

2005 ANNUAL COMPLIANCE REPORT
OPERATION AND MAINTENANCE
MARKDALE WATER SYSTEM
MUNICIPALITY OF GREY HIGHLANDS

Project No.: 402702
Date: February 2006

Prepared by:

Oweson Water Services
(a Division of Oweson Ltd.)
Owen Sound Professional Centre
945-3rd Avenue East, Suite 230
Owen Sound, Ontario, N4K 2K8
Tel: 519-519-376-7534
Fax: 519-376-8008
Email: oweson@oweson.ca
Website: www.oweson.ca

TABLE OF CONTENTS

1.0	INTRODUCTION AND BACKGROUND	1-1
2.0	PLANT OVERVIEW	2-1
3.0	DESCRIPTION OF WATER SYSTEM	3-1
4.0	SUMMARY OF WATER QUALITY MONITORING	4-1
4.1	Bacteriological Sampling	4-1
4.2	Treated Water Turbidity and Chlorine Residual Monitoring - (Point of Entry - POE) . . .	4-1
4.3	Chemical Sampling Analysis	4-2
4.3.1	Quarterly Sampling Analysis	4-2
4.3.2	Annual Sampling Analysis	4-2
4.3.3	Five Year Sampling Analysis	4-3
5.0	WATER USAGE	5-1
6.0	COMPLIANCE WITH TERMS AND CONDITIONS OF THE CERTIFICATE OF APPROVAL AND REGULATION 170/03	6-1
6.1	Compliance with Terms and Conditions of the Certificate of Approval	6-1
6.2	Regulation 170/03, Section II - Annual Reports	6-2
6.3	Inspection Report	6-3
6.4	Upgrade Requirements in Consolidated Certificate of Approval	6-4
7.0	WATER SYSTEM IMPROVEMENTS AND MAINTENANCE 2005	7-1
8.0	DISCUSSION OF MARKDALE WATER TOWER	8-1
9.0	CALCULATION OF UNCOMMITTED HYDRAULIC RESERVE CAPACITY	9-1
10.0	CONCLUSIONS	10-1
11.0	RECOMMENDATIONS	11-1

List of Tables

Table 1	Summary of Bacteriological Analysis: 2005
Table 2	Summary of POE Turbidity
Table 3	Summary of Treated ("Point of Entry") and Distribution System Water Quality: Chlorination
Table 4A	Summary of Water Usage: 2003
Table 4B	Summary of Water Usage: 2004
Table 4C	Summary of Water Usage: 2005
Table 5	Measured Water Levels: 2005

List of Appendices

Appendix A	Treated Water Flows, Turbidity and Disinfectant Residual
Appendix B	Bacteriological Sampling and Analysis
Appendix C	Chemical Sampling and Analysis
Appendix D	Certificates of Approval
Appendix E	Permit to Take Water
Appendix F	Annual Record of Water Taking
Appendix G	Drinking Water Systems Regulation – Part III Form 2
Appendix H	Selected Correspondence

List of Figures

Figure 1	Markdale Water System
Figure 2	Schematic Process Flow Diagram: Pumping Station No. 1 (Isla Street)
Figure 3	Schematic Process Flow Diagram: Pumping Station No. 2 (Terra Drive)
Figure 4	Schematic Process Flow Diagram: Pumping Station No. 3 (Eliza Street)

**2005 ANNUAL COMPLIANCE REPORT
OPERATION AND MAINTENANCE
MARKDALE WATER SYSTEM
MUNICIPALITY OF GREY HIGHLANDS**

1.0 INTRODUCTION AND BACKGROUND

The Municipality of Grey Highlands has two (2) municipal water systems under its authority. One is located in the Former Village of Markdale and a second one is located in the former Township of Euphrasia (Kimberley Amik-Talisman Water Treatment Plant). This report will focus on the Markdale Water System located in the former Village of Markdale.

The Municipality of Grey Highlands operated the Markdale water systems in 2005. The water system's Overall Responsible Operator (ORO) up until December 5th, 2005, was Mr. Maurice Dempster, Manager of Water and Wastewater, who has a Class III Water Treatment Licence and Class II Water Distribution Licence. After December 5, 2005, Oweson Water Services provided supervisory services and Mr. Kyle Snell was the ORO. Daily operations were provided by the Municipal operators: Mr. Dave Sweiger, who has a Class I Water Treatment Licence and a Class II Water Distribution Licence; Mr. Jerry Thompson, who holds a Class I Water Treatment Licence and a Class I Water Distribution Licence; Mr. Shawn Moyer, Class I Water Treatment Licence and Class I Water Distribution licence and Mr. Daryl Teeter, Water Treatment Operator in Training.

As per the most recent Certificate of Approval No. 8963-65SHY3, upgrades to the Isla Street Pumping Station and decommissioning of the Terra Drive Pumping Station were completed by June 30, 2005. Cathodic protection was installed in the water tower in September 2005.

This report is prepared by Oweson Water Services, a Division of Oweson Ltd., with data provided by the Municipality of Grey Highlands.

The Markdale Water System is operated by:

The Municipality of Grey Highlands
P O Box 409, 206 Toronto St. South
Markdale, Ontario
N0C 1H0
Tel: (519) 986-2811
Fax: (519) 986-3643

The Operating Authority currently is:

Oweson Water Services
(a Division of Oweson Ltd.)
Owen Sound Professional Centre
945-3rd Avenue East, Suite 230
Owen Sound, Ontario, N4K 2K8
Tel: 519-376-7534
Fax: 519-376-8008
Email: oweson@oweson.ca
Website: www.oweson.ca

2.0 PLANT OVERVIEW

Figure 1 shows the location of the following components of the Markdale Water System.

- Isla Street Pumping Station at Well W1
- Terra Drive Pumping Station at Well W2
- Water Tower
- Eliza Street Pumping Station at Wells W3 and W4

The existing Isla Street and Terra Drive Pumping Stations were constructed in 1976. The existing water tower was constructed in 1986 replacing the previous concrete one constructed in 1976.

The Eliza Street Pumping Station is located south of the existing water tower in the location shown on Figure 1. This Pumping Station was commissioned in November 2004.

Upgrades to the existing Isla Street Pumping Station were completed in 2005, including the provision of ultraviolet disinfection, clearwell baffling and a second high-lift pump. It is scheduled to complete the decommissioning of the existing Terra Drive Pumping Station and Well W2 in early 2006.

3.0 DESCRIPTION OF WATER SYSTEM

The Markdale water supply and treatment system is located within the former Village limits which is located within the Municipality of Grey Highlands. The existing water supply and treatment system is the sole provider of water to the former Village of Markdale.

The water supply and treatment system consists of three (3) drilled wells and two (2) pumping stations. Well No. 1, and its affiliated pumping station, are located on the Isla Street road allowance at the intersection of Glasgow Street. Wells No. 3 and 4 and the associated Eliza Street Pumping Station are located south of the water tower on a parcel of property at the termination of Eliza Street. After treatment is completed, both plants pump directly into the distribution system and standpipe reservoir. The standpipe reservoir is located at the termination of Eliza St.

Figure 2 is the schematic Process Flow Diagram for the Isla Street Pumping Station. **Figure 3** is the Schematic Process Flow Diagram for the Terra Drive Pumping Station. **Figure 4** is the Schematic Process Flow Diagram for the Eliza Street Pumping Station.

Raw water for all Pumping Stations is provided by drilled wells.

Isla Street Pumping Station

The well at the Isla St. Pumping Station is located adjacent to the west corner of the Pumping Station. The well casing is surrounded on three (3) sides near ground surface by a concrete vault that features a poured concrete floor. The concrete vault is an integral part of the building. A watertight manhole cover is located in the ceiling of the vault above the well casing. An internal opening between the vault and treatment plant wall is present to permit visual inspection and maintenance duties to be carried out from the plant's interior. The well casing itself is contained in a poured concrete block to prevent any entry of surface (floor) water into the casing. The well at the Isla St. site is equipped with a Jacuzzi submersible pump (6500-6), rated to produce 400 IGPM (1.82m³/min) against 240 feet (73 m) TDH, with a 40HP Franklin electric motor. The submersible pump feeds a 100mm dia. ductile iron (DI) pipe which enters the plant through the internal vault opening in the northwest wall.

A 100 mm magnetic flow meter is used to measure raw water flows to the contact reservoir. A 100 mm flow control valve has been placed before a 100mm x 150mm eccentric increaser in the 100mm dia. piping from the submersible pump. A raw water sampling tap is provided on the raw water piping.

In 2005, two (2) (one (1) duty and one (1) standby) Ultraviolet Disinfection Units were installed at the Isla Street Pumping Station on the low lift piping. A motorized butterfly valve in the downstream side of the units, prevents the units from draining, by closing at the end of the duty cycle.

The raw water supply terminates inside the contact reservoir with a cast iron (CI) 90° elbow turned away from the direction of plug flow in the contact chamber. The contact reservoir has a capacity of approximately 15.35 m³ (3378 IG). The normal water depth used for the calculation is the drawdown point (lowest water level) in the reservoir where the well pump turns on. In 2005, baffling improvements to the Isla Street contact chamber were performed.

Sodium hypochlorite solution is injected into the inlet area of the chlorine contact reservoir from the sodium hypochlorite solution tanks located in the entrance area. The Summa Engineering duplex metering pump system with automatic switch over is activated upon submersible pump start-up and delivers a metered flow of hypochlorite solution to the inlet point of the contact reservoir. The sodium hypochlorite solution is injected at the termination of the CI 90° elbow of the raw water piping. A 150mm dia. overflow pipe is present from the contact reservoir to the exterior of the building. The discharge point of the overflow piping is equipped with a 150mm CI 90° elbow turned down and is equipped with a birdscreen.

One high-lift pump 150mm dia. DI suction line enters the contact reservoir on the other side of the baffle and draws water from the sump area of the contact reservoir. A 150mm dia. DI 90° long radius flare elbow is located at the entry point of the drawn treated water. The 150mm dia. DI high-lift suction line is reduced to 125mm dia. DI via a 150mm to 125mm CI eccentric reducer. The 125mm dia. DI line is flanged to the inlet port of 2 side suctions, Fairbanks Morse series 5800 high-lift pump. The high-lift pump (1 duty, 1 standby) discharges to 100mm dia. DI piping equipped with tapping which accommodates an air relief valve and pressure gauge. A Singer Flow Control valve is located on the 100mm dia. piping, as well as a 100 mm dia. treated water magnetic flow meter. After the flow control valve, the 100mm dia. piping is adapted to 150mm dia. DI piping via a 100mm to 150mm CI tapered increaser. The 150mm dia. DI piping is branched off to provide blow off/pressure relief piping to the exterior of the plant.

The main 150mm dia. DI pipe leaves through the northwest wall of the building and connects to the municipal distribution network which leads to the standpipe reservoir. A treated water sampling tap is provided on the pump discharge piping.

Terra Drive Pumping Station

The Terra Drive Pumping Station has essentially the same layout as Pumping Station No. 1 with the differences occurring in the layout of the main treatment plant piping.

The Terra Drive pumping station was physically disconnected from the distribution system by the end of June 2005.

A 100mm butterfly valve is also placed in the raw water supply line before it discharges into the contact reservoir. A horizontal 100mm CI 90° elbow has been placed on the end of the raw water discharge pipe to direct flow into the chamber. A 150mm dia. overflow pipe is present from the contact reservoir to the exterior of the building. The discharge point of the overflow piping is equipped with a 150mm CI 90° elbow turned down and is equipped with a birdscreen.

Sodium hypochlorite is injected into the inlet point of contact reservoir via tubing from the Summa Engineering duplex metering pump system with automatic switch over, mounted near the sodium hypochlorite solution tank. The chlorine contact reservoir has a capacity of approximately 19.3 m³ (4246 IG).

A 100 mm dia. DI suction line is used for the high-lift pump. A 100mm CI 90° long radius flare elbow is used as an inlet for the suction piping in the contact reservoir. The 100mm dia. suction line is reduced by a 100mm x 75mm CI 90° reducing elbow. A 25mm stop cock for air relief has been implemented before the suction port of the high-lift pump. The high-lift pump is a side suction 75mm Fairbanks Morse Series 5800. The high-lift pump discharges to 50mm dia. DI piping via a Victaulic flange connection. The 50 mm dia. piping is equipped with an air relief valve and pressure gauge. A Singer Flow Control Valve is implemented into the piping. The 50mm piping is converted to 100mm DI piping via a 50mm to 100mm tapered increaser.

A treated water sampling tap has been provided on the treated water discharge header. The main 100mm dia. DI pipe leaves through the northwest wall of the building and connects to the municipal distribution

network which leads to the standpipe reservoir. A treated water sampling tap is provided on the pump discharge piping.

Eliza Street Water Treatment Plant/Pumping Station

Wells W3 and W4 are located approximately 25 m north of the Eliza Street Pumping Station. Raw water from the wells comes to the Pumping Station via PVC DR18 (Class 150) raw watermain, and changes to ductile iron prior to entering the Eliza Street Pumping Station. The Eliza Street Pumping Station has a floor elevation of 431 m, and is a one storey building (slab on grade) containing the following separate rooms:

1. Garage for storage of portable standby power generator.
2. Sodium Hypochlorite storage/metering pump panel room.
3. Washroom for Operator use.
4. Main treatment room for all raw water and treated water piping as well as all analyzers and the ultraviolet disinfection units, and electrical.

General dimensions of the Pumping Station are approximately 15 m x 6 m. Once the raw water from Wells W3 and W4 enter the Pumping Station, raw water piping runs upwards from the floor slab near the north wall of the Pumping Station. Raw water piping for Well W4 is 100 mm dia. (4") ductile iron and raw water from Well W3 is 150 mm dia. (6") ductile iron. Raw water piping configuration is similar for Wells W3 and W4 and consists of the following fittings prior to both raw water pipes joining into a common header (which is then increased to 300 mm dia. and run through the ultraviolet disinfection units):

- Raw water piping tees off to a blow-off in the north end of the Pumping Station.
- At high point of raw water piping prior to flow control valve, air release/vacuum brake valve is provided to relieve the air and also to provide vacuum relief to ensure proper operation of the flow control valve.
- Singer flow control valves are provided to allow control of the flow rate from the pump to ensure the Permit to Take Water flow rate is not exceeded. A 150 mm dia. flow control valve is provided for Well W3 and a 100 mm dia. flow control valve is provided for Well W4.
- Separate raw water meters are provided (150 mm dia. for Well W3 and 100 mm dia. for Well W4). Common bypass piping is provided for both raw water meters.

Sodium hypochlorite is injected between the flow control valve and the water meter. The raw water turbidity analyzer water sampling point is provided just after the flow control valves. After the two raw water sources come to a common point downstream of the water meters, pipe sizing is increased to 300 mm dia. and the two parallel ultraviolet disinfection units and their associated piping are located in the northwest corner of the Pumping Station. Each ultraviolet disinfection unit is provided with 2 x 300 mm dia. isolation valves to allow operation of only one duty unit at a time. These valves must be manually operated when the duty unit is changed from UV Unit 1 to UV Unit 2. It should be noted that the ultraviolet disinfection units provided require a warm-up and cool down period prior to operation, and a solenoid valve located at the base of the unit, drains the unit to provide cooling water from the distribution system during this warm-up and cool down operation, when the well pumps are not actually producing water. During manual operation, cooling water must still be provided by manual operation of a manual valve located at the UV unit base. This is discussed further in Manual Operation under Section D20 - Ultraviolet Disinfection.

After the ultraviolet disinfection unit discharge piping comes to a common point, a piping assembly for treated water along the west wall of the Pumping Station is provided to provide a location for the treated water meter and the treated water meter bypass piping, as well as pressure relief valve piping, and an associated blow-off can also be used to manually blow off the system. After the treated water has been metered, the treated water piping re-enters the floor slab, but a treated water plumbing point provided just prior to the piping entering the floor slab 19 mm dia. copper piping is located under the floor slab, carries the water to the treated water meter analytical panel located to the east of the main door. The following analyzers are provided to monitor the treated water and other parameters as follows:

1. Treated water free chlorine
2. Treated water turbidity
3. Treated water ultraviolet transmittance
4. Water tower chlorine residual displays the output from a chlorine residual analyzer located in the valve chamber near the water tower.

The main treatment room also houses cabinets and laboratory sink for Operators use, as well as the Motor Control Centre for the electrical.

Sodium hypochlorite and associated metering pump panels are stored in the chlorination room. Sodium hypochlorite solution tanks (one (1) duty and one (1) standby) are located in a secondary containment curb,

and each of the well pumps has its own metering pump panel complete with a duty and standby metering pump with automatic switchover to standby in case of duty pump failure. The sodium hypochlorite room also contains a Spill Containment Pallet for storage of the chlorination sodium hypochlorite carboys, which provides spill containment in the event of breakage of any of the individual chlorination carboys. There is also an emergency eye and face wash station located in the chlorination room.

Standpipe

The standpipe reservoir is an elevated standpipe which was installed in approximately 1986 replacing the original concrete water tower built in 1975. The steel storage facility has a capacity of approximately 1900 m³ (420,000 IG). The reservoir is approximately 10.4 m in diameter with base elevation of 435.3 m and a high water level elevation of 457.8 m. The height of water in the standpipe is approximately 22.5 m.

To the east of the standpipe reservoir is a valve chamber which houses the main flow valves regulating flow to and from the standpipe. The automatic controls for the pumps at the Pumping Stations are based on the height of water in the standpipe and are housed in the valve chamber. The valve chamber is equipped with a sump (with pump), dehumidifier, electric heater, and vent.

In September 2005, Cathodic Protection was installed in the standpipe.

4.0 SUMMARY OF WATER QUALITY MONITORING

4.1 Bacteriological Sampling

The Bacteriological water samples for the Markdale Water System were analyzed by SGS Lakefield Research. Lakefield Research performed all bacteriological analysis from January 1, 2005 to December 31, 2005. Raw water samples from each of the four (4) production wells, were analyzed for E.coli and Total Coliform Counts using Membrane filtration analysis. Regulation 170/03 indicates that raw water samples need not be analyzed for Background Count or HPC. The Point of Entry (POE) and distribution bacteriological samples were analyzed for E.coli, Total Coliforms and Background Count also using Membrane filtration analysis.

A summary of the Bacteriological sampling and analysis for each well (raw water), each Pumping Station (POE) and the distribution system is provided in **Table 1**.

Table 1 information has been provided to indicate the number of safe and unsafe water samples out of the total number of samples taken. A weekly breakdown of the bacteriological sampling and analysis of the water system is provided in **Appendix B**. On November 30, 2005, it was reported that the treated water sample collected from the Eliza Street Pumping Station on November 28, 2005 had a Total Coliform Count of 13 cfu/100ml, an E. Coli count of 1 cfu/100/ml and a background count of 318 cfu/100ml. The Bruce Grey Owen Sound Health Unit immediately issued a Boil Water Advisory (BWA) for the Markdale Water System. The BWA was in effect until mid December 2005. Two consecutive samples were collected by the Operator In Charge (OIC) and two (2) by the Grey Bruce Health Unit. All were found to be safe. Since the adverse on November 30, 2005, the OIC has continued to collect samples from all three (3) wells, both pumping stations and the distribution system five (5) days per week (Monday through Friday). This exceeds the regulatory requirements. Of the 180 samples collected from the various locations in the distribution system, all analysis results were found to be safe.

4.2 Treated Water Turbidity and Chlorine Residual Monitoring - (Point of Entry - POE)

A summary of the POE (treated) water turbidity and chlorine residual monitoring for the Markdale Water System is provided in the enclosed **Tables 2 and 3** respectively. Turbidity and chlorine residual monitoring was performed daily in 2005. A monthly breakdown of turbidity monitoring and chlorine residual in the treated water and the distribution system is provided in **Appendix A**. During 2005, there were no reportable Turbidity

results , no free chlorine residuals <0.2 mg/L leaving any of the Pumping Stations (POE) or any results <0.05 mg/L in the distribution system.

4.3 Chemical Sampling Analysis

4.3.1 Quarterly Sampling Analysis

Quarterly sampling for POE water was performed at each Pumping Station for the following parameters in 2005:

S Nitrite (NO₂)
S Nitrate (NO₃)
S THM

All NO₂ and NO₃ results were below their MAC's 1 and 10 mg/L respectively. Refer to **Appendix C** for analysis results.

Quarterly samples were collected for Trihalomethanes (THMs) from the distribution system. All distribution THM samples were found to be below the MAC of 100 µg/L. Refer to **Appendix C** for analysis results.

4.3.2 Annual Sampling Analysis

Annual sampling for POE water was performed for the following parameters in 2005:

- Inorganics as set out in Schedule 23 of O. Reg. 170/03.
- Organics as set out in Schedule 24 of O. Reg. 170/03.

All Inorganics and Organics results for the Terra Drive Pumping Station were below their respective MAC's. Refer to **Appendix C** for analysis results. The Terra Drive Pumping Station and its well have since been disconnected from the distribution system and no further samples will be collected from this pumping station.

Annual samples were collected for Lead from the distribution system. All distribution Lead samples were found to be below the MAC of 10 mg/L. Refer to **Appendix C**.

4.3.3 Five Year Sampling Analysis

Five year sampling for POE water was performed at the Eliza Street Pumping Station for the following parameters in 2004, not required in 2005: (Refer to **Appendix C**)

- Fluoride
- Sodium

Note: Samples at Eliza Street Pumping Station were taken on raw water from Well No. 3 and Well No. 4. Fluoride and Sodium samples for Isla Street Pumping Station Well No. 1 and Terra Drive Pumping Station Well No. 2 were taken in 2003 and found to be within compliance.

The Fluoride results for Well No. 3 and No. 4 were below the respective MAC of 1.5 mg/L. The Sodium results for Well No. 3 and No. 4 were found to be at 19.9 mg/L and 29.1 mg/L respectively. Sampling for Sodium and Fluoride at Well No. 1 will not be required again until 2008 (no samples required at Well No. 2 since the Terra Drive Pumping Station and Well No. 2 are decommissioned). Sampling for Sodium and Fluoride at Well No. 3 and No. 4 will not be required again until February 2009.

5.0 WATER USAGE

A summary of water usage for all of the Pumping Stations as well as the combined flow for the Markdale Water System is provided in **Appendix A**. **Appendix A** provides a monthly breakdown of total flow for the month, average day per month, maximum day per month and minimum day per month. Refer to **Appendix F** for the completed Annual Record of Water Taking Forms.

A Permit to Take Water was issued in January, 2004, which includes wells W1, W2, W3 and W4. The PTTW expired on January 31, 2006. An application for renewal was submitted on December 19, 2005. Refer to **Appendix E** for a copy of the PTTW that was issued in 2004.

The treated water quantities supplied to the distribution system for 2003, 2004 and 2005 are provided in **Table 4A**, **Table 4B** and **Table 4C** for comparison seen on the following page.

It can be seen that water production in 2005 was similar to 2004. Maximum Day Consumption for the Markdale system fell from 2,397 m³/d in 2004 to 2045 m³/d in 2005. Average Daily Consumption for the Markdale System was essentially unchanged (1,421 m³/d in 2004 to 1,432 m³/d in 2005).

Note: The measured water meter total of 522,854 m³ does not include the estimated 1,200 m³ of water diverted to the online analyzers at the Pumping Stations during 2005.

Static water levels (SWL) and Pumping Water Levels (PWL) were recorded for each of the four (4) wells in Markdale, depending on the status of the Pumping Stations when the measurements were taken.

A summary of well level data for all the Pumping Stations is shown on **Table 5**. The data indicates the amount of groundwater fluctuation from month to month.

The Permit to Take Water (PTTW) requires that Static Water Levels (SWL) be measured weekly at each production well. The operators actually measured SWL at a greater frequency than what is required.

The static water levels are measured as a height of water column above or below a fixed location (i.e. sensor).

Note: "Pump on" and "Pump off" were recorded on a daily basis.

6.0 COMPLIANCE WITH TERMS AND CONDITIONS OF THE CERTIFICATE OF APPROVAL AND REGULATION 170/03

This section provides assessment of compliance of the Markdale Water System with the Certificate of Approval (C of A) and the Ontario Drinking Water Quality Standards (ODWQS).

SGS Lakefield Research is the analytical laboratory for all bacteriological analysis as well as all chemical analysis. SGS Lakefield Research is an accredited laboratory.

6.1 Compliance with Terms and Conditions of the Certificate of Approval

Section 4.1

The rated capacity for the maximum flow rates were not exceeded for any of the treatment systems.

Section 5.1 i)ii)

Flow rates and daily volumes of water conveyed into treatment systems were continuously monitored using flow-measuring devices.

Section 5.2

Daily records were maintained recording the volume of water conveyed into each treatment system.

Section 5.3

All flow measuring devices were checked and calibrated in 2005. The flow measuring devices at the Isla Street, Eliza Street and Terra Drive Pumping Stations were calibrated on May 2005 and were found to be within $\pm 5\%$ which is acceptable.

Section 5.5

UV disinfection equipment monitoring was carried out for each treatment system ensuring a continuous UV dosage of 40 mJ/cm² was maintained throughout the life time of the UV lamps.

Section 6.1 and 6.2

Sodium hypochlorite used in the operation of each treatment system meets all applicable standards set by both the American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/60 and NSF/61. Sodium hypochlorite product registration documentation from an accredited institution is available at all times.

Section 6.4, 6.5, 6.7 and 6.8

An up-to-date Operations Manual was completed as of April 2005 and has been forwarded to the local MOE office in Owen Sound for review. Upon review by the MOE and Municipality, the finalized Operations Manual was completed and is available for reference by all persons involved in the operation of all the treatment systems. The final Operations Manual is to include all requirements as set out in Section 6.5, including a defined Well Inspection and Maintenance Plan, and up-to-date Process and Instrumentation Diagrams, Adverse Water Quality Reporting, Complaint Handling and Sampling Programs for the treatment systems as set out in Section 6.7 and 6.8. This manual was revised in December 2005.

6.2 Regulation 170/03, Section II - Annual Reports

Part III - Form 2 was submitted electronically (see **Appendix G**).

Section 11 (6) (a)

Refer to Section 2.0 of this report.

Section 11 (6) (b)

Refer to Section 6.0 of this report.

Section 11 (6) (c)

Refer to the test results summarized in the text and Appendices of this report.

Section 11 (6) (d)

Not applicable.

Section 11 (6) (e)

Refer to Section 7.0 of this report.

Section 11 (6) (f)

This report was prepared as per Schedule 22 of Regulation 170/03 and a copy of the report can be viewed at either the offices of Municipality of Grey Highlands (also Grey Gables), 206 Toronto Street South, Markdale, Ontario, N0C 1H0 or Oweson Water Services, a division of Oweson Ltd., Owen Sound Professional Centre, 945 Third Avenue East, Suite 230, Owen Sound, N4K 2K8.

Section 11 (9.1)

Once the report has been presented to the Owner (Municipality of Grey Highlands), the Owner will take all reasonable steps to notify all users of the system that the report is complete and where it may be viewed. Refer also to Form III - Part 2 in **Appendix G**.

6.3 Inspection Report

On October 4, 2005, the MOE performed an Annual Inspection of the Markdale Water System. Refer to **Appendix H** for a copy of the written Action Plan that was prepared in response to the Inspection Report.

6.4 Upgrade Requirements in Consolidated Certificate of Approval

Section 8.2

Contract tendering for the required upgrades at the Isla Street Pumping Station Well No. 1 occurred on February 23, 2005. Upgrade work was completed by June 30, 2005 as required by this section.

Section 8.3

Disconnecting of Terra Drive Pumping Station Well No. 2 from the distribution system was completed by June 30, 2005 after upgrades to the Isla Street Pumping Station Well No. 1 were complete.

Section 8.4 (I-X)

All upgrade items under Section 8.4 were completed by June 30, 2005.

Items I, II, III, IV, V, VII were included in the tender for upgrades to the Isla Street Pumping Station Well No. 1.

Item IV involves a plug and transfer switch was installed at the Isla Street Pumping Station for use with the portable standby generator, normally kept at the Eliza Street Pumping Station.

Item VI has been completed as part of the Eliza Street Pumping Station upgrades.

Section 8.4 (VIII-X)

The required TV inspections of Wells W1, W2, W3 and W4 have been performed. For Well W1, a letter report was provided to the Ministry of Environment from Henderson Paddon & Associates Limited, dated January 5, 2005. For Wells W3 and W4, a letter report was submitted February 25, 2005. For Terra Drive Well W2, a letter report dated March 5, 2004 concluded the well is in poor condition, and non-remediable.

More recently, in January and February 2006 the Well #3 and #4 were TV inspected as part of the ongoing investigations into the November 2005 adverse results.

Item X has been completed as part of the Eliza Street Pumping Station.

Section 8.5

Results of the required bacteriological sampling for Well No. 4 prior to the well being put into production have been submitted to the Director as required by this Section.

Section 8.6 (i)

A continuous level monitor is in place to monitor water levels at the spring located southwest of the wells (downloaded approximately monthly or every other month. It is recommended to be downloaded monthly).

Section 8.6 (ii)

A report of the monitoring results will be submitted no later than fifteen (15) months after Wells No. 3 and No. 4 are put into production.

7.0 WATER SYSTEM IMPROVEMENTS AND MAINTENANCE 2005

The following water system improvements and maintenance were performed in 2005:

1. Supply and installation of all required upgrades to the Isla Street Water Treatment Plant as summarized in previous sections.
2. Partial decommissioning of the Terra Drive pumphouse involving disconnecting the distribution main from the treated water header.
3. Installation of Cathodic Protection in the water tower in September 2005.
4. Further improvements to the Markdale Water System SCADA, some of which were related to the improvement to the Isla Street pumping station, and other SCADA improvements were associated with the overall control of the entire system.

8.0 DISCUSSION OF MARKDALE WATER TOWER

During the performance of the Class Environmental Assessment for the upgrading of the Markdale Water System, it was determined that the existing Markdale water tower has adequate capacity for existing water demands, but does not have adequate capacity for the estimated 20-year projected demands. Furthermore, the water tower does not deliver the minimum required water pressure as per the MOE design guidelines. Also, inspection of the water tower in 2002 indicated that the water tower painting would be required shortly, or at the very least a corrosion protection system installed to arrest the corrosion until such time as the water tower is repainted or replaced.

Provincial Officer's order #2370-5JAS78, dated February 5, 2003, required the Municipality to apply for a Certificate of Approval for the water tower, as one had never been issued before. This Approval was received and a copy is attached in the Appendices of this report. The Certificate of Approval includes the installation of cathodic protection for the existing water tower which was completed in September 2005.

The water storage issue has been identified to the Municipal Council and it has been recommended that a Class Environmental Assessment be initiated to investigate the long-term water storage alternatives for the Markdale Water System.

9.0 CALCULATION OF UNCOMMITTED HYDRAULIC RESERVE CAPACITY

Calculation of Water System Hydraulic Reserve Capacity has not been performed in this report. Well #3 and #4 are hydraulically capable of flow rates of 425 IGPM and 165 IGPM respectively, but are currently restricted to 200 IGPM and 100 IGPM respectively at the request of the MOE due to water quality concerns stemming from the boil water advisory in November 2005.

10.0 CONCLUSIONS

1. There was one (1) adverse bacteriological analysis result from the Eliza Street Pumping Station and none from either the Isla Street or the Terra Drive Pumping Stations. None of the 180 distribution samples were adverse.
2. Review of the treated water turbidity and chlorine residual monitoring indicates that there were no adverse treated water, turbidity, or chlorine residuals measured in the treated water in 2005 for any of the Pumping Stations.
3. The chlorine residuals were monitored in the distribution system in 2005 on a daily basis, at the same time as bacteriological samples were taken and also during the flushing of the distribution system. All were found to be safe.
4. Samples taken for inorganic and organic parameters, nitrite, nitrate, fluoride, sodium, lead and THMs in the treated water and distribution system were in compliance with the Ontario Drinking Water Quality Standards.
5. The Permit to Take Water #03-P-1058 was received by the Municipality in January 2004. This permit includes wells No. 1, No. 2, No. 3 and No. 4. The Permit to Take Water #03-P-1058 was not exceeded in 2005. The permit expired on January 31, 2006 and a renewal application was submitted on December 19, 2005. The MOE has acknowledge receipt of the renewal application, but has not issued the renewed PTTW.
6. Water system improvements and maintenance performed in 2005 is summarized in Section 7.0.
7. The existing Markdale water tower has adequate capacity for existing water demands, but does not have adequate capacity for the estimated 20-year projected demands. Furthermore, the water tower does not deliver the minimum required water pressure as per the MOE design guidelines. Also, inspection of the water tower in 2002 indicated that the water tower painting would be required shortly, or at the very least a corrosion protection system installed to arrest the corrosion until such time as the water tower is repainted or replaced. The Certificate of Approval for the water tower includes corrosion protection which was installed in September 2005.

8. As per the most recent Certificate of Approval No. 8963-65SHY3, upgrades to the Isla Street Pumping Station and decommissioning of the Terra Drive Pumping Station were completed by June 30, 2005.
9. It can be seen that water production in 2005 was similar to 2003 and 2004. In 2005, the maximum day occurred on September 29, 2005 and was 2,045 m³. Average Daily Consumption for the Markdale System was 1,167 m³/d in 2003 , 1,421 m³/d in 2004 and 1,432 m³/d in 2005.
10. The Operation and Maintenance Manual was revised in December 2005.
11. On October 4, 2005, the MOE performed the Annual Inspection of the Markdale Water System and the report was presented to the Municipality on December 5, 2005.
12. A BWA was issued in November and lifted in December due to an adverse bacterial result on the treated water at the Eliza Street plant.

11.0 RECOMMENDATIONS

The following recommendations are noted:

1. Continue to operate the Markdale Water System in compliance with the Drinking Water Systems Regulation as well as the requirements of the Certificate of Approval and Permit to Take Water for the Markdale Water System.
2. Water leakage should be estimated in 2006 for the Markdale Water System by comparing produced water values to the metered water values. The new SCADA system allows determination of night time water tower draw down rates, which can also be used to determine leakage, although Chapman's night time water usage must also be accounted for.
3. During days of excessive water use during the water system operation, the Municipal operators should record, in the log books, the reason for excessive water use (such as watermain break, watermain flushing, fire fighting events, etc.).
4. A Class Environmental Assessment should be initiated to investigate the long-term water storage alternatives for the Markdale Water System.
5. Continue discussions with the MOE and Health Unit regarding investigations and other requirements for Wells #3 and #4 stemming from the Boil Water Advisory in November 2005.
6. It is recommended that the 2005 Annual Compliance Report for the Markdale Water System be presented to Council.

Respectfully submitted:

OWESON WATER SERVICES
(a Division of Oweson Ltd.)

Matt G. Prentice, M.Eng., P.Eng.
Environmental Engineer
GWA/MGP/tah

Geoff Aitken, A.Sc.T.
Compliance Manager

APPENDIX A

Treated Water Flows, Turbidity and Disinfectant Residual

APPENDIX B

Bacteriological Sampling and Analysis

APPENDIX C

Chemical Sampling and Analysis

APPENDIX D

Certificates of Approval

APPENDIX E

Permits to Take Water

APPENDIX F

Annual Records of Water Taking

APPENDIX G

Drinking Water Systems Regulation – Part III Form 2

APPENDIX H
Selected Correspondence