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Bechtel Associates Professional Corporation
Ann Arbor, Michigan

TECHNICAL SPECIFICATION
FOR
SUBCONTRACT FOR
AREA DEWATERING SYSTEM
FOR THE
CONSUMERS POWER COMPANY
MIDLAND PLANT
MIDLAND MICHIGAN

POOR ORIGINAL

DRAFT FOR REVIEW
INCLUDES ONLY SECTION 10


8		Revised as noted on facing sheet			
7		Incorporated SCN 11001; added Section 10; revised as noted on facing sheet			
6	2-7-81	Revised as noted on facing sheet; incor, orated SCN 10003 and 10004. Incorp. Level I Fines Monitoring procedure	RCA	CR	WHE
5	7-24-80	Revised title block	WHE	CR	WHE
4	7-15-80	Revised as noted on facing sheet; incorporated SCNs 10002, and NCR 2999, Revised Meter Notes	WHE	CR	WHE
3	3-13-80	Revised as noted on facing sheet; inc SCN9002, 9003, 10001	WHE	CR	WHE
2	11-12-79	Revised as noted on facing sheet; INC SCN 9001	WHE	CR	WHE
1	7/11/79	Issued for subcontract- revised as noted on facing sheet	WHE	CR	WHE
0	6/2/79	ISSUE FOR BIDS	WHE	CR	WHE
No.	DATE	REVISIONS	BY	CHK	APP
OWNER		CONSUMERS POWER COMPANY MIDLAND PLANT UNITS 1&2 MIDLAND MICHIGAN	JOB No 7220		
BAPC			SPEC DES GUIDE No		REV
			C-88-Q		8

10. GRAVEL-PACKED WELLS

A. GENERAL


This section describes the material and construction methods required for the installation of the gravel-packed wells for the drawdown/recharge test. This series of wells will be a separate system and is subject to all soil particle monitoring procedures required under this specification.

B. ABBREVIATIONS







APHA - American Public Health Association 

ASTM - American Society for Testing and Materials

AWWA - American Water Works Association

WPCF - Water Pollution Control Federation 

C. REFERENCED CODES AND STANDARDS

<u>Sponsor</u>	<u>Number</u>	<u>Subject</u>	
ASTM	C-40-66	Test for Organic Impurities in Sands	
ASTM	D-422-63	Standard Method for Particle Size Analysis of Soil	
ASTM	F-480-80	Standard Specification for Thermoplastic Water Well Casing Pipe and Couplings Made in Standard Dimension Ratios 	
AWWA	A-100-66	Standard For Deep Wells	
State of Michigan	Act 218 P.A.	Groundwater Quality - Dewatering Well Records	
State of Michigan	Act 294-1965	Groundwater Quality Control	
State of Michigan	Act 315-1969	Mineral Well Act	
APHA, AWWA, WPCF	13th Edition 1971	Standard Methods for the Examination of Water and Wastewater, Total Suspended Matter (non-filterable residue) 	

D. DEWATERING WELLS

1) Materials and Equipment

Subcontractor shall furnish all material specified in Section 10, Paragraph E including, but not limited to, blank casing, centralizers, screens, gravel pack,

piezometer tips and tubing, and miscellaneous fittings necessary to drill and install a series of gravel-packed dewatering wells.

2) Documentation

- a) During drilling operations, the Contractor's geologist/hydrogeologist shall keep a log of the top and bottom, and a description of each stratum penetrated, and the depth of the water table during the drilling of each hole. Soil descriptions are to be provided by Contractor's geologist/hydrogeologist at the time of the drilling operation.
- b) The Contractor's geologist/hydrogeologist shall make reproducible copies of as-built drawings of each well installation, including well number, location, diameter of hole, total length, and description of each type of casing; a log of subsurface materials encountered; and a complete compilation of all field data obtained during drilling, installation, and developing of all the wells.
- c) Completion of a dewatering record, prepared by the Subcontractor, for wells is required by Act 218, P.Q. 1972, which is an amendment of the Dewatering Well Act 294, P.A. 1965, the Ground Water Quality Control Act.

The dewatering well record form is to be completed for every well or a composite record may be made for several wells where the subsurface conditions are similar, the surface relief relatively level, and the static water level is at a constant depth. Depending on variations in subsurface conditions, one or several composites of well records may be necessary.

Copies of the Subcontractor's records are required to be submitted to Contractor within 15 days after completion of the well system.

3) Inspection

- a) Contractor shall inspect the drilling, installation, development and testing. This program is Q-listed, and shall be in accordance with 10 CFR 50, Appendix B.

4) Testing

- a) The gravel pack shall be accepted by the Contractor based on the actual gradation of the gravel pack material at each delivery date. The gravel pack shall meet the requirements given in Section 10.E, based on ASTM D-422, Standard Test Method for Particle Size Analysis of Soil, and ASTM C 40, Standard Test Method for Organic Impurities in Sands for Concrete.



- b) The dewatering system shall be accepted by the Contractor based on the quantity of soil particles measured in the discharge water correlated with the quantity of groundwater being discharged. For initial well acceptance, soil particles are defined as inorganic, non-metallic, materials coarser than 0.05 millimeters. During system operation, soil particles are defined as inorganic, non-metallic materials coarser than 0.005 millimeters.
1. During initial well development (not to exceed 8 hours) a sample of water shall be taken from the well and tested by the Contractor. The sample shall be filtered through a 0.05 millimeter filter media, in accordance with Standard Methods for the Examination of Water and Wastewater, total suspended matter, 13th Edition, 1971, APHA, AWWA, WPCF. If the quantity of soil particles is 10 ppm or less the well shall be accepted. If the quantity of soil particles is greater than 10 ppm, the Subcontractor shall be directed to continue developing the well for an additional 8 hours (maximum) and another test taken. If the second test exceeds 10 ppm the Subcontractor shall be directed to develop the well for an additional 8 hour period (maximum) and a third test taken. If the well does not meet the acceptance criteria for soil particles after three tests the well shall be rejected and abandoned.
 2. After the well has met the initial acceptance criteria given in b.1 preceding, the well shall be connected to a separate dewatering system. This system shall be operated by the Subcontractor. The quantity of water discharged through the system overflow line shall be determined by timing the diversion of the entire flow into a container of known volume or by a water meter calibrated by gallons.

During system operation the accumulative quantity of soil particles measured at the system overflow shall not exceed 10 ppm. The accumulative quantity of soil particles shall be determined by testing a sample of water from the overflow every Monday and Thursday that the system is in operation.

If Monday or Thursday is a holiday, the testing shall be scheduled one day before, or one day after the holiday. For these tests the filter media shall not be coarser than 0.005 millimeters, and the tests shall be conducted in accordance with Standard Methods for Examination of Water and Wastewater, total suspended solids, 13th Edition, 1971, APHA, AWWA, WPCF.

If a Monday or Thursday test indicates the quantity of soil particles exceeds 10 ppm, but the accumulative total is less than 10 ppm, the Subcontractor shall be alerted. If the biweekly tests results continue to increase so that the accumulative quantity of soil particles exceeds 10 ppm for the total quantity of groundwater pumped, there shall be a systematic testing of each individual well. Any individual well found to produce greater than 10 ppm soil particles after two consecutive tests shall be repaired or removed from the system.

- c) During system operation, each individual well shall be tested monthly to determine the soil particle content in the water. Soil particle concentration exceeding 10 ppm will be brought to the attention of the Contractor's geologist/hydrogeologist. The test shall be in accordance with Standard Methods for Examination of Water and Wastewater, total suspended solids, 13th Edition, 1971, APHA, AWWA, WPCF, using a filter media no coarser than 0.005 millimeters.
- d) Records shall be maintained for each well and for the entire system, including the quantity of soil particles (ppm each time readings are taken).

5) Quality Assurance Requirements

- a) The inspection and documentation of the drilling, installation, development, and testing is Q-listed and shall be in accordance with the Contractor's quality assurance program.
- b) Contractor has the authority to stop or regulate any part of the dewatering operation to prevent damage to any part of the Contractor's work.

6) Sampling

The following sampling is for information only:

In conjunction with the documentation required by Section 10, Paragraph D.2, Subcontractor shall make available to Contractor samples taken from the cuttings from each 5-foot interval of drilling and at every formation change. Subcontractor shall place the samples in 16-ounce vapor-seal glass jars. These sample jars shall be clearly identified using a waterproof marking showing job name, well number, sample number, and top and bottom depth at which the sample was taken. These

samples shall be available to Contractor and shall become property of Owner at the completion of the Subcontract.

E. MATERIALS

1) General

Each well shall be constructed as a gravel-pack well comprising the following principal items supplied by Subcontractor. (If soil borings taken prior to start of construction disclose conditions which may influence a change in well design, the Contractor will issue specification revisions for the gravel-pack and screen design.)

- a) Well casings, temporary caps, and screens shall be 6-inch nominal diameter polyvinyl chloride (PVC). All well casings and screens shall be new material, minimum Schedule 80, with a wall thickness of 0.49 inch.
- b) Well screens shall be No. 18 (0.018 inch) slotted, plastic wire wrapped. A minimum 5-foot length of blank 6-inch PVC well casing shall be fitted to the bottom of the well screen where shown on the drawings. The blank section or well screen shall be sealed at the bottom with a cap.
- c) Piezometer tips shall be the Casagrande type, 1-1/2" od x 1" id x 1'-0" long, Norton porous stone, such as Model 51451 manufactured by Slope Indicator Company.
- d) The gravel pack shall be composed of clean, siliceous, well-rounded, medium sand particles containing less than 1% clay, less than 5% calcareous particles, and shall be free from organic matter and other deleterious materials. The gravel pack shall meet the following requirements:

<u>Sieve Size</u> <u>(Designation No.)</u>	<u>Acceptable Range</u> <u>of % Retained</u>
4	0-10
6	0-14
8	6-22
12	14-31
16	24-40
20	35-51
30	51-67
40	90-100

Particle size analysis and organic impurity test shall be taken onsite each delivery day.

- e) Grout mix shall be as shown on drawings.

2) Certificates of Compliance

Subcontractor shall submit to Contractor a Certificate of Compliance with ASTM Specification F 480, for the well casings, (and that screens comply with E.1.b) prior to use of these items.

F. CONSTRUCTION OF PERMANENT DEWATERING WELLS

1) Drilling

- a) The bored hole for each dewatering well shall be drilled in accordance with the cable-tool method. Care shall be taken in drilling the first 15 feet due to the presence of underground ducts, pipes, and conduit as shown in the design drawings.
- b) The dewatering wells shall be drilled without any obstructions to permit free and easy installation of the well casing and gravel pack as well as installation and operation of submersible pumps and level switches to be installed by others, as applicable. The Subcontractor shall be directed by the contractor's geologist/hydrogeologist to maintain the casing full of water when drilling below the water table.
- c) A surface or temporary casing of sufficient size and weight shall be placed in the hole to prevent the hole from caving in during drilling. Such casing must be removed by Subcontractor before completion of the well. Drilling mud shall not be used to stabilize the hole.
- d) Each hole shall be a minimum of 14 inches in diameter (16 inches maximum) to the depth indicated in the design drawings. The actual total depth of each well may vary depending on actual subsurface conditions and as directed by Project Engineering.
- e) Subcontractor shall not continue well installation procedures following the drilling of well holes without Contractor authorization.

2) Installation

- a) Centering devices shall be installed as required on the casing to locate and hold the casing and screen sections in proper position.
- b) The piezometer tips shall be attached to a 1/2-inch Class 160 thermoplastic riser pipe. The tip shall be placed at the bottom of each dewatering and observation well within the gravel pack between the well casing and the hole wall. The riser pipe and piezometer tip shall be secured to the well casing. A temporary 1/2-inch PVC cap shall be placed on the piezometer riser pipe.

- c) The gravel pack shall be placed by using two tremie pipes placed 180° apart in the hole. The inside diameter at the tremie pipes shall be at least 2.5 inches. At all times during the gravel packing operation, Subcontractor shall not permit free fall of gravel pack material to exceed five (5) feet from the end of the tremie pipe. The Subcontractor shall wash the gravel pack material through the tremie pipes by directing a constant flow of water into each tremie pipe, with the gravel.
- d) After the gravel pack is in place, circulation shall continue until the gravel pack is consolidated and cleaned. As the gravel pack settles, more material shall be added.
- e) After placement of the gravel pack, an 18-foot minimum thickness of grout shall be placed at the top of the gravel pack between the 6-inch casing and the drilled hole.

G. DEVELOPMENT

1) Development

Subcontractor shall furnish all necessary pumps or other equipment and shall develop the dewatering wells using the methods necessary to give the maximum yield of water per foot of drawdown from the water-bearing material and minimize the quantity of soil particles. The development process shall include backwashing using intermittent pumping and/or jetting. Development shall begin as soon as practical following the placement of the gravel pack and grout seal.

2) Drawdown Test

- a) After the wells are developed and qualified for soil particle content, eductors shall be installed in them. These eductors shall be capable of lowering and maintaining the groundwater table at elevation 585' in the pumped wells. The wells shall be pumped until otherwise directed by the Contractor's geologist/hydrogeologist.
- b) Upon completion of the drawdown test and removal of the pumping equipment, a 6-inch diameter PVC cap shall be installed on the 6-inch well casing for protection of the well.



WELL INSTALLATION DATA SHEET
WELL NUMBER _____

PROJECT _____ JOB NO. _____ SUBCONTRACTOR _____

COORDINATES _____ SURFACE ELEVATION _____

DATE STARTED _____ DATE COMPLETED _____ NO. OF SAMPLES _____

TYPE OF SAMPLES _____

DRILLING PROCEDURE

CASING DIAMETERS (IN) _____ DRILLING METHOD _____

O.D. _____ HOLE DIAMETER _____ HOLE DEPTH _____

I.D. _____ SPECIAL CONDITIONS _____

WELL INSTALLATION

WELL SCREEN CONFORMANCE REPORT ☐ GRAVEL PACK TEST RESULTS ☐

SCREEN SLOT SIZE _____ SCREEN DIAMETER _____ SCREEN LENGTH _____

CENTRALIZERS: _____

LENGTH OF BLANK BELOW SCREEN _____ LENGTH OF RISER ABOVE SCREEN _____

LENGTH OF GRAVEL PACKED ZONE _____ CALCULATED AMOUNT OF GRAVEL PACK _____

ACTUAL AMOUNT OF GRAVEL PACK _____ CIRCULATION DURING GRAVEL PACKING ☐

CASAGRANDE TIP DEPTH _____ THICKNESS OF SEAL _____

TYPE OF SEAL _____ CALCULATED AMOUNT OF SEAL _____

ACTUAL AMOUNT OF SEAL _____

WELL DEVELOPMENT

TYPE OF DEVELOPMENT _____

DEVELOPING TIME _____ AMOUNT OF MATERIAL REMOVED _____ (est)

SAND CONCENTRATION: (ppm by weight) _____

DURING DEVELOPMENT _____ SPECIAL CONDITIONS _____

FIRST RETEST _____

SECOND RETEST _____

THIRD RETEST _____

STATIC WATER LEVEL _____ DATE _____ EDUCTOR SETTING _____

SUBCONTRACTOR SUBMITTALS:

MICHIGAN DEWATERING WELL RECORD ☐

SUPERVISED BY
GEOLOGIST/HYDROGEOLOGIST _____



WELL LOG

PROJECT		JOB NUMBER		SHEET NUMBER OF		WELL NUMBER	
SITE		LOCATION		LOGGED BY GEOL/HYDROGEOL			
BEGUN	COMPLETE	DRILLER	DRILL MAKE/MODEL		HOLE SIZE	TOP OF ROCK	TOTAL DEPTH
SCREEN DIA./LENGTH/SLOT		TOP OF CASING EL	GROUND SURF. EL	DEPTH/EL GROUND WATER (DATE)			
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION		NOTES:	



WELL LOG

PROJECT				JOB NUMBER	SHEET NUMBER OF	WELL NUMBER
SITE				LOCATION		
ELEVATION	DEPTH	SAMPLE	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	NOTES:	



PUMPING WELL CONSTRUCTION SUMMARY

PROJECT _____
SITE _____
COORDINATES _____
DATE COMPLETED _____
SUPERVISED BY _____
GEOL/HYDROGEOL _____

WELL NO. _____

AQUIFER _____

GROUND
ELEVATION

Generalized Stratigraphy

Elevation of reference point _____

Height of reference point above ground surface _____

Depth of surface seal _____

Type of surface seal: _____

I.D. of surface casing _____

Type of surface casing: _____

Depth of surface casing _____

I.D. of riser pipe _____

Type of riser pipe: _____

Diameter of borehole _____

Type of filler: _____

Elevation / depth of top of seal _____

Type of seal: _____

Type of gravel pack _____

Elev. / depth of top of gravel pack _____

Elevation / depth of top of screen _____

Description of screen _____

I.D. of screen section _____

Elevation / depth of bottom of screen _____

Elev. / depth of bottom of gravel pack _____

Elev. / depth of bottom of plugged blank section _____

Type of filler below plugged section _____

Elevation of bottom of borehole _____



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

PRELIMINARY

MASTER QC INSTRUCTION TITLE

GRAVEL-PACKED WELLS

2. MASTER QC INSTRUCTION NO.

None

REV.

3. PROJECT QC INSTRUCTION NO.

7220/C-2.01

4. LOG NO.

INSPECTION CRITERIA

REVISION

5. TYPE	6. IDENTIFICATION NO.	7. REV.	8. TITLE	9. REV	10. DATE	11. DESCRIPTION	12. BY	13. CHK'D	14. APP'D
Spec.	C-88	*8	Technical Specification for Subcontract for Area Dewatering System						
Spec.	C-208	*20	Subcontract for Material Testing Services						
<p>*NOTE: Rev. Nos. in Block 7 only identify the applicable revisions of inspection criteria used to prepare Rev. A of this PQCI. Subsequent revisions to the inspection criteria shall be noted appropriately in Block 11, i.e., "PQCI revised to incorporate changes as required by Rev. ____."</p> <p>In addition, current revisions of specific engineering and vendor drawings, sketches, specifications, procedures and instructions shall be entered on the applicable Inspection Record.</p>				A		Issued for Review & Comment	TL		



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.	REV.
None	
2. PROJECT QC INSTRUCTION NO.	REV.
7220/C-2.01	A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
	<p style="text-align: center;"><u>GENERAL INSTRUCTIONS</u></p> <p><u>Purpose</u></p> <p>The purpose of this PQCI is to provide sufficient inspection activities to assure that the required quality for safety related activities for the installation and testing of the gravel-packed wells for the drawdown/recharge test.</p> <p><u>Scope</u></p> <p>An inspection record for this PQCI shall be scoped for each gravel-packed well installed. After installation of the gravel-packed wells, one inspection record will be initialed during system testing and one inspection record will be initiated for monthly testing of individual well points.</p>			



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.

None

REV.

2. PROJECT QC INSTRUCTION NO.

7220/C-2.01

REV.

A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
	<p><u>Special Instructions</u></p> <ol style="list-style-type: none">When preparing Block 7, "Reference Criteria," on the IR, the CQCE shall enter the documents necessary to perform the designated inspections. These documents shall include: (1) the primary specification(s), revision number(s) with all specification change notices (SCNs), and applicable field change request (FCRs); (2) project engineering approved drawings with all drawing change notices (DCNs) and applicable FCRs. The primary specifications are those identified in Block 6 of this PQCI cover sheet.All documents used as inspection criteria for quality verification shall be "controlled" documents.Where project engineering approved documents exist within the scope of work to be performed, the project engineering approved document shall be used.If, during the review of the reference criteria documents or at any time later during the performance of these inspections, the CQCE determines the reference criteria documents are not adequate to perform the required inspections (i.e., incomplete or omitted details, lack of cross-referencing between drawings, documents requiring clarification, etc.), the lead discipline CQCE shall be notified. The lead discipline CQCE shall discuss the problem with the project field quality control engineer (PFQCE) who will take the necessary action for resolution. The CQCE shall complete the inspection in compliance with the resolution.	Note: Reference criteria for active PQCs/IRs shall be reviewed daily and changes in revision recorded on the IR. An active IR is one which the CQCE is implementing.		



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.	REV.
None	
2. PROJECT QC INSTRUCTION NO.	REV.
7220/C-2.01	A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
	<p><u>Special Instructions (continued)</u></p> <p>5. The inspection activity codes in Column 6 of the PQCI for In-process and final inspection activities are supplemented by one of three different symbols to further define the type of inspection required:</p> <p>A. Visual Inspection (V) - to inspect by visual examination.</p> <p>B. Measurements (M) - to inspect by physical measurement of dimensions or count of required quantity.</p> <p>C. Visual Inspection and Measurement (V&M) - to visually examine to detect the apparent worst condition, take a measurement to verify acceptance, and visually compare the other items based on this measurement.</p> <p>6. Incomplete items and nonconforming items noted during these inspection activities shall be controlled in accordance with AAPD/PSP G-3.2 to prevent their inadvertent use or installation. The type of documentation generated shall depend on the nature of the item as described in AAPD/PSP G-3.2. Incomplete items which require documentation shall be recorded on Form QC DR-1. All discrepancies recorded on Form QC DR-1 must be closed out prior to final sign-off of the relevant activities under Activity Number 3.0, final inspection activities of the IR.</p> <p>7. The total number of pages to the discrepancy report shall be progressively recorded on the IR as each new page is added to the report.</p>			



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.

None

REV.

2. PROJECT QC INSTRUCTION NO.

7220/C-2.01

REV.

A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
	<p><u>Special Instructions (continued)</u></p> <p>8. The responsible Construction Quality Control Engineer shall be present during the installation of gravel-packed wells; during all field sampling of soil particles; and assure date, time, sample identification, etc. are in accordance with U.S. Testing Company approved procedures and project specifications.</p> <p>9. Actual determination of the fines content by U.S. Testing personnel shall be monitored in the laboratory by the CQCE utilizing PQCI No. SC-1.05, for dewatering effluent fines testing.</p> <p>10. The responsible CQCE shall, upon notification of failing test results, notify Bechtel geologist/hydrogeologist for resolution.</p>			



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.	None	REV.
2. PROJECT QC INSTRUCTION NO.	7220/C-2,01	REV.
3. ACT NO.	4.	A
5. ACTIVITY DESCRIPTION	INTERFACES None	7. SUPPLEMENTARY RECORD
6. INSPECTION CRITERIA		6. INSP ACT CODE



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.	REV.
None	
2. PROJECT QC INSTRUCTION NO.	REV.
7220/C-2.01	A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
1.0	<u>PREREQUISITES</u> The following activities shall be accomplished after the IR is scoped for a given work operation, but prior to the performance of any in-process inspection activities.			
1.1	Review the "Reference Criteria" to assure that all required criteria is listed, with the current applicable revision and verify that the "Reference Criteria" is understood.	None	R	



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.

None

REV.

2. PROJECT QC INSTRUCTION NO.

7220/C-2.01

REV.

A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
2.0	<u>IN-PROCESS INSPECTION ACTIVITIES</u> The following inspection activities shall be performed to verify that the in-process work is in accordance with the applicable "Reference Criteria" shown on the IR.			
2.1	<u>Location</u> Assure gravel-packed wells are located and identified as per drawing.	None	I(V)(M)	
2.2	<u>Drilling</u> A. Assure drilling is performed by the cable-tool method. B. Assure temporary casing is installed during drilling operation. C. Assure hole diameter is 14 inches minimum, 16 inches maximum. D. Assure actual total depth of hole is per design drawings or as directed by Project Engineering. E. Assure drilling mud is not used to stabilize hole. F. Assure casing is full of water when drilling below the water table if directed by the geologist or hydrogeologist. G. Review well log and as-built drawing for soil description of each stratum encountered as provided by the geologist or hydrogeologist.	C-88 10.F.1.a 10.F.1.c 10.F.1.d 10.F.1.d 10.F.1.c 10.F.1.b 10.D.2.a 10.D.2.b	I(V) I(V) I(M) I(M) I(V) I(V) R	 Well log & As-Built Dwg.



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO

None

REV

2. PROJECT QC INSTRUCTION NO

7220/C-2.01

REV

A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
2.3	<u>Installation of Gravel-Packed Well Components and Piezometers</u> A. Assure well casings and screens are properly identified. Attach Certificates of Compliance submitted by the Subcontractor to the IR. B. Assure a minimum 5-foot length of blank 6-inch PVC well casing is fitted to the bottom of the well screen when shown on the drawing. Assure blank 6-inch PVC well casing or well screen is capped at the bottom. C. Assure piezometer tip and riser pipe are secured to the well casing. Assure riser pipe is capped after installation. D. Assure centering devices are installed to locate and hold casings and screen sections in proper position. E. Assure configuration is per design drawings.	C-88 10.E.2 10.E.1.b 10.F.2.b 10.F.2.a None	I(V)R I(V)(M) I(V) I(V) I(V)	
2.4	<u>Placement of Gravel-Pack and Grout</u> A. Assure gravel-pack material is per specification requirements. B. Assure gravel-pack material is placed using two tremis pipes placed 180° apart in the hole. Free fall may not exceed 5 feet. Gravel-pack shall be consolidated by circulation to proper elevation. C. Assure an 18-foot minimum thickness of grout is placed at the top of the gravel-pack. D. Assure configuration and grout proportions are per design drawings.	C-88 10.E.1.d 10.F.2.c 10.F.2.d 10.F.2.e None	R I(V)(M) I(M) I(V)	Test Reports



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.

None

REV.

2. PROJECT QC INSTRUCTION NO.

7220/C-2.01

REV.

A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
2.5	<u>Initial Testing of Well Points</u> A. Witness the sampling of soil particles from each well during well development. Observe U.S. Testing Company personnel for implementation of their approved procedure. Verify proper sample identification including well number, date and time of sample. Sampling shall be not later than 8 hours after start of pumping. Record sampling information on Sampling of Individual Well form. B. If results of initial sampling tests are not within specification limits, development may continue for a period not to exceed 8 hours for each retest and the well points shall be resampled and retested, or rejected. Resampling shall be witnessed in accordance with Activity No. 2.5A above.	C-88 10.D.4.b.1 10.D.4.b.1	W W	MEI 223 MEI 223
2.6	<u>Monthly Testing of Well Points</u> A. Witness the sampling of the soil particles from each well during monthly sampling. Observe U.S. Testing Company personnel for implementation of their approved procedure. Verify proper sample identification including well number, date and time of sample.	C-88 10.D.4.c	W	MEI 223
2.7	<u>Soil Particles</u> A. Observe the field sampling activities to verify that the sampling frequency and sampling methods are in accordance with approved procedures and during the operation of the dewatering system. Record required sampling information on the IR.	C-88 10.D.4.b.2	W	MEI 225



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. ASSEMBLED OR INSTRUCTED TO DO THIS		REV.		
None		REV.		
2. PROJECT OR INSTRUCTION NO.		A		
7220/C-2.01				
3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. UGP ACT CODE	7. SUPPLEMENTARY RECORD
2.7	<p><u>Soil Particles (continued)</u></p> <p>B. If retesting is required, based on the average soil particles, for the total quantity of ground water pumped, witness the resampling in accordance with Activity No. 2.7A.</p> <p>C. If the retesting still shows excessive soil particles, monitor the resampling of individual wells in accordance with Activity 2.7A of this PQCL.</p>	C-88 10.D.4.b.2	W	ML 225
2.8	<p><u>Flowmeters</u></p> <p>A. Ensure that all flowmeters are currently calibrated, and readings are properly taken by U.S. Testing Company. Record calibration information on the IR.</p> <p>OR</p> <p>B. Ensure direct flow measurements determined by backup method are in accordance with approved U.S. Testing procedures.</p> <p>NOTE: Calibration information is found on U.S. Testing form ML1-227.</p>	C-88 10.D.4.b.2	I(V)	ML 224

JOB NO. 7220

MASTER OF INSTRUCTION NO.

None

[over]

2 PROJECT QC INSTRUCTION NO.

7220/€ -2,01

REV

A

[illegible]



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.	None	REV.
2. PROJECT QC INSTRUCTION NO.	7220/C-2.01	REV. A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTARY RECORD
4.0	<u>REVIEW OF SUPPLEMENTARY RECORDS</u> The following supplementary records identified in Column 7 of the PQCI shall be reviewed to verify that the required quality documentation has been satisfactorily completed and is available for filing with the IR.			
4.1	MEI-223	None	R	
4.2	MEI-224	None	R	
4.3	MEI-225	None	R	
4.4	Well Log and As-Built Drawing	None	R	
4.5	Gravel-Pack Test Reports	None	R	
4.6	Certificate of Compliance (well casings & screens)	None	R	



QUALITY CONTROL INSTRUCTION

JOB NO. 7220

1. MASTER QC INSTRUCTION NO.

None

REV.

2. PROJECT QC INSTRUCTION NO.

7220/C-2.01

REV.

A

3. ACT NO.	4. ACTIVITY DESCRIPTION	5. INSPECTION CRITERIA	6. INSP ACT CODE	7. SUPPLEMENTAL RECORD
5.0	<u>EXCEPTIONS</u>			
5.1	Review the completed IR to verify that the applicable inspection activities have been performed without any exceptions. If any exceptions exist, complete Activity 5.2.	None	R	
or 5.2	Any inspection activity exceptions noted on the IR are to be identified and described on the IR under "Remarks" and processed in accordance with PSP 6-3.2.	None	R	



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PROJECT INSPECTION RECORD NO:	PROJECT INSPECTION PLAN NO: C-20A REV: 0	TITLE: Installation of Gravel-Packed Wells	
PROJECT: Midland 1 and 2	PREPARED BY/DATE:	APPROVED BY/DATE:	APPROVED BY/DATE:

SCOPE:

CHARACTER NO	CHARACTERISTIC DESCRIPTION	REFERENCE CRITERIA	REMARKS INITIALS/DATE
1.0	Location of Gravel-Packed Wells		
1.1	Assure gravel-packed wells are located and identified as per drawing. V/A-IP/PP-S	Drawings C-2016 and C-2018	
2.0	Drilling of Gravel-Packed Wells		
2.1	Assure drilling is performed by the cable-tool method. V-IP-S	C-88 Sec. 10.F.1.a	
2.2	Assure temporary casing is installed during drilling operation. V/R-IP-S	Sec. 10.F.1.c	
2.3	Assure hole diameter is 14 inches minimum, 16 inches maximum. A/R-IP/PP-S	Sec. 10.F.1.d	
2.4	Assure actual total depth of hole is per design drawings or as directed by Project Engineering. A/R-IP/PP-S	Sec. 10.F.1.d	
	(CONTINUED ON NEXT PAGE)		

REMARKS: _____

ATTACHMENTS:

COMPLETED BY/DATE:	REVIEWED BY/DATE:
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CHARACTER NO	CHARACTERISTIC DESCRIPTION	REFERENCE CRITERIA	REMARKS INITIALS/DATE
2.5	Assure drilling mud is not used to stabilize hole. V-IP-S	Sec. 10.F.1.c	
2.6	Assure casing is full of water when drilling below the water table if directed by the geologist/hydrologist. V/A-IP-S	Sec. 10.F.1.b	
2.7	Review well log and as-built drawing for soil description of each stratum encountered as provided by the geologist or hydrogeologist. R-IP/PP-S	C-88 Sec. 10.D.2.a and 10.D.2.b	
3.0	Installation of Gravel-Packed Well Components and Piezometers		
3.1	Assure well casings and screens are properly identified and certificates of compliance have been attached to IRs. V/A-IP-S	Sec. 10.E.2 and 10.E.1.a	
3.2	Assure piezometer tips shall be the Casagrande type, 1½" od x 1" id x 1-0" long, Norton porous stone such as Model 51431, manufactured by Slope Indicator Company. V/A-IP-S	Sec. 10.E.1.c	
3.3	Assure a five-foot length of blank six-inch PVC well casing is fitted to the bottom of the well screen when shown on drawings. Assure blank six-inch PVC well casing or well screen is capped at the bottom. A-IP-S	Sec. 10.E.1.b	
3.4	Assure piezometer tip and riser pipe are secured to the well casing. Assure riser pipe is capped after installation. V-IP-S	Sec. 10.F.2.b	
3.5	Assure centering devices are installed to locate and hold casings and screen sections in proper position. V-IP-S	Sec. 10.F.2.a	



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CHARACTER NO	CHARACTERISTIC DESCRIPTION	REFERENCE CRITERIA	REMARKS INITIALS/DATE
3.6	Assure configuration is per design drawings. V/A-IP-S	C-2016	
4.0	Placement of Gravel-Pack and Grout		
4.1	Assure gravel-pack material is per specification requirements. A/R-IP/PP-S	Sec. 10.E.1.d	
4.2	Assure gravel-pack material is placed continuously with continuous, circulating water to prevent segregation. Gravel-pack shall be consolidated by circulation to proper elevation. Free fall of material shall not exceed five feet. A/V-IP-S	Sec. 10.F.2.c and 10.F.2.d	
4.3	Assure a 18-foot minimum thickness of grout is placed at the top of the gravel pack. A/R-IP/PP-S	Sec. 10.F.2.e	
4.4	Assure proper grout mixture. V-IP-S	Drawing 2016	



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PROJECT INSPECTION RECORD NO:	PROJECT INSPECTION PLAN NO: C-208 REV: 0	TITLE: Monitoring of Soils Particles for the Gravel-Packed Wells	
PROJECT: Midland 1 and 2	PREPARED BY/DATE:	APPROVED BY/DATE:	APPROVED BY/DATE:
SCOPE:			

CHARACTER NO	CHARACTERISTIC DESCRIPTION	REFERENCE CRITERIA	REMARKS INITIALS/DATE
1.0	Initial Testing of Well Points		
1.1	Observe the sampling of the soil particles from each well during well development. Observe US Testing Co personnel for implementation of their approved procedure. Verify proper sample identification including well number, date and time of sample. Sampling shall be no later than eight hours after start of pumping. V/A/R-IP/PP-S	C-88 Sec. 10.D.4.b.1	
1.2	If results of initial sampling tests are not within specification limits, development may continue for a period not to exceed eight hours for each retest, and the well points shall be resampled and retested or rejected. Resampling shall be in accordance with Act No 1.1 above. No more than two retests are permitted. V/A/R-IP/PP-S	Sec. 10.D.4.b.1	
1.3	The well shall be connected to a separate dewatering system after meeting 1.1 or 1.2.	Sec. 10.D.4.b.2	

REMARKS: _____

ATTACHMENTS:

COMPLETED BY/DATE:

REVIEWED BY/DATE:



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CHARACTER NO	CHARACTERISTIC DESCRIPTION	REFERENCE CRITERIA	REMARKS INITIALS/DATE
2.0	Monthly Testing of Well Points		
2.1	Observe the sampling of the soil particles from each well during monthly sampling. Observe US Testing personnel for implementation of their approved procedure. Verify proper sample identification including well number, date and time of sample. V/A/R-IP/PP-S	C-88 Sec. 10.D.4.c	
3.0	Monitoring of Soils Particles		
3.1	Observe the field sampling activities to verify that the sampling frequency and sampling methods are in accordance with approved procedures during the operation of the dewatering system. V/R-IP/PP-S	Sec. 10.D.4.b.2	
3.2	If retesting is required, based on the average soil particles, content for the total quantity of ground water pumped, observe the resampling in accordance with Activity 3.1 above. V/R-IP/PP-S	Sec. 10.D.4.b.2	
3.3	If the retesting still shows excessive soil particles, observe the resampling of individual wells per Activity 1.1 above. V/R-IP/PP-S	Sec. 10.D.4.b.2	
4.0	Flowmeters		
4.1	Ensure that all flowmeters are currently calibrated and readings are properly taken by US Testing Company. V/R-IP/PP-S	Sec. 10.D.4.b.2	
4.2	Ensure direct flow measurements determined by backup method are in accordance with approved US Testing procedures. V/A/R-IP/PP-S	Sec. 10.D.4.b.2 MEI 224	
5.0	Test Review		



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CHARACTER NO	CHARACTERISTIC DESCRIPTION	REFERENCE CRITERIA	REMARKS INITIALS/DATE
5.1	Review the Lab Test Reports verifying: 1. Quantities of soil particles is reported (PPM). 2. Completeness of forms (all applicable blanks filled in). 3. Proper date and location. R-IP/PP-S	C-88 Sec. 10.D.4	
5.2	Review the Lab Test Reports verifying quantities of soil particles do not exceed specification requirements for: 1. Individual wells. <u>NOTE:</u> If soil particles exceed the specified tolerances, resample in accordance with specification requirements. 2. Average quantity of the system. <u>NOTE:</u> If the average quantity of the system exceeds those specified, the individual wells shall be resampled and tested in accordance with specification requirements. R-IR/PP-S	C-88 Sec. 10.D.4.c and 10.D.4.d MEI 223 C-88 Sec. 10.D.4.b.2 and 10.D.4.d MEI 225	
6.0	Review discrepancy reports to assure that the required corrections have been completed by rework without violating any of the original design documents in accordance with AAPD/PSP G-3.2 V-IP/PP-S	PQCI C-2.10 AAPD/PSP G-3.2	