

**LANDFILL GROUNDWATER MONITORING WELL
INSTALLATION OVERVIEW & CONSTRUCTION LOGS
ALCOA CLEVELAND WORKS**



DATE: JULY 26, 1994

LANDFILL GROUNDWATER MONITORING WELL INSTALLATION OVERVIEW & CONSTRUCTION LOGS ALCOA CLEVELAND WORKS

INSTALLATION OVERVIEW

Geraghty & Miller (G&M) services were contracted in 1988 to locate and install nine (9) groundwater monitoring wells at our landfill. Initially, nine (9) boreholes were drilled with locations based on information gathered during the preliminary site assessment. These boreholes were converted to monitoring wells. Information gathered during drilling of the boreholes was used to identify the geology beneath the site, including identification of the uppermost aquifer and confining layer. Eight of the boreholes/monitor wells (ie. AL-1, AL-2, AL-3, AL-5, AL-6, AL-7, AL-8, AL-9) are located downgradient and one is located upgradient (ie. AL-4) of the landfill. The monitoring wells were completed in the uppermost aquifer and well construction logs have been provided in this report.

The boreholes and monitoring wells were drilled and installed by Lake Drilling Company of Cleveland, Ohio using hollow stem auger drilling techniques and conventional 4 1/4-inch inner diameter augers. All drilling and well installation was supervised by a G&M hydrogeologist. The wells were constructed of two-inch diameter, flush joint, schedule 40, PVC well casing and a 10 foot section of 0.010-inch slot size PVC well screen. The annular space around the screen was filter packed with clean silica sand to approximately 2 - 3 feet above the top of the screen. A minimum of two feet of certified sodium bentonite pellets was installed directly over the sand pack. A

bentonite/cement grout was placed in the remaining annular space using a tremie pipe. The filter pack, bentonite seal, and grout was installed through the augers to prevent the collapse of surface soil materials from contacting the water-producing formation. The riser pipe was capped with a vented cap to allow equilibration of the water inside the well with atmospheric pressure. A protective steel casing with a locking cap was cemented in place around each well upon completion. The protective casing was painted a fluorescent color, with well identification clearly marked; the locks were brass and keyed-alike. Surface water intrusion was prevented by constructing a sloping pad of cement around the well casing, and extending below the zone of frost heave.

Each monitoring well has a permanent, easily identified reference point from which its water level measurement can be taken. The reference points were established by a licensed surveyor, according to an established National Geodetic Vertical Datum (NGVD).

All monitoring wells were properly screened to assess the contamination levels in the upper most aquifer. Initially, the well depths were estimated to be approximately 40 feet deep, with 10 foot screens. The final depths and screen lengths were determined by actual field conditions based on the following:

- 1) Based on potential pathways of contaminant migration as determined from the field investigation.
- 2) Based on the mobility of the contaminants and other factors influencing the dispersion of the contaminants in the aquifer.
- 3) To allow groundwater sampling under all seasonal water-level conditions.

After installation, all of the monitoring wells were developed to improve the hydraulic connection between the well and water-bearing formation, and to ensure that groundwater samples collected will be representative of natural conditions in the aquifer. Proper well development removes fines from the well screen and surrounding formation, improving the flow and physical quality of the water entering the well. The use of air to develop the wells was prohibited. All well development equipment was decontaminated prior to use in each well, and all water produced was contained in drums on-site.

To minimize the potential for cross contamination, the drilling equipment (split spoons, drill rods, augers, etc.) was steam cleaned prior to drilling each borehole using an approved water source. Similarly, the split-spoon sampler was washed in laboratory grade soap and rinsed with water prior to collecting each sample from the boreholes. The use of water during drilling was restricted to minimize the introduction of contaminants to the groundwater and subsurface sediments. Water added to the boreholes was obtained from local fire hydrants on-site. For quality control purposes, one

water sample was collected from the drillers' water tank and analyzed for VOCs. To remove potential contaminants from well construction materials, the well casings and screens were steam cleaned prior to installation.

After monitoring well installation and well development had been completed, G&M conducted instantaneous displacement tests (slug tests) on selected monitoring wells to obtain estimates of the hydraulic conductivity of the upper aquifer in the study area. Slug tests are a relatively quick method of obtaining approximate values of hydraulic conductivity (K) in the immediate vicinity of the well screen. The tests consisted of displacing a known volume of water in the well with a solid object, or slug, and monitoring the water level response. The rate at which water levels return to their initial or static level is a function of the aquifer's hydraulic conductivity.

WELL CONSTRUCTION LOGS

A geotechnical site plan and copies of the bore hole logs and well construction logs have been provided herein for review.



LEGEND:

- 585 ——— GROUND-WATER ELEVATION CONTOUR
- > GROUND-WATER FLOW DIRECTION
- AL-7 ● MONITORING WELL

FIGURE 1.4-3

PERMIT - TO - INSTALL
ALCOA INDUSTRIAL LANDFILL

GEOTECHNICAL SITE PLAN

DRAWING NO:

DRAWN BY: DATE:

CHECKED BY: DATE:

APPROVED: DATE:



GERAGHTY & MILLER
ENGINEERS, INC.
ANNAPOLIS, MARYLAND

PROJECT NO. OH0414CL02		BORE HOLE NO. A1-1	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME 75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husted	
DATE START/TIME 9-20-88/ 1:30	DATE FINISH/TIME 9-20-88/ 4:00	SURFACE ELEVATION	TOTAL DEPTH 46 feet
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLOT .010

REMARKS

DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	BORE HOLE LOG		SVA/MD (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
	1	can not drive	0.0	Fill: SILT (50%); slag and gravel (40%); tr. sand; dk. grey, damp.		0.0	
5	2	5-7- 4-5	1.0	Fill: SILT (40%); fine sand (30%); v. fine sand (15%); tr. gravel; tr. med. sand; grey damp cohesive.		0.4	
10	3	7-4- 8-9	1.3	Fill: Cinders, slag and gravel; blk. and lt. grey, wet in places.		5.0	
15	4	15-16- 7-9	.5	Fill: Cinders/slag (50%); silt (50%); grey, damp, brick.		1.0	
20	5	6-5- 6-7	.75			1.0	
25	6	3-4- 5-6	2.0	CLAY (50%); silt (40%); tr. gravel; grey, moist, cohesive.		0.0	
	7	2-2- 2-3	2.0	CLAY (50%); silt (40%); tr. gravel; grey, moist and wet.		0.0	
30	8	2-1- 2-2	2.0			0.0	
	9	3-3-	2.0	Same as above, moist.		0.0	

PROJECT NO. OH0414CL02				BORE HOLE NO. A1-1			
PROJECT Alcoa				LOCATION Cleveland			
REMARKS							
DEPTH (FT.)	SAMPLE NO.	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	LITHOLOGIC DESCRIPTION	REMARKS	SVA/PID (PPM)	GRAPHIC LOG
	9	6-7	2.0			0.0	
40	10	7-9- 11-12	2.0	CLAY (50%); silt (40%); tr. gravel, grey, damp and moist.		0.0	
45	11	7-12 14-16	1.8	Till: CLAY (60%); gravel (30%); v. cs. sand (10%); blue grey, dry, hard, shale clasts.		0.0	
50							
55							
60							
65							
70							

PROJECT NO. <u>OH0414CL02</u>		BORE HOLE NO. <u>A1-2</u>	
PROJECT <u>Alcoa</u>		LOCATION <u>Cleveland, Ohio</u>	
DRILLING CONTRACTOR <u>Lake Drilling</u>		DRILLING EQUIPMENT <u>CME-75, Hollow Stem Auger</u>	
HYDROGEOLOGIST <u>George H. Colvin</u>		DRILLER <u>Joe Tosatto/Cris Husted</u>	
DATE START/TIME <u>9-16-88/ 2:40</u>	DATE FINISH/TIME <u>9-19-88/ 3:17</u>	SURFACE ELEVATION	TOTAL DEPTH <u>53 feet</u>
WELL CASING <u>2 inch PVC</u>	SCREEN TYPE <u>2 inch PVC</u>	LENGTH <u>10 feet</u>	SLOT <u>.010</u>

REMARKS

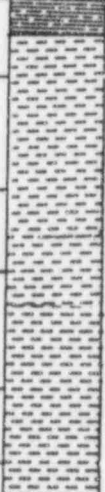
DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	REMARKS (FT.)	BORE HOLE LOG		SVA/MD (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
	1	2-6- 9-11	1.8	Topsoil Fill: SILT (40%); fine sand (35%); clay (10%); tr. cs. sand; tr. med. sand; tr. gravel; brn., damp.		0.0	
5	2	2-3- 3-4	1.4	Fill: Interbedded SILT (70%); tr. clay, tr. fine sand, tr. med. sand, med. brn., damp and well sorted fine sand; wet.		0.0	
10	3	4-8- 9-12	1.8	Fill: SILT (50%); fine sand (15%); v. fine sand; tr. med. sand; med. brn., damp, cinders.		0.3	
15	4	13-20 25-27	1.0	Fill: GRAVEL (35%); silt (40%); fine sand (15%); tr. med. sand, med. brn., grey and black, damp and moist.		0.2	
20	5	9-10- 25-42	1.9	Fill: Fine SAND (40%); silt (30%); v. fine sand (15%); tr. med. sand; tr. gravel; med. brn., damp, cohesive.		6.2	
25	6	9-10- 11-9	0	No sample except cinders		---	
30	7	6-9- 5-6	2.0	CLAY (90%); tr. silt; tr. wood; mottled grey and black.	Natural formation.	0.4	

PROJECT NO. OH0414CL02				BORE HOLE NO. A1-2			
PROJECT Alcoa				LOCATION Cleveland			
REMARKS							
DEPTH (FT.)	SAMPLE NO.	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	LITHOLOGIC DESCRIPTION	REMARKS	OVA/PID (PPM)	GRAPHIC LOG
	8	2-3- 3-4	2.0	SILT (40%); v. fine sand (35%); fine sand (25%); olive grey, wet not saturated		0.0	
40				CLAY (50%); silt (30%); v. fine sand (20%); lt. brn., and olive grey, damp, cohesive.			
	9	6-9- 10-10	2.0			0.0	
45							
	10	3-5- 7-9	2.0	SILT (80%); clay (20%); med. grey and black; moist and slightly wet.		0.0	
50				CLAY (80%); silt (20%); med. grey and dk. grey.			
	11	5-5- 7-9				0.0	
55							
60							
65							
70							

PROJECT NO. OH0414CL02		BORE HOLE NO. A1-3	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME-75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husted	
DATE START/TIME 9-21-88/ 10:00	DATE FINISH/TIME 9-21-88/ 2:00	SURFACE ELEVATION	TOTAL DEPTH 48 feet
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLOT .010 inch

REMARKS

DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	RECOVER (FT.)	BORE HOLE LOG		CWA/PID (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
	1	-	-	Fill and topsoil: SILT (90%); tr. fine sand; dk. brn., damp, organics, Al chips.		0.5	
5	2	2-3- 2-3	.5	Fill: Fine SAND (50%); silt (25%); med. sand; tr. cs. sand; brn. and white, dry, foundry sand, copper wire.		0.1	
10	3	12-13 15-13	.9	Fill: v. fine sand (35%); clay (30%); silt (25%); tr. fine sand; lt. redish brn., damp, cohesive.		0.2	
15	4	12-16- 16-13	2.0	Fill: Fine SAND (30%); silt/clay (25%); gravel (20%); v. fine sand (15%); tr. med. sand; lt. red brn., moist and spotty wet.		0.1	
20	5	6-7- 9-13	2.0			0.1	
25	6	4-4- 4-4	2.0	Fine SAND (40%); v. fine sand (30%); silt (20%); tr. med. sand; red brn. moist and wet	Natural material	0.2	
				CLAY (55%); silt (40%); tr. gravel; dk. grey black, damp, includes organic and a single white well rounded quartz pebble.	canal (?)		
30	7	6-10- 14-14		CLAY (70%); silt (30%); lt. brn., moist and damp with silt layers that are moist.		0.0	

PROJECT NO. OHO414CL02				BORE HOLE NO. A1-3			
PROJECT Alcoa				LOCATION Cleveland			
REMARKS							
DEPTH (FT.)	SAMPLE NO.	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	LITHOLOGIC DESCRIPTION	REMARKS	QVA/PID (PPM)	GRAPHIC LOG
40	8		2.0	SILT (50%); clay (30%); v. fine sand (20%); lt. brn. and lt. grey, moist and spotty wet, cohesive, lt. Fe staining		0.0	
	9	3-5- 8-8	2.0			0.0	
	45						
45	10	3-5- 7-9	2.0	SILT (50%); clay (30%); v. fine sand (20%); lt. brn. and lt. grey, moist and wet.		0.1	
50	End of boring 48 feet						
55							
60							
65							
70							

PROJECT NO. OH0414CL02		BORE HOLE NO. A1-4	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME-75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husted	
DATE START/TIME 9-22-88/ 8:00	DATE FINISH/TIME 9-22-88/ 6:00	SURFACE ELEVATION	TOTAL DEPTH 72 feet
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLOT .010

REMARKS

DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	BORE HOLE LOG		CWA/PID (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
5	1	6-7- 7-8	1.3	Fill: SILT (60%); gravel including cinders (20%); tr. fine sand; tr. med. sand; brn. and blk., damp and moist, organics.		0.5	
10	2	4-13- 16-15	1.0	Fill (foundary sands): Fine SAND (70%); tr. med. sand; tr. cs. sand; blk., grey, and coffee sand, damp, well sorted, including cinders and aluminum shavings, foundary sands.		13.5	
15	3	3-3- 5-3	1.8			13.0	
20	4	2-2- 3-3	2.0			19.0	
20	5	15- 15 1/4"	.75	Fill: SILT (60%); fine sand (20%); med. sand (15%); tr. cs. sand; brn., moist with interbedded cinders and slag.		20	
25	6	7-6- 7-8	0.3	Fill (foundary sands): same as above; dark coffee colored, damp.		8.8	
30	7	4-8- 10-8	1.9	Fill: CLAY (65%); gravel including cinders (15%); silt (10%); tr. fine and med. sand, lt. brn., damp.		1.0	

PROJECT NO. <u>OH0414CL02</u>					BORE HOLE NO. <u>Al-4</u>		
PROJECT <u>Alcoa</u>					LOCATION <u>Cleveland</u>		
REMARKS							
DEPTH (FT.)	SAMPLE NO.	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	LITHOLOGIC DESCRIPTION	REMARKS	OWA/PID (PPM)	GRAPHIC LOG
	8	6-8- 10-12	2.0	Fill: CLAY (65%); silt (20%); gravel (including cinders 10%); tr. fine sand; greenish brn., damp, cohesive.		0.6	
40	9	3-5- 7-5	1.8	Fill: SILT (40%); gravel (30%); v. cs. sand (15%); cs. sand (10%); tr. fine and med. sand, wet black, swamp liquids.		1.0	
45	10	4-6- 7-8	2.0	Fill: CLAY (40%); silt (30%); v. cs. sand (including cinders 15%); v. fine sand (15%); dk. olive grey and black, damp, includes brick material		0.5	
50	11	3-4 6-9	2.0	CLAY (60%); silt (30%); tr. v. fine sand; lt. brn. and grey mottled, damp, cohesive.		0.3	
55	12	2-3- 4-6	2.0	SILT (55%); clay (35%); tr. v. fine sand; med. grey, moist and spotted wet, cohesive.		0.3	
60	13	-	-			0.3	
65	14	5-5- 10-13	1.8	Till: CLAY (60%); v. cs. sand (20%); gravel (10%); tr. cs. and med. sand; lt. grey with pink and blue grey clasts, damp, cohesive.		0.2	
70	15	pushed	2.0	CLAY (90%); tr. silt; grey, damp.		0.2	
				End of boring 72'			


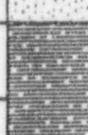
PROJECT NO. OH0414CL02		BORE HOLE NO. A1-5	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME-75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husted	
DATE START/TIME 9-15-88/ 8:15	DATE FINISH/TIME 9-15-88/ 11:30	SURFACE ELEVATION	TOTAL DEPTH 79 feet
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLOT .010

REMARKS

DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	BORE HOLE LOG		CWA/PID (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
	1	9-9- 6	1.0	Topsoil and fill: SILT (70%); v. fine sand (20%); fine sand (10%); black damp, organics		0.1	
5				Fine SAND (90%); tr. gravel; grey white and brown, damp, well sorted, rounded; fill foundary sand.			
	2	5-7- 6-3	1.5		water at 8-8.5'	1.0	
10					Natural formation		
	3	5-7- 10-12	1.8	CLAY (80%); silt (20%); med. brn. and grey mottled; damp, v. cohesive.		4.0	
15							
	4	4-4- 5-5	1.8			0.9	
20							
	5	1-1- 2-2	2.0	SILT (40%); clay (30%); v. fine sand (30%); olive grey, moist-wet.		1.1	
25							
	6	1-1- 2-2	2.0			0.6	
	7	1-2- 2-2	2.0	SILT (50%); v. fine sand (20%); clay (30%); moist-damp, dk. olive grey.		0.5	
30				End of Boring 29'			



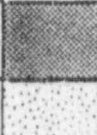
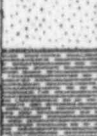
PROJECT NO. OH0414CL02		BORE HOLE NO. A1-6	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME-75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husted	
DATE START/TIME 9-20-88/ 8:10	DATE FINISH/TIME 9-20-88/ 12:10	SURFACE ELEVATION	TOTAL DEPTH 22 feet
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLIT .010 inch

REMARKS

DEPTH (FT.)	SAMPLE (IN.)	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	BORE HOLE LOG		SVA/PID (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
5	1	1-2 2-6	1.0	Topsoil: SILT (80%); tr. v. fine sand; med. brn., damp	Natural formation	0.1	
				Foundary sands: Fine SAND (60%); v. fine sand (20%); med. sand (15%); tr. wood and brick, med. brn., damp well sorted			
	2	3-3 4-4	1.2	SILT (45%); v. fine sand (35%); clay (20%); med. red brn., damp, cohesive, slight grey mottling.		0.4	
10	3	2-4 2-3	1.2	Fine SAND (70%); med. sand (15%); v. fine sand (10%); tr. silt; lt. red brn., damp, v. well sorted, sl. Fe staining.		0.5	
15	4	2-3 5-4	1.0	med. SAND (30%); cs. sand (25%); fine sand (20%); gravel (15%); tr. silt, brn. wet.		0.6	
20	5	3-8 9-10	2.0	CLAY (65%); silt (35%); grey, damp-moist, cohesive.		0.0	
25				End of boring 23'			
30							

PROJECT NO. OH0414CLO2		BORE HOLE NO. A1-7	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME-75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husted	
DATE START/TIME 9-14-88/ 8:30	DATE FINISH/TIME 9-14-88/ 11:00	SURFACE ELEVATION	TOTAL DEPTH 24 feet
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLOT .010

REMARKS

DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	BORE HOLE LOG		GVA/PID (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
5	1	2-5- 8-8	1.0	SILT (70%); clay (20%); tr. fine sand; lt. brn., damp, cohesive, organics.	water at 11'	0.0	
	2	5-8- 9-9	1.0			0.8	
	3	3-3- 3-4	1.5	SILT (60%); v. fine sand (25%); clay (15%); brn., damp, cohesive.		0.0	
10	4	2-2- 2-3	1.9	v. fine SAND (60%); fine sand (25%); silt (15%); brn., and rust, damp, Fe staining.		0.0	
	5	2-2- 3-3	2.0	SILT (70%); v. fine sand (30%); grey, moist-wet, organics		0.0	
	6	1-1- 2-2	2.0			0.1	
15	7	1-1- 2-2	2.0			0.0	
	8	1/1'- 1-3	1.6	Fine SAND (55%); v. fine sand (25%); tr. silt; tr. med. sand grey, wet.		0.2	
	9	2-2- 2-3	1.3	Med. SAND (40%); fine sand; (30%); v. fine sand (20%); tr. silt, grey, wet.		0.4	
20	10	1-1- 1-2	1.0			0.4	
	11	2-2- 3-5	1.1	CLAY (75%); silt (20%); tr. gravel; grey, damp, cohesive.		0.0	
	12	2-3- 5-6	1.4			0.0	
25				End of boring at 24'			
30							

PROJECT NO. OH0414CL02		BORE HOLE NO. A1-8	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME-75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husted	
DATE START/TIME 9-14-88/ 12:40	DATE FINISH/TIME 9-14-88/ 3:18	SURFACE ELEVATION	TOTAL DEPTH
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLOT .010

REMARKS

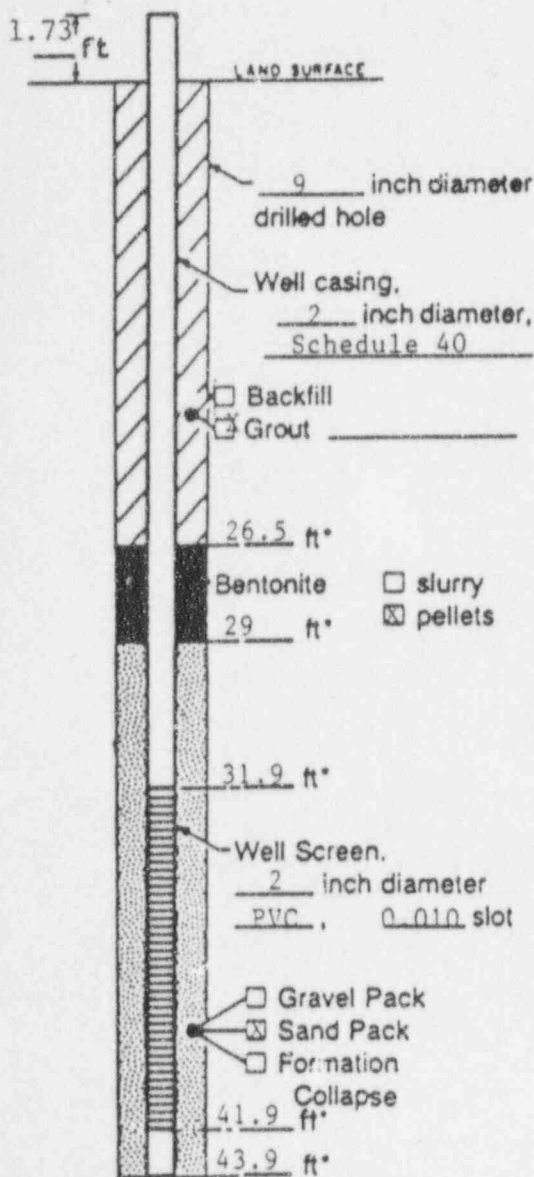
DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	BORE HOLE LOG		GVA/PIC (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
	1	2-4- 7-12	2.0	Topsoil: SILT (50%); clay (40%); tr. v. fine sand; med. brn., grey, damp.		0.0	
5	2	2-3- 3-4	2.0	CLAY (60%); silt (35%); tr. v. fine sand; med. grey, damp, organics, slight mottling.		0.2	
10	3	1-1- 2-3	1.9			0.0	
15	4	2-2- 3-2	1.3	Fine SAND (50%); medium sand (30%); tr. fine sand; tr. silt; grey and Fe stained, wet.		0.0	
20				v. fine SAND (80%); tr. silt; tr. fine sand, grey, wet.			
	5	1-1- 2-3	2.0	GRAVEL (30%); v. cs. sand (25%); cs. sand (20%); med. sand (15%); tr. fine sand; tr. silt; dk. grey, wet.		0.0	
25	6	2-3- 5-7	1.8	CLAY (90%); silt (10%); grey, damp.		0.0	
30				End of boring 26'			

PROJECT NO. OH0414CL02		BORE HOLE NO. A1-9	
PROJECT Alcoa		LOCATION Cleveland	
DRILLING CONTRACTOR Lake Drilling		DRILLING EQUIPMENT CME-75, Hollow Stem Auger	
HYDROGEOLOGIST George H. Colvin		DRILLER Joe Tosatto/Cris Husred	
DATE START/TIME 9-13-88/ 11:08	DATE FINISH/TIME 9-13-88/ 2:49	SURFACE ELEVATION	TOTAL DEPTH 26 feet
WELL CASING 2 inch PVC	SCREEN TYPE 2 inch PVC	LENGTH 10 feet	SLOT 0.010

REMARKS

DEPTH (FT.)	SAMPLE (NO.)	BLOW COUNT PER 6 IN.	RECOVERY (FT.)	BORE HOLE LOG		OVA/PID (PPM)	GRAPHIC LOG
				LITHOLOGIC DESCRIPTION	REMARKS		
				SILT (80%); tr. fine sand; tr. med. sand; dk. brn., dry			
	1	7-8-11-11	1.7	SILT (90%); tr. fine sand, med. brn., damp, cohesive.		2.0	
5	2	5-6-6-7	1.7			0.2	
	3	3-3-4-6	1.8	Interbedded v. fine sand and silt		0.2	
	4	2-3-3-4	1.8	Fine SAND (60%); med. sand (20%); tr. v. fine sand; tr. silt; red brn., damp, well sorted, Fe staining.		0.1	
10	5	2-3-2-3	1.5	SILT (80%); v. fine sand (20%); med grey, moist, Fe staining.		0.0	
	6	1-1-1-2	1.9			0.0	
15	7	1-1-2-2	2.0	v. fine SAND (60%); fine sand (30%); tr. silt; grey and red brn., wet.		0.0	
	8	1-1-1-1	1.9			0.0	
	9	1-3-3-3	1.5	Cs. SAND (35%); gravel (20%); silt (15%); med sand (15%); v. cs. sand (10%); tr. fine sand; grey wet, large wood fragments.		0.1	
20	10	1-2-4-5	1.7			0.1	
	11	5-3-6-5	1.5			0.2	
25	12	3-5-8-9	1.2	CLAY (80%); silt (20%); med. grey, damp, cohesive.		0.1	
				End of boring 26'			
30							

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Alcoa Well A1-1

Town/City Cleveland

County Cuyahoga State Ohio

Permit No. _____

Land-Surface Elevation

and Datum 610.73 feet

☒ surveyed

mean sea level

☐ estimated

Installation Date(s) 9/20/88

Drilling Method Hollow Stem Auger

Drilling Contractor Lake Drilling

Drilling Fluid none

Development Techniques(s) and Date(s)

PVC Bailer 9/88

Fluid Loss During Drilling none gallons

Water Removed During Development 8 gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm

Date _____

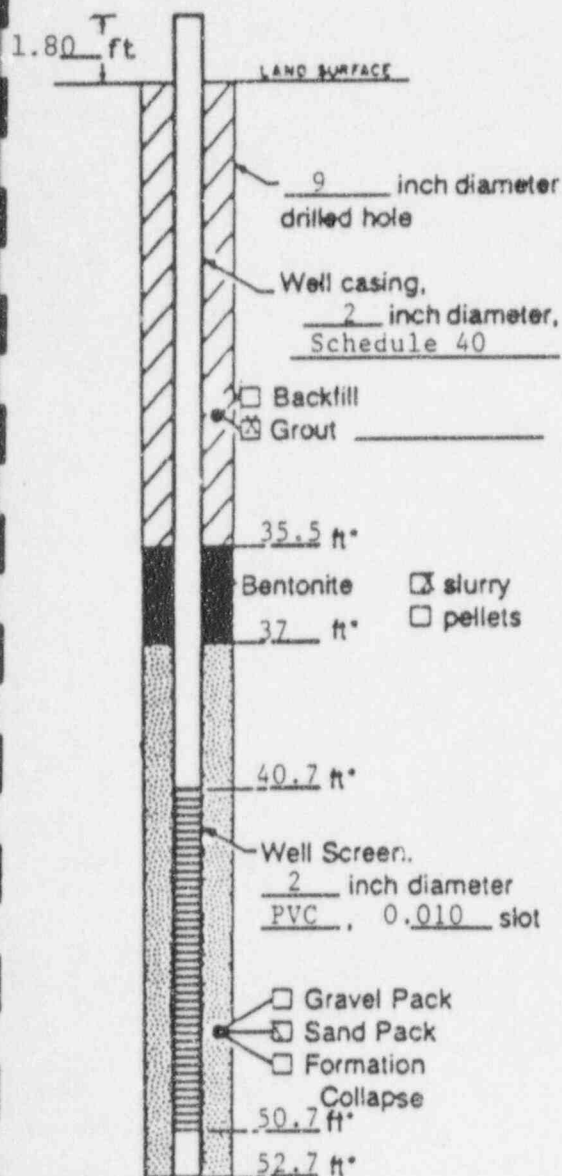
Specific Capacity _____ gpm/ft

Well Purpose Monitor well

Remarks Last sample 44-46 feet. Augered to 44.

Prepared by George H. Colvin

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Alcoa Well A1-2

Town/City Cleveland

County Cuyahoga State Ohio

Permit No. _____

Land-Surface Elevation

and Datum 618.25 feet

mean sea level

☒ surveyed

☐ estimated

Installation Date(s) 9/16/88 - 9/19/88

Drilling Method Hollow Stem Auger

Drilling Contractor Lake Drilling

Drilling Fluid none

Development Technique(s) and Date(s)

PVC hand pump and bailer

Fluid Loss During Drilling none gallons

Water Removed During Development 25.5 gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm

Date _____

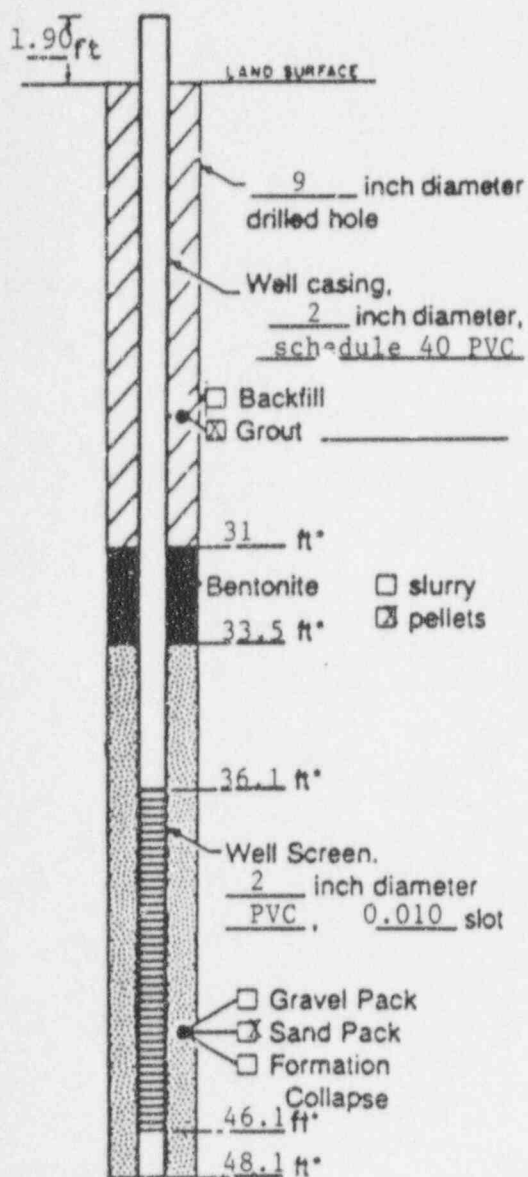
Specific Capacity _____ gpm/ft

Well Purpose Monitor well

Remarks Flush hole through augers with 40 gallons of water because water became too thick with clay to allow sand to settle. Two-foot sediment trap from 50.7 - 52.7 feet.

Prepared by George H. Colvin

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Alcoa Well A1-3

Town/City Cleveland

County Cuyahoga State Ohio

Permit No. _____

Land-Surface Elevation and Datum 622.80 feet ☒ surveyed
mean sea level ☐ estimated

Installation Date(s) 9/21/88

Drilling Method Hollow Stem Auger

Drilling Contractor Lake Drilling

Drilling Fluid none

Development Technique(s) and Date(s)
PVC bailer

Fluid Loss During Drilling _____ gallons

Water Removed During Development 27 gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm Date _____

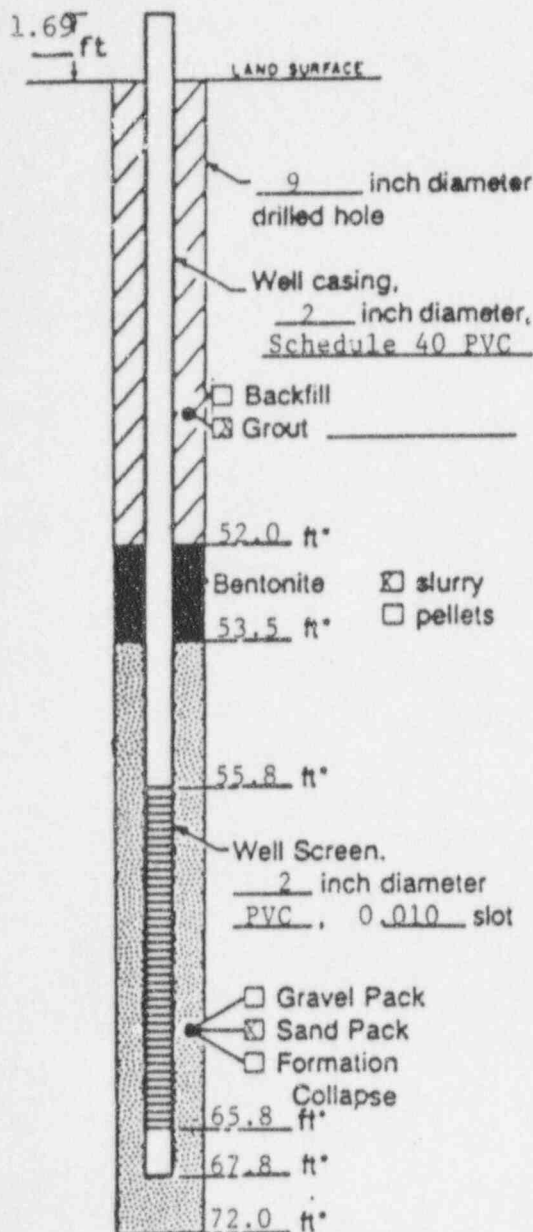
Specific Capacity _____ gpm/ft

Well Purpose Monitor well

Remarks Two-foot sediment trap from 46.1 - 48.1 feet.

Prepared by George H. Colvin

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Alcoa Well A1-4

To/In City Cleveland

County Cuyahoga State Ohio

Permit No. _____

Land-Surface Elevation and Datum 658.07 feet ☒ surveyed ☐ estimated

Installation Date(s) 9/22/88

Drilling Method Hollow Stem Auger

Drilling Contractor Lake Drilling

Drilling Fluid none

Development Technique(s) and Date(s) PVC bailer

Fluid Loss During Drilling none gallons

Water Removed During Development 38 gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm Date _____

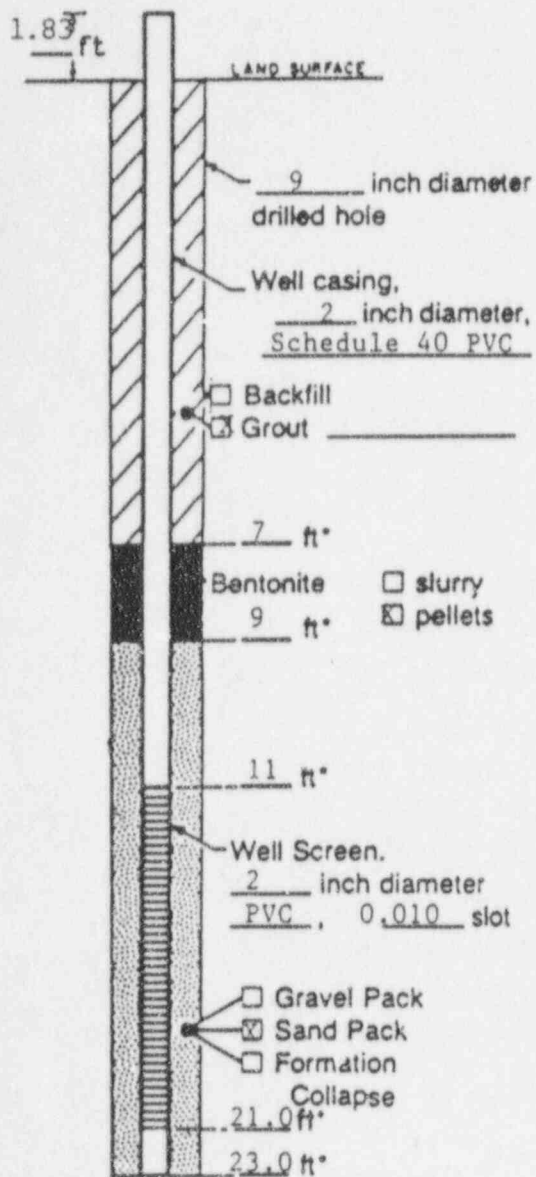
Specific Capacity _____ gpm/ft

Well Purpose Monitor well

Remarks Flushed hole with 40 gallons of water through augers because water became too thick with clay to allow sand to settle.

Prepared by George H. Colvin

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Alcoa Well A1-6

Town/City Cleveland

County Cuyahoga State Ohio

Permit No. _____

Land-Surface Elevation and Datum 587.44 feet ☒ surveyed ☐ estimated
mean sea level

Installation Date(s) 9/20/88

Drilling Method Hollow Stem Auger

Drilling Contractor Lake Drilling

Drilling Fluid none

Development Techniques(s) and Date(s)
Centrifugal pump

Fluid Loss During Drilling _____ gallons

Water Removed During Development 300 gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm Date _____

Specific Capacity _____ gpm/ft

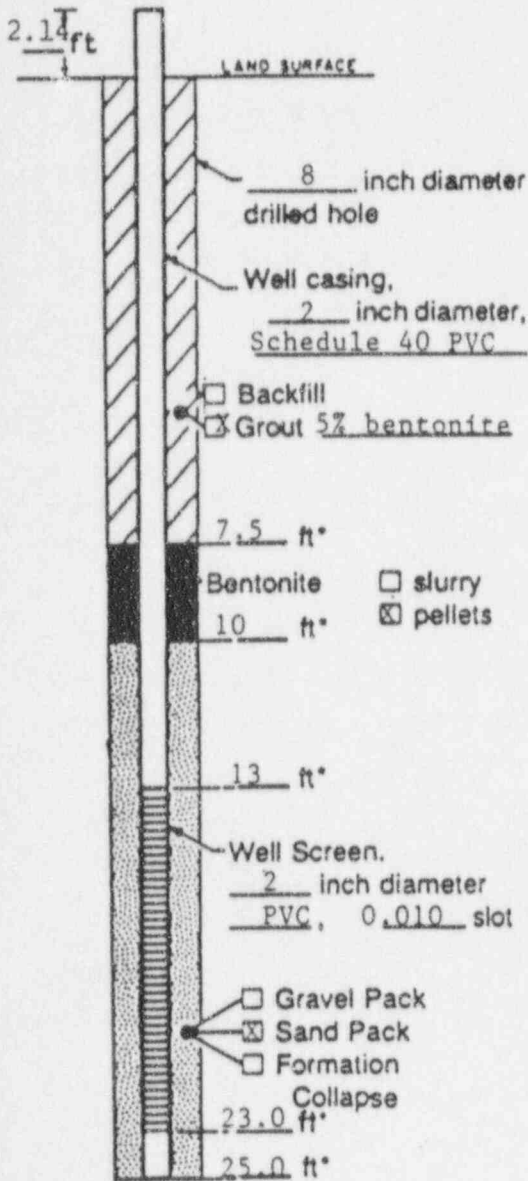
Well Purpose Monitor well

Remarks Sediment trap from 21 - 23 feet.

Prepared by George H. Colvin

Prepared by George H. Colvin

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

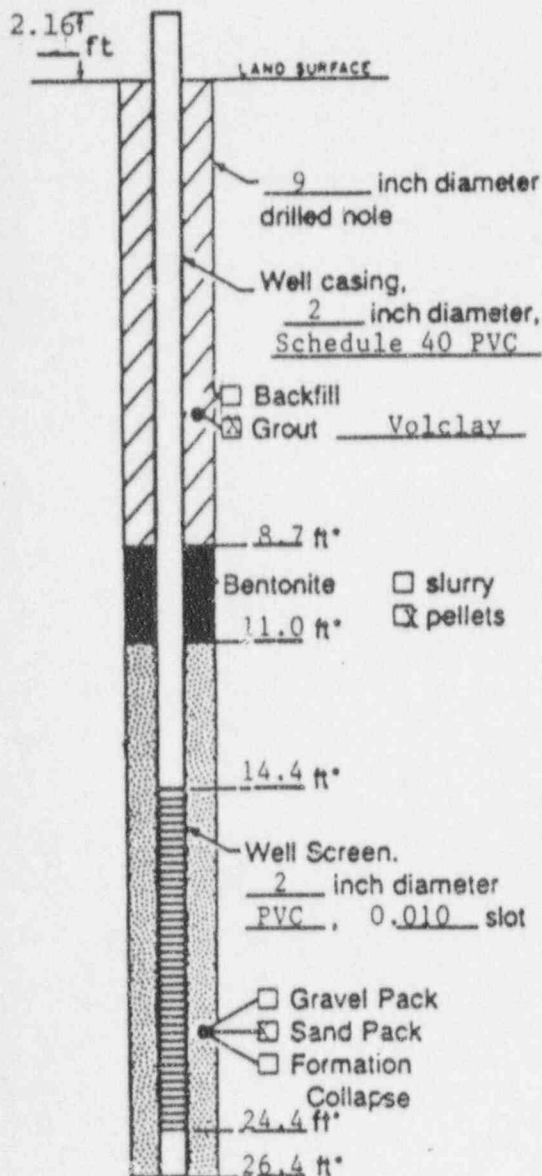
* Depth Below Land Surface

Project Alcoa Well A1-8
Town/City Cleveland
County Cuyahoga State Ohio
Permit No. _____
Land-Surface Elevation and Datum 589.08 feet ☒ surveyed
mean sea level ☐ estimated
Installation Date(s) 9/14/88
Drilling Method Hollow Stem Auger
Drilling Contractor Lake Drilling
Drilling Fluid none
Development Techniques(s) and Date(s) Centrifugal pump
Fluid Loss During Drilling none gallons
Water Removed During Development 510 gallons
Static Depth to Water _____ feet below M.P.
Pumping Depth to Water _____ feet below M.P.
Pumping Duration _____ hours
Yield _____ gpm Date _____
Specific Capacity _____ gpm/ft
Well Purpose Monitor well

Remarks Sediment trap from 23 - 25'

Prepared by George H. Colvin

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Alcoa Well A1-9

Town/City Cleveland

County Cuyahoga State Ohio

Permit No. _____

Land-Surface Elevation
and Datum 589.24 feet
mean sea level

☒ surveyed
☐ estimated

Installation Date(s) 9/13/88

Drilling Method Hollow Stem Auger

Drilling Contractor Lake Drilling

Drilling Fluid none

Development Technique(s) and Date(s)

Centrifugal pump

Fluid Loss During Drilling 312 gallons

Water Removed During Development _____ gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm Date _____

Specific Capacity _____ gpm/ft

Well Purpose Monitor well

Remarks Two foot sediment trap from 24.4 to 26.4 feet.

Prepared by George H. Colvin