TRUCKEE MEADOWS WATER AUTHORITY

1355 Capital Boulevard, Reno, Nevada 89502 www.tmwa.com P.O. Box 30013, Reno, Nevada 89520-3013

Addendum No. 1

Innovation Well and Army Aviation Well
Drilling, Construction, Development and Testing

PWP Bid No. WA-2015-235

July 16, 2015

The following information, clarifications, changes and modifications are by reference incorporated into the bid documents for the above referenced project. Any work item or contract provision not changed or modified will remain in full force and effect.

Summary of Addendum Items:

1. **Bid Schedules:** Based on equipment and constructability concerns, it was determined that the borehole diameters needed to be increased slightly.
   Response: The Bid Schedules have been revised to reflect the increased borehole diameters. Bidders are directed to replace the bid schedule pages 3-9 with the attached revised sheets.

2. **Technical Specifications Cover Sheet:** The Technical Specifications for this project did not include a cover sheet stamped by a registered engineer.
   Response: A stamped and signed cover sheet has been provided and is attached. Bidders are directed to insert the sheet before the Technical Specifications section of the Bid Documents.

3. **Technical Specifications 33211 also referred to in The Table of Contents as "Water Supply Wells Drilling and Construction":** Some revisions to the Technical Specifications have been made based on Washoe County Health Department review, and on the increased borehole diameters noted above.
   Response: Bidders are directed to replace the entire Section 33211 Technical Specification sheets and figures with the attached revised pages. These pages supersede the pages they replace.

Bidders shall familiarize themselves with all changes to the Bid Documents and shall make all appropriate adjustments to their final bids.

END OF ADDENDUM #1

REVISED BID SCHEDULES (7/16/15)

PWP #: PWP-WA-2015-235
BID TITLE: **Innovation Well and Army Aviation Well Drilling, Construction, Development and Testing**

NOTICE: No substitution or revision to this Bid Schedule form will be accepted. Truckee Meadows Water Authority will reject any Bid that is received that has changes or alterations to this document. Although the Prevailing Wages are provided in this bid document, the bidder is responsible to verify with the Labor Commissioner if any addendums have been issued. If different, the successful bidder will be required to provide the current Prevailing Wages used in preparation of their bid within 24 hours of bid submission.

PRICES must be valid for 30 calendar days after the bid opening.

A COPY OF THE "CERTIFICATE" of eligibility to receive a preference in bidding on public works issued to him/her by the State Contractors' Board and (if claiming Locals Preference) the Local's Preference Affidavit (provided above) must be submitted with his/her bid to the Contracts Division for the preference to be considered. These Statutes do not apply to projects expected to cost less than $250,000.

COMPLETION of this project is expected **PURSUANT TO CONTRACT DOCUMENTS**.

BIDDER acknowledges receipt of _____ Addendums.

Item pricing on this schedule is for use in preparing the schedule of values that will be used as a basis for partial payment during construction and for internal TMWA use. Item descriptions are not intended to be all inclusive. Bidders shall include costs for work not specifically mentioned in the most appropriate item.

Refer to Article 7 of the General Conditions for a list of items that may be included in the mobilization bid item. TMWA reserves the right to perform extra work using time and expense or negotiated lump sum procedures.

The Contract Sum will be adjusted (increased or decreased) for actual quantities per unit price items. Lump sum items will not be adjusted.

Compliance with all permit and environmental requirements is incidental to the Work. No separate bid item, or additional payment provisions, shall be made for operational constraints or conditions placed on the Work by permitting agency requirements.

_____
(signature)

SUMMARY

Description	Scheduled Value	Unit	Unit Price	Total Price
INNOVATION WELL				
1. Mobilization / demobilization: Innovation well site	1	$ Lump Sum		

Description	Scheduled Value	Unit	Unit Price	Total Price
2. Drill 34-inch borehole from ground surface to 40 ft, using auger rig or direct mud rotary drilling technique.	40	$ Per Foot		
3. Furnish and install 28-inch, 0.312-inch wall steel blank well casing.	40	$ Per Foot		
4. Furnish and install cement in the annulus between the casing and the borehole wall.	3	$ Per Cubic Yard		
*5. Drill nominal 26-inch diameter from 40 to a depth of 310 feet.	270	$ Per Foot		
6. Provide geophysical logging services: spontaneous potential, resistivity, and caliper.	1	$ Lump Sum		
7. Furnish and install nominal 14-inch 0.312-inch wall stainless steel blank well casing. Casing shall be stainless steel, type 304L, in accordance with applicable parts of ASTM A778.	200	$ Per Foot		
8. Furnish and install nominal 14 inch, 0.312-inch wall, 0.080-inch-slot wire-wrap stainless steel screen. The stainless steel screen shall be type 304L in accordance with applicable parts of ASTM A778.	100	$ Per Foot		
9. Furnish and install stainless steel casing centering guides at 40-foot intervals from 40 feet to total depth. (4 centering guides per interval).	7	$ Per Interval		
*10. Furnish and install one nominal 2.5-inch, stainless steel gravel feed tube with surface cap. The bottom opening of the tube shall be at 124 feet below ground surface.	126	$ Per Foot		
11. Furnish and install one nominal 2-inch, stainless steel water injection tube. The pipe shall be attached to a Roscoe Moss entrance chamber box welded to the 14-inch blank casing at 90 feet below ground surface.	92	$ Per Foot		
*12. Furnish and install one nominal 1.5-inch, stainless steel sounding tube. Tube shall connect to a Roscoe Moss chamber box (or other approved method) welded to the 14-inch casing 210 feet below ground surface.	212	$ Per Foot		
13. Furnish and install 1/8-inch X 1/4-inch gravel pack in the annulus between 26-inch borehole and 14 inch casing from 120 feet to 310 feet.	23	$ Per Cubic Yard		

Description	Scheduled Value	Unit	Unit Price	Total Price
14. Furnish and install bentonite pellet seal in the annulus between 26-inch borehole and 14 inch casing from 116 feet to 120 feet.	0.5	$ Per Cubic Yard		
15. Furnish and install neat cement seal in the annulus between 26-inch borehole and 14 inch casing from ground surface to 116 feet.	14	$ Per Cubic Yards		
16. Initial well development by a combination of methods including isolated swabbing with simultaneous airlift pumping, using high capacity compressor, 350 CFM and 150 psi.	40	$ Per Hour		
17. Furnish and install approximately 1,200 feet of temporary discharge pipe (of adequate size to discharge up to 1,200 gpm to Dry Creek) and all other water decanting and conveyance equipment during well development and testing.	1,200	$ Per Foot		
18. Hauling 43 cu. yards of borehole cuttings approx. 5 miles to TMWA Glendale facility.	6	$ Per Trip		
19. Furnish, install and remove 1,200 gpm test pump. Pump setting is estimated to be 125 feet below ground surface.	125	$ Per Foot		
20. Well development by surging and pumping with the test pump.	40	$ Per Hour		
21. Perform 8-hour step test and 72-hour constant flow pump test.	80	$ Per Hour		
22. Furnish, install and remove 3-inch steel pipe to 130 feet for running down the spinner flow tool	130	$ Per Foot		
23. Re-install the test pump to 125 feet and pump the well for spinner flow survey. TMWA will contract with the spinner survey contractor	10	$ Per Hour		
24. Perform video camera survey to check the integrity and exact depths of the casing and screen.	1	$ Lump Sum		
25. Well cleaning, disinfection, and capping with steel plate.	1	$ Lump Sum		

Description	Scheduled Value	Unit	Unit Price	Total Price
26. Temporary on-site waste facilities at the Innovation well site for two weeks.	1	$ Lump Sum		
27. Temporary on-site office during pumping tests at the Innovation well site for two weeks.	1	$ Lump Sum		
28. Standy hours for drilling and construction of the Innovation well, if requested by Owner.	10	$ Per Hour		
29. Perform plumbness and alignment test in the constructed Innovation well as per AWWA A100-97. A Gyroscopic Deviation survey Drift-Pac analysis or equivalent shall be performed by a contractor experienced in such surveys. A well which fails to meet AWWA A100-97 requirements for alignment or plumbness as specified herein may be rejected at TMWA's discretion.	1	$ Lump Sum		
Mobilization / demobilization: Innovation well site	1	$ Lump Sum		
TOTAL BID PRICE OF ITEMS 1 THROUGH 29 FOR THE INNOVATION WELL				
ARMY AVIATION WELL				
1. Mobilization / demobilization: from Innovation well site to Army Aviation well site.	1	$ Lump Sum		
2. Drill 38-inch borehole from ground surface to 40 ft, using auger rig or direct mud rotary drilling technique.	40	$ Per Foot		
3. Furnish and install 34-inch, 0.312-inch wall steel blank well casing.	40	$ Per Foot		
4. Furnish and install cement in the annulus between the casing and the borehole wall.	3	$ Per Cubic Yard		

Description	Scheduled Value	Unit	Unit Price	Total Price
5. Drill nominal 32-inch diameter borehole from 40 to a depth of 620 feet.	580	$ Per Foot		
6. Conduct borehole geophysical survey: spontaneous potential, resistivity, and caliper.	1	$ Lump Sum		
7. Furnish and install nominal 18-inch 0.375-inch wall stainless steel blank well casing. Casing shall be stainless steel, type 304L, in accordance with applicable parts of ASTM A778.	450	$ Per Foot		
8. Furnish and install nominal 18-inch, 0.375-inch wall, 0.090-inch-slot Ful Flo louvered stainless steel screen. The stainless steel screen shall be type 304L in accordance with applicable parts of ASTM A778.	160	$ Per Foot		
9. Furnish and install stainless steel casing centering guides at 40-foot intervals from 40 feet to total depth. (4 centering guides per interval).	14	$ Per Interval		
10. Furnish and install one nominal 3-inch, stainless steel gravel feed tube with surface cap. The bottom opening of the tube shall be at 304 feet below ground surface.	306	$ Per Foot		
11. Furnish and install two nominal 3-inch, stainless steel water injection tubes. The pipe shall be welded to a Roscoe Moss entrance chamber box on the 18-inch blank casing, 90 feet and 130 feet below ground.	184	$ Per Foot		
*12. Furnish and install one nominal 1.5-inch, stainless steel sounding tube. Tube shall connect to a Roscoe Moss chamber box (or other approved method) welded to the 14-inch casing 210 feet below ground surface.	360	$ Per Foot		
13. Furnish and install 1/8-inch x 1/4-inch gravel pack in the annulus between 32-inch borehole and 18-inch casing from 300 feet to 620 feet.	45	$ Per Cubic Yard		
14. Furnish and install bentonite pellet seal in the annulus between 32-inch borehole and 18-inch casing from 296 feet to 300 feet.	0.5	$ Per Cubic Yard		
15. Furnish and install neat cement seal in the annulus between 32-inch borehole and 18 inch casing from ground surface to 296 feet.	42	$ Per Cubic Yard		

Description	Scheduled Value	Unit	Unit Price	Total Price
16. Initial well development by a combination of methods including isolated swabbing with simultaneous airlift pumping, using high capacity compressor, 750 CFM and 300 psi.	65	$ Per Hour		
17. Furnish and install approximately 1,000 feet of temporary discharge pipe (of adequate size to discharge up to 2,500 gpm) and all other water decanting and conveyance equipment during well development and testing.	1,000	$ Per Foot		
18. Hauling 130 cu. yards of borehole cuttings approx. 12 miles to TMWA Glendale facility.	16	$ Per Trip		
19. Furnish, install and remove 2,500 gpm test pump. Pump setting is estimated to be 290 feet below ground surface.	290	$ Per Foot		
20. Well development by surging / pumping with test pump.	65	$ Per Hour		
21. Perform 8-hour step test and 72-hour constant flow pump test.	80	$ Per Hour		
22. Furnish, install and remove 3-inch steel pipe to 310 feet for running down the spinner flow tool	310	$ Per Foot		
23. Re-install the test pump to 290 feet and pump the well for spinner flow survey. TMWA will contract with the spinner survey contractor	10	$ Per Hour		
24. Perform video camera survey to check the integrity and exact depths of the casing and screen.	1	$ Lump Sum		
25. Well cleaning, disinfection, and capping with steel plate.	1	$ Lump Sum		
26. Temporary on-site waste facilities at the Army Aviation well site for two weeks.	1	$ Lump Sum		
27. Temporary on-site office during pumping tests at the Army Aviation well site for two weeks.	1	$ Lump Sum		

Description	Scheduled Value	Unit	Unit Price	Total Price
28. Standy hours for drilling and construction of the Army Aviation well, if requested by Owner.	10	$ Per Hour		
29. Perform plumbness and alignment test in the constructed Innovation well as per AWWA A100-97. A Gyroscopic Deviation survey Drift-Pac analysis or equivalent shall be performed by a contractor experienced in such surveys. A well which fails to meet AWWA A100-97 requirements for alignment or plumbness as specified herein may be rejected at TMWA's discretion.	1	$ Lump Sum		
TOTAL BID PRICE OF ITEMS 1 THROUGH 29 FOR THE ARMY AVIATION WELL				
TOTAL BID PRICE FOR BOTH WELLS: INNOVATION WELL AND ARMY AVIATION WELL				

Total Bid Price FOR BOTH Innovation and Army Aviation Wells Written in Words:

_____

Notes:

1. This project will be awarded in its entirety to one Contractor. Even if the bid for an individual site from another Contractor is low, the sites will not be separated for two Contractors. The lowest responsive responsible bidder for the total combined bid will be awarded the Contract.

TRUCKEE MEADOWS WATER AUTHORITY

1155 Corporate Blvd., Reno, Nevada 89502
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P.O. Box 30013, Reno, Nevada

Technical Specifications

Innovation Well and Army Aviation Well Drilling, Construction, Development and Testing

Project Number: 15-0018

Section
33211

WATER SUPPLY WELLS DRILLING AND CONSTRUCTION

PRODUCTION WELL DRILLING, CONSTRUCTION, DEVELOPMENT, AND TESTING

PART 1 GENERAL

A. SCOPE

This section includes a detailed description of production well construction work and requirements.

The work to be performed includes furnishing all labor, materials, transportation, tools, supplies, plant equipment and appurtenances, and incidentals to the project; the establishment of offices, buildings and other facilities necessary for work on the project; premiums or bonds and insurance; and for all other work and operations which must be performed or costs incurred before beginning work on various contract items; unless hereinafter specifically excepted, necessary to the complete and satisfactory construction, development and testing of two (2) water production wells:

- Innovation Well: 310 feet total depth, nominal 14-inch diameter production well.
- Army Aviation Well: 620 feet total depth, nominal 18-inch diameter production well.

Figure 1 shows the locations of the two production well sites. The sites are approximately 18 miles apart and within the TMWA water service area.

The two production wells shall be drilled by the Flooded Reverse Circulation method. Only threaded (not flanged) drill pipe is acceptable.

The geologic formations are expected to be unconsolidated fine- to coarse-grained material (clay, silt, sand, and gravel) throughout the borehole length at both locations.

All work and materials shall conform to the American Water Works (AWWA) A100-06 standards with supplemental standards as set forth in American Society for Testing and Materials (ASTM) 778 and 139 for the use of flooded reverse circulation drilling, and the American Welding Society (AWS), where appropriate.

B. MATERIALS

The drilling contractor shall provide all equipment, materials, and tools necessary to perform all work.

1. EQUIPMENT AND OPERATING REQUIREMENTS

TMWA shall have the right to approve or reject the types of drilling rig and equipment used, but approval will not remove the contractor's responsibility to furnish equipment to adequately complete the work in an efficient and timely manner, as specified herein. Equipment shall have sufficient capacity to adequately construct the wells, as specified herein, and shall include the following accessory equipment:

a. Portable, self-contained fluid circulation system with operational desanders and shale-shaker.

b. All appropriate pressure gauge(s).

c. Weight indicator.

d. Drill collars for added weight during early stages of drilling.

e. Plastic sheeting or drip pans will be placed under the drill rig and all motorized equipment associated with drilling operations, development pumping and test pumping to prevent soil contamination from the equipment.

f. The means to clean tires and equipment such that public streets are kept clean. Contractor shall keep all roads, utilized by contractor vehicles and equipment, clean to city/county requirements.

g. All materials used in the drilling, construction, development, and testing of the borings and wells shall be Certified Well Drilling Aids and Well Sealants as identified by the American National Standards Institute (ANSI)/NSF International (NSF) STD 60 and American Water Works Association (AWWA) A100 Standards and approved for public water supply wells. This includes but is not limited to lubricants, adhesives, foaming agents, well sealants, drilling fluids, drilling aids, and any other materials necessary to complete the work.

C. WORKMANSHIP

1. DRILLING FLUID CONTROL

It is expected that implementing the flooded reverse circulation method to drill the production wells will require minimal drilling fluid. The Contractor shall develop and provide a written drilling fluid program before mobilization to each drilling site. The drilling fluid program shall address all components of the non-invasive drilling appropriate for the flooded reverse circulation method, including but not limited to: portable pit size and design, mixing pumps and hopper to produce effective shear and velocity to settle out cuttings, mix volumes of all fluid components, appropriate methods for measuring fluid properties (weight, viscosity, sand content, cake thickness), and solids control equipment (desanders, desilters, shakers, centrifuges). The drilling

fluid shall contain additives that are recognized by the ANSI/NSF STD 60 and AWWA A100 Standards as appropriate for drilling in a fresh water aquifer. It is the Contractor's responsibility to maintain a fluid system containing a minimum of clay and fine sand so that any filter cake can be easily removed from the face of the borehole. In the event of a conflict between the fluid requirements for ease in drilling and the fluid requirements for protection of the aquifer, then the ruling requirements shall be those for aquifer protection.

All drilling fluid components and additives shall be approved by the Owner prior to use. If approved, components and additives shall be used according to manufacturer specifications. The Contractor is responsible for providing the necessary equipment and qualified personnel for performing all drilling fluid monitoring and measurements. **Copies of all recorded measurements will be supplied to the Owner.**

If in the opinion of the Owner that drilling fluid is not mixed in the best interest of aquifer protection, the Owner may require the Contractor to obtain the services of a qualified drilling fluid engineer. The Contractor shall be responsible for any payment required for the services of the engineer. The engineer shall be responsible for maintaining drilling fluids properties in a manner that protects the aquifer. The Contractor shall monitor and maintain the fluid properties as outlined by the engineer. In the event the Contractor cannot attain the required fluid properties, the fluid shall be replaced at no additional cost to the Owner.

2. PRODUCTION WELL DRILLING AND CONSTRUCTION DETAILS

The project consists of drilling and constructing two (2) water production wells: the Innovation well and the Army Aviation well. The project may be stopped at any time during the production borehole drilling or testing of the production well, if water quality and/or water quantity are found to be insufficient for production well purposes. The Innovation well shall be nominal 14-inch diameter while the Army Aviation well shall be nominal 18-inch diameter. The wells shall consist of high strength low alloy (HSLA) steel conductor casing, and 304L stainless steel blank casing. The screen for the Innovation well shall be 304L stainless steel wire wrap. The screen for Army Aviation shall be 304L stainless steel louvered. All stainless steel casing and screen shall be manufactured in accordance with the applicable parts of ASTM A778. Each well shall be drilled and constructed according to the attached Figures 2 and 3, and meet the specific requirements of the Screen and Casing tables below.

Army Aviation Well 18" Screen Requirements*	
Welding	Automatic submerged arc, inside and outside passes
Nominal wall thickness	0.375"
Minimum wall thickness	Not less than 95% of nominal wall thickness
Ovality	Not more than 1% of nominal diameter
Straightness	Maximum 0.125" deviation along 10-ft straight edge
End section perpendicularity	Maximum 0.010" deviation from true perpendicular plane
Screen openings	Machine made, horizontal to the axis of the casing, louver form with downward-facing openings. Aperture size shall be 0.090" slot with 14 openings/circle and 168 openings/foot.

Innovation Well Screen and Casing*	
Starter casing of nominal steel pipe size (if required by contractor)	Contractor choice
Borehole diameter from surface to 40 feet	34-inch
Blank casing, 0.312-inch wall from surface to 40 feet	28-inch
Borehole diameter from 40 to 310 feet	26-inch
Blank stainless steel casing, 0.312-inch wall	14-inch
Stainless steel wire-wrap screen, 0.080-inch slot, 0.312-inch wall	14-inch
Total cased depth	300 feet

Army Aviation Well Casing*	
Starter casing of nominal steel pipe size (if required by contractor)	Contractor choice
Borehole diameter from surface to 40 feet	38-inch
Blank casing, 0.312-inch wall from surface to 40 feet	34-inch
Borehole diameter from 40 to 620 feet	32-inch
Blank stainless steel casing, 0.375-inch wall	18-inch
Total cased depth	610 feet

* Nominal casing and screen diameters

2.1 Mobilization. Mobilization consists of all preparatory work and operations as defined in Section 7.01 of the General Conditions.

2.2 Markup Allowances. Covered in Section 7.04 G of the General Conditions.

2.3 <u>Innovation Well Drilling and Construction Details</u>

2.3.1 Drill/Install/Grout a 34-inch borehole and nominal 28-inch diameter surface conductor casing to a depth of 40 feet using the Mud Rotary method. Payment shall be made at the contract lump sum and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, drilling, installation of one surface casing, and installation of 3 cubic yards of grout via tremie method from ground surface to 40 feet below land surface. The owner has determined the design of the conductor, but this design may change. Design changes will not interfere with the progress of the conductor installation. No payment shall be made for over-drilling as desired by the Contractor.

Surface conductors for the production wells shall consist of high-strength low alloy steel, manufacturing standard ASTM A606 type 4, free of any coating matter. The surface conductor casing shall be spiral welded, fabricated or mill-type. All pipes shall be in compliance with Standard AWWA A100-6. The surface conductor casing shall have a wall thickness of 0.312 inches. Conductor casing wall thickness must meet or exceed requirements per Regulations of the Washoe County District Board of Health Governing Well Construction.

2.3.2 Drill one (1) 26-inch production borehole with the Flooded Reverse Circulation method. Payment shall be made at the unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes but is not limited to: drilling of one production boring using the flooded reverse circulation method. The 26-inch diameter production boring shall be drilled from the bottom of the surface conductor boring (40 feet) to total depth of 310 feet below land surface.

The owner has determined the design of the boring, but this design may change. Design changes will not interfere with the progress of the boring. No payment shall be made for over-drilling as desired by the Contractor.

2.3.3 Provide borehole geophysical logging. Payment shall be made at the unit price per each and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to providing spontaneous potential, resistivity, and caliper logging services.

The contractor shall be responsible for providing standard water well geophysical logs conducted by an Owner-approved, commercial logging services sub-contractor and performed in the presence of the Owner. The logs shall be presented in hard copy standard format and in electronic format on DVD. The logs shall consist of spontaneous potential, resistivity (point, short normal, long normal and lateral), and caliper and conducted once every 100-feet of drilled borehole. Any footage over 300 feet but less than 350 feet shall be logged as incidental to the unit price per each of this bid item. The entire borehole shall be logged as determined by the Owner.

2.3.4 Furnish/Install 10 linear feet of nominal 14-inch diameter, a minimum of 0.312-inch wall thickness, 304L stainless steel sump placed from a depth of 290 feet to 300 feet. Payment shall be made at the contract unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of one production well sump.

Production casing shall have a pipe weight of 48.46 lbs/ft for the Innovation well. Casing shall be furnished in 20-foot lengths with 10-foot lengths to complete the casing program. Casing shall be manufactured with welded collars attached.

The stainless steel sump shall be manufactured in conformance with ASTM A778. The sump shall be affixed to the bottom of the well screen using a welding collar. The well sump shall have a bull-nosed bottom constructed of 304L stainless steel and have a nominal diameter of 14 inches and a minimum wall thickness of 0.312 inches or as recommended by the manufacturer for the total length of well casing and screen to be constructed, whichever is thickest. All blank casing (sump and bull-nose bottom) shall be of new, first quality materials and free of defects in workmanship and handling. No reject, sub-grade or limited-use pipe is acceptable.

The owner has determined the design of the production well sump, but this design may change. Design changes will not interfere with the progress of the production well sump installation.

2.3.5 Furnish/Install 100 linear feet of nominal 14-inch diameter, a minimum of 0.312-inch wall thickness, 304L stainless steel wire-wrap screen placed at depths according to the well construction schedule shown in Figure 2. Payment shall be made at the contract unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of 100 feet of production well screen.

The stainless steel well screen shall be 0.080-inch slot for the nominal 14-inch Innovation well. The screen shall be furnished in 20-foot lengths with 10-foot lengths to complete the screening program. Well screen shall be manufactured by Roscoe Moss Corporation (or approved equal).

Well screen shall be in conformance with ASTM A778. The screens sections shall be manufactured with the welded collars. Collars shall be the same thickness, physical, and chemical properties as the corresponding casing or screen section. Collars must be 5 inches in width, rolled to fit the outside diameter, and factory welded to one end of each section. The inside edge of the collars shall be free of sharp edges and burrs. Section ends shall be machined flat perpendicular to the axis of the casing or screen and shall not vary more than 0.010 inch at any point from a true plane at right angles to the axis of the casing or screen. Three (3) one and one sixteenth (1-1/16)-inch diameter inspection windows must be provided in each collar to ensure proper matching of the sections during the welding process to join sections.

Screen shall have a minimum wall thickness of 0.312 inches or as recommended by the manufacturer for the total length of the well casing and screen to be constructed, whichever is thickest. All screen shall be of new, first quality materials and free of defects in workmanship and handling. No reject, sub-grade or limited-use pipe is acceptable.

The owner has determined the design of the production well screen, but this design may change. Design changes will not interfere with the progress of the production well screen installation.

2.3.6 Furnish/Install 190 linear feet of nominal 14-inch diameter, a minimum of 0.312-inch wall thickness, 304L stainless steel blank casing according to the well construction schedule shown in Figure 2. Payment shall be made at the contract unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of 190 feet of production well casing.

Production casing shall have a pipe weight of 48.46 lbs/ft for the Innovation well. Casing shall be furnished in 20-foot lengths with 10-foot lengths to complete the casing program. Casing shall be manufactured with welded collars attached.

The stainless steel casing shall be manufactured in conformance with ASTM A778. The casing shall be affixed to the bottom of the well screen using a welding collar. The well casing shall be constructed of 304L stainless steel and have a nominal diameter of 14 inches and a minimum wall thickness of 0.312 inches or as recommended by the manufacturer for the total length of well casing and screen to be constructed, whichever is thickest. All blank casing shall be of new, first quality

materials and free of defects in workmanship and handling. No reject, sub-grade or limited-use pipe is acceptable.

The owner has determined the design of the production well sump, but this design may change. Design changes will not interfere with the progress of the production well casing installation.

Casing, screen, and sump shall be installed using methods approved by the Owner. The production well casing, well screen, and sump shall be suspended as a unit above the bottom of the hole at a sufficient distance to insure that no portion of the well is supported by the bottom of the borehole. The suspended casing unit shall be firmly secured at the surface until gravel and seal are permanently installed.

The well casing and screen shall have stainless steel centering guides approved by the Owner. The centering guides shall be installed at 40-foot intervals (four centralizers per interval) along the well screen and blank casing, or as otherwise approved by the Owner.

Welders completing field assembly of the well casing, screen, and sump shall be qualified in accordance with the latest revision of the section titled, Welding Procedures of the American Welding Society (AWS) Standard Qualification Procedure. All welds shall be continuous, watertight, fully penetrating fillet welds (joining sections and inspection/centering holes), and completed in accordance with AWS Standards and AWWA C206.

2.3.7 Furnish/Install Gravel Feed Tube, Injection Tube, and Sounding Tube – Contractor shall provide materials, equipment, and labor necessary to install: one (1) nominal 3-inch gravel feed tube open to the top of the gravel pack, one (1) nominal 2-inch injection tube, and one (1) nominal 1.5-inch sounding tube. All tubes shall be equipped with water-tight caps above ground.

Contractor shall provide materials, equipment, and labor necessary to install to 124 feet, 4 feet below the bentonite seal, of nominal 2.5-inch stainless steel gravel feed tube open to the top of the gravel pack to allow for future addition of gravel, if necessary. The gravel feed tube shall be constructed of nominal 2.5-inch diameter, 0.216-inch wall thickness, 304L stainless steel manufactured in conformance with ASTM A778. The gravel feed tube shall be encased in the sanitary grout seal and shall be open at the bottom to allow for placement of addition of gravel after the sanitary grout seal is installed. The gravel feed tube shall be equipped with a water tight cap.

Contractor shall provide materials, equipment and labor necessary to install 92 feet of nominal 2-inch stainless steel injection tube. The injection tube shall be constructed of nominal 2-inch diameter, 0.216-inch wall thickness, 304L stainless steel manufactured in conformance with ASTM A778. The injection tube shall be encased in the sanitary grout seal. The bottom of the injection tube will attach to the casing at a Roscoe Moss (or approved equal) entrance chamber box (Figures 4 and 5) positioned 90 feet below land surface. The entrance chamber box shall be welded to the well casing according to manufacture specifications.

The stainless steel sounding tube shall be 212 feet and constructed of nominal 1.5-inch diameter, 0.20-inch wall thickness, 304L stainless steel manufactured in conformance with ASTM A778. The stainless steel sounding tube shall be attached to the outside of the well casing with stainless steel

bands. The sounding tubes shall be encased in the sanitary grout seal and gravel pack. The bottom of the sounding tube will enter the casing at a Roscoe Moss entrance chamber box (or other approved method) positioned 210 feet below ground. The entrance chamber box shall be welded to the well casing according to manufacture specifications.

The owner has determined the design of the gravel feed and injection, but this design may change. Design changes will not interfere with the progress of the production well screen installation.

2.3.8 Furnish and install a ⅛-inch x ¼-inch gravel pack in the well annulus via tremie pipe. Payment shall be made at the contract unit price per cubic yard and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of approximately 23 cubic yards of gravel pack via tremie pipe from 120 feet to 310 feet below land surface. The owner has determined the design of the gravel pack, but this design may change. Design changes will not interfere with the progress of the gravel pack installation.

Drilling fluid will be closely monitored throughout the drilling process to minimize borehole wall cake development prior to placement of gravel pack. Gravel pack shall be placed by tremie pipe in the annulus between well casing and borehole sidewall. Gravel pack shall be composed of washed, sound, durable, well-rounded particles containing no silt, clay, organic matter or deleterious materials. Gravel pack shall meet specifications as per AWWA A100-06. Gravel pack shall be delivered and stored at the drill site in protective bags. Gravel pack shall be manufactured by a company specializing in water well gravel pack such as SRI Supreme or approved equal. The Contractor shall supply Owner with an invoice stating quantity, gradation, and well screen compatibility for the gravel pack delivered to the drill site.

The Contractor shall determine when conditions are satisfactory for gravel pack placement. Gravel pack shall be placed through a tremie pipe installed to the depth specified by the Owner. Only potable water and disinfectant shall be mixed with the gravel pack during placement. Shoveling or end-dumping with a loader of gravel-pack directly into the borehole is not permitted. The gravel pack shall be disinfected by adding a minimum of twenty (20) pounds of 65-70%-granulated calcium hypochlorite to the gravel pack during placement. The calcium hypochlorite shall be evenly distributed throughout the gravel pack. The gravel tremie pipe shall be removed after placement.

The Contractor shall place the gravel in the annulus without bridging, such that there are no voids. Bridging of gravel pack shall be assumed if the volume of gravel-pack placed is less than 90% of the calculated annular volume for the total borehole depth. If bridging is identified by the above calculation, the bridging shall be corrected at the contractor's expense without damage to the casing, screen, sump, or borehole, or drill a new borehole and install new casing, screen, and sump to the satisfaction of the Owner. If the Contractor chooses to drill a new well, he shall be responsible for all costs associated with properly drilling the new well and properly abandoning the failed well.

2.3.9 Furnish and install bentonite pellet and sanitary seal to surface via tremie pipe. Payment shall be made at the contract unit price per cubic yard and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work.

This item includes, but is not limited to the supply and installation of 0.5 cubic yards of bentonite pellets above the gravel pack from 116 feet to 120 feet, and 14 cubic yards of cement grout seal via tremie pipe from land surface to 116 feet. The owner has determined the design of the sanitary seal, but this design may change. Design changes will not interfere with the progress of the sanitary seal installation.

The bentonite pellets and cement grout shall be placed by positive displacement through a tremie pipe or by the Haliburton method. Cement grout shall be placed within 30 minutes of mixing. The cement grout slurry shall consist of equal parts of cement and sand with 6 gallons of clean water for one 94-pound sack of Portland type C cement (or as defined in NAC 534.060 of *Regulations for Water Well and Related Drilling, Nevada Department of Conservation and Natural Resources, Division of Water Resources, revised 2014)*. The slurry shall be thoroughly mixed and free of lumps and stones and put through a protective strainer before pumping into the well. The final mix shall produce a slurry weight of 15.6 pounds per gallon. Calcium chloride, bentonite or other additives are not allowed. The slurry shall be placed in one continuous operation once the process begins. The sanitary seal shall be left undisturbed for a minimum of 24 hours after the final batch or lift of slurry has been placed. No standby time shall be paid during this period.

The Contractor shall provide an invoice stating the quantity of slurry placed into the annulus.

2.3.10 Well Development by Mechanical Method. Payment shall be made at the contract unit price per hour and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the development of the well using the dual swab and simultaneous airlift development method.

Contractor shall provide all materials, equipment and labor necessary to develop the well. Well development shall progress in three phases:

1. Predevelopment
2. Mechanical Development
3. Pump Development

Predevelopment shall occur during the drilling of the well by the Contractor using proper drilling additives (those essential for flooded reverse drilling), as specified above. Contractor shall minimize the use of drilling additives. Drilling fluids shall be conditioned (thinned), if necessary, to a minimum before installation of casing and gravel-pack to ensure ease of additive removal during subsequent development phases.

Mechanical development shall begin with the dual swab and simultaneous airlift development method. Surge blocks shall be snug-fitting double-flanged with perforated pipe and fabricated according to the diagram shown in Figure 6. Dual swab and simultaneous airlift development shall proceed by vigorously raising and lowering the drill pipe starting at the top of the screen to minimize the risk of sand locking the swabs. Surge and airlift development shall follow the procedures described on pages 514 and 515 of *Groundwater and Wells, Second Edition, Fletcher Driscoll, Johnson Filtration Systems*. The compressor for development shall have a minimum capacity to unload 290 feet of water from an airline setting of 300 feet below ground surface. The

compressor shall produce a minimum air volume of 325 cubic feet per minute at 150 psi. Development by surging shall begin at the bottom of the screen and shall gradually move upward to the top of the well.

If necessary, the Contractor will use a dispersing agent during airlift development to facilitate the breakdown of drilling additives (if used) remaining from drilling operations. **Use of phosphate products such as sodium acid pyrophosphate (SAPP) during well development is not allowed.** The Contractor shall use a dispersing agent as recommended by the manufacturer for wells of this diameter, depth and formations penetrated. Documentation of application volumes, ratios and method of introduction shall be submitted to the Owner prior to product use. The dispersant will be mixed thoroughly, injected into the well, swabbed into the well from the bottom up after injection, and then allowed to remain undisturbed overnight. No stand by time will be paid during this period. Mechanical well development by double-swab will continue at ten (10)-foot intervals until dispersant treatment is complete. Upon completion of dispersant treatment, mechanical well development by surging will continue at ten (10)-foot intervals until, in the opinion of the Owner, well development is complete. A total of 40 hours of mechanical and airlift development is anticipated.

Contractor shall control and contain all drilling cuttings and dispose of it at the TMWA Glendale plant. Contractor shall properly dispose of all development and testing water in accordance with applicable local, State, and Federal requirements and obtain necessary permits. **Disposal of water to Dry Creek, located approximately 1,200 feet to the west, shall only be allowed if a temporary discharge permit is approved by Nevada Division of Environmental Protection.** The Contractor shall monitor the flow into the drainage system and shall not allow discharge of water that will cause pollution or that will leave deposits of sediment in drainage system. **Water with suspended solids concentrations or turbidity exceeding permit requirements shall not be disposed of in the drainage system**. Refer to Section 2.3.12 for additional discharge requirements. The Contractor will contain and direct all discharged water during well development and prevent erosion of surrounding areas.

This item includes, but is not limited to providing and constructing well discharge conveyance equipment (BMPs, holding tank, and piping) to safely and adequately convey well discharges from development and testing of the well to Dry Creek. Conveyance equipment should be sized to convey up to 1,200 gpm. A large Baker tank or similar holding tank shall be used to decant the water before discharge to the piping that will convey water to the creek. Tank should have the proper openings to pump off center of tank to avoid turbid water on tank bottom.

The Contractor shall comply with the National Pollutant Discharge Elimination System (NPDES) permit regarding disposing of solids and water generated during well development and testing. The contractor shall also comply with all water quality effluent limitations specified in the applicable NPDES permit.

> NOTE: Illegal discharge is a Federal offense and maybe punishable by fines and or imprisonment. All solids and fluids shall be disposed of according to NPDES requirements.

Erosion within drainage features shall be minimized to the maximum extent practicable. Erosion and deposition of sediment downgradient, as identified by the Owner, shall be remedied after project completion if necessary, and approved by the Owner. Repair and/or removal of sediment shall be considered incidental to construction of well discharge conveyance equipment, and no additional payment will be made to the Contractor for ditch restoration work.

The well shall be sounded for total depth and the **Contractor shall remove sand and/or debris from the bottom of the well to the owner's satisfaction.**

2.3.11 Furnish and install pumping equipment for development and testing. Payment shall be made at the contract unit price per foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the installation and removal of pumping equipment to develop and test the well.

The pump development and test pumping equipment shall include a submersible pump with a variable capacity up to 1,200 gpm from an estimated pumping water level of 120 feet and intake setting of 125 feet below ground level. The anticipated static water level in the well is 10 feet. The pump shall not have a check valve at the bottom so water is allowed to free-fall back through the column pipe when the pump is shut off. A 'Whisperwatt' or equivalent quiet running generator shall be used as the power source for the pump and furnished with a 110-volt outlet for use by the Owner during testing.

The discharge rate shall be measured during development and test pumping by an orifice weir as shown in Figure 7. The weir dimensions shall include appropriate diameter pipe and orifice plate for measuring the anticipated well flow. The discharge piping shall also include a new, easily operable and stable gate valve to control flow rates. All flow-rate monitoring equipment shall be approved by the Owner before installation.

The Contractor shall furnish and install a 1/4-inch threaded tap into the discharge line to allow attachment of a Rossum Sand Tester. The Owner will provide and operate the sand testing device for sand content measurement throughout the pump development and aquifer pumping test phases.

The Contractor shall furnish and install discharge piping of sufficient size and length to convey discharge water from the wellhead and pumping equipment into a Contractor-provided settling tank and then to Dry Creek approximately 1,200 feet west of the well. The Contractor shall install, maintain and remove all BMPs, protective liners or control devices, such as plastic sheeting and straw bales, necessary to minimize bank erosion to the creek. Refer to Section 2.3.10 for additional discharge requirements.

2.3.12 Well development - Pump method. Payment shall be made at the contract unit price per hour and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the development of the well using a test pump provided by the contractor.

Pump development will begin by slowly pumping the well at approximately 20% of the anticipated capacity, then surge, and backwash gently. Pumping rate will be gradually increased as the well shows improvement and the water clears until the maximum flow rate is reached. The Owner shall determine the maximum rate after consideration of the well drawdown and discharge characteristics. At periodic intervals (approximately 15 minutes), the pump shall be stopped and water in the pump column shall be allowed to surge back through the pump bowls and into the well.

Pump development shall continue until the following conditions have been met:

1. Sand content shall average no more than 5 mg/L for a complete pumping cycle of 2-hr duration when pumping at the design-discharge capacity.
2. No less than 10 measurements shall be taken at equal intervals to permit plotting of sand content as a function of time and production rate and to determine the average sand content for each cycle.
3. Development shall continue as long as the well's specific capacity continues to increase significantly.
4. The Owner shall determine when development is complete.

A total of 40 hours of pump development is anticipated. Contractor shall control and contain all drill cuttings and dispose of it off site at the Contractor's expense. **Disposal of drill cuttings and fluids to Dry Creek is prohibited.** Contractor shall properly dispose of all development water in accordance with applicable local, State, and Federal requirements and obtain necessary permits. The Contractor will contain and direct all discharged water during well development and prevent erosion of surrounding areas. The well shall be sounded for total depth and the **Contractor shall remove sand or debris from the bottom of the well.**

2.3.13 Operation and maintenance of pumping equipment for aquifer pumping tests. Payment shall be made at the contract unit price per hour and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the operation of installed pumping equipment for the performance of a 4-step pumping test and collection of water quality samples.

Following development operations the Contractor shall provide all materials, equipment, and labor to perform a complete pumping test of the well. The discharge rate shall be measured using an orifice weir and manometer as shown in Figure 7. The Owner shall direct test pumping with the anticipated pumping scenario to include but not be limited to the following:

Step Test - The step test will include a minimum of four different pumping rates between 200 and 800 gpm. Each rate will be pumped for an anticipated 120 minutes and minimum of 100 minutes. After step test completion, the well shall be allowed to recover to within 99% of the pre-testing static water level prior to removing test pump and equipment. No standby time will be paid during the recovery period.

Constant Discharge Test - The constant discharge test must be continuous without interruption for a minimum of 72 hours at a pumping rate to be determined by Owner. At the end of the 72-hour pumping period the pump may not be removed for a period of 36 hours or until approved by the Owner. If the constant discharge test is interrupted before 72 hours of continuous pumping have

elapsed, the well shall be allowed to recover before test restart, for at least the amount of time the pump ran before failure. No payment shall be made for a constant discharge test that does not extend for a minimum of 72 hours or the time specified by the Owner, or during the recovery period following the constant discharge test.

Equipment installation for all tests shall be installed and ready to operate between 8:00-10:00 a.m. If test equipment is not ready to operate prior to 10:00 a.m. the scheduled test will be postponed until 8:00 a.m. the following morning with no bid item hourly rate or standby time being paid for the overnight delay. Actual measurements taken while testing for yield and drawdown will be the responsibility of the Owner. The Contractor shall maintain and operate all equipment and ensure its continuous uninterrupted operation as required.

After the pumping tests, the well shall be sounded for total depth and, if necessary, the Contractor shall remove sand or debris from the bottom of the well.

2.3.14 Well Spinner Survey. Payment shall be made at the contract unit price per each and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, spinner survey to the full depth of the newly-constructed well. The Contractor shall install a nominal 3-inch diameter blank pipe to a depth of 130 feet, and a test pump capable of production in excess of 800 gpm installed to a depth not greater than 125 feet. The well shall have been pumped approximately 8-hours prior to conducting the spinner survey. In addition, the pump shall run up to 2-hours during the spinner survey. The owner is responsible to contract with a spinner survey contractor.

The Contractor shall remove the nominal 3-inch diameter blank pipe and test pump used for the spinner test at the end of the spinner survey.

2.3.15 Conduct video survey of completed well. Payment shall be made at the contract unit price per each and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, video surveys to the full depth of the newly-constructed well.

The video surveying equipment shall include but not be limited to: a van capable of deploying a submersible camera unit or tools with recording capabilities and specifically designed and constructed for underwater operation and viewing of wells. The camera tool must have a bottom lens and light source for looking vertically down the well and shall record images in color. The camera shall also have a side-viewing camera and light source for viewing horizontally in the well. The side-viewing camera must be capable of providing images of the entire circumference of the well. Camera controls must be capable of switching instantaneously between the down-hole and side-views, with 360 degree rotation capability. The camera should also be equipped with a real time footage indicator on screen. The camera must record down-hole and side-view still images at 10-feet intervals within the screened portion of the well. Two copies of the video survey record shall be provided to the Owner in DVD format. Numbers indicating the depth of the camera below the top of casing shall appear continuously and be legible. The Contractor shall inject potable water and/or a water clarifier into the well for a period of 12 to 24 hours prior

to the video survey to provide greater clarity during the video survey. A Contractor experienced in video surveys such as Carson Pump of Carson City, Nevada, West Coast Well Logging Services of Rancho Cordova, California, or Owner-approved equal shall perform the video survey.

2.3.16 Well disinfection and well cap. Payment shall be made at the contract unit price lump sum and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, disinfecting the well using a chlorine solution mixed in potable water after completion of brushing, air-lift development, and pump and surge development, and all down-hole surveys. The Contractor will use a disinfecting solution of such volume and strength that a concentration of at least 50 mg/l of available chlorine shall be obtained for the entire volume of water in the well. The disinfecting solution will be introduced into the well below the static water level through a tremie pipe and mixed throughout the water column by surge block or other mechanical action. After testing and approval of the well by the Owner, the well shall be capped with a 0.250-inch minimum thickness steel plate fully welded to the casing.

2.3.17 Temporary on-site waste facilities. Payment shall be made at the contract unit price per lump sum and shall be full compensation for delivery, cleaning, and rental of temporary on-site waste containment facilities.

2.3.18 Temporary on-site office during aquifer testing. Payment shall be made at the contract unit price per lump sum and shall be full compensation for delivery, cleaning, and rental of temporary office. The temporary office (small Class B, Class C or travel trailer RV) shall be rented from a licensed RV rental company and consist of a bed, sink, and bathroom at a minimum.

2.3.19

Standby hours at Owner's request. Payment shall be made at the contract unit price per hour and shall be full compensation for standby hours if requested by the Owner.

2.4 Army Aviation Well Drilling Construction Details

2.4.1 Drill/Install/Grout a 38-inch borehole and nominal 34-inch diameter surface conductor casing to a depth of 40 feet using the Mud Rotary method. Payment shall be made at the contract lump sum and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, drilling, installation of one surface casing, and installation of 3 cubic yards of grout via tremie method from ground surface to 40 feet below land surface. The owner has determined the design of the conductor, but this design may change. Design changes will not interfere with the progress of the conductor installation. No payment shall be made for over-drilling as desired by the Contractor.

Surface conductors for the production wells shall consist of high-strength low alloy (HSLA, A606 type 4) steel free of any coating matter, and manufactured in accordance with applicable parts of ASTM Standard A 139 Grade B. The surface conductor casing shall be spiral welded, fabricated or mill-type. All pipe shall be in compliance with AWWA A100 Standards. The surface

conductor casing shall have a wall thickness of 0.312 inches. Conductor casing wall thickness must meet or exceed requirements per *Regulations for Water Well and Related Drilling, Nevada Department of Conservation and Natural Resources, Division of Water Resources, revised October 24, 2014*).

2.4.2 Drill one 32-inch production borehole with the Flooded Reverse Circulation method. Payment shall be made at the unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes but is not limited to: drilling of one production boring using the flooded reverse circulation with water method. The 32-inch diameter production boring shall be drilled from the bottom of the surface conductor boring (40 feet) to total depth of 620 feet below land surface.

The owner has determined the design of the boring, but this design may change. Design changes will not interfere with the progress of the boring. No payment shall be made for over-drilling as desired by the Contractor.

2.4.3 Provide borehole geophysical survey. Payment shall be made at the unit price per each and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to providing spontaneous potential, resistivity, and caliper logging services.

The contractor shall be responsible for providing standard water well geophysical logs conducted by an Owner-approved, commercial logging services sub-contractor and performed in the presence of the Owner. The logs shall be presented in hard copy standard format and in electronic format on DVD. The logs shall consist of spontaneous potential, resistivity (point, short normal, long normal and lateral), and caliper and conducted once every 100-feet of drilled borehole. Any footage over 600 feet but less than 650 feet shall be logged as incidental to the unit price per each of this bid item. The entire borehole shall be logged as determined by the Owner.

2.4.4 Furnish/Install 10 linear feet of nominal 18-inch diameter 0.375-inch wall thickness 304L stainless steel sump from a depth of 600 feet to 610 feet. Payment shall be made at the contract unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of one production well sump.

Production and sump casing shall have a pipe weight of 74.80 lbs/ft for the Army Aviation well. Casing shall be furnished in 20-foot lengths with 10-foot lengths to complete the casing program. Casing shall be manufactured with welded collars attached.

The stainless steel sump manufactured in conformance with ASTM A778. The sump shall be affixed to the bottom of the well screen using a welding collar. The well sump shall have a bull-nosed bottom constructed of 304L stainless steel and have a nominal diameter of 18 inches and a minimum wall thickness of 0.375 inches or as recommended by the manufacturer for the total length of the casing and screen to be constructed, whichever is thickest. All blank casing (sump and bull-nose bottom) shall be of new, first quality materials and free of defects in workmanship and handling. No reject, sub-grade or limited-use pipe is acceptable.

The owner has determined the design of the production well sump, but this design may change. Design changes will not interfere with the progress of the production well sump installation.

2.4.5 Furnish/Install 160 linear feet of nominal 18-inch diameter 0.375-inch wall thickness 304L stainless steel Ful Flo louvered screen placed at depths according to the well construction schedule shown in Figure 3. Payment shall be made at the contract unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of 160 feet of production well screen.

The stainless steel screen shall be 0.090-inch slot for the nominal 18-inch diameter Army Aviation well. The screen shall be furnished in 40-foot lengths with 10-foot lengths to complete the screening program. Well shall be manufactured by Roscoe Moss Corporation (or approved equal).

Well screen shall be in conformance with ASTM A778. The screens sections shall be manufactured with the welded collars. Collars shall be the same thickness, physical, and chemical properties as the corresponding casing or screen section. Collars must be 5 inches in width, rolled to fit the outside diameter, and factory welded to one end of each section. The inside edge of the collars shall be free of sharp edges and burrs. Section ends shall be machined flat perpendicular to the axis of the casing or screen and shall not vary more than 0.010 inch at any point from a true plane at right angles to the axis of the casing or screen. Three (3) one and one sixteenth (1-1/16)-inch diameter inspection windows must be provided in each collar to ensure proper matching of the sections during the welding process to join sections.

Screen shall have a minimum wall thickness of 0.375 inches or as recommended by the manufacturer for the total length of the well casing and screen to be constructed, whichever is thickest. All screen shall be of new, first quality materials and free of defects in workmanship and handling. No reject, sub-grade or limited-use pipe is acceptable.

The owner has determined the design of the production well screen, but this design may change. Design changes will not interfere with the progress of the production well screen installation.

2.4.6 Furnish/Install 450 linear feet of nominal 18-inch diameter 0.375-inch wall thickness 304L stainless steel blank casing per the well construction schedule shown in Figure 3. Payment shall be made at the contract unit price per linear foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of 450 feet of production well casing.

Production casing shall have a pipe weight of 74.80 lbs/ft for the Army Aviation well. Casing shall be furnished in 20-foot lengths with 10-foot lengths to complete the casing program. Cashing shall be manufactured with welded collars attached. The well casing shall be manufactured in conformance with ASTM A778. The well casing shall be affixed to the well screens using welding collars. The well casing shall consist of 304L stainless steel and have a nominal diameter of 18 inches and a minimum wall thickness of 0.375 inches or a recommended by the manufacturer for

the total length of the well casing and screen to be constructed, whichever is thickest. All casing shall be of new, first quality materials and free of defects in workmanship and handling. No reject, sub-grade or limited-use pipe is acceptable.

The owner has determined the design of the production well casing, but this design may change. Design changes will not interfere with the progress of the production well casing.

Casing, screen, and sump shall be installed using methods approved by the Owner. The production well casing, well screen, and sump shall be suspended as a unit above the bottom of the hole at a sufficient distance to insure that no portion of the well is supported by the bottom of the borehole. The suspended casing unit shall be firmly secured at the surface until gravel and seal are permanently installed.

The well casing and screen shall have stainless steel centering guides approved by the Owner. The centering guides shall be installed at 40-foot intervals (four centering guides per interval) along the well screen and blank casing, or as otherwise approved by the Owner.

Welders completing field assembly of well casing, well screen, and sump shall be qualified in accordance with the latest revision of the section titled, Welding Procedures of the American Welding Society (AWS) Standard Qualification Procedure. All welds shall be continuous, watertight, fully penetrating fillet welds (joining sections and centering holes), and completed in accordance with AWS Standards and AWWA C206.

2.4.7 Water Level Gravel Feed Tube, Injection Tubes, and Sounding Tube – Contractor shall provide materials, equipment, and labor necessary to install one (1) nominal 3-inch gravel feed tube open to the top of the gravel pack, two (2) nominal 3-inch injection tubes, and one (1) nominal 1.5-inch sounding tube. All tubes shall include water-tight caps above ground.

Contractor shall provide materials, equipment and labor necessary to install one nominal 3-inch ID stainless steel gravel feed tube to 304 feet, 4 feet below the bentonite seal, open to the top of the gravel pack to allow for future addition of gravel, if necessary. The gravel feed tube shall be constructed of nominal 3-inch diameter, 0.216-inch wall thickness, 304L stainless steel manufactured in conformance with ASTM A778. The gravel feed tube shall be encased in the sanitary grout seal and shall be open at the bottom to allow for placement of addition of gravel after the sanitary grout seal is installed. The gravel feed tube shall be equipped with a water tight cap.

Contractor shall provide materials, equipment and labor necessary to install two nominal 3-inch stainless steel injection tubes. Each injection tube will be 92 feet in length. The injection tube shall be constructed of nominal 3-inch diameter, 0.216-inch wall thickness, 304L stainless steel manufactured in conformance with ASTM A778. The injection tubes shall be encased in the sanitary grout seal. The bottom of each injection tubes will attach to the casing at a Roscoe Moss (or approved equal) entrance chamber boxes (Figures 4 and 5) positioned 90 feet below land surface. The entrance chamber box shall be welded to the well casing according to manufacture specifications.

The stainless steel sounding tube shall be 362 feet and constructed of nominal 2-inch diameter, 0.20-inch wall thickness, 304L stainless steel manufactured in conformance with ASTM A778. Stainless steel sounding tubes shall be attached to the outside of the well casing using stainless steel bands. The sounding tube shall be encased in the sanitary grout seal. The bottom of the injection tube will attach to the casing at a Roscoe Moss entrance chamber box (or other approved method), shown in Figures 4 and 5, positioned 360 feet below land surface. The entrance chamber box shall be welded to the well casing according to manufacture specifications.

The owner has determined the design of the gravel, injection, and sounding tubes but this design may change. Design changes will not interfere with the progress of the production well screen installation.

2.4.8 Furnish and install a ⅛-inch x ¼-inch gravel pack in the well annulus for the via tremie pipe for the Army Aviation well. Payment shall be made at the contract unit price per cubic yard and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of 23 cubic yards of gravel pack via tremie pipe from 300 feet to 610 feet below land surface. The owner has determined the design of the gravel pack, but this design may change. Design changes will not interfere with the progress of the gravel pack installation.

Drilling fluid will be closely monitored throughout the drilling process to minimize borehole wall cake development prior to placement of gravel pack. Gravel pack shall be placed by tremie pipe in the annulus between well casing and borehole sidewall. Gravel pack shall be composed of washed, sound, durable, well-rounded particles containing no silt, clay, organic matter or deleterious materials. Gravel pack shall meet specifications as per AWWA A100-06. Gravel pack shall be delivered and stored at the drill site in protective bags. Gravel pack shall be manufactured by a company specializing in water well gravel pack such as SRI Supreme or approved equal. The Contractor shall supply Owner with an invoice stating quantity, gradation, and well screen compatibility for the gravel pack delivered to the drill site.

The Contractor shall determine when conditions are satisfactory for gravel pack placement. Gravel pack shall be placed through a tremie pipe installed to the depth specified by the Owner. Only potable water and disinfectant shall be mixed with the gravel pack during placement. Shoveling or end-dumping with a loader of gravel-pack directly into the borehole is not permitted. The gravel pack shall be disinfected by adding a minimum of twenty (20) pounds of 65-70%-granulated calcium hypochlorite to the gravel pack during placement. The calcium hypochlorite shall be evenly distributed throughout the gravel pack. The gravel tremie pipe shall be removed after placement.

The Contractor shall place the gravel in the annulus without bridging, such that there are no voids. Bridging of gravel pack shall be assumed if the volume of gravel-pack placed is less than 90% of the calculated annular volume for the total borehole depth. If bridging is identified by the above calculation, the bridging shall be corrected at the contractor's expense without damage to the casing, screen, sump, or borehole, or drill a new borehole and install new casing, screen, and sump to the satisfaction of the Owner. If the Contractor chooses to drill a new well, he shall

be responsible for all costs associated with properly drilling the new well and properly abandoning the failed well.

2.4.9 Furnish and install bentonite pellet and sanitary seal to surface via tremie pipe. Payment shall be made at the contract unit price per cubic yard and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the supply and installation of 0.5 cubic yards of bentonite pellets above the gravel pack from 296 to 300 feet, and 42 cubic yards of cement grout seal via tremie pipe from land surface to 296 feet below land surface. The owner has determined the design of the sanitary seal, but this design may change. Design changes will not interfere with the progress of the sanitary seal installation.

The bentonite pellets and cement grout shall be placed by positive displacement through a tremie pipe or by the Haliburton method. Cement grout shall be placed within 30 minutes of mixing. The cement grout slurry shall consist of equal parts of cement and sand with 6 gallons of clean water for one 94-pound sack of Portland type C cement (or as defined in NAC 534.060 of *Regulations for Water Well and Related Drilling, Nevada Department of Conservation and Natural Resources, Division of Water Resources, revised 2014).* The slurry shall be thoroughly mixed and free of lumps and stones and put through a protective strainer before pumping into the well. The final mix shall produce a slurry weight of 15.6 pounds per gallon. Calcium chloride, bentonite or other additives are not allowed. The slurry shall be placed in one continuous operation once the process begins. The sanitary seal shall be left undisturbed for a minimum of 24 hours after the final batch or lift of slurry has been placed. No standby time shall be paid during this period.

The Contractor shall provide an invoice stating the quantity of slurry placed into the annulus.

2.4.10 Well Development - Mechanical method. Payment shall be made at the contract unit price per hour and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the development of the well using the dual swab and simultaneous airlift development method.

Contractor shall provide all materials, equipment and labor necessary to develop the well. Well development shall progress in three phases:

4. Predevelopment
5. Mechanical Development
6. Pump Development

Predevelopment shall occur during the drilling of the well by the Contractor using proper drilling additives (those essential for flooded reverse circulation drilling), as specified the manufacturer and above. Contractor shall minimize the use of drilling additives. Drilling fluids shall be conditioned (thinned), if necessary, to a minimum before installation of casing and gravel-pack to ensure ease of additive removal during subsequent development phases.

Mechanical development shall begin with the dual swab and simultaneous airlift development method. Surge blocks shall be snug-fitting double-flanged with perforated pipe and fabricated

according to the diagram shown in Figure 6. Dual swab and simultaneous airlift development shall proceed by vigorously raising and lowering the drill pipe starting at the top of the screen to minimize the risk of sand locking the swabs. Surge and airlift development shall follow the procedures described on pages 514 and 515 of *Groundwater and Wells, Second Edition, Fletcher Driscoll, Johnson Filtration Systems*. The compressor for development shall have a minimum capacity to unload 570 feet of water from an airline setting of 600 feet below top of casing. The compressor shall produce a minimum air volume of 750 cubic feet per minute at 300 psi. Development by surging shall begin at the bottom of the screen and shall gradually move upward to the top of the well.

If necessary, the Contractor will use a dispersing agent during airlift development to facilitate the breakdown of drilling additives (if used) remaining from drilling operations. **Use of phosphate products such as sodium acid pyrophosphate (SAPP) during well development is not allowed.** The Contractor shall use a dispersing agent as recommended by the manufacturer for wells of this diameter, depth and formations penetrated. Documentation of application volumes, ratios and method of introduction shall be submitted to the Owner prior to product use. The dispersant will be mixed thoroughly, injected into the well, swabbed into the well from the bottom up after injection, and then allowed to remain undisturbed overnight. No stand by time will be paid during this period. Mechanical well development by double-swab will continue at ten (10)-foot intervals until dispersant treatment is complete. Upon completion of dispersant treatment, mechanical well development by surging will continue at ten (10)-foot intervals until, in the opinion of the Owner, well development is complete. A total of 65 hours of mechanical and airlift development is anticipated.

Contractor shall control and contain all drill cuttings and fluid. Contractor shall properly dispose of all development water in accordance with applicable local, State, and Federal requirements and obtain necessary permits. The Contractor will contain and direct all discharged water during well development and prevent erosion of surrounding areas.

Payment shall be made at the contract unit price lump sum and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to providing and constructing well discharge conveyance equipment (BMPs, piping, and holding tank) to safely and adequately convey well discharges away from the well site. Conveyance equipment should be sized to convey 2500 gpm approximately 1,000 feet. A large Baker tank or similar holding tank shall be used to decant the water prior to discharge to conveyance piping. The tank should have the proper openings to pump off center of tank to avoid turbid water on tank bottom

The Contractor shall comply with the National Pollutant Discharge Elimination System (NPDES) permit regarding disposing of solids and water generated during well redevelopment, and well testing. The contractor must adhere to all water quality effluent limitations specified in the applicable NPDES permit.

> NOTE: Illegal discharge is a Federal offense and maybe punishable by fines and or imprisonment. All solids and fluids shall be disposed of according to NPDES requirements.

Erosion within drainage features shall be minimized to the maximum extent practicable. Erosion and deposition of sediment downgradient, as identified by the Owner, shall be remedied after project completion if necessary, and approved by the Owner. Repair and/or removal of sediment shall be considered incidental to construction of well discharge conveyance equipment, and no additional payment will be made to the Contractor for ditch restoration work.

The well shall be sounded for total depth and the **Contractor shall remove sand or debris from the bottom of the well to the Owner's satisfaction.**

2.4.11 Furnish and Install Pumping Equipment for Development and Testing. Payment shall be made at the contract unit price per foot and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the installation and removal of pumping equipment to develop and test the well.

The pump development and test pumping equipment shall include a submersible pump with a variable capacity up to 2500 gpm from an estimated pumping water level of 280 feet and intake setting of 290 feet below ground level. The anticipated static water level in the well is 70 feet. The pump shall not have a check valve at the bottom so water is allowed to free-fall back through the column pipe when the pump is shut off. A 'Whisperwatt' or equivalent quiet running generator shall be used as the power source for the pump and furnished with a 110-volt outlet for use by the Owner during testing.

The discharge rate shall be measured during development and test pumping by an orifice as shown in Figure 7. The weir dimensions shall include appropriate diameter pipe and orifice plate for measuring the anticipated well flow. The discharge piping shall also include a new, easily operable and stable gate valve to control flow rates. All flow-rate monitoring equipment shall be approved by the Owner before installation.

The Contractor shall furnish and install a 1/4-inch threaded tap into the discharge line to allow attachment of a Rossum Sand Tester. The Owner will provide and operate the sand testing device for sand content measurement throughout the pump development and aquifer pumping test phases.

The Contractor shall furnish and install a settling tank and approximately 1,000 feet of discharge piping of sufficient size to convey discharge water from the wellhead and pumping equipment. The Contractor shall install, maintain and remove all BMPs, protective liners or control devices, such as plastic sheeting and straw bales, necessary to minimize ground erosion.

2.4.12 Well development - Pump method. Payment shall be made at the contract unit price per hour and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the development of the well using a test pump provided by the contractor.

Pump development will begin by slowly pumping the well at approximately 20% of the anticipated capacity, then surge, and backwash gently. Pumping rate will be gradually increased as the well shows improvement and the water clears until the maximum flow rate is reached. The Owner shall

determine the maximum rate after consideration of the well drawdown and discharge characteristics. At periodic intervals (approximately 15 minutes), the pump shall be stopped and water in the pump column shall be allowed to surge back through the pump bowls and into the well.

Pump development shall continue until the following conditions have been met:

5. Sand content shall average no more than 5 mg/L for a complete pumping cycle of 2-hr duration when pumping at the design-discharge capacity.
6. No less than 10 measurements shall be taken at equal intervals to permit plotting of sand content as a function of time and production rate and to determine the average sand content for each cycle.
7. Development shall continue as long as the well's specific capacity continues to increase significantly.
8. The Owner shall determine when development is complete.

A total of 65 hours of pump development is anticipated. Contractor shall control and contain all drilling mud and dispose of it off site at the Contractor's expense. **Disposal of drilling fluid at the well site is prohibited.** Contractor shall properly dispose of all development water in accordance with applicable local, State, and Federal requirements and obtain necessary permits. The Contractor will contain and direct all discharged water during well development and prevent erosion of surrounding areas. The well shall be sounded for total depth and the **Contractor shall remove sand or debris from the bottom of the well.**

2.4.13 Operation and Maintenance of Pumping Equipment for Aquifer Pumping Tests. Payment shall be made at the contract unit price per hour and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to the operation of installed pumping equipment for the performance of a 4-step pumping test and collection of water quality samples.

Following development operations the Contractor shall provide all materials, equipment, and labor to perform a complete pumping test of the well. The discharge rate shall be measured using an orifice weir and manometer as shown in Figure 7. The Owner shall direct test pumping with the anticipated pumping scenario to include but not be limited to the following:

Step Test - The step test will include a minimum of four different pumping rates between 1000 and 2500 gpm. Each rate will be pumped for an anticipated 120 minutes and minimum of 100 minutes. After step test completion, the well shall be allowed to recover to within 99% of the pre-testing static water level prior to removing test pump and equipment. No standby time will be paid during the recovery period.

Constant Discharge Test - The constant discharge test must be continuous without interruption for a minimum of 72 hours at a pumping rate to be determined by Owner. At the end of the 72-hour pumping period the pump may not be removed for a period of 36 hours or until approved by the Owner. If the constant discharge test is interrupted before 72 hours of continuous pumping have elapsed, the well shall be allowed to recover before test restart, for at least the amount of time the pump ran before failure. No payment shall be made for a constant discharge test that does not

extend for a minimum of 72 hours or the time specified by the Owner, or during the recovery period following the constant discharge test.

Equipment installation for all tests shall be installed and ready to operate between 8:00-10:00 a.m. If test equipment is not ready to operate prior to 10:00 a.m. the scheduled test will be postponed until 8:00 a.m. the following morning with no bid item hourly rate or standby time being paid for the overnight delay. Actual measurements taken while testing for yield and drawdown will be the responsibility of the Owner. The Contractor shall maintain and operate all equipment and ensure its continuous uninterrupted operation as required.

After pumping tests, the well shall be sounded for total depth and, if necessary, the Contractor shall remove sand or debris from the bottom of the well.

2.4.14 Well Spinner Survey. Payment shall be made at the contract unit price per each and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, the spinner survey to the full depth of the newly-constructed well. The Contractor shall install a nominal 3-inch diameter blank pipe to a depth of 310 feet to perform a spinner survey, and a test pump capable of production in excess of 2500 gpm installed to a depth not greater than 300 feet. The well shall have been pumped approximately 8-hours prior to conducting the spinner survey. In addition, the pump shall run up to 2-hours during the spinner survey. The Owner is responsible to contract with a spinner survey contractor.

The Contractor shall remove the nominal 3-inch diameter blank pipe and test pump used for the spinner test at the end of the spinner survey.

2.4.15 Conduct video survey of completed well. Payment shall be made at the contract unit price per each and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, video surveys to the full depth of the newly-constructed well.

The video surveying equipment shall include but not be limited to: a van capable of deploying a submersible camera unit or tools with recording capabilities and specifically designed and constructed for underwater operation and viewing of wells. The camera tool must have a bottom lens and light source for looking vertically down the well and shall record images in color. The camera shall also have a side-viewing camera and light source for viewing horizontally in the well. The side-viewing camera must be capable of providing images of the entire circumference of the well. Camera controls must be capable of switching instantaneously between the down-hole and side-views, with 360 degree rotation capability. The camera should also be equipped with a real time footage indicator on screen. The camera must record down-hole and side-view still images at 10-feet intervals within the screened portion of the well. Two copies of the video survey record shall be provided to the Owner in DVD format. Numbers indicating the depth of the camera below the top of casing shall appear continuously and be legible. The Contractor shall inject potable water and/or a water clarifier into the well for a period of 12 to 24 hours prior to the video survey to provide greater clarity during the video survey. A Contractor experienced in video surveys such as Carson Pump of Carson City, Nevada, West Coast Well Logging

Services of Rancho Cordova, California, or Owner-approved equal shall perform the video survey.

2.4.16 Well disinfection and well cap. Payment shall be made at the contract unit price lump sum and shall be full compensation for furnishing all materials, labor, equipment, tools, and appurtenances necessary to complete the work. This item includes, but is not limited to, disinfecting the well using a chlorine solution mixed in potable water after completion of brushing, air-lift development, and pump and surge development, and all down-hole surveys. The Contractor will use a disinfecting solution of such volume and strength that a concentration of at least 50 mg/l of available chlorine shall be obtained for the entire volume of water in the well. The disinfecting solution will be introduced into the well below the static water level through a tremie pipe and mixed throughout the water column by surge block or other mechanical action. After testing and approval of the well by the Owner, the well shall be capped with a 0.250-inch minimum thickness steel plate fully welded to the casing.

2.4.17 Temporary on-site waste facilities. Payment shall be made at the contract unit price per lump sum and shall be full compensation for delivery, cleaning, and rental of temporary on-site waste containment facilities.

2.4.18 Temporary office during aquifer testing. Payment shall be made at the contract unit price per lump sum and shall be full compensation for delivery, cleaning, and rental of temporary office. The temporary office (small Class B, Class C or travel trailer RV) shall be rented from a licensed RV rental company and consist of a bed, sink, and bathroom at a minimum.

2.4.19 Standby hours at Owner's request. Payment shall be made at the contract unit price per hour and shall be full compensation for standby hours if requested by the Owner.

3. PLUMBNESS AND ALIGNMENT

The Contractor shall guarantee the completed well is sufficiently straight and plumb to permit an unencumbered installation and operation of pumping equipment. The Contractor shall conduct a gyroscopic deviation survey of the total depth of the well to verify plumbness and alignment according to AWWA A100-97. The gyroscopic deviation tool shall record the measured depth, direction the casing is traveling, and the angle or inclination of the casing. The survey shall be recorded on DVD format with readings every 10 feet. The information shall be analyzed and plotted with vertical and horizontal projection prints in a clear and readable format and submitted as a PDF. The gyroscopic deviation survey shall be performed by a Contractor experienced in such surveys such as Welenco of Bakersfield, California, or approved equal.

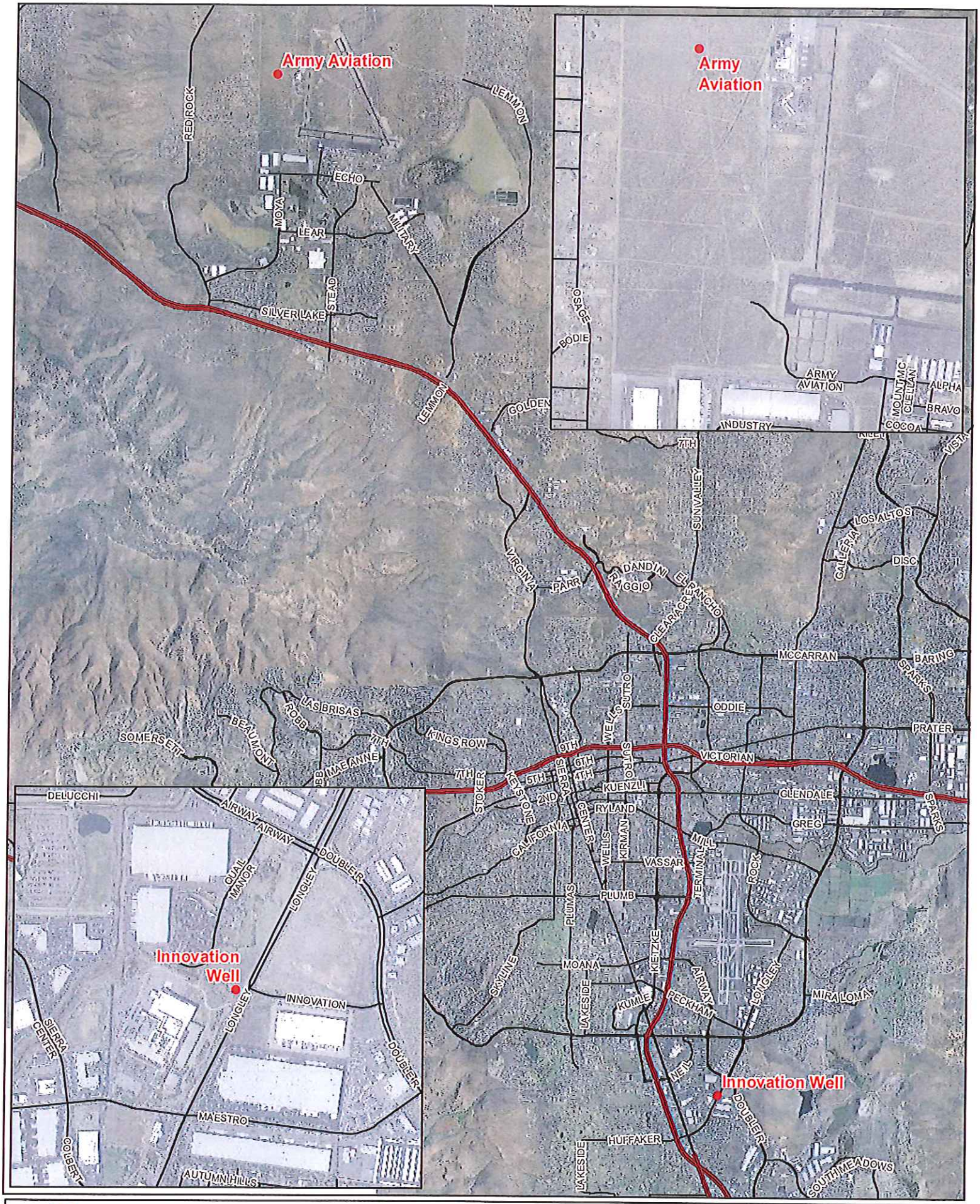
The deviation from plumbness shall not exceed two-thirds (2/3) the well's inside diameter per 100 feet. Failure to pass the gyroscopic deviation survey plumbness and alignment test shall result in rejection of the subject well. The well shall be rejected if deviations do not meet the alignment requirements. No payment shall be made for any portion of the contract if the Owner rejects the well. Should the well fail to pass the plumbness and alignment test and have to be abandoned, the Contractor shall be responsible for proper abandonment of the well at no cost to the Owner.

D. MEASUREMENT AND PAYMENT

Payment for work covered by this specification and the associated bid item in the Proposal-Schedule of Items and Prices will be as approved by the Owner. Payment will be based on the price negotiated for the additional work, or on a cost accounting basis.

Payment will be made only for additional work performed and approved by the Owner. Depending upon the amount of additional work authorized and completed at the close of the Contract, the amount bid may be entirely, partially, or not used.

END OF SECTION



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INNOVATION AND ARMY AVIATION PROJECT
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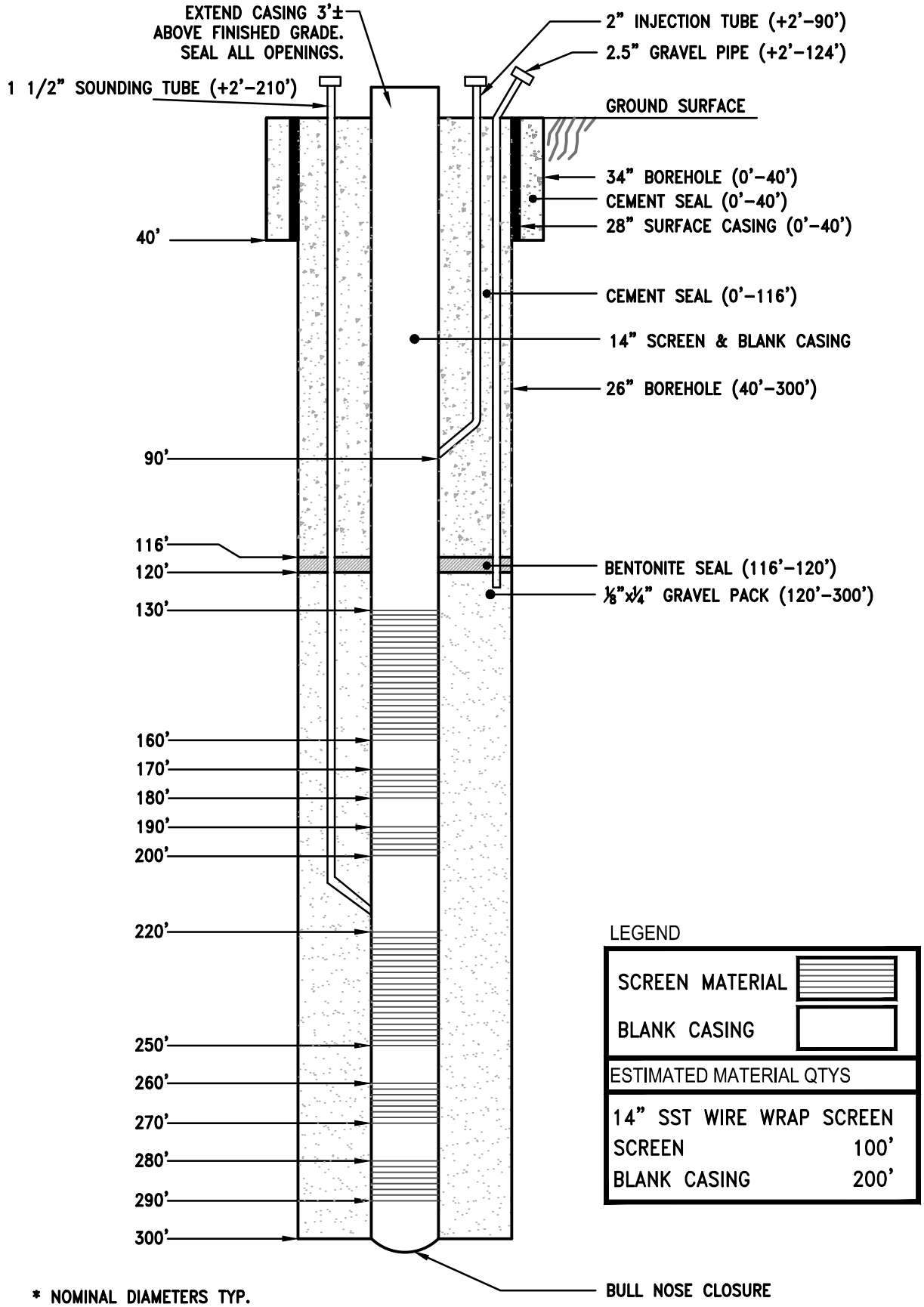
Figure 1



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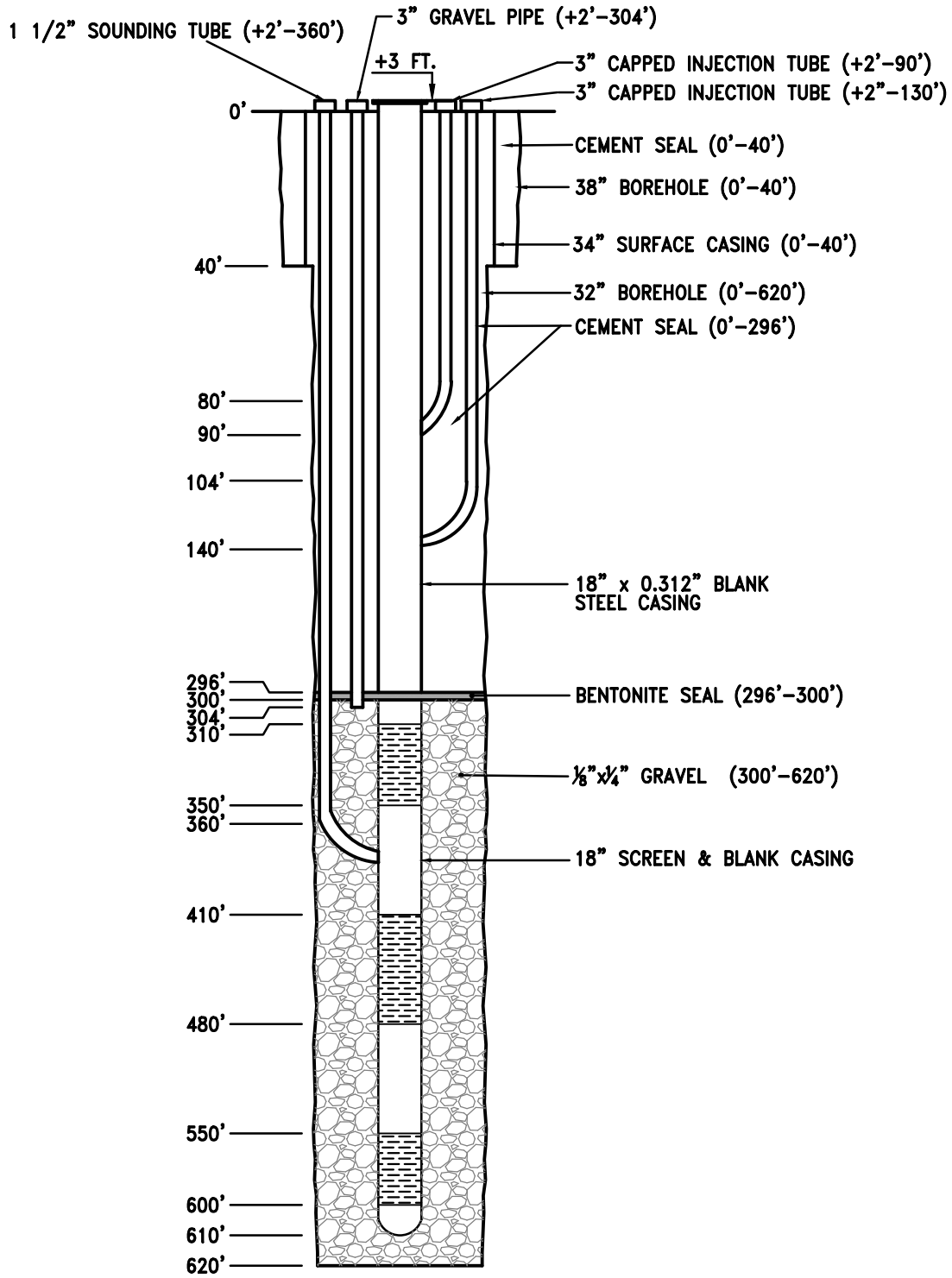
INNOVATION PRODUCTION WELL

CONSTRUCTION MATERIALS DIAGRAM

DATE:	JUNE 2015
DRAWN BY:	JK
WORK ORDER #:	
SCALE:	NTS

FIGURE 2



SCREEN SECTIONS	
310' – 350'	40'
410' – 480'	70'
550' – 600'	50'
	160'

* NOMINAL DIAMETERS TYP.

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ARMY AVIATION PRODUCTION WELL

CONSTRUCTION MATERIALS DIAGRAM

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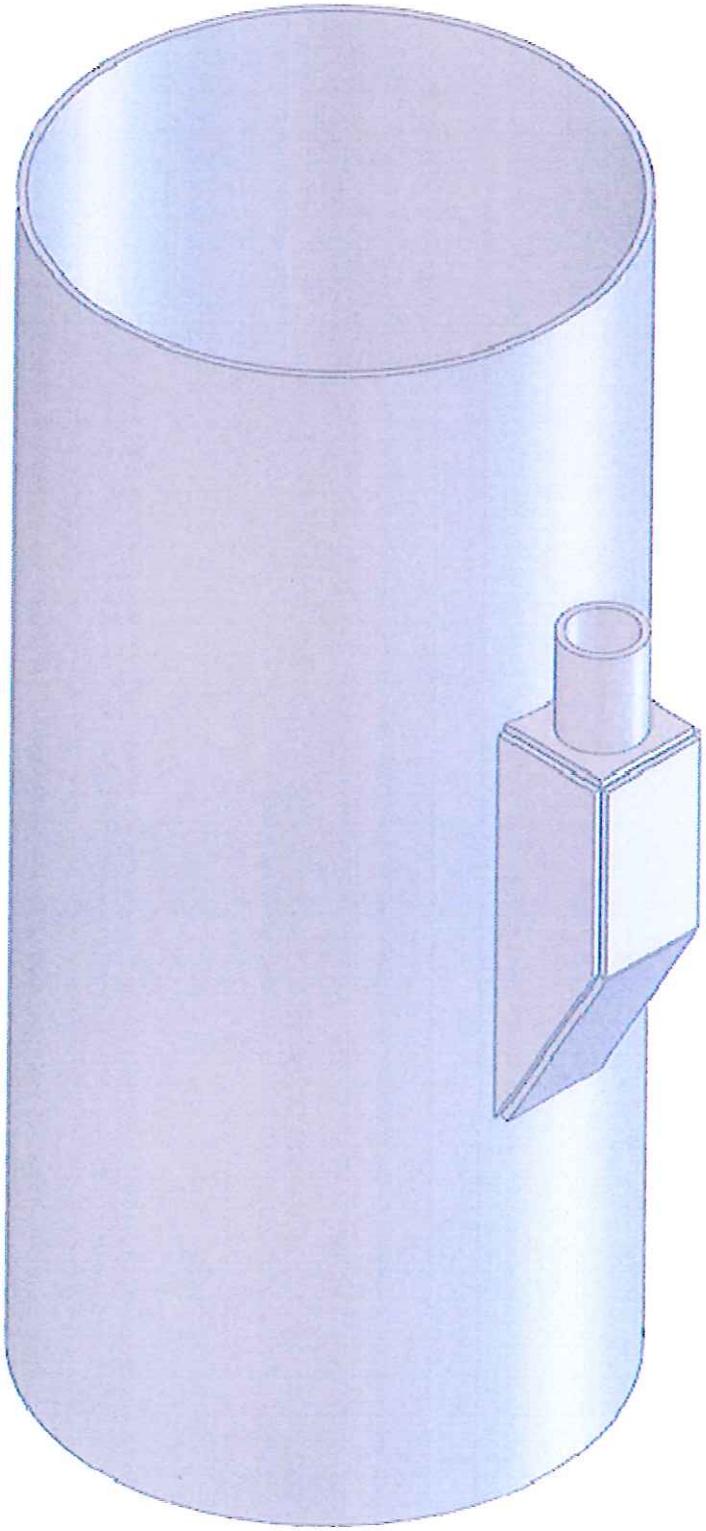
DRAWN BY:	JK
WORK ORDER #:	
SCALE:	NTS

FIGURE 3



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TUBE ENTRANCE CHAMBER BOX

DATE:	JUNE 2015
DRAWN BY:	TK
WORK ORDER #:	NA
SCALE:	NTS

FIGURE 4

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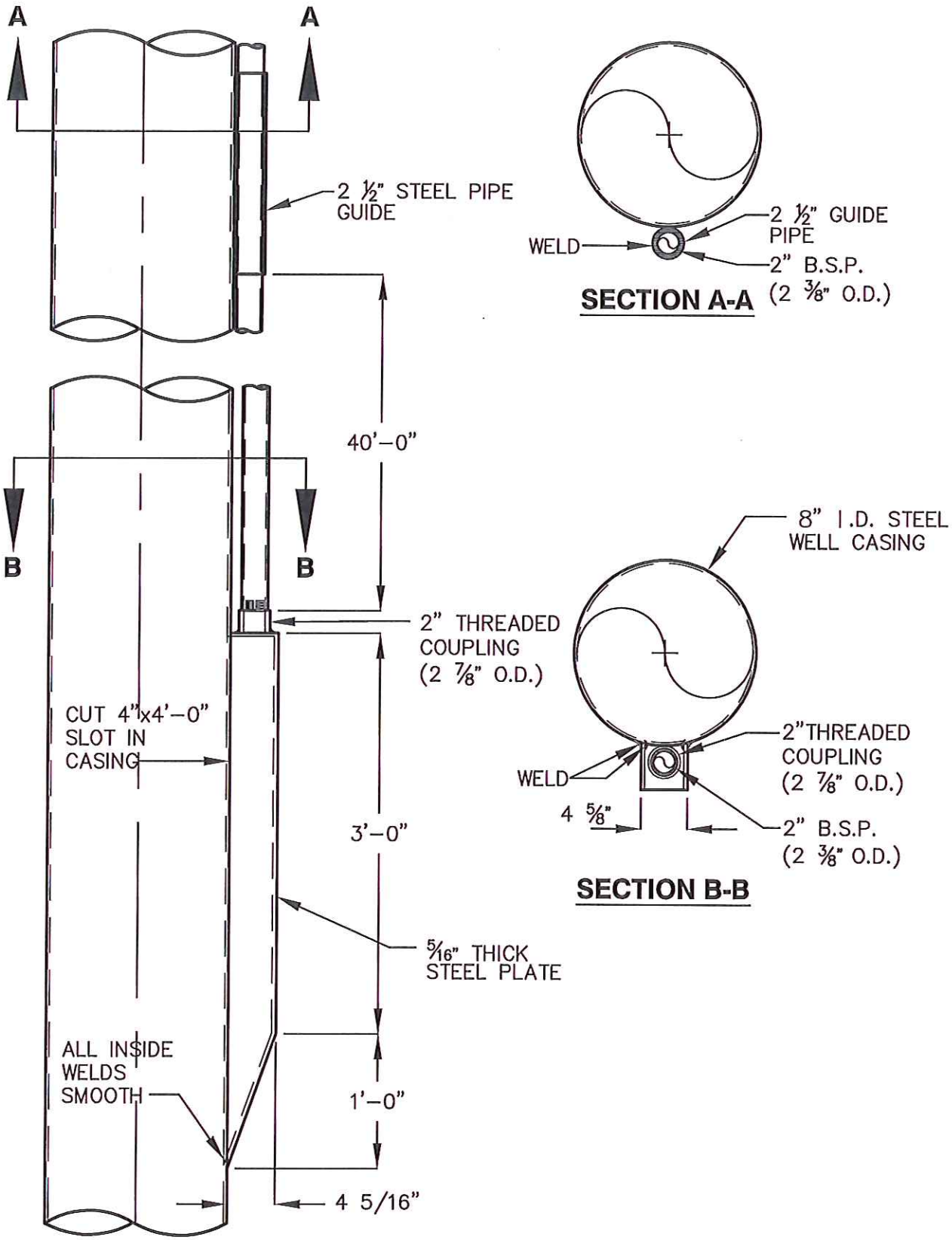
Jun 02, 2015 - 10:27am



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GENERAL SCHEMATIC for TUBE CONNECTIONS

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FIGURE 5

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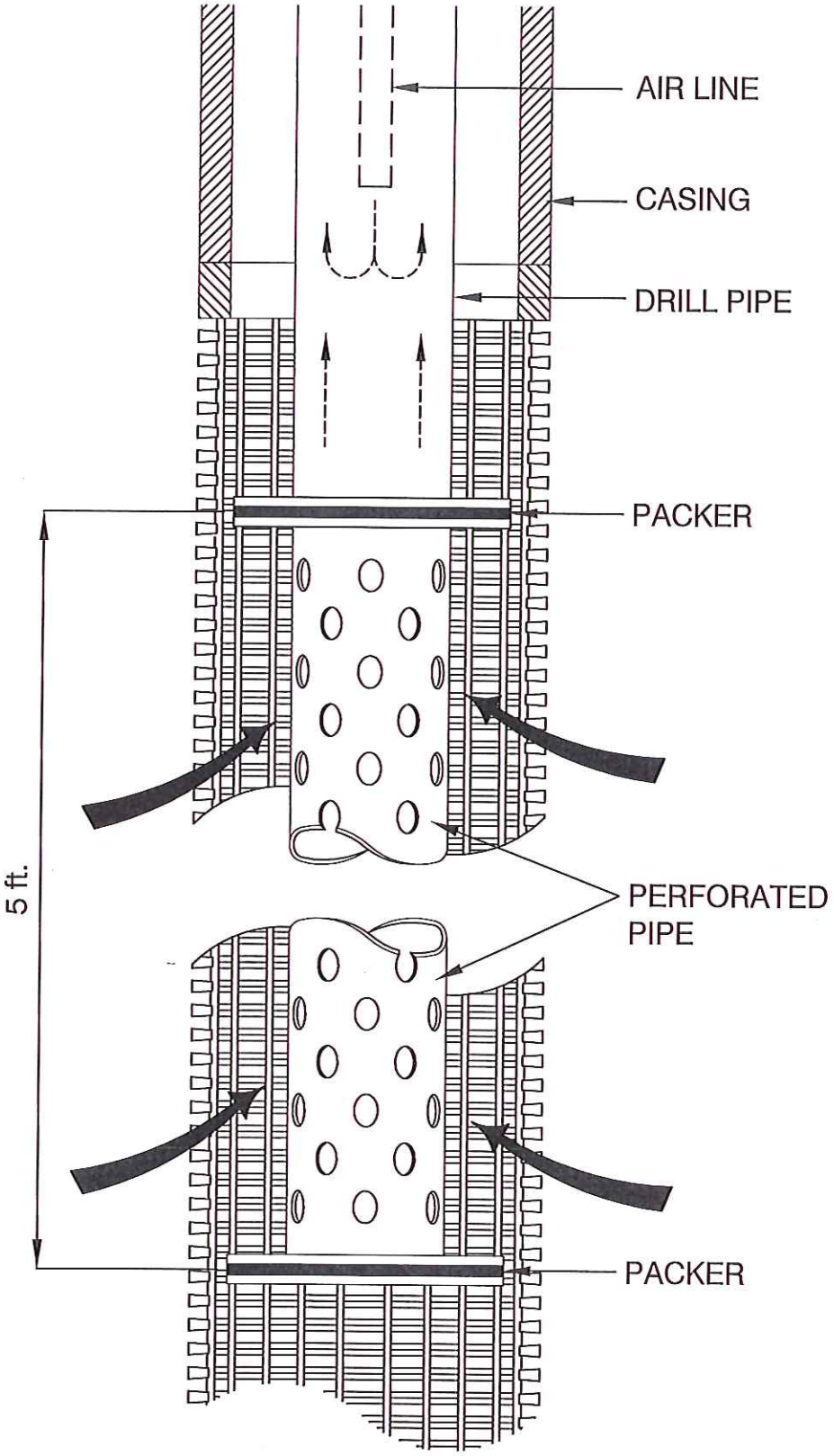

Groundwater and Wells, Johnson Filtration Systems

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DEVELOPMENT TOOL DIAGRAM

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SCALE:	NTS

FIGURE 6

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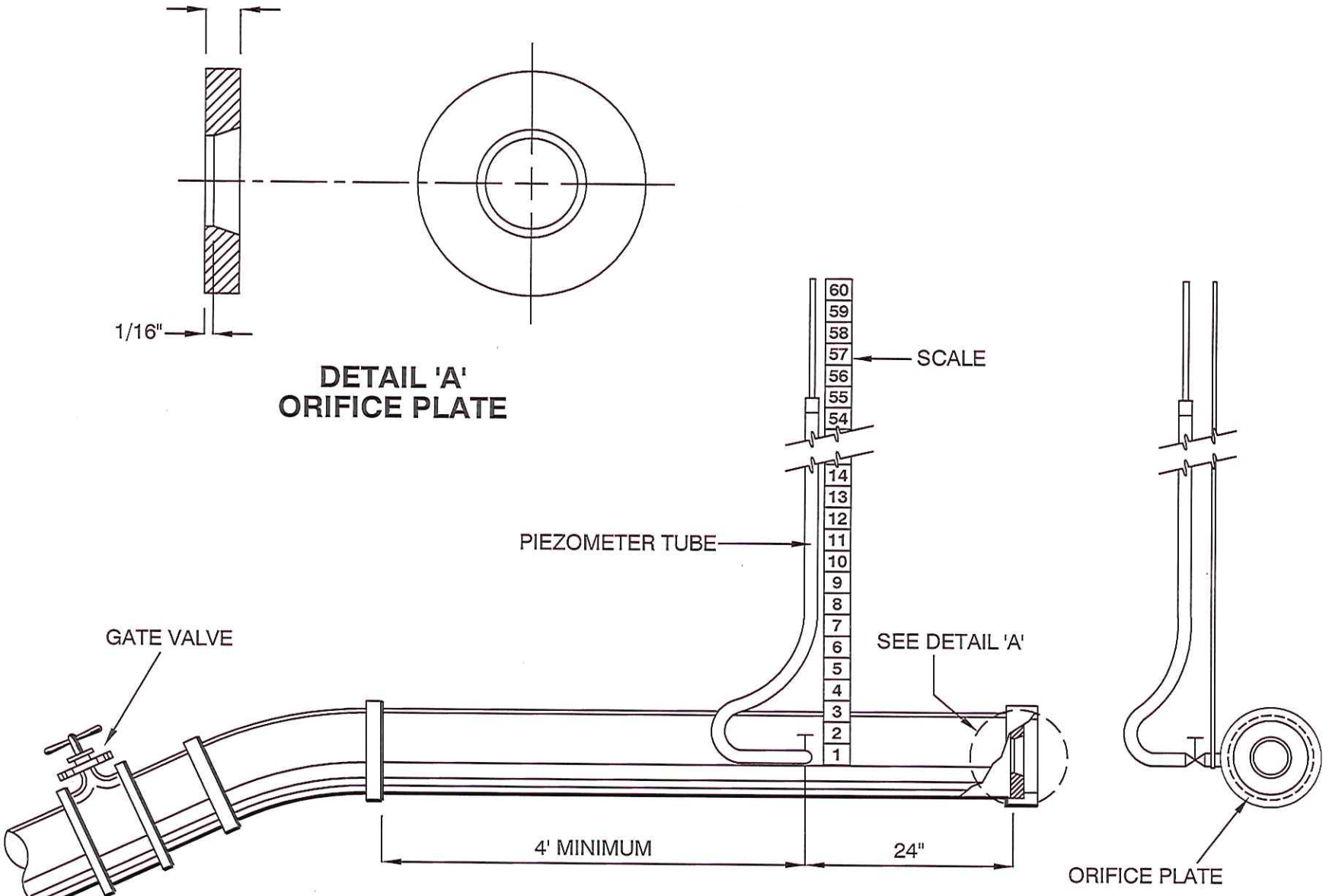

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ORIFICE WEIR DIAGRAM

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FIGURE 7