

# **TOWN OF NORTH CASTLE**



## **Request for Sealed Bids**

### **REHABILITATION OF EXISTING OVERBURDEN WATER SUPPLY WELL (WELL #5)**

**Town of North Castle  
Water District No.2  
15 Business Park Drive  
Armonk, NY 10504**

**914-273-1882**

**Deadline for Submittal:  
March 17, 2017**

**Date of Distribution  
February 27, 2017**

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## SECTION A

### NOTICE TO BIDDERS

Sealed proposals for performing the work herein described will be received by the Office of the Town Clerk, Town of North Castle, 15 Bedford Road, Armonk, New York 10504, on Friday March 17, 2017 until 11:00 A.M. E.S.T., and immediately thereafter the bids will be publicly opened and read aloud in the said office.

The work consists of pulling a 15HP Submersible pump, pre and post well redevelopment video inspection of an existing overburden supply well for the Town of North Castle Water District No. 2 located at 74 Windmill Road in the Town of North Castle, Westchester County, Armonk, New York, along with reinstalling a new submersible pump and a short-term pumping test.

Complete specifications and bid forms may be obtained at the Office of the Town Clerk on or after Monday, February 27, 2017.

Bids shall be made on the Proposal Forms furnished with the Specifications and must be accompanied by a Bid Bond acceptable by the Town, or a certified cashier's check, drawn on a solvent bank, in the amount of not less than 5% of the total amount of the Bid. Checks shall be made payable to the Town of North Castle, New York, and are to be held by the Town as a guarantee for the proper execution and delivery of the Contract and bonds to secure the faithful performance thereof. In default of such execution and delivery of Contract and Bonds, the amount of the deposit represented by the check shall be forfeited to and retained by the Town of North Castle as liquidated damages.

Bids shall be enclosed in a sealed envelope bearing the name and address of the Bidder, addressed to Alison Simon, Town Clerk, 15 Bedford Road, Armonk, New York 10504 and endorsed "Rehabilitation of Existing Overburden Water Supply Well No. 5 for Water District No. 2", Town of North Castle, New York.

The Town of North Castle reserves the right to reject any and all bids, to waive any informality in any Bid, and to award the Contract to other than the lowest Bidder if deemed in the best interest of the Town to do so.

Dated \_\_\_\_\_

TOWN OF NORTH CASTLE

BY \_\_\_\_\_

Alison Simon, Town Clerk

## SECTION B

### INSTRUCTIONS TO BIDDERS

#### **DOCUMENTS**

Complete sets of bidding documents will be issued for bidding purposes as stated in the "Notice to Bidders". A complete set of documents consists of the following:

- A. A bound copy of Specifications
- B. Addenda (if any)

#### **PROPOSALS**

To be considered, Proposals on the forms included herein, must be in accordance with these Instructions to Bidders. All bids must be submitted on the prescribed forms which are included herein, such forms also being bound in the specifications as SECTION C. All blank spaces for bid prices must be filled in, in both words and figures, either typed or in ink.

Proposals that contain any omission, erasures, alterations, additions, or items not called for in itemized Proposal, or that contains irregularities of any kind, may constitute sufficient cause for rejection of the bid. In case of any discrepancy in the price or amount bid in the Proposal, the price, as expressed in words, shall govern. All bids must be submitted in sealed envelopes addressed to Alison Simon, Town Clerk, Town of North Castle, 15 Bedford Road, Armonk, New York 10504 and be clearly identified with: (1) Project Name, (2) Name of Bidder and Address. Proposals shall be signed with bidder's name typed or printed below signature. The Bidder's seal, if a corporation, shall be affixed under the Bidder's signature. Telephone, telegraphic or "faxed" bids will not be accepted.

If a separate set of proposal sheets is issued, they may be used with the understanding that all instructions and conditions of the contract documents are the same as if these pages were bound herein.

#### **QUALIFICATIONS OF BIDDERS**

It is the intent of the Town to execute a service agreement with a Contractor that can provide reliable, uninterrupted and environmentally sound service. The Contractor must possess the financial resources, experience, technical and management qualifications to meet the requirements of the Town throughout the term of this Agreement.

The Contractor is, therefore, required to complete the detailed "Statement of Bidders' Qualifications" and provide the required submission. Sufficient information should be provided for the Town to adequately evaluate the Contractor's ability to service the Town. Should insufficient space be available to fully address each request, additional information should be included by attachment.

The Owner may make such investigations as it deems necessary to determine the qualifications of the Bidder to perform the work, and the Bidder shall furnish information and data for this purpose as may be required. The Owner reserves the right to reject any bid if the evidence submitted by a Bidder, or the investigation of such Bidder, fails to satisfy the Owner, that the Bidder is properly qualified to carry out the obligations of the Contract and/or able to complete the work contemplated therein within the time designated. Fraudulent statements shall cause rejections of Proposal and forfeiture of bid security.

### **CONDITIONS OF WORK**

Each Bidder must familiarize themselves fully of the conditions relating to the construction and labor under which work will be performed. Failure to do so will not relieve a successful Bidder of their obligation to furnish all material and labor necessary to carry out the provisions of the Contract and to complete the work for the consideration set forth in the bid. Bidder's attention is directed to Paragraph 1 of the Bid Proposal, in which the Bidder certifies that it has examined the site. Bid shall include the complete costs of furnishing all materials, labor, equipment and transportation necessary to complete the work in accordance with the Contract Plans and Specifications and all other expenses incidental thereto. Local and State sales taxes shall not be included in the bid. Insofar as possible, any Contractor in the carrying out of the work must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor, or of the proper functioning of the existing facilities of adjacent or contingent properties.

### **ADDENDA AND INTERPRETATION**

Every request for information or interpretation of Bidding Documents must be addressed in writing to Karen Destefanis, Leggette, Brashears & Graham, Inc., 4 Research Drive Suite 204, Shelton, Connecticut 06484, to be given any consideration must be received at least five (5) days prior to the date fixed for the opening of bids. Any and all such interpretations, and any supplemental instructions, will be in the form of written Addenda and will be mailed to all prospective Bidders. The failure of any Bidder to receive any such Addenda will not relieve the Bidder of any obligation under the Bid as submitted. The receipt of any Addenda shall be noted on the "Bid Form".

### **BID SECURITY**

Each Bidder is required to deposit at the time of submission of their bid, a Bid Bond or certified check in an amount representing five (5%) per cent of the bid payable to the Owner, which amount the bidder agrees is to be forfeited as liquidated damages and not as a penalty, if in case of award of the contract and thereafter fail to execute a Contract with the Owner under the conditions of this Proposal or to furnish the bonds required for the faithful performance of this contract. Bidders who submit certified checks must accompany them with a Consent of Surety from a recognized Bonding Company agreeing to supply a Performance Bond and Labor and Materials Bond if the contract is awarded to the Bidder.

Such bid security will be returned to all except the three lowest Bidders within ten (10) working days after the formal opening of bids, and the remaining bid security will be returned to the other Bidders after the Owner and the accepted Bidder have executed a Contract. In the event that no Contract has been executed within seventy five (75) calendar days after the date of the opening of bids; upon the demand of the Bidder so long as the Bidder has not been notified of the acceptance of the bid, the bidder's bid security will be returned. The Bid Security of the successful Bidder will be retained until the signing of the Agreement and the filing and approval of the bonds and insurance certificates.

### **INSURANCE REQUIRED**

The successful Bidder will be required to procure and provide insurance certificates for the following types of insurance, in accordance with the provisions listed in SECTION I: only those un-stricken apply to this bid.

- A. Workmen's Compensation
- B. N.Y.S. Disability
- C. Commercial General Liability Policy
- D. Comprehensive Automobile Policy
- E. Umbrella Liability
- F. Professional Liability
- G. Owners & Contractors Protective Liability Policy
- H. Bid Performance and Labor & Material Bonds
- I. Property Insurance
- J. Asbestos/Lead Abatement and Environmental Clean-up

### **SECURITY FOR FAITHFUL PERFORMANCE**

The Contractor shall, prior to execution of the contract, submit an executed Performance Bond in an amount equal to (Refer to Section C - BID for amount) of the accepted bid for the service provided, as security for the faithful performance of the terms, covenants and conditions of the contract. The amount of the accepted bid for bonding purposes shall equal the cost for rehabilitating an existing overburden supply well as outlined in the specification section.

The Bond shall be prepared as specified in SECTION E, Performance Bond and Labor and Material Bond, and shall have as Surety thereon such Surety Company or companies as are acceptable to the Owner and are authorized to transact business in the State of New York.

### **FORM OF AGREEMENT**

The form of the agreement is included in these documents in SECTION D.

### **AWARD**

The Contract will be awarded to the lowest responsible bidder pursuant to the provisions of the General Municipal Law. The Town Board reserves the right to determine responsibility based on an evaluation of the Contractor's qualifications, experience, organization, finances, past performances, and other applicable factors. The Town Board further reserves the right to reject any and all bids.

In evaluating the bids, the Owner shall consider the qualifications of the bidders, whether or not the bids comply with the prescribed requirements, and alternatives and unit prices if requested in the Bid Form. Owner shall evaluate the qualifications and experience of the bidder, subcontractors, and partners as presented herein and shall conduct such investigations as he deems necessary to assist in the evaluation of any bid and to establish the responsibility, qualifications and financial ability of the bidders, to perform the service in accordance with the Contract Documents. Any additional input from the Owner's ground-water consultant who prepared the specifications will be considered. The contract shall be awarded to the lowest bidder whose evaluation by the Owner indicates to the Owner that the award will be in the best interest of the Town.

## **OWNER**

The Town of North Castle Water District No. 2, Westchester County, New York.

## **SALES TAX EXEMPTION**

Under Chapter 513 of the Laws of the New York 1974, all materials and supplies sold to a Contractor and which are to become an integral, component part of a structure, building or real property owned by an exempt organization such as the Town of North Castle, are exempt from the payment of New York State Sales or compensatory use taxes. Therefore, the Contractor should not include any amount in its bid price to cover sales taxes for the above items.

## **REQUIRED SUBMISSIONS**

Prior to award, the successful bidder will be required to meet the following requirements:

- A. The successful bidder, if the business is not registered in New York State, must provide the Town with a certificate issued by the Secretary of State of New York stating that the Corporation is authorized to do business within the state and is presently in good standing. If the entity to whom the bid is awarded is not a corporation, it would be required that the entity's certificate of doing business, which should be on file in the County Clerk's Office, be provided. (This would also hold true in the case of joint ventures which would be required to disclose the underlying entities which make up the joint venture and supply the requisite certificate of doing business for each entity.)
- B. A statement by the successful bidder that no officer, director or stockholder (if less than 10 stockholders) of the successful bidder is an officer or employee of the town or is a relative of any such Town Official or employee. If such officer, director or stockholder does exist, their names and relationship shall be disclosed to the Town.

**SECTION C**  
**BID PROPOSAL**  
**REHABILITATION OF EXISTING**  
**OVERBURDEN WATER SUPPLY WELL #5**  
**WATER DISTRICT NO. 2**  
**TOWN OF NORTH CASTLE**  
**WESTCHESTER COUNTY, NEW YORK**

To:

Alison Simon, Town Clerk  
Town of North Castle  
15 Bedford Road  
Armonk, New York 10504

Bid Submitted By:

\_\_\_\_\_  
(Name)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Telephone Number)

1. I/We do hereby declare that I/We have carefully examined the Notice to Bidder, the Drawings, and the Specifications relating to the above entitled matter and the work, and have also examined the site.
2. I/We do hereby offer and agree to furnish all materials, to fully and faithfully construct, perform and execute all work in the above titled matter in accordance with the Drawings, and Specifications relating thereto, and to furnish all labor, tools, implements, models, forms, transportation and materials necessary and proper for the purpose for the price/prices as given on the bid forms.
3. I/We do hereby declare that the prices so stated cover all expenses of every kind incidental to the completion of said work, and the contract therefore, including all claims that may arise through damages or any other cause whatsoever.
4. I/We do hereby agree that I/We will execute a contract therefore, containing all the terms, conditions, provisions and covenants necessary to complete the work according to the Drawings and Specifications therefore within 10 business days after the award of the contract and if I/We fail to execute said Contract within said period of time, that the Town board shall have the power to rescind said award and also that the said Board shall retain the proceeds of the certified check, or require the payment of the sum of the bid bond.
5. I/We do declare and agree I/We will commence the work within ten days after the contract execution and will complete the work fully and in every respect including approval by the Town of North Castle Water Department on or before the time specified in said contract and do authorize the said Board, in case of failure to complete the work within such specified time to employ such men, equipment and materials as may be necessary for the proper completion of said work and to deduct the cost thereof from the amount due under the contract. The Contract execution will serve as the official notification to commence work.



6. I/We agree that the Town of North Castle reserves the right to select any one, combination of, or all the Bid items in this proposal for the Contractor to complete without affecting any of the Bid prices.
7. I/We hereby affirm that by submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under the penalty of perjury, that to the best of their knowledge and belief:
  - (a) The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;
  - (b) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and
  - (c) No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not submit a bid for the purpose of restricting competition.
  - (d) No member of the Town Board or any officer or employee of the Town of North Castle, New York, or person whose salary is payable in whole or in part from the said Town Treasury is, shall be or become interested, directly, as a contracting party, partner, stockholder, surety or otherwise, in this bid, or in the performance of the contract, or in the supplies, materials or equipment and work of labor to which it relates, or in any portion of the profits thereof.
8. I/We do hereby further agree that this proposal is a firm bid and shall remain in effect for a period of at least seventy five (75) calendar days from the date of the opening of bids, and that with said period of seventy five (75) days, the Town will accept or reject this proposal, or this period may be extended by mutual agreement.
9. I/We do hereby declare that, if this is a corporate bid, I have been duly authorized to act as the signatory on this proposal in behalf of this corporation.
10. I/We hereby affirm, under penalty of perjury, the truth of all statements in this proposal.
11. I/We hereby agree that I/We accept the unit prices on the following pages, for the various items of work.
12. I/We hereby agree that I/We shall make no claim on account of any variation of the estimated quantities of work to be done, whether the actual quantities are greater, smaller or completely deleted. A change in the quantity of any item shall not be regarded as sufficient ground for a change in the price of that item.

\_\_\_\_\_  
(Legal Name of Bidder, Partner or Corporate Officer)

By:\_\_\_\_\_ Date:\_\_\_\_\_  
(Authorized Signature)

Corporate Seal (if incorporated)

Bidder acknowledges receipt of Addenda as follows:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

## BID

I \_\_\_\_\_, \_\_\_\_\_  
Individual Office Held  
Of

\_\_\_\_\_  
Company Name Address

### **BID DOLLAR AMOUNT FOR REHABILITATION OF EXISTING OVERBURDEN WATER SUPPLY WELL NO 5 (NCWD#2):**

**Total Bid Cost: \$** \_\_\_\_\_

( \_\_\_\_\_ )

#### **Written Total Dollars**

For the rehabilitation of an existing overburden water supply well known as WD#2 Well No.5 located on 74 Windmill Road in Armonk, New York. This work will be conducted within two weeks of the bid award. All labor on this project must reflect Prevailing Wage Scales.

Said price shall include:

1. Redevelop Windmill Farms Overburden Well No. 5
- 2A. Additional Mechanical Surging.
- 2B. Additional Acid Treatment
- 2C. Additional Wetting Agent Treatment.
- 2D. Additional Chlorine Treatment.
3. Reinstall pump (new pump & motor supplied by owner)
4. Performance Bond - At the time of contract signing, a performance bond in a form acceptable to the Town Attorney will be required.

#### **The amount will be calculated as follows:**

Item #	Item Description	Unit	Unit Price	Est. Quantity	Price
1.	Redevelop Well No. 5	LS		1	
2A.	Additional Mech. Surging	HR		24 HR	
2B.	Additional Acid Treatment	EA		1	
2C.	Additional Wetting Agent Treat.	EA		1	
2D.	Additional Chlorine Treat.	EA		1	
3.	Reinstall Pump	EA		1	
4.	Performance Bond				

By: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
Secretary of Corporation

Corporate Seal

The following is a list of places where we have performed work of similar character and magnitude, together with references (beginning with the most recent):

Name of Municipality	Scope of Work	Period of Contract	References & Telephone #
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The full names and places of residence of all persons and parties interested as principals in the foregoing proposal are as follows:

Name	Title	Address

Signature of Bidder: \_\_\_\_\_

U.S. Treasury No.: \_\_\_\_\_

Business Address: \_\_\_\_\_

Place of Residence: \_\_\_\_\_

Date: \_\_\_\_\_

BIDDER BY

\_\_\_\_\_  
(Printed Name of Partner or Corporate Officer)

(Corporate Seal)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Secretary of Corporate Bidder

## **STATEMENT OF BIDDER'S QUALIFICATIONS**

It is the intent of the Town to execute an agreement with a Contractor that can provide reliable, uninterrupted, and environmentally sound service. The Contractor must possess the licenses, financial resources, experience, technical and management qualifications, equipment, vehicles, and manpower and facilities necessary to assure that the requirements of the Town will be met throughout the term of this Agreement.

The Contractor is, therefore, required to provide the following information with regard to its company and organization. Sufficient information should be provided to the Town to adequately evaluate the Contractor's ability to service the Town. Should sufficient space be available to fully address each request, additional information should be included by attachment herein.

### **COMPANY INFORMATION**

Bidder: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

Contact: \_\_\_\_\_ Type of Organization: \_\_\_\_\_

Name of Parent Company, if applicable: \_\_\_\_\_

Name of Affiliate Companies, if applicable: \_\_\_\_\_

Identity of Joint Venture Partners, if any: \_\_\_\_\_

Brief history of Bidder(s) involved in the Proposal (attach additional sheets if necessary):

\_\_\_\_\_

\_\_\_\_\_

Has Bidder ever failed to complete any contract awarded to it?: \_\_\_\_\_

If so, state name of owner, reason therefore and bonding company: \_\_\_\_\_

\_\_\_\_\_

Has any officer or partner of Bidder ever failed to complete a contract handled in his/her name?

If so, state name of individual, name of owner, reason therefore, and bonding company:

\_\_\_\_\_

\_\_\_\_\_

Has any facility that you operated been the subject of administrative or judicial action for alleged violation of environmental or public health laws or regulations. If so, state the details and disposition:

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### **FINANCIAL INFORMATION**

Financial Statement:

Bidders shall attach a complete financial statement for the most recently completed fiscal year. Statement must be prepared by a Certified Public Accountant according to accepted accounting principles.

Bank References:

Bank	Address	Name & Telephone Number of Contact Person
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Surety:

Bidder shall provide the name, address, telephone number and contact person for the surety firm provided guarantees under this Contract:

Financial References:

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The TOTAL BID shall be the total cost of replacement as specified. It is stated here only as a convenience for comparison of bids. If there are any errors in addition or multiplication, the unit prices for each item shall govern, and the bid comparison will be made on the basis of correct arithmetic applied to these unit prices. In case of a discrepancy between the total unit prices in words and the unit price in numbers, the total of unit prices in words shall govern.

The estimated quantities are not guaranteed, and are only for bid comparison purposes. The final payment will be made based on the actual quantities regardless of the estimated quantities contained herein.

## STATEMENT OF NON-COLLUSION

*(To be completed by Each Bidder)*

In accordance with Section 103(d) General Municipal Law, effective September 1, 1966, every bid or proposal hereafter made to a political subdivision of the State or any public department, agency, or official thereof or to a fire district or any agency or official thereof for work or services performed or to be performed or goods sold or to be sold, shall contain the following statement subscribed to by the bidder and affirmed by such bidder as true under the penalties of perjury; non-collusive bidding certification.

- A. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of knowledge and belief:
  - (1) The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or any competitor.
  - (2) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor.
  - (3) No attempt has been made or will be made by the bidder to induce any other person, partnership, or corporation to submit or not to submit a bid for the purpose of restricting competition.
- B. The person signing this bid or proposal certifies that they have fully informed themselves regarding the accuracy of the statements contained in this certification, and under the statements contained in this certification, and under the penalties of perjury, affirms the truth thereof, such penalties being applicable to the bidder, as well as the person signing in its behalf.
- C. That attached hereto (if a corporate bidder) is a certified copy of resolution authorizing the execution of this certificate by the signator of this bid or proposal in behalf of the corporate bidder.

## RESOLUTION

Resolved that \_\_\_\_\_ be  
(Name of Corporation)

authorized to sign and submit the bid or proposal of this Corporation for the rehabilitation of an existing overburden supply well for the North Castle Water District No. 2 with an office located at 15 Business Park Drive, Armonk, New York in the Town of North Castle

and to include in such bid or proposal the STATEMENT OF NON COLLUSION required by SECTION 103(d) of the General Municipal Law as the act and deed of such corporation, and for any inaccuracies or mis-statements in such certificate this corporate bidder shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution adopted by the

\_\_\_\_\_

Corporation at a meeting of the Board of Directors held on the \_\_\_\_\_

day of \_\_\_\_\_, 2017.

(SEAL OF THE CORPORATION)

\_\_\_\_\_  
Secretary



## OFFER OF SURETY

(To be completed by Each Bidder)

In the event the above Proposal is accepted and the undersigned is awarded the Contract for the work, the undersigned offers as surety for faithful performance, bond and/or bonds to protect labor men and material, the following surety:

---

SURETY COMPANY

Signed \_\_\_\_\_  
(Bidder)

CERTIFICATE OF SURETY is to be signed by a duly authorized official, agent or attorney of the Surety Company.

In the event that the above Proposal is accepted and the contract for the work is awarded to

said \_\_\_\_\_  
(Bidder's Name)

the \_\_\_\_\_  
(Surety) (Company)

will execute the Surety Bonds as herein before provided.

Signed: \_\_\_\_\_  
(Authorized Official, Attorney or Agent)

Date: \_\_\_\_\_

**Important:** This page must be filled out when certified check is submitted in lieu of bid bond, or bid may be rejected

## SECTION D

(Upon Award)

### AGREEMENT

#### FOR

#### **REHABILITATION OF EXISTING OVERBURDEN WATER SUPPLY WELL 5 WATER DISTRICT NO. 2 TOWN OF NORTH CASTLE WESTCHESTER COUNTY, NEW YORK**

THIS AGREEMENT made this \_\_\_\_\_ day of \_\_\_\_\_, 2017, by and between \_\_\_\_\_ \* (a Corporation organized and existing under the laws of the State of \_\_\_\_\_) \* (a partnership consisting of \_\_\_\_\_) \* (an individual trading as \_\_\_\_\_) hereinafter called the "Contractor" and the Town of North Castle, New York hereinafter called the "Owner".

\* Strike out the two terms not applicable.

WITNESSETH, that the Contractor and the Owner for the considerations stated herein mutually agree as follows:

Article 1. Statement of Work. The Contractor shall furnish all supervision, technical personnel, labor, materials, samples, machinery, tools, appurtenances, equipment and services, including utility and transportation services and perform and complete all work and required supplemental work for the completion of this Contract in strict accordance with the hereinafter referenced Contract Documents including all Addenda thereto, of pulling and reinstalling a submersible pump, short-term pumping test, well redevelopment and pre & post-well redevelopment video inspection, at an existing overburden water supply (NCWD#2- Well #5) that serves the Town of North Castle Water District No.2, 15 Business Park Drive, Armonk, New York.

Article 2. The Contract Price. The Owner will pay the Contractor for the performance of the Contract in current funds, for the total quantities of work performed at the stated prices stipulated in the Bid for the respective items of work completed subject to additions and deductions as provided in the GENERAL CONDITIONS. Owner expects that Contractor will provide monthly billings at the close of each month.

Article 3. Contract Documents. The Contract Documents shall consist of the following (including their attachments and exhibits):

- |  |                               |
|--|-------------------------------|
| a. This Agreement  | f. Technical Specifications   |
| b. Addenda (if any)  | g. General Conditions         |
| c. Notice to Bidders   | h. Payment, Performance Bonds |
| d. Instructions to Bidders   | i. and Guarantee Bond         |
| e. Signed copy of Bid, with<br>all attachments required<br>for the bidding | j. Certificates of Insurance  |
|  | k. Statement of non-collusion |

This Agreement, together with other Documents enumerated in this Article 3, which said other Documents are as fully a part of the Contract as if hereto attached or herein repeated, forms the Contract between the parties hereto. In the event that any provision in any component part of this Contract conflicts with any provision of any other component the part first enumerated in this Article 3 shall govern, except as otherwise specifically stated.

IN WITNESS WHEREOF, the parties hereto have caused this AGREEMENT to be executed in three (3) original copies on the day and year first above written.

ATTEST:

\_\_\_\_\_  
(Contractor)

BY \_\_\_\_\_ Date: \_\_\_\_\_

Title \_\_\_\_\_

ATTEST:

\_\_\_\_\_  
(Owner)

BY \_\_\_\_\_ Date: \_\_\_\_\_

Title \_\_\_\_\_

STATE OF NEW YORK

SS.:

COUNTY OF WESTCHESTER

On the \_\_\_\_\_ day of \_\_\_\_\_ 2017, before me personally came \_\_\_\_\_ to me known, who, being by me duly sworn, did depose and say that he resides at \_\_\_\_\_ that he is the \_\_\_\_\_ of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Board of Directors of said corporation; and that he signed his name thereto by like order.

\_\_\_\_\_  
NOTARY PUBLIC

STATE OF NEW YORK

SS.:

COUNTY OF WESTCHESTER

On the \_\_\_\_\_ day of \_\_\_\_\_ 2017, before me personally came Michael J. Schiliro to me known, who, being by me duly sworn, did depose and say that he maintains an office at 15 Bedford Road, Armonk, New York; that he is the Supervisor of the Town of North Castle, the municipal corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Town Board of the said corporation; and that he signed his name thereto by like order.

---

NOTARY PUBLIC

## SECTION E

### PERFORMANCE BOND

*(Performance Bond and Labor and Materials Bond is required upon award)*

**SECTION F**  
**GENERAL RELEASE**

(To Be Submitted With Requisition for Final Payment)

KNOW ALL MEN BY THESE PRESENTS, that \_\_\_\_\_ for  
(Contractor)  
and in consideration of the sum of \_\_\_\_\_ lawful  
money of the United States of America, to it in hand paid by

\_\_\_\_\_  
(Owner/Contracting Agency)

have remised, released, quit-claimed, and forever discharged, and by these presents do for its successors  
and assigns remise, release, quit-claim, and forever discharge the said

\_\_\_\_\_, and  
(Owner/Contracting Agency)

its successors and assigns and administrators, of and from any and all manner of action and actions,  
caused and causes of action, suits, debts, dues, sum and sums of money, accounts, reckonings, bonds,  
bills, specialties, covenants, contract, controversies, agreements, promises, variances, trespasses,  
damages, judgments, patents, extents, executions, claims and demands whatsoever in law and unity  
which against the said

\_\_\_\_\_,  
(Owner/Contracting Agency)

now have or which heirs, executors, or administrators hereafter can, shall, or may have, for upon or by  
reason of any matter, cause or thing whatsoever, from the beginning of the world to the day of the date  
of these presents rising out of the construction, in accordance with contract entered into between parties  
hereto, dated \_\_\_\_\_, Two Thousand and \_\_\_\_\_, any admittance or supplements  
thereto.

IN WITNESS WHEREOF, the undersigned Corporation has caused this agreement to be signed by its

\_\_\_\_\_ and its Corporation seal to be hereto affixed and duly attested by its

\_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 2017.

ATTEST:

PRINCIPAL:

\_\_\_\_\_

\_\_\_\_\_

## SECTION G

### PREVAILING WAGE RATES

The Contractor is hereby bound to pay all labor on this project at rates no less than the Prevailing Wage Scales, as prepared by the New York State Labor Department.

Contractor shall agree that every mechanic, laborer and workman employed by the Contractor or any subcontractor or any other person about or upon the work contemplated by the service agreement shall be paid not less than the prevailing rate of wages, and provided not less than the prevailing supplements, as provided for by Section 220 of the New York State Labor Law, as amended from time to time. The contractor shall acquire a schedule of such wage rates as provided by the New York State Department of Labor.

The Contractor, and his subcontractors, shall post in a prominent accessible place on the site of the work a legible statement of all wage rates and supplements as specified in the service agreement to be paid or provided for the various classes of mechanics, workmen or laborers employed for the work contemplated by the service agreement, and showing all authorized deductions, if any, from unpaid wages actually earned.

The Contractor and each subcontractor or other person doing or contracting to do the whole or any part of the work contemplated by the service agreement shall pay each and every one of his employees engaged in such work or any part thereof the full and proper wage without any deduction or kickback whatever, excepting such deductions as are made mandatory by law. Payment to each and every employee shall be made not less often than once per week and shall be made in cash, unless payment by check is authorized by certificate of the Commissioner of Labor of the State of New York as provided by law.

## SECTION H

### **COMPLIANCE WITH THE LABOR LAW AND OTHER DEPARTMENT OF LABOR REGULATIONS**

The Contractor shall comply with the applicable provisions of the "Labor Law" as amended, of the State of New York. This Contract shall be void unless applicable sections of said Labor Law are complied with.

Each and every provision of law and clause required by law to be part of this Contract shall be deemed to be included herein and this Contract shall be read and enforced as though it were included herein, and, if through mere mistake or otherwise any such provision is not included, then upon the application of either party hereto, the Contract shall forthwith be physically amended to make such inclusion.

Specifically, Section 220(e), of the Labor Law, as so amended, prohibits in contracts, discrimination on account of race, creed, color, or national origin in employment of citizens upon public works.

There may be deducted from the amount payable to the Contractor by the Owner under this Contract a Penalty of five (\$5.00) dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of Section 220(e); provided, that for a second or any subsequent violation of the provisions of said paragraph, this Contract may be canceled or terminated by the Owner and all monies due or to become due hereunder may be forfeited.



## SECTION I

### INSURANCE

Prior to commencement of any work under this Contract and until completion and final acceptance of the work, the Contractor/Provider shall, at its sole expense, maintain the following insurance on its own behalf, and furnish to the Town of North Castle certificates of insurance evidencing same and reflecting the effective date of such coverage as follows:

The term “Contractor/Provider” as used in this indemnification agreement shall mean and include Subcontractors of every tier.

- 1) Worker’s Compensation and Employers Liability Policy, covering operations in New York State. Where applicable, U.S. Longshore and Harbor Workers Compensation Act Endorsement and Maritime Coverage Endorsement shall be attached to the policy. Evidence must be provided on a C-105.2. Waiver of Subrogation to be included
- 2) N.Y.S. Disability, covering all employees. DB 120.1 must be provided.
- 3) Commercial General Liability Policy, with limits of no less than \$1,000,000 Each Occurrence/\$2,000,000 Aggregate limits for Bodily Injury and Property Damage, and shall include coverage for:
  - A. Premises & Operations
  - B. Products/Completed Operations;
  - C. Independent Contractors;
  - D. Personal & Advertising Injury
  - E. Blanket Contractual Liability
  - F. XCU
  - G. Town of North Castle and their assigns, officers, employees, representatives and agents should be named as an “Additional Insured” on the policy using ISO Additional Insured Endorsement CG 20 10 11/85 or an endorsement providing equivalent or broader coverage and shall apply on a primary and noncontributory basis, including any self-insured retentions. The Certificate of Insurance should show this applies to the General Liability coverage on the certificate, and Additional Insured Endorsement shall be attached.
  - H. To the extent permitted by New York law, the Contractor/Provider waives all rights of subrogation or similar rights against Town of North Castle, assigns, officers, employees, representatives and agents.
  - I. General Aggregate shall apply separately to each project (must be on an occurrence form).
  - J. Cross Liability coverage (Commercial General Liability and Business Automobile Liability policies only).
  - K. Coverage for athletic participants must be included if renter is an athletic team or league.

- 4) Comprehensive Automobile Policy, with limits no less than \$1,000,000 Bodily Injury and Property Damage liability including coverage for owned, non-owned, and hire private passenger and commercial vehicles.
- A. Town of North Castle and their assigns, officers, employees, representatives and agents should be named as an “Additional Insured” on the policy. The Certificate of Insurance should show this applies to the Automobile Liability coverage on the certificate, and Additional Insured Endorsement shall be attached.
- B. To the extent permitted by New York law, the Contractor/Provider waives all rights of subrogation or similar rights against Town of North Castle, assigns, officers, employees, representatives and agents.
- C. If applicable, policy should be specifically endorsed to cover snow plow operations.
- 5) Umbrella Liability, with limits of no less than \$3,000,000 Each Occurrence/\$3,000,000 Aggregate, including coverage for General Liability, Automobile, Workers Compensation and Professional Liability (if applicable).
- 6) Professional Liability (if applicable), with limits no less than \$1,000,000. Per Claim.
- 7) Owners & Contractors Protective Liability Policy, with limits no less than \$1,000,000 Per Occurrence/\$2,000,000 Aggregate shall be taken out with the Town of North Castle as the Named Insured, and maintained during the life of this contract which will protect the Town of North Castle from claims for damages for personal injury, liability, accidental or wrongful death, as well as property damage which may arise from operations under this contract whether such operations be by himself or by any subcontractor or by anyone directly or indirectly employed by either party.
- 8) Bid, Performance and Labor & Material Bonds, if required in the specifications, these bonds shall be provided by a New York State admitted surety company, in good standing.
- 9) Property Insurance, the Contractor shall cover materials being installed onsite, in transit, and/or at any other location.
- 10) Asbestos/Lead Abatement and Environmental Clean-Up, if applicable. Coverage for the removal of asbestos and/or lead and related pollution events, including coverage for third-party liability claims for bodily injury, property damage and clean-up costs \$1,000,000 per occurrence/\$2,000,000 aggregate including Products and Completed Operations. If a retroactive date is used, it must pre-date the inception of the contract
- 11) Certificates shall provide that thirty (30) days written notice prior to cancellation or expiration be given to the Town of North Castle. Policies that lapse and/or expire during term of work shall be recertified and received by the Town of North Castle no less than thirty (30) days prior to expiration or cancellation.

The Contractor/Provider shall furnish to Town of North Castle Certificates of Insurance as evidence of coverage prior to commencement of work and naming Town of North Castle as an Additional Insured **by endorsement**. The Contractor/Provider acknowledges that failure to obtain such insurance on behalf of the Town of North Castle Constitutes a material breach of contract and subjects it to liability for damages, indemnification and all other legal remedies available to the Town of North Castle. The failure of the Town of North Castle to object to the contents of the certificate or absence of same shall not be deemed a waiver of any and all rights held by the Town of North Castle.

The cost of furnishing the above insurance shall be borne by the Contractor/Provider, there will be no direct payment for this work. Cost will be deemed to have been included in the price bid for all scheduled items.

All carriers listed in the certificates of insurance shall be A.M. Best Rated A VII or better and be licensed in the State of New York.

## INDEMNIFICATION AND HOLD HARMLESS AGREEMENT

To the fullest extent permitted by law, Contractor/Provider shall indemnify, hold harmless and defend Town of North Castle, and agents and employees of any of them from and against all claims, damages, losses or expenses including but not limited to attorney's fees arising out of or resulting from the performance of the agreement, provided such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including loss of use resulting there from, and (b) is caused in whole or in part by an act or omission or violation of statutory duty or regulation of the Contractor/Provider or anyone directly or indirectly employed by it or anyone for whose acts it may be liable pursuant to the performance of the agreement. Notwithstanding the foregoing, Contractor/Provider's obligation to indemnify Town of North Castle, and its agents and employees of any of them for any judgment, mediation or arbitration award shall exist to the extent caused in whole or in part by (a) negligent acts or omissions, or (b) violations of regulatory or statutory provisions of the New York State Labor Law, OSHA, or other governing rule or applicable law; by the Contractor/Provider anyone directly or indirectly employed by it or anyone for whose acts it may be liable in connection to such claim, damage, loss and expense. The obligation of the Contractor/Provider to indemnify any party under this paragraph shall not be limited in any manner by limitation of the amount of insurance coverage or benefits including worker's compensation or other employee benefit acts provided by the Contractor/Provider.

Company Title/Name: \_\_\_\_\_

Name: \_\_\_\_\_ Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Nature/Scope of Work Being Performed: \_\_\_\_\_

## SECTION J

### NON-DISCRIMINATION CLAUSE

During the performance of this contract, the Contractor agrees as follows:

- A. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin, and will take affirmative action to insure that they are afforded equal employment opportunities without discrimination because of race, creed, color, or national origin. Such action shall be taken with reference, but not limited to: recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training or retraining, including apprenticeship and on-the-job training.
- B. The Contractor will send to each labor union or representative of workers with which it has or is bound by a collective bargaining or other agreement or understand, a notice, to be provided by the Commission of Human Rights, advising such labor union or representative of the Contractor's agreement under clauses "a" through "h" hereinafter called "non-discrimination clauses", and requesting such labor union or representative to agree in writing, whether in such collective bargaining or other agreement or understanding or otherwise, that such labor union or representative will not discriminate against any member or applicant for membership because of race, creed, color, or national origin, and will take affirmative action to insure that they are afforded equal membership opportunities without discrimination because of race, creed, color, or national origin. Such action shall be taken with reference, but not be limited to: recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of pay, or other forms of compensation, and selection for training or retraining including apprenticeship and on-the-job training. Such notice shall be given by the Contractor, and such written agreement shall be made by such labor union or representative, prior to the commencement of performances of this contract. If such labor union or representative fails or refuses so to agree in writing, the Contractor shall promptly notify the Commission for Human Rights of such failure or refusal.
- C. The Contractor will post and keep posted in conspicuous places, available to employee and applicants for employment, notices to be provided by the Commission for Human Rights setting forth the substance of the provisions of clauses "a" and "b" and such provisions of the State's Laws against discrimination as the Commission for Human Rights shall determine.
- D. The Contractor will state, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, that all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, or national origin.
- E. The Contractor will comply with the provision of Sections 291-299 of the Executive Law and the Civil Rights Law, will furnish all information and reports deemed necessary by the Commission for Human Rights under these non-discrimination clauses and such sections of the Executive Law, and will, permit access to books, records, and accounts by the Commission for Human Rights, and Owner representatives/counsel clauses and such sections of the Executive Law and Civil Rights Law.

- F. This Contract may be forthwith canceled, terminated, or suspended in whole or in part, by the Contracting agency upon the basis of a finding made by the Commission of Human Rights that the Contractor has not complied with these non-discrimination clauses, and the Contractor may be declared ineligible for future contracts made by or on behalf of the Owner/Contracting Agency until it has satisfied the Commission for Human Rights that it has established and is carrying out a program in conformity with the provisions of these non-discrimination clauses. Such finding shall be made by the Commission for Human Rights after conciliation efforts by the Commission have failed to achieve compliance with these non-discrimination clauses and after a verified complaint has been filed with the Commission, notice thereof has been given to the Contractor and an opportunity has been afforded to be heard publicly before three members of the Commission. Such sanctions may be imposed and remedies otherwise provided by law.
- G. If this Contract is canceled or terminated under clause "f", in addition to other rights of the Owner provided in this contract upon its breach by the Contractor, the Contractor will hold the Owner harmless against any additional expenses or costs incurred by the Owner in completing the work or in purchasing the services, materials, equipment, or supplies contemplated by this contract, and the Owner may withhold payments from the Contractor in an amount sufficient for this purpose and recourse may be held against the surety on the performance bond if necessary.
- H. The Contractor will include the provision of clauses "a", through "g" in every subcontract or purchase order in such a manner that such provisions will be binding upon each subcontractor or vendor as to operations to be performed within jurisdictional locale of the Project being contracted by the Owner. The Contractor will take such action in enforcing such provisions of such subcontract or purchases the Owner/Contracting Agency may direct, including sanctions or remedies for non-compliance. If the Contractor becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by the Contracting Agency/Owner, the Contractor shall promptly so notify the Owner's Representatives/Counsel, requesting intervention and protect the interests of the Owner (Contracting Agency's jurisdictional area).

# SECTION K

## TECHNICAL SPECIFICATIONS

### GENERAL

The Town of North Castle Water District No. 2 (WD2) requires rehabilitation of an overburden production well (Well 5) that was installed in 2008 and is located in the Windmill Farms Well Field. The well is screened in sand and gravel of the Mianus River Aquifer. The well is constructed with a 24-inch diameter outer casing extending to 40 ft bg (feet below grade) and 13 feet of 16-inch diameter, 90-slot, wire-wrapped, stainless steel screen set from 40 to 53 ft bg with a one-foot sump extending from 53 to 54 ft bg. The annular space around the well screen is filled with a No. 4 gravel pack. The initial testing of this well in 2008 demonstrated that it was capable of yielding 280 gpm (gallons per minute). Recent yield testing has indicated a significant loss in pumping rate (125 gpm – 175 gpm) with limited available water above the pump.

The well is equipped with a Goulds 320L15 (15 HP motor) submersible pump. Based on the condition of the pump, WD#2 will be acquiring a new pump and motor separately. However, prior to installing the new pump (to be provided by WD#2) the well will require rehabilitation.

The Contractor shall perform the work under the direction of the Town's hydrogeologic consultant (Leggette, Brashears & Graham, Inc. (LBG)). All work shall be performed using qualified, competent personnel under the supervision of a foreman who shall represent the Contractor at the work site. Based on the initial well testing conducted in 2008, there is no pumping interference between Well No. 5 and Well No. 4, the second primary well at the well field that is located approximately 775 feet from Well No. 5. However, there is an emergency backup production well (Well No. 3), located approximately 25 feet from Well No. 5. Previous testing of the two wells has demonstrated drawdown interference. **WD4 may periodically turn on nearby Well No. 3 while Well No. 5 is being cleaned, depending on the system demands. Therefore, coordination between LBG, the Contractor and WD2 will be critical as certain chemicals cannot be left in the well for extended periods when Well No. 3 is in operation.**

The site is at an operating municipal well field where wells are used for potable water supply. Therefore, refueling activities are prohibited within 200 feet of any wells. The Contractor will keep the work site clean and free of litter and debris. In addition, the well is located in the vicinity of a NYSDEC (New York State Department of Environmental Conservation) wetland. The Contractor will observe best management practices to minimize disturbance to the NYSDEC wetland. Depending on the time of year, the area may be soft, therefore planking under the rig may be needed.

## ITEM -1

### REDEVELOPMENT OF WELL NO. 5 (NCWD#2)

#### **1.1 Work Included**

Under Item 1, the Contractor shall pull the existing submersible pump, inspect the condition of the existing drop pipe and install a new submersible pump (to be supplied by WD2), perform pre-video and post-video well inspections, screen cleaning treatments and redevelopment by mechanical surging and chemical treatment, well disinfection upon completion of the work, installation of a new water-level indicator with an indirect altimeter gauge and a short pumping test to evaluate the effectiveness of each treatment (including a pre-test prior to any redevelopment activities), and appurtenant work. Following the well redevelopment activities, a short-duration “step test” will be performed using the new equipment that will be installed in the well. A maximum of three consecutive tests at increasing pumping rates will be conducted for 30-minute increments, with the last test to extend a total of 60 minutes (total two hours). The rates will be determined by the Owner’s representative who shall be present during the test.

The Contractor is reminded that this well is used for potable water supply and the Contractor shall not conduct any refueling activities within 200 feet of any supply wells.

#### **1.2 Pull and Reinstall the Pump**

The Contractor shall remove the existing submersible pump from the well and inspect the condition of the existing drop pipe. The Contractor will notify WD2 of the condition of the pipe and recommend if it needs to be replaced. The drop pipe should be of galvanized steel and a minimum of 4-inches in diameter. Following redevelopment, the Contractor shall reinstall a new submersible pump (to be provided by WD2). The new pump shall be operated to waste to verify the manufacturer’s pump curve. The Owner’s representative may be present to observe the pump and motor installation, verify analyses and observe the operation test.

#### **1.3 Pre- and Post-Rehabilitation Video Well Inspection**

The Owner’s representative shall be present to observe the pre-rehabilitation and post-rehabilitation video well inspections. The Contractor shall supply the Owner’s representative with a digital (DVD) copy of the inspection after each survey. After a review of the pre-treatment video survey, the Owner’s representative shall determine the extent of plugging inside the well screen. If there is evidence of plugging and/or encrustation inside the well screen, the screen shall be pre-treated in accordance with the requirements of Item 1.4. Following the last well rehabilitation treatment, the Contractor shall complete the post-rehabilitation video inspection to document the final condition of the well materials.



## **1.4 Pre-Treatment**

The Contractor shall treat the well screen and casing with a brush or approved equal. Pre-treatment will be dependent on the video inspection of the well screen. Once the brushing tools are removed from the well, the well shall be mechanically surged and a short pumping test shall be completed in accordance with Item 1.10.

## **1.5 Mechanical Surging**

The Contractor shall mechanically surge the well with a pumping hollow-surge tool, as directed by the Owner's representative. The tool shall incorporate a pump or airlift capability. Loose debris shall be pumped from the bottom of the well into a temporary holding tank and then discharged at the well site. Following each chemical treatment the well shall be mechanically surged and/or pumped to remove the spent chemicals in accordance with the requirements of Section 1.15 of these Specifications. For planning purposes, estimate forty (40) hours of redevelopment by mechanical surging.

## **1.6 Acid Treatment**

The Well shall be treated with 170 gallons of muriatic acid mixed with 20 gallons of NW-310 (or approved equal) and introduced to the screen zone with a tremie pipe. The acid shall be left in the well for a period of time. The actual duration will be determined in coordination with the Owner's representative. The duration will be no longer than 12 hours or overnight. The well shall be surged and pumped to waste for eight (8) hours or as directed by the Owner's representative. The discharge shall be contained in accordance with the requirements of section 1.15 of these Specifications.

## **1.7 Wetting Agent Treatment**

The well shall be treated with three (3) gallons of U.S. Filter's NW-220, or approved equal, in accordance with the manufacturer's instructions. The NW-220 shall be surged into the formation for one hour and left in the well overnight. The following day the well shall be surged and pumped to waste for eight (8) hours as directed by the owner's representative. The discharge water shall be disposed of in accordance with the requirements of section 1.15 of these Specifications.

## **1.8 Chlorine Treatment**

The well shall be treated with ten (10) gallons of 12.5% nominal sodium hypochlorite. The chlorine shall be introduced to the well mixed with water. The chlorine shall be back washed into the aquifer with 500 gallons of water. The chlorine shall be left in the well overnight. The following day the well shall be surged and pumped to waste for eight (8) hours as directed by the Owner's representative. The chlorinated water shall be pumped into a portable tank and the chlorine will be neutralized before it can be discharged. The water must be neutralized to a chlorine residual of < 3 ppm.

## **1.9 Re-Treatment**

Following one round of treatment with each of the individual chemicals (acid treatment, wetting agent treatment, and chlorine treatment), one or more treatment process may be repeated at the direction of the Owner's representative. This decision shall be based on the effectiveness of the first round of chemical treatments and when diminishing returns have been observed by the Owner's representative.

## **1.10 Performance Testing**

For each day of redevelopment, two pumping tests shall be performed to determine the specific capacity of the well. The well shall be pumped at the maximum achievable rate for a minimum of fifteen (15) minutes for each test and the pumping rate and pumping water level shall be measured. The static water level shall be measured each morning before any activities begin at the well site.

## **1.11 Reporting**

The Contractor shall make daily verbal reports to the Owner's representative during redevelopment and a written report when the redevelopment process is completed. The Contractor shall retain samples of the material being removed from the well for inspection by the Owner's representative. This report shall include the static water level, pumping water levels and pumping rate for the two daily tests; the time and date of the measurements, quantities of chemicals used and a description of the sediments and materials observed in the discharge.

## **1.12 Disinfection**

All development tools, water level indicators, pumps and associated appurtenances that enter the well or may come in contact with ground water shall be properly disinfected prior to use or installation in the well. The disinfection procedure shall include flushing all contact surfaces with a solution containing at least 50 milligrams per liter of available chlorine. All disinfection shall meet or exceed the requirements of AWWA Specification C 654-03. The Contractor shall be responsible for additional well disinfection, as needed, until the bacteria water-quality is suitable to place the well back into operation following redevelopment.

## **1.13 Post-Redevelopment "Step" Pumping Test**

The Contractor shall conduct a two (2) hour pumping test following the well redevelopment activities and the installation of the new pump. The test will be conducted by pumping the well at 30 minute increments at increasing pumping rates for two (2) hours, the last rate at the maximum pumping rate that will be pumped for one hour. The pump test will be coordinated with the WD2 to minimize pumping disruptions from the nearby production well. For planning purposes, assume that the water cannot be pumped directly into the system. The Contractor shall be responsible for providing an orifice weir and monometer on the end of the discharge pipe. Discharge shall be directed through a hose to the bank of a small pond at the headwaters of the Mianus River which is located approximately 500 feet downstream from the well. The discharge cannot cause sediment to mobilize and gully to occur, therefore there must be erosion control (i.e. tarps, wood planks, etc.) near the pond/river bank.

## **1.14 Cleanup**

Upon completion of the work and services, and before final payment is made, except as otherwise expressly directed or permitted in writing, the Contractor shall clean and remove from the site, all surplus and discharged materials, rubbish, etc. and restore in an acceptable manner all property which has been damaged during the prosecution of work and services and shall leave the entire site in a neat and presentable condition, as determined by the Owner's Representative.

### **1.15 Disposal of Well Discharge Water**

Treatment chemicals shall be pumped from the well and stored in a temporary holding tank and treated to neutralize the water. The discharge water shall be monitored for pH and chlorine residual (as appropriate) and when the pH reaches 5.5 or chlorine residual drops to 3 mg/l, the water can be discharged onsite. In addition, the discharge of water containing NW-220 requires no special handling and can be discharged onsite without treatment. Water not meeting these requirements shall become the property of the Contractor and shall be disposed off-site. The Contractor shall dispose of all materials in accordance with local, State and Federal laws and regulations. The Contractor shall make specific efforts to ensure that any discharge does not flow unabated into near by wetlands, nor directly to surface water.

All unused treatment chemicals shall be removed from the site at the Contractor's expense at the conclusion of the work.

### **1.16 Quality Assurance**

Skilled workers using proper equipment, techniques and safety precautions shall perform all work.

## ITEM -2

### ADDITIONAL CHEMICAL TREATMENT

#### **2.1 Work Included**

The Contractor shall chemically re-treat the well only upon authorization and approval from the Owner's representative. Re-treatment may include acid treatment, wetting agent treatment, chlorine treatment, mechanical surging, and appurtenant work required to re-treat the Well as directed.

#### **2.2 Mechanical Surging**

The Contractor shall mechanically surge as specified under Section 1.5 for Well No. 5.

#### **2.3 Acid Treatment**

The well shall be treated as specified under Section 1.6 for Well No. 5.

#### **2.4 Wetting Agent Treatment**

The well shall be treated as specified under Section 1.7 for Well No. 5.

#### **2.5 Chlorine Treatment**

The well shall be treated as specified under Section 1.8 for Well No. 5.

#### **2.6.1 Measurement**

The quantity for payment under Item 2A, Additional Mechanical Surging, shall be the number of hours used to mechanically surge Well No. 5, as approved by the Owner's representative.

The quantity for payment under Item 2B, Additional Acid Treatment, shall be the number of acid treatments used to treat Well No. 5, as approved by the Owner's representative.

The quantity for payment under Item 2C, Additional Wetting Agent Treatment, shall be the number of wetting agent treatments used to treat Well No. 5, as approved by the Owner's representative.

The quantity for payment under Item 2D, Additional Chlorine Treatment, shall be the number of chlorine treatments used to treat Well No. 5, as approved by the Owner's representative.

## **ITEM- 3**

### **INSTALLATION OF REPLACEMENT PUMP & MOTOR FOR WELL NO.5**

#### **3.1 Work Included**

The Contractor shall provide labor and use of equipment to pull the existing submersible pump, inspect the condition of the existing drop pipe and reinstall a new submersible pump. The Contractor shall reinstall the new pump (provided by WD2) and all the associated well equipment and devices. This will include installing a new depth gauge system to determine pumping levels in the well. The well shall then be disinfected in accordance with AWWA Specification C 654-03.

#### **3.2 General Pump Rehabilitation**

The Contractor shall install the new submersible 15 HP pump. At the time the pump is pulled, the Contractor will visually inspect the drop pipe to determine its condition. If a new pipe is required, WD2 will provide the materials prior to reinstalling the pump. The pump setting is 48 feet from grade. Because the pump is set in the well screen, the Contractor will install an 8-inch shroud over the pump (all provided by WD2).

#### **3.3 Installation of New Depth Gauge System**

The Contractor shall install a new depth gauge system to determine pumping levels in the well. The water-level indicator shall consist of a gauge (calibrated in feet), air line and fittings. The altimeter shall be six (6) inches in diameter and calibrated in feet of water and pounds per square inch and with a provision for recording air line depth on the face. The reading range shall cover the entire depth of the well. The altimeter shall have an adjustable static water level indicator hand in addition to the altitude indicator hand. The air line shall be Imperial Eastman "Poly Flow Tubing", or approved equal, with a 3/8-inch outside diameter. The end of the air line shall be located at the top of the bowl assembly. It shall be accurately measured at the time of installation, and a record made on the face of the altimeter gauge and on the report to the Owner.

#### **3.4 Reporting**

The Contractor shall submit to the Owner, the pump and motor vibration test and the operations test of the pump. The Contractor shall perform a field test of the re-installed pump and will record and submit the vibration levels at 12 points on the turbine pump. At a minimum, the re-installed pump shall operate with the same performance as before the rehabilitation. The report shall also include the altimeter measurements made at the time of installation as described in Section 3.3.

APPENDIX 1

AWWA DISINFECTION OF WELLS



**American Water Works  
Association**

The Authoritative Resource for Safe Drinking Water<sup>SM</sup>

ANSI/AWWA C654-03  
(Revision of ANSI/AWWA C654-97)

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*AWWA Standard*

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# Disinfection of Wells



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## Foreword

*This foreword is for information only and is not a part of AWWA C654.*

### I. Introduction.

I.A. *Background.* During construction or maintenance of a well, the drill hole may become contaminated by surface-water inflow and undesirable fluids through which the well may penetrate. In addition, contamination may be introduced in a well in the drilling fluid, on equipment, or through the drill hole itself. A part of this contamination may be carried into the water-producing formations.

Well disinfection in accordance with this standard includes chlorination of the well casing, the pump and associated piping, and the gravel pack and the immediate area of the aquifer around the casing as well as verification of satisfactory bacteriological quality of the water. This standard is not intended to provide procedures for disinfection of the aquifer beyond the immediate location of a well; aquifer disinfection can best be handled by an engineering evaluation of all the conditions present at a specific location. The procedures for disinfection described in this standard are expanded beyond, and are intended to complement, information contained in AWWA A100, Standard for Water Wells, Sec. 11, Well Disinfection.

I.B. *History.* This is the third edition of AWWA C654, Standard for Disinfection of Wells. The first edition was approved by the AWWA Board of Directors on Jan. 25, 1987. The second edition was approved on June 15, 1997. This third edition was approved Jan. 19, 2003.

I.C. *Acceptance.* In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for all direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research Foundation (AWWARF) and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.\* Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on Apr. 7, 1990.
2. Specific policies of the state or local agency.
3. Two standards developed under the direction of NSF, ANSI<sup>†</sup>/NSF<sup>‡</sup> 60, Drinking Water Treatment Chemicals—Health Effects, and ANSI/NSF 61, Drinking Water System Components—Health Effects.
4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,<sup>§</sup> and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with ANSI/NSF 60 and 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, "Toxicology Review and Evaluation Procedures," to ANSI/NSF 60 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of "unregulated contaminants" are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of Annex A procedures may not always be identical, depending on the certifier.

AWWA C654-03 does not address additives requirements. Thus, users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.

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\*Persons in Canada, Mexico, and non-North American countries should contact the appropriate authority having jurisdiction.

†American National Standards Institute, 25 W. 43rd St., Fourth Floor, New York, NY 10036.

‡NSF International, 789 N. Dixboro Rd., Ann Arbor, MI 48105.

§Both publications available from National Academy of Sciences, 2101 Constitution Ave. N.W., Washington, DC 20418.

2. Determine the status of certifications by all parties offering to certify products for contact with, or treatment of, drinking water.

3. Determine current information on product certification.

II. *Special Issues.* This standard has no applicable information for this section.

III. *Use of This Standard.* AWWA has no responsibility for the suitability or compatibility of the provisions of this standard to any intended application by any user. Accordingly, each user of this standard is responsible for determining that the standard's provisions are suitable for and compatible with that user's intended application.

III.A. *Purchaser Options and Alternatives.* The following items should be covered in the purchaser's specifications:

1. Standard used—that is, ANSI/AWWA C654, Standard for Disinfection of Wells, of latest revision.
2. Method of chlorination to be used.
3. Precautions related to disposal of chlorinated water.
4. Bacteriological evaluation and method to be used.
5. Redisinfection procedure to be used when necessary.

III.B. *Modification to Standard.* Any modification to the provisions, definitions, or terminology in this standard must be provided in the purchaser's specifications.

IV. *Major Revisions.* Major changes made to the standard in this revision include the following:

1. Minor editorial changes throughout the standard.

V. *Comments.* If you have any comments or questions about this standard, please call the AWWA Standards and Technical Support Group (303) 794-7711, FAX (303) 795-7603, or write to the group at 6666 W. Quincy Ave., Denver, CO 80235-3098, or by e-mail at [standards@awwa.org](mailto:standards@awwa.org).

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American Water Works  
Association

ANSI/AWWA C654-03  
(Revision of ANSI/AWWA C654-97)

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## *AWWA Standard*

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# Disinfection of Wells

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## SECTION 1: GENERAL

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### Sec. 1.1 Scope

This standard describes the procedures for shock chlorination and bacteriological testing for the disinfection of wells for potable water service. These procedures shall be followed prior to using any new or existing well for potable water service if the well may have been contaminated as a result of construction, servicing, or maintenance. The chlorination procedures provided in this standard are for the gravel pack, well casing, pump, and appurtenant piping and are presented in the sequence in which they generally would be implemented.

### Sec. 1.2 Purpose

The purpose of this standard is to establish the minimum requirements for the disinfection of wells for potable water service, including procedures for chlorination and bacteriological evaluation.

### Sec. 1.3 Application

This standard can be referenced in specifications for the disinfection of wells and can be used as a guide for procedures for chlorination and bacteriological

evaluation. The stipulations of this standard apply when this document has been referenced and then only to the disinfection of wells.

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## SECTION 2: REFERENCES

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This standard references the following documents. In their latest editions, they form a part of this standard to the extent specified within the standard. In any case of conflict, the requirements of this standard shall prevail.

ANSI\*AWWA A100—Water Wells.

ANSI/AWWA B300—Hypochlorites.

ANSI/AWWA B301—Liquid Chlorine.

*Standard Methods for the Examination of Water and Wastewater.* APHA,<sup>†</sup> AWWA, and WEF,<sup>‡</sup> Washington, D.C.

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## SECTION 3: DEFINITIONS

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This standard has no applicable information for this section.

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## SECTION 4: REQUIREMENTS

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### Sec. 4.1 Preventive Actions

Clean conditions are necessary for effective well disinfection. During construction and maintenance operations, precautions shall be taken to minimize contamination. Surface runoff shall be diverted away from the well, drilling fluid pond, and other construction areas. Drilling equipment, gravel, pump column, and any other items and materials that will be inserted in the well shall be used and stored in a manner that minimizes contamination. Special care should be taken with grease and other lubricants to protect them from contamination. Some drilling fluid additives

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\*American National Standards Institute, 25 W. 43rd St., Fourth Floor, New York, NY 10036.

†American Public Health Association, 800 I St. N.W., Washington, DC 20001.

‡Water Environment Federation, 601 Wythe St., Alexandria, VA 22314.

have been demonstrated to promote bacterial growth; additives of this type should be avoided. Cover the well between work periods.

## Sec. 4.2 Forms of Chlorine for Disinfection

The forms of chlorine that may be used in the disinfecting operations are liquid chlorine, sodium hypochlorite solution, and calcium hypochlorite granules or tablets. All disinfectants shall be approved for use in potable water.

4.2.1 *Liquid chlorine.* Liquid chlorine conforming to ANSI/AWWA B301 contains 100-percent available chlorine and is packaged in steel containers usually of 100-lb, 150-lb, or 1-ton net chlorine weight. Liquid chlorine shall be used only (1) in combination with appropriate gas-flow chlorinators and injectors to provide a controlled high-concentration solution feed to the water to be chlorinated; (2) under the direct supervision of a person who is familiar with the physiological, chemical, and physical properties of liquid chlorine, and who is trained and equipped to handle any emergency that may arise; and (3) when appropriate safety practices are observed to protect working personnel and the public.

4.2.2 *Sodium hypochlorite.* Sodium hypochlorite conforming to ANSI/AWWA B300 is available in liquid form in glass, rubber-lined, or plastic containers typically ranging in size from 1 qt to 5 gal; containers of 30 gal or larger size may be available in some areas. Sodium hypochlorite contains approximately 5 percent to 15 percent available chlorine, but care must be used in control of conditions and length of storage to minimize its deterioration.

4.2.3 *Calcium hypochlorite.* Calcium hypochlorite conforming to ANSI/AWWA B300 is available in granular form or in small tablets, and contains approximately 65 percent available chlorine by weight. The material should be stored in a cool, dry, and dark environment to minimize its deterioration. The precautions listed on the container label should be carefully noted.

## Sec. 4.3 Gravel and Gravel-Pack Chlorination

4.3.1 *Chlorination of gravel installed in new wells.* Gravel being installed in new wells shall be chlorinated by one of the following two procedures. In either case, prior to installing gravel, the drilling fluid shall be thinned as described in ANSI/AWWA A100 and shall extend to the top of the casing.

4.3.1.1 *Tablet procedure in gravel.* Calcium hypochlorite tablets (approximately 5-g size) shall be uniformly mixed with the gravel at the rate of  $\frac{1}{4}$  lb to  $\frac{1}{2}$  lb

of calcium hypochlorite per ton of gravel. The mixture shall then be fed into the gravel chute and shall completely fill the annular void outside the casing to the level desired.

**WARNING:** Gravel used in any water well should be free of organic material. Otherwise, there is potential for an explosion when gravel containing organic material is mixed with hypochlorite tablets.

**4.3.1.2 Chlorine residual in drilling fluid.** After the drilling fluid has been thinned, gravel can then be added to fill the annular void outside the well casing. After the drilling mud has been displaced, chlorinated water is then put into the well to produce a chlorine concentration of not less than 50 mg/L in the entire volume of fluid within the well. The chlorine residual shall be measured periodically during this operation and the chlorine feed adjusted if necessary.

**4.3.2 Chlorination of gravel being installed in existing wells.** When gravel has settled in an existing well, any replacement gravel used to fill the void shall be soaked, immediately prior to its use, for at least 30 min in a chlorine solution maintained at a concentration of not less than 50 mg/L.

**4.3.3 Chlorination of existing gravel pack in wells.** When an existing gravel pack appears to be the source of contamination in a well, it shall be chlorinated by feeding water containing not less than 100-mg/L chlorine residual down the gravel chute. The chlorinated water shall be fed down the gravel chute until the chute will no longer take water or until the volume down the chute is equal to at least twice the calculated volume of the annular space outside the well casing. The chlorinated water should be fed into the gravel chute through an air-gap system to avoid a pressure buildup that would lift the pump base. The maximum rate at which the gravel will accept water may vary greatly from one well to another, but rates of 20 gpm to 50 gpm (70 L/min to 190 L/min) are not unusual. (See Figure A.1 for suggested feed system.)

#### **Sec. 4.4 Chlorination of Permanent Equipment and Material Used in Wells**

All permanent equipment and material to be installed in the well shall be chlorinated just prior to installation. This shall be done by spraying such areas with a solution having a chlorine residual of not less than 200 mg/L.

#### **Sec. 4.5 Chlorination of Well After Permanent Equipment Is Installed**

After permanent equipment is installed, the well shall be chlorinated by (1) treating the water in the well casing to provide a chlorine residual of

approximately 50 mg/L; (2) circulating the chlorinated water within the well casing and pump column; and (3) pumping the well to waste to remove chlorinated water.

4.5.1 *Treating the water in the well casing.* The water in the casing shall be treated with chlorine so that an average chlorine residual of 50 mg/L is in the entire volume of water in the casing. This may be done by using calcium hypochlorite tablets or sodium hypochlorite solution in the amounts shown in Table A.1.

If calcium hypochlorite is used, it shall be dribbled down the casing vent and at least 30 min shall pass to allow the tablets to fall through the water and dissolve.

If sodium hypochlorite is used, the solution must reach all parts of the well. To accomplish this, a tube shall be suspended through the well-casing vent so that it reaches the bottom of the well. After it reaches the well bottom, it shall be withdrawn as the sodium hypochlorite solution is pumped through the tube.

After the chlorine has been applied, the well shall be surged at least three times to improve the mixing and induce contact of the chlorinated water with the adjacent aquifer. The chlorinated water shall be allowed to rest in the casing for at least 12 hr but for no more than 24 hr.

4.5.2 *Circulating the chlorinated water.* Following completion of the procedure described in Sec. 4.5.1, a pressure-tight connection shall be made at least 2 in. in diameter (but not larger than the discharge piping) from the pump discharge piping to the casing vent. The pump shall be operated against a throttled discharge valve to return a flow of several hundred gallons per minute down the well casing while the rest of the pumped water is discharged to waste. In low-producing wells, the rate of return need not exceed one-half the maximum rate of production of the well (see Figure A.2.)

CAUTION: The discharge valve shall not be throttled to the extent that the pressure developed will damage equipment or pipe-restraining ties. This procedure will remove oil or other material that has accumulated on the water surface; care must be used to ensure that such material is harmlessly disposed of on-site or is recovered for proper waste disposal.

The discharge water shall be tested periodically for chlorine residual. When zero chlorine residual is measured, the well shall continue to be pumped to waste for at least 15 min. The well shall then be sampled for bacteriological evaluation.

#### **Sec. 4.6 Disposal of Contaminants**

Any oil or other significant contaminant pumped from the well must be collected for proper disposal. In addition, if the discharge of chlorinated water would be harmful to vegetation or wildlife, measures must be taken either to impound the highly chlorinated water or to neutralize the chlorine (see appendix B for neutralizing chemicals). Federal, state, or local environmental regulations may require special provisions or permits prior to disposal of highly chlorinated water.

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### **SECTION 5: VERIFICATION**

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#### **Sec. 5.1 Bacteriological Evaluation**

After the well has been chlorinated and pumped to waste for a minimum of 15 min with zero chlorine residual, at least duplicate samples shall be taken not less than 30 min apart, and the samples shall be tested for the presence of coliform in accordance with *Standard Methods for the Examination of Water and Wastewater*. If none of these samples show the presence of coliform, the well may be placed in domestic service.

If any of these samples show the presence of coliform, one of the following procedures shall be followed:

1. Pump the well to waste for a minimum of an additional 15 min, then take at least duplicate samples not less than 30 min apart and test for the presence of coliform in accordance with the latest edition of *Standard Methods for the Examination of Water and Wastewater*. If none of these samples show the presence of coliform, the well may be placed in domestic service. (If any of these samples show the presence of coliform, follow procedure 2 or 3 below.)
2. Chlorinate and test the well as described in Sec. 4.5 and 5.1.
3. Perform corrective action as determined by a qualified engineer experienced in water well disinfection.

#### **Sec. 5.2 Disinfection of Flowing Wells**

Flowing wells discharging at the surface generally do not require chlorination. Nevertheless, bacteriological sampling and evaluation for coliform shall be done as described in Sec. 5.1. If it is determined that coliforms are present, chlorine should be applied at or below the lowest aquifer producing the artesian condition in an

amount that will produce a chlorine concentration of at least 25 mg/L in the flowing water. The chlorine may be introduced through a weighted tube discharging a solution with a high concentration of chlorine (such as 15,000 mg/L) or using calcium hypochlorite tablets confined in a perforated container. If bacteriological evaluation shows the presence of coliform after this disinfection, procedure 3 of Sec. 5.1 shall be followed.

### **Sec. 5.3 Record of Compliance**

The report of bacteriological test results certifying that the well is producing water free of contamination by coliform organisms shall be the record of compliance.

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## **SECTION 6: DELIVERY**

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This standard has no applicable information for this section.

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## APPENDIX A

### Chemical Requirements for 50-mg/L Chlorine Solution

*This appendix is for information only and is not a part of AWWA C654.*

**Table A.1** Chlorine compound required to dose 100 ft of water-filled well at 50 mg/L

Well-Hole or Well-Casing Diameter <i>in.</i>	Volume per 100 ft of Water Depth <i>gal</i>	Amount of Chemical Compound		
		Calcium Hypochlorite* (65-percent available Cl <sub>2</sub> )	Sodium Hypochlorite† (12 trade percent§)	Liquid Chlorine‡ (100-percent available Cl <sub>2</sub> ) <i>lb</i>
4	65.28	0.7 oz	3.5 fl oz	0.03
6	146.9	1.5 oz	7.8 fl oz	0.06
8	261.1	2.7 oz	13.9 fl oz	0.11
10	408.0	4.2 oz	1.4 pt	0.17
12	587.5	6.0 oz	2.0 pt	0.25
16	1,044.0	10.7 oz	3.5 pt	0.44
20	1,632.0	1 lb 1 oz	0.7 gal	0.68
24	2,350.0	1 lb 8 oz	1.0 gal	0.98
30	3,672.0	2 lb 6 oz	1.5 gal	1.53
36	5,287.0	3 lb 6 oz	2.2 gal	2.21
48	9,400.0	6 lb 1 oz	3.9 gal	3.92
60	14,690.0	9 lb 7 oz	6.1 gal	6.13

NOTE: See Table A.2 for metric conversions.

\* Quantities of Ca (OCl)<sub>2</sub> based on 65 percent available chlorine by dry weight (16 oz = 1 lb).

† Quantities of NaOCl based on 12-trade-percent available chlorine by US liquid measure (1 gal = 4 qt = 8 pt = 128 fl oz).

‡ Quantities of Cl<sub>2</sub> based on 100-percent available chlorine by weight.

§ Trade percent is a term used by chlorine manufacturers; trade percent × 10 = grams of available chlorine in 1 L of solution.

**Table A.2** Metric conversion factors

US Customary Unit	Conversion Factor	Metric Equivalent
inch (in.)	× 25.4	millimetre (mm)
feet (ft)	× 0.3048	metre (m)
US gallon (gal)	× 3.7854	litre (L)
US quart (qt)	× 0.9463	litre (L)
fluid ounce (fl oz)	× 0.02957	litre (L)
avoirdupois ounce (avdp oz)	× 0.02835	kilogram (kg)
avoirdupois pound (avdp lb)	× 0.45359	kilogram (kg)

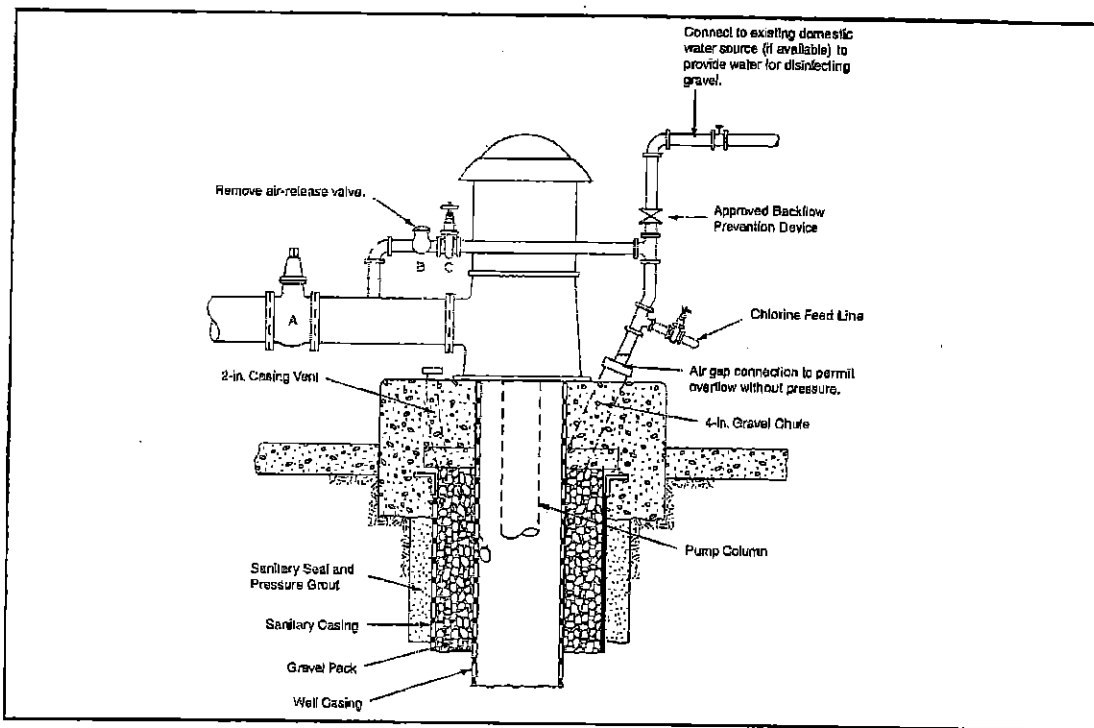


Figure A.1 Gravel-pack chlorination

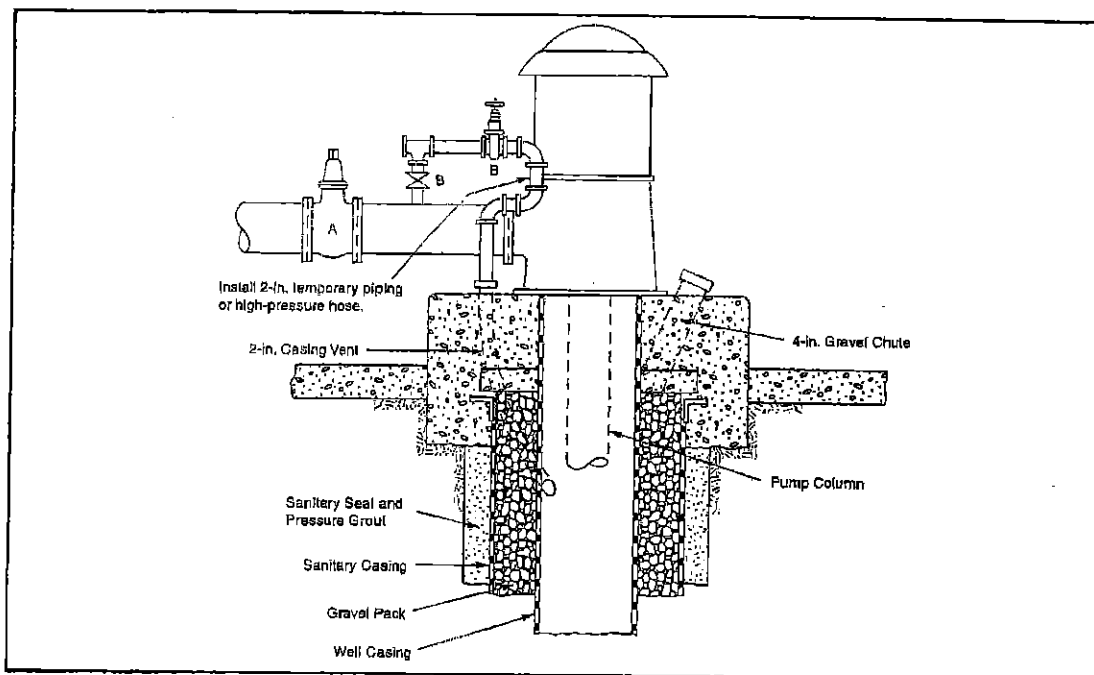


Figure A.2 Circulating chlorinated water inside well casing

## APPENDIX B

### Disposal of Heavily Chlorinated Water

*This appendix is for information only and is not part of AWWA C654.*

1. Check with local sewer department for conditions of disposal of heavily chlorinated water to sanitary sewer.
2. Chlorine residual of water being disposed will be neutralized by treating with one of the chemicals in Table B.1.

**Table B.1** Pounds of chemicals required to neutralize various residual chlorine concentrations in 100,000 gal of water\*

Residual Chlorine Concentration <i>mg/L</i>	Sulfur Dioxide (SO <sub>2</sub> ) <i>lb</i>	Sodium Bisulfite (NaHSO <sub>3</sub> ) <i>lb</i>	Sodium Metabisulfite (Na <sub>2</sub> S <sub>2</sub> O <sub>5</sub> ) <i>lb</i>	Sodium Sulfite (Na <sub>2</sub> SO <sub>3</sub> ) <i>lb</i>
1	0.8	1.2	1.1	1.5
2	1.5	2.4	2.2	3.0
10	7.5	12.2	11.2	14.8
50	38	61	56	74

\* CAUTION: A substantial excess of dechlorinating chemical also may be harmful to the environment. Care should be exercised to balance the amount of dechlorinating chemical against the chlorine present.

NOTE: Sodium dithiosulfate (Na<sub>2</sub>S<sub>2</sub>O<sub>5</sub> · 5H<sub>2</sub>O) can also be used as a dechlorinating agent. However, dosages are pH-dependent and must be calculated for each water.

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