PROJECT SPECIFIC PLAN
FOR THE INSTALLATION OF MONITORING WELLS IN THE PILOT PLANT DRAINAGE DITCH PLUME

PROJECT NUMBER 52424-PSP-0003

NOVEMBER 2001

INFORMATION ONLY

Prepared by

Fluor Fernald, Inc.

Prepared For

U.S. Department of Energy

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1.0 INTRODUCTION

This Project Specific Plan (PSP) serves as the controlling document for the installation of nine monitoring wells (63116, 83117, 23118, 63119, 83120, 63121, 63122, 83123, and 83124). The locations of all nine wells are shown on Figure 1. Five of the monitoring wells (63116, 23118, 63119, 63121, and 63122) will be standard Type 6 or Type 2 monitoring wells with ten-foot or fifteen foot screens respectively. Four of the monitoring wells (83117, 83120, 83123 and 83124) will be constructed of continuous multi-channel tubing (CMT) so several intervals at each location can be monitored. The multilevel monitoring wells are referred to as CMT wells in this PSP.

These wells are located in the Pilot Plant drainage Ditch Plume. The Waste Storage Area Phase I Groundwater Restoration Module consisting of three extraction wells was recently installed in this plume area. These monitoring wells are intended to help monitor cleanup progress around the new extraction wells once they become operational. Data collected from these wells will also be used to aid in operational decisions regarding the three extraction wells.

All drilling and sampling field activities will conform to the guidelines set forth in the Sitewide CERCLA Quality Assurance Manual (SCQ), unless otherwise specified in this PSP. Performance of the requirements specified in Standard Operating Procedure ADM-02, *Field Project Prerequisites,* shall precede all field activities.

2.0 MANAGEMENT AND ORGANIZATION

A qualified subcontractor under the direct supervision of Fluor Fernald, Inc. personnel will conduct drilling activities. Fluor Fernald, Inc. personnel will perform all sampling activities defined in this PSP. Descriptions of some of the key technical responsibilities of project personnel or organizations are provided below.

The DOE Operable Unit 5 Team Leader is responsible for:

- Acting as the point of contact within DOE and for the regulators and stakeholders for all communications concerning work carried out under this PSP.

The Aquifer Restoration/Wastewater Project (ARWWP) Manager is responsible for:

- Providing overall project management and technical guidance
- Ensuring the necessary resources are allocated to the project for the efficient and safe completion of PSP activities
- Overseeing and auditing PSP activities to ensure that the work is being performed efficiently and in accordance with all regulatory requirements and commitments, DOE Orders, site policies and procedures, and safe working practices.

The ARWWP Project Lead is responsible for:

- The safe and prompt completion of work outlined in the PSP
- Oversight and programmatic direction of sampling activities
- Providing a technical lead for the collection and interpretation of sampling data
- Establishing and maintaining the scope, schedule, and cost baseline
- Reporting to the DOE Operable Unit 5 Team Leader and ARWWP Manager on the status of PSP activities and on the identification of any problems encountered in the accomplishment of the PSP
- Obtaining the necessary funding to complete the sampling and data analysis activities

The ARWWP Technical Lead is responsible for:

- Reporting to the ARWWP Project Lead on the progress of PSP activities and on the identification of any problems encountered in the accomplishment of the PSP
- Assisting field personnel as required to complete work described in this PSP
- Interpretation of data collected in the field.

The Fluor Fernald Environmental Monitoring (EM)/Water Monitoring Section Team Coach is responsible for:

- Managing and overseeing the drilling and installation of the wells in the field.
- Oversight of the subcontractor during drilling and installation
- Reporting field progress to the ARWWP Project and Technical Leads

The key project personnel are listed below:

KEY PROJECT PERSONNEL

TITLE	PRIMARY	ALTERNATE
DOE Operable Unit 5 Team Leader	Rob Janke	
ARWWP Project Director	Dave Brettschneider	
ARWWP Project Lead	Bill Hertel	Ken Broberg
ARWWP Technical Lead	Ken Broberg	Bill Hertel
EM Water Monitoring Section Team Coach	Karen Voisard	
Field Oversight	Jon Walter	Karen Voisard
Laboratory Contact	Brenda Collier	
ARWWP Environmental Compliance Lead	Frank Johnston	
Quality Assurance Contact	Scott Wheeler	Frank Thompson

3.0 FIELD ACTIVITIES

Field activities will include:

- Surveying and staking the well sites
- Drilling and installing the monitoring wells
- Developing the monitoring wells
- Initial CMT Well Sampling Activities

3.1 SURVEYING AND STAKING WELL LOCATIONS

A surveyor's stake with a highly visible ribbon tied around the top will be driven into the ground at each drilling location and corresponding well numbers will be written on each stake. The staked locations will be surveyed vertically and horizontally to the nearest 0.1-foot according to site procedures. Survey data for each location will be entered into the Site Environmental Database (SED). Consideration to existing vegetation and trees will be given as wells are being located. Re-location of some of the wells will be considered to spare existing vegetation if it is determined that the re-location will not compromise the objective of the monitoring well. Well locations will also take into consideration future excavation work, buried utilities, and surface structures.

3.2 DRILLING AND INSTALLING THE MONITORING WELLS

The Type-6 and Type-2 monitoring wells will be installed using a rotosonic drilling rig. The Type-8 CMT Wells will be installed using a Geoprobe 6600 ™. Both boring tools utilize an outside protective casing which will minimize the potential for cross contamination. Work will be scheduled to minimize installation time to further reduce the potential for cross contamination.

3.2.1 Type 6 and Type 2 Monitoring Wells

Four Type-6, (63116, 63119, 63121, and 63122) and One Type-2 well (23118) will be installed in accordance with guidelines set forth in Appendix J of the SCQ. A Rotosonic drilling rig will be used to advance a six-inch diameter borehole to a target total depth unique to each monitoring well. Total depths and target elevations for the screen interval in each monitoring well are listed in Table 1. Lithologic descriptions of the Great Miami Aquifer will be made per EM Procedure DRL-04 titled, "Completion of Visual Classification on soils".

Samples will be collected from the Rotosonic cores obtained from wells 23118, 63121, 63122, 63119, and 63116 for Kd work. The scope for the Kd work will be defined in a stand alone PSP and is not considered part of this PSP. The aquifer intervals that will be targeted for the collection of the samples are: 1) the interval between the current water table and the 95% UCL water level of Monitoring Well 2032 (Figure 3), and 2) the depth interval that corresponds to the highest uranium plume concentrations. The Rotosonic Core recovered from these depth intervals will be transferred to 2-liter sample jars in 6-inch increments. The sample jars will be filled as much as possible to minimize any headspace in the jars. The jars will be clearly labeled, sealed and secured with custody tape for later use.

The target elevations listed in Table 1 are based on uranium profile data collected via Geoprobe borings and water level data from monitoring wells 2020 and 2032, which are located in the vicinity of the Pilot Plant Drainage Ditch Plume (Figure 1). Figures 2 and 3 display water level data for Wells 2020 and 2032 respectively. The Geoprobe borings were completed as part of the pre-design monitoring conducted for the Waste Storage Area Groundwater Restoration Module. The pre-design data were documented in the Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas (DOE April 2001).

The monitoring wells will be constructed of 2-inch diameter PVC casing. The Type-6 Wells will have a 10-foot long, 0.010-inch slot screen and an artificial filter pack. The Type-2 Wells will have a fifteen-foot long, 0.010-inch slot size screen and an artificial filter pack. All wells will have a 2.5-foot sump below the screen. Existing monitoring wells at the FEMP are completed with a similar design and yield representative groundwater samples from the aquifer.

The primary filter pack will consist of Global #7 quartz sand that is well sorted and fine-grain. The individual grains of this filter pack material are well rounded and consist of less than five- percent non-siliceous material. The size of the primary filter pack sand was selected so that 90 percent of the filter pack material will be held back by the 0.01-inch slot screen, and the uniformity coefficient of the filter pack material will not exceed 2.5. The primary filter pack will extend five feet above the top of the well screen. A secondary filter pack of slightly smaller sized material (Global #8 sand) will extend from the top of the primary filter pack sand to a height of five feet above the water table measured at the time of installation. The filter pack sands will be installed utilizing the gravity emplacement method (either a tremie line or hand poured). The vibration of the rotosonic casing will help to settle the sand and prevent bridging.

Above the bentonite seal, alternating layers of ten-feet of Global #8 sand and one-foot of bentonite pellets will be installed to a depth of approximately 2 feet below the interface with the overlying Glacial Overburden. A five-foot bentonite seal (pellets) will be installed across the interface of the Glacial

Overburden and the GMA. A backfill of grout slurry above the bentonite seal shall extend to three feet below ground surface. A three-foot thick concrete plug will complete the annular seal. The riser shall terminate approximately three feet above the ground surface. The well will be secured with a lockable well cap. A protective casing and concrete pad will be installed as outlined in the SCQ.

During installation of the well, the field geologist will be responsible for documenting that the correct thickness and volume of annular fill material is being installed, and that the well screen is installed at the correct depth. Frequent measurements of the depth to the top of the annular fill need to be collected to verify the installation process. If installation work is interrupted, (i.e., lunch, carry over to the next day, etc.) the field geologist will verify that the depth measured prior to the interruption is the same depth measured prior to resuming installation activities.

3.2.2 CMT Wells

Four Continuous Multilevel Tubing (CMT) ® will be installed. The CMT well consists of tubing that is divided into seven separate channels, Figure 4. Each channel will be completed at a different depth in the aquifer. The channels will be sampled using polyethylene tubing with check valves, connected to a Waterra® pump. With this design, it is anticipated that a more accurate 3-dimensional assessment of the contaminant plume can be made.

The aquifer in this area is divided in half by a unit of clay known as the "blue clay". The monitoring wells pertaining to this PSP will monitor the aquifer above the blue clay, where the contaminant plume is located. The blue clay serves as a protective barrier between the upper and lower aquifers. No aquifer contamination has been detected below the blue clay in this area. The top of the blue clay has been well characterized in the OU5 RI/FS. Information collected during the installation of Monitoring Well 32765 and recent geoprobe data (Borings 12715 and 12721) have been used to further refine the RI/FS data in order to assure that wells do not penetrate the blue clay.

The CMT Multilevel System Model 403 uses 1.7 inch outside diameter polyethylene, continuous seven channel tubing (see Figure 4). Before the system is lowered into the casing, Water Monitoring (WM) personnel will construct the CMT either on clean plastic sheeting resting on the ground surface or above ground surface resting on saw horses. The CMT will be securely covered in plastic if left out over night or in the event of rain.

The top and bottom of the screen intervals in each sampling channel are based on historical groundwater level data in the area of the plume and uranium plume thickness. Figures 2 and 3 display water level data for Monitoring Wells 2020 and 2032. The location of these wells is shown in Figure 1. The basis for the uranium plume thickness and area extent was derived from geoprobe and monitoring well data provided in the Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas (DOE April 2001). Figure 5 shows the locations of the existing monitoring wells and geoprobe points as well as the locations of the proposed monitoring wells. Figures 6 and 7 show the CMT well design information as well as the uranium profile data from nearby geoprobe points.

The six outer channels will be designated C1 through C6 identifying the sampling channels from shallowest (C1) to the deepest (C6), Figure 4. The center channel, designated as C7, will be open at the bottom of the well at 3 of the 4 well locations. Monitoring Well 83124 will not use C7 due to the anticipated presence of the blue clay just below the sump of C6. Table 2 provides a summary of screen elevations for each proposed CMT well and the basis for the selection of these elevations. The Geoprobe results referenced in the table were documented in the Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas (DOE April 2001).

Prior to any work, the CMT will be visually inspected for damage that may have occurred during manufacturing or shipping. Each channel may be pressure tested to check for leaks. Starting at the bottom, each CMT screen interval will be measured. Tables 3, 4, 5, and 6 provide the depths of each component for each of the channels in each respective well. Drill holes will be measured within each channel's monitoring zone using the CMT installation template. Three, 3/8-inch holes or 1/4 inch holes at 3/4-inch apart will be drilled in each 4-inch subinterval of the monitoring zone. The holes will be drilled with a standard drill using a drill stop to prevent drilling too deep. A 4-inch long, 0.010-inch mesh screen will be wrapped around the drilled subsection of the CMT, one around each three holes. Individual subsections of screen are limited to 4 inches in length to address screen buckling during installation. The screens will be secured to the CMT by stepless, low profile stainless steel clamps.

At 2.5 feet below each individual outer channel-monitoring zone, a notch will be cut, and the individual channel will be plugged by inserting an expandable plug into the channel, Figure 4. If the expandable plugs are not available, then the channel will be plugged by the following method: At 2.5 feet below the monitoring zone, a 3/8-inch hole will be drilled. A foam plug will then be inserted and pushed approximately 1.5 inches towards the bottom of the well. Glue will then be injected into the hole. The foam plug will serve to hold the glue in place until it sets. The length of CMT between the plug and the last hole of the monitoring zone will serve as the sump for the channel. A vent hole will be drilled 1-foot below the plug of the channel so that the hole is located behind the screen mesh of the next lower monitoring zone. This will allow water to exit the channel as it is being installed. A guide point will be installed at the bottom of the tubing, which has a 60-micron port for the center channel, C-7. Prior to installing the guide port, all six outer channels will be plugged from the bottom by inserting an expandable plug into the bottom of the channel. If expandable plugs are not available, then a foam rubber plug will be inserted 1.5 inches from the bottom, then glue will be injected to seal the channel from the bottom.

A Geoprobe® 6600 series with 3.25 inch outside diameter casing and expendable point at the end of the tool string will be used to drill the borehole into which the CMT will be installed. If refusal or resistance occurs, then the borehole may be augured or pre-probed through the glacial overburden and upper unsaturated portion of the aquifer. The casing will be pushed to approximately 5 feet below the desired bottom depth for each well (with the exception of Well 83124) then a sufficient quantity of de-ionized or potable water will be added to the casing to prevent heaving sands. Since the blue clay is directly below the deepest channel in Well 83124, the probe will only be pushed 1 foot below the desired bottom depth. The prepared CMT will be lowered into the casing. As the casing is removed, the formation will be allowed to collapse. Once collapse stops, normally at the top of the water table, Global #7 or #5 sand will be gravity placed to approximately 2.5 feet below the aquifer/overburden interface. There, a bentonite pellet plug of at least 5 feet in length will be placed and hydrated for approximately one hour before injecting grout slurry to 3 feet below the surface. The grout will be allowed to settle for 24 hours. Additional grout will be added if any settling occurs in the first grout placement. A 3-foot thick concrete plug will be placed in the borehole to the ground surface. A protective cover and concrete pad will be installed as specified in Appendix J of the SCQ. A "FEMP Multichannel Well Completion Record" will be completed for each CMT. The "FEMP Multichannel Well Completion Record" is provided as an attachment to this PSP.

3.3 DEVELOPING THE MONITORING WELLS

The goal of development is to achieve clear water (<5 Nephelometric Turbidity Units [NTU]) that contains little or no sediment. Type 6 and Type 2 Monitoring Wells will be developed according to site procedure DRL-03 titled, "Monitoring Well Development". At the end of development a groundwater sample will be collected from each of the channels and analyzed for total uranium at the on-site lab. Samples will be collected in 250 ml plastic bottles and preserved with nitric acid to a pH < 2. A duplicate will be collected from the interval that is expected to contain the highest uranium concentration. Results will not be validated. No field QC samples are required. If the pre-sample turbidity is greater than 5 NTUs, then the sample will be filtered using a 5-micron filter. If the turbidity of the 5 micron filtered sample is still greater than 5 NTUs, then the 5 micron filtered sample will be additionally filtered using a 0.45-micron filter. Both the unfiltered and the final filtered total uranium sample will be analyzed at the on-site laboratory.

CMT wells will be allowed to sit for 48 hours before development begins. A Waterra® pump equipped with polyethylene tubing with a bottom check/valve will be used to pump each of the seven channels. For each channel, a minimum of five channel volumes of water will be removed. In addition, if water is added during installation, a minimum of at least the volume of water added during drilling will be removed. The minimum volume removed will be divided evenly between all channels.

The Waterra® has a surge stroke of 4 inches; therefore each CMT channel will be pumped/surged in 4-inch intervals starting at the top of the screen (for interval C1, start the surge at the top of the water table). Due to friction in deeper channels that may cause sample tubing to kink, the screened sections of the deeper channels may be surged by hand instead of using the Waterra®. A "Monitoring, Development/Redevelopment Form" will be completed for each CMT interval. The "Monitoring Development/Redevelopment Form" is provided as an attachment to this PSP.

3.4 CMT WELL SAMPLING ACTIVITIES

Following development of each CMT Well groundwater samples will be initially collected and analyzed for total uranium only. Three tubing volumes of groundwater will be purged from each sampling channel prior to collection of groundwater samples. Each channel will be purged using the Waterra® pump equipped with a dedicated polyethylene tube and ball/check valve that will be present at the well site in a marked box. The ball/check valve will be placed near the water table of each interval for purging and sample collection to ensure that the samples collected are representative (refer to Table 7 for purge volumes). Temperature, specific conductance, turbidity, and pH will be measured after each channel volume per EM procedure EQT-02, *Horiba Water Quality Meter*.

If the pre-sample turbidity is greater than 5 NTUs, then the sample will be filtered using a 5-micron filter. If the turbidity of the 5 micron filtered sample is still greater than 5 NTUs, then the 5 micron filtered sample will be additionally filtered using a 0.45-micron filter. Both the unfiltered and the final filtered total uranium sample will be analyzed at the on-site laboratory. Samples will be placed in a 250-mL plastic bottle treated with nitric acid per EM procedure SMPL-02, *Liquids and Sludge Sampling*, Data Quality Objective (DQO) GW-30.

After an initial test sampling period, the CMT wells may be added to routine IEMP sampling. Long-term sampling plans for these wells include only total uranium and field parameters due to the increased sampling/analysis/data management costs associated with sampling multiple horizons. The sampling frequency for the various intervals is expected to vary depending on uranium concentration and rate of change in that concentration, after the extraction well pumping is initiated next year. The longer term sampling plans (frequency/intervals) will be provided in the IEMP.

4.0 EQUIPMENT DECONTAMINATION

If drilling and sampling equipment are being moved from a FEMP Controlled Area, the equipment shall be decontaminated to Level I, using a pressure washer to remove visible materials, prior to transport to the drilling location. Upon completion of drilling activities at each location, decontamination of drilling tools and equipment shall be performed to fulfill the Level I specification of the SCQ (Reference Section K). Sampling equipment used to collect water samples and all well materials will be decontaminated to Level II per EM Procedure SMPL-02, "Liquids and Sludge Sampling".

5.0 WASTE DISPOSAL

Small volumes of groundwater, decontamination water, and contact wastes will be generated during field activities. Generation of water and contact waste will be minimized in the field; whenever possible. Contact waste generation will be minimized by limiting contact with sample media, and by only using disposable materials that are necessary. The disposal of drill cuttings will be coordinated with and approved by the Manager of the WAO group. Options include spreading the drill cuttings out on the ground surface at the drilling site, or transporting the cuttings to a holding area for later disposal into the OSDF. Final directions for the disposal of the cuttings will be issued prior the commencement of drilling activities for the installation of the well.

Pumped water (generated during well development) will be managed as directed by the ARWWP Environmental Compliance Lead. Field personnel will assure that any needed handling and disposal permits have been obtained prior to the production of any waste material.

6.0 HEALTH & SAFETY

EM personnel and project subcontractor personnel shall conform to precautionary surveys performed by the personnel representing the Utility Engineer, Industrial Hygiene, and Radiological Control. Concurrence with applicable safety permits (indicated by the signature of personnel assigned to this project) is expected from all project personnel in the performance of their assigned duties.

The EM Team Coach will ensure that all EM and subcontractor personnel performing project related activities have read or been briefed on the Project Health and Safety Matrix (PHSM) and the applicable surveys that protect worker safety and health. Signing the PHSM is an acknowledgment of reading and understanding it. It is a requirement for all personnel involved in the drilling and sampling activities associated with the well installation. A copy of applicable safety permits/surveys issued for worker safety and health shall be available for reference/review at each sample location. At the completion of the project, the completed forms shall be submitted for incorporation into the project files.

7.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

Well Installation and Development work follows Quality Assurance/Quality Control (QA/QC) protocol.

7.1 PROJECT REQUIREMENTS FOR SURVEILLANCE

Self-assessment of work processes and operations may be undertaken to assure quality of performance. Surveillance of field activities may be performed by the Project Lead and field leads identified in Section 2.0 of this PSP, and shall encompass technical and procedure requirements. Such self-assessment may be conducted at any point in the project.

The Fluor Fernald, Inc. QA organization, may perform an independent assessment by conducting surveillance. Surveillance shall consist of monitoring/observing ongoing project activity and work areas to verify conformance to specified requirements. Surveillance shall be planned and documented in accordance with Section 12.3 of the SCQ.

7.2 CHANGES TO THE PROJECT SPECIFIC PLAN

Prior to the implementation of changes, the Project Lead and/or Technical Lead shall be informed of the proposed field changes. Once approval has been obtained from the Project Lead and/or Technical Lead and QA representative for the changes to the PSP, the field changes may be implemented. Variances shall be processed per Section 15.3 of the SCQ.

TABLE 1

SCREEN INTERVALS FOR TYPE 6 AND TYPE 2 MONITORING WELLS

Monitoring Well Number	Total Depth (ft AMSL)	Screen Interval (ft AMSL)	Basis For Screen Interval (Geoprobe Data)
63116	497.5	510-500	12708, 12710,12713
23118	500.5	518-503	12717
63119	492.5	505-495	12711, 12715
63121	497.5	510-500	12724, 12721
63122	487.5	500-490	12715, 12721

TABLE 2

SCREEN INTERVALS FOR CMT WELLS

Monitoring Well #	Screen Intervals (ft AMSL)	Basis For Screen Intervals
83117	C1: 525-515 C2: 512-502 C3: 499-489 C4: 486-476 C5: 473-463 C6: 460-450 C7: 446.5	Water levels in MWs 2032 and 2020. Geoprobe Results from Boring 12715. Top Blue Clay at ~442 ' AMSL in (Boring 12715)
83120	C1: 525-515 C2: 512-502 C3: 499-489 C4: 486-476 C5: 473-463 C6: 460-455 C7: 446.5	Water levels in MWs 2032 and 2020. Geoprobe Results from Boring 12715. Top Blue Clay at ~442 ' AMSL in (Boring 12715)
83123	C1: 525-515 C2: 512-502 C3: 499-489 C4: 486-476 C5: 473-463 C6: 460-450 C7: 446.5	Water levels in MWs 2032 and 2020. Geoprobe Results from Boring 12721. Blue Clay apparently not encountered at Boring 12721 (Went to ~440 AMSL)
83124	C1: 525-515 C2: 512-502 C3: 499-489 C4: 486-476 C5: 473-463 C6: 460-457.5 C7: NR	Water levels in MWs 2032 and 2020. Geoprobe Results from Boring 12707. Top Blue Clay at ~455 ' AMSL (MW 32765) C6 is only 2.5 feet long to provide for a 2.5 foot sump above the blue clay.

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TABLE 3

DEPTH TO EACH CMT WELL COMPONENT IN 83117
Elevation 575 AMSL
(Feet Below Ground Surface)

Channel	Screen	Blank	Plug	Vent
C1	50-60	60-63	62.5	63.5
C2	63-73	73-76	75.5	76.5
C3	76-86	86-89	88.5	89.5
C4	89-99	99-102	101.5	102.5
C5	102-112	112-115	114.5	115.5
C6	115-125	125-128	127.5	128
C7	128.5	n/a	n/a	n/a

TABLE 4

DEPTH TO EACH CMT WELL COMPONENT IN 83120
Elevation 577 AMSL
(Feet Below Ground Surface)

Channel	Screen	Blank	Plug	Vent
C1	52-62	62-65	64.5	65.5
C2	65-75	75-78	77.5	78.5
C3	78-88	88-91	90.5	91.5
C4	91-101	101-104	103.5	104.5
C5	104-114	114-117	116.5	117.5
C6	117-127	127-130	129.5	130
C7	130.5	n/a	n/a	n/a

TABLE 5

DEPTH TO EACH CMT WELL COMPONENT IN 83123
Elevation 578 AMSL
(Feet Below Ground Surface)

Channel	Screen	Blank	Plug	Vent
C1	53-63	63-66	65.5	66.5
C2	66-76	76-79	78.5	79.5
C3	79-89	89-92	91.5	92.5
C4	92-102	102-105	104.5	105.5
C5	105-115	115-118	117.5	118.5
C6	118-128	128-131	130.5	131
C7	131.5	n/a	n/a	n/a

TABLE 6

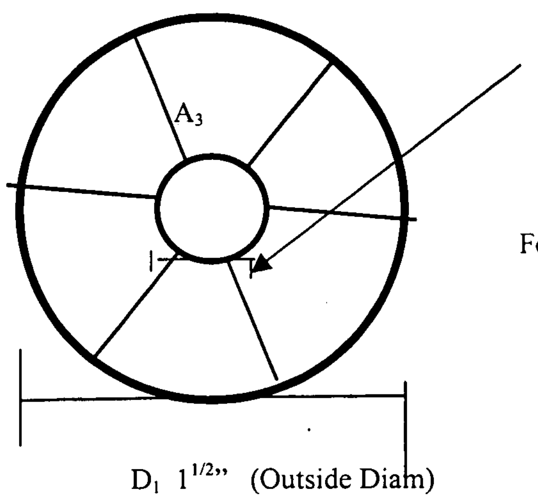
DEPTH TO EACH CMT WELL COMPONENT IN 83124
Elevation 556 AMSL
(Feet Below Ground Surface)

Channel	Screen	Blank	Plug	Vent
C1	31-41	41-44	43.5	44.5
C2	44-54	54-57	56.5	57.5
C3	57-67	67-70	69.5	70.5
C4	70-80	80-83	82.5	83.5
C5	83-93	93-96	95.5	96.5
C6	96-98.5	98.5-101	101	n/a
C7	n/a	n/a	n/a	n/a

TABLE 7
WELL PURGE VOLUMES FOR CMT WELLS

Height of Water Column (ft)	Volume Per Channel	Purge Volume (X3)	Purge Volume (Gallons)
1	54 mL	162 mL	0.042
2	108 mL	325 mL	0.085
3	162 mL	487 mL	0.128
4	216 mL	648 mL	0.171
5	270 mL	811 mL	0.214
6	325 mL	974 mL	0.257
7	379 mL	1.13 L	0.300
8	433 mL	1.29 L	0.342
9	487 mL	1.46 L	0.385
10	541 mL	1.62 L	0.428
20	1.08 L	3.24 L	0.857
30	1.62 L	4.86 L	1.28
40	2.16 L	6.48 L	1.71
50	2.70 L	8.11 L	2.14
60	3.24 L	9.73 L	2.57
70	3.78 L	11.3 L	3.00

Example: Depth of 73 feet = 3 gallons + 0.128 gallons = 3.128 gallons

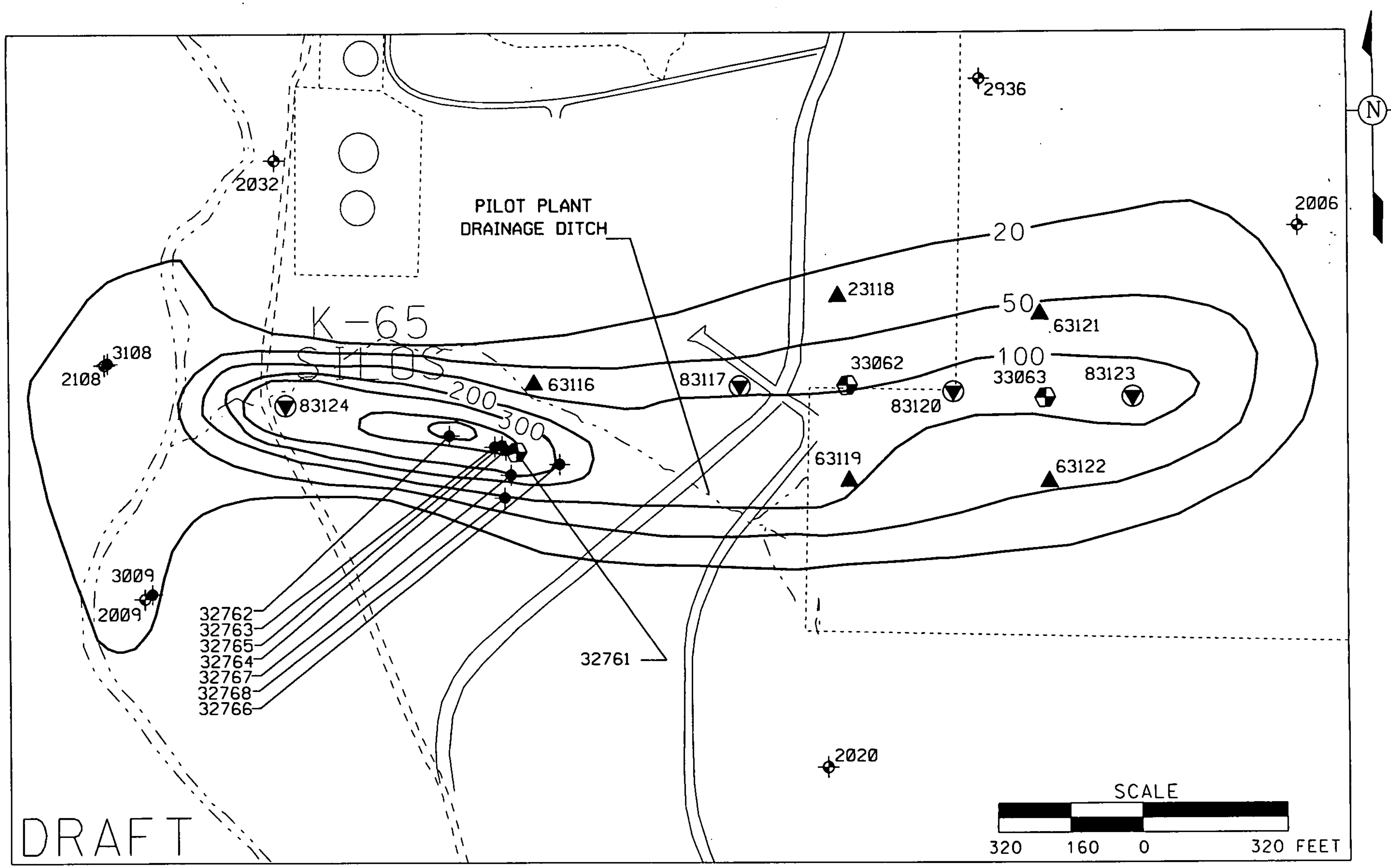


Formula: $$A_1 = \frac{\pi\ (D_1)^2}{4}$$

$$A_2 = \frac{\pi\ (D_2)^2}{4}$$

$$A_3 = \frac{A_1 - A_2}{6}$$

Volume = A_3(height)



LEGEND:

TOTAL URANIUM CONTOUR, JUNE, 2000 ($\mu g/L$)

EXTRACTION WELL

PROPOSED MONITORING WELL LOCATION (10 FOOT SCREEN)

PROPOSED MONITORING WELL LOCATION (MULTILEVEL)

EXISTING MONITORING WELL

Figure 2
MW2020 Water Elevations

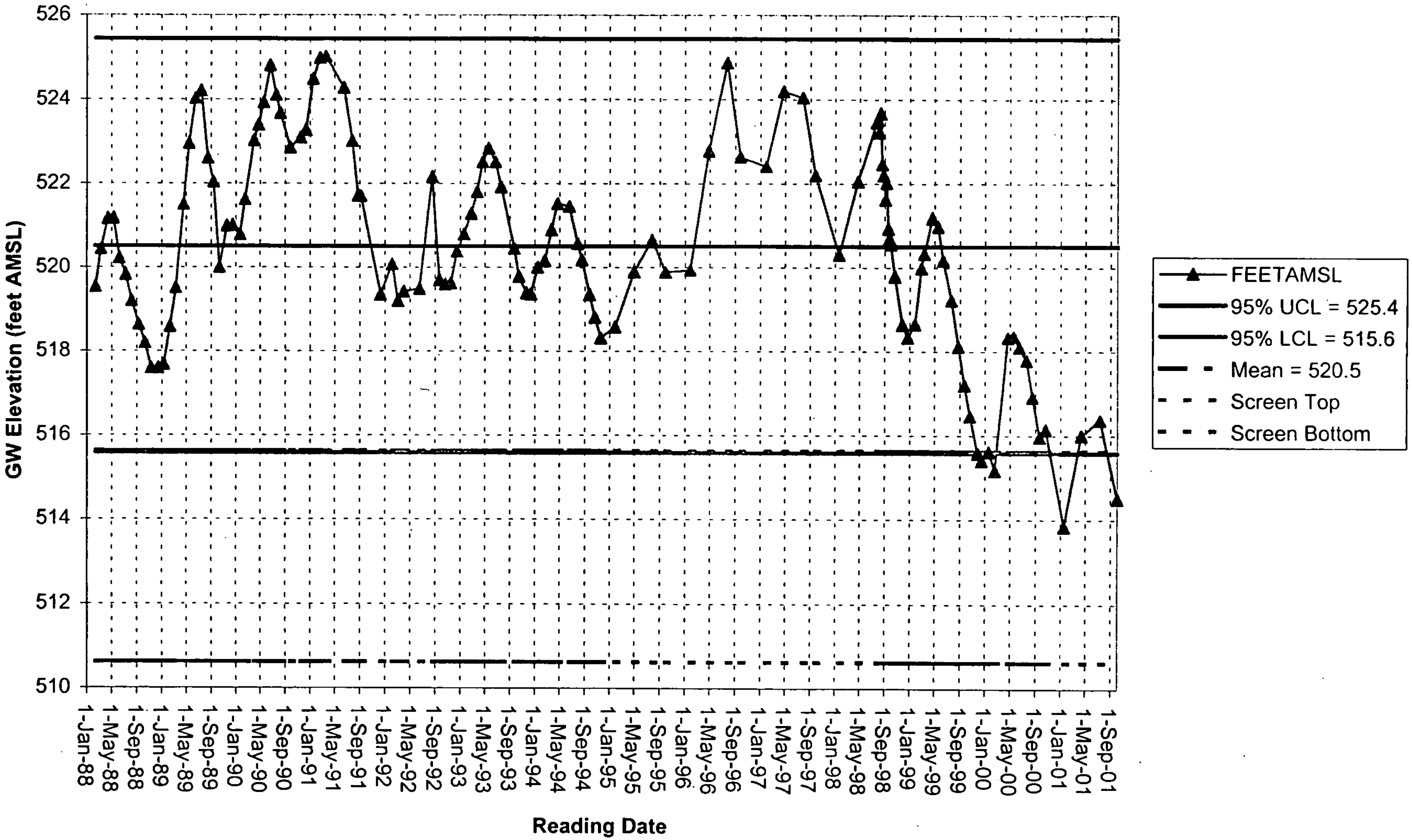


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Figure 3
MW2032 Water Elevations

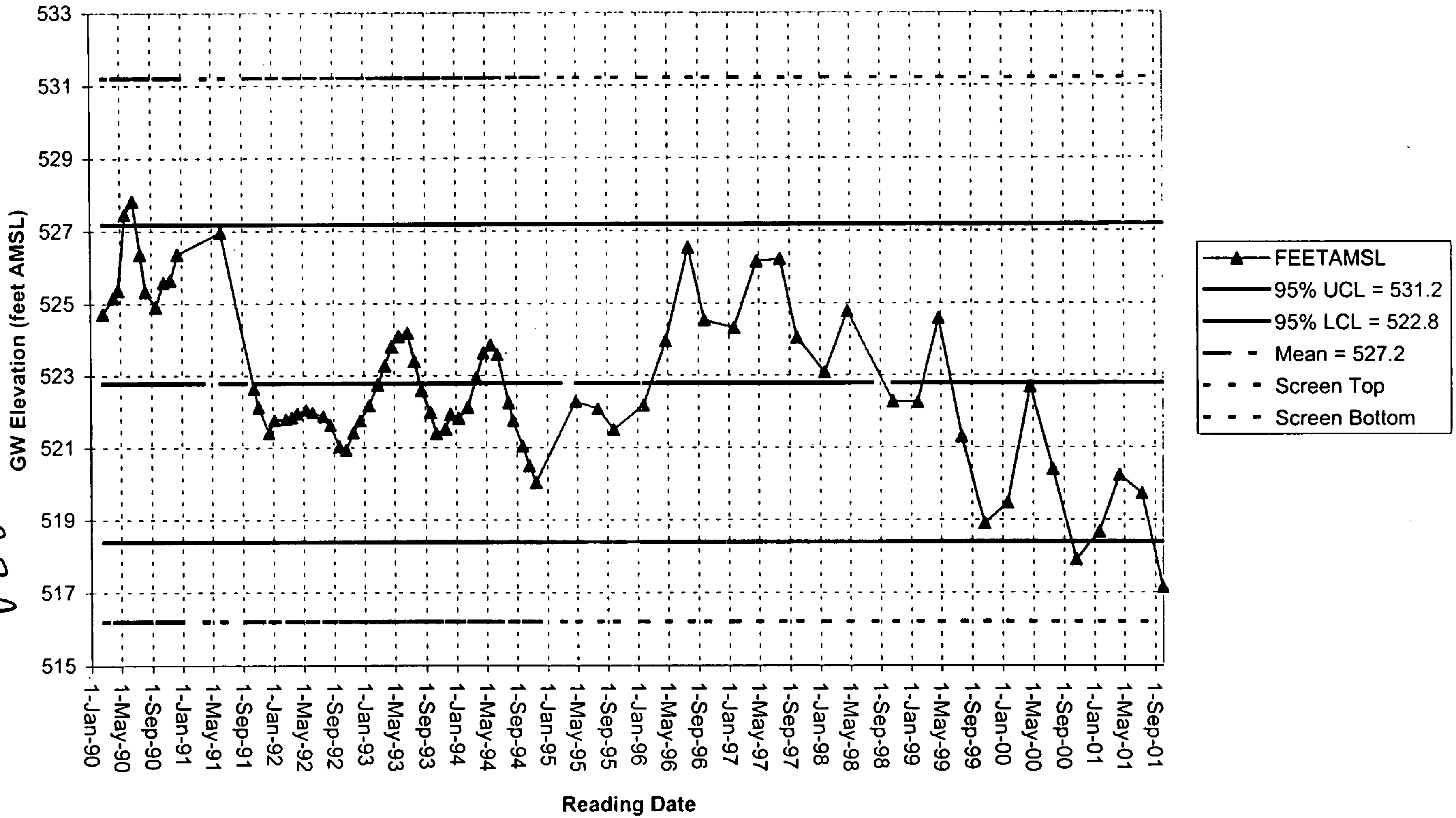

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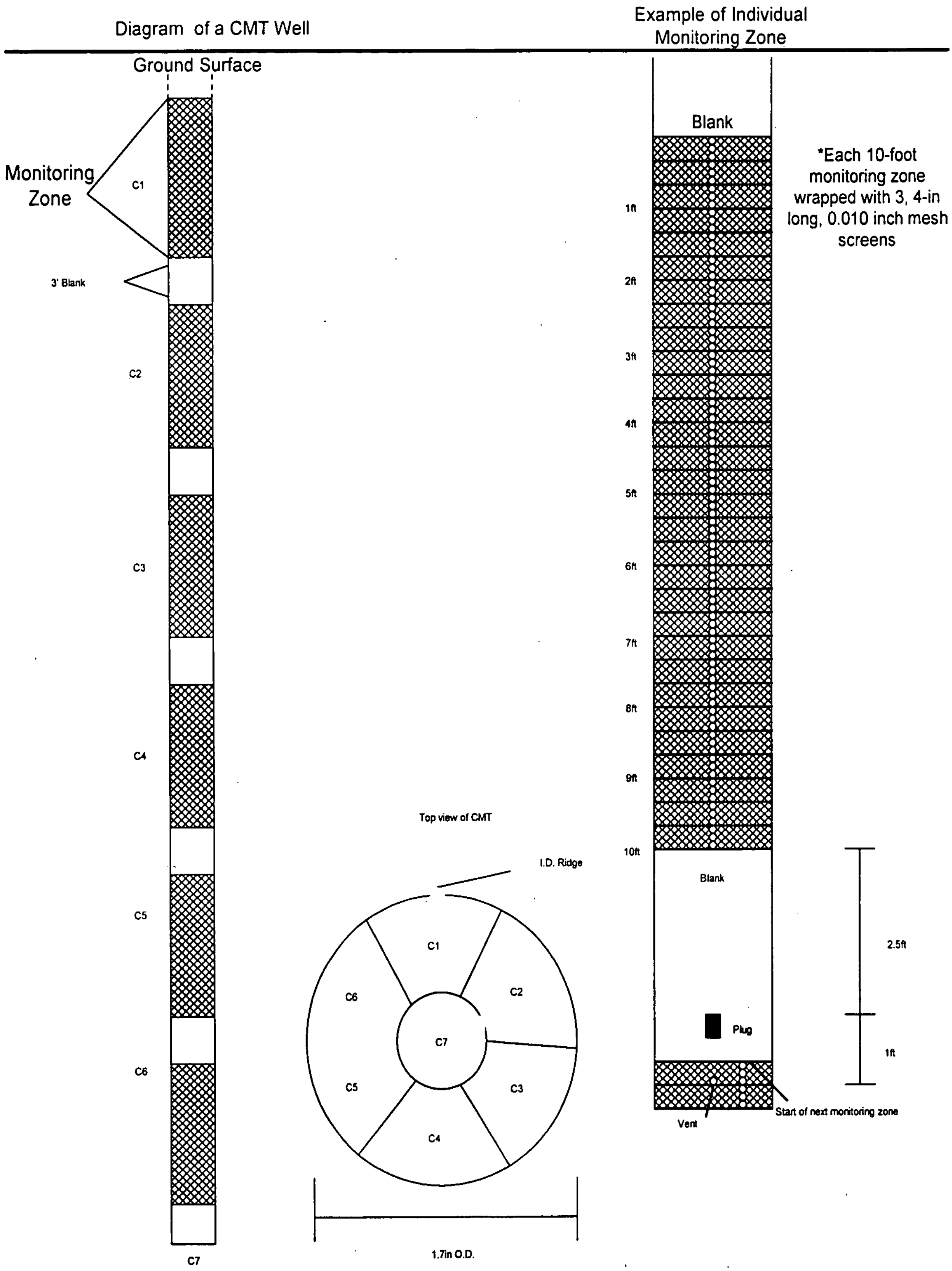
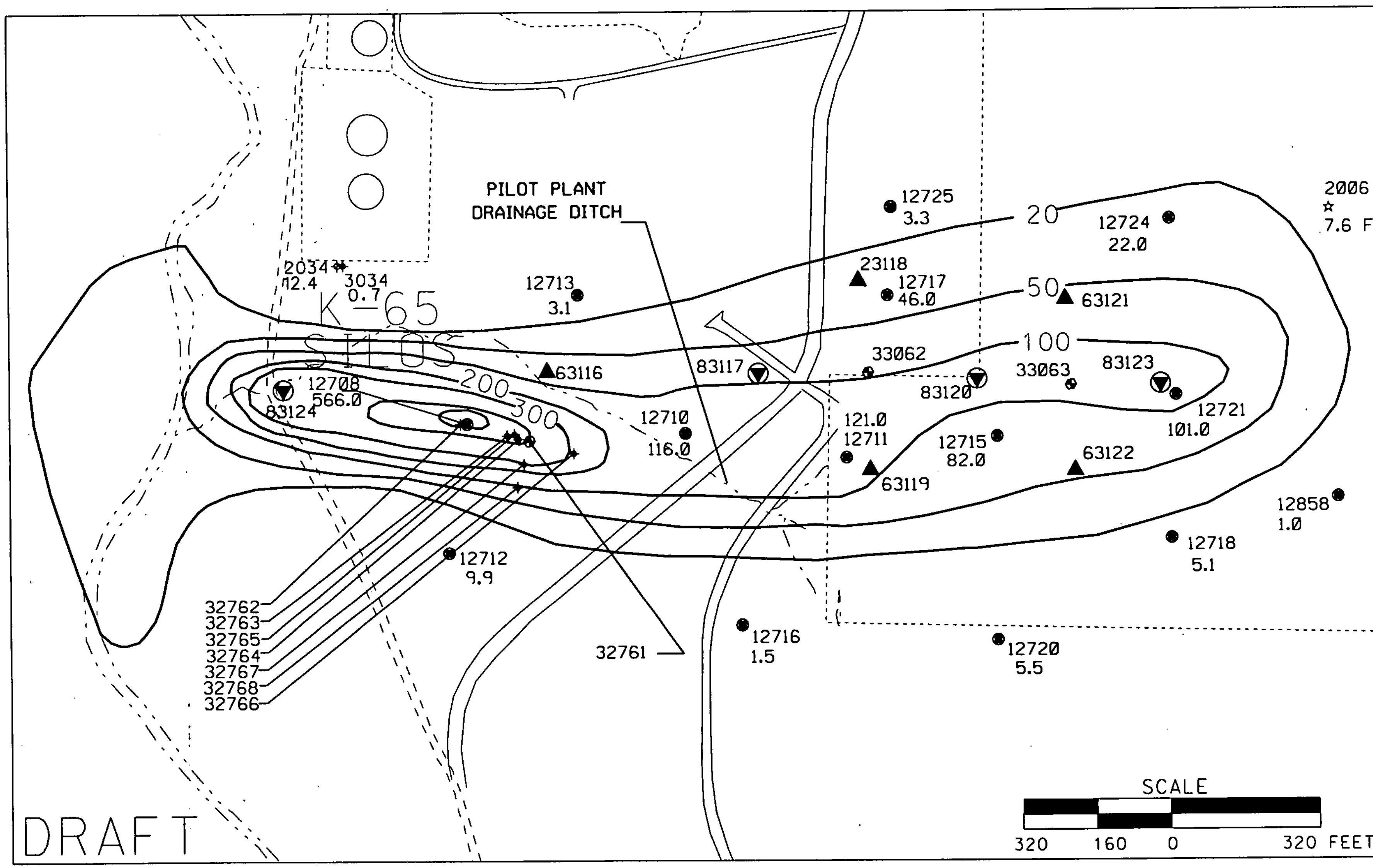
FIGURE 4
Multilevel System Model 403



000024



LEGEND:

TOTAL URANIUM CONTOUR, JUNE, 2000 (µg/L)

EXTRACTION WELL

PROPOSED MONITORING WELL LOCATION

PROPOSED MONITORING WELL LOCATION (MULTILEVEL)

COMPLETED GEOPROBE LOCATION

RECENT DATA (JANUARY THROUGH MAY 2000)

IEMP DATA (JUNE 2000)

15-NOV-2001

FIGURE 5 - MONITORING WELL AND GEOPROBE LOCATION MAP

FIGURE 6

WELL DESIGN INFORMATION FOR CMT WELLS 83117 AND 83120

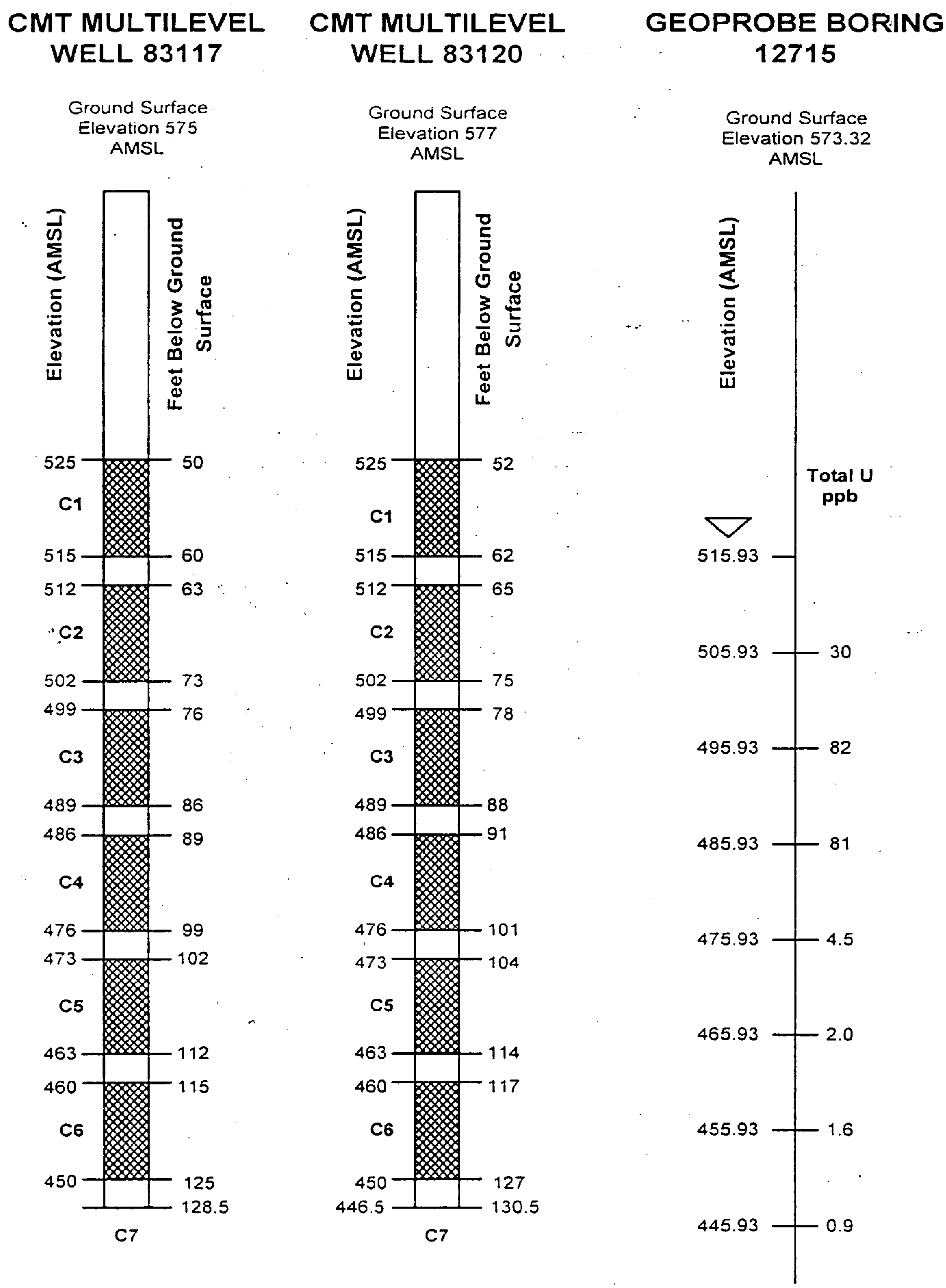
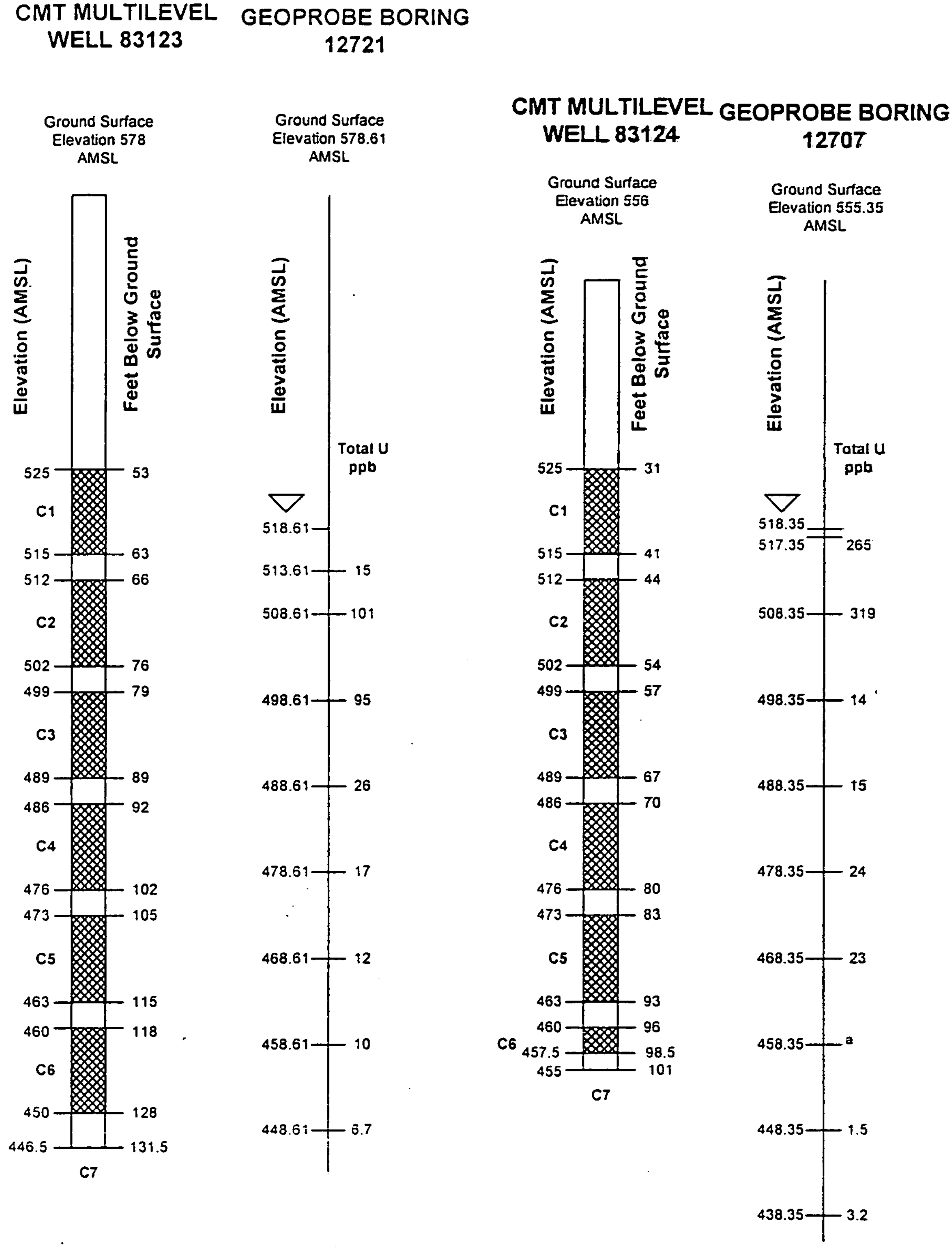


FIGURE 7

WELL DESIGN INFORMATION FOR CMT WELLS 83123 AND 83124



[a]Sample was not collected due to presence of silt.

ATTACHMENT A

FORMS

3989

FEMP

MULTICHANNEL MONITORING WELL DEVELOPMENT FORM

		CONTROL NO:	
PREPARED BY:	BADGE NO:	PAGE ____ OF ____	
REVIEWED BY:	BADGE NO:	PROJECT NO:	WELL NUMBER:
PROJECT NAME:			INSTALLATION DATE:
WELL DEVELOPMENT START DATE / TIME:		WELL DEVELOPMENT END DATE / TIME:	

DEPTH READINGS

TOTAL DEPTH OF CHANNEL C1	BEFORE DEVELOPMENT:	AFTER DEVELOPMENT:
TOTAL DEPTH OF CHANNEL C2	BEFORE DEVELOPMENT:	AFTER DEVELOPMENT:
TOTAL DEPTH OF CHANNEL C3	BEFORE DEVELOPMENT:	AFTER DEVELOPMENT:
TOTAL DEPTH OF CHANNEL C4	BEFORE DEVELOPMENT:	AFTER DEVELOPMENT:
TOTAL DEPTH OF CHANNEL C5	BEFORE DEVELOPMENT:	AFTER DEVELOPMENT:
TOTAL DEPTH OF CHANNEL C6	BEFORE DEVELOPMENT:	AFTER DEVELOPMENT:
TOTAL DEPTH OF CHANNEL C7	BEFORE DEVELOPMENT:	AFTER DEVELOPMENT:

WATER LOST DURING DRILLING: ________ / ________ = ________
total volume added (L) / number of channels sampled = water lost per channel (L)

PURGE VOLUME CALCULATIONS *NOTE: 1 gallon = 3.79 L

CHANNEL C1: (______ - ______) x .054 = ______ x 5 + ______ = ______
(total depth (ft) - water level (ft)) x liters per ft. = well volume (L) x 5 + water lost per channel (L) = total purge volume (L)

CHANNEL C2: (______ - ______) x .054 = ______ x 5 + ______ = ______
(total depth (ft) - water level (ft)) x liters per ft. = well volume (L) x 5 + water lost per channel (L) = total purge volume (L)

CHANNEL C3: (______ - ______) x .054 = ______ x 5 + ______ = ______
(total depth (ft) - water level (ft)) x liters per ft. = well volume (L) x 5 + water lost per channel (L) = total purge volume (L)

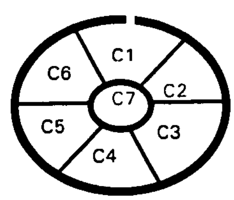
CHANNEL C4: (______ - ______) x .054 = ______ x 5 + ______ = ______
(total depth (ft) - water level (ft)) x liters per ft. = well volume (L) x 5 + water lost per channel (L) = total purge volume (L)

CHANNEL C5: (______ - ______) x .054 = ______ x 5 + ______ = ______
(total depth (ft) - water level (ft)) x liters per ft. = well volume (L) x 5 + water lost per channel (L) = total purge volume (L)

CHANNEL C6: (______ - ______) x .054 = ______ x 5 + ______ = ______
(total depth (ft) - water level (ft)) x liters per ft. = well volume (L) x 5 + water lost per channel (L) = total purge volume (L)

CHANNEL C7: (______ - ______) x .088 = ______ x 5 + ______ = ______
(total depth (ft) - water level (ft)) x liters per ft. = well volume (L) x 5 + water lost per channel (L) = total purge volume (L)

TYPE AND DIAMETER OF PUMP:	TOTAL VOLUME OF WATER REMOVED:
DESCRIPTION OF DEVELOPMENT METHOD:	MULTICHANNEL TUBING DIAGRAM



Multichannel Well Development Form Completion Instructions

1. PREPARED BY (NAME)/BADGE NO./DATE: Print name and badge number of person preparing form and date of form preparation.
2. CONTROL NO: Record sequential number obtained from Field Coordinator.
3. PAGE___OF___: Sequentially number pages in first blank and record total number of pages used for one day for one location in second blank
4. REVIEWED BY (NAME)/BADGE NO./DATE: Print name and badge number of person reviewing form and date of form review.
5. PROJECT NO.: Record number of well development project.
6. WELL NO.: Record identification number of well to be developed.
7. PROJECT NAME: Record name of well development project.
8. INSTALLATION DATE: Record date well installation was completed.
9. WELL DEVELOPMENT START DATE/TIME: Record date and time field work was initiated for development activity.
10. WELL DEVELOPMENT COMPLETION DATE/TIME: Record date and time field work was completed for development activity.

DEPTH READINGS

11. BEFORE DEVELOPMENT: Measure and record depth to water from reference point before development.
12. AFTER DEVELOPMENT: Measure and record depth to water from reference point following development.

TOTAL DEPTH OF CHANNELS #C1 THROUGH #C7

13. BEFORE DEVELOPMENT: Measure and record total depth of well from reference point before development.
14. AFTER DEVELOPMENT: Measure and record total depth of well from reference point following development.

WATER LOST DURING DRILLING:

15. Divide volume of water added (L) by number of channels sampled.

CHANNELS #C1 THROUGH #C7 VOLUME CALCULATIONS:

16. Record water level (ft) and subtract from total depth (ft) for each channel.
17. Multiply difference by .0541 for well volume (L)
18. Multiply well volume by 5 for total purge volume (L)

19. TYPE AND DIAMETER OF PUMP: Record type and diameter of pump used to develop well.
20. TOTAL VOLUME OF WATER REMOVED: Record the total volume of water removed during the development process.
21. DESCRIPTION OF DEVELOPMENT METHOD: Describe method used to develop well.

MULTILVEVEL WELL DEVELOPMENT FORM
(CONTINUATION PAGE)

CONTROL NO.:	PROJECT NAME/NO.:		PAGE ___ OF ___
PREPARED BY (NAME):		BADGE NO.:	DATE:
WELL NO.:	REVIEWED BY (NAME):	BADGE NO.:	DATE:

SAMPLE COLLECTION		CHANNEL NUMBER:	VOLUME OF WATER PURGED (gals.)		TEMP. (°C)	pH (SU)	SPEC. COND. (mS/cm)	TURB. (NTU)	D.O. (mg/L)	COLOR	COMMENTS
DATE	TIME		NO. LITERS	CUM. TOTAL							3989

Multilevel Well Development Form Continuation Page Instructions

1. CONTROL NO: Record sequential number obtained from Field Coordinator.
2. PROJECT NAME/NO.: Record name and number of well development project.
3. PAGE___OF___: Sequentially number pages in first blank and record total number of pages used for one day for one location in second blank.
4. PREPARED BY (NAME)/BADGE NO./DATE: Print name and badge number of person preparing form and date of form preparation.
5. WELL NO.: Record identification number of well to be developed.
6. REVIEWED BY (NAME)/BADGE NO./DATE: Print name and badge number of person reviewing form and date of form review.
7. SAMPLE COLLECTION DATE/TIME: Record date and time of water quality sample collection.
8. CHANNEL NUMBER: Record channel number that is being developed.

VOLUME OF WATER PURGED (gals.):

9. NO. GALS: Record volume of water purged at time of water quality sample collection.
10. CUM. TOTAL: Record cumulative volume of water purged at time of water quality sample collection.
11. TEMP.(°C): Record temperature of water quality sample from water quality meter.
12. pH (SU): Record pH of water quality sample from water quality meter.
13. SPEC. COND. (mS/cm): Record specific conductivity of water quality sample from water quality meter.
14. TURB (NTU): Record turbidity of water quality sample from water quality meter.
15. D.O. (mg/L): Record dissolved oxygen of water quality sample from water quality meter.
16. COLOR: Record color of water quality sample (e.g., orange, brown).
17. COMMENTS: Record any additional comments or observations concerning the water quality sample (e.g., presence of particulates, odor, sudden color change).

FEMP MULTICHANNEL WELL COMPLETION RECORD

CONTROL NO.:		WELL NO.:
PROJECT NAME:	PROJECT NO.:	

PREPARED BY (NAME):	BADGE NO.:	DATE:	REVIEWED BY (NAME):	BADGE NO.:	DATE:

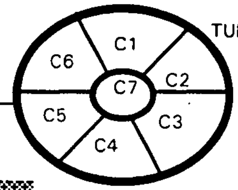
SUBCONTRACTOR:	DRILLING METHOD:	DRILLER NAME:	DRILL RIG MAKE / MODEL:

INSTALLATION START DATE:	INSTALLATION COMPLETION DATE:	COORDINATES:	VOLUME OF WATER LOST:

WATER LEVEL (FT.):	DATE:	GROUT USED			BENTONITE PELLETS/CHIPS USED		
		POUNDS	MANUFACTURER	LOT NO.	POUNDS	MANUFACTURER	LOT NO.

PROTECTIVE CASING:________ FT.

MULTICHANNEL TUBING DIAGRAM

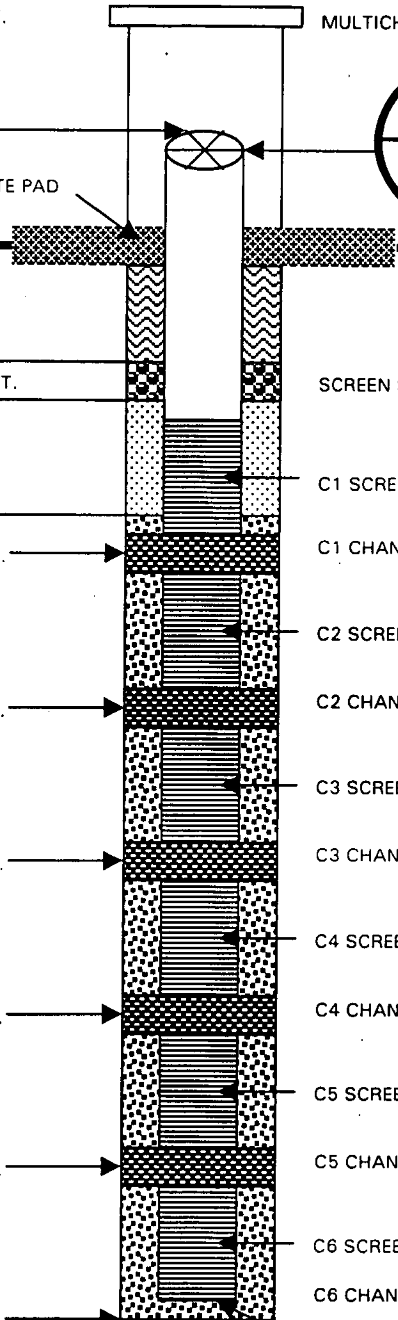


TUBING DIAMETER: ______ IN

TOP OF MULTICHANNEL WELL TUBING

FILLED WITH CONCRETE LEVEL WITH CONCRETE PAD

PAD DIMENTIONS:________



GROUND SURFACE

TOP OF GROUT (BOTTOM OF CONCRETE AND PROTECTIVE CASING): ________ FT.

TOP OF BENTONITE PELLET SEAL: FT.

SCREEN SLOT SIZE: _____ IN.

TOP OF FILL SAND ______ FT.

C1 SCREEN: _____ TO ______ FT.

BENTONITE PACKER: ______ TO ______ FT.

C1 CHANNEL PLUG: ______ FT. VENT ______ FT

C2 SCREEN: _____ TO ______ FT.

BENTONITE PACKER: ______ TO ______ FT.

C2 CHANNEL PLUG ______ FT VENT ______ FT

C3 SCREEN: _____ TO ______ FT.

BENTONITE PACKER: ______ TO ______ FT.

C3 CHANNEL PLUG: ______ FT. VENT ______ FT

C4 SCREEN: _____ TO ______ FT.

BENTONITE PACKER: ______ TO ______ FT.

C4 CHANNEL PLUG: ______ FT. VENT ______ FT

C5 SCREEN: _____ TO ______ FT.

BENTONITE PACKER: ______ TO ______ FT.

C5 CHANNEL PLUG ______ FT. VENT ______ FT

C6 SCREEN: _____ TO ______ FT.

C6 CHANNEL PLUG ______ FT. VENT ______ FT

BENTONITE PACKER: ______ TO ______ FT.

C7 BOTTOM OF CENTER CHANNEL: ______ FT.

BOTTOM OF BOREHOLE:________ FT. BOREHOLE DIAMETER ________ IN.

COMMENTS:

MULTICHANNEL WELL COMPLETION RECORD INSTRUCTIONS

1. WELL NO.: Record number of well.
2. PROJECT NAME: Record name of project.
3. PROJECT NO.: Record number of project.
4. PREPARED BY (NAME/BADGE NO./DATE): Print name and badge number of person preparing form and date of form preparation.
5. SUBCONTRACTOR: Record name of drilling subcontractor performing the work (e.g., Moody's of Dayton).
6. DRILLING METHOD: Record drilling method used to install well (e.g., rotasonic, hollow stem auger, cable tool, Geoprobe®, etc.).
7. DRILLER NAME: Record name of person operating drill rig.
8. DRILL RIG MAKE/MODEL: Record drill rig make and model.
9. INSTALLATION START DATE: Record beginning date of well installation.
10. INSTALLATION COMPLETION DATE: Record end date of well installation.
12. WATER LEVEL (FT): Record water level and date.
13 BENTONITE PELLETS USED: Record pounds, manufacturer, and lot number of pellets.
14. TOP OF PROTECTIVE CASING (FT): Record top of protective casing above ground surface.
15. TOP OF MULTILEVEL WELL TUBING (FT): Record top of riser above ground surface.
16. CONCRETE PAD (IN.): Record dimensions of concrete pad:
17. TUBING DIAMETER (IN.): Record diameter of multichannel.
18. TOP OF GROUT (BOTTOM OF CONCRETE AND PROTECTIVE CASING FT): Record top of grout and bottom of concrete and protective casing.
19. PAD DIMENTIONS: Record pad dimentions.
20. TOP OF FILL SAND (FT): Record top of fill sand.
21. BENTONITE PACKER (FT): Record depth of each benonite packer.
22. BOREHOLE DIAMETER (IN.): Record diameter of borehole.
23. SCREEN SLOT SIZE (IN.): Record screen slot size.
24. C1 SCREEN (FT): Record top of screen and bottom of channel screen. Repeat through C6 channel screen.
25. C1 CHANNEL PLUG (FT): Record depth channel plug C1 through C6.
26. VENT (FT): Record depth of vent for each channel.
27. C7 BOTTOM OF CENTER CHANNEL (FT): Record location of C7 channel opening (bottom of tubing).
28. BOTTOM OF BOREHOLE (FT): Record deepest penetration of borehole.