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FEDERAL FACILITY COMPLIANCE AGREEMENT - REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS) - FEED MATERIALS PRODUCTION CENTER (FMPC)

06/19/87

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DOE-ORO/USEPA
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LETTER

[redacted]

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Department of Energy
Oak Ridge Operations
P. O. Box E
Oak Ridge, Tennessee 37831

June 19, 1987
DOE 126-87

Environmental Review Branch
Planning & Management Division
US - EPA
Region V - 5ME-12
230 S. Dearborn Street
Chicago, Illinois 60604

Attn: Katherine McCord

FEDERAL FACILITY COMPLIANCE AGREEMENT - REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS)-FEED MATERIALS PRODUCTION CENTER (FMPC)

Dear Katherine:

On April 22, 1987, a conference call occurred between USEPA-5 (Steve Clough), Ohio EPA (Graham Mitchell), Department of Energy (Rick Collier) and others at the FMPC. The purpose of the conference call was to discuss the initiation of the groundwater investigation program associated with Task 3 of the RI/FS.

On December 19, 1986, DOE submitted the sitewide RI/FS Work Plan to USEPA-5. This submittal was supplemented by supporting documents/plans on January 30, 1987. As of this writing, USEPA-5 has yet to provide DOE with formal comments on the Work Plan; informal comments have been provided by Steve Clough.

DOE has a critical need to proceed with the installation of forty-five (45) monitoring wells at the FMPC. The proposed wells are consistent with and are a subset of the monitoring wells identified in the Task 3 Groundwater Sampling Plan of the RI/FS Work Plan.

During the conference call, the proposed wells were discussed in greater detail. USEPA-5 requested, and DOE agreed, that all wells would be constructed of stainless steel, and the installations would conform to the plans outlined in Task 3. At the conclusion of the conference call, both USEPA-5 and Ohio EPA indicated that DOE could proceed with the well installations subsequent to formal regulatory notification and a two weeks notice. Please consider this letter as formal notification.

For your additional information, we plan to install forty-one (41) till (100 series) and four (4) sand and gravel (200 series)

wells. Proposed well locations, siting criteria and drilling/construction specifications are further defined in the attachment to this letter. The proposed wells are consistent with the Task 3 - Groundwater Sampling Plan except as follows:

1. All wells will be constructed of stainless steel as recommended by USEPA-5 and Ohio EPA.

2. Twelve (12) subsurface borings in the waste pit storage area have been converted to monitoring wells.

3. Minor siting adjustments have been made to the shallow well locations to reflect specific informational needs of the EIS and the progressive findings of the nearly completed Characterization Investigation Study.

4. Wells will be installed utilizing the cable tool technique.

5. Volclay grout will be utilized for sealing well casings.

In summary, DOE is proceeding to install forty-five (45) monitoring wells proposed in Task 3 of the RI/FS Work Plan. Except as above, these wells are consistent with the Work Plan previously submitted to your office. Unless formal objections are raised by USEPA-5 or Ohio EPA by July 7, 1987, DOE plans to initiate the installations on or after July 8, 1987. As always, both USEPA-5 and Ohio EPA are welcome to visit the FMPC and observe any portion of the well installations desired. Please contact Rick Collier of my staff (513-738-6660) to make visit arrangements.

We appreciate your consideration of this matter. Please contact Rick Collier if you have any questions on this letter.

Sincerely,

James A. Reafsnyder
Site Manager

DP-84:Collier

cc w/att.

Graham Mitchell, OEPA
Bill Franz, USEPA-5
Bill Miner, 5HE-12, USEPA-5
Amy Blumberg, USEPA-5

ATTACHMENT 1

GENERAL SPECIFICATION AND SITING CRITERIA FOR PROPOSED WELLS TO SATISFY EIS DATA NEEDS

General

Forty-five wells are proposed to be installed at the FMPC to support the sitewide EIS. These wells generally consist of a subset of the wells identified in the Groundwater Sampling Plan submitted to U.S. EPA in January, 1987. One principal difference is the recent decision to convert twelve proposed subsurface borings in the waste storage area into monitoring wells. In addition, several minor adjustments in shallow well locations have been made to reflect specific information needs of the EIS and the progressive findings of the sitewide RI/FS.

Well Drilling and Installation

All boreholes for the proposed wells will be advanced utilizing the cable tool technique. A temporary steel casing of a nominal eight inch diamater will be driven to allow for construction of the monitoring wells. Continuous split-spoon sampling will be performed for each of the wells installed. Sampling and logging of the subsurface materials will be consistent with the requirements of the Subsurface Soils Sampling Plan of the sitewide RI/FS submitted January, 1987.

Shallow wells (100 series) will be screened in the water table or in localized perched water zones in the till, which overlie the upper portion of the regional sand and gravel aquifer over the majority of the site. The intermediate wells (200 series) will be screened at the top of the sand and gravel aquifer such that the top of the screen is below the base of the till and at least 10 feet below the water table. All casings and screens used in well construction will be 4 inch diameter, 316 stainless steel.

Screen lengths for the wells will not exceed 10 feet. Shorter well screens will be used in the till zone if the saturated zone is less than 10 feet thick. All wells will be backfilled with sand pack to a height of between two and four feet above the top of the well screen, followed by five feet of bentonite pellets, and finally grouted to just below the surface with Volclay grout. All sand pack, bentonite plug, and Voclay grout will be placed using pumps and tremie line methods.

Screen sand pack material will be a well-sorted medium quartz sand. Sodium bentonite pellets will be utilized above the sand pack. American Colloid Company Volclay grout will be utilized as specified in the attached manufacturer's cut sheet. Representative samples of all sand pack materials, bentonite and Volclay grout, will be retained for chemical analysis.

Upon completion, the monitoring wells will be developed by pumping and flushing with water to remove fines and to enhance interaction between the water bearing zone and the monitoring well. Water pumped from the wells will be handled, treated, and discharged in conformance with the FMPC NPDES permit requirements.

Well construction diagrams will be completed following well installation. Well security and survey, geophysical logging, hydrologic data collection, and groundwater sampling methodology will be consistent with Section 3 of the RI/FS Sampling Plan submitted to U.S. EPA in January, 1987.

Proposed Wells and Siting Criteria

The following monitoring wells, as defined in Table 1 and in figures 3.1 - 3.4,are to be installed to support the data needs of the EIS. In general, the identified wells represent a subset of the porposed wells in the Groundwater Sampling Plan of the January sitewide RI/FS submittal. Minor siting adjustments have been made to the shallow well locations originally identified in the RI/FS Sampling Plan to reflect specific identified data needs of the EIS and progressive findings of the Characterization Investigation Study.

TABLE 1

100 SERIES (SHALLOW) AND SELECTED 200 SERIES MONITORING WELLS

WELL NO.	JUSTIFICATION
104*	a,b,f
108	a,b
109*	f,g
110	a,b
111	a,c,f
114*	f,g
116*	d,f,g
118	a
124	a,b,c
125	a,b
127	a,b
128*	a,b
129	a,b
130	a,b
131	a,b,h
132	a,b,f
134	a,b
135	a,b
137	a,b
138	a,b
139	a,b
141	a,b
142	a,b
145	b,d
146*	b,d
147	d,e
149	d,e
152	c
165	e
172	a,b
173	a,b,h
174	a,b
175	a,b,h
176	a,b
177	a,b
178	a,b,h
179	a,b
180	a,b,h
181	a,b
182	a,b
183	a,b
209	i
249	i
265	i
266	i

JUSTIFICATION INDEX

(a) Shallow monitoring wells to evaluate effects of waste disposal units

(b) Provide information on ground water quality around individual contaminant sources

(c) Provide background Water Water Quality Sampling Points

(d) Assess potential impacts of fly ash piles on ground water quality

(e) Assess the impact of the storm water outfall ditch flows on the shallow ground water system

(f) Evaluate shallow ground water quality near Paddy's Run

(g) Assess surface water/ground water interaction and shallow flow patterns along Paddy's Run

(h) Assess potential of abandoned and buried Paddy's Run tributaries to provide preferential pathways for subsurface contaminant migration

(i) Prioritized by ORNL for EIS informational needs. Justification unchanged from that given in Ground Water Sampling Plan.

*If shallow aquifer is absent at these sites, then may become 200 Series well.

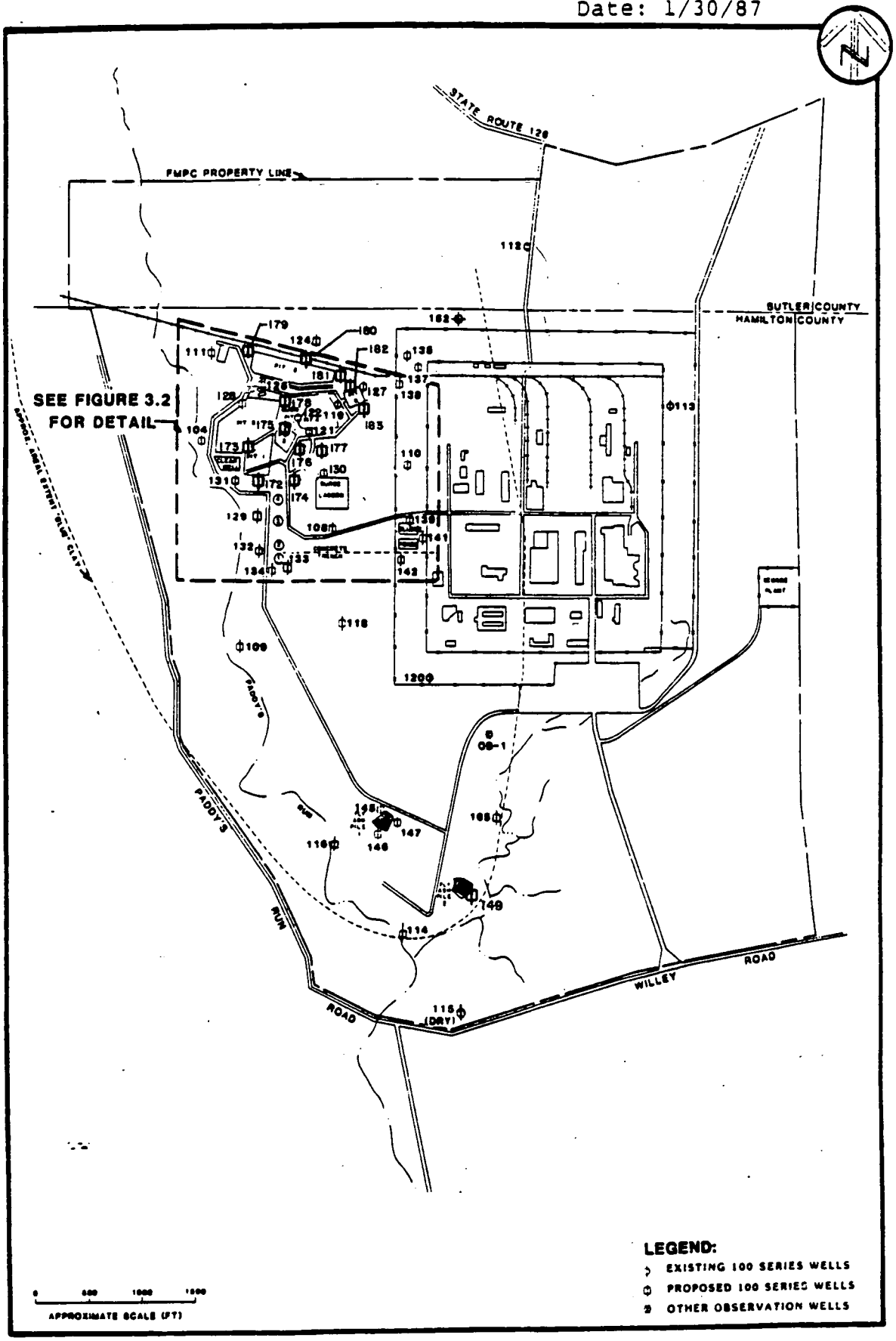

FIGURE 3.1 (MODIFIED)

100 SERIES WELLS- GLACIAL TILL FMPC FACILITY

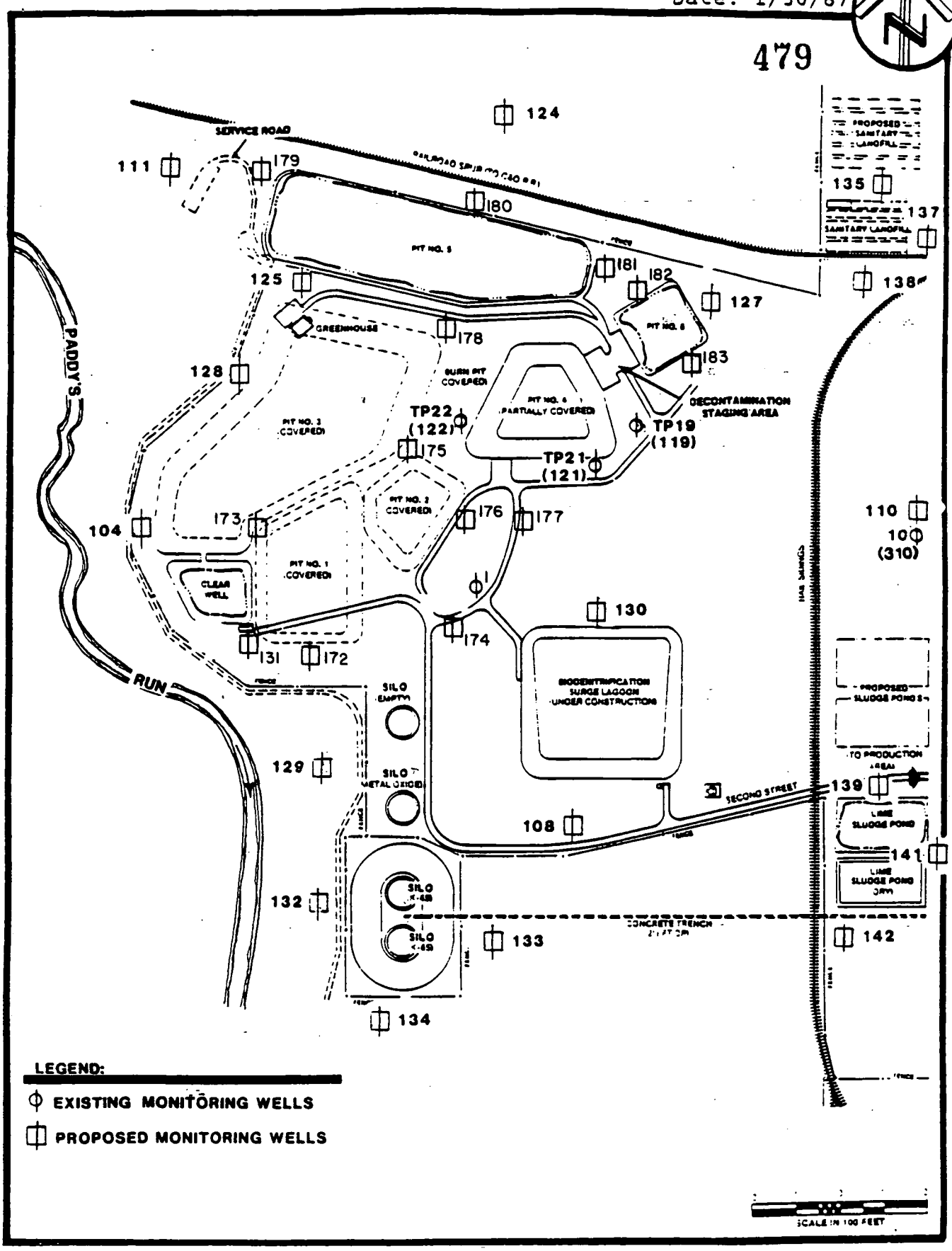

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FIGURE 3.2 (MODIFIED)
100 SERIES WELLS- WASTE MANAGEMENT AREA

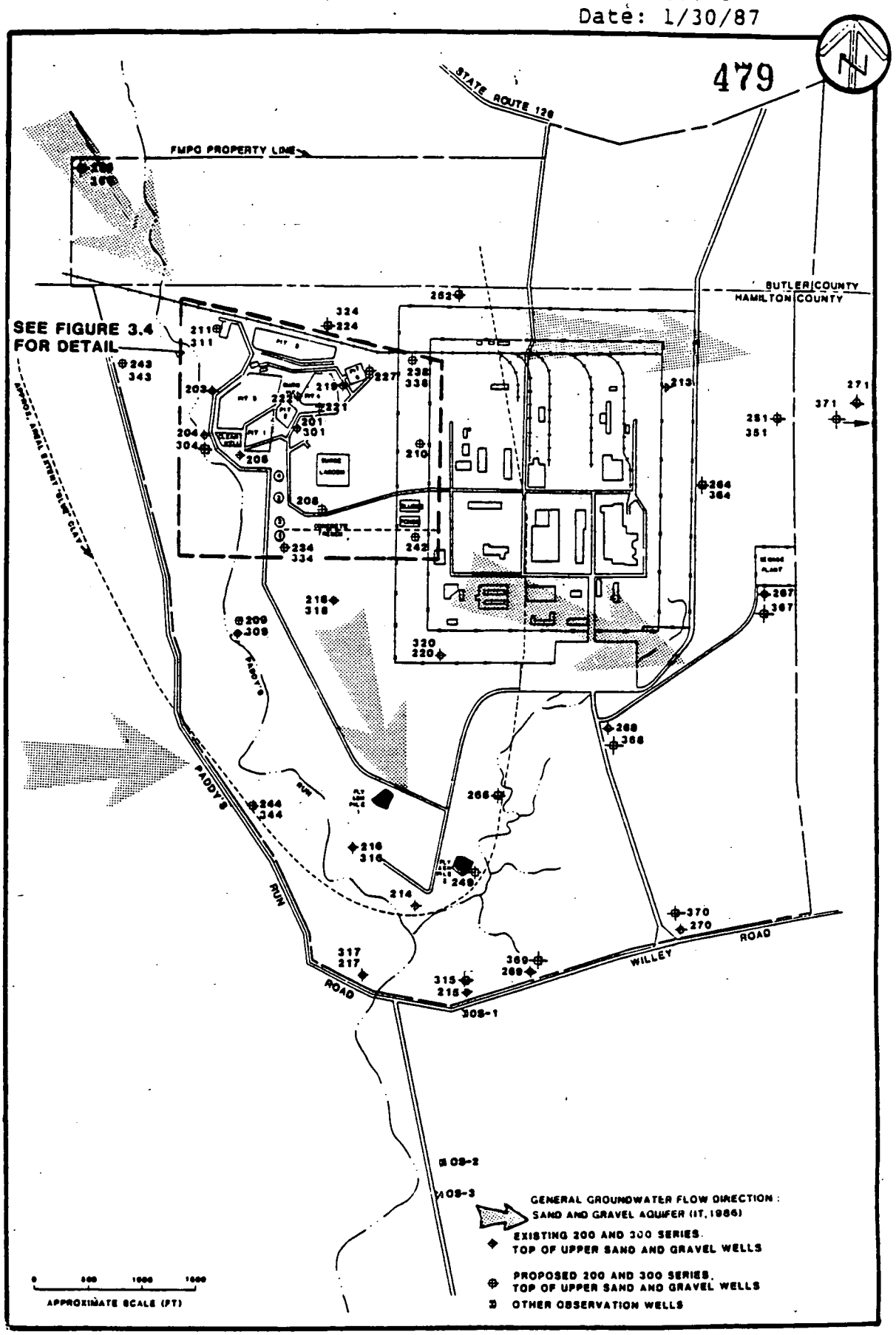


FIGURE 3.3

200 SERIES AND 300 SERIES WELLS - SAND AND GRAVEL AQUIFER FMPC FACILITY

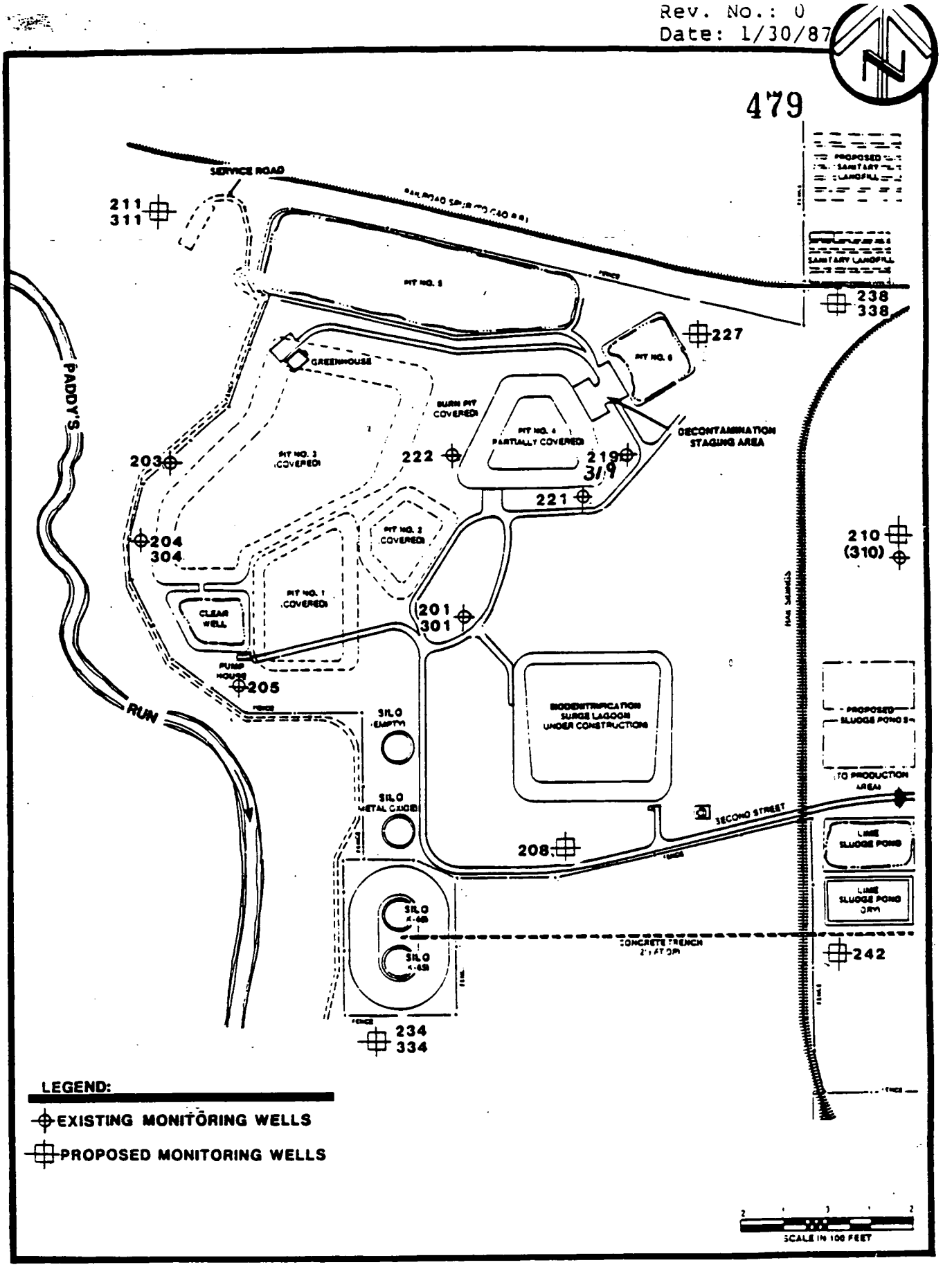


FIGURE 3.4
200 AND 300 SERIES WELLS- WASTE MANAGEMENT AREA

TECHNICAL DATA

VOLCLAY GROUT

A Tighter-Sealing Alternative to Cement and Ready Mix Grouting Materials

DESCRIPTION

Volclay Grout is a high-solids, bentonite clay grout. It utilizes the proven sealing characteristics of bentonite clay to achieve a low permeability seal. The product is easily mixed and placed in the bore hole. It sets up into a clay plug of plastic consistency after 8 hours. Volclay Grout prevents inter-aquifer transfer and groundwater contamination from surface water run-off. It remains flexible and tends to self-seal after movements of the well casing or ground formation, thus providing a more permanent seal than cement.

APPLICATIONS

The Grout is ideally suited for sealing and plugging geo-technical monitoring wells. It is non-contaminating and non-leaching so that it can be used successfully in geo-technical applications where grout contamination must not affect the measurements of strata being tested.

On water wells, the Grout provides an easily-installed, positive well casing seal.

As a hole abandonment seal, the Grout serves as a permanent barrier in all types of geological formations.

The Grout can be used as a remedial sub-grade foundation seal where it provides a water-tight, flexible, non-migratory clay barrier.

ADVANTAGES

- Maintains a tighter seal than cement or cement/bentonite grouts.
- Easy installation — mixes readily, pumps smoothly with existing drill rig equipment.
- Remains pumpable and placeable for 2 hours, assuring a positive grout placement.
- Eliminates grout contamination — non-toxic, non-organic, with a moderate pH. Can be used safely for sensitive sub-strata tests.
- Won't damage PVC pipe since no heat is generated during set-up
- Product bonds to well casing — does not shrink or crack in sub-strata ground formations.
- Does not burn skin, cleans up easily
- Only one-sixth the quantity of Volclay Grout is needed compared to cement to produce an equivalent volume of grout. There's less to carry to a job site, less to mix, less to handle.

AMERICAN COLLOID COMPANY
Water/Mineral Division • One North Arlington • 1500 West Shure Drive • Arlington Heights, Illinois 60004
312/392-4600 • Telex 4330321 • Fax (312) 506-6199

PHYSICAL PROPERTIES

SP.G = 2.5 cm^3

Dry bulk Density: 55#/$ft.^3$

pH: 9 to 10.5

Composition: Bentonite modified to increase the solids and set strength of the Grout.

PERMEABILITY

To measure the sealing performance of Volclay Grout, a 12-inch seal was placed in a simulated well bore with casing and subjected to a 6-foot column of head pressure. By measuring the daily loss of water, the coefficient of permeability was determined using the standard variable head calculation. For comparison, neat cement and nine bag mixes were run under identical conditions to determine their relative sealing efficiency.

Permeability Comparison (PPM)

COP*	CM/SEC
Volclay tablets	1×10^{-8}
Volclay Grout	1×10^{-7}
Cement	1×10^{-5}
Nine sack mix	1×10^{-5}

*Coefficient of permeability. Readings taken after two week equilibrium.

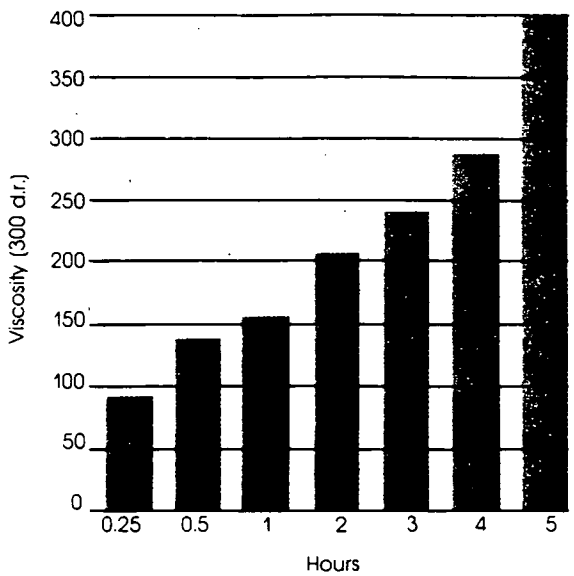
pH of Effluent

Tablet	9.10
Volclay Grout	9.10
Cement	11.22
Bentonite/Cement	12.64

1 2 3 4 5 6 7 8 9 10 11 12 13

VISCOSITY

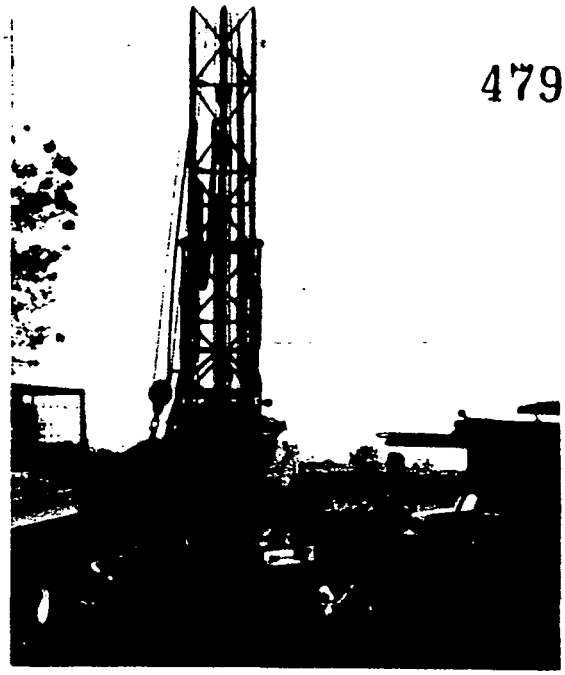
Viscosity vs. Thickening Time



Slurry viscosity increases with time as demonstrated by the above graph of viscosity vs. thickening time. As shown, the viscosity of the slurry increases gradually for a long period of time until it reaches a point at which irreversible setting begins. This time correlates with the amount of time the slurry can be pumped down hole before pump pressure becomes excessive.

USAGE GUIDE

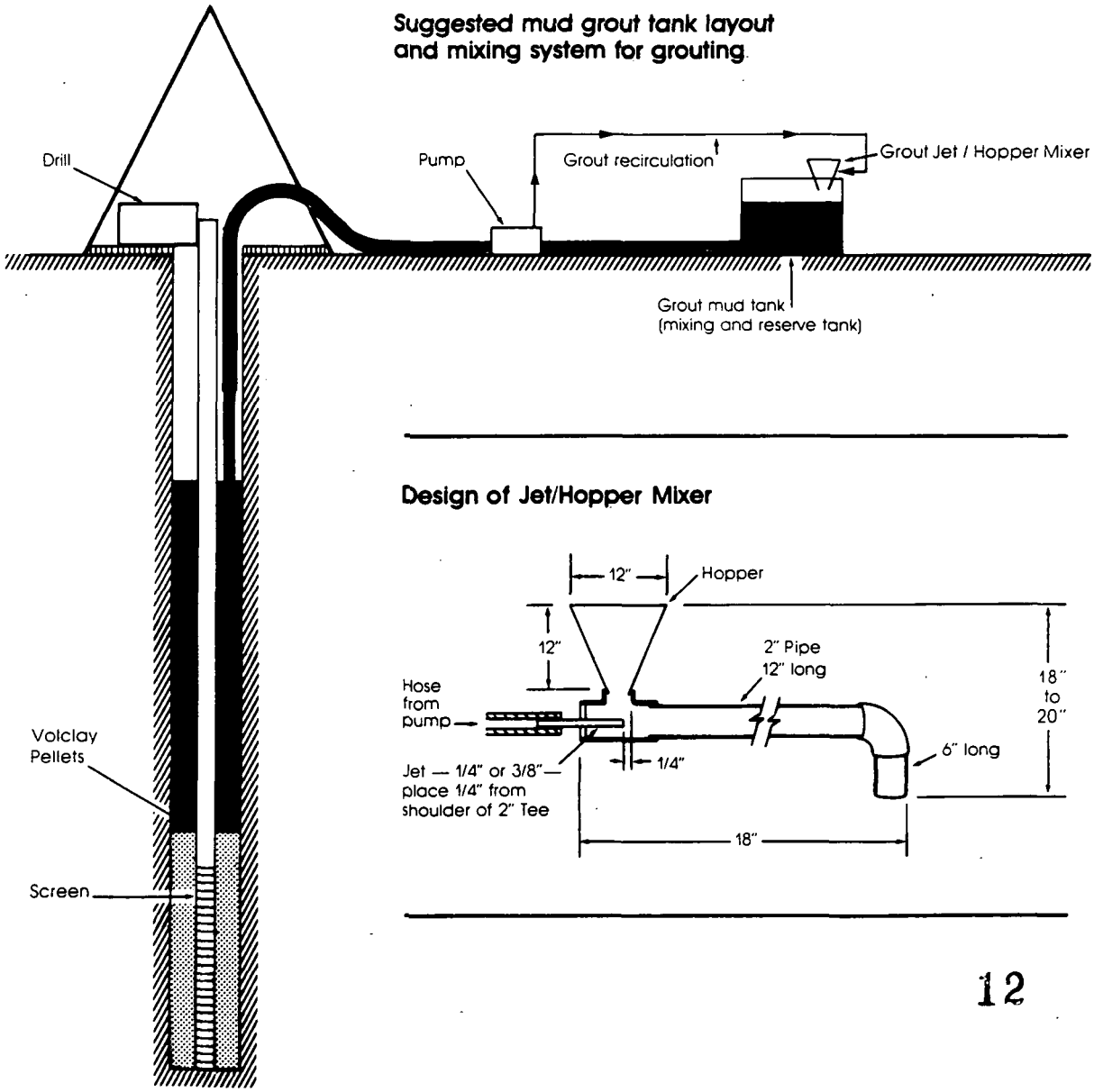
The recommended mix is 2.1 lbs. of Volclay Grout to 1 gallon of fresh water. 14.3 lbs. Volclay Grout mixed with 6.7 gallons of water yields 1 cu.ft. of usable grout. One 52-pound unit of Volclay Grout makes up 3.5 cubic feet of grout slurry. (While a 52 lb. unit of Volclay Grout is normally considered to have a bulk volume of approximately 0.9 cubic feet, its absolute volume is actually 0.32 cubic feet of solids or 2.4 gallons).



MIXABILITY

Volclay Grout mixes with moderate agitation in fresh water. The product is designed to be mixed using existing drill rig equipment. For best results, use a jet-hopper mixer and mud pump recirculation system. High shear mixing equipment will increase viscosity development of the grout slurry, reducing the ultimate work time by up to 20%. Do not exceed maximum recommended amount of mixing water. Follow printed instructions on each package.

Suggested mud grout tank layout and mixing system for grouting

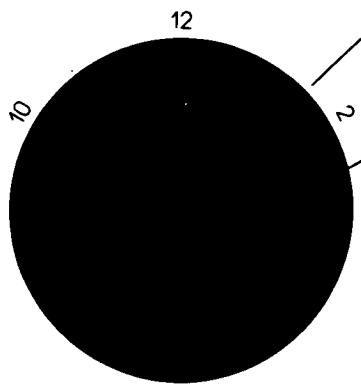


Design of Jet/Hopper Mixer

WORKABILITY & PLACEMENT

Volclay Grout is reliable, behaving in a predictable manner during mixing and placement. It remains workable for two hours. Volclay grout offers the contractor the maximum flexibility to place the Grout using the most economical and reliable method that will result in the highest effective seal, without compromising the in-place properties of the grout. The Grout should be placed in the borehole using the tremie method. For best results use the positive displacement tremie pipe method. All hoses, tubes, pipes, water swivels, drill rods or other passage ways through which the Volclay Grout will be pumped shall have an inside diameter of at least 0.5 inches. For security, a cement cap or native solids should be placed at the interface of the Volclay Grout just below the frost line to protect the seal from damage due to frost heaving and surface traffic damage.

CURING TIME



2 HOURS — Remains pumpable up to 2 hours. Flowable slurry, workable viscosity

AFTER 8-24 HOURS — Initial cure, rigid gel state. Very viscous, unpumpable. Initial set, no longer thixotropic. (Grout no longer deformed when moderate shear applied)

FROM 24-72 HOURS — Final cure, structural strength developed.

GROUT COMPARISONS

Types of Grout	Volclay Grout		Polymer/Bentonite	
Functions				
Low Permeability				
Non Shrink				
Moderate pH				
Mixability				
Workability				
Placeability				
High Quality Installation				
Non-organic				

FIELD TEST

To ensure that the proper Volclay grout-to-water mix has been achieved, measure the grout slurry density using an American Colloid Company mud balance. The density is a measure of weight per unit of volume. Prior to placement of the Volclay Grout, a 9.4 lb. per gallon weight must be achieved.

To ensure a uniform Volclay Grout consistency through out the entire bore hole, retest the Volclay Grout density after it is pumped back to the surface. It must achieve the 9.4 lb. per gallon weight to ensure proper set-up of the Grout.

PACKAGING

Volclay Grout is packaged in 50 lb. bags plus a 2 lb. initiator bag. Product is shipped 48/50 lb. bags plus 48/2 lb. initiator bags per pallet, plastic wrapped.

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AMERICAN COLLOID COMPANY

Volclay® Grout

Product Information

GENERAL DESCRIPTION

Volclay Grout is a high solid bentonite based clay grout, formulated for use as a borehole and well casing seal. It is designed to be a neat cement or bentonite/cement grout replacement. It is easily mixed with fresh water. Remains placeable for up to two hours. After 8 hours sets up into a moderate plastic clay putty material.

PACKAGING

50 lb./multi-wall, water proof bag. Plus a separate 2 lb./plastic intiator bag. Bagged material is shipped 48/50 lb. bags plus 48/2 lb. intiator bags per pallet, plastic wrap. 52lb./6 gal. plastic pail with the separate intiator bag included.

PROPERTIES OF VOLCLAY GROUT

- Has a low permeability 1 x 10^{-7}.
- Stable, does not migrate through coarse soil conditions.
- Eliminates grout contamination. Non-Toxic.
- When set has a moderate pH.
- No heat generation when setting.
- Sets up to a moderate plastic clay putty consistency.

FUNCTIONS OF VOLCLAY GROUT

- Seals all types of boreholes and well casing.
- Provides a positive water tight barrier.
- Can be positively placed ensuring uniform consistent application success.
- Remains flexible; will not shrink or crack below surface soil grade.
- Product will provide a positive high solids seal for Geotechnical Monitoring wells, water well casing and abandoned bore holes.

PHYSICAL PROPERTIES

- SP.G = 2.5 cm.
- Dry bulk density: 55 lb./ft.
- pH 9 to 10.5.
- Composition is Clay based material modified with an initiator.

USAGE GUIDE

- Volclay Grout can be mixed using a Jet/hopper mixer and a mud rotary recirculation system.
- Mix 2.1 lb. Volclay Grout with 1 gal. fresh water.
- 14.3 lb. Volclay Grout mixed with 6.7 gal. water yields 1 cu. ft. of usable grout.
- A 52 lb./bag of Volclay Grout will yield 3.5 cu. ft. of usable grout.

FIELD TEST GUIDE

- To ensure a consistent application mud balance test should be run on each batch mix prior to placement. Volclay Grout slurry weight must achieve a minimum 9.4 lb. per gallon at time of placement.

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technical data

VOLCLAY GROUT CHEMICAL ANALYSIS

GENERAL DESCRIPTION: A Bentonite based product formulated for use as a non-bridging, high solids clay grout.

FUNCTIONAL USE: Useful for sealing and grouting well casings, plugging abandoned wells and waterproofing earthen structures.

CHEMICAL COMPOSITION:

	PERCENT	
SiO_2	56.2	Silica
Al_2O_3	13.6	Alumina
CaO	1.53	Calcium
MgO	5.40	Magnesium
Na_2O	2.92	Sodium Oxide
K_2O	.66	Potassium Oxide
Fe_2O_3	3.07	Iron (Ferric)
TiO_2	.22	Titanium dioxide
Mn_3O_4	.05	Manganese Oxide
P_2O_5	1.22	Phosphorus Pentoxide
L.O.I.	14.8	Loss on Ignition

MOISTURE CONTENT: Maximum 12% as shipped

pH: 5% suspension 9 to 10.5

BULK DENSITY: 55 lbs./cubic ft.

SPECIFIC GRAVITY: 2.5 g/c.c

HANDLING PRECAUTION: Non toxic, avoid breathing dust.

PACKAGING: 50 lb. net wt. paper bag plus 2 lb. initiator bag.

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technical data

LEACHABILITY EVALUATION FOR HEAVY METALS

1. SAFE DRINKING WATER STANDARDS
2. E.P.TOX GUIDE LINES FOR HAZARDOUS WASTE
3. CEMENT LEACHABILITY RESULTS
4. VOLCLAY GROUT RESULTS

CONT	SDWA* mg/l	E.P.TOX. mg/l	CEMENT	VG PC
ARSENIC	0.05	5	0.001	0.006
BARIUM	1	100	<.01	<.01
CADMIUM	0.01	1	0.011	<0.001
CHROMIUM	0.05	5	0.053	0.043
LEAD	0.05	5	0.19	<0.01
MERCURY	0.002	0.2	<.0001	<0.0001
SELENIUM	0.01	1	<.001	<0.001
SILVER	0.05	5	0.028	<0.001

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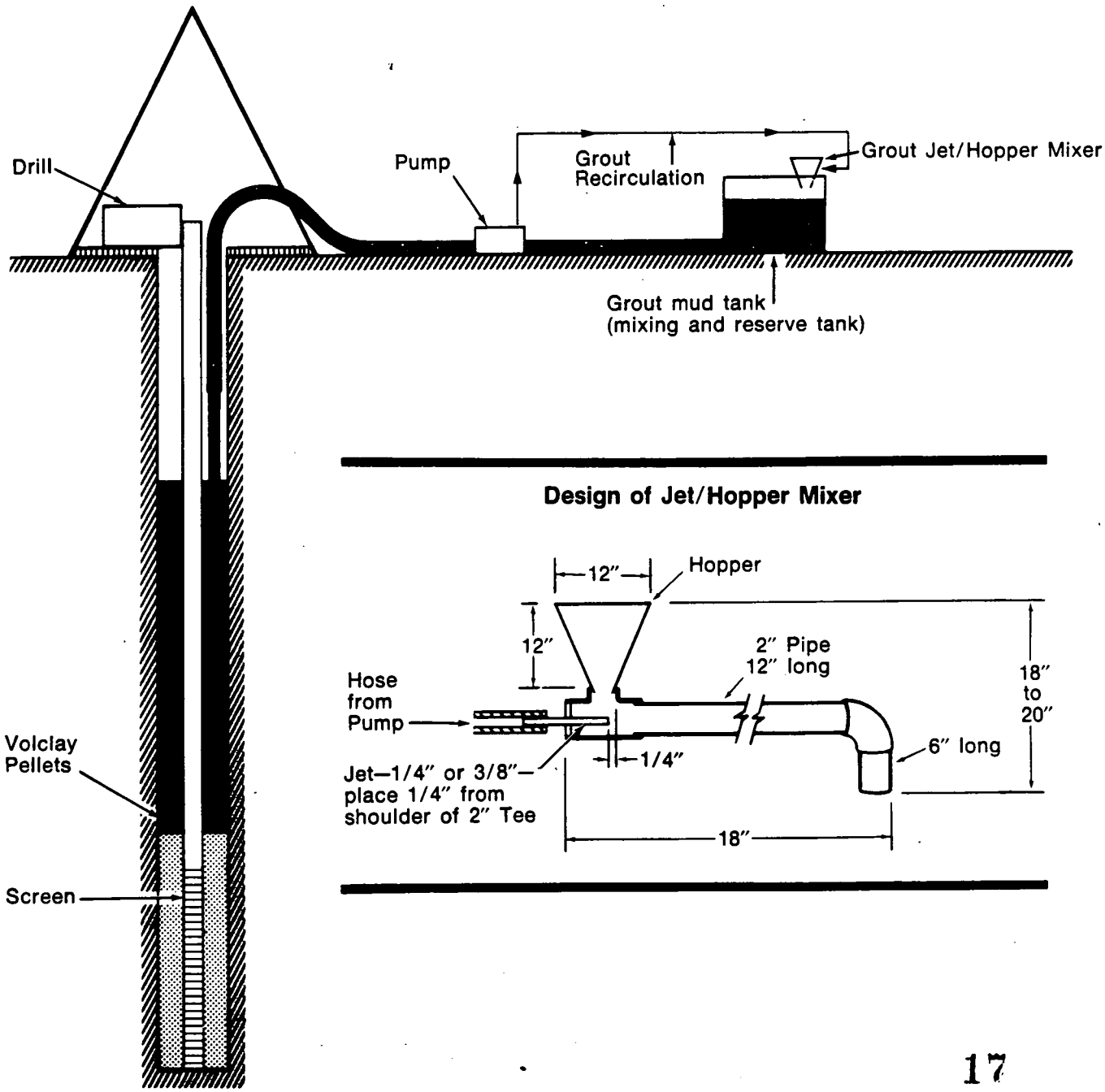
Suggested tank layout and mixing system



Design of Jet/Hopper Mixer

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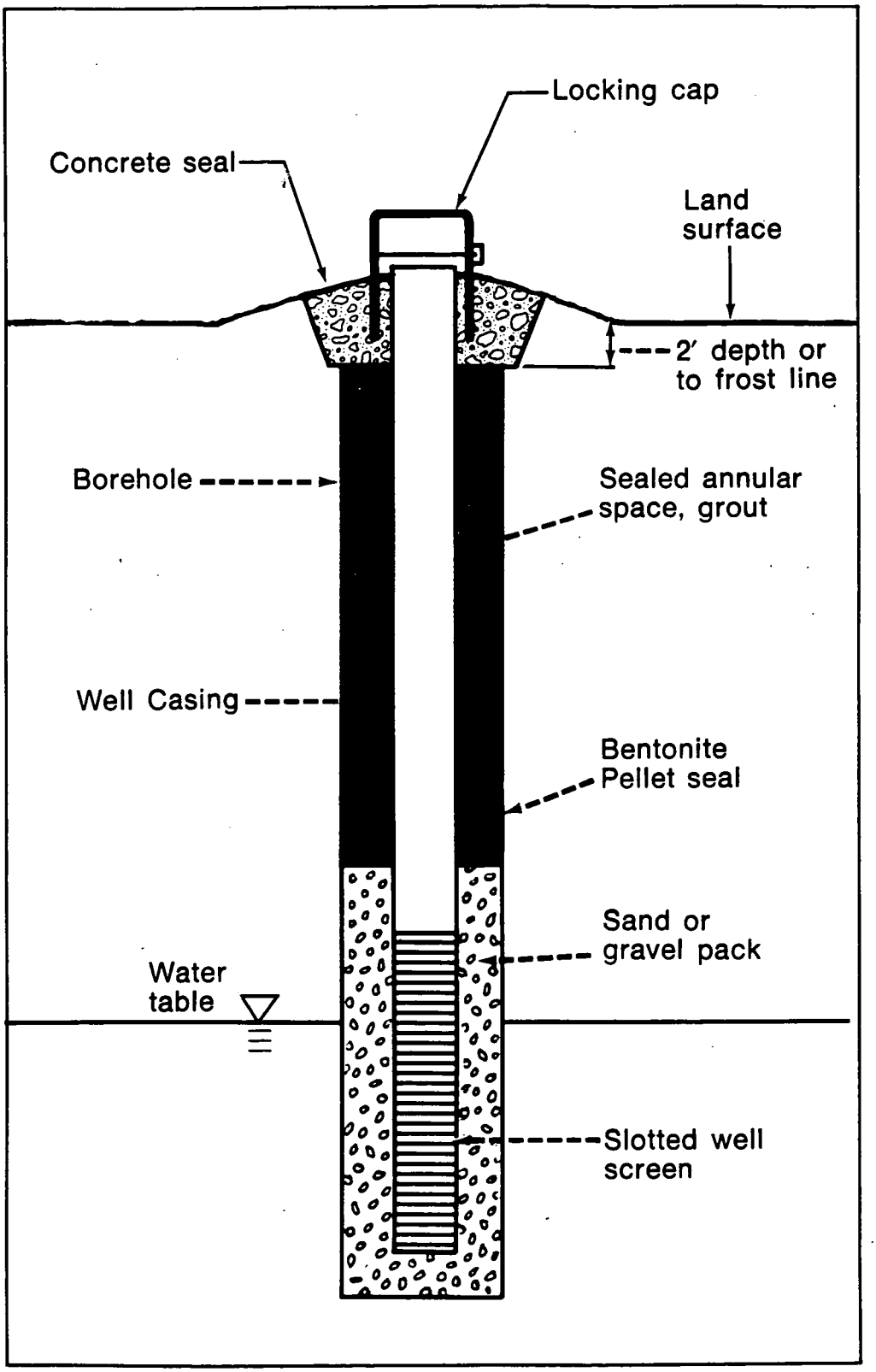
A typical groundwater-monitoring well