

Appendix A

Loudoun and Virginia Department of Health Correspondence



Loudoun County, Virginia

Department of Building and Development
1 Harrison Street, S. E., Leesburg, VA 20177-7000
Administration: 703/777-0397 Fax: 703/771-5215

September 12, 2007

Mr. David L. Bowers, P.E.
Stantec Consulting Services Inc.
108 Church Street, S.E.
Leesburg, VA 20175-3003

Re: WAIV-2007-0111 - Request Waiver of Hydrogeologic Study Requirements for Town of Hamilton Communal Water Supply Well Located at MCPI 454-20-8349
Related Application SPEX 2007-0022 - Town of Hamilton Water Treatment Plant

Dear Mr. Bowers:

This letter is in response to your request (enclosed letter dated August 9, 2007) for a waiver of the hydrogeologic study requirements specified in section 6.240 of the Loudoun County Facilities Standards Manual (FSM). The hydrogeologic study is required for the proposed groundwater withdrawals from a new water supply well (well #14) to supplement existing water wells serving the Town of Hamilton and a planned elementary school.

Background

Production well #14 is on a 1.36 acre parcel located slightly less than one mile outside of the Town limits. During drilling and development of this well in November 2000, water level monitoring in several wells on adjacent properties showed impacts due to the water being pumped from well #14. (The wells on the adjacent property were being tested as part of a hydrogeologic study for the proposed Saddle Ridge subdivision. Those wells now serve individual lots of the subdivision as domestic water supplies.) In a meeting in February 2005, County staff informed Town officials that the planned use of well #14 would require submission and approval of a hydrogeologic study (per Loudoun County Facilities Standards Manual Chapter 6.240) since proposed groundwater withdrawals outside of the Town limits would exceed an average of 10,000 gallons per day (gpd) during any single 30 day period. A hydrogeologic study for groundwater withdrawals from well #14 was never submitted to the County. In May 2007, a Special Exception Application (SPEX-2007-0022) was accepted by the County for the associated water treatment system that the Town proposed and staff have recommended that an approved hydrogeologic study be made a special condition of approval.

The County still believes that a hydrogeologic study is the most thorough approach to determine the pumping interference between well #14 and wells on adjacent properties and to develop an effective pumping management, monitoring, and mitigation plan. However, in a meeting at the County Government Center on July 12, 2007, the County agreed that, if a plan for Pumping, Monitoring, and Mitigation (hereafter referred to as a PMM plan) were developed by the Town, submitted to the County for review, and found to be satisfactory and approved, the County would consider waiving the FSM 6.240 hydrogeologic study requirements if requested by the Town.

Comments and Decision

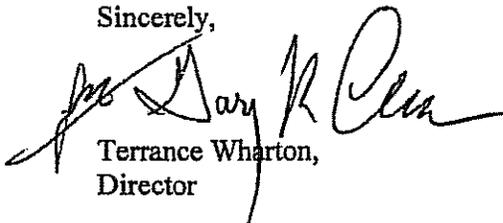
Provided with your August 9, 2007 waiver request letter was a document that included very limited information on proposed pumping management, monitoring, and mitigation. For the County to consider waiving FSM 6.240, sufficient detail and supporting information must be provided in a comprehensive PMM plan. The current information submitted is inadequate and will have to be significantly enhanced before staff will conduct an official evaluation and consider approval. The PMM plan should include (but not be limited to) information that thoroughly addresses the issues listed in subsections G, I, J, and K of FSM 6.240. To help provide you with additional guidance on what staff will be evaluating in the PMM plan, comments on the previously submitted information are listed in the Attachment to this letter. Please note that the comments in the Attachment are only intended as guidance and that a formal review with comments will not be made by staff until a comprehensive PPM plan is submitted.

The County's intent in consideration of this waiver request is to work with the Town of Hamilton so that they are able to use well #14 to support the water needs of the Town and protect the existing water supplies of adjacent property owners. With the expectation that the Town will submit a PMM plan that is acceptable to the County, your request to waive FSM 6.240 is hereby **conditionally approved**. This waiver approval will be void if a PMM plan to address groundwater withdrawals from the Town of Hamilton well #14 is not submitted and approved by the County prior to or concurrent with approval of Special Exception application SPEX-2007-0111. Please note that the County will require up to 30 days for initial review and comment on the submitted PMM plan and up to 2 weeks for review and comment on subsequent rounds of submissions, if needed.

If you have any questions, please contact either of the following members of my staff:

Kelly Baty at 703-771-5390 / Kelly.Baty@loudoun.gov
Glen Rubis at 703-777-0222 / Glen.Rubis@loudoun.gov

Sincerely,



Terrance Wharton,
Director

TW/gr

Attachment (additional guidance)

cc: FSM Waiver Library

Michael Seigfried, Alex Blackburn, Todd Taylor - Department of Building & Development

Rodion Iwanczuk - Department of Planning

Jeff Widmeyer - Department of Health

Sarah Howard-O'Brien - Loudon County Public Schools

Supervisor James Burton - Loudoun County Board of Supervisors

Bob Edelman - Virginia Department of Health

Additional guidance on developing a Pumping Management, Monitoring, and Mitigation Plan for the Town of Hamilton well #14

- Prior to evaluation by the County of the PMM plan, the Town must obtain all permits required by the Virginia Department of Health that may affect groundwater withdrawals from well #14.
- PMM plan shall include (but not be limited to) issues listed in FSM Chapter 6.240 G. (monitoring), I. (pumping plan), J. (analysis/evaluation of impacts), and K (mitigation).
- Per the documentation include with the 8/9/07 waiver request letter - Clarify the proposed monitoring plan relative to the phrase in the 3rd paragraph on page 2 of the supporting documentation “...on a 30 day cycle for up to 5 wells for a period of 2 years.”
- Each well to be monitored in the mitigation zone will need to have water levels monitored and recorded for a period of at least 30 days before pumping from well #14 begins so that baseline water level data are available for comparison purposes.
- Per the documentation include with the 8/9/07 waiver request letter - The monitoring procedures explained in the County’s Volunteer Well Donation Project (Attachment D referenced in your supporting documentation), were not designed for potable water supply sources. Monitoring of any domestic (potable) supply wells shall account for the need to maintain sanitary conditions of well and water. Any proposed monitoring methodology shall be reviewed by the County Department of Health for comment on sanitation issues.
- If the rate or duration of pumping from well #14 are increased, the Town shall notify the County and the County will evaluate the need for possible increased monitoring (or reinstating monitoring if previously suspended).
- The PMM plan submitted for review shall be accompanied by sufficient supporting information, maps, and analyses necessary for clarity, accuracy, and evaluation.
- The County will evaluate and consider requests by the Town to modify the approved PMM plan after 2 years of monitoring are completed. Such requests may include reduction or suspension of monitoring activities with the understanding that those activities would be reinstated if well #14 pumping rates or durations increased in the future. Requests shall include supporting data and analyses.



DLB RECEIVED
174910280
SEP 19 2007

COMMONWEALTH of VIRGINIA

STANTEC
LEESBURG

Environmental Engineering Field Office
400 S. Main St., 2nd Floor
Culpeper, VA 22701

*Department of Health
Office of Drinking Water*

Phone: (540) 829-7340
Fax: (540) 829-7337
www.vdh.virginia.gov

SEP 18 2007

SUBJECT: Loudoun County
Water - Town of Hamilton

Mr. David Bowers, P.E.
Stantec Consulting Services Inc.
108 Church Street South East
Leesburg, VA 220175-3003

We have received the Pumping, Monitoring and Mitigation Plan (PMMP) dated August 9, 2007 for the Town of Hamilton's proposed Well #14. This Plan was prepared in response to Loudoun County's requirement for a hydrogeologic study as part of a Special Exception application.

According to data available to VDH ODW, a hydrogeologic study on the Town of Hamilton's Well #14 was never completed. The available testing includes a pump and drawdown test conducted during December 2000. We don't know if operation of Well #14 will cause an adverse impact or interference on any nearby wells.

VDH ODW believe that having an ongoing Pumping Management, Monitoring and Mitigation Program (PMMP), including a plan for addressing mitigation of potential interference is desirable considering the value of a high-yielding well such as Well #14. VDH ODW envisions the PMMP to include what amounts to a long-term pumping test, including ongoing water level monitoring and reporting at the production well and selected private wells (monitoring wells). The PMMP could be a useful tool to protect both the interests of the Town and nearby private well owners. While conducting a new hydrogeologic study on Well #14 and the impacts on surrounding private wells is the most desirable option, an ongoing PMMP could be a reasonable compromise.

In general, we find the submitted PMMP lacks many important details and will need to be fleshed out further in order to be a useful tool to the Town. Some suggested items that should be addressed include but are not limited to:

- Scope and objectives of the Plan.
- Scope of the mitigation area.
- Activities and associated schedules, including frequency of data collection and reporting.
- Monitoring protocols and equipment.
- Data review and analysis activities.

Mr. David Bowers, P.E.
Page 2 of 2

SUBJECT: Loudoun County
Water - Town of Hamilton

- Validation and Mitigation of interferences.
- Dispute resolution.

The PMMP includes a subdivision map and a list of wells and excerpts from the Saddle Ridge Hydrogeologic study by Emery & Garrett Groundwater, Inc.; however these items don't provide enough information to make significant conclusions about the nearby private wells. Among other things, the private wells would need to be located on the map, and other data for the private well identified, including, but not limited to ground elevations, elevations of static water level, pump elevations, final well yields, well pumping rates, etc. We suggest that either as part of the revised PMMP or part of the PMMP activities that needed additional information be collected in order to target private wells most likely to be impacted.

The following comments directly impact the operation and design capacity that may be reflected in an operating permit to cover Well #14:

1. Note that the proposed pumping schedule allows only for 8 hours (480 minutes) per day of well operation, whereas the *Waterworks Regulations* effectively allow 800 minutes per day. If adopted as written, this would reduce the design capacity of the well to $350 \text{ gpm} \times 480 \text{ minutes/day} = 168,000 \text{ gpd}$.
2. The proposed pumping plan contemplates using Well #14 only between 9:00 pm and 5:00 am. Note that in an emergency (low water level in storage) the water system wells would automatically operate, regardless of the time. Does the Town plan to exclude use of Well #14 during the daytime?

As stated previously, revised plans and specifications for the Well #14 project, including, but not limited to the well (and associated appurtenances), raw water lines, treatment system, storage, and finished water lines must be submitted to this office for review and approval. Construction of this project shall not begin until a construction permit is issued.

Please feel free to contact me if you have questions or need assistance regarding this matter.

Sincerely,



Robert D. Edelman, P.E.
District Engineer

RDE/ajb

CC: Mr. Ray Whitbey, Mayor, Town of Hamilton
Mr. Glen Rubis, Loudoun County Building & Development Department
Loudoun County Health Department
ODW - Central

R:\Dist 08\LOUDOUN COUNTY\Hamilton, Town of\2007\Well 14 PMMP 9-07.doc

Appendix B

Well Completion Report, Pump Test Data and Engineering Sheet

Well Log

COMMONWEALTH OF VIRGINIA
WATER WELL COMPLETION REPORT
(Certification of Completion/County Permit)

*BUCK No.

State Water Control Board
P. O. Box 11143
2111 North Hamilton St.
Richmond, VA 23230

County/City LOUDOUN /

County/City Stamp

| | |
|--------------------------------------|-------|
| SUCB Permit | _____ |
| County Permit | _____ |
| Certification of inspecting official | _____ |
| This well does _____ does not _____ | _____ |
| meet code/law requirements. | _____ |
| \$ | _____ |
| Date | _____ |
| For office use | |

| | |
|------------------|-------|
| Tax Map I.D. No. | _____ |
| Subdivision | _____ |
| Section | 45/1 |
| Block | _____ |
| Lot | _____ |
| Class Well | TYPE |

| | |
|------------------------------|----------|
| * Virginia Plane Coordinates | |
| N | |
| E | |
| Latitude & Longitude | |
| N | |
| W | |
| * Topo Map No. | |
| * Elevation | ft. |
| * Formation | |
| * Lithology | |
| * River Basin | |
| * Province | |
| * Type Log | DRILLERS |
| * Cuttings | |
| * Water Analysis | |
| * Aquifer Test | |

* Owner TOWN OF HAMILTON
 * Well Designation or Number 95722
 Address P.O. BOX 13C
 HAMILTON, VA 20159-
 Phone (840)338-7793

* Drilling Contractor VALLEY DRILLING CORP. VA
 Address 9172 JOHN S. HOSBY HWY.
 UPPERVILLE, VA 20184
 Phone (800)582-9355

WELL LOCATION FEET direction of TOWN OF HAMILTON & STONE EDEN FARM
 and FEET direction of
 (If possible please include map showing location marked)

Date started 10/20/00 * Date completed 10/21/00 Type rig ROTARY RIG 1

1. WELL DATA:
- * Total depth 420 ft.
 - * Depth to bedrock 15 ft.
 - * Hole size (Also include reamed zones):
 - * 12 inches from 0 to 123 ft.
 - * 8 inches from 123 to 420 ft.
 - * inches from to ft.
 - * Casing size (I.D.) and material:
 - * 6 inches from 15 to 126 ft.
 - Material STEEL
 - Wt. per foot 19.25 or wall thickness .322 in.
 - * inches from to ft.
 - Material NONE
 - Wt. per foot or wall thickness in.
 - * inches from to ft.
 - Material NONE
 - Wt. per foot or wall thickness in.
 - * Screen size and mesh for each zone (where applicable):
 - * inches from to ft.
 - * Mesh size Type to ft.
 - * inches from to ft.
 - * Mesh size Type to ft.
 - * inches from to ft.
 - * Mesh size Type to ft.
 - * inches from to ft.
 - * Mesh size Type to ft.
 - * Gravel Pack:
 - * From to ft.
 - * From to ft.
 - * Grout:
 - * From 0 to 100 ft., Type CEMENT
 - * From to ft., Type NONE

2. WATER DATA: Water Temperature 56 F
- * Static water level (unpumped level measured) 17 ft
 - * Stabilized measured pumping water level ft
 - * Stabilized yield 400 gpm after 3 hours
 - Natural Flow NO flow rate gpm
 - Comment on quality CLEAR

3. WATER ZONES:
- | | | | |
|----------|--------|------|----|
| From 240 | To 360 | From | To |
| From | To | From | To |
| From | To | From | To |

4. USE DATA:
 Type of use: DRINKING

Type of facility: PUBLIC WATER

5. PUMP DATA: Type * Rated HP
- * Intake depth * Capacity at
6. WELLHEAD: Type well seal WATER TIGHT CAP
- Pressure tank gal., Loc.
 - Sample tap NO Measurement port NO
 - Well vent NO Pressure relief valve NO
 - Gate valve NO Check valve (when required) NO
 - Electrical disconnect switch on power supply NO
7. DISINFECTANT: Well disinfected NO
- Date / / Disinfectant used
 - Amount Hours used
8. ABANDONMENT (where applicable) * NO
- Casing pulled Not Applicable
 - Plugging grout Fr to sat

OWNER TOWN OF HAMILTON

BWCN No.

9. State law requires submitting to the Virginia State Water Control Board information about groundwater and wells for every well made in the State intended for water, or any other non-exempt well. This information must be submitted whether the well is completed, on standby, or abandoned. Information required includes: an accurately and completely prepared water well completion report, full data from any aquifer pumping tests, drill cuttings taken at ten foot intervals, (unless exemption is secured), the results of any chemical analyses, and copies of any geophysical logs. Quarterly pumpage and use reports are required from owners of public supply and industrial wells. County or State permits to drill may be required in some parts of the state. Some counties require submission of a water well completion report. The Virginia State Health Department requires a water well completion report for public supply wells.

10. DRILLERS LOG (Use additional sheets if necessary)

| DEPTH (feet) | | | TYPE OF ROCK OR SOIL | REMARKS | 11. | 12. DIAGRAM OF WELL CONSTRUCTION (with dimensions) |
|--------------|-----|--|--|---|----------------------|--|
| From | To | | (Color, material, fossils, hardness, etc.) | (water, caving, cavities, broken, core, shot, etc.) | Drilling Time (Min.) | |
| 0 | 15 | | OVERBURDEN | | | |
| 15 | 420 | | GRANITE | | | |
| 240 | 360 | | WATER BEARING | 400 GPM @ 360' | | |

13. Well lot dedicated? NO Size: ft. X ft. Well House? NO.
 Distance to nearest pollutant source ft., Type NONE
 Distance to nearest property line ft., Building ft.
 14. WATER SERVICE PIPE: Checked under p.s.i. for minutes
 Pipe size Inches, Material NONE
 Installer _____
 Date _____

15. I certify that the information contained herein is true and correct and that this well and/or system has been installed and constructed in accordance with the requirements for well construction as specified in compliance with appropriate county or independent city ordinances and the laws and rules of the Commonwealth of Virginia.

Signature Juanita Sechart (Seal) Date 10-24-00
 (well driller or authorized person)

License No. W0016
 Class A-2705 027957A

Pump Test Data

VALLEY DRILLING CORPORATION OF VIRGINIA

9172 JOHN S. MOSBY HIGHWAY
UPPERVILLE, VIRGINIA 20184

UPPERVILLE 540/592-3239 TOLL FREE 1-800/582-9355 FAX 540/592-3259

DATE Sunday 12/10/00

WELL TEST PUMPING DATA - YIELD & DRAWDOWN, RECOVERY

LOCATION Stone Eden Farm - New Well
OWNER Town of Hamilton
PWSID # 6107150
TEST PUMP 6JCXA 50 HP
TEST DURATION 48 Hours RECOVERY X
SAMPLING: CHEMICAL X BACTERIOLOGICAL X
STATIC WATER LEVEL 10.5'
METER READING BEFORE 1723200 AFTER _____

WELL DATA:
DEPTH 420'
CASING 126'
YIELD _____ GPM @ _____
DIAMETER 8"
TYPE OF TEST Yield & Drawdown
TEST PUMP INTAKE SET @ 258'
AIR LINE _____ ELECTRODE X

| DATE | TIME | MINUTES | GPM | PWL | MECH | TEST DATA COMMENTS |
|----------|----------|---------|-----|-------|---------|--------------------|
| 12/10/00 | 12:00 AM | | | | DS & SS | Disinfected Well |
| | 12:01 PM | 1 | 300 | 53.0' | DS & SS | |
| | 12:02 PM | 2 | 300 | 55.7' | DS & SS | |
| | 12:03 PM | 3 | 300 | 56.8' | DS & SS | |
| | 12:04 PM | 4 | 300 | 57.4' | DS & SS | |
| | 12:05 PM | 5 | 300 | 58.0' | DS & SS | |
| | 12:06 PM | 6 | 300 | 58.7' | DS & SS | |
| | 12:07 PM | 7 | 300 | 58.8' | DS & SS | |
| | 12:08 PM | 8 | 300 | 58.9' | DS & SS | |
| | 12:09 PM | 9 | 300 | 59.0' | DS & SS | |
| | 12:10 PM | 10 | 300 | 59.0' | DS & SS | |
| | 12:12 PM | 12 | 300 | 60.2' | DS & SS | |
| | 12:14 PM | 14 | 300 | 60.8' | DS & SS | |
| | 12:16 PM | 16 | 300 | 61.3' | DS & SS | |
| | 12:18 PM | 18 | 300 | 62.1' | DS & SS | |

VALLEY DRILLING CORPORATION OF VIRGINIA

DATE Sunday 12/10/00

PAGE 2

WELL TEST PUMPING DATA - YIELD & DRAWDOWN, RECOVERY

LOCATION Stone Eden Farm - New Well

OWNER Town of Hamilton

| DATE | TIME | MINUTES | GPM | PWL | MECH | TEST DATA COMMENTS |
|----------|----------|---------|-----|-------|---------|--------------------|
| 12/10/00 | 12:20 PM | 20 | 300 | 62.5' | DS & SS | |
| | 12:25 PM | 25 | 300 | 64.2' | DS & SS | |
| | 12:30 PM | 30 | 300 | 65.0' | DS & SS | |
| | 12:45 PM | 45 | 300 | 68.2' | DS & SS | |
| | 1:00 PM | 60 | 300 | 70.4' | DS & SS | |
| | 1:15 PM | 75 | 300 | 73.2' | DS & SS | |
| | 1:30 PM | 90 | 300 | 75.0' | DS & SS | |
| | 2:00 PM | 120 | 300 | 77.5' | DS & SS | |
| | 2:30 PM | 150 | 300 | 78.9' | DS & SS | |
| | 3:00 PM | 180 | 300 | 80.6' | DS & SS | |
| | 4:00 PM | 240 | 300 | 82.0' | DS & SS | |
| | 5:00 PM | 300 | 300 | 84.4' | DS & SS | |
| | 6:00 PM | 360 | 300 | 86.0' | DS & SS | |
| | 7:00 PM | 420 | 300 | 87.0' | DS & SS | |
| | 8:00 PM | 480 | 300 | 88.2' | DS & SS | |
| | 9:00 PM | 540 | 300 | 88.6' | DS & SS | |
| | 10:00 PM | 600 | 300 | 89.0' | DS & SS | |
| | 11:00 PM | 660 | 300 | 89.0' | DS & SS | |
| | 12:00 PM | 720 | 300 | 90.0' | DS & SS | |
| 12/11/00 | 1:00 AM | 780 | 300 | 90.6' | DS & SS | |
| | 2:00 AM | 840 | 300 | 91.0' | DS & SS | |

VALLEY DRILLING CORPORATION OF VIRGINIA

DATE Monday 12/11/00
PAGE 3

WELL TEST PUMPING DATA - YIELD & DRAWDOWN, RECOVERY

LOCATION Stone Eden Farm - New Well

OWNER Town of Hamilton

| DATE | TIME | MINUTES | GPM | PWL | MECH | TEST DATA COMMENTS |
|----------|----------|---------|-----|--------|---------|--------------------------------|
| 12/11/00 | 3:00 AM | 900 | 300 | 91.0' | DS & SS | |
| | 4:00 AM | 960 | 300 | 91.0' | DS & SS | |
| | 5:00 AM | 1020 | 300 | 91.0' | DS & SS | |
| | 6:00 AM | 1080 | 300 | 91.0' | DS & SS | |
| | 7:00 AM | 1140 | 300 | 92.2' | DS & SS | |
| | 8:00 AM | 1200 | 300 | 93.3' | DS & SS | 8:30 AM - INCREASED TO 350 GPM |
| | 9:00 AM | 1260 | 350 | 108.8' | DS & SS | |
| | 10:00 AM | 1320 | 350 | 109.8' | DS & SS | |
| | 11:00 AM | 1380 | 350 | 110.2' | DS & SS | |
| | 12:00 AM | 1440 | 350 | 110.8' | DS & SS | |
| | 1:00 PM | 1500 | 350 | 111.3' | DS & SS | |
| | 2:00 PM | 1560 | 350 | 112.0' | DS & SS | |
| | 3:00 PM | 1620 | 350 | 114.0' | DS & SS | |
| | 4:00 PM | 1680 | 350 | 114.0' | DS & SS | |
| | 5:00 PM | 1740 | 350 | 114.0' | DS & SS | |
| | 6:00 PM | 1800 | 350 | 114.0' | DS & SS | |
| | 7:00 PM | 1860 | 350 | 114.0' | DS & SS | |
| | 8:00 PM | 1920 | 350 | 114.0' | DS & SS | |
| | 9:00 PM | 1980 | 350 | 114.0' | DS & SS | |
| | 10:00 PM | 2040 | 350 | 114.0' | DS & SS | |
| | 11:00 PM | 2100 | 350 | 114.0' | DS & SS | |

VALLEY DRILLING CORPORATION OF VIRGINIA

DATE Monday 12/11/00
PAGE 4

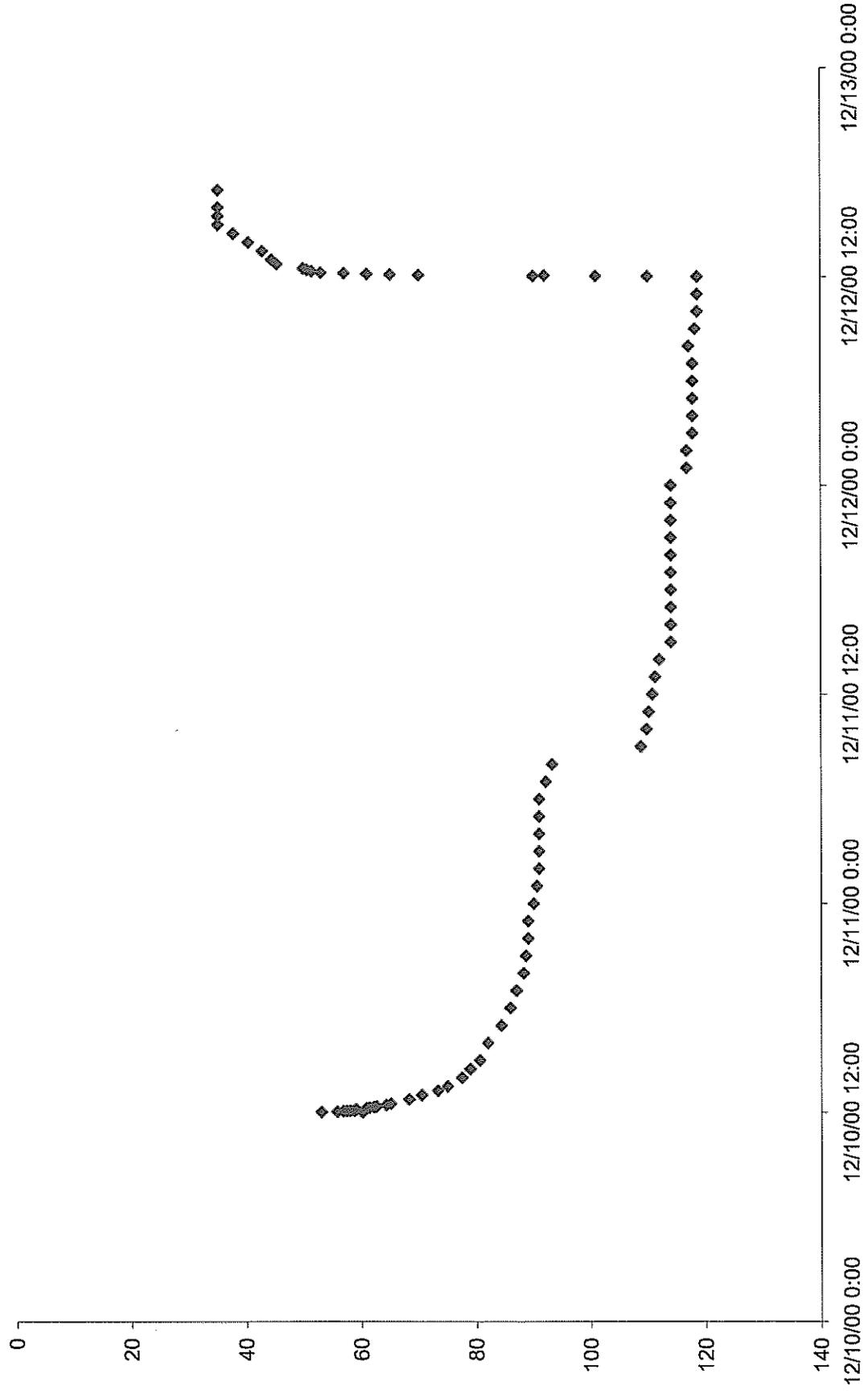
WELL TEST PUMPING DATA - YIELD & DRAWDOWN, RECOVERY

LOCATION Stone Eden Farm - New Well

OWNER Town of Hamilton

| DATE | TIME | MINUTES | GPM | PWL | MECH | TEST DATA COMMENTS |
|----------|----------|---------|-----|--------|---------|---------------------------------|
| 12/11/00 | 12:00 PM | 2160 | 350 | 114.0' | DS & SS | |
| 12/12/00 | 1:00 AM | 2220 | 350 | 116.8' | DS & SS | |
| | 2:00 AM | 2280 | 350 | 116.8' | DS & SS | |
| | 3:00 AM | 2340 | 350 | 117.8' | DS & SS | |
| | 4:00 AM | 2400 | 350 | 117.8' | DS & SS | |
| | 5:00 AM | 2460 | 350 | 117.8' | DS & SS | |
| | 6:00 AM | 2520 | 350 | 117.8' | DS & SS | |
| | 7:00 AM | 2580 | 350 | 117.8' | DS & SS | |
| | 8:00 AM | 2640 | 350 | 117.1' | DS & SS | |
| | 9:00 AM | 2700 | 350 | 118.2' | DS & SS | |
| | 10:00 AM | 2760 | 350 | 118.6' | DS & SS | |
| | 11:00 AM | 2820 | 350 | 118.6' | DS & SS | |
| | 12:00 AM | 2880 | 350 | 118.6' | DS & SS | Shut off pump - begin recovery. |
| | | | | | | |
| 12/12/00 | 12:01 PM | 1 | | 118.6' | DS & SS | |
| | 12:02 PM | 2 | | 110.0' | DS & SS | |
| | 12:03 PM | 3 | | 101.0' | DS & SS | |
| | 12:04 PM | 4 | | 90.0' | DS & SS | |
| | 12:05 PM | 5 | | 92.0' | DS & SS | |
| | 12:07 PM | 7 | | 70.0' | DS & SS | |
| | 12:09 PM | 9 | | 65.0' | DS & SS | |

Well 14 Water Level Depths - Pump test



Engineering Sheet

**VIRGINIA DEPARTMENT OF HEALTH
ENGINEERING DESCRIPTION SHEET**

DATE: March 31, 2004

WATERWORKS NAME: Town of Hamilton

CERTIFIED CLASS: IV

COUNTY/CITY: Loudoun County

LOCATION: Hamilton is located on Business Route 7; the Stone Eden well is located at the end of Stone Eden Drive, and the filter building is located off Bates Drive, both on the southwest side of town.

OWNER: Keith Reasoner, Mayor
Town of Hamilton
53 East Colonial Highway
Hamilton, VA 20159
Tele. No. (540) 338-2811

OPERATOR: Harold Lemarr
Town of Hamilton
53 East Colonial Highway
Hamilton, VA 20159
Tele. No. (540) 338-2811

PERMIT NUMBER: 601304

DATE ISSUED: March 31, 2004

TYPE OF TREATMENT: Greensand filtration and disinfection

SOURCE: Stone Eden Well (Well #14) and Wells 6 and 8

DESIGN CAPACITY: Increase of 331,200 gpd

DESCRIPTION OF SYSTEM:

The purpose of this project is to add a well, replace an existing treatment system for Wells 6 and 8 and increase the finished water storage capacity of the Town's water system.

Stone Eden Well (Well #14)

The well is located about 240 feet southwest of the end of Stone Eden Drive.

It was drilled in October of 2000. It is 420 feet deep with 8-inch steel casing to 126 feet and cement grout to 100 feet. A 48-hour pump test in December 2000 established the safe yield of the well at 350 gpm with a drawdown of 66 feet (static water level was 53 feet and drawdown level was 119 feet). The well will be equipped with 4 - inch ASTM A53 Grade B steel drop pipe, pitless adapter, lockable and screened watertight well cap, pressure transducer for water level measurement, 7-foot by 7-foot by 6-inch concrete pad around the well head, a check valve at the top of the drop pipe and a submersible pump with a 40 hp motor set with intake at 341.5 feet depth. The pump can deliver 350 gpm at 279 feet of TDH.

A water meter vault located adjacent to the well includes a 4-inch horizontal turbine meter, a discharge pressure gauge, an air release valve and a sample tap. The water meter vault is equipped with a light and a screened floor drain. A 6-inch screened blowoff and valve is located on the well discharge line, after the meter vault.

Approximately 3,200 feet of 6-inch DI pipe will connect the well to a new filtration building to be located on a Town owned parcel between Stone Eden Drive and Bates Drive.

Stone Eden Water Treatment System

The water treatment system consists of a 50,000 gallon bolted steel raw water storage tank (20-feet in diameter, 24-feet in height), a 200,000-gallon bolted steel ground level finished water storage tank (31 feet in diameter and 38 feet in height), a 16,000-gallon underground filter backwash equalization tank (12 feet in diameter, and 20 feet in depth), a filtration building (approximately 63 feet long, 36 feet wide and 16 feet interior clearance), a 400 gpm greensand filtration system and associated pumps and appurtenances. The raw water tank and the finished water tank are of bolted steel construction. The filter backwash equalization tank is of pre-cast concrete construction.

The greensand filtration system consists of two 400-gpm filter feed pumps, two vertical pressure filters, chemical addition systems for addition of sodium hypochlorite and sodium permanganate, three 500-gpm finished water booster pumps, and two 80-gpm backwash equalization pumps. A radio telemetry system is provided to control the operation of Wells 6, 8 and 14 as well as the treatment system.

Process Description

Ground water is pumped from Well 14 via the 350 gpm submersible well pump to the 50,000 gallon raw water storage tank. Wells 6 and 8 also deliver raw water to the raw water storage tank. From the raw water storage tank, the filter feed pumps pump the water at 400 gpm through the greensand filtration system into the 200,000 gallon finished water storage tank, located at ground level. Sodium hypochlorite and sodium permanganate are added continuously to the raw water upstream of the greensand filtration unit for oxidation and removal of iron and manganese.

The finished water is injected with chlorine following filtration and transferred to the finished water storage tank. System feed pumps, transfer finished water from the ground storage tank to the existing 75,000 gallon elevated water storage tank and into the Town of Hamilton's water supply system at 500 gpm.

Greensand filters are backwashed using finished water from the elevated tank. The used backwash water is collected in an underground backwash equalization tank with a capacity of 16,000 gallons. Duplex 80 gpm submersible pumps will transfer backwash water from the equalization tank to the Town of Hamilton's sanitary sewage collection system for disposal.

Greensand Filtration System

The greensand filtration system consists of two vertical filtration vessels, 9'-6" in diameter and 72 inches minimum sideshell height. The filters have a design surface loading of 2.82 gpm/sf and a surface area of 70.88 square feet. The filter media consists of 18 inches of manganese greensand capped with a 12 inch layer of anthracite. The manganese greensand has an effective size of 0.30 to 0.35 mm with a uniformity coefficient less than 1.60. The anthracite cap has an effective size of 0.60 to 0.80 mm and a uniformity coefficient less than 1.85. A 12-inch thick layer of support gravel is covered by a 3-inch layer of 0.2 - 1.2 mm torpedo sand.

An airwash blower delivering 213 scfm at 5 psig is provided for use during simultaneous air/water backwash. Water is applied during this backwash stage at 3 gpm/sf (213 gpm) for 10 minutes. A water only slow wash operates at 5 gpm/sf (354 gpm) for two minutes. A fast water wash operates at 15 gpm/sf (1,063 gpm) for three minutes.

Chemical Addition Systems

Positive-displacement solenoid driven diaphragm chemical metering pumps will deliver chemicals, from the original containers as received from the chemical vendor, through flexible tubing to appropriate locations within the treatment system. One additional warehouse spare pump of each size will be provided. The following table summarizes the chemical addition systems.

| Chemical | Addition Point | Pumping Capacity |
|---------------------|---|-----------------------|
| Sodium hypochlorite | After raw water feed pump | 0.13 gal/hr @ 300 psi |
| Sodium permanganate | After sodium hypochlorite addition | 0.13 gal/hr @ 300 psi |
| Spare pump | Not installed | 0.13 gal/hr @ 300 psi |
| Sodium hypochlorite | After greensand filters, prior to finished water storage tank | 0.45 gal/hr @ 300 psi |
| Spare pump | Not installed | 0.45 gal/hr @ 300 psi |

Automatic Control System

An automatic control and telemetry system will control the operation of wells 6, 8, and 14 as well as the ground water treatment system.

The liquid level in Well 14 will be sensed by a submersible level transducer, mounted approximately 400 feet below the top of the well.

The well pumps at wells 6, 8 and 14 will be automatically operated based on the level of the Raw Water Storage Tank. When the Hand-Off-Auto (HOA) switch for the well pumps are in the Auto position, the well pump will operate when the level in the raw water tank drops to a predetermined level (initial set point is 12 feet). The well pumps will operate until the tank is filled (initial set point 22.5 feet).

The level in the 200,000 gallon finished water storage tank governs the automatic operation of the filter feed pumps and the filters. When the HOA switches for the filter feed pumps are in the auto position and the telemetry system is in the "telemetry" position, one of the filter feed pumps and the filters is energized when the level in the finished water tank drops to a predetermined level and shall operate until the tank is filled. Upon initiating backwash cycle and a "Major Filter System Alarm", the filter feed pumps is stopped. The filter feed pumps shall be de-energized upon reaching "high tank alarm". The filter feed pumps are de-energized upon reaching a "low tank alarm" in the raw water tank.

The level in the existing elevated 75,000 gallon storage tank (remotely located from the treatment system) governs the operation of the system feed pumps. When the HOA switches for the system feed pumps are in the Auto position, the lead pump shall be energized when the level in the elevated water tanks drops to a predetermined level. Should the level in the tank continue to drop to a lower predetermined level, a second system feed pump shall be energized. The pumps will operate until the tank is filled. The controls also include set points for "low tank alarm" and "high tank alarm" for the elevated storage tank. The system feed pumps will be de-energized upon "high tank alarm" for the elevated storage tank.

Design Capacity

Wells:

| Well # | Yield (gpm) | Yield (gpd) | Pumping Capacity (gpm) | Pumping Capacity (gpd) | Limiting Capacity (gpd) |
|--------------|-------------|--|------------------------|---|-------------------------|
| 14 (New) | 350 | 350 gpm x 2 ERC/gpm x 400 gpd/ERC = 280,000 | 350 gpm | 350 gpm x 1,440 min/day = 504,000 | 280,000 |
| 6 (Existing) | 60 gpm | 48,000 | 42 | 60,480 | 48,000 |
| 8 (Existing) | 35 | 28,000 | 22 | 31,680 | 28,000 |
| Total | 445 | 356,000 | 414 | 596,160 | 356,000 |

Thus total wells 6, 8 and 14 limiting capacity is 356,000 gpd based on the above calculations.

The treatment capacity is:

Based on filter surface loading rate: $2.82 \text{ gpm/sf} \times 70.88 \text{ sf/vessel} \times 2 \text{ vessels} = 400 \text{ gpm}$

Based on hydraulic capacity: $400 \text{ gpm} \times 1,440 \text{ min/day} = 576,000 \text{ gpd}$

Booster pump capacity:

Booster pumps deliver to an elevated storage tank and consist of three 500 gpm units.

Capacity is determined with the largest pump out of service (the "firm" pump capacity).

$2 \text{ pumps} \times 500 \text{ gpm/pump} \times 1,440 \text{ min/day} = 1,440,000 \text{ gpd}$

Storage capacity:

A 200,000 gallon finished water ground storage tank is provided. Therefore, the storage capacity is

$200,000 \text{ gallons} \times 1 \text{ ERC}/200 \text{ gallons} = 1,000 \text{ ERC}$

$1,000 \text{ ERC} \times 400 \text{ gpd/ERC} = 400,000 \text{ gpd}$.

Design Capacity

Based on the calculations above, the design capacity of this project is limited to the total yield of Wells 6, 8 and 14 or 356,000 gpd. Discounting for Wells 6 and 8, Well 14 will increase the Town's waterworks capacity by 280,000 gpd. Wells 6 and 8 contribute 76,000 gpd to the total capacity of this project. The same wells contribute 51,200 gpd to the existing capacity of the Town of Hamilton waterworks. The additional capacity ($76,000 - 51,200 = 24,800 \text{ gpd}$) realized from these wells in this project is due to a relaxation in the pumping capacity calculation for a well, which the Department has adopted recently. Thus, this project would increase the Town's permit capacity by 331,200 gpd.

RDE/tjb

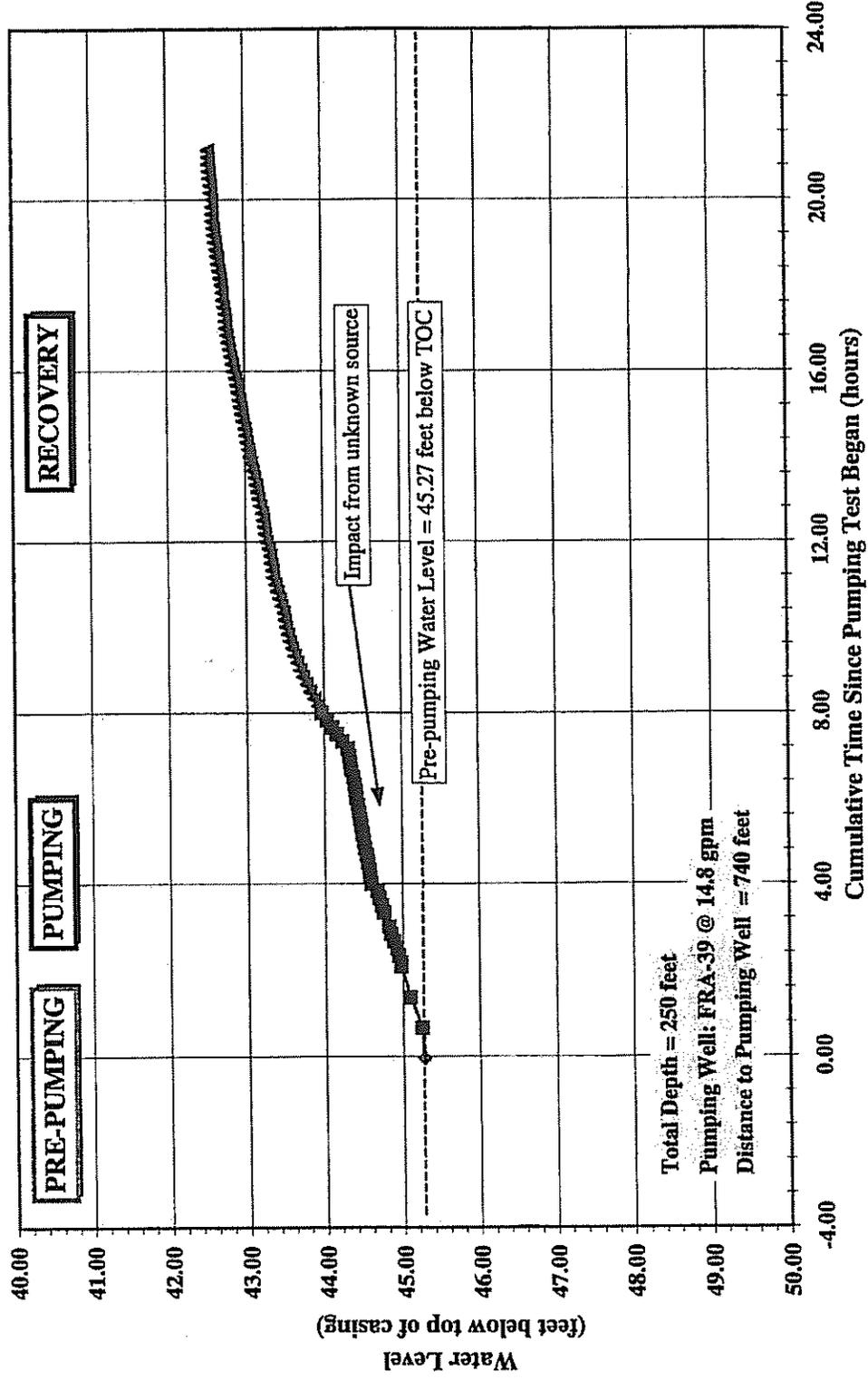
S:\Dist 08\Loudoun\Hamilton, Town of\Stone Eden Well.doc

Appendix C

Pump Test Graphics from Saddle Ridge Report

FRA-18 Monitoring Well

Maximum Drawdown Observed During Pumping Test = not impacted

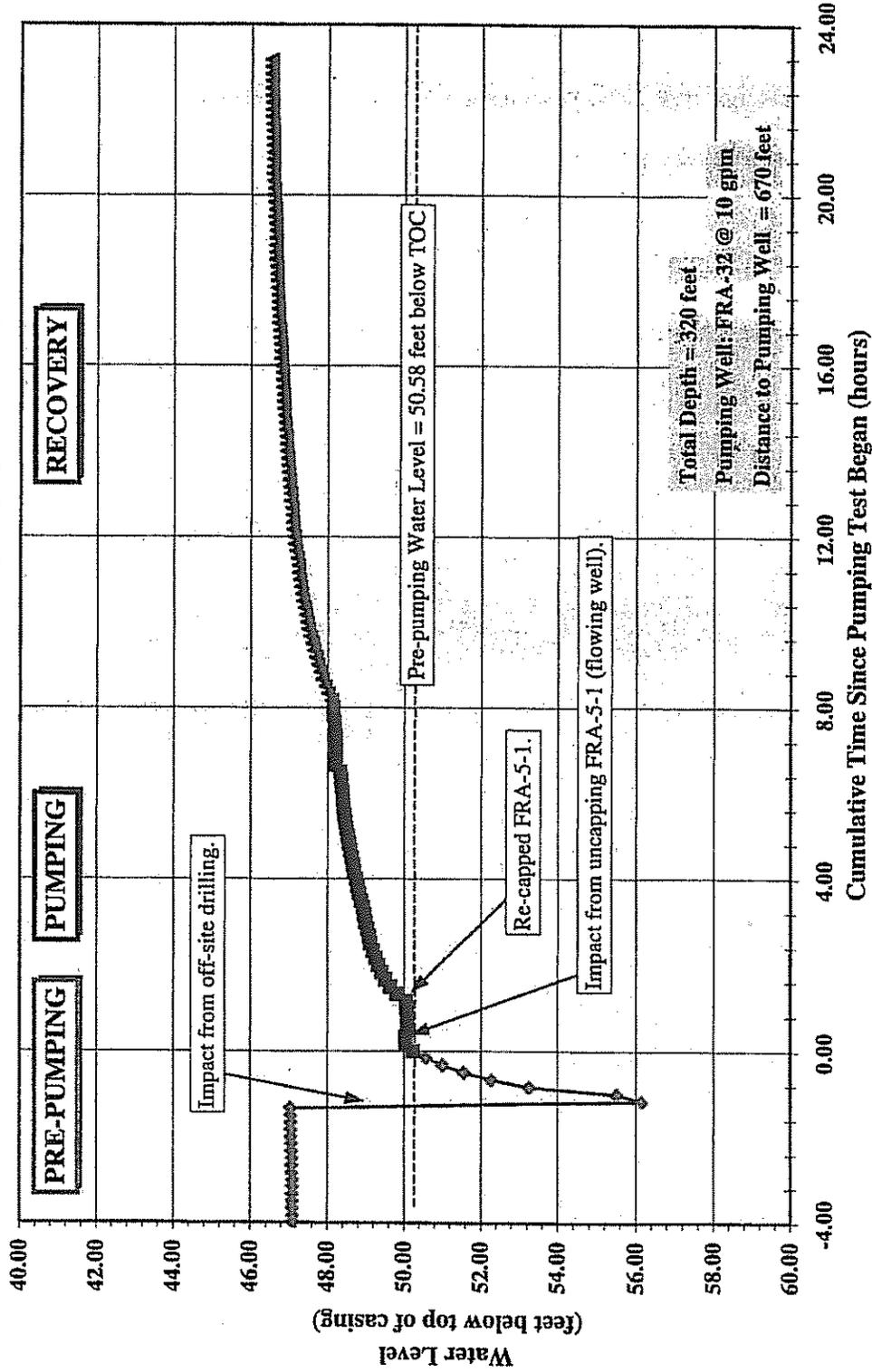


Plot of Water Level versus Time for November 10-11, 2000

Saddle Ridge A-3 Subdivision
Loudoun County, Virginia

FRA-30 Monitoring Well

Maximum Drawdown Observed During Pumping Test = not impacted

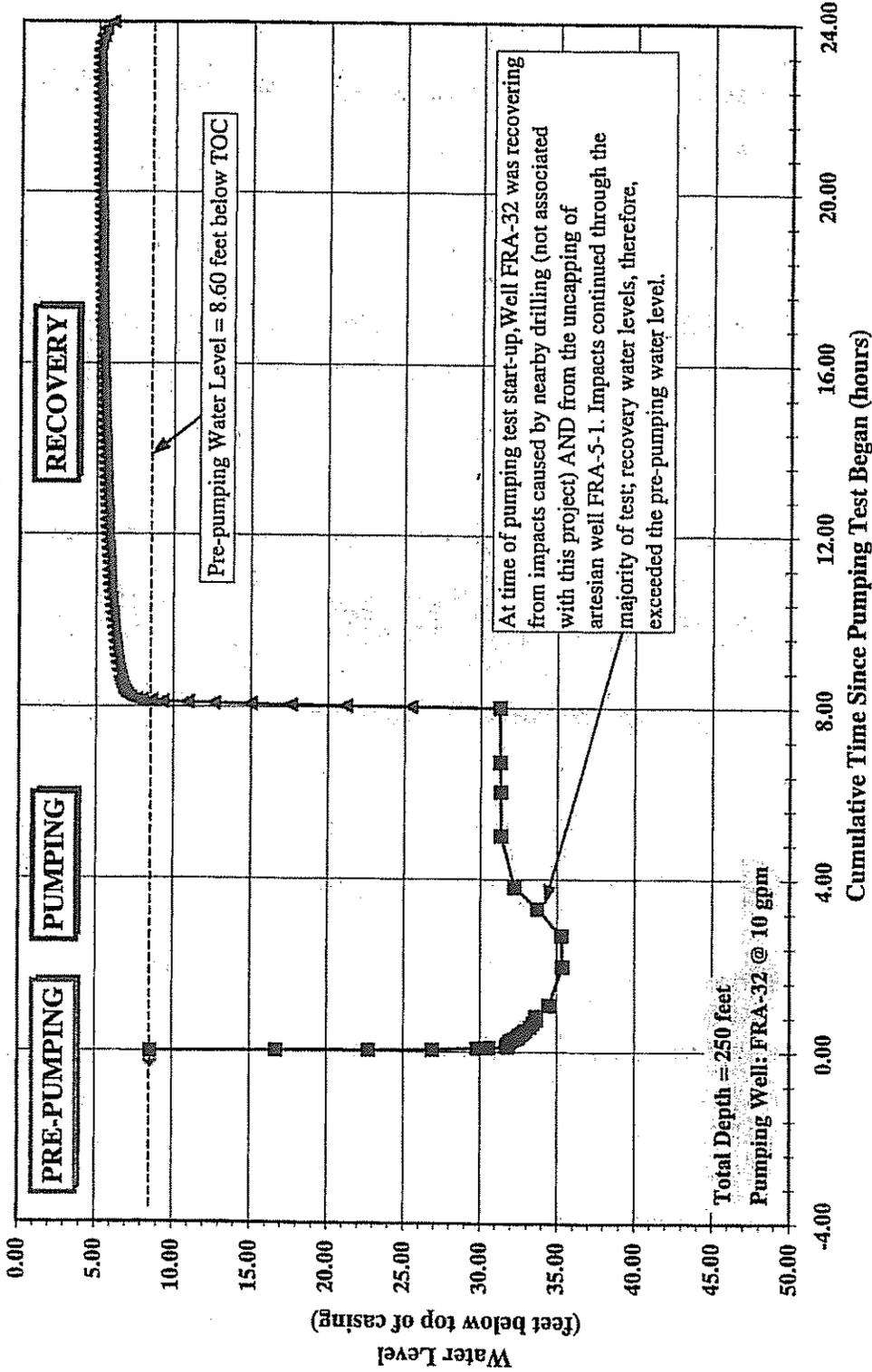


Plot of Water Level versus Time for November 10-11, 2000

Saddle Ridge A-3 Subdivision
 Loudoun County, Virginia

FRA-32 Pumping Well

Maximum Drawdown Observed During Pumping Test = 26.76 feet

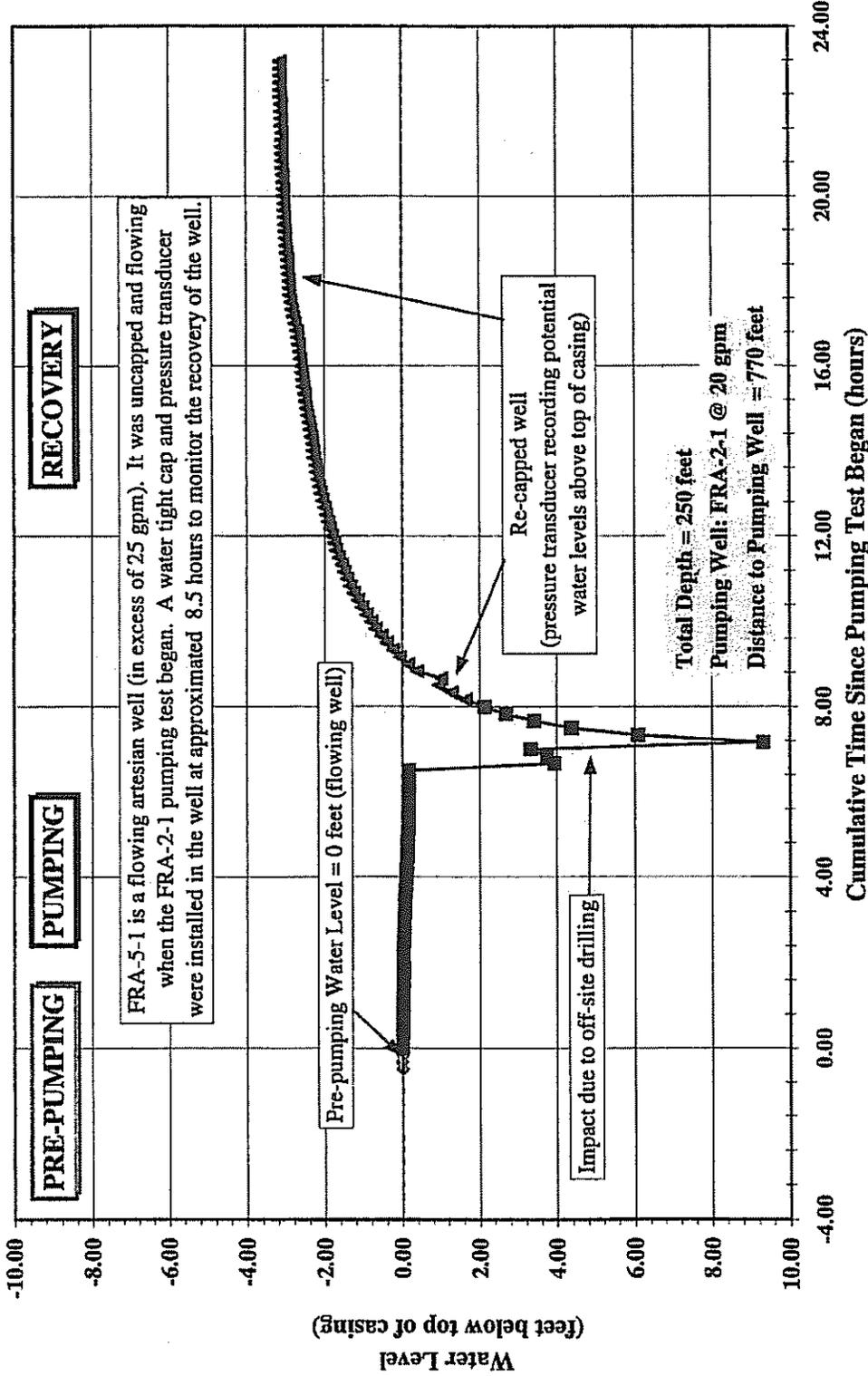


Plot of Water Level versus Time for November 10-11, 2000

Saddle Ridge A-3 Subdivision
Loudoun County, Virginia

FRA-5-1 Monitoring Well

Maximum Drawdown Observed During Pumping Test = not impacted

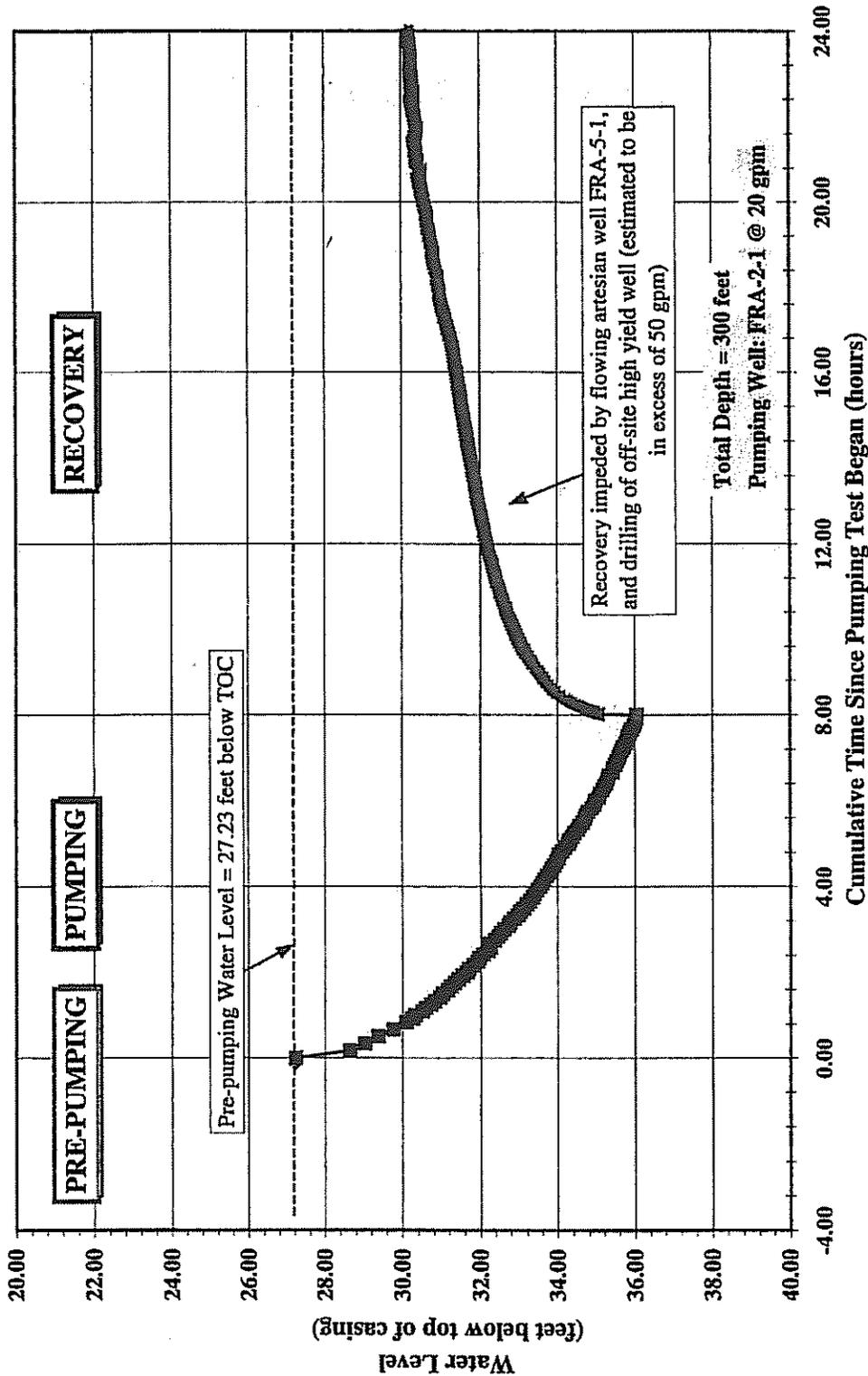


Plot of Water Level versus Time for November 9-10, 2000

Saddle Ridge A-3 Subdivision
Loudoun County, Virginia

FRA-2-1 Pumping Well

Maximum Drawdown Observed During Pumping Test = 8.82 feet



Plot of Water Level versus Time for November 9-10, 2000

Saddle Ridge A-3 Subdivision
Loudoun County, Virginia