Date 11/17/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 494.69 **Hole Dia.** 8.5 in.
Northing 505168.9098 **Easting** 1238117.08

Well Construction Details

Top of PVC Casing Elev. **496.75 ft.**

GROUND SURFACE

4" DIA. SCHED. 40 BLANK CASING: +2.0 to 10 ft.

BENTONITE-CEMENT SEAL: 0 to 4 ft.

BENTONITE-PELLET SEAL: 4 to 7 ft.

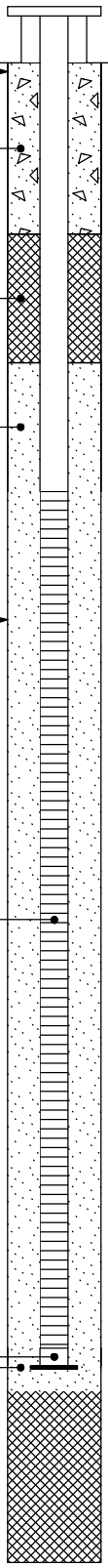
Medium Aquarium SAND PACK: 7 to 31 ft.

8.5" DIA. BOREHOLE: 0 to 40 ft.

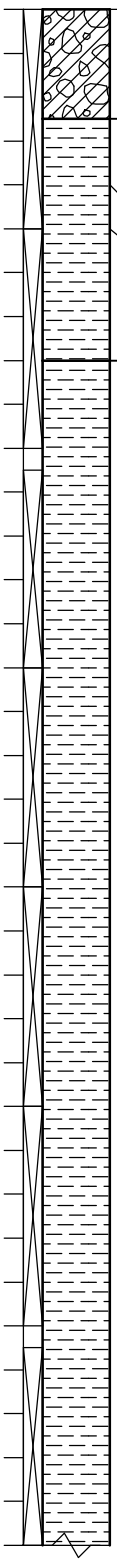
4" DIA. SLOTTED CASING (0.04"): 10 to 30 ft.

HOLE CLEANED OUT to 31 ft.

BOTTOM WELL CAP: 30.5 ft.



Recovery (inches)	PID Reading (ppm)
	0
60	
	0
60	
	0
54	
	0
60	
	0
60	
	0
60	
	0
54	



Depth (ft.) Sample: 0, 5, 10, 15, 20, 25, 30, 35

Light Yellowish Brown Clayey Gravel with Sand (GC) (10YR 6/4) Dense, dry, 60% fine angular mudstone gravel, 20% sand, 20% clay/fines (Fill)

Grayish Brown Weathered Mudstone (2.5Y 5/2) Moderately consolidated, crushed to intensely fractured, low hardness, weak, deeply weathered, some laminated bedding, iron oxide throughout

@ 3.7 - 4.9 ft.: Subhorizontal fractures with gypsum

@ 5 ft.: Very dark grayish brown

Dark Gray Unweathered Mudstone, Moderately consolidated, massive, occasionally fractured, low hardness, weak, little to no weathering

@ 10.9 - 12 ft.: Vertical fracture

@ 13.1 ft.: Subangular fractures at 13.1, 14.1, and 14.5 ft.

@ 15 ft.: Changes to moderately hard, moderately strong

@ 16 ft.: Vertical fractures seen in video

@ 18.4 ft.: Irregular vertical fracture observed in video

@ 19.5 ft.: Vertical fracture with iron oxide.
From 19.5 - 23.8 ft.: Iron oxide gone by 21 ft.

Vertical fractures from 20.8 - 23.3 ft. and 20.9 - 22.1 ft.

@ 22 ft.: White mineral in-filling visible in video log, water streaming in at 22.6 ft. in video.

@ 24.3 ft.: White nodules, mildly calcareous from 24.3 - 25 ft.; subhorizontal fracture visible in video log at 24.3 ft.

@ 29.3 ft.: Small subhorizontal fractures at 29.3, 29.6 and 30.2 ft.

@ 32.7 ft.: White layers

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-01

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE **E9-1**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/17/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	494.69 **Hole Dia.** 8.5 in.
Northing	505168.9098 **Easting** 1238117.08

Well Construction Details	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
BENTONITE PELLET BACKFILL: 31 to 40 ft.		0	35		@ 35.2 ft.: White layer
	60				@ 37.7 ft.: White layer
			40		Bottom of boring at 40 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-01

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-1

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/3/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	455.65 **Hole Dia.** 8.5 in.
Northing	505132.464 **Easting** 1237402.214

Well Construction Details

Top of PVC Casing Elev. **457.60 ft.**

GROUND SURFACE

4" DIA. SCHED. 40 BLANK CASING: +1.9 to 20 ft.

8.5" DIA. BOREHOLE: 0 to 41 ft.

BENTONITE-CEMENT SEAL: 0 to 14 ft.

BENTONITE-PELLET SEAL: 14 to 17 ft.

Medium Aquarium SANDPACK: 17 to 41 ft.

4" DIA. SLOTTED (0.040") CASING: 20 to 40 ft.

Recovery (inches)	PID Reading (ppm)
	0
42	
	0
54	
	0
51	
	0
60	
	0
18	
	0
60	
	0
60	

Depth (ft.) Sample

0 5 10 15 20 25 30 35

Topsoil

Dark Grayish Brown Sandy Lean Clay (CL) (10YR 4/2) Very firm to hard, 60% clay, 30% sand, 10% gravel

@ 7.0 ft.: Gravel increasing to 25%
@ 8 ft.: Chloride diffusion sample collected at 8 ft.

Brown Weathered Mudstone (10YR 5/3) Moderately consolidated, intensely fractured to crushed, low hardness, weak, deeply weathered

@ 11.0 ft.: Fractured w/ void space-in-filling of clays and black oxides

@ 13.5 ft.: Change to light brownish gray, more competent
@ 14.3 ft.: Three vertical fractures with iron oxide mineralization from 14.3 - 15.5 ft., 16.6 - 17.5 ft., and 19.2 - 19.7 ft.
@ 15.3 ft.: Abundant horizontal fractures w/ iron oxide from 15.3 to 19.7 ft.

@ 22.0 ft.: Pooling observed in video

@ 24.0 ft.: Very platey, weak to friable
@ 24.5 ft.: Water with air bubbles seen in video, drips seen at 25.2 ft.

Dark Gray Unweathered Mudstone (5Y 4/1) Moderately consolidated, massive, occasionally fractured, low hardness, little or no weathering
@ 27.2 ft.: Sub-horizontal fractures from 27.2 to 30.3 ft. w/ iron oxide mineralization

@ 31.0 ft.: White layer, water running in video
@ 31.1 ft.: Sub-horizontal fractures from 31.1 to 34.0 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-02

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

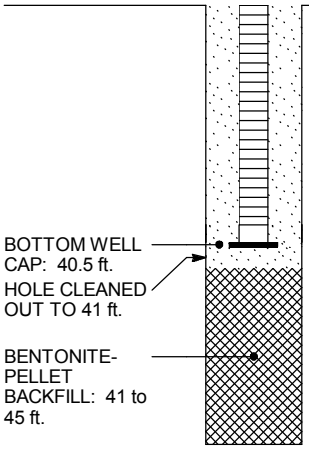
PLATE

E9-2

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/3/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	455.65 **Hole Dia.** 8.5 in.
Northing	505132.464 **Easting** 1237402.214

Well Construction Details



Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	
35			0	
		42		
40			0	@ 42.0 ft.: White layer
		54		
45				Bottom of boring at 45.0 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-02

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-2

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/30/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 480.29 **Hole Dia.** 8.5 in.
Northing 505618.747 **Easting** 1237384.433

Well Construction Details

Top of PVC Casing Elev. **482.50 ft.**

GROUND SURFACE

BENTONITE-CEMENT SEAL: 0 to 2 ft.

BENTONITE-PELLET SEAL: 2 to 4 ft.

Medium Aquarium SANDPACK: 4 to 31.5 ft.

4" DIA. SCHED. 40 PVC CASING: +2.2 to 6 ft.

8.5" DIA. BOREHOLE: 0 to 31.5 ft.

4" DIA. SLOTTED CASING (0.040"): 6 to 31 ft.

HOLE CLEANED OUT to 31.5 ft.

BOTTOM WELL CAP: 31.5 ft.

BENTONITE-PELLET BACKFILL: 31.5 to 35 ft.

Recovery (inches)	PID Reading (ppm)
	0
48	
	0
36	
	0
12	
	225
24	
	135
36	
	104
24	
30	
	0
60	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Light Olive Brown Lean Clay with Sand (CL) (2.5Y 5/4) Soft, dry, 60% clay, 25% fine sand, 15% silt (Fill)

@ 5 ft.: Oxidation staining throughout

@ 10 ft.: Driller says formation to soft for core recovery from 10-14 ft.

Very Dark Gray Sandy Lean Clay (CL) (5Y 5/1) Soft, wet, 65% clay, 25% fine sand, 10% gravels (Fill)

@ 15 ft.: Driller pushed from 15 to 20 ft. without air, very soft

Olive Gray Weathered Mudstone, Moderately consolidated, intensely fractured, low hardness, weak, deeply weathered oxide staining throughout

@ 31 - 33 ft.: Oxidation staining along 40° fracture zones

From 31.4 - 35 ft.: Platey bedding fractures

Bottom of boring at 35 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-03

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-3

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/11/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 590.56 **Hole Dia.** 8.5 in.
Northing 506189 **Easting** 1236296.75

Well Construction Details

Top of PVC Casing Elev. **592.64 ft.**

GROUND SURFACE

4" DIA. SCHED. 40 PVC CASING: +1.9 to 40 ft.

8.5" DIA. BOREHOLE: 0 to 61 ft.

BENTONITE-CEMENT SEAL: 0 to 34 ft.

HOLE CLEANED OUT TO 41 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
0				Topsoil
		0		Light Olive Brown Mudstone (2.5Y 5/3) Moderately consolidated, platey bedding, intensely fractured, low hardness, weak, deeply weathered, Iron oxide along fractures
	48			@ 5 ft.: Soft material - no recovery
5				
		0		
	24			
10		0		@ 10.6 ft.: Subhorizontal fractures with iron oxide banding from 10.6 - 11.4 ft.; subangular fracture from 11.7 - 12.5 ft.
	54			@ 12.5 ft.: Vertical fracture with iron oxide, some gypsum @ 12.8 - 18 ft.: Variation in color along fractures to yellowish brown (10YR 5/4), liesegang banding.
15		0		From 16.2 - 19.4 ft.: Subhorizontal fractures with iron oxide and gypsum
	60			
20		0		
	60			From 22 - 30 ft.: Abundant fractures with iron oxide and gypsum
25		0		@ 25 ft.: Large void seen in video From 26.2 - 30.5 ft.: Vertical fracture; intermittent from 29.5 - 30.5 ft.
	60			@ 28 ft.: Video shows gypsum washout
30		0		Dark Gray Mudstone (5Y 3/1) Unweathered/weathered transition zone; high angle fracture from 30.3 - 31 ft. Very Dark Gray Unweathered Mudstone (5Y 3/1), Moderately consolidated, massive, occasionally fractured, low hardness, weak little to no weathering
	60			@ 34 ft.: High angle fracture with no oxides
35				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-05

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

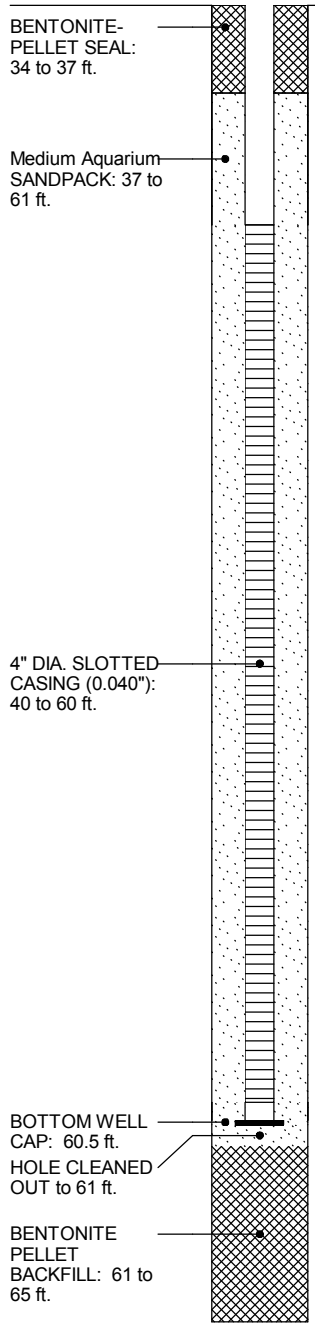
PLATE

E9-4

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/11/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	590.56 **Hole Dia.** 8.5 in.
Northing	506189 **Easting** 1236296.75

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
		0		@ 34 - 34.4 ft. moisture along fracture observed in video.
	60			
				@ 38.5 ft.: Video indicates small vertical fracture with moisture
		0		
40				@ 40.5 ft.: Vertical/high angle fractures without oxides from 40.5 - 41.7 and 41.9 - 42.5; video shows some moisture at 42.8 ft.
	60			
				From 42.8 - 44.5 ft.: White inclusion zones
45				From 45 - 46 ft.: Friable platey fracture
				@ 46 ft.: Massive and unfractured
				@ 48 ft.: White layer
		0		
	12			@ 49.5 ft.: Minor fracture
50		0		@ 50 ft.: Video shows flowing water, unable to pinpoint source
	54			
55				
	60			@ 57.8 ft.: Video indicates white inclusions
60				@ 60 ft.: Video indicates vertical fracture
				From 61.2 - 62 ft.: White calcareous inclusions
	60			
65				Bottom of boring at 65 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-05

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Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-4

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/21/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 616.09 **Hole Dia.** 8.5 in.
Northing 506325.488 **Easting** 1236329.321

Well Construction Details

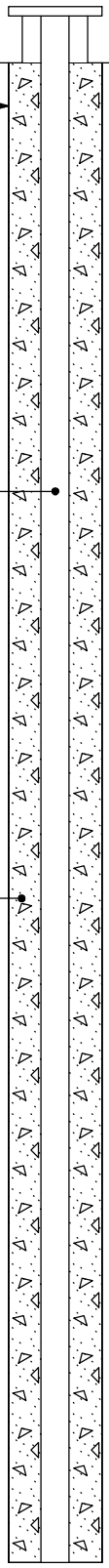
Top of PVC Casing Elev. **618.10 ft.**

GROUND SURFACE

8.5" DIA. BOREHOLE: 0 to 71 ft.

4" DIA. SCHED. 40 PVC CASING: +2.0 to 45 ft.

BENTONITE-CEMENT SEAL: 0 to 39 ft.



Recovery (inches)	PID Reading (ppm)
	0
36	
	0
54	
	0
48	
	0
60	
	0
60	
	0
60	
	0
54	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Asphalt

Light Olive Brown Weathered Mudstone (2.5Y 5/3) Moderately consolidated, very thinly bedded, closely fractured, low hardness, weak, deeply weathered, iron oxide and manganese oxide along subhorizontal and vertical fractures and surrounding rock, black oxide flecks

@ 11 ft.: Subhorizontal oxide-coated fractures with less vertical fractures; decreased oxidation from 11 - 30 ft.

@ 26.5 ft.: Oxide coating decreasing, some liesegang banding

@ 32 ft.: Gypsum in conjunction with iron oxide and manganese oxide along fractures, some gray banding

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-06

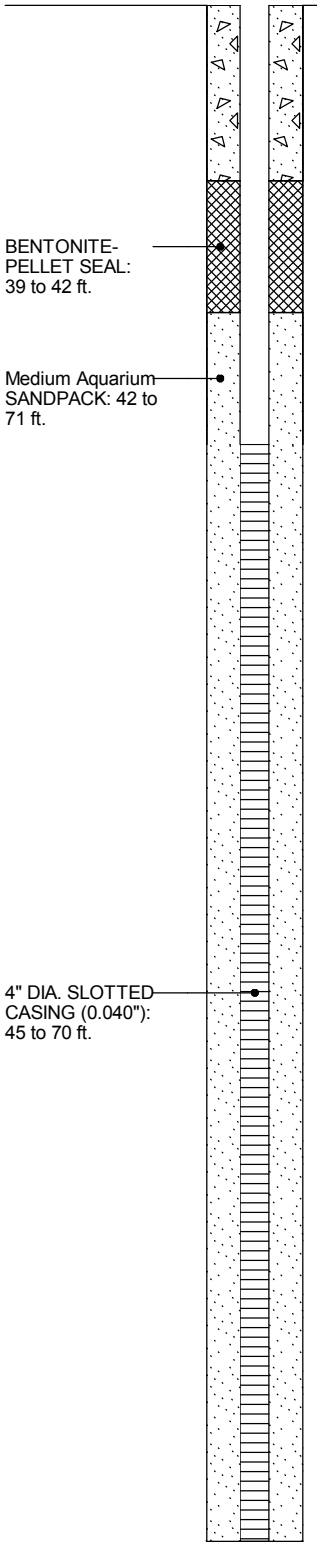
Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE **E9-5**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

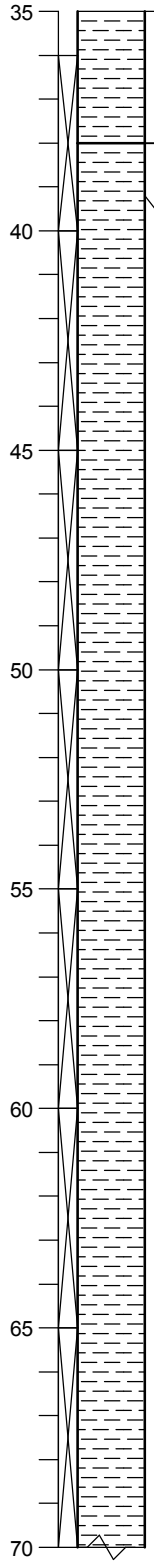
Date	11/21/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	616.09 **Hole Dia.** 8.5 in.
Northing	506325.488 **Easting** 1236329.321

Well Construction Details



Recovery (inches)	PID Reading (ppm)
	0
48	
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	

Depth (ft.) Sample



@ 36 ft.: Video shows gypsum in-filling washout; no visible water.

Dark Gray Unweathered Mudstone (5Y 4/1) Moderately consolidated, massive, very little fracturing, low hardness, weak, little to no weathering

@ 39.3 ft.: Subhorizontal fractures at 39.3, 39.7, 40.5 and 41.5 ft.

@ 45.9 ft.: White layer

@ 50.2 ft.: Subhorizontal fracture

@ 51.7 ft.: White layers

@ 57 ft.: Video shows white layer

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-06

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-5

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/21/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	616.09 **Hole Dia.** 8.5 in.
Northing	506325.488 **Easting** 1236329.321

Well Construction Details	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
BOTTOM WELL CAP: 70.5 ft. HOLE CLEANED OUT to 71 ft.			70		Bottom of boring at 70.5 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-06

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-5

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/28/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 639.38 **Hole Dia.** 8.5 in.
Northing 506364.49 **Easting** 1236668.985

Well Construction Details

Top of PVC Casing Elev. **641.36 ft.**

GROUND SURFACE

8.5" DIA. BOREHOLE: 0 to 76 ft.

4" DIA. SCHED. 40 PVC CASING: +2.0 to 50 ft.

BENTONITE-CEMENT SEAL: 0 to 44 ft.

Recovery (inches)	PID Reading (ppm)
	350
48	
	600
22	
	700
36	
	26
	450
24	
	350
54	
	200
	1700
60	
	7000
54	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Asphalt

Grayish Brown Clayey Gravel with Sand (GC) (10YR 6/2) Medium dense, moist, 60% gravel, 20% clay, 20% sand, strong odor, mild staining (Fill)

Black Weathered Mudstone (5Y 5/1) Moderately consolidated, massive, intensely fractured, low hardness, weak, deeply weathered, stained black along fractures

@ 18 ft.: Change to gray (5GY 5/1), less staining, horizontal fractures from 18.2 - 19.8 ft., vertical fracture from 18.5 - 19.9 ft.
@ 19 ft.: Subangular fracture, iron oxide along fractures, greenish discoloration along fractures

@ 22 ft.: Change to olive (5Y 5/4), shaley or platey bedding, intensely fractured with horizontal subangular and vertical fractures with green discoloration and precipitate appearance

Wet

Fractured with iron oxide, olive (5Y 5/6) coloration fractures

@ 33.3 ft.: Large vertical fracture with void space. Dark brown sheen from 33.3 - 35, 35.6 - 36.8, and 37.8 - 38.5 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-07

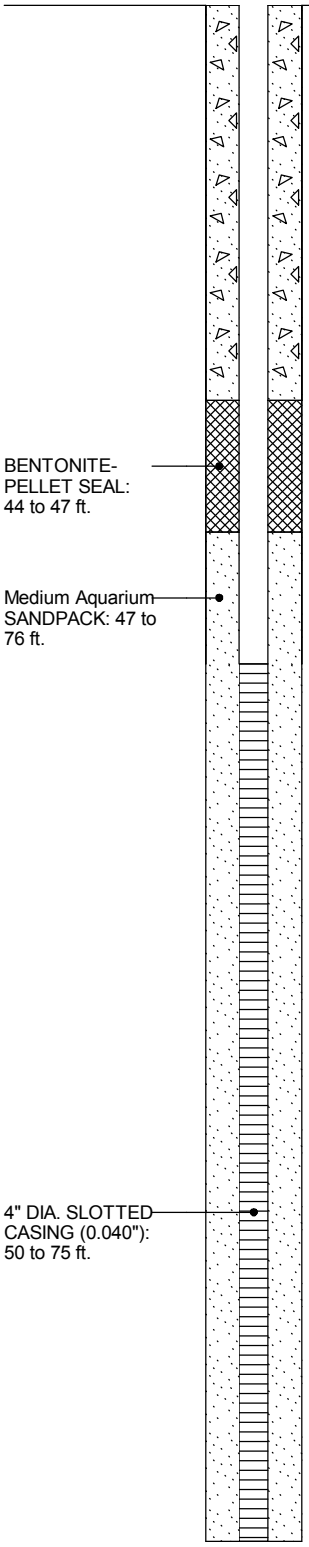
Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE **E9-6**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/28/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	639.38 **Hole Dia.** 8.5 in.
Northing	506364.49 **Easting** 1236668.985

Well Construction Details



Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	300	35		
60				
	350	40		
58				@ 43 ft.: Continue highly fractured, banding along fracture
				@ 44.5 ft.: Black oxides
	100	45		
60				Continue highly fractured with slight droplet of product
	130	50		@ 50 ft.: Coating on fracture at 50 and 51 ft.
				@ 51 ft.: Increase moisture
54				@ 53 ft.: Fewer fractures, all with iron oxide and gypsum
	200	55		@ 55 ft.: Gypsum coating on fracture
60				
	1.5	60		Weathered/Unweathered Transition Zone - banding of dark gray mudstone, iron oxide and gypsum along fractures
60				
	30	65		Olive Gray Unweathered Mudstone (5Y 4/2) Moderately consolidated, moderately fractured, low hardness, weak, little weathering, platey bedding where visible @ 65 - 67.1 ft. and 68 - 70 ft.: Vertical fractures with iron oxide and faint white coatings
60				
		70		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-07

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

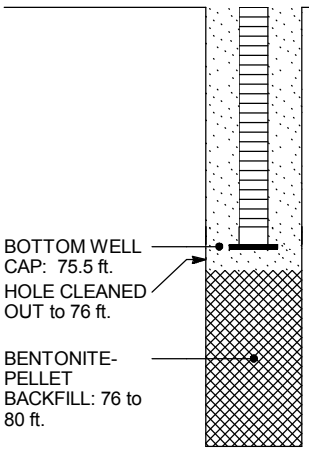
PLATE

E9-6

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/28/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	639.38 **Hole Dia.** 8.5 in.
Northing	506364.49 **Easting** 1236668.985

Well Construction Details



Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	Description
70			2.5	@ 70 - 74 ft.: Change to Dark Olive Gray, weaker, increase in moisture
		60		
				@ 74 ft.: Moderately strong, massive
75			1	
		60		@ 78 ft.: Subhorizontal fractures
				@ 78 and 79 ft.: Near vertical fracture, with iron oxide staining from 79.2 - 80 ft.
80				Bottom of boring at 80 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-07

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-6

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/22/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 656.92 **Hole Dia.** 8.5 in.
Northing 506524.379 **Easting** 1236356.087

Well Construction Details

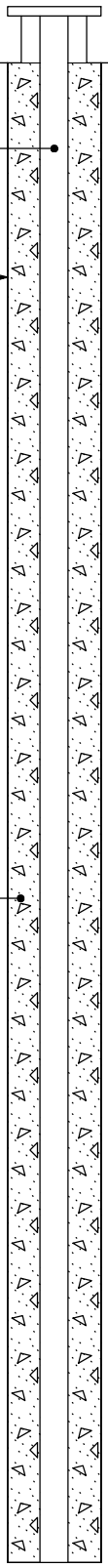
Top of PVC Casing Elev. **658.93 ft.**

GROUND SURFACE

4" DIA. SCHED. 40 PVC CASING: +1.9 to 45 ft.

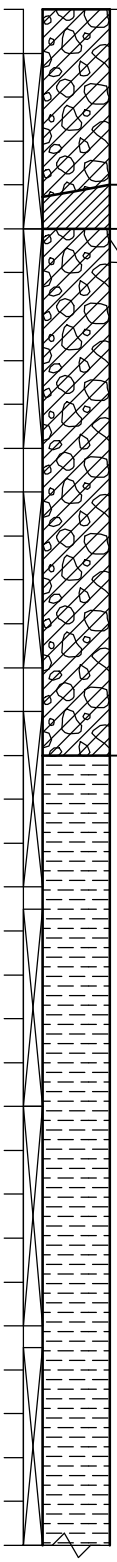
8.5" DIA. BOREHOLE: 0 to 66 ft.

BENTONITE-CEMENT SEAL: 0 to 39 ft.



Recovery (inches)	PID Reading (ppm)
	0
48	
	0
60	
	0
48	
	0
48	
	0
54	
	0
60	
	0
54	

Depth (ft.) Sample



0 — Light Yellowish Brown Clayey Gravel with Sand (GC) (2.5Y 6/3) Hard, dry, 50% angular mudstone (gravel), 30% clay, 20% sand

Dark Gray Sandy Lean Clay (CL) (10YR 4/1) hard, dry, 65% clay, 35% mudstone sand

5 — Light Yellowish Brown Clayey Gravel with Sand (GC) (2.5Y 6/3) Hard, dry, 50% angular mudstone gravel, 30% clay, 20% sand

@ 5.2 ft.: Mudstone cobble

10

@ 14.5 ft.: Change to very dark gray (10YR 3/1)

15

Brown Weathered Mudstone (10YR 5/3) Moderately consolidated, massive, intensely fractured, low hardness, weak, deeply weathered, iron oxide along abundant fractures, some manganese oxide, no discoloration

20

25

30

@ 31 ft.: Change to light olive brown (2.5Y 5/3); abundant subhorizontal to vertical fractures throughout

35

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-08

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

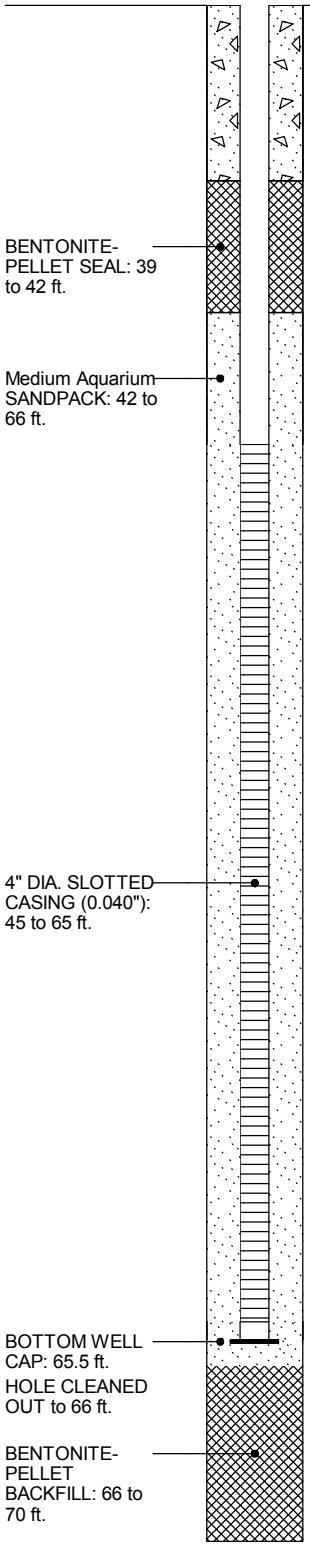
PLATE

E9-7

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/22/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	656.92 **Hole Dia.** 8.5 in.
Northing	506524.379 **Easting** 1236356.087

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
		0		
	60			
		0		
	60			
		0		
		0		
	60			
		0		
		20		
		30		
	60			
		80		
		80		
	24			
	27			
		20		
		0		
	60			
		0		
		0		
	60			
		0		
		0		

35, 40, 45, 50, 55, 60, 65, 70

@ 49 ft.: Continuing fractures throughout; video shows fracture with trace moisture

@ 58 ft.: Change to greenish gray (5GY 5/1) with abundant iron oxide along fractures, continue fractured throughout

@ 59 ft.: Video shows water dripping down sidewall

Dark Gray Unweathered Mudstone (5Y 4/1) Moderately consolidated, massive, unfractured, low hardness, weak, little to no weathering Subhorizontal fractures at 60.1, 60.3, 60.5, 62.7 and 62.9 ft.; subhorizontal fracture with iron oxide at 61.7 ft.; subangular fracture at 61.9 ft.

Bottom of boring at 70 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-08

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-7

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/12/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 452.11 **Hole Dia.** 8.5 in.
Northing 504625.763 **Easting** 1235076.533

Well Construction Details

Top of PVC Casing Elev. **453.96 ft.**

GROUND SURFACE

4" DIA. SCHED. 40 PVC CASING: +1.8 to 43 ft.

8.5" DIA. BOREHOLE: 0 to 66 ft.

BENTONITE-CEMENT SEAL: 0 to 37 ft.

Recovery (inches)	PID Reading (ppm)
12	0
24	0
24	0
24	0
24	0
12	0
54	0
54	0
60	0
60	0
60	0

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Pale Yellow Silty Sand with Gravel (SM) (2.5Y 7/3) Loose, dry, 50% fine to medium sand, 30% mudstone and siltstone gravel, 20% silt (Fill)

Light Olive Brown Clayey Sand with Gravel (SC) (2.5Y 5/4) Dense, dry, 40% lean clay, 30% fine to medium angular sand, 30% claystone and siltstone (Fill)
@ 6, 8 and 10 ft.: Vertical fracture with secondary mineralization

@ 15 ft.: Color change to olive brown (2.5Y 4/3)

Yellowish Brown Sandy Lean Clay (CL) (2.5Y 6/4) Medium stiff, dry, 60% clay, 35% fine to coarse sand, 5% siltstone and claystone gravels (Fill)
@ 20 ft.: Color change to dark grayish brown (2.5Y 4/2)

@ 24 ft.: Color change to very dark gray (10YR 3/1)

@ 29 ft.: Color change to dark grayish brown (2.5Y 4/2)

@ 32 ft.: Change to 60% clay, 30% sand, 10% gravel, trace oxidation staining

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-09

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

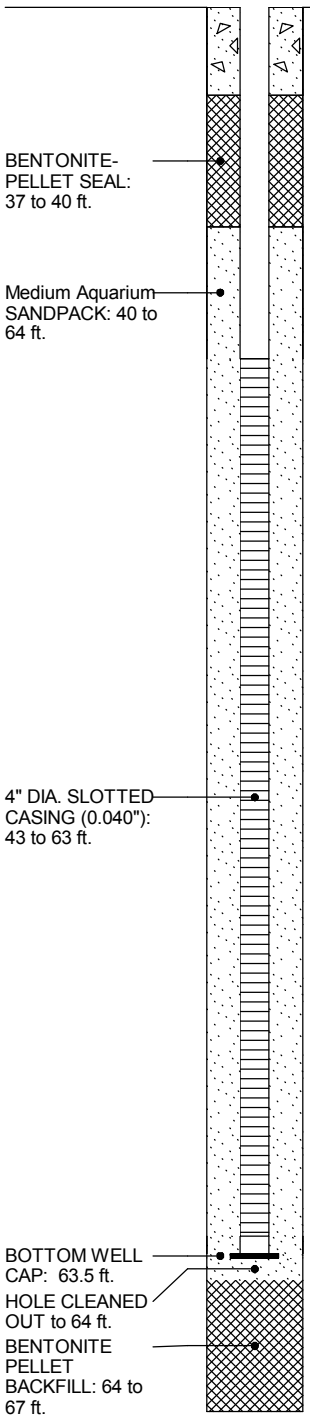
PLATE

E9-8

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/12/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 452.11 **Hole Dia.** 8.5 in.
Northing 504625.763 **Easting** 1235076.533

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
35				@ 35 ft.: Color change to light olive brown (2.5Y 6/3), trace oxidation staining
		0		@ 36 ft.: Color change to dark grayish brown (2.5Y 4/2)
				@ 38 ft.: Color change to light olive gray (2.5Y 5/3)
	60			
40				@ 40.5 ft.: Color change to dark gray (2.5Y 4/1)
		0		
	60			
45				@ 45 ft.: Color change to very dark gray
		0		
				@ 48 ft.: Change to soft, wet
				@ 49 ft.: Color change to very dark grayish brown (5Y 3/1), trace red brick debris
	60			
50				@ 51 ft.: Color change to light olive brown (2.5Y 5/3)
		0		@ 52 ft.: Color change to very dark gray (2.5Y 4/1)
	60			
55				
		0		
	6			
60				
		0		@ 62 ft.: Color change to dark gray (2.5Y 4/1)
	48			Olive Gray Sandy Lean Clay with Gravel (CL) (5Y 4/2) Soft, wet, 50% clay, 30% fine to coarse sand, 20% siltstone and claystone gravels
65				Olive Gray Clayey Gravels with Sand (GC) (5Y 4/2) Loose, wet, 50% gravels, 35% fine to coarse sand, 15% lean clay
				Dark Gray Sandy Lean Clay (CL) (5Y 4/1) Soft, wet, 60% clay, 30% fine to coarse sand, 10% gravels
				Bottom of boring at 67 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-09

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PLATE **E9-8**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 9/12/06
Driller Air Rotary
Drilling Method Air Rotary
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 663.91 **Hole Dia.** 8.5
Northing 506597.8129 **Easting** 1236143.128

Well Construction Details

Top of PVC Casing Elev. **665.88 ft.**

GROUND SURFACE

4" DIA SCH 40 PVC CASING: +2 to 40 ft.

8.5" DIA BOREHOLE: 0 to 71 ft.

BENTONITE-CEMENT SEAL: 0 to 32 ft.

BENTONITE-CHIP SEAL: 32 to 36.9 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
0		0		Light Brownish Gray Lean Clay (CL) (10YR 6/2) Medium stiff, dry, 95% clay, 5% silt (Fill)
5				
9				@9 ft.: Slight oxidation staining
10	24	0		@10 ft.: Moist
	24	0		
15	12			Olive Brown Weathered Claystone (2.5Y 4/3) Moderately fractured, moderately strong, moderately weathered, moist, slight oxidation staining, mottled with a very dark gray (2.5Y 3/1)
	12	0		
20				
	6			
	18	2		
25				@25 ft.: Change to Light Brownish Gray (2.5Y 6/2) Moderately hard to hard, oxidation staining along fractures, slight manganese oxide staining
	30			
	30			
30				
	36			@32 ft.: Abundant oxidation staining, slight manganese staining
	24	0		
35				
	30			

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-10

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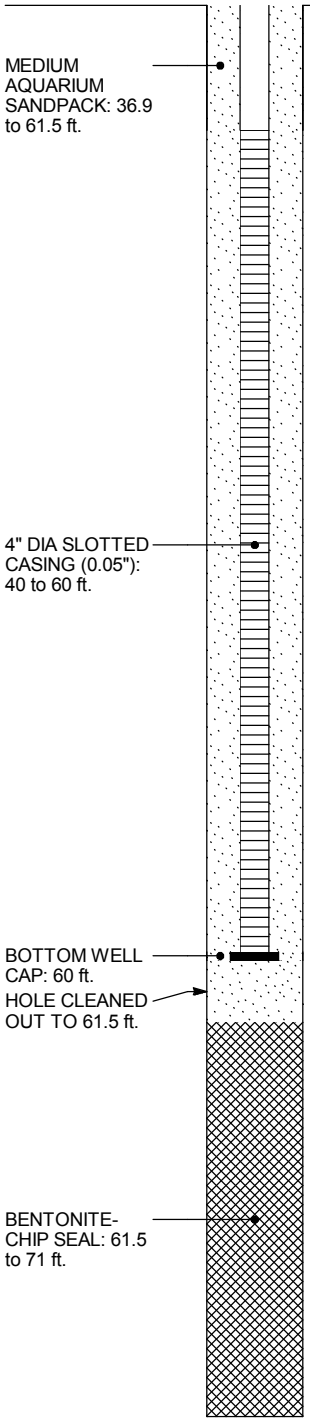
PLATE **E9-9**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/12/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	663.91 **Hole Dia.** 8.5
Northing	506597.8129 **Easting** 1236143.128

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
	18	0		
40	24			
	24	0		@43 ft.: Improved core quality, 60° fracture, visible oxidation along bedding planes, slight manganese staining
	24			
45	24			
	24	0		@49 ft.: 50° fracture
50	30			
	24	0		@52.7-53.2 ft.: Subhorizontal to 30° fractures, decrease in oxidation staining
55	36			
	24	0		
60	36			Dark Bluish Gray Unweathered Claystone (5B 4/1) Very to occasionally fractured, moderately hard, strong, little weathering @61 ft.: Possible vertical fracture @62.5-63.5 ft.: Vertical fracture
	24			
65				Bottom of boring at 64 feet. Hole opened to 71 feet prior to installation of monitoring well.
70				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-10

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-9

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date 9/19/06
Driller Air Rotary
Drilling Method Air Rotary
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 578.48 **Hole Dia.** 8.5 in.
Northing 506353.0899 **Easting** 1236028.455

Well Construction Details

Top of PVC Casing Elev. **580.87 ft.**

GROUND SURFACE

4" DIA. SCH 40 PVC CASING: +2.4 to 55 ft.

8.5" DIA. BOREHOLE: 0 to 56 ft.

BENTONITE-CEMENT SEAL: 0 to 24 ft.

BENTONITE-CHIP SEAL: 24 to 27 ft.

MEDIUM AQUARIUM SANDPACK: 27 to 56 ft.

4" DIA. SLOTTED CASING (0.05"): 30 to 55 ft.

Recovery (inches)	PID Reading (ppm)
48	0
30	
12	
24	0
30	
30	
36	
24	0
30	
36	0
60	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Grayish Brown Lean Clay (CL) (2.5Y 5/2) Hard, moist, 80% clay, 10% fine sand, 10% silt (Fill)

Grayish Brown Weathered Claystone (2.5Y 5/2) Moderately fractured, moderately hard, moderately strong, moderately weathered, dry, oxidation staining

@5-10 ft.: Driller notes hard material, possibly debris dragged down from above

@8 ft.: Color change to Light Olive Brown (2.5Y 5/3)

@11.5 ft.: Change to Olive Brown (2.5Y 4/3) Moderately fractured, moderately hard, moderately weathered

@13 ft.: Collected Chloride Diffusion sample RIMW-11-14

Weathered/Unweathered Claystone Transition Zone, decrease oxidation staining, gypsum deposits from 14 to 16 ft.

Dark Gray Unweathered Claystone (2.5Y 4/1) Occasionally fractured, strong, moderately hard to hard, little weathering

@28 ft.: More competent, rig chatter

@32 ft.: Change to Gray (2.5Y 6/1) Intensely fractured, moderately hard, little weathering

@34 ft.: Rig chatter, fracture observed in video log

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-11

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Casmalia Resources Superfund Site
Casmalia, California

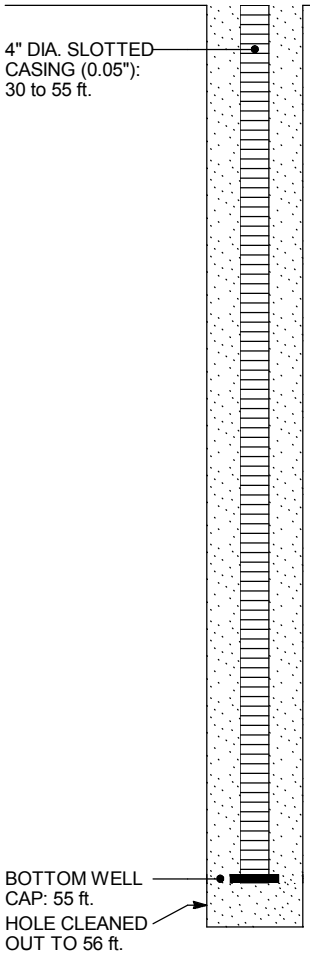
PLATE

E9-10

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/19/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	578.48 **Hole Dia.** 8.5 in.
Northing	506353.0899 **Easting** 1236028.455

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
35		0		@37 ft.: Occasionally fractured, fracture observed in video log
				@38-39 ft.: Five white stripes, reacts strongly with muriatic acid
	60			@39 ft.: Water seen leaking from fracture in video log
40				@40 ft.: White calcite stripe observed in video log
		0		@41.5-43 ft.: Solid core, very little to no fracturing
				@43-48 ft.: Fractures or mechanical breakage, core in 2 to 3-in. pieces
	60			
45				
				@46 ft.: Vertical fracture observed in video log
				@47 ft.: White stripes observed in video log
	60			@49.5 ft.: Horizontal to subhorizontal fracture, vertical fracture observed at 49 ft. in video log
50				@51 ft.: Gray (2.5Y 5/1) Occasionally fractured, moderately hard, moderately strong, little weathering
		0		@52 ft.: Vertical fracture observed in video log
	12			@53 ft.: Collected Chloride Diffusion sample RIMW-11-54
	12			
55				Bottom of boring at 54 feet. Hole opened to 56 feet prior to well installation. Vertical fracture observed at 56 ft. in video log

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIMW-11

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PLATE

E9-10

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date 11/16/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 397.40 **Hole Dia.** 6.5 in.
Northing 503678.061 **Easting** 1236852.614

Well Construction Details

Top of PVC Casing Elev. **399.49 ft.**

GROUND SURFACE

2" DIA. SCHED. 40 PVC CASING: +2.0 to 35 ft.

6.5" DIA. BOREHOLE: 0 to 50.5 ft.

BENTONITE-CEMENT SEAL: 0 to 29 ft.

BENTONITE-PELLET SEAL: 29 to 32 ft.

Medium Aquarium SANDPACK: 32 to 50.5 ft.

Recovery (inches)	PID Reading (ppm)
42	0
48	0
6	0
12	0
3	0
60	0
3	0

Depth (ft.) 0, 5, 10, 15, 20, 25, 30, 35

Sample

Brown Clayey Gravel with Sand (GC) (10YR 5/3) Dense, dry to moist, 40% mudstone gravel, 30% sand, 30% clay (Fill)

Dark Grayish Brown Clayey Sand with Gravel (SC) (10YR 4/2) Dense, moist, 50% mudstone sand , 30% clay, 20% gravel (FIll)

Very Dark Grayish Brown Sandy Lean Clay (CL) (10YR 3/2) Firm, moist, 70% clay, 30% sand (Fill)

Light Olive Brown to Dark Grayish Brown Sandy Fat Clay with Sand (SC) (2.5Y 5/3 to 2.5Y 4/2) Loose, wet, 60% mudstone sand, 40% clay (Fill)

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-02

Final Remedial Investigation Report
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Casmalia, California

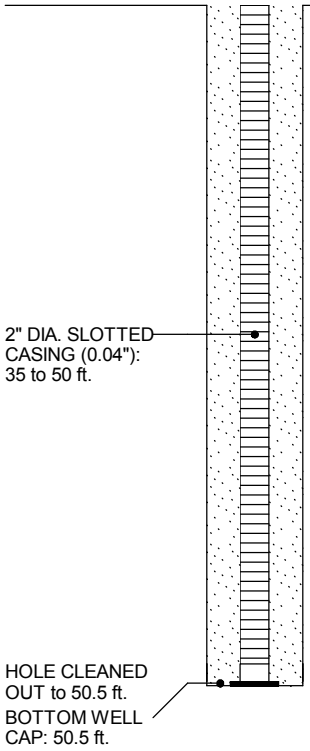
PLATE

E9-11

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/16/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	397.40 **Hole Dia.** 6.5 in.
Northing	503678.061 **Easting** 1236852.614

Well Construction Details



Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	Description
			0	
		48		
35				
40				Grayish Brown Weathered Mudstone (2.5Y 5/2) Moderately consolidated, massive, intensely fractured, low hardness, weak, deeply weathered, iron oxide along fractures @ 40 ft.: Video shows vertical fracture with water running in
		0		Dark Gray Unweathered Mudstone (5Y 4/1) Moderately consolidated, massive, closely fractured, low hardness, weak, little to no weathering @ 42, 44 and 44.6 ft.: White layers @ 43 ft.: High angle fracture @ 45 ft.: White layer with offset bedding @ 45.6 ft.: Video shows horizontal fracture and white layer at 46.2 ft. @ 47, 47.2 and 47.2 ft.: Subhorizontal fractures
45			0	
		60		
50				Bottom of boring at 50.5 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-02

Final Remedial Investigation Report
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Casmalia, California

PLATE

E9-11

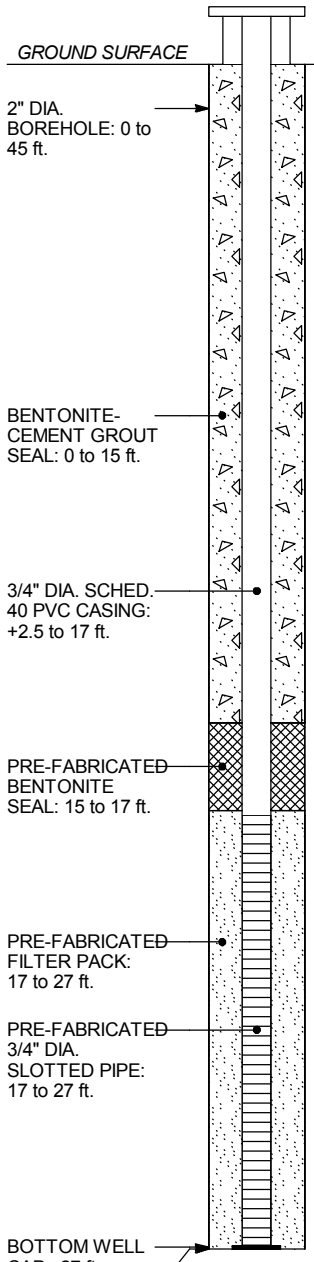
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 8/31/04
Driller Direct Push
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 441.65 **Hole Dia.** 1.75 in.
Northing 504278.726 **Easting** 1238830.9

Well Construction Details

Top of PVC Casing Elev. **444.12 ft.**

GROUND SURFACE



Recovery (inches)	PID Reading (ppm)
	0
30	
	0
30	
	0
24	
	0
24	
	0
24	
	0
24	
	0
24	
	0
24	
	0
18	
	0
18	
	0
18	
	0
18	
	0
12	
	0
18	
	0
12	
6	0

Depth (ft.) Sample

0

Very Dark Gray Lean Clay (CL) (10YR 3/1) Hard, dry, 95% clay, 5% sand, trace gravel, some root fibers, occasional white oxide specks (fill)

@4 ft.: Moist

5

@6 ft.: Abundant white non-calcareous oxides along cracks, brecciation pattern

@8.5 ft.: Change to Light Olive Brown (2.5Y 5/4), iron oxide and manganese oxide flecks throughout

10

@11 ft.: Iron oxide mottling, 2" long vertical white crystalline oxide in-filling

@12.5 ft.: Color change to Yellowish Brown (10YR 5/4), increase iron oxide mottling

@14.5 ft.: Dry

15

@16 ft.: Abundant vertical to 45° fractures with iron oxide precipitated

@17 ft.: Change to Pale Brown (10YR 6/3), friable, gypsum and iron oxide along fractures, some liesegang banding

20

@20 ft.: Harding drilling

Olive Gray Weathered Mudstone (5Y 5/1) Dry, low hardness, friable, deeply weathered, poorly consolidated, some iron oxide staining at contact diminishing with depth

@23.5 ft.: Moist, claylike

25

30

@32.5 ft.: Totally sheared, no moisture, no oxidation

Gray Unweathered Mudstone (5Y 6/1) Dry, moderately hard, weak, moderately fractured, no oxides

Drilling refusal at 34.5 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-03

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-12

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 8/30/04
Driller Direct Push
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 445.69 **Hole Dia.** 1.75 in.
Northing 504278.641 **Easting** 1238808.338

Well Construction Details

Top of PVC Casing Elev. **448.34 ft.**

GROUND SURFACE

1.75" DIA. BOREHOLE: 0 to 34 ft.

BENTONITE-CEMENT SEAL: 0 to 20.5 ft.

3/4" DIA. SCHED. 40 PVC CASING: +2.7 to 22.5 ft.

PRE-FABRICATED BENTONITE SEAL: 20.5 to 22.5 ft.

PRE-FABRICATED FILTER PACK: 22.5 to 32.5 ft.

PRE-FABARICATED 3/4" DIA. SLOTTED PIPE: 22.5 to 32.5 ft.

BOTTOM WELL CAP: 32.5 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
0				Very Dark Gray Lean Clay (CL) (10YR 2/2) Hard, dry, 95% clay, 5% sand, some root fibers, some white oxidation along relict desiccation cracks (fill)
	24	0		
5		0		Gray Clayey Sand (SC) (10YR 5/1) Dense, dry, 60% sand, 40% clay/fines with white oxide (fill)
	36			Very Dark Gray Lean Clay (CL) (10YR 2/2) Hard, dry 95% clay, 5% sand (fill)
		0		@ 7 ft.: Change to Yellowish Brown (10YR 5/4), mottled iron oxide staining within clay matrix
				@ 9 ft.: Change to (10YR 5/4 to 10YR 5/6), 90% clay, 5% sand, 5% fine gravel, irregular and patchy iron oxide mottling
10	48			@ 11 ft.: Iron oxide mottling parallel to bedding planes
		0		@ 12 ft.: No trace of gravel from 12 to 12.7 ft.
	48			
15				@15 ft.: Iron oxide banding perpendicular to drill core axis at angle of 60 degrees from vertical
20	48	2.5		
	24	1		@21 ft.: Iron oxide banding in parallel planes, some white non-calcareous oxides as irregular void in-filling
	24	0		
25	24			Dark Gray Weathered Mudstone (10YR 4/1) Dry, low hardness, friable, deep weathering, well consolidated, iron oxide staining at contact diminishing with depth
				@26 ft.: Drilling refusal using direct push technology at 26 feet. Advance CPT rods to 34 feet.
30				
				Bottom of boring at 34 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-04

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-13

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 9/30/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 451.74 **Hole Dia.** 6.5 in.
Northing 504663.203 **Easting** 1235103.352

Well Construction Details

Top of PVC Casing Elev. **451.09 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 65 ft.

2" DIA. SCHED. 40 PVC CASING: 0.7 to 44 ft.

BENTONITE-CEMENT GROUT SEAL: 0 to 38 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)
0		6.3
	60	
5		0
	60	
10		0
	54	
15		0
	60	
20		0
	60	
25		0
	60	
30		0
	60	
35		

Road base

Light Yellowish Brown Gravelly Lean Clay (CL) (2.5Y 6/3) Stiff, dry, 60% clay, 30% siltstone and claystone gravel, 10% silt (Fill)

Light Olive Brown Sandy Lean Clay with Gravel (CL) (2.5Y 5/3) Stiff, dry, 60% clay, 20% fine to coarse sand, 20% siltstone and claystone gravel

Light Olive Brown Sandy Lean Clay (CL) (2.5Y 5/3) Stiff, dry, 65% clay, 30% fine to coarse sand, 5% gravel

@ 11 ft.: Change to light olive brown (2.5Y 5/4), soft, 65% clay, 30% fine to coarse sand, 5% silt

@ 13 ft.: Change to 60% clay, 30% fine to coarse sand, 5% claystone and siltstone gravel, 5% silt

Light Olive Brown Sandy Lean Clay with Gravel (CL) (2.5Y 5/4) Medium stiff, dry, 50% clay, 30% fine to coarse sand, 15% siltstone and claystone gravel, 5% silt (Fill)

@ 21 ft.: 5% soft black subrounded organic debris

@ 23 ft.: Trace roots, plant matter

@ 25.5 ft.: Color change to Dark Gray (5Y 4/1)

@ 28 ft.: Color change to light Olive Brown

@ 29.5 ft.: Iron oxide staining

@ 31 ft.: Change to 45% clay, 30% sand, 20% gravel, 5% silt

@ 32 ft.: Color change to Dark Gray (2.5Y 4/1), mottled with Light Olive Brown (2.5Y 5/4)

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-05

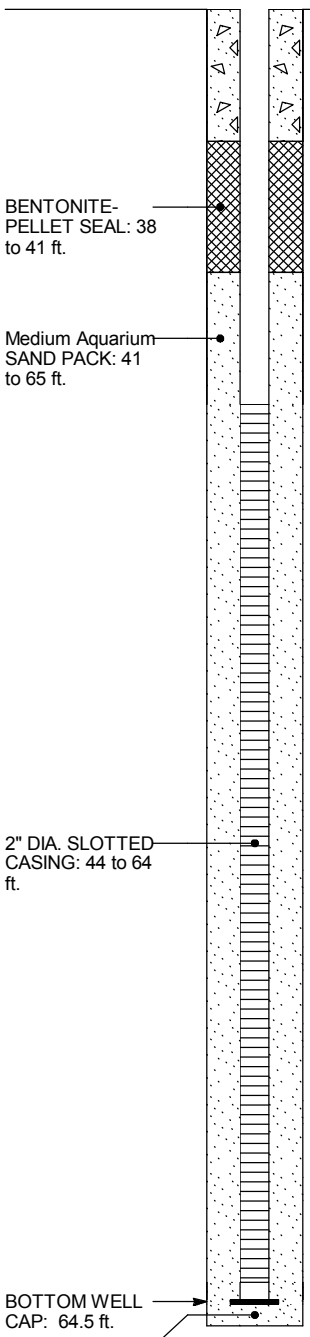
Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE **E9-14**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 9/30/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 451.74 **Hole Dia.** 6.5 in.
Northing 504663.203 **Easting** 1235103.352

Well Construction Details



Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	Description
35			0	@ 35 ft.: Change to Light Olive Brown
		60		
40			0	Dark Gray Silt (ML) (5Y 4/1) Very stiff, dry, 100% silt
				Olive Gray Sandy Lean Clay with Gravel (CL) (5Y 4/2) Soft, moist, 50% clay, 30% fine to coarse sand, 25% gravel, 5% silt (Fill)
		60		@ 42 ft.: Change to 50% clay, 25% sand, 20% gravel, 5% silt
				@ 44 ft.: Change to wet
45				
50		6	0	
			0	
55		6	0	Light Olive Brown Sandy Lean Clay with Gravel (CL) (2.5Y 5/3) Soft, wet
		60		@ 57.5 ft.: Color change to Dark Gray (2.5Y 4/1)
				@ 58.5 ft.: Color change to Light Olive Brown (2.5Y 5/3)
60			0	
		48		
65				Bottom of boring at 65 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-05

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-14

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/2/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 463.82 **Hole Dia.** 6.5 in.
Northing 505264.528 **Easting** 1237307.728

Well Construction Details

Top of PVC Casing Elev. **465.87 ft.**

GROUND SURFACE

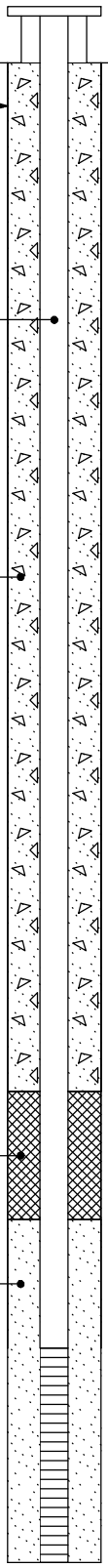
6.5" DIA. BOREHOLE: 0 to 51 ft.

2" DIA. SCHED. 40 PVC CASING: +2.0 to 30 ft.

BENTONITE-CEMENT SEAL: 0 to 24 ft.

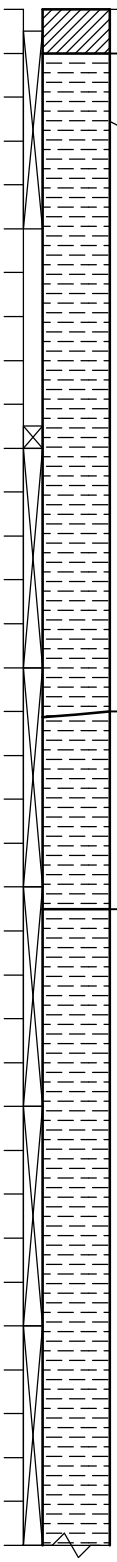
BENTONITE-PELLET SEAL: 24 to 27 ft.

Medium Aquarium SANDACK: 27 to 51 ft.



Recovery (inches)	PID Reading (ppm)
	0
54	
6	0
	0
60	
	0
54	
	4
60	
	0
60	
	0
60	

Depth (ft.) Sample



0 5 10 15 20 25 30 35

Brown Sandy Lean Clay (CL) (10YR 5/3) Very firm, moist, 70% clay, 20% sand, 10% fine mudstone gravel (Topsoil)

Light Olive Brown Weathered Mudstone (2.5Y 5/3) with variations in color to Light Yellowish Brown (2.5Y 6/3) and Light Orange Brown (2.5Y 5/4) Moderately consolidated, platey bedding, moderately strong, weak, intensely fractured, deeply weathered

@ 10.8 ft.: Gypsum in-filling of subhorizontal fractures from 10.8 to 13.4 ft.

Olive Brown Weathered/Unweathered Transition Zone Mudstone (2.5Y 4/3) Moderately consolidated, some platey bedding, closely fractured, low hardness, weak, deep to moderate weathering
Video log shows fractures at 45° to vertical, iron oxide coated, more competent at 18 ft.

Dark Gray Unweathered Claystone (5Y 4/1) Moderately consolidated, massive, occasionally fractured, low to moderate hardness, weak to moderately strong, little to no weathering, yellowish oxides

@ 25.7 ft.: Small low angle fractures with no oxides from 25.7 to 26.5 ft.

@ 30 ft.: Video log shows very high angle fracture

@ 31 ft.: Very solid, dry

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-06

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

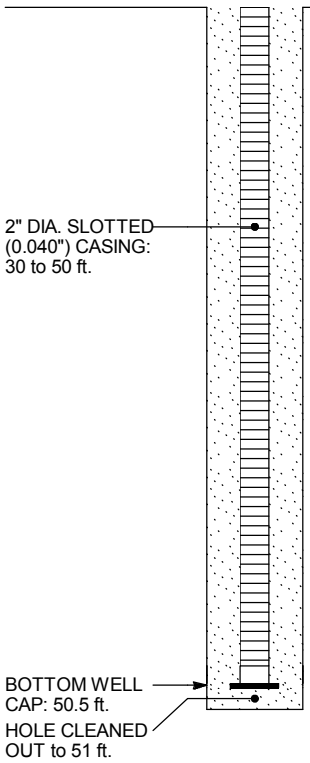
PLATE

E9-15

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/2/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	463.82 **Hole Dia.** 6.5 in.
Northing	505264.528 **Easting** 1237307.728

Well Construction Details



Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	
35			0	@ 34.6 ft.: Small low angle fractures with no oxides at 34.6, 36.2 and 37.6 ft.
		60		
40			0	@ 41 ft.: White layer
		54		
45			0	@ 45.4 ft.: White layer
		60		@ 47.2 ft.: Subhorizontal fractures with trace iron oxides at 47.2 and 48.1 ft.
				@ 49.5 ft.: White layer
50				Bottom of boring at 51 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-06

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-15

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 9/1/04
Driller Direct Push
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 463.82 **Hole Dia.** 1.75 in.
Northing 505313.451 **Easting** 1237342.372

Well Construction Details

Top of PVC Casing Elev. **465.87 ft.**

GROUND SURFACE

1.75" DIA. BOREHOLE: 0 to 38 ft.

BENTONITE-CEMENT SEAL: 0 to 21.2 ft.

3/4" DIA SCHED. 40 PVC CASING: +2.7 to 23.2 ft.

PRE-FABRICATED BENTONITE SEAL: 21.2 to 23.2 ft.

PRE-FABRICATED FILTER PACK: 23.2 to 33.2 ft.

PRE-FABRICATED 3/4" DIA. SLOTTED PIPE: 23.2 to 33.2 ft.

BOTTOM WELL CAP: 33.2 ft.

Well casing installed to 33.2 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample
0		0	
	27		
		0	
5			
	48		
		0	
10	48		
		0	
	30		
		0	
15	30		
		0	
	36		
20		0	
	36		
		0	
	36		
25		0	
	36		
		0	
30	36		
	12	0	
35		0	

Pale Yellow Clayey Gravel with Sand (GC) (2.5Y 7/4) Very dense, dry, 60% siltstone/claystone gravel, 25% dark grayish brown (10YR 4/2) clay, 15% sand (Fill)

Light Yellowish Brown Weathered Mudstone (2.5Y 6/4) Intensely fractured, low hardness, friable, deeply weathered to Brownish Yellow (10YR 6/8), iron oxide staining

@ 8.5 ft.: Iron oxide staining occurs only within veining. Some vertical fracturing and void in-filling

@13 to 14 ft.: Very poorly consolidated

@ 16.7 ft.: 3-inch sandy zone

@17 ft.: Horizontal fine-grained platey fracture. Some liesegang banding.

@19.8 ft.: 3-inch sandy zone

@20.1 ft.: Increase in consolidation. Horizontal and 45° fractures with white mineral in-filling

@22 ft.: Iron oxide mottling

@23 ft.: Horizontal fractures with iron oxide and white mineral in-filling

@23.5 ft.: 45°, 90°, and horizontal fractures

@24 ft.: Sandy Claystone

@25.5 ft.: Dry, sheared, some iron oxide and white oxides along irregular cracks

@27 ft.: Increase in consolidation. Vertical iron oxide coated cracks

@29 ft.: Unconsolidated, sheared, pulverized dry material

@31 ft.: Change to Olive (5Y 5/3)

@32 ft.: Change to Olive Gray (5Y 5/2). Unidentified product odor

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-07

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-16

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample
BGS	9		35	
		0		
	15			

Date 9/1/04
Driller Direct Push
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 463.82 **Hole Dia.** 1.75 in.
Northing 505313.451 **Easting** 1237342.372

Refusal at 38 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-07

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

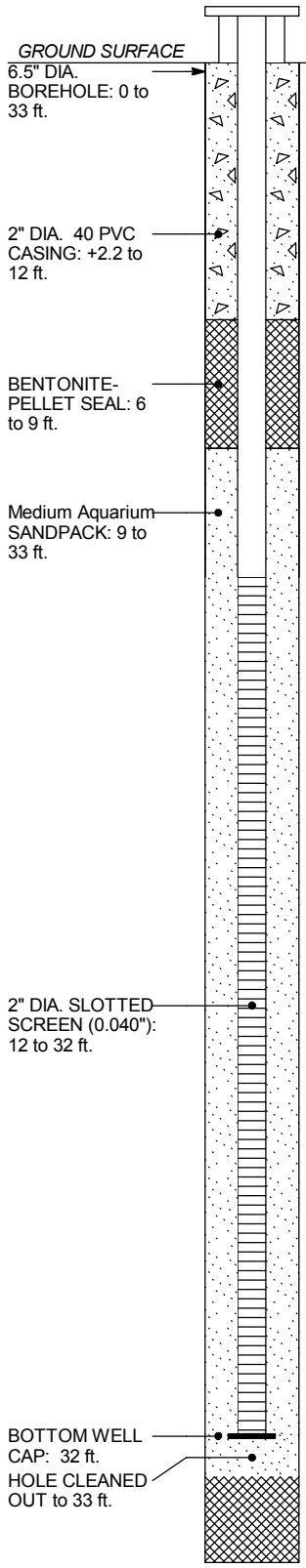
E9-16

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 12/1/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 529.00 **Hole Dia.** 6.5 in.
Northing 505816.883 **Easting** 1237121.193

Well Construction Details

Top of PVC Casing Elev. **531.35 ft.**



Recovery (inches)	PID Reading (ppm)
48	0
9	2.5
12	0
24	12
60	7
60	25
60	2.5

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Light Yellowish Brown Sandy Lean Clay (CL) (2.5Y 6/3) Soft, dry, 60% clay, 30% fine sand, 10% claystone gravels (Fill)

@ 5 ft.: Soft material; driller pushed without air

Light Olive Gray Weathered Mudstone (2.5Y 6/2), Moderately consolidated, moist, intensely fractured, no visible bedding planes, low hardness, weak, deeply weathered oxide staining along fractures

@ 19 ft.: Water seen dripping in video

@ 19.3, 19.7 and 19.9 ft.: Subhorizontal fractures

@ 23 ft.: High angle fracture

@ 24.1 ft.: Five fractures between 24.1 and 25 ft.; oxidation shown in video

Light Olive Brown and Dark Gray Mudstone (Weathered/Unweathered Transition Zone)

Dark Gray Unweathered Mudstone (5Y 4/4)

@ 30.8 ft.: Subhorizontal fractures with oxide staining along joints at 30.8, 31.3 and 32 ft.

Color change to Olive Gray (5Y 5/2)

@ 33 ft.: Video shows product floating on water; product drops on camera

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-08

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-17

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/1/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	529.00 **Hole Dia.** 6.5 in.
Northing	505816.883 **Easting** 1237121.193

Well Construction Details	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	Description
		25	35		
	60				
		30	40		Dark Gray Mudstone (5Y 4/1), moderately consolidated, moderately fractured, low hardness, weak, moderately weathered, moist (possibly due to drilling fluids)
	60				
					@ 44 ft.: Occasionally fractured, core moist
		27	45		
					@ 47 ft.: High angle fractures
BENTONITE-PELLET BACKFILL: 33 to 62 ft.	60				
		0	50		
					@ 51 ft.: Occasionally fractured, low hardness, weak, moderately weathered, massive
	54				
		12	55		@ 55 ft., 56 ft. and 58 ft.: White inclusions
	60				
		0	60		
	24				Bottom of boring at 62 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-08

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-17

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/27/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 592.94 **Hole Dia.** 6.5 in.
Northing 506273.03 **Easting** 1236277.063

Well Construction Details

Top of PVC Casing Elev. **594.92 ft.**

GROUND SURFACE

Top of casing at 2 ft. above ground level

6" DIA. BOREHOLE: 0 to 70 ft.

2" DIA. SCHED. 40 PVC CASING: +2.0 to 49.5 ft.

BENTONITE-CEMENT SEAL: 0 to 42.5 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample
0		0	
	57		
5		0	
	60		
10		0	
	60		
15		0	
	60		
20		0	
	60		
25		0	
	60		
30		0	
	60		
35			

ASPHALT

Light Olive Brown Clayey Gravel (GC) (2.5Y 5/4) Medium dense, moist, 60% angular mudstone gravel weathered to clay consistency, 30% clay/fines, 10% sand (Fill)

Light Yellowish Brown Weathered Mudstone (2.5Y 6/3) Poorly to moderately consolidated, Massive, intensely fractured, low hardness, weak, deeply weathered, iron oxide, gypsum in-fill

@ 13 ft.: Horizontal to subhorizontal bedding surfaces, platey

@ 17 ft.: Vertical fracture with liesegang banding from 17 to 20 ft. and 20 to 21 ft.

@ 21.5 ft.: Iron oxide staining

Weathered/Unweathered Mudstone Transition Zone, iron oxide discoloration along fractures

Dark Gray Unweathered Mudstone (5Y 4/1) Moderately consolidated, massive with occasional horizontal bedding plane, very little fracturing, low to moderate hardness, weak to moderately strong, little to no weathering

@ 28 ft.: Gypsum in-filling

@ 31.5 ft.: Subangular fracture from 31.4 to 33.5 ft.; fracture appears in down hole video at 33 to 35.5 ft.

@ 34 ft.: Hard drilling from 34 to 40 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RIPZ-09

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

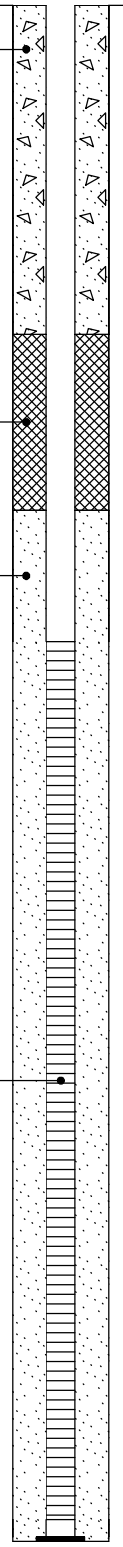
PLATE

E9-18

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/27/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	592.94 **Hole Dia.** 6.5 in.
Northing	506273.03 **Easting** 1236277.063

Well Construction Details



Recovery (inches)	PID Reading (ppm)
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	

Depth (ft.) Sample

35, 40, 45, 50, 55, 60, 65, 70

@ 36.1 ft.: White layers from 36.1 to 36.4 ft.

@ 37 ft.: Subangular fractures, slight iron oxide

@ 38.4 ft.: No iron oxide
@ 39.6 and 40.5 ft. Slight iron oxide

@ 40 ft.: White zone observed in video; drilling not as hard from 40 to 42 ft.

@ 42 ft.: Hard drilling from 42 to 50 ft.

@ 45.6 ft.: White layer

@ 50 ft.: Drilling not as hard from 50 to 53.5 ft.

@ 52 ft.: White layer observed in video

@ 53.5 ft.: Harder drilling from 53.5 to 68.5 ft.

Faint white layer with mineralization

@ 64 ft.: White layers

@ 65 ft.: Water observed in video

@ 67 - 68 ft.: Fracture observed in video, no oxides

@ 69 ft.: Weaker, platey fracture
@ 69.8 ft.: White layer

Bottom of boring at 70 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RIPZ-09

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PLATE

E9-18

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/20/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 744.92 **Hole Dia.** 6.5 in.
Northing 507555.489 **Easting** 1236761.191

Well Construction Details

Top of PVC Casing Elev. **747.01 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 86 ft.

2" DIA. SCHED. 40 PVC CASING: +2.1 to 55 ft.

BENTONITE-CEMENT SEAL: 0 to 49 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
0				Sandy Silt (ML) Topsoil at surface
				Light Brownish Gray Weathered Mudstone (2.5Y 6/2) Moderately consolidated, intensely fractured, low hardness, deeply weathered, iron oxide along cutting surfaces and as veins
				Note: Log cuttings from surface to 50 ft.
5				
10		0		
15				
		0		
20				
25				@ 24.5 ft.: Color change to Light Olive Brown (2.5Y 5/3), with abundant iron oxide
30				Dark Gray Unweathered Mudstone (5Y 4/1) Moderately consolidated, occasionally fractured, low hardness, weak, little to moderate weathering
35				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10B

Final Remedial Investigation Report
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Casmalia, California

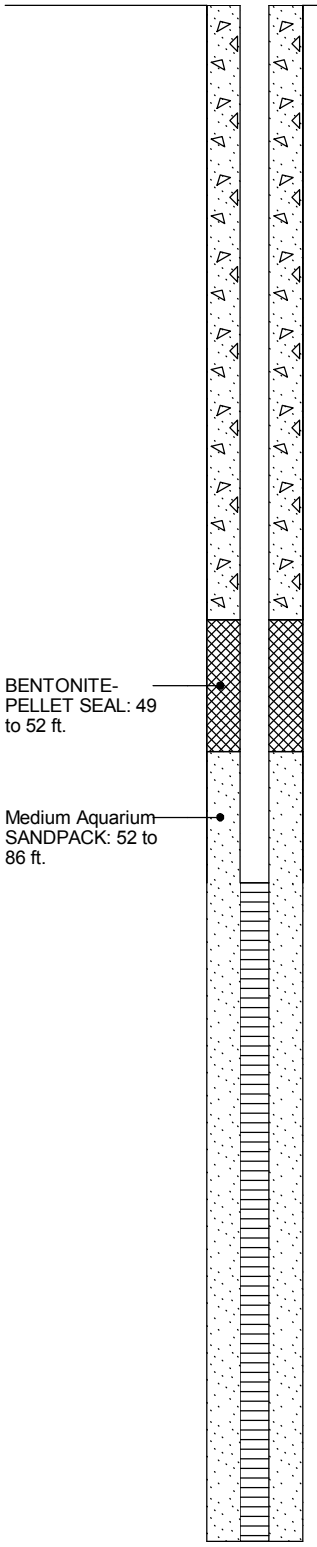
PLATE

E9-19

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/20/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.92 **Hole Dia.** 6.5 in.
Northing	507555.489 **Easting** 1236761.191

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)
35		
40		0
45		
50	18	0
55	18	0
60	51	0
65	60	0
70		

Sample

@ 47.5 ft.: Large cuttings with iron oxide along fractures

@ 52.3 ft.: Subhorizontal non-calcareous
@ 52.3-52.5 ft.: White bed
@ 53 ft.: Dark Gray (5Y 4/1), moderately consolidated, occasionally fractured, low hardness, weak, little to no weathering, some harder intervals, very mildly calcareous

@ 56.8 ft.: Chloride diffusion sample collected from 56.8 to 57.8 ft.

@ 62-65 ft.: Long nearly vertical fracture, no visible oxides

@ 68 ft.: Possible subhorizontal fracture, no oxides

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10B

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Casmalia Resources Superfund Site
Casmalia, California

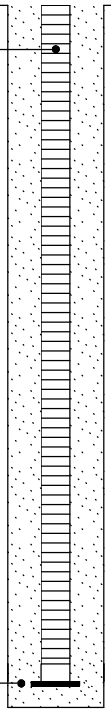
PLATE

E9-19

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/20/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.92 **Hole Dia.** 6.5 in.
Northing	507555.489 **Easting** 1236761.191

Well Construction Details



2" DIA. SLOTTED (0.040") CASING: 55 to 85 ft.

BOTTOM WELL CAP: 85.5 ft.

HOLE CLEANED OUT to 86 ft.

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	70		@ 70.5 ft.: Weaker material, breaks in fine layers
54				
	0	75		@ 75.3-75.4 ft.: White zone
60				@ 77.6-78.3 ft.: Small vertical fractures, no oxides
	0	80		@ 80 ft.: Fine layers
60				
		85		Bottom of boring at 86 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10B

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-19

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/22/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 744.46 **Hole Dia.** 6.5 in.
Northing 507570.342 **Easting** 1236769.797

Well Construction Details

Top of PVC Casing Elev. **746.44 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 136 ft.

2" DIA. SCHED. 40 PVC CASING: +2.0 to 115 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
0				Sandy Silt (ML) Topsoil
				Light Gray Weathered Mudstone (2.5Y 7/2) Moderately consolidated, intensely fractured, low hardness, weak, deeply weathered, iron oxides along edges of cuttings
		0		
5				
10				
15				@ 15 ft.: Black oxides along edges of cuttings
		0		
20				
				@ 22.5 ft. Some white oxides
25				
				@ 27 ft.: Color change to Dark Gray (5Y 4/1)
				@ 28 ft.: Color change to Light Brownish Gray (2.5Y 5/2)
		0		
30				Dark Gray Unweathered Mudstone (5Y 4/1) Moderately consolidated, low hardness, moderately strong to weak
35				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10C

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Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-20

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/22/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.46 **Hole Dia.** 6.5 in.
Northing	507570.342 **Easting** 1236769.797

Well Construction Details	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
			35		
		0	40		
			45		
			50		
			55		@ 58 ft.: White oxides
			60		@ 60 ft.: Cuttings are flat, platey fracture/bedding
		0			
			65		
			70		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10C

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Casmalia Resources Superfund Site
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PLATE

E9-20

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/22/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.46 **Hole Dia.** 6.5 in.
Northing	507570.342 **Easting** 1236769.797

Well Construction Details

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
70				
				@ 72 ft.: White oxides
75				
80				
		0		
85				@ 85 ft.: Harder drilling
90				@ 90 ft.: cuttings as fine platey chips
95				
		0		
100	60			Dark Gray to Olive Gray (5Y 4/1 to 5Y 4/2), moderately consolidated, shaley to platey, occasionally fractured, low hardness, weak, little weathering, mildly calcareous @ 100 ft.: Small subhorizontal fracture @ 102 ft.: Change to Very Dark Gray (5Y 3/1), moist
		0		
105				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10C

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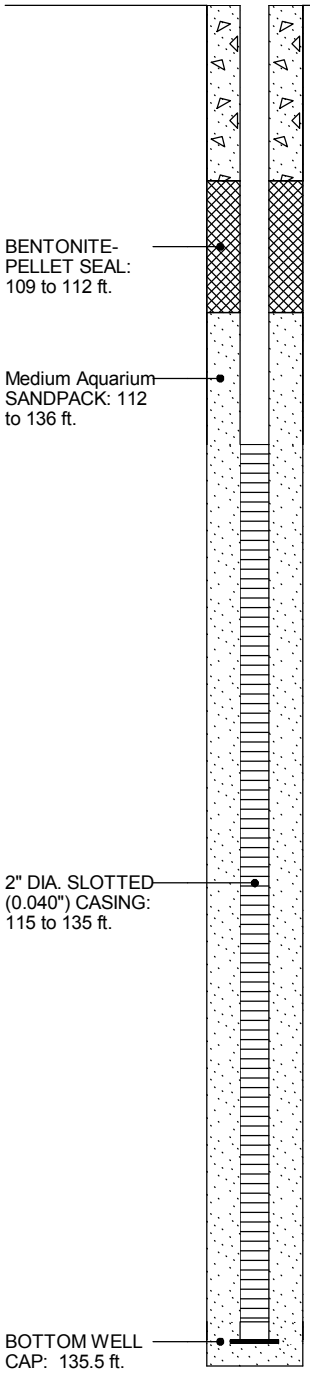
PLATE

E9-20

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/22/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.46 **Hole Dia.** 6.5 in.
Northing	507570.342 **Easting** 1236769.797

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
105	60			
		0		@ 107.1 ft.: Possible fine fracture; harder from 106.9 to 108 ft.
110	60			
		0		@ 111.9 to 113 ft.: Harder
115	60			@ 115 ft.: Change to Dark Gray (5Y 4/1), platey discs when broken
		0		@ 117 ft.: Harder from 117 to 119.5 ft.
120	60			
		0		@ 123 ft.: White calcareous layers, possible cementation around layers
125	60			
		0		@ 128 ft.: Fine fracture
130	60			@ 130 and 130.3 ft.: Thin white layers
		0		@ 132.3 ft.: Fine fracture @ 133 ft.: Thin, white layer, harder material, dry; change to Dark Gray (5Y 4/1)
135	36			

Bottom of boring at 136 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10C

Final Remedial Investigation Report
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PLATE

E9-20

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/13/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 744.68 **Hole Dia.** 6.5 in.
Northing 507565.743 **Easting** 1236761.911

Well Construction Details

Top of PVC Casing Elev. **746.48 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 240 ft.

2" DIA. SCHED. 40 PVC CASING: +1.8 to 200 ft.

BENTONITE-CEMENT SEAL: 0 to 194 ft.

Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	Description
0				Sandy Silt (ML) Topsoil
				Light Gray Weathered Mudstone, Moderately consolidated, massive, intensely fractured, low hardness, weak, deeply to moderately weathered, iron oxide along abundant fractures
			0	
		24		
5			0	
		48		From 7.2 - 7.4 ft.: 75° fracture From 7.7 - 8.3 ft.: 10° fracture @ 9 ft.: Liesegang banding, iron oxide throughout
10				
			0	@ 12 ft.: Some dark brown oxide flecks From 12.8 - 14 ft.: Iron oxide coated fractures of 15° - 75°
		30		
15				@ 14.5 ft.: two iron oxide horizontal to subhorizontal bands along bedding plane
			0	@ 18.5 ft.: Iron oxide and black oxide along fractures ranging from horizontal to vertical
		21		
20				
25			0	@ 25 ft.: Change to Grayish Brown (2.5Y 3/2) with horizontal gypsum and iron oxide in-filling, friable, platey bedding, poorly consolidated; small fractures at 25.3, 25.8, 27.2, 28.8, 29 and 29.8 ft. with gypsum
		30		
			0	@ 28 ft.: Color change to Dark Grayish Brown (2.5Y 4/2), flakey platey bedding
		30		
30				Dark Gray Unweathered Mudstone (5Y 4/1), Platey, shaley bedding, weak, near vertical
		24		From 32 to 37.8 ft.: Fracture pair
			0	
35				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10D

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PLATE

E9-21

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/13/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.68 **Hole Dia.** 6.5 in.
Northing	507565.743 **Easting** 1236761.911

Well Construction Details

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
35	60	0		
40	60	0		From 43 - 47.5 ft.: Weaker appearance, planar bedding "discs"
45	54	0		From 47 - 49 ft. and 48.6 to 49.8 ft.: Fractures 15° off vertical, some iron oxide
50	60	0		@ 54 ft.: 15° off vertical and near vertical fracture at 54 - 59.5 ft. and 54.8 - 55.3 ft.; no visible oxides
55	60	0		
60	60	0		
65	60	0		@ 65 ft.: Light gray harder inclusion, possible redox feature
70	30			

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10D

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PLATE

E9-21

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/13/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.68 **Hole Dia.** 6.5 in.
Northing	507565.743 **Easting** 1236761.911

Well Construction Details

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Description
70			
		0	
	36		@ 73 ft.: Change to Gray (5Y 5/1), moderately consolidated, thin bedding; no in-situ fracturing, low hardness, moderately strong
75		0	
	60		Subhorizontal bedding planes
80			
		0	
	45		
85			
		0	
	39		@ 88 ft.: Fracture zone with white oxides, weaker material, faster drilling
90			
		0	
	24		
		0	
	24		
95		0	
	60		@ 96.5 ft.: White bedding surface
100		0	
	60		
105			@ 104.8 ft.: Possible fine 65° off vertical fracture

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10D

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PLATE

E9-21

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/13/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.68 **Hole Dia.** 6.5 in.
Northing	507565.743 **Easting** 1236761.911

Well Construction Details

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	105		
60				
		110		
	0			
30				
	0			@ 113 ft.: Harder material
24				
		115		From 114.9 - 115.3 ft.: White, light gray bedding From 115.4 - 116, 117 - 118.5 and 119.5 - 120 ft.: Harder
	0			
54				
				@ 119 ft.: Angular fractures, no oxides
		120		
	0			
21				
		125		
12				
	0	130		@ 130.6 ft.: White bedding ~0.5" thick, 70° off vertical
60				@ 132.8 ft.: White bedding 75° off vertical
	0	135		
60				@ 137.1 ft.: White bedding 70° off vertical
		140		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10D

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PLATE

E9-21

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	10/13/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.68 **Hole Dia.** 6.5 in.
Northing	507565.743 **Easting** 1236761.911

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	140		@ 141.5 ft.: White bedding 75° off vertical
60				@ 142.7 ft.: 80° fracture, no oxides
	0	145		@ 145.7 ft.: White bedding 75° off vertical
60				@ 148.3 ft.: 75° off vertical fracture
	0	150		
60				
	0	155		
60				@ 157.6 ft.: 80° off vertical fracture, iron oxide
		160		
				@ 163.9 ft.: 80° off vertical fracture, no oxides
	0	165		@ 165.4 ft.: Iron oxide inclusion along possible fracture
				@ 166.5 ft.: Thin white bedding
60				@ 167.5 ft. and 168.7 ft.: 80° off vertical fracture
	0	170		@ 171.1 ft.: Fracture surfaces with very minor iron oxide color at 171.1 ft., 171.3 ft. and 171.8 ft.
				@ 171.5 ft. and 172 ft.: Thin white bed
54				@ 173 ft.: Fracture
		175		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10D

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PLATE

E9-21

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/13/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.68 **Hole Dia.** 6.5 in.
Northing	507565.743 **Easting** 1236761.911

Well Construction Details

Recovery (inches)	PID Reading (ppm)
18	0
	0
60	
	0
60	
	0
54	
	0
60	
	0
60	
	0
60	

Depth (ft.) Sample

175, 180, 185, 190, 195, 200, 205, 210

BENTONITE-PELLET SEAL: 194 to 197 ft.

Medium Aquarium SANDPACK: 197 to 221 ft.

@ 179.5 ft.: 80° off vertical fracture with no oxides
@ 179.7 ft.: Thin white bed

80° off vertical fracture without oxides at 183.2 ft., 183.4 ft., and 184.2 ft.

Subhorizontal fractures at 188.1 ft., 189 ft., 189.3 ft., 189.8 ft., and 190.7 ft.

@ 192.5 ft.: White bedding; subhorizontal fractures at 192.5 ft., 193.2 ft., 195.5 ft., 196.7 ft., 197.5 ft., and 198.2 ft.

@ 200.3 ft.: Fish fossil
@ 201 ft.: White beds
@ 201.3 ft.: Fracture
@ 202.1 ft. and 202.6 ft.: White beds

@ 204.7 ft.: Fracture

@ 207.6 ft. and 207.8 ft.: White beds
Fractures with very minor to no oxidation at 208 ft., 208.3 ft., 209 ft., 209.5 ft., and 210.2 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10D

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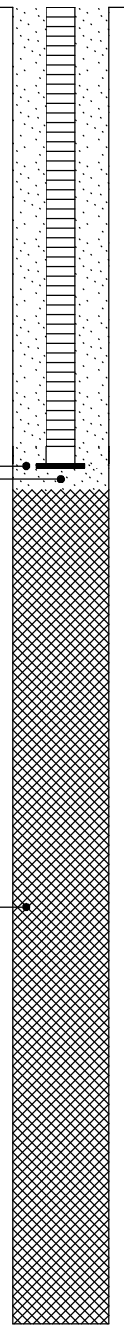
PLATE

E9-21

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/13/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	744.68 **Hole Dia.** 6.5 in.
Northing	507565.743 **Easting** 1236761.911

Well Construction Details



Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	Description
	0	210		@ 210.9 ft., 211 ft., 212 ft., 212.6 ft., and 214.3 ft.: Subhorizontal fractures; @ 212.6 ft.: Minor oxides
60				
	0	215		@ 215 ft.: White layer
60				@ 217.2 ft. and 218.5 ft.: Subhorizontal fracture @ 217.7 ft., 218.9 ft., 219.4 ft., and 220.1 ft.: White layers
	0	220		
60				@ 222.7 ft.: White layer @ 223 ft.: Fracture with white oxide flecks
	0	225		
60				@ 228 ft.: Fracture with minor iron oxide @ 228.7 ft. and 231.1 ft.: White layer
	0	230		@ 230 ft.: Subhorizontal fracture with minor iron oxide
54				
	0	235		@ 235 ft.: White layer @ 235.6 ft.: Subhorizontal fracture
60				@ 236.8 - 237.2 ft.: Vertical fracture @ 237.2 ft. and 237.6 ft.: Two subhorizontal fractures
		240		Bottom of boring at 240 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-10D

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PLATE

E9-21

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/10/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 485.23 **Hole Dia.** 6.5 in.
Northing 505370.34 **Easting** 1237292.421

Well Construction Details

Top of PVC Casing Elev. **487.24 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: +1.8 to 65 ft.

2" DIA. SCHED. 40 PVC CASING: 0 to 30 ft.

BENTONITE-PELLET SEAL: 24 to 27 ft.

Medium Aquarium SANDPACK: 27 to 51 ft.

Recovery (inches)	PID Reading (ppm)
	0
48	
	0
36	
	0
36	
	0
60	
	0
60	
	0
60	
	0
60	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Light Brownish Gray Weathered Mudstone (2.5Y 6/2), Moderately consolidated, shaley to platey bedding where visible, closely fractured, low hardness, weak, deeply weathered, fractures with strong brown iron oxide coatings from 0.6 - 4.9 ft.

@ 8 ft.: Change to intensely fractured, iron oxide coatings throughout

@ 12 ft.: Change to Brown (10YR 5/3)

@ 15 ft.: Subvertical fracture from 15 - 17.9 ft.
@ 15.5 ft.: Change to Light Olive Brown (2.5Y 5/3), closely fractured, moderately hard, weak, subhorizontal fractures with iron oxide coatings and liesegang banding from 15.7 to 18.8 ft.

@ 20.8 ft.: Vertical fractures with iron oxide and black oxides at 20.8 - 22.1 ft. and 22.7 to 24 ft., subvertical fracture with black oxides from 24 - 24.9 ft.

@ 25 ft.: White oxide with sheared punky texture seen in video

@ 27 ft.: Video shows fractures with pooling water
@ 28 ft.: First appearance of gypsum with iron oxide subhorizontal fractures from 27.6 - 30 ft.
@ 29 ft.: Video shows large fractures with gypsum

@ 31 ft.: Some liesegang banding

Very Dark Gray Unweathered Mudstone (5Y 3/1), Moderately consolidated, platey splitting, low hardness, weak, little weathering, subhorizontal fractures with iron oxide from 32.2 - 34.3 ft.
@ 34 ft.: Friable

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-11

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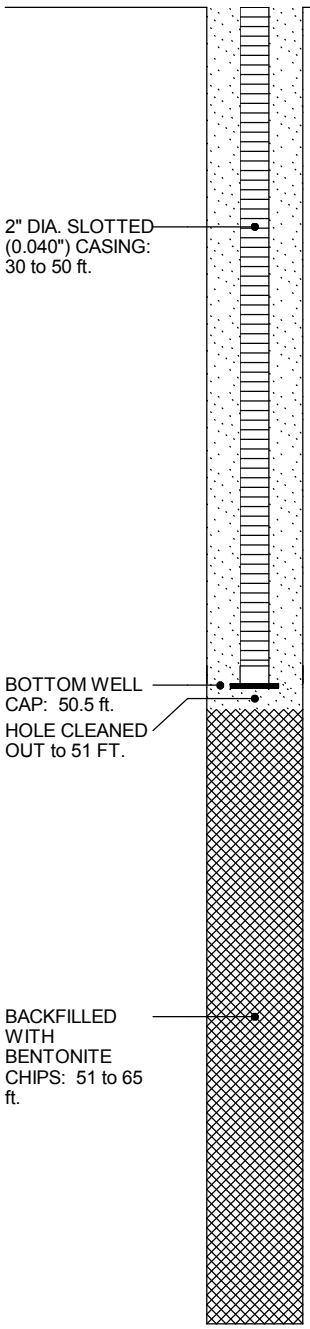
PLATE

E9-22

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/10/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 485.23 **Hole Dia.** 6.5 in.
Northing 505370.34 **Easting** 1237292.421

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
		0		@ 35 ft.: No significant oxides along fractures, more competent; high angle fracture from 35.2 - 36.7 ft.; iron oxide at top of fracture, no iron oxide by the bottom
	60			@ 38.2 ft.: Subhorizontal fractures at 38.2, 39.1, 39.3, 39.6, 41 and 41.2 ft., subvertical fracture from 40.5 - 41.1 ft.
35				
		0		
40				From 41- 42 ft.: Friable
	60			@ 42.8 ft.: Subangular fractures at 42.8, 44, and 44.7 ft.
		0		
45				
	42			@ 47 ft.: Subvertical fractures from 47 - 48 ft., 48.5 - 49 ft., and 49.3 - 50 ft.
				@ 49.2 and 50.7 ft.: White layer
50				@ 50 ft.: Intermittently friable, platey
		0		
				From 52 - 54 ft.: massive and competent
	54			
		0		
55				@ 55 ft.: Massive
				From 56 - 56.6 ft. and 56.9 - 58.1 ft.: Subvertical fractures
				@ 56.5 and 56.8 ft.: Subhorizontal fractures, no oxides
	60			
		0		
60				@ 60.6 ft.: White layer
				@ 61 ft.: Driller notes harder drilling
				Subvertical fractures at 60.8, 61.5, 62.2 and 63.7 ft.
	54			
				@ 64.3 and 64.7 ft.: White layers
65				Bottom of boring at 65 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-11

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PLATE

E9-22

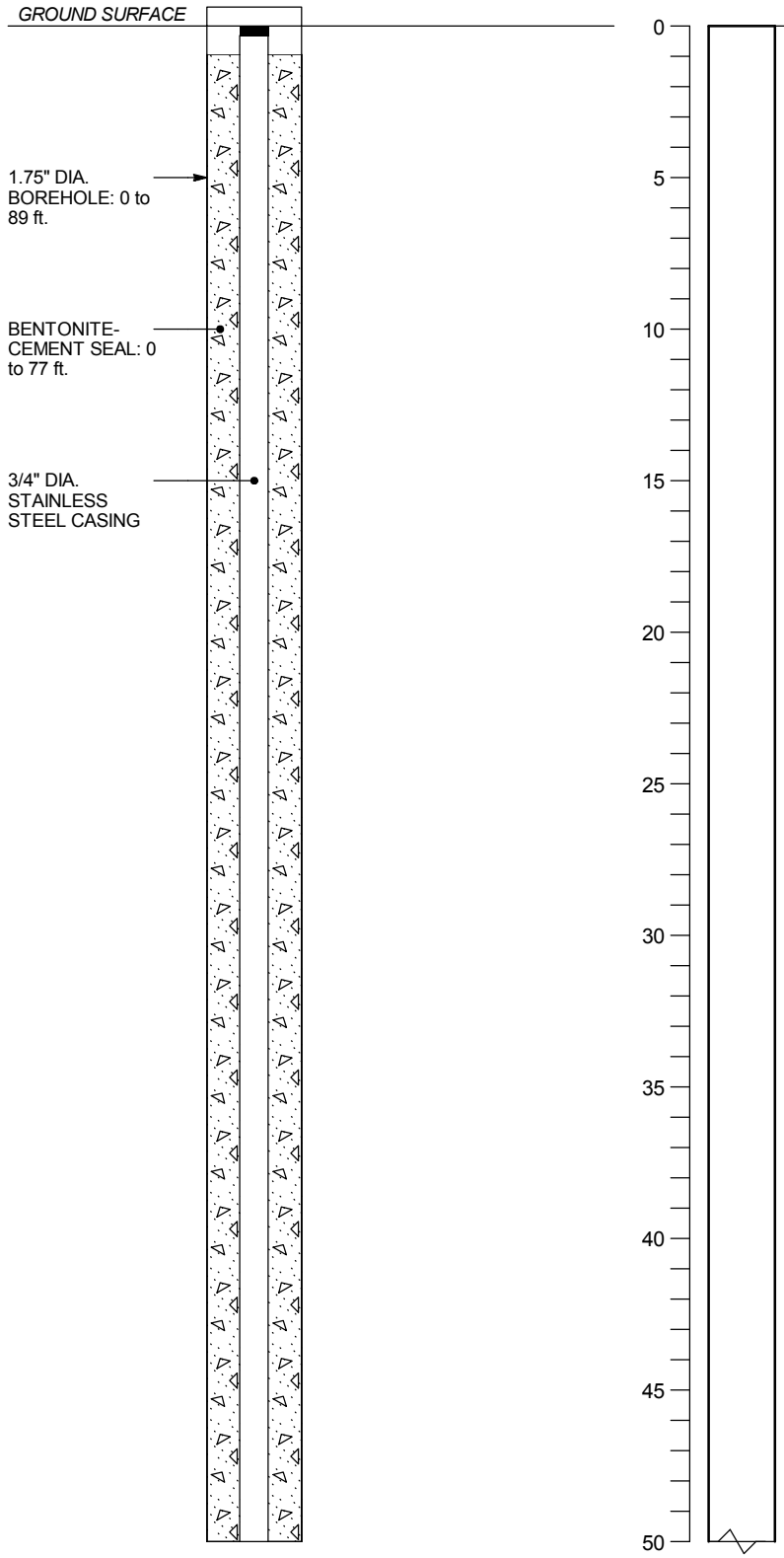
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **573.18 ft.**

Date	9/8/04
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	573.22
Hole Dia.	1.75 in.
Northing	506279.559
Easting	1237849.261

Boring advanced using CPT rig. No lithologic descriptions generated.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-12

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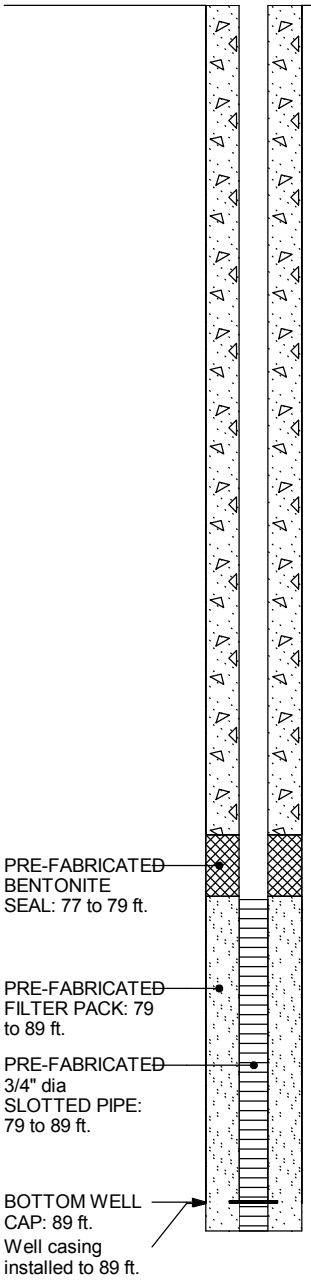
PLATE

E9-23

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	9/8/04
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	573.22
Hole Dia.	1.75 in.
Northing	506279.559
Easting	1237849.261



Depth (ft.) | Sample

50, 55, 60, 65, 70, 75, 80, 85, 90, 95

Hollow steel push rods advanced through CPT hole to 89 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-12

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Casmalia, California

PLATE

E9-23

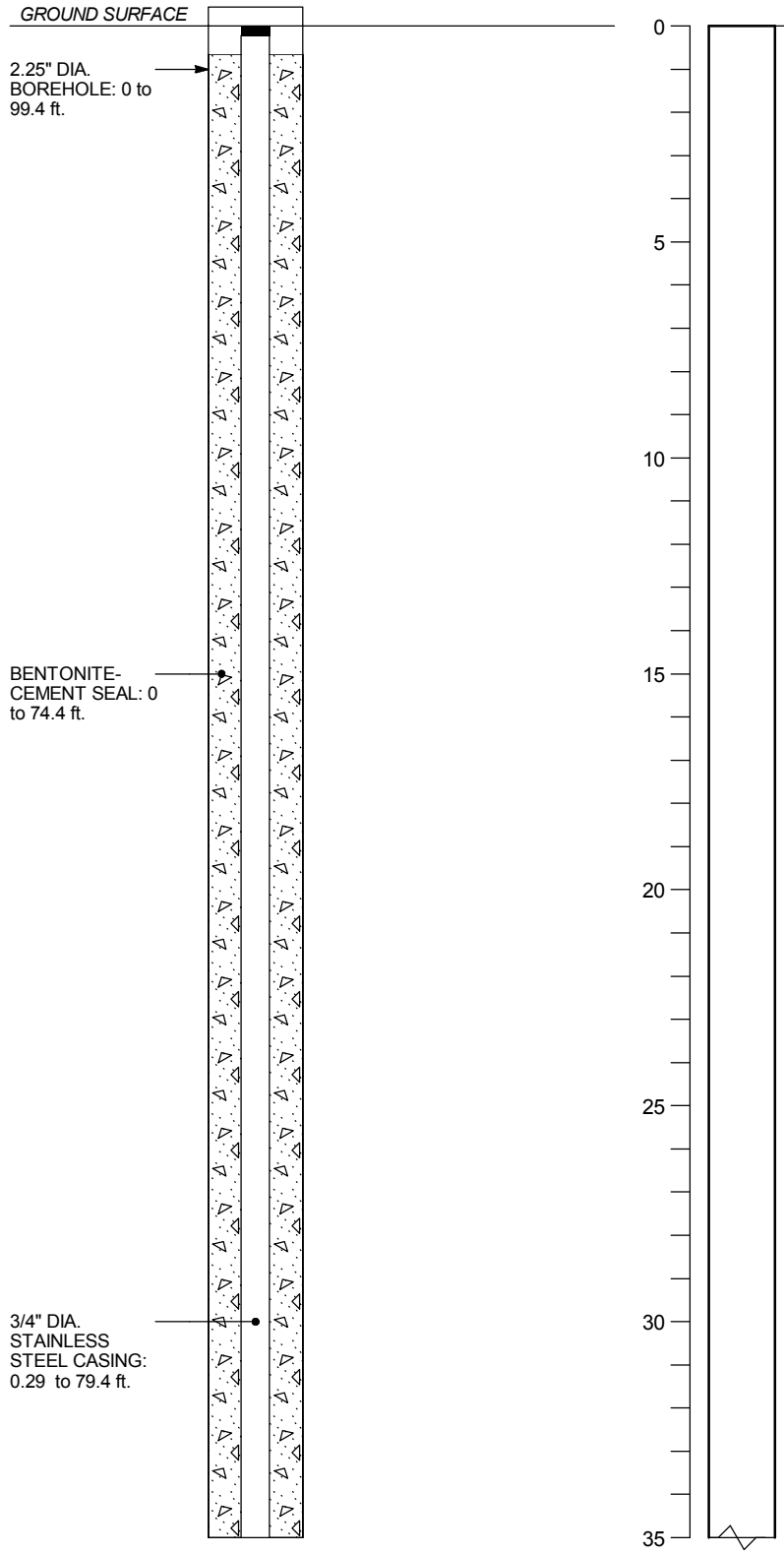
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **595.48 ft.**

Date	8/20/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	595.75
Hole Dia.	2.25
Northing	506070.082
Easting	1237172.808

Boring advanced using CPT rig. No lithologic descriptions generated.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-13

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Casmalia, California

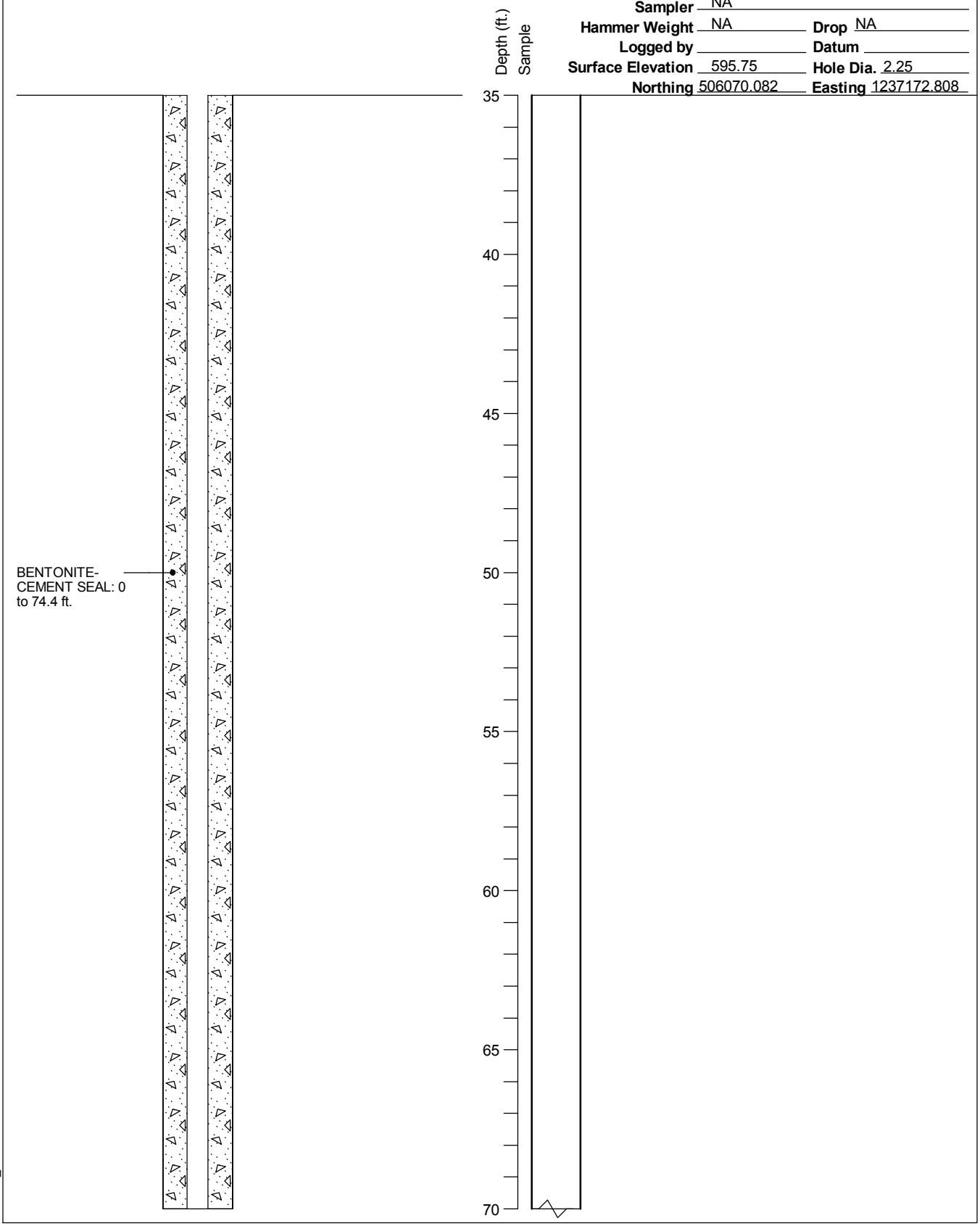
PLATE

E9-24

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/20/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	595.75
Hole Dia.	2.25
Northing	506070.082
Easting	1237172.808



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-13

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

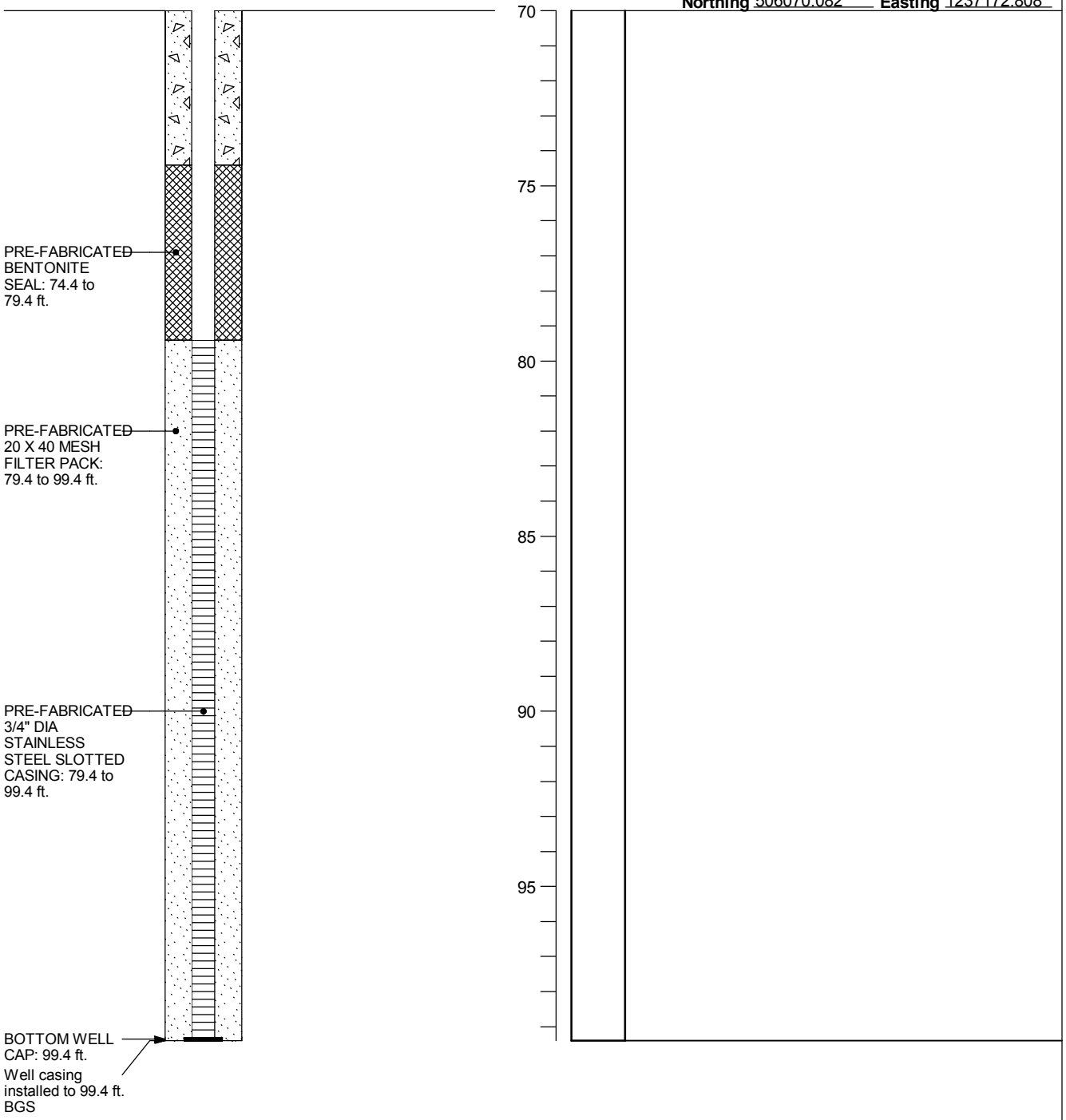
PLATE

E9-24

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/20/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	595.75
Hole Dia.	2.25
Northing	506070.082
Easting	1237172.808



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-13

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E9-24

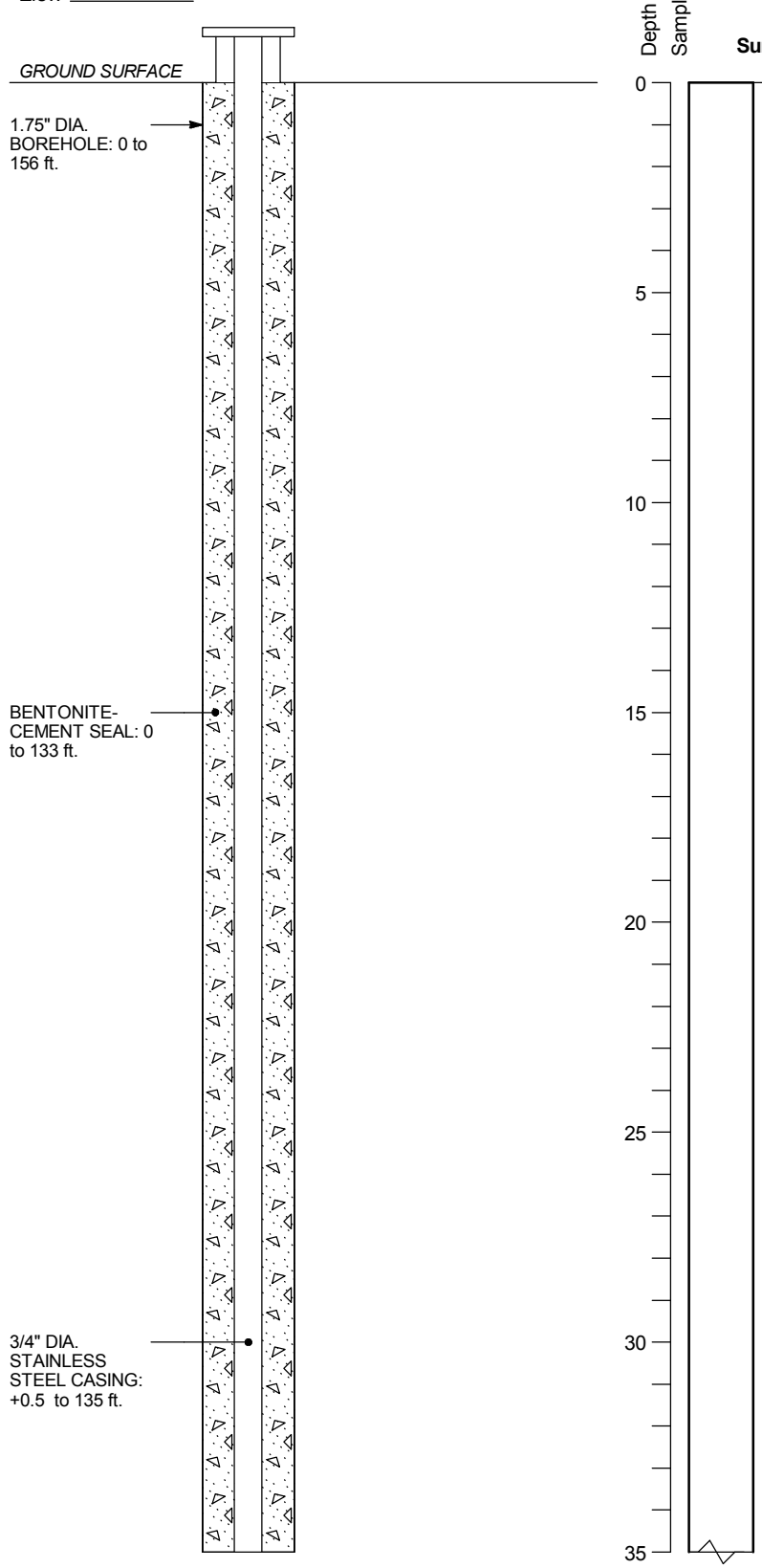
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **708.66 ft.**

Date	8/17/06
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	708.07
Hole Dia.	1.75 in.
Northing	506559.664
Easting	1237036.39

Boring advanced using CPT rig. No lithologic descriptions generated.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-14

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Casmalia Resources Superfund Site
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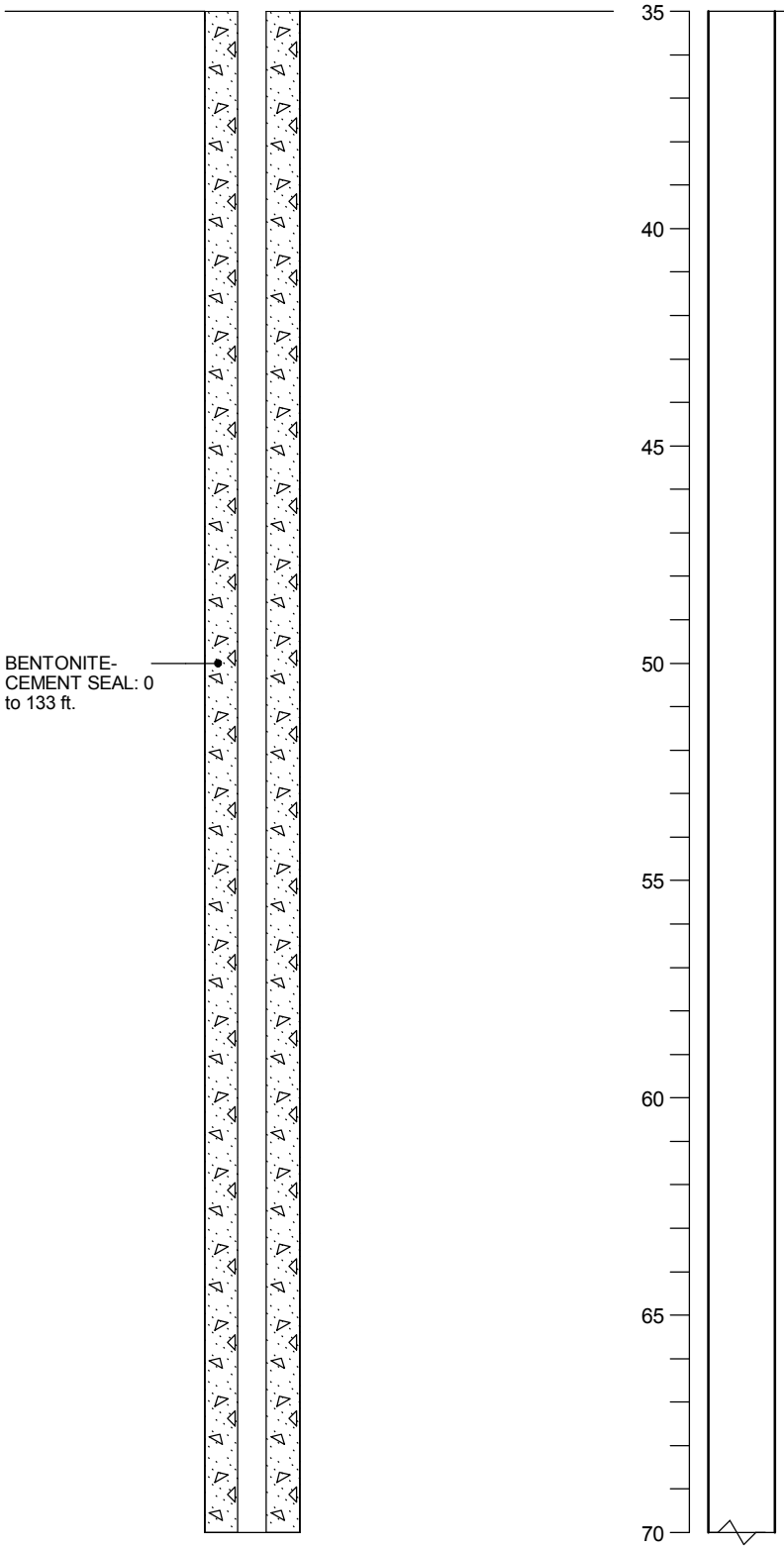
PLATE

E9-25

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/17/06
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	708.07
Hole Dia.	1.75 in.
Northing	506559.664
Easting	1237036.39



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-14

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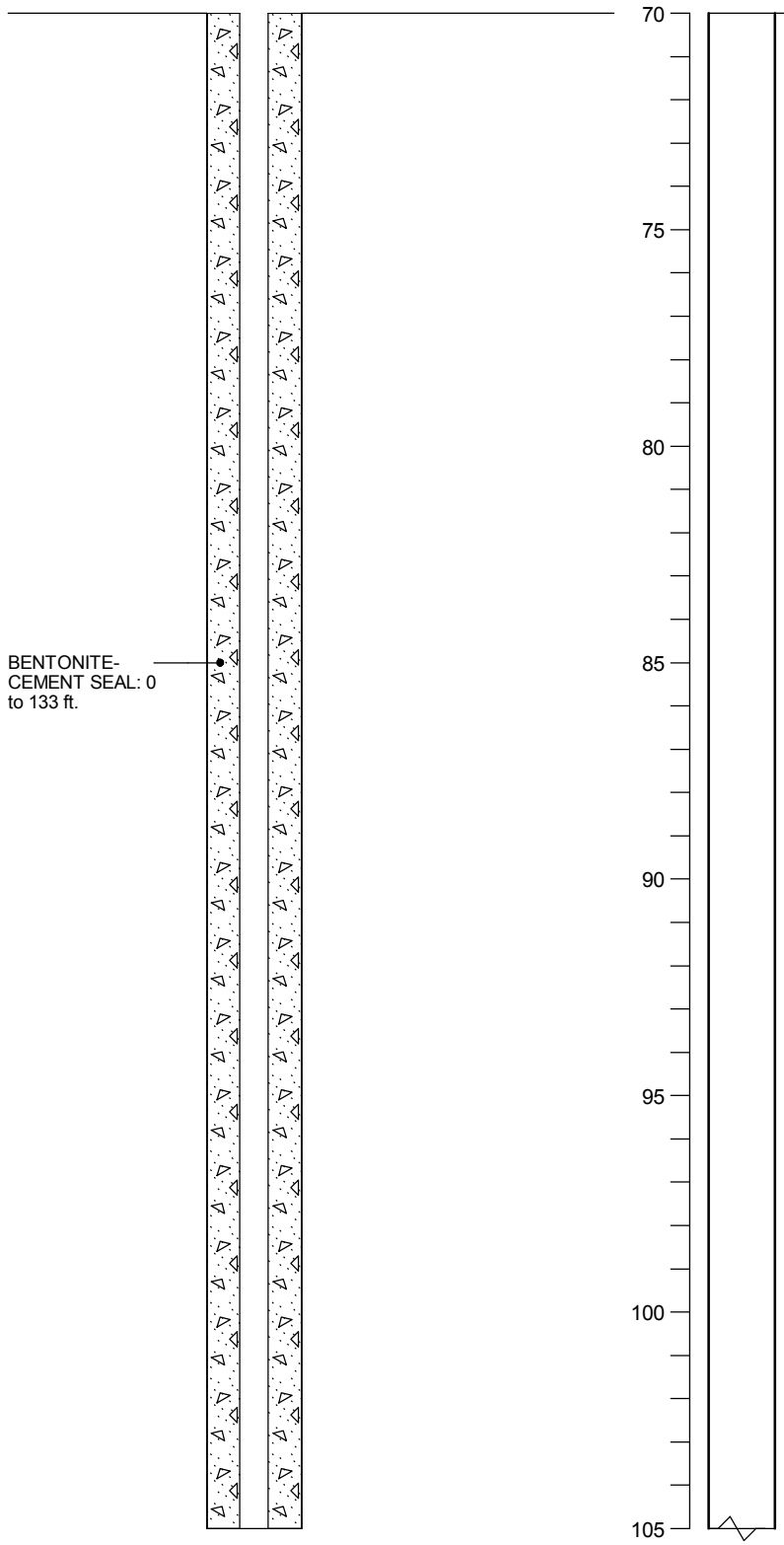
E9-25

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/17/06
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	708.07
Hole Dia.	1.75 in.
Northing	506559.664
Easting	1237036.39



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-14

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Casmalia, California

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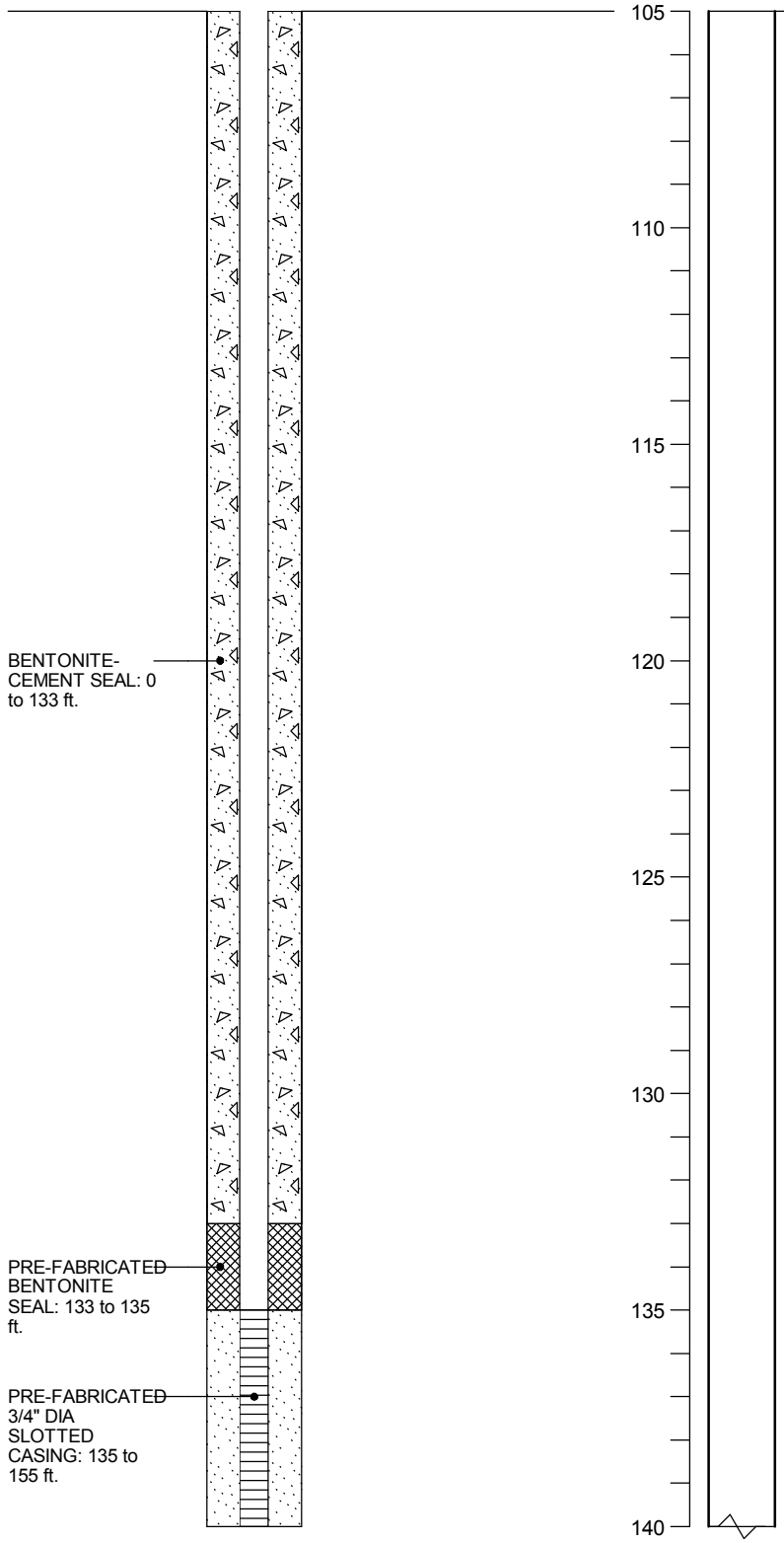
E9-25

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/17/06		
Driller	CPT		
Drilling Method	CPT		
Sampler	NA		
Hammer Weight	NA	**Drop**	NA
Logged by		**Datum**	
Surface Elevation	708.07	**Hole Dia.**	1.75 in.
Northing	506559.664	**Easting**	1237036.39



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-14

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

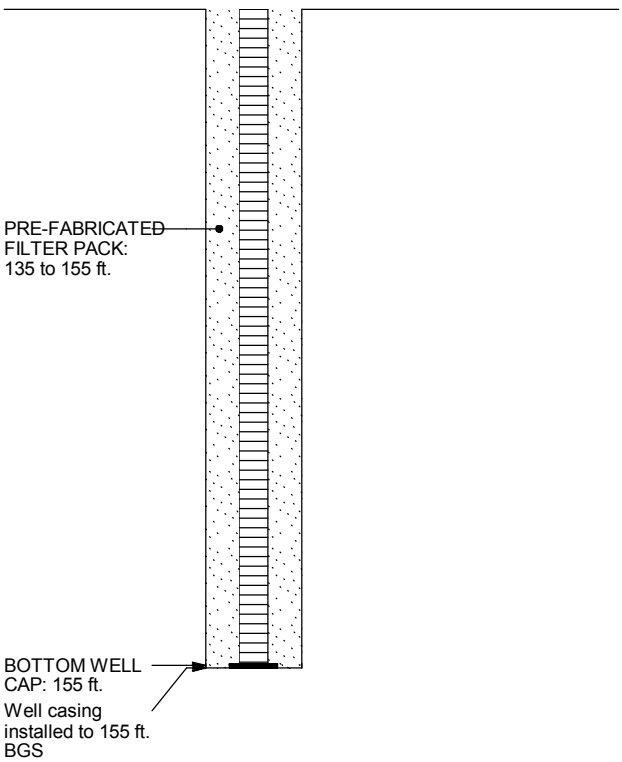
PLATE

E9-25

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/17/06
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	708.07
Hole Dia.	1.75 in.
Northing	506559.664
Easting	1237036.39



Depth (ft.) | Sample

140

145

150

155

Hollow steel push rods advanced through CPT hole to 155 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-14

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E9-25

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date	12/8/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	653.41 **Hole Dia.** 9 5/8 in.
Northing	506496.626 **Easting** 1236491.264

Well Construction Details

Top of PVC Casing Elev. **655.27 ft.**

GROUND SURFACE

9-5/8" DIA. BOREHOLE: 0 to 73 ft.

2" DIA. SCHED. 40 PVC CASING: +2 to 140 ft.

BENTONITE-CEMENT SEAL: 0 to 134 ft.

Recovery (inches)	PID Reading (ppm)
	0
51	
	0
0	
	0
12	
	0
36	
	0
51	
	0
60	
	0
42	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Brown Gravelly Lean Clay (CL) (10YR 5/3) Hard, dry to moist, 70% clay, 30% mudstone gravels, some white oxide precipitate

@ 7.5 ft.: Color change to Very Dark Gray (10Y 3/1) from 7 - 7.5 ft. and 8.5 to 9 ft.

Very Dark Gray Clayey Gravel (GC) (10YR 3/1) Dense, moist, 60% olive mudstone gravel, 40% clay/fines

Light Olive Brown Weathered Mudstone (2.5Y 5/3), Moderately consolidated, massive, intensely fractured, low hardness, weak, deeply weathered, iron oxide throughout, primarily along fractures

Fracture orientations vary from horizontal to vertical

@ 28 ft.: Change to Dark Grayish Brown (2.5Y 4/2), abundant fractures with iron oxide

@ 33 ft.: Intensely crushed/fractured to pieces 6.5 in. on edge

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-15

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E9-26

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/8/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	653.41 **Hole Dia.** 9 5/8 in.
Northing	506496.626 **Easting** 1236491.264

Well Construction Details

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	35		@ 36 ft.: Less fractured, vertical fracturing predominates
60				
	0	40		
60				@ 42 ft.: Fracturing at all orientations with iron oxide
	40	45		
60				@ 48.3 ft.: Slight sheen
	10	50		@ 51 ft.: Slight sheen as droplets on outside of core
48				@ 52 ft.: Gray band from 52 - 53 ft.
	0	55		
60				@ 57, 58.3, 59, and 59.6 ft.: Gray bands
	0	60		Dark Gray Unweathered Mudstone (5Y 4/1), Moderately consolidated, massive, occasionally fractured, low hardness, weak, little to no weathering
60				@ 61 ft.: Small subhorizontal fractures between 61 and 62 ft., white layer at 62.2 ft.
	0	65		Subvertical fractures at 65.8 and 68 ft.; small subhorizontal fractures between 67.3 and 69 ft.
60				@ 69.2, 69.4, and 71 ft.: White layers
		70		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-15

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PLATE

E9-26

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/8/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	653.41 **Hole Dia.** 9 5/8 in.
Northing	506496.626 **Easting** 1236491.264

Well Construction Details

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
70	60	0		7-5/8" DIA. BOREHOLE: 73 to 75 ft.
75	60	0		@ 74 ft.: Angled fracture with iron oxide coating @ 75.8 ft.: White layer and angled fracture
80	60	0		@ 77.8 ft.: Small subangular fractures at 77.7, 79.4, 82.8, 84. 84.2, and 84.5 ft.; subvertical fractures at 85 ft.
85	60	0		
90	60	0		@ 86 ft.: Massive, unfractured
95	54	0		@ 90.6 and 90.7 ft.: Small subhorizontal fractures @ 93.6 ft.: Video survey shows white layer with offset beds and iron oxide coated fracture at 94.5 ft. @ 94.5 and 95.8 ft.: White layers
100	60	0		@ 96.4 ft.: Fracture with pyrite microcrystals and odor From 96.9 - 97.8 ft.: Fracture weeping water during video survey @ 99 and 102 ft.: High angle fractures 6.5" DIA. BOREHOLE: 75 to 161 ft.
105	60			@ 102 - 105 ft.: Video survey shows fractured, sheared; white layer at 103.3 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-15

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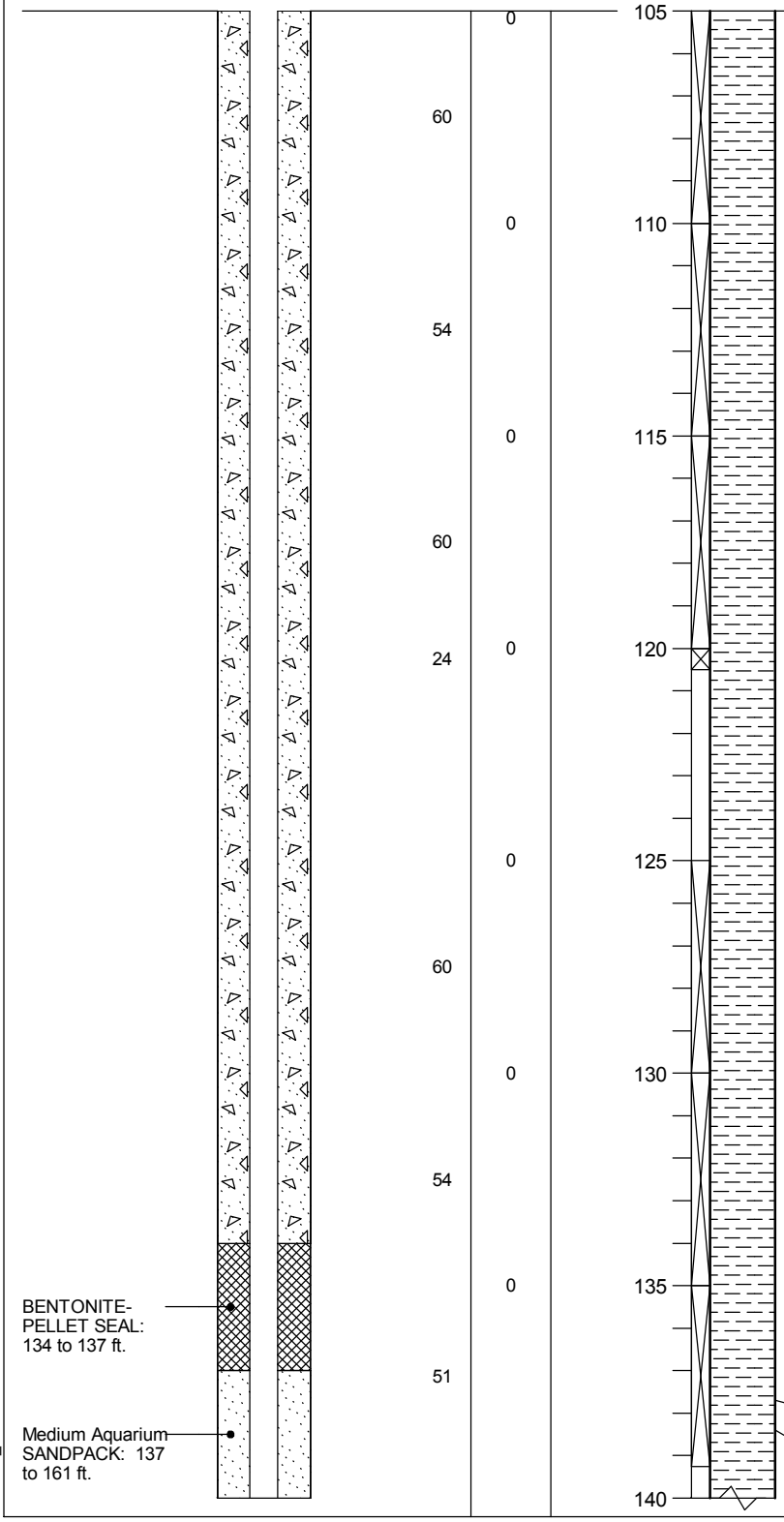
E9-26

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/8/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	653.41 **Hole Dia.** 9 5/8 in.
Northing	506496.626 **Easting** 1236491.264

Well Construction Details



Recovery (inches)	PID Reading (ppm)
	0
60	
	0
54	
	0
60	
24	0
	0
60	
	0
54	
	0
51	

Depth (ft.) Sample: 105, 110, 115, 120, 125, 130, 135, 140

@ 106 ft.: Video survey shows high angle fracture, lighter color

@ 108 ft.: Video survey shows many tiny high angle fractures

@ 109 ft.: High angle fracture

@ 111 ft.: Video survey shows high angle fracture with milky pooling

@ 113.3 - 114 and 114.5 - 115.3 ft.: High angle fractures

@ 118 - 126 ft.: Vertical fractures; no recovery from 120 - 123 ft., but fracture observed in video log; water seen bubbling out of fracture

@ 124 ft.: Massive, unfractured

@ 127 ft.: Video survey shows white layer

@ 131 ft.: Massive, unfractured

@ 137.5 ft.: 2 in. white zone
138.5 ft.: Optical televiewer shows white zone with water running along fracture
@ 139 ft.: Very hard drilling, hard spot, mildly calcareous

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-15

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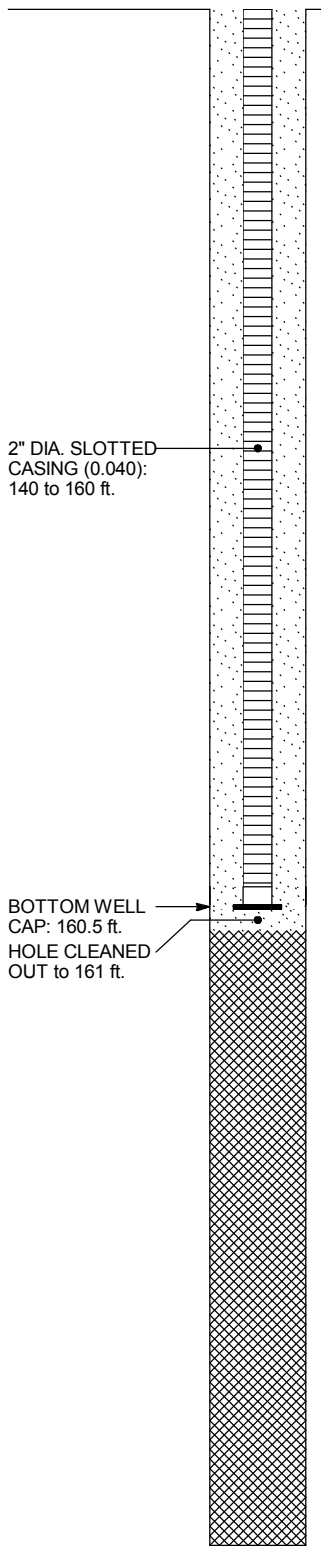
E9-26

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

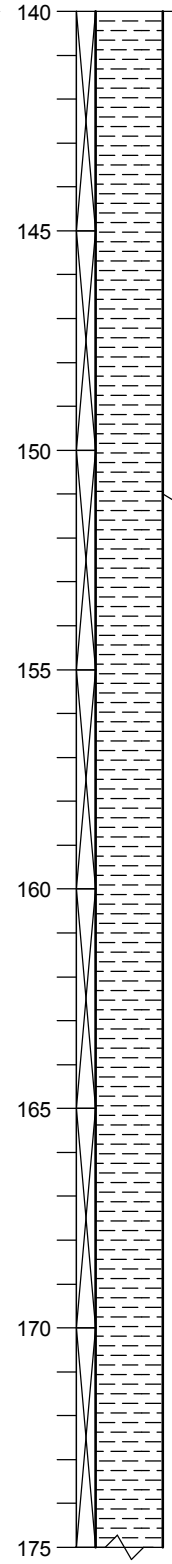
Date	12/8/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	653.41 **Hole Dia.** 9 5/8 in.
Northing	506496.626 **Easting** 1236491.264

Well Construction Details



Recovery (inches)	PID Reading (ppm)
0	0
0	0
60	0
60	0
60	0
60	0
60	0
54	0

Depth (ft.) / Sample



@ 142 - 144 ft.: Video survey shows massive high angle fracture

@ 146.3 - 148.5 ft.: Parallel vertical fractures with white oxide; in video log water seen dripping from fracture

@ 149 ft.: Video survey shows a lot of water running down sidewalls

@ 151 ft.: Video survey shows white layer; vertical fracture from 151.2 - 151.7 ft.

@ 150.8 ft.: White layer; small subhorizontal fractures at 150.8, 153.6, and 153.8

@ 157 - 163.5 ft.: Intensely fractured, no oxides

@ 160.5 - 161.6 ft.: Vertical fractures set at perpendicular orientation

@ 165.5, 165.7, 167.5, 167.7., 167.9, and 169.2 ft.: Small subhorizontal fractures; subangular fractures at 166.7 and vertical fracture at 169.7

@ 170.5 ft.: Video shows formation sheared up with white oxidation; borehole making more water at this zone than fracture zones above

@ 172.5 - 173.5 ft.: High angle fracture

@ 174.6 - 177.5 ft.: Subhorizontal fractures

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-15

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E9-26

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/8/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	653.41 **Hole Dia.** 9 5/8 in.
Northing	506496.626 **Easting** 1236491.264

Well Construction Details

BENTONITE PELLET BACKFILL: 161 to 200 ft.

Recovery (inches)	PID Reading (ppm)
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	

Depth (ft.) Sample

175, 180, 185, 190, 195, 200

@ 178 ft.: Textural change to harder, breaks have granular texture on surfaces; mudstone is sheared to pieces and re-cemented, does not fall apart along fracture surfaces

@ 179 ft.: Particles dropping from above vast video camera; abandon video run at 187 ft. due to falling debris

@ 187 - 195.2 ft.: Return to normal texture; abundant subhorizontal high angle and vertical fractures

@ 197.8 and 198.2 ft.: White layers; subhorizontal fractures at 196, 198, 198.2, 198.4, and 198.7 ft.

@ 199.3 ft.: Vertical fracture

Bottom of boring at 200 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-15

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E9-26

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 12/3/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 622.79 **Hole Dia.** 9 5/8 in.
Northing 506312.895 **Easting** 1236459.512

Well Construction Details

Top of PVC Casing Elev. **625.13 ft.**

GROUND SURFACE

9-5/8" DIA. BOREHOLE: 0 to 60 ft.

2" DIA. SCHED. 40 PVC CASING: +2.3 to 135 ft.

BENTONITE-CEMENT SEAL: 0 to 129 ft.

Blows/Foot	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		0	0		Light Olive Gray Sandy lean Clay (CL) (5Y 6/2) Soft, dry, 70% clay, 20% fine sand, 10% claystone gravel
48					
		0	5		Light Yellowish Brown Weathered Claystone (2.5Y 6/3), Moderately consolidated, intensely fractured, massive, low hardness, deeply weathered, oxides and manganese staining throughout joints and fractures
	60				
		0	10		
	60				@ 12 ft.: Oxides and manganese stains along joints and fractures
		0	15		
	60				
		0	20		@ 20 ft.: Abundant oxide and manganese staining along joints and fractures
	60				@ 22 - 24 ft.: Core broken up; abundant oxidation staining, some manganese staining
		0	25		
	60				
		0	30		@ 30 ft.: Driller started using water
	60				@ 31 ft.: Color change to Light Olive Gray (5Y 6/2), intensely fractured @ 32 ft.: Friable @ 31 - 33.8 ft.: Small subhorizontal fractures
			35		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-16

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PLATE

E9-27

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/3/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	622.79 **Hole Dia.** 9 5/8 in.
Northing	506312.895 **Easting** 1236459.512

Well Construction Details

Depth (ft.)	Blows/Foot	Recovery (inches)	PID Reading (ppm)	Description
35			0	@ 35 ft.: Moderately fractured, moderately weathered, abundant oxide staining along joints and fractures @ 36.2 ft.: Small subhorizontal fractures @ 36.7 - 40.8 ft.: Subangular fractures
		60		
40			0	@ 40 ft.: Intensely fractured, oxidized; alternates between Light Olive Gray and Olive Gray (5Y 5/2) @ 40.1 and 41 ft.: Fractures
		60		@ 42.3 and 42.7 ft.: Subhorizontal fractures @ 43 ft.: Gypsum coating subangular fracture
45			0	@ 46 ft.: Gypsum, some fractures have no oxidation staining
		60		
50			0	
		54		Dark Gray Unweathered Mudstone (5Y 4/1), Moderately consolidated, massive, very little fracturing, low hardness, weak, little to no weathering
55			0	
		60		
60			0	
		60		
65			0	
		36		
			0	@ 68.1 ft.: Four small subhorizontal fractures, two upper fractures with iron oxide
70		24		

7-5/8" DIA. BOREHOLE: 60 to 68 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-16

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PLATE

E9-27

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/3/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	622.79 **Hole Dia.** 9 5/8 in.
Northing	506312.895 **Easting** 1236459.512

Well Construction Details

Blows/Foot	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		0	70		
	54				
		0	75		
	60				@ 78.2 ft.: One small subhorizontal fracture, no oxides
		0	80		@ 79.7 and 80.5 ft.: Video survey shows white layers @ 81 ft.: Massive, unfractured
	60				
		0	85		@ 84.4 ft.: White layer
	60				
		0	90		@ 90, 92, and 93 ft.: White layers
	60				
		0	95		
	30				
		0	100		
	60				@ 102 ft.: White zone shown in optical televiewer survey, 101 shown in video survey
			105		

6.5" DIA. BOREHOLE: 68 to 151 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-16

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Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-27

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/3/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	622.79 **Hole Dia.** 9 5/8 in.
Northing	506312.895 **Easting** 1236459.512

Well Construction Details

Depth (ft.)	Blows/Foot	Recovery (inches)	PID Reading (ppm)	Sample	Description
			0		
		60			
105					@ 106 ft.: Massive, unfractured
			0		
110					@ 110.8, 111.6, 114.8, 115.8, and 117.8 ft.: Small subhorizontal oxides
		60			
115			0		@ 114.5 ft.: White zone
		60			
120			0		@ 118 ft.: Video survey shows white layer; water seen running down borehole sidewall from above @ 118.8 ft.: Small minor poorly-developed vertical fracture, some white oxide @ 120.5 ft.: Harder drilling, rock is moderately strong from 120.5 - 124 ft.; small subhorizontal and subangular fractures from 120.9 to 124.2 ft.
		60			
125			0		
		60			@ 128 ft.: Video survey shows vertical fracture
130			0		@ 130 ft.: Optical televiewer shows white layer
		12			
135			0		@ 134 ft.: Video survey shows subhorizontal fracture
		54			@ 137 ft.: Video survey shows high angle fracture with water cascading out
140					

BENTONITE-PELLET SEAL: 129 to 132 ft.

Medium Aquarium SANDPACK: 132 to 151 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-16

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Casmalia, California

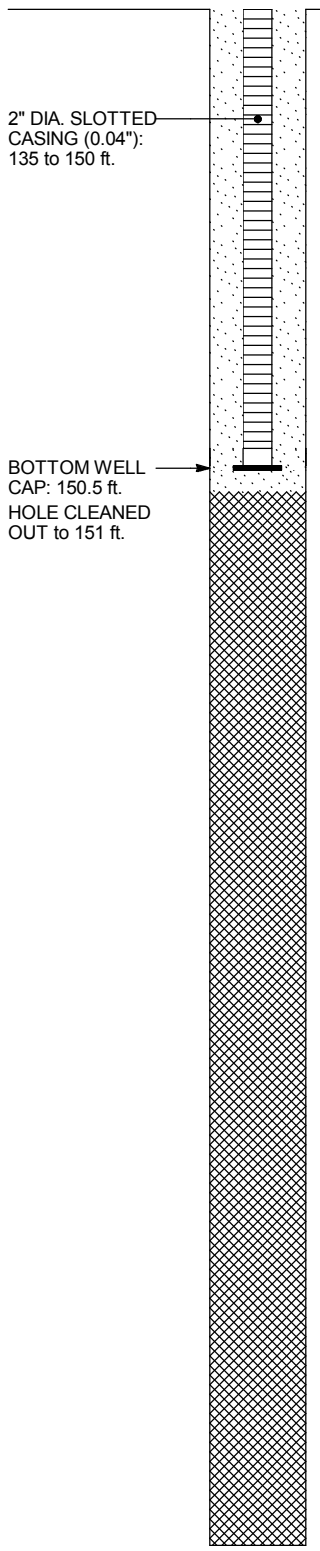
PLATE

E9-27

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/3/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	622.79 **Hole Dia.** 9 5/8 in.
Northing	506312.895 **Easting** 1236459.512

Well Construction Details



Blows/Foot	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		0	140		@ 141.4 ft.: Subhorizontal fracture; some slight iron oxide staining from 141.4 - 145.1 ft.
	60				
		0	145		@ 146.6 ft.: Subangular fractures from 146.6 - 151 ft.
	60				
		0	150		
	60				From 153.1 - 154.2 ft.: Subhorizontal fractures @ 154.5 - 155.5 ft.: White zone; subhorizontal fractures at 155.8, 158.2, 158.5, 158.8, 160.2, 161.8, and 162.2 ft.
		0	155		
	60				
		0	160		
	60				@ 163.6 ft.: Subhorizontal fractures
		0	165		@ 165.3 - 172 ft.: Subhorizontal fractures
	70				@ 167 ft.: Video survey shows high angle fracture
		0	170		@ 171 ft.: Video survey shows 20° off horizontal fracture
	51				Vertical fractures from 172 - 173 ft., 272 - 172.5 ft., 175 - 176 ft., 174.8 - 175.2, and 175.4 - 176; some white oxides @ 173 ft.: Video survey shows fracture emitting water with suspended solids
			175		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-16

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PLATE

E9-27

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	12/3/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	622.79 **Hole Dia.** 9 5/8 in.
Northing	506312.895 **Easting** 1236459.512

Well Construction Details	Blows/Foot	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
BENTONITE-PELLET BACKFILL: 151 to 200 ft.			0	175		@ 175 ft.: Video survey shows offset beds
		60				
			0	180		@ 180 ft.: High angle fractures with some oxidation from 180 - 184.5 ft.
		60				
			0	185		
		60				@ 187 ft.: Massive, unfractured
			0	190		
		54				@ 191.8, 193.5, and 194 ft.: Subangular fractures
			0	195		
		60				@ 196 ft.: Massive
				200		Bottom of boring at 200 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-16

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PLATE

E9-27

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/18/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	757.59 **Hole Dia.** 6.5 in.
Northing	507602.281 **Easting** 1236538.02

Well Construction Details

Top of PVC Casing Elev. **759.40 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 160 ft.

2" DIA. SCHED. 40 PVC CASING: +1.8 to 149.5 ft.

BENTONITE-CEMENT SEAL: 0 to 143.5 ft.

Recovery (inches)	PID Reading (ppm)
	0
60	
	0
60	
	0
36	
	0
60	
	0
60	
	0
60	
	0
54	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Topsoil

Light Yellowish Brown Weathered Mudstone (2.5Y 6/4), Moderately consolidated, closely to intensely fractured, low hardness, weak, deeply weathered, iron oxide staining throughout, some black oxides

@ 5.5 and 6.5 ft.: Iron oxide concretion

@ 9 - 10 ft.: More massive, less fractures

@ 13 ft.: Vertical to horizontal fractures with iron oxide

@ 15 ft.: Change to Light Yellowish Brown (2.5Y 5/3), massive, moderately to closely fractured, deep to moderate weathering

@ 15.3, 16.2, 17.5, 17.8 and 19 ft.: Subhorizontal fractures

@ 17 ft.: Video shows fracture with voids

@ 21.7 ft.: Iron and manganese oxide along fracture surfaces, on subangular fractures from 21.7 - 25.2 ft.

@ 23 ft.: Video shows high angle fracture with oxidation, no visible water

@ 26 ft.: Change to Olive Brown (2.5Y 4/3), subangular fractures at 26, 27, and 29 ft.

Gray Unweathered Mudstone (2.5Y 4/1), Moderately consolidated, massive, moderately fractured, low hardness, moderately strong, little to no weathering

@ 33.5 - 34.5 ft.: Vertical fracture with iron oxide

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-17

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PLATE

E9-28

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/18/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 757.59 **Hole Dia.** 6.5 in.
Northing 507602.281 **Easting** 1236538.02

Well Construction Details

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
35		0		@ 35 - 36 ft.: High angle parallel fractures
	60			@ 37 - 38.2 ft.: High angle fracture with iron oxide
				@ 38.8 ft.: White layer, video shows fracture with dark oxides
40		0		@ 40 ft.: Subangular fracture with iron oxide
				Massive, unfractured from 41 ft.
	60			
45		0		
	60			
50		0		@ 50 ft.: White zone
	60			
55		0		@ 55.7 - 56.7 ft. and 57.8 - 59 ft.: High angle fractures
	60			
60		0		
	60			@ 63.2 ft.: White layer
65		0		
	60			@ 67 and 67.5 ft.: White layers
70				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-17

Final Remedial Investigation Report
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PLATE

E9-28

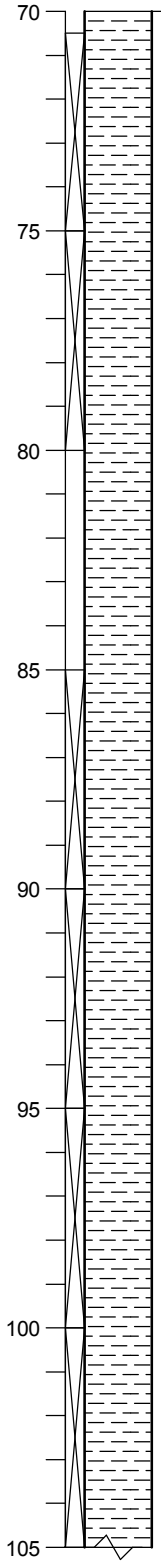
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/18/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	757.59 **Hole Dia.** 6.5 in.
Northing	507602.281 **Easting** 1236538.02

Well Construction Details

Recovery (inches)	PID Reading (ppm)
	0
54	
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	

Depth (ft.) / Sample



@ 76.2 ft.: Small subhorizontal fractures

@ 79.8 ft.: White layer

@ 91.7 ft.: Hard, white layer

@ 92.7 - 93.7 ft.: Crushed zone, video shows vertical fracture below large void

@ 95.7, 96.2, and 96.7 ft.: Subangular fractures

@ 99.1, 99.9, 101 and 101.3 ft.: Subhorizontal fractures

@ 100 ft.: Fracture with iron oxide

@ 101 ft.: White layer

@ 104.7 and 105.5 ft.: White layers

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-17

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PLATE

E9-28

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/18/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	757.59 **Hole Dia.** 6.5 in.
Northing	507602.281 **Easting** 1236538.02

Well Construction Details

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	105		
60				@ 109.1 ft.: Subhorizontal fracture @ 109.4 ft.: White layer
	0	110		
60				
	0	115		
60				
	0	120		
60				
				@ 124 ft.: Small subhorizontal fracture
	0	125		
60				
	0	130		
60				
	0	135		
				@ 136.5 ft.: Small subhorizontal fracture
60				
		140		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-17

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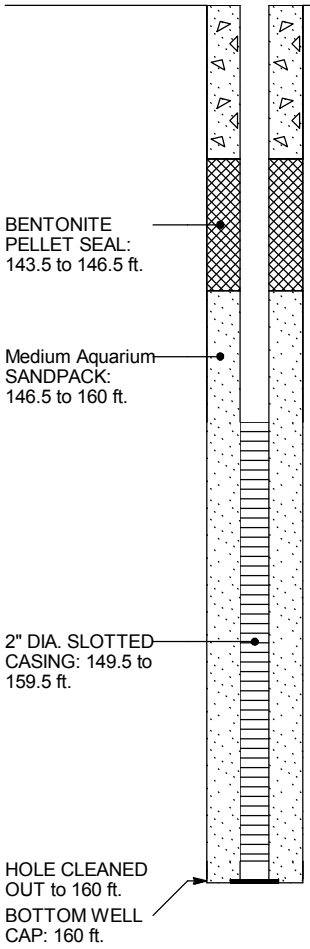
E9-28

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/18/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	757.59 **Hole Dia.** 6.5 in.
Northing	507602.281 **Easting** 1236538.02

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
140		0		@ 140.9 and 141 ft.: Small subhorizontal fracture
	60			@ 143 ft.: White layer @ 143.1, 144 and 145.9 ft.: Small subhorizontal fractures
145		0		
	60			
				@ 148.8 and 149 ft.: White layers @ 149.2 and 150.1 ft.: Small subhorizontal fractures
150		0		
	60			@ 151.9, 154.1, 154.8, 155.6, 157.7, 158, 159 and 159.4 ft.: Small subhorizontal fractures, minor iron oxide at 154.1 ft.
155		0		
	60			@ 157.8 ft.: White layer
160				Bottom of boring at 160 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-17

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E9-28

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/1/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 447.41 **Hole Dia.** 6.5 in.
Northing 505242.604 **Easting** 1237538.007

Well Construction Details

Top of PVC Casing Elev. **449.22 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 40.5 ft.

2" DIA. SCHED. 40 PVC CASING: +1.9 to 40 ft.

BENTONITE-CEMENT SEAL: 0 to 19 ft.

BENTONITE-PELLET SEAL: 19 to 22 ft.

Medium Aquarium SANDPACK: 22 to 25 ft.

2 in DIA. SLOTTED CASING (0.040"): 25 to 40 ft.

Recovery (inches)	PID Reading (ppm)
54	0
60	0
70	0
36	0
	0
	0
	0
60	0
60	0

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Brown to Dark Grayish Brown Lean Clay with Sand (CL) (10YR 4/3 to 10YR 4/2) Soft to hard, moist to dry, 80% clay, 15% sand, 5% fine gravel (Fill)

@ 7 ft.: Dry, hard

Very Dark Grayish Brown Sandy Lean Clay (CL) (10YR 3/2) Hard, dry, 60% clay, 40% sand, trace gravel, iron oxide void space in-filling (Fill)

@ 16.5 ft.: Change to Very Dark Gray (5Y 3/1), stained appearance possible pond bottom material, no odor

@ 21.2 - 22.2 ft.: Chloride diffusion sample collected

Olive Brown Weathered Mudstone (2.5Y 4/3), Moderately consolidated, shaley to platey bedding, intensely fractured to crushed, low hardness, weak, deeply weathered, iron oxide and gypsum

@ 25 ft.: Liesegang banding

@ 28 ft.: Dark Gray weathered to unweathered Transition Zone

Dark Gray Mudstone (5Y 4/1), Moderately consolidated, massive, low hardness, weak to moderately strong, little to no weathering; two subhorizontal fractures with iron oxide at 31 and 32 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-18

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PLATE

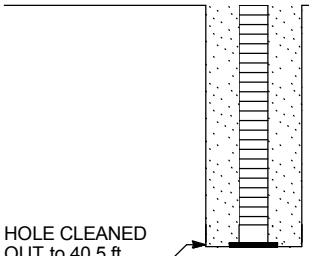
E9-29

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/1/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	447.41 **Hole Dia.** 6.5 in.
Northing	505242.604 **Easting** 1237538.007

Well Construction Details

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		35		
		40		Bottom of cored interval at 38 ft. Boring opened to 40.5 ft.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-18

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PLATE

E9-29

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/8/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 493.51 **Hole Dia.** 6.5 in.
Northing 505414.987 **Easting** 1237248.144

Well Construction Details

Top of PVC Casing Elev. **496.15 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 60.5 ft.

2" DIA. SCHED. 40 PVC CASING: +2.5 to 40 ft.

BENTONITE-CEMENT SEAL: 0 to 33.5 ft.

Recovery (inches)	PID Reading (ppm)
	0
48	
	0
39	
	0
48	
	0
12	
	0
60	
	0
60	
	0
36	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Very Dark Grayish Brown Clayey Gravel with Sand (GC) (10YR 3/2) Dense, dry, 50% gravel, 30% clay, 20% sand

Grayish Brown Weathered Mudstone (2.5Y 5/2), Moderately consolidated, shaley or platey bedding, intensely fractured, low hardness, weak, deeply weathered, iron oxide and black oxides throughout

@ 6.7 ft.: Change to Light Olive Brown (2.5Y 5/3), subhorizontal and 30° off vertical fractures with strong brown iron oxide coatings, closely fractured, some iron oxide bleed

@ 11 ft.: Change to Grayish Brown (2.5Y 5/2), intensely fractured, iron oxide along fractures

@ 15.5 - 19 ft.: Grayish brown very hard calcareous concretion type material; required Tricone bit to drill past

@ 19 - 20 ft.: Liesegang banding

@ 22 - 23 ft.: Low angle fractures with iron oxide and black oxides

@ 24.7, 25.3, 26.1, and 23.3 ft.: Large fractures with gypsum

@ 27 - 30 ft.: Highly fractured, with black and iron oxides and gypsum

Dark Gray Weathered/Unweathered Transition Zone (5Y 4/1)

@ 32.7 ft.: Multiple subhorizontal and vertical fractures with iron oxide bands from 32.7 to 33.8 ft.

@ 34.2 and 35.8 ft.: Subhorizontal fractures without iron oxide

@ 34.4 ft.: White layer seen in video

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-19

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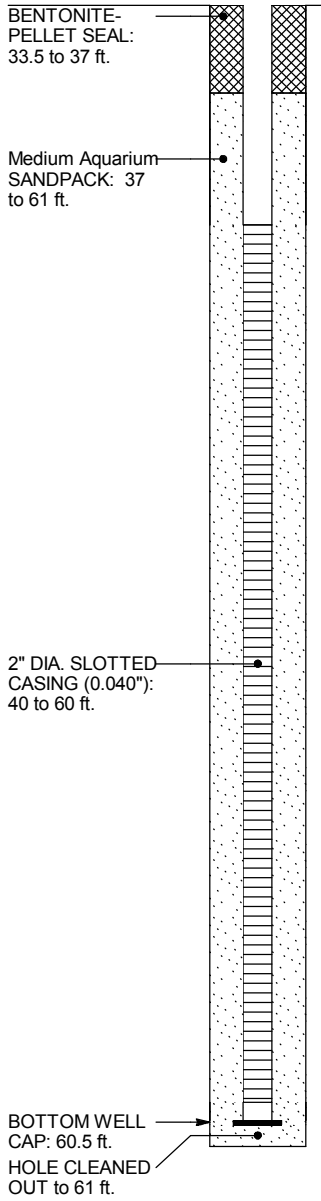
PLATE

E9-30

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/8/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	493.51 **Hole Dia.** 6.5 in.
Northing	505414.987 **Easting** 1237248.144

Well Construction Details



Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	Description
35			0	Dark Gray Unweathered Mudstone (5Y 4/1), Moderately to poorly consolidated, generally massive, some thinly laminated bedding visible, closely fractured, low hardness, weak, little to no weathering
		57		@ 36.3 ft.: Steep angle fracture without oxides seen in video
40			0	
				@ 41 ft.: White layer
		60		@ 42 ft.: Subhorizontal fractures without oxides at 42, 42.3, 43.3, 43.5, 44, and 44.9 ft.
				@ 43.8, 46, and 49 ft.: White layer
45			0	@ 45 ft.: Platey and friable, dry; core breaks into platey discs from 45 - 47 f t.
		60		@ 48.1 ft.: Subhorizontal fractures without oxides at 48.1, 48.3, 49.1, 49.3, and 49.5 ft.
50			0	@ 51 - 55.5 ft.: Competent
		54		@ 54 ft.: White layers seen in video at 54 and 56 ft.
55			0	From 55.5 ft.: Subhorizontal fractures at 50.8 and 57 ft.; white layer at 51.8 ft.
				From 56.4 - 57.2 and 58 - 58.8 ft.: Vertical fractures
		60		@ 57.5 ft.: White layers offset by fracture; video shows subhorizontal fractures with minimal oxides
60				

Bottom of boring at 61 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-19

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PLATE

E9-30

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/26/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 559.31 **Hole Dia.** 6.5 in.
Northing 505720.871 **Easting** 1236860.207

Well Construction Details

Top of PVC Casing Elev. **558.91 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 65.5 ft.

2" DIA. SCHED. 40 PVC CASING: +2.5 to 55 ft.

BENTONITE-CEMENT SEAL: 0 to 49 ft.

Recovery (inches)	PID Reading (ppm)
	0
54	
	0
54	
	0
12	
	0
36	
	0
15	
	0
60	
	0
24	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Pale Brown Silty Gravel with Sand (GM) (10YR 6/3) Dense, dry, 70% angular gravel to 3/4 in., 15% sand, 15% silt/fines (road base)

@ 2.9 ft.: Change to Very Dark Brown (10YR 2/2), old road base with oil

Very Dark Grayish Brown Clayey Gravel (GC) (10YR 3/2) Dense, moist, 60% angular mudstone gravel, 30% clay, 10% sand (Fill)

Grayish Brown Weathered Mudstone (2.5Y 5/2), Moderately consolidated, massive, intensely fractured, low hardness, weak, deeply weathered, cross-cut by abundant fractures with iron oxide staining

@ 14 ft.: Iron oxide and black manganese oxides on all fracture surfaces; color change to Light Olive Brown (2.5Y 5/3)

@ 19 ft.: Vertical to horizontal fracture orientation; gypsum fracture in-filling

@ 24 - 28 ft.: Competent

@ 27 ft.: Friable

@ 29 ft.: Friable

@ 30 ft.: Highly fractured with water movement observed in video; possible surface source for water

@ 33.8 ft.: Gypsum or fracture

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-20

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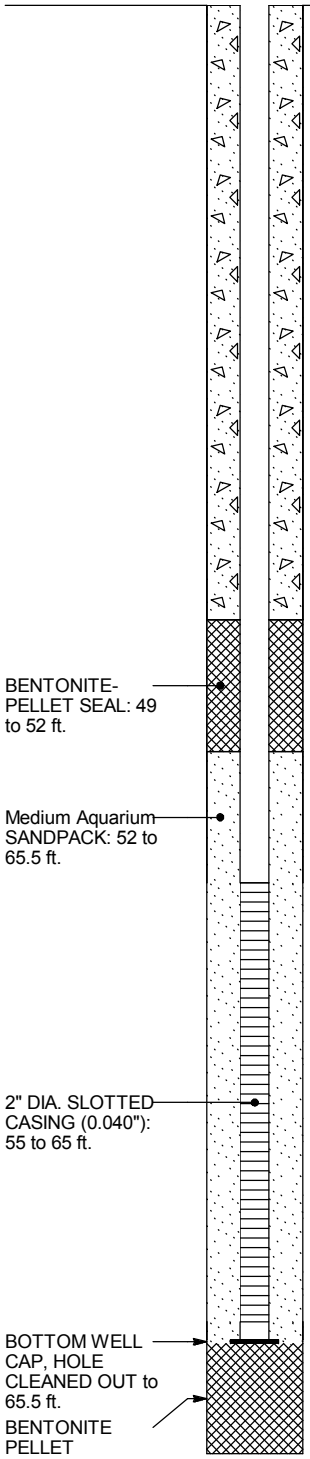
PLATE

E9-31

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/26/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 559.31 **Hole Dia.** 6.5 in.
Northing 505720.871 **Easting** 1236860.207

Well Construction Details



Recovery (inches)	PID Reading (ppm)
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	
	0
60	

Depth (ft.) Sample

35
40
45
50
55
60
65

@ 34.2 - 36.3 ft., 35.9 - 38 ft., and 37.6 - 40 ft.: Subangular fractures

@ 36.5 ft.: Gypsum or fracture

Dark Gray Unweathered Mudstone

@ 41 - 42 ft.: Subangular fracture with oxide coatings

@ 45.5 - 48.5 ft. and 45.5 - 50.2 ft.: Subangular fractures

@ 50.2 ft.: Video shows white layer

@ 50.5 - 51.5 ft. and 52.4 - 53.2 ft.: Fractures 30° off horizontal

@ 50.8 ft.: Fractures and white inclusion seen in video

@ 55.1 ft.: White layer

@ 57 ft.: Video shows a fracture and dripping water

@ 58 - 58.1 ft.: White layer

@ 58.7 and 59 ft.: Subhorizontal fractures

@ 60 ft.: Video shows fracture without evidence of water

@ 61.5 ft.: Massive

@ 62 and 66 ft.: White layer

Bottom of boring at 68 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-20

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-31

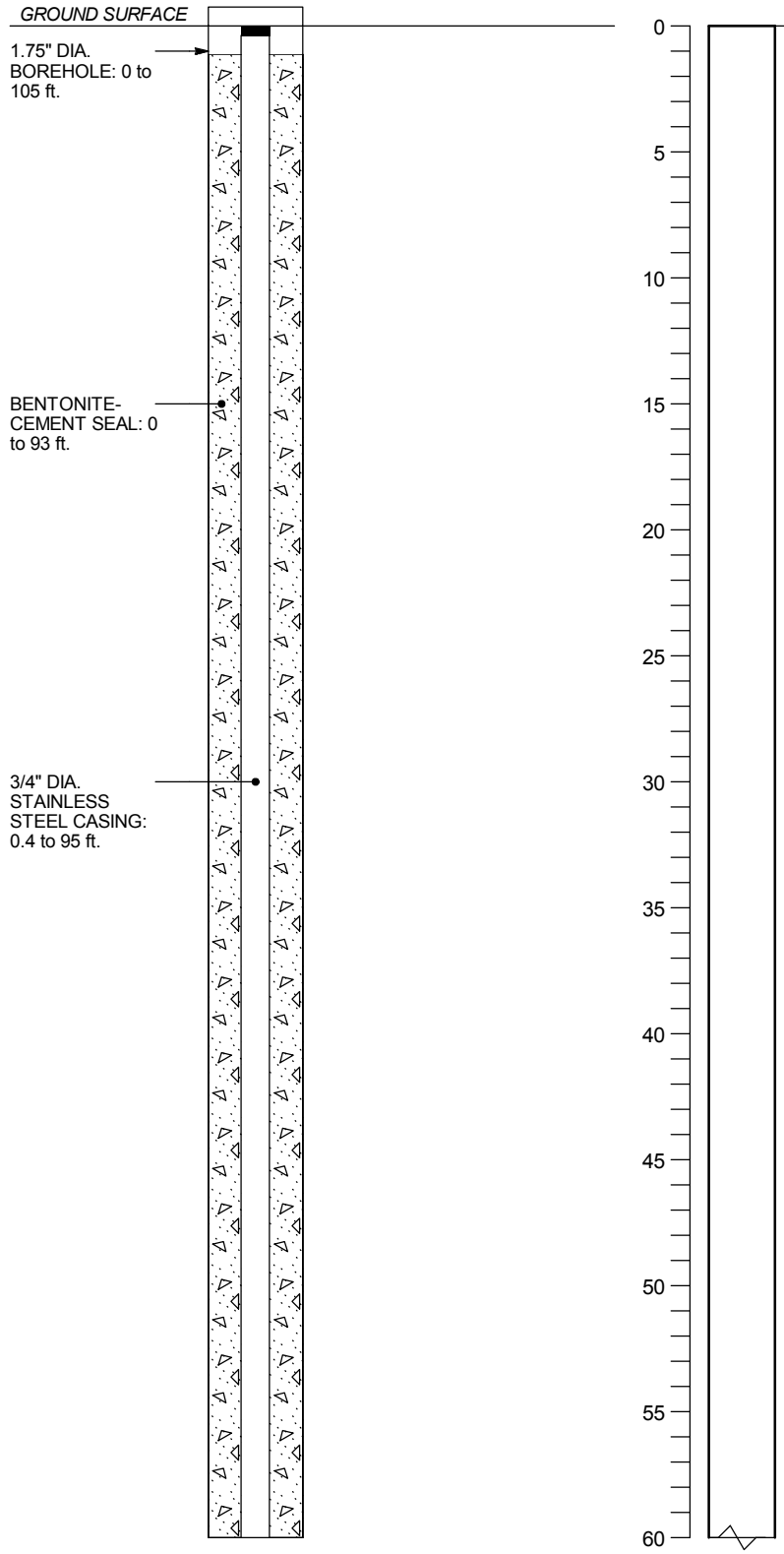
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **606.46 ft.**

Date	9/7/04
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	606.86
Hole Dia.	1.75 in.
Northing	506110.881
Easting	1238223.264

Boring advanced using CPT rig. No lithologic descriptions generated.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-22

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

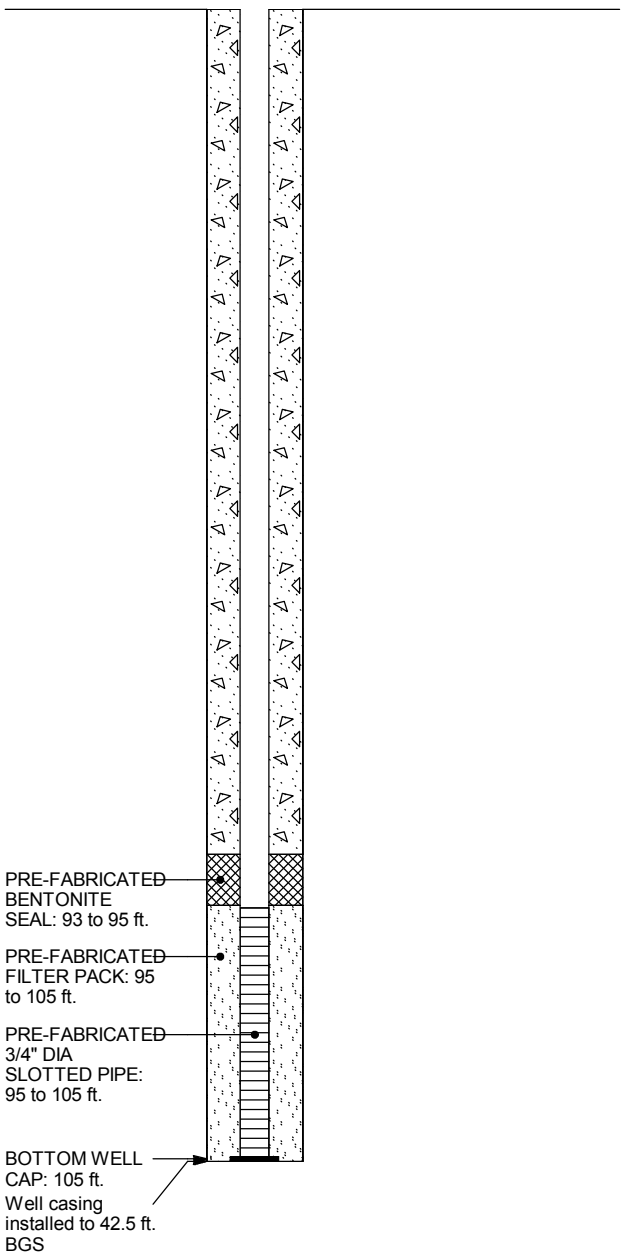
PLATE

E9-32

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	9/7/04
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	606.86
Hole Dia.	1.75 in.
Northing	506110.881
Easting	1238223.264



Depth (ft.) | Sample

60, 65, 70, 75, 80, 85, 90, 95, 100, 105

Hollow steel push rods advanced through CPT hole to 105 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-22

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

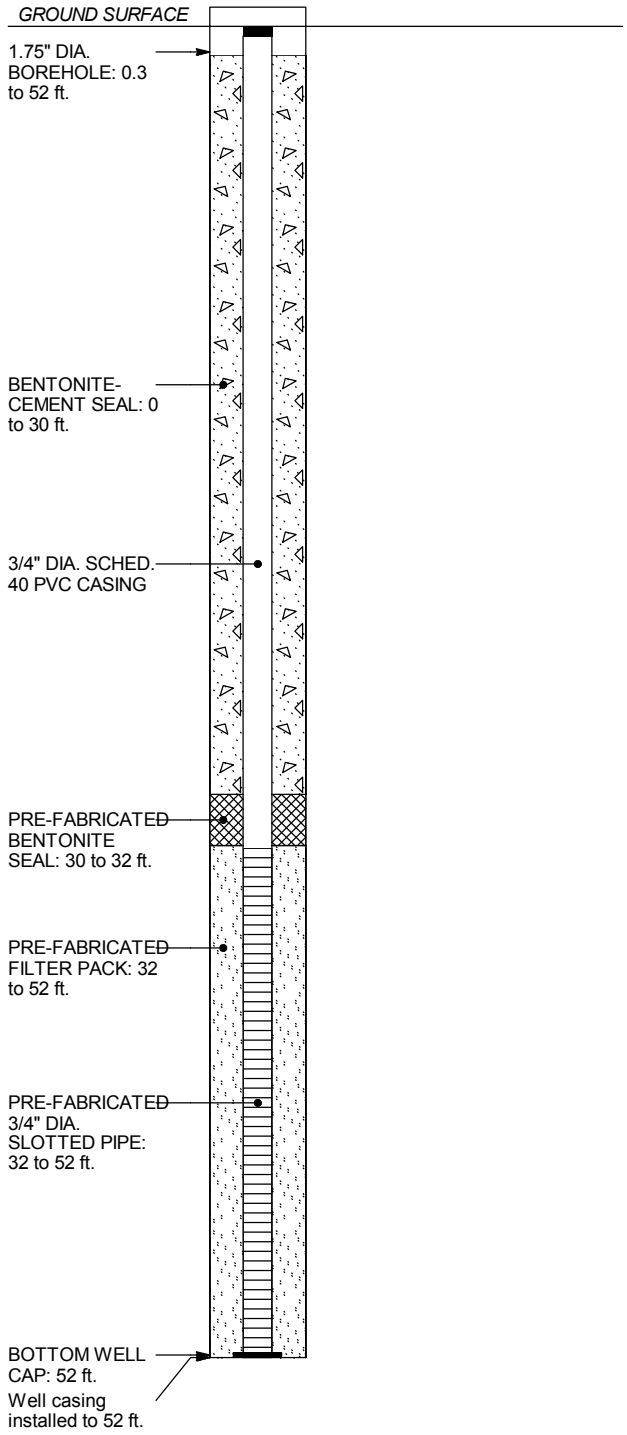
E9-32

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **560.38 ft.**

Date	9/8/04
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	560.57
Hole Dia.	1.75 in.
Northing	505937.377
Easting	1237260.603



Depth (ft.) | Sample

0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55

Boring advanced using CPT rig. No lithologic descriptions generated.

Hollow steel push rods advanced through CPT hole to 52 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-23

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

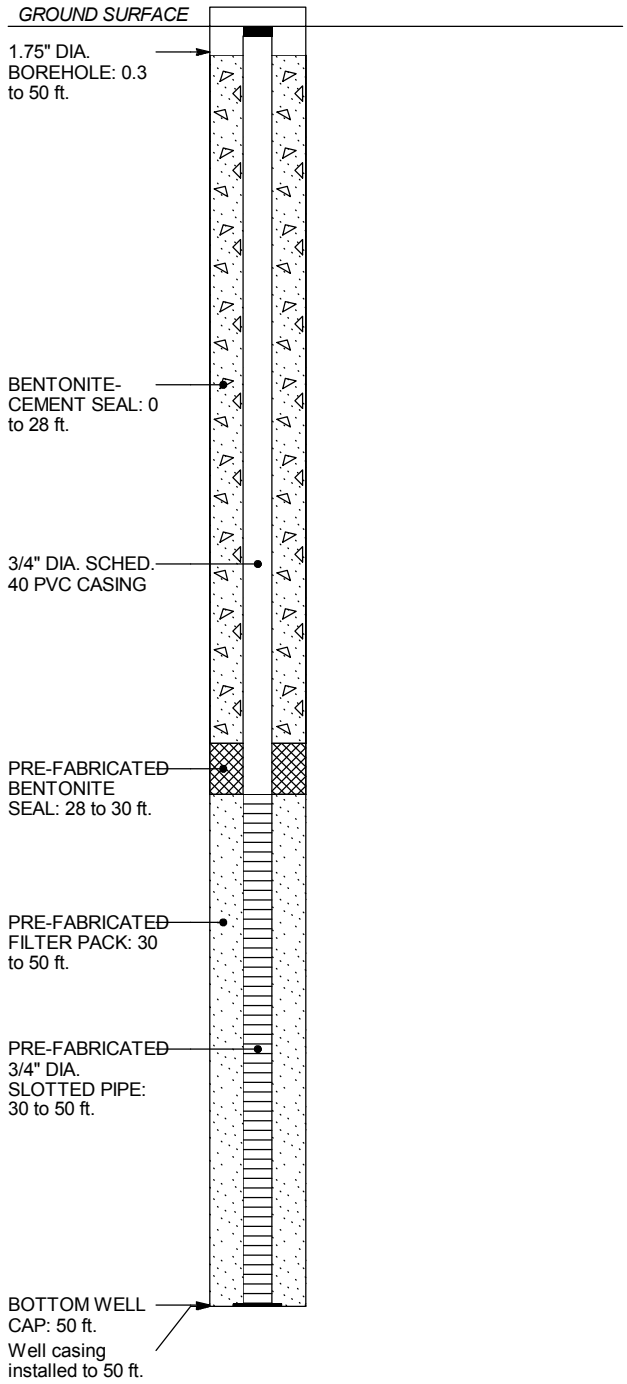
E9-33

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **557.24 ft.**

Date	9/9/04
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	557.41
Hole Dia.	1.75 in.
Northing	505943.456
Easting	1237308.416



Depth (ft.) | Sample

0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60

Boring advanced using CPT rig. No lithologic descriptions generated.

Hollow steel push rods advanced through CPT hole to 50 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-24

Final Remedial Investigation Report
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Casmalia, California

PLATE

E9-34

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 9/2/04
Driller Direct Push
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 483.27 **Hole Dia.** 1.75 in.
Northing 505704.559 **Easting** 1237426.927

Well Construction Details

Top of PVC Casing Elev. **485.34 ft.**

GROUND SURFACE

2" DIA. BOREHOLE: +2.1 to 23 ft.

BENTONITE-CEMENT SEAL: 0 to 3 ft.

3/4" DIA. SCHED. 40 PVC CASING: +2.1 to 3 ft.

PRE-FABRICATED FILTER PACK: 3 to 23 ft.

PRE-FABRICATED 3/4" DIA. SLOTTED PIPE: 3 to 23 ft.

BOTTOM WELL CAP: 23 ft.

Well casing installed to 23 ft. BGS

Recovery (inches)	PID Reading (ppm)
	0
48	
	0
24	
12	650
	350
36	
	>1,000
36	
	>1,000
18	
	500
24	

Depth (ft.) Sample

0, 5, 10, 15, 20

Dark Grayish Brown Clayey Sand with Gravel (SC) (10YR 4/2) Dense, dry, 50% sand, 25% gravel, 25% lean clay, calcite cemented (fill)

Very Dark Gray Sandy Lean Clay with Gravel (CL) (10YR 3/1) Stiff, moist, 60% clay, 25% sand, 15% fine angular to sub-rounded gravel, sand and gravel particles are oxidized and weathered to clay consistency (fill)

@11.8 ft.: Two inch lens of Black (5Y 5/2) wet, saturated with product or LNAPL, possible organic debris derived

Olive Gray Weathered Claystone (5Y 5/2) Unconsolidated, shaley to platey bedding, intensely fractured, low hardness, friable, deeply weathered, iron oxide mottling and liesegang banding along irregular fractures

Black Gravelly lean clay with sand (CL) (5Y 2.5/1) Soft, wet, 60% clay or organic derived debris, 20% sand, 20% gravel, Saturated with product or LNAPL material, possible material from Sump 9B Trench construction, no cohesion (fill)

Light Yellowish Brown Weathered Claystone (2.5Y 6/2) Poorly consolidated, moderately fractured, low hardness, friable, deeply weathered, iron oxide liesegang banding along fractures

Drilling refusal at 23 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-25

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

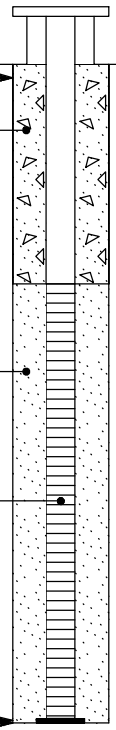
PLATE **E9-35**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 9/2/04
Driller Direct Push
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 465.71 **Hole Dia.** 1.75 in.
Northing 505479.375 **Easting** 1237485.947

Well Construction Details

Top of PVC Casing Elev. **468.33 ft.**



GROUND SURFACE

1.75" DIA. BOREHOLE: 0 to 18 ft.

BENTONITE-CEMENT SEAL: 0 to 5 ft.

3/4" DIA. SCHED. 40 PVC CASING: +2.6 to 5 ft.

PRE-FABRICATED FILTER PACK: 5 to 15 ft.

PRE-FABRICATED 3/4" DIA. SLOTTED PIPE: 5 to 15 ft.

BOTTOM WELL CAP: 15 ft.

Well casing installed to 15 ft.

Recovery (inches)	PID Reading (ppm)
	0
27	
	0
24	
	2
48	
	22
36	
	228
36	

Depth (ft.) Sample

0, 5, 10, 15

Light Yellowish Brown Lean Clay with Sand (CL) (2.5Y 6/4) Hard, dry, 60-75% clay, 20% sand, 5% fine shale gravel, friable (fill)

@3 ft.: Change to Dark Grayish Brown (10YR 4/2)

Dark Brown Fat Clay (CH) (10YR 3/3) Soft, moist to wet, 95% clay, 5% sand (fill)

@11 ft.: Less than 1" thick sandy lenses at 11, 11.5, and 11.8 ft.

Gray Sandy Lean Clay with Gravel (CL) (5Y 5/1) Firm, moist, 60% clay, 20% sand, 20% fine iron oxide stained subrounded gravel

Bottom of boring at 18 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-26

Final Remedial Investigation Report
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Casmalia, California

PLATE **E9-36**

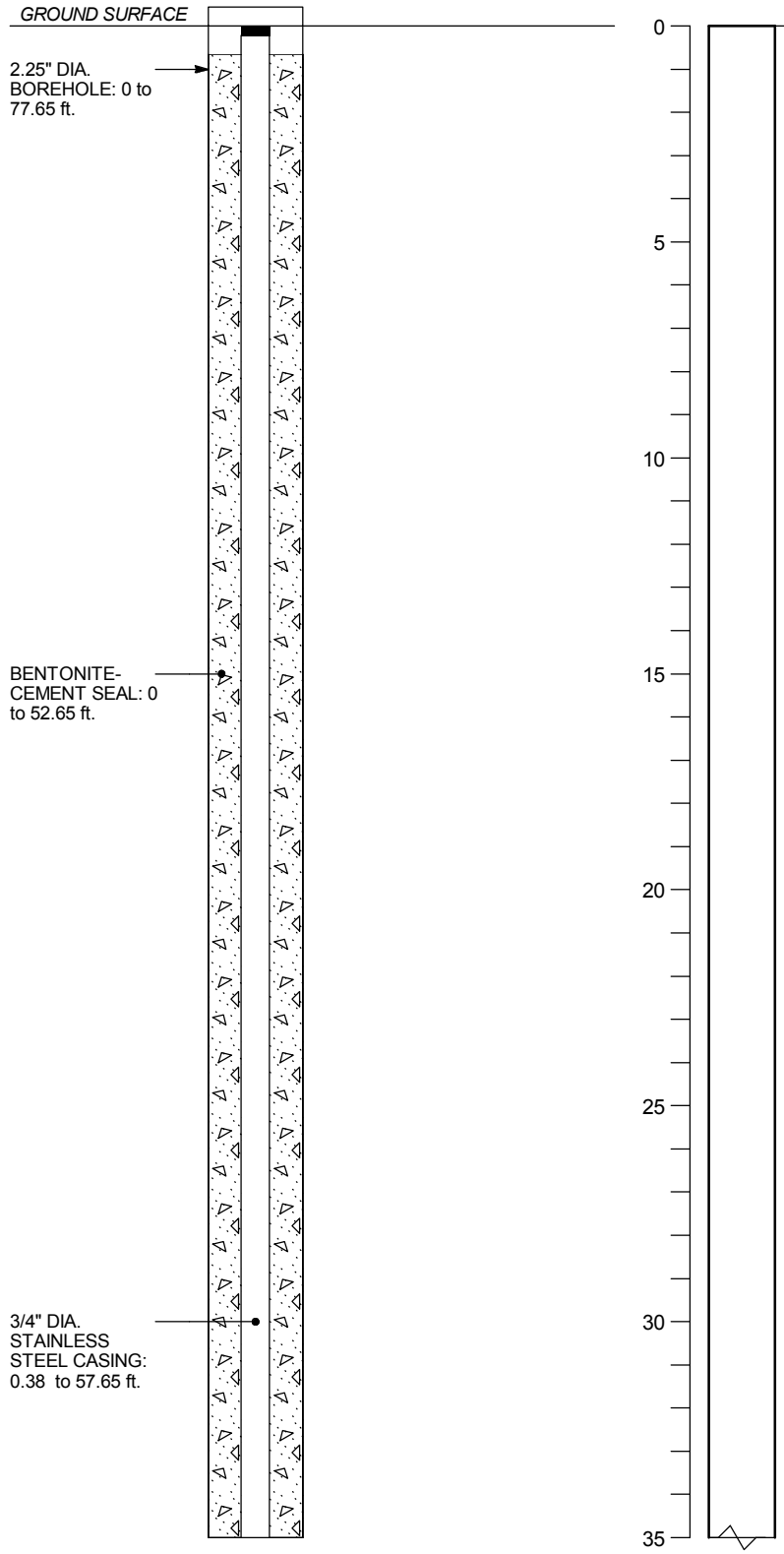
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **559.13 ft.**

Date	8/22/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	559.51
Hole Dia.	2.25
Northing	505937.398
Easting	1237282.997

Boring advanced using CPT rig. No lithologic descriptions generated.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-27

Final Remedial Investigation Report
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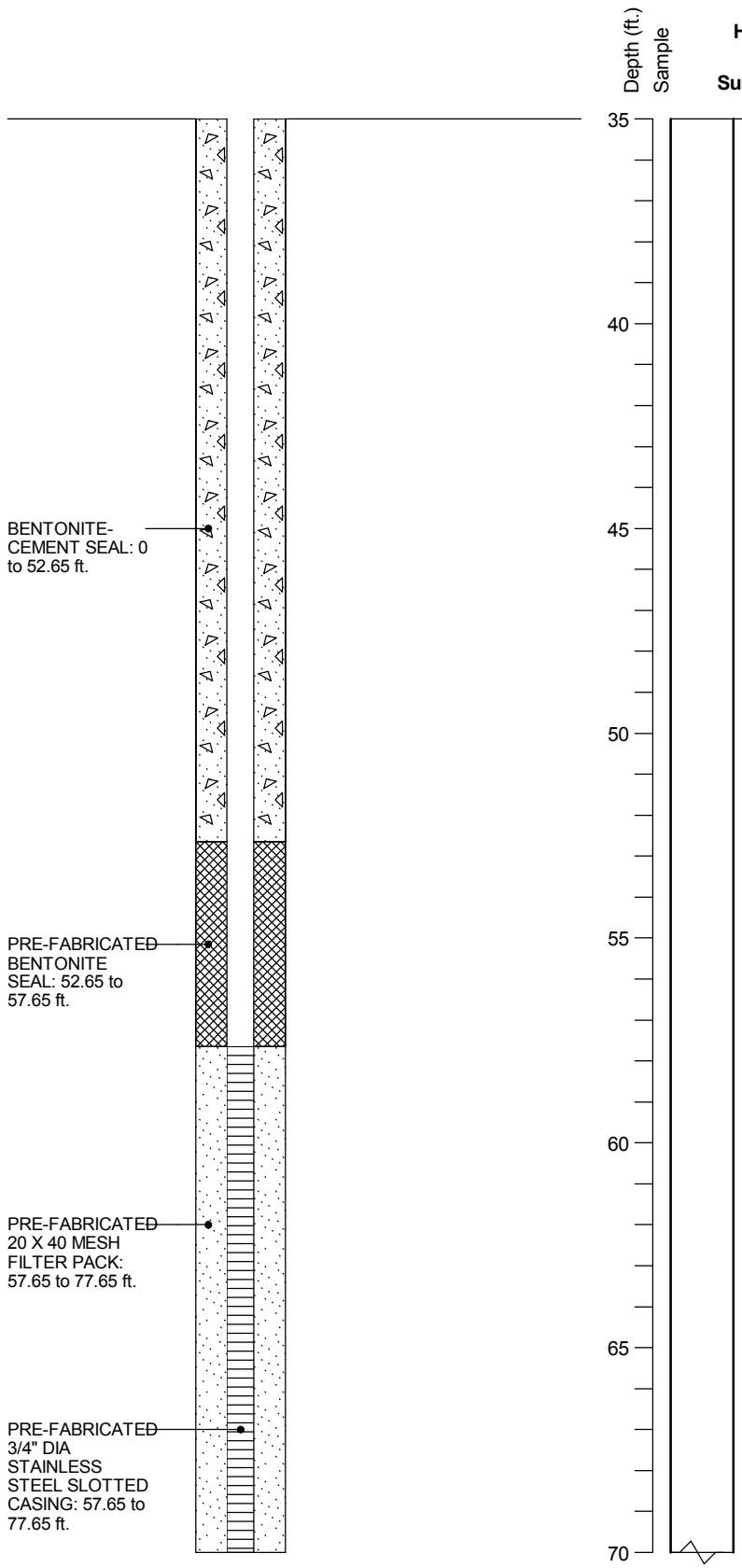
PLATE

E9-37

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/22/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	559.51
Hole Dia.	2.25
Northing	505937.398
Easting	1237282.997



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-27

Final Remedial Investigation Report
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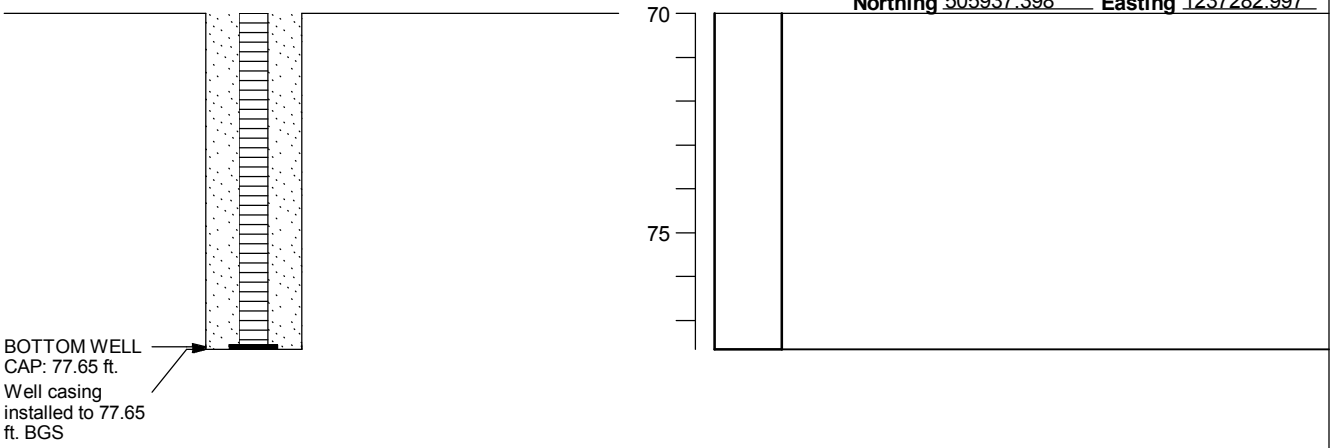
PLATE

E9-37

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/22/07		
Driller	CPT		
Drilling Method	CPT		
Sampler	NA		
Hammer Weight	NA	**Drop**	NA
Logged by		**Datum**	
Surface Elevation	559.51	**Hole Dia.**	2.25
Northing	505937.398	**Easting**	1237282.997



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-27

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-37

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 9/20/06
Driller Air Rotary
Drilling Method Air Rotary
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 653.29 **Hole Dia.** 6 in.
Northing 506508.1145 **Easting** 1236462.864

Well Construction Details

Top of PVC Casing Elev. **655.33 ft.**

GROUND SURFACE

6" DIA BOREHOLE: 0 to 62 ft.

2" DIA. SCH 40 PVC CASING: +2 to 25 ft.

BENTONITE-CEMENT SEAL: 0 to 19 ft.

BENTONITE-PELLET SEAL: 19 to 22 ft.

MEDIUM AQUARIUM SANDPACK: 22 to 47 ft.

2" DIA. SLOTTED SCREEN: (0.02"): 25 to 45 ft.

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
0	6	0		Grayish Brown Lean Clay (CL) (10YR 5/3) Soft, dry, 90% clay, 10% silt (Fill)
5	12			Grayish Brown Weathered Claystone (2.5Y 5/2) Closely fractured, low hardness, weak to moderately strong, moderately weathered
10	30	0		@10 ft.: Increase oxidation staining
	30	0		@13 ft.: Color change to Light Brownish Gray (2.5Y 6/2)
15	30			
	30	0		
20	12			
25	36	0		@24.6 to 25.1 ft.: Vertical fracture
	24			@26 ft.: Fracture observed in video log
				@28 ft.: Driller notes rig chatter
30				@30 to 32 ft.: Vertical fracture observed in video log
	24			@33 ft.: Loosing air circulation into formation. Driller notes formation is hard and fractured
35				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-29

Final Remedial Investigation Report
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Casmalia, California

PLATE

E9-38

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date	9/20/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	653.29 **Hole Dia.** 6 in.
Northing	506508.1145 **Easting** 1236462.864

Well Construction Details

2" DIA. SLOTTED SCREEN: (0.02"): 25 to 45 ft.

BOTTOM WELL CAP: 45 ft.

HOLE CLEANED OUT TO 47 ft.

BENTONITE-PELLET BACKFILL: 47 to 62 ft.

Recovery (inches)	PID Reading (ppm)
	13
24	40
24	
24	39
	32
36	
	208
30	1,107
30	
	47
30	
18	
	0
30	
30	0

Depth (ft.) Sample

35, 40, 45, 50, 55, 60

@35 ft.: Water observed in video log dripping from 35 ft.:
@36 ft to 37 ft.: Vertical fracture

@39 ft.: Change to Dark Bluish Gray (5GY 4/1) Intensely fractured, moderately strong, moderate weathering, iron oxidation staining along fracture surfaces. Free water level at time of video log
@39.5 to 40.1 ft.: Vertical fracture with black manganese staining

@42.6 to 46.3 ft.: Vertical fracture

@49.7 ft.: 40_o fracture

@52 ft.: Intensely fractured, moderately hard, moderately strong, moderate to deep weathering, abundant iron oxide staining

Bottom of boring at 62 feet.
Water level at 35.42 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-29

Final Remedial Investigation Report
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PLATE

E9-38

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 9/25/06
Driller Air Rotary
Drilling Method Air Rotary
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 622.45 **Hole Dia.** 6 in.
Northing 506304.6485 **Easting** 1236528.262

Well Construction Details

Top of PVC Casing Elev. **624.23 ft.**

GROUND SURFACE

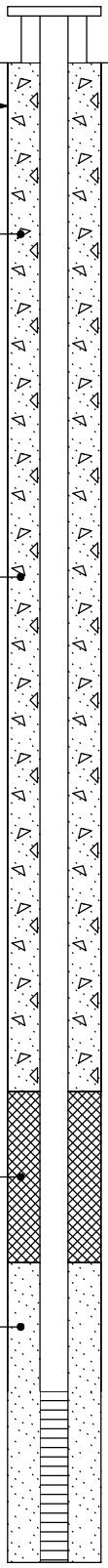
6" DIA BOREHOLE: 0 to 58 ft.

2" DIA. SCH 40 PVC CASING: +1.8 to 31 ft.

BENTONITE-CEMENT SEAL: 0 to 24 ft.

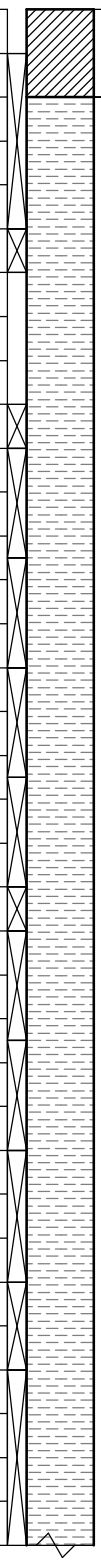
BENTONITE PELLET SEAL: 24 to 28 ft.

MEDIUM AQUARIUM SANDPACK: 21 to 58 ft.



Recovery (inches)	PID Reading (ppm)
48	
12	0
12	
30	
30	0
30	
30	0
30	0
30	
12	12
12	25
30	
30	12
36	10
24	
60	0

Depth (ft.) Sample



0 5 10 15 20 25 30 35

Gray Lean Clay (CL) (2.5Y 6/1) Soft, dry, 80% clay, 10% fine sand, 10% silt

Light Yellowish Brown Weathered Claystone (2.5Y 6/3) Platy/shaly, moderately fractured, moderately hard, weak, moderately weathered, oxidation staining along bedding planes

@11 ft.: Oxidation staining along fractures and bedding planes

@13 ft.: Change to grayish brown (2.5Y 5/2) Moderately fractured, moderately hard, moderately strong, moderately weathered. Horizontal fracture at 13 ft.

@14.8-15.2 ft.: Vertical fracture

@16.7-17.1 ft.: Vertical fracture

@18 ft.: Intensely fractured

@19.7-20.2 ft.: Vertical fracture

@20.7-21.1 ft.: Vertical fracture

@26 ft.: Intensely fractured, abundant oxidation staining along fractures and bedding planes, vertical fracture from 26 to 31 ft.

@33 ft.: Moderately fractured, moderately strong, moderately hard, moderately weathered

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-30

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

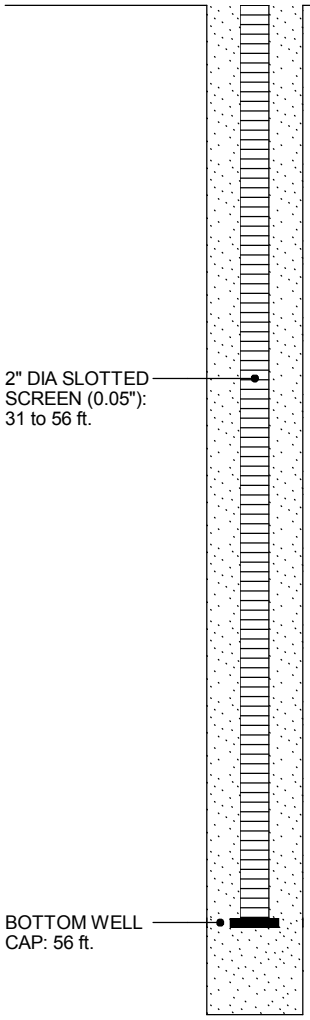
PLATE

E9-39

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date	9/25/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	622.45 **Hole Dia.** 6 in.
Northing	506304.6485 **Easting** 1236528.262

Well Construction Details



Recovery (inches)	PID Reading (ppm)
60	6
48	
42	0
60	

Depth (ft.) / Sample

35, 40, 45, 50, 55

@35 ft.: 45° fracture

@37 ft.: Horizontal fracture

@37.7-38.1 ft.: Vertical fracture

@38 ft.: Intensely fractured, oxidation staining along bedding planes and fractures. Soil appears wet when opening hole from 38 to 40 ft.

@39.9-40.2 ft.: Vertical fracture

Gray Weathered/Unweathered Claystone Transition Zone (2.5Y 5/1) Gypsum deposits, manganese staining, gypsum deposits at 45 ft.

Dark Gray Unweathered Claystone (2.5Y 4/1) Occasionally fractured, moderately hard, moderately strong, moderate to little weathering

@47.8-48.2 ft.: Vertical fracture with oxidation staining

@51 ft.: 70° fracture

@52 ft.: Very little fractures, moderately hard, strong, moderate to little weathering

Bottom of boring at 56 feet. Hole opened to 58 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-30

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Casmalia, California

PLATE

E9-39

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 7/20/06
Driller Rhino Rig
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 482.10 **Hole Dia.** 2 in.
Northing 505689.282 **Easting** 1237400.885

Well Construction Details

Top of PVC Casing Elev. **484.55 ft.**

GROUND SURFACE

2" DIA. BOREHOLE: to 18 ft.

BENTONITE-CEMENT SEAL: 0 to 6 ft.

3/4" DIA. SCHED. 40 PVC CASING: +2 to 8 ft.

PRE-FABRICATED BENTONITE SEAL: 6 to 8 ft.

PRE-FABRICATED FILTER PACK: 8 to 18 ft.

PRE-FABRICATED 3/4" DIA. SLOTTED CASING: 8 to 18 ft.

BOTTOM WELL CAP: 18 ft.

Well casing installed to 18 ft. BGS

Recovery (inches)	PID Reading (ppm)
48	12
	29
36	1,000
	10
48	7
	3,000
48	225
24	300
	300

Depth (ft.) Sample

0, 5, 10, 15

Very Dark Gray Gravelly Lean Clay with Sand (CL) (2.5Y 3/1) Very stiff, dry, 55% clay, 30% fine angular gravel, 20% fine to coarse sand (fill)

Very Dark Gray Sandy Lean Clay with Gravel (CL) (2.5Y 3/1) Very stiff, dry, 60% clay, 25% fine to coarse sand, 15% gravel (fill)

Dark Grayish Brown Gravelly Lean Clay with Sand (CL) (2.5Y 4/2) Very Stiff, Dry, 55% clay, 25% angular gravel 20% fine to coarse sand (fill)

Very Dark Gray Sandy Lean Clay (CL) (2.5Y 3/1) Medium stiff, dry to moist, 70% clay, 20% fine to coarse sand, 10% angular gravel (fill)

Grayish Brown Weathered Mudstone, moderately hard, weak to friable, deeply weathered, dry, iron oxidation streaks along fractures

Refusal at 18 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-31

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

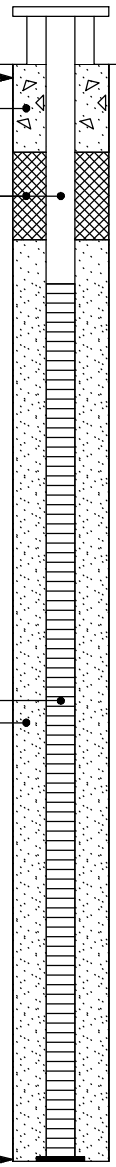
PLATE **E9-40**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 10/26/06
Driller HSA
Drilling Method HSA
Sampler
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 482.7 **Hole Dia.** 8 in.
Northing 505698.1311 **Easting** 1237413.392

Well Construction Details

Top of PVC Casing Elev. **484.74 ft.**



PID Reading (ppm)
0
20
5,000
3,000
500
300
300

Depth (ft.) | Sample

0 | 5 | 10 | 15 | 20 | 25

Very Dark Gray Gravelly Lean Clay with Sand (CL) (2.5Y 3/1) Stiff, dry, 55% clay, 30% fine angular claystone gravel, 15% fine to coarse sand

Very Dark Gray Sandy Lean Clay with Gravel (CL) (2.5Y 3/1) Stiff, dry, 60% clay, 25% fine to coarse sand, 15% gravel

@12 ft.: Change to Dark Grayish Brown (2.5Y 4/2) Very stiff, dry, 55% clay, 25% gravel, 20% fine to coarse sand

@14 ft.: Color change to Very Dark Gray (2.5Y 3/1)

@18 ft.: Driller notes harder drilling

Grayish Brown Weathered Claystone, moderately hard, weak to friable, deeply weathered, dry

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-31-B

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE **E9-41**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 7/19/06
Driller Rhino Rig
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 456.23 **Hole Dia.** 2 in.
Northing 505399.492 **Easting** 1237550.519

Well Construction Details

Top of PVC Casing Elev. **458.89 ft.**

GROUND SURFACE

2" DIA. BOREHOLE: to 24.5 ft.

BENTONITE-CEMENT SEAL: 0 to 2.5 ft.

3/4" DIA. SCHED. 40 PVC CASING: +2 to 4.5 ft.

PRE-FABRICATED BENTONITE SEAL: 2.5 to 4.5 ft.

PRE-FABRICATED FILTER PACK: 4.5 to 24.5 ft.

PRE-FABRICATED 3/4" DIA. SLOTTED CASING: 4.5 to 24.5 ft.

BOTTOM WELL CAP: 24.5 ft.

Well casing installed to 24.5 ft. BGS

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
0	48	0		Very Dark Gray Sandy Lean Clay with Gravel (CL) (5Y 3/1) Medium stiff, dry, 65% clay, 20% fine to coarse sand, 15% angular gravel (fill)
5	48	0		Very Dark Gray Lean Clay with Sand (CL) (5Y 3/1) Medium stiff, dry, 80% clay 15% fine to coarse sand, 5% angular gravel (fill)
		0		Olive Gray Gravelly Lean Clay with Sand (CL) (5Y 4/2) Medium stiff, dry, 50% clay, 30% angular gravel, 20% fine to coarse sand (fill)
		4		Olive Gray Sandy Lean Clay (CL) (5Y 4/2) Medium stiff, dry, 70% clay, 20% sand, 10% gravel (fill)
10	48	9		
		0		Very Dark Gray Sandy Lean Clay with Gravel (CL) (5Y 3/1) Medium stiff, dry to moist, 55% clay, 30% fine to coarse sand, 15% angular mudstone gravel (fill)
15	48	4		
		0		
	48	0		@18.5 ft.: Change to Soft, dry to very moist
20		4		
	48	0		Very Dark Gray Sandy Lean Clay (CL) (5Y 3/1) Soft, wet, 50% clay, 40% fine to coarse sand, 10% angular gravel (fill)
	6			Light Olive Brown Lean Clay (CL) (2.5Y 5/3) Very stiff, dry, 90% clay, 10% silt, iron oxide staining
				Refusal at 24.5 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-32

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-42

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 7/18/06
Driller Rhino Rig
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 470.92 **Hole Dia.** 2 in.
Northing 505566.679 **Easting** 1237494.33

Well Construction Details

Top of PVC Casing Elev. **473.75 ft.**

GROUND SURFACE

2" DIA. BOREHOLE: to 25 ft.

BENTONITE-CEMENT SEAL: 0 to 8 ft.

3/4" DIA. SCHED. 40 PVC CASING: +2 to 10 ft.

PRE-FABRICATED BENTONITE SEAL: 8 to 10 ft.

PRE-FABRICATED FILTER PACK: 10 to 25 ft.

PRE-FABRICATED 3/4" DIA. SLOTTED CASING: 10 to 25 ft.

BOTTOM WELL CAP: 25 ft.

Well casing installed to 25 ft. BGS

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
0				Very Dark Gray Sandy Lean Clay with Gravel (CL) (5Y 3/1) (fill)
	36	0		Olive Gray Clayey Sand (SC) (5Y 4/2) Medium dense, dry, 60% fine to coarse sand, 30% clay, 10% subangular gravel (fill)
		0		Very Dark Gray Sandy Lean Clay (CL) (5Y 3/1) Medium stiff, dry, 70% clay, 30% fine to coarse sand, trace gravel (fill)
5	48	0		@5 ft.: Color change to Light Olive Brown (2.5Y 5/4)
				@8 ft.: Color change to Very Dark Gray (5Y 3/1)
10	48	0		@10 ft.: Trace roots
		0		Very Dark Gray Lean Clay with Sand (CL) (5Y 3/1) Medium stiff, dry, 80% clay, 20% fine to coarse sand (fill)
	48			Dark Grayish Brown Clayey Sand with Gravel (SC) (2.5Y 4/2) Loose, dry, 55% fine to coarse sand, 25% clay, 20% fine to coarse subangular mudstone gravel (fill)
15		5		Dark Olive Gray Lean Clay with Sand (CL) (5Y 3/2) Medium stiff, dry, 75% clay, 25% fine to coarse sand, trace fine mudstone gravel (fill)
	48	7		@18 ft.: Change to medium stiff
20		0		@20 ft.: Change to dry to moist
	48			
	48	0		Dark Greenish Gray Lean Clay (CL) (5GY 4/1) Very Stiff, dry, 90% clay, 10% silt, trace iron oxidation staining
25				Bottom of boring at 25 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-33

Final Remedial Investigation Report
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Casmalia, California

PLATE **E9-43**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 10/2/06
Driller HSA
Drilling Method HSA
Sampler
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 471.62 **Hole Dia.** 8 in.
Northing 505578.9614 **Easting** 1237490.868

Well Construction Details

Top of PVC Casing Elev. **473.95 ft.**

GROUND SURFACE

8" DIA. BOREHOLE: to 24.5 ft.

BENTONITE-CEMENT SEAL: 0 to 2 ft.

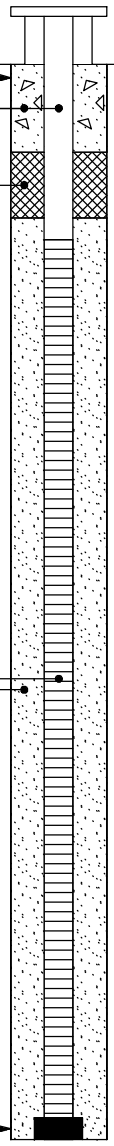
2" DIA. SCHED. 40 PVC CASING: +2.3 to 4 ft.

BENTONITE - PELLET SEAL: 2 to 3.5 ft.

MEDIUM AQUARIUM SANDPACK: 3.5 to 24.5 ft.

2" DIA. SLOTTED CASING (0.02): 4 to 24 ft.

BOTTOM WELL CAP: 24.5 ft.



PID Reading (ppm)	Depth (ft.)	Sample	
	0		Light Brownish Gray Clayey Gravel (GC) (2.5Y 6/2) Loose dry, 60% fine subrounded to subangular gravel, 40% lean clay (Fill)
0	5		Very Dark Gray Lean Clay (CL) (2.5Y 3/1) Soft, moist, 85% clay, 15% silt (Fill)
0	10		
0	15		@15 ft.: Change to Very Dark Gray (2.5Y 6/1) Soft, moist to dry, 85% clay, 10% silt, 5% fine sand, trace mudstone gravel
0	20		@23 ft.: Driller notes harder drilling
0			

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-33-B

Final Remedial Investigation Report
Casmalia Resources Superfund Site
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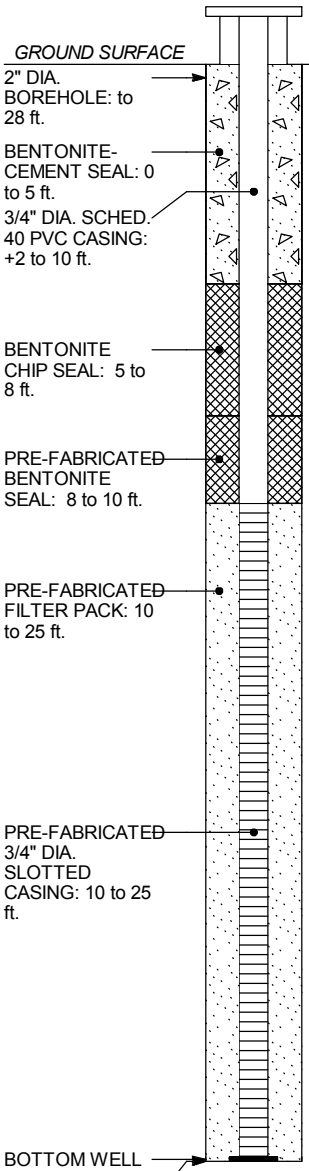
PLATE **E9-44**

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 8/18/06
Driller Direct Push
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 511.74 **Hole Dia.** 2-in.
Northing 505812.537 **Easting** 1237345.846

Well Construction Details

Top of PVC Casing Elev. **514.73 ft.**



Recovery (inches)	PID Reading (ppm)
36	0
48	0
48	0
48	65
48	500
48	600
48	400

Depth (ft.) Sample

0, 5, 10, 15, 20, 25

Light Yellowish Brown Lean Clay (CL) (10YR 6/4) Very stiff, dry, 90% clay, 10% silt, trace mudstone gravel, trace oxidation staining

@3 ft.: Mottled with Dark Grayish Brown (10YR 4/2) to 40%

@8 ft.: Color change to Very Dark Grayish Brown (10YR 3/2)

@11 ft.: Change to Grayish Brown (10YR 3/2), Soft, dry to moist

@13 ft.: Change to Very Dark Gray (10YR 3/1) Medium stiff

@14 ft.: Change to Dark Greenish Gray (5GY 4/3) Stiff, dry

@15 ft.: Color change to Brown (10YR 4/3)

@18 ft.: Change to Olive Gray (5Y 4/2), no gravels

@21 ft.: Color change to Very Dark Gray (5Y 3/1)

@24 ft.: Change to soft, dry to moist

@25 ft.: Change to Very Dark Gray (5Y 3/1) Very stiff, dry

@27 ft.: Color change to Dark Gray (5Y 4/3) Stiff

Bottom of boring at 28 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-34

Final Remedial Investigation Report
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Casmalia, California

PLATE **E9-45**

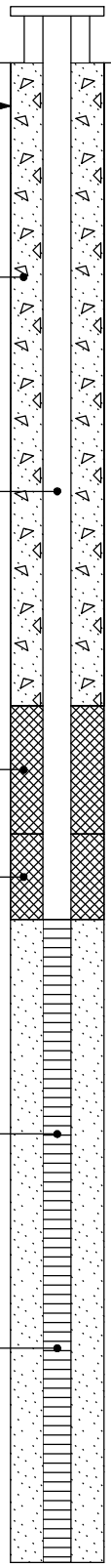
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 1/3/07
Driller Direct Pusy
Drilling Method CPT
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 512.28 **Hole Dia.** 2 in.
Northing 505807.9 **Easting** 1237324.2

Well Construction Details

Top of PVC Casing Elev. **515.71 ft.**

GROUND SURFACE



Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		0		Direct push rods advanced to 25 feet with a closed tip. See boring log for Piezometer RIPZ-34 for lithology for this interval
		5		
		10		
		15		
		20		
		25		Dark Grayish Brown Lean Clay with Sand (CL) (10YR 4/2) Soft, moist to dry, 70% clay, 20% fine sand, 10% silt (fill)
36				
	8			@28 ft.: Color change to Gray (5Y 4/2)
48		30		
	27			@32 ft.: Mottled with Very Dark Gray (5Y 3/1)
48		35		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-34-B

Final Remedial Investigation Report
Casmalia Resources Superfund Site
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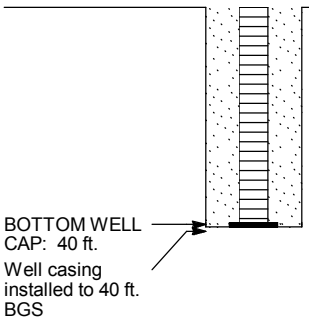
PLATE

E9-46

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date	1/3/07
Driller	Direct Pusy
Drilling Method	CPT
Sampler	Clear Liners
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	512.28 **Hole Dia.** 2 in.
Northing	505807.9 **Easting** 1237324.2

Well Construction Details



Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	300	35		
48				@38 ft.: Change to Dark Greenish Gray, wet
	800			Grayish Brown Weathered Claystone (10YR 5/2) Dry, intensely fractured, moderately hard, moderately strong, moderately weathered
	0	40		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-34-B

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-46

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 7/19/06
Driller Rhino Rig
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 511.68 **Hole Dia.** 2 in.
Northing 1237374.762 **Easting** 513.9666

Well Construction Details

Top of PVC Casing Elev. **513.97 ft.**

GROUND SURFACE

2" DIA. BOREHOLE: to 22 ft.

BENTONITE-CEMENT SEAL: 0 to 5 ft.

3/4" DIA. SCHED. 40 PVC CASING: +2 to 7 ft.

PRE-FABRICATED BENTONITE SEAL: 5 to 7 ft.

PRE-FABRICATED FILTER PACK: 7 to 22 ft.

PRE-FABRICATED 3/4" DIA. SLOTTED CASING: 7 to 22 ft.

BOTTOM WELL CAP: 22 ft.

Well casing installed to 22 ft. BGS

Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
0				Dark Grayish Brown Sandy Lean Clay with Gravel (CL) (2.5Y 4/2) Very stiff, dry, 50% clay, 30% fine to coarse sand, 20% fine mudstone gravel (fill)
	48			
		19		
5				
	48			
		4.6		Dark Grayish Brown Sandy Lean Clay (CL) (2.5Y 4/2) Very stiff, dry, 65% clay, 30% fine to coarse sand, 5% angular gravel (fill)
10	48			
		29		Very Dark Gray Sandy Lean Clay with Gravel (CL) (5Y 3/1) Very stiff, dry, 65% clay, 25% fine to coarse sand, 10% angular gravel (fill)
	48	10		Very Dark Gray Sandy Lean Clay (CL) (5Y 3/1) Medium stiff, dry, 70% clay, 30% fine to coarse sand, trace angular gravel (fill)
15		996		Very Dark Gray Sandy Lean Clay with Gravel (CL) (5Y 3/1) Medium stiff, dry to moist, 55% clay, 30% fine to coarse sand, 15% angular gravel (fill) @17 ft.: Color change to Olive Gray
	48			
		300		
		300		
20	24			@21 ft.: Driller notes change to harder material at 21 ft.
		300		Olive Lean Clay (CL) (5Y 4/3) Very stiff, dry, 85% clay, 15% silt, oxidation staining
				Refusal at 22 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-35

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-47

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 7/17/06
Driller Rhino Rig
Drilling Method Direct Push
Sampler Clear Liners
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 448.96 **Hole Dia.** 2 in.
Northing 504316.062 **Easting** 1236620.06

Well Construction Details

Top of PVC Casing Elev. **452.97 ft.**

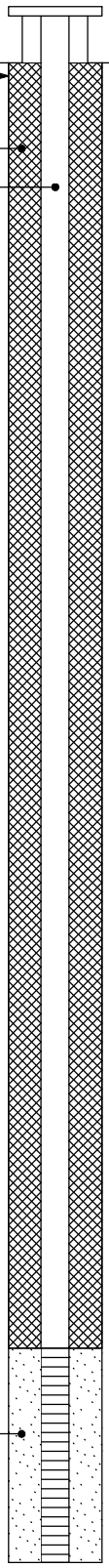
GROUND SURFACE

2" DIA. BOREHOLE: to 50 ft.

BENTONITE CHIP BACKFILL

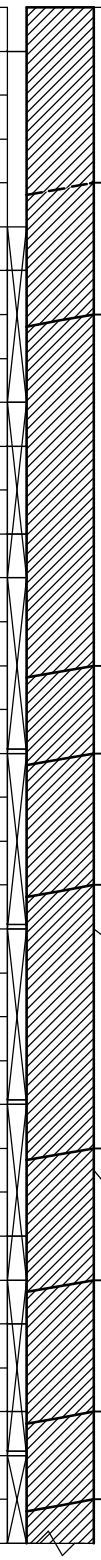
3/4" DIA. SCHED. 40 PVC CASING: +2 to 30 ft.

PRE-FABRICATED FILTER PACK: 30 to 50 ft.



Recovery (inches)	PID Reading (ppm)
	0
	0
48	
	0
48	
	0
48	
	0
48	
	0
48	
	0
48	
	0
48	
	4.5
	129

Depth (ft.) Sample



0 5 10 15 20 25 30 35

Olive Gray Gravelly Lean Clay with Sand (CL) (5Y 4/2) Stiff, dry, 50% clay, 30% fine to coarse gravel. 20% fine to coarse sand (fill)

Drillers hand augered first 5 feet of borehole

Olive Gray Lean Clay with Sand (CL) 5Y 5/2) Stiff, dry, 75% clay, 25% fine sand, trace gravel, iron oxidation staining (fill)

Dark Olive Gray Gravelly Lean Clay with Sand (CL) (5Y 3/2) Stiff, dry, 60% clay, 25% subangular mudstone gravel, 15% fine to medium sand (fill)

Very Dark Gray Gravelly Lean Clay (CL) (5Y 3/2) Stiff, dry, 70% clay, 20% angular mudstone gravel, 10% fine sand (fill)

Very Dark Gray Sandy Lean Clay with Gravel (CL) (5Y 3/2) Stiff, dry, 55% clay, 25% sand, 20% gravel (fill)

Very Dark Gray Lean Clay with Gravel (CL) (5Y 3/2) Stiff, dry 75% clay, 20% gravel, 5% sand, trace roots (fill)
@21 ft.: Slight hydrocarbon odor

@25 ft.: Slight hydrocarbon odor

Olive Gray Gravelly Lean Clay with Sand (CL) (5Y 4/2) Stiff, dry, 55% clay, 30% fine gravel, 15% fine to coarse sand (fill)
@26.5 ft.: Color change to Very Dark Gray

Very Dark Gray Lean Clay with Sand (CL) (5Y 3/1) Stiff, dry, 80% clay, 20% fine sand, trace gravel (fill)

Black Lean Clay (CL) (5Y 2.5/1) Soft, dry, 85% clay, 15% silt (fill)

Black Lean Clay with Sand (CL) (5Y 2.5/1) Soft, dry, 85% clay, 15% fine sand (fill)

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-37

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

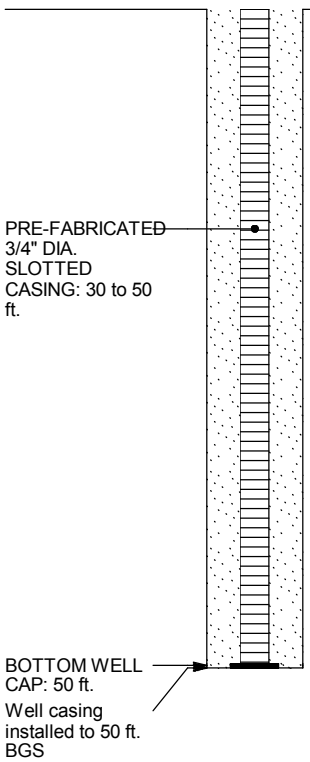
PLATE

E9-48

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date	7/17/06
Driller	Rhino Rig
Drilling Method	Direct Push
Sampler	Clear Liners
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	448.96 **Hole Dia.** 2 in.
Northing	504316.062 **Easting** 1236620.06

Well Construction Details



Depth (ft.)	Sample	Recovery (inches)	PID Reading (ppm)	Description
35		48	1.5	@35 ft.: Moist
			30	Black Sandy Lean Clay (CL) (5Y 2.5/1) Soft, wet, 65% clay, 35% fine to medium sand (fill)
				@37 to 39 ft.: No recovery
40		24	0	
		36	10	Dark Gray Sandy Lean Clay with Gravel (CL) (5Y 4/1) Soft, wet, 50% clay, 30% fine to coarse sand, 20% fine angular gravel (fill)
				Olive Gray Lean Clay with Gravel (CL) (5Y 4/2) Stiff, dry, 70% clay, 30% fine angular gravel, one piece concrete (fill)
45			3	
		42		Olive Gray Sandy Lean Clay with Gravel (CL) (5Y 4/2) Soft, wet, 55% clay, 30% fine to coarse sand, 15% fine gravel (fill)
				Dark Olive Gray Sandy Lean Clay (CL) (5Y 4/2) Soft, dry, 70% clay, 30% fine to coarse sand, trace angular gravel (fill)
		12		
50				Bottom of boring at 50 feet.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-37

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-48

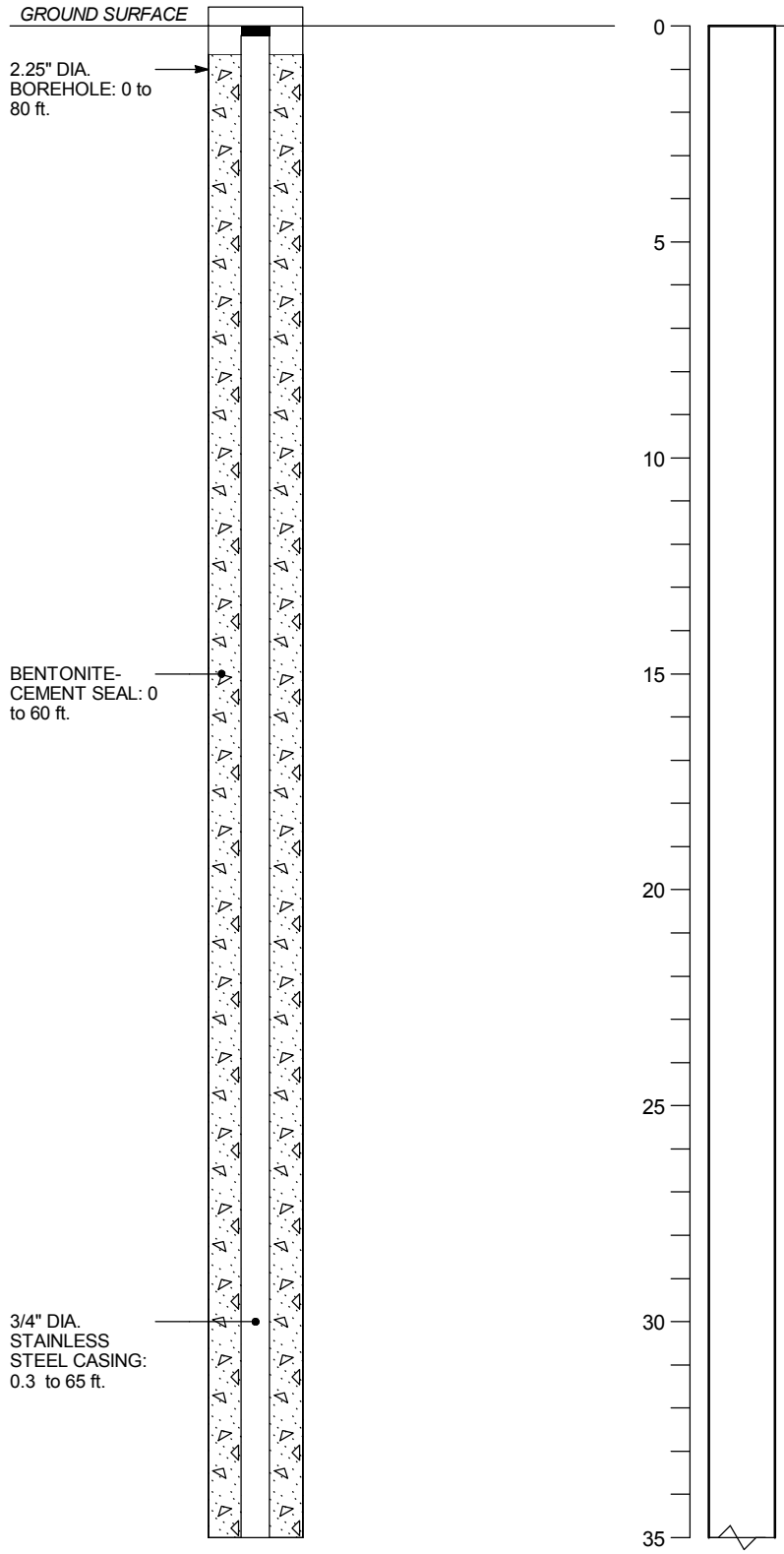
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **562.64 ft.**

Date	8/22/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	562.94
Hole Dia.	2.25
Northing	505937.629
Easting	1237233.764

Boring advanced using CPT rig. No lithologic descriptions generated.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-38

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

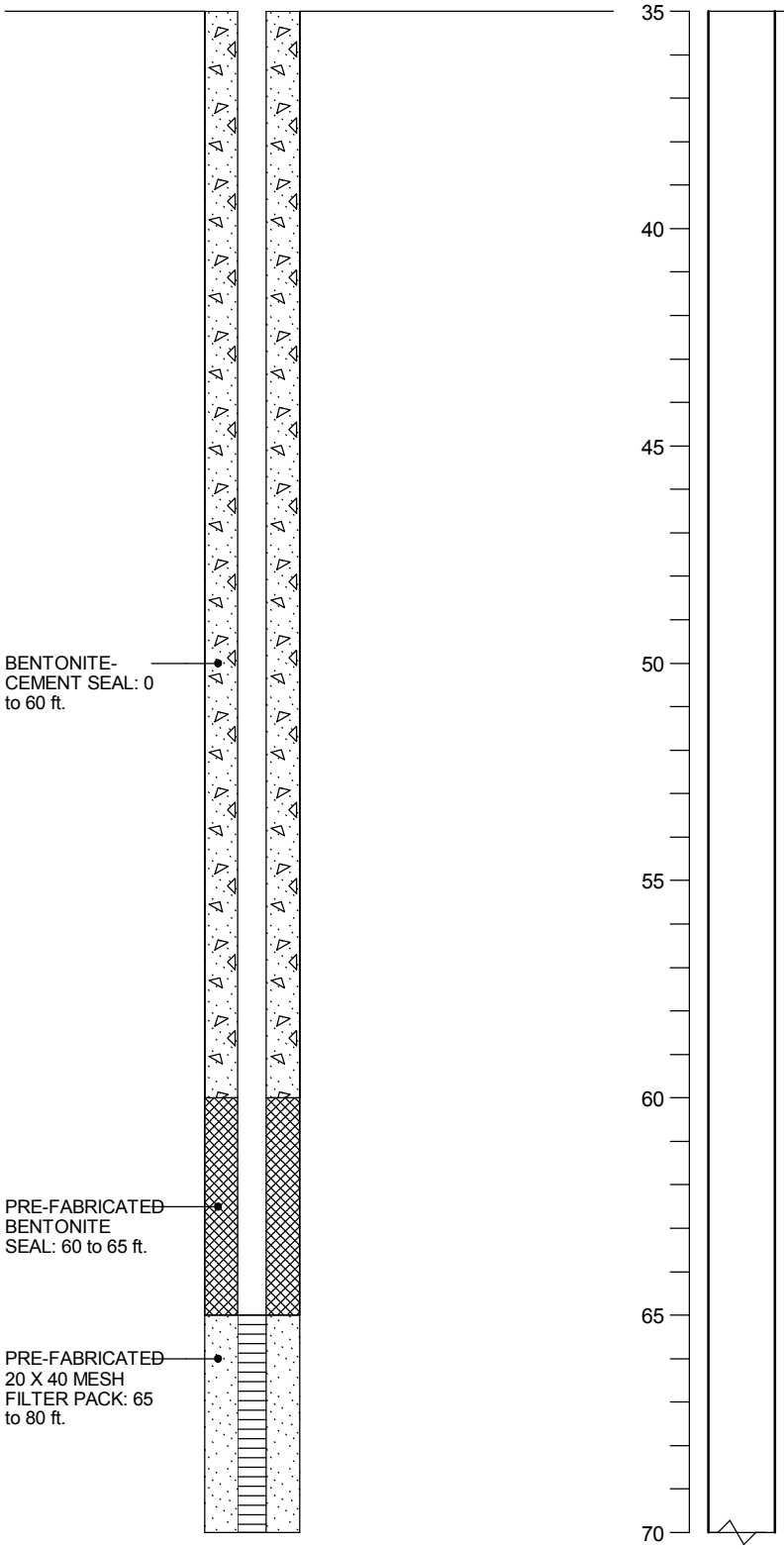
PLATE

E9-49

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/22/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	562.94
Hole Dia.	2.25
Northing	505937.629
Easting	1237233.764



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-38

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

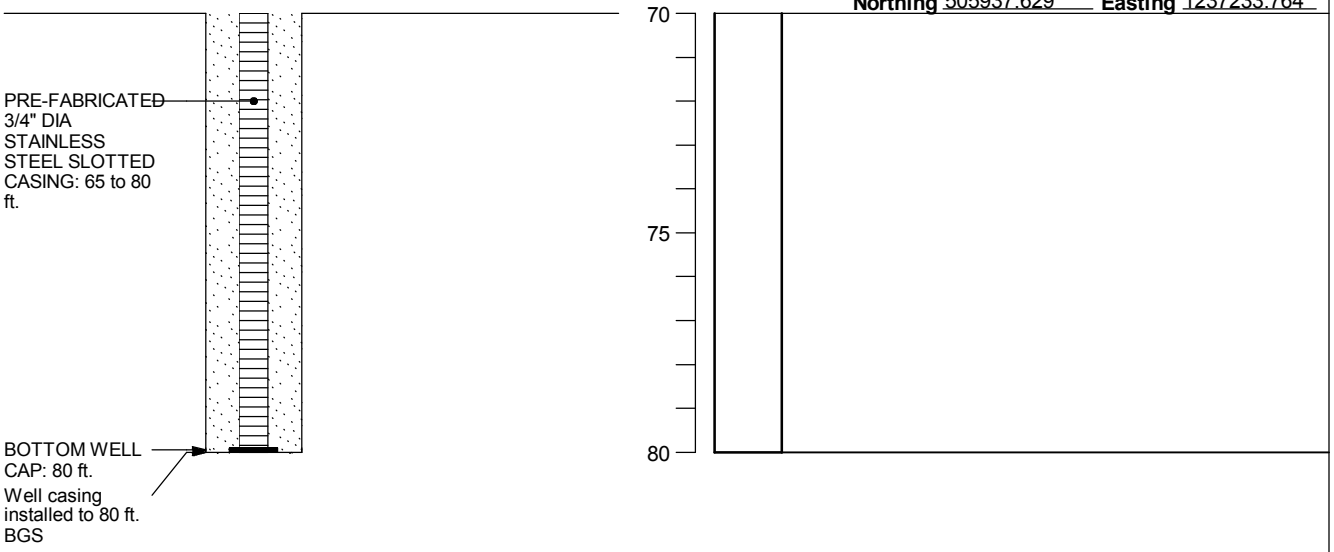
PLATE

E9-49

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/22/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	562.94
Hole Dia.	2.25
Northing	505937.629
Easting	1237233.764



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-38

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-49

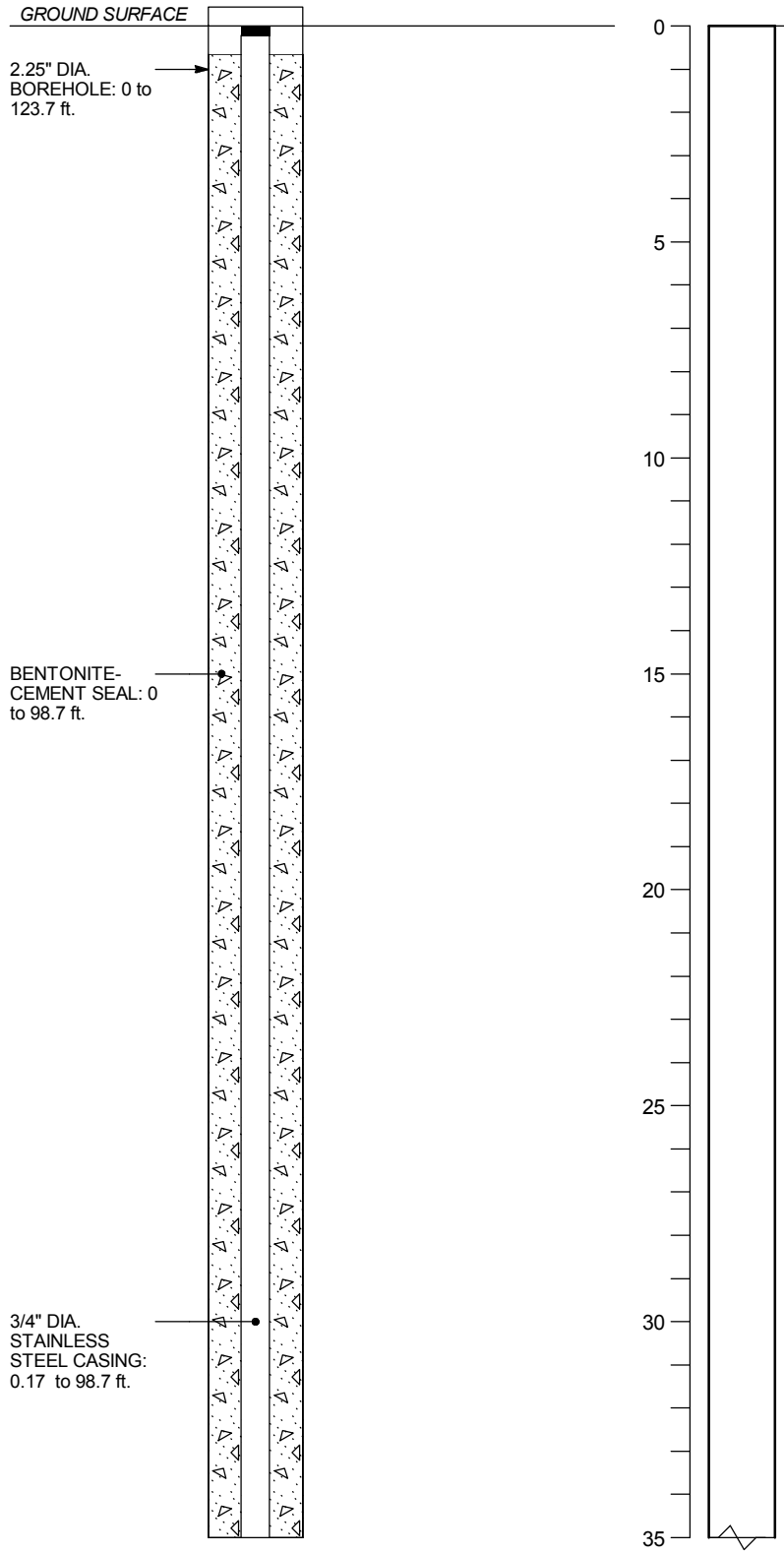
DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Top of PVC Casing Elev. **634.94 ft.**

Date	8/21/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	635.11
Hole Dia.	2.25
Northing	506208.556
Easting	1237085.584

Boring advanced using CPT rig. No lithologic descriptions generated.



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-39

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

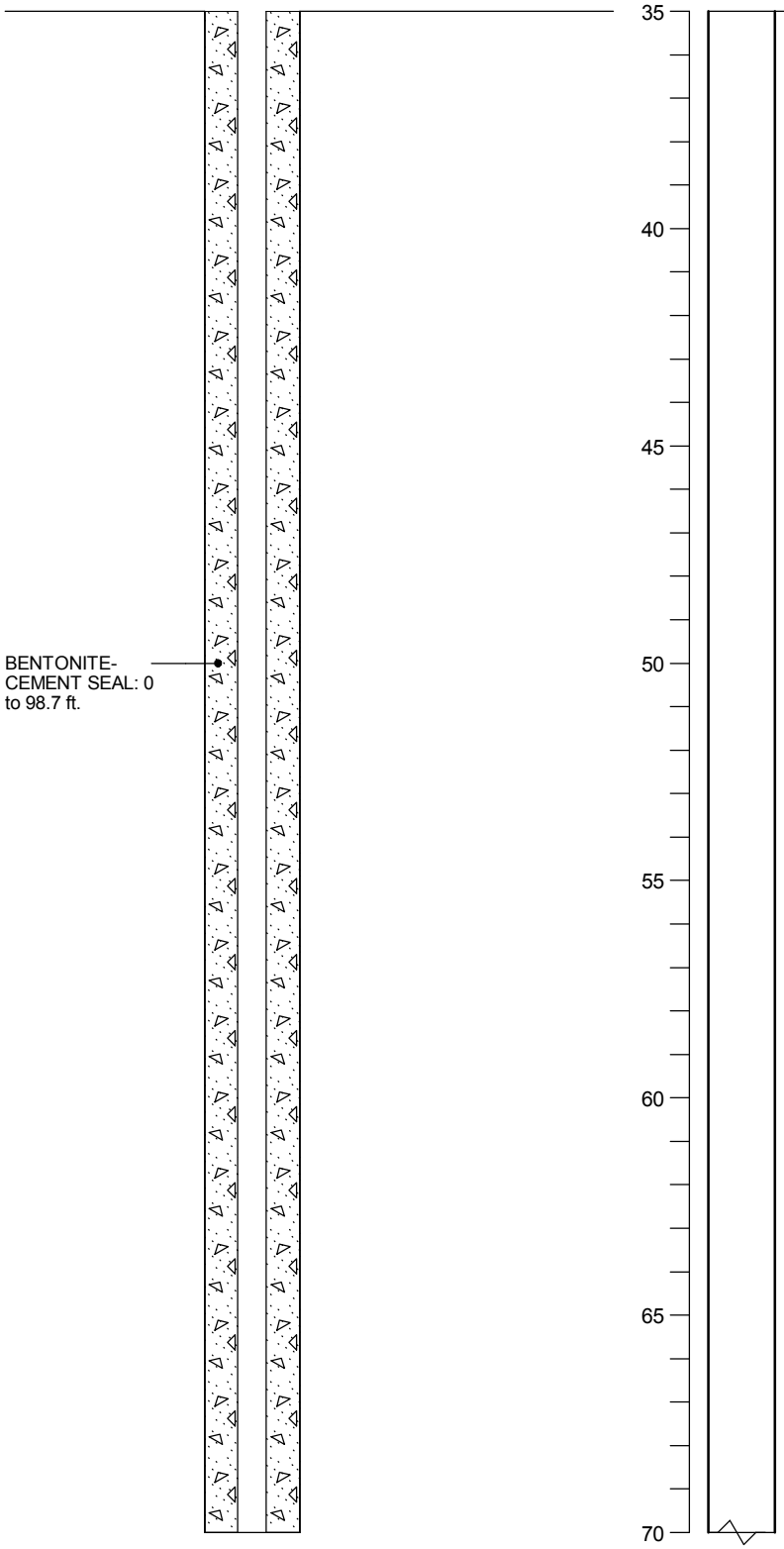
PLATE

E9-50

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/21/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	635.11
Hole Dia.	2.25
Northing	506208.556
Easting	1237085.584



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-39

Final Remedial Investigation Report
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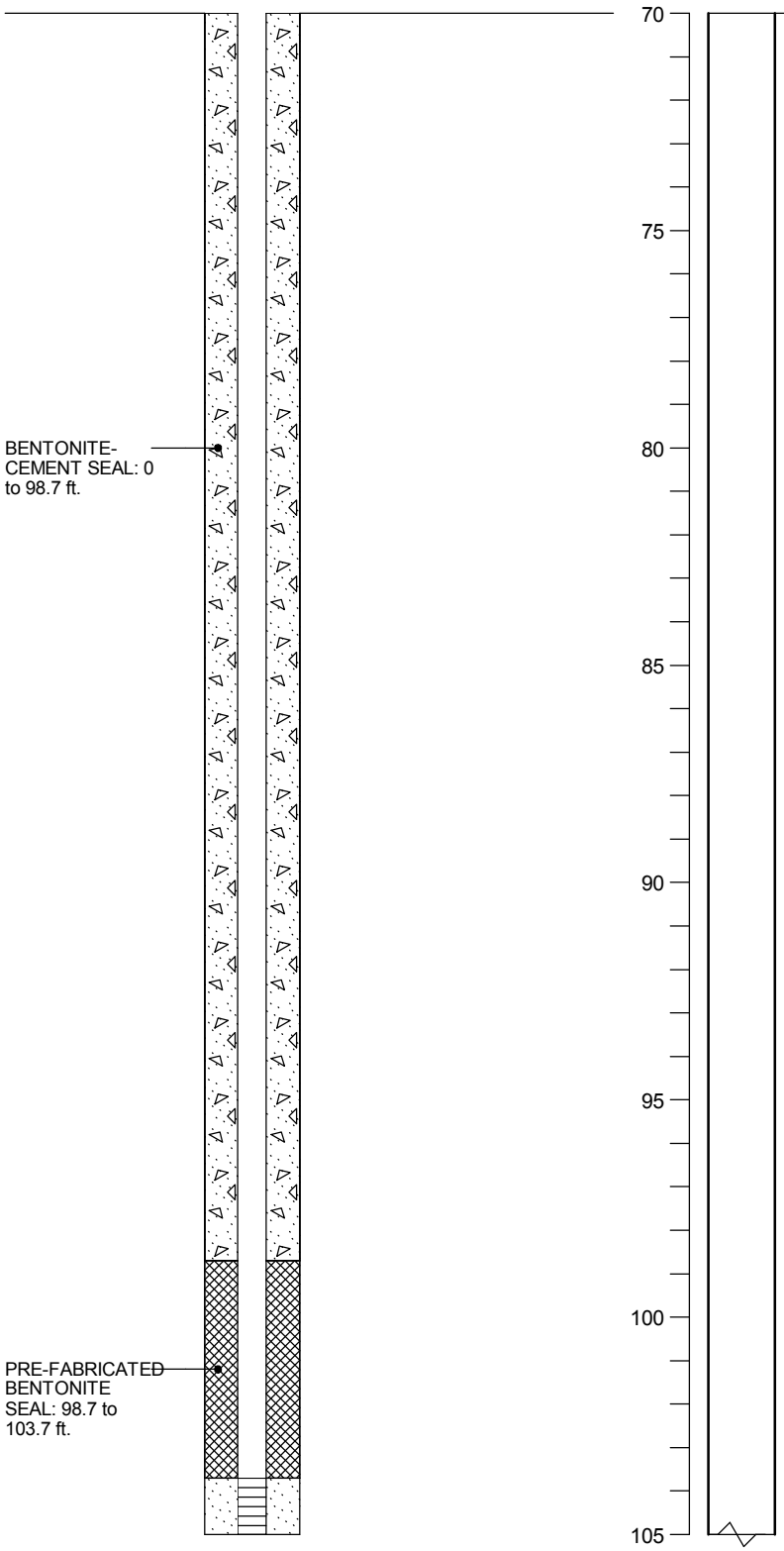
PLATE

E9-50

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/21/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	635.11
Hole Dia.	2.25
Northing	506208.556
Easting	1237085.584



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-39

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Casmalia Resources Superfund Site
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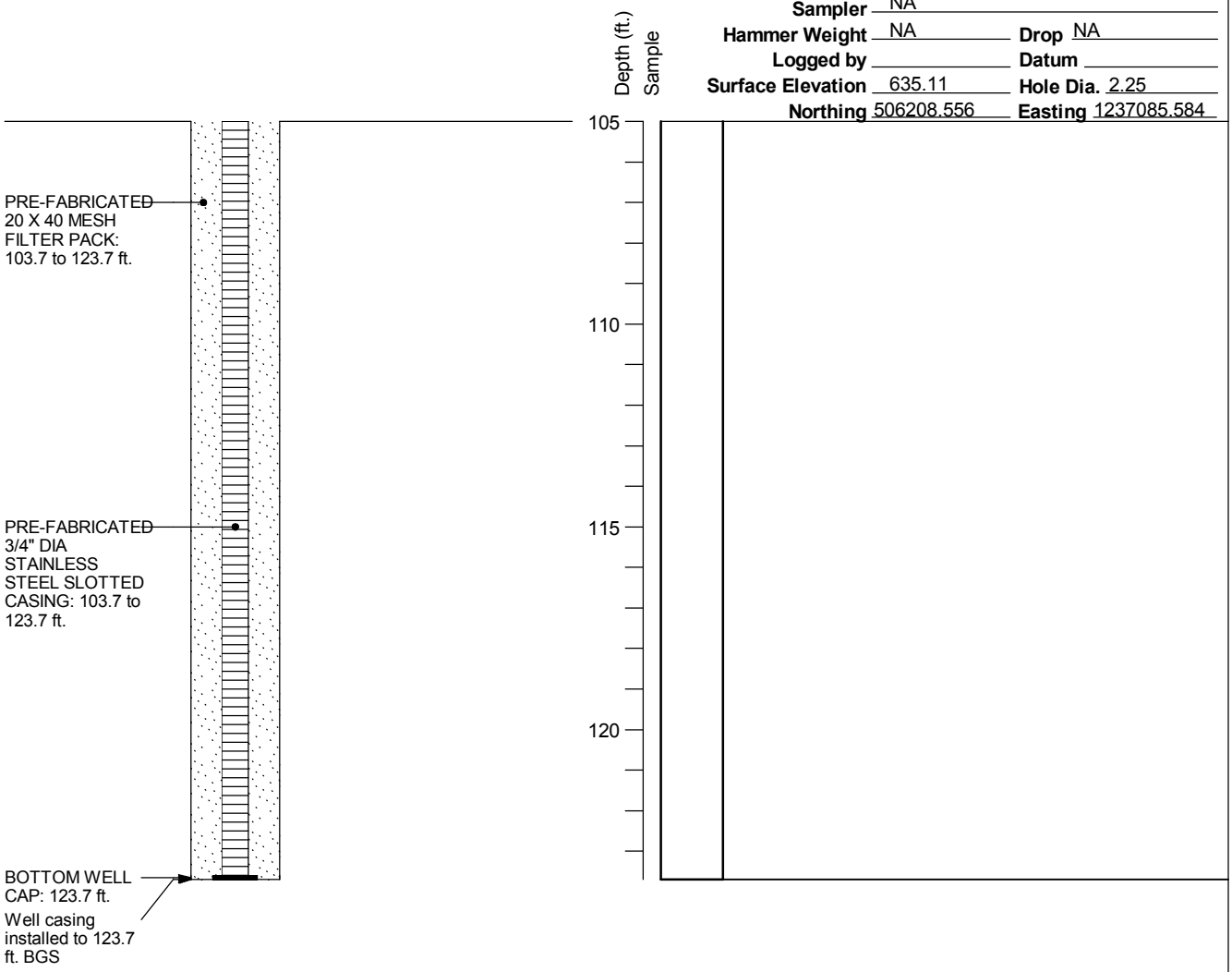
PLATE

E9-50

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Well Construction Details

Date	8/21/07
Driller	CPT
Drilling Method	CPT
Sampler	NA
Hammer Weight	NA
Drop	NA
Logged by	
Datum	
Surface Elevation	635.11
Hole Dia.	2.25
Northing	506208.556
Easting	1237085.584



BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Well Construction Details and Log of Boring RIPZ-39

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

PLATE

E9-50

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
WJF	4088097619	WJF	1/11	WBC	1/11

Date 10/22/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 723.68 **Hole Dia.** 8.5 in.
Northing 507351.782 **Easting** 1237020.307

Well Construction Details

Top of PVC Casing Elev. **725.60 ft.**

GROUND SURFACE

4" DIA. SCHED. 40 PVC CASING: +1.9 to 60 ft.

8.5" DIA. BOREHOLE: 0 to 80.5 ft.

BENTONITE-CEMENT SEAL: 0 to 53 ft.

Recovery (inches)	PID Reading (ppm)
	0
51	
	0
51	
	0
36	
	3
60	
	0
60	
	0
60	
	0
54	

Depth (ft.) Sample

0, 5, 10, 15, 20, 25, 30, 35

Light Olive Brown Clayey Gravel with Sand (GC) (2.5Y 5/3) Dense, moist, 60% fine, angular mudstone gravel, 20% sand, 20% clay (Fill)

Light Olive Gray Weathered Mudstone (2.5Y 6/2), Poorly to moderately consolidated, massive, closely to intensely fractured, low hardness, weak, deeply weathered, strong iron oxide along subhorizontal fractures, with some liesegang banding between 3.8 and 5.8 ft.

@ 7.4 ft.: Intensely fractured in all directions with iron oxide staining from 7.4 - 9.9 ft.

@ 11.7 ft.: Abundant low and high angle fractures from 11.7 - 15 ft.

@ 14 ft.: More competent, change to Olive Brown (2.5Y 4/3)

@ 16.2 ft.: Fractured throughout with mostly iron oxide and black manganese from 16.2 - 19.7; gypsum at 16.2, 18.2, and 18.7 ft.

@ 20.8 ft.: Series of subhorizontal fractures with gypsum in-filling from 20.8 - 24.5 ft.

@ 25 ft.: Series of subangular fractures
@ 25 - 30 ft.: 35-45° off vertical fractures with iron oxide and gypsum

@ 31 ft.: Vertical and subangular fractures with iron oxide and gypsum from 31 - 33 ft.

@ 33.8 ft.: Subhorizontal fractures with gypsum and iron oxide from 33.8 - 35.5 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RG-11B-2

Final Remedial Investigation Report
Casmalia Resources Superfund Site
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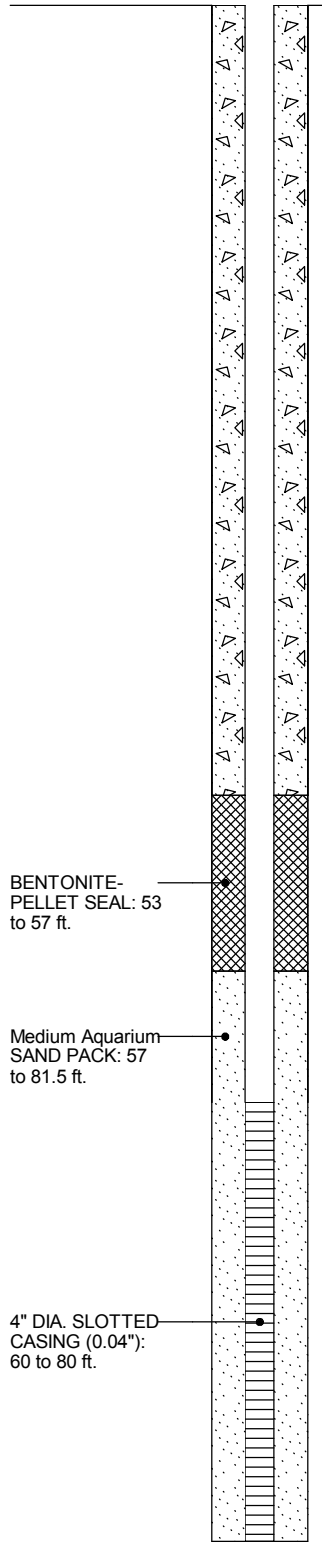
PLATE

E9-51

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/22/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	723.68 **Hole Dia.** 8.5 in.
Northing	507351.782 **Easting** 1237020.307

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	Description
35	60	0		@ 35.7 - 43 ft.: Multiangular fractures; iron oxide at 36.5 and 40 ft.; iron oxide and gypsum at 38 ft.
40	60	0		
45	60	0		Dark Gray to Very Dark Gray Unweathered Mudstone (5Y 4/1 - 4Y 3/1), Moderately consolidated, massive, low hardness, weak to moderately strong, moderate to little weathering
50	60	0		@ 50 - 54 ft.: Harder @ 50.8 ft.: White layer @ 51.5 - 52.5 ft.: High angle fracture; some iron oxide staining; no moisture seen in video
55	60	0		
60	60	0		@ 57.5 ft.: White inclusion @ 58 ft.: White layer
65	60	0		
70	60			

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RG-11B-2

Final Remedial Investigation Report
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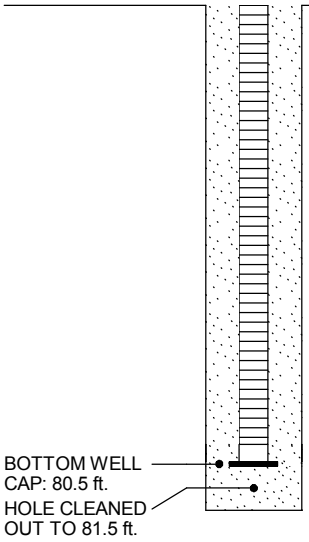
PLATE

E9-51

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/22/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	723.68 **Hole Dia.** 8.5 in.
Northing	507351.782 **Easting** 1237020.307

Well Construction Details



Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	70		@ 70.8 - 71.4 ft.: High angle 30° from vertical fracture
60				@ 72.5 ft.: Video shows fracture with white oxides
	0	75		
60				@ 78 ft.: Water seen flowing on video
				@ 79.1 ft.: White layer
		80		

Bottom of boring at 80 ft.
Hole opened to 81.5 ft

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RG-11B-2

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PLATE

E9-51

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 11/23/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 702.66 **Hole Dia.** 8.5 in.
Northing 507186.936 **Easting** 1237303.384

Well Construction Details

Top of PVC Casing Elev. **704.93 ft.**

GROUND SURFACE

6.5" DIA. BOREHOLE: 0 to 76 ft.

BENTONITE-CEMENT SEAL: 0 to 49 ft.

Recovery (inches)	PID Reading (ppm)
	0
48	
	0
60	
	0
54	
	0
60	
	0
60	
	0
60	
	0
60	

Depth (ft.) Sample

0 Topsoil

Light Olive Brown Weathered Mudstone (2.5Y 5/3), Moderately consolidated, intensely fractured, massive, low hardness, weak, deeply weathered, iron oxide and manganese and gypsum coatings throughout

5

10

@ 10.7, 10.8, and 11.1 ft.: Fractures with gypsum in-filling

@ 12 and 13 ft.: Subhorizontal fractures; subangular fracture with iron oxide at 13.1 ft.

@ 14.1 ft.: Mostly subangular fractures with iron oxide, highly oxidized through 25 ft.; vertical fracture from 14.5 to 15.8 ft.

15

@ 19.6 ft.: Gypsum

20

25

@ 25 ft.: Gray bands at 25 - 25.2 ft., 25.8 - 26.7 ft., 27.2 - 28 ft., 28.3 - 28.5 ft., and 28.9 - 29.5 ft.

Weathered/Unweathered Transition Zone from 25 - 30.7 ft.

30

Dark Gray Unweathered Mudstone (5Y 4/1), Moderately consolidated, occasionally fractured, massive, low hardness, weak, moderately weathered; Olive Brown subhorizontal fracture/oxide zone with iron oxide at 32.7, 34.1 and 34.8 ft.

35

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RGPZ-10B-2

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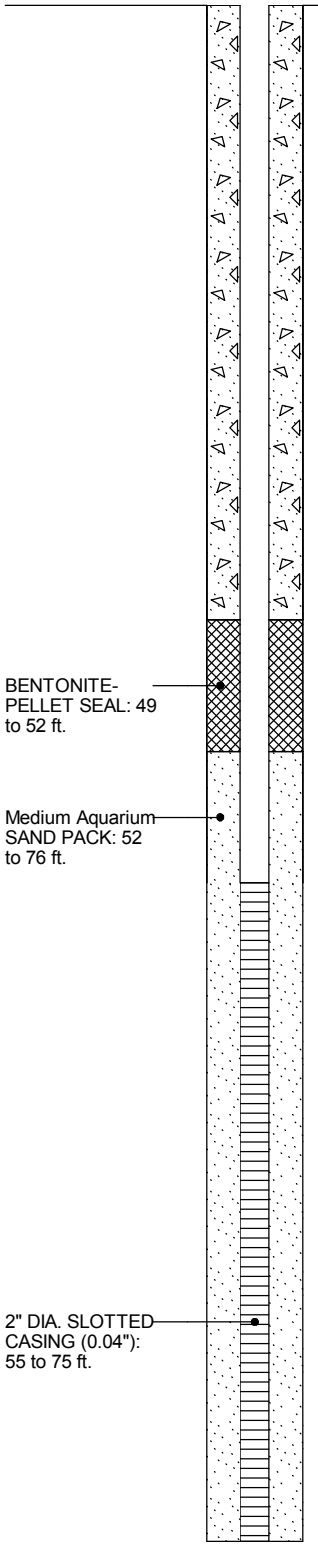
PLATE

E9-52

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/23/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	702.66 **Hole Dia.** 8.5 in.
Northing	507186.936 **Easting** 1237303.384

Well Construction Details



Depth (ft.)	Recovery (inches)	PID Reading (ppm)	Sample	
35		0		
	60			
40				@ 41 ft.: White inclusions interbedded between 41 and 41.8 ft.
	60			
				@ 44 ft.: White inclusions interbedded between 44 and 44.5 ft.
45		0		
				@ 47.1 ft.: High angle fracture with minor iron oxide
	60			
50		0		
	54			
55		0		From 55 - 58 ft.: Friable, platey
	60			From 58 - 60 ft.: Massive
60		0		From 60 - 64 ft.: Slightly friable, platey
	60			
65		0		@ 65.5 ft.: White inclusion
	60			
				@ 68.5 ft.: Massive
70				

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RGPZ-10B-2

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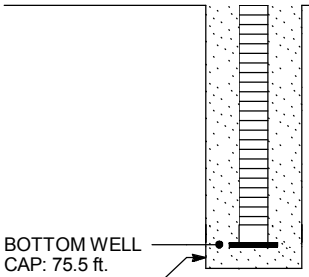
PLATE

E9-52

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	11/23/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	702.66 **Hole Dia.** 8.5 in.
Northing	507186.936 **Easting** 1237303.384

Well Construction Details



Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		70		@ 70.5 - 71.5 ft.: Slightly friable From 71.5 ft.: Tight, massive
		75		Bottom of boring at 76 ft.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/14/10

Well Construction Details and Log of Boring RGPZ-10B-2

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PLATE

E9-52

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/4/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	652.44 **Hole Dia.** 6.5 in.
Northing	506615.155 **Easting** 1238500.217

GROUND SURFACE	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
			0		Vegetation/Topsoil at surface
		0			Pale Brown Gravelly Lean Clay (CL) (10YR 6/3) Hard, dry, 60% clay, 30% mudstone gravel, 10% sand
	48				
					@ 4.4 ft.: HDPE Geonet layer
	6		5		
		0			@ 8.5 ft.: Geotextile layer
	17				Grayish Brown Lean Clay with Sand (CL) (10YR 5/2) Hard, moist, 85% clay, 15% sand laminations (Fill)
			10		@ 10 ft.: HDPE liner
		0			
	42				Grayish Brown Weathered Mudstone (2.5Y 5/2), Poorly consolidated, closely fractured, low hardness, weak, deeply weathered, with iron oxide banding and gypsum from 15 - 20 ft.
		0	15		From 15.3 - 19.4 ft.: Softer drilling
					@ 16 ft.: Change to Light Olive Brown (2.5Y 3/3), moderately consolidated, shaley bedding, with gypsum and manganese black oxide along nearly horizontal fractures from 15.3 - 19.4 ft.
	60				
		0	20		
	60				Grayish Brown to Olive Brown Clayey Gravel (GC) (2.5Y 5/2 - 2.5Y 5/3) Hard, moist to dry, 60% gray mudstone gravel, 20% mudstone sand, 20% clay
		0	25		Light Yellowish Brown Weathered Mudstone (2.5Y 6/3), Moderately consolidated, shaley bedding, closely fractured, low hardness, weak, deeply weathered, horizontal fractures at 26, 27, 28, and 29.7 ft.; vertical fractures at 27.1 ft.
	60				
		0	30		@ 30.2 ft.: 0.25 in. thick gypsum to 27.5 ft. and 29.1 - 29.3 ft.
					@ 31 - 32 ft.: Occasionally friable
					@ 31.7, 32,3, and 33 ft.: Fractures with oxides and gypsum
	54				
					@ 33.7 ft.: Horizontal fracture with iron oxide and gypsum
					@ 34.3 ft.: Horizontal fracture with gypsum
			35		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

PLATE

Log of Boring RISB-01

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E9-53

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/4/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 652.44 **Hole Dia.** 6.5 in.
Northing 506615.155 **Easting** 1238500.217

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	Description
	0	35		@ 35.2, 35.76, 36.1, 36.7, and 37.7 ft.: Horizontal or near horizontal fractures
60				@ 38 ft.: Angular fracture with gypsum @ 39 - 39.4 ft.: Vertical fracture @ 39.2, 39.7, and 40.7 ft.: Horizontal fractures
	0	40		@ 40.5 ft.: Textural change in core from 35 - 40 ft.; core run barrel wet
60				Dark Gray Weathered/Unweathered Mudstone (Transition Zone), Moderately consolidated, shaley/platey bedding, moderately fractured, friable to weak, moderately weathered
	0	45		@ 45.7 ft.: Weak with calcium carbonate cementation
60				@ 47 ft.: Gypsum and iron oxide color banding
				@ 49 - 50 ft.: Weak calcium carbonate cementation, first observed water
	0	50		
60				
9	0	55		Dark Gray Unweathered Mudstone (5Y 4/1), Moderately consolidated, very thinly bedded, occasionally fractured, moderately hard, moderately strong, little weathering
18	0			
9	0	60		@ 59.9 ft.: Weak calcium carbonate cementation
6	0			
6	0			@ 62 ft.: Fracture 10° off vertical, some iron oxide, platey bedding
6	0 0			
24				
	0	65		@ 66 ft.: Friable
60				
		70		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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E9-53

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/4/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	652.44 **Hole Dia.** 6.5 in.
Northing	506615.155 **Easting** 1238500.217

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	70		From 70.9 - 74 ft.: Zones are more resistant
60				
				From 74 - 75 ft.: Hard
		75		
	0			@ 78 ft.: More resistant; hard from 79 - 86 ft.
24				@ 79.5 ft.: Two horizontal and subhorizontal fractures with white mineral in-filling, evidence of near vertical jointing
	0	80		
60				
		85		@ 85 ft.: Back to more friable, thinly bedded material; weak from 86 - 90 ft.
24				
	0			
60		90		@ 89.5 ft.: Wet zone, no mineralization; hard from 90 - 90.5 ft. @ 90.6 ft.: Wet zone, no mineralization; weak from 90.5 - 112 ft.; little weight on bit needed to advance core
	0			
45				@ 94.3 ft.: More resistant material
		95		
	0			
60				
		100		
	0			
60				
		105		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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E9-53

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/4/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	652.44 **Hole Dia.** 6.5 in.
Northing	506615.155 **Easting** 1238500.217

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	105		@ 107 ft.: Driller notes slightly harder drilling
60				
		110		
	0			@ 112 - 113 ft.: Harder
				@ 113 ft.: Weak
60				
		115		@ 114.7 - 114.8 ft.: Harder
	0			
60				
		120		@ 120 - 124.5 ft.: Harder
	0			
60				
		125		@ 124.5 - 130.5 ft.: Weak
	0			@ 126 ft.: Sheared and powdery, friable, dry
60				
		130		@ 130 ft.: More resistant
	0			@ 130.5 - 132 ft.: Harder; horizontal fractures at 131 ft.
				@ 132 - 138.5 ft.: Weak
60				@ 133 - 133.5 ft.: Wet, no mineralization
		135		@ 135 ft.: White zone
				@ 136.1 - 136.4 ft.: Massive bedding feature, not platey, bedding inclination near horizontal
				@ 137 - 137.5 ft.: Wet, no mineralization
				@ 138.5 - 141 ft.: Harder
		140		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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Log of Boring RISB-01

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E9-53

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/4/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	652.44 **Hole Dia.** 6.5 in.
Northing	506615.155 **Easting** 1238500.217

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		140		@ 140 - 141 ft.: Weak, calcium carbonate cementation, wet, no mineralization
	0			@ 140.6 ft.: Horizontal and vertical mineralization, moist
				@ 141 and 142.5 ft.: Wet, no mineralization; weak from 141 - 143 ft.
60				@ 143 - 145 ft.: Harder
		145		@ 145 - 150.5 ft.: Weak
	0			@ 146 - 146.6 ft.: Wet fracture at top of core, no mineralization
				@ 148 ft.: Wet fracture, no mineralization
60				
		150		@ 150.5 ft.: Harder; no recovery from 151 - 161 ft.; attempt different core methods to better optimize core
		155		
				@ 159 ft.: White band observed in video run
		160		@ 160 - 162.5 ft.: Weak
	0			@ 161 ft.: Mild calcite cementation
				@ 162.5 - 169 ft.: harder
				@ 162.8 - 162.9 ft.: Lens of dense white material
60				
		165		@ 165.2 - 165.3 ft.: More resistant
	0			
48				
				@ 169 - 172.5 ft.: Weak
	0	170		@ 170.4 - 170.8 ft.: Wet fracture, no mineralization
				@ 171 ft.: Change to Gray to Dark Gray (5Y 5/1 - 5Y 4/1), shaley to platey bedding, low hardness, weak
60				@ 172.5 - 175 ft.: harder
				@ 173 ft.: 45° off horizontal, change in color with white inclusions and oxidation staining, no fracture
		175		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

PLATE

Log of Boring RISB-01

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

E9-53

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/4/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	652.44 **Hole Dia.** 6.5 in.
Northing	506615.155 **Easting** 1238500.217

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	175		@ 175 - 180 ft.: Weak @ 177 ft.: Core is wet throughout
60				
	0	180		@ 180 - 185 ft.: Harder @ 181.5 ft.: Change to Dark Gray (5Y 4/1), massive bedding, weak to moderately strong, core breaks along irregular surfaces, no oxidation or mineralization
58				
	0	185		@ 185 - 190 ft.: Weak; wet from 185.2 - 106.5 ft., no mineralization
60				
	0	190		@ 190 - 195 ft.: Platey bedding
54				
	0	195		@ 194 - 195 ft.: Minor calcite cementation @ 195 - 199.5 ft.: Weak, wet throughout, no mineralization
60				
	0	200		@ 199.5 - 205.5 ft.: Harder, moist
60				
	0	205		@ 204 ft.: Moderate calcite cementation @ 205.5 - 209.5 ft.: Weak, friable @ 206 - 207 ft.: Moist
60				
		210		@ 209.5 - 210.5 ft.: Harder

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

PLATE

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Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

E9-53

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	10/4/04
Driller	Air Rotary
Drilling Method	ARCH
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	652.44 **Hole Dia.** 6.5 in.
Northing	506615.155 **Easting** 1238500.217

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	Description
	0	210		@ 210.5 - 211 ft.: Wet; @ 210.5 - 215 ft.: Weak
60				@ 212 ft.: Friable, wet
		215		@ 214.6 - 215 ft.: Harder, some near vertical fracturing @ 215 ft.: Harder drilling, plugging shoe, no recovery
12	0 0	220		@ 219 ft.: MInor calcite cementation, harder
60				@ 221 - 223.5 ft.: Weak
	0	225		@ 223.5 - 226 ft.: Harder, moderate calcite cementation, moist, no mineralization @ 224.5 - 225.8 ft.: Harder bedding surface
60				@ 226 - 230 ft.: Weak
	0	230		@ 228 - 228.3 ft.: Harder @ 228.3 - 229 ft.: Wet, no mineralization @ 229 ft.: Dry, friable @ 230 - 235.5 ft.: Harder
54				
	0	235		@ 234.8 ft.: Fine cracks, 5% off vertical with tiny crystalline structures on surface between 234.7 and 236.6 ft. @ 235.5 - 239 ft.: Weaker with pyrite appearance @ 236 - 237 ft.: Moist, no mineralization/oxidation
60				@ 237 ft.: Fine laminations, wet, mineralization at 237 ft. but not below @ 238 ft.: Fracture plane nearly vertical, perpendicular to bedding
	0	240		@ 239 - 240 ft.: Moist, minor pyrite mineralization/oxidation @ 239 - 244.5 ft.: Harder
60				@ 244 ft.: Vertical fracture @ 244.2 - 244.9 ft.: Fracture at 15° off vertical, pyrite
		245		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

PLATE

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Casmalia Resources Superfund Site
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E9-53

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date 10/4/04
Driller Air Rotary
Drilling Method ARCH
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 652.44 **Hole Dia.** 6.5 in.
Northing 506615.155 **Easting** 1238500.217

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	0	245		@ 244.5 to 248 ft.: Weaker
60				@ 248.6 - 249.2 ft.: Fracture at 10° off vertical, with pyrite Harder from 248 ft. to total depth.
	0	250		@ 250.8 - 251.2 ft.: Fracture
54				@ 254 - 255 ft.: Two fractures at 15° off vertical
		255		Bottom of boring at 255 ft. Boring backfilled with bentonite cement grout.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
CN	4088097619	WJF	1/11	WBC	1/11

Date	9/26/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	467.09 **Hole Dia.** 6 in.
Northing	505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	Description
		GROUND SURFACE		
		0		Dark Gray Lean Clay (CL) (2.5Y 4/1) Soft, dry, 80% clay, 10% fine sand, 10% silt
		5		
		10		Light Yellowish Brown Weathered Claystone (2.5Y 6/3) Moderately fractured, moderately hard, moderately strong, weak, moderately weathered
48				
	152			
12		15		
		20		
				@24 ft.: Change to Olive Gray (5Y 5/2) Intensely fractured, moderately hard, moderately strong, moderately weathered, oxidation staining along bedding planes
36	32	25		@26 ft.: Color change to Dark Gray (2.5Y 4/1)
	20			
30				Dark Gray Unweathered Claystone (2.5Y 4/1) Very little fracturing, moderately hard, moderately strong, moderately weathered, oxidation staining along bedding planes
	322	30		@30 ft.: Oxidation staining gone
6				
24		35		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

PLATE

Log of Boring RISB-02

Final Remedial Investigation Report
Casmalia Resources Superfund Site
Casmalia, California

E9-54

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/26/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	467.09 **Hole Dia.** 6 in.
Northing	505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
30	182	35		@37.5 ft.: Two white layers up to 1.5 cm each
40		40		
	1,407			
30	683			
30		45		
12	1,542			@47-48.5 ft.: Visible NAPL visible coating outer edge of core. Vertical fracture between 47 and 48 ft. in video log, 30° fracture also visible at 47 ft. in video log.
24				
	678	50		@50.5 ft.: Fractures observed in optical televiewer
36	11			@52 ft.: Product sheen on surface of core, continue very little fracturing, moderately hard, moderately strong, little weathering
30				
	91	55		
30				
	14			@58 ft.: 0.5 cm white layer with a 2x6 cm irregular shape
60		60		
	12			@62 ft.: Five white stripes within 4 inches of core
60		65		@65.5 ft.: Fracture observed with greenish color in optical televiewer
	0			@66-67 ft.: Deep, cavernous fracture observed in video log
60		70		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date 9/26/06
Driller Air Rotary
Drilling Method Air Rotary
Sampler Continuous Core
Hammer Weight NA **Drop** NA
Logged by **Datum**
Surface Elevation 467.09 **Hole Dia.** 6 in.
Northing 505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
	23	70		@70-82 ft.: 0.25 to 0.5 cm white stripes throughout interval. Faint "zebra stripe" pattern, fractures observed in video log @71 ft.: Staining of borehole walls observed in video log
30				
30	396	75		@75 ft.: High angle fracture, 0.25 cm white stripes, product sheen on core
	8			
60		80		@79 ft.: Black product observed dripping from fracture in video log @80.5 ft.: High angle fracture, hairline fracture observed in optical televiewer
	5			
60		85		@85 ft.: High angle fracture @86-87 ft.: Water dripping from fracture observed in video log
	14			@88.5 ft.: High angle fracture
60		90		
12	5			@91.5 ft.: Staining observed without evidence of fracture in optical televiewer @93 ft.: Driller notes water entry into borehole, continue moderately hard, moderately strong, little weathering
60		95		@96 ft.: Vertical fracture observed in video log @98-100 ft.: Possible vertical fracture observed in video log
60		100		
	10	105		@103 ft.: Driller notes harder drilling @104 ft.: White clayey stripes

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/26/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	467.09 **Hole Dia.** 6 in.
Northing	505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		105		
	14			
12	0			
24				@109 ft.: Fracture observed in video log, fractures observed in optical televiewer at 108 and 109 ft.
	0	110		
36	4			
30				@114 ft.: Fractures with dendritic pattern observed in video log
		115		
18	0			@116-118 ft.: Vertical fracture observed in video log
30	0			
		120		
30	0			@122-128 ft.: Possible fractures or mechanical breakage of core, vertical fracture along western side of borehole observed in optical televiewer
60		125		
60		130		@130 ft.: Vertical fracture observed in southern side of borehole in optical televiewer @130.8-131.5 ft.: Vertical fracture @132 ft.: Brown residue coating fracture, vertical fracture observed in video log
	6			
48		135		@135 ft.: Continue as above, little fracturing, moderately strong, moderately hard, little weathering @137 ft.: White layering no longer present
	5			
		140		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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E9-54

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/26/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	467.09 **Hole Dia.** 6 in.
Northing	505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
48		140		@140 ft.: Calcite veins resemble clustered together like spaghetti @141 ft.: Possible horizontal fracture
	3			
				@143 ft.: Possible vertical fracture
60		145		@144.5 ft.: Occasionally fractured to moderately fractured @145-146 ft.: Near vertical calcium carbonate deposit. Reacts strongly with muriatic acid
	0			
60		150		@149 ft.: Possible horizontal fracture
	0			@152 ft.: 3/8 in., white layer, reacts slightly with muriatic acid @153-153.7 ft.: Possible vertical fracture
60		155		@155 ft.: Possible horizontal fracture
	0			@157.2 ft.: White stripes up to 0.5 in. react slightly with muriatic acid @158.5 ft.: White stripes up to 0.5 in. react slightly with muriatic acid
60		160		@159-159.5 ft.: Three possible fractures @160.5 ft.: White stripe to 1/8 in., slight reaction to muriatic acid @161-162 ft.: Several possible horizontal fractures
	0			
60		165		@164 ft.: 20° fracture
	0			@166 ft.: Core is wet, soft @166.5 ft.: 70° fracture @167 ft.: Driller notes easier drilling, smooth coring
60		170		@170-171 ft.: Three fractures observed in optical televiewer
	0			
60		175		@174-177 ft.: Intensely fractured, veining observed in video log

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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E9-54

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/26/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	467.09 **Hole Dia.** 6 in.
Northing	505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		175		
	0			@177 ft.: Very little fracturing, moderately strong, moderately hard, very little weathering
60		180		
	0			@182 ft.: Vertical fracture observed in video log, becomes more horizontal at 185 ft., returns to vertical at 186 ft. @183 ft.: Driller notes harder drilling
60		185		
	0			@186.5 ft.: Fracture observed in optical televiewer @187-190 ft.: Possible vertical fractures
60				@189-192 ft.: Vertical fracture observed in optical televiewer
		190		
6				
60		195		
	0			@197 ft.: 70° fracture
36				@198 ft.: 70° fracture @198.5 ft.: Possible vertical fracture
		200		
30				@201.5-203.5 ft.: Vertical fracture observed in optical televiewer
30				@203-208 ft.: Calcium carbonate deposit in fractures @204 ft.: 70° fracture
		205		
12				@206 ft.: Calcite deposits observed in video log
60		210		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/26/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	467.09 **Hole Dia.** 6 in.
Northing	505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		210		@211-214 ft.: Possible fracture zone
	225			
48				
		215		
				@217 ft.: Fracture observed in optical televiewer
48				
		220		
24				@222.5-224 ft.: Multiple hairline 70° fractures observed in optical televiewer
				@224 ft.: Very little fracturing, moderately hard, moderately strong, little weathering
48		225		@225-227 ft.: 70° fracture observed in optical televiewer
	0			
60		230		
	0			
60		235		@235.5-236.2 ft.: 70° fracture
24	0			
36		240		
	0			
60		245		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	9/26/06
Driller	Air Rotary
Drilling Method	Air Rotary
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	**Datum**
Surface Elevation	467.09 **Hole Dia.** 6 in.
Northing	505517.1018 **Easting** 1237464.583

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample
		245	
	0		
54		250	
	0		
12			

Bottom of boring at 252.5 feet

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

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E9-54

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	5/22/07
Driller	Rhino Rig
Drilling Method	Direct Push
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	Lyz Cullman **Datum**
Surface Elevation	NM **Hole Dia.** 2
Northing	504161.05 **Easting** 1236752.52

GROUND SURFACE	Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
			0		Olive Gray Lean Clay with Sand (CL) (5YR 4/2) Medium stiff to stiff, dry, 75% clay, 25% coarse sand, mottling, weathered (Fill)
	48				
		0			
			5		@5.5 ft.: Change to Dark Olive Brown (2.5YR 3/3) 80% clay, 20% medium to coarse sand
	36	0			
		0			@7-12 ft.: No core recovery
			10		
					@12 ft.: Change to moist
	24	0			
					@14-16 ft.: No core recovery
			15		
					@16 ft.: Change to Black (2.5YR 2.5/1) 85% clay, 15% sand
	24				
		0			@18-20 ft.: No core recovery
			20		@20 ft.: Change to soft, wet
	32	0			
					@22.5-24 ft.: No core recovery
					@24 ft.: Change to 80% clay, 20% sand, trace fine to coarse gravel
			25		
		0			
	48				
					Dark Gray Sandy Lean Clay with Gravel (CL) (5YR 4/1) Medium stiff, moist to wet, 65% clay, 20% fine to coarse sand, 15% fine angular gravel (Fill)
		0			
			30		
		0			
	24				
					@34-36 ft.: No core recovery
			35		

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

PLATE

Log of Boring RIHP-07

Final Remedial Investigation Report
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Casmalia, California

E9-55

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

Date	5/22/07
Driller	Rhino Rig
Drilling Method	Direct Push
Sampler	Continuous Core
Hammer Weight	NA **Drop** NA
Logged by	Lyz Cullman **Datum**
Surface Elevation	NM **Hole Dia.** 2
Northing	504161.05 **Easting** 1236752.52

Recovery (inches)	PID Reading (ppm)	Depth (ft.)	Sample	
		35		@36 ft.: Change to Olive Gray (5YR 4/2) wet, 55% clay, 30% fine to coarse sand, 15% fine gravel
36	0			
		40		Bottom of boring at 40 feet. Temporary PVC casing placed into open borehole: Screened from 20-40 feet below ground surface.

BORING_WELL2 CASMALIARIFS.GPJ GEOL.GDT 12/13/10

PLATE

Log of Boring RIHP-07

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Casmalia, California

E9-55

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS OVER 50% > No.200 SIEVE SIZE	GRAVELS MORE THAN 1/2 OF COARSE FRACTION > No.4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVELS WITH OVER 15% FINES	GM	Silty gravels, gravel-sand mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS MORE THAN 1/2 OF COARSE FRACTION < No.4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW	Well-graded sand or gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH OVER 15% FINES	SM	Silty sand, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS OVER 50% < No.200 SIEVE SIZE	SILTS & CLAYS LIQUID LIMIT 50% OR LESS		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LIQUID LIMIT GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488-93

☒	Bulk or classification sample
■	Sample preserved for possible laboratory analysis
□	No Recovery
▨	Hydropunch Sample
▽	First encountered groundwater
▼	Static groundwater level
(10YR 4/4)	Munsell Soil color 1990 edition
NA	Not Available
ND	Not Detected

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.75
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.75
SAND	No. 4 to No. 200	4.75 to 0.075
coarse	No. 4 to No. 10	4.75 to 2.00
medium	No. 10 to No. 40	2.00 to 0.425
fine	No. 40 to No. 200	0.425 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

KEY TO TEST DATA*

Source: ASTM D 2488-93, based on Unified Soil Classification system
*. Not part of ASTM Classification System

SOIL_CLASS_GEOL CASMALIARIFS.GPJ GEOL.GDT 12/13/10

Soil Classification Chart and Key to Test Data PLATE

Final Remedial Investigation Report
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Casmalia, California

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DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	WJF	1/11	WBC	1/11