Groundwater
& Environmental Services, Inc.

2142 Priest Bridge Court, Suite 1 • Crofton, Maryland 21114 • (800) 220-3606 • (410) 721-3733

August 24, 2011

Ms. Ellen Jackson
Oil Control Program
Maryland Department of the Environment
1800 Washington Blvd, Suite 620
Baltimore, Maryland 21230

RE: **PRELIMINARY INFILTRATION GALLERY & REMEDIAL SYSTEM DESIGN**
Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road
Parkton, Maryland
OCP Case #2006-0319-BA2

Dear Ms. Ellen Jackson:

Groundwater & Environmental Services, Inc. (GES), on behalf of Carroll Independent Fuels Company (CIFC), respectfully submits the *Preliminary Infiltration Gallery & Remedial System Design* for 19200 Middletown Road in Parkton, Maryland (Site) requested in the meeting held with the Maryland Department of the Environment (MDE) on Friday, August 12, 2011. The purpose of this document is to provide supplemental information to the MDE prior to the MDE's response to the Pumping Test Summary (PTS) and Corrective Action Plan Addendum (CAPA) submitted by GES on June 29, 2011. The CAPA had been submitted to fulfill CIFC compliance with the Administrative Consent Order (ACO) entered into by CIFC and the MDE on March 18, 2011.

The goal of this document is to present the results of infiltration testing, provide a preliminary design of an infiltration gallery, and further detail the design of a pump and treat (P&T) groundwater remediation system. Please note that following approval of the CAPA, a CAP Implementation Plan is to be submitted, further detailing the design and planned operation of the remedial system and providing a proposed schedule for P&T remediation system installation and system startup.

Site Remediation

As outlined in the CAPA, a P&T system is to be utilized to remediate the area of greatest groundwater impact at the Site. The P&T system is to be initially connected to two existing recovery wells (RW-1 and RW-2). The system will be designed for potential connection to the potable wells at 1606 and/or 1608 Rayville Road. It is planned that connection to any potable well would occur after the P&T system has begun to operate on recovery wells RW-1 and RW-2. In addition, contingency stub-up piping will be installed for potential future connection to the area of RW-3.

System Design

The P&T system components for the treatment of recovered fluids will be designed to treat the maximum groundwater recovery rate expected from the anticipated recovery well network. The expected groundwater recovery rates from recovery wells RW-1 and RW-2, determined after pump testing on each well, are approximately 1 gallon per minute (gpm) and 2 gpm, respectively. However, due to the anticipated expansion of the recovery well network to include the potable wells at 1606 and/or 1608 Rayville Road and possibly additional extraction wells, the treatment system is to be designed to process

a sustained influent groundwater recovery rate of approximately 10 gpm. Sizing the remediation system for 10 gpm provides the flexibility to expand the recovery well network at a later time.

Remediation system design drawings are included as an attachment to this letter as **Appendix A**. The P&T system will be contained within an 8-foot-wide by 20-foot-long shed stationed to the southeast of the Curry's Excavation building, and as indicated in the attached design drawings. Groundwater will be extracted by submersible electric groundwater pumps deployed at the extraction wells. Each electric pump will be equipped with a controller capable of adjusting the operation of the electric pump to draw the groundwater table down to a desired level or pump at a stable flow rate. The remediation system will house an equalization tank, an air stripper for primary water treatment, solids filtration equipment, and liquid granular activated carbon (LGAC) vessels for secondary water treatment. Treatment of the air stripper off-gas is expected to be required initially and will consist of vapor phase granular activated carbon (VGAC) vessels. It is anticipated that off-gas treatment will be removed at a later date for direct discharge to atmosphere. A preliminary process & instrumentation diagram for the P&T component of the system is presented in the attached design drawings.

Individual groundwater recovery and electric lines will be installed below grade to RW-1 and RW-2, and in addition, a spare conduit and water lines will be installed for contingent usage at RW-3. Groundwater recovery lines will be constructed of schedule 80 polyvinyl chloride (PVC). Trenches will be installed at depths of a minimum of 36 inches below grade. Piping will be bedded in pea gravel, sand, or other select bedding material. Trenches will then be backfilled with suitable material and will be resurfaced to meet existing conditions.

Operation & Maintenance (O&M)

It is anticipated that for the first one to two months of system operation, O&M visits will occur on a weekly basis. After that, it is anticipated that routine O&M of the system will be reduced to twice per month. Air samples will be collected monthly, and water samples will be collected on a frequency consistent with the the permit and amount discharged. Currently, it is anticpated that the P&T system will initially operate at a rate of 3.0 gpm and therefore approximately 130,000-gallons of water will be treated and discharged per month. Based upon this anticipated monthly recovery volume, effluent samples will be collected twice per month as required by MDE NPDES discharge permit requirements.

Remedial System Permitting

The treatment enclosure will comply with all state and local building codes and requirements. In addition to building, electric, and occupancy permits, other permits may include:

- Air Discharge Permit: Permits from the MDE Air & Radiation Management Administration (ARMA) will be required prior to system installation and operation. The air discharge permit limits volatile organic compound (VOC) emissions to 20 pounds per day, unless the discharge is reduced by 85 percent or more overall.
- On approval of this CAPA, a formal application to discharge the treated groundwater to an infiltration gallery will be submitted to the appropriate authority. Alternative discharge options are being evaluated for use as a contingency to the infiltration gallery, should it fail to perform to design specifications. A potential discharge alternative to one of the area storm drains has been identified. If discharge to a storm drain is permitted and accessible, a NPDES General Discharge permit will be required.

- Water Appropriations Permit: A Water Appropriations Permit will be required as the planned use of ground water on an annual average is anticipated to be up to 10,000 gallons per day (gpd).
- Construction Permits: Building and electrical permits must be obtained from the County, Town or City municipality prior to installation of any remediation shed or enclosure.

Infiltration Borehole Installation and Testing

On July 7, 2011 GES, on behalf of CIFC, submitted a *Borehole Infiltration Test Work Plan* (Work Plan) to the MDE. This Work Plan proposed revised procedures regarding infiltration rate characterization at the Wally's location, from procedures initially presented in documents titled *Pump Test Work Plan* and the *Pumping Test Work Plan – Addendum #1 – Infiltration Testing* submitted to the MDE on January 11, 2011 and January 14, 2011, respectively.

The July 7, 2011 Work Plan presented a revised approach toward the characterization of overburden infiltration rates and laid the groundwork for a corresponding design of a proposed treated groundwater infiltration gallery. The infiltration gallery would be utilized to re-infiltrate treated system effluent from the planned groundwater P&T remediation system to be installed in the near future.

The July 7, 2011 Work Plan proposed the following action items:

- Installation of three 6-inch diameter infiltration test boreholes at the following depths:
  - 5 feet below grade surface (bgs)
  - 12 feet bgs
  - 16 feet bgs
- Conduct a one-day test event that includes a series of falling head infiltration tests on each of the three installed test boreholes

An onsite meeting was held on August 5, 2011 with representatives from the MDE, Baltimore County Department of Environmental Protection (DEPS), CIFC and GES. The purpose of the meeting was to review the proposed location of the infiltration boreholes and the potential for impact of an infiltration gallery on existing well and septic structures on and off site. During the meeting, it was agreed that two additional boreholes would be placed west of the three initially proposed locations in order to provide characterization of an area that could be used as an alternate location for infiltration.

Borehole Installation

On August 18, 2011, GES and the drilling contractor, SGS North America Inc, were onsite to install the five approved infiltration boreholes. Initially, each of the five boreholes were "hand-cleared" to a depth of five (5) feet bgs by using air knifing techniques to avoid underground utilities. Following utility clearance activities, a Geoprobe 7822DT rig was used to collect a series of 5-foot direct push macro-core samples from 5 feet bgs to the terminal depth at each of borehole location.

In general, the lithology from each of the boreholes was described as a red-brown to green-gray silt with varying occurrences of parent schist rock fragments. Rock fragments were noted as large as 2 centimeters in some samples. In addition, the relict structural fabric of the parent rock was evident in most borings below a depth of 5 feet bgs. The presence of mica or mica pseudomorphs (weathered mica clay minerals) was also evident in most samples below 5 feet bgs in varying grain sizes, typically increasing at depth. In summary, the lithologic profiles determined from the direct push sample sleeves indicated the occurrence

of a structured saprolite zone beginning between 5 to 7 feet bgs. This structured saprolite zone would correspond to a USDA "C soil horizon" based on the presence of relict structural features and highly weathered parent rock fragments.

Upon completion of the direct-push sampling activities, SGS drilled out the five (5) borehole locations to depth with a 4.25"ID/7.0" (OD) hollow stem auger driven by the Geoprobe machine. A summary of the completed boreholes is presented below in Table 1.

Table 1 – Borehole Completion Summary

Infiltration Borehole	Install Date	Borehole Diameter (inches)	Installation Depth (feet bgs)	Screen Interval (feet bgs)
IB-1	08/08/2011	7	16	0 - 16
IB-2	08/08/2011	7	12	0 – 12
IB-3	08/08/2011	7	5	none
IB-4	08/08/2011	7	16	0 - 16
IB-5	08/08/2011	7	12	0 - 12

Note that all boreholes, with the exception of the shallow IB-3 borehole, were "cased" with 6.0-inch ID (6.6-inch OD) - 020 slotted PVC well screen. Sections of well screen were used to assure the deeper boreholes would stay open through testing procedures. It was assumed that the perforated well screen would have a nominal effect on borehole wall infiltration capacity.

After the boreholes were completed, each hole was "pre-soaked" to grade with potable water supplied by SGS. Subsequently, borehole testing was conducted on August 19, 2011 and the boreholes were properly abandoned by SGS on August 23, 2011.

Borehole Infiltration Testing

On the day following the installation and pre-soak activities (August 19, 2011), a series of infiltration tests were performed in each of the boreholes. The three testing phases included:

- A one (1) hour constant volume (5-gallon) falling head test
- A series of three (3) constant volume (5-gallon) falling head tests and
- A series of three (3) referenced height, falling head tests

The constant volume (5-gallon) falling head tests were performed by adding a fixed 5 gallon volume of water into the borehole. This method was performed in order to provide a low height or low head infiltration rate. This constant volume testing means was selected as it was determined in the field that accurately starting a low-height infiltration test at a predetermined height within a deep casing was difficult to achieve.

The referenced height, falling head tests were conducted by filling each of the boreholes to a predetermined reference point or datum marked either within the screen pipe or with a mark in the open-hole excavation (IB-3). The frequency of tests within this series occurred every 0.5 hours where the water column was refilled to the datum level. During each phase of testing, water levels were collected in five minute intervals using a water level interface probe.

Data Analysis

The borehole infiltration data was evaluated based on the following equation adopted from the *Low Impact Development (LID) Manual for Michigan -Appendix E* (2008) where:

Infiltration Rate = (Percolation Rate) / (Reduction Factor)

With the Reduction Factor defined as:

$$R_f = \frac{(2*d_1 - \Delta d)}{DIA} + 1$$

where:

d_1 = Initial Water Depth (in.)
Δd = Average/Final Water Level Drop (in.)
DIA = Diameter of the Percolation Hole (in.)

The Michigan LID infiltration equation was selected for this analysis as it compensates for additional infiltration occurring along the borehole wall. Correspondingly, a geometric mean of 2.03 inches per hour was determined from all infiltration rates computed via the Michigan LID infiltration rate equation.

A graphical presentation of the borehole infiltration test data is presented in **Appendix B** to this correspondence. A tabularized summary of the collected infiltration test data is presented in **Appendix C.** Note that the application of the Reduction Factor as defined in the Michigan LID document to the collected field data in parts a significant element of conservatism to this evaluation.

Infiltration Gallery Design

Based on infiltration testing and the proposed design of the P&T remediation system, a subsurface infiltration gallery is an appropriate discharge option and can be constructed at the site. The results of the infiltration testing and analysis suggest that the area selected for infiltration has an average infiltration rate of 2.03 inches per hour (in/hr). The P&T remediation system is planned to discharge up to 10,000 gpd, and the discharge of the extracted and treated groundwater is assumed to be continuous over each 24 hour period (will in practice occur in batches as the equalization tank fills and empties).

The design is based solely on the expected discharge rate and volume of the system (e.g., stormwater infiltration is not included as the infiltration gallery and surrounding area is primarily covered with an impervious surface [asphalt]). Extracted groundwater will be treated prior to discharge to the infiltration gallery (i.e., pretreated) as noted above. The location of the proposed infiltration gallery is shown in the System Layout Map attached in **Appendix A**. The location shall comply with all setback requirements, including from water supply wells, septic drain fields, roads and structures.

This design references the applicable sections of the Maryland Stormwater Design Manual, and members of the Baltimore County Department of Environmental Protection & Sustainability (DEPS) were consulted. *Section D.13.2.2 Design of Infiltration Trenches (I-1)* of the Maryland Stormwater Design Manual provided the information necessary to determine the total area needed for the infiltration gallery.

The equation used in the design basis is:

$$A_t = \frac{V_w}{nd_t + fT}$$ (Equation D – 13.3, Maryland Stormwater Design Manual)

A_t: area of infiltration trench in square feet (sq. ft.)
V_w: design volume that enters the trench; 10,000 gallons for a 24 hour period
n: porosity of the stone reservoir in the trench
d_t: depth of the trench
f: minimum infiltration rate in in/hr; 2.0 in/hr
T: effective filling time for the trench; 24 hours

Because the infiltration needs to be continuous, the void space available in the infiltration gallery (represented by the term nd_t in the above equation) shall not be available to store water. Therefore, the standard stormwater equation was modified to accommodate the continuous nature of this application. Removing this term leaves the gallery size to be dependent solely on infiltration. Thus, the above equation simplifies to:

$$A_t = \frac{V_w}{fT}$$

The area needed for infiltration determined using the above equation is approximately ~334 sq. ft. Based on the location selected for the infiltration gallery, the conceptual design is planned to consist of two infiltration trenches (167 sq. ft per trench). The trenches are to be approximately 5-feet wide by 34-feet long, and have at least 10 feet of space separating the two trenches. Based on the infiltration testing results, the trenches should be excavated to a depth of approximately 8 feet. The 8-foot vertical depth has been selected to provide additional conservative protection to minimize the potential for impacts to adjacent infrastructure such as septic and basements. The trench bottoms and side walls are to be sufficiently scarified to allow for maximum infiltration. The trench is to be filled to approximately 10 inches below grade with coarse gravel. Above this gravel layer shall be asphalt to match pre-existing site conditions.

The infiltration gallery trenches are to be equipped with multiple piezometers to monitor the water level (i.e., by manual liquid level gauging), as well as one high level float per trench leg that would shut down the remediation system in the event a high level condition occurs within the infiltration gallery. It is anticipated that the high level floats would shut down the remediation system for a period of time of at least two hours, then allow the remediation system to automatically restart. The conceptual design of each of the two infiltration trenches is depicted in the design drawings included in **Appendix A.** A final design of the infiltration gallery is to be completed following approval of the CAPA. Applicable Best Management Practices (BMPs) presented in the Maryland Stormwater Design Manual and suggested by the DEPS shall be included in the design as appropriate.

GES appreciates the continued guidance of the MDE on this project. If you have any questions or would like additional information, please contact the undersigned at 800-220-3606, extension 3712 or 3717, respectively, or Herb Meade at 410-261-5450.

Sincerely,
GROUNDWATER & ENVIRONMENTAL SERVICES, INC.

Prepared By:

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Enclosures

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Richard Martin, 1606 Rayville Road
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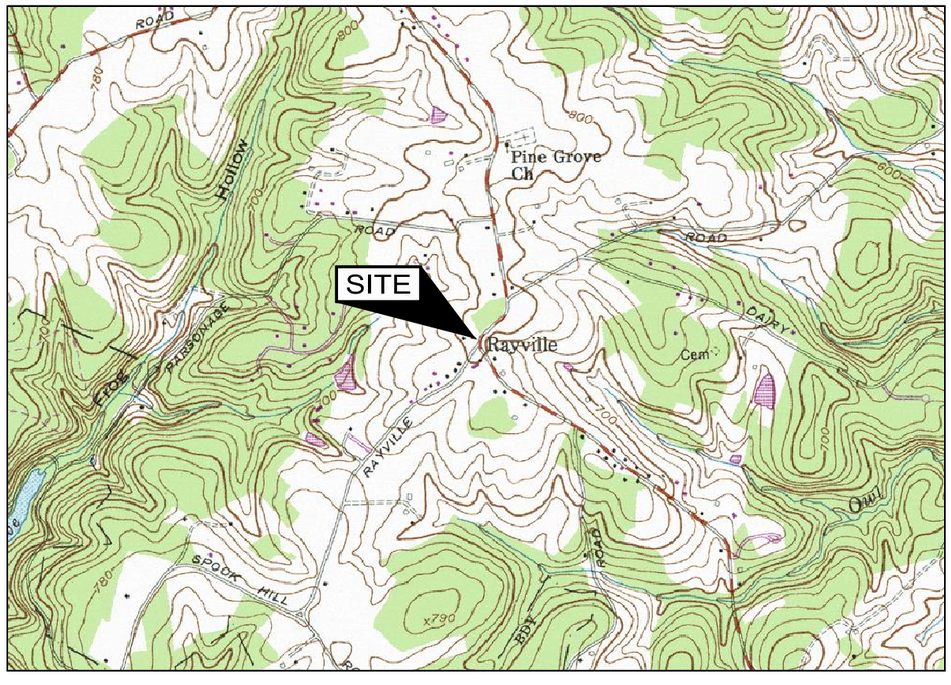
WALLY'S CITGO STATION
19200 MIDDLETOWN ROAD
PARKTON, MARYLAND

FIGURE	DESCRIPTION
1	TITLE PAGE
2	SITE MAP
3	TRENCH LAYOUT MAP
4	TRENCH CROSS SECTIONS
5	WELL CONSTRUCTION DETAIL
6	ABOVEGROUND PIPING STUB-UP DETAIL
7	EQUIPMENT COMPOUND LAYOUT
8	INFILTRATION GALLERY CROSS SECTIONS



APPENDIX A

DRAFTED BY: B.C.S. (N.J.)	TITLE PAGE
CHECKED BY:	WALLY'S CITGO STATION 19200 MIDDLETOWN ROAD PARKTON, MARYLAND
REVIEWED BY:	Groundwater & Environmental Services, Inc. 2142 PRIEST BRIDGE COURT, SUITE 1, CROFTON, MD 21114
NOT TO SCALE	DATE 8-23-11 / FIGURE 1

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PW-3
PW-2
PW-1
Storage
MW-9A
MW-9B
MW-13B
MW-13A
Machine Shop
MW-6
Salon
MW-5B
MW-12B
Bait Shop
SVE-5
SVE System
MW-5
AST
MW-8B
MW-8A
MW-14A
RW-3
MW-14B
SVE-4
MW-2
Canopy
MW-3
SVE-3
MW-3S
SVE-1
SVE-2
MW-1
MW-10B
MW-10A
RW-1
MW-4
Middletown Road
FARM FIELD
Currey's Excavation
MW-17B
MW-17A
MW-7B
MW-7A
RW-2
MW-18A
MW-18B
Rayville Road
1606 Rayville Road
MW-11A
MW-11B
1608 Rayville Road
MW-15
1612 Rayville Road
FIELD
MW-16A
MW-16B

Legend

- Monitoring Well
- Recovery Well
- Abandoned Well
- Potable Well
- Soil Vapor Extraction Point
- Edge of Pavement
- Fence
- Tank Field
- Building
- Canopy
- Dispenser
- Gravel

Source: Maryland GIS, Maryland Aerial Photography August 19, 2010.

DRAFTED BY: AM	SITE MAP
CHECKED BY:	WALLY'S CITGO STATION 19200 MIDDLETOWN ROAD PARKTON, MARYLAND
REVIEWED BY: SMS	
NORTH	Groundwater & Environmental Services, Inc. 2142 Priest Bridge Court, Suite #1, Crofton, MD 21114
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	FIGURE: 2

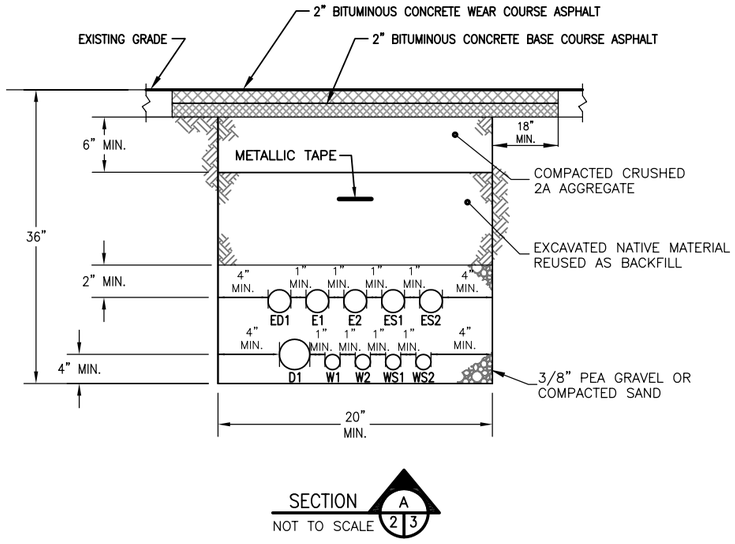
P:\CarrollFuels\ParktonMD\GIS\Maps\CarrollFuels_ParktonMD_Trench Layout Map.mxd - Scale 1:900 - Date: 08-05-11 - Time: [04:47 PM] - amcelvery

PW-3
PW-2
PW-1
Storage
MW-9B
MW-9A
MW-13B
MW-13A
Machine Shop
MW-6
Salon
MW-12B
Bait Shop
MW-5B
SVE-5
SVE System
AST
IB-3
MW-5
Infiltration Gallery
IB-2
SVE-4
Canopy
MW-2
MW-3
MW-14A
MW-14B
IB-4
IB-1
MW-3S
SVE 3
RW-3
E 2|5
SVE-1
SVE-2
IB-5
MW-10B
MW-10A
MW-1
J-1
RW-1
D 2|4
MW-4
C 2|3
FARM FIELD
Currey's Excavation
MW-17A
MW-17B
MW-7B
MW-7A
System Location
RW-2
A 2|1
B 2|2
MW-18B
MW-18A
Middletown Road
Rayville Road
1606 Rayville Road
MW-11A
MW-11B
MW-15
1612 Rayville Road
1608 Rayville Road
FIELD
MW-16A
MW-16B

Legend

- Junction Box
- Trench Piping
- Monitoring Well
- Recovery Well
- Abandoned Well
- Potable Well
- Soil Vapor Extraction Point
- Edge of Pavement
- Fence
- Tank Field
- Building
- Canopy
- Dispenser
- Gravel
- Section ID (D 2|4)
- Figure No. Where Called Out
- Figure No. Where Shown
- IB-5 Infiltration Borehole Location
- Septic Location

DRAFTED BY: AM	TRENCH LAYOUT MAP
CHECKED BY:	WALLY'S CITGO STATION 19200 MIDDLETOWN ROAD PARKTON, MARYLAND
REVIEWED BY: SMS	Groundwater & Environmental Services, Inc. 2142 Priest Bridge Court, Suite #1, Crofton, MD 21114
NORTH	SCALE IN FEET: 0 – 75 / DATE: 8-05-11 / FIGURE: 3



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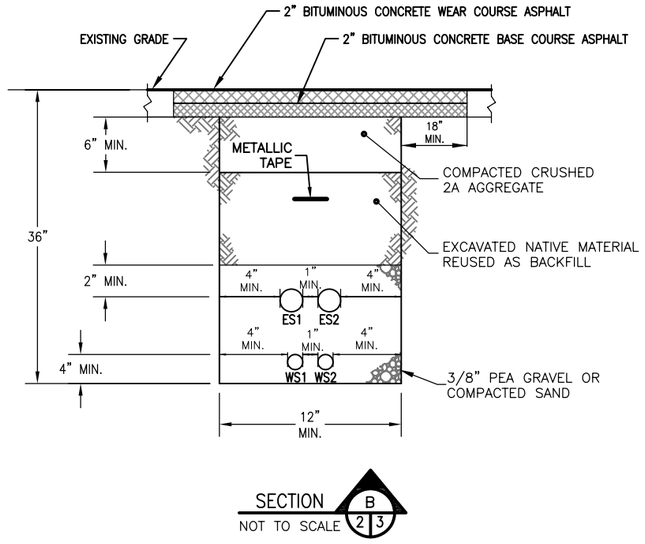

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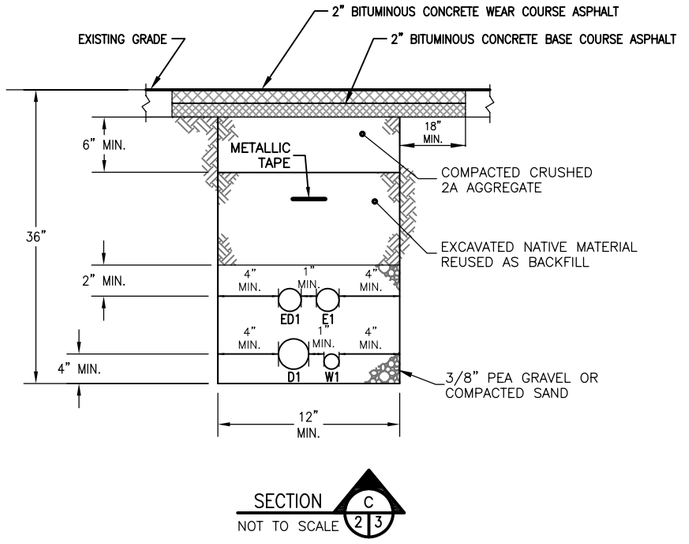

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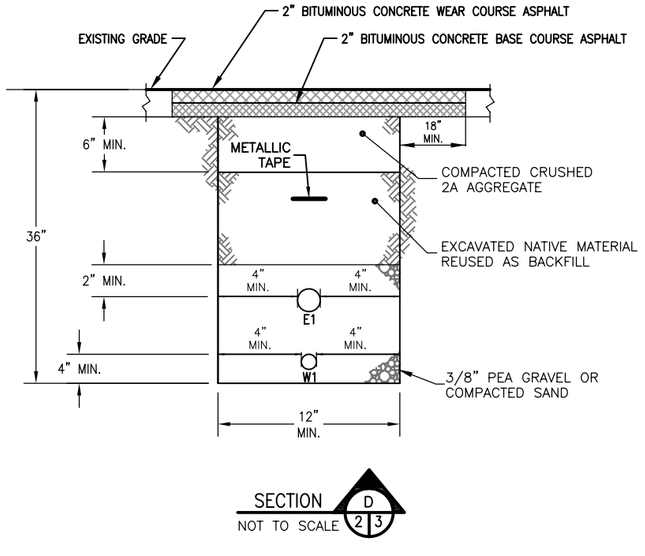

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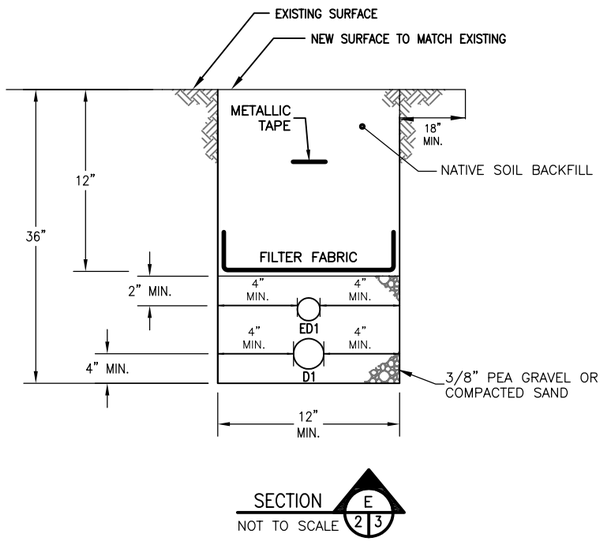

SECTION E
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Pipe ID	Diameter	Material	Description
D1	3-inch	Schedule 80 PVC	Treated water discharge line from the equipment compound to the Infiltration Gallery.
W1, W2	1-inch	Schedule 80 PVC	Groundwater recovery lines from the equipment compound to individual recovery wells RW-1 and RW-2.
WS1, WS2	1-inch	Schedule 80 PVC	Groundwater recovery lines (spare).
ED1	1 $^{1}/_{2}$-inch	Schedule 40 PVC	Electrical conduit from the equipment compound control panel to the Infiltration Gallery.
E1, E2	1 $^{1}/_{2}$-inch	Schedule 40 PVC	Electrical conduits from the equipment compound control panel to individual recovery wells RW-1 and RW-2.
ES1, ES2	1 $^{1}/_{2}$-inch	Schedule 40 PVC	Electrical conduits (spare).

DRAFTED BY: B.C.S. (N.J.)
CHECKED BY:
REVIEWED BY:

TRENCH CROSS SECTIONS

WALLY'S CITGO STATION
19200 MIDDLETOWN ROAD
PARKTON, MARYLAND

Groundwater & Environmental Services, Inc.
2142 PRIEST BRIDGE COURT, SUITE 1, CROFTON, MD 21114

NOT TO SCALE | DATE 8-16-11 | FIGURE 4

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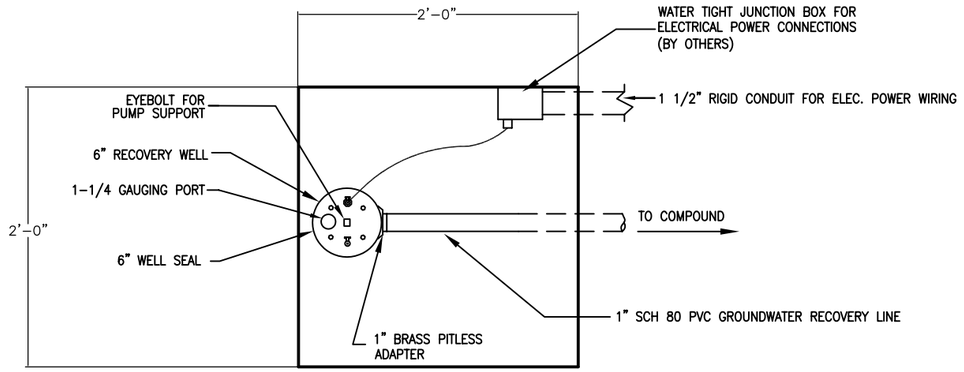
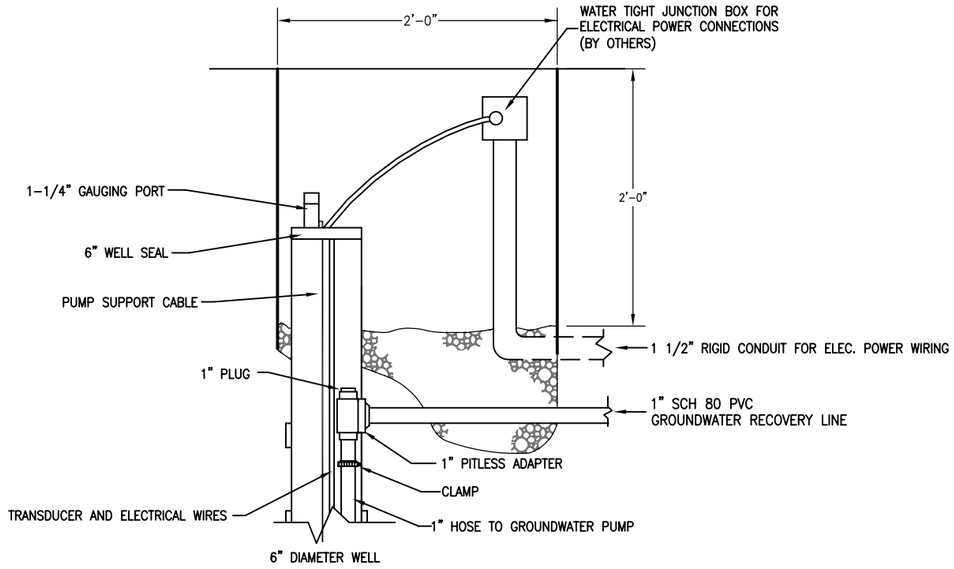
WELL CONSTRUCTION DETAIL
(RW-1, RW-2)

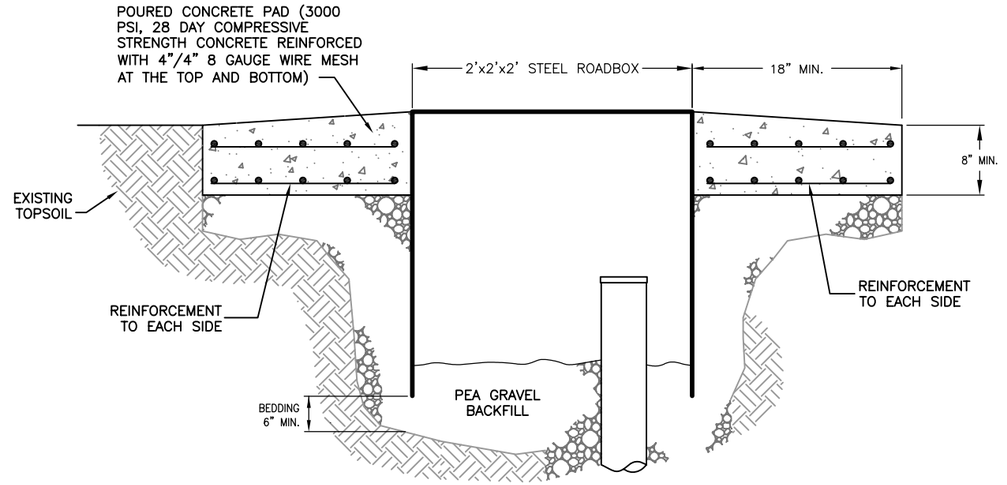


PLAN VIEW



SIDE VIEW

VAULT CONSTRUCTION DETAIL



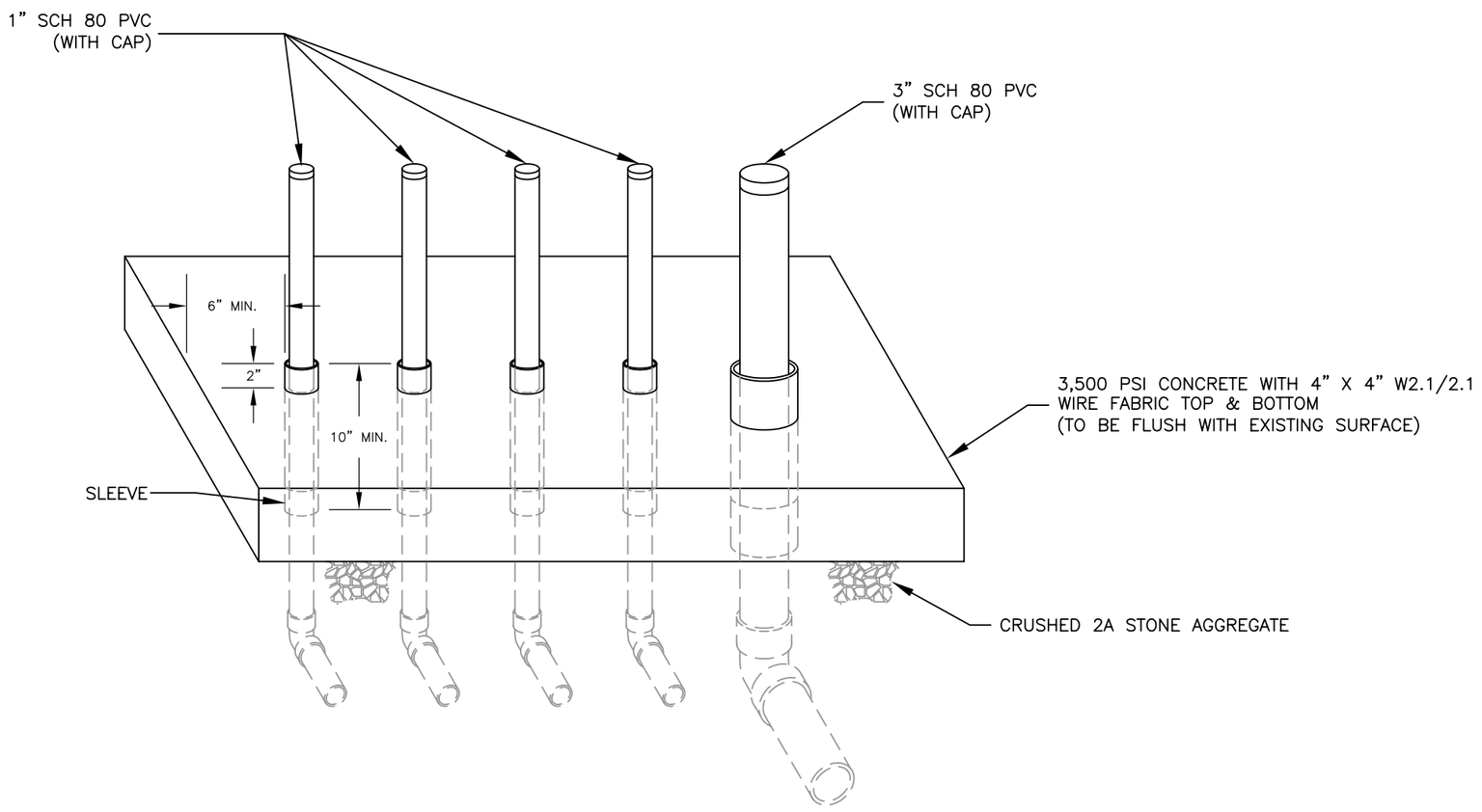
NOTE:

1. CONTRACTOR TO INSTALL PITLESS ADAPTER, GES TO INSTALL GROUNDWATER PUMP & HOSE, WELL SEAL, ELECTRIC.

DRAFTED BY: B.C.S. (N.J.)	WELL CONSTRUCTION DETAIL	
CHECKED BY:	WALLY'S CITGO STATION 19200 MIDDLETOWN ROAD PARKTON, MARYLAND	
REVIEWED BY:	Groundwater & Environmental Services, Inc. 2142 PRIEST BRIDGE COURT, SUITE 1, CROFTON, MD 21114	
	NOT TO SCALE	DATE 8-17-11 / FIGURE 5

M:\Graphics\0400-Crofton\Misc\Carroll Fuels\Carroll Fuels Parkton Wallys\Engineering\Carroll Fuels Parkton Wallys Well Construction Detail.dwg, BSilvestri

ABOVEGROUND PIPING STUB UP DETAIL



NOTES:

1. PVC PIPES ARE TO BE INSTALLED THROUGH PVC SLEEVES SET IN CONCRETE.

2. 10" MIN. LENGTH PVC SLEEVES TO BE INSTALLED PROTRUDING 2" ABOVE & 2" BELOW CONCRETE.

3. SPACE BETWEEN SLEEVE & PIPE IS TO BE PACKED WITH INSULATION.

DRAFTED BY: B.C.S. (N.J.)	ABOVEGROUND PIPING STUB UP DETAIL	
CHECKED BY:	WALLY'S CITGO STATION 19200 MIDDLETOWN ROAD PARKTON, MARYLAND	
REVIEWED BY:	Groundwater & Environmental Services, Inc. 2142 PRIEST BRIDGE COURT, SUITE 1, CROFTON, MD 21114	
	NOT TO SCALE	DATE 8-17-11 / FIGURE 6

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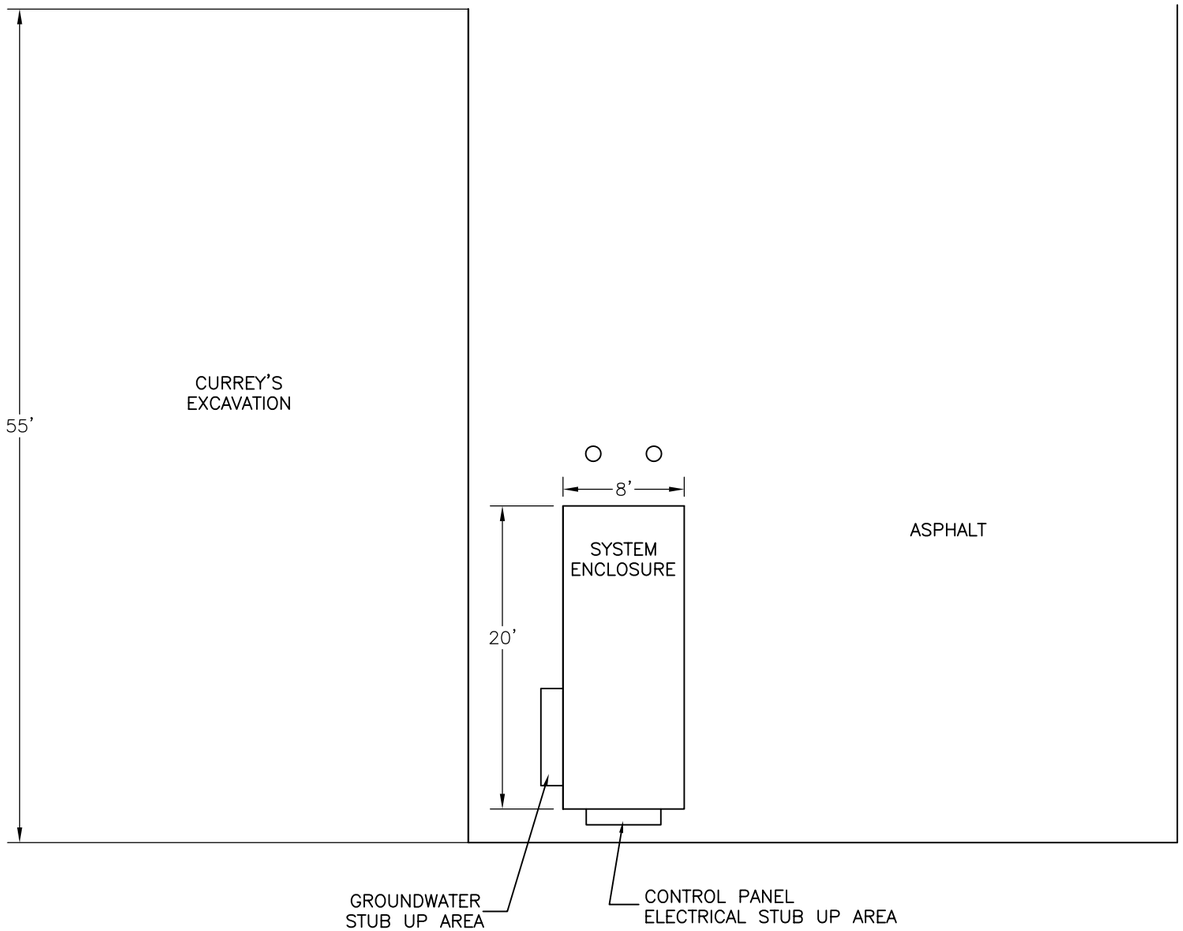
LEGEND

○ BOLLARD



DRAFTED BY: B.C.S. (N.J.)	EQUIPMENT COMPOUND LAYOUT
CHECKED BY:	WALLY'S CITGO STATION 19200 MIDDLETOWN ROAD PARKTON, MARYLAND
REVIEWED BY:	Groundwater & Environmental Services, Inc. 2142 PRIEST BRIDGE COURT, SUITE 1, CROFTON, MD 21114
NOT TO SCALE	DATE 8-17-11 / FIGURE 7

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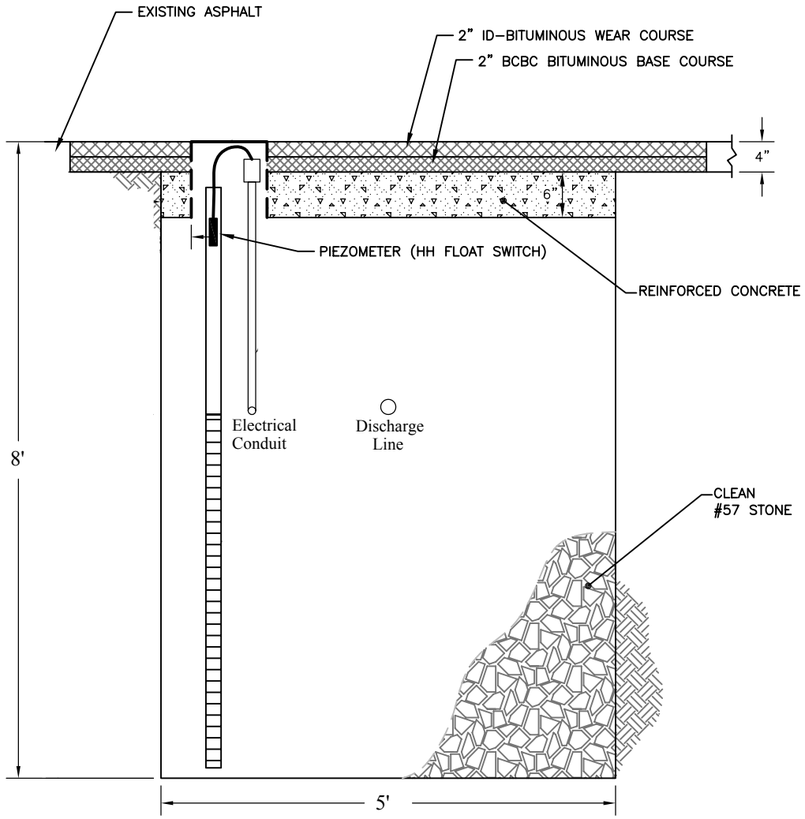
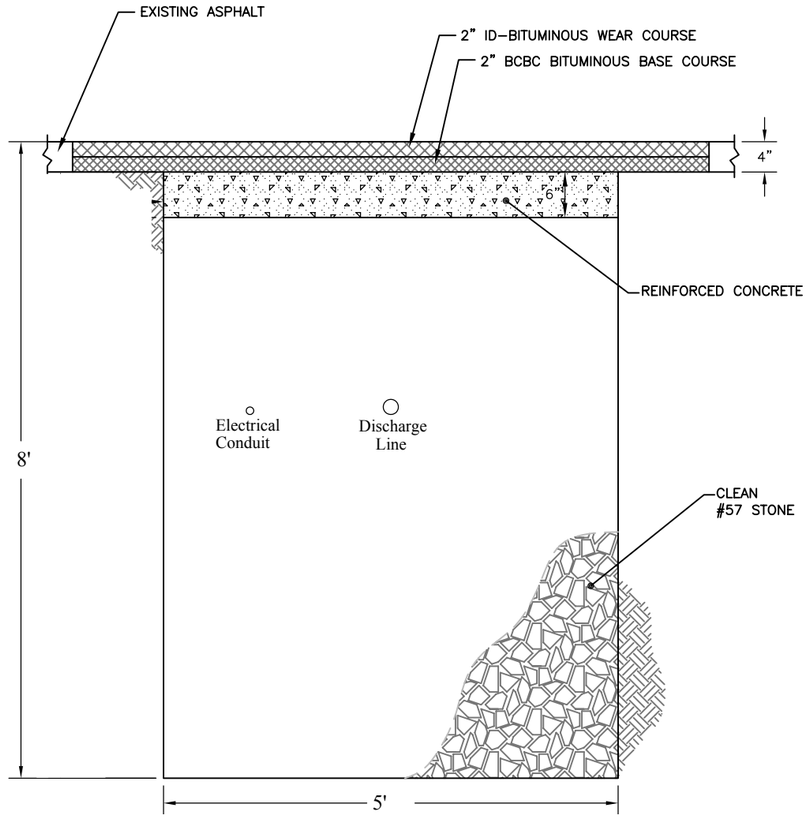
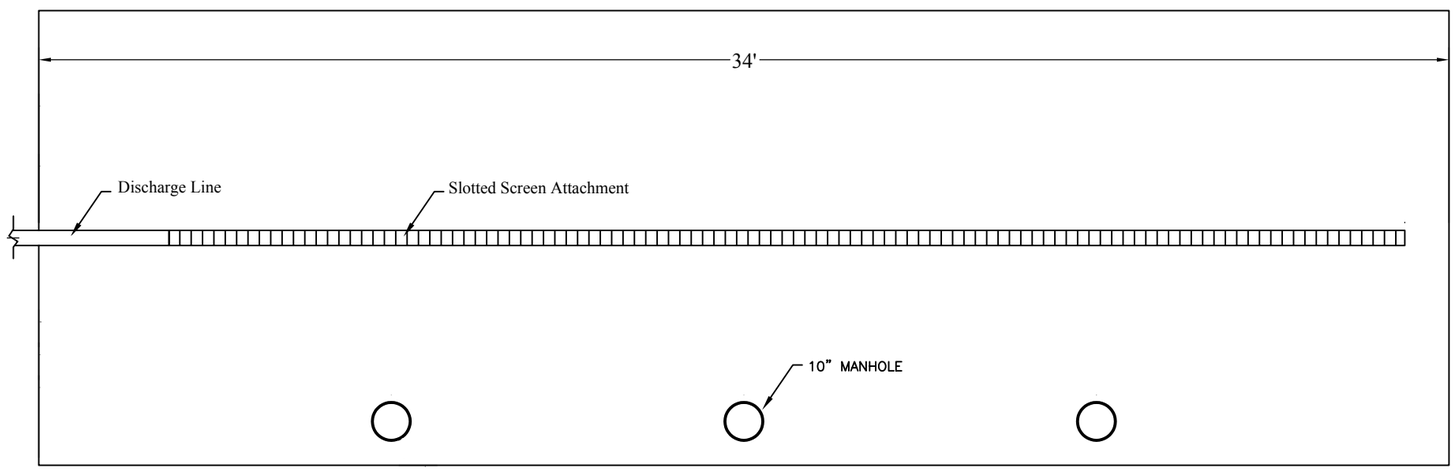


TYPICAL CHARACTERISTIC OF INFILTRATION GALLERY



TYPICAL CHARACTERISTIC OF INFILTRATION GALLERY



TYPICAL CHARACTERISTIC OF INFILTRATION GALLERY
(N.T.S.)

DRAFTED BY: B.C.S. (N.J.)	INFILTRATION GALLERY CROSS SECTIONS
CHECKED BY:	WALLY'S CITGO STATION 19200 MIDDLETOWN ROAD PARKTON, MARYLAND
REVIEWED BY:	Groundwater & Environmental Services, Inc. 2142 PRIEST BRIDGE COURT, SUITE 1, CROFTON, MD 21114
NORTH	NOT TO SCALE / DATE 8-22-11 / FIGURE 8

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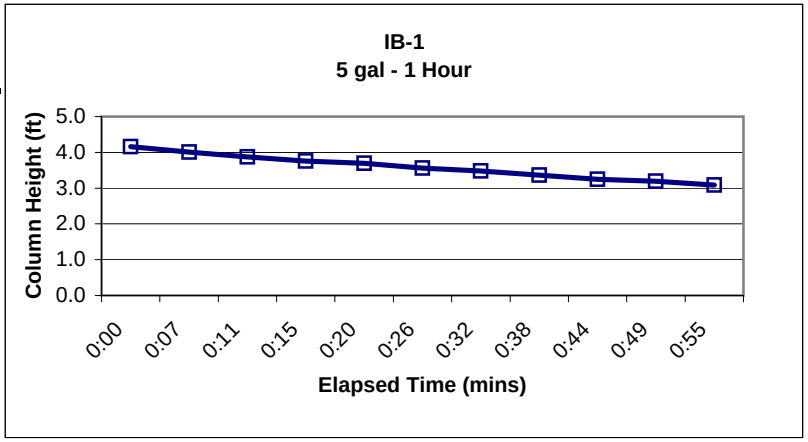
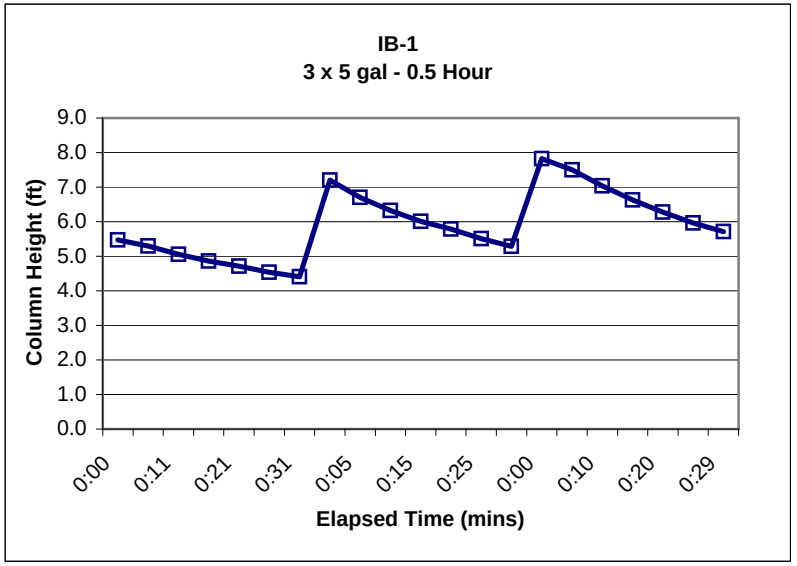
APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-1	8:29		13.1	1.1		14.21	
Test 1	8:31	0:00:00	10.05	4.16	0.00		add 5 gal
	8:38	0:07:00	10.2	4.01	0.15		
	8:42	0:11:00	10.34	3.87	0.29		
	8:46	0:15:00	10.45	3.76	0.40		
	8:51	0:20:00	10.52	3.69	0.47		
	8:57	0:26:00	10.65	3.56	0.60		
	9:03	0:32:00	10.73	3.48	0.68		
	9:09	0:38:00	10.85	3.36	0.80		
	9:15	0:44:00	10.96	3.25	0.91		
	9:20	0:49:00	11.02	3.19	0.97		
	9:26	0:55:00	11.12	3.09	1.07		



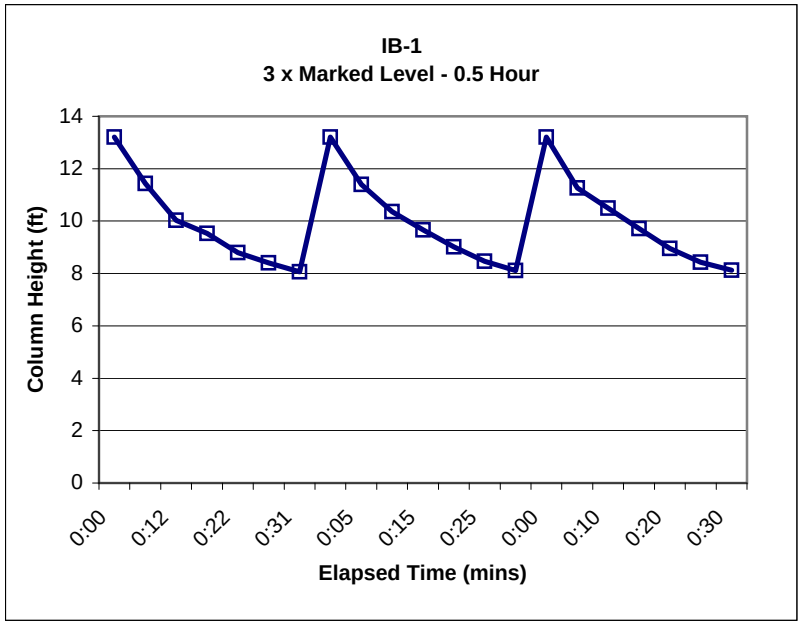
Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-1	9:58		11.57	2.64		14.21	
Test 2	9:59	0:00:00	8.74	5.47	0.00		add 5 gals
	10:04	0:05:00	8.91	5.3	0.17		
	10:10	0:11:00	9.15	5.06	0.41		
	10:15	0:16:00	9.35	4.86	0.61		
	10:20	0:21:00	9.5	4.71	0.76		
	10:25	0:26:00	9.67	4.54	0.93		
	10:30	0:31:00	9.8	4.41	1.06		
Test 3	10:31	0:00:00	7.01	7.2	0.00		add 5 gals
	10:36	0:05:00	7.51	6.7	0.50		
	10:41	0:10:00	7.89	6.32	0.88		
	10:46	0:15:00	8.2	6.01	1.19		
	10:51	0:20:00	8.42	5.79	1.41		
	10:56	0:25:00	8.7	5.51	1.69		
	11:02	0:31:00	8.92	5.29	1.91		
Test 4	11:03	0:00:00	6.39	7.82	0.00		add 5 gals
	11:08	0:05:00	6.71	7.5	0.32		
	11:13	0:10:00	7.17	7.04	0.78		
	11:18	0:15:00	7.58	6.63	1.19		
	11:23	0:20:00	7.93	6.28	1.54		
	11:28	0:25:00	8.25	5.96	1.86		
	11:32	0:29:00	8.5	5.71	2.11		



APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

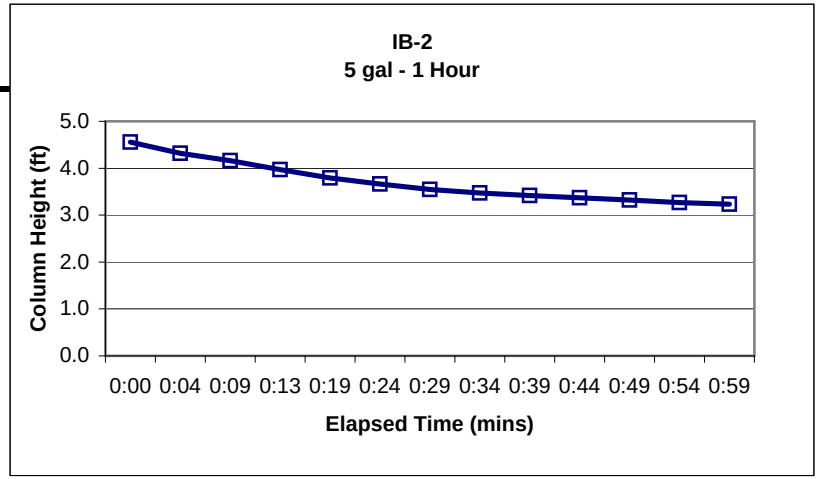
Bore-hole	Time	Elapsed Time (mins)	Measured DTW	Corrected DTW	Column Height (ft)	Depth to Bottom (ft)	Notes
IB-1	12:40	0:00:00	1.00	0.00	13.21	14.21	Fill to datum
Test 5	12:45	0:05:00	2.78	1.78	11.43		
	12:52	0:12:00	4.18	3.18	10.03		
	12:57	0:17:00	4.68	3.68	9.53		
	13:02	0:22:00	5.41	4.41	8.8		
	13:07	0:27:00	5.8	4.8	8.41		
	13:11	0:31:00	6.15	5.15	8.06		
Test 6	13:15	0:00:00	1.00	0.00	13.21		Fill to datum
	13:20	0:05:00	2.81	1.81	11.4		
	13:25	0:10:00	3.85	2.85	10.36		
	13:30	0:15:00	4.55	3.55	9.66		
	13:35	0:20:00	5.2	4.2	9.01		
	13:40	0:25:00	5.75	4.75	8.46		
	13:45	0:30:00	6.1	5.1	8.11		
Test 7	13:46	0:00:00	1.00	0.00	13.21		Fill to datum
	13:51	0:05:00	2.95	1.95	11.26		
	13:56	0:10:00	3.72	2.72	10.49		
	14:01	0:15:00	4.5	3.5	9.71		
	14:06	0:20:00	5.25	4.25	8.96		
	14:11	0:25:00	5.78	4.78	8.43		
	14:16	0:30:00	6.09	5.09	8.12		



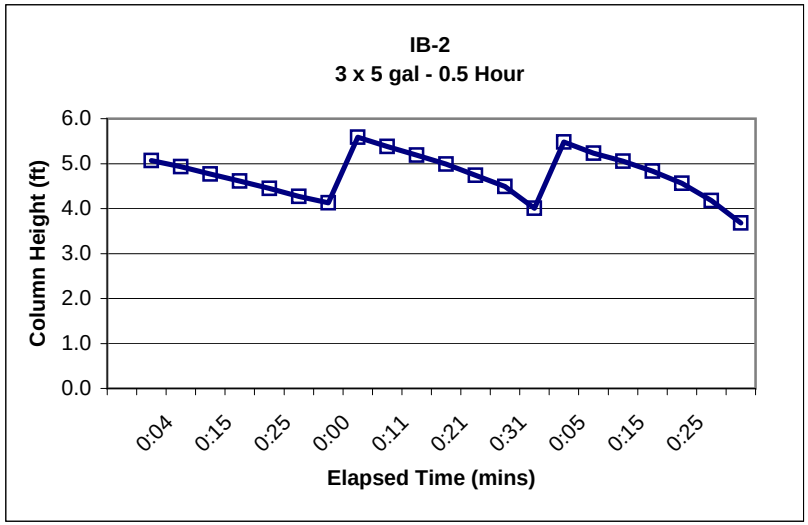
APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-2			8.44			10.28	
Test 1	8:19	0:00:00	5.72	4.56	0.00		add 5 gal
	8:24	0:04:30	5.96	4.32	0.24		
	8:29	0:09:30	6.12	4.16	0.4		
	8:33	0:13:30	6.31	3.97	0.59		
	8:39	0:19:30	6.49	3.79	0.77		
	8:44	0:24:30	6.62	3.66	0.9		
	8:49	0:29:30	6.73	3.55	1.01		
	8:54	0:34:30	6.81	3.47	1.09		
	8:59	0:39:30	6.86	3.42	1.14		
	9:04	0:44:30	6.91	3.37	1.19		
	9:09	0:49:30	6.96	3.32	1.24		
	9:14	0:54:30	7.01	3.27	1.29		
	9:19	0:59:30	7.05	3.23	1.33		



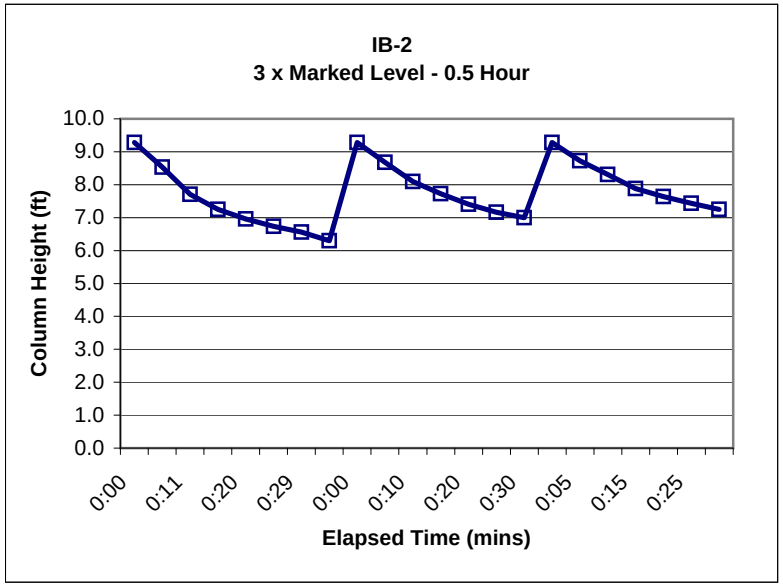
Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-2			7.42			10.28	
Test 2	10:01	0:00:00	5.21	5.07	0.00		add 5 gal
	10:05	0:04:00	5.35	4.93	0.14		
	10:10	0:09:00	5.51	4.77	0.30		
	10:16	0:15:00	5.67	4.61	0.46		
	10:21	0:20:00	5.83	4.45	0.62		
	10:26	0:25:00	6.01	4.27	0.80		
	10:31	0:30:00	6.15	4.13	0.94		
Test 3	10:32	0:00:00	4.69	5.59	0.00		add 5 gal
	10:38	0:06:00	4.9	5.38	0.21		
	10:43	0:11:00	5.09	5.19	0.40		
	10:48	0:16:00	5.29	4.99	0.60		
	10:53	0:21:00	5.54	4.74	0.85		
	10:57	0:25:00	5.79	4.49	1.10		
	11:03	0:31:00	6.27	4.01	1.58		
Test 4	11:05	0:00:00	4.8	5.48	0.00		add 5 gal
	11:10	0:05:00	5.05	5.23	0.25		
	11:15	0:10:00	5.23	5.05	0.43		
	11:20	0:15:00	5.45	4.83	0.65		
	11:25	0:20:00	5.72	4.56	0.92		
	11:30	0:25:00	6.1	4.18	1.30		
	11:35	0:30:00	6.6	3.68	1.80		



APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

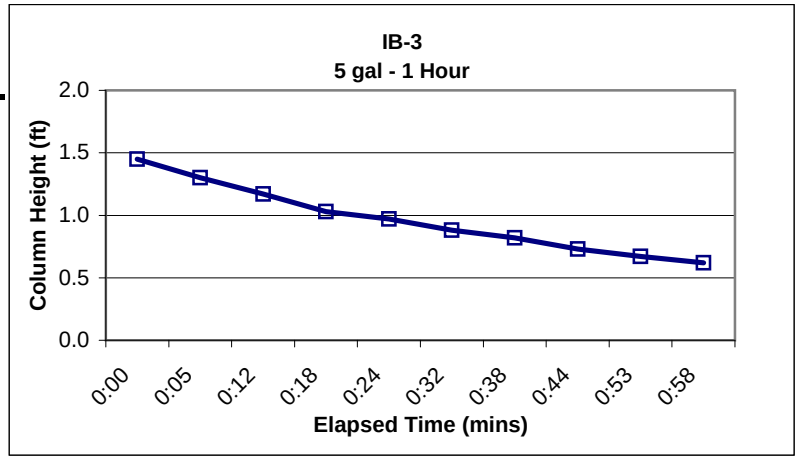
Bore-hole	Time	Elapsed Time (mins)	Measured DTW	Corrected DTW	Column Height (ft)	Depth to Bottom (ft)	Notes
IB-2	12:43	0:00:00	1	0	9.28	10.28	Fill to datum
Test 5	12:48	0:05:00	1.75	0.75	8.53		
	12:54	0:11:00	2.57	1.57	7.71		
	12:59	0:16:00	3.03	2.03	7.25		
	13:03	0:20:00	3.32	2.32	6.96		
	13:08	0:25:00	3.55	2.55	6.73		
	13:12	0:29:00	3.72	2.72	6.56		
	13:17	0:34:00	3.98	2.98	6.30		
Test 6	13:18	0:00:00	1	0	9.28		Fill to datum
	13:23	0:05:00	1.6	0.6	8.68		
	13:28	0:10:00	2.18	1.18	8.1		
	13:33	0:15:00	2.55	1.55	7.73		
	13:38	0:20:00	2.87	1.87	7.41		
	13:43	0:25:00	3.12	2.12	7.16		
	13:48	0:30:00	3.28	2.28	7.00		
Test 7	13:49	0:00:00	1	0	9.28		Fill to datum
	13:54	0:05:00	1.55	0.55	8.73		
	13:59	0:10:00	1.97	0.97	8.31		
	14:04	0:15:00	2.4	1.4	7.88		
	14:09	0:20:00	2.64	1.64	7.64		
	14:14	0:25:00	2.85	1.85	7.43		
	14:19	0:30:00	3.03	2.03	7.25		



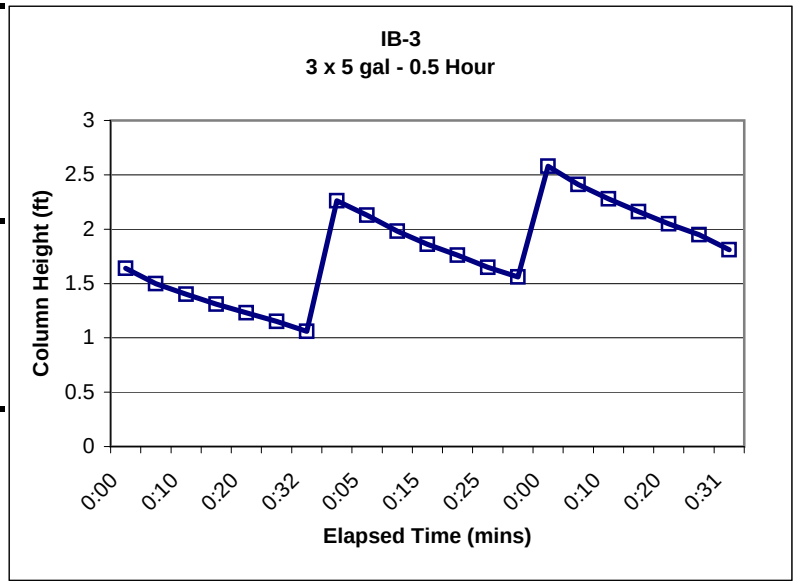
APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-3	8:25	0:00:00	Dry			4.45	
Test 1	8:25	0:00:00	3.00	1.45	0.0		add 5 gal
	8:30	0:05:00	3.15	1.30	0.2		
	8:37	0:12:00	3.28	1.17	0.28		
	8:43	0:18:00	3.42	1.03	0.42		
	8:49	0:24:00	3.48	0.97	0.48		
	8:57	0:32:00	3.57	0.88	0.57		
	9:03	0:38:00	3.63	0.82	0.63		
	9:09	0:44:00	3.72	0.73	0.72		
	9:18	0:53:00	3.78	0.67	0.78		
	9:23	0:58:00	3.83	0.62	0.83		



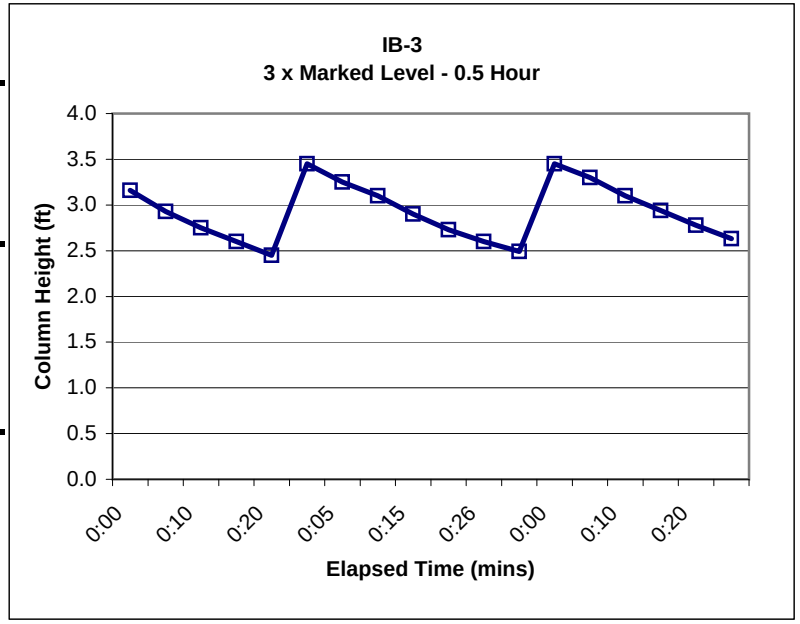
Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-3	10:01	0:00:00	4.05			4.45	
Test 2	10:02	0:00:00	2.81	1.64	0		add 5 gals
	10:07	0:05:00	2.95	1.5	0.14		
	10:12	0:10:00	3.05	1.4	0.24		
	10:17	0:15:00	3.14	1.31	0.33		
	10:22	0:20:00	3.22	1.23	0.41		
	10:27	0:25:00	3.3	1.15	0.49		
	10:34	0:32:00	3.39	1.06	0.58		
Test 3	10:35	0:00:00	2.19	2.26	0		add 5 gals
	10:40	0:05:00	2.32	2.13	0.13		
	10:45	0:10:00	2.47	1.98	0.28		
	10:50	0:15:00	2.59	1.86	0.40		
	10:55	0:20:00	2.69	1.76	0.50		
	11:00	0:25:00	2.8	1.65	0.61		
	11:06	0:31:00	2.89	1.56	0.70		
Test 4	11:07	0:00:00	1.87	2.58	0		add 5 gals
	11:12	0:05:00	2.04	2.41	0.17		
	11:17	0:10:00	2.17	2.28	0.3		
	11:22	0:15:00	2.29	2.16	0.42		
	11:27	0:20:00	2.4	2.05	0.53		
	11:32	0:25:00	2.5	1.95	0.63		
	11:38	0:31:00	2.64	1.81	0.77		



APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

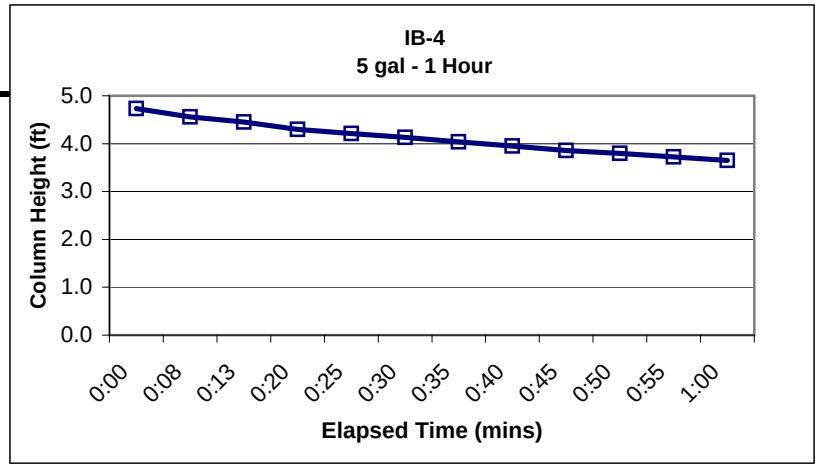
Bore-hole	Time	Elapsed Time (mins)	Measured DTW	Corrected DTW	Column Height (ft)	Depth to Bottom (ft)	Notes
IB-3	12:49	0:00:00	1.0	0.00	3.45	4.45	Fill to datum
Test 5	12:55	0:00:00	1.29	0.29	3.16		
	13:00	0:05:00	1.52	0.52	2.93		
	13:05	0:10:00	1.7	0.70	2.75		
	13:10	0:15:00	1.85	0.85	2.60		
	13:15	0:20:00	2.0	1.00	2.45		
Test 6	13:23	0:00:00	1.0	0.00	3.45		Fill to datum
	13:28	0:05:00	1.2	0.20	3.25		
	13:33	0:10:00	1.35	0.35	3.10		
	13:38	0:15:00	1.55	0.55	2.90		
	13:44	0:21:00	1.72	0.72	2.73		
	13:49	0:26:00	1.85	0.85	2.60		
	13:54	0:31:00	1.96	0.96	2.49		
Test 7	13:55	0:00:00	1.0	0.00	3.45		Fill to datum
	14:00	0:05:00	1.15	0.15	3.30		
	14:05	0:10:00	1.35	0.35	3.10		
	14:10	0:15:00	1.51	0.51	2.94		
	14:15	0:20:00	1.67	0.67	2.78		
	14:20	0:25:00	1.82	0.82	2.63		



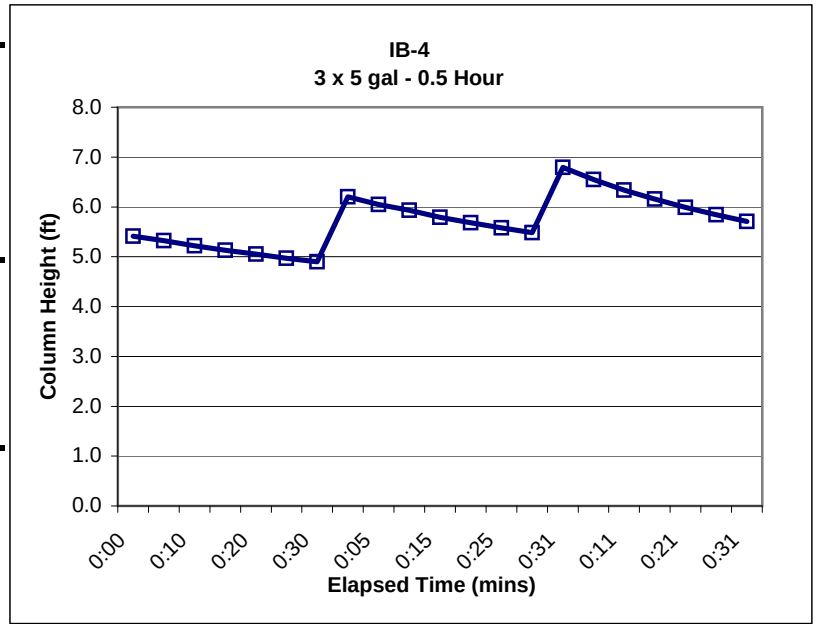
APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-4			12.44	2.04		14.48	
Test 1	9:08	0:00:00	9.75	4.73	0.00		add 5 gal
	9:16	0:08:00	9.92	4.56	0.17		
	9:21	0:13:00	10.03	4.45	0.28		
	9:28	0:20:00	10.18	4.30	0.43		
	9:33	0:25:00	10.27	4.21	0.52		
	9:38	0:30:00	10.35	4.13	0.60		
	9:43	0:35:00	10.44	4.04	0.69		
	9:48	0:40:00	10.53	3.95	0.78		
	9:53	0:45:00	10.62	3.86	0.87		
	9:58	0:50:00	10.68	3.80	0.93		
	10:03	0:55:00	10.76	3.72	1.01		
	10:08	1:00:00	10.83	3.65	1.08		



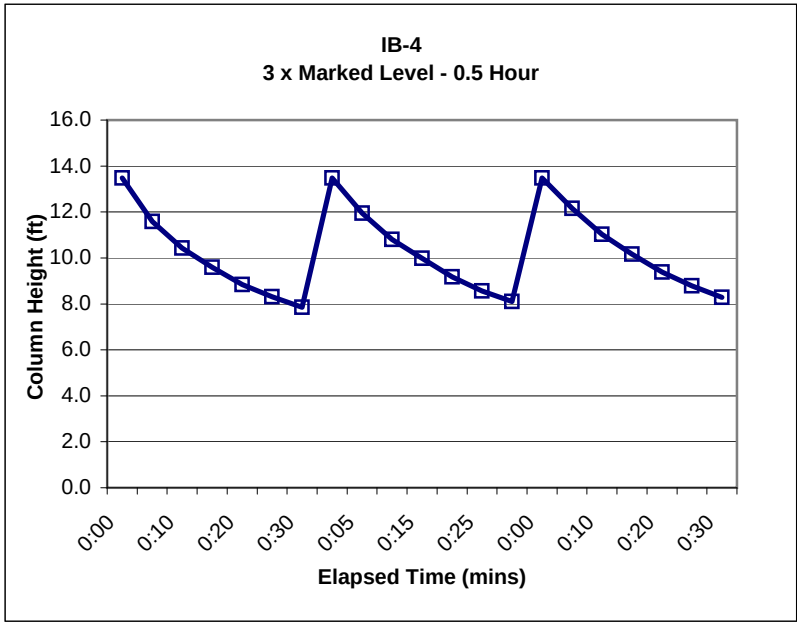
Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-4			10.86	3.62		14.48	
Test 2	10:12	0:00:00	9.07	5.41	0.00		add 5 gal
	10:17	0:05:00	9.16	5.32	0.09		
	10:22	0:10:00	9.26	5.22	0.19		
	10:27	0:15:00	9.35	5.13	0.28		
	10:32	0:20:00	9.43	5.05	0.36		
	10:37	0:25:00	9.51	4.97	0.44		
	10:42	0:30:00	9.58	4.9	0.51		
Test 3	10:43	0:00:00	8.28	6.2	0		add 5 gals
	10:48	0:05:00	8.43	6.05	0.15		
	10:53	0:10:00	8.55	5.93	0.27		
	10:58	0:15:00	8.69	5.79	0.41		
	11:03	0:20:00	8.8	5.68	0.52		
	11:08	0:25:00	8.9	5.58	0.62		
	11:13	0:30:00	9	5.48	0.72		
Test 4	11:14	0:31:00	7.69	6.79	0		add 5 gals
	11:19	0:06:00	7.93	6.55	0.24		
	11:24	0:11:00	8.14	6.34	0.45		
	11:29	0:16:00	8.32	6.16	0.63		
	11:34	0:21:00	8.49	5.99	0.8		
	11:39	0:26:00	8.64	5.84	0.95		
	11:44	0:31:00	8.77	5.71	1.08		



APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

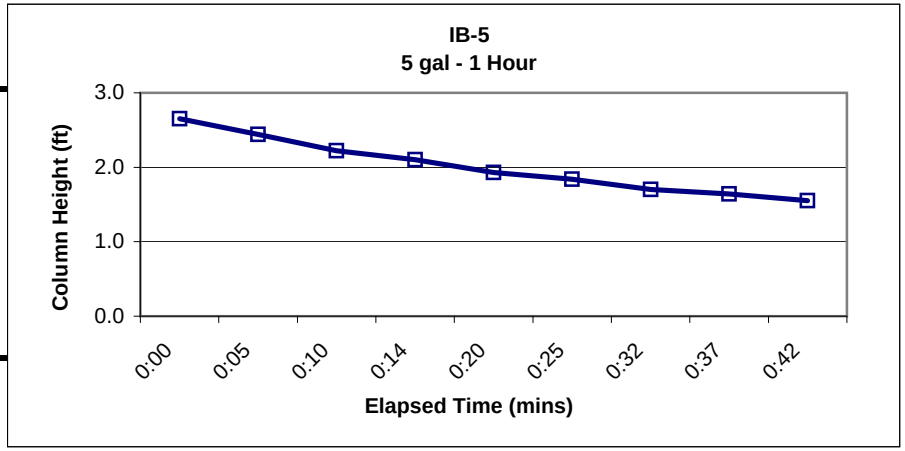
Bore-hole	Time	Elapsed Time (mins)	Measured DTW	Corrected DTW	Column Height (ft)	Depth to Bottom (ft)	Notes
IB-4	12:36	0:00:00	1.00	0.00	13.48	14.48	Fill to datum
Test 5	12:41	0:05:00	2.89	1.89	11.59		
	12:46	0:10:00	4.05	3.05	10.43		
	12:51	0:15:00	4.89	3.89	9.59		
	12:56	0:20:00	5.64	4.64	8.84		
	13:01	0:25:00	6.17	5.17	8.31		
	13:06	0:30:00	6.63	5.63	7.85		
Test 6	13:08	0:00:00	1.00	0.00	13.48		Fill to datum
	13:13	0:05:00	2.53	1.53	11.95		
	13:18	0:10:00	3.67	2.67	10.81		
	13:23	0:15:00	4.49	3.49	9.99		
	13:28	0:20:00	5.30	4.30	9.18		
	13:33	0:25:00	5.92	4.92	8.56		
	13:38	0:30:00	6.37	5.37	8.11		
Test 7	13:39	0:00:00	1.00	0.00	13.48		Fill to datum
	13:44	0:05:00	2.32	1.32	12.16		
	13:49	0:10:00	3.45	2.45	11.03		
	13:54	0:15:00	4.31	3.31	10.17		
	13:59	0:20:00	5.10	4.10	9.38		
	14:04	0:25:00	5.69	4.69	8.79		
	14:09	0:30:00	6.20	5.20	8.28		



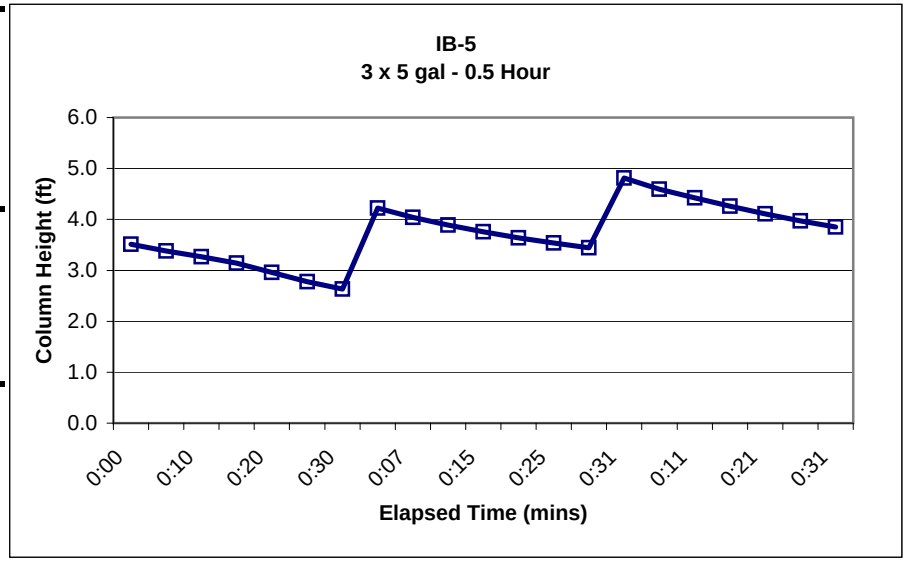
APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-5			Dry			11.65	
Test 1	8:55	0:00:00	9.00	2.65	0.00		add 5 gal
	9:00	0:05:00	9.21	2.44	0.21		
	9:05	0:10:00	9.43	2.22	0.43		
	9:09	0:14:00	9.55	2.1	0.55		
	9:15	0:20:00	9.72	1.93	0.72		
	9:20	0:25:00	9.81	1.84	0.81		
	9:27	0:32:00	9.95	1.7	0.95		
	9:32	0:37:00	10.01	1.64	1.01		
	9:37	0:42:00	10.1	1.55	1.10		



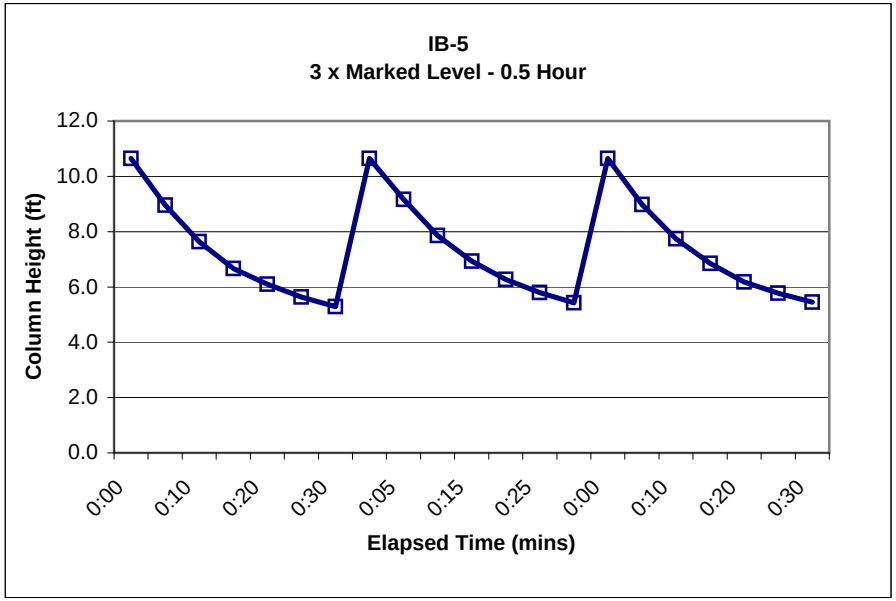
Bore-hole	Time	Elapsed Time (mins)	DTW (ft from TOC)	Water Column Height (ft)	Water Level Change (ft)	Depth to Bottom (ft)	Notes
IB-5			10.51	1.14		11.65	
Test 2	10:10	0:00:00	8.14	3.51	0.00		add 5 gals
	10:15	0:05:00	8.27	3.38	0.13		
	10:20	0:10:00	8.38	3.27	0.24		
	10:25	0:15:00	8.51	3.14	0.37		
	10:30	0:20:00	8.69	2.96	0.55		
	10:35	0:25:00	8.87	2.78	0.73		
	10:40	0:30:00	9.02	2.63	0.88		
Test 3	10:41	0:00:00	7.43	4.22	0.00		add 5 gals
	10:48	0:07:00	7.61	4.04	0.18		
	10:51	0:10:00	7.76	3.89	0.33		
	10:56	0:15:00	7.89	3.76	0.46		
	11:01	0:20:00	8.01	3.64	0.58		
	11:06	0:25:00	8.11	3.54	0.68		
	11:11	0:30:00	8.21	3.44	0.78		
Test 4	11:12	0:31:00	6.84	4.81	0.00		add 5 gals
	11:17	0:06:00	7.06	4.59	0.22		
	11:22	0:11:00	7.23	4.42	0.39		
	11:27	0:16:00	7.39	4.26	0.55		
	11:32	0:21:00	7.54	4.11	0.70		
	11:37	0:26:00	7.68	3.97	0.84		
	11:42	0:31:00	7.8	3.85	0.96		



APPENDIX B
Borehole Infiltration Test Graphs

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

Bore-hole	Time	Elapsed Time (mins)	Measured DTW	Corrected DTW	Column Height (ft)	Depth to Bottom (ft)	Notes
IB-5	12:34	0:00:00	1.00	0.00	10.65	11.65	Fill to datum
Test 5	12:39	0:05:00	2.69	1.69	8.96		
	12:44	0:10:00	4.01	3.01	7.64		
	12:49	0:15:00	4.99	3.99	6.66		
	12:54	0:20:00	5.55	4.55	6.10		
	12:59	0:25:00	6.01	5.01	5.64		
	13:04	0:30:00	6.36	5.36	5.29		
Test 6	13:06	0:00:00	1.00	0.00	10.65		Fill to datum
	13:11	0:05:00	2.48	1.48	9.17		
	13:16	0:10:00	3.79	2.79	7.86		
	13:21	0:15:00	4.72	3.72	6.93		
	13:26	0:20:00	5.38	4.38	6.27		
	13:31	0:25:00	5.85	4.85	5.80		
	13:36	0:30:00	6.22	5.22	5.43		
Test 7	13:37	0:00:00	1.00	0.00	10.65		Fill to datum
	13:42	0:05:00	2.67	1.67	8.98		
	13:47	0:10:00	3.91	2.91	7.74		
	13:52	0:15:00	4.80	3.80	6.85		
	13:57	0:20:00	5.47	4.47	6.18		
	14:02	0:25:00	5.88	4.88	5.77		
	14:07	0:30:00	6.20	5.20	5.45		



APPENDIX C
Borehole Infiltration Test Data

Carroll Fuels Wally's BP (Former Citgo)
19200 Middletown Road, Parkton, MD

Borehole	Diameter of Borehole (inches)	Test	Elapsed Time (hrs)	Initial Column Height (inches)	Final Column Height (inches)	Perculation Rate (inches/hr)	Reduction Factor (R_f)			Corrected Infiltration Rate (in/hr)
							D_1 (inches)	Δd (inches)	R_f	
IB-1	7	1	0.92	49.92	37.08	14.0	49.92	12.84	13.43	1.04
	7	2	0.52	65.64	52.92	24.6	65.64	12.72	17.94	1.37
	7	3	0.48	86.40	63.48	47.4	86.4	22.92	22.41	2.12
	7	4	0.48	93.84	68.52	52.4	93.84	25.32	24.19	2.17
	7	5	0.52	158.52	96.72	119.6	158.52	61.8	37.46	3.19
	7	6	0.50	158.52	97.32	122.4	158.52	61.2	37.55	3.26
	7	7	0.50	158.52	97.44	122.2	158.52	61.08	37.57	3.25
IB-2	7	1	0.99	54.72	38.76	16.1	54.72	15.96	14.35	1.12
	7	2	0.50	60.84	49.56	22.6	60.84	11.28	16.77	1.35
	7	3	0.52	67.08	48.12	36.7	67.08	18.96	17.46	2.10
	7	4	0.50	65.76	44.16	43.2	65.76	21.6	16.70	2.59
	7	5	0.57	111.36	75.6	63.1	111.36	35.76	27.71	2.28
	7	6	0.50	111.36	84	54.7	111.36	27.36	28.91	1.89
	7	7	0.50	111.36	87	48.7	111.36	24.36	29.34	1.66
IB-3	7	1	0.97	17.4	7.44	10.3	17.4	9.96	4.55	2.27
	7	2	0.53	19.68	12.72	13.1	19.68	6.96	5.63	2.32
	7	3	0.52	27.12	18.72	16.3	27.12	8.4	7.55	2.15
	7	4	0.52	30.96	21.72	17.9	30.96	9.24	8.53	2.10
	7	5	0.33	41.40	29.4	36.0	41.4	12	11.11	3.24
	7	6	0.52	41.40	29.88	22.3	41.4	11.52	11.18	1.99
	7	7	0.42	41.40	31.56	23.6	41.4	9.84	11.42	2.07
IB-4	7	1	1.00	56.76	43.8	13.0	56.76	12.96	15.37	0.84
	7	2	0.50	64.92	58.8	12.2	64.92	6.12	18.67	0.66
	7	3	0.50	74.40	65.76	17.3	74.4	8.64	21.02	0.82
	7	4	0.52	81.48	68.52	25.1	81.48	12.96	22.43	1.12
	7	5	0.50	161.76	94.2	135.1	161.76	67.56	37.57	3.60
	7	6	0.50	161.76	97.32	128.9	161.76	64.44	38.01	3.39
	7	7	0.50	161.76	99.36	124.8	161.76	62.4	38.30	3.26
IB-5	7	1	0.70	31.8	18.6	18.9	31.8	13.2	8.20	2.30
	7	2	0.50	42.12	31.56	21.1	42.12	10.56	11.53	1.83
	7	3	0.50	50.64	41.28	18.7	50.64	9.36	14.13	1.32
	7	4	0.52	57.72	46.2	22.3	57.72	11.52	15.85	1.41
	7	5	0.50	139.8	75.48	128.6	139.8	64.32	31.75	4.05
	7	6	0.50	139.8	77.16	125.3	139.8	62.64	31.99	3.92
	7	7	0.50	139.8	77.4	124.8	139.8	62.4	32.03	3.90

Geometric Mean **2.01** **inches/hr**
4.02 **ft/day**