

March 4, 1999

Mr. Amir K. Gholami Alameda County Health Care Services Environmental Health Services 1131 Harbor Bay Parkway, Suite 250 Alameda, California 94502-6577

Subject:

Groundwater Velocity for Tosco 76 Branded Facility No. 6034, 4700 First Street,

Livermore, California

Mr. Gholami:

At the request of Tosco Marketing Company (Tosco), Gettler-Ryan Inc. (GR) has prepared this letter in response to your January 6, 1999, correspondence regarding the subject site. Eight groundwater monitoring wells are present at the site. In accordance with the Alameda County Health Care Services, Environmental Health Services correspondence dated December 19, 1996, monitoring wells MW-2 and MW-4 are monitored and sampled semi-annually. The remaining wells are monitored semi-annually and are not sampled. The groundwater elevations, potentiometric contours, and a summary of analytical results from the October 16, 1998 sampling event are presented on the enclosed Figures 1 and 2.

The estimated groundwater velocity has been calculated using the seepage velocity formula derived from Darcy's Law. The formula and calculations are enclosed with this letter. The boring log for well MW-2 (also enclosed) indicates silt (Unified Soil Classification Symbol ML) and well graded gravel with sand (GW) are the permeable soil types in the saturated interval of the well. Values for hydraulic conductivity ( $10^{-3}$  gpd/ft² and  $10^{2}$  gpd/ft², respectively) and porosity (35%) for silt and well graded gravel with sand were selected from the ranges of published values¹. Using these values and the hydraulic gradient measured on October 16, 1998, the seepage velocities calculated were 0.0014 ft/yr for silt and 139.7 ft/yr for well graded gravel with sand.

The seepage velocity for the gravel suggest dissolved hydrocarbons in MW-2 migrating in the gravel should have reached well MW-7. However, groundwater analytical results have consistently shown no detectable concentrations of dissolved hydrocarbons in MW-7 during 20 sampling events from 1991 to 1996. Dissolved hydrocarbons have been detected in MW-2 since 1989 but may be largely confined to the capillary fringe within the silt encountered between 12.5 to 17 feet bgs. Groundwater analytical results indicate the seepage velocity calculated for the silt accurately reflects groundwater flow conditions at the site where dissolved hydrocarbons have not migrated laterally or downgradient and are limited to the vicinity of MW-2.

As requested, groundwater samples from the next sampling event will be analyzed by EPA Method 8260 on a one-time basis to confirm the absence of fuel oxygenates other than MTBE.

Driscoll, F. G., Groundwater and Wells, Johnson Division, St. Paul, Minnesota, 1986.

If you have any questions, please call us in our Dublin office at (925) 551-7555.

JOEL 6. GREGER No. EG 1633 CERTIFIED ENGINEERING

GEOLOGIST

Sincerely,

Gettler-Ryan Inc.

Douglas J. Lee

Project Manager

Joel G. Greger

Senior Engineering Geologist

C.E.G. EG 1633

Enclosures: Figure 1 - Potentiometric Map

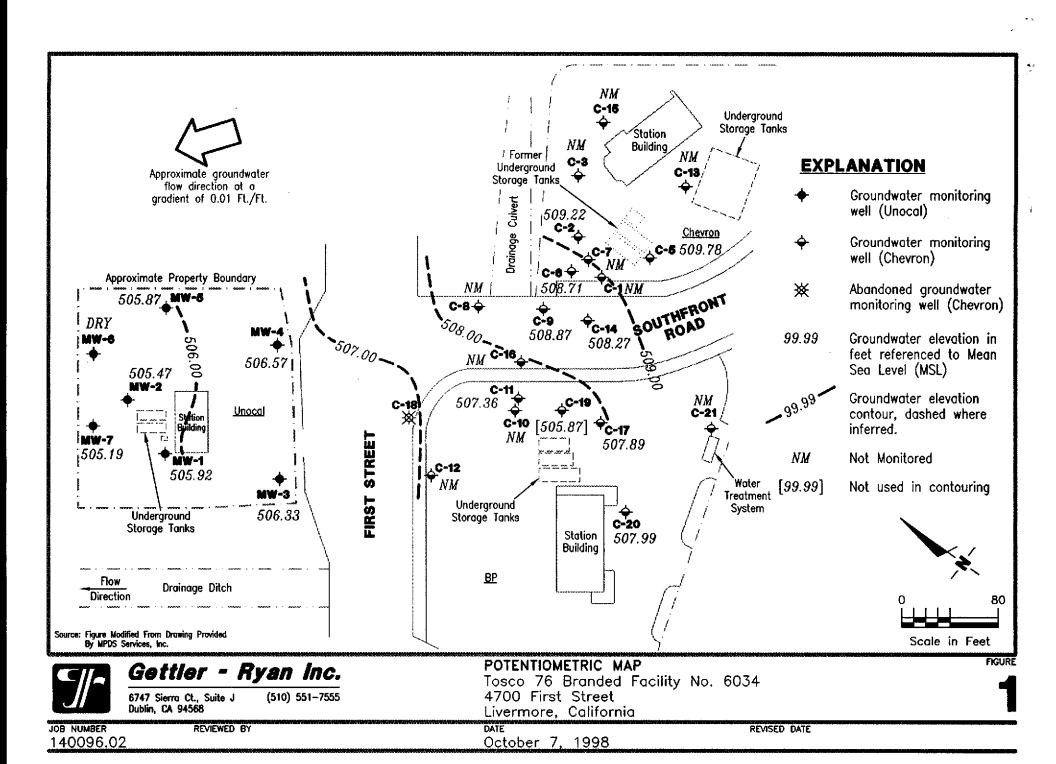
Figure 2 - Concentration Map

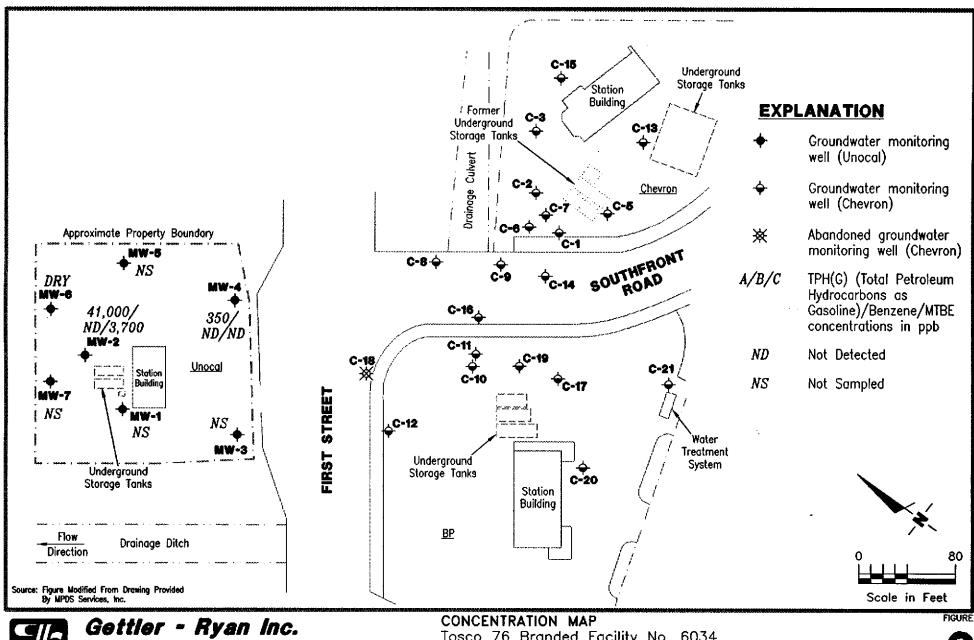
**Groundwater Velocity Calculations** 

Boring Log - MW-2

Well Completion Diagram - MW-2

cc: Mr. David B. De Witt, Tosco Marketing Company







6747 Sierra Ct., Suite J Dublin, CA 94568 (510) 551-7555

Tosco 76 Branded Facility No. 6034 4700 First Street

Livermore, California

DATE

October 7, 1998

2

JOB NUMBER 140096.02 REVIEWED BY

REVISED DATE

#### GROUNDWATER VELOCITY CALCULATIONS

Tosco 76 Branded Facility No. 6034, 4700 First Street, Livermore, Ca.

$$V_{s} = \frac{K i}{n}$$

$$V_{s} = See page Velocity (ft/yr)$$

$$K = Hydraulic Conductivity (ft/yr)$$

$$i = Hydraulic Gradient (ft/ft)$$

$$n = Effective Porosity (Porosity)$$

Hydraulic Conductivity (Well Graded Gravel with Sand)<sup>1</sup> = 10<sup>2</sup>gpd/ft<sup>2</sup> Hydraulic Conductivity (Silt)<sup>1</sup> = 10<sup>-3</sup>gpd/ft<sup>2</sup> Porosity (Well Graded Gravel with Sand)<sup>1</sup> = 35% Porosity (Silt)<sup>1</sup> = 35% 1 gpd/ft<sup>2</sup> = 0.134 ft/day Hydraulic Conductivity<sup>2</sup>

#### SILT:

$$10^{-3} \text{ gpd/ft}^2 \text{ x} \quad \frac{0.134 \text{ft/day}}{1 \text{ gpd/ft}^2} \quad \text{x} \quad \frac{365 \text{ days}}{1 \text{ yr}} = 0.0489 \text{ ft/yr}$$

Seepage Velocity 
$$V_s = \frac{(0.0489 \text{ ft/yr})(0.01\text{ft/ft})}{0.35} = 0.0014 \text{ ft/yr}$$

#### WELL GRADED GRAVEL WITH SAND:

$$10^{2} \text{ gpd/ft}^{2} \text{ x} = \frac{0.134 \text{ft/day}}{1 \text{ gpd/ft}^{2}} \text{ x} = \frac{365 \text{ days}}{1 \text{ yr}} = 4891 \text{ ft/yr}$$

Seepage Velocity 
$$V_s = \frac{(489 \text{ ft/yr})(0.01 \text{ft/ft})}{0.35} = 139.7 \text{ ft/yr}$$

<sup>&</sup>lt;sup>1</sup>Driscoll, F. G., Groundwater and Wells, Johnson Division, St. Paul, Minnesota, 1986

<sup>&</sup>lt;sup>2</sup>Fetter, C. W., <u>Applied Hydrogeology</u>, Charles E. Merrill Publishing Co., Columbus, Ohio, 1980 140096.02

			·	ВО	RIN	G :	LOG	
Project No. Boring & Casing KEI-P89-0801 9"						ing D		Logged By D.L.
Project Name Unocal Livermore - First St. Well Head					ad El N/A	evati	on	Date Drilled 10-25-89
Boring No. MW2	•			lling hod	3	Hollo Auge	ow-stem	Drilling Company EGI
Penetra- tion blows/6"	G. W. level		oth (aples			ati- phy S	1	Description
9/12/14			5		GW/	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	sand, me	ement  ded gravel with silt and edium dense, moist, rown: fill.
5/8/11			10		СН		sand and	ph plasticity, 10-15% gravel, gravel to 3/8" noist, black.
			.* ·		CL/ CH		stiff, m	derate plasticity, noist, dark gray w/mod. ion, blocky, dark n gray below 11 feet.
6/8/10					ML		from 12.	clay, 10-15% fine sand 5-13.5 feet, stiff, lark greenish gray.
3/4/6			15					stiff to very stiff ole recovery at 16 feet.
10/22/32	Δ̈́				<del></del>		-	
40/50-5"		— — —	20	<u>-</u>	GW		10% fine dark gra Well grad	led gravel with sand, 5- es, very dense, wet, ey. led gravel with sand, with well graded gravel

			во	RIN	G :	LOG	
	Project No. Boring & Cas. KEI-P89-0801 9"					iameter	Logged By D.L.
Project Name Unocal Well Head Elev Livermore - First St. N/A					evatio	on	Date Drilled 10-25-89
Boring No.	•		Drilling Method	3	Holle Auge	ow-stem r	Drilling Company EGI
Penetra- tion blows/6"	G. W. level		oth (ft) ples	gra	Strati- graphy USCS		Description
				GW		very de	t and sand, trace clay, nse, wet, dark gray, red, some gravel is ed.
8/11/20 8/11/18			25	CL/ CH		to 10% s stiff, o moist, l pale oli	derate plasticity, trace silt and sand, very cemented, slightly light olive brown to ive, mottled, gravelly .5' to 26', sandy below
			30			<u>26.75'.</u>	
			35				
		<u> </u>	40 —				TOTAL DEPTH 27'
			40				TOTAL DEPIR 2/

#### WELL COMPLETION DIAGRAM

PROJECT NAME: Unocal - Livermore - 4700 First St. BORING/WELL NO. MW2

PROJECT NUMBER: KEI-P89-0801

WELL PERMIT NO.:\_\_\_\_

Flush-mounted Well Cover	Α.	Total Depth: 26'
TIMES	В.	Boring Diameter*: 9"
		Drilling Method: Hollow Stem
		Auger
i	c.	Casing Length: 26'
		Material: Schedule 40 PVC
H	D.	Casing Diameter: OD = 2.375"
		<u>ID = 2.067"</u>
	Ė.	Depth to Perforations: 11'
	F.	Perforated Length: 15'
		Machined Perforation Type: Slot
		Perforation Size: 0.020"
	G.	Surface Seal: 7'
		Seal Material: Concrete
	н.	Seal: 2'
		Seal Material: Bentonite
	ı,	Gravel Pack: 17' RMC Lonestar
	•	Pack Material: Sand
		Size: #3
	J.	Bottom Seal: 1'(Sampler hole)
В		Seal Material: <u>Bentonite</u>

\*Boring diameter can vary from 8-1/4" to 9" depending on bit wear.

ID:9252772361

### TOSCO MARKETING **COMPANY**

FAX



Mesterna

ENVIRONMENTAL REMEDIATION and COMPLIANCE

2000 Crow Canyon Place, Suite 400 San Ramon, CA 94583

fax (925) 277-2361

то :	Mr. Amir	Gholami		
COMPANY:_			,	
	510-337	U		
	•		SEC CENT	r. a (including cover)

Dane Dewitt

925-277-2384

**COMMENTS:** 

DATE:

Amir :

Please find attached a copy of report which calculates the grandwater velocity for the sets site. Gettlee-Ryan is our ensultant for the site. Please call with questions

Dave De Will







## GETTLER-RYAN INC.

25603433 X EP ----

3 18 4 5

March 4, 1999

Mr. Amir K. Gholami Alameda County Health Care Services Environmental Health Services 1131 Harbor Bay Parkway, Suite 250 Alameda, California 94502-6577 RECEIVED MAR - 8 1999 ENV. COMPLIANCE

Subject:

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Livermore, California

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Driscoll, F. G., Groundwater and Wells, Johnson Division, St. Paul, Minnesota, 1986.

PAGE 3/

Groundwater Velocity - Tosco 76 Branded Facility No. 6034 March 4, 1999

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Gettler-Ryan Inc.

Douglas J. Lee Project Manager

Joel G. Greger

Senior Engineering Geologist

C.E.G. EG 1633

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Enclosures:

Figure 1 - Potentiometric Map Figure 2 - Concentration Map

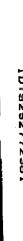
Groundwater Velocity Calculations

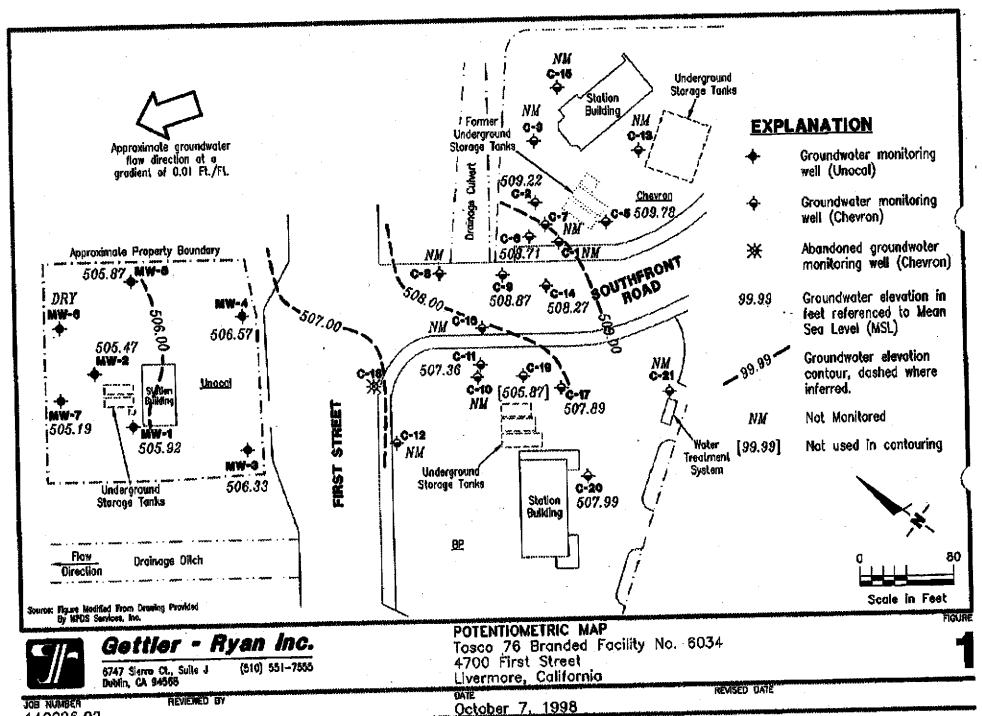
Boring Log - MW-2

Well Completion Diagram - MW-2

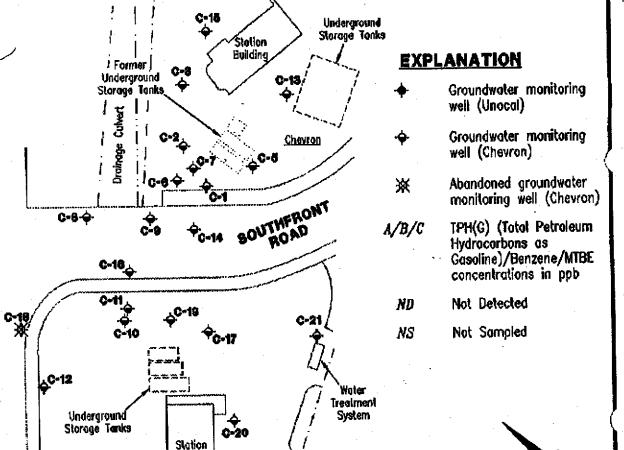
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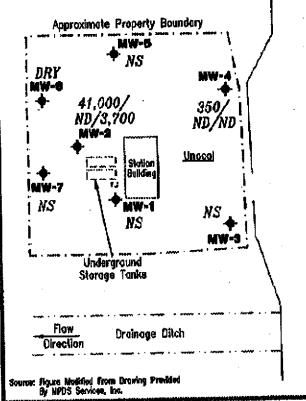








REVISED DATE



Gettler - Ryan Inc.

REVIEWED BY

6747 Slerra Ct., Suite J Dublin, CA 94568

(510) 551-7555

STREET

FIRST

CONCENTRATION MAP Tosco 76 Branded Facility No. 6034 4700 First Street Livermore, California

CATE

BP

Scale in Feet

JOB NUMBER 140096,02

October 7, 1998

Building

### GROUNDWATER VELOCITY CALCULATIONS Tosco 76 Branded Facility No. 6034, 4700 First Street, Livermore, Ca.

Hydraulic Conductivity (Well Graded Gravel with Sand)<sup>1</sup> =  $10^2$ gpd/ft<sup>2</sup> Hydraulic Conductivity (Silt)<sup>1</sup> =  $10^3$ gpd/ft<sup>2</sup> Porosity (Well Graded Gravel with Sand)<sup>1</sup> = 35%Porosity (Silt)<sup>1</sup> = 35%1 gpd/ft<sup>2</sup> = 0.134 ft/day Hydraulic Conductivity<sup>2</sup>

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BORING LOG								
Project No KEI-P89-08	01		Boring 6	Soring & Casing Diameter 9" 2"			Logged By D.L.	Deb
Project Na Livermore	me Unoca - First	l st.	Well He	d Ele N/A	evatio	n	Date Drille 10-25-89	ā
Boring No.			Drillin Method	<b>J</b>	Hollo Auger	w-stem	Drilling Con EGI	mbanà
Penetra- tion blows/6"	G. W. level		oth (ft)		ati- phy s		Description	
			-	GW/		sand. M	ement ded gravel wi edium dense, crown: fill.	th silt and moist,
9/12/14			5			OTIVE D		
			-	CH		sand ar	igh plasticity nd gravel, gra moist, black	Met to 3/0.
5/8/11		-  -  -	10	CL/		stiff, cements greeni	oderate plast moist, dark ation, blocky sh gray below	gray W/Mod. , dark 11 feet.
6/8/10				ML		I from 1	th clay, 10-1 2.5-13.5 feet dark greenis	, SLILL,
3/4/6			15 —			<u>-</u>	ng stiff to v mple recovery	•
10/22/32	Δ̈́		_	GW		Well gr	aded gravel w	ith sand, 5-
40/50-5"			20 —	d "		dark g		ith sand,

BORING LOG								
Project No. Boring & Casi KEI-P89-0801 9"					ng Di 2"	ameter	Logged By D.L.	DAYD.
Project Name Unocal Well Head Ele Livermore - First St. N/A					vatio	vation Date Drilled 10-25-89		
Boring No. MW2			Drillin Method	<b>~</b>	Hollo Auger	ow-stem	Drilling Compa EGI	iny
Penetra- tion blows/6"	G. W. level		oth (ft) mples	Stra grap USCS	hy	·	Description	
				GW		very de	t and sand, tracense, wet, dark ored, some grave.	gray,
8/11/20	,		25	CL/ CH		to 10% stiff.	derate plastici silt and sand, cemented, sligh	very tly
8/11/18			-			pale ol	light olive brownive, mottled, grants, to 26', sand	ravelly
			30 —					
		<u>.                                    </u>						
			- - -					
		<u>-</u> -	35 -					
				<b>-</b>				
			40 -				TOTAL DEPTH 27	, <b>,</b>

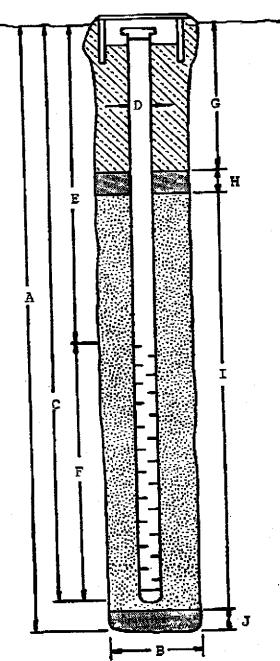
METT COMBFELLON DIVER	% LI
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PROJECT NAME: Unocal - Livermore - 4700 First St. BORING/WELL NO. MW2

PROJECT NUMBER: KEI-P89-0801

WELL PERMIT NO.:\_\_\_\_

flush-mounted	Well	Cover
---------------	------	-------



- A. Total Depth: 26'
- B. Boring Diameter\*: 9"

  Drilling Method: Hollow Stem
- C. Casing Length: 26'

  Material: Schedule 40 PVC
- D. Casing Diameter: <u>OD = 2.375"</u>

  ID = 2.067"
  - .

Auger

- E. Depth to Perforations: 11'
  - Perforated Length: 15'

    Machined

    Perforation Type: Slot

Perforation Size: 0.020"

G. Surface Seal: 7:

Seal Material: <u>Concrete</u>

H. Seal: 2'

Seal Material: Bentonite

I. Gravel Pack: 17'
RMC Lonestar

Pack Material: Sand

Size:\_\_#3\_\_\_\_\_

J. Bottom Seal: 1'(Sampler hole)

Seal Material: Bentonite

\*Boring diameter can vary from 8-1/4" to 9" depending on bit wear.



Gettler-Ryan Inc. 6747 Sierra Court, Suite J Dublin, CA 94568-2611

# FACSIMILE COVERS: EEC.

	WR	AMIR	<b>√</b> ₹	הער	IMMI	
TO:	1./16	111.11.1	600	<b>0117</b>	<b>—</b> , , , ,	

COMPANY: RCHCSA/EHS

RE: Tosco No Go34/ And Fines State State

FROM: QUUS LEE

PHONE:

(925) 551-7555

FAX:

(925) 551-7888

COMMENTS: GROUNDWATER VELOCITY LETTER
SORRY BROWT THE DELBY AND THRINK YOU FOR YOUR
DRIVENCE PLEASE CALL IF YOU HAVE BUY QUESTIONS

9 pages including cover

If there are any problems with this transmission, please call (925) 551-7555



\_ Hardcopy to follow BY MAIL



### GETTLER-RYAN INC.

March 4, 1999

Mr. Amir K. Gholami Alameda County Health Care Services Environmental Health Services 1131 Harbor Bay Parkway, Suite 250 Alameda, California 94502-6577

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Groundwater Velocity - Tosco 76 Branded Facility No. 6034 March 4, 1999

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Project Manager

Joel G. Greger

Senior Engineering Geologist

<sub>h.</sub> C.E.G. EG 1633

\* No. EG 1633
CERTIFIED
ENGINEERING
GEOLOGIST
OF CALIFORNIA

Enclosures:

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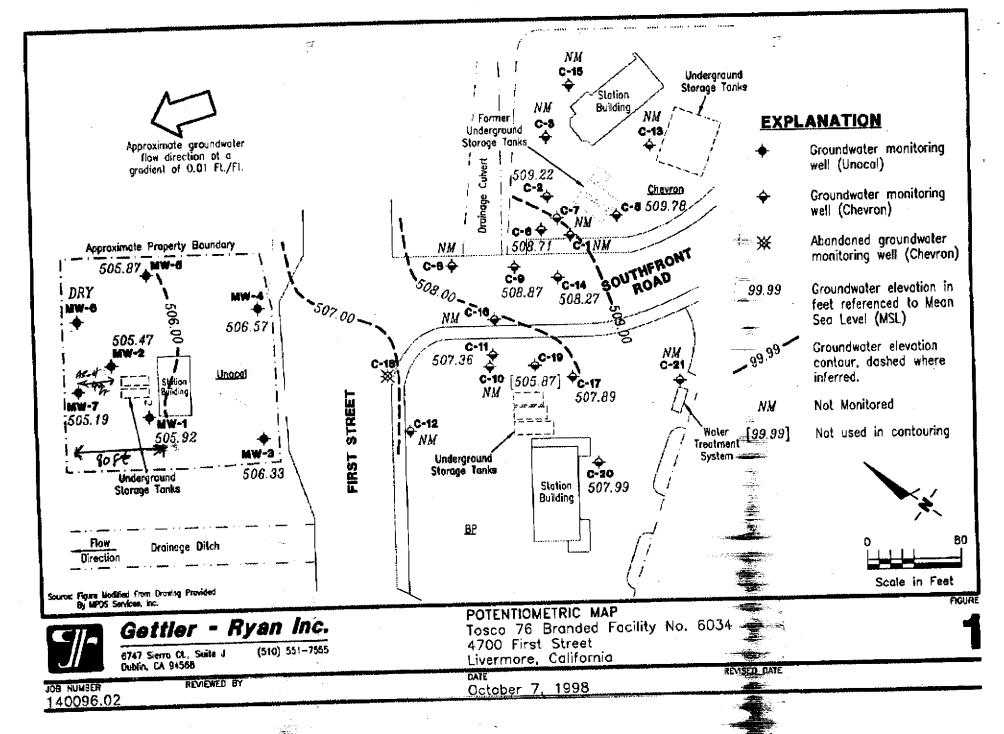
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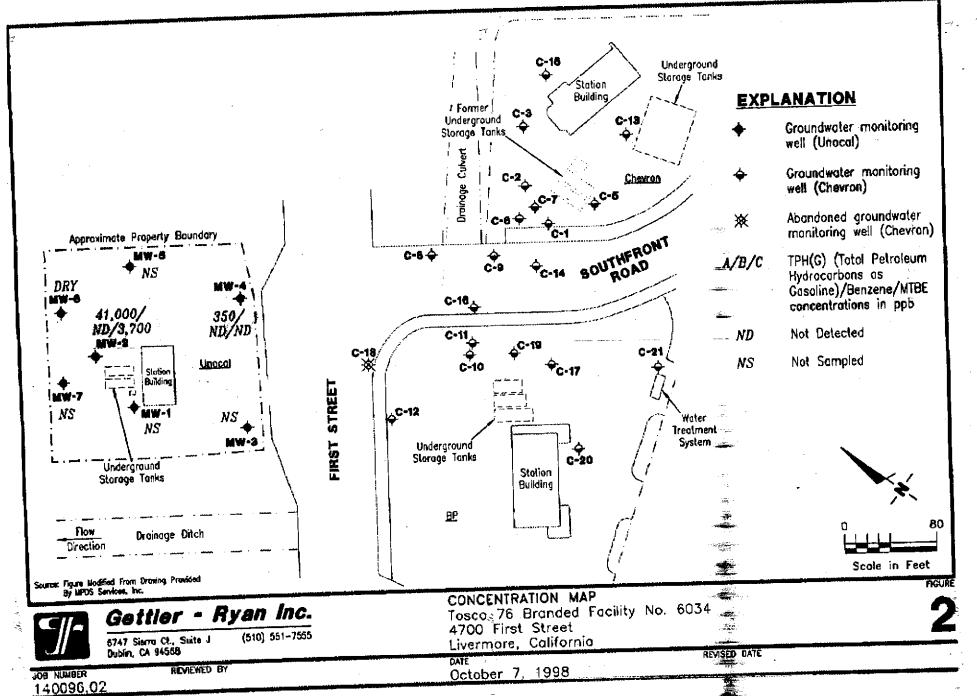
Boring Log - MW-2

Well Completion Diagram - MW-2

cc: Mr. David B. De Witt, Tosco Marketing Company

Ì.





## GROUNDWATER VELOCITY CALCULATIONS Tosco 76 Branded Facility No. 6034, 4700 First Street, Livermore, Ca.

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V<sub>s</sub> = Seepage Velocity (ft/yr)
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			BOR	IN	G L	0 G	
Project No KEI-P89-08	01	Bor 9	ing &	Casi	ng Di 2"	Logged By	
Project Na Livermore	me Unoca - First	_		d Ele N/A	vatio	n 	Date Drilled 10-25-89
Boring No.			llling hod	7	Hollo Auger	w-stem	Drilling Company EGI
Penetra- tion blows/6"	G. W. level	Depth Samples		stra grap USCS	ohy		Description
9/12/14				GW/ GM		sand. I	ement  aded gravel with silt and  medium dense, moist,  prown: fill.
Tr.,			     	СН	00.0	sand a	igh plasticity, 10-15% nd gravel, gravel to 3/8" moist, black.
5/8/11			·	CL/		stiff, cement greeni	oderate plasticity, moist, dark gray w/mod. ation, blocky, dark sh gray below 11 feet.
6/8/10				MI		from 1 moist,	th clay, 10-15% fine same 2.5-13.5 feet, stiff, dark grachish gray. Ing stiff to very stiff
10/22/32	立。					<i></i>	emple recovery at 16 feet
40/50-5"			- 10 —	GW		10% f	raded gravel with sand, 5 ines, very dense, wet, gray. raded gravel with sand, d with well graded gravel

				RIN			Torgod By	2003
Project No. KEI-P89-0801			Boring 9"	& Casi	ng Di	aneter	Logged By D.L.	
Project Na Livermore	me Unoca - First	al St.	Well He	ad Ele	evatio	on	Date Drille 10-25-89	đ
Boring No. MW2			Drillin Method	g	Hollow-stem Auger		Drilling Co	mpany
Penetra- tion blows/6"	G. W. level		oth (ft) mples	str gra USC			Description	
			-	GW		verv de		k gray, vel is
ř.,			_	]				n sape
8/11/20			25	CL/ CH		to 10% stiff.	oderate plasti silt and sand cemented, sli	i, very Ightly
8/11/18			23	-		moist, pale o from 2	light olive b live, mottled, 5.5' to 26', s	rown to gravelly
						26.75'	•	<u></u>
							·	
			30 —					
			-					
	,		35 <del>-</del>		:		1 g 4 3 3 3	$x \mapsto \frac{1}{2} \left( \frac{1}{2} \left( \frac{1}{2} \right)^{-\frac{1}{2}} + \frac{1}{2} \right)$
			33					,
٠, ن			-			i		en Maria
		-	No. of the last					
			40 -	$\exists$			TOTAL DEPT	1 27'

WELL COMPLETI	ON DIAGRAM
PROJECT NAME: Unocal - Livermore - 470	00 First St. BORING/WELL NO. MW2
PROJECT NUMBER: KEI-P89-0801	1
WELL PERMIT NO.:	
Flush-mounted Well Cover	A. Total Depth: 26'
THE BY	B. Boring Diameter*: 9"
	Drilling Method: Hollow Stem
	Auger
G G	C. Casing Length: 26'
	Material: Schedule 40 PVC
Н Н	D. Casing Diameter: OD = 2.375"
E	n = 2.067"
	E. Depth to Perforations: 11'
	F. Perforated Length: 15'
A	Machined Perforation Type: Slot
r	Perforation Size: 0.020"
	G. Surface Seal: 7!
	Seal Material: Concrete
	H. Seal: 2'
	Seal Material: Bentonite
	I. Gravel Pack: 17' RMC Lonestar
	Pack Material: Sand
	Size: <u>#3</u>
	J. Bottom Seal: 1'(Sampler hole)
The state of the s	Seal Material: Bentonite
B	
*Boring diameter can vary from	8-1/4" to 9" depending on bit wear.