Weiss Associates *Environmental and Geologic Services*

5500 Shellmound Street, Emeryville, CA 94608-2411 *Fax: 510-547-5043* *Phone: 510-450-6000*

August 8, 1997

Scott Seery
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay parkway, 2nd Floor
Alameda, California, 94502

RE: **Vapor Pathway Survey**
Former Chevron Service Station #9-5607
5269 Crow Canyon Road
Castro Valley, California
WA Job #4-1129-71

Dear Mr. Seery:

On behalf of Chevron Products Company (Chevron), Weiss Associates (WA) has completed a vapor pathway survey for the above referenced site. The survey was conducted to identify possible preferential vapor transport pathways that may intersect condominium units in the Forest Creek Townhomes complex located on Waterford Place in Castro Valley California (Figure 1). The survey consisted of collecting parcel plans from the City of Castro Valley Building Department (CVBD) and contacting utility services to determine the locations and depths of underground conduits in the vicinity of Townhome units 1 through 9. Utility service information was combined with soil boring and hydrocarbon sampling information to prepare cross sections indicating the location of the utility conduits, hydrocarbon impact, site lithology and the Townhomes. The information collection process and sources are presented below followed by a discussion of the cross section figures.

Vapor Pathway Data Collection

WA obtained a copy of the sewer service and storm drain design plans for Forrest Creek Townhomes units 1 through 9 from CVBD. These plans depict the locations, material specifications and depth of burial of sewer service and storm drain piping in the vicinity of the Townhome units. Only the sewer service piping was shown to intersect the Townhomes Units. The location of the sewer service piping is depicted in plan view in Figure 1. On June 30, 1997, David Charles of WA contacted Roland Williams of the Castro Valley Sanitary District (CVSD) by telephone to determine whether the plans obtained from CVBD accurately depict the locations and depths of the sewer service piping. On July 2, 1997, David Charles of WA sent a FAX transmittal of the plans to Roland Williams of CVBD. Roland Williams verified that the sewer service piping was located as indicated in the plans.

David Charles of WA contacted Pacific Gas and Electric Company (PGE), East Bay Municipal Utilities District (EBMUD) and Pacific Bell to determine the locations and depths of other underground conduits that may intersect the Townhomes Units. PGE was able to roughly specify the location and diameter of natural gas and electrical service piping but was not able to specify a depth of burial. EBMUD also specified the diameter and general location of water supply piping but was unable to specify depth of burial. Pacific Bell did not offer information about conduit location or depth of burial. The typical burial depth of gas, electric, water and telephone service conduit is approximately 24 inches below ground surface. A line locator service may help to determine the lateral location of these services but excavation is likely the only way to obtain depth of burial.

Vapor Pathway Figures

The locations of sewer service piping intersecting Forest Creek Townhomes Units 1 through 8 are depicted in Figure 1. A plan view of cross sections A-A', B-B', C-C', D-D' and E-E' is also depicted in Figure 1. The cross sections are shown in Figures 2, 3, 4 and 5. Review of the cross section figures indicates that:

- There is no potential for preferential vapor transport into Townhomes Unit #9 (Figure 2, Cross Section A-A'). Impacted soil or ground water is not present in the vicinity of the sewer service conduit.

- There is little potential for preferential vapor transport into Townhomes Unit #4 (Figure 3, Cross Section B-B'). Approximately 5 feet of clean clay/silt separates the deepest portion of the sewer service piping and impacted ground water or soil.

- There may be a potential for preferential vapor transport into Townhomes Unit #1 (Figure 4, Cross Section C-C'). Impacted ground water or soil may intersect the base of the sewer service conduit within a region of silty/clayey sand or gravel. However, the exact lithology near the deepest section of this pipe is unknown (Figure 5, Cross section E-E').

No attempt was made to sketch gas, electric, water or telephone conduits due to the lack of precise location and depth information and due to the shallow depths these conduits are typically buried. Preferential vapor transport paths are probably not complete for gas, electric, water or telephone conduits because they are not likely buried deep enough (approximately 24 inches below ground surface) to connect impacted soil or ground water with the Townhomes units. The sewer service piping was investigated in the greatest detail because it is a hydraulic gravity feed system requiring sloped burial at significantly greater depths.

Conclusions

Preferential vapor transport pathways are not likely to be present at the Forest Creek Townhomes. Generally, impacted ground water or soil is several feet deeper than the conduits identified in this survey. There is no potential for vapor transport into Townhomes Unit #8 and little

potential for vapor transport into Unit #4. Some potential for preferential vapor transport exists at the deepest end of the sewer service that leads into Townhomes Unit #1.

We trust this submittal meets your needs. Please call me at (510) 450-6193 if you have any technical questions about this submittal.

Sincerely,
Weiss Associates

Tim Utterback, P.E.
Senior Staff Engineer

Enclosures: Figure 1. Plan View of Utility Conduits and Lithological Cross Sections
Figure 2. Cross Section A-A'
Figure 3. Cross Section B-B'
Figure 4. Cross Section C-C'
Figure 5. Cross Sections D-D' and E-E'
Appendix A – Copies of Soil Boring Logs

Cc: Brett Hunter, Chevron USA Products Company, P.O. Box 5004, San Ramon, CA 94583-0804

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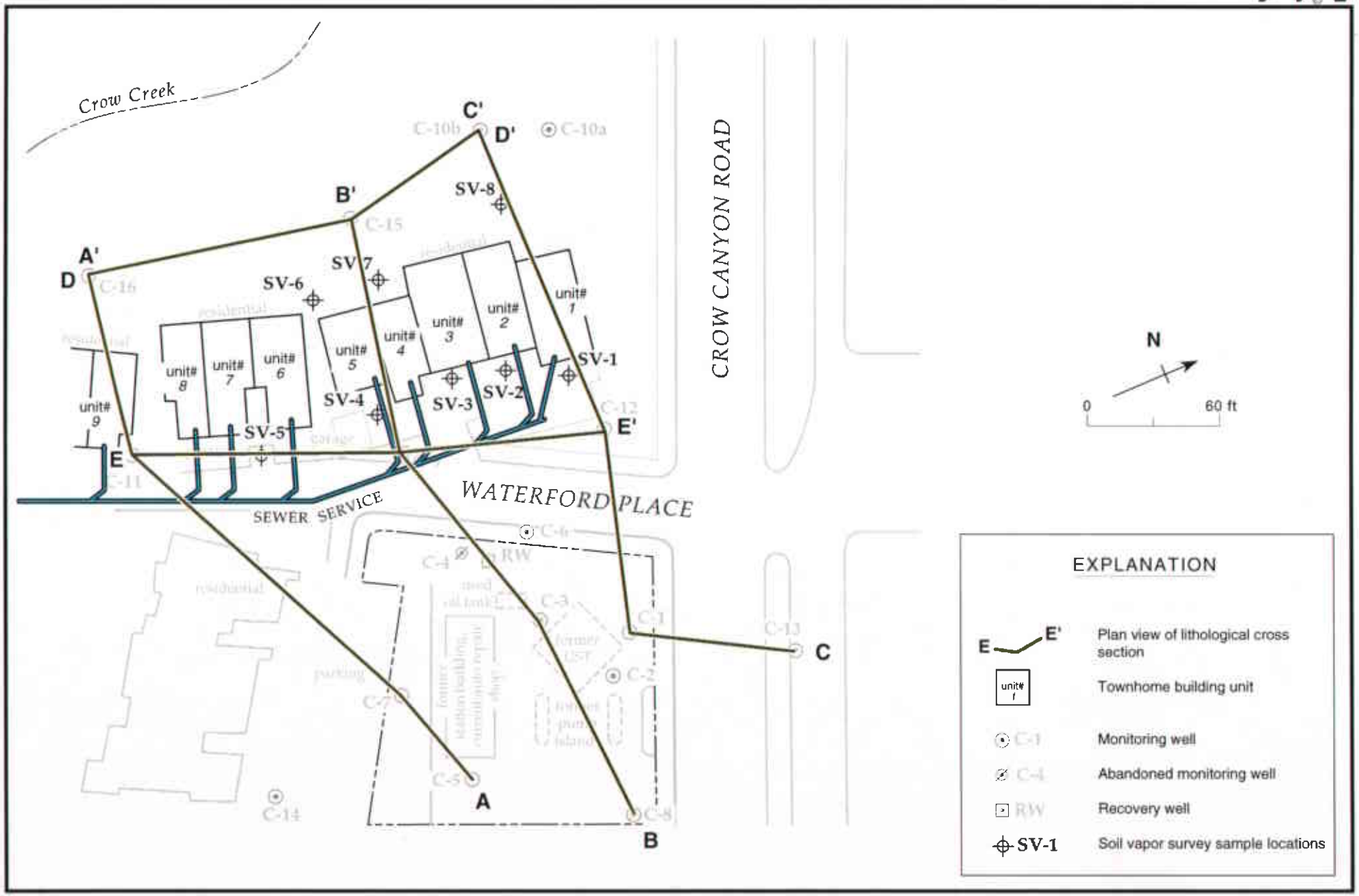
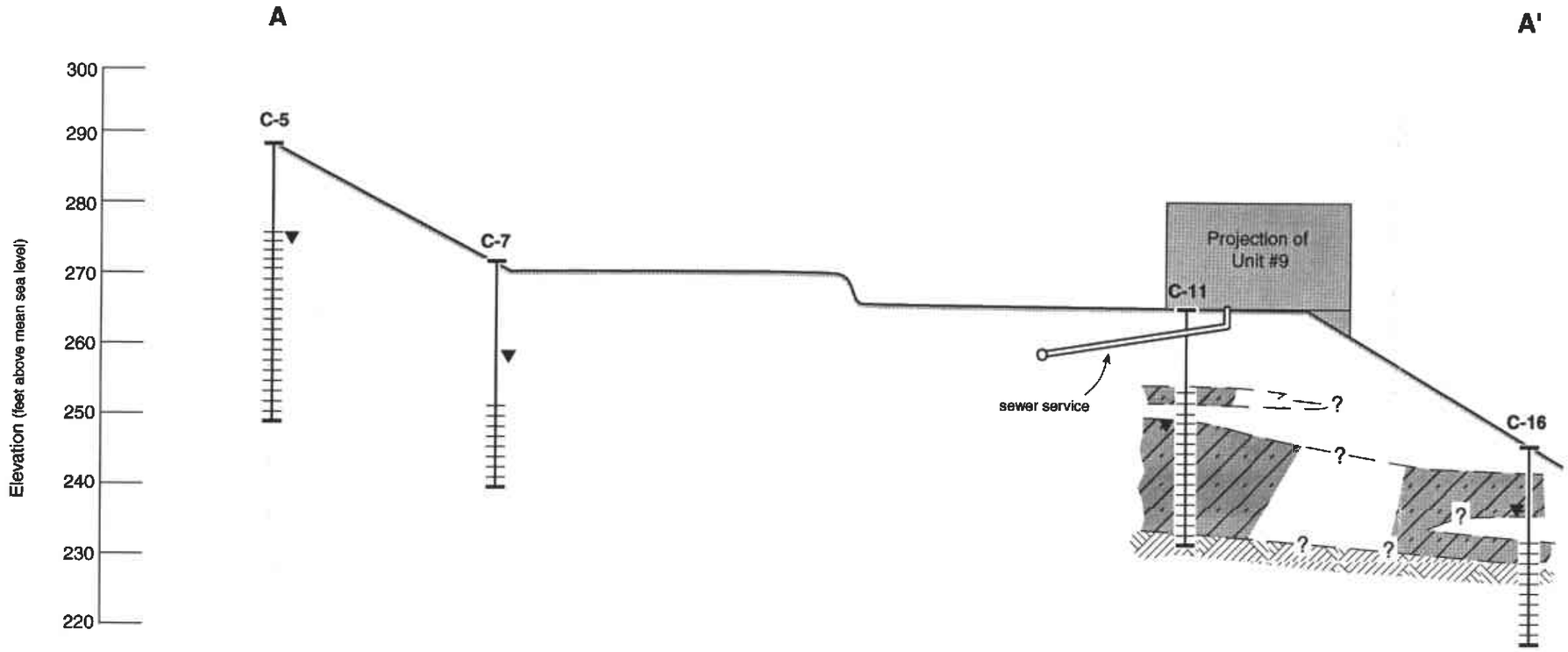


Figure 1. Plan View of Utility Conduits and Lithological Cross Sections - Chevron Station 9-5607, 5269 Crow Canyon Road, Castro Valley, California

C1129-12.ai

07/23/97



EXPLANATION

bedrock

silty / clayey sand or gravel

clay / silt

0 10 20 30 horizontal scale

10 vertical scale 20

▼ DTW 10/10/96

Figure 2. Cross Sections A - A', Forest Creek Townhomes, Waterford Place, Castro Valley, California

c1129-08.ai

07/25/97

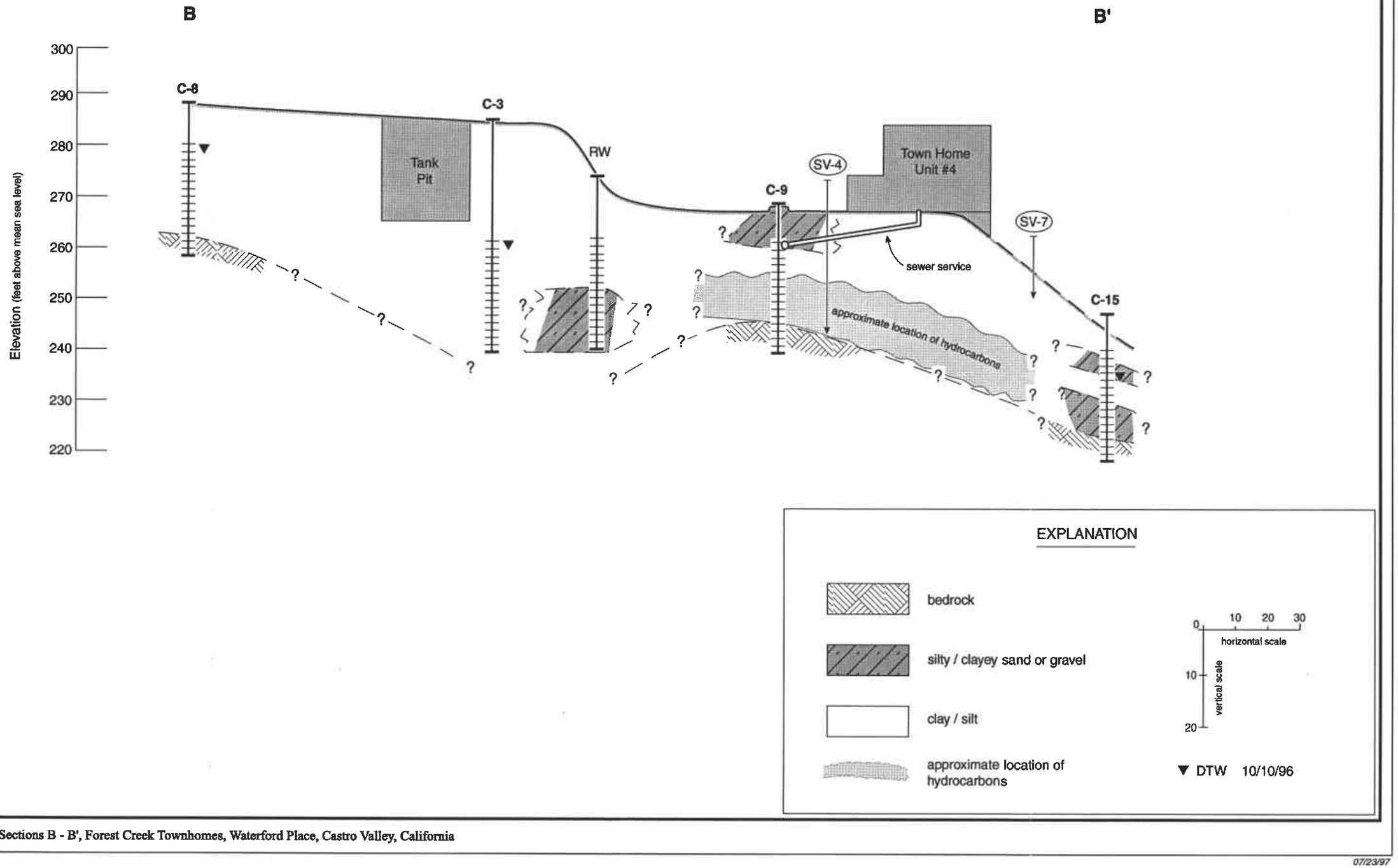
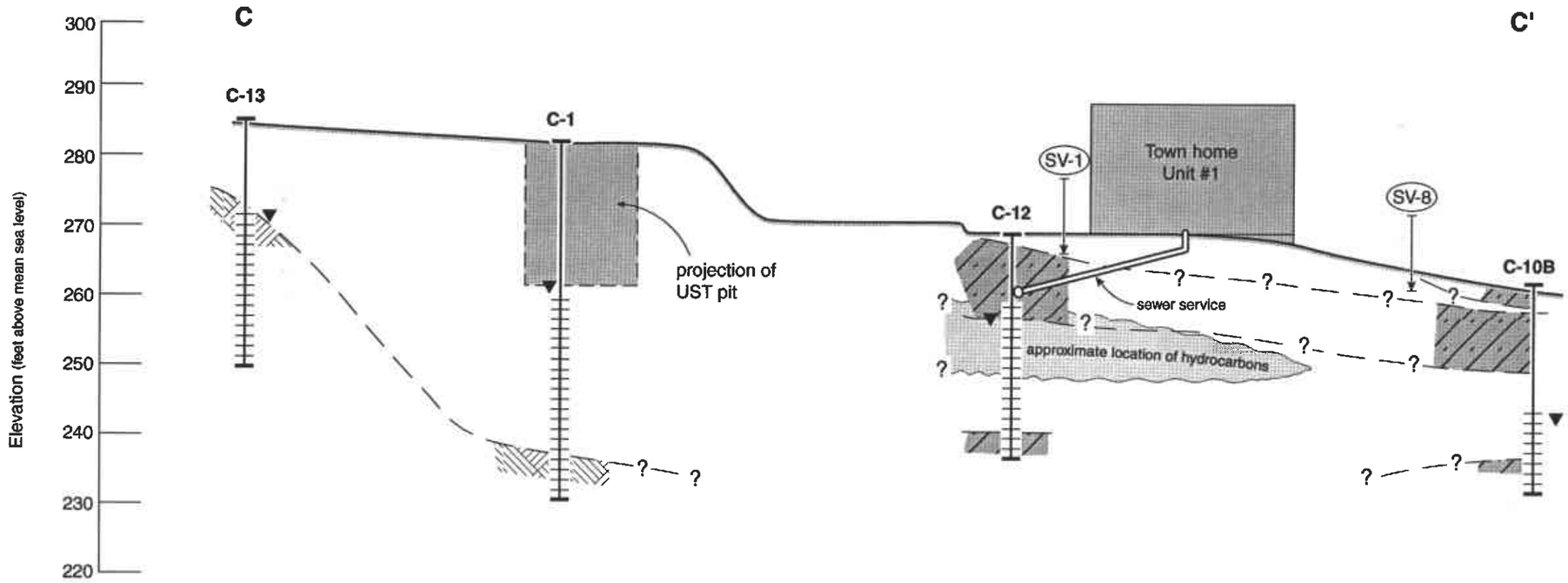


Figure 3. Cross Sections B - B', Forest Creek Townhomes, Waterford Place, Castro Valley, California

c1129-09.ai

07/23/97



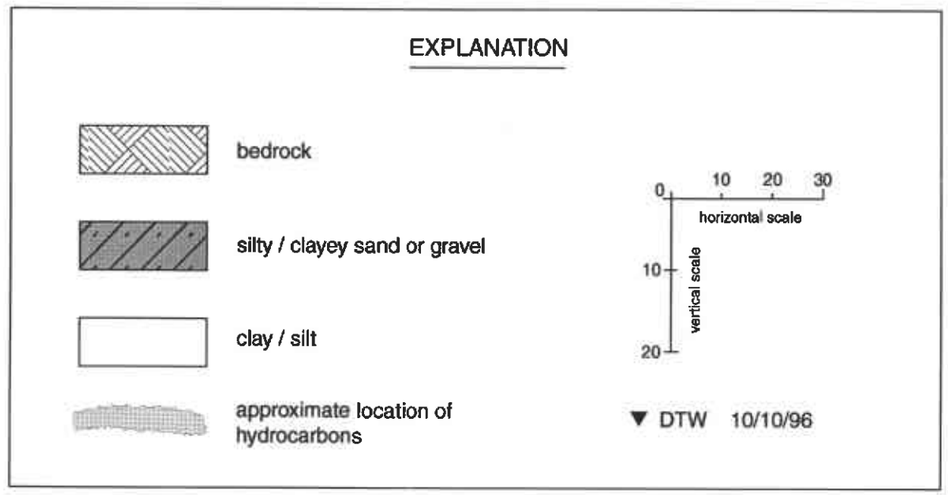


Figure 4. Cross Sections C - C', Forest Creek Townhomes, Waterford Place, Castro Valley, California

c1129-10.ai

07/24/97

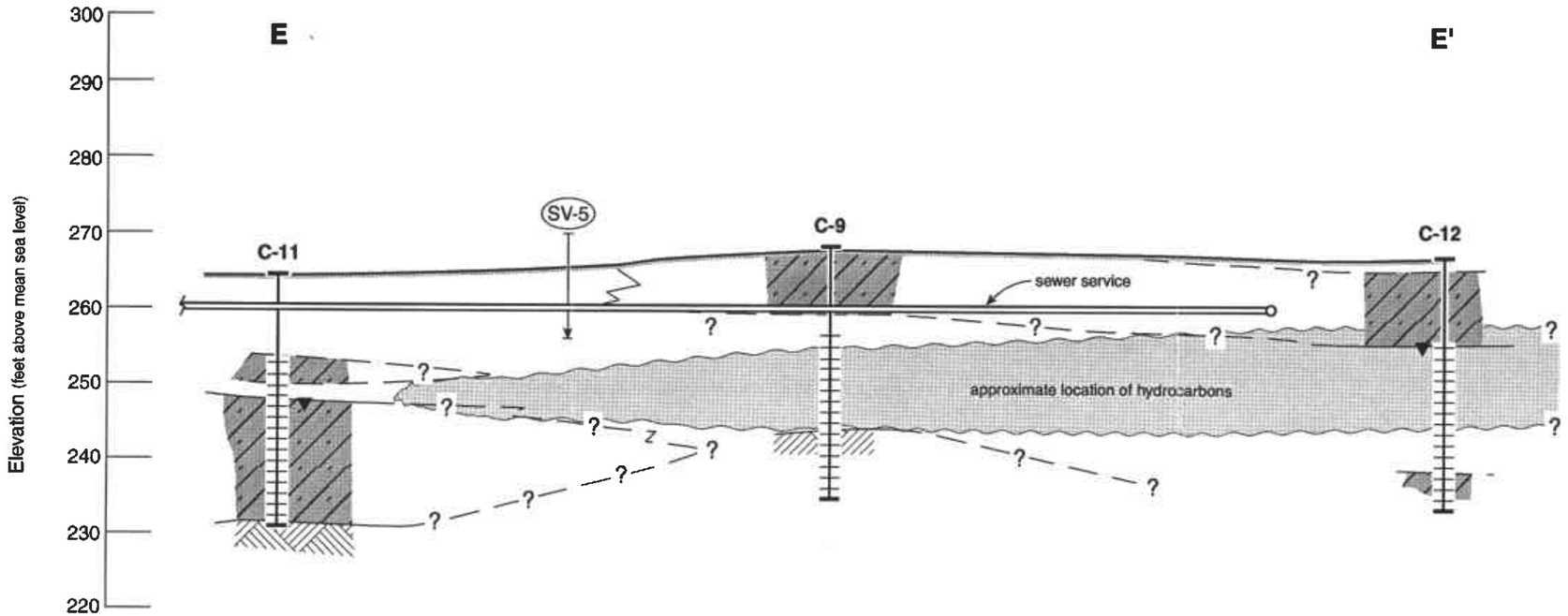


Figure 5. Cross Sections D - D' and E - E', Forest Creek Townhomes, Waterford Place, Castro Valley, California

APPENDIX A

COPIES OF SOIL BORING LOGS

TAL E 1
WELL LOGS

GROUNDWATER TECHNOLOGY
Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 1

Project Chevron/Castro Valley Owner _____

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-5-85 Total Depth of Hole 55' Diameter 4"

Surface Elevation _____ Water Level, Initial 42' 24-hrs. 23.26'

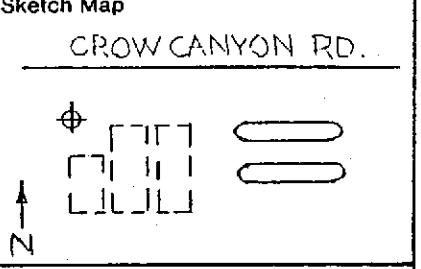
Screen: Dia. 4" Length 30' Slot Size .020

Casing: Dia. 4" Length 25' Type PVC

Drilling Company Kleinfelder Drilling Method HSA

Driller John/Doug Log by P.J. Walsh

Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
3"					Asphalt
4"					Gravel base (slight gas odor)
7'					Gray clay with gravel
10					Brown clay with some gravel
					Alternating layers of brown clay and graveley clay to 30 feet
20					
25					Intermittant moist clay and gravel Initial depth to water
30					Tighter gray brown clay, no pebbles and odors are present
40					
42					
48					Hit bedrock. Spoils indicate gray weathered shale to bottom
50					
55					Bottom of well

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 2

Project Chevron/Castro Valley Owner

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-6-85 Total Depth of Hole 46' Diameter 4"

Surface Elevation Water Level, Initial 24-hrs. 26.10'

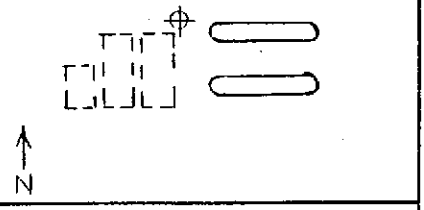
Screen: Dia. 4" Length 25' Slot Size .020

Casing: Dia. 4" Length 21' Type PVC

Drilling Company Kleinfelder Drilling Method HSA

Driller Paul/Doug Log by P. Walsh

Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
4"					Asphalt and concrete
6"					Gravel base with brown soil
1'					Gray brown soil
5					Gray soil 60% rounded pebbles
8					Gray clay with pebbles
9					Very dark gray clay with occasional white dust
10					Slight odor at 10 feet
					Reddish brown clay with some pebbles
20					
23					Light brown dry soil with rounded pebbles, slight odor
25					Intermittant layers of gravel and light brown clayey soils with auger occasionally bringing up very moist clay. Bedrock reached at 35 feet
30					
35					Bedrock
40					
46					Refusal BOTTOM OF WELL
50					

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 3

Project Chevron/Castro Valley Owner

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-6-85 Total Depth of Hole 55' Diameter 4"

Surface Elevation Water Level, Initial 24-hrs. 26.30'

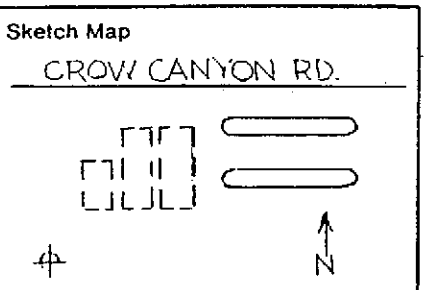
Screen: Dia. 4" Length 30' Slot Size .020

Casing: Dia. 4" Length 25' Type PVC

Drilling Company Kleinfelder Drilling Method HSA

Driller Paul/Doug Log by P.Walsh

Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
4"					Asphalt
1'					Gravel
					Dark gray clay
10					
15					Continue dark gray clayey soil
20					Reddish brown clayey soil
25					Light brown clayey soil Slight odor at 25 feet
30					
40					
50					Pulled augers indicate moist clay from 30 feet to wet clay at 40 feet to bottom of well at 55'

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 4

Project Chevron/Castro Valley Owner

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-9-85 Total Depth of Hole 35' Diameter 4"

Surface Elevation Water Level, Initial 17.80' 24-hrs.

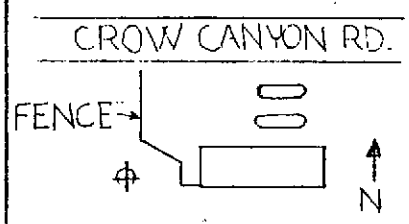
Screen: Dia. 4" Length 25' Slot Size .020

Casing: Dia. 4" Length 10' Type PVC

Drilling Company Kleinfelder Drilling Method HSA

Driller Log by P. Walsh

Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
1					Dark brown soil
2					Light brown sandy soil
5					Light brown soil with some gravel
7					Dark brown clayey soil
8					Dark gray clay
10					
15					Dark brown clay
18					Very wet light brown mud
20					
35					Rejection in gray weathered shale Bottom of well.

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 5

Project Chevron/Castro Valley Owner

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-9-85 Total Depth of Hole 45' Diameter 4"

Surface Elevation Water Level, Initial 25' 24-hrs.

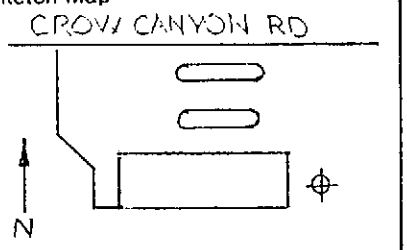
Screen: Dia. 4" Length 30' Slot Size .020

Casing: Dia. 4" Length 15' Type

Drilling Company KLEINFELDER Drilling Method HSA

Driller Log by P. Walsh

Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
3					Asphalt
1					Reddish brown soil
3					Clayey reddish soil with gravel
5					
7					Clayey brown soil with some gravel
10					Brown clay
11					Dark brown clay
15					Dark brown clay with gravel
20					Lighter brown clayey soil
25					Saturated light brown clayey mud
35					
45					Liquid surfaced with augers at 45 feet Bottom of well

GROUNDWATER TECHNOLOGY
Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 6

Project Chevron/Castro Valley Owner _____

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-14-85 Total Depth of Hole 35' Diameter 4"

Surface Elevation _____ Water Level, Initial 18.51' 24-hrs. _____

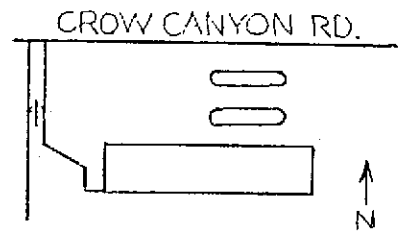
Screen: Dia. 4" Length 25' Slot Size .020

Casing: Dia. 4" Length 10' Type PVC

Drilling Company Kleindfelder Drilling Method HSA

Driller _____ Log by P. Walsh

Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
5'					Dark brown top soil
8					Dark gray clay
13					Lighter brown clay
15					
20					Initial depth to water
25					Light brown clay water saturated
30					
35					Bottom of well.

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 6B

Project Castro Valley Owner Chevron

Location Waterford Place Project Number 20-3231

Date Drilled 3-13-85 Total Depth of Hole 11' Diameter ---

Surface Elevation ---- Water Level, Initial ---- 24-hrs. ----

Screen: Dia. --- Length --- Slot Size .02

Casing: Dia. --- Length --- Type ----

Drilling Company Sierra Pacific Drilling Method HSA

Driller ---- Log by P. Walsh

Sketch Map

Notes

Abandoned

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
3					Asphalt
4					Gravel bed
6					Brown sandy soil
5					Sandy clay
10					
11					Refusal at 11 feet powder on end of bit white limey dust
					Backfilled hole and re-surfaced road

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 7

Project Chevron/Castro Calley Owner

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-21-85 Total Depth of Hole 35' Diameter 2"

Surface Elevation Water Level, Initial 24-hrs.

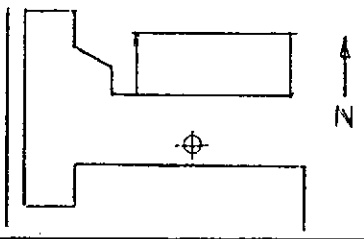
Screen: Dia. 2" Length 15' Slot Size 020

Casing: Dia. 2" Length 15' Type PVC

Drilling Company Laine Western Drilling Method HSA

Driller Mike/Mark Log by P. Walsh

Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
4"					Top soil with gravel
5'					
1'					Light brown soil
4					Dark brown clay
7					Some gravel
8					Back into dark brown clay
11					1" of wet clay
					Back into dark brown clay
15					Lighter brown clay
20					Water 21 feet
28					Firmed up a bit, flowing water at 30 feet
30					Bottom of well

GROUNDWATER TECHNOLOGY
Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number 8

Project Chevron/Castro Valley Owner

Location 5269 Crow Canyon Rd. Project Number 20-3231

Date Drilled 3-21-85 Total Depth of Hole 29' Diameter 2"

Surface Elevation Water Level, Initial 23.50' 24-hrs.

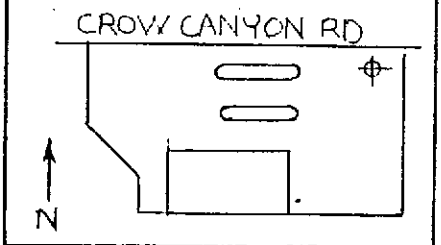
Screen: Dia. 2" Length 20' Slot Size .020

Casing: Dia. 2" Length 9' Type PVC

Drilling Company Layne Western Drilling Method HSA

Driller Gunner Log by P. Walsh

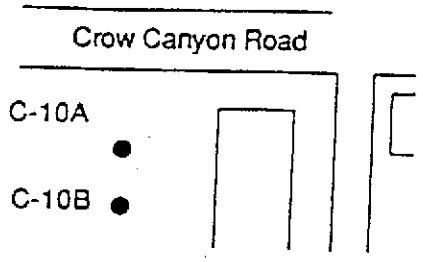
Sketch Map



Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
5"					Asphalt over concrete
4'					Light brown clayey soil
5					Light brown clay
7					
8					Dark brown moist clay
12					
13					Light brown sandy clayey fill (dry) mixed with some gravel at 13 feet
20					Very sandy light brown slightly
21					Clayey soil
23					Tight clay
23.5					Initial depth to water
25					
29					Weathered bedrock
31					Bedrock rejection (gray shale)

LOCATION MAP



PACIFIC ENVIRONMENTAL GROUP, INC.

WELL / C-10A
BORING NO.
PAGE 1 OF 1

PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

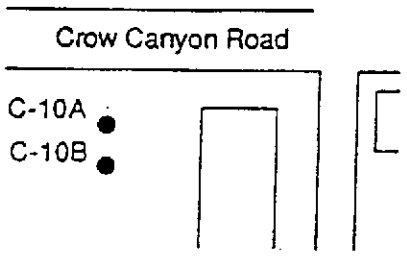
CLIENT: Chevron USA
DATE DRILLED: 2-22-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 21'
WELL DEPTH: 21'
WELL DIAMETER: 3"

WELL COMPLETION	MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SAMPLE	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
GROUT	Dp			2			GC	CLAYEY GRAVEL; dark brown; moderate plasticity; 15% clay and silt; 25% fine sand; 20% medium to coarse sand; <10% fine sub-angular gravel; medium dense; no product odor.
	Mst			4			CL SC	CLAY; dark brown; moderate plasticity; 40% fine to coarse sand; 5% fine gravel; stiff; no product odor.
	Mst			6				CLAYEY SAND; dark yellow brown; grayish brown; gravelly; low to moderate plasticity; 30% clay and silt; 30% fine sand; 20% medium to coarse sand; 20% fine sub-angular gravel (well cemented sandstone); medium dense; no product odor.
	Mst			8			SM	@4': concrete with rebar.
	Dp			10			SC	SILTY SAND; dark gray; low plasticity; 30% silt; 50% fine sand; 30% medium sand; 10% coarse sand; trace fine gravel; medium dense; no product odor.
SAND	Wt			12				CLAYEY SAND; dark gray; low to moderate plasticity; 20% clay and silt; 20% fine sand; 50% medium to coarse arkosic sub-angular sand; 10% fine sub-angular to rounded gravel; medium dense; no product odor.
				14				@10-14': wood chips and sweet odor.
	Mst			16			ML	SILT; very dark brown; low plasticity; 30% fine to medium sand; root material; hard; no product odor.
	Dp			18			CL	CLAY; brown to yellow brown; moderate to high plasticity; 20-40% fine to coarse sand; trace fine gravel; occasional caliche cemented nodules <1cm; iron oxide stain; olive mottling; black speckling; very stiff; no product odor.
	Mst			20			CH	CLAY; brown; high plasticity; trace gravel; very soft.
				22				@21': stiff and very stiff; no product odor.
				24				
				26				
				28				
				30				
				32				
				34				
				36				
				38				
				40				
				42				
				44				

BOTTOM OF BORING AT 21'

NOTE: Refer to boring log for Well C-10B for Sampling Intervals, Penetration Resistance, and PID Vapor readings.

LOCATION MAP

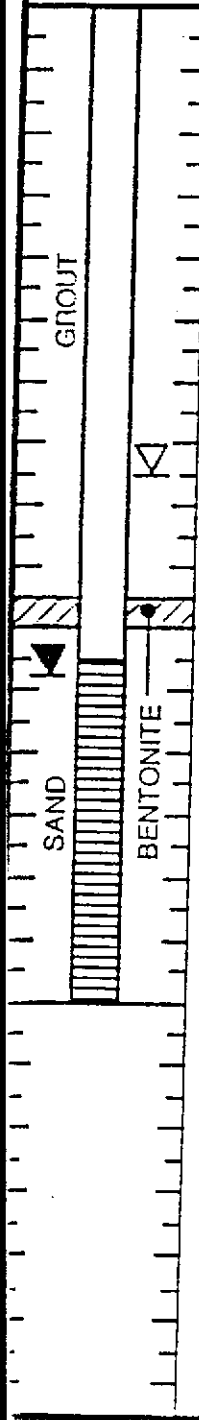


PACIFIC ENVIRONMENTAL GROUP, INC.

WELL / C-10B
BORING NO.
PAGE 1 OF 1

PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

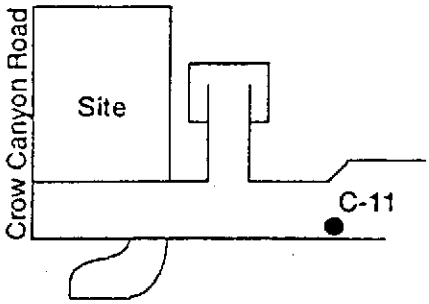
CLIENT: Chevron USA
DATE DRILLED: 2-21,22-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 32'
WELL DEPTH: 32'
WELL DIAMETER: 3"



MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SAMPLE	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
Dp			2			GC	CLAYEY GRAVEL; dark brown; moderate plasticity; 15% clay and silt; 25% fine sand; 20% medium to coarse sand; <40% fine sub-angular gravel; medium dense; no product odor.
Mst			4			CL / SC	CLAY; dark brown; moderate plasticity; 40% fine to coarse sand; 5% fine gravel; stiff; no product odor.
Mst	4.6	15	6			SM	CLAYEY SAND; dark yellow brown; grayish brown gravelly; low to moderate plasticity; 30% clay and silt; 30% fine sand; 20% medium to coarse sand; 20% fine sub-angular gravel (well cemented sandstone); medium dense; no product odor.
Mst			8			SC	SILTY SAND: dark gray; low plasticity; 30% silt; 50% fine sand; 30% medium sand; 10% coarse sand; trace fine gravel; medium dense; no product odor.
Dp	1.8	15	10				CLAYEY SAND; dark gray; low to moderate plasticity; 20% clay and silt; 20% fine sand; 50% medium to coarse arkosic sub-angular sand; 10% fine sub-angular to rounded gravel; mecium dense; no product odor.
Wt	1.2	14	12				
			14				
Mst			16			ML / CL	SILT; very dark brown; low plasticity; 30% fine to medium sand; root material; hard; no product odor.
Dp			18			CH	CLAY; brown to yellow brown; moderate to high plasticity; 20-40% fine to coarse sand; trace fine gravel; occasional caliche cemented nodules <1cm; iron oxide stain; olive mottling; black speckling; very stiff; no product odor.
Mst	1.2	17	20				
Mst		11*	22				CLAY; brown; high plasticity; trace gravel; very soft. @21': stiff and very stiff; no product odor. @23.5': brown; high plasticity; 70% clay and silt; 25% fine sand; 5% medium to coarse black well rounded sand grains; weak platy structure; thin zoneof sub-angular blocky structure; minor iron oxide discoloration; trace small (<5mm) caliche nodules; very stiff; no productodor.
Mst		22*	24				
Mst	0	18	26				
Mst	0	>50	28			SM	SILTY SANDSTONE; dark yellow brown; arkosic; sub-angular; moderate to well sorted; thin (1/2 cm) thick moderately cemented laminations interbedded with friable and loose sands; vertical gray sand structure; caliche zones; no visible fractures; moderate to deep weathering; friable; moist; no product odor.
			30				
			32				BOTTOM OF BORING AT 32'
			34				
			36				
			38				
			40				
			42				
			44				

* Standard Penetration, Split-Spoon Sampler

LOCATION MAP

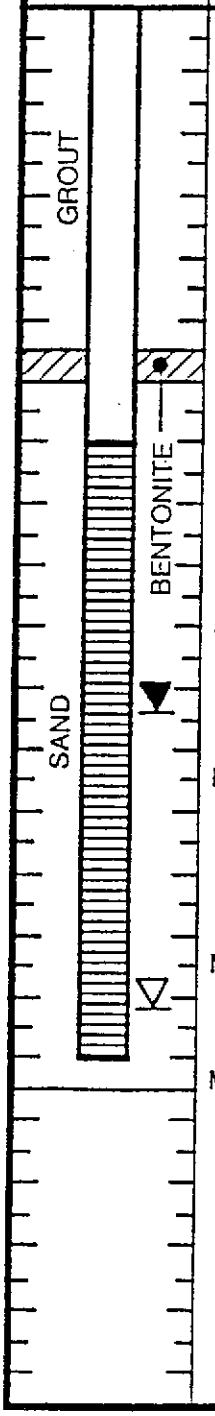


PACIFIC ENVIRONMENTAL GROUP, INC.

WELL / C-11
BORING NO.
PAGE 1 OF 1

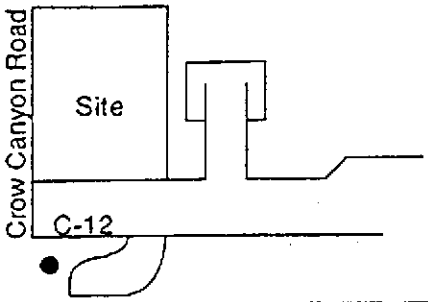
PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

CLIENT: Chevron USA
DATE DRILLED: 2-22-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 35'
WELL DEPTH: 34'
WELL DIAMETER: 3"



MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SAMPLE	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
							FILL; asphalt; road base.
Dp			2			CL	CLAY - FILL; brown; gravelly; 10% gravel; stiff; no product odor.
Mst	0	PUSH	4				@4': dark yellow brown; gravelly; moderate to high plasticity; 50% clay and silt; 20% fine sand; 10% medium to coarse sand; 20% fine sand; 20% sub-angular to sub-rounded gravel; very stiff; no product odor.
			6				
			8				
Dp	1.5	22	10				@9': angular blocks of sandstone; gravels; angular blocks of gray fill soil; very stiff; no product odor.
			12				@11': stiff; drilling change.
							@12': soft; drilling change.
						SC	CLAYEY SAND; dark gray; moderate to high plasticity; 30% clay and silt; 20% fine sand; 35% medium to coarse sand; 15% fine gravel; medium dense; no product odor.
Mst	2.2	13	14				
						CL	CLAY; dark yellow brown; gravelly; moderate to high plasticity; 50% clay and silt; 20% fine sand; 10% medium to coarse sand; 20% fine sand; 20% sub-angular to sub-rounded gravel; very stiff; no product odor.
			16				
			18			SC	CLAYEY SAND (native); dark brown; moderate plasticity; 40% clay; 30% fine sand; 30% medium sand; medium dense; no product odor.
Mst	1.5	18	20				
			22				@19': dark yellowish brown; moderate plasticity; 40% clay; 40% fine sand; 20% medium sand; weak sub-angular blocky structure; iron oxide discoloration patches (<1/2 cm diameter); medium dense; no product odor.
			24				
Mst	0.5	33	26				@24': 25% clay; 20% silt; 35% fine sand; 20% medium sand; weak platy structure; dense; no product odor.
			28				
V. Mst	0.1	24	30			SM	SILTY SAND; brown; clayey; low to moderate plasticity; 30% silt and clay; 30% fine sand; 40% medium to coarse arkosic sub-angular sand; trace of angular blocks of 3/4" diameter iron oxide sandstone; dark brown to black speckling; iron oxide speckling; minor rootholes; <3mm with gray alteration and wet; medium dense; no product odor.
			32				
Mst	0	>50	34			SM	SILTY SANDSTONE; interlayered yellow brown to dark yellow brown; arkosic sand and terrigenous clay composition; poorly sorted; sub-angular; thinly bedded (<1/4" to 1/2") approximate dip ~30°; thin laminations of claystone with angular claystone clasts <1/2"; no observable fractures;deep weathering; weak to moderate cementation; friable to medium hardness; with soft (semi-plastic) claystone; no product odor.
			36				
			38				
			40				
			42				
			44				BOTTOM OF BORING AT 35'

LOCATION MAP



PACIFIC ENVIRONMENTAL GROUP, INC.

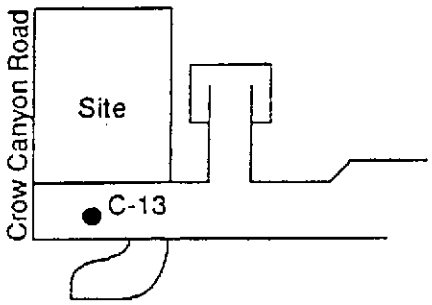
WELL / C-12
BORING NO.
PAGE 1 OF 1

PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

CLIENT: Chevron USA
DATE DRILLED: 2-22-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 34.5'
WELL DEPTH: 30.5'
WELL DIAMETER: 3"

WELL COMPLETION	MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SAMPLE	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
GROUT				2				FILL; dark brown; sandy organic top soil.
	Mst	1.5	PUSH	4			SC	CLAYEY SAND - FILL; dark brown to dark yellow brown; low plasticity; 10-20% clay and silt; 30% fine sand; 50-60% medium arkosic sub-angular sand; angular blocks of yellow brown sand and clay; medium dense; no product odor.
				6				@8': approximate fill material/native material contact.
				8				
BENTONITE	Mst	0	22	10			ML	@9.5': 10-20% fine sub-angular gravels; medium dense; no product odor.
				12				SILT; dark brown.
	V. Mst	123	13	14			ML	SILT; brown to yellow brown; sandy; low to moderate plasticity; 55-60% silt and clay; 30% fine sand; 10-15% medium sand; iron oxide discoloration; thin layer of sub-angular blocky clay with gravel; rootholes (<1mm); very moist; stiff; strong product odor.
	Wt			16				
				18			CH-ML	CLAY to SILT; brown; sandy; moderate to high plasticity; 35% clay; 30% silt; 35% fine sand; trace medium to coarse sand; wet rootholes (<1mm); firm; faint product odor.
	Wt	2.0	7	20				
SAND				22				
				24				
	Mst	2.0	16	26			CH	CLAY; dark yellow brown; sandy; moderate to high plasticity; 45% clay; 20% silt; 20% fine sand; 20% medium to coarse sand; fine rootholes and rootholes up to 2mm; stiff; no product odor.
				28				@29.5': 30% clay; 25% silt; 20% fine sand; 20% medium to coarse sand; 5% fine well rounded gravel; horizontal, lenticular iron oxide discoloration band <5mm thick; minor rootholes; stiff; no product odor.
	Mst	11	19	30				
	V. Mst			32			SM	SILTY SAND; brown; low plasticity; 10% clay; 35% silt; 35% fine sand; 20% medium to coarse sand; trace gravel; platy blocks of sandy claystone (<3cm diameter); iron oxide banding; medium dense; no product odor.
				34				
				36				BOTTOM OF BORING AT 34.5'
				38				
				40				
				42				
				44				

LOCATION MAP

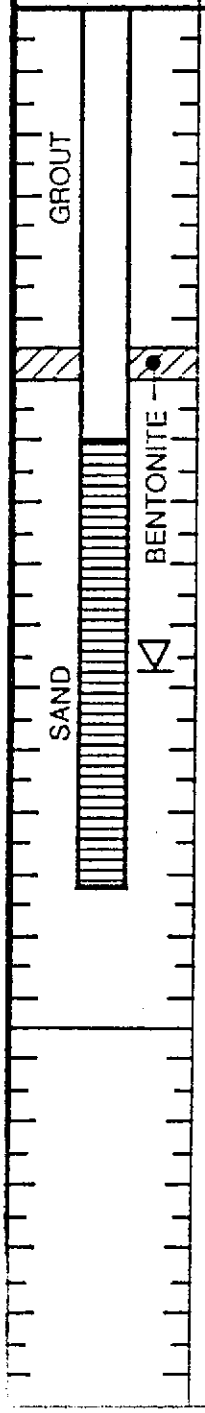


PACIFIC ENVIRONMENTAL GROUP, INC.

WELL / C-13
BORING NO.
PAGE 1 OF 1

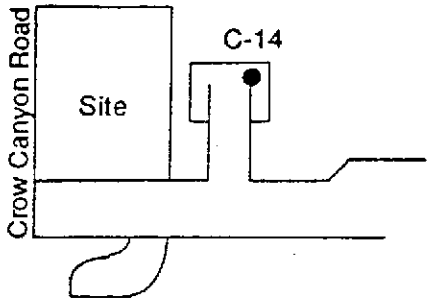
PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

CLIENT: Chevron USA
DATE DRILLED: 2-23-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 33'
WELL DEPTH: 28.5'
WELL DIAMETER: 3"



MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SAMPLE	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
							FILL; asphalt.
Dp			2			GC	CLAYEY GRAVEL; roadbase; dark yellow brown; occasional cobbles; dense; no product odor.
			4				@4.5': no sample taken; gravel and cobbles.
Mst			6			CL	CLAY - FILL; dark gray; sandy; no product odor.
							@6.5': yellow brown.
Mst			8			GC	CLAYEY GRAVEL - FILL; sandy; dark yellow brown; 30% clay and silt; 20% fine to coarse sand; 50% fine gravels; sub-angular; very dense; no product odor.
Dp	0	>50	10			SB	SILTSTONE (Bedrock); sandy; yellow brown; terrigenous and arkosic sediments; no observable bedding; thin (<1/4") parting; no observable fractures; moderate to deep weathering; weak cementation; friable; no product odor.
			12				
			14				
Dry	313	>50	16				@14.5': fissile, shale like parting; less sand; no product odor.
			18				
						SM	SILTY SANDSTONE; dark yellow brown; arkosic; sub-angular; poorly sorted; thin lenticular beds of silty sandstone interlayered with thin shaley beds of silt and claystone, oriented ~<10°; organic shales with thin (1 cm long and 1 mm wide) organic inclusions in-line with bedding; iron oxide discoloration; no observable fractures; weak to moderate cementation; angular sandstone inclusions; deep to moderate weathering; friable to moderate hardness; no product odor.
Dry-Dp	45	>50	20				
			22				
			24				
Mst	3.0	>50	26			CS	CLAYSTONE; silty; very dark gray; organic marine shaley claystone; bedding oriented at 10-15°; thin lenticular and cemented beds <1/2" thick; very light gray; discoloration lamination <1mm to 5mm; plastic sediments between cemented zones; weak weathering; friable to soft; no product odor.
			28				
Mst	NA	>50	30				@29.5': 1/2" bedding of dark gray; gray and brown gray claystone and siltstone; bedding apparently at ~65°; poorly cemented; soft; no product odor.
			32				@33': auger refusal; gray; well cemented; hard.
Dry			34				
			36				BOTTOM OF BORING AT 33'
			38				
			40				
			42				
			44				

LOCATION MAP



PACIFIC ENVIRONMENTAL GROUP, INC.

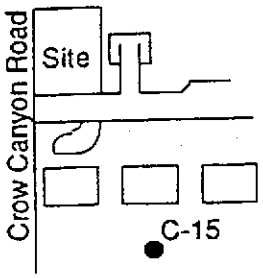
WELL / C-14
BORING NO.
PAGE 1 OF 1

PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

CLIENT: Chevron USA
DATE DRILLED: 2-23-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 30.5'
WELL DEPTH: 28.5'
WELL DIAMETER: 3"

WELL COMPLETION	MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SAMPLE	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
GROUT				0				FILL; asphalt and road base
	Mst	0	PUSH	2			SC	CLAYEY SAND; dark yellow brown; low to moderate plasticity; 30% clay and silt; 30% fine sand; 30% medium to coarse arkosic sub-angular sand; 10% fine gravel; medium dense; no product odor.
				4				
				6				
				8				
	Mst	0	15	10			CL	CLAY; dark yellow brown; moderate plasticity; 60% clay; 20% fine sand; 20% medium to coarse sand; trace angular blocks of sandstone gravel; rootholes (<1mm); weak sub-angular blocky; stiff; no product odor.
				12				@14': increase in fines; no gravel; increase in plasticity; stiff; no product odor.
BENTONITE	V. Mst	0	9	14				
				16				
				18			SC	CLAYEY SAND; yellow brown; moderate to high plasticity; 30% clay and silt; 30% fine sand; 30% medium to coarse sand; 10% fine to coarse sand; angular block of very dark brown iron oxide cemented sandstone; wet rootholes (<2mm) with no alteration; medium dense; no product odor.
	Mst	0	22	20				
SAND				22				
	Dp-Mst	0	>50	24			CS	CLAYSTONE; dark yellowish brown; terrigenous; no observable bedding; shaley; crushed after sampling; well lithified; deep weathering; friable; no product odor.
				26				
				28				
	Dp	0	>50	30				@30': flaser bedding in zones; bedding <45°; no product odor.
				32				
				34				
				36				
				38				
				40				
				42				
				44				BOTTOM OF BORING AT 30.5'

LOCATION MAP



PACIFIC ENVIRONMENTAL GROUP, INC.

WELL / C-15
BORING NO.
PAGE 1 OF 1

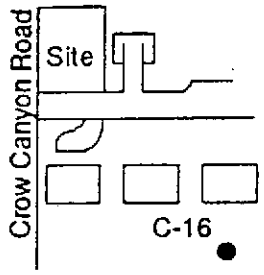
PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

CLIENT: Chevron USA
DATE DRILLED: 2-24-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 21'
WELL DEPTH: 17.5'
WELL DIAMETER: 3"

WELL COMPLETION	MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SOIL TYPE	LITHOLOGY / REMARKS
GROUT	Mst			2		FILL; top soil (clayey sand); trace organics.
	Mst			4	CH-OH	CLAY; very dark brown; high plasticity; topsoil; 50% clay and silt; 40% fine sand; root material; stiff; no product odor.
	Dry	0	PUSH	6	SM	SILTY SAND; dark yellow brown; low plasticity; 20-30% silt and clay; 40% fine sand; 30-40% medium sand; clayey sand inclusions; rootholes <1mm; medium dense; no product odor.
BENTONITE				8		
	Mst	61	12	10	CL	@8.5': soft; drilling change. CLAY; dark brown; sandy; moderate to high plasticity; 65% clay and silt; 35% fine sand; 5% medium sand; rootholes <4mm, wet, with 2-4mm gray alteration rinds;
SAND				12		
				14	SC-SM	stiff; moderate to strong product odor. CLAYEY SAND to SILTY SAND; dark brown; low to moderate plasticity; 20% clay; 20% silt; 40% fine sand; 20% medium sand; rootholes (<1mm), wet, with minor gray alteration; one 3mm tap root with gray alteration rind; medium dense; no product odor.
	V. Mst	0	15	16		
				18		
NATURAL	Dp-Dry	0	>50	20	SM	SILTY SANDSTONE; dark yellow brown; arkosic; poorly sorted; sub-angular; bedding oriented at >45°; thin (1/4") thick lentucular laminations of sandstone with claystone inclusions; iron oxide discoloration; gray discoloration; deep brown discoloration; no visible fractures; moderate to deep weathering; friable; no product odor.
				22		
				24		
				26		
				28		
				30		
				32		
				34		
				36		
				38		
				40		
				42		
				44		

BOTTOM OF BORING AT 21'

LOCATION MAP

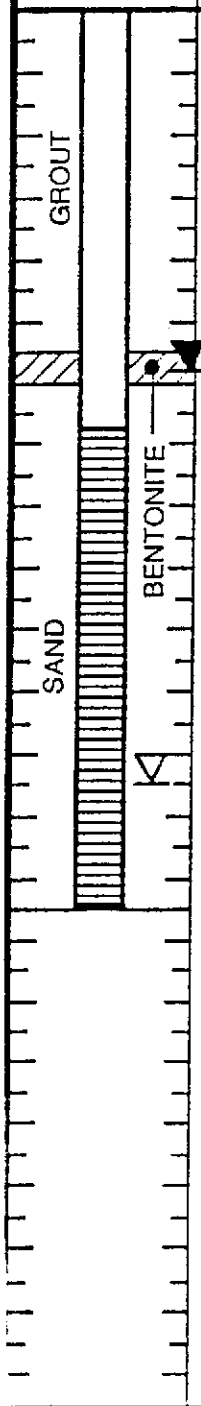


PACIFIC ENVIRONMENTAL GROUP, INC.

WELL / C-16
BORING NO.
PAGE 1 OF 1

PROJECT NO. 320-18.02
LOGGED BY: DKU
DRILLING METHOD: HSA
SAMPLING METHOD: CAL MOD
CASING TYPE: Sch 40 PVC
SLOT SIZE: 0.020"
GRAVEL PACK: 2 X 12 SAND

CLIENT: Chevron USA
DATE DRILLED: 2-24-90
LOCATION: Crow Canyon Road
HOLE DIAMETER: 8"
HOLE DEPTH: 29.0'
WELL DEPTH: 29.0'
WELL DIAMETER: 3"



MOISTURE CONTENT	H-NU READING (PPM)	PENETRATION RESISTANCE (BLOWS/FT)	DEPTH (FEET)	SAMPLE	GRAPHIC	SOIL TYPE	LITHOLOGY / REMARKS
Mst			2			CL	CLAY - FILL; brown; sandy; moderate to high plasticity; 60% clay and silt; 30% fine to medium sand; 10% coarse sand and fine gravel; medium dense; no product odor.
V. Mst			4				
Mst	0	20	6			SC	CLAYEY SAND; dark yellow brown; low to moderate plasticity; 20-30% clay and silt; 30% fine sand; 40-50% medium arkosic, sub-angular sand; black speckling; moist rootholes (<1mm) with gray alteration; root material; soil fractures (vertical); weak sub-angular blocky; iron oxide discoloration; strong iron oxide and manganese oxide altered coarse sand grains; medium dense; no product odor.
			8				
Mst	61	10	10			CL	CLAY; dark brown; sandy; moderate to high plasticity; 65% fat and lean clay and silt; 25% fine arkosic sand; 10% medium to coarse quartz sand; rootholes with tap root <3mm having a1cm gray alteration rind; iron oxide mottling; stiff; no product odor.
			12				
			14			SC	
Mst-Dp	0	20	16			SS	CLAYEY SAND; dark yellow brown; moderate plasticity; 30% clay and silt; 40% fine sand; 20% medium arkosic sub-angular sand;10% claystone and sandstone angular blocks.
			18				
Dry	0	>50	20			MS	SILTY SANDSTONE; dark yellow brown; arkosic; poorly sorted; no visible bedding; no visible fractures crushed after sampling; iron oxide laminations; black iron oxide and manganese oxidized claystone fragments and horizons; deep weathering; friable; no product odor.
			22				
Dry	0	35	24				SILTSTONE; brown; clayey; sandy; terrigenous silts; no observable bedding; crushed after sampling; iron oxide patches; black manganese oxide patches; gray alteration patches; moderately weathered; moderately lithified; friable; no product odor.
			26				
			28				@25': very dark gray; shaley; sandy; bedding >45°; silty sandstone; iron oxide interbed<1" thick; possible crushed fracturing; shaley parting; calcite precipitate (sparite) lenses and sparse veins <3mm thick and <1" long, filling fractures; well lithified; moderate to weak weathering; friable to moderate hardness; wet on top and dry on bottom; no product odor.
Dry	0	0	30				@29': gray; auger refusal; dusty dry recovery in tip.
			32				
			34				BOTTOM OF BORING AT 29.0'
			36				
			38				
			40				
			42				
			44				

VAPOR SAMPLE COLLECTION PROTOCOL

I. Probe Placement

A) A clean soil gas probe is removed from the "clean" storage tube.

B) The soil gas probe is placed in the jaws of a hydraulic pusher/puller mechanism.

C) A sampling drive point is inserted into the bottom of the probe.

D) The hydraulic pushing mechanism is used to push the probe into the ground.

E) If the pusher mechanism will not push the probe into the ground to a sufficient depth for sampling, a hydraulic hammer is used to pound the probe into the ground.

II. Soil Gas Sample Extraction

A) An adapter is attached to the top of the soil gas probe.

B) A vacuum pump is attached to the adapter via polyethylene tubing.

C) The vacuum pump is turned on and used to purge the sampling equipment with soil gas.

D) Approximately three probe volumes are purged before a sample is collected. Since the flow rate is dependent on resistance to flow, the evacuation time is adjusted to ensure the proper volume is extracted.

15 Ft of tubing

E) The probe purge flow rate is monitored using a rotometer at the vacuum pump and the flow rate is maintained between 5 and 10 liters per minute.

$\pi\left(\frac{1}{2}\times\frac{3}{16}\right)^2 \times 15\,ft \times \frac{12\,in}{ft} = 4.97\,in^3 \times 16.39\,ml/in^3 = 81.4\,ml$

3 purge vol x 81.4 ml = 244 ml ~ 250 ml

III. Soil Gas Sample Collection

A) With the vacuum pump running, a stainless steel hypodermic syringe needle attached by Teflon tubing to a SUMMA canister is inserted through the silicone rubber, which acts as a seal, and down into the metal tubing of the sample probe. This technique eliminates the possibility of exposing the sample stream to any part of the adapter and associated tubing. Soil gas samples only contact clean decontaminated surfaces and never contact potentially sorbing materials (i.e., tubing, hose, pump diaphragm). Clean stainless steel hypodermic syringe needles and Teflon sample tubing are used for each sample.