow for April	**7,415,250**				

RIB Flows

Saturday, May 01, 2010	324,250	2			
Sunday, May 02, 2010	300,500	2			
Monday, May 03, 2010	325,750	2			
Tuesday, May 04, 2010	307,750	2			
Wednesday, May 05, 2010	365,000	2			
Thursday, May 06, 2010	308,750	2			
Friday, May 07, 2010	377,500	2			
Saturday, May 08, 2010	320,000	3			
Sunday, May 09, 2010	309,000	3			
Monday, May 10, 2010	324,750	3			
Tuesday, May 11, 2010	321,750	3			
Wednesday, May 12, 2010	303,000	3			
Thursday, May 13, 2010	306,500	1			
Friday, May 14, 2010	347,750	1			
Saturday, May 15, 2010	401,500	2			
Sunday, May 16, 2010	395,750	2			
Monday, May 17, 2010	363,250	2			
Tuesday, May 18, 2010	354,500	2			
Wednesday, May 19, 2010	365,750	2			
Thursday, May 20, 2010	365,250	2			
Friday, May 21, 2010	364,750	2			
Saturday, May 22, 2010	346,750	3			
Sunday, May 23, 2010	371,500	3			
Monday, May 24, 2010	364,750	3			
Tuesday, May 25, 2010	360,750	3			
Wednesday, May 26, 2010	346,250	3			
Thursday, May 27, 2010	360,250	1			
Friday, May 28, 2010	352,500	1			
Saturday, May 29, 2010	364,250	2			
Sunday, May 30, 2010	357,000	2			
Monday, May 31, 2010	346,250	2			
Total Flow for May	**10,723,250**				
Total Flow since Jan 2010	**42,734,500**				

NOTE: On June 1, 2010 RIBs 4 and 5 were ready for operation. Since that time we have been running 2 beds at a time. Rotating the primary RIBs 1, 2 and 3 and running one of the 2 newer RIBs, 4 or 5. On June 1, 2010 RIB 5 was the secondary RIB and we performed a bucket test to estimate flow. During the first couple of weeks we discharge 25,000 gpd to beds 4 or 5, the balance went to the primary RIB, so on June 1st the primary RIB (#2) received 349,250-25,000 = 324,250 gallons. Bucket test were done each time RIBs 4 and 5 were changed.

Date	Daily Flow Gal/day	Primary RIB	RIB Total	2nd RIB	RIB Total
Tuesday, June 01, 2010	349,250	2		5	*25,000*
Wednesday, June 02, 2010	363,500	2		5	
Thursday, June 03, 2010	398,500	2		5	
Friday, June 04, 2010	363,750	2	1,475,000	5	0
Saturday, June 05, 2010	52,500	3		4	*25,000*
Sunday, June 06, 2010	217,750	3		4	
Monday, June 07, 2010	348,000	3		4	
Tuesday, June 08, 2010	363,750	3		4	
Wednesday, June 09, 2010	365,750	3	1,347,750	4	
Thursday, June 10, 2010	353,714	1		4	
Friday, June 11, 2010	353,714	1	707,429	4	0
Saturday, June 12, 2010	353,714	2		5	*25,000*

RIB Flows

Sunday, June 13, 2010	353,714	2		5	
Monday, June 14, 2010	353,714	2		5	
Tuesday, June 15, 2010	353,714	2		5	
Wednesday, June 16, 2010	353,714	2		5	
Thursday, June 17, 2010	399,250	2		5	0
Friday, June 18, 2010	389,000	2	2,556,821	4	*50,000*
Saturday, June 19, 2010	381,250	3		4	
Sunday, June 20, 2010	398,250	3		4	
Monday, June 21, 2010	401,000	3		4	
Tuesday, June 22, 2010	382,250	3		4	0
Wednesday, June 23, 2010	389,250	3	1,952,000	5	*50,000*
Thursday, June 24, 2010	394,250	1		5	
Friday, June 25, 2010	401,500	1	795,750	5	
Saturday, June 26, 2010	385,250	2		5	
Sunday, June 27, 2010	381,750	2		5	
Monday, June 28, 2010	392,500	2		5	
Tuesday, June 29, 2010	401,750	2		5	
Wednesday, June 30, 2010	388,750	2	1,950,000	5	
Total Flow for June	10,784,750				
Thursday, July 01, 2010	391,250	2	773,250	5	
Friday, July 02, 2010	382,000	2	2,723,250	5	
Saturday, July 03, 2010	400,000	3		5	
Sunday, July 04, 2010	409,000	3		5	
Monday, July 05, 2010	381,500	3		5	
Tuesday, July 06, 2010	388,750	3		5	
Wednesday, July 07, 2010	402,000	3	1,981,250	5	
Thursday, July 08, 2010	402,500	1		5	
Friday, July 09, 2010	408,000	1	810,500	5	
Saturday, July 10, 2010	424,000	2		5	
Sunday, July 11, 2010	424,000	2		5	
Monday, July 12, 2010	442,250	2		5	0
Tuesday, July 13, 2010	452,250	2		5	*75,000*
Wednesday, July 14, 2010	446,000	2		5	
Thursday, July 15, 2010	446,000	2		5	
Friday, July 16, 2010	446,000	2	3,080,500	5	
Saturday, July 17, 2010	446,000	3		5	
Sunday, July 18, 2010	446,000	3		5	
Monday, July 19, 2010	451,750	3		5	
Tuesday, July 20, 2010	470,900	3		5	
Wednesday, July 21, 2010	474,500	3	2,289,150	5	
Thursday, July 22, 2010	469,500	1		5	
Friday, July 23, 2010	475,100	1	944,600	5	0
Saturday, July 24, 2010	475,100	2		4	*75,000*
Sunday, July 25, 2010	475,100	2		4	
Monday, July 26, 2010	500,400	2		4	
Tuesday, July 27, 2010	500,400	2		4	
Wednesday, July 28, 2010	500,100	2		4	
Thursday, July 29, 2010	500,100	2		4	
Friday, July 30, 2010	500,100	2	3,450,700	4	
Saturday, July 31, 2010	500,100	3		4	
Total Flow for July	13,830,650				
Sunday, August 01, 2010	500,100	3		4	
Monday, August 02, 2010	500,100	3		4	
Tuesday, August 03, 2010	500,100	3		4	
Wednesday, August 04, 2010	500,100	3	2,500,500	4	
Thursday, August 05, 2010	500,100	1		4	
Friday, August 06, 2010	500,100	1	1,000,200	4	

RIB Flows

Saturday, August 07, 2010	500,100	2		4	
Sunday, August 08, 2010	500,100	2		4	
Monday, August 09, 2010	500,100	2		4	
Tuesday, August 10, 2010	500,100	2		4	
Wednesday, August 11, 2010	500,100	2		4	
Thursday, August 12, 2010	500,100	2		4	
Friday, August 13, 2010	500,200	2	3,500,700	4	
Saturday, August 14, 2010	500,100	3		4	
Sunday, August 15, 2010	500,200	3		4	0
Monday, August 16, 2010	500,100	3		5	*100,000*
Tuesday, August 17, 2010	500,100	3		5	
Wednesday, August 18, 2010	500,100	3	2,500,500	5	
Thursday, August 19, 2010	500,100	1		5	
Friday, August 20, 2010	500,200	1	1,000,200	5	
Saturday, August 21, 2010	500,100	2		5	
Sunday, August 22, 2010	500,100	2		5	
Monday, August 23, 2010	500,400	2		5	
Tuesday, August 24, 2010	500,100	2		5	
Wednesday, August 25, 2010	500,200	2		5	
Thursday, August 26, 2010	500,100	2		5	
Friday, August 27, 2010	500,100	2	3,500,700	5	
Saturday, August 28, 2010	500,100	3		5	
Sunday, August 29, 2010	500,100	3		5	
Monday, August 30, 2010	500,100	3		5	0
Tuesday, August 31, 2010	500,200	3		4	*100,000*
Total Flow for August	15,503,900				
Wednesday, September 01, 2010	500,200	3	2,500,500	4	
Thursday, September 02, 2010	500,100	1		4	
Friday, September 03, 2010	400,100	1	900,200	4	*75,000*
Saturday, September 04, 2010	400,200	2		4	
Sunday, September 05, 2010	400,100	2		4	
Monday, September 06, 2010	400,200	2		4	
Tuesday, September 07, 2010	400,100	2		4	
Wednesday, September 08, 2010	400,100	2		4	
Thursday, September 09, 2010	400,100	2		4	
Friday, September 10, 2010	400,100	2	2,800,700	4	
Saturday, September 11, 2010	400,100	3		4	
Sunday, September 12, 2010	400,100	3		4	
Monday, September 13, 2010	400,100	3		4	
Tuesday, September 14, 2010	400,100	3		4	
Wednesday, September 15, 2010	400,100	3		4	
Thursday, September 16, 2010	400,100	3	2,400,600	4	
Friday, September 17, 2010	400,100	1	400,100	4	
Saturday, September 18, 2010	400,100	2		4	
Sunday, September 19, 2010	400,100	2		4	
Monday, September 20, 2010	400,100	2		4	
Tuesday, September 21, 2010	400,100	2		4	
Wednesday, September 22, 2010	400,100	2		4	
Thursday, September 23, 2010	400,100	2		4	
Friday, September 24, 2010	400,100	2	2,800,700	4	
Saturday, September 25, 2010	400,100	3		4	
Sunday, September 26, 2010	400,100	3		4	
Monday, September 27, 2010	400,100	3		4	
Tuesday, September 28, 2010	400,100	3		4	
Wednesday, September 29, 2010	400,100	3	2,000,500	4	
Thursday, September 30, 2010	400,200	1		4	
Total Flow for September	12,203,400				

RIB Flows

Friday, October 01, 2010	400,100	1	800,200	4	
Saturday, October 02, 2010	400,300	2		4	
Sunday, October 03, 2010	400,100	2		4	
Monday, October 04, 2010	400,100	2		4	
Tuesday, October 05, 2010	400,100	2		4	
Wednesday, October 06, 2010	400,200	2		4	
Thursday, October 07, 2010	400,100	2		4	
Friday, October 08, 2010	400,100	2	2,800,700	4	
Saturday, October 09, 2010	400,100	3		4	0
Sunday, October 10, 2010	400,100	3		4	0
Monday, October 11, 2010	400,100	3		4	0
Tuesday, October 12, 2010	400,100	3		4	0
Wednesday, October 13, 2010	400,100	3	2,000,500	5	*75,000*
Thursday, October 14, 2010	400,100	1		5	
Friday, October 15, 2010	400,100	1	800,200	5	
Saturday, October 16, 2010	400,100	2		5	
Sunday, October 17, 2010	400,100	2		5	
Monday, October 18, 2010	400,100	2		5	
Tuesday, October 19, 2010	400,100	2		5	
Wednesday, October 20, 2010	400,100	2		5	
Thursday, October 21, 2010	400,100	2		5	
Friday, October 22, 2010	400,100	2	2,800,700	5	
Saturday, October 23, 2010	400,100	3		5	
Sunday, October 24, 2010	400,100	3		5	
Monday, October 25, 2010	400,100	3		5	
Tuesday, October 26, 2010	400,100	3		5	
Wednesday, October 27, 2010	400,200	3	2,000,500	5	
Thursday, October 28, 2010	400,100	1		5	
Friday, October 29, 2010	400,100	1	800,200	5	
Saturday, October 30, 2010	400,100	2		5	
Sunday, October 31, 2010	400,100	2		5	
Total Flow for October	12,403,500				
Monday, November 01, 2010	400,100	2		5	
Tuesday, November 02, 2010	400,100	2		5	
Wednesday, November 03, 2010	400,100	2		5	
Thursday, November 04, 2010	400,100	2		5	
Friday, November 05, 2010	400,100	2	2,400,600	5	
Saturday, November 06, 2010	400,100	3		5	
Sunday, November 07, 2010	400,100	3		5	
Monday, November 08, 2010	281,600	3		5	
Tuesday, November 09, 2010	400,000	3		5	
Wednesday, November 10, 2010	400,100	3		5	0
Thursday, November 11, 2010	400,100	3	2,282,000	4	*75,000*
Friday, November 12, 2010	400,100	1	400,100	4	
Saturday, November 13, 2010	400,100	2		4	
Sunday, November 14, 2010	400,100	2		4	
Monday, November 15, 2010	400,100	2		4	
Tuesday, November 16, 2010	400,100	2		4	
Wednesday, November 17, 2010	369,300	2		4	
Thursday, November 18, 2010	374,200	2		4	
Friday, November 19, 2010	400,100	2	2,743,900	4	0
Saturday, November 20, 2010	400,100	3		5	*75,000*
Sunday, November 21, 2010	400,100	3		5	
Monday, November 22, 2010	408,200	3		5	
Tuesday, November 23, 2010	408,400	3		5	
Wednesday, November 24, 2010	400,100	3	2,000,500	5	
Thursday, November 25, 2010	400,100	2		5	

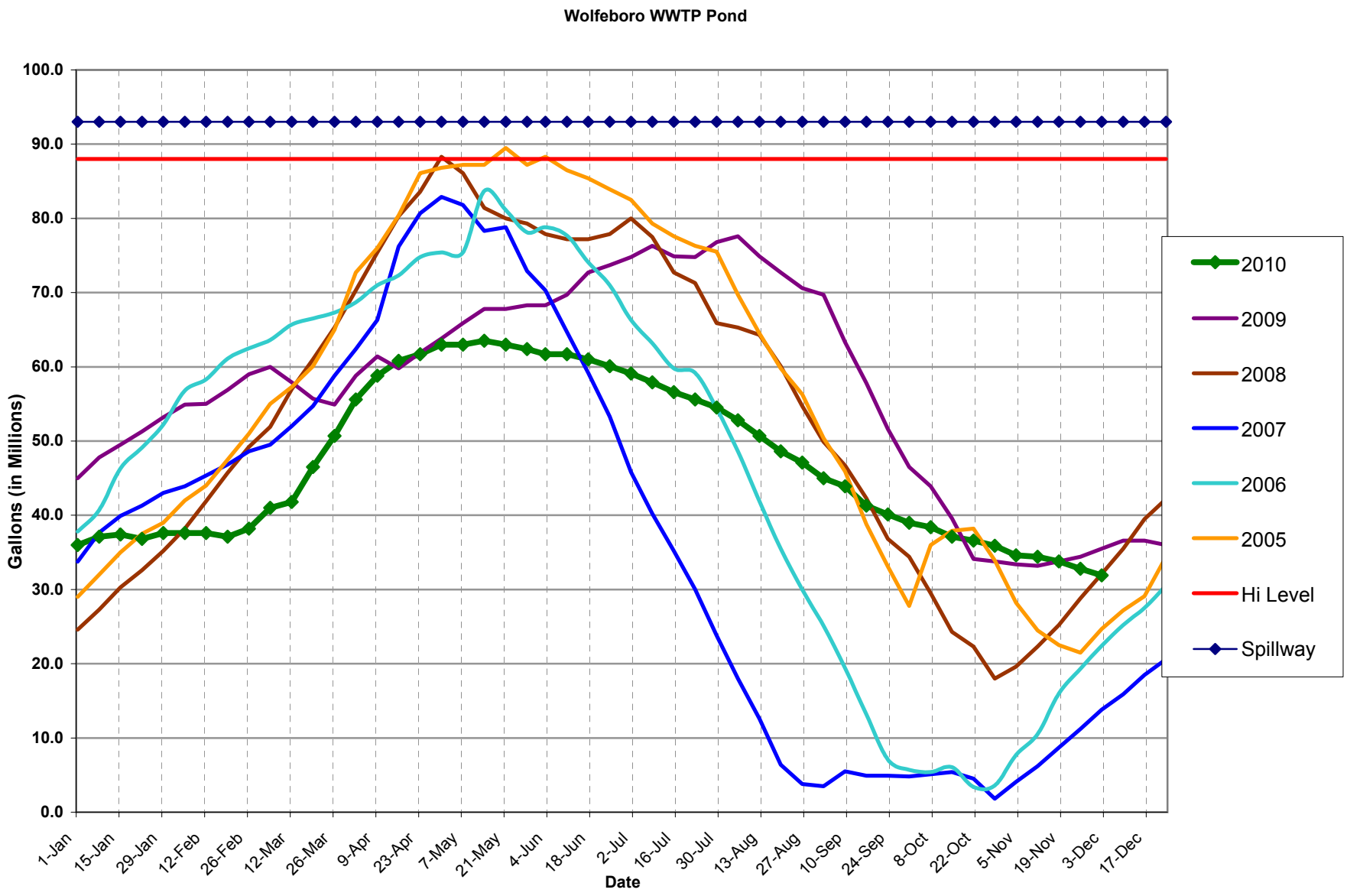
RIB Flows

Friday, November 26, 2010	**400,200**	**2**		**5**	
Saturday, November 27, 2010	**400,100**	**2**		**5**	
Sunday, November 28, 2010	**400,100**	**2**		**5**	
Monday, November 29, 2010	**388,900**	**2**		**5**	
Tuesday, November 30, 2010	**411,300**	**2**	2,400,600	**5**	0
Total Flow for November	**11,844,200**				

Appendix L

Effluent Storage Pond Evaluations

Wolfeboro, NH WWTP Pond Level Chart									
	Pond								
Date 2008	Week	2010	2009	2008	2007	2006	2005	Hi Level	Spillway
1-Jan-10	1	36.0	45.0	24.6	33.8	37.8	29.0	88.0	93.0
8-Jan-10	2	37.1	47.8	27.3	37.7	40.7	32.0	88.0	93.0
15-Jan-10	3	37.4	49.5	30.3	39.9	46.3	35.0	88.0	93.0
22-Jan-10	4	36.8	51.3	32.6	41.3	49.1	37.5	88.0	93.0
29-Jan-10	5	37.6	53.2	35.2	43.0	52.2	39.0	88.0	93.0
5-Feb-10	6	37.6	54.9	38.2	43.9	56.8	42.0	88.0	93.0
12-Feb-10	7	37.6	55.0	41.9	45.4	58.3	44.0	88.0	93.0
19-Feb-10	8	37.1	56.9	45.7	46.8	61.1	47.5	88.0	93.0
26-Feb-10	9	38.2	59.0	49.2	48.6	62.5	51.0	88.0	93.0
5-Mar-10	10	41.0	60.0	51.9	49.5	63.6	55.0	88.0	93.0
12-Mar-10	11	41.8	57.9	57.0	52.0	65.7	57.3	88.0	93.0
19-Mar-10	12	46.5	55.7	61.0	54.7	66.5	60.1	88.0	93.0
26-Mar-10	13	50.7	54.9	65.3	58.8	67.3	65.0	88.0	93.0
2-Apr-10	14	55.6	58.8	70.3	62.4	68.7	72.7	88.0	93.0
9-Apr-10	15	58.8	61.4	75.4	66.3	71.0	76.0	88.0	93.0
16-Apr-10	16	60.8	59.8	80.3	76.2	72.3	80.4	88.0	93.0
23-Apr-10	17	61.7	61.9	83.6	80.7	74.8	86.1	88.0	93.0
30-Apr-10	18	63.0	63.8	88.3	82.9	75.4	86.8	88.0	93.0
7-May-10	19	63.0	65.9	86.1	81.8	75.4	87.2	88.0	93.0
14-May-10	20	63.5	67.8	81.4	78.3	83.7	87.2	88.0	93.0
21-May-10	21	63.0	67.8	80.0	78.8	81.1	89.5	88.0	93.0
28-May-10	22	62.4	68.3	79.3	72.9	78.1	87.2	88.0	93.0
3-Jun-10	23	61.7	68.3	77.9	70.3	78.8	88.3	88.0	93.0
10-Jun-10	24	61.7	69.7	77.2	64.7	77.7	86.5	88.0	93.0
17-Jun-10	25	61.0	72.7	77.2	59.2	74.1	85.4	88.0	93.0
24-Jun-10	26	60.1	73.7	77.9	53.3	71.0	83.9	88.0	93.0
1-Jul-10	27	59.1	74.8	80.0	45.8	66.3	82.5	88.0	93.0
8-Jul-10	28	57.9	76.3	77.5	40.2	63.2	79.3	88.0	93.0
15-Jul-10	29	56.6	74.9	72.7	35.2	59.8	77.6	88.0	93.0
22-Jul-10	30	55.6	74.8	71.3	30.0	59.2	76.3	88.0	93.0
29-Jul-10	31	54.5	76.8	65.9	23.8	54.4	75.5	88.0	93.0
5-Aug-10	32	52.8	77.6	65.3	18.0	48.6	69.7	88.0	93.0
12-Aug-10	33	50.7	74.9	64.3	12.6	41.9	64.5	88.0	93.0
19-Aug-10	34	48.6	72.7	60.1	6.4	35.5	59.8	88.0	93.0
26-Aug-10	35	47.1	70.6	54.7	3.8	30.0	56.3	88.0	93.0
2-Sep-10	36	45.0	69.7	49.9	3.5	25.1	50.4	88.0	93.0
9-Sep-10	37	43.9	63.3	46.7	5.5	19.4	45.9	88.0	93.0
16-Sep-10	38	41.3	57.8	42.3	4.9	13.2	38.8	88.0	93.0
23-Sep-10	39	40.1	51.6	36.8	4.9	7.1	33.1	88.0	93.0
30-Sep-10	40	39.0	46.5	34.4	4.8	5.7	27.8	88.0	93.0
7-Oct-10	41	38.4	43.9	29.5	5.1	5.4	36.0	88.0	93.0
14-Oct-10	42	37.1	39.6	24.3	5.4	6.1	37.9	88.0	93.0
21-Oct-10	43	36.6	34.1	22.3	4.5	3.4	38.2	88.0	93.0
28-Oct-10	44	35.9	33.8	18	1.8	3.6	33.9	88.0	93.0
4-Nov-10	45	34.6	33.4	19.6	4.1	7.7	28.2	88.0	93.0
11-Nov-10	46	34.4	33.2	22.3	6.2	10.5	24.5	88.0	93.0
18-Nov-10	47	33.8	33.8	25.2	8.7	16.0	22.5	88.0	93.0
25-Nov-10	48	32.8	34.4	28.8	11.2	19.3	21.5	88.0	93.0
2-Dec-10	49	31.9	35.5	32.1	13.8	22.4	24.7	88.0	93.0
9-Dec-10	50		36.6	35.5	15.9	25.2	27.2	88.0	93.0
16-Dec-10	51		36.6	39.5	18.5	27.5	29.1	88.0	93.0
23-Dec-10	52		36.0	42.2	20.6	30.5	34.4	88.0	93.0


Wolfeboro WWTP Pond
Gallons (in Millions)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1-Jan
15-Jan
29-Jan
12-Feb
26-Feb
12-Mar
26-Mar
9-Apr
23-Apr
7-May
21-May
4-Jun
18-Jun
2-Jul
16-Jul
30-Jul
13-Aug
27-Aug
10-Sep
24-Sep
8-Oct
22-Oct
5-Nov
19-Nov
3-Dec
17-Dec
Date
2010
2009
2008
2007
2006
2005
Hi Level
Spillway