

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
1151 Punchbowl Street, Room 221
Honolulu, Hawaii 96813

ADDENDUM NO. 2

TO

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT
0.5 MG RESERVOIR AND TRANSMISSION MAIN
North Kohala, Island of Hawaii, Hawaii

02/16/23

This addendum as issued shall become part of the Contract Documents for the subject project. The bid documents, plans, and specifications shall be amended as follows:

GENERAL INFORMATION

The Offer Due Date and Time shall be changed to February 23, 2023, at 2 P.M. Offer proposals shall be submitted through the HiePRO solicitation.

PROPOSAL

REPLACE the proposal issued in Addendum No. 1 in its entirety with the attached revised proposal of which is available for download on the HiePRO website.

SPECIFICATION

1. Section 33 11 41 – Vertical Turbine Pumping Unit shall be replaced with the attached Section 33 11 41 – Vertical Turbine Pumping Unit.
2. Section 40 71 00 – Magnetic Flow Meter shall be added to the specification sections. The specification section is attached to this addendum.

CONSTRUCTION PLANS

1. The follow plan sheets shall be deleted and replaced with the same numbered addendum plan sheets:
 - Sheet C-07, Grading Plan
 - Sheet C-12, Typical Road Sections
 - Sheet C-18, Well Pump Piping Plan & Sections
 - Sheet C-19, Well Pump & Piping Details
2. These revised construction plans are available for download in the HiePRO solicitation.

QUESTIONS AND CLARIFICATIONS

4. Detail 6/C-19 shows an air compressor, is air compressor to be placed on a concrete slab or enclosure? If so, please furnish detail?
Answer: Electrical Drawing E-301 shows the air compressor being located within the Motor Control Center; inside the gauge board cabinet.
5. Should proposal item No. 37 be 541 LF instead of 1,246 LF?
Answer: Item No. 37 should be 551 LF. The proposal has been revised and is attached to the addendum. It is also available on HiePRO to download.
6. Should proposal item No. 38 be 1,246 LF instead of 541 LF?
Answer: Item No. 38 should be 1,256 LF. The proposal has been revised and is attached to the addendum. It is also available on HiePRO to download.
7. On sheet C-18, detail 2, the top of the well casing shows a hatched area below the new concrete support slab. Is this existing or a new slab to be installed? If new, where is the structural drawing indicating what reinforcement is required?
Answer: A revised well sheet showing the concrete slab detail is provided in Addendum No. 2 and is available on HiePRO to download.
8. Regarding Bid Items 71 & 101, how much grout per hole should Contractor's to assume in their bid. Typically, 3 times the neatline quantity is assumed.
Answer: The average volume of grout for each probe hole shall be bid based on a volume double of the neat volume.
9. If a void is encountered during the probe and grout operation, please quantify how much grout are bidders to assume to fill the void in order for the County to provide a uniformed basis for bid?
Answer: If the volume needed to fill probe holes and voids are in excess of the volume described for question 12, the volume shall be considered in excess of the bid volume and shall be paid for under the General Conditions for Price Adjustment.

10. If additional probes are requested to find the limits of voids, please confirm that this will be paid for under the General Conditions for Price Adjustment OR provide a bid item for additional probe and an assumed quantity.
Answer: The extra probes and corresponding grout volume needed shall be paid for under the General Conditions for Price Adjustment.
11. Please confirm that the quantity for Bid Item 37 should be 541 LF.
Answer: Bid Item 37 should be 551 LF. The proposal has been revised and is attached to the addendum. It is also available on HlePRO to download.
12. Bid Items 102 and 103 refer to a Column Pad Footing, however there are no locations noted or details provided. Please provide location and details for the columns and column pad footings for the steel tank.
Answer: The Contractor is responsible for procuring the tank design and tank construction materials from a steel tank provider who can provide information about the number of columns needed, if any. If a column is provided, assume the column foundation size will be 6 feet square in plan x 1'-6" thick and reinforced with #5 bars at 12" each way at bottom of footing. The number of pads will be equal to the number of columns installed as part of the steel tank designed by the contractor's selected steel tank provider's design engineering staff.
13. Sheet E-400 "One Line Diagram" mentions a "New 3P400A Non-Fusible Disconnect Switch, NEMA 4XSS". Per Addendum 1 Proposal Schedule Bid Item 57 it mentions "3P400A enclosed circuit breaker, NEMA 3R". Please advise if this is a non-fusible disconnect or if it's a enclosed circuit breaker enclosure. Also please advise if this should be NEMA 4X 316SS, NEMA 4X 304SS, or NEMA 3R.
Answer: It is a non-fusible disconnect NEMA 4X 316SS.
14. Addendum 1 Proposal Schedule Bid Item 60 "20 C.Y. Cement". Is this for concrete jacket conduit encasement? If so please check quantity as we are coming up with more than 20 C.Y.
Answer: It is for the concrete encasement and with the updated conduit routes it shall be around 25 CY of concrete.
15. Sheet E-400 "One Line Diagram" is showing 4-350MCM conductors from the HELCO Transformer to Outdoor Switchboard and from Outdoor Switchboard to New MCC. Per Addendum 1 proposal schedule Bid Item 50 mentions 300MCM conductors. Please advise which is correct.
Answer: It shall be 350MCM.
16. Sheet E-400 "One Line Diagram is showing 3-#4/0, 1-#2 conductors from New MCC to New Well Booster Pump. There is no bid item in proposal schedule for #2 conductors. Please advise.
Answer: #2 conductor shall be included for the ground for the motor.

17. 2.1.6 Tank Materials – Item 6 calls for stainless steel sheet edges. This is an outdated manufacturing process that is no longer utilized, at least by CST who to my knowledge was the only manufacturer that did this at one time. The new process for sheet edges is to round the edges and coat with glass, the same as the rest of the sheet. This new process was adopted several years back and took the place of the SST edge coating. We take exception to the SST coating requirement on sheet edges and request the latest process for sheet edges shown here be accepted?

Answer: Yes, this proposed edge treatment is acceptable.

18. 2.2.D Exterior Tank Ladder – The spec calls for aluminum ladder with aluminum or 304SST safety cage. The standard manufacturer's ladder is aluminum for the ladder and the safety cage and observation platform is galvanized steel. In order to supply a aluminum or 304SST ladder cage, I will need to get the entire ladder system from a 3rd party manufacturer and it will be more expensive. I'm requesting the standard aluminum ladder and galvanized steel cage be accepted for this project.

Answer: Structurally, it is acceptable to have galvanized steel landing and ladder cage as long as isolation is provided between galvanized steel and aluminum surfaces.

19. Exterior Color – I do not see the exterior color specified? A non- standard color is priced differently, so we need to know the exterior color of the tank in order to price it accurately. Also, section 2.2.J calls for the dome cover to be painted the same color as the tank, so we need to clarify the exterior color. Cobalt Blue is standard.

Answer: Owner is to specify color or at least for bid, state the color will be one of the standard (no extra charge) colors.

20. 1.6.3 – NSF certification. – This section states, “All materials furnished by the tank manufacturer shall be certified and listed by the National Sanitation Foundation (NSF) to meet ANSI.NSF Additive Standard no. 61” The tank is NSF certified, however the Dome is not. The dome does not come in contact with the water, and to my knowledge no domes in the industry or country are NSF certified. Please clarify this requirement.

Answer: The intent is for materials that are or could be in contact with the stored water shall have NSF 61 certification, the dome roof structure is exempt from this requirement.

21. The concrete tank design shows a 4 ft by 8 ft access hatch in the roof of the tank. Nothing is indicated in the steel tank spec for this hatch. My question is, does the hatch opening have to be at a level elevation? If that is a requirement, I will need to have the aluminum dome design incorporate a dormer in the dome to allow the hatch opening to be level. The much less costly alternative is that the opening and doors for the hatch would be at a slope the same as the dome structure rise in the roof. I'd appreciate clarification.

Answer: The steel tank hatch can be on a slight slope, but should be configured and sized for both construction activity and personnel access after the tank is put into service. Safety railing to the edge of the roof is to be provided per OSHA requirements at the roof hatch. A level 3'-0" x 4'-0" non-slip landing outside of the hatch is to be provided if the roof surface is sloped.

Engineering Division



Carty S. Chang
Chief Engineer

P R O P O S A L

FOR

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
State of Hawaii

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT
0.5 MG RESERVOIR AND TRANSMISSION MAIN
North Kohala, Island of Hawaii, Hawaii

_____, 2023

Chief Engineer
Engineering Division
Department of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

Dear Sir:

The undersigned, having carefully examined the local conditions and all available records and information covering conditions which may affect the cost of the work to be performed, and having carefully examined the Plans and Specifications, and other contract documents, hereby proposes to furnish and pay for all materials, tools, equipment, labor and other incidental work necessary to install a new pump and piping for the existing Upolu Well, construct a new 0.5 MG water storage tank, install influent and effluent watermains, construct an access road and install perimeter fencing, as required or called for in this Proposal, all according to the true intent and meaning of the Notice to Bidders, Information and Instructions to Bidders, Proposal, Detailed Specifications, Interim General Conditions, Plans, and any and all addenda for:

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT
0.5 MG RESERVOIR AND TRANSMISSION MAIN
North Kohala, Island of Hawaii, Hawaii

on file in the office of the Engineering Division for the TOTAL BASE BID (Items 1 to 94) of:

Dollars (\$ _____)

and will fully complete all work under this contract within 365 consecutive calendar days from the date of written notice to proceed, including date of said order, said total sum being itemized on the following pages.

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
<u>GENERAL</u>					
1	L.S.		NPDES Permit Compliance. For Contractor specific data such as contractor information and project contcts, site specific BMP's and Notice of Intent, etc., for construction phase.		
2	L.S.		Site BMP measures for water pollution and erosion and sediment control during construction phase of project, including installation, maintenance, and removal at end of project		
3	L.S.		Preparation, maintenance and updating of As-Built/Record Drawings for duration of project and final submittal and contractor certification of drawings to Department of Land and Natural Resources at end of project.		
4	L.S.		Project Sign, in place complete		
5	Allowance		Field Office		\$10,000.00
Subtotal for GENERAL (Items 1 to 5)					
<u>EARTHWORK, ROADWAY, AND SITE WORK</u>					
6	L.S.		Clearing and grubbing		
7	L.S.		Mass site, roadway excavation and embankment inclusive of removal and disposal of excess material to the elevations shown on plan Excavation = 2,590 Cu. Yd. Embankment = 205 Cu. Yd.		
8	49	S.Y.	4" gravel fill over geotextile fabric, grade A #3 course, conforming to ASTM size 5, inclusive of compaction, in place complete		
9	1,645	S.Y.	2" thick asphaltic concrete pavement (Mix No. 3) inclusive of surface preperation, in place complete		
10	1,645	S.Y.	6" thick base course for A.C. Pavement inclusive of compaction, in place complete		

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
11	1,522	L.F.	6' High chain link fence and appurtenances, including "No Trespassing" signs (5) in place complete		
12	2	EA	6' High double-swing gate and appurtenances, including "No Trespassing", sign in place complete		
13	542	L.F.	Demolish and remove existing cattle fence		
14	2	EA	"Non-Potable Water Do Not Drink" sign and post, in place complete.		
15	13	EA	Pipe Barrier, including excavation, concrete footing, and all related work, in place complete		
16	L.S.		Furnish and install 8-inch well drain line outlet, including excavation, headwall, apron, cutoff wall, wing walls, backfill and related work, in place complete.		
17	37	S.Y.	Rock rip rap, including excavation, mortar, cut-off walls, weep holes, geotextile fabric, backfill and all related work, in place complete.		
18	350	L.F.	4' wide reinforced concrete swale inclusive of excavation and incidental work, in place complete		
19	94	L.F.	8" cement-lined ductile iron pipe, Cl. 52 (Washout & Overflow Lines), including trench excavation, backfill and cushion material and connection to seepage pits, in place complete		
20	1	EA	8" Gate valve and valve box (for Tank Washout Line), in place complete		
21	1	EA	8" Tideflex check valve (for Tank Washout Line), in place complete		
22	1	EA	6" Flap valve (for Well Drain Line), in place complete		

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
23	L.S.		Perforated Pipe Ring Drain, including but not limited to the following: 267 L.F. 6" HDPE perforated pipe 1 - 6" ABS Tee 2 - COTG 1 - 6" Flap Valve, or S.S. Screen and necessary fittings and accessories, inclusive of excavation aggregate backfill, filter fabric, connections to seepage pits, and necessary related work, in place complete		
24	1	EA	Seepage pit, including but not limited to: excavation, backfill, grating, geotextile fabric, reinforced concrete cover with galvanized metal grate and seat, 8'-0" diameter reinforced concrete ring liners, and all appurtenances and incidental work, in place complete		
25	L.S.		20' wide gravel driveway for access pasture area, inclusive of excavation, backfill, tie-in of existing cattle fence, in place complete		
26	L.S.		Temporary Cattle Fence along limits of project, inclusive of installation of posts and barbed wires, excavation, tie-in to existing cattle fence, and any incidental work to ensure adjacent pasture area is secure		
Subtotal for EARTHWORK, ROADWAY AND SITE WORK (Items 6 to 26)					
<u>WATER SYSTEM PIPING AND APPURTENANCES</u>					
27	L.S.		Furnish and install one pumping unit including pump, motor, pump piping, valves, wellhead, well column and tubing, instrumentation, testing, painting and appurtenances, in accordance with the plans and specifications, in place complete.		
28	L.S.		Furnish and install new compressed air system (well level) and discharge pressure system, gauge board indicators and gauges, transmitter, tubing, valves, fittings, accessories, testing, painting and appurtenances, in accordance with the plans and specifications, in place complete.		

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
29	L.S.		Furnish and install underground copper air line in PVC conduit from well to gauge board, including trenching and appurtenances, in accordance with the plans and specifications, in place complete.		
30	L.S.		Furnish and install flow meter system including gauge board indicator and gauge, tubing, valves, fittings, accessories, testing, painting and appurtenances, in accordance with the plans and specifications, in place complete.		
31	L.S.		Furnish and install Stilling Well with float switch and pressure transducer, and necessary appurtenances, in place complete.		
32	393	L.F.	8" HDPE WL-A pipe and fittings, including trench excavation, pipe cushion, backfill, in place complete		
33	2	EA	8"x8"x8" Tee, Butt Fusion, in place complete		
34	4	EA	8" Gate Valve & Box, in place complete		
35	1	EA	8" 1/8 Bend, Butt Fusion, in place complete		
36	2	EA	8"x6" Reducer, Butt Fusion, in place complete		
37	551	L.F.	6" HDPE WL-B pipe and fittings, including trench excavation, pipe cushion, backfill, in place complete		
38	1256	L.F.	6" HDPE WL-C pipe and fittings, including trench excavation, pipe cushion, backfill, in place complete		
39	4	EA	8" Gate Valve & Box, in place complete		
40	2	EA	6" Gate Valve Cover and Cap, in place complete		
41	1	EA	1" Air Relief Valve Unit and Box, in place complete		

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
42	2	C.Y.	CY, DWS 2,500 concrete for reaction blocks, test blocks, concrete beams, slabs, inclusive of necessary structural struts, straps, rods, reinforcing steel and appurtenances, with Geotextile Fabric for abrasion resistance, in place complete.		
43	Allowance		Contingency for WL-B and WL-C additional bends, fittings, and appurtenances, as necessary, in place complete		\$ 20,000.00
Subtotal for WATER SYSTEM PIPING AND APPURTENANCES (Items 27 to 43)					
<u>ELECTRICAL WORK</u>					
44	600	L.F.	Trenching & backfill		
45	250	L.F.	4"C, PVC Schedule 40		
46	100	L.F.	3"C, PVC Schedule 40		
47	150	L.F.	2"C, PVC Schedule 40		
48	80	L.F.	1.5"C, PVC Schedule 40		
49	1000	L.F.	1"C, PVC Schedule 40		
50	800	L.F.	Electrical conductor 300KCMIL, RHW		
51	200	L.F.	Electrical conductor #4/0, RHW		
52	2000	L.F.	Electrical conductor #12, RHW		
53	1	EA	Switchboard		
54	1	EA	Switchboard enclosure		
55	1	EA	Motor control center		
56	1	EA	Motor control center enclosure		
57	1	EA	3P400A enclosed circuit breaker, NEMA 3R		
58	3	EA	8"L X 6"W X 6"D junction box, NEMA4XSS		
59	1	EA	Handhole		

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
60	25	C.Y.	Concrete		
61	1	EA	Service receptacle, weather proof		
62	9	EA	Equipment connection		
63	1	EA	SCADA system		
64	1	EA	Miscellaneous and testing		
Subtotal for ELECTRICAL WORK (Items 44 to 64)					
<u>CONVENTIONALLY REINFORCED CONCRETE RESERVOIR</u>					
65	100	C.Y.	Floor Slab- 6" Thick Aggregate Base		
66	5410	S.F.	Floor Slab- 30 mil PVC & 6 mil Poly Sheeting		
67	72	C.Y.	Floor Slab- 6" Reinforced Concrete Slab		
68	60	L.F.	Pipe Jackets-Ef/Influent, Washout, Overflow Pipes		
69	160	L.F.	Floor Slab- Waterstop @ Slab Joint		
70	240	L.F.	Floor Slab- Wall Base Joint		
71	L.S.		Foundation - Probe and Grout		
72	83	C.Y.	Foundation - Wall Footing		
73	34	C.Y.	Foundation - Column Pad Footing		
74	60	EA	Foundation - Seismic Cables		
75	238	C.Y.	Walls - 14" Reinforced Concrete Walls		
76	17	C.Y.	Columns - 18" Diameter Columns		
77	120	EA	Walls - Roof Dowels to Wall		
78	240	L.F.	Walls - Horiz. Wall Joint		
79	L.S.		Walls - Overflow Pipe Coating & Supports		
80	5500	S.F.	Walls - Exterior Painting		

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
81	136	C.Y.	Roof - 9" Reinforced Concrete Roof Slab		
82	15	C.Y.	Roof - Column Drop Panels		
83	80	L.F.	Roof - Waterstop @ Slab Joint		
84	4900	S.F.	Roof - Fluid Applied Roofing System		
85	1	EA	Roof - Roof Opening (4'x6') w/ Access Hatch		
86	1	EA	Roof - Observation Hatch (2' x 2')		
87	1	EA	Roof - Aluminum Roof Ventilator		
88	40	L.F.	Roof - Galvanized Steel Guardrailing		
89	2	EA	Roof - S.S. Safety Anchors		
90	27	L.F.	Ladders - Galv Steel Exterior Ladder + Rails		
91	26	L.F.	Ladders - S.S. Interior Ladder + Extension		
92	L.S.		Water Level Indicator and Supports		
93	L.S.		Disinfection of Interior @ Leak Test		
Subtotal for CONVENTIONALLY REINFORCED CONCRETE RESERVOIR (Items 65 to 93)					
94	L.S.		Mobilization and demobilization (not to exceed 10% of the Subtotal Base Bid, Items 1 to 93)		
TOTAL BASE BID (Items 1 to 94)					

JOB NO. G25CH17A
UPOLU WELL DEVELOPMENT, 0.5 MG RESERVOIR, AND TRANSMISSION LINE
North Kohala, Island of Hawaii, Hawaii

ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL
<u>ADDITIVE ALTERNATIVE NO. 1</u>					
95	L.S.		0.5 MG Bolted Steel Tank & Accessories	_____	_____
96	100	C.Y.	Floor Slab- 6" Thick Aggregate Base	_____	_____
97	4170	S.F.	Floor Slab- 30 mil PVC & 6 mil Poly Sheeting	_____	_____
98	45	C.Y.	Floor Slab- 6" Reinforced Concrete Slab	_____	_____
99	70	L.F.	Floor Slab- Floor Joint & Waterstop	_____	_____
100	100	L.F.	Pipe Jackets-Ef/Influent, Washout, Overflow Pipes	_____	_____
101	L.S.		Probing & Grouting for Foundation	_____	_____
102	100	C.Y.	Tank Footing & Center Column Pad Footing	_____	_____
103	6	C.Y.	Column Pad Footings	_____	_____
Total for ADDITIVE ALTERNATIVE NO. 1 (Items 95 to 103)				_____	_____

RECYCLED PRODUCTS PREFERENCE

This project allows a 10% price preference for recycled products in accordance with HRS 103D-1005. Please indicate your selection of recycled or non-recycled product by indicating its cost FOB jobsite unloaded in the schedule below, including applicable General Excise & Use Taxes.

<u>DESCRIPTION</u>	<u>RECYCLED PRODUCT COST</u>	<u>NONRECYCLED PRODUCT COST</u>
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____
_____	\$ _____	\$ _____

The bidder requesting a recycled product preference shall also complete and submit the form "CERTIFICATION OF RECYCLED CONTENT" as shown in the Interim General Conditions and provide all supporting information with this proposal. Additional information may be requested to qualify a product.

The following definitions are applicable to the CERTIFICATION OF RECYCLED CONTENT form:

"Post-consumer recovered material" means any product used by a consumer, including a business that purchases the material, that has served its intended end use, and that has been separated or diverted from the solid waste stream for the purpose of use, reuse, or recycling.

"Product" includes materials, manufactures, supplies, merchandise, goods, wares, and foodstuffs.

"Recovered material" means waste material and by-products that have been separated, diverted, or removed from the solid waste stream after a manufacturing process for the purpose of use, reuse, or recycling. Recovered material does not include those materials and by-products that are generated and normally reused on-site or within original manufacturing processes (such as mill broke, in the case of paper products).

"Recycled content" means the percentage of a product composed of recovered material, or post-consumer recovered material, or both.

"Recycled product" means a product containing recovered material, or post-consumer recovered material, or both.

The bidder agrees that preference for recycled products shall be taken into consideration to determine the low bidder in accordance with said Section and the rules promulgated, however, the award of contract will be in the amount of the bid offered exclusive any preference.

APPRENTICESHIP AGREEMENT PREFERENCE

1. If applicable to this project, any bidder seeking the preference must be a party to an apprenticeship agreement registered with the State Department of Labor and Industrial Relations (DLIR) at the time the bid is submitted for each apprenticeable trade the bidder will employ to construct the project. “Employ” means the employment of a person in an employer-employee relationship.
 - a. The apprenticeship agreement shall be registered with the DLIR and conform to the requirements of Hawaii Revised Statutes Chapter 372.
 - b. Subcontractors do not have to be a party to an apprenticeship agreement for the bidder to obtain preference.
 - c. The bidder is not required to have apprentices in its employ at the time the bid is submitted to qualify for the preference.
2. A bidder seeking the preference must state the apprenticeable trade the bidder will employ for each trade to be employed to perform the work by submitting a completed signed original Certification Form 1 verifying participation in an apprenticeship program registered with DLIR. “Apprenticeable trade” shall have the same meaning as “apprenticeable occupation” pursuant to Hawaii Administrative Rules (HAR) §12-30-5.
 - a. The *Certification Form 1* shall be authorized by an apprenticeship sponsor listed on the DLIR list of registered apprenticeship programs. “Sponsor” means an operator of an apprenticeship program and in whose name the program is approved and registered with the DLIR pursuant to HAR §12-30-1.
 - b. The authorization shall be an original signature by an authorized official of the apprenticeship sponsor.
 - c. The completed signed original Certification Form 1 for each trade must be submitted with the bid. Previous certifications shall not apply.
 - d. When filling out the *Certification Form 1*, the name of Apprenticeable Trade and Apprenticeship Sponsor must be the same as recorded in the List of Construction Trades in Registered Apprenticeship Programs that is posted on the DLIR website. “Registered apprenticeship program” means a construction trade program approved by the DLIR pursuant to HAR §12-301 and §12-30-4.
 - e. The *Certificate Form 1* and the List of Construction Trades in Registered Apprenticeship Programs is available on the DLIR website at: <http://hawaii.gov/labor/wdd>.
3. Upon receiving the *Certification Form 1*, the Procurement Officer will verify that the apprenticeship program is on the List of Construction Trades in Registered Apprenticeship Programs and that the form is signed by an authorized official of the Apprenticeship Program Sponsor. If the programs and signature are not confirmed by the DLIR, the bidder will not qualify for the preference.
4. If the bidder is certified to participate in an apprenticeship program for each trade which will be employed by the bidder for the project, a preference will be applied to decrease the bidder’s bid

amount by five percent (5%) for evaluation purposes.

5. Should the bidder qualify for other preferences, all applicable preferences shall be applied to the bid price.

CONTRIBUTIONS BY STATE AND COUNTY CONTRACTORS PROHIBITED

Contractors are hereby notified of the applicability of Section 11-355, HRS, which states that campaign contributions are prohibited from specified State or county government contractors during the term of the contract if the contractors are paid with funds appropriated by a legislative body.

CONDITION OF AWARD

It is understood that the award of the contract will be made on the basis of the lowest responsible Total Base Bid (Items 1 to 94), **or the Total Adjusted Bid as explained in Section K of the Information and Instructions to Bidders of Addendum No. 1**, selected by the Board of Land and Natural Resources. Write the total of bid items 1 to 94 on page P-1.

In the event the low bid is below the available funds certified by the appropriate fiscal officer, the head of the purchasing agency responsible for the procurement in question is authorized to award Additives to the lowest bidder. The award of Additives may be in any order or combination such that the Base Bid plus Additives do not exceed the available funds.

It is understood and agreed that the Board of Land and Natural Resources reserves the right to reject any and/or all bids and waive any defects when, in the Board's opinion, such rejection or waiver will be for the best interest of the State of Hawaii.

In the event all bids exceed available funds certified by the appropriate fiscal officer, the head of the purchasing agency responsible for the procurement in question is authorized in situations where time or economic considerations preclude resolicitation of work of a reduced scope to negotiate an adjustment of the bid price, including changes in the bid requirements, with the low responsible and responsive bidder, in order to bring the bid within the amount of available funds. It is understood and agreed upon that the head of the purchasing agency may delete a portion or all of any item(s) in the proposal at the stated unit or lump sum price as necessary to stay within the available funding. The bidder is responsible to make an earnest effort to represent the actual cost of each item, including all materials, labor, equipment, overhead and profit in their bid proposal to preclude claims of anticipated profit or loss of profit because of an unbalanced bid proposal.

It is also understood that if a mutually agreeable cost for the reduced scope of work necessitated by a lack of available funds cannot be agreed upon between the bidder and the head of the purchasing agency within 14 calendar days after the bid opening, then the bid may be rejected in the best interest of the purchasing agency, and the head of the purchasing agency may negotiate in progressive order (lowest to highest) with the next lowest responsible and responsive bidder.

It is also understood and agreed that the award of the contract shall be conditioned upon funds being made available for this project and further upon the right of the Board of Land and Natural Resources to hold all bids received for a period of **two hundred seventy-four (274) days** from the date of the opening thereof, unless otherwise required by law, during which time no bid may be withdrawn.

It is also understood that Notice to Proceed may be delayed up to **five hundred forty-eight (548) calendar days** after the bid opening date, and that no additional compensation will be provided for any claim for escalation or delay for issuance of Notice to Proceed on or before that date.

It is also understood and agreed that the quantities given herewith are approximate only and are subject to increase or decrease, and that the undersigned will perform all quantities of work as either increased or decreased, in accordance with the provisions of the Contract Specifications.

It is also understood and agreed that the estimated quantities shown for the items for which a UNIT PRICE is asked in this Proposal are only for the purpose of comparing on a uniform basis, bids offered for the work under this contract, and the undersigned agrees that he is satisfied with and will at no time, dispute said estimated quantities as a means of claims for anticipated profit or loss of profit, because of a difference between the quantities of the various classes of work done or the materials and equipment installed, and the said estimated quantities. On UNIT PRICE bids, payment will be made only for the

actual number of units incorporated into the finished project at the contract UNIT PRICE.

After the HIEPRO bid due date and time, the figures will be extended and/or totaled in accordance with the bid prices of the acceptable proposals and the totals will be compared. In the comparison of bids, words written in the proposal shall govern over figures and unit prices will govern over totals. Until the award of the contract, however, the right will be reserved to reject any and all proposals and to waive any defects or technicalities as may be deemed best for the interest of the State.

It is also understood and agreed that liquidated damages in the amount of Five Hundred and 00/100 dollars (\$500.00) for each and every calendar day in excess thereof prior to completion of the contract shall be withheld from payments due to the Contractor.

It is also understood and agreed that if this bid is accepted, the successful bidder must enter into and execute a contract with the Board of Land and Natural Resources and furnish a Performance and Payment Bond, as required by law. These bonds shall conform to provisions of Section 103D-324 and 325, Hawaii Revised Statutes and any law applicable hereto.

It is also understood and agreed that the successful bidder will provide all necessary labor, materials, tools, equipment, and other incidentals necessary to do all the work and furnish all the materials specified in the contract in the manner and time herein prescribed, and according to the requirements of the Engineer as therein set forth.

It is understood that by submitting this proposal, the undersigned is declaring that his firm has not been assisted or represented on this matter by an individual who has, in a State capacity, been involved in the subject matter of this contract in the past two years.

It is understood that by submitting this proposal in accordance with HAR 3-122-192, the undersigned is declaring that the price submitted is independently arrived without collusion.

It is also understood that by submitting this proposal, a Certification for Safety and Health Programs for bids in excess of \$100,000 (in accordance with HRS 396-18), the undersigned certifies that his organization will have a written safety and health plan for this project that will be available and implemented by the Notice to Proceed date of this project. Details of the requirements of this plan may be obtained from the Department of Labor and Industrial Relations, Occupational, Safety and Health Division (HIOSH).

It is further understood and agreed that the successful bidder shall comply with paragraph 3.1.a "SUBCONTRACTING" of the General Provisions which requires that the contractor shall perform with his own organization and with the assistance of workmen under his immediate superintendence, work of a value not less than twenty percent (20%) of the value of all work embraced in the Contract, except that certain contract items of work, if specifically referred to in the special provisions, will be exempted from said twenty percent requirement.

Compliance with §103-310 HRS. As a condition of award all bidders shall comply with all laws governing entities doing business in the State, including Chapter 237 HRS (general excise tax); Chapter 383 HRS (employment security – unemployment insurance); Chapter 386 HRS (workers compensation); Chapter 392 HRS (temporary disability insurance); and Chapter 393 HRS (pre-paid health care), and shall produce all documents to the State (DLNR, Engineering Division) required to demonstrate compliance with these subsections. Any bidder making a false affirmation or certification under this subsection shall be suspended and may be debarred from further offerings or awards pursuant to §103D-702 HRS.

RECEIPT OF ADDENDA

The bidder also acknowledges receipt of any and all addenda issued by the Engineering Division, by recording the date of receipt of the respective addenda in the space provided below:

<u>Addendum</u>	<u>Date Received</u>	<u>Addendum</u>	<u>Date Received</u>
No. 1	_____	No. 5	_____
No. 2	_____	No. 6	_____
No. 3	_____	No. 7	_____
No. 4	_____	No. 8	_____

It is understood that failure to receive any such addendum shall not relieve the Contractor from any obligation under this Proposal as submitted.

It is also understood and agreed that if this Proposal is accepted and the undersigned should fail or neglect to contract as aforesaid, the Board may determine that the bidder has abandoned the Contract, and thereupon, forfeiture of the security accompanying his proposal shall operate and the same shall become the property of the Board.

JOINT CONTRACTORS OR SUBCONTRACTORS
TO BE ENGAGED ON THIS PROJECT

The Bidder agrees that the following is a complete listing of all joint contractors or subcontractors covered under Chapter 444, Hawaii Revised Statutes (HRS), who will be engaged by the Bidder on this project to perform the required work indicated pursuant to Section 103D-302, HRS. It is the sole responsibility of the contractor to review the requirements of this Project and determine the appropriate licenses that are required to complete the Project. The Bidder certifies that the completed listing of joint contractors or subcontractors fulfills the requirements for the project and the Bidder, together with the listed subcontractors or joint contractors have all the specialty contractor's licenses to complete the work, except as provided for in HRS §103D-302(b). Failure of the Bidder to comply with this requirement may be just cause for rejection of the bid.

"A" General Engineering Contractors and "B" General Building Contractors are reminded that due to the Hawaii Supreme Court's January 28, 2002 decision in Okada Trucking Co., Ltd. v. Board of Water Supply, et al., 97 Haw. 450 (2002), they are prohibited from undertaking any work, solely or as part of a larger project, which would require the general contractor to act as a specialty contractor in any area in which the general contractor has no license. Although the "A" and "B" contractor may still bid on and act as the "prime" contractor on an "A" or "B" project (*See, HRS §444-7 for the definitions of an "A" and "B" project.*), respectively, the "A" and "B" contractor may only perform work in the areas in which they have the appropriate contractor's license (*An "A" or "B" contractor obtains "C" specialty contractor's licenses either on its own, or automatically under HAR § 16-77-32*). The remaining work must be performed by appropriately licensed entities.

General Engineering "A" Contractors automatically have these "C" specialty contractor's licenses: C-3, C-9, C-10, C-17, C-24, C-31a, C-32, C-35, C-37a, C-37b, C-38, C-43, C-49, C-56, C-57a, C-57b and C-61.

General Building "B" Contractors automatically have these "C" specialty contractor's licenses: C-5, C-6, C-10, C-12, C-24, C-25, C-31a, C-32a, C-42a and C-42b.

In completing the Joint Contractors or Subcontractors List, describe the specialty contractor's nature and scope of work to be performed for this project and provide the complete firm name of the joint contractor or subcontractor in the respective columns. If the Bidder is a general contractor and providing the work of the required specialty contractor, fill in the Bidder's (general contractor's) name and nature and scope of work to be performed on this project.

List only one joint contractor or subcontractor per required specialty contractor's classification, unless within the same specialty, the work of each joint contractor or subcontractor can be described so that there is no overlap in work descriptions.

If a contractor's license is required by law for the performance of the work which is called for in this bid, the bidder and all subcontractors must have the required license before the submission of the bidder's proposal in the case of a non-federal aid project, and for federal-aid projects, the bidder must have the required license prior to the award of the project and all subcontractors prior to the start of the subcontracted work.

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

**JOINT CONTRACTORS OR SUBCONTRACTORS LIST FOR THE ADDITIVE
ALTERNATIVE NO. 1**

Bidder agrees that for projects with additives alternative(s), the Bidder, joint contractor or subcontractor listed in the completed “Joint Contractors or Subcontractors List for the Additive Alternative No. 1” will perform work for the respective additive alternative.

Additive Alternative No. 1

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

Enclosed herewith is a:

- | | | | |
|----|-----------------------------|---|--------|
| 1. | Surety Bond (*1) |) | |
| 2. | Legal Tender (*2) |) | |
| 3. | Cashier's Check (*3) |) | |
| 4. | Certificate of Deposit (*3) |) | in the |
| 5. | Certified Check (*3) |) | amount |
| 6. | Official Check (*3) |) | of |
| 7. | Share Certificate (*3) |) | |
| 8. | Teller's Check (*3) |) | |
| 9. | Treasurer's Check (*3) |) | |

(Cross Out Those Not Applicable)

_____ Dollars (\$_____)

as required by law.

Respectfully submitted,

Name of Company, Joint Venture
or Partnership

Contractor's License No.

By _____
Signature (*4)

Title _____

Print Name _____

Date _____

Address _____

Telephone No. _____

E-Mail Address _____

NOTES:

1. Surety bond underwritten by a company licensed to issue bonds in this State;
2. Legal tender; or
3. A certificate of deposit; share certificate; or cashier's, treasurer's, teller's, or official check drawn by, or a certified check accepted by, and payable on demand to the State by a bank, a savings institution, or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration.
 - A. These instruments may be utilized only to a maximum of \$100,000.
 - B. If the required security or bond amount totals over \$100,000, more than one instrument not exceeding \$100,000 each and issued by different financial institutions shall be accepted.
4. Please attach to this page evidence of the authority of this officer to submit bids on behalf of the Company and also the names and residence addresses of all officers of the Company.
5. Fill in all blank spaces with information asked for or bid may be invalidated. PROPOSAL MUST BE INTACT, MISSING PAGES MAY INVALIDATE YOUR BID.

End of Proposal

SECTION 33 11 41

VERTICAL TURBINE PUMPING UNIT

PART 1 – GENERAL

- 1.1 This section of the specifications provides a description of the requirements for the well line shaft pump. The Contractor shall be responsible for furnishing new material. The Contractor shall field verify the well and pump components dimensions and shall be responsible for proper fit and operation of the pump installation in the well. The well's plumbness and alignment test results are listed in Table A at the end of this section
- 1.2 All work covered by this section of the specifications shall be done by a Contractor holding a C-57 Well Drilling Specialty License from the State of Hawaii and the burden of proof shall rest with the Bidder
- 1.3 All new metal items including factory painted items shall be painted as specified in the Water System Standards, Honolulu Board of Water Supply, 2002 and all subsequent amendments herein after referred to as the Water System Standards. Payment for painting work shall be part of the unit price bid or lump sum bid, whichever is specified, for the item of which it is a part.
- 1.4 Contractor shall field verify Well Data shown on the construction plans and provide updated drawing after inspection. The Contractor shall verify the well inside diameter before ordering the pump. It is the Contractor's responsibility to provide the right size pump for a complete installation and operation.
- 1.5 Operation of the deepwell pumping system is to be automatic. The pump shall be started and stopped by the reservoir level controller or by supervisory control from a representative designated by the DLNR. Manual controls shall also be provided at the pumping unit.

The pumping unit shall be started with the pump control valve open. After oil pre-lubrication and a selectable time delay, the pump control valve slowly closes, and flow is established to the system. Under normal shut down conditions, the pump control valve shall slowly open, with the pump unit continuing in operation. As the pump control valve nears its fully open position, it shall trip a microswitch shutting down the pumping unit. Opening and closing speed control valves shall be provided to adjust the opening and closing speed of the pump control valve, thereby limiting line pressure fluctuation to a minimum.

PART 2 – PRODUCTS

2.1 PUMP BOWL ASSEMBLY:

- A. Number Required: One (1)

Vertical Turbine Pumping Unit

33 11 41-1

- B. Pump rated capacity and head:
1. 395 gpm at 640 feet head
 2. Minimum guaranteed overall efficiency of pump bowl assembly at rated capacity and head when tested at the factory shall be 75 percent. Pump test shall conform to Section 2.12.
- C. Example of pump performance characteristics desired:
1. 0 gpm at 997 feet head
 2. 200 gpm at 865 feet head (Bowl efficiency not less than 64%)
 3. 300 gpm at 776 feet head (Bowl efficiency not less than 77%)
 4. 500 gpm at 450 feet head (Bowl efficiency not less than 66%)
- D. Maximum shut-off head:
1. 997 feet
- E. Pump used to specify pump performance Characteristics:
1. Weir Floway 8JKH (25 stages)
 2. Contractor shall verify the well inside diameter before ordering the pump. It's contractor's responsibility to provide a right size pump for a complete installation and operation.
- F. Maximum pump speed:
1. 1800

2.2 MOTOR: The existing motor shall be replaced with a new motor.

- A. Number required: One (1)
- B. Minimum horsepower rating: 125
- C. Power: 460 volts / 3-phase / 60 Hz
- D. Enclosure: Weather Protected NEMA Type 1 (WP1)
- E. Minimum full load motor efficiency: 90%

Vertical Turbine Pumping Unit
33 11 41-2

F. Maximum speed of motor: 1800 RPM

G. Minimum motor service factor: 1.10

2.3 MOTOR DRIVE SHAFT:

A. Provide new motor drive shafts. The drive shaft shall connect the new head shaft with new motor-pump coupling.

B. The drive shaft shall be ground and polished Type 416 stainless steel conforming to ASTM A582. The shaft shall be furnished in a length to fit the new motor. A suitable method shall be provided on the top end of the shaft to allow for impeller adjustment by means of an adjusting nut. The nut shall be provided with a positive locking device.

2.4 DISCHARGE HEADS:

A. Surface Discharge Head:

1. Size of discharge flange: 6 inches

2. Class of pipe flange:

250 lb. ANSI B16.1,

Contractor to verify and match existing flange class.

3. See Section 2.7.D.2

B. Head Shaft:

The new shaft in accordance with Section 2.7.D.3

2.5 DISCHARGE COLUMN ASSEMBLY:

A. Discharge column pipe and column adapter size:

1. Pipe and column adapter size:

6 inches

2. Minimum pipe wall thickness:

0.280 inches (Schedule 40)

Vertical Turbine Pumping Unit

33 11 41-3

3. Approximate length of new replacement discharge column piping and column adapters to be field verified:

588 feet

4. See Section 2.7.C

B. Enclosed line shaft and shaft enclosing tube:

1. Minimum enclosed line shaft size:

1.50 inches

2. Enclosed line shaft and coupling material:

ASTM A108 grade C1045

3. Shaft Enclosing Tube Material:

ASTM A120 Schedule 80 steel pipe

4. Line Shaft Bearings:

ASTM B584 C93200 bronze

5. Approximate length of new line shaft and couplings to be field verified:

590 feet

6. See Section 2.7.C

2.6 AIR LINE:

Air lines are contractor supplied/installed and are not part of the pump manufacturer's materials.

In the Well:

- A. Elevation of bottom of air line:

-15.0 ± feet

- B. Material: 1/4 inch extra strong, Schedule 80, brass pipe.

- C. Approximate length in well to be field verified: 583 feet

Vertical Turbine Pumping Unit

33 11 41-4

The Contractor shall field-measure the new air line during installation and provide the Engineer with the installed length, as referenced from the top of the pump base to the nearest 0.10 feet.

D. See 2.7.C.6

Outside of Well:

The air line installed underground between that in the well and the gauge board shall be 1/4-inch soft copper water tubing, type L. The line shall be installed in a 2-inch PVC conduit a minimum of 12 inches below the ground surface. The airline installed in the gauge board shall be 1/4-inch soft copper water tubing, Type K.

2.7 PUMPS:

The vertical turbine pump shall be of the multi-stage type manufactured by Xylem Goulds Pumps, Floway, Byron Jackson, National Pump Company or an NSF 61 certified approved equal.

The manufacturer of the pump bowl assembly shall be certified by the International Organization of Standards (ISO) as conforming to the requirements of the ISO 9000 series standards.

The pump bowl assembly shall be customized (impeller-trimming), assembled, and tested at the manufacturer's facility certified by the International Organization of Standards (ISO) as conforming to the requirements of the ISO 9000 series standards.

Each pumping unit shall consist of a motor, a pump bowl assembly, a discharge column assembly and a discharge head assembly.

The pumping unit shall conform to the standards set for by “NSF/ANSI Standard 61: Annex G certified, or both NSF-61 certified and NSF-372 certified. Certification will only be accepted from the following American National Standards Institute (ANSI) accredited third-party certification bodies: NSF International, UL, IAPMO R&T Inc., ICC-ES, Intertek, Truesdail, WQA, or CSA Group.

The pumping unit supplied shall conform with these specifications and the “American National Standard for Deepwell Vertical Turbine Pumps – Line Shaft and Submersible Types”, ANSI B58.1 as last revised. These specifications shall serve as a complement to ANSI B58.1 and, where contradictions occur, these specifications shall govern. These specifications indicate minimum material quality and performance required.

A. PUMP BOWL ASSEMBLY

The pump bowl assembly shall consist of the pump bowls, impellers, shaft, suction case, discharge case, and strainer.

Vertical Turbine Pumping Unit
33 11 41-5

The pump manufacturer shall provide enough clearance in the pump bowls to allow for any shaft stretch under any operating condition without the impeller making contact with the bowl.

1. Pump Bowls:

The pump bowls shall be designed for a minimum pressure of 300 psi and shall be made of close-grained cast iron, free from blow holes, sand holes, and other defects. The bowls shall conform to ASTM Designation A48, Class 30 or better, as required, with a minimum tensile strength of 30,000 pounds per square inch. The bowls shall be capable of withstanding a hydrostatic pressure equal to the greater of either twice the pressure at the rated capacity, or 1.5x the pressure at shutoff. Each bowl shall be glass lined and accurately machined and fitted to close dimensions and fitted with bronze sleeve type bearings on each side of the impellers.

2. Impellers:

The impeller shall be of the fully enclosed type and shall be of silicon bronze UNS C87610, aluminum bronze UNS C95200, or other approved material, of heavy construction and free from blow holes, porosity and other defects. The impeller shall be finished all over, accurately fitted and perfectly balanced, both mechanically and hydraulically. Passages shall be smooth to assure efficient operation and to prevent air or sand locking. The impeller shall be locked securely to the shaft with keys, taper bushings, locknuts or set screws.

3. Impeller Shaft:

The impeller shaft shall support the impellers and shall be of ground and polished Type 416 stainless steel, ASTM A 582. The shaft shall be supported by suitable bronze sleeve type bearings on both sides of each impeller with positive means for water lubricating each bearing. The shaft shall be threaded at the lower end to receive an assembly nut to accurately locate the shaft with respect to the bowls during assembly of the bowl unit. The bottom case bearing shall be of UNS C89835 bismuth tin bronze or other approved material.

4. Suction Case:

The suction case shall connect the strainer to the pump bowls and house the bearing which supports the bottom portion of the impeller shaft. The suction case shall be of cast iron construction conforming to ASTM A 48, Class 30, properly designed to guide water from the well to the first impeller with minimum friction loss.

Vertical Turbine Pumping Unit

33 11 41-6

5. Discharge Case:

The discharge case shall be of glass lined cast iron, ASTM A48, Class 30, and shall contain a bronze bearing to support the upper end of the pump shaft.

6. Strainer:

The strainer shall be of the cylindrical type. The strainer shall be directly attached to the lower end of the suction case or attached to the suction case by means of a short length of suction piping with suitable couplings. The suction piping shall not exceed one (1) foot in length and shall be of identical size and construction as the discharge column coupling.

The strainer shall be of galvanized steel construction. The net inlet area of the strainer shall not be less than three (3) times the suction case area. The maximum opening shall not be more than 75 percent of the minimum opening of the water passage through the bowl or impeller. The discharge case shall be of glass lined cast iron, ASTM A48, Class 30, and shall contain a bronze bearing to support the upper end of the pump shaft

B. TEFC MOTOR:

The electric motor shall be vertical hollow shaft with non-reverse ratchet, oil lubricated, P-base, squirrel cage induction design, NEMA premium efficiency. Enclosure shall be NEMA Weather Protected Type I with stainless steel screens over air inlet and outlet openings. Motor shall conform to the standards of the National Electrical Manufacturers Association and the American Institute of Electrical Engineers. The motor shall be designed for "soft start" starting, and capable of continuous operation under the head specified.

Motor shall be provided with Resistance Temperature Detection (RTDs) for Motor windings. Provide two 100 Ohm platinum RTDs per motor phase. Coordinate RTD system with electrical specifications.

The motor shall have a horsepower rating of not less than specified and shall not be loaded in excess of 95% of its nameplate rating at the rated head and capacity of the pump. Additionally, the motor shall not be loaded in excess of 100% of its nameplate rating at any condition from zero flow to the maximum capacity of the pump. The motor shall be capable of operating for a few minutes under shutoff head conditions.

Motor windings shall be encapsulated or sealed with epoxy according to NEMA standards by an insulation system such as Custom Polyseal or approved equal.

Motor shall be equipped with space heaters which shall operate only when the motor is not running, rated at 120 VAC, 1 PH, with wattage as required by the motor manufacturer. Space heater leads shall be brought into the motor terminal box or it

Vertical Turbine Pumping Unit

33 11 41-7

shall have a separate terminal box of its own for conduit connection.

Thrust bearings shall be provided as an integral part of the motor and shall be of ample capacity to handle the continuous down thrust as specified by the pump manufacturer. The bearing shall be of such a size that the average life rating based on continuous operation is no less than five (5) years. The bearings shall also have the capacity to allow the pump to operate for at least ten (10) minutes with the discharge valve closed. The motor shall be designed to prevent reverse rotation when the unit is shut down.

Contractor shall be responsible for all modifications to insure proper fit and match for new motor on pump discharge head.

The motor shall be General Electric, U. S. Motors, or approved equal.

The motor shall be manufactured within the previous two (2) years of the date of this contract and the manufacturer's certificate of compliance shall be provided for DLNR approval.

C. DISCHARGE COLUMN ASSEMBLY:

The discharge column assembly shall consist of the discharge column pipe, enclosed line shaft, line shaft couplings, line shaft bearings, shaft enclosing tube and air line.

1. Discharge Column Pipe:

New discharge column pipe shall be Schedule 40 steel pipe conforming to ASTM Designation A 53, Grade B, size and thickness as specified, coated with zinc inside and outside by the hot-dip process or epoxy coated ID & OD with an NSF approved epoxy such as Carboline 891 or equal. Each section of column shall have straight threads with ends accurately machined to form a butt joint to insure accurately assembled column length and perfect alignment. The pipe shall be furnished in interchangeable sections of not more than ten (10) feet in length. The top end (attached to the discharge head bottom) and the bottom (attached to the top of the pump bowl assembly) of the discharge column pipe shall not exceed five (5) feet in length each.

2. Enclosed Line Shaft:

The enclosed line shaft shall be turned and ground; furnished in interchangeable sections having a nominal length of 10 feet. To insure accurate alignment of the shafts, they shall be straight within 0.005 inch total indicator reading for a ten (10) feet section; the butting faces shall be machined square to the axis of the shaft; the maximum permissible error in the axial alignment of the thread axis with the axis of the shaft shall be 0.002 inches in 6 inches.

Vertical Turbine Pumping Unit

33 11 41-8

3. Line Shaft Coupling:

New individual sections of the line shaft shall be connected with turned and ground steel couplings. The couplings shall be designed with a safety factor of 1- 1/2 times shaft safety factor and shall have a left-handed thread to tighten during pump operations without distortion or vibrations.

4. Line Shaft Bearings:

The line shaft bearings, which are also integral tube couplings, shall be spaced not more than 5 feet apart. The bearings shall contain oil grooves or a separate bypass hole which will readily allow the oil to flow through and lubricate the bearings below.

5. Shaft Enclosing Tube

The shaft enclosing tube shall be manufactured with ends machined square and parallel, threaded internally to receive the line shaft bearings. Maximum tube runout in 5 feet length shall not exceed 0.005 inches. The shaft enclosing tube shall be provided in interchangeable sections not more than 5 feet in length.

6. Air Line:

The air line in the well is 1/4 inch, extra strong brass pipe and shall be terminated at the elevation specified. The airline shall be strapped to the pump column with stainless steel straps no more than ten (10) feet apart. The air line shall have machined couplings.

D. DISCHARGE HEAD ASSEMBLY:

The discharge head assembly shall consist of a head baseplate, head shaft, and a surface discharge head. Replace all existing mounting fasteners with new fasteners of equal quality, grade, etc.

1. Head Baseplate:

A base plate, of sufficient area and thickness to support the weight of the entire pumping unit, shall be furnished for mounting the surface discharge head. The base plate shall be of cast iron construction, free from blow holes, sand holes and all other detrimental defects and conform to ASTM A 48, Class 30. The base plate shall be accurately machines, drilled and tapped to fit the discharge head and shall be properly fitted in as a permanent part of the concrete pump foundation to prevent the entrance of water into the well. The opening of the base plate shall be of sufficient size to allow the installation of the pump bowl assembly, the discharge column assembly, the well level recorder air line, and the air relief valve.

Vertical Turbine Pumping Unit

33 11 41-9

2. Surface Head Discharge:

The surface discharge head shall support the driver, the discharge column assembly and the pump bowl assembly and shall discharge water from the discharge column assembly. The discharge head shall be accurately machined of cast iron, free of sand holes and other defects. The discharge head shall be of fabricated steel construction conforming to ASTM A53 and incorporate a discharge elbow having an aboveground flanged outlet.

The discharge head shall be equipped with a tube tensioning device to apply and maintain proper tension to the shaft enclosing tube. This device shall consist of an ASTM A48 Class 30 cast iron tube tension plate and an ASTM B548 C83600 bronze combination tube tension nut and bearing. Tension shall be applied to the shaft enclosing tube through internal threads in the top tube.

The discharge head shall have two ½-inch NPT taps in the space between the well casing and the pump discharge column to allow connection of the air relief line and to permit passage of the well level recorder air line; one ¾-inch NPT tap for drain and another NPT tap for the lubrication line.

The pump shall be furnished with an aluminum nameplate securely mounted to the discharge head. At a minimum, it shall contain information providing:

- a) Design flow
- b) Design TDH
- c) HP, RPM
- d) Bowl model number, number of stages
- e) Manufacturer serial number
- f) Pump type & impeller setting dimension.

3. Head Shaft:

The new head shaft shall connect the line shaft to the driver. The head shaft shall be ground ASTM A108 C1045 carbon steel. The head shaft shall not be longer than ten (10) feet and shall be of the size as called for in these specifications. A suitable method shall be provided on the top of the head shaft to allow impeller adjustment by means of an adjusting nut. The nut shall be provided with a positive locking device. Straightness and machining tolerances shall be as specified under the “Enclosed Line Shaft” section of these specifications.

Vertical Turbine Pumping Unit
33 11 41-10

2.8 PRE-LUBRICATION SYSTEM:

The discharge head shall be equipped with a standard four-quart oil reservoir fitted with a sight drip oiler and a solenoid valve for automatic lubrication. The pre-lubrication system and its components shall oil lubricate the stuffing box assembly in the discharge head and pump shaft bearings before startup and during pump operation. Lubrication shall stop when the pump shuts down. The lubrication system shall meet the following conditions. The pre-lubrication system and its components shall be installed by a contractor holding a current C57 Well Drilling Specialty License from the State of Hawaii. The Contractor shall be responsible for providing any additional valves, piping, parts, associated hardware, or modifications to the discharge head or discharge head connection that are not specified or shown in the drawings, necessary to provide acceptable lubrication onto the line shaft at no additional cost to the DLNR.

2.9 SPARE PARTS:

Each bidder shall include in his bid the cost of supplying and delivering the following list of spare parts to the DLNR:

- A. One (1) extra set of packing rings.
- B. One (1) extra set of bearings for one (1) motor.

2.10 SUBSTITUTION OF SPECIFIED PUMP:

If a specified pump model has been used to dimension plans and specify pump performance characteristics, a substitute pump can be used only if the following conditions have been met:

- A. All changes in dimensions resulting from the substitution of the specified pump shall be the responsibility of the Contractor. The substitution must be approved by the DLNR.
- B. The substitute pump shall have performance characteristics equal to or better than the specified pump. Performance characteristics that shall be compared are the required horsepower, efficiency and head-capacity curve.
- C. The DLNR shall approve the substitution before the substitute pump is ordered.

2.11 PRELIMINARY SUBMITTALS:

The Contractor shall obtain written approval from the DLNR prior to ordering the pumping unit. The DLNR reserves the right to reject any non-approved pumping unit that is ordered and require the Contractor to supply a different pumping unit that meets with DLNR's approval at no additional cost. To obtain approval to order the proposed pumping unit the Contractor shall submit six (6) copies of the following to the DLNR:

Vertical Turbine Pumping Unit
33 11 41-11

A. Preliminary Pump Characteristics curves:

The preliminary pump characteristic curves shall show the proposed head, efficiency and brake horsepower vs. capacity of the pump to be furnished.

B. Pumping Unit Specifications:

The Contractor shall submit complete specifications for the pump and motor he proposes to furnish. All pumping unit material shall be specified.

C. Thrust Load Curves:

The Contractor shall supply with his proposal a curve showing the thrust load from shutoff head to the lowest head specified. The rating of the thrust bearing being furnished with the motor shall be shown as part of the data on the curve.

D. Motor Data:

The Contractor shall submit certified test data for motor A.C. winding resistance, no load current, full load current, locked rotor current, starting torque, motor efficiency at 50, 75, and 100% full load, power factor at 50, 75, 100% full load, and power factor at 90 and 110% rated voltage.

E. Discharge Column Joint Lock:

The method of locking the discharge column joints to prevent their loosening shall be submitted with the pump specifications.

F. Certification of Compliance with ISO 9000 Series Standards:

The Contractor shall submit certification that the pump and motor manufacturers is (are) registered/certified by the ISO as conforming to the requirements of ISO 9000 series standards.

2.12 MANUFACTURER LABORATORY PUMP TEST:

The Contractor shall obtain written approval from the DLNR of all curves and data sheets for each bowl assembly to be used before the pumps may be installed. The DLNR reserves the right to reject any pump that is installed for which the Contractor has not obtained approval for and require the Contractor to remove and replace the non-approved pump at no additional cost to the DLNR.

To obtain DLNR approval the Contractor shall submit six (6) manufacturer-certified copies of performance curves and test data sheets of the manufacturer's laboratory running test conducted for each bowl assembly furnished and witnessed by an independent engineering

Vertical Turbine Pumping Unit

33 11 41-12

firm. The running test shall be conducted in accordance with the latest edition of the “American National Standard for Deepwell Vertical Turbine Pumps – Line Shaft and Submersible Types” ANSI B 58.1 to show that the specified conditions can be met by the bowl assemblies furnished. The performance curves shall show the head-capacity, efficiency-capacity, overall efficiency-capacity and required brake horsepower capacity curves for each bowl assembly.

2.13 CERTIFICATION OF DISCHARGE COLUMN PIPE:

The Contractor shall obtain written approval from the DLNR before the installation of any column pipe. The DLNR reserves the right to reject any non-approved column pipe that is installed and require the Contractor to remove and replace the non-approved column pipe with a column pipe that meets with the DLNR’s approval at no additional cost to the DLNR. To obtain approval the Contractor shall submit to the DLNR, a certificate verifying the following:

- A. The thickness of the discharge column pipe furnished is as specified.
- B. The pipe conforms to ASTM Designation A 53.

2.14 LAYOUT DRAWINGS:

The Contractor shall obtain written approval of the pump and piping layout drawings before any construction may begin. The DLNR reserves the right to reject any layout drawings that have not been approved and require the Contractor to revise the layout drawings at no additional cost to the DLNR. The Contractor, at no additional cost to the DLNR, shall redo construction work that is done prior to the DLNR’s approval of the layout drawings or that is not in accordance with the approved layout drawings. To obtain approval the Contractor shall submit six (6) sets of pump and piping layout drawings. All dimensions of pump, valves, piping, fittings and appurtenances shall be shown.

PART 3 - EXECUTION

3.1 INSPECTION OF EXISTING WELL AND INSTALLATION OF PUMPING UNIT:

The Contractor shall have an inspection of the existing well conducted before installing the pumping unit. The Contractor shall obtain written approval of the proposed inspection procedure from the DLNR before the inspection may be conducted.

The Contractor shall inspect the existing well for silting, caving-in and foreign materials before installing the pumping unit. The inspection shall include a visual inspection of the well by video camera lowered into the well.

A written report stating the results of the inspection along with an updated layout drawing showing all elevations shall be submitted to the DLNR. The DLNR reserves the right to reject any inspection that is conducted without written prior approval and require another

Vertical Turbine Pumping Unit
33 11 41-13

inspection to be conducted at no additional cost to the DLNR.

The Contractor shall be liable for any damages resulting from the installation of the pumping unit prior to the DLNR's approval of the inspection procedure. In the event deficiencies are observed, the Contractor shall take corrective measures, including, but not limited to, cleaning of the well.

Inspection of the existing well and the Installation of the pumping units shall be conducted by the same Contractor holding a current C- 57 Well Drilling Specialty License for the State of Hawaii. The installation shall be performed under the direction of the supplier of the pumping units, and be performed in the presence of the DLNR's Construction Inspector.

3.2 INSTALLATION INSTRUCTIONS AND MAINTENANCE MANUAL:

The pump manufacturer shall also provide at least six (6) copies of instructions for the installation of the pumping units and proper maintenance of the same. The manuals shall include tolerances and part numbers, and it shall be in bound folders.

- A. Upon completion of installing the new pumping unit, the Contractor shall notify the DLNR for rotation testing of the new equipment. The Contractor shall coordinate testing of the new pump with the DLNR Inspector and DLNR Project Engineer. All testing shall be done in the presence of a DLNR Representative; failure to do so shall result in liquidated damages for failure to comply with specifications.

3.3 TESTING AND CERTIFICATION OF PUMP:

After installation of all machinery and other equipment in the well, a complete operating test of the pumping unit and other equipment shall be made over a test period of two (2) days or two complete pumping cycles, whichever lasts longest. The Contractor shall make his own arrangements and pay for power and other costs as required.

Throughout the operating test, the pumping unit shall run smoothly without vibration, leaks or heating of the bearings. If during or as a result of this test, any structural or mechanical defect or weakness develops, or if the equipment fails to deliver its required discharge at the respective head under required conditions, the DLNR reserves the right to reject any part or all of the equipment and demand reconstruction or replacement to meet the requirements of these specifications.

During the operating test, DLNR shall operate the new pump equipment and place the facility into service. The Contractor shall be on stand-by notice to repair any equipment defects that occur during the test period. Any repairs needed due to equipment and material defects shall be performed at no additional cost to the DLNR. Upon completion of necessary repairs, the Warranty period shall start over. The test period shall be repeated as necessary until the test period has passed free of defects and failures. After completion of the test period, Construction Branch will notify other divisions that final inspection has

Vertical Turbine Pumping Unit
33 11 41-14

been completed.

During the period between the first test and the final acceptance of the pumping unit by the DLNR, the unit shall be left in place and in good working condition for use by the DLNR in order to provide service, if required and at no additional cost to the DLNR.

3.4 INSTALLATION OF VERTICAL TURBINE PUMP:

Installation of the vertical turbine pump shall be done for the Contractor by a DLNR approved subcontractor holding a current C-57 License. The equipment shall be installed only in the presence of the authorized DLNR representative.

The pump installer shall have a minimum of five (5) years of experience in the installation, testing, maintenance, and repair of vertical turbine deepwell pumping units of similar capacity, head, setting and horsepower as the pumping unit specified. The pump installer shall also have nearby plant facilities and equipment to immediately repair the pumping units should any emergency arise.

3.5 WELL COMPLETION REPORT:

After installation of the pumping unit, the Contractor shall complete a Well Completion Report and submit it to the State Water Commission Office.

3.6 PROJECT COMPLETION:

It shall be the Contractor's responsibility to guarantee proper operation of all newly installed components, including compatibility with any reused or modified components of the pumping unit, having met all applicable tests prior to DLNR acceptance. It is the Contractor's responsibility to conduct all necessary field testing required by DLNR to prove proper operation of the newly installed components. After acceptance of the pump by the DLNR and throughout the warranty period, all troubleshooting, repairs, and replacements necessary to meet the rated capacity of the pumping unit and these project specifications is the responsibility of the Contractor, at no additional costs to the DLNR.

Table A. Well Plumbness and Alignment Test Results				
Inside Diameter Casing = 10 inches		Outside Diameter Plumbet = 9.5 inches		
Height of Apex Above Top of Well Casing or Hole = 20 feet				
Approximate Spindle Length = 12.5 inches				
Depth of Plumbet Below Top of Well (ft.)	Horizontal Deflection of Plumb Line at Top of Casing (ft.)			
	North	South	East	West
0	0.000	-0.000	0.000	0.000
20	0.000	-0.010	-0.052	0.000
40	0.000	-0.042	-0.083	0.000
60	0.000	-0.052	-0.094	0.000
80	0.000	-0.083	-0.083	0.000
100	0.000	-0.135	-0.115	0.000
120	0.000	-0.146	-0.115	0.000
140	0.000	-0.161	-0.104	0.000
160	0.000	-0.156	-0.115	0.000
180	0.000	-0.146	-0.130	0.000
200	0.000	-0.151	-0.125	0.000
220	0.000	-0.146	-0.130	0.000
240	0.000	-0.135	-0.146	0.000
260	0.000	-0.141	-0.125	0.000
280	0.000	-0.116	-0.125	0.000
300	0.000	-0.135	-0.125	0.000
320	0.000	-0.135	-0.125	0.000
340	0.000	-0.177	-0.120	0.000
360	0.000	-0.146	-0.120	0.000
380	0.000	-0.151	-0.125	0.000
400	0.000	-0.167	-0.115	0.000
420	0.000	-0.156	-0.125	0.000
440	0.000	-0.156	-0.125	0.000
460	0.000	-0.146	-0.125	0.000
480	0.000	-0.151	-0.125	0.000
500	0.000	-0.151	-0.130	0.000
520	0.000	-0.151	-0.135	0.000
540	0.000	-0.135	-0.115	0.000
560	0.000	-0.135	-0.115	0.000
580	0.000	-0.156	-0.130	0.000
Alignment Test: 40-foot dummy passed through entire well column				

END OF SECTION

Vertical Turbine Pumping Unit
33 11 41-16

Job No.G25CH17A
Upolu Well Development, 0.5MG Reservoir,
and Transmission Main

Addendum No. 2

SECTION 40 71 00
MAGNETIC FLOW METER

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. An electromagnetic flow meter shall be installed on the influent line, as shown on the plans. The meter unit shall be capable of the flow rates and converting them to analog signals to be sent to the SCADA system specified for this project.
2. This section of the specifications includes the furnishing and installation of an electromagnetic flowmeter for each application site described below. The flowmeters shall be an ABB WaterMaster Electromagnetic Flowmeter DN200, or approved equal, and include a flow tube, transmitter, and interconnection cables

B. Application Options:

1. Influent Line:
 - a. Number Required: One (1)
 - b. Flow Meter Sensor Size: 8 inches
 - c. Flange End: ASME Class 150
 - d. Model No.: WaterMaser Electromagnetic Flowmeter DN200, or approved equal
 - e. Location: As Shown on Plans

1.2 QUALITY ASSURANCE

A. Guarantee:

1. The equipment covered by these specifications shall be guaranteed against defective parts due to faulty material or workmanship for one year after the date of acceptance of project. The Contractor shall guarantee to replace all defective parts within the period of time specified. All costs for the replacement of defective parts shall be paid for by the Contractor at no cost to the Department of Land and Natural Resources. The guarantee shall be in writing and shall be given to the Department of Land and Natural Resources prior to the completion of the project.

B. Warranty:

Magnetic Flow Meter
407100-1

1. The manufacturer of the electromagnetic flow meter shall guarantee for one year of operation that the equipment shall be free from defects in design, workmanship, or materials. In the event a component fails to perform as specified or is proven defective in service during the guarantee period, the manufacturer shall promptly repair or replace the defective part at no cost to the owner.

PART 2 – PRODUCTS

2.1 FULL BORE MAGNETIC FLOW METER

A. Method of Operation:

1. Measure, indicate, and transmit the process flow in a full pipe. Meter must be a full bore meter with the magnetic field traversing the entire cross-section of the flow tube. Insertion magmeters or multiple single point probes inserted into a spool piece are not acceptable.

B. Process Connection

1. Meter Size: As noted
2. Connection Type: Flanged: ASME Class 150
3. Flange Material: Carbon steel
4. Pressure Rating: Meter system shall be fully rated to the same design pressure as the flanges

C. Performance Requirements:

1. Range: 1500 to 1 for 8” and larger.
2. Accuracy: Accuracy shall be +/- .4% optional for all flow rates greater than 2.2 feet per second
3. Calibration shall be per compliance with OIML R49 Type P standards
4. Flow range: As noted
5. Housing Material: Carbon Steel with a polyurethane coating with NSF 61 approval.

2.3 FLOW TUBE

A. Performance Requirement:

Magnetic Flow Meter
407100-2

1. The sensor flow tube shall be 304 stainless-steel surrounded by two coils. Metering Tube shall be aluminum alloy and shall be lined with a Rilsan coating with NSF 61 approval. Connecting flanges shall be Carbon Steel, ANSI Class 150 Flanges. Meter Body Pressure Rating must be equal-to or greater-than the Integral Flange Pressure Rating.

2.4 TRANSMITTER

A. Performance Requirements:

1. Power: 85 to 265 VAC or 17 to 24 VDC
2. Display: Three line back-lit graphical display with capacitive keys; allows for external configuration without removing covers and compromising the integrity of environmental classifications.
3. Bi-direction flow: Forward and reverse flow indication; total and rate 2x10-digit user configurable display.
4. Totalizers: Three 9 digit totalizers for forward, reverse and net
5. Enclosure: Powder coated aluminum with glass window
6. MODBUS RTU protocol, RS485 galvanically isolated
7. Integral Transmitter rotateable up to 270 degrees without tools
8. IP 67
9. Calibration shall be per OIML R49 Type P standards
10. Type "P" continuous self checking capabilities (not just on start-up)
11. Redundant data storage in sensor and transmitter with continuous replication of calibration factors, meter size, serial numbers, and site-specific settings.
12. Infrared service port for meter configuration and diagnostic interrogation. Shall have capability to hook to laptop. Shall be able to configure as keypad image, Hart, or Hyper Terminal. Shall be able to do remote trouble shooting from remote location with computer laptop packages such as PC anywhere.
13. Paint: $370\text{ }\mu\text{m}$ thick RAL 9002 (light grey)

2.6 SPARE PARTS

Magnetic Flow Meter
407100-3

B. Descriptions:

1. One set of manufacturer's recommended spare parts.
2. Extra operation manuals as required.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Installation of Flow Sensor: Follow manufacturer's recommendation for the minimum upstream and downstream installation requirements for the flow sensor. Wiring between flow sensors and remote mounted signal converters shall use cable type and procedures as per the manufacturers' recommendations.
- B. Installation of Full Bore Flow Meter: Install flow meter in accordance with manufacturer's requirements and recommended procedures. Design for flow meter shall include two separate conduits to maintain separation of power and signal wiring where applicable.

3.2 CALIBRATION

- A. Calibration of Flow Sensor:
1. Test Mode: Provide the ability to verify the accuracy of the unit and the integrity of the current loop without any external equipment.
 2. Meter calibration shall be compliant to OIML R49 Type P, self-calibration requirements
 3. Meter must be able to generate periodical simulated signals that verify that the output is within predefined limits
 4. Coil Inductance and resistance along with electrode voltage and impedance must be verifiable through diagnostic functionality
 5. Warnings and Alarms: Shall be classified to NAMUR NE 107 standards. Meter must have ability to display severity of warning with "maintenance, check-function, failure and out of spec" warning indications.
 6. Alarm priorities shall be classified as: "None; Maintenance; Out-of-spec; Function check; and Error."
 7. The duration of an alarm, time-summation for that alarms and time elapsed since last alarm message must be recorded and accessible

Magnetic Flow Meter
407100-4

8. All replacement transmitters shall be interchangeable without need for programming sensor calibration factors, meter size, site information, and serial numbers
9. Insitu Calibration Verification: This system shall be used to verify in a quantifiable manner the meter's current conditions vs. the meters condition when originally manufactured. This calibration verification of the meter shall be performed without need for physical access to the meter flow tube. Method will check over 20 groups(200 Values) Method must be able to print out hard copy of verification and diagnostic reports.
10. Meters to be designed, manufactured, and calibrated in an ISO9001, UKAS/NAMAS, NIST, or NATA certified facility. Flow facility must be certified by volume or weight certified provers. Facility must have the capability to hold the flow rate at the specified calibration points for a minimum of five minutes to allow stabilization for flow and repeatability point checks.

3.3 MANUFACTURER'S START-UP SERVICES

B. Installation Instructions, Maintenance Manual and Equipment:

1. The Contractor shall provide formal training to selected DLNR or DOA personnel in the proper use and operation of the installed equipment by a factory certified technician. Training shall be provided with other equipment training required for this project.

END OF SECTION

Magnetic Flow Meter
407100-5