

Addendum No. 1

for

"Phase 1b – Contract A2 – Water Supply Wells
Illinois Alluvial Regional Water Company
Jersey County, Illinois

October 6, 2026

The contract documents prepared by MECO-Heneghan Engineers for Phase 1b – Contract A2 – Water Supply Wells for the Illinois Alluvial Regional Water Company are hereby amended or clarified as follows:

1. BID DATE

The bid opening date has been extended as follows:

Bids for the construction of the Project will be received at the Illinois Alluvial Regional Water Company, Inc. located at 1009 State Highway 16, Jerseyville, IL 62052, until **October 16, 2026** at 2:00pm local time. At that time the Bids received will be publicly opened and read.

All questions from potential bidders must be submitted by 12:00 p.m. on Friday, October 9, 2026. Questions submitted after that time will not be addressed.

2. FRONT END DOUMENTS

Changes / additions/ clarifications to the project are listed below:

The Bid Form has been modified. Item 1a Well Test Well has been removed from the base bid and added as Alternate C, Item 1, Well 4 Test Well. The attached Bid Form replaces all previous versions and must be used for all valid bids. Any bid submitted using an earlier version of this form will be rejected.

3. SPECIFICATIONS

Changes / additions/ clarifications to the project are listed below:

- A. Specification Section 133423, Fiberglass Reinforced Polymer (FRP) Shelter, has been added. **This section replaces Section 067000, Fiberglass Reinforced Polymer (FRP) Products and Fabricators.**
- B. Specification Section 331136, Vertical Turbine Pumps, has been revised. The attached revised Section 331136 replaces any previously issued versions.
- C. Specification Section 332113, Alluvial Wells, has been revised. The attached revised Section 332113 replaces any previously issued versions.

4. **GENERAL CLARIFICATIONS**

The questions and responses below are provided for general clarification from questions presented by Bidders and/or Subcontractors.

How long does the turbine need to be? They are referring to this dimension as the TPL. Specifically, they need to know the distance from the bottom of the sole plate to the bottom of the basket strainer. **Please base your bid on setting the pump inlet 40' above the bottom of the wells. We may modify this length by change order after we are able to test pump the first production well.**

END OF ADDENDUM NO. 1



Max F. Middendorf, P.E. #062-049419 ILL.



exp. 11-30-2027

ADDENDUM NO. 1 RECEIVED AND ACCEPTED BY:

Signature

Date

MFM:bpg



BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, and the General Conditions, ~~and the Supplementary Conditions~~.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

**Allen Davenport, Board President
Illinois Alluvial Regional Water Company, Inc.
1009 State Highway 16, Jerseyville, IL, 62052**

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

- A. Required Bid security;
- B. List of Proposed Subcontractors;
- C. List of Proposed Suppliers;
- D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;
- E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
- F. Required Bidder Qualification Statement with supporting data; and
- G. **Non-Collusion and Certification Statements**
- H. **Certification of Nonsegregated Facilities**
- I. **Certificate Regarding Bid Rigging & Rotating (Criminal Code 33E)**
- J. **Certificate Regarding Debarment, Suspension, and Other Responsibility Matters**
- K. **Certification that all iron, steel manufactured products and construction materials used for this project must be produced in the United States. [Build America, Buy America Act]**
- L. **Disadvantaged Business Utilization and Affirmative Efforts**

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Unit Price Bids*

- A. Bidder will perform the following Work at the indicated unit prices:

Base Bid A – Contract A-2					
Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1.	Well Installation	EA	3	\$	\$
2.	Well Pump / Motor	EA	3	\$	\$
3.	Wellhouse Enclosure	EA	3	\$	\$
4.	Access Stairs	EA	3	\$	\$
5.	Wellhouse Platform	EA	3	\$	\$
6.	12" Ductile Iron Flush Piping/Fittings/Valves/Vault	EA	3	\$	\$
7.	Well Electrical/Controls	EA	3	\$	\$
8.	Electrical Power Feed to Each Well	EA	3	\$	\$
9.	Fence/Gravel Access/Sitework	EA	3	\$	\$
Total of All Unit Price Bid Items					\$

Dollars

(In Words)

Alternate A – Contract A-2					
Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1.	Well Installation	EA	1	\$	\$
2.	Well Pump / Motor	EA	1	\$	\$
3.	Wellhouse Enclosure	EA	1	\$	\$
4.	Access Stairs	EA	1	\$	\$
5.	Wellhouse Platform	EA	1	\$	\$
6.	12" Ductile Iron Flush Piping/Fittings/Valves/Vault	EA	1	\$	\$
7.	Well Electrical/Controls	EA	1	\$	\$

8.	Electrical Power Feed to Each Well	EA	1	\$	\$
9.	Fence/Gravel Access/Sitework	EA	1	\$	\$
Total of All Unit Price Bid Items					\$

Dollars

(In Words)

Alternate B – Contract A-2					
Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1.	Well Installation	EA	1	\$	\$
2.	Well Pump / Motor	EA	1	\$	\$
3.	Wellhouse Enclosure	EA	1	\$	\$
4.	Access Stairs	EA	1	\$	\$
5.	Wellhouse Platform	EA	1	\$	\$
6.	12" Ductile Iron Flush Piping/Fittings/Valves/Vault	EA	1	\$	\$
7.	Well Electrical/Controls	EA	1	\$	\$
8.	Electrical Power Feed to Each Well	EA	1	\$	\$
9.	Fence/Gravel Access/Sitework	EA	1	\$	\$
Total of All Unit Price Bid Items					\$

Dollars

(In Words)

Alternate C – Contract A-2					
Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
1.	Well 4Test Well	EA	1	\$	\$

Total of All Unit Price Bid Items	\$
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Dollars

(In Words)

B. Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3.02 *Total Bid Price (Lump Sum and Unit Prices)*

Total Bid Price (Total of all Lump Sum and Unit Price Bids)	\$
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ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

- A. This Bid will remain subject to acceptance for 120 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

- A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

- A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 6—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

6.01 Bidder’s Representations

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the SupplementaryGeneral Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the SupplementaryGeneral Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the SupplementaryGeneral Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder’s (Contractor’s) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
 - b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
 - c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
 - d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

Bidder is currently certified as an MBE or WBE under EPA's DBE Program? Yes ☐ No ☐

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

Address for giving notices:

Bidder's Contact:

Name:

(typed or printed)

Title:

(typed or printed)

Phone:

Email:

Address:

Bidder's Contractor License No.: (if applicable)

DIVISION 13: SPECIAL CONSTRUCTION**SECTION 133423 - FIBERGLASS REINFORCED POLYMER (FRP) SHELTER****1.00 GENERAL****1.01 SYSTEM DESCRIPTION**

- A. Shelter Name: Contract A2 Raised Well
1. Size:
 - a) Exterior Width: 12 ft – 6 in
 - b) Exterior Length: 12 ft – 6 in
 - c) Wall Height: 8 ft
 2. Roof Slope: Sufficient to allow rain drainage, 12° – 17° pitch.
 3. Roof Type: Roof shall be single-slope as shown on Plans or wind-resistant “hip” design sloping up from all four sides. Roof shall form a permanent weather-proof connection with a seamless exterior appearance that uses low-maintenance silicone caulk matching the shelter's exterior color.
 4. Roof deck is compliant with ASTM E 108/ULC S107 (class C) with <13' Flame Spread.
 5. Roof shall not overhang walls in order to maximize shelter's wind speed rating.
- B. System: Design, furnish, and install complete package using manufacturer's standard components.
- C. Structure Type: Fiberglass Reinforced Polymer (FRP) shelter on a formed and poured concrete pad as specified herein.
- D. Submittals: Shelter vendor to provide one (1) digital version of shop drawings and manufacturer's data including the following:
- a) Dimensions, weight, materials, parts, devices, and all other information required to verify compliance with these Specifications.
 - b) Manufacturer's Literature and Technical Data: Drawings and Specifications for proposed system.
 - c) Drawings prepared specifically for this Project:
 - (i) Materials and Details: Show materials, details of components (including doors and other accessories), finishes, fastenings, methods of joining, sealants, anchor bolt details, structural members and bracing, and openings.
 - (ii) Anchorage details of structure to foundation.
- E. Operations and Maintenance (O&M) Manual including installation instructions, digital version only, to be provided after shelter ships.

1.02 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer:
 - a) Longevity: At least 10 years' experience in work of the type required in this section.
 - b) Capacity: Production throughput sufficient to provide work required for this Project without delay.
 - c) Manufacturing facility for this shelter shall be located within the United States of America.
 - d) Certified Test Results: The manufacturer shall have an entire fiberglass panel destructive tested by an accredited Testing Laboratory and Third Party Quality Control Agency and upon request shall furnish to the engineer the certified and stamped test results of the laboratory testing. The accredited Testing Laboratory must be accredited to ISO 17020 and 17025.

FIBERGLASS REINFORCED POLYMER (FRP) SHELTER

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- e) Quality: The manufacturer shall maintain a quality assurance program that is reviewed and approved by a Third Party Quality Control Agency.
- 2. Erector/Installer:
 - a) Not less than 2 years' experience in the offloading and installation of prefabricated structures.

B. Material Properties:

- 1. Fiberglass Laminate Properties:
 - a) Tensile Strength (ASTM D 638) 16,000 (psi)
 - b) Flexural Strength (ASTM D 790) 33,700 (psi)
 - c) Flexural Modulus (ASTM D 790) 1,160,000 (psi)
 - d) Tensile Modulus (ASTM D 638) 1,300,000 (psi)
 - e) Barcol Hardness 45
 - f) Izod Impact – Notched ((ft.-lbs)/in) 16.30
 - g) Izod Impact – Unnotched ((ft.-lbs)/in) 21.79
- 2. Foam shall be rigid closed cell, polyisocyanurate with a density of 1.5 – 1.9 pounds per cubic foot.
 - a) Flame Spread (ASTM E 84) <75
 - b) Smoke Development (ASTM E 84) <450

1.03 DELIVERY, STORAGE, AND HANDLING

- A. The fiberglass shelter and the accessory items shall be carefully transported, stored, handled and set in place in a manner that will prevent distortion, misalignment or other damage to the units.
- B. During storage prior to installation and following installation, but prior to placing in service, the manufacturer's recommendations regarding handling shall be followed.

1.04 MANUFACTURERS WARRANTY

- A. Manufacturer shall provide a twenty-five (25) year warranty on the shelter materials and workmanship, according to the following specifications:
 - 1. The shelter will be free from manufacturing defects in workmanship and will not appreciably deteriorate under conditions of normal use and regular service and maintenance when installed properly, for a period of twenty-five (25) years from the original date of purchase.
 - 2. Component parts will be purchased from reputable manufacturers and carry their own warranties.
 - 3. Any shelter penetrations made by shelter manufacturer must be maintained by the Customer to ensure proper sealing. Suggested intervals is every (2) two years. All penetrations made by the Customer are the responsibility of the Customer and may void or limit the warranty if larger than 2" diameter. Customer field penetrations through areas specifically designed to prevent exposure of core materials will neither void nor limit the warranty.
 - 4. All warranties are Null and Void if the shelter and/or its components are modified or damaged as a result of unauthorized repair, misuse, negligence, accident, or act of God. This warranty does not cover vandalism, unreasonable use, damage caused by flying or falling objects, collision with animals or vehicles, or damages caused by environmental extremes or natural disasters, such as earthquakes, floods, hail or lightning.

2.00 PRODUCTS

2.01 SHELTER MANUFACTURERS

- A. Product from Shelter Works, St. Louis, MO or approved equal on this Project.

2.02 SYSTEM PERFORMANCE. Structural Loading:

- A. Shelter: Own dead load.
- B. Standard: ASCE/SEI 7-22, Risk Category III, ground level.
- C. Roof Load: 27 psf ground snow load
- D. Wind Load: 115 mph
- E. Seismic Load: Per local building code

2.03 COMPONENTS

- A. U-BOLTS. Through-wall lifting/tie-down eyes at the top of each corner to facilitate handling, 304 stainless steel.
- B. WALLS. Each wall shall be one single monolithic piece with faux brick textured appearance. Panelized construction not acceptable because connections could fail and leak over time.
- C. CONNECTIONS. Wall panels shall overlap to form a permanent weather-proof connection with a seamless exterior appearance that uses low-maintenance silicone caulk matching the shelter's exterior color. Internal connections shall use stainless steel hardware spaced no more than 12" on center.
- D. EXTERIOR. All exterior surfaces shall have 18-20 mils of superior performance marine grade gel coat, incorporating ultra-violet inhibitors. Exterior color shall be desert sand, polar white, meadow green, or storm gray.
- E. INTERIOR. All interior surfaces shall be sprayed with 18-20 mils of Polycor 944 high quality isophthalic white gel coat finish offering the same characteristics as the exterior surfaces without ultra-violet inhibitors. Interior surface shall not contain any visible surface-mounted strut or other unsightly channel.
- F. BASE FLANGE. Shelter shall have an FRP mounting flange around the entire interior perimeter, 1/4" thick x minimum 2" wide. Pockets which reduce the wall's full insulation value shall not be accepted. ConSeal Bitumen/Butyl sealant shall be provided for a weather-proof connection below the shelter's base.
- G. ACCESS
 - 1. Roof scuttle/hatch as shown on Plans, 4' x 4' Bilco F-40.
 - 2. Pedestrian door shall be made of fiberglass reinforced polymer (FRP) using exclusive FiberWrap technology to eliminate the possibility of edge delamination during the shelter's entire lifespan.
 - 3. Pedestrian door shall be hung with stainless steel ball bearing type hinges equipped with tamper-resistant, non-removable pins. Hinges shall be oriented with no fasteners exposed when door is closed.
 - 4. Pedestrian door shall be sealed with a weather-tight EPDM gasket along the entire perimeter of the door.
 - 5. Pedestrian door shall have a 2.5" deep aluminum rain drip molding located above.
 - 6. All pedestrian doors must be able to be set in 'open' position with no hands. Doors must be able to be removed from 'open' position and closed with no hands. Doors must have hydraulic closer to prevent wind damage to door.
 - 7. (1) 3'-0" wide x 6'-8" high single door.
 - a) Closure system is 3-point, pad-lockable with anti-entrapment.
 - b) Threshold is raised step-over FRP (<3" high).
- H. PENETRATIONS. (2) rectangular area where the end-user can cut through wall or ceiling without exposing the core foam material thereby guaranteeing a weatherproof penetration for the life of the structure. Locations must not be visible from outside the shelter.
- I. TERMINATION. Electrical terminations in combined transformer/breaker panel, 15kVA, single-phase, 480V primary, 120/240V secondary, PVC NEMA 4X junction box **-OR-** NEMA 1 120/240V single-phase load center with 100 amp main breaker and at least 10 breaker slots.
- J. RECEPTACLES: (2) GFCI, duplex, 120V, 20A, each with weatherproof-when-not-in-use cover.
- K. WIRING

1. Schedule 40 PVC conduit installed around the interior perimeter of the shelter, along the top of the wall. All conduit and fittings shall be UL Listed.
2. Conduit and wiring shall be installed in accordance with the most recent National Electric Code (NEC).
3. Minimum 12 gauge shall be used for wiring in conduit.
4. Wiring shall not be loaded above 60° C temperature rating.

L. ILLUMINATION

1. (2) interior vapor-tight, LED light fixtures, mounted to ceiling as shown on Plans.
2. Interior lights to be operated by (1) single-pole switch with weatherproof cover.
3. (1) exterior LED light above door as shown on Plans, photocell operation with switch override to prevent illumination when in 'DOWN' position.

M. VENTILATION

1. (1) exhaust fan, as shown on Plans, through-wall, fan controlled by switch only (no thermostat).
2. (1) gravity intake louver with insect screen and aperture size equal to or larger than the fan opening. Manual vents are not acceptable in order to avoid fan motor burnout which could occur if fan were energized when manual vents are closed.
3. Intake louver shall be protected from the elements with a weather-tight fiberglass hood the same color as the shelter itself.

N. PTAC climate control unit as shown on Plans.

2.04 MATERIALS

1. Walls, roof and doors shall be seamless, one-piece panels laminated with 1/8" thick sprayed fiberglass outside surface, core material, and 1/8" thick sprayed fiberglass inside surface. Walls and roof shall have continuous FiberBeam laminations (floor to ceiling and top-of-wall to ridge) every 12" to permanently bond inner FRP surface with outer FRP surface to provide structural integrity and prevent de-lamination of the fiberglass from the core material.
2. Walls and roof shall have minimum R-17 insulation with core consisting of minimum 2.5" thick foam.
3. Minimum 19/32" thick wood encapsulated within interior surface of wall portions for field mounting equipment weighing more than 10 lbs:
 - a) Interior surface of all walls
 - b) (1) 4'W x 6'H of exterior surface to support weatherhead and meter.

3.00 EXECUTION

3.01 EXAMINATION. Investigate site, including soils, to determine effect on proposed shelter.

3.02 PREPARATION.

- A. Install concrete slab true and level to a maximum surface variance of 3/16" where the shelter interfaces with the slab.
- B. The slab immediately surrounding the shelter perimeter shall be sloped away at a pitch of 1/2" per foot to promote proper drainage and eliminate the potential of standing water around the shelter.

3.03 ERECTION

- A. At the time of installation the slab shall be clean and dry.
- B. Follow written offloading and installation instructions provided by shelter manufacturer.
- C. Contractor shall provide any required Type 304 stainless steel expansion anchors.
- D. Install and make final electrical connections to all equipment shipped loose with water-tight flexible conduit and fittings.

END OF SECTION 133423

DIVISION 33 - UTILITIES**SECTION 331136 – VERTICAL TURBINE PUMPS****1.00 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the contract, including General and Special Conditions and Division 1 specification section, apply to this section.

1.02 SUMMARY

- A. Furnish all labor, equipment, and materials to install, test, and place the pumps into successful operation for each well as noted on the Plans.
- B. Although 5 (five) turbine multi-stage vertical pumps, motors and accessories are called out, this Contract A for Phase 1 is to construct only 2 (two) of the 5 (five) wells at this time.
- C. Submittal of shop drawings, catalog cuts, specifications, and certified pump curves will be required for all pumps.

1.03 QUALITY ASSURANCE

- A. The Contract Documents represent the minimum acceptable standards for products specified in this section on this project. All products shall conform fully in every respect to the requirements of the respective parts and sections of the drawings and specifications. If not named, the product which is a "standard product" with that manufacturer shall be modified, from the standard mode and shall be furnished with special features, accessories, materials of construction or finishes as may be necessary to conform to the quality mandated by the technical and performance requirements of the specification.
- B. Reference Standards: Comply with all applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. American Water Works Association (AWWA)
 2. Hydraulic Institute Standards
 3. American Society of Testing and Materials (ASTM)
 4. National Electrical Manufacturers Association (NEMA)
- C. Maintain one copy of the manufacturer's application instructions on the project site.
- D. Verify that the manufacturer's label contains reference to ASTM standard.

1.04 SUBMITTALS

- A. Product Data: Include the following:
1. Product literature
 2. Manuals
 3. Complete product description
 4. Manufacturer's warranty
 5. A list of all deviations from drawings and specifications
 6. Manufacturer's installation instructions.
 7. Head capacity curves, brake horsepower curves and efficiency curves.
 8. Dimensioned outline drawings of pumps and motors showing type and size of all pump components.

1.05 SYSTEM DESCRIPTION:

A. Performance Requirements:

Multi-Stage Vertical Turbine Pumps:

1400 GPM @ 395 ft TDH Eff. = 82.8%
BHP = 163, Motor Actual = 200 HP
Discharge size 10-inch Flanged
Column size 10-inch with 1-11/16" line shaft

1. Pumps shall be capable of meeting the respective duty conditions specified herein, with water temperature of 60 degrees F and specific gravity of 1.00. The TDH (total dynamic head) specified does not include internal pump losses, those losses shall be accounted for by the pump manufacturer in the selection.
2. The maximum acceptable speed for pumps shall not exceed 1800 RPM.
3. Maximum acceptable motor HP nameplate rating, without considering SF, shall not exceed the horsepower specified above.

B. Interface with Adjacent Systems:

1. Pumps shall interface with plant control panel at a minimum to provide:
 - (1) Operate in accord with system plant demand.
 - (2) To stop the pumps at high level in clearwell.
 - (3) Operate with valves and controls to prevent hydraulic surge and pipe hammer

1.06 QUALITY ASSURANCE:

A. Qualifications:

1. This specification covers Pump equipment as manufactured by Aurora Pumps (or equal).

B. Standards:

1. American National Standards Institute (ANSI)
2. American Water Works Association (AWWA)
3. American Society of Testing and Materials (ASTM)
4. National Electrical Manufacturers Association (NEMA)
5. Hydraulic Institute Standards

1.07 INSTALLATION REQUIREMENTS:

A. Contractor provide services of equipment manufacturer or agent to assist in the following:

1. Provide instruction to train workers on correct installation procedures.
2. Onsite services at time of startup to make all necessary tests and adjustments to place equipment into complete and satisfactory operation.
3. Minimum of two (2) trips onsite service, installation instruction and one (1) for startup and to instruct Owner's personnel in correct operation and maintenance procedures.

2.00 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS: AURORA PUMPS (OR EQUAL)

- ### **A.**
- Pump shall be Layne Verti-Line 1100 Series, size 12TLV (8 stage) open line shaft pump.. Pump shall comply with AWWA Standard E-101 for Vertical Turbine Pumps.

- B. The discharge head shall be size 16 ½ x 10, Type SDC, ASTM-A48-CL30 cast iron with 125 lb. discharge flange. The bottom of the discharge head shall be machined flat for mounting on a base plate. A steel foundation late is to be provided by the manufacturer. The stuffing box shall be steel with a bronze bearing furnished with Teflon based packing. The head shaft shall be two-piece construction with a coupling located just above the stuffing box. Contractor shall provide tubing to drain for the stuffing box drip.
- C. The pump bowl shall ASTM-A30 cast iron, free from blow holes, sand holes, and all other defects. The bowls shall be lined with a smooth porcelain enamel coating. The impeller shaft shall be of grade A582, 416 SS (stainless steel) and shall be supported by a combination of C84400 A40 neoprene rubber bearings supported by 304 stainless steel bearing retainers. The impellers shall be cast from bronze alloy, B584-C83600 enclosed type.
- D. The column pipe shall be standard weight stainless steel conforming to the requirements of AWWA standards for deep well turbine pumps. The pipe sections shall not exceed 10' in length and shall be connected with threaded, sleeve type couplings. The joints are to be butted to insure perfect alignment after assembly. These short coupled pumps must be furnished assembled less motor.
- E. The line shaft shall be turned and ground 416 stainless steel with stainless steel couplings. The line shaft bearings shall be neoprene rubber and supported by 304 stainless steel bearing retainers. The bearing retainers shall be drop in type retained by the butted pipe ends. Line shaft sections shall not exceed 10' in length and the size of the shaft shall be ample to transmit the horsepower required by the pump.
- F. The motor for driving each pump shall be vertical hollow shaft, with non-reverse ratchet, squirrel cage induction type, complying with applicable AWWA and ASA standards. The connection to the pump shaft shall be through a threaded 416 stainless steel coupling in the discharge head. The motor shall be of the proper size to drive the pump continuously over the full range of the performance curve without the load exceeding the nameplate rating of the motor, without considering SF, service factor.
- G. A thrust bearing of ample capacity to carry the weight of all rotating parts plus the hydrostatic thrust, plus any up-thrust conditions, shall be incorporated into the motor as an integral part of it. The bearing shall be of such size that the average life rating is not less than 5 years of continuous operations.

2.02 PUMP SUPPORT BASE PLATES:

- A. Provide five (5) steel support base plates as shown on the drawings. The bases shall include properly sized anchor bolts to allow for leveling of the pump sole plate and grouting beneath.
- B. Concrete shall have a minimum 28 day cure strength of 4000 PSI.

2.03 PIPING:

- A. Piping shall be of the size and type specified on the drawings. Fittings and valves shall be bolted flanged 125 Lb type.
- B. Provide a flexible bellows type connector on the discharge of each Pump with pipe supports and alignment such that no stress or pull is transmitted to the turbine pumps.
- C. Provide automatic air release valves as near the discharge as possible to remove trapped air in the pump column.

2.04 ELECTRICAL:

- A. Pump motors shall be Heavy duty Vertical hollow shaft type with WP-1 enclosure and shall be furnished by the Pump Manufacturer.
- B. Pump motors shall be wired in accord with Specification Division 16000 and per National Electrical Code standards. Motor starters and control panels shall be furnished under the electrical contract as specified and as shown on the drawings.

- C. Motor shall be rated for inverter duty to be driven by VF drives furnished by others. It shall be the responsibility of the VFD supplier to assure that the VFD matches the motor and pump requirements such that the pump may be operated smoothly throughout the operating RPM ranges.

3.00 EXECUTION

3.01 GENERAL

- A. The Contractor shall be responsible for furnishing and installing the specified pumping equipment and necessary accessories in strict conformance with the plans, specifications, and equipment manufacturer.
- B. The equipment manufacturer shall furnish necessary personnel for testing and startup of the pump equipment.
- C. The manufacturer shall furnish the Owner six (6) copies of an Operation and Maintenance Manual for all equipment furnished by the manufacturer.

3.02 INSTALLATION

- A. Tolerances
 - 1. Pump and piping shall fit together in true alignment.
 - 2. The pump support must be level and the pump must hang perfectly vertical within +/-1%.

END OF SECTION 331136

DIVISION 33 - UTILITIES**SECTION 332113 – ALLUVIAL WELLS****1.00 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Scope of Work:
1. The Contractor shall furnish all labor, materials, tools and equipment necessary for the drilling, casing, installing screen, developing and testing of the gravel pack type alluvial wells.
 2. The work shall include everything necessary and requisite for the complete installation of the alluvial wells although every detail necessarily involved may not be particularly mentioned.
 3. The work of drilling and installing the casing and screen into the wells and developing the wells shall be performed by careful and efficient mechanics, skilled in this work, and who are normally employed on a full-time basis by the Contractor.
- B. Related sections include the following:
1. 119915 Vertical Turbine Pumps (Wells #1 - #5)

1.03 QUALITY ASSURANCE:

- A. All equipment and material shall be the latest design, new undeteriorated, and the first quality standard product of manufacturers regularly engaged in the production of such equipment and material.
- B. Applicable Codes and Standards:
1. API Specification 5L.
 2. AWWA A100 - Water Wells.
 3. AWWA C206 - Field Welding of Steel Water Pipe.
- C. Well shall be constructed in accordance with all requirements of the Illinois State Geologist and Illinois Environmental Protection Agency.

1.04 SUBMITTALS:

- A. Samples and Records:
1. A Driller's log shall be maintained in accordance with AWWA A100.
 2. At least one week before starting to drill the well, the Drilling Contractor shall send a written request to the State Geologist; who will furnish a set of small sacks, a drill record book, and letter of instruction regarding the collection and handling of drill cuttings. The driller shall save a sample of soils or other materials from every 5' and place them in sacks, properly labeling same. These samples shall be taken from the discharge of the drilling equipment and not from the slush pit.

The sacks containing the samples shall be sent prepaid to the Division of Geological Survey and Water Resources of Illinois.

Accompanying each set shall be a copy of the driller's log for the interval submitted. The collecting, sacking and sending of samples shall be at the expense of the Contractor. A copy of the Driller's log shall also be sent to the Engineer.

3. The Driller shall note in the drill record book the location and depths of any crevices, openings, or soft or broken ground encountered, together with complete information as to the depth of casing, method of sealing same and the results of the seal test.
4. Upon completion of the well, or prior to completion, if requested, the driller shall forward all samples of cuttings not previously submitted, together with the completed drill record book to the State Geologist's Office for correlation and completion of the Owner's copy of the completed log of the well.

2.00 PRODUCTS

2.01 CASINGS:

- A. The casing shall be new wrought steel pipe conforming to API Specification 51 with beveled ends for welding and shall be not less than the size and thickness as follows:

<u>Nominal Size</u>	<u>Outside Diameter</u>	<u>Inside Diameter</u>	<u>Wall Thickness</u>	<u>Weight Per Ft.</u>
24"	24.000"	23.000"	0.500"	125.49

- B. The exact amount of casing required will be determined by the State Geologist.
- C. Any temporary outer casing required for construction purposes only shall be of such weight and design as necessary to prevent entrance of sand and silt, to be reasonably water tight, and to permit its installation without distortion or rupture to the required depth and dimension.

2.02 WELL SCREEN:

- A. The well screen shall be stainless steel wedge wire wound screen containing not less than 18% chromium and 8% nickel and shall be AISI, Type 304. The screen nominal diameter shall not be less than 24". The screen shall have a slot size, to be determined by the well contractor, to effectively filter the gravel pack and let the maximum amount of water enter the well (1,400 gpm design flow). The bottom of the screen shall be sealed by means of a 3/8" stainless steel plate welded to the entire circumference of the well screen. The screen shall be as manufactured by Johnson Screens (or equal).
- B. The well screen shall have an inner screen support rod having a diameter of 0.250 inches for the rod as shown on the plans.

2.03 WELL GRAVEL PACK:

- A. All material used for construction of the gravel wall around the well screen shall be cleaned, thoroughly disinfected, well rounded particles of sound siliceous material which has been thoroughly cleaned of all silt, dust, and other foreign matter. Not more than 5 percent of the gravel shall be soluble in hydrochloric acid. All gravel used shall be screened and processed to a material size and gradation required to effectively keep the natural formation from entering the well and yet allow the maximum amount of water to enter. The final material used for the gravel pack shall be determined based on the analysis of the material removed during drilling operations. The gravel pack shall have a SG of 2.65, and shall have a uniformity coefficient of 1.6. The gravel pack shall be #90 Well Pack by Red Flint Sand and Gravel, L.L.C., equivalent products by Winter Brothers, Northern Gravel Company, (or equal).

2.04 GROUT:

- A. Permanent well casing shall be surrounded by a minimum of 1 ½ inches of grout to the depth required.

- B. Neat Cement Grout
 - a. Cement conforming to AWWA A100, and water, with not more than six gallons of water per 94 pounds of cement, must be used for 1 ½ inch openings.
 - b. Additives may be used to increase fluidity subject to approval by the reviewing authority.
- C. Concrete Grout
 - a. Equal parts of cement conforming to AWWA A100, and sand, with not more than six gallons of water per 94 pounds of cement may be used for openings larger than 1 ½ inches.
 - b. Where an annular opening larger than four inches is available, gravel not larger than one-half inch in size may be added.

2.05 TEMPORARY / PERMANENT CAPPING REQUIREMENTS:

- A. Wells, temporary or permanent, shall be effectively located/sealed against the entrance of water and contaminants.
- B. A 1" thick metal plate shall be used for capping well.
- C. At all times during the progress of work, the Contractor shall provide protection to prevent tampering with the well or entrance of foreign materials.

3.00 CONSTRUCTION REQUIREMENTS

3.01 TEST HOLES

- A. Test holes were drilled and documentation is provided at the end of the specification section.
- B. There is no express or implied guarantee as to the accuracy or completeness of the test hole information, or to the interpretation thereof by the Owner, the Engineer, or any of their representatives. The subsurface information or copies thereof **do not** form a part of this or any other Contract Documents issued by the Owner for this project.
- C. Each prospective bidder shall make his own interpretation of subsurface information issued to him, and shall, at his own expense, make any surveys and investigations as he may deem necessary to evaluate conditions which will affect performance of the work.
- D. The Contractor shall be responsible for the drilling of a test hole at the location of the proposed well to a depth equal to the proposed well depth.
- E. The Contractor shall be responsible for collecting split spoon soil samples at two and a half (2.5') intervals and at every change in formations for the completion of a bore log and sieve analysis.
- F. The Contractor shall be responsible for determining the static water level, as well as, completing an analysis of a water sample taken from the test hole. Samples shall not be taken without first pumping the test hole for a period of no less than one hour. The following testing shall be completed on the water sample and referenced from Attachment 1 of IEPA's Schedule C-I Well Construction.
 - 1. Groundwater sampling parameters are listed on the following page.

Attachment 1

New Well Groundwater Quality Sampling Parameters

Field Measurements - Conductivity - pH - Run Time Prior to Sampling (Min)		- Temperature (C) - Static Water Level (Feet) - Flow (Pumping) Rate (Gal/M) - Pumping Level (Feet)	Water Quality Parameters - Hardness - Alkalinity
Inorganic Chemical Constituents - Antimony - Arsenic - Barium - Beryllium - Boron - Cadmium - Calcium - Chloride - Chromium		- Cobalt - Copper - Cyanide - Fluoride - Iron - Lead - Manganese - Mercury - Nickel - Nitrate as N	- Perchlorate - Radium-226 - Radium-228 - Selenium - Silver - Sulfate - Thallium - Total Dissolved Solids (TDS) - Vanadium - Zinc
Organic Chemical Constituents - Acenaphthene - Acetone - Alachlor* - Aldicarb Aldrin - Atrazine - Benzenes* - Benzo(a)anthracene* - Benzo(b)fluoranthene* - Benzo(k)fluoranthene* - Benzo(a)pyrene* 2-Butanone (MEK) - Carbofuran - Carbon Disulfide - Carbon Tetrachloride* - Chlordane* Chlorobenzene - Chloroform* - Chrysene* - Dalapon - Dibenzo(a,h)anthracene* - Dibromochloropropane* 1,2-Dibromo-3-Chloropropane* - Dicamba DDT Dieldrin - ortho-Dichlorobenzene - para-Dichlorobenzene - Dichlorodifluoromethane		1,1-Dichloroethane 1,2-Dichloroethane* 1,2-Dichloropropane 1,1-Dichloroethylene - cis-1,2-Dichloroethylene - trans-1,2-Dichloroethylene - Dichloromethane* Di(2-ethylhexyl) adipate - Di(2-ethylhexyl)phthalate* - Diethyl Phthalate - Di-n-butyl Phthalate - Dinoseb Diquat - Endothall - Endrin - Ethylbenzene - Ethylene Dibromide* - Fluoranthene - Fluorene - Heptachlor* - Heptachlor Epoxide* Hexachlorobenzene - Hexachlorocyclopentadiene - Indeno(1,2,3-cd)pyrene* - Isopropylbenzene (Cumene) - Lindane (Gamma-Hexachlorocyclohexane) 2,4-D	- MCP (Mecoprop) - Methoxychlor 2-Methylnaphthalene 2-Methylphenol - Methyl Tertiary-Butyl Ether - Monochlorobenzene Oxamyl (Vydate) - P-Dioxane* - Pentachlorophenol* - Phenols - Picloram - Polychlorinated Biphenyls (PCBs) (as decachloro-biphenyl)* - Pyrene - Simazine - Styrene 2,4,5-TP (Silvex) - Tetrachloroethylene* - Toluene - Toxaphene* 1,2,4-Trichlorobenzene 1,1,1-Trichloroethane 1,1,2-Trichloroethane - Trichloroethylene* - Trichlorofluoromethane - Vinyl Chloride* - Xylenes

*Denotes a carcinogen List includes constituents listed in Section 620.410 Class I: Potable Resource Groundwater and nine constituents required by Drinking Water Compliance Assurance noted above in **Bold**.

- G. The wells will be tested for levels of PFOS and PFAS.
- H. Should the raw water analysis identify an undesirable level of any tested for, the Contractor shall re-test the raw water for the items determined to be undesirable by the Owner.
- I. The Contractor shall provide the Engineer a copy of all test results and analysis completed. The Contractor shall also provide a recommendation for the screen size and gravel pack to be utilized to minimize the entrance velocity, while obtaining the desired flow.
- J. Contractor shall submit sieve analysis along with proposed gravel pack and screen size to IEPA Groundwater Section and Illinois State Water Survey for concurrence.
- K. The Contractor shall receive the Engineer's written approval and concurrence from IEPA Groundwater Section

ALLUVIAL WELLS

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and the Illinois State Water Survey prior to proceeding with the construction of the alluvial well.

- L. If, for any reason, the test hole provides information suggesting a completed well would not produce the quantity or quality of water desired, the Engineer may direct the Contractor to complete an additional test hole(s) until a suitable source is found. If this occurs, the Contractor is responsible for properly decommissioning the test hole and returning the location to pre-drilling condition.

3.02 DEPTH OF WELL:

- A. The total depth of the (5) wells varies estimated to be approximately 100-105 feet. This depth is not guaranteed, but is assumed as a basis for the base price, and may be greater or lesser as determined by drilling operations and approved by IEPA.
- B. Accurate measurements of the total well depth, as well as the depths of casing and screen are set, shall all be recorded in the drilling record. All measurements shall be made in the presence of the Owner's Representative, and records shall be furnished to the Owner.

3.03 DRILLING METHOD:

- A. The well shall be of the gravel wall variety and shall be installed by the reverse circulation rotary hydraulic method. The use of drilling mud and bucket-type rigs will not be permitted in the drilling of the well. The use of drilling mud shall not be used unless conditions warrant such products. No drilling mud shall be used unless approved in writing by the Engineer.

3.04 DISPOSAL OF WATER AND CUTTINGS:

- A. During the drilling and test pumping, the Contractor shall discharge all water and cuttings into an earth pit where the cuttings can be separated from the water so as to minimize the discharge of the cuttings to the natural drainage course. The pit volume shall be approximately 3 (three) times the hole volume and shall include two (2) settling weirs. The Contractor shall bear full responsibility for all discharge water and shall mitigate any damages caused by the water. Drainage is poor in this area so it is important that the Contractor develop a plan for discharging the water.
- B. The method of disposal shall be approved by the Owner. The Contractor shall furnish all labor, materials and equipment for constructing ditches or laying pipe and the cost of all such work shall be paid for by the Contractor. All ditches and pits dug by the Contractor shall be filled in to the satisfaction of the Owner upon completion of the work.

3.05 INSTALLATION OF CASING, SCREEN, GRAVEL PACK AND CEMENT GROUT SEAL:

- A. The Contractor shall conduct sieve analyses on the formation surrounding the proposed well screen prior to obtaining or placing the well screen. These sieve analyses, along with engineering calculations and rationale, shall be submitted to the Engineer for review. The Contractor shall be responsible for selecting the gravel pack material and screen slot size based upon the results of the sieve analyses. Entrance velocity into the well screen shall not exceed 0.1 foot per second at a pumping rate of 1,400 gpm.
- B. Gravel pack materials shall be well rounded, 95% siliceous material, that are smooth and uniform, free of foreign material, washed and disinfected immediately prior to or during placement. Gravel pack materials shall have an average specific gravity of not less than 2.5, a uniformity coefficient not to exceed 2.5 and a gravel pack to formation sand ratio within the range of 6:1 to 4:1.
- C. After the drilling is completed, the 24" screen and casing shall be installed concentrically in the drilled hole. Centering guides shall be provided to assure that the screen and casings are plumb and concentric in the drilled hole.
- D. Properly sized gravel shall be placed in the annular space between the casing and any temporary casings or drilled hole. The gravel envelope shall be placed as shown on the plans. The gravel shall be introduced into the well by means of a Tremie pipe. During the placing of the gravel, the elevation of the bottom of the Tremie

pipe shall be controlled so that at no time will the bottom of the pipe be more than 2' above the gravel already deposited in the well.

- E. Any temporary outer casing shall be removed during the grouting operations so there is a minimum of caving of the natural soil during this operation.
- F. The drilling rig used for the drilling of the well shall be a reverse circulation type where the water and cuttings are pumped up through the drill stem. Care shall be taken to provide a continuous and sufficient supply of water so that the drilled hole will be kept full of water at all times during the drilling operation. Any costs incurred for using this water shall be borne by the Contractor.
- G. The casing shall be installed and each joint satisfactorily welded.
- H. The diameter of the drill hole from the ground surface to the casing point shall not be less than 4" greater than the nominal diameter of the well casing to assure proper sealing of the casing. The casing shall be centered in the drill hole. Spacer guides to center the casing shall be provided at the bottom of the casing and along the entire length of casing as needed. The spacer guides shall be installed parallel to the casing and shall in no way interfere with the cement grouting of the well.
- I. Before the cement grout is introduced, water shall be circulated upward through the annular space and forced to the ground surface. A satisfactory casing seal shall be made by filling the entire annular space between the casing and forced upward until the grout emerges at the surface of the ground. Pressure shall be retained on the cement grout for a minimum period of 72 hours before the plug and bridge are drilled out.

J.

3.06 TESTING FOR PLUMBNESS AND ALIGNMENT:

- A. All holes shall be constructed and all casing and liners set plumb and true to line. The Contractor shall furnish all labor, tools and equipment and shall make the tests described herein in the manner prescribed by and to the satisfaction of the Owner. Tests for plumbness and alignment must be made after the complete installation of the well and before its acceptance. Additional tests, however, may be made by the Contractor during the performance of the work.
- B. Plumbness and alignment shall be tested by lowering into the well, to the total depth, a section of pipe 40' long or a dummy of the same length. The outer diameter of the plumb shall not be more than 1/2" smaller than the diameter of that part of the casing or hole being tested. If a dummy is used, it shall consist of a rigid spindle with three rings, each ring being 12" wide. The rings shall be truly cylindrical and shall be spaced one at each end of the dummy and one ring in the center thereof. The central member of the dummy shall be rigid so that it will maintain the alignment of the axes of the rings.
- C. Should the plumb or dummy fail to move freely throughout the length of the casing or hole, or should the well vary from the vertical in excess of 2/3 of the smallest inside diameter of that part of the well being testing per 100' – 105' of depths, or beyond limitations of this test, the plumbness of the well and alignment shall be corrected by the Contractor at his own expense. Should the Contractor fail to correct such faulty alignment or plumbness, the Owner may refuse to accept the well.

3.07 DEVELOPMENT OF THE WELL:

- A. Disinfection of all equipment prior to placing it into the well is paramount and will be enforced.
- B. The Contractor's plan for well development, including a description of equipment, methods and procedures to be used, and an estimate of time required, shall be submitted to the Engineer for review prior to development.
- C. Acceptable Surging and Pumping Development Method:
 - 1. Upon completion of drilling, the well shall be fully developed by removing all of the sand from the gravel pack and well bore. The method of development shall be by surging and pumping. The surging shall

be done using a disc surge block with a relief valve to create a milder down stroke than the upstroke. The relief valve shall minimize the possibility that fines are driven further into the formation.

2. Begin at the bottom screen section and proceed upward.
 3. Pumping simultaneously with surging may be used.
 4. Bail sand from the well whenever the sand depth reaches 10 percent of screen length.
 5. Other development methods may be approved but must be submitted in writing and approved by the Engineer.
- D. Contractor shall be prepared to air develop or use other methods as necessary to ensure proper development.
- E. The Contractor shall furnish all necessary pumps, compressors, high pressure jets, bailers, or other needed equipment and shall develop the well by such approved methods as shall be necessary to give the maximum yield of water per foot of drawdown and extract from the water bearing formation in the well, the maximum practical quantities of sand as may, during the life of the well, be drawn through the screen when the well is pumped under maximum conditions of drawdown, on either a continuous or intermittent basis.
- F. In the event that chemical additives, are required to aid in development of the well through dissolving drilling muds, silts or clays which may have sealed or partially sealed the outer surfaces of the bore hole in the water bearing portion of the aquifer, the Contractor shall furnish and apply same at no additional cost to the Owner.
- G. The contractor should be prepared to apply non-phosphate dispersants used for drilling mud such as Aqua-Clear or NuWell 220 or equal. These products are injected and surged during the day, allowed to react overnight and then removed the following day.
- H. Well development shall continue until the water from the well runs clear and the sand content is less than or equal to 1.0 ppm, which shall be considered a sand-free condition. The sand content shall be determined by averaging the results of ten (10) samples. At least five (5) samples shall be collected at the following times during the final pumping test: (1) 15 minutes after start of the test; (2) after 1/4th of the total planned test time has elapsed; (3) after 1/2 of the time has elapsed; (4) after 3/4ths of the time has elapsed; and (5) near the end of the pumping test. The pumping cycle shall last for two (2) hours at the design discharge capacity of 1,400 gpm. The method of sampling and testing for sand content shall be approved by the Engineer. The Contractor shall provide additional development of the well as required to meet this specification.
- I. Failure by the contractor to construct a well with at least the specified efficiency of 80%, or to construct a sand-free well, as defined above, will be considered negligence on the part of the Contractor and will result in refusal to accept the well and the associated pumping test by the Owner.

3.08 TESTING FOR YIELD AND DRAWDOWN:

- A. After the well has been fully developed as specified, the Contractor shall furnish and install test pumping equipment to perform a pumping test. The pumping and measuring equipment shall have the capacity to test flow rates ranging from 750 to 2,100 gpm. Determination of the quantity of water pumped shall be by the Contractor by use of meter furnished by the Contractor.
- B. All measurements taken during the pumping tests shall be recorded with electric tape lines so that water measurements may be accurate within 0.1". The static water level readings shall be taken immediately preceding the starting of the pumping test. The test shall be conducted at a pumping rate of 1.5 times the desired flow rate of the well for the entire test unless the formation is not capable of producing said flows.
- C. The Contractor shall perform a step-drawdown pumping test in accordance with AWWA A100 and Appendix E of AWWA A100. The Contractor shall pump the well for at least 30 minutes at each flowrate indicated in the following table. The Contractor shall begin by pumping the well at 1,050 gallons per minute (gpm) for 30 minutes, then proceed to increase the flowrate to 1,400 gpm for another 30 minutes and continuing this

process for the 1,750 gpm and 2,100 flowrates.

Step	Duration (min)	Flowrate (gallons per minute)
1	30	1,050
2	30	1,400
3	30	1,750
4	30	2,100

- D. For each step and corresponding flowrate, the pumping level shall be measured and recorded for the time intervals listed in the following table. A water level measurement shall also be taken and recorded just before the pumping test starts.

Duration of Step (min)	Time Interval Between Pumping Level Measurements
0 – 5	Every minute
5 - 15	2 minutes
15 - 30	5 minutes

- E. After 30 minutes of pumping at 2,100 gpm, the Contractor shall then stop pumping and measure the water level at one minute intervals for ten minutes, then two minute intervals for the next ten minutes, following by five minute intervals until the water level returns to approximately static conditions. Upon completion of the test, the Contractor shall prepare a written report of the test pumping with all readings in chronological order. Each time, the depth to water, pumping rate, altitude gauge reading shall be included.
- F. After recovery, the Contractor shall conduct a constant-rate pumping test in accordance with AWWA A100 and Appendix E of AWWA A100. The Contractor shall pump the well at a constant pumping rate for 24 hours or until a stable water level is reached. The pumping rate shall be approximately 2,100 gpm and is subject to verification by the Engineer before the start of the test. The Contractor shall measure and record the water level just before the start of the test and measure and record the pumping level in accordance with the following table during the test.

Time Since Pumping Started (min)	Measurements (min)
0 - 60	2
60 - 120	5
120 - 240	10
240 - 360	30
360 - 1440	60

- G. Exact procedures for test pumping shall be subject to direction of the IEPA, the State Geologist, and the Engineer. The pump for the test pumping shall be suitable to pump a minimum of 2,100 gallons per minute, and accessories shall include equipment suitable for varying the flow as stated above.
- H. The duration of the test pumping shall be considered to begin at the start of pumping and measuring and to end after the rate of recovery is measured, unless additional pumping is requested.
- I. The Contractor shall provide a copy of the yield, drawdown, static water level, and recovery data to the IEPA, the State Geologist, the Owner and the Engineer.

- J. The Contractor shall furnish all necessary discharge piping for the pumping unit that will be of sufficient size and length to discharge the water to the selected point of discharge.

3.09 DISINFECTION:

- A. After the well has been completely constructed, it shall be thoroughly cleaned of all foreign substances, including tools, debris of any kind, cement, oil, grease, joint dope, etc. The casing shall be thoroughly swabbed, using alkalis, if necessary to remove oil, grease or joint dope. The well shall then be disinfected with a chlorine solution in accordance with AWWA C654.
- B. The gravel for gravel packing of the well shall be disinfected by immersing the gravel in a chlorine solution containing not less than 100 ppm of available chlorine. Upon completion, the well shall be disinfected by adding sufficient hypochlorite solution in concentration of 100 ppm and the solution shall be allowed to remain in the well for a period of at least 24 hours before being pumped to waste.

3.10 PROTECTION OF THE QUALITY OF WATER:

- A. The Contractor shall:
 - 1. Take such precautions as are necessary or as may be required permanently to prevent contaminated water from entering through the opening made by the Contractor.
 - 2. Take the necessary precautions during the construction period to prevent contaminated water, gasoline or any other contaminants from entering the well, either through the opening or through seepage from the ground surface.
- B. Correction of Contaminated Well Shall:
 - 1. Be at the Contractor's expense.
 - 2. Be performed by the Contractor, who shall provide all necessary labor, equipment and materials.

3.11 WELL ABANDONMENT (IF NECESSARY):

- A. Should the new well drill hole be deemed unacceptable for any reason, the Contractor shall abandon the well in accordance with all IEPA rules and regulations.
- B. Should the cause of the abandonment be at no fault of the Contractor, the cost of abandonment shall constitute a change order. If the cause of the abandonment is deemed the fault of the Contractor, the cost of abandonment and drilling a second well shall be borne by the Contractor.

3.12 CLEANING UP:

- A. After the construction work is completed, all refuse and debris resulting from the work shall be cleaned up and disposed of to the satisfaction of the Owner. All excess excavation, waste concrete, wiring, piping, lumber or other refuse shall be removed or stored as directed by the Owner.

END OF SECTION 332113