SUBSURFACE INVESTIGATION SUMMARY REPORT AMERICAN NATIONAL CAN COMPANY OAKLAND, CALIFORNIA, FACILITY

Prepared for:

American National Can Company
Chicago, Illinois

Date: June, 1992

DUNN CORPORATION
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June 26, 1992

Mr. Dennis J. Byrne
Senior Hazardous Materials Specialist
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, CA 94621

Dear Mr. Byrne:

Subject: Subsurface Investigation Summary Report
ANC Oakland, CA, Facility

Enclosed please find a copy of the subject report. The report updates DUNN's interpretations of the findings of our investigation of subsurface conditions at the plant. This report precedes the soil and ground water remedial workplans, which address the subsurface conditions, and which will be forwarded for your review in the near future.

Please call me with your questions and comments.

Very truly yours,

DUNN CORPORATION

Edward W. Alusow

Edward W. Alusow
Senior Project Manager
CA Registered Geologist #4282

EWA/me

Enclosures

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Prepared for:

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Prepared by:

Dunn Corporation
12 Metro Park Road
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EXECUTIVE SUMMARY

INTRODUCTION

At the request of the American National Can Company (ANCC), Dunn Corporation (DUNN) conducted a subsurface investigation at the ANCC facility in Oakland, California. DUNN prepared a Subsurface Investigation Report (SI Report) in August, 1991 to complete the preliminary phase of this investigation.

This summary report provides an update of DUNN's interpretations of conditions at each of the five areas of the Site, based on information gathered since the completion of the preliminary investigation. The investigation of each of the five areas is now deemed complete as follows:

AREA 1 - FORMER GASOLINE UNDERGROUND STORAGE TANK (UST)

Ground water quality monitoring in Area 1 over the past year, specifically that located immediately downgradient from the former gasoline UST, has revealed no impact to ground water from the UST.

AREA 2 - FORMER HEATING FUEL UST

Additional investigations in Area 2 have included the installation of three monitoring wells and one test well and the completion of three rounds of ground water sampling. Results of these investigations have shown that the water bearing sediments in Area 2 are impermeable relative to the rest of the Site. Ground water moves quite slowly in this area and it appears that any product may be trapped in the relatively impermeable silt and clay sediments and not allowed to migrate to a significant extent. In addition, ground water monitoring results indicate that free product in Area 2 is not dissolving into the ground water to any significant degree. Downgradient ground water monitoring also indicates that no significant levels of contaminants are migrating from Area 2 and, therefore, are not impacting groundwater in other areas of the Site.

AREA 3 - PARKING LOT ADJACENT TO EKOTEK LUBE

Additional investigations in Area 3 have included the installation of three ground water monitoring wells and the completion of three rounds of ground water sampling. Results of these investigations have not altered DUNN's interpretations regarding the source or extent of subsurface impact in Area 3. The lateral extent of ground water and resultant soil contamination is controlled and represented by the axis of the ground water trough which extends from the north end to the southeast corner of Building #12. DUNN maintains its conclusion that the source of soil and ground water contamination in Area 3 is the EKOTEK Lube property.

AREA 4 - FORMER COMPOUND UST AND PIPELINES

Since the completion of the preliminary investigation in Area 4, DUNN has installed 2 new monitoring wells, drilled six test borings, completed three rounds of ground water sampling and performed a soil gas survey. Data gathered from these additional investigations shows

that some contaminated soil exists both immediately north and east of the former compound USTs and along the underground compound pipelines. The extent of the impacted soil is, however, limited as defined by the investigations. Ground water is contaminated in the immediate vicinity of the former compound USTs. However, the investigations show that the extent of this impact is limited and indicate that this impacted ground water is not migrating off site. It appears that perched water in the base fill gravels immediately beneath the concrete driveway slab is contaminated with gasoline-related chemical compounds. The data suggests that this perched water may be recharging ground water within the area of the former compound USTs and, as a result, contributing to the ground water contamination in this area.

AREA 5 - FORMER STEAM CLEANER

Additional investigations in Area 5 have included the collection of shallow soil samples around the former steam cleaning facility and the completion of three additional rounds of ground water sampling. The investigation results show that activities in this area of the Site have not significantly impacted soil or ground water quality.

1.0 INTRODUCTION

In May, 1991, Dunn Corporation (DUNN) completed a subsurface investigation (preliminary investigation) at the American National Can Company's (ANCC) Oakland, California facility (Site). The preliminary investigation was carried out in response to requests made by the Alameda County Department of Health Care Services Agency (Agency) in letters dated December 5 and December 7, 1990. In August, 1991, DUNN submitted a subsurface investigation report (SI report) to the Agency which presented a comprehensive summary of the preliminary investigation.

Since May of 1991, DUNN has completed several additional tasks at the Site. In response to the Agency's requests, DUNN completed three rounds of quarterly ground water monitoring of selected wells. These sampling events were performed in July, 1991; October, 1991 and January, 1992. Each monitoring round included the measurement of ground water levels and product thicknesses, the purging and sampling of any wells not containing free product, and the analysis of samples for area-specific compounds by a California-certified laboratory. DUNN carried out additional drilling programs in September, 1991, and January, 1992 to gather additional subsurface information necessary for both the evaluation of remedial alternatives and for the preparation of remedial plans. Individual data packages generated from each of the events described above were transmitted to the Agency under a cover letter and included figures, summary tables, detailed laboratory analytical reports, ground water contour maps, and copies of test boring and monitoring well completion logs. The methods utilized while carrying out the additional investigations are generally the same as those employed during the preliminary investigation. However, those methods which either have changed since, or were not included as part of, the preliminary investigation are described in this report.

This report provides an update of DUNN's interpretations of subsurface conditions in each of the five areas of the Site. These interpretations are based on the results of additional work conducted since the completion of the preliminary investigation.

2.0 AREA 1 - FORMER GASOLINE UST

The monitoring well network in Area 1 has not been modified since the completion of the preliminary investigation. Well MW-12 is located immediately downgradient from a former gasoline underground storage tank (UST) removed by DUNN in December, 1990. Well GW-5, installed prior to DUNN's preliminary investigation, is located approximately 125 feet upgradient of the former UST. The monitoring wells in Area 1 have been sampled three times since the completion of the preliminary investigation, in July, 1991; October, 1991 and January, 1992.

Analytical results from the three quarterly rounds of sampling performed on well MW-12 revealed no detectable concentrations of Total Petroleum Hydrocarbons as gasoline (TPHg) or of benzene, toluene, ethylbenzene or xylenes (BTEX). The first two samples from well GW-5 (April and July, 1991) also revealed no detectable concentrations of these compounds. With the approval of the Agency, DUNN discontinued the sampling of well GW-5 following the second round.

Based on the analytical results of the four rounds of monitoring, specifically those of well MW-12, DUNN's conclusion is that there has been no impact to ground water quality from the UST.

(1) would like to see final closure report however.

3.0 AREA 2 - FORMER HEATING FUEL UST

3.1 Background

Area 2 is located along the northeast perimeter of the Site in the vicinity of a former underground heating oil tank. DUNN's preliminary investigation of Area 2 included the installation of one upgradient monitoring well (MW-13) and the completion of three soil borings (SB-17, SB-18 and SB-18A). Physical obstructions in Area 2 prevented the installation of downgradient monitoring wells in the yard area. Ground water monitoring in Area 2 revealed the presence of a free product layer in pre-existing well GW-6 and, therefore, this well was not sampled. A parts per billion range concentration of total petroleum hydrocarbons as diesel (TPHd) was detected in the sample collected from MW-13.

Based on the results of activities conducted during the preliminary investigation, DUNN began an evaluation of the feasibility of a product recovery system for Area 2.

3.2 Additional Investigations

Since the completion of the preliminary investigation, DUNN has completed two additional phases of drilling and completed three rounds of ground water sampling. In September, 1991, DUNN completed a second round of drilling in Area 2. The program included the installation of one 6-inch diameter test well (TW-1) and one 4-inch diameter monitoring well (MW-15). During this second phase of drilling, test well TW-1 was installed immediately adjacent to pre-existing well GW-6 to evaluate whether product recovery would be enhanced with a larger diameter well. Observation well MW-15 was installed adjacent to pre-existing soil boring locations SB-18 and SB-18A to determine if product had migrated to this portion of Area 2 and to provide piezometric and ground water quality data.

The test borings for wells MW-15 and TW-1 were drilled with 8 5/8-inch inside diameter (I.D.) hollow stem augers. Soil samples were collected from each boring at depths of 5.0 feet and then again continuously from 8.5 feet to the two boring's total depths.

Each of the two new wells were developed on October 4, 1991, with a 3-inch PVC bailer equipped with a bottom ball valve. A total of five well volumes were removed from well MW-15. Due to very low recovery rates, well TW-1 was purged of only 3 well volumes. All development water was temporarily stored in 55-gallon drums pending proper disposal.

Wells MW-15 and TW-1 were initially sampled during the October, 1991, quarterly round of monitoring. The samples from these wells were analyzed for BTEX, TPHg, TPHd, nickel and zinc. A pumping test on well TW-1 was performed on October 25, 1991. During the test, all four wells in Area 2 were monitored at timed intervals for depth to water and for the presence of product. Wells were also monitored during the recovery of the test well after the pumping was stopped. All ground water removed from the test well during the pump test was discharged directly into 55-gallon drums for temporary storage pending proper disposal.

DUNN completed a third round of drilling in Area 2 in February, 1992 to install two downgradient monitoring wells (MW-17 and MW-21) inside Building #15. These two wells were installed to provide downgradient ground water flow and quality data. Ground water from the two wells was sampled during the week of February 27, 1991. Samples were analyzed for volatile organic compounds (VOCs), semi-VOCs (BNA), TPHg, TPHd, total oil and grease, PCBs, nickel and zinc. Data generated during this round of drilling and well sampling was submitted to the Agency in a report dated March 27, 1992.

3.3 Results

3.3.1 Stratigraphy

Soil samples collected from borings for wells MW-15 and TW-1, as well as from previously drilled borings SB-18 and SB-18A, indicate that fill materials are present from the ground surface to a depth of 10 feet in this vicinity of Area 2. The fill materials consist of a mix of gravel, sand and clayey silt.

Samples collected from below 10 feet in MW-15 and TW-1 were classified as belonging to the fluvial stratigraphic unit identified during the preliminary investigation. As shown by the descriptions of these samples, however, the fluvial unit in this vicinity of Area 2 is much finer grained than in other areas of the Site. Consisting predominantly of silt and clay, with occasional thin layers, partings, and seams of coarser sediments, this unit was most likely deposited in a low energy environment of the fluvial system.

The recent borings drilled for wells MW-17 and MW-21 also encountered the fluvial unit. This unit is composed predominantly of coarse grained sand and fine gravel. The coarser texture of the fluvial unit in the vicinity of these two wells indicates that it was deposited in a higher energy environment than that of the finer sediments associated with the immediate vicinity of Area 2. Considering the nature of fluvial deposition, it is likely that a fairly abrupt transition in the fluvial unit exists somewhere between TW-1 and MW-21.

3.3.2 Hydrogeology

As discussed in Section 3.3.1, the fluvial unit in the vicinity of MW-15 and TW-1 is very fine grained and dense whereas the unit is coarse-textured near wells MW-17 and MW-21. It would, therefore, be expected that the fluvial unit would be much less permeable near wells MW-15 and TW-1 than at wells MW-17 and MW-21. On October 25, 1991, DUNN performed a pumping test on well TW-1. Based on data obtained during previous development and purging, the well was pumped with a discharge rate of only 0.2 gallons per minute (gpm). Table 1 presents the results obtained during the pumping test. A steady water level drawdown rate of approximately 0.05 ft/min. was achieved at the pump discharge rate. However, prior to reaching a static water level drawdown, the pump lost lift and discontinued pumping. Therefore, a maximum sustainable pumping rate for the well was not obtained during the test. The test results do indicate that such a rate would be extremely low, probably not in excess of 0.2 gpm. It was noted that prior to the start of the test, well GW-6 did not contain any product. However, as the water level in

TABLE 1
AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA PLANT

Area 2 Pumping Test Results - October 25, 1991
PUMPING WELL: TW-1

TIME		TW-1		GW-6				MW-15		MW-13	
Actual	Elapsed	DTW	DD	DTP	DTW	DD	PT	DTW	DD	DTW	DD
9:24	0	13.11	0.00								
9:28	0									11.65	0.00
9:29	0							13.22	0.00		
9:52	0				15.11	0.00					
10:16	0	Start pump									
10:23	0:07	14.23	1.12								
10:24	0:08				15.23	0.12					
10:25	0:09	14.31	1.20								
10:26	0:10				15.23	0.12					
10:27	0:11	14.40	1.29								
10:29	0:13							13.21	-0.01		
10:30	0:14	14.51	1.40								
10:31	0:15				15.26	0.15					
10:32	0:16	14.61	1.50								
10:33	0:17				15.28	0.17					
10:34	0:18	14.68	1.57								
10:36	0:20									11.54	-0.11
10:39	0:23							13.21	-0.01		
10:40	0:24	14.88	1.77								
10:45	0:29				15.37	0.26					
10:50	0:34	15.53	2.42								
10:52	0:36				15.43	0.32					
10:53	0:37									11.51	-0.14
10:54	0:38							13.21	-0.01		
10:55	0:39	15.85	2.74								
10:57	0:41				15.46	0.35					
11:00	0:44	16.10	2.99								
11:05	0:49	16.42	3.31								
11:07	0:51				15.59	0.48					
11:09	0:53							13.22	0.00		
11:10	0:54	16.70	3.59								
11:17	1:01				15.74	0.63					
11:20	1:04	17.20	4.09								
11:23	1:07									11.48	-0.17
11:27	1:11				15.90	0.79					
11:30	1:14	17.57	4.46								
11:39	1:23							13.22	0.00		
11:40	1:24	17.90	4.79								
11:42	1:26				16.16	1.05					
11:50	1:34	18.05	4.94								
11:53	1:37									11.44	-0.21
12:02	1:46				16.55	1.44					
12:07	1:51	18.75	5.64								
12:09	1:53							13.22	0.00		
12:10	1:54	Pump off, lost lift									

TABLE 1 (continued)
AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA PLANT

Area 2 Pumping Test Results - October 25, 1991
PUMPING WELL: TW-1

TIME		TW-1		GW-6				MW-15		MW-13	
Actual	Elapsed	DTW	DD	DTP	DTW	DD	PT	DTW	DD	DTW	DD
12:15	1:59	18.70	5.59								
12:16	2:00				16.73	1.62					
12:20	2:04	18.54	5.43								
12:21	2:05				16.80	1.69					
12:25	2:09	18.37	5.26								
12:26	2:10				16.88	1.77					
12:30	2:14	18.26	5.15								
12:31	2:15				16.92	1.81					
12:40	2:24	18.00	4.89								
12:41	2:25				17.03	1.92					
12:50	2:34	17.76	4.65								
12:51	2:35			17.12	17.13	2.01	0.01				
12:53	2:37							13.23	0.01		
13:10	2:54	17.32	4.21								
13:11	2:55			17.21	17.27	2.10	0.06				
13:20	3:04	Pump restarted									
13:25	3:09	17.40	4.29								
13:30	3:14	17.39	4.28								
13:33	3:17	Pump lost lift									
13:40	3:24	17.19	4.08								
13:41	3:25			17.28	17.44	2.17	0.16				
13:50	3:34	17.00	3.89								
13:51	3:35			17.29	17.46	2.18	0.17				
14:50	4:34	16.07	2.96	Removed some product with bailer							
14:51	4:35			17.13	17.17	2.02	0.04				
15:10	4:54	15.81	2.70								
15:40	5:24	15.48	2.37								
15:41	5:25			17.01	17.02	1.90	0.01				
16:10	5:54	15.19	2.08								
16:11	5:55				16.84	1.73					
16:40	6:24	14.93	1.82								
16:41	6:25				16.67	1.56					
17:10	6:54	14.72	1.61								
17:11	6:55				16.52	1.41					

Notes: Approximate pump discharge rate throughout test was 0.20 gallons per minute.
DTW = Depth to water below measuring point.
DTP = Depth to product below measuring point.
DD = Drawdown in water level.
PT = Apparent product thickness.

GW-6 lowered to approximately 17 feet in response to the pumping of TW-1, product began to enter the well casing.

Monitoring wells MW-17 and MW-21 were developed on February 6, 1992. These wells were developed by removing 20 well casing volumes of water with a centrifugal pump. The pump was run at a high speed and a discharge rate of between 3 and 3.5 gpm was obtained from each well, over the duration of the development. The water level in each well was monitored prior to turning off the pump and the drawdown resulting from the pumping was less than 1.0 foot in each case. Considering that these two wells are only 2 inches in diameter, this pumping data indicates that, in this area, the fluvial unit is considerably more permeable than it is near well TW-1.

Based on water level measurements recorded on February 25, 1992, the ground water elevations in wells MW-13, MW-15, GW-6 and TW-1 are significantly higher than those in the newly installed wells MW-17 and MW-21. However, the ground water elevations of MW-17 and MW-21 are only slightly higher than those recorded for wells in Area 3 and Area 4 further to the south where, as test boring data indicates, the fluvial unit is of similar composition to that of MW-17 and MW-21. DUNN's interpretation of this phenomenon is that the significant difference in the ground water elevation between the other wells of Area 2 and wells MW-17 and MW-21 is caused by stratigraphic changes in the fluvial unit. The relatively impermeable sediments restrict ground water flow, preventing the recharge water from draining from the sediments; whereas the more permeable sediments represent an area of preferred ground water flow and, as such, do not support high ground water elevations. Steep ground water gradients exist in the vicinity of MW-13, MW-15, GW-6 and TW-1 as a result of the proximity of the more permeable fluvial unit. The gradient fluctuates somewhat due to seasonal changes in recharge. The concept postulated in the SI report that the steep gradient is the result of precipitation only is no longer considered viable.

Table 2 provides a summary of the ground water gradients calculated between wells MW-13 and GW-6 at various times during the year. The data in this table shows that as ground water elevations at the site decrease following the end of the region's wet season (April, May, June and July, 1991 data), the gradient in Area 2 continues to increase (steepen). At some time prior to the end of the dry season, the gradient begins to decrease (flatten) (October, 1991 data). As the region's wet season progresses, the gradient decreases even more as exhibited by the February, 1992 data. Fluctuations in the steepness of the gradient relative to seasonal climatological changes appear to support the concept that the gradient is caused by sediment permeability conditions to the south of TW-1.

3.3.3 Analytical

Soil

During the second round of drilling, one soil sample from the boring for well MW-15 (MW-15, S-2) and 3 soil samples from the boring for well TW-1 (TW-1, S-1; TW-1, S-2; and TW-1, S-4) were analyzed for TPHg, TPHd and BTEX by California LUFT Methods. These samples were selected based on photoionization detector (PID) headspace screening of all soil samples collected from the borings. Sample TW-1, S-2, collected at a depth of 9.25 feet was

TABLE 2

AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA, FACILITY

Summary of Ground Water Gradients - Area 2

PLATE NUMBER	DATE	GROUND WATER ELEVATIONS		GRADIENT (ft/ft)
		MW-13	GW-6	
2	April 16, 1991	9.15	6.43	(9.15 - 6.43)/54 = 0.050
3	May 15, 1991	8.84	5.86	(8.84 - 5.86)/54 = 0.055
4	June 17, 1991	8.58	5.54	(8.58 - 5.54)/54 = 0.056
5	July 15, 1991	8.36	5.28	(8.36 - 5.28)/54 = 0.057
6	Oct. 21, 1991	7.29	4.79	(7.29 - 4.79)/54 = 0.046
9	Feb. 25, 1992	9.57	7.28	(9.57 - 7.28)/54 = 0.042

Notes: Elevations are expressed in feet above mean sea level.
Gradients equal the change in ground water elevation from MW-13 to GW-6 divided by the distance between the wells (54 ft).
Plate number indicates the ground water contour map previously submitted to the agency.

reported to have concentrations of TPHg and TPHd of 870 and 1,100 mg/Kg (ppm), respectively, and a xylene concentration of 3.9 ppm. The target compounds were either not detected or detected at very low concentrations in samples MW-15; S-2, TW-1; S-1 and TW-1; S-4. These analytical results were previously reported on January 13, 1992.

Ground Water

Since the preliminary investigation, DUNN has completed three quarterly rounds of ground water sampling (July, 1991, October, 1991, and January, 1992) in Area 2. In February, 1992, DUNN completed a preliminary sampling round of the newly installed wells MW-17 and MW-21.

Wells MW-13 and GW-6 were sampled in July, 1991. Low concentrations of VOCs, BNAs and TPHd were detected in the sample from GW-6. It should be noted, however, that free product was removed from GW-6 prior to the sampling. The July, 1991, analytical results for MW-13 revealed only the presence of TPHd, nickel and zinc.

In October, 1991, wells MW-15 and TW-1 were sampled along with well MW-13 as part of the third round of quarterly sampling. It should be noted that DUNN elected not to sample well GW-6 due to the presence of free product. However, well TW-1, which is located within 5 feet of GW-6, did not contain any measurable free product and thus was included in the sampling. In accordance with DUNN's October 11, 1991 letter to the Agency, these wells were sampled for BTEX, TPHg, TPHd, nickel and zinc. TPHd was detected in all three wells with the highest concentration at parts-per-billion levels reported for well TW-1. BTEX and TPHg was not detected in any of the samples analyzed. A high concentration of zinc was again detected in MW-13; however, this was the only significant concentration of zinc detected in Area 2.

In January, 1992, the Area 2 sampling and analysis plan was identical to that of October, 1991. Again, TW-1 did not contain any free product. The analytical results were consistent with those from October, 1991, with TPHd detected in all three samples. Nickel and zinc were also detected in sample MW-13. Overall, the concentrations detected were slightly higher than those reported from the October round of sampling.

In February 1992, the newly installed Area 2 downgradient wells MW-17 and MW-21 were sampled for the first time. Since these wells were being sampled for the first time, the samples were analyzed for VOCs, BNAs, TPHg, TPHd, total oil and grease, PCBs, nickel and zinc. Analytical results revealed slight concentrations of TPHd in both wells and a low estimated concentration (at ppb concentrations) of pentachlorophenol in the sample from MW-17. MW-17 was installed through a railroad bed which enters Building #11 from the south. The pentachlorophenol and diesel reported in the sample from this well is probably related to this railroad bed, from the preserved ties and historical uses.

3.4 Summary

As discussed in Section 3.3, the steep ground water gradient and the apparent low permeability indicates that ground water moves quite slowly, if at all, in the immediate

vicinity of Area 2. The continued presence of free product in well GW-6 so long after the removal of the source supports this supposition. The presence of product in well GW-6 after the water level dropped during the pumping test and the continued absence of product from well TW-1, indicates that the product may not be very mobile and may be essentially trapped in partings, seams and voids contained within the relatively impermeable silt and clay sediments.

The ground water analytical results show that the ground water in Area 2 does not contain significantly high concentrations of petroleum compounds. The July, 1991, water sample from GW-6 containing 29,000 ppb of TPHd, was contaminated by the free product in the well. TW-1, located within 5 feet of GW-6, has not been shown to contain more than 3,000 ppb of TPHd. TW-1 represents true downgradient ground water quality untainted by free floating product. This data indicates that the product present in Area 2 may not be dissolving into the ground water to any significant degree.

The latest monitoring well installed in Area 2, MW-21, is directly downgradient from GW-6 and TW-1. This well monitors potential downgradient migration of ground water contaminants from Area 2. The first round of analytical results (February, 1992) from this well indicate that no significant levels of contaminants are migrating downgradient from Area 2 and, therefore, are not contributing to the ground water impact identified in other areas of the Site.

4.0 AREA 3 - PARKING LOT ADJACENT TO EKOTEK LUBE

4.1 Background

Area 3 represents the eastern section of the Site and includes ANCC's Lithography Building (Building #12) and the former parking area between this building and the EKOTEK Lube property. Results of DUNN's preliminary investigation revealed that soil and ground water in Area 3 are severely impacted. Based on the results of the preliminary investigation, DUNN concluded that the source of soil and ground water impact is the EKOTEK Lube property and that the western limit of this impact is located on ANCC property, beneath Building #12.

4.2 Additional Investigations

Since the completion of the preliminary investigation, DUNN has completed three rounds of quarterly ground water monitoring in Area 3, as described in Section 1.0. DUNN completed an additional investigation in February, 1992. The purpose of this second phase of drilling and sampling was to provide information to:

- determine the extent to which Area 3 ground water contamination extends beneath ANCC's property;
- determine if impacted ground water from other areas of the Site are contributing to the level of impact identified in Area 3; and
- further characterize ground water flow conditions beneath Building #12.

The additional investigation included the installation and sampling of three ground water monitoring wells (MW-18, MW-19 and MW-20).

4.3 Results

4.3.1 Stratigraphy

Test borings drilled for the installation of wells MW-18, MW-19 and MW-20 penetrated tidal marsh and fluvial stratigraphic units. Analysis of soil samples from these borings indicate that the fluvial unit is relatively coarse textured and permeable beneath Building #12. Although thin layers of finer grained sediments were found to be present, they are characteristic of the unit in general and are not expected to be laterally extensive. The composition of the unit at these wells appears to be generally similar to that identified in Area 2 wells MW-17 and MW-21, and in other Area 3 and Area 4 wells.

4.3.2 Hydrogeology

Data obtained from the newly installed Area 3 wells (MW-18, MW-19 and MW-20) support the ground water flow regime depicted in DUNN's SI report. However, data gathered from the quarterly rounds of ground water monitoring provides for a more detailed characterization of the Area 3 flow regime. Based on those results, this section discusses the character of the flow regime and the variations that it exhibited throughout the past year.

Ground water contour maps prepared from each quarterly round of monitoring show that ground water flows predominantly in a south-southeast direction beneath most of the ANCC property (regional flow). The maps also show the presence of a ground water mound (mound) near the ANCC/EKOTEK Lube property line from which some components of radial ground water flow are in a northwest direction, and enters the ANCC property. An area of low ground water elevations (ground water trough) exists between these opposing ground water flow directions. This ground water trough, which appears to encircle the north and west perimeter of the mound, captures ground water from the mound and redirects it around the mound back to the regional (south-southeast) flow direction. The inferred axis of this ground water trough, as shown on the October, 1991, (Plate 6) and February, 1992, (Plate 9) ground water contour maps, appears to extend from the north end of Building #12 near wells MW-1 and MW-7, to the southeast corner of Building #12, near well GW-2. The axis of the ground water trough represents a hydraulic barrier across which ground water and accompanying contaminants do not flow.

Table 3 provides a summary of ground water gradients calculated between two sets of Area 3 wells (MW-2 to MW-4 and MW-3 to GW-2). The data shows that the mound flattens as ground water elevations at the Site decrease during dry periods. However, the data shows that the mound does not disappear at any time during a dry season. Thus, it is suspected that sources of recharge other than direct precipitation may be causing this mound to exist. Specifically, the physical features of the EKOTEK Lube property (i.e., open sumps, drains, and spill containment structures) previously discussed in the SI Report, are likely collecting and concentrating precipitation ,thereby increasing ground water recharge.

As ground water elevations at the Site vary on a seasonal basis, the location of the axis of the trough may shift laterally between wells MW-1 and MW-7. However, at the southeast corner of Building #12, the axis has appeared to be very close to well GW-2 during all rounds of ground water monitoring as the ground water elevation of GW-2 has always been lower than that of MW-6.

Ground water elevations of the three newly installed wells (MW-18, MW-19 and MW-20), as shown on Plate 9, fit the ground water flow regime presented in this report. Furthermore, they confirm that the axis of the trough exists beneath Building #12.

If the ground water high is a mound, as DUNN interprets, a ground water divide must exist on its northwest side and lie perpendicular to the trough beneath Building #12. Ground water within the trough on opposing sides of the divide would flow in opposite directions around the perimeter of the mound. It appears that as ground water recharge conditions and resulting ground water elevations in the region change, the location of this divide also changes. April, May and June 1991 data (Plates 2, 3 and 4) indicate that the

TABLE 3

AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA, FACILITY

Summary of Ground Water Gradients - Area 3

PLATE NUMBER	DATE	GROUND WATER ELEVATIONS		GRADIENT (ft/ft)
		MW-2	MW-4	
2	April 16, 1991	5.91	3.27	(5.91 - 3.27)/87 = 0.030
3	May 15, 1991	4.81	2.91	(4.81 - 2.91)/87 = 0.022
4	June 17, 1991	4.36	2.69	(4.36 - 2.69)/87 = 0.019
5	July 15, 1991	4.12	2.50	(4.12 - 2.50)/87 = 0.019
6	Oct. 21, 1991	3.28	2.00	(3.28 - 2.00)/87 = 0.015
9	Feb. 25, 1992	5.92	3.99	(5.92 - 3.99)/87 = 0.022

PLATE NUMBER	DATE	GROUND WATER ELEVATIONS		GRADIENT (ft/ft)
		MW-3	GW-2	
2	April 16, 1991	6.29	2.65	(6.29 - 2.65)/83 = 0.044
3	May 15, 1991	5.82	2.35	(5.82 - 2.35)/83 = 0.042
4	June 17, 1991	5.27	2.12	(5.27 - 2.12)/83 = 0.038
5	July 15, 1991	5.03	2.04	(5.03 - 2.04)/83 = 0.036
6	Oct. 21, 1991	3.97	1.67	(3.97 - 1.67)/83 = 0.028
9	Feb. 25, 1992	6.39	3.65	(6.39 - 3.65)/83 = 0.033

Notes: Elevations are expressed in feet above mean sea level.
Plate number indicates the ground water contour map previously submitted to the agency.
Regions wet season = October 1 to April 1.
Regions dry season = April 1 to October 1.

divide extends northwest of well GW-1, and that ground water flows in the trough from MW-7, beneath Building #12 to GW-2. October, 1991, (Plate 6) and February, 1992, (Plate 9) data indicate that the divide has swung onto the property perpendicular to Building #12. Under this condition, ground water in the vicinity of wells GW-1, MW-1, MW-2, MW-4, and MW-7 appears to flow in a northeasterly direction in the trough while south of the divide, flow continues to be in a southerly direction towards well GW-2.

4.3.3 Analytical

Soil

Soil samples collected from the borings for wells MW-18, MW-19 and MW-20 were screened by headspace analysis technique with a photoionization detector (PID). PID results indicate that the soil above the water table has been impacted in well MW-19 but not in wells MW-18 and MW-20. Soil samples from these three borings were not analyzed at an analytical laboratory.

Ground Water

Area 3 monitoring wells were sampled as part of the three quarterly ground water monitoring rounds (July, 1991, October, 1991 and January, 1992). Following the July, 1991 round of monitoring, wells found to contain product (GW-1, MW-2 and MW-5) were not sampled as representative ground water samples could not be collected. Analytical results from the three rounds were consistent with the April, 1991, results.

Wells MW-18, MW-19 and MW-20 were sampled for the first time in February, 1992. The wells were sampled for Area 3 parameters including VOCs, BNAs, TPHg, TPHd, total oil and grease, and PCBs. With the exception of a low estimated concentration of tetrachloroethene in MW-20, none of the target parameters were detected in the samples from MW-18 or MW-20. Concentrations of VOCs, BNAs, TPHg, TPHd and total oil and grease were detected in the MW-19 sample; however, PCBs were not detected. The VOCs and BNAs detected in the MW-19 sample were the same as those detected in other Area 3 wells.

4.4 Summary

Based on the data gathered in Area 3 since the completion of the preliminary investigation, DUNN interpretations and conclusions regarding subsurface conditions have not changed from those outlined in the SI Report. Based on the ground water flow regime and analytical results, DUNN concludes that the EKOTEK Lube property is the source of Area 3 soil and ground water contamination.

Based on the ground water flow regime presented in Section 4.3.2, the axis of the ground water trough represents a hydraulic barrier across which ground water does not flow. As a result, it is concluded that the axis of the trough represents the lateral extent of ground water contamination, and associated soil impact, present between ANCC Building #12 and

the EKOTEK Lube property. Additionally, based on the first round of ground water analytical results from newly installed wells MW-18, MW-20, and MW-21, groundwater flowing into Area 3 from the northwest is not contaminated. As a result, it is concluded that ANCC is not contributing to subsurface contamination identified in Area 3.

5.0 AREA 4 - FORMER COMPOUND USTS AND PIPELINES

5.1 Background

Area 4 is located on the southern perimeter of the Site. It generally includes the vicinity of the compound storage building and extends along underground product pipelines to the Lithography building (Building #12).

Prior to 1980, a 500 gallon gasoline UST was reportedly removed from service and permanently closed in-place. In 1987, a group of seven USTs used for the storage of various coating-related products were removed from the area immediately east of the Compound Storage building. It was reported that due to the presence of an 8-inch underground propane pipeline, all of the contaminated soil could not be removed during the excavation of these tanks. In addition, the buried product pipeline used to transfer product from the tanks to Building #12 was not removed.

In 1989, a Phase I site investigation was conducted at the Site. As part of that investigation, a ground water monitoring well (GW-3) was installed in the vicinity of the former group of USTs and five (5) shallow soil samples were collected along the buried product pipeline.

During the preliminary investigation, DUNN installed three (3) ground water monitoring wells (MW-8, MW-9 and MW-10) to evaluate soil and ground water quality in Area 4. Based on the results of the preliminary investigation DUNN concluded that both the near surface soil in the vicinity of the buried product pipelines and the soil and ground water near GW-3 are impacted with volatile organic compounds.

5.2 Additional Investigations

In June, 1991, DUNN conducted a soil gas survey along the buried product pipeline. The purpose of the survey was to evaluate the extent of shallow soil contamination around the pipeline. The survey included the installation and sampling of 31 monitoring points. Each monitoring point consisted of a 3/8-inch diameter driven probe hole, to a depth of approximately 2-feet below grade. The annular space between the tube and the probe hole was sealed with a bentonite paste. Following installation, a suction bulb was used to draw air from the pore spaces of the soil into the aluminum tube. A PID was then attached to the top of the tube and, while drawing air from the tube, the highest reading was recorded.

In September, 1991, DUNN completed a second phase of drilling in Area 4. This phase included the drilling of five soil borings (SB-4-1 through SB-4-4 and SB-4-6) and the drilling and installation of two ground water monitoring wells (MW-14 and MW-16). The soil borings were drilled to a depth of approximately 10-feet to determine the extent of residual soil contamination in the vicinity of well GW-3. Wells MW-14 and MW-16 were installed immediately downgradient and upgradient, respectively, of well GW-3 to further evaluate the extent of ground water impact in this area. The wells were installed within the fluvial stratigraphic unit. While attempting to drill MW-16, perched water with gasoline odor was encountered in a layer of gravel immediately beneath the concrete slab of the driveway and

above the tidal marsh deposit. A grab sample of this water (MW-1S) was collected and analyzed for BTEX and TPHg.

MW-16 was subsequently installed approximately 8-feet north of the MW-1S sampling location. The perched water discussed above was again encountered in MW-16. However, a 10-inch steel casing was installed to 3.0 feet below grade and cemented in place and the boring for MW-16 was subsequently drilled inside this casing. The casing was installed to prevent the perched water from impacting subsurface soils and ground water during drilling. Data generated during this second phase of drilling was submitted to the Agency in a summary report dated January 13, 1992.

Since the completion of the preliminary investigation, DUNN has completed three quarterly rounds of ground water monitoring in Area 4 (July, 1991, October, 1991, and January, 1992). The July, 1991, sampling and analysis plan was identical to that of the preliminary investigation. However, in the October, 1991, round, wells MW-14 and MW-16 were added to the sampling program. Based on April and July analytical results, the target parameters were reduced in number for the October, 1991, and January, 1992, sampling rounds. The revisions to the Area 4 sampling plan were approved by the Agency.

5.3 Results

5.3.1 Stratigraphy

Subsurface soil samples collected from soil borings drilled during the recent phases of drilling in Area 4 provided information necessary to characterize the stratigraphy in the vicinity of the compound storage building. All the soil borings encountered fill materials and/or the tidal marsh deposit overlying the fluvial stratigraphic unit.

Soil borings SB-4-1 and SB-4-2 penetrated 10-feet of fill associated with the previous excavation and removal of the seven USTs. This fill was also encountered in borings SB-4-3 and MW-14 from the surface to depths of 5.9 feet and 3.0 feet, respectively. The fill consisted of moderately well-sorted medium-to-fine sand.

The tidal marsh deposit was encountered in borings SB-4-4, SB-4-6, MW-14 and MW-16. The tidal marsh is similar in composition to other areas of the site. It consists of black silty clay. It is highly organic, very dense and is very plastic. The tidal marsh has been removed in the area near GW-3 where the former USTs were removed.

An 0.7-foot thick layer of fill was encountered in MW-16 between the base of the concrete pad driveway and the top of the tidal marsh unit. This base fill material consists of coarse sandy gravel and is expected to underlie the entire concrete pad. The thickness of this layer is unknown and may vary.

The upper 15-feet of the fluvial unit was penetrated in borings MW-14 and MW-16. Soil sample descriptions indicate that the unit is generally coarse-textured, consisting predominantly of coarse-to-fine sand with traces of silt and gravel. Above the ground water table, the unit is fairly dense and fine-grained.

5.3.2 Ground Water

The water table in Area 4 is present at a depth of approximately 10 feet below grade. Ground water contour maps produced from water level measurements recorded over the past year show that ground water flows generally in a southerly direction. The ground water gradient in the area is very small. From ground water elevations between MW-10 and GW-3 over the past year, an average gradient of 0.002 ft/ft exists in the area.

The layer of perched water was found to exist in the base fill gravel beneath the concrete pad driveway. The perched water was encountered at drilling locations MW-1S and MW-16. It is expected that the water in this layer of gravel has come from precipitation that has infiltrated cracks in the concrete or from leaks in drain pipes that connect the plant's roof drains to the storm sewer network. It appears that the relatively impermeable underlying tidal marsh unit is perching this water and preventing it from infiltrating to the water table. Due to the absence of the tidal marsh unit in the vicinity of the group of former USTs, the perched water may be permitted to infiltrate to the water table through the backfill in the former UST excavation.

5.3.3 Analytical

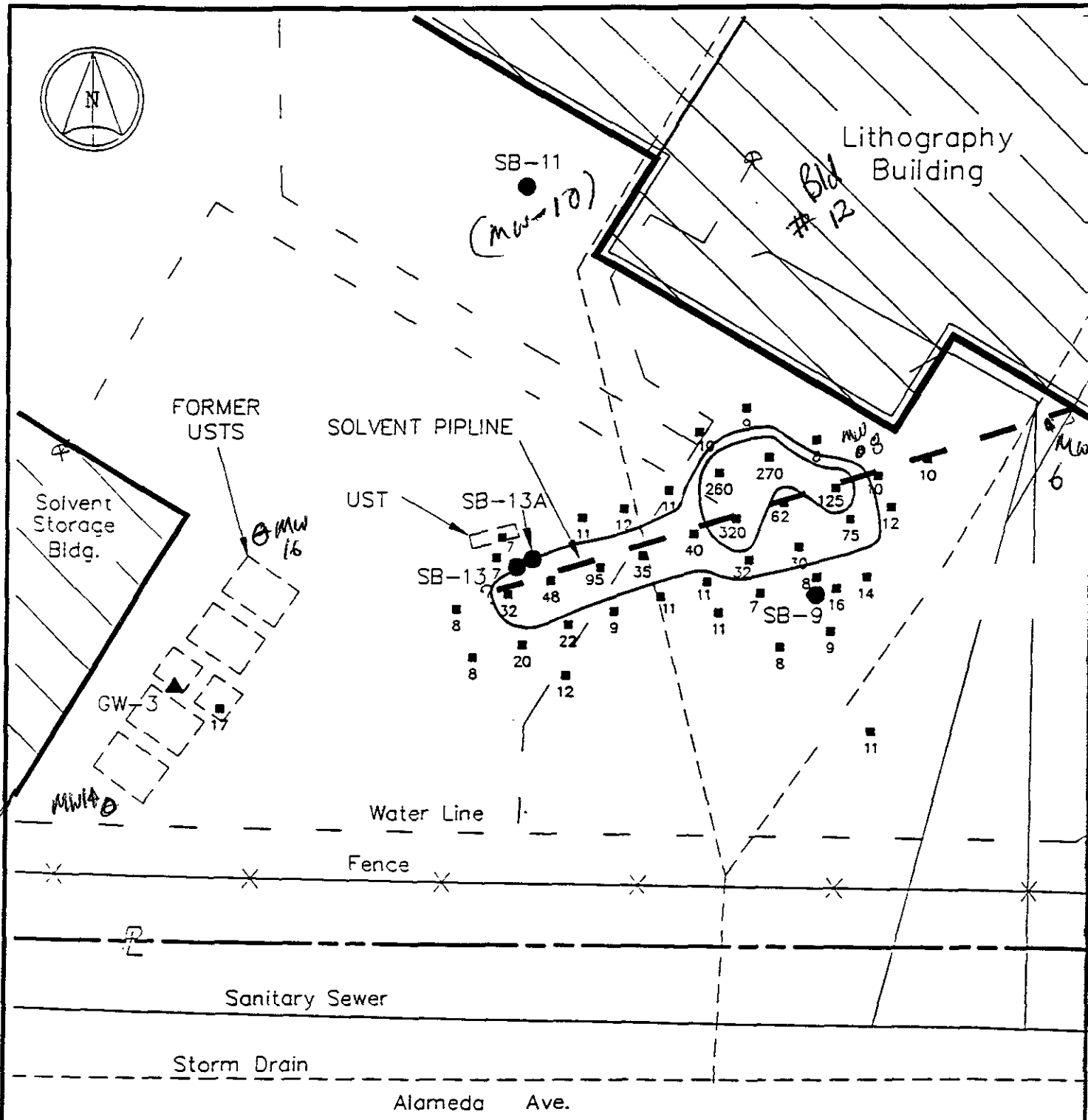
Soil

Figure 1 provides a summary of the soil gas survey conducted along the product pipeline. This map depicts the locations that were sampled and provides the maximum PID reading recorded at each of the locations. The readings recorded ranged from a high of 320 to a low of 7. The highest levels were recorded immediately adjacent to the product pipeline. It appears that levels below 30 are equal to site background conditions and represent the lateral extent of impact.

Selected soil samples collected during the second phase of drilling in Area 4 were analyzed at an off-site laboratory for BTEX and TPHd. The samples selected for analysis were based on PID headspace screening results and stratigraphy. Only samples of natural sediments that appeared to exhibit impact were analyzed. This procedure was used to determine the extent to which contaminated soil was not removed during previous excavation of the group of USTs.

PID headspace screening results of borings SB-4-2 and SB-4-7 indicate that the soil along the north and west sides of the excavation of the former tank was not completely remediated.

Selected soil samples from SB-4-3, SB-4-6, MW-14 and MW-16 were analyzed. The sample from SB-4-3, collected just above the water table exhibited a very low concentration of toluene and total xylenes. The shallow (5.75') sample from MW-14 was reported to contain TPHd and total xylenes. However, the deeper sample from MW-14 (9.25') contained only



LEGEND

■ Soil Gas Sample Point
21 HNU Reading

DUNN CORPORATION
12 Metro Park Road
Albany, NY 12205

SOIL GAS SURVEY RESULTS
AREA 4
ANC – OAKLAND

PROJECT NO 02345-01983 | DATE June 1991 | SCALE IN FEET 0 15 30

A89H5A4A

TPHd with no xylenes. Two samples analyzed from SB-4-6 and MW-16 exhibited none of the target compounds.

Ground Water

The July, 1991, ground water analytical results were consistent with those of April, 1991. VOCs and BNAs were not detected in wells MW-8, MW-9 and MW-10. Xylenes, ethylbenzene, toluene, and various BNAs were detected in GW-3. Some of the targeted metals were detected at low concentrations within each of the four wells sampled.

During the October, 1991, round of ground water sampling, wells MW-8, MW-9 and MW-10 were sampled for selected metals only. Newly installed wells MW-14 and MW-16 and existing well GW-3 were also analyzed for the VOCs and BNAs. No VOCs or BNAs were detected in MW-14 or MW-16. The October analysis revealed xylenes, ethylbenzene and the various BNAs in sample GW-3. All concentrations were substantially reduced from those reported in July. The metals results of all the six Area 4 wells were at insignificant concentrations, with the filtered samples being below the Primary and Secondary National Drinking Water Regulations as promulgated under the Safe Drinking Water Act (SDWA).

During the January, 1992, round of quarterly monitoring, the Area 4 wells were not sampled for metals. As a result, wells MW-8, MW-9 and MW-10 were not sampled. Analytical results again revealed concentrations of xylenes, ethylbenzene, toluene and various BNAs in GW-3. GW-3 was also reported to have concentrations of TPHg. With the exception of parts per billion concentrations of xylenes reported in MW-16, no VOCs or BNAs were detected in samples MW-14 or MW-16. TPHg was not detected in MW-14 or MW-16.

During the September phase of Area 4 drilling, a sample of the perched water (MW-1S) present in the base fill gravel beneath the concrete pad driveway was collected and analyzed for VOCs and BNAs. The analytical results of this sample, submitted to the Agency in a report dated January 13, 1992, revealed the presence of xylenes, ethylbenzene, 4-methylphenol, naphthalene and bis(2-ethylhexyl)phthalate.

5.4 Summary

Based on data gathered during the additional phases of drilling in Area 4, there appears to be some contaminated soil present in the north and east walls of the former excavation for the removal of the group of compound USTs. However, it appears that the remainder of the contaminated soil was adequately remediated during the removal of these tanks.

Based on the soil gas survey results, it appears that the lateral extent of impacted soil near the product pipelines is confined to an area immediately adjacent to (within 5 feet) of the pipeline. There appears to be a slightly more widespread lobe of impacted soil near the middle of the pipeline. The tidal marsh unit in the area most likely limits the vertical extent of this impact to a depth of about 3 feet.

Analytical results obtained over the past year indicate that the ground water in the immediate vicinity of the former compound USTs is impacted with VOCs and BNAs.

Analytical results of well MW-14 indicate that the impacted ground water has not migrated downgradient from the area. As a result, it appears that the impacted ground water is limited in areal extent and possibly confined to the backfilled excavation of the former compound USTs.

The perched water layer beneath the concrete pad driveway may be recharging ground water within the area of the former compound USTs. The analytical results of MW-1S indicate that this water is impacted. As a result, this water potentially represents a source of the ground water impact identified in well GW-3.

6.0 AREA 5 - FORMER STEAM CLEANER

6.1 Background

Area 5 represents the area in the immediate vicinity of the Site's former steam cleaner facility. During a Phase I investigation conducted in 1989, a shallow soil sample (SC-1-2C) collected near the steam cleaner facility reported the presence of TPH. A downgradient monitoring well (GW-4) did not reveal any ground water impact. As part of the preliminary investigation, DUNN drilled soil borings (SB-14 and SB-16) to validate the TPH concentration previously discovered and installed a downgradient monitoring well (MW-11) to determine if ground water in this area of the site is impacted.

Based on the results of the preliminary investigation, DUNN concluded that previous activities in the area may have impacted ground water quality slightly, but that the level of impact is low. Soil analytical results did not validate the TPH concentrations previously reported.

6.2 Additional Investigations

In June, 1991, DUNN collected shallow soil samples from hand augered borings on the east, south and north sides of the steam cleaner facility. These samples were analyzed for VOCs and total petroleum hydrocarbons. This round of sampling confirmed the findings of the preliminary investigation that soil in the area was not impacted. Analytical results were submitted to the Agency in a letter dated August 7, 1991.

Since the completion of the preliminary investigation, DUNN has completed three quarterly rounds of ground water monitoring in Area 5. Well MW-11 was sampled during each of the three rounds. Following the approval of the Agency, DUNN reduced the analytical list for well MW-11 and did not sample well GW-4 during the last two quarterly monitoring rounds (October, 1991, and January, 1992).

6.3 Results

Considering that no additional drilling has taken place in Area 5 since the completion of the preliminary investigation, DUNN has not revised any of its interpretations regarding the stratigraphy and hydrogeology in this vicinity of the Site.

6.3.1 Analytical

Soil

The four soil samples collected around the steam cleaner in June, 1991 contained low concentrations of total petroleum hydrocarbons. Total VOC concentrations were low with the primary compound detected (acetone) also detected in the laboratory blank sample.

Ground Water

The July and October, 1991, and January, 1992, VOC analysis of MW-11 revealed tetrachloroethene at concentrations below the method detection limit. An estimated concentration of 1,2-dichlorobenzene was also detected in MW-11 during the January, 1992, round of monitoring. The presence of part per billion concentrations of TPHd and lead were reported in October, 1991, for MW-11. However, the TPHd was not detected in the January, 1992, analysis.

6.4 Summary

The soil analytical program carried out over the past year has not confirmed the concentrations of total petroleum hydrocarbons reported during the Phase I investigation previously completed in Area 5. It appears that the soil in the vicinity of the steam cleaner is not significantly impacted.

The ground water analytical results obtained over the past year indicate that ground water in Area 5 has not been significantly impacted by previous activities at the steam cleaner. The estimated concentration of tetrachloroethene have been equal to or below both the United States Environmental Protection Agency (USEPA) and California Department of Health Care Services maximum contaminant level (MCLs) of 5 ppb for drinking water. The recently detected low concentration of 1,2-dichlorobenzene is anomalous as it was only detected once in four rounds of sampling. Regardless, the concentration is very low in relation to the USEPA MCL of 600 ppb for drinking water.

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June 26, 1992

Mr. Dennis J. Byrne
Senior Hazardous Materials Specialist
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, CA 94621

Dear Mr. Byrne:

Subject: Subsurface Investigation Summary Report
ANC Oakland, CA, Facility

Enclosed please find a copy of the subject report. The report updates DUNN's interpretations of the findings of our investigation of subsurface conditions at the plant. This report precedes the soil and ground water remedial workplans, which address the subsurface conditions, and which will be forwarded for your review in the near future.

Please call me with your questions and comments.

Very truly yours,

DUNN CORPORATION

Edward W. Alusow

Edward W. Alusow
Senior Project Manager
CA Registered Geologist #4282

EWA/me

Enclosures

cc: Mr. Rich Hiatt
San Francisco Bay Regional Water Quality Ccontrol Board
1800 Harrison Street, Suite 700
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J. Peters, ANCC
J. Moran, ANCC

92 JUN 30 PM 1:33

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SUBSURFACE INVESTIGATION SUMMARY REPORT
AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA, FACILITY

Prepared for:

American National Can Company
Chicago, Illinois

Prepared by:

Dunn Corporation
12 Metro Park Road
Albany, New York

June, 1992

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EXECUTIVE SUMMARY

INTRODUCTION

At the request of the American National Can Company (ANCC), Dunn Corporation (DUNN) conducted a subsurface investigation at the ANCC facility in Oakland, California. DUNN prepared a Subsurface Investigation Report (SI Report) in August, 1991 to complete the preliminary phase of this investigation.

This summary report provides an update of DUNN's interpretations of conditions at each of the five areas of the Site, based on information gathered since the completion of the preliminary investigation. The investigation of each of the five areas is now deemed complete as follows:

AREA 1 - FORMER GASOLINE UNDERGROUND STORAGE TANK (UST)

Ground water quality monitoring in Area 1 over the past year, specifically that located immediately downgradient from the former gasoline UST, has revealed no impact to ground water from the UST.

AREA 2 - FORMER HEATING FUEL UST

Additional investigations in Area 2 have included the installation of three monitoring wells and one test well and the completion of three rounds of ground water sampling. Results of these investigations have shown that the water bearing sediments in Area 2 are impermeable relative to the rest of the Site. Ground water moves quite slowly in this area and it appears that any product may be trapped in the relatively impermeable silt and clay sediments and not allowed to migrate to a significant extent. In addition, ground water monitoring results indicate that free product in Area 2 is not dissolving into the ground water to any significant degree. Downgradient ground water monitoring also indicates that no significant levels of contaminants are migrating from Area 2 and, therefore, are not impacting groundwater in other areas of the Site.

AREA 3 - PARKING LOT ADJACENT TO EKOTEK LUBE

Additional investigations in Area 3 have included the installation of three ground water monitoring wells and the completion of three rounds of ground water sampling. Results of these investigations have not altered DUNN's interpretations regarding the source or extent of subsurface impact in Area 3. The lateral extent of ground water and resultant soil contamination is controlled and represented by the axis of the ground water trough which extends from the north end to the southeast corner of Building #12. DUNN maintains its conclusion that the source of soil and ground water contamination in Area 3 is the EKOTEK Lube property.

AREA 4 - FORMER COMPOUND UST AND PIPELINES

Since the completion of the preliminary investigation in Area 4, DUNN has installed 2 new monitoring wells, drilled six test borings, completed three rounds of ground water sampling and performed a soil gas survey. Data gathered from these additional investigations shows

that some contaminated soil exists both immediately north and east of the former compound USTs and along the underground compound pipelines. The extent of the impacted soil is, however, limited as defined by the investigations. Ground water is contaminated in the immediate vicinity of the former compound USTs. However, the investigations show that the extent of this impact is limited and indicate that this impacted ground water is not migrating off site. It appears that perched water in the base fill gravels immediately beneath the concrete driveway slab is contaminated with gasoline-related chemical compounds. The data suggests that this perched water may be recharging ground water within the area of the former compound USTs and, as a result, contributing to the ground water contamination in this area.

AREA 5 - FORMER STEAM CLEANER

Additional investigations in Area 5 have included the collection of shallow soil samples around the former steam cleaning facility and the completion of three additional rounds of ground water sampling. The investigation results show that activities in this area of the Site have not significantly impacted soil or ground water quality.

1.0 INTRODUCTION

In May, 1991, Dunn Corporation (DUNN) completed a subsurface investigation (preliminary investigation) at the American National Can Company's (ANCC) Oakland, California facility (Site). The preliminary investigation was carried out in response to requests made by the Alameda County Department of Health Care Services Agency (Agency) in letters dated December 5 and December 7, 1990. In August, 1991, DUNN submitted a subsurface investigation report (SI report) to the Agency which presented a comprehensive summary of the preliminary investigation.

Since May of 1991, DUNN has completed several additional tasks at the Site. In response to the Agency's requests, DUNN completed three rounds of quarterly ground water monitoring of selected wells. These sampling events were performed in July, 1991; October, 1991 and January, 1992. Each monitoring round included the measurement of ground water levels and product thicknesses, the purging and sampling of any wells not containing free product, and the analysis of samples for area-specific compounds by a California-certified laboratory. DUNN carried out additional drilling programs in September, 1991, and January, 1992 to gather additional subsurface information necessary for both the evaluation of remedial alternatives and for the preparation of remedial plans. Individual data packages generated from each of the events described above were transmitted to the Agency under a cover letter and included figures, summary tables, detailed laboratory analytical reports, ground water contour maps, and copies of test boring and monitoring well completion logs. The methods utilized while carrying out the additional investigations are generally the same as those employed during the preliminary investigation. However, those methods which either have changed since, or were not included as part of, the preliminary investigation are described in this report.

This report provides an update of DUNN's interpretations of subsurface conditions in each of the five areas of the Site. These interpretations are based on the results of additional work conducted since the completion of the preliminary investigation.

2.0 AREA 1 - FORMER GASOLINE UST

The monitoring well network in Area 1 has not been modified since the completion of the preliminary investigation. Well MW-12 is located immediately downgradient from a former gasoline underground storage tank (UST) removed by DUNN in December, 1990. Well GW-5, installed prior to DUNN's preliminary investigation, is located approximately 125 feet upgradient of the former UST. The monitoring wells in Area 1 have been sampled three times since the completion of the preliminary investigation, in July, 1991; October, 1991 and January, 1992.

Analytical results from the three quarterly rounds of sampling performed on well MW-12 revealed no detectable concentrations of Total Petroleum Hydrocarbons as gasoline (TPHg) or of benzene, toluene, ethylbenzene or xylenes (BTEX). The first two samples from well GW-5 (April and July, 1991) also revealed no detectable concentrations of these compounds. With the approval of the Agency, DUNN discontinued the sampling of well GW-5 following the second round.

Based on the analytical results of the four rounds of monitoring, specifically those of well MW-12, DUNN's conclusion is that there has been no impact to ground water quality from the UST.

① would like to see final closure report however.

3.0 AREA 2 - FORMER HEATING FUEL UST

3.1 Background

Area 2 is located along the northeast perimeter of the Site in the vicinity of a former underground heating oil tank. DUNN's preliminary investigation of Area 2 included the installation of one upgradient monitoring well (MW-13) and the completion of three soil borings (SB-17, SB-18 and SB-18A). Physical obstructions in Area 2 prevented the installation of downgradient monitoring wells in the yard area. Ground water monitoring in Area 2 revealed the presence of a free product layer in pre-existing well GW-6 and, therefore, this well was not sampled. A parts per billion range concentration of total petroleum hydrocarbons as diesel (TPHd) was detected in the sample collected from MW-13.

Based on the results of activities conducted during the preliminary investigation, DUNN began an evaluation of the feasibility of a product recovery system for Area 2.

3.2 Additional Investigations

Since the completion of the preliminary investigation, DUNN has completed two additional phases of drilling and completed three rounds of ground water sampling. In September, 1991, DUNN completed a second round of drilling in Area 2. The program included the installation of one 6-inch diameter test well (TW-1) and one 4-inch diameter monitoring well (MW-15). During this second phase of drilling, test well TW-1 was installed immediately adjacent to pre-existing well GW-6 to evaluate whether product recovery would be enhanced with a larger diameter well. Observation well MW-15 was installed adjacent to pre-existing soil boring locations SB-18 and SB-18A to determine if product had migrated to this portion of Area 2 and to provide piezometric and ground water quality data.

The test borings for wells MW-15 and TW-1 were drilled with 8 5/8-inch inside diameter (I.D.) hollow stem augers. Soil samples were collected from each boring at depths of 5.0 feet and then again continuously from 8.5 feet to the two boring's total depths.

Each of the two new wells were developed on October 4, 1991, with a 3-inch PVC bailer equipped with a bottom ball valve. A total of five well volumes were removed from well MW-15. Due to very low recovery rates, well TW-1 was purged of only 3 well volumes. All development water was temporarily stored in 55-gallon drums pending proper disposal.

Wells MW-15 and TW-1 were initially sampled during the October, 1991, quarterly round of monitoring. The samples from these wells were analyzed for BTEX, TPHg, TPHd, nickel and zinc. A pumping test on well TW-1 was performed on October 25, 1991. During the test, all four wells in Area 2 were monitored at timed intervals for depth to water and for the presence of product. Wells were also monitored during the recovery of the test well after the pumping was stopped. All ground water removed from the test well during the pump test was discharged directly into 55-gallon drums for temporary storage pending proper disposal.

DUNN completed a third round of drilling in Area 2 in February, 1992 to install two downgradient monitoring wells (MW-17 and MW-21) inside Building #15. These two wells were installed to provide downgradient ground water flow and quality data. Ground water from the two wells was sampled during the week of February 27, 1991. Samples were analyzed for volatile organic compounds (VOCs), semi-VOCs (BNA), TPHg, TPHd, total oil and grease, PCBs, nickel and zinc. Data generated during this round of drilling and well sampling was submitted to the Agency in a report dated March 27, 1992.

3.3 Results

3.3.1 Stratigraphy

Soil samples collected from borings for wells MW-15 and TW-1, as well as from previously drilled borings SB-18 and SB-18A, indicate that fill materials are present from the ground surface to a depth of 10 feet in this vicinity of Area 2. The fill materials consist of a mix of gravel, sand and clayey silt.

Samples collected from below 10 feet in MW-15 and TW-1 were classified as belonging to the fluvial stratigraphic unit identified during the preliminary investigation. As shown by the descriptions of these samples, however, the fluvial unit in this vicinity of Area 2 is much finer grained than in other areas of the Site. Consisting predominantly of silt and clay, with occasional thin layers, partings, and seams of coarser sediments, this unit was most likely deposited in a low energy environment of the fluvial system.

The recent borings drilled for wells MW-17 and MW-21 also encountered the fluvial unit. This unit is composed predominantly of coarse grained sand and fine gravel. The coarser texture of the fluvial unit in the vicinity of these two wells indicates that it was deposited in a higher energy environment than that of the finer sediments associated with the immediate vicinity of Area 2. Considering the nature of fluvial deposition, it is likely that a fairly abrupt transition in the fluvial unit exists somewhere between TW-1 and MW-21.

3.3.2 Hydrogeology

As discussed in Section 3.3.1, the fluvial unit in the vicinity of MW-15 and TW-1 is very fine grained and dense whereas the unit is coarse-textured near wells MW-17 and MW-21. It would, therefore, be expected that the fluvial unit would be much less permeable near wells MW-15 and TW-1 than at wells MW-17 and MW-21. On October 25, 1991, DUNN performed a pumping test on well TW-1. Based on data obtained during previous development and purging, the well was pumped with a discharge rate of only 0.2 gallons per minute (gpm). Table 1 presents the results obtained during the pumping test. A steady water level drawdown rate of approximately 0.05 ft/min. was achieved at the pump discharge rate. However, prior to reaching a static water level drawdown, the pump lost lift and discontinued pumping. Therefore, a maximum sustainable pumping rate for the well was not obtained during the test. The test results do indicate that such a rate would be extremely low, probably not in excess of 0.2 gpm. It was noted that prior to the start of the test, well GW-6 did not contain any product. However, as the water level in

TABLE 1
AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA PLANT

Area 2 Pumping Test Results - October 25, 1991
PUMPING WELL: TW-1

TIME		TW-1		GW-6				MW-15		MW-13	
Actual	Elapsed	DTW	DD	DTP	DTW	DD	PT	DTW	DD	DTW	DD
9:24	0	13.11	0.00							11.65	0.00
9:28	0							13.22	0.00		
9:29	0										
9:52	0				15.11	0.00					
10:16	0	Start pump									
10:23	0:07	14.23	1.12								
10:24	0:08				15.23	0.12					
10:25	0:09	14.31	1.20								
10:26	0:10				15.23	0.12					
10:27	0:11	14.40	1.29								
10:29	0:13							13.21	-0.01		
10:30	0:14	14.51	1.40								
10:31	0:15				15.26	0.15					
10:32	0:16	14.61	1.50								
10:33	0:17				15.28	0.17					
10:34	0:18	14.68	1.57							11.54	-0.11
10:36	0:20							13.21	-0.01		
10:39	0:23										
10:40	0:24	14.88	1.77								
10:45	0:29				15.37	0.26					
10:50	0:34	15.53	2.42								
10:52	0:36				15.43	0.32				11.51	-0.14
10:53	0:37							13.21	-0.01		
10:54	0:38										
10:55	0:39	15.85	2.74								
10:57	0:41				15.46	0.35					
11:00	0:44	16.10	2.99								
11:05	0:49	16.42	3.31								
11:07	0:51				15.59	0.48					
11:09	0:53							13.22	0.00		
11:10	0:54	16.70	3.59								
11:17	1:01				15.74	0.63					
11:20	1:04	17.20	4.09							11.48	-0.17
11:23	1:07										
11:27	1:11				15.90	0.79					
11:30	1:14	17.57	4.46								
11:39	1:23							13.22	0.00		
11:40	1:24	17.90	4.79								
11:42	1:26				16.16	1.05					
11:50	1:34	18.05	4.94								
11:53	1:37									11.44	-0.21
12:02	1:46				16.55	1.44					
12:07	1:51	18.75	5.64								
12:09	1:53							13.22	0.00		
12:10	1:54	Pump off, lost lift									

TABLE 1 (continued)
AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA PLANT

Area 2 Pumping Test Results - October 25, 1991
PUMPING WELL: TW-1

TIME		TW-1		GW-6				MW-15		MW-13	
Actual	Elapsed	DTW	DD	DTP	DTW	DD	PT	DTW	DD	DTW	DD
12:15	1:59	18.70	5.59								
12:16	2:00				16.73	1.62					
12:20	2:04	18.54	5.43								
12:21	2:05				16.80	1.69					
12:25	2:09	18.37	5.26								
12:26	2:10				16.88	1.77					
12:30	2:14	18.26	5.15								
12:31	2:15				16.92	1.81					
12:40	2:24	18.00	4.89								
12:41	2:25				17.03	1.92					
12:50	2:34	17.76	4.65	17.12	17.13	2.01	0.01	13.23	0.01		
12:51	2:35										
12:53	2:37										
13:10	2:54	17.32	4.21								
13:11	2:55			17.21	17.27	2.10	0.06				
13:20	3:04	Pump restarted									
13:25	3:09	17.40	4.29								
13:30	3:14	17.39	4.28								
13:33	3:17	Pump lost lift									
13:40	3:24	17.19	4.08								
13:41	3:25			17.28	17.44	2.17	0.16				
13:50	3:34	17.00	3.89								
13:51	3:35			17.29	17.46	2.18	0.17				
14:50	4:34	16.07	2.96	Removed some product with bailer							
14:51	4:35			17.13	17.17	2.02	0.04				
15:10	4:54	15.81	2.70								
15:40	5:24	15.48	2.37	17.01	17.02	1.90	0.01				
15:41	5:25										
16:10	5:54	15.19	2.08		16.84	1.73					
16:11	5:55										
16:40	6:24	14.93	1.82								
16:41	6:25				16.67	1.56					
17:10	6:54	14.72	1.61								
17:11	6:55				16.52	1.41					

Notes: Approximate pump discharge rate throughout test was 0.20 gallons per minute.
DTW = Depth to water below measuring point.
DTP = Depth to product below measuring point.
DD = Drawdown in water level.
PT = Apparent product thickness.

GW-6 lowered to approximately 17 feet in response to the pumping of TW-1, product began to enter the well casing.

Monitoring wells MW-17 and MW-21 were developed on February 6, 1992. These wells were developed by removing 20 well casing volumes of water with a centrifugal pump. The pump was run at a high speed and a discharge rate of between 3 and 3.5 gpm was obtained from each well, over the duration of the development. The water level in each well was monitored prior to turning off the pump and the drawdown resulting from the pumping was less than 1.0 foot in each case. Considering that these two wells are only 2 inches in diameter, this pumping data indicates that, in this area, the fluvial unit is considerably more permeable than it is near well TW-1.

Based on water level measurements recorded on February 25, 1992, the ground water elevations in wells MW-13, MW-15, GW-6 and TW-1 are significantly higher than those in the newly installed wells MW-17 and MW-21. However, the ground water elevations of MW-17 and MW-21 are only slightly higher than those recorded for wells in Area 3 and Area 4 further to the south where, as test boring data indicates, the fluvial unit is of similar composition to that of MW-17 and MW-21. DUNN's interpretation of this phenomenon is that the significant difference in the ground water elevation between the other wells of Area 2 and wells MW-17 and MW-21 is caused by stratigraphic changes in the fluvial unit. The relatively impermeable sediments restrict ground water flow, preventing the recharge water from draining from the sediments; whereas the more permeable sediments represent an area of preferred ground water flow and, as such, do not support high ground water elevations. Steep ground water gradients exist in the vicinity of MW-13, MW-15, GW-6 and TW-1 as a result of the proximity of the more permeable fluvial unit. The gradient fluctuates somewhat due to seasonal changes in recharge. The concept postulated in the SI report that the steep gradient is the result of precipitation only is no longer considered viable.

Table 2 provides a summary of the ground water gradients calculated between wells MW-13 and GW-6 at various times during the year. The data in this table shows that as ground water elevations at the site decrease following the end of the region's wet season (April, May, June and July, 1991 data), the gradient in Area 2 continues to increase (steepen). At some time prior to the end of the dry season, the gradient begins to decrease (flatten) (October, 1991 data). As the region's wet season progresses, the gradient decreases even more as exhibited by the February, 1992 data. Fluctuations in the steepness of the gradient relative to seasonal climatological changes appear to support the concept that the gradient is caused by sediment permeability conditions to the south of TW-1.

3.3.3 Analytical

Soil

During the second round of drilling, one soil sample from the boring for well MW-15 (MW-15, S-2) and 3 soil samples from the boring for well TW-1 (TW-1, S-1; TW-1, S-2; and TW-1, S-4) were analyzed for TPHg, TPHd and BTEX by California LUFT Methods. These samples were selected based on photoionization detector (PID) headspace screening of all soil samples collected from the borings. Sample TW-1, S-2, collected at a depth of 9.25 feet was

TABLE 2

AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA, FACILITY

Summary of Ground Water Gradients - Area 2

PLATE NUMBER	DATE	GROUND WATER ELEVATIONS		GRADIENT (ft/ft)
		MW-13	GW-6	
2	April 16, 1991	9.15	6.43	(9.15 - 6.43)/54 = 0.050
3	May 15, 1991	8.84	5.86	(8.84 - 5.86)/54 = 0.055
4	June 17, 1991	8.58	5.54	(8.58 - 5.54)/54 = 0.056
5	July 15, 1991	8.36	5.28	(8.36 - 5.28)/54 = 0.057
6	Oct. 21, 1991	7.29	4.79	(7.29 - 4.79)/54 = 0.046
9	Feb. 25, 1992	9.57	7.28	(9.57 - 7.28)/54 = 0.042

Notes: Elevations are expressed in feet above mean sea level.
Gradients equal the change in ground water elevation from MW-13 to GW-6 divided by the distance between the wells (54 ft).
Plate number indicates the ground water contour map previously submitted to the agency.

reported to have concentrations of TPHg and TPHd of 870 and 1,100 mg/Kg (ppm), respectively, and a xylene concentration of 3.9 ppm. The target compounds were either not detected or detected at very low concentrations in samples MW-15; S-2, TW-1; S-1 and TW-1; S-4. These analytical results were previously reported on January 13, 1992.

Ground Water

Since the preliminary investigation, DUNN has completed three quarterly rounds of ground water sampling (July, 1991, October, 1991, and January, 1992) in Area 2. In February, 1992, DUNN completed a preliminary sampling round of the newly installed wells MW-17 and MW-21.

Wells MW-13 and GW-6 were sampled in July, 1991. Low concentrations of VOCs, BNAs and TPHd were detected in the sample from GW-6. It should be noted, however, that free product was removed from GW-6 prior to the sampling. The July, 1991, analytical results for MW-13 revealed only the presence of TPHd, nickel and zinc.

In October, 1991, wells MW-15 and TW-1 were sampled along with well MW-13 as part of the third round of quarterly sampling. It should be noted that DUNN elected not to sample well GW-6 due to the presence of free product. However, well TW-1, which is located within 5 feet of GW-6, did not contain any measurable free product and thus was included in the sampling. In accordance with DUNN's October 11, 1991 letter to the Agency, these wells were sampled for BTEX, TPHg, TPHd, nickel and zinc. TPHd was detected in all three wells with the highest concentration at parts-per-billion levels reported for well TW-1. BTEX and TPHg was not detected in any of the samples analyzed. A high concentration of zinc was again detected in MW-13; however, this was the only significant concentration of zinc detected in Area 2.

In January, 1992, the Area 2 sampling and analysis plan was identical to that of October, 1991. Again, TW-1 did not contain any free product. The analytical results were consistent with those from October, 1991, with TPHd detected in all three samples. Nickel and zinc were also detected in sample MW-13. Overall, the concentrations detected were slightly higher than those reported from the October round of sampling.

In February 1992, the newly installed Area 2 downgradient wells MW-17 and MW-21 were sampled for the first time. Since these wells were being sampled for the first time, the samples were analyzed for VOCs, BNAs, TPHg, TPHd, total oil and grease, PCBs, nickel and zinc. Analytical results revealed slight concentrations of TPHd in both wells and a low estimated concentration (at ppb concentrations) of pentachlorophenol in the sample from MW-17. MW-17 was installed through a railroad bed which enters Building #11 from the south. The pentachlorophenol and diesel reported in the sample from this well is probably related to this railroad bed, from the preserved ties and historical uses.

3.4 Summary

As discussed in Section 3.3, the steep ground water gradient and the apparent low permeability indicates that ground water moves quite slowly, if at all, in the immediate

vicinity of Area 2. The continued presence of free product in well GW-6 so long after the removal of the source supports this supposition. The presence of product in well GW-6 after the water level dropped during the pumping test and the continued absence of product from well TW-1, indicates that the product may not be very mobile and may be essentially trapped in partings, seams and voids contained within the relatively impermeable silt and clay sediments.

The ground water analytical results show that the ground water in Area 2 does not contain significantly high concentrations of petroleum compounds. The July, 1991, water sample from GW-6 containing 29,000 ppb of TPHd, was contaminated by the free product in the well. TW-1, located within 5 feet of GW-6, has not been shown to contain more than 3,000 ppb of TPHd. TW-1 represents true downgradient ground water quality untainted by free floating product. This data indicates that the product present in Area 2 may not be dissolving into the ground water to any significant degree.

The latest monitoring well installed in Area 2, MW-21, is directly downgradient from GW-6 and TW-1. This well monitors potential downgradient migration of ground water contaminants from Area 2. The first round of analytical results (February, 1992) from this well indicate that no significant levels of contaminants are migrating downgradient from Area 2 and, therefore, are not contributing to the ground water impact identified in other areas of the Site.

4.0 AREA 3 - PARKING LOT ADJACENT TO EKOTEK LUBE

4.1 Background

Area 3 represents the eastern section of the Site and includes ANCC's Lithography Building (Building #12) and the former parking area between this building and the EKOTEK Lube property. Results of DUNN's preliminary investigation revealed that soil and ground water in Area 3 are severely impacted. Based on the results of the preliminary investigation, DUNN concluded that the source of soil and ground water impact is the EKOTEK Lube property and that the western limit of this impact is located on ANCC property, beneath Building #12.

4.2 Additional Investigations

Since the completion of the preliminary investigation, DUNN has completed three rounds of quarterly ground water monitoring in Area 3, as described in Section 1.0. DUNN completed an additional investigation in February, 1992. The purpose of this second phase of drilling and sampling was to provide information to:

- determine the extent to which Area 3 ground water contamination extends beneath ANCC's property;
- determine if impacted ground water from other areas of the Site are contributing to the level of impact identified in Area 3; and
- further characterize ground water flow conditions beneath Building #12.

The additional investigation included the installation and sampling of three ground water monitoring wells (MW-18, MW-19 and MW-20).

4.3 Results

4.3.1 Stratigraphy

Test borings drilled for the installation of wells MW-18, MW-19 and MW-20 penetrated tidal marsh and fluvial stratigraphic units. Analysis of soil samples from these borings indicate that the fluvial unit is relatively coarse textured and permeable beneath Building #12. Although thin layers of finer grained sediments were found to be present, they are characteristic of the unit in general and are not expected to be laterally extensive. The composition of the unit at these wells appears to be generally similar to that identified in Area 2 wells MW-17 and MW-21, and in other Area 3 and Area 4 wells.

4.3.2 Hydrogeology

Data obtained from the newly installed Area 3 wells (MW-18, MW-19 and MW-20) support the ground water flow regime depicted in DUNN's SI report. However, data gathered from the quarterly rounds of ground water monitoring provides for a more detailed characterization of the Area 3 flow regime. Based on those results, this section discusses the character of the flow regime and the variations that it exhibited throughout the past year.

Ground water contour maps prepared from each quarterly round of monitoring show that ground water flows predominantly in a south-southeast direction beneath most of the ANCC property (regional flow). The maps also show the presence of a ground water mound (mound) near the ANCC/EKOTEK Lube property line from which some components of radial ground water flow are in a northwest direction, and enters the ANCC property. An area of low ground water elevations (ground water trough) exists between these opposing ground water flow directions. This ground water trough, which appears to encircle the north and west perimeter of the mound, captures ground water from the mound and redirects it around the mound back to the regional (south-southeast) flow direction. The inferred axis of this ground water trough, as shown on the October, 1991, (Plate 6) and February, 1992, (Plate 9) ground water contour maps, appears to extend from the north end of Building #12 near wells MW-1 and MW-7, to the southeast corner of Building #12, near well GW-2. The axis of the ground water trough represents a hydraulic barrier across which ground water and accompanying contaminants do not flow.

Table 3 provides a summary of ground water gradients calculated between two sets of Area 3 wells (MW-2 to MW-4 and MW-3 to GW-2). The data shows that the mound flattens as ground water elevations at the Site decrease during dry periods. However, the data shows that the mound does not disappear at any time during a dry season. Thus, it is suspected that sources of recharge other than direct precipitation may be causing this mound to exist. Specifically, the physical features of the EKOTEK Lube property (i.e., open sumps, drains, and spill containment structures) previously discussed in the SI Report, are likely collecting and concentrating precipitation ,thereby increasing ground water recharge.

As ground water elevations at the Site vary on a seasonal basis, the location of the axis of the trough may shift laterally between wells MW-1 and MW-7. However, at the southeast corner of Building #12, the axis has appeared to be very close to well GW-2 during all rounds of ground water monitoring as the ground water elevation of GW-2 has always been lower than that of MW-6.

Ground water elevations of the three newly installed wells (MW-18, MW-19 and MW-20), as shown on Plate 9, fit the ground water flow regime presented in this report. Furthermore, they confirm that the axis of the trough exists beneath Building #12.

If the ground water high is a mound, as DUNN interprets, a ground water divide must exist on its northwest side and lie perpendicular to the trough beneath Building #12. Ground water within the trough on opposing sides of the divide would flow in opposite directions around the perimeter of the mound. It appears that as ground water recharge conditions and resulting ground water elevations in the region change, the location of this divide also changes. April, May and June 1991 data (Plates 2, 3 and 4) indicate that the

TABLE 3

AMERICAN NATIONAL CAN COMPANY
OAKLAND, CALIFORNIA, FACILITY

Summary of Ground Water Gradients - Area 3

PLATE NUMBER	DATE	GROUND WATER ELEVATIONS		GRADIENT (ft/ft)
		MW-2	MW-4	
2	April 16, 1991	5.91	3.27	(5.91 - 3.27)/87 = 0.030
3	May 15, 1991	4.81	2.91	(4.81 - 2.91)/87 = 0.022
4	June 17, 1991	4.36	2.69	(4.36 - 2.69)/87 = 0.019
5	July 15, 1991	4.12	2.50	(4.12 - 2.50)/87 = 0.019
6	Oct. 21, 1991	3.28	2.00	(3.28 - 2.00)/87 = 0.015
9	Feb. 25, 1992	5.92	3.99	(5.92 - 3.99)/87 = 0.022

PLATE NUMBER	DATE	GROUND WATER ELEVATIONS		GRADIENT (ft/ft)
		MW-3	GW-2	
2	April 16, 1991	6.29	2.65	(6.29 - 2.65)/83 = 0.044
3	May 15, 1991	5.82	2.35	(5.82 - 2.35)/83 = 0.042
4	June 17, 1991	5.27	2.12	(5.27 - 2.12)/83 = 0.038
5	July 15, 1991	5.03	2.04	(5.03 - 2.04)/83 = 0.036
6	Oct. 21, 1991	3.97	1.67	(3.97 - 1.67)/83 = 0.028
9	Feb. 25, 1992	6.39	3.65	(6.39 - 3.65)/83 = 0.033

Notes: Elevations are expressed in feet above mean sea level.
Plate number indicates the ground water contour map previously submitted to the agency.
Regions wet season = October 1 to April 1.
Regions dry season = April 1 to October 1.

divide extends northwest of well GW-1, and that ground water flows in the trough from MW-7, beneath Building #12 to GW-2. October, 1991, (Plate 6) and February, 1992, (Plate 9) data indicate that the divide has swung onto the property perpendicular to Building #12. Under this condition, ground water in the vicinity of wells GW-1, MW-1, MW-2, MW-4, and MW-7 appears to flow in a northeasterly direction in the trough while south of the divide, flow continues to be in a southerly direction towards well GW-2.

4.3.3 Analytical

Soil

Soil samples collected from the borings for wells MW-18, MW-19 and MW-20 were screened by headspace analysis technique with a photoionization detector (PID). PID results indicate that the soil above the water table has been impacted in well MW-19 but not in wells MW-18 and MW-20. Soil samples from these three borings were not analyzed at an analytical laboratory.

Ground Water

Area 3 monitoring wells were sampled as part of the three quarterly ground water monitoring rounds (July, 1991, October, 1991 and January, 1992). Following the July, 1991 round of monitoring, wells found to contain product (GW-1, MW-2 and MW-5) were not sampled as representative ground water samples could not be collected. Analytical results from the three rounds were consistent with the April, 1991, results.

Wells MW-18, MW-19 and MW-20 were sampled for the first time in February, 1992. The wells were sampled for Area 3 parameters including VOCs, BNAs, TPHg, TPHd, total oil and grease, and PCBs. With the exception of a low estimated concentration of tetrachloroethene in MW-20, none of the target parameters were detected in the samples from MW-18 or MW-20. Concentrations of VOCs, BNAs, TPHg, TPHd and total oil and grease were detected in the MW-19 sample; however, PCBs were not detected. The VOCs and BNAs detected in the MW-19 sample were the same as those detected in other Area 3 wells.

4.4 Summary

Based on the data gathered in Area 3 since the completion of the preliminary investigation, DUNN interpretations and conclusions regarding subsurface conditions have not changed from those outlined in the SI Report. Based on the ground water flow regime and analytical results, DUNN concludes that the EKOTEK Lube property is the source of Area 3 soil and ground water contamination.

Based on the ground water flow regime presented in Section 4.3.2, the axis of the ground water trough represents a hydraulic barrier across which ground water does not flow. As a result, it is concluded that the axis of the trough represents the lateral extent of ground water contamination, and associated soil impact, present between ANCC Building #12 and

the EKOTEK Lube property. Additionally, based on the first round of ground water analytical results from newly installed wells MW-18, MW-20, and MW-21, groundwater flowing into Area 3 from the northwest is not contaminated. As a result, it is concluded that ANCC is not contributing to subsurface contamination identified in Area 3.

5.0 AREA 4 - FORMER COMPOUND USTS AND PIPELINES

5.1 Background

Area 4 is located on the southern perimeter of the Site. It generally includes the vicinity of the compound storage building and extends along underground product pipelines to the Lithography building (Building #12).

Prior to 1980, a 500 gallon gasoline UST was reportedly removed from service and permanently closed in-place. In 1987, a group of seven USTs used for the storage of various coating-related products were removed from the area immediately east of the Compound Storage building. It was reported that due to the presence of an 8-inch underground propane pipeline, all of the contaminated soil could not be removed during the excavation of these tanks. In addition, the buried product pipeline used to transfer product from the tanks to Building #12 was not removed.

In 1989, a Phase I site investigation was conducted at the Site. As part of that investigation, a ground water monitoring well (GW-3) was installed in the vicinity of the former group of USTs and five (5) shallow soil samples were collected along the buried product pipeline.

During the preliminary investigation, DUNN installed three (3) ground water monitoring wells (MW-8, MW-9 and MW-10) to evaluate soil and ground water quality in Area 4. Based on the results of the preliminary investigation DUNN concluded that both the near surface soil in the vicinity of the buried product pipelines and the soil and ground water near GW-3 are impacted with volatile organic compounds.

5.2 Additional Investigations

In June, 1991, DUNN conducted a soil gas survey along the buried product pipeline. The purpose of the survey was to evaluate the extent of shallow soil contamination around the pipeline. The survey included the installation and sampling of 31 monitoring points. Each monitoring point consisted of a 3/8-inch diameter driven probe hole, to a depth of approximately 2-feet below grade. The annular space between the tube and the probe hole was sealed with a bentonite paste. Following installation, a suction bulb was used to draw air from the pore spaces of the soil into the aluminum tube. A PID was then attached to the top of the tube and, while drawing air from the tube, the highest reading was recorded.

In September, 1991, DUNN completed a second phase of drilling in Area 4. This phase included the drilling of five soil borings (SB-4-1 through SB-4-4 and SB-4-6) and the drilling and installation of two ground water monitoring wells (MW-14 and MW-16). The soil borings were drilled to a depth of approximately 10-feet to determine the extent of residual soil contamination in the vicinity of well GW-3. Wells MW-14 and MW-16 were installed immediately downgradient and upgradient, respectively, of well GW-3 to further evaluate the extent of ground water impact in this area. The wells were installed within the fluvial stratigraphic unit. While attempting to drill MW-16, perched water with gasoline odor was encountered in a layer of gravel immediately beneath the concrete slab of the driveway and

above the tidal marsh deposit. A grab sample of this water (MW-1S) was collected and analyzed for BTEX and TPHg.

MW-16 was subsequently installed approximately 8-feet north of the MW-1S sampling location. The perched water discussed above was again encountered in MW-16. However, a 10-inch steel casing was installed to 3.0 feet below grade and cemented in place and the boring for MW-16 was subsequently drilled inside this casing. The casing was installed to prevent the perched water from impacting subsurface soils and ground water during drilling. Data generated during this second phase of drilling was submitted to the Agency in a summary report dated January 13, 1992.

Since the completion of the preliminary investigation, DUNN has completed three quarterly rounds of ground water monitoring in Area 4 (July, 1991, October, 1991, and January, 1992). The July, 1991, sampling and analysis plan was identical to that of the preliminary investigation. However, in the October, 1991, round, wells MW-14 and MW-16 were added to the sampling program. Based on April and July analytical results, the target parameters were reduced in number for the October, 1991, and January, 1992, sampling rounds. The revisions to the Area 4 sampling plan were approved by the Agency.

5.3 Results

5.3.1 Stratigraphy

Subsurface soil samples collected from soil borings drilled during the recent phases of drilling in Area 4 provided information necessary to characterize the stratigraphy in the vicinity of the compound storage building. All the soil borings encountered fill materials and/or the tidal marsh deposit overlying the fluvial stratigraphic unit.

Soil borings SB-4-1 and SB-4-2 penetrated 10-feet of fill associated with the previous excavation and removal of the seven USTs. This fill was also encountered in borings SB-4-3 and MW-14 from the surface to depths of 5.9 feet and 3.0 feet, respectively. The fill consisted of moderately well-sorted medium-to-fine sand.

The tidal marsh deposit was encountered in borings SB-4-4, SB-4-6, MW-14 and MW-16. The tidal marsh is similar in composition to other areas of the site. It consists of black silty clay. It is highly organic, very dense and is very plastic. The tidal marsh has been removed in the area near GW-3 where the former USTs were removed.

An 0.7-foot thick layer of fill was encountered in MW-16 between the base of the concrete pad driveway and the top of the tidal marsh unit. This base fill material consists of coarse sandy gravel and is expected to underlie the entire concrete pad. The thickness of this layer is unknown and may vary.

The upper 15-feet of the fluvial unit was penetrated in borings MW-14 and MW-16. Soil sample descriptions indicate that the unit is generally coarse-textured, consisting predominantly of coarse-to-fine sand with traces of silt and gravel. Above the ground water table, the unit is fairly dense and fine-grained.

5.3.2 Ground Water

The water table in Area 4 is present at a depth of approximately 10 feet below grade. Ground water contour maps produced from water level measurements recorded over the past year show that ground water flows generally in a southerly direction. The ground water gradient in the area is very small. From ground water elevations between MW-10 and GW-3 over the past year, an average gradient of 0.002 ft/ft exists in the area.

The layer of perched water was found to exist in the base fill gravel beneath the concrete pad driveway. The perched water was encountered at drilling locations MW-1S and MW-16. It is expected that the water in this layer of gravel has come from precipitation that has infiltrated cracks in the concrete or from leaks in drain pipes that connect the plant's roof drains to the storm sewer network. It appears that the relatively impermeable underlying tidal marsh unit is perching this water and preventing it from infiltrating to the water table. Due to the absence of the tidal marsh unit in the vicinity of the group of former USTs, the perched water may be permitted to infiltrate to the water table through the backfill in the former UST excavation.

5.3.3 Analytical

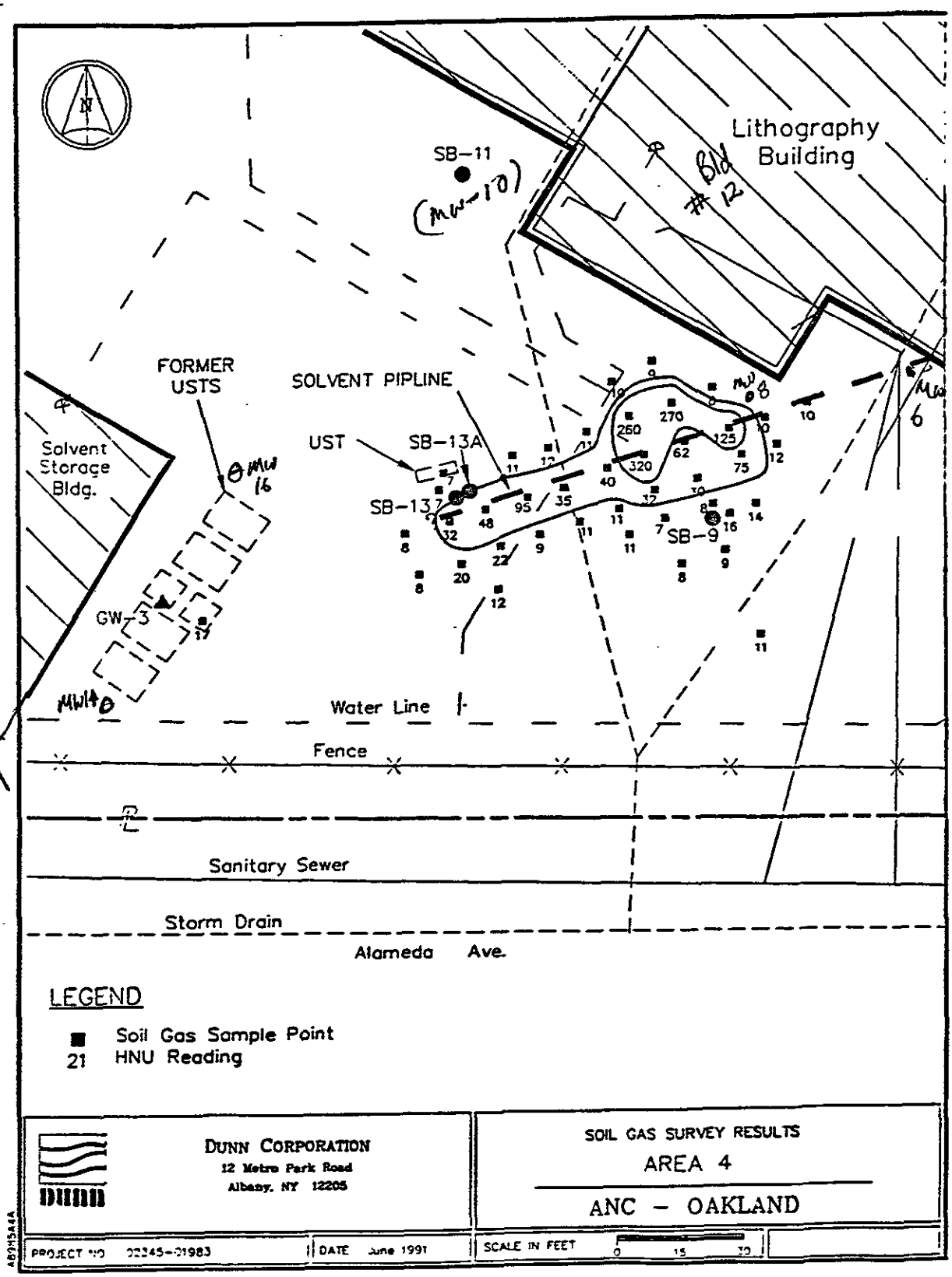
Soil

Figure 1 provides a summary of the soil gas survey conducted along the product pipeline. This map depicts the locations that were sampled and provides the maximum PID reading recorded at each of the locations. The readings recorded ranged from a high of 320 to a low of 7. The highest levels were recorded immediately adjacent to the product pipeline. It appears that levels below 30 are equal to site background conditions and represent the lateral extent of impact.

Selected soil samples collected during the second phase of drilling in Area 4 were analyzed at an off-site laboratory for BTEX and TPHd. The samples selected for analysis were based on PID headspace screening results and stratigraphy. Only samples of natural sediments that appeared to exhibit impact were analyzed. This procedure was used to determine the extent to which contaminated soil was not removed during previous excavation of the group of USTs.

PID headspace screening results of borings SB-4-2 and SB-4-7 indicate that the soil along the north and west sides of the excavation of the former tank was not completely remediated.

Selected soil samples from SB-4-3, SB-4-6, MW-14 and MW-16 were analyzed. The sample from SB-4-3, collected just above the water table exhibited a very low concentration of toluene and total xylenes. The shallow (5.75') sample from MW-14 was reported to contain TPHd and total xylenes. However, the deeper sample from MW-14 (9.25') contained only


Lithography Building
Bldg #12
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(MW-10)
FORMER USTS
SOLVENT PIPLINE
UST
SB-13A
SB-13
SB-9
Solvent Storage Bldg.
MW 16
GW-3
MW 8
MW 6
MW 9
Water Line
Fence
Sanitary Sewer
Storm Drain
Alameda Ave.
LEGEND
Soil Gas Sample Point
21 HNU Reading
DUNN CORPORATION
12 Metro Park Road
Albany, NY 12205
SOIL GAS SURVEY RESULTS
AREA 4
ANC - OAKLAND
PROJECT NO 02345-01983
DATE June 1991
SCALE IN FEET 0 15 30

EH 000040 03

TPHd with no xylenes. Two samples analyzed from SB-4-6 and MW-16 exhibited none of the target compounds.

Ground Water

The July, 1991, ground water analytical results were consistent with those of April, 1991. VOCs and BNAs were not detected in wells MW-8, MW-9 and MW-10. Xylenes, ethylbenzene, toluene, and various BNAs were detected in GW-3. Some of the targeted metals were detected at low concentrations within each of the four wells sampled.

During the October, 1991, round of ground water sampling, wells MW-8, MW-9 and MW-10 were sampled for selected metals only. Newly installed wells MW-14 and MW-16 and existing well GW-3 were also analyzed for the VOCs and BNAs. No VOCs or BNAs were detected in MW-14 or MW-16. The October analysis revealed xylenes, ethylbenzene and the various BNAs in sample GW-3. All concentrations were substantially reduced from those reported in July. The metals results of all the six Area 4 wells were at insignificant concentrations, with the filtered samples being below the Primary and Secondary National Drinking Water Regulations as promulgated under the Safe Drinking Water Act (SDWA).

During the January, 1992, round of quarterly monitoring, the Area 4 wells were not sampled for metals. As a result, wells MW-8, MW-9 and MW-10 were not sampled. Analytical results again revealed concentrations of xylenes, ethylbenzene, toluene and various BNAs in GW-3. GW-3 was also reported to have concentrations of TPHg. With the exception of parts per billion concentrations of xylenes reported in MW-16, no VOCs or BNAs were detected in samples MW-14 or MW-16. TPHg was not detected in MW-14 or MW-16.

During the September phase of Area 4 drilling, a sample of the perched water (MW-1S) present in the base fill gravel beneath the concrete pad driveway was collected and analyzed for VOCs and BNAs. The analytical results of this sample, submitted to the Agency in a report dated January 13, 1992, revealed the presence of xylenes, ethylbenzene, 4-methylphenol, naphthalene and bis(2-ethylhexyl)phthalate.

5.4 Summary

Based on data gathered during the additional phases of drilling in Area 4, there appears to be some contaminated soil present in the north and east walls of the former excavation for the removal of the group of compound USTs. However, it appears that the remainder of the contaminated soil was adequately remediated during the removal of these tanks.

Based on the soil gas survey results, it appears that the lateral extent of impacted soil near the product pipelines is confined to an area immediately adjacent to (within 5 feet) of the pipeline. There appears to be a slightly more widespread lobe of impacted soil near the middle of the pipeline. The tidal marsh unit in the area most likely limits the vertical extent of this impact to a depth of about 3 feet.

Analytical results obtained over the past year indicate that the ground water in the immediate vicinity of the former compound USTs is impacted with VOCs and BNAs.

Analytical results of well MW-14 indicate that the impacted ground water has not migrated downgradient from the area. As a result, it appears that the impacted ground water is limited in areal extent and possibly confined to the backfilled excavation of the former compound USTs.

The perched water layer beneath the concrete pad driveway may be recharging ground water within the area of the former compound USTs. The analytical results of MW-1S indicate that this water is impacted. As a result, this water potentially represents a source of the ground water impact identified in well GW-3.

6.0 AREA 5 - FORMER STEAM CLEANER

6.1 Background

Area 5 represents the area in the immediate vicinity of the Site's former steam cleaner facility. During a Phase I investigation conducted in 1989, a shallow soil sample (SC-1-2C) collected near the steam cleaner facility reported the presence of TPH. A downgradient monitoring well (GW-4) did not reveal any ground water impact. As part of the preliminary investigation, DUNN drilled soil borings (SB-14 and SB-16) to validate the TPH concentration previously discovered and installed a downgradient monitoring well (MW-11) to determine if ground water in this area of the site is impacted.

Based on the results of the preliminary investigation, DUNN concluded that previous activities in the area may have impacted ground water quality slightly, but that the level of impact is low. Soil analytical results did not validate the TPH concentrations previously reported.

6.2 Additional Investigations

In June, 1991, DUNN collected shallow soil samples from hand augered borings on the east, south and north sides of the steam cleaner facility. These samples were analyzed for VOCs and total petroleum hydrocarbons. This round of sampling confirmed the findings of the preliminary investigation that soil in the area was not impacted. Analytical results were submitted to the Agency in a letter dated August 7, 1991.

Since the completion of the preliminary investigation, DUNN has completed three quarterly rounds of ground water monitoring in Area 5. Well MW-11 was sampled during each of the three rounds. Following the approval of the Agency, DUNN reduced the analytical list for well MW-11 and did not sample well GW-4 during the last two quarterly monitoring rounds (October, 1991, and January, 1992).

6.3 Results

Considering that no additional drilling has taken place in Area 5 since the completion of the preliminary investigation, DUNN has not revised any of its interpretations regarding the stratigraphy and hydrogeology in this vicinity of the Site.

6.3.1 Analytical

Soil

The four soil samples collected around the steam cleaner in June, 1991 contained low concentrations of total petroleum hydrocarbons. Total VOC concentrations were low with the primary compound detected (acetone) also detected in the laboratory blank sample.

Ground Water

The July and October, 1991, and January, 1992, VOC analysis of MW-11 revealed tetrachloroethene at concentrations below the method detection limit. An estimated concentration of 1,2-dichlorobenzene was also detected in MW-11 during the January, 1992, round of monitoring. The presence of part per billion concentrations of TPHd and lead were reported in October, 1991, for MW-11. However, the TPHd was not detected in the January, 1992, analysis.

6.4 Summary

The soil analytical program carried out over the past year has not confirmed the concentrations of total petroleum hydrocarbons reported during the Phase I investigation previously completed in Area 5. It appears that the soil in the vicinity of the steam cleaner is not significantly impacted.

The ground water analytical results obtained over the past year indicate that ground water in Area 5 has not been significantly impacted by previous activities at the steam cleaner. The estimated concentration of tetrachloroethene have been equal to or below both the United States Environmental Protection Agency (USEPA) and California Department of Health Care Services maximum contaminant level (MCLs) of 5 ppb for drinking water. The recently detected low concentration of 1,2-dichlorobenzene is anomalous as it was only detected once in four rounds of sampling. Regardless, the concentration is very low in relation to the USEPA MCL of 600 ppb for drinking water.

WELL INSTALLATION

NR WATER LEVEL MEASUREMENTS NOT RECORDED

4.0 GROUNDWATER CONTOUR

DIRECTION OF GROUNDWATER FLOW

INFERRED LOCATION OF GROUNDWATER TROUGH SHOWING FLOW DIRECTION

INFERRED LOCATION OF GROUNDWATER DIVIDE

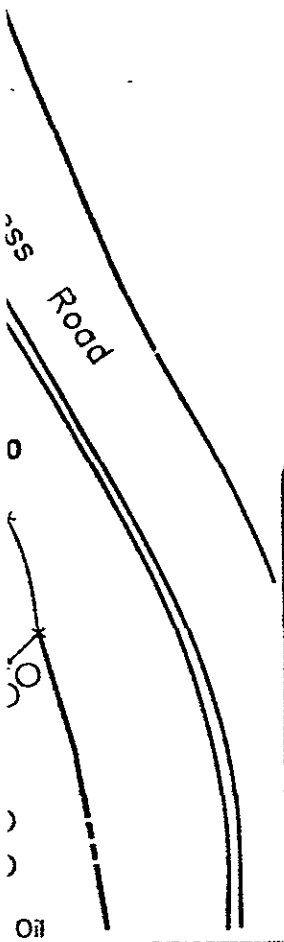
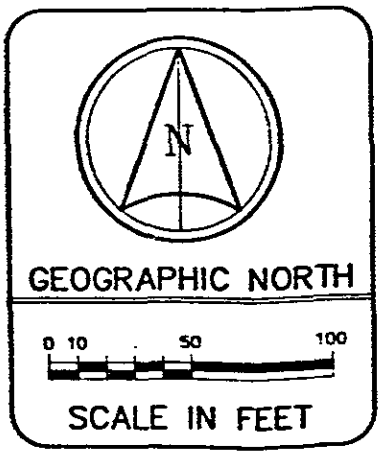


PLATE 6

	REVISIONS	BY	DATE
PROJ. MGR: Edward W. Alusow			
PREPARED BY: Walter O. Howard			
DRAFTED BY: S.C.Galloway			
CHECKED BY:			
PROJ. NO.: 02345-01983			
DWG. NO. 2M8985_8			
DATE: June 1991			
SHEET 7 OF 8			
DATUM Mean Sea Level			
CONTOUR INTERVAL= 0.25/1.0 FT.			
USGS QUAD.: OAKLAND EAST			



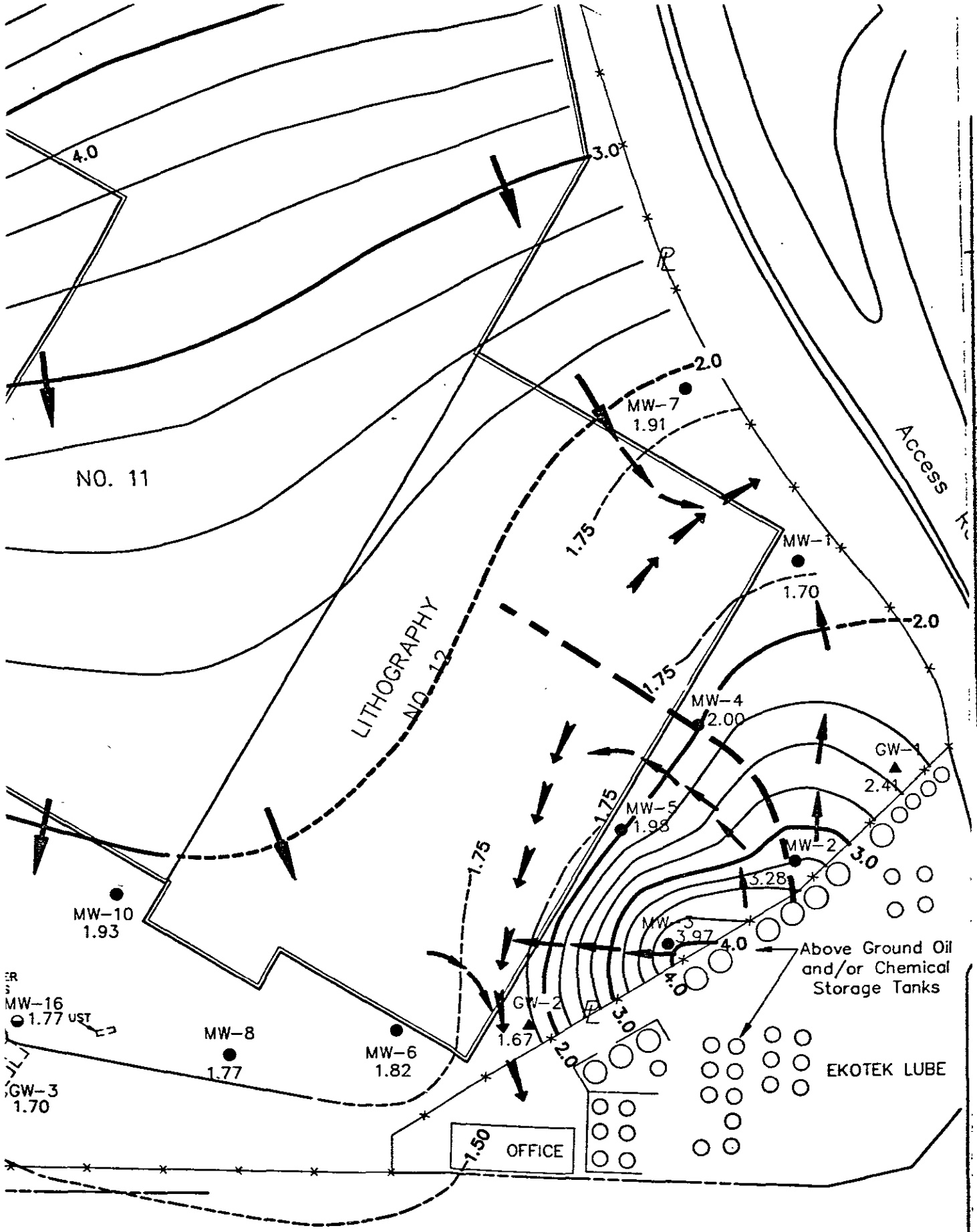
DUNN GEOSCIENCE CORPORATION
12 Metro Park Road
Albany, NY 12205

GROUNDWATER CONTOUR MAP
10/21/91
AMERICAN NATIONAL CAN
OAKLAND PLANT

CITY OF OAKLAND ALAMEDA COUNTY, CA

LEGEND

MW-3	WELL IDENTIFICATION NUMBER
●	MONITORING WELL LOCATION
6.29	GROUNDWATER ELEVATION
MW-16 ◒	OCTOBER 1991 MONITORING WELL INSTALLATION
NR	WATER LEVEL MEASUREMENTS NOT RECORDED
----4.0	GROUNDWATER CONTOUR
←	DIRECTION OF GROUNDWATER FLOW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3.0
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MW-1
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LITHOGRAPHY
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1.75
MW-4
2.00
GW-1
2.41
1.75
MW-5
1.98
1.75
MW-2
3.0
3.28
MW-10
1.93
MW-3
3.97
4.0
Above Ground Oil
and/or Chemical
Storage Tanks
MW-16
1.77 UST
GW-2
1.67
3.0
4.0
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MW-6
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EKOTEK LUBE
GW-3
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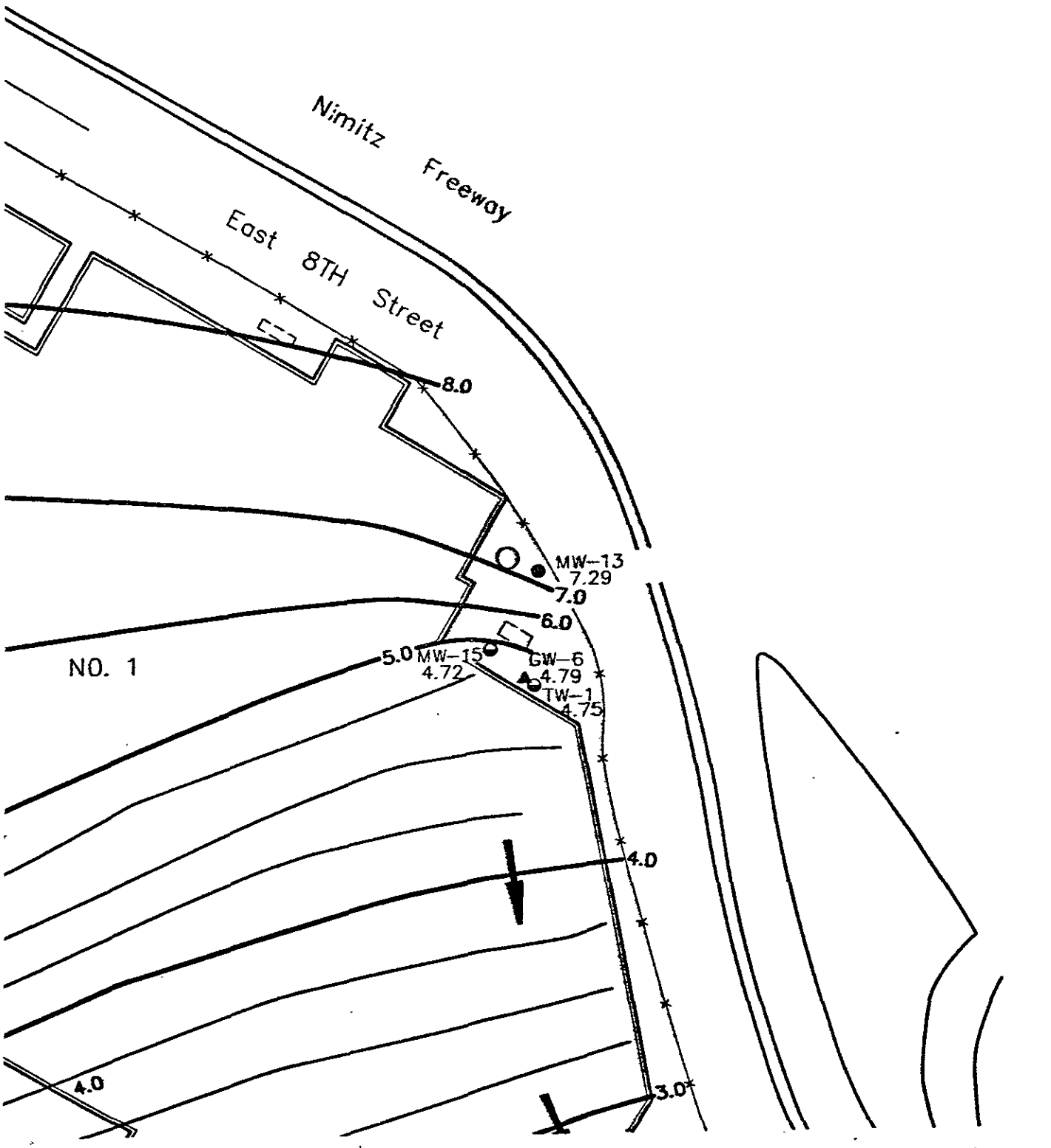
1.50
OFFICE
Access

EH 000041-0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7.0
6.0
5.0
4.0
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MW-15
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GW-6
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TW-1
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EH
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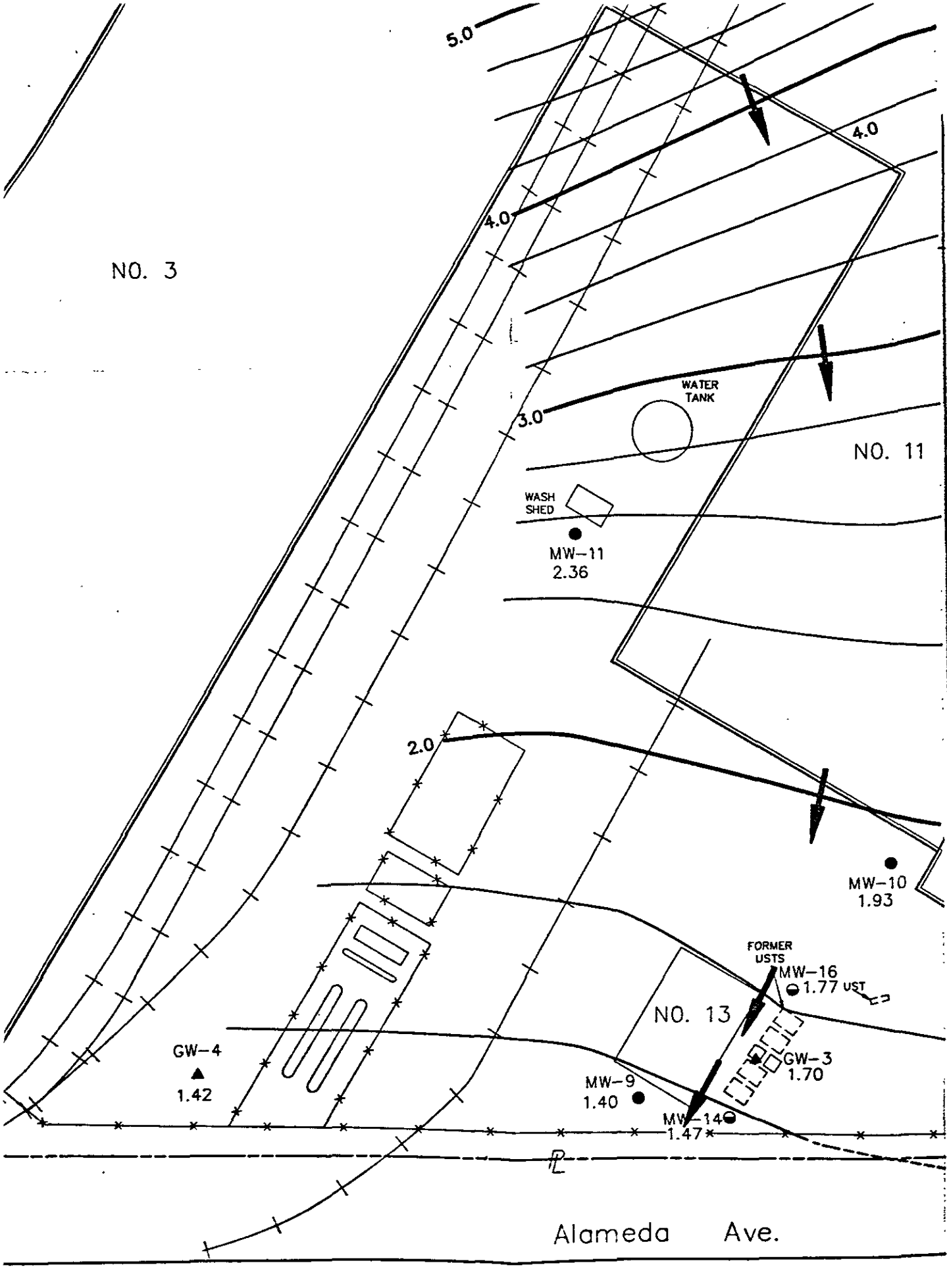
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FORMER USTS
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UST
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EH
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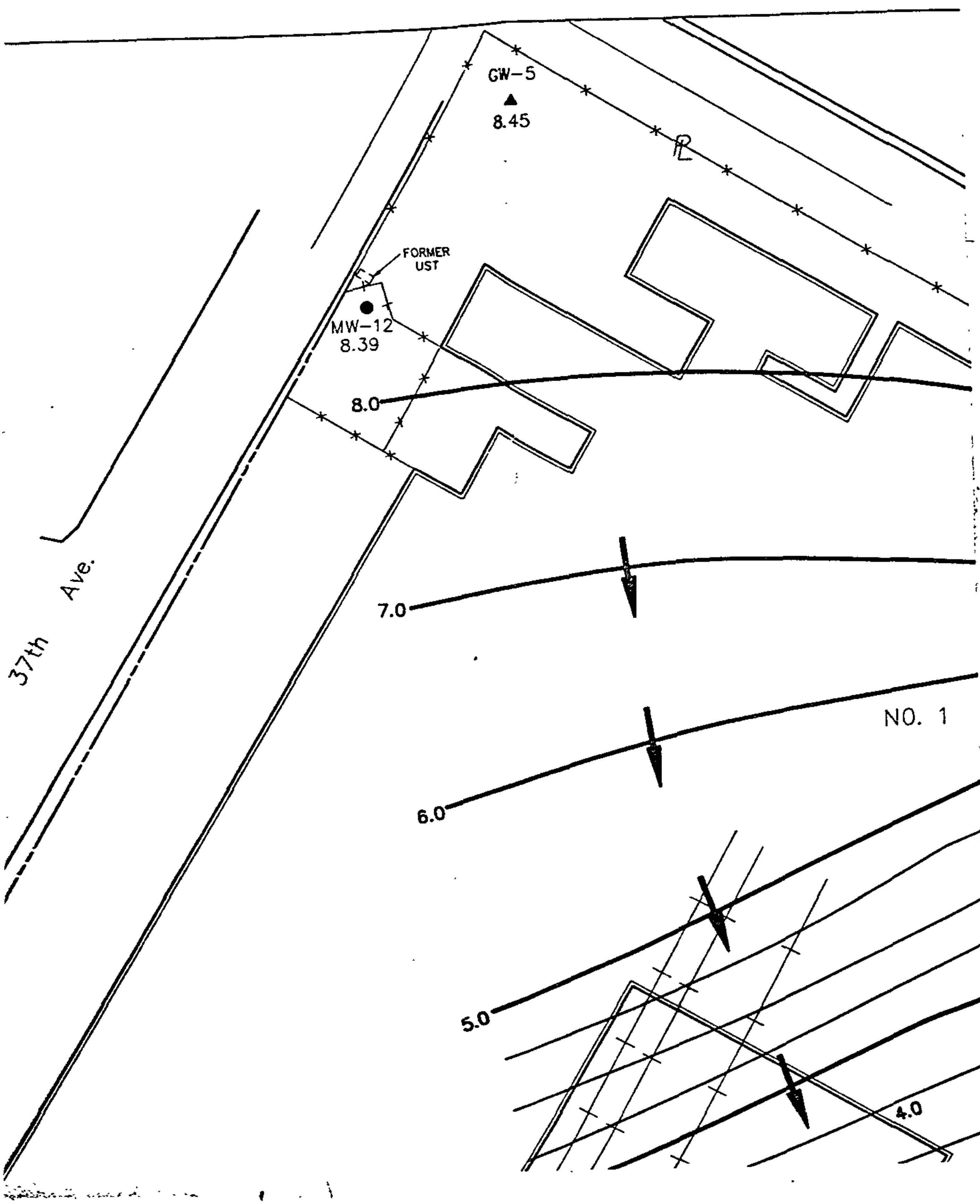

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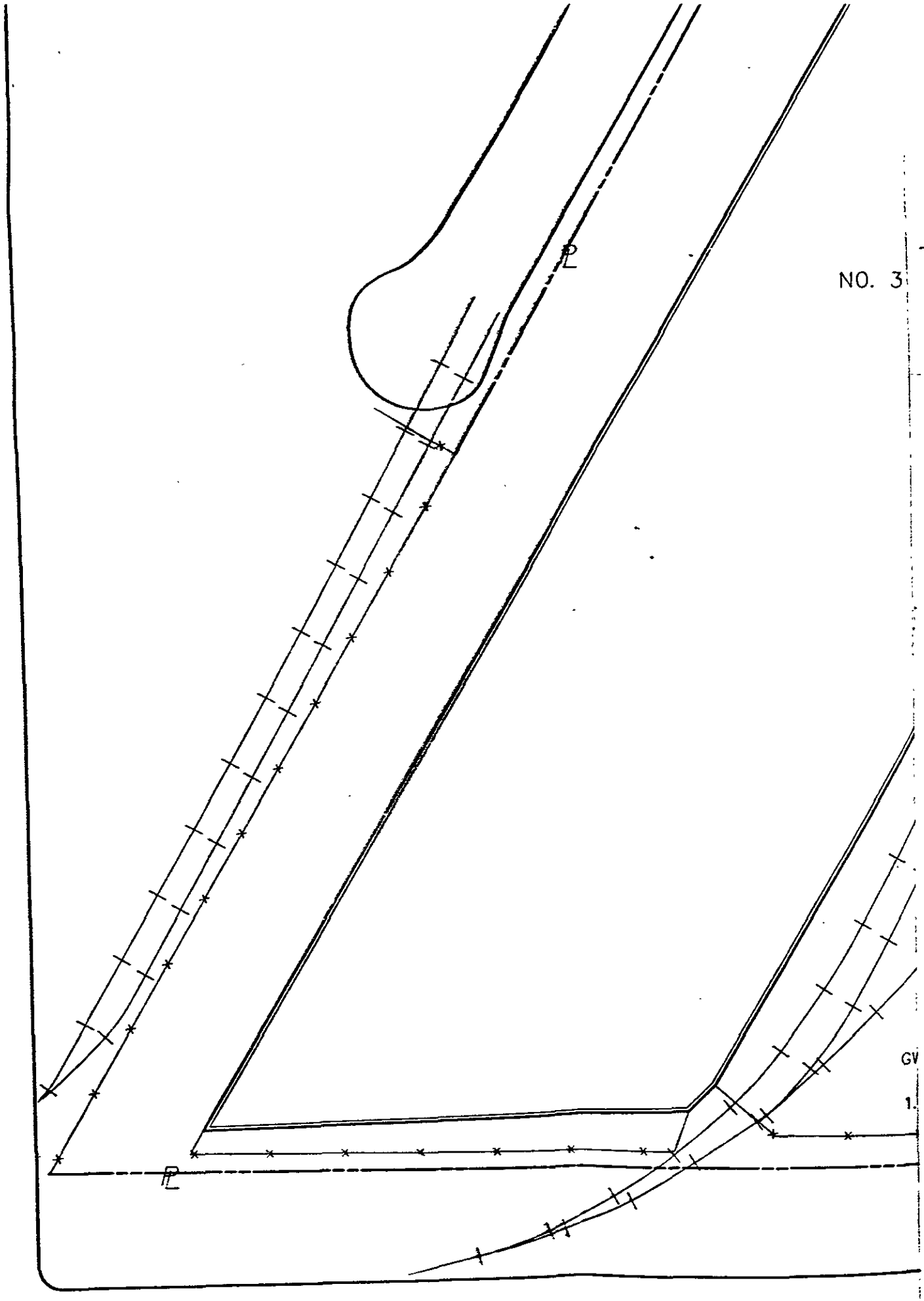
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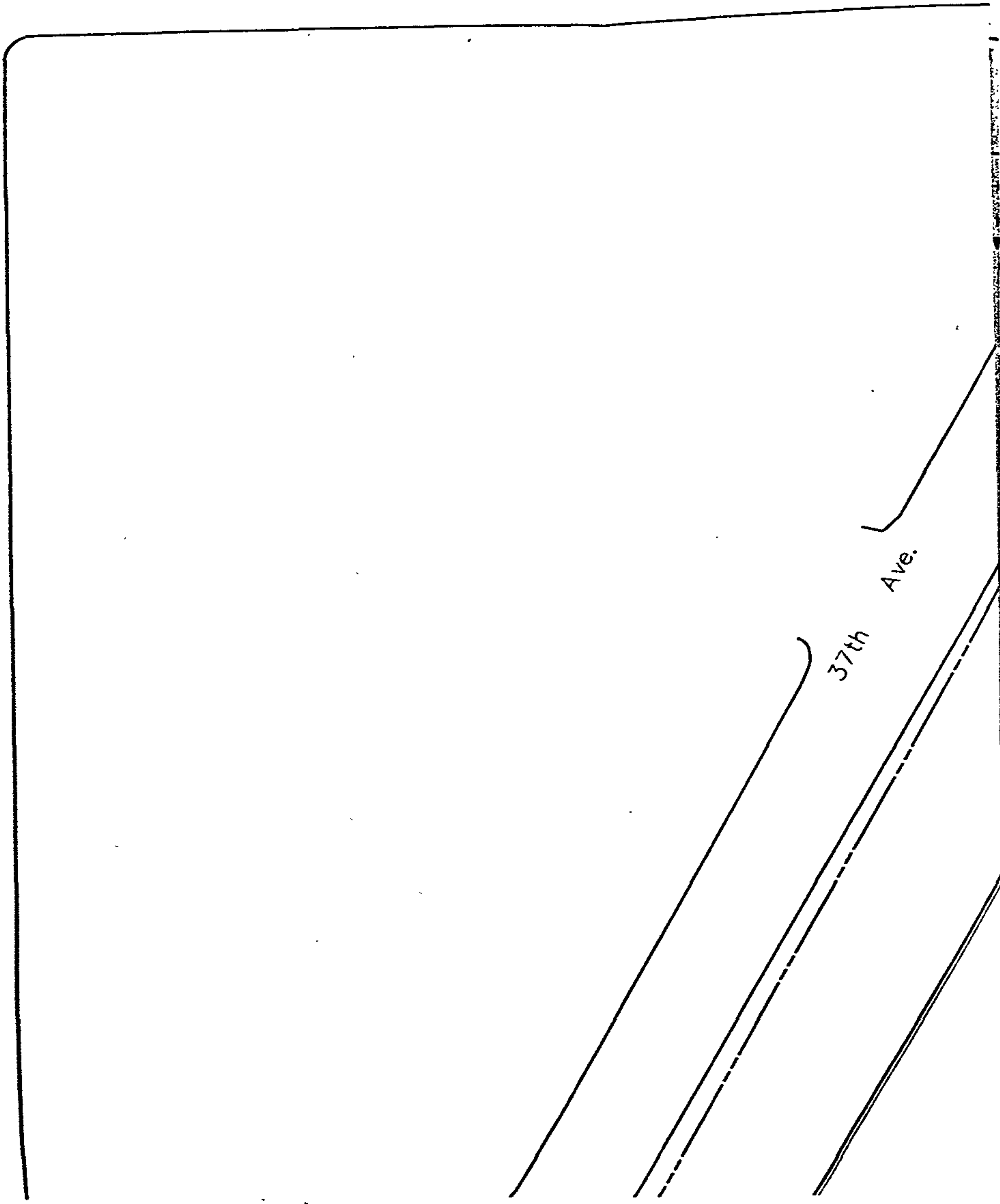


DIRECTION OF GROUNDWATER FLOW

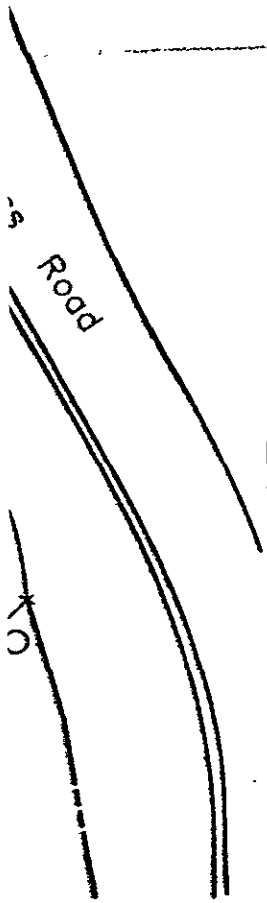


PLATE 4

	REVISIONS	BY	DATE
PROJ. MGR: Edward W. Alusow			
PREPARED BY: Walter O. Howard			
DRAFTED BY: S.C.Galloway			
CHECKED BY:			
PROJ. NO.: 02345-01983			
DWG. NO. 2M8985_3			
DATE: June 1991			
SHEET 4 OF 4			
DATUM: Mean Sea Level			
CONTOUR INTERVAL = 1.0 FEET			
USGS QUAD.: OAKLAND EAST			

N

GEOGRAPHIC NORTH

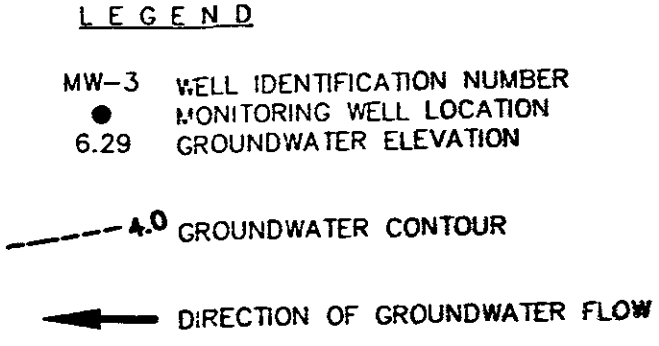
0 10 50 100

SCALE IN FEET

DUNN GEOSCIENCE CORPORATION
12 Metro Park Road
Albany, NY 12205

GROUNDWATER CONTOUR MAP
6/17/91
AMERICAN NATIONAL CAN
OAKLAND PLANT

CITY OF OAKLAND ALAMEDA COUNTY, CA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MONITORING WELL LOCATION
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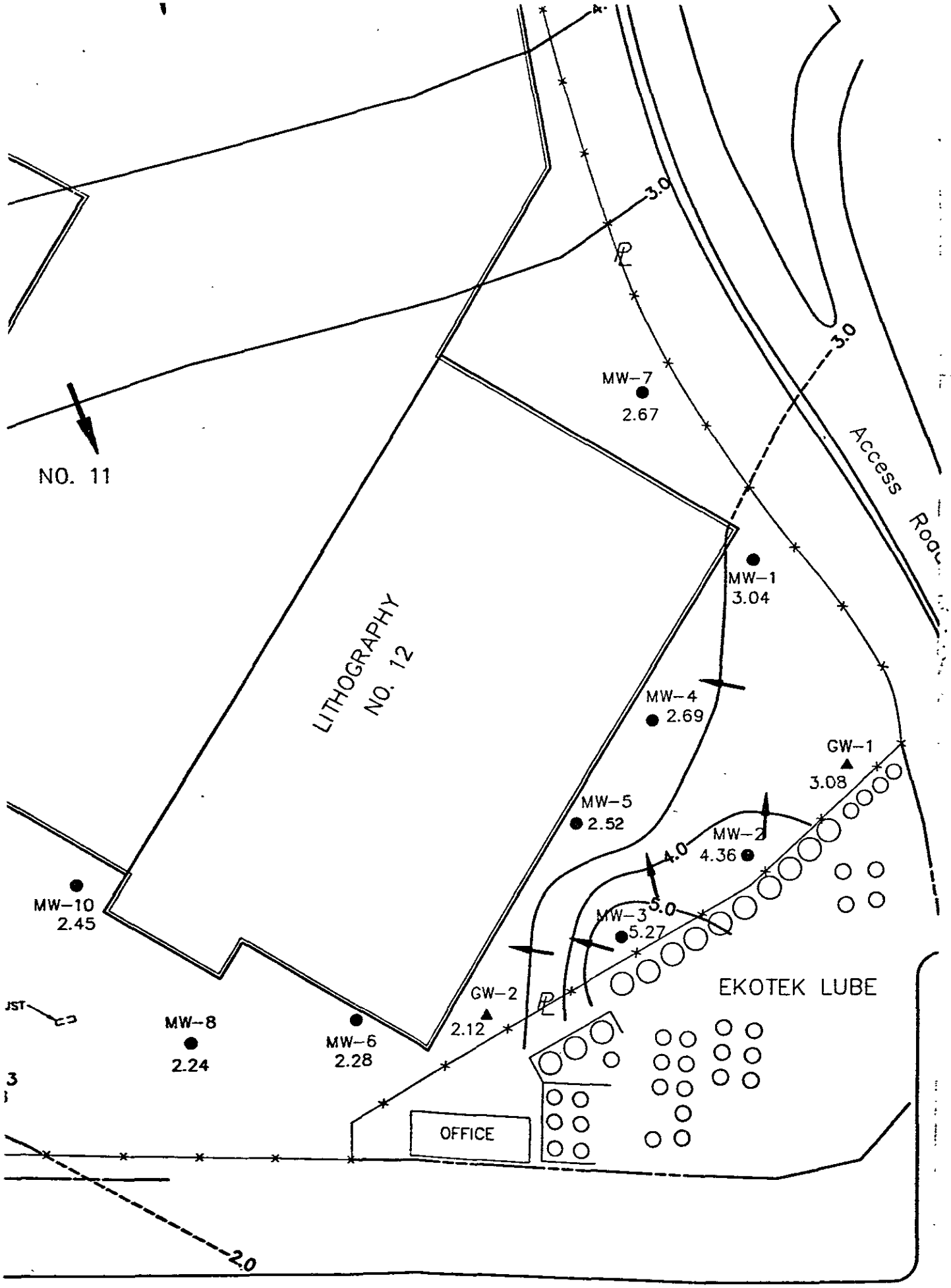
4.0 GROUNDWATER CONTOUR
DIRECTION OF GROUNDWATER FLOW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MW-3
5.27
GW-1
3.08
GW-2
2.12
MW-10
2.45
MW-8
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EKOTEK LUBE
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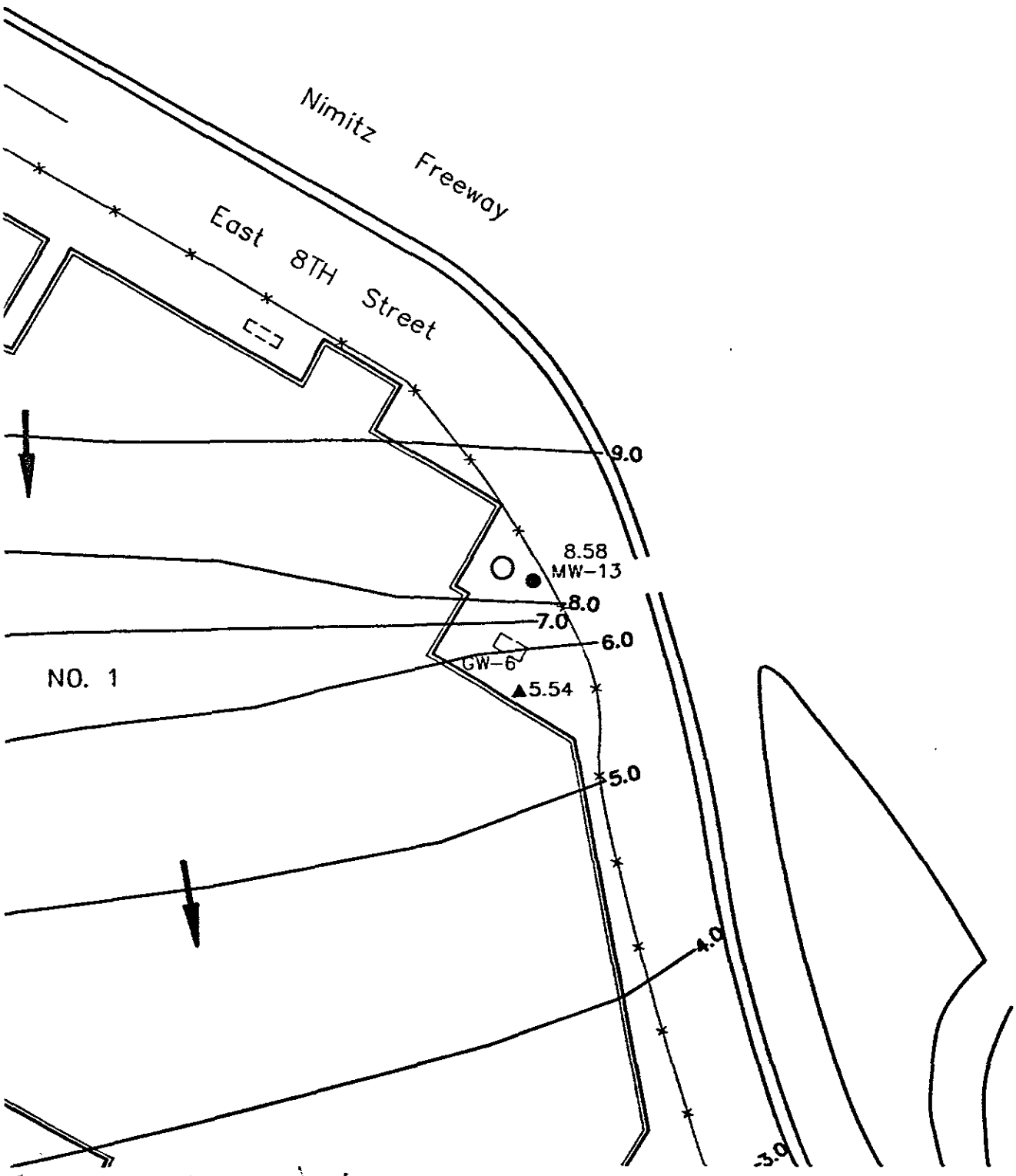
Access Road

EH 000041-8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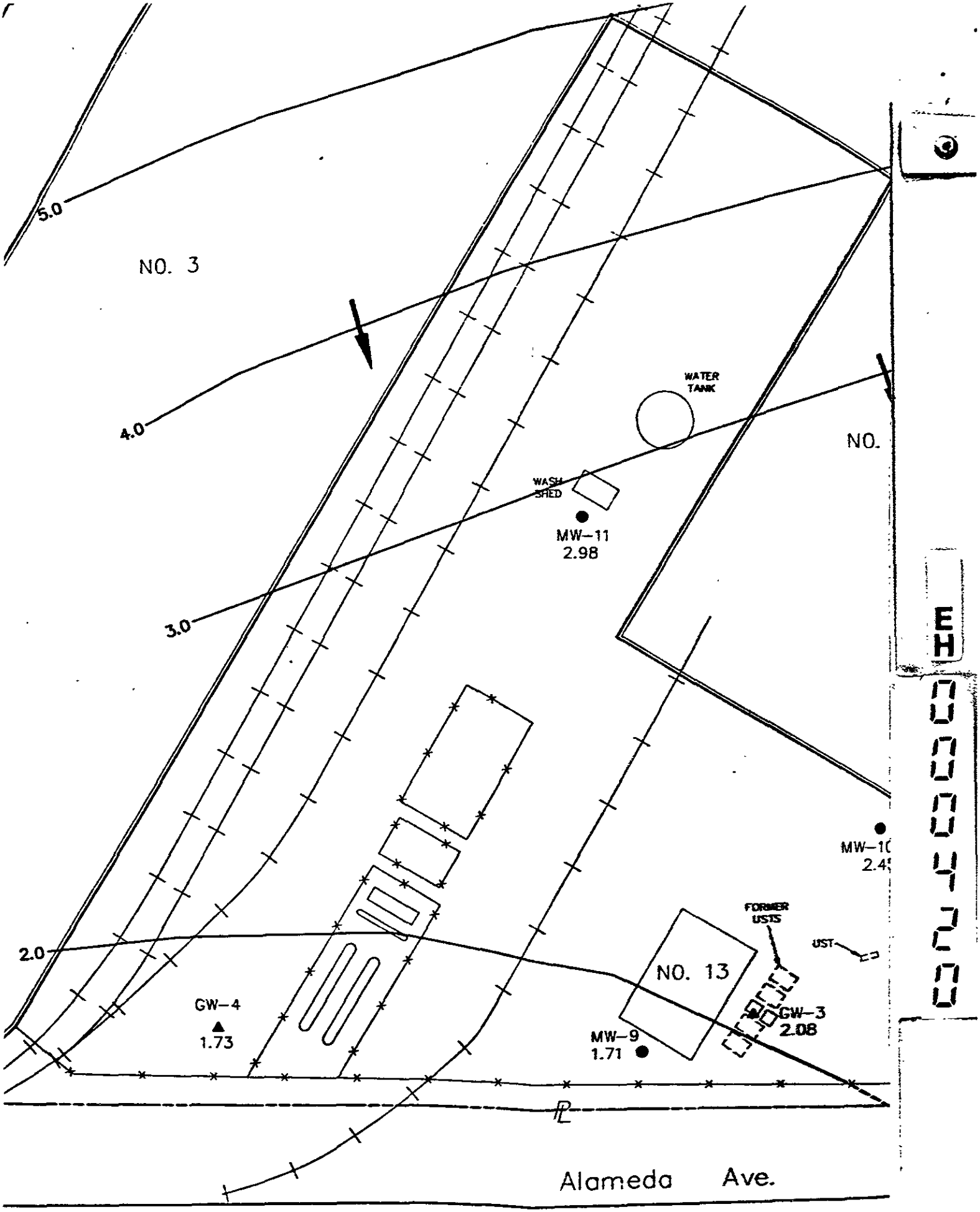
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Alameda Ave.

EH
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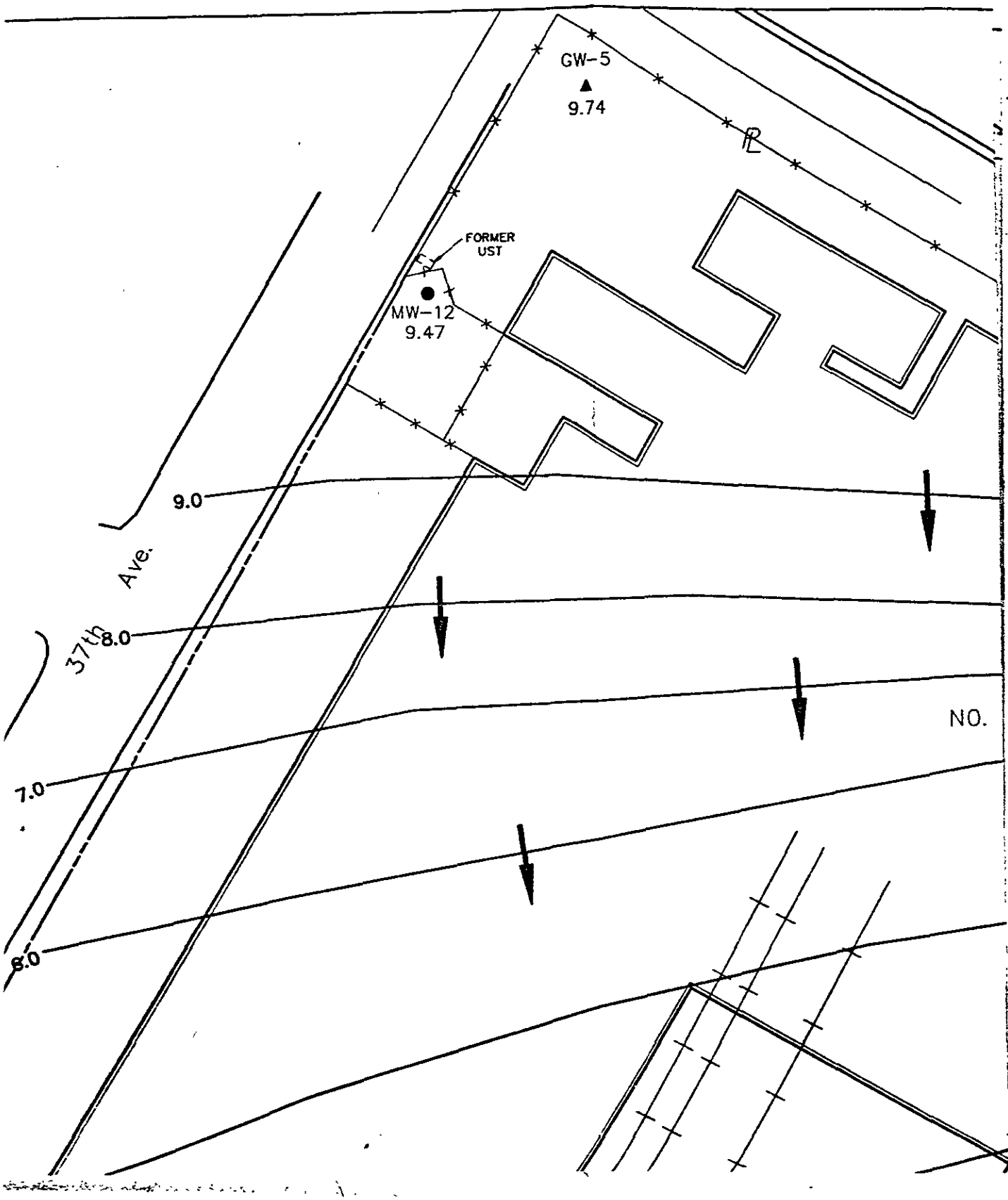

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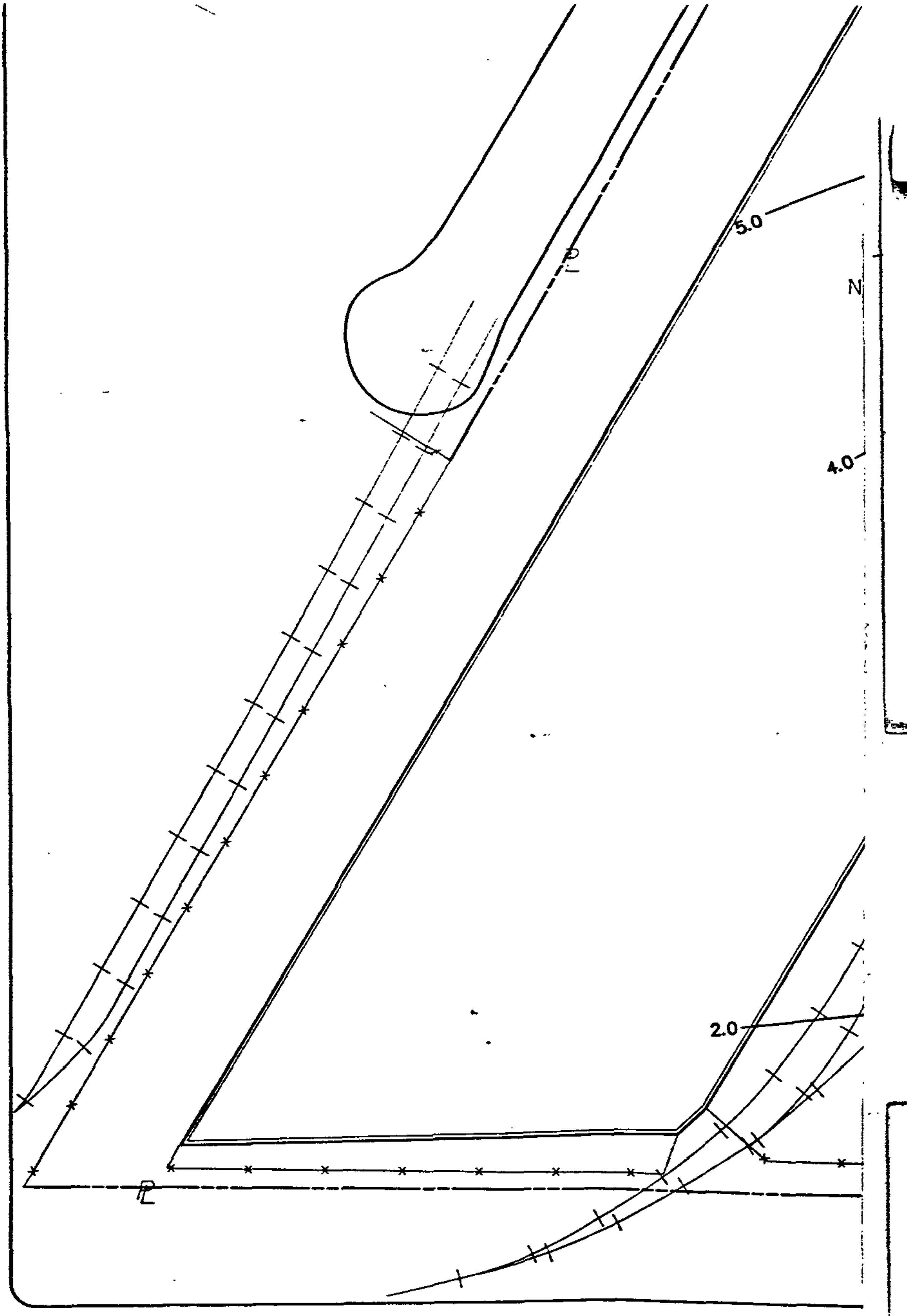

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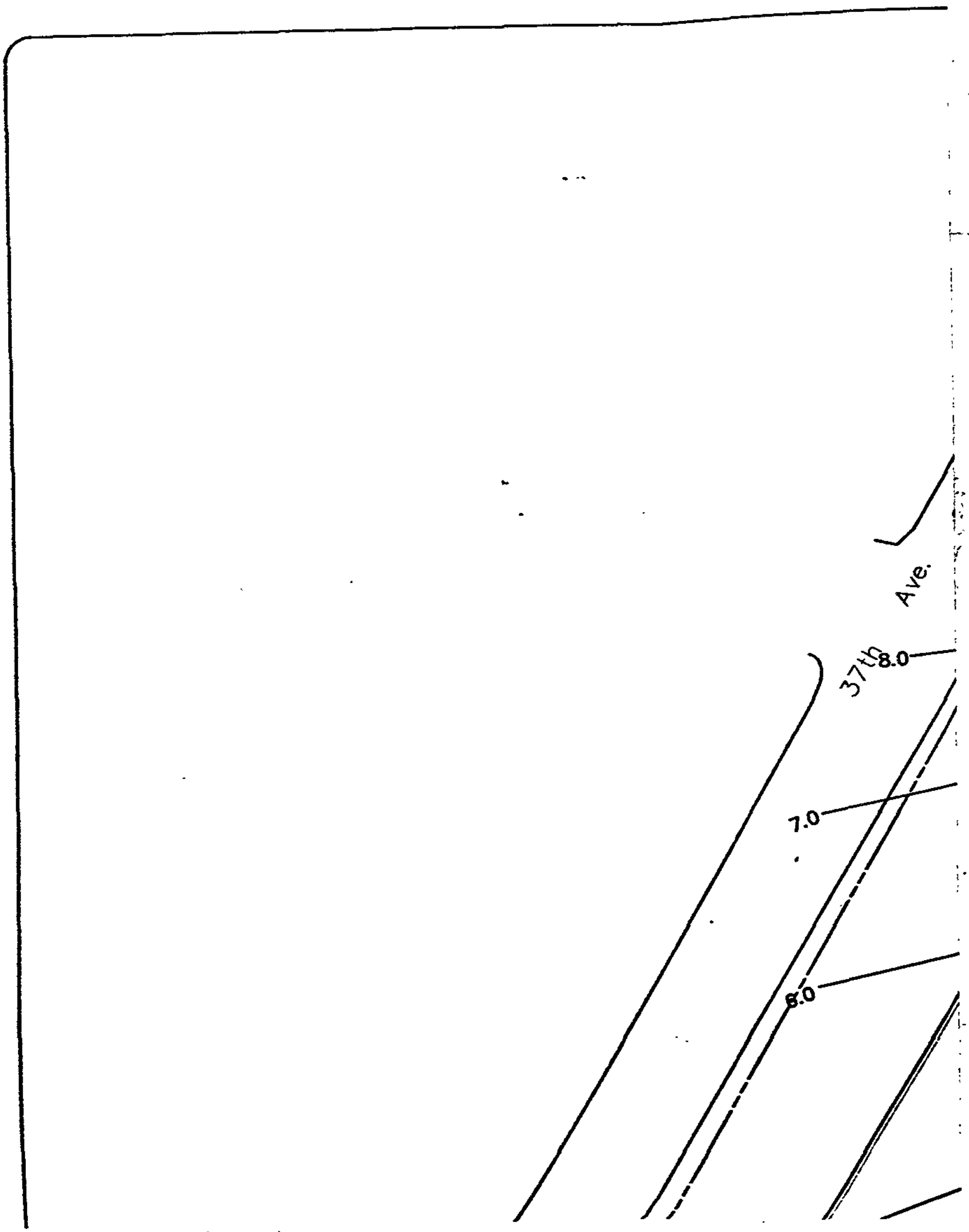

FRAGMENT END

EH

DIRECTION OF GROUNDWATER FLOW

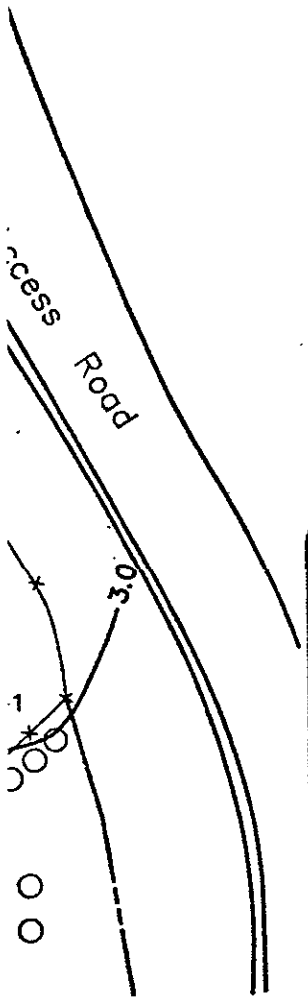

PLATE 5

	REVISIONS	BY	DATE
PROJ. MGR: Edward W. Alusow			
PREPARED BY: Walter O. Howard			
DRAFTED BY: S.C.Galloway			
CHECKED BY:			
PROJ. NO.: 02345-01983			
DWG. NO. 2M8985_4			
DATE: June 1991			
SHEET 5 OF 5			
DATUM: Mean Sea Level			
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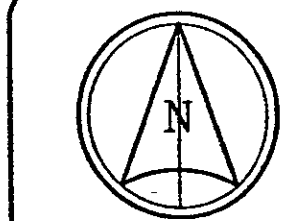
USGS QUAD.: OAKLAND EAST			



GEOGRAPHIC NORTH

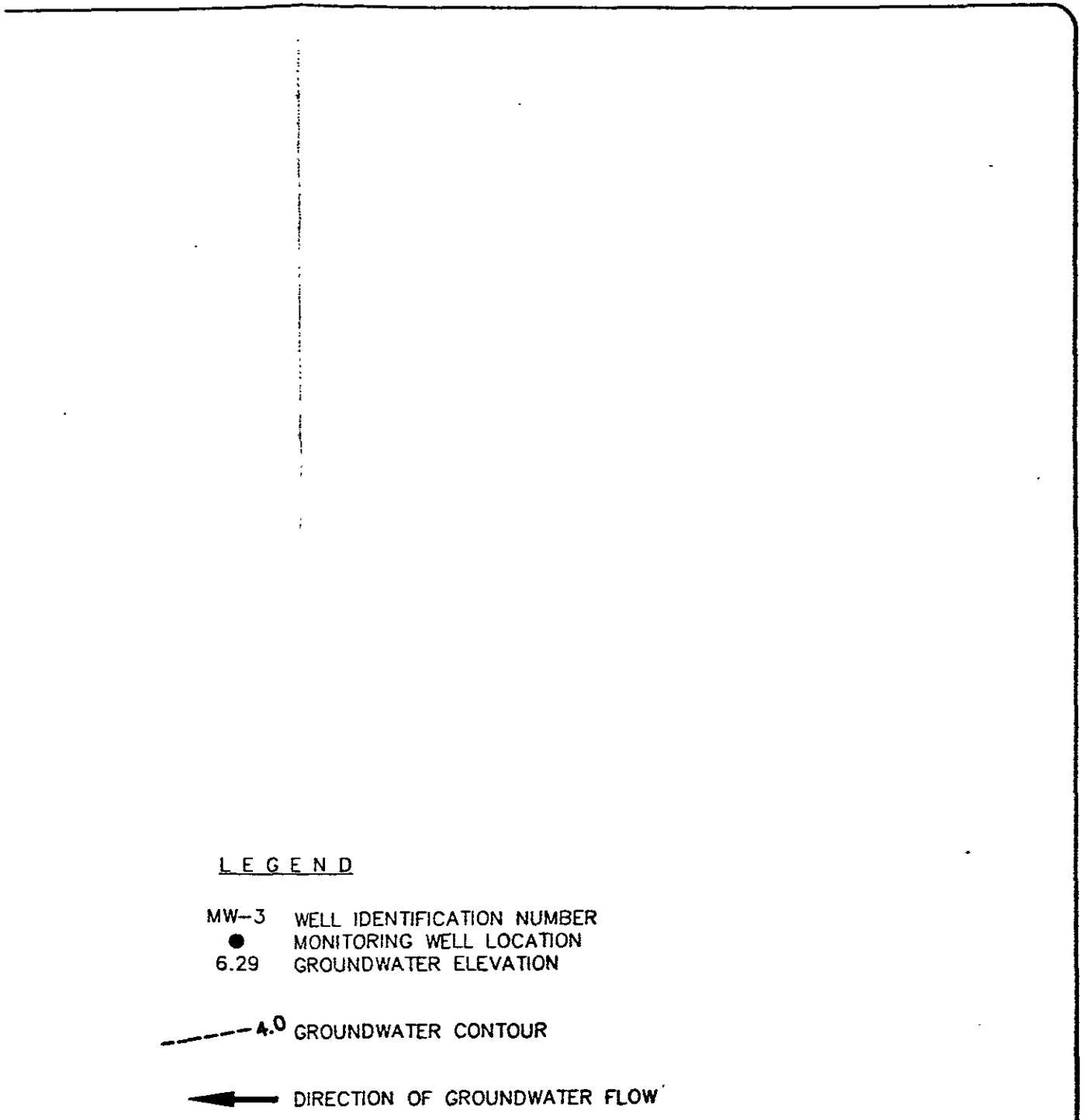
0 10 50 100

SCALE IN FEET

DUNN GEOSCIENCE CORPORATION
12 Metro Park Road
Albany, NY 12205

GROUNDWATER CONTOUR MAP
7/15/91
AMERICAN NATIONAL CAN
OAKLAND PLANT

CITY OF OAKLAND ALAMEDA COUNTY, CA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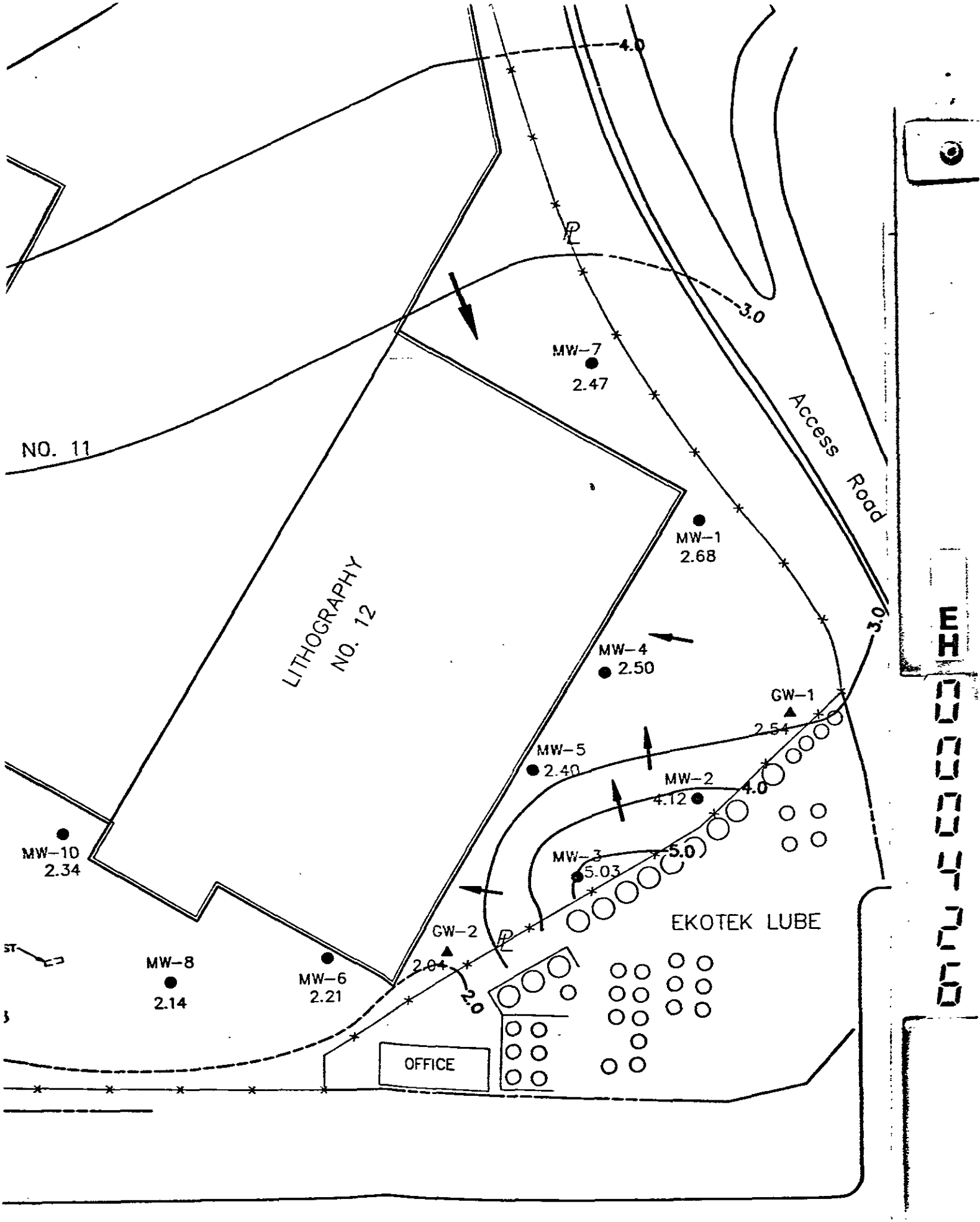
4.0 GROUNDWATER CONTOUR
DIRECTION OF GROUNDWATER FLOW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MW-6
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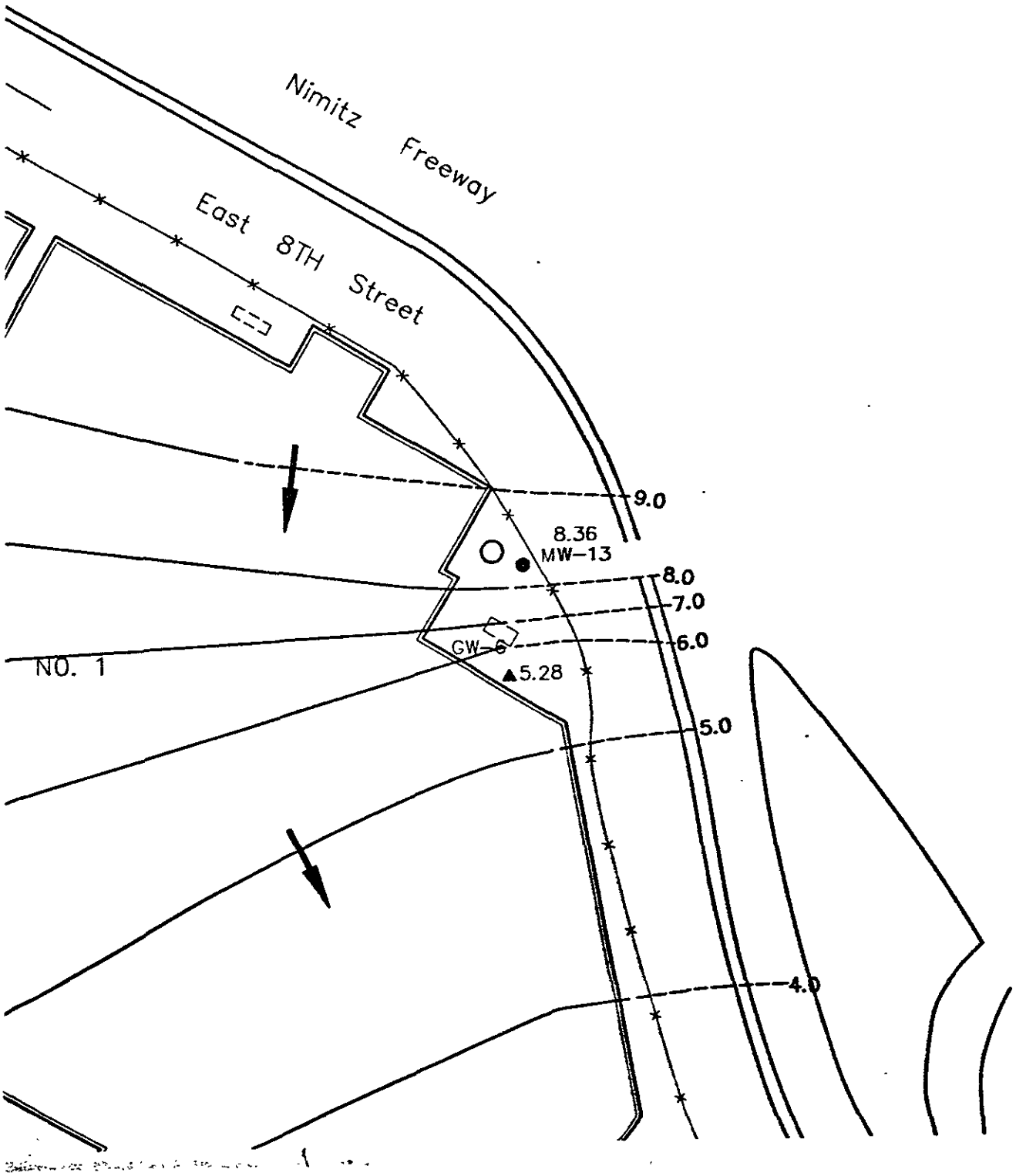
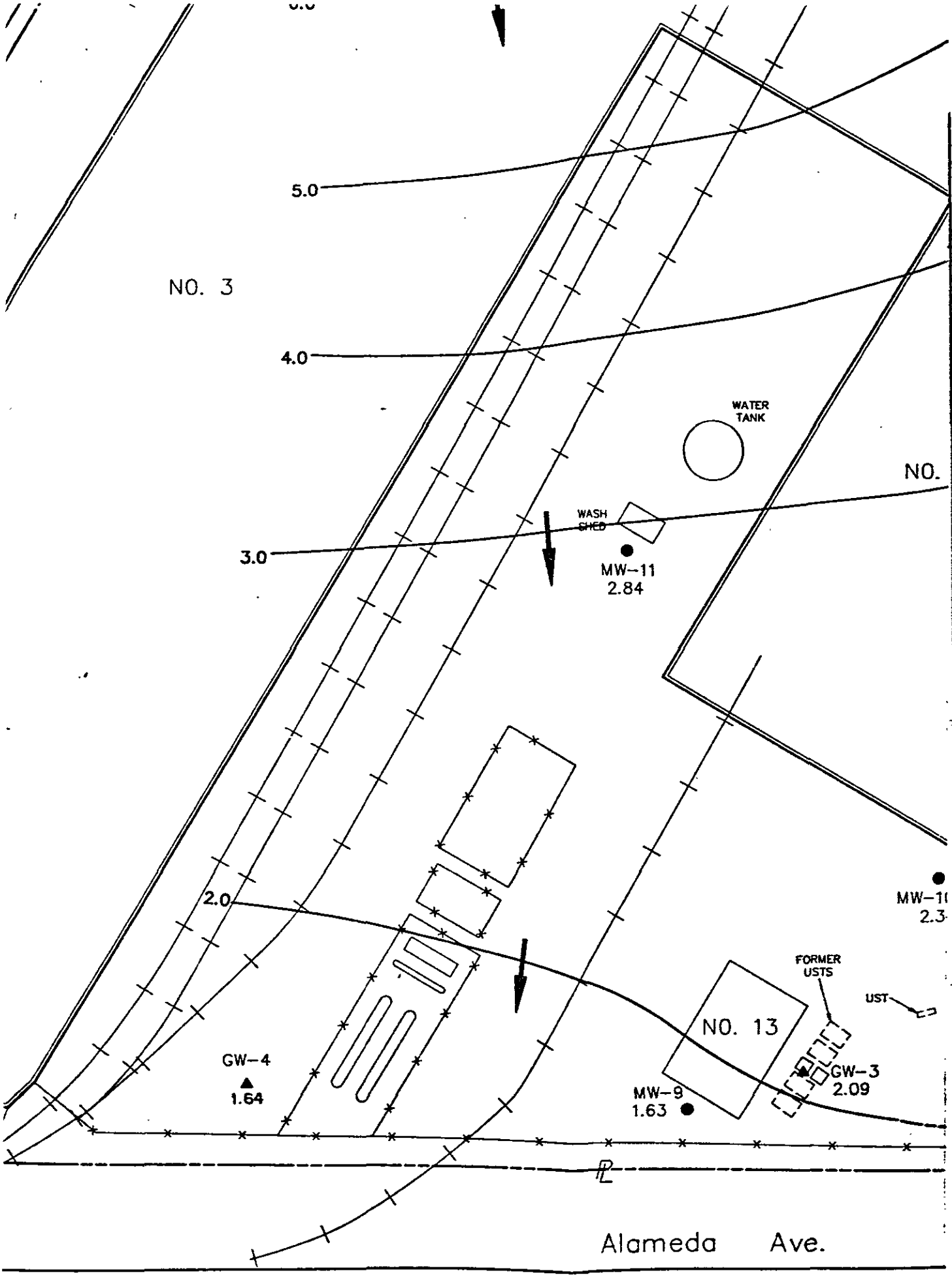
OFFICE

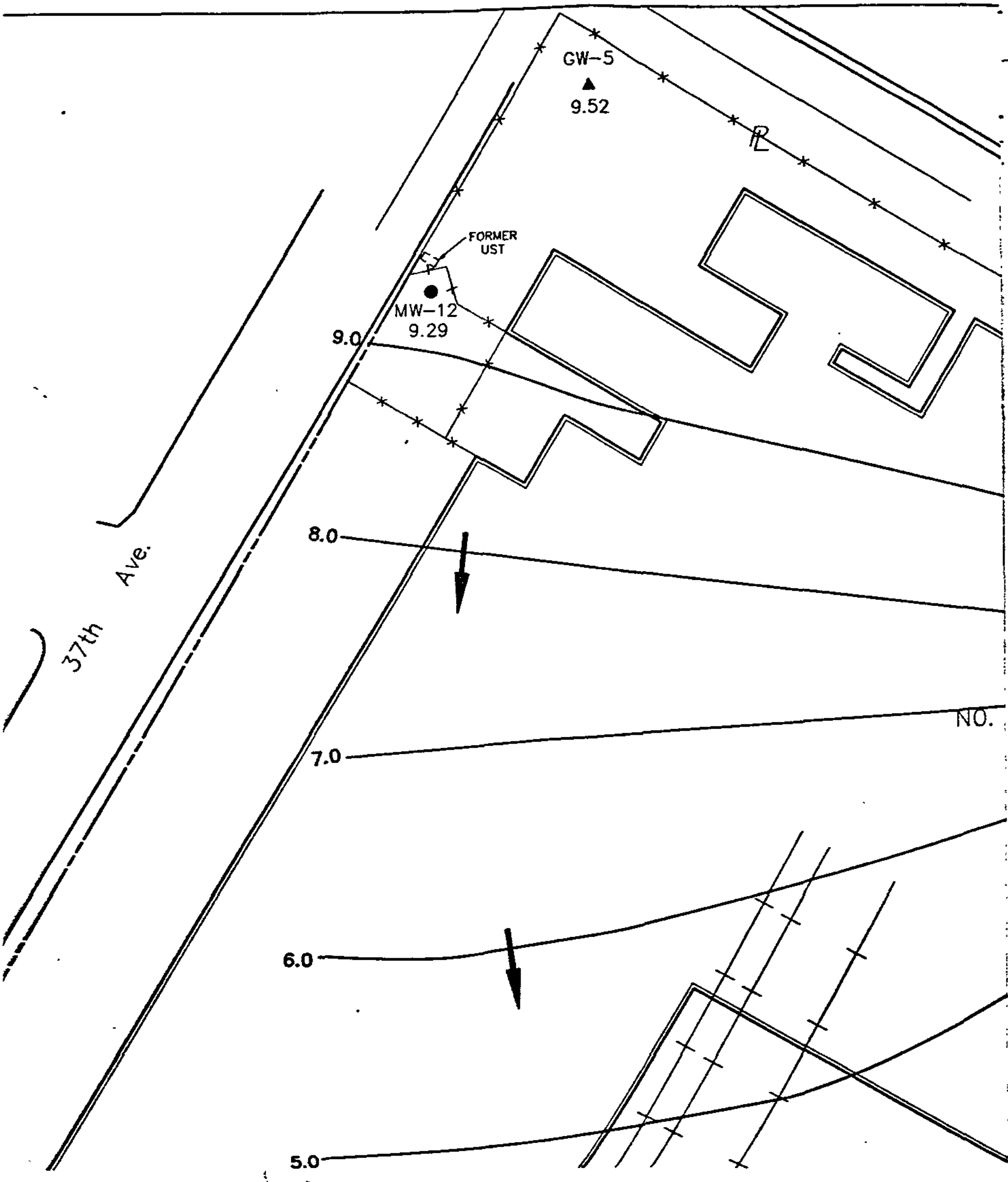
EH 000426


Nimitz Freeway
East 8TH Street
9.0
8.36
MW-13
8.0
7.0
6.0
GW-6
5.28
NO. 1
5.0
4.0

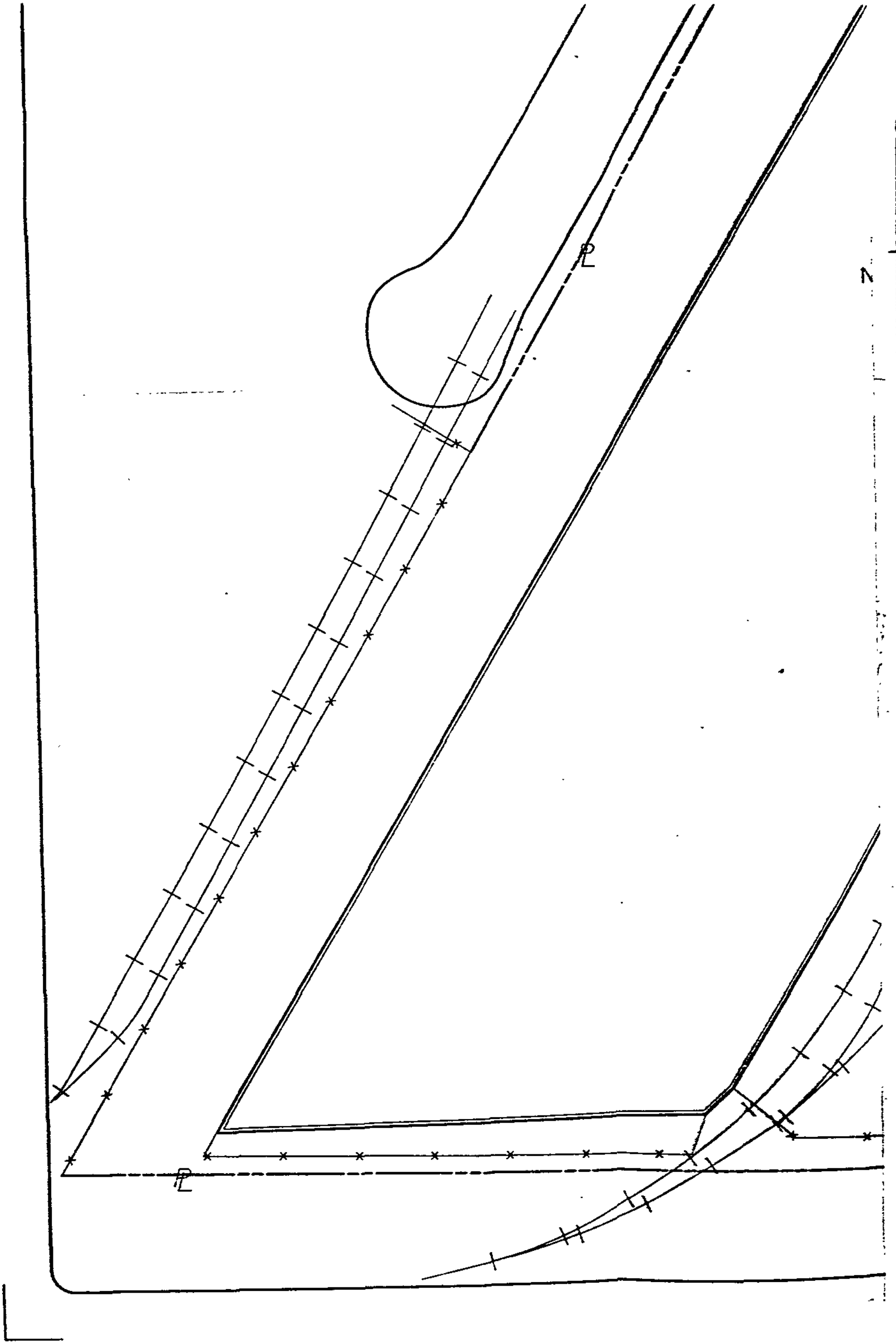
EH 000427


5.0
NO. 3
4.0
WATER TANK
NO.
WASH SHED
3.0
MW-11
2.84
2.0
MW-1(
2.3
FORMER USTS
UST
NO. 13
GW-4
1.64
GW-3
2.09
MW-9
1.63
℄
Alameda Ave.

EH 0000472

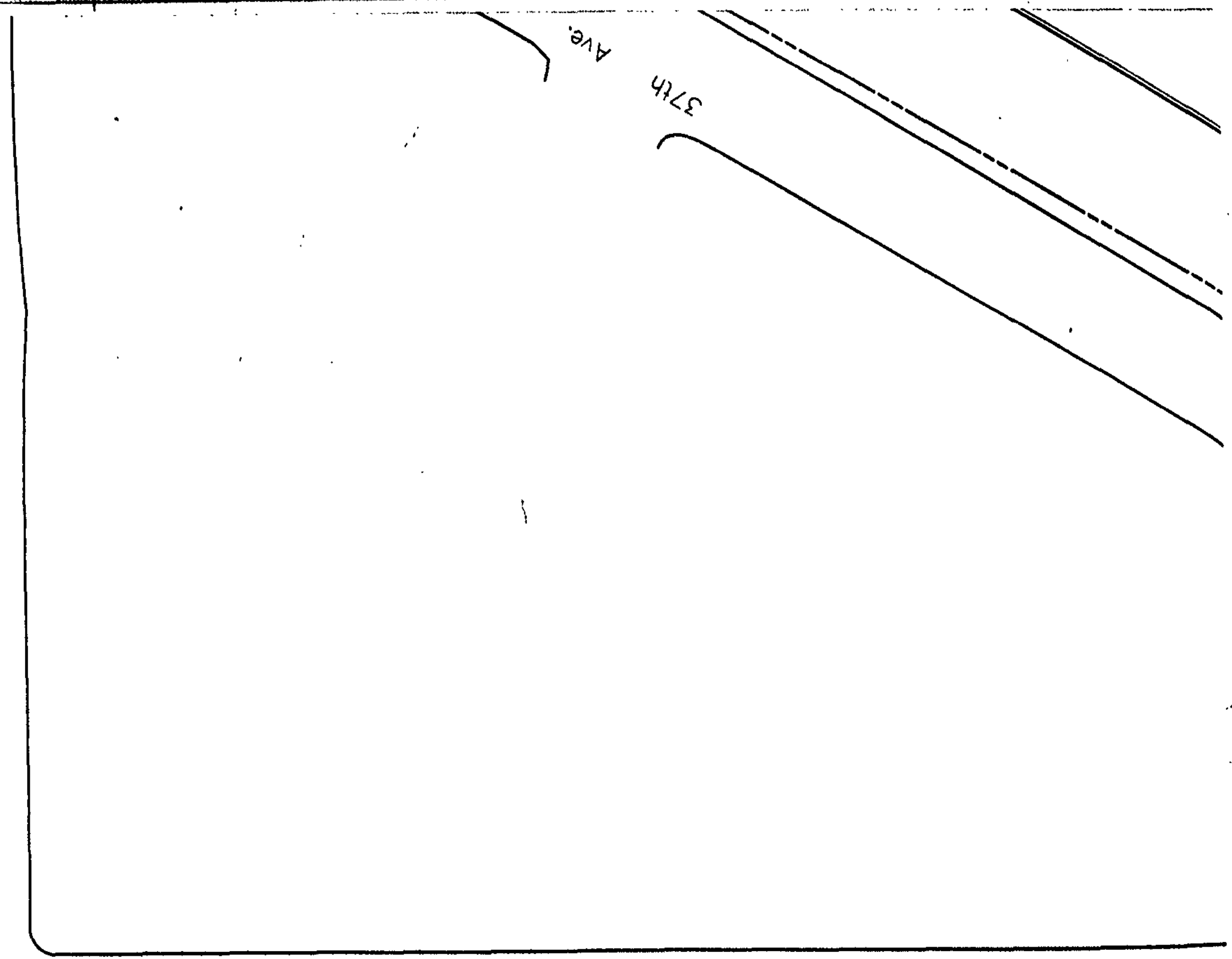


EH 0000429



FRAGMENT END

EH000471



DIRECTION OF GROUNDWATER FLOW

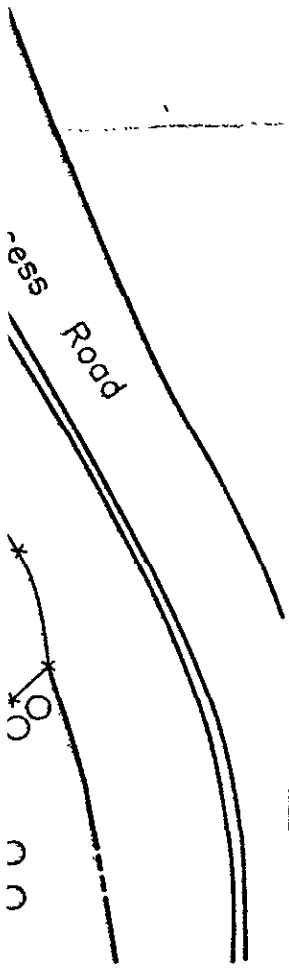
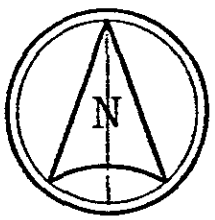


PLATE 3

	REVISIONS	BY	DATE
PROJ. MGR: Edward W. Alusow			
PREPARED BY: Walter O. Howard			
DRAFTED BY: S.C.Galloway			
CHECKED BY:			
PROJ. NO.: 02345-01983			
DWG. NO. 2M8985_2			
DATE: June 1991			
SHEET 3 OF 4			
DATUM: Mean Sea Level			
CONTOUR INTERVAL = 1.0 FEET			
USGS QUAD.: OAKLAND EAST			



GEOGRAPHIC NORTH

0 10 50 100

SCALE IN FEET

DUNN GEOSCIENCE CORPORATION
12 Metro Park Road
Albany, NY 12205

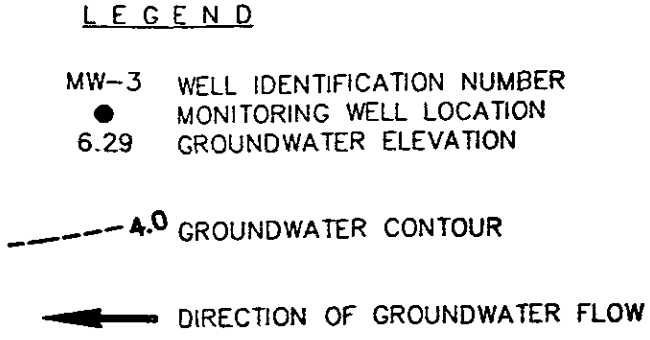
GROUNDWATER CONTOUR MAP
5/15/91

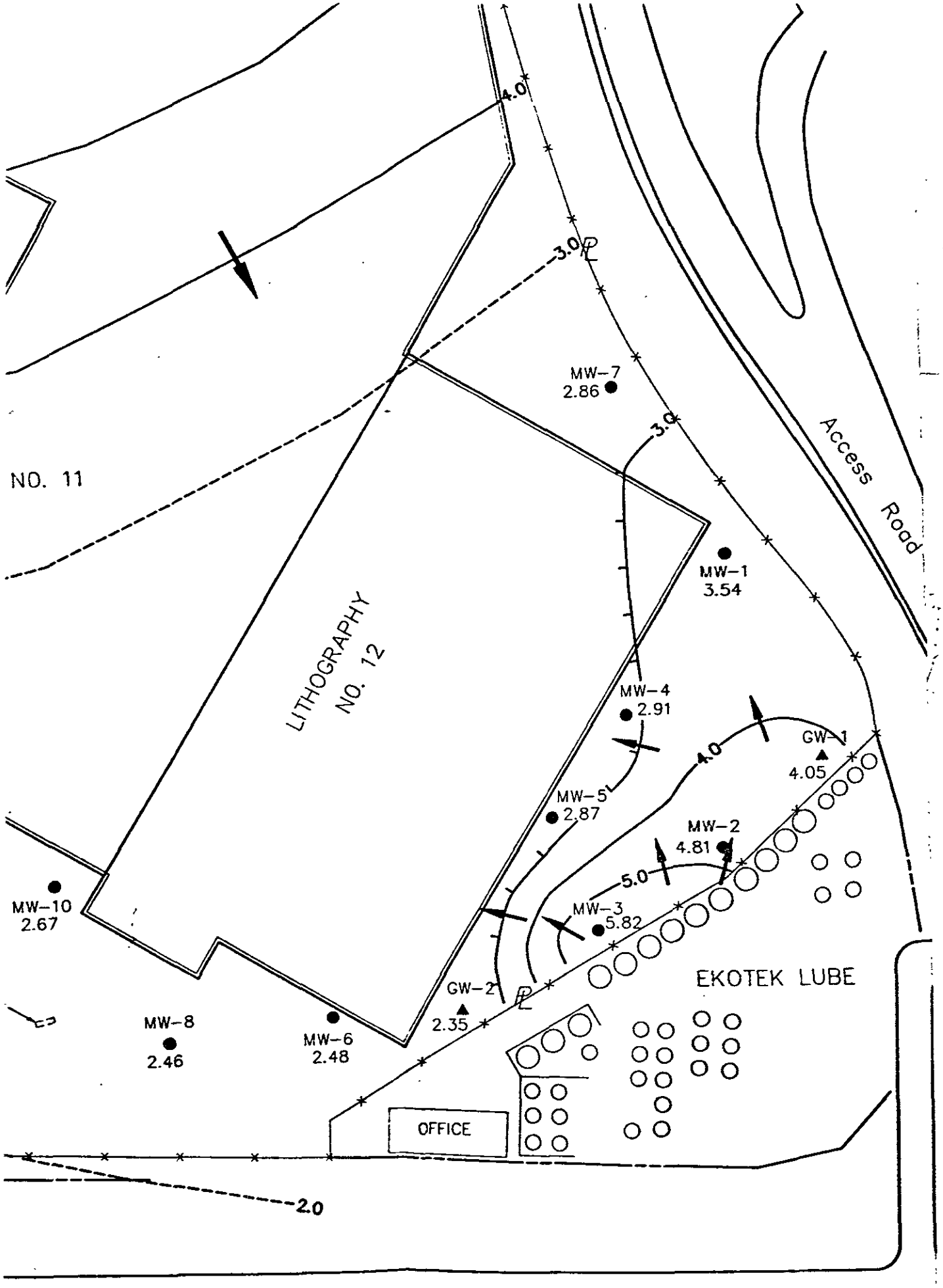
AMERICAN NATIONAL CAN
OAKLAND PLANT

CITY OF OAKLAND ALAMEDA COUNTY, CA

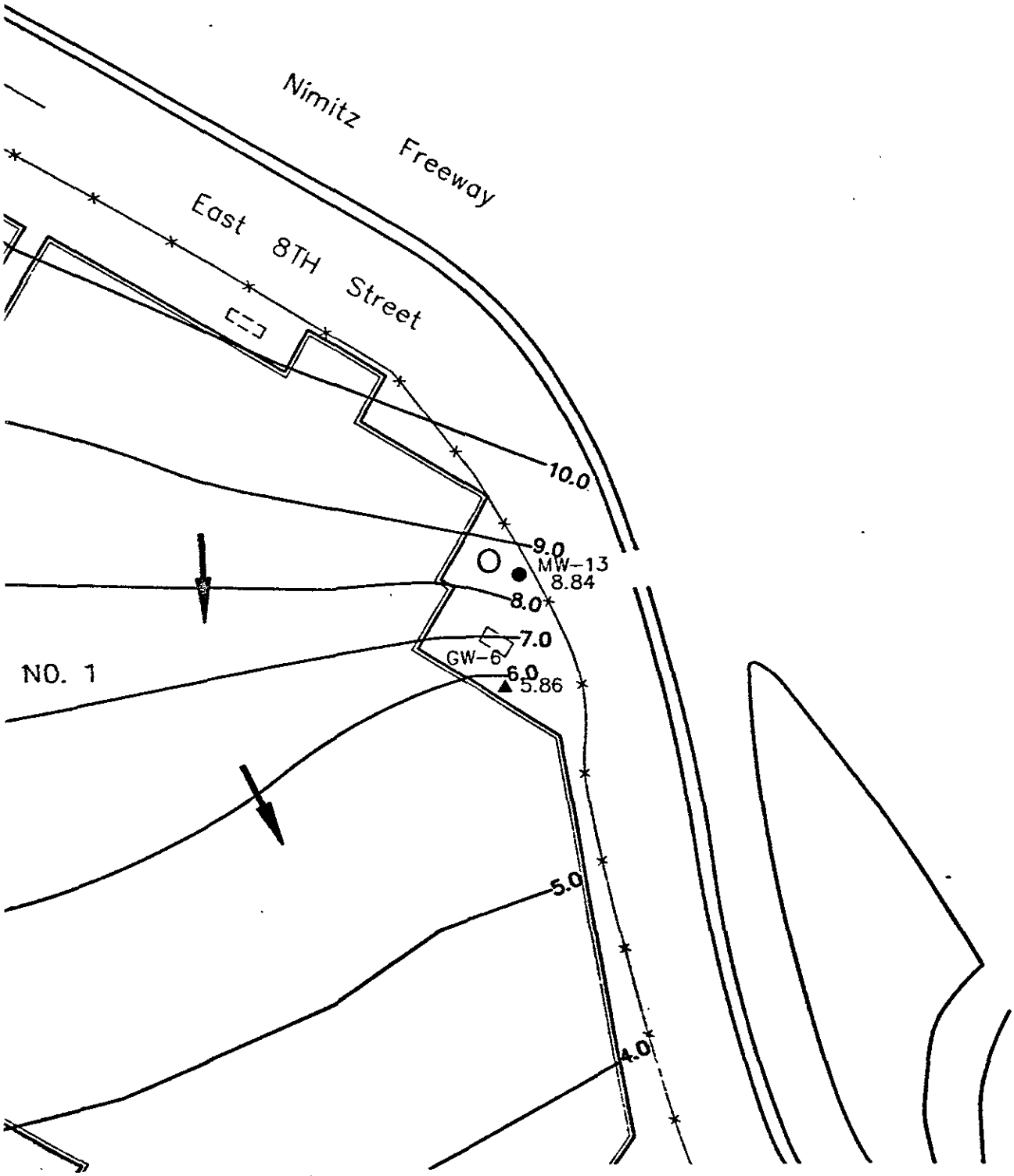
FRAGMENT BEGIN

EH 000047

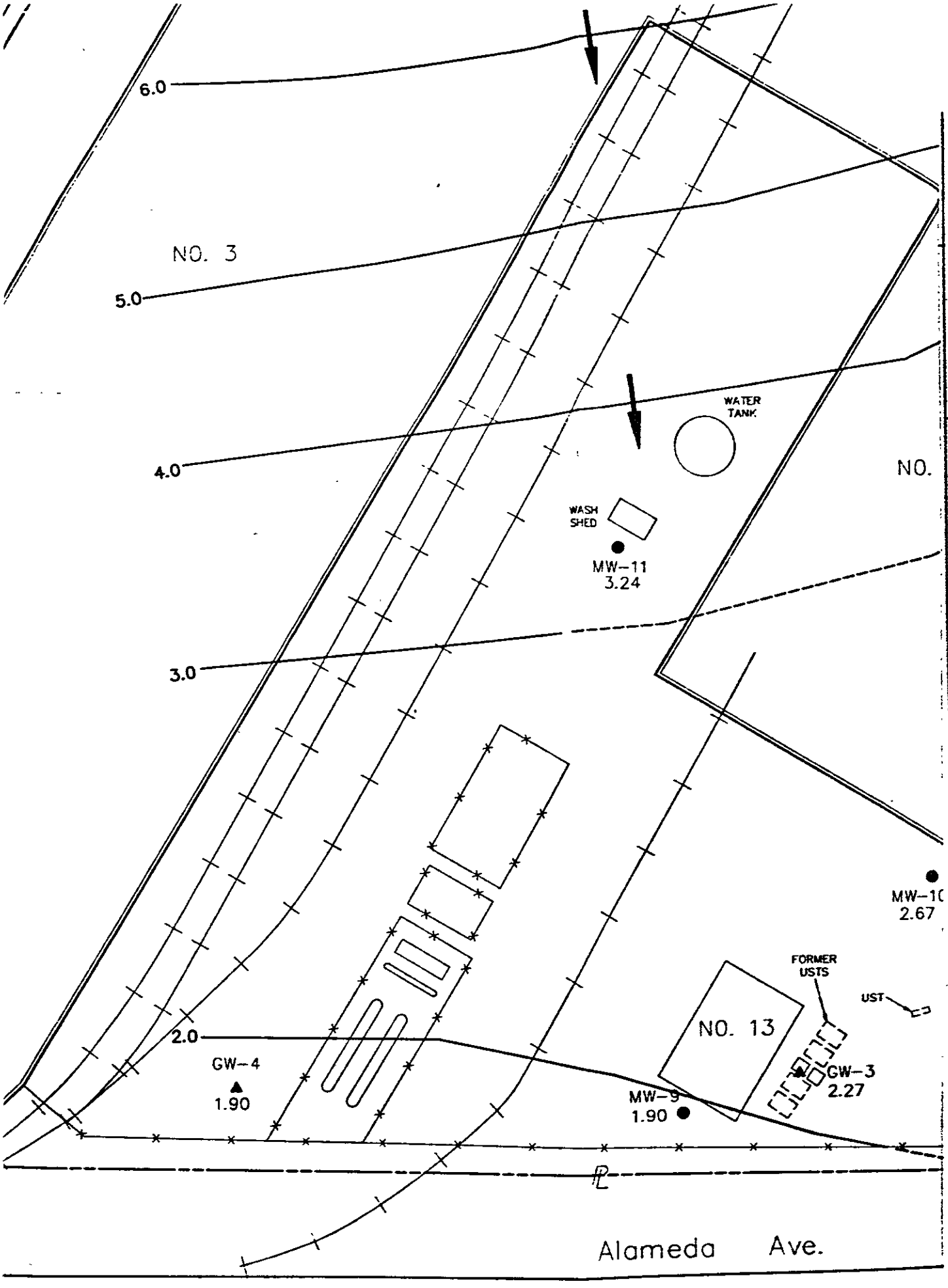

LEGEND
MW-3 WELL IDENTIFICATION NUMBER
MONITORING WELL LOCATION
6.29 GROUNDWATER ELEVATION
4.0 GROUNDWATER CONTOUR
DIRECTION OF GROUNDWATER FLOW


4.0
3.0
MW-7
2.86
3.0
Access Road
NO. 11
MW-1
3.54
LITHOGRAPHY
NO. 12
MW-4
2.91
GW-1
4.05
4.0
MW-5
2.87
MW-2
4.81
5.0
MW-10
2.67
MW-3
5.82
EKOTEK LUBE
GW-2
2.35
MW-8
2.46
MW-6
2.48
OFFICE
2.0

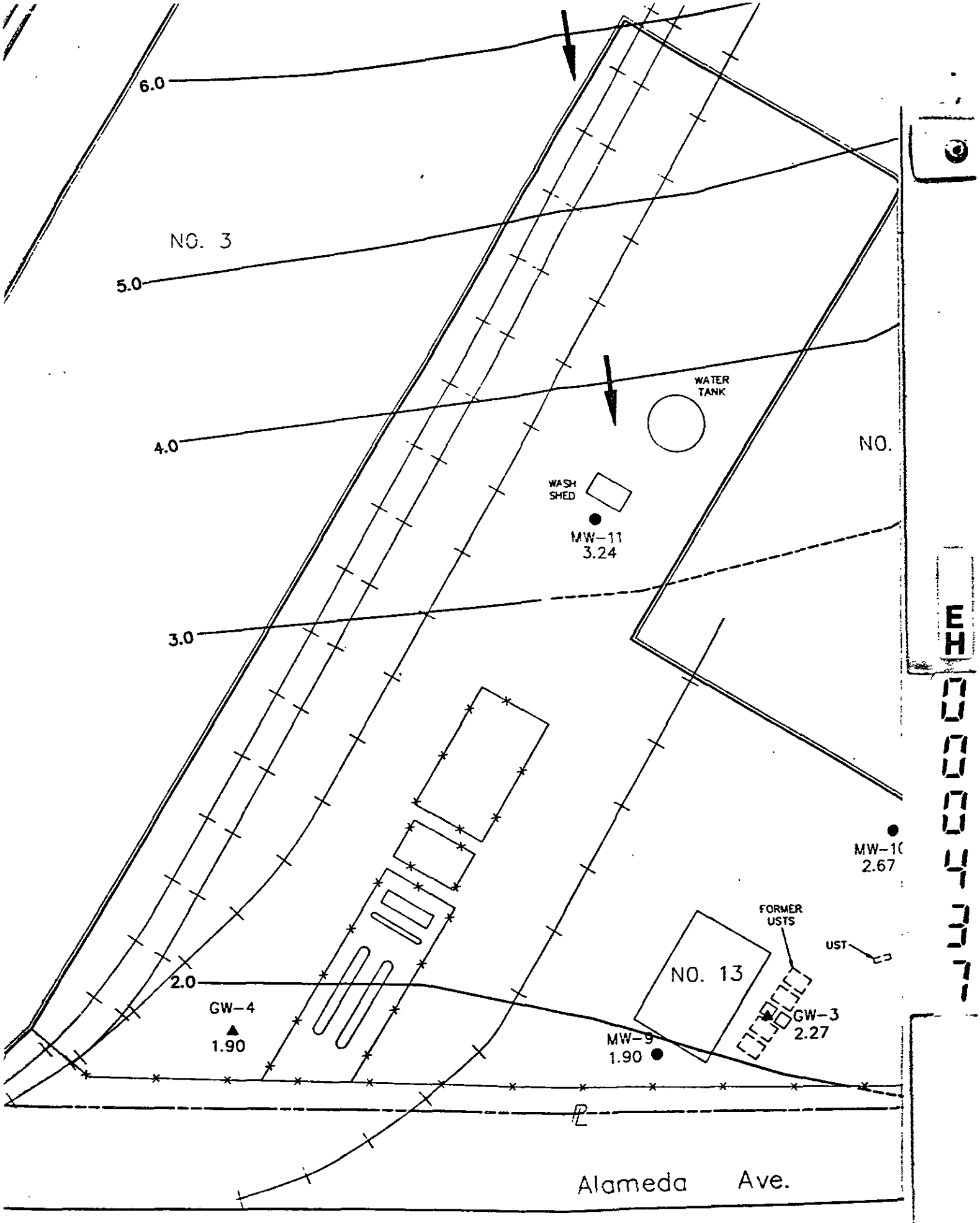
EH 000434


Nimitz Freeway
East 8TH Street
10.0
9.0
MW-13
8.84
8.0
7.0
GW-6
6.0
5.86
NO. 1
5.0
4.0

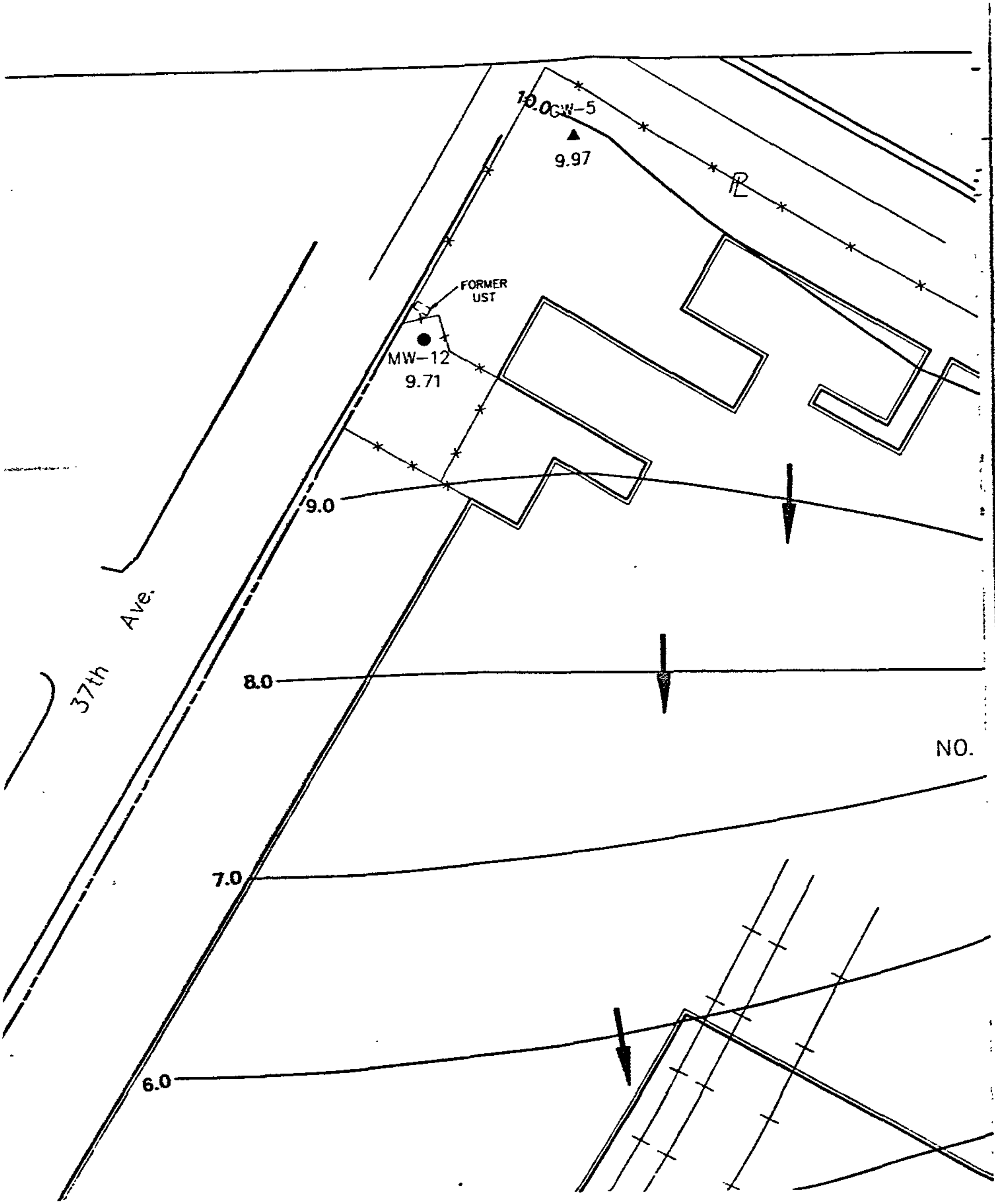
EH


6.0
5.0
4.0
3.0
2.0
NO. 3
NO.
WATER TANK
WASH SHED
MW-11
3.24
MW-1(
2.67
FORMER USTS
UST
NO. 13
GW-4
1.90
GW-3
2.27
MW-9
1.90
Alameda Ave.

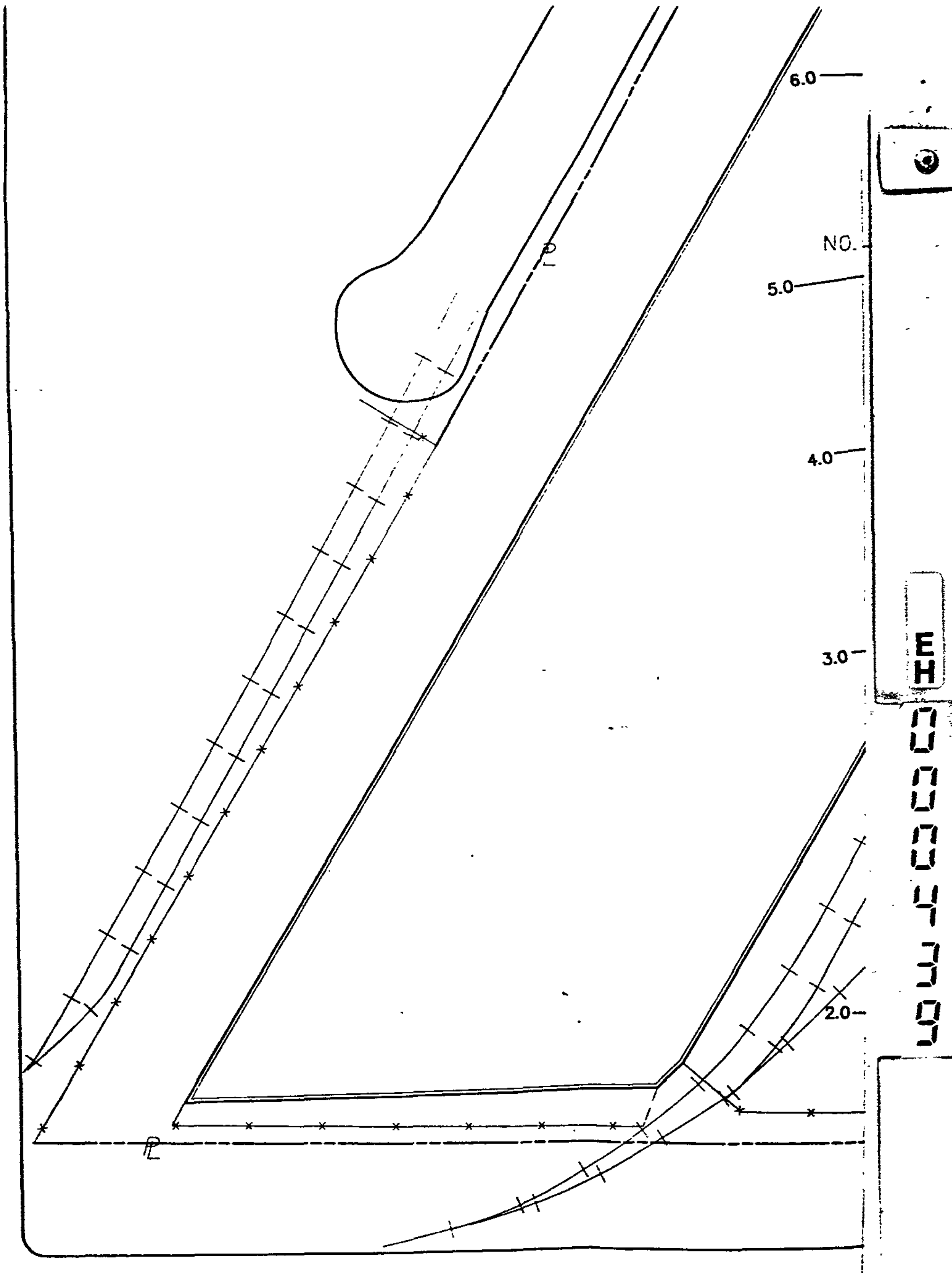
EH 0000436


6.0
5.0
4.0
3.0
2.0
NO. 3
NO.
WATER TANK
WASH SHED
MW-11
3.24
MW-1(
2.67
FORMER USTS
UST
NO. 13
GW-4
1.90
MW-9
1.90
GW-3
2.27
Alameda Ave.

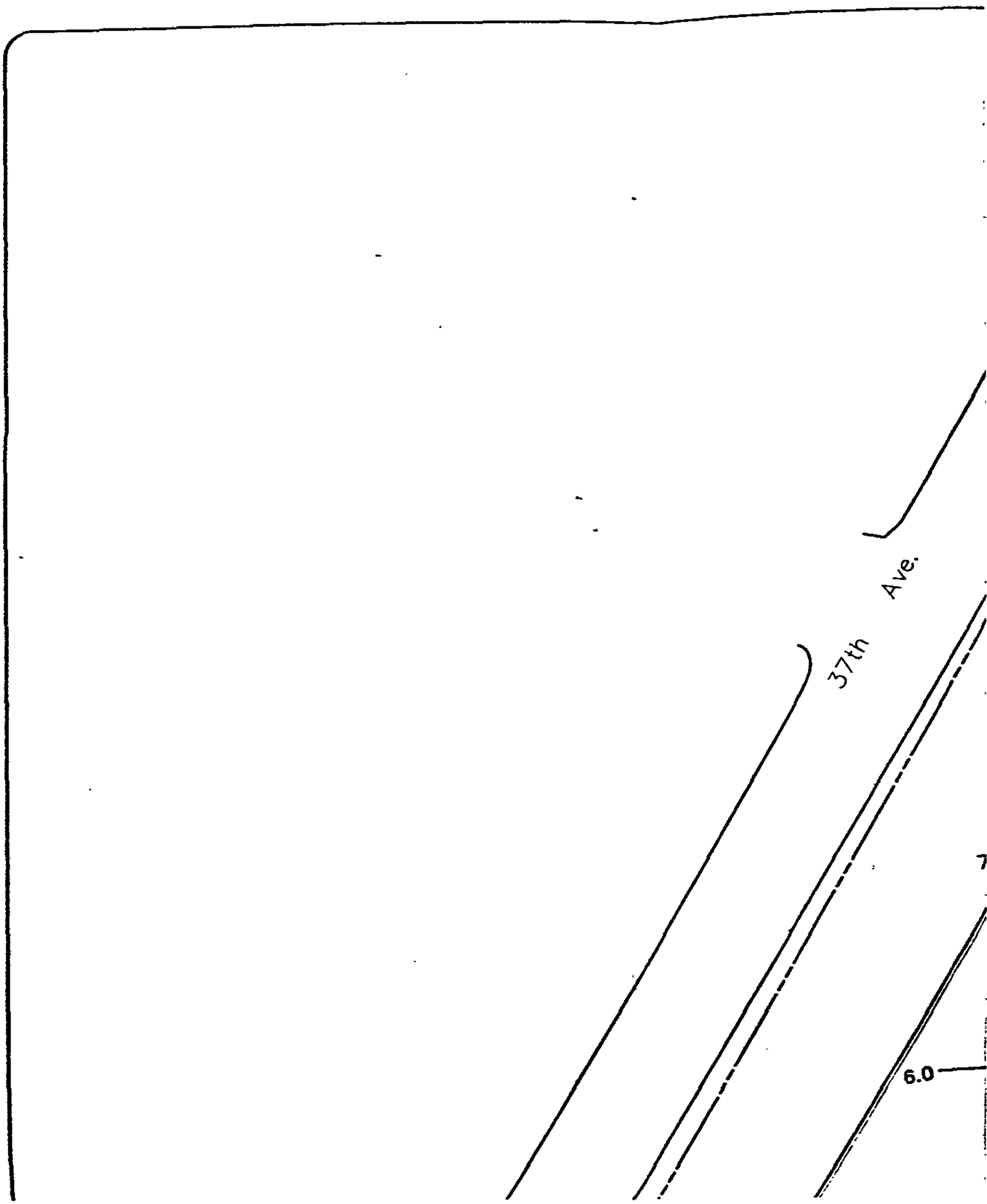
EH 0000437



EH0000438



EH 0004379



DIRECTION OF GROUNDWATER FLOW

INFERRED LOCATION OF GROUNDWATER TROUGH SHOWING FLOW DIRECTION

INFERRED LOCATION OF GROUNDWATER DIVIDE

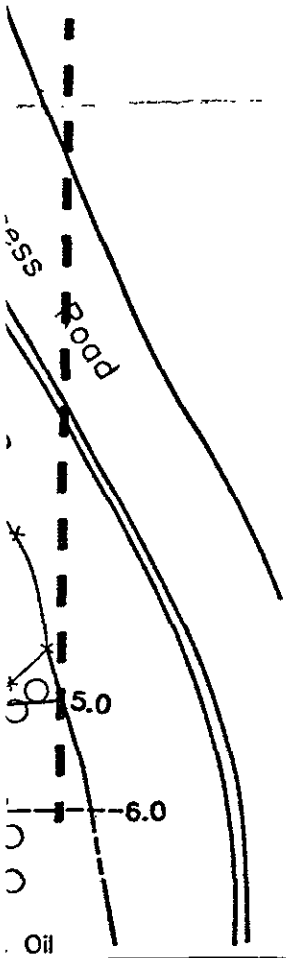
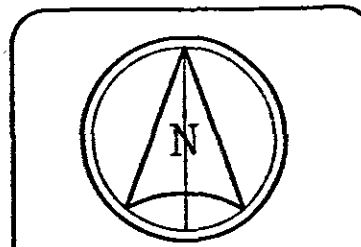


PLATE 2

PROJ. MGR: Edward W. Alusow	REVISIONS	BY	DATE
PREPARED BY: Walter O. Howard			
DRAFTED BY: S.C.Galloway			
CHECKED BY:			
PROJ. NO.: 02345-01983			
DWG. NO. 2M8985_1			
DATE: June 1991			
SHEET 2 OF 4			
DATUM: Mean Sea Level			
CONTOUR INTERVAL = 1.0 FEET			
USGS QUAD.: OAKLAND EAST			



GEOGRAPHIC NORTH

0 10 50 100

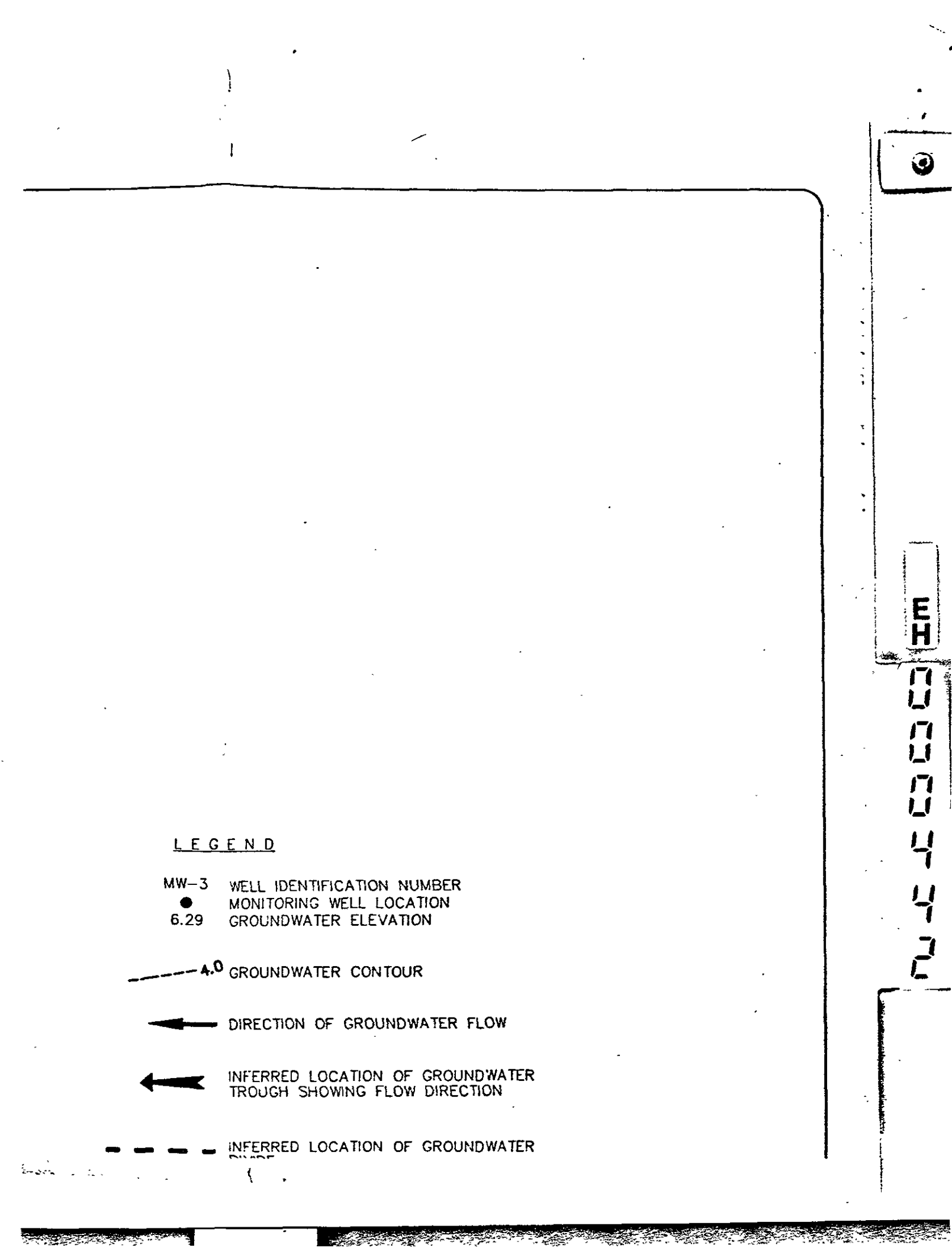
SCALE IN FEET

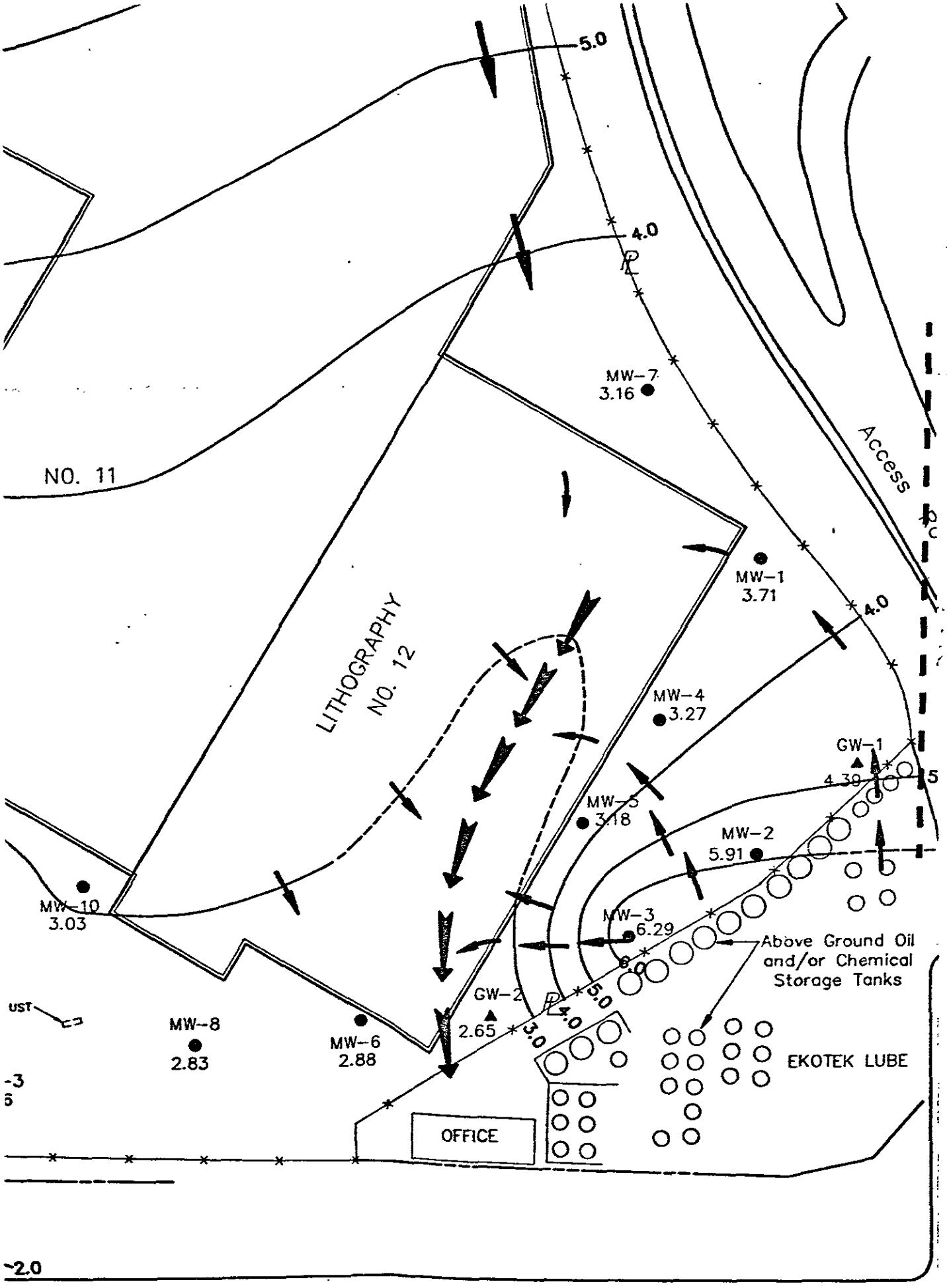
DUNN GEOSCIENCE CORPORATION
12 Metro Park Road
Albany, NY 12205

GROUNDWATER CONTOUR MAP
4/16/91

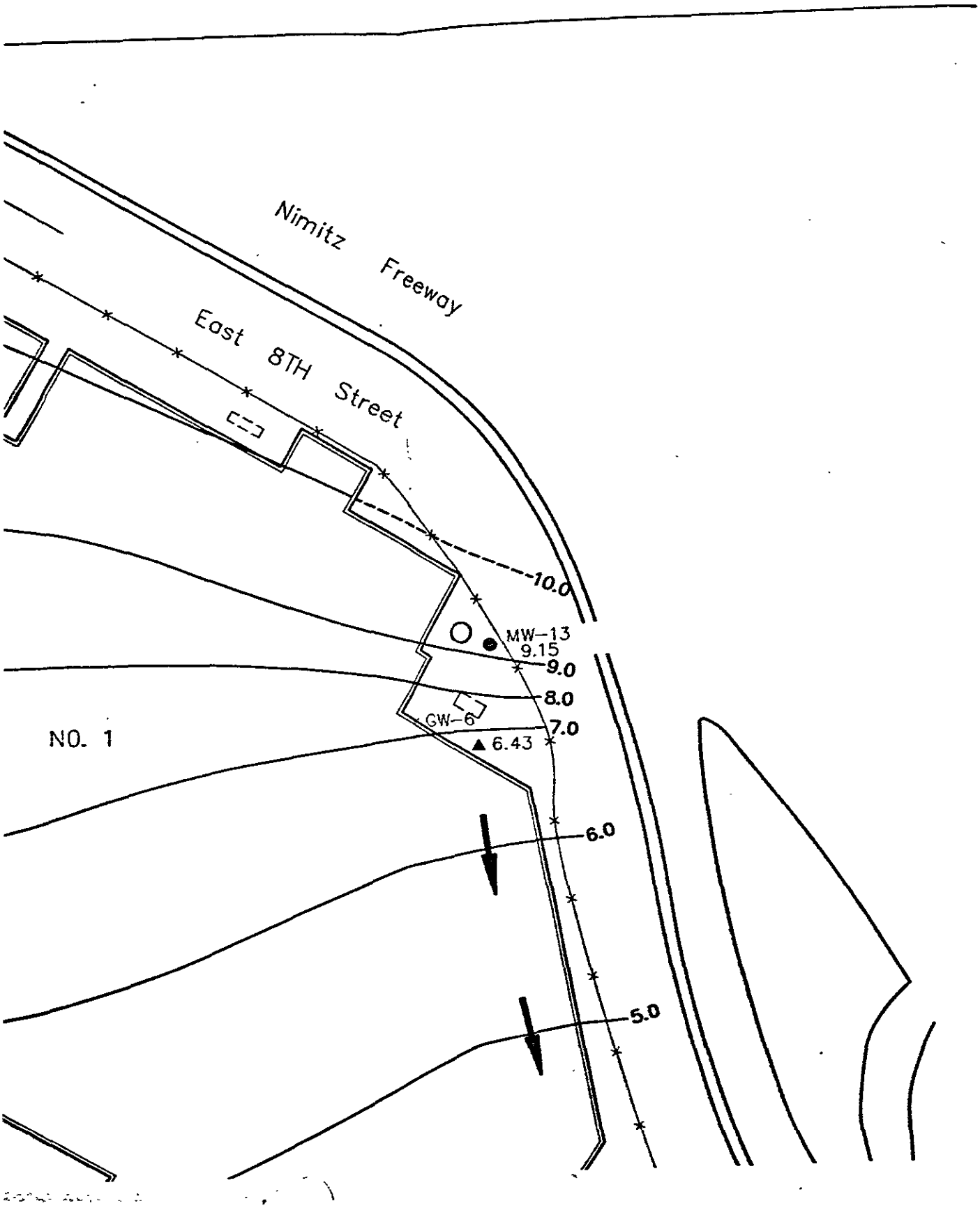
AMERICAN NATIONAL CAN
OAKLAND PLANT

CITY OF OAKLAND ALAMEDA COUNTY, CA

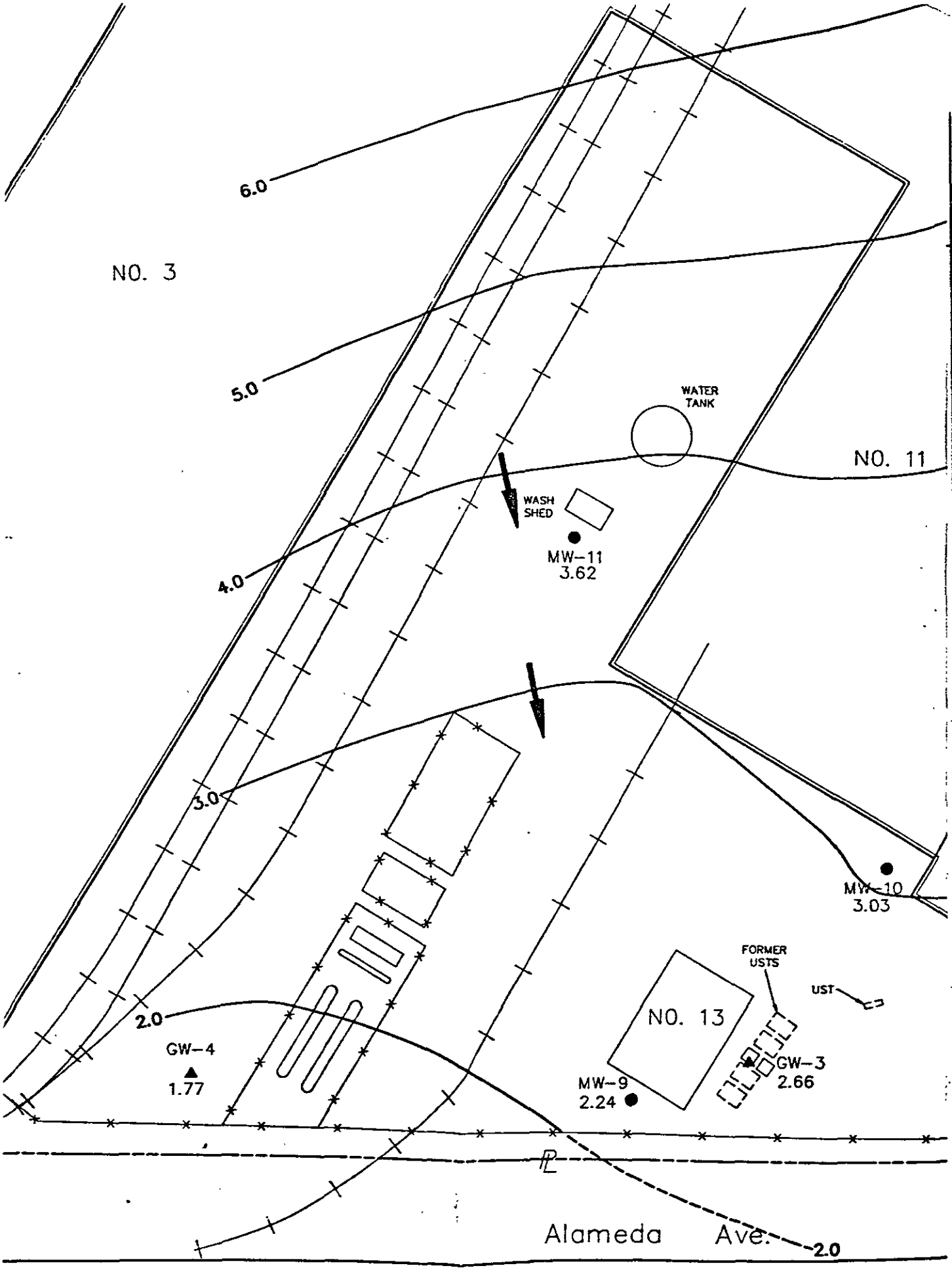

LEGEND
MW-3 WELL IDENTIFICATION NUMBER
MONITORING WELL LOCATION
6.29 GROUNDWATER ELEVATION
4.0 GROUNDWATER CONTOUR
DIRECTION OF GROUNDWATER FLOW
INFERRED LOCATION OF GROUNDWATER TROUGH SHOWING FLOW DIRECTION
INFERRED LOCATION OF GROUNDWATER


5.0
4.0
MW-7
3.16
NO. 11
Access
MW-1
3.71
LITHOGRAPHY
NO. 12
MW-4
3.27
GW-1
4.39
MW-5
3.18
MW-2
5.91
MW-10
3.03
MW-3
6.29
Above Ground Oil
and/or Chemical
Storage Tanks
GW-2
2.65
MW-8
2.83
MW-6
2.88
EKOTEK LUBE
OFFICE
UST
3.0
2.0

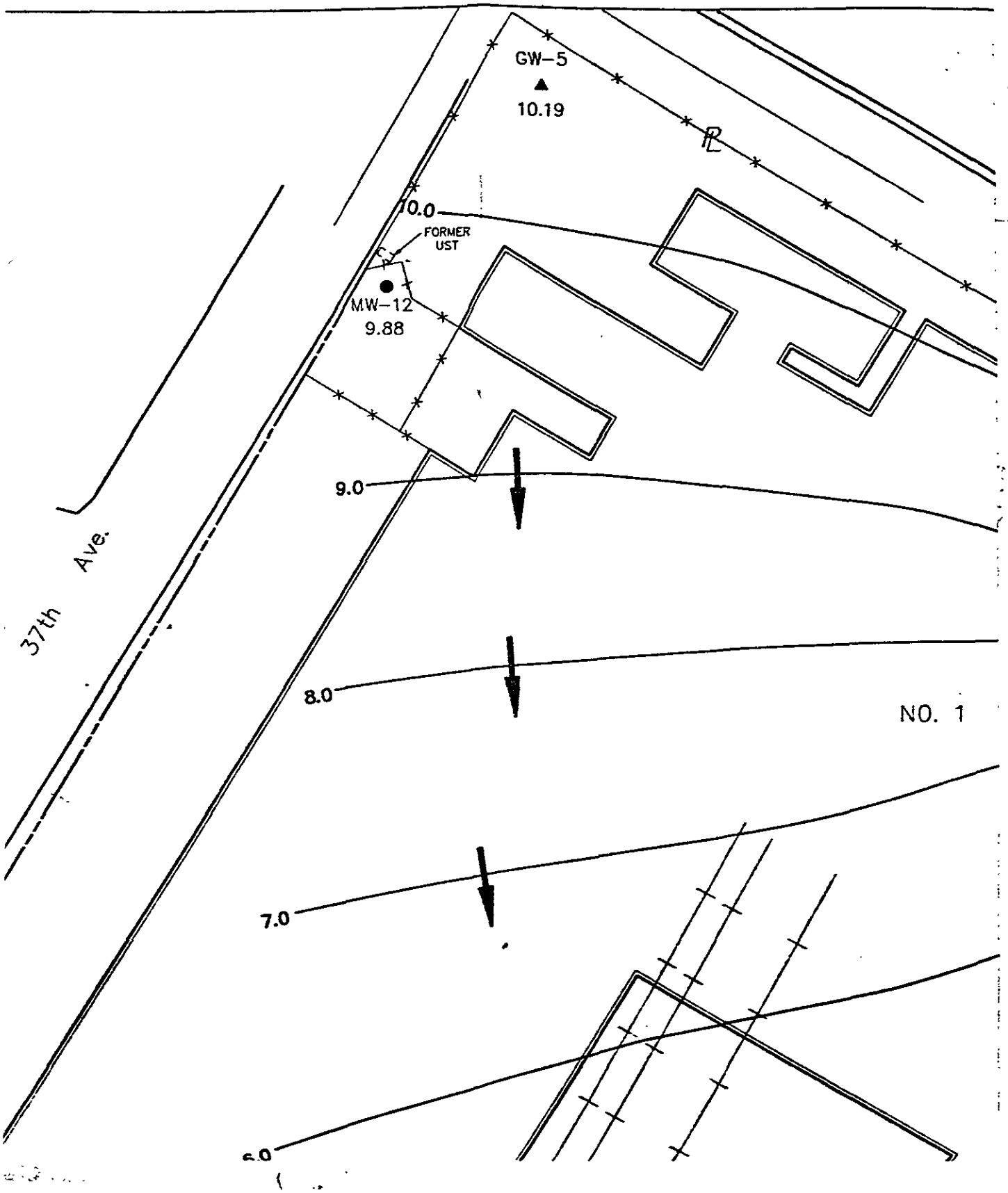
EH 0000443


Nimitz Freeway
East 8TH Street
10.0
MW-13
9.15
9.0
8.0
GW-6
7.0
▲ 6.43
NO. 1
6.0
5.0

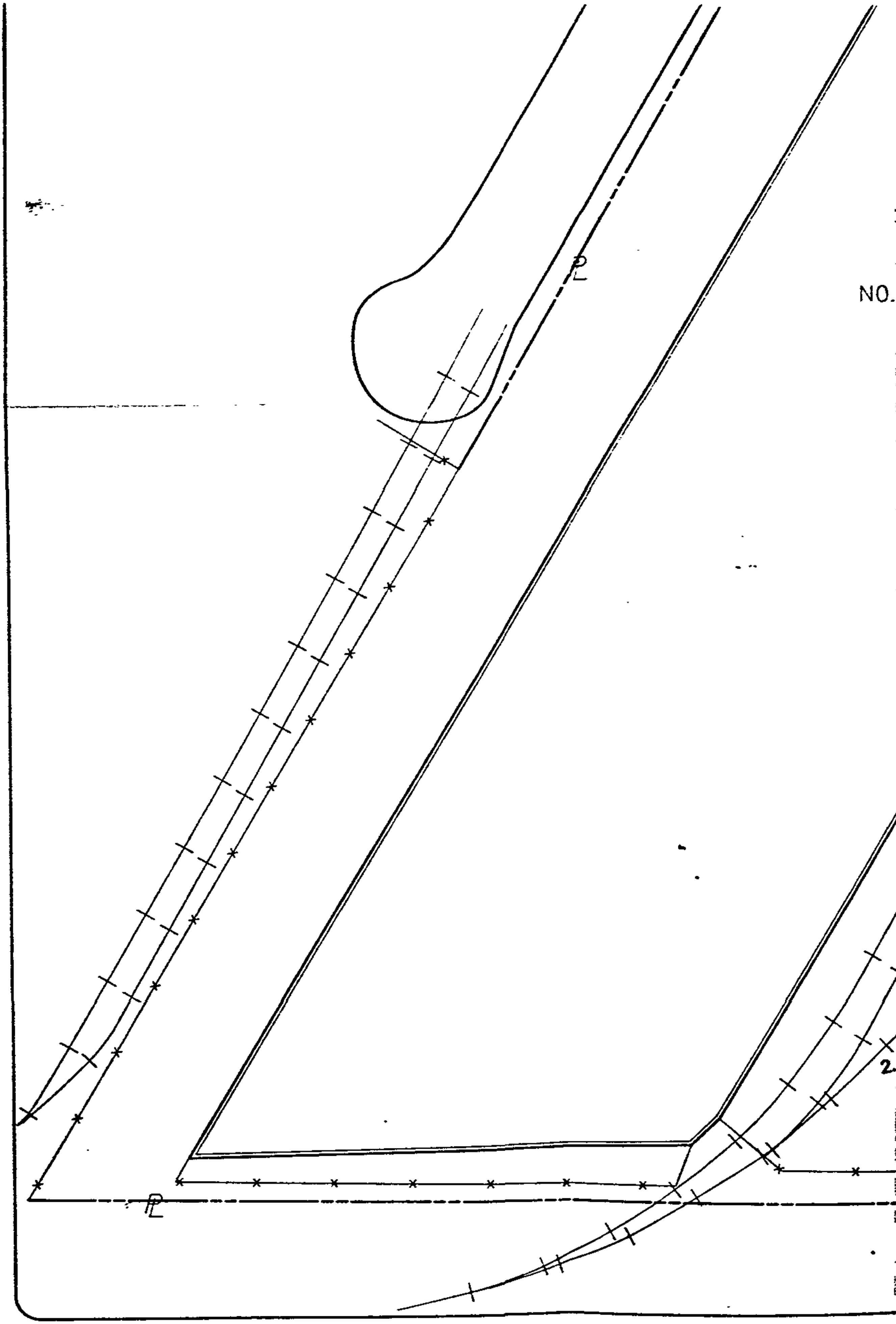
EH 000444


6.0
NO. 3
5.0
WATER TANK
NO. 11
WASH SHED
MW-11
3.62
4.0
3.0
MW-10
3.03
FORMER USTS
UST
NO. 13
2.0
GW-4
1.77
GW-3
2.66
MW-9
2.24
Alameda Ave.
2.0

EH 0000445



EH 0000446



NO.

FRAGMENT END

EH 000448