APPENDIX D

HYDRAULIC CONDUCTIVITY, LNAPL RECOVERABILITY OBSERVATIONS AND LNAPL TRANSMISSIVITY CALCULATIONS

APPENDIX D
LNAPL LIQUID PROPERTIES AND SMEAR ZONE PHYSICAL PROPERTIES
PERMANENT SOLUTIONS WITH CONDITIONS REPORT
ATLANTIC BRIDGE PROJECT
WEYMOUTH COMPRESSOR STATION
WEYMOUTH, MASSACHUSETTS

This Appendix summarizes LNAPL liquid and soil smear zone physical characteristics based on the analytical results from Alpha Laboratory and PST Laboratory, which are also included in this Appendix.

1.0 LNAPL LIQUID PROPERTIES

1.1 Initial LNAPL Sample

A sample of LNAPL was collected from MW-201 on November 3, 2016 and submitted to ALPHA Analytical Laboratory on the same day for analysis of VPH, EPH, and chemical properties (viscosity, density, specific gravity and molecular weight). The analytical results follow:

- The VPH analytical results indicated the detection of C9-C12 Aliphatics 2,120 mg/kg and 730 mg/kg (adjusted), and C9-C10 Aromatics 1,390 mg/kg. C5-C8 Aliphatics, and VPH target analytes (benzene, toluene, ethylbenzene, xylenes, MTBE and naphthalene) were not detected.
- The EPH results indicated the detection of C9-C18 Aliphatics at 58,700 mg/kg, C19-C36 Aliphatics at 93,200 mg/kg, and C11-C22 Aromatics at 93,200 mg/kg. EPH target analytes were not detected.
- The Kinematic Viscosity @ 104^{o} F. was 1560 centistokes (cSt).
- API Gravity at @ 60^{o} F. was 13.54,
- Specific Gravity and Density @ 60^{o} F. was reported as 0.9756, and the molecular weight as 485 grams per mole (g/mol).

In summary, most #2 Fuel Oil, a middle distillates contain some benzene, toluene, ethylbenzene, and xylenes and naphthalene (Cole, 1994); therefore the absence of these compounds indicates the LNAPL has undergone weathering.

1.2 Comprehensive LNAPL Analysis

Additional LNAPL samples were collected from MW-201, during weekly gauging events between January 5 and January 15, 2017, and submitted to PTS Laboratories for three-point viscosity, density, and specific gravity analysis to support, in part analysis of LNAPL mobility. The three points selected were 50, 70, and 100 degrees, with the lowest temperature approximating the temperature of groundwater at the Site. The three point analysis was selected to support PTS testing of “LNAPL mobility parameters”, rather than utilizing the previous results performed at higher

temperatures than groundwater. The PTS analytical results are provided in **Appendix C**. The analytical results are summarized below:

- At 50°F the specific gravity, density and kinematic viscosity were 0.9787, 0.9785 grams per cubic centimeter (g/cc), and 44,600 cSt. The dynamic viscosity is equal to the kinematic viscosity (cSt) multiplied by the density (g/cc) is equal to 43,641.1 centipoise (cP).
- At 70°F the specific gravity, density and kinematic viscosity were 0.9792, 0.9724 g/cc, and 10,700 cSt. The dynamic viscosity is 10,404.68 cP.
- At 100°F the specific gravity, density and kinematic viscosity were 0.9761, 0.9624 g/cc, and 2,070 cSt. The dynamic viscosity is 1,992.168 cP.

In summary, the analytical results indicate the LNAPL consists primarily of EPH long chain C11-C22 aromatic and C9-C36 aliphatic compounds and is a viscous, weathered, high molecular weight oil. The LNAPL dynamic viscosity value of 43,641 cP at 50°F is representative of groundwater temperature or LNAPL present in-situ, and is 4 orders of magnitude of a cutoff point for significant migration of 2-3 cSt (Cole, 1994), and above the "red line" in MassDEP's LCSM Policy Figure 8, for site data of 10^{-2} cm/s hydraulic conductivity, and observed LNAPL thickness indicating "hydraulic/vacuum recovery technologies deemed to be infeasible" (MassDEP, 2016, p.33). The LNAPL kinematic velocity is a measure of the product's resistance to flow; that is a measure of the relative ease with which liquid flow through soils. The LNAPL kinematic viscosity of 10,700 cSt at 70°F is two orders of magnitude greater than the viscosity of light fuel oil (#1, and #2) reported as 1.4 to 3.6 cSt at 70°F. (Riddick, et al., 1986), indicating the reported product stored at the Site (#2 Fuel Oil) has undergone significant weathering over time. For comparison, the reported viscosity of lubricating oil of 400 to 600 cSt at 70°F. (Riddick, et al., 1986).

2.0 SMEAR ZONE SOIL PROPERTIES

2.1 Soil Core Collection and Preservation

This LNAPL mobility evaluation was based upon physical analysis of soil cores collected beside two borings (B-412, B-413) in the central portion of the former AST where observed product thickness was measured as high and at two borings (B-404, B-406) located near the perimeter of the former AST where the product thickness was measured as relatively lower. Refer to **Figure 2 or Figure 3** for the boring locations.

Two-foot soil cores from four borings located within 1 foot of B-404, B-406, B-412, and B-413 (B404A, B406A, B412A, and B413A) were submitted for laboratory analysis of "LNAPL mobility parameters". Borings B412A and B413A are located beneath the central portion of the former AST, and B404A and B406A are located near the boundary of the former AST. The cores were collected and placed on dry ice on December 15, 2016 and shipped via common carrier (Fedex) overnight in a large cooler with a chain-of-custody (COC) to PTS Laboratories (Santa Fe Springs, CA).

PTS received the cores on December 16, 2016, intact and frozen. PTS cut each core in longitudinal slabs, photographed both slabs, put one slab under natural light, and the other under ultraviolet (UV) light. The purpose of the slab photography was to identify depth intervals for selection of

subcores for analysis of "LNAPL mobility parameters". The UV fluorescence (UVF) was initially expected to be bright sky blue or purple, which is characteristic of the presence of polycyclic aromatic hydrocarbons (PAHs). TRC discussed the UV results with the PTS Laboratory Director, who identified the depth intervals of UVF. The UVF displayed in these cores consisted of shades of gold to dark brown. PTS suggested the shades of tan and brown are consistent with medium to high molecular weight petroleum compounds, respectively. The UVF findings were considered with LNAPL observations recorded on the boring logs and soil TPH results when selecting subcores for the LNAPL observations. Calculated soil TPH, and subcore sample depths are summarized on **Table A-1 (Table 11 in the ISI Report)**. Subcore soil samples were analyzed for the following "LNAPL mobility parameters":

- **Pore Fluid Saturation Package:** American Petroleum Institute (API) RP40 Dean-Stark method. Includes initial pore fluid saturations, total porosity, air-filled porosity, grain and dry bulk density, and moisture content. LNAPL permeability, and hydraulic conductivity on a subset of representative samples.
- **Free Product Mobility Package**: Applied centrifugal force demonstrates product mobility; included residual saturations by Dean-Stark, total porosity, grain and dry bulk density. Test procedure modified for centrifuge to run at speed and time to simulate 30 days of gravity drainage.
- **LNAPL/Water Imbibition Capillary Pressure Curve**: LNAPL/Water Drainage Capillary Pressure Curve (water displacing LNAPL), dry bulk density, moisture content, and total (water only) pore fluid saturations.
- **Grain Size Analysis**: Selected in fill and fine to medium sand for comparison with grain size analyses at other intervals to document grain size distribution in subsurface materials containing LNAPL.

A total of 12 subcores were selected consisting of three subcores from each of the four soil borings. Subcores were targeted from the upper, middle and lower part of the observed saturated product zone to characterize LNAPL mobility parameters and soil properties across the observed vertical product thickness based on UVF core photography, and the PTS minimum subcore sample size of 0.2 feet.

Also, after completion of three rounds of product gauging including the 400 series monitoring wells on January 23, 2017, the product thickness was less than 0.5 feet, which indicated that bailing tests and/or skimming tests may not be implementable. Therefore, on January 23, 2017, TRC requested LNAPL permeability and hydraulic conductivity be included in the testing to calculate LNAPL transmissivity – a key line of evidence identified in the MassDEP LNAPL Policy (#WSC-16-450). TRC selected subcores for LNAPL permeability and hydraulic conductivity analysis from the observed upper to middle product zones in the vicinity of the highest observed LNAPL thickness at B412A, and B413, and in the vicinity of the LNAPL boundary at B404A and B406A. The upper and middle product zones are where LNAPL is expected to be the most mobile. The UV results are summarized with other LNAPL observations, soil TPH results, and the depths of subcore samples in tables in the PSCS report. The UV logs, and final physical testing report are provided in this appendix**.**

2.2 Physical Testing Results

2.2.1 Soil Particle Size Results

Four subcore soil samples were submitted to PTS for particle size analysis (ASTM D422M) for comparison with soil observations recorded on the boring log at three locations where fill was observed and one location where fine-medium sand was observed. The results are presented in this appendix and summarized below:

- Three of the four samples were collected from B404A, B412A, and B413A from 14.6 to 14.8 feet bgs, and the samples contained the following size fractions 37.4 to 76.88% gravel, 8.61 to 20.57% coarse sand, 9.69 to 24.74% medium sand, 3.72 to 14.21% fine sand, and 1.1 to 5.65% silt/clay. These samples are associated with Historic Fill (coal, cola ash, and clinkers) where residual LNAPL has been observed.

- The remaining sample, collected from B-406A from 12.6 to 12.8 feet was comprised mostly of 15.77% medium sand, 79% fine sand, and 4.35% silt/clay, and less than 1% gravel and coarse sand combined. These results are consistent with the same depth interval at boring log from B-406, which indicated fine-medium sand with trace of silt/sand. The boring log indicated this zone was saturated with oil globules.

In summary, particle size results support boring log visual soil classifications. Fill materials consist of mostly coarse sand and gravel size material with lesser amounts of medium to fine sand and with trace of silt/clay.

2.2.2 Permeability Data – Oil/Water Capillary Pressure

A total of four subcore soil samples were collected from four borings (B404A, B406A, B412A, B413A) for analysis of hydraulic conductivity, and specific intrinsic permeability to LNAPL supplied from the Disposal Site. The results are summarized below:

- **Specific permeability to water** in three of the four subcores ranged from 6,790 millidarcy at 14.5 ft in B413A to 7,950 millidarcy at 12.5 ft in B412A, while in the remaining sample, it was an order of magnitude lower at 703 millidarcy at 11.4 ft bgs in B406A.

- **Hydraulic conductivity** ranged in three of the four subcores ranged from $6.72E^{-03}$ to $7.89E^{-03}$ cm/s, and was an order of magnitude lower at 6.99 E^{-04} cm/s in the remaining subcore sample that was collected from B406A.

- **Specific permeability to LNAPL (**LNAPL from the Site), ranged from 18,000 to 23,700 millidarcy in three of the four subcores that consisted of sand and gravel, and only 491 millidarcy in the sample from B406A that consisted of fine-medium sand.

In summary, specific permeability to water, hydraulic conductivity and specific permeability to LNAPL values were within one order of magnitude in samples from 10.7 ft bgs in B404A, 12.5 ft bgs in B412A, and at 14.5 ft bgs in B413A, and an order of magnitude lower at 11.4 ft bgs in B406A. According to the logs for adjacent borings at B404, B412, and B413 subcore samples appear to be collected from coarse sand and gravel materials, which the particle size analysis indicated consist mostly of coarse sand and gravel, and the sample from B406 appears to be from fine to medium sand, which is consistent with particle size results. These analyses were conducted under 25 PSI pressure. In comparison, the in-situ hydraulic conductivity (K) results were an order of magnitude higher (3.0×10^{-3} to 3.7×10^{-2} cm/s), which are representative of K in the horizontal direction (Kh), while the laboratory hydraulic conductivity were determined in vertical cores, which are representative of K in the vertical direction (Kv).

2.2.3 Pore Fluid Saturations

A total of 12 subcore soil samples were collected from four borings (B404A, B406A, B412A, B413A) for analysis of moisture content, dry bulk density, grain size density, total porosity, air filled porosity, water saturation, and LNAPL saturations. The results are summarized below:

- **Moisture Content** (% weight) ranged from 17.5% at 12.1 feet bgs in B406A to 31.9% at 12.1 feet bgs in B412A.
- **Dry bulk density** ranges from 1.05 g/cc at 11.0 feet bgs at B406A to 1.62 at 12.1 ft bgs at B406A.
- **Grain density** ranged from 2.30 g/cc at 14.1 ft bgs at B404A to 2.68 g/cc at 14.1 ft bgs at B406A.
- **Total Porosity** ranged from 37.8% at 12.1 ft bgs in B406A to 55.9% at 11.0 ft bgs at B406A.
- **Air-Filled Porosity** ranged from 6.5% at 12.1 ft bgs in B412A to 31% at 11.0 ft bgs at B406A.
- **Water Saturation** ranged from 28.4 to 65.7% of pore volume.
- **LNAPL Saturation** ranged from 2.0 to 40.1% of pore volume.

In summary, the sample collected from 11.0 ft bgs at B406A showed the highest air filled porosity of 31%, and lowest water saturation of 28.4% of pore volume, which is interpreted to be from the vadose zone. The NAPL saturation of this sample was 16.3% of pore volume, while deeper samples in the saturated zone from B406A at 12.1 and 14.1 ft bgs contained higher water saturations ranging from 36.3 to 42.1% of pore volume, and higher LNAPL saturations ranging from 34.1 to 39.8% of pore volume. In the remaining three borings (B404A, B412A, B413A) samples collected from 10.3 to 14.1 ft bgs in each of these borings contained water saturations ranging from 52.7 to 65.7% of pore volume, and LNAPL saturations ranging from 2 to 30.5% of pore volume, with the exception of B413A. At B413A, at a depth of 14.1 ft bgs, the water saturation was 38.7% of pore volume and NAPL saturation was 40.1% of pore volume, which is similar to that observed at the same depth at B406A.

2.2.4 Free Product Mobility: Initial and Residual Saturations

A total of 12 subcore soil samples were collected from four borings (B404A, B406A, B412A, B413A) for analysis of water and NAPL saturations before and after centrifuging at 30 times gravity (30xG) for 24 hours, for simulating 30 days of gravity drainage. Comparison of the pre- and post-centrifuge results are summarized below:

- In 10 of the 12 samples, NAPL saturation decreased less than 3% after centrifuging indicating the NAPL is essentially immobile;

- In the remaining two samples, both collected from B406A, the NAPL saturation decreased 12.7% at 14.3 ft bgs and 27.8% at 12.3 ft bgs. These results suggest the NAPL has limited mobility in these two samples.

PTS noted the following after centrifuging.

- B404A - at 10.5 ft bgs, brown water with no hydrocarbon odor was produced; at 12.3 ft, **dark brown LNAPL and clear water was produced**; at 14.3 ft clear water was produced.

- B406A – at 11.2 ft bgs, trace dark brown LNAPL and clear water were produced; at 12.3 and at 14.3 ft, **dark brown LNAPL and clear water were produced**.

- B412A – at 12.3 and 16.3 ft bgs, dark brown LNAPL and clear water were produced; at 14.3 ft, trace dark brown LNAPL and clear water were produced.

- B413A – at 12.3 and 14.3 ft bgs, dark brown or brown LNAPL and clear water were produced; at 16.3 ft, trace LNAPL and clear water were produced.

In summary, LNAPL saturation decreased less than 3% in 83.3% of the samples after centrifuging at 30xG, for simulating 30 days of gravity drainage, which suggests that LNAPL has limited mobility. Under laboratory conditions, likely at higher temperatures than that in-situ, LNAPL and clear water were observed after centrifuging in samples from B404A at 12.3 ft, from B406A at 12.3 and 14.3 ft, from B412A at 12.3 and 16.3 ft, and from B413A from 12.3 and 14.3 ft bgs. Trace brown LNAPL was produced from B406A at 11.2 ft, from B412A at 14.3 ft, and from B413A at 14.3 ft bgs. With the exception of the sample from B404A at 11.2 ft that produced brown water, clear water was produced from the same samples that produced LNAPL, and clear water was produced from B404A at 14.3 ft bgs only. Overall, these laboratory test results support the LNAPL mobility is limited.

2.2.5 Oil/Water Capillary Pressure

A total of 12 subcore soil samples were collected from four borings (B404A, B406A, B412A, B413A) for analysis of moisture content, dry bulk density, grain size density, total porosity, air

filled porosity, and total port fluid saturations. The subcore samples are adjacent to those analyzed in previous subcore testing. The results are summarized below:

- **Moisture Content** (% weight) ranged from 17.2% at 16.5 feet bgs in B413A to 70.7% at 12.5 feet bgs in B413A.
- **Dry bulk density** ranges from 0.76 g/cc at 12.5 feet bgs at B413A to 1.50 at 12.5 ft bgs at B406A.
- **Grain density** ranged from 2.11 g/cc at 16.45 ft bgs at B412A to 2.68 g/cc at 12.5 ft bgs and 14.5 ft bgs at B406A.
- **Total Porosity** ranged from 40.0% at 11.4 ft bgs in B406A to 65.5% at 12.5 ft bgs at B413A.
- **Air-Filled Porosity** ranged from 9.9% at 14.5 ft bgs in B413A to 30% at 16.5 ft bgs at B413A.
- **Total Pore Fluid Saturation** ranged from 41.5% to 84.2% of pore volume.

2.2.6 Oil/Water Capillary Pressure Results

A total of 12 subcore soil samples were collected from four borings (B404A, B406A, B412A, B413A) for analysis of the effect of capillary pressure on water and oil saturation following ASTM D6836 Method E (Centrifugal Method: Single point drainage followed by imbibition). The results are summarized below:

2.2.6.1 *Boring B404A – NAPL Margin*

- At soil core B404A-B collected at 10.7 ft bgs, the oil saturation was 35.2% of pore space. When capillary pressure increased to the equivalent of 72.9 ft above the water table, it resulted in a 31.1 % increase in oil saturation (66.3-35.2). During imbibition, as capillary pressure decreased, water displaced oil. At the equivalent pressure of 2.9 feet of water table height, (representative of site seasonal water table fluctuation), oil saturation decreased to 65.7%, which represents only a 0.6% decrease in oil saturation (66.3-65.7%), which supports very limited NAPL mobility at a pressure representative of Disposal Site seasonal water table fluctuation. At the end of imbibition, at a water table height of 70.5 feet, the oil saturation was 14.4% higher than its initial value.

- The next deeper soil core at B404A-C at 12.5 ft bgs the oil saturation was 21.1% of pore space. When capillary pressure was increased to the equivalent of 79.2 feet of water, oil saturation increased from 21.1 to 66.5%, equivalent to an increase of 44.4%. At the equivalent of 3.05 feet of water height, oil saturation decreased slightly from 66.5% to 65.1% a change of only 1.4%. At the end of imbibition, at the equivalent of 77.3 feet of water table height, oil saturation decreased from 66.5% to 32.5% or only 34%, which is 11.4% higher than its initial value.

- In the next deeper soil core at B404A-D at 14.5 feet bgs, oil saturation at 3.5% of pore space. When capillary pressure increased to 75.6 feet of water table height, oil displaced water by 57.8% of pore space (61.3 – 3.5 initial). At a capillary pressure equivalent to 3.01 feet of water table height, oil saturation decreased from 61.3% to 50.1 %, a change of 11.2% of pore space. At the end of imbibition, at a water table height of 73.3 feet (similar to that of the initial water table height of 75.6 feet), the oil saturation was at 16.4%, which is 12.9% higher than that of the initial value.

In summary, at boring B404A, oil saturations decreased with depth from 35.2 to 3.5%. During imbibition, when negative capillary pressures equaled approximately 3 feet height above the water table, which is representative of seasonal water table fluctuation, oil saturation decreased slightly in the upper two samples with values of 0.6 and 1.4%, while in the deeper sample oil saturation decreased by 11.2%. End of test oil saturations ranged from 11.4 to 14.6% higher than initial values.

2.2.6.2 *Boring B406A – LNAPL Margin*

- At soil core B406A-B collected at 11.4 ft bgs, oil saturation was at 11.8% of pore space. When pressure increased to the equivalent of 75.2 ft above the water table, it resulted in a 19.4 % increase in oil saturation from 11.8 to 31.2%. At a capillary pressure equivalent of 3.00 feet of height above the water table, oil saturation decreased only 0.2%. At the end of imbibition, oil saturation was 23.8% of pore volume, which is 12% higher than its initial value.

- The next deeper soil core at B406A-C at 12.5 ft bgs, oil saturation was 27.0% of pore space. When capillary pressure was increased to 75.9 feet of water, oil saturation increased from 27 to 75.9% or by 48.9%. At the equivalent of 3.02 feet of water table height, oil saturation decreased 0.3% (75.9% initial - 75.6%). At the end of imbibition, at a capillary pressure equal to 73.6 feet height above the water table, oil saturation was 43% of pore volume, which is 16.0% higher than its initial value.

- In the last (deeper) soil core at B406A-D at 14.5 feet bgs, oil saturation was at 31.6% of pore space. When capillary pressure was increased to 75.3 feet of water, oil displaced water by 50.6% of pore space (82.2 - 31.6 initial). At a capillary pressure equal to 3.00 feet of water height, oil saturation decreased from 82.2 to 74.8% or 7.4% decrease in oil saturation. At the end of imbibition, at a capillary pressure equal 73 ft height above the water table, oil saturation was 30.9% of pore volume, which is similar to its initial value.

In summary at boring B-406A, oil saturations increased with depth ranging from 11.8 to 31.6%. During imbibition, when negative capillary pressures equaled approximately 3 feet of height above the water table, which is representative of seasonal water table fluctuation, oil saturation decreased slightly in the upper two samples with values of 0.2 and 0.3%, and decreased only 7.4% in the

deeper sample at this location. End of test oil saturations was close to its initial value in the sample from 14.5 ft bgs, and 12% -16% higher than initial values in the remaining two subcore samples.

2.2.6.3 *Boring B412A – Central Source Area*

- At soil core B412A-B collected at 12.5 ft bgs, initial oil saturation was 16.4% of pore space. When pressure increased to the equivalent of 75.6 feet above the water table, oil saturation increased from 16.4 to 71.8%. At a capillary pressure equivalent to 3.2 feet height above the water table, the oil saturation decreased from 71.8% to 59%, a decrease of 46.4%. During imbibition, oil saturation decreased from 71.8% to 25.4% as negative pressure approaching the initial pressure, which is 9% higher than its initial value.

- The next deeper soil core at B412A-C at 14.5 ft bgs, initial oil saturation was 8.6%. When capillary pressure was increased to 75.8 feet of water, oil saturation increased to 67.1%. At a pressure equivalent to 3.21 feet of water, oil saturation decreased from 22.8% to 44.3%. At the end of imbibition, at 73.5 ft height above the water table, oil saturation decreased to 29.2% of pore space, which is 20.6% higher than its initial value.

- In the remaining (deeper) soil core, which was collected from B412A-D at 16.45 feet bgs, initial oil saturation was 11.1%. When the capillary pressure was increased to 70.9 feet height above the water table, oil saturation increased to 79.5% of pore volume. At a capillary pressure equal to 2.99 feet of water height above the water table, oil saturation decreased to 45.3% of pore space, a decrease of 34.2%. At the end of imbibition, at 68.5 feet height above the water table, oil saturation decreased to 26.2% of pore space, which is 15.1% higher than its initial value.

In summary, at boring B-412A, initial oil saturations varied with depth ranging from 16.4% at 12.5 ft bgs to 8.6% at 14.5 ft bgs. During imbibition, when negative capillary pressures equaled approximately 3 feet of height above the water table, which is representative of seasonal water table fluctuation, oil saturation decreased between 22.8 to 45.3% relative to that at static pressure 0 psi). End of test oil saturations were 9.0 to 20.6% higher than initial values. These results suggest NAPL has a tendency to stay in the soil.

2.2.6.4 *Boring B413A – Central Source Area*

- At soil core B413A-B collected at 12.5 ft bgs, initial oil saturation was at 27.8%. When pressure was increased to the equivalent of 71.5 ft above the water table, oil saturation increased to 69.2%. During imbibition, at a capillary pressure equal to 3.02 feet of water, oil saturation decreased from 69.2 to 61.1%, (8.1%). At the end of imbibition, at 69.1 ft height above the water table, oil saturation was 29% of pore volume, which is similar to its initial value.

- The next deeper soil core at B413A-C at 14.5 ft bgs, initial oil saturation was at 26.9%. When capillary pressure was increased to 71.9 feet of water, oil saturation increased to 80.8%. At the equivalent of 3.03 feet of height above the water table, oil saturation decreased 1.2% to 79.6%. At the end of imbibition, at 69.5 ft of water above the water table, oil saturation was 29.6% of pore volume, which is slightly higher than its initial value.

- In the last (deeper) soil core at B413A-D at 16.5 feet bgs, initial oil saturation was 42.7%. When capillary pressure was increased to 83 feet of water, oil saturation increased by 33.7% of pore space (76.4 – 42.7 initial). At a capillary pressure equal to 3.53 feet height of water above the water table, oil saturation decreased 2.2% from 76.4 to 74.2%. At the end of imbibition, at 80.9 ft of water above the water table, oil saturation was 22.3% of pore volume. When compared with the initial soil saturation, this is 20.4% lower in oil saturation relative to its initial value.

In summary, at boring B-413A, initial oil saturations ranged from 26.9% at 14.5 ft bgs to 42.7% at 16.5 ft bgs. During imbibition, when negative capillary pressures equaled approximately 3 feet of height above the water table (seasonal water table fluctuation), oil saturation decreased 8.1% at 12.5 ft bgs, decreasing to only 1.2% at 14.5 ft bgs, and decreased 2.2% at 16.5 ft bgs. End of test oil saturations were 1.2 to 2.7% higher in two samples, and were 20.4% lower in the subcore from 16.5 ft bgs relative to its initial value.

2.2.6.5 *Comparison of Oil/Water Capillary Pressure Results: LNAPL Source Zone and Margin Zone*

Soil borings B412A and B413A were selected beneath the central area of the former AST, in the vicinity of MW-201 where LNAPL was first observed, and where PSS was observed to range from 5 to 6 feet in thickness. In comparison, soil borings B404A and B406A were located in the vicinity of the south – southwest side of the former AST, where PSS was observed to range from 0.5 to 3.5 feet thick.

In the source vicinity borings, initial oil saturations ranged from 8.6 to 16.4% at B412A and were 26.9 to 42.7% at B413A. During imbibition, when the capillary pressure decreased from static to a negative pressure equal to approximately 3 feet height above the water table, the oil saturation decreased from 22.8 to 45.3% at B412A and only from 1.2 to 8.2% at B413A. These laboratory results indicated limited NAPL mobility, which is consistent with the lack of NAPL observed in MW-412 and MW-413 located beside B412A and B413A, respectively.

In the LNAPL margin soil borings, initial oil saturations ranged from 35.2 to 3.5% at B404A, and ranged from 11.8 to 31.6% at B406A. During imbibition at B404A, when the capillary pressure approximated 3 feet height above the water table, the oil saturation decreased only 0.6 to 1.4% of pore space in shallow and midlevel samples, and 11.2% in the deeper sample. Similarly, at B406A, when the capillary pressure approximated 3 feet height above the water table, the oil saturation

was close to the initial saturation in the shallow and midlevel samples and 11.4% lower in the deeper sample. These results suggest limited mobility of NAPL.

2.3 Limitations of Soil Core Laboratory Results

Laboratory testing assume the soil samples are representative, and undisturbed. The laboratory tests were performed on vertical subcores 0.1-0.2 ft long; therefore, individual test results are representative of small scale properties. However, the collection of multiple samples at four borings with two borings located in the vicinity of MW-201, and two locations near the south west side of the former AST by way of comparison provide information on larger scale properties. Nevertheless, advancing the soil sampler may compress the samples and displace fluid; fluids that accumulate in the sampling device above the sample will drain through the sample as it is brought to the surface altering water and product saturations; and/or air can invade the pore space as the core is retrieved allowing product/and/or water to drain out. The severity of these problems increase with the hydraulic conductivity and length of sample collected.

Soil cores were collected with direct push technology in acetate liners, the ends capped, immediately placed horizontally on/surrounded by dry ice, and shipped overnight to PTS Laboratory. PTS received the core shipment intact and frozen, which indicates the cores were not disrupted. The cores were not likely to be significantly compressed due to the coarse material observed. Most of the samples were collected at or below the water table, therefore, the impact on water and product saturations are unlikely to be minimal, if any. The percent saturation for water is unlikely to be significantly impacted because it is in direct contact with the soil, LNAPL is the non-wetting surface in contact with water not the soil. The percent water saturation varies over a narrow range for most of the samples that consist of sand and gravel. The percent saturation of LNAPL is unlikely to be significantly affected because of the high viscosity and sticky nature of the LNAPL. Laboratory temperature is higher than that in-situ. Viscosity decreases with increasing temperature, making it easier to flow. Therefore, the laboratory tests tend to be very conservative, biased high toward mobility. Although the mobility tests are biased high, the results support there is limited or no LNAPL mobility, which is consistent with field gauging, recoverability, and NAPL transmissivity testing.

ANALYTICAL REPORT

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Project Name:	ATLANTIC BRIDGE
Project Number:	140143.0000.7478
Report Date:	11/29/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478

Lab Number: L1635614
Report Date: 11/29/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1635614-01	MW-201 (LNAPL)	OIL	WEYMOUTH, MA	11/03/16 09:30	11/03/16

Project Name: ATLANTIC BRIDGE **Lab Number:** L1635614

Project Number: 140143.0000.7478 **Report Date:** 11/29/16

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	YES
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	YES
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478

Lab Number: L1635614
Report Date: 11/29/16

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

Project Name:	ATLANTIC BRIDGE	**Lab Number:**	L1635614
Project Number:	140143.0000.7478	**Report Date:**	11/29/16

Case Narrative (continued)

Report Submission

This final report replaces the partial report issued November 10, 2016 and includes the results of all requested analyses.

The analyses of Viscosity, Density, and Molecular Weight were subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

MCP Related Narratives

VPH

L1635614-01: The sample has elevated detection limits due to the dilution required by the sample matrix.

In reference to question H:

L1635614-01: The surrogate recovery is outside the acceptance criteria for 2,5-Dibromotoluene-FID (167%); however, the sample was not re-analyzed due to coelution with obvious interferences. A copy of the chromatogram is included as an attachment to this report. The results are not considered to be biased.

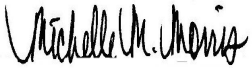
EPH

L1635614-01: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

In reference to question H:

L1635614-01: The surrogate recoveries are below the acceptance criteria for chloro-octadecane (0%) and o-terphenyl (0%) due to the dilution required to quantitate the sample. Re-extraction was not required; therefore, the results of the original analysis are reported.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:  Michelle M. Morris

Title: Technical Director/Representative Date: 11/29/16

ORGANICS

PETROLEUM HYDROCARBONS

Project Name: ATLANTIC BRIDGE
Lab Number: L1635614
Project Number: 140143.0000.7478
Report Date: 11/29/16

SAMPLE RESULTS

Lab ID:	L1635614-01 D	Date Collected:	11/03/16 09:30
Client ID:	MW-201 (LNAPL)	Date Received:	11/03/16
Sample Location:	WEYMOUTH, MA	Field Prep:	Not Specified
Matrix:	Oil		
Analytical Method:	100,VPH-04-1.1		
Analytical Date:	11/09/16 10:13		
Analyst:	JM		
Percent Solids:	Results are reported on an 'AS RECEIVED' basis.		

Quality Control Information

Condition of sample received:	Satisfactory
Sample Temperature upon receipt:	Received on Ice
Were samples received in methanol?	Covering the Soil
Methanol ratio:	8.8:1

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Petroleum Hydrocarbons - Westborough Lab						
C5-C8 Aliphatics	ND		mg/kg	484	--	20
C9-C12 Aliphatics	2120		mg/kg	484	--	20
C9-C10 Aromatics	1390		mg/kg	484	--	20
C5-C8 Aliphatics, Adjusted	ND		mg/kg	484	--	20
C9-C12 Aliphatics, Adjusted	730		mg/kg	484	--	20
Benzene	ND		mg/kg	19.4	--	20
Toluene	ND		mg/kg	19.4	--	20
Ethylbenzene	ND		mg/kg	19.4	--	20
p/m-Xylene	ND		mg/kg	19.4	--	20
o-Xylene	ND		mg/kg	19.4	--	20
Methyl tert butyl ether	ND		mg/kg	9.69	--	20
Naphthalene	ND		mg/kg	38.8	--	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2,5-Dibromotoluene-PID	127		70-130
2,5-Dibromotoluene-FID	**167**	Q	70-130

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478
Lab Number: L1635614
Report Date: 11/29/16

SAMPLE RESULTS

Lab ID:	L1635614-01 D	Date Collected:	11/03/16 09:30
Client ID:	MW-201 (LNAPL)	Date Received:	11/03/16
Sample Location:	WEYMOUTH, MA	Field Prep:	Not Specified
Matrix:	Oil	Extraction Method:	EPA 3580A
Analytical Method:	98,EPH-04-1.1	Extraction Date:	11/07/16 17:15
Analytical Date:	11/09/16 00:20	Cleanup Method1:	EPH-04-1
Analyst:	DV	Cleanup Date1:	11/07/16
Percent Solids:	Results are reported on an 'AS RECEIVED' basis.		

Quality Control Information

Condition of sample received:	Satisfactory
Sample Temperature upon receipt:	Received on Ice
Sample Extraction method:	Extracted Per the Method

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Extractable Petroleum Hydrocarbons - Westborough Lab						
C9-C18 Aliphatics	58700		mg/kg	1700	--	20
C19-C36 Aliphatics	93200		mg/kg	1700	--	20
C11-C22 Aromatics	93200		mg/kg	1700	--	20
C11-C22 Aromatics, Adjusted	93200		mg/kg	1700	--	20
Naphthalene	ND		mg/kg	84.9	--	20
2-Methylnaphthalene	ND		mg/kg	84.9	--	20
Acenaphthylene	ND		mg/kg	84.9	--	20
Acenaphthene	ND		mg/kg	84.9	--	20
Fluorene	ND		mg/kg	84.9	--	20
Phenanthrene	ND		mg/kg	84.9	--	20
Anthracene	ND		mg/kg	84.9	--	20
Fluoranthene	ND		mg/kg	84.9	--	20
Pyrene	ND		mg/kg	84.9	--	20
Benzo(a)anthracene	ND		mg/kg	84.9	--	20
Chrysene	ND		mg/kg	84.9	--	20
Benzo(b)fluoranthene	ND		mg/kg	84.9	--	20
Benzo(k)fluoranthene	ND		mg/kg	84.9	--	20
Benzo(a)pyrene	ND		mg/kg	84.9	--	20
Indeno(1,2,3-cd)Pyrene	ND		mg/kg	84.9	--	20
Dibenzo(a,h)anthracene	ND		mg/kg	84.9	--	20
Benzo(ghi)perylene	ND		mg/kg	84.9	--	20

Project Name: ATLANTIC BRIDGE
Lab Number: L1635614
Project Number: 140143.0000.7478
Report Date: 11/29/16

SAMPLE RESULTS

Lab ID: L1635614-01 D
Client ID: MW-201 (LNAPL)
Sample Location: WEYMOUTH, MA
Date Collected: 11/03/16 09:30
Date Received: 11/03/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Extractable Petroleum Hydrocarbons - Westborough Lab

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Chloro-Octadecane	**0**	Q	40-140
o-Terphenyl	**0**	Q	40-140
2-Fluorobiphenyl	89		40-140
2-Bromonaphthalene	93		40-140

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478

Lab Number: L1635614
Report Date: 11/29/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 98,EPH-04-1.1
Analytical Date: 11/08/16 01:46
Analyst: DV

Extraction Method: EPA 3580A
Extraction Date: 11/07/16 17:15
Cleanup Method: EPH-04-1
Cleanup Date: 11/07/16

Parameter	Result	Qualifier	Units	RL	MDL
Extractable Petroleum Hydrocarbons - Westborough Lab for sample(s): 01 Batch: WG949964-1					
C9-C18 Aliphatics	ND		mg/kg	895	--
C19-C36 Aliphatics	ND		mg/kg	895	--
C11-C22 Aromatics	ND		mg/kg	895	--
C11-C22 Aromatics, Adjusted	ND		mg/kg	895	--
Naphthalene	ND		mg/kg	44.8	--
2-Methylnaphthalene	ND		mg/kg	44.8	--
Acenaphthylene	ND		mg/kg	44.8	--
Acenaphthene	ND		mg/kg	44.8	--
Fluorene	ND		mg/kg	44.8	--
Phenanthrene	ND		mg/kg	44.8	--
Anthracene	ND		mg/kg	44.8	--
Fluoranthene	ND		mg/kg	44.8	--
Pyrene	ND		mg/kg	44.8	--
Benzo(a)anthracene	ND		mg/kg	44.8	--
Chrysene	ND		mg/kg	44.8	--
Benzo(b)fluoranthene	ND		mg/kg	44.8	--
Benzo(k)fluoranthene	ND		mg/kg	44.8	--
Benzo(a)pyrene	ND		mg/kg	44.8	--
Indeno(1,2,3-cd)Pyrene	ND		mg/kg	44.8	--
Dibenzo(a,h)anthracene	ND		mg/kg	44.8	--
Benzo(ghi)perylene	ND		mg/kg	44.8	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Chloro-Octadecane	72		40-140
o-Terphenyl	72		40-140
2-Fluorobiphenyl	82		40-140
2-Bromonaphthalene	79		40-140

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478
Lab Number: L1635614
Report Date: 11/29/16

Method Blank Analysis
Batch Quality Control

Analytical Method: 100,VPH-04-1.1
Analytical Date: 11/09/16 09:17
Analyst: JM

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Petroleum Hydrocarbons - Westborough Lab for sample(s): 01 Batch: WG950701-3					
C5-C8 Aliphatics	ND		mg/kg	26.6	--
C9-C12 Aliphatics	ND		mg/kg	26.6	--
C9-C10 Aromatics	ND		mg/kg	26.6	--
C5-C8 Aliphatics, Adjusted	ND		mg/kg	26.6	--
C9-C12 Aliphatics, Adjusted	ND		mg/kg	26.6	--
Benzene	ND		mg/kg	1.07	--
Toluene	ND		mg/kg	1.07	--
Ethylbenzene	ND		mg/kg	1.07	--
p/m-Xylene	ND		mg/kg	1.07	--
o-Xylene	ND		mg/kg	1.07	--
Methyl tert butyl ether	ND		mg/kg	0.533	--
Naphthalene	ND		mg/kg	2.13	--

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2,5-Dibromotoluene-PID	92		70-130
2,5-Dibromotoluene-FID	93		70-130

Lab Control Sample Analysis

Batch Quality Control

Project Name: ATLANTIC BRIDGE

Project Number: 140143.0000.7478

Lab Number: L1635614

Report Date: 11/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Extractable Petroleum Hydrocarbons - Westborough Lab Associated sample(s): 01 Batch: WG949964-2 WG949964-3								
C9-C18 Aliphatics	109		117		40-140	7		25
C19-C36 Aliphatics	114		135		40-140	17		25
C11-C22 Aromatics	109		97		40-140	12		25
Naphthalene	82		69		40-140	17		25
2-Methylnaphthalene	80		68		40-140	16		25
Acenaphthylene	85		72		40-140	17		25
Acenaphthene	85		70		40-140	19		25
Fluorene	82		69		40-140	17		25
Phenanthrene	80		67		40-140	18		25
Anthracene	83		68		40-140	20		25
Fluoranthene	85		72		40-140	17		25
Pyrene	88		74		40-140	17		25
Benzo(a)anthracene	78		66		40-140	17		25
Chrysene	85		72		40-140	17		25
Benzo(b)fluoranthene	80		71		40-140	12		25
Benzo(k)fluoranthene	88		74		40-140	17		25
Benzo(a)pyrene	79		68		40-140	15		25
Indeno(1,2,3-cd)Pyrene	75		66		40-140	13		25
Dibenzo(a,h)anthracene	77		63		40-140	20		25
Benzo(ghi)perylene	80		70		40-140	13		25
Nonane (C9)	76		78		30-140	3		25

Lab Control Sample Analysis

Batch Quality Control

Project Name: ATLANTIC BRIDGE

Project Number: 140143.0000.7478

Lab Number: L1635614

Report Date: 11/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Extractable Petroleum Hydrocarbons - Westborough Lab Associated sample(s): 01 Batch: WG949964-2 WG949964-3								
Decane (C10)	81		82		40-140	1		25
Dodecane (C12)	82		84		40-140	2		25
Tetradecane (C14)	82		84		40-140	2		25
Hexadecane (C16)	85		89		40-140	5		25
Octadecane (C18)	89		95		40-140	7		25
Nonadecane (C19)	85		88		40-140	3		25
Eicosane (C20)	90		96		40-140	6		25
Docosane (C22)	90		94		40-140	4		25
Tetracosane (C24)	88		93		40-140	6		25
Hexacosane (C26)	86		91		40-140	6		25
Octacosane (C28)	86		90		40-140	5		25
Triacontane (C30)	83		88		40-140	6		25
Hexatriacontane (C36)	81		86		40-140	6		25

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Chloro-Octadecane	77		89		40-140
o-Terphenyl	86		77		40-140
2-Fluorobiphenyl	95		76		40-140
2-Bromonaphthalene	94		74		40-140
% Naphthalene Breakthrough	0		0		
% 2-Methylnaphthalene Breakthrough	0		0		

Lab Control Sample Analysis

Batch Quality Control

Project Name: ATLANTIC BRIDGE

Project Number: 140143.0000.7478

Lab Number: L1635614

Report Date: 11/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Petroleum Hydrocarbons - Westborough Lab Associated sample(s): 01 Batch: WG950701-1 WG950701-2								
C5-C8 Aliphatics	89		96		70-130	7		25
C9-C12 Aliphatics	100		106		70-130	6		25
C9-C10 Aromatics	95		99		70-130	5		25
Benzene	91		98		70-130	7		25
Toluene	94		100		70-130	6		25
Ethylbenzene	95		100		70-130	6		25
p/m-Xylene	95		100		70-130	5		25
o-Xylene	96		101		70-130	5		25
Methyl tert butyl ether	88		98		70-130	10		25
Naphthalene	91		102		70-130	12		25
1,2,4-Trimethylbenzene	95		99		70-130	5		25
Pentane	81		87		70-130	7		25
2-Methylpentane	89		96		70-130	7		25
2,2,4-Trimethylpentane	95		101		70-130	6		25
n-Nonane	100		105		30-130	5		25
n-Decane	101		105		70-130	4		25
n-Butylcyclohexane	101		107		70-130	6		25

Lab Control Sample Analysis

Batch Quality Control

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478

Lab Number: L1635614
Report Date: 11/29/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Petroleum Hydrocarbons - Westborough Lab Associated sample(s): 01 Batch: WG950701-1 WG950701-2								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2,5-Dibromotoluene-PID	92		100		70-130
2,5-Dibromotoluene-FID	91		100		70-130

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478

Lab Number: L1635614
Report Date: 11/29/16

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information Custody Seal

Cooler	
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1635614-01A	Glass 60mL/2oz unpreserved	A	N/A	3.8	Y	Absent	-
L1635614-01B	Glass 500ml/16oz unpreserved	A	N/A	3.8	Y	Absent	VPH-DELUX-10(28),EPH-DELUX-10(14)
L1635614-01C	Glass 500ml/16oz unpreserved	A	N/A	3.8	Y	Absent	SUB-MOLECULARWEIGHT(14),SUB-DENSITY(28),SUB-VISCOSITY()
L1635614-01X	Vial unpreserved	A	N/A	3.8	Y	Absent	VPH-DELUX-10(28)

*Values in parentheses indicate holding time in days

Project Name:	ATLANTIC BRIDGE	**Lab Number:**	L1635614
Project Number:	140143.0000.7478	**Report Date:**	11/29/16

GLOSSARY

Acronyms

EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Footnotes

1	- The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A	- Spectra identified as "Aldol Condensation Product".
B	- The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the

Report Format: Data Usability Report

Project Name:	ATLANTIC BRIDGE	**Lab Number:**	L1635614
Project Number:	140143.0000.7478	**Report Date:**	11/29/16

Data Qualifiers

reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

Report Format: Data Usability Report

Project Name: ATLANTIC BRIDGE
Project Number: 140143.0000.7478
Lab Number: L1635614
Report Date: 11/29/16

REFERENCES

98 Method for the Determination of Extractable Petroleum Hydrocarbons (EPH), MassDEP, May 2004, Revision 1.1 with QC Requirements & Performance Standards for the Analysis of EPH under the Massachusetts Contingency Plan, WSC-CAM-IVB, July 2010.

100 Method for the Determination of Volatile Petroleum Hydrocarbons (VPH), MassDEP, May 2004, Revision 1.1 with QC Requirements & Performance Standards for the Analysis of VPH under the Massachusetts Contingency Plan, WSC-CAM-IVA, July 2010.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: NPW and SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
EPA 9012B: NPW: Total Cyanide
EPA 9050A: NPW: Specific Conductance
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
SM 2540D: TSS
EPA 3005A NPW
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: ***EPA 3050B***

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

Mansfield Facility:

Drinking Water
EPA 200.7: Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1** Hg.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

L1635614

SPL

SPL Work Order No.:	Acct. Mate Code:	Dept. Code	Page	Pages
			1	1

Report To: (Company Name):	Alpha Analytical			
Address:	8 Walkup Drive			
City/State/Zip:	Westboro	MA	1581	
Contact:	Ashaley Kane	subreports@alphalab.com		
Phone:	508-439-5158	Fax:	508-898-9193	

Project/Station Name:	Project/Station Number:	Project/Station Location:

Special Instructions:

Requested TAT*

10 business days

* Surcharges May Apply (See quote for details)

Indicate Billing Type: (Place "X", where appropriate)	Net 30 day Acct.		Check #	
	Credit Card		<<<Contact SPL, Inc for CC payment arrangements.	

Invoice To: (Company Name):	Alpha Analytical			
Address:	8 Walkup Drive			
City/State/Zip:	Westboro	MA	1581	
Contact:	Accounts Payable	ap@alphalab.com		
Phone:	508-439-5158	Fax:	508-898-9193	
Client PO# or Ref. No.:	N/A			
Contract/Proposal #: (i.e. SPLQ####)	SPLQ7378			

† Terms: Cylinders will be rented for $10/cyl. All cylinders checked out are to be returned within 21 days, whether they contain sample or not. Cylinders not returned after 30 days will be considered lost and will be billed at current replacement cost.

Requested Analysis (Place an "X" next to Sample ID below)

Sample ID (used to log/track sample)	Sample Date	Sample Time	Sample Type (Gas/Liq. /Solid)	Duplicate	Composite	Spot	Cylinder Tracking Info† Cylinder #	Date Out	Date In	AS-D-445	AS-D-5002	AS-MOLWT	Comments
MW-201 (2NAPL)	11/3/16	9:30	Oil							✓	✓	✓	

Sampled By-Print Name: / Signature:			Received By-Company:		
Relinquished By-Print Name: / Signature:	Date:	Time:	Received By-Print Name: / Signature:	Date:	Time:
Relinquished By-Print Name: / Signature:	Date:	Time:	Received By-Print Name: / Signature:	Date:	Time:
Relinquished By-Print Name: / Signature:	Date:	Time:	Received By-Print Name: / Signature:	Date:	Time:

CHAIN OF CUSTODY

PAGE OF

ALPHA ANALYTICAL World Class Chemistry

Westborough, MA TEL: 508-898-9220 FAX: 508-898-9193
Mansfield, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 11/3/16
ALPHA Job #: L1635614

Project Information

Project Name: Atlantic Bridge
Project Location: Weymouth, MA
Project #: 140143.0000.7478
Project Manager: Rick Paquette
ALPHA Quote #:

Client Information

Client: TRC
Address: 2 Liberty Square
Boston, MA 02109
Phone: 617-350-3443
Fax: 617-350-3444
Email: rniles@trcsolutions.com
☐ These samples have been Previously analyzed by Alpha

Turn-Around Time

☒ Standard ☐ Rush (ONLY IF PRE-APPROVED)
Due Date: Time:

Report Information Data Deliverables

☐ FAX ☒ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #: 102044

Regulatory Requirements/Report Limits

State/Fed Program	Criteria
MCP	N/A

MCP PRESUMPTIVE CERTAINTY-CT REASONABLE CONFIDENCE PROTOCOLS

☒ Yes ☐ No Are MCP Analytical Methods Required?
☐ Yes ☒ No Are CT RCP (Reasonable Confidence Protocols) Required?

Other Project Specific Requirements/Comments/Detection Limits:
For sample jar, Analysis: SUB (Molecular, Wgt, Viscosity; Density) – lab will need to possibly filter out some water

ANALYSIS

SAMPLE HANDLING
Filtration
☐ Done
☒ Not Needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	VPH	EPH	Viscosity	density	Molecular Weight								Sample Specific Comments	TOTAL # BOTTLES
35614-01	MW-201 (LNAPL)	11/3/16	0930	LNAPL		☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	See Melissa Gulli	1
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		
						☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		

PLEASE ANSWER QUESTIONS ABOVE!

Container Type	G	G	G	A	G	-	-	-	-	-	-	-
Preservative	A	A	A	A	A	-	-	-	-	-	-	-

IS YOUR PROJECT MA MCP or CT RCP?

Relinquished By:	Date/Time	Received By:	Date/Time
Lauren V. Hopp	11/3/16 1412	[signature] AAC	11/3/16 1412
Charles Hayes AAC	11/3/16 16:05	[signature]	11/3/16 1605

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms.

FORM NO: 01-01(I) (rev. 5-JAN-12)

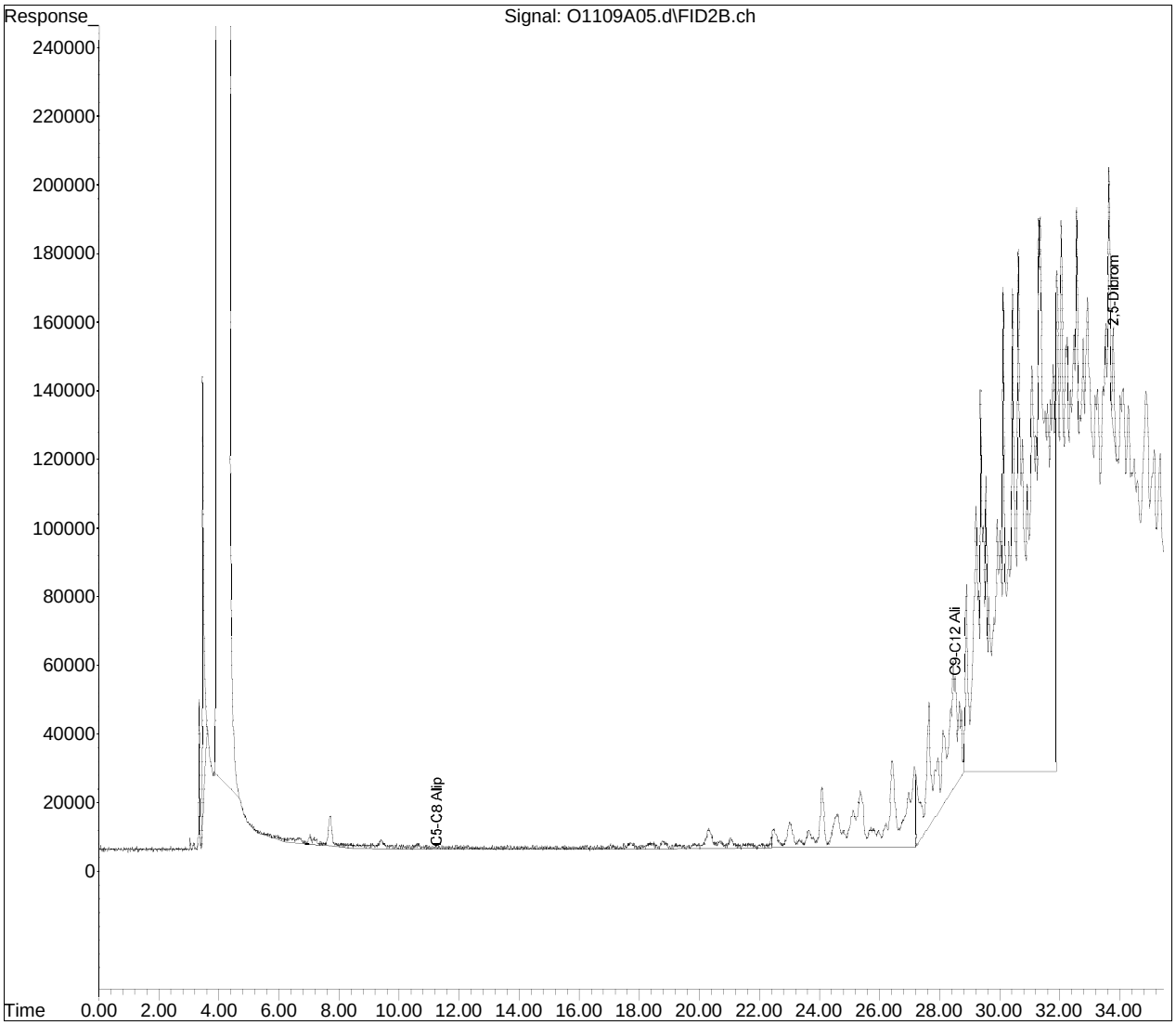
Quantitation Report (QT Reviewed)

Data Path : I:\OVPH\161109ali\
Data File : O1109A05.d
Signal(s) : FID2B.ch
Acq On : 9 Nov 2016 10:13 am
Operator : OVPH:JM
Sample : l1635614-01D,41,10.66,1.1,.005
Misc : WG950701,ICAL12828
ALS Vial : 5 Sample Multiplier: 1

Integration File: autoint1.e
Quant Time: Nov 09 10:56:15 2016
Quant Method : I:\OVPH\161109ali\vph-ali160830.m
Quant Title : VPH ALIPHATIC
QLast Update : Wed Aug 31 07:53:22 2016
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

Sub List : Default - All compounds listed



Houston Laboratories
8820 Interchange Drive
Houston, TX 77054
Phone 713-660-0901

Certificate of Analysis

Number: 1030-16110356-001A

Nov. 29, 2016

Ashaley Kane
Alpha Analytical
8 Walkup Drive
Westborough, MA 01581

Station Name: MW-201 (LNAPL)
Sample Conditions:

Sampled By: N/A
Sample Of: Liquid Spot
Sample Date: 11/03/2016 09:30

Analytical Data

Test	Method	Result	Units	Detection Limit	Lab Tech.	Analysis Date
Viscosity - Kinematic @ 104°F	ASTM D-445	1560	cSt		FM	11/29/2016
Viscosity - Kinematic @ 104°F	ASTM D-445	7228	SUS		FM	11/29/2016
API Gravity @ 60° F	ASTM D-5002	13.54	°		JJH	11/10/2016
Specific Gravity @ 60/60° F	ASTM D-5002	0.9756	_		JJH	11/10/2016
Density @ 60° F	ASTM D-5002	0.9746	g/ml		JJH	11/10/2016
Molecular Weight	Proprietary	485	g/mol		JSG	11/11/2016

Comments:
AS-D-445: Analysis perfomed on hydrocarbon layer.

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP, GPA guidelines for quality assurance, unless otherwise stated.

L1635614

SPL

SPL Work Order No.:	Acct. Mate Code:	Dept. Code	Page	Pages
			1	1

Report To: (Company Name):	Alpha Analytical			Project/Station Name:	Project/Station Number:	Project/Station Location:	Requested TAT*
Address:	8 Walkup Drive			Special Instructions:			10 business days
City/State/Zip:	Westboro	MA	1581				
Contact:	Ashaley Kane	subreports@alphalab.com		Indicate Billing Type: (Place "X", where appropriate)	Net 30 day Acct.	Check #	
Phone:	508-439-5158	Fax:	508-898-9193		Credit Card	<<<Contact SPL, Inc for CC payment arrangements.	* Surcharges May Apply (See quote for details)
Invoice To: (Company Name):	Alpha Analytical			† Terms: Cylinders will be rented for $10/cyl. All cylinders checked out are to be returned within 21 days, whether they contain sample or not. Cylinders not returned after 30 days will be considered lost and will be billed at current replacement cost.	Requested Analysis (Place an "X" next to Sample ID below)		
Address:	8 Walkup Drive						
City/State/Zip:	Westboro	MA	1581				
Contact:	Accounts Payable	ap@alphalab.com					
Phone:	508-439-5158	Fax:	508-898-9193				
Client PO# or Ref. No.:	N/A						
Contract/Proposal #: (i.e. SPLQ####)	SPLQ7378						

Sample ID (used to log/track sample)	Sample Date	Sample Time	Sample Type (Gas/Liq. /Solid)	Duplicate	Composite	Spot	Cylinder Tracking Info† Cylinder #	Date Out	Date In	AS-D-445	AS-D-5002	AS-MOLWT	Comments
MW-201 (2WAPL)	11/3/16	9:30	Oil							✓	✓	✓	

Sampled By-Print Name:				Received By-Company:			
Signature:							
Relinquished By-Print Name:	Elizabeth Ka	Date: 11/7/16	Time: 14:25	Received By-Print Name:		Date: 11/8	Time: 12:31
Signature:				Signature:			
Relinquished By-Print Name:		Date:	Time:	Received By-Print Name:		Date:	Time:
Signature:				Signature:			
Relinquished By-Print Name:		Date:	Time:	Received By-Print Name:		Date:	Time:
Signature:				Signature:			

8100 Secura Way • Santa Fe Springs, CA 90670
Telephone (562) 347-2500 • Fax (562) 907-3610

January 30, 2017

Ryan Niles
TRC Companies, Inc.
2 Liberty Square 6th Floor
Boston, MA 02109

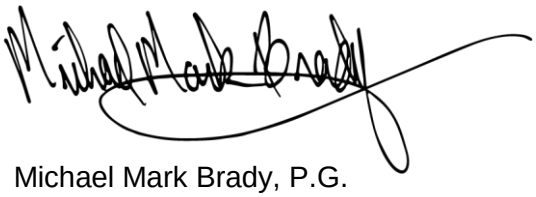
Re: PTS File No: 47030
Physical Properties Data
Atlantic Bridge Project; 140143.0000.4903

Dear Mr. Niles:

Please find enclosed report for Physical Properties analyses conducted upon samples received from your Atlantic Bridge Project; 140143.0000.4903 project. All analyses were performed by applicable ASTM, EPA, or API methodologies. The samples are currently in storage and will be retained for thirty days past completion of testing at no charge. Please note that the samples will be disposed of at that time. You may contact me regarding storage, disposal, or return of the samples.

PTS Laboratories appreciates the opportunity to be of service. If you have any questions or require additional information, please give me a call at (562) 347-2502.

Sincerely,
PTS Laboratories, Inc.



Michael Mark Brady, P.G.
Laboratory Director

Encl.

Project Name: Atlantic Bridge Project
Project Number: 140143.0000.4903

PTS File No: 47030
Client: TRC Companies, Inc.

TEST PROGRAM - 20170119

FLUID ID	Date	Time	Fluid Type	Fluid Cleaning	3-Point Viscosity LNAPL				Comments
			Method:	Proprietary	ASTM D445, D1481				
Date Received: 20170119									
MW-201 LNAPL	**20170105/ 20170117**	**1500**	**LNAPL**	**X**	**X**				
TOTALS:				**1**	**1**				**1**

Laboratory Test Program Notes

Standard TAT for basic analysis is 10-15 business days.

3-point viscosity includes viscosity and density at three temperatures (70, 100, 130°F).

Per client request in COC comments, run 3-point viscosity and density at 50, 70, and 100°F.

PTS Laboratories

PTS File No: 47030
Client: TRC Companies, Inc.
Report Date: 01/30/17

VISCOSITY, DENSITY, and SPECIFIC GRAVITY DATA

(METHODOLOGY: ASTM D445, ASTM D1481, API RP40)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

SAMPLE ID	MATRIX	TEMPERATURE, °F	SPECIFIC GRAVITY	DENSITY, g/cc	VISCOSITY	
					centistokes	centipoise
MW-201 LNAPL	NAPL	50	0.9787	0.9785	44600	43600
		70	0.9792	0.9724	10700	10400
		100	0.9761	0.9624	2070	1990

QUALITY CONTROL DATA

Date:	01/20/17	01/24/17
FLUID TYPE:	Cannon® CVS S3	Cannon® CVS S3
TEMPERATURE, °F:	70	
DENSITY, MEASURED:	0.8669	
DENSITY, PUBLISHED:	0.8666	
RPD:	0.04	
VISCOSITY, MEASURED:	4.64	4.65
VISCOSITY, PUBLISHED:	4.57	4.57
RPD:	1.57	1.88

CVS Lot #: 16101 CVS = Certified Viscosity Standard

PTS Laboratories, Inc.

CHAIN OF CUSTODY RECORD

PAGE 1 OF

COMPANY: TRC Solutions

ADDRESS: 21 Liberty Square 6th Floor | CITY: Boston, MA | ZIP CODE: 02109

PROJECT MANAGER: Rick Paquette | email: CRacca@TRCsolutions.com

PROJECT NAME: Atlantic Bridge Project | PHONE NUMBER: 617-385-6033

PROJECT NUMBER: 140143.0000.4903 | FAX NUMBER:

SITE LOCATION: 6 & 50 Bridge ST. Weymouth, MA

SAMPLER SIGNATURE: Benjamin Clay

PO# 163297

TURNAROUND TIME: 24 HOURS ☐ 72 HOURS ☐ 5 DAYS ☐ NORMAL ☑

OTHER:

SAMPLE INTEGRITY (CHECK): INTACT X TEMP(F) 52

PTS QUOTE NO.

PTS FILE: 47030

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	3-Point Density/Viscosity	COMMENTS
MW-201 LNAPL	1/5/17	1500	12.92	3	X	50, 70, 100 Degrees F
	1/17/17					

Columns: SOIL PROPERTIES PACKAGE; HYDRAULIC CONDUCTIVITY PACKAGE; PORE FLUID SATURATIONS PACKAGE; TCEQ/TNRCC PROPERTIES PACKAGE; CAPILLARITY PACKAGE; FLUID PROPERTIES PACKAGE; PHOTOLOG: CORE PHOTOGRAPHY; VAPOR TRANSPORT PACKAGE; POROSITY: TOTAL, AIR FILLED, WATER FILLED; POROSITY: EFFECTIVE, ASTM D425M; SPECIFIC GRAVITY, ASTM D854; BULK DENSITY (DRY), API RP40 or ASTM D2937; AIR PERMEABILITY, API RP40; HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084; GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M; TOC: WALKLEY-BLACK; ATTERBERG LIMITS, ASTM D4318; VAPOR INTRUSION PACKAGE; FREE PRODUCT MOBILITY PACKAGE

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
COMPANY: TRC	COMPANY: PTS LABS	COMPANY	COMPANY
DATE: 1/18/17 TIME: 1500	DATE: 1/19/17 TIME: 1010	DATE TIME	DATE TIME

2100 Secure Way • Santa Fe Springs, CA 90670 • Phone (562) 347-2500 • Fax (562) 279-1150

PTS Laboratories, Inc.

CHAIN OF CUSTODY RECORD

PAGE 1 OF 1

COMPANY: TRC Solutions

ADDRESS: 2 Liberty Square 6th floor | CITY: Boston, MA | ZIP CODE: 02109

PROJECT MANAGER: Rick Paquette | email: CRare@TRCSolutions.com

PROJECT NAME: Atlantic Bridge Project | PHONE NUMBER: 617-385-6033

PROJECT NUMBER: 140143.0000.4903 | FAX NUMBER:

SITE LOCATION: 6350 Bridge ST. Weymouth, MA

SAMPLER SIGNATURE: Brian Azer

PO# 103297

TURNAROUND TIME
24 HOURS ☐ 5 DAYS ☐
72 HOURS ☐ NORMAL ☑

OTHER:

SAMPLE INTEGRITY (CHECK):
INTACT X TEMP(F) 63.8

PTS QUOTE NO.

PTS FILE: 46705

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE	3 POINT - Density/Viscosity
MW-201 LNAPL MW-410, MW-414	1/6/17, 1/23/17, 2/14/17																							X

COMMENTS: 50, 70, 100 Degrees F

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
COMPANY: TRC	COMPANY: PTS LABS	COMPANY:	COMPANY:
DATE: 2/15/17 TIME: 1700	DATE: 2/16/17 TIME: 1350	DATE: TIME:	DATE: TIME:

PTS Laboratories

Project Name: Atlantic Bridge Project
Project Number: 140143.0000.4903

PTS File No: 47030
Client: TRC Companies, Inc.

TEST PROGRAM - 20170119

FLUID ID	Date	Time	Fluid Type	Fluid Cleaning	3-Point Viscosity LNAPL				Comments
			Method:	Proprietary	ASTM D445, D1481				
Date Received: 20170119									
MW-201 LNAPL	**20170105/ 20170117**	**1500**	**LNAPL**	**X**	**X**				
TOTALS:				**1**	**1**				**1**

Laboratory Test Program Notes

Standard TAT for basic analysis is 10-15 business days.
3-point viscosity includes viscosity and density at three temperatures (70, 100, 130°F).
Per client request in COC comments, run 3-point viscosity and density at 50, 70, and 100°F.

8100 Secura Way • Santa Fe Springs, CA 90670
Telephone (562) 347-2500 • Fax (562) 907-3610

April 26, 2017

Ryan Niles
TRC Environmental Corp
650 Suffolk Street STE 200
Lowell, MA 01854

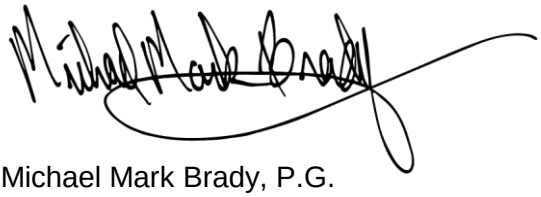
Re: PTS File No: 46705R1
Physical Properties Data –Revised Report
Atlantic Bridge Project; 140143.0000.4903

Dear Mr. Niles:

Please find enclosed revised report for Physical Properties analyses conducted upon samples received from your Atlantic Bridge Project; 140143.0000.4903 project. The report was revised to add annotation to the analytical report documenting conditions under which the modified centrifugal test (Free Product Mobility) was conducted. All analyses were performed by applicable ASTM, EPA, or API methodologies.

PTS Laboratories appreciates the opportunity to be of service. If you have any questions or require additional information, please give me a call at (562) 347-2502.

Sincerely,
PTS Laboratories, Inc.



Michael Mark Brady, P.G.
Laboratory Director

Encl.

Project Name: **Atlantic Bridge Project** **PTS File No: 46705R1**
Project Number: **140143.0000.4903** **Client: TRC Solutions**

TEST PROGRAM - 20170127

CORE ID	Depth ft.	Core Recovery ft.	Slab and Core Photo	Grain Size Analyses	Pore Fluid Saturation Package	Free Product Mobility	O/W Imbibition Capillary Pressure Curve	NAPL Permeability API RP40	Hydraulic Conductivity API RP40	Comments
		Plugs:	1/4:3/4	Grab	Vert. 1.5"	Vert. 1.5"	Vert. 1"	Vert. 1"	Vert. 1"	
Date Received: 20161216										
B406A-A	**8-10**	**0.95**	**1**							
B406A-B	**10-12**	**1.45**	**2**		**10.9-11.1**	**11.1-11.3**	**11.3-11.5**	**X**	**X**	Labeled B406A-A, include hydraulic conductivity and LNAPL permeability
B406A-C	**12-14**	**1.40**	**2**	**12.6-12.8**	**12-12.2**	**12.2-12.4**	**12.4-12.6**			Labeled B406A-B
B406A-D	**14-16**	**1.15**	**2**		**14-14.2**	**14.2-14.4**	**14.4-14.6**			Labeled B406A-C
B406A-E	**16-18**	**1.10**	**2**							Labeled B406A-D
B404A-A	**8-10**	**1.70**	**2**							
B404A-B	**10-12**	**0.80**	**1**		**10.2-10.4**	**10.4-10.6**	**10.6-10.8**			
B404A-C	**12-14**	**0.75**	**1**		**12-12.2**	**12.2-12.4**	**12.4-12.6**	**X**	**X**	include hydraulic conductivity and LNAPL permeability
B404A-D	**14-16**	**0.85**	**1**	**14.6-14.8**	**14-14.2**	**14.2-14.4**	**14.4-14.6**			
B404A-E	**16-18**	**0.85**	**1**							
B412A-A	**10-12**	**1.25**	**2**							
B412A-B	**12-14**	**1.35**	**2**		**12-12.2**	**12.2-12.4**	**12.4-12.6**	**X**	**X**	include hydraulic conductivity and LNAPL permeability
B412A-C	**14-16**	**0.90**	**1**	**14.6-14.8**	**14-14.2**	**14.2-14.4**	**14.4-14.6**			
B412A-D	**16-18**	**0.55**	**1**		**16-16.2**	**16.2-16.4**	**16.4-16.55**			
B412A-E	**18-20**	**0.90**	**1**							
B413A-A	**10-12**	**1.00**	**1**							
B413A-B	**12-14**	**0.90**	**1**		**12-12.2**	**12.2-12.4**	**12.4-12.6**			
B413A-C	**14-16**	**1.20**	**2**	**14.6-14.8**	**14-14.2**	**14.2-14.4**	**14.4-14.6**	**X**	**X**	include hydraulic conductivity and LNAPL permeability
B413A-D	**16-18**	**0.90**	**1**		**16-16.2**	**16.2-16.4**	**16.4-16.6**			
B413A-E	**18-20**	**0.65**	**1**							
TOTALS:	**20 Cores**	**20.60**	**28**	**4**	**12**	**12**	**12**	**4**	**4**	**36**

Laboratory Test Program Notes

Contaminant identification: _____

Standard TAT for basic analysis is 10-15 business days.

Samples received cryogenically preserved will be stored frozen at standard core storage rates from sample date of receipt. Core storage charges will be billed monthly or quarterly depending upon project.

Sample locations to be selected by TRC Solutions personnel from core photography.

Grain Size Analysis: Laser or sieve method; includes tabular data, graphics and statistical sorting in Excel format.

Pore Fluid Saturation Package: API RP40 Dean-Stark Method: Includes initial pore fluid saturations, total porosity, air-filled porosity, grain density, dry bulk density and moisture content.

Hydraulic conductivity and LNAPL permeability added for four (4) O/W Imbibition Pc tests per C. Race/TRC 20170123. Use NAPL MW-201 (PTS File No. 47030).

Free Product Mobility Package: Applied centrifugal force demonstrates product mobility; includes residual saturations by Dean-Stark, total porosity, grain and dry bulk density.

Free Product Mobility – Extended Run tests are to be conducted at 30xG for 24 hours per C. Race/TRC 20170201.

Additional NAPL (MW-201, MW-410, MW-414 composite) received frm TRC on 20170216 to complete remaining O/W Pc tests.

PTS Laboratories

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PHYSICAL PROPERTIES DATA - PORE FLUID SATURATIONS

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

		METHODS:	API RP 40 / ASTM D2216	API RP 40		API RP 40		API RP 40	
SAMPLE ID.	DEPTH, ft.	SAMPLE ORIENTATION (1)	MOISTURE CONTENT, % weight	DENSITY		POROSITY, %Vb (2)		PORE FLUID SATURATIONS, % Pv (3)	
				DRY BULK, g/cc	GRAIN, g/cc	TOTAL	AIR FILLED	WATER	NAPL
B406A-B	11.0	V	23.6	1.05	2.38	55.9	31.0	28.4	16.3
B406A-C	12.1	V	17.5	1.62	2.60	37.8	9.0	42.1	34.1
B406A-D	14.1	V	18.8	1.60	2.68	40.2	9.6	36.3	39.8
B404A-B	10.3	V	29.6	1.27	2.42	47.5	9.7	59.8	19.7
B404A-C	12.1	V	17.7	1.61	2.54	36.8	8.3	65.7	11.8
B404A-D	14.1	V	25.3	1.18	2.30	48.8	18.9	59.2	2.0
B412A-B	12.1	V	31.9	1.25	2.36	46.8	6.5	55.7	30.5
B412A-C	14.1	V	20.2	1.36	2.51	45.7	18.0	52.7	7.8
B412A-D	16.1	V	20.3	1.30	2.43	46.3	19.8	49.7	7.5
B413A-B	12.1	V	30.4	1.24	2.40	48.5	10.6	53.5	24.6
B413A-C	14.1	V	29.2	1.27	2.41	47.6	10.1	38.7	40.1
B413A-D	16.1	V	27.3	1.22	2.31	47.1	13.6	59.0	12.2

(1) Sample Orientation: H = horizontal; V = vertical; R = remold

(2) Total Porosity = all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids.

(3) Fluid density used to calculate pore fluid saturations: Water = 0.9996 g/cc, NAPL = 0.9724 g/cc.

Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

FREE PRODUCT MOBILITY: INITIAL AND RESIDUAL SATURATIONS

(Centrifugal method: samples spun under air for 24 hours)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

			METHODS:	API RP 40		API RP 40	ASTM D425M, DEAN-STARK			
							PORE FLUID SATURATIONS (3), % Pv			
		SAMPLE		DENSITY		TOTAL	Initial Fluid Saturations		After Centrifuge at 30xG	
SAMPLE ID.	DEPTH, ft.	ORIENTATION (1)	ANALYSIS DATE	DRY BULK, g/cc	GRAIN, g/cc	POROSITY (2), %Vb	WATER (Swi) SATURATION	NAPL (Soi) SATURATION	WATER (Srw) SATURATION	NAPL (Sor) SATURATION
B406A-B	11.2	V	20170209	0.89	2.21	59.9	62.4	21.2	24.8	21.1
NOTE: Trace dark brown LNAPL produced. Produced water clear.										
B406A-C	12.3	V	20170209	1.57	2.68	41.4	34.6	49.8	14.4	22.0
NOTE: Dark brown LNAPL produced. Produced water clear.										
B406A-D	14.3	V	20170209	1.49	2.69	44.4	38.0	43.2	10.1	30.5
NOTE: Dark brown LNAPL produced. Produced water clear.										
B404A-B	10.5	V	20170209	1.40	2.46	43.3	52.4	20.1	24.5	20.1
NOTE: No visible NAPL produced. Produced water cloudy with brown color and no hydrocarbon odor.										
B404A-C	12.3	V	20170213	1.14	2.25	49.1	59.2	21.1	23.0	18.9
NOTE: Dark brown DNAPL produced. Produced water clear.										
B404A-D	14.3	V	20170213	1.41	2.38	40.7	78.2	1.8	32.8	1.8
NOTE: No visible NAPL produced. Produced water clear with no hydrocarbon odor.										
B412A-B	12.3	V	20170213	1.02	2.13	51.9	56.6	23.4	25.4	21.2
NOTE: Dark brown LNAPL produced. Produced water clear.										
B412A-C	14.3	V	20170213	1.48	2.44	39.4	80.7	12.0	30.6	11.6
NOTE: Trace dark brown LNAPL produced. Produced water clear.										

(1) Sample Orientation: H = horizontal; V = vertical; R = remold

(2) Total Porosity = all interconnected pore channels.

(3) Fluid density used to calculate pore fluid saturations: Water = 0.9996 g/cc, NAPL = 0.9724 g/cc.

Swi = Initial Water Saturation as received prior to centrifuging at 1000xG, Soi = Initial NAPL Saturation as received prior to centrifuging at 1000xG.

Srw = Residual Water Saturation after centrifuging at 1000xG, Sor = Residual NAPL Saturation after centrifuging at 1000xG.

Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

FREE PRODUCT MOBILITY: INITIAL AND RESIDUAL SATURATIONS

(Centrifugal method: samples spun under air for 24 hours)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

			METHODS:	API RP 40		API RP 40	ASTM D425M, DEAN-STARK			
							PORE FLUID SATURATIONS (3), % Pv			
		SAMPLE		DENSITY		TOTAL	Initial Fluid Saturations		After Centrifuge at 30xG	
SAMPLE ID.	DEPTH, ft.	ORIENTATION (1)	ANALYSIS DATE	DRY BULK, g/cc	GRAIN, g/cc	POROSITY (2), %Vb	WATER (Swi) SATURATION	NAPL (Soi) SATURATION	WATER (Srw) SATURATION	NAPL (Sor) SATURATION
B412A-D	16.3	V	20170214	1.27	2.39	46.7	66.8	8.7	19.7	7.8
NOTE: Dark brown LNAPL produced. Produced water clear.										
B413A-B	12.3	V	20170214	0.97	2.17	55.4	57.9	30.4	28.1	27.8
NOTE: Dark brown LNAPL produced. Produced water clear.										
B413A-C	14.3	V	20170214	1.08	2.31	53.1	57.2	31.8	24.9	30.0
NOTE: Brown LNAPL produced. Produced water clear.										
B413A-D	16.3	V	20170214	1.15	2.42	52.4	47.7	9.5	17.2	9.4
NOTE: Trace LNAPL produced. Produced water clear.										

(1) Sample Orientation: H = horizontal; V = vertical; R = remold

(2) Total Porosity = all interconnected pore channels.

(3) Fluid density used to calculate pore fluid saturations: Water = 0.9996 g/cc, NAPL = 0.9724 g/cc.

Swi = Initial Water Saturation as received prior to centrifuging at 1000xG, Soi = Initial NAPL Saturation as received prior to centrifuging at 1000xG.

Srw = Residual Water Saturation after centrifuging at 1000xG, Sor = Residual NAPL Saturation after centrifuging at 1000xG.

Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

SAMPLE PROPERTIES - OIL/WATER CAPILLARY PRESSURE

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

		METHODS:	API RP 40 / ASTM D2216	API RP 40		API RP 40		API RP 40
		SAMPLE	MOISTURE	DENSITY		POROSITY, %Vb (2)		TOTAL PORE FLUID
SAMPLE ID.	DEPTH, ft.	ORIENTATION (1)	CONTENT, % weight	DRY BULK, g/cc	GRAIN, g/cc	TOTAL	AIR FILLED	SATURATIONS (3), % Pv
B406A-B	11.4	V	17.5	1.42	2.37	40.0	15.1	62.3
B406A-C	12.5	V	22.0	1.50	2.68	44.0	10.9	75.1
B406A-D	14.5	V	22.3	1.47	2.68	45.2	12.4	72.5
B404A-B	10.7	V	27.8	1.25	2.49	49.8	15.1	69.6
B404A-C	12.5	V	18.4	1.37	2.32	41.1	15.9	61.3
B404A-D	14.5	V	13.0	1.35	2.42	44.3	26.8	39.6
B412A-B	12.5	V	58.9	0.83	2.19	62.0	13.0	79.1
B412A-C	14.5	V	46.5	0.99	2.29	56.7	10.6	81.2
B412A-D	16.45	V	62.4	0.79	2.11	62.8	13.7	78.1
B413A-B	12.5	V	70.7	0.76	2.19	65.5	12.0	81.7
B413A-C	14.5	V	64.7	0.82	2.19	62.7	9.9	84.2
B413A-D	16.5	V	17.2	1.23	2.53	51.3	30.0	41.5

(1) Sample Orientation: H = horizontal; V = vertical; R = remold

(2) Total Porosity = all interconnected pore channels; Air Filled = pore channels not occupied by pore fluids.

(3) Fluid densities used to calculate pore fluid saturations: Water = 0.9996 g/cc; MW-5 NAPL = 0.9724 g/cc

Vb = Bulk Volume, cc; Pv = Pore Volume, cc; ND = Not Detected

PTS Laboratories

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PERMEABILITY DATA - OIL/WATER CAPILLARY PRESSURE

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

		METHODS:	API RP 40; EPA 9100		
			25 PSI CONFINING STRESS		
SAMPLE ID.	DEPTH, ft.	SAMPLE ORIENTATION (1)	SPECIFIC PERMEABILITY TO WATER, millidarcy (2,3)	HYDRAULIC CONDUCTIVITY, cm/s (3)	SPECIFIC PERMEABILITY TO NAPL, millidarcy (4)
B406A-B	11.4	V	703	6.99E-04	491
B406A-C	12.5	V	Permeability Analyses Not Requested		
B406A-D	14.5	V	Permeability Analyses Not Requested		
B404A-B	10.7	V	Permeability Analyses Not Requested		
B404A-C	12.5	V	7320	7.29E-03	18000
B404A-D	14.5	V	Permeability Analyses Not Requested		
B412A-B	12.5	V	7950	7.89E-03	23700
B412A-C	14.5	V	Permeability Analyses Not Requested		
B412A-D	16.45	V	Permeability Analyses Not Requested		
B413A-B	12.5	V	Permeability Analyses Not Requested		
B413A-C	14.5	V	6790	6.72E-03	21900
B413A-D	16.5	V	Permeability Analyses Not Requested		

(1) Sample Orientation: H = horizontal; V = vertical; R = remold
(2) Effective (Native) = With as-received pore fluids in place.
(3) Permeability/conductivity measured at saturated condition.
(4) Specific (intrinsic) permeability.
Water = filtered Laboratory Fresh (tap) or Site water; NAPL = Client supplied

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B406A-B at 11.4 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	88.2	11.8
0.887	62.4	75.2	68.8	31.2
			Spontaneous Imbibition	
0.000	0.00	0.00	68.8	31.2
0.000	0.00	0.00	68.8	31.2
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	68.8	31.2
-0.004	-0.31	0.38	68.8	31.2
-0.009	-0.62	0.75	68.8	31.2
-0.015	-1.06	1.28	68.8	31.2
-0.023	-1.64	1.98	68.9	31.1
-0.035	-2.48	3.00	69.1	30.9
-0.048	-3.37	4.06	69.2	30.8
-0.065	-4.54	5.47	69.4	30.6
-0.097	-6.83	8.23	69.7	30.3
-0.161	-11.4	13.7	70.6	29.4
-0.244	-17.2	20.7	71.5	28.5
-0.383	-26.9	32.5	72.2	27.8
-0.860	-60.5	72.9	76.2	23.8

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

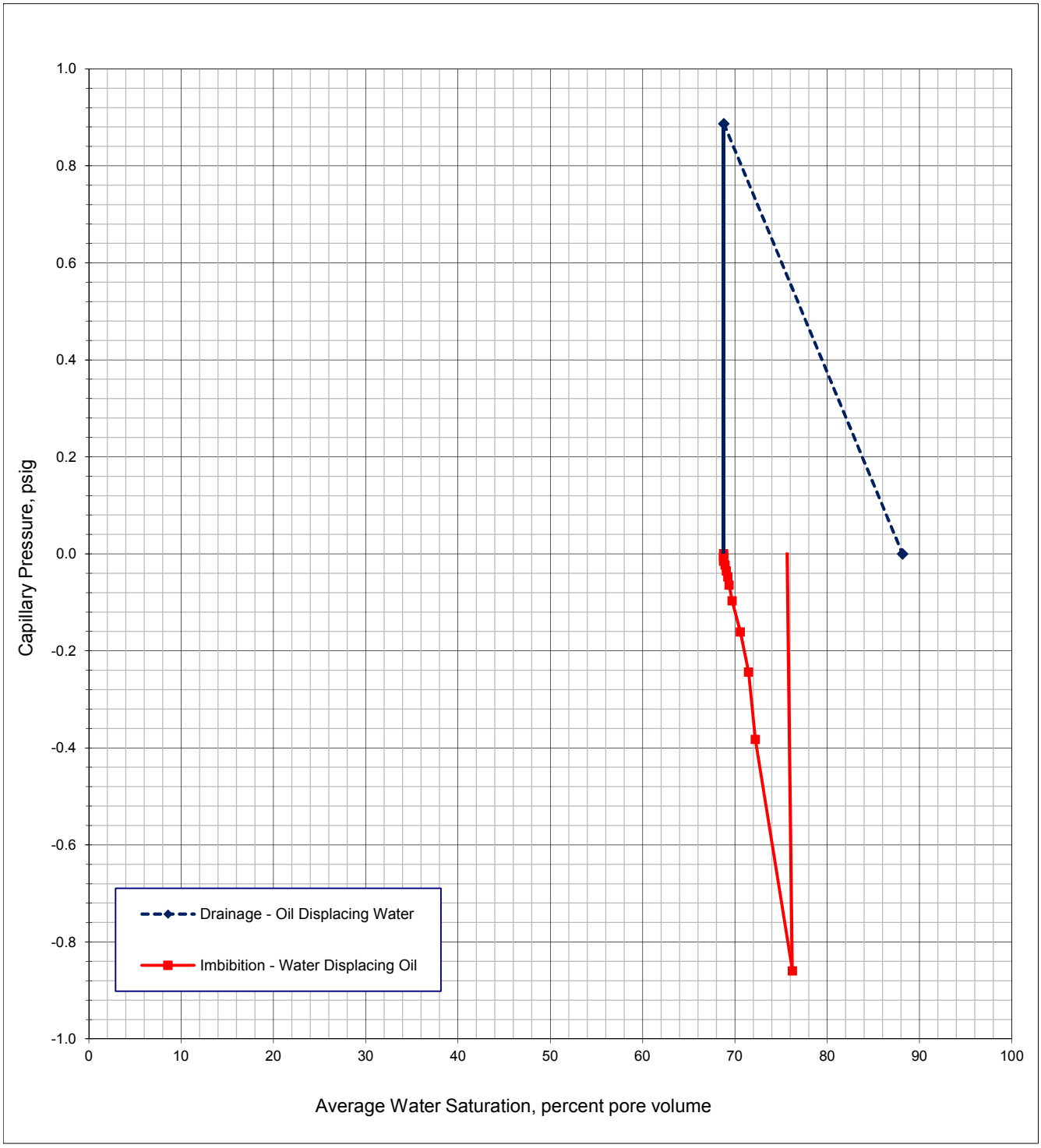
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B406A-B
Depth, ft.: 11.4



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

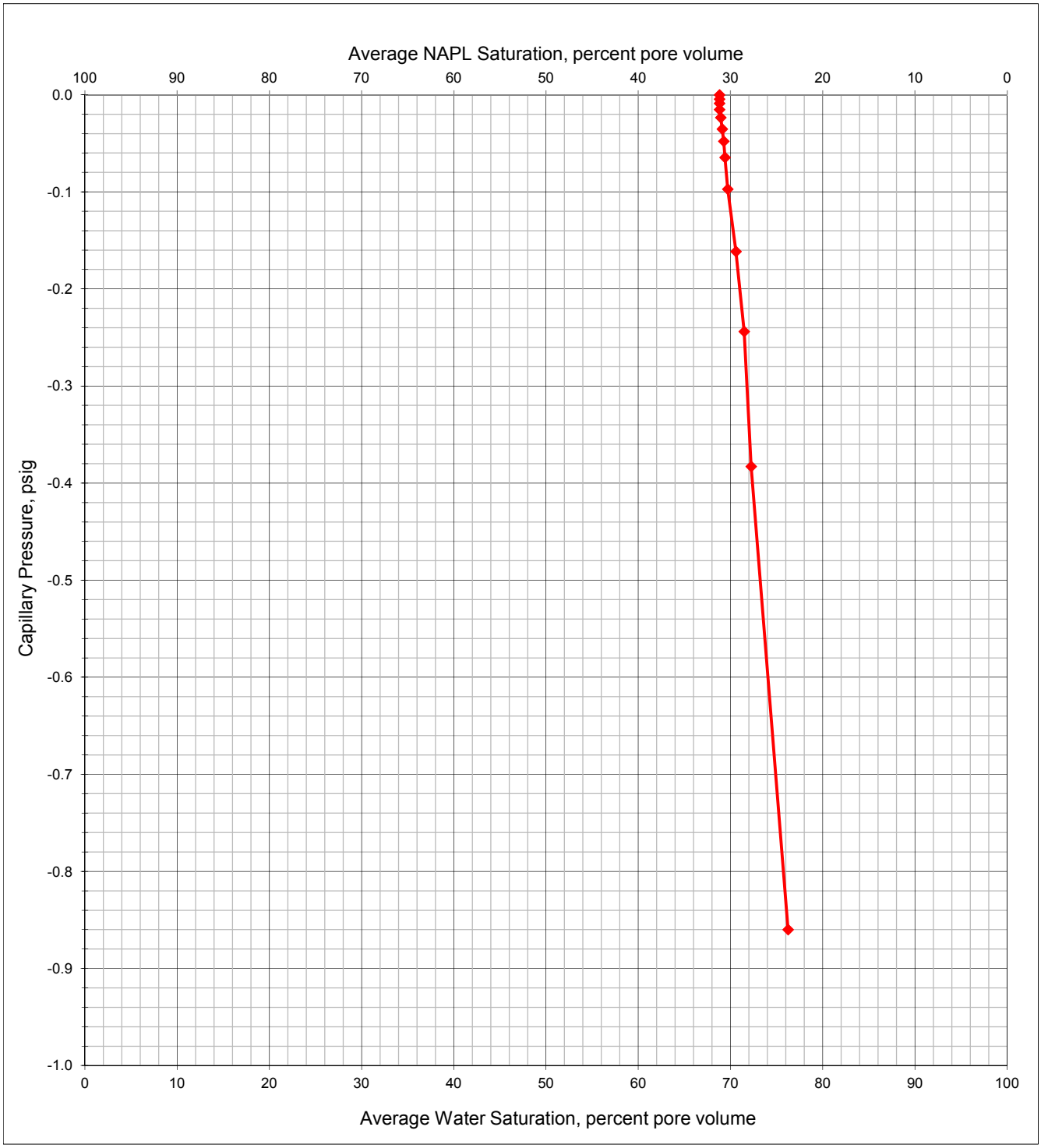
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B406A-B
Depth, ft.: 11.4



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B406A-C at 12.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	73.0	27.0
0.895	62.9	75.9	24.1	75.9
			Spontaneous Imbibition	
0.000	0.00	0.00	24.1	75.9
0.000	0.00	0.00	24.1	75.9
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	24.1	75.9
-0.005	-0.32	0.38	24.1	75.9
-0.009	-0.63	0.76	24.1	75.9
-0.015	-1.07	1.30	24.1	75.9
-0.024	-1.65	2.00	24.3	75.7
-0.036	-2.51	3.02	24.4	75.6
-0.048	-3.40	4.10	25.0	75.0
-0.065	-4.58	5.53	25.6	74.4
-0.098	-6.89	8.31	26.4	73.6
-0.163	-11.5	13.8	28.1	71.9
-0.246	-17.3	20.9	31.5	68.5
-0.387	-27.2	32.8	38.4	61.6
-0.868	-61.0	73.6	57.0	43.0

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

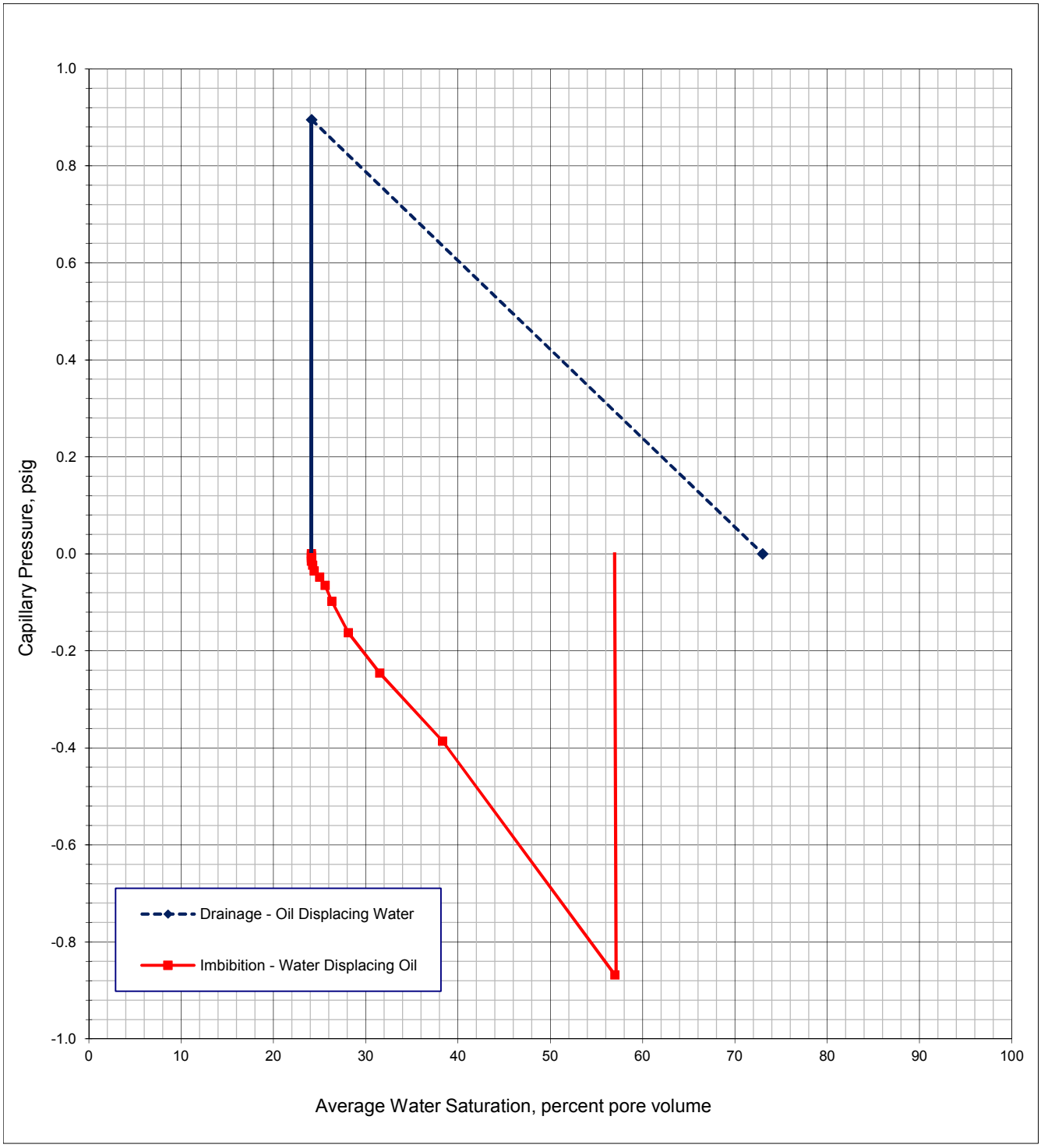
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B406A-C
Depth, ft.: 12.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

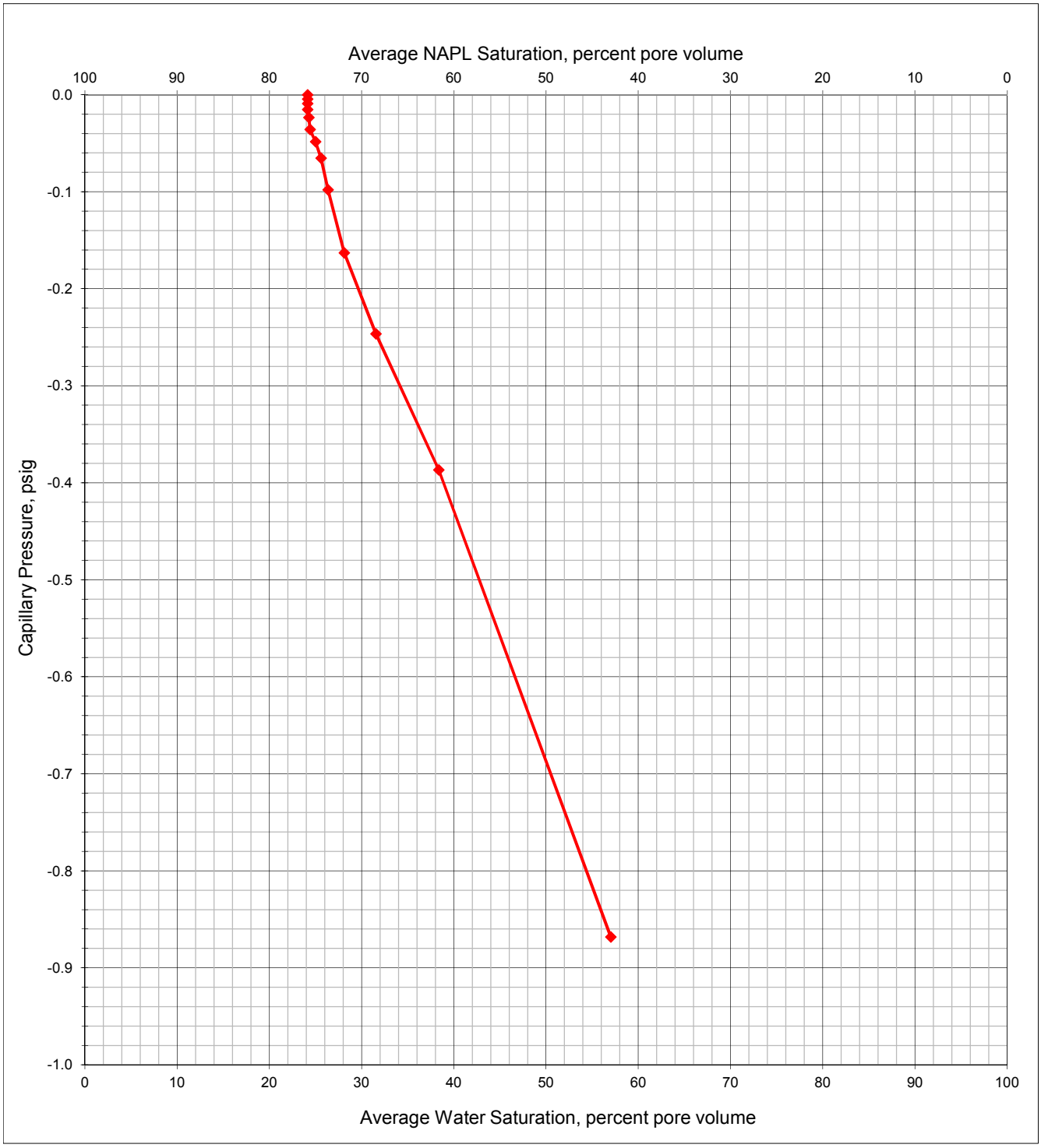
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B406A-C
Depth, ft.: 12.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B406A-D at 14.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	68.4	31.6
0.888	62.5	75.3	17.8	82.2
			Spontaneous Imbibition	
0.000	0.00	0.00	17.8	82.2
0.000	0.00	0.00	17.8	82.2
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	17.8	82.2
-0.004	-0.31	0.38	17.8	82.2
-0.009	-0.62	0.75	17.8	82.2
-0.015	-1.07	1.29	18.6	81.4
-0.023	-1.64	1.98	23.7	76.3
-0.035	-2.49	3.00	25.2	74.8
-0.048	-3.37	4.07	25.9	74.1
-0.065	-4.54	5.48	27.2	72.8
-0.097	-6.83	8.24	29.2	70.8
-0.162	-11.4	13.7	33.2	66.8
-0.244	-17.2	20.7	38.2	61.8
-0.383	-27.0	32.5	45.2	54.8
-0.861	-60.5	73.0	69.1	30.9

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

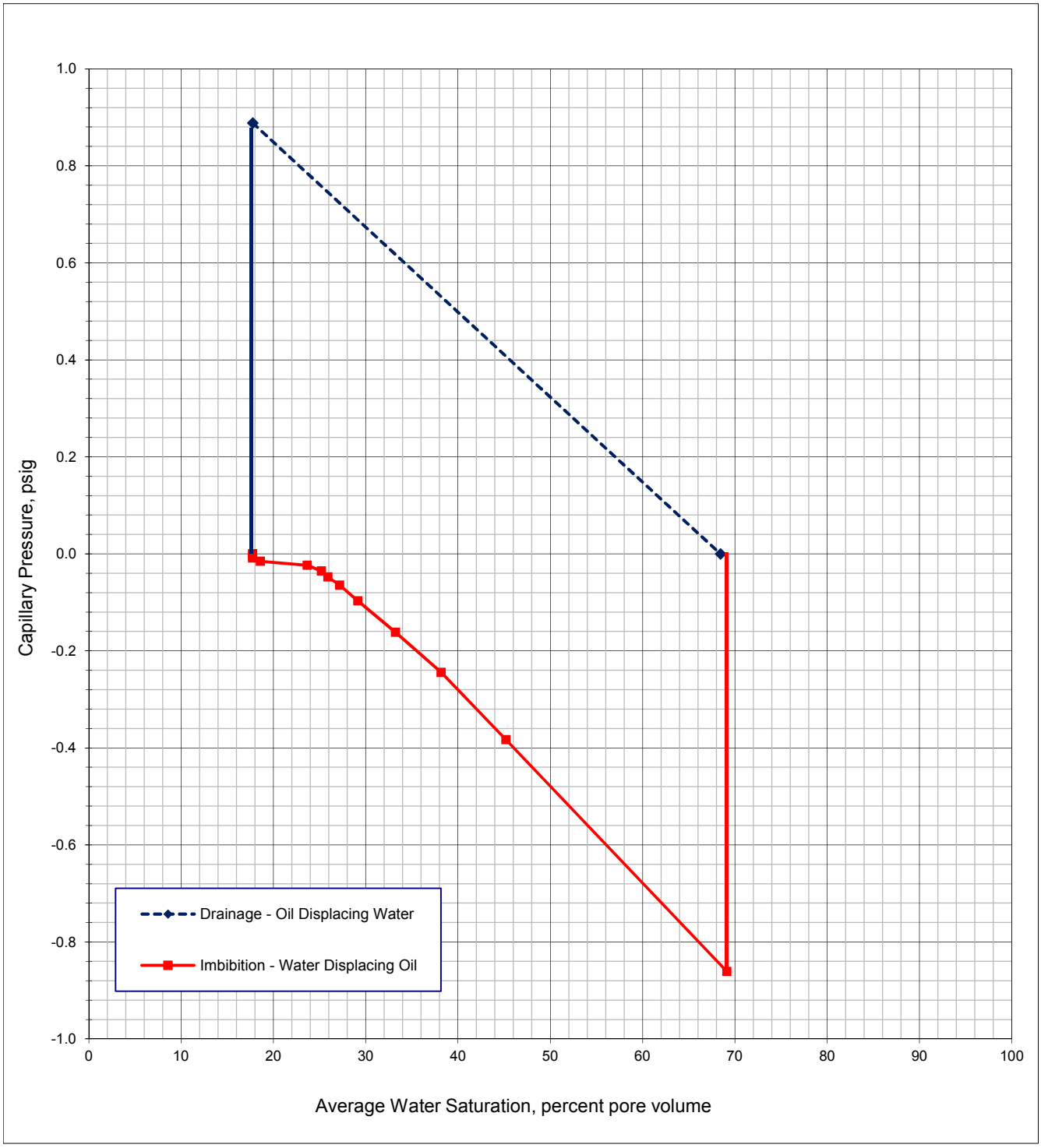
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B406A-D
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

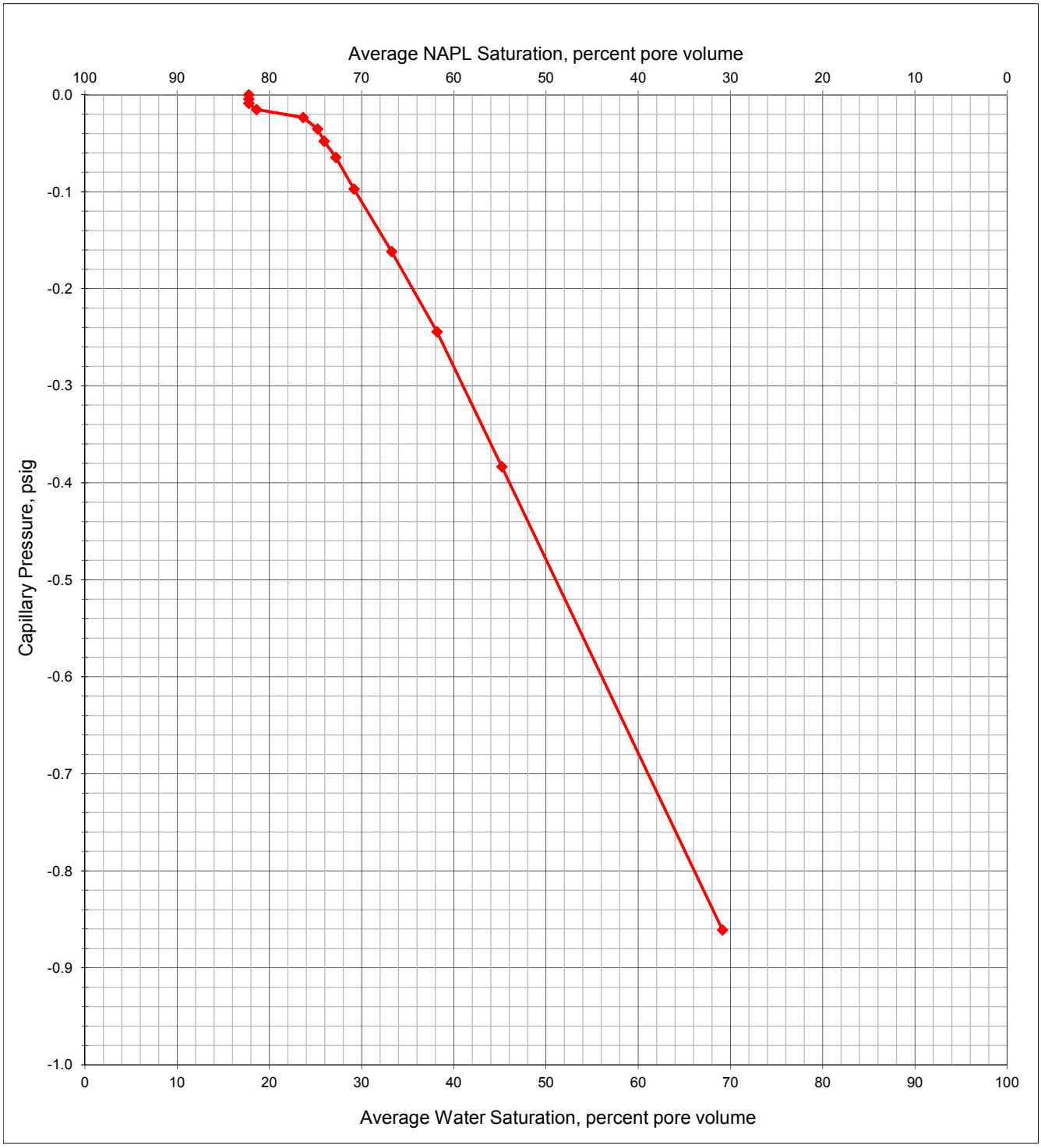
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B406A-D
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B404A-B at 10.7 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	64.8	35.2
0.859	60.4	72.9	33.7	66.3
			Spontaneous Imbibition	
0.000	0.00	0.00	33.7	66.3
0.000	0.00	0.00	33.7	66.3
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	33.7	66.3
-0.004	-0.30	0.37	33.7	66.3
-0.009	-0.60	0.72	33.9	66.1
-0.015	-1.03	1.24	34.0	66.0
-0.023	-1.59	1.91	34.1	65.9
-0.034	-2.40	2.90	34.3	65.7
-0.046	-3.26	3.93	34.6	65.4
-0.062	-4.39	5.29	35.0	65.0
-0.094	-6.60	7.96	36.0	64.0
-0.156	-11.0	13.2	38.7	61.3
-0.236	-16.6	20.0	41.2	58.8
-0.370	-26.0	31.4	44.6	55.4
-0.832	-58.5	70.5	50.4	49.6

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

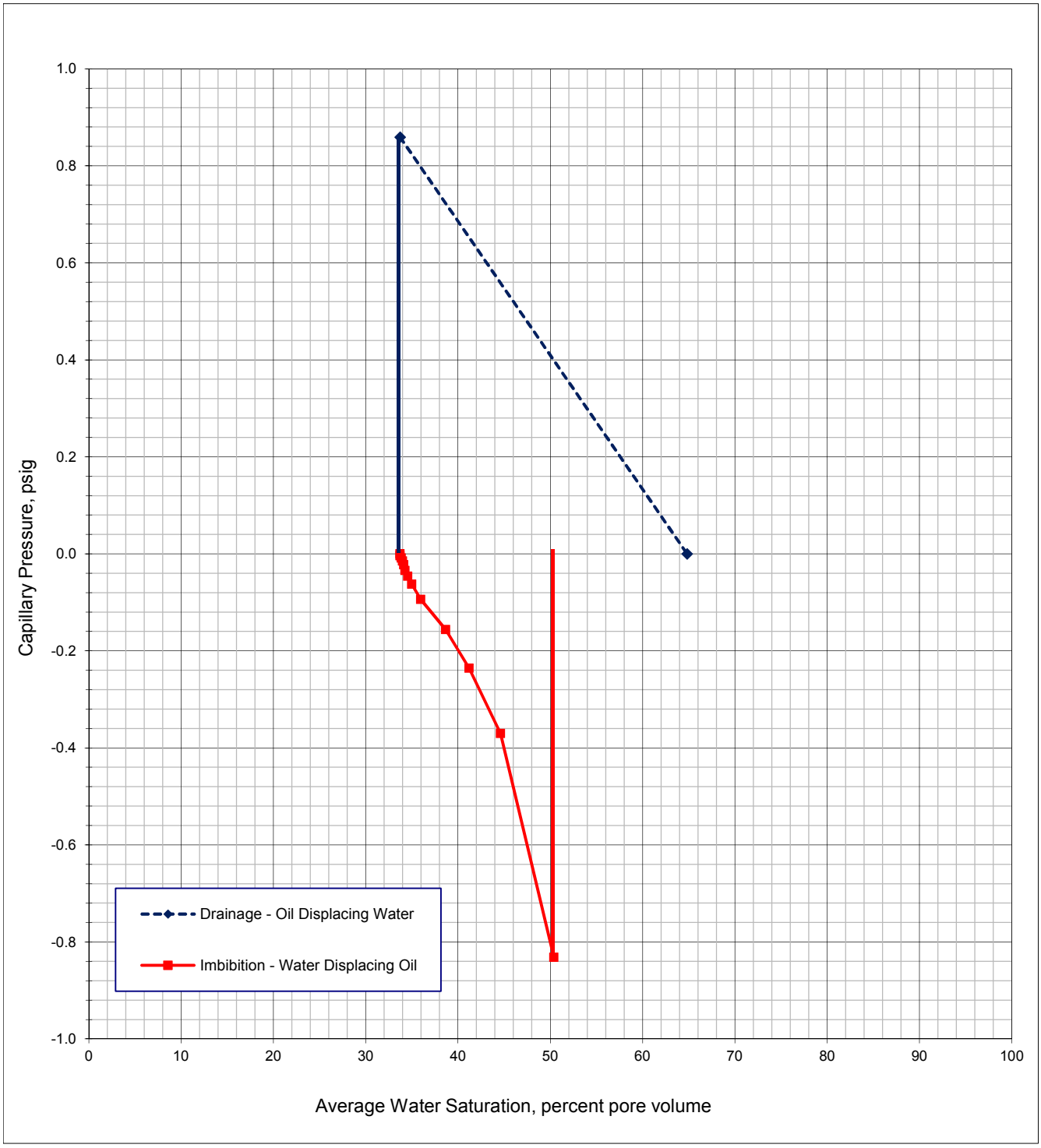
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B404A-B
Depth, ft.: 10.7



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

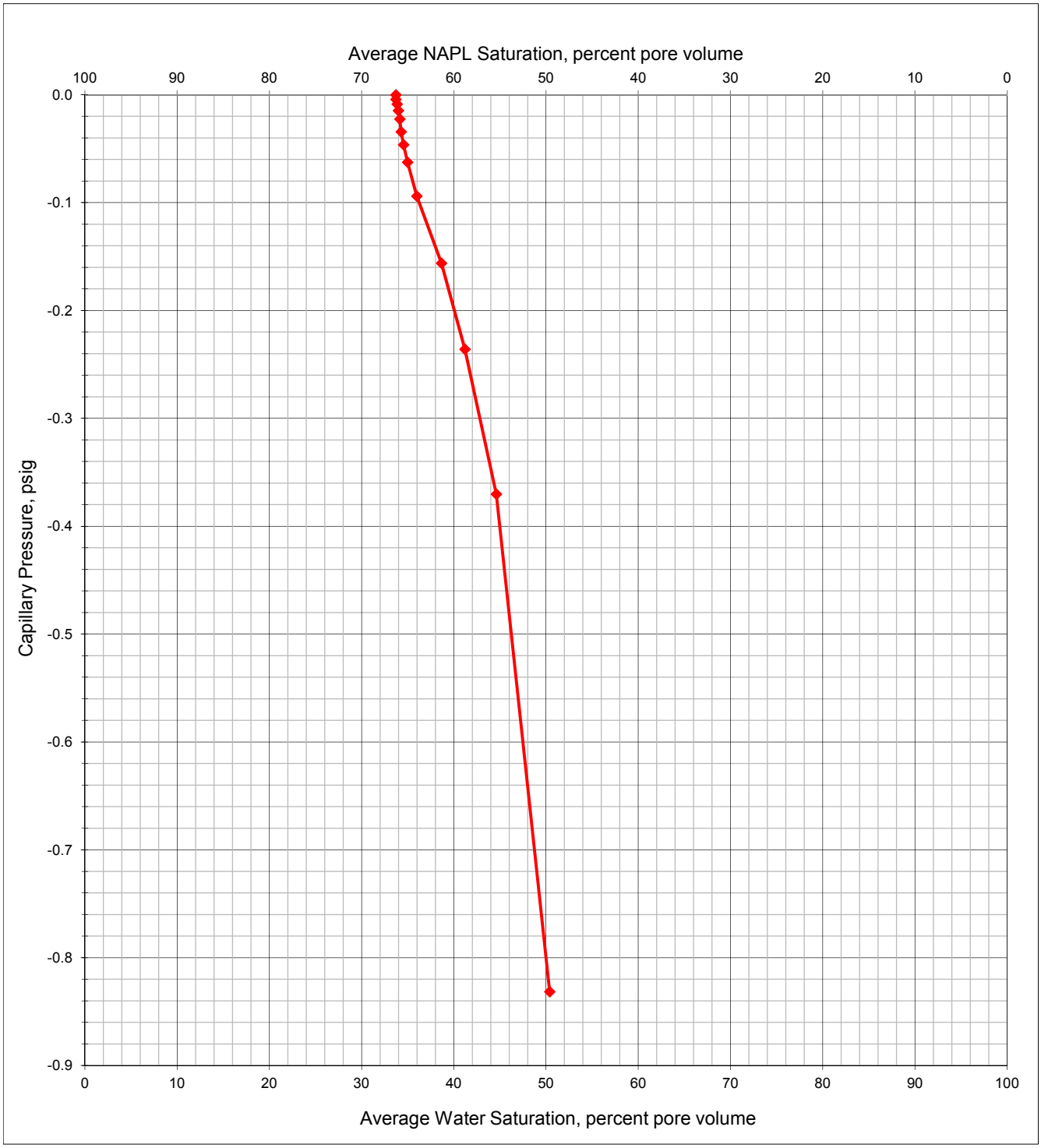
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B404A-B
Depth, ft.: 10.7



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B404A-C at 12.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	78.9	21.1
0.933	65.6	79.2	33.5	66.5
			Spontaneous Imbibition	
0.000	0.00	0.00	33.5	66.5
0.000	0.00	0.00	33.5	66.5
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	33.5	66.5
-0.005	-0.32	0.39	33.5	66.5
-0.009	-0.64	0.78	33.5	66.5
-0.017	-1.21	1.46	33.6	66.4
-0.025	-1.72	2.08	33.7	66.3
-0.036	-2.53	3.05	34.9	65.1
-0.051	-3.60	4.34	38.6	61.4
-0.063	-4.41	5.32	42.4	57.6
-0.105	-7.38	8.90	45.8	54.2
-0.171	-12.0	14.5	50.5	49.5
-0.258	-18.1	21.9	55.9	44.1
-0.404	-28.4	34.2	60.0	40.0
-0.912	-64.1	77.3	67.5	32.5

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

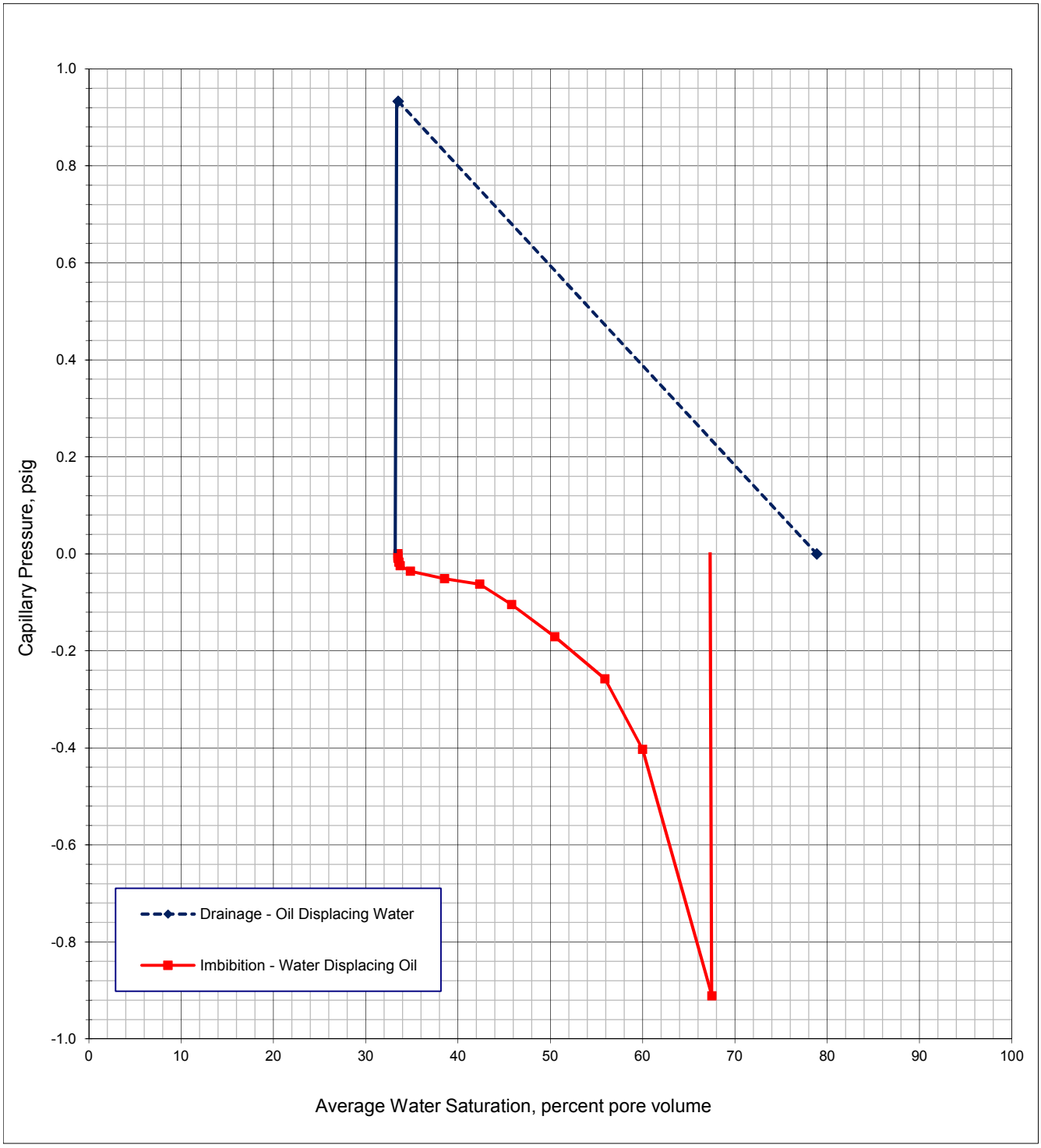
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B404A-C
Depth, ft.: 12.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

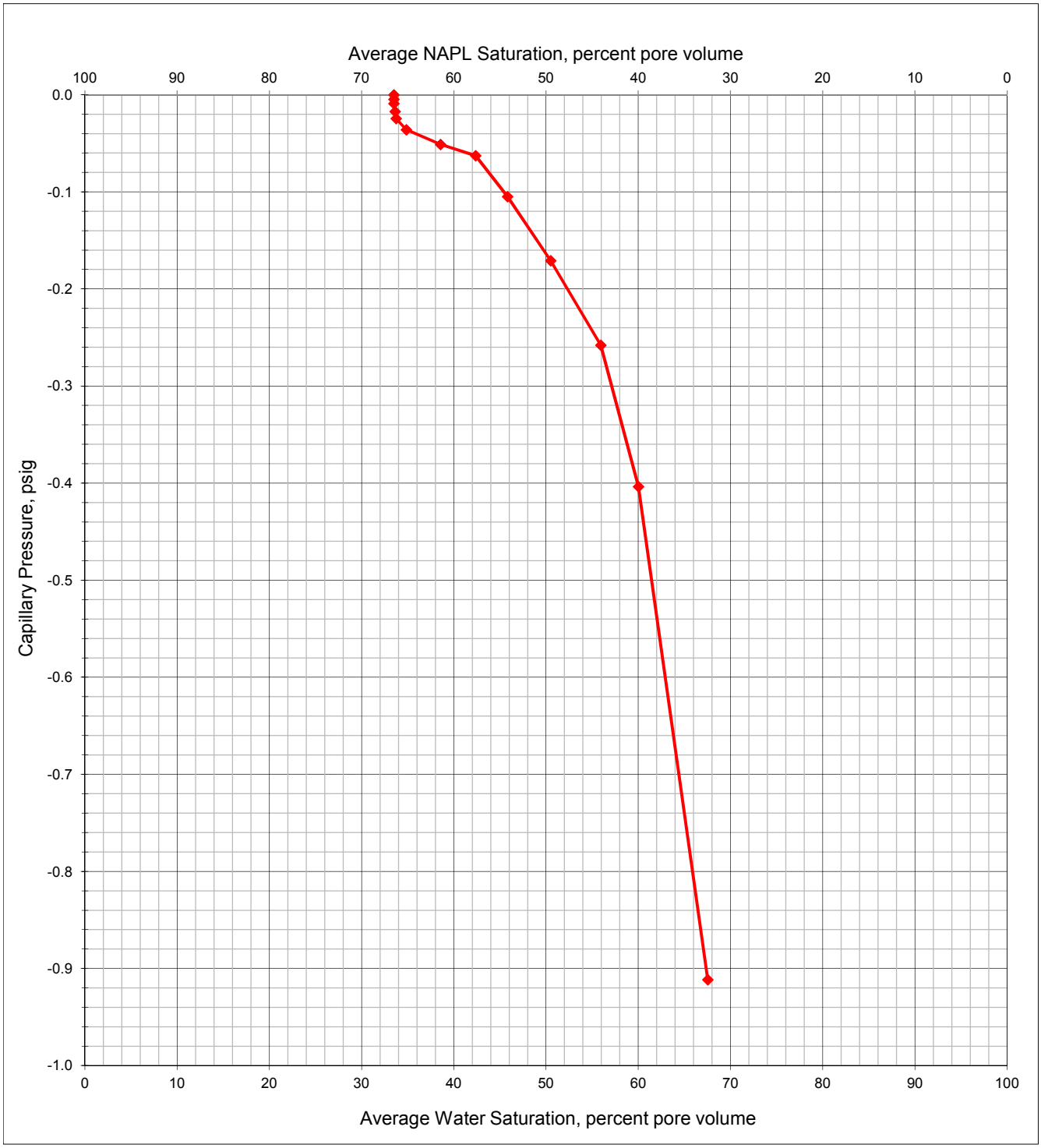
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B404A-C
Depth, ft.: 12.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B404A-D at 14.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	96.5	3.5
0.892	62.7	75.6	38.7	61.3
			Spontaneous Imbibition	
0.000	0.00	0.00	38.7	61.3
0.000	0.00	0.00	38.7	61.3
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	38.7	61.3
-0.004	-0.32	0.38	38.7	61.3
-0.009	-0.62	0.75	39.0	61.0
-0.015	-1.07	1.29	40.8	59.2
-0.023	-1.65	1.99	46.1	53.9
-0.036	-2.50	3.01	49.9	50.1
-0.048	-3.39	4.08	52.9	47.1
-0.065	-4.56	5.50	55.8	44.2
-0.098	-6.86	8.28	61.2	38.8
-0.162	-11.4	13.8	69.1	30.9
-0.245	-17.2	20.8	74.1	25.9
-0.385	-27.1	32.7	78.9	21.1
-0.865	-60.8	73.3	83.6	16.4

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

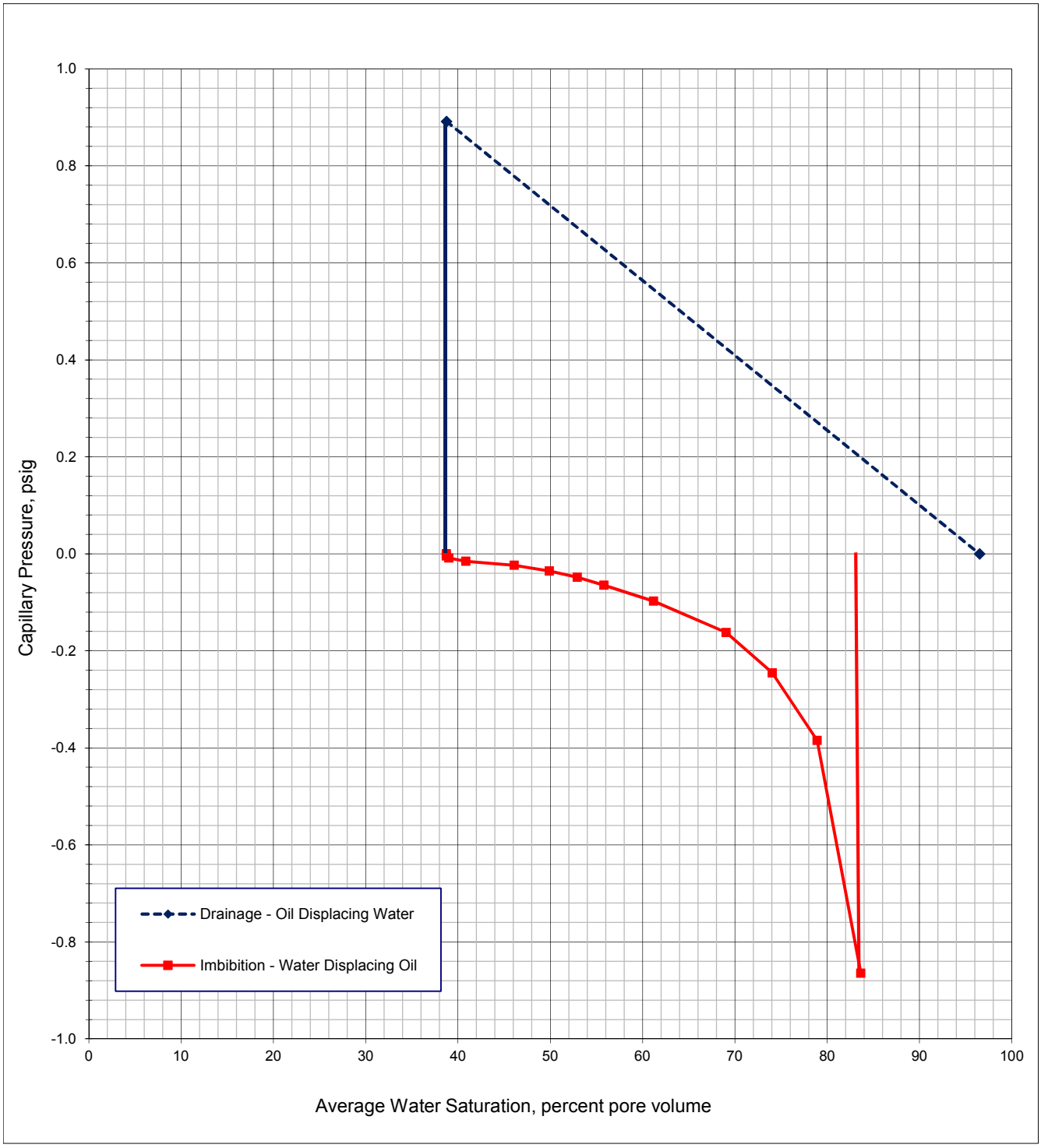
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B404A-D
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

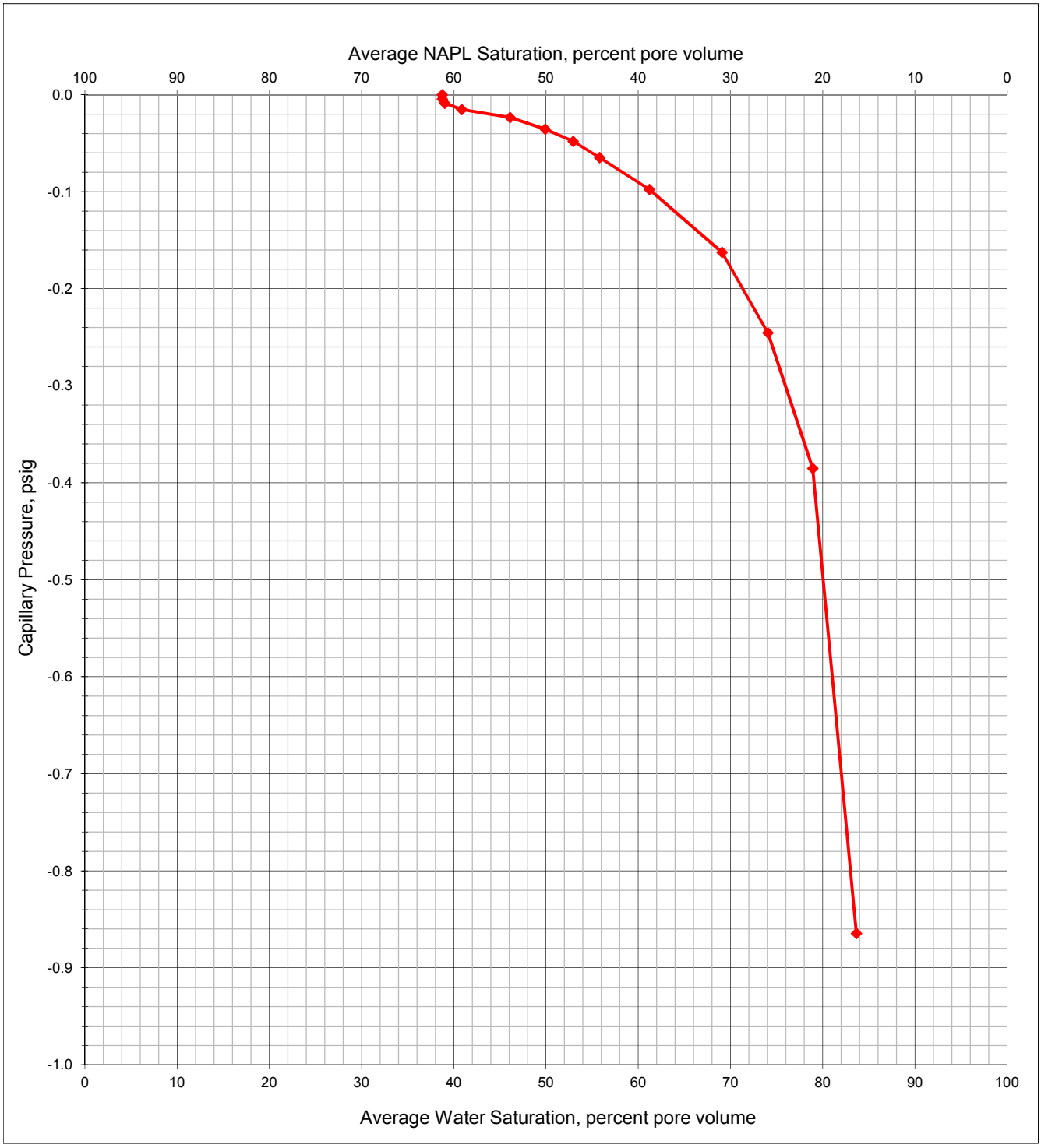
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B404A-D
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B412A-B at 12.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	83.6	16.4
0.892	62.7	75.6	28.2	71.8
			Spontaneous Imbibition	
0.000	0.00	0.00	28.2	71.8
0.000	0.00	0.00	28.2	71.8
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	28.2	71.8
-0.004	-0.30	0.36	28.2	71.8
-0.009	-0.61	0.74	28.2	71.8
-0.016	-1.11	1.34	28.4	71.6
-0.027	-1.90	2.30	36.2	63.8
-0.038	-2.65	3.20	41.0	59.0
-0.047	-3.33	4.02	46.0	54.0
-0.066	-4.61	5.56	49.9	50.1
-0.096	-6.75	8.15	54.2	45.8
-0.162	-11.4	13.8	62.1	37.9
-0.246	-17.3	20.9	68.8	31.2
-0.380	-26.7	32.3	71.6	28.4
-0.864	-60.8	73.3	74.6	25.4

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

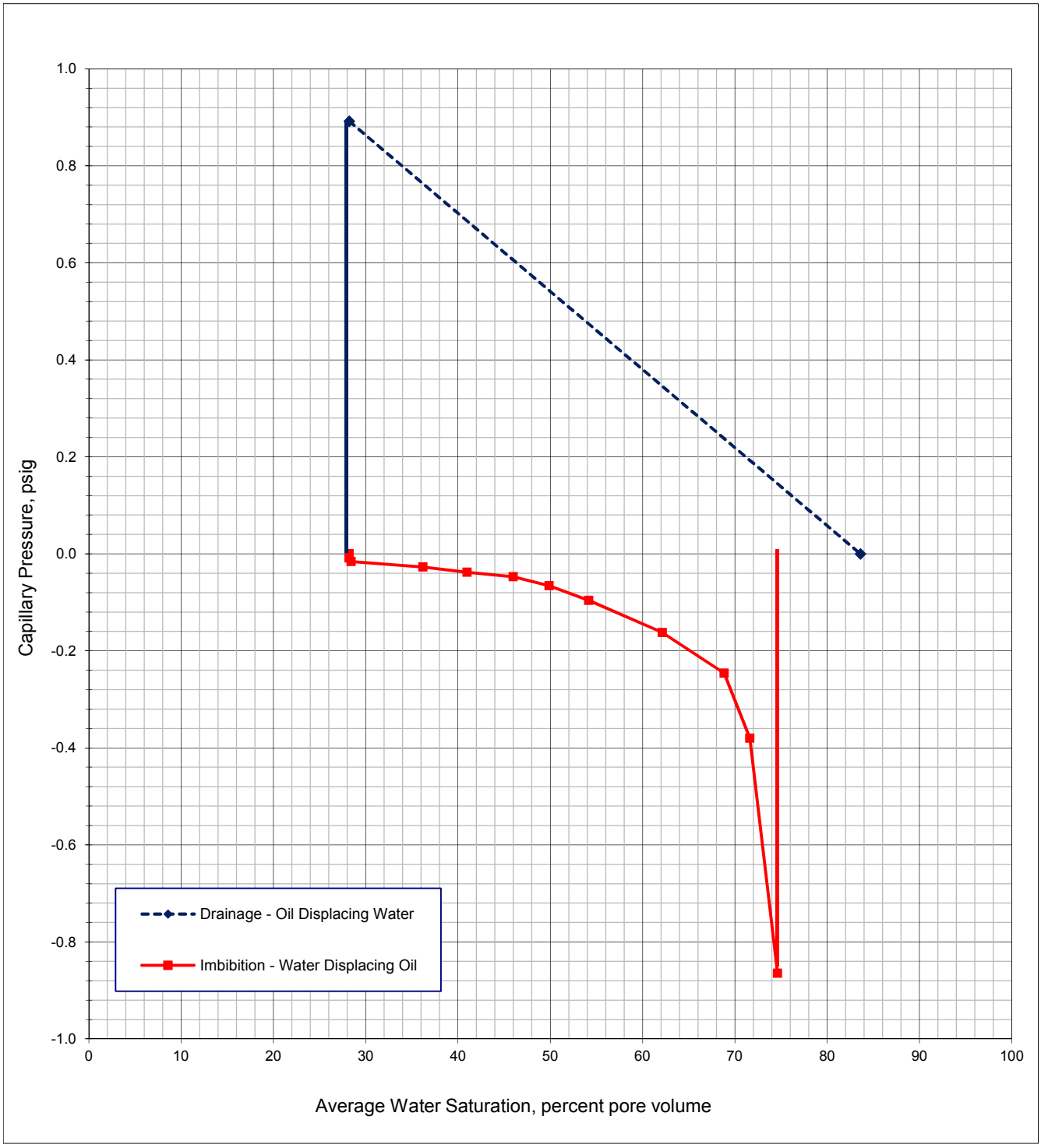
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B412A-B
Depth, ft.: 12.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

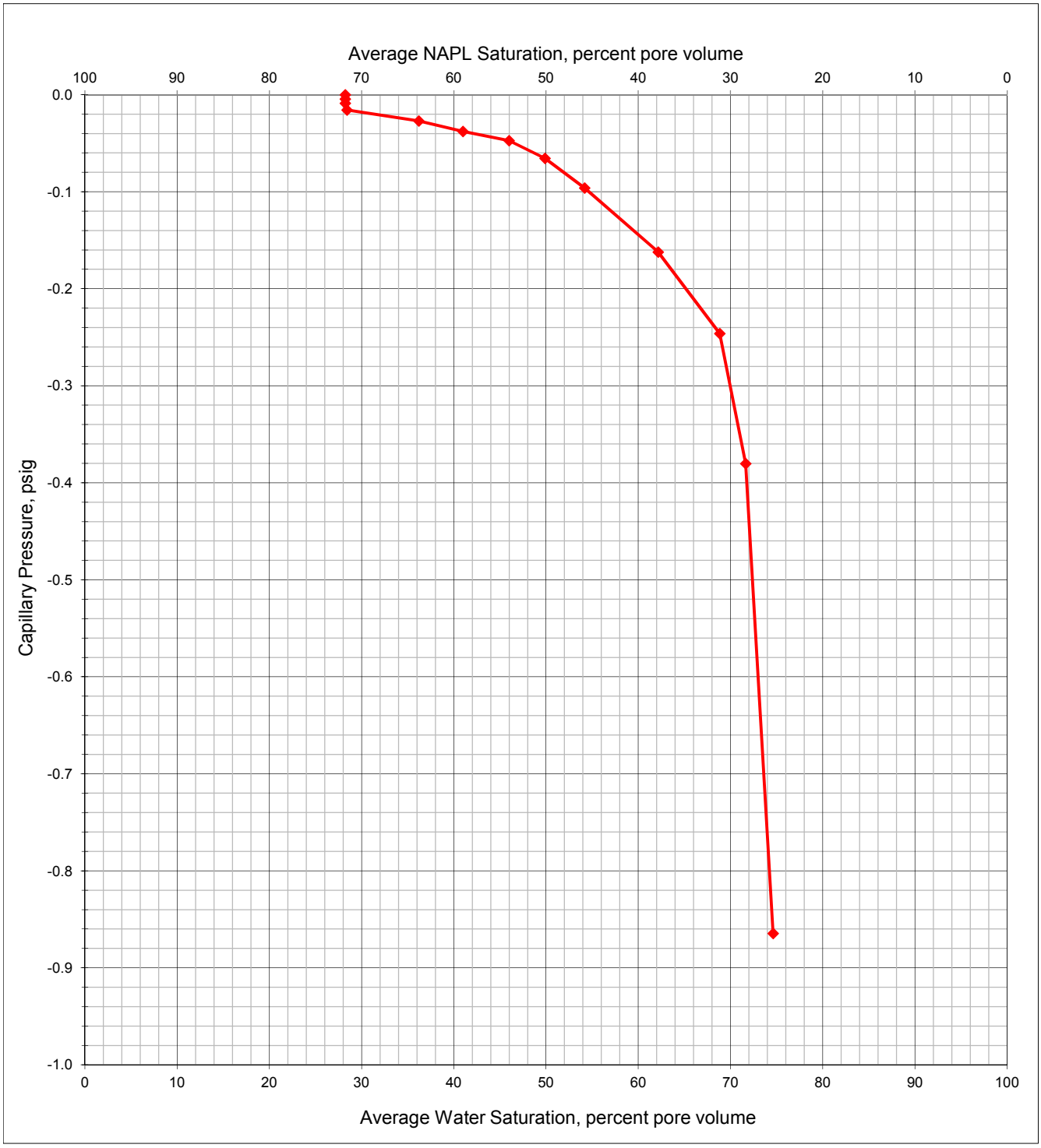
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B412A-B
Depth, ft.: 12.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B412A-C at 14.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	91.4	8.6
0.894	62.9	75.8	32.9	67.1
			Spontaneous Imbibition	
0.000	0.00	0.00	32.9	67.1
0.000	0.00	0.00	32.9	67.1
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	32.9	67.1
-0.004	-0.30	0.37	32.9	67.1
-0.009	-0.62	0.74	38.9	61.1
-0.016	-1.11	1.34	43.3	56.7
-0.027	-1.91	2.30	49.5	50.5
-0.038	-2.66	3.21	55.7	44.3
-0.048	-3.34	4.03	56.8	43.2
-0.066	-4.62	5.58	58.4	41.6
-0.096	-6.77	8.17	59.7	40.3
-0.163	-11.4	13.8	62.2	37.8
-0.247	-17.4	20.9	64.6	35.4
-0.381	-26.8	32.3	67.5	32.5
-0.867	-60.9	73.5	70.8	29.2

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

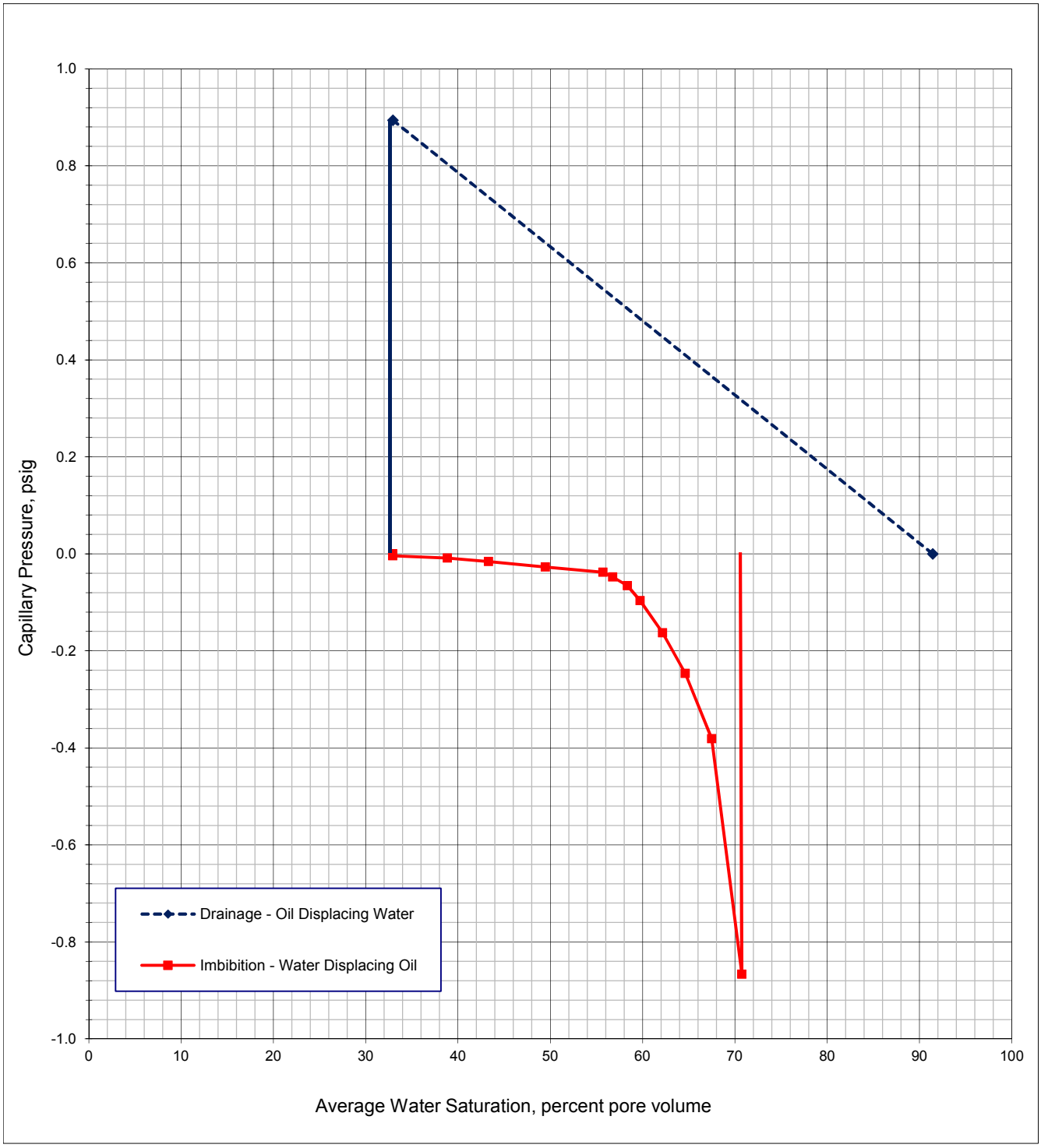
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B412A-C
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

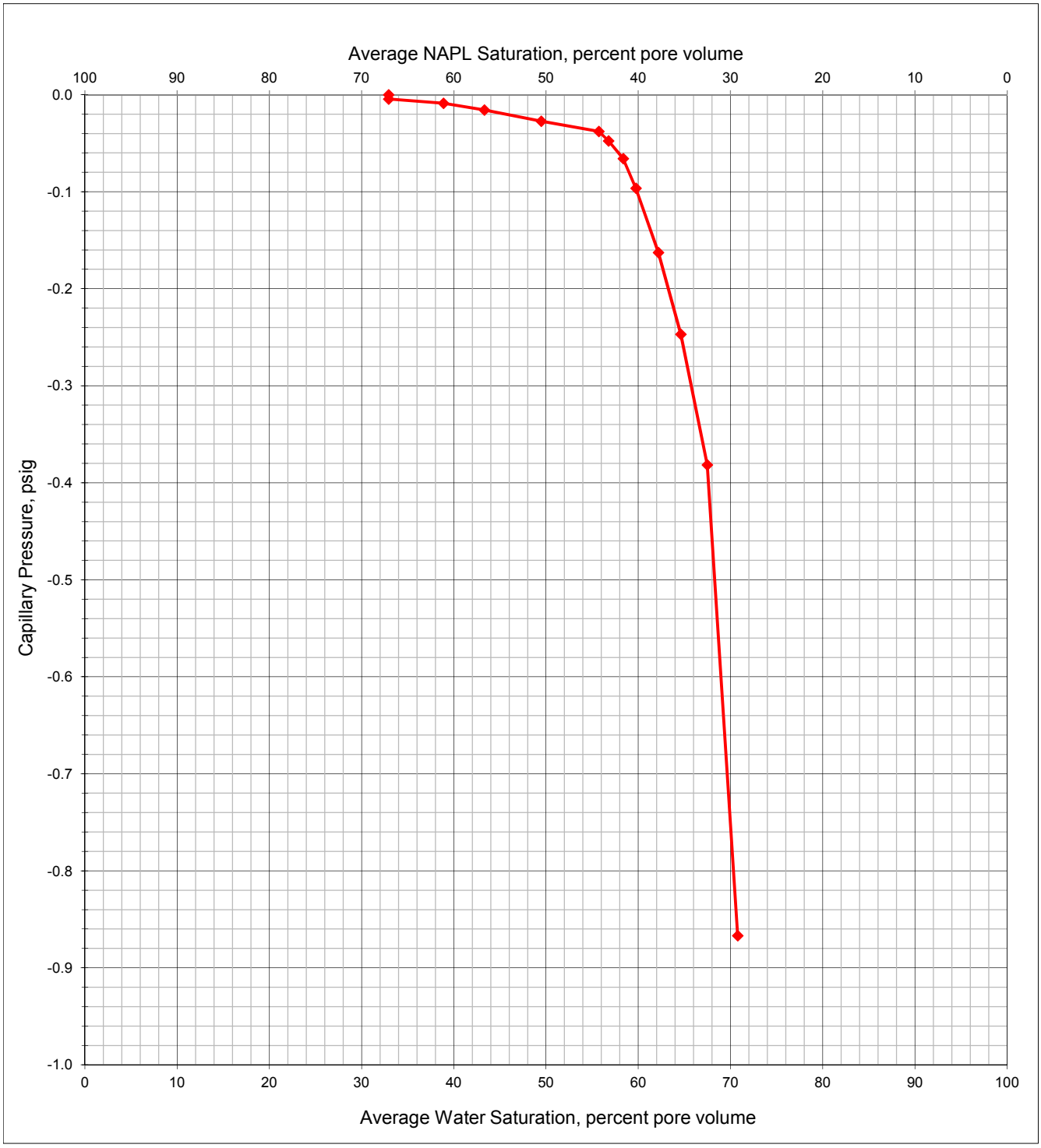
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B412A-C
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B412A-D at 16.45 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	88.9	11.1
0.836	58.8	70.9	20.5	79.5
			Spontaneous Imbibition	
0.000	0.00	0.00	20.5	79.5
0.000	0.00	0.00	20.5	79.5
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	20.5	79.5
-0.004	-0.28	0.34	20.6	79.4
-0.008	-0.57	0.69	20.7	79.3
-0.015	-1.04	1.25	20.9	79.1
-0.025	-1.78	2.14	21.5	78.5
-0.035	-2.48	2.99	54.7	45.3
-0.044	-3.11	3.76	58.1	41.9
-0.061	-4.31	5.20	60.5	39.5
-0.090	-6.31	7.61	62.7	37.3
-0.151	-10.7	12.8	65.2	34.8
-0.230	-16.2	19.5	68.2	31.8
-0.355	-25.0	30.1	71.4	28.6
-0.808	-56.8	68.5	73.8	26.2

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

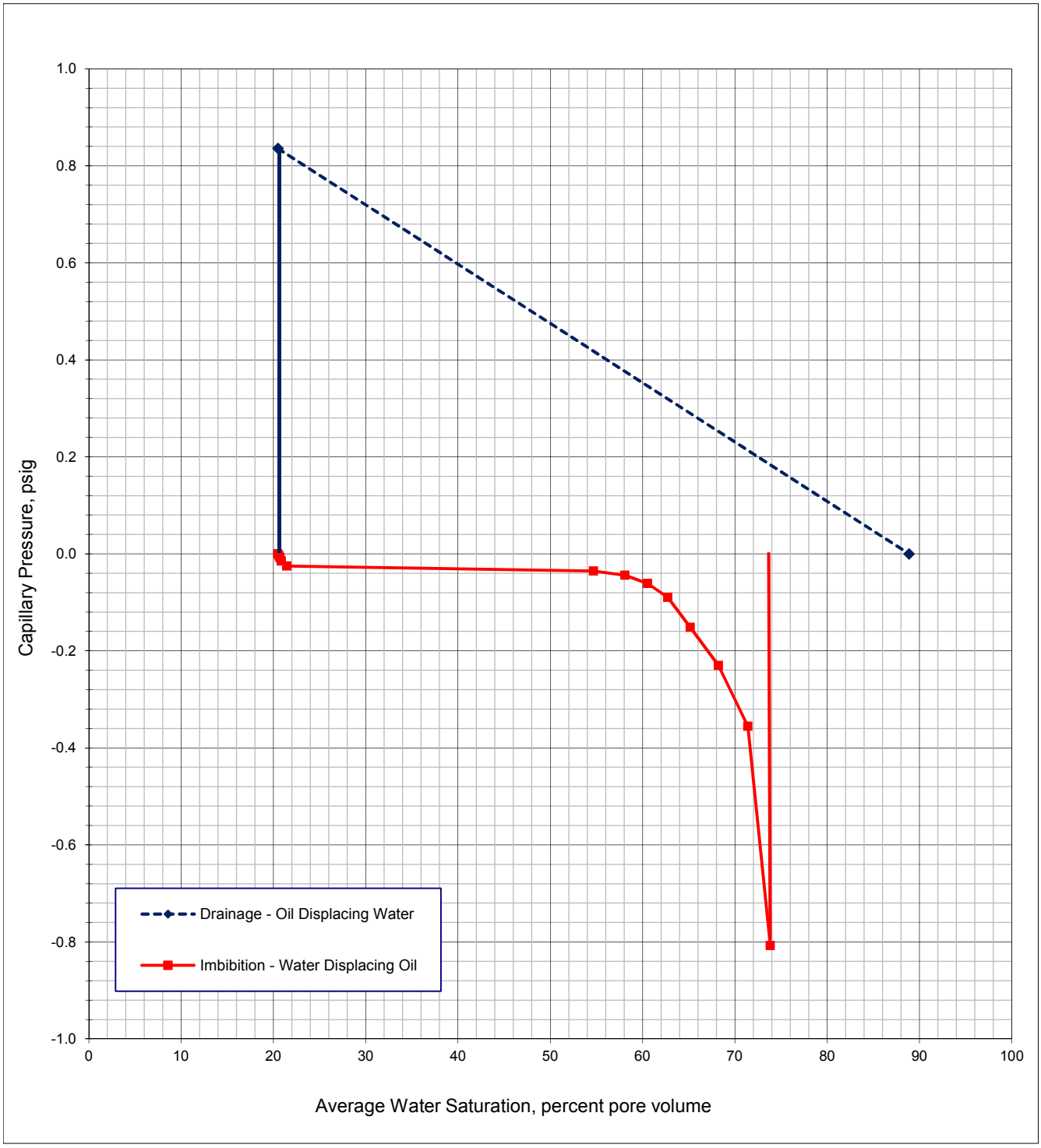
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B412A-D
Depth, ft.: 16.45



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

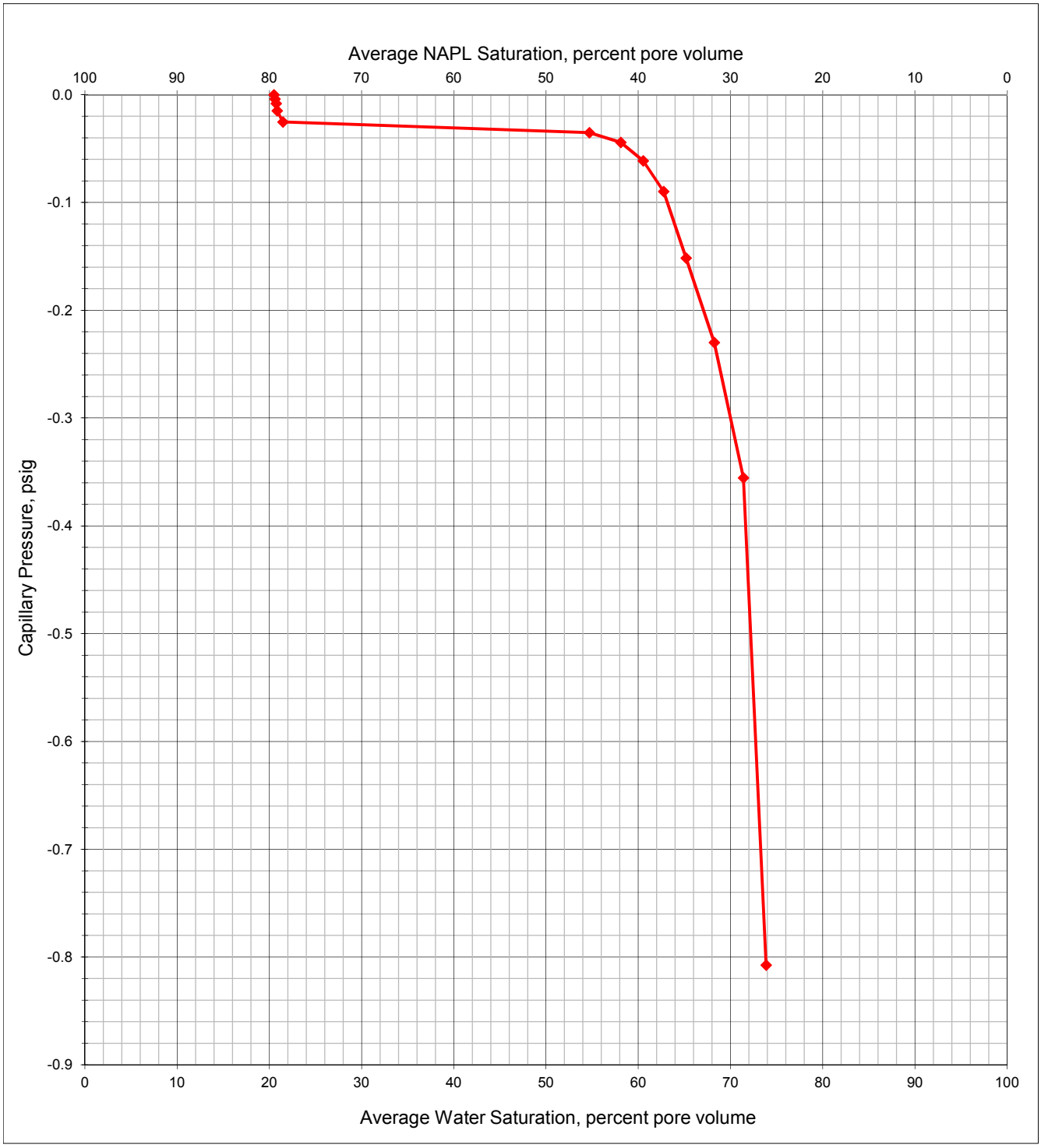
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B412A-D
Depth, ft.: 16.45



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B413A-B at 12.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	72.2	27.8
0.843	59.3	71.5	30.8	69.2
			Spontaneous Imbibition	
0.000	0.00	0.00	30.8	69.2
0.000	0.00	0.00	30.8	69.2
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	30.8	69.2
-0.004	-0.28	0.34	30.8	69.2
-0.008	-0.58	0.70	30.9	69.1
-0.015	-1.04	1.26	33.8	66.2
-0.026	-1.79	2.16	36.0	64.0
-0.036	-2.50	3.02	38.9	61.1
-0.045	-3.14	3.79	42.7	57.3
-0.062	-4.35	5.24	46.2	53.8
-0.091	-6.36	7.68	50.6	49.4
-0.153	-10.7	13.0	56.9	43.1
-0.232	-16.3	19.7	62.7	37.3
-0.358	-25.2	30.4	68.0	32.0
-0.815	-57.3	69.1	71.0	29.0

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

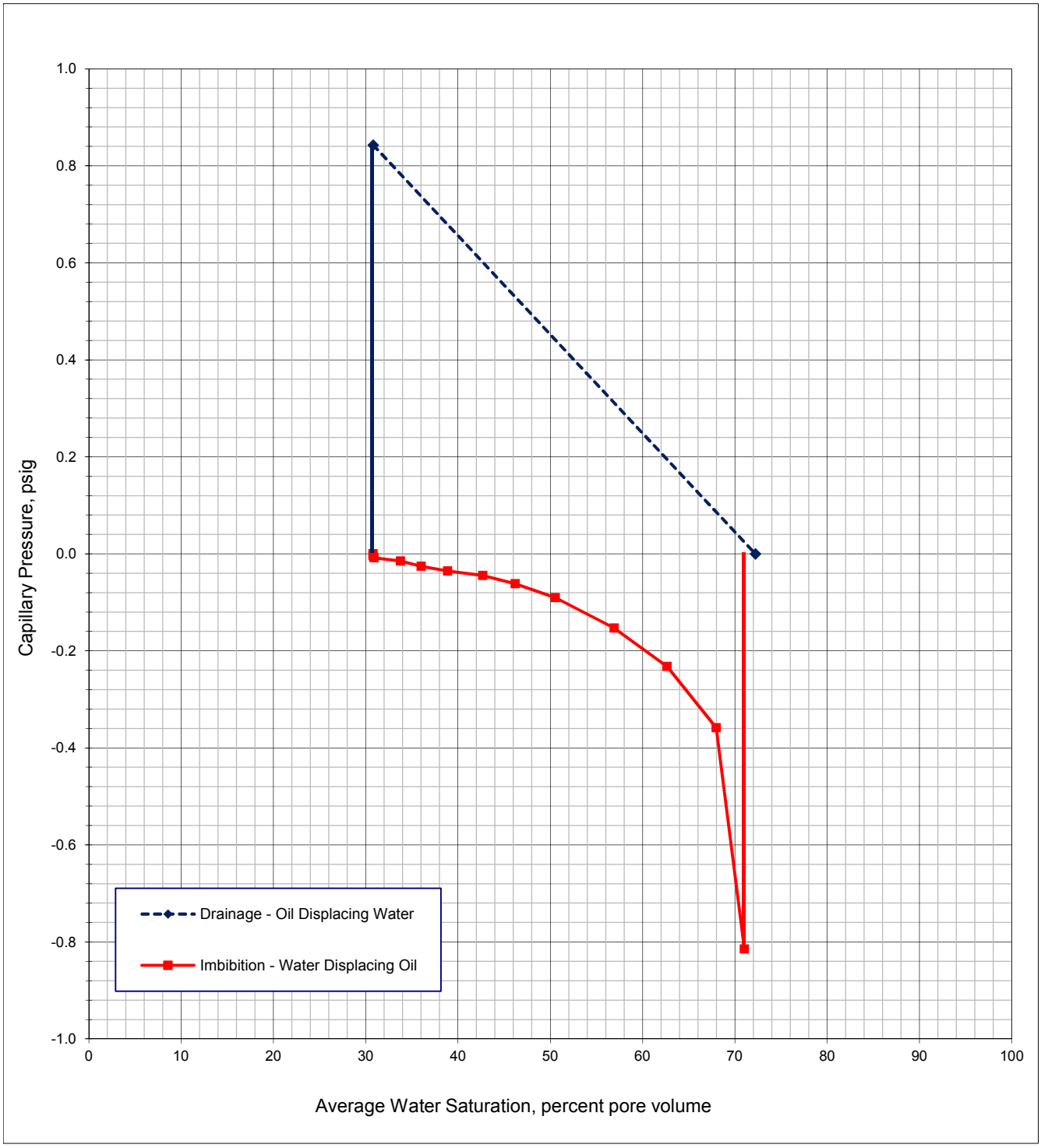
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B413A-B
Depth, ft.: 12.5



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Client: TRC Solutions
Report Date: 04/26/17

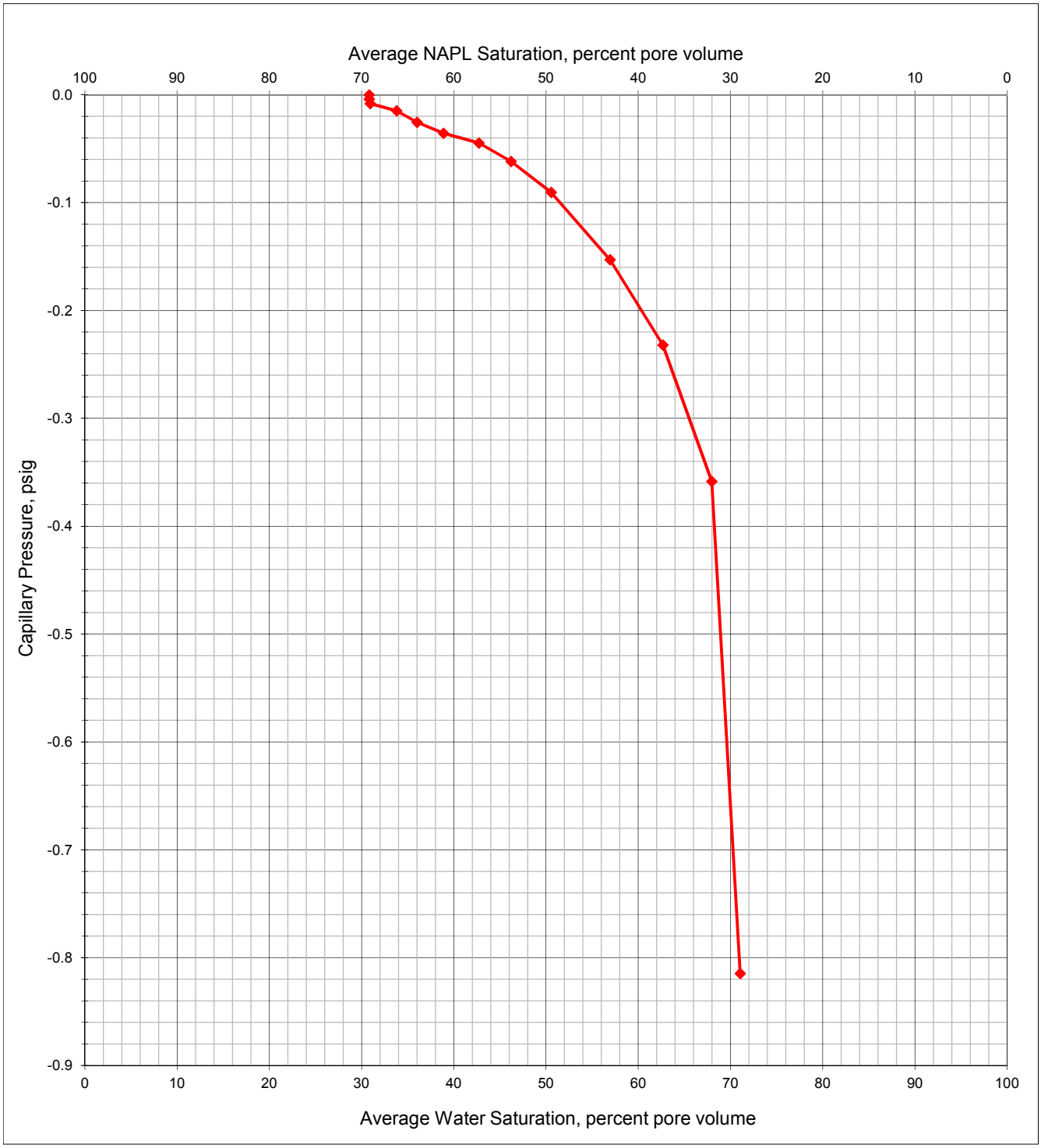
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B413A-B
Depth, ft.: 12.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B413A-C at 14.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	73.1	26.9
0.848	59.6	71.9	19.2	80.8
			Spontaneous Imbibition	
0.000	0.00	0.00	19.2	80.8
0.000	0.00	0.00	19.2	80.8
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	19.2	80.8
-0.004	-0.29	0.35	19.2	80.8
-0.008	-0.58	0.70	19.2	80.8
-0.015	-1.05	1.27	19.3	80.7
-0.026	-1.80	2.18	19.4	80.6
-0.036	-2.51	3.03	20.4	79.6
-0.045	-3.16	3.81	32.8	67.2
-0.062	-4.37	5.27	40.9	59.1
-0.091	-6.40	7.72	46.5	53.5
-0.154	-10.8	13.0	52.7	47.3
-0.233	-16.4	19.8	58.6	41.4
-0.361	-25.4	30.6	65.0	35.0
-0.819	-57.6	69.5	70.4	29.6

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

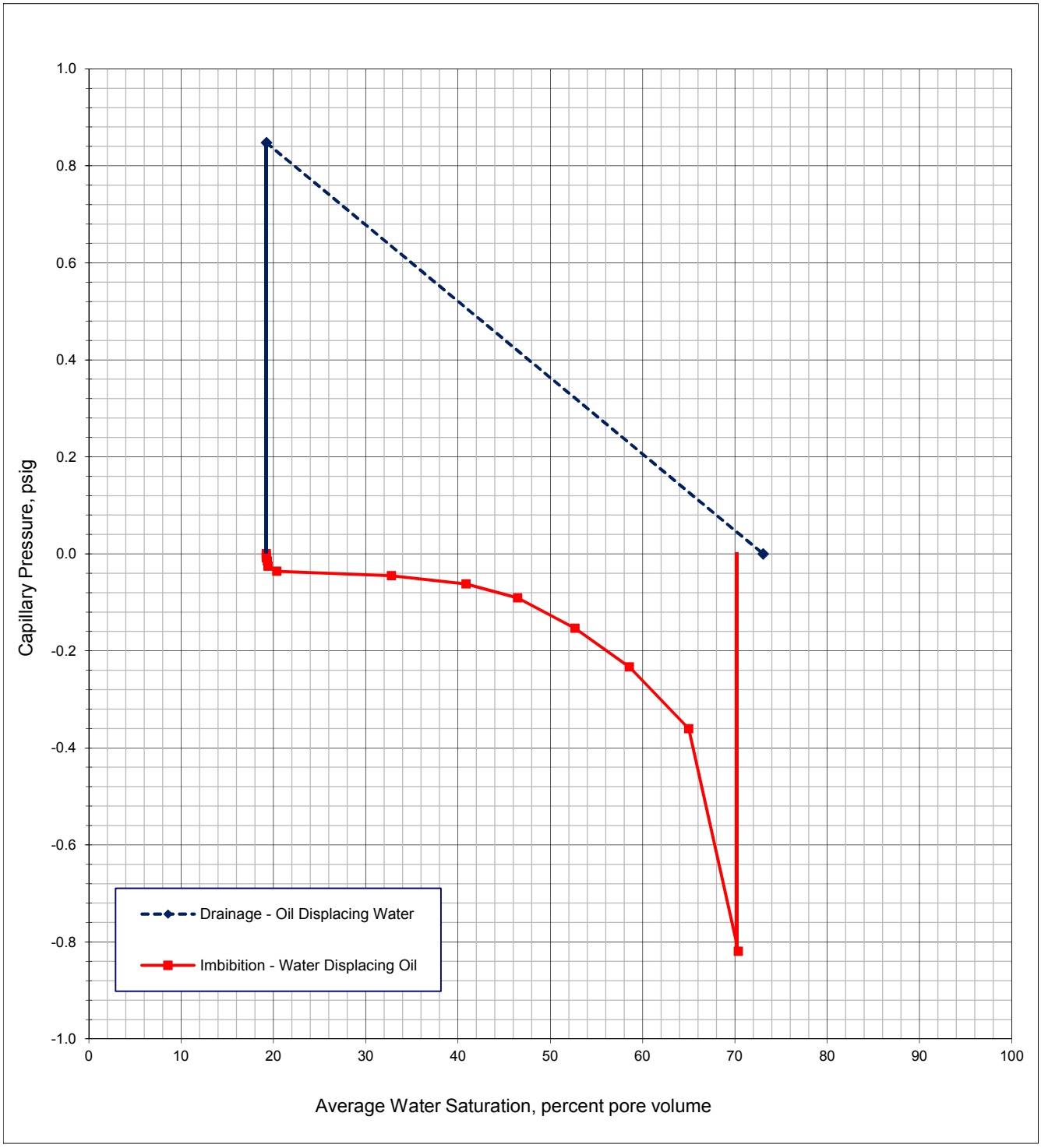
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B413A-C
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

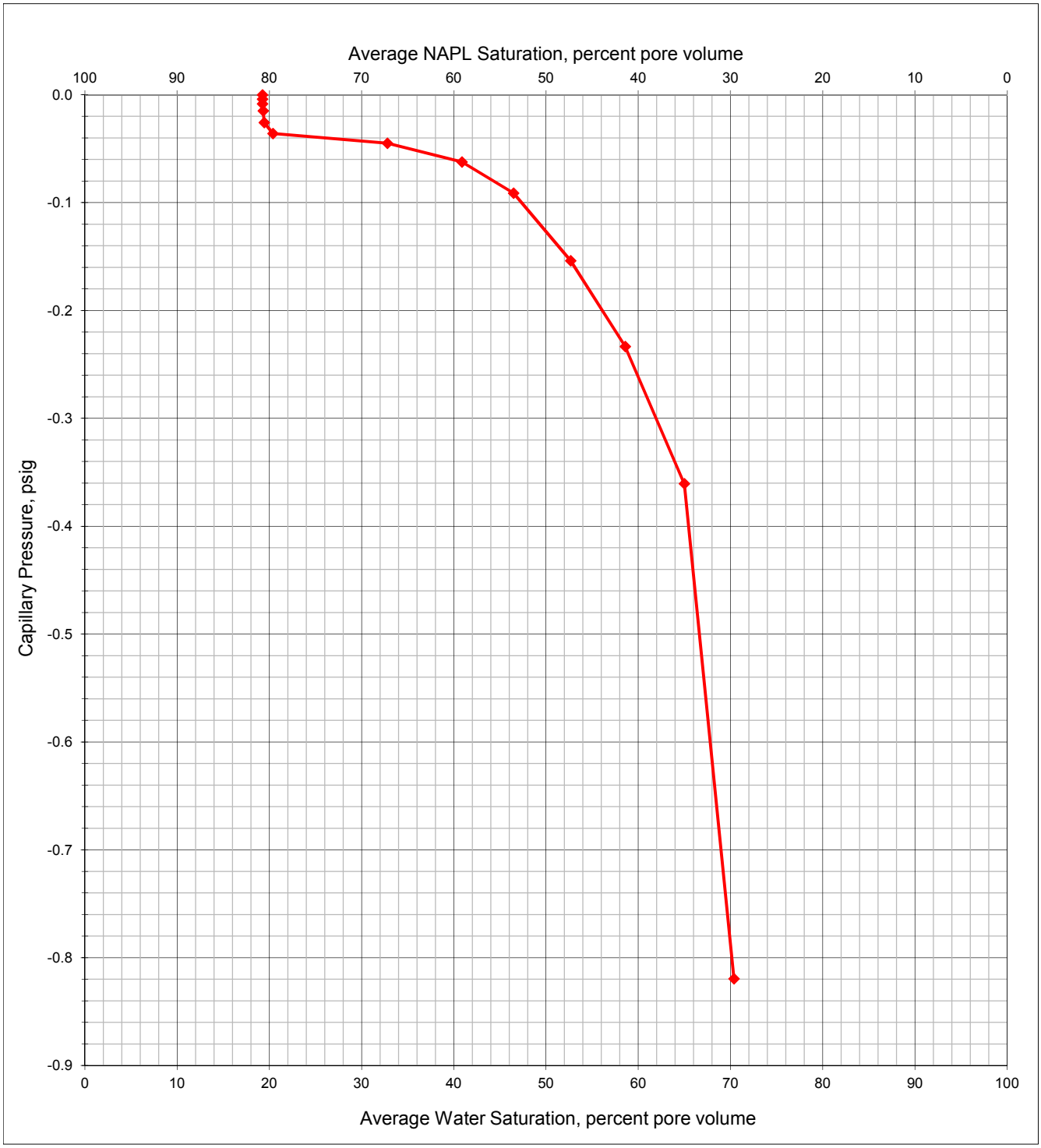
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B413A-C
Depth, ft.: 14.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

PTS Laboratories

OIL/WATER CAPILLARY PRESSURE TABULAR DATA

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Capillary Pressure		Height Above Water Table,	Sample ID	
			B413A-D at 16.5 ft.	
			Average Saturation, % pore volume	
psi	cm water	ft	Water	Oil (NAPL)
			Drainage - Oil Displacing Water	
0.000	0.00	0.00	57.3	42.7
0.978	68.8	83.0	23.6	76.4
			Spontaneous Imbibition	
0.000	0.00	0.00	23.6	76.4
0.000	0.00	0.00	23.6	76.4
			Imbibition - Water Displacing Oil	
0.000	0.00	0.00	23.6	76.4
-0.005	-0.33	0.40	23.6	76.4
-0.010	-0.68	0.82	24.4	75.6
-0.017	-1.22	1.47	25.0	75.0
-0.030	-2.10	2.53	25.3	74.7
-0.042	-2.93	3.53	25.8	74.2
-0.052	-3.68	4.43	26.5	73.5
-0.072	-5.09	6.13	27.1	72.9
-0.106	-7.45	8.98	27.7	72.3
-0.179	-12.6	15.2	41.9	58.1
-0.271	-19.1	23.0	58.7	41.3
-0.420	-29.5	35.6	66.2	33.8
-0.953	-67.0	80.9	77.7	22.3

PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

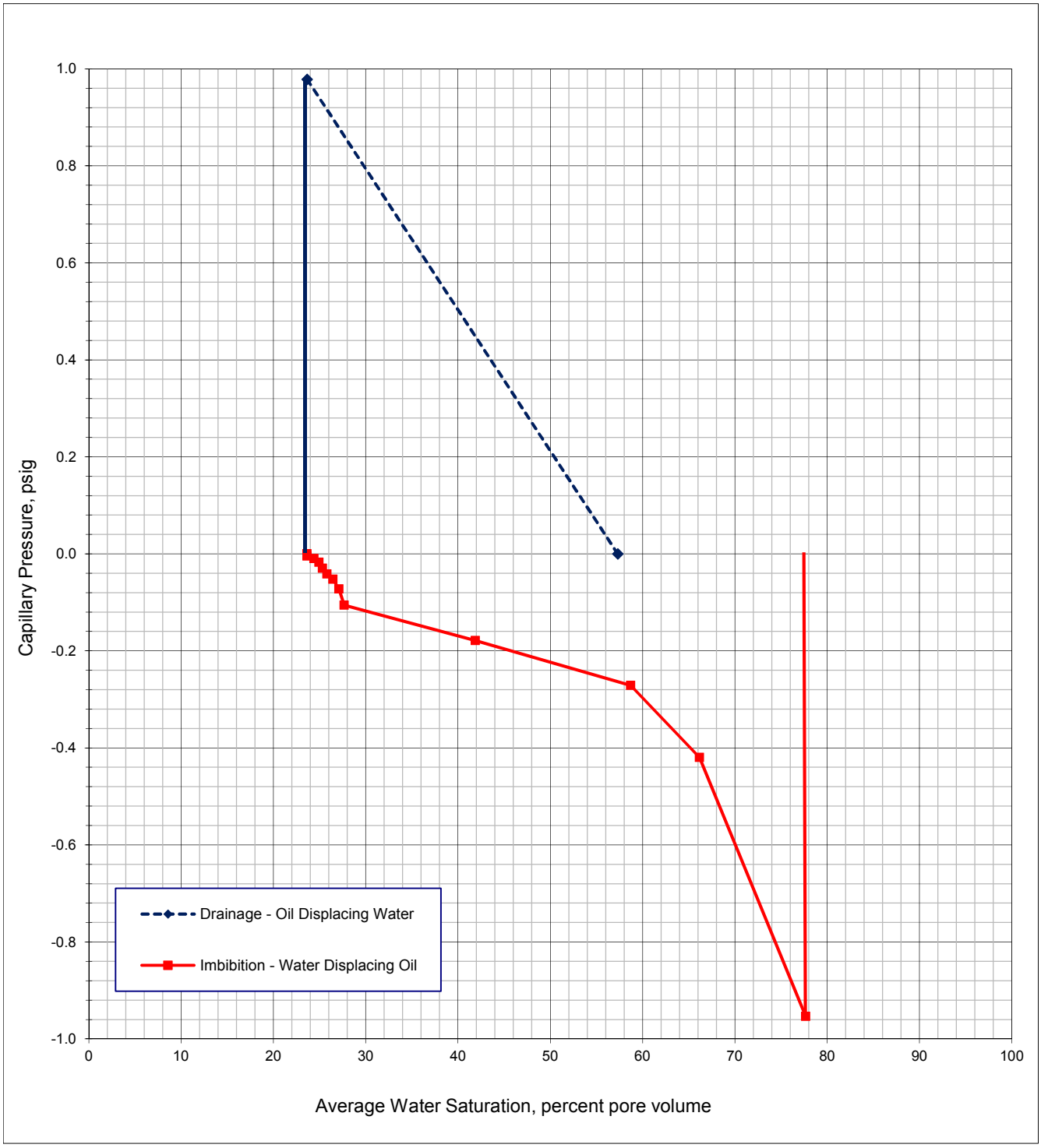
PTS Laboratories

OIL/WATER DRAINAGE & IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B413A-D
Depth, ft.: 16.5



PTS File No: 46705R1
Client: TRC Solutions
Report Date: 04/26/17

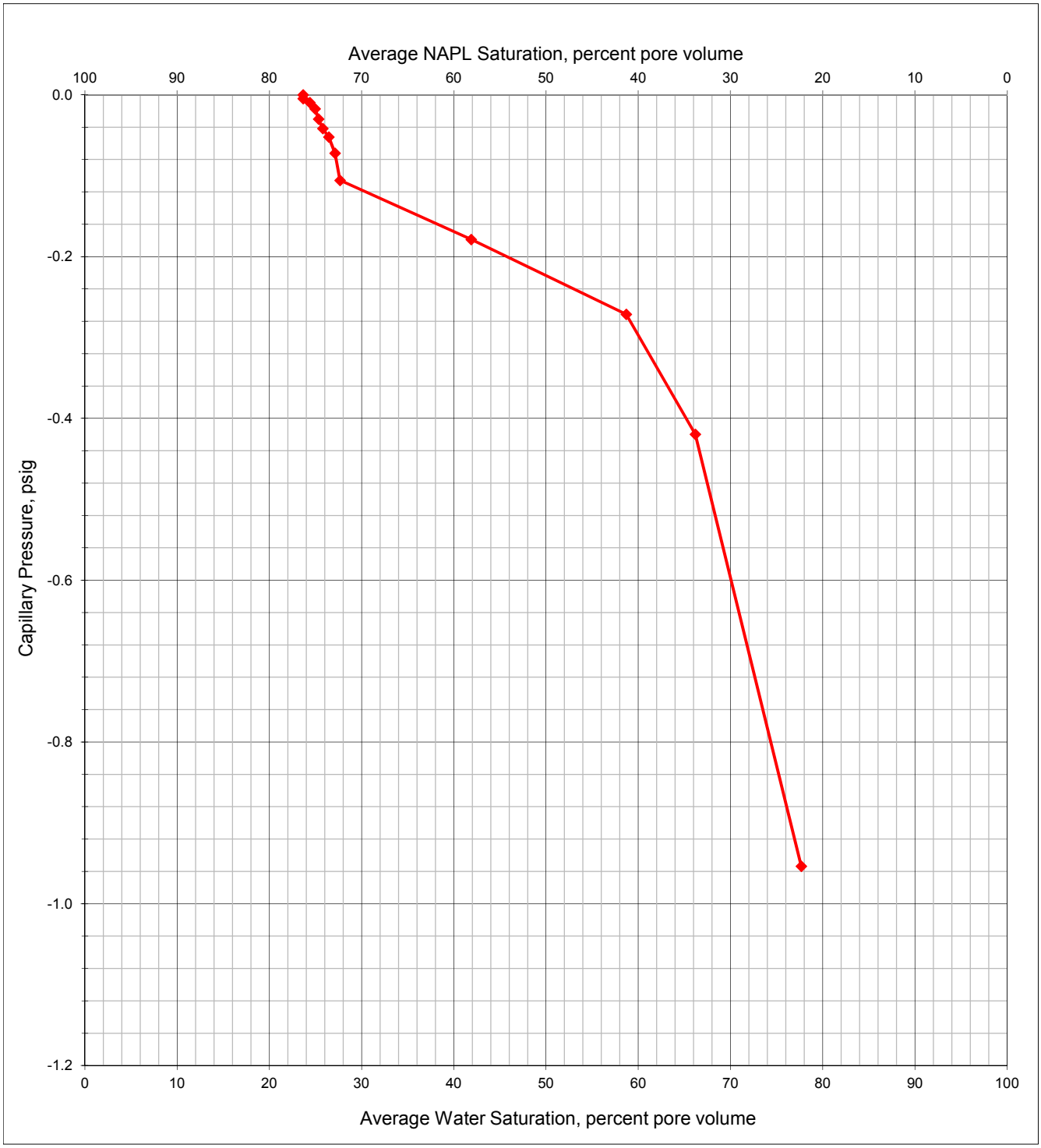
PTS Laboratories

OIL/WATER IMBIBITION CAPILLARY PRESSURE GRAPH

ASTM D6836; Method E (Centrifugal Method: Single point drainage followed by imbibition)

Project Name: Atlantic Bridge Project
Project No: 140143.0000.4903

Sample ID: B413A-D
Depth, ft.: 16.5



PARTICLE SIZE SUMMARY

(METHODOLOGY: ASTM D422M)

PROJECT NAME: Atlantic Bridge Project
PROJECT NO: 140143.0000.4903

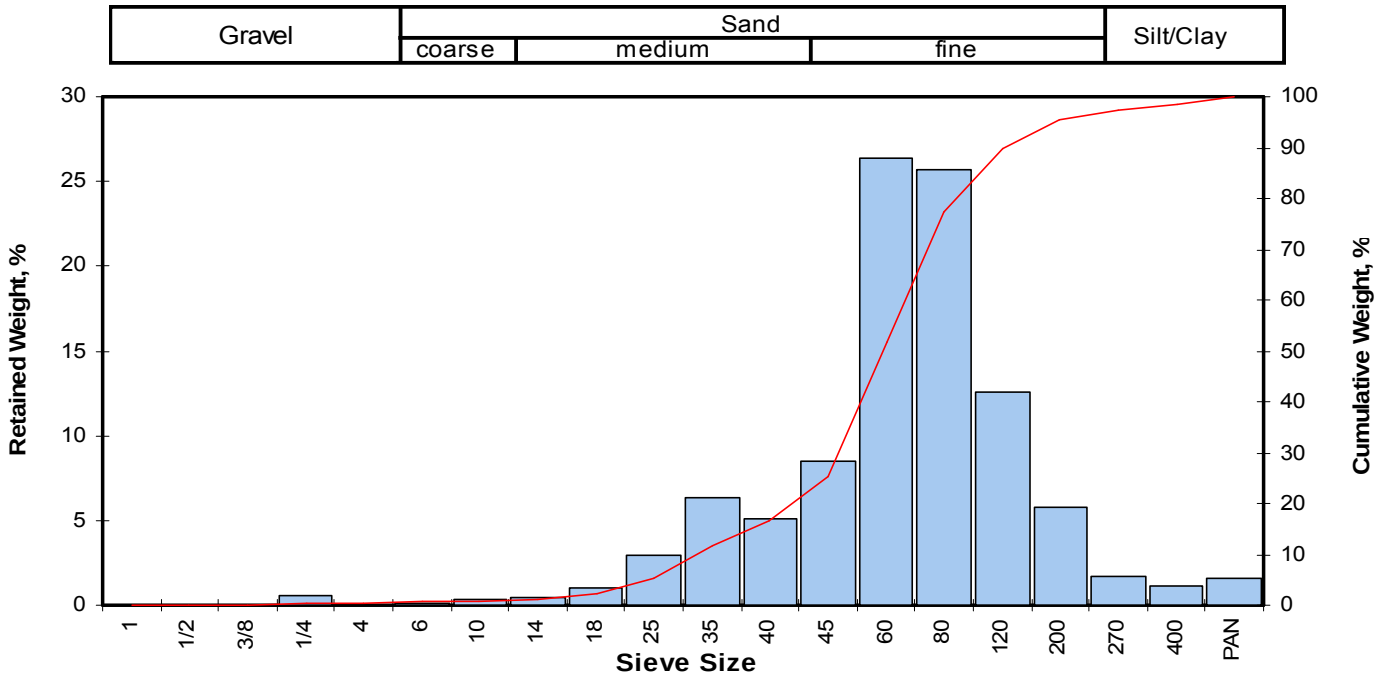
Sample ID	Depth, ft.	Mean Grain Size Description USCS/ASTM (1)	Median Grain Size, mm	Particle Size Distribution, wt. percent				
				Gravel	Sand Size			Silt/Clay
					Coarse	Medium	Fine	
B406A-C	12.6-12.8	Fine sand	0.255	0.53	0.37	15.77	78.99	4.35
B404A-D	14.6-14.8	Gravel	13.468	76.88	8.61	9.69	3.72	1.10
B412A-C	14.6-14.8	Coarse sand	2.585	37.40	18.00	24.74	14.21	5.65
B413A-C	14.6-14.8	Gravel	3.861	44.50	20.57	18.85	11.65	4.42

(1) Based on Mean fromTrask

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D422M

Client:	TRC Solutions	**PTS File No:**	46705R1
Project:	Atlantic Bridge Project	**Sample ID:**	B406A-C
Project No:	140143.0000.4903	**Depth, ft:**	12.6-12.8



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	0.00	0.00	0.00
0.3740	9.500	-3.25	3/8	0.00	0.00	0.00
0.2500	6.351	-2.67	1/4	0.71	0.53	0.53
0.1873	4.757	-2.25	4	0.00	0.00	0.53
0.1324	3.364	-1.75	6	0.09	0.07	0.60
0.0787	2.000	-1.00	10	0.40	0.30	0.90
0.0557	1.414	-0.50	14	0.53	0.40	1.30
0.0394	1.000	0.00	18	1.33	1.00	2.30
0.0278	0.707	0.50	25	3.84	2.89	5.19
0.0197	0.500	1.00	35	8.47	6.37	11.56
0.0166	0.420	1.25	40	6.80	5.11	16.67
0.0139	0.354	1.50	45	11.35	8.53	25.20
0.0098	0.250	2.00	60	35.05	26.35	51.55
0.0070	0.177	2.50	80	34.22	25.73	77.28
0.0049	0.125	3.00	120	16.72	12.57	89.85
0.0029	0.074	3.75	200	7.72	5.80	95.65
0.0021	0.053	4.25	270	2.27	1.71	97.36
0.0015	0.037	4.75	400	1.44	1.08	98.44
			PAN	2.07	1.56	100.00
TOTALS				133.01	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	0.47	0.0285	0.723
10	0.88	0.0214	0.544
16	1.22	0.0169	0.430
25	1.49	0.0140	0.355
40	1.78	0.0115	0.291
50	1.97	0.0100	0.255
60	2.16	0.0088	0.223
75	2.46	0.0072	0.182
84	2.77	0.0058	0.147
90	3.02	0.0049	0.123
95	3.67	0.0031	0.079

Measure	Trask	Inman	Folk-Ward
Median, phi	1.97	1.97	1.97
Median, in.	0.0100	0.0100	0.0100
Median, mm	0.255	0.255	0.255
Mean, phi	1.90	1.99	1.99
Mean, in.	0.0106	0.0099	0.0099
Mean, mm	0.269	0.251	0.253
Sorting	1.396	0.775	0.872
Skewness	0.997	0.028	0.044
Kurtosis	0.205	1.063	1.363

Grain Size Description (ASTM-USCS Scale)	Fine sand (based on Mean from Trask)

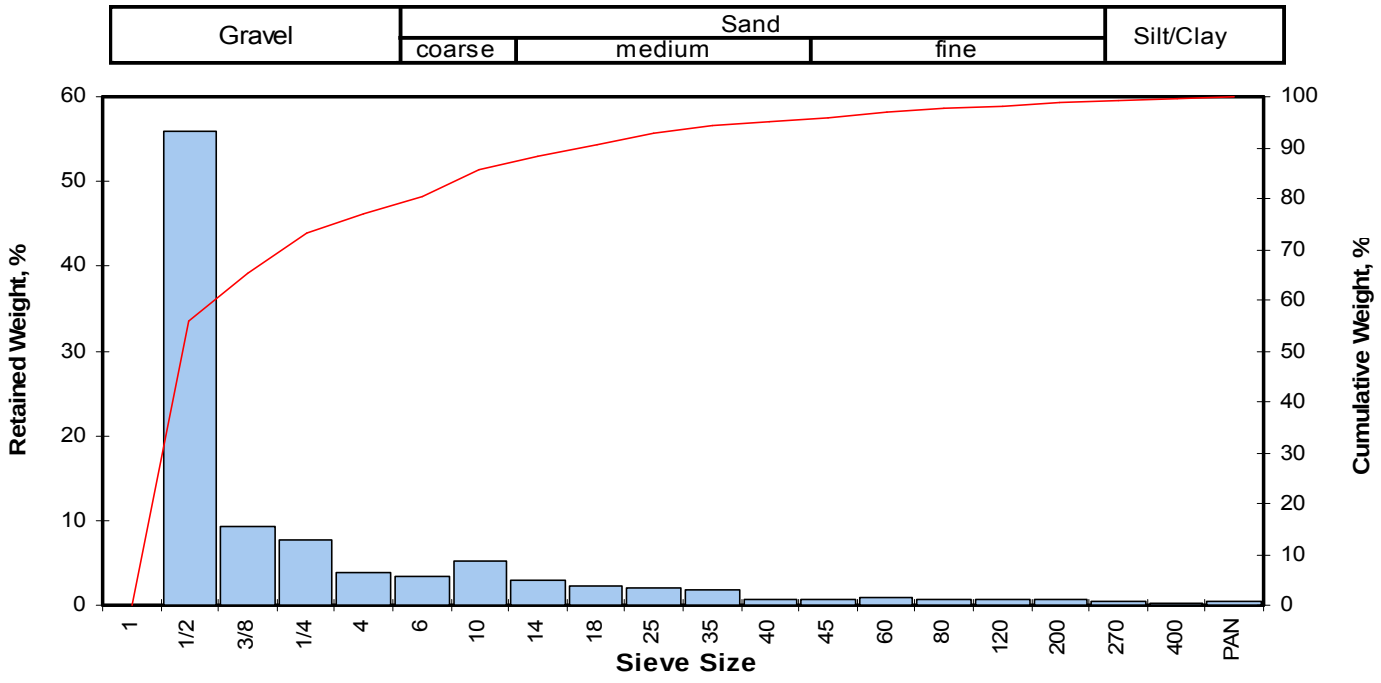
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.53
Coarse Sand	10	0.37
Medium Sand	40	15.77
Fine Sand	200	78.99
Silt/Clay	<200	4.35
	Total	100

Phone: (562) 907-3607
Fax: (562) 907-3610

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D422M

Client:	TRC Solutions	**PTS File No:**	46705R1
Project:	Atlantic Bridge Project	**Sample ID:**	B404A-D
Project No:	140143.0000.4903	**Depth, ft:**	14.6-14.8



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	65.46	56.02	56.02
0.3740	9.500	-3.25	3/8	10.97	9.39	65.41
0.2500	6.351	-2.67	1/4	8.95	7.66	73.07
0.1873	4.757	-2.25	4	4.46	3.82	76.88
0.1324	3.364	-1.75	6	4.07	3.48	80.37
0.0787	2.000	-1.00	10	5.99	5.13	85.49
0.0557	1.414	-0.50	14	3.44	2.94	88.44
0.0394	1.000	0.00	18	2.54	2.17	90.61
0.0278	0.707	0.50	25	2.48	2.12	92.73
0.0197	0.500	1.00	35	2.06	1.76	94.50
0.0166	0.420	1.25	40	0.80	0.68	95.18
0.0139	0.354	1.50	45	0.80	0.68	95.87
0.0098	0.250	2.00	60	1.14	0.98	96.84
0.0070	0.177	2.50	80	0.90	0.77	97.61
0.0049	0.125	3.00	120	0.78	0.67	98.28
0.0029	0.074	3.75	200	0.73	0.62	98.90
0.0021	0.053	4.25	270	0.40	0.34	99.25
0.0015	0.037	4.75	400	0.34	0.29	99.54
			PAN	0.54	0.46	100.00
TOTALS				116.85	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	-4.55	0.9253	23.503
10	-4.47	0.8698	22.093
16	-4.36	0.8076	20.512
25	-4.20	0.7225	18.350
40	-3.93	0.6001	15.242
50	-3.75	0.5302	13.468
60	-3.48	0.4381	11.128
75	-2.46	0.2160	5.487
84	-1.22	0.0916	2.327
90	-0.14	0.0434	1.102
95	1.18	0.0173	0.440

Measure	Trask	Inman	Folk-Ward
Median, phi	-3.75	-3.75	-3.75
Median, in.	0.5302	0.5302	0.5302
Median, mm	13.468	13.468	13.468
Mean, phi	-3.58	-2.79	-3.11
Mean, in.	0.4692	0.2720	0.3398
Mean, mm	11.919	6.909	8.631
Sorting	1.829	1.570	1.654
Skewness	0.745	0.613	0.667
Kurtosis	0.306	0.828	1.350

Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	76.88
Coarse Sand	10	8.61
Medium Sand	40	9.69
Fine Sand	200	3.72
Silt/Clay	<200	1.10
	Total	100

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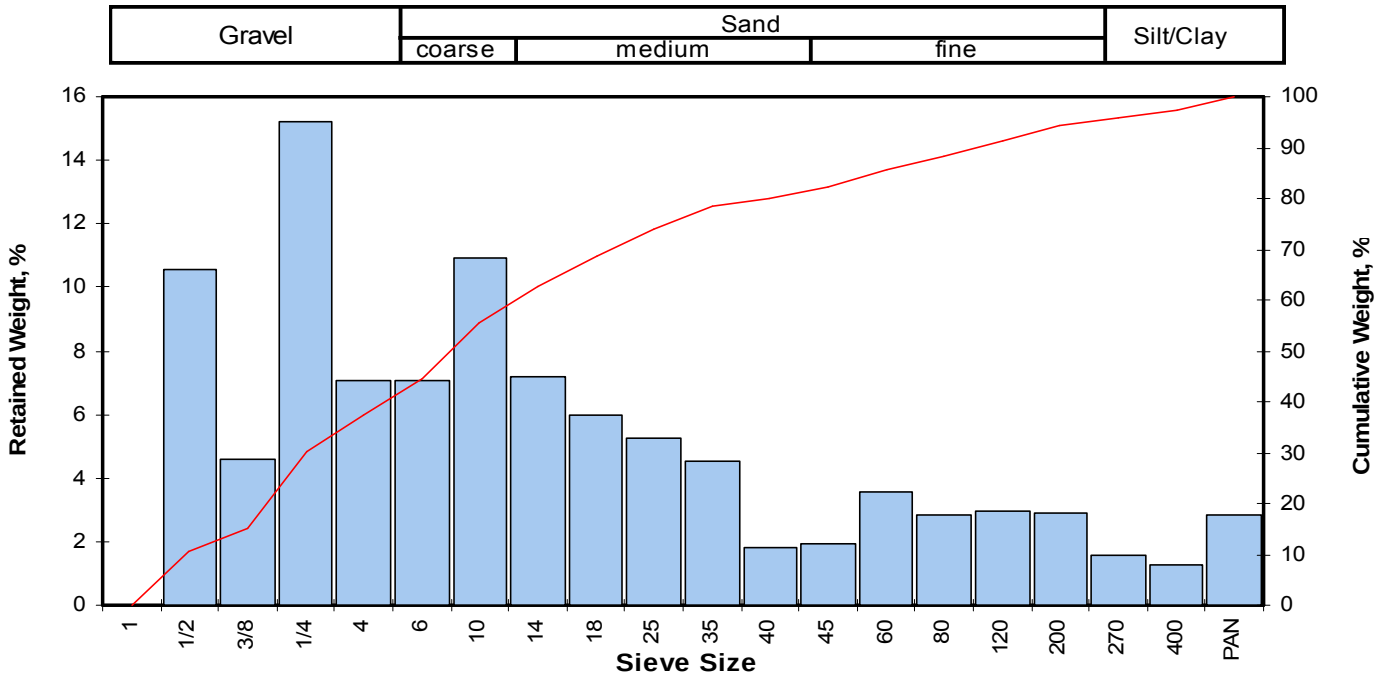
PTS Laboratories, Inc.

Particle Size Analysis - ASTM D422M

Client:	TRC Solutions	**PTS File No:**	46705R1
Project:	Atlantic Bridge Project	**Sample ID:**	B412A-C
Project No:	140143.0000.4903	**Depth, ft:**	14.6-14.8



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	8.44	10.55	10.55
0.3740	9.500	-3.25	3/8	3.65	4.56	15.11
0.2500	6.351	-2.67	1/4	12.17	15.21	30.32
0.1873	4.757	-2.25	4	5.67	7.09	37.40
0.1324	3.364	-1.75	6	5.65	7.06	44.46
0.0787	2.000	-1.00	10	8.75	10.93	55.40
0.0557	1.414	-0.50	14	5.74	7.17	62.57
0.0394	1.000	0.00	18	4.79	5.99	68.56
0.0278	0.707	0.50	25	4.21	5.26	73.82
0.0197	0.500	1.00	35	3.62	4.52	78.34
0.0166	0.420	1.25	40	1.44	1.80	80.14
0.0139	0.354	1.50	45	1.55	1.94	82.08
0.0098	0.250	2.00	60	2.84	3.55	85.63
0.0070	0.177	2.50	80	2.25	2.81	88.44
0.0049	0.125	3.00	120	2.39	2.99	91.43
0.0029	0.074	3.75	200	2.34	2.92	94.35
0.0021	0.053	4.25	270	1.27	1.59	95.94
0.0015	0.037	4.75	400	1.00	1.25	97.19
			PAN	2.25	2.81	100.00
TOTALS				80.02	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	-4.17	0.7087	18.000
10	-3.70	0.5102	12.959
16	-3.21	0.3653	9.279
25	-2.87	0.2878	7.311
40	-2.07	0.1649	4.188
50	-1.37	0.1018	2.585
60	-0.68	0.0630	1.601
75	0.63	0.0254	0.646
84	1.77	0.0115	0.293
90	2.76	0.0058	0.148
95	3.95	0.0025	0.065

Measure	Trask	Inman	Folk-Ward
Median, phi	-1.37	-1.37	-1.37
Median, in.	0.1018	0.1018	0.1018
Median, mm	2.585	2.585	2.585
Mean, phi	-1.99	-0.72	-0.94
Mean, in.	0.1566	0.0649	0.0754
Mean, mm	3.979	1.649	1.916
Sorting	3.364	2.492	2.477
Skewness	0.841	0.260	0.286
Kurtosis	0.260	0.630	0.951

Grain Size Description (ASTM-USCS Scale)	Coarse sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	37.40
Coarse Sand	10	18.00
Medium Sand	40	24.74
Fine Sand	200	14.21
Silt/Clay	<200	5.65
	Total	100

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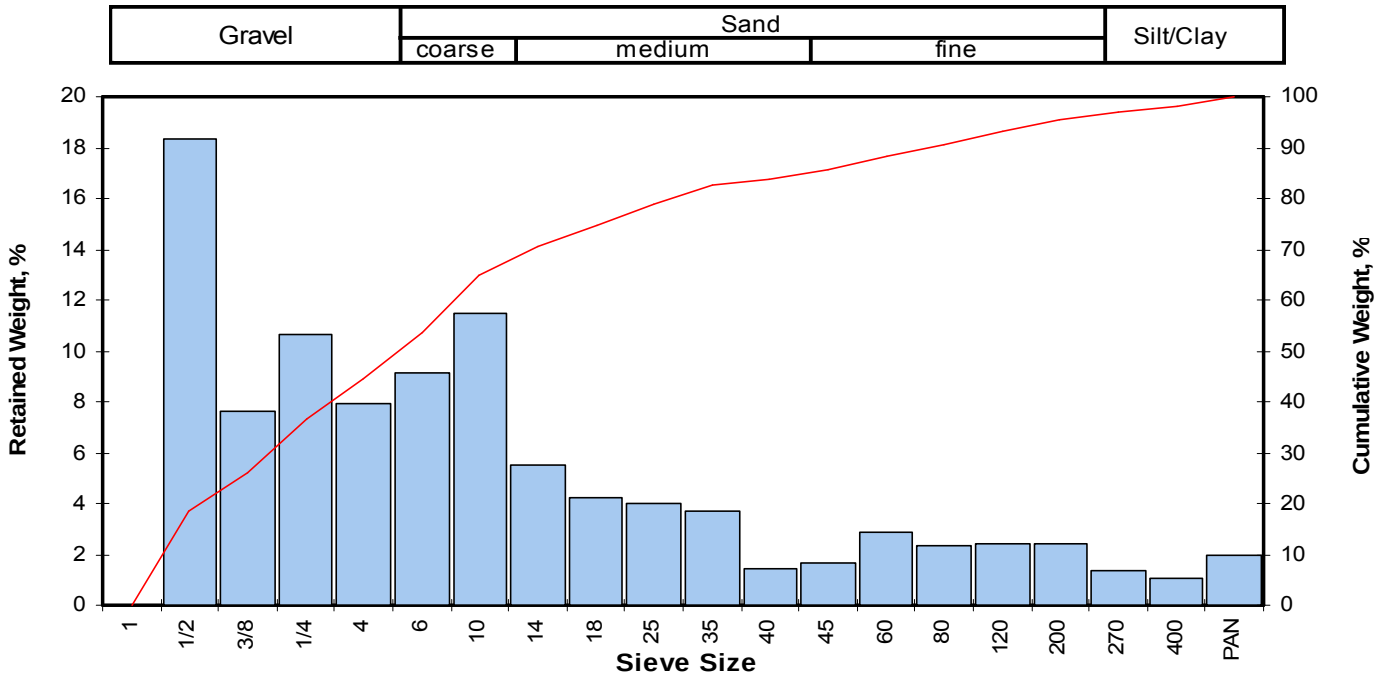
PTS Laboratories, Inc.

Particle Size Analysis - ASTM D422M

Client:	TRC Solutions	**PTS File No:**	46705R1
Project:	Atlantic Bridge Project	**Sample ID:**	B413A-C
Project No:	140143.0000.4903	**Depth, ft:**	14.6-14.8



Opening		Phi of	U.S. Sieve	Sample Weight	Incremental Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.9844	25.002	-4.64	1	0.00	0.00	0.00
0.4922	12.501	-3.64	1/2	13.84	18.31	18.31
0.3740	9.500	-3.25	3/8	5.76	7.62	25.93
0.2500	6.351	-2.67	1/4	8.07	10.68	36.61
0.1873	4.757	-2.25	4	5.97	7.90	44.50
0.1324	3.364	-1.75	6	6.90	9.13	53.63
0.0787	2.000	-1.00	10	8.65	11.44	65.07
0.0557	1.414	-0.50	14	4.14	5.48	70.55
0.0394	1.000	0.00	18	3.18	4.21	74.76
0.0278	0.707	0.50	25	3.05	4.03	78.79
0.0197	0.500	1.00	35	2.82	3.73	82.52
0.0166	0.420	1.25	40	1.06	1.40	83.93
0.0139	0.354	1.50	45	1.25	1.65	85.58
0.0098	0.250	2.00	60	2.14	2.83	88.41
0.0070	0.177	2.50	80	1.75	2.32	90.73
0.0049	0.125	3.00	120	1.83	2.42	93.15
0.0029	0.074	3.75	200	1.84	2.43	95.58
0.0021	0.053	4.25	270	1.03	1.36	96.94
0.0015	0.037	4.75	400	0.82	1.08	98.03
			PAN	1.49	1.97	100.00
TOTALS				75.59	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	-4.37	0.8146	20.691
10	-4.10	0.6741	17.123
16	-3.77	0.5371	13.643
25	-3.30	0.3868	9.824
40	-2.49	0.2208	5.609
50	-1.95	0.1520	3.861
60	-1.33	0.0992	2.519
75	0.03	0.0386	0.979
84	1.26	0.0164	0.417
90	2.34	0.0078	0.197
95	3.57	0.0033	0.084

Measure	Trask	Inman	Folk-Ward
Median, phi	-1.95	-1.95	-1.95
Median, in.	0.1520	0.1520	0.1520
Median, mm	3.861	3.861	3.861
Mean, phi	-2.43	-1.25	-1.49
Mean, in.	0.2127	0.0939	0.1103
Mean, mm	5.402	2.386	2.801
Sorting	3.167	2.516	2.461
Skewness	0.803	0.276	0.333
Kurtosis	0.261	0.578	0.979

Grain Size Description (ASTM-USCS Scale)	Gravel (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	44.50
Coarse Sand	10	20.57
Medium Sand	40	18.85
Fine Sand	200	11.65
Silt/Clay	<200	4.42
	Total	100

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CHAIN OF CUSTODY RECORD

COMPANY: TRC		
ADDRESS: Two Liberty Square, 6th Floor	CITY: Boston	ZIP CODE: 02109
PROJECT MANAGER: Rick Paquette	email: crace@trcsolutions.com	
PROJECT NAME: Atlantic Bridge Project	PHONE NUMBER: 617-385-6033	
PROJECT NUMBER: 140143.0000.4903	FAX NUMBER:	
SITE LOCATION: 6 & 50 Bridge Street, Weymouth, MA		
SAMPLER SIGNATURE:		

PO# 103297

TURNAROUND TIME
24 HOURS ☐ 5 DAYS ☐
72 HOURS ☐ NORMAL ☑
OTHER: _____

SAMPLE INTEGRITY (CHECK):
INTACT ____ TEMP(F) -33F

PTS QUOTE NO.: Q16-170R1

PTS FILE: 46705

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE			COMMENTS
B406A-A	12/15/16	1120	8-10								x															Additional analyses to be
B406A-B	12/15/16	1130	10-12								x															determined based on core
B406A-C	12/15/16	1135	12-14								x															photography.
B406A-D	12/15/16	1145	14-16								x															
B406A-E	12/15/16	1150	16-18								x															
B404A-A	12/15/16	1255	8-10								x															
B404A-B	12/15/16	1305	10-12								x															
B404A-C	12/15/16	1310	12-14								x															
B404A-D	12/15/16	1315	14-16								x															
B404A-E	12/15/16	1320	16-18								x															

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
COMPANY: TRC	COMPANY: PTS Labs Inc	COMPANY:	COMPANY:
DATE: 12/15/16 TIME: 1400	DATE: 12/16/16 TIME: 1245	DATE: TIME:	DATE: TIME:

PTS Laboratories, Inc.

CHAIN OF CUSTODY RECORD

COMPANY	TRC
ADDRESS	Two Liberty Square, 6th Floor
CITY	Boston
ZIP CODE	02109
PROJECT MANAGER	Rick Paquette
email	crace@trcsolutions.com
PROJECT NAME	Atlantic Bridge Project
PHONE NUMBER	617-385-6033
PROJECT NUMBER	140143.0000.4903
FAX NUMBER	
SITE LOCATION	6 & 50 Bridge Street, Weymouth, MA
SAMPLER SIGNATURE	

PO# 103297

TURNAROUND TIME
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OTHER: _____

SAMPLE INTEGRITY (CHECK):
INTACT ____ TEMP(F) 33°F

PTS QUOTE NO.
Q16-170R1

PTS FILE:
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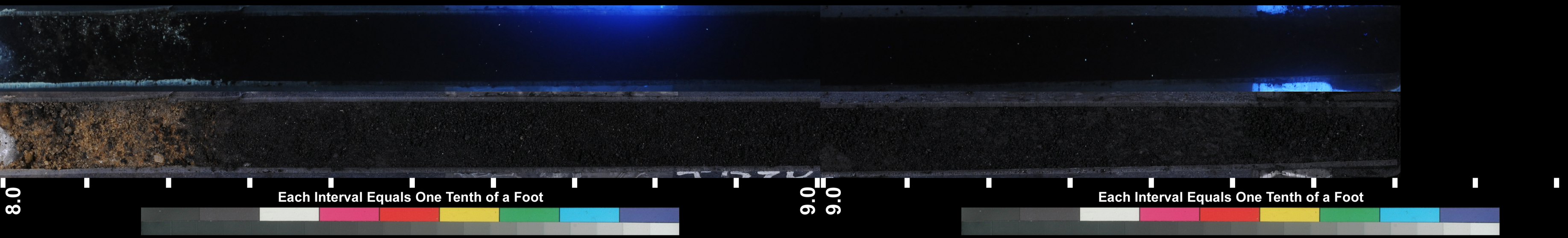
ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE			COMMENTS
B412A-A	12/15/16	0820	10-12								x															Additional analyses to be 24"
B412A-B	12/15/16	0830	12-14								x															determined based on core
B412A-C	12/15/16	0835	14-16								x															photography.
B412A-D	12/15/16	0845	16-18								x															
B412A-E	12/15/16	0855	18-20								x															
B413A-A	12/15/16	1015	10-12								x															
B413A-B	12/15/16	1025	12-14								x															
B413A-C	12/15/16	1030	14-16								x															
B413A-D	12/15/16	1035	16-18								x															
B413A-E	12/15/16	1045	18-20								x															

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
COMPANY: TRC	COMPANY: PTS Labs. INC	COMPANY:	COMPANY:
DATE: 12/15/16 TIME: 1400	DATE: 12/16/16 TIME: 1245	DATE: TIME:	DATE: TIME:

PTS Laboratories
PTS File No.: 46705



Project: Atlantic Bridge Project Boring ID: B404A

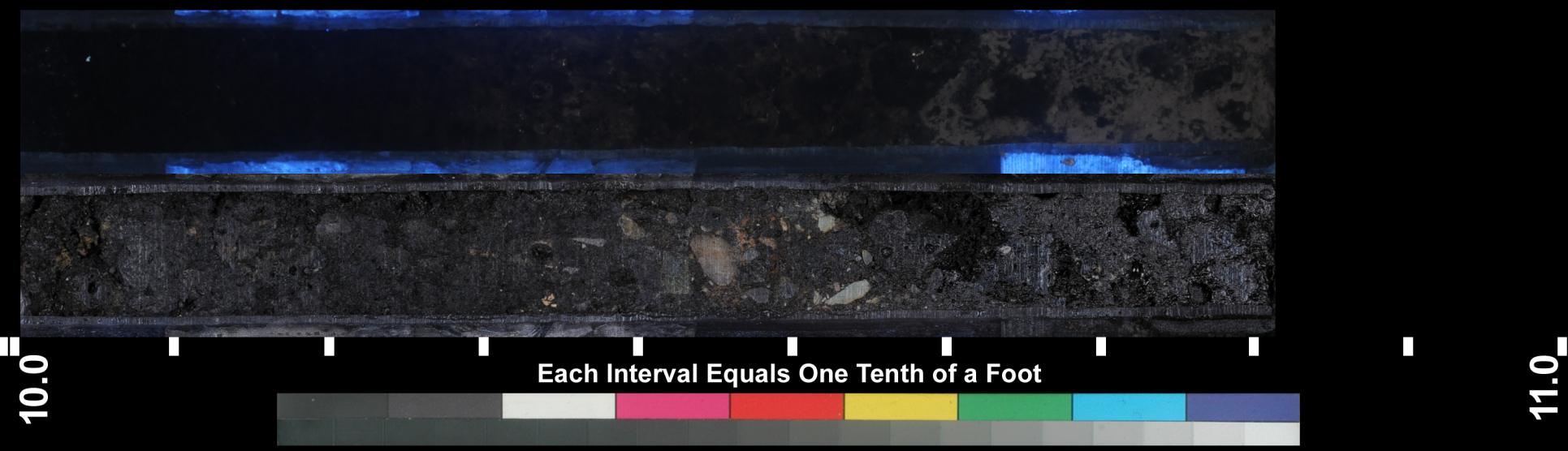
Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705

Project: Atlantic Bridge Project Boring ID: B404A

Project No.: 140143.0000.4903

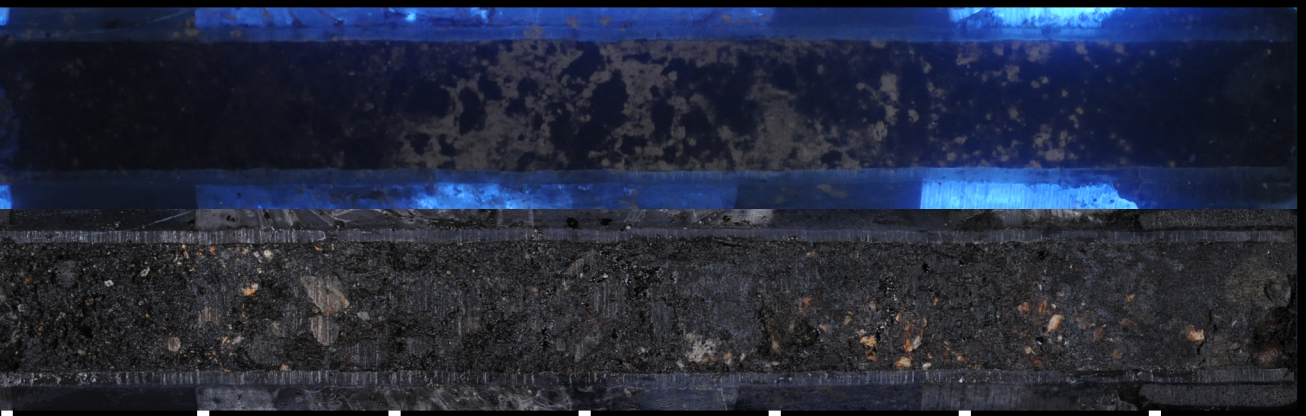
PTS Laboratories
PTS File No.: 46705



Project: Atlantic Bridge Project Boring ID: B404A

Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705



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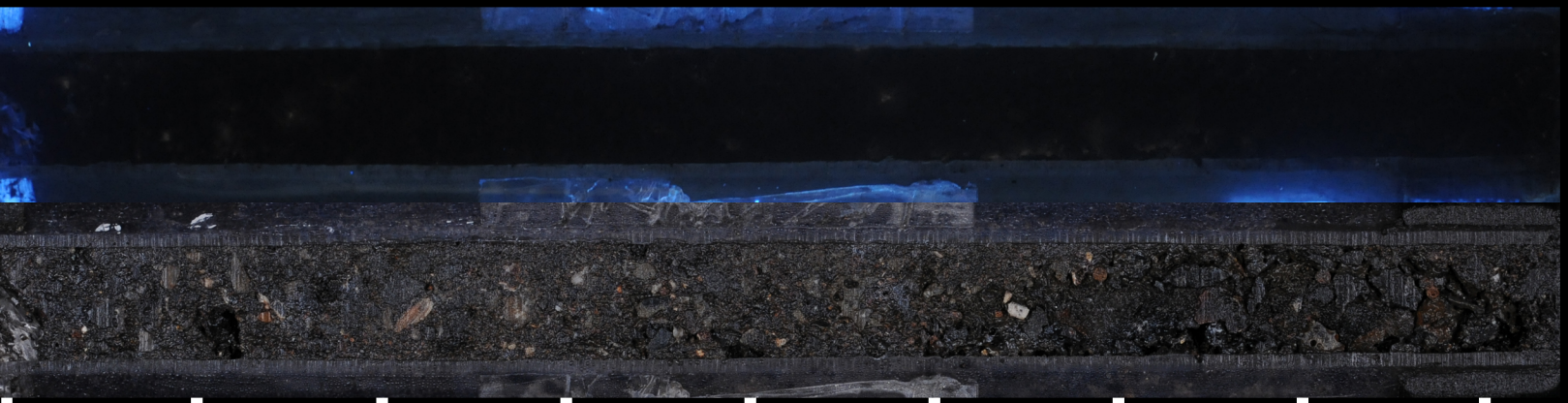
Each Interval Equals One Tenth of a Foot

Project: Atlantic Bridge Project Boring ID: B404A

Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705



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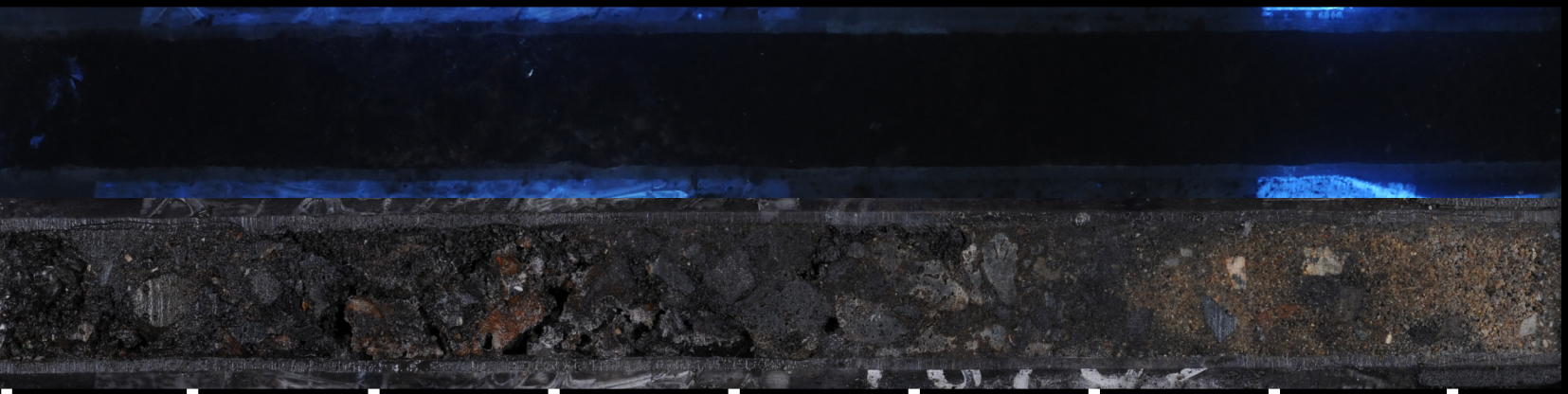
Project: Atlantic Bridge Project Boring ID: B404A

Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705



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Each Interval Equals One Tenth of a Foot

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Project: Atlantic Bridge Project Boring ID: B404A

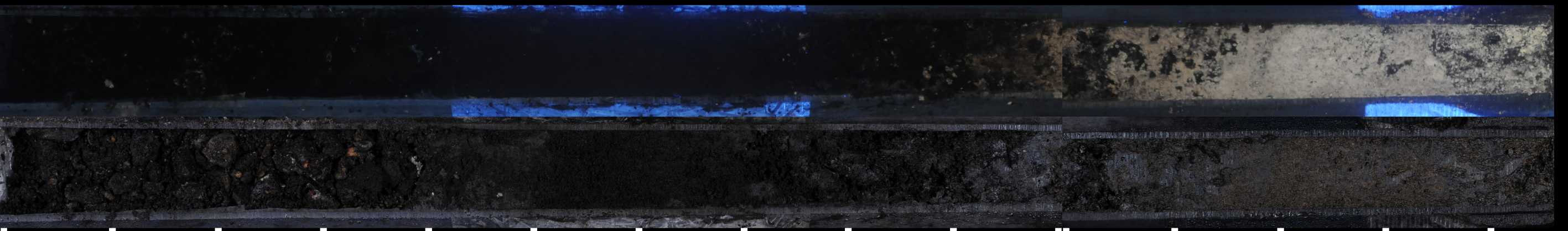
Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705

Project: Atlantic Bridge Project Boring ID: B406A

Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705



Project: Atlantic Bridge Project Boring ID: B406A

Project No.: 140143.0000.4903

PTS Laboratories
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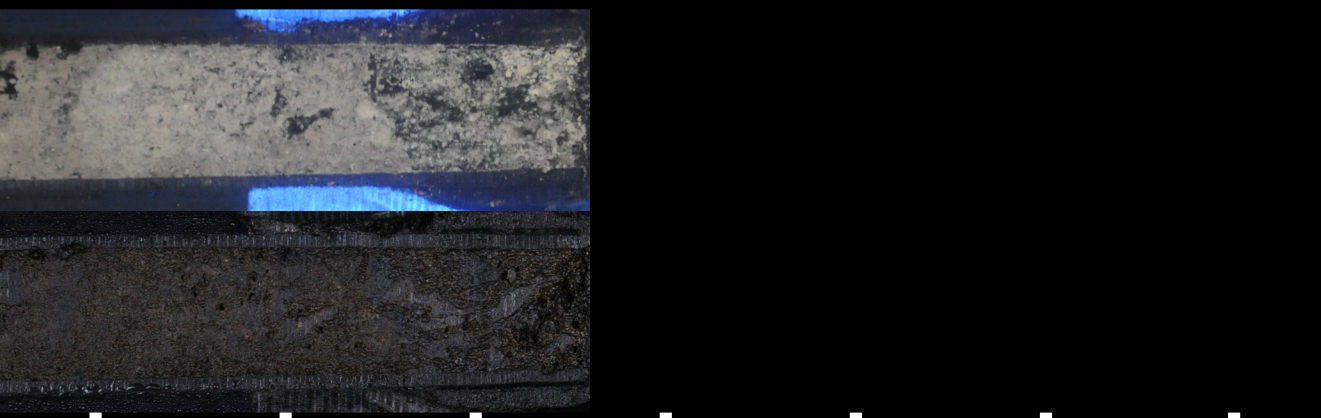

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Project No.: 140143.0000.4903

PTS Laboratories
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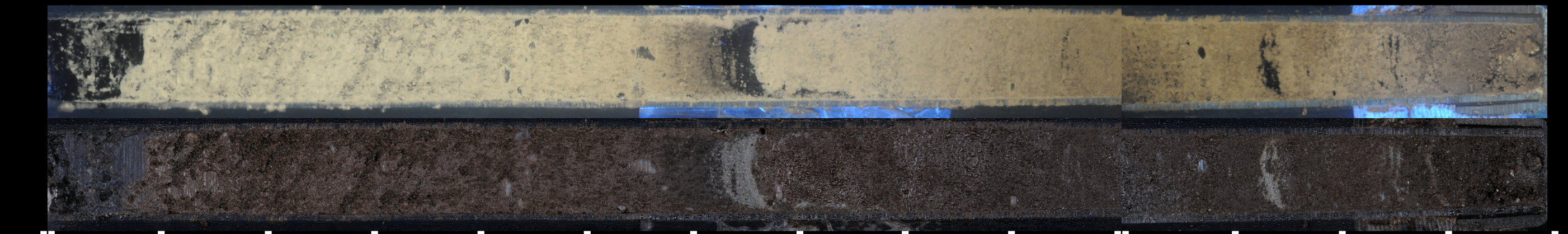

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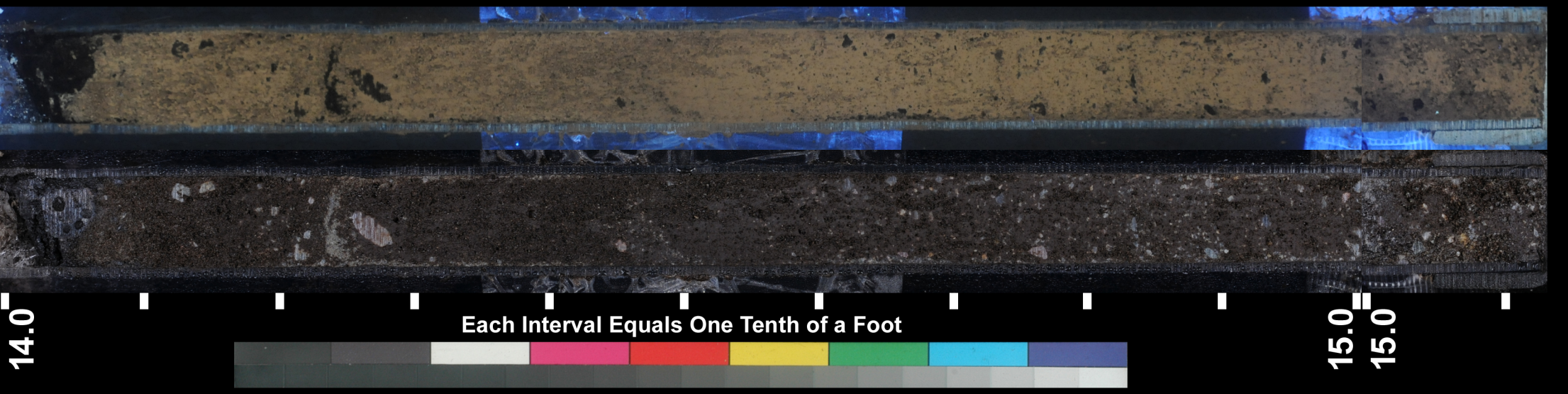

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PTS Laboratories
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Each Interval Equals One Tenth of a Foot

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Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705

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Project No.: 140143.0000.4903

PTS Laboratories
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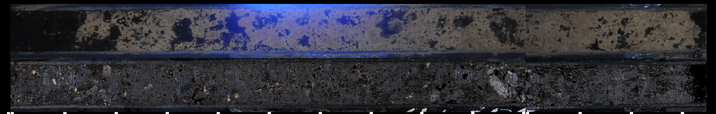

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Each Interval Equals One Tenth of a Foot

Project: Atlantic Bridge Project Boring ID: B412A

Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705

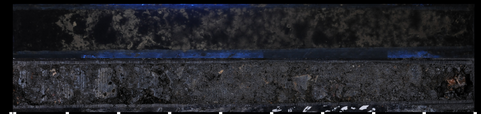
13.0 14.0

Each Interval Equals One Tenth of a Foot

Project: Atlantic Bridge Project Boring ID: B412A

Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705



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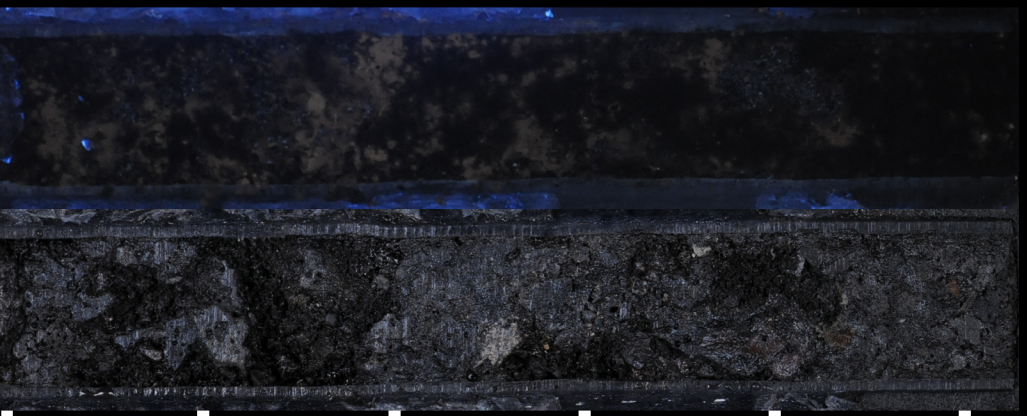
Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705



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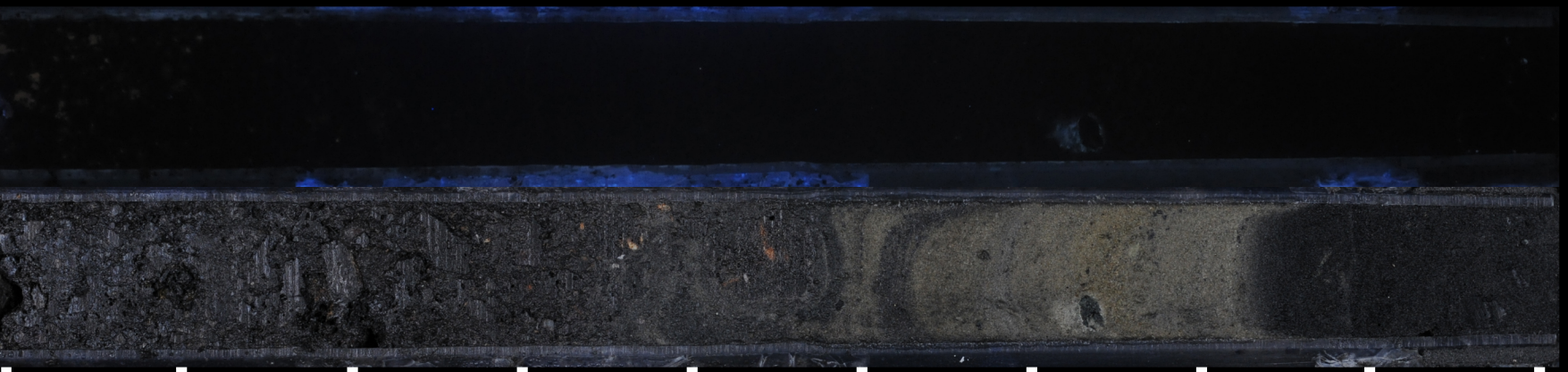
Project: Atlantic Bridge Project Boring ID: B412A

Project No.: 140143.0000.4903

PTS Laboratories
PTS File No.: 46705



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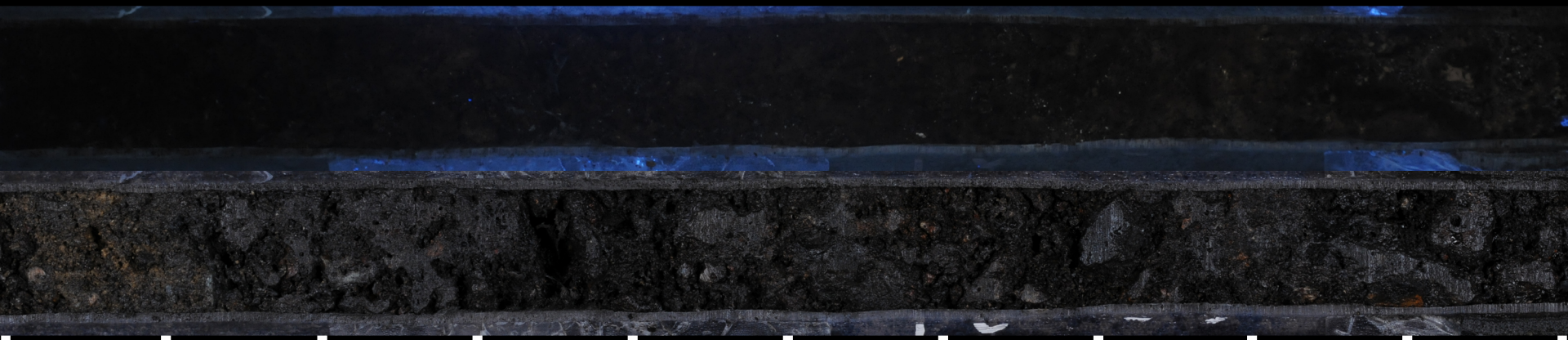

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Project No.: 140143.0000.4903

PTS Laboratories
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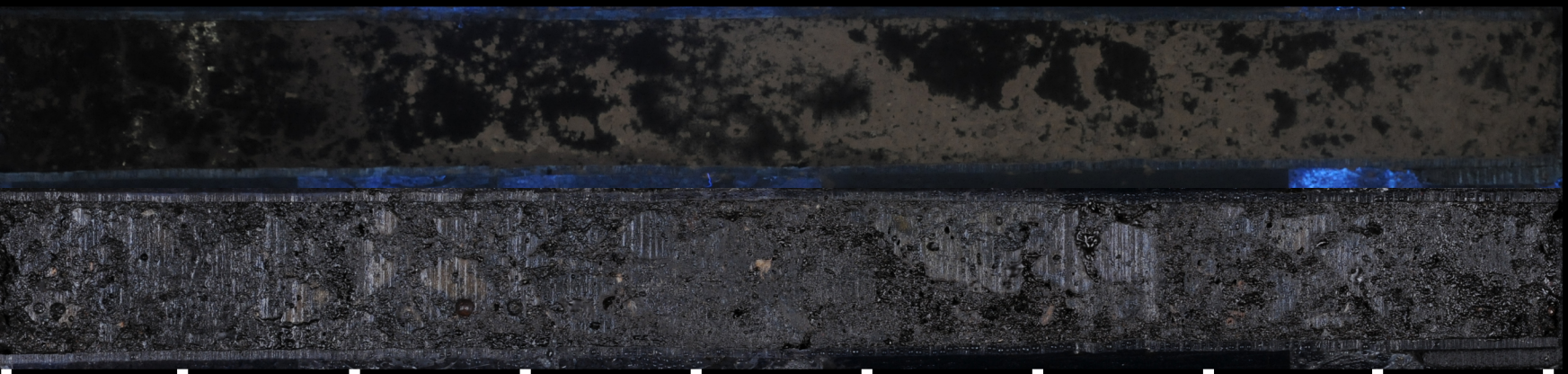

Project: Atlantic Bridge Project Boring ID: B413A

Project No.: 140143.0000.4903

PTS Laboratories
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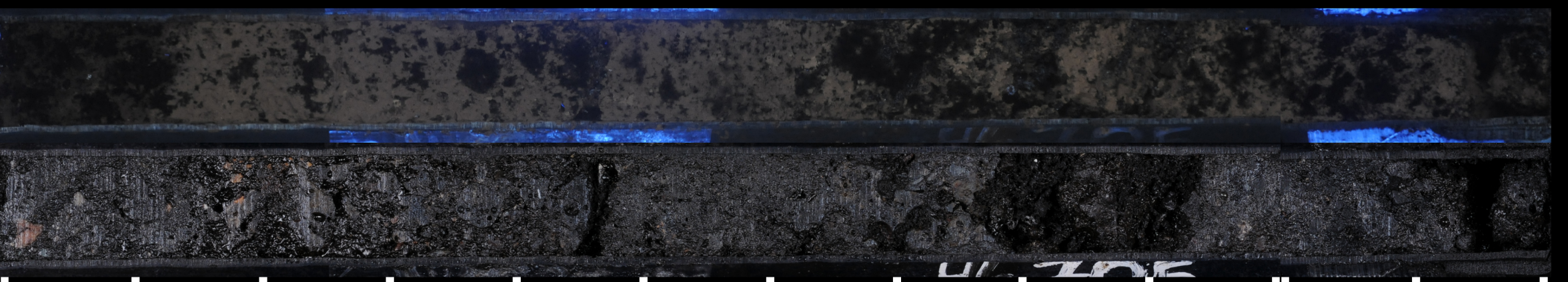

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PTS Laboratories
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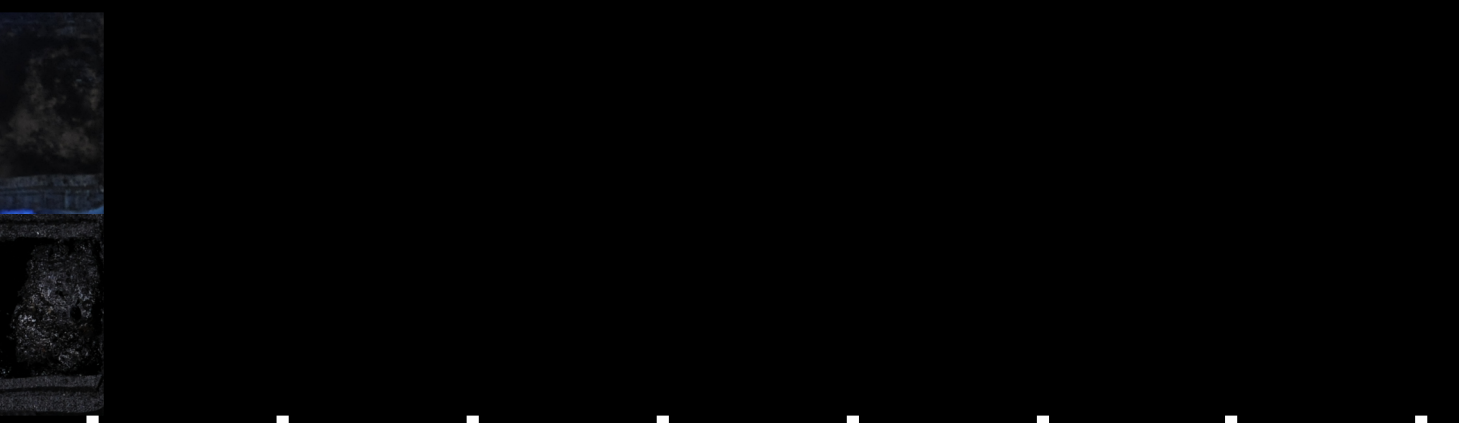

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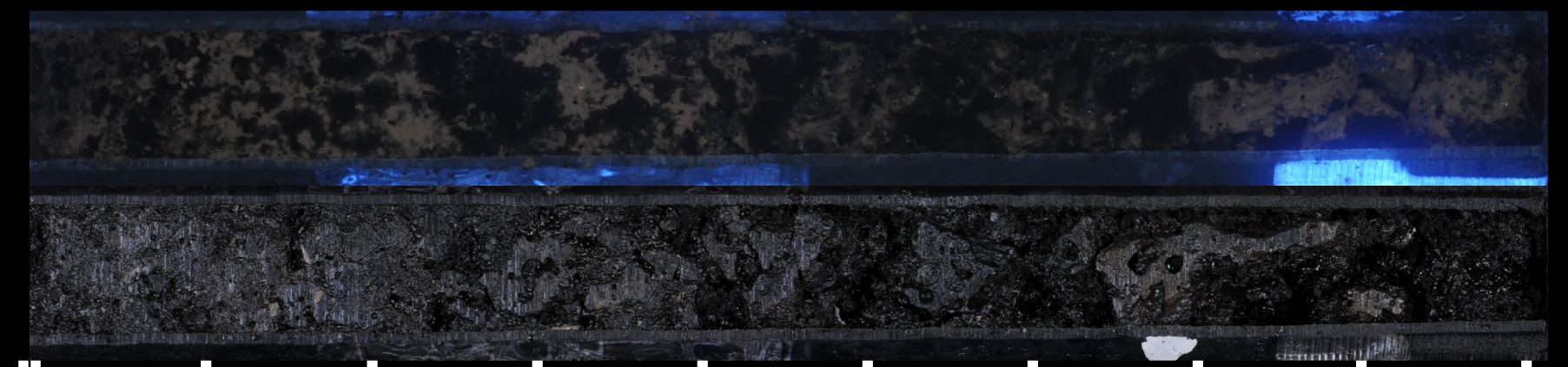

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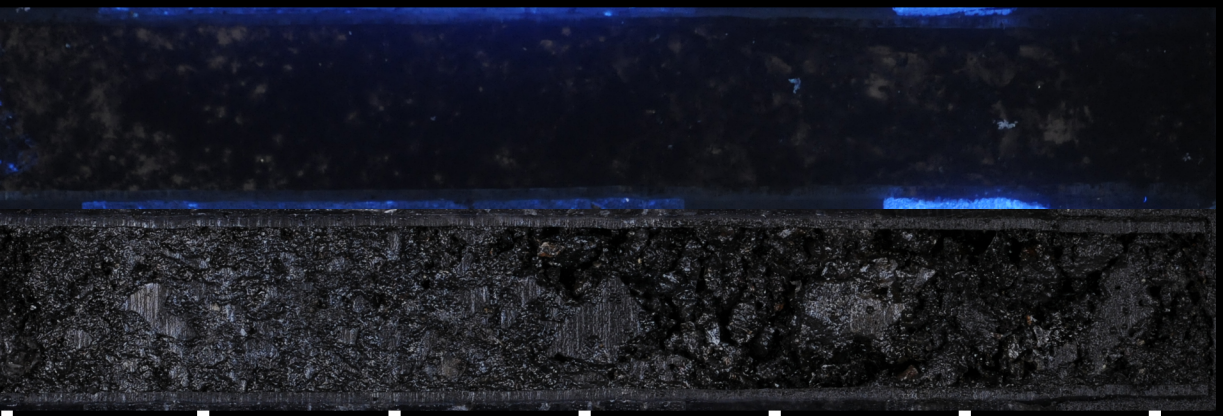


18.0

Each Interval Equals One Tenth of a Foot

19.0

Project: Atlantic Bridge Project Boring ID: B413A

Project No.: 140143.0000.4903

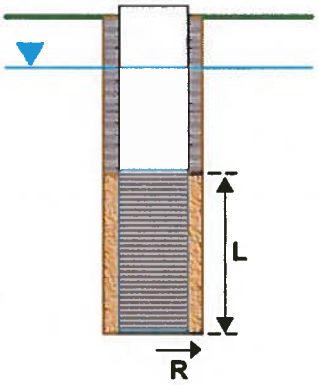
MW-202
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	206.35	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.36	L/min
Steady state drawdown (cm)	H=	0.91	cm
* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).	Computed Values		
	K=	1.47E-02	cm/s
	K=	4.18E+01	ft/day

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-203
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

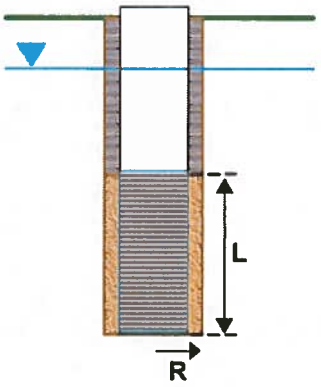
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	173.13	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.27	L/min
Steady state drawdown (cm)	H=	2.13	cm
	Computed Values		
	K=	5.29E-03	cm/s
	K=	1.50E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1+\left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1+\left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-204
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

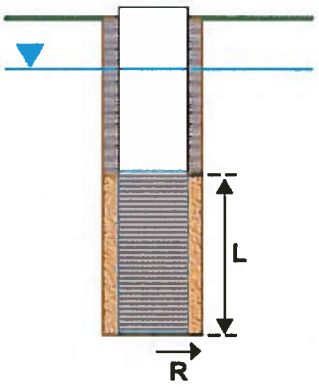
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	204.83	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.29	L/min
Steady state drawdown (cm)	H=	1.22	cm
	Computed Values		
	K=	8.89E-03	cm/s
	K=	2.52E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-205
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

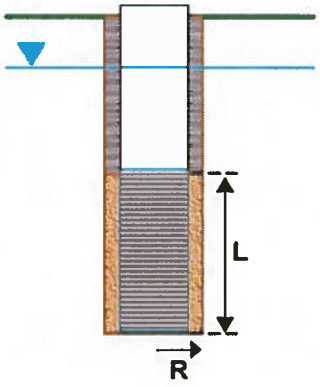
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	152.40	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.5	L/min
Steady state drawdown (cm)	H=	0.61	cm
	Computed Values		
	K=	3.70E-02	cm/s
	K=	1.05E+02	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

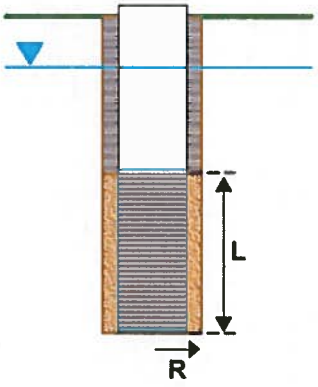
MW-206
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	146.91	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.35	L/min
Steady state drawdown (cm)	H=	0.61	cm
* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).	Computed Values		
	K=	**2.65E-02**	cm/s
	K=	**7.52E+01**	ft/day

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-400
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

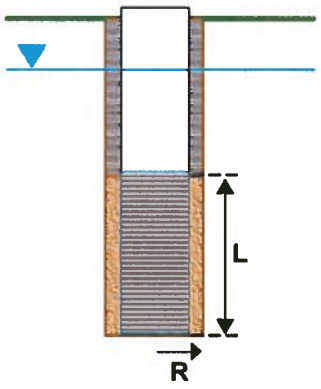
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	356.31	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.22	L/min
Steady state drawdown (cm)	H=	1.22	cm
	Computed Values		
	K=	5.41E-03	cm/s
	K=	1.53E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-401
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

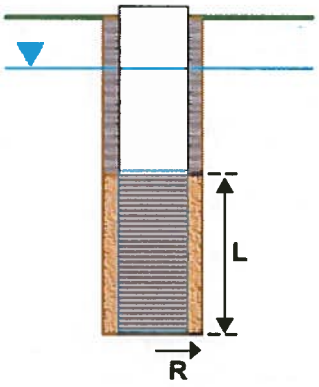
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	250.55	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.15	L/min
Steady state drawdown (cm)	H=	1.22	cm
	Computed Values		
	K=	4.79E-03	cm/s
	K=	1.36E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single O/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-402
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

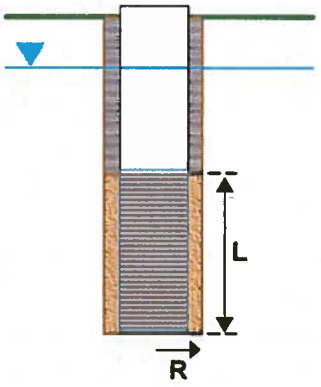
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	244.14	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.3	L/min
Steady state drawdown (cm)	H=	1.22	cm
	Computed Values		
	K=	9.75E-03	cm/s
	K=	2.76E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-403
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

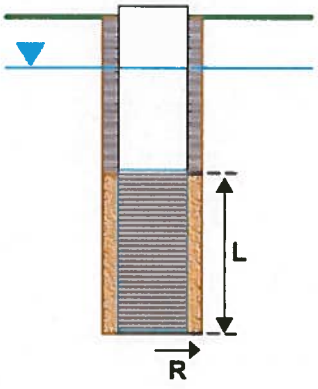
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	284.99	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.27	L/min
Steady state drawdown (cm)	H=	0.61	cm
	Computed Values		
	K=	1.57E-02	cm/s
	K=	4.44E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-404
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

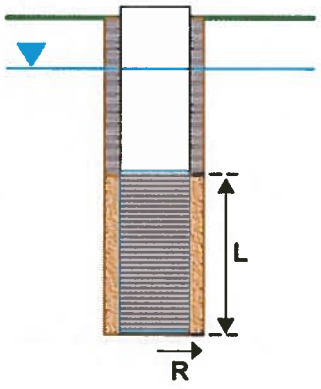
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	230.12	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.375	L/min
Steady state drawdown (cm)	H=	0.91	cm
	Computed Values		
	K=	1.43E-02	cm/s
	K=	4.05E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-405
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

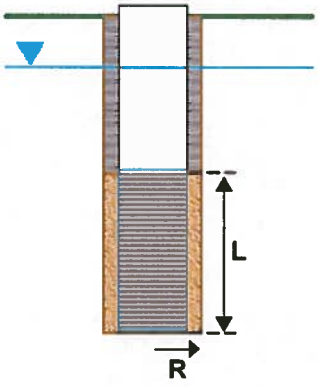
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	218.54	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.375	L/min
Steady state drawdown (cm)	H=	0.61	cm
	Computed Values		
	K=	2.64E-02	cm/s
	K=	7.49E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-406
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

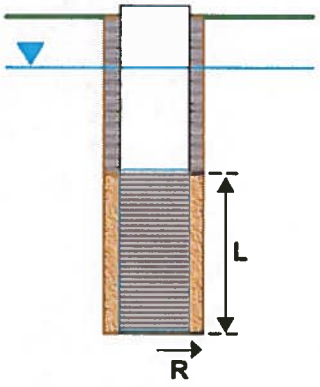
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	279.20	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.32	L/min
Steady state drawdown (cm)	H=	1.52	cm
	Computed Values		
	K=	7.57E-03	cm/s
	K=	2.15E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-408
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

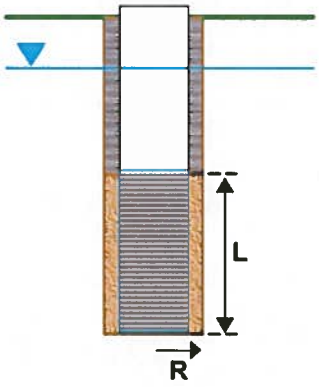
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	293.83	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.3	L/min
Steady state drawdown (cm)	H=	0.91	cm
	Computed Values		
	K=	1.14E-02	cm/s
	K=	3.24E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single O/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-409
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

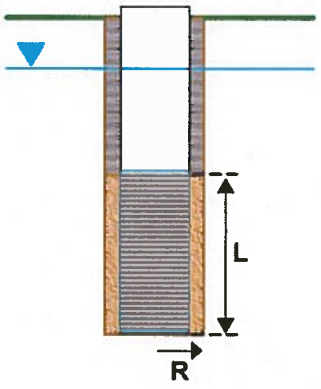
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	302.36	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.27	L/min
Steady state drawdown (cm)	H=	3.05	cm
	Computed Values		
	K=	3.00E-03	cm/s
	K=	8.51E+00	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-411
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

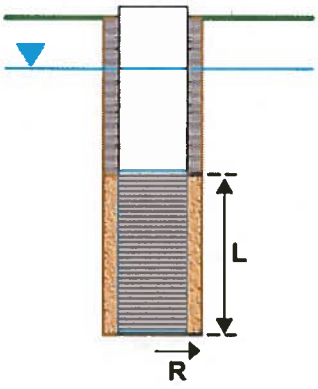
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	309.07	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.4	L/min
Steady state drawdown (cm)	H=	0.61	cm
	Computed Values		
	K=	2.19E-02	cm/s
	K=	6.20E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-412
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

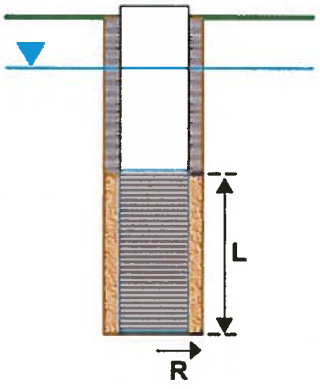
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	293.52	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.2	L/min
Steady state drawdown (cm)	H=	1.52	cm
	Computed Values		
	K=	3.86E-03	cm/s
	K=	1.09E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-413
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

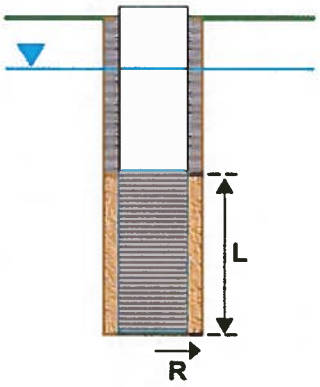
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	283.16	cm
Intake (hole) diameter (cm)	D=	22.860	cm
Steady state discharge (L/min)	Q=	0.33	L/min
Steady state drawdown (cm)	H=	1.22	cm
	Computed Values		
	K=	8.14E-03	cm/s
	K=	2.31E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

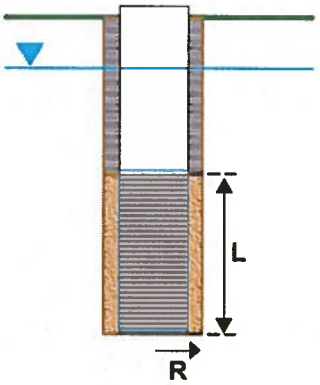
MW-415
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	233.17	cm
Intake (hole) diameter (cm)	D=	12.700	cm
Steady state discharge (L/min)	Q=	0.33	L/min
Steady state drawdown (cm)	H=	1.22	cm
* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).	Computed Values		
	K=	1.11E-02	cm/s
	K=	3.14E+01	ft/day

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

MW-416
Low Flow Kh Calculation Sheet
Spectra Energy Partners
Atlantic Bridge Project
Weymouth Compressor Station,
Weymouth, Massachusetts

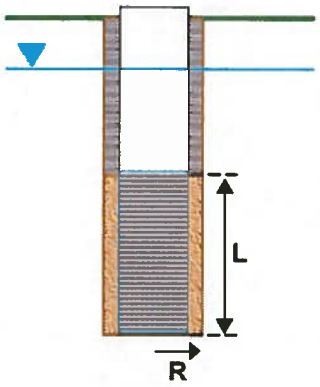
Ellipsoidal Flow Steady State Model
Single Pair of Discharge and Drawdown

Intake (screen) length (cm)	L=	356.01	cm
Intake (hole) diameter (cm)	D* =	12.700	cm
Steady state discharge (L/min)	Q=	0.24	L/min
Steady state drawdown (cm)	H=	1.52	cm
	Computed Values		
	K=	4.74E-03	cm/s
	K=	1.34E+01	ft/day

* This workbook can be used with the half ellipsoidal model by subsitituting the intake hole radius (R) instead of the intake hole diameter (D).

Formula

$$Q = \frac{2\pi LKH}{2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}$$



Single Q/H

$$K = \frac{Q * 2.303 \log\left[\frac{L}{D} + \sqrt{1 + \left(\frac{L}{D}\right)^2}\right]}{2\pi LH}$$

Model based on Hvorslev (1951)

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140143	1/4/17	

TRC Personnel: Kolleen Mea

Well ID: MW-201

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment:

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch — Other: _____

WELL MATERIAL: [X] PVC [ ] SS — Other: _____

Well Depth 13.64 ft. [X] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth — ft. LNAPL/DNAPL Depth = 13.64

Well Volume _____ NAPL Thickness = _____

Depth of pump intake: 18ft

Static water level after pump put into well: 300 ml/min

Initial purge Rate/ Water Level (100-400 ml/min): 300 ml/min

Adjusted purge Rates/time/WL(record changes)

Flow rate at time of sampling: 300ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	0930	0935	0940	0945	0950	0955	1000	1005	1010
Temp. (°C)	P	10.44	11.83	12.03	12.03	12.03	12.13	12.10	12.08
Conduct. (µmhos/cm)		36623	36418	36462	36463	36469	36503	36536	36564
DO (mg/L)	U	3.50	2.71	2.23	2.24	2.16	1.93	1.85	1.85
pH (su)	E	6.00	6.26	6.27	6.27	6.20	6.25	6.25	6.25
ORP (millivolts)	G	-44.0	-58.9	-64.7	-66.5	-67.1	-69.5	-71.4	-71.5
Turbidity (NTU)	E	13.0	2.90	3.19	2.09	2.05	1.08	1.53	2.06
Flow (ml/min)		300	300	300	300	300	300	300	300
Depth To Water (ft)	13.64	—	—	—	—	—	—	—	—
Cumulative Purge Vol. (gal or L)									

Time	1015	1020	1025	1025			Stabilization Criteria* (3 consecutive readings)
Temp. (°C)	12.17	12.11	12.10	S			- Temperature: ± 3 %
Conduct. (µmhos/cm)	36586	36650	36654				- Conduct. (µmhos/cm): ± 3 %
DO (mg/L)	1.80	1.75	1.78	A			- DO (mg/L): ± 10 % (for values >0.5 mg/L)
pH (Std. Units)	6.25	6.25	6.25	M			- pH (Std. Units): ± 0.1 SU
Eh/ORP (millivolts)	-72.0	-73.0	-73.5				- ORP (millivolts): ± 10 mV
Turbidity (NTU)	2.03	1.41	1.09	P			- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
Flow (ml/min)	300	300	300	L			- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)
Depth To Water (ft)	—	—	—	E			
Cumulative Purge Vol. (gal or L)							

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: _____		

Comments: final DTP: 13.59ft

pump ~ 6 gallons water in rubbish drum

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1L A	1025	none	
VPH	N	HCl	3	40mL A	1025	none	

* Consult the applicable regulatory guidance for the specific criteria.

Signed: Kolleen Mea

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	143140	1/4/17	

TRC Personnel: Kelleenby

Well ID: MW-202

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present	✓	

Sampling Equipment: YSI

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER ☐ 2 inch ☐ 4 inch ☐ 6 inch

Other: _____

WELL MATERIAL ☑ PVC ☐ SS

Other: _____

Well Depth 23 ft. ☒ top of riser ☐ top of casing ☐ _____ ☐ measured ☐ historical

Water Depth 12.23 ft.

Well Volume _____

LNAPL/DNAPL Depth = NA

NAPL Thickness = NA

Depth of pump intake: ~18 ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 350 ml/min

Adjusted purge Rates/time/WL(record changes)

350 → 300 @ 0920

Flow rate at time of sampling: 300 ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	0910	0915	0920	0925	0930	0935	0940	0945	0950
Temp. (°C)		11.64	11.56	11.65	11.57	11.67	11.69	11.69	11.69
Conduct. (µmhos/cm)		30514	30137	29892	29902	29950	29919	29991	30005
DO (mg/L)		1.10	0.69	.68	.60	.65	.56	.57	.57
pH (su)		6.48	6.27	6.18	6.16	6.12	6.10	6.10	6.10
ORP (millivolts)		-18.2	-15.4	-15.2	-15.6	-15.6	-16.0	-15.8	-16.1
Turbidity (NTU)		25.1	20.0	11.5	6.54	4.83	4.53	4.21	4.12
Flow (ml/min)	350	350	350	300	300	300	300	300	300
Depth To Water (ft)	12.23	12.26	12.27	12.26	12.26	12.26	12.26	12.26	12.26
Cumulative Purge Vol. (gal or L)									

Time	0955	1000	1000
Temp. (°C)	11.65	11.65	S
Conduct. (µmhos/cm)	30001	30000	A
DO (mg/L)	.58	.57	M
pH (Std. Units)	6.10	6.10	P
Eh/ORP (millivolts)	-16.1	-16.2	L
Turbidity (NTU)	4.32	4.11	E
Flow (ml/min)	300	300	
Depth To Water (ft)	12.26	12.26	
Cumulative Purge Vol. (gal or L)			

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	☒	☒
Submersible Pump	☐	☐
Bladder Pump	☐	☐
Bailer	☐	☐
Other: _____	☐	☐

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1L AG	1000	none	
VPH	N	HCl	3	40mL A	1000	none	

* Consult the applicable regulatory guidance for the specific criteria.

Signed: Kelleenby

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra Weymouth CS	146483.000 4403	1/3/17 1410	

TRC Personnel: BA

Well ID: MW-203

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present	✓	

Sampling Equipment: Peristaltic pump

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground) 2 ft.

Riser Stick-up (from ground) 2 ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: ____

WELL MATERIAL: [✓] PVC [✓] SS Other: ____

Well Depth ____ ft. [X] top of riser [ ] top of casing [ ] ____ [ ] measured [ ] historical

Water Depth 13.32 ft.

Well Volume ____

LNAPL/DNAPL Depth = ____

NAPL Thickness = ____

Depth of pump intake: ____

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 220

Adjusted purge Rates/time/WL(record changes): 260, 270

Flow rate at time of sampling: 270

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1410	1415	1420	1425	1430	1435	1440	1445	1450
Temp. (°C)	Start	11.37	11.46	11.49	11.54	11.64	11.49	11.50	11.40
Conduct. (µmhos/cm)	Purge	4199.7	4196.4	4193.6	4194.7	4187.5	4187.4	4186.4	4173.3
DO (mg/L)		3.61	2.47	3.73	2.59	4.39	4.62	4.54	4.53
pH (su)		6.51	6.48	6.50	6.48	6.48	6.48	6.47	6.47
ORP (millivolts)		93.4	89.1	92.1	89.3	87.9	89.3	87.1	86.1
Turbidity (NTU)	↓		28.4	23.7	26.4	21.0	19.3	18.7	13.6
Flow (ml/min)	220	260	270	→	→	→	→	→	→
Depth To Water (ft)	13.32	13.39	→	→	→	→	→	→	→
Cumulative Purge Vol. (gal or L)									

Time	1455	1500	1505	1510	1515	1520
Temp. (°C)	11.41	11.47	11.53	11.51	11.56	11.57
Conduct. (µmhos/cm)	4173.4	4183.1	4197.6	4201.6	4163.2	4184.6
DO (mg/L)	4.76	4.41	5.31	5.61	5.50	5.63
pH (Std. Units)	6.46	6.47	6.47	6.45	6.46	6.45
Eh/ORP (millivolts)	85.3	84.4	82.6	83.7	83.9	82.6
Turbidity (NTU)	11.4	9.79	8.76	10.41	11.3	9.70
Flow (ml/min)	270	→	→	→	→	→
Depth To Water (ft)	13.39	→	→	→	→	→
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	✓	✓
Submersible Pump		
Bladder Pump		
Bailer		
Other: ____		

Comments: Clear, No Odor, No Sheen

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VOA	N	HCl	~~3~~ 3	40ml Amber	1320		
EPH	N	HCl	~~3~~ 2	1L Amber	↓		↓

- Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

TRC

Groundwater Field Data Record

Project: Spectra Weymouth CS | Project No.: 140493.0000.4403 | Date/Time: 1/4/17 0845 | Sheet 1 of 1

TRC Personnel: BA

Well ID: MW-204

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present	✓	

Sampling Equipment: Peristaltic

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground) 2 ft.

Riser Stick-up (from ground) 2 ft.

WELL DIAMETER: [✓] 2 inch [ ] 4 inch [ ] 6 inch; Other: ______

WELL MATERIAL: [✓] PVC [ ] SS; Other: ______

Well Depth ______ ft. [✓] top of riser [ ] top of casing [ ] measured [ ] historical

Water Depth 13.28 ft.

Well Volume ______

LNAPL/DNAPL Depth = ______

NAPL Thickness = ______

Depth of pump intake: 18

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 230

Adjusted purge Rates/time/WL(record changes): 290

Flow rate at time of sampling: 290

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	0850	0855	0900	0905	0910	0915	0920	0925	0930
Temp. (°C)	Start	12.36	12.27	12.24	12.21	12.23	12.18	12.46	12.35
Conduct. (μmhos/cm)	Purge	31913	32059	32147	32269	32373	32471	32502	32673
DO (mg/L)	↓	2.19	2.14	2.01	1.85	1.82	1.87	1.99	1.92
pH (su)		6.76	6.73	6.68	6.66	6.64	6.61	6.58	6.56
ORP (millivolts)		50.3	49.5	44.6	49.7	42.6	40.3	31.1	27.6
Turbidity (NTU)		49.4	47.3	42.1	33.4	24.7	21.3	19.7	6.41
Flow (ml/min)	230	290	→						
Depth To Water (ft)	13.28	13.32	→						
Cumulative Purge Vol. (gal or L)									

Time	0935	0940	0945	0950	0955	
Temp. (°C)	12.37	12.57	12.53	12.53	12.56	
Conduct. (μmhos/cm)	32417	32343	32004	31747	31515	
DO (mg/L)	2.03	2.10	2.24	2.39	2.26	
pH (Std. Units)	6.53	6.53	6.53	6.53	6.54	
Eh/ORP (millivolts)	20.7	15.2	10.5	7.2	6.2	
Turbidity (NTU)	5.31	2.55	2.31	2.01	1.93	
Flow (ml/min)	290	→				
Depth To Water (ft)	13.32	→				
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (μmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	✓	✓
Submersible Pump		
Bladder Pump		
Bailer		
Other:		

Comments: Clear, N/O, N/S

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1L Amber	0955		MW-204
VPH	↓	HCl	3	40mL Amber	↓		↓

* Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140143	11/3/17	

TRC Personnel: Kathleen Sica

Well ID: MW-205

	YES	NO
Secure	X	
Intact	X	
Intact	X	
Present	X	
Lock Present	X	

Protective Casing Stick-up (from ground) _____ ft.

Riser Stick-up (from ground) _____ ft.

Well Depth _____ ft. [X] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth 15.00 ft. LNAPL/DNAPL Depth = —

Well Volume _____ NAPL Thickness = —

WELL DIAMETER [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: _____

WELL MATERIAL [✓] PVC [ ] SS

Other: _____

ng Equipment: YSI

w-thru Cell Volume:

ID SCREENING MEAS.

Background	—
Well Mouth	—

Depth of pump intake: ~18 ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 400ml/min

Adjusted purge Rates/time/WL(record changes) 400 → 350 @ 1430

Flow rate at time of sampling: 350 ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1430	1430	1435	1440	1445	1450	1455	1500	1505
Temp. (°C)	D	12.01	12.02	12.04	12.07	12.08	12.05	12.05	12.04
Conduct. (µmhos/cm)	V	27823	27320	27100	27108	27579	27611	27635	27653
DO (mg/L)	R	1.21	1.20	1.13	1.01	.90	1.12	2.19	2.36
pH (su)	G	7.08	7.08	7.08	7.08	7.07	7.07	7.06	7.06
ORP (millivolts)	E	-94.6	-94.3	-95.6	-96.1	-98.8	-95.6	-96.7	-96.8
Turbidity (NTU)		5.86	5.51	4.23	3.82	3.72	2.89	3.24	3.58
Flow (ml/min)	400	400	350	350	350	350	350	350	350
Depth To Water (ft)	15.00	15.02	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Cumulative Purge Vol. (gal or L)									

Time	1510	1515	1520	1525	1525		
Temp. (°C)	12.03	12.11	12.01	11.99	S		
Conduct. (µmhos/cm)	27810	27899	27911	27944	A		
DO (mg/L)	2.30	2.60	2.51	2.47	M		
pH (Std. Units)	7.06	7.05	7.05	7.05	P		
Eh/ORP (millivolts)	-94.8	-84.6	-84.2	-83.6	L		
Turbidity (NTU)	2.92	3.81	3.92	3.34	E		
Flow (ml/min)	350	350	350	350			
Depth To Water (ft)	15.00	15.00	15.00	15.00			
Cumulative Purge Vol. (gal or L)							

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: _____		

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPA	N	HCl	2	1LA	1525	None	
VPH	N	HCl	3	40MA	1525	None	

- Consult the applicable regulatory guidance for the specific criteria.

Signed: _____

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140143	1/4/17	

TRC Personnel: Kolleen Shea

Well ID: MW 206

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: YSI

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: _____

WELL MATERIAL

[✓] PVC [ ] SS

Other: _____

Well Depth _____ ft. [X] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth 14.18 ft.

Well Volume _____

LNAPL/DNAPL Depth = —

NAPL Thickness = —

Depth of pump intake: ~18ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 400 ml/min

Adjusted purge Rates/time/WL(record changes): 400 → 350 @ 1220

Flow rate at time of sampling: 350ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1215	1220	1225	1230	1235	1240	1245	1250	1255
Temp. (°C)	p	12.97	12.92	12.91	12.96	13.03	13.01	13.03	12.99
Conduct. (µmhos/cm)	p	5081	5454	5458	5525	5448	5351	5321	5306
DO (mg/L)	U	3.28	2.97	2.97	3.00	3.33	3.36	3.40	3.42
pH (su)	K	6.58	6.44	6.44	6.43	6.42	6.42	6.42	6.41
ORP (millivolts)	G	-68.1	-74.5	-74.5	-73.8	-71.1	-71.0	-70.9	-69.9
Turbidity (NTU)	E	23.1	10.46	6.86	2.47	3.11	3.25	2.17	0.97
Flow (ml/min)	400	400	350	350	350	350	350	350	350
Depth To Water (ft)	14.18	14.21	14.20	14.20	14.20	14.19	14.19	14.19	14.19
Cumulative Purge Vol. (gal or L)									

Time	1300	1305	1310	1310			
Temp. (°C)	13.01	13.00	12.99	S			
Conduct. (µmhos/cm)	5299	5285	5280				
DO (mg/L)	3.51	3.50	3.61	A			
pH (Std. Units)	6.42	6.42	6.42	M			
Eh/ORP (millivolts)	-68.8	-68.2	-68.5				
Turbidity (NTU)	0.87	0.56	0.61	P			
Flow (ml/min)	350	350	350	L			
Depth To Water (ft)	14.19	14.19	14.19	E			
Cumulative Purge Vol. (gal or L)							

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: _____		

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1LA	1310	none	
VPH	N	HCl	3	40mlA	1310	none	

- Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of ___
Spectra Weymouth C/S	HO143.0000	1/3/17 1235	

TRC Personnel: BA

Well ID: MW-400

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Peristaltic Pump

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground): BA N/A 2 ft.

Riser Stick-up (from ground): BA N/A 2 ft.

WELL DIAMETER: ☑ 2 inch ☐ 4 inch ☐ 6 inch

Other: ___

WELL MATERIAL: ☑ PVC ☐ SS

Other: ___

Well Depth ___ ft. ☒ top of riser ☐ top of casing ☐ ___ ☑ measured ☐ historical

Water Depth 13.31 ft.

Well Volume ___

LNAPL/DNAPL Depth = ___

NAPL Thickness = ___

Depth of pump intake: ___

Static water level after pump put into well: ___

Initial purge Rate/ Water Level (100-400 ml/min): 220

Adjusted purge Rates/time/WL(record changes): 260

Flow rate at time of sampling: 260

Total volume of water purged: ___

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1235	1240	1245	1250	1255	1300	1305	1310	1315
Temp. (°C)	Start	12.37	12.24	12.15	12.07	12.0	12.06	12.09	12.11
Conduct. (µmhos/cm)	Purge	4136.4	4127.6	4114.3	4117.7	4128.9	4150.5	4163.1	4171.1
DO (mg/L)		1.23	1.24	3.47	4.46	4.52	4.56	4.49	4.47
pH (su)		6.45	6.39	6.37	6.36	6.36	6.35	6.35	6.35
ORP (millivolts)		151.5	143.6	137.1	131.5	130.6	126.2	120.3	120.4
Turbidity (NTU)			29.6	24.3	21.6	17.7	7.40	2.27	2.17
Flow (ml/min)	220	260	→	→	→	→	→	→	→
Depth To Water (ft)	11.31	11.35	11.37	→	→	→	→	→	→
Cumulative Purge Vol. (gal or L)									

Time	1320	1325	1330	1335		
Temp. (°C)	12.18	12.18	12.28	12.16		
Conduct. (µmhos/cm)	4187.2	4199.8	4198.8	4211.1		
DO (mg/L)	4.47	4.63	4.72	4.75		
pH (Std. Units)	6.35	6.35	6.34	6.35		
Eh/ORP (millivolts)	119.8	118.6	117.7	116.9		
Turbidity (NTU)	2.31	2.10	1.96	1.90		
Flow (ml/min)	260	→	→	→		
Depth To Water (ft)	11.39	→	→	→		
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	✓	✓
Submersible Pump		
Bladder Pump		
Bailer		
Other: ___		

Comments: Clear, N/O, N/S

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VPH	N	HNO_3	2	3 X 40mL	1335		
EPH		HCl	3	1L Amber	↓		↓

- Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

TRC

Groundwater Field Data Record

Project: Spectra	Project No.: 140145	Date/Time: 1/31/17	Sheet 1 of 1

TRC Personnel: Kelly Nee

Well ID: MW-401

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: YSI

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: _____

WELL MATERIAL

[X] PVC [ ] SS

Other: _____

Well Depth _____ ft. [X] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth 14.38 ft.

Well Volume _____

LNAPL/DNAPL Depth = —

NAPL Thickness = —

Depth of pump intake: ~18ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 200 ml/min

Adjusted purge Rates/time/WL(record changes)

200 → 150 @ 1305

Flow rate at time of sampling: 150 ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1255	1300	1305	1310	1315	1320	1325	1330	1335
Temp. (°C)	P	12.40	12.39	12.51	12.50	12.53	12.69	12.71	12.72
Conduct. (µmhos/cm)		29077	29005	29026	29035	29219	29381	29382	29410
DO (mg/L)	R	1.86	1.71	1.73	1.70	1.60	1.58	1.54	1.55
pH (su)		7.02	7.02	7.02	7.03	7.01	7.01	7.01	7.02
ORP (millivolts)	E	21.2	21.2	20.6	20.5	19.6	19.5	16.9	15.0
Turbidity (NTU)		2.95	3.05	2.97	3.75	2.01	3.23	4.01	3.02
Flow (ml/min)	200	200	150	150	150	150	150	150	150
Depth To Water (ft)		14.42	14.42	14.42	14.42	14.42	14.42	14.42	14.42
Cumulative Purge Vol. (gal or L)									

Time	1340	1345	1350	1350		
Temp. (°C)	12.69	12.71	12.73	S		
Conduct. (µmhos/cm)	29398	29518	29879	A		
DO (mg/L)	1.55	1.54	1.54	M		
pH (Std. Units)	7.02	7.02	7.02	P		
Eh/ORP (millivolts)	14.6	14.2	14.1	L		
Turbidity (NTU)	3.12	3.11	3.60	E		
Flow (ml/min)	150	150	150	S		
Depth To Water (ft)	14.42	14.42	14.42			
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria*
(3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: _____		

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1 L A	1350	none	
VPH	N	HCl	3	40 mL A	1350	none	

- Consult the applicable regulatory guidance for the specific criteria.

Signed: Kelly Nee

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140143	1/5/17	

TRC Personnel: Kelleher Shea

Well ID: MW-402

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: YSI

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch — Other: _____

WELL MATERIAL: [X] PVC [ ] SS — Other: _____

Well Depth _____ ft. [ ] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth 14.99 ft. Well Volume _____

LNAPL/DNAPL Depth = —

NAPL Thickness = —

Depth of pump intake: ~15ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 350ml/min

Adjusted purge Rates/time/WL(record changes)

350 @ 300 @ 0840

Flow rate at time of sampling: 300ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	0835	0840	0845	0850	0855	0900	0905	0910	0915
Temp. (°C)	P	14.00	14.03	14.4	14.12	14.18	14.18	14.19	14.25
Conduct. (µmhos/cm)	U	35318	34305	34309	35031	36161	36165	35545	35545
DO (mg/L)	R	1.11	1.44	1.21	1.44	1.16	1.18	1.56	1.51
pH (su)	G	6.59	6.66	6.62	6.64	6.67	6.67	6.65	6.68
ORP (millivolts)	E	2.8	-25.2	-31.2	-44.2	-54.3	-54.6	-61.4	-61.6
Turbidity (NTU)		10.3	5.81	1.41	1.24	31.55	21.78	0.87	0.51
Flow (ml/min)	350	350	300	300	300	300	300	300	300
Depth To Water (ft)	14.99	15.03	15.03	15.03	15.03	15.03	15.03	15.03	15.03
Cumulative Purge Vol. (gal or L)									

Time	0920	0925	0930	0930		
Temp. (°C)	14.19	14.21	14.20	S		
Conduct. (µmhos/cm)	34925	34953	34968	A		
DO (mg/L)	1.52	1.59	1.60	M		
pH (Std. Units)	6.69	6.70	6.70	P		
Eh/ORP (millivolts)	-66.9	-66.8	-67.1	L		
Turbidity (NTU)	0.79	0.83	0.92	E		
Flow (ml/min)	300	300	300			
Depth To Water (ft)	15.03	15.03	15.03			
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other:		

Comments: Were particles (yellow) precipitate that accumulated at bottom of purge bucket

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1LA	0930	none	
VPH	N	HCl	3	40mLA	0930	none	

- Consult the applicable regulatory guidance for the specific criteria.

Signed: Kelleher Shea

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet ___ of ___
Spectra Vegetation CS	149443.0000 -403	1/4/17 1355	Sheet 1 of 1

TRC Personnel: BA

Well ID: MW-403

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Peristaltic

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground): 2 ft.

Riser Stick-up (from ground): 2 ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: ____

WELL MATERIAL: [X] PVC [ ] SS

Other: ____

Well Depth ____ ft. [X] top of riser [ ] top of casing [ ] ____ [X] measured [ ] historical

Water Depth 13.65 ft.

Well Volume ____

LNAPL/DNAPL Depth = ____

NAPL Thickness = ____

Depth of pump intake: 18'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 270

Adjusted purge Rates/time/WL(record changes)

Flow rate at time of sampling: 270

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1355	1400	1405	1410	1415	1420	1425	1430	1435
Temp. (°C)	Start	13.46	13.94	13.51	13.65	13.69	13.41	13.67	13.63
Conduct. (µmhos/cm)	Purge	29052	29431	29606	31343	33593	34172	34379	36967
DO (mg/L)		4.47	4.52	4.69	3.80	3.43	3.21	3.03	2.53
pH (su)		6.47	6.46	6.42	6.39	6.37	6.36	6.36	6.35
ORP (millivolts)		62.4	62.9	63.4	67.4	64.2	69.7	69.6	70.6
Turbidity (NTU)		6.91	6.32	4.48	3.72	3.69	3.60	3.14	2.71
Flow (ml/min)		270	→	→	→	→	→	→	→
Depth To Water (ft)	13.65	13.67	→	→	→	→	→	→	→
Cumulative Purge Vol. (gal or L)									

Time	1440	1445	1450	1455		
Temp. (°C)	13.61	13.56	13.59	13.60		
Conduct. (µmhos/cm)	36946	37821	38675	39272		
DO (mg/L)	2.61	2.76	2.53	2.61		
pH (Std. Units)	6.35	6.34	6.34	6.34		
Eh/ORP (millivolts)	70.7	70.7	71.7	72.5		
Turbidity (NTU)	2.96	2.87	2.74	2.68		
Flow (ml/min)	270	→	→	→		
Depth To Water (ft)	13.67	→	→	→		
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: ____		

Comments: Clear, NO, NS

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VPH	N	HCl	3	40mL Ambers	1455		MW-403
EPH	↓	↓	2	1 L Ambers	↓		↓

- Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140143	1/5/17	

TRC Personnel: Kolleen Allen

Well ID: MW-404

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment:

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: ☐ 2 inch ☑ 4 inch ☐ 6 inch

Other: _____

WELL MATERIAL: ☑ PVC ☐ SS

Other: _____

Well Depth _____ ft. ☐ top of riser ☐ top of casing ☐ _____ ☐ measured ☐ historical

Water Depth 12.85 ft. 11.94 ft

Well Volume _____ LNAPL/DNAPL Depth = sheen

NAPL Thickness = _____

Depth of pump intake: ~18ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 400 ml/min

Adjusted purge Rates/time/WL(record changes): 400 → 375 @ 1315

Flow rate at time of sampling: 375

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1310	1315	1320	1325	1330	1335	1340	1345	1350
Temp. (°C)	13.21	13.37	13.33	13.37	13.35	13.38	13.43	13.44	13.44
Conduct. (µmhos/cm)	45777	45774	45768	45746	45758	45760	45761	45781	45793
DO (mg/L)	1.02	0.55	0.53	0.49	0.47	0.46	0.45	0.42	0.41
pH (su)	6.54	6.40	6.40	6.35	6.34	6.34	6.33	6.32	6.32
ORP (millivolts)	-25.6	-13.5	-13.3	-11.9	-12.0	-12.0	-12.0	-11.6	-11.5
Turbidity (NTU)	4.51	6.59	5.66	3.69	3.25	3.77	3.53	3.21	7.34
Flow (ml/min)	400	400	~~375~~	375	375	375	375	375	375
Depth To Water (ft)	12.85	12.88	12.88	12.88	12.88	12.88	12.88	12.88	12.88
Cumulative Purge Vol. (gal or L)									

Time	1355	1400	1405	1405			Stabilization Criteria* (3 consecutive readings)
Temp. (°C)	13.44	13.44	13.44	S			- Temperature: ± 3 %
Conduct. (µmhos/cm)	45780	45778	45781	A			- Conduct. (µmhos/cm): ± 3 %
DO (mg/L)	0.42	0.43	0.43	M			- DO (mg/L): ± 10 % (for values >0.5 mg/L)
pH (Std. Units)	6.31	6.31	6.31	P			- pH (Std. Units): ± 0.1 SU
Eh/ORP (millivolts)	-11.5	-11.5	-11.9	L			- ORP (millivolts): ± 10 mV
Turbidity (NTU)	3.50	2.96	2.20	E			- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
Flow (ml/min)	375	375	375				- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)
Depth To Water (ft)	12.88	12.88	12.88				
Cumulative Purge Vol. (gal or L)							

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: _____		

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1 Lh	1405	none	
VPH	N	HCl	3	40 mL VOA	1405	none	

- Consult the applicable regulatory guidance for the specific criteria.

Signed: Kolleen Allen

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140145	1/4/17	

TRC Personnel: Kolleen Rea

Well ID: MW-405

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: YSI

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: _____

WELL MATERIAL: [✓] PVC [ ] SS

Other: _____

Well Depth _____ ft. [X] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth 14.33 ft.

Well Volume _____

LNAPL/DNAPL Depth = —

NAPL Thickness = —

Depth of pump intake: ~18'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 400 ml/min

Adjusted purge Rates/time/WL(record changes)

100 @ 375 @ 1355

Flow rate at time of sampling: 375 ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1350	1355	1400	1405	1410	1415	1420	1425	1430
Temp. (°C)	F	15.06	15.08	15.11	15.03	15.05	15.06	15.07	15.11
Conduct. (µmhos/cm)		32545	33158	35207	35397	36880	36920	36881	36981
DO (mg/L)	V	1.03	1.08	0.74	0.66	0.59	0.57	0.53	0.53
pH (su)	R	5.84	5.86	5.89	5.89	5.88	5.88	5.88	5.87
ORP (millivolts)	G	98.2	98.9	101.2	101.1	101.1	101.2	101.1	101.0
Turbidity (NTU)	E	6.64	3.95	3.52	2.38	1.79	1.50	1.02	1.31
Flow (ml/min)	400	400	375	375	375	375	375	375	375
Depth To Water (ft)	14.33	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35
Cumulative Purge Vol. (gal or L)									

Time	1435	1440	1440				
Temp. (°C) 1635 1/4 15.11	~~37141~~	~~37359~~	15.11 1/4				
Conduct. (µmhos/cm)	37141	37359	A				
DO (mg/L)	0.54	0.53					
pH (Std. Units)	5.87	5.87	M				
Eh/ORP (millivolts)	101.0	101.1	P				
Turbidity (NTU)	1.01	1.97	L				
Flow (ml/min)	375	375					
Depth To Water (ft)	14.33	14.33	E				
Cumulative Purge Vol. (gal or L)							

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: _____		

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1-L A	1440	none	
VPH	N	HCl	3	40ml A	1440	none	

* Consult the applicable regulatory guidance for the specific criteria.

Signed: Kolleen Rea

Rev: April 2014

TRC

Groundwater Field Data Record

Project: Sherwin Williams 4403 | Project No.: 140433.0002.4403 | Date/Time: 1/5/17 1510 | Sheet 1 of 1

TRC Personnel: BA | Well ID: MW-406 DUP-2

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Peristaltic

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground) 2 ft.

Riser Stick-up (from ground) 2 ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: ____

WELL MATERIAL: [✓] PVC [ ] SS

Other: ____

Well Depth ____ ft. [X] top of riser [ ] top of casing [X] measured [ ] historical

Water Depth 13.84 ft. LNAPL/DNAPL Depth = 13.80

Well Volume ____ NAPL Thickness = 0.04

Depth of pump intake: 18'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 250

Adjusted purge Rates/time/WL(record changes) 320

Flow rate at time of sampling: 320

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1510	1515	1520	1525	1530	1535	1540	1545	1550
Temp. (°C)	Start	12.56	12.61	12.59	12.62	12.70	12.66	12.62	12.57
Conduct. (µmhos/cm)	Pumping	9736	26311	27401	26407	28614	35281	37205	37477
DO (mg/L)	↓	11.12	3.74	3.01	2.86	2.25	1.80	1.87	2.00
pH (su)		6.91	6.73	6.27	6.19	6.18	6.19	6.22	6.22
ORP (millivolts)		-104.4	-93.6	-84.9	-80.9	-77.4	-73.7	-76.1	-77.2
Turbidity (NTU)	↓	000		20.3	13.9	10.1	8.92	7.31	4.22
Flow (ml/min)	250	320	→	→	→	→	→	→	→
Depth To Water (ft)	13.84	13.89	→	→	→	→	→	→	→
Cumulative Purge Vol. (gal or L)									

Time	1555	1600				
Temp. (°C)	12.59	12.61				
Conduct. (µmhos/cm)	37711	37812				
DO (mg/L)	2.10	2.13				
pH (Std. Units)	6.22	6.22				
Eh/ORP (millivolts)	-78.7	-79.3				
Turbidity (NTU)	3.97	3.74				
Flow (ml/min)	320	→				
Depth To Water (ft)	13.89	→				
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: ____		

Comments:
Product @ 13.80' DTW: 13.84'
Tubing able to pierce through product and into water table
Clear, Sl. odor, Sl. Sheen

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VOA	N	HCl	3	40 mL Amber	1600		MW-406 DUP-2
EPH	↓	↓	2	1 L Amber	↓		↓

* Consult the applicable regulatory guidance for the specific criteria.

Signed: ____

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140143	1/5/17	

TRC Personnel: Kollenkiea

Well ID: MW-407

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment:

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: ☐ 2 inch ☐ 4 inch ☐ 6 inch

Other: _____

WELL MATERIAL: ☒ PVC ☐ SS

Other: _____

Well Depth _____ ft. ☒ top of riser ☐ top of casing ☐ measured ☐ historical

Water Depth 14.57 ft. LNAPL/DNAPL Depth = 14.54

Well Volume _____ NAPL Thickness = .03

Depth of pump intake: ~ 18ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 300

Adjusted purge Rates/time/WL(record changes)

Flow rate at time of sampling: 350 ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1515	1520	1525	1535	1540	1545	1550	1555	1600
Temp. (°C)	P	13.12	13.14	13.13	13.24	13.24	13.28	13.31	13.32
Conduct. (µmhos/cm)		18080	15065	17947	15014	18001	18013	18020	18035
DO (mg/L)	U	1.74	2.05	9.09	1.87	1.89	1.87	1.89	1.91
pH (su)	R	6.54	6.54	6.53	6.55	6.55	6.55	6.55	6.55
ORP (millivolts)	G	-116.6	-116.7	-114.8	-120.0	-126.0	-127.0	-128.1	-127.9
Turbidity (NTU)	E	11.11	10.16	5.52	3.77	3.09	2.65	2.37	3.15
Flow (ml/min)		350	350	350	350	350	350	350	350
Depth To Water (ft)	14.57	14.57	14.57	14.57	14.57	14.57	14.57	14.57	14.57
Cumulative Purge Vol. (gal or L)									

Time	1605	1610	1610			
Temp. (°C)	13.32	13.33	S			
Conduct. (µmhos/cm)	18016	18000	A			
DO (mg/L)	1.92	1.89	M			
pH (Std. Units)	6.55	6.55	P			
Eh/ORP (millivolts)	-129.2	-128.4	L			
Turbidity (NTU)	3.12	3.05	E			
Flow (ml/min)	350	350				
Depth To Water (ft)	14.57	14.57				
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)
- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	☒	☒
Submersible Pump	☐	☐
Bladder Pump	☐	☐
Bailer	☐	☐
Other: _____	☐	☐

Comments: faint sheen in water, dump in drum

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1L A	1610		
VPH	N	HCl	3	40mL A	1610		

* Consult the applicable regulatory guidance for the specific criteria.

Signed: _____

Rev: April 2014

TRC

Groundwater Field Data Record

Project: Spectra Weymouth C/S 4003 | Project No.: 140483.0000 | Date/Time: 1/5/17 0845 | Sheet 1 of 1

TRC Personnel: BA | Well ID: MW-408

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present	✓	

Sampling Equipment: Peristaltic Pump

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground) 2 ft.

Riser Stick-up (from ground) 2 ft.

WELL DIAMETER: ✓ 2 inch; 4 inch; 6 inch; Other:

WELL MATERIAL: [x] PVC; [ ] SS; Other:

Well Depth ____ ft. ✓ top of riser; top of casing; ✓ measured; historical

Water Depth 13.36 ft. | Well Volume ____ | LNAPL/DNAPL Depth = ____ | NAPL Thickness = ____

Depth of pump intake: 19'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 230

Adjusted purge Rates/time/WL(record changes): 280, 300

Flow rate at time of sampling: 300

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	0845	0850	0855	0900	0905	0910	0915	0920	0925
Temp. (°C)	Start	10.31	11.08	10.98	11.39	11.46	11.36	11.35	11.38
Conduct. (µmhos/cm)	purge	6741	7592	7240	6697	6621	6774	6731	6744
DO (mg/L)	↓	6.31	7.69	6.44	7.41	7.24	6.91	6.44	7.31
pH (su)		6.87	6.91	6.86	6.79	6.78	6.76	6.75	6.75
ORP (millivolts)		-130.3	-128.8	-134.2	-151.3	-152.8	-150.8	-154.1	-153.7
Turbidity (NTU)		73.4	68.3	57.4	41.6	35.4	27.1	24.3	18.4
Flow (ml/min)	230	230	280	300	→	→	→	→	→
Depth To Water (ft)	13.36	13.39	13.39	→	→	→	→	→	→
Cumulative Purge Vol. (gal or L)									

Time	0930	0935	0940	0945	0950
Temp. (°C)	11.41	11.63	11.33	11.46	11.60
Conduct. (µmhos/cm)	6725	6954	6568	6454	6457
DO (mg/L)	4.31	4.24	4.11	4.03	3.97
pH (Std. Units)	6.74	6.72	6.76	6.74	6.76
Eh/ORP (millivolts)	-155.5	-160.3	-163.4	-165.0	-162.1
Turbidity (NTU)	16.7	12.7	4.75	5.73	7.31
Flow (ml/min)	300	→	→	→	→
Depth To Water (ft)	13.39	→	→	→	→
Cumulative Purge Vol. (gal or L)					

Stabilization Criteria* (3 consecutive readings)
- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	✓	✓
Submersible Pump		
Bladder Pump		
Bailer		
Other:		

Comments: Clear, N/O, N/S

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VPH	N	HCl	3	3 40ML Amber	0950		MW-408
EPH	↓	↓	2	1L Amber	↓		↓

* Consult the applicable regulatory guidance for the specific criteria.

Signed:

TRC

Groundwater Field Data Record

Project: Spectra Weymouth C/S — Project No.: 140113.0004.4403 — Date/Time: 1/4/17 1025 — Sheet 1 of 1

TRC Personnel: BA — Well ID: MW-409

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Peristaltic pump

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground) 2 ft.

Riser Stick-up (from ground) 2 ft.

WELL DIAMETER: ☑ 2 inch ☐ 4 inch ☐ 6 inch — Other:

WELL MATERIAL: ☑ PVC ☐ SS — Other:

Well Depth ____ ft. ☑ top of riser ☐ top of casing ☐ ____ — ☑ measured ☐ historical

Water Depth 13.08 ft. — Well Volume ____ — LNAPL/DNAPL Depth = ____ — NAPL Thickness = ____

Depth of pump intake: 15'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 220

Adjusted purge Rates/time/WL(record changes): 270

Flow rate at time of sampling: 270

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1035	1040	1045	1050	1055	1100	1105	1110	1115
Temp. (°C)	Start		12.23	12.29	12.37	12.50	12.85	12.66	12.14
Conduct. (µmhos/cm)	Purge		6057	7107	6688	6540	3568	6321	6440
DO (mg/L)	↓		6.97	~~6.99~~ 2.99	10.14	11.40	8.85	10.91	10.58
pH (su)	↓		6.85	6.71	6.64	6.70	6.70	6.69	6.67
ORP (millivolts)	↓		-130.0	-127.2	-134.1	-136.7	-133.3	-135.7	-139.9
Turbidity (NTU)	↓		21.6	14.1	10.2	8.16	5.01	7.91	7.31
Flow (ml/min)	~~220~~ 270	270	→	→	→	→	→	→	→
Depth To Water (ft)	~~13.08~~ 13.17	13.17	13.18	→	→	→	→	→	→
Cumulative Purge Vol. (gal or L)									

Time	1120	1125	1130	1135	1140	1145
Temp. (°C)	12.34	12.10	12.31	12.37	12.38	
Conduct. (µmhos/cm)	6315	6251	6166	6260	6269	
DO (mg/L)	9.92	9.54	7.93	7.35	7.39	
pH (Std. Units)	6.68	6.68	6.69	6.69	6.68	
Eh/ORP (millivolts)	-144.0	-145.9	-149.9	-150.3	-151.0	
Turbidity (NTU)	6.21	4.73	3.74	2.94	2.91	
Flow (ml/min)	270	→	→	→	→	
Depth To Water (ft)	13.18	→	→	→	→	
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)
- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other:		

Comments: Clear, NO, NS

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1L Amber	1140		MW-409
VPH	↓	↓	3	40mL Amber	↓		↓

- Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

TRC

a Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
SPECTRA Weymouth	140143	11/20/17	

TRC Personnel: Kathleen Mac

Well ID: MW-410

NTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Pumstalnc

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: _____

WELL MATERIAL: [X] PVC [ ] SS

Other: _____

Well Depth _____ ft. [ ] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth _____ ft.

Well Volume _____

LNAPL/DNAPL Depth = 13.02

NAPL Thickness = _____

Depth of pump intake: 18 ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min):

Adjusted purge Rates/time/WL(record changes)

Flow rate at time of sampling: 300 mL/m

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1135	1140	1145	1150	1155	1200	1205	1210	1215	
Temp. (°C)		11.78	11.83	11.83	11.76	11.78	11.85	11.78	11.79	
Conduct. (µmhos/cm)		31990	35268	35521	35898	36233	36653	36901	36920	
DO (mg/L)		4.91	4.66	4.73	4.81	4.93	5.10	5.26	5.30	
pH (su)		6.68	6.51	6.49	6.46	6.44	6.41	6.39	6.39	
ORP (millivolts)		-74.2	-24.8	-27.8	-26.0	-24.3	-24.2	-39.6	-41.6	
Turbidity (NTU)		22.3	12.7	8.07	8.04	5.59	2.84	2.98	2.88	
Flow (ml/min)		300	300	300	300	300	300	300	300	
Depth To Water (ft) Initial	13.02	—	—	—	—	—	—	—	—	
Cumulative Purge Vol. (gal or L)										

Time	1220	1225	1230	1230			
Temp. (°C)	11.81	11.80	11.79	S			
Conduct. (µmhos/cm)	37011	37121	37210	A			
DO (mg/L)	5.34	5.37	5.40	M			
pH (Std. Units)	6.37	6.37	6.37	P			
Eh/ORP (millivolts)	-43.3	-45.9	-46.2	L			
Turbidity (NTU)	1.35	0.89	1.20	E			
Flow (ml/min)	300	300	300				
Depth To Water (ft)	—	—	—				
Cumulative Purge Vol. (gal or L)							

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: _____		

Comments: Final DTP: 13.05 FT

dump ~6 gallons of water into labeled drum

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1L	1230	MA	
VPH	N	HCl	3	40mL	1230	NA	

- Consult the applicable regulatory guidance for the specific criteria.

Signed: Kathleen Mac

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	14043	1/4/17	

TRC Personnel: Kolleen Shea

Well ID: MW-411

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: YSI

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: _____

WELL MATERIAL: [✓] PVC [ ] SS

Other: _____

Well Depth _____ ft. [X] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth 12.86 ft.

Well Volume _____

LNAPL/DNAPL Depth = —

NAPL Thickness = —

Depth of pump intake: ~18ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): ~18ft

Adjusted purge Rates/time/WL(record changes)

400@375@1040

Flow rate at time of sampling: 375ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1035	1040	1045	1050	1055	1100	1105	1110	1115
Temp. (°C)	P	13.73	13.71	13.68	13.70	13.68	13.66	13.67	13.67
Conduct. (µmhos/cm)	U	29071	28986	28983	28826	28826	28658	28126	29135
DO (mg/L)	K	1.01	.99	.56	.61	.52	.49	.49	.51
pH (su)	G	6.03	6.02	6.02	6.03	6.02	6.02	6.03	6.03
ORP (millivolts)	#	-39.3	-40.7	-46.6	-49.4	-52.9	-54.2	-57.9	-57.8
Turbidity (NTU)	C	5.50	4.60	4.12	4.05	4.39	4.05	3.82	3.92
Flow (ml/min)	400	400	375	375	375	375	375	375	375
Depth To Water (ft)	12.86	12.88	12.88	12.88	12.88	12.88	12.89	12.89	12.89
Cumulative Purge Vol. (gal or L)									

Time	1120	1125	1125			
Temp. (°C)	13.72	13.71	S			
Conduct. (µmhos/cm)	29139	29135	S			
DO (mg/L)	.51	.52	A			
pH (Std. Units)	6.02	6.02	M			
Eh/ORP (millivolts)	-58.3	-58.5	P			
Turbidity (NTU)	4.12	3.84	L			
Flow (ml/min)	375	375	E			
Depth To Water (ft)	12.89	12.89				
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Baifer		
Other: _____		

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
FPH	N	HCl	2	1LA	1125	None	
VPH	N	HCl	3	40mL A	1125	None	

- Consult the applicable regulatory guidance for the specific criteria.

Signed: Kolleen Shea

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	143140	1/5/17	

TRC Personnel: Kolloensuu **Well ID:** MW-41A (DUP-1)

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: ______

Flow-thru Cell Volume: ______

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up (from ground) ______ ft.

Riser Stick-up (from ground) ______ ft.

WELL DIAMETER: ☐ 2 inch ☒ 4 inch ☐ 6 inch Other: ______

WELL MATERIAL: ☒ PVC ☐ SS Other: ______

Well Depth ______ ft. ☒ top of riser ☐ top of casing ☐ ______ ☐ measured ☐ historical

Water Depth 13.37 ft. Well Volume ______

LNAPL/DNAPL Depth = ______

NAPL Thickness = Sheen

Depth of pump intake: ~18 ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 250 ml/min

Adjusted purge Rates/time/WL (record changes): 250 → 200 @ 1040

Flow rate at time of sampling: 200 ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1035	1040	1045	1050	1055	1100	1105	1110	1115
Temp. (°C)	P	12.64	12.57	12.49	12.55	12.59	12.61	12.68	12.70
Conduct. (µmhos/cm)	U	30388	30392	30397	30385	30395	30365	30345	30333
DO (mg/L)	R	1.38	1.13	1.15	1.03	1.07	0.98	0.99	0.94
pH (su)	G	6.30	6.24	6.24	6.22	6.22	6.21	6.20	6.20
ORP (millivolts)	E	8.5	11.8	12.68	11.4	11.4	13.1	12.9	13.2
Turbidity (NTU)		21.0	12.8	11.08	9.21	7.28	6.65	7.10	6.44
Flow (ml/min)	250	250	200	200	200	200	200	200	200
Depth To Water (ft)	13.37	13.42	13.42	13.42	13.42	13.42	13.42	13.42	13.42
Cumulative Purge Vol. (gal or L)									

Time	1120	1125	1130	1130		
Temp. (°C)	12.68	12.67	12.66	S		
Conduct. (µmhos/cm)	30359	30326	30327	A		
DO (mg/L)	0.92	0.92	0.91	M		
pH (Std. Units)	6.19	6.18	6.19	P		
Eh/ORP (millivolts)	14.6	14.4	15.4	L		
Turbidity (NTU)	4.89	4.48	4.47	E		
Flow (ml/min)	200	200	200			
Depth To Water (ft)	13.42	13.42	13.42			
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)
- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: ______		

Comments: ~~fluffy brownish precipitate~~ fluffy brownish precipitate at bottom of purge bucket

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1 LA	1130	~~None~~	DUP-1
VPH	N	HCl	3	40 MLA	1130	~~None~~	DUP-1

- Consult the applicable regulatory guidance for the specific criteria.

Signed: Kolloensuu

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet
Spectra Weymouth C/S	MCMS.0000.4433	1/3/17 1030	Sheet 1 of 1

TRC Personnel: BA

Well ID: MW-4/13

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present	✓	

Sampling Equipment: Peristaltic

Flow-thru Cell Volume:

Protective Casing Stick-up (from ground): 2 ft.

Riser Stick-up (from ground): 2 ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: ______

Well Depth ______ ft. [X] top of riser [ ] top of casing [ ] ______ [X] measured [ ] historical

Water Depth 13.71 ft.

Well Volume ______

LNAPL/DNAPL Depth = ______

NAPL Thickness = ______

Depth of pump intake: 18'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 300

Adjusted purge Rates/time/WL(record changes): 330

PID SCREENING MEAS.

Background	
Well Mouth	

WELL MATERIAL

[X] PVC [ ] SS

Other: ______

Flow rate at time of sampling: 330

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1030	1035	1040	1045	1050	1055	1100	1105	1110
Temp. (°C)	Start	11.64	11.88	12.14	12.10	11.93	11.91	11.75	11.70
Conduct. (µmhos/cm)	Purge	26013	26174	27066	27641	27655	27806	27884	28030
DO (mg/L)	↓	5.21	4.95	4.29	4.02	3.86	3.30	3.59	1.80
pH (su)		6.37	6.33	6.26	6.24	6.20	6.18	6.17	6.17
ORP (millivolts)		-43.0	-41.4	-40.4	-38.7	-36.7	-34.5	-32.7	-30.2
Turbidity (NTU)		54.3	37.9	31.7	26.9	23.4	20.2	15.6	13.1
Flow (ml/min)	300	330	→						→
Depth To Water (ft)	13.71	13.75	→						→
Cumulative Purge Vol. (gal or L)									

Time	1115	1120	1125	1130	1135	1140
Temp. (°C)	11.74	11.88	11.72	12.07	11.98	12.09
Conduct. (µmhos/cm)	28134	28165	28128	28147	28150	28141
DO (mg/L)	1.74	1.57	1.50	1.13	1.21	1.21
pH (Std. Units)	6.16	6.16	6.16	6.16	6.16	6.16
Eh/ORP (millivolts)	-29.4	-27.3	-26.2	-25.7	-24.9	-24.6
Turbidity (NTU)	13.4	12.8	10.41	8.85	7.41	7.43
Flow (ml/min)	330	→				→
Depth To Water (ft)	13.75	→				→
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)
- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: ______		

Comments: Note: YSI DO readings high, recalibrated @ 1035, no readings then - Start @ 1040
Clear, Sl. sheen, Sl. petro odor

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VPH	N	HCl	3	40mL Amber	1140		
EPH	↓	↓	2	1L Amber	↓		↓

* Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

TRC

Groundwater Field Data Record

Project: Spectra Weymouth Project No.: 146943.4403

Date/Time: 1/6/17 1235

Sheet 1 of 1

TRC Personnel: BA

Well ID: MW-414

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Peristaltic

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground) 2 ft.

Riser Stick-up (from ground) 2 ft.

WELL DIAMETER: 2 inch [ ] 4 inch [X] 6 inch [ ]

Other: ____

WELL MATERIAL: PVC [X] SS [ ]

Other: ____

Well Depth ____ ft. [X] top of riser [ ] top of casing [ ] ____ [X] measured [ ] historical (Pre)

Water Depth 14.65 ft. LNAPL/DNAPL Depth = ~~14.68~~ 14.60 (3)

Well Volume ____ NAPL Thickness = 0.08 ~~0.05~~ (3)

Depth of pump intake: 18'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 300

Adjusted purge Rates/time/WL(record changes) 330

Flow rate at time of sampling:

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1235	1240	1245	1250	1255	1300	1305	1310	1315
Temp. (°C)	Start	12.05	12.11	12.27	12.16	12.06	12.16	12.17	12.21
Conduct. (µmhos/cm)	Purge	26107	26731	26688	26367	26195	26055	25745	25646
DO (mg/L)	↓	6.31	6.36	6.41	6.50	6.54	6.58	6.64	6.64
pH (su)	↓	6.26	6.26	6.24	6.22	6.21	6.21	6.21	6.21
ORP (millivolts)	↓	-32.4	-33.1	-35.1	-34.4	-34.3	-40.3	-42.2	-43.2
Turbidity (NTU)	↓	42.7	33.9	31.6	22.5	17.2	13.9	9.31	5.84
Flow (ml/min)	300	330	→	→	→	→	→	→	→
Depth To Water (ft)	14.65	→	→	→	→	→	→	→	→
Cumulative Purge Vol. (gal or L)									

Time	1320
Temp. (°C)	12.22
Conduct. (µmhos/cm)	25480
DO (mg/L)	6.70
pH (Std. Units)	6.21
Eh/ORP (millivolts)	-43.7
Turbidity (NTU)	7.31
Flow (ml/min)	330
Depth To Water (ft)	14.65
Cumulative Purge Vol. (gal or L)	

Stabilization Criteria* (3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: ____		

Comments: Clear, slight odor, Steam

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VPH	N	HCl	3	40mL Amber	1320		MW-414
EPH	"	"	2	1L Amber	"		"

- Consult the applicable regulatory guidance for the specific criteria.

Signed: ____

Rev: April 2014

TRC

Groundwater Field Data Record

Project: Spectrum/Plymouth CS
Project No.: MOMA 000.4603
Date/Time: 1/5/17 1310
Sheet 1 of 1

TRC Personnel: BA
Well ID: MW-415

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Peristaltic

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground) 2 ft.

Riser Stick-up (from ground) 2 ft.

WELL DIAMETER [X] 2 inch [ ] 4 inch [ ] 6 inch

Other:

WELL MATERIAL [X] PVC [ ] SS

Other:

Well Depth ____ ft. [X] top of riser [ ] top of casing; [X] measured [ ] historical

Water Depth 15.35 ft.

Well Volume

LNAPL/DNAPL Depth =

NAPL Thickness =

Depth of pump intake: 18'

Static water level after pump put into well:

Initial purge Rate/Water Level (100-400 ml/min): 260

Adjusted purge Rates/time/WL(record changes): 300, 330

Flow rate at time of sampling: 330

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	1310	1315	1320	1325	1330	1335	1340	1345	1350
Temp. (°C)	Start Purge	13.03	13.45	13.33	13.65	13.58	13.98	14.01	13.83
Conduct. (µmhos/cm)		25452	25446	25622	25768	25797	25953	26093	26100
DO (mg/L)		1.79	1.89	1.76	1.34	1.22	0.51	0.99	1.05
pH (su)		6.78	6.75	6.72	6.72	6.72	6.72	6.70	6.73
ORP (millivolts)		-43.1	-56.2	-67.8	-72.7	-74.6	-81.0	-85.3	-88.4
Turbidity (NTU)		7.86	4.97	3.98	2.80	2.63	1.65	1.37	1.21
Flow (ml/min)	260	300	330	→					
Depth To Water (ft)	15.35	15.39	→						
Cumulative Purge Vol. (gal or L)									

Time	1355	1400	1405	1410	1415	1420
Temp. (°C)	13.84	13.87	13.86	13.86	14.03	14.01
Conduct. (µmhos/cm)	26069	26031	26100	26059	26071	26107
DO (mg/L)	1.19	1.24	1.37	1.55	1.41	1.39
pH (Std. Units)	6.73	6.73	6.73	6.74	6.74	6.74
Eh/ORP (millivolts)	-89.4	-93.4	-97.6	-98.3	-101.2	-103.4
Turbidity (NTU)	0.99	0.91	0.84	0.75	0.59	0.61
Flow (ml/min)	330	→				
Depth To Water (ft)	15.39	→				
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria* (3 consecutive readings)
- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other:		

Comments: Clear, Sheen, Sl. Petro odor

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
VPH	N	HCl	3	40ml Amb	1420		MW-415
EPH	↓	↓	2	1 L Amb	↓		↓

- Consult the applicable regulatory guidance for the specific criteria.

Signed: [signature]

Rev: April 2014

TRC

Groundwater Field Data Record

Project: Spectra Weymouth C/S | Project No.: 420143.0000 | Date/Time: 1/3/17 0945 | Sheet 1 of 8

TRC Personnel: BA | Well ID: BMW-41B

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: Peristaltic Pump

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	
Well Mouth	

Protective Casing Stick-up (from ground): N/A ft.

Riser Stick-up (from ground): N/A ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch — Other: ____

WELL MATERIAL: [X] PVC [ ] SS — Other: ____

Well Depth ____ ft. [X] top of riser [ ] top of casing [ ] ____ | [X] measured [ ] historical

Water Depth 11.32 ft. | Well Volume ____ | LNAPL/DNAPL Depth = ____ | NAPL Thickness = ____

Depth of pump intake: 18'

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 240 ML/MIN

Adjusted purge Rates/time/WL(record changes): 270 ML/MIN

Flow rate at time of sampling: 270 m/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	0945	0950	0955	1000	1005	1010	1015	1020	1025
Temp. (°C)	Start Purge	11.93	11.91	11.81	11.98	11.86	11.90	11.94	
Conduct. (µmhos/cm)			3174.6	3044.6	3369.0	3571.6	3361.6	3476.1	3481.0
DO (mg/L)		2.21	1.99	1.87	2.11	2.31	2.39	2.41	2.68
pH (su)		6.24	6.25	6.27	6.28	6.28	6.29	6.29	6.29
ORP (millivolts)		191.3	190.1	186.1	181.7	173.4	171.6	174.3	173.7
Turbidity (NTU)		OOR	24.6	24.7	22.7	19.3	17.6	15.5	17.1
Flow (ml/min)	240	270							
Depth To Water (ft)	11.32	11.37	11.37	11.38					
Cumulative Purge Vol. (gal or L)									

Time	1030	1035	1040	1045	1050	1055
Temp. (°C)	12.15	12.10	12.04	12.00	12.19	12.22
Conduct. (µmhos/cm)	3561.3	3571.0	3592	4016.0	3950.1	3957.6
DO (mg/L)	2.71	2.81	3.02	3.16	3.30	3.17
pH (Std. Units)	6.29	6.30	6.31	6.28	6.29	6.29
Eh/ORP (millivolts)	172.9	174.0	172.8	173.1	169.1	168.3
Turbidity (NTU)	16.7	17.2	17.0	22.1	10.01	8.27
Flow (ml/min)	270					
Depth To Water (ft)	10.38					
Cumulative Purge Vol. (gal or L)					5 gal	

Stabilization Criteria* (3 consecutive readings)
- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other: ____		

Comments: Clear, No Odor, No Sheen

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	~~ASTM~~ HCl	2	1L Amber	1055		MW-41B (D)
VPH	↓	HNO_3	3	3 40mL	↓		↓

- Consult the applicable regulatory guidance for the specific criteria.

Signed: ____

Rev: April 2014

TRC

Groundwater Field Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
Spectra	140143	11/3/17 0955	

TRC Personnel: Kaileen Shea

Well ID: MW417

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Sampling Equipment: YSI

Flow-thru Cell Volume:

PID SCREENING MEAS.

Background	—
Well Mouth	—

Protective Casing Stick-up _____ ft. (from ground)

Riser Stick-up (from ground) _____ ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

Other: _____

WELL MATERIAL: [✓] PVC [ ] SS

Other: _____

Well Depth — ft. [X] top of riser [ ] top of casing [ ] _____ [ ] measured [ ] historical

Water Depth 11.05 ft.

Well Volume _____

LNAPL/DNAPL Depth = —

NAPL Thickness = —

Depth of pump intake: ~17 ft

Static water level after pump put into well:

Initial purge Rate/ Water Level (100-400 ml/min): 200 ml/min

Adjusted purge Rates/time/WL(record changes) 200 @ 150 @ 1000

Flow rate at time of sampling: 150ml/min

Total volume of water purged:

FIELD WATER QUALITY MEASUREMENTS (record at appropriate intervals)

Time	0955	1000	1005	1010	1015	1020	1025	1030	1035
Temp. (°C)	11.62	11.93	11.93	11.94	11.94	11.95	11.99	12.03	12.11
Conduct. (µmhos/cm)	36131	35965	35964	35989	35954	36017	36052	36103	36152
DO (mg/L)	1.33	1.40	1.39	1.38	1.35	1.36	1.26	1.21	1.17
pH (su)	6.62	6.38	6.37	6.35	6.33	6.33	6.33	6.32	6.30
ORP (millivolts)	63.3	104.36	117.5	115.6	117.0	119.1	122.2	126.3	126.4
Turbidity (NTU)	19.37	15.53	15.41	14.32	12.91	10.51	9.97	9.56	10.01
Flow (ml/min)	200	150	150	150	150	150	150	150	150
Depth To Water (ft)	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07	11.07
Cumulative Purge Vol. (gal or L)									

Time	1040	1045				
Temp. (°C)	12.12	S				
Conduct. (µmhos/cm)	36163	A				
DO (mg/L)	1.17	M				
pH (Std. Units)	6.30	P				
Eh/ORP (millivolts)	126.9	L				
Turbidity (NTU)	9.98	E				
Flow (ml/min)	150					
Depth To Water (ft)	11.07					
Cumulative Purge Vol. (gal or L)						

Stabilization Criteria*
(3 consecutive readings)

- Temperature: ± 3 %
- Conduct. (µmhos/cm): ± 3 %
- DO (mg/L): ± 10 % (for values >0.5 mg/L)
- pH (Std. Units): ± 0.1 SU
- ORP (millivolts): ± 10 mV
- Turbidity (NTU): +/- 10 % (for values >5.0 NTUs)
- Drawdown: < 0.3 ft (can be greater as long as water level stabilizes above well screen)

	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Bailer		
Other:		

Comments:

Analytical Parameter	Filtered (Y/N)	Preservation	# Bottles	Size/Type Bottles	Time Collected	QC	Sample #
EPH	N	HCl	2	1LA	1045	None	MW-417
VPH	N	HCl	3	40mLA	1045	None	

* Consult the applicable regulatory guidance for the specific criteria.

Signed: Kaileen Shea

Rev: April 2014