TECHNICAL SPECIFICATIONS FOR THE DRILLING OF
City of Sumner,
Fleischmann Site Production Well

May 2010

1. General

The City of Sumner herein referred to as the **Owner**, requires the drilling of a 16-inch production well to an approximate depth of 550 feet. The well will be drilled at the Fleischmann site (adjacent to the Fleishmann vinegar plant) in the industrial area north of Main Street in the City of Sumner (Pierce County Assessor's parcel number 0420241150). This site is specifically located in Section 24 of Township 20 North, Range 4 West. It is anticipated that the targeted aquifer will exhibit flowing conditions at the selected site. As such, the well will require installation of a flow-control seal prior to the initiation of the 20-inch drilling casing. The completed well will be tested to demonstrate the production capacity of the well and to obtain information needed to evaluate the proposed withdrawal to meet the regulatory requirements of the preliminary permit issued by the Department of Ecology. Robinson Noble, Inc., herein referred to as the Geologist, shall direct all work for the Project and act as the Owner's representative in activities associated with the drilling, design, construction, development, and testing of the well.

2. Scope of Work

The intent of this contract is to construct a production well in a flowing aquifer that is expected to occur at depths between 455 and 510 feet. The well is to be drilled utilizing cable-tool drilling methods, and must land a minimum of 16-inch casing at depths of up to 550 feet, fully penetrating the target aquifer. Because flowing conditions are anticipated at the site, drilling will commence with the placement of a flow-control seal to a depth of between 100 and 200 feet, depending on the specific geologic conditions encountered during drilling. This seal will be constructed by first installing 30-inch casing to a depth specified by the Geologist, and then grouting in 24-inch casing while the 30-inch casing is fully extracted. Once the seal is place and allowed to cure, drilling will proceed to depth using 20-inch casing. Depending on drilling conditions, a casing reduction to 16-inch may be required to reach the contracted depth. This reduction, if required, should occur prior to penetrating the targeted aquifer. Any casing reductions must be made in materials suitable for reducing (i.e. non-heaving) and in such a way as to prevent the binding of telescoped casings, as determined by the Contractor.

Upon completion of drilling, the Geologist will determine the required well design, construction and development procedures, and define the appropriate testing procedures. Following completion and development of the well, at a minimum, a step-rate test and a long-term constant-rate pumping test of at least 24-hours duration will be conducted at rates up to 2,000 gallons per minute (gpm) from a setting of 150 feet. Discharge water during testing will need to be escorted away from the wellhead a distance of up to 1,000 feet to a discharge point to be determined by the Owner.

Temporary disposal of drill cuttings into an on-site spoils pit will be allowed. However, cuttings in excess of that which can be contained within the spoils pit must be permanently disposed of off-site. The Contractor will be responsible for all aspects of cutting disposal including the initial excavation of a spoils pit near the well, the periodic clearing of the pit (using a vactor truck or some other appropriate means) and removal of the excess cuttings from the site, final decommissioning of the pit upon completion of the drilling, and restoration of the site to like conditions prior to the commencement of drilling. The Contractor will be responsible for providing the necessary equipment (i.e. back hoe, vactor truck, dump truck, etc.) to excavate and periodically clean out the spoils pit, and to decommission the pit and restore the site upon completion of drilling.

Drilling water will **not** be available on site and must be provided by the Contractor. The Owner will provide access to the site prior to mobilization. The Contractor will be responsible for adequately securing the area immediately surrounding the drilling operation to prevent public access to hazardous areas including but not limited to the spoils pit, the drilling rig, and other equipment. This may include providing chain-link fencing around the drilling site and a lockable cover for the spoils pit.

All work will be completed between **7:00 A.M. and 6:00 P.M.** on regular working days. There shall be no work performed on weekends or holidays, unless specific approval for such work is granted by the Owner and the Geologist. Requests for such extended work shall be made at least 48 hours prior to the requested time. Completion time for the work specified shall be within 120 calendar days from the issuance of the notice to proceed. The project starting time shall be no later than 14 calendar days from the date stated in the bid proposal.

Well drilling, construction, development, and testing, shall be accomplished in accordance with applicable requirements of Washington Administrative Code (WAC) 173-160, and the requirements of these specifications. Where the requirements of these specifications are more stringent, the requirements of the specifications shall prevail, provided that nothing in these specifications shall be construed to require work in violation of the WAC.

3. Equipment and Materials

3.1 Drilling Machine. Drilling shall be accomplished by cable-tool methods only with a rig of no less capability than a 72-Star. All appurtenant equipment including, but not limited to, bailers, jacks, and casing cutters are to be considered as part of the rig, available to the project as needed, and delivered to the site as a function of job mobilization.

3.2 Test Pump. The test pump shall have the capability of up to 2,000 gallons per minute from a -150-foot setting in a 16-inch pumping chamber. The test pump shall be run in with two, 1-inch I.D. sounding tubes that can be either PVC or galvanized steel. The sounding tubes shall be strapped to the pump column at regular intervals and run to within 10 feet of the top of the pump. If the bottom of the sounding tube is sitting on the shoulder of the pump so as to prevent instruments from exiting the tube, no cap on the sounding tube is required. Otherwise, the sounding tube will be capped and sufficient openings will be made in the tube wall to facilitate water entry. Pump accessories shall also include means of varying the discharge and accurately measuring the discharge rates.

3.3 Drive Shoes. All permanent casings shall have drive shoes which are forged or cast and of an industry-approved manufacturer. A shoe or armor plate on any temporary casing shall be of sufficient strength to allow that casing to be driven to required depth.

3.4 Temporary Casing. The 30-inch temporary casing shall meet the requirements of holding an oversized hole to the minimum drilled depth of 200 feet and sustain roundness until extracted as the flow-control seal is completion. This casing remains the Contractor's property.

3.5 Permanent Casing shall be new, or equal, with a minimum wall thickness of 0.375-inch for the 24-inch (flow-control seal) casing and 0.322-inch for the 20-inch and 16-inch casing.

3.6 Riser and spacer casings, if used, shall be new, or equal, and have a wall thickness as directed.

3.7 Extra Materials such as gravel pack or special fabrications shall be provided by the Contractor as specified by the Geologist during the course of the work.

3.8 Well Screen and Fittings shall be specified by the Geologist and provided by the Contractor as directed.

4. Execution of Work

4.1 Completion Time for the specified work shall be within 120 calendar days from issuance of the notice to proceed. The project starting time shall be no later than 14 calendar days from the date stated in the bid proposal. There shall be no work performed on holidays or weekends, unless approval for such work is granted by the Owner and Geologist. Requests for extended work hours or days shall be made at least 48 hours prior to that requested time. Exceptions may be granted in emergency situations where it is clear and agreed to by all parties that project progress would be significantly threatened by a holiday/weekend delay or to allow the Contractor to affect repairs on his equipment in order to ensure continued project progress on the next regular workday.

4.2 Flow-Control Seal. The flow-control seal shall consist of a 24-inch casing grouted into place to a depth of no less than 100 feet and no more than 200 feet, depending on specific geologic condition encountered during drilling, and as specified by the Geologist. The flow-control seal shall be constructed by first installing a 30-inch temporary casing to the required depth. The 24-inch casing will then be place within the 30-inch casing and grout shall be tremied into the annulus while extracting the outer temporary casing in accordance with WAC 173-160-221 and 173-160-231. The outer temporary casing shall be fully withdrawn as the grout is placed from the bottom up.

Prior to installation of the 24-inch casing, the Contractor will cut off the drive shoe or armoring from the 30-inch temporary casing using in-hole casing cutters to allow easier pulling. The temporary casing shall be extracted by use of hydraulic jacks. No other pullback method shall be used without express authorization from the Geologist. All costs associated with completing the flow control seal, including but not limited to the 30-inch shoe cut and casing extraction utilizing hydraulic jacks, will be accomplished as part of the price bid for completing the flow-control seal.

The completed flow-control seal will then be allowed to cure for a period of at least three days prior to commencing deeper drilling with the 20-inch casing. The Contractor is responsible for maintaining proper sealing procedures according to WAC 173-160-231(2).

4.3 Drilling shall be by churn-drill or drive-and-bail methods, and cuttings are to be removed with a sand-pump bailer unless otherwise authorized by the Geologist. Casing shall be kept within 5 feet of the bottom of the previously drilled hole at all times. The hole shall be drilled in such a manner that any over-excavation is held to a minimum. The Geologist shall have the authority to stop progress immediately if there is apparent over-excavation, and drilling shall not resume until procedures have been taken to remedy the problem.

At all times during the course of the work, the Contractor shall have on hand a supply of chlorine solution or dry chlorine. Chlorination shall be done on occasion as directed by the Geologist or as desired by the Contractor such that disinfection of the drill string and materials is accomplished. No extra payment is authorized for normal chlorination.

Drilling shall be performed by an experienced and licensed well drilling Contractor and a helper. Only competent workmen shall be employed on the job.

4.4 Permanent Casing. All casing utilized in the drilling of the well shall be new, or equal, with a minimum wall thickness as noted in Item 3.5 above.

4.5 Refusal of Casing. During the drilling process, casing refusal is a condition that might occur before the required depth is reached. To justify a call of "refusal," the Contractor shall state, to the best of their knowledge, the full reason to the Geologist for contract consideration. Such consideration shall include alternative plans and any change of prices. Economics related to slower-than-expected drilling progress shall not be accepted as a reason for refusal.

4.6 Sampling. The Contractor shall ensure that representative samples of formations drilled are collected during the drilling process. They shall be taken at least every 10 feet or at formation changes, and at least every 3 feet in water-bearing zones or as directed by the Geologist. Samples of water-bearing materials shall be collected from the entire contents of the sand-pump bailer. The bailer load shall be collected on a clean, 4' x 8' ¾-inch thick (minimum) plywood board (or equivalent) provided by the Contractor and the sample taken from a mix obtained there from. Samples shall be labeled with the project name, date and time collected, and true depth below ground.

At the direction of the Geologist, the Contractor shall collect a drive sample using a standard Dames and Moore sampler.

4.7 Records. The Contractor shall keep a daily written log of operation, including formations drilled; size and length of the casing placed; tools used; depth to water at the beginning and end of the shift; location, size and length of screen; and progress of development work. A duplicate copy of the daily log shall be furnished to and approved by the Geologist **no later than the beginning of the following day's work**.

4.8 Scheduling and Communication. Prior to mobilization to the project site, the Contractor will provide the Owner and Geologist with a schedule for site work, including anticipated daily arrival and departure times and any foreseeable schedule conflicts. The Contractor is responsible for notifying the Geologist in advance of any conditions resulting in a delayed arrival to or early departure from site or if the Contractor will not be on site during a scheduled work day. To facilitate communication with the Owner and Geologist, the Contractor and crew will have a working cellular phone or other means of communication on-site at all times.

4.9 Welding. All steel casings, risers and liners shall be joined by arc welding using standard procedures (American Welding Society, 1981). The Contractor assumes full responsibility for any breakage of casing, drive shoe failing, or weld failing during the course of the work. Stainless steel screens shall be welded with stainless steel welding rod according to manufacturer's specifications (see UOP Johnson Bulletin 1271).

4.10 Alignment. The basic alignment requirement is that all casings, liners, risers, screens, and tools can be freely run through the well, and that a test pump and permanent pump can be freely set in the well. Other alignment tests will not be required unless doubt arises during the work. If the Geologist or Owner requires an alignment test, the Contractor will be required to conduct a test as specified by the AWWA Standard for Water Wells publication (ANSI/AWWA A100-06, Appendix D: Plumbness and Alignment—Procedure for Testing). The bid hourly rig rate shall be paid for this test, unless the results of the test show alignment does not meet the above-specified conditions, in which case the Contractor shall bear the expense of the test and the expense of correcting or otherwise mitigating the misalignment.

4.11 Screen Setting and Pullback. The screen assembly shall be lowered into the fully cased well by methods approved by the Geologist. The casing shall be extracted by use of hydraulic jacks to the depth specified on the well completion diagram provided by the Geologist. No other pullback method shall be used without express authorization from the Geologist. Both the screen position and the level of filter-pack material, if used, shall be constantly checked by the Contractor during pullback. **The Contractor assumes full responsibility for the accuracy of casing extraction measurements and the successful retraction of the casing as required**. Unless otherwise directed, the Contractor will cut off the shoe with in-hole casing cutters to allow easier pulling. The shoe cut will be accomplished for the price bid, including running in, cutting and removing the cutter assembly.

4.12 Development of the well will be as directed by the Geologist. Development shall consist of bailing and surging with surge discs on the drill stem or other means (e.g. water jetting, air-lift pumping) as deemed appropriate by the Geologist.

4.13 Test Pumping. The test pump shall be initially set into a chlorinated water column. The test pump shall be run at variable speeds to prove both the capacity of the well and to determine if the water is free from sand. The test pump shall then be run at a constant discharge for a period of up to 24 hours. Constant-rate tests must have discharge rates kept to within 5% of the specified discharge, and, if pumped over eight hours, must be run uninterrupted for the first eight hours. Following the first eight hours, brief shutdowns of no more than six minutes each 12 hours shall be allowed or the results of the test could be nullified and, if so, testing would have to be repeated at the Contractor's expense.

4.14 Capping. At all times during the progress of the work, the Contractor shall protect the well in such a manner as to effectively prevent either tampering with the well or entrance of foreign matter into it. The completed well shall have a 1/4-inch steel plate cap welded in place. A 2-inch port and plug shall be installed on the cap to facilitate subsequent water level measurement. A steel ring shall also be firmly welded between all outer casings and the permanent casing.

4.15 Well Abandonment. In the event that the Contractor shall fail to complete the well because of lost tools, misalignment, or any reason determined to prevent the reasonable expected scope of the Contract, the well shall be abandoned in accordance with abandonment procedures in WAC 173-160-381. In such case, no payment will be due the Contractor for work performed to abandon the well. In the event that the well is abandoned by direction of the Owner, procedures must also meet the requirements of WAC 173-160, and the payment for the abandonment procedures will be due to the Contractor.

4.16 Disposal of Cuttings. The Contractor will be allowed to temporarily dispose of drill cuttings on site within the spoils pit only. It is the responsibility of the Contractor to have a spoils pit excavated prior to the start of drilling. It is also the responsibility of the Contractor to occasionally clean out the spoils pit during the drilling process (prior to overfilling), and to have all excess cuttings permanently removed from the site (excess cuttings will not be graded into the adjacent areas of the site). Upon completion of drilling, the Contractor will be responsible for backfilling the spoils pit and restoring the site to a condition similar to that prior to the start of drilling. The Contractor will take appropriate steps throughout the project to contain the cuttings so as to prevent addition of turbidity to neighboring properties, storm water systems and local streams or water bodies.

5. Submittals

5.1 Project Invoices. The Contractor will provide the Geologist with a copy of each invoice prior to submittal to the Owner. The Geologist will review the invoice for accuracy. The Contractor will allow sufficient time for this review such that the Owner’s scheduled submittal of invoices can still be met.

5.2 Well Screen and Fittings. Prior to screen installation, the Contractor will provide to the Geologist a copy of the screen manufacturer’s technical specifications for the screen as ordered.

5.3 Water Well Report. At the conclusion of the project, the Contractor will provide the Geologist with a copy of the Washington State Water Well Report as submitted to the Department of Ecology as required by 18.104.050 RCW.

6. Insurance and Indemnity

The Contractor shall carry, from the time it begins work or from the date of this contract, whichever comes first, until its completion, insurance to cover liability for all damages on account of bodily injury or death suffered by any person or persons not lawfully in the employ of the Contractor, upon or about the site or upon the ways adjacent thereto; which coverage shall include property covered by this Contract. Combined limits of public liability shall be $2,000,000. The Contractor **must** provide the Owner with said

certificate of insurance prior to mobilizing to the site.

7. Measurement and Payment

7.1 Mobilization and Demobilization shall be billable at the rate of **70%** of price bid when drilling starts and the final **30%** when all equipment and materials are removed from the site and the site is left in a clean and orderly state. This item includes all compensation for site preparation and the fee for the Washington Department of Ecology Notice of Intent.

7.2 Flow-Control Seal payment shall be for a completed seal to the required depth as described above in Section 4.2. Price bid includes all labor and materials to drill the oversized hole, provide temporary use of casing, maintain proper sealing procedures according to WAC 173-160-231(2), and to provide and place the seal specifically as described in Section 4.2.

7.3 Drive Shoe payment shall be for shoes welded to permanent casings and successfully driven to depth.

7.4 Drilling Hole For Casing shall be paid per lineal foot of hole drilled below the base of the flow-control seal which is capable of being cased with the contracted diameter of casing.

7.5 Casing shall be paid for per lineal foot of permanent 20-inch and 16-inch casing set below land surface, plus two feet of final stickup. Price bid shall include labor for installation of casing, including any overlap casing, should casing reduction be required.

7.6 Shoe Cut shall be paid on a lump sum basis for a successful separation of the drive shoe from the permanent casing. The price bid shall include all costs for the provision of the cutter assembly, as well as running in, cutting, and removing the cutter assembly.

7.7 Commercial Well Screens and Fittings, delivered to the site, shall be paid for at the manufacturer's published price plus actual cost of freight. The screen order shall be made at the direction of the Geologist.

7.8 Extra Materials not otherwise herein specified shall be provided only as directed and shall be paid for at documented cost plus 15% handling. Extra materials include, but are not limited to, risers, spacers for well screen assemblies, and gravel pack material.

7.9 Authorized Rig Work shall be paid for any directed work that requires a fully operating rig and **a minimum of a two-person crew** and is not otherwise covered by unit prices herein. No extra payment for hourly work shall be made when equipment being used is not in good working condition.

7.10 Test Pump shall be paid for at the price bid, such payment to include provision, installation and final removal, and pumping for four (4) hours to verify the initial well capacity and final well development. Specified accessories are part of the pump unit. Unless otherwise authorized, this item is to be used only once per well. Interim removal and resetting in the same well would be covered under Item 7.9. Price bid includes provision of an accepted discharge method for water pumped and any cost for additional eductor pipe to escort discharge water to the point of disposal. Payment for this item will not be made if representative water level measurements cannot be obtained from the installed sounding tubes.

7.11 Operate Pump Beyond 4 hours shall be paid at the hourly rate bid. Only one operator is required during pump operation. Payment for this item will not be authorized in situations where the pump is not operational, representative water level measurements cannot be obtained from the installed sounding tube, or when the pump operation is below the requirements set forth in Items 3.2 and 4.13 unless otherwise agreed to by the Geologist.

7.12 Authorized Stand-by and Shop Time shall be paid for any directed work not otherwise covered by unit prices herein, which does not require a fully operating rig. Stand-by and Shop Time shall also be paid per hour for time lost during a single 8-hour working shift while geophysical logging is delaying work, or for time required for one employee to fabricate shop items. During geophysical logging, the Contractor will provide one employee for assistance as directed by the Geologist.

7.13 Salvage Credit at the price bid shall be deducted for all permanent casing that is recovered and reusable in lengths of 5 feet or more, and as agreed upon by the Contractor and Geologist. Such recovered casing becomes the Contractor's property. Labor for salvage is paid at the rate bid for rig work (Item 7.9).