

**Draft Comprehensive Report For
Groundwater Monitoring Investigation
Coastal Drilling Facility
Soldotna, Alaska**



**Prepared for
Alaska Department of Environmental
Conservation**

**June 2002
8574**

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Groundwater Monitoring Investigation
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***Prepared by
Hart Crowser, Inc.***

***Russell G. Grandel
Project Geologist***

***Herminio R. Muniz, R.P.G.
Senior Associate Hydrogeologist***

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**DRAFT COMPREHENSIVE REPORT FOR
GROUNDWATER MONITORING INVESTIGATION
COASTAL DRILLING FACILITY
SOLDOTNA, ALASKA**

1.0 INTRODUCTION

The Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Response Program contracted Hart Crowser to perform a three-year groundwater monitoring investigation at the Coastal Drilling Facility in Soldotna, Alaska. The purpose of the work was to further investigate possible groundwater contamination related to past maintenance and drilling support activities. The Coastal Drilling Facility is located at Mile 0.5 of the Kenai Spur Highway in Soldotna, Alaska (Figure 1).

This report presents a summary of the project history and the results for the three-year groundwater monitoring investigation, and provides recommendations for additional action for this site. This report has been prepared in accordance with ADEC Contract Number ASPS No. 18-98-0135A, Notice to Proceed No. 1820121305A, and our Final Work Plan dated November 5, 1998 (Hart Crowser 1998).

2.0 BACKGROUND

2.1 *Site Description*

The Coastal Drilling Facility is an abandoned industrial site, which occupies approximately 7.4 acres in Soldotna, Alaska (Figure 2). The facility is located in Section 29 of Township 5 North, Range 10 West (T5N, R10W), Seward Meridian Kenai (B-3), Alaska. The site consists of an open and covered disposal pits area, a concrete slab, a concrete foundation, and undeveloped land. The central portion of the property (around the disposal pits area) is fenced, although a portion of the fence has been knocked down. Vehicle parts and an assortment of metal and wood debris are scattered over the central portion of the site. The open disposal pit is filled with wood debris. Between 20 and 30 drums, presumably associated with previous environmental investigations, are also present on the property.

Two permanent structures exist on the site. An approximately 2,500-square-foot wooden structure fronts the Kenai Spur Highway. A second structure, approximately 6,000 square feet in size, is situated northwest of the first

building. Custom Game and Seafood Processing occupies both buildings. An Alaska Communications System relay antenna structure is situated between the buildings.

The areas immediately north and east of the property are vacant and undeveloped; however, residential areas lie beyond these undeveloped areas. Light industrial and commercial businesses are located west and south of the Coastal Drilling Facility. Soldotna Elementary School is located across the Kenai Spur Highway to the west of the site.

The local surface topography is relatively flat, with a general slope toward the north and west. Hayward Hill, which is located northeast of the property, provides the highest relief in the immediate area. A gravel road runs along the base of the hill on the property's northeast boundary, and a small pond exists near the eastern margin of the property. The unoccupied areas to the north and east support native vegetation. Much of the property itself supports native vegetation. No major drainages are located in the immediate vicinity.

2.2 Site History

The Coastal Drilling Facility was developed in 1957 as a maintenance and support facility for petroleum and gas exploration in the Cook Inlet Region. Disposal of old engines, drill rig parts, oil tanks, drums, drilling mud, used oil, and miscellaneous scrap metal, rubber, and timber is known to have occurred onsite. Two centrally-located, pits (one currently soil-covered and one uncovered) were reportedly used as primary disposal sites and have been the focus of past environmental investigations. The covered pit was also reportedly used as a drain field for liquid wastes discharged into a metal grate located near a concrete slab that was reportedly used for vehicle and equipment wash-down. The grate was connected to the pit by a 6-inch-diameter steel pipe. Previous environmental investigations have encountered petroleum hydrocarbons, chlorinated solvents, and polychlorinated biphenyls (PCBs) in surface and subsurface soils. Low levels of aromatic hydrocarbons were previously identified in groundwater at the site. Previous investigations onsite are detailed later in this section.

2.3 Previous Investigations

This section discusses the previous investigations and work performed at and for the Coastal Drilling Facility site, focusing primarily on the potential for groundwater contamination.

Tryck, Nyman & Hayes, Inc., 1987. In 1987, Tryck, Nyman & Hayes, Inc., performed a preliminary site assessment. Their report gave a general overview of the site history and documented disposal activities at the site as reported by a former Coastal Drilling employee; by a resident of Soldotna; and by the owner of Hydrotest, a company which leased building space on the property at the time. A site investigation was recommended based on the site's proximity to Soldotna drinking water wells and to the Soldotna Elementary School.

ENSR, Inc., 1988. The Federal Savings and Loan Insurance Corporation contracted with ENSR, Inc., to conduct an environmental site investigation at the site in 1988. ENSR used magnetometer and electromagnetic subsurface surveys and excavated 10 trench pits to evaluate the site. Three monitoring wells were also installed and sampled.

Laboratory results indicated that elevated concentrations of total petroleum hydrocarbons were present in soil samples from the two disposal pits area. Low levels of aromatic hydrocarbons were also present in the unconfined aquifer. PCBs were detected in one soil sample. ENSR suspected, but could not confirm, that contamination from the disposal pits area was migrating to surrounding undisturbed soils.

Harding Lawson Associates, 1990. In 1990 Harding Lawson Associates (HLA) conducted a site investigation for the ADEC to characterize the horizontal and vertical extent of contamination, and to provide preliminary data with which to formulate a remediation plan. The project included trench excavation, soil borings, monitoring well installation and sampling, and an evaluation of onsite drums.

The investigation indicated that elevated concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX), total petroleum hydrocarbons (TPH), PCBs, trichloroethene (TCE), tetrachloroethene (PCE), and lead were present in soils near the metal grate and drainline, and in surface soils within the disposal pits area. Contaminants above federal drinking water maximum contaminant levels (MCLs) were not detected in groundwater samples. The concentrations of contaminants found outside the disposal pits area generally decreased with depth and with distance. Contaminant migration to nearby soils or groundwater was not observed. Based on the large head differential between perched water within the open disposal pit and groundwater levels measured in onsite monitoring wells, Harding Lawson concluded that hydraulic communication between the open disposal pit and the unconfined groundwater system was "very poor".

Max Schwenne, ADEC, 1991. A risk assessment for the site was prepared by Mr. Max Schwenne for the ADEC in 1991. The risk assessment indicated that physical contact with soil posed a slight risk to human health under existing land use conditions. A higher potential risk to human health was indicated in the event that the groundwater beneath the site should become contaminated.

Shannon & Wilson, Inc., 1991-1992. In 1991, the ADEC requested that Shannon & Wilson, Inc., (S&W), conduct an investigation that would further evaluate the vertical and horizontal extent of contamination at the site. S&W investigation consisted of test pit excavation, installation and sampling of three monitoring wells, sampling of seven existing monitoring wells and one offsite drinking water well, and limited surface soil sampling. S&W continued its investigation of the site for the ADEC in 1992. Additional exploratory borings and monitoring well installations were used to further characterize the site during the 1992 work.

S&W concluded that the unconfined groundwater table was being recharged by surface water collecting in, and infiltrating through, the disposal pits. They also concluded that contaminants previously documented within the pits had not impacted the groundwater. In their opinion, there was a high potential that contaminants encountered onsite would eventually leach into and impact the unconfined groundwater.

Western Environmental Consultants, Inc., 1994. Western Environmental Consultants, Inc., prepared a corrective action plan in 1994 under contract to Northern Petroleum Services, Inc. A combination of soil stockpiling and stabilization, perched groundwater pre-discharge filtration, backfill, and confirmation sampling was recommended for remediation of the site. The plan has not yet been implemented.

HLA, 1994. HLA completed a feasibility study for the ADEC in 1994. Remedial objectives were developed that specified contaminants of concern, potential exposure routes, and acceptable residual contaminant levels for each potential exposure route. Five remedial alternatives were also developed. Each alternative was each assessed against the nine evaluation criteria developed by the U.S. Environmental Protection Agency (EPA). Estimated costs to implement the remedial alternatives ranged from \$190,000 to \$5,850,000.

Rozack Engineering, Inc., 1995. Rozak Engineering, Inc., performed additional soil borings and sampling for LandMark, Inc. (Mark Kulstad). Laboratory analytical results indicated high concentrations of TPH and elevated barium and lead concentrations in soil samples collected from two of the borings.

Hart Crowser 1998-2001. In 1998 Hart Crowser began a groundwater investigation of the site that consisted of six semi-annual groundwater monitoring events. The first monitoring event occurred on November 12, 1998, and the sixth and final event occurred on May 25, 2001.

The field effort included sampling groundwater from four selected onsite monitoring wells and an offsite drinking water well. Water levels were measured and recorded from the four wells sampled and additional available onsite wells to assess hydrologic conditions.

This report summarizes the Hart Crowser's three-year investigation and makes recommendations for the site based on the past work performed on the site and data obtained by Hart Crowser.

3.0 SUMMARY OF WORK PERFORMED BY HART CROWSER

The following section summarizes the work performed and results of groundwater measurements and groundwater monitoring during the three-year assessment performed at the site.

Hart Crowser performed six semi-annual groundwater sampling events beginning in the fall of 1998. The six monitoring events were performed in on the following dates:

- November 12, 1998;
- May 18, 1999;
- November 18, 1999;
- May 10, 2000;
- November 2, 2000; and
- May 25, 2001.

These events included the measurement of groundwater levels in the monitoring wells, sampling of selected monitoring wells to determine groundwater quality, and reporting of the findings of the monitoring events.

During various events, measuring point elevations were resurveyed to ensure accurate groundwater elevation calculations and minor repair work was performed on the monitoring wells to keep the wells usable.

A site plan with onsite monitoring well locations is provided as Figure 2.

4.0 RESULTS

4.1 *Site Hydrogeology*

Two principal groundwater systems are present in the area. An upper, unconfined, system is separated from a lower, confined, system by an approximately 40-foot thick layer of blue clay. Silt stringers result in discontinuous perched groundwater lenses above the unconfined system. Monitoring wells located onsite are screened at various depths within the perched and unconfined systems. A drinking water well located at the adjacent Karsten Mall is completed within the confined aquifer as an open casing at 73 feet below ground surface (bgs). The Karsten Mall well has a static water level of 15 feet. The confined aquifer supplies many of the water wells in the area, including Well A, an active, city-owned municipal water supply well located approximately 1,800 feet southwest of the Coastal Drilling Facility property.

Based on the six groundwater elevation measurement events, the following observations are made. Tables 1A and 1B summarize groundwater elevation measurements and Figures 3 through 8 display the groundwater elevation maps for the six groundwater measurement events.

- Based on available data, localized groundwater flow beneath the site is inferred as occurring in a primarily northeasterly direction. However, components of flow to the northwest, west, and southwest were also observed.
- The unconfined groundwater elevation data, interpreted as is, suggests that a groundwater mound exists in the vicinity of the buried pit at GW-5, and that a localized, radial groundwater flow pattern originates in that area. The data, and potential radial flow pattern, supports S&W's 1992 conclusion that the unconfined groundwater table is being recharged by surface water preferentially infiltrating through the disposal pits.
- Three drinking water wells located near the site were describe in S&W 1992 report as possible being installed in a deeper confined aquifer. S&W's measurements of drinking water wells WW1 and WW2 indicated a higher

groundwater elevation than the unconfined aquifer on the coastal drilling site. Thus, the underlying confined aquifer is artesian in nature and a strong upward vertical gradient exists within the confined aquifer. Such a gradient significantly decreases the susceptibility of the confined aquifer to impacts associated with potential downward contaminant migration from the unconfined aquifer.

4.2 Groundwater Quality

The groundwater sampling program at the site included collection and analysis for BTEX; gasoline-range organics (GRO); diesel-range organics (DRO); PCBs; volatile organic compounds (VOC); and dissolved lead, chromium, and barium. The following sections summarize the analytical results. Laboratory data is summarized in Tables 2 and 3. Detected concentrations were compared to 18 AAC 75.345 Table C cleanup levels.

BTEX/GRO

No GRO or BTEX concentrations were detected in any wells during any of the six monitoring events.

DRO

DRO was detected in four samples over the six monitoring events, in one well in November 1999 (GW-6), and in three wells in May 2000 (B-3MW, GW-5, and GW-6). The concentrations were all less than half the ADEC cleanup level of 1.5 milligrams per liter (mg/L).

PCBs

PCB concentrations were not detected in any wells during the six monitoring events.

Dissolved Metals

Dissolved barium, dissolved chromium, and dissolved lead were detected during various sampling events; however, none were detected at or above applicable ADEC cleanup levels during any monitoring event.

VOC

During the course of Hart Crowser's investigation, several halogenated volatile organic compounds (HVOC) were detected at low levels, primarily in

monitoring well GW-6, located between the open and covered disposal pits. Detected compounds included 1,2-dichloroethane, cis-1,2-dichloroethene, 1,1-dichloroethane, 1,4-dichlorobenzene, and 1,2-dichloropropane. None of the detected HVOC concentrations exceeded ADEC cleanup levels.

5.0 CONCLUSIONS AND RECOMENDATIONS

It does not appear that contaminants remaining in the soils pose a significant threat to the unconfined groundwater beneath the site. While soil data collected from previous investigations suggest that contaminants are present that exceed ADEC migration-to-groundwater cleanup levels, the groundwater monitoring study has shown that the contaminants that remain are either in an insoluble form (metals) or of too small a volume (petroleum and VOC) to impact groundwater to a degree that cleanup levels would be exceeded. The vertical gradient between the confined and unconfined aquifer appears to be upward; therefore, no threat to the drinking water supply appears to exist.

According to data collected in 1992, concentrations of chromium and arsenic may remain in soil above ADEC ingestion criteria per 18 AAC 75.341, Table B1.

We recommend the following courses of actions:

1. Place a cap over the disposal pit areas to minimize contact with the soils, and reduce migration of any vapors. This action will also minimize water infiltration through the soils in this zone. Examples of a cap would be a compacted clay layer, asphalt, or a building.
2. Place institutional controls on the site precluding placement of any water supply wells that would provide a potential pathway into the confined aquifer. In addition, a prohibition on excavation of the soils in the disposal pit area should be imposed.

6.0 LIMITATIONS

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work to be completed. It is intended for the exclusive use of the ADEC for specific application to the project site. This report is not meant to represent a legal opinion, and no other warranty, express or implied, is made.

7.0 REFERENCES

Alaska Department of Environmental Conservation, (ADEC) 1999. 18 AAC 75 - Oil and Hazardous Substances Pollution Control Regulations.

Hart Crowser, 1998. *Final Work Plan For Groundwater Monitoring, Coastal Drilling Facility, Soldotna, Alaska*. November 5.

Hart Crowser, 1999. *Final Report, Fall 1999 Sampling Event, Groundwater Monitoring Investigation, Coastal Drilling Facility, Soldotna, Alaska*. January 4.

Shannon & Wilson, Inc., 1992. *Environmental Site Investigation, Coastal Drilling Facility, Soldotna, Alaska*. August 1992.

TABLE 1A - Comparative Physical Well Data Summary for Sampled Wells
COASTAL DRILLING FACILITY

Well Number, Screen Interval, and Date	pH	Temp in °C	DO in mg/L	Conductance in µS/cm	Casing Elevation ¹ in ft	Casing Stick-up in ft	Depth to Groundwater in ft btoc	Depth to Groundwater in ft bgs	Groundwater Elevation ¹ in ft
B-2MW (34'-44' bgs)									
5/25/2001	8.27	5.7	0.18	213	103.45	2.9	40.11	37.25	63.34
11/2/2000	6.7	3.9	4.5	171	103.46	2.9	40.59	37.73	62.87
5/10/2000	7.51	3.1	4.9	248	103.46	2.9	38.66	35.80	64.80
11/18/1999	7.29	3.9	4.8	219	103.46	2.9	39.69	36.83	63.77
5/18/1999	7.09	3.9	4.7	310	103.46	2.9	38.41	35.55	65.05
11/12/1998	7.35	4	5.2	211	103.46	2.9	40.43	37.57	63.03
B-3MW (30'-40' bgs)									
5/25/2001	8.33	5.7	0.68	382	102.50	2.9	37.74	34.80	64.76
11/2/2000	6.6	4.4	2.90	138	102.84	2.9	37.42	34.48	65.42
5/10/2000	7.33	2.7	2.89	311	102.84	2.9	36.83	33.89	66.01
11/18/1999	7.34	2.9	2.21	245	102.84	2.9	37.20	34.26	65.64
5/18/1999	7.15	3.3	2.31	251	102.84	2.9	37.55	34.61	65.29
11/12/1998	7.29	2.7	2.08	232	102.84	2.9	38.22	35.28	64.62
GW-5 (30'-40' bgs)									
5/25/2001	7.62	5.3	0.20	223	100.33	1.2	35.13	33.95	65.20
11/2/2000	6.87	4.9	3.43	197	100.28	1.2	35.70	34.52	64.58
5/10/2000	7.54	2.8	3.44	292	100.28	1.2	34.11	32.93	66.17
11/18/1999	7.24	3.1	3.11	234	100.28	1.2	34.56	33.38	65.72
5/18/1999	7.27	3.1	2.79	249	100.28	1.2	34.27	33.09	66.01
11/12/1998	7.31	2.9	2.88	221	100.28	1.2	35.42	34.24	64.86
GW-6 (31'-41' bgs)									
5/25/2001	8.08	7	0.62	172	101.18	1.7	36.37	34.65	64.81
11/2/2000	6.81	4.1	6.29	158	101.42	1.7	37.20	35.48	64.22
5/10/2000	7.27	2.7	2.49	311	101.42	1.7	35.35	33.63	66.07
11/18/1999	7.51	3.3	2.37	247	101.42	1.7	35.74	34.02	65.68
5/18/1999	7.34	3.7	2.99	255	101.42	1.7	35.95	34.23	65.47
11/12/1998	7.4	3.1	3.71	239	101.42	1.7	36.80	35.08	64.62

Notes:
¹ = All elevations surveyed on 6/1/01 use the top of casing of reference well B-3MW as a benchmark with a relative elevation of 102.5 feet.
 btoc = Below ground surface.
 bgs = Below top of casing.
 °C = Degrees celsius.
 DO = Dissolved oxygen.
 ft = feet.
 mg/L = Milligrams per Liter.
 µS/cm = MicroSiemens per centimeter.

TABLE 1B - Comparative Physical Well Data Summary for Unsamped Wells
Coastal Drilling Facility

Well Number, Screen Interval, and Date	pH	Temp in °C	DO in mg/L	Conductance in µS/cm	Casing Elevation ¹ in ft	Casing Stick-up in ft	Depth to Groundwater in ft btoc	Depth to Groundwater in ft bgs	Groundwater Elevation ¹ in ft
B-4MW (32.5'-42.5' bgs)									
5/25/2001	NM	NM	NM	NM	104.56	1.8	38.23	Dry	66.33
11/2/2000	NM	NM	NM	NM	102.34	1.8		Dry	
5/10/2000	NM	NM	NM	NM	102.34	1.8		Dry	
11/18/1999	NM	NM	NM	NM	102.34	1.8		Dry	
5/18/1999	NM	NM	NM	NM	102.34	1.8	37.39	35.55	64.95
B-11MW (32'-42' bgs)									
5/25/2001	NM	NM	NM	NM	102.97	2.8	39.78	36.98	63.19
11/2/2000	NM	NM	NM	NM	103.10	2.8	40.48	37.68	62.62
5/10/2000	NM	NM	NM	NM	103.10	2.8	38.46	35.66	64.64
11/18/1999	NM	NM	NM	NM	103.10	2.8	39.60	36.80	63.50
5/18/1999	NM	NM	NM	NM	103.10	2.8	38.30	35.50	64.80
GW-1 (32'-42' bgs)									
5/25/2001	NM	NM	NM	NM	101.91	1.7	37.28	35.62	64.63
11/2/2000	NM	NM	NM	NM	101.86	1.7	37.70	36.04	64.16
5/10/2000	NM	NM	NM	NM	101.86	1.7	36.40	34.74	65.46
11/18/1999	NM	NM	NM	NM	101.86	1.7	36.70	35.04	65.16
5/18/1999	NM	NM	NM	NM	101.86	1.7	37.00	35.34	64.86
GW-2 (32'-42' bgs)									
5/25/2001	NM	NM	NM	NM	102.49	0.0	37.74	37.76	64.75
11/2/2000	NM	NM	NM	NM	Could not open well due to rusted lock				
5/10/2000	NM	NM	NM	NM	99.78	-0.02	33.73	33.75	66.05
11/18/1999	NM	NM	NM	NM	Unable to locate well due to snow cover				
5/18/1999	NM	NM	NM	NM	99.78	-0.02	34.35	34.37	65.43
GW-3 (30'-40' bgs)									
5/25/2001	NM	NM	NM	NM	102.11	2.5	36.98	34.52	65.13
11/2/2000	NM	NM	NM	NM	102.06	2.5	37.55	35.09	64.51
5/10/2000	NM	NM	NM	NM	102.06	2.5	35.98	33.52	66.08
11/18/1999	NM	NM	NM	NM	102.06	2.5	36.34	33.88	65.72
5/18/1999	NM	NM	NM	NM	102.06	2.5	36.56	34.10	65.50
GW-4 (31'-41' bgs)									
5/25/2001	NM	NM	NM	NM	101.29	2.0	36.16	34.21	65.13
11/2/2000	NM	NM	NM	NM	101.25	2.0	36.75	34.80	64.50
5/10/2000	NM	NM	NM	NM	101.25	2.0	35.17	33.22	66.08
11/18/1999	NM	NM	NM	NM	101.25	2.0	35.57	33.62	65.68
5/18/1999	NM	NM	NM	NM	101.25	2.0	35.30	33.35	65.95
GW-7 (24'-34' bgs)									
5/25/2001	NM	NM	NM	NM	103.45	2.7	32.88	30.14	70.57
11/2/2000	NM	NM	NM	NM	103.44	2.7	32.94	30.20	70.50
5/10/2000	NM	NM	NM	NM	103.44	2.7	32.81	30.07	70.63
11/18/1999	NM	NM	NM	NM	103.44	2.7	32.87	30.13	70.57
5/18/1999	NM	NM	NM	NM	103.44	2.7	32.76	30.02	70.68

Notes:

¹ - All elevations surveyed on 6/1/01 use the top of casing of reference well B-3MW as a benchmark with a relative elevation of 102.5 feet.

bgs = Below ground surface.

btoc = Below top of casing.

°C = Degrees celsius.

DO = Dissolved oxygen.

ft = feet.

TABLE 2 - Comparative Hydrocarbon and metals Concentrations
Coastal Drilling Facility

Well Number and Date	GRO AK101 in mg/L	DRO AK102 in mg/L	BTEX				Dissolved Metals (EPA 6010)													
			EPA 8021B(EPA 8260B) Benzene in mg/L	Ethylbenzene in mg/L	Toluene in mg/L	Xylenes in mg/L	PCBs (EPA 8081) in mg/L	Lead in mg/L	Chromium in mg/L	Barium in mg/L										
B-2MW																				
5/25/2001	0.09 U	0.532 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.000400 U	0.0040 U	0.020								
11/2/2000	0.09 U	0.36 U	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0020 U	0.0001 U	0.0001 U	0.005 U	0.010 U	0.020								
5/10/2000	0.09 U,J	0.32 U,J	0.0005 U,J	0.0020 U,J	0.0020 U,J	0.0005 U,J	0.0020 U,J	0.0001 U,J	0.0001 U,J	0.005 U,J	0.010 U,J	0.017 J								
11/18/1999	0.10 U	0.27 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00052 U	0.00052 U	0.003 U	0.010 U	0.018								
5/18/1999	0.10 U	0.25 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.00048 U	0.00048 U	0.0091	0.037	0.160								
11/12/1998	0.10 U	0.25 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0011 U	0.0011 U	0.030 U	0.010 U	0.040								
B-3MW																				
5/25/2001	0.09 U	0.532 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.00104 U	0.00104 U	0.00361 U	0.004 U	0.038								
11/2/2000	0.09 U	0.34 U	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0020 U	0.0001 U	0.0001 U	0.005 U	0.010 U	0.139								
5/10/2000	0.09 U,J	0.45 J	0.0005 U,J	0.0020 U,J	0.0020 U,J	0.0005 U,J	0.0020 U,J	0.0001 U,J	0.0001 U,J	0.005 U,J	0.010 U,J	0.015 J								
11/18/1999	0.10 U	0.25 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00042 U	0.00042 U	0.003 U	0.010 U	0.013								
5/18/1999	0.10 U	0.26 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.00048 U	0.00048 U	0.0042	0.010 U	0.063								
11/12/1998	0.10 U	0.25 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00094 U	0.00094 U	0.030 U	0.010 U	0.017								
GW-5																				
5/25/2001	0.09 U	0.521 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.000104 U	0.000104 U	0.0004 U	0.004 U	0.113								
11/2/2000	0.09 U	0.31 U	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0020 U	0.0001 U	0.0001 U	0.0051	0.010 U	0.133								
5/10/2000	0.09 U,J	0.33 J	0.0005 U,J	0.0020 U,J	0.0020 U,J	0.0005 U,J	0.0020 U,J	0.0001 U,J	0.0001 U,J	0.005 U,J	0.010 U,J	0.085 J								
11/18/1999	0.10 U	0.25 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00049 U	0.00049 U	0.003 U	0.010 U	0.13								
5/18/1999	0.10 U	0.26 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.00048 U	0.00048 U	0.003 U	0.010 U	0.068								
11/12/1998	0.10 U	0.29 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00097 U	0.00097 U	0.030 U	0.010 U	0.16								
GW-6																				
5/25/2001	0.09 U	0.61 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.000104 U	0.000104 U	0.0070	0.0059	0.059								
11/2/2000	0.09 U	0.32 U	0.0010 U	0.0010 U	0.0010 U	0.0020 U	0.0020 U	0.0001 U	0.0001 U	0.005 U	0.010 U	0.012								
5/10/2000	0.09 U,J	0.78 J	0.0005 U,J	0.0020 U,J	0.0020 U,J	0.0005 U,J	0.0020 U,J	0.0001 U,J	0.0001 U,J	0.005 U,J	0.010 U,J	0.012 J								
11/18/1999	0.10 U	0.71	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00047 U	0.00047 U	0.003 U	0.010 U	0.013								
5/18/1999	0.10 U	0.25 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.00048 U	0.00048 U	0.0087	0.021	0.096								
11/12/1998	0.10 U	0.25 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00097 U	0.00097 U	0.030 U	0.010 U	0.019								
GW-60 (duplicate)																				
5/25/2001	0.09 U	0.532 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.0010 U	0.000104 U	0.000104 U	0.00470	0.0040 U	0.0376								
ADEC																				
CLEANUP LEVEL¹	1.3	1.5	0.005	0.7	1	10	0.015	0.1	0.0005	0.015	0.1	2.0								

Notes:

- 1 = 18 AAC 75.345, Table C
- U = Not detected above detection limit indicated.
- J = Value should be considered an estimate due to cooler temperatures below the acceptable range.

**TABLE 3 - Comparative Detected HVOC Concentrations
Coastal Drilling Facility**

Sampling Event	Sampling Date	Well Number	Detected		ADEC Cleanup	
			HVOC EPA Method 8260B	Concentration in mg/L	Level ¹ in mg/L	
Spring 2001	5/25/2001	All ²	None	NA	NA	
Fall 2000	11/2/2000	All ²	None	NA	NA	
Spring 2000	5/10/2000	GW-6	1,2-Dichloroethane	0.00104 J	0.005	
		KM-1	1,4-Dichlorobenzene	0.00129 J	0.075	
Fall 1999	11/18/1999	GW-6	1,2-Dichloropropane	0.00037	0.005	
			cis-1,2-Dichloroethene	0.00028	NA	
			1,1-Dichloroethane	0.00067	3.65	
			1,2-Dichloroethane	0.0011	0.005	
Spring 1999	5/18/1999	GW-6	1,2-Dichloropropane	0.00023	0.005	
			cis-1,2-Dichloroethene	0.0012	NA	
			1,1-Dichloroethane	0.0048	3.65	
			1,2-Dichloroethane	0.0065	0.005	
Fall 1998	11/12/1998	B-2MW	1,1-Dichloroethane	0.00022	3.65	

Notes:

¹ = 18 AAC 75, Table C

² = All sampled wells (B-2MW, B-3MW, GW-5, and GW-6)

HVOC = Halogenated volatile organic compounds.

J = Result should be considered an estimate due to analysis outside of acceptable sample holding time limits.

NA = Not available

Hart Crowser

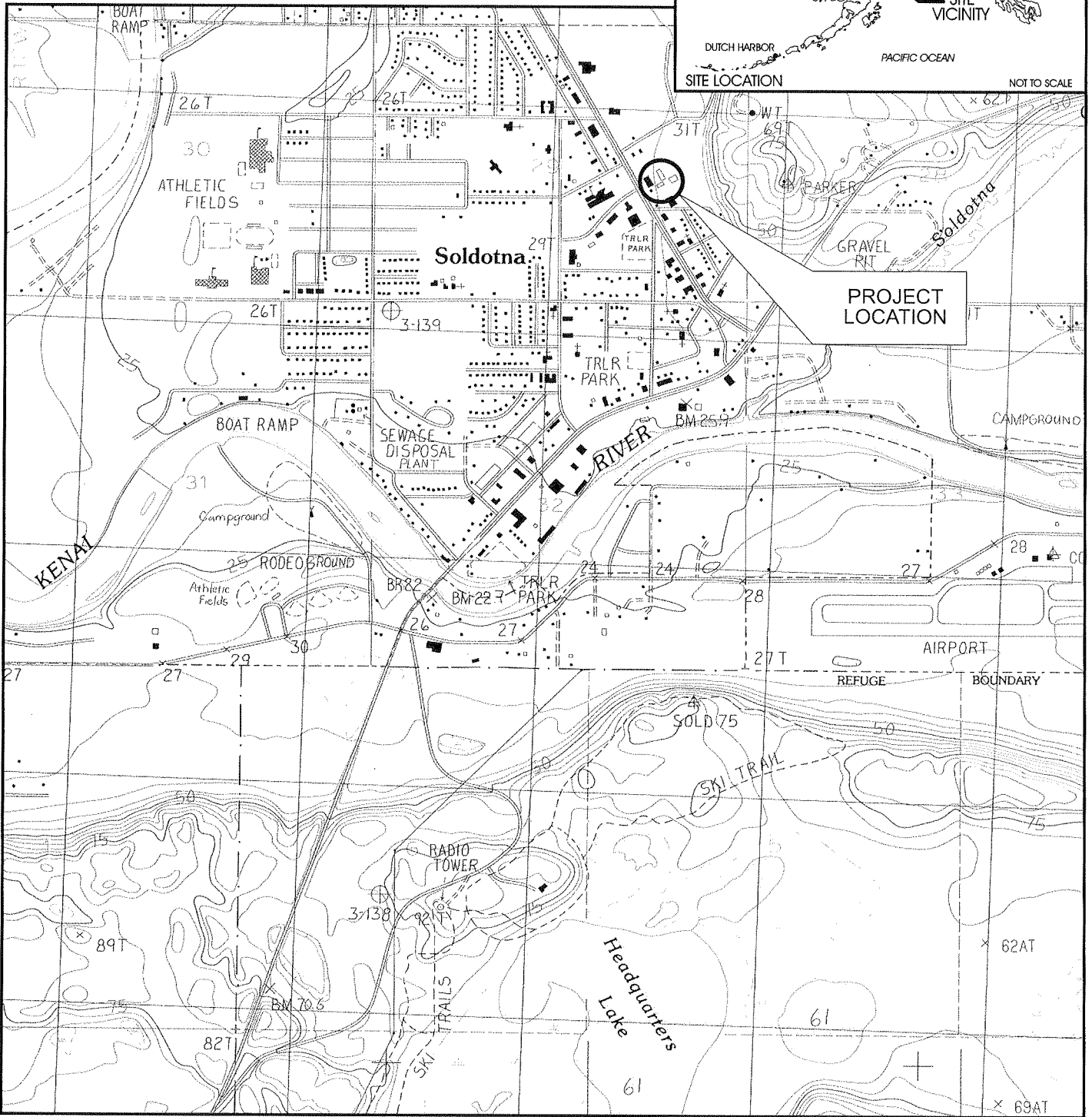
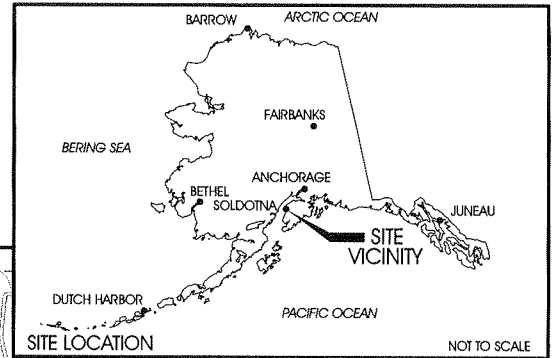
8574

J:\Project\8574\

Site Location and Vicinity Map

Coastal Drilling Facility

Soldotna, Alaska



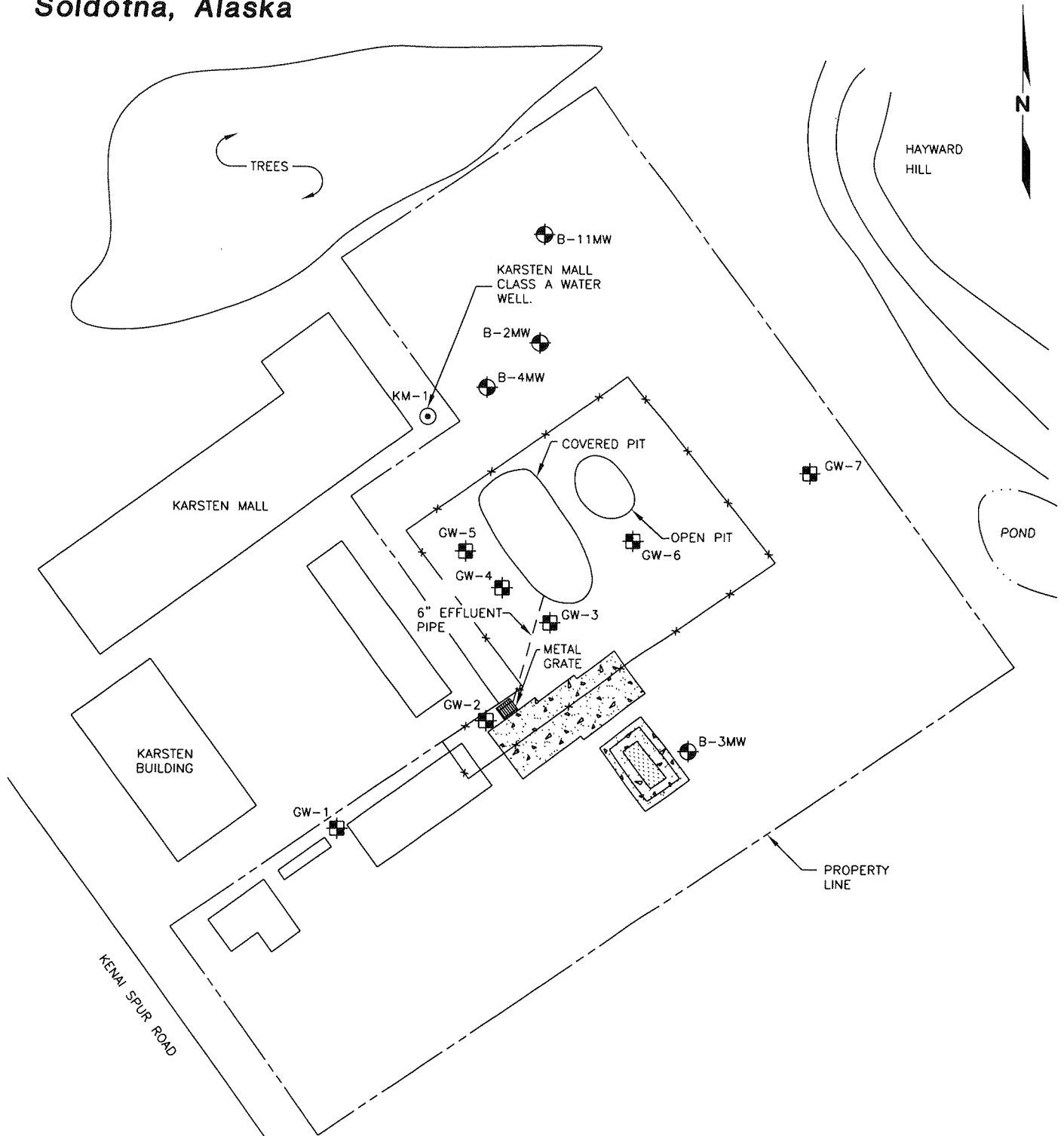
353C

SOURCE: USGS 1:25,000, KENAI (B-3)
NW, ALASKA 1986

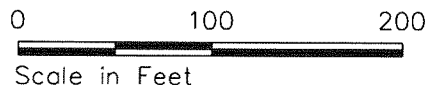


HARTCROWSER
8574 6/02
Figure 1

Site Plan Coastal Drilling Facility Soldotna, Alaska



SOURCE: SHANNON & WILSON, INC.
AUGUST, 1992



- LEGEND
- GW-2 MONITORING WELL INSTALLED BY ENSR (1988) AND HARDING LAWSON (1990)
 - KM-1 CLASS A WATER WELL
 - B-4MW BORING/MONITORING WELL INSTALLED BY SHANNON & WILSON, INC. (1991-1992)



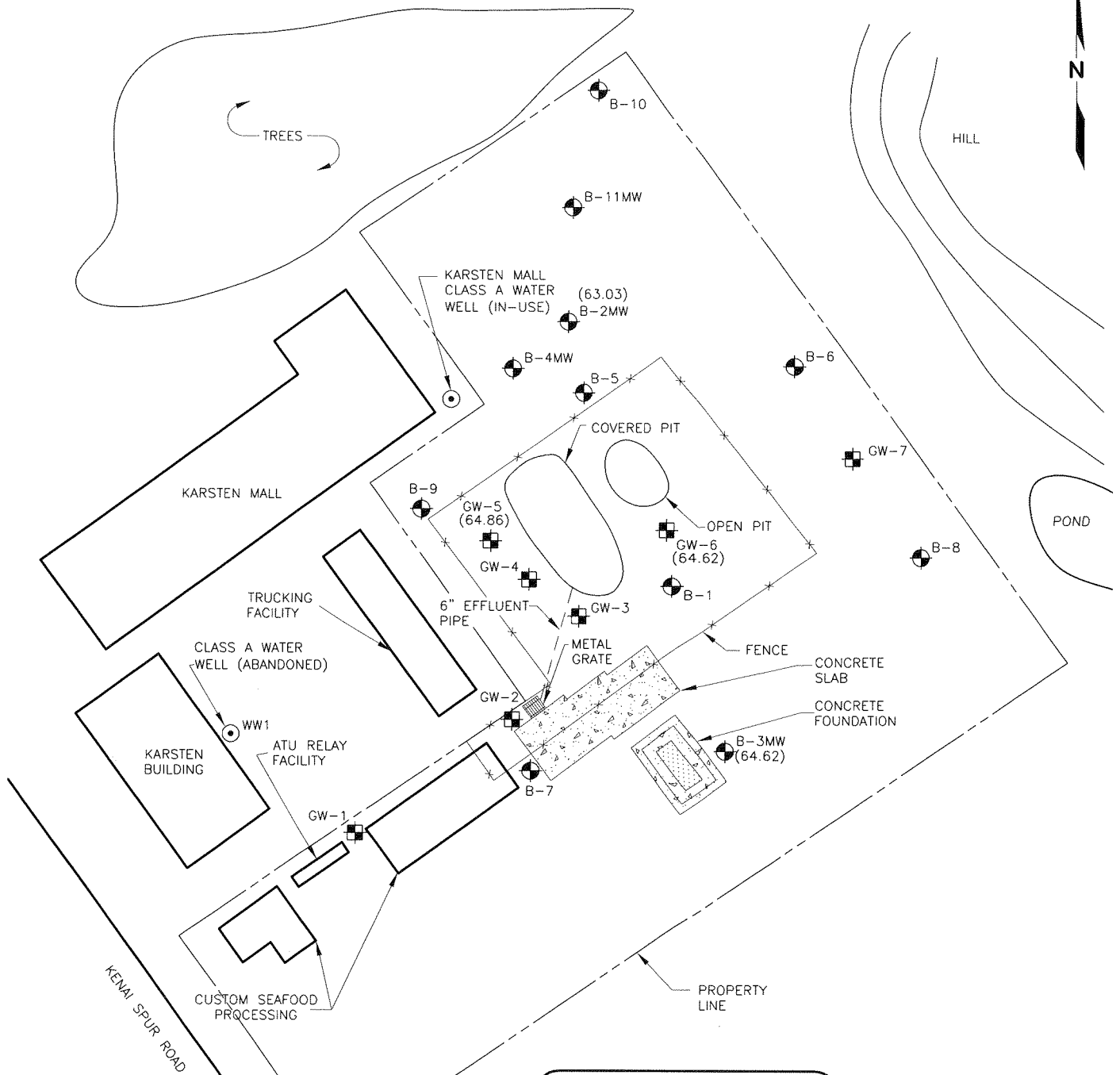
8574 6/02
Figure 2

BRJ 1=1
103981

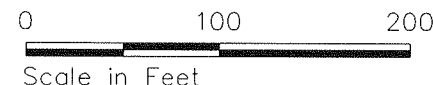
Site Plan November 12, 1998

Coastal Drilling Facility

Soldotna, Alaska



SOURCE: SHANNON & WILSON, INC.
AUGUST, 1992



LEGEND

- GW-2 MONITORING WELL INSTALLED BY ENSR (1988) AND HARDING LAWSON (1990)
- WW1 CLASS A WATER WELL
- B-4MW BORING/MONITORING WELL INSTALLED BY SHANNON & WILSON, INC. (1991-1992)
- (64.86) UNCONFINED GROUNDWATER ELEVATION ON 11/12/98 REFERENCED TO AN ARBITRARY BENCHMARK OF 100 FEET PREVIOUSLY ESTABLISHED ONSITE.

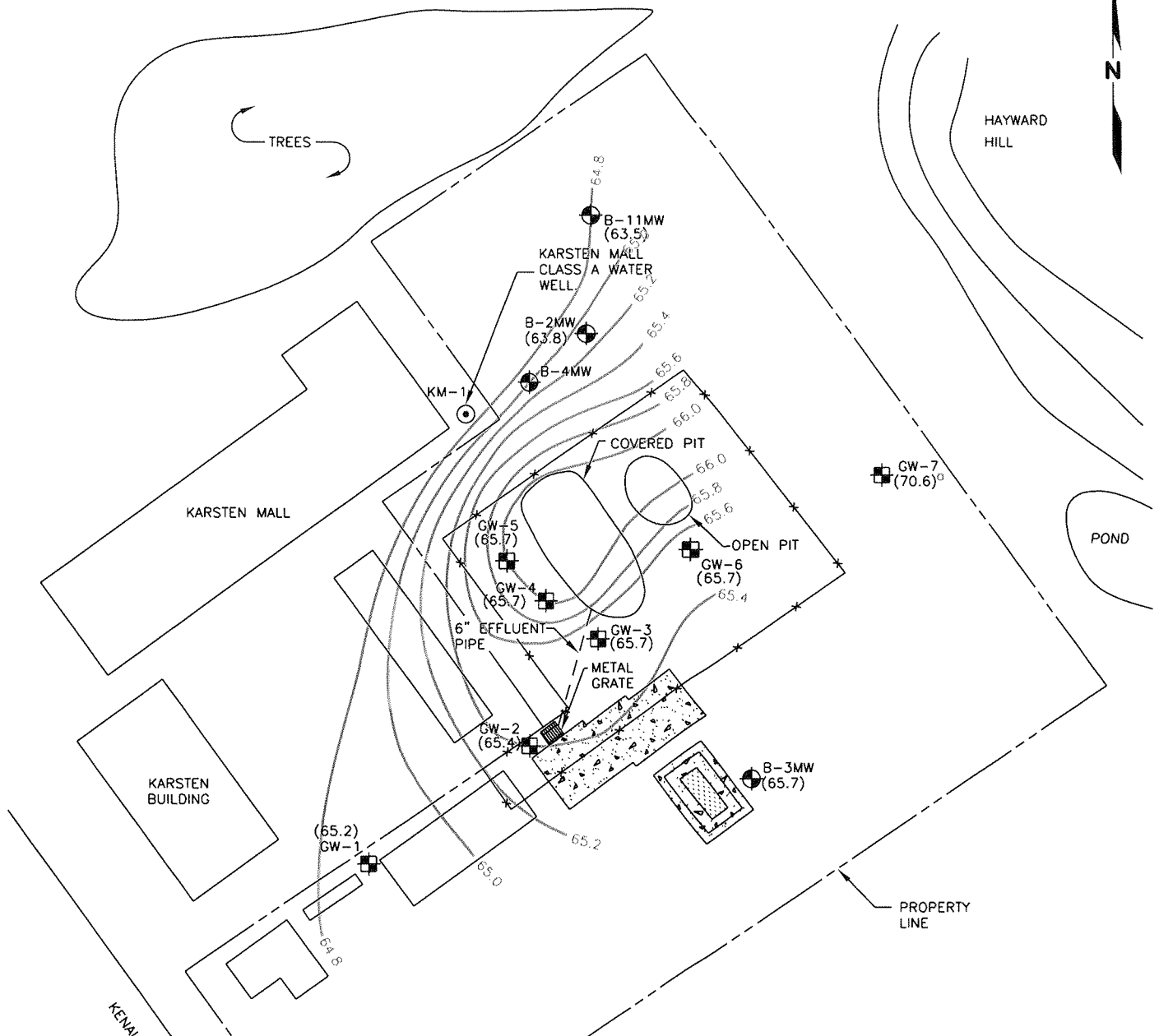
HARTCROWSER
8574 6/02
Figure 3

BHJ 10/98 1=1 STD.PCP
55882

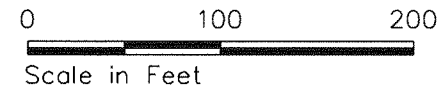
Site Plan May 18, 1999

Coastal Drilling Facility

Soldotna, Alaska



SOURCE: SHANNON & WILSON, INC.
AUGUST, 1992



LEGEND

- GW-2 MONITORING WELL INSTALLED BY ENSR (1988) AND HARDING LAWSON (1990)
- KM-1 CLASS A WATER WELL
- B-4MW BORING/MONITORING WELL INSTALLED BY SHANNON & WILSON, INC. (1991-1992)
- (65.7) UNCONFINED GROUNDWATER ELEVATION ON 5/18/99 REFERENCED TO AN ARBITRARY BENCHMARK OF 100 FEET PREVIOUSLY ESTABLISHED ONSITE
- NOT INCLUDED IN GROUNDWATER CONTOUR INTERPRETATION.
- 66.0 INFERRED GROUNDWATER CONTOUR LINE (0.2 FOOT CONTOUR INTERNAL).

HARTCROWSER

8574 6/02

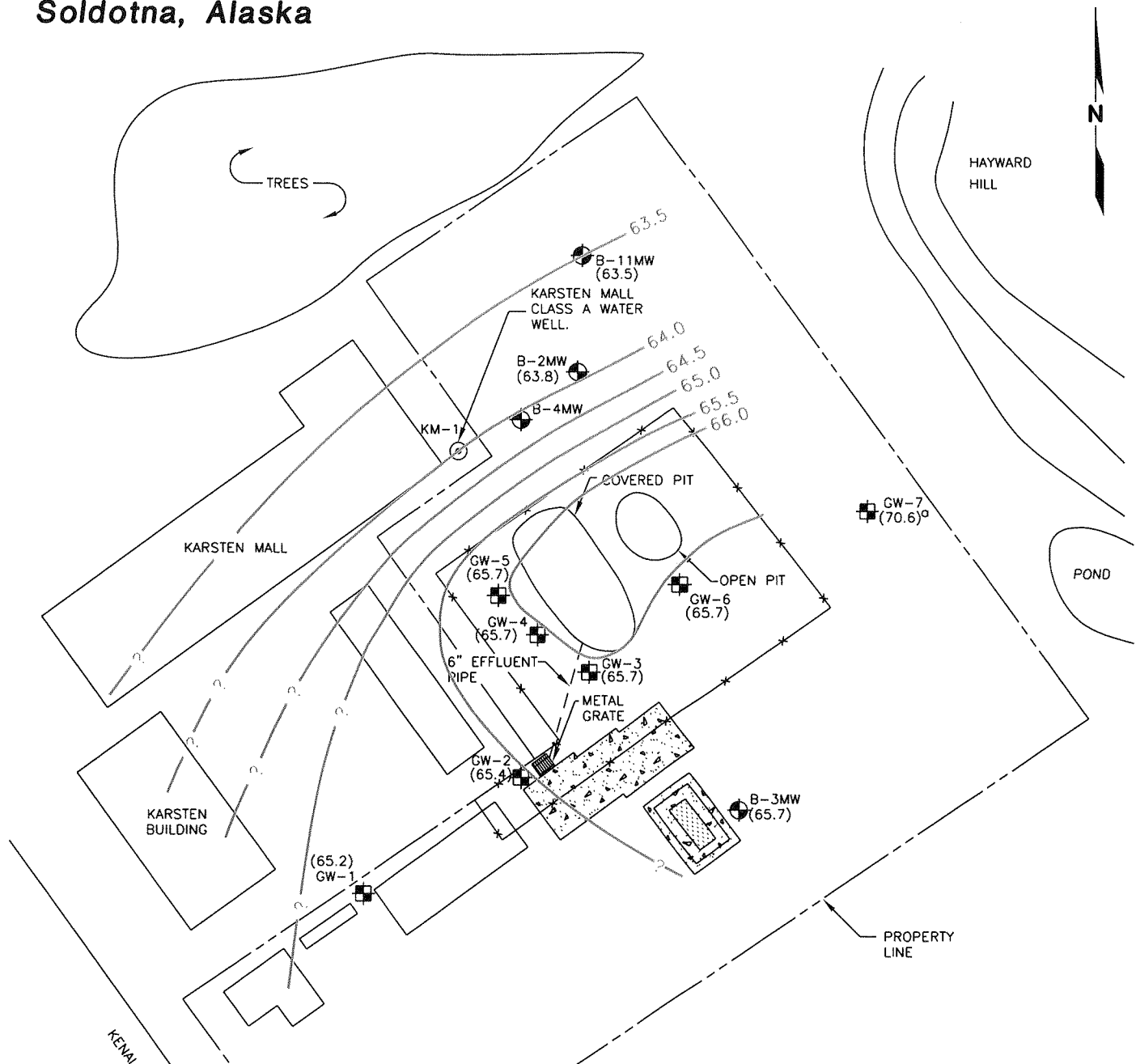
Figure 4

BHJ 6/99 1=1
55881

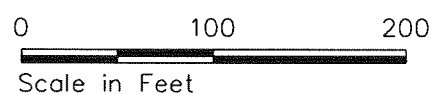
Site Plan November 18, 1999

Coastal Drilling Facility

Soldotna, Alaska



SOURCE: SHANNON & WILSON, INC.
AUGUST, 1992



LEGEND

- GW-2** MONITORING WELL INSTALLED BY ENSR (1988) AND HARDING LAWSON (1990)
- KM-1** CLASS A WATER WELL
- B-4MW** BORING/MONITORING WELL INSTALLED BY SHANNON & WILSON, INC. (1991-1992)
- (65.7)** UNCONFINED GROUNDWATER ELEVATION ON 11/18/99 REFERENCED TO AN ARBITRARY BENCHMARK OF 100 FEET PREVIOUSLY ESTABLISHED ONSITE
- NOT INCLUDED IN GROUNDWATER CONTOUR INTERPRETATION.
- 65.0-** INFERRED GROUNDWATER CONTOUR LINE (0.5 FOOT CONTOUR INTERNAL).

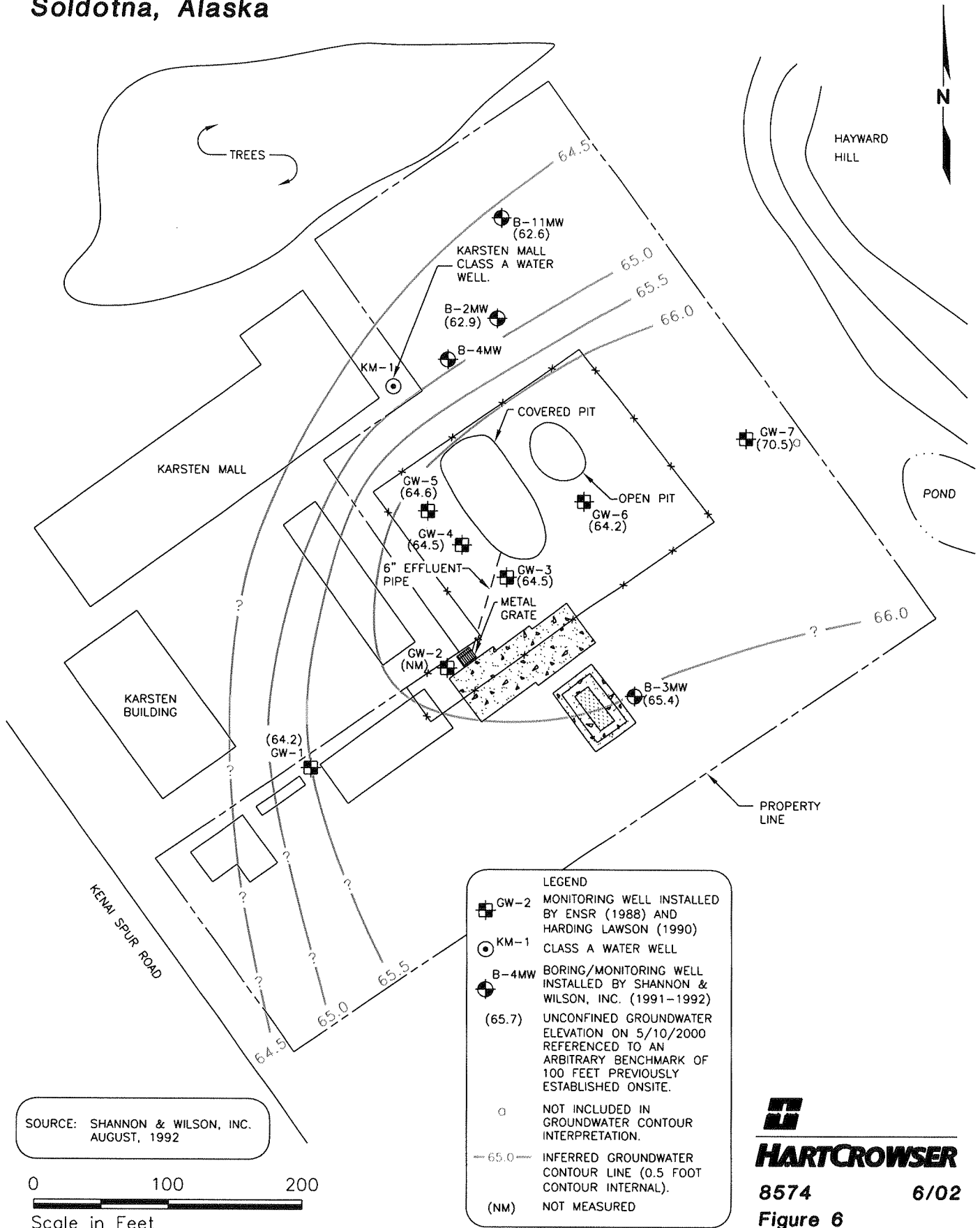
HARTCROWSER
8574 6/02
Figure 5

BHJ 6/99 1=1
55883

Site Plan May 10, 2000

Coastal Drilling Facility

Soldotna, Alaska

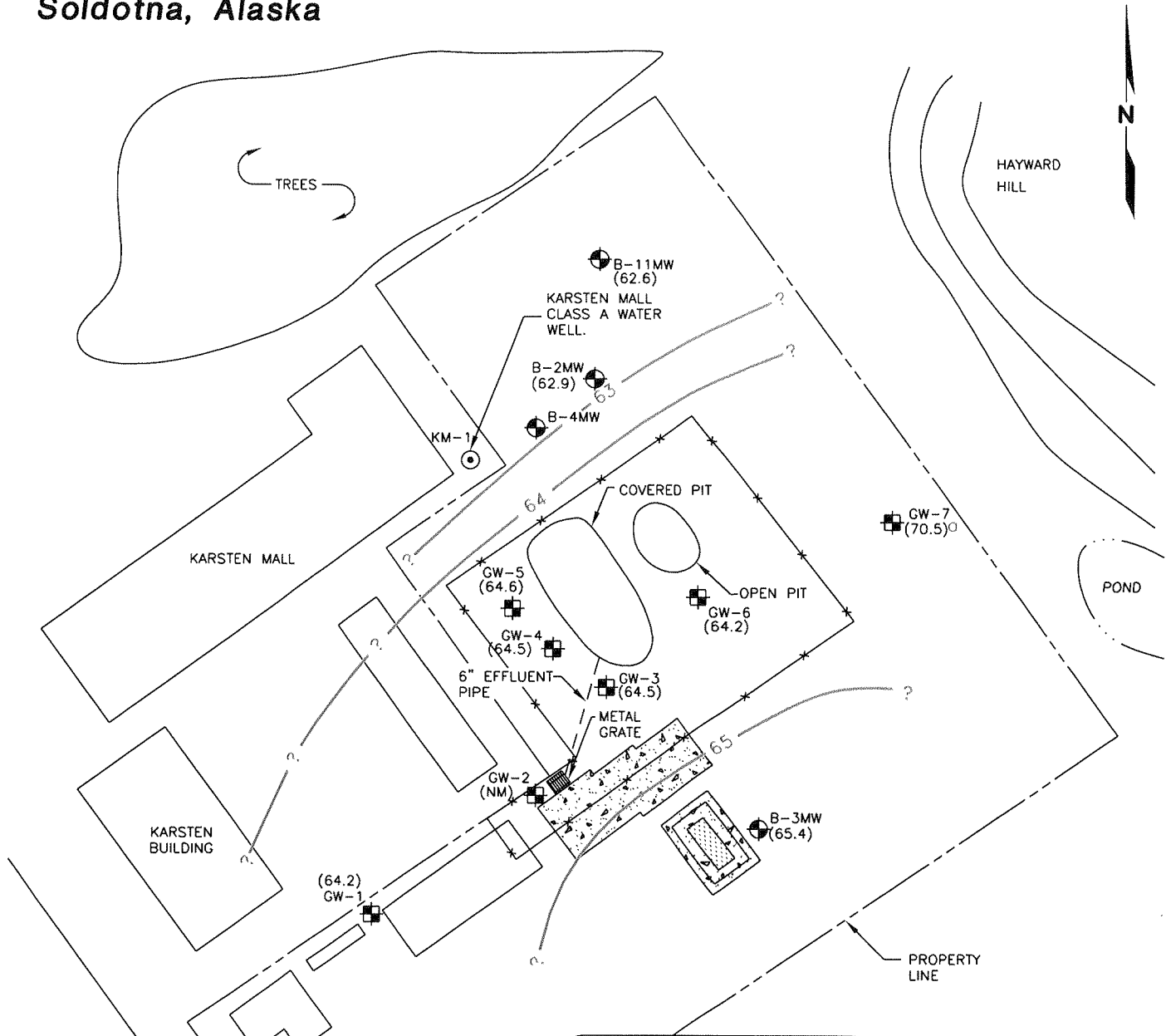


BHJ 1=1
 92581

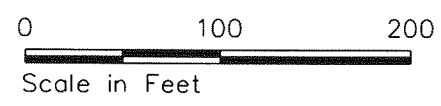
Site Plan November 2, 2000

Coastal Drilling Facility

Soldotna, Alaska



SOURCE: SHANNON & WILSON, INC.
AUGUST, 1992



LEGEND

- GW-2 MONITORING WELL INSTALLED BY ENSR (1988) AND HARDING LAWSON (1990)
- KM-1 CLASS A WATER WELL
- B-4MW BORING/MONITORING WELL INSTALLED BY SHANNON & WILSON, INC. (1991-1992)
- (65.7) UNCONFINED GROUNDWATER ELEVATION ON 11/2/2000 REFERENCED TO AN ARBITRARY BENCHMARK OF 100 FEET PREVIOUSLY ESTABLISHED ONSITE.
- NOT INCLUDED IN GROUNDWATER CONTOUR INTERPRETATION.
- 65 INFERRED GROUNDWATER CONTOUR LINE (1.0 FOOT CONTOUR INTERNAL).
- (NM) NOT MEASURED

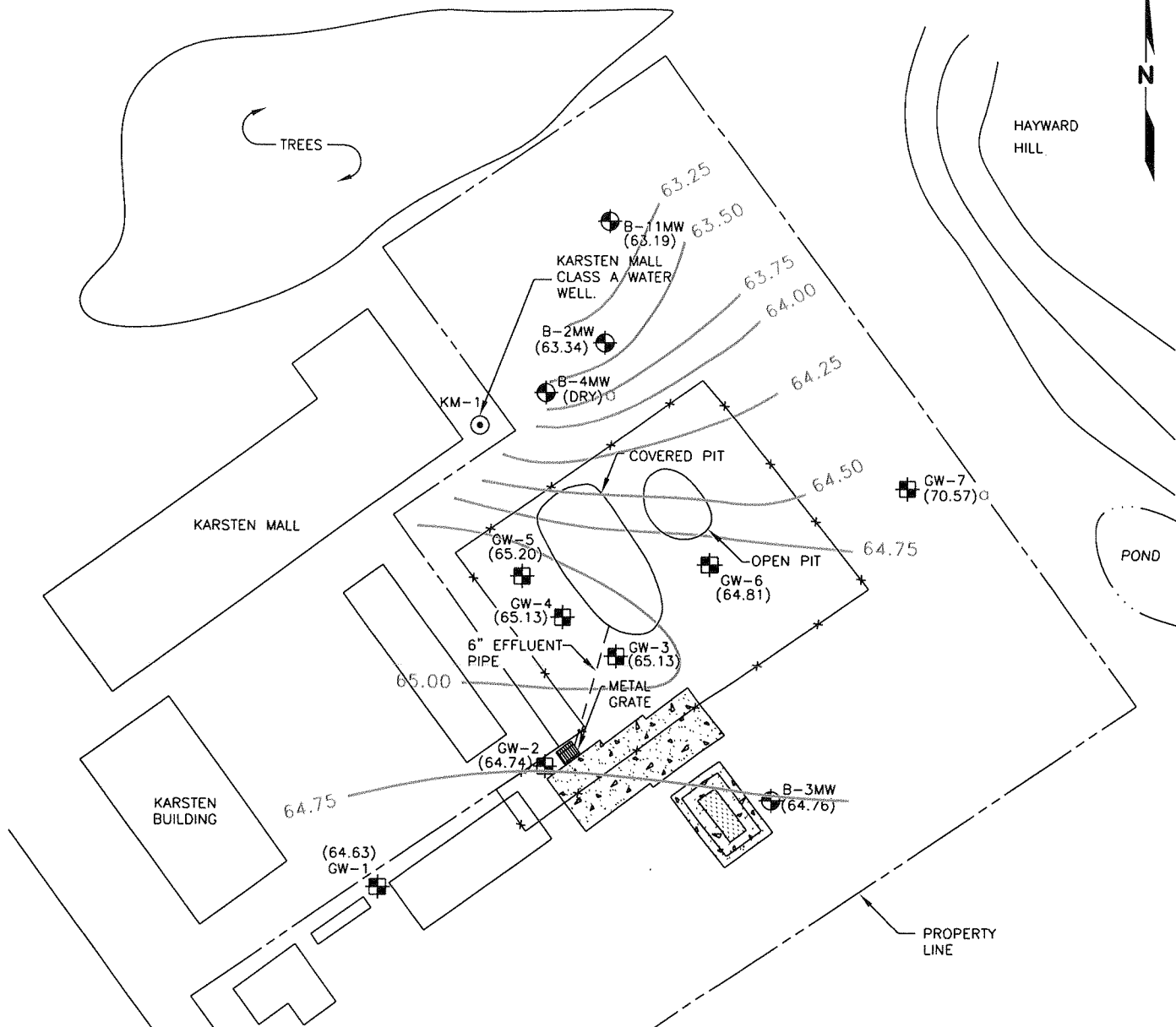
HARTCROWSER
8574 6/02
Figure 7

BHU 1=1
925B

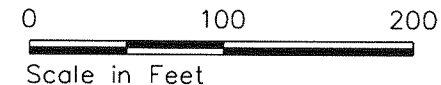
Site Plan May 25, 2001

Coastal Drilling Facility

Soldotna, Alaska



SOURCE: SHANNON & WILSON, INC.
AUGUST, 1992



LEGEND

- GW-2 MONITORING WELL INSTALLED BY ENSR (1988) AND HARDING LAWSON (1990)
- KM-1 CLASS A WATER WELL
- B-4MW BORING/MONITORING WELL INSTALLED BY SHANNON & WILSON, INC. (1991-1992)
- (65.7) UNCONFINED GROUNDWATER ELEVATION ON 5/25/2001 REFERENCED TO AN ARBITRARY BENCHMARK OF 100 FEET PREVIOUSLY ESTABLISHED ONSITE.
- NOT INCLUDED IN GROUNDWATER CONTOUR INTERPRETATION.
- 65 — INFERRED GROUNDWATER CONTOUR LINE (1.0 FOOT CONTOUR INTERNAL).

BHJ 1=1
10398