

THRIFTY OIL CO.

Ro 4

Inclusive

October 21, 2003

Ms. Barney Chan
Alameda County Health Care Services
Department of Environmental Health
1131 Harbor Bay Parkway, 2nd Floor
Alameda, CA 94502

O.39726
Local #4057
RWQCB #01-1478
Global ID #T0600101365

RE: **Former Thrifty Oil Co. Station #049**
ARCO Products Company Station #9535
3400 San Pablo Avenue
Oakland, CA 94612
Groundwater Production Well and Utility Conduit Survey

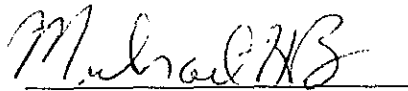
Alameda County
OCT 27 2003
Environmental Health

Dear Mr. Chan:

Presented herewith is the *Groundwater Production Well and Utility Conduit Survey* prepared by Advanced GeoEnvironmental, Inc. for former Thrifty Oil Co. Station #049 located at 3400 San Pablo Avenue, Oakland, California.

If you have any questions or comments, please contact the undersigned in this report or myself at (562) 921-3581.

Sincerely,



Michael H. Bowery, R. G.
Project Manager

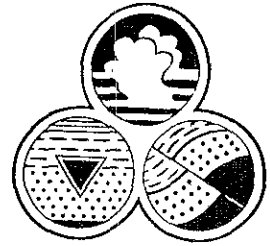


Chris Panaitescu
General Manager
Environmental Affairs

cc: BP West Coast Products LLP; Ms. Kateri Luka
File



Advanced GeoEnvironmental, Inc.



09 October 2003
AGE-NC Project No. 03-1059

Mr. Mike Bowery
Thrifty Oil Company
P.O. Box 2128
Santa Fe Springs, CA 90670

Alameda County
OCT 27 2003
Environmental Health

1.39673
RECEIVED
OCT 20 2003
ENVIRONMENTAL
TOC#049

**Subject: Ground Water Production Well and Utility Conduit Survey
THRIFTY OIL STATION #049
3400 San Pablo Avenue, Oakland, California**

INTRODUCTION

At your request, *Advanced GeoEnvironmental, Inc.*(AGE) has conducted a *Production Well and Utility Conduit Survey* for Thrifty Oil Station #49, 3400 San Pablo Avenue, Oakland, California (site).

SCOPE OF WORK

The scope of work for the sensitive receptor survey was to locate potential vertical conduits including municipal, domestic or irrigation wells within a one mile radius of the site. Furthermore, a search was performed to locate utility trenches that could potentially serve as pathways to surface water. The location of the site, and the immediately surrounding area are illustrated on Figure 1. Structures are depicted on Figure 2.

PROCEDURES

On 05 August 2003, an AGE representative reviewed well drillers' reports from the California Department of Water Resources-Central District (DWRCD) for water production wells located in the vicinity of the site; driller's reports for seven water wells located within a one mile radius were found. Based on driller descriptions four of the wells (Well I.D. 1- 4) could be located; there was not enough information to locate the three remaining wells (Well I.D. 5-7). Water wells located from the review of well drillers' reports are included in Table 1; a summary of the water wells that could not be located from the review of well drillers' reports is included in Table 2. Well locations are depicted on Figure 1; copies of the well drillers' reports are included in Appendix A.

On 05 August 2003 Ms. Mona Foster-White of the East Bay Municipal Utilities Department (EBMUD) was contacted by an AGE representative. According to Ms. Foster-White, EBMUD has no municipal wells in the area and provides the water and sewer service for the site.

On 06 August 2003, an AGE representative reviewed records at the City of Oakland Planning Department, a boundary and topographic survey drawing of the site was obtained. The drawing indicates the approximate locations of water main, storm drain, and sanitary sewer. Locations of the utilities are depicted on Figure 2. The design of the utility trenches from the "Standard Specifications" and "Standard Drawings" manuals provided by EBMUD is included as Appendix C.

On 06 August 2003, an AGE representative performed an area reconnaissance for visually observable, potential sensitive receptors located within a one-mile radius of the subject site. No additional production water wells were identified during the reconnaissance. However, three additional leaking underground fuel tank sites were located adjacent to the subject site. A summary of the additional sites located from the area reconnaissance is included in Table 3, locations of the additional sites are depicted on Figure 1.

On 13 August 2003 Ms. Jamie Adishion of Pacific Gas and Electric (PG&E) Service Planning Department- Oakland was contacted by an AGE representative. According to Ms. Adishion, PG&E has no records depicting the cross sectional view of the utility trenches at or near the site. Furthermore a written letter from the property owner would be required for the layout of utilities at the site. Ms. Adishion's recommendation was to have an Underground Service Alert done at the site to show location of utilities.

On 08 September 2003 an AGE representative met with a PG&E representative to perform a utility survey; during the survey the locations of local electrical and gas lines were marked. The locations of the service lines are depicted on Figure 2. The exact design of the utility trenches is unknown; the general design of utility trenches from the PG&E "Green Book" August 2002 edition, is included in Appendix B.

FINDINGS

The findings are based on field observations, public records, and utility company standards. Groundwater flow direction at the site is southwest at a gradient of 0.0214 feet /foot. As previously reported by Thrifty Oil Company in 3rd Quarter 2003 monitoring report dated 18 September 2003.

PRODUCTION WELL SURVEY

Well Driller's Reports for seven water wells located within a one mile radius of the site were found. None of the wells listed on the reports were identified visually. No additional sensitive receptors were identified visually, however three additional leaking underground fuel tanks sites were located

09 October 2003
AGE-NC Project No. 03-1059
Page 3 of 3

adjacent to the subject site. EBMUD has no municipal wells in the area and provides the water and sewer service for the site.

Utility Conduit Survey

The local utility companies have two main trenches that border the site. The trenches follow 34th street and San Pablo Avenue. According to the diagrams available from the utility companies the utility trenches are approximately 38 inches deep and up to 24 inches in width.

inclusion?

If you have any questions please contact our office at (209) 467-1006.

Sincerely,

Advanced GeoEnvironmental, Inc.



Christopher R. Miller
Environmental Specialist
Enclosures



Map - find wells

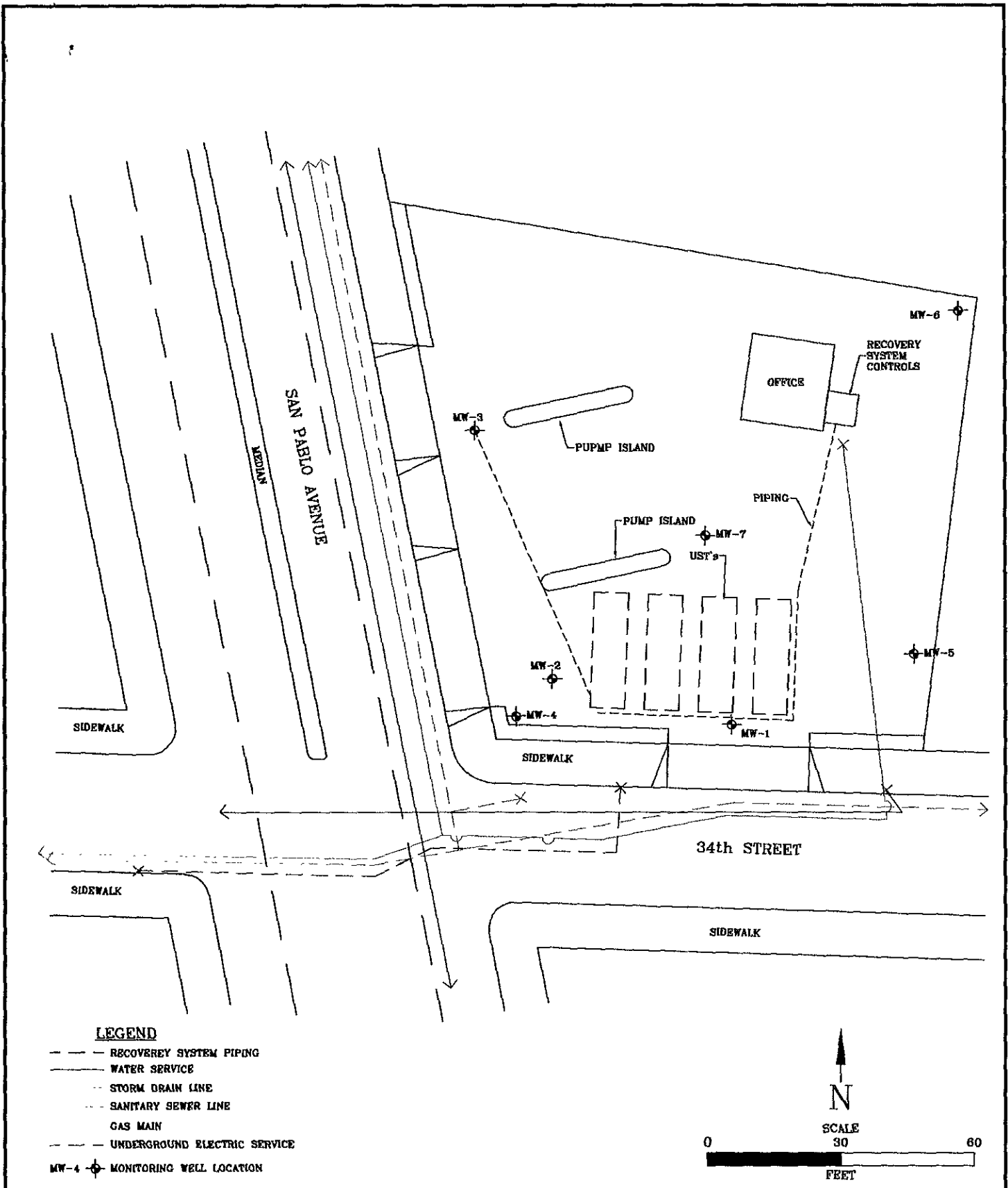


Location Map
 Thrifty Oil #49
 3400 San Pablo Avenue
 Oakland, California



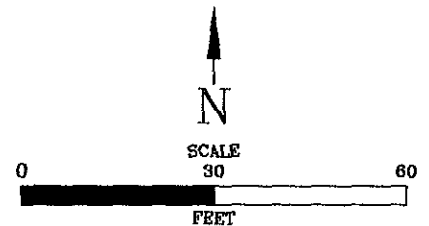
Advanced
 GeoEnvironmental, Inc.

PROJECT NO. AGE-NC-03-1049	FILE: Thrifty49-1	FIGURE:
DATE: 14 August, 2003	DRAWN BY: MAC	2



LEGEND

- - - RECOVERY SYSTEM PIPING
- WATER SERVICE
- - - STORM DRAIN LINE
- - - SANITARY SEWER LINE
- GAS MAIN
- - - UNDERGROUND ELECTRIC SERVICE
- MW-4 ⊕ MONITORING WELL LOCATION



SITE PLAN
 Thrifty Oil #49
 3400 San Pablo Avenue
 Oakland, California



Advanced
GeoEnvironmental, Inc.

PROJECT NO. AGE-NC-03-1049	FILE: Thrifty49-2	FIGURE:
DATE: 21 September 2003	DRAWN BY: MAC	2

TABLES

3400 San Pablo Ave

Table 1
Production Well Survey - October 2003
Summary of Located Well Logs
Thrifty Oil #049
3400 San Pablo Avenue, Oakland, California

Well I.D.	Property Address	Distance/ Direction from site	Year Completed	Comments	Well Log	Visually Observed
1	1450 Sherwin Street Sherwin Williams Paint & Varnish Facility	4,000' east	unknown	304' Total Depth, 12 Inch Diameter	X	
2	899 40 th Street Toscani Bakery	1,100' north	1928	108' Total Depth, 8 Inch Diameter	X	
3	3516 Adeline Street City of Paris Cleaning & Dyeing Works	900' west	1927	3 well logs for industrial wells, Total Depths range from 97' to 295' completion dates on 2 logs is unknown	X	
4	30 th & Webster Street Providence Hospital	3,200' east	unknown	2 well logs, total depths 150' and 365', no other information is given	X	

Production Well Survey - October 2003
 Wells in Vicinity that Cannot-Be-Located
 Thrifty Oil #049
 3400 San Pablo Avenue, Oakland, California

Table 2

Well ID.	Property Address	Year Completed	Comments
5	22 nd and Grove Street	unknown	197' total depth
6	Yosemite Laundry Company Emeryville	unknown	490' total depth
7	45 th Street Emeryville Presto-Lite Co.	1908	408' total depth

Production Well Survey - October 2003
 LUFT Sites in Vicinity
 Thrifty Oil #049
 3400 San Pablo Avenue, Oakland, California

Table 3

Site ID.	Property Address	Distance/ Direction from site	Comments
8	3314 San Pablo Avenue	100' south	FG GASOLINE, Open Investigation
9	3420 San Pablo Avenue	50' north	Shell, Open Investigation
10	3501 San Pablo Avenue	100' northwest	CAHON ASSOCIATES INC, Closed Investigation

APPENDIX A

1450 Sherwin St.

1450 Sherwin St.

BORED WELL

12 In. Diameter

In Sherwin-Williams Company

Paint & Varnish Works

10/4W-28C

01-779

Soil	4 Feet	
Yellow Clay	10 "	
Gravel	20 "	
Blue Clay	24 "	
Yellow Clay	42 "	
Gravel (Perforated)	46 "	10
Yellow Clay	62 "	
Cement Gravel (Perforated)	70 "	10
Yellow Clay	80 "	
Cement Gravel (Perforated)	86 "	8
Yellow Clay	94 "	
Cement Gravel (Perforated)	100 "	14
Yellow Clay	104 "	
Cement Gravel (Perforated)	116 "	10
Gray Clay	126 "	
Yellow Clay	176 "	
Cement Gravel (Perforated)	178 "	52
Yellow Clay	230 "	
Blue Lime Clay	244 "	
Yellow Clay	284 "	
Yellow Sediment	294 "	
Cemented Gravel (Perforated)	296 "	
Yellow Sediment	302 "	
White Lime Clay	304 "	5 in.

Re perforated

Handwritten signature and date: 11/27/11

18/11
01-738

Job #1047. Toscani Bakery, 899 - 40th.St

LOG OF WELL

Took over well at -----	50	feet
Sandy clay -----	50 to 60	" "
Yellow clay -----	60 " 82	" "
Cement gravel -----	82 " 83	" "
Yellow clay -----	83 " 90	" "
Sandy clay -----	90 " 97	" "
Gravel -----	97 " 102	" "
Sandy clay -----	102 " 106	" "
Clay -----	106 " 108	" "

About 54' of 10" casing put in by Hell.

108 feet of 8" No. 14 R. H. Collar Casing with
50 feet of machine perforations & Welded reband.

Foreman J. Carrere.

Well finished May 8 - 1928.

01-745

Job #1744. City of Paris Cleaning & Dyeing Works,
3516 - Adeline Street, Oakland.

LOG OF WELL.

Black adobe -----	3 feet.
Hard yellow clay -----	3 to 18 "
Small water gravel -----	18 " 20 "
Hard yellow sandy clay -----	20 " 34 "
Coarse water gravel -----	34 " 37 "
Hard brown sandy clay -----	37 " 38 "
Hard blue sandy clay -----	38 " 49 "
Hard yellow clay -----	49 " 80 "
Hard brown clay, some rock in it -----	80 " 97 "

From 42 feet to 97 feet open hole no casing in it.

42 feet 8" No. 14 R. H. Collar Casing with 10 perforated
1/8" open slot

30 feet 6" No. 16 R. H. Collar Casing with 12' perforated.

Water 16 feet from top of casing.

15) 401 - 93

3576

Job #246.

City of Paris Laundry.

LOG OF WELL.

		6 feet
Top soil	0 to 20	"
Sandy clay	20 "	25 "
Cement gravel	25 "	35 "
Yellow clay	35 "	45 "
Loose gravel	45 "	48 "
Yellow clay	48 "	65 "
Cement gravel	65 "	70 "
Yellow clay	70 "	120 "
Dry cement gravel	120 "	125 "
Cement gravel (wet)	125 "	150 "
Yellow clay	150 "	175 "
Cement gravel	175 "	195 "
Yellow clay	195 "	210 "
Cement gravel	210 "	240 "
Yellow clay	240 "	285 "
Cement gravel	285 "	295 "
Sand rock	295	

295 feet of 12" #14 R. H. Double casing.

1 - 12" #14 Dbl. Starter 22' long

18 - feet of machine perforations

1 - 12 Shoes 1/2" x 4"

Extra Perforations 125'-150'

175'-195'

210'-240'

Foreman J. Carrere.

Finished April 30 - 1927.

OWNER SIGNATURE

WELL

APR 30 1927

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

State No. _____

01-746

WELL DATA

Owner City of Pacific State No. 1544023M
 Address 5516 Haden St. Oakland Other No. _____
 Tenant _____
 Address _____

Type of Well: Hydrograph Key Index Semiannual
 Location: County Alameda Basin _____ No. _____
 U.S.G.S. Quad. OAKLAND WEST Quad. No. _____
 1/4 Section _____, Twp. _____, Rge. _____
MD
SB
H Base & Meridian

Description 70' S.W. 1/4 35th St.
120' N.E. 1/4 Haden St. 5 F.

Reference Point description Neighborhood

which is _____ ft. above land surface. Ground Elevation _____ ft.
below

Reference Point Elevation _____ ft. Determined from _____

Wells Use Industrial Condition _____ Depth 42' ft.
 Casing, size _____ in., perforations No casing from 42' - 47'

Measurements By: DWR USGS USBR County Irr. Dist. Water Dist. Cons. Dist.

Chief Aquifer: Name _____ Depth to Top Aq. _____ Depth to Bot. Aq. _____

Type of Material _____ Perm. Rating _____ Thickness _____

Gravel Packed? Yes No Depth to Top Gr. _____ Depth to Bot. Gr. _____

Supp. Aquifer _____ Depth to Top Aq. _____ Depth to Bot. Aq. _____

Driller _____ Date drilled 2/2 Log, filed S.W. 1/4 open (1) _____ confidential (2) _____

Equipment: Pump, type DW 11 make _____

Serial No. _____ Size of discharge pipe _____ in.

Power, Kind Elec Make R.M.

H. P. 1 Motor Serial No. M5B2F 96 YB

Elec. Meter No. _____ Transformer No. _____

Yield _____ G.P.M. Pumping level _____ ft.

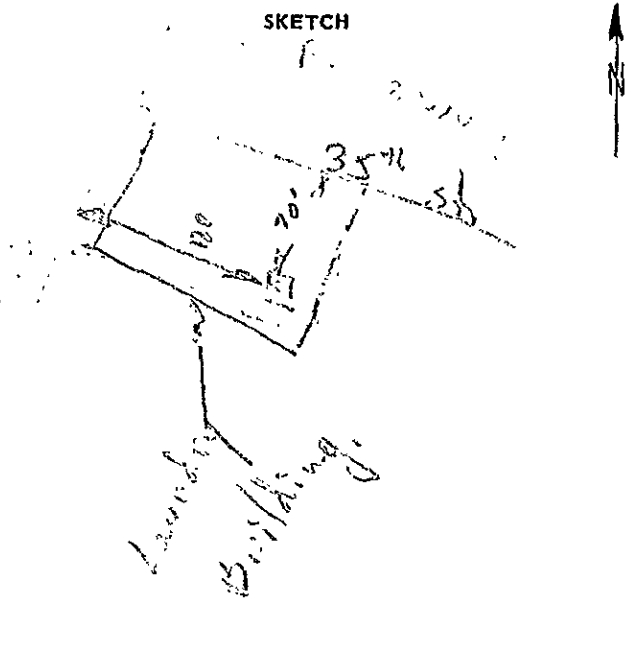
Water Analysis: Min. (1) _____ San. (2) _____ H.M. (3) _____

Water Levels available: Yes (1) _____ No _____

Period of Record: Begin _____ End _____

Collecting Agency: _____

Prod. Rec. (1) _____ Pump Test (2) _____ Yield (3) _____



REMARKS

Recorded by: _____
 Date _____

18/4 10.36

01-815

Job #1050. Providence Hospital, Oakland.

LOG OF WELL.

Top soil -----	4 feet
Cement Gravel -----	4 to 12 "
Sandy clay -----	12 " 60 "
Yellow clay -----	60 " 74 "
Sand -----	74 " 78 "
Sandy clay -----	78 " 93 "
Sand -----	93 " 100 "
Blue clay -----	100 " 125 "
Sand -----	125 " 127 "
Gravel -----	127 " 131 "
Cement Gravel -----	131 " 136 "
Yellow clay -----	136 " 150 "

150 feet of 10" No. 12 R. H. Double Casing, including,
 1 Starter 10" No. 12 R. H. Double,
 30 feet of machine perforations, Shisel Slot 1/8" open,
 1 - 10" Shoe 5/7" x 6"

15/4W-26A

26 G

Job #1080.

Providence Hospital, Oakland,
30th & Webster

LOG OF WELL No. 8.

Dry sand, little gravel	57	feet
Sandy clay	57 to 69	"
Sand & gravel	69	"
Yellow sandy clay	72	"
Blue clay, soft	88	"
- Blue sandy clay	93	"
Brown clay	127	"
Reddish clay & lime rock	142	"
Soft lime rock	162	"
Hard lime	162	"
Lime and Blue clay	164	"
White clay & lime	168	"
Hard Lime	170	"
White clay & lime	174	"
Brown clay	176	"
Black water sand & small gravel	177	"
Yellow sandy clay	178	"
Soft lime	185	"
- Blue clay & sand	192	"
Hard lime rock	202	"
Blue sandy clay, some lime	204	"
Hard brown clay & lime	227	"
Black water sand	228	"
Lime and clay	234	"
Yellow water sand	272	"
Hard sand, clay, lime	273	"
Cementy gravel & loose rocks	279	"
Sand cementy gravel, yellow clay	286	"
Sand, clay & lime, a little gravel	290	"
Sand, red rock & clay, cement	341	"
Yellow clay	360	"
Hard sandy red rock, clay	363	"

196
18
39
13
4

1411 - 6 L
1/2 1/2 - 6

01-843

Well No. 1 - At 22nd and Grove Streets.

100 ft. of 15" surface casing.

16 ft. Gal. Starter

13 ft. of perforator (900)

Filled in ground	0
Yellow Sand	11-19
Blue Clay.....	14-53
Yellow Clay.....	7-40
Yellow Cement.....	48-83
Yellow Clay.....	78-166
Yellow Sand Clay.....	6-172
Sand & Gravel.....	4-176
Gravel.....	5-184
Yellow Clay.....	4-192
Sand & Gravel.....	4-198
Yellow Clay.....	107-210 1/2"

Tools measured up by A. S. Bissell

Water table..... 53 ft.
Water table pumping 1200 gals. per
hour - 60 ft.

15.4W - 23A
 15/4W
 4701

01-751

Job #795. Yosemite Laundry Compa
 Drilling Well Emeryville

LOG OF WELL.

Surface soil		4 feet
Sandy yellow clay	4 to 20	"
Dry Gravel	20 "	26 "
Sandy clay	26 "	50 "
Cement gravel	50 "	60 "
Yellow clay	60 "	115 "
Cement gravel	115 "	120 "
Yellow clay	120 "	160 "
Sandy yellow clay	160 "	225 "
Blue clay	225 "	235 "
Decomposed sandstone	235 "	270 "
Sandy clay	270 "	285 "
Sandstone	285 "	300 "
Blue clay	300 "	310 "
Sandy clay	310 "	330 "
Blue shale	330 "	335 "
Yellow cementy clay	335 "	385 "
Blue sand & clay	385 "	398 "
Water gravel	398 "	400 "
Yellow sandy clay	400 "	470 "
Yellow sand	470 "	490 "

12" clay Cemental 300'
 16" " 466'

J.M. Cough.
 1201 E 12th St.

15/4 N - 2
 15/4 N - 22057

01-750

LOG OF WELL

Presto-Lite Company,
 45th. Street, Emeryville.

Black adobe -----	8	feet
Cement gravel -----	8 to 12	"
Yellow clay & gravel -----	12 "	52 "
Blue clay & gravel -----	52 "	58 "
Yellow clay & gravel -----	58 "	66 "
Cement gravel -----	66 "	76 "
Yellow clay -----	76 "	88 "
Cement gravel -----	88 "	92 "
Yellow clay -----	92 "	106 "
Cement gravel -----	106 "	112 "
Yellow clay & gravel -----	112 "	129 "
Red cement gravel -----	129 "	134 "
Yellow clay -----	134 "	140 "
Yellow clay & gravel -----	140 "	153 "
Yellow clay -----	153 "	183 "
Cement gravel -----	183 "	196 "
Blue clay -----	196 "	220 "
Blue clay & sand -----	220 "	230 "
Blue hard pan -----	230 "	234 "
White Hard Pan -----	234 "	238 "
Yellow hard pan & rock -----	238 "	266 "
Yellow clay -----	266 "	280 "
Cement gravel -----	280 "	282 "
Yellow clay -----	282 "	293 "
Yellow clay & sand -----	293 "	302 "
Blue clay -----	302 "	304 "
Cement gravel -----	304 "	307 "
Sediment & sand -----	307 "	314 "
Yellow clay, gritty -----	314 "	326 "
Cement gravel -----	326 "	335 "
Yellow clay & grit -----	335 "	358 "
Cement gravel -----	358 "	373 "
Yellow clay, grit -----	373 "	383 "
Cement gravel -----	383 "	398 "
Yellow clay, gritty -----	398 "	408 "

393 feet of 8" No. 14 R. H. Double Casing, no shoe.

Water table 10 feet.

September 1908.

Kinney, driller.
 G. P. Marcus, Contractor.

M. Cogh.
 201 - E 12th St.

APPENDIX B

Section 5

Electric Service: Underground

5.1. Scope

This section provides information to help an applicant, as well as the applicant's engineer and contractor, to select an acceptable location and type of termination for underground service from PG&E's overhead or underground electric distribution system.

Additionally, Section 5.4. on Page 5-14 provides a helpful list of PG&E's underground service documents. These documents specifically address the requirements of this section.

5.2. General

Pacific Gas and Electric Company (PG&E) has the right to enter and leave the applicant's premises at any time for any purpose related to PG&E's obligation to furnish electric service. Only qualified PG&E personnel shall connect to service lateral conductors or disconnect them from PG&E's distribution system. This includes installing or removing metering facilities or any other work related to PG&E's facilities or systems.

5.2.1. Safety Reminder

Before you begin digging at or adjacent to your building site, call the Underground Service Alert (USA) Center at 1-800-227-2600. USA will contact member companies, asking them to locate and mark existing underground facilities. By contacting USA, you can avoid damaging any existing underground facilities. Call USA 2 working days (excluding weekends and holidays) in advance for marking service. Additional information is available from the USA North website at <http://www.usanorth.org>.

5.2.2. Conditions for Establishing Underground Electric Service

When applicants' electric services are to be underground, applicants must provide service trenching, backfill, excavation, paving, permits, conduit, and substructures on their property and in public areas. Applicants must also provide satisfactory termination facilities on or within the structures to be served. The locations for all transformers and meters, as well as the sizes, types, and quantities of conduit, are subject to PG&E specifications and approval. An applicant is responsible for owning and maintaining conduit and substructures on private property, but will convey ownership of any portion in a public (franchise) area or right-of-way (if applicable) to PG&E. An applicant is also responsible for providing, installing, and maintaining any structures that are required to protect service facilities from damage.

Figure 5-1 shows the usual location for the applicant's service termination and meter. For more information on meter location requirements, see (as applicable) Section 7, "Electric Metering: General," Section 8, "Electric Metering: Residential," and Section 9, "Electric Metering: Commercial and Industrial." PG&E will provide and install the service lateral conductors along the shortest, most practical, and most available route and connect them to the applicant's termination facilities.

When a separate transformer is used to serve an individual applicant's load, the transformer and service termination may be located in a PG&E-approved location in the vicinity of the applicant's load center. This minimizes voltage drop and flicker. The applicant shall pay any additional material and installation costs above the estimated cost of providing service at the closest practical service termination point.

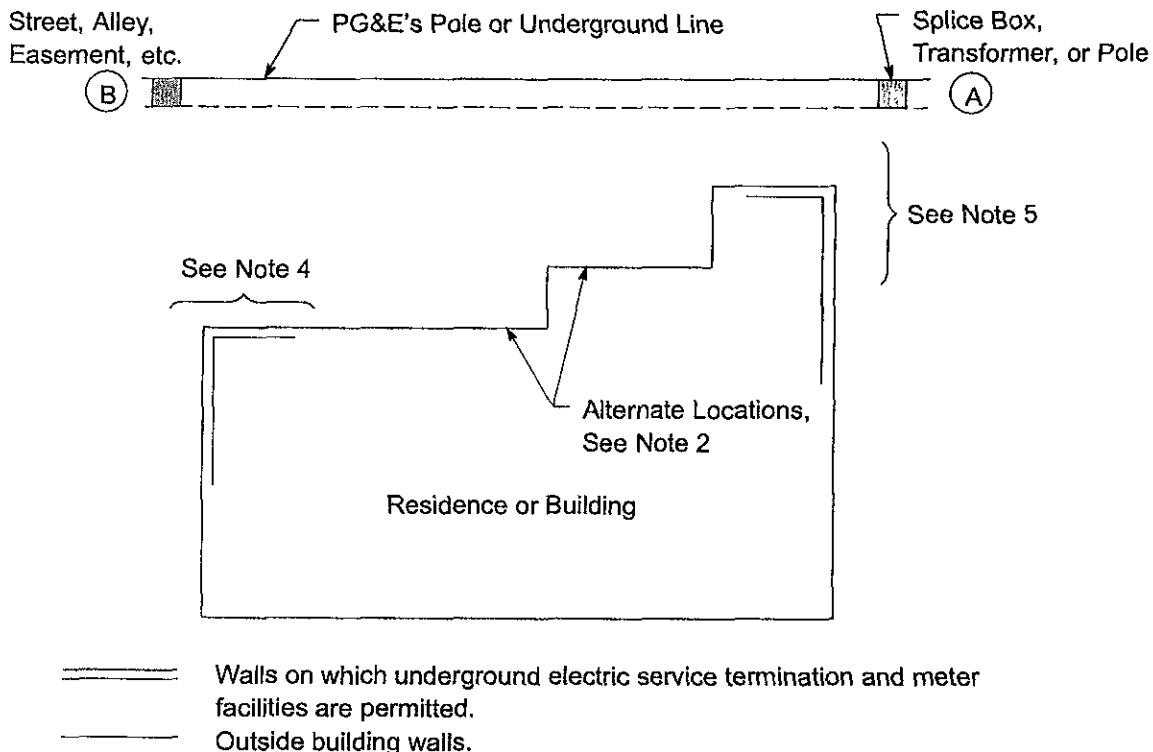


Figure 5-1

Location of Underground Electric Service Termination and Meter Facilities

Notes in reference to Figure 5-1.

1. If it is practical, attach the underground electric service termination facility and the meter to the wall at a preferred location. To avoid future operating and maintenance problems, locate the facilities as close as possible to PG&E's service facilities.
2. PG&E must approve all service locations before they are constructed.
3. Where it is practical, locate the service so that the meter can be read without entering into a fenced or enclosed location.
4. Preferred locations for electric service termination and meter facilities from Point B.
5. Preferred locations for underground electric service termination and meter facilities from Point A.

5.2.3. Ground Rods

Applicants or their contractors are required to install ground rods whenever specifically required by PG&E as part of substructure installation; for example, whenever a transformer pad is required. In addition, PG&E may require applicants to install ground rods in either primary or secondary enclosures. Refer to PG&E Electric Engineering Design Standard 013109, "Corrosion Resistant Ground Rods and Ground Rod Clamps," (see Section 5.4. on Page 5-14) for further information.

5.2.4. Service for Two or More Buildings on One Lot

If more than two dwellings or buildings are located on the same lot, consult PG&E to determine the acceptable service termination location and meter locations before wiring the buildings.

Usually, only one service lateral is installed to a single building on one premise or to one enterprise (with one or multiple buildings) on a single premise. However, more than one service lateral may be provided if they are:

- A. Allowed or required by PG&E's tariff schedules.
- B. Provided for PG&E's convenience.
- C. Required by ordinance.
- D. Installed as special facilities.

5.2.5. Inspections

A PG&E field representative will inspect and must approve of the service equipment and other components for an underground service installation when that underground service installation is furnished and installed by the applicant.

The "Underground Construction Inspection Card," form 62-4067, shown in Figure 5-2 on Page 5-6, will be used to accept, or to indicate reasons for rejecting, the applicant's installation.

A signed inspection form indicating approval or disapproval shall be issued by the inspector before service facilities such as transformer pads, vaults, pull boxes, and associated conduit and trenching are poured, set, covered or backfilled.

The signed inspection form indicating approval is the applicant's or contractor's authorization to proceed to pour concrete, set pads, and backfill or cover, as required, around the conduit system.

All rejections and reasons for rejection of any applicant's service installation shall be written on or attached to the "Underground Construction Inspection Card." The form will be signed by the PG&E inspector. The applicant shall receive one of the signed copies.

POST THIS CARD IN A CONSPICUOUS PLACE ON JOB

PACIFIC GAS & ELECTRIC COMPANY

UNDERGROUND CONSTRUCTION INSPECTION CARD**Telephone:**

Name _____

Project _____

Address _____

S/D _____ Gas _____ Headquarters _____ PG&E Rep. _____
 Electric _____

Where applicable, these items require inspections:

Trench	Gas _____	By _____	Date _____
	Electric _____	By _____	Date _____
Separation	Gas _____	By _____	Date _____
	Electric _____	By _____	Date _____
Backfill	Gas _____	By _____	Date _____
	Electric _____	By _____	Date _____
Duct	_____	By _____	Date _____
Vault	_____	By _____	Date _____
Pad	_____	By _____	Date _____
TRF Post	_____	By _____	Date _____
Meter Panels	_____	By _____	Date _____
Pull Strings	_____	By _____	Date _____
Panel	_____	By _____	Date _____
Lock Box	_____	By _____	Date _____
Gas/Electric Meter Separation	_____	By _____	Date _____
Vents/Window Clearance	_____	By _____	Date _____
FINAL INSPECTION	_____	By _____	Date _____

This is a certificate of Final Inspection when properly signed by PG&E Inspector. No substructures shall be covered in any way or pads poured until approved by Inspector. Inspector must be given 24-Hour Notice for each inspection.

Note: Applicant or his representative is responsible for installing facilities in accordance with PG&E's standards and specifications for this project.

Approval of the facilities by the PG&E Inspector does not relieve the applicant or representative from this responsibility.

Figure 5-2
Underground Construction Inspection Card

5.3. Underground Service Installation Requirements

5.3.1. From Underground Distribution Systems

The applicant will be served from an underground service if the site or lot is located in an area that is supplied from an existing underground distribution system. PG&E will own, maintain, and install the underground service lateral conductors. Underground-to-underground service will be provided along the shortest, most practical, and most available route to the applicant's service termination facility. The termination facility will usually be on or within the building or structure (see Figure 5-3). The conductors shall be installed in conduit. The applicant is required to provide, or to make arrangements and pay for, the trenching, backfill, excavation, paving, permits, and any required substructures (i.e., conduit, boxes, transformer pads) in accordance with PG&E specifications and California Public Utilities Commission (CPUC) Electric Rule 16. PG&E will install the transformer, if required, and connect service lateral conductors to the applicant's termination facilities.

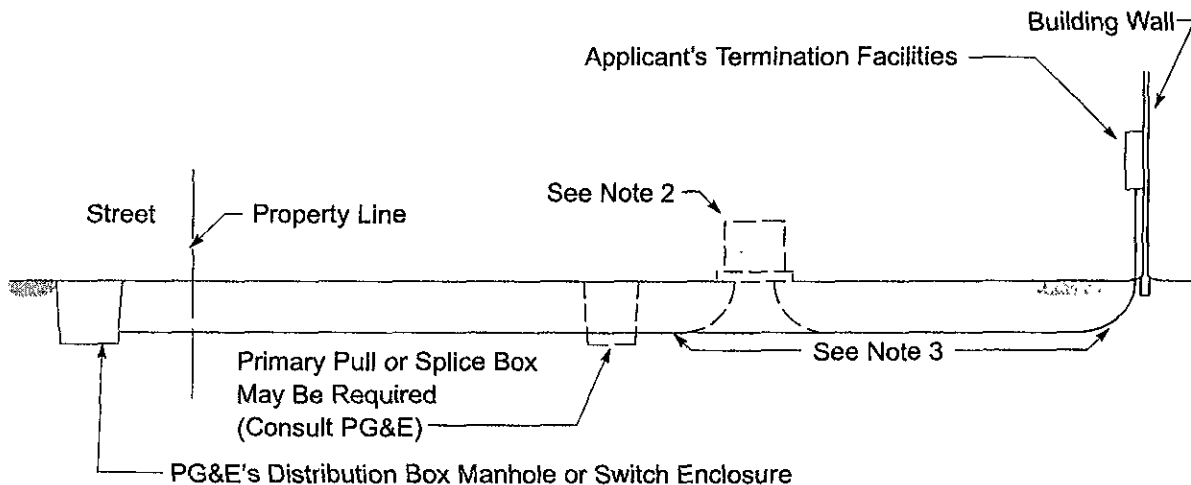


Figure 5-3
Underground-to-Underground Service Connection

Notes in reference to Figure 5-3.

1. When the service delivery voltage is the same as the available primary distribution voltage (over 2,000 volts), the applicant will normally provide a primary splice box in accordance with PG&E's requirements. The splice box must be placed at a location designated by PG&E, at or near the applicant's property line or property easement.
2. PG&E will supply a transformer, if required. The applicant must provide the trench, backfill, and required conduit, pad, and substructures.
3. PG&E-owned primary and/or secondary conductors (the applicant must furnish the substructures).

5.3.2. From Overhead Distribution Systems

PG&E provides service from an underground riser installed on an existing pole (see Figure 5-4) if:

- The applicant is located in an area served from an overhead system and the applicant prefers to have the service installed underground.
- The applicant's load requires a transformer size 75 kVA or larger.
- The city or county requires underground service by ordinance.

In this case, in addition to the requirements described in Section 5.3.1. on Page 5-7, the applicant is required to pay the material costs of the pole riser facility and any required conduit in the public right-of-way.

Refer to Section 6.9., "Customer-Owned, Installed, or Furnished Wood Poles," on Page 6-25 for specific requirements.

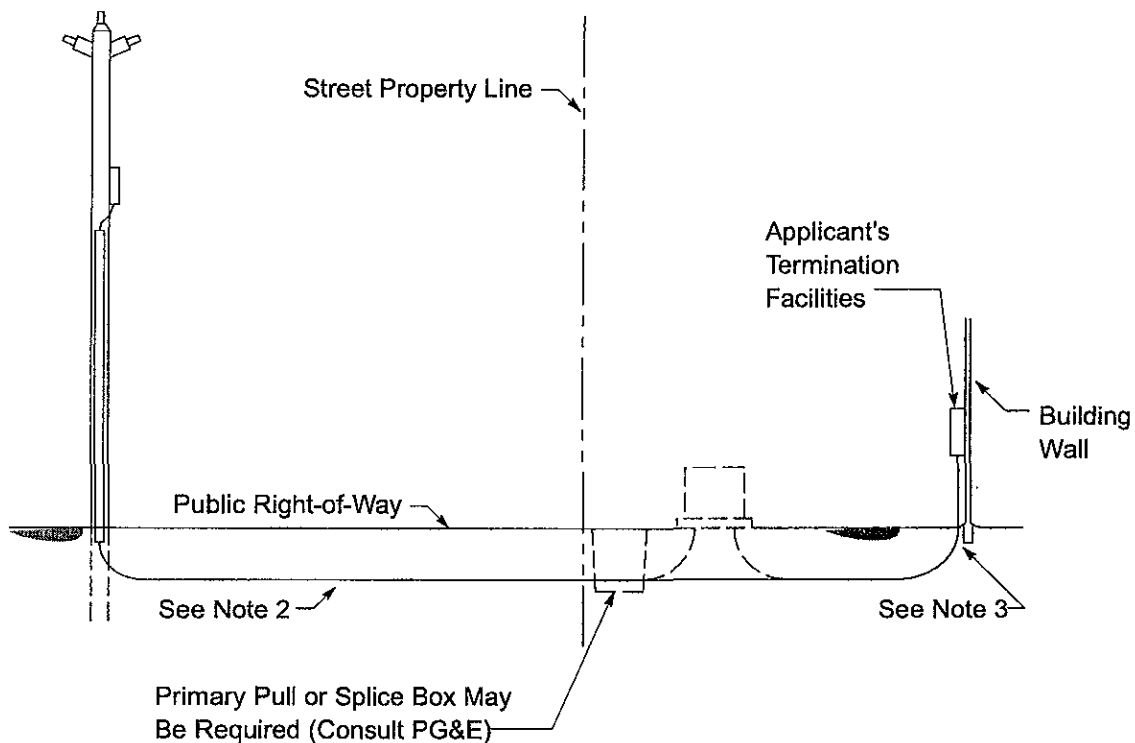


Figure 5-4
Overhead-to-Underground Service Connection

Notes in reference to Figure 5-4.

1. When the service-delivery voltage is the same as the available, primary-distribution voltage (over 2,000 volts), the applicant will usually provide a primary splice box in accordance with PG&E's requirements. The splice box must be placed at a location designated by PG&E, at or near the applicant's property line or property easement.
2. PG&E's pole and secondary riser (the applicant must pay the installed cost of the pole riser and conduit within the right-of-way).
3. PG&E-owned service lateral conductors (the applicant must furnish the conduit, as required).

5.3.3. Conduit for Underground Service

A conduit system is required for underground service laterals. It is the applicant's responsibility to provide service conduit in accordance with the following two PG&E design standards:

- Electric Engineering Design Standard 063927, "Methods and Requirements for Installing Residential Underground Electric Services 0–600 Volts to Customer-Owned Facilities"
- Electric Engineering Design Standard 063928, "Methods and Requirements for Installing Commercial Underground Electric Services 0–600 Volts to Customer-Owned Facilities"

See Section 5.4. on Page 5-14 for more information.

Conduit runs require a polyester pull-tape (Code 560154) to initiate the cable pulling. The pull-tape shall be securely attached to conduit plugs or caps.

The applicant shall prove, in a manner acceptable to PG&E, that the service conduit system is free of dirt, rocks, or other obstructions that could prevent, hinder, or harm the installation of the service lateral conductors. The applicant shall furnish and install conduit caps or plugs on the ends of all conduits. In addition, at the locations where the cable insulation may be damaged (e.g., transformer pads or switchboard pull sections), the applicant is required to install cable protection at all the conduit ends. Contact PG&E for specific requirements.

For trenches containing only electric service facilities that are located on private property, designated sidewalks, or parking areas, electric service conduit must be **covered** for installation as follows:

- An 18-inch minimum **cover** for secondary (0–750 volts) electric service conduit.
- A 24-inch minimum **cover** for primary (over 750 volts) service conduit.

The term "**cover**" refers to the standard distance between the outer surface of an underground facility and the final grade level. **The actual trench depth must be greater than the cover depth.** All electric service conduit must enter PG&E splice boxes or enclosures from the bottom or through the boxes' conduit knockouts. Therefore, the installed depth of the conduit may need to be increased at those locations. In all cases, when increased traffic loading, soil erosion, open ditches, or similar situations are anticipated or exist, PG&E may require the service conduit to be installed deeper than 18 inches to 24 inches, or may require other protection to be provided by the applicant.

The **trench depth** must be sufficient to accommodate:

- The required cover (as stated above).
- The conduit size being installed (e.g., 3-inch, 4-inch, or other sizes).
- Any necessary bedding materials.
- The electric conduit bends (e.g., 24-inch or 36-inch bends).

Therefore, for **service trenches**, the normal trench depth must be a **minimum** of 24 inches below grade. Reducing the 24-inch, minimum-depth requirements requires advance review and approval from PG&E.

Where electric service facilities are installed with other services such as telephone or cable television, refer to Figure 5-5 on Page 5-12, Table 5-1 on Page 5-13, and the local PG&E office for additional details and requirements.

Where more than two 90° bends are required, consult PG&E to determine whether an additional raceway pull-box is needed to avoid excessive pulling tension on the service cables.

The applicant may be required to (a) install larger conduits and/or additional splice boxes or pull boxes to accommodate the installation of the conductors, and (b) transition to cables appropriately sized for the service capacity when:

- PG&E determines that larger-than-standard cables or conductors are required to maintain voltage and flicker drop.
- Normal pulling tensions may be exceeded.

Do not use either pin adaptors or cable ringing to terminate the cables. PG&E does not accept these practices.

Applicants shall use backfill (sand or native soil, when suitable) to provide a smooth bedding. Fill all voids around facilities and provide at least 4 inches of cover for the conduit. Soil containing occasional rounded rocks 1/2 inch in diameter or less is acceptable backfill. Crushed rock or sharp-edged materials of any kind are unacceptable.

Only when backfilling a service trench, the applicant may install rigid, galvanized-steel conduit instead of the backfill described in the previous paragraph. Rigid polyvinyl chloride (PVC), American Society of Testing and Materials (ASTM) F-512-DB-120 *or better* conduit, may be used if PG&E approves the conduit in advance.

When the intrusion of water can reasonably be expected to occur into the wire and conduit system and migration into the meter panel and/or building, the customer or customer's contractor shall be responsible for providing a means to allow the discharge of excess water or water pressure from the conduit system. The means to allow for the discharge of water or water pressure can be either (1) a box installed at the base of the riser to the meter panel, or (2) a fitting or series of fittings installed in the conduit riser to the meter panel which channel the water out of and away from the service wire and conduit system. If a box is installed, it must have a bolt down cover to prohibit insertion and/or extension of any object or wire into the meter panel. Any fitting or series of fittings installed must be constructed and installed in such a manner to (1) prevent physical damage to the wires or conduit riser contained within the conduit system, and (2) prevent access to, insertion of and/or extension of any object or wire into the conduit and wire system or into the meter panel.

5.3.4. Joint Trenches

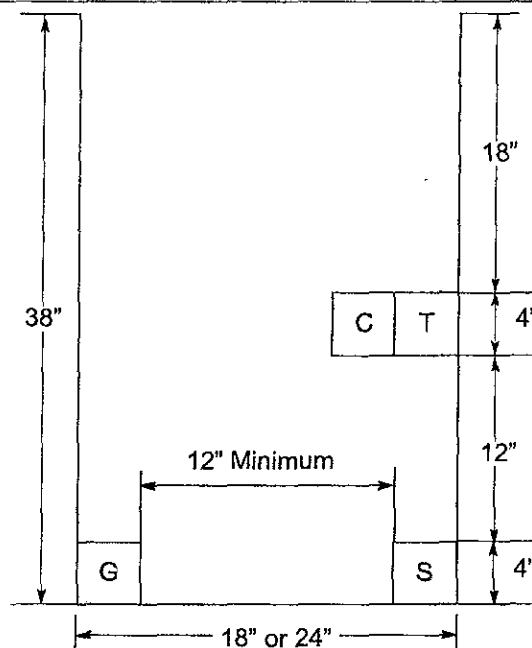
Whenever feasible, PG&E will install the electric underground service lateral with gas, telephone, cable television, and/or any other wire service facilities in a joint trench sized to accommodate those facilities. For more information regarding joint trenches, refer to PG&E's Utility Operations (UO) Standard S5453, "Joint Trench." The applicant or the applicant's contractor may excavate and backfill the joint trench to PG&E's and other trench occupants' specifications. The applicant may also elect to have PG&E or another trench occupant excavate and backfill the trench. A joint trench may include telephone and cable television facilities. Customer-owned gas piping, to include propane lines, are not permitted in a joint trench. Water, sewer, sanitary, or storm drain and other wet utility piping **are not permitted** in a joint trench. Additionally, there are separation requirements between a joint trench and wet utility trenches. Please contact PG&E for further assistance. To request the installation of any other facilities in a joint trench, submit a written request, with justification, to PG&E for review and approval before work begins.

The standard service trench design is shown in Figure 5-5 on Page 5-12. Contact PG&E for specific gas-pipe and electric-conduit material, route depth, and trench width. Refer to Note 1 under Figure 5-5 for backfill requirements. In all cases, ensure that the separation between facilities and trench sidewalls is sufficient to allow backfill material to flow and fill the area between the facilities and/or trench sidewalls.

To use a joint trench, the gas and electric meters must be installed adjacent to one another. Refer to Section 7, Section 8, and Section 9 for the acceptable electric meter locations. Refer to Section 2, "Gas: General," for acceptable gas meter locations.

See Table 5-1 on
Page 5-13 for Minimum
Separation and Clearance

T = Telephone
G = Gas
C = Cable Television
S = Electric Service
(Secondary)



Profile View-Typical

**Figure 5-5
Typical PG&E Service Trench Design**

Notes in reference to Figure 5-5.

1. The preferred trench location is in the Public Utilities Easement (PUE).
2. All the depths and the resulting cover requirements are measured from the final grades.
3. Minimum cover shall be consistent with General Order 128 and 49 Code of Federal Regulations (CFR) 192. Exceptions to these minimums shall be reviewed for justification and must be based on PG&E safety and technical requirements.
4. Native backfill is preferred for use throughout the entire trench. Using import soil shall be limited to shading of trench occupants and/or for backfilling when native soils will not allow for the required compaction.
5. Where native soil exceeds 1/2-inch minus and where gas and/or electric facilities are to be placed at the bottom of a trench, a minimum 2-inch sand bed is required.
6. A 12-inch trench width is acceptable if field conditions warrant its use. This trench width is intended for use with reconstruction and Rule 20 projects.
7. Street light facilities may be placed at the same trench level as electric facilities. Street light facilities may not be placed at the gas level of any distribution trench.
8. Maintain a minimum of 5 feet of separation between any wet utilities when installing electric and gas facilities.

Table 5-1 Joint Service Trench (Minimum Separation and Clearance Requirements)

Facility	Gas	Telephone (Conduit)	Telephone (Direct Buried)	Cable TV	Secondary Electric	Primary Electric
Facility	All Measurements Are in Inches					
Gas	NA	6	6	6	6	12
Telephone (Conduit)	6	1	1	N/A	12	12
Telephone (Direct Buried)	6	N/A	N/A	1	12	12
Cable TV	6	1	1	N/A	1	6
Secondary Electric	6	12	12	1	N/A	1
Primary Electric	12	12	12	6	1	N/A
Street Lights	6	12	12	1	1	1

5.3.5. Service Termination Facility

In addition to the requirements in Table 5-1 above, it is the applicant's responsibility to provide and maintain a satisfactory termination facility on or within the building or structure to be served. Examples of satisfactory residential and nonresidential service termination facilities are listed with reference figures in Electric Engineering Design Standard 058817, "Terminating Underground Electric Services 0-600 Volts in Customer-Owned Facilities" (see Appendix B of this book). Termination facilities are also illustrated with specifications in Section 8, "Electric Metering: Residential," Paragraph 8.5.1.2. through Paragraph 8.5.1.4. on Pages 8-7 to 8-9; Section 9, "Electric Metering: Commercial and Industrial," Paragraph 9.3.2.1. through Paragraph 9.3.2.4. and Paragraph 9.3.4.1. on Pages 9-6 to 9-10 and Page 9-15; Section 11, "Electric Metering: Components," Paragraph 11.2. through Paragraph 11.3. on Pages 11-3 to 11-4; and Section 12, "Electric Switchboards: 0 to 600 Volts," Paragraph 12.3.13. through Paragraph 12.3.15. on Pages 12-23 to 12-26.

Large services that are designed to use bus duct for utility service termination require special engineering specifications. Contact PG&E for individual job requirements. Also, see Electric Design Standard 063929, "Requirements for Bus Duct Entrance Termination Unit for Use with Pad-Mounted Transformers" (see Appendix B of this manual).

Services supplied from different electrical sources will not be installed in the same termination facility unless they are separated by suitable barriers. When two or more such services are in one termination facility, the minimum dimensions of each compartment created by the barriers shall be the same as if each compartment were a separate termination facility.

5.4. Electric Underground Design Standards

The following electric engineering design standards are furnished for reference in Appendix B, and can also be found in the PG&E *Electric Underground Construction Manual*, Volume 1.

Section	Document Number	Title
Connectors	013109	Corrosion Resistant Ground Rods and Ground Rod Clamps
Enclosures	028028	Secondary Boxes for Electric Underground
Transformers	045292	Concrete Pad for Three-Phase, Loop-Style Pad-Mounted Transformers
General	051122	Location, Clearances, and Mechanical Protection Details for Pad-Mounted and Subsurface Equipment
Services	058817	Terminating Underground Electric Services 0 – 600 Volts in Customer-Owned Facilities
Transformers	063422	Landscape Screen for Pad-Mounted Transformers
Services	063927	Methods and Requirements for Installing Residential Underground Electric Services 0 – 600 V to Customer-Owned Facilities
Services	063928	Methods and Requirements for Installing Commercial Underground Electric Services 0 – 600 Volts to Customer-Owned Facilities
Services	063929	Requirements for Bus Duct Entrance Termination Unit for Use with Pad-Mounted Transformers
Transformers	064309	Box Pad for Pad-Mounted Transformers
General	066211	PG&E Approved Manufacturers

APPENDIX C

SECTION 02316.1

TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Trenching, backfilling, and compacting for the installation of pipe and pipeline appurtenances, to the required lines and grades.
- B. Related Sections:
 - 1. Section 02720.1 - Imported Backfill Materials
 - 2. Section 02951.1 - Pavement Replacement
 - 3. Section 03345.1 - Controlled Density Fill
- C. Definitions:
 - 1. Competent Person: As defined in Section 1504 of the Construction Safety Orders Title 8, Chapter 4, Subchapter 4 of the California Code of Regulations: One who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.

1.2 QUALITY ASSURANCE

- A. The Contractor will take samples and perform tests to determine compliance with the specified compaction requirements.
 - 1. Compaction requirements are specified as relative compaction and expressed as a percentage. Relative compaction is the ratio of the field in-place dry density to the laboratory maximum dry density.
 - 2. Laboratory maximum dry density will be determined in accordance with California Test 216.
 - 3. Field in-place density will be determined in accordance with ASTM D 2922 and field in-place moisture will be determined in accordance with ASTM D 3017.

1.3 SUBMITTALS

- A. Submit written designation of Competent Persons for the District's record prior to work.
- B. Submit copy of Cal/OSHA excavation permit prior to work.
- C. Submit a detailed plan for worker protection and control of ground movement for the District's record prior to any excavation work at jobsite. Include drawings and details of system or systems to be used, area in which each type of system will be used, de-watering (if applicable), means of access and egress, storage of materials, and equipment restrictions. If plan is modified or changed, submit revised plan.
- D. Submit compaction test results for the District's record prior to placement of aggregate base.

1.4 JOB CONDITIONS

A. Existing Utilities:

- 1. Locations of known underground utilities and structures are shown on the drawings as they are supposed to exist. Appurtenances and service laterals are not usually shown if their presence can be inferred from the presence of other visible facilities.
- 2. If a utility is encountered which was not shown on the drawings and is in conflict with the work, immediately notify the utility owner and the Engineer in writing and arrange for necessary work.

B. Excavation Safety:

- 1. All excavation work and all work in the vicinity of an excavation shall be in full conformance to Article 6, Excavations, of the Construction Safety Orders, in addition to other applicable safety requirements.
- 2. Designate in writing one or more individuals as Competent Persons. Written designation shall certify that each designated Competent Person has the training, knowledge, and authority required of a competent person under Article 6, Excavations, of the Construction Safety Orders.
- 3. A designated Competent Person, with authority to inspect the work and supervise conformance with Article 6, shall be on site at all times whenever any excavation work or work in or about an excavation is in progress.
- 4. All excavations 5 feet or greater or not in stable rock shall have a protective system to prevent earth movement. Protective system shall, at a minimum, conform to Cal/OSHA standards for sloping and benching, or for timber

shoring for trenches, or for aluminum shoring for trenches; or shall be designed and constructed in accordance with tabulated data as allowed by Article 6 of the Construction Safety Orders; or shall be designed and constructed in accordance with a plan that conforms to Paragraph 5 below.

5. For excavations greater than 20 feet in depth or where the protective system differs from those specified in 4. above, detailed plans showing the materials and methods to be used shall be prepared by a California registered Civil or Structural Engineer. The registered engineer shall:

- a. Have at least five years' responsible experience in work of this nature.
- b. Inspect the installation of the system prior to entry of any persons into the excavation and certify in writing to the District that the system is installed as designed.
- c. Perform any necessary additional work that may be required because of unanticipated movements, deflections, or settlements of the protective system or the ground.

C. Contaminated Soils:

1. Applicant only:

- a. If contaminated soils are encountered or suspected, see General Conditions, Contaminants Article, for Applicant's responsibility.
- b. Immediately notify Engineer of presence or suspected presence of contaminants. Notification is for safety of District personnel and information of the Engineer.

2. District Forces only:

- a. If contaminated soils are encountered or suspected, follow procedures outlined in EBMUD Contingency Plan for Contaminated Soils, Appendix A.

1.5 ALTERNATES

A. Controlled Density Fill may be used as an alternative backfill material above pipe bedding and in lateral trenches where permitted by the agency having jurisdiction. See Section 03345.1.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS

- A. No material shall be used for trench backfill which, because of excessive moisture or any other reason, cannot be compacted to the degree specified. Any such material shall be considered unsuitable, and if it is deposited in the trench, it shall be removed and replaced with suitable material.
- B. Imported backfill materials shall conform to Section 02720.1.
- C. Controlled Density Fill shall conform to Section 03345.1.
- D. Select backfill shall be material selected from the excavation by the Engineer. Select backfill material shall be free of organic or other unsuitable materials and shall not include rocks, boulders, or unbroken masses of soil larger than 3" in greater dimension.

PART 3 - EXECUTION

3.1 EXCAVATION

A. General:

1. Notify city, county, or state a minimum of 3 working days prior to work when their survey monuments will be disturbed or when the trench edge will be within 3' from the closest edge of the monument so that they may be referenced and relocated. The Applicant is responsible for all costs associated for re-establishing survey monuments. Relocation shall be by or under direction of agency having jurisdiction.
2. Remove all materials of whatever nature encountered necessary to install the pipeline.
3. Blasting is not permitted.
4. Cut pavement accurately to correct lines. Sawcut pavement and dispose of slurry as required by the agency having jurisdiction. Discharged water shall comply with Section 01000.1, Article 1.5.B.
5. Keep trench dry throughout construction operations.
6. Store materials to minimize obstruction to traffic.
7. Trench shall be backfilled, compacted, and paved at the end of each day's work where excavation is in a public road. An alternative that will permit safe public

use of the road and complies with Cal-OSHA standards may be used if advance approval is obtained from the agency having jurisdiction.

B. Alignment, Depth, and Width:

1. Trench excavation shall follow the alignment of the pipe centerline and shall be in accordance with Drawing 1992-A.
2. Excavation to a greater depth than shown on the drawings may be required if the native material at the bottom of the trench will not provide proper support for the pipe.
3. If the trench width exceeds that shown or if sloping sides are used, the maximum trench width at the crown of the pipe shall not exceed that allowed by Drawing 1992-A.
4. Sloping sides of the trench excavation will not be permitted in public streets.

C. Excavation shall be supported or excavated so that:

1. Adjoining ground shall be prevented from sliding or settlement.
2. Existing improvements of any kind shall be fully protected from damage.
3. Worker protection is provided as required by Cal/OSHA.

D. Excavation in Sidewalk:

1. Sidewalk shall be removed and replaced where the trench lies within and approximately parallels a concrete sidewalk 4' or less in width.
2. Sidewalk shall be removed and replaced to nearest parallel groove or score outside trench where sidewalk is more than 4' in width.

E. Excavation Required Beyond Trench Limits:

1. See Paragraph B.2.
2. Excavation (bell holes) where necessary in the sides and bottom of the trench at pipe joint locations shall be large enough to make joints and permit District inspection.
3. Where leaks occur, remove all adjacent saturated material.

F. Disposal:

1. Dispose of excess excavated material and excavated material that is not approved by Engineer for use as backfill.
2. Deliver and unload salvageable pipe or other material belonging to the District to 5601 Oakport Street, Oakland. Delivery will require a Material Return Order (Form P-015) prepared by the Engineer. See Section 01600.1, 1.1 G. 1.

3.2 UTILITIES

A. Location:

1. Contractor is responsible for having all underground utilities and structures located by the owners in advance of excavation.
 - a. Notify all known owners of underground utilities in the area of proposed work and Underground Service Alert, 800-642-2444, at least 2 working days before the start of actual excavation.
 - b. Identify the area to be excavated as required by PUC/CA Government Code 4216.

B. Excavation Around Utilities:

1. Excavation and other work under or adjacent to utilities shall not interfere with their safe operation and use.
2. Probe carefully to determine the exact location of utility, and hand excavate where necessary to avoid damage. Hand excavation is required within 24" on either side of the exterior surface of any underground utility (except nonpressurized sewers, drain lines, and storm drains) as that utility has been located by the utility owner except:
 - a. Power-driven or power-operated equipment may be used for the removal of pavement if there are no utilities in the pavement.
 - b. Power-driven or power-operated equipment may be used to any depth with agreement of the utility owner.
3. In the event of damage incurred during construction to such structures or property, immediately notify the owners and other authorities, and arrange for immediate repairs.
4. Notify the local fire department every time damage to a gas utility results in a leak or suspected leak or when damage to any utility results in a threat to the public.

- C. Tunneling under utilities:
 - 1. Tunneling may be allowed for short distances with the approval of the utility owner.
- 3.3 BRIDGES
 - A. Minimum 4-foot wide bridges adequate for pedestrian traffic and with handrails and uprights of dressed lumber shall be installed where required.
 - B. Bridges adequate for handling all vehicular traffic shall be installed when excavation obstructs more than one-half the width of the street or road crossing.
 - C. Provide bridges from public streets onto private property to permit safe use of all garage driveways and other roadways.
 - D. Maintain bridges as long as the condition of the work requires.
 - E. Relocate bridges as required to perform work in the immediate vicinity of a bridge.
- 3.4 BACKFILL OF TRENCHES
 - A. General:
 - 1. Remove all loose material, wood, and debris from trench prior to backfilling.
 - 2. Backfill pipeline trenches to the level of original ground surface or underside of the pavement base course.
 - 3. Backfill material shall not be dropped directly on the pipe.
 - 4. Shoring removal:
 - a. Carefully remove timbering, sheeting, shoring, and sheet piling using methods that will minimize caving.
 - b. Metal sheet piling, sheeting, and bracing may be left in place on approval of the Engineer.
 - 5. Low points along the pipe trench shall not be backfilled until all backfill at adjacent higher elevations has been completed. Water collecting at the low points shall be removed by pumping or other means.
 - 6. If the trench has been excavated below the specified depth, that portion of the trench shall be backfilled with pipe bedding material and compacted before pipe installation.

- 7. Backfill with the specified material to the full width of the trench as excavated.
- B. Pipe Bedding and Compaction:
 - 1. Install Class I Backfill as shown on Drawing 1992-A.
 - 2. Bedding support under pipe:
 - a. Bring to a uniform grade to provide continuous support for the pipe sections as they are laid in final position.
 - b. If more than 3" thick, compact in 8" maximum lifts with approved plate-type vibrating equipment.
 - 3. Pipe bedding above grade line:
 - a. Bring up simultaneously on both sides of the pipe.
 - b. Maximum lift as it is placed before compaction shall be 24" where compaction by saturating with water and vibration is permitted and used.
 - c. Maximum lift as it is placed before compaction shall be 8" where compaction by saturating with water and vibration is not used.
 - 4. Compaction:
 - a. Compact by saturating with water and vibrating where permitted. Saturate by water jets or by other approved means while densification by vibration is in progress. Excessive or improper saturation or flooding will not be allowed. Consolidate mass with immersion type vibrators of sufficient length to extend to the bottom of each lift. Vibrate and water jet alternately on both sides of pipe. Do not remove vibrators from the mass until water jets are removed.
 - b. Compact by impact, vibration, or a combination of these methods where compaction by saturating with water and vibrating is not permitted.
 - c. Thoroughly compact before additional fill is placed.
- C. Backfill and Compaction Above Pipe Bedding:
 - 1. Install Aggregate Base backfill material where excavation is in a paved public road, unless another backfill material is permitted by the local agency permit. Install select backfill material at other locations.

2. Install Aggregate Base backfill material in lieu of select when the Engineer determines that excavated material does not meet the requirements for select backfill.
3. Maximum lift as it is placed before compaction shall be 8". Lifts to 12" may be allowed if specified compaction can be obtained without adverse effects on the pipe.
4. Placement of the backfill shall not damage the pipe coating.
5. Only hand-operated motor driven mechanical compacting equipment shall be used over pipelines until the backfill has been compacted to 24" over the crown of the pipe.
6. Compaction methods and equipment are subject to the approval of the Engineer. Compaction by saturating with water and vibrating is not permitted.
7. Paved public or private roads:
 - a. Compact Aggregate Base backfill that is more than 3 feet below the existing surface to at least 90% relative compaction.
 - b. Compact Aggregate Base backfill in the upper 3 feet of the excavation to at least 95% relative compaction.
8. Other locations: Compact backfill to at least 90% relative compaction.
9. At the time of compaction, the moisture content of backfill material shall be such that the required relative compaction will be obtained.
 - a. Condition material which contains insufficient moisture or excessive moisture until the moisture content is such that the required relative compaction will be obtained.
10. Controlled Density Fill (CDF) may be used in lieu of aggregate base backfill material where excavation is in a paved public road and where this option is permitted. See Section 03345.1.

D. Backfill and Compaction in Lateral Trenches:

1. Lateral trenches:
 - a. Any trench extending from a water main at 60° to 90° angle to the centerline of a street.
 - b. Backfill with Aggregate Base material or CDF and compact as for main trench unless required otherwise by local agency permit.

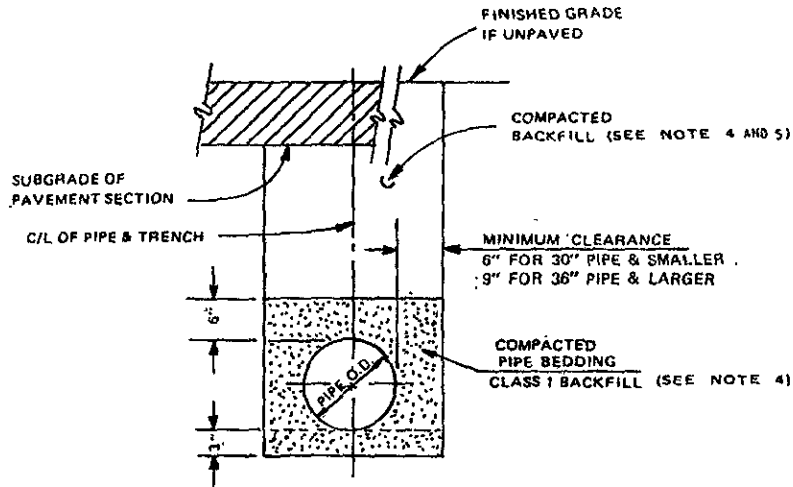
2. Where leaks occur:

- a. Remove all adjacent saturated material.
- b. Backfill with new materials and compact as for adjoining trenches.

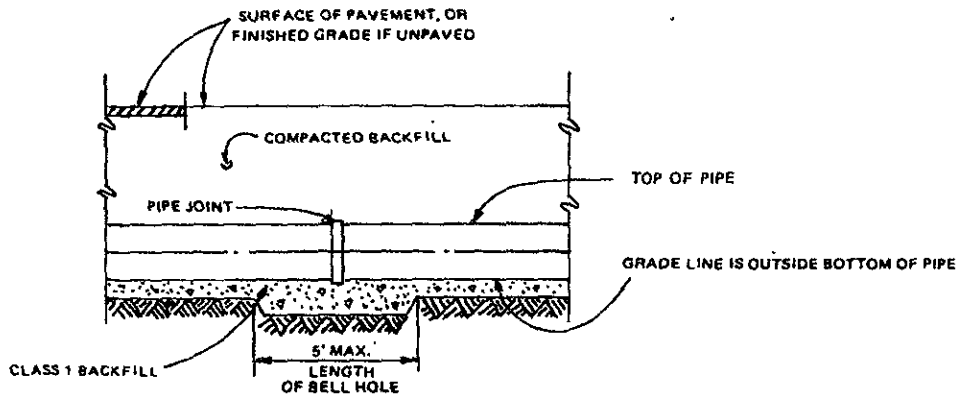
3.5 GRADING

- A. Top of the backfill in the areas with no additional planned improvements (such as paving or structures) shall be graded with a crown for positive drainage away from the backfill area.
- B. Areas outside of the trench limits shall also be graded for a positive drainage but grading shall not alter the existing drainage pattern.

END OF SECTION



TYPICAL TRENCH SECTION



BELL HOLE DETAIL

NOTES

1. CONFORM TO ALL SAFETY STANDARDS, ORDERS, RULES AND REGULATIONS OF CAL-OSHA AND OTHER AGENCIES HAVING JURISDICTION.
2. THE WIDTH OF THE TRENCH AT THE ELEVATION OF THE TOP OF THE PIPE SHALL NOT EXCEED:
 - o 16" AND SMALLER - THE OUTSIDE DIAMETER OF THE PIPE PLUS 24 INCHES.
 - o 20" AND LARGER - TWO TIMES THE OUTSIDE DIAMETER OF THE PIPE.
3. FOR COMPACTION REQUIREMENTS, SEE SPECIFICATIONS.
4. FOR MAIN BREAK REPAIR, AGGREGATE BASE MAY BE USED IN LIEU OF THE BACKFILL AND THE CLASS 1 BACKFILL.
5. CONTROLLED DENSITY FILL MAYBE USED AS AN ALTERNATIVE BACKFILL MATERIAL ABOVE PIPE BEDDING, WHERE PERMITTED BY THE AGENCY HAVING JURISDICTION. SEE SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

REVISED 17 MAY 93 C.A.D. *W.B.*

EAST BAY MUNICIPAL UTILITY DISTRICT OAKLAND, CALIFORNIA			
STANDARD DRAWING			
PIPE TRENCH EXCAVATION AND BACK FILL			
DESIGNED BY	EBMUD	DRAWN BY	EBMUD
SR. CIVIL ENGR. R.P.E. NO. C 27714	<i>W. Bode</i>	SCALE	NONE
MGR. OF DESIGN R.P.E. NO. C 16814	<i>H. Hilliard</i>	DATE	23 FEB '89
ASST. CH. ENG. FOR DES. & CONST., R.P.E. NO. C 29111	<i>D. S. ...</i>		1992-A

APPROVED

C. T. Way
CHIEF ENGINEER, R.P.E. NO. C 26724