PACIFIC groundwater GROUP

LOWER YAKIMA VALLEY GROUNDWATER MANAGEMENT AREA AMBIENT GROUNDWATER MONITORING WELL INSTALLATION REPORT

APRIL, 2019

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WELL INSTALLATION REPORT

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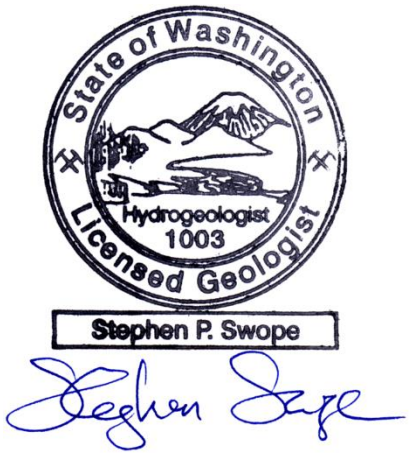
SIGNATURE

This report, and Pacific Groundwater Group's work contributing to this report, were reviewed by the undersigned and approved for release.



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1.0 INTRODUCTION

The Lower Yakima Valley (LYV) Groundwater Management Area (GWMA) was formed in 2011 in response to elevated nitrate concentrations in groundwater. The GWMA project is a multi-agency, citizen-based, coordinated effort to reduce groundwater nitrate concentrations in the LYV to below Washington State drinking water standards. The GWMA extends from Union Gap southeast to the Yakima County boundary, minus the Yakama Reservation (Figure 1).

The purpose of the ambient groundwater monitoring program was to develop a network of wells to measure baseline water quality conditions representative of the Groundwater Management Area. To achieve this goal, the Groundwater Advisory Committee (GWAC) for the Lower Yakima Valley Groundwater Management Area (GWMA) requested the design and installation of a purpose-built groundwater monitoring system to establish a baseline of groundwater quality conditions near the water table. The water table was targeted since little data from this zone exists, and because water quality changes associated with land use change will occur there before it occurs in deeper aquifers.

PGG was contracted by Yakima County to record geologic logs, observe monitoring well installations, perform short duration aquifer tests, and collect groundwater samples from 30 wells. PGG staff conducted field work on the initial 24 wells between October 24 and December 6, 2018. Yakima County then authorized another six monitoring well locations. PGG staff conducted the remainder of the field work between January 14 and February 27, 2019. PGG field personnel included David Wampler, Inger Jackson, Koshlan Mayer-Blackwell, Theo Fehsenfeld, and Travis Klaas. Steve Swope acted as project Manager for PGG.

This work was performed, and this report prepared, in accordance with hydrogeologic practices generally accepted at this time in this area, for the exclusive use of Yakima County and the Lower Yakima Valley Groundwater Advisory Committee, for specific application to the project. This is in lieu of other warranties, express or implied.

2.0 WELL LOCATING METHOD

The well locating method was developed under a separate scope of work (PGG, 2016). Generally, the wells were located using an objective, randomized method to distribute well locations across the GWMA while minimizing bias. The network was designed to be appropriate for calculating basin wide average conditions at the water table, and for tracking concentration changes at the water table over time. The network can also be used for mapping of the variation in concentrations at the water table.

The monitoring well installation workplan describes the method used to locate "preliminary drill sites." An initial set of 30 preliminary drill sites was randomly selected, sited, and mapped as part of the workplan. Most of the preliminary points occurred on private property; therefore, the next step was to move the points to the closest public right-of-way to streamline access. Preliminary drill sites were also set back from irrigation canals and drains. Adjustments to preliminary drill sites were made in two other locations where water quality anomalies were possible and monitoring wells already existed. Well 7 was moved away from Port of Sunnyside's spray field and Well 23 was moved to avoid the EPA dairy cluster. The Port of Sunnyside's spray field and EPA dairy cluster both have their own set of purpose-built monitoring wells.

After approval of the workplan, Yakima County surveyed road rights-of-way in the vicinity of each preliminary drill site to confirm sufficient width to accommodate a drill rig. The sites were also field checked for overhead or underground utilities and to confirm that the site was sufficiently level to accommodate

the drill rig. In some cases, several sites were reviewed and rejected before an acceptable site was found. Well installations were canceled if no acceptable location could be identified near the preliminary drill site, which was the case for 8 of the 30 preliminary drill sites (3, 4, 13, 18, 20, 22, 29, and 30).

During the first well installation effort in November 2018, project cost tracking identified that additional wells could be installed within the project budget. Yakima County requested that PGG locate additional wells to augment the network. PGG and Yakima County coordinated to rapidly locate drill sites for wells 31 through 49 while drilling was on going. The process included randomized GIS selection of preliminary drill sites, selection of proximate rights-of-way, setbacks from certain irrigation features, utility clearances, surveying of rights-of-way widths, and field verification. Specific facilities or land uses were not targeted when locating well sites.

3.0 FIELD METHODS

In addition to observing and documenting well installation, PGG performed aquifer tests and collected groundwater samples from monitoring wells consistent with the scope of work. Resulting nitrate concentrations are presented in Figure 2. A monitoring well was not installed at one location (YC-MW-35) because groundwater was not encountered within the drilled depth, which was limited by bedrock.

3.1 WELL DRILLING, CONSTRUCTION, AND GEOLOGIC LOGS

3.1.1 Well Construction

All monitoring wells were drilled, installed, and developed by Yellow Jacket Drilling of Portland, Oregon, a Washington State licensed driller, in accordance with WAC 173-160. Drilling was completed with a sonic drilling rig by Casey Wallace as the lead driller. Individual maps of each boring location are included in Appendix A.

All borings were advanced to depth using a four-inch inner core barrel, and six-inch outer casing. Continuous soil cores were extracted from borings in five or ten-foot increments. Borehole drilling was terminated after encountering the regional water table. Soil cores were captured using 6-inch diameter plastic sleeves directly from the core barrel. PGG logged cores for hydrogeologic project objectives. Geologic logs are included in Appendix B. A well construction summary is provided in Table 1.

A well was not constructed at YC-MW-35 and the boring was backfilled due to insufficient water. No well was installed, and no groundwater sample was collected. The boring was decommissioned in accordance with WAC 173-160.

All wells were completed as two-inch PVC monitoring wells with 0.010-inch slotted PVC screens, #12/20 silica sand packs, and bentonite surface seals. Well heads were housed in flush-to-grade steel vaults, and J-plugs are used to secure the PVC casings inside the vaults. Boring logs and as-builts are included in Appendix B.

3.1.2 Screen Placement Method

The ambient groundwater monitoring network targeted groundwater quality at the water table, which is shallower than typical water supply wells that have provided GWMA data to date. The strategy outlined in the bullets below was used during drilling and well construction to meet this goal. The wells were drilled in November 2018 through January 2019 – a season of falling groundwater levels in this area dominated by irrigation recharge that ceases in October. Review of limited historic water level records

indicated that the average seasonal water level fluctuation was about 10 ft, with the maximum in fall, and minimum in spring. That seasonal water level trend was considered in the well screen strategy. Predictions of the depth to the regional water table at each location, developed from USGS and EPA groundwater level data, also served as a guide to drilling depths. The strategy used to locate well screen during drilling included the following components:

- Moisture contents and soil stratigraphy revealed by drill cores were qualitatively logged by the on-site hydrogeologist.
- Water levels were measured within the outer drill casing between every coring run. Water levels measured by this means are termed "at time of drilling" (ATD) and may differ from water levels in constructed wells.
- Borings generally penetrated about 20 ft below the ATD water level to allow screening as much as 20 ft below the regional water table if saturated soils were not highly stratified. If soils were highly stratified, shorter well screens were often used to avoid screening across aquitards.
- The regional water table occurred within thin permeable zones with low water levels in a few locations. In cases where such a zone was the only screened zone, wells may contain groundwater sometimes of the year, and may be dry at other times of the year. Constructing wells that yield samples solely from the shallowest seasonally saturated zone, but that may not yield samples at all times of the year, was intentional. Alternatives to by-pass such zones, or screen across an aquitard with a long well screen were considered but were rejected because they are not consistent with project objectives.
- At YC-MW-02, very shallow perched groundwater was by-passed in favor of screening at the regional water table. The GWMA might consider constructing perched-groundwater monitoring well at this location.

3.1.3 Well Development

Wells were developed (cleaned after construction) by Yellow Jacket Drilling using a surge block and submersible pump. PGG was not present to observe well development. Wells were developed until water was visually clean if possible. Well development times ranged from 30 to 60 minutes. YC-MW-14 was not developed due to insufficient water. In some cases, turbidity was still relatively high at the termination of sampling. Turbidity values are included in Table 2.

3.2 GROUNDWATER SAMPLING

Groundwater samples were generally collected using a 2-inch diameter submersible pump and dedicated tubing. Submersible pumps included a Proactive Tempest DC purge pump and a Geotech Geosub pump. The depth to water at monitoring wells YC-MW-11, YC-MW-15, and YC-MW-25 was beyond the capabilities of either two-inch submersible pumps, so these samples were collected using a decontaminated stainless-steel bailer. A water quality sample was not collected at YC-MW-14 because there was insufficient water during the December 2018 sampling event.

Groundwater samples were collected into laboratory-provided HDPE bottles and placed in coolers with ice. pH, conductivity, turbidity, temperature, and oxidation reduction potential were measured in the field using an Oakton multimeter. Aquifer testing was performed immediately prior and resulted in purging for approximately 30 – 70 minutes prior to collection of samples. Field parameters were recorded during testing and parameter stabilization was noted. Sampling pumping rates are given in Table 2.

Groundwater sampling sheets and analytical chain of custody have been included in Appendix E.

All sampling and screening equipment was decontaminated with liquinox and distilled water prior to each use. Clean nitrile gloves were used while deploying pumps and were changed again before each sample collection.

Groundwater samples were collected into a laboratory provided bottle and placed on ice in a cooler immediately after collection. Chain of custody was maintained, and samples were submitted for nitrate analysis to Cascade Analytical Inc. in Union Gap, WA, a Washington State Accredited Lab.

3.3 PUMPING TESTS

Single well pumping tests were completed at 29 of the 30 monitoring wells to evaluate the pumping methods and rates for subsequent water quality sample collection. Single well pumping tests were generally conducted using a submersible pump. Depths to water during pumping tests were measured from the top of the PVC casing (MP). Table 2 includes measured distances between these MPs and the top of the steel flush-to-grade monuments that were surveyed by Yakima County, and includes calculated MP elevations. The depth to water at monitoring wells YC-MW-11, YC-MW-15, and YC-MW-25 was beyond the lift capabilities of two-inch submersible pumps so aquifer testing was not performed at YC-MW-14, because there was insufficient water during the December 2018 sampling event.

Short-term constant-rate pumping tests were performed in wells with depths to water generally less than 120 feet using submersible pumps with new, disposable discharge lines. Pumping rates were measured using a bucket and stopwatch. Purge water was discharged to the ground in the rights-of-way near the wellheads. During the pumping tests, water levels were measured continuously with a transducer and manually with a sounder; and pH, specific conductance, temperature, and oxidation-reduction potential were measured in the field using hand meters. At the end of each pumping test, a water quality sample was collected directly from the pump discharge line into a laboratory-provided bottle and was submitted to Cascade Analytical, Inc. for nitrate analysis. The submersible pumps, transducer, and sounder were decontaminated in the field before use in each monitoring well. A summary of final pumping rates is provided in Table 2. Appendix D includes plots of drawdown and recover. The drawdown curve is plotted against elapsed pumping time (t, minutes). The recovery curve is plotted against dimensionless time, which is the elapsed time since pumping began divided by time since pumping stopped (t/t'). Therefore, recovery data from early time plots to the right of recovery data from later time on the graph.

4.0 FIELD NARRATIVE

PGG observed drilling at 31 locations, installed 30 wells, and collected groundwater samples at 29 wells. Work at each location is described below. Well construction details and water levels during sampling are summarized in Table 1, and water quality results are summarized in Table 2. Geologic logs and as-built diagrams are included in Appendix B. Wellhead completion photos are included in Appendix D.

4.1 YC-MW-01

Monitoring well YC-MW-01 was drilled and installed on November 11, 2018 in the road-way adjacent to East Lincoln Avenue near the intersection of Yakima Valley Highway in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet below ground surface (bgs). A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 26 feet bgs.

The upper 6 feet of material consists of moist to wet dark brown silt, overlaying material generally consisting of a silty fine sand to fine sand from 6 to 24 feet bgs.

Monitoring well YC-MW-01 was completed with a 0.010-inch slot PVC screen from 10 to 25 feet bgs surrounded by a #12-20 silica sand pack that extends up to 8 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-01 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-01 is BKB-745. The elevation of the top of the steel monument is 735.53 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.31 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-01 on December 4, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 8.03 bmp. The well was pumped at a constant rate of approximately 1.17 gpm for 40 minutes and water was discharged to ground in the right-of-way approximately 50 feet northwest from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-01 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 68.3 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-01 sample was 22.2 mg/L.

4.2 YC-MW-02

Monitoring well YC-MW-02 was drilled and installed on October 28, 2018 in the right-of-way adjacent to Arrowsmith Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 76 feet bgs.

The upper 21 feet of material generally consisted of dry to moist, sandy and clayey silt. A layer of semi-consolidated siltstone or possibly ash was encountered from 21 to 29 feet bgs, which was water-bearing. When the borehole had been advanced into the semi-consolidated siltstone, the depth to water was approximately 11.4 feet bgs. The siltstone was underlain by a thin layer of gravelly sand and a more significant thickness of sandy silt from 30 to 59 feet bgs that appeared oxidized between 40 and 47 feet. A clean, fine to medium sand unit was encountered at 59 feet bgs that extended to the total borehole depth of 76 feet bgs. When the borehole had been advanced into this fine to medium sand unit, the depth to water was 46.7 feet bgs. Based on the stratigraphic sequence observed during drilling, and predictions of the regional water table developed from USGS and EPA groundwater level data, the water level in the semi-consolidated siltstone was interpreted to be perched by the underlying sandy silt and the water level in the fine to medium sand was interpreted to be the regional water table.

Monitoring well YC-MW-02 was completed with a 0.010-inch slot PVC screen from 61 to 76 feet bgs surrounded by a #12-20 silica sand pack that extends up to 59 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-02 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-02 is BKB-726. The elevation of the top of the steel monument is 875.67 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.41 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-02 on November 15, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 56.25 bmp. The well was

pumped at a constant rate of approximately 2.14 gpm for 43 minutes and water was discharged to ground in the right-of-way approximately 25 feet east from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-02 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 374.5 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-02 sample was 17.2 mg/L.

4.3 YC-MW-05

Monitoring well YC-MW-05 was drilled and installed on October 27, 2018 in the right-of-way adjacent to South Lester Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.75 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 46 feet bgs.

The upper 16 feet of material was generally a sandy silt that was moist below 6 feet bgs and wet from 11 to 13 feet bgs. A moist to wet slightly sandy silt was encountered between 16 and 34.5 feet bgs that was underlain by wet, fine to medium sand from 34.5 to 36 feet bgs. A moist, slightly sandy silt unit was encountered at 36 feet bgs that extended to the total borehole depth of 46 feet bgs.

Based on water levels measured during drilling and the observed stratigraphy, monitoring well YC-MW-05 was completed with a 0.010-inch slot PVC screen from 23 to 38 feet bgs surrounded by a #12-20 silica sand pack that extends up to 21 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 39.5 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-05 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-05 is BKB-725. The elevation of the top of the steel monument is 797.56 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.38 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-05 on November 15, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 14.13 bmp. The well was pumped at a constant rate of approximately 0.43 gpm for 57 minutes and water was discharged to ground in the right-of-way approximately 60 feet north from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-05 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 16.7 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-05 sample was 3.14 mg/L.

4.4 YC-MW-06

Monitoring well YC-MW-06 was drilled and installed on November 18, 2018 in the right-of-way adjacent to Hanford Road near the intersection of Sli Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to approximately 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 76 feet bgs.

The upper 16 feet of material consisted of moist fine, sandy silt. An interval of gravely silt and rocks was encountered from 18 to 23 feet bgs overlaying a moist, olive gray silt to 56 feet bgs transitioning to a moist reddish-brown sandy silt from 56 to 61 feet bgs. Saturated conditions were encountered in wet silty sand from 61 to 74 feet bgs and wet very fine sandy silt below 74 feet bgs.

Monitoring well YC-MW-06 was completed with a 0.010-inch slot PVC screen from 58 to 68 feet bgs surrounded by a #12-20 silica sand pack that extends up to 56 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 70 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-06 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-06 is BKB-744. The elevation of the top of the steel monument is 944.62 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.29 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-06 on December 5, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 48.14 bmp. The well was pumped at a constant rate of approximately 0.39 gpm for 48 minutes and water was discharged to ground in the right-of-way approximately 45 feet west from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-06 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 13.6 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-06 sample was 58.4 mg/L.

4.5 YC-MW-07

Monitoring well YC-MW-07 was drilled and installed on November 13, 2018 in the right-of-way adjacent to Linderman Road near the intersection of Murray Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 46 feet bgs.

The upper 8 feet of material consisted of fine sand overlaying approximately 4 feet of silt from 8 to 12 feet bgs. The silt interval was underlain by fine to medium sand coarsening with depth. A 4-foot interval of saturated wet coarse sand was encountered from 23 to 30 feet bgs underlain by fine to medium sand to the total depth of 46 feet bgs.

Monitoring well YC-MW-07 was completed with a 0.010-inch slot PVC screen from 24 to 44 feet bgs surrounded by a #12-20 silica sand pack that extends up to 22 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-07 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-07 is BKB-736. The elevation of the top of the steel monument is 693.11 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.31 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-07 on November 26, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 16.27 bmp. The well was pumped at a constant rate of approximately 0.55 gpm for 65 minutes and water was discharged to ground in the right-of-way approximately 40 feet south from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-07 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 385 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-07 sample was 4.34 mg/L.

4.6 YC-MW-08

Monitoring well YC-MW-08 was drilled and installed on November 9, 2018 in the right-of-way adjacent to Van Belle Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 36 feet bgs.

The upper 6 feet of material consisted of moist silty sand. Wet brown sandy silt continues from 6 to 18 feet bgs. Underlying this unit was silty sand to 36 feet bgs. This silty sand was targeted for screening.

Monitoring well YC-MW-08 was completed with a 0.010-inch slot PVC screen from 16 to 36 feet bgs surrounded by a #12-20 silica sand pack that extends up to 14 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-08 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-08 is BKB-733. The elevation of the top of the steel monument is 786.59 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.32 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-08 on November 15, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 5.85 bmp. The well was pumped at a constant rate of approximately 2.19 gpm for 50 minutes and water was discharged to ground in the right-of-way approximately 50 feet east from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-08 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 153.3 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-08 sample was 15.4 mg/L.

4.7 YC-MW-09

Monitoring well YC-MW-09 was drilled and installed on October 29-30, 2018 in the right-of-way adjacent to Sheller Road near the intersection with Bethany Road in Sunnyside, WA. A hand auger was used as a pilot hole to 6 feet bgs, and a 6-inch outer diameter sonic-drilling core barrel with a 4-inch inner diameter barrel was used to advance the borehole to a total depth of 72 feet bgs.

The materials penetrated in the upper 21 feet were dry and consisted of sandy silt overlying fine sand. A semi-consolidated layer of fine sandstone or possibly ash was encountered between 22.5 and 24 feet bgs. The material underlying the semi-consolidated sandstone was wet sand from 24 to 29 feet bgs with varying amounts of gravel. The material between 29 and 43.5 feet bgs was generally finer grained than above, varying from sandy silt to clayey silt with the exception of a gravelly sand layer between 33 and 35 feet bgs. Coarser-grained fine sand and gravelly fine sand was encountered from 43.5 to 53 feet bgs, which was underlain by silt, cobbles, and boulders. The bottom of the borehole was drilled into unfractured rock between 71 and 72 feet bgs.

Monitoring well YC-MW-09 was screened from 26 to 36 ft, which included the shallowest saturated materials observed during drilling. Depth to water prior to the start of testing was observed at 23.72 bmp. A #12-20 silica sand pack extends up to 24 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 37.5 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-09 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-09 is BKB-727. The elevation of the top of the steel monument

is 926.89 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.44 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-09 on December 3, 2018 using a GeoSub submersible pump. The well was pumped at a constant rate of approximately 0.39 gpm for 18 minutes and water was discharged to ground in the right-of-way approximately 50 feet west from the wellhead. The pump test results were inconclusive but sustainable pumping rate during sampling is below 0.39 gpm. Water quality results from the sampling event are summarized in Table 2. The nitrate concentration in the YC-MW-09 sample was 1.7 mg/L.

4.8 YC-MW-10

Monitoring well YC-MW-10 was drilled and installed on October 26, 2018 in the right-of-way adjacent to Roza Drive in Zillah, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 85 feet bgs.

The upper 26 feet of material generally consisted of fine sand, underlain by silt from 26 to 34 feet bgs. The material from 34 to 66 feet bgs consisted of sand and sandy silt, with saturated wet sand and sandy silt encountered at from 66 to 76 feet bgs. The water bearing interval is underlain by clayey silt from 77 to 85 feet bgs.

Monitoring well YC-MW-10 was completed with a 0.010-inch slot PVC screen from 66 to 76 feet bgs surrounded by a #12-20 silica sand pack that extends up to 64 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 78 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-10 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-10 is BKB-739. The elevation of the top of the steel monument is 1034.09 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.40 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-10 on November 13, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 62.08 bmp. The well was pumped at a constant rate of approximately 1.11 gpm for 47 minutes and water was discharged to ground in the right-of-way approximately 5-7 feet south from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-10 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 12.1 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-10 sample was 11.5 mg/L.

4.9 YC-MW-11

Monitoring well YC-MW-11 was drilled and installed on November 7-8, 2018 in the right-of-way adjacent to Eagle Peak Road in Zillah, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 180 feet bgs.

The upper 6 feet consisted of moist silty sand, underlain by moist sandy silt from 6 to 12 feet bgs. Predominantly sandy gravel extended from 12 to 21 feet bgs. Between 21 and 75 feet bgs were

predominantly sands, varying from silty sand to coarse gravelly sand. Increased oxidization was present from 56 to 74 feet. Between 74 and 118 feet bgs were predominantly silts, varying from sandy silt to clayey silt. Clayey silt layers in this section were often especially dense and were interpreted to represent aquitards. Coarser units of gravelly sand and sandy gravels extended from 118 feet to the total boring depth of 180 feet bgs.

Monitoring well YC-MW-11 was completed with a 0.010-inch slot PVC screen from 164 to 179 feet bgs surrounded by a #12-20 silica sand pack that extends from 162 to 180 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-11 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-11 is BKB-731. The elevation of the top of the steel monument is 974.49 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.36 feet as measured in the field by PGG during pump testing and sampling.

Depth to water prior to the start of testing on December 2, 2018 was observed at 162.55 bmp. This depth to water exceeded the lift capacity of the pumps so no drawdown test was performed. The groundwater sampled was collected with a decontaminated stainless-steel bailer. The nitrate concentration in the YC-MW-11 sample was 1.74 mg/L

4.10 YC-MW-12

Monitoring well YC-MW-12 was drilled and installed on November 16-17, 2018 in the parking lot at Dykstra Park accessible from South Euclid Road in Grandview, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 62 feet bgs.

The upper 21 feet of material generally consisted of fine sand with wet gravelly silt from 21 to 26 feet bgs underlain by clayey silt from 26 to 62 feet bgs.

Monitoring well YC-MW-12 was completed with a 0.010-inch slot PVC screen from 22 to 42 feet bgs surrounded by a #12-20 silica sand pack that extends up to 20 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 43 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-12 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-12 is BKB-742. The elevation of the top of the steel monument is 790.73 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.37 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-12 on December 3, 2018 using a Proactive Tempest submersible pump. Depth to water prior to the start of testing was observed at 25.48 bmp. The well was pumped at a constant rate of approximately 0.16 gpm for 43 minutes and water was discharged to ground in the right-of-way approximately 10 feet east from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-12 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 0.76 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-12 sample was 0.38 mg/L.

4.11 YC-MW-14

Monitoring well YC-MW-14 was drilled and installed on November 6, 2018 in the right-of-way adjacent to Harrison Road near the intersection of Alexander Extension in Grandview, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 48 feet bgs.

The upper 9.5 feet of material was composed of moist well-sorted fine sand. Silty sand continued from 9.5 to 19 feet bgs followed by alternating gravelly sand and sandy gravel between 19 and 27 feet bgs. This sandy gravel was significantly oxidized from 25.5 to 27 feet bgs. Between 27 and 48 feet bgs basalt was encountered. This basalt contained a trace of moderately oxidized fractures and was interpreted as an aquitard.

Monitoring well YC-MW-14 was completed with a 0.010-inch slot PVC screen from 22 to 27 feet bgs surrounded by a #12-20 silica sand pack that extends up to 20 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 28 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-14 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-14 is BKB-729. The elevation of the top of the steel monument is 938.32 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.27 feet as measured in the field by PGG during pump testing and sampling. No aquifer test was performed, no depth to water measured, and no water quality sample was collected due to insufficient water during the December 2018 field mobilization.

4.12 YC-MW-15

Monitoring well YC-MW-15 was drilled and installed on November 10-11, 2018 in the right-of-way adjacent to Chaffee Road near the intersection of Scoon Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 200 feet bgs.

The upper 9 feet was composed of sand and gravelly sand. Underlying these sands was finer silty sand from 9 to 17.5 feet bgs. Between 17.5 and 80 feet bgs were alternating layers of predominantly silty fine sands and fine sandy silts, with an overall slight trend of coarsening downward, followed by finer units of silt and fine sandy silt to 117 feet bgs. Between 117 and 136.5 feet bgs, a general coarsening downward trend was observed, transitioning from alternating fine sandy silt and silty fine sand into silty fine sand and fine to medium sand. Units further below ground surface continued to coarsen into predominantly sandy gravels and gravelly sands, with units between 145 and 156 feet bgs commonly displaying slight to moderate oxidization. These sandy gravels and gravelly sands continued from 136.5 feet to the total boring depth of 200 feet bgs.

Monitoring well YC-MW-15 was completed with a 0.010-inch slot PVC screen from 185 to 200 feet bgs surrounded by a #12-20 silica sand pack that extends up to 183 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-15 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-15 is BKB-734. The elevation of the top of the steel monument is 1168.49 feet

(NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.31 feet as measured in the field by PGG during pump testing and sampling.

Depth to water prior to the start of testing on December 5, 2018 was observed at 188.68 bmp. This depth to water exceeded the lift capacity of the pumps so no drawdown test was performed. The groundwater sampled was collected with a decontaminated stainless-steel bailer. The nitrate concentration in the YC-MW-15 sample was 1.02 mg/L.

4.13 YC-MW-16

Monitoring well YC-MW-16 was drilled and installed on October 27, 2018 in the right-of-way adjacent to Van Belle Road in Outlook, WA. A hand auger was used as a pilot hole to 5 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was then used to advance the borehole to a total depth of 36 feet bgs.

Moist, slightly silty, fine sand was encountered in the upper 12 feet of material that overlay wet, fine sand between 12 and 14 feet bgs, and moist, slightly silty to silty fine sand between 14 and 16 feet bgs. The materials penetrated between 16 and 23.5 feet bgs decreased in moisture with depth although the grain sized coarsened downwards from sandy silt to slightly silty fine with trace medium sand. Layers of silt, fine sand, and slightly silty sand were observed between 23.5 and 27.5 feet bgs and then slightly sandy silt to a total depth of 36 feet bgs.

YC-MW-16 was completed with a 0.010-inch slot PVC screen from 13 to 23 feet bgs surrounded by a #12-20 silica sand pack that extends up to 11 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 24.5 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-16 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-16 is BKB-740. The elevation of the top of the steel monument is 775.96 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.34 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-16 on November 14, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 9.99 bmp. The well was pumped at a constant rate of approximately 0.70 gpm for 51 minutes and water was discharged to ground in the right-of-way approximately 40 feet east from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-16 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 122.5 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-16 sample was 6.3 mg/L.

4.14 YC-MW-17

Monitoring well YC-MW-17 was drilled and installed on October 24, 2018 in the right-of-way adjacent to Konnowac Pass Road near the intersection of Brooks Road in Donald, WA. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 127 feet bgs.

The upper most portion of this boring consisted of rock that is believed to be a fill material and was encountered down to 11 feet bgs. Between 11 and 83 feet bgs, the boring consisted of predominantly silt with varying clays, sands and gravels. Between 60 and 83 feet bgs there were zones of oxidation observed. Between 83 and 120 feet bgs, a coarsening downward sequence was observed, starting as a silty

sand, grading to medium sands. Zones of oxidation were observed from 100 to 120 feet bgs. The bottom of the boring from 120 to 127 feet bgs transitioned back to dense clayey silt.

Monitoring well YC-MW-17 was completed with a 0.010-inch slot PVC screen from 100 to 120 feet bgs surrounded by a #12-20 silica sand pack that extends up to 97.5 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-17 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-17 is BKB-737. The elevation of the top of the steel monument is 1037.03 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.33 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-17 on November 12, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 85.67 bmp. The well was pumped at a constant rate of approximately 2.12 gpm for 67 minutes and water was discharged to ground in the right-of-way approximately 15 feet east from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-17 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 1,060 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-17 sample was 6.85 mg/L.

4.15 YC-MW-19

Monitoring well YC-MW-19 was drilled and installed on October 25, 2018 in the right-of-way adjacent to Darby Lane near the intersection of Blue Goose Road in Sunnyside, WA. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 87 feet bgs.

The upper 47 feet of the boring consisted of silt with varying sand and gravel content. Oxidation was observed at 43 feet bgs. Sandy silt and fine to medium sand layers continued from 47 to 61 feet bgs. Clayey silt was observed from 61 to 67.5 feet bgs, followed by sandy silt to the total boring depth of 87 feet bgs.

Monitoring well YC-MW-19 was completed with a 0.010-inch slot PVC screen from 47 to 62 feet bgs surrounded by a #12-20 silica sand pack that extends up to 45 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 63.5 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-19 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-19 is BKB-738. The elevation of the top of the steel monument is 913.23 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.32 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-19 on November 13, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 49.41 bmp. The well was pumped at a constant rate of approximately 0.94 gpm for 38 minutes and water was discharged to ground in the right-of-way approximately 5 feet west from the wellhead into a sloping ditch. A semi-logarithmic plot of drawdown in YC-MW-19 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 822.5 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-19 sample was 15.1 mg/L.

4.16 YC-MW-21

Monitoring well YC-MW-21 was drilled and installed on November 12, 2018 in the right-of-way adjacent to Belma Road in Grandview, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 66 feet bgs.

The upper 20 feet of material was sand, with a thin layer of silty sand from 14 to 15 feet bgs. Underlying these units, sandy silt was observed from 20 to 65 feet bgs, with one layer of silty fine sand from 22 to 24 feet bgs. An extremely dense layer of pinkish sandy silt was observed between 61 and 65 feet bgs, which was interpreted as an aquitard. Underlying this aquitard was a unit of sandy gravel from 65 to 66 feet bgs. The aquitard was sealed with bentonite and a screen was installed in the fine sandy silt overlying the aquitard.

Monitoring well YC-MW-21 was completed with a 0.010-inch slot PVC screen from 41 to 61 feet bgs surrounded by a #12-20 silica sand pack that extends from 39 to 62 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 62 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-21 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-21 is BKB-735. The elevation of the top of the steel monument is 724.68 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.31 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-21 on November 27, 2018 using a Proactive Tempest submersible pump. Depth to water prior to the start of testing was observed at 30.18 bmp. The well was pumped at a constant rate of approximately 0.27 gpm for 58 minutes and water was discharged to ground in the right-of-way approximately 30 feet west from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-21 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 15.8 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-21 sample was 0.66 mg/L.

4.17 YC-MW-23

Monitoring well YC-MW-23 was drilled and installed on November 8-9, 2018 in the right-of-way adjacent to North Granger Road in Zillah, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 116 feet bgs.

The upper 17.5 feet were composed of silty sand and very-well sorted sand layers, underlain by a sequence of silt from 17.5 to 19 feet bgs followed by sand from 19 to 22.5 feet bgs, and coarsening-downward sandy silt from 22.5 to 28 feet bgs. Material between 28 and 116 feet bgs was predominantly composed of sand, gravelly sand, and sandy gravel.

Monitoring well YC-MW-23 was completed with a 0.010-inch slot PVC screen from 94 to 114 feet bgs surrounded by a #12-20 silica sand pack that extends from 92 to 114.5 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 114.5 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-23 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-23 is BKB-732. The elevation

of the top of the steel monument is 890.12 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.30 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-23 on November 14, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 94.95 bmp. The well was pumped at a constant rate of approximately 1.97 gpm for 70 minutes and water was discharged to ground in the right-of-way approximately 70 feet south from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-23 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 2,298 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-23 sample was 6.0 mg/L.

4.18 YC-MW-24

Monitoring well YC-MW-24 was drilled and installed on November 13, 2018 in the right-of-way adjacent to Wilson Highway in Grandview, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 60 feet bgs.

The upper 30 feet consisted of fine sand to a silty fine sand, underlain by sandy silt and silts from 30 to 43 feet bgs. Wet silty sand containing gravel and gravely sandy silt was encountered from 43 to 57 feet bgs, underlain by non-fractured basalt at 57 feet bgs.

Monitoring well YC-MW-24 was completed with a 0.010-inch slot PVC screen from 46 to 56 feet bgs surrounded by a #12-20 silica sand pack that extends up to 45 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 57 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-24 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-24 is BKB-741. The elevation of the top of the steel monument is 815.73 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.28 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-24 on December 3, 2018 using a Proactive Tempest submersible pump. Depth to water prior to the start of testing was observed at 37.66 bmp. The well was pumped at a constant rate of approximately 0.92 gpm for 33 minutes and water was discharged to ground in the right-of-way approximately 50 feet south from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-24 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 644 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-24 sample was 6.32 mg/L.

4.19 YC-MW-25

Monitoring well YC-MW-25 was drilled and installed on November 27-29, 2018 in the right-of-way adjacent to Bailey Road near the intersection of Highland Drive in Zillah, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 275 feet bgs.

The upper 13 feet consisted of fine to medium sand. The material from 13 to 76 feet bgs consisted primarily of sand with variable content silt. A silt occurred from 77 to 79 feet bgs, underlain by sand with gravel from 79 to 126 feet bgs including a 3 ft gravely silt from 106 to 109 feet bgs. The material from 126 to 217 feet bgs generally consists of silty sand, with some sandy silt zones, underlain by a gravelly medium sand from 217 to 246 feet bgs. From 246 to 253 feet bgs, material consisted of moist sandy silt transitioning to wet silty fine sand (with some gravel and rocks) at 253 to 257 feet bgs, underlain by moist-to-wet very fine sand to sandy silt from 257 to 265 feet bgs and silty sand to medium sand from 265 to 273 feet bgs.

Monitoring well YC-MW-25 was completed with a 0.010-inch slot PVC screen from 253 to 273 feet bgs surrounded by a #12-20 silica sand pack that extends up to 251 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-25 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-25 is BKB-747. The elevation of the top of the steel monument is 1204.93 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.26 feet as measured in the field by PGG during pump testing and sampling.

Depth to water prior to the start of testing on December 6, 2018 was observed at 263.55 bmp. This depth to water exceeded the lift capacity of the pumps so no drawdown test was performed. The groundwater sampled was collected with a decontaminated stainless-steel bailer. The nitrate concentration in the YC-MW-25 sample was 3.58 mg/L

4.20 YC-MW-26

Monitoring well YC-MW-26 was drilled and installed on November 5, 2018 in the right-of-way adjacent to Riggins Road in Sawyer, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 116 feet bgs.

The upper 6 feet was composed of dry to moist gravelly sand, underlain by sandy silt to 14 feet bgs. From 14 to 39 feet bgs coarsening downward layers of silty sand to sand with a gravel fraction were observed. Clayey silt and sandy silt were observed from 39 to 53 feet bgs, followed by alternating sequences of predominantly silty sand and sandy silt to 95 feet bgs. Gravel fractions were common between 78 and 95 feet bgs in both the sand and silt layers. Below 95 feet was a sequence of clayey silt and sandy silt to 112.5 feet bgs, underlain by gravelly sand to 116 feet bgs. The clayey silt and sandy silt layers beginning at 95 feet were interpreted as a probable aquitard.

Monitoring well YC-MW-26 was completed with a 0.010-inch slot PVC screen from 76 to 96 feet bgs surrounded by a #12-20 silica sand pack that extends from 74 to 97 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 97 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-26 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-26 is BKB-728. The elevation of the top of the steel monument is 1039.52 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.39 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-26 on November 13, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 73.77 bmp. The well was

pumped at a constant rate of approximately 0.22 gpm for 47 minutes and water was discharged to ground in the right-of-way approximately 25 feet northwest from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-26 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 10.3 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-26 sample was 3.26 mg/L.

4.21 YC-MW-27

Monitoring well YC-MW-27 was drilled and installed on November 6, 2018 in the right-of-way adjacent to Tear Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 36 feet bgs.

The upper 2.5 feet of material was fine sandy silt, underlain by fine to medium sand from 2.5 to 3.5 feet bgs. The remaining material from 3.5 feet to 36 feet bgs was entirely composed of alternating layers of fine sandy silt and silty fine sand.

Monitoring well YC-MW-27 was completed with a 0.010-inch slot PVC screen from 21 to 36 feet bgs surrounded by a #12-20 silica sand pack that extends up to 19 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-27 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-27 is BKB-730. The elevation of the top of the steel monument is 719.52 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.35 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-27 on November 27, 2018 using a Proactive Tempest submersible pump. Depth to water prior to the start of testing was observed at 9.08 bmp. The well was pumped at a constant rate of approximately 1.39 gpm for 91 minutes and water was discharged to ground in the right-of-way approximately 25 feet southeast from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-27 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 8.0 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-27 sample was 24.6 mg/L.

4.22 YC-MW-28

Monitoring well YC-MW-28 was drilled and installed on November 17, 2018 in the right-of-way adjacent to Rusk Road in Grandview, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 46 feet bgs.

The upper 9 feet consisted of sandy silt, underlain by silt with coarse sand and rounded gravel from 11 to 20 feet bgs. Groundwater was encountered in gravely sand at 26 to 28 feet bgs, underlain by wet sandy silt, sand, and gravelly sand from 28 to 46 feet bgs.

Monitoring well YC-MW-28 was completed with a 0.010-inch slot PVC screen from 22 to 42 feet bgs surrounded by a #12-20 silica sand pack that extends up to 21 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 43 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-28 is below land surface, a 2-inch, water-tight expanding well cap was installed in the

top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-28 is BKB-743. The elevation of the top of the steel monument is 731.62 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.24 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-28 on December 4, 2018 using a Proactive Tempest submersible pump. Depth to water prior to the start of testing was observed at 25.25 bmp. The well was pumped at a constant rate of approximately 1.41 gpm for 41 minutes and water was discharged to ground in the right-of-way approximately 50 feet east from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-28 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 653 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-28 sample was 3.1 mg/L.

4.23 YC-MW-31

Monitoring well YC-MW-31 was drilled and installed on January 17, 2019 in the right-of-way adjacent to Murray Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 5 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 45 feet bgs.

The upper 10 feet of material was composed of silty fine sand and fine sand. A thin layer of fine sandy silt was observed from 10 to 11.5 feet bgs, followed by sand from 11.5 feet to the total boring depth of 45 feet bgs. These sand layers were predominantly well sorted and overall coarsened downward from fine to medium sand into medium and medium to coarse sand.

Monitoring well YC-MW-31 was completed with a 0.010-inch slot PVC screen from 30 to 45 feet bgs surrounded by a #12-20 silica sand pack that extends up to 29 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-31 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-31 is BKB-756. The elevation of the top of the steel monument is 693.23 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.39 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-31 on February 26, 2019 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 29.04 bmp. The well was pumped at a constant rate of approximately 2.80 gpm for 38 minutes and water was discharged to ground in the right-of-way approximately 40 feet west from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-31 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 4,900 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-31 sample was 5.94 mg/L.

4.24 YC-MW-33

Monitoring well YC-MW-33 was drilled and installed on January 16, 2019 in the right-of-way adjacent to Hudson Road in Granger, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 36 feet bgs.

The upper 29 feet of material was composed of silty fine sand. From 29 to the total boring depth of 36 feet bgs alternating layers of fine sandy silt and silty fine sand were observed.

Monitoring well YC-MW-33 was completed with a 0.010-inch slot PVC screen from 14 to 29 feet bgs surrounded by a #12-20 silica sand pack that extends up to 13 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 29.5 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-33 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-33 is BKB-754. The elevation of the top of the steel monument is 763.16 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.27 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-33 on February 27, 2019 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 6.23 bmp. The well was initially pumped at approximately 0.9 gpm for 12 minutes, which was reduced to approximately 0.69 gpm for the remaining 31 minutes of the test to avoid excessive drawdown in the well. Pumping test water was discharged to ground in the right-of-way approximately 40 feet west from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-33 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 2.6 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-33 sample was 24.2 mg/L.

4.25 YC-MW-35 (BOREHOLE ONLY)

A borehole was drilled at location YC -MW-35 on January 19, 2019 in the right-of-way adjacent to Gould Road near the intersection of Sli Road in Sunnyside, WA. A 6-inch outer-diameter sonic-drilling core barrel and 4-inch inner core barrel was used to advance the borehole to a total depth of 24 feet bgs.

The upper 10 feet of material was composed of sandy silt that was wet between 3.5 and 9 feet bgs. A layer of moist, gravelly, sandy silt was observed from 10 to 12 feet bgs that had increasing angular rock with depth and was underlain by dry angular gravel/fractured rock. Competent basalt was encountered at 14 feet bgs to the total boring depth of 24 feet bgs.

Although a monitoring well was originally intended to be installed at YC-MW-35, a well was not constructed based on field observations of insufficient water above the basalt. The boring was backfilled with hydrated bentonite 3/8 holeplug chips to ground surface and decommissioned in accordance with WAC 173-160. Because a well was not installed, hydraulic tests were not performed, and a groundwater quality sample was not collected.

4.26 YC-MW-38

Monitoring well YC-MW-38 was drilled and installed on January 17-18, 2019 in the right-of-way adjacent to Robinson Road in Grandview, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 5 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 140 feet bgs.

The upper 81 feet of material was composed of sandy gravel, with layers commonly including a moderate presence of calcium carbonate accumulation on gravel clasts and/or trace to moderate presence of oxidization. Between 81 and 140 feet bgs alternating layers of gravelly sand and sandy gravel were observed, including two thin layers of fine to medium sand from 91 to 93.5 feet bgs and from 100 to 103 feet bgs.

Monitoring well YC-MW-38 was completed with a 0.010-inch slot PVC screen from 120 to 135 feet bgs surrounded by a #12-20 silica sand pack that extends from 116 to 137 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-38 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-38 is BKB-758. The elevation of the top of the steel monument is 766.97 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.22 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-38 on February 26, 2019 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 120.39 bmp. The well was pumped at a constant rate of approximately 1.5 gpm for 33 minutes and water was discharged to ground in the right-of-way approximately 44 feet west from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-38 is presented in Appendix D. An estimated lower-end value of transmissivity based on the drawdown response is 5,250 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-38 sample was 10.3 mg/L.

4.27 YC-MW-39

Monitoring well YC-MW-39 was drilled and installed on January 14-15, 2019 in the right-of-way adjacent to Smith Road in Zillah, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 116 feet bgs.

The upper 13 feet of material was composed of silty fine sand and well-sorted medium sand, underlain by a layer of coarse sandy gravel from 13 to 16 feet bgs. Between 16 and 71.5 feet bgs, layers of silty fine sand and fine sandy silt were observed. Beneath these layers was a thin layer of medium to coarse sand from 71.5 to 74 feet bgs, followed by predominantly sandy gravel and gravel to the total boring depth of 116 feet bgs, with common signs of oxidation.

Monitoring well YC-MW-39 was completed with a 0.010-inch slot PVC screen from 100 to 115 feet bgs surrounded by a #12-20 silica sand pack that extends from 99 to 116 feet bgs. Bentonite 3/8 holeplug chips were used to fill the annular space between the sand pack and approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-39 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-39 is BKB-753. The elevation of the top of the steel monument is 880.92 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.29 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-39 on February 27, 2019 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 107.11 bmp. The pump test results were inconclusive, but sustainable pumping rate appears to be 350 mL/min. The nitrate concentration in the YC-MW-39 sample was 18.1 mg/L.

4.28 YC-MW-41

Monitoring well YC-MW-41 was drilled and installed on November 30, 2018 in the right-of-way adjacent to Factory Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of

the borehole and a hand auger was used as a pilot hole to 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 72 feet bgs.

The upper 15 feet consisted of sand and sandy silt, underlain by dry vesicular basalt from 15 to 55 feet bgs. Wet, fractured basalt was encountered from 55 to 72 feet bgs.

Monitoring well YC-MW-41 was completed with a 0.010-inch slot PVC screen from 56 to 66 feet bgs surrounded by a #12-20 silica sand pack that extends up to 54 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 67 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-41 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-41 is BKB-748. The elevation of the top of the steel monument is 965.95 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.29 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-41 on December 5, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 44.29 bmp. The well was pumped at a constant rate of approximately 2.64 gpm for 38 minutes and water was discharged to ground in the right-of-way approximately 60 feet west from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-41 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 924 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-41 sample was 26.9 mg/L.

4.29 YC-MW-42

Monitoring well YC-MW-42 was drilled and installed on November 26, 2018 in the right-of-way adjacent to East Euclid Road in Grandview, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 7 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 50 feet bgs.

The upper 30 feet consisted of fine to coarse sand and silty sand, underlain by moist-to-wet silt containing rounded gravels from 30 to 45 feet bgs. Dry fractured basalt was encountered from 45 to 50 feet bgs.

Monitoring well YC-MW-42 was completed with a 0.010-inch slot PVC screen from 32 to 47 feet bgs surrounded by a #12-20 silica sand pack that extends up to 48 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 48 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-42 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-42 is BKB-746. The elevation of the top of the steel monument is 699.70 feet (NAV88) as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.29 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-42 on December 4, 2018 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 33.39 bmp. The well was pumped at a constant rate of approximately 1.05 gpm for 32 minutes and water was discharged to ground in the right-of-way approximately 50 feet east from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-42 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 7.5

ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-42 sample was 7.04 mg/L.

4.30 YC-MW-44

Monitoring well YC-MW-44 was drilled and installed on January 15, 2019 in the right-of-way adjacent to East Allen Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 27 feet bgs.

The upper 20 feet of material consisted primarily of fine to medium sand, underlain by saturated sandy gravel from 20 to 22 feet bgs and silt from 22 to 27 feet bgs.

Monitoring well YC-MW-44 was completed with a 0.010-inch slot PVC screen from 12 to 22 feet bgs surrounded by a #12-20 silica sand pack that extends up to 11 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 23 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-44 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-44 is BKB-755. The elevation of the top of the steel monument is 754.70 feet NAV88 as surveyed by Yakima County and the stick down from the top of the monument to the top of the PVC well is 0.29 feet as measured in the field by PGG during pump testing and sampling.

A short-term pumping test was performed at YC-MW-44 on February 26, 2019 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 13.85 bmp. The well was pumped at a constant rate of approximately 3.44 gpm for 35 minutes and water was discharged to ground in the right-of-way approximately 40 feet west from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-44 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 1,204 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-44 sample was 30.2 mg/L.

4.31 YC-MW-46

Monitoring well YC-MW-46 was drilled and installed on January 18, 2019 in the right-of-way adjacent to Chute Road in Sunnyside, WA. A 24-inch diameter core barrel was used to drill the upper 1.5 feet of the borehole and a hand auger was used as a pilot hole to 6 feet bgs. A 6-inch outer-diameter sonic-drilling core barrel was used to advance the borehole to a total depth of 40 feet bgs.

The upper 13 feet consisted of medium sand transitioning to wet sand from 14 to 36 feet bgs, underlain by sandy silt from 36 to 40 feet bgs.

Monitoring well YC-MW-46 was completed with a 0.010-inch slot PVC screen from 18 to 33 feet bgs surrounded by a #12-20 silica sand pack that extends up to 16 feet bgs. Bentonite 3/8 holeplug chips were used to backfill the borehole below 35 feet bgs, and to fill the annular space above the sand pack to approximately 1-foot bgs. Water was added to the borehole to hydrate chips above the water table. Because the top of YC-MW-46 is below land surface, a 2-inch, water-tight expanding well cap was installed in the top of the PVC casing and a metal flush-to-grade monument set in a concrete pad protects the wellhead. Ecology's Unique Well Identification (UWID) for YC-MW-46 is BKB-757. The elevation of the top of the steel monument is 824.48 feet (NAV88) as surveyed by Yakima County and the stick down from the

top of the monument to the top of the PVC well is 0.30 feet as measured in the field by PGG during pump testing and sampling

A short-term pumping test was performed at YC-MW-46 on February 27, 2019 using a GeoSub submersible pump. Depth to water prior to the start of testing was observed at 12.78 bmp. The well was pumped at a constant rate of approximately 0.75 gpm for 51 minutes and water was discharged to ground in the right-of-way approximately 40 feet south from the wellhead. A semi-logarithmic plot of drawdown in YC-MW-46 is presented in Appendix D. The estimated transmissivity based on the drawdown response is 3.9 ft^2/day. Water quality results from the pump-test event are summarized in Table 2. The nitrate concentration in the YC-MW-46 sample was 18.1 mg/L.

5.0 REFERENCES

Pacific Groundwater Group. June 2016. Lower Yakima Valley GWMA Proposed Ambient Groundwater Monitoring Network. Consultant report to Yakima County.

USGS. 2009. Estimated water-level elevation contours for the Yakima Valley, Washington. SIR 2009-5152.

Table 1. Well Construction Summary, Yakima GWMA

Sample ID	Screen Depth (feet bgs)	Total Well Depth (feet bgs)	Total Borehole Depth (feet bgs)	Northing (feet NAD83)	Easting (feet NAD83)	Measuring Point (MP) Elevation [1] (feet NAVD88)	Stick Down (feet from Surveyed Ref. Point [2] to MP)	Depth to Water [3] (feet bmp)
YC-MW-01	10 - 25	25.2	26	359237.334	1770045.871	735.22	0.31	8.03
YC-MW-02	61 - 76	76	76	374757.932	1757182.650	875.26	0.41	56.25
YC-MW-05	23 - 38	39.2	46	358146.766	1753715.120	797.18	0.38	14.13
YC-MW-06	58 - 68	68.2	76	375010.934	1771956.787	944.33	0.29	48.14
YC-MW-07	24 - 44	46	46	342923.197	1759069.666	692.80	0.31	16.27
YC-MW-08	16 - 36	36.2	36	369502.468	1742525.475	786.27	0.32	5.85
YC-MW-09	26 - 36	36.2	72	364486.635	1785256.122	926.45	0.44	23.72
YC-MW-10	66 - 76	78.2	85	404973.197	1700493.573	1033.69	0.40	62.08
YC-MW-11	164 - 179	179.2	180	393333.483	1713616.447	974.13	0.36	162.55
YC-MW-12	22 - 42	42.2	62	333677.572	1788570.848	790.36	0.37	25.48
YC-MW-14	22 - 27	27.2	48	353843.614	1788172.966	938.04	0.27	27.05
YC-MW-15	185 - 200	200.2	200	388100.116	1761377.267	1168.18	0.31	188.68
YC-MW-16	13 - 23	23.2	36	369623.515	1731005.323	775.62	0.34	9.99
YC-MW-17	100 - 120	120	127	422577.081	1675477.030	1036.70	0.33	85.67
YC-MW-19	47 - 62	62.5	87	403733.504	1691142.457	912.91	0.32	49.41
YC-MW-21	41 - 61	61.2	66	332464.159	1776332.565	724.37	0.31	30.18
YC-MW-23	94 - 114	114.2	116	386455.508	1716288.296	889.82	0.30	94.95
YC-MW-24	46 - 56	56.2	60	343838.572	1790793.076	815.45	0.28	37.66
YC-MW-25	253 - 273	275	275	401363.813	1711060.025	1204.67	0.26	263.55
YC-MW-26	76 - 96	96.2	116	415545.787	1681988.644	1039.13	0.39	73.77
YC-MW-27	21 - 36	36.2	36	348483.147	1775485.346	719.17	0.35	9.08
YC-MW-28	22 - 42	43.2	46	313832.248	1778744.707	731.38	0.24	25.25
YC-MW-31	30 - 45	45.2	45	343074.772	1752292.157	692.84	0.39	29.04
YC-MW-33	14 - 29	29.2	36	374861.697	1721596.356	762.89	0.27	6.23
YC-MW-38	120 - 135	135.2	140	324604.962	1794427.124	766.75	0.22	120.39
YC-MW-39	100 - 115	115.2	116	395749.623	1703378.774	880.63	0.29	107.11
YC-MW-41	56 - 66	66.2	72	359036.960	1789145.667	965.66	0.29	44.29
YC-MW-42	32 - 47	47.2	50	321854.004	1778078.378	699.42	0.29	33.39
YC-MW-44	12 - 22	22.2	27	356483.938	1777955.978	754.41	0.29	13.85
YC-MW-46	18 - 33	33.2	40	372869.717	1748379.578	824.19	0.30	12.78

bgs - below ground surface

bmp - below measuring point on top of 2-inch well casing

NM = not measured

[1] Top of steel flush-to-grade monument surveyed by Yakima County. Measuring Point (MP) elevation calculated using stick-down field measurements between top of monument and top of 2-inch casing made by PGG using a steel tape with 1/100th foot increments.

[2] Surveyed Ref. Point = top of stell flush-to-grade monument surveyed by Yakima County

[3] Static depth to water measurements made during hydraulic testing/sampling event.

[4] The measuring point elevation for YC-MW-46 provided by Yakima County; surveyed elevation of top of steel flush-to-grade monument is 824.49 feet NAVD88

Table 2. Groundwater Quality Sampling Results, Yakima GWMA

Sample ID	Aquifer Test/ Sampling Purge Rate (gpm)	pH, Field (S.U.)	Specific Conductance, Field (uS/cm)	Oxidation Reduction Potential, Field (mV)	Temperature, Field (°C)	Turbidity, Field (NTU)	Nitrate, EPA Method 300.0 (mg/L)	Depth to Water [1] (feet bmp)
YC-MW-01	1.17	7.71	1872	-53	18.3	9.94	22.2	8.03
YC-MW-02	2.14	7.8	1008	-54.9	13.7	14.6	17.2	56.25
YC-MW-05	0.43	8.05	790.7	-68.6	14.3	158.7	3.14	14.13
YC-MW-06	0.39	7.6	880.5	-51.8	13	38.52	58.4	48.14
YC-MW-07	0.55	7.63	1278	-49.1	13.8	0.21	4.34	16.27
YC-MW-08	2.19	7.8	944	-55.8	12.9	56.31	15.4	5.85
YC-MW-09	0.39	7.89	493.1	-63.9	13.9	482.5	1.7	23.72
YC-MW-10	1.11	7.6	1093	-46.3	14	221.8	11.5	62.08
YC-MW-11	B	8.38	559.5	[2]	14.1	35.98	1.74	162.55
YC-MW-12	0.16	8.18	267.1	-79.1	15.6	119.1	0.38	25.48
YC-MW-14	[3]	[3]	[3]	[3]	[3]	[3]	[3]	27.05
YC-MW-15	B	8.61	377.6	-102.8	14	179.4	1.02	188.68
YC-MW-16	0.7	7.55	1299	-43.3	13.5	1.15	6.3	9.99
YC-MW-17	2.12	7.27	929.2	-28.4	14.1	1.65	6.85	85.67
YC-MW-19	0.94	7.6	1102	-46	13.9	3.29	15.1	49.41
YC-MW-21	0.27	8.07	483.6	-63.7	14.3	44.32	0.66	30.18
YC-MW-23	1.97	7.71	817.8	-52.5	13.8	6.5	6	94.95
YC-MW-24	0.92	7.71	531.1	-54.4	13.9	14.49	6.32	37.66
YC-MW-25	B	7.82	544.7	-66.7	15.4	506	3.58	263.55
YC-MW-26	0.22	7.83	624.6	-58.4	15.3	27.59	3.26	73.77
YC-MW-27	1.39	8.13	834.8	-67.7	15.3	198.3	24.6	9.08
YC-MW-28	1.41	8.07	250.5	-72	15.2	3.09	3.1	25.25
YC-MW-31	2.8	7.94	376.6	-67.1	15.2	1.64	5.94	29.04
YC-MW-33	0.69 [4]	7.91	1102	-57.5	12.5	2.43	24.2	6.23
YC-MW-38	1.5	7.43	629.1	-38.7	14.9	3.88	10.3	120.39
YC-MW-39	0.09	7.81	972.3	-51.7	10.9	738	18.1	107.11
YC-MW-41	2.64	7.48	968.9	-45.2	13.3	1.37	26.9	44.29
YC-MW-42	1.05	7.67	542.8	-51	13.2	>1100	7.04	33.39
YC-MW-44	3.44	7.51	815.9	-43	12.9	2.1	30.2	13.85
YC-MW-46	0.75	7.53	1089	-36.8	11.3	117	18.1	12.78

B - well was hand bailed, no purge rate was determined

bmp- below measuring point

°C - degrees celsius.

mg/L = milligrams/liter

mV = millivolts

NTU = Nephelometric Turbidity Units

S.U. - standard units

uS/cm - microSiemens/centimeter

[1] Static depth to water measurements made during hydraulic testing/sampling event.

[2] Field parameter not measured.

[3] No aquifer test was performed at monitoring well YC-MW-14, this well had insufficient water during the December 2018 sampling event.

[4] YC-MW-33 initially pumped at approximately 0.9 gpm for 12 minutes, which was reduced to approximately 0.69 gpm for the remaining 31 minutes of the test to avoid excessive drawdown in the well.

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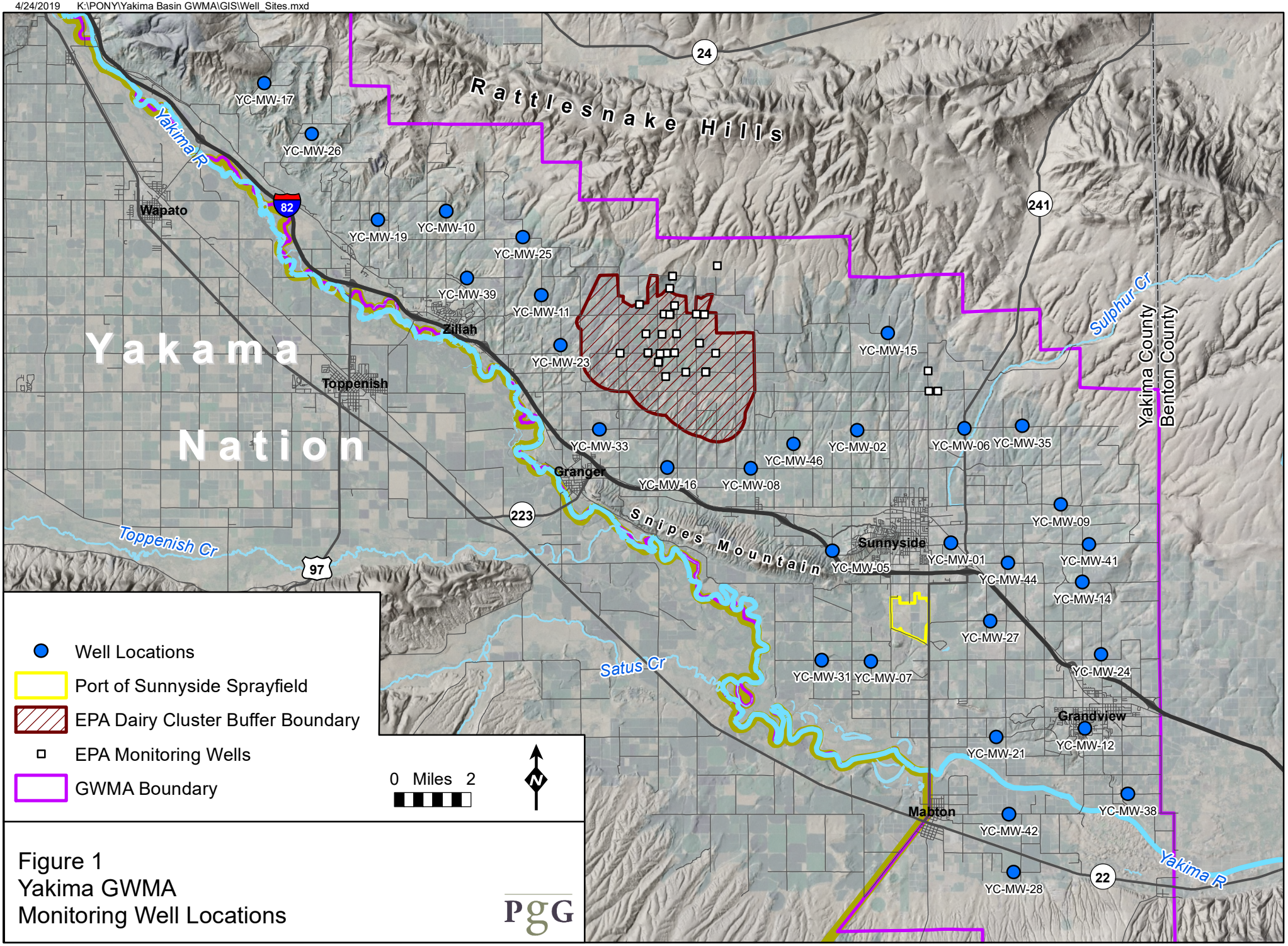

Figure 1
Yakima GWMA
Monitoring Well Locations

PgG

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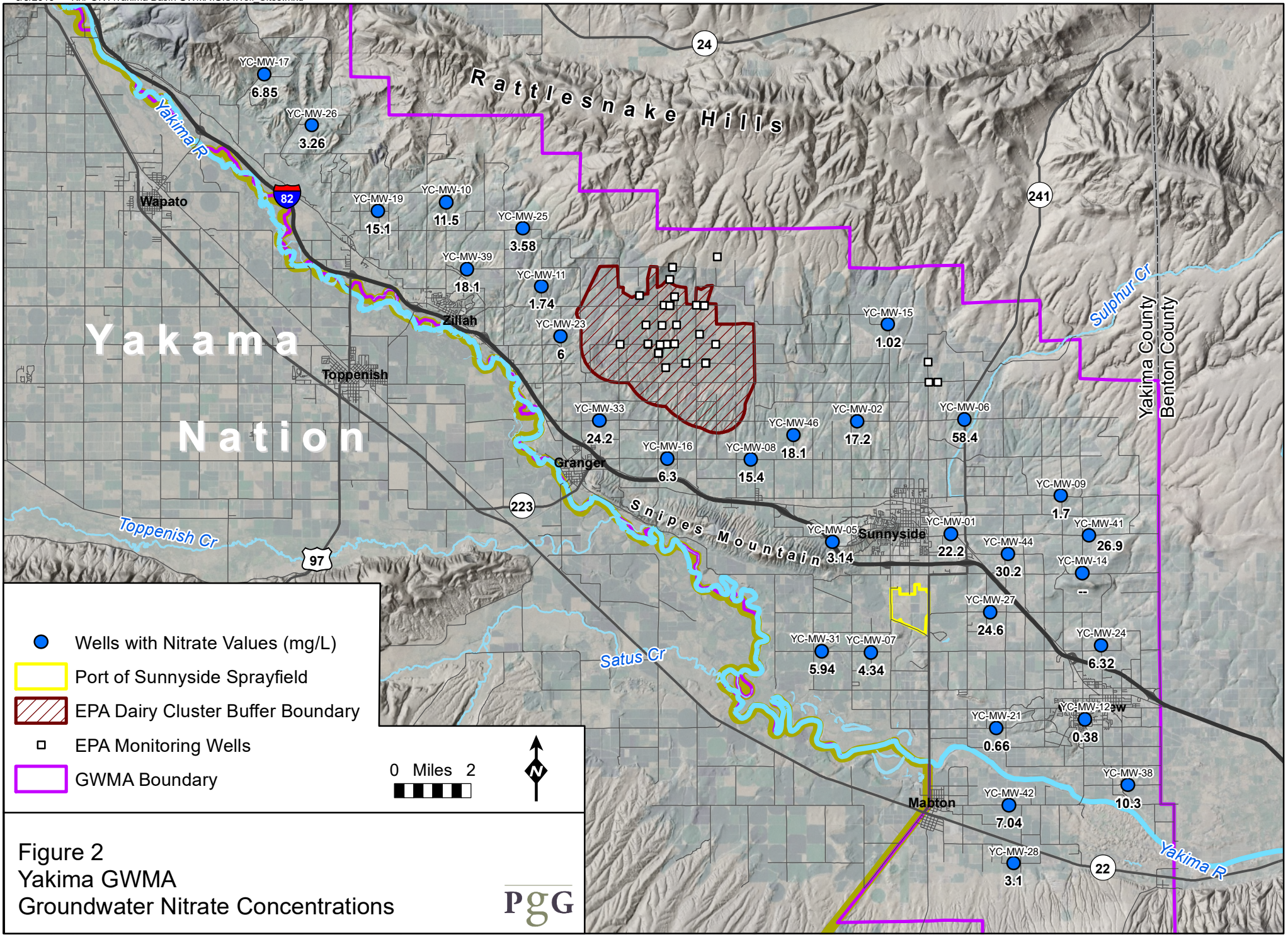

Figure 2
Yakima GWMA
Groundwater Nitrate Concentrations

PgG

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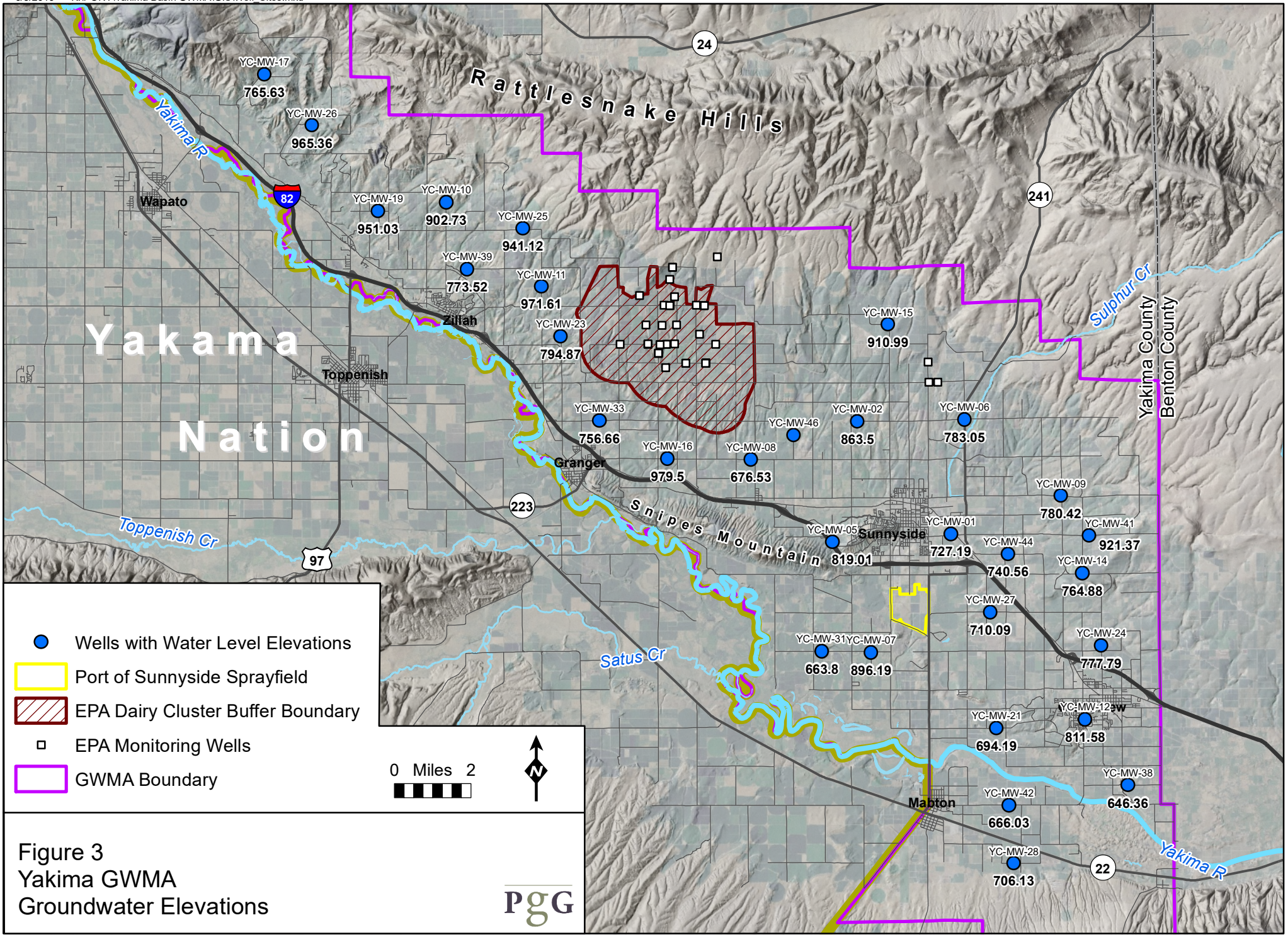
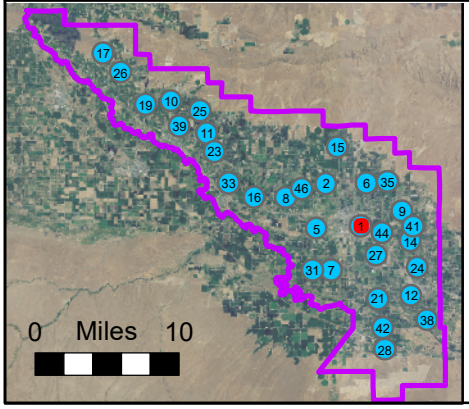


Figure 3
Yakima GWMA
Groundwater Elevations

PgG

APPENDIX A
BORING Location Maps





Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-01

PgG

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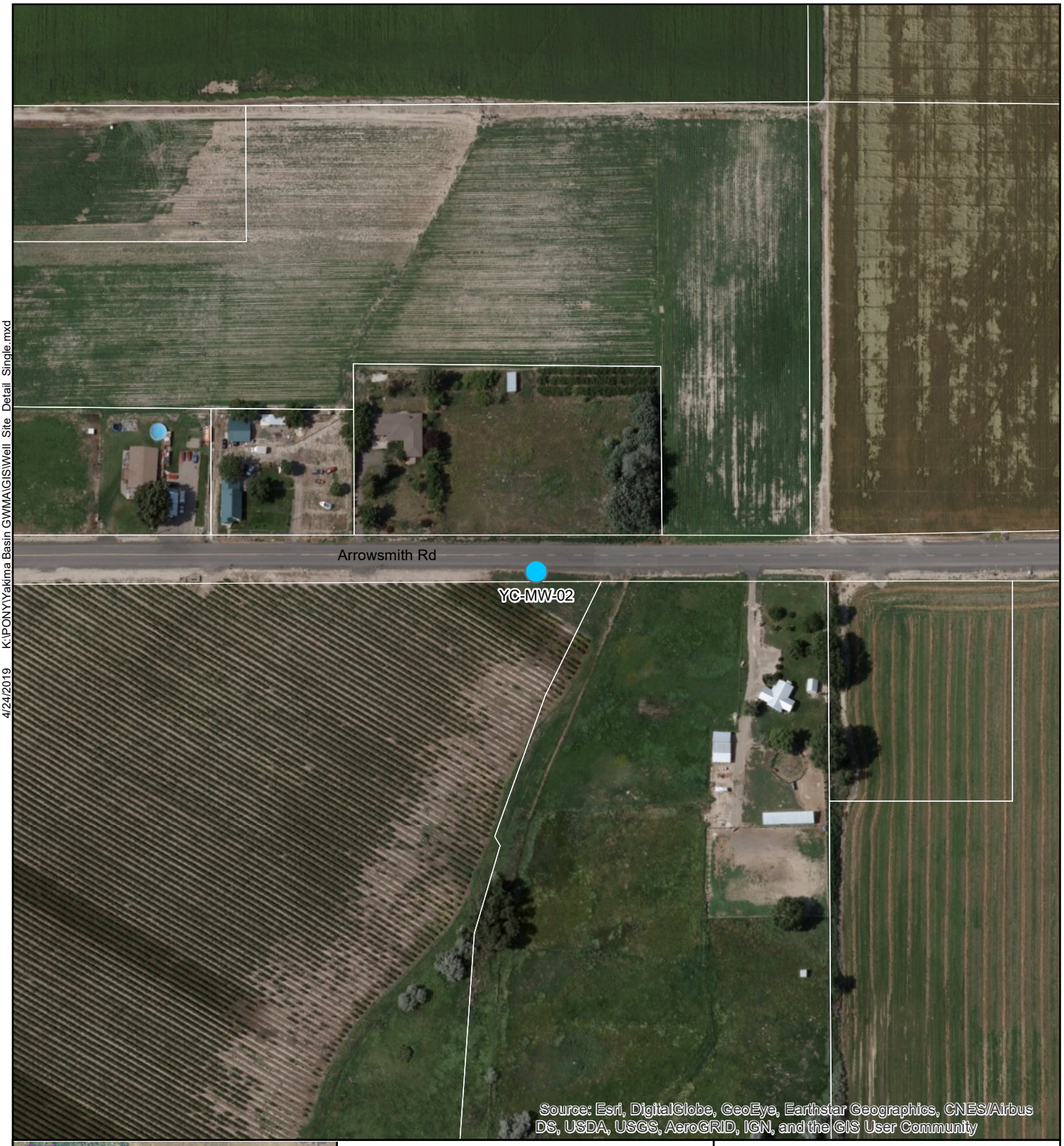

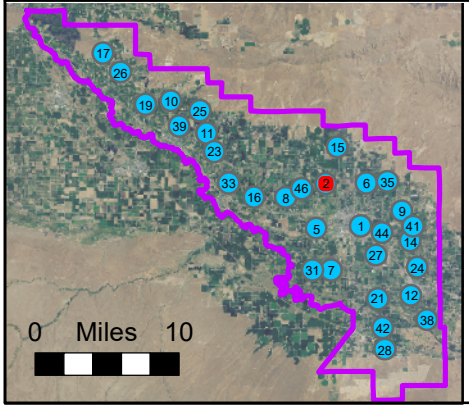

Well Location

N

0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-02

PgG

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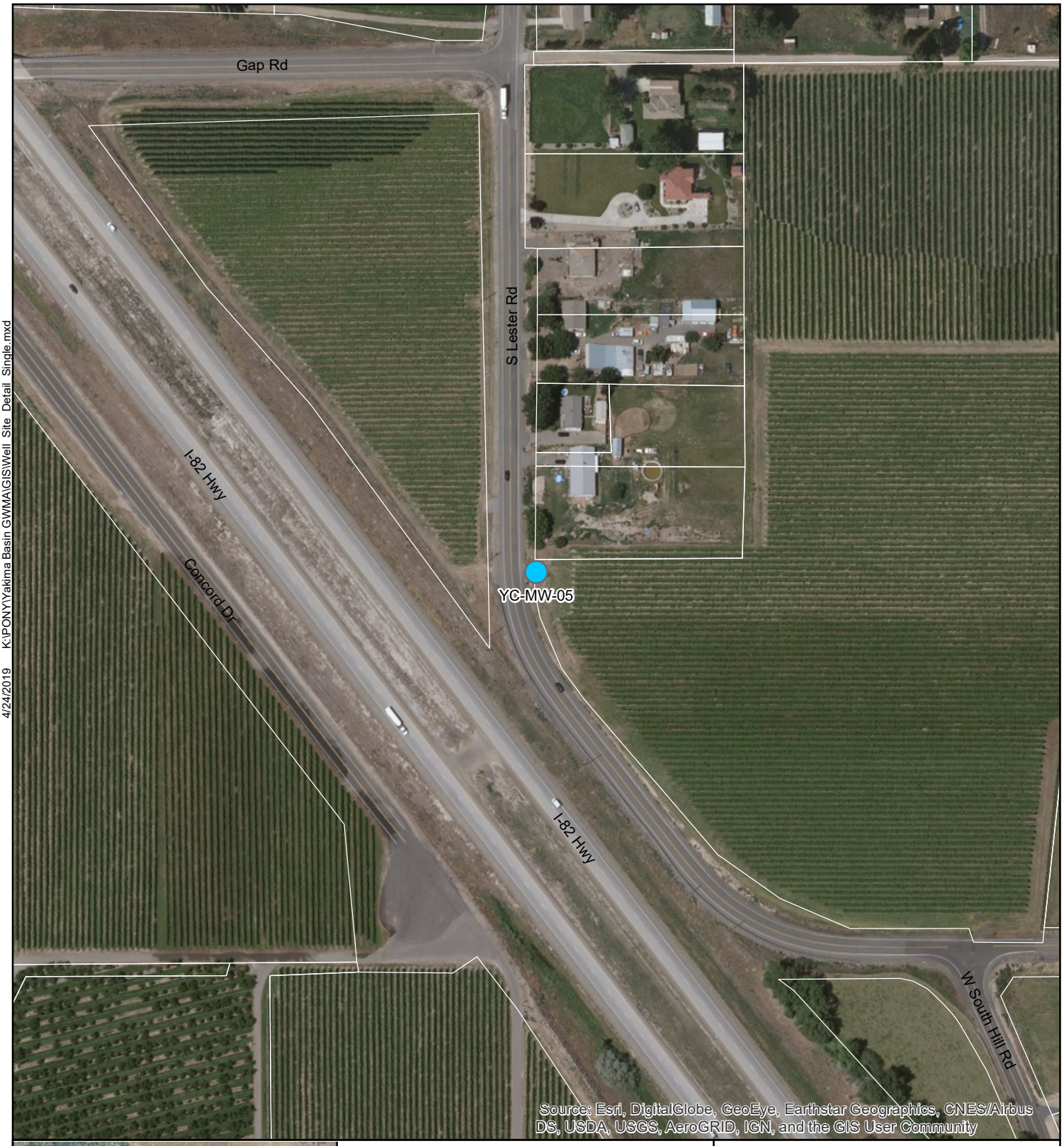

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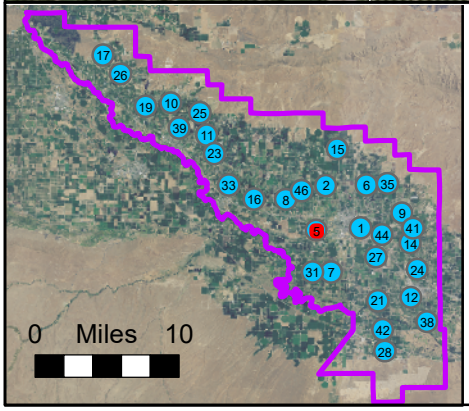


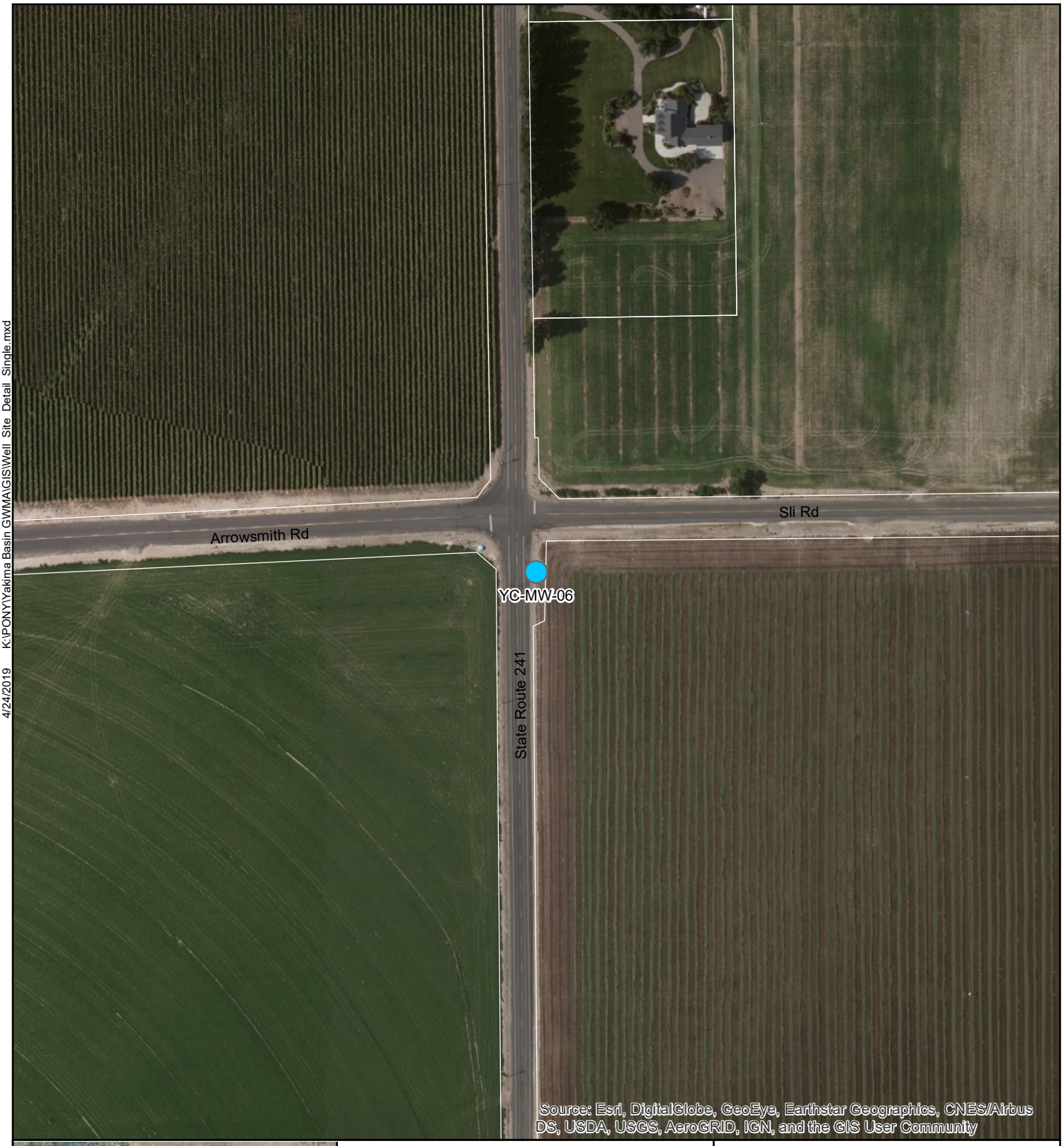
Well Location

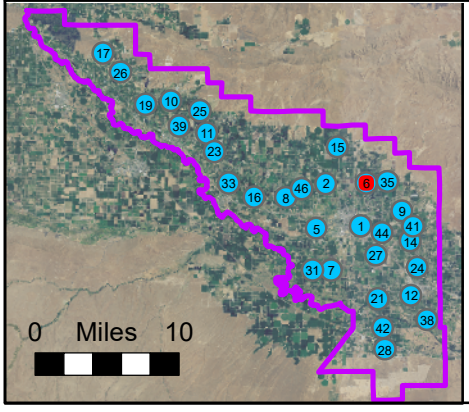
N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-05

PgG





Well Location

N

0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-06

PgG

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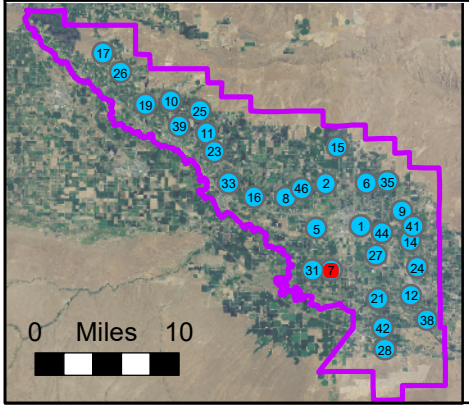

Well Location

N

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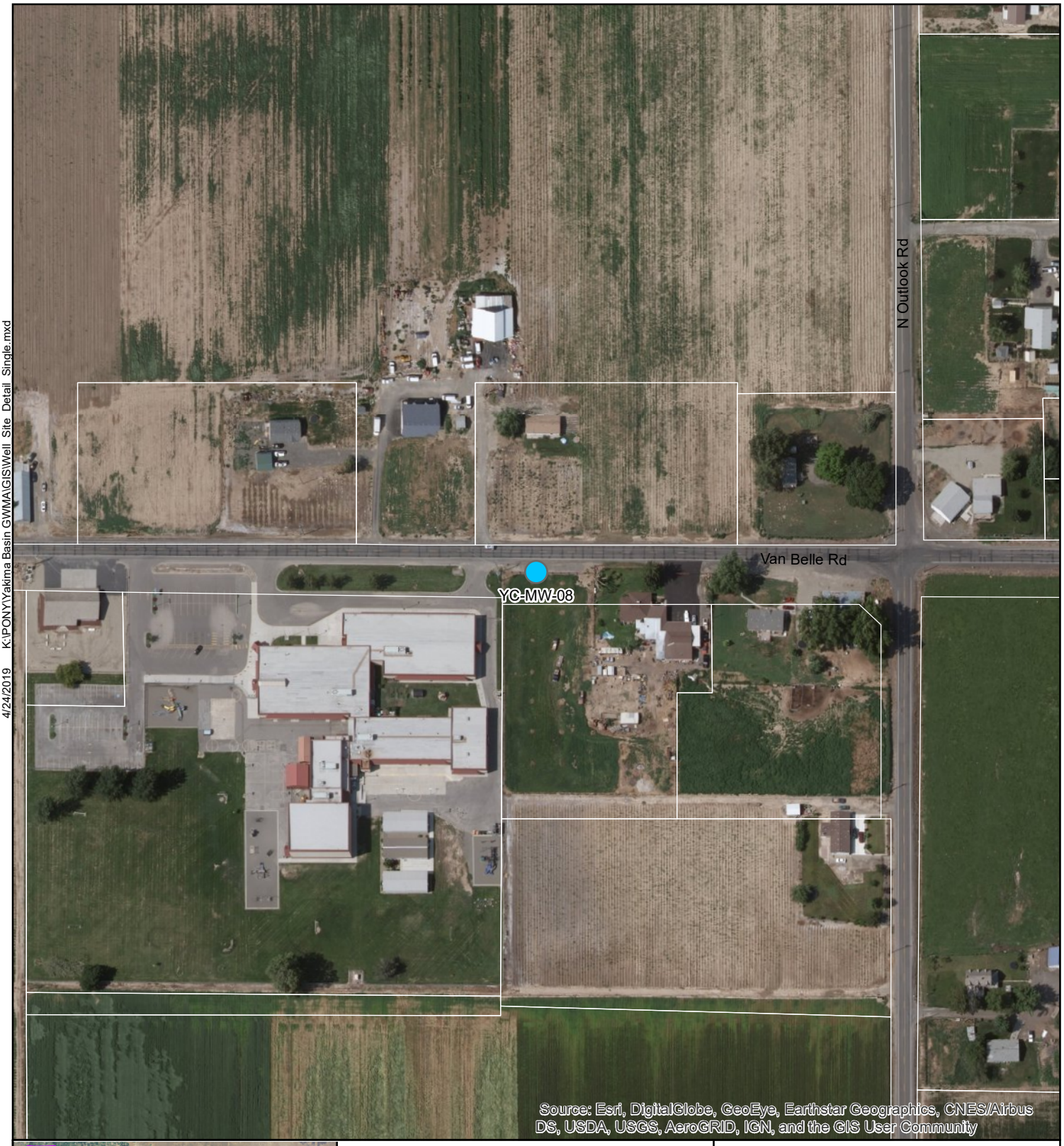
Yakima GWMA Monitoring Well YC-MW-07

PgG



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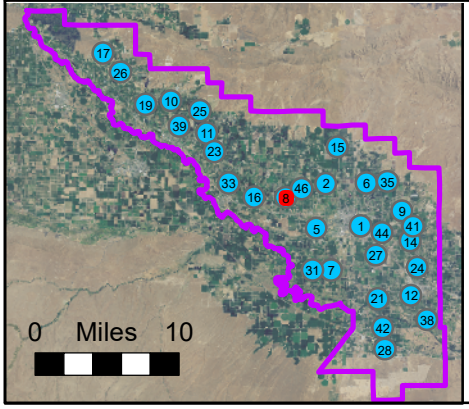


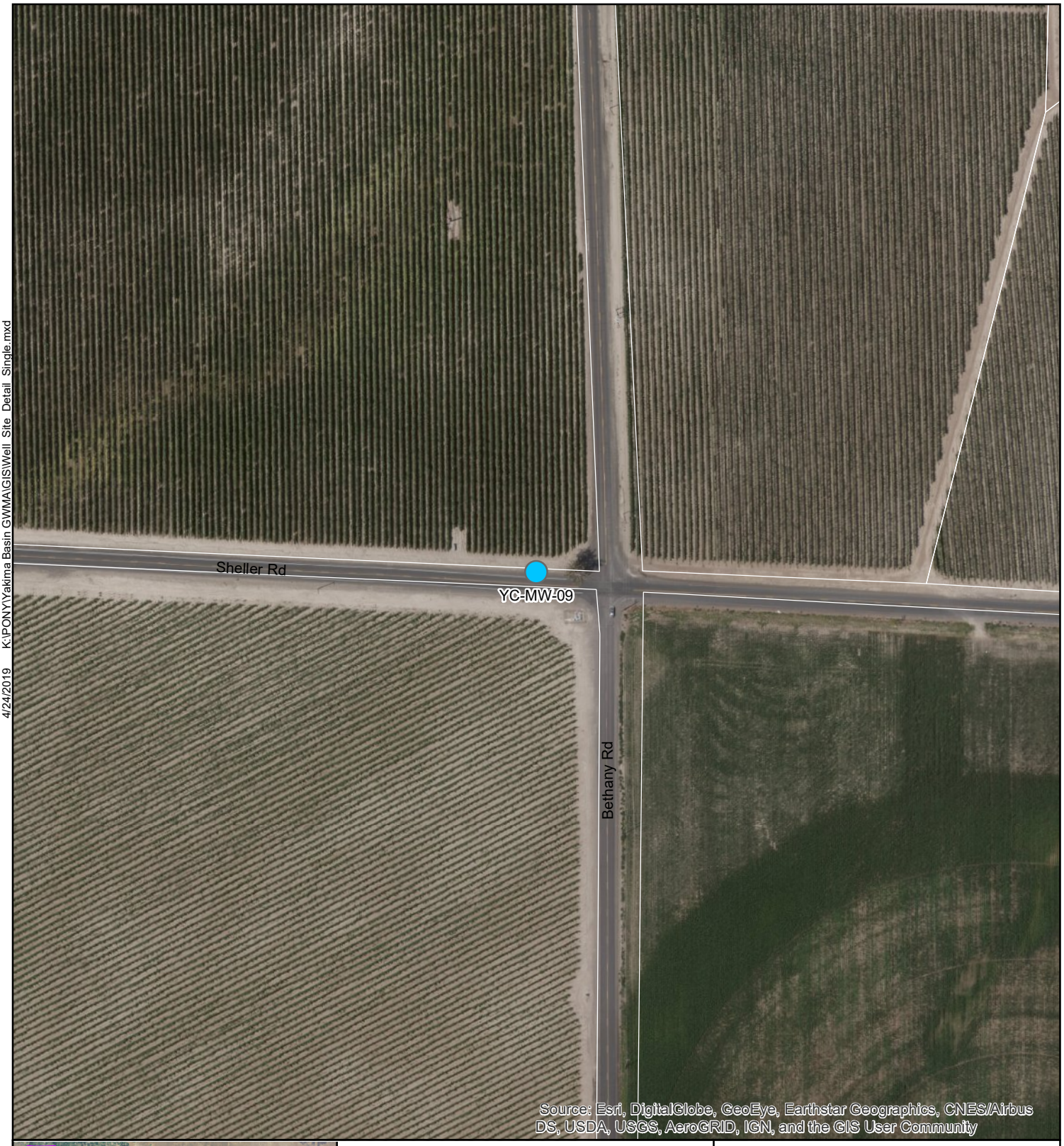
Well Location

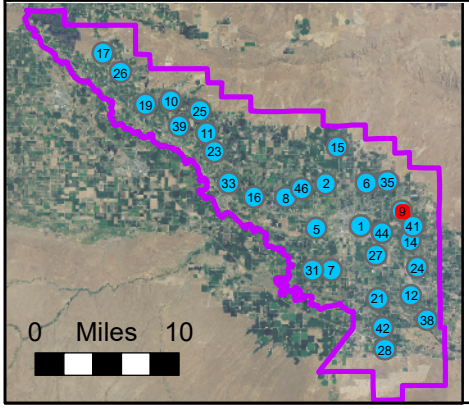
N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-08

PgG





Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-09

PgG

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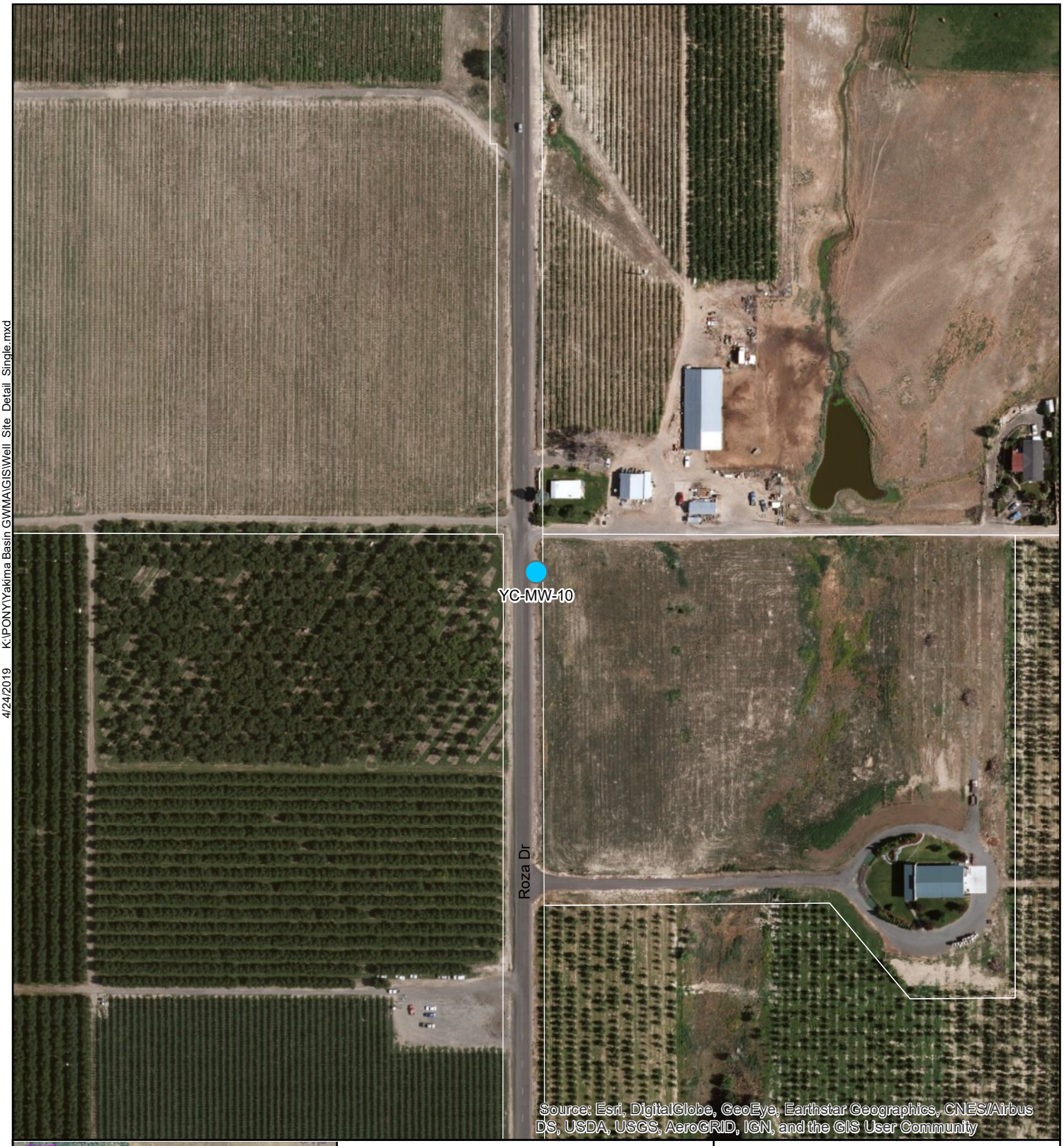

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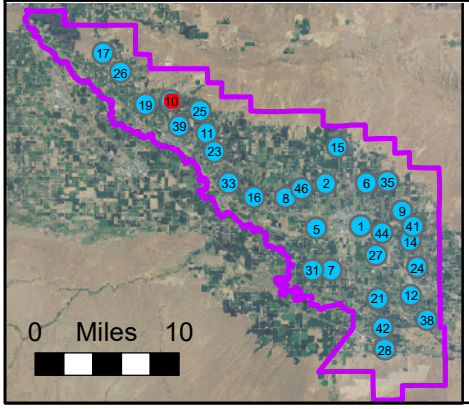


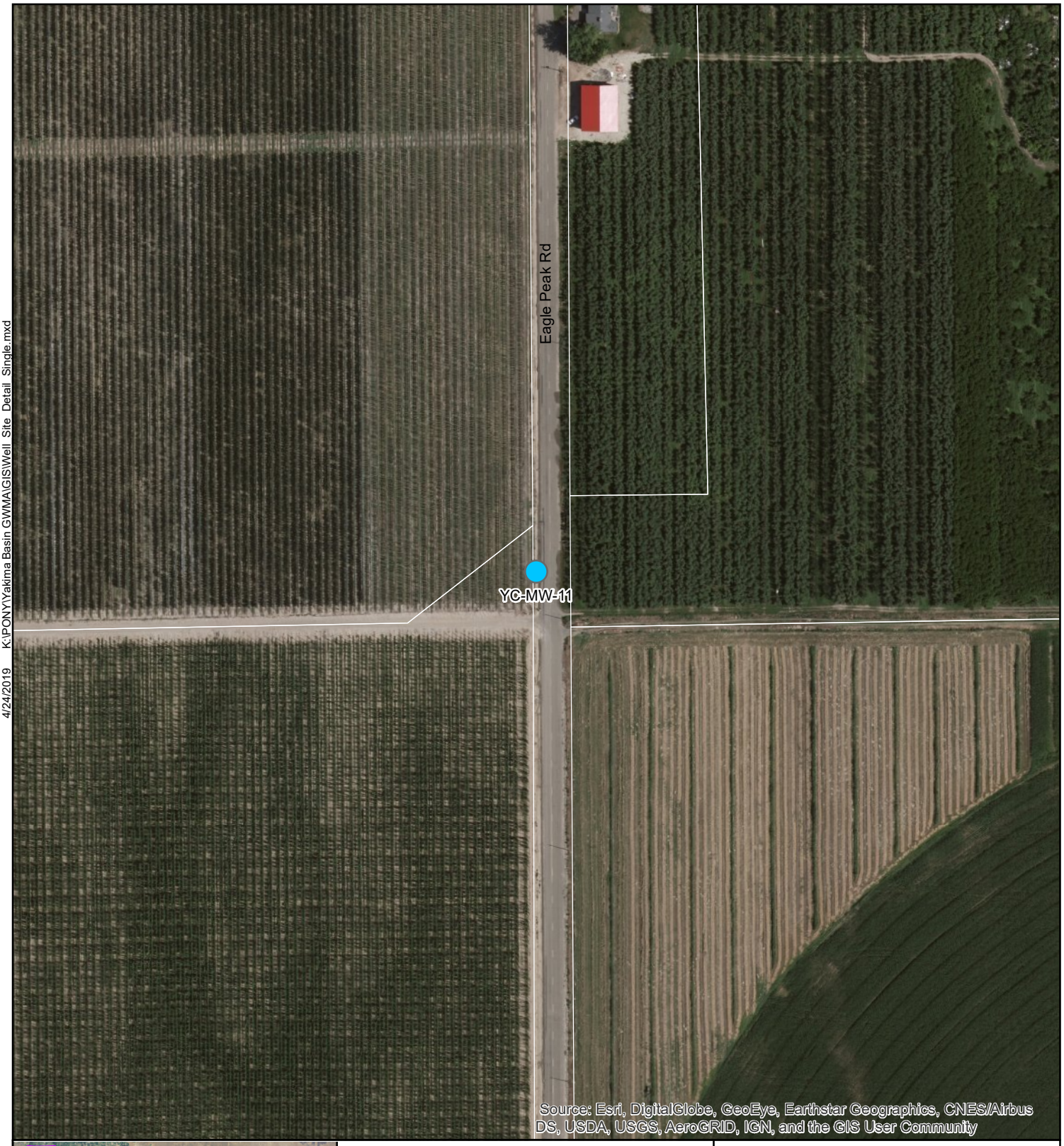
Well Location

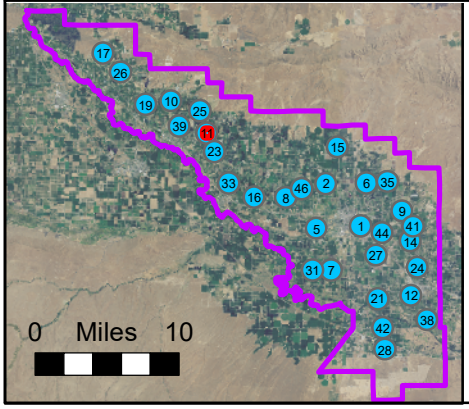
N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-10

PgG





Well Location

N

0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-11

PgG

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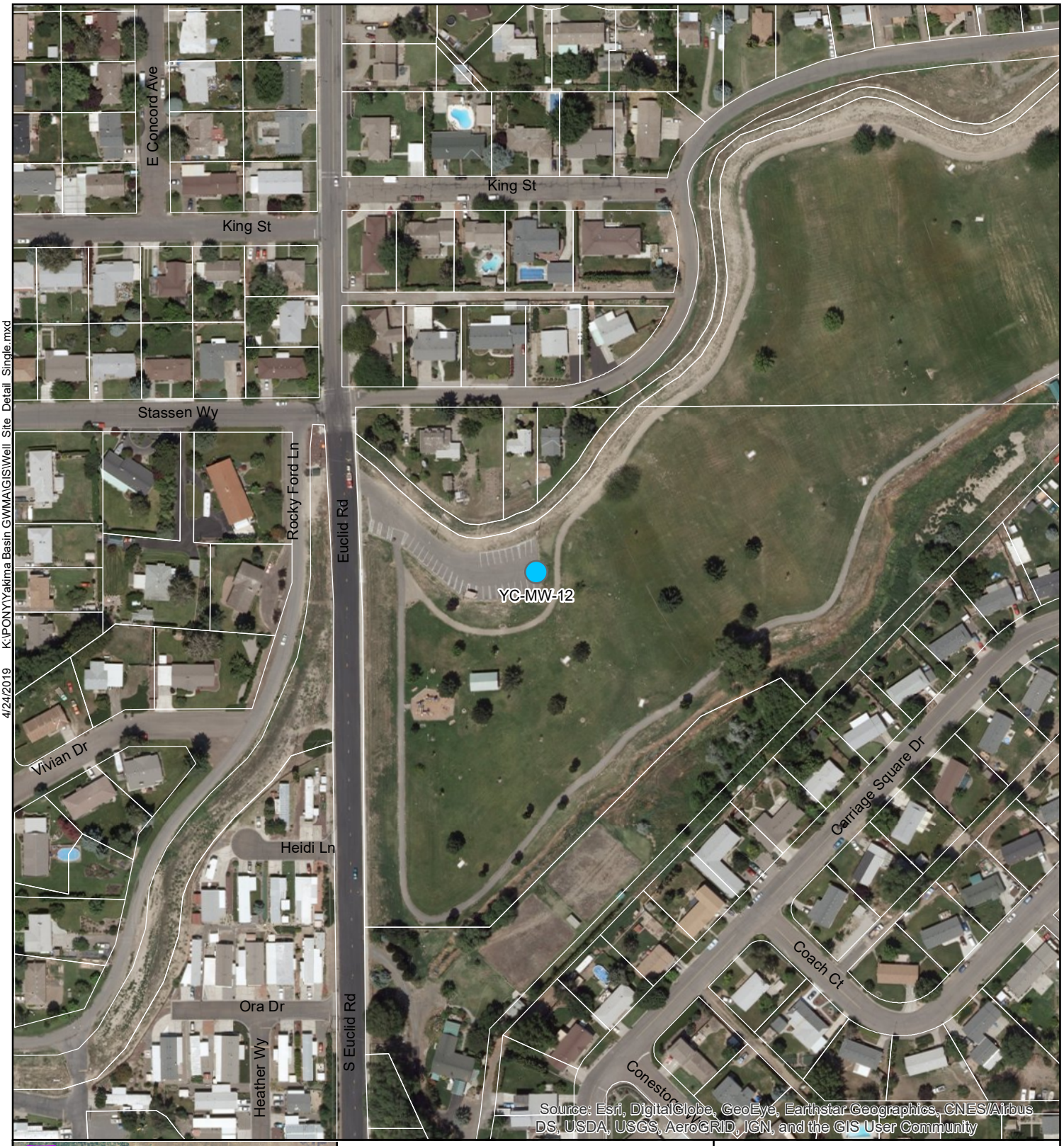

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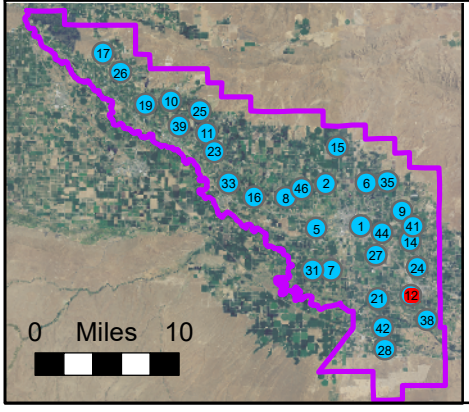


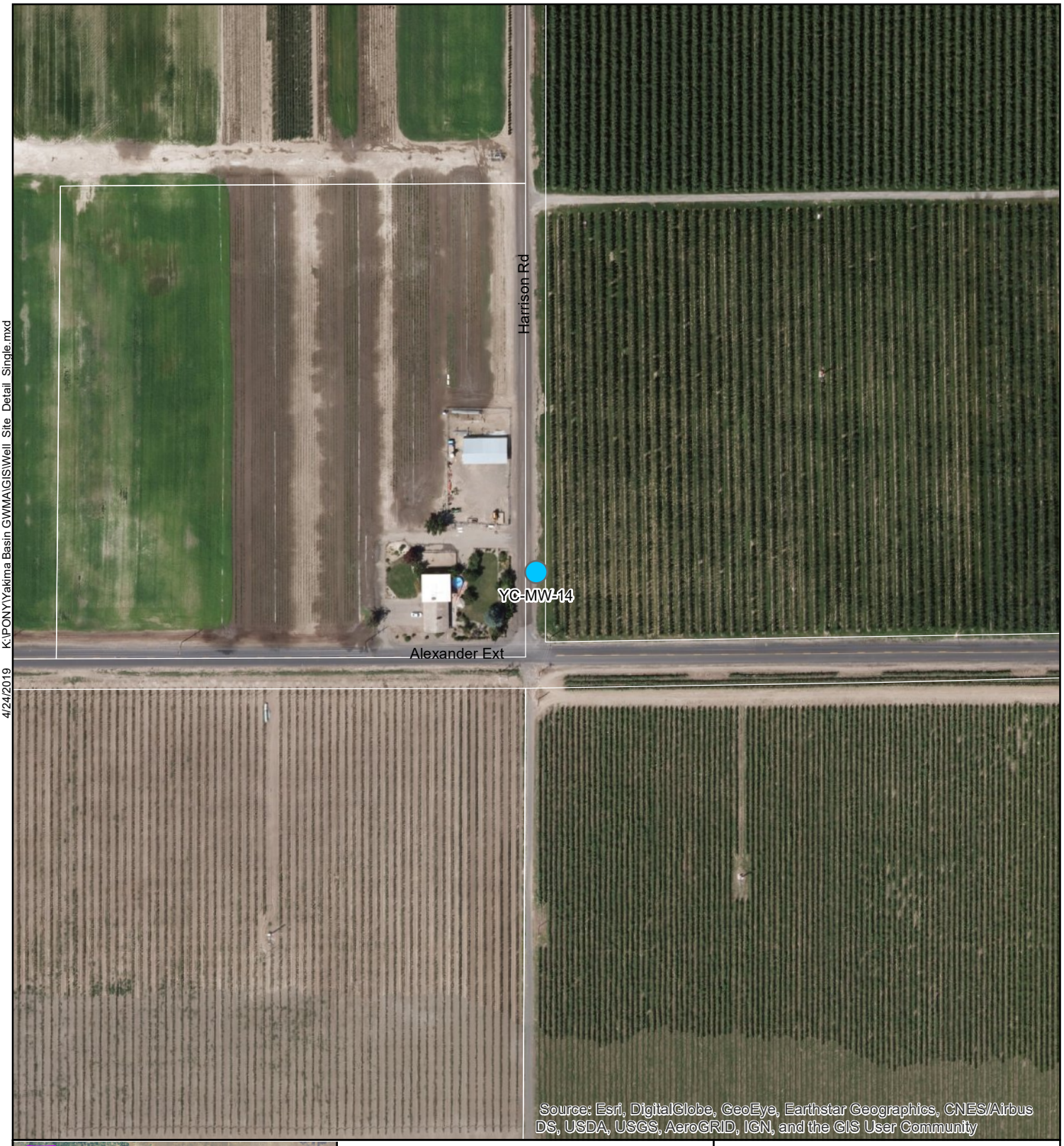
Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-12

PgG



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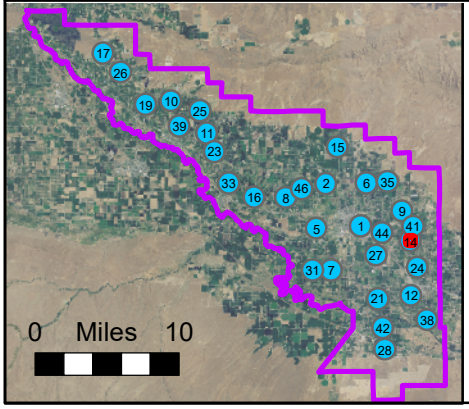


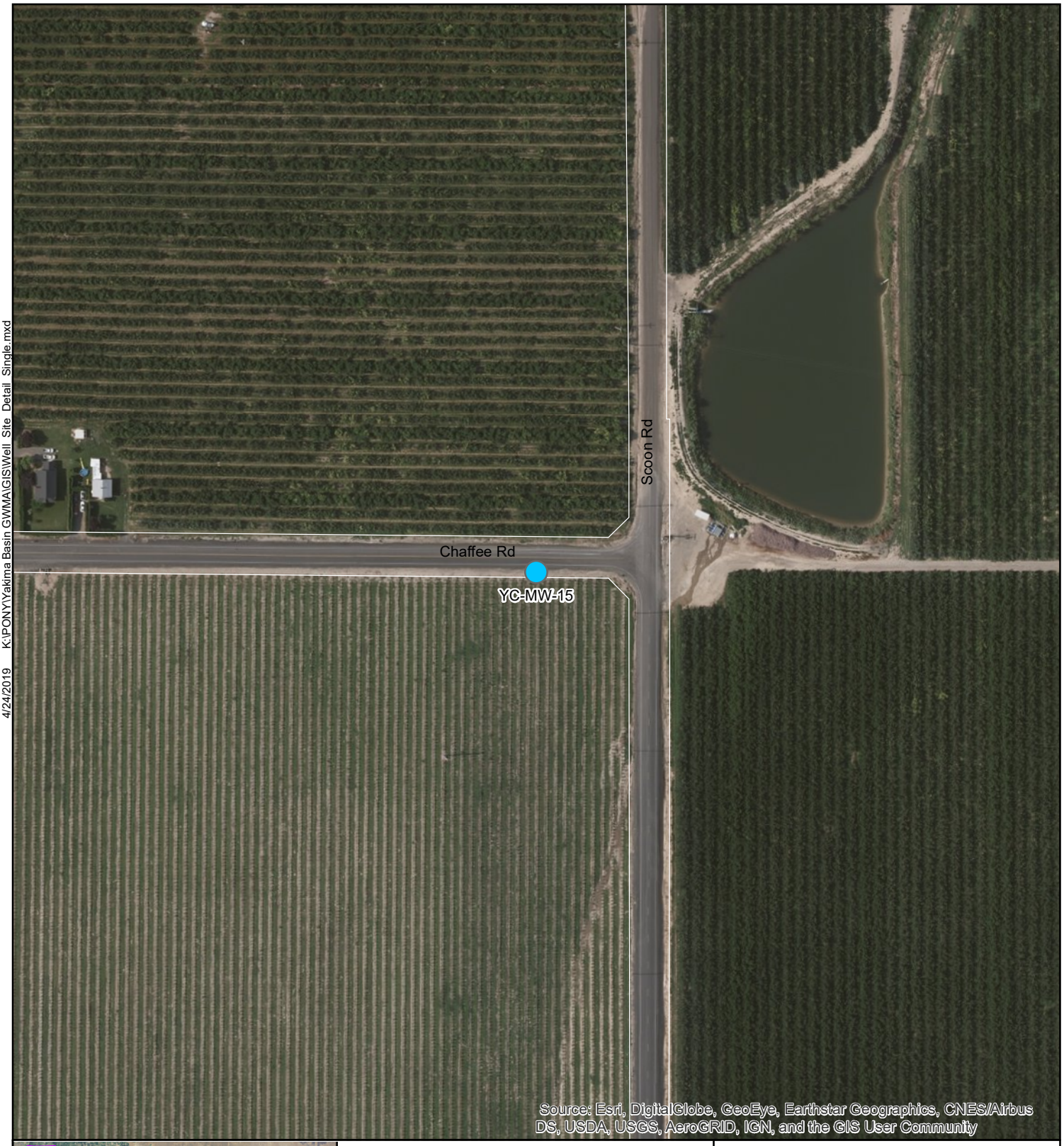
Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-14

PgG



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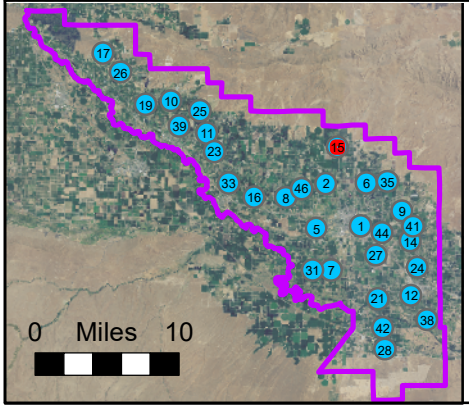


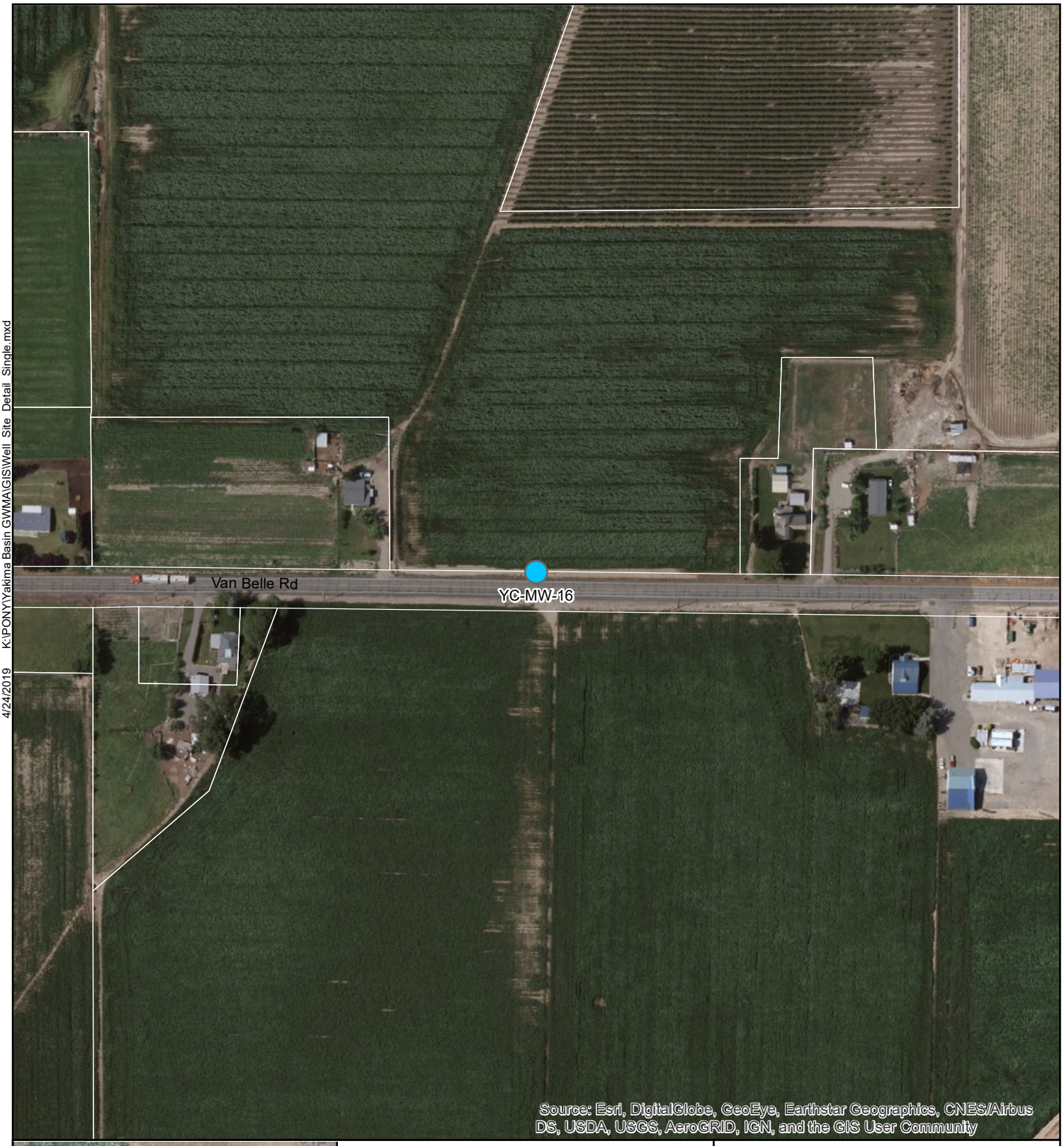
Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-15

PgG



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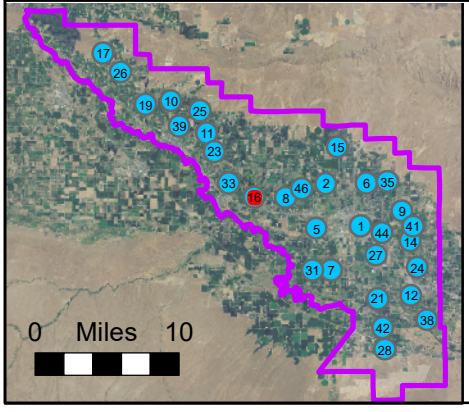


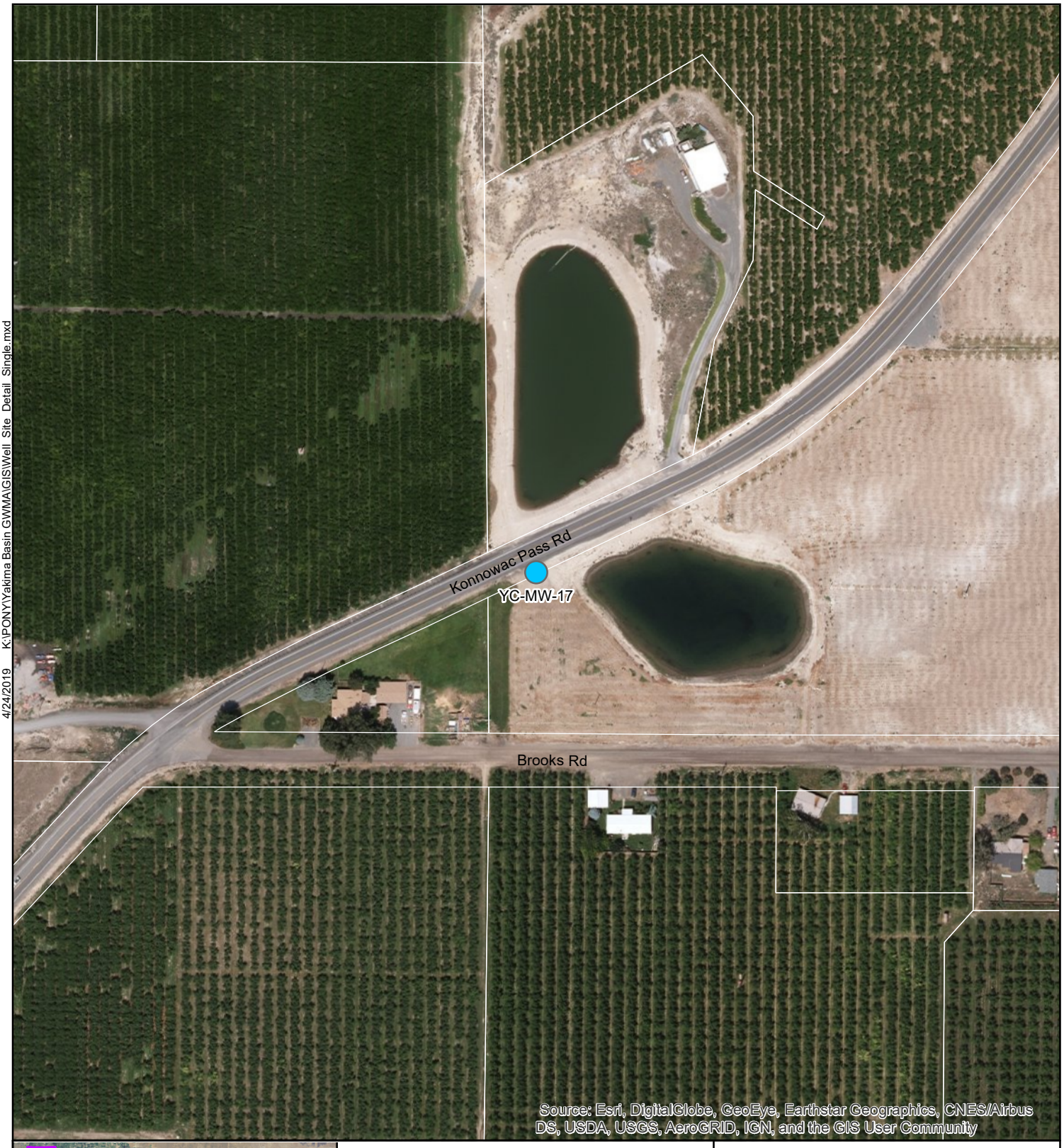
Well Location

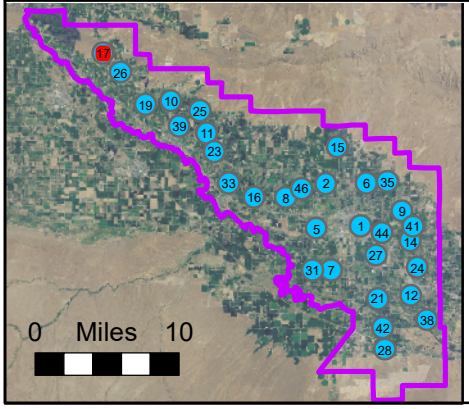
N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-16

PgG





Well Location

N

0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-17

PgG

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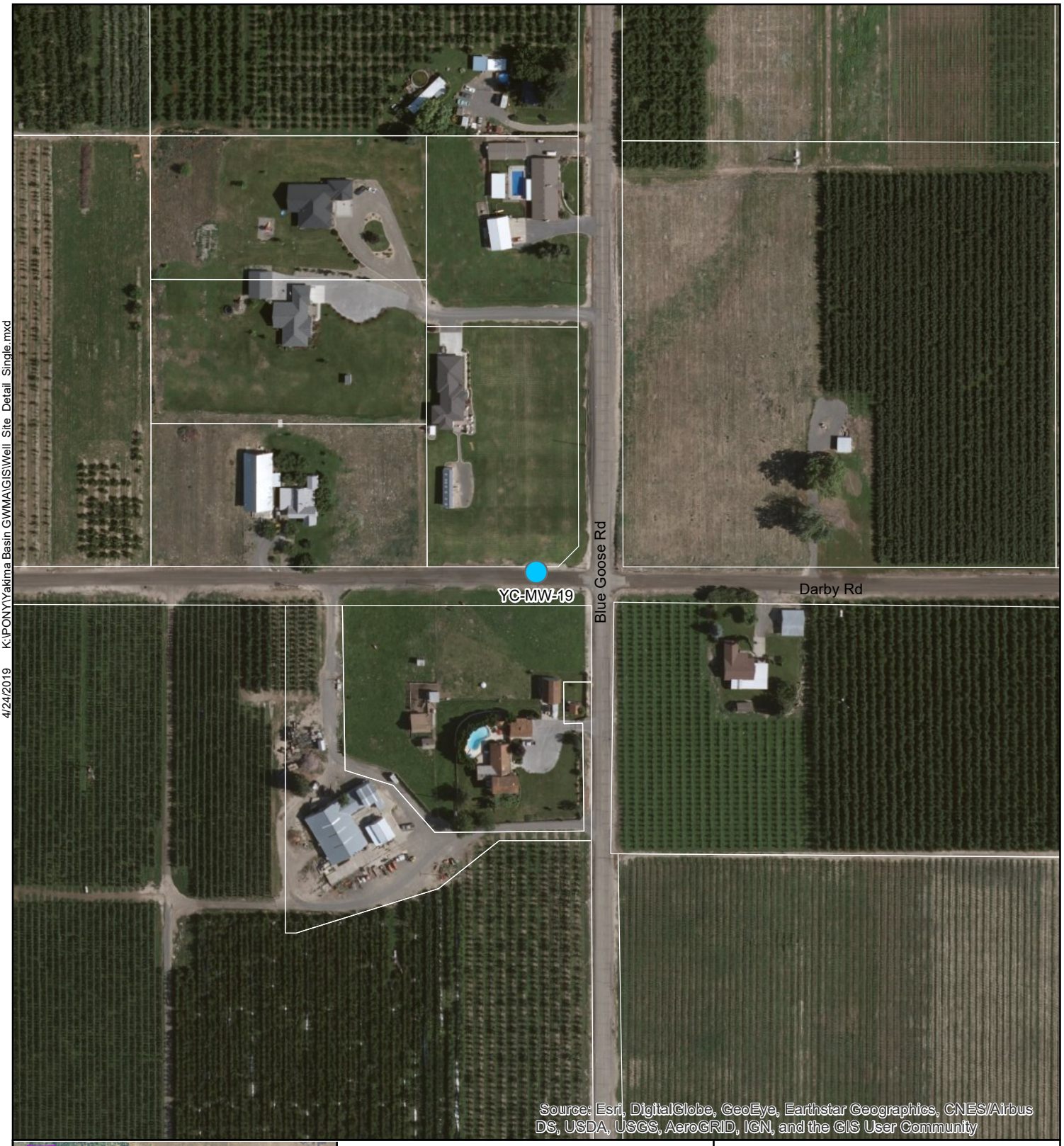

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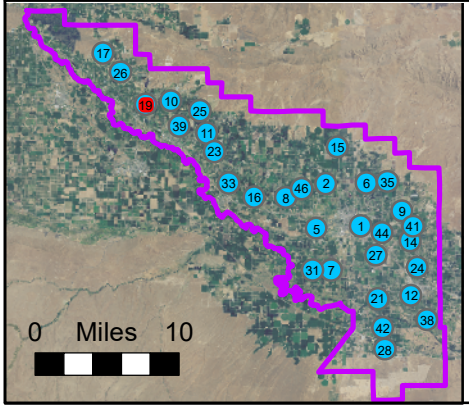


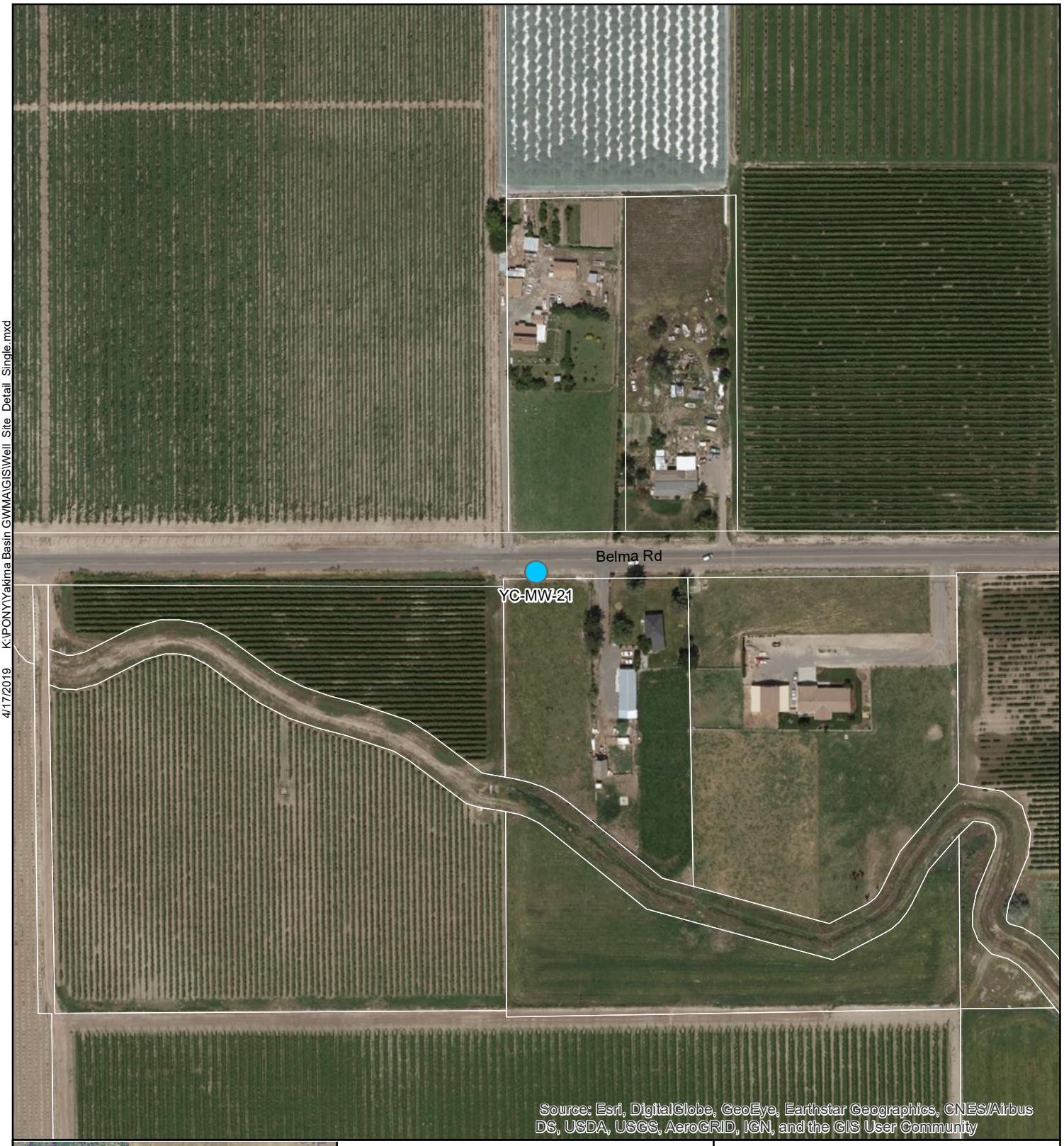
Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-19

PgG



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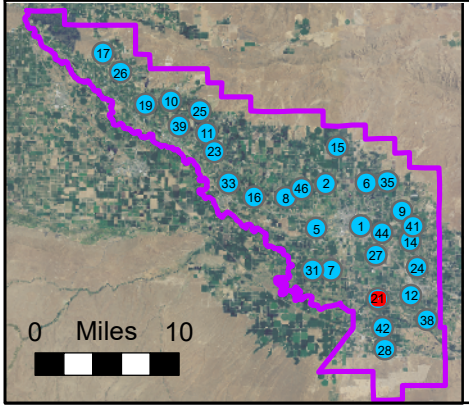


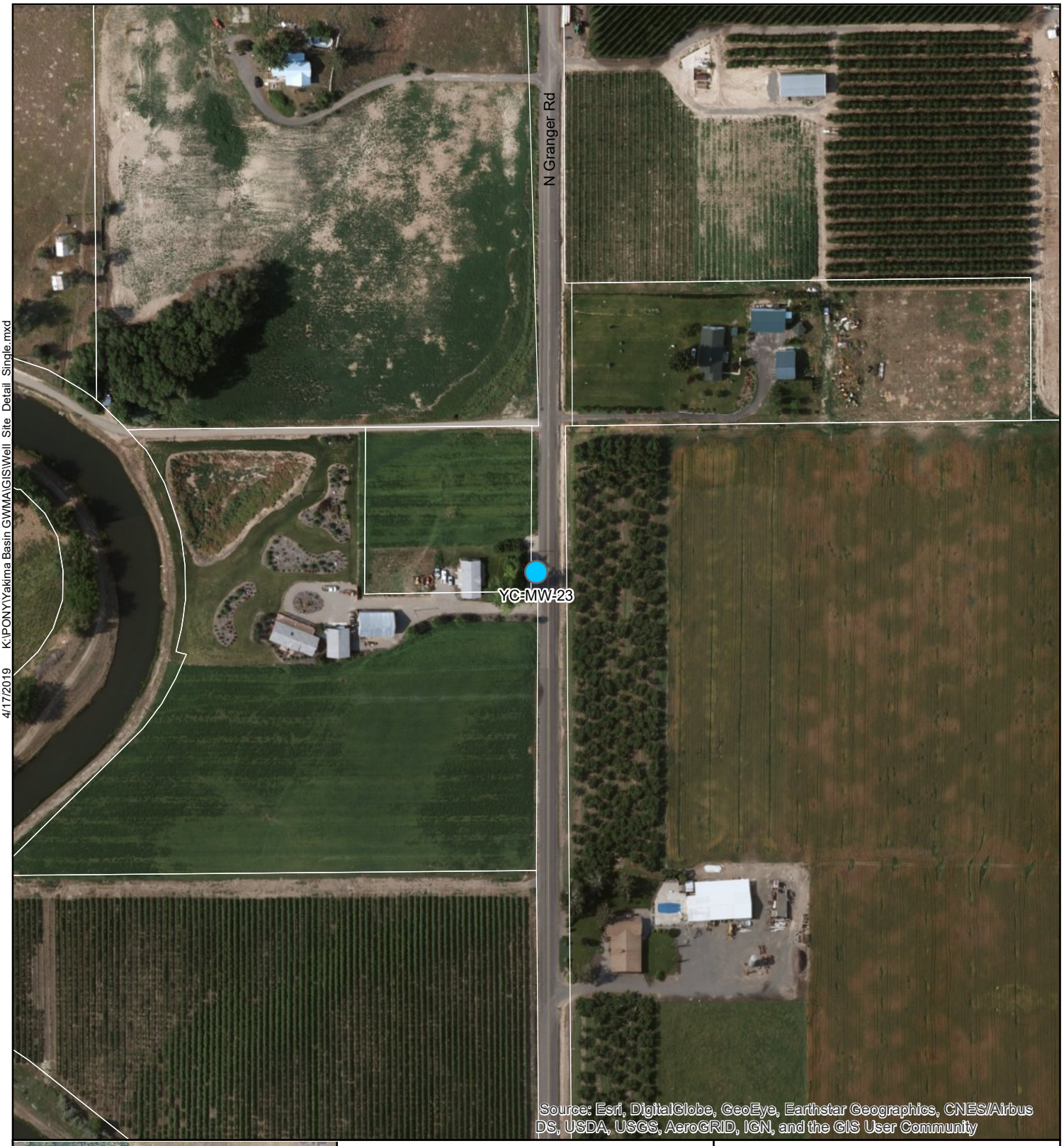
Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-21

PgG



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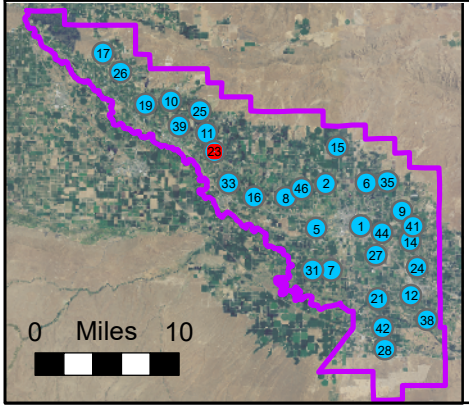


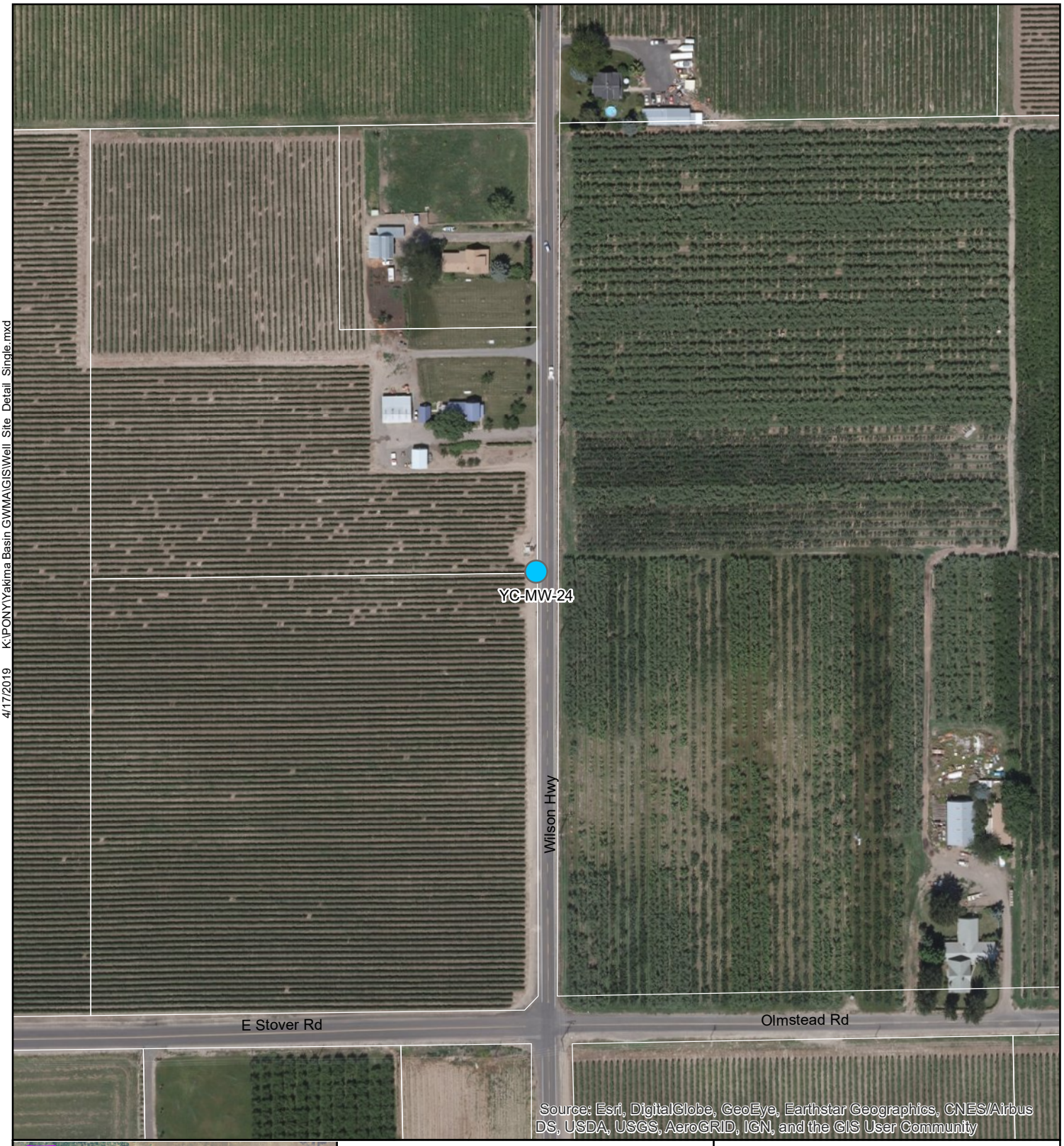
Well Location

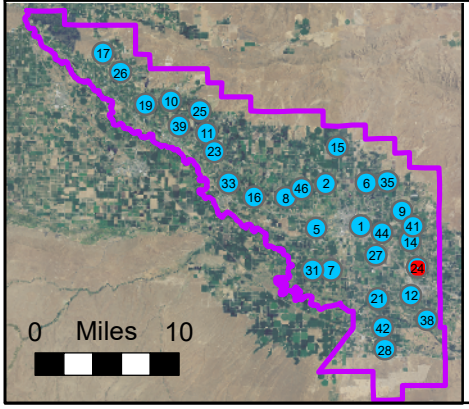
N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-23

PgG





Well Location

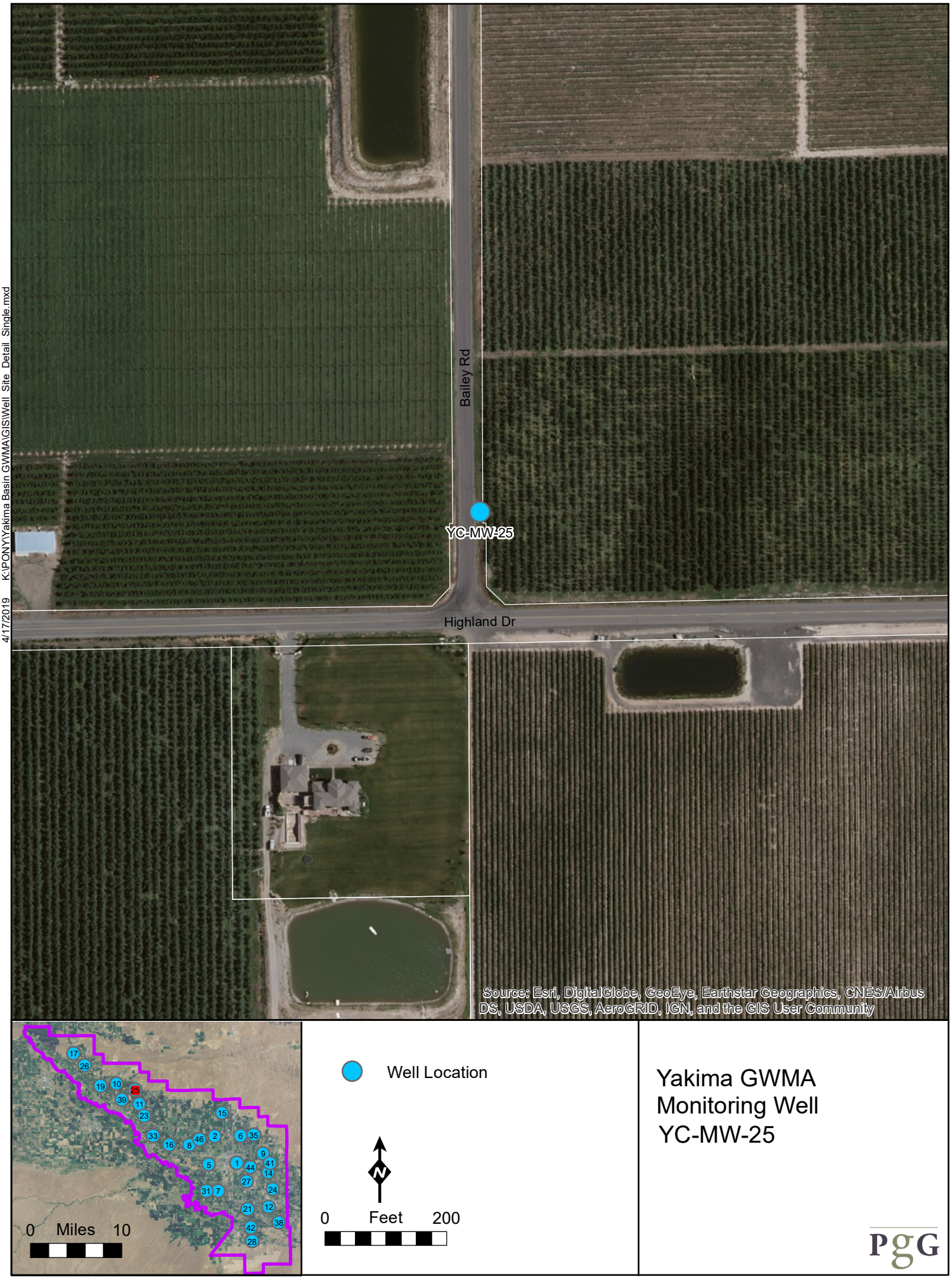
N

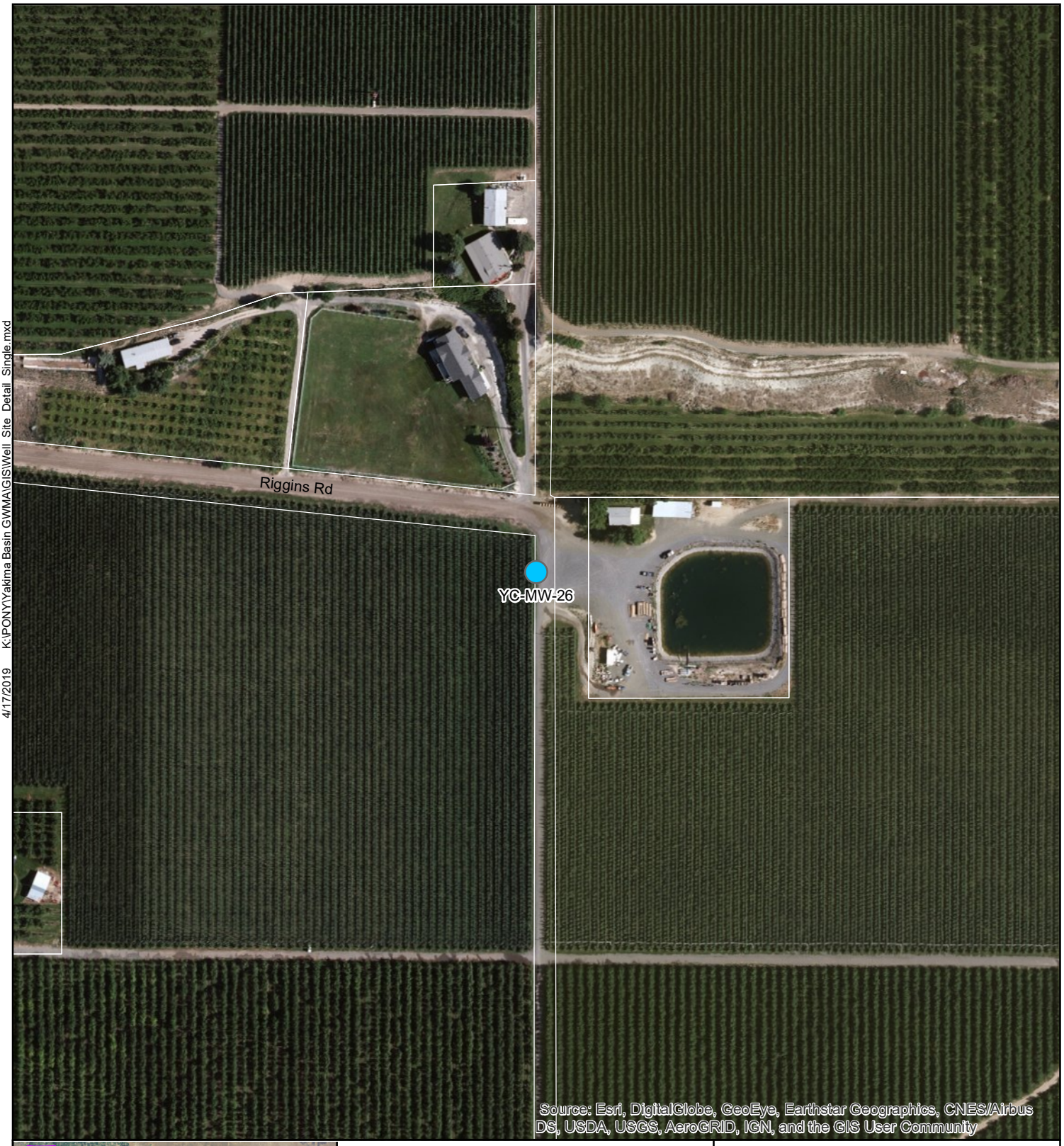
0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-24

PgG

4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd


4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd
Bailey Rd
YC-MW-25
Highland Dr
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
0 Miles 10
Well Location
N
0 Feet 200
Yakima GWMA
Monitoring Well
YC-MW-25
PgG



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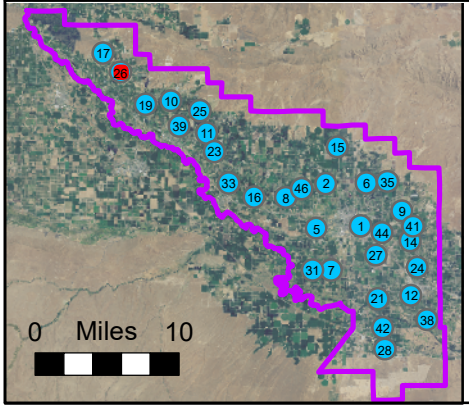


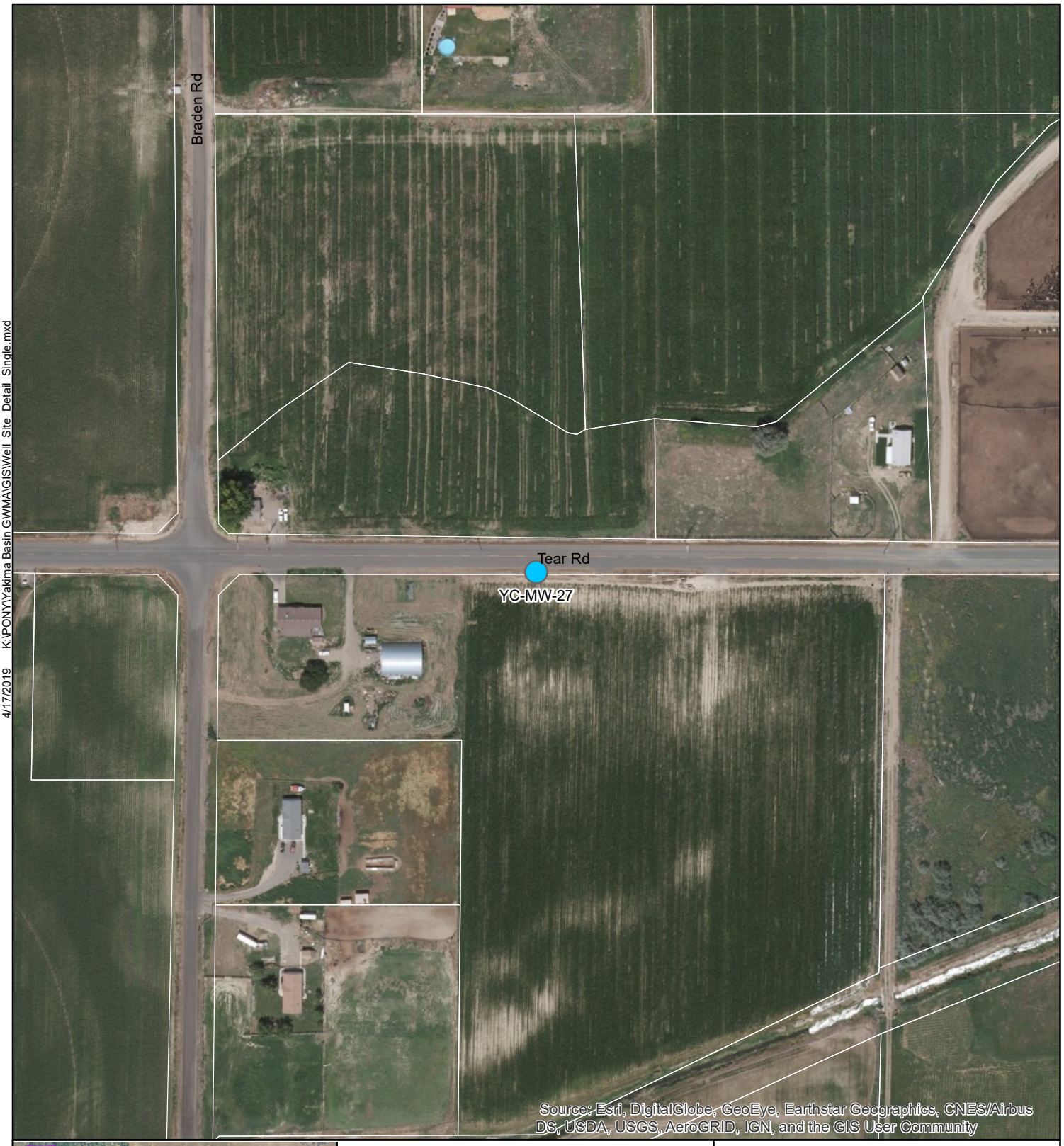
Well Location

N

0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-26

PgG



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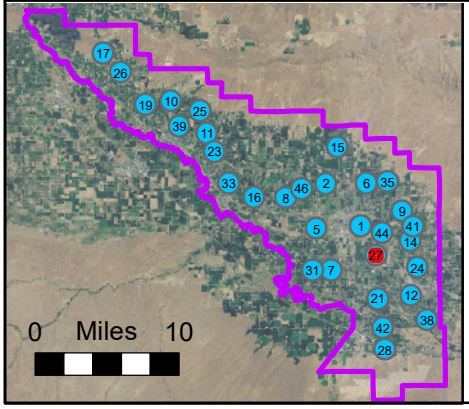


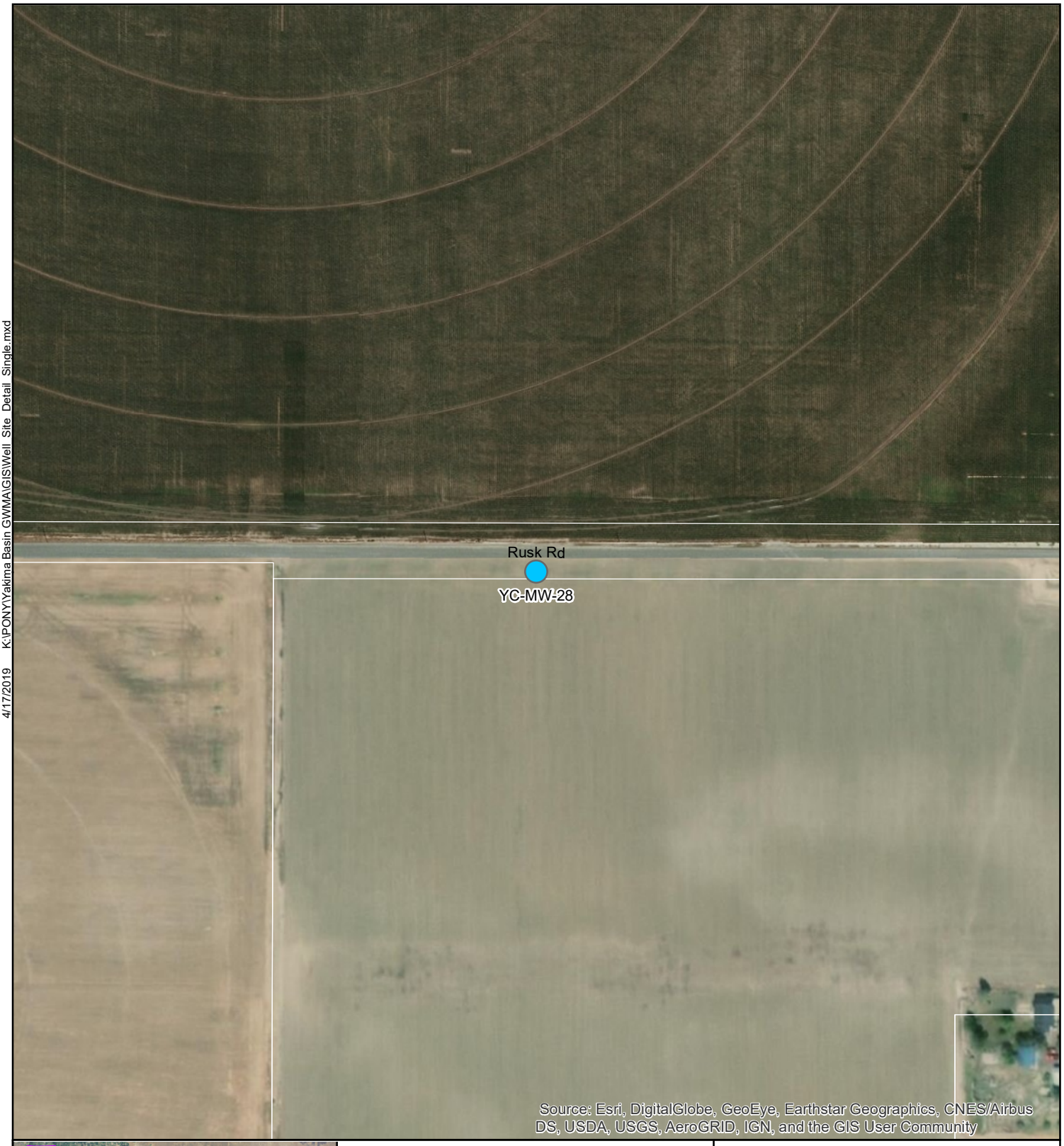
Well Location

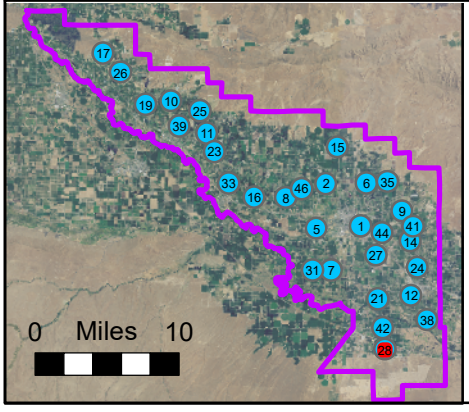
N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-27

PgG





Well Location

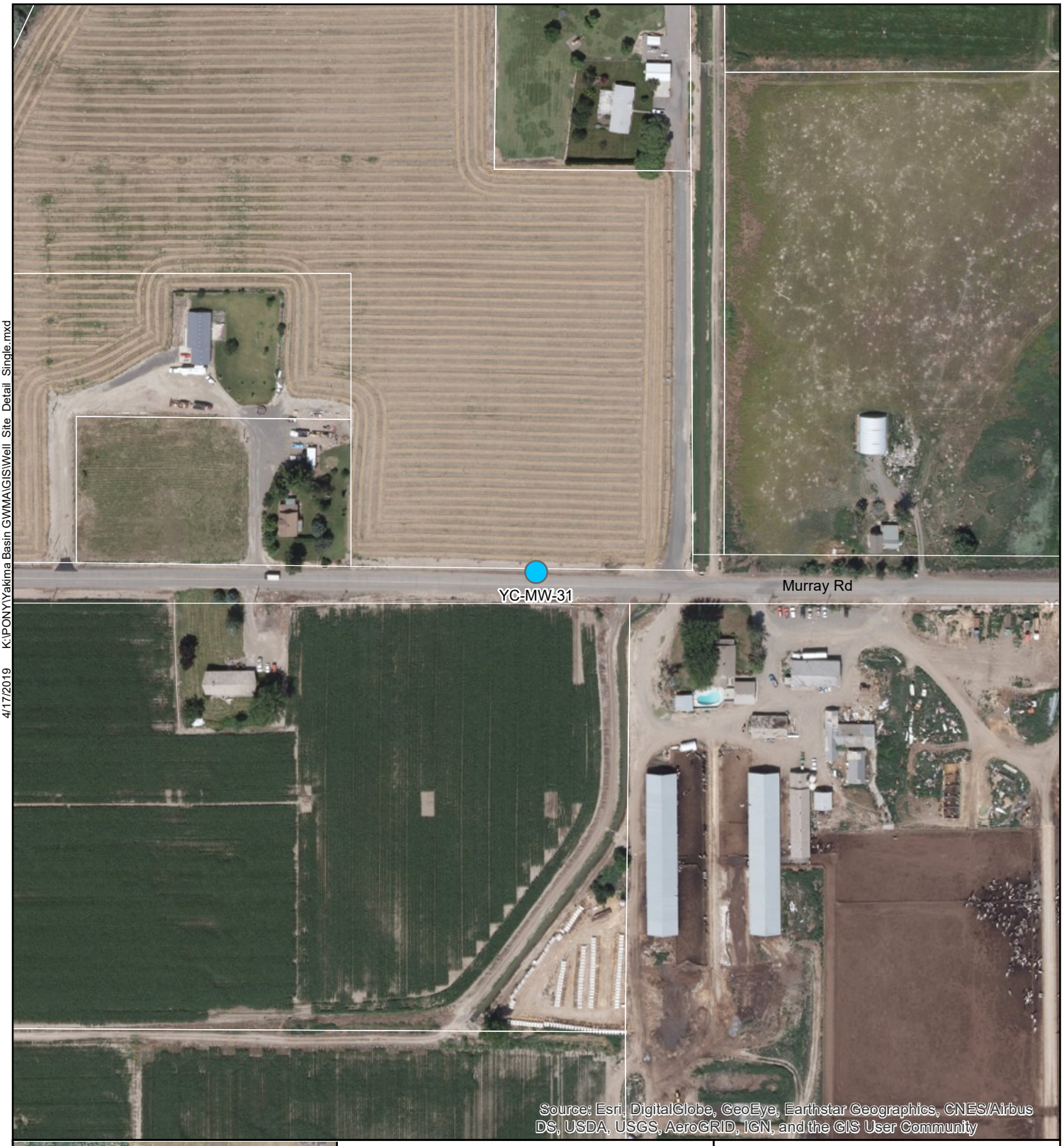
N

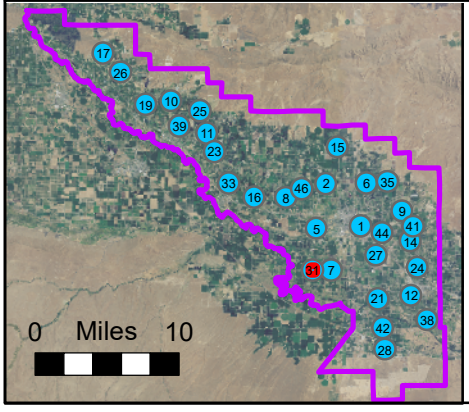
0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-28

PgG

4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd





Well Location

N

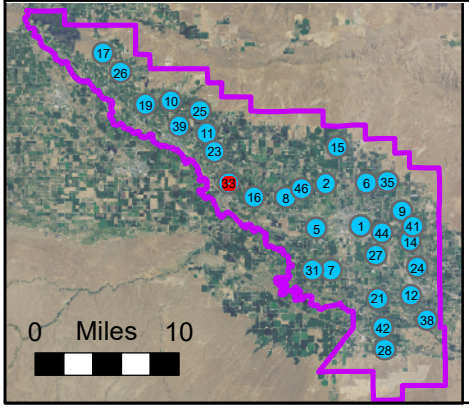
0 Feet 200

Yakima GWMA Monitoring Well YC-MW-31

PgG

4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd





Well Location

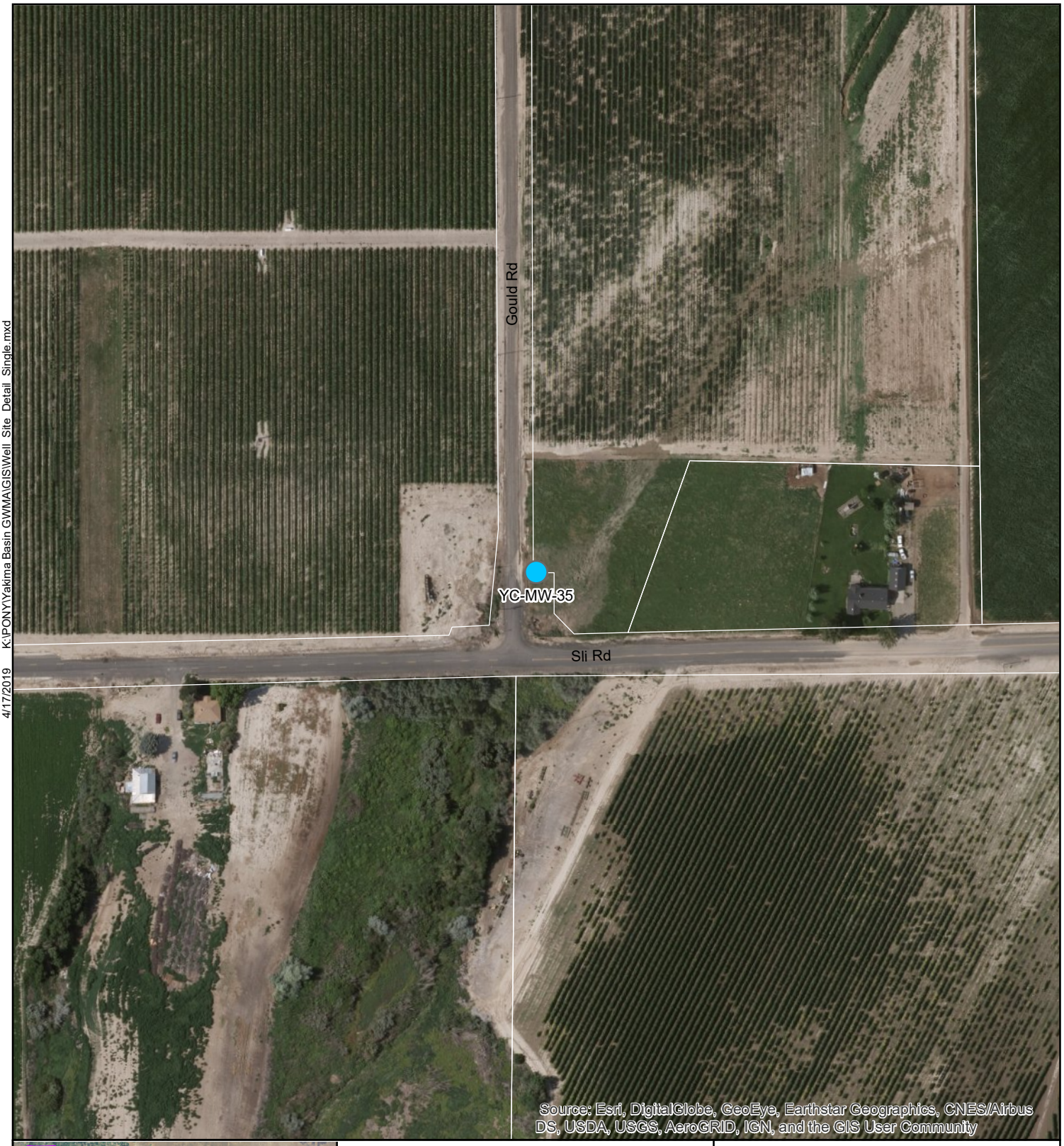
N

0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-33

PgG

4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd



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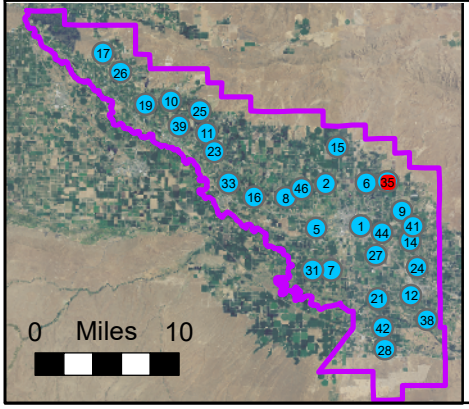


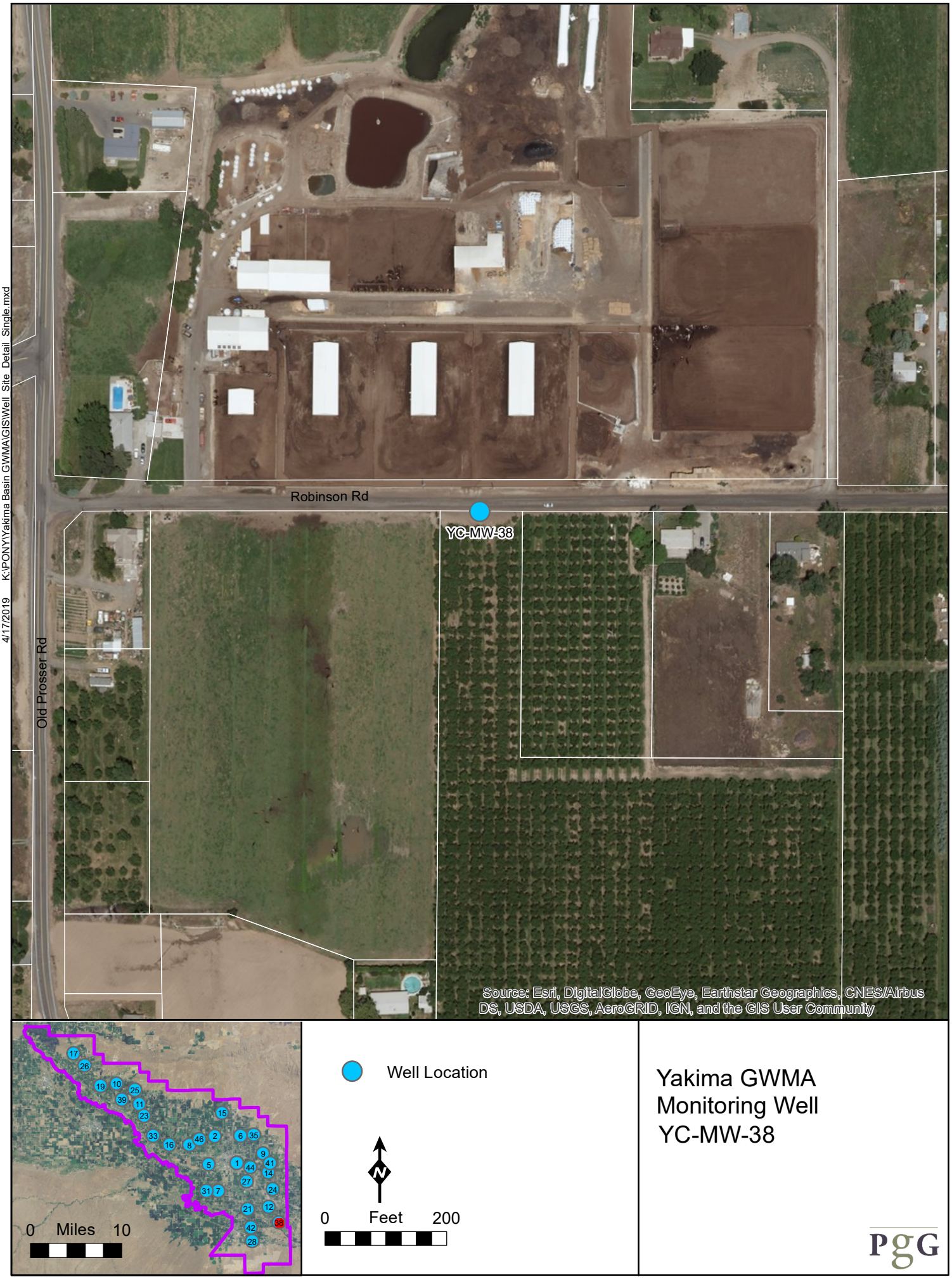
Well Location

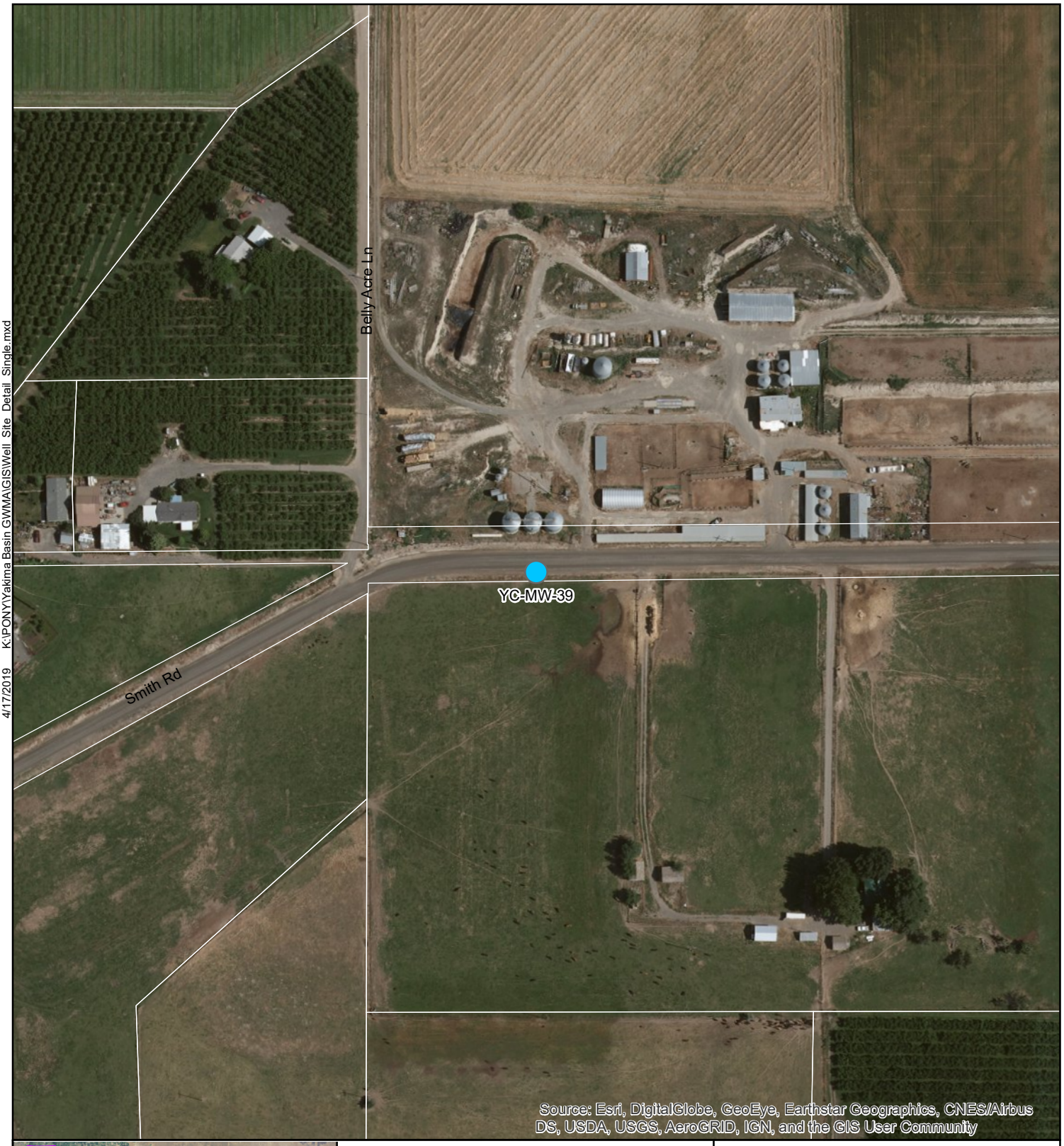
N

0 Feet 200

Yakima GWMA
Monitoring Well
YC-MW-35

PgG


4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd
Robinson Rd
YC-MW-38
Old Prosser Rd
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
17
26
19
10
25
39
11
23
15
33
16
46
8
2
6
35
9
41
5
1
44
14
27
31
7
24
21
12
42
38
28
0 Miles 10
Well Location
N
0 Feet 200
Yakima GWMA
Monitoring Well
YC-MW-38
PgG



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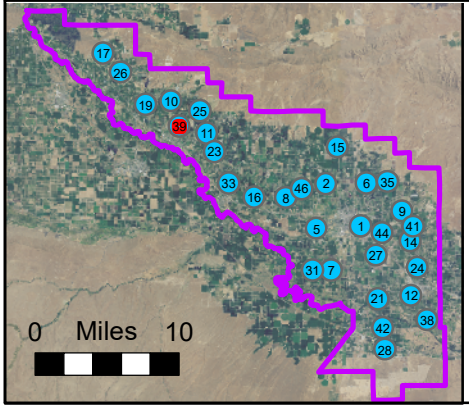


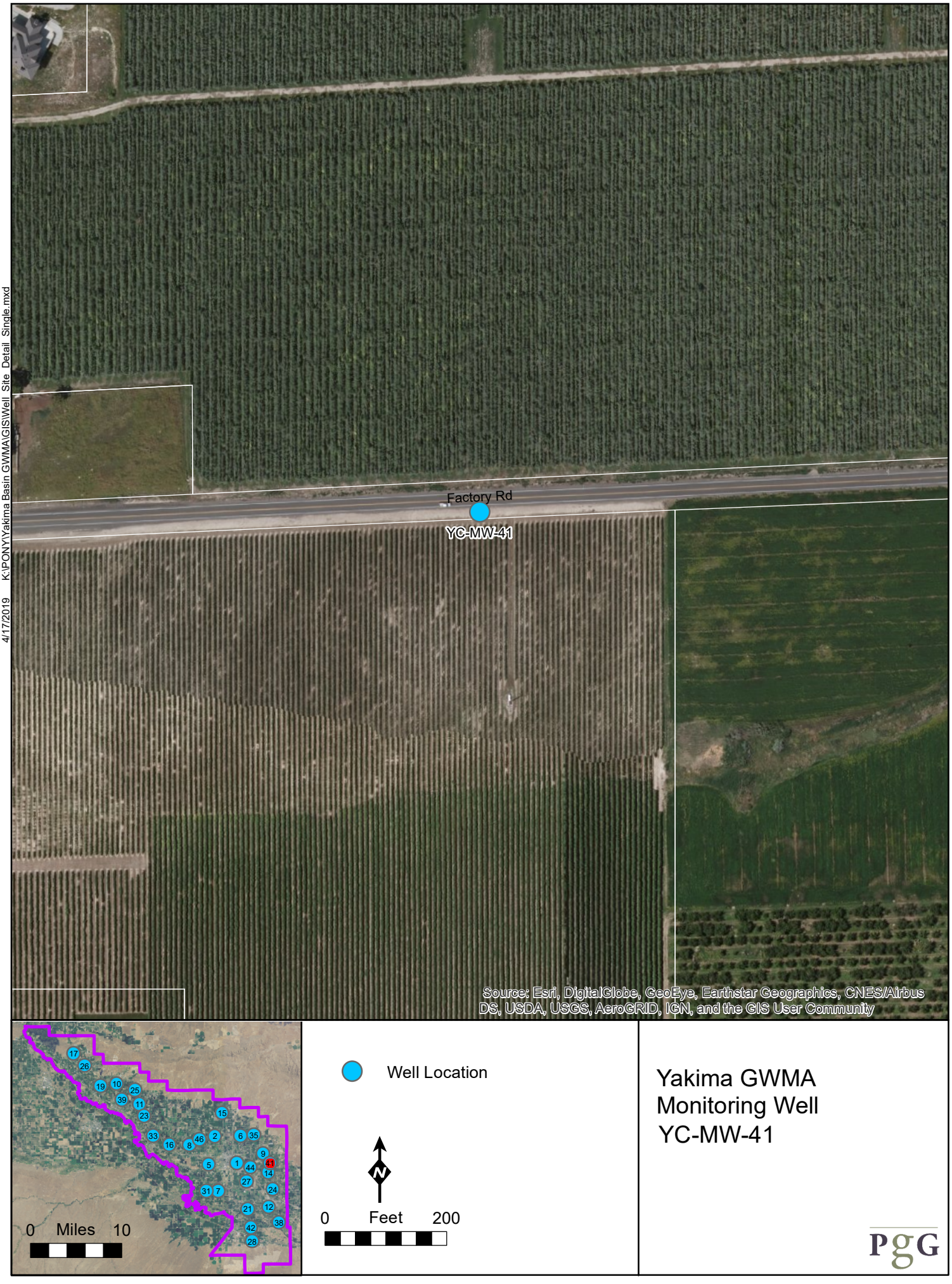
Well Location

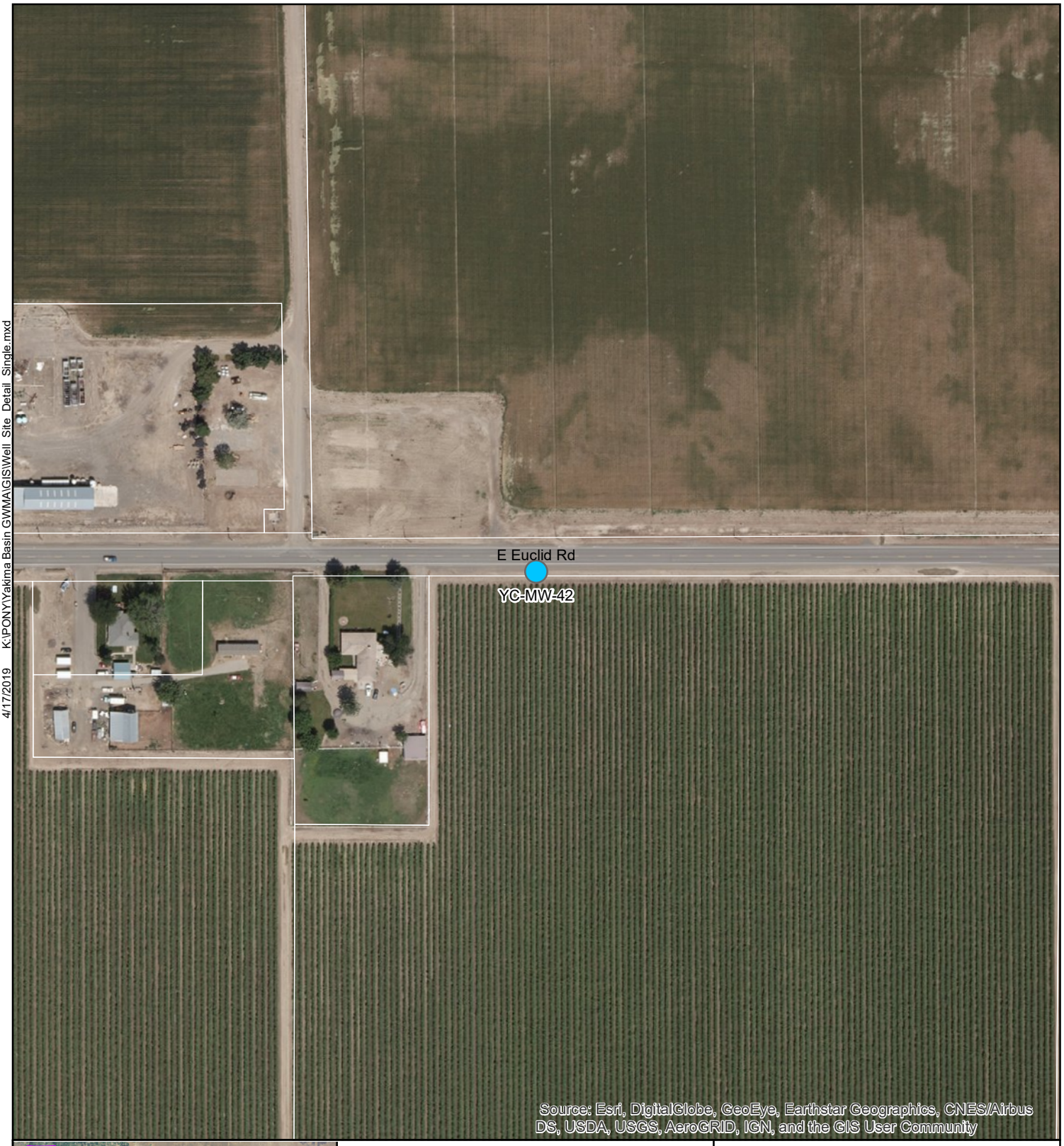
N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-39

PgG


Factory Rd
YC-MW-41
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
0 Miles 10
Well Location
N
0 Feet 200
Yakima GWMA
Monitoring Well
YC-MW-41
PgG
4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd



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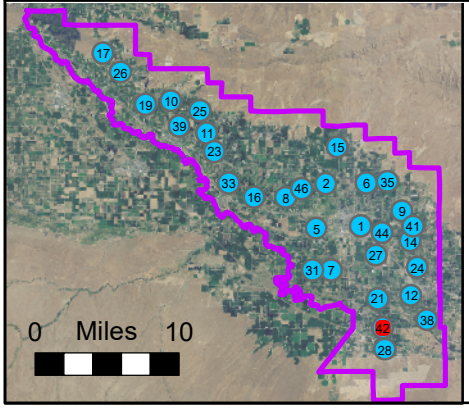


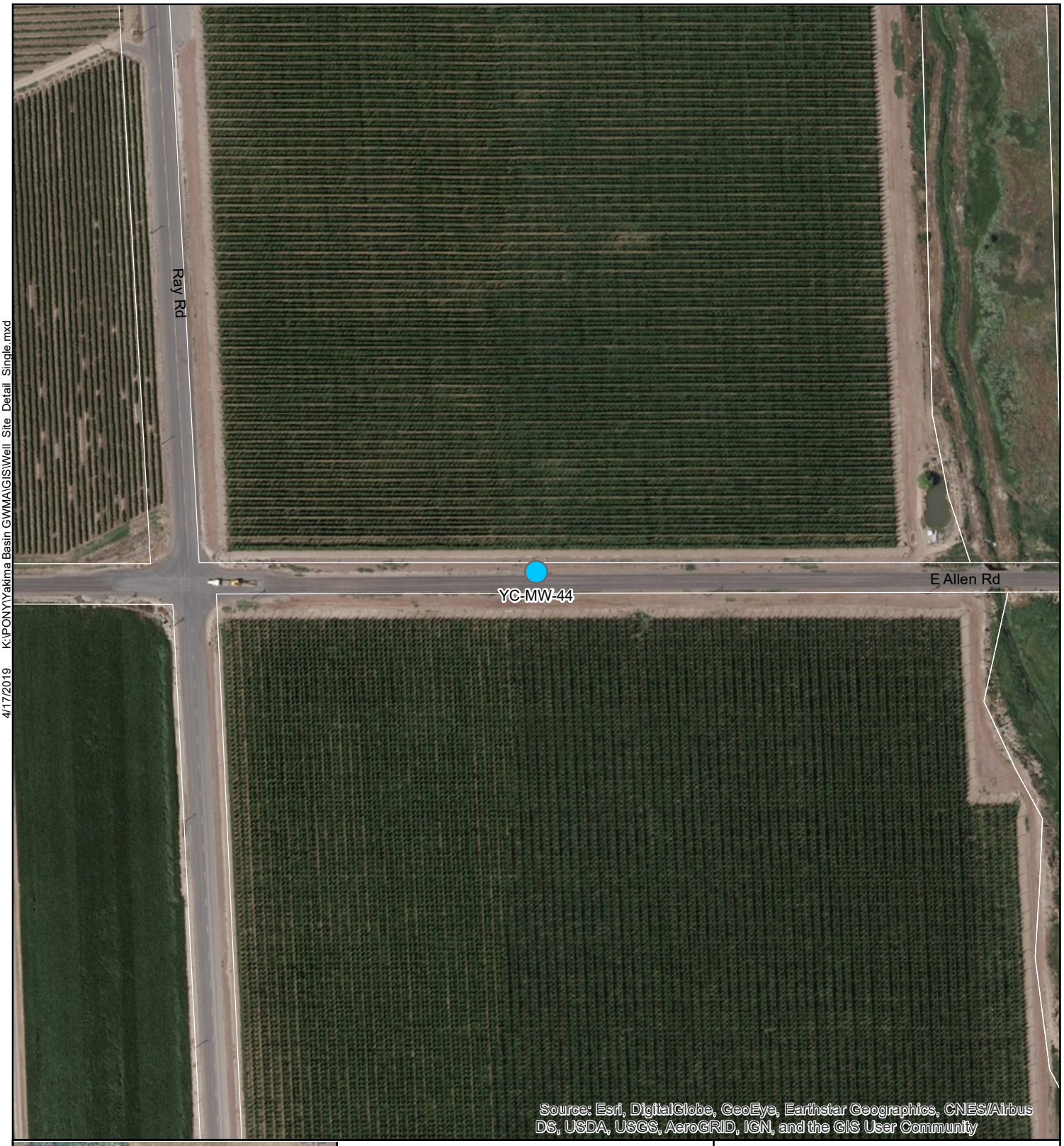
Well Location

N

0 Feet 200

Yakima GWMA Monitoring Well YC-MW-42

PgG



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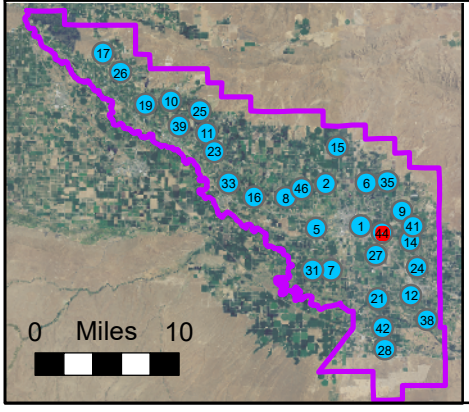


Well Location

N

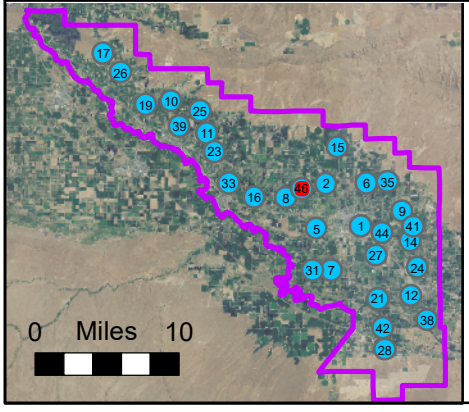
0 Feet 200

Yakima GWMA Monitoring Well YC-MW-44

PgG



4/17/2019 K:\PONY\Yakima Basin GWMA\GIS\Well Site Detail Single.mxd



Well Location

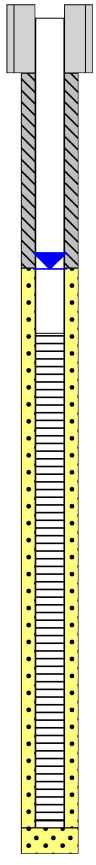
0 Feet 200

Yakima GWMA Monitoring Well YC-MW-46

PgG

APPENDIX B
BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
0				Moist to wet, dark brown SILT.	Flush mount monument with concrete pad Top of PVC is 0.31 feet below top of steel monument Hydrated bentonite annular seal 2-8 feet.
5				Wet, dark brown, silty, fine SAND.	12-20 silica sand pack 8-25.2 feet 2-inch 10 slot PVC screen 10-25 feet with a flush thread tail pipe
10				Wet, dark brown, fine SAND.	Borehole diameter 6-inches 2-inch schedule 40 flush thread PVC blank well casing 0.31-25.2 feet
15					
20					
25				Wet, light brown, sandy SILT.	Bottom of the well 25.2 feet Bottom of the boring 26 feet
30					
35					
40					
45					



Location (TRS): T10R23-30
Northing/Easting: N 359237.3 ft, E 1770045.9 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/18/2018
Ecology ID: BKB-745

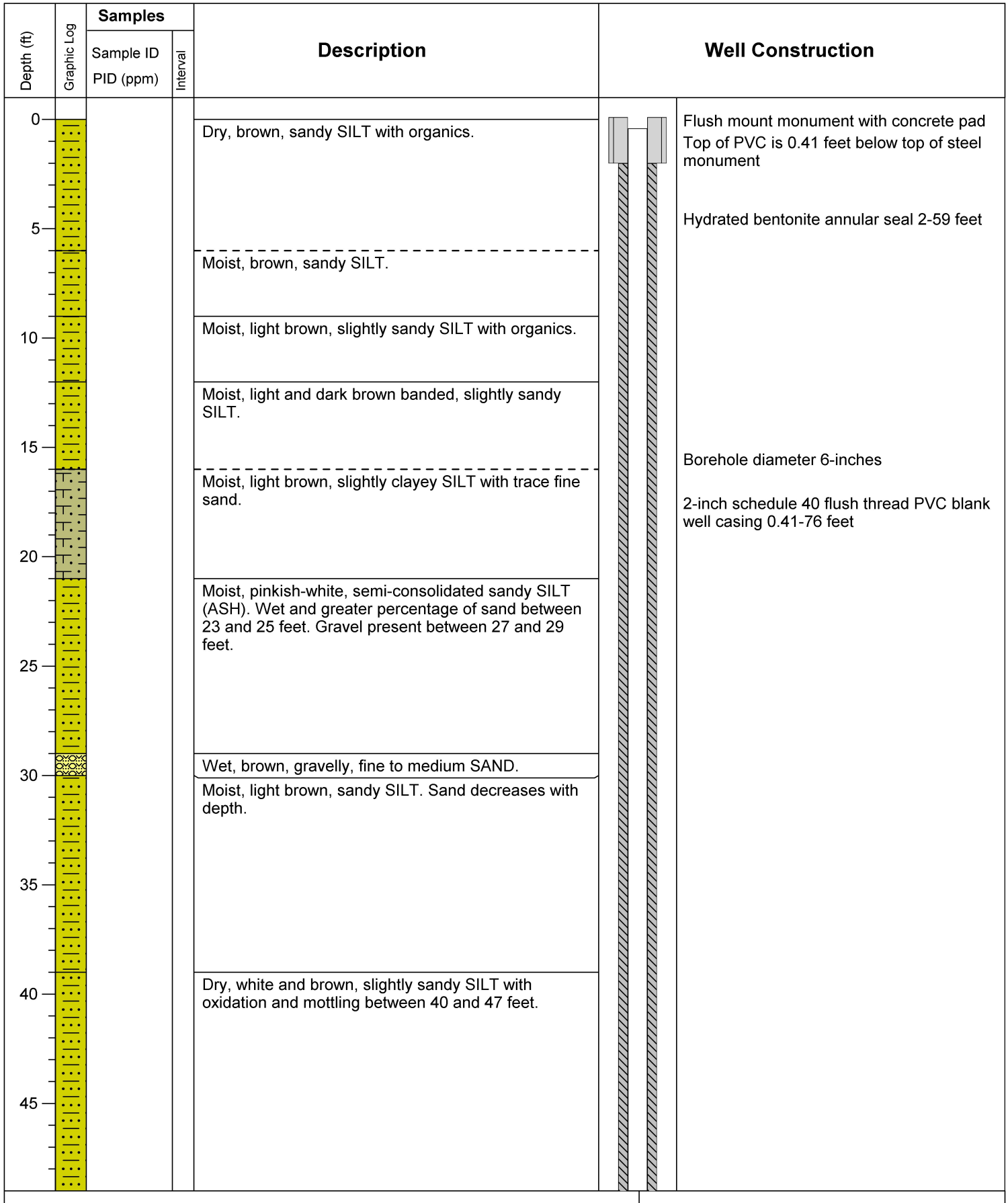
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 8.03 ft
MP Elevation: 735.22 ft
V. Datum: NAD88

YC-MW-01
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T10R22-14 NW Qtr QW QtrQtr
Northing/Easting: N 374757.9 ft, E 1757182.7 ft
Logged by: Inger Jackson, PGG
Completion Date: 10/28/2018
Ecology ID: BKB-726

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 56.25 ft
MP Elevation: 875.26 ft
V. Datum: NAD88

YC-MW-02
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
50					
55					
60				Wet, brown, micaceous, fine with medium SAND.	12-20 silica sand pack 59-76 feet 2-inch 10 slot PVC screen 60.8-75.8 feet with a flush thread tail pipe
65					
70					
75					Bottom of the well 76 feet Bottom of the boring 76 feet
80					
85					
90					
95					

Location (TRS): T10R22-14 NW Qtr QW QtrQtr
Northing/Easting: N 374757.9 ft, E 1757182.7 ft
Logged by: Inger Jackson, PGG
Completion Date: 10/28/2018
Ecology ID: BKB-726

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 56.25 ft
MP Elevation: 875.26 ft
V. Datum: NAD88

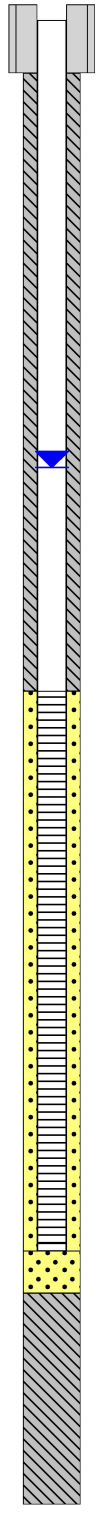
YC-MW-02
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description
0				Dry to moist, dark brown, sandy SILT. Moist below 6 feet and wet from 11 to 13 feet.
15				Moist to wet, light brown, slightly sandy SILT.
35				Wet, brown, medium with fine SAND.
40				Moist, light brown, slightly sandy SILT. Minor oxidation at 44 feet. Silty medium sand lens approximately 2-inchs thick at 45 feet.
45				



Well Construction

- Flush mount monument with concrete pad
- Top of PVC is 0.38 feet below top of steel monument
- Hydrated bentonite annular seal 2-21 feet
- Borehole diameter 6-inches
- 2-inch schedule 40 flush thread PVC blank well casing 0.38-38.2 feet
- 12-20 silica sand pack 21-39.5 feet
- 2-inch 10 slot PVC screen 21-38 feet with a flush thread tail pipe
- Bottom of the well 38.2 feet
- Bentonite bottom seal 39.5-46 feet
- Bottom of the boring 46 feet

Location (TRS): T10R22-34 NE Qtr NW QtrQtr
Northing/Easting: N 358146.8 ft, E 1753715.1 ft
Logged by: Inger Jackson, PGG
Completion Date: 10/27/2018
Ecology ID: BKB-725

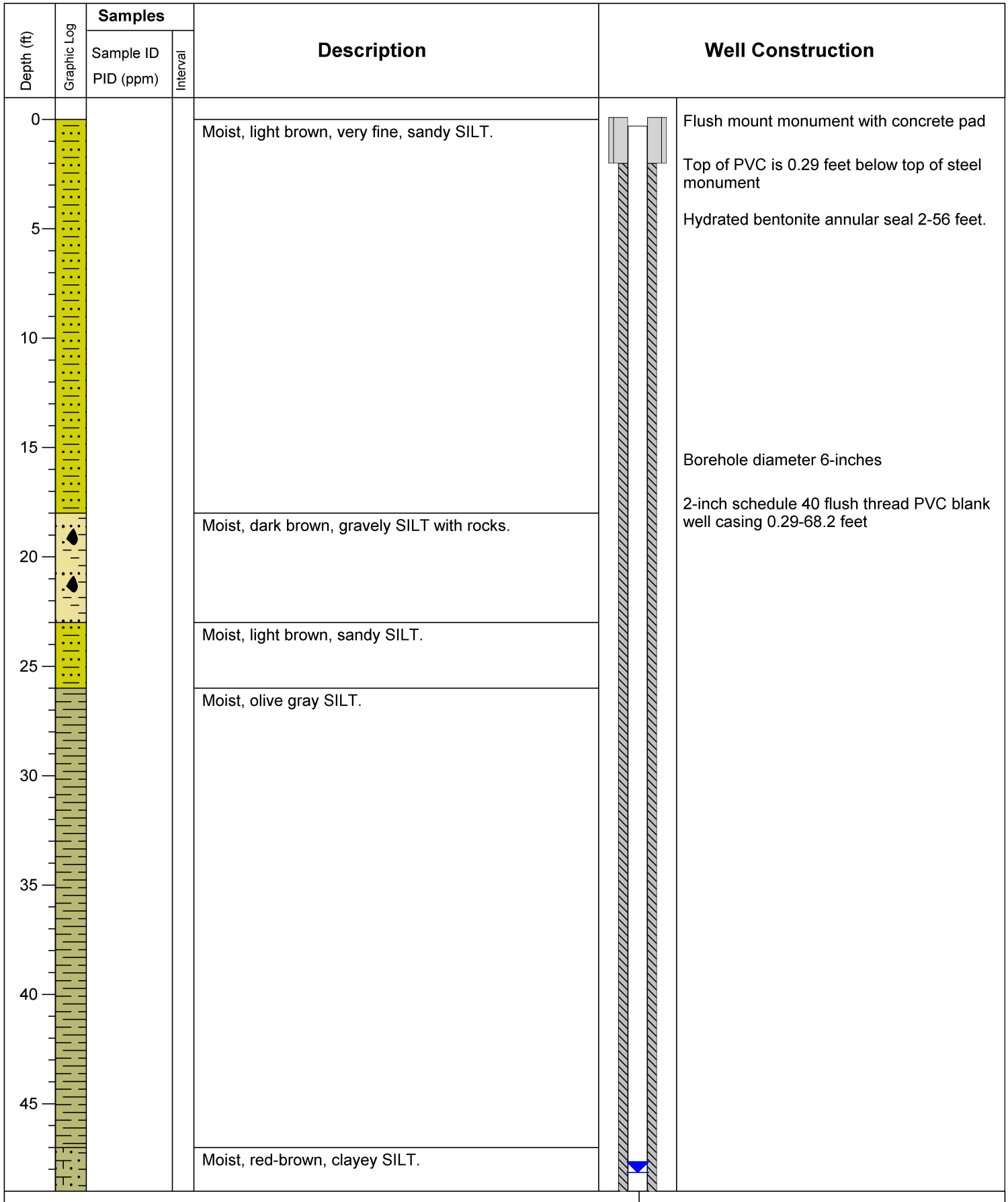
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 14.13 ft
MP Elevation: 797.18 ft
V. Datum: NAD88

YC-MW-05
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T10R23-17
Northing/Easting: N 375010.9 ft, E 1771956.8 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/18/2018
Ecology ID: BKB-744

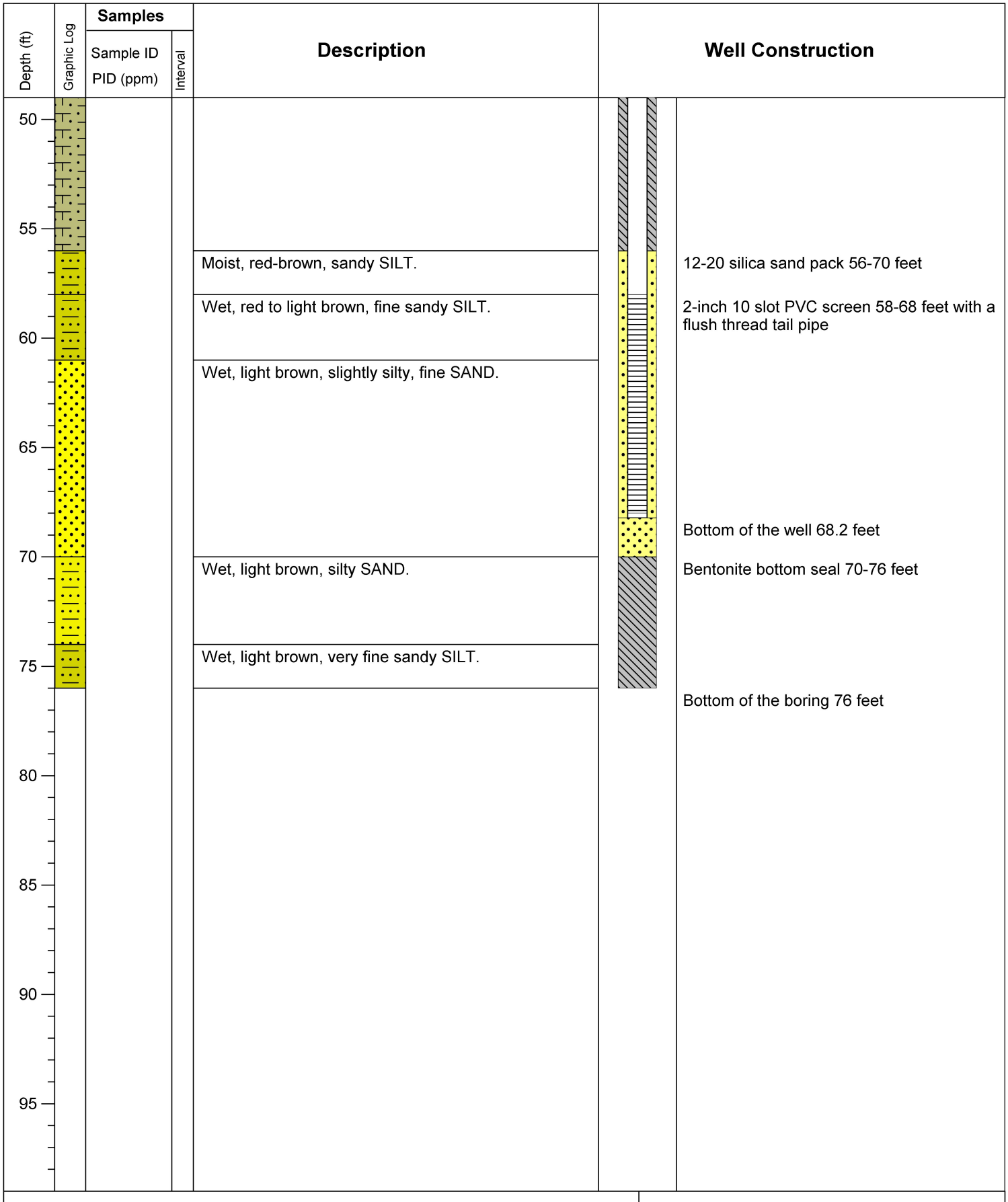
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 48.14 ft
MP Elevation: 944.33 ft
V. Datum: NAD88

YC-MW-06
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T10R23-17
Northing/Easting: N 375010.9 ft, E 1771956.8 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/18/2018
Ecology ID: BKB-744

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 48.14 ft
MP Elevation: 944.33 ft
V. Datum: NAD88

YC-MW-06
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
0				Moist, brown, fine SAND.	Flush mount monument with concrete pad Top of PVC is 0.3 feet below top of steel monument
5					Hydrated bentonite annular seal 2-22 feet.
10				Moist to wet, brown SILT.	
15				Moist, olive brown, fine to medium SAND.	Borehole diameter 6-inches 2-inch schedule 40 flush thread PVC blank well casing 0.3-68.2 feet
20					
25					12-20 silica sand pack 22-46 feet 2-inch 10 slot PVC screen 24-44 feet with a flush thread tail pipe
30				Moist to wet, dark brown and black coarse SAND.	
35				Wet, brown, fine to medium SAND. (Some coarse grain sand observed at 45-46ft).	
40					
45					Bottom of the well 46 feet Bottom of the boring 46 feet

Location (TRS): T9R22-14
Northing/Easting: N 342923.2 ft, E 1759069.7 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/13/2018
Ecology ID: BKB-736

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 16.27 ft
MP Elevation: 692.8 ft
V. Datum: NAD88

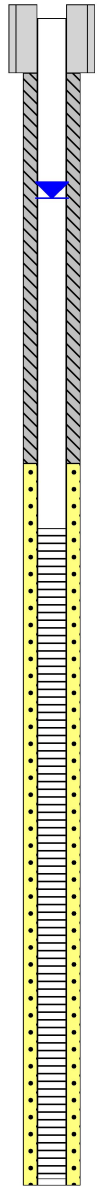
YC-MW-07
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description
0				Moist, brown, silty fine SAND.
5				Moist to wet, brown to grey, fine sandy SILT.
10				Wet, brown to grey, fine sandy SILT. Fining downward.
15				Wet, brown to grey, fine sandy SILT. Dense.
20				Wet, brown, silty fine SAND. Dense. Abundant thin layers of oxidized fine sand.
25				
30				
35				
40				
45				



Well Construction

- Flush mount monument with concrete pad
- Top of PVC is 0.32 feet below top of steel monument
- Hydrated bentonite annular seal 2-14 feet
- 12-20 silica sand pack 14-36.2 feet
- Borehole diameter 6-inches
- 2-inch 10 slot PVC screen 16-36 feet with a flush thread tail pipe
- 2-inch schedule 40 flush thread PVC blank well casing 0.32-36.2 feet
- Bottom of the well 36.2 feet
- Bottom of the boring 36.2 feet

Location (TRS): T10R22-20
Northing/Easting: N 369502.5 ft, E 1742525.5 ft
Logged by: David Wampler, PGG
Completion Date: 11/10/2018
Ecology ID: BKB-733

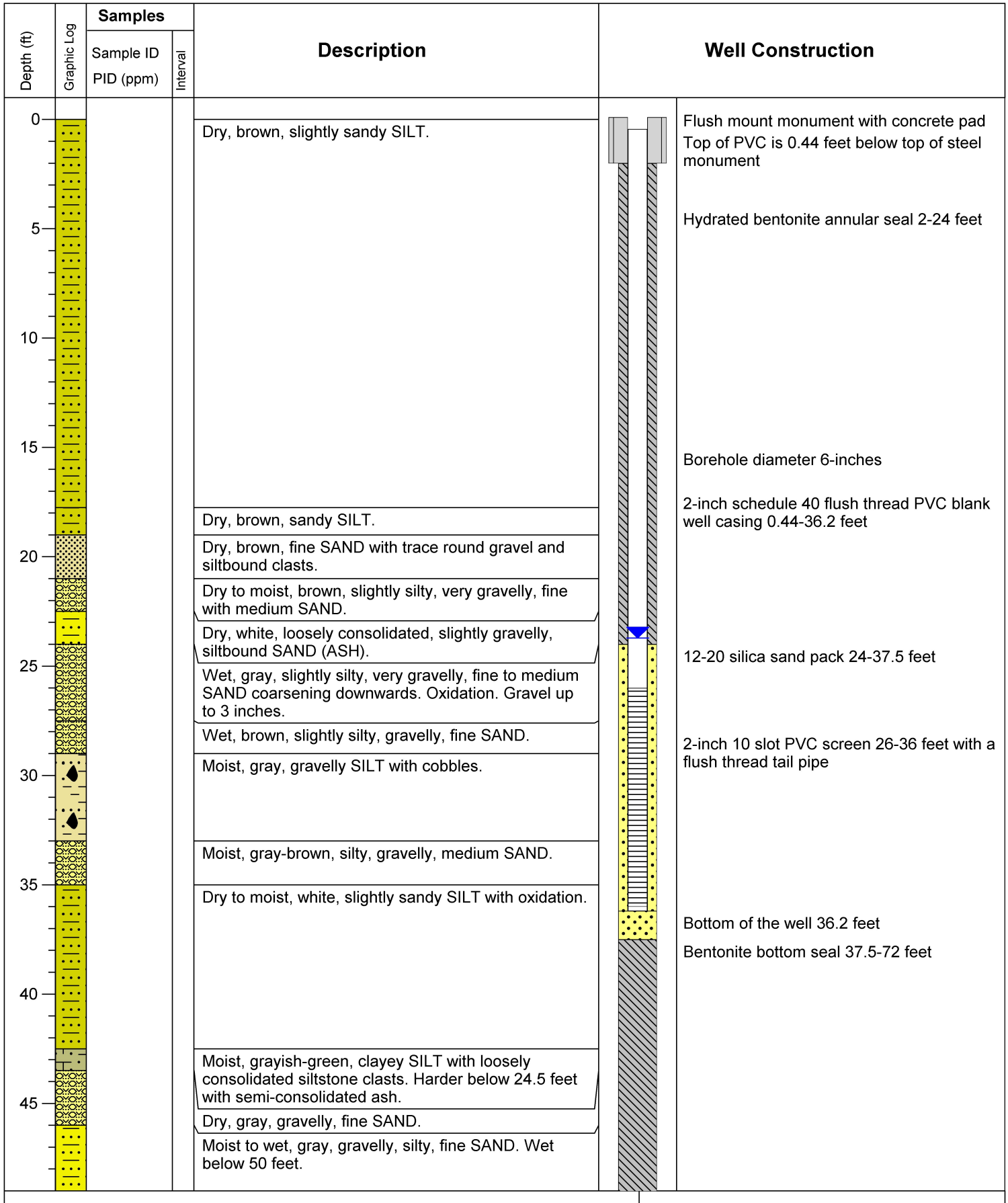
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 5.85 ft
MP Elevation: 786.27 ft
V. Datum: NAD88

YC-MW-08
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T10R23-22 SW Qtr SE QtrQtr
Northing/Easting: N 364486.6 ft, E 1785256.1 ft
Logged by: I. Jackson and K. Mayer-Blackwell, PGG
Completion Date: 10/29/2018
Ecology ID: BKB-727

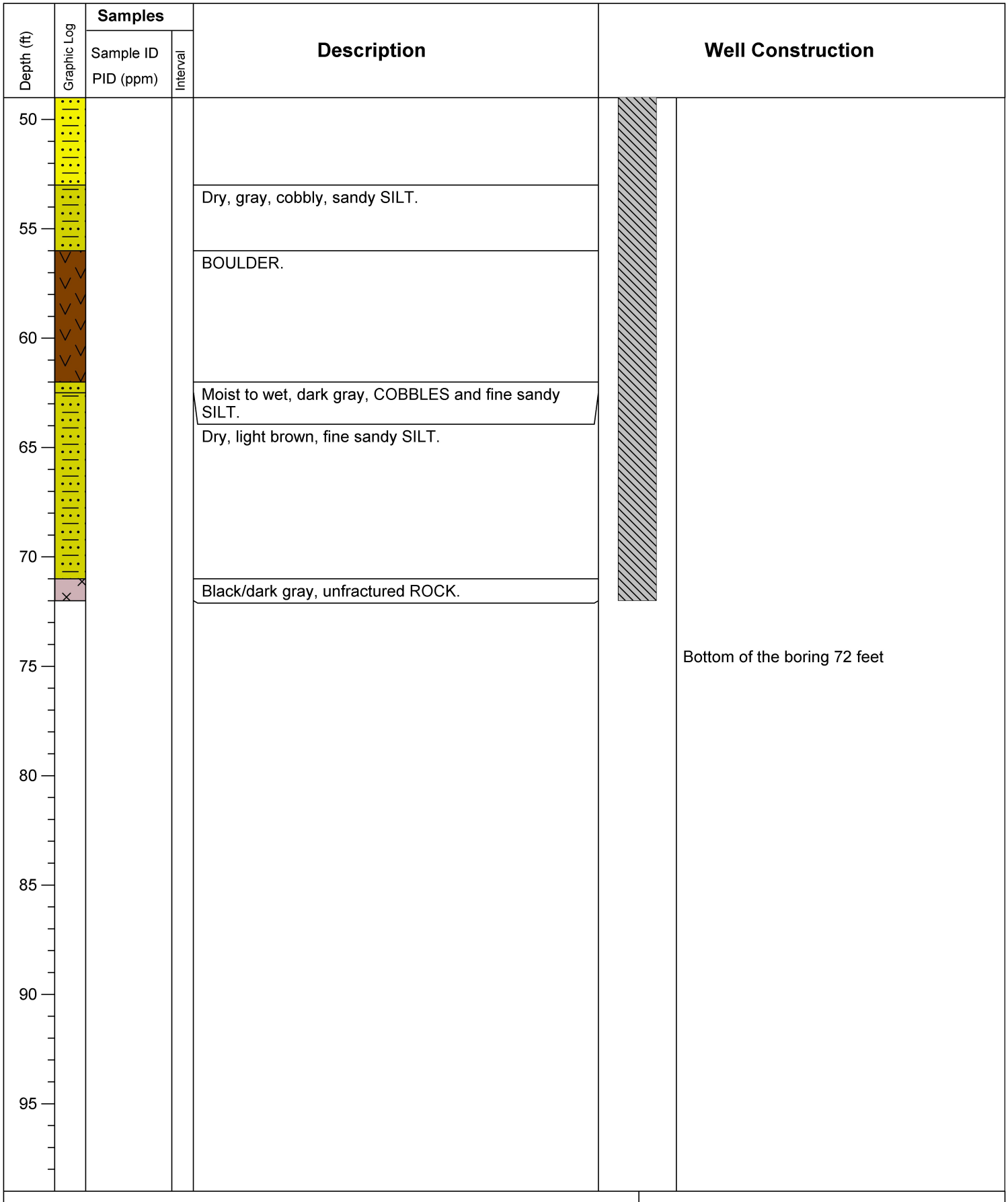
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 23.72 ft
MP Elevation: 926.45 ft
V. Datum: NAD88

YC-MW-09
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T10R23-22 SW Qtr SE QtrQtr
Northing/Easting: N 364486.6 ft, E 1785256.1 ft
Logged by: I. Jackson and K. Mayer-Blackwell, PGG
Completion Date: 10/29/2018
Ecology ID: BKB-727

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 23.72 ft
MP Elevation: 926.45 ft
V. Datum: NAD88

YC-MW-09
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
0				Dry to moist, light gray to light brown, fine to medium SAND.	Flush mount monument with concrete pad Top of PVC is 0.3 feet below top of steel monument Hydrated bentonite annular seal 2-64 feet
10				Moist, light gray, fine SAND.	
				Moist, light brown, fine SAND.	Borehole diameter 6-inches 2-inch schedule 40 flush thread PVC blank well casing 0.3-78.18 feet
20				Moist, brown, silty, very fine SAND.	
				Moist, brown, silty, fine SAND with small to large gravel.	
				Moist, light brown, medium SAND.	
30				Moist, light brown SILT.	
				Moist, light brown, clayey SILT.	
				Moist to dry, brown SILT (with some very fine sand).	
40				Moist, fine to medium SAND.	
				Moist, fine to medium SAND (with sporadic gravels up to 25%).	
				Moist, light gray, silty, fine SAND (with some sporadic gravel).	

Location (TRS): T11R20-13
Northing/Easting: N 404973.2 ft, E 1700493.6 ft
Logged by: Koshlan Mayer-Blakcwell, PGG
Completion Date: 10/26/2018
Ecology ID: BKB-739

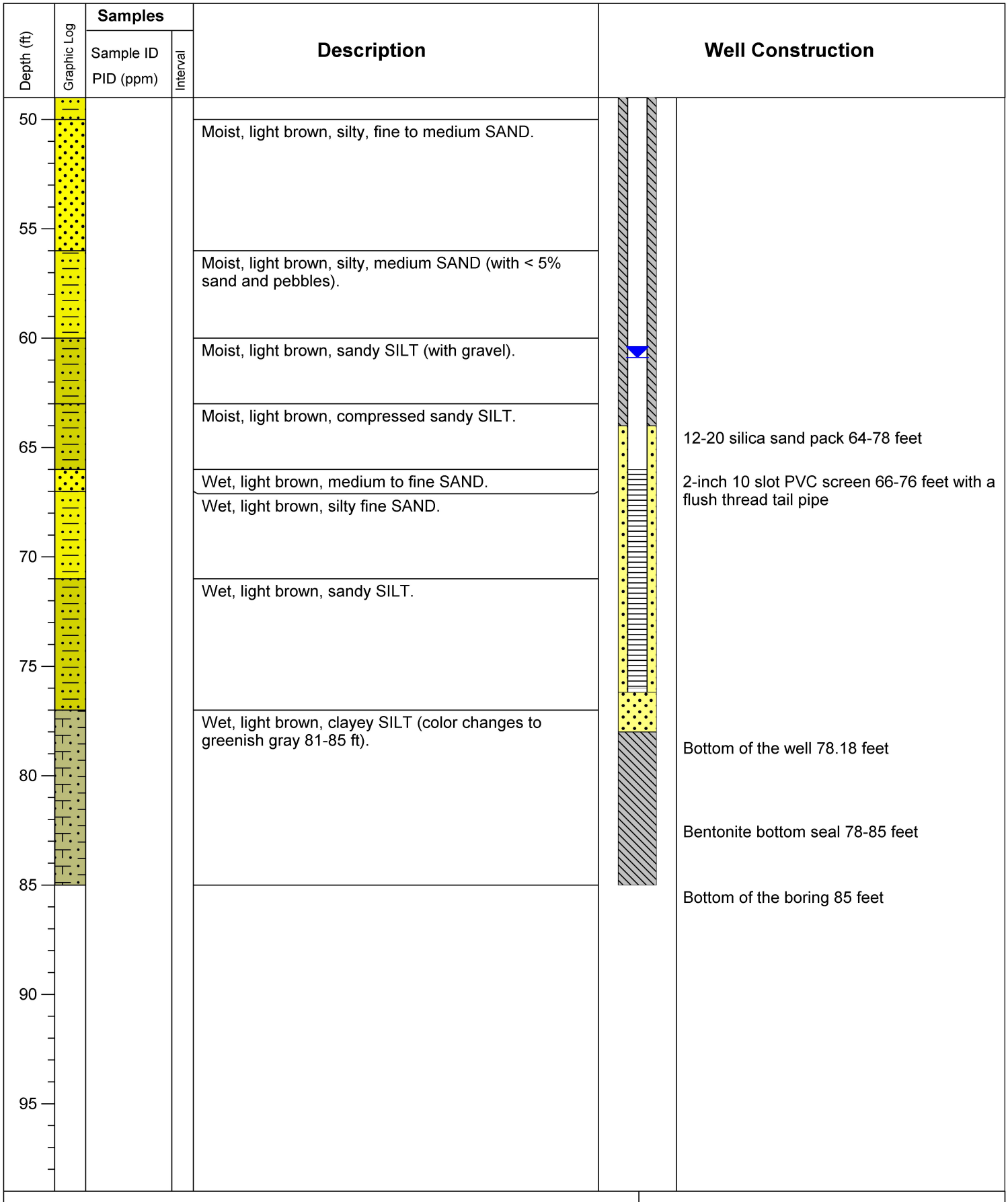
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 62.08 ft
MP Elevation: 1033.69 ft
V. Datum: NAD88

YC-MW-10
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R20-13
Northing/Easting: N 404973.2 ft, E 1700493.6 ft
Logged by: Koshlan Mayer-Blakcwell, PGG
Completion Date: 10/26/2018
Ecology ID: BKB-739

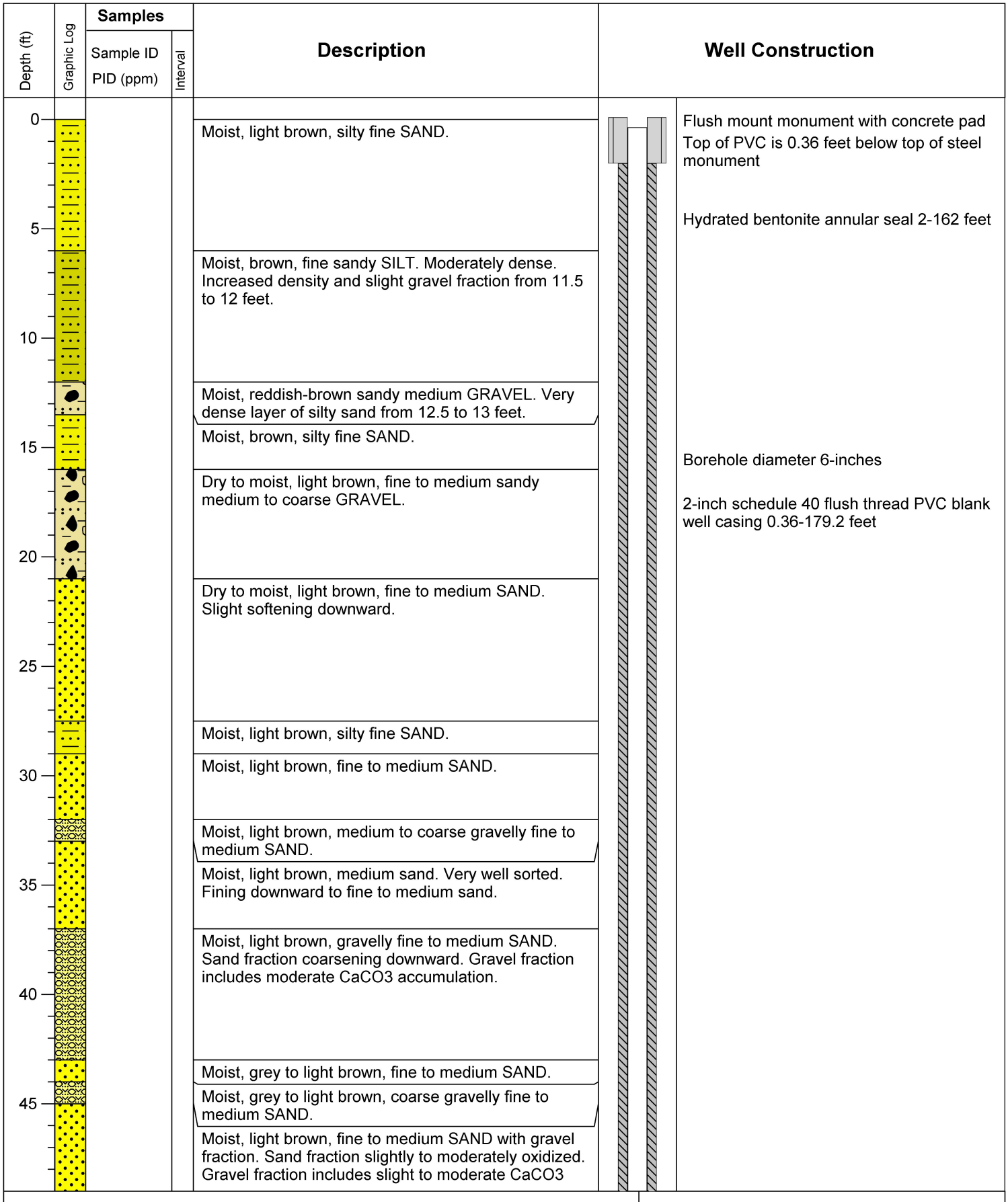
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 62.08 ft
MP Elevation: 1033.69 ft
V. Datum: NAD88

YC-MW-10
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-29
Northing/Easting: N 393333.5 ft, E 1713616.4 ft
Logged by: David Wampler, PGG
Completion Date: 11/7/2018
Ecology ID: BKB-731

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 162.55 ft
MP Elevation: 974.13 ft
V. Datum: NAD88

YC-MW-11
Boring Log and As-Built

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PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
50				accumulation.	
55				Moist, reddish-brown, clayey SILT. Silt fraction moderately oxidized.	
60				Moist, light brown, fine to medium SAND. Well sorted. Fining downward. Trace gravel fraction.	
65				Moist, light brown to reddish brown, fine to medium SAND. Well sorted. Moderate to significant presence of oxidization.	
70				Moist, light brown to reddish brown, fine to medium SAND. Well sorted. Slight presence of oxidization.	
75				Moist, light brown, silty fine to medium SAND. Interbedded sandy silt.	
				Dry to moist, brown to grey, fine sandy SILT.	
80				Moist to wet, reddish brown to grey, clayey SILT.	
				Moist, grey, fine sandy SILT.	
85				Moist, grey, clayey SILT.	
				Moist, grey, fine sandy SILT. Interbedded dense clayey silt layers.	
90				Moist, reddish brown, fine sandy SILT. Slight clay fraction. Slight presence of thin beds with significant oxidization.	
95				Moist, brown to grey, clayey SILT. Hardening downward from slightly to moderately dense.	

Location (TRS): T11R21-29
Northing/Easting: N 393333.5 ft, E 1713616.4 ft
Logged by: David Wampler, PGG
Completion Date: 11/7/2018
Ecology ID: BKB-731

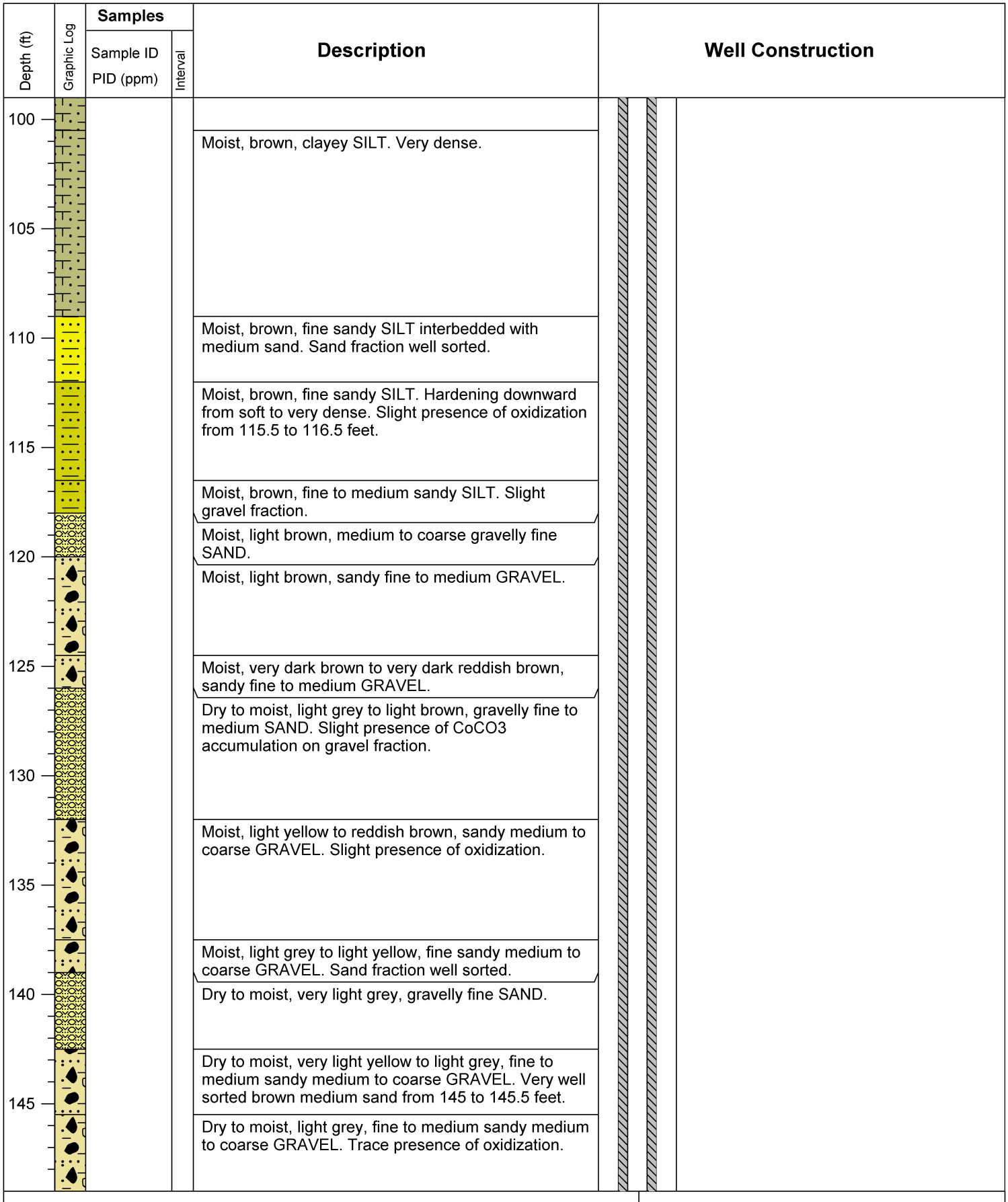
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 162.55 ft
MP Elevation: 974.13 ft
V. Datum: NAD88

YC-MW-11
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-29
Northing/Easting: N 393333.5 ft, E 1713616.4 ft
Logged by: David Wampler, PGG
Completion Date: 11/7/2018
Ecology ID: BKB-731

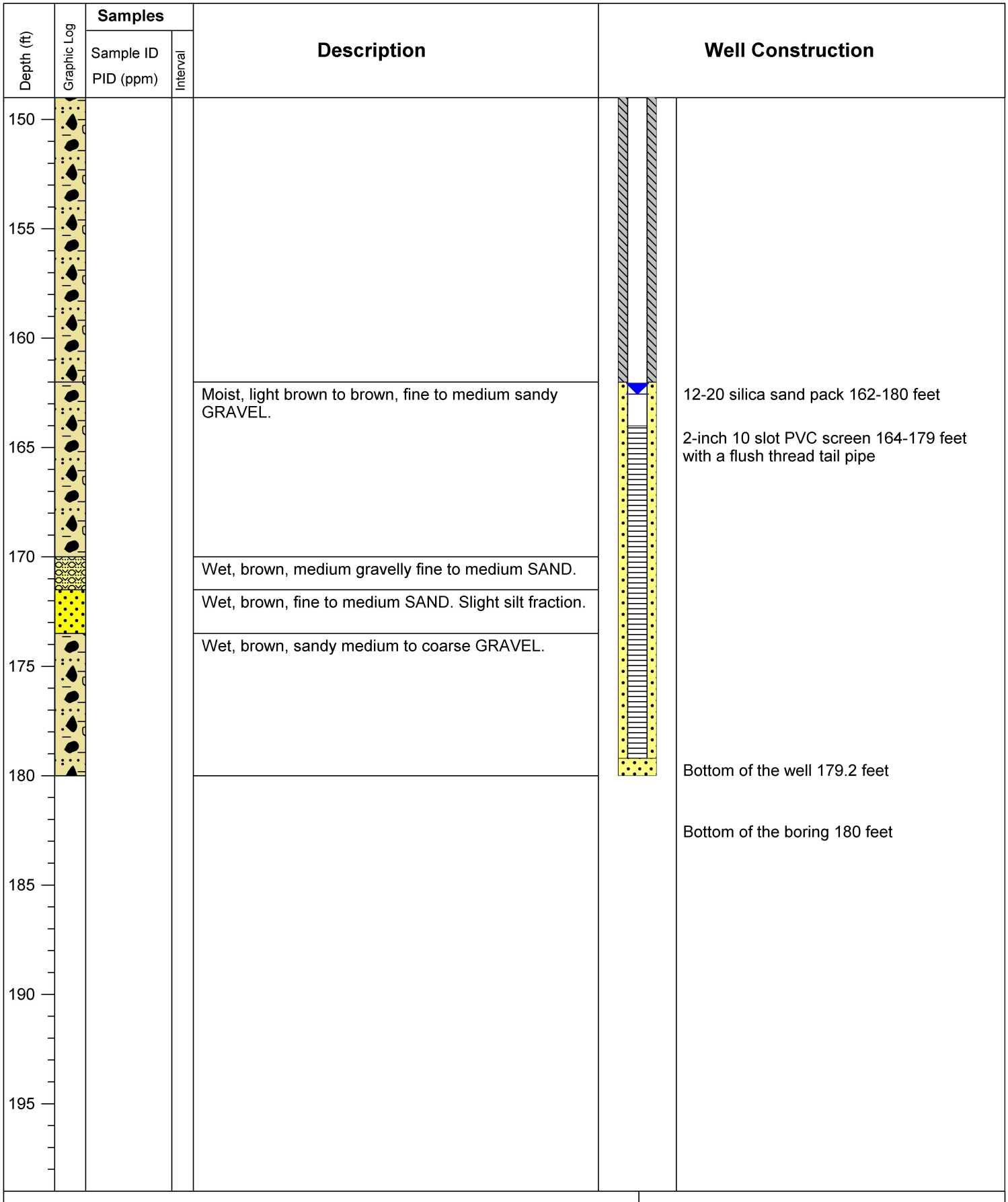
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 162.55 ft
MP Elevation: 974.13 ft
V. Datum: NAD88

YC-MW-11
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-29
Northing/Easting: N 393333.5 ft, E 1713616.4 ft
Logged by: David Wampler, PGG
Completion Date: 11/7/2018
Ecology ID: BKB-731

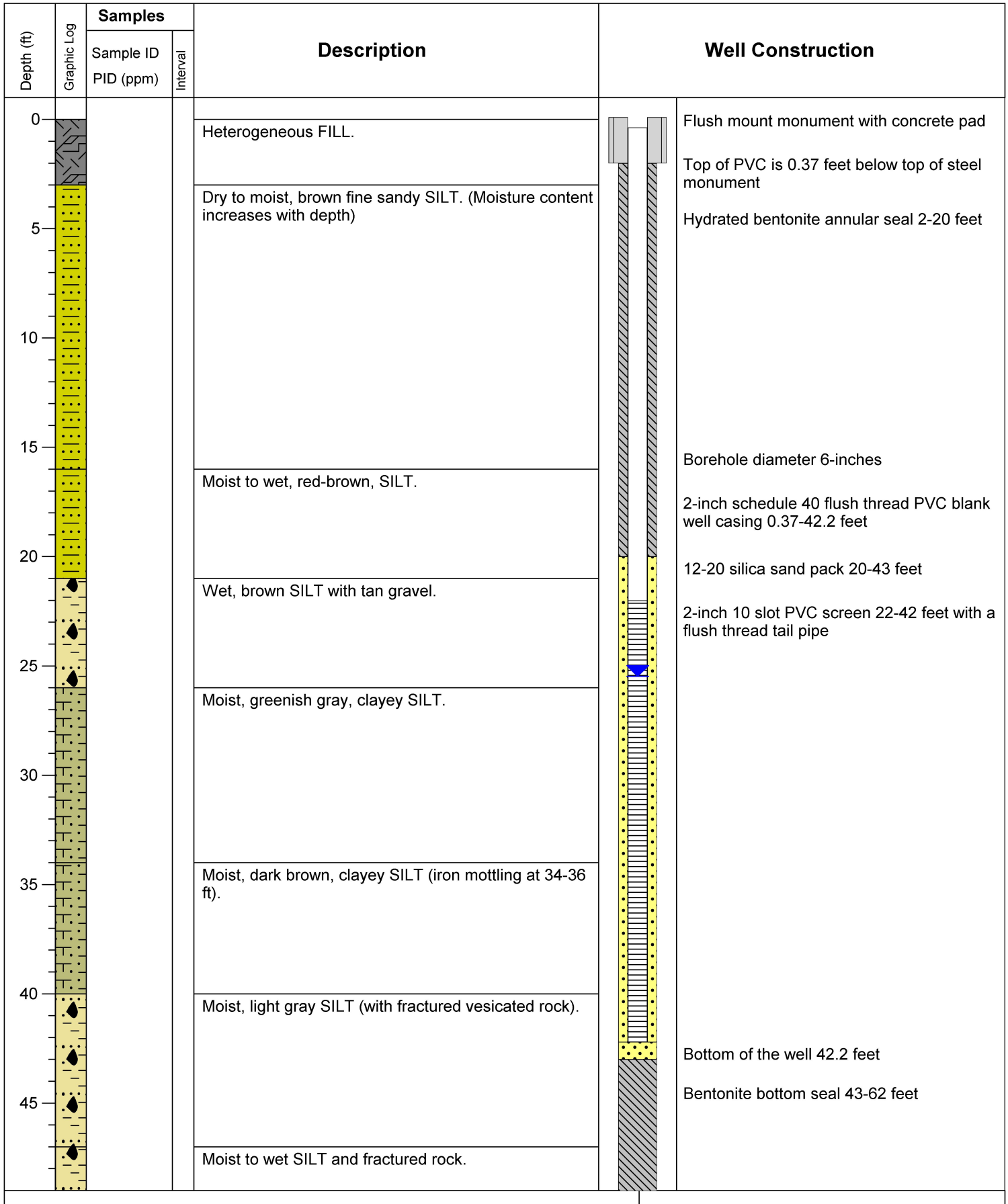
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 162.55 ft
MP Elevation: 974.13 ft
V. Datum: NAD88

YC-MW-11
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-23
Northing/Easting: N 333677.6 ft, E 1788570.8 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/16/2018
Ecology ID: BKB-742

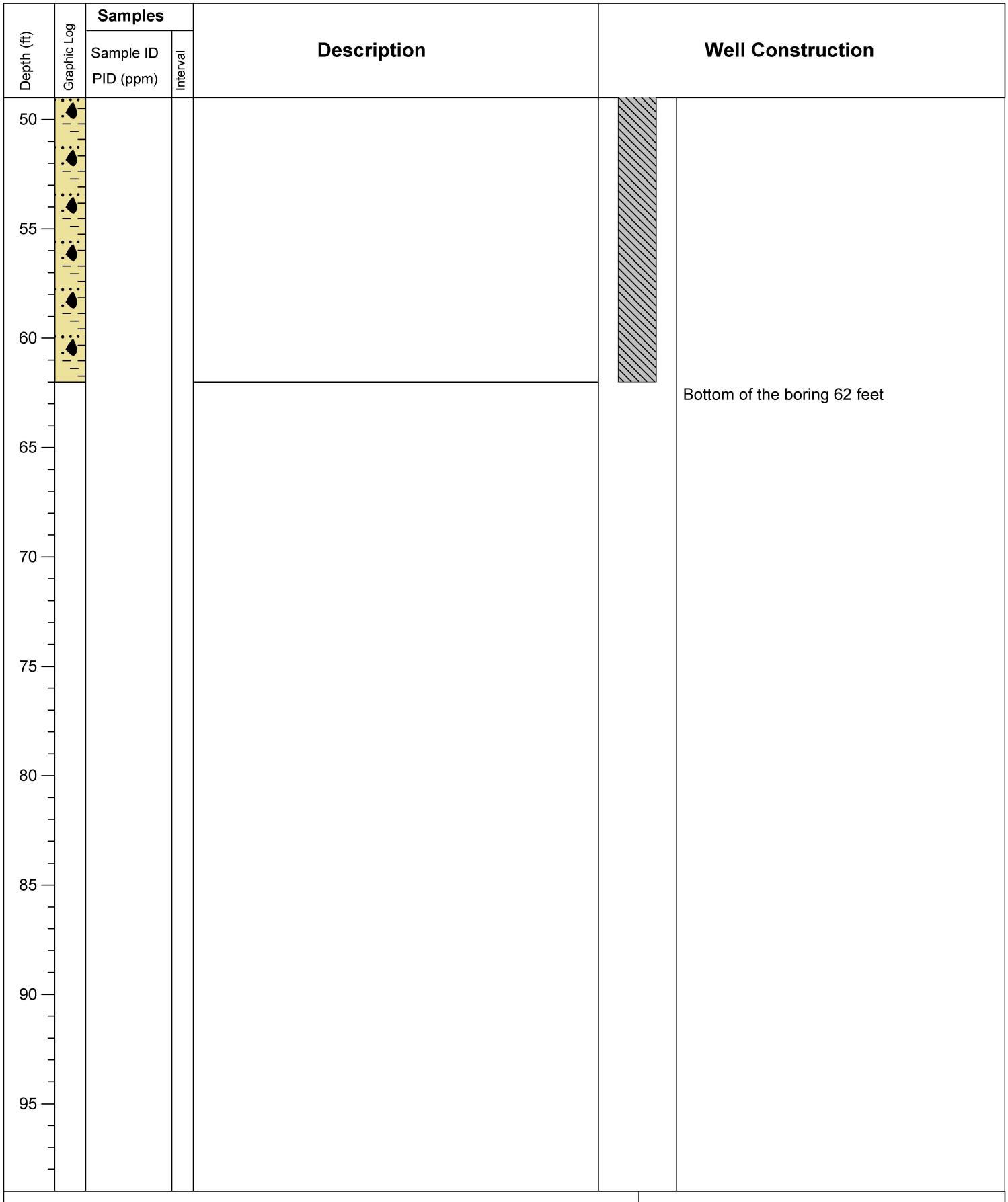
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 25.48 ft
MP Elevation: 790.36 ft
V. Datum: NAD88

YC-MW-12
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-23
Northing/Easting: N 333677.6 ft, E 1788570.8 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/16/2018
Ecology ID: BKB-742

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 25.48 ft
MP Elevation: 790.36 ft
V. Datum: NAD88

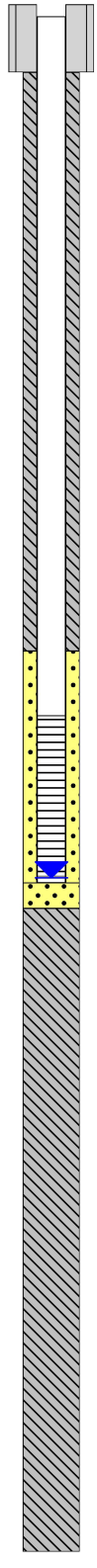
YC-MW-12
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description
0				No recovery.
5				Moist, light brown, fine SAND. Massive structure.
10				Moist, light brown, silty fine SAND.
15				
20				Moist, brown, gravelly SAND with silt fraction.
				Moist, brown, sandy GRAVEL. Gravel fraction predominantly basalt. Gravel fraction is significantly oxidized and has CaCO3 accumulation.
25				Moist, brown, gravelly SAND.
				Moist, brown, sandy GRAVEL. Gravel fraction predominantly basalt. Gravel fraction is significantly oxidized and has CaCO3 accumulation.
30				Dry, dark brown to dark grey, BASALT. Trace to slight presence of oxidized fractures.
35				
40				
45				



Well Construction

Flush mount monument with concrete pad
Top of PVC is 0.27 feet below top of steel monument

Hydrated bentonite annular seal 2-20 feet

Borehole diameter 6-inches

2-inch schedule 40 flush thread PVC blank well casing 0.27-27.2 feet

12-20 silica sand pack 20-28 feet

2-inch 10 slot PVC screen 22-27 feet with a flush thread tail pipe

Bottom of the well 27.2 feet
Bentonite bottom seal 28-48 feet

Location (TRS): T10R23-35
Northing/Easting: N 353843.6 ft, E 1788173 ft
Logged by: David Wampler, PGG
Completion Date: 11/6/2018
Ecology ID: BKB-729

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 27.05 ft
MP Elevation: 938.04 ft
V. Datum: NAD88

YC-MW-14
Boring Log and As-Built

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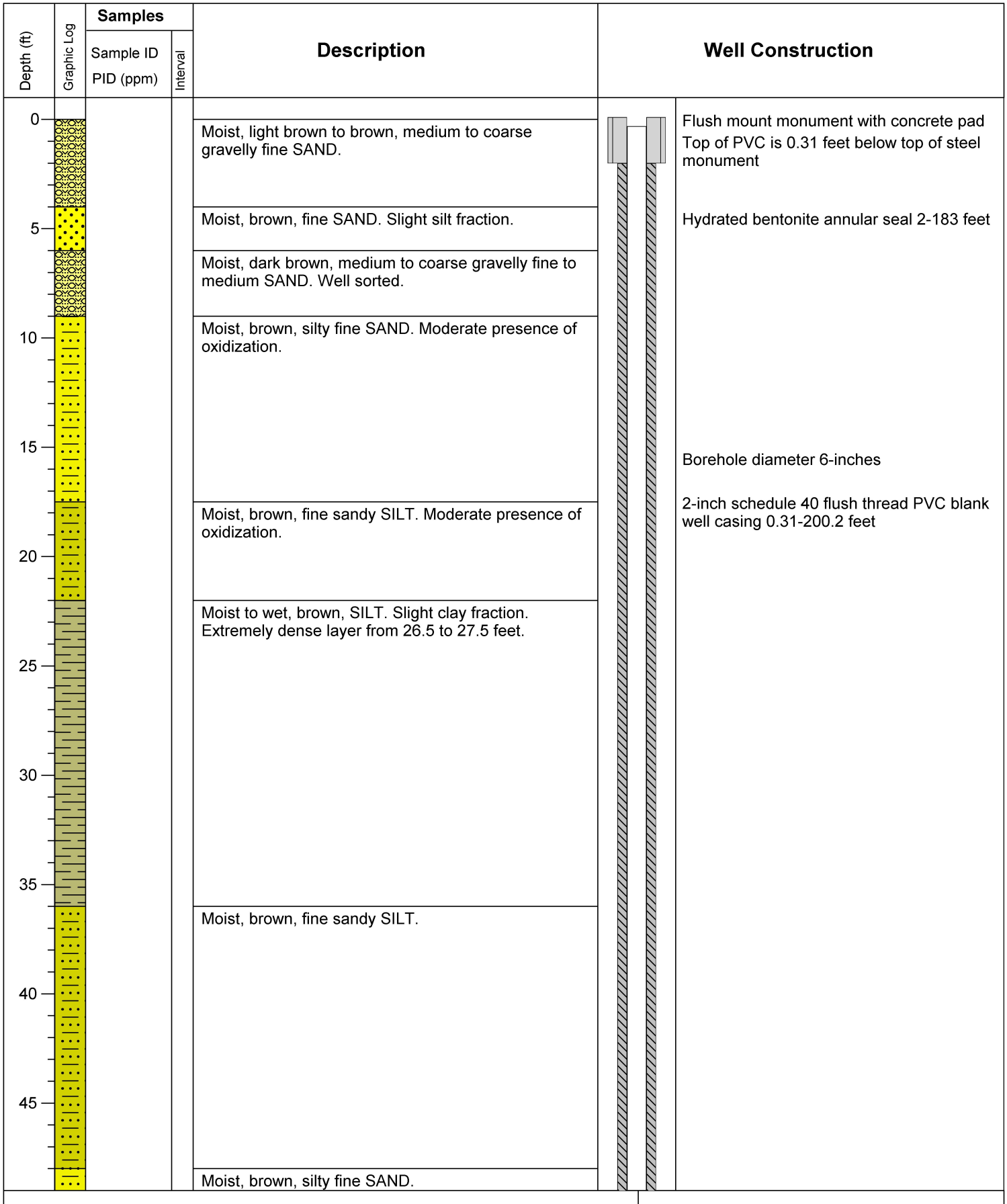
JE1803

PgG



Location (TRS): T11R22-35
Northing/Easting: N 388100.1 ft, E 1761377.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/12/2018
Ecology ID: BKB-734

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 188.68 ft
MP Elevation: 1168.18 ft
V. Datum: NAD88

YC-MW-15
Boring Log and As-Built

Yakima GWMA

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PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
50				Moist, brown, fine sandy SILT.	
				Moist, brown, silty fine SAND.	
55				Moist, brown, fine SAND. Well sorted.	
				Moist, brown, silty fine SAND. Fining downward.	
60					
65					
				Moist, brown, fine sandy SILT.	
70					
				Moist, brown, silty fine SAND.	
75				Moist, brown, fine sandy SILT. Thin bed of moderately oxidized silt at bottom of layer.	
				Moist, brown, silty fine SAND. Moderate presence of oxidization.	
80				Moist, light brown to grey, SILT with clay and fine sand fractions.	
85					
				Moist, light grey, fine sandy SILT.	
90					
				Moist, light grey, SILT. Very dense. Hardening downward. Trace presence of clayey silt beds. Slight presence of oxidization.	
95					

Location (TRS): T11R22-35
Northing/Easting: N 388100.1 ft, E 1761377.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/12/2018
Ecology ID: BKB-734

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 188.68 ft
MP Elevation: 1168.18 ft
V. Datum: NAD88

YC-MW-15
Boring Log and As-Built

Yakima GWMA

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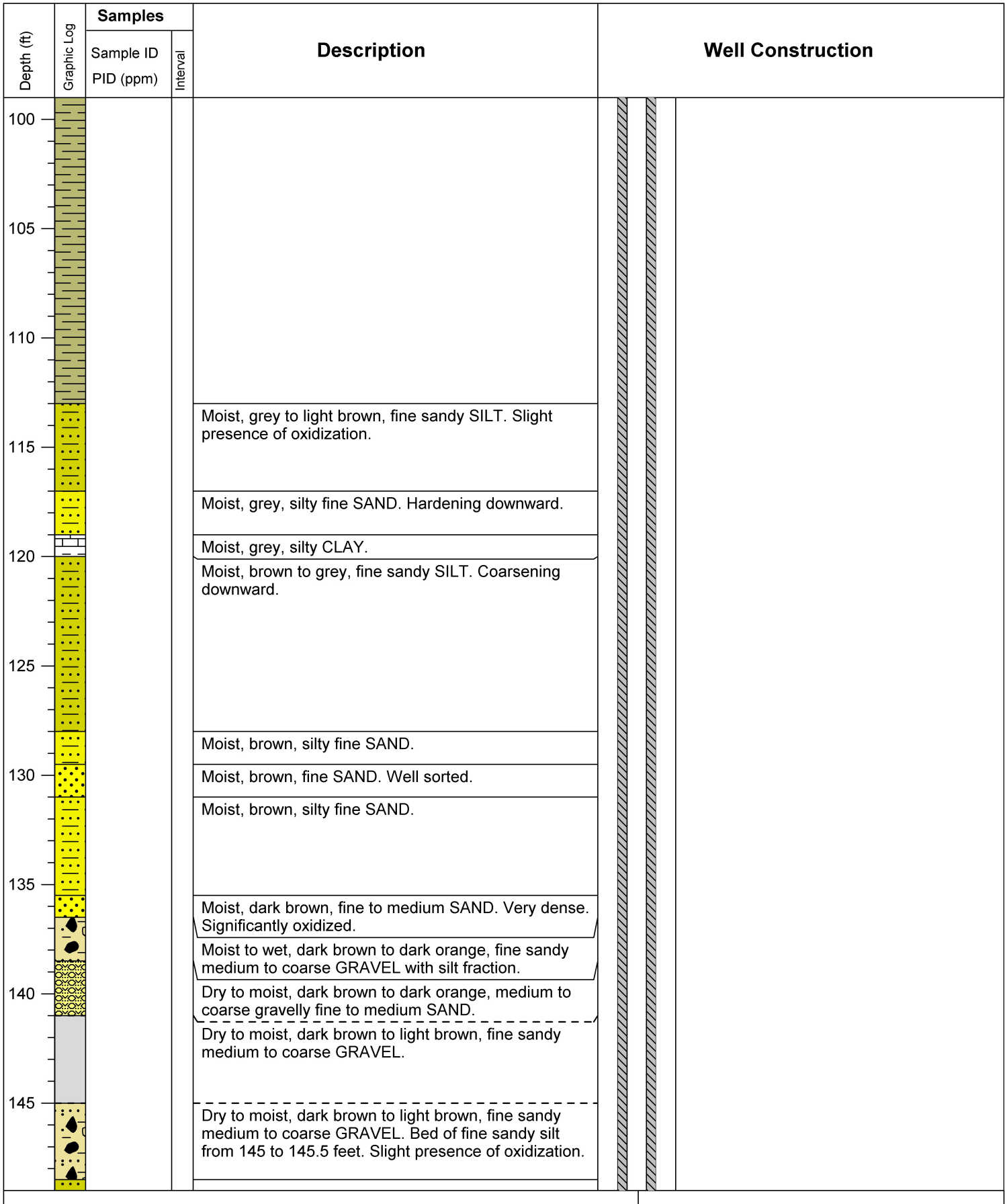
PgG



Location (TRS): T11R22-35
Northing/Easting: N 388100.1 ft, E 1761377.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/12/2018
Ecology ID: BKB-734

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 188.68 ft
MP Elevation: 1168.18 ft
V. Datum: NAD88

YC-MW-15
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
150				Moist, dark brown, gravelly fine sandy SILT.	
				Dry, light grey, medium to coarse gravelly fine SAND.	
155				Moist, dark brown, fine sandy SILT with medium to coarse gravel fraction. Slight to moderate presence of oxidization.	
				Moist, dark brown, medium to coarse gravelly fine to medium SAND. Moderate presence of oxidization.	
				Moist, dark brown, fine to medium sandy medium to coarse GRAVEL.	
160					
				Moist, dark brown, fine to medium sandy medium to coarse GRAVEL.	
165				Dry to moist, brown to light grey, medium to coarse gravelly fine to medium SAND. Moderate presence of oxidization.	
				Moist, dark brown, fine sandy medium to coarse GRAVEL.	
170					
				Moist, dark brown to light grey, medium to coarse gravelly fine SAND.	
175				Moist, light yellow, fine to medium SAND. Well sorted.	
180					
				Moist, dark brown, medium to coarse gravelly fine to medium SAND.	
				Dry, light grey, fine to medium sandy GRAVEL.	12-20 silica sand pack 183-200.2 feet
185					2-inch 10 slot PVC screen 185-200 feet with a flush thread tail pipe
				Moist to wet, dark brown to light grey, medium to coarse GRAVEL with fine sand and silt fractions. Well sorted.	
				Moist, yellowish brown to grey, fine to medium sandy medium GRAVEL.	
190				Wet, dark brown, fine to medium SAND. Well sorted.	
				Wet, dark brown, medium gravelly SAND.	
				Wet, dark brown, silty fine to medium SAND.	
195				Wet, dark brown to grey, fine to medium sandy medium to coarse GRAVEL.	

Location (TRS): T11R22-35
Northing/Easting: N 388100.1 ft, E 1761377.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/12/2018
Ecology ID: BKB-734

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 188.68 ft
MP Elevation: 1168.18 ft
V. Datum: NAD88

YC-MW-15
Boring Log and As-Built

Yakima GWMA

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PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
200					Bottom of the well 200.2 feet Bottom of the boring 200.2 feet
205					
210					
215					
220					
225					
230					
235					
240					
245					

Location (TRS): T11R22-35
Northing/Easting: N 388100.1 ft, E 1761377.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/12/2018
Ecology ID: BKB-734

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 188.68 ft
MP Elevation: 1168.18 ft
V. Datum: NAD88

YC-MW-15
Boring Log and As-Built

Yakima GWMA

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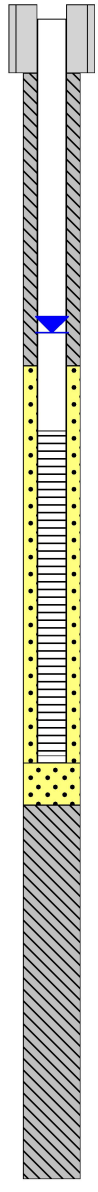
PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description
0				Dry to moist, dark brown, slightly silty, fine SAND. Moist below 5 feet.
10				Wet, dark brown, fine SAND with trace silt.
15				Moist, dark brown, slightly silty to silty, fine SAND.
				Wet, brown, sandy SILT with minor oxidation at 18 feet.
20				Wet, brown, slightly silty, fine SAND with trace medium sand below 20 feet.
25				Moist, light brown, SILT.
				Moist, brown, slightly silty, fine SAND.
				Moist, lightly brown, SILT.
				Moist, slightly silty to silty, fine SAND.
30				Moist, light brown, slightly sandy SILT. Layer of sandy silt approx. 4 inches thick at 32 feet.
35				
40				
45				



Well Construction

- Flush mount monument with concrete pad
- Top of PVC is 0.34 feet below top of steel monument
- Hydrated bentonite annular seal 2-11 feet
- 12-20 silica sand pack 11-24.5 feet
- 2-inch 10 slot PVC screen 13-23 feet with a flush thread tail pipe
- Borehole diameter 6-inches
- 2-inch schedule 40 flush thread PVC blank well casing 0.34-23.2 feet
- Bottom of the well 23.2 feet
- Bentonite bottom seal 24.5-36 feet
- Bottom of the boring 36 feet

Location (TRS): T10R21-13 SW Qtr SE QtrQtr
Northing/Easting: N 369623.5 ft, E 1731005.3 ft
Logged by: Inger Jackson, PGG
Completion Date: 10/27/2018
Ecology ID: BKB-740

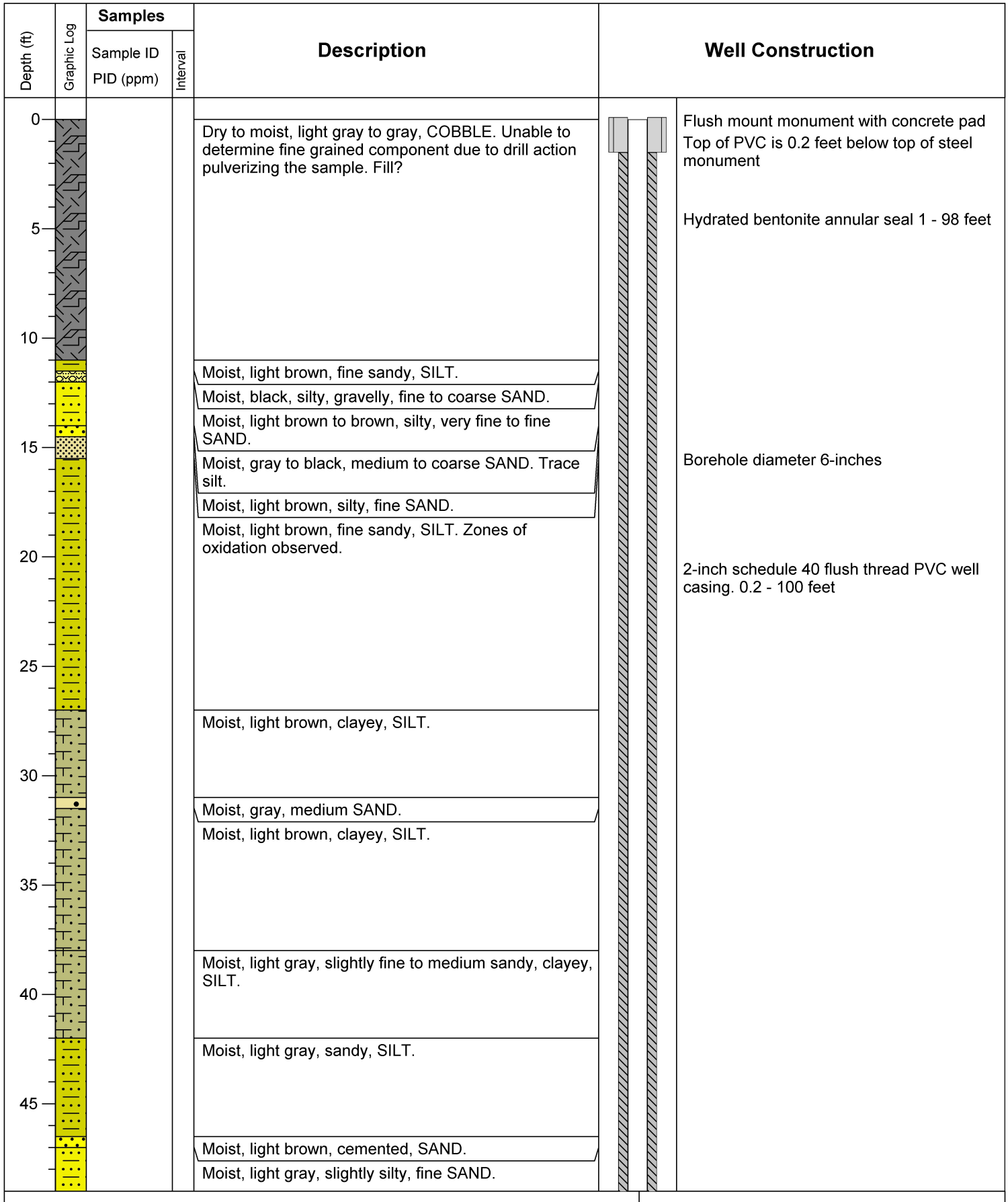
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 9.99 ft
MP Elevation: 775.62 ft
V. Datum: NAD88

YC-MW-16
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS):
Northing/Easting: T12R20-30
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 10/24/2018
Ecology ID: 85.67 ft

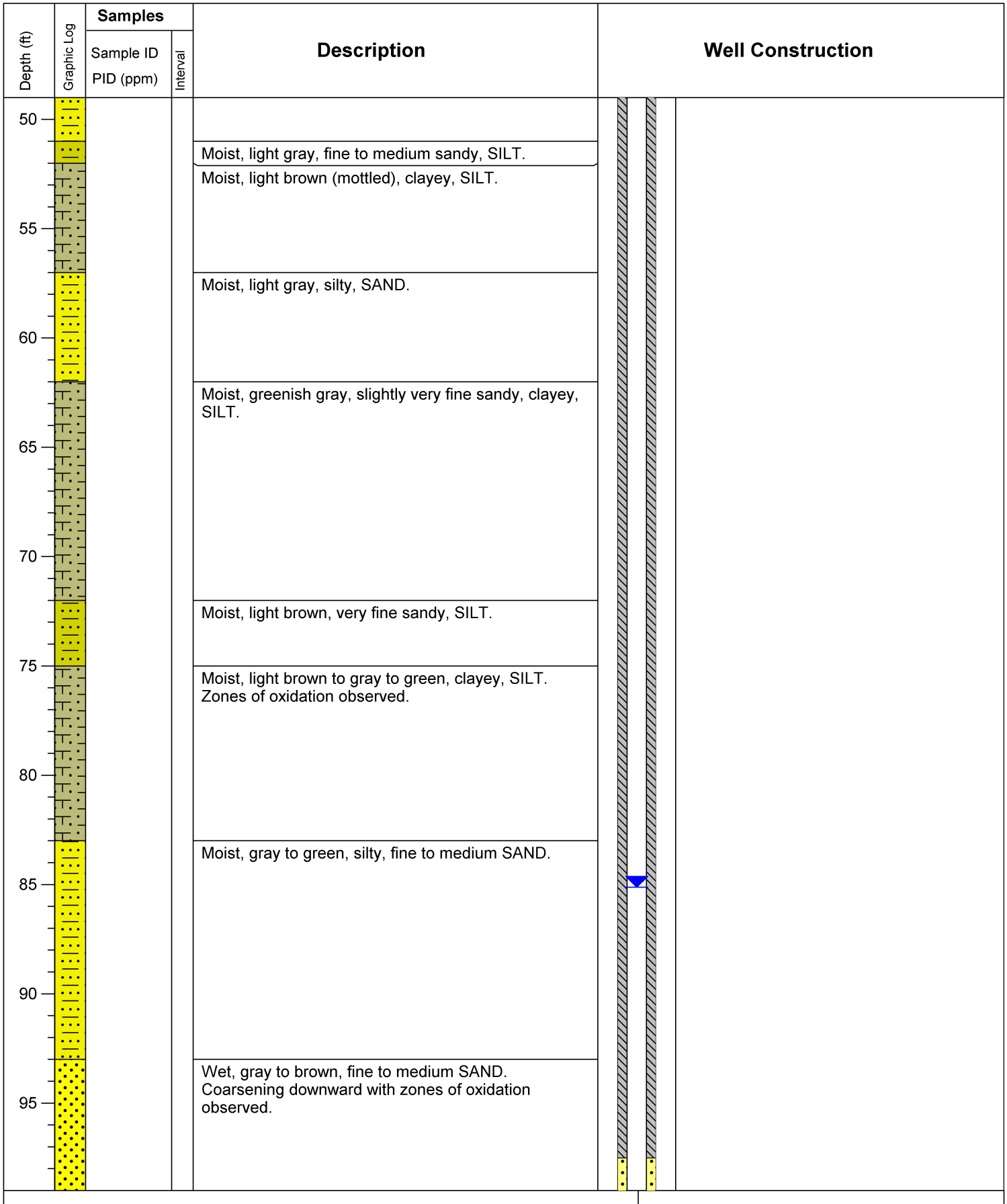
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 1036.7 ft
MP Elevation: NAD88
V. Datum: BKB-737

YC-MW-17
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS):
Northing/Easting: T12R20-30
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 10/24/2018
Ecology ID: 85.67 ft

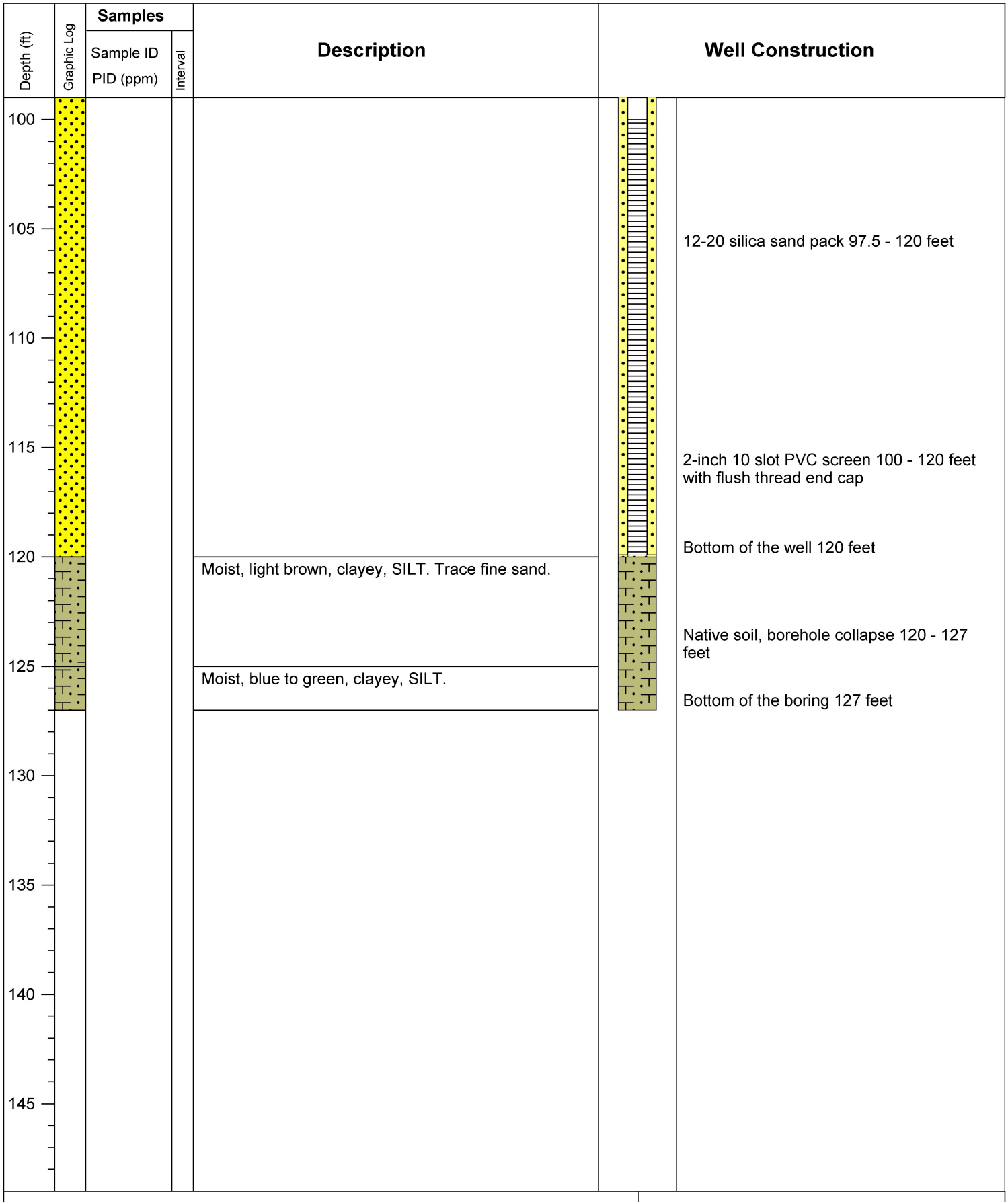
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 1036.7 ft
MP Elevation: NAD88
V. Datum: BKB-737

YC-MW-17
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS):
Northing/Easting: T12R20-30
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 10/24/2018
Ecology ID: 85.67 ft

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 1036.7 ft
MP Elevation: NAD88
V. Datum: BKB-737

YC-MW-17
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
0				Moist, ligth brown, SILT. Sporadic gravels	Flush mount monument with concrete pad Top of PVC is 0.2 feet below top of steel monument
5					Hydrated bentonite annular seal 1 - 45 feet
10					
15					Borehole diameter 6-inches
20				Moist, light brown, clayey, SILT.	
25				Moist, gray, silty, GRAVEL. Sporadic cobbles, sample pulverized by drill action.	2-inch schedule 40 flush thread PVC blank well casing. 0.2 - 47 feet
30				Moist, light brown to brown, silty, very fine to fine SAND.	
35				Moist, light brown, medium to coarse sandy, GRAVEL. Trace silt Moist, light brown to red (mottled), clayey, SILT.	
40				Moist, light brown, fine to medium SAND. Trace silt, sporadic gravels	
45				Moist, light brown, clayey, SILT. Zones of oxidation observed.	12-20 silica sand pack 45 - 63.5 feet
				Moist, gray, fine to medium SAND. Sporadic gravels.	

Location (TRS):
Northing/Easting: T11R20-15
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 10/25/2018
Ecology ID: 49.41 ft

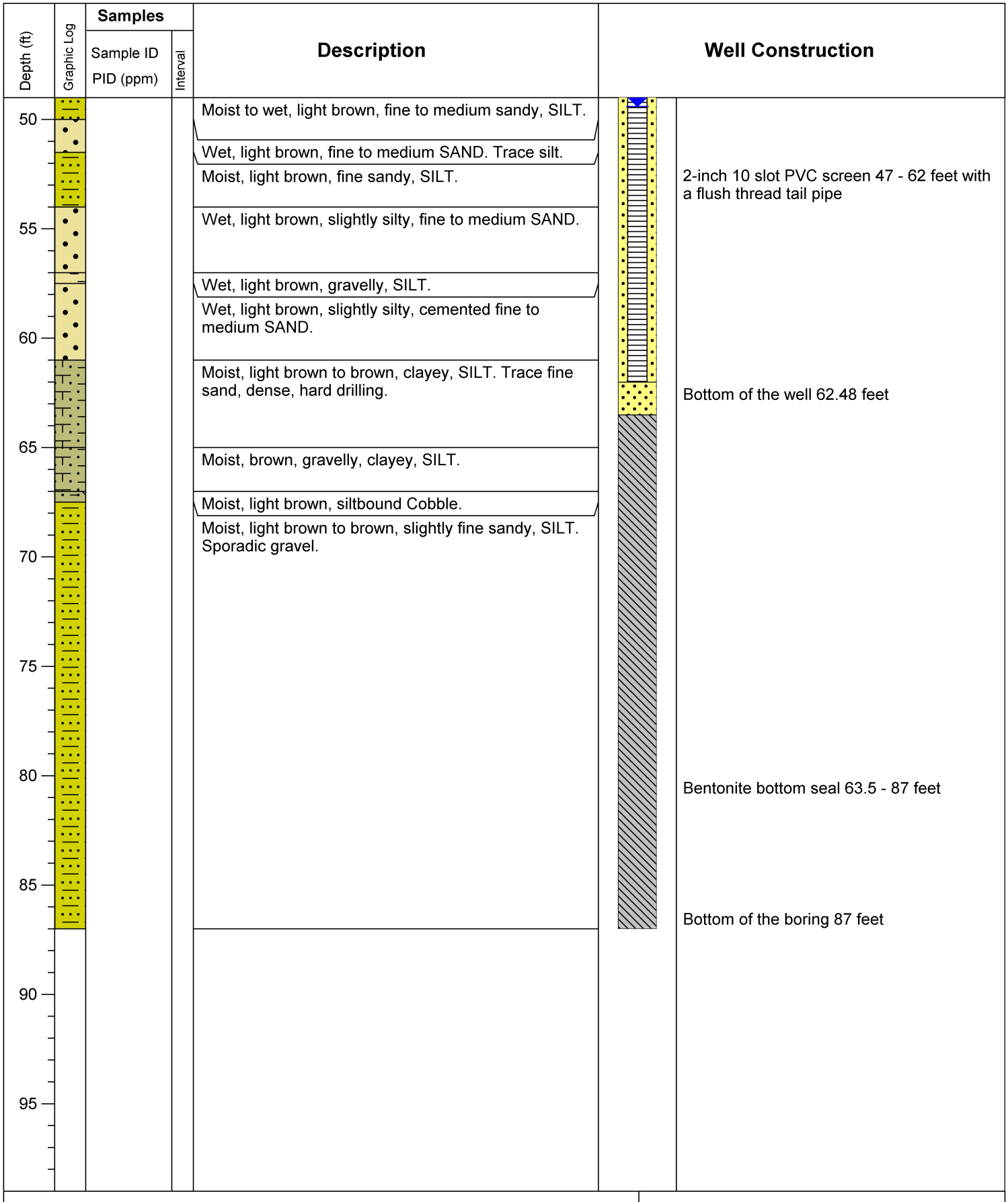
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 912.91 ft
MP Elevation: NAD88
V. Datum: BKB-738

YC-MW-19
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS):
Northing/Easting: T11R20-15
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 10/25/2018
Ecology ID: 49.41 ft

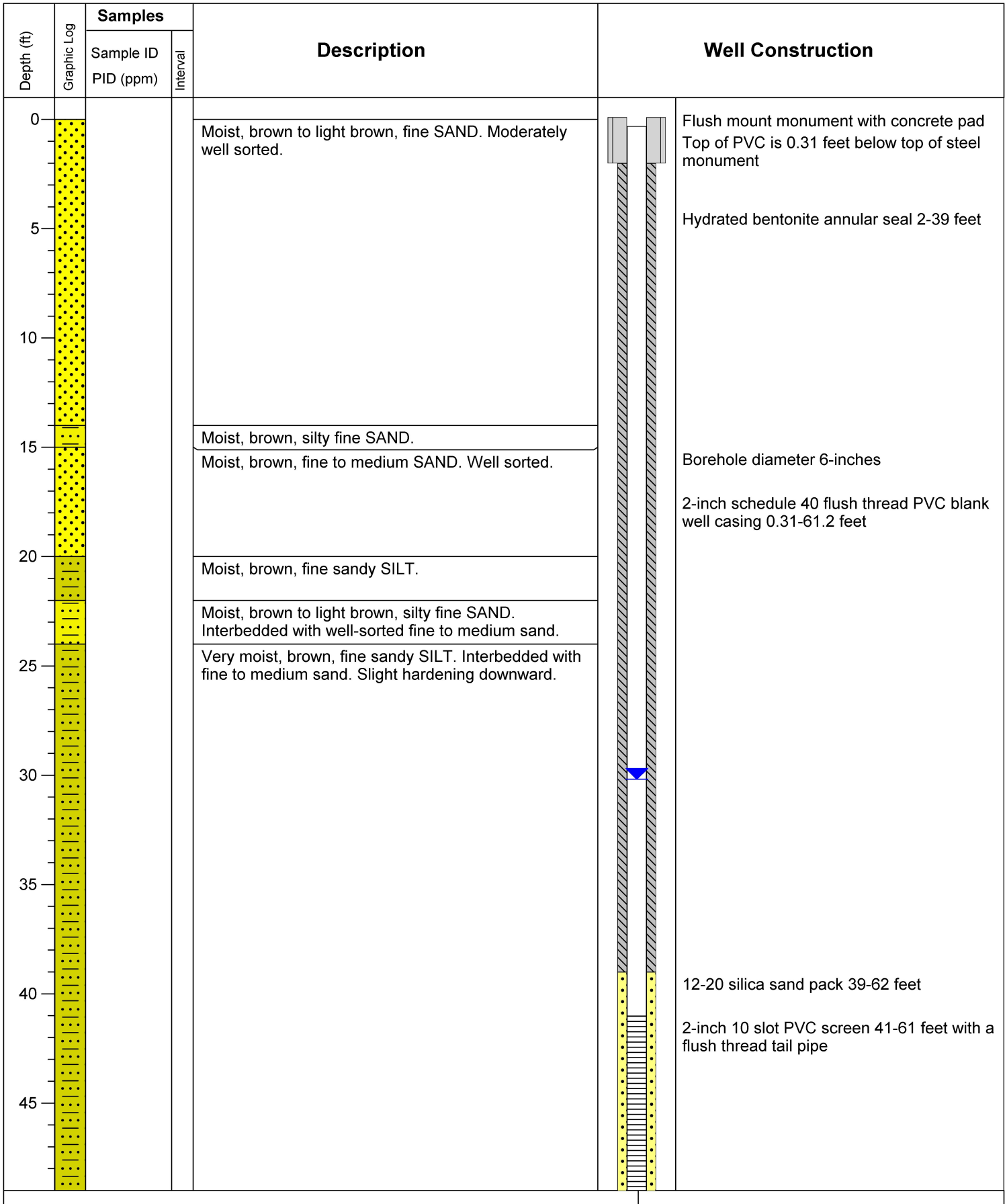
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 912.91 ft
MP Elevation: NAD88
V. Datum: BKB-738

YC-MW-19
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-29
Northing/Easting: N 332464.2 ft, E 1776332.6 ft
Logged by: David Wampler, PGG
Completion Date: 11/12/2018
Ecology ID: BKB-735

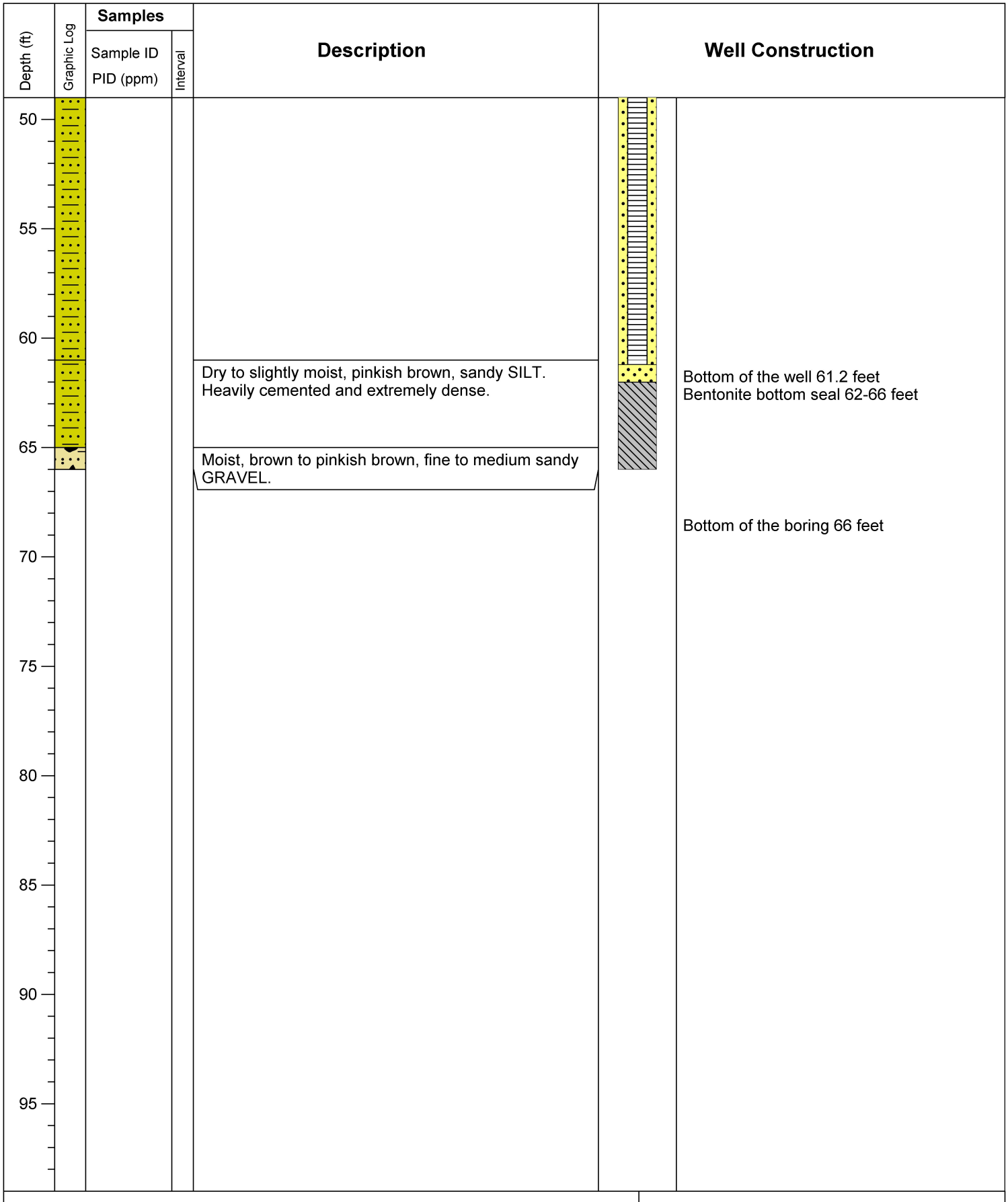
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 30.18 ft
MP Elevation: 724.37 ft
V. Datum: NAD88

YC-MW-21
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-29
Northing/Easting: N 332464.2 ft, E 1776332.6 ft
Logged by: David Wampler, PGG
Completion Date: 11/12/2018
Ecology ID: BKB-735

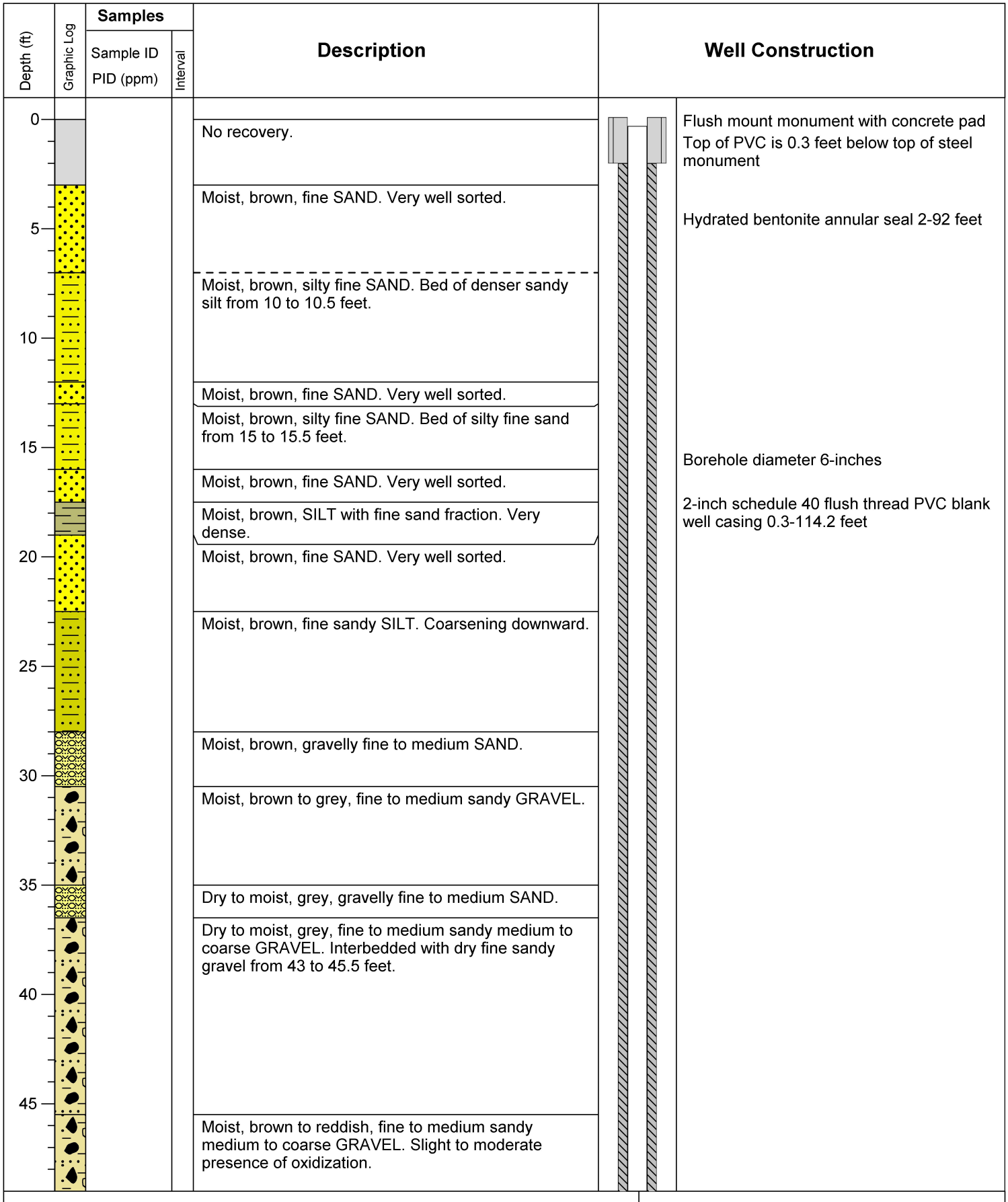
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 30.18 ft
MP Elevation: 724.37 ft
V. Datum: NAD88

YC-MW-21
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-33
Northing/Easting: N 386455.5 ft, E 1716288.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/9/2018
Ecology ID: BKB-732

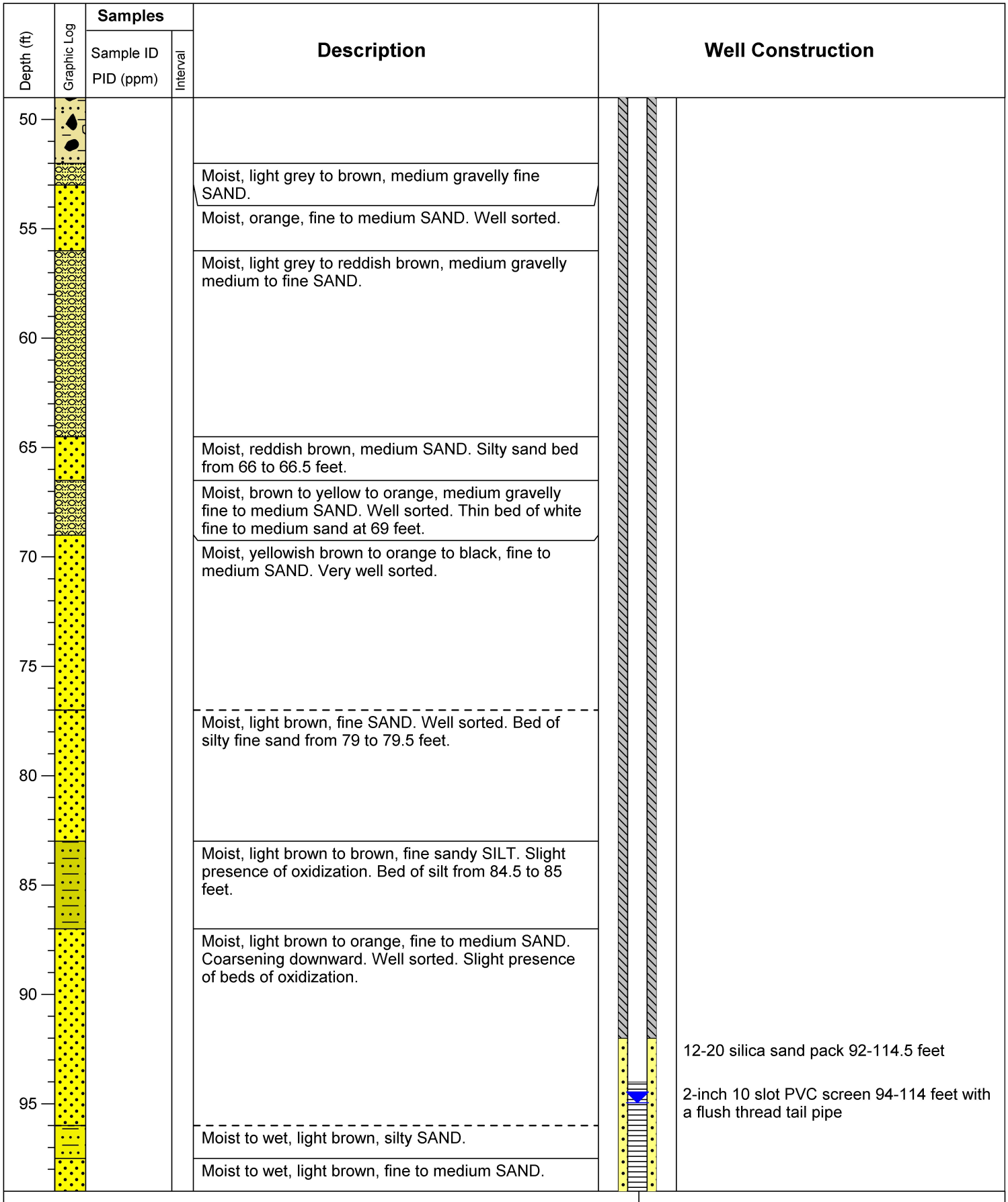
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 94.95 ft
MP Elevation: 889.82 ft
V. Datum: NAD88

YC-MW-23
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-33
Northing/Easting: N 386455.5 ft, E 1716288.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/9/2018
Ecology ID: BKB-732

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 94.95 ft
MP Elevation: 889.82 ft
V. Datum: NAD88

YC-MW-23
Boring Log and As-Built

Yakima GWMA

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PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
100				Coarsening downward. Very well sorted. Bed of black to grey fine to medium sand with gravel fraction from 113.5 to 114 feet.	
105					
110					
115				Moist, light brown, fine sandy SILT. Moderate presence of oxidization.	Bottom of the well 114.2 feet Bentonite bottom seal 114.5-116 feet
				Moist to wet, dark brown to orangish brown, fine to medium SAND. Thin gravel bed from 115.25 to 115.5 feet.	Bottom of the boring 116 feet
120					
125					
130					
135					
140					
145					

Location (TRS): T11R21-33
Northing/Easting: N 386455.5 ft, E 1716288.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/9/2018
Ecology ID: BKB-732

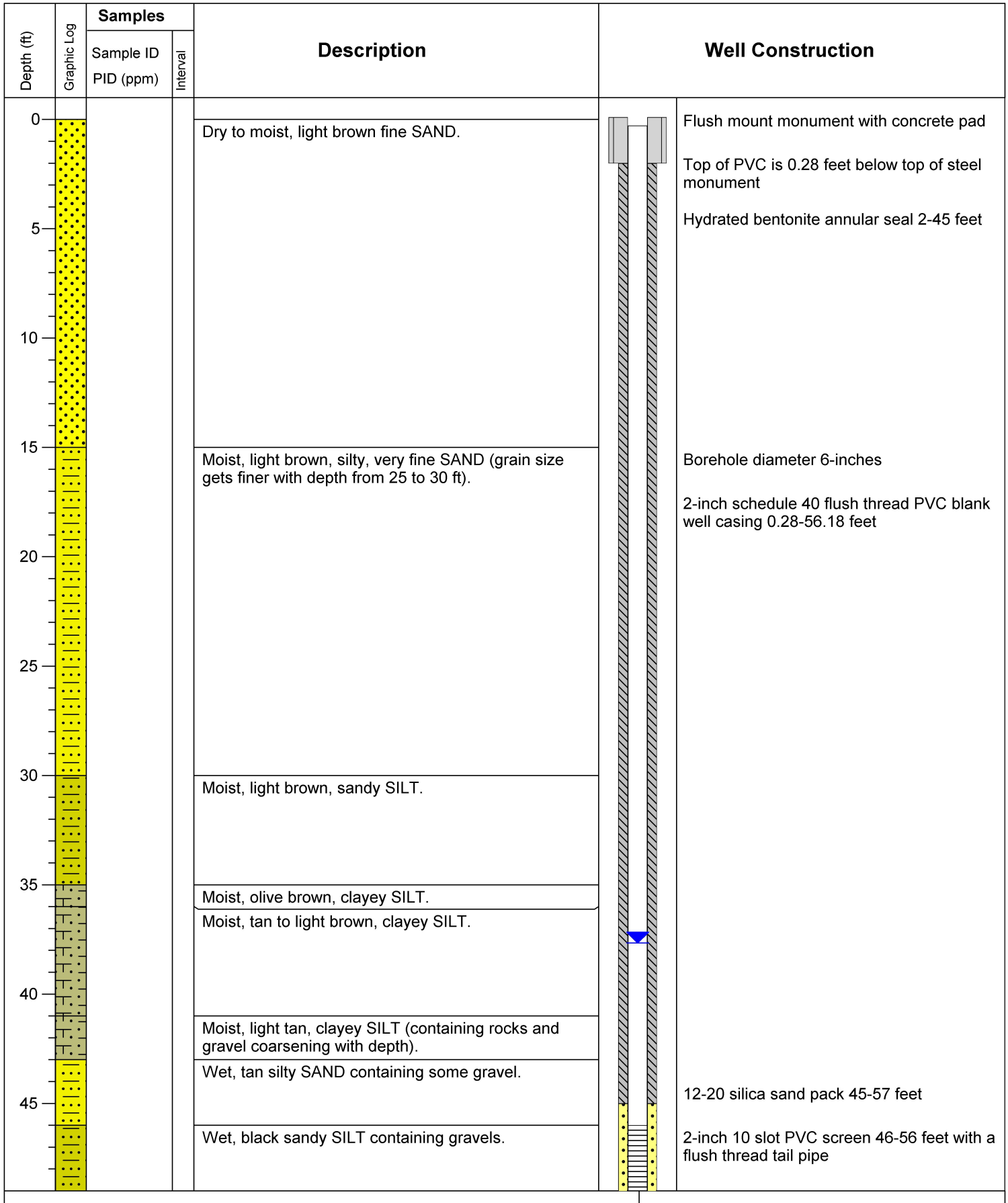
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 94.95 ft
MP Elevation: 889.82 ft
V. Datum: NAD88

YC-MW-23
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-11
Northing/Easting: N 343838.6 ft, E 1790793.1 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/14/2018
Ecology ID: BKB-741

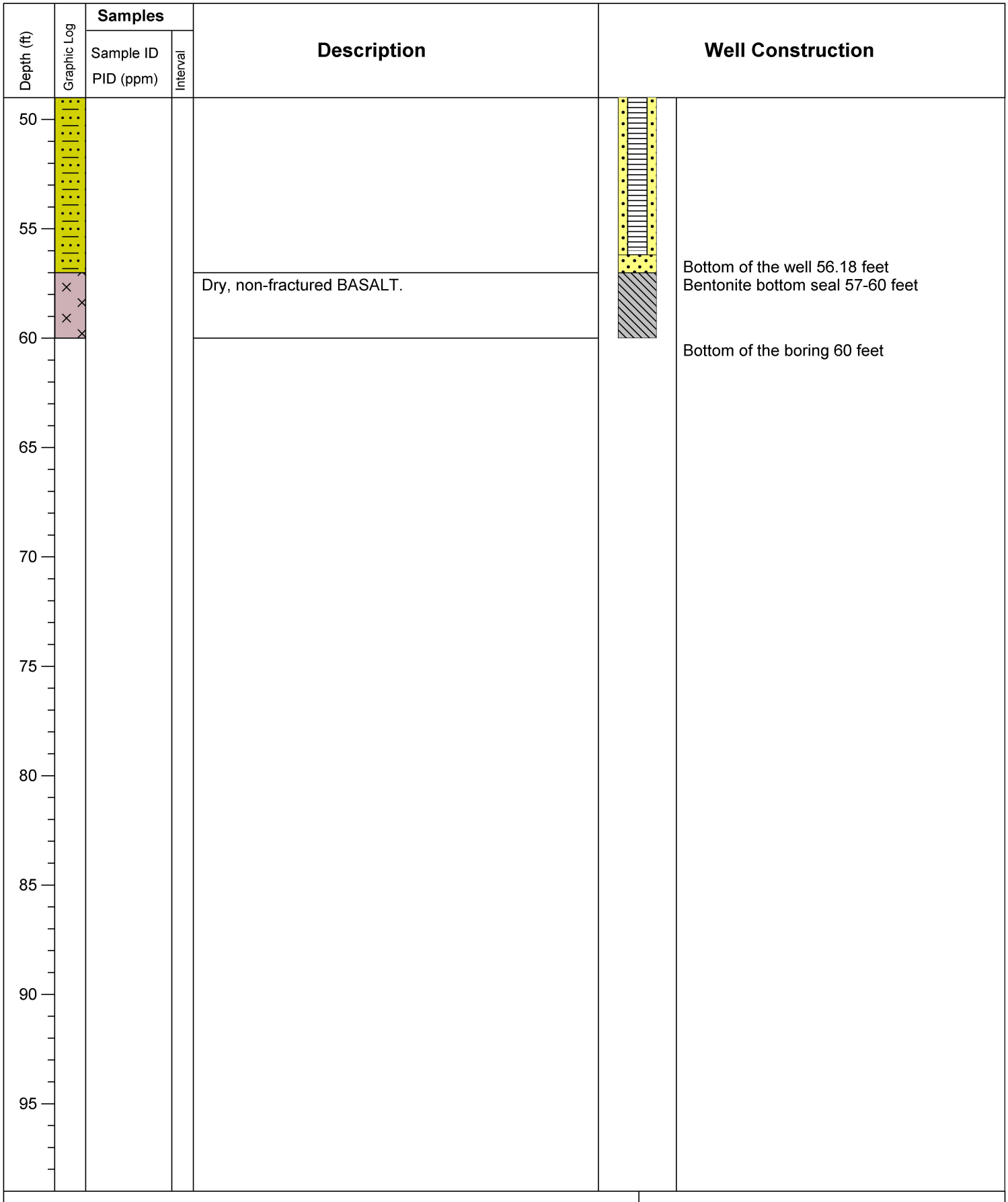
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 37.66 ft
MP Elevation: 815.45 ft
V. Datum: NAD88

YC-MW-24
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-11
Northing/Easting: N 343838.6 ft, E 1790793.1 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/14/2018
Ecology ID: BKB-741

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 37.66 ft
MP Elevation: 815.45 ft
V. Datum: NAD88

YC-MW-24
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
0				Dry, tan fine to medium SAND.	Flush mount monument with concrete pad Top of PVC is 0.26 feet below top of steel monument Hydrated bentonite annular seal 2-251 feet
5					
10					
15				Moist to wet, tan clayey SILT.	Borehole diameter 6-inches 2-inch schedule 40 flush thread PVC blank well casing 0.26-273.2 feet
20				Dry to moist, fine SAND.	
25				Moist to wet, olive brown, silty fine SAND.	
30				Dry, gray fine to medium SAND (grain sizes coarsens with depth).	
35				Dry, gray, medium SAND containing some gravel between 32-33ft.	
40					
45				Moist, light brown sandy SILT (mottling 39-43 ft).	

Location (TRS): T11R21-17
Northing/Easting: N 401363.8 ft, E 1711060 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/29/2018
Ecology ID: BKB-747

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 263.55 ft
MP Elevation: 1204.67 ft
V. Datum: NAD88

YC-MW-25
Boring Log and As-Built

Yakima GWMA

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PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
50					
				Moist, orange-brown, medium SAND.	
55				Moist to dry, silty medium to coarse SAND.	
60				Moist, light brown, sandy SILT.	
				Moist to dry, tan, fine SAND.	
65					
70					
				Moist to dry, orange-brown, silty very fine silty SAND.	
75					
				Moist orange-brown, sandy SILT.	
80				Moist, light gray medium to coarse SAND with gravel and rocks.	
85					
90					
95					

Location (TRS): T11R21-17
Northing/Easting: N 401363.8 ft, E 1711060 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/29/2018
Ecology ID: BKB-747

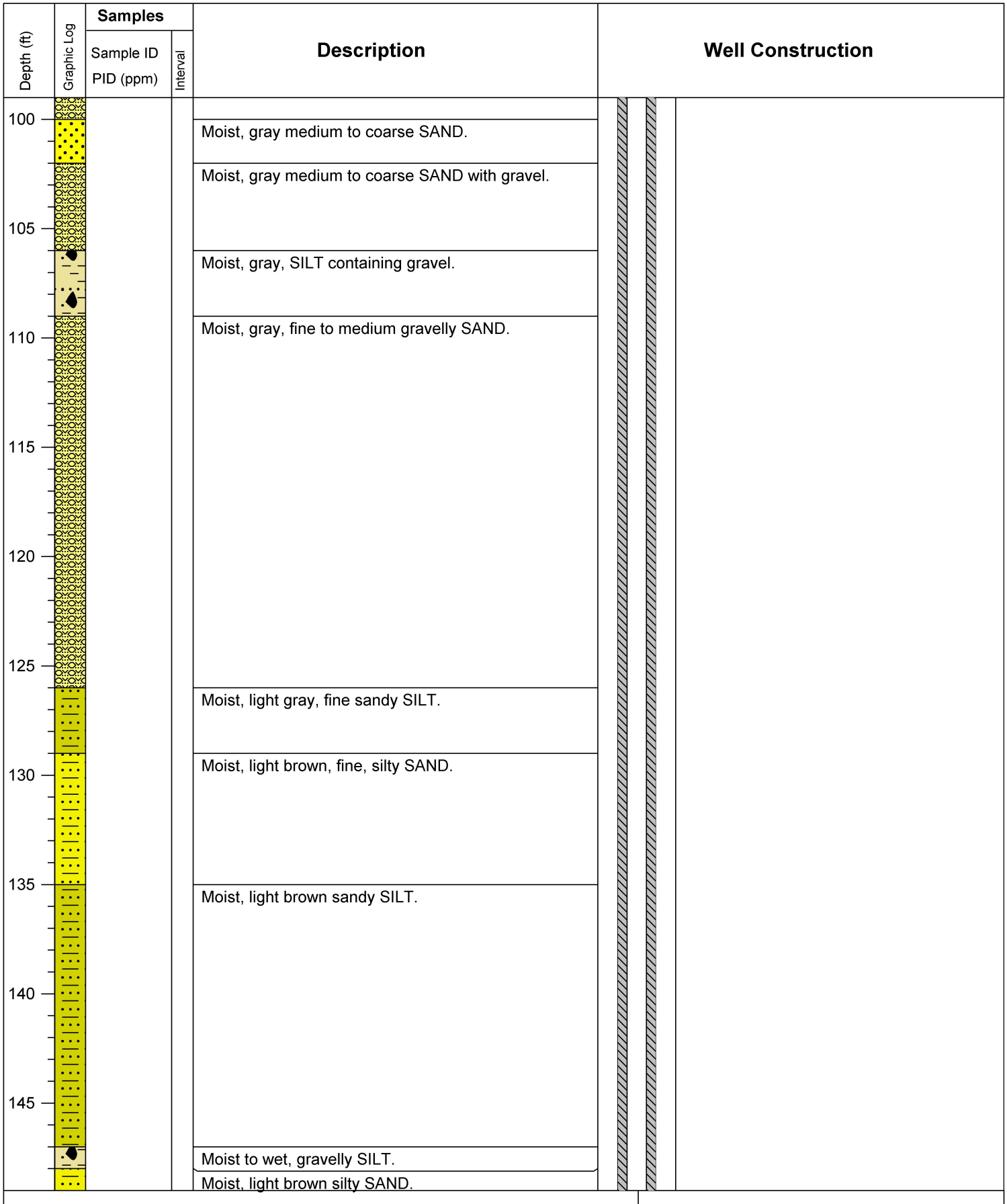
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 263.55 ft
MP Elevation: 1204.67 ft
V. Datum: NAD88

YC-MW-25
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-17
Northing/Easting: N 401363.8 ft, E 1711060 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/29/2018
Ecology ID: BKB-747

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 263.55 ft
MP Elevation: 1204.67 ft
V. Datum: NAD88

YC-MW-25
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
150					
155					
160				Moist, light gray fine SAND.	
				Moist, light brown, very fine sandy SILT.	
165				Moist, light brown, silty fine SAND.	
170					
175				Moist, light gray, medium to coarse SAND.	
180					
185					
190					
195				Moist, tan, silty, fine SAND.	

Location (TRS): T11R21-17
Northing/Easting: N 401363.8 ft, E 1711060 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/29/2018
Ecology ID: BKB-747

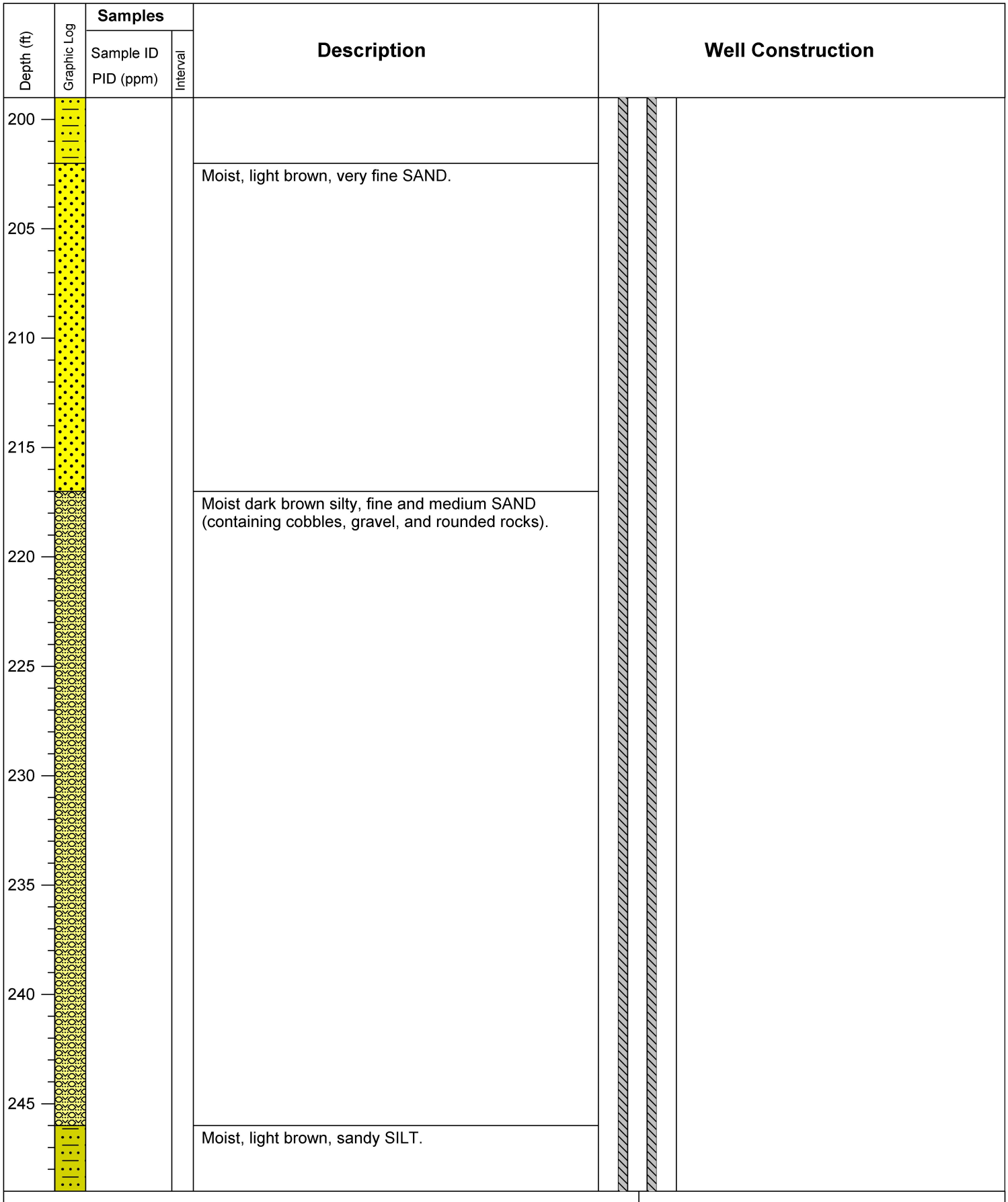
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 263.55 ft
MP Elevation: 1204.67 ft
V. Datum: NAD88

YC-MW-25
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-17
Northing/Easting: N 401363.8 ft, E 1711060 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/29/2018
Ecology ID: BKB-747

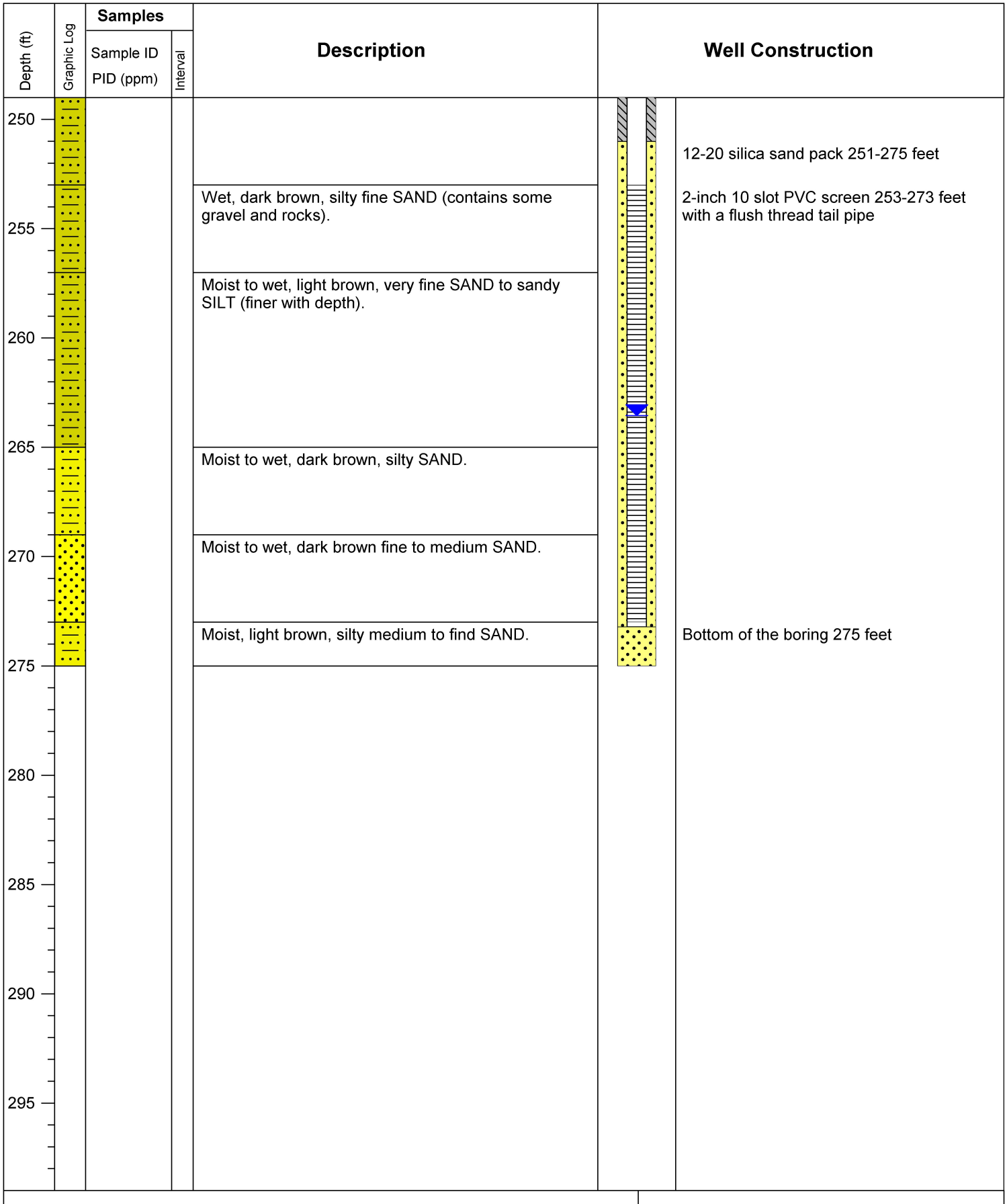
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 263.55 ft
MP Elevation: 1204.67 ft
V. Datum: NAD88

YC-MW-25
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-17
Northing/Easting: N 401363.8 ft, E 1711060 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/29/2018
Ecology ID: BKB-747

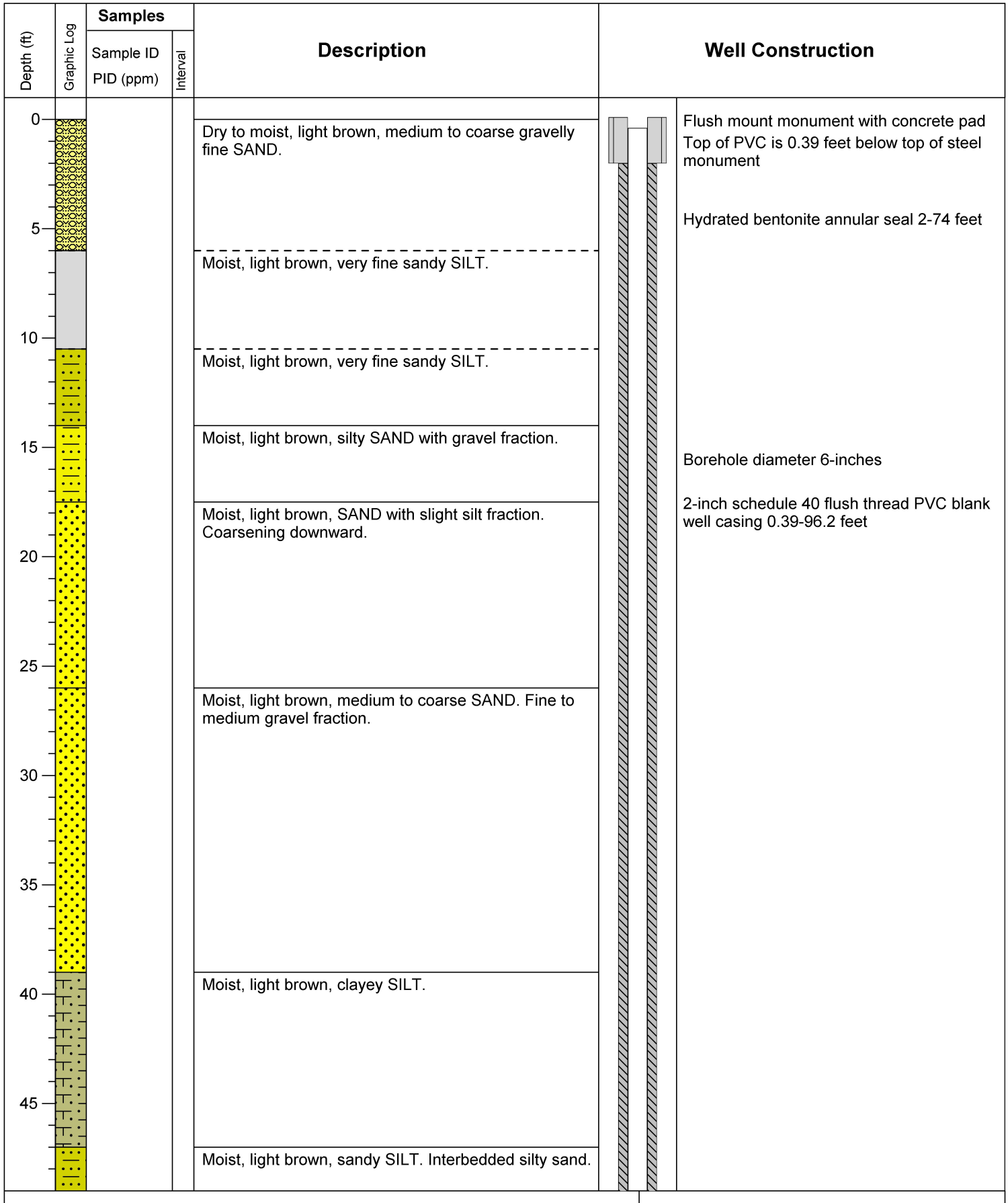
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 263.55 ft
MP Elevation: 1204.67 ft
V. Datum: NAD88

YC-MW-25
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R20-05
Northing/Easting: N 415545.8 ft, E 1681988.6 ft
Logged by: David Wampler, PGG
Completion Date: 11/5/2018
Ecology ID: BKB-728

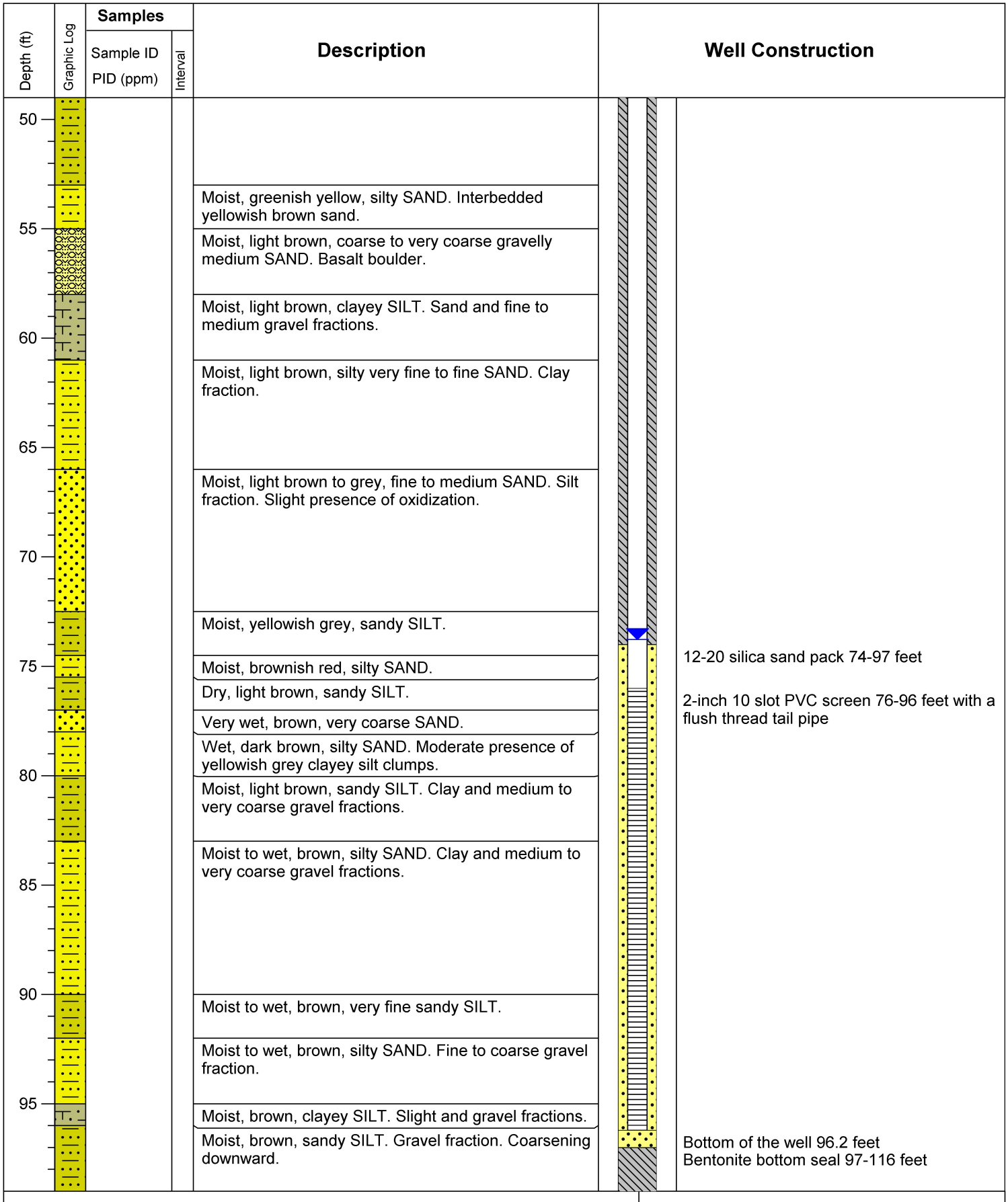
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 73.77 ft
MP Elevation: 1039.13 ft
V. Datum: NAD88

YC-MW-26
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R20-05
Northing/Easting: N 415545.8 ft, E 1681988.6 ft
Logged by: David Wampler, PGG
Completion Date: 11/5/2018
Ecology ID: BKB-728

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 73.77 ft
MP Elevation: 1039.13 ft
V. Datum: NAD88

YC-MW-26
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
100					
105					
110				Moist, dark brown to very dark brown, sandy SILT. Slight presence of breccia gravels composed of sand and pebbles.	
115				Wet, dark brown, gravelly SAND. Slight presence of heavily oxidized clumps of sand.	
120					Bottom of the boring 116 feet
125					
130					
135					
140					
145					

Location (TRS): T11R20-05
Northing/Easting: N 415545.8 ft, E 1681988.6 ft
Logged by: David Wampler, PGG
Completion Date: 11/5/2018
Ecology ID: BKB-728

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 73.77 ft
MP Elevation: 1039.13 ft
V. Datum: NAD88

YC-MW-26
Boring Log and As-Built

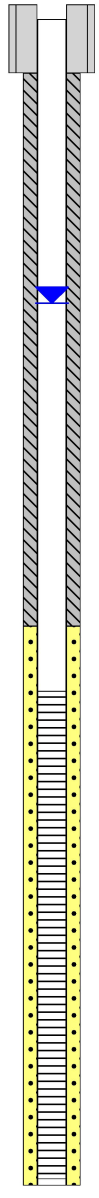
Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description
0				Moist to wet, brown, fine sandy SILT.
				Moist, brown, fine to medium SAND.
5				Moist, brown, fine sandy SILT.
				Moist, brown, silty fine SAND.
10				
				Moist, brown, fine sandy SILT.
				Moist, brown, silty fine SAND.
15				Moist, brown, fine sandy SILT.
				Moist, brown, silty fine SAND.
				Moist, brown, fine sandy SILT.
20				Moist, brown, silty fine SAND.
				Moist, brown, fine sandy SILT.
				Moist, brown, silty fine SAND.
				Moist, brown, fine sandy SILT.
25				Moist, brown, silty fine SAND. Hardening downward.
				Moist, brown, fine sandy SILT.
30				Moist, brown, silty fine SAND.
				Moist, brown, fine sandy SILT.
				Moist, brown, silty fine SAND.
35				
40				
45				

Well Construction



Flush mount monument with concrete pad
Top of PVC is 0.35 feet below top of steel monument

Hydrated bentonite annular seal 2-19 feet

Borehole diameter 6-inches

2-inch schedule 40 flush thread PVC blank well casing 0.35-36.2 feet

12-20 silica sand pack 19-36.2 feet

2-inch 10 slot PVC screen 21-36 feet with a flush thread tail pipe

Bottom of the well 36.2 feet

Bottom of the boring 36.2 feet

Location (TRS): T9R23-08
Northing/Easting: N 348483.1 ft, E 1775485.3 ft
Logged by: David Wampler, PGG
Completion Date: 11/6/2018
Ecology ID: BKB-730

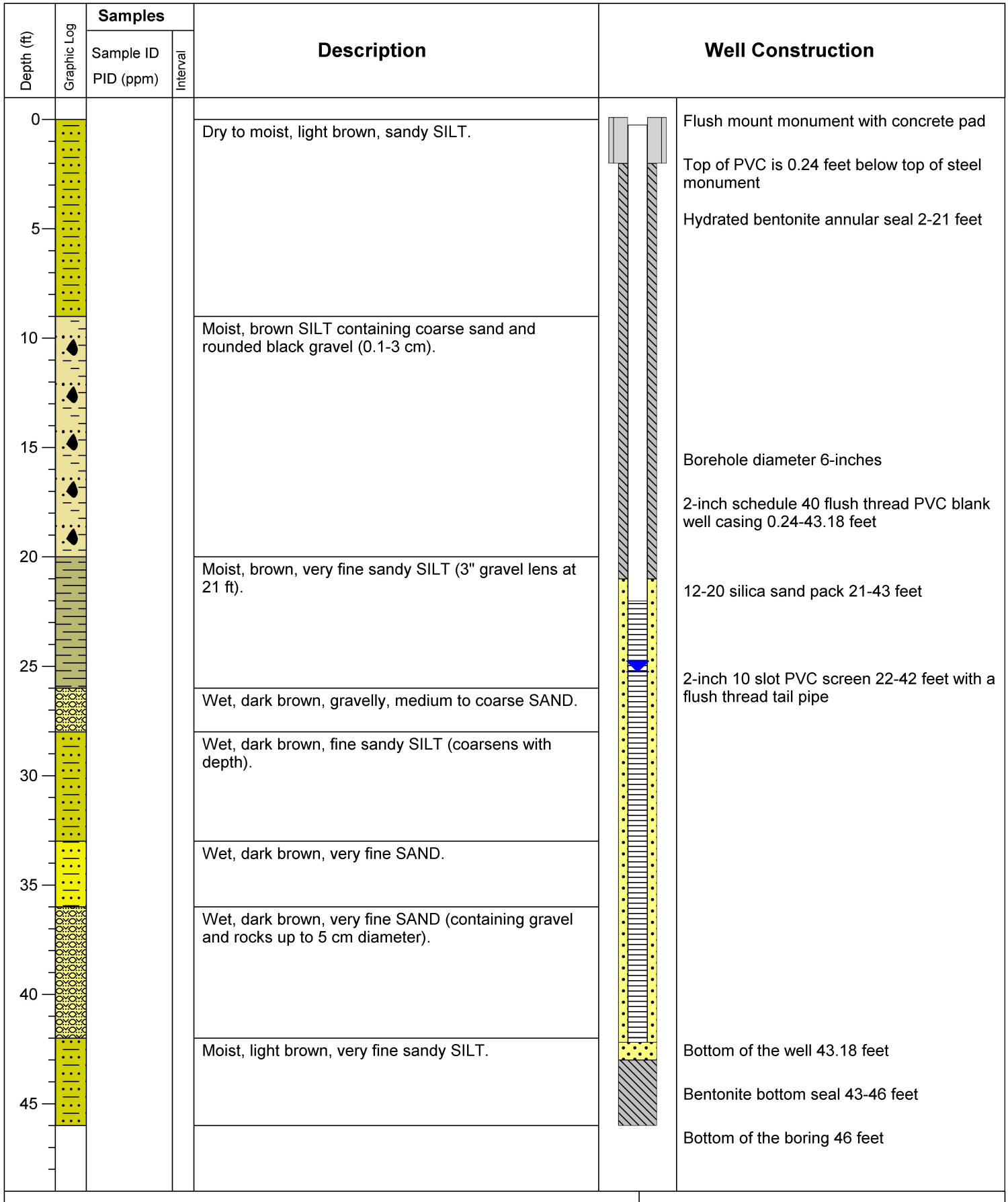
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 9.08 ft
MP Elevation: 719.17 ft
V. Datum: NAD88

YC-MW-27
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T8R23-08
Northing/Easting: N 313832.2 ft, E 1778744.7 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/17/2018
Ecology ID: BKB-743

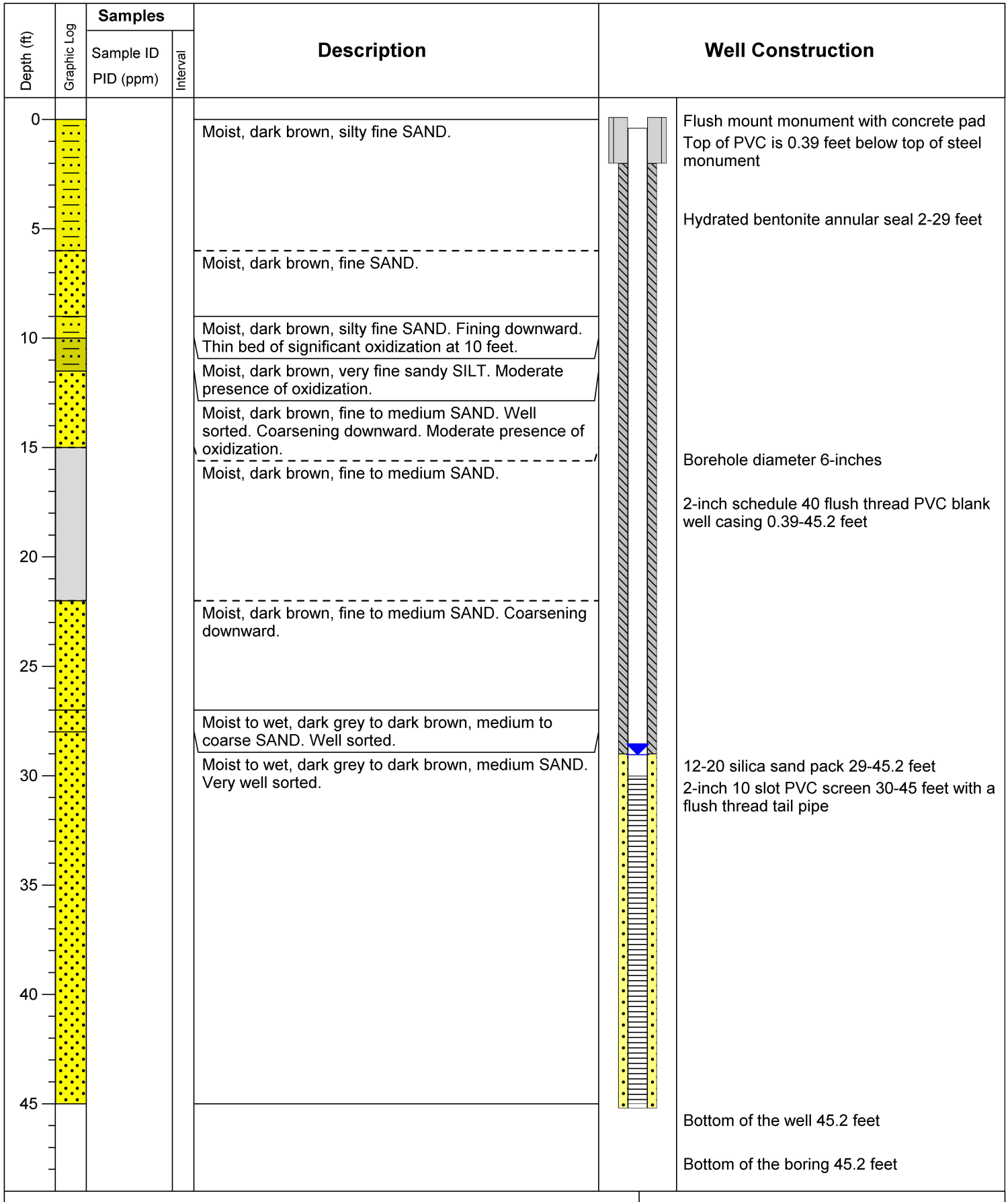
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 25.25 ft
MP Elevation: 731.38 ft
V. Datum: NAD88

YC-MW-28
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R22-10
Northing/Easting: N 343074.8 ft, E 1752292.2 ft
Logged by: David Wampler, PGG
Completion Date: 1/16/2019
Ecology ID: BKB-756

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 29.04 ft
MP Elevation: 692.84 ft
V. Datum: NAD88

YC-MW-31
Boring Log and As-Built

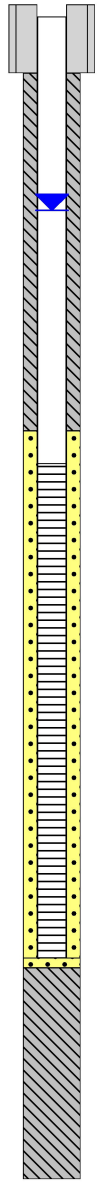
Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description
0				Moist, dark brown, silty fine SAND.
				Moist to wet, dark brown, silty fine SAND.
5				
				Moist to wet, brown to dark brown, silty fine SAND. Slightly hardens downward.
10				
15				
20				
25				
30				Moist, brown, fine sandy SILT.
				Moist to wet, dark brown, silty fine SAND.
				Moist, brown, fine sandy SILT.
35				Moist to wet, dark brown, silty fine SAND.
				Moist, brown, fine sandy SILT.
40				
45				

Well Construction



Flush mount monument with concrete pad
Top of PVC is 0.27 feet below top of steel monument

Hydrated bentonite annular seal 2-13 feet

12-20 silica sand pack 13-29.5 feet

2-inch 10 slot PVC screen 14-29 feet with a flush thread tail pipe

Borehole diameter 6-inches

2-inch schedule 40 flush thread PVC blank well casing 0.27-29.2 feet

Bottom of the well 29.2 feet

Bentonite bottom seal 29.5-36 feet

Bottom of the boring 36 feet

Location (TRS): T10R21-15
Northing/Easting: N 374861.7 ft, E 1721596.4 ft
Logged by: David Wampler, PGG
Completion Date: 1/14/2019
Ecology ID: BKB-754

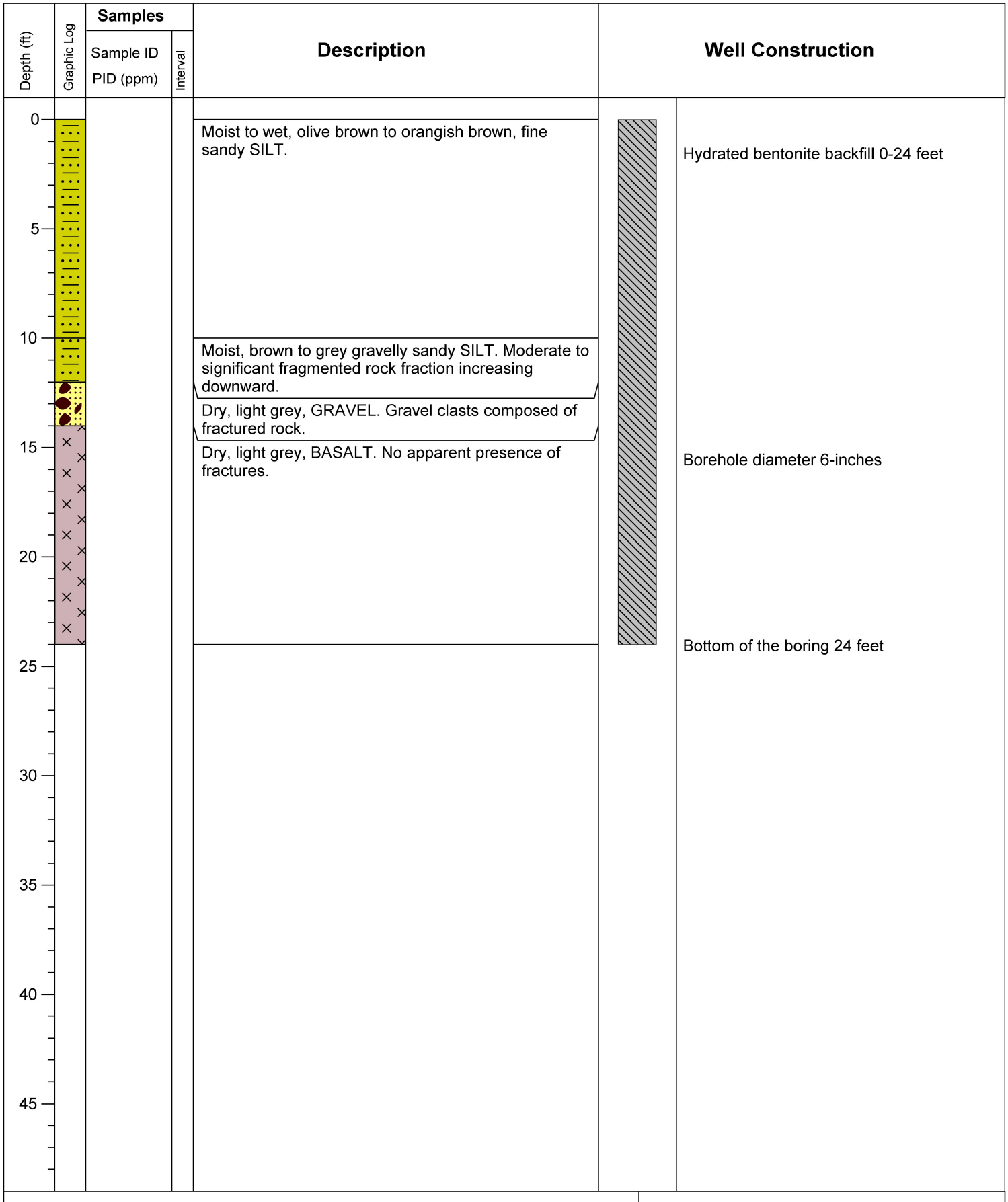
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 6.23 ft
MP Elevation: 762.89 ft
V. Datum: NAD88

YC-MW-33
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T10R23-09
Northing/Easting: N 375350.1 ft, E 1779900.9 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 1/19/2018
Ecology ID: N/A

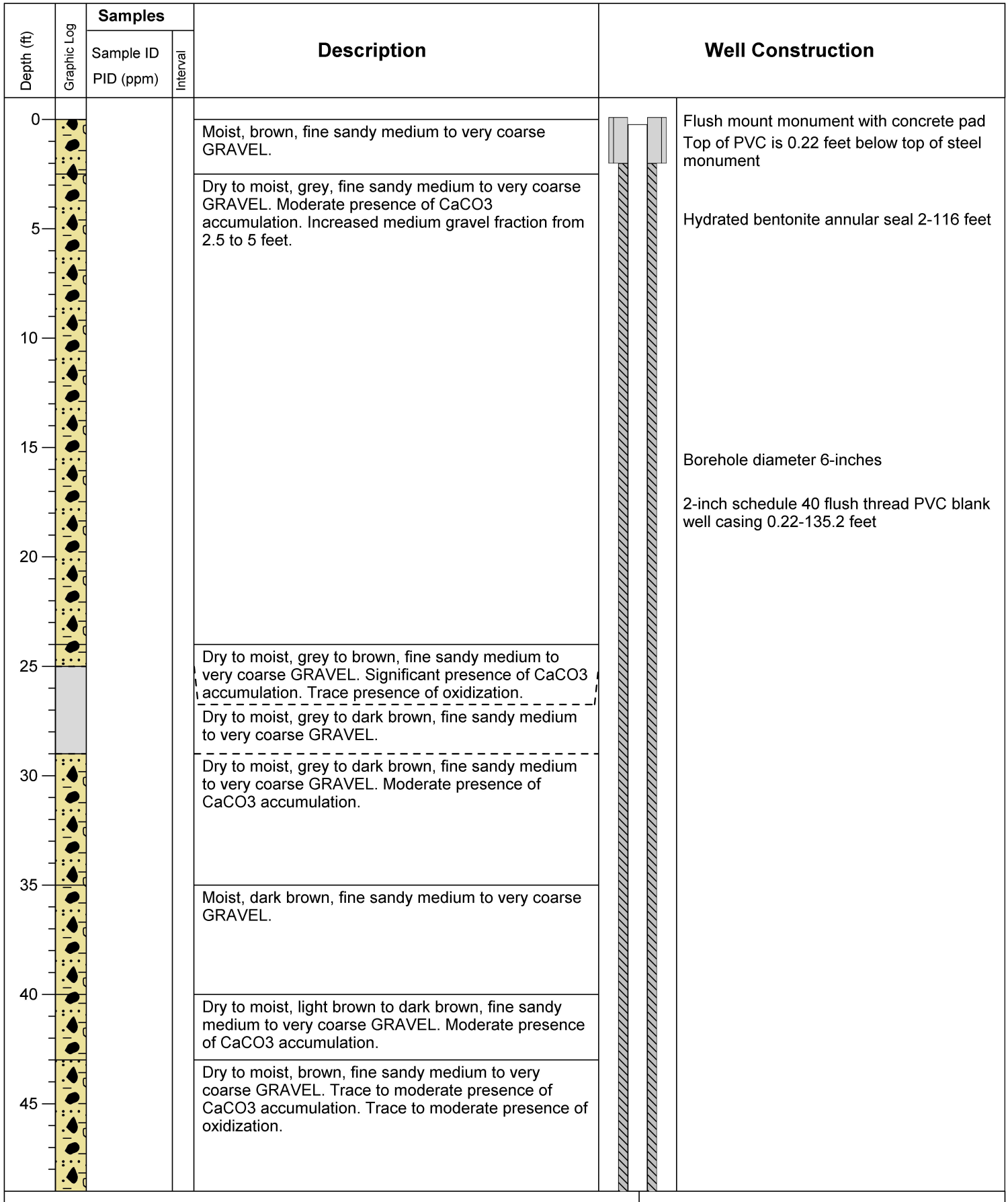
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: N/A
MP Elevation: N/A
V. Datum: NAD88

YC-MW-35
Boring Log

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-36
Northing/Easting: N 324605 ft, E 1794427.1 ft
Logged by: David Wampler, PGG
Completion Date: 1/17/2019
Ecology ID: BKB-758

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 120.39 ft
MP Elevation: 766.75 ft
V. Datum: NAD88

YC-MW-38
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
50					
55				Dry to moist, light grey, fine sandy fine to medium GRAVEL.	
60				Dry to moist, light grey, fine sandy fine to medium GRAVEL. Moderate presence of CaCO3. Fining downward.	
65					
70				Dry to moist, light brown, fine sandy medium to coarse GRAVEL. Gravel fraction predominantly medium. Moderate CaCO3 accumulation. Moderate presence of oxidization.	
				Dry to moist, light brown to light grey, fine sandy medium to very coarse GRAVEL.	
75				Dry to moist, light brown to light grey, fine sandy medium to very coarse GRAVEL. Elevated fraction of medium gravel. Moderate presence of CaCO3 accumulation. Trace presence of oxidization.	
80				Dry to moist, light brown to brown, medium gravelly very coarse sand.	
85				Dry to moist, light brown, medium to coarse sandy GRAVEL.	
				Dry to moist, light brown, fine sandy medium to coarse GRAVEL. Moderate presence of CaCO3 accumulation.	
90				Dry to moist, light brown to brown, fine to medium SAND. Fining downward.	
				Dry to moist, light brown, sandy medium GRAVEL. High pebble fraction.	
95				Dry to moist, light brown to light grey, fine sandy medium to very coarse GRAVEL.	

Location (TRS): T9R23-36
Northing/Easting: N 324605 ft, E 1794427.1 ft
Logged by: David Wampler, PGG
Completion Date: 1/17/2019
Ecology ID: BKB-758

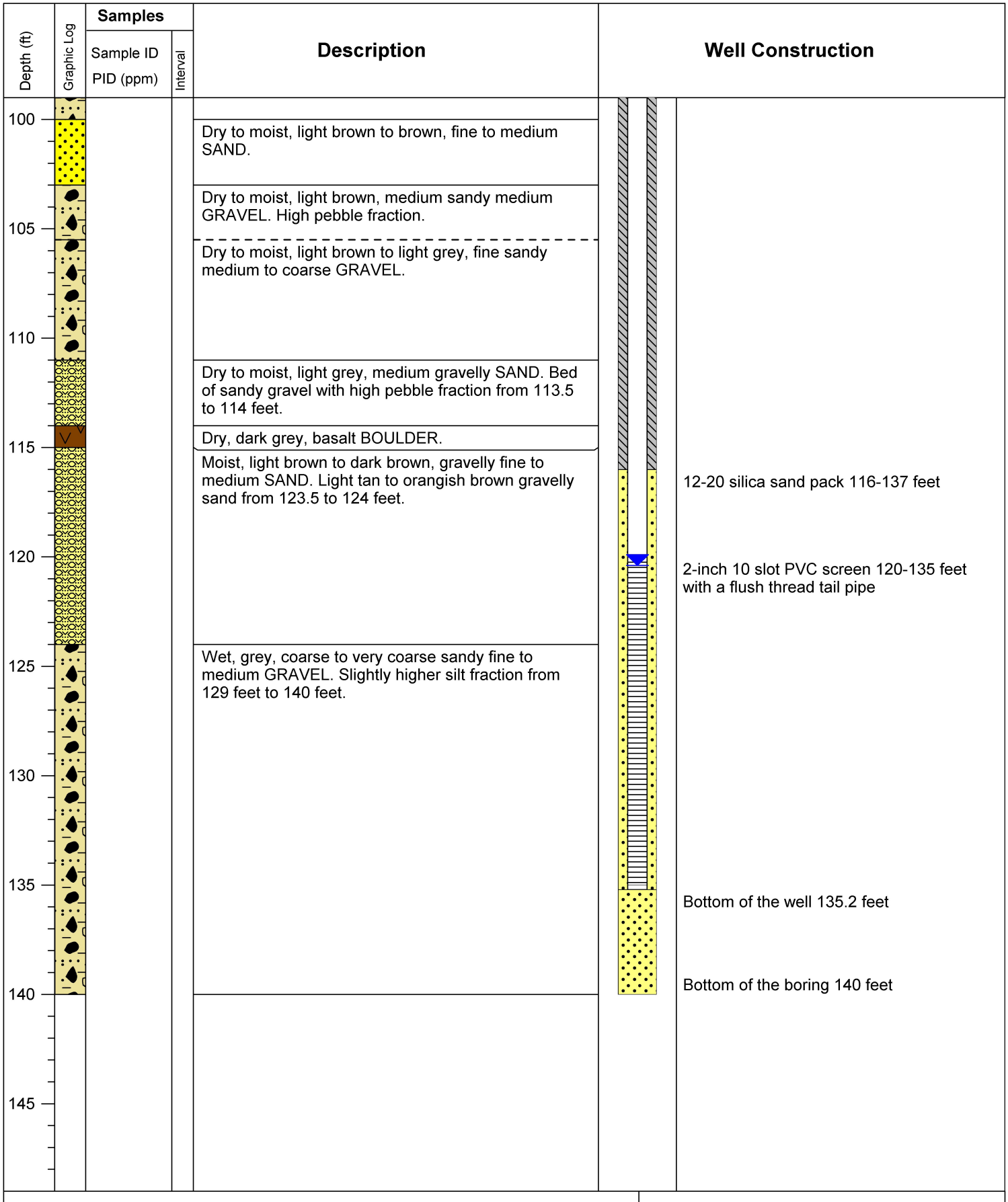
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 120.39 ft
MP Elevation: 766.75 ft
V. Datum: NAD88

YC-MW-38
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T9R23-36
Northing/Easting: N 324605 ft, E 1794427.1 ft
Logged by: David Wampler, PGG
Completion Date: 1/17/2019
Ecology ID: BKB-758

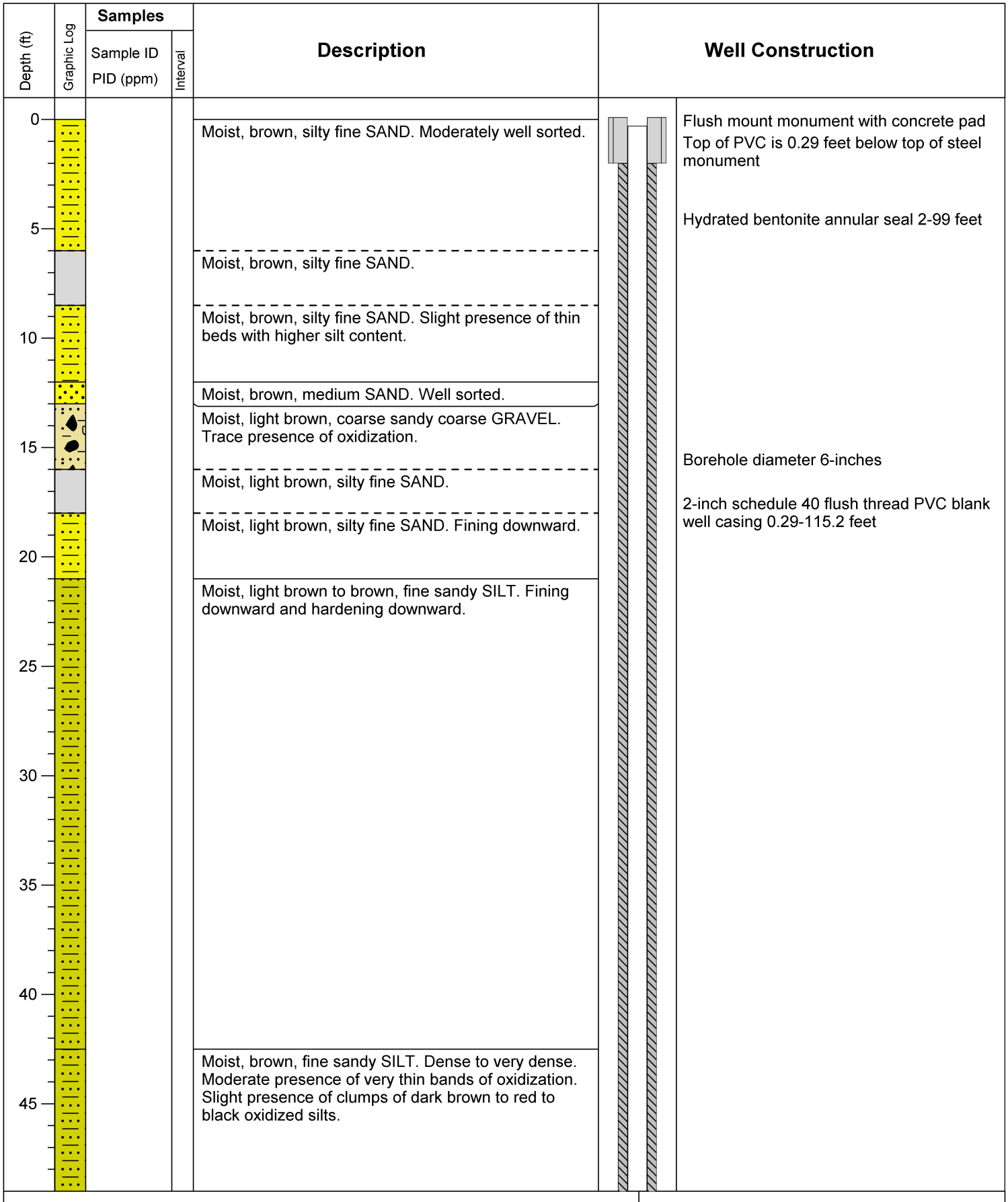
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 120.39 ft
MP Elevation: 766.75 ft
V. Datum: NAD88

YC-MW-38
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-19
Northing/Easting: N 395749.6 ft, E 1703378.8 ft
Logged by: David Wampler, PGG
Completion Date: 1/13/2019
Ecology ID: BKB-753

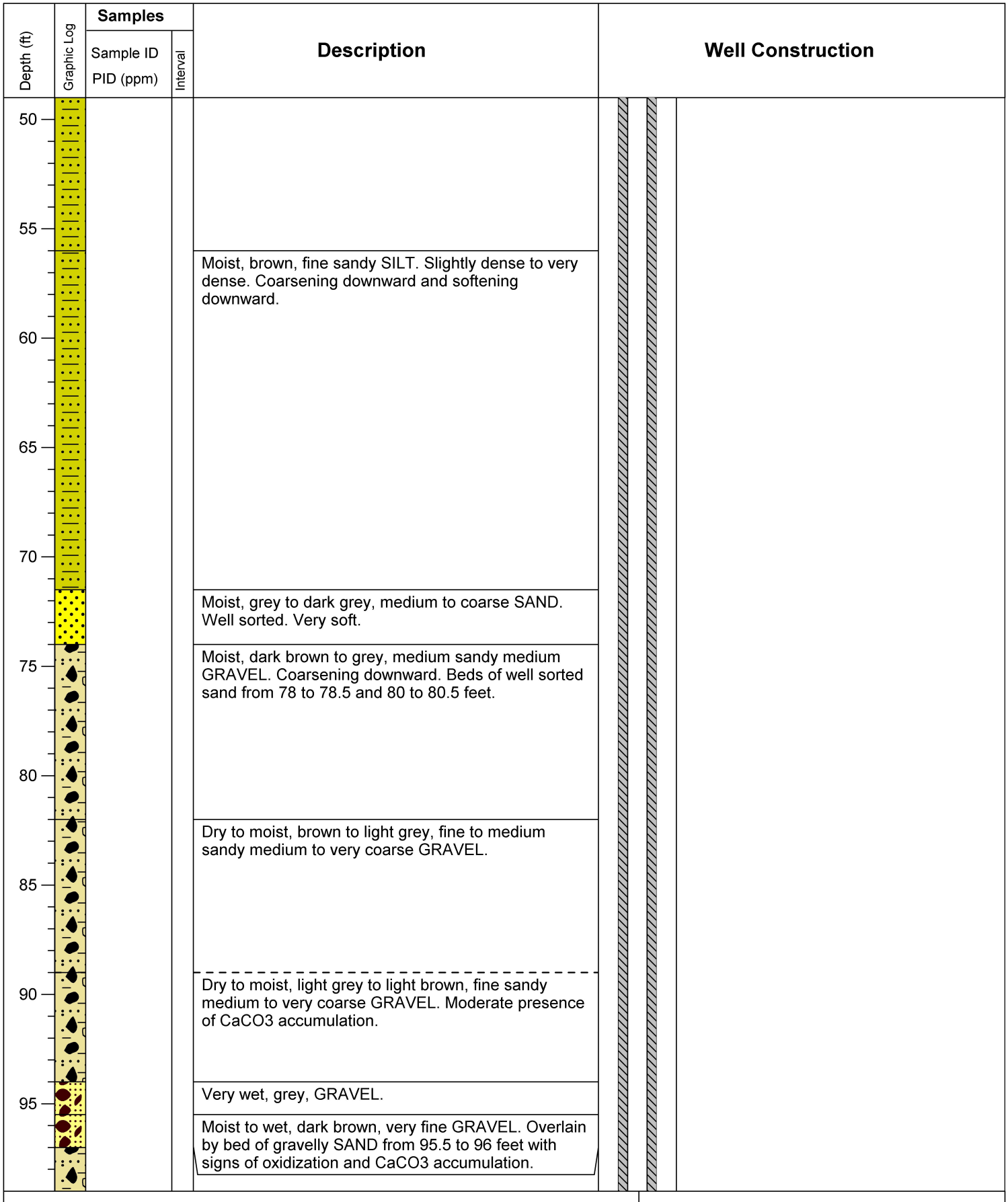
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 107.11 ft
MP Elevation: 880.63 ft
V. Datum: NAD88

YC-MW-39
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-19
Northing/Easting: N 395749.6 ft, E 1703378.8 ft
Logged by: David Wampler, PGG
Completion Date: 1/13/2019
Ecology ID: BKB-753

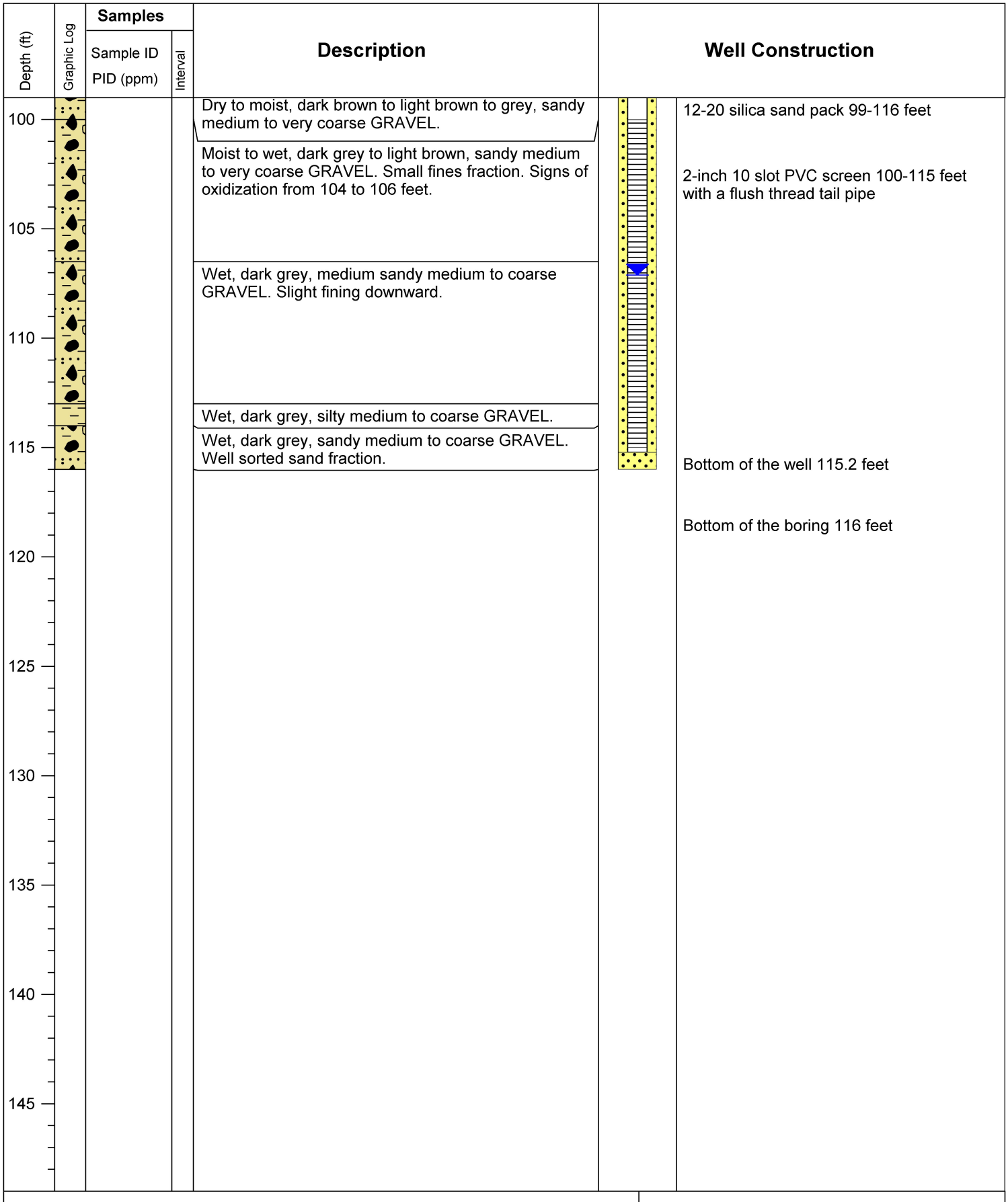
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 107.11 ft
MP Elevation: 880.63 ft
V. Datum: NAD88

YC-MW-39
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T11R21-19
Northing/Easting: N 395749.6 ft, E 1703378.8 ft
Logged by: David Wampler, PGG
Completion Date: 1/13/2019
Ecology ID: BKB-753

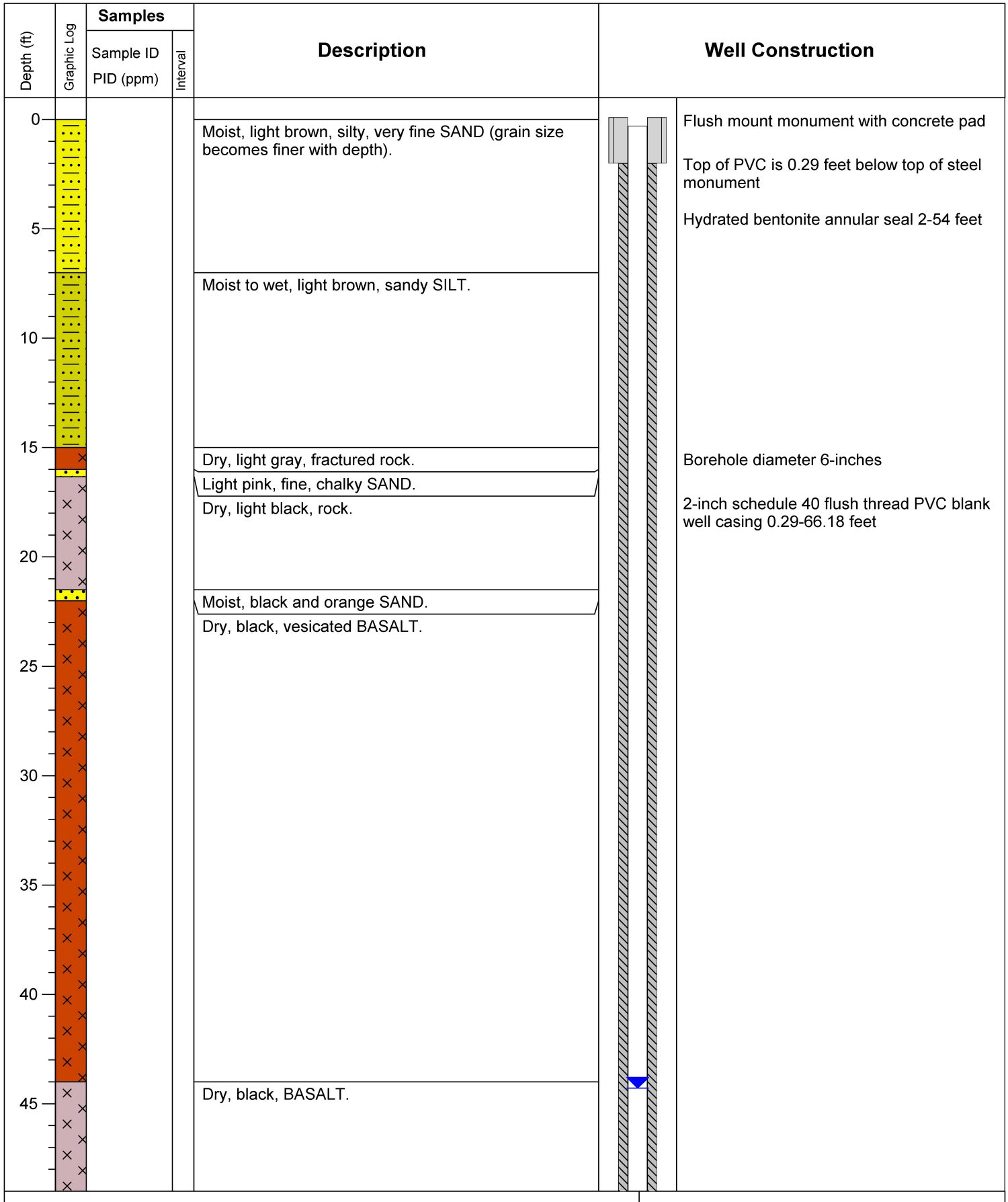
Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 107.11 ft
MP Elevation: 880.63 ft
V. Datum: NAD88

YC-MW-39
Boring Log and As-Built

Yakima GWMA

JE1803

PgG



Location (TRS): T10R23-35
Northing/Easting: N 359037 ft, E 1789145.7 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/26/2018
Ecology ID: BKB-748

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 44.29 ft
MP Elevation: 965.66 ft
V. Datum: NAD88

YC-MW-41
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
50					
55				Wet, black, fractured BASALT.	12-20 silica sand pack 54-67 feet 2-inch 10 slot PVC screen 56-66 feet with a flush thread tail pipe
60					
65					Bottom of the well 66.18 feet Bentonite bottom seal 67-72 feet
70					Bottom of the boring 72 feet
75					
80					
85					
90					
95					

Location (TRS): T10R23-35
Northing/Easting: N 359037 ft, E 1789145.7 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/26/2018
Ecology ID: BKB-748

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 44.29 ft
MP Elevation: 965.66 ft
V. Datum: NAD88

YC-MW-41
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
0				Moist, light brown, silty, find SAND	Flush mount monument with concrete pad Top of PVC is 0.3 feet below top of steel monument Hydrated bentonite annular seal 2-30 feet
5					
				Moist brown and black, medium to coarse SAND (small gravel)	
10				Moist brown and black, medium to coarse SAND (gravel and pebbles up to 2 cm)	
				Moist brown and black, medium to coarse SAND (cobbles up to 15 cm)	
15					Borehole diameter 6-inches 2-inch schedule 40 flush thread PVC blank well casing 0.3-47.18 feet
20				Moist, brown, silty SAND (contains gravel and rocks)	
25				Moist, brown, silty SAND (contains gravel and rocks)	
30				Moist to wet, dark brown, fine sandy SILT (contains gravel and rounded rocks)	12-20 silica sand pack 30-48 feet 2-inch 10 slot PVC screen 32-47 feet with a flush thread tail pipe
35				Moist to wet, light brown SILT (contains light tan, pink, and gray rounded small rocks)	
				Moist to wet, dark brown SILT (contains rounded and fractured rocks and gravel)	
40					
45				Dry, dark gray, fracture ROCK.	Bottom of the well 47.18 feet Bentonite bottom seal 48-50 feet

Location (TRS): T8R23-05
Northing/Easting: N 321854 ft, E 1778078.4 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/26/2018
Ecology ID: BKB-746

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 33.39 ft
MP Elevation: 699.42 ft
V. Datum: NAD88

YC-MW-42
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
50					Bottom of the boring 50 feet
55					
60					
65					
70					
75					
80					
85					
90					
95					

Location (TRS): T8R23-05
Northing/Easting: N 321854 ft, E 1778078.4 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 11/26/2018
Ecology ID: BKB-746

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 33.39 ft
MP Elevation: 699.42 ft
V. Datum: NAD88

YC-MW-42
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description	Well Construction
0				Moist, brown, very-fine SAND.	Flush mount monument with concrete pad Top of PVC is 0.29 feet below top of steel monument Hydrated bentonite annular seal 2-11 feet
5					
10				Moist, brown silty, very fine SAND. Moist, brown, very fine SAND. Moist, brown silty, very fine SAND. Moist, brown to dark brown, fine SAND	12-20 silica sand pack 11-23 feet 2-inch 10 slot PVC screen 12-22 feet with a flush thread tail pipe Borehole diameter 6-inches
15				Wet, dark brown, fine to medium SAND (coarsens downward to medium to coarse)	2-inch schedule 40 flush thread PVC blank well casing 0.29-22.18 feet
20				Wet, dark brown to dark gray, medium to coarse sandy GRAVEL.	
25				Wet to moist, brown, fine sandy SILT.	Bottom of the well 22.18 feet Bentonite bottom seal 23-27 feet Bottom of the boring 27 feet
30					
35					
40					
45					

Location (TRS): T10R23-33
Northing/Easting: N 356483.9 ft, E 1777956 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 1/15/2019
Ecology ID: BKB-755

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 13.85 ft
MP Elevation: 754.41 ft
V. Datum: NAD88

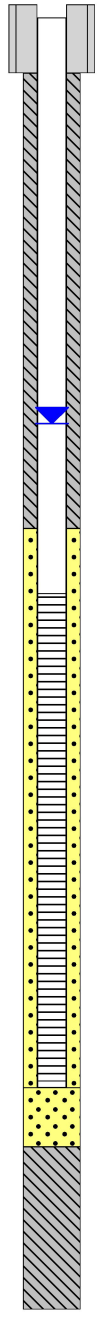
YC-MW-44
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

Depth (ft)	Graphic Log	Samples: Sample ID / PID (ppm)	Samples: Interval	Description
0				Moist, dark brown, silty medium SAND.
5				
10				
15				Moist to wet, silty, medium SAND.
				Wet, dark brown, medium SAND.
20				Wet, dark brown, silty, fine medium SAND (finer with depth).
25				
30				
35				Wet, dark, brown, silty fine SAND.
				Wet, light brown, very fine sandy SILT.
40				
45				



Well Construction

- Flush mount monument with concrete pad
- Top of PVC is 0.3 feet below top of steel monument
- Hydrated bentonite annular seal 2-16 feet
- Borehole diameter 6-inches
- 12-20 silica sand pack 16-35 feet
- 2-inch schedule 40 flush thread PVC blank well casing 0.3-33.18 feet
- 2-inch 10 slot PVC screen 18-33 feet with a flush thread tail pipe
- Bottom of the well 33.18 feet
- Bentonite bottom seal 35-40 feet
- Bottom of the boring 40 feet

Location (TRS): T10R22-16
Northing/Easting: N 372869.7 ft, E 1748379.6 ft
Logged by: Koshlan Mayer-Blackwell, PGG
Completion Date: 1/18/2019
Ecology ID: BKB-757

Drilling Firm: Yellow Jacket
Drilling Method: Sonic
DTW: 12.78 ft
TOM Elevation: 824.48
V. Datum: NAD88

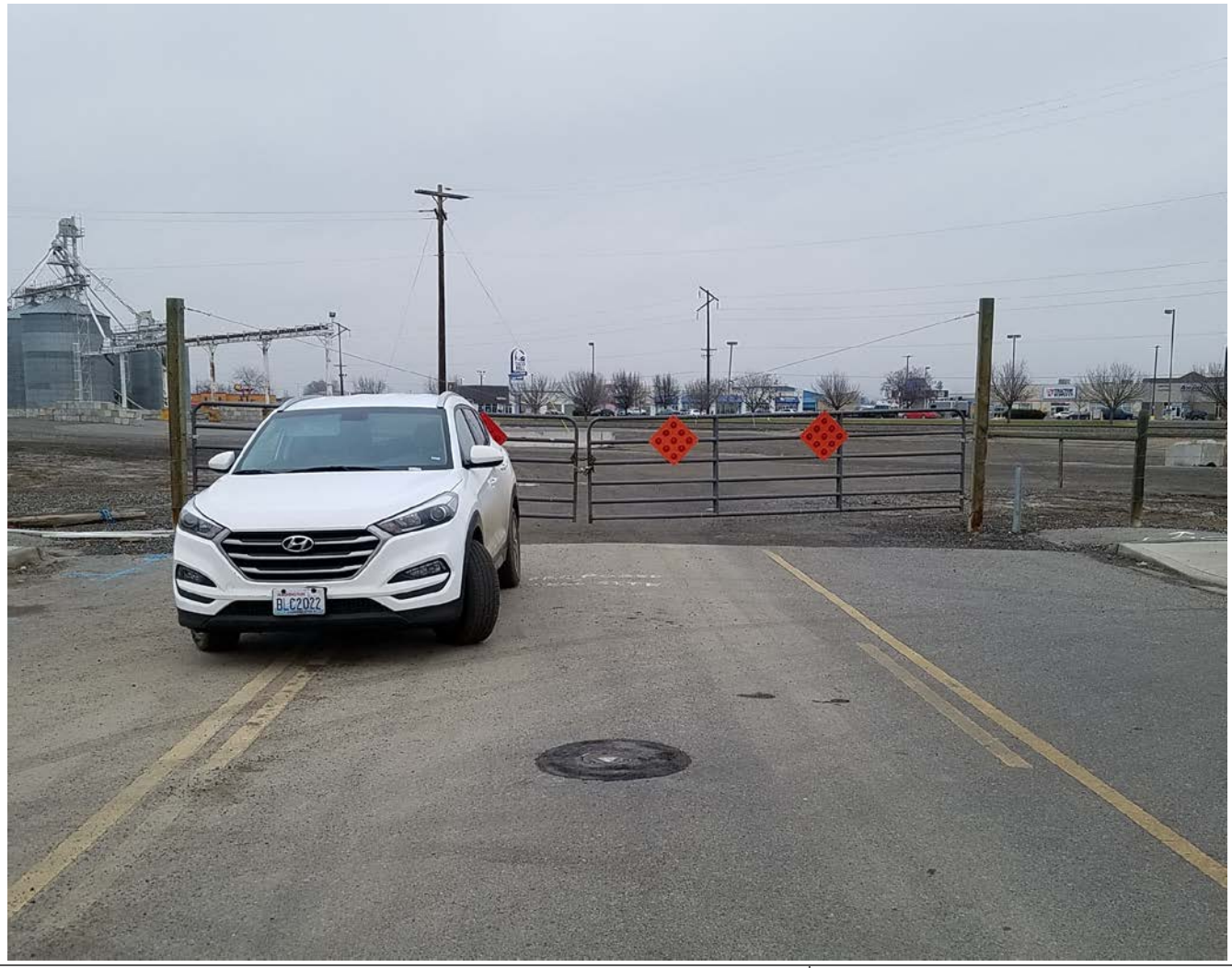
YC-MW-46
Boring Log and As-Built

Yakima GWMA

JE1803

PgG

APPENDIX C
Wellhead Completion Photos



YC-MW-01
Wellhead Completion Photo



YC-MW-02
Wellhead Completion Photo

PgG



YC-MW-05
Wellhead Completion Photo

PgG



YC-MW-06
Wellhead Completion Photo



YC-MW-07
Wellhead Completion Photo



YC-MW-08
Wellhead Completion Photo

PgG



YC-MW-09
Wellhead Completion Photo



YC-MW-10
Wellhead Completion Photo

PgG



YC-MW-11
Wellhead Completion Photo

PgG



YC-MW-12
Wellhead Completion Photo



YC-MW-14
Wellhead Completion Photo

PgG



YC-MW-15
Wellhead Completion Photo

PgG



YC-MW-16
Wellhead Completion Photo

PgG



YC-MW-17
Wellhead Completion Photo

PgG



YC-MW-19
Wellhead Completion Photo

PgG



YC-MW-21
Wellhead Completion Photo



YC-MW-23
Wellhead Completion Photo

PgG



YC-MW-24
Wellhead Completion Photo

PgG



YC-MW-25
Wellhead Completion Photo

PgG



YC-MW-26
Wellhead Completion Photo



YC-MW-27
Wellhead Completion Photo



YC-MW-28
Wellhead Completion Photo



YC-MW-31
Wellhead Completion Photo

PgG



YC-MW-33
Wellhead Completion Photo

PgG



YC-MW-38

Wellhead Completion Photo

PgG



YC-MW-39
Wellhead Completion Photo



YC-MW-41

Wellhead Completion Photo

PgG



YC-MW-42

Wellhead Completion Photo

PgG



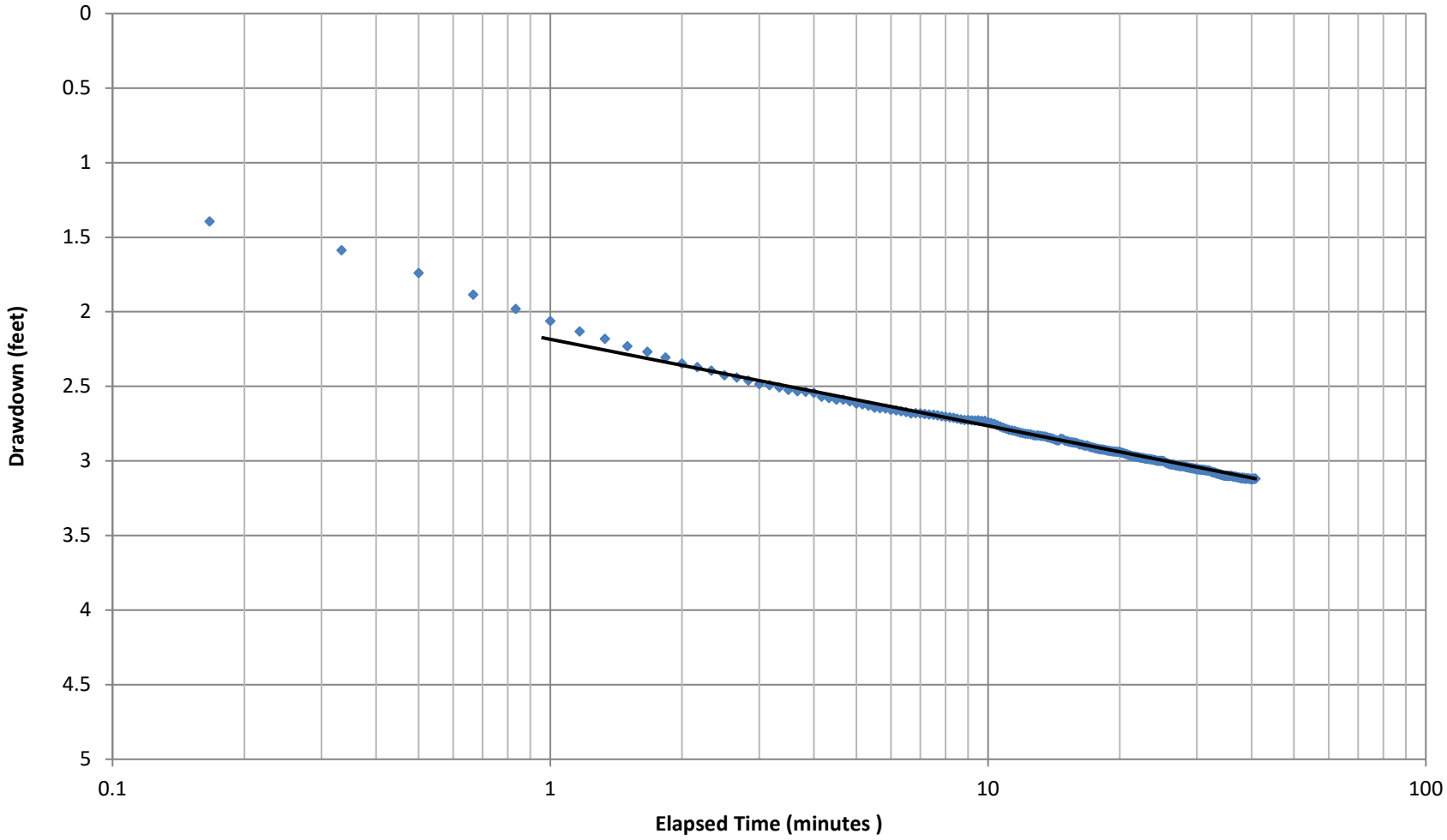
YC-MW-44
Wellhead Completion Photo



YC-MW-46
Wellhead Completion Photo

PgG

APPENDIX D
PUMPING TEST DATA



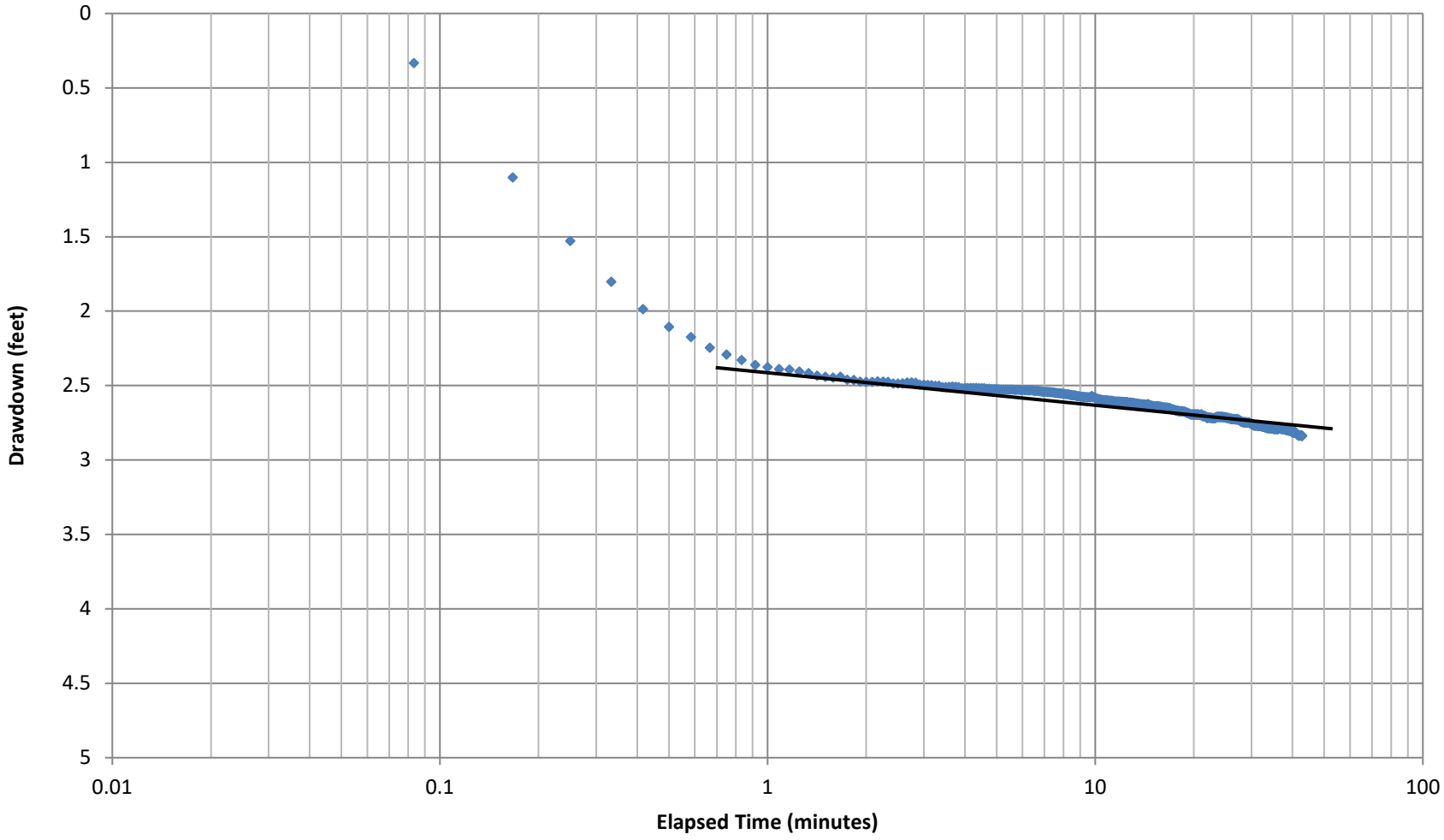
◆ YC-MW-01 Drawdown

Pump On: 12/04/18 13:58:10
Pump Off: 12/04/18 14:39
Average Pumping Rate: 1.17 gpm

Drawdown per log cycle = 0.60
T = 35*1.17/0.60 = 68.3 ft2/day

YC-MW-01
Drawdown Plot
GWMA Single Well Tests

PgG



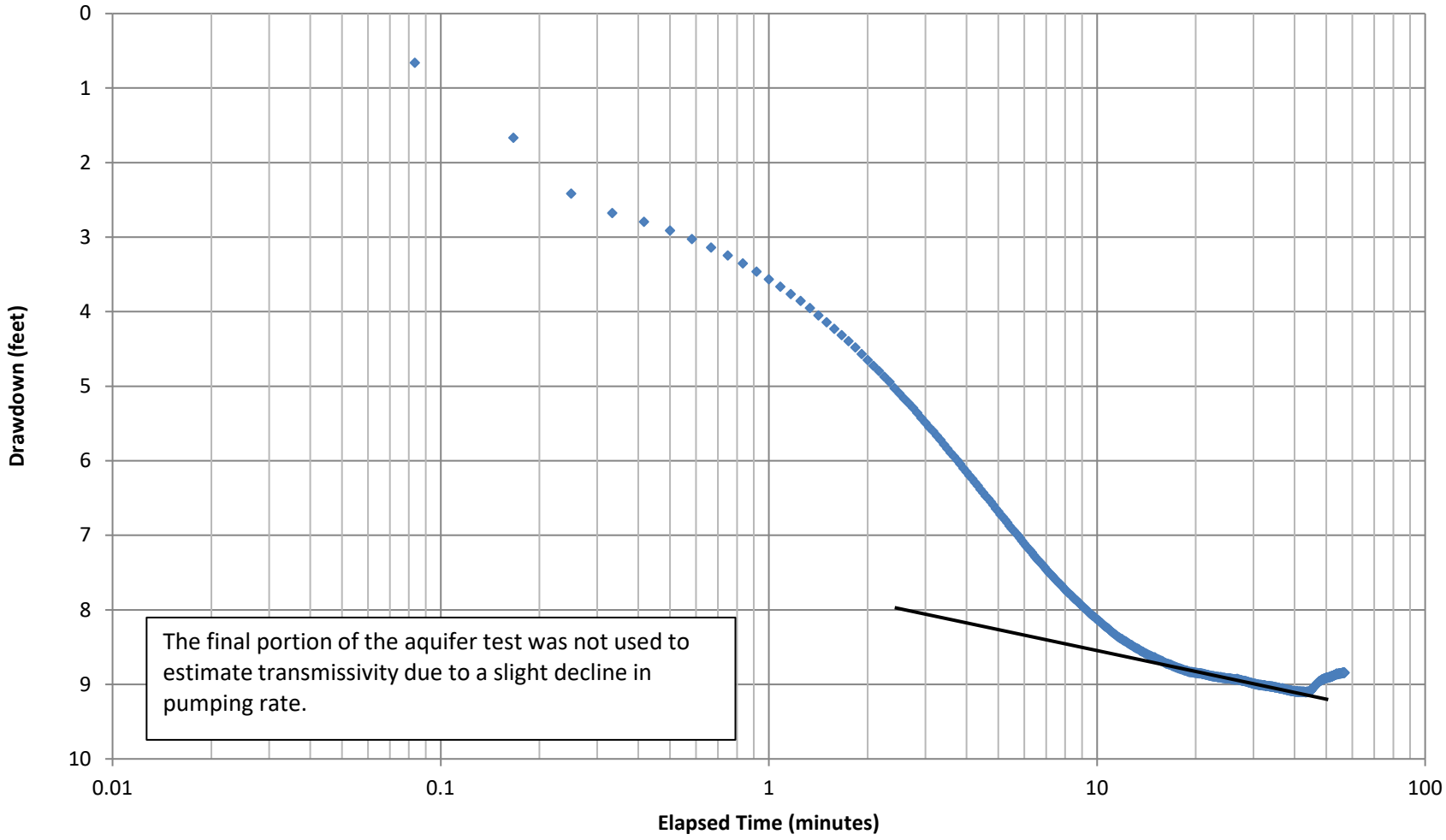
◆ YC-MW-02 Drawdown

Pump On: 11/15/18 14:17:10
Pump Off: 11/15/18 15:00
Average Pumping Rate: 2.14 gpm

Drawdown per log cycle = 0.20
T = 35*2.14/0.20 = 374.5 ft2/day

YC-MW-02
Drawdown Plot
GWMA Single Well Tests

PgG



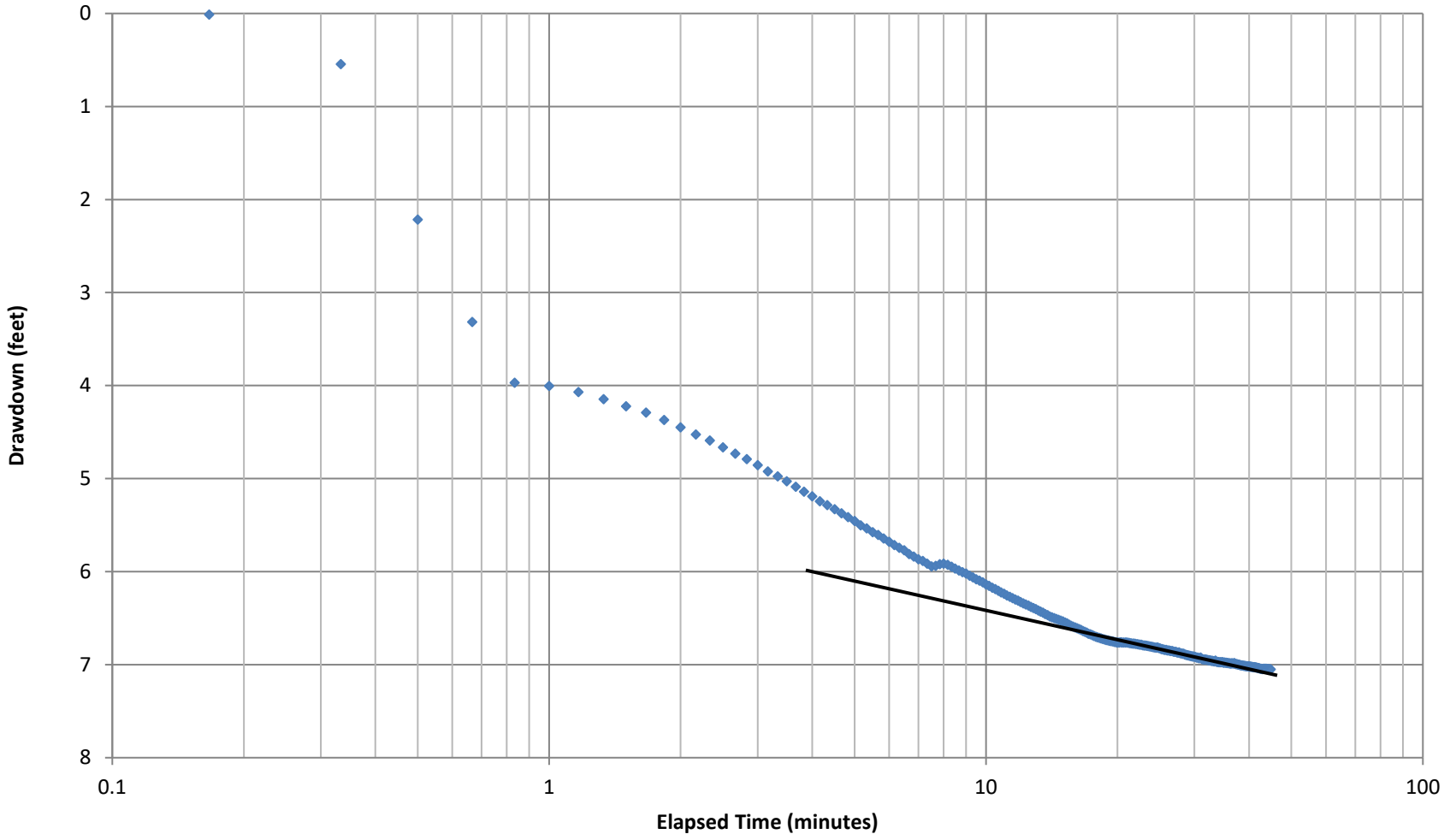
◆ YC-MW-05 Drawdown

Pump On: 11/15/18 12:15:10
Pump Off: 11/15/18 13:12
Average Pumping Rate: 0.43 gpm

Drawdown per log cycle = 0.9
T = 35*0.43/0.9 = 16.7 ft2/day

YC-MW-05
Drawdown Plot
GWMA Single Well Tests

PgG



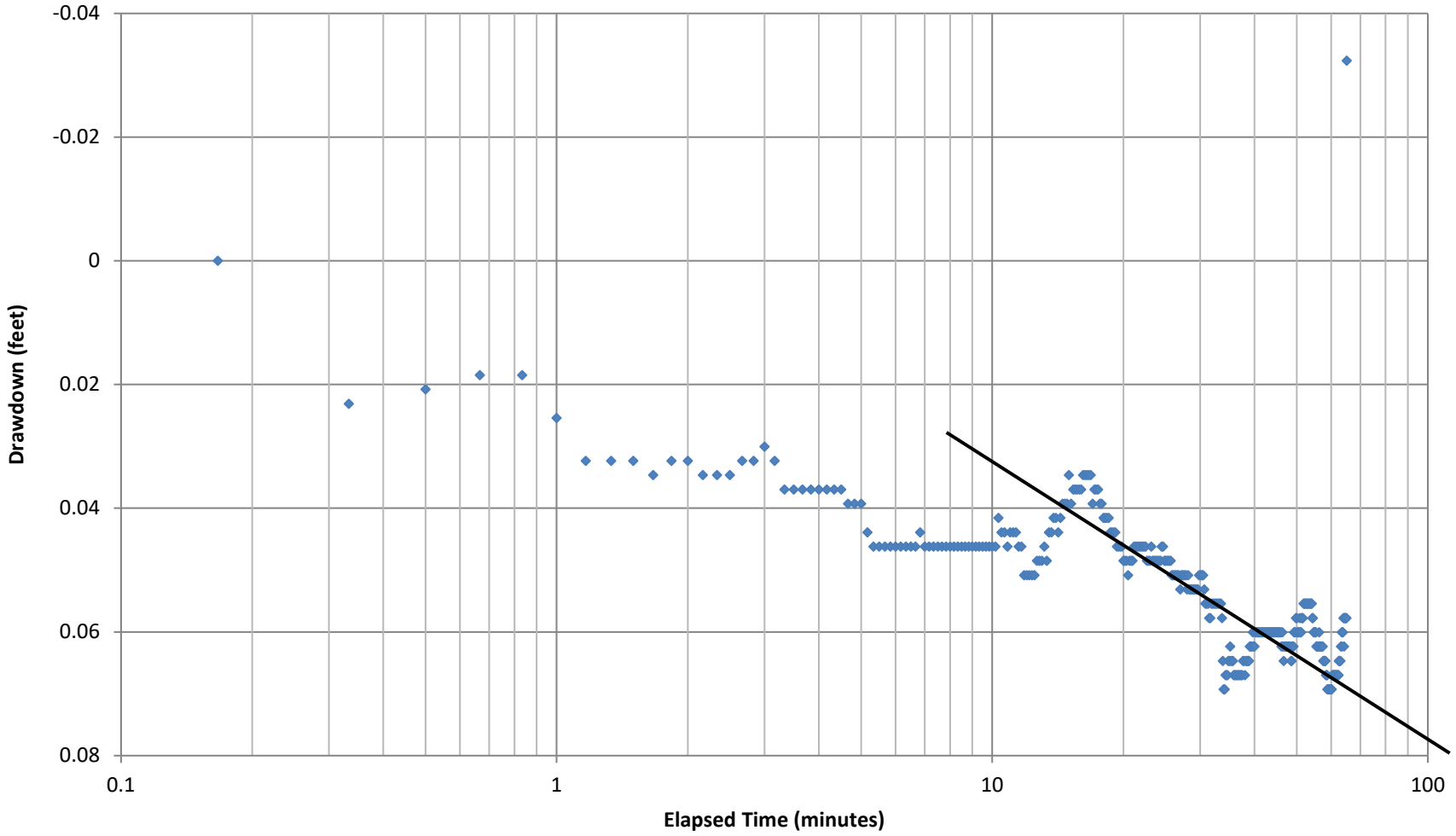
◆ YC-MW-06 Drawdown

Pump On: 11/26/18 12:09:00
Pump Off: 11/26/18 12:56:30
Average Pumping Rate: 0.39 gpm

Drawdown per log cycle = 1.0
T = 35*0.39/1.0 = 13.6 ft2/day

YC-MW-06
Drawdown Plot
GWMA Single Well Tests

PgG



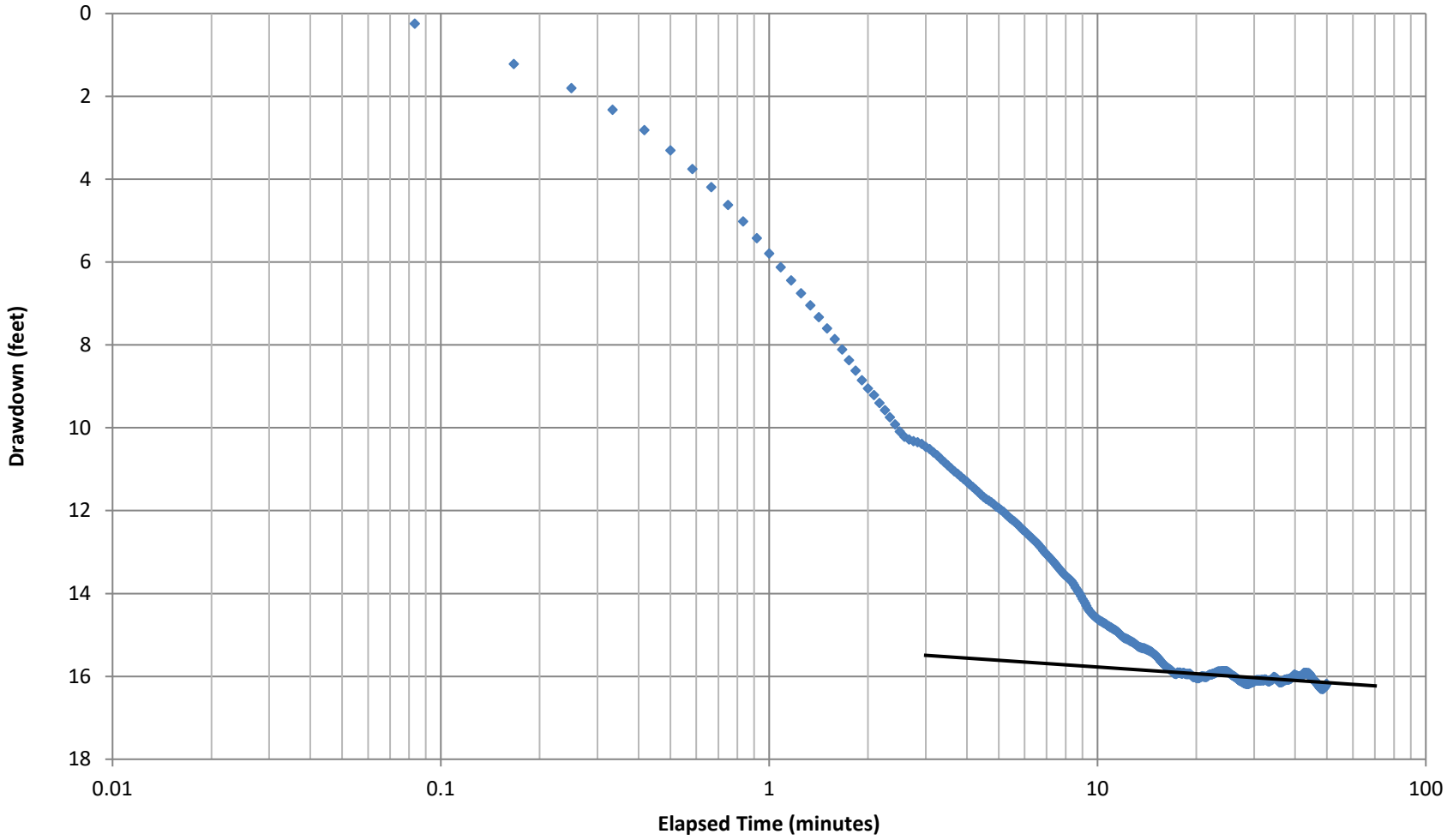
◆ YC-MW-07 Drawdown

Pump On: 11/26/18 13:45:00
Pump Off: 11/26/18 14:50:00
Average Pumping Rate: 0.55 gpm

Drawdown per log cycle = 0.05
T = 35*0.55/0.05 = 385 ft2/day

YC-MW-07
Drawdown Plot
GWMA Single Well Tests

PgG



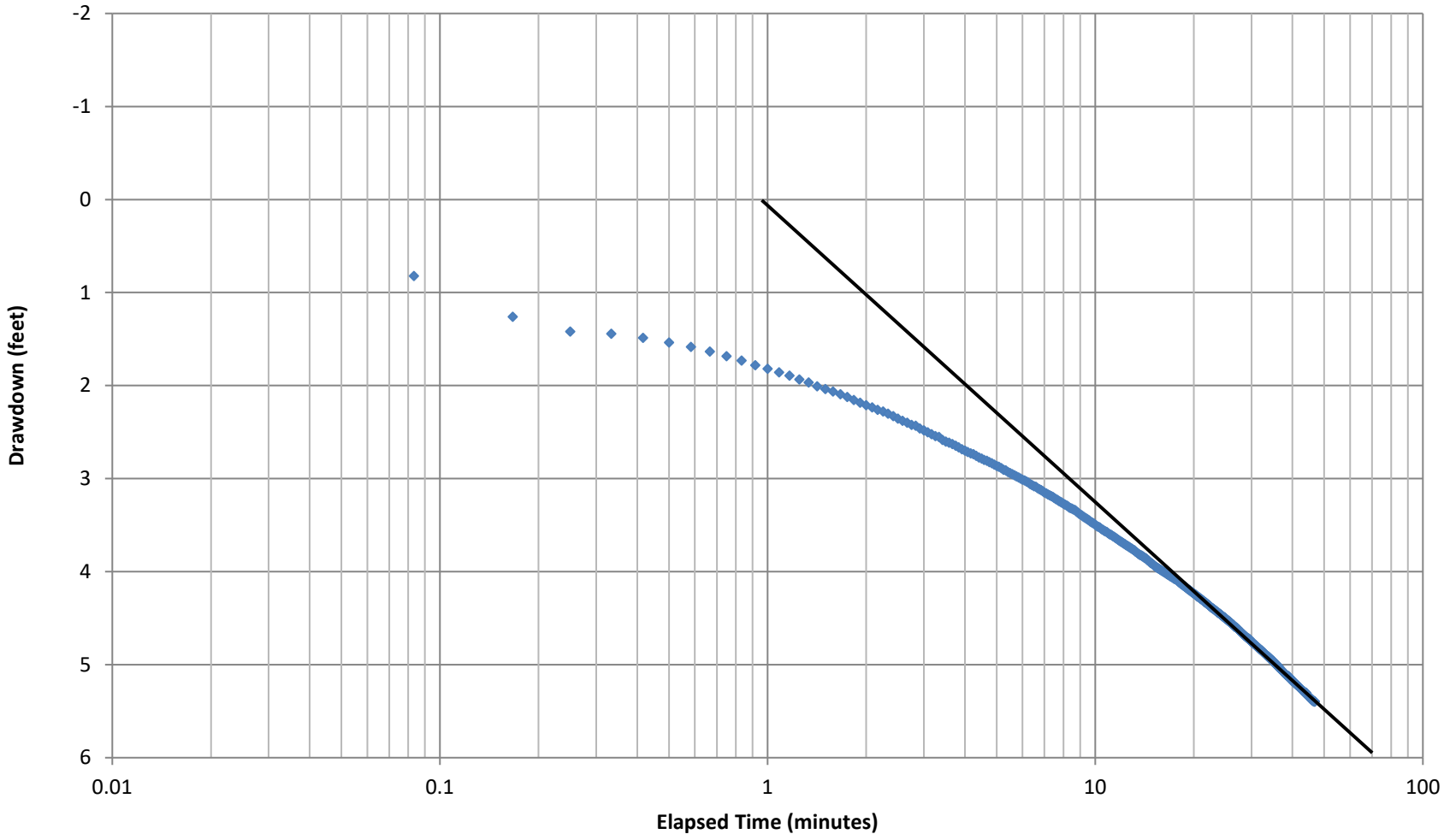
◆ YC-MW-08 Drawdown

Pump On: 11/15/18 8:38:10
Pump Off: 11/15/18 9:28
Average Pumping Rate: 2.19 gpm

Drawdown per log cycle = 0.5
T = 35*2.19/0.5 = 153.3 ft2/day

YC-MW-08
Drawdown Plot
GWMA Single Well Tests

PgG



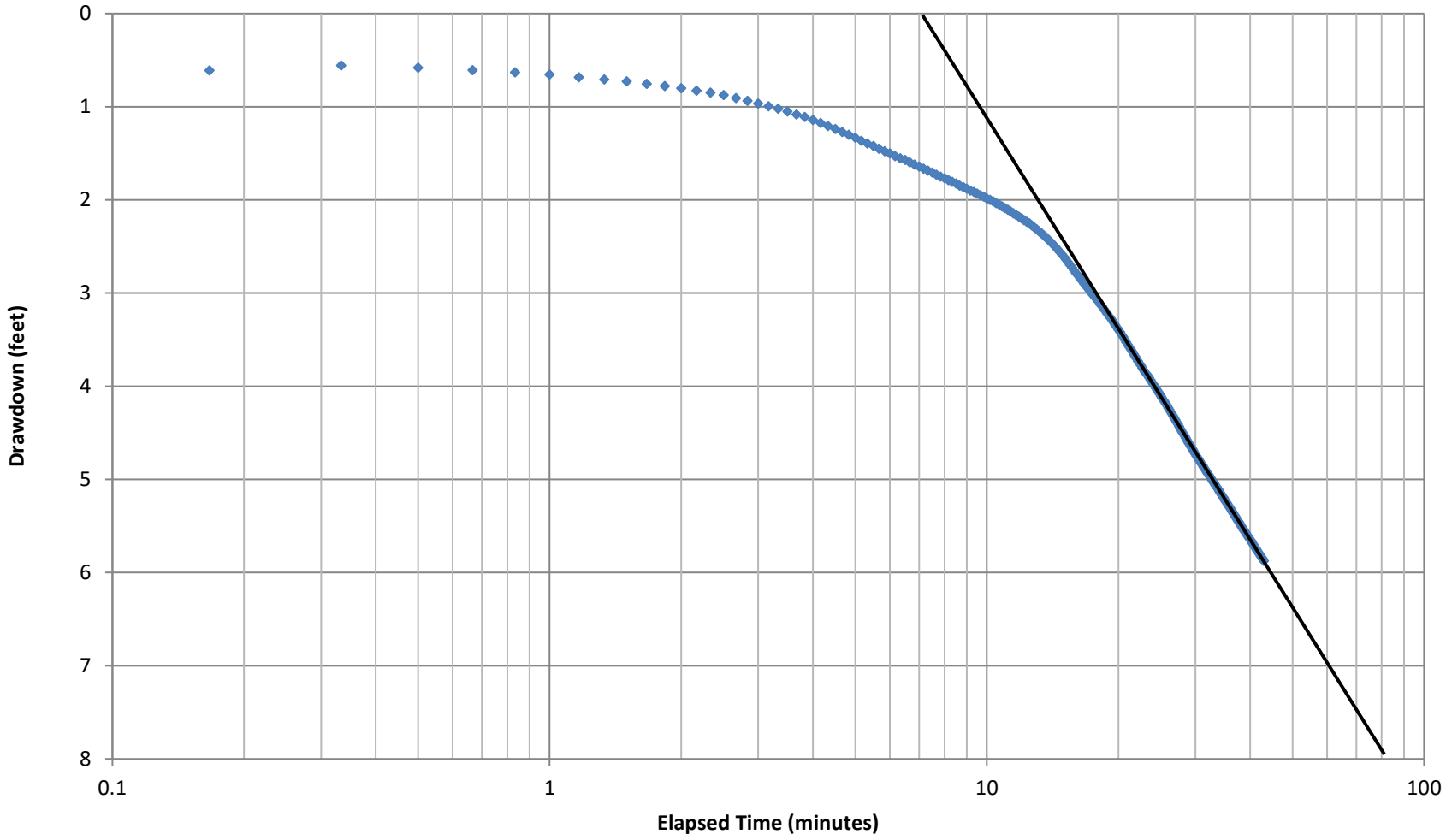
◆ YC-MW-10 Drawdown

Pump On: 11/13/18 13:16:10
Pump Off: 11/13/18 14:03
Average Pumping Rate: 1.11 gpm

Drawdown per log cycle = 3.2
T = 35*1.11/3.2 = 12.1 ft2/day

YC-MW-10
Drawdown Plot
GWMA Single Well Tests

PgG



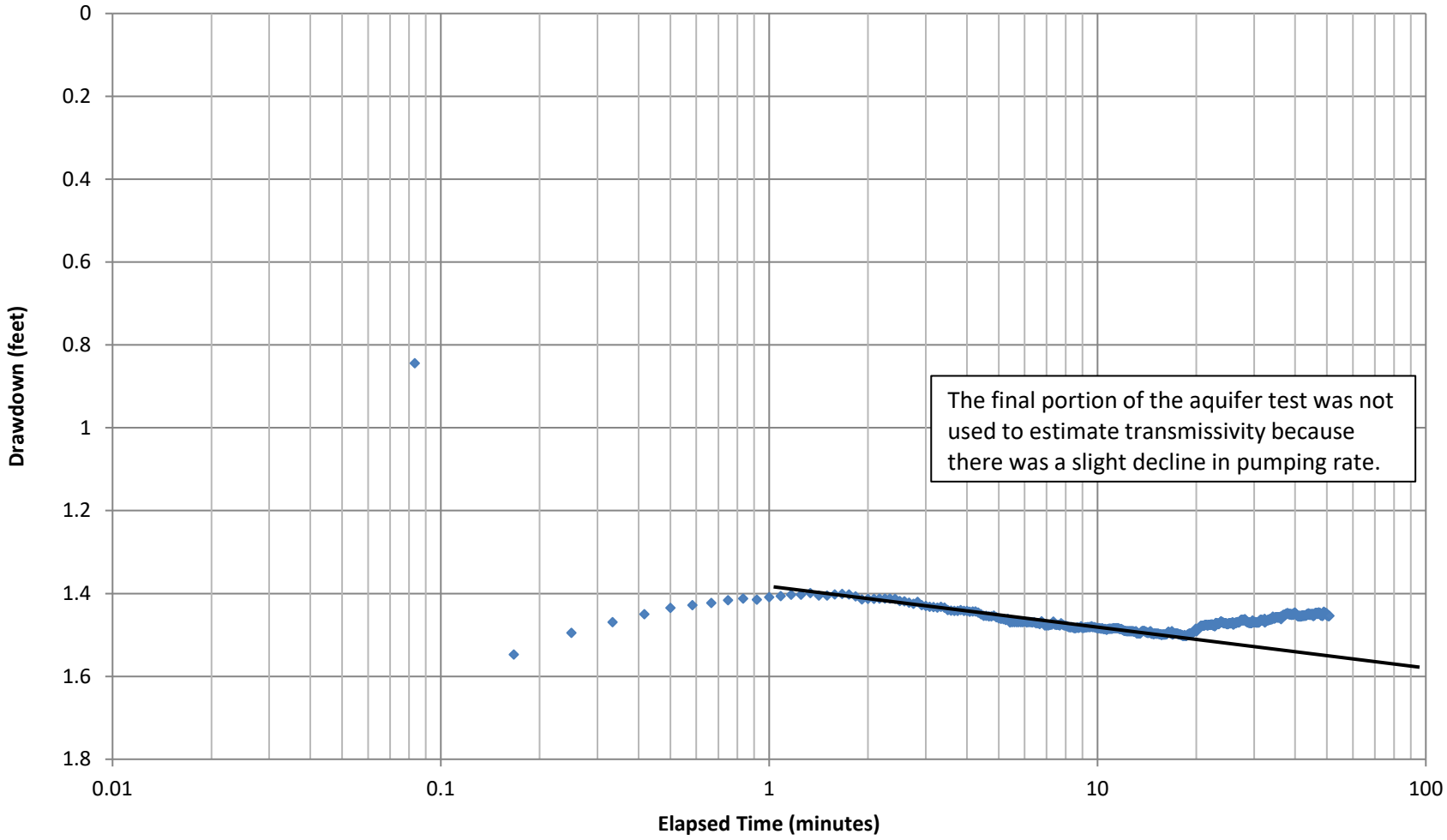
◆ YC-MW-12 Drawdown

Pump On: 12/03/18 15:05
Pump Off: 12/03/18 15:48
Average Pumping Rate: 0.16 gpm

Drawdown per log cycle = 7.4
T = 35*0.16/7.4 = 0.76 ft2/day

YC-MW-12
Drawdown Plot
GWMA Single Well Tests

PgG



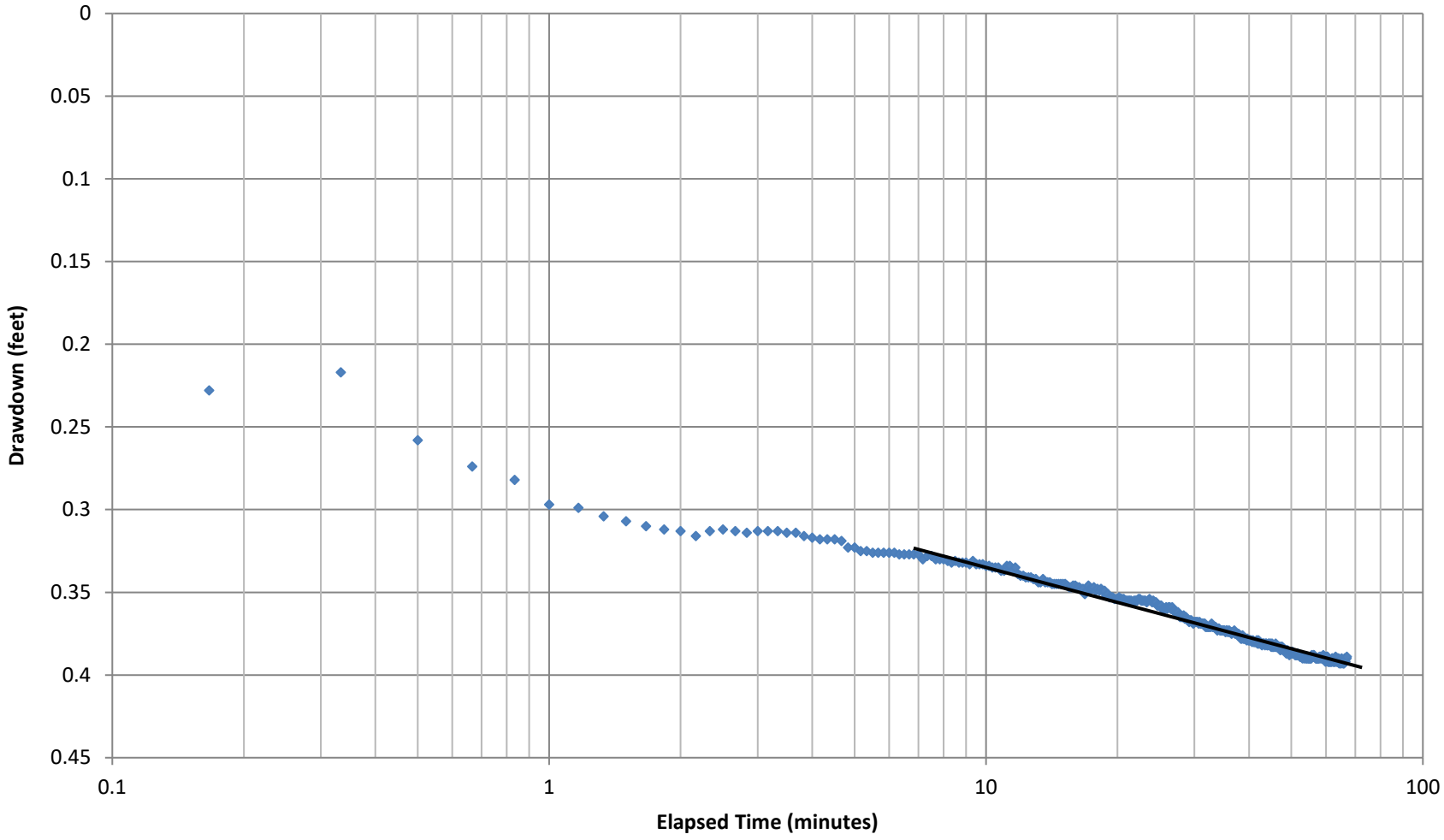
◆ YC-MW-16 Drawdown

Pump On: 11/14/18 14:21:10
Pump Off: 11/14/18 15:12
Average Pumping Rate: 0.7 gpm

Drawdown per log cycle = 0.2
T = 35*0.7/0.2 = 122.5 ft2/day

YC-MW-16
Drawdown Plot
GWMA Single Well Tests

PgG



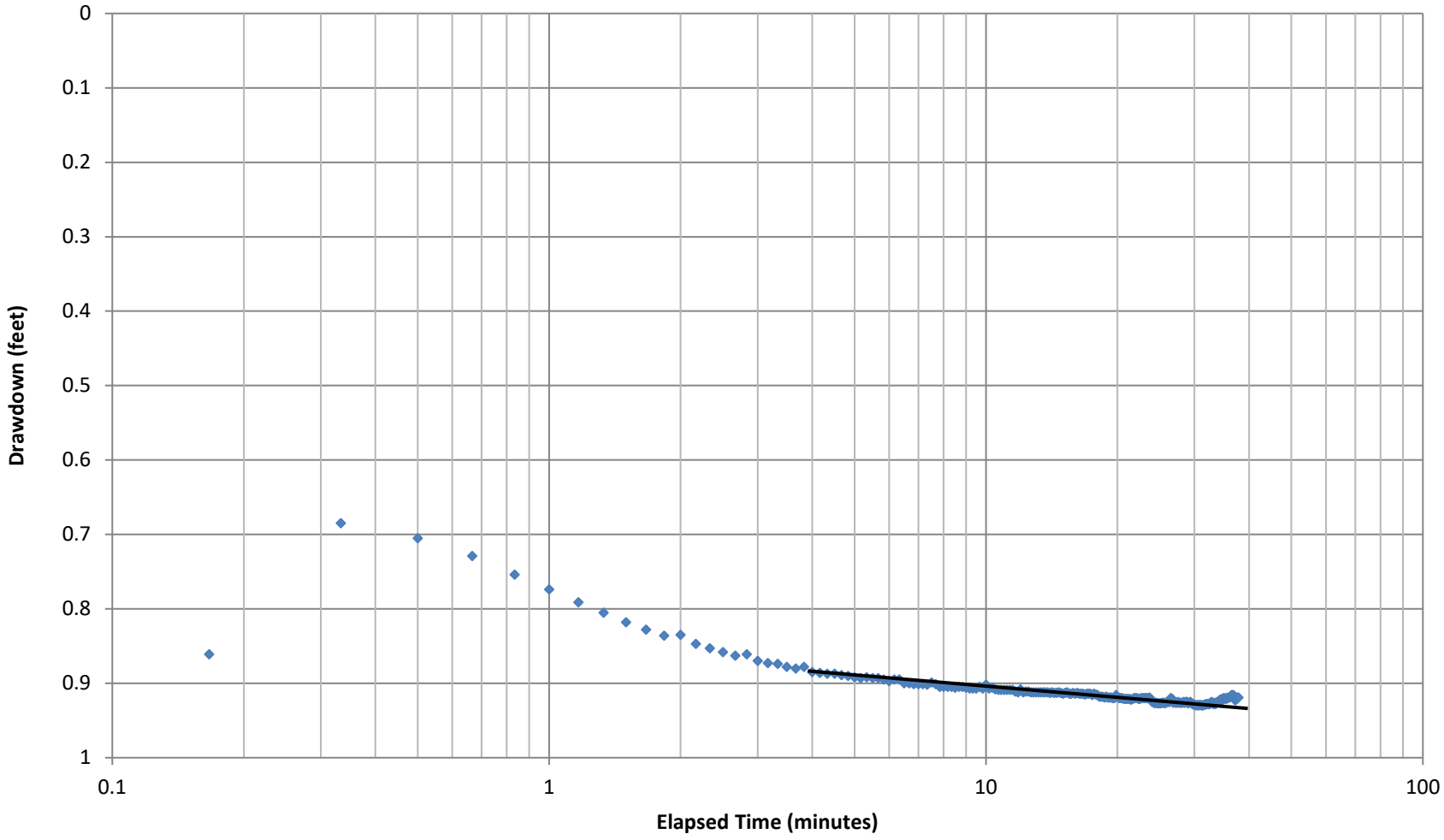
◆ YC-MW-17 Drawdown

Pump On: 11/12/18 13:37
Pump Off: 11/12/18 14:44
Average Pumping Rate: 2.12 gpm

Drawdown per log cycle = 0.07
T = 35*2.12/0.07 = 1,060 ft2/day

YC-MW-17
Drawdown Plot
GWMA Single Well Tests

PgG



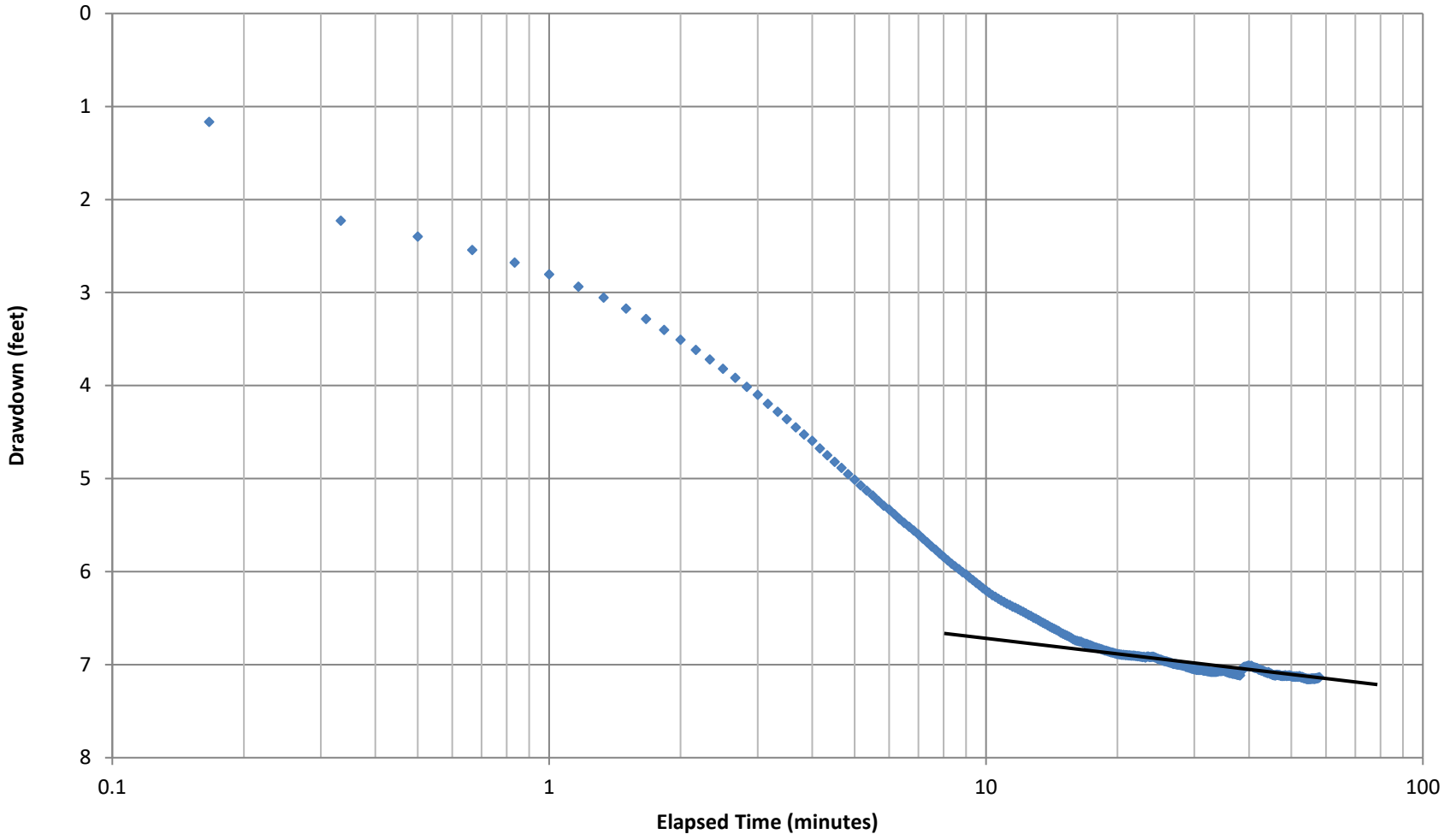
◆ YC-MW-19 Drawdown

Pump On: 11/13/18 10:20:10
Pump Off: 11/13/18 10:58
Average Pumping Rate: 0.94 gpm

Drawdown per log cycle = 0.04
T = 35*0.94/0.04 = 822.5 ft2/day

YC-MW-19
Drawdown Plot
GWMA Single Well Tests

PgG



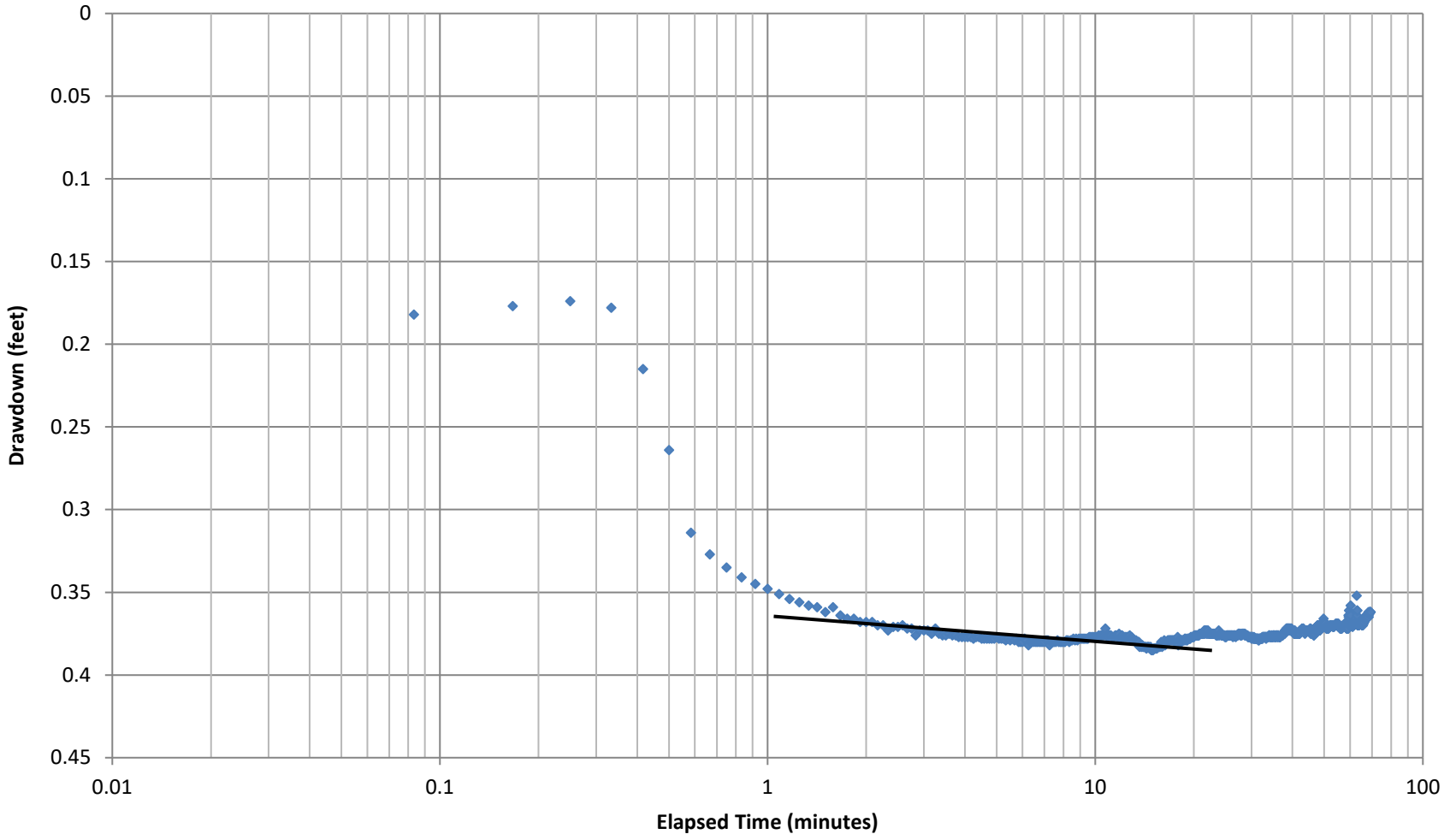
◆ YC-MW-21 Drawdown

Pump On: 11/27/18 13:30:00
Pump Off: 11/27/18 14:28:00
Average Pumping Rate: 0.27 gpm

Drawdown per log cycle = 0.6
T = 35*0.27/0.6 = 15.8 ft2/day

YC-MW-21
Drawdown Plot
GWMA Single Well Tests

PgG



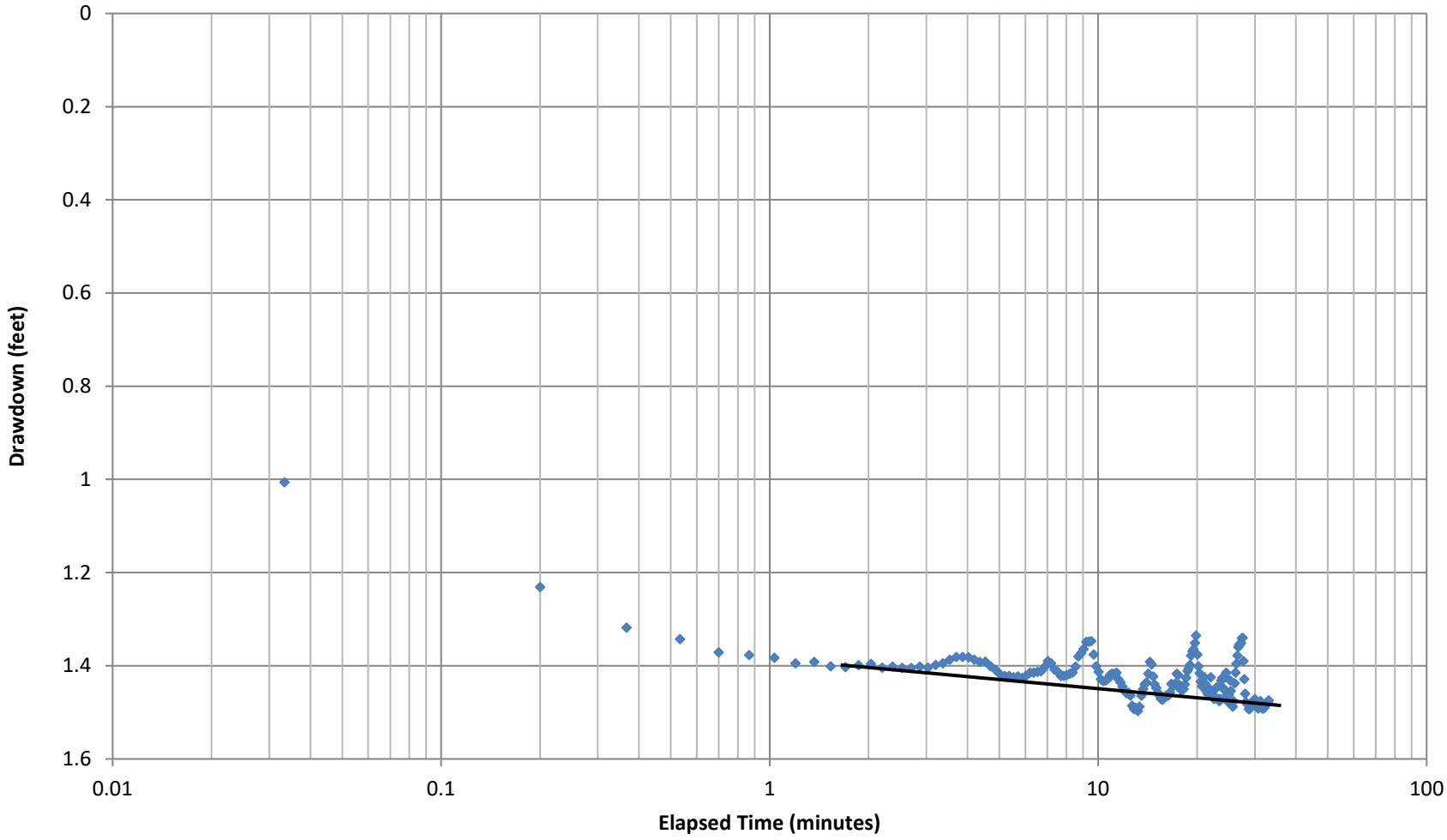
◆ YC-MW-23 Drawdown

Pump On: 11/14/18 10:22:50
Pump Off: 11/14/18 11:32
Average Pumping Rate: 1.97 gpm

Drawdown per log cycle = 0.03
T = 35*1.97/0.03 = 2,298 ft2/day

YC-MW-23
Drawdown Plot
GWMA Single Well Tests

PgG



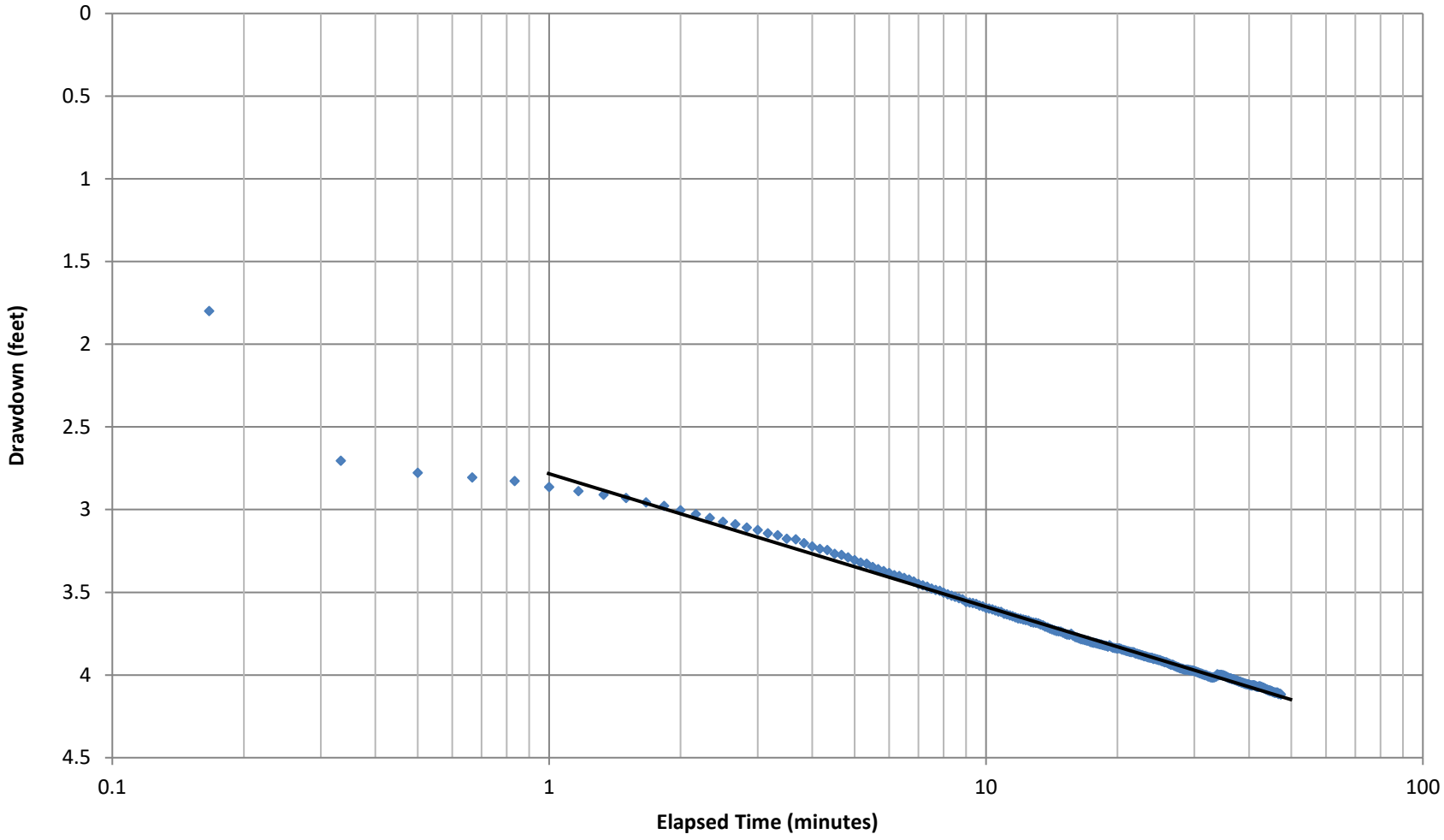
◆ YC-MW-24 Drawdown

Pump On: 12/03/18 12:41:58
Pump Off: 12/03/18 13:15
Average Pumping Rate: 0.92 gpm

Drawdown per log cycle = 0.05
T = 35*0.92/0.05 = 644 ft2/day

YC-MW-24
Drawdown Plot
GWMA Single Well Tests

PgG



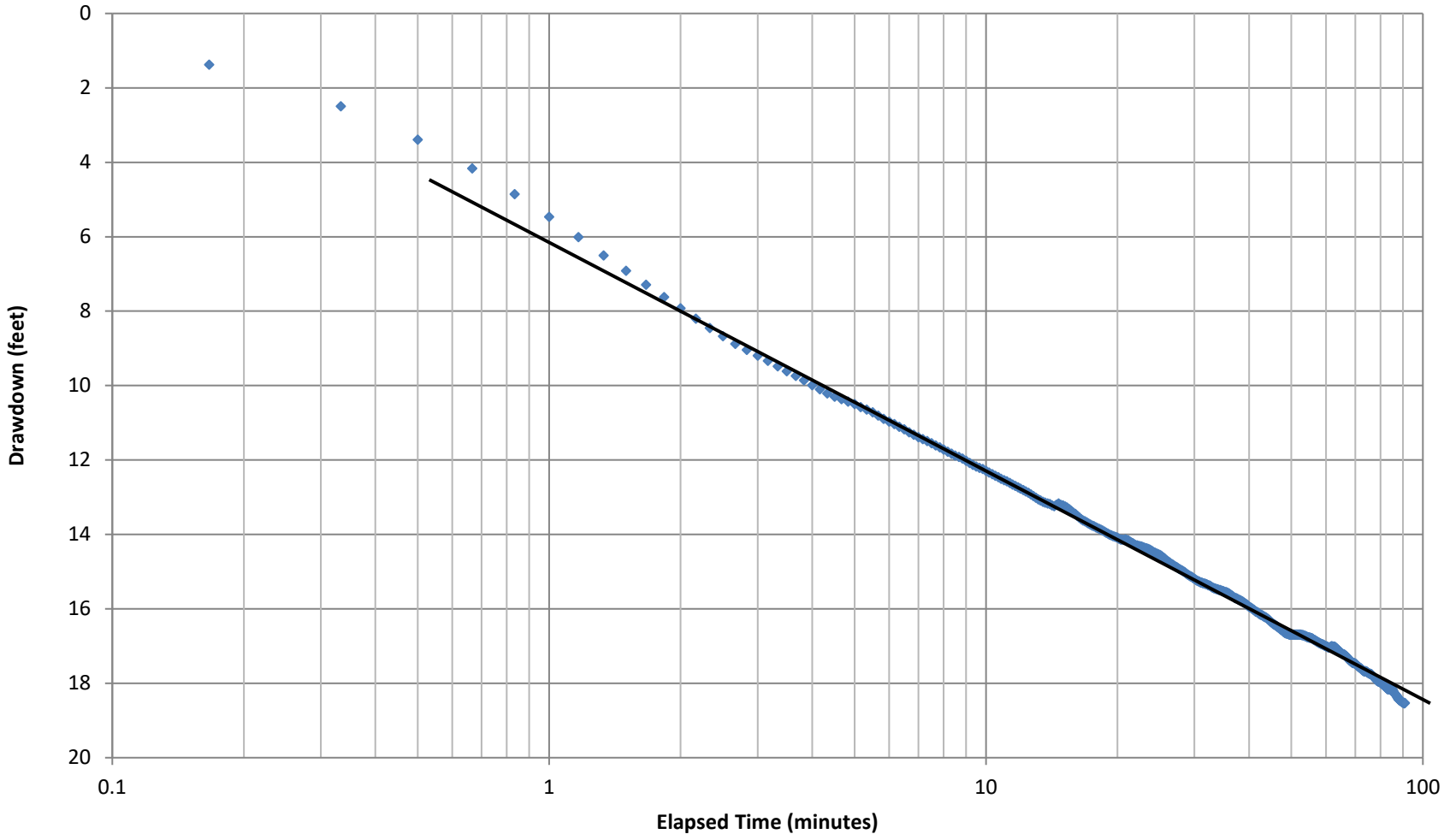
◆ YC-MW-26 Drawdown

Pump On: 11/13/18 7:46:10
Pump Off: 11/13/18 8:33:30
Average Pumping Rate: 0.22 gpm

Drawdown per log cycle = 0.79
T = 35*0.22/0.79 = 10.3 ft2/day

YC-MW-26
Drawdown Plot
GWMA Single Well Tests

PgG



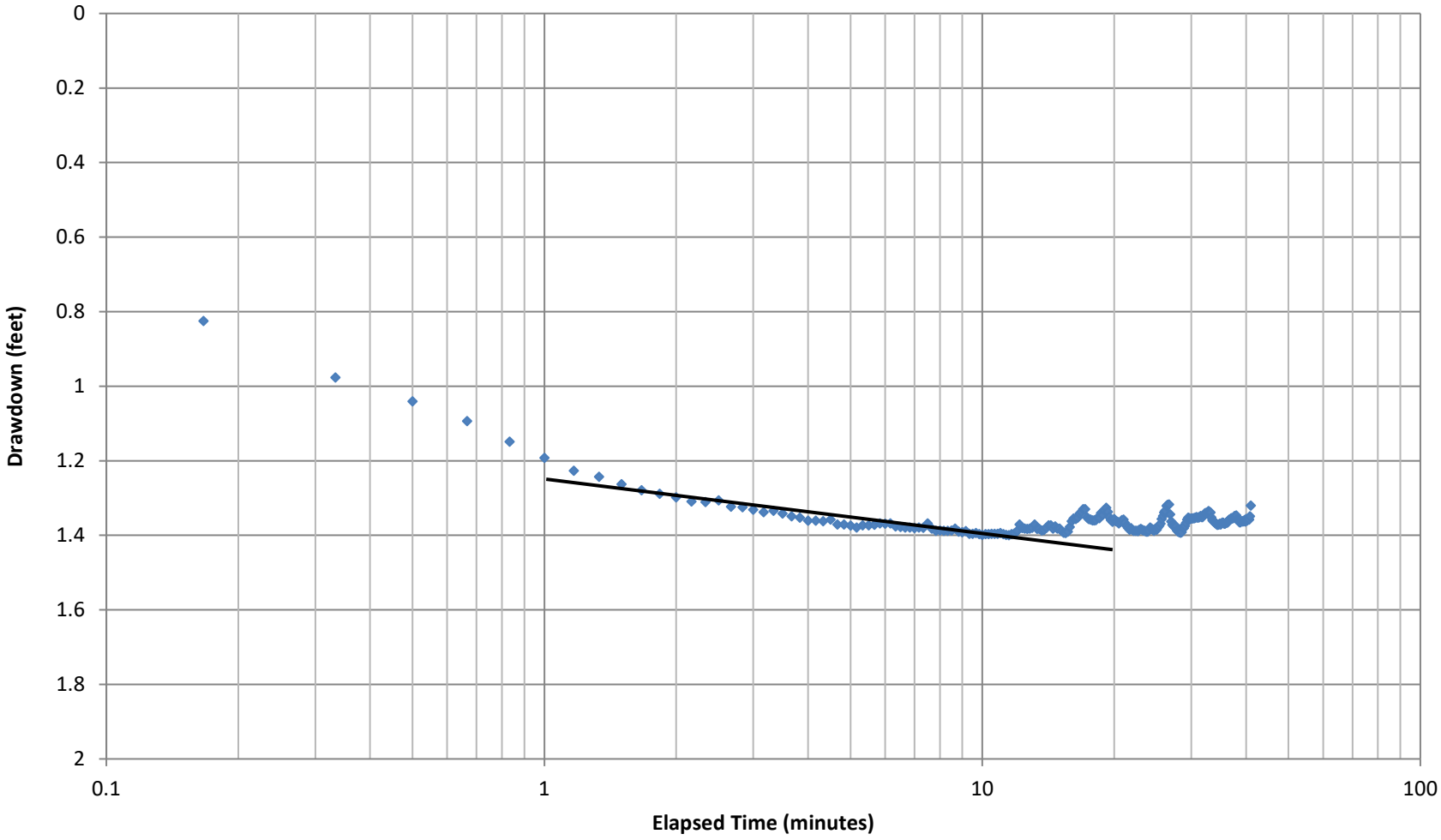
◆ YC-MW-27 Drawdown

Pump On: 11/27/18 09:10:00
Pump Off: 11/27/18 10:41:00
Average Pumping Rate: 1.39 gpm

Drawdown per log cycle = 6.1
T = 35*1.39/6.1 = 8.0 ft2/day

YC-MW-27
Drawdown Plot
GWMA Single Well Tests

PgG



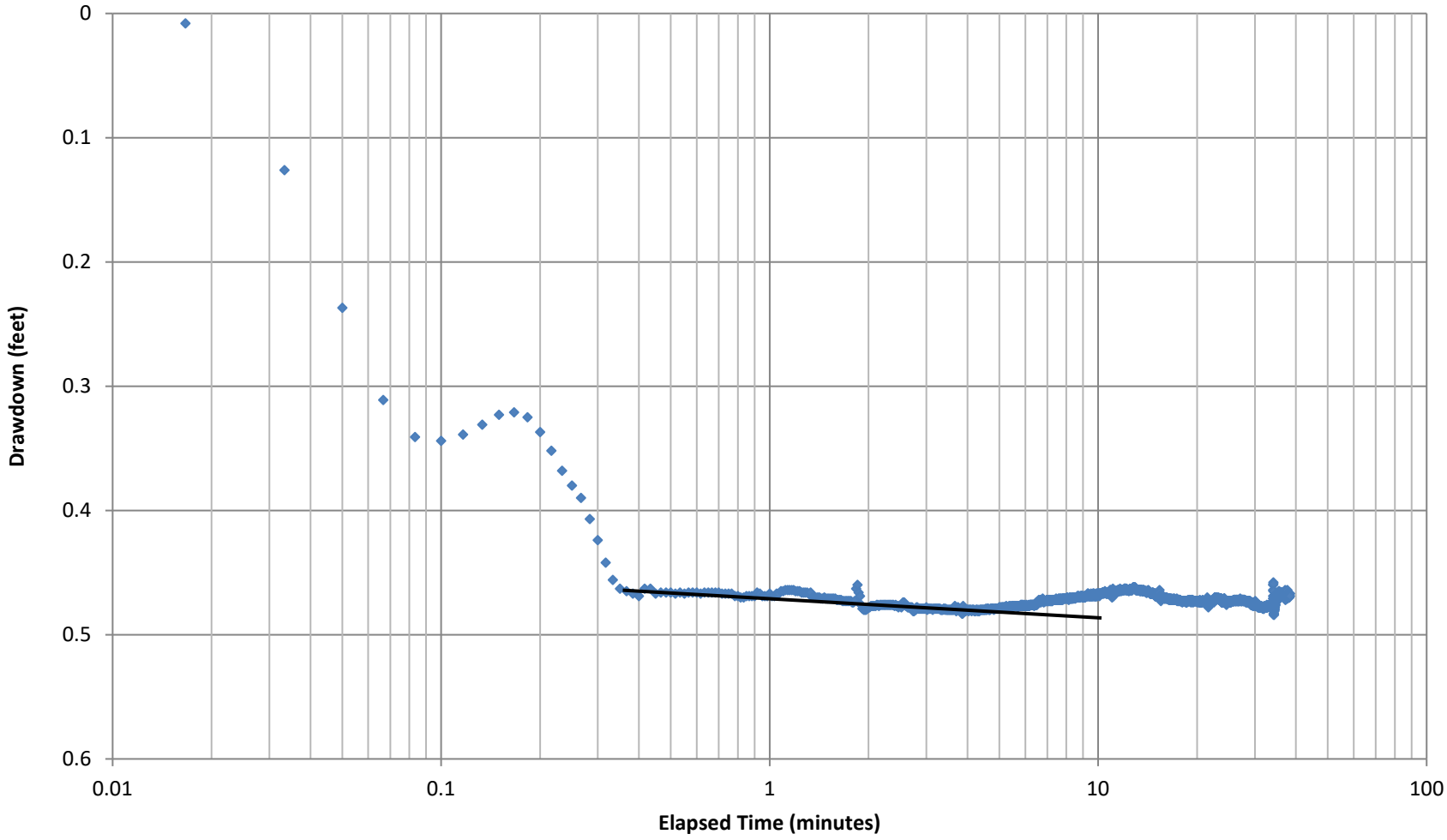
◆ YC-MW-28 Drawdown

Pump On: 12/04/18 9:38
Pump Off: 12/04/18 10:19
Average Pumping Rate: 1.4 gpm

Drawdown per log cycle = 0.075
T = 35*1.4/0.075= 653 ft2/day

YC-MW-28
Drawdown Plot
GWMA Single Well Tests

PgG



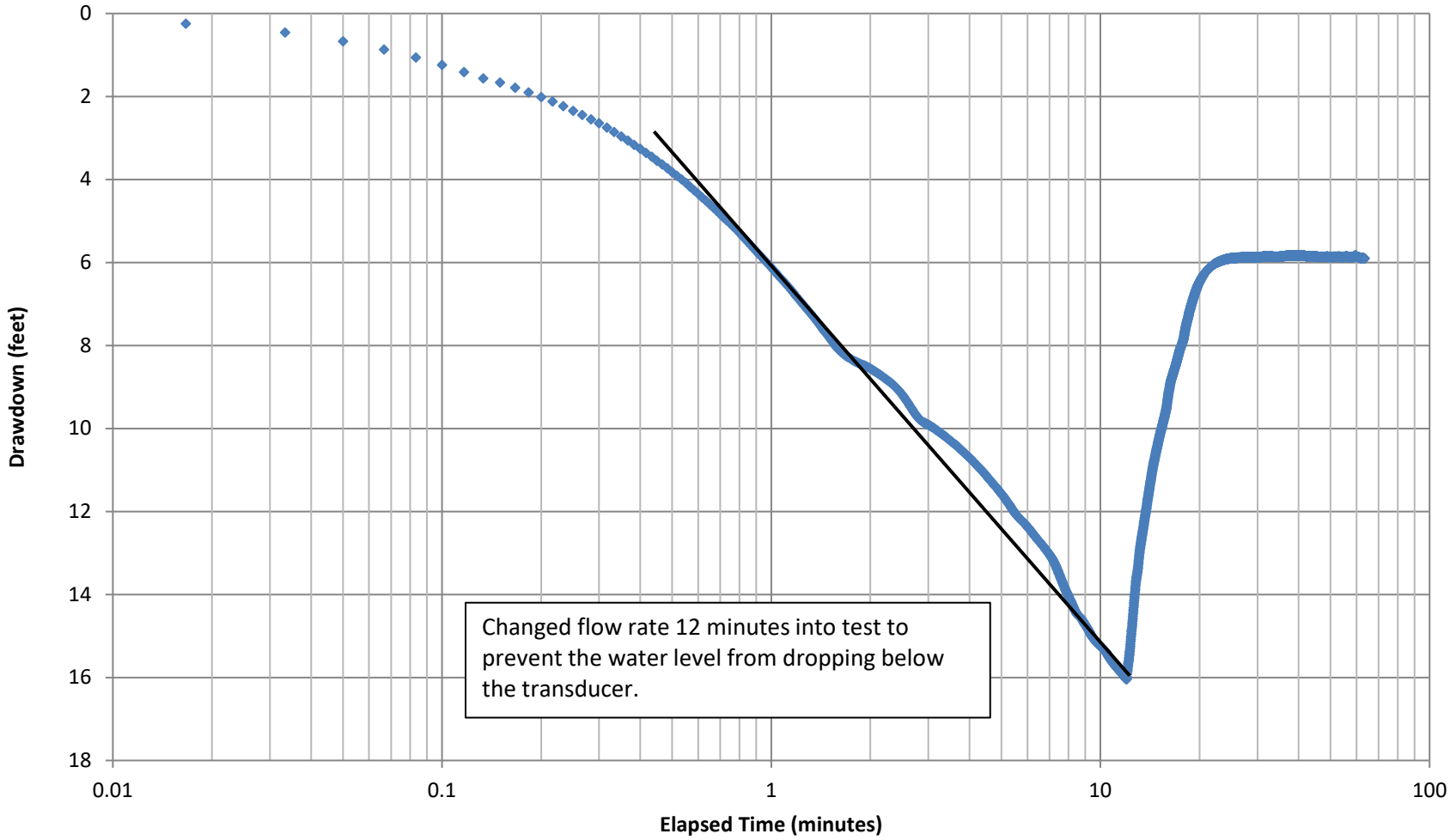
◆ YC-MW-31 Drawdown

Pump On: 02/26/2019 15:50:11
Pump Off: 02/26/2019 16:28:31
Average Pumping Rate: 2.8 gpm

Drawdown per log cycle = 0.02
T = 35*2.8/0.02 = 4,900 ft2/day

YC-MW-31
Drawdown Plot
GWMA Single Well Tests

PgG



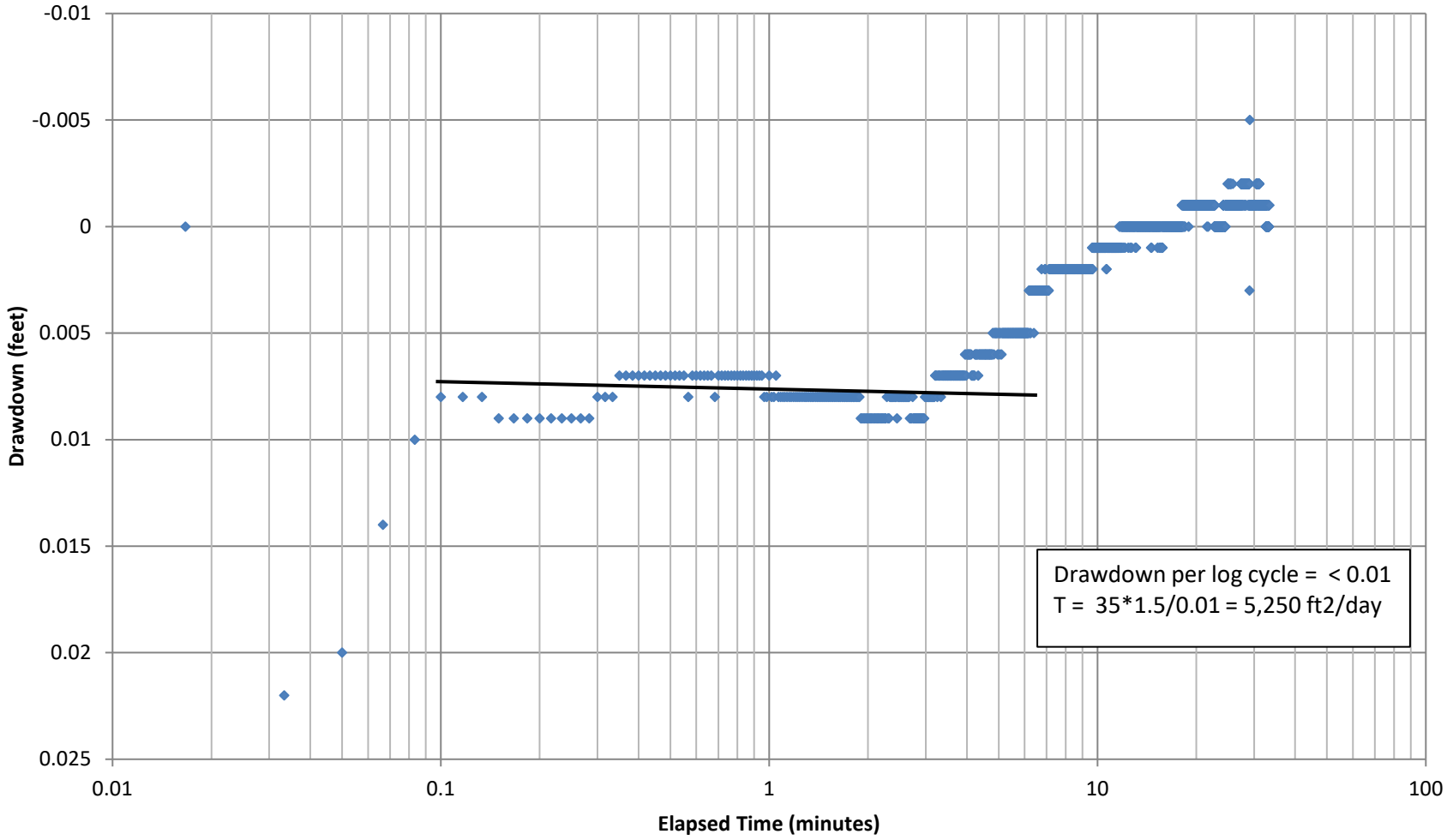
◆ YC-MW-33 Drawdown

Pump On: 2/27/2019 11:04
Pump Off: 2/27/2019 12:07:40
Average Pumping Rate: 0.68 gpm

Drawdown per log cycle = 9.2
T = 35*0.68/9.2 = 2.6 ft2/day

YC-MW-33
Drawdown Plot
GWMA Single Well Tests

PgG



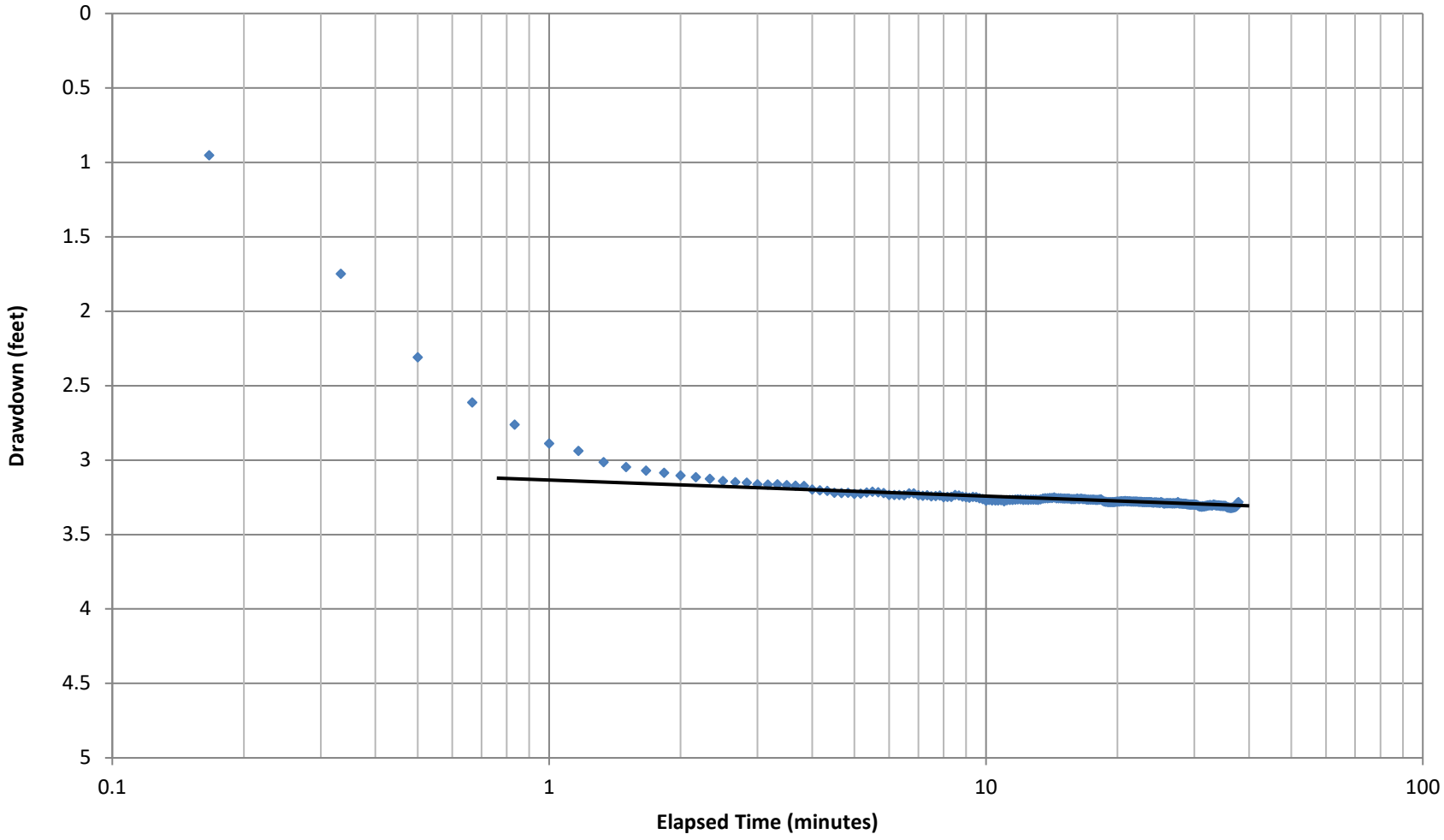
◆ YC-MW-38 Drawdown

Pump On: 2/26/19 11:23:00
Pump Off: 2/26/19 11:56:30
Average Pumping Rate: 1.5 gpm

Note: well could not be pumped hard enough to produce adequate drawdown for analysis, transducer drift is apparent in plotted data. Therefore the estimated hydraulic conductivity should be considered a lower-end value.

YC-MW-38
Drawdown Plot
GWMA Single Well Tests

PgG



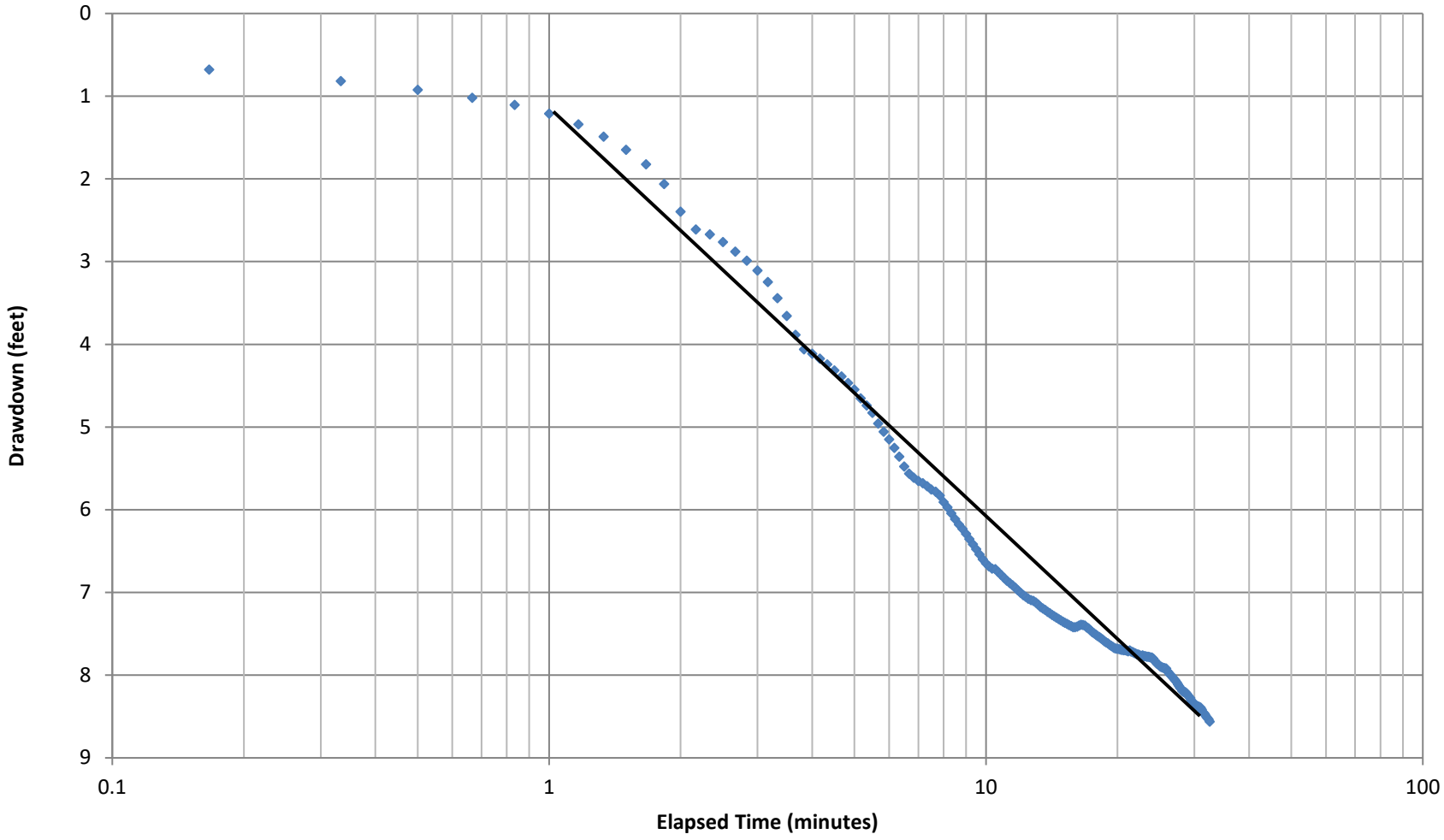
◆ YC-MW-41 Drawdown

Pump On: 12/05/18 9:03:10
Pump Off: 12/04/18 9:41:00
Average Pumping Rate: 2.64 gpm

Drawdown per log cycle = 0.1
T = 35*2.64/0.1 = 924 ft2/day

YC-MW-41
Drawdown Plot
GWMA Single Well Tests

PgG



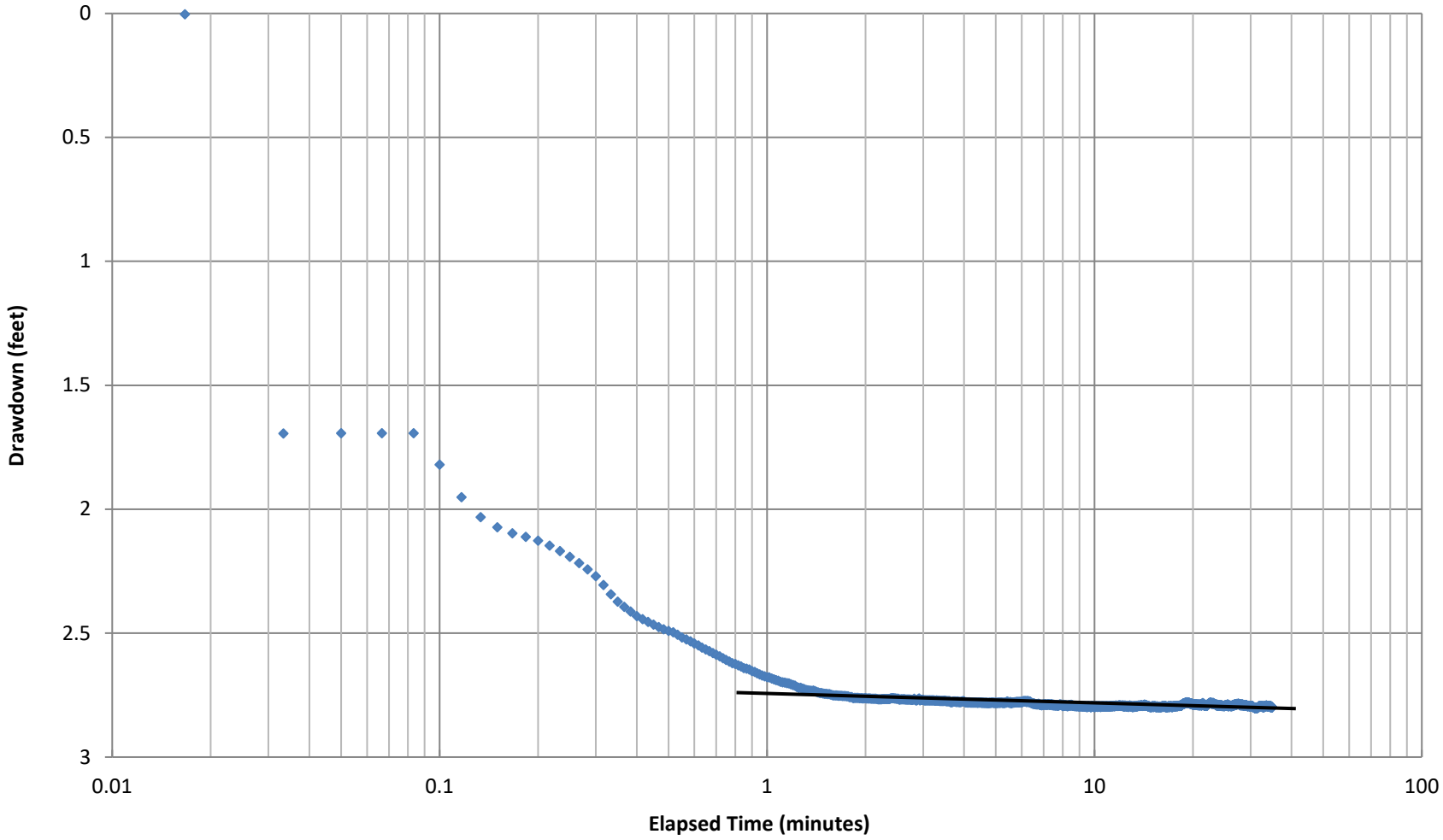
◆ YC-MW-42 Drawdown

Pump On: 12/04/18 11:37:00
Pump Off: 12/04/18 12:09:30
Average Pumping Rate: 1.05 gpm

Drawdown per log cycle = 4.9
T = 35*1.05/4.9 = 7.5 ft2/day

YC-MW-42
Drawdown Plot
GWMA Single Well Tests

PgG



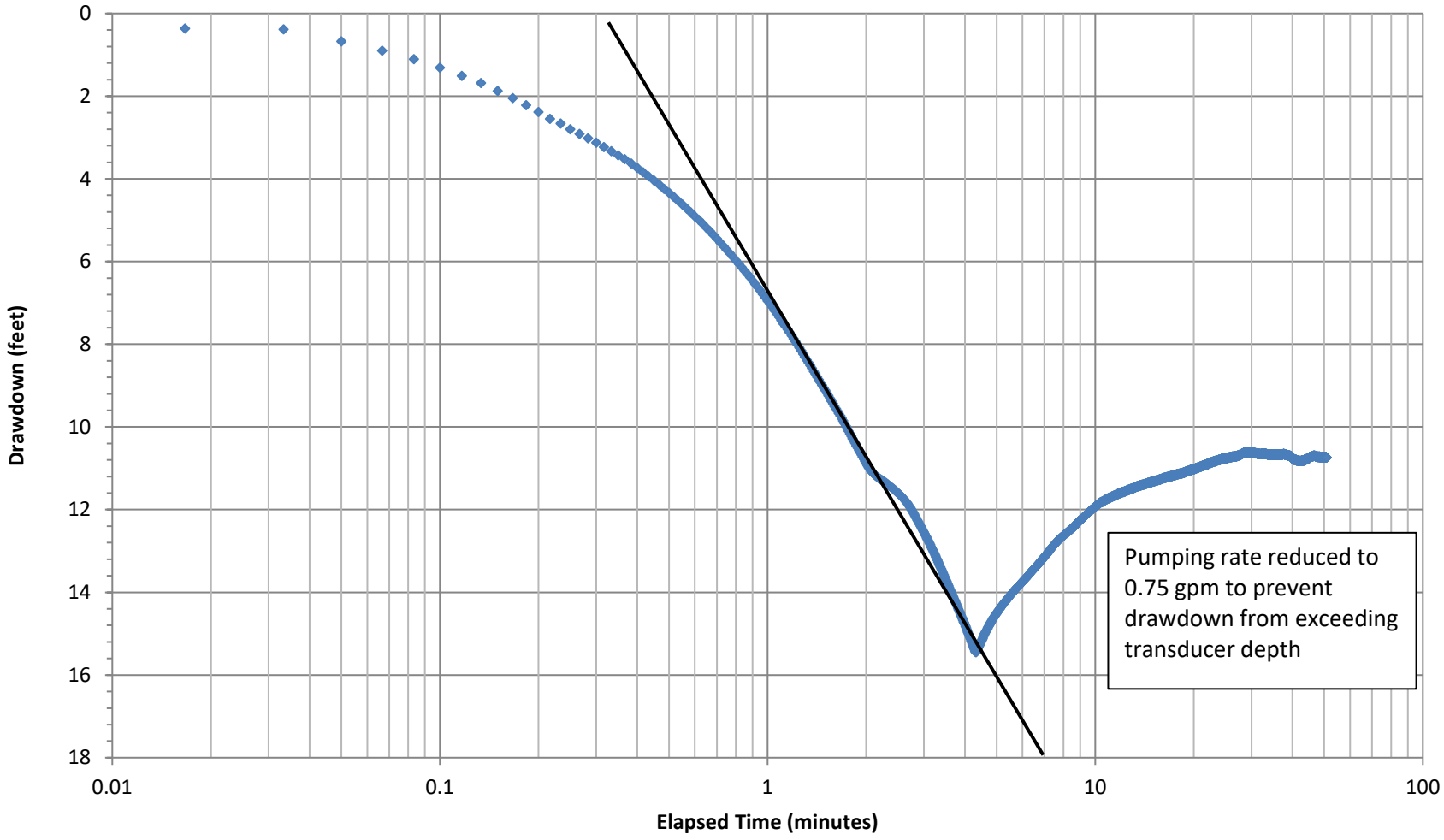
◆ YC-MW-44 Drawdown

Pump On: 2/26/19 14:02:08
Pump Off: 2/26/19 14:37:00
Average Pumping Rate: 3.44 gpm

Drawdown per log cycle = 0.1
T = 35*3.44/0.1 = 1,204 ft2/day

YC-MW-44
Drawdown Plot
GWMA Single Well Tests

PgG



◆ YC-MW-46 Drawdown

Pump On: 2/27/2019 08:52
Pump Off: 2/27/2019 09:43
Initial Pumping Rate: 1.5 gpm
Pumping rate reduced to 0.75 gpm at 08:56:30

Drawdown per log cycle = 13.5
T = 35*1.5/13.5 = 3.9 ft2/day

YC-MW-46
Drawdown Plot
GWMA Single Well Tests

PgG

APPENDIX E
GROUNDWATER SAMPLING SHEETS AND CHAIN-OF-CUSTODY SHEETS

CASCADE ANALYTICAL, INC.
1-800-545-4206

(509) 662-1888
Fax: (509) 662-8183
3019 G. S. Center Road
Wenatchee, WA 98801

(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd
Union Gap, WA 98903

Batch: 883978
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis Klaas
PO Number:

--- Water Analytical Report ---

Report Date: 11/21/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E036107
Sample Identification: YC MW-2

Date Received: 11/15/18
Date Sampled: 11/15/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	17.2	mg/L	0.25	EPA 300.0	11/16/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

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Fax: (509) 452-7773
1008 W. Ahtanum Rd
Union Gap, WA 98903

Batch: 883978
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis Klaas
PO Number:

--- Water Analytical Report ---

Report Date: 11/21/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E036108
Sample Identification: YC MW-8

Date Received: 11/15/18
Date Sampled: 11/15/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	15.4	mg/L	0.25	EPA 300.0	11/16/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 883978
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis Klaas
PO Number:

--- Water Analytical Report ---

Report Date: 11/21/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E036109
Sample Identification: YC MW-5

Date Received: 11/15/18
Date Sampled: 11/15/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	3.14	mg/L	0.1	EPA 300.0	11/16/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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Union Gap, WA 98903
(509) 452-7707
Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 883978

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	X				
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other			X		
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	X				

New Acct. #

CLIENT NAME/ADDRESS
Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102
SAMPLER'S NAME
Travis Klaas

BILLING NAME/ADDRESS

PHONE

E-mail

E-mail

RELINQUISHED BY (Signature) 1	DATE	RELINQUISHED BY (Signature) 2	DATE	RELINQUISHED BY (Signature) 3	DATE
	11/15/18				
(Printed) Travis Klaas	TIME 16:05	(Printed)	TIME	(Printed)	TIME
RECEIVED BY (Signature) DSemdt	DATE 11/15/18	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE
(Printed) DSemdt	TIME 1625	(Printed)	TIME	(Printed)	TIME

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

36107	1	YC-MW-2 11/15/2018	Sample Date
		15:00	Sample Time
36108	2	YC-MW-8 11/15/18	Sample Date
		9:20	Sample Time
36109	3	YC-MW-5 11/15/18	Sample Date
		13:10	Sample Time
	4		Sample Date
			Sample Time
	5		Sample Date
			Sample Time

*METALS - circle type of analysis - T=total or D=dissolved
Total N package = TKN, NO_3, NO_2, NH_3
Sample container received by client was sealed Yes ✓ No
Sample container received by laboratory was sealed Yes ✓ No

(see legend on back)

	IRRIGATION WATER	SAMPLE # 1	2	3	4	5
	Standard					
	GENERAL CHEMISTRY					
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite					
1265	NO_3 (As N)	X	X	X		
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO4)					
1180	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
	MICROBIOLOGY					
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
	METALS - TOTAL OR DISSOLVED					
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
	MINERALS					
1120	Calcium (Ca)					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

Disclaimer:
Cascade Analytical, Inc., makes no warranty of any kind, expressed or implied, and customer assumes all risk and liability from the use of Cascade's test results. Cascade neither assumes nor authorizes any person to assume for Cascade any other liability in connection with the testing done by Cascade Analytical, Inc., and there are no other oral agreements or warranties collateral to or affecting this agreement.
Cascade Analytical Inc.'s liability to customer as a result of customers use of Cascade's test results shall be limited to a sum equal to the fees paid by customer to Cascade Analytical, Inc. for the testing work.

Customer Signature: _____ Date 11/15/2018

This form also serves as "Chain of Custody."

CASCADE ANALYTICAL, INC

Sample Receipt Form

Date Received: 11/15/18 Time Received: 16:05 Initials: DS

Client Name: Pacific Groundwater Project Name: _____

Temperature of cooler upon receipt: 7 °C Thermometer ID: _____

Custody seals: (Intact) Broken None N/A

Chain of Custody Completed:

Client name, address, and phone number;	(Yes)	No
Date and time of sampling;	(Yes)	No
Test requests clear;	(Yes)	No
Completed in ink;	(Yes)	No
Signed by client;	(Yes)	No

All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	N/A	(Yes)	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: Ice Blue Ice (None) Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: CAI Cooler CAI Cooler Box Client's Cooler (None) Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____

CASCADE ANALYTICAL, INC.
1-800-545-4206

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Wenatchee, WA 98801

(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd
Union Gap, WA 98903

Batch: 883896
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis Klaas
PO Number:

--- Water Analytical Report ---

Report Date: 11/20/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E035905
Sample Identification: YC MW-23

Date Received: 11/14/18
Date Sampled: 11/14/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	6.00	mg/L	0.5	EPA 300.0	11/15/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd
Union Gap, WA 98903

Batch: 883896
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis Klaas
PO Number:

--- Water Analytical Report ---

Report Date: 11/20/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E035906
Sample Identification: YC MW-16

Date Received: 11/14/18
Date Sampled: 11/14/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	6.30	mg/L	0.5	EPA 300.0	11/15/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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2

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Wenatchee, WA 98801
(509) 662-1888
Fax: (509) 662-8183
1-800-545-4206

1008 W. Ahtanum Rd.
Union Gap, WA 98903
(509) 452-7707
Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 883896

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	X				
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other			X		
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	X				

New Acct. #

CLIENT NAME/ADDRESS
Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA
SAMPLER'S NAME
Travis Klaas

BILLING NAME/ADDRESS

PHONE

E-mail steve@pgwg.com

E-mail

RELINQUISHED BY: (Signature) 1	DATE	RELINQUISHED BY: (Signature) 2	DATE	RELINQUISHED BY: (Signature) 3	DATE
	11/14/18				
(Printed) Travis Klaas	TIME 16:10	(Printed)	TIME	(Printed)	TIME
RECEIVED BY: (Signature)	DATE 11/14/18	RECEIVED BY: (Signature)	DATE	RECEIVED FOR LAB BY: (Signature)	DATE
(Printed) DSandt	TIME 16:12	(Printed)	TIME	(Printed)	TIME

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

35905	1	YC-MW-23 11/14/18	Sample Date
		11:30	Sample Time
35906	2	YC-MW-16 11/14/18	Sample Date
		15:05	Sample Time
	3		Sample Date
			Sample Time
	4		Sample Date
			Sample Time
	5		Sample Date
			Sample Time

***METALS - circle type of analysis - T=total or D=dissolved**

Total N package = TKN, NO_3, NO_2, NH_3

Sample container received by client was sealed Yes ✓ No____

Sample container received by laboratory was sealed Yes____ No____

Disclaimer:
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Customer Signature: _____ Date 11/14/18

This form also serves as "Chain of Custody."

CAICOF - 03

REV. 04/26/2013

(see legend on back)

		SAMPLE # 1	2	3	4	5
IRRIGATION WATER						
	Standard					
GENERAL CHEMISTRY						
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite					
1265	NO_3 (As N)	X	X			
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO4)					
1180	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
	Nitrate	X	X			
MICROBIOLOGY						
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
METALS - TOTAL OR DISSOLVED						
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
MINERALS						
1120	Calcium (Ca)					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

CASCADE ANALYTICAL INC.

Sample Receipt Form

Date Received: 11/14/18 Time Received: 16:12 Initials: DS

Client Name: Pac Groundwater Group Project Name: _____

Temperature of cooler upon receipt: 2 °C Thermometer ID: OR2

Custody seals: (Intact) Broken None N/A

Chain of Custody Completed:

Client name, address, and phone number;	(Yes)	No
Date and time of sampling;	(Yes)	No
Test requests clear;	(Yes)	No
Completed in ink;	(Yes)	No
Signed by client;	(Yes)	No

All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	N/A	(Yes)	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: Ice (Blue Ice) None Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: CAI Cooler CAI Cooler Box (Client's Cooler) None Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____

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Wenatchee, WA 98801

(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 883796
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 11/16/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E035699 Date Received: 11/13/18
Sample Identification: YC MW-17 Date Sampled: 11/12/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	6.85	mg/L	0.25	EPA 300.0	11/14/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 883796
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 11/16/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 1A-E035700 Date Received: 11/13/18
Sample Identification: YC MW-26 Date Sampled: 11/13/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	3.26	mg/L	0.1	EPA 300.0	11/14/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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Fax: (509) 662-8183
3019 G. S. Center Road
Wenatchee, WA 98801

(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 883796
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 11/16/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E035701
Sample Identification: YC MW-19

Date Received: 11/13/18
Date Sampled: 11/13/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	15.1	mg/L	0.5	EPA 300.0	11/14/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

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1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 883796
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 11/16/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E035702
Sample Identification: YC MW-10

Date Received: 11/13/18
Date Sampled: 11/13/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	11.5	mg/L	0.1	EPA 300.0	11/14/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 883796

SEND RESULTS TO (1) Client 2) Billing 3) Both) steve@pgwg.com

SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other

SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO	X	X	X	X	
SAMPLE BY	X	X	X	X	

New Acct. #

CLIENT NAME/ADDRESS
Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102
SAMPLER'S NAME
Travis

BILLING NAME/ADDRESS
same
PHONE

E-mail steve@pgwg.com

E-mail

RELINQUISHED BY (Signature) 1	DATE	RELINQUISHED BY (Signature) 2	DATE	RELINQUISHED BY (Signature) 3	DATE
	11/13/18				
(Printed) Travis Klaas	TIME 14:55	(Printed)	TIME	(Printed)	TIME
RECEIVED BY (Signature) Kristin Erickson	DATE 11/13/18	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE
(Printed) Kristin Erickson	TIME 2:55	(Printed)	TIME	(Printed)	TIME

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

35699	1	YC-mw-17 11/12/2018	Sample Date
		14:40	Sample Time
35700	2	YC-mw-26 11/13/2018	Sample Date
		8:30	Sample Time
35701	3	YC-mw-19 11/13/2018	Sample Date
		11:00	Sample Time
35702	4	YC-mw-10 11/13/2018	Sample Date
		14:00	Sample Time
	5		Sample Date
			Sample Time

***METALS - circle type of analysis - T=total or D=dissolved**
Total N package = TKN, NO_3, NO_2, NH_3
Sample container received by client was sealed Yes ✓ No____
Sample container received by laboratory was sealed Yes ✓ No____

Disclaimer:
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Cascade Analytical Inc.'s liability to customer as a result of customers use of Cascade's test results shall be limited to a sum equal to the fees paid by customer to Cascade Analytical, Inc. for the testing work.

Customer Signature: _____ Date_____

This form also serves as "Chain of Custody."

CAICOF - 03

REV. 04/26/2013

(see legend on back)

		SAMPLE # 1	2	3	4	5
IRRIGATION WATER	Standard					
GENERAL CHEMISTRY						
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite					
1265	NO_3 (As N)					
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO_4)					
1180	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
	Nitrate	X	X	X	X	
MICROBIOLOGY						
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
METALS - TOTAL OR DISSOLVED						
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
MINERALS						
1120	Calcium (Ca)					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

CASCADE ANALYTICAL, INC.

Sample Receipt Form

Date Received: 11.13.18 Time Received: 2:55 Initials: KE

Client Name: Pacific Groundwater Group Project Name: _____

Temperature of cooler upon receipt: 1.2 °C Thermometer ID: OR2

Custody seals: (Intact) Broken None N/A

Chain of Custody Completed:

Client name, address, and phone number;	(Yes)	No
Date and time of sampling;	(Yes)	No
Test requests clear;	(Yes)	No
Completed in ink;	(Yes)	No
Signed by client;	(Yes)	No

All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	(N/A)	Yes	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: (Ice) Blue Ice None Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: CAI Cooler CAI Cooler Box (Client's Cooler) None Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____

CASCADE ANALYTICAL, INC.
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Wenatchee, WA 98801

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Fax: (509) 452-7773
1008 W. Ahtanum Rd
Union Gap, WA 98903

Batch: 884253
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Theo
PO Number:

--- Water Analytical Report ---

Report Date: 11/29/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E036675
Sample Identification: YC MW 21 11/27/18

Date Received: 11/27/18
Date Sampled: 11/27/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	0.66	mg/L	0.1	EPA 300.0	11/29/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

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Union Gap, WA 98903

Batch: 884253
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Theo
PO Number:

--- Water Analytical Report ---

Report Date: 11/29/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E036676
Sample Identification: YC MW 27 11/27/18

Date Received: 11/27/18
Date Sampled: 11/27/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	24.6	mg/L	0.5	EPA 300.0	11/29/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884253
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Theo
PO Number:

--- Water Analytical Report ---

Report Date: 11/29/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E036677
Sample Identification: YC MW 7 11/26/18

Date Received: 11/27/18
Date Sampled: 11/26/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	4.34	mg/L	0.1	EPA 300.0	11/29/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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1-800-545-4206

1008 W. Ahtanum Rd.
Union Gap, WA 98903
(509) 452-7707
Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 884253

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	X				
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other			X		
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	X				

New Acct. #

CLIENT NAME/ADDRESS: Pacific Groundwater Group

BILLING NAME/ADDRESS: 2377 Eastlake Ave E, Seattle, WA 98102

SAMPLER'S NAME: Travis Theo

PHONE: 206-329-0141

E-mail: steve@pgwg.com

E-mail:

RELINQUISHED BY (Signature) 1	DATE	RELINQUISHED BY (Signature) 2	DATE	RELINQUISHED BY (Signature) 3	DATE
	11/27/18				
(Printed) Travis	TIME 15:45	(Printed)	TIME	(Printed)	TIME
RECEIVED BY (Signature)	DATE 11/27/18	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE
(Printed) DSchmidt	TIME 15:45	(Printed)	TIME	(Printed)	TIME

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

			Sample Date / Sample Time
366675	1	YC-MW-21 11272018 14:30	11/27/18
366676	2	YC-MW-27 11272018 10:30	11/27/18
366677	3	YC-MW-7 11282018 14:50	11/28/18
	4		
	5		

*METALS - circle type of analysis - T=total or D=dissolved

Total N package = TKN, NO_3, NO_2, NH_3

Sample container received by client was sealed Yes ✓ No

Sample container received by laboratory was sealed Yes ✓ No

(see legend on back)

		SAMPLE # 1	2	3	4	5
IRRIGATION WATER						
	Standard					
GENERAL CHEMISTRY						
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite					
1265	NO_3 (As N)	X	X	X		
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO4)					
1180	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
MICROBIOLOGY						
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
METALS - TOTAL OR DISSOLVED						
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
MINERALS						
1120	Calcium (Ca)					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

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Customer Signature: _____ Date 11/27/18

This form also serves as "Chain of Custody."

CAICOF - 03

REV. 04/26/2013

CASCADE ANALYTICAL, INC.

Sample Receipt Form

Date Received: 11/27/18 Time Received: 15:45 Initials: DS

Client Name: Pacific Groundwater Project Name: _____

Temperature of cooler upon receipt: 8 °C Thermometer ID: OR2

Custody seals: (Intact) Broken None N/A

Chain of Custody Completed:

Client name, address, and phone number;	(Yes)	No
Date and time of sampling;	(Yes)	No
Test requests clear;	(Yes)	No
Completed in ink;	(Yes)	No
Signed by client;	(Yes)	No

All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	N/A	(Yes)	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: (Ice) Blue Ice None Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: CAI Cooler (CAI Cooler Box) Client's Cooler None Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____

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(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884521
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Inger
PO Number:

--- Water Analytical Report ---

Report Date: 12/10/18

received 12.17.18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037284
Sample Identification: YC-MW-11

Date Received: 12/ 3/18
Date Sampled: 12/ 2/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	1.74	mg/L	0.1	EPA 300.0	12/ 5/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884521
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Inger
PO Number:

--- Water Analytical Report ---

Report Date: 12/10/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037285
Sample Identification: YC-MW-9

Date Received: 12/ 3/18
Date Sampled: 12/ 3/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	1.70	mg/L	0.1	EPA 300.0	12/ 5/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884521
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Inger
PO Number:

--- Water Analytical Report ---

Report Date: 12/10/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037286
Sample Identification: YC-MW-24

Date Received: 12/ 3/18
Date Sampled: 12/ 3/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	6.32	mg/L	0.1	EPA 300.0	12/ 5/18	

Approved By Name: Andy Schul
Function: Lab Manager/Yakima

Signature:

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WATER ANALYSIS ORDER FORM

Batch# 884521

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	X				
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other			X		
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	X				

New Acct. #

CLIENT NAME/ADDRESS	BILLING NAME/ADDRESS
Pacific Groundwater Group	Chris Keener
2377 Eastlake Ave E	2377 Eastlake Ave E
Seattle, WA 98102	Seattle, WA 98102
SAMPLER'S NAME: Travis & Inger	PHONE: 206-329-0141
E-mail steve@pgwg.com	E-mail chris@pgwg.com

RELINQUISHED BY (Signature) 1	DATE	RELINQUISHED BY (Signature) 2	DATE	RELINQUISHED BY (Signature) 3	DATE
	12/3/18				
(Printed) Travis	TIME 15:25	(Printed)	TIME	(Printed)	TIME
RECEIVED BY (Signature)	DATE 12/3	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE 12/3/18
(Printed)	TIME 4:06	(Printed)	TIME	(Printed) Andy Schuh	TIME 1606

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

37284	1	YC-MW-11	Sample Date 12/2/18
			Sample Time 17:00
37285	2	YC-MW-9	Sample Date 12/3/18
			Sample Time 11:05
37286	3	YC-MW-24	Sample Date 12/3/18
			Sample Time 13:15
	4		Sample Date
			Sample Time
	5		Sample Date
			Sample Time

***METALS - circle type of analysis - T=total or D=dissolved**
Total N package = TKN, NO_3, NO_2, NH_3
Sample container received by client was sealed Yes ✓ No_____
Sample container received by laboratory was sealed Yes_____ No_____

Disclaimer:
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Customer Signature: _____ Date 12/3/2018

This form also serves as "Chain of Custody."

CAICOF - 03

REV. 04/26/2013

(see legend on back)

	IRRIGATION WATER	SAMPLE # 1	2	3	4	5
	Standard					
	GENERAL CHEMISTRY					
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite					
1265	NO_3 (As N)	X	X	X		
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO_4)					
1180	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
	MICROBIOLOGY					
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
	METALS - TOTAL OR DISSOLVED					
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
	MINERALS					
1120	Calcium (Ca)					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

CASCADE ANALYTICAL, INC

Sample Receipt Form

Date Received: 12/3/18 Time Received: 1606 Initials: AS

Client Name: Pacific Groundwater Project Name: _____

Temperature of cooler upon receipt: 0.2 °C Thermometer ID: OR2

Custody seals: (Intact) Broken None N/A

Chain of Custody Completed:

Client name, address, and phone number;	(Yes)	No
Date and time of sampling;	(Yes)	No
Test requests clear;	(Yes)	No
Completed in ink;	(Yes)	No
Signed by client;	(Yes)	No

All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	N/A	(Yes)	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: (Ice) Blue Ice None Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: CAI Cooler (CAI Cooler Box) Client's Cooler None Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____

CASCADE ANALYTICAL, INC.
1-800-545-4206

(509) 662-1888
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3019 G. S. Center Road
Wenatchee, WA 98801

(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884609
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/10/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037452
Sample Identification: YC-MW 28

Date Received: 12/ 4/18
Date Sampled: 12/ 4/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	3.10	mg/L	0.1	EPA 300.0	12/ 6/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

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Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884609
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/10/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037453
Sample Identification: YC-MW 42

Date Received: 12/ 4/18
Date Sampled: 12/ 4/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	7.04	mg/L	0.1	EPA 300.0	12/ 6/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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Union Gap, WA 98903

Batch: 884609
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/10/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037454
Sample Identification: YC-MW 1

Date Received: 12/ 4/18
Date Sampled: 12/ 4/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	22.2	mg/L	0.5	EPA 300.0	12/ 6/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884609
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/10/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037455
Sample Identification: YC-MW 12

Date Received: 12/ 4/18
Date Sampled: 12/ 4/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	0.38	mg/L	0.1	EPA 300.0	12/ 6/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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1008 W. Ahtanum Rd.
Union Gap, WA 98903
(509) 452-7707
Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 884609

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	X				
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other			X		
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	X				

New Acct. #

CLIENT NAME/ADDRESS
Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

SAMPLER'S NAME
Travis

BILLING NAME/ADDRESS
Chris Keener
2377 Eastlake Ave E
Seattle, WA 98102

PHONE
206 329-0141

E-mail steve@pgwg.com

E-mail chris@pgwg.com

RELINQUISHED BY (Signature) 1	DATE	RELINQUISHED BY (Signature) 2	DATE	RELINQUISHED BY (Signature) 3	DATE
	12/4/18				
(Printed) Travis	TIME 15:35	(Printed)	TIME	(Printed)	TIME
RECEIVED BY (Signature)	DATE	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE
	12/4/18				
(Printed)	TIME	(Printed)	TIME	(Printed)	TIME
	15:35				

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

37452	1	YC - MW - 28	Sample Date 12/4/18
			Sample Time 10:15
37453	2	YC - MW - 42	Sample Date 12/4/18
			Sample Time 12:00
37454	3	YC - MW - 1	Sample Date 12/4/18
			Sample Time 14:35
37455	4	YC - MW - 12	Sample Date 12/3/18
			Sample Time 15:45
	5		Sample Date
			Sample Time

***METALS - circle type of analysis - T=total or D=dissolved**
Total N package = TKN, NO_3, NO_2, NH_3
Sample container received by client was sealed Yes ✓ No
Sample container received by laboratory was sealed Yes No ✓

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Customer Signature: _____ Date 12/4/18

This form also serves as "Chain of Custody."

CAICOF - 03

REV. 04/26/2013

(see legend on back)

IRRIGATION WATER		SAMPLE # 1	2	3	4	5
	Standard					
GENERAL CHEMISTRY						
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite					
1265	NO_3 (As N)	X	X	X	X	
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO4)					
1180	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
MICROBIOLOGY						
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
METALS - TOTAL OR DISSOLVED						
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
MINERALS						
1120	Calcium (Ca)					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

CASCADE ANALYTICAL, INC.

Sample Receipt Form

Date Received: 12/4/18 Time Received: 15:35 Initials: DF

Client Name: Pacific GW Group Project Name: _____

Temperature of cooler upon receipt: 13 °C Thermometer ID: CR2

Custody seals: Intact Broken (None) N/A

Chain of Custody Completed:

Client name, address, and phone number;	(Yes)	No
Date and time of sampling;	(Yes)	No
Test requests clear;	(Yes)	No
Completed in ink;	(Yes)	No
Signed by client;	(Yes)	No

All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	N/A	(Yes)	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: Ice Blue Ice (None) Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: CAI Cooler CAI Cooler Box Client's Cooler (None) Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____

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(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884746
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/13/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037731 Date Received: 12/ 6/18
Sample Identification: YC MW-41 Date Sampled: 12/ 5/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	26.9	mg/L	0.5	EPA 300.0	12/12/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884746
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/13/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037732
Sample Identification: YC MW-25

Date Received: 12/ 6/18
Date Sampled: 12/ 6/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	3.58	mg/L	0.1	EPA 300.0	12/11/18	

Approved By Name: Andy Schut
Function: Lab Manager Yakima

Signature:

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(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884746
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/13/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 18-E037733
Sample Identification: YC MW-15

Date Received: 12/ 6/18
Date Sampled: 12/ 5/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	1.02	mg/L	0.1	EPA 300.0	12/11/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 884746
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis
PO Number:

--- Water Analytical Report ---

Report Date: 12/13/18

Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

~~Laboratory Number: 18-E037734~~ ~~Date Received: 12/ 6/18~~
Sample Identification: YC MW-6 Date Sampled: 12/ 5/18

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	58.4	mg/L	1	EPA 300.0	12/12/18	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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(509) 452-7707
Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 884746

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	X				
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other			X		
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	K				

New Acct. #

CLIENT NAME/ADDRESS	BILLING NAME/ADDRESS
Pacific Groundwater Group	Chris Keeney
2377 Eastlake Ave E	2377 Eastlake Ave E
Seattle, WA 98102	Seattle, WA 98102
SAMPLER'S NAME: Travis	PHONE: 206 329-0141

E-mail steve@pgwg.com E-mail Chris@pgwg.com

RELINQUISHED BY (Signature) [1]	DATE	RELINQUISHED BY (Signature) [2]	DATE	RELINQUISHED BY (Signature) [3]	DATE
	12/6/18				
(Printed)	TIME	(Printed)	TIME	(Printed)	TIME
Travis	1330				
RECEIVED BY (Signature)	DATE	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE
	12/6/18				
(Printed)	TIME	(Printed)	TIME	(Printed)	TIME
DSchmidt	13:30				

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

37731	1	YC-MW-41	Sample Date 12/5/18
			Sample Time 9:35
37732	2	YC-MW-25	Sample Date 12/6/18
			Sample Time 12:10
37733	3	YC-MW-15	Sample Date 12/5/18
			Sample Time 17:00
37734	4	YC-MW-6	Sample Date 12/5/18
			Sample Time 12:55
	5		Sample Date
			Sample Time

***METALS - circle type of analysis - T=total or D=dissolved**
Total N package = TKN, NO_3, NO_2, NH_3
Sample container received by client was sealed Yes ✓ No ____
Sample container received by laboratory was sealed Yes ____ No ✓

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Customer Signature: _____ Date 12/6/18

This form also serves as "Chain of Custody."

CAICOF - 03 REV. 04/26/2013

(see legend on back)

IRRIGATION WATER	SAMPLE # 1	2	3	4	5
Standard					
GENERAL CHEMISTRY					
1135 pH					
1140 Conductivity					
1200 Solids-Dis. (TDS)					
1230 Solids-Susp. (TSS)					
1240 Tot. Phosphorus					
1250 Orthophosphate					
1260 Kjeldahl Nitrogen (TKN)					
1170 Nitrate+Nitrite					
1265 NO_3 (As N)	X	X	X	X	
1280 Ammonia					
1300 Biol. Oxy. Demand					
1310 Chem. Oxy. Demand					
1190 Sulfate (SO4)					
1180 Chloride (Cl)					
1150 Turbidity					
1320 Hexane Ext. Mat.					
1340 Alkalinity					
217 Total N Pkg					
MICROBIOLOGY					
10040 Total Coliform MF					
10010 Fecal Coliform MF					
10041 Total Coliform MPN					
10011 Fecal Coliform MPN					
METALS - TOTAL OR DISSOLVED					
1391 Antimony (Sb)					
1011 Arsenic (As)					
1025 Barium (Ba)					
1405 Beryllium (Be)					
1031 Cadmium (Cd)					
1045 Chromium (Cr)					
1215 Copper (Cu)					
1065 Iron (Fe)					
1075 Manganese (Mn)					
1081 Mercury (Hg)					
1435 Molybdenum (Mo)					
1051 Lead (Pb)					
1335 Nickel (Ni)					
1091 Selenium (Se)					
1105 Silver (Ag)					
1381 Thallium (Tl)					
1225 Zinc (Zn)					
MINERALS					
1120 Calcium (Ca)					
1130 Magnesium (Mg)					
1115 Potassium (K)					
1110 Sodium (Na)					

CASCADE ANALYTICAL, INC.

Sample Receipt Form

Date Received: 12/6/18 Time Received: 13:30 Initials: DS

Client Name: Pacific Groundwater Project Name: _____

Temperature of cooler upon receipt: 3 °C Thermometer ID: OR2

Custody seals: Intact Broken (None) N/A

Chain of Custody Completed:

Client name, address, and phone number;		(Yes)	No
Date and time of sampling;		(Yes)	No
Test requests clear;		(Yes)	No
Completed in ink;		(Yes)	No
Signed by client;		(Yes)	No
All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	N/A	(Yes)	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: Ice Blue Ice (None) Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: CAI Cooler CAI Cooler Box Client's Cooler (None) Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____

CASCADE ANALYTICAL, INC.
1-800-545-4206

(509) 662-1888
Fax: (509) 662-8183
3019 G. S. Center Road
Wenatchee, WA 98801

(509) 452-7707
Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 987601
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Glenn
PO Number:

--- Water Analytical Report ---

Report Date: 3/ 4/19

Pacific Groundwater Group
Travis Klaas
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 19-F004574
Sample Identification: YC-MW-39

Date Received: 2/27/19
Date Sampled: 2/27/19

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	18.1	mg/L	0.5	EPA 300.0	2/28/19	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

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Union Gap, WA 98903

Batch: 987601
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Glenn
PO Number:

--- Water Analytical Report ---

Report Date: 3/ 4/19

Pacific Groundwater Group
Travis Klaas
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 19-E004575
Sample Identification: YC-MW-33

Date Received: 2/27/19
Date Sampled: 2/27/19

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	24.2	mg/L	0.5	EPA 300.0	2/28/19	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 987601
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Glenn
PO Number:

--- Water Analytical Report ---

Report Date: 3/ 4/19

Pacific Groundwater Group
Travis Klaas
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 19-E004576
Sample Identification: YC-MW-44

Date Received: 2/27/19
Date Sampled: 2/26/19

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	30.2	mg/L	0.5	EPA 300.0	3/ 1/19	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 987601
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Glenn
PO Number:

--- Water Analytical Report ---

Report Date: 3/ 4/19

Pacific Groundwater Group
Travis Klaas
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 19-E004577
Sample Identification: YC-MW-38

Date Received: 2/27/19
Date Sampled: 2/26/19

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	10.3	mg/L	0.1	EPA 300.0	2/28/19	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima
Signature:

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Union Gap, WA 98903

Batch: 987601
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Glenn
PO Number:

--- Water Analytical Report ---

Report Date: 3/ 4/19

Pacific Groundwater Group
Travis Klaas
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 19-E004578
Sample Identification: YC-MW-31

Date Received: 2/27/19
Date Sampled: 2/26/19

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	5.94	mg/L	0.1	EPA 300.0	3/ 1/19	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

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Fax: (509) 452-7773
1008 W. Ahtanum Rd.
Union Gap, WA 98903

Batch: 987601
Client: Pacific Groundwater Group
Account: 03558
Sampler: Travis/Glenn
PO Number:

--- Water Analytical Report ---

Report Date: 3/ 4/19

Pacific Groundwater Group
Travis Klaas
2377 Eastlake Ave E
Seattle, WA 98102

Laboratory Number: 19-E004579
Sample Identification: YC-MW-46

Date Received: 2/27/19
Date Sampled: 2/27/19

Test Requested	Results	Units	RL	Method	Date Analyzed	Flags
Nitrate-N	18.1	mg/L	0.5	EPA 300.0	2/28/19	

Approved By Name: Andy Schut
Function: Lab Manager/Yakima

Signature:

Cascade Analytical uses procedures established by EPA, AOAC, APHA, ASTM, and FDA/BAM. Cascade Analytical makes no warranty of any kind the client assumes all risk and liability from the use of these results. Cascade Analytical, Inc.'s liability to the client as a result of use of Cascade's test results shall be limited to a sum equal to the fees paid by the client to Cascade Analytical, Inc. for analysis. PLEASE REVIEW YOUR DATA IN A TIMELY MANNER. DATA GAPS OR ERRORS AFTER THREE MONTHS WILL NOT BE OUR RESPONSIBILITY. THOUGH WE DO KEEP ALL ANALYTICAL DATA FOR SEVERAL YEARS, SAMPLES ARE DISPOSED OF AFTER SIX WEEKS.

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Union Gap, WA 98903
(509) 452-7707
Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 987601

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	1	1	1	1	1
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other	3	3	3	3	3
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	1	1	1	1	1

New Acct. #

CLIENT NAME/ADDRESS
Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102
SAMPLER'S NAME
Travis Klaas, Glenn Mutti-Driscoll

BILLING NAME/ADDRESS
← same

PHONE
206-329-0141

E-mail travis@pgwg.com

E-mail

RELINQUISHED BY (Signature) 1	DATE	RELINQUISHED BY (Signature) 2	DATE	RELINQUISHED BY (Signature) 3	DATE
(Printed) Travis Klaas	TIME 15:35	(Printed)	TIME	(Printed)	TIME
RECEIVED BY (Signature) DSchmidt	DATE 2/27/19	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE
(Printed) DSchmidt	TIME 15:35	(Printed)	TIME	(Printed)	TIME

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

4574	1	YC-MW-39	Sample Date 2-27-19 / Sample Time 1445
4575	2	YC-MW-33	Sample Date 2-27-19 / Sample Time 1145
4576	3	YC-MW-44	Sample Date 2-26-19 / Sample Time 14:30
4577	4	YC-MW-38	Sample Date 2-26-19 / Sample Time 11:50
4578	5	YC-MW-31	Sample Date 2-26-19 / Sample Time 1620

***METALS - circle type of analysis - T=total or D=dissolved**

Total N package = TKN, NO_3, NO_2, NH_3

Sample container received by client was sealed Yes_____ No_____

Sample container received by laboratory was sealed Yes_____ No_____

Disclaimer:

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Cascade Analytical Inc.'s liability to customer as a result of customers use of Cascade's test results shall be limited to a sum equal to the fees paid by customer to Cascade Analytical, Inc. for the testing work.

Customer Signature: _____ Date 2/27/19

This form also serves as "Chain of Custody."

CAICOF - 03

REV. 04/26/2013

(see legend on back)

	IRRIGATION WATER	SAMPLE # 1	2	3	4	5
	Standard					
	GENERAL CHEMISTRY					
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite					
1265	NO_3 (As N)	X	X	X	X	X
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO_4)					
1160	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
	MICROBIOLOGY					
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
	METALS - TOTAL OR DISSOLVED					
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
	MINERALS					
1120	Calcium (Ca)					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

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1008 W. Ahtanum Rd.
Union Gap, WA 98903
(509) 452-7707
Fax: (509) 452-7773

WATER ANALYSIS ORDER FORM

Batch# 98'1601

	SAMPLE # 1	2	3	4	5
SEND RESULTS TO 1) Client 2) Billing 3) Both	1				
SAMPLE REPRESENTS 1) Irrigation 2) Waste Water 3) Other	3				
SAMPLE BY 1) Client 2) Quality Control 3) Cascade 4) Other	1				

New Acct. #

CLIENT NAME/ADDRESS
Pacific Groundwater Group
2377 Eastlake Ave E
Seattle, WA 98102

SAMPLER'S NAME
Travis Klaas, Glenn Mutti-Driscoll

BILLING NAME/ADDRESS
← same

PHONE

E-mail travis@pgwg.com

E-mail

RELINQUISHED BY (Signature) 1	DATE	RELINQUISHED BY (Signature) 2	DATE	RELINQUISHED BY (Signature) 3	DATE
	2/27/19				
(Printed) Travis K	TIME 15:35	(Printed)	TIME	(Printed)	TIME
RECEIVED BY (Signature) DSchmidt	DATE 2/27/19	RECEIVED BY (Signature)	DATE	RECEIVED FOR LAB BY (Signature)	DATE
(Printed) DSchmidt	TIME 1535	(Printed)	TIME	(Printed)	TIME

FORM MUST BE COMPLETED BEFORE ANALYSIS WILL BE PERFORMED.

4579	1	YC-MW-46	Sample Date 2/27/19
			Sample Time 930
	2		Sample Date
			Sample Time
	3		Sample Date
			Sample Time
	4		Sample Date
			Sample Time
	5		Sample Date
			Sample Time

***METALS - circle type of analysis - T=total or D=dissolved**

Total N package = TKN, NO_3, NO_2, NH_3

Sample container received by client was sealed Yes_____ No_____

Sample container received by laboratory was sealed Yes_____ No_____

(see legend on back)

	IRRIGATION WATER	SAMPLE # 1	2	3	4	5
	Standard					
	GENERAL CHEMISTRY					
1135	pH					
1140	Conductivity					
1200	Solids-Dis. (TDS)					
1230	Solids-Susp. (TSS)					
1240	Tot. Phosphorus					
1250	Orthophosphate					
1260	Kjeldahl Nitrogen (TKN)					
1170	Nitrate+Nitrite	X				
1265	NO_3 (As N)	X				
1280	Ammonia					
1300	Biol. Oxy. Demand					
1310	Chem. Oxy. Demand					
1190	Sulfate (SO4)					
1180	Chloride (Cl)					
1150	Turbidity					
1320	Hexane Ext. Mat.					
1340	Alkalinity					
217	Total N Pkg					
	MICROBIOLOGY					
10040	Total Coliform MF					
10010	Fecal Coliform MF					
10041	Total Coliform MPN					
10011	Fecal Coliform MPN					
	METALS - TOTAL OR DISSOLVED					
1391	Antimony (Sb)					
1011	Arsenic (As)					
1025	Barium (Ba)					
1405	Beryllium (Be)					
1031	Cadmium (Cd)					
1045	Chromium (Cr)					
1215	Copper (Cu)					
1065	Iron (Fe)					
1075	Manganese (Mn)					
1081	Mercury (Hg)					
1435	Molybdenum (Mo)					
1051	Lead (Pb)					
1335	Nickel (Ni)					
1091	Selenium (Se)					
1105	Silver (Ag)					
1381	Thallium (Tl)					
1225	Zinc (Zn)					
	MINERALS					
1120	**Calcium (Ca)**					
1130	Magnesium (Mg)					
1115	Potassium (K)					
1110	Sodium (Na)					

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Customer Signature: _____ Date 2/27/19

This form also serves as "Chain of Custody."

CASCADE ANALYTICAL, INC.

Sample Receipt Form

Date Received: 2/27/19 Time Received: 15:35 Initials: DS

Client Name: Pacific Groundwater Project Name: _____

Temperature of cooler upon receipt: 1.7 °C Thermometer ID: OR2

Custody seals: Intact Broken (None) N/A

Chain of Custody Completed:

Client name, address, and phone number;	(Yes)	No
Date and time of sampling;	(Yes)	No
Test requests clear;	(Yes)	No
Completed in ink;	(Yes)	No
Signed by client;	(Yes)	No

All samples received:		(Yes)	No
All samples intact:		(Yes)	No
Sample ID's match COC form:		(Yes)	No
Appropriate containers used:		(Yes)	No
Sufficient amount of sample for analysis:		(Yes)	No
Correct preservative verified:	N/A	(Yes)	No
Air bubbles in VOC, TTHM, or HAA5 samples:	(N/A)	Yes	No
Sample(s) exceed hold time:		Yes	(No)

Type of coolant: (Ice) Blue Ice None Other Comment: _____

Shipping Method: FedEx UPS USPS Brett & Sons (Hand Delivered) CAI Sampled

Shipping Container: (CAI Cooler) CAI Cooler Box Client's Cooler None Other _____

Samples accepted for analysis: (Yes) No

Reason for Rejection: _____

Name of Person Contacted: _____ Date Contacted: _____

Comments: _____