

EXEMPTION NOTICE FORM

University of Hawai'i at Mānoa, Office of Project Delivery
2002 East-West Road
Honolulu HI, 96822

TO: 1. Agency-Maintained Public Files for Chapter 343 HRS Exemption Determinations
2. Office of Planning and Sustainable Development Environmental Review Program
3. [Applicant, if applicable]

FROM: Nelson Lee, Director, UH Office of Project Delivery

SUBJECT: Exemption Notice for Waikiki Aquarium Test Injection Well Construction

DATE: 11/9/2021

AGENCY OR APPLICANT ACTION

Check applicable box

- This exempted action is an agency action as defined by Section 343-5(b), Hawai'i Revised Statutes (HRS), and Section 11-200.1-8, Hawai'i Administrative Rules (HAR),
- This exempted action is an applicant action as defined by Section 343-5(e), HRS, and Section 11-200.1-9, HAR

EXEMPTION TYPE:

The Exemption Notice for the action described below is based on the general types enumerated in Section 11-200.1-15(c), Hawai'i Administrative Rules (HAR), Exemption Type 5.

As applicable, the exemption for the action described below is also supported by the Exemption List for the University of Hawai'i, reviewed and concurred to by the Environmental Council on 3/14/2001.

- Exemption List Class 5.
- Item Number 3.
- Applicable language from the exemption list: Basic data collection, research, experimental management, and resource and infrastructure testing and evaluation activities that do not result in a serious or major disturbance to an environmental Resource. (3) Topographic, land use, soils and drainage surveys.

DESCRIPTION OF ACTION

Proposing Agency or Applicant: University of Hawai'i Office of Project Delivery
Project Name & Address/Location: Waikiki Aquarium Test Discharge Well / Waikiki Aquarium / 2777 Kalakaua Ave, Honolulu, HI 96815
Anticipated Start Date: 6/30/2022

Anticipated End Date: 10/31/2022

Island and District: O`ahu Honolulu

Tax Map Key(s) and other geolocation means: (1) 3-1-031:006

All Necessary Permits and Approvals: Underground Injection Control Permit (Approval to Construct), Special Management Area Determination

NARRATIVE

Describe the action and why it qualifies for the exemption: The proposed action involves construction of a test injection well for the Waikiki Aquarium for disposal of aquarium exhibit wastewater. The well will be located on the south side of the property. The well will then be tested for suitability and performance for exhibit wastewater disposal as well as for water quality for a possible additional saltwater supply well. This action qualifies for an exemption because the test well construction and testing are for basic data collection and will not result in a major disturbance to an environmental resource. If tests go well, future improvements at the Aquarium will include converting the test well into a permanent injection well and constructing other injection wells, at which time a formal Chapter 343 Environmental Review Process will be conducted for the permanent well, and an Approval to Operate (ATO) will be sought.

RECEIVING ENVIRONMENT

Describe the site, including any impacts on the receiving environment: The Waikiki Aquarium is located on the south shore of O`ahu next to the Waikiki Natatorium War Memorial and Kaimana Beach Park. Just offshore of the Aquarium is a Marine Life Conservation District (MLCD) that is managed by the Department of Land and Natural Resources Division of Aquatic Resources. The MLCD extends from the groin at the end of Kapahulu Avenue to the ewa (west) wall of the Natatorium, and from the Waikiki Aquarium seawall out to 500 yards or to the edge of the fringing reef, whichever point is further. The waters within the MLCD are classified as Class AA waters. Construction and testing of the test well will not discharge any water into the ocean or MLCD. In addition, proper construction BMPs including containment and disposal of drill cuttings, development fluids, and associated solids will be done in accordance with all applicable laws and regulations. At the end of construction, a final clean up shall remove all temporary equipment and materials and restore the site as close as possible to the original condition. Therefore, minimal impacts to the receiving environment are expected.

ENVIRONMENTAL ANALYSIS

I have considered the potential effects of the proposed project and all related activities against the criteria checked below:

- | | Not Applicable |
|---|--------------------------|
| <input checked="" type="checkbox"/> Land Use and Zoning Conformance | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Traffic (Vehicles, Bicycles, Pedestrian) | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Infrastructure (Roads, Buildings, Utilities) | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Air Quality Pollutant Emissions | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Noise Emissions | <input type="checkbox"/> |
| <input checked="" type="checkbox"/> Solid, Hazardous, and Liquid Waste Management | <input type="checkbox"/> |

- Social
- Economic
- Health and Safety
- Recreation
- Public Beach Access
- Cultural Resources and Practices
- Visual/Aesthetic
- Environmental Justice

- Rare, Threatened, and/or Endangered Species
- Surface and Ground Water Resources
- Wetlands
- Floodplains
- Riparian/Coastal Resources
- Other

Comments/summary of impact analysis: The impact analysis of constructing and testing the temporary injection well will not result in a major disturbance to an environmental resource. A hydrogeological analysis conducted by a professional geologist concluded that the site is suitable for an injection well. A formal environmental review process through HRS Chapter 343 will be conducted for the permanent injection well when it goes through the Approval to Operate (ATO) process.

MITIGATION

Describe all mitigation measures and best management practices planned to address impacts during the project activities and after project completion: All work shall be performed as specified and in accordance with the Hawaii Department of Health, Hawaii Administrative Rules, Chapter 11-23, Underground Injection Control; The UIC ATO permit; and the Hawaii Well Construction & Pump Installation Standards, 2nd Edition (February 2004). If the Contractor finds any discrepancy between the Specifications and the State/Local requirements, the Contractor shall notify the Owner's Representative immediately and inform accordingly. The Contractor shall be responsible for contacting Hawaii One Call to identify and avoid damaging existing utilities. Gravity disposal testing of the wells will be conducted to conform to the requirements of the Department of Health UIC permit. The tests will include a step-build up test followed by a 12-hour constant rate injection test for the disposal well. The Contractor shall be responsible for coordinating with the Owner to obtain the necessary amount of water. Drilling solids, cuttings, and fluids generated during the well construction shall be properly contained on-site during well construction. Upon completion of the well construction all drilling solids, cuttings, and fluids shall be properly disposed offsite by the Contractor at a licensed disposal facility in accordance with all applicable laws and regulations. The Contractor shall properly contain all development fluids and associated solids in temporary settling and storage tank(s); and properly dispose all development fluids and associated solids offsite at a licensed disposal facility in accordance with all applicable laws and regulations. The Contractor shall be responsible for cleaning up the construction site immediately following completion of the well construction. The clean-up shall include removal of all temporary piping, equipment, materials, and debris. The Contractor shall restore the site as close as possible to the original condition. The grass or lawn on the site shall be restored to its original condition or better. The Owner reserves the right to accept or reject any restoration. The Contractor shall secure the wellhead with a temporary locking well cover upon completion of the well construction. The locking temporary well cover will secure the wellhead

until well vault installation and injection equipping are conducted. The well head shall extend two feet above ground level.

CONSULTATION

The following parties have been consulted about this declaration exemption (Name, affiliation, consultation date): need to consult with CCH DDP because in SMA Area (ROH Chp 25). Will consult with DPP once the SMA Determination is processed.

EXEMPT DECLARATION

The direct, cumulative, and potential impacts of the action described above have been considered pursuant to Chapter 343, Hawai'i Revised Statutes and Chapter 11-200.1, Hawai'i Administrative Rules. I declare that the action described above will have minimal or no significant impact on the environment and is therefore exempt from the requirement to prepare an environmental assessment.



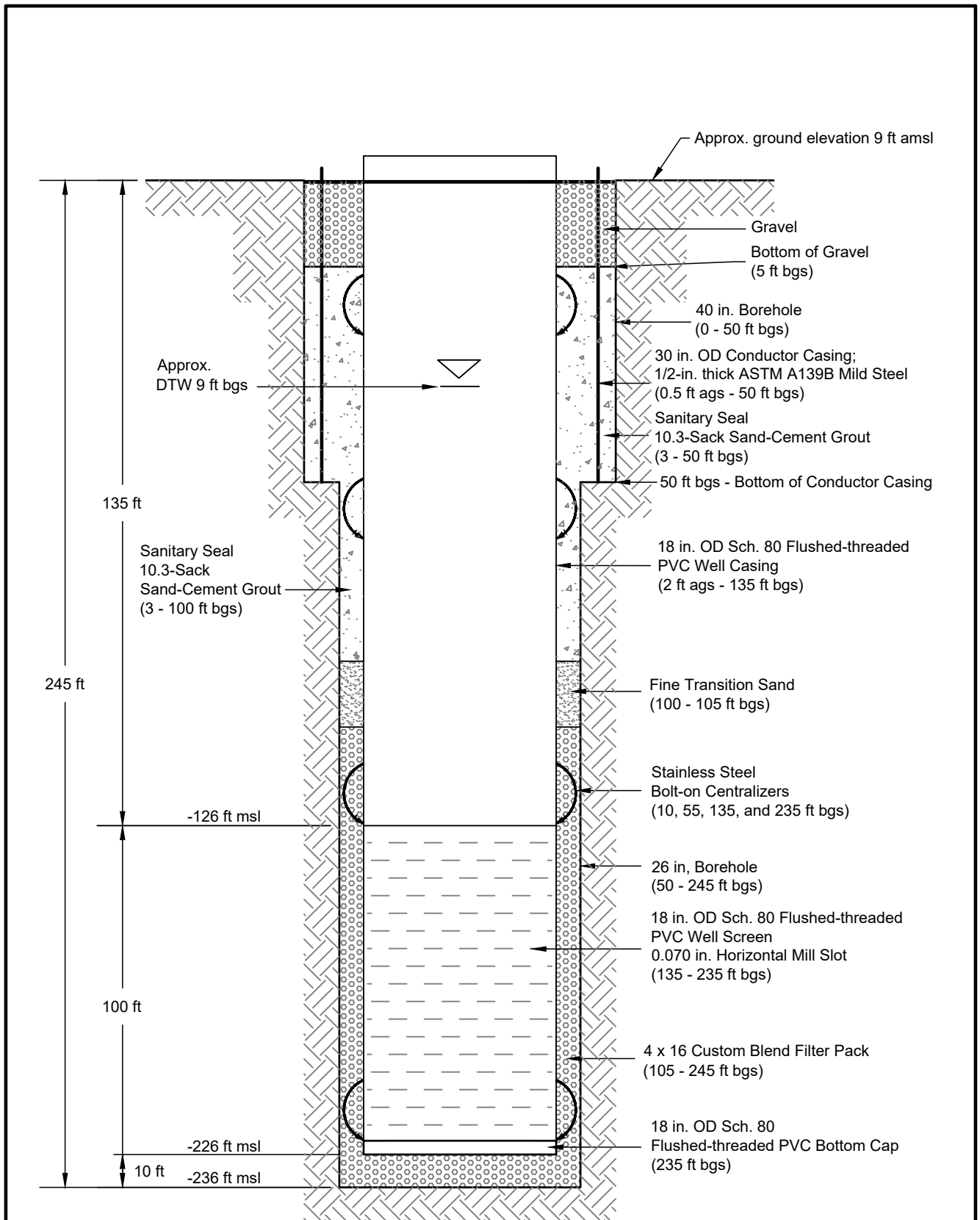
Signature of Director or Delegate

11/10/2021

Date

This document is to be kept on file in the agency's records and made available for public review

- Please check here if this document is being submitted to the Office of Environmental Quality Control for voluntary publication in *The Environmental Notice*



NOT TO SCALE

DRAFT

Figure 1
 Waikiki Aquarium
 Facility Injection Well Design Section
 Injection interval: Lower Caprock
 Waikiki, Oahu, Hawaii



SECTION 1000

INJECTION WELL DRILLING, CONSTRUCTION, DEVELOPMENT, AND TESTING

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

A. SCOPE

1. The objective of the work described in these specifications is to construct a test injection well for the Waikiki Aquarium (Owner) for disposal of aquarium wastewater at the Waikiki Aquarium located at 2777 Kalakaua Avenue in the Waikiki area of Honolulu on the Island Oahu, Hawaii.
2. The work shall include drilling, construction, development, and testing of Waikiki Aquarium Injection Well No. 1.
3. The design injection flow rate for the well is 560 gallons per minute (gpm). The injection well is to be constructed in water bearing formation to a depth of 245 feet beneath ground surface (ft bgs). The work includes:
 - a. The drilling of a 40-inch diameter borehole and installation of a 30-inch OD conductor casing to a depth of 50 ft bgs.
 - b. The drilling of a 24-inch diameter borehole to a total depth of 245 ft bgs.
 - c. Collect representative formation samples and provide to the Owner's Representative for lithologic logging by the onsite Geologist.
 - d. As determined by the Owner's Representative, construct an 18-inch outer diameter injection well with Schedule 80 PVC casing with factory cut 0.070-inch horizontal mill slot well screen and corresponding filter pack. The injection well will be constructed to the standards in Section 1.2 and in accordance with these specifications. The well design is presented in the following table and is further described in these specifications and shown on the well design drawing in Figure 1.

Design for Waikiki Aquarium Injection Well No. 1

Interval (ft bgs)	Borehole Diameter (in.)	Casing Diameter (in.)	Screen Slot Size (in.)	Material Type
+0.5 - 50	40	30 OD	-	Surface Conductor Casing ¹ (ASTM A139 Grade B Mild Steel; ½-inch Wall Thickness)
0 - 3	26	-	-	Gravel
3 - 100	26	-	-	Sand-Cement Seal (10.3 Sack Sand-Cement Slurry)
100 - 105	26	-	-	Fine Transition Sand
105 - 245	26	-	-	4 x 16 Custom Blend Filter Pack
+2 - 135	26	18 OD	-	Blank Casing (Flush-Threaded Schedule 80 PVC)
135 - 235	26	18 OD	0.070	Horizontal Mill Slot with Flush- Threaded Bottom Cap (Flush-Threaded Schedule 80 PVC)
235 - 245	26	-	-	Filter Pack Beneath Casing

Note: 1. If bedrock is encountered shallower than 50 feet beneath ground surface (ft bgs) the conductor casing total depth of installation may be adjusted to top of bedrock at the direction of the Owner's Representative.

- e. Develop the well by surging and bailing as specified below in Subsection 3.10.
- f. The work also includes:
 - Procurement of necessary permits
 - Mobilization/Demobilization
 - Providing and maintaining temporary sanitation facilities
 - Spill prevention
 - Conveying construction water and injection test water to the drill site
 - Providing continuous safety and protective measures
 - Coordinate and obtain necessary permissions for disposal of development water.
 - Downwell Video Survey
 - Site restoration
 - Disposing of water, cuttings, and drilling fluids
 - Performing other work incidental to the project

B. PERSONNEL AND EQUIPMENT

1. The Contractor shall employ only competent workmen for the execution of the work and all such work shall be performed under the direct supervision of experienced water well drillers and pump installers.
2. The Contractor shall furnish drilling equipment and well development equipment complete with all necessary tools and appurtenances of adequate capacity to complete the work. All equipment to be used for the performance of the work shall comply with all Federal, State, and local safety regulations.
3. Downhole drilling and development equipment shall be thoroughly cleaned prior to use on the project.

C. SECURITY

1. The Contractor shall always be fully responsible for the safety and security of all work areas. The Contractor shall take any necessary measures to prevent access of unauthorized persons and animals into the drilling and well construction site. All safety and security measures shall be maintained throughout the course of the entire project duration.

D. NOTIFICATION

1. The Contractor shall give notice to the Owner's Representative in writing or by telephone of specific operations related to the injection well project as follows:
 - a. Forty-eight (48) hours advance notice of intent to start any drilling operation.
 - b. Twenty-four (24) hours advance notice of the scheduled installation of well casing, screen, and filter pack.
 - c. Twenty-four (24) hours advance notice of the scheduled grout seal installation.
 - d. Twenty-four (24) hours advance notice of the scheduled well development.
 - e. Ninety-six (96) hours advance notice of the scheduled injection testing.
 - f. Twenty-four (24) hours advance notice of the scheduled video well survey.
 - g. If operations are suspended by the Contractor for any reason, notice shall be given at that time stating the reason for suspension. Notice shall also be given twenty-four (24) hours prior to resuming work.
 - h. Twenty-four (24) hours advance notice of completion of borehole to total depth. This is necessary to facilitate groundwater sampling in the open borehole as described in section 3.6.

E. LICENSES, PERMITS AND REPORTS

1. The well drilling contractor shall possess a valid C-57 Well Drilling Contractor's license issued by the State of Hawaii. The Contractor shall pay all costs to procure all permits and licenses required by law for the execution of their work. The Contractor shall have in possession at the job site all required drilling permits. Contractor shall comply with all

State and local laws, ordinances, rules, and regulations relating to performance of the work. Contractor shall file all necessary reports related to the well drilling and construction as required by the State and local agencies within 30 days of completing the well installation. Copies of all licenses, permits, and reports shall be submitted to the Owner's Representative. If necessary, the Contractor shall obtain and comply with the provisions of a Community Noise Permit.

F. HOURS OF OPERATION

1. Standard work hours shall be between 7:30 AM and 5:00 PM. No work shall be done on Saturdays, Sundays, or legal State holidays without the written consent of the Owner or Owner's Representative. No work shall be done at night unless authorized by the Owner or Owner's Representative.

1.2 REFERENCES

- A. All work shall be performed in accordance with the requirements provided herein and in accordance with the Water Systems Standards, State of Hawaii (2002), Hawaii Well Construction & Pump Installation Standards, 2nd Edition (February 2004); and the requirements in Chapter 11-23 of the Hawaii administrative Rules. The Department of Health, Safe Drinking Water Branch may also prescribe requirements in the Approval-to-Construct permit.
 1. HDLNR. 2004. Hawaii Department of Land and Natural Resources (HDLNR), 2004. Hawaii Well Construction and Pump Installation Standards. Commission on Water Resource Management. February 2004.
 2. HDOH. Hawaii Department of Health, Hawaii Administrative Rules, Chapter 11-23, Underground Injection Control.
 3. AWWA. 2020. American Water Works Association – Standard for Water Wells (AWWA A100-20).

1.3 SUBMITTALS

- A. The following shall be submitted by the Contractor to the Owner or the Owner's Representative:
 1. Copies of all licenses, permits, and reports.
 2. Site-Specific Health and Safety Plan.
 3. Contractor's Proposed Drilling Program (To be submitted with the Bid). Including:
 - a. Type(s) of drill bits.
 - b. Size and type of drill casing and drill pipe (the use of flanged drill pipe will not be accepted).
 - c. Sample collection box, or approved method of collecting formation samples.

4. A Spill Prevention Plan provided to the Owner's Representative at least ten (10) days prior to mobilization.
5. Fluid disposal plan.
6. Copies of all well development records.
7. Specifications for well casing and screen prior to delivery to the site.
8. Specifications for well casing and screen centralizers prior to delivery to the site.
9. Submit filter pack certificate of quality, gradation description, sample, and manufacturer sieve analysis of specified filter pack materials prior to delivery to the site.
10. Specifications for fine transition sand prior to delivery to the site.
11. Specifications for sand-cement grout prior to delivery to the site.
12. Copies of delivery tickets for all well construction materials.
13. Copy of video well survey on USB and video survey summary report.
14. Signed copies of disposal manifests/forms for drill cuttings, and drilling fluids.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All well materials utilized shall be new.

2.2 WELL SURFACE CASING

- A. Provide 30-inch O.D. blank well casing. Well casing shall be 1/2-inch thick, and manufactured in accordance with ASTM A139, Grade B low carbon (mild) steel, applicable parts.
- B. Furnish mild steel casing centralizers that provide at least 1-foot length of bearing surface at the wall of the borehole.
- C. Perform welding with shielded arc electrodes.
- D. All casing material shall be new.
- E. Provide outer-annular sanitary seal material for the surface casing consisting of sand-cement grout as specified below in Subsection 2.8.

2.3 PVC WELL CASING, SCREEN, AND BOTTOM CAP

- A. Provide 18-inch outer diameter flush-threaded Schedule 80 PVC blank casing and 18-inch outer diameter flush-threaded Schedule 80 PVC screen with factory cut 0.070-inch horizontal mill slots and a flush-thread PVC bottom cap. The PVC casing and screen shall conform to

the physical properties of the American Society for Testing and Materials (ASTM) specification F480.

2.4 CENTRALIZERS FOR PVC CASING AND SCREEN

- A. The centralizer guides utilized on PVC casing and screen shall be stainless steel bolt-on centralizers. Centralizer installation is described below in Subsection 3.8B.

2.5 WELL CAP

- A. The well cap shall consist of a temporary locking cover to secure the wellhead prior to final vault installation and injection equipping. The well casing will extend two feet above ground level.

2.6 FILTER PACK

- A. The following filter pack gradation has been pre-designed and shall be used for the injection well construction.
- B. The filter pack material shall be composed of sound, durable, well-rounded particles of natural silica gravel; free from thin, flat, or elongated particles with a length to width ratio greater than 3:1. The filter pack material shall be washed so that it is free from organic matter, shale, carbonates, mica, silt, clay, or other deleterious materials. Crushed rock (basalt or otherwise) will not be acceptable for use in the well. The uniformity coefficient of the filter pack material shall be less than 2.5, unless otherwise specified by the Owner's Representative. The uniformity coefficient is defined as the ratio of the D60 size to the D10 size of the material (D_x , where x is the percent passing). No more than 5% of the filter pack shall be soluble in hydrochloric acid. The filter pack material shall be Tacna Sand & Gravel (Yuma, Arizona) 4 x 16 custom blend, or approved equivalent, with the following approximate gradation.

**Design Filter Pack Gradation
 4 x 16 Custom Blend**

U.S Standard Sieve No.	Sieve Opening [in.]	Sieve Opening [mm]	Cumulative Percent Passing
3/8"	0.375	9.53	100
1/4"	0.250	6.35	97
4	0.187	4.75	93
6	0.132	3.36	78
10	0.079	2.00	30
12	0.066	1.68	20
14	0.056	1.41	15
18	0.039	1.00	8
20	0.033	0.84	5
30	0.023	0.59	0

- C. The filter pack material shall be contained in a temporary storage area at the well site in such a manner as to prevent contamination. The filter pack material shall be bagged in approximately 2,200-pound (about one metric ton) “super sacks”. Each bag must be labeled with its actual weight. Any filter pack material delivered unbagged or unlabeled will be rejected.
- D. Upon delivery and offloading of the filter pack material at the well site, the filter pack material shall be inspected by the Contractor and the Owner’s Representative. Any flaws, foreign coatings, impurities, defects, or other attributes of the filter pack material that do not comply with this Section must be identified during the inspection, and correction of any inadequacies thereof will be the responsibility of the Contractor. Once the filter pack material has been inspected by all parties and have been determined to be in conformance with this Section, the Contractor will immediately become responsible for all transport and handling of the filter pack material prior to and during its installation, as well as during subsequent development and testing activities, prior to acceptance of the well.

2.7 FINE TRANSITION SAND

- A. The fine transition sand will be siliceous 16 x 40 gradation #1C sand blend available from CEMEX Lapis Lustre Sands (Marina, CA), or approved equivalent. All fine transition sand will be delivered to the site in 100 lb. bags and protected from contamination until installation.

2.8 SAND-CEMENT GROUT SEAL

- A. Sand-cement grout mixture consisting of 968 lbs (per cubic yard) of Type II cement INTERA, Inc.

(ASTM C150 Standard specification for Portland Cement) and 1,936 lbs washed sand, to create a volume of one cubic yard of material. Approximately 60 gallons of water per cubic yard shall be added, with a maximum of 63 gallons per cubic yard allowed. The weight of the mixture shall be approximately 128 lbs/cu ft.

1. No fly ash shall be used as an additive in the cement mixture.
2. No more than 2 hours shall pass from the time of mix of the sand-cement grout to the time of installation. The sand-cement grout mix shall be free of clots and gravel exceeding 2 inches in diameter.

2.9 DISCHARGE LINE

- A. Provide the temporary discharge piping and any necessary pumps, valves, fittings, and equipment required to convey well development water to the settling tank(s) and disposal trucks. The discharge line shall have a minimum capacity of 100 gpm.

2.10 CONSTRUCTION WATER TOTALIZER

- A. Provide certified totalizing flowmeter and backflow preventer for construction water.

2.11 SURGE BLOCK TOOL

- A. Provide surge block development tool that consists of flanged surge block assembly with rubber swabs (or approved equivalent). The outside diameter of the swab rubbers shall not be more than ½-inch less than the ID of the well screen. The surge block utilized by the Contractor shall be properly designed for development of PVC wells to prevent damage to the PVC well screen and casing during well development activities.

2.12 BAILER

- A. Provide a bailer for purging of groundwater and sediment during well development. The bailer shall be a nominal 12-inches in diameter and 10-feet long (or approved alternate dimensions) for efficient bailing of the injection well. The bailer utilized by the Contractor shall be properly designed for development of PVC wells to prevent damage to the PVC well screen, casing, and bottom cap during well development activities.

2.13 WATER QUALITY MONITORING INSTRUMENTS

- A. Provide three (3) Imhoff cones for monitoring sand content during the surging and bailing well development.

PART 3 – EXECUTION

3.1 GENERAL

- A. All work shall be performed as specified and in accordance with the Hawaii Department of Health, Hawaii Administrative Rules, Chapter 11-23, Underground Injection Control; The UIC ATO permit; and the Hawaii Well Construction & Pump Installation Standards, 2nd Edition (February 2004). If the Contractor finds any discrepancy between the Specifications

and the State/Local requirements, the Contractor shall notify the Owner's Representative immediately and inform accordingly. The Contractor shall be responsible for contacting Hawaii One Call to identify and avoid damaging existing utilities.

3.2 SURFACE CASING BOREHOLE

- A. The surface casing (a.k.a. conductor casing) borehole shall be drilled to a minimum 40-inch diameter, to a depth of 50 ft bgs. The Contractor shall initially hand dig or air knife the surface casing borehole from ground surface to a minimum depth of 5 feet bgs to check for potential subsurface utilities and prevent damage to potential irrigation pipelines or other subsurface utilities. The Contractor shall promptly repair any damaged utilities to the satisfaction of the utility owner. After clearing potential subsurface utilities to a minimum depth of 5 ft bgs, the surface casing borehole may be drilled by the bucket-auger method or alternate method approved by the Owner's Representative as conditions may require. The total depth of the conductor casing borehole may be shallower than 50 ft bgs at the direction of the Owner's Representative if bedrock is encountered at a shallower depth. If archaeological materials or human remains are discovered, the Contractor shall immediately stop work and notify the Owner and Owner's Representative.

3.3 SURFACE CASING

- A. The 30-inch O.D. surface casing pipe joints shall be secured by butt welding techniques and shall be watertight. The 30-inch O.D. surface casing shall be installed from 0.5 feet above ground surface (ft ags) to 50 ft bgs. The surface casing total depth of installation may be shallower than 50 ft bgs at the direction of the Owner's Representative if bedrock is encountered at a shallower depth.

3.4 SURFACE CASING CENTRALIZERS

- A. Weld four (4) mild steel guides positioned 90 degrees apart horizontally to the exterior of the surface casing. Place the first set of guides 10 ft above the bottom of the casing, and the second set 10 ft below the top of the 50.5-ft casing.

3.5 SURFACE CASING GROUT SEAL

- A. Fill the open annular space between the surface casing and the borehole with the sand-cement grout mix specified above in Subsection 2.8 using a tremie pipe. Do not allow grout to free fall into the annular space. The tremie pipe shall initially be located 10 feet above the bottom of the annular space to be grouted. Once the bottom of the tremie pipe is covered with grout, the tremie pipe shall be removed in a manner that allows the bottom of the tremie pipe to remain covered throughout seal placement. The grout seal shall extend to the ground surface.
- B. The grout mix shall be tremied into the annular space surrounding the surface casing from 3 to 50 ft bgs. After grouting operations are completed, leave the grout undisturbed for a minimum of 24 hours. The total depth of grout installation shall match the total depth of surface conductor casing installation. If the surface conductor casing installation total depth is adjusted by the Owner's Representative based on depth to bedrock, a corresponding adjustment in grout total depth shall be made.
- C. Record the volume of grout used. The volume shall not be less than the calculated annular space between the surface casing and the borehole wall. Significant difference between

estimated and actual volume of cement installed may be grounds for well rejection.

3.6 BOREHOLE DRILLING

- A. Drill a 26-inch diameter injection well borehole through the surface conductor casing to a depth of 245 ft bgs in the lower cap rock. The drilling fluid shall consist of air or water. Bentonite shall not be used in the drilling fluid. Any drilling fluid additives must be preapproved by the Owner's Representative. The Contractor shall properly contain all drilling fluids and associated solids; and properly dispose all drilling fluids and associated solids offsite at a licensed disposal facility in accordance with all applicable laws and regulations.

Upon completion of the borehole, the driller shall stop work for 72 hours. The driller shall trip out of the hole and allow borehole resting and sampling access. The wellbore shall be rested for 48 hours and then the consultant will obtain water samples from the borehole at various intervals.

3.7 FORMATION SAMPLING

- A. Take one representative formation sample for each 5-foot interval of drilling and at each change in formation. Preserve each sample in labeled gallon-size Ziplock freezer bags. Clearly mark each sample with well designation, date, time, and depth interval represented. Store the samples in a manner that prevents breakage, loss, or contamination from drilling fluids for inspection and lithologic logging by the Owner's Representative (onsite Geologist).

3.8 INJECTION WELL INSTALLATION

- A. The injection well casing shall consist of 18-inch outer diameter flush-threaded Schedule 80 PVC. The well screen shall consist of 18-inch outer diameter flush-threaded PVC casing with 0.070-inch horizontal factory mill slots with a flush-threaded Schedule 80 PVC bottom cap. The PVC casing and screen shall conform to the physical properties of the ASTM specification F480. Suspend the well casing and screen string in tension from the ground surface by means of a clamp. The bottom of the casing and screen assembly shall be at sufficient distance above the bottom of the borehole to ensure that none of the casing assembly will be supported by the bottom of the hole. If for any reason the casing and screen cannot be placed in the correct position or at a depth acceptable to the Owner's Representative, construct another well at an adjacent location selected by the Owner's Representative and complete this well in accordance with the specifications and drawings at no additional cost to the Owner. Seal the abandoned hole according to Hawaii Department of Health – Safe Drinking Water Branch requirements at no additional cost to the Owner. Stainless steel bolt-on centralizers shall be placed at the bottom and top of the injection well screen (235 and 135 ft bgs, respectively), and at 55 and 10 ft bgs on the blank injection well casing as noted on Figure 1.
- B. The annular filter pack shall consist of natural 4 x 16 gradation custom blend gravel as specified above in Subsection 2.6B. The filter pack shall be installed by the tremie method using potable water. The bottom of the tremie pipe shall be maintained no more than 30 feet above the current filter pack placement depth. During the filter pack installation, measure the depth to the top of the filter pack at regular intervals using a weighted tagger. A pump should be used for installation of the filter pack. The annular filter pack shall be installed from 105 to 245 ft bgs unless otherwise determined by the Owner's Representative.

During the entire filter pack installation operation, circulate potable water through the annular space between the borehole wall and well screen and casing. After the filter pack is placed, gently work a swab across the respective screen interval. As the filter pack gravel settles, add more. Upon completion of filter pack placement to the specified depth swab the full screen interval for additional filter pack settlement. Swab the screen interval for a minimum of 4 hours and continue swabbing for at least one hour after there is no further settlement to ensure no filter pack voids. Tremie supplementary filter pack as necessary to the specified design depth.

Upon completion of this operation and after removal of the swab, remove rock, sand, and foreign materials from the casing by bailing or open-end airlifting. Verify filter pack is placed to the specified level as directed by the Owner's Representative.

Record the volume of filter pack used. The volume shall not be less than the calculated volume of the annular space between the borehole wall and the well screen and casing.

- C. The annular fine transition sand shall consist of Cemex Lapis Lustre® #1C sand, or approved equivalent. The fine transition sand placement level shall be tagged at regular intervals with a weighted tape during placement. The annular fine transition sand shall be installed from 100 to 105 ft bgs unless otherwise determined by the Owner's Representative.
- D. Fill the remaining open annular space between the well casing and the borehole/surface casing from 3 to 100 ft bgs with the specified sand-cement grout mix using a tremie pipe. Do not allow grout to free fall into the annular space. The tremie pipe shall initially be located 10 feet above the bottom of the annular space to be grouted. Once the bottom of the tremie pipe is covered with grout, the tremie pipe shall be removed in a manner that allows the bottom of the tremie pipe to remain covered throughout seal placement. The Contractor shall notify Hawaii Department of Health – Safe Drinking Water Branch prior to placement of the grout seal in accordance with the approval to construct permit to schedule grout inspection.

After grouting operations are completed, leave the grout undisturbed for a minimum of 24 hours. Record the volume of grout used. The volume shall not be less than the calculated annular space between the surface casing and the borehole wall. Significant difference between estimated and actual volume of cement installed may be grounds for well rejection.

The Contractor shall take whatever precautions are necessary to prevent casing collapse during placement of the sand-cement seal. The Contractor should be aware of and protect against any large hydrostatic forces which may be involved, and if necessary (based on the collapse strength of the casing), conduct the grout placement in stages (a.k.a., lifts), allowing sufficient time after each interval has been grouted for hydration and consolidation of the sand-cement.

The placing of the cement shall be done in a manner such that the casing is entirely sealed against infiltration by water. Care shall be taken to prevent damage to the well casing by excessive heat generated during curing of the cement seal.

3.9 DISCHARGE LINE INSTALLATION AND REMOVAL

- A. The Contractor shall install a discharge line to transfer development water from the injection well to the settling tanks and disposal trucks. The discharge line is further described above in

Subsection 2.9A. The Contractor shall remove the discharge line following completion of well development.

3.10 DEVELOPMENT BY SURGING AND BAILING

- A. Development activities shall commence no sooner than 24 hours after completion of grout seal placement and no later than 48 hours after grout seal placement. The Contractor shall provide the necessary surge block and bailer equipment as described above in Subsections 2.11 and 2.12 to perform the required well development. The Contractor shall initially bail from near the bottom of the well to remove sediment and residual drilling fluid from the well. The Contractor shall then proceed with development and cleaning of the gravel pack and aquifer of the well by surging and bailing. The Contractor shall surge the well screen interval in 10-foot stages opposite the entire screened interval until the filter pack is cleaned and consolidated. Vigorous surging is necessary to mechanically dislodge fine-grained sediments and drilling fluid from the filter pack and near-well zones of the aquifer. Following surging the loosened material shall be removed by bailing before moving to the next 10-foot interval. The surging and bailing process shall be repeated making downward passes through the screen interval as necessary until discharge of sand, silt, and mud is minimized. After surging and bailing the Contractor shall switch to bailing the well without additional surging. The surging/bailing and bailing development activities shall have a combined duration up to 16 hours of active development. The net development groundwater purge volume should be approximately 12 to 15 submerged well casing volumes (16,000 to 20,000 gallons). The bailer and surge block utilized by the Contractor shall be properly designed for development of PVC wells to prevent damage to the PVC well screen and casing during well development activities. The Contractor shall cautiously use the bailer and surge block near the bottom of the well to avoid damaging the well bottom cap. If the Contractor damages the well during development, the Contractor shall properly abandon and replace the well at no additional cost to the Owner.
- B. The outside diameter of the surge block swab rubbers shall not be more than ½-inch less than the ID of the well screen.
- C. The Contractor shall contain the groundwater purged during well development bailing in temporary holding and settling tank(s) and transfer the purged groundwater to disposal trucks.

3.11 INJECTION TESTING

- A. Description:

Gravity disposal testing of the wells will be conducted to conform to the requirements of the Department of Health UIC permit. The tests will include a step-build up test followed by a 12-hour constant rate injection test for the disposal well. The Contractor shall be responsible for coordinating with the Owner to obtain the necessary amount of water.

- B. Disposal Test Equipment:

Disposal testing for DOH-UIC compliance shall be conducted using combination of saltwater and potable water from on-site supply. Storage may be necessary to provide up to 800 gpm for the step-build up test and 560 gpm for the sustained test. Water will be conveyed to the top of the well being tested and cascaded down the well. The aquarium owned saltwater

intake point near the seal pool is 300 feet away from the injection well site. The contractor shall pump and convey the water from the intake point to the well. The conveyance piping shall be water-tight preventing saltwater damage to surrounding properties.

The rate of disposal shall be controlled by an appropriate valve and shall be measured with a calibrated water meter to be furnished by the Contractor. The Contractor shall furnish all other equipment and materials that may be required to convey and regulate the injection water and to measure the rate of injection. The Contractor shall provide the necessary and proper fittings to connect the water meter.

Two (2) 1-inch (min.) diameter sounding tubes shall be installed to 10 ft below water level of the tested well during the disposal testing, one for manual measurements of the head build-up and the other for continuous recording of the water level with a downhole pressure transducer.

C. Injection Testing:

After the disposal test equipment has been acceptably installed, two tests will be run. The first will be a step-build up test run at four (4) different rates for up to 60 minutes at each rate. The step-build up test shall be run at four rates varying from approximately 300 gpm to 800 gpm. After the step test has been completed and sufficient time has elapsed for the well to recover to its pre-test level, a 12-hour continuous rate injection test will be run. The constant rate injection test will be run at approximately 560 gpm.

3.12 VIDEO WELL SURVEY

- A. The Contractor shall run a color video survey of the entire well from top of casing to total depth in the presence of the Owner's Representative. The survey shall be performed using a closed-circuit color television camera with two (2) camera lenses with appropriate light sources. One lens shall be the conventional fisheye and the other shall be a side scan wide-angle lens for viewing the interior of the casing directly. The video equipment shall include a real-time monitor which records the camera depth readout superimposed on the video picture. The survey shall be recorded in color and on USB which shall show the date of the survey, the well identification, and a continuous forward and reverse display of the depth of the camera in feet with an accuracy within 2 feet in 1,000 feet.
- B. The video survey shall serve as the final inspection of the finished well product and shall be retained by the Owner as a permanent record of the completed well. Should visibility be poor or should simultaneous downhole and sidewall view not be acceptable, the Contractor shall re-run the video survey at his own expense. One (1) copy of the USB shall be provided to the Owner's Representative upon completion of the survey and the remaining copies shall be provided to the Owner within 5 days after completion of the video well survey. A summary report shall also be provided with the video survey.

3.13 DRILL CUTTINGS DISPOSAL

- A. Drilling solids, cuttings, and fluids generated during the well construction shall be properly contained on-site during well construction. Upon completion of the well construction all drilling solids, cuttings, and fluids shall be properly disposed offsite by the Contractor at a licensed disposal facility in accordance with all applicable laws and regulations.

3.14 DISPOSAL OF DEVELOPMENT FLUIDS

- A. The Contractor shall properly contain all development fluids and associated solids in temporary settling and storage tank(s); and properly dispose all development fluids and associated solids offsite at a licensed disposal facility in accordance with all applicable laws and regulations.

3.15 FINAL CLEANING

- A. The Contractor shall be responsible for cleaning up the construction site immediately following completion of the well construction. The clean-up shall include removal of all temporary piping, equipment, materials, and debris. The Contractor shall restore the site as close as possible to the original condition. The grass or lawn on the site shall be restored to its original condition or better. The Owner reserves the right to accept or reject any restoration.

3.16 WELL CAPPING

- A. The Contractor shall secure the wellhead with a temporary locking well cover upon completion of the well construction. The locking temporary well cover will secure the wellhead until well vault installation and injection equipping are conducted. The well head shall extend two feet above ground level.

PART 4 – MEASUREMENT AND PAYMENT

4.1 GENERAL

- A. Payment for the injection well construction, development, and testing will be in accordance with the corresponding contract bid schedule items.
- B. Payment for well development will be at the Contract hourly rate for active development time. There will be no payment for time for tripping tools in and out of the injection well.
- C. There will be no separate payment for the 96-hour idle period (described in Subsection 3.6) used to rest the borehole and complete open borehole groundwater sampling prior to installation of the 18-inch diameter well casing and screen. Cost for the idle period and potential wiper drilling pass afterward and prior to installation of the 18-inch diameter well casing and screen should be covered within other line item(s) in the Bid Schedule.

END OF SECTION