SANTA MARGARITA
Groundwater Agency

2 Civic Center Drive
Scotts Valley, CA 95066

GROUNDWATER MONITORING WELLS PROJECT

Contract Documents

VOLUME II

TECHNICAL SPECIFICATIONS – MONITORING WELL INSTALLATION

VOLUME I:
- Notice Inviting Bids
- Instructions to Bidders
- General and Special Conditions
- Form of Construction Contract
- Form of Payment Bond
- Form of Performance Bond

VOLUME II:
- Technical Specifications – Monitoring Well Installation

VOLUME III:
- Form of Bid Proposal
- Bid Schedule
  - Table 1. Bid Schedule for Base Bid
  - Table 2. Bid Schedule for Alternate
- Acknowledgement of Addenda
- Bidder's Bond (sample form)
- Name and Titles Form
- Noncollusion Affidavit
- Bidder Certifications
- Designation of Subcontractors

January 6, 2023

TECHNICAL SPECIFICATIONS

Monitoring Well Installation

Prepared for:

SANTA MARGARITA Groundwater Agency

Prepared by:

Montgomery & Associates
1970 Broadway Avenue, Suite 225
Oakland, CA 94612
510-903-0458 | elmontgomery.com

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Acronyms & Abbreviations

API	American Petroleum Institute
bgs	below ground surface
CONTRACTOR	Drilling Contractor, their subcontractors, and subconsultants
County	Santa Cruz County
Environmental Health	Santa Cruz County Environmental Health
GSP	Groundwater Sustainability Plan
OWNER	Santa Margarita Groundwater Agency, their designated representatives, and their consultants
PVC	polyvinyl chloride
Sch	Schedule
SLVWD	San Lorenzo Valley Water District
SMGWA	Santa Margarita Groundwater Agency

1 DRILLING PROGRAM REQUIREMENTS

As one of the first tasks of implementing the Santa Margarita Groundwater Basin Groundwater Sustainability Plan (GSP), the Santa Margarita Groundwater Agency (SMGWA) is soliciting bids for installation and development of up to 8 groundwater monitoring wells to address data gaps in the GSP groundwater level monitoring network. The monitoring wells will be installed in Santa Cruz County (County) at a range of depths from approximately 100 to 800 feet below ground surface (bgs). These technical specifications describe the minimum standards for the required work and serve as the basis for bidding. The term CONTRACTOR is used herein to refer to the drilling contractor, their subcontractors, and subconsultants; the term OWNER refers to the SMGWA and their designated representatives and consultants.

1.1 Description of Work

Monitoring wells shall be installed in various locations throughout the San Lorenzo Valley and Scotts Valley between Highway 9 and Highway 17 (Figure 1). The CONTRACTOR's scope of work includes the furnishing of all materials, labor, equipment, fuel, tools, transportation, and services for the drilling, construction, and development of the monitoring wells described in Table 1 and in these technical specifications. The CONTRACTOR may only utilize 1 drill rig and 1 development crew or vacuum truck concurrently to complete the work, unless otherwise approved by OWNER. The anticipated scope and order of work for each well installation is specified below:

- BASE BID: SMGWA-2 through SMGWA-8 (seven (7) shallow wells) – Drill the boreholes; install the monitoring wells; develop wells; and complete wellheads.
    - ENGINEER'S ESTIMATE FOR BASE BID: $507,500
- ALTERNATE 1: SMGWA-1 (deep well) – Drill the borehole; run downhole geophysical, caliper, and deviation surveys; install monitoring well; develop well; and complete wellhead.
    - ENGINEER'S ESTIMATE FOR ALTERNATE 1: $300,000

The attached figures show the location of each well and preliminary well design:

- General site location map (Figure 1)
- Detailed site maps for each well location (Figures 2-10)
- Preliminary conceptual well schematics (Figures 11-13)

Table 1. Monitoring Well Locations

Well ID	Location Name	Location Description	Target Aquifer/Formation	Anticipated Well Depth (ft bgs)	Latitude	Longitude
SMGWA-1 (Alt #1)	Vine Hill School	West side of Scotts Valley Drive just inside Vine Hill Elementary school's northern gate	Butano	800	37.0683°	-121.9979°
SMGWA-2	Bean Creek Downstream of Mackenzie Creek	County right-of-way on the west side of Bean Creek Road located 75 feet east of Bean Creek and approximately 1,200 feet south of Mackenzie Creek	Santa Margarita	80	37.0682°	-122.0159°
SMGWA-3	Ruins Creek	County right-of-way on the west side of Nelson Road, and approximately 50 feet east of Ruins Creek	Santa Margarita	300	37.0684°	-122.0248°
SMGWA-4	Nelson Road / Lockhart Gulch	County right-of-way on the north side of Nelson Road approximately 450 feet north of the confluence between Bean Creek and Lockhart Gulch	Santa Margarita	100	37.0578°	-122.0326°
SMGWA-5	Bahr Drive	North side of Bahr Dr in County right-of-way or in street	Santa Margarita	200	37.0652°	-122.0648°
SMGWA-6	Quail Hollow Road	SLVWD-owned parcel with an inactive extraction well (Well #8)	Santa Margarita	300	37.0825°	-122.0749°
SMGWA-7	Love Creek	County right-of-way on the west side of Love Creek Road and 120 feet west of Love Creek	Monterey	300	37.1038°	-122.0859°
SMGWA-8	Randall Morgan Sandhills Preserve	Land Trust of Santa Cruz County property. Well will be drilled through an existing concrete pad.	Monterey	200	37.0560°	-122.0399°

SLVWD = San Lorenzo Valley Water District

1.2 Hydrogeology

Monitoring wells shall be completed in water-bearing sedimentary bedrock formations. Geologic formations from shallowest to deepest are as follows:

- Santa Margarita Sandstone
- Monterey Shale Formation

- Lompico Sandstone
- Butano Sandstone

Of the 8 planned monitoring wells, 5 shall be completed in the Santa Margarita Sandstone, 2 shall be completed in the Monterey Formation, and 1 shall be completed in the Butano Sandstone. The anticipated depth to first groundwater is unknown, but may range between 10 and 200 feet bgs.

At most sites weathered Santa Margarita Sandstone or alluvium outcrops at ground surface. The Santa Margarita Sandstone is not present in all locations, so the Monterey Shale may be the first geologic layer encountered. The Santa Margarita Sandstone is not expected to be encountered at SMGWA-7.

One monitoring well (SMGWA-1) shall be installed in the deep Butano Sandstone. The contact between the Lompico and Butano Sandstones can be difficult to ascertain from drill cuttings, so geophysical logging may be used to help identify the geologic contact for designing the well screen.

1.3 Contractor Specifications

The CONTRACTOR must possess a Type "A" General engineering license and/or C57 license issued by the State of California.

1.4 Standards

The CONTRACTOR must comply with applicable sections of the following standard(s) with respect to material, workmanship, construction, and testing methods:

- California Department of Water Resources Water Well Standards:
  State of California (1981, Bulletin 74-81)
- California Department of Water Resources California Well Standards
  (1991, Bulletin 74-90, supplement to Bulletin 74-81)
- Santa Cruz County Ordinance 4901 and 5022 and Chapter 7.70 of Santa Cruz County Code relating to water wells

1.5 Schedule and Working Hours

To the extent feasible, construction activities should be limited to daytime hours between 0800 and 1800, Monday through Friday. Deviations from this schedule may only be allowed

with OWNER approval. SMGWA-1 (Alternate 1) will be drilled at Vine Hill School and must be completed when the school is out of session from approximately June 1 to August 15, 2023.

1.6 Bid Schedule

Costs for this project shall be defined by the completed and accepted Bid Schedules contained in Groundwater Monitoring Wells Project Contract Documents Volume III. The Bid Schedules are 2 separate tables in Volume III. The Bid Schedule for the shallow wells SMGWA-2 through SMGWA-8 (Base Bid) is Volume III: Table 1. The Bid Schedule for the deep well SMGWA-1 (Bid Alternate) is Volume III: Table 2. The completed Bid Schedules shall be submitted by the CONTRACTOR according to the instructions to Bidders. The deep well, SMGWA-1, is an alternate bid and may not be awarded until the summer of 2023. Quantities outlined in the Bid Schedule and discussed herein are estimates and may not be the final quantities.

The work to be performed by Contractor includes all labor, materials, equipment, tools, construction equipment and machinery, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, including but not limited to: permits, mobilization, site preparation, traffic control, utility clearance, borehole drilling, well installation, well development, surface completion, site cleanup, drilling waste management and demobilization.

Additionally, it shall be noted that 5% of the total costs shall be retained by the OWNER for 40 days following final approval by OWNER of all project work.

2 BORING AND WELL CONSTRUCTION

2.1 Contractor Equipment

The CONTRACTOR shall provide all necessary equipment, tools, and appurtenances for the timely completion of the work. The CONTRACTOR shall provide the OWNER a list of major equipment to be used, including type of equipment, manufacturer, age, and other applicable technical data. The CONTRACTOR's equipment shall be in safe operating condition and shall be appropriately maintained and operated during the project. The CONTRACTOR shall be solely responsible for the condition of their equipment and shall maintain an inventory of necessary spare parts for the timely repair of equipment in the event of a failure or breakdown. No payment shall be made for standby time or equipment rental caused by a breakdown or failure of the CONTRACTOR's equipment. The drill rig utilized must have the ability to fully lift and land the anticipated casing loads without the use of float plugs or other similar methods. All drill pipe must utilize threaded flush or upset tool joints, flanged pipe, or equal, as approved by the OWNER.

2.2 Mobilization/Demobilization (Bid No. 1)

The CONTRACTOR shall provide, mobilize, and set up all material and equipment. The CONTRACTOR shall prepare the sites for drilling, including the following measures:

- Clear the site of grasses, weeds, and/or brush that inhibit access or pose a fire hazard during drilling.
- Practice noise suppression efforts to minimize disturbance to nearby residents, workers, and the general public. The work site shall be managed and arranged to minimize noise to the extent practicable, including use of mufflers, shielding, and by placing noise-producing equipment away from sensitive receptors, as feasible.
- Prior to beginning work at each drilling location, site conditions must be approved by the OWNER.

During site activities, the CONTRACTOR is responsible for keeping the site free of litter and debris on a daily basis. The CONTRACTOR shall ensure vehicles leaving unpaved sites do not track mud onto public rights-of-way by removing trackable mud, cuttings, sand, grout, and other materials from undercarriages, tires, and other surfaces of equipment prior to moving equipment on or across public roads and pathways.

Upon completion and acceptance of work at the site, the CONTRACTOR shall remove from each drilling location all equipment, unused materials, temporary facilities, and other items resulting from or used in drilling operations. Final site cleanup shall be performed by the CONTRACTOR to the OWNER's satisfaction. The CONTRACTOR shall be responsible for repairing or replacing excessive damage to land or property caused by routine or unauthorized activities.

The bid for Bid Item No. 1 "Mobilization/Demobilization" shall be made at the lump sum bid for mobilization to and demobilization for each well site.

2.3 Well Construction Permits

The OWNER shall obtain Santa Cruz County Environmental Health (Environmental Health) Well Construction Permits for well installation. The SMGWA will be the well owner listed on each well permit. The OWNER shall submit applications and pay requisite fees, and obtain well construction permits. The CONTRACTOR will be responsible for complying with the permit conditions. In accordance with the County Environmental Health well construction permit, the installation of annular seals shall be inspected or otherwise explicitly approved by a County representative. A 48-hour notice is required to schedule County inspections. At the completion of the project, the CONTRACTOR is responsible for submitting required permit compliance documentation to the County. The CONTRACTOR is also responsible for submitting the Well Completion Report to the California Department of Water Resources.

2.4 Site Access and Encroachment Permits

Site access agreements and/or easements shall be acquired by the OWNER, as necessary. Wells to be drilled on non-County property include:

- SMGWA-1 (Alternate 1) located at the Vine Hill School in Scotts Valley. Access is through a temporary construction easement between OWNER and the Scotts Valley Unified School District.
- SMGWA-6 located on property owned by San Lorenzo Valley Water District. Access is through a temporary construction easement between OWNER and the San Lorenzo Valley Water District.
- SMGWA-8 located at the Randall Morgan Sandhills Preserve property owned by the Land Trust of Santa Cruz County. Access is through a temporary construction easement between OWNER and the Land Trust of Santa Cruz County.

The 5 other well sites are located along roadsides in the County right-of-way, as described in Table 1. The OWNER shall be responsible for obtaining County encroachment permit requirements for wells installed in County rights-of-way. The wells installed in County rights-of-way are SMGWA-2 through SMGWA-5 and SMGWA-7. The CONTRACTOR shall be responsible for providing traffic control measures that adhere to the encroachment permits. Encroachment permit responsibilities include but are not limited to providing proper notice of lane closure, traffic control, and signage, as specified in Section 3.3. The CONTRACTOR shall maintain copies of all project permits at the construction site and confine drilling and construction operations to within the limits of each permitted well site.

2.5 Traffic Control (Bid No. 2)

The CONTRACTOR shall be responsible for providing traffic control measures, where necessary. The CONTRACTOR shall provide a Traffic Control Plan that specifies traffic control measures that adhere to Santa Cruz County Encroachment permitting requirements. Traffic control measures may include barricades, flaggers, warning signs, lights, and other devices. The CONTRACTOR shall post "No Parking" signs that clearly state the enforced dates, at a minimum 72-hours prior to construction and at 50-foot maximum spacing. The CONTRACTOR shall check and maintain signs on a daily basis. The wells installed in County rights-of-way that will require traffic control are SMGWA-2 through SMGWA-5 and SMGWA-7.

The bid for Bid Item No. 2 "Traffic Control" shall be made at the lump sum bid for each traffic control drilling site.

2.6 Utility Clearance (Bid No. 3)

Prior to drilling, the CONTRACTOR will notify Underground Service Alert in accordance with California Government Code 4216.[1] Some subsurface hazards may not be identified by surface locating methods, so the CONTRACTOR shall clear the subsurface in each location by hand-auger, air knife, and/or vacuum truck to a depth of no less than 5 feet bgs. If the CONTRACTOR encounters refusal on bedrock or native sediments at depths less than 5 feet bgs than the CONTRACTOR may advance the boring with OWNER approval. Once the area is cleared for the presence of subsurface obstructions and utilities, the CONTRACTOR may choose to backfill the excavation with excavated cuttings or other OWNER approved backfill. The excavation area must be appropriately secured until the drilling rig is mobilized.

The bid for Bid Item No. 3 "Utility Clearance" shall be made at the lump sum bid for each drilling site.

2.7 Borehole Drilling (Bid No. 4a and 4b)

The drilling method shall be selected by the CONTRACTOR and approved by the OWNER. The CONTRACTOR must specify the drilling method for each location in their bid. The CONTRACTOR may select different drilling methods for each well. Potential drilling options include but are not limited to direct rotary, rotosonic, and hollow stem auger. Specifics unique to each of these 3 methods are described in the following sections. The CONTRACTOR may choose to use up to 1 concurrent drill rig and 1 development or vacuum excavation rig at any given time, unless otherwise approved by the OWNER.

Prior to mobilization, the OWNER, County Environmental Health, and County surveyor will identify appropriate locations to drill a monitoring well at the Site. The exact location of monitoring wells shall be determined in the field by the CONTRACTOR. At each location, a borehole shall be drilled to accommodate a single completion monitoring well. Each monitoring well shall be nominal 2-inch diameter except for the deepest well, SMGWA-1, which shall be nominal 4-inch diameter. Approximate borehole depths are expected to range between 100 and 800 feet bgs as summarized in Table 2. The exact depth of boreholes shall be determined in the field by the OWNER. A borehole diameter that meets radial thickness requirements for monitoring wells, per California Well Standards shall be selected by the CONTRACTOR and approved by the OWNER.

[1] https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=GOV&division=5.&title=1.&part=&chapter=3.1.&article=2.

- **The bid for Bid Item No. 4a** (**Alternate**) "Borehole Drilling – 4-inch diameter well" shall be made at the unit price bid per linear foot.
- **The bid for Bid Item No. 4b (Base Bid)** "Borehole Drilling – 2-inch diameter wells" shall be made at the unit price bid per linear foot.

2.7.1 Direct Rotary Drilling

Direct rotary drilling uses drilling fluid to maintain an open borehole during boring and well completion. The CONTRACTOR is responsible for determining the need for a temporary or permanent surface casing. If a permanent surface casing is used, the details of its installation must be approved by the OWNER prior to installation. No additional compensation will be provided for surface casing installation unless otherwise agreed to by the OWNER.

A drilling and fluid system description shall be provided for OWNER approval. Drilling with clear water alone shall not be permitted. The drilling and fluid system description shall include the types of fluid, weights, viscosities, sand and solids contents, water loss control, and the name of the drilling fluid supplier. Potable water shall be used to mix a polymer or bentonite-based drilling fluid designed to adequately maintain the bore wall, minimize invasion of drilling fluid into the formation, and permit recovery of representative samples of cuttings. Soda ash may be used to increase pH of the water used to mix drilling fluids. The drilling fluid shall possess such characteristics that it can be readily removed from the borehole during well development.

Surface containment (i.e., tanks and/or bins) for drilling fluids shall be required; excavation of on-site drilling fluid pits will not be permitted. Drill cuttings and fluids removed from tanks shall be stored and contained on site for removal. Upon completion of drilling operations and well construction, all fluids shall be removed from the site and legally disposed of by the CONTRACTOR.

It is the responsibility of the CONTRACTOR to ensure that the sizing and configuration of the fluid system, mechanical separator and/or settling tanks are adequate to meet the drilling fluid properties outlined below. In the event the CONTRACTOR cannot attain these properties, drilling shall be halted and the mud replaced at no cost to the OWNER. Proper control of the drilling fluid must remain in compliance with these specifications, and the CONTRACTOR may be required to retain or employ an experienced, qualified Drilling Fluid (Mud) Engineer to supervise and maintain drilling fluid characteristics at no cost to the OWNER.

The methods and materials that the CONTRACTOR would utilize in the event of borehole stability problems and/or loss of circulation must be approved by the OWNER. In no case shall materials be added to the drilling fluid system or drill hole without prior approval of such

materials by the OWNER. Addition of unapproved materials to the drill hole or fluid system may result in OWNER rejection of the well.

The CONTRACTOR must provide Standard American Petroleum Institute (API) measurement devices in proper working order at the drilling site at all times, along with qualified operating personnel to determine drilling fluid properties. Drilling fluid properties should be measured and comply with API Code RP 13B (or recent modification) "Recommended Standard Procedures for Testing Drilling Fluids". The following drilling fluid and borehole properties shall be routinely measured and addressed if measurements are out of specifications:

1. Weight – maximum of 9.2 pounds per gallon
2. Viscosity – minimum of 28 and maximum of 32 seconds measured using Marsh Funnel
3. Sand content – maximum 1% by volume
4. Borehole water loss – maximum 30-minute water loss of 15 cubic centimeters
5. Borehole wall cake thickness – maximum thickness of 2/32 inches
6. pH less than 9.0

Drilling fluid entering the mud pump or leaving the circulation tank must be recorded by the CONTRACTOR at a minimum of 4-hour intervals, or every 100 feet of drilling, or whenever conditions appear to change or problems arise. The CONTRACTOR shall maintain a log showing the drilling fluid properties, date, time, depth, and any other pertinent comments.

Immediately prior to monitoring well construction, the CONTRACTOR shall complete a wiper pass to the total depth of the original borehole, unless the OWNER approves otherwise. Completion of the wiper pass shall be done at no additional cost to the OWNER. Wiper pass completion may begin during the design period but should be coordinated such that well construction can begin as soon as possible after the completion of the wiper pass. Prior to placement of the filter pack in the well, the drilling fluid shall be thinned as appropriate with potable water to reduce weight and viscosity.

2.7.2 Rotosonic Drilling

Potable water is the only drilling fluid permitted for rotosonic drilling. The CONTRACTOR shall measure the volume of water introduced during drilling and report values to the OWNER at the completion of each well. Prior to installation of a monitoring well the CONTRACTOR shall remove accumulated drilling slough at the bottom of the well using the core barrel. The CONTRACTOR shall install the monitoring well within the outer casing (as necessary). Outer casing shall be removed without rotation in order to prevent damage to the installed well.

2.7.3 Hollow Stem Auger Drilling

No drilling fluids shall be permitted with this method. Either a wooden plug (or similar inert material) shall be placed in the lead auger and knocked out before installation of the well, or a center bit shall be placed on the lead auger. The CONTRACTOR shall remove the auger flights without rotation in order to prevent damage to the installed well.

2.8 Drill Cuttings Samples

The CONTRACTOR shall collect and preserve 1 set of representative drill cutting samples at a minimum 10-foot interval during boring advancement. Samples shall be collected in heavy weight plastic bags or sleeves and labeled with the sample depth interval. The OWNER must approve the collection method before samples are collected.

Drilling method-specific sampling considerations are as follows:

- Direct rotary: Samples shall be collected from the shaker table.
- Rotosonic: Samples shall be collected nominal 4-inch diameter continuous coring.
- Hollow Stem Auger: Samples shall be collected from drill cuttings lifted in the auger flights.

2.9 Geophysical, Caliper, and Deviation Survey (Bid No. 5)

A geophysical, caliper, and deviation survey shall be completed by OWNER option prior to well installation at deep well SMGWA-1.

The CONTRACTOR shall provide the name and qualifications of the proposed geophysical, caliper, and deviation logging subcontractor for OWNER review. The borehole surveys shall include measurements of:

- Spontaneous potential
- Electrical resistivity (single-point, 16-inch normal, 64-inch normal, and focused guard)
- Natural gamma ray
- Sonic Velocity
- Borehole diameter

The CONTRACTOR shall ensure that the borehole is properly conditioned by circulating drilling fluids in preparation for geophysical logging, and that the borehole is continually filled

with fluid during logging operations. Standby time shall not be paid for additional cleaning and conditioning of the pilot borehole to enable logging operations to proceed. If the logging probe fails to descend to the desired depth, the CONTRACTOR, at their own expense, shall condition the borehole to permit the logging probe to descend to the bottom of the hole. If the caliper and deviation survey shows the borehole to be less than the specified diameter(s) or the borehole is less than the specified depth, the borehole shall be re-reamed or re-drilled and resurveyed at the CONTRACTOR's expense.

The CONTRACTOR shall provide field hardcopies and digital versions of the surveys. Survey logs shall have a vertical scale of 50 feet per inch and horizontal scale appropriate to the log type and response values.

The bid for Bid Item No. 5 "Geophysical, Caliper, and Deviation Survey" shall be made at the lump sum.

2.10 Well Design

The OWNER will interpret the depth to first groundwater, lithology, drilling characteristics, and any other information collected from the borehole and other nearby wells to design the monitoring wells. The OWNER will provide the final well design for SMGWA-1 within 48 hours of receiving electronic submittals of the geophysical, caliper, and deviation surveys. The OWNER will provide the final well design for all other monitoring wells within 1 business day after total depth is reached.

2.11 Well Construction

A summary of anticipated boring depths and well construction details is provided in Table 2. General schematic diagrams of 2- and 4-inch monitoring wells are shown on Figures 11 and Figure 12, respectively. Preliminary conceptual designs are provided for bidding purposes only and are subject to change by OWNER based on information obtained during drilling.

Table 2. Anticipated Boring and Well Depths

Well ID	Total Boring Depth	Sanitary Seal Depth	Screen Top Depth	Screen Bottom Depth	Screen Length
	← feet bgs →				feet
SMGWA-1 (Alternate 1)	800	735	750	790	40
SMGWA-2	80	40	55	70	15
SMGWA-3	300	260	275	290	15
SMGWA-4	100	60	75	90	15
SMGWA-5	200	160	175	190	15
SMGWA-6	300	260	275	290	15
SMGWA-7	300	260	275	290	15
SMGWA-8	200	160	175	190	15

Note: All depths are subject to change based on field conditions.

SMGWA-1 shall be installed with 4-inch nominal diameter Schedule (Sch) 80 polyvinyl chloride (PVC) well casing and screen. The remaining monitoring wells shall be installed with 2-inch nominal diameter Sch 40 PVC well casing and screen.

The well casing and screen shall be plumb and centered in the hole. The casing shall be suspended in tension from the surface by means of an appropriate hanger or clamp. Centering guides shall be affixed to the top and bottom of the well screen and at intervals of not more than 80 feet within the blank casing. If the boring is over drilled, the annular space below the well may be backfilled with bentonite pellets, grout, pea gravel and/or filter pack. The OWNER and County Environmental Health shall approve backfill materials and depths for an over drilled boring prior to placement by the CONTRACTOR.

Filter pack shall be placed in the annular space around the well screen, from the bottom of the boring to at least 3 feet above the screened interval. Following placement of the filter pack to the depth specified in the final well design, a surge block or similar shall be used across the well screen to settle the filter pack. The CONTRACTOR shall measure the level of the filter pack and continue surge activities until no measurable change in the filter pack level is noted. Additional filter pack shall be added, as needed, to comply with the final well design**.** A maximum 5-foot layer of transition sand shall be placed above the filter pack to separate the cement seal from the filter pack.

Sealing material shall be placed by the CONTRACTOR only with explicit approval of County Environmental Health and the OWNER. An annular sand cement grout seal shall be placed above the transition seal to within 2 feet of the ground surface. Sealing material shall be installed by hydraulically pumping through the tremie pipe from the top of the transition sands upwards to ground surface in a manner that prevents freefall, bridging or separation. Placement shall be completed in one continuous operation, where feasible. The CONTRACTOR shall place sealing material in a manner which does not cause damage to the well casing. For deep seals, care must be taken to ensure exothermic reactions in sealing material do not negatively impact collapse strength of the well casing and cause deformation or failure. Mitigation through methods such as multiple pours, addition of retardants, or circulation of fresh water should be utilized as deemed necessary by the CONTRACTOR and approved by the OWNER.

2.12 Materials for Well Installation

The CONTRACTOR shall provide all well construction supplies, including a reasonable amount of additional casing, screen, and annular materials to accommodate field design changes. Materials used for well construction must be approved in advance by the OWNER.

2.12.1 Well Casing (Bid No. 6a and 6b)

Flush threaded well casing and screen shall be procured by the CONTRACTOR from a single manufacturer. Casing shall be threaded and intended for use in water wells in accordance with ASTM F480. Male threads shall include a rubber O-ring to ensure water tightness. Casing lengths shall accommodate a variety of well design considerations. Casing shall be provided in 10- to 20-foot-long sections and a cellar with a threaded end cap shall be provided in 5 to 10-foot sections. The upper 2 feet of blank casing below grade shall be 4-inch diameter to accommodate groundwater level monitoring equipment. To accommodate this design, the 2-inch diameter monitoring wells will have a 4-inch to 2-inch reducer installed at least 2 feet below the ground surface.

- **The bid for Bid Item No. 6a (Alternate)** "Blank Casing and Threaded End Cap – 4-inch diameter, Sch 80" shall be made at the unit price bid per linear foot.
- **The bid for Bid Item No. 6b** (**Base Bid**) "Blank Casing, Threaded End Cap, and 4-inch to 2-inch Reducer – 2-inch diameter, Sch 40" shall be made at the unit price bid per linear foot.

2.12.2 Well Screen (Bid No. 7a and 7b)

The CONTRACTOR shall provide 4-inch diameter, Sch 80 PVC machine slot well screen for SMGWA-1 and 2-inch diameter Sch 40 PVC machine slot well screen for the remaining wells. The screened casing shall have 0.040-inch-wide horizontal machine-cut slots at ¼-inch spacing.

The CONTRACTOR shall provide well screen in 5- and 10-foot sections. Other well screen specifications are identical to the well casing specifications described in the previous section.

- **The bid for Bid Item No. 7a (Alternate)** "Well Screen – 4-inch diameter, Sch 80, 0.04-inch slot" shall be made at the unit price bid per linear foot.
- **The bid for Bid Item No. 7b (Base Bid)** "Well Screen – 2-inch diameter, Sch 40" shall be made at the unit price bid per linear foot.

2.12.3 Centralizers (Bid No. 8a and 8b)

The CONTRACTOR shall install centralizers above and below the screened interval and at 80-foot intervals along the casing to the surface in each well. Guides shall be designed to have minimum bore wall contact of 4 inches and extend from the casing not less than 2 inches.

- **The bid for Bid Item No. 8a (Alternate)** "Centralizers – 4-inch diameter well" shall be made at the lump sum bid per centralizer.
- **The bid for Bid Item No. 8b (Base Bid)** "Centralizers – 2-inch diameter well" shall be made at the lump sum bid per centralizer.

2.12.4 Filter Pack (Bid No. 9a and 9b)

The CONTRACTOR shall place filter pack in the annular space around the well screen. Filter pack materials shall be 8 x 16 gradation for bidding purposes. Filter pack materials shall be hard, water worn, and washed clean of silt, dirt, and foreign matter. The CONTRACTOR shall install a maximum 5-foot layer of #60 plaster sand transition immediately above the top of the filter pack to separate the cement seal from the filter pack.

- **The bid for Bid Item No. 9a (Alternate)** "Filter Pack – 4-inch diameter well" shall be made at a unit price bid per linear foot.
- **The bid for Bid Item No. 9b (Base Bid)** "Filter Pack – 2-inch diameter well" shall be made at a unit price bid per linear foot.

2.12.5 Sanitary Seal (Bid No. 10a and 10b)

The CONTRACTOR shall either procure batch-mixed cement or mix cement on site for completing the sanitary seal in conformance with County permitting requirements. Batch-mixed cement shall be 10.3-sack sand cement. Site-mixed cement shall be 94 pounds of Type II-V Portland cement to 5 to 7 gallons of potable water. The CONTRACTOR may include less than 5% bentonite powder in the grout mixture.

- **The bid for Bid Item No. 10a (Alternate)** "Sanitary Seal – 4-inch diameter well" shall be made at a unit price bid per linear foot.
- **The bid for Bid Item No. 10b** (**Base Bid**) "Sanitary Seal – 2-inch diameter well" shall be made at a unit price bid per linear foot.

2.13 Well Development (Bid No. 11)

The CONTRACTOR shall develop each well using a combination of swabbing, airlifting, and pumping. The CONTRACTOR shall commence development not less than 24 hours and no more than 48 hours after placing the grout seal. The CONTRACTOR shall monitor and record pumping water level, pumping rate and total volume pumped from the well. The OWNER will determine when the well is sufficiently developed.

The CONTRACTOR shall mechanically develop each well by surging and airlifting sediment. The CONTRACTOR shall use an open-ended, single-swab surge block to surge and airlift heavy drilling muds and solids from the well. Surging and airlifting shall be completed from the top of the well screen to the bottom and shall be performed until measurable solids are no longer present in the bottom of the well.

After mechanical development is complete the CONTRACTOR shall perform pump development on each well. The CONTRACTOR shall furnish and install a submersible pump and complete pump development for not less than 5 borehole volumes. Water quality parameters including electric conductivity, oxidation reduction potential, pH, temperature, and turbidity shall be measured at 10-minute increments throughout pump development, which shall continue until at least 3 consecutive parameter measurements produce consistent results as approved by the OWNER. If the depth to groundwater is too deep to operate a submersible pump than the CONTRACTOR will complete well development by airlifting until approved by the OWNER.

The OWNER will collect a groundwater quality sample from the pump discharge at each well at the end of development. The CONTRACTOR will help collect sample(s) with a bailer if the depth to groundwater is too deep to operate a submersible pump.

The CONTRACTOR is responsible for the containment, hauling, and disposal of purged groundwater during well development. Excess drilling fluid and initial development water which contains drilling fluids shall be contained on site and legally disposed of offsite.

The bid for Bid Item No. 11 "Well Development" shall be made at a lump sum price for each well site.

2.14 Surface Completions (Bid No. 12)

The CONTRACTOR shall install a 12-inch diameter (round) Morrison Brothers Test Well Manhole Cover (or OWNER approved equivalent) lockable and watertight traffic-rated well vault. Each vault shall be bolt-down style, include a steel skirt, and a watertight gasket. Well vaults shall be installed to allow surface water to flow away from the well but shall not be set at a height that poses a hazard to pedestrians or vehicle traffic. Vaults shall be set in a concrete pad approximately 2.5-feet on each side and in conformance with encroachment permit or OWNER access agreement requirements. Lampblack may be required to match surrounding asphalt color. Well vaults shall be placed such that the well casing is centered and approximately 8-inches below completed grade. Each well casing shall be fit with a lockable, water-tight compression well cap. Locks will be provided by the OWNER.

The bid for Bid Item No. 12 "Surface Completions" shall be made at a lump sum bid for each drilling site.

2.15 Drilling Waste Management (Bid No. 13)

The CONTRACTOR shall contain and dispose of all soil and rock cuttings, excess grout, and purged groundwater produced during drilling and well installation. The CONTRACTOR should thoroughly clean downhole equipment between borings to prevent cross-contamination between boreholes.

The bid for Bid Item No. 13 "Drilling Waste Management" shall be made as a lump sum bid for each well site.

2.16 Well Survey

The OWNER will be responsible for surveying the wells after installation.

3 OTHER GENERAL CONSIDERATIONS

3.1 Access

The OWNER shall maintain reasonable access to each drilling site, including acquiring access agreements and County encroachment permits.

3.2 Security

Site security is the responsibility of the CONTRACTOR and shall be maintained throughout the course of work. The CONTRACTOR shall prevent access of unauthorized persons or animals into the drilling site using temporary fencing, signage, cones, and/or caution tape. The CONTRACTOR shall place a plate or cap over an open boring to secure the site when the drill rig is moved. The CONTRACTOR shall be responsible for overnight security to oversee the protection of their equipment and supplies, as necessary. The OWNER will not be responsible for any lost or damaged equipment due to vandalism. The OWNER will provide a secure off-site location for long term storage of supplies and equipment for the duration of the drilling project.

3.3 Health and Safety

The CONTRACTOR shall compile a Health and Safety Plan for their scope of work. All work related to drilling and well construction shall be conducted in accordance with the CONTRACTOR Health and Safety Plan.

3.3.1 Training and Records

The CONTRACTOR shall be responsible for assuring that staff have documented training appropriate to their job descriptions. Training and safety documentation shall be assessed by the OWNER during the procurement process.

3.3.2 Safety Equipment

The CONTRACTOR shall maintain safety equipment inspection records, an operable fire extinguisher, and first aid kit on site at all times.

3.3.3 Personal Protection

The CONTRACTOR shall be responsible for complying with their Health and Safety Plan and supplying all materials and equipment required to maintain compliance. The CONTRACTOR should be expected to wear protective equipment that includes, but is not limited to the following:

- Hard hat
- Reflective, high-visibility clothing
- Safety glasses with side shields
- Protective gloves for the task
- Steel-toed boots
- Ear protection

3.4 Sanitation

The CONTRACTOR shall provide and maintain adequate sanitation facilities (i.e., porta potty and handwashing station) appropriate to the number of personnel working on site. No more than 5 people are anticipated to be on site at any time.

3.5 Construction Water

Water used for drilling and well construction purposes will be provided by the OWNER. The CONTRACTOR shall be responsible for conveying potable water from OWNER fire hydrants or filling stations to points of use. The CONTRACTOR shall request OWNER approval prior to using a hydrant and shall furnish and install a hydrant meter, measure, and report water use to the OWNER.

3.6 Spills, Leaks, and Releases

The CONTRACTOR shall not cause release of any hazardous or nuisance substances to the environment and, if such release occurs, shall be responsible for all costs associated with remedial or corrective actions to mitigate the release. For example, CONTRACTOR shall maintain equipment to prevent leaks of fuel, lubricants, or hydraulic fluid and shall begin the project with appropriate containment in place for any equipment suspected or reasonably anticipated to cause such leaks. If such leaks occur, the CONTRACTOR shall remove and properly dispose affected soil and place and maintain appropriate containment to prevent further impacts.

3.7 Standby Time

CONTRACTOR'S bid proposal shall include standby time. CONTRACTOR will not be separately compensated for standby time.

3.8 Annular Seal Inspection

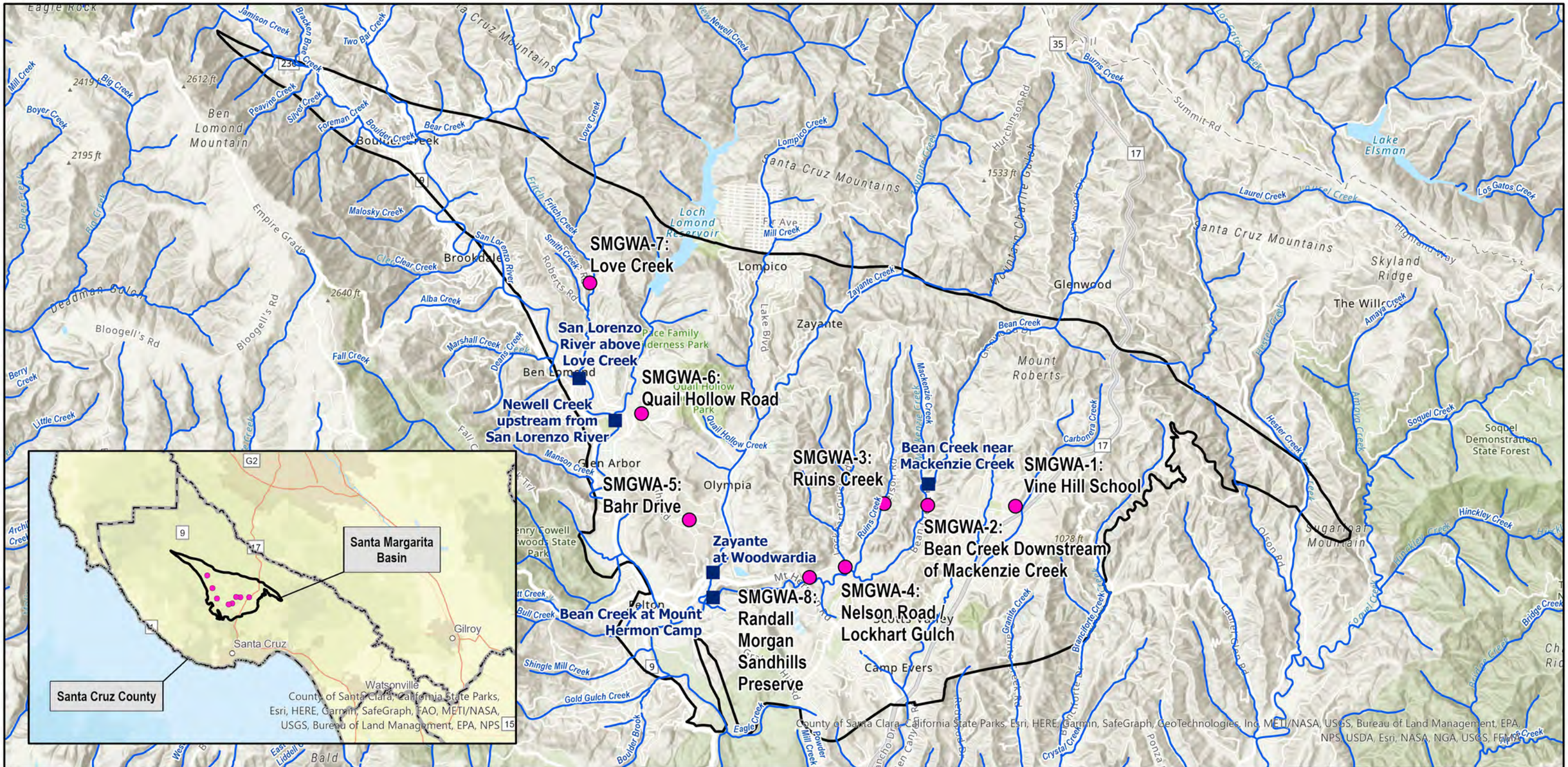
A County Environmental Health inspector is required to witness well installation annular sealing operations and requires 48-hour advance notice of intent to grout. The CONTRACTOR shall communicate the anticipated date and time of day when annular seal placement is expected to occur with the OWNER and County Environmental Health and schedule a confirmed appointment with a County Environmental Health grout inspector. CONTRACTOR'S bid proposal shall include standby time. CONTRACTOR will not be separately compensated for standby time.

3.9 Drilling Reports

The CONTRACTOR shall maintain a detailed driller's report and provide it to the OWNER on a daily basis. Within 1 week of completion of each borehole and/or well, the CONTRACTOR shall furnish a complete description of number of feet drilled, number of hours on the job, number of shutdowns due to breakdown, feet of casing set, quantity of materials used as part of advancement of the borehole or well installation, and other pertinent data as may be requested by the OWNER. All measurements for depths shall be referenced to existing ground surface at the well site.

3.10 Submittals

Required submittals are listed and described in Appendix A. The CONTRACTOR shall be responsible for receiving acceptance for all required equipment and information referenced elsewhere in these Technical Specifications. All submittals required from the CONTRACTOR shall be considered part of the scope of work. Submittal documents shall be provided to the OWNER within the time frames listed in Appendix A. All submittals are subject to acceptance by the OWNER; submittal requirements shall be satisfied upon acceptance. Premobilization submittals must be accepted by the OWNER prior to the CONTRACTOR mobilizing equipment to the work site.



EXPLANATION

- SMGWA Monitoring Wells
- County of Santa Cruz Active Streamflow Gage
- Santa Margarita Basin
- Stream

N

0 1 2 3 4

Miles

Santa Margarita Basin
Santa Cruz County, California

Figure 1. SMGWA Monitoring Well Locations

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F1_MW_Locations_v2.aprx

SMGWA-1:
Vine Hill School
(-121.9979, 37.0683)
800 ft deep

Site Boundary
APN: 023-101-02

Tabor Dr
Bethany Dr
Carbonera Creek
Scotts Valley Dr
Highway 17
Vine Hill School Rd
17

EXPLANATION
- Vine Hill School Monitoring Well
- Parcel Boundary
- Subject Parcel
- Stream

N

0 75 150 225 300
Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 2. SMGWA-1: Vine Hill School Monitoring Well

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F2_SMGWA_1_VineHillSchool_Location.aprx

SMGWA-2:
Bean Creek Downstream of Mackenzie Creek
(-122.0159, 37.0682)
80 ft deep

Bean Creek Rd

Bean Creek

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EXPLANATION

- Bean Creek Downstream of Mackenzie Creek Monitoring Well
- Parcel Boundary
- Stream

N

0 75 150 225 300

Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 3. SMGWA-2: Bean Creek Downstream of Mackenzie Creek Monitoring Well

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F3_SMGWA_2_BeanCkDsMackenzieCk_Location.aprx

Nelson Rd

Ruins Creek

Nelson Rd

Ruins Creek

SMGWA-3:
Ruins Creek
(-122.0248, 37.0684)
300 ft deep

Ruins Creek

Nelson Rd

EXPLANATION

- Ruins Creek Monitoring Well
- Parcel Boundary
- Stream

N

0 75 150 225 300

Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 4. SMGWA-3: Ruins Creek Monitoring Well

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F4_SMGWA_3_RuinsCreek_Location.aprx

SMGWA-4:
Nelson Road / Lockhart Gulch
(-122.0326, 37.0578)
100 ft deep

Lockhart Gulch Rd

Nelson Rd

Ruins Creek

Bean Creek

Bean Creek

Bean Creek

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EXPLANATION

- Nelson Road / Lockhart Gulch Monitoring Well
- Parcel Boundary
- Stream

N

0 90 180 270 360

Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 5. SMGWA-4: Nelson Road / Lockhart Gulch Monitoring Well

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F5_SMGWA_4_NelsonRd_Location.aprx

El Alamein Rd

Bahr Dr

Bahr Dr

SMGWA-5:
Bahr Drive
(-122.0648, 37.0652)
200 ft deep

Bahr Dr

Bahr Dr

Kim Way

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EXPLANATION

- Bahr Drive Monitoring Well
- Parcel Boundary

N

0 75 150 225 300

Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 6. SMGWA-5: Bahr Drive Monitoring Well

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F6_SMGWA_5_BahrDrive_Location.aprx

EXPLANATION

- Quail Hollow Road Monitoring Well
- Parcel Boundary
- Subject Parcel
- Stream

N

0 90 180 270 360

Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 7. SMGWA-6: Quail Hollow Road Monitoring Well

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F7_SMGWA_6_QuailHollowRoad_Location.aprx

Spring Ave
Love Creek Rd
Love Creek Rd Love Creek Rd
Love Creek
Vineland Rd
Vineland Rd
Ridge Rd
Ridge Rd
Parcel Boundary
APN: 076-192-19
Love Creek Rd
Love Creek
SMGWA-7:
Love Creek
(-122.0859, 37.1038)
300 ft deep
Vineland Rd
Vineland Rd
Rd
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EXPLANATION

- Love Creek Monitoring Well
- Parcel Boundary
- Subject Parcel
- Stream

N

0 75 150 225 300

Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 8. SMGWA-7: Love Creek Monitoring Well

2022

MONTGOMERY & ASSOCIATES

Path: H:\Santa_Margarita_Basin\9060.16_MonNetworkEnhancement\GIS\Tech_Spech_Figures\F8_SMGWA_7_LoveCreek_Location.aprx

EXPLANATION

- Randall Morgan Sandhills Preserve Monitoring Well
- Parcel Boundary
- Subject Parcel
- Stream

N

0 150 300 450 600

Feet

Santa Margarita Basin
Santa Cruz County, California

Figure 9. SMGWA-8: Randall Morgan Sandhills Preserve Monitoring Well

2022

MONTGOMERY & ASSOCIATES

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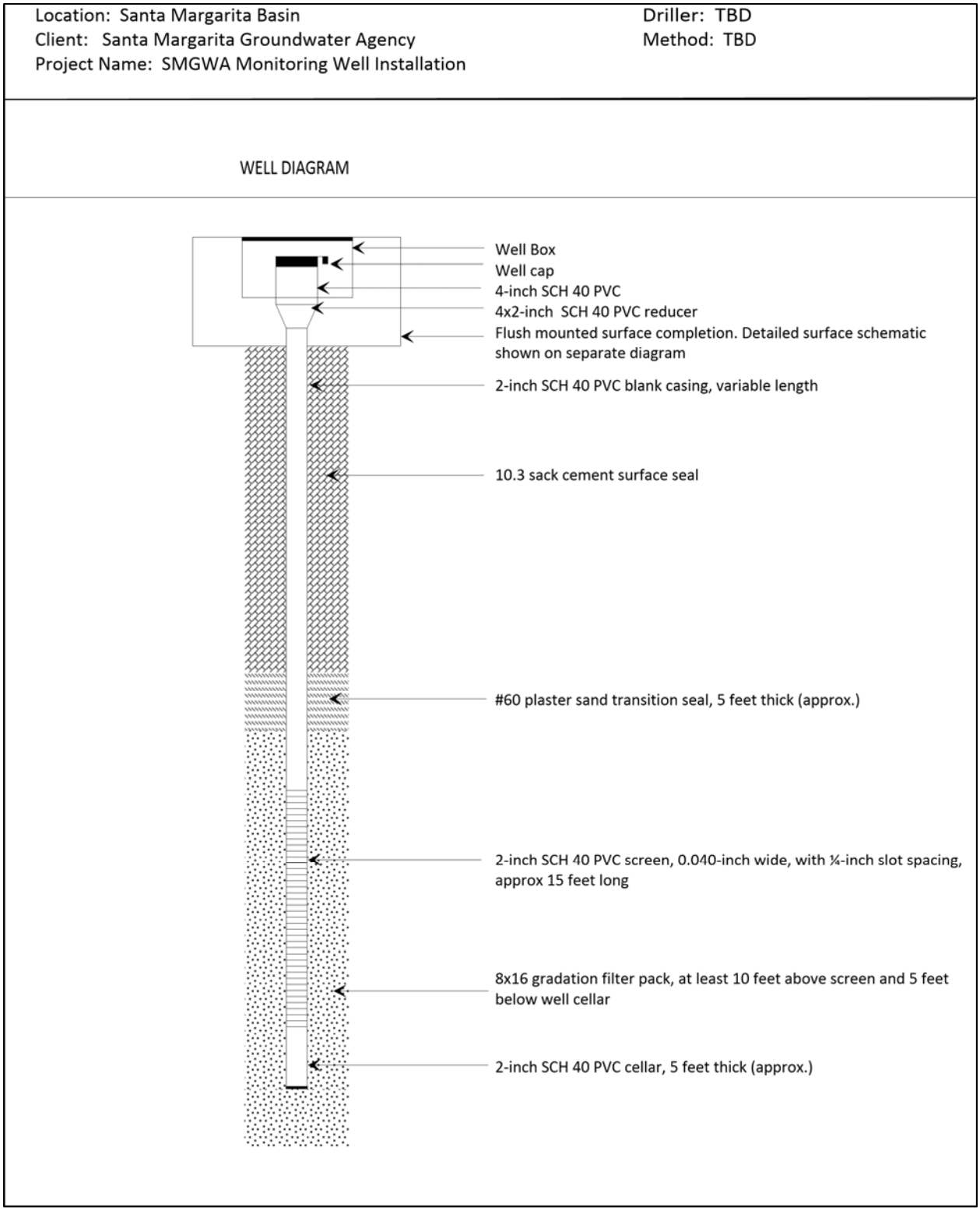

Figure 10. SMGWA Shallow Monitoring Well Schematic

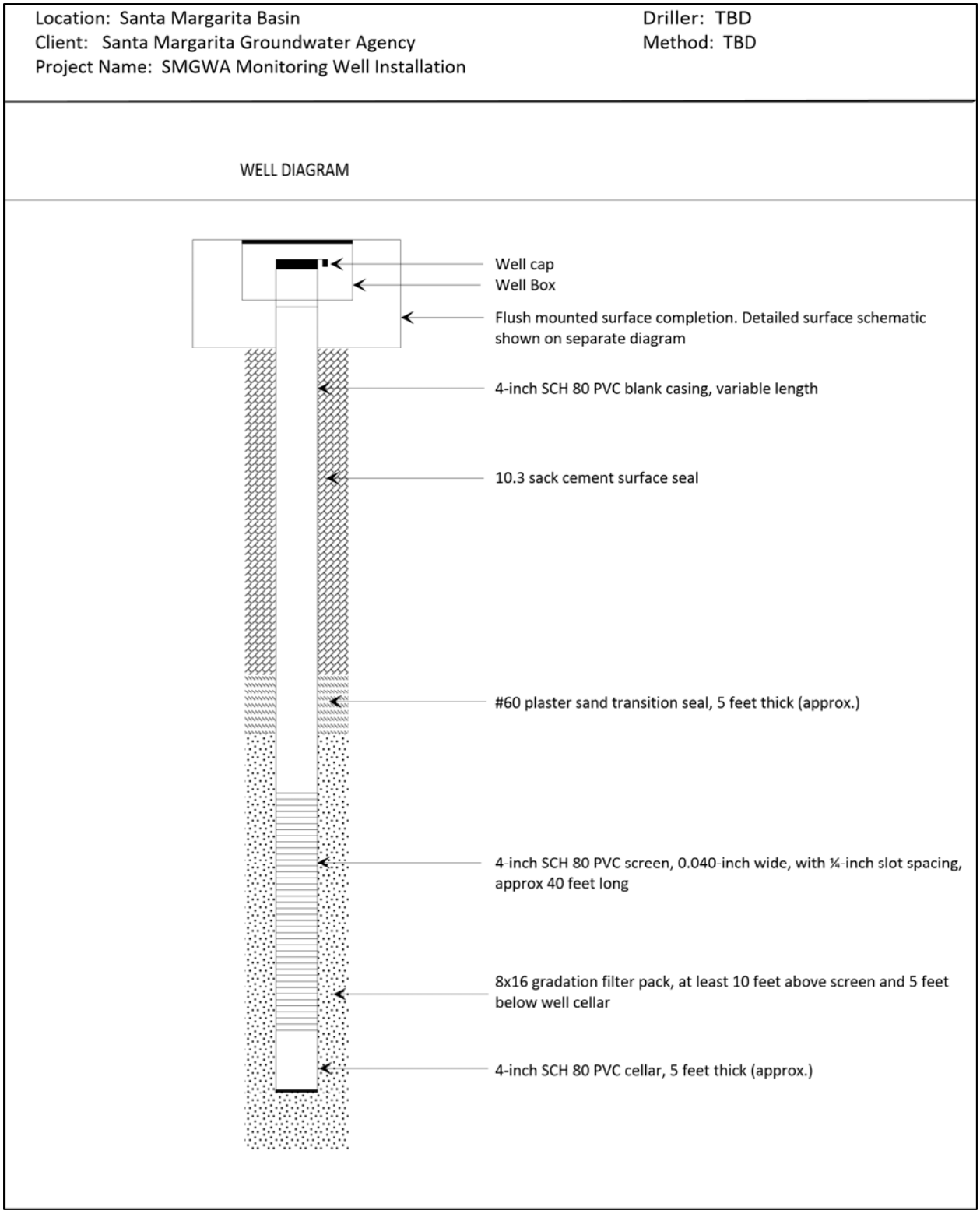

Figure 11. SMGWA Deep Monitoring Well Schematic

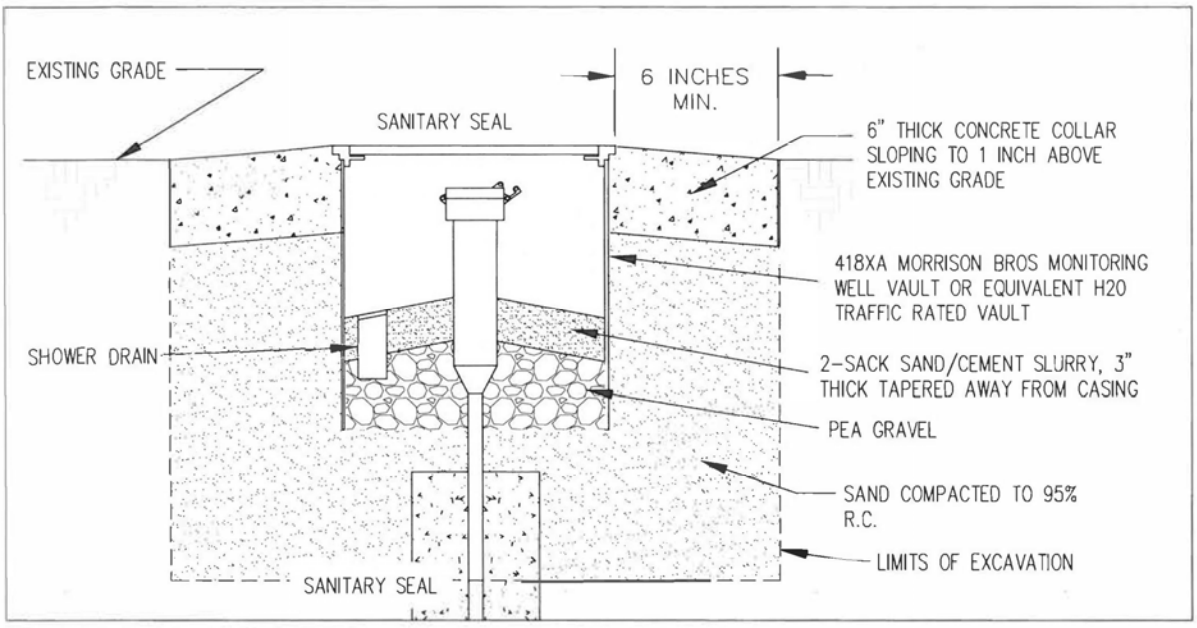

Figure 12A. Typical Monitoring Wellhead Completion Detail

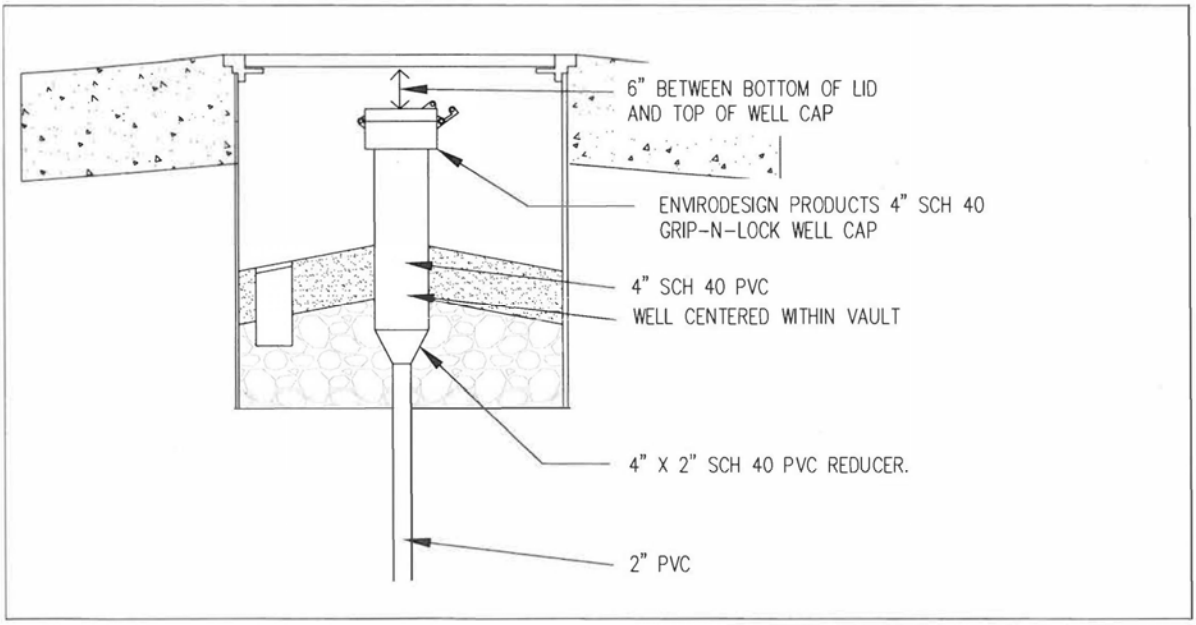

Figure 12B. Wellhead Material and Spacing

Appendix A

Required Submittals

Submittal	Specifications Sections	Due
A scale drawing of drill rig, drilling waste containment, and support equipment layout	2.1	Prior to mobilization
Description and layout of the drilling and fluid system (only direct rotary drilling)	2.1	Prior to mobilization
The name and qualifications of the firm proposed for traffic control, if other than CONTRACTOR	2.5	Prior to mobilization
Traffic Control Plan	2.5	Prior to mobilization
The name and qualifications of the firm proposed for completing borehole clearance, if other than CONTRACTOR	2.6	Prior to mobilization
The name and qualifications of the proposed mud engineer, if other than CONTRACTOR	2.7	Prior to mobilization
Drilling fluid property log	2.7	Daily during drilling
Formation samples every 10 feet	2.8	As collected
The name and qualifications of the firm proposed for completing geophysical surveys	2.9	Prior to mobilization
Copies of the geophysical survey logs	2.9	Within 12 hours of completion
The name and qualifications of the firm proposed for completing caliper and alignment surveys	2.9	Prior to mobilization
Copies of the caliper and alignment survey logs	2.9	Within 12 hours of completion
Manufacturer, type and material of well casing, screen, and centralizers	2.12	Prior to mobilization
Type and content of filter pack and sealing material	2.12	Prior to mobilization
Cement weight tickets	2.12	Upon arrival to site
Well development data field logs	2.13	Daily during development
Manufacturer and model of well vault	2.14	Prior to mobilization
Hydrant water use reports	3.5	Daily during drilling
Daily progress logs	3.9	Daily during drilling