THE CORPORATION OF THE
TOWN OF BLIND RIVER

REQUEST FOR PROPOSAL FOR WELL REHABILITATION 2023

CONTRACT NO. 23-0803

Consultant

RFP Close: Friday May 19th, 2023 - 2:00 pm

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APPENDICES

1 GENERAL

Please read these sections carefully.

These general conditions, instructions to those submitting a proposal, description of works, and specifications forming a part of this Request for Proposal, shall constitute a valid and binding contract between the Proponent with the successful Submission and The Corporation of the Town of Blind River and it shall ensure to the benefit of, and be binding upon both their successors, executors, administrators and assigns.

2 PURPOSE

This Request for Proposals has been prepared to solicit Proposals from qualified Contractors for the Rehabilitation of two (2) Municipal drinking water wells, specifically Well #6 and Well #7, as well as maintenance work on Well #5 and Well #8, as shown on the mapping presented in Appendix A.

3 DEFINITIONS

The words "Corporation" and "Owner" mean The Corporation of the Town of Blind River.

The words "Director of Public Services" shall be understood as referring to that of the Town of Blind River.

The word "Engineer" shall be understood as referring to TULLOCH Engineering Inc.

The word "Contract" means the agreement to do the work entered into with the Corporation, the general conditions, the specifications, the drawings, and other documents referred to or connected with the said contract.

The words "Proponent" or "Tenderer" means the person or persons who have undertaken to carry out this contract.

The words "Town" and "Corporation" may be used interchangeably with the same intent and meaning for the purpose of the RFP.

4 DELIVERY AND OPENING OF PROPOSALS

SEALED PROPOSALS, enclosed in an envelope clearly identified as "**Proposal for Contract 23-0803 Well Rehabilitation 2023**" and addressed to the **CAO/Clerk** will be received at The Corporation of the Town of Blind River, 11 Hudson Street, Blind River, ON, P0R 1B0, up to **2:00 p.m., local time, on Friday, May 12, 2023.**

Alternatively, proposals may be submitted electronically to the CAO/Clerk at katie.scott@blindriver.ca

The Proposals will be opened on **Friday, May 19th, 2023** at **2:15 local time** at the Municipal Office. There will be no public opening. The list of Proponents only, of the proposals received will be emailed to all Proponents after the opening. Proponents wishing to receive a copy of the Total Proposal Prices must provide an email address to do so.

The Corporation reserves the right to reject any or all proposals and the lowest priced proposal will not necessarily be accepted.

5 DEADLINE FOR QUESTIONS & RESPONSES

All questions during the proposal period must be submitted to the Engineer in writing via email, prior to 12:00pm on Tuesday, May 16th, 2023. No such communications are to be directed to anyone other than the Engineer as follows.

Chris Kirby, P.Eng, Project Manager
TULLOCH Engineering Inc.
200 Main Street
Thessalon ON, P0R 1L0
Email chris.kirby@tulloch.ca

The Engineer will issue all responses as soon as possible after receipt, however no later than 5:00pm on Wednesday, May 17th, 2023. Responses will be via addendum posted on the Town of Blind River website. No oral interpretation will be effective to modify any provision of the Contract Documents.

6 DISCREPANCIES

Should a Proponent find discrepancies in or omissions from the Contract Documents, or be in doubt as to any meaning, the Proponent shall notify the Engineer, who may issue a written addendum. Neither the Owner nor the Engineer will make oral interpretations of the meaning of the Contract Documents.

Should the Proponent not agree that the materials and methods specified, will meet the requirements of the project, the Proponent shall notify the Engineer in writing, stating the reason for the objection and may submit a suggested alternative. In such an event, the Engineer may choose to issue an addendum.

7 ADDENDA

Addenda issued during the proposal period shall be allowed for by the Proponent. Addenda shall be posted on the Town of Blind River website http://blindriver.ca/town_hall/bids_tenders. It is the responsibility of all prospective Proponents to monitor the website and ensure that any change to the proposal document in the form of an addendum is responded to appropriately. Addenda will be issued under the following circumstances:

a) Interpretation of RFP documents as a result of queries from prospective Proponents;
b) Revision, deletions, additions or substitutions of any portion of RFP documents.

All such changes as addressed in the addenda shall become an integral part of the Proposal documents and shall be allowed for in arriving at the Proposal price. Addendums, which have financial implication and have not been acknowledged on the Schedule of Items & Prices, may be automatically rejected. Oral instructions shall not be considered valid unless confirmed in writing through the Engineer.

The Proponent shall acknowledge the number of addenda issued within their proposal.

8 EXAMINATION OF SITE

The Proponents shall visit the facilities before submitting their proposal and shall by personal examination satisfy themselves as to the local conditions that may be encountered during performance of the Work. They shall make their own estimate of the

facilities and difficulties that may be encountered and the nature of the work and conditions. Proponents shall contact the Mr. Chris Zagar, Director of Public Services at 705-356-2601 or chris.zagar@blindriver.ca to arrange a site visit.

The Proponent shall not claim at any time after submission of their proposal that there was any misunderstanding of the terms and conditions of the Contract relating to the facilities.

9 HARMONIZED SALES TAX

This project is taxable under the Harmonized Sales Tax (HST). In calculating prices, DO NOT include HST payable by the Proponent.

The HST payable by the Owner shall be shown as a separate line in the Schedule of Items & Prices and is not to be included in the unit prices. It will be added to the net amount of each progress payment and will be paid to the Proponent.

10 INFORMAL OR UNBALANCED PROPOSALS

All entries in the Schedule of Items & Prices shall be made in ink or by typewriter. Entries or changes made in pencil shall, unless otherwise decided by the Owner, be invalid or informal. Proposals which are incomplete, conditional, illegible or obscure, or that contain additions not called for, reservations, alterations (unless properly and clearly made and initialed by the proponent's signing officer) or irregularities of any kind, may be rejected as informal. Proposals that contain prices which appear to be so unbalanced as likely to affect adversely the interests of the Owner may be rejected.

Whenever the amount proposed for an item does not agree with the extension of the estimated quantity and the proposed unit price, the unit price shall govern and the amount and the Total Cost shall be corrected accordingly, unless otherwise decided by the Owner.

A discrepancy in addition or subtraction in a proposal shall be corrected by the Owner by adding or subtracting the items correctly and correcting the Schedule of Items & Prices accordingly, unless otherwise decided by the Owner. Where an error has been made in transferring the amount from one part of the Services Pricing Table to another, the amount shown before transfer shall, subject to any correction as provided for above, be taken to be correct and the amount shown after transfer and the Total Price shall be corrected accordingly.

If a proponent has omitted to enter a price for an item of work set out in the Services Pricing Table, they shall, unless they have specifically stated otherwise in their proposal, be deemed to have allowed elsewhere in the Services Pricing Table for the cost of carrying out the said work and, unless otherwise agreed to by the Owner, no increase shall be made in the Total Price on account of such omission.

The Owner reserves the right to waive formalities at their discretion.

11 CONFLICT OF INTEREST

All firms are required to disclose to the Town any potential Conflict of Interest, may it be pecuniary or otherwise. If a conflict of interest does exist with the potential successful Proponent, the Town may, at its discretion, refrain from awarding the project to the Proponent.

The Proponent covenants that it presently has no interests, and it shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of its service hereunder. The Proponent further covenants that in the performance of this contract no person having such known interest shall be employed.

12 INDEMNIFICATION

The successful Proponent shall indemnify and hold harmless the Town of Blind River, its officers, council members, partners, agents and employees from and against all actions, claims, demands, losses, costs, damages, suits or proceedings whatsoever which may be brought against or made upon the Town of Blind River and against all loss, liability, judgements, claims, suits, demands or expenses which the Town of Blind River may sustain, suffer or be put to resulting from or arising out of the successful Proponent's failure to exercise reasonable care, skill or diligence or omissions in the performance or rendering of any work or service required hereunder to be performed or rendered by the successful Proponent, its agent, officials and employees.

13 ACCEPTANCE OF TERMS

Each Proponent, by submitting a proposal, represents that the Proponent has read, understands and accepts the terms and conditions of this proposal in full.

14 ACCEPTANCE OF PROPOSALS

The Owner is not bound to accept the lowest or any Proposal and reserves the right to reject any or all Proposals and to waive formalities as the interests of the Owner may require without stating reasons therefore.

The Owner also reserves the right to evaluate the Proposals in any manner it deems fit.

The Owner shall not be responsible for any liabilities, costs, expenses, loss or damage incurred, sustained or suffered by any Proponent before or after, or by reason of, the acceptance or the non-acceptance by the Owner of any proposal, or by reason of any delay in the acceptance of a proposal. Proposals are subject to a formal contract being prepared and executed.

15 WITHDRAWAL PROCEDURES

A Proponent may request that his or her submitted proposal be withdrawn, up until the closing time for a particular contract. Withdrawals can only be made in person and the Proponent wishing to withdraw from a particular proposal must attend the Town Office and execute an appropriate withdrawal form, signed by a principal of the Proponent, or provide a letter from the Proponent, signed by a principal, withdrawing the Proposal.

The withdrawal of a proposal does not disqualify a Proponent from submitting another proposal for the same contract provided that all of the proposal procedures are observed and the new proposal is received prior to the terminal time for closure. However, unless withdrawal procedures have been followed, more than one proposal from the same Proponent will result in the disqualification of the Proponent.

16 RESULTS

The name of all Proponents and their total price shall be deemed public information following the proposal review process, however, unit prices will not be disclosed where proposals were requested as a total contract price.

17 PROJECT SCHEDULE

Time is of the Essence on this Project and must be completed prior to October 31st, 2023**.**

The Contractor shall submit a detailed work program outlining each task that will be undertaken during the implementation of the proposed rehabilitation program for review by the Engineer. The proposal shall include a complete listing of all chemicals, materials, equipment, application rates, concentrations, application pressures, etc. to be used, together with the step-by-step methodology to be employed.

The schedule and description of work methods shall be submitted one week prior to the start of construction and shall include, but not necessarily be limited to, the following requirements:

a) Work a minimum 5 days per week, 8 hours per day on controlling operations except for Statutory Holidays.
b) Work on the project to be complete prior to October 31st, 2023.

The Contractor will not be allowed to commence construction unless this plan has been submitted to the Engineer for review. It will be the Contractors' responsibility to update the schedule at regular intervals as required to ensure that it is current with construction operations.

18 PROOF OF INSURANCE

The Proponent shall at his own expense, procure and maintain liability insurance in accordance with GC6.0 of the General Conditions of OPSS MUNI 100 and the requirements set out below. The insurance shall be entirely comprehensive for all phases of the work pertaining to this contract.

a. Commercial General Liability Insurance and Property Damage for bodily injury or property damage, not less than $5,000,000.00.
b. Automobile Public Liability and Property Damage for bodily injury or property damage, not less than $5,000,000.00.
c. Be Comprehensive Liability Insurance covering all operations and liability assumed under contract with the Municipality.
d. Not contain any exclusions or limitations.
e. Include insurance against liability for bodily injury and property damage caused by vehicles owned by the Proponent and used on the work, and in addition, shall include insurance against liability for bodily damage caused by vehicles not owned by the Proponent and used on the work. Each insurance shall have a limit of liability of not less than $5,000,000.00 inclusive for any occurrence. A vehicle shall be as defined in the Highway Traffic Act.
f. Be endorsed to provide that the policy or policies will not be altered, cancelled or allowed to lapse within 30 days prior written notice to the Municipality.
g. Protect the insured from any losses arising out of contractual liabilities and completed operations. The policy(ies) shall name the Owner as "additional Insured" and shall contain a cross liability clause insuring each person, firm or

corporation in the same manner to the same extent as if a separate policy was issued to each, but not so as to increase the limits of the insurance company's liability.

h. Be kept in force for the duration of the contract.

The deductible amount or amounts in any insurance policy required by the Corporation pursuant to this contract shall be subject to the approval of the Corporation. In the event the Corporation does not accept the deductible amount as proposed by the Proponent, the Proponent shall provide insurance with a deductible amount acceptable to the Corporation. The Proponent is responsible to pay any and all deductible amounts that may result from an insurance claim made.

The Proponent shall indemnify and save harmless the Owner from and against all claims, demands, loss, damages and costs resulting directly or indirectly from the performance of the work.

The certificate(s) of insurance and copies of insurance policy(ies), each naming the Owner as "Additional Insured", must be filed with the Town Clerk upon execution of the Contract.

19 WORKPLACE SAFETY & INSURANCE BOARD

The **Successful Proponent** shall furnish evidence of compliance with all requirements of the Workplace Safety & Insurance Act of Ontario. Such evidence shall include a Certificate of Good Standing issued prior to the execution of the contract, and a further certificate issued prior to the release of the Construction Act Holdback.

20 RENEWAL OF INSURANCE AND WSIB

The **Successful Proponent** will provide proof of valid Insurance and WSIB on each and every anniversary date of the policy during the life of this or any other contract with the Town of Blind River. Verification is to be sent to the Director of Public Services, Town of Blind River, 11 Hudson Street, Blind River, Ontario P0R 1B0.

21 OCCUPATIONAL HEALTH AND SAFETY ACT

For purposes of the Occupational Health and Safety Act, the Proponent for this project will not be considered as an employee of the Town, rather as a Contractor and will have the responsibilities of the Contractor as set out in the current Act and its Regulations.

The Proponent will agree to take responsibility for any health and safety violations as well as the cost to defend any charges as a result of any violation.

The Proponent will be required to furnish a copy of their Health & Safety Policy and proof of orientation of their staff.

22 ENGINEER'S AUTHORITY

The Engineer may be called upon by Public Works to supervise aspects of the work to the extent of ensuring the fulfillment of the contract and the completion of the work in accordance with the Contract.

The Engineer may be called to verify the quantities of the several kinds of work which are to be paid for under contract, and determine questions relating to the said work and

construction thereof. The Engineer shall make decisions for questions which may arise relative to the performance of the contract, as requested by the Corporation, and in such cases the estimate and findings shall be final.

The Engineer shall, within a reasonable time, render a decision on all claims by the contractor and all questions which may arise relative to the performance of the work, or the interpretation of the contract. The contractor shall at all times and at his own expense furnish all reasonable aid and assistance required by the Engineer or any Inspector for the proper assessment, inspection and examination of the work or part thereof.

The contractor, at his own expense, shall furnish samples for testing when required and shall furnish all reasonable facilities for the inspection of the material and workmanship. The contractor shall obey the directions and instructions of any Inspector and they shall be made in writing at the request of the Contractor.

Notwithstanding any inspection that the Corporation might carry out, the failure of the Engineer or the Inspector to condemn or object to any deficiency in the work or material shall not constitute a waiver of any specifications or the approval or acceptance of such defective work or material and, except as otherwise provided herein, the contractor shall be and remain liable for such defective work or material and any loss, costs, charges, or expenses in connection therewith.

23 PROPONENT'S RESPONSIBILITY FOR DAMAGES

If the Proponents, agents, and all workers and persons employed by him/her, or under his/her control, including subcontractors, shall use due care that no person or property is injured and that no rights are infringed upon in the execution of the work, and the Proponent shall be solely responsible for all damages by whomsoever claimable in respect of any injury to persons or to lands, buildings, structures, fences, livestock, trees, crops, roadways, ditches, drains and water courses whether natural or artificial, or property of whatever description, and in respect of any infringement on any right, privilege, or work or any part thereof, or by any neglect, misfeasance or nonfeasance on the Proponent's part or on the part of any of his agents, workers, or persons employed by him/her, or under his/her control, including subcontractors and shall bear the full cost thereof, and shall at his/her own expense make such temporary provisions as may be necessary to ensure the avoidance on any such damage, injury, or menace to the persons and owners the uninterrupted enjoyment of all their rights, in and during the performance of the work, and the Proponent shall indemnify and save harmless the owners from and against all claims, demands, loss, costs, damages, actions, suits or other proceedings by whomsoever made, brought, or prosecuted in any manner based upon, occasioned by, or attributed to any such damage, injury, or infringement.

Notwithstanding the indemnity provision contained in this RFP, where in the opinion of the Director of Public Services, the Proponent has failed to rectify any damage, injury, or infringement or has failed to adequately compensate any person for any damage, injury, or infringement for which the Proponent is responsible under this Contract, the Corporation, following notice in writing to the Proponent of its intention to do so, may withhold payment of monies due to the Proponent under this or any other contract until the Proponent has rectified such damage, injury, or infringement, or has paid adequate compensation for such damage, injury, or infringement provided however that the

Corporation will not withhold such monies where there is a reasonable disagreement with respect to the rights of the party affected and the Proponent has given such person a reasonable time in which to take court action to establish the validity of the claim.

24 GOVERNMENT REGULATIONS AND PERMITS

The Proponent(s) shall comply with all provisions of the rules, regulations and orders of Federal, Provincial, and Municipal Government agencies applicable to the work under this Contract. The Proponent(s) shall co-operate with the Corporation in promptly furnishing any information that may be required by such governmental agencies. It shall be the obligation of the Proponent(s) to keep him/herself informed of these governmental rules, regulations, and orders and the Proponent(s) shall make the requirements of this article a part of any subcontract he/she may enter into. In addition, the Proponent(s) shall secure and provide, at their own expense, all other permits that may be necessary under any by-law of the appropriate municipality or any act of the Federal or Ontario Legislature or any regulation made under Federal or Provincial Authority.

25 GENERAL DESCRIPTION OF EXISTING FACILITIES

The following is a general description of the existing facilities for information purposes only. Proponents are responsible for attending the facilities to determine for themselves the operating equipment and system configurations and to prepare their proposals accordingly.

The general locations of the respective well sites are shown on the plan included in Appendix A. Well 6 is housed within Pump House #6 along with the controls, whereas Well 7 is located just north of Pump House #7 and Well 8 is located approximately 140m northeast of Pump House #8, with discharge and controls located within their respective Pump Houses. All wells discharge into a 400mm diameter raw watermain to convey well water to the water treatment plant located on Murray Street. The wells are GUDI, in the range of 60 feet deep and submersible pumps are installed in all wells. Descriptions of the wells are included in Appendix B.

Access will be provided to the Contractor by the Town. The Contractor will be responsible for obtaining any required Provincial or local permits necessary to complete the work and for coordinating all work with the DWS operator, PUC Services Inc.

Detailed descriptions of the aquifer and wells is provided in the hydrogeological reports included in Appendix B. Appendix C contains a copy of the latest well rehabilitation reports for Well #6 (2015 & 2019), Well #7 (2015 & 2019) and Well #8 (2021).

The Contractor is encouraged to visit the well field prior to submitting a proposal for the project to develop a clear understanding of the type, location and condition of each well and well head and its suitability to accommodate their proposed rehabilitation program. The Owner shall not entertain any request(s) for increased costs on the basis of unknown site conditions.

26 SCOPE OF WORK

The Town of Blind River is inviting qualified Contractors to submit a proposal for the rehabilitation of two (2) Municipal drinking water wells, specifically Well #6 and #7 and for maintenance work to install a water level transmitter casing on Well #8.

The Contractor shall submit a detailed work program outlining each task that will be undertaken during the implementation of the proposed rehabilitation program for review by the Engineer. The proposal shall include a complete listing of all chemicals, materials, equipment, application rates, concentrations, application pressures, etc. to be used, together with the step-by-step methodology to be employed.

It is recognized that there may be several processes or combination of processes that may have to be applied by the Contractor, based on their experience, in order to successfully rehabilitate the existing wells. Past rehabilitation work has shown acidification for cleaning performs well, however it is up to the Proponent to determine the proper approach to rehabilitation.

Prior to undertaking any of the work, the Contractor shall devise and submit an implementation schedule for the work recognizing that an uninterrupted and adequate supply of water must be supplied continually throughout the rehabilitation process to meet the water demands within the Town. Only one well may be taken out of service at a time. The submitted schedule shall be subject to the review and approval of the Engineer and the Municipal Water Works Operator. The work must also be undertaken continuously and as expeditiously as possible.

In submitting a proposal for the work, the Contractor warrants to repair any damage to the wells (identified by observation and/or by the turbidity and suspended sediment analysis) at no additional cost to the owner.

27 WORK PROGRAM

MOBILIZATION/DEMOBILIZATION

Mobilization and demobilization shall include mobilization, and demobilization of all required/necessary equipment, materials, labourers, tools and any other items necessary for completion of the Contractor developed well rehabilitation program.

WELL HEAD PREPARATION

Well head preparation shall include any modifications to the well head and the setup and removal of all necessary equipment, materials, labour, tools and any other items necessary for the testing programs and for completion of the Contractor developed rehabilitation program at each well. The well head and all disturbed areas shall be reinstated to the same condition following the rehabilitation work that existed prior to initiating the work.

REMOVE AND RE-INSTALL PUMPING EQUIPMENT

The Contractor shall be responsible for the removal and re-installation of the Town's pumping equipment. The Contractor shall disinfect all down-hole equipment including cameras, rehabilitation equipment, and the re-installed pumps using a chlorine solution of appropriate strength. The re-installed equipment shall be tested to confirm the adequacy of its connection to the system. All work must conform to the requirements of Ontario's Wells Regulation (Regulation 903).

PRE- AND POST-REHABILITATION DOWNHOLE CAMERA INSPECTION

The Contractor shall provide all labour, equipment, and materials to complete a down-hole camera inspection of each well to be rehabilitated to provide a visual record of the condition of the well prior to and after undertaking any rehabilitation work. The Contractor shall supply the Town with two copies of the video recordings.

WELL REHABILITATION PROGRAM

The Contractor shall be responsible to complete the well rehabilitation program following industry best practices and standards. It is recognized that there may be several processes or combination of processes that may have to be applied by the Contractor, based on their experience, in order to successfully rehabilitate the existing wells. Past rehabilitation work has shown acidification for cleaning performs well, however it is up to the Proponent to determine the proper approach to rehabilitation.

The Contractor shall provide all necessary equipment, materials, labour, tools and any other items necessary for the rehabilitation program and for completion of the Contractor developed rehabilitation program at each well.

PRE- AND POST-REHABILITATION STOP-START PUMP TESTS

The Contractor shall provide all labour, equipment, and materials to conduct a stop-start pump test on each well to be rehabilitated, in the presence of the Engineer, to establish the suspended solids content (in mg/L) in the well water prior to and after undertaking any of the rehabilitation work. The stop-start pump tests shall consist of pumping the well at the current rate of yield. The pump shall be started and stopped at ten-minute intervals for three cycles.

If the results of the post rehabilitation stop-start pump test and/or the turbidity test are unacceptable (ie: the concentration of suspended solids and/or the turbidity is higher than the concentration found prior to undertaking the rehabilitation effort) than the Contractor shall undertake additional well development and shall repeat the start-stop pump test and sampling until an acceptable quality of water is demonstrated (ie: equal or lower turbidity and suspended solids concentration than established prior to undertaking the rehabilitation work).

The cost to repeat any laboratory analyses required to demonstrate an acceptable quality of water shall be borne by the Contractor.

CONTRACTOR DEFINED VARIABLE RATE SPECIFIC CAPACITY TESTS

The Contractor shall provide all labour, equipment and materials to conduct a variable-rate pumping test at each of the proposed wells prior to and after rehabilitation utilizing the Town's existing pumping equipment. The Contractor shall establish appropriate test parameters (i.e. rates and durations) and shall provide all of the necessary test equipment, which shall include discharge piping from the respective well to a point of discharge away from the well head so as to not influence well recharge, and will include a gate valve to regulate the flow rate and a device to measure the discharge rate. The discharge equipment shall be in good condition and be capable of operating continuously.

The Contractor shall make provisions for and conduct water-level measurements at each well, prior to and during testing.

The variable rate pump testing conducted following the rehabilitation effort will be compared with the results of the pump testing completed prior to rehabilitation to determine the increase in the specific capacity.

The Contractor shall prepare and submit a detailed report to the Engineer summarizing the results of the rehabilitation program (data shall be presented in tables and charts where appropriate).

MAINTENANCE WORK AT WELL #8

For this item the Work involves the installation of a piece of 25mm Ø PVC, flush jointed to the top of the pump, (capped and slotted) for the water level transmitter, to prevent the transmitter from being drawn into the pump.

28 BASIS OF PAYMENT

Payment for Item 1 Mobilization and Demobilization will be made following the Contractor's demobilization from the site and provided the Municipal well system is operating to the satisfaction of the Engineer. Where payment is split over multiple draws, 50% will be paid for mobilization and 50% for demobilization.

Payment for the items 2 through 8, inclusive, will be made following the Contractor's completion of all work, as confirmed by the Engineer, associated with individual wells. Payment will only be made following submission of a request by the Contractor in the form of a monthly draw, to be submitted to the Engineer. The Engineer will subsequently submit a payment recommendation to the Owner.

29 PROPOSAL REQUIREMENTS

The following sections outline the minimum requirements for the proposal submission. Proponents are required to submit either a hardcopy or digital copy of their proposal.

30 PROOF OF ABILITY

The Proponent shall be competent and capable of performing the various items of Work. The Proponent shall include in their proposal the following information at a minimum.

i. Proponent Qualifications
ii. Proof of Experience
iii. List of Key Staff and Qualifications
iv. List of Subcontractors

The Proponent shall employ only orderly, competent and skillful individuals to do the work and whenever the Director of Public Services shall inform in writing that anyone carrying out the work is, in the opinion of the Director of Public Services, incompetent, unfaithful or disorderly, such an individual shall be discharged from the work and shall not again be employed on the work without the consent, in writing, of the Director of Public Services.

31 METHODOLOGY

The Proponent shall include in their proposal a methodology section that describes their understanding of the works and approach to complete the work.

32 AGREEMENT

A form of agreement has been enclosed in Appendix F. Proponents may submit with their proposal an alternate form of agreement for review by the Town. The Town is not obligated to accept the Proponents agreement and may choose to negotiate with the Proponent to achieve an agreement acceptable to both parties.

33 CONTINGENCY

It is understood and agreed that the Contingency Allowance listed is merely for the convenience of accounting by the Owner, and the Contractor is not entitled to payment thereof except for extra or additional work carried out by the Contractor as directed by the Engineer and in accordance with the Contract Documents and only to the extent of such extra or additional work.

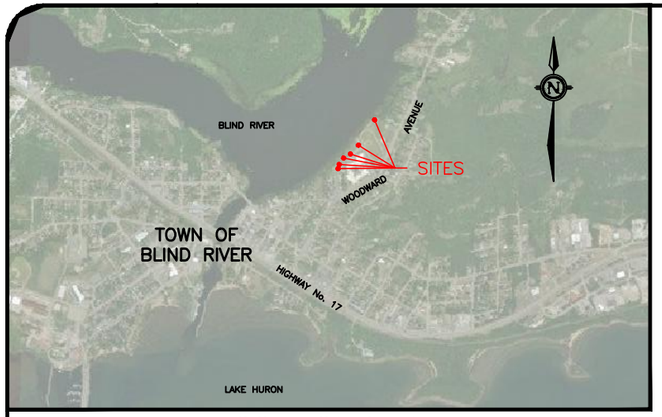
APPENDIX A
Well Location Plan
230803-G1

APPENDIX B
Hydrogeological Reports

APPENDIX C
Historical Rehabilitation Reports

APPENDIX D
Schedule of Items and Prices

APPENDIX E
Agreement



LOCATION PLAN
1:30,000

BLIND RIVER

WELL No. 8

BALL FIELD

PUMP HOUSE
WELL No. 8

PUMP HOUSE No. 6
WELL No. 6

WELL
No. 7

PUMP HOUSE No. 5
WELL No. 5

PUMP HOUSE
WELL No. 7

HIGH SCHOOL TRACK

BALL FIELD

WELL
No. 9

PUMP HOUSE
WELL No. 9

W.C. EAKET
SECONDARY SCHOOL

RIVERSIDE DRIVE

WOODWARD AVENUE

TULLOCH

Blind River

REVISIONS

No	DATE	REMARKS

PRELIMINARY
NOT FOR CONSTRUCTION
APRIL 27, 2023

PROJECT TITLE

MUNICIPAL WELL REHABILITATION

DRAWING TITLE

WELL LOCATION PLAN

LOCATION

TOWN OF BLIND RIVER
ONTARIO

DATE	APRIL 2023
DRAWN	DAS
CHECKED	CLK
SCALE	1:1000

DWG. No.	PROJECT No.	REV. No.
G1	23-0803	0

HYDROTERRA LIMITED
Consultant in Groundwater Engineering
15 Glamis Place, Thornhill, Ontario L3T 3G7
(905) 889-1669

June 26, 1996

MEMORANDUM

To: H. Kresin, Kresin Engineering and Planning Limited

From: L. Bryck, Hydroterra Limited

Re: Wellfield Capacity Evaluation
Town of Blind River
Kresin File: 5104.01
HT File: 8988

1. Based on the interpreted hydraulic conditions and observed well responses - within the leaky artesian aquifer having a transmissivity of 380 m^2/day and being recharged within three days of continuous pumping - an eight-well municipal system may be reasonably expected to deliver about 6300 m^3/day within the presently developed aquifer extending about 1200 metres along the Blind River shoreline. This assessment assumes that each individual well can continue to deliver 550 l/min, while maintaining 50 percent efficiency.

2. Potential exists for additional withdrawals by the completion of additional wells in the northerly and southerly wellfield areas (to minimize the mutual interference with the interior wells), and under full-drawdown conditions, the wellfield may possibly support another four 550 l/min wells, bringing the system capacity to about 9500 m^3/day under peak-withdrawal operating conditions. On-going monitoring of the wellfield response and additional test drilling will be required to confirm the higher ultimate capacity.

Leon G. Bryck

HYDROTERRA LIMITED
Consultant in Groundwater Engineering
15 Glamis Place, Thornhill, Ontario L3T 3G7
(905) 889-1669

June 26, 1996

MEMORANDUM

To: H. Kresin, Kresin Engineering and Planning Limited

From: L. Bryck, Hydroterra Limited

Re: June 21, 1996 Letter
Town of Blind River

Would you please replace the page 7 with the attached corrected page (6300 m^3/day).

Leon

Leon G. Bryck

Enc.

3. Based on the deduced hydraulic parameters, a system of eight wells (which may comprise existing and new installations), each delivering 550 l/min and extending along the shoreline from Well 1 to Well 8 should deliver a combined supply of 6300 m^3/day with acceptable drawdown in the pumping wells operating at a 50 percent efficiency. This assessment assumed that the transmissivity averages 380 m^2/day; that the effective storativity was 0.04; and that drawdown stabilization occurred within three days of pumping, when the drawdown effect theoretically extended about 200 metres beneath the river.

4. Conventional rehabilitation (chlorination, acidization) of capacity-impacted wells has been relatively expensive and unsuccessful, resulting in low yield improvements for relatively short durations. Nevertheless, occasional super-chlorination of the individual wells may be undertaken by the operator (rather than a drilling contractor) in an effort to decrease any biofouling effects.

5. Rehabilitation should be restricted to vigorous agitation by water/air jetting and surging at the next production well scheduled for upgrading. Ideally, Well 4A should be considered for agitation treatment, being a 150 mm diameter naturally developed well to assess if such wells are amenable to rehabilitation.

6. Should the agitation treatment prove ineffective, the system capacity should be readily upgraded by the periodic replacement of the poor-capacity wells by relatively inexpensive 150 mm diameter, naturally developed wells (in close proximity to the abandoned wells).

7. The groundwater quality is unlikely to improve at higher withdrawal rates, and may possibly deteriorate with prolonged operation of the system. On-going treatment should be expected for colour/iron/manganese removal or control to meet provincial drinking-water standards.

.../8

HYDROTERRA LIMITED
15 Glamis Place, Thornhill, Ontario L3T 3G7
Consultant in Groundwater Engineering
(905) 889-1669

June 21, 1996

Kresin Engineering and Planning Limited
523 Wellington Street East
Sault Ste Marie, Ontario
P6A 2M4

Attention: Mr. H. Kresin, P. Eng.

Re: Wellfield Capacity Review
Town of Blind River
Kresin File: 5104.01
HT File: 898B

Dear Mr. Kresin:

As requested, a hydrogeological review was undertaken of the available groundwater and well-construction reports, and pumpage/water-level information to provide a technical opinion of the maximum sustainable yield of the existing municipal wellfield.

The following comments highlight the key features/issues identified during this review, and reference should be made to the background documentation for specific details on the aquifer/well capabilities (Appendix A).

1.0 Aquifer Response

1. The municipal wellfield (presently comprising Well 4A, Well 5, Well 6, Well 7 and Well 8) is situated immediately adjacent to Blind River (Figure 1). Considering the distribution of the bedrock outcroppings, the established wellfield servicing the town for about 70 years may be interpreted to have limited areal extent within a bedrock-controlled depression, and to be sustained by river-bottom infiltration.

.../2

2. The groundwater system supplying the municipal wellfield comprises a granular deposit of glaciofluvial fine to medium sand from surface to a depth of about 20 metres (Figure 2). Within the central/northern area, the aquifer is thinly veneered by sandy silty/silty clay.

Extension of this surficial formation may be interpreted beneath the adjacent river, with significant hydraulic communication occurring between the developed aquifer in the 10 to 20 metre depth interval and the river bottom through the intervening shallow fine-sand deposit.

3. Recent pumping-test data obtained at south-central Well 7, central TW 7-85 and northern Well 8 substantiated that the defined overburden aquifer has fairly uniform and moderately high transmissivity of 380 m^2/day and a leaky artesian storativity of about 0.04 (Figure 3). During 24-hour tests on Wells 7 and 8, the groundwater levels were essentially stabilized within the aquifer, with the drawdown influence extending about 70 to 150 metres.

4. Limited water-level information for the existing monitor wells obtained in 1985 and during the Well 8 testing indicated that the aquifer level occurs about 1.3 metres below surface, excepting in the near vicinity of the operating wells. No aquifer-storage depletion was discernable from these water-level data.

The potentiometric-surface configuration deduced from the 1985 elevations established an appreciable gradient from the river toward the municipal wells, and supporting the interpretation of river-bottom infiltration to the developed aquifer (Figure 4).

5. Within the defined aquifer setting, the sustained groundwater availability is dependent on the available drawdown/mutual interference in the individual production wells, and on the river-bed infiltration under the prevailing vertical-gradient conditions (rather than the direct rainfall recharge to the groundwater system). Adequate additional drawdown exists at the present wellfield withdrawal to comfortably accommodate an increased extraction at least 50 percent.

.../3

2.0 Well Performances

1. Normally, at the observed transmissivity and the induced-infiltration availability, perennial yields ranging from 900 to 1135 l/min (200 to 250 gpm) may be expected from individual production wells.

Such yields were initially obtained from each of the ten production wells (including Well 4A), but with routine operation for several years, the specific capacities decreased in these wells (possibly excepting Well 8). Subsequent rehabilitation (chlorination, acidization) yielded nominal improvements in certain production wells, but capacity deterioration continued thereafter, resulting in the discontinuance of the groundwater sources.

Original and final/current pumping capacities are summarized as follows:

	Original (l/min)	Final/Current (l/min)
Well 1	1250	90
Well 2	1635	Abandoned
Well 3	680	Abandoned
Well 4	910	Discontinued
Well 4A (TW 7-85)	910	270
Well 5	910	360
Well 6	910	360
Well 7	910	360
Well 8	1135	1135

2. Yield decreases were entirely due to efficiency losses within the production wells (rather the aquifer-storage depletion).

Well 4 was drilled in close proximity to abandoned Well 2 and initially yielded 910 l/min. At the time of initial capacity reduction, adjacent well TW 7-85 was tested and rated at 910 l/min.

.../4.

Well 7 was drilled near abandoned Well 3 (which was discontinued after two rehabilitation attempts) and initially yielded 910 l/min.

3. Rehabilitation did not restore the original capacity in any well, and following such work, the well capacity decreased to less than the pre-rehabilitation capacity within a few years.

Well 3 had a specific capacity of about 160 l/min/m originally, that decreased to 75 l/min/m after 9 years; that was improved to 100 l/min/m by rehabilitation and decreased to 70 l/min/m in four years; and that improved marginally after subsequent rehabilitation and decreased thereafter to 20 l/min/m when abandoned eight years later.

Well 4 had a specific capacity of about 230 l/min/m originally, that decreased to 45 l/min/m in ten years; that improved to 150 l/min/m after initial rehabilitation and decreased to 40 l/min/m in five years; and that increased to about 100 l/min/m after subsequent rehabilitation and decreased to about one-fifth that capacity in about two years.

4. The most rapid capacity decreases appear to have occurred in Well 3 and in Well 7, which are both double packed to maximize the individual-well yield in finer grained formation than apparent at the other well sites. However, Well 4A screens the coarser formation and has also experienced an appreciable capacity decrease within a short operating interval.

5. Three potential sources may cause the observed well-capacity decreases, being:

i) carbonate/iron encrustation
ii) biological fouling
iii) physical plugging

.../5

Considering the groundwater chemistry, chemical encrustation of the well screens does not appear to be the probable plugging source. Recent chemical testing has indicated that the Langelier Index is negative, meaning that the groundwater tends to be corrosive rather than encrusting.

Biological plugging may be a significant mechanism, recognizing that nuisance organisms (iron bacteria, sulphate-reducing bacteria) have been detected in certain wells. Periodic super-chlorination by the operator may decrease the accumulation rate of such organisms. Such practice has elsewhere provided moderate results.

Physical plugging may also be a significant cause of well-yield reduction. Normally, such plugging is caused by the gradual movement of fine-grained sediment into the interstices between the larger grains at or above the developed well capacity. However, in northern soils, the granular Precambrian-derived materials tend to be angular and may progressively compact under routine on-off operation. Pumping at lower withdrawal rates and/or constructing naturally-developed production wells to facilitate the agitation of aquifer materials adjacent to the screen may prolong the original specific-capacity of the production wells.

3.0 Groundwater Quality

1. The groundwater typically contains colour exceeding the Ontario Drinking Water Objective (ODWO) of 5 TCU, and occasionally exceeds iron and manganese ODWO standards of 0.3 mg/l and 0.05 mg/l at the established well sites.

2. The presence of elevated colour and metals may be inherent to the local groundwater system that is largely recharged through the river bottom. Organic sediments/debris may locally cause oxgyen-deficient conditions, with the resultant mobilization of iron/manganese occurring in the native soils.

.../6

3. The increasing iron concentration in Well 8 from an acceptable 0.12 mg/l at the time of aquifer testing to the present 0.77 mg/l may reflect the capture of surface-water derived recharge in the groundwater system. Similar quality trends have been observed elsewhere adjacent to a recharging surface-water source.

4. The elevated chemical parameters may be expected to persist above the ODWO, considering that the groundwater withdrawal is largely balanced by river-water recharge.

5. Within a limited-extent, permeable aquifer in which groundwater gradients appreciably exceed the natural gradients due to the pumping-well effects, rapid groundwater movement may be anticipated, possibly exceeding 100 metres/year. Consequently, the aquifer should be classified as being highly vulnerable, particularly since the aquifer extends to surface over a wide area of the catchment.

4.0 Conclusions

1. The production well/observation well responses indicated that the developed overburden aquifer should be capable of sustaining appreciably larger withdrawals than presently required to meet the town water demands.

2. Rather than depend on few high-capacity wells that progressively lose their capacities, consideration should be given to the installation of several low capacity wells, particularly if the efficiency losses may be largely attributable to physical plugging effects. Such replacement wells could be 150 mm diameter, naturally developed installations that are equipped to deliver about 550 l/min, thereby decreasing the entrance velocity and drawdown fluctuation in the individual well to potentially minimize the aquifer-compaction effect.

.../7

3. Based on the deduced hydraulic parameters, a system of eight wells (which may comprise existing and new installations), each delivering 550 l/min and extending along the shoreline from Well 1 to Well 8 should deliver a combined supply of 4400 m^3/day with acceptable drawdown in the pumping wells operating at a 50 percent efficiency. This assessment assumed that the transmissivity averages 380 m^2/day; that the effective storativity was 0.04; and that drawdown stabilization occurred within three days of pumping, when the drawdown effect theoretically extended about 200 metres beneath the river.

4. Conventional rehabilitation (chlorination, acidization) of capacity-impacted wells has been relatively expensive and unsuccessful, resulting in low yield improvements for relatively short durations. Nevertheless, occasional super-chlorination of the individual wells may be undertaken by the operator (rather than a drilling contractor) in an effort to decrease any biofouling effects.

5. Rehabilitation should be restricted to vigorous agitation by water/air jetting and surging at the next production well scheduled for upgrading. Ideally, Well 4A should be considered for agitation treatment, being a 150 mm diameter naturally developed well to assess if such wells are amenable to rehabilitation.

6. Should the agitation treatment prove ineffective, the system capacity should be readily upgraded by the periodic replacement of the poor-capacity wells by relatively inexpensive 150 mm diameter, naturally developed wells (in close proximity to the abandoned wells).

7. The groundwater quality is unlikely to improve at higher withdrawal rates, and may possibly deteriorate with prolonged operation of the system. On-going treatment should be expected for colour/iron/manganese removal or control to meet provincial drinking-water standards.

.../8.

8. A pumpage/water level/water quality monitoring program should be initiated to analyze the quality/efficiency variations, and should include representative observation wells and all production wells.

Sincerely,

Leon G. Bryck, P. Eng.

APPENDIX A

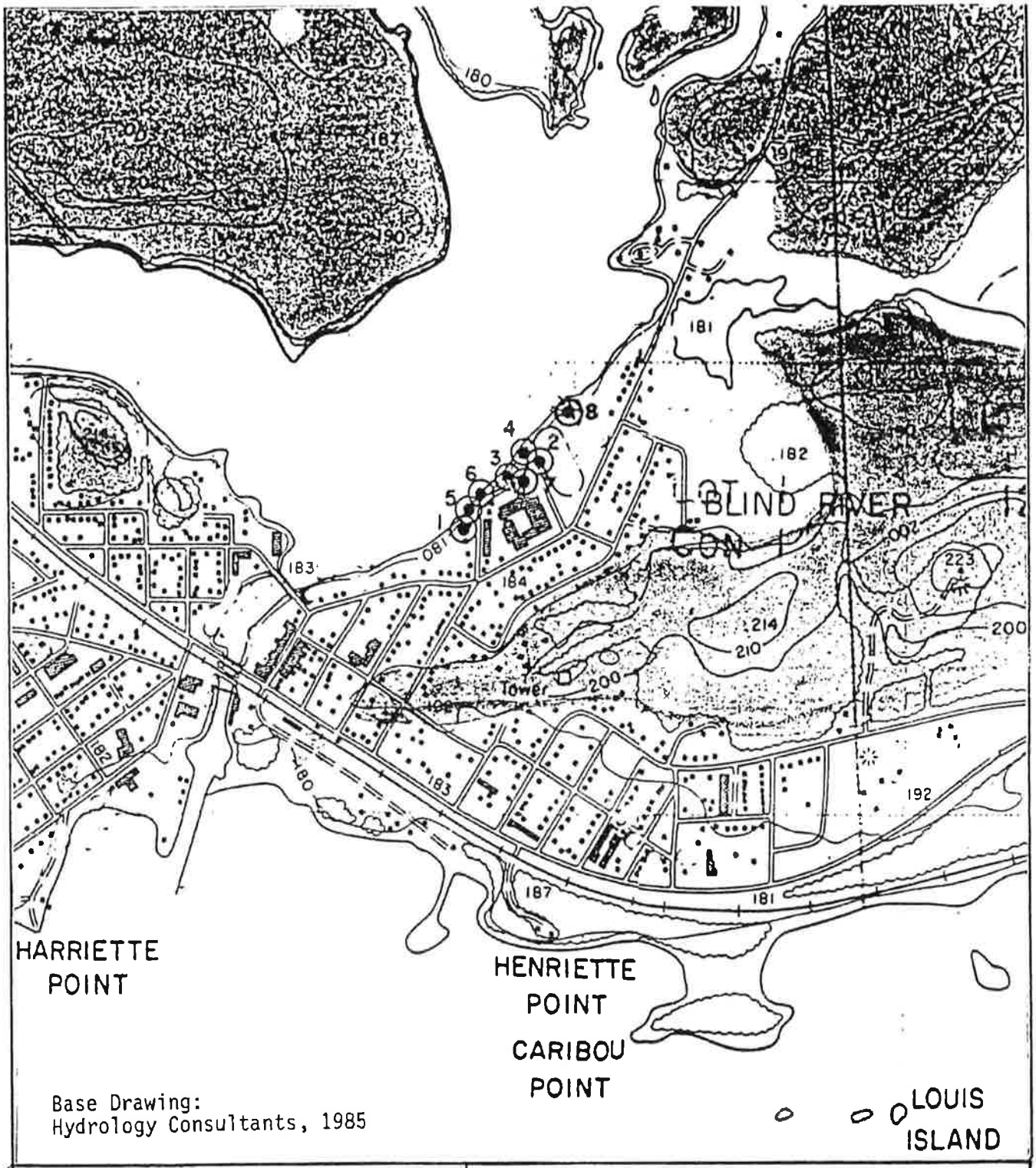
1. Hydrogeologic Investigation, Town of Blind River, Interim Report, August 1985; Hydrology Consultants.

2. Hydrogeologic Investigation, Town of Blind River, Final Report, February 1986; Trow Ltd.

3. Report on Drilling and Testing Municipal Well 8, February 1992; Lotowater Ltd.

4. Report on No. 7 Well Construction, Town of Blind River, December 1987; International Water Supply Limited.

5. Summary of Pumpage/Water Levels, Municipal Well Field 1993-96; H. P. Waterworks and Treatment.



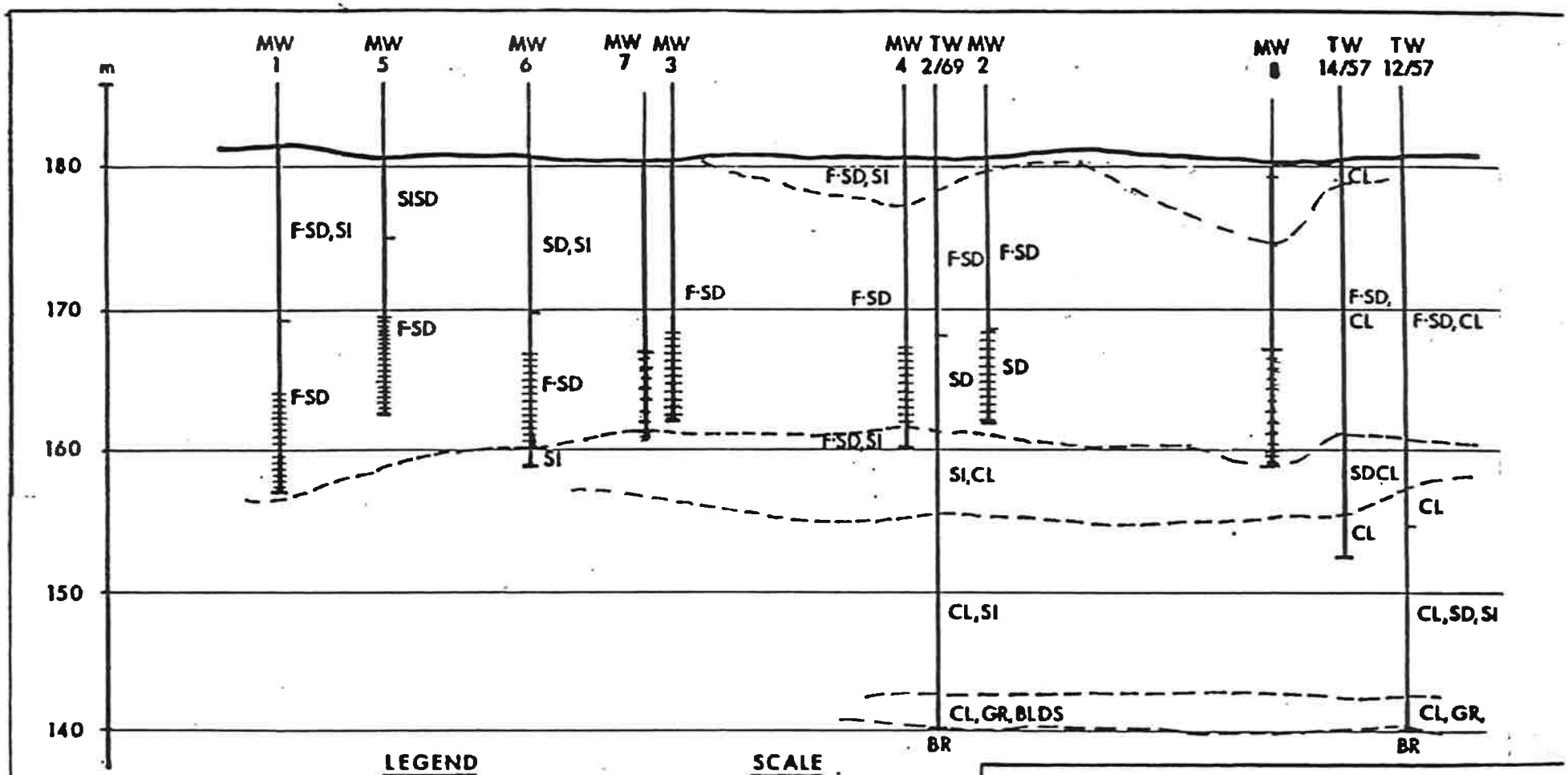
Bedrock Outcrop

Town of Blind River
Wellfield Review

PRODUCTION WELL LOCATIONS

HYDROTERRA LIMITED

Job No. 898B	Scale NTS
Drawn by	Date June 1996
Appr. by	Figure 1
Revised	



LEGEND

SD – SAND
F-SD – FINE SAND
SI – SILT
CL – CLAY
GR – GRAVEL
BLDS – BOULDERS
BR – BEDROCK
GEOLOGIC CONTACT
SCREENED INTERVAL

SCALE

vert. AS SHOWN
horz. 1:2000

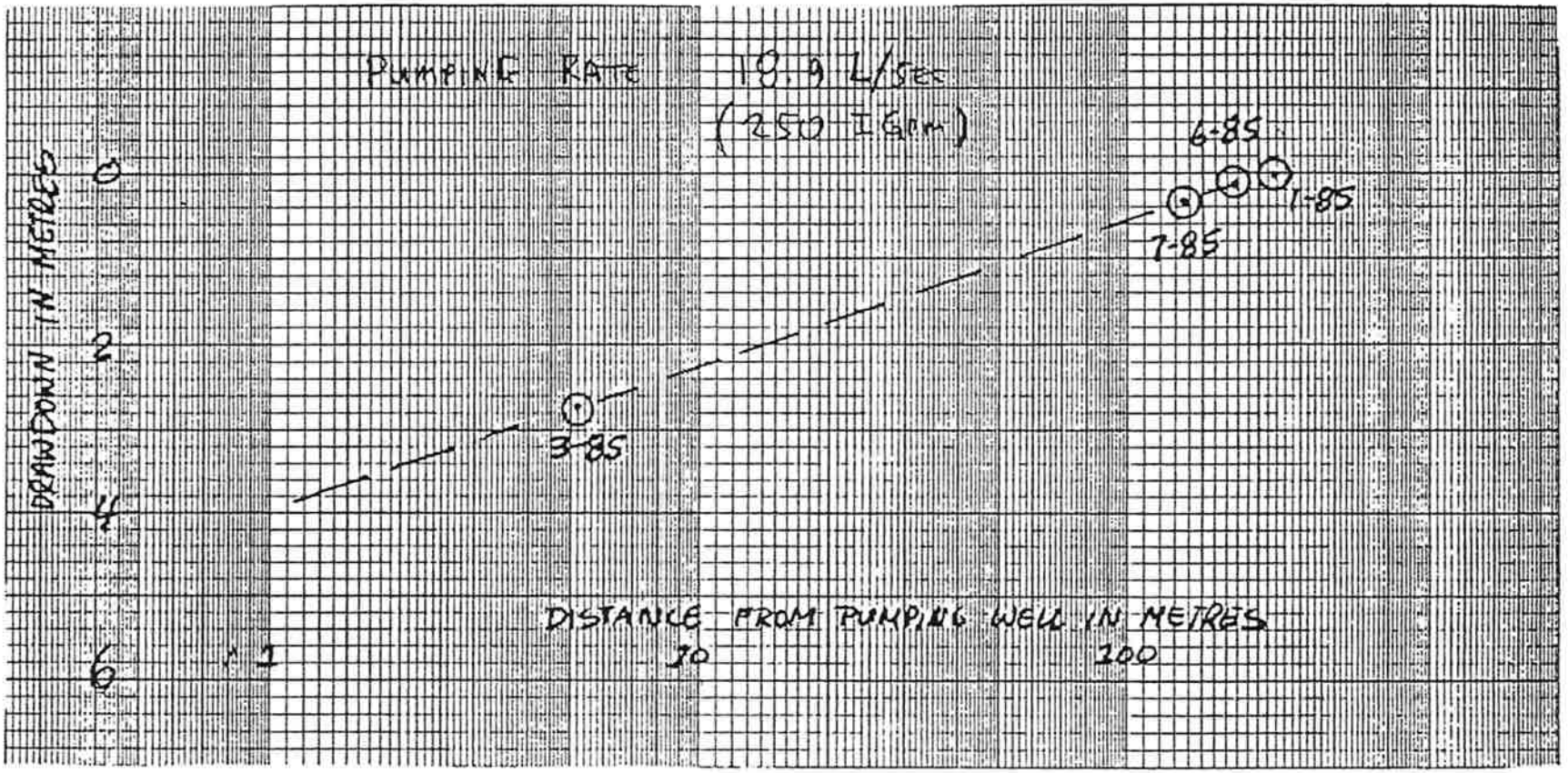
Base Drawing:
Hydrology Consultants, 1985

Town of Blind River
Wellfield Review

GEOLOGIC SECTION

HYDROTERRA LIMITED

Job No. 898B	Scale NTS
Drawn by	Date June 1996
Appr. by	Figure 2
Revised	



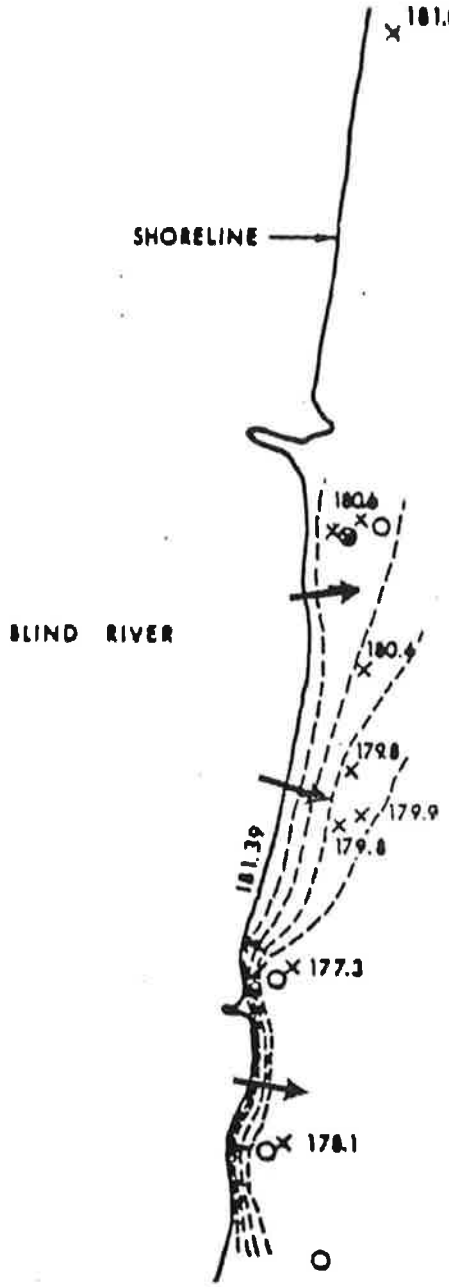
Lotowater, 1992

Town of Blind River
Wellfield Review

PRODUCTION WELL 8
DRAWDOWN-DISTANCE RESPONSE

HYDROTERRA LIMITED

Job No. 8988	Scale NTS
Drawn By	Date June 1996
Appr. By	Figure 3
Revised	



LEGEND

- MUNICIPAL PRODUCTION WELL
- TEST WELL
- 179.8 MONITOR WELL WITH WATER LEVEL ELEVATION (m.a.m.s.l.)
- EQUIPOTENTIAL LINE WITH DIRECTION OF GROUNDWATER FLOW

Base Drawing:
Hydrology Consultants, 1985

Town of Blind River
Wellfield Review

POTENTIOMETRIC SURFACE
UNDER PUMPING CONDITIONS

HYDROTERRA LIMITED

Job No. 898B	Scale NTS
Drawn by	Date June 1996
Appr. by	Figure 4
Revised	

TOWN OF BLIND RIVER
ONTARIO

TOWN OF BLIND RIVER

Blind River Municipal Wellfield

Capacity Evaluation

Prepared By:

KRESIN Engineering Corporation

In Consultation With:

GOFFCO Limited
Groundwater Consulting Services

March 2006

KEC Ref. No. BR05.07

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LIST OF APPENDICES

1.0 Introduction

The community of Blind River is located on the north shore of Lake Huron, approximately 150km east of Sault Ste Marie on Trans Canada Highway No. 17. The current water treatment system consists of a control building, sodium hypochlorite and fluoride injection systems, six (6) municipal wells located on Riverside Drive, and an elevated storage tank that "floats" on the distribution system. The well field is rated for 81.8L/s (7071 m^3/day) by Permit to Take Water (PTTW) No. 2000-P-6004. A copy of the PTTW is included in Appendix A.

In accordance with drinking water regulations, construction of a chemically assisted filtration plant (WTP) will be completed by fall 2006 to replace the current facilities and provide treated water to approximately 3400 residents. Commissioning the WTP and meeting the demands of the Town will require a raw water flow of 63.65L/s (5500 m^3/day) for up to 6 weeks. The WTP must be operated without error for two (2) weeks before commissioning is complete.

2.0 Scope of Work

The objectives of the well field evaluation are as follows:

1. Determine the daily volume of water that can be pumped from the existing well system for the purpose of meeting demands of the Town and commissioning the WTP;
2. Identify necessary improvements to the well system; and
3. Compile information regarding well construction, pump characteristics, and available drawdown.

3.0 Background

The following information was used to identify characteristics of the municipal wells:

1. Final Environmental Study Report, Kresin Engineering and Planning Limited, 1997;
2. Rehabilitation of Municipal Wells, Lotowater Limited, 1996;
3. Rehabilitation of Municipal Wells 7 and 8, Lotowater, 1999;
4. Rehabilitation of Municipal Wells, Lotowater Limited, 2001;
5. First Engineer's Report, Kresin Engineering Corporation, 2000;
6. Correspondence with Mr. Ken Goff (GOFFCO Limited) and flow requirements summarized by Mr. Jahangir Chowdhury (SEGL), 2005 - 2006;
7. Static and pumping water levels observed in January 2006;
8. Survey conducted in January 2006 to establish reference elevations (top of casing and baseplate); and
9. Digital photographs of the pump control panels at wells 4, 5, 6 and 8.

The Lotowater reports provided elevations for the tops and bottoms of well screens and some submersible pump intakes. Overall well depths were found in the First Engineer's report, and the remaining pump intake elevations were written in permanent marker on the pump control panels and verified during the procedure by Ontario Clean Water Agency (OCWA) staff.

4.0 Test Procedure

The test procedure was developed with input from Mr. Ken Goff, P.Geo. and OCWA Operators. Details of the procedure and a sample data collection sheet are included in Appendix B.

Level transducers installed at each well on January 10, 2006 were programmed to record at one minute intervals, and manual measurements were taken with an electronic tape prior to and during the test. A 3-hour recovery period from normal pumping was provided prior to starting the test.

After establishing "static" water levels with manual measurements, all of the wells were brought online in 30 minute intervals and pumped to waste. Well no. 4 was offline due to poor production and was used for monitoring purposes (i.e. interference) during the test. Flow was increased at each well until maximum pump discharge was achieved or the water level in the well was within 2 meters of the pump intake. Flow was monitored using inline flow meters at wells number 4A and 8, and "strap on" ultrasonic flowmeters from Endress + Hauser at wells number 5 and 6. As there were no straight sections of pipe at well number 7 that met the minimum upstream / downstream distance requirement for the meter, the pressure reading only at well number 7 was recorded. Mr. Jenson (OCWA) later verified the flow by directing water through the inline flowmeter at the pressure recorded during the test.

Water levels were taken by manual measurement and recorded during the initial 30 minutes of pumping at each well, and for several minutes following each rate increase in order to confirm that water levels remained at least 2 meters above the pump intake. Test data and static water levels observed before and after the test were documented on record sheets. All adjustments to the pumping rates were made by OCWA operators.

The test was initiated at 5:50pm on January 11, 2006 and concluded by 8:00am on January 12, 2006 when the discharge from the wells was redirected to the distribution system to fill the reservoir. Monitoring the "recovery" period was not possible at that time due to system demand;

however, the wells were shutdown for approximately 8 hours on January 16 to observe recovery of water levels. The level transducers were retrieved on January 17, 2006.

5.0 Discussion of Results

Data recorded manually in the field was supplemented by data recorded by the transducers from January 10 through 17, 2006, and flow records from the control building. For comparison purposes, the manual measurements and logged water levels were converted into elevations based on top of casing or base plate elevation. Top of casing and baseplate elevations are included in Appendix C and a summary of the field measurements taken is included in Appendix D.

Table 1 summarizes screen and pump intake elevations, and the water levels observed during the test period.

Table 1: Summary of Elevations and Drawdown

Well No.	Static Water Elevation (m)	Intake Elevation (m)	Top of Screen Elevation (m)	Min Pumped Elevation During Test (m)	Max Drawdown During Test (m)	Available Drawdown to Pump Intake (m)
4A	178.69	165.00	164.88	167.54	11.15	13.69
5	178.87	167.35	167.75	171.9	6.97	11.52
6	178.82	163.37	166.45	164.97	13.86	15.45
7	178.67	169.21	168.82	171.46	7.21	9.46
8	178.91	168.19	167.89	170.41	8.5	10.72

Note:
- All elevations are masl.
- Available drawdown measured from static water level.

Table 2 summarizes the conditions that were identified during the test as limiting the discharge from each well.

Hydrographs showing water levels in each of the wells for the 24 hour period from noon on January 11 to noon on January 12 are provided in Appendix E. These hydrographs show the shut-down period prior to pumping when static (or near static) water levels were established, followed by the pumping periods. 'Steps' in the pumping levels, such as the recorded levels at well number 8, reflect manual adjustments made to the pumping rates based on observed drawdown. The increases in the water levels at about 1200 minutes (8:00am on January 12) indicate reductions in pumping rates as the pump to waste piping was closed and the flow redirected to the distribution system and reservoir.

Table 2: Factors Limiting the Available Flow

Well No.	Limiting Factors / Comments
4A	- Drawdown was the limiting factor. - Initial pumping rate of 10.8L/s caused drawdown to approximately 1.2 meters above the pump intake elevation of 165 meters.
5	- Pump capacity was the limiting factor. - Water level could only be drawn down to 4.5m above the intake (approximately 2.5 meters of usable drawdown remained).
6	- Drawdown was the limiting factor. - Pumping rate of 5.4L/s caused drawdown to approx. 164.97 meters which is less than 2 meters above the pump intake elevation of 163.37 meters.
7	- Drawdown was the limiting factor. - Water level was drawn down to 2.25 meters above the pump intake elevation.
8	- Drawdown was the limiting factor. - Water level was drawn down to 2.22 meters above the pump intake elevation.

The attached hydrographs (Appendix E) show the relationship between 'stable' portions of the hydrographs and logarithmic time in order to estimate the water levels and drawdown after 2 weeks of continuous pumping. These drawdowns were also used to calculate specific capacities and the maximum yields of the wells assuming that pumping levels could be lowered to within 0.5 metres of the pump intakes. The projected drawdown after two weeks of pumping at well number 7 exceeded the available drawdown (from static to the pump intake) by approximately one meter; however, this should have minimal effect on the available flow from well no. 7. As only manual measurements were taken at well number 6, a graph for test results at well number 6 has not been included.

The water elevations logged from January 10 through January 17 are presented graphically for each well in Appendix F. Due to the volume of raw data recorded by the level transducers, printed records have not been included in this report.

The pumping rate from the well field during the test was 44.5 L/s, and the maximum projected pumping rate is approximately 52.4 L/s under 'open discharge' conditions. However, applying specific capacities to the drawdowns after 1200 minutes (i.e. when the wells are connected to the distribution system) indicates an operating well field capacity of approximately 30 L/s. This observation was verified by checking the totalized flow for January 12, 2006 (31 L/s) which was recorded by OCWA at the Control Building. The OCWA generated flow record is included with field measurements in Appendix D.

Table 3 presents the discharges observed and projected at each well.

The well pumps were started in sequence to observe water levels and check for interference between wells. Based on a review of the results, it appears that interference between the pumped wells is negligible. For instance, the transducer in well number 4 detected only a minimal decline in water level when well number 4A (approximately 5m away) was pumped.

Table 3: Summary of Available Flow

Well No.	Q (l/s)	Projected Drawdown (2_{wks}, m)	Specific Capacity (2_{wks}, L/s per m)	Available Drawdown (m)	Calculated Q_{max} (L/s)
4A	6.4	11.29	0.567	13.19	7.48
5	8.8	7.02	1.254	11.02	13.82
6	5.4	14	0.386	14.95	5.77
7	11.5	9.92	1.159	8.96	10.38
8	12.4	8.7	1.425	10.52	14.99
Total	**44.5**				**52.4**

Note:
- Available drawdown is to 0.5 metres above intake.

5.1 Review of Historical Well Rehabilitation Results

In 1996, Lotowater conducted mechanical and chemical rehabilitation of wells number 4, 4A, 6 and 7 and performance testing of wells number 5 and 8. Subsequent rehabilitation in 1999 and 2001 using two (2) hydrochloric acid treatments either returned or slightly improved the available drawdown at each well when compared to the values observed in 1996.

It was noted that the pre-rehabilitation specific capacities of the wells in 1996 is comparable to the values identified from the wellfield test conducted in January 2006. If the same degree of improvement can be achieved, rehabilitating the wells would increase the total available flow from the wellfield. Records indicated that the most recent rehabilitation of well number 4 increased yield to approximately 17l/s (8m drawdown).

When compared to the as-constructed conditions, the municipal wells are producing considerably less water, and it is not expected that future rehabilitation will improve yields beyond the results observed in 1996, 1999 and 2001.

A summary of specific capacities (L/s per meter of drawdown) observed before and after rehabilitation in 1996, 1999 and 2001 is included in Appendix G.

6.0 Conclusions

SEGL has estimated that 63.7L/s (5500 m^3/day) will be required to supply the Town and commission the WTP for up to 6weeks. By projecting observed flow (open discharge) during the test over a two (2) week commissioning period, 52.4L/s (4527 m^3/day) is available to supply the Town and commission the WTP.

As the pump test was completed by open discharge, an adjustment was made to determine available flow to the distribution system and WTP under normal operating pressure. This flow (30L/s) was estimated based on water level recovery observed in each well after OCWA staff directed flow to the distribution system (i.e. water level recovery indicates reduced flow from the wells).

Based on the results of this evaluation, it is concluded that additional capacity is required from the wellfield in order to supply the Town and commission the WTP.

7.0 Recommendations

1. In order to utilize the available drawdown at well number 5 (i.e. maximize flow), the pumping rate should be increased (i.e. pump repairs, improvements or replacement). This should be done to optimize the well's performance when supplying the new WTP;

2. Based on a review of rehabilitation and performance records, the municipal wells should be rehabilitated with acid treatments to increase flow from the wellfield. The capacity should be evaluated after rehabilitation to determine if the new flow is adequate to supply the Town and commission the WTP;

3. Well number 4 should also be rehabilitated as an alternative to drilling a new well. The discharge piping from this well would have to be modified in order to pump wells nos. 4, 4A and 8 into the distribution system;

4. Transducers should be installed at existing monitoring wells to further assess interference between 4A, 4 and 8;

5. Should additional capacity be required after rehabilitation, suitable locations for a new well (or wells) would be within 5 meters of well number 4, and between wells number 4A and 8; and

6. All well records (if available) should be located for the production wells.

Respectfully submitted by:

Kresin Engineering Corporation

April Tucker, P.Eng.

GOFFCO Ltd.

Ken Goff, M.Sc., P.Geo.
Hydrogeologist

APPENDIX A

PTTW NO. 2000- P-6004

Ministry of the Environment

435 James Street South
Suite 331
Thunder Bay, ON P7E 6S7

Ministère de l'Environnement

435, rue James Sud
Bureau 331
Thunder Bay, ON P7E 6S7

Ontario

Fax: (807) 475-1754
Direct Line: (807) 475-1729

January 25, 2000

Mr. Dadean Assam
Town of Blind River
P.O. Box 640, 11 Hudson Street
BLIND RIVER, ON P0R 1B0

Dear Mr. Assam:

Re: Permit To Take Water 2000-P-6004

Enclosed is Permit To Take Water No. 2000-P-6004. This Permit allows for the taking of water from Well Nos. 4, 4a, 5, 6, 7, and 8 for the purpose of providing a municipal water supply to the Town of Blind River. Please note that Permit No. 92-P-5948, which currently covers the taking from Well No. 8, will be cancelled to allow all of the municipal wells to be covered by a single Permit. The permitted quantities for well No 8 remain unchanged. A separate notice of the MOE's intent to cancel Permit No. 92-P-5948 is enclosed.

Permit No. 2000-P-6004 allows for the taking of the following quantities of water from the following sources:

1) 682 L/min (150 Igal/min) and 982 m^3/day (216,000 Igal/day) from Well No. 4;
2) 591 L/min (130 Igal/min) and 851 m^3/day (187,200 Igal/day) from Well No. 4a;
3) 1023 L/min (225 Igal/min) and 1473 m^3/day (324,000 Igal/day) from Well Nos. 5 and 7;
4) 455 L/min (100 Igal/min) and 655 m^3/day (144,000 Igal/day) from Well No. 6;
5) 1137 L/min (250 Igal/min) and 1637 m^3/day (360,000 Igal/day) from Well No. 8.

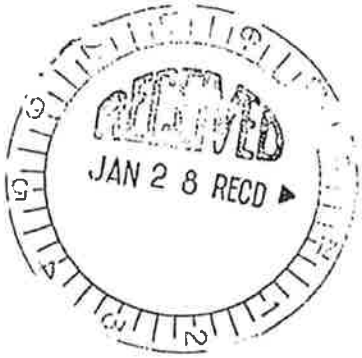
The General Terms and Conditions are shown on the front and reverse side of the Permit. Additional Special Terms and Conditions are provided on the attached Appendix 1.

Should you have any questions or concerns regarding this Permit, please contact this office as soon as possible.

Yours truly,

Mark Puumala
Regional Hydrogeologist
Technical Support Section

/mp
Encl.



Ontario

Ministry of the Environment

NOTICE OF TERMS AND CONDITIONS

In accordance with Section 100 of the ***Ontario Water Resources Act***, R.S.O. 1990, notice is hereby given of the issuance of Permit To Take Water

No. 2000-P-6004

which contains terms and conditions pertaining to the taking of water and to the results of the taking. The terms and conditions have been designed to allow for the development of water resources for beneficial purposes while providing reasonable protection to existing water uses and to public interests in water.

You may, by written notice served upon me and the Environmental Appeal Board, within fifteen days after receipt of this Notice, require a hearing by the Board. Section 101 of the ***Ontario Water Resources Act***, as amended provides that this Notice requiring a hearing shall state:

1. The portions of the permit or each term or condition in the permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice shall also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Permit to Take Water number;
6. The date of the Permit to Take Water;
. The name of the Director;
8. The municipality within which the works is located;

and the Notice should be signed and dated by the appellant.

The Notice must be served upon:

The Secretary,
Environmental Appeal Board,
P.O. Box 2382,
2300 Yonge St., Suite 1201
Toronto, Ontario, M4P 1E4

The Director,
Section 34,
Ontario Water Resources Act
Ministry of the Environment
(issuing office)

Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board by telephone at (416) 314-4600 by fax at (416) 314-4506 or by e-mail at www.ert.gov.on.ca

In the event of an appeal, the terms and conditions of the permit, as issued, would remain in effect until the appeal has been finalized.

Dated at Thunder Bay

This 26th day of January 2000.

Director Section 34
Ontario Water Resources Act R.S.O. 1990

MINISTRY OF THE ENVIRONMENT

PERMIT TO TAKE WATER

No. 2000-P-6004

Under Section 34 of The Ontario Water Resources Act, R.S.O. 1990, this permit is issued to:

Town of Blind River,

whose address for all purposes pertaining to this permit is:

P.O. Box 640
11 Hudson Street
Blind River, Ontario P0R 1B0

for the taking of water in accordance with the terms and conditions set out below, on the back of this form, and on the attached Appendix 1.

TERMS AND CONDITIONS

PARTICULARS

SOURCE(s): The following wells, as identified on Permit to Take Water Application forms submitted to MOE by the Town of Blind River and dated February 13, 1992 and January 7, 2000.

1) Well No. 4
2) Well No. 4a
3) Well No. 5
4) Well No. 6
5) Well No. 7
6) Well No. 8

LOCATION(s): Town of Blind River, District of Algoma.

PURPOSE: Municipal supply.

TAKING TO COMMENCE ON: February 1, 2000.

PERMIT EXPIRES: January 31, 2010.

RATE OF WATER TAKING NOT TO EXCEED:

Source No. 1: 682 L/min and 982 m^3/day.
Source No. 2: 591 L/min and 851 m^3/day.
Source No. 3: 1023 L/min and 1473 m^3/day.
Source No. 4: 455 L/min and 655 m^3/day.
Source No. 5: 1023 L/min and 1473 m^3/day.
Source No. 6: 1137 L/min and 1637 m^3/day.

Dated at Thunder Bay, Ontario this 26th day of January, 2000.

Director, Section 34
Ontario Water Resources Act

See over...

APPENDIX 1

SPECIAL TERMS AND CONDITIONS

Permit To Take Water 2000-P-6004
Town of Blind River
P.O. Box 640, 11 Hudson Street
Blind River, Ontario P0R 1B0

1. No water shall be taken under the authority of this Permit unless a Water Works Certificate of Approval (C. of A.) is in effect as required under Section 52 of the OWRA.

2. The Permittee shall ensure that a copy of the Permit and the attached Appendix 1 are posted at the location of taking for anyone wishing to review its contents.

Jan. 26/00
Date

Director, Section 34
Ontario Water Resources Act, R.S.O. 1990

APPENDIX B

TEST PROCEDURE

Evaluating Capacity of the Blind River Municipal Well Field

Testing Procedure

Preparation

1. Level Monitors

Level loggers should be programmed as follows and installed at the levels indicated in Table 1:

1. Sampling Interval = 1 minute;
2. Approx. ground elevation = 180 mASL; and
3. Barometric pressure to be monitored at well no. 7.

Table 1: Depth of Level Monitors (m, bBP or bgl)

Well No.	Top of Screen	Pump Intake	Previous Depth of Installation	Proposed Depth of Installation
4	13.7	14.6	8.2	13
4A	16.1	15.4	8.2	13.5
5	12.5	14.1	6.0	12
6	14.6	unknown	12.0*	12.0*
7	12.5	11.8	8.2	10.0
8	12.8	12.5	11.2	11

* Logger may not pass through obstruction in the well for deeper installation.
**Installation of logger is approximately 2meters above well pump intakes.

Level monitors must be installed in each well after pumping has stopped and at least 3 – 4 hours prior to the start of the test.

2. Flow Monitoring

Flow from wells 5, 6 and 7 will be monitored and recorded at the pump to waste piping using "strap on" type flow meters (model Prosonic 92 from Endress and Hauser). Flow readings will be observed and recorded at wells 4A and 8 from the existing flow meters.

Test Procedure

1. Record static water levels at each well using a wetted tape (just prior to testing);
2. Record initial totalizer readings from flow meters at each building;
3. Start well pump no. 5 and pump for 30 minutes. Record time, water level and totalized (or instantaneous) flow;
4. Start well pump no. 6 and pump with no. 5 for 30 minutes. Record time, water levels and totalized (or instantaneous) flow at each flowmeter;
5. Start well pump no. 7 and pump with no. 5 and 6 for 30 minutes. Record time, water levels and totalized (or instantaneous) flow at each flowmeter;
6. Start well pump no. 4A and pump with 5, 6 and 7 for 30 minutes. Record time, water levels and totalized (or instantaneous) flow at each flowmeter;
7. Start well pump no. 8 and pump with 5, 6, 7 and 4A for 30 minutes. Record time, water levels and totalized (or instantaneous) flow at each flowmeter;
8. Begin manual water level measurements at each well (approximate 30 minute intervals). Also record time and totalized (or instantaneous) flow;
9. Once water level is "stable" at current pump settings, increase flow rates beginning with well no. 5. Note the time and flow rate prior to and after the increase;
10. Continue recording time, water level and flow at each well;
11. If pumps must be throttled back, note the time and new flow rate;
12. Increase pumping rates until maximum flow is achieved or "stable" water level is within 2meters of the pump intakes;
13. Continue pumping over night.
14. Record time, water levels, and flow at each well;
15. Shutdown well pumps in 30 minute intervals beginning with well no. 5. Record time of shutdown and totalized flow at each building;
16. Plot and evaluate; and
17. Allow wellfield to recover overnight prior to downloading info from leveloggers.

Note:

1. Time, water level and flow reading to be measured together to show changes in water level and flow rate from each well.
2. Data should be continuously plotted and evaluated (in so far as this is possible).

To be Done Prior to Testing:

1. OCWA to confirm presence/absence of low water level lockouts;
2. OCWA to confirm the pump intake elevations;
3. OCWA to supply a second wetted tape for level monitoring (wellhouses nos. 5, 6 and 7);
4. KEC to supply silt fencing for installation at the pump to waste outfalls; and
5. KEC to confirm elevation of top of casing or base plate at each well.

DATA COLLECTION SHEET
EVALUATING CAPACITY OF BLIND RIVER MUNICIPAL WELL FIELD

KEC Ref. No. BR05.07

Well No. 5				
Reading No.	Time of Measurement	Water Level (m, bTOC or bBP)	Flow (specify units)	Measurements Taken By

APPENDIX C

ELEVATIONS (TOP OF CASING AND BASEPLATE)

Wellfield Elevations (m)			
Well No.	Top of Casing (m)	Top of Vent (m)	Top of Baseplate (m)
4	-	-	180.96
4A	180.833	180.893	-
5	-	-	181.499
6	-	-	181.054
7	181.321	181.421	-
8	181.189	181.249	-

Note:
- Survey was conducted by Kresin Engineering Corporation in January 2006.
- Manual measurements taken at wells nos. 4A, 7 and 8 with reference to the tops of the air vents.

APPENDIX D

SUMMARY OF FIELD MEASUREMENTS

DATA COLLECTION SHEET
EVALUATING CAPACITY OF BLIND RIVER MUNICIPAL WELL FIELD

KEC Ref. No. BR05.07

Well No. 5					
Reading No.	Elapsed Time (mins)	Time of Measurement	Water Level (m, bTOC or bBP)	Flow (specify units)	Measurements Taken By
		17:50			start pump - 11-Jan-06
1		16:25	2.63		
2	1	17:51	7.34		
3	2	17:52	7.82		
4	3	17:53	7.98		
5	4	17:57	8.29	9.2l/s	strap-on fe
6	5	17:58	8.34		
7	6	17:59	8.37		
8	7	18:00	8.41		
9	8	18:01	8.44		
10	10	18:03	8.49		
11	48	18:41	9		
12	88	19:21	9.2	9.2l/s	check fe
13	133	20:06	9.29		
14	135	20:08	9.3	8.95l/s	opened valve to inc
15	218	21:31	9.42	8.4l/s	flow - pump was at capacity-adjusted back to 8.8l/s
16	838	7:51	9.575	8.8l/s	12-Jan-06

DATA COLLECTION SHEET
EVALUATING CAPACITY OF BLIND RIVER MUNICIPAL WELL FIELD

KEC Ref. No. BR05.07

Well No. 6					
Reading No.	Elapsed Time (min)	Time of Measurement	Water Level (m, bTOC or bBP)	Flow (specify units)	Measurements Taken By
1		16:59	2.23		
2		18:07	2.65		11-Jan-06
3		18:09	2.68		
4		18:11	2.695		
5		18:14	2.725		
6		18:17	2.74		
7		18:19	2.76		
8		18:20	2.76		-start pump just
9	1	18:21	7.6		after reading
10	5	18:25	15.07	5l/s	-approx. 140psi
11	6	18:26	15.21		
12	7	18:27	15.285		
13	9	18:29	15.36		
14	10	18:30	15.39		
15	11	18:31	15.4		
16	12	18:32	15.415		
17	14	18:34	15.445		
18	24	18:44	15.51		
19	58	19:18	15.9	5.33l/s	130-135 psi
20	121	20:21	16.08	5.25l/s	
21	194	21:34	16.08		
22	805	7:45	16.085	5.4l/s	12-Jan-06

DATA COLLECTION SHEET
EVALUATING CAPACITY OF BLIND RIVER MUNICIPAL WELL FIELD

KEC Ref. No. BR05.07

Well No. 7					
Reading No.	Elapsed Time (min)	Time of Measurement	Water Level (m, bTOC or bBP)	Flow (specify units)	Measurements Taken By
1		16:55	2.75		
2		18:48	3.115	fe not working,	11-Jan-06
3		18:50	3.12	insufficient flow +	
4		18:53	3.13	not full ptw pipe	-start pump at 6:55
5	2	18:57	10.77		
6	4	18:59	11.21		
7	5	19:00	11.32		-80psi
8	7	19:02	11.44		-cut flow down,
9	8	19:03	9.78		108psi
10	9	19:04	9.54		
11	10	19:05	9.465		
12	11	19:06	9.44		
13	12	19:08	9.42		
14	14	19:10	9.43		
15	16	19:12	9.44		
16	18	19:14	9.45		
17	29	19:25	9.47		
18	92	20:28	9.68		110psi
19	161	21:37	9.78		
20	766	7:42	9.97		12-Jan-06

DATA COLLECTION SHEET
EVALUATING CAPACITY OF BLIND RIVER MUNICIPAL WELL FIELD

KEC Ref. No. BR05.07

Well No. 4A					
Reading No.		Time of Measurement	Water Level (m, bTOC or bBP)	Flow (specify units)	Measurements Taken By
1		16:40	2.2		-below top of vent
2	1	19:45	2.51	650l/min	*note 1
3	8	19:58	10.22	320l/min	-started to reduce
4	10	20:00	10.12		flow back to 320
5	14	20:34	10.17		-8:36pm, flow inc
6	21	20:41	12.99		to 480l/min
7	25	20:45	13.01	385l/min	-8:38pm, dec to
8	54	21:14	13.06		385l/min
9	81	21:41	13.1		
10	677	7:37	13.33		12-Jan-06

1. 7:46pm started pump, increased flow resulted in drawdown >15m at 7:53

DATA COLLECTION SHEET
EVALUATING CAPACITY OF BLIND RIVER MUNICIPAL WELL FIELD

KEC Ref. No. BR05.07

Well No. 8					
Reading No.	Elapsed Time (min)	Time of Measurement	Water Level (m, bTOC or bBP)	Flow (specify units)	Measurements Taken By
					11-Jan-06
					pump was running
					at 106IGPM at
					7:30pm, 97-98psi
1		16:32	2.37		
2	16	18:36	8		
3	19	19:39	8		
4	78	20:48	8.12		inc flow rate to
5	85	20:55	9.25		134IGPM at 8:52pm
6	88	20:58	9.27		
7	104	21:14	9.3		
8	108	21:10	9.31		
9	118	21:20	11.06		inc flow rate to
10	122	21:24	11.085		164IGPM at 9:16pm
11	143	21:45	11.16		
12	732	7:34	11.36		12-Jan-06

1. Strap-on flow meter would not fit on piping inside pumphouse no. 7 so was installed outside. The sensors were installed at the pump to waste but could not meter (either due to "noise" or partially filled pipe)

Ontario Clean Water Ag[illegible]
Daily Process Data Collectio[illegible] Form

Facility: [6219] - Blind River Water Treatment Plant
Works: [210000041] - Blind River Water Treatment Plant
Month: January 06

Treated Water/Flows [TW - Treated Water]	8	9	10	11	12	13	14
Treated Flow (L/s)	28.8	27.5	32.1	9.4	31	26.1	26.1
Treated Flow (m3/d)	1894	1546	2220	412	2684	1960	1960
Raw Water/Flows [RW4 - Well 4]							
Raw Flow: Avg. (L/s) out of serv.	Ø	Ø	Ø	Ø	Ø	Ø	Ø
Raw Water/Flows [RW4A - Well 4A]							
Raw Flow: Avg. (L/s)	5.2	5.0	4.7	3.1	6.6	6.6	6.6
Raw Water/Flows [RW5 - Well 5]							
Raw Flow: Avg. (L/s) Std by	Ø	Ø	Ø	Ø	2.3	Ø	Ø
Raw Water/Flows [RW6 - Well 6]							
Raw Flow: Avg. (L/s)	3.4	3.1	10.6	1.1	4.2	2.9	2.9
Raw Water/Flows [RW7 - Well 7]							
Raw Flow: Avg. (L/s)	7.3	6.9	6.8	2.1	6.2	4.4	4.4
Raw Water/Flows [RW8 - Well 8]							
Raw Flow: Avg. (L/s)	12.9	12.5	10.0	3.1	11.7	12.2	12.2
Raw Water/Flows [RW4 - Well 4]							
Raw Flow: Sum (m3/d) out of serv.	Ø	Ø	Ø	Ø	Ø	Ø	Ø
Raw Water/Flows [RW4A - Well 4A]							
Raw Flow: Sum (m3/d)	340	272	338	136	572	486	486
Raw Water/Flows [RW5 - Well 5]							
Raw Flow: Sum (m3/d) Std by	Ø	Ø	Ø	Ø	203	Ø	Ø
Raw Water/Flows [RW6 - Well 6]							
Raw Flow: Sum (m3/d)	229.3	181	728	49	365	211	211
Raw Water/Flows [RW7 - Well 7]							
Raw Flow: Sum (m3/d)	481	375	468	91	533	322	322

Ontario Clean Water Agency
Daily Process Data Collection Form

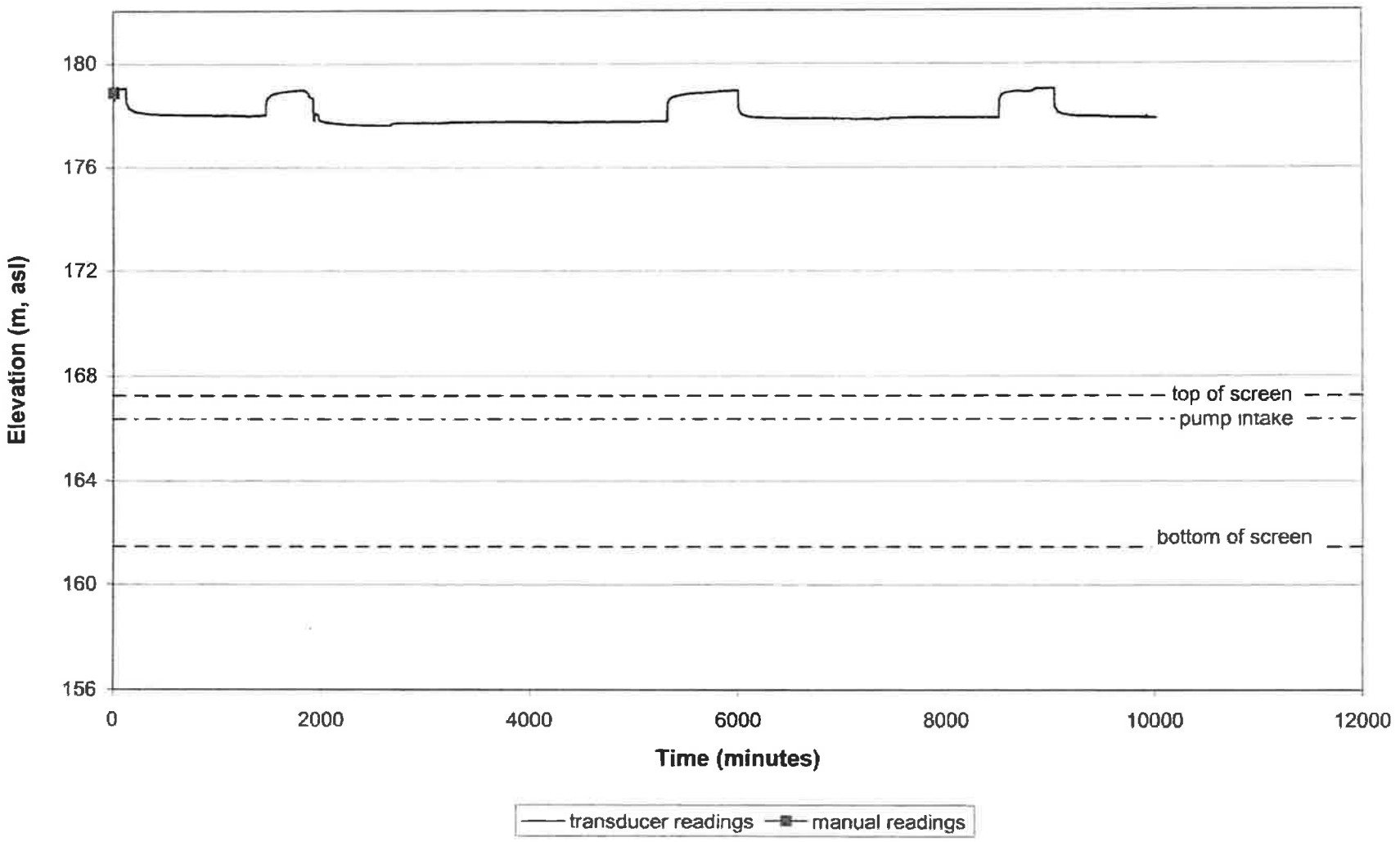
Facility: [6219] - Blind River Water Treatment Plant
Works: [210000041] - Blind River Water Treatment Plant
Month:

	8	9	10	11	12	13	14
Raw Water/Flows [RW8 - Well 8]							
Raw Flow: Sum (m3/d)	849	718	686	136	1011	891	891
Raw Water/Raw Water [RW4 - Well 4]							
Well Pump Run Time (h/d) out of srv	Ø	Ø	Ø	Ø	Ø	Ø	Ø
Raw Water/Raw Water [RW4A - Well 4A]							
Well Pump Run Time (h/d)	18.3	15	20	12	24	20.6	20.6
Raw Water/Raw Water [RW5 - Well 5]							
Well Pump Run Time (h/d) shd by	Ø	Ø	Ø	Ø	7	Ø	Ø
Raw Water/Raw Water [RW6 - Well 6]							
Well Pump Run Time (h/d)	18.3	16	19	12	24	20.3	20.3
Raw Water/Raw Water [RW7 - Well 7]							
Well Pump Run Time (h/d)	18.3	15	19	12	24	20.3	20.3
Raw Water/Raw Water [RW8 - Well 8]							
Well Pump Run Time (h/d)	18.3	16	19	12	24	20.3	20.3
Treated Water/In-House Result [TW - Treated Water]							
Fluoride Conc (mg/L) - grab IH	—	.61	.61	.67	.73	.49	—
Fluoridation/Fluoridation [TW - Treated Water]							
Fluoride Dosage (mg/L)	.81	1.20	.50	.54	.62	.45	.45
Treated Water/Health [TW - Treated Water]							
Fluoride Residual: Max. (mg/L)	.65	.65	.90	.95	.80	.50	.58
Fluoride Residual: Mean (mg/L)	.62	.61	.66	.62	.54	.48	.47
Fluoride Residual: Min. (mg/L)	.34	.59	.47	.37	.10	.42	.17
Post Disinfection/Disinfection [TW - Treated Water]							
Cl Used (kg)	11.62	7.64	13.64	2.73	15.27	11.07	11.07
Cl Dosage (mg/L)	6.14	4.94	6.14	6.63	5.67	5.80	5.80

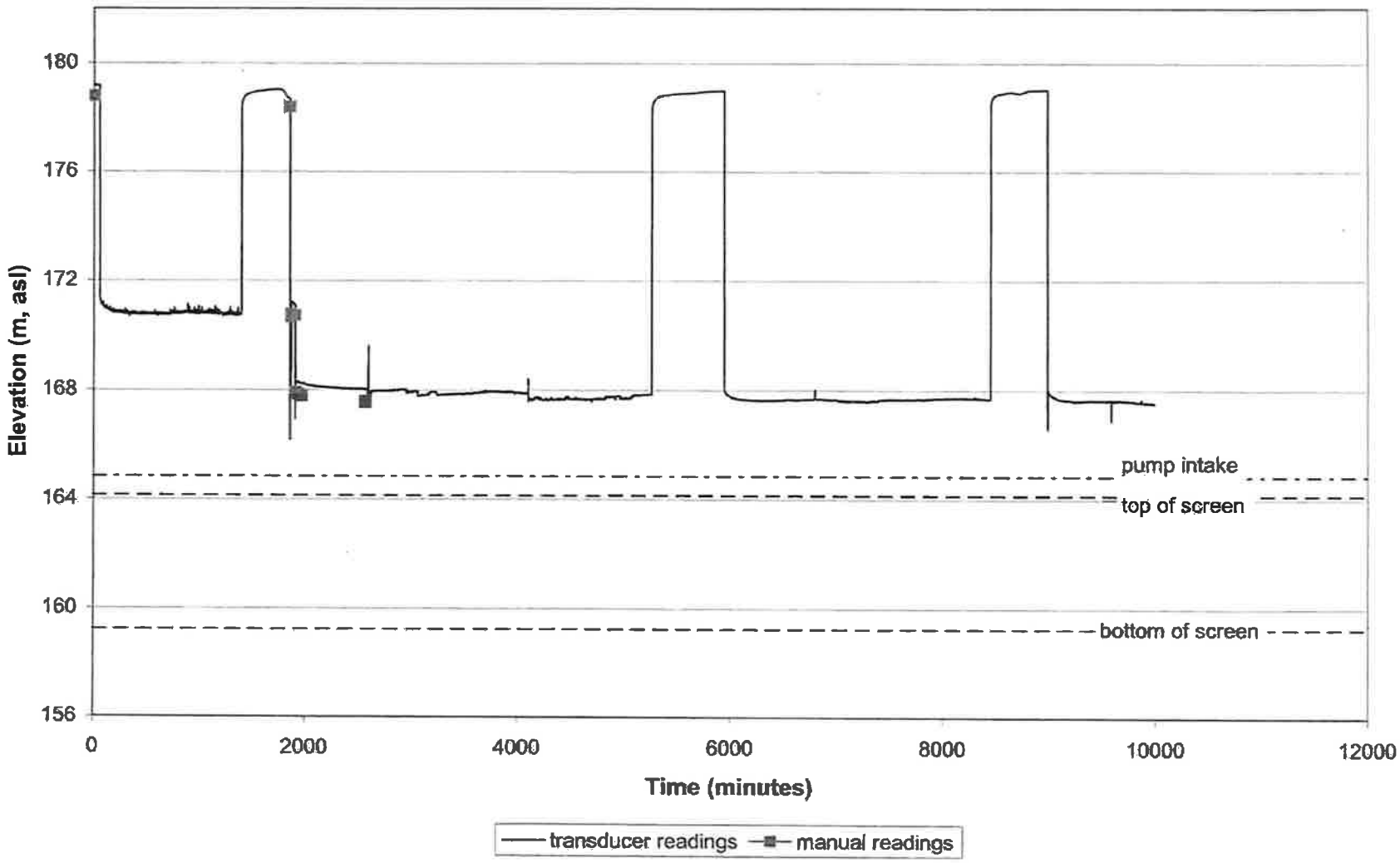
APPENDIX E

HYDROGRAPHS (24 HOUR TEST PERIOD)

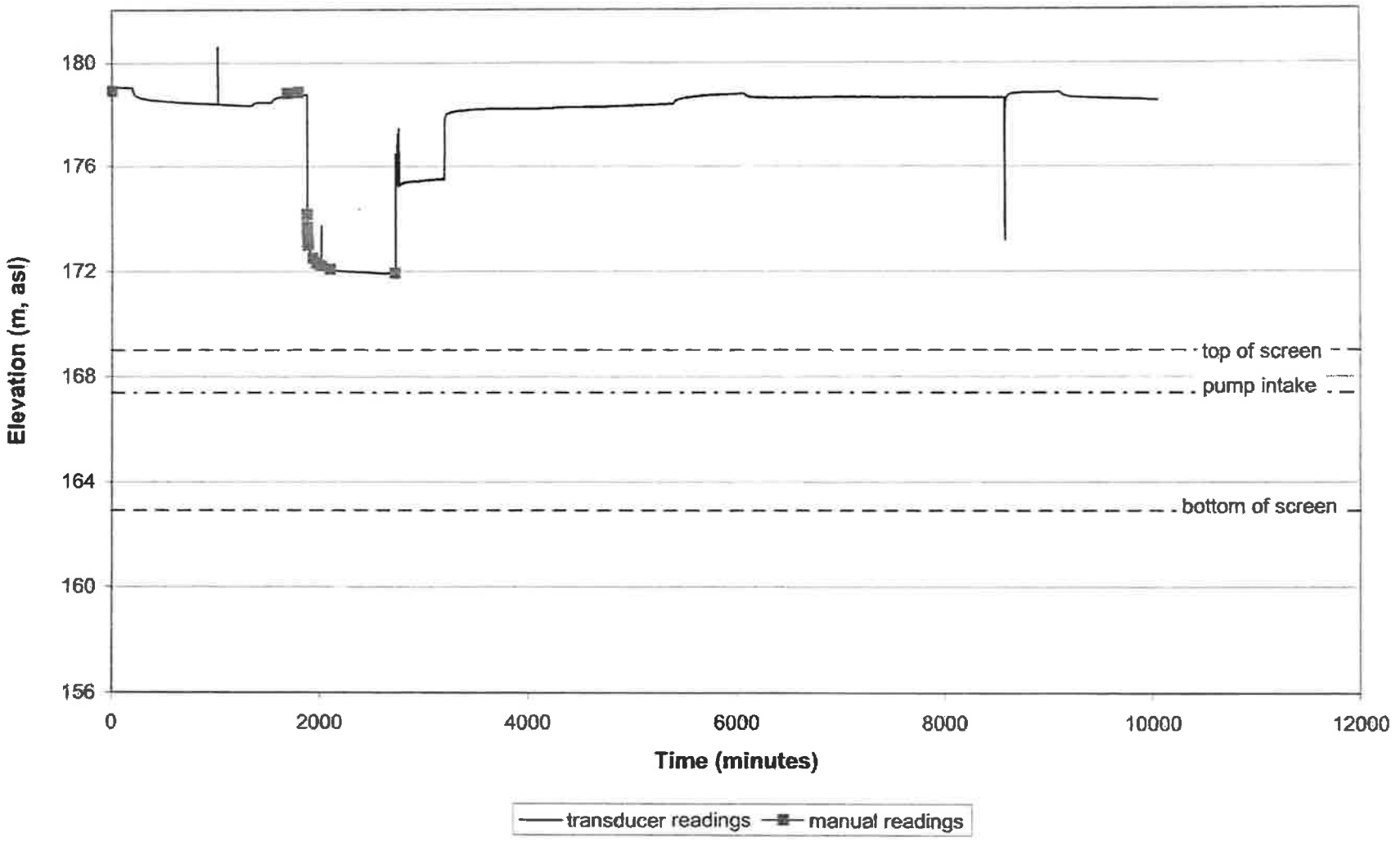
Water Elevation at Well No. 4



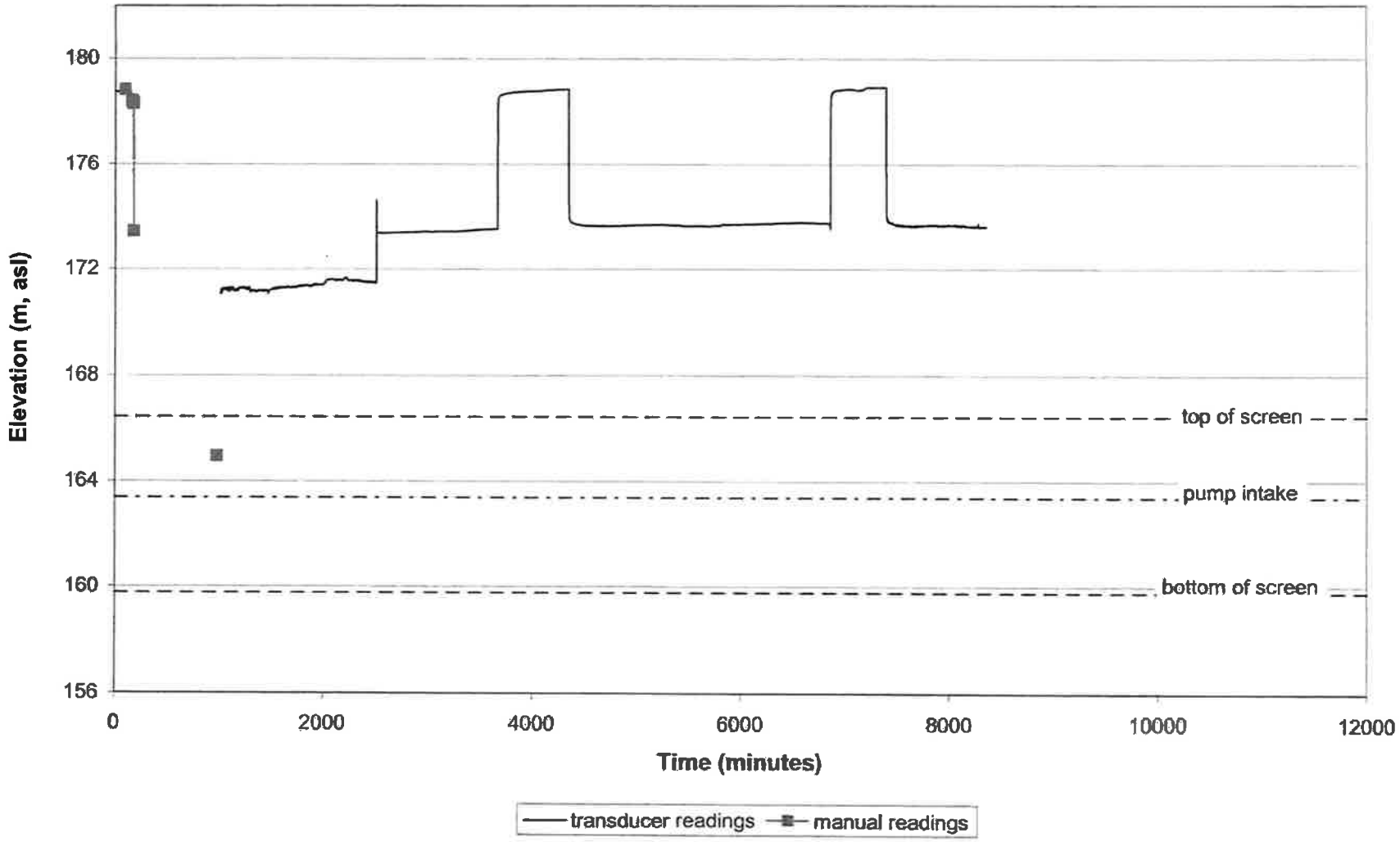
Water Elevation at Well No. 4A



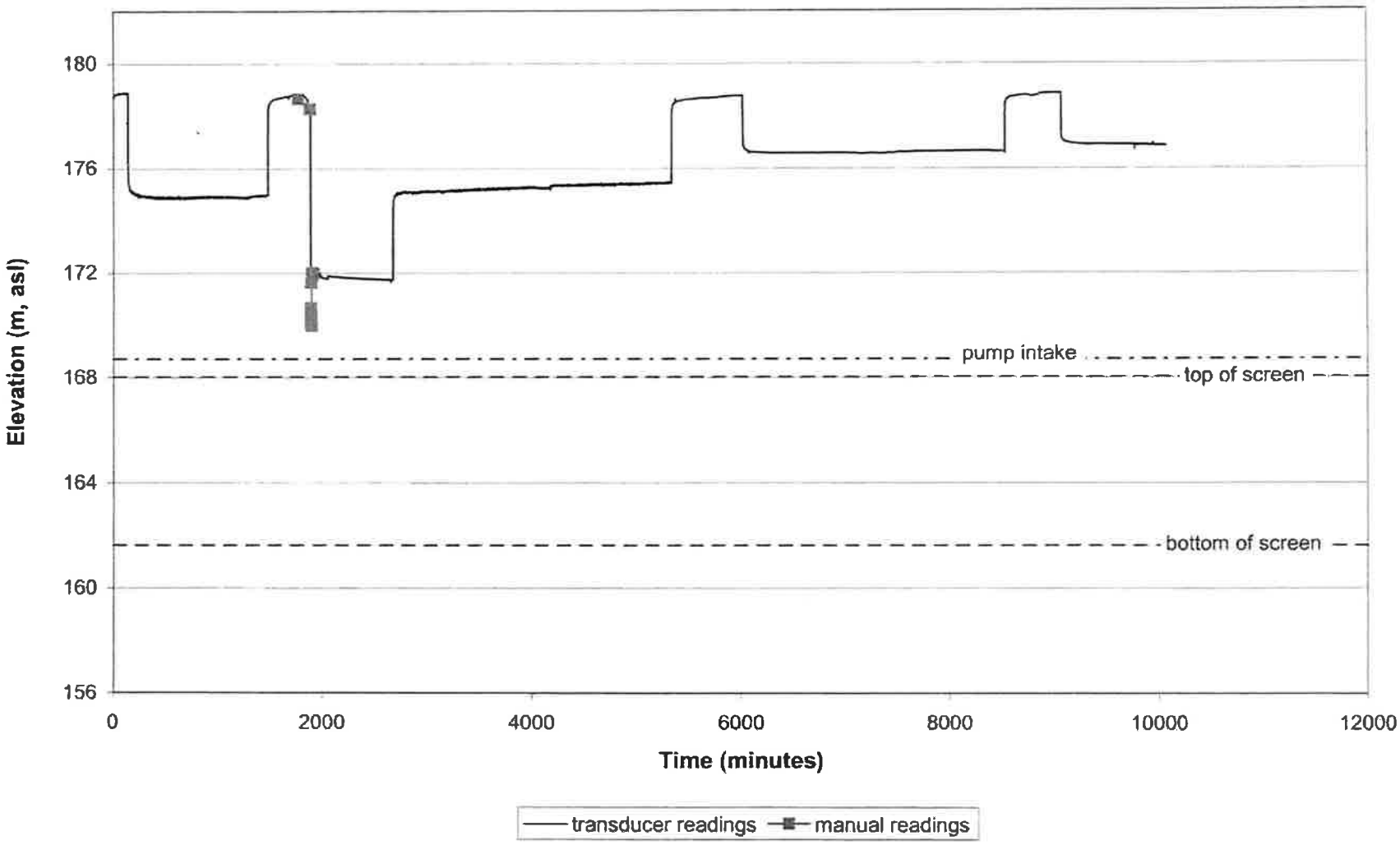
Water Elevation at Well No. 5



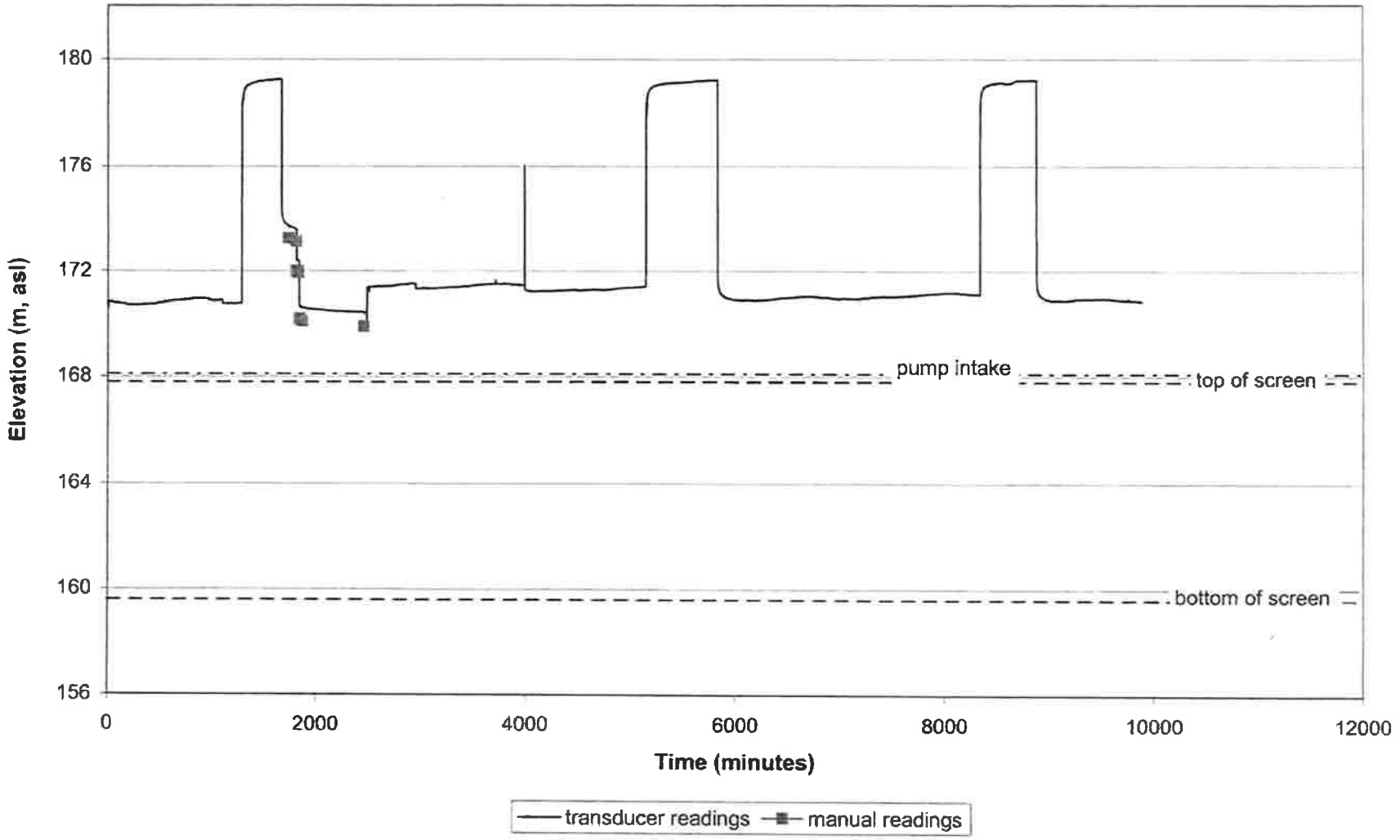
Water Elevation at Well No. 6



Water Elevation at Well No. 7



Water Elevation at Well No. 8



APPENDIX G

SUMMARY OF HISTORICAL WELL REHABILITATION RECORDS

Summary of Rehabilitation Results (Lotowater, 1996, 1991 and 2001)

Well No.	Original Specific Capacity	Specific Capacities (L/s/m) - 1996		Specific Capacities (L/s/m) - 1999		Specific Capacities (L/s/m) - 2001		Observed Specific Capacity (2006)
		Pre-Rehabilitation	Post-Rehabilitation	Pre-Rehabilitation	Post-Rehabilitation	Pre-Rehabilitation	Post-Rehabilitation	
4	2.48	0.47	1.73	-	-	-	-	-
4A	1.85	0.53	0.89	-	-	0.54	0.84	0.57
5	-	2.95	-	-	-	-	-	1.26
6	1.77	0.44	1.13	-	-	0.70	1.09	0.39
7	2.48	0.89	1.83	1.67	1.89	1.09		1.60
8	2.26	1.84	-	1.30	1.79	-	-	1.46

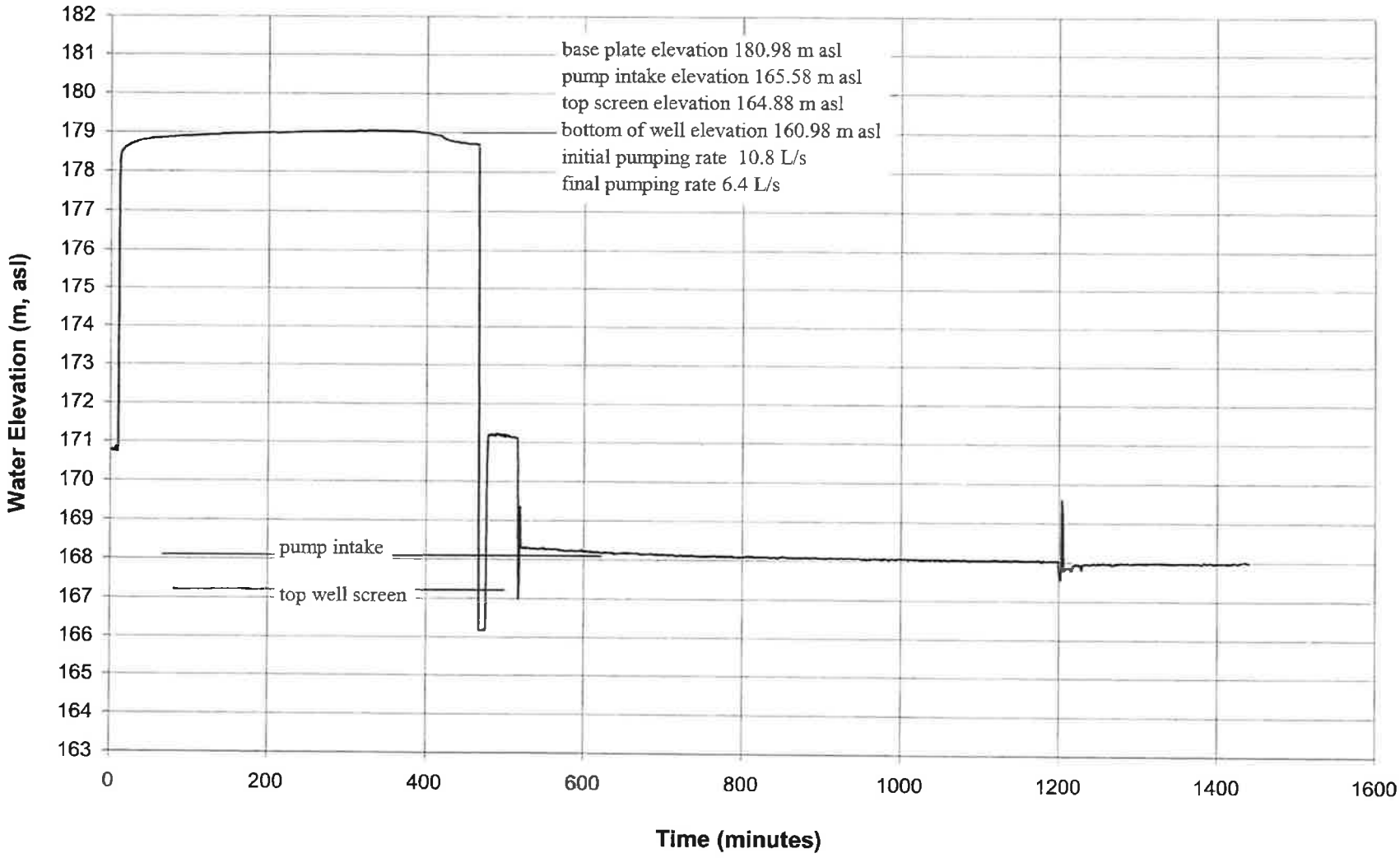
Note:

- Original specific capacities are from the 1996 Lotowater Report
- Performance of wells 5 and 8 was assessed in 1996. Neither were rehabilitated
- Performance of well no 7 was assessed in 2001. The well was not rehabilitated

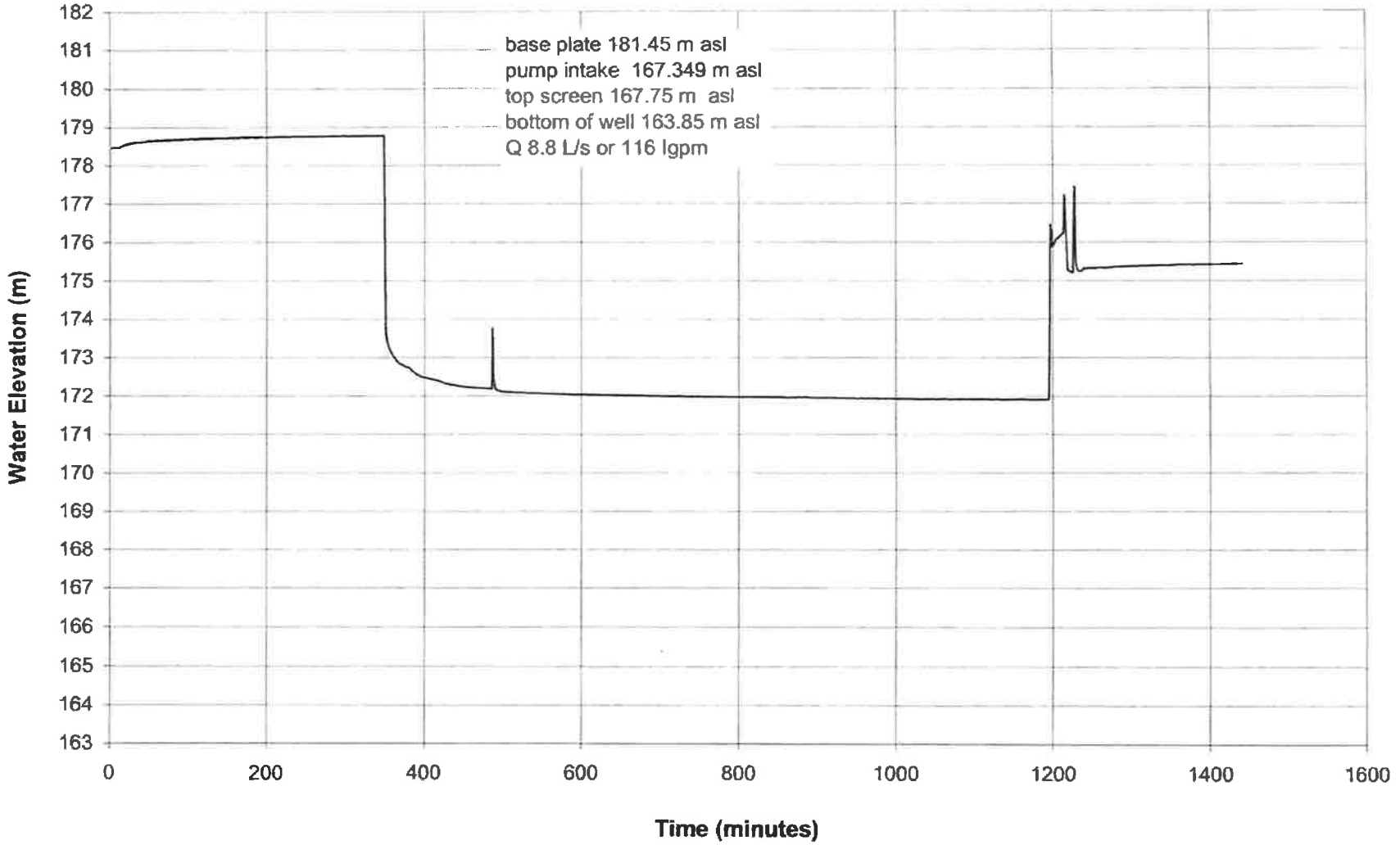
APPENDIX F

HYDROGRAPHS (7 DAY PERIOD)

Test Results at Well no. 4A

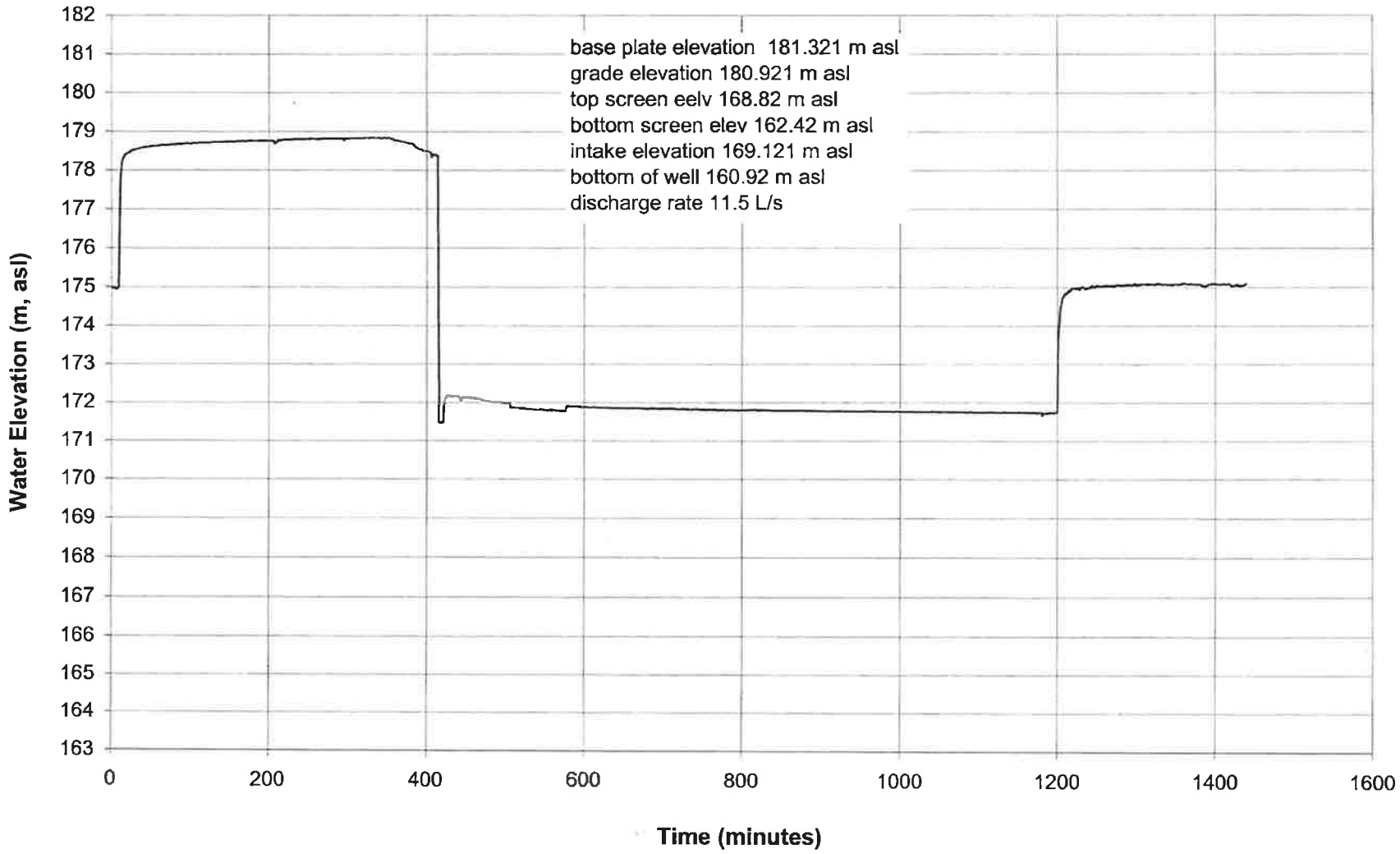


Test Results at Well no.5



kresin engineering corporation 2/24/2006 GOFFCO Limited

Test Results at Well no. 7



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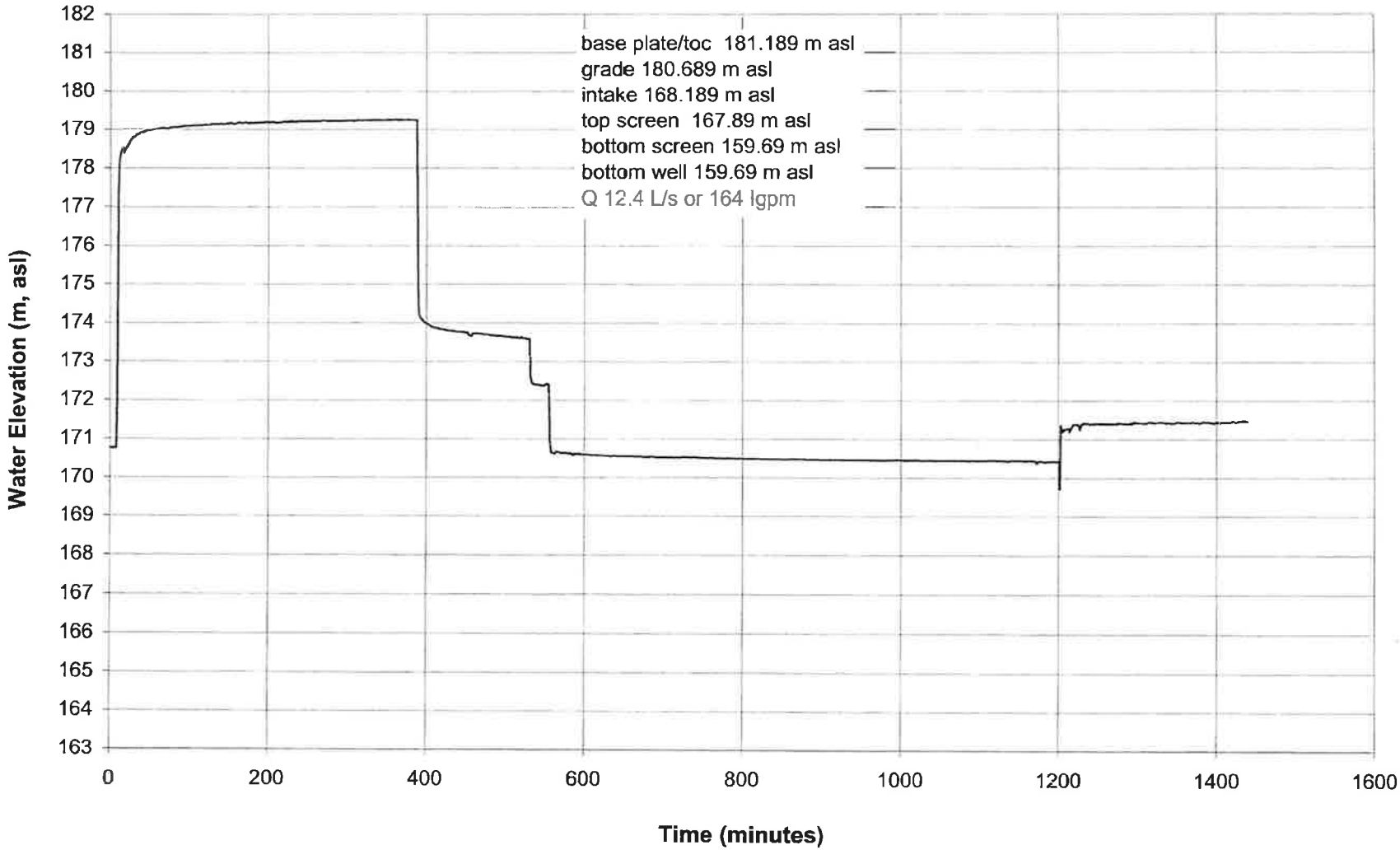
Test Results at Well no. 8

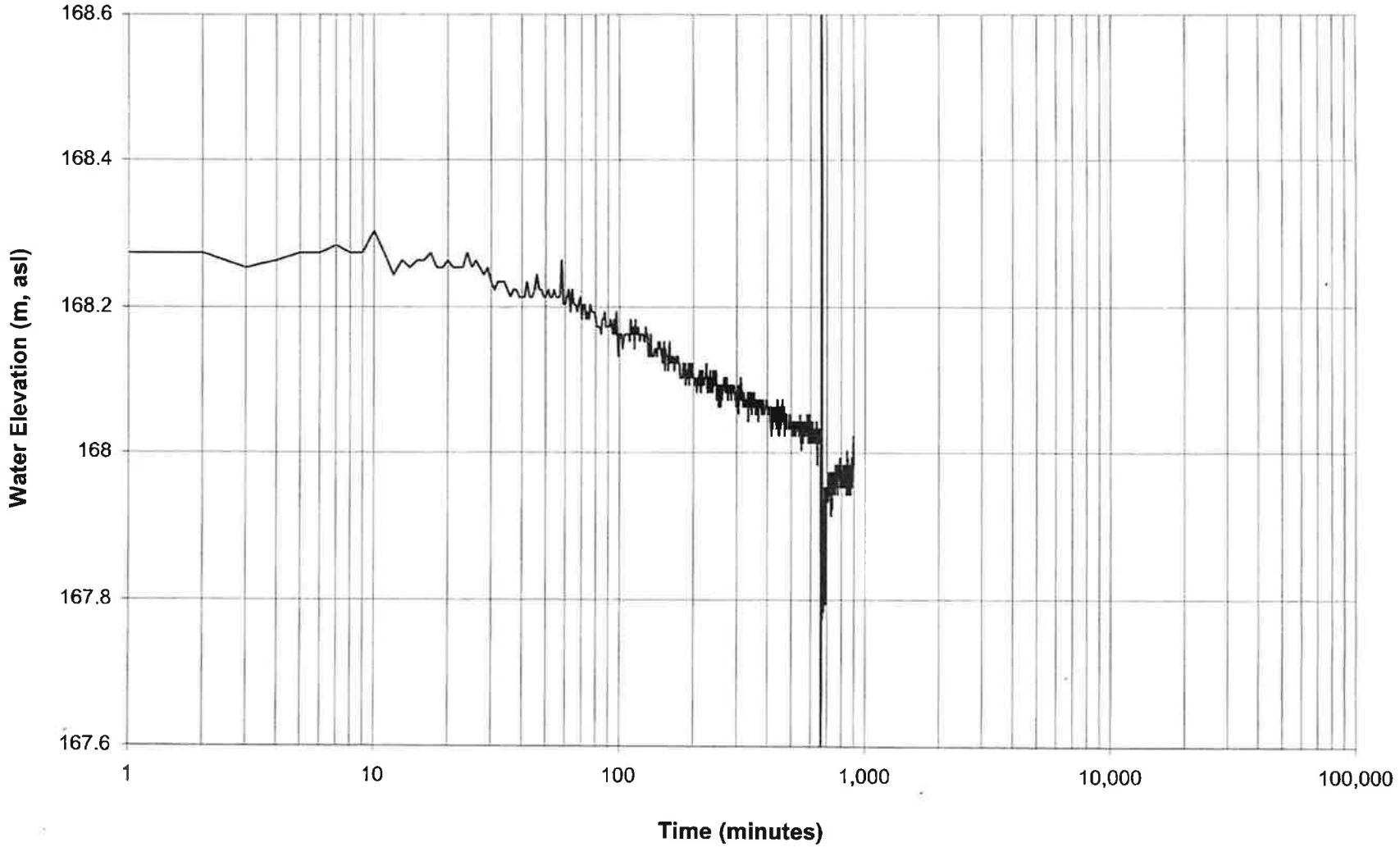


kresin engineering corporation

2/24/2006

GOFFCO Limited

Drawdown at Well no. 4A

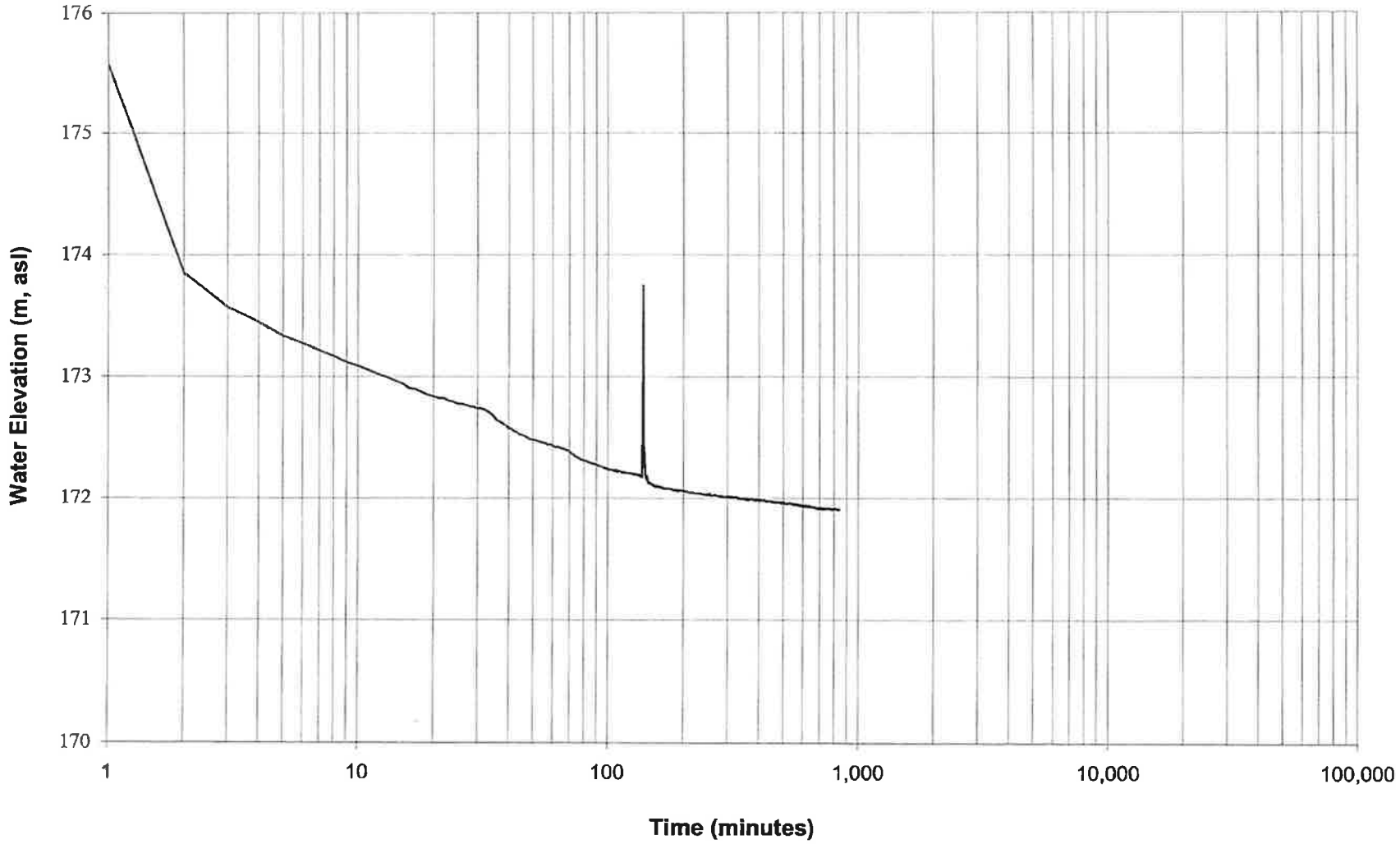


Kresin Engineering Corporation

4/3/2006

GOFFCO Limited

Drawdown at Well no. 5



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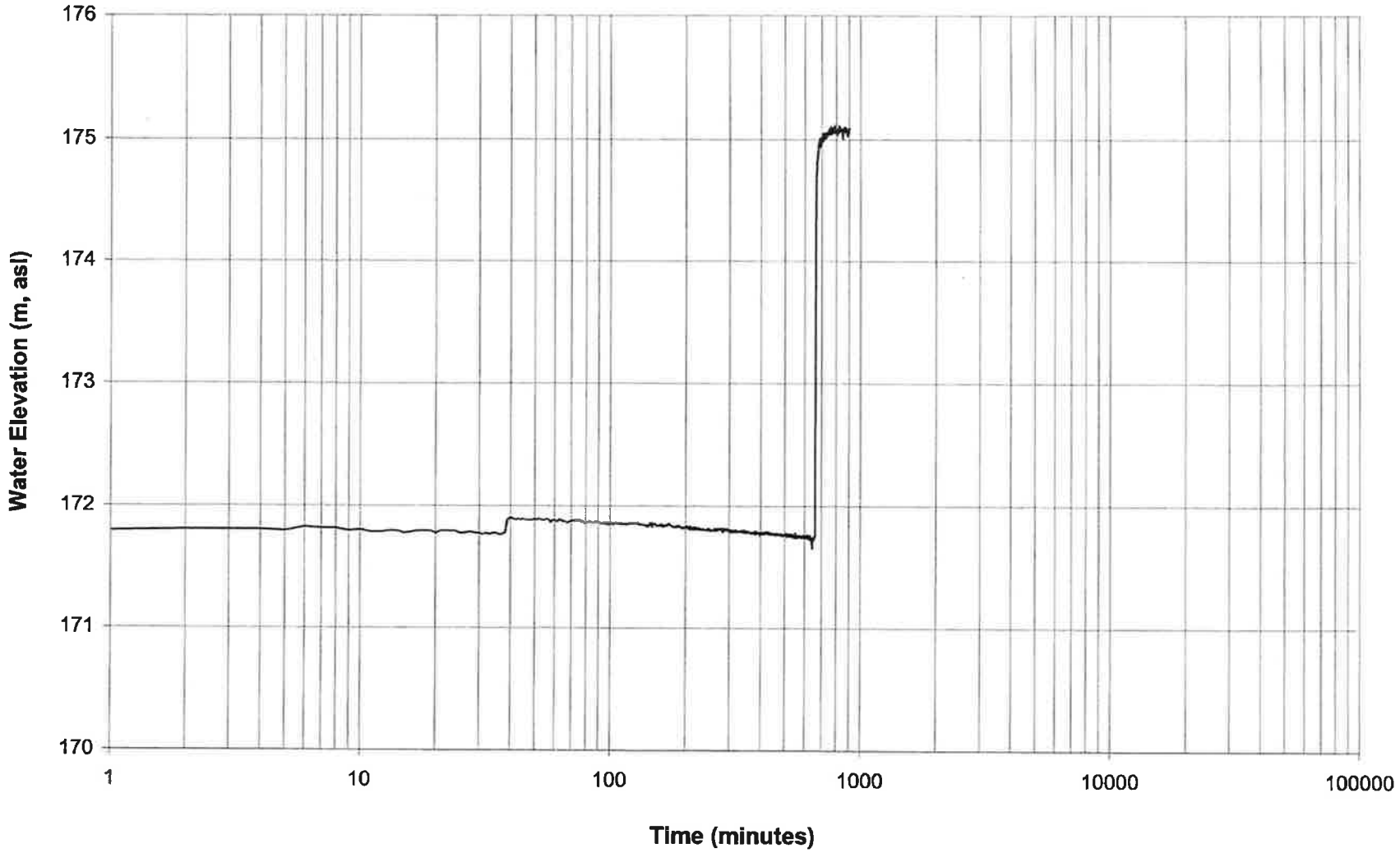
Drawdown at Well no. 7



Kresin Engineering Corporation

4/3/2006

GOFFCO Limited

BLIND RIVER WELL #6 SERVICE

Prepared for:

TOWN OF BLIND RIVER

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Lotowater
TECHNICAL SERVICES INC.

Date: September 3, 2015

Reference: 184-012

TOWN OF BLIND RIVER

BLIND RIVER WELL #6 SERVICE

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September 3, 2015

Reference: 184-012

Kresin Engineering Corporation
536 Fourth Line East
Sault Ste. Marie, Ontario
P6A 6J8

Attention: Chris Kresin, M.Sc. (Eng.), P. Eng.

SUBJECT: BLIND RIVER WELL #6 SERVICE

This report documents the work performed by Lotowater Technical Services Inc. (LTS) at Blind River Well #6. The service program included visual pumping equipment inspection, well rehabilitation, video surveys and well performance testing. This work was completed over July and August 2015 as part of a complete well field rehabilitation program where similar work was completed at the other Blind River wells.

BACKGROUND

Blind River Well #6 was constructed in 1981 with a 450 mm (18") diameter outer steel casing that terminates at an unknown depth. The 250 mm (10") diameter inner steel well casing is set to a depth of 14.9 m. The remainder of the well is screened with a 0.30 mm slot stainless steel screen to a depth of 21.1 m. The well is currently equipped with a Grundfos 230S150 – 4 stage submersible pump coupled with a Grundfos 15 horsepower motor. The well's permitted capacity is 7.58 L/s (655 m^3/day) although the well has not operated at this rate for years due to persistent plugging which is common to all the Blind River wells and necessitates frequent rehabilitation. Although rehabilitations are effective at increasing performance they do not fully restore the well to the original as constructed condition such that over time it becomes less and less productive. Well #6 was last rehabilitated in 2010.

PRE-REHABILITATION TESTING

A pre-rehabilitation variable rate performance test was attempted July 7, 2015, but could not be completed due to the very low performance of the well. While testing to system, the well broke suction almost immediately at 2.9 L/s; indicating an approximate specific capacity of 0.22 L/s/m. Based on this very low performance level, we proceeded with the rehabilitation program.

PRE-REHABILITATION VIDEO SURVEY

A pre-rehabilitation static video was completed July 8, 2015 with significant well construction details noted in **Table 1**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the upper portions of the well screen were severely impacted by biological fouling (**Photo 1**). The video also showed sediment at the bottom of the well (**Photo 2**). The well required cleaning to remove this buildup.

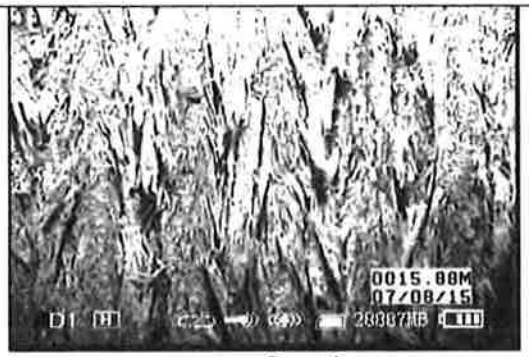


Photo: 1 Screen Severely Fouled

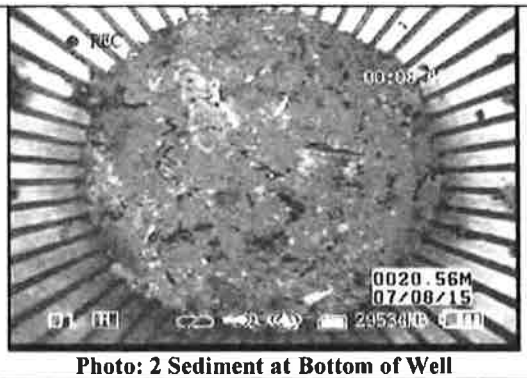


Photo: 2 Sediment at Bottom of Well

WELL REHABILITATION

To rehabilitate the well, an inflatable packer was installed to isolate the screened interval of the well. Afterwards, an airlift assembly was installed in the well; allowing the screened interval to be airlift pumped and surged to remove loose fouling material from the bottom of the well and screen interior. After the discharge cleared from this initial cleaning, 5000 L of a reductant solution was prepared and injected into the screened interval. This solution was air displacement surged out through the screen to the surrounding formation and gravel pack before being left in the well overnight to react. The following day, the reductant solution was removed from the well and neutralized in a storage bin before being hauled offsite for disposal. The well was airlift pumped and surged for the remainder of the day until the discharge was clear and sediment free.

PUMPING EQUIPMENT INSPECTION AND SERVICE

The pump was cleaned prior to inspection to remove any fouling present. The pumping equipment was inspected visually afterward for any exterior damage that would prevent us from reinstalling the pumping equipment. The pumping equipment appeared to be in good condition and was suitable for continued service.

POST-REHABILITATION VIDEO SURVEY

A post-rehabilitation static video was completed July 10, 2015. Significant well construction details are noted in **Table 2**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the rehabilitation has removed the fouling that was present on the well screen (**Photo 3**). The video also shows the sediment that had accumulated at the bottom of the well has been removed (**Photo 4**).

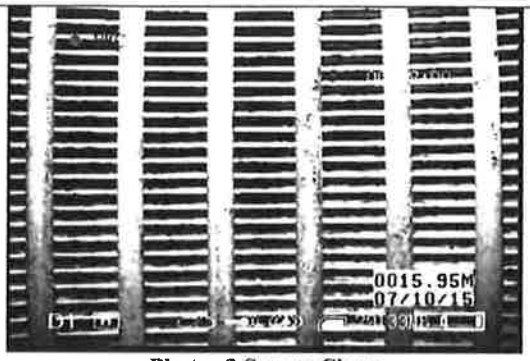


Photo: 3 Screen Clean

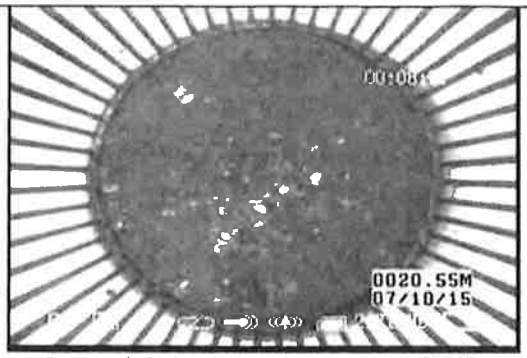


Photo: 4 Well Screen Clear to Total Depth

POST-REHABILITATION TESTING

A post-rehabilitation variable rate well performance test was conducted on July 10, 2015. The data collected is provided in **Table 3** and was plotted graphically and compared against historical pumping levels on **Figure 1**. The post-rehabilitation test results indicate well performance has improved from a specific capacity of 0.22 L/s/m to 0.38 L/s/m; leaving performance at 22% of the level measured at the time of construction. The short term maximum sustainable pumping rate has increased from less than 2.9 L/s to approximately 4-4.5 L/s.

Data was collected during the step test to verify the satisfactory operation of the pump and motor. The test results are presented in **Table 4** and indicate the pump is on its curve. The data indicates the motor is operating satisfactorily. A pump installation drawing has been included as **Figure 2**.

A well disinfection record is included in **Appendix A**.

CONCLUSIONS AND RECOMMENDATIONS

The rehabilitation has successfully removed the biological fouling attached to the screen and the sediment that had accumulated at the bottom of the well. The post-rehabilitation video indicated the screen is in great condition. The well performance has improved the maximum yield from less than 2.9 L/s to approximately 4-4.5 L/s. The well is operating at 22% of the as-constructed level and is still well below capacities obtained after the last well rehabilitation in 2010. It is expected the well performance will continue to decline to a point where it will not meet minimum system requirements. More frequent and intense rehabilitation efforts may stave off such declines but it is unlikely that they will ever fully restore, or even stop the decline. A replacement well program should therefore be implemented along with the rehabilitation program to maintain this well field's capacity at functioning levels.

The pump and motor are both operating satisfactorily but are significantly oversized for the wells current capacity. It is recommended that the well pump be replaced at the next service with a lower flow pump more suitably sized for the current capacity. The existing motor, wire and discharge piping can still be used. A smaller pump would offer savings in electrical energy costs of several thousand dollars per year per well. Consideration should be made to replacing all existing well pumps with the same model of pump to allow interchangeability between wells and

pumps. A suitable pump for this and the other operating wells would be a Grundfos 85S75-5 (7.5bhp).

It has been a pleasure working with the Town of Blind River on this project. Please contact the undersigned if there are any questions.

Yours sincerely,
Lotowater Technical Services Inc.

Edward Hunter, P.Eng.
Project Manager

Boyd Pendleton, B.Sc., P.Geo.
Senior Project Manager

TABLES

TABLE 1

Town of Blind River

Well #6
Pre-Rehabilitation Static Video Summary
2015/07/08

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	0.00	0.00	Top of casing
0:01	8.53	2.60	Static water level
0:02	15.09	4.60	Pause video to set pump to clear image
0:04	22.87	6.97	Below top of base plate
0:05	26.25	8.00	Casing joint
0:09	47.57	14.50	Top of screen
0:11	58.07	17.70	Screen joint
0:12	63.32	19.30	Screen joint
0:16	64.30	19.60	Screen joint
0:19	59.06	18.00	Screen joint
0:27	48.88	14.90	Top of screen
0:30	10.50	3.20	Recovery water level
0:32	0.00	0.00	Top of casing

Video survey conducted by Jason Dion

Note: Measuring point (MP) is top of casing which is 0.21 m above floor

TABLE 2

Town of Blind River

Well #6
Post-Rehabilitation Static Video Summary
2015/07/10

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	0.00	0.00	Top of casing
0:01	8.43	2.57	Static water level
0:03	13.22	4.03	Pause video to set pump to clear image
0:07	26.25	8.00	Casing joint
0:09	47.57	14.50	Top of screen
0:10	58.07	17.70	Screen joint
0:11	63.65	19.40	Screen joint
0:14	69.16	21.08	Bottom of well
0:17	64.27	19.59	Screen joint
0:22	58.99	17.98	Screen joint
0:33	48.82	14.88	Top of screen
0:35	9.61	2.93	Recovery water level
0:36	0.10	0.03	Top of base plate

Video survey conducted by Jason Dion

Note: Measuring point (MP) is top of casing which is 0.21 m above floor

TABLE 3

VARIABLE RATE PERFORMANCE TEST
Post-Rehabilitation

Lotowater TECHNICAL SERVICES INC.

Well Name:	Well #6	**Project Number:**	184-012
Client:	Town of Blind River	**Date:**	2015-07-10
Technician Name:	Cory Mitchell	**Pump:**	Client's pump
Water Level Device:	LTS water level meter	**Pump Inlet:**	16.0 m
Water Level Reference:	Top of casing = 0.21 m above floor	**Flow Measuring Device:**	LTS flow meter
Test Note:			

Time *hr:min*	Elapsed Time *min*	Level *mbBP*	Drawdown *m*	Flow *L/s*	Note
0:00	0	2.67	0.00	4.0	Start Step 1
0:01	1	11.01	8.34	4.0	
0:02	2			4.0	
0:03	3	12.36	9.69	4.0	
0:04	4	12.59	9.92	4.0	
0:05	5	12.87	10.20	4.0	
0:06	6	12.91	10.24	4.0	
0:08	8	12.96	10.29	4.0	
0:10	10	13.03	10.36	4.0	
0:12	12	13.09	10.42	4.0	
0:15	15	13.14	10.47	4.0	
0:20	20	13.20	10.53	4.0	Amps (L1 = 14.27, L2 = 13.9, L3 = 14.1)
0:25	25	13.23	10.56	4.0	
0:30	30	13.28	10.61	4.0	Pressure = 86 psi

TABLE 4

Submersible Pump & Motor Installation Test Record

Project # 184-012

Well Name: Well #6
Client: Town of Blind River
Test Date: July 10, 2015
Notes By: Cory Mitchell

Flow Measurement: LTS flow meter
Water Level Ref: Top of casing
Pressure Gauges: LTS pressure gauge
Level Measurement: LTS water level meter

Well

Well Diameter: 250 mm **Well Depth:** 21.1 m **Static Water Level:** 2.67 m

Pump

Make: Grundfos **Bowl Length:** 0.8 m **Imp. Diam:** Full **Stage:** 4
Model: 230S150-4 **Bowl Diameter:** 150 mm **Imp. Type:** Stainless steel
Serial #: A15B70004 **Notes:**

Pipe

Diameter: 100 mm **Type:** Flanged steel **Total Length:** 15.2 m **Lengths:** 3
Suction Intake: 16.0 m **Notes:**

Motor & Wiring

Make: Grundfos
Model: MS6000
Serial #: 0515
HP: 15 **Volts:** 575 **Phase:** 3
FL Amps: 16.6 **SF Amps*:** 19.0 **RPM:** 3450
Wire Type: TWU **Gauge:** #8-4 **Length:** 17.0 m
Overloads:
Surge Arrestor:
Notes:

Winding Resistance Test

	L1-L2	L1-L3	L2-L3	
In Well:	n/a	n/a	n/a	ohms
Out of Well:	n/a	n/a	n/a	ohms

Insulation Resistance Test

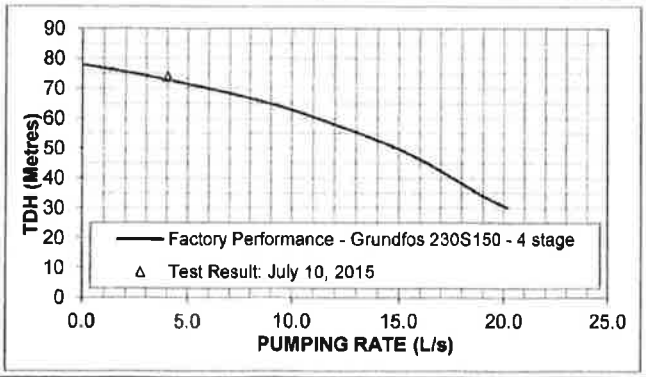
	L1-G	L2-G	L3-G	
In Well:	n/a	n/a	n/a	Mohms
Out of Well:	n/a	n/a	n/a	Mohms

Voltage Test

	Static	Load
L1-L2:	na	na
L1-L3:	na	na
L2-L3:	na	na

Test Data

Q L/s	WL mbmp	Pres psi	FL m	TDH m	L1 amps	L2 amps	L3 amps	Avg amps	Current unbalance	% FL Amps
0.0										
4.0	13.28	86	0.10	73.9	14.3	13.9	14.1	14.1	1.3%	84.9%



Notes:

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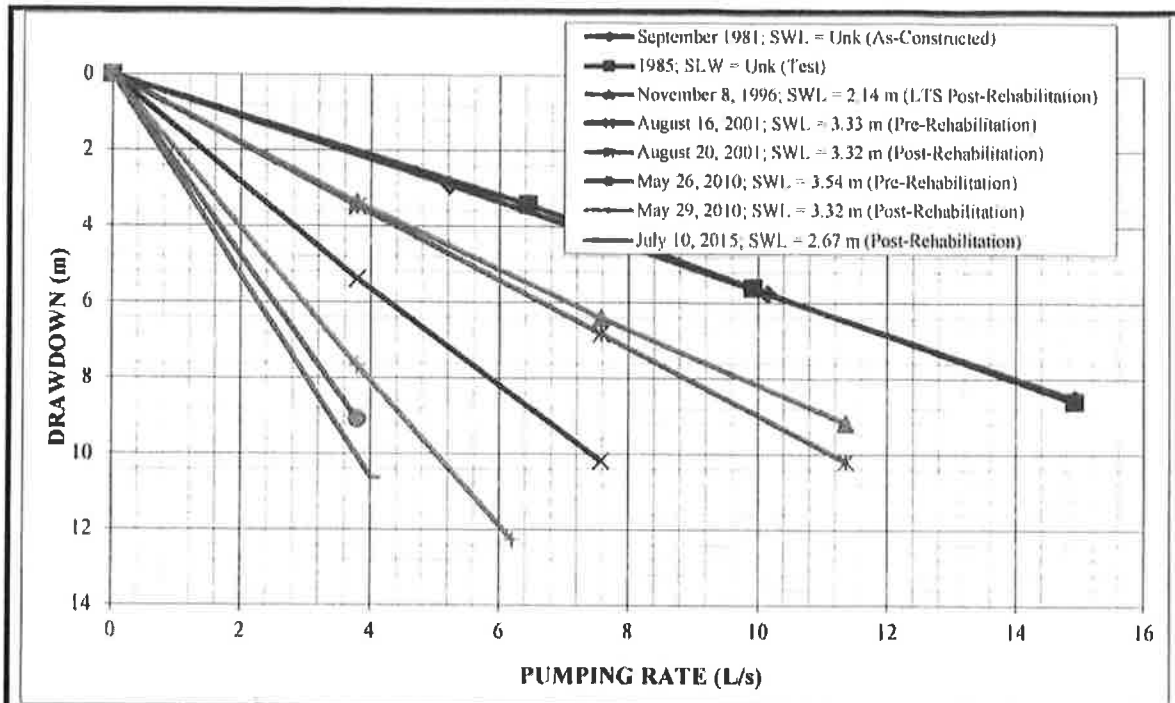
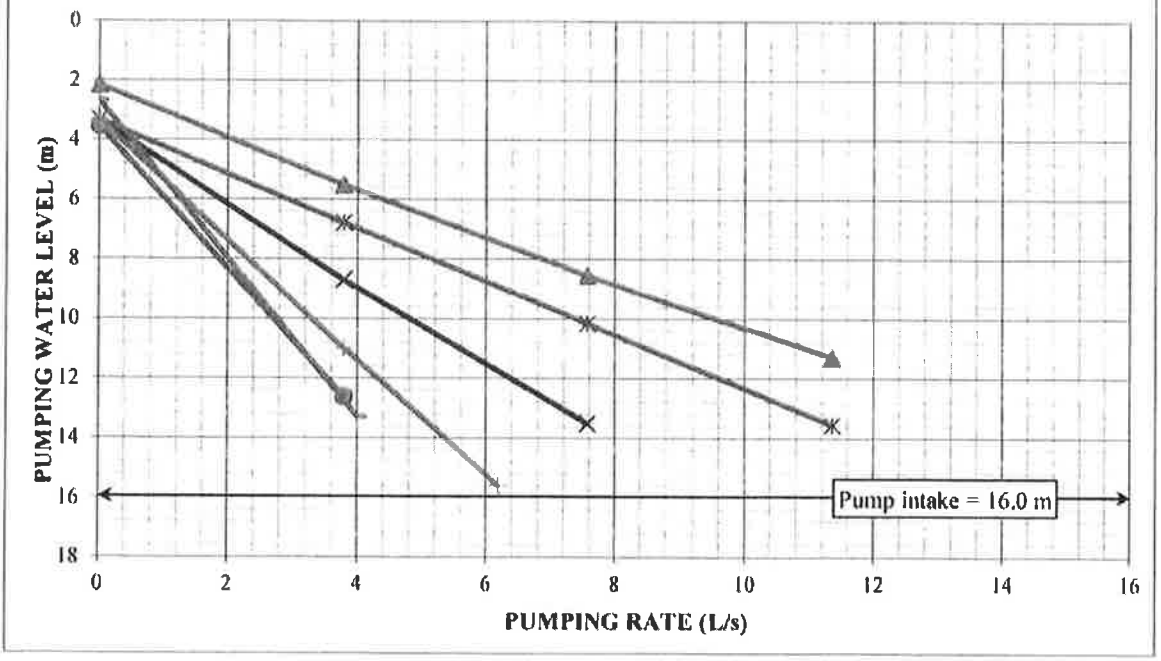
FIGURES





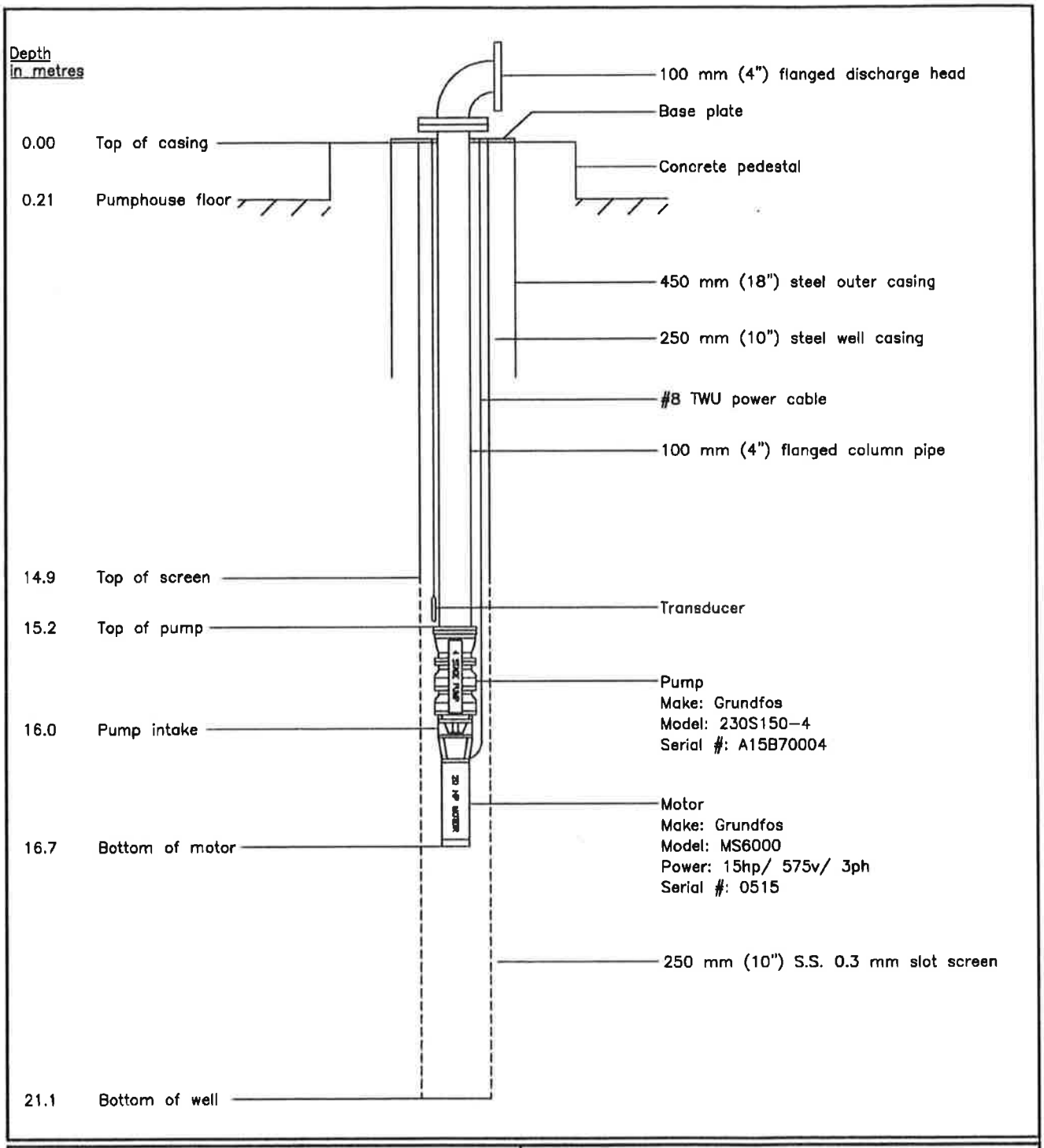
Notes:
All water levels are referenced from top of casing
Top of casing = 0.21 m above floor

Town of Blind River

Well #6

Comparison of Variable Rate Tests

Lotowater Technical Services Inc. **Figure 1**
Reference: 184-012 2015-06-29



Lotowater
TECHNICAL SERVICES INC.

CLIENT: TOWN OF BLIND RIVER

TITLE: Well #6
Pump Installation Drawing

PROJECT No. 184-012			G:\Lotowater Projects\184 Blind River\012 2015 Rehabilitations\W6 Installation Drawing.dwg		FIGURE 2
DESIGN			REVISION No. 2015/08/19	SCALE N.T.S.	
DRAWN	EH	2015/08/19			
CHECKED					

APPENDIX A

Well Disinfection Record

Well Chlorination Record

Well Name:	Well #6	
Client:	Town of Blind River	
Project #:	184-012	
Disinfected By:	Cory Mitchell	
LTS Chlorination Worksheet Used:	Yes	
Treatment Volume:	1,066	**Litres**
Desired Concentration:	150	**ppm**
Volume of Mixing Water:	n/a	**Litres**
Qty of Sterilene Needed (granular 55%):	290.80	**grams**
Type and Quantity of Chlorine Used:	Sterilene 300 grams	
Date and Time Chlorine Added:	2015-07-10 16:00	
Chlorine Addition Method:	Poured in top and circulated with client's pumping equipment	
Chlorine Residual Measured at Surface:	>160 ppm	
Chlorine Residual Measurement Method:	Test strips	
Date & Time Chlorine Purged:	2015-07-11 7:30	
Pre-Purge Chlorine Residual Measured at Surface:	>150 ppm	
Chlorine Residual Measurement Method:	Test strips	
Purged By:	Cory Mitchell	
Purged To:	Waste	
Quantity and Type of Dechlorinating Agent Used:	50 grams of Chlor-Oust De-chlorination agent	
Minutes of Pumping until Zero Free Chlorine Residual:	10 minutes	
Final Turbidity Measurement (NTU):	n/a	
Notes on Disinfection:		

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BLIND RIVER WELL 6
SERVICE AND
REHABILITATION

Prepared for:

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Lotowater
TECHNICAL SERVICES INC.

Date: July 12, 2019

Reference: 184-013

TOWN OF BLIND RIVER

BLIND RIVER WELL 6 SERVICE AND REHABILITATION

TABLES

FIGURES

APPENDIX

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July 12, 2019

Reference: 184-013

Kresin Engineering Corporation
536 Fourth Line East
Sault Ste. Marie, Ontario
P6A 6J8

Attention: Mark Edwards, C. Tech.

SUBJECT: BLIND RIVER WELL 6 SERVICE AND REHABILITATION

This report documents the work performed by Lotowater Technical Services Inc. (LTS) at Blind River Well 6. The service program included visual pumping equipment inspection, well rehabilitation, video surveys and well performance testing. This field work was completed from June 10-26, 2019, as part of a multi-well rehabilitation program where similar work was performed at Blind River Wells 5 and 7.

BACKGROUND

Blind River Well 6 was constructed in 1981 with a 450 mm (18") diameter outer steel casing that terminates at an unknown depth. The 250 mm (10") diameter inner steel well casing is set to a depth of 14.9 m. The remainder of the well is screened with a 0.30 mm slot stainless steel screen to a depth of 21.1 m. The well is currently equipped with a Grundfos 230S150 – 4 stage submersible pump coupled with a Grundfos 15 horsepower motor. The well's permitted capacity is 7.58 L/s (655 m^3/day); although the well has not operated at this rate for years due to persistent plugging which is common to all the Blind River wells, and necessitates frequent rehabilitation. Although rehabilitations are effective at increasing performance, they do not fully restore the well to the original as-constructed condition, such that over time it becomes less and less productive. Note, that the existing pump had failed sometime in the spring of 2019 and the pump was not operating when Lotowater arrived at the site in June 2019.

PRE-REHABILITATION TESTING

The existing pump was non-operational and was therefore, removed from the well so a temporary test pump could be installed. A pre-rehabilitation performance test was completed June 11, 2019, but could only be pumped up to 3.0 L/s before the pump broke suction when attempting to pump at 6 L/s. The test indicated a specific capacity of 0.33 L/s/m with a maximum pumping rate of approximately 4.5 L/s. This is about 19% of the well performance as when it was constructed in 1981.

PRE-REHABILITATION VIDEO SURVEY

A pre-rehabilitation pumping video was completed June 10, 2019, with significant well construction details noted in **Table 1**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the lower section of the screen below 15.2 m not significantly impacted with buildup. Above 15.2 m, there is significant biological growth on the screen and casing (**Photos 1 and 2**).

Photo 1: Lower Section of screen not significantly impacted with growth

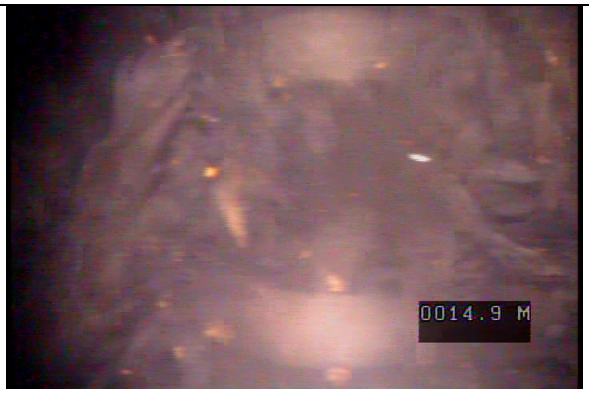


Photo 2: Area of screen impacted with growth completely covering screen

WELL REHABILITATION

Well 6 was rehabilitated over several days from June 10-12, 2019. The well was rehabilitated using physical surging with a surge block, air displacement surging using an inflatable packer, and airlift pumping which included a 350 kg acid treatment.

The well was initially airlifted and surged using a dual surge block to remove loose fouling material from the casing and screen. An inflatable packer was then installed to the top of the screen and the well airlifted off bottom, which produced a dark discharge and fine sediment. 350 kg of acid was then injected into the well and this solution was air displacement surged out through the screen to the surrounding formation and gravel pack before being left in the well overnight to react. The following day, the acid solution was removed from the well and neutralized in a storage bin before being hauled offsite for disposal. The well was then surged and airlifted with a surge block, concentrating on the upper section of the well screen where the majority of the buildup in the video was noticed. This produced a black discharge that slowly cleared with airlifting.

PUMPING EQUIPMENT INSPECTION AND SERVICE

The existing pump was non-functioning and identical used backup equipment that was provided by the Town was installed. In addition, a new cross over adapter was replaced along with new wire which was provided by Lotowater.

POST-REHABILITATION VIDEO SURVEY

A post-rehabilitation pumping video was completed June 12, 2019. Significant well construction details are noted in **Table 2**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the rehabilitation has removed the fouling that was present on the well screen (**Photos 3 and 4**). The screen and casing were clear and unobstructed.

Photo 3: Clean Screen

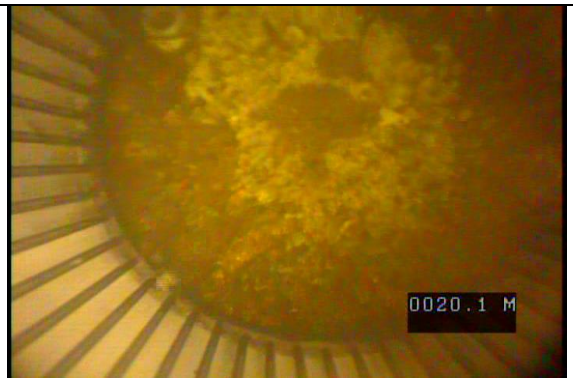


Photo 4: Bottom of well

POST-REHABILITATION TESTING

A post-rehabilitation variable rate well performance test was conducted on June 12, 2019. The data collected is provided in **Table 3** and was plotted graphically and compared against historical pumping levels on **Figure 1**. The post-rehabilitation test results indicate well performance has not improved the wells' capacity. The wells' maximum capacity is still about 4.5 L/s.

Data was collected during the step test to verify the satisfactory operation of the backup pump and motor. The test results are presented in **Table 4** and indicate the pump is on its curve. The data indicates the motor is operating satisfactorily. A pump installation drawing has been included as **Figure 2**.

A well disinfection record is included in **Appendix A**.

CONCLUSIONS AND RECOMMENDATIONS

The rehabilitation has successfully removed the biological fouling attached to the screen and the casing. The post-rehabilitation video indicated the screen is free of obvious physical obstruction. Despite this, the rehabilitation has not improved the wells' performance. It is not clear why the performance has not improved, but it is believed this may be due to a limitation in the ability to displace acid into the formation with air pressure, like what has been done typically at the other wells. Pressure surging the casing when the casing is sealed with a packer will push the water column, filled with acid, during rehabilitation, out into the formation. In this case, the annular space is open at the surface such that when pressurizing the casing, water is displaced up and out of the casing into the pump house. This limits the ability to displace the acid deep into the formation where we expect the plugging is occurring. Sealing this with cement grout would allow for increased pressures on the casing and more effective air displacement surging. It is recommended the space be sealed at the next well service and then the well rehabilitated with a higher quantity of acid that can then be pressure displaced deeper in the surrounding formation.

The pump and motor are both operating satisfactorily, but are significantly oversized for the wells' current capacity. If future rehabilitations can't increase performance, a smaller pump and motor should be installed. A suitable pump for the current well capacity would be a Grundfos 85S75-5 (7.0bhp) rated at 4.5L/s @ 70m TDH. This pump would have the potential to save approximately $4,800 per year in energy costs over the existing 15 horsepower pump.

It has been a pleasure working with Kresin Engineering and the Town of Blind River on this project. Please contact the undersigned if there are any questions.

Yours sincerely,
Lotowater Technical Services Inc.

Boyd Pendleton, B. Sc., P. Geo.
Senior Project Manager

TABLES

TABLE 1

Town of Blind River

Well #6
Pre-Rehabilitation Pumping Video Summary
2019-06-10

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
			*Video file #1 of 3
0:00	0.0	0.0	Top of casing
0:00	5.2	1.6	Water level
0:02	49.9	15.2	Top of screen
0:02	56.4	17.2	Screen joint
0:02	66.6	20.3	Bottom of well
			*Video file #2 of 3
0:02	61.7	18.8	Screen joint
0:05	56.1	17.1	Screen joint
0:09	50.2	15.3	Biomass
0:11	45.9	14.0	Screen/casing joint, biomass zone
			*Video file #3 of 3
0:00	37.4	11.4	In casing
0:07	3.9	1.2	Water level
0:09	0.0	0.0	Top of casing

Video survey conducted by Arthur Krzysko

Note: Measuring point (MP) is top of casing which is 0.21 m above floor

TABLE 2

Town of Blind River

Well #6
Post-Rehabilitation Pumping Video Summary
2019-06-12

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	0.0	0.0	Top of casing
0:00	3.9	1.2	Static water level
0:03	45.9	14.0	Top of screen
0:04	56.1	17.1	Screen joint
0:05	61.7	18.8	Screen joint
0:06	66.6	20.3	Bottom of well
0:08	62.0	18.9	Screen joint
0:10	56.4	17.2	Screen joint
0:13	46.3	14.1	Casing/screen joint
0:17	42.0	12.8	Possible casing joint
0:23	24.6	7.5	Casing joint
0:27	13.8	4.2	Possible casing joint
0:29	4.3	1.3	Water level
0:30	0.0	0.0	Top of casing

Video survey conducted by Arthur Krzysko

Note: Measuring point (MP) is top of casing which is 0.21 m above floor

TABLE 3

VARIABLE RATE PERFORMANCE TEST
Post-Rehabilitation

Lotowater TECHNICAL SERVICES INC.

Well Name:	Well #6	**Project Number:**	184-013
Client:	Town of Blind River	**Date:**	2019-06-12
Technician Name:	Arthur Krzysko	**Pump:**	Client's pump
Water Level Device:	LTS water level meter	**Pump Inlet:**	16.0 m
Water Level Reference:	Top of casing = 0.21 m above floor	**Flow Measuring Device:**	LTS flow meter
Test Note:			

Time *hr:min*	Elapsed Time *min*	Level *mbBP*	Drawdown *m*	Flow *L/s*	Note
12:03	0	1.97	0.00	3.5	Start Step 1
12:04	1	8.41	6.44	3.5	
12:05	2	10.49	8.52	3.5	25 psi
12:06	3	11.29	9.32	3.5	
12:07	4	11.67	9.70	3.5	
12:08	5	11.95	9.98	3.5	
12:09	6	12.17	10.20	3.5	
12:11	8	12.25	10.28	3.5	
12:13	10	12.33	10.36	3.5	
12:15	12	12.37	10.40	3.5	
12:18	15	12.41	10.44	3.5	
12:23	20	12.45	10.48	3.5	
12:28	25	12.49	10.52	3.5	
12:33	30	12.53	10.56	3.5	No sand content
					Start Step 2
					Broke suction @ 4.5 L/s

TABLE 4

Submersible Pump & Motor Installation Test Record

Project # 184-013

Well Name: Well #6
Client: Town of Blind River
Test Date: June 25, 2019
Notes By: Alex O'Hearn
test to waste out back of pump house

Flow Measurement: LTS flow meter
Water Level Ref: Top of casing
Pressure Gauges: Clients pressure gauge
Level Measurement: LTS water level meter

Well

Well Diameter: 250 mm **Well Depth:** 21.1 m **Static Water Level:** 2.67 m

Pump

Make: Grundfos **Bowl Length:** 0.8 m **Imp. Diam:** Full **Stage:** 4
Model: 230S150-4 **Bowl Diameter:** 150 mm **Imp. Type:** Stainless steel
Serial #: **Notes:** this is a used backup pump supplied by Town, installed 2019

Pipe

Diameter: 100 mm **Type:** Flanged steel **Total Length:** 15.2 m **Lengths:** 3
Suction Intake: 16.0 m **Notes:**

Motor & Wiring

Make:
Model:
Serial #:
HP: 15 **Volts:** 575 **Phase:** 3
FL Amps: 16.6 **SF Amps*:** 19.0 **RPM:** 3450
Wire Type: TWU **Gauge:** #10-4 **Length:** 17.0 m
Overloads:
Surge Arrestor:
Notes: Backup motor supplied by Town, installed 2019
New wire supplied by Lotowater

Winding Resistance Test

	L1-L2	L1-L3	L2-L3	
In Well:	n/a	n/a	n/a	ohms
Out of Well:	n/a	n/a	n/a	ohms

Insulation Resistance Test

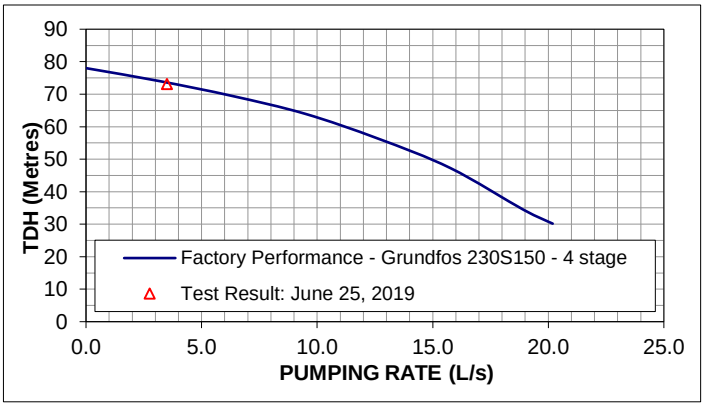
	L1-G	L2-G	L3-G	
In Well:	n/a	n/a	n/a	Mohms
Out of Well:	n/a	n/a	n/a	Mohms

Voltage Test

	Static	Load
L1-L2:	na	na
L1-L3:	na	na
L2-L3:	na	na

Test Data

Q L/s	WL mbmp	Pres psi	FL m	TDH m	L1 amps	L2 amps	L3 amps	Avg amps	Current unbalance	% FL Amps
0.0										
3.5	12.60	86		73.1						



Notes:

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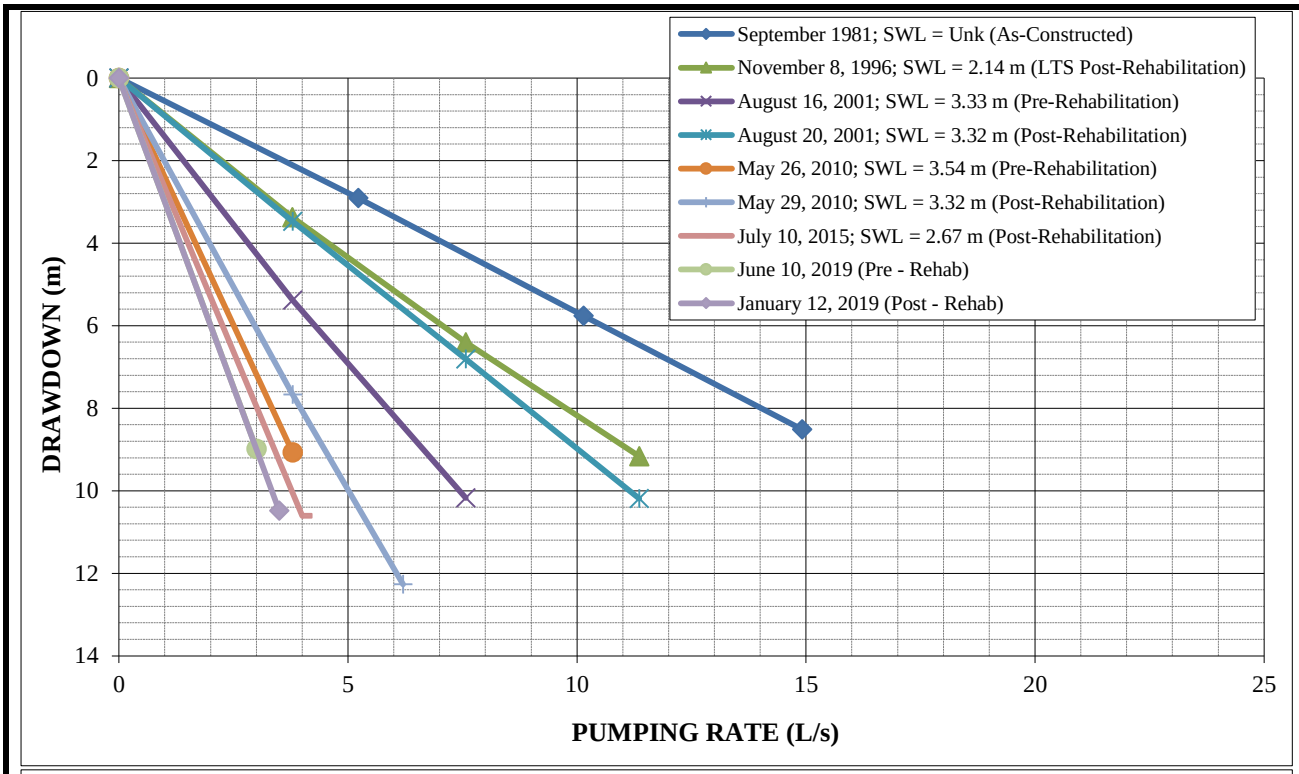
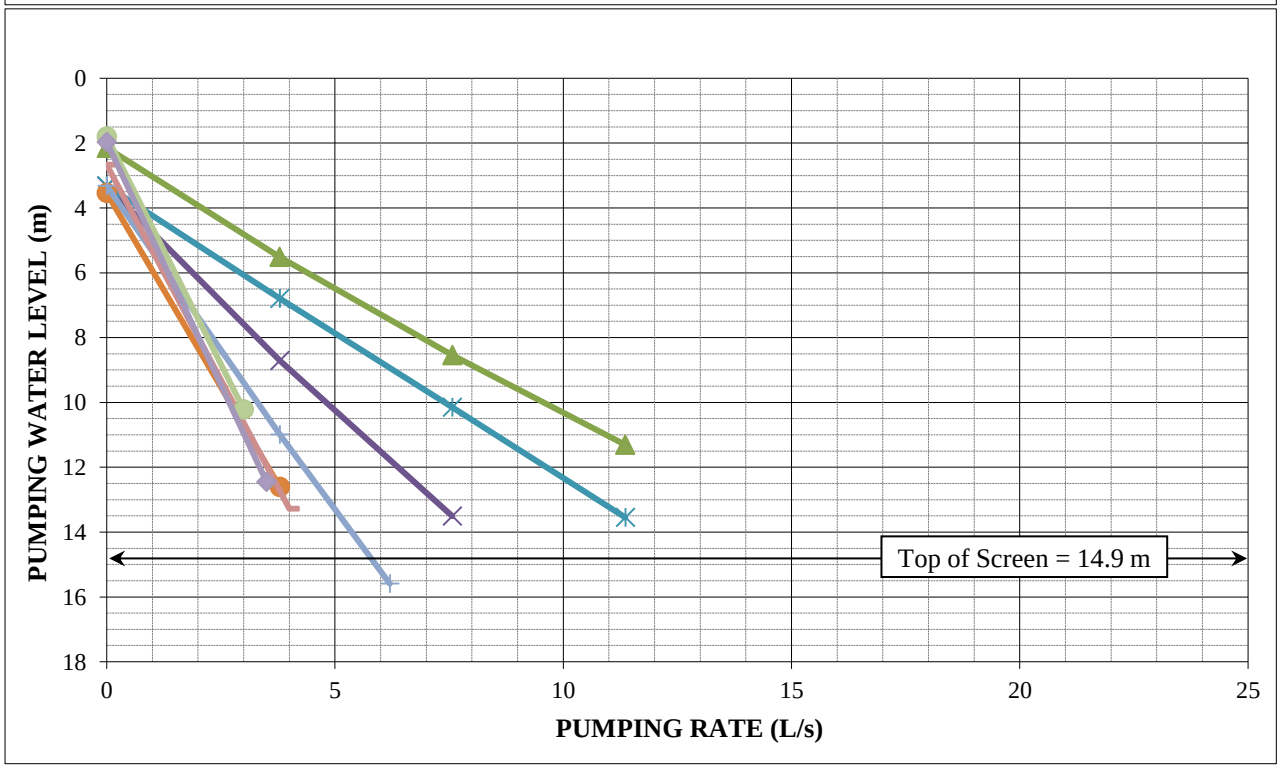
FIGURES





Notes:

All water levels are referenced from top of casing

Top of casing = 0.21 m above floor

Pump Inlet = 16.0 mbtc

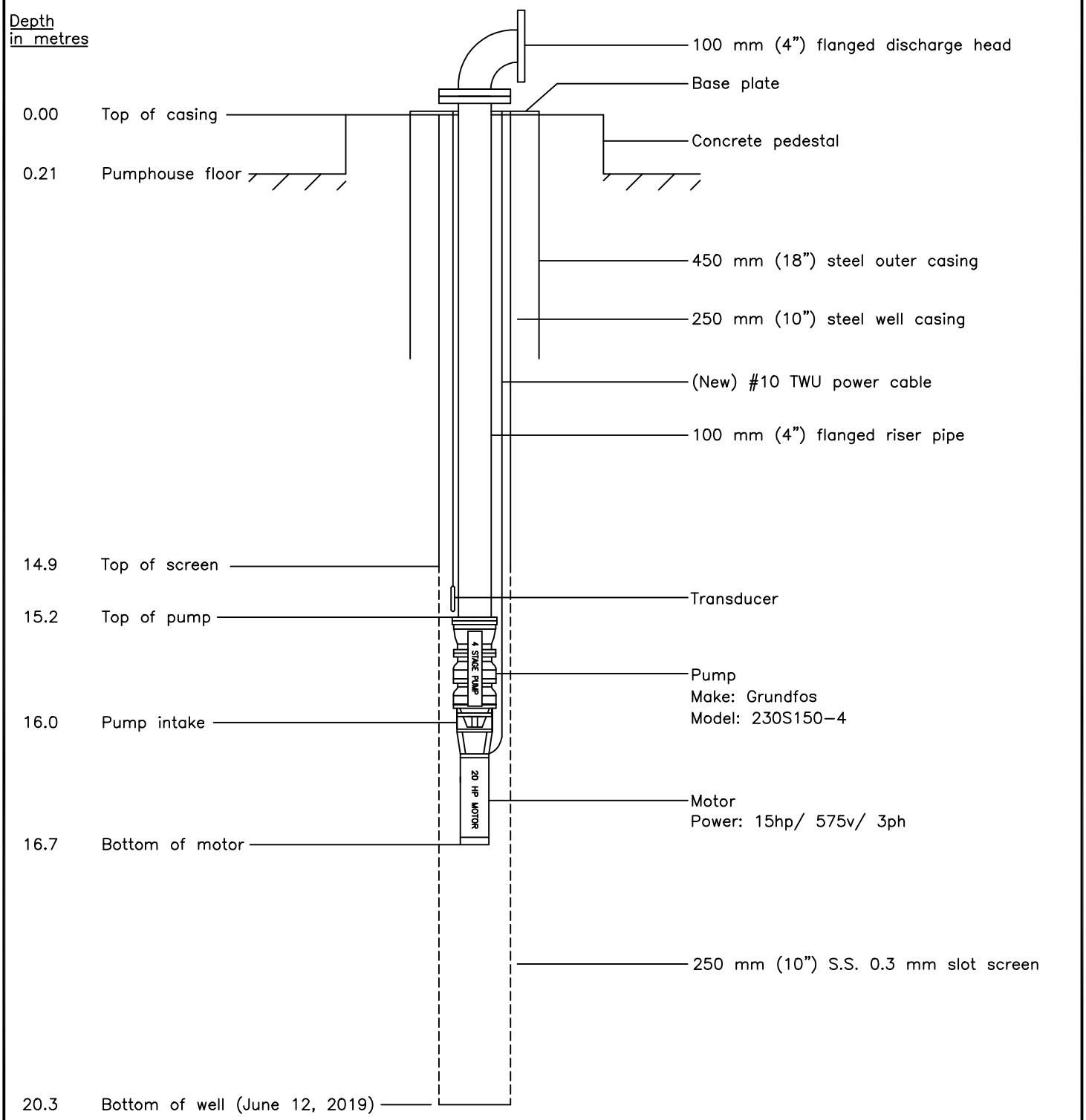
Town of Blind River

Well #6

Comparison of Variable Rate Tests

Lotowater Technical Services Inc. **Figure 1**

Reference: 184-013 2019-06-10



Lotowater TECHNICAL SERVICES INC.

CLIENT: TOWN OF BLIND RIVER

TITLE: Well #6 Pump Installation Drawing

PROJECT No. 184-013			G:\Lotowater Projects\184 Blind River\013 2019 Rehabilitations\W6 Installation Drawing.dwg		FIGURE 2
DESIGN			REVISION No. 2019/07/12	SCALE N.T.S.	
DRAWN	EH	2015/08/19			
CHECKED					

APPENDIX A

Well Disinfection Record

APPENDIX A

Well Disinfection Record

Well Name:	Well #6	
Client:	Town of Blind River	
Project #:	184-013	
Disinfected By:	Alex O'Hearn	
LTS Chlorination Worksheet Used:	Yes	
Treatment Volume:	1,066	**Litres**
Desired Concentration:	150	**ppm**
Volume of Mixing Water:	n/a	**Litres**
Qty of Sterilene Needed (granular 55%):	290.80	**grams**
Type and Quantity of Chlorine Used:	Sterilene 300 grams	
Date and Time Chlorine Added:	2019-06-17 16:00	
Chlorine Addition Method:	Poured in from top and recirculated with test pump	
Chlorine Residual Measured at Surface:	200 ppm	
Chlorine Residual Measurement Method:	Test strip	
Date & Time Chlorine Purged:	2019-06-18 8:00	
Pre-Purge Chlorine Residual Measured at Surface:	150 ppm	
Chlorine Residual Measurement Method:	Test strip	
Purged By:	Alex O'Hearn	
Purged To:	Dechlorination bin	
Quantity and Type of Dechlorinating Agent Used:	5 Chlor-Oust pucks 100 g	
Minutes of Pumping until Zero Free Chlorine Residual:	10 minutes	
Final Turbidity Measurement (NTU):		
Notes on Disinfection:		

Lotowater TECHNICAL SERVICES INC.

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BLIND RIVER WELL #7 SERVICE

Prepared for:

TOWN OF BLIND RIVER

Mail: P.O. Box 451, Paris ON N3L 3T5
Office: 92 Scott Avenue, Paris ON N3L 3R1
Phone: (519) 442-2086
Fax: (519) 442-7242

Lotowater
TECHNICAL SERVICES INC.

Date: September 21, 2015

Reference: 184-012

TOWN OF BLIND RIVER

BLIND RIVER WELL #7 SERVICE

TABLES

FIGURES

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Lotowater
TECHNICAL SERVICES INC.

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September 21, 2015

Reference: 184-012

Kresin Engineering Corporation
536 Fourth Line East
Sault Ste. Marie, Ontario
P6A 6J8

Attention: Chris Kresin, M.Sc. (Eng.), P. Eng.

SUBJECT: BLIND RIVER WELL #7 SERVICE

This report documents the work performed by Lotowater Technical Services Inc. (LTS) at Blind River Well #7. The service program included visual pumping equipment inspection, well rehabilitation, video surveys and well performance testing. This work was completed over July and August 2015 as part of a complete well field rehabilitation program where similar work was completed at the other Blind River wells.

BACKGROUND

Blind River Well #7 was constructed in 1987 with a 600 mm (24") diameter outer steel casing that terminates at an unknown depth. The 300 mm (12") diameter inner steel well casing is set to a depth of 13.0 m. The remainder of the well is screened with a #50 slot stainless steel screen to a depth of 19.4 m. The well is currently equipped with a Grundfos 230S150 – 4 stage submersible pump coupled with a Grundfos 15 horsepower motor. The well's permitted capacity is 17.05 L/s (1,473 m^3/day), although the well has not operated at this rate for years due to persistent plugging which is common to all the Blind River wells and necessitates frequent rehabilitation. Although rehabilitations are effective at increasing performance, they do not fully restore the well to the original as constructed condition, such that over time it becomes less and less productive. Well 7 was last rehabilitated in 2010.

PRE-REHABILITATION TESTING

A pre-rehabilitation variable rate performance test was attempted July 13, 2015, but could not be completed due to the very low performance of the well. While testing to system, the well broke suction almost immediately at 3.4 L/s; indicating an approximate specific capacity of 0.37 L/s/m. Based on this very low performance level, we proceeded with the rehabilitation program.

PRE-REHABILITATION VIDEO SURVEY

A pre-rehabilitation static video was completed July 13, 2015 with significant well construction details noted in **Table 1**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the upper portions of the well screen were severely impacted by biological fouling (**Photo 1**). The video also showed sediment at the bottom of the well (**Photo 2**). The well required cleaning to remove this buildup.

Photo: 1 Screen Severely Fouled

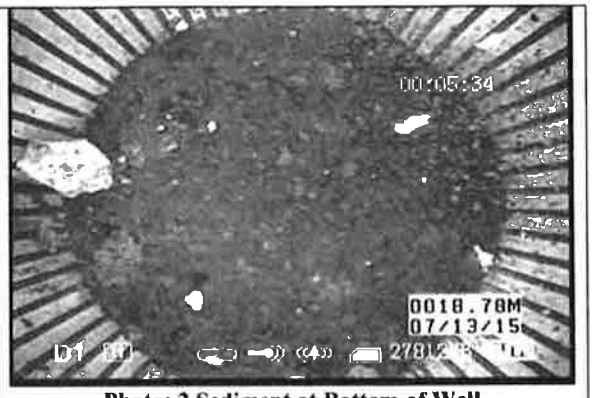


Photo: 2 Sediment at Bottom of Well

WELL REHABILITATION

To rehabilitate the well, an inflatable packer was installed to isolate the screened interval of the well. Afterwards, an airlift assembly was installed in the well; allowing the screened interval to be airlift pumped and surged to remove loose fouling material from the bottom of the well and screen interior. After the discharge cleared from this initial cleaning, 5,000 L of a reductant solution was prepared and injected into the screened interval. This solution was air displacement surged out through the screen to the surrounding formation and gravel pack before being left in the well overnight to react. The following day, the reductant solution was removed from the well and neutralized in a storage bin before being hauled offsite for disposal. The well was airlift pumped and surged for the remainder of the day until the discharge was clear and sediment free.

PUMPING EQUIPMENT INSPECTION AND SERVICE

The pump was cleaned prior to inspection to remove any fouling present. The pumping equipment was inspected visually afterward for any exterior damage that would prevent us from reinstalling the pumping equipment. The pumping equipment appeared to be in good condition and was suitable for continued service.

POST-REHABILITATION VIDEO SURVEY

A post-rehabilitation static video was completed July 16, 2015. Significant well construction details are noted in **Table 2**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the rehabilitation has removed most of the fouling that was present on the well screen (**Photo 3**). The video also shows the sediment that had accumulated at the bottom of the well has been removed (**Photo 4**).

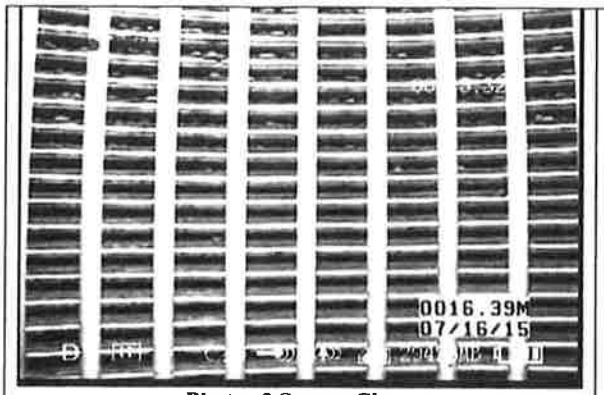


Photo: 3 Screen Clean

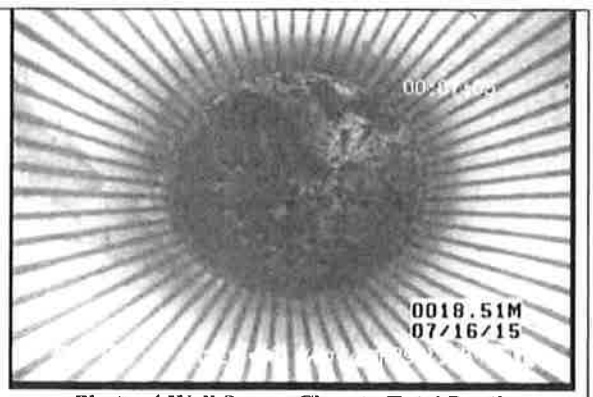


Photo: 4 Well Screen Clear to Total Depth

POST-REHABILITATION TESTING

A post-rehabilitation well performance test was conducted on July 17, 2015. The data collected is provided in **Table 3** and was plotted graphically and compared against historical pumping levels on **Figure 1**. The post-rehabilitation test results indicate well performance has improved from a specific capacity of 0.37 L/s/m to 0.63 L/s/m; leaving performance at 26% of the level measured at the time of construction. The short term maximum sustainable pumping rate has increased from 3.4 L/s to approximately 5.5 L/s.

Data was collected during the step test to verify the satisfactory operation of the pump and motor. The test results are presented in **Table 4** and indicate the pump is operating significantly below the manufacturer's suggested pump curve. The data indicates the motor is operating satisfactorily. A pump installation drawing has been included as **Figure 2**.

A well disinfection record is included in **Appendix A**.

CONCLUSIONS AND RECOMMENDATIONS

The rehabilitation has successfully removed the biological fouling attached to the screen and the sediment that had accumulated at the bottom of the well. The post-rehabilitation video indicated the screen is in good condition. The well performance has improved the maximum yield from 3.4 L/s to approximately 5.5 L/s. The well is operating at 26% of the as-constructed level, and is still well below capacities obtained after the last rehabilitation in 2010. It is expected the well performance will continue to decline to a point where it will not meet minimum system requirements. More frequent and intense rehabilitation efforts may stave off such declines, but it is unlikely that they will ever fully restore, or even stop the decline. A replacement well program should therefore be implemented along with the rehabilitation program to maintain this well field's capacity at functioning levels.

The pump is operating significantly below the manufacturer's suggested performance curve and the motor is performing satisfactorily. The pumping equipment is significantly oversized for the wells current capacity. It is recommended that the pump be replaced at the next service with a lower flow pump more suitably sized for the current capacity of Well 7. The existing motor, wire and discharge piping can still be used. A smaller pump would offer savings in electrical energy costs of several thousand dollars per year per well. Consideration should be made to

replacing all existing well pumps with the same model of pump to allow interchangeability between wells and pumps. A suitable pump for this and the other operating wells would be a Grundfos 85S75-5 (7.5 bhp).

It has been a pleasure working with the Town of Blind River on this project. Please contact the undersigned if there are any questions.

Yours sincerely,
Lotowater Technical Services Inc.

Edward Hunter, P.Eng.
Project Manager

Boyd Pendleton, B.Sc., P.Geo.
Senior Project Manager

TABLES

TABLE 1

Town of Blind River

Well #7
Pre-Rehabilitation Static Video Summary
2015/07/13

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	2.72	0.83	Below top of casing
0:00	6.56	2.00	Pitless adapter
0:01	18.04	5.50	Water level
0:03	42.65	13.00	Top of screen
0:04	53.15	16.20	Screen joint
0:06	63.12	19.24	Bottom of well
0:09	54.17	16.51	Screen joint
0:11	48.88	14.90	Screen joint
0:14	43.70	13.32	Top of screen
0:24	12.27	3.74	Water level
0:26	6.82	2.08	Pitless adapter
0:28	3.58	1.09	Old penetration in casing
0:28	2.66	0.81	Below top of casing

Video survey conducted by Jason Dion

Note: Measuring point (MP) is top of casing which is 0.68 m above ground

TABLE 2

Town of Blind River

Well #7
Post-Rehabilitation Static Video Summary
2015/07/16

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	2.62	0.80	Below top of casing
0:00	6.56	2.00	Pitless adapter
0:01	13.42	4.09	Water level
0:01	18.27	5.57	Pause video to set pump to clear image
0:06	42.65	13.00	Top of screen
0:06	47.57	14.50	Screen joint
0:07	53.15	16.20	Screen joint
0:09	63.62	19.39	Bottom of well
0:14	54.00	16.46	Screen joint
0:19	48.72	14.85	Screen joint
0:23	43.57	13.28	Top of screen
0:36	9.51	2.90	Water level
0:37	6.63	2.02	Pitless adapter
0:38	2.33	0.71	Below top of casing

Video survey conducted by Jason Dion

Note: Measuring point (MP) is top of casing which is 0.68 m above ground

TABLE 3

VARIABLE RATE PERFORMANCE TEST
Post-Rehabilitation

Lotowater TECHNICAL SERVICES INC.

Well Name:	Well #7	**Project Number:**	184-012
Client:	Town of Blind River	**Date:**	2015-07-17
Technician Name:	Cory Mitchell	**Pump:**	Client's pump
Water Level Device:	LTS water level meter	**Pump Inlet:**	12.2 m
Water Level Reference:	Top of casing	**Flow Measuring Device:**	LTS flow meter
Test Note:			

Time *hr:min*	Elapsed Time *min*	Level *mbBP*	Drawdown *m*	Flow *L/s*	Note
0:00	0	2.82	0.00	3.8	Start Step 1
0:01	1			3.8	
0:02	2			3.8	
0:03	3	6.96	4.14	3.8	
0:04	4	7.93	5.11	3.8	
0:05	5	8.17	5.35	3.8	
0:06	6	8.35	5.53	3.8	
0:08	8	8.69	5.87	3.8	
0:10	10	8.89	6.07	3.8	
0:12	12	9.07	6.25	3.8	
0:15	15	9.14	6.32	3.8	
0:20	20	9.17	6.35	3.8	Amps (L1 = 13.1, L2 = 13.4, L3 = 13.6)
0:25	25	9.21	6.39	3.8	
0:30	30	9.24	6.42	3.8	Pressure = 27 psi
0:31	1			5.5	Start Step 2
0:32	2			5.5	
0:33	3	9.82	7.00	5.5	
0:34	4	10.39	7.57	5.5	
0:35	5	10.82	8.00	5.5	
0:36	6	11.00	8.18	5.5	
0:38	8	11.29	8.47	5.5	
0:40	10	11.36	8.54	5.5	
0:42	12	11.44	8.62	5.5	
0:45	15	11.49	8.67	5.5	
0:50	20	11.54	8.72	5.5	
0:55	25	11.55	8.73	5.5	
1:00	30	11.56	8.74	5.5	

TABLE 4

Submersible Pump & Motor Installation Test Record

Project # 184-012

Well Name: Well #7
Client: Town of Blind River
Test Date: July 17, 2015
Notes By: Cory Mitchell

Flow Measurement: LTS flow meter
Water Level Ref: Top of casing
Pressure Gauges: LTS pressure gauge
Level Measurement: LTS water level meter

Well

Well Diameter: 300 mm | Well Depth: 19.4 m | Static Water Level: 2.82 m

Pump

Make: Grundfos | Bowl Length: 0.8 m | Imp. Diam: Full | Stage: 4
Model: 230S150-4 | Bowl Diameter: 150 mm | Imp. Type: Stainless steel
Serial #: A15B70004 | Notes:

Pipe

Diameter: 100 mm | Type: Steel | Total Length: 9.4 m | Lengths: 2
Suction Intake: 12.2 m | Notes:

Motor & Wiring

Make: Grundfos
Model: MS6000
Serial #: 0746
HP: 15 | Volts: 575 | Phase: 3
FL Amps: 16.6 | SF Amps*: 19.0 | RPM: 3450
Wire Type: TWU | Gauge: #8-4 | Length: 13.0 m
Overloads:
Surge Arrestor:
Notes:

Winding Resistance Test

	L1-L2	L1-L3	L2-L3	
In Well:	n/a	n/a	n/a	ohms
Out of Well:	n/a	n/a	n/a	ohms

Insulation Resistance Test

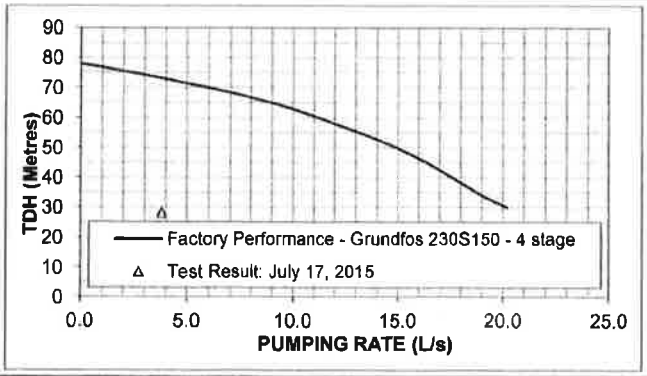
	L1-G	L2-G	L3-G	
In Well:	n/a	n/a	n/a	Mohms
Out of Well:	n/a	n/a	n/a	Mohms

Voltage Test

	Static	Load
L1-L2:	na	na
L1-L3:	na	na
L2-L3:	na	na

Test Data

Q L/s	WL mbmp	Pres psi	FL m	TDH m	L1 amps	L2 amps	L3 amps	Avg amps	Current unbalance	% FL Amps
0.0	2.82									
3.8	9.24	27	0.04	28.3	13.1	13.4	13.6	13.4	2.0%	80.5%
5.5	11.56	0	0.09	11.7						



Notes:

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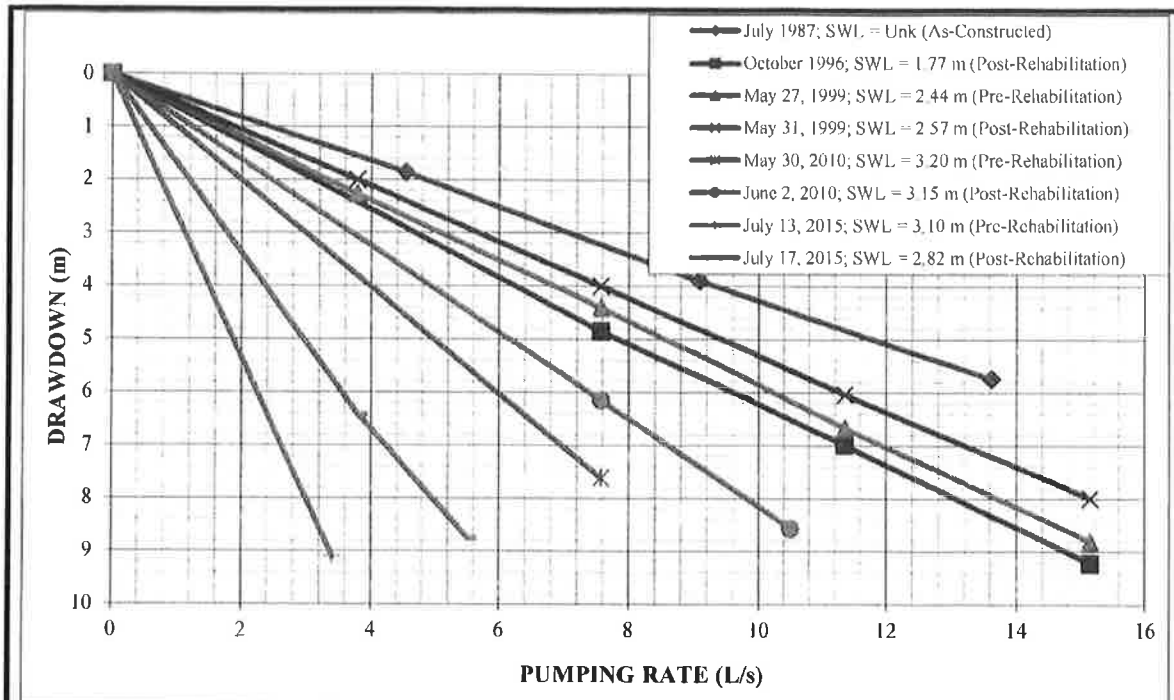
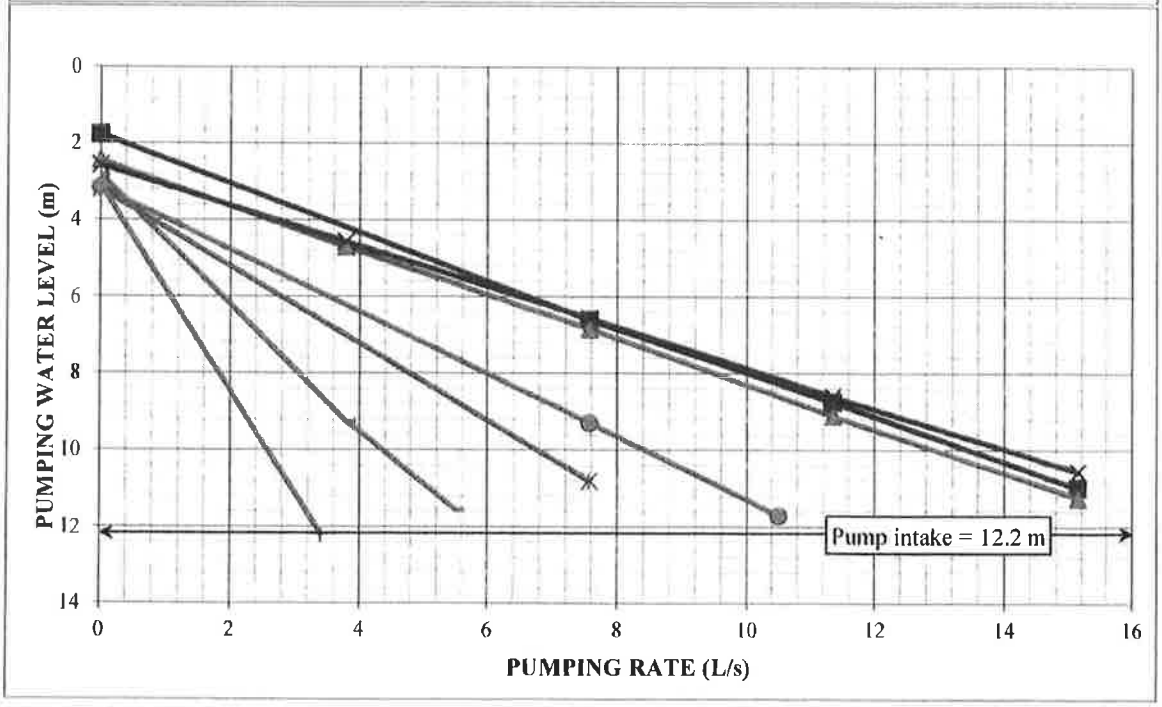
FIGURES





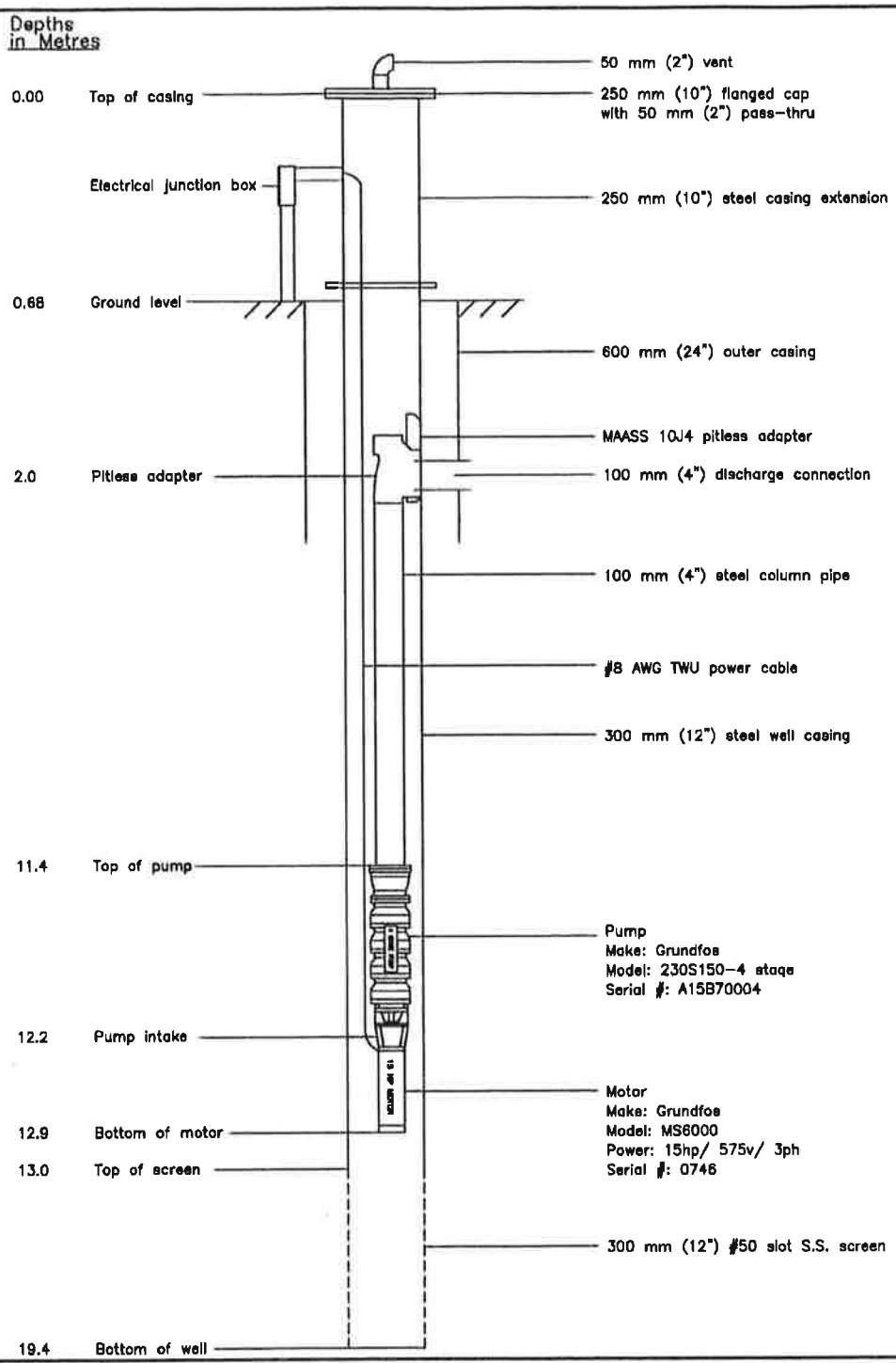
Notes:
All water levels are referenced from top of casing
Top of casing = 0.68 m above ground surface

Town of Blind River

Well #7

Comparison of Variable Rate Tests

Lotowater Technical Services Inc. **Figure 1**
Reference: 184-012 2015-07-17



Lotowater
TECHNICAL SERVICES INC.

CLIENT: TOWN OF BLIND RIVER

TITLE: Well #7
Pump Installation Drawing

PROJECT No. 184-012			G:\Lotowater Projects\184 Blind River\012 2015 Rehabilitations\W7 Installation Drawing.dwg		FIGURE 2
DESIGN			REVISION No. 2015/08/19	SCALE N.T.S.	
DRAWN	EH	2015/08/19			
CHECKED					

APPENDIX A

Well Disinfection Record

Well Chlorination Record

Well Name:	Well #7	
Client:	Town of Blind River	
Project #:	184-012	
Disinfected By:	Cory Mitchell	
LTS Chlorination Worksheet Used:	Yes	
Treatment Volume:	974	**Litres**
Desired Concentration:	150	**ppm**
Volume of Mixing Water:	n/a	**Litres**
Qty of Sterilene Needed (granular 55%):	265.57	**grams**
Type and Quantity of Chlorine Used:	300 g of Sterilene	
Date and Time Chlorine Added:	2015-07-16 13:30	
Chlorine Addition Method:	Poured in top and circulated with pump	
Chlorine Residual Measured at Surface:	> 150 ppm	
Chlorine Residual Measurement Method:	Test strip	
Date & Time Chlorine Purged:	2015-07-17 8:30	
Pre-Purge Chlorine Residual Measured at Surface:	160 ppm	
Chlorine Residual Measurement Method:	Test strip	
Purged By:	Cory Mitchell	
Purged To:	Waste	
Quantity and Type of Dechlorinating Agent Used:	50 g of Chlor-Oust	
Minutes of Pumping until Zero Free Chlorine Residual:	10 minutes	
Final Turbidity Measurement (NTU):	n/a	
Notes on Disinfection:		

Lotowater
TECHNICAL SERVICES INC.

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BLIND RIVER WELL 7
SERVICE AND
REHABILITATION

Prepared for:

TOWN OF BLIND RIVER

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Fax: (519) 442-7242

Lotowater
TECHNICAL SERVICES INC.

Date: July 12, 2019

Reference: 184-013

TOWN OF BLIND RIVER

BLIND RIVER WELL 7 SERVICE AND REHABILITATION

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F (519) 442 7242
www.lotowater.com

July 12, 2019

Reference: 184-013

Kresin Engineering Corporation
536 Fourth Line East
Sault Ste. Marie, Ontario
P6A 6J8

Attention: Mark Edwards, C. Tech.

SUBJECT: BLIND RIVER WELL 7 SERVICE AND REHABILITATION

This report documents the work performed by Lotowater Technical Services Inc. (LTS) at Blind River Well 7. The service program included visual pumping equipment inspection, well rehabilitation, video surveys and well performance testing. This field work was completed from June 10-26, 2019, as part of a multi-well rehabilitation program where similar work was performed at Blind River Wells 5 and 6.

BACKGROUND

Blind River Well 7 was constructed in 1987 with a 600 mm (24") diameter outer steel casing that terminates at an unknown depth. The 300 mm (12") diameter inner steel well casing is set to a depth of 13.0 m. The remainder of the well is screened with a #50 slot stainless steel screen to a depth of 19.4 m. The well is currently equipped with a Grundfos 230S150 – 4 stage submersible pump coupled with a Grundfos 15 horsepower motor. The well's permitted capacity is 17.05 L/s (1,473 m^3/day); although the well has not operated at this rate for years due to persistent plugging, which is common to all the Blind River wells and necessitates frequent rehabilitation. Although rehabilitations are effective at increasing performance, they do not fully restore the well to the original as-constructed condition, such that over time it becomes less and less productive. Well 7 was last rehabilitated in 2015.

PRE-REHABILITATION TESTING

A pre-rehabilitation variable rate performance test was attempted June 19, at 3 L/s. A second flow rate of 6 L/s was attempted, but the pump broke suction. This yielded a specific capacity of 0.47 L/s/m and a maximum well capacity of approximately 4.5 L/s. The performance was down from when the well was last rehabilitated in 2015, but not as low as the 2015 pre-rehabilitation values where the wells capacity was approximately 3.0 L/s.

PRE-REHABILITATION VIDEO SURVEY

A pre-rehabilitation static video was completed on June 21, 2019, with significant well construction details noted in **Table 1**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the upper portions of the well screen were severely impacted by biological fouling (**Photo 1**). The video also showed sediment at the bottom of the well (**Photo 2**). The well required cleaning to remove this buildup and increase performance.

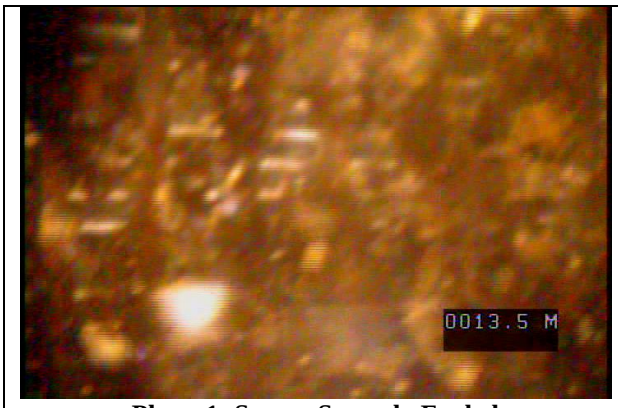


Photo 1: Screen Severely Fouled

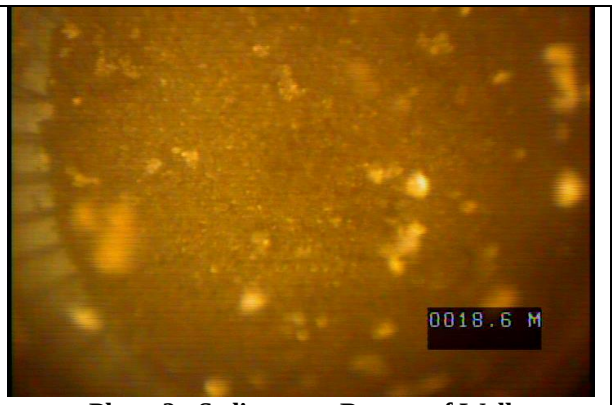


Photo 2: Sediment at Bottom of Well

WELL REHABILITATION

An experimental high pressure jetting procedure was used at this well to test the effectiveness of such a method at improving well performance at this and other Blind River wells (**Photos 3 and 4**). The well was first airlifted using similar procedures as used at this and other blind river wells in the past, to remove loose debris from the well. After this initial airlifting, a rotating jetting tool with a pressure of 10,000 psi and 1 L/s flow rate was raised and lowered over the screen and casing while simultaneously pumping the well at approximately 5.5 L/s. The well was jetted and pumped in this fashion for approximately 5 hours which produced a dark fine sediment and turbid water. In addition, the pump and exterior of the pump riser pipe were also cleaned; which removed a brownish red sludge buildup. Immediately after jetting, the well was tested at 5.5 L/s and showed an improvement in performance. The wells' capacity had been increased from roughly 4.5 L/s to 6.5 L/s from jetting.

The well was then treated with acid and surging similar to techniques typically used at this and other Blind River wells in the past. The well was treated with 400 kg of acid, which were surged and displaced into the formation and allowed to react overnight. The following day, the well was airlifted which produced a brownish red discharge which cleared over the day.

Photo 3: Jetting Nozzle

Photo 4: High Pressure Jetting Pump

PUMPING EQUIPMENT INSPECTION AND SERVICE

The pump was cleaned prior to inspection to remove any fouling present. This included using the high pressure jetting tool to clean the interior of the discharge piping. The pumping equipment was inspected, appeared to be in good condition, and was suitable for continued service.

POST-REHABILITATION VIDEO SURVEY

A post-rehabilitation static video was completed June 26, 2019. Significant well construction details are noted in **Table 2**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the rehabilitation has removed nearly all the fouling that was present on the well screen (**Photos 5 and 6**).

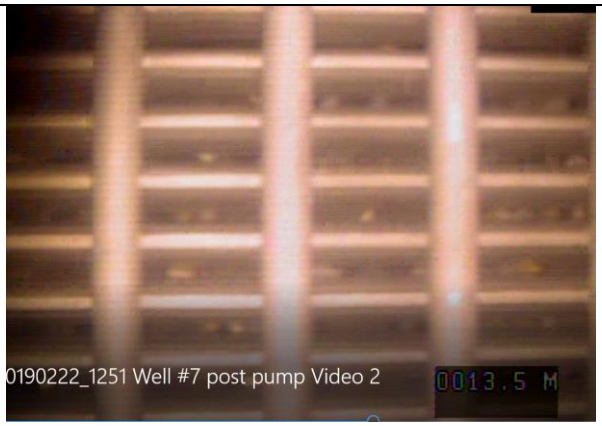


Photo 5: Screen Clean at 13.5 m

Photo 6: General Rehab Setup at Well 7

POST-REHABILITATION TESTING

A post-rehabilitation well performance test was conducted on July 17, 2019. The data collected is provided in **Table 3** and was plotted graphically and compared against historical pumping levels on **Figure 1**. The post-rehabilitation test results indicate well performance has improved from a specific capacity of 0.47 L/s/m to 0.90 L/s/m. The wells' capacity has increased from approximately 4.5 L/s to approximately 8.5 L/s.

Data was collected during the step test to verify the satisfactory operation of the pump and motor. The test results are presented in **Table 4** and indicate the pump is operating significantly below the manufacturer's suggested pump curve. The data indicates the motor is operating satisfactorily. A pump installation drawing has been included as **Figure 2**.

A well disinfection record is included in **Appendix A**.

CONCLUSIONS AND RECOMMENDATIONS

The rehabilitation has successfully removed the biological fouling attached to the screen and the casing. The jetting portion of the rehabilitation appears to have been effective at removing sediment and buildup from the well, in addition to increasing the wells' capacity. Post-jetting and acidification provided further increase in capacity. Jetting produced increases from roughly 4.5 to 6.5 L/s and acidification further from 6.5 to 8.5 L/s. The wells' specific capacity is now about 50% of its as-constructed value.

Note, that the pre-rehabilitation performance was similar to the performance measured after the last rehabilitation in 2015. This indicates that there wasn't a significant decline from 2015 to 2019 and that an equilibrium may have been reached. In addition, the 2015 rehabilitation using a strong reducing agent, did not appear effective at increasing performance.

The existing pump appears to be significantly underperforming. Consider replacing this pump at its' next service. The existing pump may be a limiting factor in the wells' capacity.

It has been a pleasure working with Kresin Engineering and the Town of Blind River on this project. Please contact the undersigned if there are any questions.

Yours sincerely,
Lotowater Technical Services Inc.

Boyd Pendleton, B. Sc., P. Geo.
Senior Project Manager

TABLES

TABLE 1

Town of Blind River

Well #7
Pre-Rehabilitation Static Video Summary
2019-06-21

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	0.0	0.0	Top of casing
0:00	5.2	1.6	Water level
0:03	42.3	12.9	Top of screen
0:03	52.2	15.9	Screen joint
0:04	61.7	18.8	Well bottom
0:06	57.7	17.6	Biomass
0:08	52.8	16.1	Biomass
0:08	51.8	15.8	Screen joint
0:09	48.6	14.8	Biomass
0:10	46.6	14.2	Screen joint
0:11	42.0	12.8	Biomass
0:12	41.3	12.6	Biomass
0:18	5.2	1.6	Water level

Video survey conducted by Arthur Krzysko

Note: Measuring point (MP) is top of casing which is 0.68 m above ground

TABLE 2

Town of Blind River

Well #7
Post-Rehabilitation Pumping Video Summary
2019-06-26

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
-	-	-	* Video file #1 of 3
0:00	59.06	18.00	Bottom of well
0:03	51.84	15.80	Screen (cleaned)
-	-	-	* Video file #2 of 3
0:00	50.20	15.30	Screen joint
0:02	44.62	13.60	Screen joint
0:04	39.37	12.00	Screen/casing joint
-	-	-	* Video file #3 of 3
0:00	39.37	12.00	Screen/casing joint
0:04	19.03	5.80	Under pump
0:07	17.06	5.20	Possible casing joint
0:10	4.59	1.40	Water level
0:10	2.62	0.80	Pitless
0:12	0.00	0.00	Top of casing

Video survey conducted by Arthur Krzysko

Note: Measuring point (MP) is top of casing which is 0.68 m above ground

TABLE 3

VARIABLE RATE PERFORMANCE TEST
Post-Rehabilitation

Lotowater TECHNICAL SERVICES INC.

Well Name:	Well #7	**Project Number:**	184-013
Client:	Town of Blind River	**Date:**	2019-07-17
Technician Name:	Arthur Krzysko	**Pump:**	Client's pump
Water Level Device:	LTS water level meter	**Pump Inlet:**	12.2 m
Water Level Reference:	Top of casing	**Flow Measuring Device:**	LTS flow meter
Test Note:			

Time *hr:min*	Elapsed Time *min*	Level *mbtc*	Drawdown *m*	Flow *L/s*	Note
12:52	0	2.30	0.00	3.0	Start Step 1
12:53	1	4.72	2.42	3.0	
12:54	2	5.87	3.57	3.0	
12:55	3	6.39	4.09	3.0	
12:56	4	6.68	4.38	3.0	
12:57	5	6.83	4.53	3.0	
12:58	6	6.91	4.61	3.0	
13:00	8	7.05	4.75	3.0	
13:02	10	7.12	4.82	3.0	
13:04	12	7.19	4.89	3.0	
13:07	15	7.26	4.96	3.0	
13:12	20	7.29	4.99	3.0	
13:17	25	7.29	4.99	3.0	
13:22	30	7.29	4.99	3.0	
13:23	1	8.78	6.48	5.0	Start Step 2
13:24	2	9.06	6.76	5.0	Pressure = 28 psi
13:25	3	9.24	6.94	5.0	
13:26	4	9.34	7.04	5.0	
13:27	5	9.39	7.09	5.0	
13:28	6	9.40	7.10	5.0	
13:30	8	9.42	7.12	5.0	
13:32	10	9.42	7.12	5.0	
13:34	12	9.43	7.13	5.0	
13:37	15	9.43	7.13	5.0	
13:42	20	9.43	7.13	5.0	
13:47	25	9.43	7.13	5.0	
13:52	30	9.43	7.13	5.0	
13:23	1	10.73	8.43	7.0	Start Step 3
13:24	2	11.25	8.95	7.0	Pressure = 22 psi
13:25	3	11.55	9.25	7.0	
13:26	4	11.71	9.41	7.0	
13:27	5	11.75	9.45	7.0	
13:28	6	11.77	9.47	7.0	
13:30	8	11.79	9.49	7.0	
13:32	10	11.80	9.50	7.0	
13:34	12	11.80	9.50	7.0	
13:37	15	11.80	9.50	7.0	
13:42	20	11.80	9.50	7.0	
13:47	25	11.81	9.51	7.0	
13:52	30	11.81	9.51	7.0	

TABLE 3

VARIABLE RATE PERFORMANCE TEST
Post-Rehabilitation

Lotowater TECHNICAL SERVICES INC.

Well Name:	Well #7	**Project Number:**	184-013
Client:	Town of Blind River	**Date:**	2019-07-17
Technician Name:	Arthur Krzysko	**Pump:**	Client's pump
Water Level Device:	LTS water level meter	**Pump Inlet:**	12.2 m
Water Level Reference:	Top of casing	**Flow Measuring Device:**	LTS flow meter
Test Note:			

Time *hr:min*	Elapsed Time *min*	Level *mbtc*	Drawdown *m*	Flow *L/s*	Note
13:23	1	12.99	10.69	9.0	Start Step 4
13:24	2	13.18	10.88	9.0	
13:25	3	13.18	10.88	9.0	Broke suction @ 13.18 m

TABLE 4

Submersible Pump & Motor Installation Test Record

Project # 184-013

Well Name: Well #7
Client: Town of Blind River
Test Date: June 26, 2019
Notes By: Art Krysko

Flow Measurement: LTS flow meter
Water Level Ref: Top of casing
Pressure Gauges: LTS pressure gauge
Level Measurement: LTS water level meter

Well

Well Diameter: 300 mm **Well Depth:** 19.4 m **Static Water Level:** 2.82 m

Pump

Make: Grundfos **Bowl Length:** 0.8 m **Imp. Diam:** Full **Stage:** 4
Model: 230S150-4 **Bowl Diameter:** 150 mm **Imp. Type:** Stainless steel
Serial #: A15B70004 **Notes:**

Pipe

Diameter: 100 mm **Type:** Steel **Total Length:** 9.4 m **Lengths:** 2
Suction Intake: 12.2 m **Notes:**

Motor & Wiring

Make: Grundfos
Model: MS6000
Serial #: 0746
HP: 15 **Volts:** 575 **Phase:** 3
FL Amps: 16.6 **SF Amps*:** 19.0 **RPM:** 3450
Wire Type: TWU **Gauge:** #8-4 **Length:** 13.0 m
Overloads:
Surge Arrestor:
Notes:

Winding Resistance Test

	L1-L2	L1-L3	L2-L3	
In Well:	n/a	n/a	n/a	ohms
Out of Well:	n/a	n/a	n/a	ohms

Insulation Resistance Test

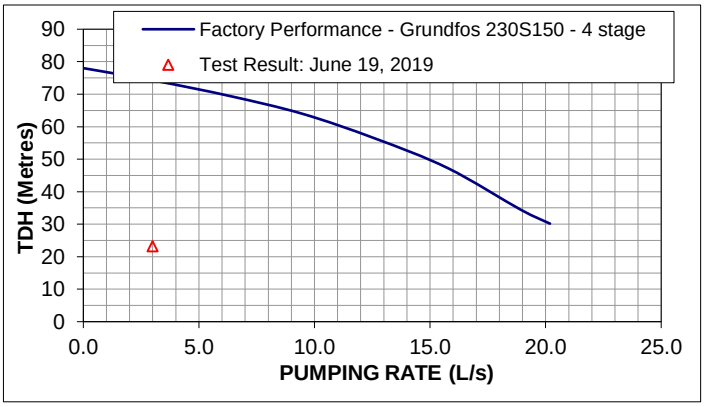
	L1-G	L2-G	L3-G	
In Well:	n/a	n/a	n/a	Mohms
Out of Well:	n/a	n/a	n/a	Mohms

Voltage Test

	Static	Load
L1-L2:	na	na
L1-L3:	na	na
L2-L3:	na	na

Test Data

Q *L/s*	WL *mbmp*	Pres *psi*	FL *m*	TDH *m*	L1 *amps*	L2 *amps*	L3 *amps*	Avg *amps*	Current *unbalance*	% FL Amps
0.0	2.36									
3.0	5.64	25		23.2	13.1	12.9	13.3	13.1	1.5%	78.9%
5.0	7.62									
7.0	10.04									



Notes:

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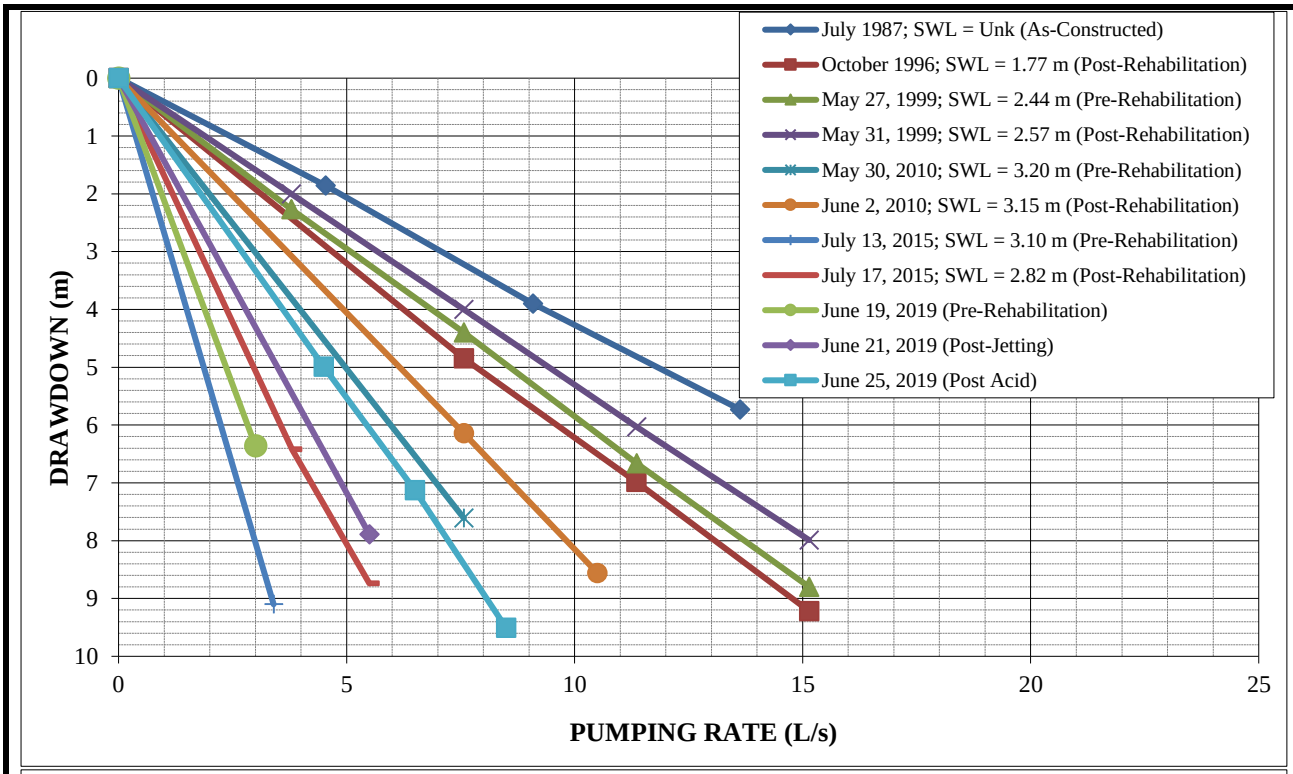
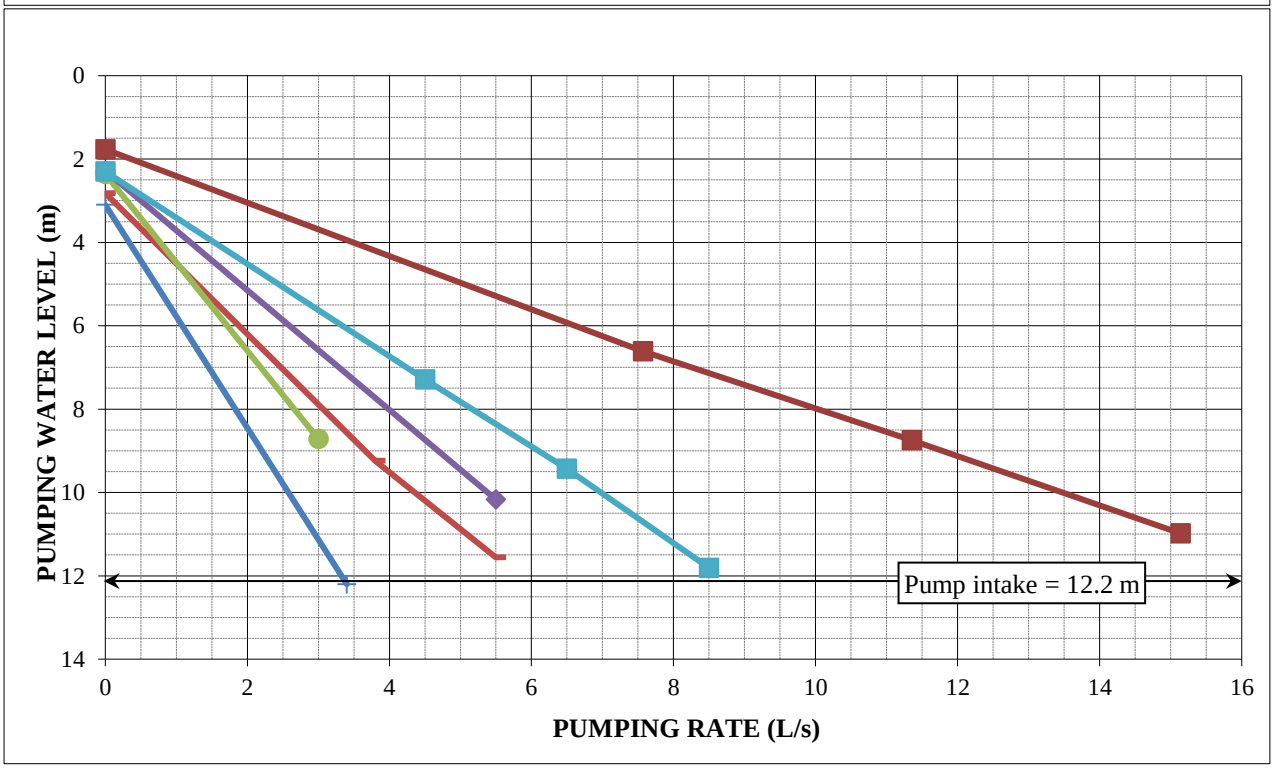
FIGURES





Notes:

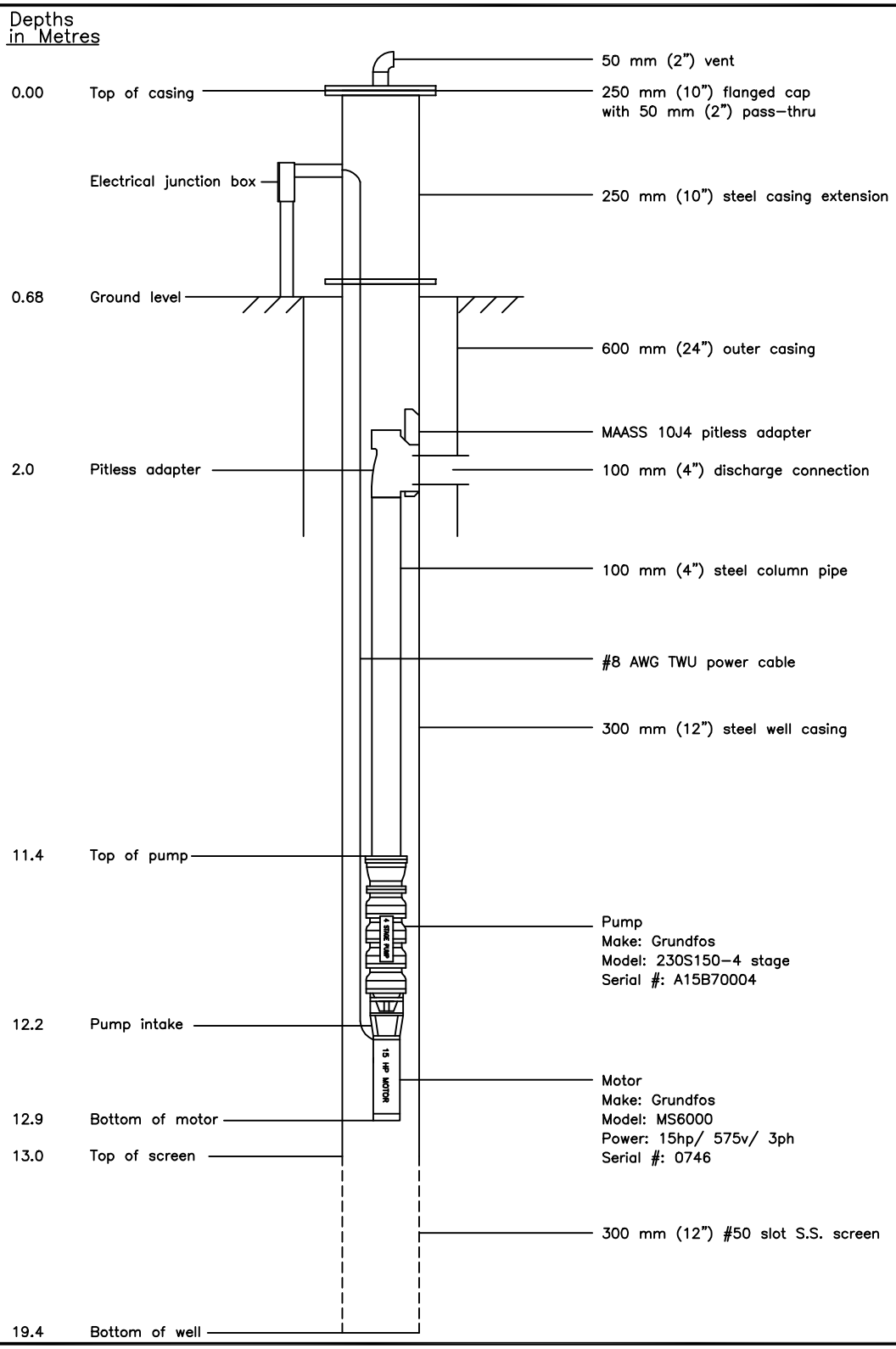
All water levels are referenced from top of casing
Top of casing = 0.68 m above ground surface
Top of screen = 13.0 m

Town of Blind River

Well 7

Comparison of Variable Rate Tests

Lotowater Technical Services Inc. **Figure 1**
Reference: 184-013 2019-06-26



Lotowater
TECHNICAL SERVICES INC.

CLIENT
TOWN OF BLIND RIVER

TITLE
Well #7
Pump Installation Drawing

PROJECT No. 184-013			G:\Lotowater Projects\184 Blind River\013 2019 Rehabilitation\W7 Installation Drawing.dwg		FIGURE 2
DESIGN			REVISION No. 2019/07/17	SCALE N.T.S.	
DRAWN	EH	2015/08/19			
CHECKED					

APPENDIX A

Well Disinfection Record

APPENDIX A

Well Disinfection Record

Well Name:	Well #7	
Client:	Town of Blind River	
Project #:	184-013	
Disinfected By:	Alex O'Hearn	
LTS Chlorination Worksheet Used:	Yes	
Treatment Volume:	1,216	**Litres**
Desired Concentration:	150	**ppm**
Volume of Mixing Water:	n/a	**Litres**
Qty of Sterilene Needed (granular 55%):	331.58	**grams**
Type and Quantity of Chlorine Used:	400 g of Sterilene	
Date and Time Chlorine Added:	2019-06-25 16:30	
Chlorine Addition Method:	Injected in from top and recirculated	
Chlorine Residual Measured at Surface:	150ppm	
Chlorine Residual Measurement Method:	Test strip	
Date & Time Chlorine Purged:	2019-06-26 8:00	
Pre-Purge Chlorine Residual Measured at Surface:	125 ppm	
Chlorine Residual Measurement Method:	Test strip	
Purged By:	Alex O'Hearn	
Purged To:	Dechlor bin	
Quantity and Type of Dechlorinating Agent Used:	5 Chlor-Oust Pucks 100 g	
Minutes of Pumping until Zero Free Chlorine Residual:	15 minutes	
Final Turbidity Measurement (NTU):		
Notes on Disinfection:	Recirculated through pump house back to well	

Lotowater TECHNICAL SERVICES INC.

92 SCOTT AVENUE **T (519) 442-2086**
PARIS, ON N3L 3R1 **F (519) 442-7242**
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BLIND RIVER WELL 7
WELL RE-DISINFECTION AND CROSS INFLUENCE TESTING

Prepared for:

TOWN OF BLIND RIVER

Mail: P.O. Box 451, Paris ON N3L 3T5
Office: 92 Scott Avenue, Paris ON N3L 3R1
Phone: (519) 442-2086
Fax: (519) 442-7242

Lotowater
TECHNICAL SERVICES INC.

Date: August 13, 2019

Reference: 184-013

TOWN OF BLIND RIVER

BLIND RIVER WELL 7 RE-DISINFECTION AND CROSS INFLUENCE TESTING

TABLE

FIGURES

ATTACHMENT

Lotowater
TECHNICAL SERVICES INC.

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F (519) 442 7242
www.lotowater.com

August 13, 2019

Reference: 184-013

Kresin Engineering Corporation
536 Fourth Line East
Sault Ste. Marie, Ontario
P6A 6J8

Attention: Mark Edwards, C. Tech.

SUBJECT: WELL 7 RE-DISINFECTION AND CROSS INFLUENCE TESTING

Lotowater has recently performed a well re-disinfection at Well 7 and conducted a cross borehole influence test at the Blind River Well field. The field work was completed over two days on August 8-9, 2019.

Well 7 Re-Disinfection

Well 7 was recently rehabilitated in June 2019. After rehabilitation, the well failed its initial disinfection on June 26, 2019. The well was purged and sampled several other times, but failed subsequent sampling events. Lotowater returned on August 8, 2019, to flush and re-disinfect the well.

On August 8th, Lotowater arrived and began to flush Well 7 to waste. A recirculation line was installed in the well as per **Figure 1** and **Photo 1**. This allowed all stagnation zones above the pump in the well to be flushed. After the well was flushed, a granular buffered chlorine solution was added to the well (Sterilene) and circulated. This solution was allowed to sit overnight. The following morning, August 9th, the solution was recirculated in the well for one hour then flushed to waste. The Blind River operators then collected two samples approximately 30 minutes apart, along with a duplicate sample. Details of the sampling are given in the Well Disinfection Record in **Table 1**.

Laboratory sample results are summarized in the **Attached Certificate of Analysis** that show Total Coliforms of 20 & 30 CFU's for the two samples. E.coli was 0 for both samples.

Cross Well Influence Testing

Testing was performed on August 9, 2019, after the disinfection of Well 7, to test pumping influences each of the Blind River Wells has on the other. There was some indication that pumping from certain wells was impacting other wells, and this was complicating interpretation of step test data used to assess effectives of rehabilitation efforts. A test was designed to measure such impacts by pumping each well by itself for approximately 30 minutes while measuring levels using data logging pressure transducers in all other pumping wells. (Note, a problem with a pressure transducer at Well 5 prevented automated level measurement at this well. For this reason, manual level measurements

were taken at Well 5 for this testing.) This was followed by a 30 minute recovery period where all wells were turned off and levels monitored. Results of this testing are summarized in the attached hydrographs on **Figures 2-6**. Note, Well 8 was not pumped during this testing, as the test duration had to be shortened due to operational concerns with the plant. However, this well is not expected to be significantly impacted, or impact other wells, due to its distance from the rest of the well field.

Results of this testing show limited impacts from pumping from one well to another. The biggest impact is from pumping Well 5 at 9.8 L/s, which produced 0.57 m of drawdown at Well 9. Well 6 appears impacted from Wells 5 and 7 by about 0.25 m and 0.16 m respectively, at the testing flow rates. There are lesser and more subtle impacts between some of the other wells that can be seen when comparing **Figures 2-6**. Note, that the level influences from one well to another are not going to translate into significant flow reductions. For this reason, no special corrections need to be considered in the daily operations of the well field due to cross well influences.

The testing provided a good opportunity to rate the current well capacities which are summarized as follows:

Well 8 = 6.5 L/s
Well 6 = 4.1 L/s
Well 9 = 2.8 L/s
Well 7 = 11.0 L/s (Well was tested at 8.2 L/s but testing indicates higher flow possible)
Well 5 = 12.0 L/s (Well was tested at 9.3 L/s but testing indicates higher flow possible)

Total = 36.4 L/s

Note, that well field was found operating prior to testing on August 8 at approximately 16 L/s. This was meeting the average daily demand which is approximately 15 L/s. This was split between three wells as follows:

Well 8 = 6.5 L/s
Well 6 = 4.1 L/s
Well 5 = 5.4 L/s
Well 9 = off
Well 7 = off

Total = 16 L/s

Some other noteworthy findings from the testing are summarized as follows:

- The capacity of Well 7 appears to be higher than when last tested after rehabilitation in June 2019. Testing after rehabilitation indicated a capacity of approximately 7 L/s and flows currently are estimated at approximately 11 L/s. It is unclear what the reason is for the increase.

- Each of the wells have a level transducer, but only Wells 5 and 6 appear to be working.

    - Well 5 transducer is set at a depth of 12.8 m and reports submergence in m of water at the local readout in the pump house.

        - Use this to easily assess water level in well. Maintain a minimum of 0.1 m of water on this to provide adequate submergence on the pump to prevent cavitation.

    - Well 6 transducer is set to a depth of 10.97 m and reports submergence in m of water at the local readout in the pump house.
        - Note that the top of screen is at 14.9 m so the transducer setting is about 4 m higher than needed. This transducer needs to be lowered 4 m to be effective for monitoring level to maximize flow from the well.

- The other transducers in Wells 7, 8 and 9 do not have a local readout that appears to be working, so we were unable to check and calibrate when on site. It is recommended that all the transducers be set to the top of the well pump and be used to control well flows to maintain submergence on the pump and/or well screen.

If you have any questions please feel free to contact us. We look forward to hearing from you and appreciate the opportunity to bid on this work.

Yours truly,
Lotowater Technical Services Inc.

Boyd Pendleton, P. Geo.
Vice-President

TABLE 1

Well Disinfection Record

Table 1

Well Disinfection Record

Well Name:	Well #7	
Client:	Town of Blind River	
Project #:	184-013	
Disinfected By:	Boyd Pendleton	
LTS Chlorination Worksheet Used:	Yes	
Treatment Volume:	625	**Litres**
Desired Concentration:	150	**ppm**
Volume of Mixing Water:	n/a	**Litres**
Qty of Sterilene Needed (granular 55%):	170.42	**grams**
Type and Quantity of Chlorine Used:	170 g of Sterilene	
Date and Time Chlorine Added:	2019-08-08 16:30	
Chlorine Addition Method:	Injected in from top and recirculated	
Chlorine Residual Measured at Surface:	150ppm	
Chlorine Residual Measurement Method:	Test strip & Field Titration	
Date & Time Chlorine Purged:	2019-09-09 9:05	
Pre-Purge Chlorine Residual Measured at Surface:	75 ppm	
Chlorine Residual Measurement Method:	Test strip	
Purged By:	Boyd Pendleton	
Purged To:	Dechlor bin	
Quantity and Type of Dechlorinating Agent Used:	Dechlor Pucks	
Minutes of Pumping until Zero Free Chlorine Residual:	15 minutes	
Final Turbidity Measurement (NTU):		
Notes on Disinfection:	Recirculated for 60min then purged	
	to waste	
	Disinfected sample taps inside pump house	

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TECHNICAL SERVICES INC.

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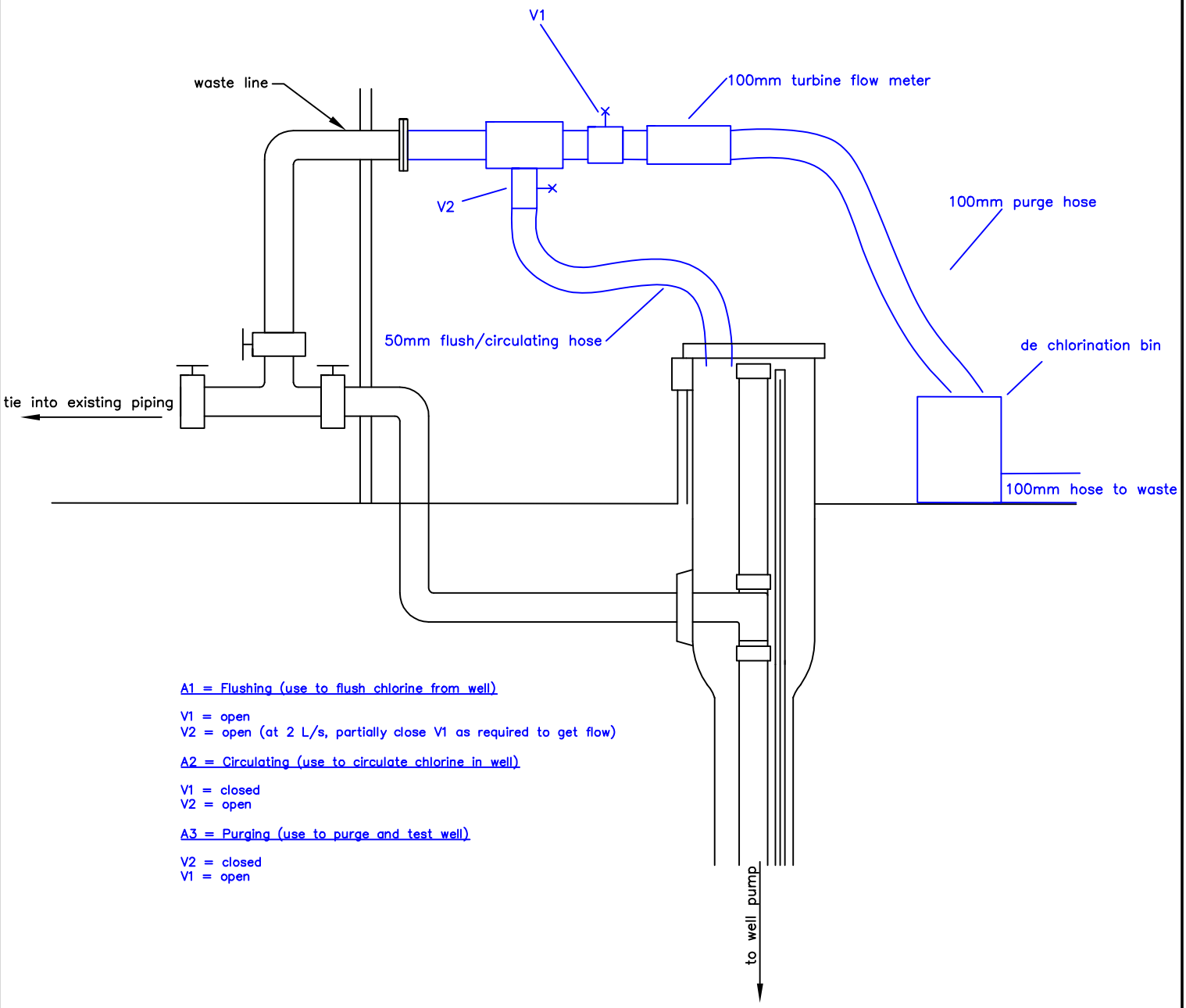
FIGURES

Temporary Purge/Flush/Circulating Assembly



A1 = Flushing (use to flush chlorine from well)

V1 = open
V2 = open (at 2 L/s, partially close V1 as required to get flow)

A2 = Circulating (use to circulate chlorine in well)

V1 = closed
V2 = open

A3 = Purging (use to purge and test well)

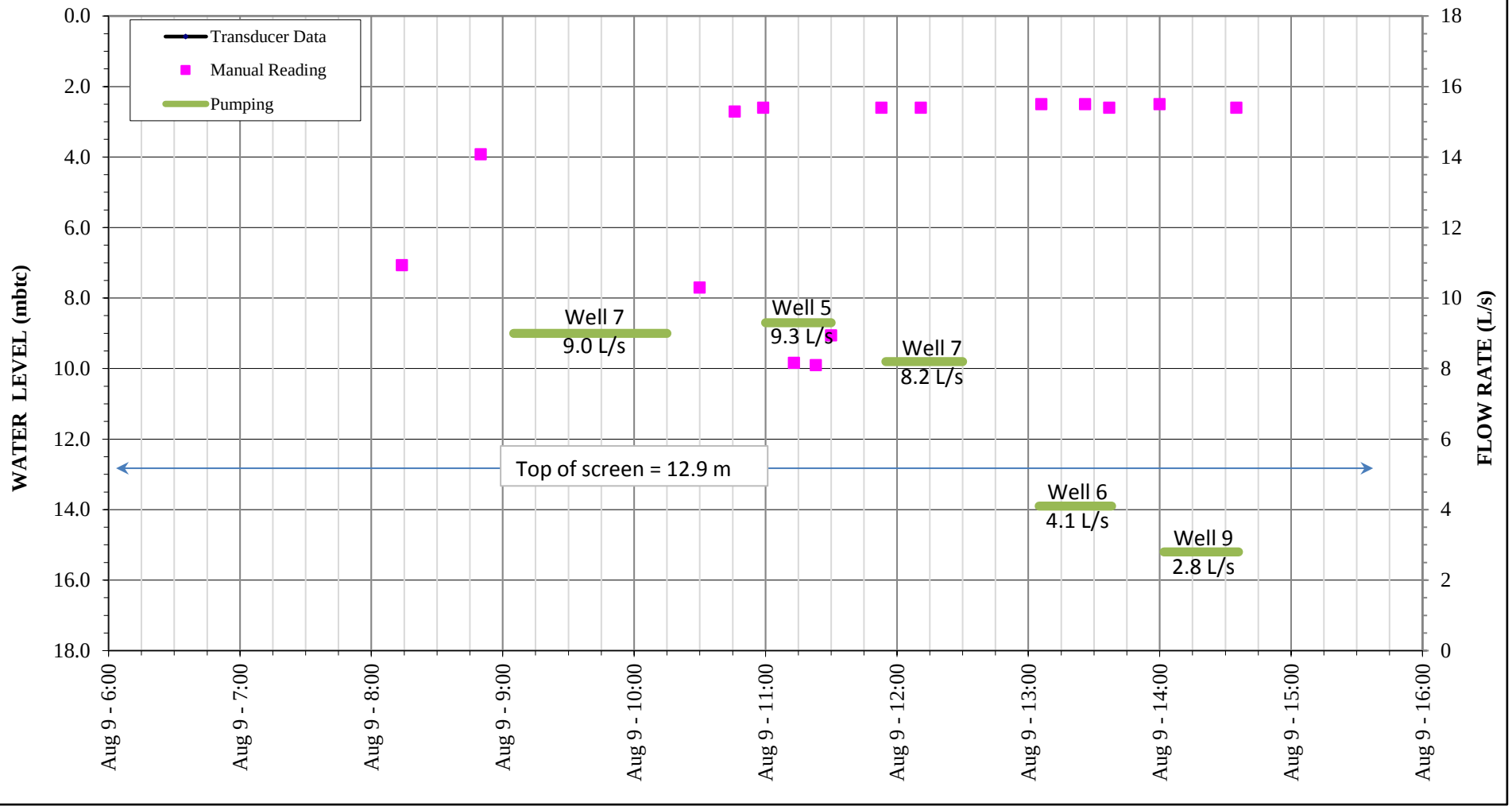
V2 = closed
V1 = open

Lotowater TECHNICAL SERVICES INC.

CLIENT: BLIND RIVER

TITLE: WELL 7
Well and Piping Disinfection Plan

PROJECT No. 184-013			G:\Lotowater Projects\		FIGURE 1
DESIGN	BP	2019/08/13	REVISION No. August 12, 2019	SCALE N.T.S.	
DRAWN	BP				
CHECKED					



Notes:

Measuring Point: Top of casing

Note: Wells 5, 6 & 8 pumping a combined 15 L/s approx. prior to 10:25 am after which wells shut off

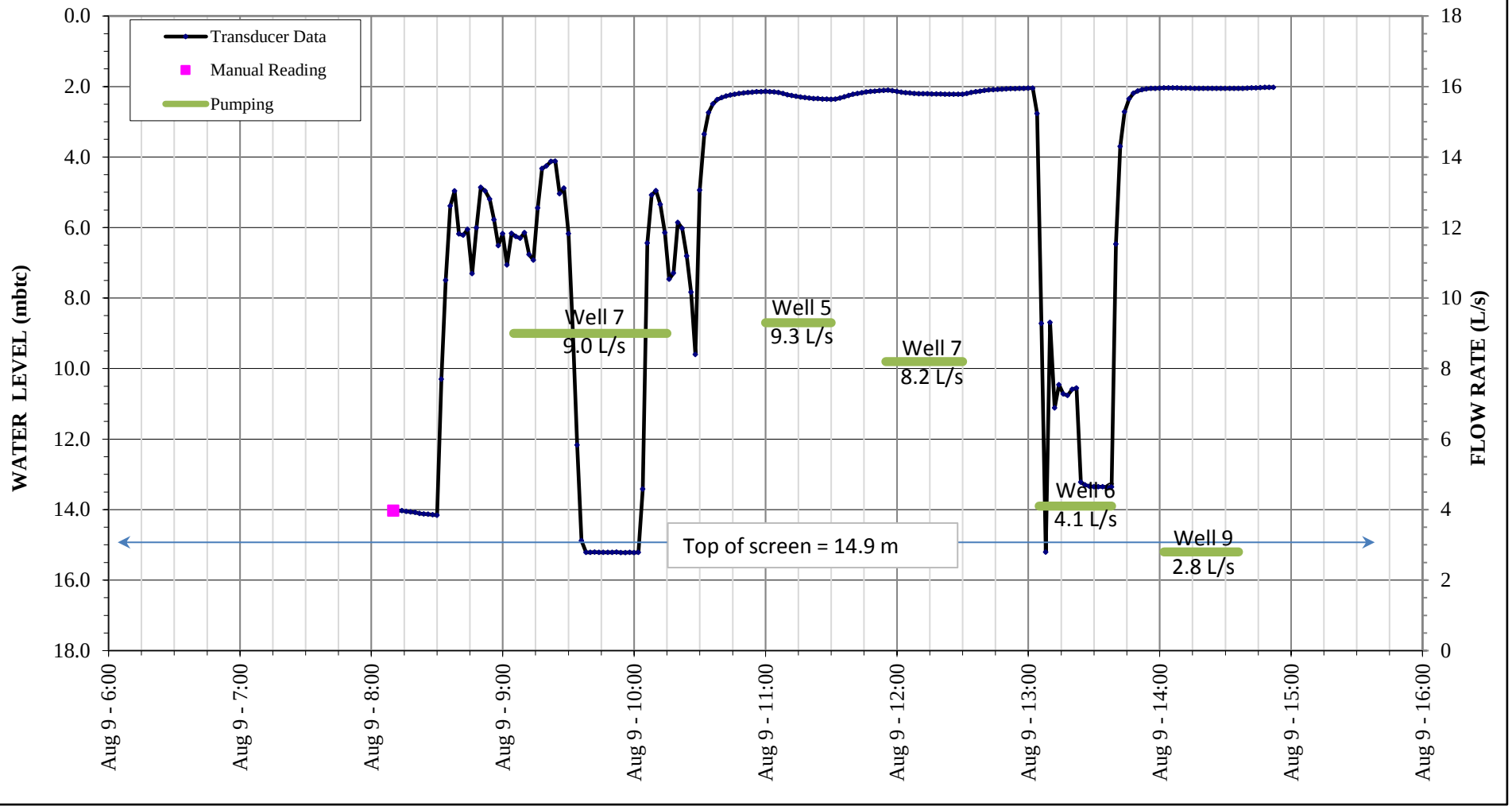
Pump inlet at 14.1 m

BLIND RIVER

Well 5 Interference Testing

Lotowater Technical Services Inc. **Figure 2**

Reference: 184-013 2019-08-12



Notes:

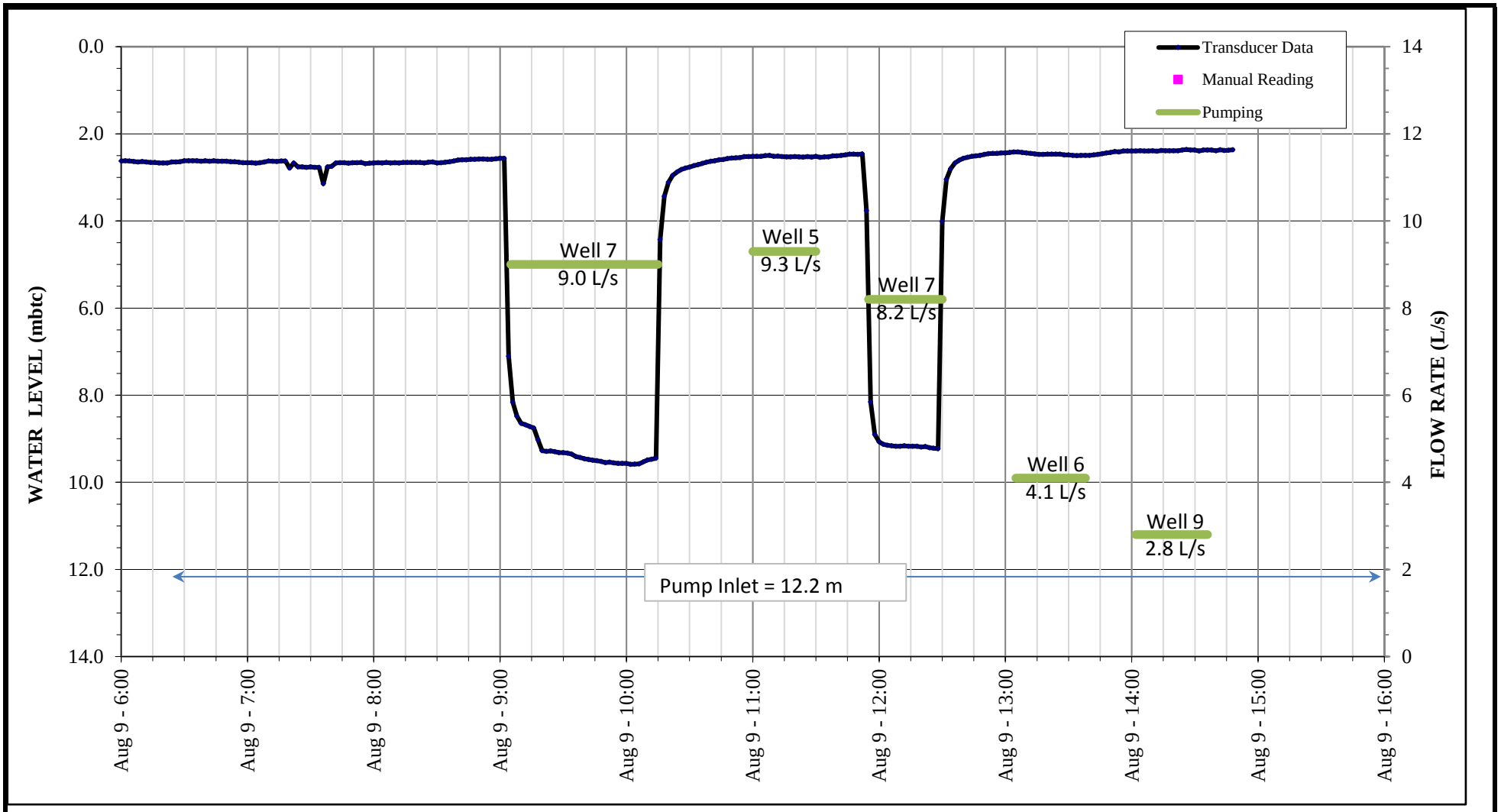
Measuring Point: Top of casing

Note: Wells 5, 6 & 8 pumping a combined 15 L/s approx. prior to 10:25 am after which wells shut off
Pump Inlet at 16.0 m

BLIND RIVER

Well 6 Interference Testing

Lotowater Technical Services Inc. **Figure 3**
Reference: 184-013 2019-08-12



Notes:

Measuring Point: Top of casing

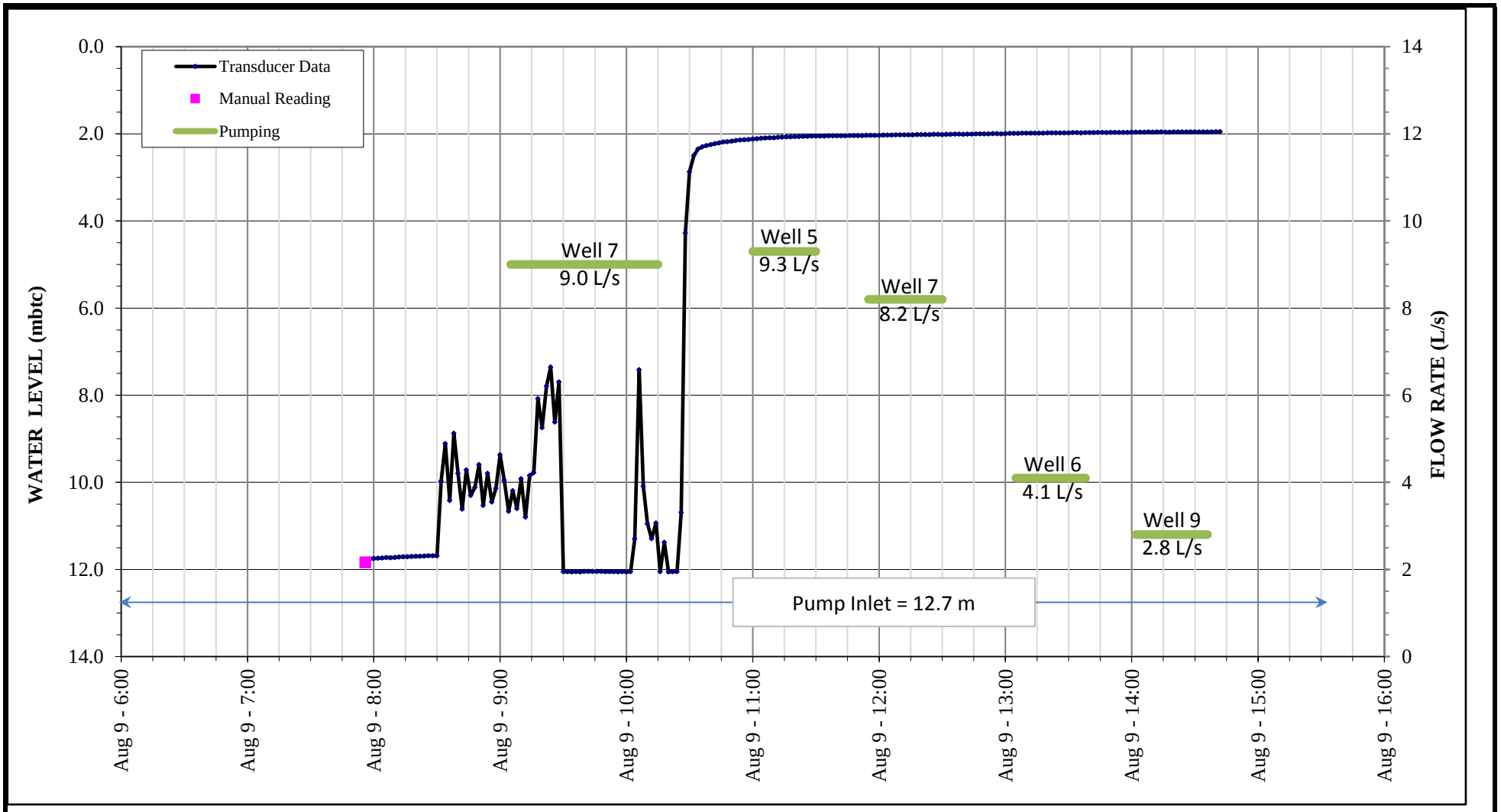
Note: Wells 5, 6 & 8 pumping a combined 15 L/s approx. prior to 10:25 am after which wells shut off

BLIND RIVER

Well 7 Interference Testing

Lotowater Technical Services Inc. **Figure 4**

Reference: 184-013 2019-08-12



Notes:

Measuring Point: Top of casing

Note: Wells 5, 6 & 8 pumping a combined 15 L/s approx. prior to 10:25 am after which wells shut off

Well 8 operating at a varying flow around 6.5 L/s prior to shut down at 10:25

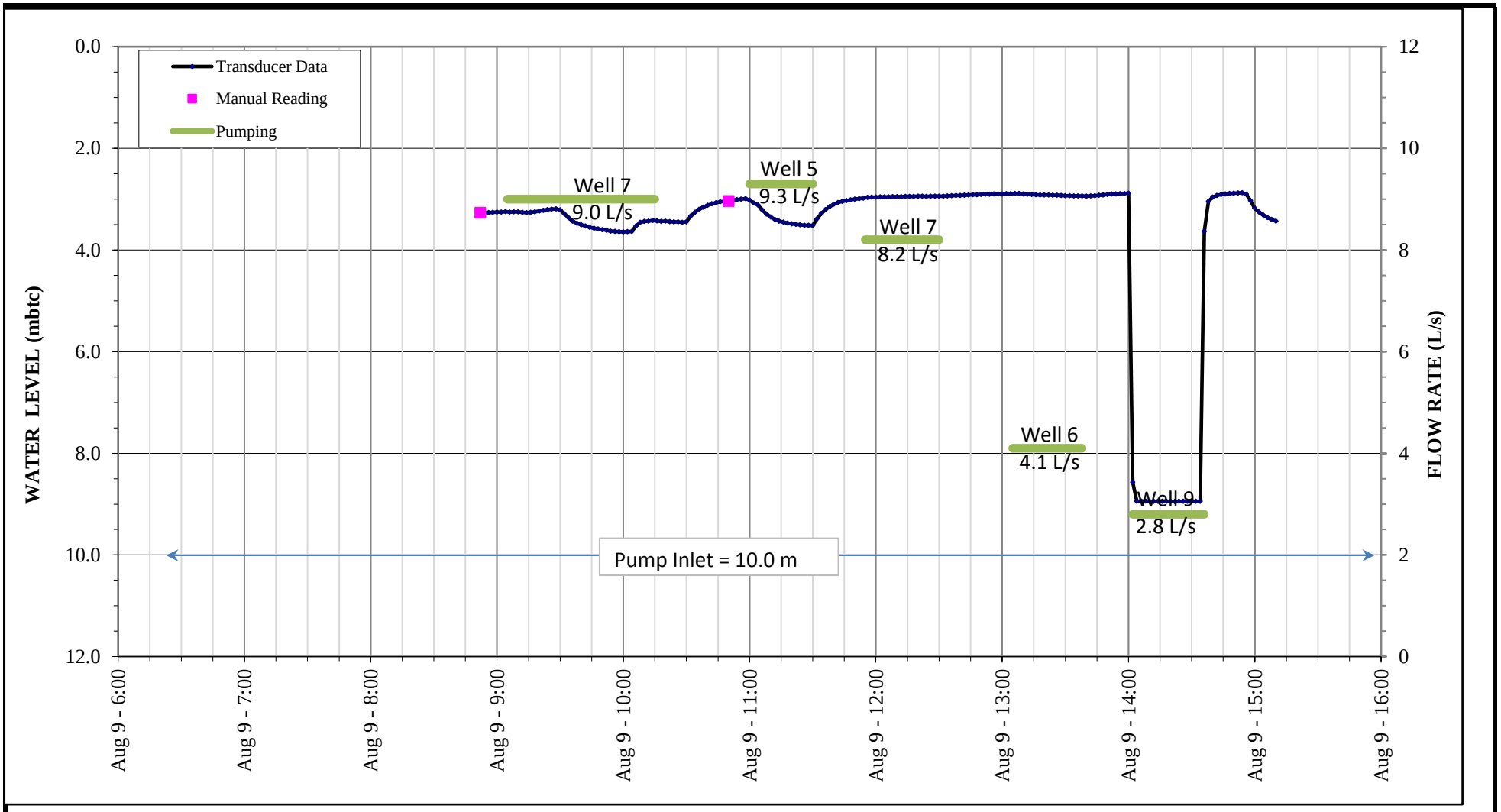
Top of screen 13.3 m

BLIND RIVER

Well 8 Interference Testing

Lotowater Technical Services Inc. **Figure 5**

Reference: 184-013 2019-08-12



Notes:

Measuring Point: Top of casing

Note: Wells 5, 6 & 8 pumping a combined 15 L/s approx. prior to 10:25 am after which wells shut off

Top of screen 12.0 m

BLIND RIVER

Well 9 Interference Testing

Lotowater Technical Services Inc. **Figure 6**

Reference: 184-013 2019-08-12

ATTACHMENT

Sterilene Specification Sheet

DESIGN WATER
TECHNOLOGIES

The new chlorine

get rid of
iron bacteria!
...coliform too!

Product Specification Sheet

Product Description
Sterilene is a 55% available chlorine for usage in one time chlorination in wells and pipelines.

Market Advantages
Sterilene is a sodium based, granular chlorine that does not require a control of pH using vinegar or acid to make it effective. Sterilene is far more effective than any other standard chlorine (liquid sodium hypochlorite or calcium hypochlorite) at a competitive price. This means a lower cost, no premixing, and far less failures. Sterilene is NSF 60 Certified.

Sterilene is non-oxidative which means, 1. it will not cause corrosion. 2. there are no corrosive fumes during usage. 3. it will not oxidize soluble minerals in water, causing discoloration. 4. there will be far less obtrusive, chlorine odors. 5. there are no shipping or storage concerns. Ships Class 55, non-corrosive and non-oxidative.

It is granular product but mixes easily, even in cold water with no maximum saturation point. Sterilene does not have a shelf life which means the product remains stable over time. It is available in 8.5 lb containers with a measuring cap, in 50 lb containers with a measuring cup, and in 8 oz Retail Tubs, for resale to domestic clients. Free technical help is available if you have 3 failures using Sterilene correctly. More professional ..... better answers.

Product Usage
Good method: You can mix 2 capfuls of Sterilene into a small container and simply pour into the well. Recirculate with the pump. Pump into a system until you have a chlorine residual or can smell a chlorine odor. Let set 4-5 hours. Pump to waste until there is no chlorine residual or no chlorine odor. See Disposal.

Best method: Dosage recommendations are 100 ppm. Less than 200' of water in the well. There is a dosage chart on the 8.5 and 50 lb containers. This automatically calculates 2 volumes of the well per foot of water in the well. Multiply the footage of water in the well by this well volume. Have a mix tank at the well head with this amount of water. Start a pump, recirculate in the tank and slowly pour Sterilene into the intake of the pump for mixing. Pump or pour into the well. More than 200' of water in the well. Follow the dosage and multiply by the total footage of water. Mix in a surface tank. Set a tremie line and displace the chlorine solution in 40' increments from the bottom of the well upwards to the static level. For either condition, surge the well or recirculate chlorine with the pump. Pump into the system until a chlorine residual. Let set 4-5 hours or overnight. Pump to waste. See Disposal.

Disposal
Chlorine will kill grass and plants. If dechlorination is required, use Chlor-Oust.

Safety Information
See MSDS sheet.

5920 Covington Road, Shorewood, MN 55331 Phone 952-474-4657 • Fax 952-470-6637
Toll Free 888-437-6426 (888 4 dsn h2o) • E-mail designh2o@aol.com • www.designwater.com

BLIND RIVER WELL #8
SERVICE 2021

Prepared for:

TOWN OF BLIND RIVER

Mail: P.O. Box 451, Paris ON N3L 3T5
Office: 92 Scott Avenue, Paris ON N3L 3R1
Phone: (519) 442-2086
Fax: (519) 442-7242

Lotowater
TECHNICAL SERVICES INC.

Date: September 24, 2021

Reference: 184-014

TOWN OF BLIND RIVER

BLIND RIVER WELL #8 SERVICE 2021

TABLES

FIGURES

APPENDIX

Lotowater
TECHNICAL SERVICES INC.

P.O. Box 451
Paris, ON N3L 3T5

92 Scott Avenue
Paris, ON N3L 3R1
T (519) 442-2086
T (800) 923-6923
F (519) 442 7242
www.lotowater.com

September 24, 2021

Reference: 184-014

TULLOCH Engineering Inc.
200 Main St.
Thessalon, Ontario
P0R 1L0

Attention: Chris Kirby, P. Eng.

SUBJECT: BLIND RIVER WELL #8 SERVICE (2021)

This report documents the work performed by Lotowater Technical Services Inc. (LTS) at Blind River Well #8. The service program included visual pumping equipment inspection, well rehabilitation, video surveys and well performance testing. This work was completed August 23 – 26, 2021.

BACKGROUND

Blind River Well #8 was constructed in 1991 with a 500 mm (20") diameter outer steel casing that terminates at an unknown depth. The 250 mm (10") diameter inner steel well casing is set to a depth of 13.3 m. The remainder of the well is screened with a #25 slot stainless steel screen to a depth of 21.4 m.

The well is currently equipped with a Grundfos 230S150 – 4 stage submersible pump coupled with a Franklin 15 horsepower motor.

The well operates under Permit to Take Water #3410-BV7S4M which allows a maximum taking of 18.94 L/s (1637 m^3/day). The well has not operated at this rate for years due to persistent plugging which is common to all the Blind River wells and necessitates frequent rehabilitation. Although rehabilitations are effective at increasing performance, they do not fully restore the well to the original as-constructed condition, such that over time it becomes less and less productive. Well 8 was last rehabilitated in 2015.

PRE-REHABILITATION TESTING

A pre-rehabilitation variable rate performance test was attempted August 23, 2021, and was planned to be conducted at 3.8, 7.6 and 10 L/s. The pump broke suction immediately at the 3.8 L/s rate and attempts to run at a lower rate with the existing equipment were unsuccessful. To collect some pre-rehabilitation data, a 30 minute test was completed with a small capacity pump

at 0.6 L/s. The results of this test are presented in **Table 1** and are shown graphically with historical test results on **Figure 1**. The data indicated the well performance has declined significantly and required rehabilitation.

PRE-REHABILITATION VIDEO SURVEY

A pre-rehabilitation static video was completed August 23, 2021, with significant well construction details noted in **Table 2**. A DVD copy of the video has been enclosed with the original hard copy of this report. The video showed the upper portions of the well screen were moderately impacted by biological fouling (**Photos 1 – 3**) The video also showed sediment at the bottom of the well (**Photo 4**). The well required cleaning to remove this buildup.

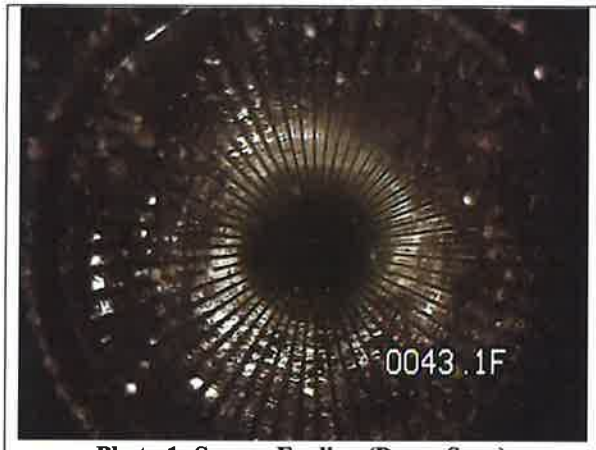


Photo 1: Screen Fouling (Down-Scan)

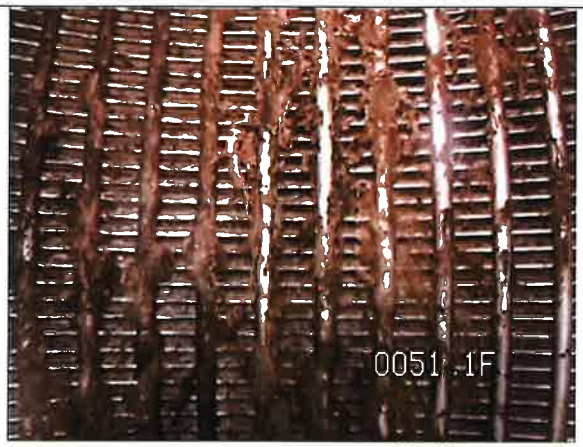


Photo 2: Moderate Screen Fouling

Photo 3: Biological Fouling

Photo 4: Sediment on Bottom

WELL REHABILITATION

To rehabilitate the well, an inflatable packer was installed to isolate the screened interval of the well. Afterwards, an airlift assembly was installed in the well; allowing the screened interval to be airlift pumped and surged to remove loose fouling material from the bottom of the well and screen interior.

After the discharge cleared from this initial cleaning, 300 L of acid was injected into the screened interval. This solution was air displacement surged out through the screen to the surrounding formation and gravel pack before being left in the well overnight to react. The following day, the spent solution was removed from the well and neutralized in a storage bin before being hauled offsite for disposal. The well was airlift pumped and surged until the well started producing clear water.

The final step of the rehabilitation involved installing a rubber surge block in the well to scrub the casing. After the casing was cleaned, the surge block was advanced to the bottom of the well and an airlift was set up to vacuum out any accumulated sediment / casing flake. The surge block was then moved up and down the screen interval while airlift pumping to flush fine material from the surrounding gravel pack until the discharge was clear and sediment free.

PUMPING EQUIPMENT INSPECTION

The pumping equipment was removed (**Photos 5 and 6**), cleaned and visually inspected on-site. It was found to be in decent condition for re-installation.

Photo 5: Pump Removal

Photo 6: Fouling on Pump

POST-REHABILITATION VIDEO SURVEY

A post-rehabilitation static video was completed August 25, 2021, with significant features noted in the video summary in **Table 3**. The video indicated the casing was in satisfactory condition. The casing and screen were successfully cleaned with no significant amount of fouling remaining (**Photos 7 - 9**). The sediment at the bottom of the well was removed (**Photo 10**).

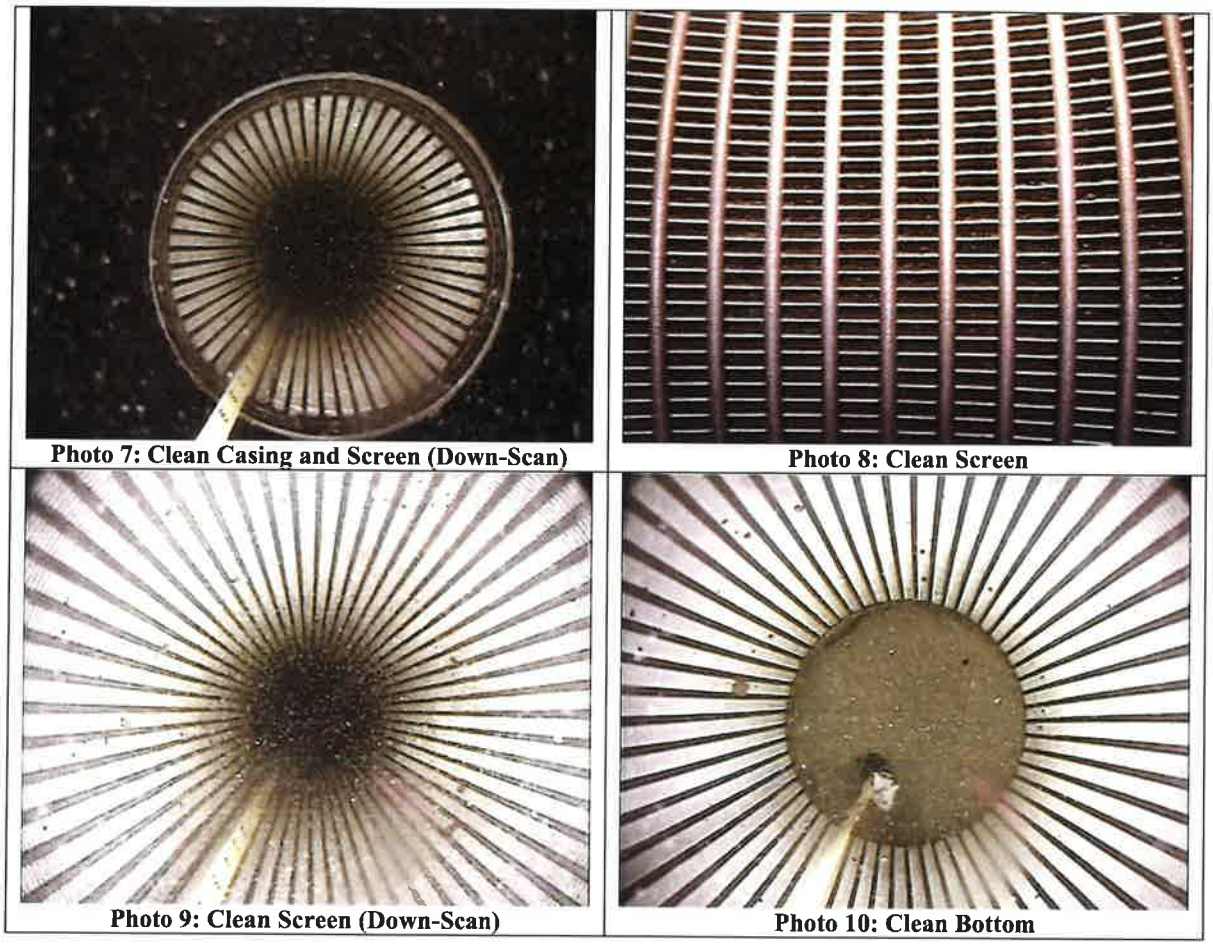


Photo 7: Clean Casing and Screen (Down-Scan)

Photo 8: Clean Screen

Photo 9: Clean Screen (Down-Scan)

Photo 10: Clean Bottom

POST-REHABILITATION TESTING

A post-rehabilitation well performance test was conducted on August 26, 2021, at 3.8 and 7.6 L/s. The data collected is provided in **Table 4** and was plotted graphically and compared against historical pumping levels on **Figure 1**. The post-rehabilitation test results indicate well performance has increased when compared to the pre-rehabilitation test.

Pump performance data was collected during the step test. The data can be found in **Table 5** and indicates the pump is performing below the manufacturer's stated performance curve. The motor is working satisfactorily at this time.

A pump installation drawing is included as **Figure 2**, and a well disinfection record is included in **Appendix A**.

CONCLUSIONS AND RECOMMENDATIONS

The final video inspection indicated the well rehabilitation had successfully removed the biological fouling from the screen section of the well. The video showed the casing to be in good condition with no obvious holes or deficiencies.

The pumping equipment is operating below the manufacturers' stated performance curve. During the next scheduled service, we recommend a more involved assessment that would require that we transport the equipment back to our shop to disassemble and inspect the pump. The motor is performing satisfactorily.

We recommend installing a strand of 25 mm PVC flush joint (capped and slotted) to the top of the pump for the water level transmitter. This will ensure the transmitter will not get sucked up into the pump.

The well performance has declined from a maximum short-term yield of 11 L/s to approximately 9 L/s. The well is operating at 32% of the as-constructed level. It is expected the well performance will continue to decline to a point where it will not meet minimum system requirements. More frequent and intense rehabilitation efforts may stave off such declines, but it is unlikely that they will ever fully restore, or even stop the decline. A replacement well program should therefore be implemented along with the rehabilitation program to maintain this well field's capacity at functioning levels.

The Town of Blind River should continue to collect pumping information, such as well water levels, flow rates and discharge pressure. This information should be reviewed annually by a qualified well professional to assess the well and pump performance. The data can also be used to provide guidance on optimal well pumping rates.

It has been a pleasure working with the Town of Blind River on this project. Please contact the undersigned if there are any questions.

Yours sincerely,
Lotowater Technical Services Inc.

Rodney Secor, A.Sc.T.
Project Manager

Bill Beaton, P.Eng.
Senior Project Manager

L:\Lotowater Projects\184 Blind River\014 2021 Rehabilitation Wells 5 & 8\9. Reports\Well 8\Blind River Well 8 Report.docx

TABLES

TABLE 1

VARIABLE RATE PERFORMANCE TEST
Pre-Rehabilitation

Lotowater TECHNICAL SERVICES INC.

Well Name:	Well #8	**Project Number:**	184-014
Client:	Town of Blind River	**Date:**	2021-08-23
Technician Name:	Alex O'Hearn	**Pump:**	LTS test pump
Water Level Device:	LTS water level meter	**Pump Inlet:**	12.4 m
Water Level Reference:	Top of casing	**Flow Measuring Device:**	Time to fill known volume
Test Note:	Client's pump broke suction at 3.8 L/s and could not be valved back to a suitable rate		

Time *hr:min*	Elapsed Time *min*	Level *mbBP*	Drawdown *m*	Flow *L/s*	Note
0:00	0	2.34	0.00	0.6	Start Step 1
0:01	1	2.86	0.52	0.6	
0:02	2	3.22	0.88	0.6	
0:03	3	3.60	1.26	0.6	
0:04	4	3.91	1.57	0.6	
0:05	5	4.15	1.81	0.6	
0:06	6	4.35	2.01	0.6	
0:08	8	4.71	2.37	0.6	
0:10	10	4.94	2.60	0.6	
0:12	12	5.12	2.78	0.6	
0:15	15	5.23	2.89	0.6	
0:20	20	5.35	3.01	0.6	
0:25	25	5.40	3.06	0.6	
0:30	30	5.42	3.08	0.6	

TABLE 2

Town of Blind River

Well #8
Pre-Rehabilitation Static Video Summary
2021/08/23

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	2.8'	0.9	Below top of casing
0:00	6.1'	1.9	Static water level
0:01	9'	2.7	Install sample pump to clear image
0:12	12'	3.7	Pump breaking suction, lower pump
1:22	43.7'	13.3	Bottom of casing
1:24	56.7'	17.3	Screen joint
1:25	70.4'	21.5	Bottom of well
1:30	57.1'	17.4	Screen joint
1:31	56.3'	17.2	Buildup behind screen
1:32	52.7'	16.1	Fouling on screen
1:33	50.4'	15.4	Buildup behind screen
1:35	45'	13.7	Buildup behind screen
1:37	44.1'	13.4	Top of screen
1:37	41.8'	12.7	Exposed casing
1:38	40.7'	12.4	Blisters on casing
1:45	12.4'	3.8	Water level
1:46	7.6'	2.3	Pitless adapter
1:47	2.8'	0.9	Below top of casing

Video survey conducted by Arthur Krzysko

Note: Measuring point (MP) is top of flange which is 0.65 m above ground surface

TABLE 3

Town of Blind River

Well #8
Post-Rehabilitation Static Video Summary
2021/08/25

Elapsed Time (h:min)	Depth (ft below MP)	Depth (m below MP)	Comments
0:00	Camara depth counter malfunctioned		Below top of casing
0:26	(Please see Pre-Rehabilitation video summary		Set sample pump to clear image
0:46	for approximate depths)		Bottom of casing
0:48			Screen joint
0:49			Bottom of well, some sediment
0:54			Screen joint
1:00			Top of screen
1:16			Screen joint
1:21			Water level
1:23			Casing joint
1:24			Pitless adapter
1:25			Below top of casing

Video survey conducted by Arthur Krzysko

Notes: Measuring point (MP) is top of flange which is 0.65 m above ground surface
Camera depth counter stopped working prior to the video

TABLE 4

VARIABLE RATE PERFORMANCE TEST
Post-Rehabilitation

Lotowater TECHNICAL SERVICES INC.

Well Name:	Well #8	**Project Number:**	184-014
Client:	Town of Blind River	**Date:**	2021-08-23
Technician Name:	Alex O'Hearn	**Pump:**	Client's pump
Water Level Device:	LTS water level meter	**Pump Inlet:**	12.4 m
Water Level Reference:	Top of casing	**Flow Measuring Device:**	LTS flow meter
Test Note:			

Time *hr:min*	Elapsed Time *min*	Level *mbBP*	Drawdown *m*	Flow *L/s*	Note
0:00	0	1.77	0.00	3.8	Start Step 1
0:01	1	6.17	4.40	3.8	
0:02	2	6.26	4.49	3.8	
0:03	3	6.32	4.55	3.8	
0:04	4	6.34	4.57	3.8	
0:05	5	6.36	4.59	3.8	
0:06	6	6.37	4.60	3.8	
0:08	8	6.38	4.61	3.8	
0:10	10	6.39	4.62	3.8	
0:12	12	6.40	4.63	3.8	
0:15	15	6.41	4.64	3.8	
0:20	20	6.43	4.66	3.8	Amps (L1 = 13.65, L2 = 12.41, L3 = 13.57)
0:25	25	6.45	4.68	3.8	
0:30	30	6.46	4.69	3.8	Pressure = 91 psi
0:31	1	9.14	7.37	7.6	Start Step 1
0:32	2	9.79	8.02	7.6	
0:33	3	10.11	8.34	7.6	
0:34	4	10.49	8.72	7.6	
0:35	5	11.12	9.35	7.6	
0:36	6	11.60	9.83	7.6	
0:38	8	11.64	9.87	7.6	
0:40	10	11.66	9.89	7.6	
0:42	12	11.66	9.89	7.6	
0:45	15	11.67	9.90	7.6	
0:50	20	11.68	9.91	7.6	
0:55	25	11.66	9.89	7.6	Flow rate adjusted
1:00	30	11.65	9.88	7.6	Pressure = 66 psi

TABLE 5

Submersible Pump & Motor Installation Test Record

Project # 184-014

Well Name: Well #8
Client: Town of Blind River
Test Date: August 26, 2021
Notes By: Alex O'Hearn

Flow Measurement: LTS flow meter
Water Level Ref: Top of casing
Pressure Gauges: LTS pressure gauge
Level Measurement: LTS water level meter

Well

Well Diameter: 250 mm **Well Depth:** 21.4 m **Static Water Level:** 1.77 m

Pump

Make: Grundfos **Bowl Length:** 0.7 m **Diam:** Full **Stage:** 4
Model: 230S150-4 **Bowl Diameter:** 140 mm **Type:** Stainless steel
Serial #: 12360004 P11625 **Notes:**

Pipe

Diameter: 75 mm **Type:** Steel **Total Length:** 9.4 m
Suction Intake: 12.4 m **Notes:** Pitless depth = 2.3 m

Motor & Wiring

Make: Franklin
Model: 2366238120
Serial #: 16E19-09-06121A
HP: 15 **Volts:** 575 **Phase:** 3
FL Amps: 16.6 **SF Amps:** 19.0 **RPM:** 3450

Wire Type: TWU **Gauge:** #10-4 **Length:** 13.0 m

Overloads:
Surge Arrestor:
Notes: Motor length = 0.71 m

Winding Resistance Test

	L1-L2	L1-L3	L2-L3	
In Well:	n/a	n/a	n/a	ohms
Out of Well:	n/a	n/a	n/a	ohms

Insulation Resistance Test

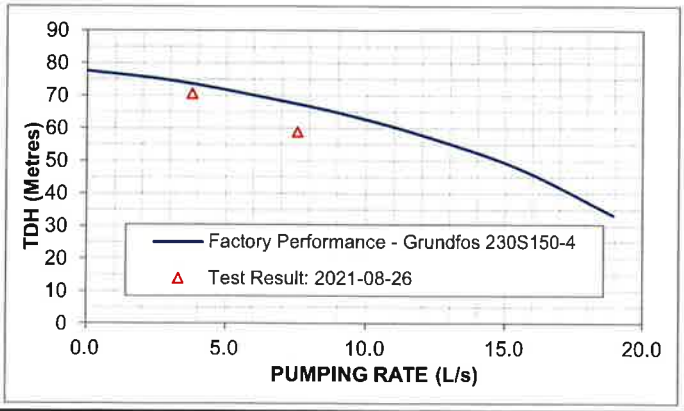
	L1-G	L2-G	L3-G	
In Well:	n/a	n/a	n/a	Mohms
Out of Well:	n/a	n/a	n/a	Mohms

Voltage Test

	Static	Load
L1-L2:	na	na
L1-L3:	na	na
L2-L3:	na	na

Test Data

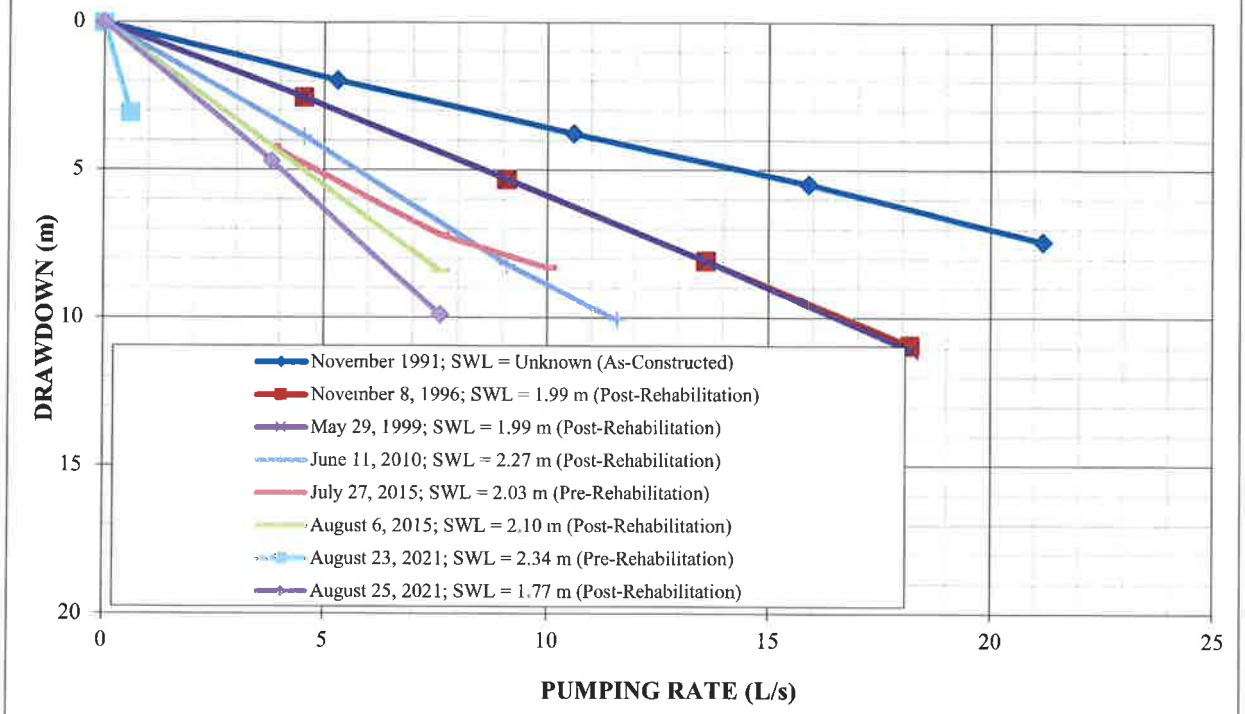
Q L/s	WL mbmp	Pres psi	FL m	TDH m	L1 amps	L2 amps	L3 amps	Avg amps	Current unbalance	% FL Amps
0.0	1.77									
3.8	6.46	91	0.25	70.8	13.7	12.4	13.6	13.2	6.1%	79.6%
7.6	11.65	66	0.91	59.0				#DIV/0!	#DIV/0!	#DIV/0!

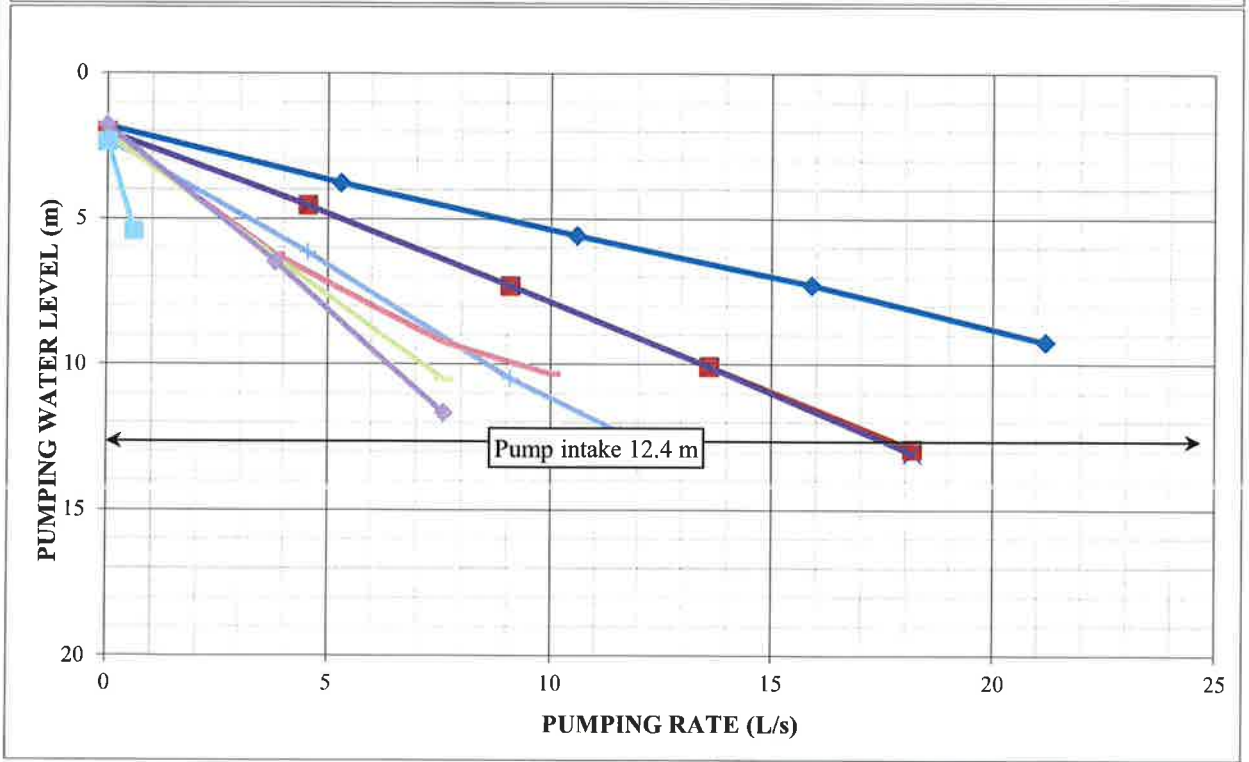


Notes:
Water Level Transmitter
Make: Endress-Hauser
Model: Water Pilot FMX167
Serial #: 9C01B40108E
Set to 11.7 m

Lotowater
TECHNICAL SERVICES INC.
92 SCOTT AVENUE T (519) 442-2086
PARIS, ON N3L 3R1 F (519) 442-7242
www.lotowater.com

FIGURES





Notes:

All water levels are referenced from top of casing
Top of screen at 13.3 m below top of casing
Top of casing = 0.65 m above ground surface
Pumping duration = 30 minute steps

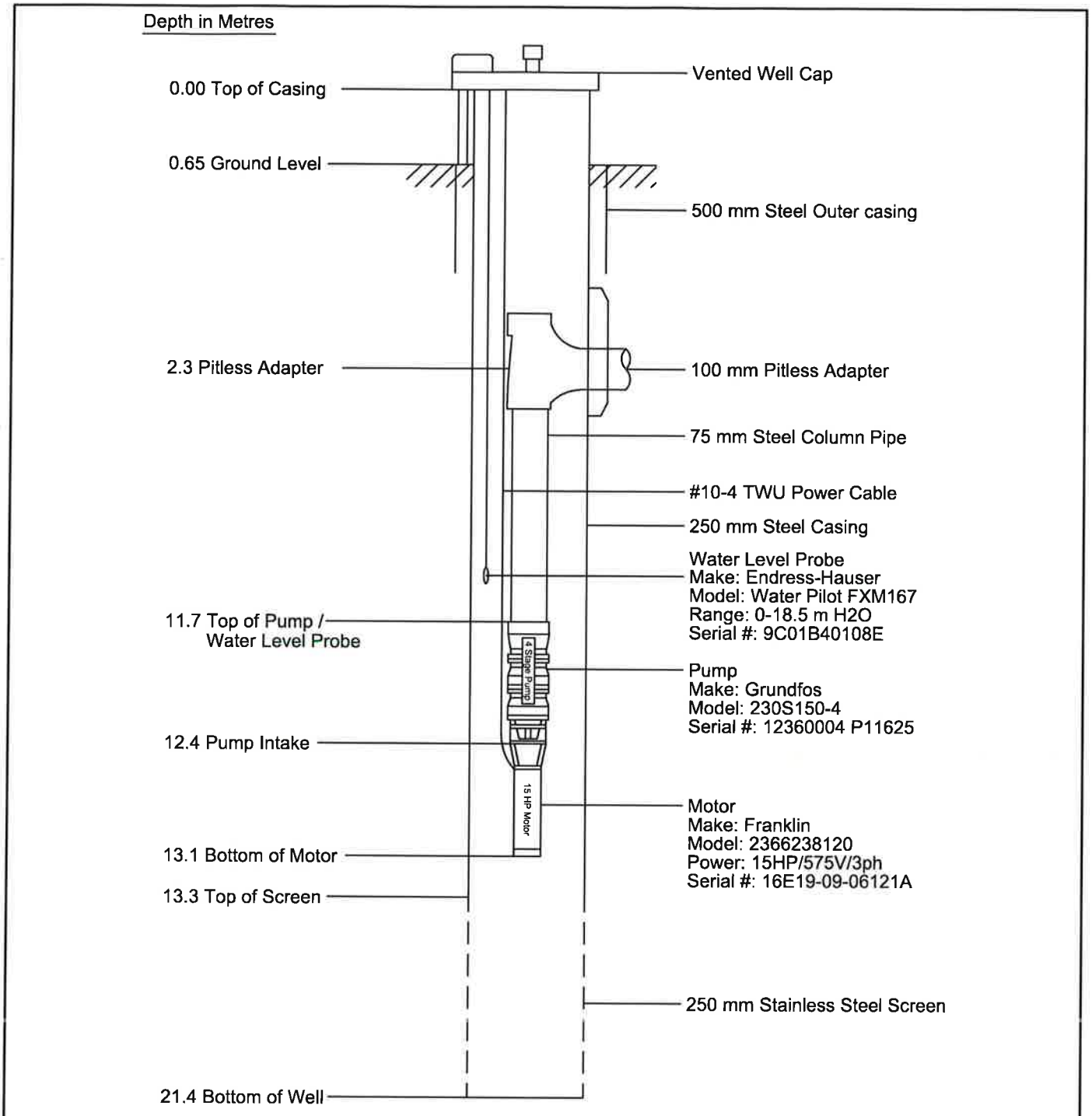
Town of Blind River

Well #8

Comparison of Variable Rate Tests

Lotowater Technical Services Inc. **Figure 1**

Reference: 184-014 2021-08-26



Lotowater
TECHNICAL SERVICES INC.

CLIENT
TOWN OF BLIND RIVER

TITLE
WELL #8
PUMP INSTALLATION DRAWING

PROJECT #:	184-014	L:\...\184 Blind River\014 2021 Rehabilitation Wells 5 & 8\7. Technical\Well 8			
DESIGN			REVISION No.	SCALE	FIGURE
DRAWN	EH	2015/08/19	2021-09-15	N.T.S	2
CHECKED	BB	2021/09/20			

APPENDIX A

Well Disinfection Record

APPENDIX A

Well Disinfection Record

Well Name:	Well #8
Client:	Town of Blind River
Project #:	184-014
Disinfected By:	Alex O'Hearn
LTS Chlorination Worksheet Used:	Yes
Treatment Volume:	1,047 **Litres**
Desired Concentration:	150 **ppm**
Volume of Mixing Water:	N/A **Litres**
Qty of Sterilene Needed (granular 55%):	285.54 **grams**
Type and Quantity of Chlorine Used:	300 g of Sterilene
Date and Time Chlorine Added:	2021-08-25 12:00
Chlorine Residual Measured at Surface:	190 ppm
Chlorine Residual Measurement Method:	Test strip
Date & Time Chlorine Purged:	2021-08-26 6:00
Pre-Purge Chlorine Residual Measured at Surface:	150 ppm
Chlorine Residual Measurement Method:	Test strip
Purged By:	Alex O'Hearn
Purged To:	Waste
Quantity and Type of Dechlorinating Agent Used:	ChlorOust and D-Chlor pucks
Minutes of Pumping until Zero Free Chlorine Residual:	15 minutes
Final Turbidity Measurement (NTU):	N/A
Notes on Disinfection:	Circulate with test pump set to bottom of well

Lotowater
TECHNICAL SERVICES INC.

92 SCOTT AVENUE T (519) 442-2086
PARIS, ON N3L 3R1 F (519) 442-7242
www.lotowater.com

CONTRACT NO. 23-0803
Corporation of the Town of Blind River
Request for Proposal - Well Rehabilitation 2023
Schedule of Items and Prices

Item No.	Description	Item Quantity	Item Units	Unit Cost	Item Cost
1	Mobilization/Demobilization	Lump Sum			$
2	Well Head Preparation	2	ea.	$	$
3	Remove and Re-Install Pumping Equipment	2	ea.	$	$
4	Pre- and Post-Rehabilitation Downhole Camera Inspection	2	ea.	$	$
5	Contractor Defined Well Rehabilitation Program	2	ea.	$	$
6	Pre- and Post-Rehabilitation Stop-Start Pump Tests	2	ea.	$	$
7	Pre- and Post-Rehabilitation Variable Rate Specific Capacity Tests	2	ea.	$	$
8	Maintenance Operations and Installation of 25mm PVC Flush Strand - Well #8	1	ea.	$	$
9	Contingency	Lump Sum			$ 5,000.00
Definitions: ea. – each				Proposal Value	$
				HST (13%)	$
				Total Proposal Price	$

ADDENDA: We agree that we have received addenda ____ to ____ inclusive, and the Proposal Price includes the provisions set out in such addenda.

AGREEMENT BETWEEN OWNER & CONTRACTOR
WELL #6 and WELL #7 REHABILITATION AND MAINTENANCE OF WELL #8

THIS AGREEMENT made ON THE ____ Day of _____ **2023**

by and between:

_____

_____
(hereinafter called the "Owner")

and

_____

_____
(hereinafter called the "Contractor")

The Owner and the Contractor agree as follows:

ARTICLE 1 - THE WORK

A general description of the work is:

(a) Conduct works necessary to implement a well rehabilitation for Well #6 and #7 as well as the described maintenance work for Well #8.

(b) The Contractor shall, for the prices set out in Schedule A of the Proposal and except as otherwise specifically detailed in the RFP provide at no additional cost to the Owner all and every kind of labour, machinery, materials, appliances, articles and things necessary for the due execution and completion of all the work set out in these Contract Documents and shall forthwith according to the instructions of the Engineer, commence the works and diligently execute the respective portions thereof, and deliver the works complete in every particular to the Owner within the time specified in the Contract Documents.

ARTICLE 2 - CONFLICT

In case of any inconsistency or conflict between the provisions of this Agreement, the Contract Documents and the Proponents Proposal, the Provisions of such documents shall take precedence and govern as detailed following:

(a) Agreement
(b) Addenda
(c) Request for Proposal
(d) Proponents Proposal

ARTICLE 3 - AMENDMENTS

The Contract may be amended from time to time, as agreed to by the Proponent and the Town.

ARTICLE 4 - CONTRACT PRICE

The Owner covenants with the Contractor that the Contractor having in all respects complied with the provisions of this Contract, will be paid for and in respect of the work the sum of**:**

_____ ($_____)

and subject to such additions and deductions as may properly be made under the terms hereof, subject to the provision that the Owner may make payments on account monthly or otherwise agreed upon.

ARTICLE 5 - ADDRESSES FOR NOTICES

Notices in writing between the parties or between them and the Engineer shall be considered to have been received by the addressee on the date of delivery if delivered to the individual, or to a member of the firm, or to an officer of the corporation for whom they are intended by hand or by registered post; or if sent by regular post, to have been delivered within 5 Working Days of the date of mailing when addressed as follows:

The Owner at **Corporation of the Town of Blind River**
Owner's Name

11 Hudson Street
Street and Number and Postal Box Number if Applicable

Blind River, ON P0R 1B0
Post Office or District, Province, Postal Code

The Contractor at _____
Contractor's Name

_____
Street and Number and Postal Box Number if Applicable

_____
Post Office or District, Province, Postal Code

The Engineer at **TULLOCH Engineering Inc.**
Owner's Name

200 Main Street
Street and Number and Postal Box Number if Applicable

Thessalon, ON P0R 1L0
Post Office or District, Province, Postal Code

ARTICLE 6 - CONTRACT DOCUMENTS

A copy of each of the Request for Proposal and Proponents Proposal, hereto annexed are made part of this Contract as fully to all intents and purposes as though recited in full herein.

ARTICLE 7 - EXPRESSED COVENANTS

No implied contract of any kind whatsoever by or on behalf of the Owner shall arise or be implied by or inferred from anything in this Contract contained, nor from any position or situation of the parties at any time, it being clearly understood that the express covenants and agreements herein contained made by the Owner shall be the only covenants and agreements upon which any rights against the Owner may be founded.

ARTICLE 8 – CONTRACTOR'S RESPONSIBILITY

The Proponent declares that during the preparation of this Proposal and in entering into this Contract they have either investigated the character of the work and all local conditions that might affect the price or his acceptance or performance of the work, or that not having so investigated, acknowledges that responsibilities under the Contract are in no way reduced or limited thereby and, in either case, is willing to assume and does hereby assume all risk of conditions arising, developing, or being revealed in the course of the work which might or could make the work, or any items thereof, more expensive in character, or more onerous to fulfill, than was contemplated or known when the tender was made or the Contract signed. The Contractor also declares that he did not and does not rely upon information furnished by any methods whatsoever by the Owner or its officers, employees or agents, being aware that any information from such sources was and is approximate and speculative only, and was not in any manner warranted or guaranteed by the Owner.

ARTICLE 11 - SUCCESSION

The Contract shall apply to and be binding on the parties hereto and their successors, administrators, executors and assigns and each of them.

IN WITNESS WHEREOF the parties hereto have hereunto set their hands and seals the day and year first above written or caused their corporate seals to be affixed, attested by the signature of their proper officers, as the case may be.

SIGNED AND DELIVERED
in the presence of:

OWNER

Owner's name

signature

name and title of person signing

WITNESS

signature

name and title of person signing

signature

name and title of person signing

CONTRACTOR

Contractor's name

signature

name and title of person signing

WITNESS

signature

name and title of person signing

signature

name and title of person signing