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Bureau of Land Management

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National Petroleum Reserve in Alaska: 2013 Legacy Wells Summary Report

BLM

Alaska

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Cover

Fall colors at the Kugrua #1 Legacy Well site.

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U.S. Department of the Interior
Bureau of Land Management
Alaska State Office
222 W. 7th Ave., #13
Anchorage AK 99513

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Introduction

Between 1944 and 1982, the U.S. Navy and the U.S. Geological Survey (USGS) conducted a program of exploratory and scientific drilling on Alaska's North Slope in the Naval Petroleum Reserve No. 4 (or PET-4) – now called the National Petroleum Reserve in Alaska (NPR-A). In 1976, the Bureau of Land Management (BLM) was given responsibility for managing the NPR-A, and in 1982 the BLM inherited the responsibility to assess, plug, and clean up the wells that the U.S. Navy and USGS left behind.

Since 1982, the BLM has spent tens of millions of dollars cataloging and remediating these "legacy wells." Some wells are still being used for scientific research, so at this point only 50 wells – fewer than half of the original number – currently require additional remediation work.

In order to take the next step towards full remediation of the remaining wells, the BLM completed this ***2013 Legacy Wells Summary Report: National Petroleum Reserve in Alaska***, which is a comprehensive site-by-site assessment of the condition of the remaining inherited wells. The report forms the basis for the *2013 Legacy Wells Strategic Plan*, which lays out a dynamic and flexible near-term strategy for addressing some of the highest priority wells, while reemphasizing BLM's commitment to achieving full remediation of all of the inherited wells.

About this Report

This illustrated *2013 Legacy Wells Summary Report* assesses well conditions and status information for all 136 wells drilled under the direction of the Navy or the USGS, and updates the November 2004 BLM *Alaska Legacy Wells Summary Report: National Petroleum Reserve-Alaska (NPR-A*) open file report. The report describes both surface and subsurface conditions for each legacy well in the NPR-A. Surface information includes location, site description, and a risk assessment. Subsurface information includes general well information, geology, development potential, groundwater, any additional relevant information, and a risk assessment.

The BLM conducted a full assessment of all 136 wells drilled under the direction of the U.S. Navy or the USGS, which resulted in the summaries in **Tables 1**, **2**, and **3.**

The assessment shows that:

- 68 Wells require no additional BLM action
- 18 Wells are currently in use by USGS
- 50 Wells currently require BLM remediation

The well sites are presented in alphabetical order.

BLM actively monitors the NPR-A legacy wells, especially the wells in close proximity to the coast and subsequently at potential risk from coastal erosion. The BLM monitors wellheads, casings and site conditions at the inland wells approximately every three years. The information from these monitoring efforts are contained for each site in this report.

Risk Assessment Methodology

This 2013 update to the 2004 report includes risk assessments for surface and subsurface conditions for each well site. The sites are ranked as ***None, Low, Moderate*** or ***High risk***. The BLM's full assessment of all 136 wells drilled under the direction of the U.S. Navy or the USGS are grouped into categories (see **Table 3**):

Surface Risks

The surface risk assessment is based on the potential of the well or core test site to pose a risk or negative impact to surface resources and activities, including air, water, vegetation, or wildlife resources, as well as travel and visual resources. To assess surface risk, the BLM evaluated site conditions surrounding the well or core test.

The BLM assessed and rated the surface risk conditions at each site when it has any of the following:

- **High** surface risk when the site has:
  - ✓ Known contaminants present
  - ✓ A potential threat from accelerated coastal erosion during the term of the Strategic Plan
  - ✓ Significant solid waste present that affects visual resources or public safety
  - ✓ Potential to affect air or water quality because of the discharge of hydrocarbons under pressure

- **Moderate** surface risk when a site has:
  - ✓ A travel or transportation risk to local residents due to surface debris
  - ✓ Debris that impacts visual resources

- **Low** surface risk when a site has no threat due to erosion and has:
  - ✓ Minor solid waste present
  - ✓ No known contaminants present
  - ✓ Minimal impact to visual resources

- **None** (no surface risk) when a site is:
  - ✓ Fully remediated with no surface debris
  - ✓ No surface indication of a well site

Subsurface Risks

To determine a well or core test's subsurface risk, the BLM evaluated historical documents, such as drill logs and geologic reports, and conducted site assessments. The BLM also considered data on well plugging, including casing and cementing depth and materials, and the composition of materials in the borehole.

The BLM assessed and rated the subsurface conditions at sites as:

- **High** subsurface risk when a well or core test at the site penetrated oil or gas stratigraphy or water resources, and is leaking hydrocarbons.

- **Moderate** subsurface risk when a well or core test at the site penetrated oil and gas stratigraphy or water resources, and any of the following conditions exist:

  - ✓ The well or core test does not permanently isolate producible geologic horizon or casing perforations
  - ✓ There is a cement plug below the perforations of the producing interval, but some surface controls are in place, such as a wellhead or column of frozen drill mud that currently isolates the formation, and there is no indication of migration of fluid or gas through the frozen column of drilling mud.

- **Low** subsurface risk when a well or core test either:

  - ✓ Penetrated oil or gas stratigraphy or water resources, but the producible oil and gas formations or water resources are isolated; or
  - ✓ Diesel present within the wellbore, but the diesel is contained with no risk of release.

- **No** subsurface risk when a well or core test either:

  - ✓ Did not penetrate oil or gas stratigraphy or water resources; or
  - ✓ Has been adequately plugged

Photo shows the U.S. Geological Survey logging the West Fish Creek #1 test well in August 2009.

Timeline - Legacy Wells

1944-1952: The U.S. Navy drills 91 wells in the Naval Petroleum Reserve No. 4 (PET-4), including 59 cased exploratory wells and 32 uncased core tests.

1953-1975: The U.S. Navy drills 17 additional wells near Barrow in support of the Barrow Gas Field development.

1976: The Naval Petroleum Reserves Production Act of 1976 (NPRPA; Public Law 94-258) renames the PET-4 as the National Petroleum Reserve in Alaska (NPR-A), and orders the transfer of jurisdiction over the reserve from the Secretary of the Navy to the Secretary of the Interior, effective June 1, 1977.

The law directed the Department of the Interior to protect the surface and explore for oil and gas. At the time the law was enacted, the U.S. Geological Survey (USGS) supervised exploration and development for leases on Federal, Indian and certain Naval petroleum reserve land (to include NPR-A after the transfer).

1977: The BLM and USGS enter into a Memorandum of Understanding (42 FR 4542) giving USGS exclusive jurisdiction over the South Barrow Gas Field and specifying that the BLM and USGS share management of the surface of areas of operations. The MOU designated the USGS as manager of the continuing exploration program during the interim period between the transfer of jurisdiction from the Navy to Interior.

1975-1982: The Navy and USGS drill 28 wells through a contract with Husky Oil Company.

1980: The NPRPA is amended to direct an expedited program of leasing.

1981: The BLM conveys the W.T. Foran well to the Arctic Slope Regional Corporation (ASRC).

1982: In January, the Minerals Management Service (MMS) takes over the functions of oil and gas exploration and development from the USGS Conservation Division. In December, onshore minerals management functions are transferred to the BLM via Secretarial Order 3087.

1982: The first BLM oil and gas lease sale is held for the NPR-A.

1984: The Barrow Gas Field Transfer Act transfers ownership responsibility of 19 Legacy Wells to North Slope Borough.

1986: The BLM conveys Grandstand #1 well to ASRC.

1995: The Alaska State Dept of Environmental Conservation issues final closure for 27 of the USGS reserve pits. ADEC issues one reserve pit (East Teshekpuk) conditional closure. BLM conveys Gubik #1 and Gubik #2 wells to ASRC.

2002: Umiat #2 and Umiat #5 wells plugged by the U.S. Army Corps of Engineers, under the oversight of the BLM at a cost of $25 million.

2003-2005: The BLM inspects and evaluates all 136 wells and uncased core test sites to determine the threat posed to human health, safety and the environment. The 2004 Legacy Wells Summary Report prioritized those sites with the most immediate need of corrective action.

2005-2013: The BLM conducts clean-up efforts of several high priority well sites identified in the 2004 Legacy Wells Summary Report.

Table 1: *NPR-A Legacy Wells –Well Information Summary*

API #			WELL NAME	#	OPERA-TOR	LAT	LONG	TD (ft)	Year Spud	Well-head	Plate / Marker
50	23	10008	Arcon Barrow	1	USN	71.328	-156.668	1,442	1947	No	
50	103	20008	Atigaru Point	1	USGS	70.556	-151.717	11,535	1977	No	Plate
50	23	10013	Avak	1	USN	71.251	-156.468	4,020	1952	No	
50	155	20001	Awuna	1	USGS	69.148	-158.024	11,200	1980	Yes	
50	23	10007	Barrow Big Rig	1	USN	71.329	-156.668	685	1944	No	
50	23	10005	Barrow Core Rig Test	1	USN	71.324	-156.651	344	1944	No	
50	23	10006	Barrow core Rig Test	2	USN	71.317	-156.650	236	1944	No	
50	103	20004	Cape Halkett	1	USN	70.767	-152.466	9,900	1975	No	
50	279	20002	Drew Pt.	1	USGS	70.880	-153.900	7,946	1978	No	Plate
50	119	10006	East Oumalik	1	USN	69.791	-155.544	1,805	1951	No	
50	279	20005	East Simpson	1	USGS	70.918	-154.618	7,739	1979	Yes	
50	279	20007	East Simpson	2	USGS	70.978	-154.674	7,505	1980	Yes	
50	103	20006	East Teshekpuk	1	USGS	70.569	-152.943	10,664	1976	No	Plate
50	279	10034	East Topagoruk	1	USN	70.577	-155.373	3,589	1951	No	
50	103	10001	Fish Creek	1	USN	70.311	-151.870	7,020	1949	Yes	
50	57	10001	Grandstand	1	USN	68.966	-151.917	3,939	1952	No	
50	287	10013	Gubik	1	USN	69.423	-151.447	6,000	1951	No	
50	287	10014	Gubik	2	USN	69.431	-151.438	4,620	1951	Yes	
50	23	20007	Iko Bay	1	USN	71.170	-156.167	2,731	1975	Yes	
50	279	20004	Ikpikpuk	1	USGS	70.456	-154.333	15,481	1980	Yes	
50	119	10001	Ikpikpuk Core	1	USN	69.827	-155.399	178	1947	No	
50	279	20003	Inigok	1	USGS	70.000	-153.095	20,102	1979	Yes	
50	279	20006	J. W. Dalton	1	USGS	70.920	-153.138	9,367	1979	No	Plate
50	297	10001	Kaolak	1	USN	69.933	-160.248	6,952	1951	No	
50	119	10012	Knifeblade	1	USN	69.151	-154.889	1,805	1951	No	
50	119	10013	Knifeblade	2	USN	69.139	-154.737	373	1951	No	
50	119	10014	Knifeblade	2A	USN	69.123	-154.734	1,805	1951	No	
50	119	20001	Koluktak	1	USGS	69.770	-154.531	5,882	1981	Yes	
50	163	20002	Kugrua	1	USGS	70.587	-158.662	12,588	1978	Yes	
50	163	20003	Kuyanak	1	USGS	70.933	-156.032	6,690	1981	Yes	
50	137	20003	Lisburne	1	USGS	68.478	-155.651	17,000	1980	Yes	
50	163	10002	Meade	1	USN	70.042	-157.490	5,305	1950	No	
50	279	10031	Minga Velocity	1	USN	70.983	-154.743	1,233	1950	No	
50	103	20017	North Inigok	1	USGS	70.258	-152.766	10,170	1981	Yes	
50	103	20011	North Kalikpik	1	USGS	70.509	-152.368	7,395	1978	Yes	

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API #			WELL NAME	#	OPERA-TOR	LAT	LONG	TD (ft)	Year Spud	Well-head	Plate / Marker
50	23	10004	North Simpson	1	USN	71.057	-154.957	3,774	1950	No	
50	119	10005	Oumalik	1	USN	69.842	-155.971	11,872	1950	No	
50	119	10002	Oumalik Core Founda-tionTest	1	USN	69.000	-155.000	< 50	1950	No	
50	119	10002	Oumalik Core Founda-tionTest	2	USN	69.000	-155.000	< 50	1950	No	
50	119	10002	Oumalik Core Founda-tionTest	3	USN	69.000	-155.000	< 50	1950	No	
50	119	10003	Oumalik Core Founda-tionTest	4	USN	69.000	-155.000	< 50	1950	No	
50	119	10003	Oumalik Core Founda-tionTest	5	USN	69.000	-155.000	< 50	1950	No	
50	119	10002	Oumalik Core Founda-tionTest	6	USN	69.000	-155.000	< 50	1950	No	
50	119	10002	Oumalik Core Founda-tionTest	7	USN	69.000	-155.000	< 50	1950	No	
50	119	10003	Oumalik Core Founda-tionTest	8	USN	69.000	-155.000	< 50	1950	No	
50	119	10003	Oumalik Core Founda-tionTest	9	USN	69.000	-155.000	< 50	1950	No	
50	119	10002	Oumalik Core Founda-tionTest	10	USN	69.000	-155.000	< 50	1950	No	
50	119	10002	Oumalik Core Test	2	USN	69.838	-155.990	190	1950	No	Plate & Marker
50	119	10003	Oumalik Core Test	11	USN	69.838	-155.990	303	1950	No	
50	119	10003	Oumalik Core Test	12	USN	69.829	-155.696	300	1950	No	
50	119	10002	Oumalik Core Test	1	USN	69.829	-155.696	392	1950	No	
50	301	20002	Peard	1	USGS	70.716	-159.001	10,225	1979	Yes	
50	287	20007	Seabee	1	USGS	69.380	-152.173	15,611	1980	Yes	
50	287	10012	Sentinel Hill Core Test	1	USN	60.602	-157.450	1,180	1947	Yes	
50	279	10032	Simpson	1	USN	70.953	-155.364	7,002	1948	No	
50	279	10013	Simpson Core Test	13	USN	70.983	-154.645	1,438	1949	No	
50	279	10014	Simpson Core Test	14	USN	70.987	-154.627	1,270	1949	No	
50	279	10015	Simpson Core Test	14-A	USN	70.987	-154.627	290	1949	No	
50	279	10016	Simpson Core Test	15	USN	70.985	-154.636	900	1949	No	
50	279	10026	Simpson Core Test	28	USN	70.993	-154.671	2,505	1950	No	
50	279	10027	Simpson Core Test	29	USN	70.930	-154.692	700	1950	No	
50	279	10001	Simpson Core Test	1	USN	70.928	-155.289	116	1945	No	
50	279	10002	Simpson Core Test	2	USN	70.928	-155.292	226	1945	No	
50	279	10003	Simpson Core Test	3	USN	70.927	-155.292	368	1945	No	
50	279	10004	Simpson Core Test	4	USN	70.929	-155.264	151	1945	No	
50	279	10005	Simpson Core Test	5	USN	70.938	-155.279	130	1945	No	
50	279	10006	Simpson Core Test	6	USN	70.933	-155.309	149	1945	No	

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API #			WELL NAME	#	OPERA-TOR	LAT	LONG	TD (ft)	Year Spud	Well-head	Plate / Marker
50	279	10007	Simpson Core Test	7	USN	70.930	-155.303	532	1945	No	
50	279	10008	Simpson Core Test	8	USN	70.945	-155.294	580	1945	No	
50	279	10009	Simpson Core Test	9	USN	70.945	-155.292	320	1945	No	
50	279	10010	Simpson Core Test	10	USN	70.962	-155.292	500	1945	No	
50	279	10011	Simpson Core Test	11	USN	70.980	-155.292	580	1945	No	
50	279	10012	Simpson Core Test	12	USN	70.972	-155.292	460	1945	No	
50	279	10017	Simpson Core Test	16	USN	70.983	-154.631	800	1949	No	
50	279	10018	Simpson Core Test	17	USN	70.987	-154.643	1,100	1949	No	
50	279	10019	Simpson Core Test	18	USN	70.994	-154.670	1,460	1949	No	
50	279	10020	Simpson Core Test	19	USN	70.988	-154.716	1,061	1949	No	
50	279	10021	Simpson Core Test	20	USN	70.997	-154.589	1,002	1949	No	
50	23	10001	Simpson Core Test	21	USN	70.997	-154.589	1,002	1949	No	
50	279	10022	Simpson Core Test	22	USN	70.992	-154.604	903	1949	No	
50	23	10002	Simpson Core Test	23	USN	71.034	-154.634	1,035	1949	No	
50	23	10003	Simpson Core Test	24	USN	71.029	-154.617	900	1949	No	
50	279	10023	Simpson Core Test	25	USN	70.936	-154.703	1,510	1950	No	
50	279	10024	Simpson Core Test	26	USN	70.936	-154.684	1,171	1950	Yes	
50	279	10025	Simpson Core Test	27	USN	70.935	-154.668	1,500	1951	Yes	
50	279	10028	Simpson Core Test	30	USN	70.931	-154.676	693	1951	Yes	
50	279	10029	Simpson Core Test	30-A	USN	70.930	-154.681	701	1951	No	
50	279	10030	Simpson Core Test	31	USN	70.956	-154.629	355	1951	Yes	
50	163	10001	Skull Cliff core test	1	USN	70.900	-157.600	779	1947	No	
50	23	10009	South Barrow	1	USN/ NSB	71.320	-156.704	3,553	1948	No	
50	23	10010	South Barrow	2	USN/ NSB	71.262	-156.634	2,505	1950	Yes	
50	23	10011	South Barrow	3	USN/ NSB	71.158	-156.567	2,900	1949	No	Plate & Marker
50	23	10012	South Barrow	4	USN/ NSB	71.264	-156.631	2,538	1950	Yes	
50	23	10014	South Barrow	5	U.S.A.F.	71.264	-156.631	2,456	1955	Yes	
50	23	10015	South Barrow	6	USN/ NSB	71.262	-156.615	2,363	1964	Yes	
50	23	20001	South Barrow	7	USN/ NSB	71.251	-156.338	2,351	1968	Yes	
50	23	20002	South Barrow	8	U.S.A.F.	71.265	-156.592	2,359	1969	Yes	
50	23	20003	South Barrow	9	USN/ NSB	71.268	-156.615	2,450	1970	Yes	
50	23	20004	South Barrow	10	USN/ NSB	71.259	-156.626	2,349	1973	Yes	
50	23	20005	South Barrow	11	USN/ NSB	71.257	-156.607	2,350	1974	Yes	

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API #			WELL NAME	#	OPERA-TOR	LAT	LONG	TD (ft)	Year Spud	Well-head	Plate / Marker
50	23	20006	South Barrow	12	USN/ NSB	71.237	-156.338	2,285	1974	Yes	
50	23	20008	South Barrow	13	USN/ NSB	71.237	-156.338	2,285	1974	Yes	
50	23	20009	South Barrow	14	USN/ NSB	71.237	-156.338	2,285	1974	Yes	
50	23	20016	South Barrow	15	USN/ NSB	71.237	-156.338	2,285	1974	Yes	
50	23	20010	South Barrow	16	USN/ NSB	71.237	-156.338	2,285	1974	Yes	
50	23	20011	South Barrow	17	USN/ NSB	71.237	-156.338	2,285	1974	Yes	
50	23	20017	South Barrow	18	USGS/ NSB	71.282	-156.546	2,400	1978	Yes	
50	23	20012	South Barrow	19	USGS/ NSB	71.282	-156.546	2,400	1978	Yes	
50	23	20015	South Barrow	20	USGS/ NSB	71.282	-156.546	2,400	1978	Yes	
50	103	20007	South Harrison Bay	1	USGS	70.425	-151.731	11,290	1977	Yes	
50	163	20001	South Meade	1	USGS	70.606	-156.876	9,945	1979	Yes	
50	279	20001	South Simpson	1	USGS	70.807	-154.982	8,795	1977	Yes	
50	119	10007	Square Lake	1	USN	69.567	-153.300	3,987	1952	No	
50	119	10011	Titaluk	1	USN	69.423	-154.568	4,020	1951	No	
50	279	10033	Topagoruk	1	USN	70.625	-155.893	10,503	1951	No	
50	23	20018	Tulageak	1	USGS	71.189	-155.709	4,015	1981	Yes	
50	301	20001	Tunalik	1	USGS	70.197	-161.072	20,335	1980	Yes	
50	287	10001	Umiat	1	USN	69.396	-152.328	6,005	1946	Yes	
50	287	10011	Umiat	11	USN	69.124	-152.097	3,303	1952	No	
50	287	10002	Umiat	2	USN	69.382	-152.083	6,212	1947	No	
50	287	10003	Umiat	3	USN	69.387	-152.085	572	1947	Yes	
50	287	10004	Umiat	4	USN	69.388	-152.079	840	1950	No	
50	287	10005	Umiat	5	USN	69.384	-152.080	1,077	1950	No	
50	287	10006	Umiat	6	USN	69.378	-152.092	825	1950	No	
50	287	10007	Umiat	7	USN	69.375	-152.101	1,384	1951	No	
50	287	10008	Umiat	8	USN	69.399	-152.115	1,327	1951	Yes	
50	287	10009	Umiat	9	USN	69.386	-152.167	1,257	1952	No	
50	287	10010	Umiat	10	USN	69.400	-152.117	1,573	1952	Yes	
50	103	20010	W. T. Foran	1	USGS	70.832	-152.303	8,864	1977	Yes	
50	23	20013	Walakpa	1	USGS	71.099	-156.886	3,666	1979	Yes	
50	23	20019	Walakpa	2	USGS	71.050	-156.952	4,360	1981	Yes	
50	23	20014	West Dease	1	USGS	71.159	-155.631	4,170	1980	Yes	
50	103	20009	West Fish Creek	1	USGS	70.327	-152.061	11,427	1977	Yes	

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API #			WELL NAME	#	OPERA-TOR	LAT	LONG	TD (ft)	Year Spud	Well-head	Plate / Marker
50	119	10008	Wolf Creek	1	USN	69.386	-153.521	1,500	1951	Yes	
50	119	10009	Wolf Creek	2	USN	69.405	-153.521	1,618	1951	No	
50	119	10010	Wolf Creek	3	USN	69.386	-153.524	3,760	1952	No	

Table 2. *Legacy Wells Disposition Summary*

(Numbers in Parentheses Indicate Number of Wells)

Wells Requiring No Additional BLM Action (68)	
Transferred under the Barrow Gas Field Transfer Act (19)	South Barrow 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 ,16, 17, 18, 19, 20; Walakpa 1, 2
Transferred to ASRC in 1981 (1)	W.T. Foran 1
Plugged: no subsurface risk, no surface risks (11)	Atigaru Point 1, Drew Point 1, East Teshekpuk 1, , Simpson Core Test 27, Simpson Core Test 31, Umiat 2, 5, 6, 7, 8, 10
Shallow, uncased wellbore: no subsurface risk, no surface risks (35)	Barrow Core Rig Test 1, Ikpikpuk Core 1, Oumalik Core Test 1; Oumalik Foundation 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; Simpson Core Test 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12; Simpson Core Test 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
Cased wellbore, surface inaccessible due to subsequent land use by NSB (1)	Barrow Big Rig Test 1
Plugged well, USACE doing surface clean-up (1)	Umiat 9

Wells Currently in Use by USGS (18)	
Wells being used by USGS for temperature monitoring; future plugging and surface clean-up will be necessary when no longer in use. (17)	Awuna 1, East Simpson 1, East Simpson 2, Ikpikpuk 1, Koluktak 1, Kugrua 1, Kuyanak 1, Lisburne 1, North Inigok 1, North Kalikpik, Peard 1, Seabee 1, South Harrison Bay 1, South Meade 1, Tunalik 1, West Dease 1, West Fish Creek 1
As above, with additional surface monitoring (1)	Tulageak 1

Wells Currently Requiring BLM Remediation (50)	
Plugged, need surface clean-up (8)	Cape Halkett 1, Inigok 1, Simpson Core Test 30, 30A, South Simpson 1, Square Lake 1, Umiat 3, 4
Require plugging and surface clean-up (36)	Arcon Barrow Core Test 1, Avak 1, Barrow Core Rig Test 2, East Oumalik 1, East Topagoruk 1, Fish Creek 1, Iko Bay Test 1, Kaolak 1; Knifeblade 1, 2, 2A; Meade 1, North Simpson 1, Oumalik 1, Oumalik Core Test 2, Oumalik Core Test 11, Oumalik Core Test 12, Simpson 1; Simpson Core Test 13, 14, 14A, 15, 26, 28, 29, Skull Cliff Core Test 1; South Barrow 1, 2, 3; Titaluk 1, Topagoruk 1, Umiat 1, Umiat 11, Wolf Creek 1, Wolf Creek 2, Wolf Creek 3
Plugged; requires monitoring (1)	JW Dalton 1
Require monitoring and potential future plugging; No accurate GPS coordinates (2)	Minga Velocity Test 1, Sentinel Hill Core Test 1
Transferred to ASRC in 1996; require more BLM action (3)	Grandstand 1, Gubik Test 1, Gubik Test 2

Table 3: Well Categories

Well Name (Ordered alphabetically)	Cased Wells Future Action Necessary	Future Surface Action Necessary	USGS Temperature Monitoring	Uncased Wellbore	Without Accurate GPS Coordinates	Not BLM Jurisdiction	Plugged
Arcon Barrow Core Test #1	●	●					
Atigaru Point #1							●
Avak #1	●	●					
Awuna #1	●	●	●				
Barrow Big Rig Test #1*							
Barrow Core Rig Test #1				●			
Barrow Core Rig Test #2	●	●					
Cape Halkett		●					●
Drew Point #1							●
East Oumalik #1	●	●					
East Simpson #1	●	●	●				
East Simpson #2	●	●	●				
East Teshekpuk #1							●
East Topagoruk #1	●	●					
Fish Creek #1	●	●					
Grandstand #1	●	●				●	
Gubik Test #1	●	●				●	
Gubik Test #2	●	●				●	
Iko Bay Test #1	●	●					
Ikpikpuk #1	●	●	●				
Ikpikpuk Core Test #1				●			
Inigok #1							●
J.W. Dalton #1**							●
Kaolak #1	●	●					
Knifeblade #1	●	●					
Knifeblade #2	●	●					
Knifeblade #2A	●	●					
Koluktak #1	●	●	●				
Kugrua #1	●	●	●				
Kuyanak #1	●	●	●				
Lisburne #1	●	●	●			●	
Meade #1	●	●					
Minga Test Velocity #1	●				●		

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* No future action necessary; Barrow Big Rig Test #1l has since been overlain by a sand/gravel base and the site is being used to store equipment, vehicles and materials
** Requires monitoring.

Table 3: Well Categories

Well Name *(Ordered alphabetically)*	Cased Wells Future Action Necessary	Future Surface Action Necessary	USGS Temperature Monitoring	Uncased Wellbore	Without Accurate GPS Coordinates	Not BLM Jurisdiction	Plugged
North Inigok #1	●	●	●				
North Kalikpik #1	●	●	●				
North Simpson #1	●	●					
Oumalik #1	●	●					
Oumalik Core Test #1				●			
Oumalik Core Test #2	●	●					
Oumalik Core Test #11	●	●					
Oumalik Core Test #12	●	●					
Oumalik Foundation #1				●			
Oumalik Foundation #2				●			
Oumalik Foundation #3				●			
Oumalik Foundation #4				●			
Oumalik Foundation #5				●			
Oumalik Foundation #6				●			
Oumalik Foundation #7				●			
Oumalik Foundation #8				●			
Oumalik Foundation #9				●			
Oumalik Foundation #10				●			
Peard #1	●	●	●				
Seabee #1	●	●	●				
Sentinel Hill Core Test #1	●				●		
Simpson #1	●	●					
Simpson Core Test #1				●			
Simpson Core Test #2				●			
Simpson Core Test #3				●			
Simpson Core Test #4				●			
Simpson Core Test #5				●			
Simpson Core Test #6				●			
Simpson Core Test #7				●			
Simpson Core Test #8				●			
Simpson Core Test #9				●			
Simpson Core Test #10				●			
Simpson Core Test #11				●			
Simpson Core Test #12				●			
Simpson Core Test #13	●	●					

(continues on next page)

Table 3: Well Categories

Well Name *(Ordered alphabetically)*	Cased Wells Future Action Necessary	Future Surface Action Necessary	USGS Temperature Monitoring	Uncased Wellbore	Without Accurate GPS Coordinates	Not BLM Jurisdiction	Plugged
Simpson Core Test #14	●	●					
Simpson Core Test #14A	●	●					
Simpson Core Test #15	●	●					
Simpson Core Test #16				●			
Simpson Core Test #17				●			
Simpson Core Test #18				●			
Simpson Core Test #19				●			
Simpson Core Test #20				●			
Simpson Core Test #21				●			
Simpson Core Test #22				●			
Simpson Core Test #23				●			
Simpson Core Test #24				●			
Simpson Core Test #25				●			
Simpson Core Test #26	●	●					●
Simpson Core Test #27							●
Simpson Core Test #28	●	●					
Simpson Core Test #29	●	●					
Simpson Core Test #30		●					●
Simpson Core Test #30A		●					●
Simpson Core Test #31							●
Skull Cliff Core Test #1	●	●					
South Barrow #1	●	●					
South Barrow #2	●	●					
South Barrow #3	●	●					
South Barrow #4						●	
South Barrow #5						●	●
South Barrow #6						●	●
South Barrow #7						●	●
South Barrow #8						●	●
South Barrow #9						●	●
South Barrow #10						●	●
South Barrow #11						●	●
South Barrow #12						●	●
South Barrow #13						●	●
South Barrow #14						●	●

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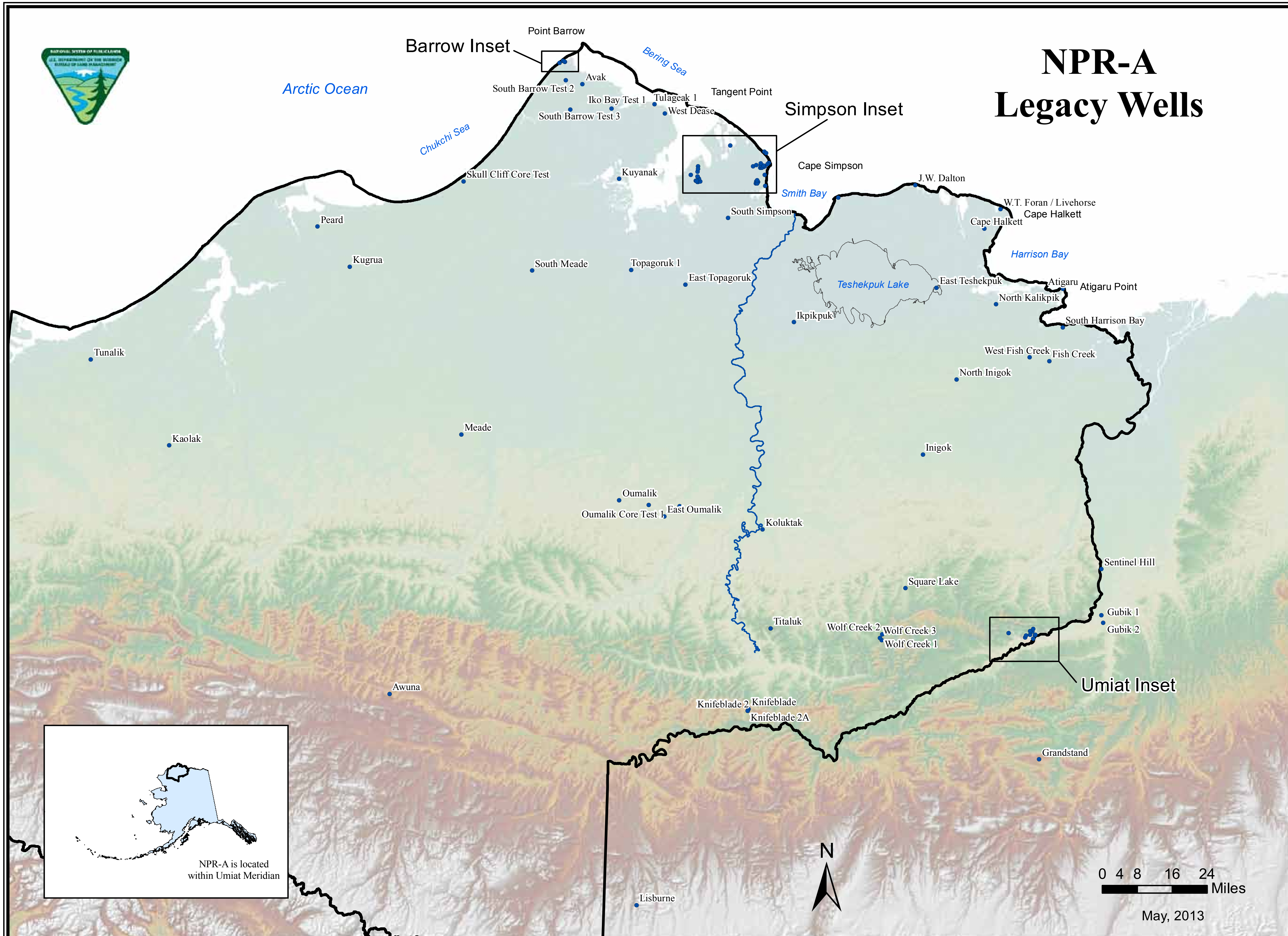
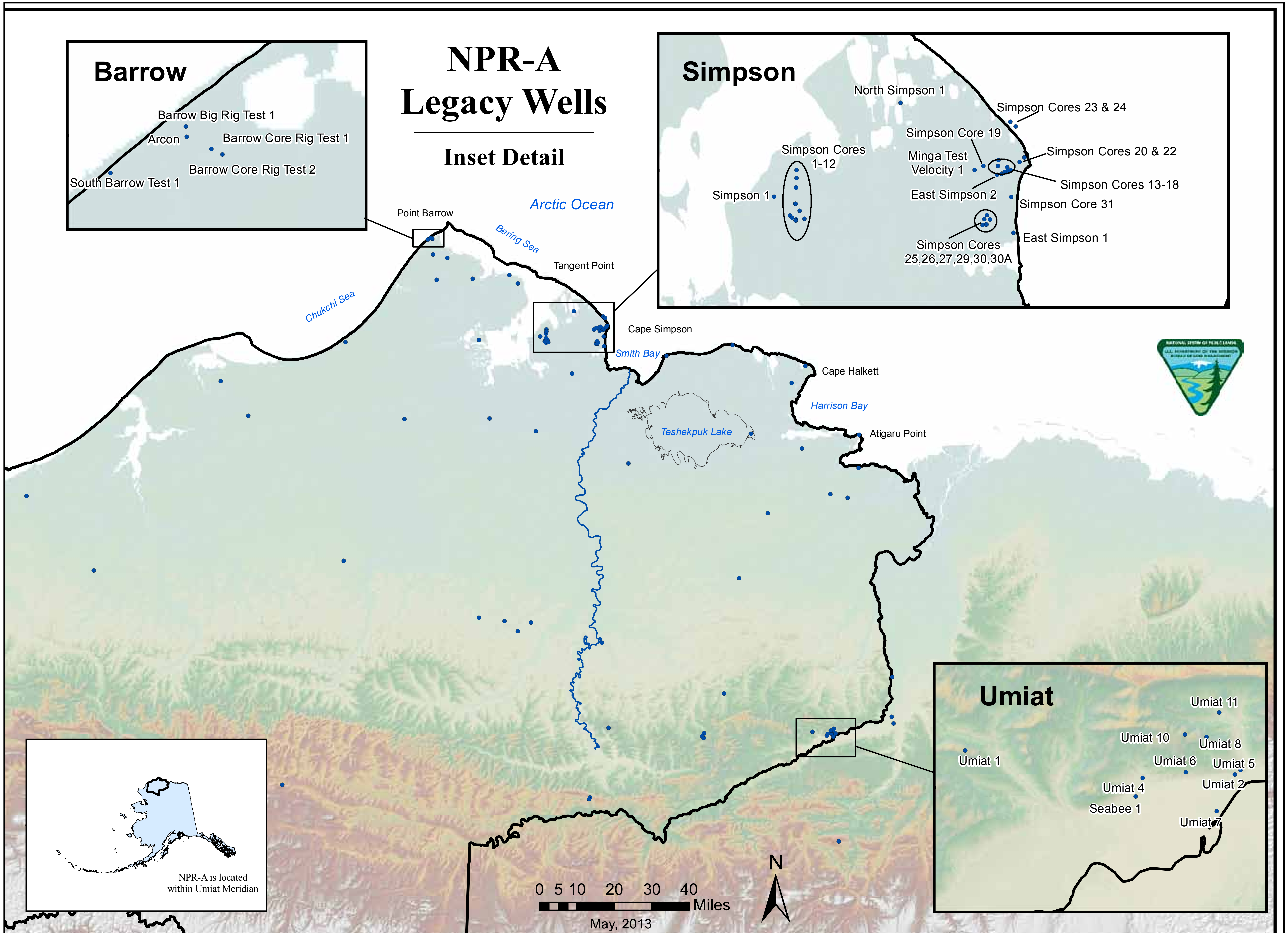
Table 3: Well Categories

Well Name *(Ordered alphabetically)*	Cased Wells Future Action Necessary	Future Surface Action Necessary	USGS Temperature Monitoring	Uncased Wellbore	Without Accurate GPS Coordinates	Not BLM Jurisdiction	Plugged
South Barrow #15						●	●
South Barrow #16						●	
South Barrow #17						●	●
South Barrow #18						●	●
South Barrow #19						●	●
South Barrow #20						●	●
South Harrison Bay #1	●	●	●				
South Meade #1	●	●	●				
South Simpson #1		●					●
Square Lake #1		●					●
Titaluk #1	●	●					
Topagoruk #1	●	●					
Tulageak #1	●	●	●				
Tunalik #1	●	●	●				
Umiat #1	●	●					
Umiat #2							●
Umiat #3		●					●
Umiat #4		●					●
Umiat #5							●
Umiat #6							●
Umiat #7							●
Umiat #8							●
Umiat #9		●					●
Umiat #10							●
Umiat #11	●	●					
W. T. Foran #1						●	●
Walakpa #1						●	●
Walakpa #2						●	●
West Dease #1	●	●	●				
West Fish Creek #1	●	●	●				
Wolf Creek #1	●	●					
Wolf Creek #2	●	●					
Wolf Creek #3	●	●					


NPR-A
Legacy Wells
Barrow Inset
Point Barrow
Arctic Ocean
Bering Sea
Chukchi Sea
Avak
South Barrow Test 2
Iko Bay Test 1
Tulageak 1
West Dease
South Barrow Test 3
Tangent Point
Simpson Inset
Cape Simpson
Skull Cliff Core Test
Kuyanak
Smith Bay
J.W. Dalton
W.T. Foran / Livehorse
Cape Halkett
Cape Halkett
South Simpson
Peard
Kugrua
South Meade
Topagoruk 1
East Topagoruk
Harrison Bay
Teshekpuk Lake
East Teshekpuk
Atigaru
Atigaru Point
North Kalikpik
Ikpikpuk
South Harrison Bay
Tunalik
West Fish Creek
Fish Creek
North Inigok
Meade
Kaolak
Inigok
Oumalik
East Oumalik
Oumalik Core Test 1
Koluktak
Sentinel Hill
Square Lake
Gubik 1
Gubik 2
Titaluk
Wolf Creek 2
Wolf Creek 3
Wolf Creek 1
Umiat Inset
Awuna
Knifeblade 2
Knifeblade
Knifeblade 2A
Grandstand
NPR-A is located within Umiat Meridian
N
0 4 8 16 24
Miles
Lisburne
May, 2013


NPR-A
Legacy Wells
Inset Detail
Barrow
Barrow Big Rig Test 1
Arcon
Barrow Core Rig Test 1
Barrow Core Rig Test 2
South Barrow Test 1
Simpson
North Simpson 1
Simpson Cores 23 & 24
Simpson Core 19
Simpson Cores 1-12
Minga Test Velocity 1
Simpson Cores 20 & 22
Simpson Cores 13-18
Simpson 1
East Simpson 2
Simpson Core 31
Simpson Cores 25,26,27,29,30,30A
East Simpson 1
Arctic Ocean
Point Barrow
Bering Sea
Tangent Point
Chukchi Sea
Cape Simpson
Smith Bay
Cape Halkett
Harrison Bay
Teshekpuk Lake
Atigaru Point
Umiat
Umiat 11
Umiat 10
Umiat 8
Umiat 1
Umiat 6
Umiat 5
Umiat 4
Umiat 2
Seabee 1
Umiat 7
NPR-A is located within Umiat Meridian
0 5 10 20 30 40
Miles
N
May, 2013

Arcon Barrow Core Test #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.3278° N, -156.1670° W. The Arcon Barrow Core Test #1 site is approximately 5 miles northeast of downtown Barrow in an area of town referred to as NARL, the former Naval Arctic Research Laboratory, which is accessible from Stevenson Street. The last site inspection was in July 2012.

Site Description: The Arcon Barrow Core Test #1 site consists of open casing located inside a constructed wooden cellar and a small amount of associated scattered surface debris in an area measuring 30 feet east to west by 15 feet north to south **[Figure 1]**. The U.S. Navy drilled this core test in 1947. There is no pad or reserve pit associated with the core test. Instead of digging a cellar, the U.S. Navy constructed a 5x5-foot box to use as a mud pit **[Figure 2]**. This box containing the core test remains intact, and has grass and other vegetation growing inside of it. There are no visible drilling muds inside this box. One of the large timbers used for rig support is present and the cellar is intact. The immediate area surrounding the core test is largely devoid of garbage, with the exception of some busted cement near the 5x5-foot box.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the site. Arcon lies about 100 feet from the shoreline of Imikpuk Lake. Erosion from the lake is not likely to have any effect on this core test in the near future, as erosion is very minimal. Imikpuk Lake is a relatively small, shallow-thaw lake with beach deposits and no bluffs or exposed permafrost. The lake does not serve as Barrow's drinking water source due to possible contaminants from gasoline and diesel spills that occurred near the lake in the 1970s (Alaska Department of Environmental Conservation 2012). Visual resource impacts are minimal.

The site is accessible by residents of Barrow, who travel along Stevenson Street to access seasonal cabins for subsistence use. With the large amount of development and infrastructure near the site that prevents off-road travel, it is unlikely that the site poses a travel risk to local residents **[Figure 3]**.

Figure 1: Overview of Arcon Barrow Core Test #1 showing casing, cellar, rig timber and concrete pile.

Figure 2: Arcon Barrow Core Test #1 located inside wood cellar; remaining rig timber in background.

Figure 3: View of Arcon Barrow Core Test #1 site area shows additional nearby infrastructure.

Figure 4: Water type valve on Arcon Barrow Core Test #1.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled the Arcon Barrow Core Test #1 in 1947 upon completion of the Skull Cliff test well using a Failing 314-C drill rig. A camp area was created by clearing away vegetation with a bulldozer in order to place temporary infrastructure to support drilling operations. (Note: camp area is currently unidentifiable due to later construction/ improvements by the U.S. Navy at NARL). The drill rig was set up within the camp area to drill for stratigraphic information and experiment with reverse circulation for coring. The rig was set up on 12x12-foot timbers, 24 inches off the ground. Instead of digging a cellar, a 5x5-foot box was constructed to use as a mud pit. The core test reached a total depth of 1,442 feet, which was the maximum depth that the rig was capable of drilling safely.

- **Well Condition:** There is no wellhead associated with Arcon #1 [**Figure 4**]. It has 2-inch tubing with a water type valve inside a 5¼-inch open casing. Both the tubing and the 5 ¼-inch casing have clamps. The open casing with tubing is approximately 36 inches high. A plumb-bob was dropped downhole and hit solid at 6 feet, likely an ice plug. Three barrels of diesel fuel mixed with water is present in the tubing between the ice plug and the surface. Grass and other vegetation are growing inside the box that contains the core test. There are no visible drilling muds in the box.

- **Wellhead Components:** None. There is no wellhead at this site. The tubing containing diesel fuel has a single water-type valve, but the main casing is open.

Geologic Setting: The test hole encountered the Gubik, Grandstand, and Topagoruk formations. There were no shows of oil and gas (Collins and Brewer 1961).

Development Potential: Gas development has occurred near this area for several decades. No detrimental effects from the Arcon #1 core test have been observed to date. There are no documented plugs **[Figure 5]**. The BLM plans to plug this core test within the next three years.

Groundwater Resource: None. Continuous permafrost is about 1400 feet thick throughout the entire Barrow region. Fresh water aquifers are not present. Barrow, the closest population center to the Arcon #1 site, gets its drinking water from treated surface water, rather than from aquifers. The active layer measures between 20 to 55 inches (Alaska Department of Environmental Conservation 2012).

Other Information: There were no hydrocarbons present on the surface near the core test.

Subsurface Risk Assessment: Low

Justification: Arcon-Barrow #1 is a shallow core test with no cement plugs, but had no oil or gas shows. This alone would rate it as having "No subsurface risk," but three barrels of diesel were added downhole. There is no risk of diesel escaping the tubing due to the closed water-type valve present at the surface. This brings the subsurface risk assessment up a category to "low."

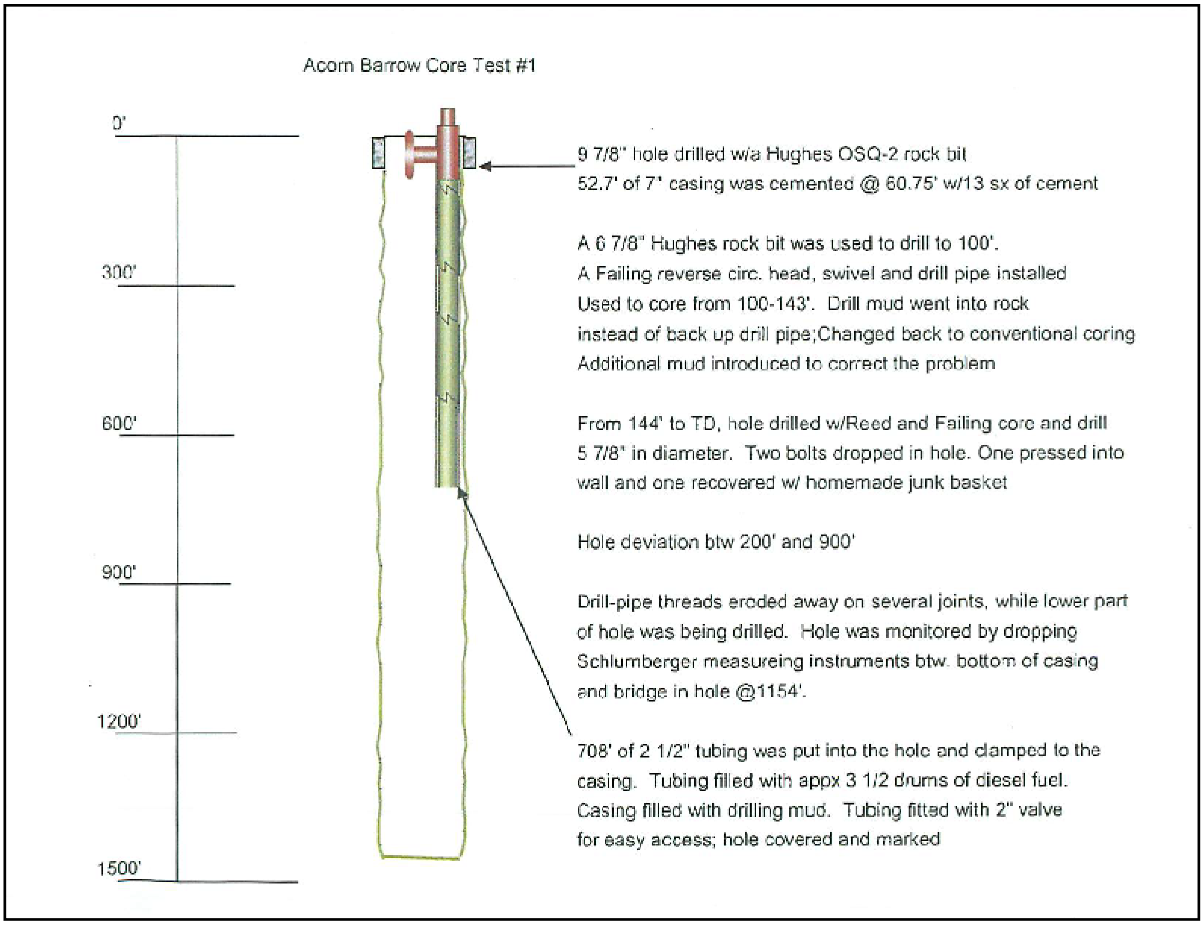


Figure 5: Arcon Barrow Core Test #1 Wellbore Diagram.

Atigaru Point #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.5561° N, -151.7172° W. The Atigaru Point #1 well site is located 28 miles northwest of Nuiqsut, 81 miles northwest of Umiat, and 127 southeast of Barrow. [**Figure 1**] BLM-Alaska conveyed the subsurface to the Arctic Slope Regional Corporation and the surface to the Kuukpik Corporation in the Cape Halkett exchange. The U.S. Navy drilled the well in 1977. The last overflight of the Atigaru Point #1 well site was in August 2011.

Site Description: The Atigaru Point #1 site consisted of a well, pad, and reserve pit. [**Figures 2-3**] In 2009, BLM had the well plugged and abandoned to current standards. An advancing and actively eroding Beaufort Sea coastline prompted the removal of the reserve pit. Atigaru Point #1 presented no problems downhole, but the extent of the coastal erosion put the site at risk of releasing the contaminated soils into the reserve pit and into the Beaufort Sea. The well casing would be subject to mechanical wearing by sea ice. If the casing had failed, several thousand gallons of diesel fuel would have been released into the Beaufort Sea. The wellhead was on a narrow peninsula that constantly changes shape due to erosion and deposition of sediments. The coastline consists of a small 34-foot, ice-rich bluff (not the larger 10- to 15-foot bluff present at the J.W. Dalton and Drew Point well sites). Close monitoring over the past decade revealed a change in the local landscape. The sea eroded Atigaru Point into a small island and continues to erode at a steady pace. Wellhead and reserve pit capture appeared inevitable. At the time, the wellhead was approximately 150 feet from the ocean.

Surface Risk Assessment: None

Justification: The BLM remediated Atigaru Point #1 in 2009. There is no remaining surface debris or surface indication of a well site.

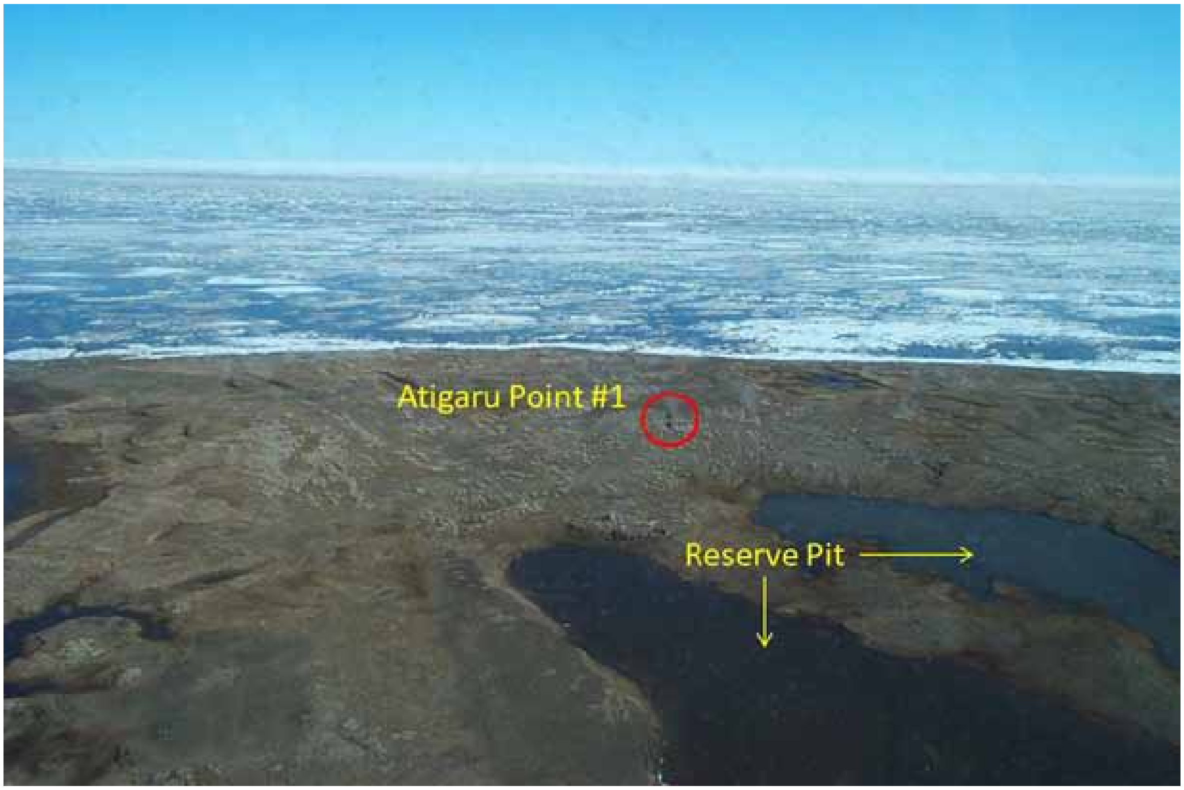


Figure 1: Atigaru Point #1 site (June 2005) approximately 3 ½ years before the BLM plugged the well and remediated the reserve pit.

Figure 2: Aerial view of Atigaru Point #1 well site in 2003.

Figure 3: Atigaru Point #1 wellhead and reserve pit (June 2005).

Figure 4: Removal of the Atigaru Point #1 wellbore 18 feet below the ground surface (April 2009).

Figure 5: Identification plate welded onto the Atigaru well casing after it was cut 18 feet below ground level (April 2009).

Figure 6: Removing material from the reserve pit at Atigaru Point #1 (April 2009).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy spudded the Atigaru Point #1 well in January 1977 to a total depth of 11,535 feet. The drill pad is a thick pad design using materials from small sand deposits approximately 4 miles away. Thick pads were the initial pad design used by Husky Oil prior to the thin pads. The pads are comprised of material that is 5 feet thick (BLM 2005). Five plugs were set downhole during the abandonment process in 1977, with the top plug set at 2,155 feet. From 2,155 feet to the surface, diesel was added to the wellbore to allow for temperature measurements by the U.S. Geological Survey (USGS) (Husky Oil 1983a).

  Prior to the 2009 plugging operations, the USGS had plugged the well back to 2,255 feet in 1977. Diesel fuel left in the wellbore provided a non-freezing, non-corrosive medium that enabled the USGS to collect temperature data. During the 2009 well-plugging operations, the diesel was completely displaced (approximately 14,400 gallons) with NaCl (salt) saturated water. The NaCl water was then evacuated from the casing down to a depth of 125 feet below ground level (BGL), and an inflatable plug was set at this depth. Cement was mixed at 15.8 ppg and dumped on top of the plug, filling the casing to within 15 feet of the surface. The frozen earth around the wellbore was excavated down to 19 feet BGL and the wellbore was cut off at 18 feet BGL. [**Figure 4**] An identification plate was welded onto the cut off casing and the excavated hole was backfilled with clean dirt to 4 feet above ground level. [**Figure 5**] The reserve pit was remediated by extracting all identified contaminants. [**Figure 6**] The excavated material was loaded into a dump truck and transported by ice road to the North Kalikpik reserve pit, where it is currently stored.

- **Well Condition:** The well is adequately plugged and abandoned [**Figure 7**].

- **Wellhead Components:** None. The well was plugged and abandoned.

Geologic Setting: The primary objectives of the well were the Kuparuk River Sandstone, the Sadlerochit Group, and the basal Torok Sand. When the well was completed, the primary objectives had insufficient porosity development to provide adequate potential reservoir rocks. There were fair oil shows in the Nanushuk Group. The mid-Torok Formation had poor oil shows with oil staining in the lower Torok. The Echooka Formation had a gas show at depths ranging from 9,411 feet to 9,425 feet (Husky Oil 1983b).

Development Potential: The BLM has properly plugged Atigaru Point #1 and the well site will not have any effect on future exploration or production that may occur.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface, as the well is properly plugged.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

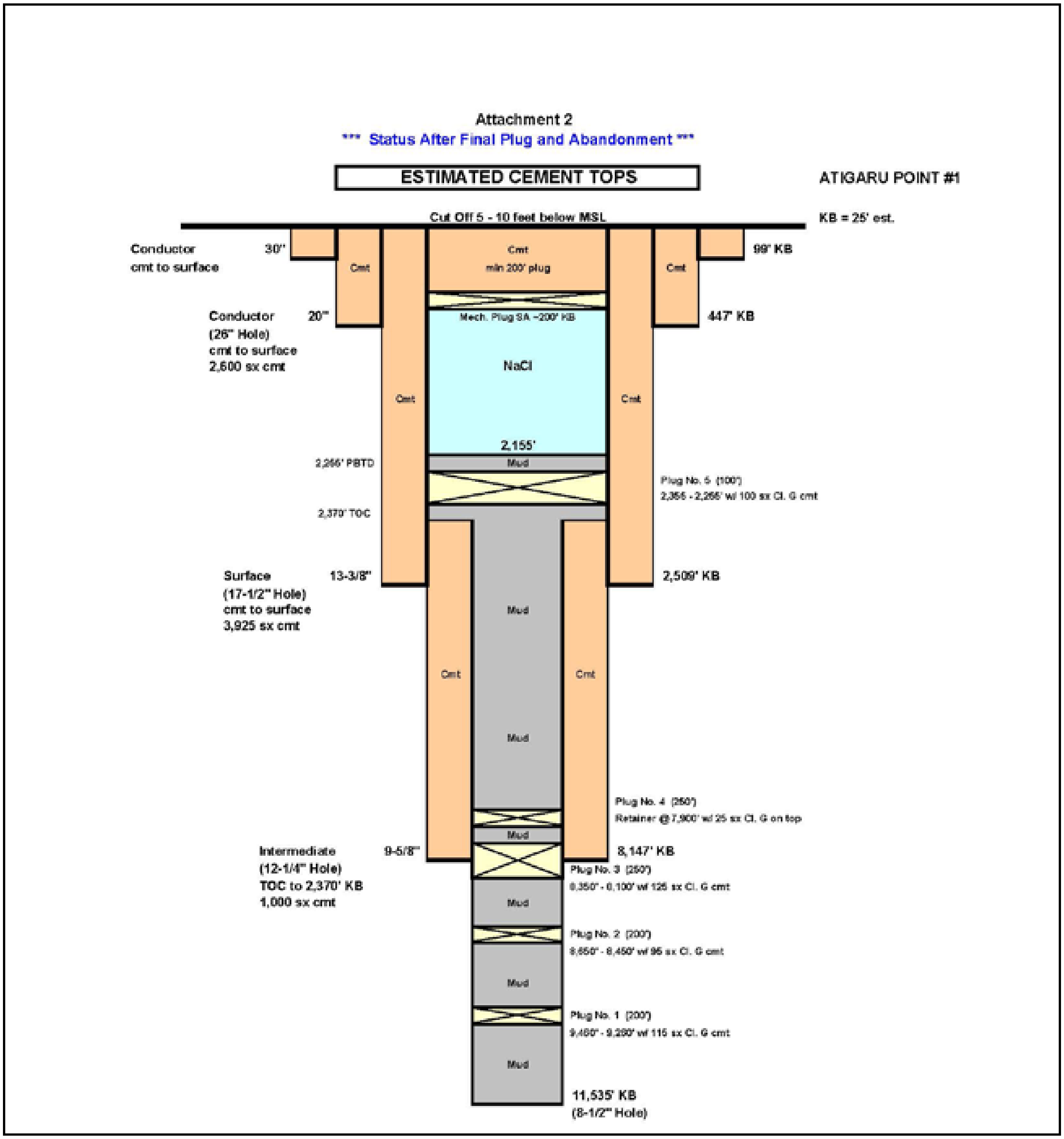


Figure 7: Atigaru Point #1 wellbore diagram.

Avak #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.2506° N, -156.4683° W. The Avak #1 well site is located along the Barrow Gas Field Road that connects Barrow with the East Barrow Gas Field **[Figure 1]**. This well is approximately 200 feet on the north side of the road, approximately 7 miles from Barrow. The last site inspection was in July 2012.

Site Description: The Avak #1 site consists of a well and its associated scattered surface debris in an area measuring 30 feet north to south by 50 feet east to west **[Figure 2]**. The U.S. Navy drilled the well in 1951. There is no pad or reserve pit associated with this well. The well has a cellar, consisting of a 10 feet by 10 feet wooden box. The inside of this box was excavated to a depth of about 10 inches. At the time of the last inspection, standing water and algae were present in the cellar. A total of 20 metal pilings are in the immediate area surrounding the well. These pilings extend from 6- to 24-inches above the ground surface, and at least 4 pilings have metal plates attached at the top to create a flat surface. The depth the pilings extend below ground is unknown, but they would need to be deep enough to support a working platform for drilling operations. Approximately 35 feet north of the well are two pieces of rusted, corrugated metal sitting on the surface, which may be associated with the well **[Figure 3]**.

Surface Risk Assessment: **Moderate**

Justification: This site has no known contaminants present on the site. The Avak #1 site area appears to be consistent with the surrounding vegetation and landscape, with no scars or other visible damage. Given the location of the site, it could pose a risk to travelers from the community of Barrow. The well site lies about 200 feet from a tributary of the Mayoeak River, and the river itself is less than ½ mile to the west. Neither the river nor its tributary pose any risk of erosion to the well or associated surface debris, and there does not appear to be any impact from the well site to the river.

Figure 1: Aerial view of Avak #1 (in center of photo) and access road to the East Barrow Gas Field, with the associated pipeline running east to west. The Mayoeak River is in the foreground of the photo.

Figure 2: Avak #1 casing and associated metal pilings.

Figure 3: View of Avak #1 well site to the southeast. Note the two pieces of surface debris that may be associated with the well site.

Figure 4: Close-up of Avak #1 well casing showing dents created by bullets.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled Avak #1 in October 1951 using an Ideco derrick with Cardwell Model H drawworks. When completed, a plug was set at 1,348 feet using 25 sacks of High Early cement **[Figure 5]**. The well was drilled to test an anomaly identified by seismic surveys. These surveys showed a nearly circular area of no reflections and several faults that radiated outwards in several directions. The other objective was to learn more about the pre-Mesozoic rocks in the area (Collins and Brewer 1961).

- **Well Condition:** Instead of a wellhead, the well consists of a casing that is open to the environment. This casing diameter is 10 ¾ inches and total height is approximately 4 feet. Five bullet holes are present at the top of the casing, but do not completely penetrate the metal **[Figure 4]**.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The Avak #1 test hole showed very complex subsurface geology with a slight oil show. The shows consisted of visible oil cuts in the Hue Shale and within the Lower Jurassic period Barrow sand. The well also penetrated the Gubik Formation (Collins and Brewer 1961).

Development Potential: Development occurred in this area for decades. Avak #1 has not had any detrimental impacts to the existing infrastructure or the development process. The oil show is below the existing plug.

Groundwater Resource: None. Continuous permafrost is about 1400 feet thick throughout the entire Barrow region. Fresh water aquifers are not present. The town of Barrow does not get its drinking water from aquifers, but rather from treated surface water (Alaska Department of Environmental Conservation 2012).

Other Information: There is no indication of hydrocarbon escapement at or near the Avak #1 well.

Subsurface Risk Assessment: Low

Justification: Avak #1 had a slight oil show, but the show was below the existing plug at 1,325 feet.

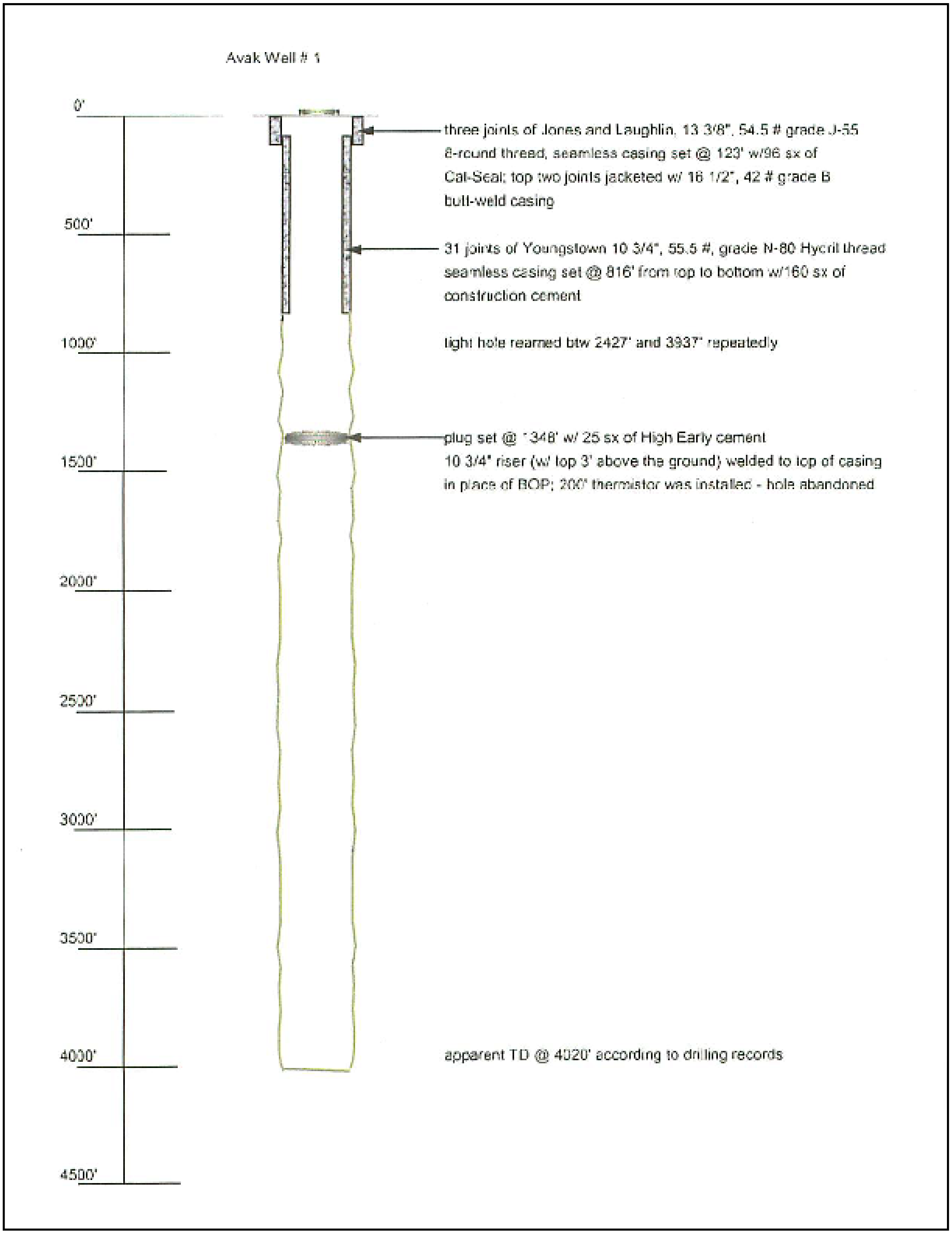


Figure 5: Avak #1 wellbore diagram.

Awuna #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 69.1480° N, -158.0242° W. The Awuna #1 well site is located 90 miles southwest of Atqasuk. Awuna #1 is the most remote well site in the National Petroleum Reserve in Alaska. **[Figure 1]** The site is 151 miles south of Barrow and 404 miles northwest of Fairbanks. The nearest gravel strip is at Ivotuk (Lisburne), 72 miles to the southeast. The last site inspection was in June 2011, poor weather prohibited an inspection in 2012.

Site Description: The Awuna #1 site consists of a well housed in a wooden cellar, pad, and reserve pit. Husky Oil drilled the well in 1980 and 1981 while under contract to the U.S. Geological Survey. Husky Oil constructed ice roads and a 5,000-foot ice airstrip for logistical support. The ice airstrip accommodated Hercules C-130 aircraft. Approximately 200 wooden pilings were set to support surface structures necessary for the drilling operations. The project cost for the multi-winter operation was approximately $6 million (Husky Oil 1983).

Awuna #1 is experiencing erosion to the pad from the reserve pit. **[Figure 2]** Due to the orientation of the pad, prevailing winds force wave action into the drilling pad, undermining the sands and silts that make up the pad. Styrofoam was used below the sands and silts to insulate the underlying permafrost. Wave action has eroded tens of feet into the drilling pad, exposing the Styrofoam, which consequently litters the area when it breaks loose and blows away. There is Styrofoam all around the pad, with pieces blown up to 5 miles away. **[Figures 3-5]** Wooden pilings exposed from erosion show how much attrition has taken place. The cellar, constructed of 2 feet by 12 feet wooden beams, is eroding away from the wellhead and toward the rat hole.

The walls separating the reserve and flare pits have also eroded. The pit walls continue to erode. The silt pad is overgrown with seeded vegetation, mostly consisting of non-native grasses and sedges. The pad is slowly reverting back to the surrounding thermokarst landscape and contains numerous small ponds. A small outlet stream has appeared on the opposite end of the reserve pit from the wellhead. This stream flows out into other surrounding surface waters **[Figure 6]**.

Surface Risk Assessment: **Moderate**

Justification: Although not an environmental hazard, the solid waste, including the loose Styrofoam, makes this location unsightly. Large and small pieces are concentrated at the well site, but they are also spread out for a distance of about 5 miles. Despite its remoteness, visual resources are impacted. The slow erosion of the reserve pit is threatening the cellar.

During breakup, surface waters are flowing downhill through the reserve and flare pits and ultimately into the nearby lakes. A small outlet stream from the reserve pit flows into surrounding surface waters. The stream is approximately 12 inches wide. The stream appears to lose its channel downstream of the outlet as it enters the willows. It is unknown if the waters can make it into the Awuna River. The Awuna River is approximately 3 miles north of the wellsite. The Colville River is 15 miles to the south.

Figure 1: Aerial view of Awuna #1 (June 2011).

Figure 2: Closer aerial view of Awuna #1 showing the extent of erosion in comparison to the pilings (June 2011).

Figure 3: Pilings are now in Awuna #1's reserve pit (June 2012).

Figure 4: Condition of the Awuna #1 wellhead and pilings in August 2008.

Figure 5: Condition of the Awuna #1 wellhead and pilings in August 2006.

Figure 6: Congestion of Styrofoam at Awuna #1 reserve pit's outlet stream (June 2011).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Awuna #1 was spudded February 1980 and completed April 1981. It is the only well drilled in the southwest portion of the National Petroleum Reserve in Alaska, and is the most remote well in the entire petroleum reserve. The well was drilled to a total depth of 11,200 feet. The drilling was conducted over two consecutive winters.

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the well was plugged back with two cement and mechanical plugs. The top of the shallowest cement plug is at 4,000 feet. From 4,000 feet to the surface, the hole is filled with diesel fuel. There is no Arctic Pack in any of the remaining casing annuluses **[Figure 7]**. The cellar is eroding away from the wellhead and toward the rat hole. There is no hazard to the wellhead given the size of the outer casing and the depth it is set. Downhole, the well is adequately cased and cemented from all lower formations.

- **Wellhead Components:** The wellhead consists of four gate valves and an operational needle valve **[Figure 8]**.

Geologic Setting: The drill hole only encountered two different Cretaceous formations: Torok and Fortress Mountain. Slight oil shows occurred near the base of the Torok, with occasional visible oil cuts and florescence. Gas shows appeared once into the Fortress Mountain Formation and were fairly constant until about 8,500 feet. A drill stem test recovered gas at about 8,400 feet.

Development Potential: This area is extremely remote. There are much better areas to explore that are closer to infrastructure. Development is extremely unlikely in the area for the foreseeable future. If development were to occur, this well is adequately cased and cemented from all lower formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

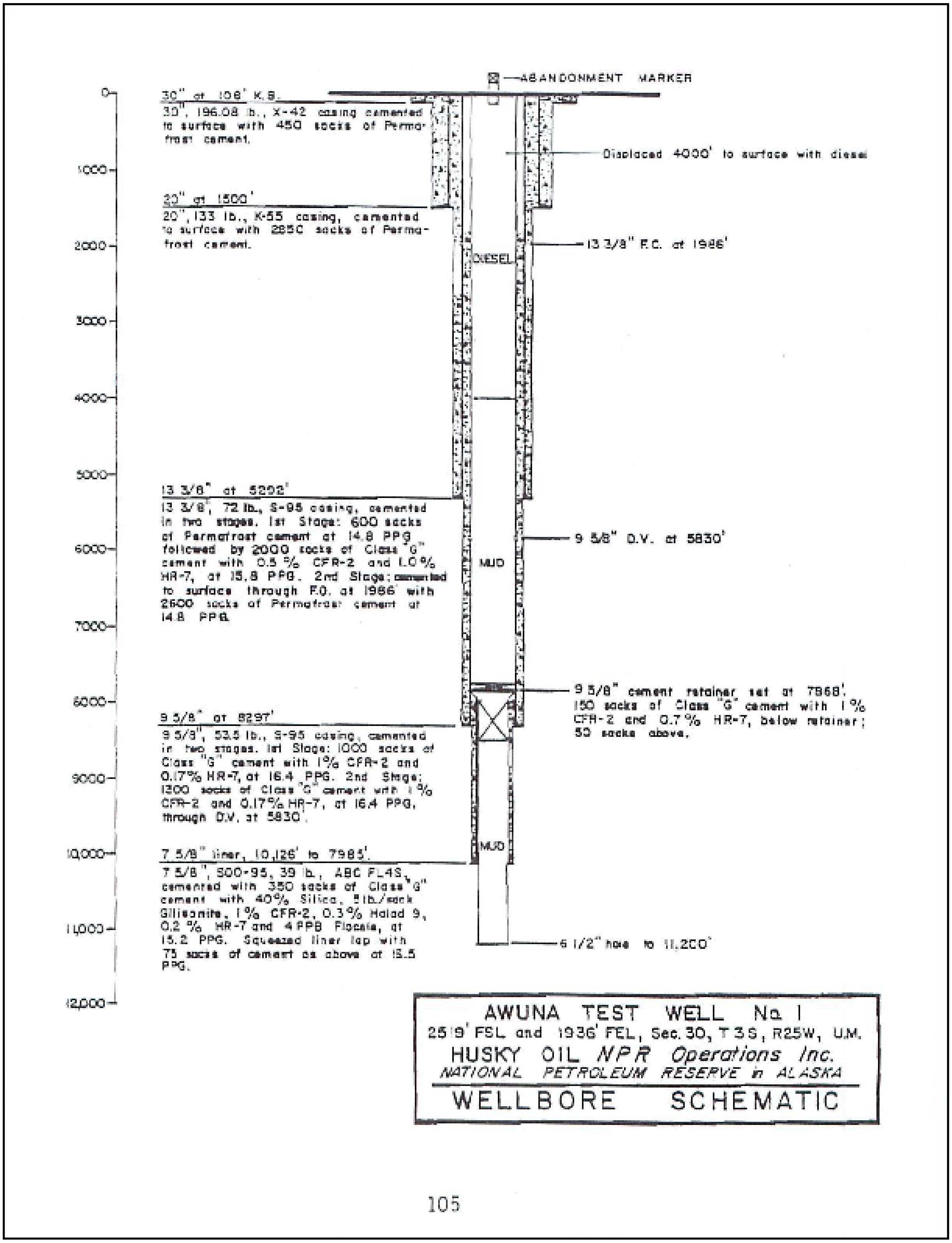


Figure 7: Awuna #1 wellbore diagram.

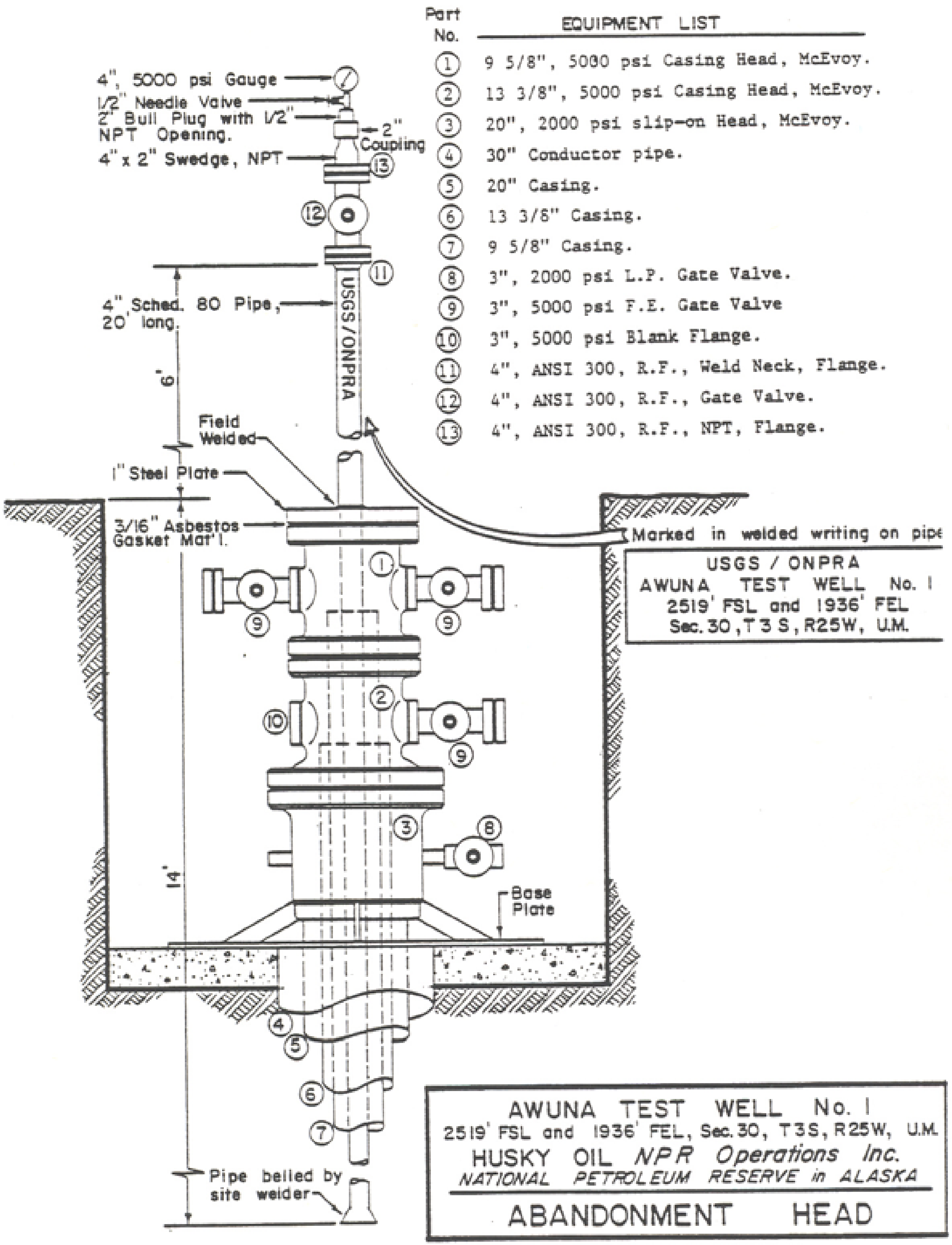


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Figure 8: Awuna #1 wellhead assembly.

Barrow Big Rig Test #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 71.3289° N, -156.6683° W. The exact location of the Barrow Big Rig Test #1 unknown. The rig test may be uncased. The general location is 5 miles to the northeast of downtown Barrow, in an area of town that is referred to as NARL, the former Naval Arctic Research Lab, and is accessible from Stevenson Street. The last site inspection was in August 2012.

To further assist in locating this test hole, the original GPS coordinates from the USGS 305K Report were recalculated into NAD 83 Datum. This approach was quite successful in determining other well locations in the Barrow area (Personal Communication with Richard Reanier, 2011). The recalculated coordinates were used as an onsite navigation point with handheld GPS. A grid approximately 100 feet from the calculated location was searched, but the casing was not found. **[Figure 1]**

Site Description: The rig test drilled in an area known as NARL (Naval Arctic Research Laboratory) has undergone major changes since 1944. The area where the rig test occurred is now a scrapyard full of old equipment. **[Figure 2]** The large sand/gravel base for the scrapyard was overlain on top of the casing, which could have also been pulled without documentation. If it wasn't pulled, the casing was likely cutoff at ground level and covered with sand and gravel. The BLM inquired of many locals about the location of the test hole, but have turned up no new information. Even locals recommended to the BLM as having vast knowledge of NARL and the scrapyard have turned up empty. One possibility to determine if the casing was pulled is to shoot ground penetrating radar, but even this is not a guarantee, given the possibility of buried solid wastes interfering with the radar.

There is no existing cellar and no reserve pits were ever established for the rig test. All cuttings were put back into the hole to freeze after the drilling concluded.

Surface Risk Assessment: None

Justification: The general location of the test is in the middle of a large sand/gravel pad (connected to the rest of NARL) on conveyed land. The pad houses scrap vehicles, equipment, and solid wastes placed there long after the rig test was drilled. The drill hole does not present a travel hazard, assuming it is uncased or cut off at ground level and buried. Given its location in a scrapyard, it will have no effect on visual resource management.

Figure 1: Expanded view of GPS location of the Barrow Big Rig Test 1 (August 2012).

Figure 2: Location of recalculated coordinates for Barrow Big Rig Test #1 (August 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The Barrow Big Rig Test #1 was spudded and completed in October 1944 using a Nation 50 drill rig, reaching a total depth of 685 feet. The purpose of the drill hole was to test the drill rig in arctic conditions, and familiarize the crew with the rig. The rig was not housed and the mud pit consisted of two pontoons welded together. The U.S. Navy experienced major problems with freezing while drilling this test hole, which eventually led to the abandonment of the test hole (Collins and Brewer 1961).

- **Well Condition:** The Barrow Rig Test #1 was not drilled to a producible depth. It is possible the test hole is uncased, given the incomplete records available. There is no record of the casing being cemented.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The hole primarily encountered Cretaceous sandstone and shale, with exception of the upper 100-120 feet, which consisted of sediments from the Gubik Formation.

Development Potential: This rig test will not affect future drilling due to its shallow total depth and lack of hydrocarbon shows.

Groundwater Resource: None. Continuous permafrost is about 1400 feet thick throughout the entire Barrow region. Fresh water aquifers are not present. NARL, the closest population center to the site, does not get its drinking water from aquifers, but from treated surface water. The active layer was measured between 20- to 55-inches (Alaska Department of Environmental Conservation 2012).

Other Information: Despite its proximity to a population base, the rig test does not pose a risk to surface or subsurface resources. There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: None

Justification: Barrow Big Rig #1 was simply a test of the drilling rig to familiarize the crew of its functionality before conducting a drilling program in the Barrow area. It is a shallow well that reached a total depth 685 feet and had no oil or gas shows. It is unclear if the casing was pulled upon abandonment given the incomplete records. There is no record of the casing being cemented. After the well was completed, casing could have dropped or it could have been pulled.

Barrow Big Rig Test #1	Rig:	National 50		
	Drilled:	Oct 13 - Oct 22, 1944		
Barrow Area Core Tests and Test Wells	API #:	**50-023-10007-00**		Created
	GL: 8.5'	KB: 16'		5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	71° 19' 44"N - 156° 40' 06"W		Last mod
	Reviewing Engineer:	Justin T. Miller		

Original RKB = 16'

Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
11-3/4"	47	J-55			0	67

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		67	685	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A			
B			
C			

Figure 3. Barrow Big Rig Test #1 wellbore diagram.

Barrow Core Rig Test #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.3236° N, -156.6506° W. The Barrow Core Rig Test #1 site is approximately 5 miles northwest of Barrow near an area adjacent to the community known as NARL, the former Naval Arctic Research Laboratory. The last site visit was in August 2012. **[Figure 1]**

Site Description: The Barrow Core Rig Test #1 is an uncased core test near the south shore of Imikpuk Lake. No drill pad was constructed, as the drill rig was set on top of large timbers. These timbers were removed when the test hole was abandoned. Ground disturbance from drilling operations is not obvious and there are no solid wastes present.

Surface Risk Assessment: None

Justification: There are no solid wastes, drillings muds, or other leftover wastes in the approximately location of the Barrow Core Rig Test #1.

Figure 1: Approximately location of the Barrow Core Rig Test #1 near the south shore of Imikpuk Lake. The Naval Arctic Research Laboratory is on the far shore of the lake (August 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The core rig test was spudded in September and completed in October 1944, after reaching a total depth of 344 feet. The casing was pulled prior to abandoning the hole. The purpose of the core test was to obtain structural information from the underlying geology (Collins and Brewer 1961).
- **Well Condition:** Barrow Core Rig Test #1 is uncased. The test hole that once penetrated the ground has healed completely by the natural process of earth collapsing over the hole and revegetating. The uncased test hole is no longer visible.
- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The test hole encountered the Gubik Formation and probably some of the underlying Cretaceous rocks, but paleontologic data is lacking for verification (Collins and Brewer 1961).

Development Potential: Gas development has occurred near this area for several decades. There has been no effects to development from the Barrow Core Rig Test #1.

Groundwater Resource: None. Continuous permafrost is about 1,400 feet thick throughout the entire Barrow region (Alaska Department of Environmental Conservation 2012). Fresh water aquifers are not present above the dense permafrost. The town of Barrow does not get its drinking water from aquifers, but rather from treated surface water.

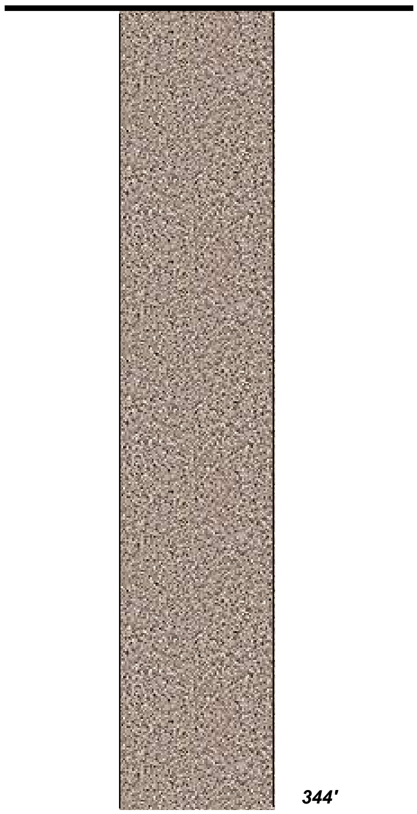
Other Information: There is no indication of hydrocarbon escapement at or near the approximate location of the core rig test. Barrow Core Rig Test #2 is approximately ½-mile to the south.

Subsurface Risk Assessment: None

Justification: This is a shallow uncased drill hole and did not penetrate oil or gas stratigraphy or water resources.

Barrow Core Rig Test #1	Rig:	Sprague and Henwood Drilling Machine		
	Drilled:	Sep 17 - Oct 7, 1944		
Barrow Area Core Tests and Test Wells	API #:	**50-023-10005-00**		Created
	GL: 10.4'	KB: N/A		5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	71° 19' 25"N - 156° 39' 02"W		Last mod
	Reviewing Engineer:	Justin T. Miller		

Original RKB = N/A



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
Uncased; Drilled with 2-3/4" fishtail bit. 3" casing was set at 49' but was pulled prior to abandonment.						

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	344	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	10/7/44	344	Hole abandoned full of frozen drilling mud.
B			
C			

Figure 2. Barrow Core Rig Test #1 wellbore diagram.

Barrow Core Rig Test #2

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.3167° N, -156.6497° W. The Barrow Core Rig Test #2 site is approximately 5 miles northwest of Barrow, near an area adjacent to the community known as NARL, the former Naval Arctic Research Laboratory **[Figure 1]**. The last site inspection was in August 2012.

Site Description: The Barrow Core Rig Test #2 site consists of an open casing with a small wooden frame structure at its base and a small pile of drilling mud, located within a 10 feet square area **[Figure 2]**. The U.S. Navy drilled the test hole in 1944.

There is no pad, reserve pit, or cellar associated with the test hole. The core rig test consists of a cased, open 10-inch diameter pipe that sticks up approximately 7 feet from the ground surface. A metal 30-inches long cross-beam was welded to the side of the pipe, approximately 6 inches from the top. Adjacent to the core rig test is a hand-made wooden A-frame box measuring 36-inches long by 18-inches wide at its base and 24-inches tall. The apex of the A-frame is covered with a small piece of corrugated sheet metal **[Figure 3]**. This box was likely constructed to cover the open casing and rest upon the metal cross beam near the top of the casing, but it has fallen off the top to the ground.

A small pile of drilling mud 3 feet in diameter is on the ground 5 feet east of the core rig test. Approximately 45 percent of the top of the mud pile is currently re-vegetated **[Figure 4]**. The drilling mud is near a re-vegetated depression. This depression is likely the result of clean-up after drilling (see *Well History*).

Surface Risk Assessment: Low

Justification: There are no known contaminants present at this site. The pile of drilling mud is small, stable, and in the process of being naturally re-vegetated. There is no indication that the core rig test has the potential to affect any nearby surface water. There is little to no solid waste onsite and the site does not pose a travel risk to local residents.

Figure 1: Location of Barrow Core Rig Test #2 in relation to the Naval Arctic Research Laboratory (June 2007).

Figure 2: Barrow Core Rig Test #2 site view to the north. Note the small pile of drilling mud in the far right frame (August 2012).

Figure 3: Wooden box at the Barrow Core Rig Test 2 that appears to have been a covering for the open casing (August 2012).

Figure 4: Small pile of drilling muds located east of the Barrow Core Rig Test #2. The community of Barrow is in the background in the distance (August 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The core rig test was spudded and completed in October 1944 after reaching a total depth of 236 feet, upon which it was junked and abandoned. The purpose of the core test was to obtain structural information from the underlying lithology. At 236 feet, the diesel heating stove exploded and 75 percent of the equipment and rig were lost in the fire. Flaming oil from a broken fuel line ignited the plywood housing, which could not be controlled in the gusting winds (Collins and Brewer 1961).

- **Well Condition:** Barrow Core Rig Test #2 is a cased, open hole that sticks up approximately 7 feet from ground level. A collar was left in place at the top of the casing. A plumb-bob was lowered down hole and hit solid at 13 feet (measured from the top of the casing). The plumb-bob likely hit an ice plug.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The test hole encountered the Gubik Formation and probably some of the underlying Cretaceous rocks, but paleontologic data is lacking for verification (Collins and Brewer 1961).

Development Potential: Gas development occurred near this area for several decades. No detrimental effects from the Barrow Core Rig Test #2 have been observed.

Groundwater Resource: None. Continuous permafrost is about 1,400 feet thick throughout the entire Barrow region. Fresh water aquifers are not present above the dense permafrost. The town of Barrow does not get its drinking water from aquifers, but rather from treated surface water (Alaska Department of Environmental Conservation 2012).

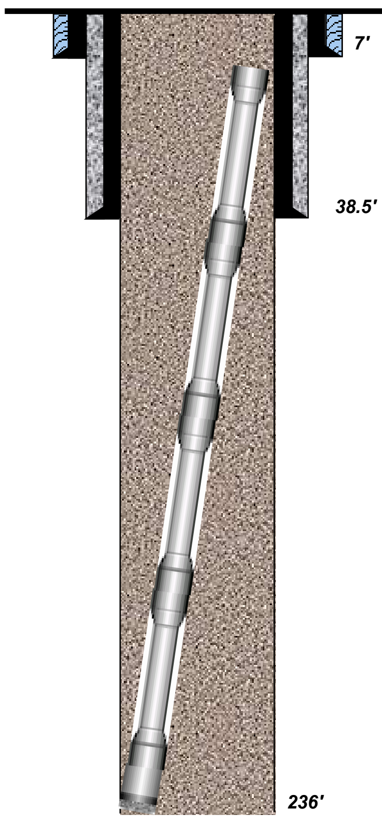
Other Information: There is no indication of hydrocarbon escapement at or near the surface.

Subsurface Risk Assessment: Low

Justification: Barrow Core Rig Test #2 was a very shallow test reaching a total depth of 236 feet with no oil of gas shows.

Barrow Core Rig Test #2	Rig:	Sprague and Henwood Drilling Machine		
	Drilled:	Oct 9 - Oct 17, 1944		
Barrow Area Core Tests and Test Wells	API #:	**50-023-10006-00**		Created
	GL: 13.45'	KB: 15.75' (Swivel)		5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	71° 19' 00"N - 156° 38' 59"W		Last mod
	Reviewing Engineer:	Justin T. Miller		

Original RKB = 15.75'



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
6"					0	7
3"					0	38.5

While drilling at a depth of 236', a fire broke out resulting in loss of the coring rig and equipment. The hole was junked and abandoned with bit string in place secured with frozen drilling mud.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		38.5	236	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	10/17/44	236	Hole abandoned full of frozen drilling mud.
B	10/17/44	236	2-3/4" fishtail bit and drillstring junked in hole.
C			

Figure 5. Barrow Core Rig Test #2 wellbore diagram.

Cape Halkett #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.7674° N, -152.4665° W. The Cape Halkett #1 site is on the arctic coastal plain in the northeast portion of National Petroleum Reserve in Alaska. The well is 105 miles east/southeast of Barrow and 51 miles northwest of Nuiqsut. The last site visit to Cape Halkett #1 was in July 2010.

Site Description: Husky Oil drilled the Cape Halkett #1 well in 1975 for the U.S. Navy. The site is swampy, with the majority inundated with water [**Figures 1 and 2**]. Water levels vary, depending on the extent of spring melt or summer precipitation. The drilling area is in a low area approximately 4 miles west of the Beaufort Sea. No drilling pad appears to have been established. Instead, wooden pilings supported an elevated platform above the water for camp and overall support for drilling operations. The pilings at Cape Halkett #1 extend west from the well and are more extensive than most other sites drilled by Husky Oil. There is no reserve pit. Drilling muds appear on the tundra directly adjacent to the east side of the well [**Figure 3**]. There is no wellhead. The open casing is centered within a steel framed and sheeted cellar. The east side of the metal-sheeted cellar is sheared, and the base of the entire cellar has rusted. Minor amounts of metal debris, including piping, remain in the cellar. Broken cement blocks line the outside of the cellar.

Some aquatic grasses have reappeared; sparse vegetation has accumulated on the drier areas of this site, primarily moss and lichens. Vegetation is approximately 40 percent. Erosion is not a factor at Cape Halkett #1 due to the lack of topographic relief.

Surface Risk Assessment: Low

Justification: While unsightly, the solid wastes in the form of concrete and metal present no threat to the environment. The drilling logs indicate that Husky Oil used no environmentally harmful substances in the drilling process.

Figure 1: Location of Cape Halkett #1 looking east. The Beaufort Sea is 4 miles to the east and visible on the horizon (June 2005).

Figure 2: Aerial view of Cape Halkett #1. No drilling pad appears to have been established as the camp and supporting facilities were elevated off the water, as evidenced by the remaining pilings. This photo was taken shortly after spring breakup in June 2005.

Figure 3: The partially revegetated drilling muds looking south toward the metal cellar and the broken concrete around its perimeter at Cape Halkett #1 (July 2010).

Figure 4: Cape Halkett #1 open casing and metal cellar (July 2010).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Cape Halkett #1 was drilled to a total depth of 9,900 feet. The well was spudded on March 24, 1975, and plugged by May 23, 1975.

- **Well Condition:** The Cape Halkett #1 site consists of a welded flanged base plate with open 7-inch casing inside of a constructed metal cellar **[Figure 4]**. The casing protrudes about 2 feet above ground level. It is an open hole with no gauges or valves present. Four plugs were placed downhole to separate out the different formations. The surface plug is 1,425 feet thick **[Figure 5]**. The BLM considers the well properly plugged.

- **Wellhead Components:** None. There is no wellhead at this site.

Geologic Setting: The purpose of this well was to test for the presence of oil or gas productive formations within a truncated half dome structure near the Barrow Arch. Gas productive sands were found near the base of the Lower Cretaceous. Visible oil was at the boundary of the Torok Formation and Shublik Formation at a depth of 8,000 feet. Gas shows in the form of methane and ethane between 7,000 feet and 8,000 feet was clustered above the Kingak Shale, a Late Cretaceous unconformity, at the bottom of the Torok Formation (Patterson et al. 1975).

Development Potential: Cape Halkett #1 is plugged and abandoned and will not affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the well site.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

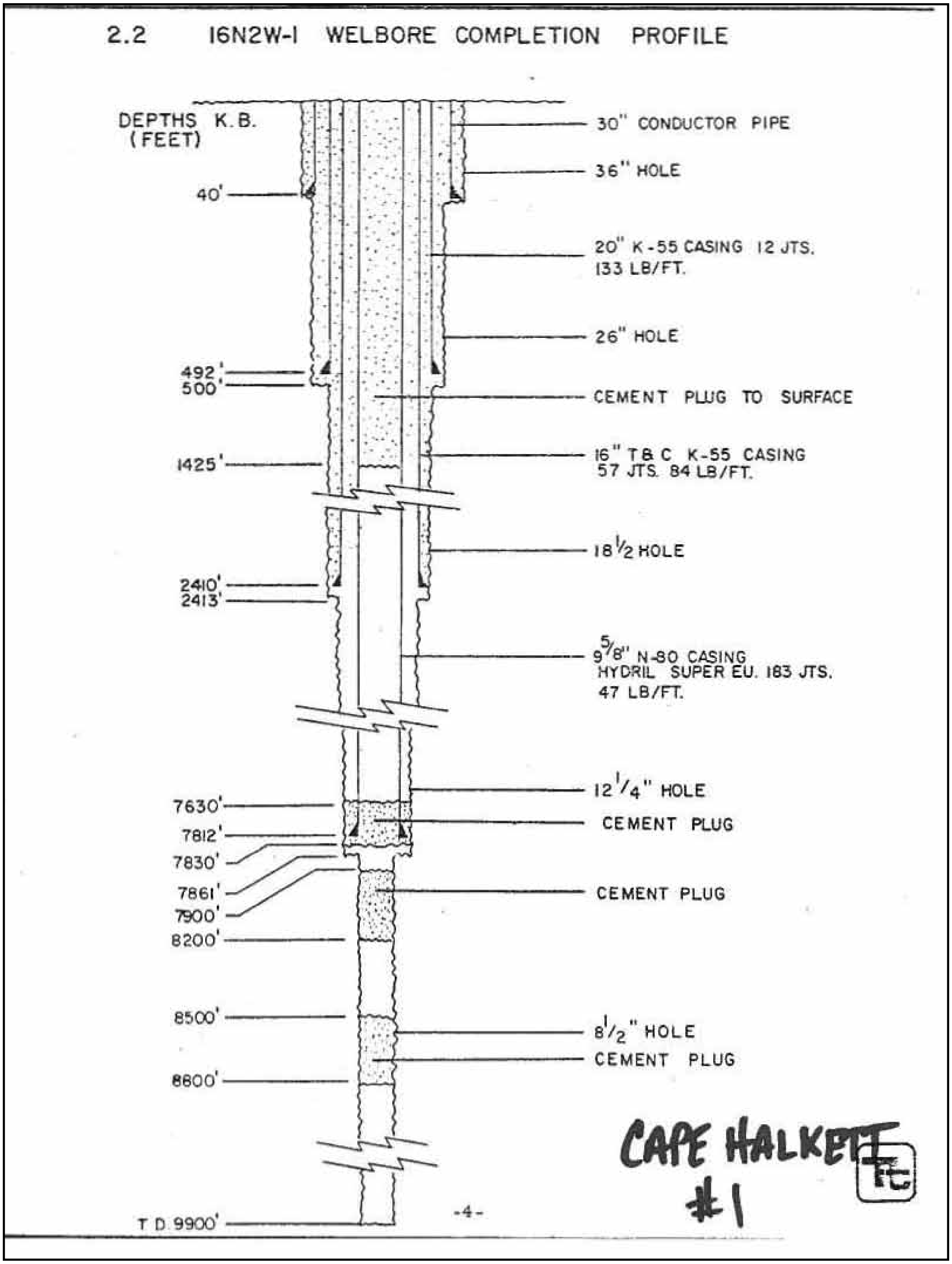


Figure 5: Cape Halkett #1 wellbore diagram.

Drew Point #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.8798° N, -153.9000° W. The Drew Point #1 site is 71 miles southeast of Barrow, 81 miles northwest of Nuiqsut, and 86 miles northeast of Atqasuk. The last overflight for this site was in August 2011.

Site Description: The Drew Point #1 well site consisted of a well contained within a wooden cellar, a pad and a reserve pit [**Figures 1-2**]. Coastal erosion over the years made Drew Point an important well to plug and remediate [**Figures 3-4**]. There were no concerns downhole, but the site was less than 400 feet from the advancing Beaufort Sea. The well was visited several times in 2007 and 2008. A single storm event in late July 2008 eroded more than 50 linear feet of shoreline to the point where the pad was eroding **[Figure 5**]. The rate of erosion, especially compared with previous year's photos [**Figures 6-8**], convinced the BLM to plug and abandon the well and remediate the reserve pit during the winter of 2010.

The Drew Point #1 reserve pit was remediated concurrently with the well plugging [**Figure 9**]. Material from the Drew Point reserve pit was hauled 33 miles south over a snow trail and deposited into the Ikpikpuk reserve pit. Eight side dump trailers were outfitted with rubber tracks to allow for the use of a snow trail, rather than having to construct and maintain a 33-mile ice road [**Figures 10-12**].

Surface Risk Assessment: None

Justification: The Drew Point #1 site was remediated in 2010. There is no remaining surface debris or surface indiciation of a well site.

Figure 1: Drew Point #1 wellhead, cellar, pilings, rat hole and drilling pad prior to plugging (August 2006).

Figure 2: Drew Point #1 wooden cellar, wellhead and rat hole prior to plugging and abandonment (June 2003).

Figure 3: Large chunks of ice-rich tundra cave into the Beaufort Sea at Drew Point #1 from constant wave erosion (August 2006).

Figure 4: Large chunks of ice rich tundra that have collapsed into the Beaufort Sea at Drew Point (August 2006).

Figure 5: Location of the Drew Point #1 wellhead (red circle) and distance to the advancing Beaufort Sea.

Figure 6: Photo from August 2006 shows the Beaufort Sea eroding into the tundra near the Drew Point #1 drilling pad. Note: caribou in the middle of the photo provides a scale.

Figure 7: Aerial photo of Drew Point #1 with the reserve pit in the foreground and the Beaufort Sea in the background. The wellhead is in the upper middle portion of the photo (June 2003).

Figure 8: Aerial view of Drew Point #1 in August 2000.

Figure 9: Excavation of the reserve pit at Drew Point #1 occurred concurrently with the well plugging operations (March 2010).

Figure 10: Loading the side dumps at Drew Point #1 with reserve pit material to be transported to the Ikpikpuk #1 reserve pit (March 2010).

Figure 11: Hauling dirt from Drew Point #1 to Ikpikpuk #1 along the snow trail (March 2010).

Figure 12: Aerial view of moving excavated material from Drew Point #1 to Ikpikpuk #1 along the snow trail (March 2010).

Figure 13: Drew Point #1 before plugging operations (March 2010).

Figure 14: Preparing to add cement into the mixer at Drew Point #1 to pump into the wellbore (March 2010).

Figure 15: Drew Point #1 wellbore full of cement (March 2010).

Figure 16: Cutting off the casing at 29 feet below ground level at Drew Point #1 (March 2010).

Figure 17: Identification plate at Drew Point #1 after welding the plate to the cutoff casing (April 2010).

Figure 18: Mounded dirt covers the cutoff casing and identification plate at Drew Point #1 (March 2010).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Drilling-related operations for Drew Point #1 well commenced in January 1978 and completed in March 1978. Husky Oil drilled the well under contract from USGS. The drilling contractor was Nabors Alaska Drilling, Inc., who used a Nation 110 for the drilling rig. The rig was brought to Drew Point by rolligon from W. T. Foran (Husky Oil 1983a).

  Upon well completion in 1978, the well was plugged back into the 13⅜-inch surface casing (2,661 feet) with 4 cement plugs by the USGS in 1978. The top of the shallowest plug was located at 2,153 feet. Diesel fuel left in the wellbore provided a non-freezing, non-corrosive medium that enabled temperature data collection by the USGS. Drew Point was a crucial part of the USGS Global Climate Observing System to measure shallow- and deep-permafrost temperature changes to a depth of 250 m.

  During the 2010 well-plugging operations [**Figure 13**], the diesel fuel was completely displaced (approximately 13,380 gal) with NaCl (salt) saturated water. The NaCl water was then evacuated from the casing down to a depth of 114 feet below ground level (BGL) and an inflatable plug was set at this depth. Cement was mixed at 15.7 ppg and dumped on top of the plug filling the wellbore casing to the surface [**Figures 14-15**]. The frozen earth around the wellhead was excavated down to 30 feet BGL, the wellhead cut off at 29 feet BGL (8 feet below Mean Sea Level) [**Figure 16**], and 6 inches of void 13 ⅜-inch by 20-inch casing annulus filled with cement. An identification plate was welded onto the cut off casing [**Figure 17**], and the excavated hole was backfilled with clean dirt and mounded to 4 feet above ground level [**Figure 18**].

- **Well Condition:** The well is adequately plugged and abandoned as shown in the wellbore diagram [**Figure 19**].

- **Wellhead Components:** The wellhead was removed during the plugging and abandonment in 2010.

Geologic Setting: The well reached a total depth of 7,946 feet and penetrated rocks from Recent to pre-Carboniferous age. The primary objective of the well was to test the Sadlerochit and Lisburne Groups, with a secondary interest in the Kuparuk River Sandstone. Non-productive gas shows were recorded in the Torok Formation and in the upper section of the Shublik Formation. Fair oil shows were found in the Sag River sands. Although good oil shows were observed in the Permo-Triassic Sadlerochit sandstone, a drillstem test failed to yield any hydrocarbons. No suitable reservoir rocks were found in this well (Husky Oil 1983b).

Development Potential: Drew Point #1 is properly plugged and will not have any effect on future exploration or production that may occur.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface, as the well is plugged.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

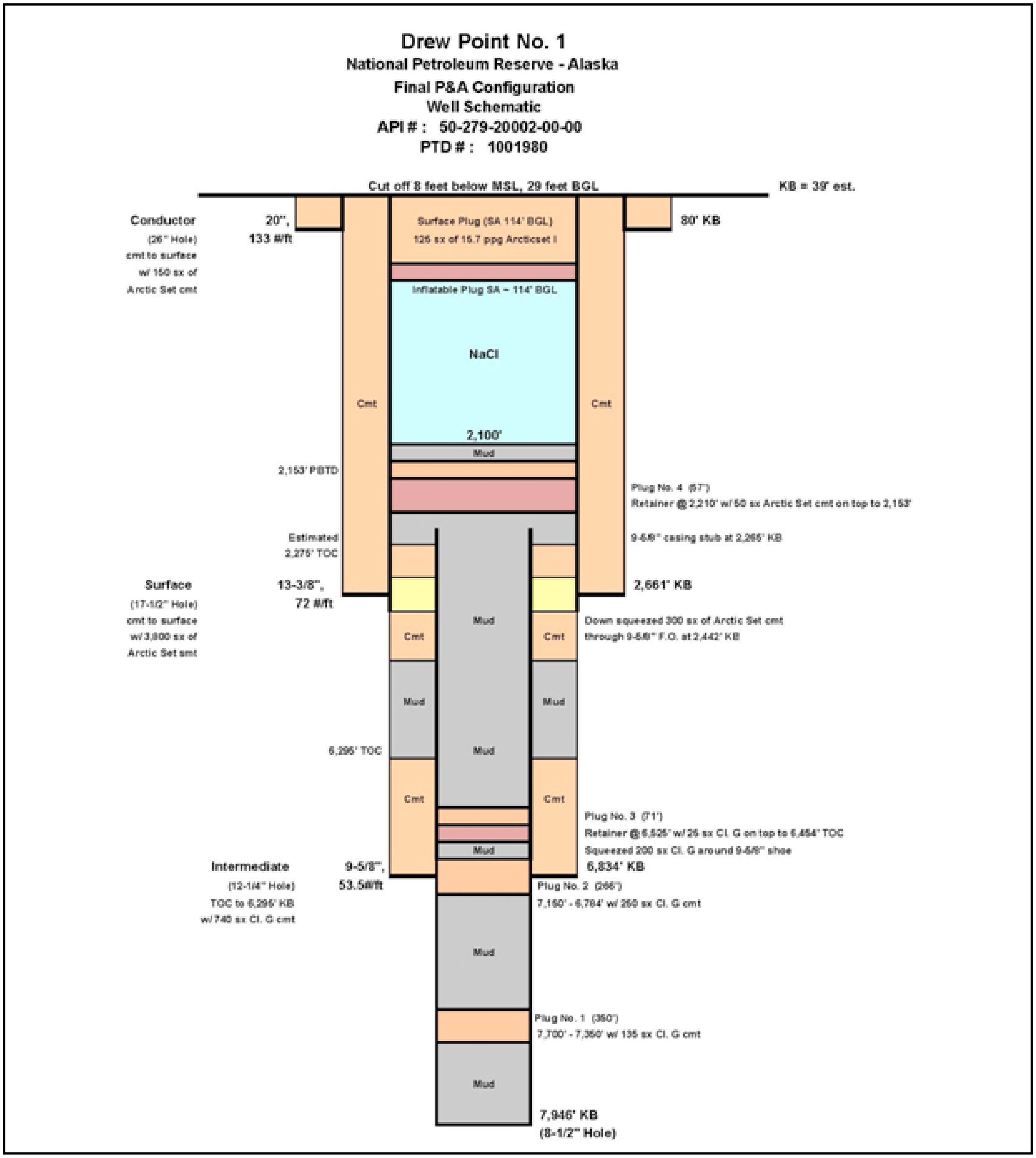


Figure 19: Drew Point #1 wellbore diagram.

East Oumalik #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.7914° N, -155.5442° W. The East Oumalik #1 site is 65 miles southeast of Atqasuk and 88 miles northwest of Umiat. This well is located within the Northwest National Petroleum Reserve in Alaska. The last site visit was in July 2012.

Site Description: There is no established drilling pad, but a large area (~ 500 feet by 300 feet) was disturbed for the East Oumalik #1 drilling operations, which is evidenced today by deciduous vegetation in an otherwise uniform tussock tundra setting. The U.S. Navy drilled the well in 1950. The dense willows and other thick vegetation anchor the site from any potential erosion. Wet areas are also present within the disturbed area. Small ponds now make up low areas bulldozed during drilling operations. Low areas that lacked the depth of the present day ponds became wet, marshy areas. Topographic relief is approximately 50-100 feet from the well location to the river. The drilling location is between the river's entrenched meanders. **[Figures 1-4]**

The main feature at the site is an 8-foot by 8-foot square wooden cellar filled with water with plank walls roughly 3-4 feet in height. The interior of the cellar is roughly 1-2 feet below the surrounding surface and has contained standing water during all site visits. The cellar is filled with deteriorating dimensional lumber. **[Figures 5-6]** The cellar is missing one of its upper wooden segments on the east side, and has a 1-inch pipe also encircling it. A rat hole is located about 4-5 feet from the cellar.

The area surrounding the cellar, up to 50-100 feet in diameter, contains a light but consistent scatter of surface debris. This debris consists of many 10-foot sections of dimensional lumber, a few 4-foot pipes (probably rig anchors) sticking up out of the ground, and general debris including cables and metal pilings **[Figure 7]**. Between the willows and solid wastes, there is no safe place to land a helicopter within the disturbed area.

Surface Risk Assessment: Low

Justification: There are no known contaminants onsite. There does not appear to be any impact to the surrounding surface waters from the East Oumalik #1 well site. There is no threat from the river that occupies the valley below East Oumalik #1, as the river is situated in a well-developed and entrenched channel. There is a small amount of solid waste present, but given the remote location of the site it does not pose a travel risk to local residents. Impact to visual resources is minimal.

Figure 1: East Oumalik #1 is located on a ridge that overlooks a large tributary of the Oumalik River (July 2012).

Figure 2: Early spring at East Oumalik #1 (June 2011).

Figure 3: Aerial photo of the East Oumalik #1 well pad, taken during early September 2002.

Figure 4: Wet areas likely formed in low areas that were cleared during East Oumalik #1 drilling operations (July 2012)

Figure 5: East Oumalik #1 wooden cellar with the 1-inch pipe encircling the perimeter (July 2012).

Figure 6: East Oumalik #1 cellar with scrap wood among the algae and moss (July 2012).

Figure 7: Cut-off pilings present in various locations amongst the brush at the East Oumalik #1 site (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** East Oumalik #1 was drilled on a ridge that overlooks a large tributary of the Oumalik River. The drill site is highly remote. Drilling operations commenced in 1950 and reached a total depth of 6,035 feet in January 1951. The well is cased to 1,100 feet and classified as a dry hole. [**Figure 8**]

- **Well Condition:** There is a wooden cellar filled with standing water, within which is an open casing underneath the water. A 1inch diameter pipe is stuck at an angle in the hole to mark the well's location within the cellar; the pipe projects out of the water about 5 feet. A plumb-bob was dropped downhole and hit solid at 6 feet.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: Very poor oil and gas shows were reported in the Grandstand Formation and very poor gas shows were reported in Topagoruk Formation (Robinson and Bergquist 1956).

Development Potential: It is unlikely that exploration and development will occur in the well vicinity in the near future.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the well.

Subsurface Risk Assessment: Moderate

Justification: East Oumalik #1 was drilled to a total depth of 6,035 feet and had very poor gas shows within both the Grandstand and Topagoruk formations. There are no cement plugs. Frozen drilling muds are present in the wellbore. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

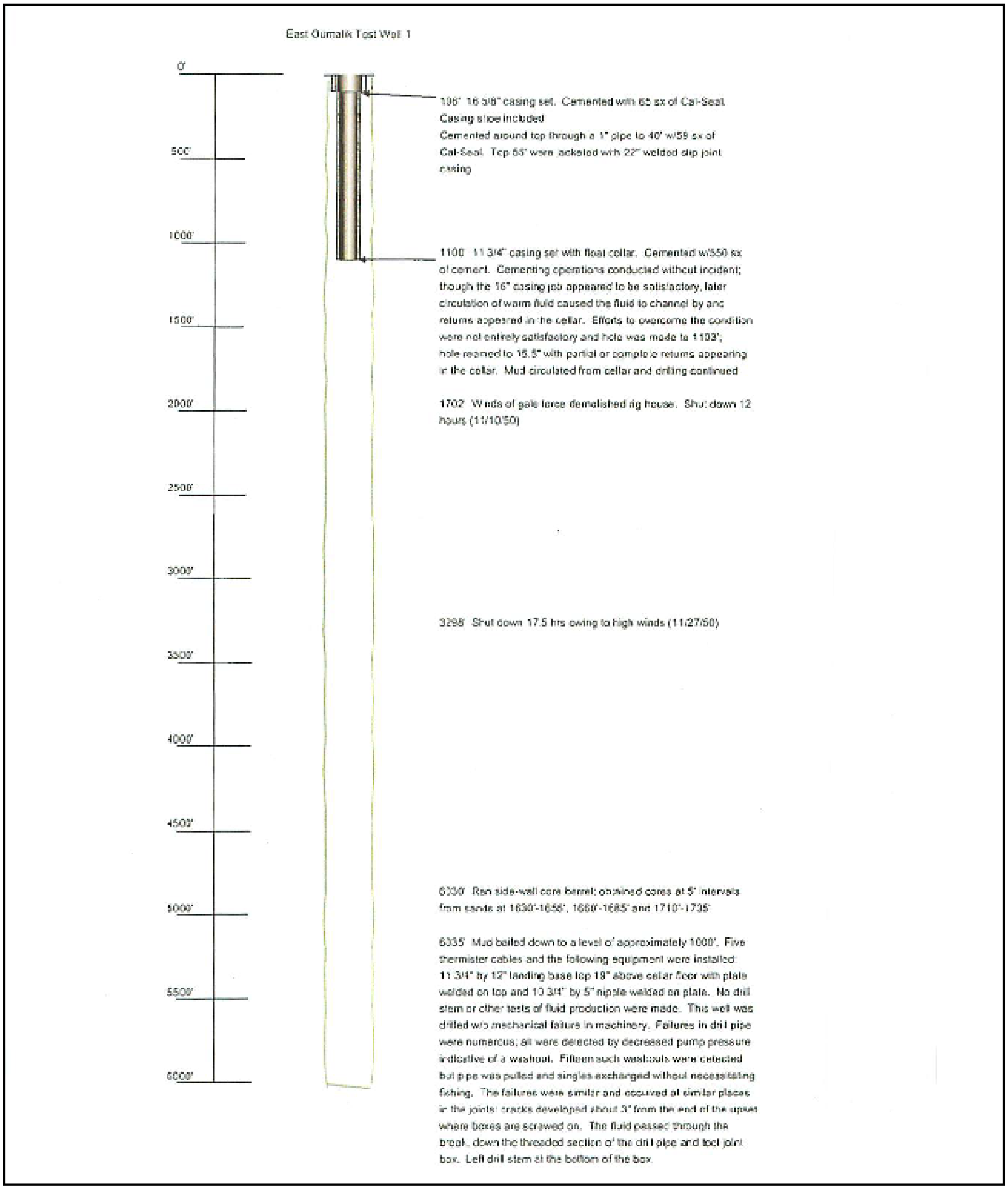


Figure 8: East Oumalik #1 wellbore diagram.

East Simpson #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.9178° N, -154.6180° W. The East Simpson #1 well is 56 miles southeast of Barrow and 72 miles east of Wainwright. The last site inspection was in July 2012.

Site Description: The East Simpson #1 site consists of a well contained within a wooden cellar, pad and reserve pit **[Figure 1]**. USGS contractor Husky Oil, Inc. drilled the well in February 1979. The pad is relatively flat with minimal vegetation growth. The pad is of the thin-pad design where silty clay was used from the reserve pit. The thin pad design was fine for operations requiring only winter use (Husky Oil 1983). The wooden cellar stands at approximately 4 feet above the ground surface and is filled with water. The cellar is several feet deep and contains no solid wastes. It is made of 2 feet by 12 feet construction and is in fair condition. The cellar has been jacked up on the south side from permafrost action **[Figure 2]**. A blue tarp was nailed around the cellar, but the tarp has torn away on the west side due to continual exposure to the elements **[Figure 3]**. Wooden pilings extend from the wellhead to the east and have become more exposed as a result of permafrost action **[Figures 4-5]**.

The reserve pit has expanded outward as tundra has thawed. In the process, the southernmost wooden pilings are now contained in the reserve pit. There is no threat of them becoming dislodged from the ground, as they were set roughly 30 feet into the ground surface, and there is generally very little wave action from the reserve pit. The flare pit walls have eroded into the reserve pit. Water flows from the reserve and flare pit to nearby surface waters during breakup.

Halfway between the wellhead and the coastline, there is a U.S. Coastal & Geodetic Survey Marker and what appears to be as an old camp site. This site has minor solid waste [**Figure 6**] at and near the surface; it could be historical based on its age. A few dandelion (Taraxacum officinale) plants were found on mounds near this site.

Surface Risk Assessment: **Moderate**

Justification: East Simpson #1 is approximately 800 feet from the coast. The coastal erosion occurring from Smith Bay is not as prevalent as experienced at the legacy wells plugged by the BLM along the coast north of Teshekpuk Lake. The bluff by East Simpson #1 is much smaller, ranging from 1 foot to 6 feet, depending on the topography **[Figure 7]**. The larger bluffs, as common north of Teshekpuk Lake, will expose the underlying ice lenses and hasten erosion.

In addition to the close proximity of Smith Bay, there are some nearby small-to-medium sized ponds. There does not appear to be any effect to surface waters from East Simpson #1. The Alaska Department of Environmental Conservation (ADEC) sampled the reserve pit and closed it in its current condition in 1995. ADEC did not consider anything in the pit harmful in the well's current condition. Geese and smaller birds are drawn to this site **[Figure 8]**, but observed mortality from entrapment in the open rat hole casing or cellar has been limited.

The surface debris poses a transportation risk to local residents.

Figure 1: Aerial view of East Simpson #1. Smith Bay is to the left of the photo (July 2012).

Figure 2: The cellar for East Simpson #1 has been thrust out of the ground due to permafrost action on the south side. The rat hole is outside of the cellar (July 2012).

Figure 3: The blue tarp at East Simpson #1 was partially intact in this photo dated June 2003.

Figure 4: Pilings are now in the East Simpson #1 reserve pit due to low-level erosion as evident from the erosion marks against the drilling pad (July 2012).

Figure 5: East Simpson #1 in June 2001. The cellar has been thrust by permafrost, but the pilings have not been exposed to the extent they are in 2012.

Figure 6: Old camp site between the East Simpson #1 wellsite and the coast with minor solid wastes. There is a U.S. Coastal & Geodetic Survey Marker nearby (July 2012).

Figure 7: Coastal erosion is occurring approximately 800 feet to the east of East Simpson #1. The ice-rich bluff varies from 1 foot to 6 feet (July 2012).

Figure 8: Molting geese at East Simpson #1 (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Drilling-related operations commenced with rig-up on Feb. 7, 1979. The well was spudded on Feb. 19, 1979, and activity terminated on April 10, 1979. The well was drilled to a total depth of 7,739 feet, cased to 7,167 feet, and plugged back to 2,039 feet. Air support was available via construction of a nearby ice airstrip. A surface plug was intentionally not set to allow the USGS to conduct temperature monitoring at regular intervals. Diesel fuel was chosen as the medium as it will not corrode the casing, nor will it freeze at the temperatures encountered downhole. At the conclusion of the drilling and evaluation operations, the well was plugged back with cement and mechanical plugs set at selected intervals.

- **Well Condition:** Four cement and mechanical plugs were set with the top of the shallowest cement plug at 2,039 feet. **[Figure 9]** From 2,039 feet to +/- 25 feet from the surface, the hole is filled with diesel fuel. There is no Arctic Pack in any of the remaining casing annuluses. The 13 ⅜ in surface casing has cement from 2,661 feet to surface with cement in the 13 ⅜-inch by 20-inch casing annulus from 90 feet to surface. The 9 ⅝ in casing was cut off at 2,200 feet and removed with a retainer set above at 2,153 feet and cement set on top of retainer, top of casing (TOC) 2,039 feet (Husky Oil 1983).

- **Wellhead Components:** The wellhead contains an operational gate and needle valve **[Figure 10]**.

Geologic Setting: The primary objective of East Simpson #1 well was to test a structural/stratigraphic trap in the Triassic to Permian Section. The primary zones of interest were the Sag River Sandstone and Sadlerochit formations. Drilling of the East Simpson Test Well #1 confirmed the presence of potential hydrocarbon reservoirs. Good porosity zones were found in the Ivishak Formation, Sag River Sandstone, and scattered sandstones of the Torok Formation. Unfortunately, permeabilities were low. Only very minor hydrocarbon shows were noted (Husky Oil 1983).

Development Potential: With the well adequately cased and cemented from all lower formations to 2,039 feet and diesel fuel a non-corrosive agent, there are no downhole issues with the well. East Simpson #1 in its current condition will not affect any potential future operations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There was no visible indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

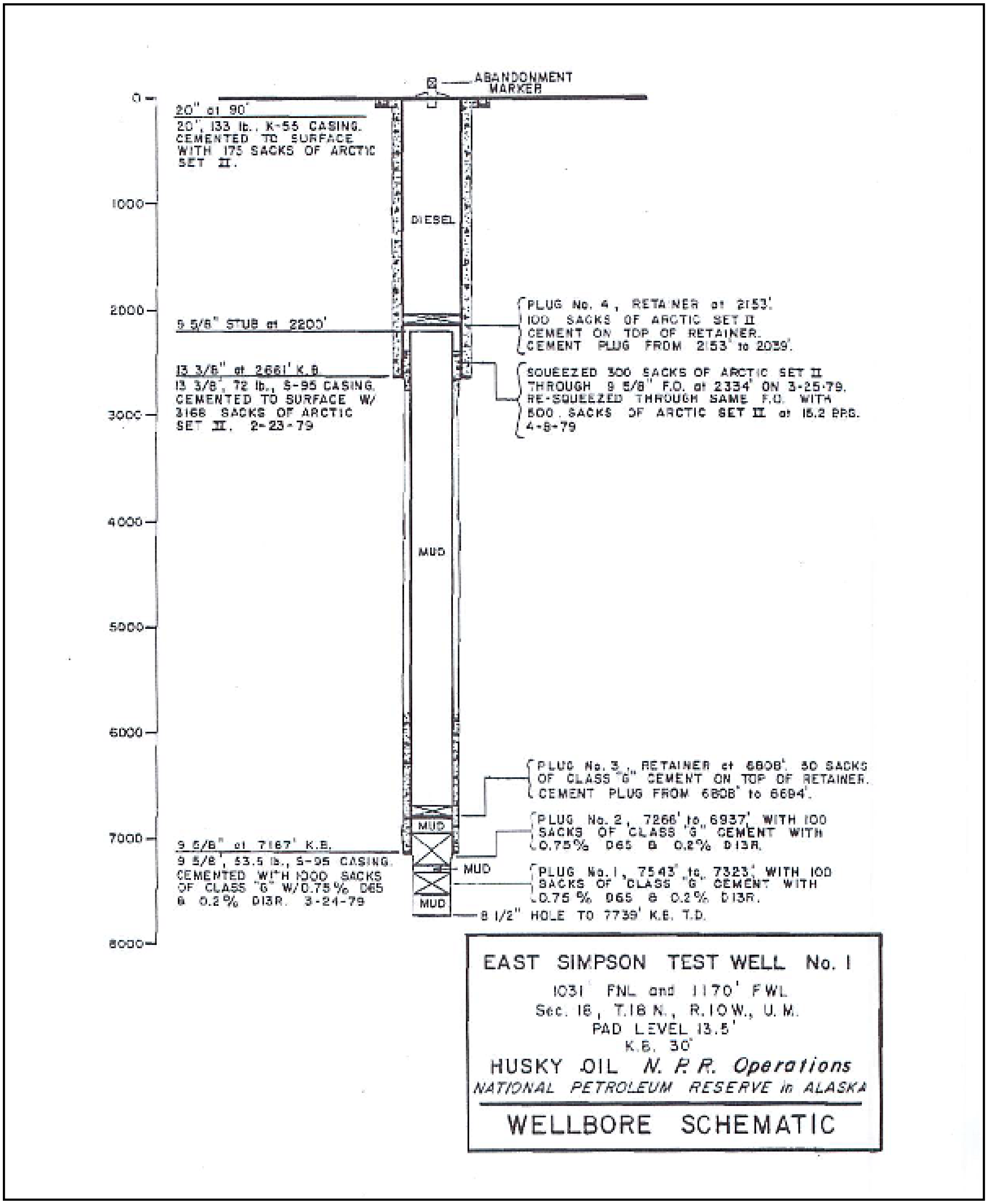


Figure 9: East Simpson #1 wellbore diagram.

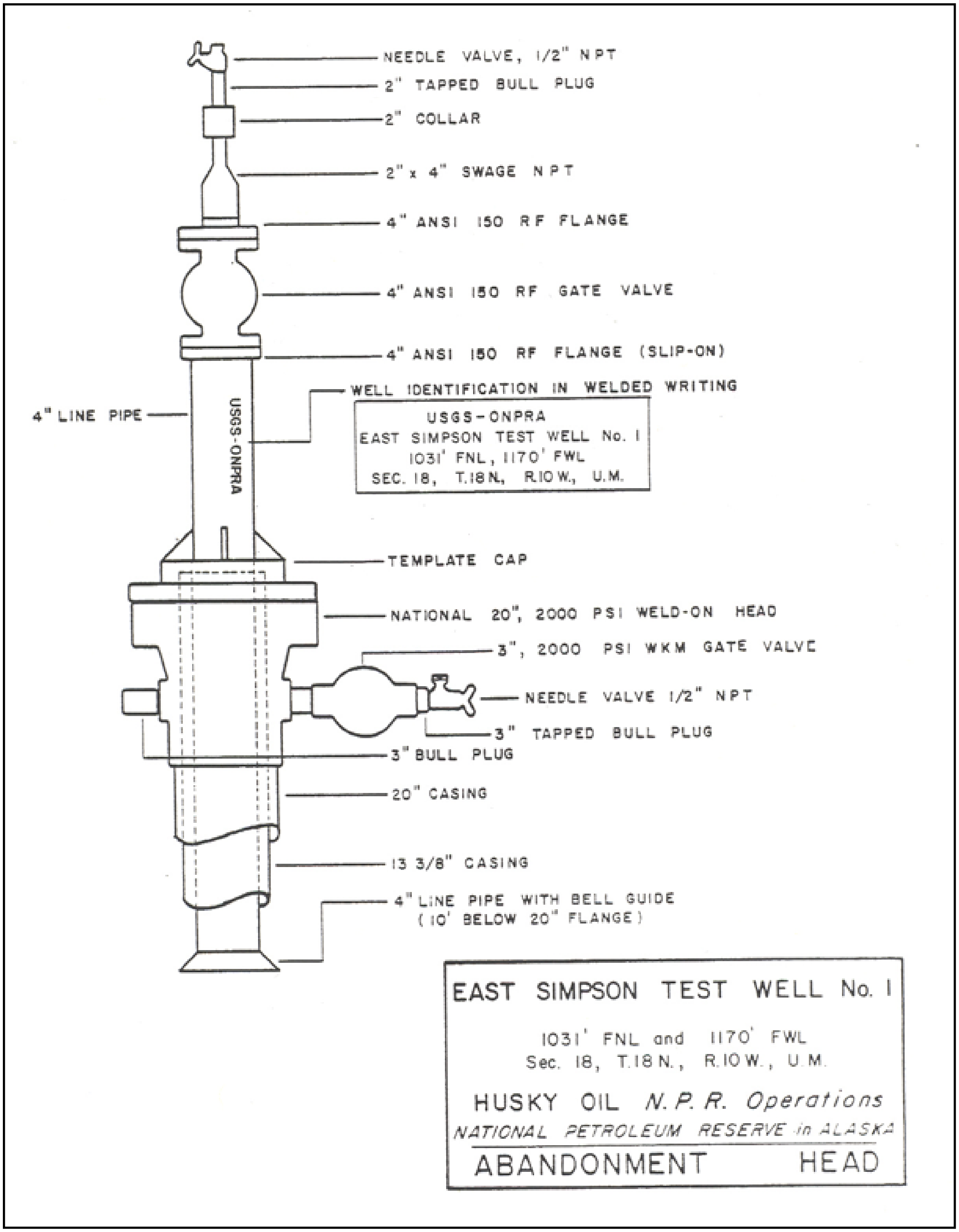


Figure 10: East Simpson #1 wellhead assembly.

East Simpson #2

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.9785° N, -154.6738° W. East Simpson #2 is 53 miles southeast of Barrow and 73 miles northeast of Atqasuk. The last site inspection was in July 2012. **[Figure 1]**

Site Description: The East Simpson #2 site consists of a well located in a wooden cellar, a pad, and a reserve pit **[Figure 2]**. The U.S. Navy drilled this well in 1979. The cellar is a wooden 12-foot by 12-foot cellar with standing water. The drilling pad is a thin gravel pad without insulation between the gravel and tundra surface. There is surface debris and exposed pilings stick up to a height of 2 feet from the surface. Exposed wooden pilings extend out away from the wellhead **[Figure 3]**. A large pile of drilling muds is also present, just outside of the cellar and on the edge of the reserve pit. **[Figures 4-5]**

The wellhead's casing spool is underwater within the cellar **[Figure 6]**. An open rat hole is outside of the cellar near the wellhead. The perimeters of the reserve and flare pit walls are thawing more rapidly than many of the other reserve pits at other sites. A water outlet exists on the west side of the reserve and flare pits, connecting it to nearby ponds.

Surface Risk Assessment: Low

Justification: There are numerous small ponds in the vicinity of the East Simpson well. There does not appear, however, to be any effect to surface waters from East Simpson #2, despite the heavy effect from the freeze-thaw cycle **[Figure 7]**. The Alaska Department of Environmental Conservation sampled the reserve pit and closed the well in its current condition in 1995. There was nothing in the pit considered harmful in its current condition. The original pad has been replaced by natural tundra **[Figure 8]**.

The site has no known contaminants.

Figure 1: East Simpson #2 in June 2002.

Figure 2: Aerial view of East Simpson #2 site showing the cellar, pilings, drilling muds, and expanded reserve pit (August 2010).

Figure 3: Pilings extending to the east from the East Simpson #2 wellhead (August 2010).

Figure 4: Cellar, rat hole, large pile of drilling muds and pilings for the East Simpson #2 (August 2010).

Figure 5: Drilling mud pile is partially contained within the reserve pit of East Simpson #2 (August 2010).

Figure 6: Inside the wooden cellar of East Simpson #2 well. The casing spool and components are under water. There is a 4-inch line pipe leading to the 4-inch gate valve and needle valve (August 2010).

Figure 7: Aerial view of East Simpson #2. The reserve pit has experienced an intense freeze-thaw cycle and consequently expanded beyond its original defined boundaries (August 2010).

Figure 8: The original tundra has taken over much of the old East Simpson #2 pad area (August 2011).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** East Simpson #2 was drilled in 1977 to 7,505 feet and cased to 6,427 feet. Five cement plugs were set, with the top of the shallowest plug set at 1,997 feet. An addiitonal surface plug was intentionally not set to allow the USGS to conduct temperature monitoring. The USGS does not use East Simpson #2 at this time because nearby East Simpson #1 is available. Diesel fuel was chosen as the medium as it will not corrode the casing, nor will it freeze at the temperatures encountered downhole.

  Supplies in support of the drilling program were flown in by Hercules C-130 to a nearby ice airstrip. Rig up began Jan. 7, 1977, and took 22 days. The well was spudded Jan. 29, 1977, and completed with the rig released on March 16, 1977. Nabors Alaska Drilling was the drilling contractor. Nabors used Nabors Rig 1, an Emsco A800, to drill the well (Husky Oil 1982).

- **Well Condition:** Five cement and mechanical plugs were set with the top of the shallowest cement plug at 1,977 feet. From 1,977 feet to approximately 25 feet from the surface, the hole is filled with diesel fuel **[Figure 9]**. With the well properly plugged and diesel fuel a non-corrosive agent, there are no downhole issues with the well at this time. There is no Arctic Pack in any of the remaining casing annuluses. The 9 ⅝ in casing was cut at 2,110 feet and 49 joints (2,090 feet) were recovered. A retainer was set in the 13 ⅜ in casing at 2,090 feet and Plug #5 (100 sacks 15.2 ppg ArcticSet II) spotted on top of it. The top of the plug was at 1,977 feet. The 13 ⅜ in annulus was displaced with water and then with diesel to the surface (Husky Oil 1982).

- **Wellhead Components:** The wellhead [**Figure 10]** consists of a casing head, side gate valve, a master gate valve, and a needle valve.

Geologic Setting: The primary objective of the well was to test the Ivishak Sandstone where it onlaps the Pre-Devonian age basement rock (Husky Oil 1982). Small-scale faulting was found between the wells in the area, possibly accounting for the thin section representing the Sadlerochit Formation. A very poor oil show was encountered at 6,000 feet in the Torok Formation and Endicott age sandstones cored with poor porosity and dead oil shows. A weak gas show was encountered at 7,152 feet (Husky Oil 1983).

The well is officially listed as a dry hole. Upon completion of the production tests, the well was plugged back to 1,997 feet and filled with approximately 280 barrels of diesel to facilitate permafrost temperature measurements.

Development Potential: With the well properly plugged back to 1,997 feet and diesel fuel a non-corrosive agent, there are no downhole issues with the well. East Simpson #2 in its current condition will not affect any potential future operations. If this exploration and development establishes infrastructure nearby, it would greatly facilitate finishing plugging this well and significantly reduce costs.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

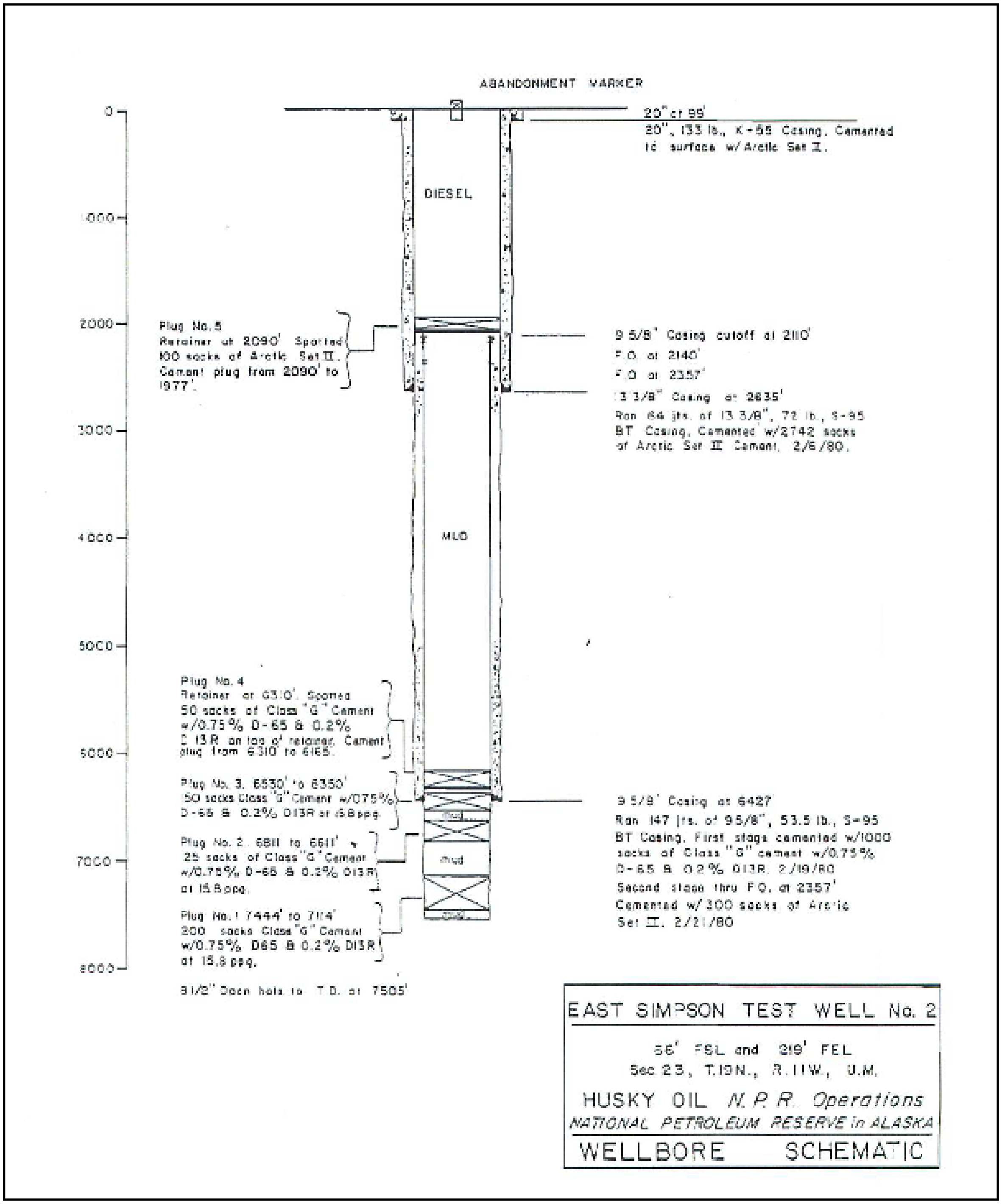


Figure 9: East Simpson #2 wellbore diagram.

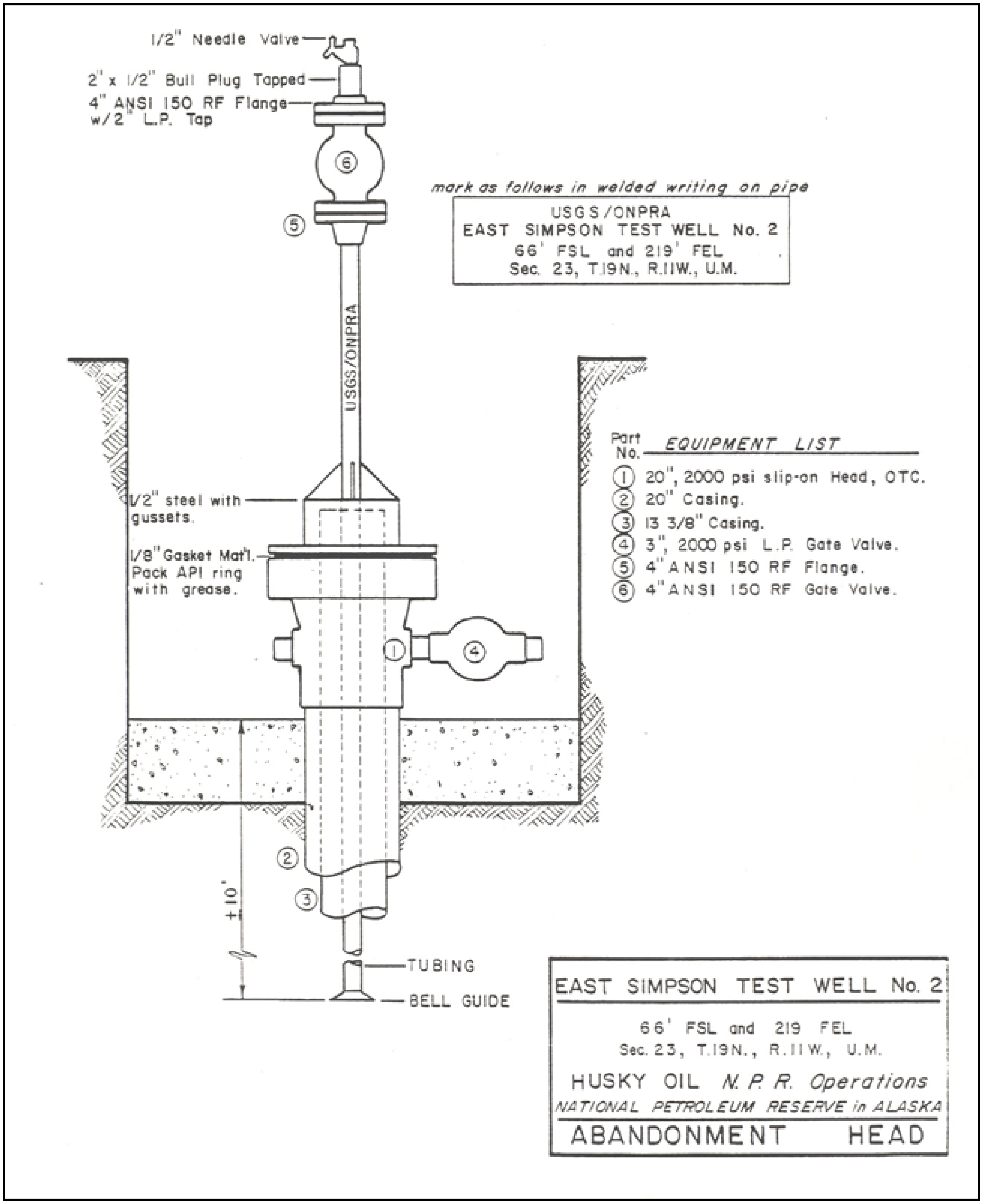


Figure 10: East Simpson #2 wellhead assembly.

East Teshekpuk #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.5693° N, -152.9429° W. The East Teshekpuk #1 well is 52 miles to the west/northwest of Nuiqsut, 84 miles northwest of Umiat, and 101 miles southeast of Barrow on a small peninsula on the southeast side of Teshekpuk Lake. The last overflight of the site was in July 2012.

Site Description: The East Teshekpuk #1 well consisted of a well, pad and reserve pit [**Figure 1**]. The U.S. Navy drilled the well in 1976. The drilling pad was of thick pad design comprised of excavated materials from the reserve pit, as well as materials from nearby Kealok Creek. When drilling completed in May 1976, the solid wastes from the camp and operations were buried on the northern portion of the pad and the reserve pit. The burial area faced Teshekpuk Lake. Over time, the cumulative effect of erosion from Teshekpuk Lake exposed these solid wastes [**Figures 2-4**]. Not only unsightly, the wastes were potentially hazardous.

During the winter of 2008, BLM-Alaska plugged and abandoned the East Teshekpuk well and excavated the reserve pit to remove the solid wastes and diesel-contaminated soils [**Figures 5-10**]. The solid wastes were hauled back to Deadhorse for disposal. The excavated soil was hauled to the North Kalikpik reserve pit. The North Kalikpik reserve pit is far from the coast and is not threatened by erosion.

Surface Risk Assessment: None

Justification: There are no contaminants or solid wastes remaining at the East Teshekpuk site. Excavating the reserve pit created a little cove along that portion of Teshekpuk Lake. Wave action from the lake will continue to slowly undermine the small ice-rich bluff. There has been no exposure of any additional solid wastes.

There is no surface debris or surface indication of a well site.

Figure 1: Aerial view of the East Teshekpuk #1 drilling pad in 1990 (left) and shortly after completion in 1978 (right). The 1978 photo was taken before solid wastes were buried in a portion of the reserve pit.

Figure 2: Aerial photo of East Teshekpuk #1 drilling pad, small reserve pit, and erosion from Teshekpuk Lake on the right portion of the photo (August 1999).

Figure 3: Aerial view of East Teshekpuk #1 in June 2005, the water body in the foreground is Teshekpuk Lake.

Figure 4: Solid wastes on the shoreline of Teshekpuk Lake that were cleaned up in 2008 (August 2006).

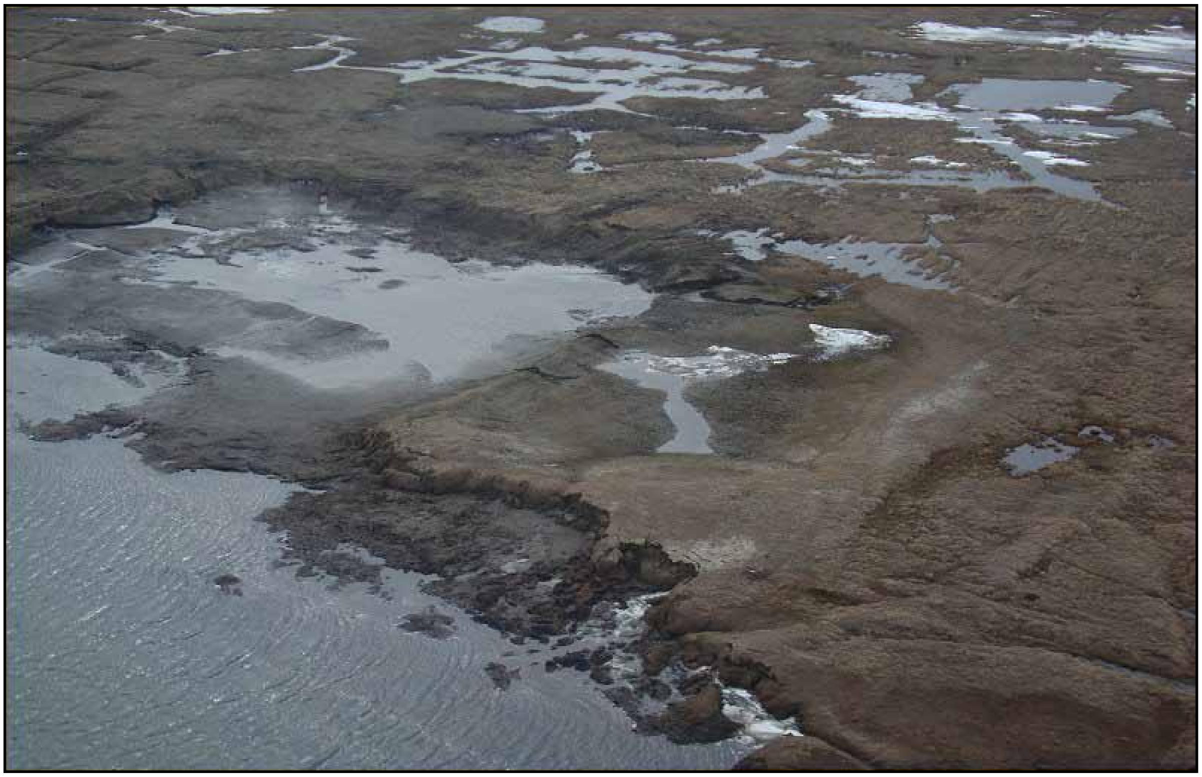


Figure 5: East Teshekpuk #1, June 2008 after excavating the reserve pit and plugging the well. The reserve pit created a small cove as a result of digging up the pit materials and solid wastes.

Figure 6: The body of water on the left is Teshekpuk Lake, while on the right are the remnants of the excavated reserve pit of the East Teshekpuk #1 well site (July 2008).

Figure 7: Cutting off the wellhead after plugging the East Teshekpuk #1 well (April 2008).

Figure 8: This shows the East Teshekpuk #1 well site shortly after cutting off the wellhead. The cut wellhead is lying next to the excavator while excavation work of the reserve pit is occurring in the background (April 2008).

Figure 9: Diesel-contaminated soils are loaded into a dump truck, which transported the material by ice road to the North Kalikpik well site reserve pit (April 2008).

Figure 10: Solid wastes collected at East Teshekpuk #1 during cleanup (April 2008).

Figure 12: Data logging of the East Teshekpuk #1 wellbore by the USGS in August 2006.

Figure 11: The mounded area represents the location of the buried casing and identification plate for the East Teshekpuk #1 well site (July 2008). The mounded area has completely disappeared as of the last overflight in 2012.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** East Teshekpuk #1 was spudded in March 1976 on a small peninsula on the southeast side of Teshekpuk Lake. Drilled to a total depth of 10,664 feet, the well was set up for monitoring by the USGS by adding diesel fuel from the top of the shallowest plug (2,250 feet) to the surface (Husky Oil 1982). The diesel provided a non-freezing, non-corrosive medium that enables temperature data collection to occur at any time of the year **[Figure 11]**. In 1976 when the U.S. Navy abandoned the well, it was properly plugged below this point with five plugs. The Navy left the Arctic Pack in the annulus. Arctic Pack is a combination of diesel or jet fuel and other additives (water, salt, barite, bentonite, and an emulsifier) that act as an insulator to the surrounding permafrost (McKendrick 1986).

- **Well Condition:** During well plugging operations in April 2008, diesel was circulated out of the well with 9.4 ppg brine and hauled off-site. The 10 ¾-inch casing was perforated at 187 feet and the "Arctic Pack" between the 10 ¾-inch casing and the 16-inch casing was circulated to surface with 9.4 ppg brine. A plug was set in the 10 ¾-inch casing at 190 feet and cement was placed in the casing and casing annulus to surface with 15.8 ppg cement. The wellhead was cut at 12 feet below-ground level and an abandonment plate installed upon the casing. The hole was backfilled and mounded **[Figure 12]**. Concurrently, solid wastes were extracted as the remediation of the reserve pit occurred.

- **Wellhead Components:** The wellhead was removed during the plugging and abandonment.

Geologic Setting: The primary objectives of the East Teshekpuk #1 well were sandstones of the Sadlerochit Group and carbonates of the Lisburne Group. Both were present in the well, but they contained porosities well below those needed for a potential producing reservoir. In addition, neither of the primary objectives had shows of hydrocarbons, except for very minor gas shows. There were slight shows of oil in the Kuparuk Sandstone equivalent, but the thin sandstone present (15 feet net) and its relatively low porosity of 7-14 percent, precluded any attempt to evaluate the zone by testing. No other zones had shows of significance (Husky Oil 1983).

Development Potential: East Teshekpuk #1 is properly plugged, and will not have any effect on future exploration or production that may occur.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

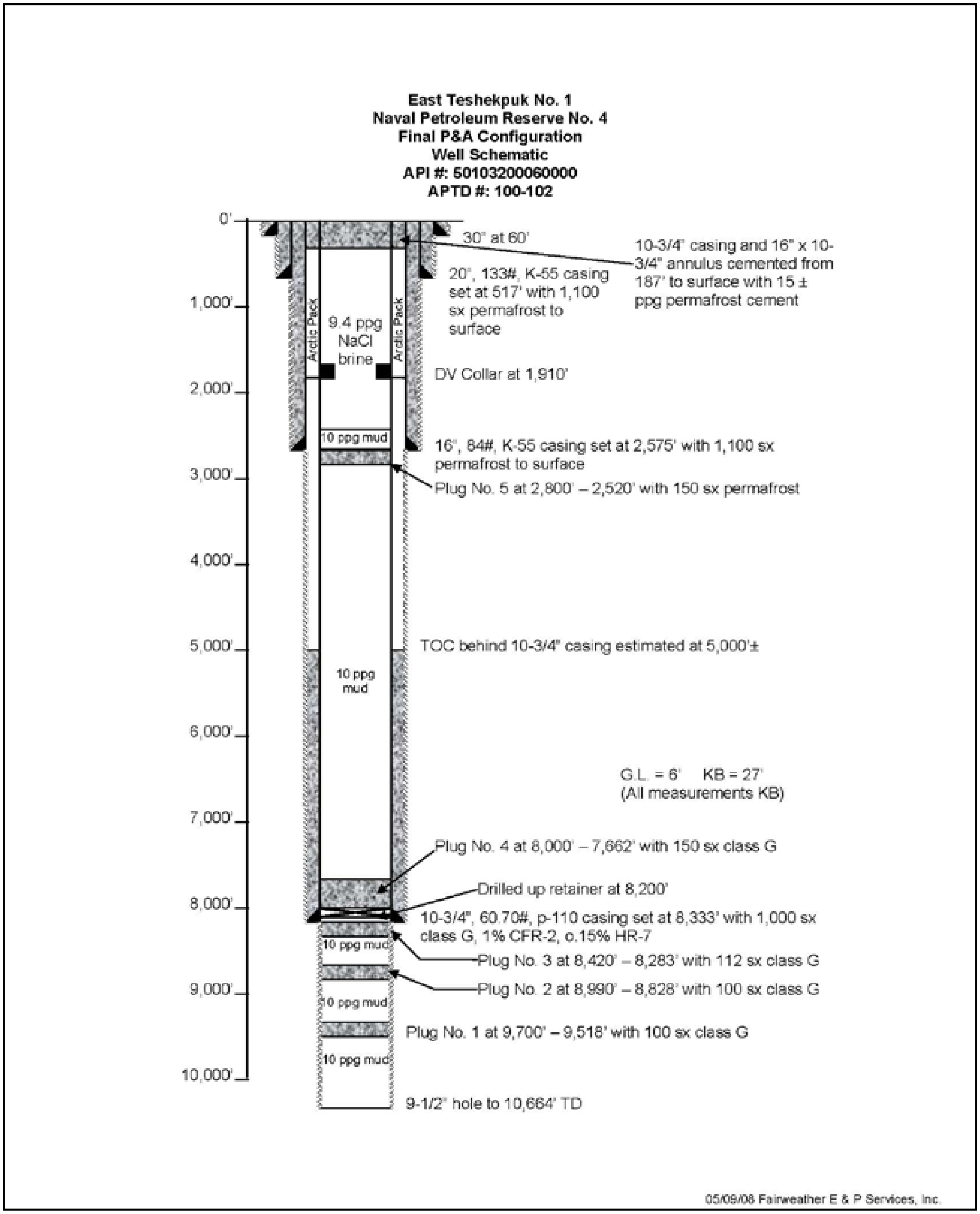


Figure 13: East Teshekpuk #1 wellbore diagram.

East Topagoruk #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.5772° N, -155.3725° W. The East Topagoruk #1 site is about 48 miles east/northeast of Atqasuk and 58 miles southeast of Barrow. The last East Oumalik site visit was in July 2012.

Site Description: East Topagoruk #1 is on an upland area, above a series of lakes connected by a small stream in the Chipp River delta. There is approximately 30-40 feet of topographic relief between the well and the lake below. The natural vegetation consists of grasses and tussocks that make up the polygonal ground. The area disturbed for drilling operations has recovered, with the returned vegetation dominated by low shrubs and grasses. **[Figures 1-2]** The U.S. Navy drilled this well in 1951.

A drill pad does not exist. The main feature at the site is the well and cellar. There is no wellhead. An open 10 ¾-inch diameter casing sticks up 3 feet from ground level inside a shallow, wooden cellar filled with water. The cellar measures 6 feet by 6 feet, and is only about 2 feet in height **[Figure 3]**. During spring break-up and high precipitation events, water will completely fill the cellar **[Figure 4]**.

Immediately surrounding the well for about 50 feet in diameter are some minor metal solids, including stell deadmen (rig anchors) and a rusted piece of drill string. Further surrounding the well (~ 100 feet diameter) are small quantities of solids spread over a larger area including; a small pile (~ 3 feet diameter) of broken concrete near the bluff, wooden planks, a barrel and light camp trash in a small ravine that leads to the lake below the bluff.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. Although surface water is present near the well, there is no indication this well site has a negative effect to surrounding surface waters. Solid wastes at this location are minor with no hazardous materials. The site does not pose a travel risk to local residents given its remote location away from known travel routes.

Figure 1: East Topagoruk #1 location looking north (July 2012).

Figure 2: East Topagoruk #1 site and well, looking southwest (July 2012).

Figure 3: East Topagoruk #1 well and cellar after a normal precipitation pattern.

Figure 4: East Topagoruk #1 well and cellar after heavy rains in August 2002.

Figure 5: East Topagoruk #1, crushed concrete near the bluff that overlooks the old river channel (July 2012).

Figure 6: An empty drum sitting in a small alluvial fan that drains into the old river channel at the East Topagoruk #1 site (July 2012).

Figure 7: Domestic camp trash at the head of a small rill that runs down the slope and into the old river channel near the East Topagoruk #1 site (July 2012).

SUBSURFACE INFORMATION

Well Information

- **Well History:** The U.S. Navy drilled the East Topagoruk #1 well in 1951. The well reached a total depth of 3,589 ft and is cased to 1,100 ft. One plug was set from 1,120 ft to 1,049 ft **[Figure 8]**. The purpose of this well was to test an anticline with closure and to test the fluid content of the permeable Cretaceous sandstone (Collins and Bergquist 1958).

- **Well Condition:** An open 10 ¾-in diameter casing sticks up 3 ft from ground level as measured from inside the wooden cellar.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The purpose of the East Topagoruk #1 well was to test an anticline with closure and to test the fluid content of the permeable Cretaceous sandstone. A very poor gas show in the Topagoruk Formation is the only reported hydrocarbons encountered in the well and no oil or gas was recovered during multiple production tests (Collins and Bergquist 1958).

Development Potential: Exploration and development in the vicinity of this well is not likely within the next 20 years. To date, industry has shown no interest in the Topagoruk area.

Groundwater Resource: None. Continuous permafrost exists throughout the entire NPR-A. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: Low

Justification: East Topagoruk did encounter a very poor gas show from the Topagoruk Formation, but is below an existing concrete plug. The wellbore is filled with drilling muds, which have subsequently frozen. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

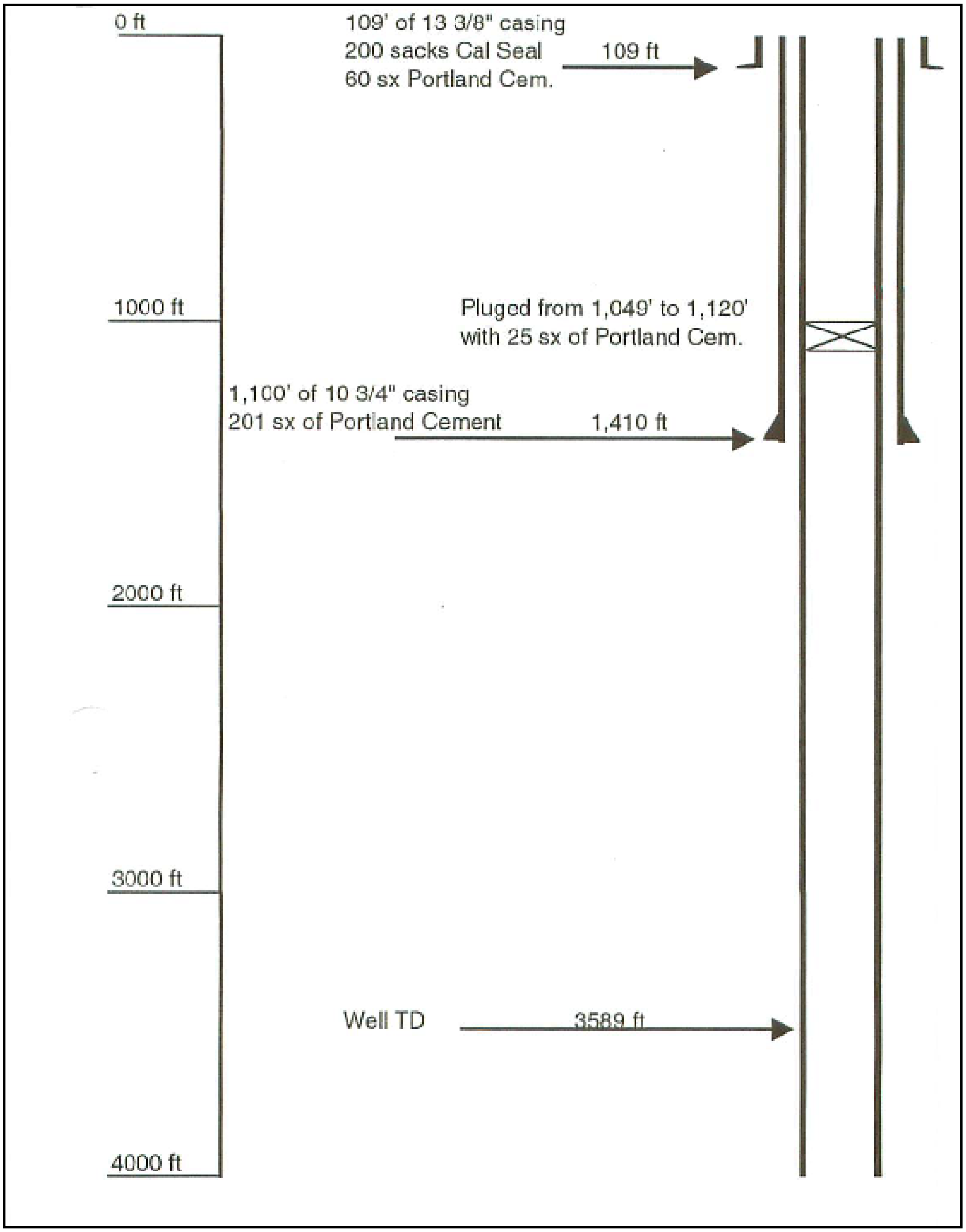


Figure 8: East Topagoruk #1 wellbore diagram

Fish Creek #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.3111° N, -151.8700° W. The Fish Creek #1 well is 24 miles west of Nuiqsut, 129 miles east of Atqasuk, and 130 miles southeast of Barrow. The last site inspection was in July 2012.

Site Description: The Fish Creek #1 site consists of a well within a constructed concrete cellar and pad. The drilling pad and cellar construction is concrete reinforced with steel matting, similar to the Simpson #1 well. The concrete, matting, and pilings are still in place today, albeit severely heaved by permafrost [**Figure 1**]. The disturbed area beyond the concrete is also quite extensive for this site, as the large area was bulldozed to support drilling operations **[Figures 2-3]**

There is still some surface debris present at Fish Creek #1. Several 55-gallon trash drums filled with debris are located off of the concrete pad **[Figure 4-5]**. Other light debris is also present within 500 feet of the pad.

Surface Risk Assessment: **Moderate**

Justification: A minor amount of hardened tar is present around the lower flange within the well cellar, and seasonal snow melt or rain water hydrates the tar and can create a light sheen on the standing water that is completely contained within the cellar **[Figures 6 and 7]**. This, along with the solid waste, has the potential to impacts visual resources resulting in an assessment level of moderate. However, there is no evidence of threat to the well from erosion. While vegetation was disturbed during the construction of the well site, it has been recovering in the intervening years. The site is located near the community of Nuiqsut, and may also pose a travel risk to local residents.

Figure 1: Fish Creek #1 concrete pad and wellhead (July 2002).

Figure 2: Old photo taken of the Fish Creek #1 drilling operations in 1947.

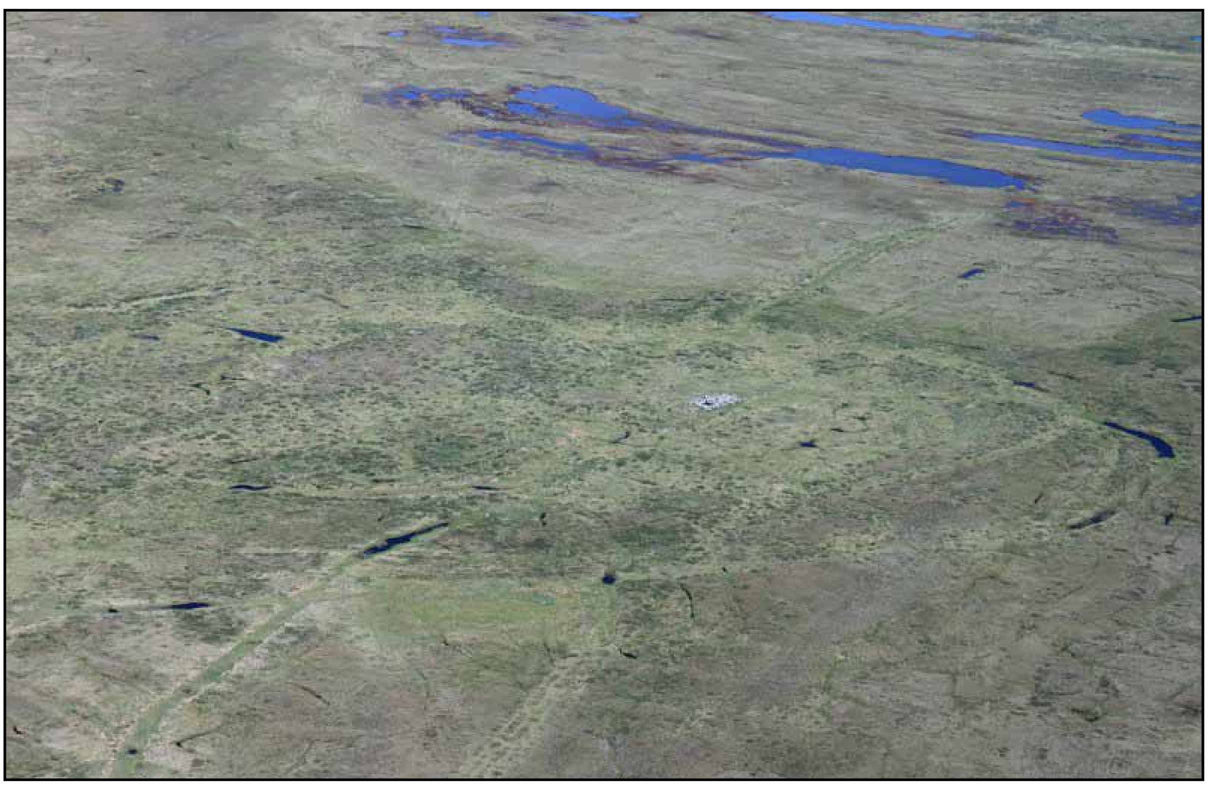


Figure 3: Same area as the 1947 photo (Figure 2) of Fish Creek #1. The concrete pad is visible in the middle of the photo where the change in vegetation type identifies the disturbed area (July 2012).

Figure 4: Fish Creek #1 wellhead with concrete pad, pilings and other solid wastes (July 2012).

Figure 5: Solid wastes near the Fish Creek #1 wellhead (July 2012).

Figure 6: Fish Creek #1 wellhead with water filled concrete cellar (July 2012).

Figure 7: View inside the Fish Creek #1 concrete well cellar. Note the light sheen for the dry tar coming into contact with the cellar water. (July 2002).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: The U.S. Navy drilled Fish Creek #1 in 1949 near a natural oil seep, approximately 20 miles west of the mouth of the Colville River. Total depth of the well was 7,020 feet. The well was plugged back to approximately 2,550 feet, drilled to a new total depth of 3,018 feet, and cased to 3,017 feet [**Figure 8**] (Robinson and Collins 1959).

- **Well Condition**: The wellhead has no pressure at the surface. Hardened tar is apparent on the lower portion of the wellhead.

- **Wellhead Components**: There are two wing valves and a master valve.

Geologic Setting: The well was drilled to test a large gravity anomaly that suggested the possible presence of petroleum-bearing rocks and some structural anomaly that might be a trap for oil. Very poor oil shows were identified in the Topagoruk Formation at depths from 5,550-6,000 feet and a productive sand was reported at 3,000 feet. The Fish Creek well is not a flowing well, but was pump-tested at rates averaging 12 barrels of oil per day through a gravel-packed completion. It also produced a small amount of methane gas. The hole encountered the Gubik, Schrader Bluff, Tuluvak, and Seabee formations. No anticline or closure was detected at any depth. However, downhole records indicate the possibility of a small normal fault that intersects the well near the upper portion of the oil-bearing zone (Robinson and Collins 1959).

Development Potential: In 2004, industry drilled an exploratory well within 7 miles. The target of the exploration was the Upper Jurassic at depth of approximately 8,000 feet and it is unlikely that this unplugged well will adversely effect development in the area. Industry has also proposed a road and a drilling pad less than 8 miles from this well. The 2003 Alpine Satellites EIS examined the impacts of oil and gas development in this area. Given the low level of risk, the plugging of this well should be postponed until infrastructure is established in the vicinity unless change to the integrity of the casing or wellhead is detected.

Other Information: There is no indication of hydrocarbon escapement at the site, aside from some minor sheen in the water of the completely enclosed concrete cellar. However, this poses no risk to outside resources as it is completed enclosed by the concrete cellar. Hardened tar is present around the lower flange.

A natural oil seep is located about 1.5 miles to the southwest of the Fish Creek #1 well site and is inactive. Discovery of the seep played a role in drilling the Fish Creek #1 well. The USGS 305-I reports the dimension of the seep as being 6 feet by 20 feet (Florence and Brewer 1964), however, BLM personnel located the seep in 2001 and noted its dimension to be 3 feet by 6 feet. The seep was revisited in July 2012 and has shrunk to approximately 2 feet by 4 feet.

Subsurface Risk Assessment: Moderate

Justification: The original drill hole was plugged above the oil and gas shows. However, the sidetracked hole was not plugged above the shows. A wellhead is present and prevents hydrocarbons from reaching the surface up through the wellbore. The valve on the wellhead was opened on a recent inspection and revealed no pressure.

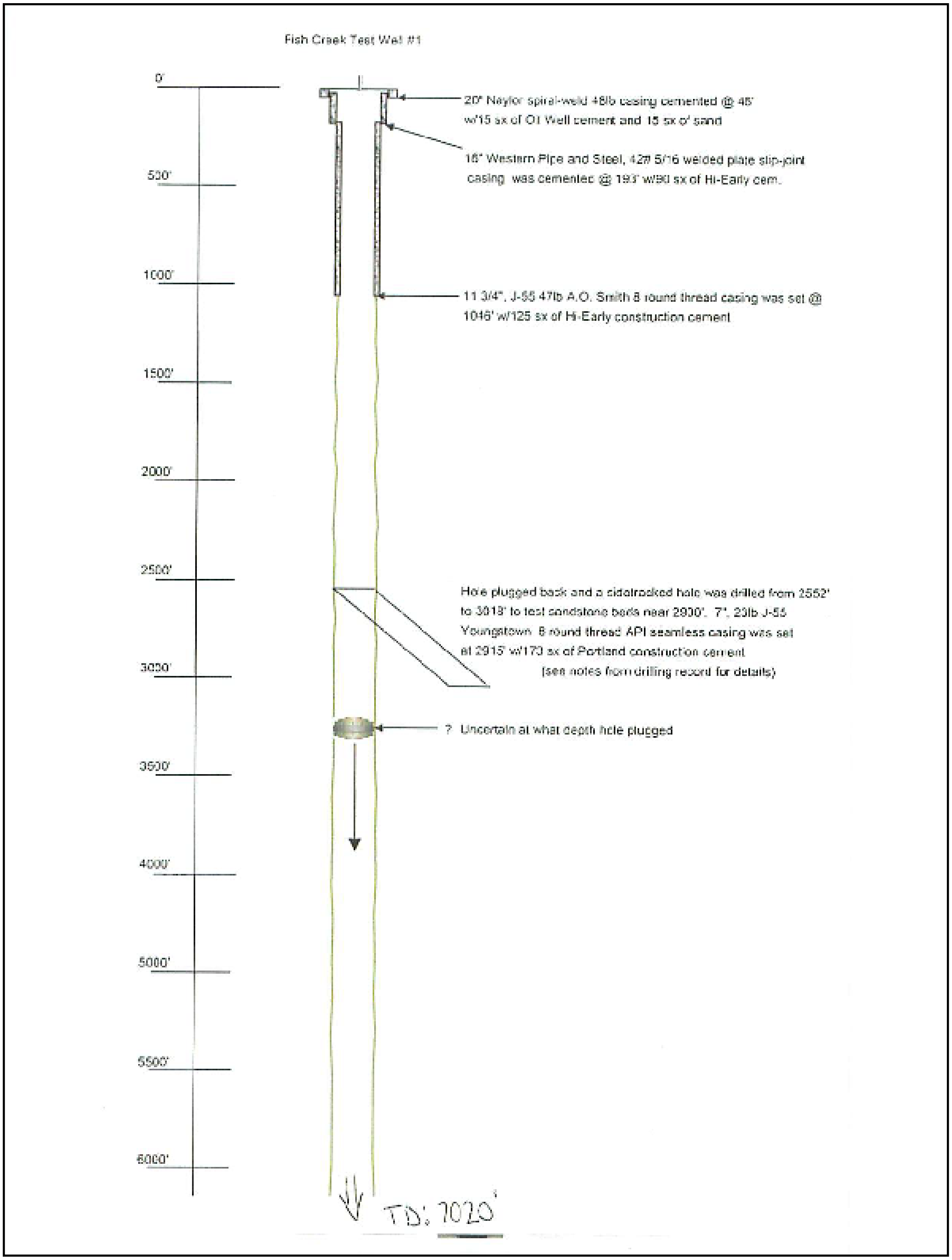


Figure 8: Fish Creek #1 wellbore diagram.

Grandstand #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 68.9661° N, -151.9172° W. Grandstand #1 is 28 miles south of Umiat and 59 miles north/northwest of Anaktuvuk Pass. The last site visit was in June 2003.

Site Description: Grandstand #1 is located on a low bench along the west side of the Chandler River at the base of a 600-foot-high east-trending ridge [**Figure 1**]. The natural vegetation consists of mosses, sedges, and willows. The willows have taken a stronghold on areas of previous disturbance from drilling operations. Downstream of the Grandstand #1 well site, the Chandler River appears to spread out, broadening its floodplain.

A drill pad does not exist, as the gravel from the floodplain likely made an acceptable work surface. The casing, with no wellhead, and compressible gas canister in the surrounding willows still remain onsite **[Figure 2-4].** A minor sloped, sparsely vegetated, pile of muds mixed with larger cobbles is located to the northeast of the casing. What appears to be an open rat hole is approximately 8 feet to the southeast of the well **[Figure 5]**.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. The Chandler River runs near the Grandstand #1 well, but it is unlikely the river will form a new channel that will threaten the well, due to a moderate embankment and other low areas that would be easier to follow. There is no indication that the well site has a negative effect to surrounding surface waters, it does not pose a travel hazard, and there is no impact to visual resources from the site.

Figure 1: Aerial locator of the Grandstand #1 test well (June 2003).

Figure 2: Grandstand #1 is in the center of the photo with the rat hole to the lower left; the mixture of muds and cobbles are to the right of the well (June 2003).

Figure 3: Photo shows the casing configuration of Grandstand #1 (June 2003).

Figure 4: Empty compressed gas canister that rests in the willows about 12 feet from the Grandstand #1 well (June 2003)

Figure 5: Open casing, an apparent rat hole, approximately 8 feet from the Grandstand #1 (June 2003).

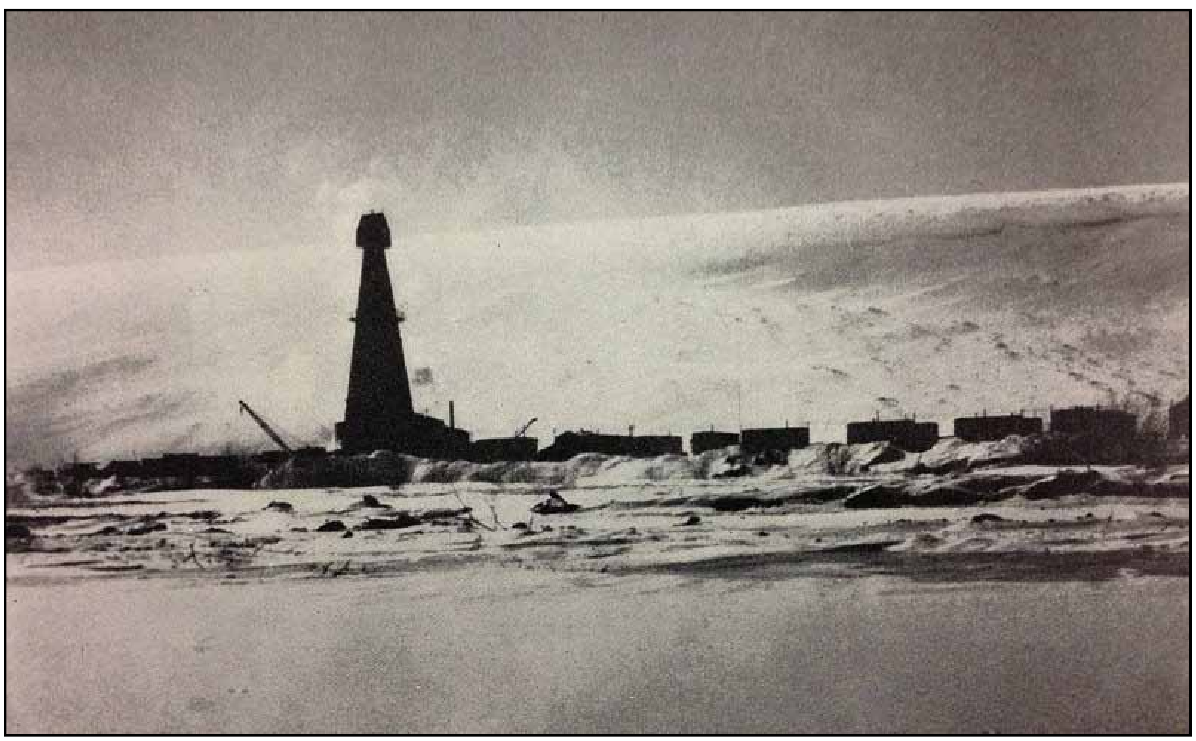


Figure 6: Looking across the Chandler River at the Grandstand #1 drilling rig and support camp in April 1952 (Robinson and Bergquist 1958).

SUBSURFACE INFORMATION

Well Information

- **Well History**: Arctic Contractor drilled Grandstand Test Well #1 in 1952 to a total depth of 3,939 feet, under contract to the U.S. Navy as a part of the same exploratory program for Naval Petroleum Reserve No. 4 in northern Alaska [**Figure 6**]. Grandstand #1 was drilled outside the boundaries of the National Petroleum Reserve in Alaska. The test was on the Grandstand anticline about 30 miles south-southeast of Umiat within the northern foothills of the Brooks Range (Robinson and Bergquist 1958).

  Grandstand #1 objectives were: To test sandstones of the lower part of the Nanushuk Group for oil and gas; to determine reservoir characteristics of Tuktu Formation sandstones and whether shale beds might serve as cap rock over such sands; to better define the thickness of the lower part of the Nanushuk Group and if that part was within reach of the drill; to obtain paleontological data helpful in correlating subsurface units in and near the reserve; and, to compare the lateral extent of the sandstone outcrop sections and the subsurface section at Umiat to better evaluate other structures near the Grandstand anticline for the presence of petroleum. The hole was dry. Sandstone was not well developed in the Tuktu Formation and the reservoir rocks in the Grandstand Formation that produced oil at Umiat have very low permeability (Robinson and Bergquist 1958). The Navy set 2 cement plugs before well completion in August 1952. One plug was set at a depth of 3,690 feet and the other at 742 feet (Robinson and Bergquist 1958) **[Figure 7]**. The BLM conveyed Grandstand #1 surface and subsurface to the Arctic Slope Regional Corporation on Sept. 25, 1986.

- **Well Condition**: Grandstand #1 has three casing strings: a 15½-inch surface with a welded cover, encompassing an 11 ¾-inch intermediate casing that appears to be open, but filled at the surface with vegetation. This surrounds a 4-inch tubing with a loose cover containing a 2-inch weep hole. What appears to be a rat hole is approximately 8 feet from the open casing.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: The drilling penetrated sandstone and shale of the Nanushuk Group of Cretaceous age and was drilled to 3,939 feet and then abandoned in the shale of the Torok Formation of Early Cretaceous age. No important shows of oil or gas were found in this well. Grandstand #1 penetrated alluvium from 20-110 feet, the Grandstand and Chandler formations varicolored chert, with black and brown chert predominant. No clay was noted in the well cuttings (Robinson and Bergquist 1958).

Development Potential: This area holds no real interest to industry at this time. The well in its current state would not likely affect any future drilling, as plugs have been set to seal off subsurface formations. A surface plug would be appropriate to add when resources are available.

Groundwater Resource: Fresh water aquifers are not present due to the thick, continuous permafrost in this area.

Other Information: There is no indication of hydrocarbon escapement at or near the Grandstand #1 well.

Subsurface Risk Assessment: Low

Justification: Grandstand #1 reached a total depth of 3,939 feet and had very poor oil and gas shows. Two cement plugs were set upon abandonment; the upper plug is above all hydrocarbon shows.

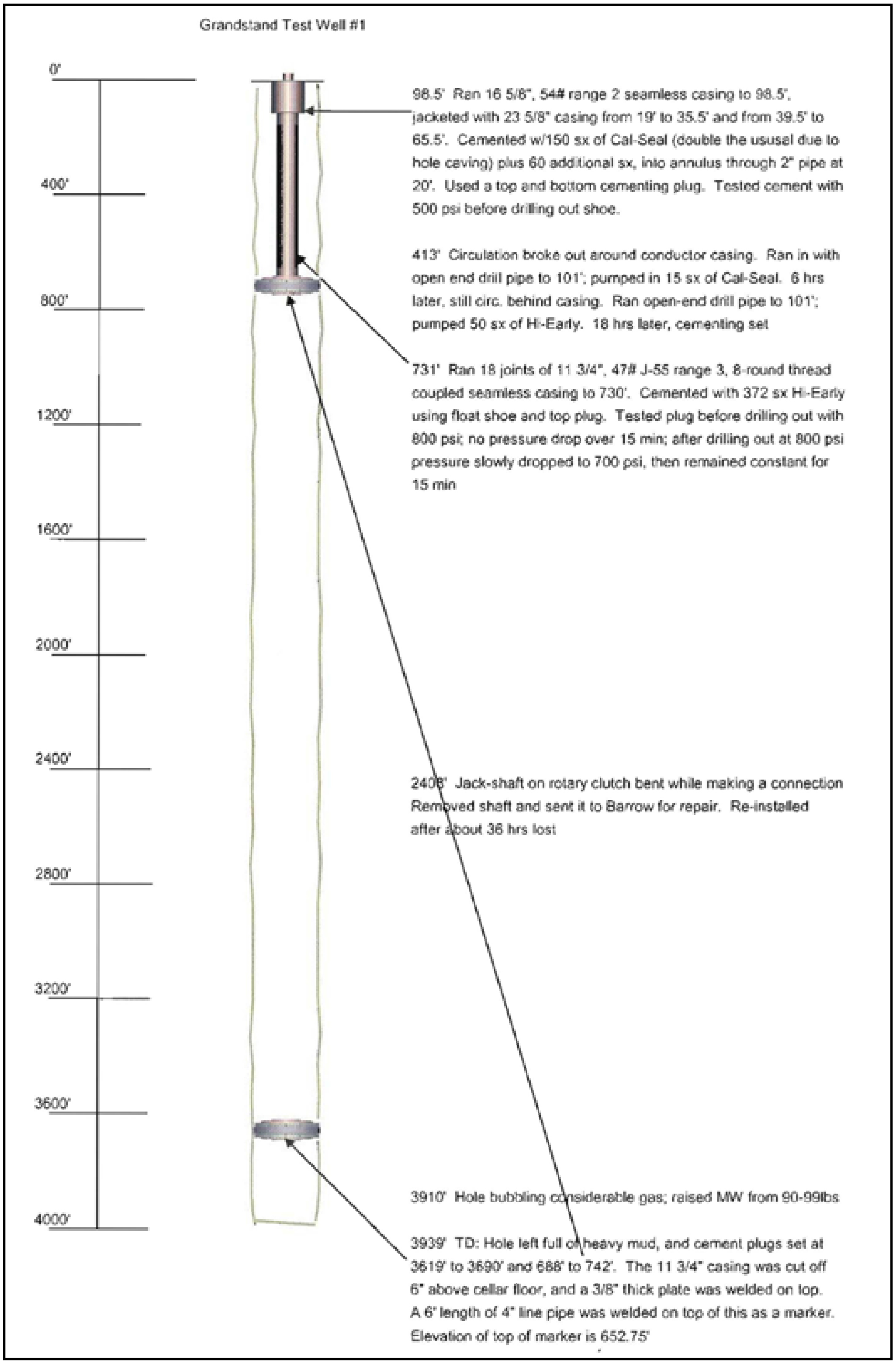


Figure 7: Grandstand #1 wellbore diagram

Gubik Test Well #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.4228° N, -151.4475° W. Gubik Test Well #1 is 16 miles east of Umiat and 54 miles south of Nuiqsut. It is approximately one mile outside of the NPR-A boundary. Gubik Test #2 is roughly 5,000 feet upstream from Gubik Test Well #1. The last site visit was in July 2012.

Site Description: Gubik Test Well #1 is located near an old channel of the Chandler River [**Figure 1**]. It sits on a low terrace that once represented the old floodplain to the river. The well pad is well-defined as there has been little vegetation regrowth since operations concluded in 1951. The casing was cut off at ground level at the bottom of the three foot wooden cellar **[Figure 2].** Steel matting is present next to the cellar. An old structure, possibly associated with the Gubik drilling operations, is approximately 200 feet to the south **[Figure 3]**. There are approximately ten empty drums near the building. Additionally, there are two 8 ⅝-inch casing strings in the ground adjacent to the east side of the building **[Figure 4]**. Both casings have been cut off at ground level. Their origin is undocumented and are too far away from the Gubik #1 Test Well to be a mouse or rat hole.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. Presently, there is no threat from the Chandler River to Gubik Test Well #1 or the structure and its associated small amount of solid waste. The site does not pose a travel risk and visual resources are only minimally impacted.

Figure 1: Aerial relationship of the Gubik #1 Test Well and the old building. There are approximately 200 feet of separation between the two. The unvegetated area represents the original drilling pad. The meander scar represents the remains of an old, inactive channel (June 2011).

Figure 2: At the bottom of the 3-foot cellar lies the open casing representing Gubik Test Well #1 (August 2002).

Figure 3: Photo showing the old building with rusting drums, about 200 feet from the Gubik Test Well #1. Three cased holes are spaced out in the unvegetated portion of the pad (foreground), but the 8 ⅝-inch casing is not visible from this height (June 2003).

Figure 4: Photo showing the 8 ⅝-inch casing of unknown origin near the old building and about 200 feet from the Gubik Test Well #1 (June 2003).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The Gubik Test Well #1 was drilled on the west side of the Chandler River a little more than a mile above its junction with the Colville River in May 1951 at an elevation of 141 feet (above sea level). The test well reached a total depth of 6,000 feet. Five cement plugs were set by the U.S. Navy prior to well completion in August 1951. Plug depths are at 3,625 feet, 1,650 feet, 900 feet, 870 feet, and 800 feet **[Figure 5]**. A surface plug was not set (Robinson and Bergquist 1958).

  Gubik Test Well #1 was originally drilled on Federal ground by the U.S. Navy; however, the land was selected by and conveyed to the Arctic Slope Regional Corporation on Sept. 27, 1995, for both surface and subsurface.

- **Well Condition:** There is no wellhead. Gubik Test Well #1 is represented by 8 ⅝-inch open casing. There is no associated rat hole.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: Gubik Test Well #1 was drilled near the apex of the Gubik anticline to test the oil and gas possibilities between the surface and the bottom of the sands that are productive on the nearby Umiat anticline. Gas in commercial quantities was found at a depth of 890 feet to 1,750 feet in the sandstones of the Tuluvak Tongue in the Prince Creek Formation (Upper Cretaceous) and at a depth of

3,350-3,700 feet in the sandstones of the undifferentiated Chandler and Ninuluk formations (Robinson and Bergquist 1958).

The producing strata at Umiat, the upper and lower sandstone beds of the Grandstand Formation, apparently become finer grained eastward and in Gubik #1 are represented only by siltstone with a few thin beds of sandstone. Surprisingly good cuts were obtained from the silty clays in cores 42-44 and in core 50 of Gubik Test Well #1, considering the “tight” nature of these rocks (Robinson and Bergquist 1958).

Development Potential: Industry has shown interest in this general area as exploration has occurred on neighboring State lands. Gas is the primary commodity in this area, but development is not likely until the construction of a gas line occurs for transportation to market.

Groundwater Resource: Fresh water aquifers are not present due to the thick, continuous permafrost in this area.

Other Information: There is no indication of hydrocarbon escapement at or near the well.

Subsurface Risk Assessment: Low

Justification: Gubik Test Well #1 reached a total depth of 6,000 feet with gas shows. There is no wellhead, but has five cement plugs that separate the different formations and contain all gas shows.

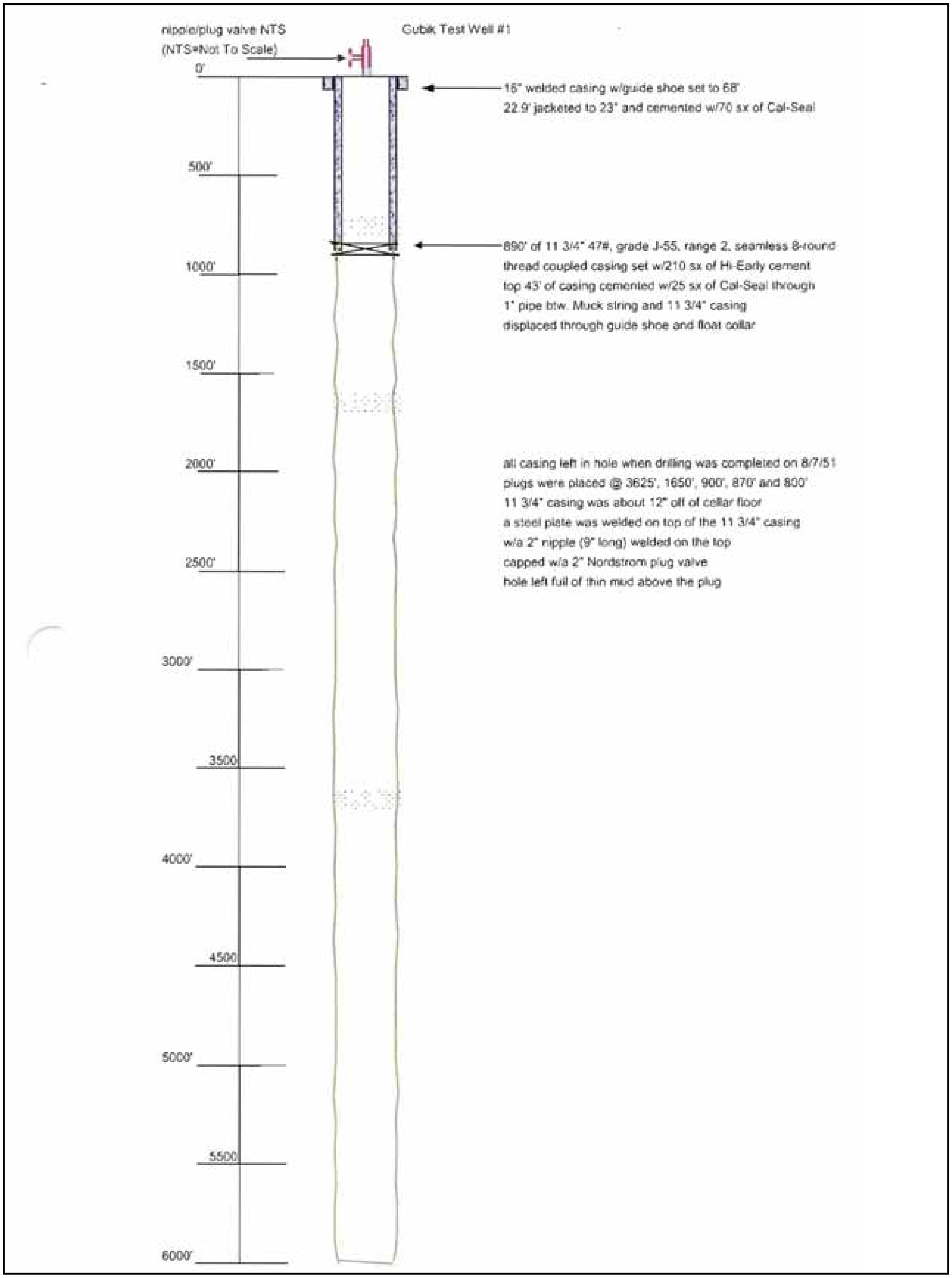


Figure 5: Gubik Test Well #1 wellbore diagram.

Gubik Test Well #2

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.4308° N, -151.4383° W. Gubik Test Well #2 is 17 miles east of Umiat and 55 miles south of Nuiqsut. It is approximately 2 miles outside of the National Petroleum Reserve in Alaska boundary. The last site visit to the Gubik Test Well #2 was in July 2012.

Site Description: Gubik Test Well #2 is within the floodplain on the west side of the Chandler River **[Figures 1-2]**. Vegetation is primarily mosses, sedges, and willows. The willows are thick in the areas once disturbed by drilling operations. There are several well-traveled trails in the willows, likely created by the bears frequently observed in this area.

A drill pad does not exist. The gravel bar and adjacent tundra provided a sufficient working surface. There are several large timbers remaining around the wellhead, as they once enclosed the wellhead **[Figures 3-4**]. These timbers toppled over sometime between 2000 and 2002. A small, but steeply sloped pile of hardened bentonite is present approximately 15 feet to the west of the wellhead. Directly adjacent to that is a small pile of drilling muds. A minor amount of rusting metal debris is contained within the area between the two piles [**Figures 5-6**]. An open rat hole is located approximately 6 feet to the southeast of the well [**Figure 7**]. The rat hole has been thrust several feet out of the ground by an active freeze/thaw process. It was approximately 1 foot above ground level in 2002, but by 2012, the rat hole was sticking up nearly 5 feet.

Surface Risk Assessment: **High**

Justification: The Gubik Test Well #2 leaks a small amount of methane into the atmosphere, resulting in a possible impact to air quality. It is unclear whether the pile of bentonite clay was used or simply stockpiled. If used, then the clay could contain a small amount of trace hydrocarbons, which could have naturally attenuated over the long amount of time it has been present onsite. The Chandler River is less than 100 feet from the well, but the river has not been a threat to the well since it was drilled in 1951. That trend apparently will continue as the channel of the Chandler River closest to the well location is a secondary channel that is becoming cut off by the main channel **[Figure 2]**. There is no indication that the well has a negative effect on surrounding surface waters, nor is there any impacts to visual resources at this site.

Figure 1: Well location for the Gubik Test Well #2 (July 2012).

Figure 2: A zoomed-in image of the previous photo shows the channel nearest to the wellsite has been cut off from the main channel (red circle). Gubik Test Well #2 is not pictured, but off the photo to the right (July 2012).

Figure 3: Gubik Test Well #2 showing the well enclosed by large timbers (August 2000).

Figure 4: Gubik Test Well #2 wellhead is surrounded by large timbers. The recently thrusted rat hole is behind and to the right of the wellhead (July 2012).

Figure 5: Minor amounts of solid waste on the pile of bentonite clay that has hardened over time at the Gubik Test Well #2 site (July 2012).

Figure 6: Gubik Test Well #2 wellhead after the timbers surrounding the wellhead was knocked over. This also shows the relationship of the wellhead to the pile of bentonite and muds (August 2002).

Figure 7: The rat hole at Gubik Test Well #2 before it was thrusted several feet out of the ground from the freeze/thaw process. The wood to the right represents a partially buried timber (August 2002).

SUBSURFACE INFORMATION

Well Information

- **Well History:** Gubik Test Well #2 was spudded by Arctic Contractor on Sept. 10, 1951, and was completed Dec. 14, 1951, reaching a total depth of 4,620 feet. A very strong blow of gas was encountered while drilling, in excess of 8 million cubic feet per day, which eventually resulted in a blowout while attempting to plug this well. The well blow went wild and ignited, causing the drill rig to collapse. After the hole sanded up on its own, two days later the hole reopened and blew with the same force. After seveal hours, the hole once again sanded up on its own. After the flame was extinguished with carbon dioxide, the hole was filled with 204 barrels of water. A wellhead was put on the well and it was left in a suspended status. Upon completion, the well was junked and abandoned. The BLM conveyed the surface and subsurface lands with the Gubik Test Well #2 site to the Arctic Slope Regional Corporation on Sept. 27, 1995. The U.S. Navy set one cement plug at 2,300 feet prior to suspending the well in December 1951 **[Figure 8]**.

- **Well Condition**: A very small amount of gas is seeping where the bell reducer attaches to the adapter flange (just below the only valve). It is difficult to hear the seep unless standing adjacent to the adapter flange.

- **Wellhead Components:** The wellhead consists of 1 single valve (closed) without any gauges.

Geologic Setting: The Gubik Test Well #2 is on the south flank of the Gubik anticline, 240 feet to 270 feet structurally lower than Gubik Test Well #1. The drilled stratigraphic section is identical to that of Gubik Test Well #1, except for an additional 250 feet of younger Cretaceous rocks (Barrow Trail member of the Schrader Bluff Formation) at the top.

The average dip of the beds from the top of the hole to the bottom of the Seabee Formation is 6 to 7 degrees. In the undifferentiated Chandler and Ninuluk formations, the dip is 3 degrees. This lower dip may only be apparent due to the excessive hole deviation of 4 degrees recorded at 3,825 feet. The dip in the Grandstand Formation averages 4 degrees, but the normal fault (mentioned below) may affect it. Although only 200 feet of the Topagoruk Formation was penetrated in Gubik Test Well #2, the lowest two cores show an increase in dip to 13 degrees, similar to that of the Topagoruk Formation in Gubik Test Well #1. Excessively high dips are not present in Gubik Test Well #2. Slickensides were noted at 1,916, 4,252, and 4,415 feet. Approximately 200 feet of section in the middle of the Grandstand Formation present in Gubik Test Well #1 is missing in Gubik Test Well #2. This is possibly because the section was cut out by a normal fault at 4,270 feet. Another possibility is that the missing section represents an unconformity. Regionally, however, there is no evidence for an unconformity within the Grandstand Formation (Robinson and Bergquist 1958).

Development Potential: Industry has shown interest in this general area, as exploration has occurred on neighboring State of Alaska lands. Gas is the primary commodity in this area, but development is not likely until the construction of a gas line occurs for transportation to market.

Groundwater Resource: None. Fresh water aquifers are not present due to the thick, continuous permafrost in this area.

Other Information: With the discovery of the well seeping a minor amount of gas, it is considered a well that will need to be plugged in the near future.

Subsurface Risk Assessment: **High**

Justification: Gubik Test Well #2 is leaking a minor amount of methane into the atmosphere. There are no subsurface cement plugs between the wellhead and the large gas show encountered while drilling the well.

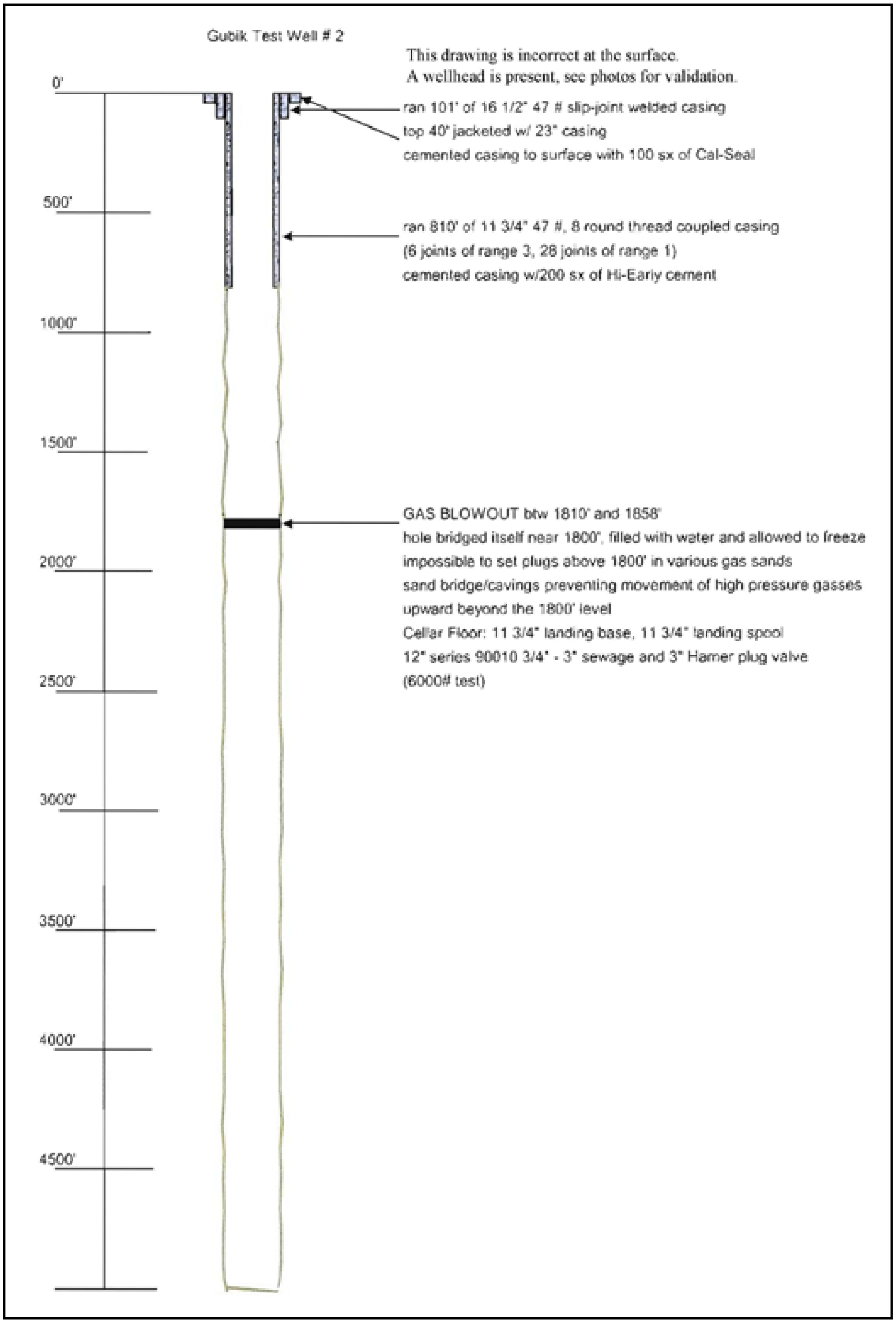


Figure 8: Gubik Test Well #2 Wellbore Diagram

Iko Bay #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 71.1702° N, -156.1670° W. The Iko Bay #1 well site is approximately 7 miles southeast of the East Barrow Gas Field and 15 miles southeast of Barrow. The last site inspection was in July 2012.

Site Description: The Iko Bay #1 well site consists of a well, along with associated scattered surface features, in area measuring approximately 50 feet east to west by 50 feet north to south. The U.S. Navy drilled the well in 1975. There is no pad or reserve pit associated with the well. The well is housed inside a small wooden frame structure that is elevated above the ground surface on top of large 12x12 timbers placed on log pilings **[Figure 1]**. The frame structure has been painted orange, measures 12 feet square, has a flat roof, 2x4 construction, and consists of plywood panels. Two of the four walls are intact, as well as the roof. The other two walls have holes where plywood is missing. There is no floor within the structure. Just to the west of the structure is a 10-inch diameter metal pipe placed vertically into the ground and extending about 5 feet above the ground surface. This pipe is assumed to be the rat hole.

There are 22 pilings present onsite, extending in an evenly spaced pattern from the well to the south and east. The pilings are all approximately 5 feet above ground level. Many of the pilings are connected to each other by 4x4 angled cross beams. Several additional 2x8 planks remain that connect the tops of several of the pilings. At least one of these planks is present in the frame structure. The well cellar measures 10-feet by 10-feet [**Figure 2**]. The top of the northwest corner of the cellar has collapsed. The cellar contents are comprised of dirt, dried oil and grease-soaked gravels, and are contained within the cellar. No standing water is present in the cellar [**Figure 3**]. It is evident that at one time the ground within the piling area was scraped to bare mineral soil. Currently, this area is slowly recovering, and has a groundcover of moss and grass.

Four deadman anchors are present, embedded in the tundra roughly 50 feet from the well, forming a square **[Figure 4**]. These anchors were utilized during the drilling operation to support the rig. Miscellaneous pieces of lumber, including several pieces of painted plywood that were part of the frame structure, are scattered throughout the site with most predominantly near the piling area.

Surface Risk Assessment: **High**

Justification: A small amount of surface contamination in the form of diesel range organics is present on the Iko Bay #1 site within the well cellar. This material consists of dried oil and grease soaked gravels in a 10 feet by 10 feet area to a depth of approximately 3 inches below GL, resulting in an estimated amount of no more than 25 cubic feet of material. While there are ponds near the site, there is no indication that the materials inside the cellar could be released into the nearby surface water. There is no evidence of sheening on any of the ponds near the well site. Small quantities of gas leaks into the atmosphere from the well, resulting in a possible impact to air quality.

The deadman anchors near the site could be travel hazards to local residents using snowmachines within the area. It is very customary for local residents to use anomalies on the landscape, such as the frame structure and associated piling, as landmarks for navigation. This is especially true during the winter months when there is little or no relief.

Figure 1: Aerial view of Iko Bay #1 well site.

Figure 2: Iko Bay #1 wellhead, frame structure, and cellar.

Figure 3: Close-up of Iko Bay #1 well cellar.

Figure 4: Deadman anchor at the Iko Bay #1 well site.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled the Iko Bay #1 well in March 1975 and reached a total depth of 2,731 feet. The well was drilled as an additional exploration well to the 8 wells drilled at Barrow from 1953-1975. Iko Bay #1 was drilled with a Navy-owned Cardwell Model H drilling rig. One cement plug was set between 2,035 and 2,210 feet. **[Figure 5]**

- **Well Condition:** The wellhead is approximately 8 feet in height from the ground surface. There is a very faint leak in the wellhead, allowing gas to exit into the environment.

- **Wellhead Components:** There is a single 4-inch gate valve with no gauges. From the gate valve, a 4-inch to 2-inch reducer leads to a 2-inch plug. The leak occurs at the top of the reducer.

Geologic Setting: Oil shows and stains were discovered in the Barrow sandstone, Sag River Formation, and Shublik Formation. Gas shows were found in the Torok Formation and the Pebble shale unit. Gas from the wellhead was sampled in August 2002 at a recorded pressure of 390 psi. The gas has no discernible biogenic component. The gas appears to be at about the same maturity as the Shublik-generated gas from the Tarn field and was calculated to flow at approximately 639 Mcf/d. The Iko Bay #1 gas does not have the similar dryness found at the Barrow or Walakpa gas fields (personal communication Bob Burress December 2002).

Development Potential: The gas was sampled in August 2002 at a recorded pressure of 390 psi. As the well is not a producing gas well, it needs to be plugged.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist. Permafrost levels have been documented to extend from the surface to a minimum 1,400 feet around Barrow (Alaska Department of Environmental Conservation 2012).

Other Information: The leak on the 4-inch to 2-inch reducer (where it connects to the gate valve) has nearly ceased. Since the last site visit in 2007, pressure dwindled to a nearly inaudible hiss (less than 5 psi) at the leak. It was confirmed the 4-inch gate valve was stuck in the open position, despite repeated tests of opening and closing the valve.

Subsurface Risk Assessment: **High**

Justification: Iko Bay #1 is leaking methane into the atmosphere through failed wellhead components. There is one cement plug, but it is below the oil and gas shows.

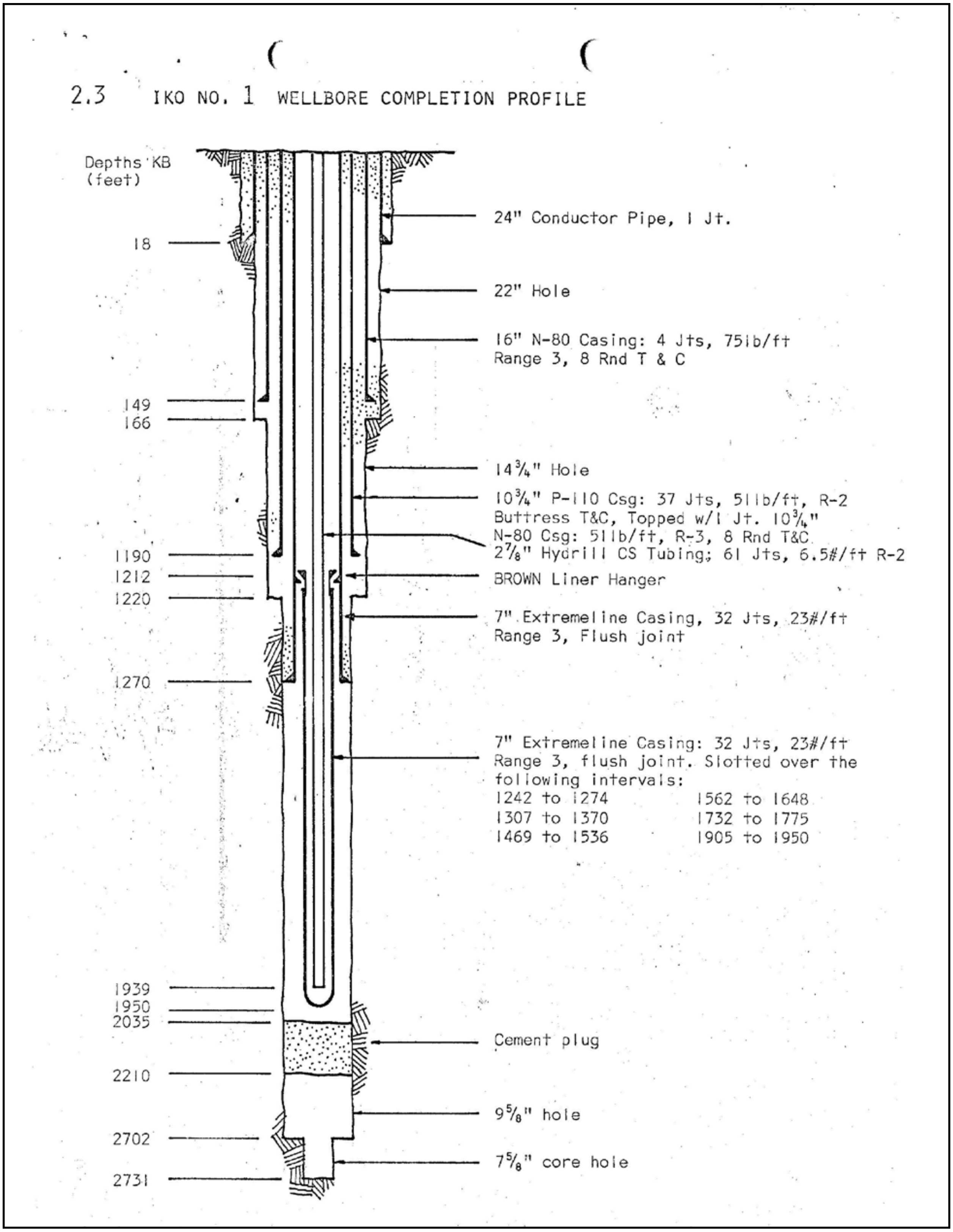


Figure 5: Iko Bay #1 wellbore diagram.

Ikpikpuk #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.4556° N, -154.3328° W. The Ikpikpuk #1 well is 72 miles east of Atqasuk, 80 miles west of Nuiqsut, and 80 miles southeast of Barrow. The last site inspection was in July 2012.

Site Description: The Ikpikpuk #1 site consists of a well in a constructed wooden cellar, a pad and a reserve pit **[Figures 1-5]**. Husky Oil drilled the well for the U.S. Navy in 1978. Ikpikpuk has a wood cellar consisting of two 2x12 boards stacked on top of each other. One side of the cellar has been missing a 2x12 board since at least 1995. The cellar has accumulated soil over time, stimulating vegetation growth such that a valve is now partially covered **[Figure 6]**. The rat and mouse hole are just outside the cellar and are open to the environment. There is a small storage container and 3,000 gallon fuel tank on the Ikpikpuk #1 drilling pad **[Figure 7]**.

The pad is of thick pad design and is in good condition. The pad was created with materials from the reserve pit. It is relatively flat with little vegetation cover. The pad has a few non-native vegetation species growing on it, including the common dandelion (*Taraxacum officinale*).

Surface Risk Assessment: Low

Justification: Erosion has occurred to the pit walls from wave action and thawing has also played a role is shaping the pit walls. Water can escape to the surrounding tundra in these areas. The flare pit is still intact and separate from the reserve pit. In 2010, the reserve and flare pit materials from Drew Point #1 were added to the flare pit area of Ikpikpuk #1. The materials are capped with clean materials and is now a large, unvegetated mound standing approximately 5 to 6 feet tall. The BLM is fertilizing the mounds in an experiment to speed vegetation growth on the mineral soils.

A small meandering stream is approximately ½ mile away. It does not provide any threat of erosion to the wellsite. Additionally, there does not appear to be any effect to surrounding surface waters from Ikpikpuk #1. The Alaska Department of Environmental Conservation sampled and closed the reserve pit in its current condition in 1995. The addition of reserve pit materials from Drew Point in 2010 does not appear to have any negative impacts. It should be noted that reserve pit materials from Drew Point came from a pit that was sampled and closed in the same report.

Figure 1: The material from Drew Point was added to the Ikpikpuk #1 reserve pit in 2010 (July 2012).

Figure 2: Constant freeze-thaw cycles have broken down the Ikpikpuk #1 reserve pit walls allowing water to enter the surrounding tundra (July 2012).

Figure 3: Looking across the Ikpikpuk #1 pad and reserve pit toward the Drew Point material (July 2010).

Figure 4: Ikpikpuk #1 drilling pad and reserve pit at spring break-up (June 2003).

Figure 5: Ikpikpuk #1 drilling pad and reserve pit (August 1999).

Figure 6: Ikpikpuk #1 wellhead and cellar (July 2010).

Figure 7: Small storage container and 3,000 gallon fuel tank on the Ikpikpuk #1 drilling pad (June 2007).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Ikpikpuk #1 well was drilled in 1978. Rig mobilization operations began on April 14, 1978, and rig-up began on April 18, 1978. Mobilization occurred via 51 Rolligon loads and 91 Hercules C-130 loads. Parco Rig 96, a National 130, was used to drill the well. The mobilization was completed on May 2, 1978, and operations were suspended for the summer, with the rig approximately 85 percent rigged up. Operations began again on Nov. 1, 1978. An ice airstrip, long enough to support a Hercules C-130, was once again constructed to support operations. The derrick was raised on Nov. 23, 1978, and the well was spudded on Nov. 28, 1978. Drilling continued through the 1979 winter season. The well had reached 14,210 feet and casing was run to 14,208 feet with liner top at 9,528 feet **[Figure 8]**. The liner top was squeezed through a cement retainer and capped with 5 barrels of cement on top. A tubing kill-string was landed at 6,556 feet. The well was secured and the rig released on April 17, 1979, after the rig was partially rigged down. The camp was closed and all personnel were off-site by April 21, 1979. Operations commenced again on Nov. 21, 1979, for the second winter season. After two winter seasons of drilling, the well was terminated on Feb. 28, 1980. The well was drilled to a total depth of 15,481 feet, cased to 14,208 feet, and plugged back to 2,047 feet (Husky Oil 1983).

  Diesel is present in the wellbore from the uppermost plug to the surface to facilitate temperature monitoring conducted by the USGS. Diesel was chosen as the medium for temperature monitoring as it will not corrode the casing, nor will it freeze at the temperatures encountered downhole.

- **Well Condition:** At the conclusion of the drilling and evaluation operations, the well was plugged back to 2,047 feet with five cement and mechanical plugs set at selected intervals. The Arctic Pack was left in the 9 ⅝-inch x 13 ⅜-inch annulus from the 9 ⅝-inch fluid oriface (FO) at 2,142 feet to the surface wellhead. The top of the shallowest cement plug is at 2,047 feet. From 1,839 feet to the surface, the hole is filled with diesel fuel (130 barrels) overlying 208 feet of mud. With the well properly plugged and there are no downhole issues with the well at this time. The wellhead is in good condition.

- **Wellhead Components:** There are 3 gate valves. The needle valve was replaced with a 2-inch cap. **[Figure 9]**

Geologic Setting: Ikpikpuk #1 was drilled to provide stratigraphic information and to test structural closure in Triassic through Devonian sediments. The well encountered very minor methane shows (associated with coal beds) and dull to medium fluorescence in the Nanushuk Group. The Torok Formation had some visible oil cuts as well as gas recovered in a drill stem test at 6,925 feet. The drill hole also encountered the following stratigraphy without any notable hydrocarbon shows; Pebble Shale and Kuparuk Formation of the Cretaceous, Kingak Formation of the Jurassic, Sag River Sandstone and Shublik Formation of the Triassic, Ivashak and Echooka Formation of the Triassic-Permian, and the Lisburne and Endicott Groups of the Permian-Mississippian (Husky Oil 1983).

Development Potential: An exploration well was drilled near Ikpikpuk #1 in the early 2000s, but nothing since. If development were to occur, this well is adequately cased and cemented from all lower formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

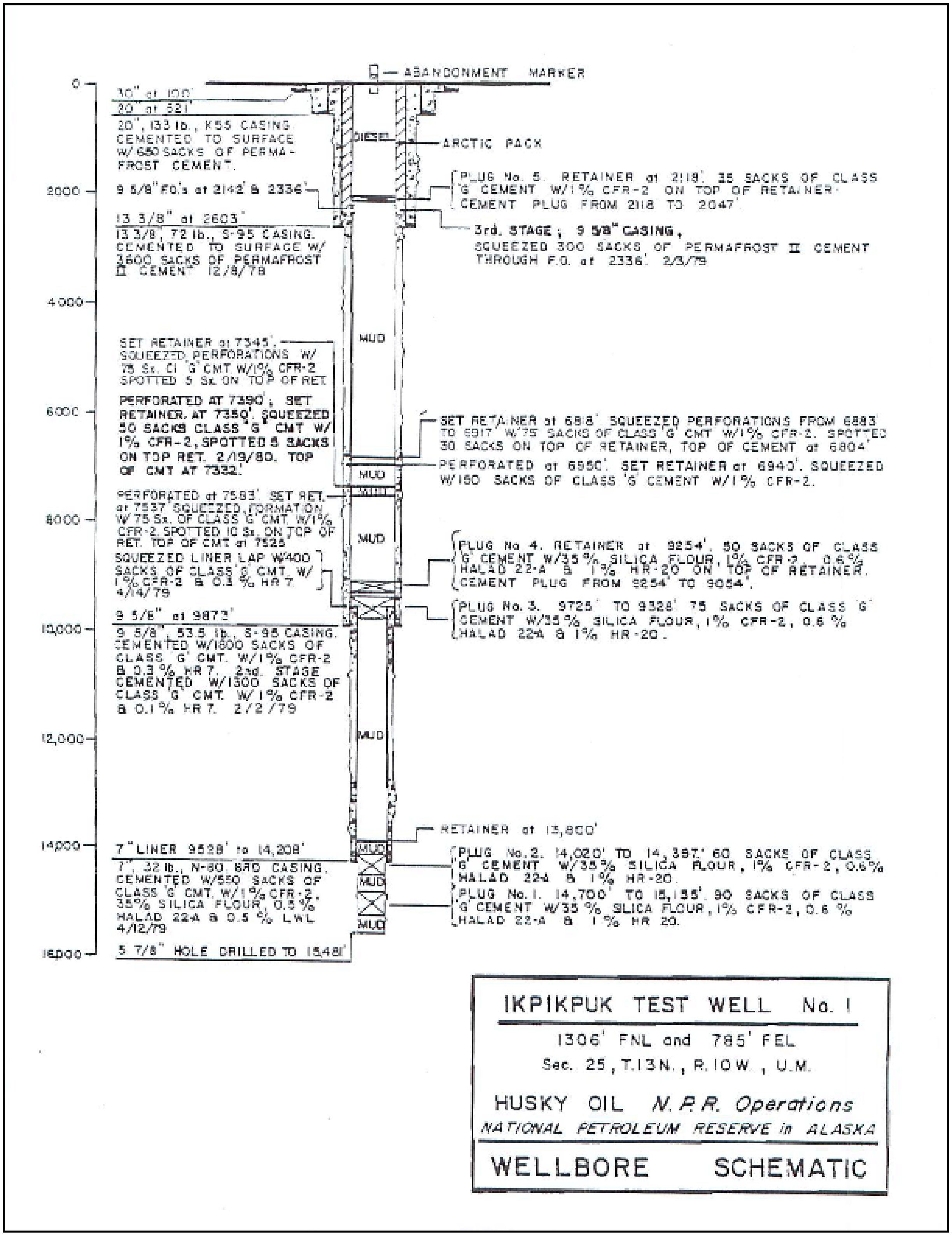


Figure 8: Ikpikpuk #1 wellbore diagram.

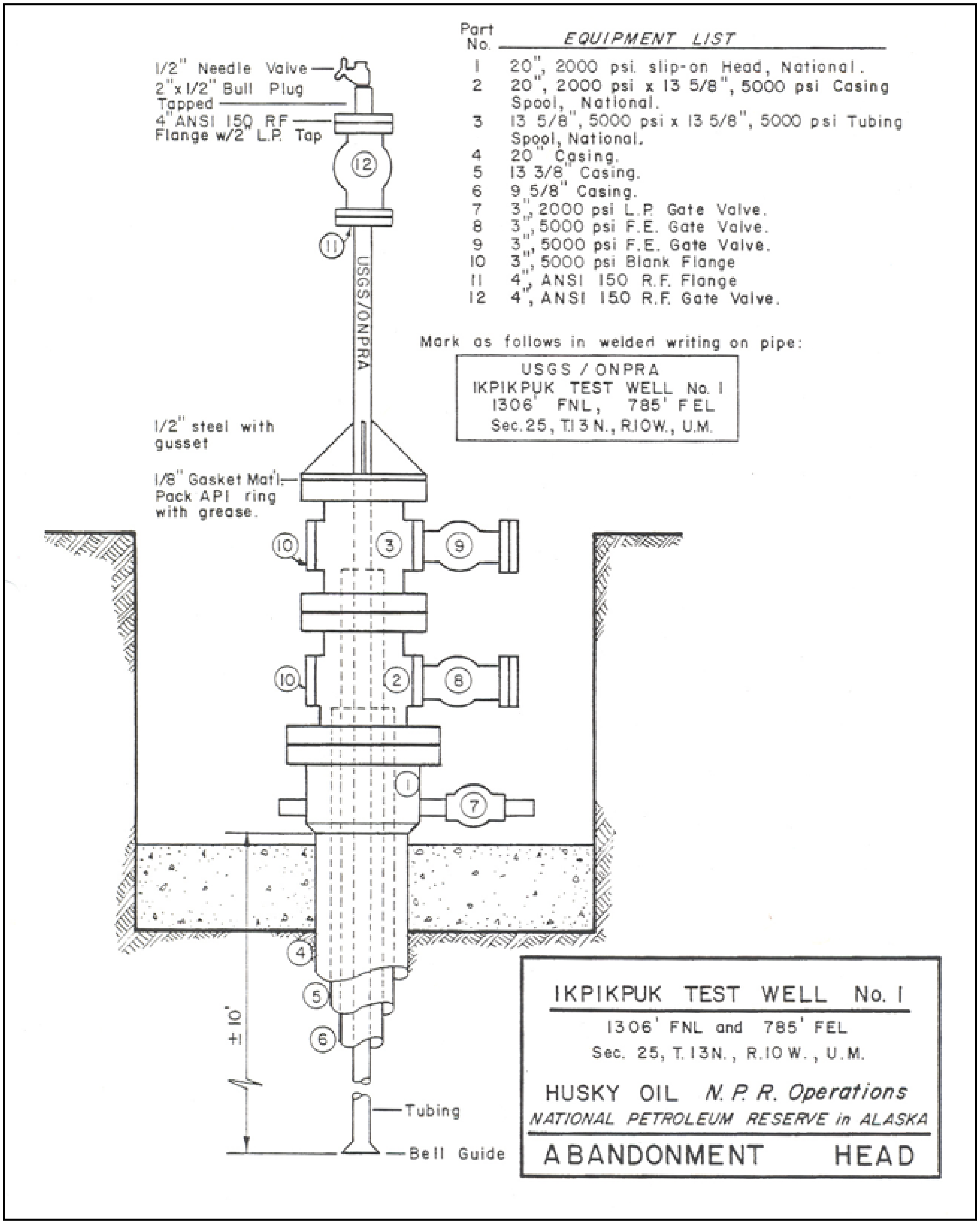


Figure 9: Ikpikpuk #1 wellhead assembly.

Ikpikpuk Core Test #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 69.8292° N, -155.6958° W. The Ikpikpuk Core Test #1 is located approximately 60 miles southeast of Atqasuk. It is also 93 miles west/northwest of Umiat and 102 miles south of Barrow. It is located roughly seven miles east of Oumalik Test Well #1. The last site inspection was in July 2012.

Site Description: The Ikpikpuk Core Test #1 is an uncased core test that has completely disappeared by collapsing internally and the surface naturally revegetating. A drill pad was never established at this location. However, the site is conspicuous due to the unnatural amount of willows present compared to the surrounding tundra **[Figure 1]**. Additionally, the scar left behind from the initial trail used by the U.S. Navy is apparent but not as obvious as at the nearby Oumalik Core Test #1 site.

A ground search was completed using the original coordinates from the USGS Professional Paper 305-A. The search was carried out using a magnetic wand and walking in a 100 meter circle from the reference point. No solid wastes were discovered in the thick willows at this location.

Surface Risk Assessment: None

Justification: The core test is uncased, no solid wastes are present, and there does not appear to be any impact from the core test to nearby surface waters.

Figure 1: Photo from the approximate location of the uncased Oumalik Core Test #1 looking across the valley toward the estimated location of Ikpikpuk Core Test #1 (June 2011).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Ikpikpuk Core Test #1 was drilled by the U.S Navy in 1947 to a total depth of 178 feet approximately ¼ milesouth of Oumalik Core Test #1. The purpose of the well was to obtain stratigraphic and structural information about the Oumalik anticline. Unfortunately, Ikpikpuk Core Test #1 encountered mechanical problems and was not able to achieve the desired depth of 400 feet, nor confirm the anticipated structural information (Robinson and Bergquist 1956).

- **Well Condition:** Ikpikpuk Core Test #1 is uncased.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The test hole encountered the Chandler Formation of the Nanushuk Group which is Cretaceous in age (Robinson and Bergquist 1956).

Development Potential: These uncased core tests will have no effect on future drilling in the area.

Groundwater Resource: None. Continuous permafrost exists throughout the entire NPR-A. Fresh water aquifers do not exist.

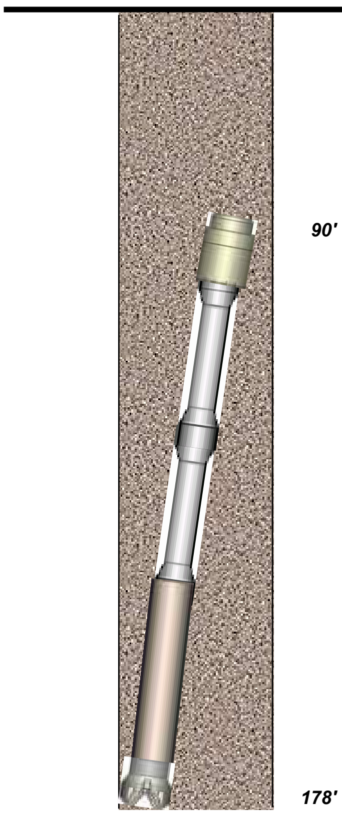
Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: None

Justification: This is a shallow uncased drill hole and did not penetrate oil or gas stratigraphy or water resources. The old drill location has blended harmlessly with the environment.

Ikpikpuk Core Test #1	Rig:	Failing M 314-C Rotary Core Drill (M-1500)			
	Drilled:	Jul 9 - Jul 17, 1947			
Oumalik Area Core Tests and Test Wells	API #:	**50-119-10001-00**		Created	
	GL: 170'	KB: 180'		5/7/13	
Naval Petroleum Reserve - 4	Lat/Long:	69° 49' 36"N - 155° 41' 57"W		Last mod	
	Reviewing Engineer:	Justin T. Miller			

Original RKB = 180'



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
Uncased; Drilled with 5-7/8" rock bit. 7" casing was set at 39' but was pulled prior to abandonment after drillstring twisted off at 90' and could not be fished.						

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	178	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	7/17/47	90-178	Hole abandoned full of frozen drilling mud with fish. No thermistor cables were installed.
B			
C			

Figure 2. Ikpikpuk Core Test #1 wellbore diagram.

Inigok #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.0003° N, -153.0946° W. The Inigok #1 site is 53 miles northeast of Nuiqsut, 123 miles southwest of Barrow, and 49 miles southeast of Umiat. The Inigok area is an important location for the BLM, as it houses year-round structures and seasonal camps. It is a common flight and staging area during the snow-free months. The airstrip and apron are in need of maintenance. The last site inspection was in July 2012.

Site Description: The Inigok #1 site consists of a well in a metal cellar, a pad, and a reserve pit; as well as an associated airstrip and apron **[Figures 1-3]**. A short gravel road connects the airstrip and apron to the lower drilling pad. Husky Oil drilled the well for the USGS in 1979. Gravel for the airstrip, apron, and pad were hauled via a 23-mile ice road from the Colville River. The well pad was partially insulated and is in fair condition. Insulation was used to help reduce the amount of gravel needed for the site, as well as increase the life of the pad. Some thawing has occurred on the periphery in addition to the uninsulated sections at the eastern portion of the pad. Jay McKendrick seeded the grasses in the 1980s and has helped stabilize the pad. The grasses were not necessarily native seed, but they have not spread from the pad area.

The wellhead is in good condition. It consists of 3 spools, each with a gate valve, a master valve, and a needle valve **[Figure 5]**. A rat hole lies adjacent to the wellhead. The cellar is a metal culvert in a steel frame full of standing water. The flare pit walls have eroded into the reserve pit. The pit walls have been subject to many freeze/thaw cycles, resulting in erosion such that water flows out of the pit and into the nearby surface waters during breakup. The drill pad has been used for occasional staging by industry over the past 10 years.

There is various wiring and other debris sticking out of the drill pad. An old seismic camp is situated on the southeast portion of the pad, which is scheduled to be removed during the winter of 2013-14 [**Figure 6]**.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. The site is not under threat due to erosion or other natural processes. Water can escape from the reserve pit into surrounding surface waters during high water events. However, the pit was sampled in 1989 and closed by the Alaska Department of Environmental Conservation in 1995. There is little to no solid waste onsite and the site does not pose a travel risk to local residents.

Figure 1: Aerial view of Inigok #1. The drill pad and reserve pit are visible in the lower left. A road leads from the oversized apron off the airstrip to the drilling pad. The BLM camp is situated on the apron.

Figure 2: Inigok #1 flare pit and its connection with the reserve pit.

Figure 3: Aerial view of the Inigok #1 drill pad and reserve pit. The green areas of the pad show the uninsulated portions and have been subject to thermokarsting.

Figure 4: Inigok camp seen from the road that leads to the Inigok #1 well.

Figure 5: Inigok #1 wellhead with the reserve pit to the right.

Figure 6: Seismic exploration camps have periodically staged equipment over summer at Inigok.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Inigok #1 was drilled in 1979 to a depth of 20,102 feet and cased to 17,432 feet. It is the second deepest well drilled by Husky Oil (Tunalik is the deepest). The objective of the test well was to assess a structural/stratigraphic trap within the Sadlerochit and Lisburne groups (Husky Oil NPR Operations for U.S. Geological Survey-Inigok 1983). Gravel for the airstrip, apron, and pad were hauled via a 23-mile ice road from the Colville River.

- **Well Condition**: The wellhead is good condition. It consists of three spools, each with a gate valve, a master valve, and a needle valve. There are 10 plugs to surface. There is no diesel fuel in the wellbore **[Figure 7]**.

Plugs	Depth (feet)	Cement
Plug No. 1	**19,200**	**200 Sacks Class J**
Plug No. 2	**17,978**	**200 Sacks Class J**
Plug No. 3	**16,600**	**250 Sacks Class J**
Plug No. 4	**12,251**	**200 Sacks Class G**
Plug No. 5	**11,450**	**200 Sacks Class G**
Retainer Set	**@ 7,981**	
Plug No. 6	**7,981**	**200 Sacks Class G**
Retainer Set	**@ 2,003**	
Plug No. 7	**2,003**	**250 Sacks Arctic Set II**
Plug No. 8	**1,409**	**250 Sacks Arctic Set II**
Plug No. 9	**940**	**200 Sacks Arctic Set II**
Plug No. 10	**425**	**234 Sacks Arctic Set II**

- **Wellhead Components**: There are two gate valves and no gauges **[Figure 8]**.

Geologic Setting: Some very poor gas shows were recorded in the Sag River, Nanushuk, and Endicott Group. Poor oil shows were reported for the Kingak Shale and Lisburne Group. The best shows were found in the base of the Torok Formation at 8,852 feet. No oil or gas was recovered during multiple production tests (Husky Oil NPR Operations for U.S. Geological Survey-Inigok 1983).

Development Potential: Until future subsurface information dictates otherwise, the Inigok area is not seen by industry as a future potential exploration target. Inigok #1 will have no effect on future development as it is plugged.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: None

Justification: There are adequate cement plugs including a surface plug that prevents the movement of any fluids between the different formations or to the surface. The wellhead remains in place.

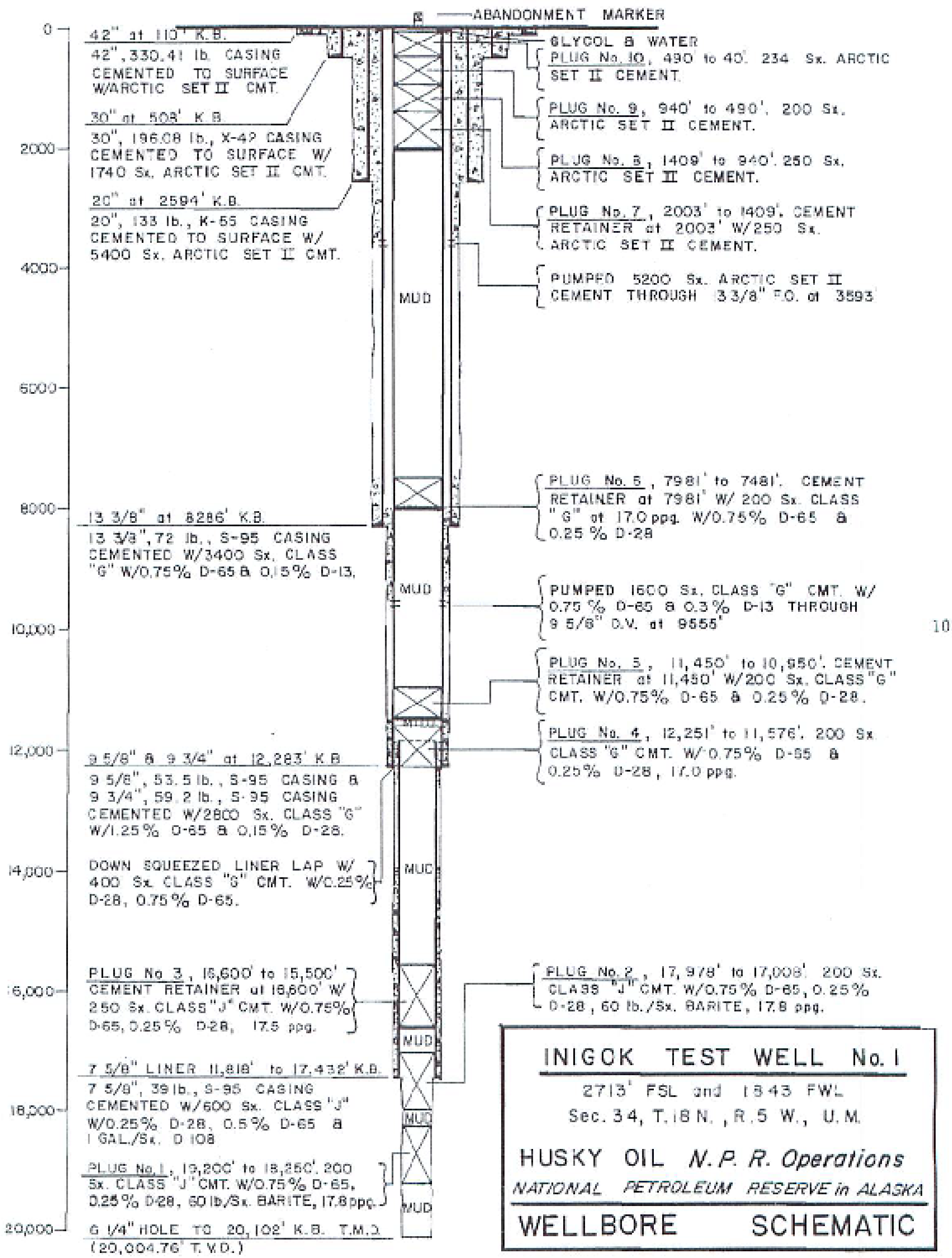


Figure 7: Inigok #1 wellbore diagram.

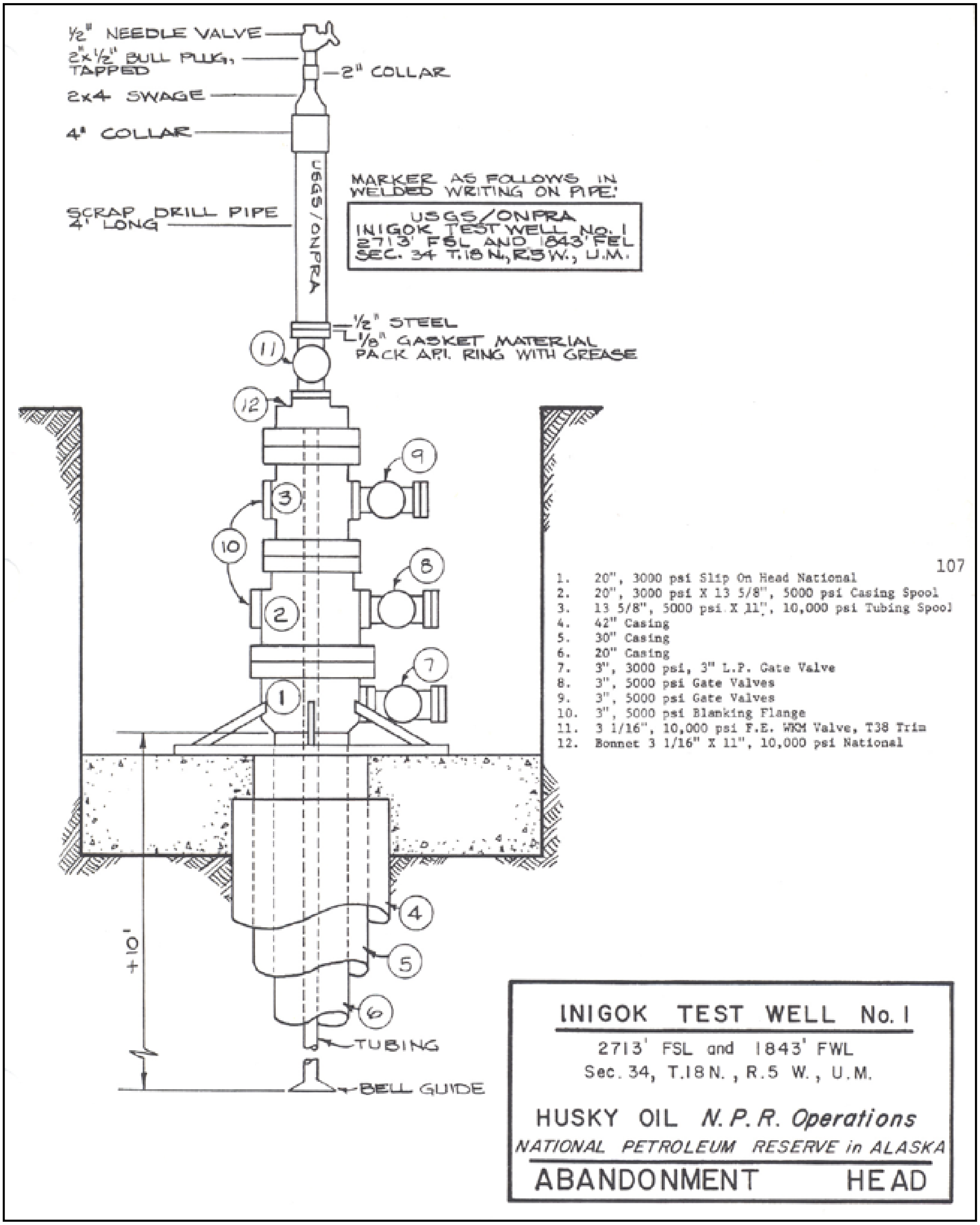


Figure 8: Inigok #1 Wellhead Assembly

J.W. Dalton #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9202° N, -153.1378° W. The J.W. Dalton site is 1 mile east of the Lonely Defense Early Warning (DEWLine) site, approximately 70 miles northwest of Nuiqsut and 87 miles southeast of Barrow. The last overflight of the J. W. Dalton site was in July 2011.

Site Description: The J.W. Dalton site consisted of a well, pad and reserve pit. Husky Oil drilled the well for the USGS in 1979. [**Figures 1-4**] In the summer of 2004, warmer temperatures, wind, and wave action eroded nearly 200 feet of the coastline adjacent to the well putting the well on the fringe of the oceans grasp. Aerial photos taken of the J.W. Dalton well site in September 2004 revealed imminent exposure of the well and its reserve pit to the Beaufort Sea. [**Figures 5-6**] In October 2004, a site visit discovered that the conductor casing of this well had been exposed by the processes of coastal erosion. Plans were put into place to plug and abandon this well before another year of summer and fall storms would ultimately place this well into the Beaufort Sea, potentially causing a leak of the diesel fuel from inside the wellbore. The well was excavated to 8 feet below sea level, cut and capped at 5 feet below sea level and buried on April 23, 2005. **[Figures 7-10]**

The reserve pit was evaluated in 1989 in a joint effort between the BLM and USGS. Limited sampling found elevated levels of Barium, Chromium, Cobalt, and Zinc. The reserve pit was sampled again in October 2004, but was not taken at a sufficient depth to determine the presence of hydrocarbons. In a letter dated Dec. 8, 2004, the Alaska Department of Environmental Conservation (ADEC) required that the BLM to implement measures to prevent release of drilling wastes, conduct additional sampling, and submit a corrective plan of action based on the sampling results. Additional sampling occurred in mid-February 2005 by contractor Ecology and the Environment. Their report showed the reserve pit did not contain elevated levels of hydrocarbons. Likewise, none of the 14 priority metal pollutants were significantly elevated. However, Barium was detected at relatively high levels. Excavation of the reserve pit occurred concurrently with the well plugging to save on mobilization and demobilization costs. The material excavated from the reserve pit was brought to Point Lonely (approximately 1 mile to the east), where it was bagged up in Supersacks and barged off the following summer.

Surface Risk Assessment: None

Justification: The site has been remediated. As of the last overflight in 2011, the old location of the wellbore was approximately 200-300 feet offshore. **[Figures 11-12]** All surface debris was removed during well plugging operations and reserve pit remediation.

Figure 1: J.W. Dalton #1 wellhead, filled-in cellar, wooden pilings, and Beaufort Sea (August 2000).

Figure 2: J.W. Dalton #1 looking toward the Beaufort Sea. The reserve pit, which experienced as much thermokarsting as the pad, is at the bottom of the photograph (August 2000).

Figure 3: J.W. Dalton #1 wellhead with filled-in cellar is at the middle left (June 2003).

Figure 4: J. W. Dalton #1 pilings extending toward the Beaufort Sea (June 2003).

Figure 5: J.W. Dalton on October 26, 2004. Soil cracking was occurring around the wellhead and the north and east side of the cellar was exposed to the Beaufort Sea.

Figure 6: Aerials of the J.W. Dalton #1 site. The left image was September 2004 and the right image was August 2006. The red circles show the wellhead location.

Figure 7: Excavating around the J.W. Dalton wellhead in preparation for plugging and removal of the casing (April 2005).

Figure 8: While cutting away the conductor at the J.W. Dalton #1 well, gas seeping from around the outside of the casing caught fire. Gas continues to seep around the outside of the casing today creating an underwater gas seep (April 2005).

Figure 9: Lined cells created at Lonely to store excavated reserve pit material before putting in Supersacks (April 2005).

Figure 10: Excavation of the J.W. Dalton #1 reserve pit (April 2005).

Figure 11: In June 2007, all that remained of J.W. Dalton #1 well site was the old flare pit.

Figure 12: J.W. Dalton #1 in July 2010. It is approximately 200 feet from the shoreline (at right).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** J.W. Dalton #1 was drilled in 1979 to a depth of 9,367 feet. It was cased down to 8,898 feet and was plugged back to 1,580 feet (Husky Oil 1982). Approximately 230 barrels of diesel fuel were placed downhole to act as a neutral medium for collecting wellbore temperatures. Diesel fuel inside the well was being used as a non-freezing medium for temperature logging by the USGS. Plugging operations began on April 13, 2005. Approximately 9,300 gallons of diesel was displaced with salt water mixed with additional salt down to the shallowest plug at 1,580 feet. A bridge plug was run into the well at 180 feet and cement pumped from 180 feet to 28 feet. The well was excavated to 8 feet below sea level, and the casing was cut off and capped at 5 feet below sea level, and buried on April 23, 2005.

  After the plugging was completed on the well, gas was observed to be seeping up from the outside of the well casing. This phenomenon is suspected to be a result of using warm fluids downhole, warming the casing, causing gas to break from the permafrost. It is not unreasonable to think that the situation will become static given enough time and that the gas will cease to seep. Unfortunately, the water surrounding the casing may impede this process. At this point, there is not a good remedy, as the gas is coming up from the outside of the casing wall. The well is properly plugged and it is judged to be *extremely* unlikely that the gas is coming from deeper formations.

- **Well Condition:** J.W. Dalton #1 has been properly plugged and abandoned **[Figure 13]**.

- **Wellhead Components:** The wellhead was removed during the plugging and abandonment in 2005.

Geologic Setting: The primary objective of the well was to determine if hydrocarbons were present within the Sadlerochit and Lisburne Groups. Gas shows were encountered in trace amounts in the Ivishak Formation, and the Lisburne and Endicott Groups. Poor-to-good oil shows were discovered in the Ivishak Formation and the Lisburne Group. A drill stem test of the Lisburne Group recovered 22 barrels of oily water. Oil and trace gas was also recovered within the Ivishak Formation (Gyrc 1988).

Development Potential: There is not much chance for development on BLM-managed lands in the J.W. Dalton area as they are closed to leasing. The area offshore is managed by the State of Alaska where leasing could occur, with possible development. J.W. Dalton #1 will have no effect on future development as it is properly plugged.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: This well was a USGS monitor well from 1979 until 2004.

Subsurface Assessment: Low

Justification: The well has been adequately plugged per Federal regulations, however, the gas seeping around the outside of the casing will continue to be monitored.

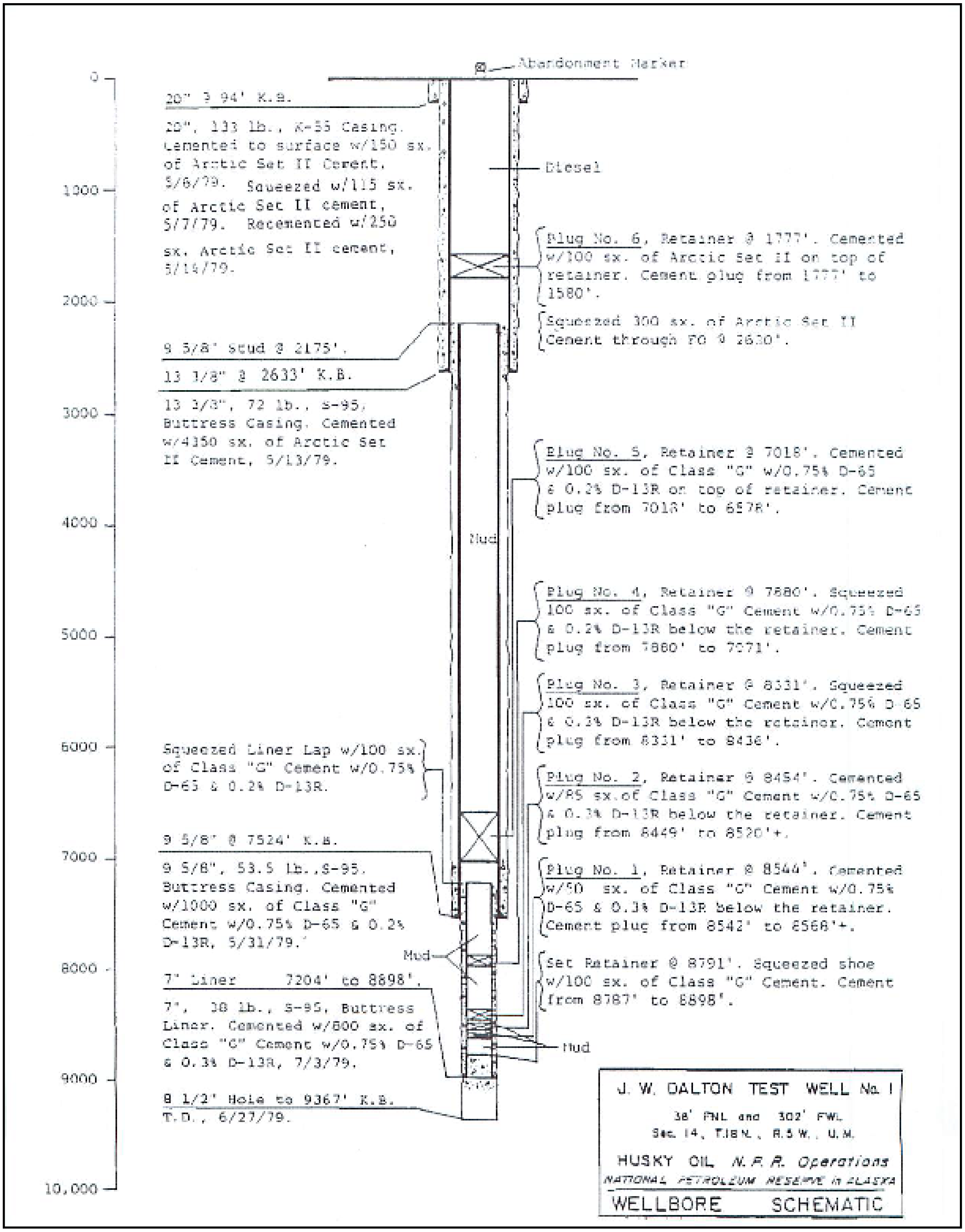


Figure 13: J.W. Dalton #1 wellbore diagram.

Kaolak #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.9333° N, -160.2475° W. The Kaolak #1 site is 46 miles southwest of Wainwright and 77 miles west of Atqasuk. The last site inspection was in July 2012.

Site Description: The Kaolak #1 site consists of a well with an associated scatter of surface debris, including a building, a collapsed building, and 55-gallon drums [**Figure 1**]. The site did not include a pad, well cellar or reserve pit. The U.S. Navy drilled the Kaolak #1 well in 1949 **[Figure 2]**. A cabin/ structure is present on the northern portion of the pad. The structure appears to be a relic from the drilling operation **[Figure 3]**. Remnants of a once-standing structure are located to the northeast of the existing structure. Specifically, the structure appears to have once been a splitting image of the standing structure (same layout, dimensions, building materials, roof construction, plywood siding, etc). Two drums (presumably empty) are floating in a pond near the well **[Figure 4]**.

Approximately 30 steel pipes protrude from the ground to the north of the well. These pipes appear to have been support members for a platform associated with drilling operations **[Figure 5]**. The flat tops that housed the base of the platform are cut off (as was common practice by the Navy when leaving a site). An additional 40-50 wooden pilings are within 50 feet in all directions of the well. Their surface height varies depending on the upward effect from the underlying permafrost.

To the west (up the hill) from the well about 500 feet appears to be an area used to bury solid wastes **[Figure 6]**. The possible bury site is relatively small, approximately 20 feet by 30 feet and overgrown with vegetation, while the entire area of disturbance is about five times that. The extent of buried solids is impossible to tell due to the vegetation. It is also possible that solids were left on the ground surface at abandonment and nothing is buried there at all. Noted at this location is a large steel frame and 4 large timbers. The potential bury site is sandwiched by two small ponds.

Surface Risk Assessment: Moderate

Justification: There are no known contaminants present on the Kaolak Site. No oil sheen or hydrocarbon odors were detected in the pond with the floating drums or within any surface water body checked. Additionally, the well site is not near any streams of rivers and is not under any threat due to erosion or other natural processes. Most of the ponds present resulted from low areas filling in with water after the Navy bulldozed the original tundra mat. There is a large amount of solid waste present on the site, which both impacts visual resources and could pose a travel risk to local residents.

Figure 1: Overall layout of the Kaolak #1 well site. North is to the right in this photo (July 2012).

Figure 2: Kaolak #1 well with old U.S. Navy structure/subsistence cabin in the background (July 2012).

Figure 3: Recent bear activity on the west side of the old structure at the Kaolak #1 site (July 2012).

Figure 4: Two drums floating in a small tundra pond near the Kaolak #1 well (July 2012).

Figure 5: Large timbers resting on top of uncut metal pilings at the Kaolak #1 site (July 2012).

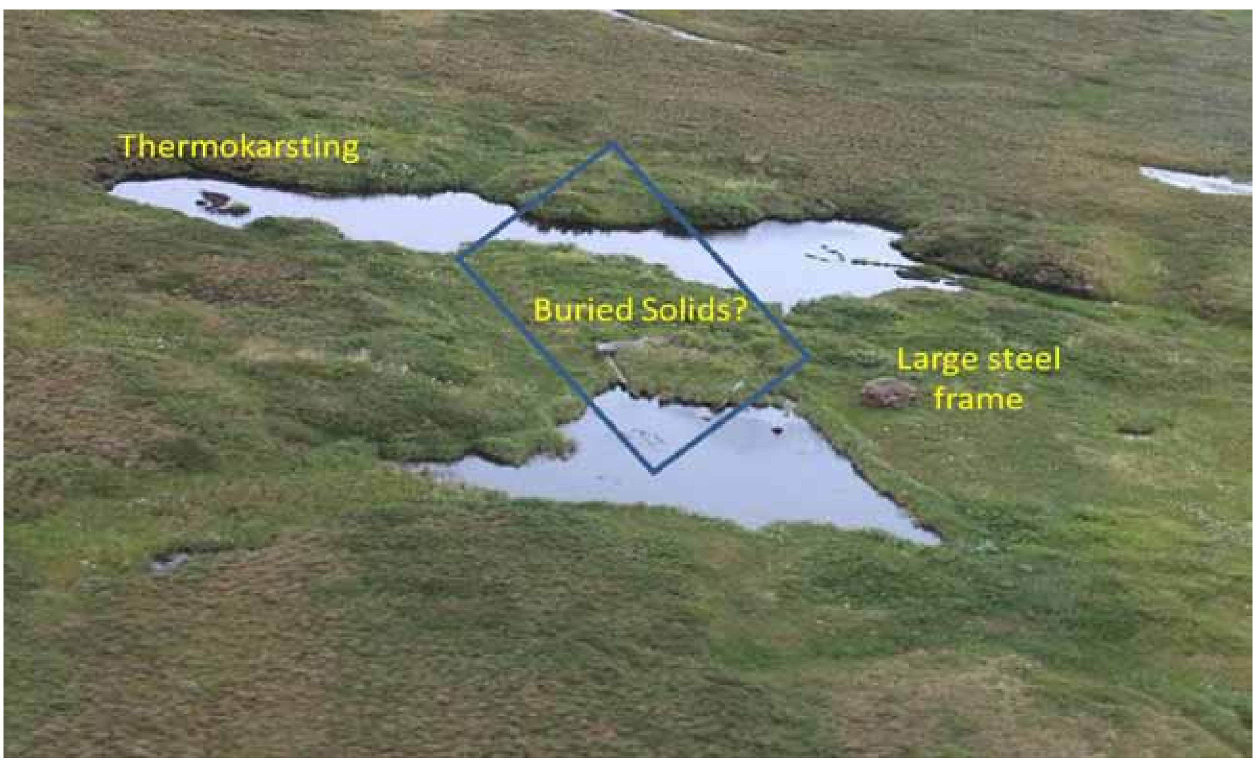


Figure 6: Photo showing possible solid waste disposal area at the Kaolak #1 site (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Kaolak #1 was drilled in 1951 to a depth of 6,952 feet and casing was set to 1,000 feet **[Figure 7]**. Drilling in this remote portion of the reserve served two purposes, to determine the presence of any reservoir characteristics; and, if oil or gas shows were present. The site was chosen based on a seismographic survey in 1950 that identified an anticline at this location. The intent was to drill to a depth of 8,000 feet, but a windstorm destroyed the derrick. After the storm, the hole was abandoned due to unsatisfactory oil and gas shows. Findings indicated some very poor oil and gas shows in the Chandler Formation and very poor shows in the Topagoruk Formation (Collins and Bergquist 1958).

- **Well Condition:** There is no cellar or reserve pit(s) associated with Kaolak. The well is open to the atmosphere with no valves or gauges.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: Drilling resulted in some very poor oil and gas shows in the Chandler Formation and very poor shows in the Topagoruk Formation. Gas shows were attributed to association with the coal beds (Collins and Bergquist 1958).

Development Potential: Gas shows were attributed to association with the coal beds (Collins and Bergquist 1958). Upon abandonment, no plugs were set and the hole was filled with heavy muds. If development were to occur, industry would likely target deeper formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is was no indication of hydrocarbons escapement at this location.

Subsurface Risk Assessment: **Moderate**

Justification: The test well encountered very poor oil and gas shows and there were no cement plugs set. Heavy muds were added to the wellbore before abandonment. These muds have frozen and have created an ice plug. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

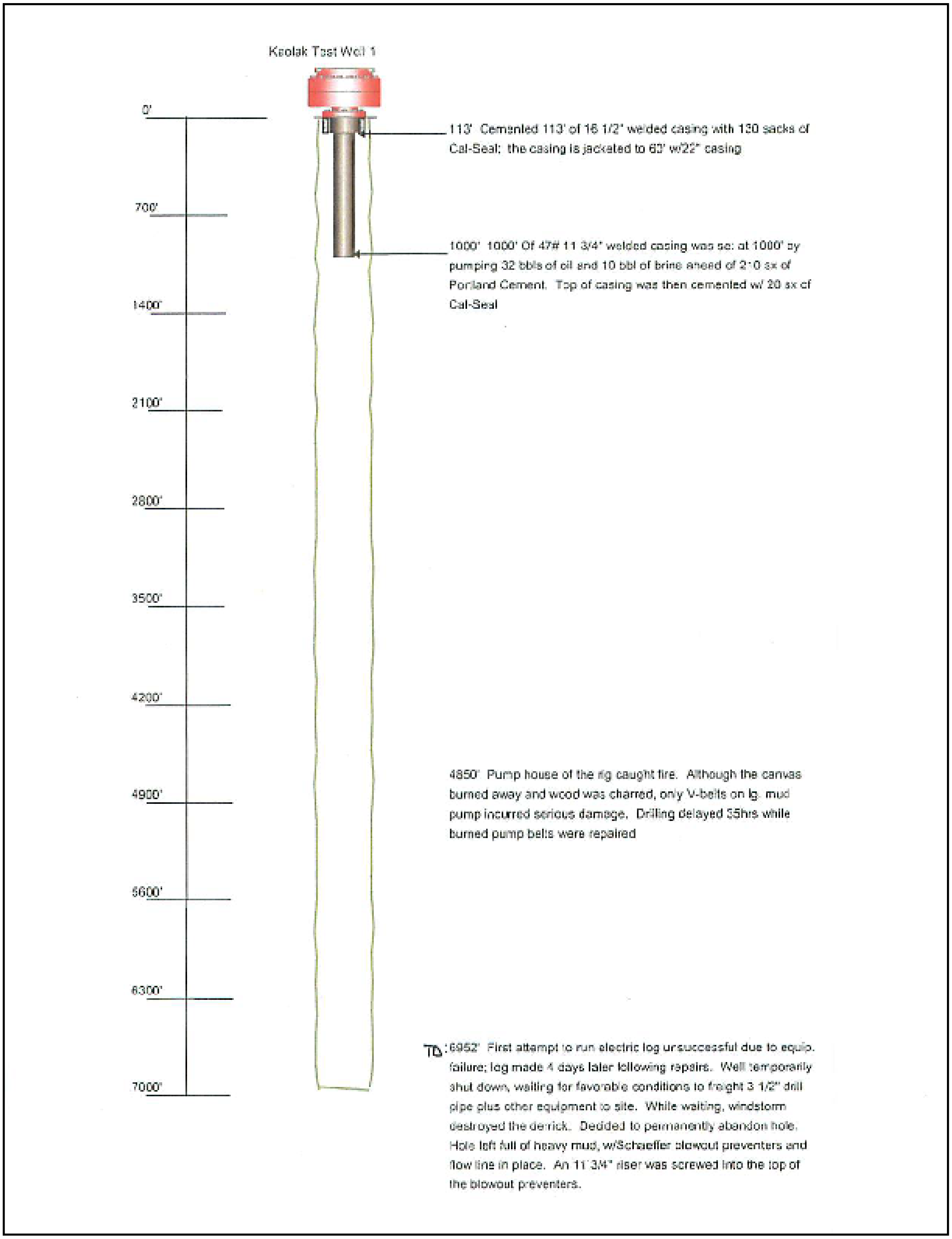


Figure 7: Kaolak #1 wellbore diagram.

Knifeblade #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.1511° N, -154.8892° W. The Knifeblade #1 site is 65 miles west/southwest of Umiat, 111 miles southeast of Atqasuk, and 116 miles southwest of Nuiqsut. The last site inspection was in July 2012 **[Figure 1].**

Site Description: The Knifeblade #1 site consists of a well casing only. There is no cellar, pad or reserve pit associated with this site. The U.S. Navy drilled this well in 1951. The well casing consists of an 8 ¼-inch diameter pipe, about 3 feet above the ground surface. The top of the casing is threaded and has been damaged **[Figure 2]**

The well is located in a wide, bowl-like depression near the top of Knifeblade Ridge. It is characterized by wet grasses [**Figure 3]**. The open casing is located within the wet grasses. The permafrost surrounding the well has degraded to the point that a very small pond has formed [**Figure 4]**. Knifeblade #1 is located at the headwaters of a small stream that eventually develops a channel and flows several miles south and into the Colville River.

Surface Risk Assessment: Low

Justification: There are no contaminants or solid wastes at Knifeblade #1. The site is not under threat due to erosion or other natural processes. There is no solid waste on site and it does not pose a travel risk to local residents. The site has minimal impacts to visual resources.

Figure 1: Knifeblade #1 is located in a valley dominated by wet grasses (yellow) below ridgeline (June 2010).

Figure 2: Knifeblade #1 damaged casing (July 2010).

Figure 3: Wet grasses dominate the area around Knifeblade #1 (August 2002).

Figure 4: The Knifeblade #1 well and small puddle forming around the base of the casing. The small puddle is a result of permafrost slowly melting around the base of the casing (July 2010).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Knifeblade #1 was drilled in 1951 and is classified as a dry hole. The well was drilled to a depth of 1,805 feet and cased to 1,211 feet **[Figure 5]**. Knifeblade #1 is only 20 miles south of Titaluk #1. The drill rig at Titaluk #1 could be seen on clear days (Robinson and Bergquist 1959). Knifeblade #1 is approximately 1 mile NE of Knifeblade #2 and #2A. The mobilization from the Wolf Creek area to Knifeblade was made during July. The lead tractor, which could not pull a load, was taxed to its capacity by bulldozing a furrow down to the permafrost zone so that the following tractors could secure sufficient footing. As much as 18 inches of thaw was encountered in some places, although 12 inches was the average depth. By comparison, the same load could be transported in winter in 1½ days with 2 tractors (Robinson and Bergquist 1959).

- **Well Condition**: A drill pad does not exist. Since the drilling occurred in the wet tundra, there is not even a tundra scar to outline the operations area. The drill rig (mast, engine, etc) were assembled as a complete unit and mounted on a welded steel-pipe sled, which was blocked up on 12-inch x 12-foot timbers (Robinson and Bergquist 1959). Knifeblade #1 is a difficult well to locate, as the only indication of past activity is the open casing sticking up out of the ground. The open casing is a 8 ¼-inch pinup inside an 11 by 12 ¼-inch collar. The top of the casing is damaged. A plumb-bob was lowered downhole and hit solid at 12 feet (likely the ice plug).

Wellhead Components: There is no wellhead at this site.

Geologic Setting: The purpose of the well was to test the oil and gas properties of the Grandstand and Tuktu formations. The well encountered very poor gas shows in the Killik Tongue of the Chandler Formation and very poor oil and gas shows in the Grandstand Formation. The geology is slightly different at Knifeblade #1 than Knifeblades #2 and #2A as it is on a different fault block and higher up in the Chandler Formation (Robinson and Bergquist 1959).

Development Potential: It is speculated that the Knifeblade wells were dry because they were drilled too low on the anticline, but more likely this is due to an unfavorable structural history (Robinson and Bergquist 1959). Regardless, industry has shown no interest in this area since the U.S. Navy drilled these wells.

Groundwater Resource: Temperature readings from thermistors were used at Knifeblade #1 to calculate permafrost depths, and found them to be shallower here than any other location in National Petroleum Reserve in Alaska. Water was encountered at 845-850 feet in Knifeblade #1 and at 857 feet in Knifeblade #2A (Robinson and Bergquist 1959). Permafrost above these depths would preclude the possibility of fresh water aquifers.

Other Information: An airstrip constructed on top of a nearby ridge would be suitable for a C-47 type aircraft. To support the drilling effort at Knifeblade, approximately 100 tons of supplies were flown in (Robinson and Bergquist 1959). Today, the airstrip is hardly visible. There is no indication of hydrocarbon escapement at or near the well.

Subsurface Risk Assessment: **Moderate**

Justification: Knifeblade #1 is a shallow test well drilled to a total depth of 1,805 feet. Very poor oil and gas shows were encountered while drilling. No cement plugs were set, but the hole was backfilled with heavy drilled muds that froze in place, creating an ice plug. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

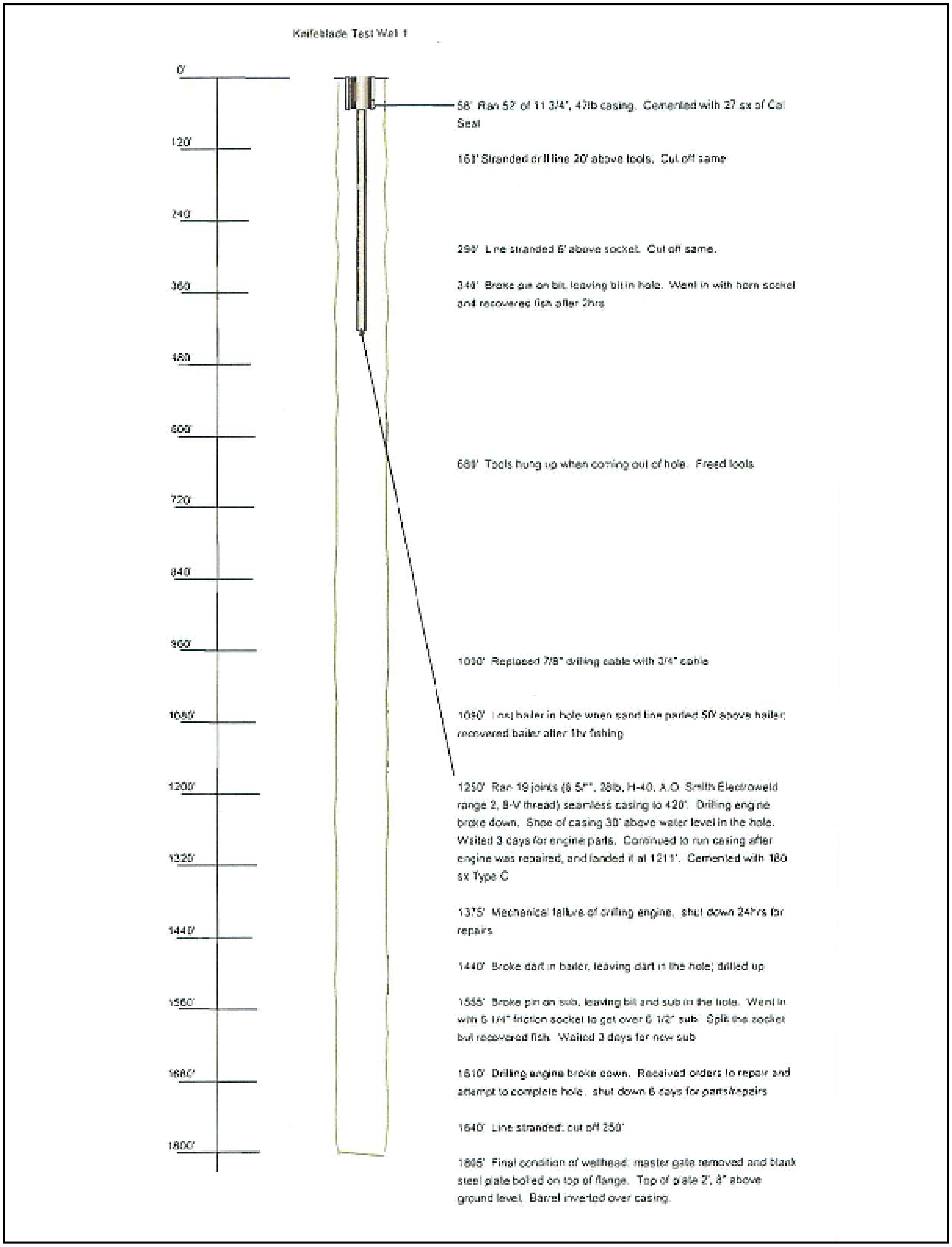


Figure 5: Knifeblade #1 wellbore diagram.

Knifeblade #2 and #2A

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.1386° N, -154.7366° W and 69.1227° N, -154.7337° W respectively. Knifeblade #2 and #2A are approximately 67 miles west/southwest of Umiat. Atqasuk is 112 miles to the northwest and Nuiqsut is 118 miles to the northeast. The last site inspection was in July 2012.

Site Description: The Knifeblade #2 and #2a site consists of two wellbores and a small scatter of surface debris **[Figure 1]**. The U.S. Navy drilled these wells in 1951. There is no cellar, pad, or reserve pit associated with this well site. Scattered around the wells are debris, drums, and equipment parts. Several empty drums and broken pieces of wood are in the bottom portion of the ephemeral stream, among the tall willows. Navy drilling operations moderately disturbed the general area, but willows have overgrown the area since demobilization occurred. Knifeblade #2 and 2a are adjacent to each other, approximately 28 feet apart, on the toe of a hill **[Figures 2-4].** Knifeblade #2 shows minor corrosion occurring where the casing meets the ground surface **[Figure 5]**. Knifeblade #2A can be seen surrounded by small willows [**Figure 6]**.The ephemeral stream that flows through the area has exposed a thick coal seam **[Figure 7].**

Surface Risk Assessment: Low

Justification: This site has no known contaminants. A small, ephemeral stream drains within 50 feet of the two open holes. There is no risk of erosion to the two wells from the small stream, however, as willows and other vegetation stabilized the stream banks. A small stream runs through the main valley, downhill of the two wells and solid wastes. The ephemeral drainage flows into this stream. There is little to no solid waste on site and it does not pose a travel risk to local residents.

Figure 1: Layout of the Knifeblade #2 and #2A site (July 2010)

Figure 2: The bottom of the hill along the ephemeral stream, Knifeblade #2 and #2a lie outside of the photo, upstream and to the left. The thick vegetation in the upper middle of the photo shows the location of the perennial stream. Small amounts of water are oftentimes observed at this portion of the ephemeral stream as it nears its confluence with the perennial stream. The blue drum in the photo is empty (August 2002).

Figure 3: Empty blue drum from the previous photo in the stream below Knifeblade wells #2 and #2a (August 2002).

Figure 4: Ephemeral stream with solid wastes in the channel at Knifeblade #1 in August 2002 are still present today. Knifeblade wells #2 and #2a are located to right of the photograph (not pictured).

Figure 5: Knifeblade #2. showing minor corrosion occurring where the casing meets the ground surface (June 2011).

Figure 6: Knifeblade #2A (June 2011).

Figure 7: Near Knifeblade wells #2 and #2a, the ephemeral stream has an exposed coal seam upstream of the wells (June 2011).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Knifeblade #2 was drilled in 1951 and was classified as a dry hole. The drill rig was brought to Knifeblade #2 after drilling in the Wolf Creek area. Knifeblade #2 was the first of the three Knifeblade wells the U.S. Navy drilled, and reached a total depth of 373 feet, was cased to 45 feet, then junked and abandoned. The drill hole did not even get through the permafrost. It was the shallowest cased test well the Navy completed.

  After completing the Knifeblade #2 well, the rig was skidded over 28 feet to drill Knifeblade #2A **[Figure 9]**. It was also drilled in 1951, reached a total depth of 1,805 feet and was cased to 38 feet (Robinson and Bergquist 1959).

- **Well Condition**: Some corrosion has occurred to the outside of the casing on Knifeblade #2, but not enough to affect its structural integrity. [**Figure 5**] The collar for Knifeblade #2 was cut with a torch before the U.S. Navy departed the site.

- **Wellhead Components**: There is no wellhead at this site for either Knifeblade #2 or #2A.

Geologic Setting: The purpose of Knifeblade wells #2 and #2a was to test the oil and gas properties of the Grandstand and Tuktu formations. Knifeblade #2 did not have any hydrocarbon shows. Knifeblade #2A reported a very poor oil and gas show in the Grandstand Formation (Robinson and Bergquist 1959).

Development Potential: It is unlikely that exploration and development will occur in the well's vicinity in the near future. If left unplugged, the wells have no potential to adversely affect future development.

Groundwater Resource: Permafrost depths were calculated using temperature readings from thermistors.Permafrost proved to be shallower here than at any other location in the National Petroleum Reserve in Alaska. Water was encountered at 845-850 feet in Knifeblade #1 and at 857 feet in Knifeblade #2A (Robinson and Bergquist 1959). Permafrost above these depths would preclude the possibility of fresh water aquifers.

Other Information: There is no indication of hydrocarbon escapement at or near the wells.

Knifeblade #2 Subsurface Risk Management: Low

Justification: Knifeblade #2 was drilled to a shallow depth of 373 feet and had no oil and gas shows. No cement plugs were set and there is no wellhead.

Knifeblade #2A Subsurface Risk Assessment: **Moderate**

Justification: Knifeblade #2A is a shallow test well drilled to a total depth of 1,805 feet. Very poor oil and gas shows were encountered while drilling. No cement plugs were set, but the hole was backfilled with heavy drilled muds that froze in place, creating an ice plug. No migration of hydrocarbons has been observed coming up through the frozen column of drilling muds.

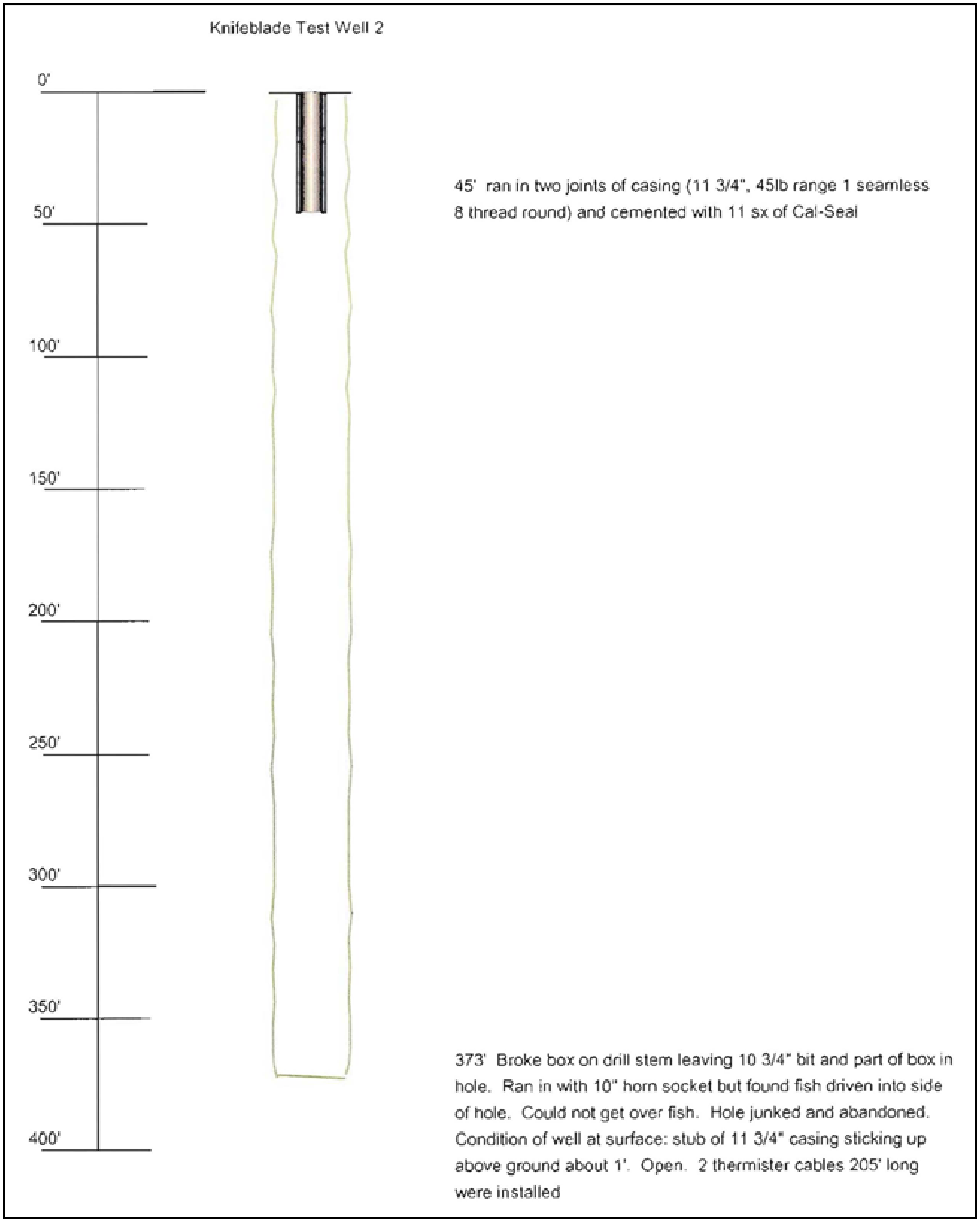


Figure 8: Knifeblade #2 wellbore diagram.

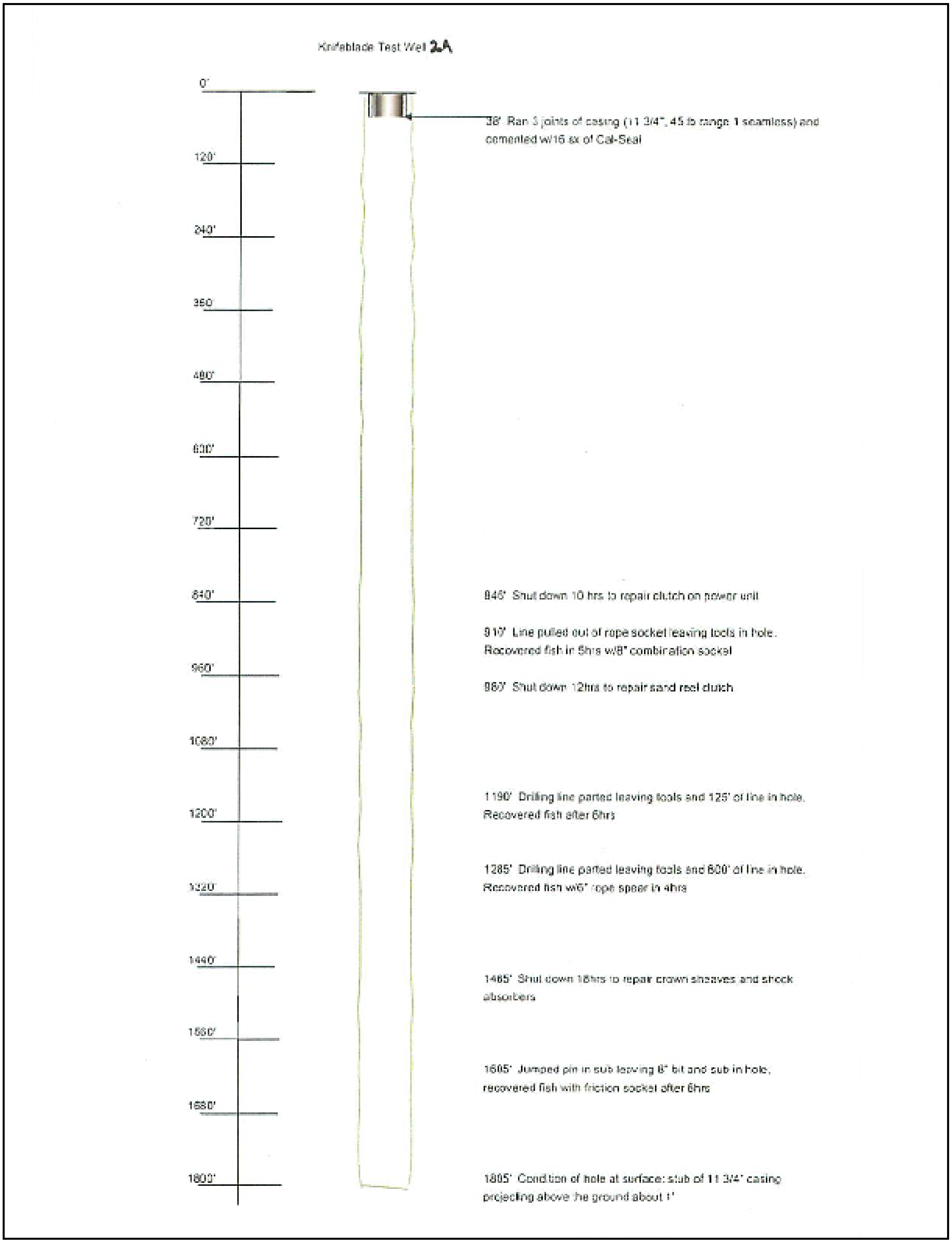


Figure 9: Knifeblade #2A wellbore diagram.

Koluktak #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 69.7696° N, -154.5310° W. The Koluktuk #1 site is 65 miles west/northwest of Umiat, 84 miles southeast of Atqasuk, and 93 miles southwest of Nuiqsut. The last site inspection was in July 2012.

Site Description: The Koluktuk #1 site consists of a well in a constructed wooden cellar, a primary and secondary pad, and a reserve pit. [**Figures 1-4**] Husky Oil drilled the well under contract to the USGS in 1981. The wooden cellar is in fair condition and has several inches of standing water. The rat hole within the cellar is open to the environment **[Figures 5-8]**. There are two other open holes with identical casing outside of the cellar and both holes are open to the environment.

The primary well pad is in good condition, with some uplift on the northern edge. The second well pad is in the process of slowly being reclaimed by the surrounding tundra. Both pads are heavily vegetated from a vegetation experiment comprised of mostly non-native species (invasive plants). These non-native species are migrating off the pad and pit walls into the surrounding tundra. Overall, vegetation is light, as gravel still prevails, and no camp trash or solid wastes are visible. There is some capped rebar on the pad with no name.

The flare pit wall has weathered to the point it now connects with the reserve pit. The reserve and flare pit walls are thawing, and this allowed water to move out of the pits and onto the adjoining tundra. The Alaska Department of Environmental Conservation sampled and closed the reserve pit in 1995. The BLM maintains a small drum cache of aviation fuel on-site within secondary containment for emergencies.

Surface Risk Assessment: Low

Justification: The site has no known contaminants. There is no threat of erosion from the river to the north at this time. Impact to visual resources is minimal.

Figure 1: Aerial view of Koluktak #1 showing the primary and secondary pads (July 2012).

Figure 2: Aerial view of Koluktak #1 (June 2011).

Figure 3: Aerial view of Koluktak #1 in June 2003.

Figure 4: Looking back toward the Koluktak #1 wellhead across both the flare pit (foreground) and the reserve pit (July 2012).

Figure 5: Exposed wooden pilings adjacent to the reserve pit at Koluktak #1 (July 2012).

Figure 6: Koluktak #1 wellhead and wooden cellar (July 2012).

Figure 7: Functional gate valve and replaced needle valve for Koluktak #1. Temperature monitoring by the USGS occurs through the old needle valve position (July 2012).

Figure 8: Rat hole inside the cellar for Koluktak #1 (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Koluktak #1 drilling pad was originally constructed in 1980, but was enlarged when field operations commenced Jan. 4, 1981. After the pad was completed, the drilling rig, Nabors Rig 17, was moved from the Lisburne wellsite to Koluktak. An ice airstrip was built to accommodate the move. The rig and camp move began on Feb. 17, 1981 and required 182 Hercules aircraft loads, which were completed on March 3, 1981. The well was spudded March 23, 1981, and activity was terminated on May 2, 1981. The well was drilled to a total depth of 5,882 feet, cased to 1,525 feet, and plugged back to 1,400 feet (Husky Oil 1983).

  The Koluktak #1 well is an active USGS monitor well. With the well properly plugged back and diesel fuel a non-corrosive agent, there are no downhole issues with the well at this time.

- **Well Condition:** At the conclusion of the drilling and evaluation operations, the well was plugged back with 4 cement and mechanical plugs set at various intervals in the wellbore with the top of the shallowest cement plug at 1,400 feet. From 1,300 feet to the surface, the hole is filled with diesel fuel overlying 100 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 9 ⅝-inch surface casing has cement from 1,525 feet to surface with cement in the 9 ⅝-inch by 20-inch casing annulus from 106 feet to surface. [**Figure 9**] The wellhead is capped with a closed – and operational – gate valve and cap. The wellhead is in good condition.

- **Wellhead Components:** There are three valves and no gauges [**Figure 10**]**.** The USGS has removed the needle valve to allow for a protected cable to be run down the wellbore to log temperature data.

Geologic Setting: The primary objective was Cretaceous sandstones of the Nanushuk Group. The trap was a combination structural/stratigraphic trap with structural closure to the north, east, and south and a facies change from sandstone to shales to the west. The expected trap was not confirmed after drilling the well (Husky Oil 1983).

Minor shows of gas were detected from sands and coals in the lower Killik Tongue of the Chandler Formation and in the Grandstand Formation, but there were only rare occurrences of faint fluorescence or cuts. One sandstone unit at 3,724-3,742 feet had a 2,560-unit gas kick that required a 1.4 lb. per gallon increase in mud weight to kill. Only one other zone had any gas worth mentioning, and it was at the top of a sandstone at 2,220-2,248 feet where 700 units of gas were detected, but no fluorescence or cut was observed. Hydrocarbon shows in the Torok Formation were limited to minor gas kicks at 4,133-4,143 feet (250 units) and 4,147-4,157 feet (255 units). A study of the electric logs shows that although zones with porosities as high as 23 percent were present, most appear to have a high argillaceous and/or calcareous content that would make permeabilities low (Husky Oil 1983).

Development Potential: Industry has not expressed any interest in this area, but if development were to occur, Koluktak #1 is adequately cased and cemented from all lower formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: The USGS also maintains a weather station several hundred feet off the pad to the west. The weather station is enclosed by an electric fence due to bears.

There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

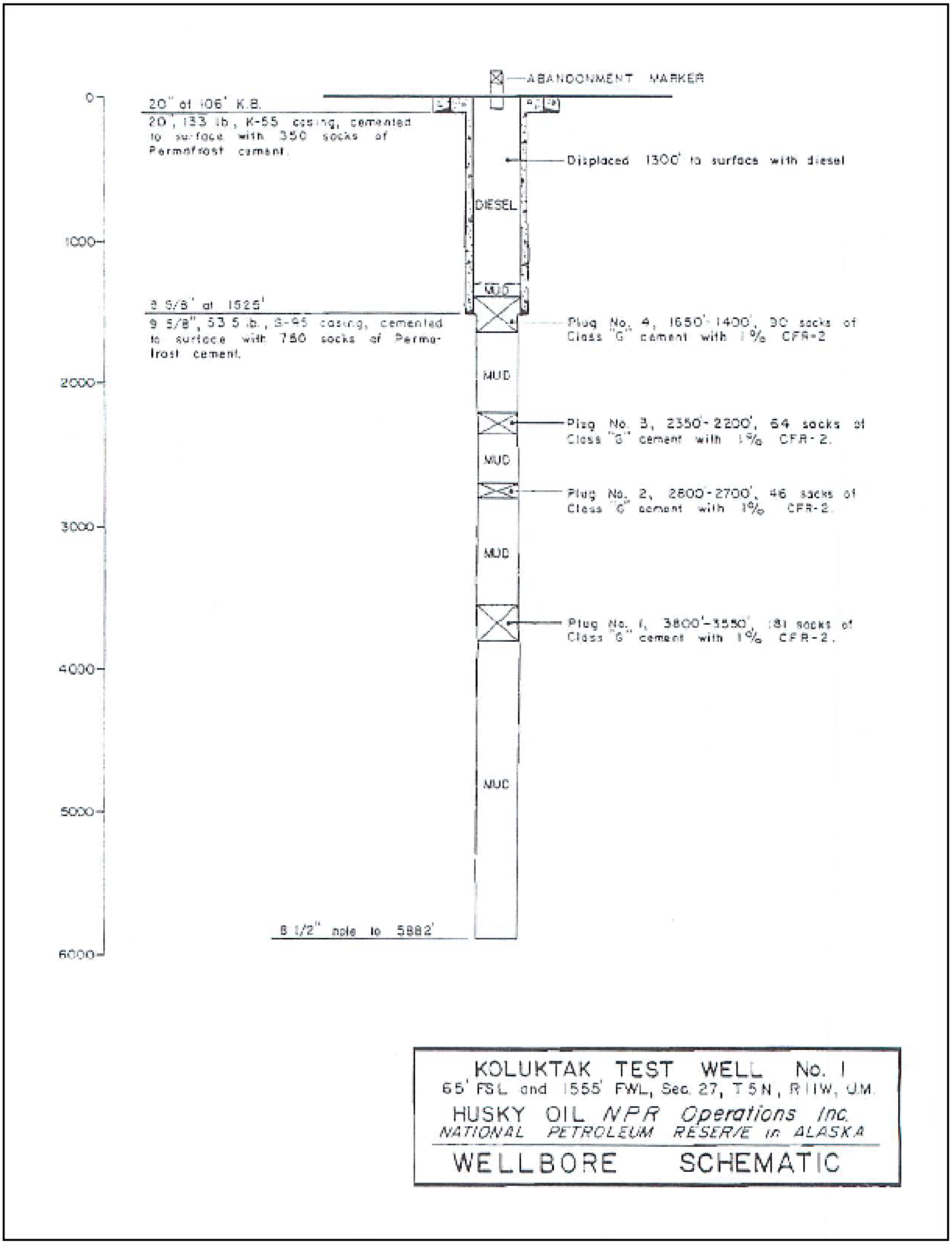


Figure 9: Koluktak #1 wellbore diagram.

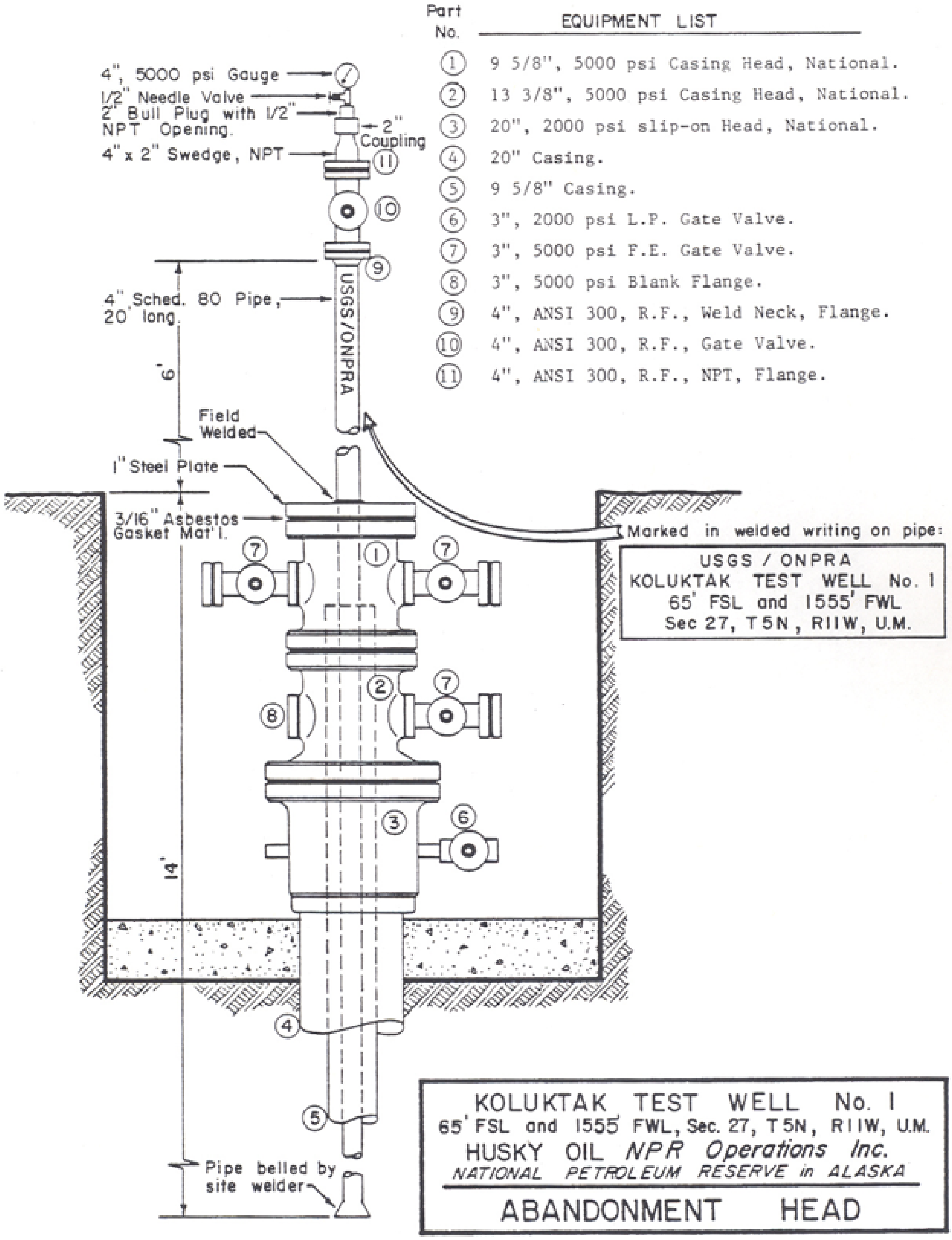


Figure 10: Koluktak #1 wellhead assembly.

Kugrua #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.5870° N, -158.6620° W. The Kugrua #1 site is 31 miles west of Atqasuk, 33 miles east of Wainwright, and 65 miles southwest of Barrow. The last inspection was in July 2012.

Site Description: The Kugrua #1 site consists of a well inside a constructed wooden cellar, a pad, and a reserve pit, flare pit, and fuel pit (all connected to the pad area) [**Figure 1**]. Husky Oil drilled the well in 1978 under contract to the USGS. The cellar is constructed of wooden 2 x 12s [**Figures 2-3]**. It is dry and slowly filling with organics. The bottom valve is partially covered with soil and grass.

The drill pad is made up of sandy material that was excavated while creating the reserve pit. The pad is one of the thick pad designs. The pad is approximately 5 feet thick with insulation placed between the sandy layers. In general, it is also a longer pad than the thin design, 500 feet compared to 200 feet. There is some thawing and erosion occurring along the pad edges **[Figure 4]**. Pilings remain from the drilling operations and extend to the south **[Figure 5]**. Two mud piles are visible on either side of the wellhead next to the reserve pit. Most of the pad is revegetated with grasses, mosses and sedges, with the exception of a few bare areas that appear dug out by an animal **[Figure 6]**. The pad is in adequate condition given its age and no maintenance.

The drill site contains a reserve pit, flare pit, and fuel pit. These three pits are still visible and separated by conspicuous berm. All three pits appear angular in appearance and intact. There are two piles of drilling muds stacked up next to the reserve pit. Wooden pilings also extend outward from the wellhead.

Surface Risk Assessment: Low

Justification: The site has no known contaminants. There are several small ponds near the drilling location, but these water bodies do not appear affected by Kugrua Test Well #1 site. The site itself is not under threat by erosion or any other natural processes. This site has minimal effect to visual resources.

Figure 1: Aerial view of Kugrua #1 (July 2012).

Figure 2: The cellar of Kugrua #1, with one side missing containing the wellhead and mouse hole. The rat hole is outside the cellar (July 2012).

Figure 3: Kugrua #1 wellhead with reserve pit and the larger of the two tailings piles (July 2012).

Figure 4: The Kugrua #1 reserve pit shoreline shows evidence of minor erosion during higher water events (July 2012).

Figure 5: The flare pit of Kugrua #1 is very shallow and contains small islands made of mud.

Figure 6: Little holes such as these consistent with ground squirrel or arctic fox activity, appear in several locations across the Kugrua #1 pad (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Barges brought the construction equipment to Peard bay during the summer of 1977 and transported south 12 miles to the Kugrua #1 well site. Well operations commenced with rig-up on Jan. 17, 1978. The well was spudded on Feb. 12, 1978, and activity terminated on May 29, 1978. From here, a Hercules C-130 brought the drilling rig to Tunalik. The Hercules' airstrip was located on a large lake approximately 1 mile west of the Kugrua #1 drilling location. Kugrua #1 was drilled to a total depth of 12,588 feet, cased to 8,704 feet, and plugged back to 1,894 feet **[Figure 7]**. To allow for the USGS to conduct temperature monitoring at regular intervals, no surface plug was set. Diesel fuel was used as the medium as it will not corrode the casing or freeze at temperatures encountered downhole.

- **Well Condition:** Six cement and mechanical plugs were set at various intervals in the wellbore, with the top of the shallowest cement plug at 1,894 feet. From 1,800 feet to the surface, the hole is filled with diesel fuel overlying 94 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 13 ⅜-inch surface casing has cement from 2,611 feet to surface with cement in the 13 ⅜-inch x 20-inch casing annulus from 496 feet to surface. The 9 ⅝-inch casing was cut off at 2,055 feet and removed with a retainer set above at 1,950 feet and cement set on top of retainer. The rat hole is open to the environment, located just off the wellhead and contained within the cellar.

- **Wellhead Components:** There is one gate valve and a needle valve, both are operational [**Figure 8**].

Geologic Setting: The objective of the well was to test a stratigraphic closure within the basal Lisburne Group or Devonian Age sediments. Other zones of interest included the Sadlerochit Group and possibly the Kuparuk River Sandstone. Gas shows were fairly frequent within the Nanushuk Group, specifically the formations associated with Cretaceous aged rocks (Corwin, Grandstand, and Torok formations). A gas show was recorded within the Kuparuk River sandstone. There were no shows of oil and gas in rocks from the either the Sadlerochit or Lisburne group. Poor porosity was encountered in this area (Husky Oil 1983).

Development Potential: Kugrua #1 is adequately cased and cemented from all lower formations, and should not adversely affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

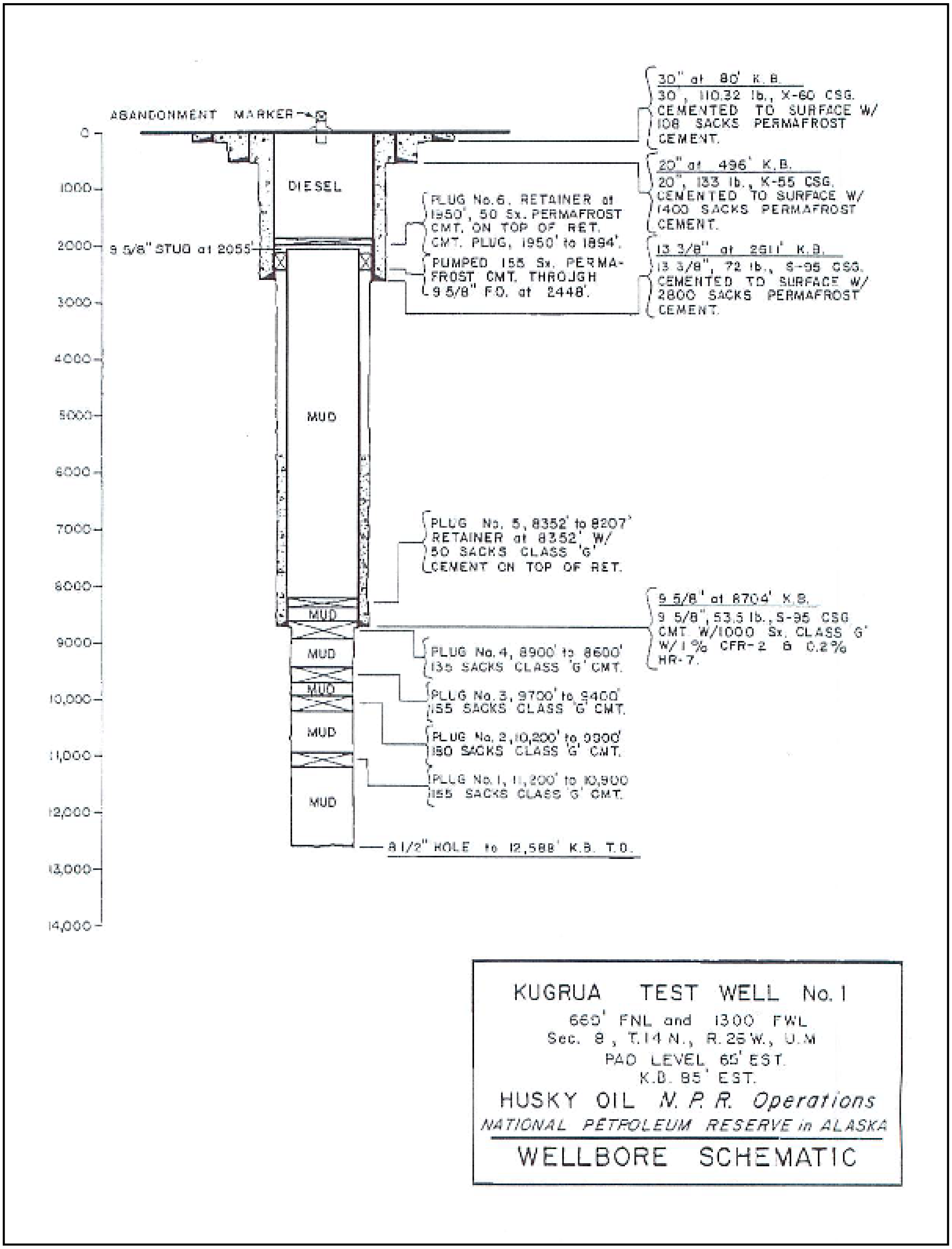


Figure 7: Kugrua #1 wellbore diagram.

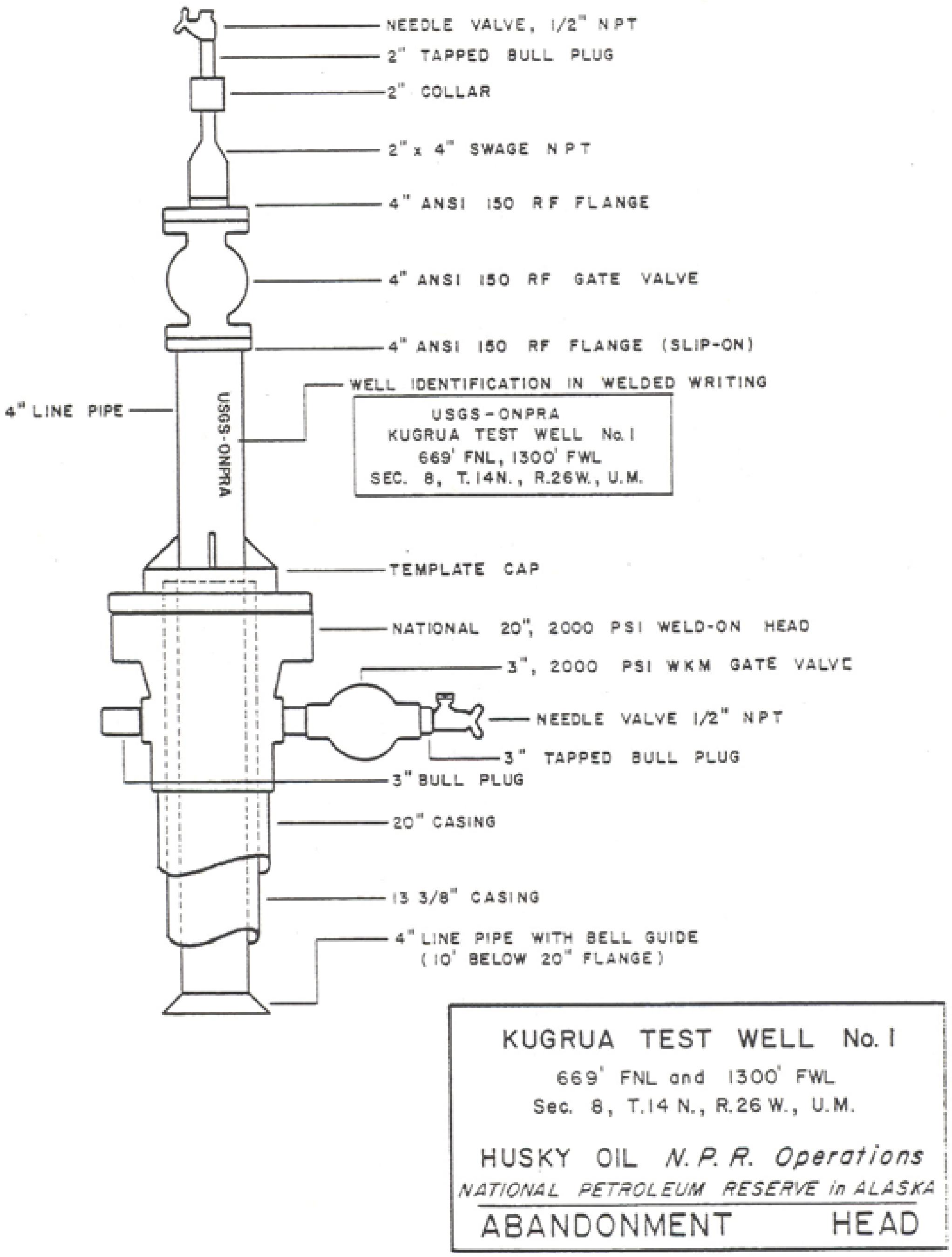


Figure 8: Kugrua #1 wellhead assembly.

Kuyanak #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.9328° N, -156.0223° W. Kuyanak #1 is 29 miles southeast of Barrow, 45 miles northeast of Atqasuk, and 128 miles west/northwest of Nuiqsut. The last site inspection was in July 2012.

Site Description: The Kuyanak #1 well site consists of a well inside a constructed wooden cellar, a pad, and a reserve and flare pit. **[Figures 1-4]** Husky Oil drilled the well under contract to the USGS in 1981. The wellhead is capped with a closed – and operational – gate valve and cap. The cellar is constructed of wooden 2x12s on 12x12-inch wood beams. **[Figure 5]** The cellar is intact and in good condition overall. Approximately 12 to 16 inches of water fills the cellar. The rat hole is outside the cellar and is open to the environment. A chopped-up hose and other minor debris are located within the reserve pit along the shoreline next to the wellhead. **[Figure 6]**

The drill pad is partially vegetated with grasses and sedges. The pad is in satisfactory condition given its age and no maintenance. The pad was created using the thin pad design, with the reserve pit being the borrow source. A small pile of drilling muds next to the wellhead is slowly collapsing into the reserve pit. Wooden pilings established at the time of drilling operations are partially submerged in the reserve pit. The shoreline, however, does not appear to have changed too much when comparing recent photographs with those taken in 2001.

The reserve and flare pit have become connected due to wave erosion of the common wall that once separated them. Both pits are still fairly angular in shape.

Surface Risk Assessment: Low

Justification: The site has no known contaminants. Despite the proximity to Admiralty Bay, there is no threat of erosion to the Kuyanak #1 at this time. **[Figures 7-8]** The site has minimal impacts to visual resources.

Figure 1: Aerial view of Kuyanak #1 with the southern extent of Admiralty Bay (Dease Inlet) in the background. This also shows the drained lake bed used for the drilling location (July 2012).

Figure 2: Kuyanak #1 in July 2012. There has been little erosion from the reserve pit when compared to the aerial photo taken in 2001.

Figure 3: Kuyanak #1 during spring break-up (June 2003).

Figure 4: Aerial view of Kuyanak #1 in August 2001. Note the wooden pilings were partially submerged.

Figure 5: View along the shoreline of the Kuyanak #1 reserve pit showing exposed pilings, collapsed drilling muds, and the chopped red hose (July 2010).

Figure 6: The same pile of drilling muds and red hose viewed in August 2001.

Figure 7: Kuyanak #1 Wellhead, cellar, rat hole and pilings (July 2010).

Figure 8: Kuyanak #1 Wellhead during spring break-up (June 2003).

SUBSURFACE INFORMAITON

Well Information:

- **Well History:** Mobilization of the drilling equipment for the Kuyanak #1 well and camp began on Jan. 16, 1981. Drilling related operations started with rig-up on Jan. 26, 1981. The well was spudded on Feb. 13, 1981, and completed on Mar. 31, 1981. Nabors Alaska Drilling, Inc., drilled the well to a total depth of 6,690 feet, cased to 4,755 feet, and plugged back to 4,464 feet using cement and mechanical plugs set at selected intervals. **[Figure 9]** An ice airstrip was constructed to support the drill site and was completed Jan. 22, 1981 (Husky Oil 1983). The well is an active USGS monitor well.

- **Well Condition:** Three cement and mechanical plugs were set at various intervals in the wellbore with the top of the shallowest cement plug at 4,464 feet. From 2,000 feet to the surface, the hole is filled with diesel fuel overlying 2,464 feet of mud. There is no indication that Arctic Pack was left in the 9 ⅝-inch by 13 ⅜-inch annulus from the upper fluid orifice at 1,198 feet to surface. There appears to be only mud in the 9 ⅝-inch by 13 ⅜-inch annulus from the upper fluid orifice at 1,198 feet to the surface.

- **Wellhead Components:** There are three gate valves and a needle valve. No gauges. **[Figure 10]**

Geologic Setting: The primary objective of the well was the Jurassic age Simpson Sandstone within the Kingak Formation. Secondary objectives were the underlying Sag River Sandstone and possibly the overlying Walakpa Sandstone of Cretaceous age. The proposed traps were combination structural/stratigraphic in nature.

Three separate gas shows were found in the Torok Formation with some minor fluorescence and staining. The drill hole also encountered the following without any hydrocarbon shows; Nanushuk Group, the Pebble Shale Unit, Kemik Sandstone, Kingak Shale, Sag River Sandstone, and Shublik Formation (Husky Oil 1983).

Development Potential: There has been very little interest in this area to date. If development were to occur, this well is adequately cased and cemented from all lower formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

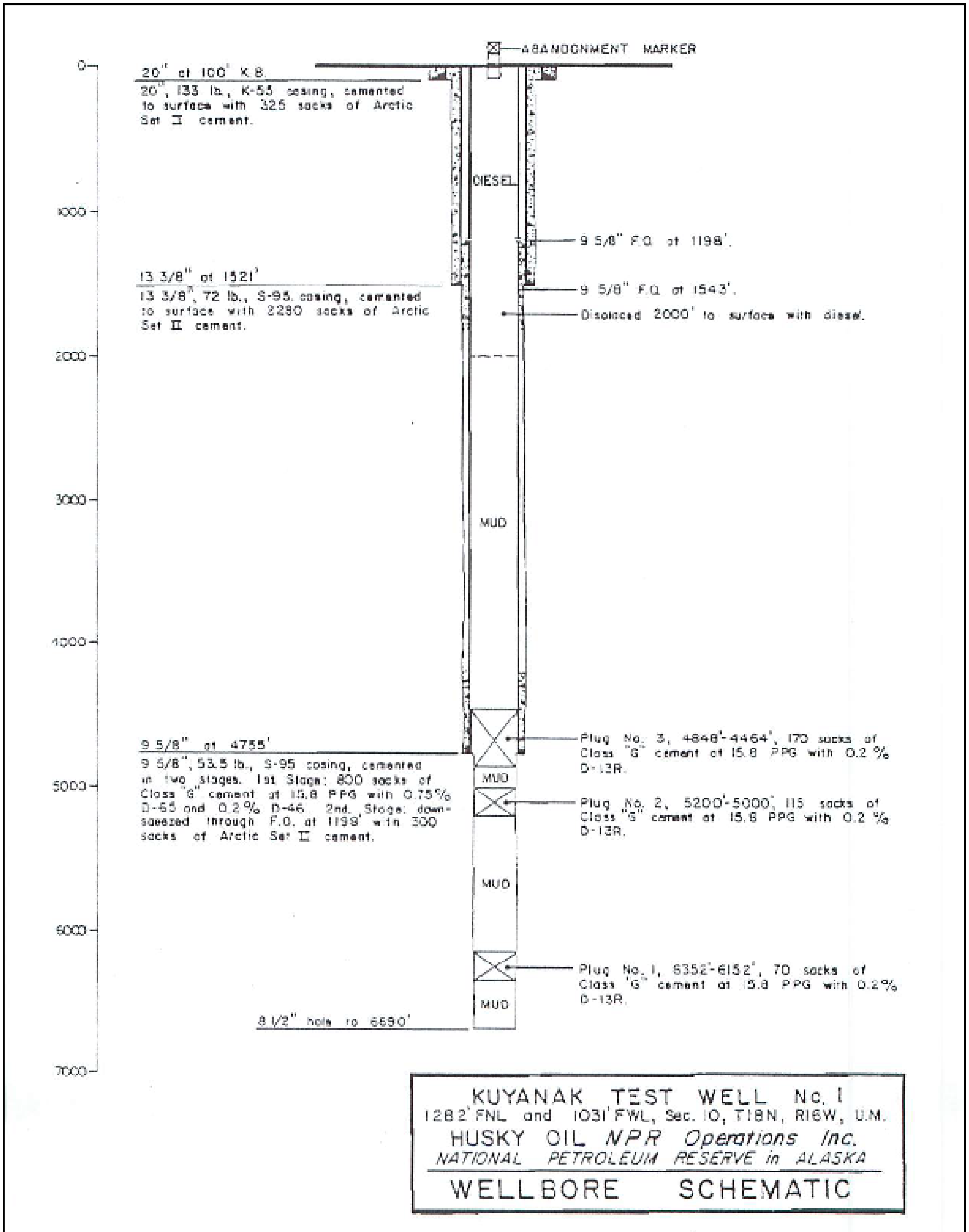


Figure 9: Kuyanak #1 wellbore diagram.

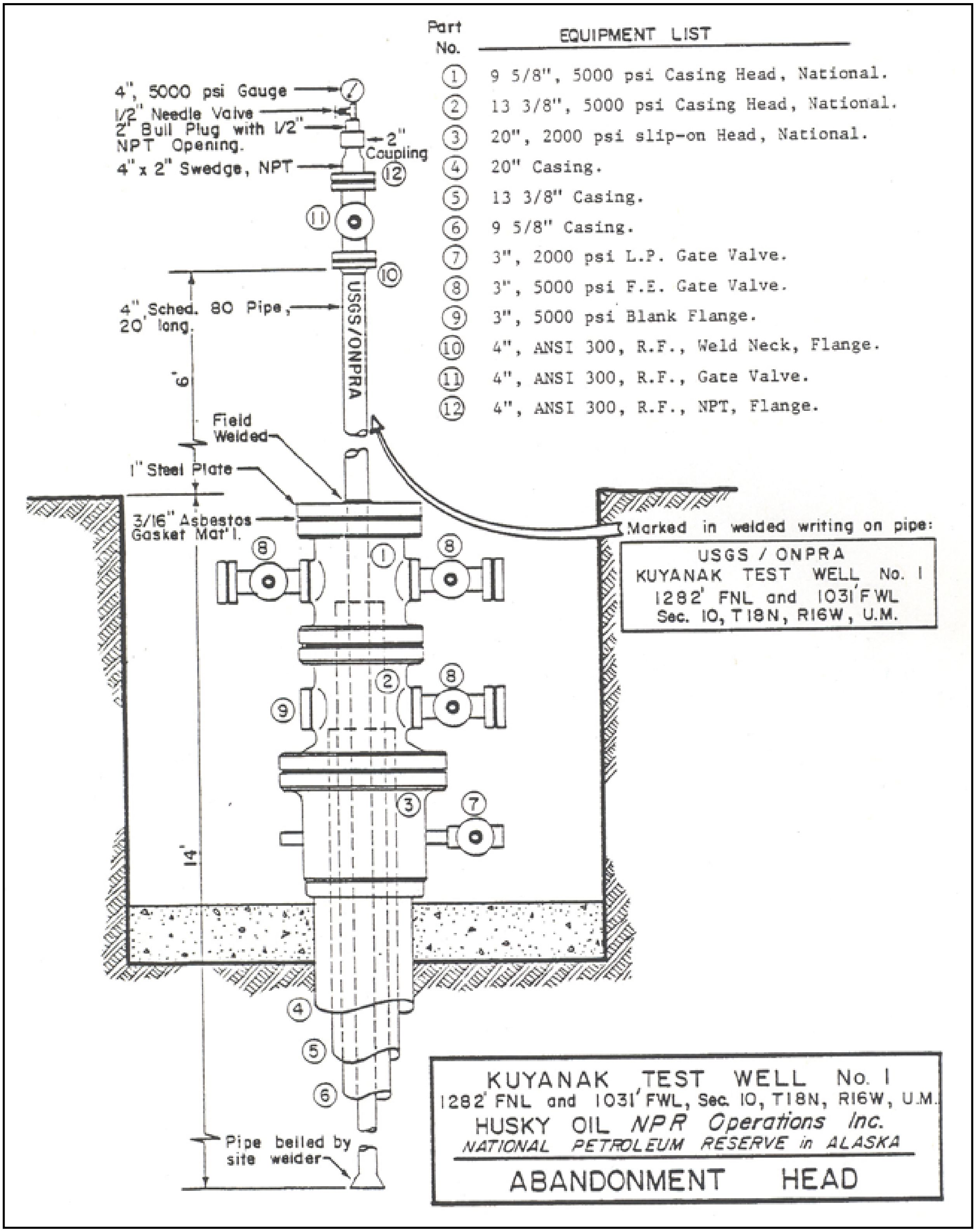


Figure 10: Kuyanak #1 wellhead assembly.

Lisburne #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 68.4784° N, -155.6507° W. The Lisburne #1 site is 107 miles west of Anaktuvuk Pass and 108 miles southwest of Umiat, on lands that are outside of the National Petroleum Reserve in Alaska. The BLM has conveyed a portion of the site containing the airstrip and apron to the Arctic Slope Regional Corporation and the BLM has current easement to use this area. The last site inspection was in July 2011.

Site Description: The Lisburne #1 site consists of a well inside a metal cellar, a reserve pit, terraced pad, and an associated airstrip, apron, road, and bridge. **[Figure 1]** The airstrip and apron are collectively known as Ivotuk, and serve as an administrative site the BLM uses as a base for operations. The BLM maintains a fuel tank, a fenced area housing a cabin, two outhouse structures with incinerating toilets, and two wall tent frames. The several other facilities at Ivotuk, including weather stations or fuel caches, are under permit by ASRC to third party entities not affiliated with the BLM. [**Figures 2-4**]

The Lisburne #1 wellsite is located a distance from the airstrip, accessible by a road that has severely frost-heaved with a now-defunct bridge across Otuk Creek. The bridge was passable on foot until sometime between 2003 and 2006, when a high water event washed out the west portion of the bridge and created a 10-foot gap.

The wellhead is capped with a closed – and operational – gate valve and cap. No rat hole is associated with this well. The cellar is a metal culvert in a steel frame and filled with water. The pad was constructed on a hillside, creating three terraces. The well is on the middle terrace, while the reserve and flare pits are below the wellhead. A smaller pad exists above the wellhead, which was possibly for the drilling camp. The pads are partially vegetated with local vegetation, as well as with non-native species.

The reserve and flare pits are partially dry because the lower reserve pit wall is breached and the waters drained into the nearby stream and Otuk Creek. Drilling muds are visible on the exposed portions of the reserve pit. There are some old tarps and rusted steel that became exposed when the reserve pit partially breached.

The BLM removed solid wastes from the drill pad in 1995.

Surface Risk Assessment: Low

Justification: The Lisburne #1 site has no known contaminants. A tributary of Otuk Creek partially breached the reserve pit between 2003 and 2006. The Alaska Department of Environmental Conservation sampled the Lisburne #1 reserve pit and closed it in 1995. It is possible that the tributary could cause additional erosion and might capture the remaining surface water of the reserve pit at this site.

Figure 1: Lisburne #1 well site with terraced pad and partially breached reserve pit, viewed from the northern side of Ivotuk Mountain (June 2011).

Figure 2: Partially drained reserve pit for Lisburne #1. The breach point is in the right portion of the photo (June 2011).

Figure 3: Otuk Creek bridge near Lisburne #1 was no longer usable even on foot from June 2006 to present.

Figure 4: Lisburne #1 wellhead and cellar (June 2011).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Rig-up for Lisburne #1 began on May 18, 1979, and the well was spudded on June 11, 1979. Nabors Alaska Drilling, Inc., the drilling contractor, used Nabors Rig 17, an Oilwell 860, to drill the well. Drilling operations were suspended on Aug. 23, 1979, with the total depth of the well at 6,773 feet. Rig operations started up again on Oct. 19, 1979 and continued through the 1980 drilling season, when the rig was released to the Koluktak well site on June 2, 1980. The Lisburne #1 well was drilled to a total depth of 17,000 feet, cased to 13,650 feet, and plugged back to 1,860 feet (Husky Oil 1983). Diesel is present in the wellbore from the uppermost plug to the surface to facilitate USGS temperature monitoring. Diesel was the medium selected for temperature monitoring, as it will not corrode the casing nor freeze at the temperatures encountered downhole.

- **Well Condition:** At the conclusion of the drilling and evaluating operations, the well was plugged back with eight cement and mechanical plugs set at various intervals in the wellbore. **[Figure 5]** The top of the shallowest cement plug is at 1,840 feet. From 1,840 feet to the surface, the hole is filled with diesel. There is no indication that Arctic Pack was left in the 9 ⅝-inch by 13 ⅜-inch annulus from the upper fluid oriface (FO) at 2,013 feet to surface. There appears to be only mud in the 9 ⅝-inch by 13 ⅜-inch annulus (fluid oriface) from the upper FO at 2,013 feet to the surface.

- **Wellhead Components:** There are two gate valves within the metal cellar and an operational needle valve at the top of the wellhead **[Figure 6]**.

Geologic Setting: The primary objective of the well was to test the Lisburne Group carbonates on a closed anticlinal structure created by thrusting from the Brooks Range. The anticline is elongate in a generally east-west direction, with the major thrust fault located to the north and northeast of the well location. The Lisburne Group of carbonates (Late Mississippian) was penetrated five separate times. The well had minor gas shows from 585 feet continuing down to 16,850 feet. The gas shows occurred in rocks with poor reservoir quality. On two separate occasions, the drill stem tests recovered small amounts of gas. The Torok Formation, encountered from about 1,000 to 2,155 feet had oil staining and an instance of oil bleeding from the core. The test hole also encountered the Pebble Shale and Shublik Formation (Husky Oil 1983).

Development Potential: Industry has shown no interest to even explore in this area. If development were to occur at some point, Lisburne #1 is adequately cased and cemented from all lower formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska (NPR-A). Fresh water aquifers do not exist.

Other Information: The well was originally drilled within the NPR-A boundary. However, the wellhead is now outside of the NPR-A, due to the boundary moving six miles west. There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

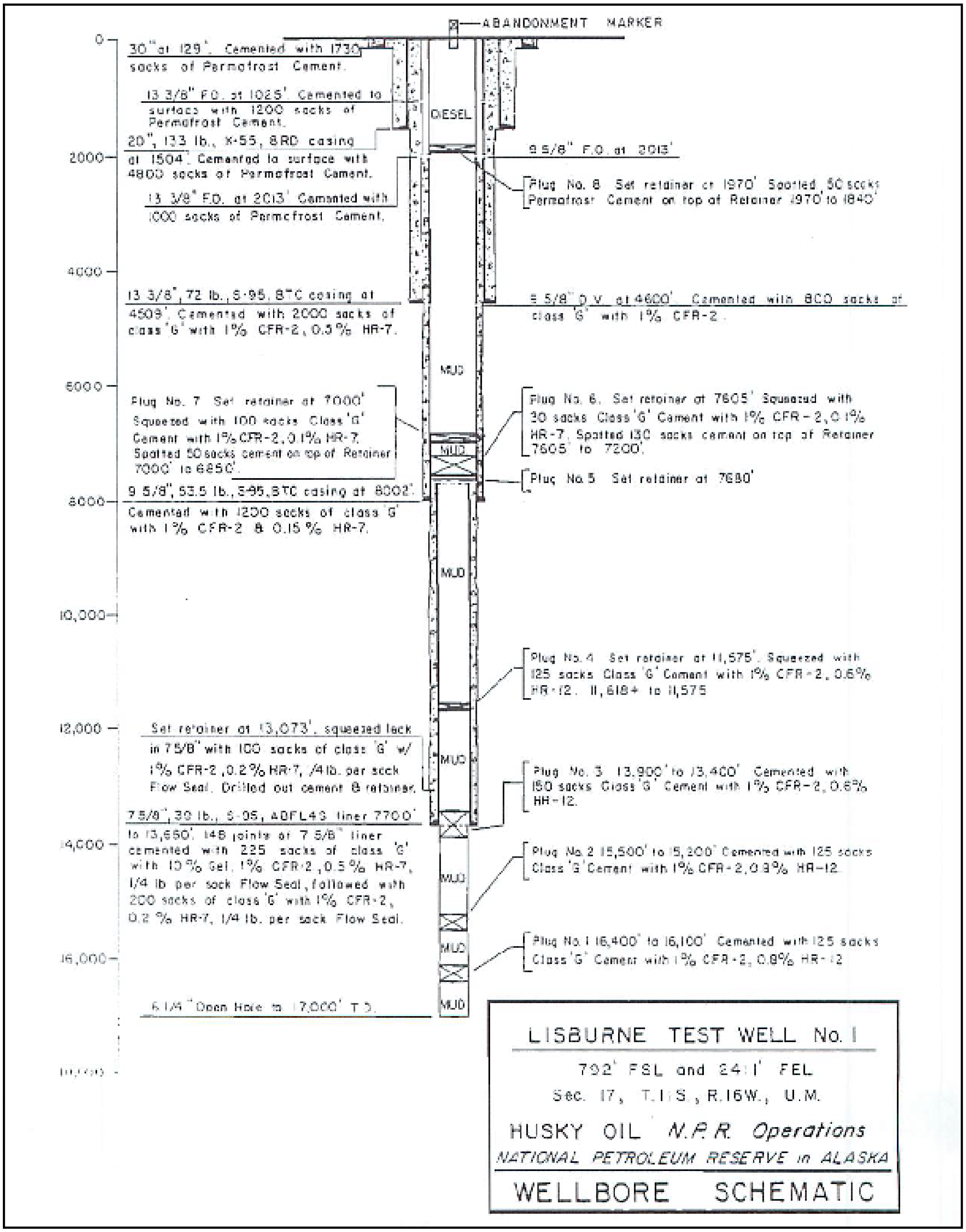


Figure 5: Lisburne #1 wellbore diagram.

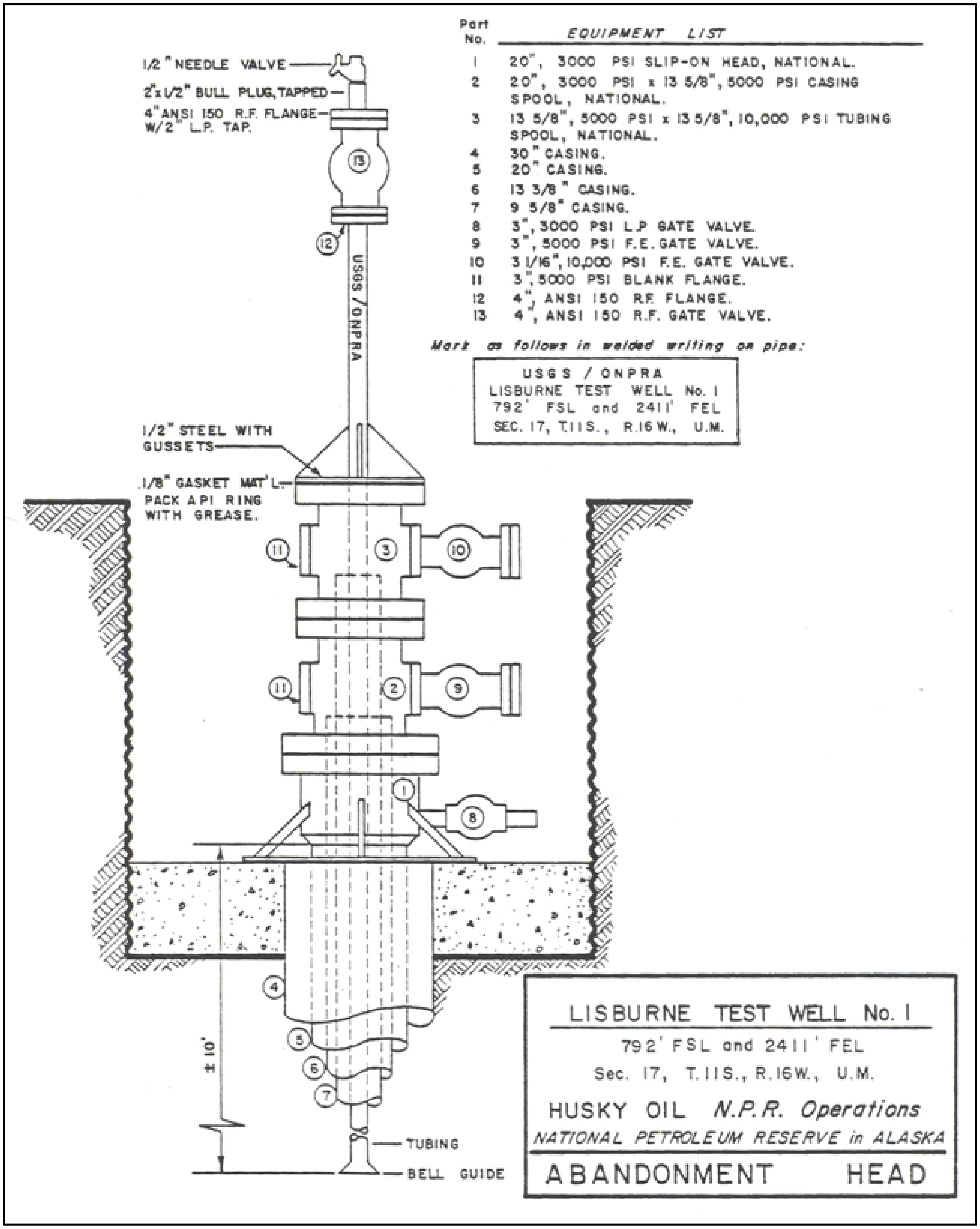


Figure 6: Lisburne Test Well #1 wellhead assembly.

Meade #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70 02.22° N, 157 28.87° W. Meade #1 is approximately 30 miles southwest of the community of Atqasuk and is within the National Petroleum Reserve in Alaska. The last site inspection was in July 2012.

Site Description: The Meade #1 site consists of a well and associated scattered surface debris in an area measuring approximately 500 feet east to west and 150 feet north to south. The U.S. Navy drilled the well in 1950. There is no pad, reserve pit(s), or cellar associated with this well. Rather than creating a pad, the Navy bulldozed a large area to use for staging and operations. That bulldozed area is now overgrown with willows, but the area can still be delineated based on vegetation differences from the surrounding area. Overgrown access trails extending from both the southern and northern extent of the area of the site are visible because of the contrasting vegetation [**Figure 1**].

The open wellbore is difficult to find as it is at ground level and partially covered by willows [**Figure 2**]. Meade #1 consists of an open flange bolted to the top of the 8 ½ in casing (see Well Information, below). The associated scattered debris at the site consists of several pilings that extend from 6 inches to 18 inches above the ground surface. Unlike other sites, these pilings are not evenly spaced, but instead are dispersed around the site, primarily to the southeast of the wellbore. Also present on the site are several metal pipes, extending from between 18 inches to 48 inches above the ground surface. Two large timbers are located parallel to each other approximately 50 feet south of the wellbore. A small pile of used drilling muds approximately 4 feet in diameter and no more than 18 inches tall above the ground surface is also present about 50 feet southeast of the wellbore. The drilling mud is currently overgrown with vegetation and lichen [**Figure 3**].

Three small ponds, roughly 10 feet by 5 feet in size, are within the disturbed area. These ponds are presumed to result from thawing associated with the bulldozing activity and water collecting on low areas of the site [**Figure 4**]. The ponds appear to be recovering naturally and are surrounded by native vegetation.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the Meade #1 site. The area previously disturbed by bulldozing has been recovering, with native vegetation (mostly willows) reclaiming the entire site area.

Based on a visual inspection, there is no indication that the wellbore or any of the associated debris on site has the potential to affect surface water. The overall site area is generally contained, given that the overall relief of the site is several inches lower than the surrounding terrain due to the bulldozing. This prevents the ability of any surface water from channeling and flowing into the moderately sized lake to the north of the wellhead. There is little to no solid waste on site and it does not pose a travel risk to local residents.

Figure 1: Aerial view of the Meade #1 site (July 2012).

Figure 2: This open casing at Meade #1 is partially obscured by brush, making it very difficult to see from the air. Note piece of overgrown lumber from the frame on the left (July 2012).

Figure 3: Drilling muds with black lichen and scattered moss at Meade #1. Note the metal pipe in right frame. A BLM employee (white jacket) marks the location of the wellhead (July 2012).

Figure 4: General view of the disturbance area at Meade #1. Note the large timber in foreground (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Meade #1 is a gas well drilled by the U.S. Navy to a depth of 5,305 feet in 1950. The well was cased to 2,785 feet and two cement plugs were set, with the top of the shallowest plug tagged at 2,783 feet inside the casing [**Figure 5**].

- **Well Condition**: The wellhead consists of an open flange bolted to the top of the 8-inch casing. This wellhead differs from U.S. Navy reports (USGS 305) that indicate the wellhead was abandoned in place. Obviously, the wellhead is not there anymore and there is no record of why it was removed. A BLM field crew bailed the hole and discovered a swedge and 2-inch needle valve junked downhole. The plumb-bob was dropped downhole after the removal of these components and hit solid at 28 inches. Likely, the plumb-bob struck more junk downhole and not an ice plug.

- **Wellhead Components**: There is no wellhead at this site.

- **Geologic Setting**: The well encountered some gas shows in one productive sand within the Grandstand Formation. The gas tested at rates up to 1.1 million cubic feet per day during open-hole flow tests of the sand at 2,949 to 2,969 feet. The gas reserves are estimated at 10 BCF. Gas pockets are relatively common in this portion of the National Petroleum Reserve in Alaska, due in large part to the underlying coal.

Development Potential: This site is very remote, with little to no interest from industry. There is a limited risk of adverse impacts to subsurface resources, since the gas zones are isolated below the cement plugs.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: Meade #1 had gas shows and tested at rates up to 1.1 million cubic ft per day. Meade #1 is the discovery well of the small Meade Gas Field. Upon abandonment by the Navy, the well was filled with drilling muds and two cement plugs were set, one above and one below the gas show.

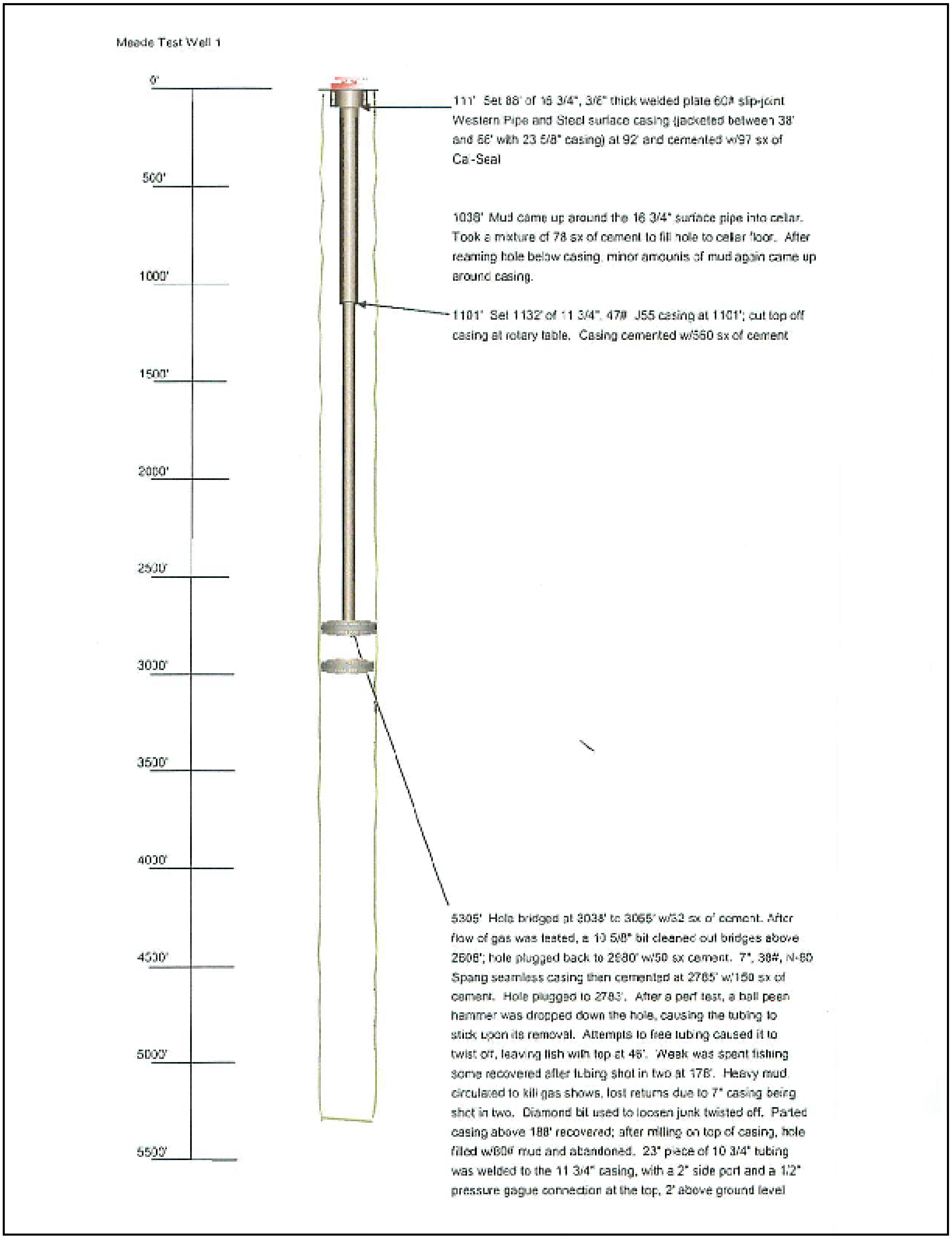


Figure 5: Meade #1 wellbore diagram.

Minga Test Velocity #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.9833° N, -154.7433° W. The Minga Test Velocity #1 site is approximately 51 miles southeast of Barrow and 71 miles northeast of Atqasuk. The last site overflight was in July 2012.

Site Description: The U.S. Navy drilled the Minga Test Velocity #1 in the eastern portion of Lake Sinclair (aka Lake Minga) in 1950 as an experiment in drilling during the winter [**Figure 1**]. As a result, the Navy constructed all ancillary facilities from ice. There is no cellar, pad, or reserve pit associated with the Minga Test Velocity #1 site. When the velocity test was abandoned, the top of the casing was cut 5 feet below the lake surface with a rubber hose extension to house the thermistor cables. It is noted that after the ice went out, the hose went missing (Robinson 1964).

Surface Risk Assessment: None

Justification: There is no surface indication of this test site. No solid wastes have been observed on the lakeshore near the location of where this velocity test was drilled.

Figure 1: Approximate location of Minga Test Velocity (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled Minga Test Velocity #1 in April and May 1950 using a Failing 314 core rig, which is the same rig used to drill the majority of the other Simpson Core Tests. The rig and supporting camp was set up directly on the lake ice. The test hole set two 15 feet joints of 8 ⅝ in casing through 4 ½ feet of ice and an additional 2 feet of water, with 4 sacks of construction cement. Total depth of the hole reached 1,233 feet **[Figure 2]**.

- **Well Condition:** Upon abandonment, the top of the casing was cut 5 feet below the lake surface.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The U.S. Navy drilled the test hole to check on the effects of permafrost variations on different seismic velocities. The finding was that the average vertical velocity from the surface to about 900 feet measured 6,000 feet per second (fps). A typical average in frozen ground is at least 8,400 fps. The average vertical velocity was from a test hole drilled in the lake, and this produced the apparent seismic "low" (under the lake), which has 300 feet of relief. This reading is the result of lower-velocities in lake-covered areas lacking permafrost; compared to adjacent land areas that are frozen to a depth approximating 1,000 feet. Minga Test Velocity #1 had no hydrocarbon shows (Robinson 1964).

Development Potential: It is not likely any exploration or development will occur in the vicinity within the next 20 years. It is unlikely this drill hole would have an adverse impact on any future development, since it did not penetrate productive zones or leave a footprint. Future development will likely target deeper, more productive formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: The coordinates given in the USGS 305-L Report by Robinson are approximations and are not reliable for navigating to an 8-inch casing over a flat, expansive area (or in the case of Minga, casing below the surface of the water). The BLM over-flights of the portion of Lake Minga that depicts the test location did not reveal the casing. It may be possible to locate the casing with an underwater camera 5 feet below the lake's water level, using a raft and a systematic grid. However, it is impossible to know what the lake's water level was in 1950 when the casing was cut, compared to today's water level. Visibility is also a factor, since if the water is slightly murky due to wind and the extremely fine sediments in the lake, it would be possible to be directly on top of the casing and still not see it. To date, the BLM has not searched for the Minga Test Velocity #1 casing using either a boat or raft.

Subsurface Assessment: Low

Justification: Minga Test Velocity was drilled to check on the effects of permafrost variations using different seismic velocities. The test encountered no oil or gas shows or water resources. The hole was filled with drilling muds upon completion.

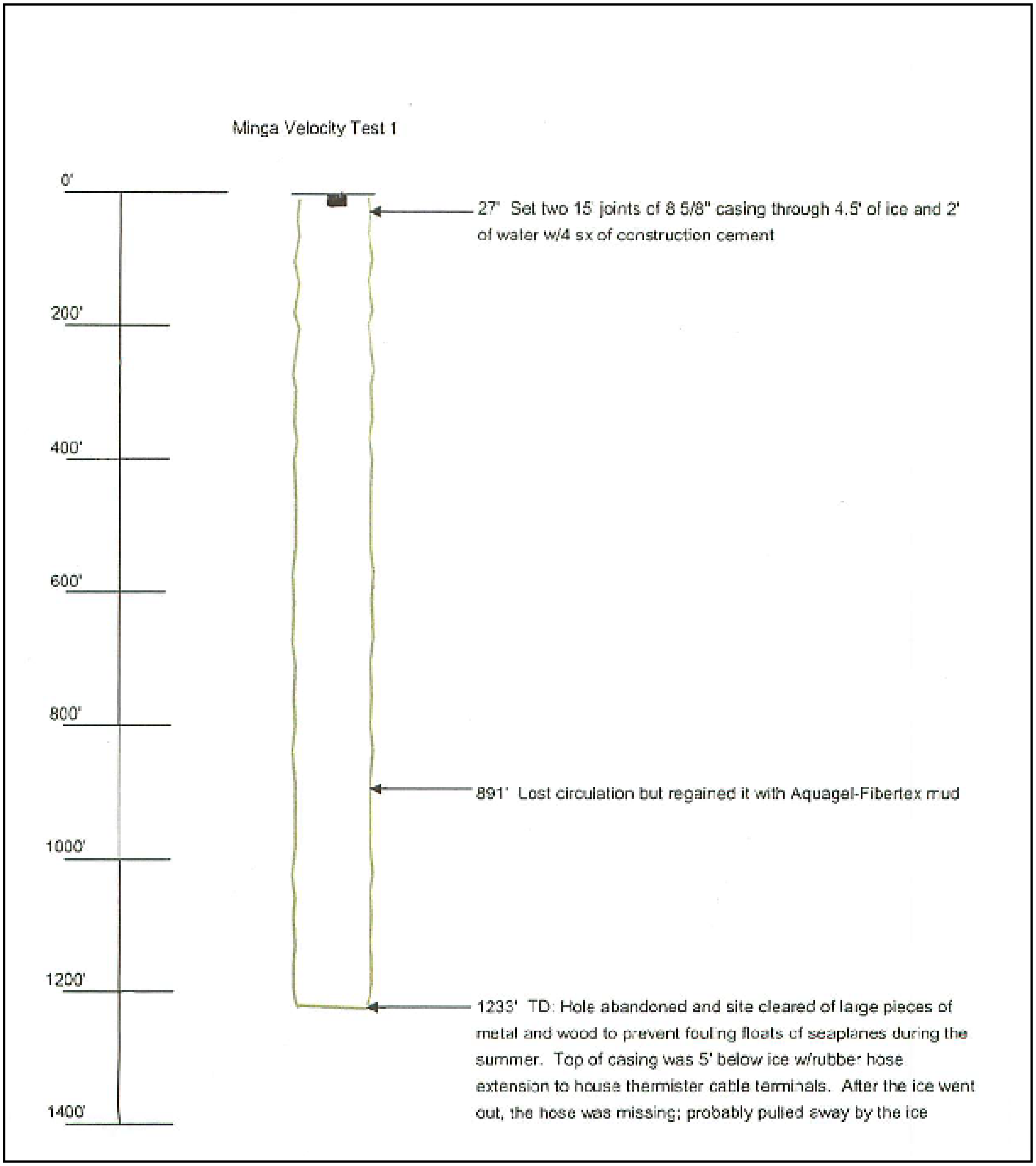


Figure 2: Minga Test Velocity #1 wellbore diagram.

North Inigok #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.2575° N, -152.7663° W. The North Inigok #1 site is 42 miles west of Nuiqsut, 62 miles northwest of Umiat and 111 miles east of Atqasuk. The last site inspection was in August 2010.

Site Description: The North Inigok #1 site consists of a well located in a constructed wooden cellar, a pad, and a reserve pit **[Figures 1-4]**. The wellhead is equipped with a 4-inch gate valve and cap [**Figure 5]**. Husky Oil drilled the North Inigok #1 well under contract to the USGS in 1981. The cellar is constructed of wooden 2x12s on 12x12-inch wood beams. Water fills the cellar **[Figures 6-7]**.

The drilling pad is of the thin pad design, constructed using silty-sand materials from the reserve pit. The pad is in adequate condition for its age and no maintenance. There is some thawing occurring along the pad edges. The pad has revegetated with thick grasses and sedges **[Figure 8]**. On the north side of the reserve pit, there is a small intermittent channel observed flowing out of the reserve pit during high water events and onto the surrounding tundra **[Figure 9]**. This channel is approximately 12 inches wide and 12 inches in depth (from the surface). Some erosion exists on the south side of the reserve pit **[Figure 10]**. The reserve pit adjoins the flare pit.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on site and no surface debris. There does not appear to be any effects to surrounding surface waters from North Inigok #1. The Alaska Department of Environmental Conservation sampled the reserve pit and closed it in its current condition in 1995. The site is not under threat by erosion of nearby waters or any other natural processes.

Figure 1: Aerial view of the North Inigok #1 wellhead, pad, and reserve pit (August 2010).

Figure 2: Aerial view of the connected reserve and flare pits at North Inigok #1 (August 2010).

Figure 3: Aerial view of North Inigok #1 during spring breakup (June 2005).

Figure 4: Aerial view of North Inigok #1 (August 1999).

Figure 5: North Inigok #1 4-inch gate valve and cap (August 2010).

Figure 6: Cellar filled with water and wellhead at North Inigok #1 (June 2003).

Figure 7: North Inigok #1 wooden cellar filled with water and wellhead (August 2010).

Figure 8: Thick grasses have revegetated the North Inigok #1 drilling pad (August 2010).

Figure 9: Small outlet channel of North Inigok #1's reserve pit (August 2010).

Figure 10: Minor slumping from North Inigok #1's reserve pit erosion at the southwest corner of the reserve pit. The remainder of the pit has very little erosion (August 2010).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** North Inigok #1 operations commenced on Jan. 23, 1981. The well was spudded on Feb. 12, 1981, and activity terminated on April 17, 1981. The well was drilled to a total depth of 10,170 feet, cased to 8,457 feet, and plugged back to 8,155 feet **[Figure 11]**. Nabors Alaska Drilling, Inc. was the drilling contractor. Nabors used the Nabors Rig 25, a National 110, to drill the well. A C-130 Hercules aircraft moved the rig move from the Seabee well location to North lnigok. To accommodate the move, the Hercules, and provide logistical support during drilling operations, an ice airstrip was constructed nearby (Husky Oil 1982).

  To facilitate USGS temperature monitoring, diesel is present in the wellbore from the uppermost plug to the surface. Diesel as a medium for temperature monitoring does not corrode the casing, nor freeze at the temperatures encountered down hole.

- **Well Condition**: At the conclusion of drilling and evaluation operations, three cement and mechanical plugs were set at selected intervals in the wellbore, with the top of the shallowest cement plug at 8,155 feet. From 2,000 feet to the surface, the hole is filled with diesel fuel overlying 6,155 feet of mud. There is no indication that Arctic Pack was left in the 9 ⅝" x 13 ⅜" annulus from the upper fluid orifice (FO) at 2,165 feet to surface. There appears to be only mud in the 9 ⅝-inch x 13 ⅜-inch annulus from the lower FO at 2,342 feet to the upper 9 ⅝-inch FO at 2,165 feet. There are no downhole issues with the well at this time.

- **Wellhead Components:** There are five gate valves and a 2-inch cap in place of the removed needle valve **[Figure 12]**.

Geologic Setting: The primary object was an apparent stratigraphic sandstone development in the Upper Jurassic formations with the Sag River Sandstone as a secondary target. Gas shows were found in the lower portion of the Torok Formation and the Kingak Shale. The latter successfully collected gas in a drill stem test. The drill hole also encountered the following lithologies; Sagavanirktok Formation, Colville Group, Nanushuk Group, and Pebble Shale Unit of the Cretaceous, Kingak Shale of the Jurassic, and Sag River Sandstone and Shublik Formation of the Triassic (Husky Oil 1981).

Development Potential: If development were to occur, this well is adequately cased and cemented, securing the well from all lower formations, and will not affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

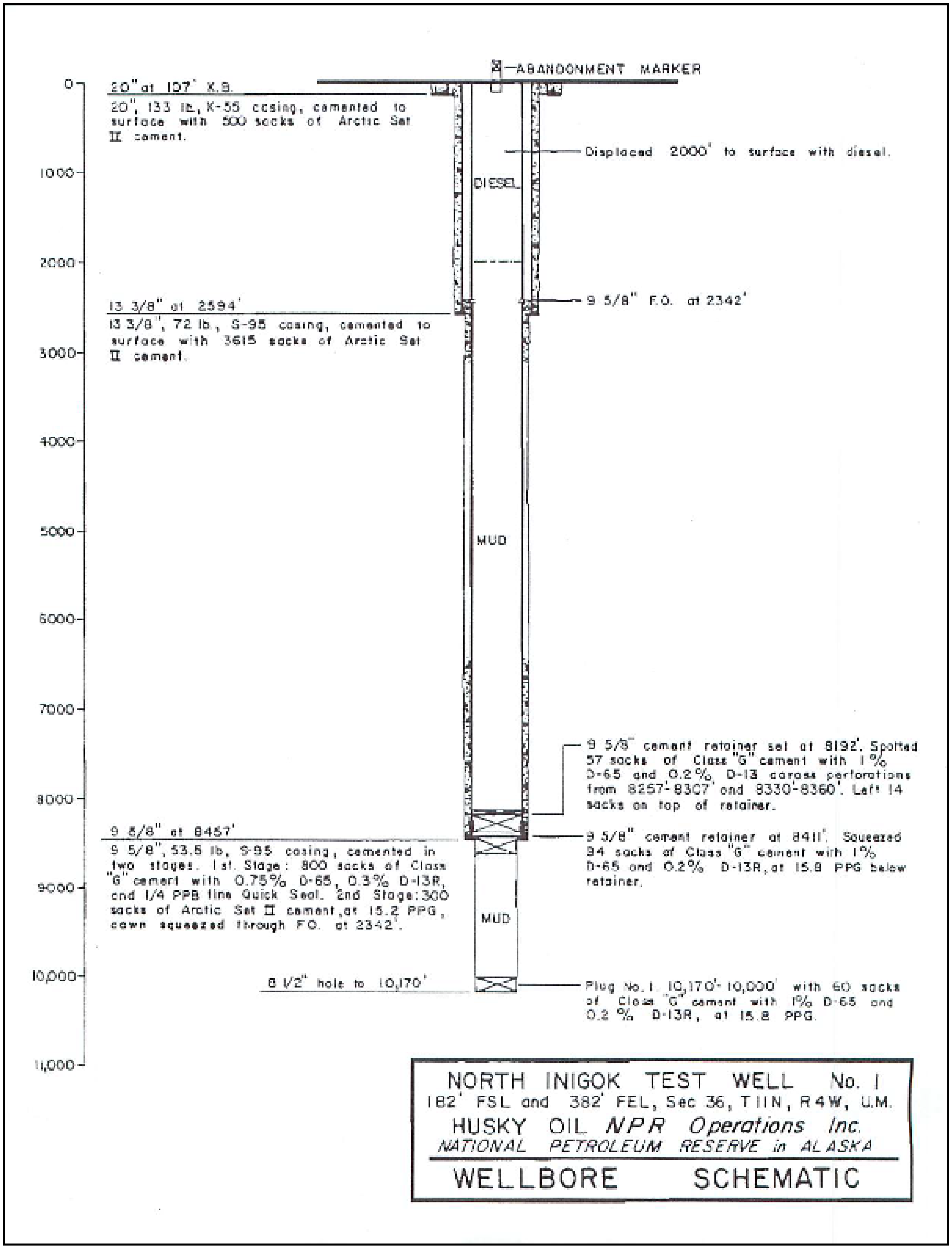


Figure 11: North Inigok #1 wellbore diagram.

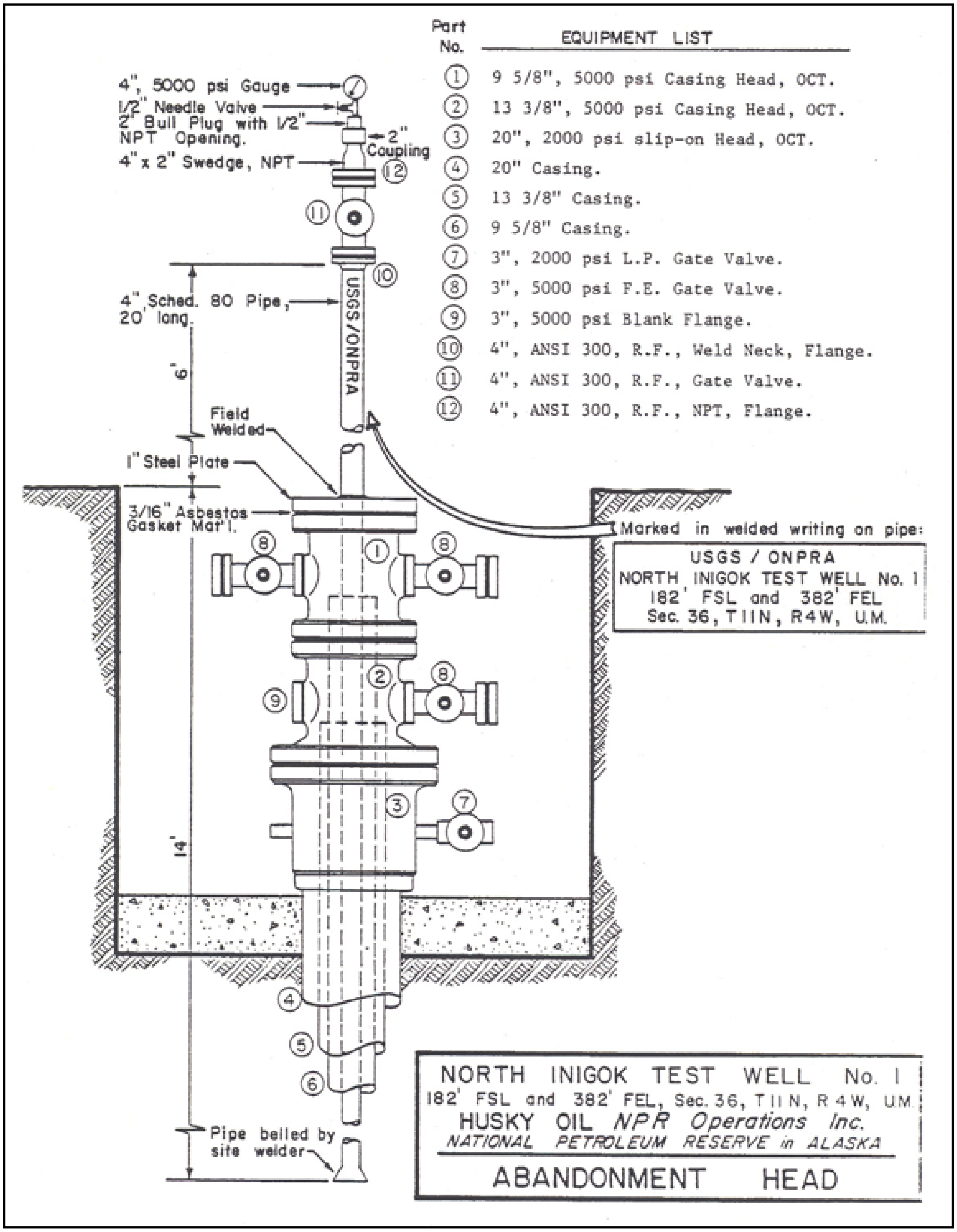


Figure 12: North Inigok #1 wellhead assembly.

North Kalikpik #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.5092° N, -152.3678° W. The North Kalikpik #1 site is 38 miles northwest of Nuiqsut and 115 miles southeast of Barrow. The last site inspection was in July 2012.

Site Description: The North Kalikpik #1 site consists of a well located in a constructed wooden cellar, a pad, and a reserve and flare pit **[Figures 1-6]**. Husky Oil drilled the well under contract to the USGS in 1978. The wellhead is capped with a closed – and operational – gate valve and cap **[Figure 7]**. The cellar is constructed of wooden 2x12s on 12x12-inch wood beams. The cellar is dry and filled with soil and vegetation **[Figure 8]**. Wooden pilings stick out of the ground around the cellar. The rat hole is outside of the cellar and opens to the environment.

The pad is of the thick pad design and in good condition. The pad was subject to a vegetation experiment in the late 1980s with non-native species, but there is very little of that vegetation left. The pad is partially re-vegetated, approximately 40 percent, with natural tundra. The southern portion of the pad contains numerous frost heaves.

The flare pit walls are intact and full of water. The reserve pit walls are eroding slowly, changing the shape of the pit **[Figure 9]**. The reserve pit contains the reserve and flare pit materials from East Teshekpuk Test Well #1 and Atigaru Test Well #1 **[Figure 10]**. Those materials are encapsulated in the western portion of the reserve pit. The mounds are approximately 4 feet and 12 feet tall, respectively, with little to no vegetation as of July 2012. East Teshekpuk #1 materials were added in the winter of 2008 and Atigaru #1 materials were added in 2009. As the slope from the mineral soil cap works to reach stabilization, its contents are creeping onto the surrounding tundra. These mineral soils cover between 3 to 10 feet of tundra. The reserve pit appears breached at the west end where the new reserve pit materials form the new shoreline. The ensuing channel (a thermokarst line) allows water and materials to escape onto the tundra. Note that the reserve pits for all three well locations have been signed off by Alaska Department of Environmental Conservation as printed in the 1995 report.

Surface Risk Assessment: Low

Justification: Reserve pit materials from East Teshekpuk (2008) and Atigaru (2009) were placed into North Kalikpik's reserve pit when those sites were plugged and abandoned. The materials are not considered hazardous because they were sampled in their reserve pits in 1992 and closed by the Alaska Department of Environmental Conservation in their current condition. There are no other known contaminants on the North Kalikpik #1 site. The several breaches in the northern reserve pit wall allow high-water events to flow out of the pit.

The BLM is fertilizing the mounds at North Kalikpik #1 in an experiment to speed vegetation growth on the mineral soils. The common dandelion (*Taraxacum officinale*) is now growing along the northern edge of the reserve pit near the mounds.

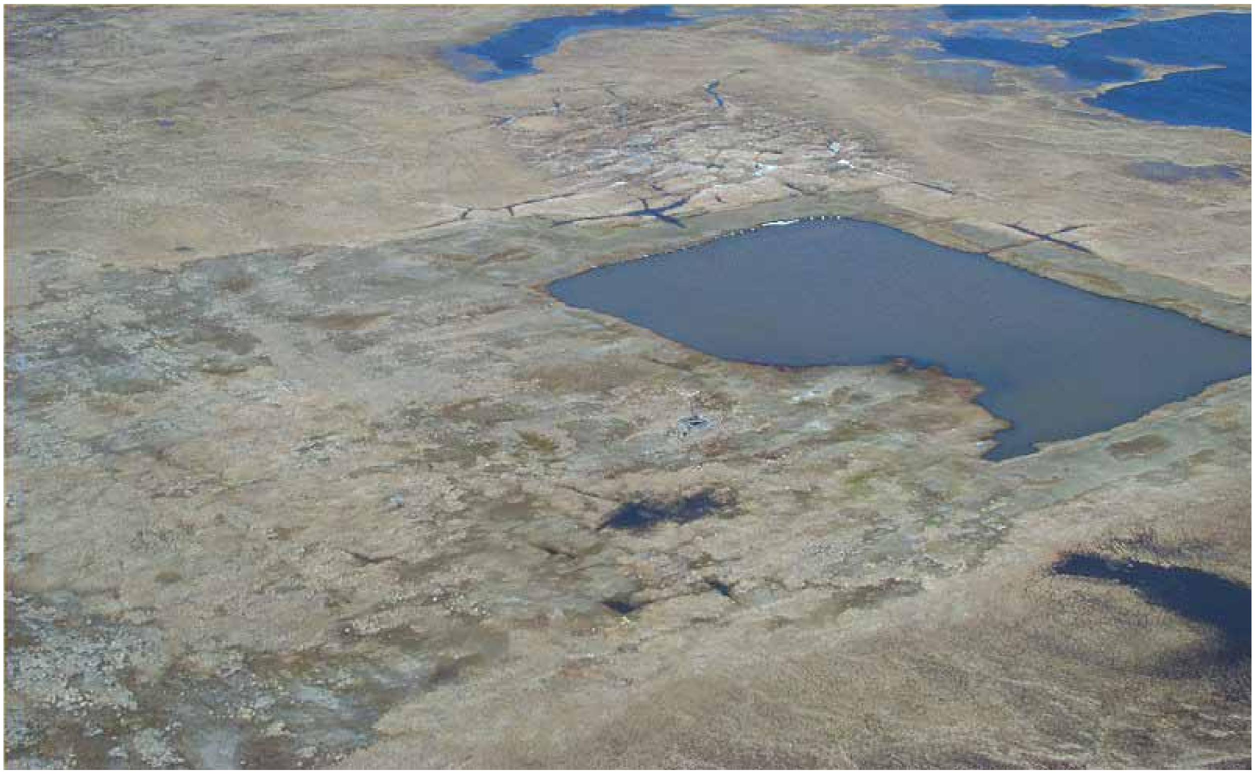


Figure 1: North Kalikpik #1 in June 2005.

Figure 2: Aerial view of North Kalikpik #1. The reserve pit is partially filled with materials from East Teshekpuk #1 and Atigaru #1 (July 2012).

Figure 3: Materials from East Teshekpuk #1 is the smaller pile toward the bottom of the photo, and the Atigaru materials are the larger pile in the center at North Kalikpik #1.

Figure 4: North Kalikpik #1 as seen only a few months after the Atigaru reserve pit materials were added (July 2009).

Figure 5: North Kalikpik #1 in July 2008, only a few months after the East Teshekpuk #1 reserve pit materials were added.

Figure 6: North Kalikpik #1 wellsite prior to adding any additional material to the reserve pit (July 1999).

Figure 7: North Kalikpik #1 wellhead with the rat hole outside the cellar and a few wood pilings (July 2012).

Figure 8: Inside the cellar for North Kalikpik #1 (July 2012).

Figure 9: Gully coming out of the North Kalikpik #1 reserve pit that allows high water events to escape to the surrounding tundra (July 2012).

Figure 10: Partially filled in reserve pit for North Kalikpik #1. The new materials from East Teshekpuk #1 are in the mid-center of the photo, while Atigaru's materials are on the left (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: North Kalikpik #1 Well operations commenced with rig-up on Feb. 5, 1978. The same National 130 drilling rig used for West Fish Creek #1 was brought over to drill North Kalikpik #1. It took 110 loads by Rolligon to move the rig. The well was spudded on Feb. 27, 1978, and ceased operations on May 5, 1978. The North Kalikpik #1 well is about 15 miles east of Teshekpuk Lake. The well was drilled to a total depth of 7,395 feet, cased to 2,603 feet, and plugged back to 2,293 feet (Husky Oil 1982) **[Figure 11]**. Diesel is present from the upper most plug to the surface to facilitate USGS temperature monitoring. Diesel will not corrode the casing, nor freeze at the temperatures encountered downhole.

- **Well Condition**: Five cement and mechanical plugs were set at various intervals in the wellbore with the top of the shallowest cement plug at 2,293 feet. From 2,200 feet to the surface, the hole is filled with diesel fuel overlying 93 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 13 ⅜ in surface casing has cement from 2,603 feet to surface with cement in the 13 ⅜-inch by 20-inch casing annulus from 103 feet to surface.

- **Wellhead Components**: There is one operational gate valve. The needle valve was replaced with a removable 2-inch cap to facilitate well bore monitoring **[Figure 12]**.

Geologic Setting: The primary objective of the North Kalikpik #1 well was to test a stratigraphic, erosional remnant of the Kuparuk River Sandstone. The remnant encountered in the nearby East Teshekpuk well was interpreted from seismic records to be present at the North Kalikpik #1 site. Unfortunately, those observations were proven incorrect as there was no Kuparuk River Sandstone present, nor were there any indications of oil at any subsurface depth. There were several minor gas shows within the Cretaceous aged rocks; most notably the Nanushuk Group and Torok and Pebble Shale formations (Husky Oil 1983).

Development Potential: North Kalikpik #1 is properly plugged back to 2,293 feet and diesel fuel a non-corrosive agent, there are no downhole issues with the well that would affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

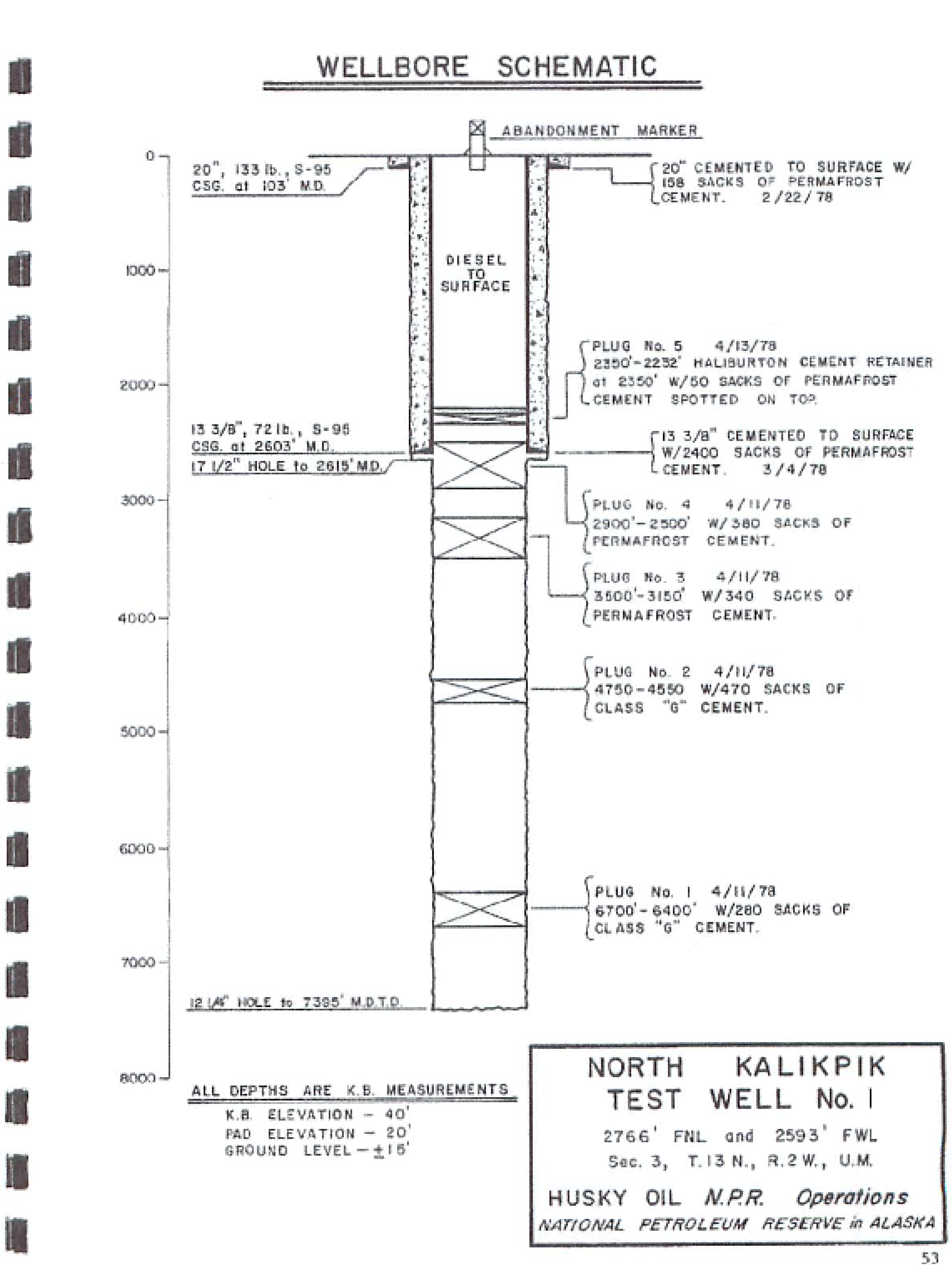


Figure 11: North Kalikpik #1 wellbore diagram.

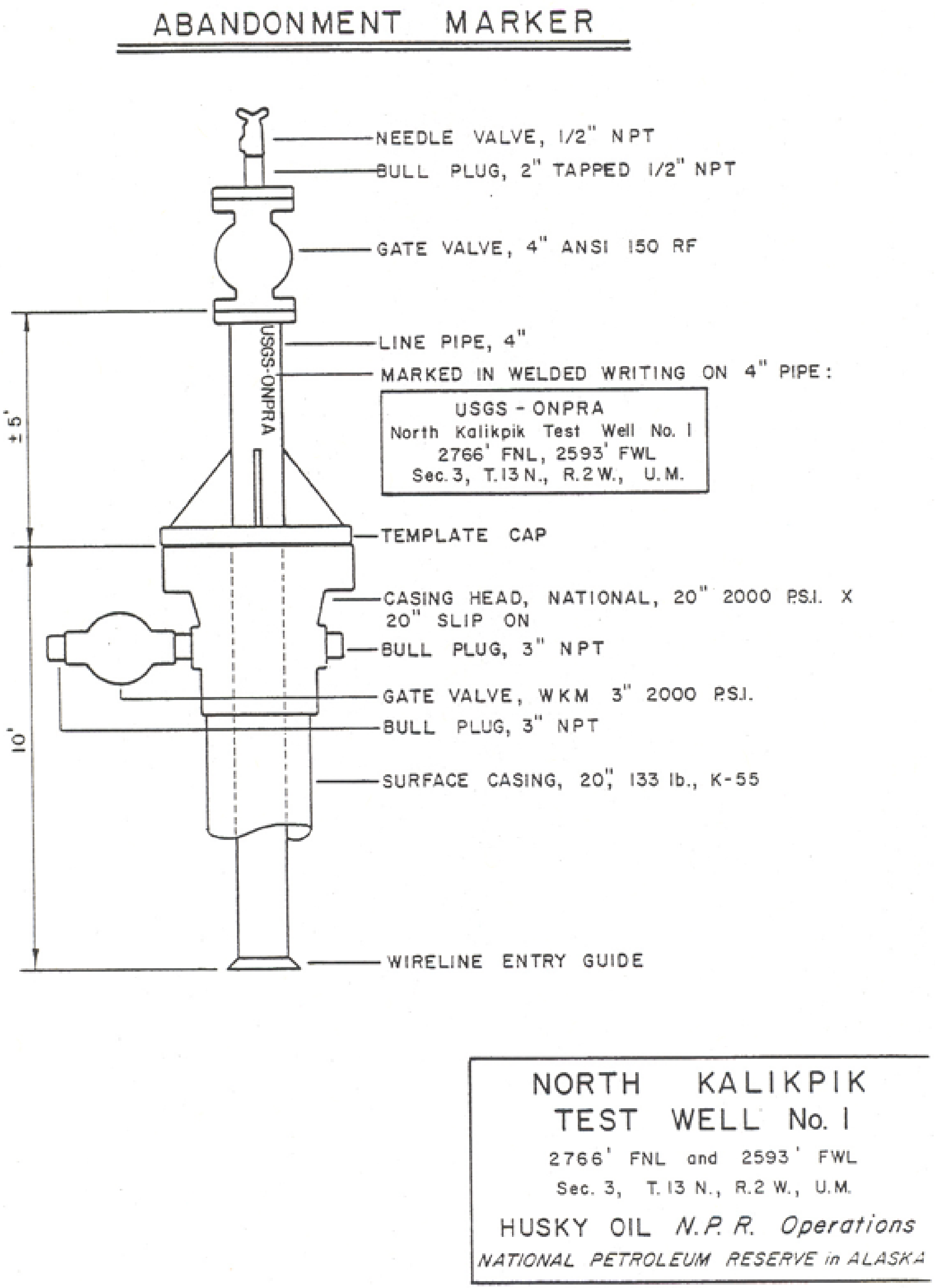


Figure 12: North Kalikpik #1 wellhead assembly.

North Simpson #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.0572° N, -154.9568° W. The North Simpson #1 site is located 45 miles to the southeast of barrow and 70 northeast of Atqasuk. The last site inspection was in August 2010.

Site Description: The North Simpson #1 site consists of a wellhead and associated surface debris **[Figures 1-4]**. The well was drilled in 1950 by the U.S. Navy. There is no pad or reserve pit associated with the well. The area immediately surrounding the wellhead contains numerous metal pilings and a small amount of debris around the wellhead **[Figures 5 and 6]**. The well consists of a bull plug installed on top of a swedge and is closed at the top. The outer casing is showing signs of corrosion **[Figure 7]**. There is no frame around the cellar and it appears to be just a hole that was dug into the ground. Other debris includes the skeleton of an old drum, small pieces of dimensional lumber, and pieces of concrete. A pile of what appears to be drilling mud is also located on site.

Surficially, the area is wet with the wellhead partially submerged intermittently throughout the summer. The wet, silty soil does not allow for much growth of vegetation. There is a large amount of algae present in the water at this location. North Simpson #1 is approximately five miles from the Beaufort Sea. However, it is only a couple hundred feet from McKay Inlet. McKay Inlet is actually a series of thaw lakes that have been breached by the Beaufort Sea as a result of wind erosion.

Surface Risk Assessment: **Moderate**

Justification: There is no known contamination at the site. Barrier Islands and extremely little topographic relief help protect McKay Inlet from causing erosion that would threaten the well site. However, the site does flood during high water events. Surface debris present on the site could pose a travel risk to local residents.

Figure 1: Location of the North Simpson #1 Test Well. McKay Inlet has breached the lake in the background and it contains brackish water. The Beaufort Sea is several miles away (August 2010).

Figure 2: Aerial view of North Simpson #1 showing surface debris (August 2010).

Figure 3: North Simpson #1 after a long period of rain when the surrounding lakes had reached floodwater stage (August 2001).

Figure 4: Photo of North Simpson #1 after a long period of rain when the surrounding lakes had reached floodwater stage (August 2001).

Figure 5: North Simpson #1 during breakup (June 2003).

Figure 6: Rings left behind from a corroded 55-gallon drum at North Simpson #1 (August 2010).

Figure 7: North Simpson #1 wellhead (August 2010).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: North Simpson #1 was drilled in 1950 to a depth of 3,774 feet and cased to 109 feet. Upon completion, no plugs were set and the hole was filled with drilling muds **[Figure 8]**.
- **Well Condition**: The outer casing is showing signs of corrosion.
- **Wellhead Components**: The wellhead consists of a bull plug installed on top of a swedge and is closed at the top. There are no valves or gauges present.

Geologic Setting: The purpose of the well was to test a seismic anomaly that was identified when the Navy checked the seismic profiles that were shot for the Simpson Seeps. No hydrocarbon shows were reported during the drilling of this well as no sandstone was encountered. No sandstones or potential reservoir rocks were encountered either (Robinson and Yuster 1959). The well didn't encounter anything that would suggest the potential for hydrocarbons. The well penetrated the Colville Group and Torok Formation both of Cretaceous age.

Development Potential: Exploration and development in the vicinity of this well is unlikely. It is also unlikely the well will have an adverse impact on development since it did not penetrate productive zones, and future development will likely target deeper formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the site.

Subsurface Risk Assessment: Low

Justification: North Simpson #1 did not have any oil or gas shows and no cement plugs were set. Drilling muds were added downhole after completion and subsequently froze. The test well does have a wellhead.

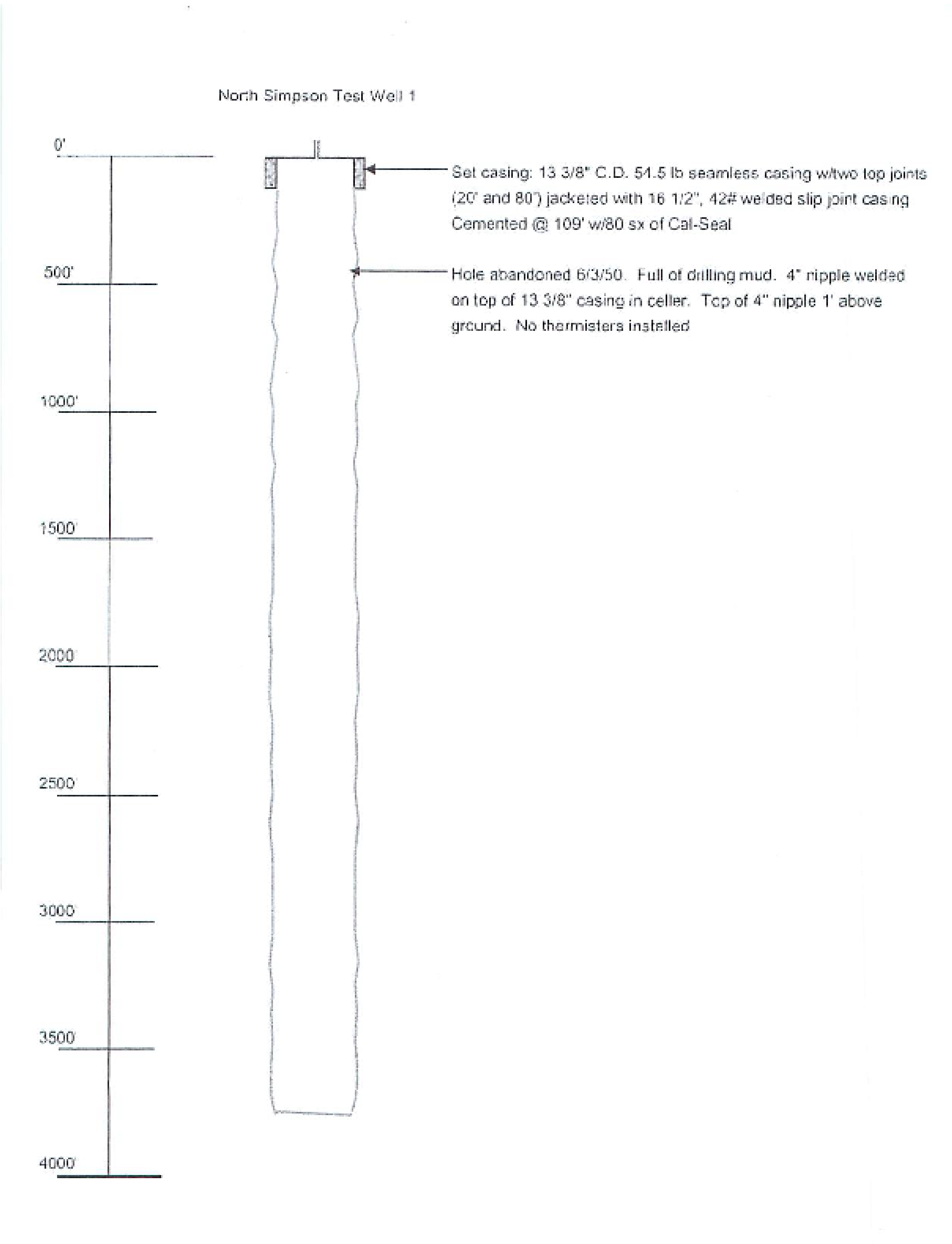


Figure 8: North Simpson #1 wellbore diagram.

Oumalik #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.8416° N, -155.9712° W. The Oumalik #1 site is approximately 55 miles southeast of Atqasuk, 100 miles west/northwest of Umiat, and 100 miles south of Barrow. The last site inspection was in July 2012.

Site Description: The Oumalik #1 site consists of a well inside a concrete cellar and associated surface debris **[Figures 1, 2]**. The U.S. Navy drilled the well 1950. The site does not contain a reserve pit or pad. A relatively flat area that was the former construction camp location has revegetated and is now barely discernible. A combination of muds, dirt and crushed cement has filled the cellar **[Figure 3]**. A thin layer of soil that accumulated over time is allowing vegetation to grow in patches **[Figure 4]**. It is not easy to define the pad. As was typical for the Navy during the early exploration period, a bulldozer cleared a large area to serve as a work pad. The camp and other structures associated with the drilling operations were placed on pilings in this heavily permafrosted area.

Numerous, but spread over a large area, wood and metal pilings were left in the ground at Oumalik #1 and stretch out primarily to the west/northwest, covering a distance of about 2,000 feet. Near the well, about 20 feet to east, the ground appears to have been reinforced with large timbers, perhaps in support of the large-scale refrigeration system used in an attempt to keep the ground frozen while conducting drilling operations. The numerous steel pipes are probably the most obvious debris still visible on the site. The pipes nearest to the well are primarily left over from drilling operations or the refrigerant system. The refrigerant system piping runs parallel to the ground or sticks up vertically from the ground surface. Other solid wastes include some minor camp debris.

The existing cement pad contains piping from a ground refrigeration system similar to Topagoruk #1. Circulating cooled diesel fuel in the pipes enabled drilling to occur without significantly degrading the permafrost **[Figure 5]**. Afterwards, the steel pilings were pulled from the ground to be reused at another site (Robinson and Bergquist 1956). Steel pipes, including some filled with diesel fuel, remain **[Figure 6]**. A 6-inch circumference of stressed vegetation was noted around a few of the low-cut pipes.

There were another 12 core tests drilled in the Oumalik area, with 11 of those drilled within 500 feet of the Oumalik #1 test well. Only three core tests were cased (#2, #11, and #12), and all three are within 100 feet of the Oumalik #1 test well.

Surface Risk Assessment: **Moderate**

Justification: Some metal pipes/pilings remaining on the site contain a small amount of diesel fuel, which could leak onto the ground surface. There does not appear to be any impact from Oumalik #1 into nearby surface waters. There are no streams in the near vicinity of the wells. Some small ponds exist, but they are approximately ¼ to ½ mile from the drilling or camp areas. The small, swampy areas in the vicinity of the well are a result of thermokarsting that occurred from the scraping away of surface tundra during drilling operations.

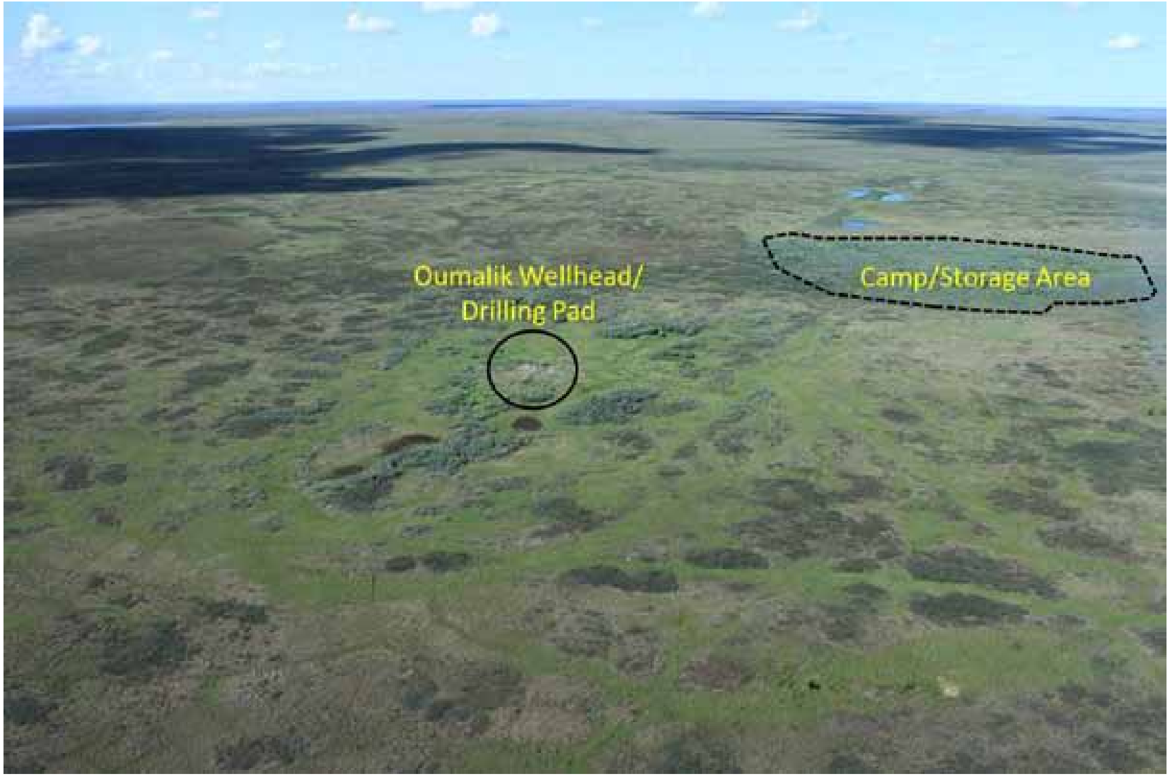


Figure 1: Aerial view of Oumalik #1 (July 2012).

Figure 2: Aerial of Oumalik #1 during the fall (August 2002).

Figure 3: Same photo as previous of the Oumalik #1 site, but taken during spring. (June 2011)

Figure 4: Oumalik #1 test well, concrete cellar and remnants of the refrigeration system. (July 2012)

Figure 5: Oumalik #1 test well showing welded plate and tubes for thermistors. (June 2011)

Figure 6: Oumalik #1 test well, cellar, large timbers reinforcing the pad (right), and a multitude of 8 ⅝-inch casing with an assortment of pipes once used for the diesel refrigeration system. (July 2012)

SUBSURFACE INFORMATION

Well Information

- **Well History**: The U.S. Navy drilled Oumalik #1 in 1950 and classified it as a dry hole. The well was drilled to a total depth of 11,872 feet and cased to 2,762 feet. Oumalik #1 was the deepest well drilled by the early U.S. Navy program [**Figure 7]**. The well location was positioned on the apex of the Oumalik Anticline and drilled with the intent of revealing the oil, gas, and water content of the penetrated stratigraphy. Two cement plugs were set; the shallowest is at 2,543 feet.

- **Well Condition**: The well is covered by a fabricated plate and is at ground level. Two 2 ½-inch nipples are open to the atmosphere and are above ground to allow thermistor cables to be run into the well. The nipples are attached to a steel plate capping the wellbore.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: Very poor oil and gas shows were reported in the Grandstand Formation, and poor gas shows were noted in both the Topagoruk and Oumalik formations. During multiple production testing, small, undetermined volumes of gas were recovered. It is believed that the gas encountered was large enough to furnish fuel to a camp, but not large enough to become a commercial producer. The gas encountered during drilling showed high gas pressure, but the sandstones in which they were observed are thin with low porosity (Robinson and Bergquist 1956).

Development Potential: Near-term development is unlikely, as the Oumalik area is not of interest to industry given its limited exploration and remoteness.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbons at this location.

Subsurface Risk Assessment: **Moderate**

Justification: Oumalik #1 was the deepest well drilled by the Navy during the early exploration period. Two cement plugs were set, but a very poor oil and gas show occurred above the upper most plug. Heavy drilling muds were left in the hole to freeze. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

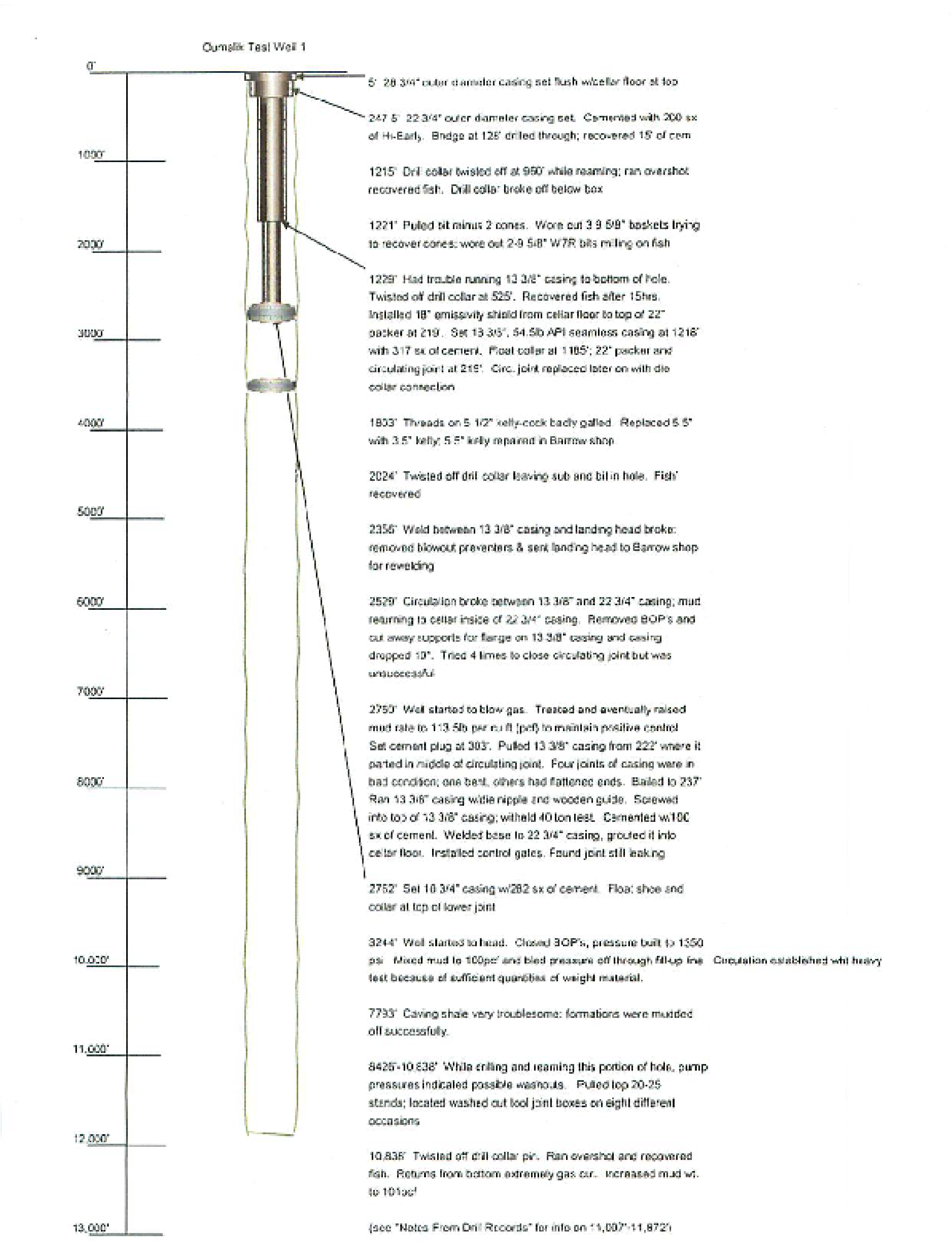


Figure 7: Oumalik #1 wellbore diagram.

Oumalik Core Test #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 69.8292° N, -155.6958° W. The Oumalik Core Test #1 is approximately 60 miles southeast of Atqasuk, 93 miles west/northwest of Umiat, and 102 miles south of Barrow. The site is located roughly 7 miles east of Oumalik Test Well No 1. A medium-sized lake is present to the east. The last site visitation was in July 2012.

Site Description: The Oumalik Core Test #1 is an uncased core test that has completely disappeared by collapsing internally with natural revegetation on the surface. The U.S. Navy drilled the core test in 1947. The Navy never established a drill pad at this location. The site is very easy to find due to the unnatural amount of willows present, compared to the surrounding tundra **[Figure 1]**. The trail the U.S. Navy used to reach the location remains a visible scar on the landscape.

Using the original coordinates from the USGS Professional Paper 305-A, a ground search using a magnetic wand and walking a grid pattern approximately 100 feet from the reference point of the Oumalik Core Test #1 site was completed **[Figure 2]**. The search uncovered no solid wastes in the thick willows at this location.

Surface Risk Assessment: None

Justification: No solid wastes were discovered. There does not appear to be any impact from the core test to nearby surface waters.

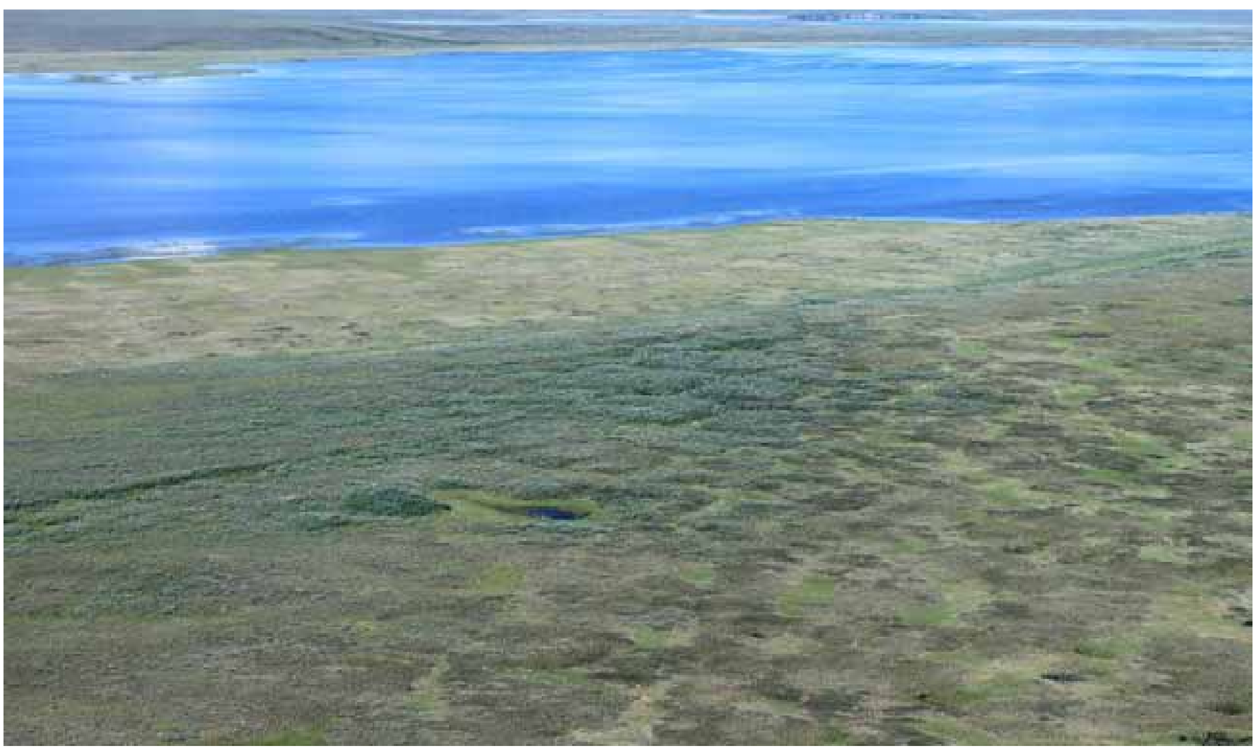


Figure 1: Disturbed ground showing the location of the uncased Oumalik Core Test #1 (July 2012).

Figure 2: Marking the GPS location of the notated coordinates from the USGS Professional Paper 305-A. The ground search was carried out based on this location marker. No surface casing was found at the Oumalik Core Test #1 site (July 2010).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled the Oumalik Core Test #1 in 1947 to a total depth of 392 feet, approximately ¼ mile north of Ikpikpuk Core Test #1. The Navy drilled the Oumalik Core Test #1 core test to obtain stratigraphic and structural information about the Oumalik Anticline. The Navy was unable to drill the Ikpikpuk Core Test #1 deep enough to gather this information, as the test hole was abandoned due to mechanical problems. The core samples taken from Oumalik Core Test #1 were of poor quality, making correlation with Ikpikpuk Core #1 difficult. The Navy abandoned the hole when the core barrel became stuck at 88 feet while trying to retrieve a sample (Robinson and Bergquist 1956).

- **Well Condition:** There is no cased drill hole at this location.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The core test encountered the Chandler Formation of the Nanushuk Group, Cretaceous in age. It was inconclusive, however, if the core test penetrated any other formations, as 95 percent of the samples were contaminated by cement, drilling mud, and near surface sands (Robinson and Bergquist 1956).

Development Potential: These uncased core tests will have no effect on future drilling in the area.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

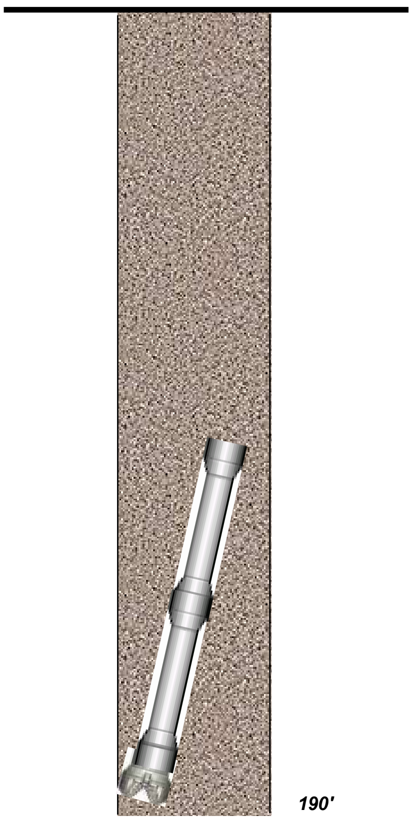
Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: None

Justification: This is a shallow uncased drill hole and did not penetrate oil or gas stratigraphy or water resources. Drilling muds were used to fill the wellbore upon completion, and subsequently froze. The old drill location has blended harmlessly with the environment.

Oumalik Core Test #1	Rig:	Failing M 314-C Rotary Core Drill (M-1500)		
	Drilled:	Jul 21 - Jul 29, 1947		
Oumalik Area Core Tests and Test Wells	API #:	**50-119-10002-00**		Created
	GL: 245'		KB: 255'	5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	69° 49' 45"N - 155° 41' 30"W		Last mod
	Reviewing Engineer:		Justin T. Miller	

Original RKB = 255'



190'

Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm

Uncased; Drilled with a rock bit of unknown diameter on 2-3/8" drillstring. 5-1/2" casing was set at 9' but was pulled prior to abandonment after drillstring twisted off and could not be fished.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	190	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	9/10/47	190	Hole abandoned full of frozen drilling mud with fish. No thermistor cables were installed.
B			
C			

Figure 3. Oumalik Core Test #1 wellbore diagram.

Oumalik Core Test #2

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.8383° N, -155.9900° W. The Oumalik Core Test #2 is approximately 55 miles southeast of Atqasuk, 100 miles west/northwest of Umiat, and 100 miles south of Barrow. Oumalik Core Test #2 is located within the same operations area as Oumalik Test Well #1 **[Figure 1]**.

Site Description: The Oumalik Core Test #2 site is 20 feet to the south of the Oumalik Test Well #1 **[Figure 2]**. The U.S. Navy drilled the core test in 1949. There is no reserve pit or pad associated with the core test, except for the common operations area shared with Oumalik Test Well #1. Debris on the site consists mostly of numerous steel pipes. These pipes nearest to the core test are left over from either the drilling operations or the refrigerant system. The piping for the refrigerant system runs parallel to the ground or sticks up vertically from the ground surface. The remaining piping makes it difficult to discern the cased core tests, as piping size is the same (8 ⅝ in) **[Figure 3]**. Other solid wastes include some minor camp debris, such as lumber or pieces of scrap metal.

Surface Risk Assessment: **Moderate**

Justification: Oumalik Core Test #2 is on the same pad as Oumalik #1 and is ranked the same, based on association.

Figure 1: Aerial photo showing the locations of the test holes at Oumalik. (July 2012)

Figure 2: An orange marker designates the Oumalik Core Test #2 site, located about 20 feet from the Oumalik Test #1 well site. (July 2012)

Figure 3: Oumalik Core Test #2 with the orange marker. (July 2012)

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Drilled in 1949, the Oumalik Core Test #2 is approximately 20 feet northwest of Oumalik Test Well #1. Total depth is 190 feet. There were no oil or gas shows. The hole was abandoned due to a stuck drill pipe (Robinson and Bergquist 1956).

- **Well Condition:** The open wellbore consists of 8 ⅝-inch casing in good condition.

Wellhead Components: There is no wellhead at this site.

Geologic Setting: The core test encountered both the Gubik and Grandstand formations.

Development Potential: Near-term development is unlikely, as the Oumalik area is not of interest to industry given its limited exploration and remoteness. If left unplugged, the core test has no potential to adversely affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

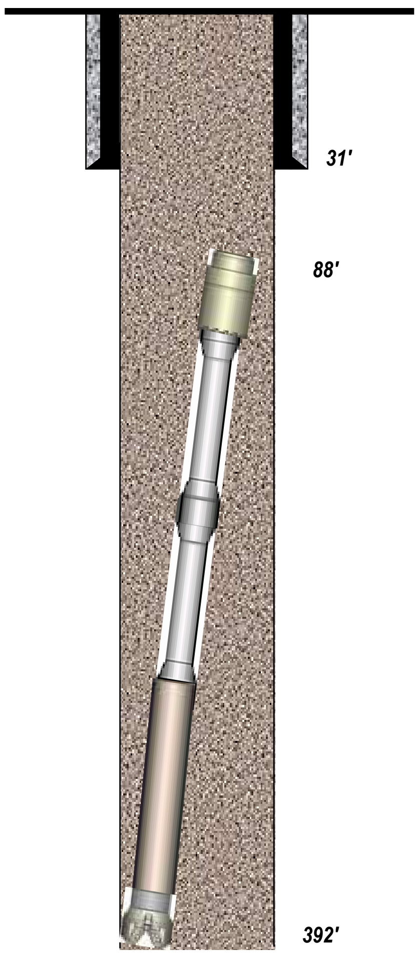
Other Information: There is no indication of hydrocarbon escapement at or near the core test.

Subsurface Risk Assessment: Low

Justification: Oumalik Core Test #2 is a shallow hole drilled to a total depth of 190 feet. There were no oil of gas shows and no plugs added. Drilling muds were added in the wellbore and allowed to freeze.

Oumalik Core Test #2	Rig:	Mayhew Model-1000 Shothole Drill		
	Drilled:	Sep 8 - Sep 10, 1947		
Oumalik Area Core Tests and Test Wells	API #:	**50-119-10002-00**		Created
	GL: 178'	KB: 196'		5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	69° 50' 18"N - 155° 59' 24"W		Last mod
	Reviewing Engineer:	Justin T. Miller		

Original RKB = 196'



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
7"	UNK	UNK	UNK		0	31

Drilled with 5-7/8" rock bit. 7" casing was set at 31'. Drillstring twisted off at 88' and could not be fished.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	392	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	7/29/47	88-392	Hole abandoned full of frozen drilling mud with fish. No thermistor cables were installed.
B			
C			

Figure 4: Oumalik Core Test #2 wellbore diagram.

Oumalik Core Test #11

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.8383° N, -155.9900° W. The Oumalik Core Test #11 is approximately 55 miles southeast of Atqasuk, 100 miles west/northwest of Umiat, and 100 miles south of Barrow. [**Figure 1]**

Site Description: Oumalik Core Test #11 consists of an open, cased hole; it is adjacent to the Oumalik Test Well #1, and could be considered an extension of this site. The U.S. Navy drilled the core test in 1949. There is no reserve pit or pad associated with this core test, except for the common drilling operations area shared with Oumalik Test Well #1. [**Figures 2-5**]

Surface Risk Assessment: Moderate

Justification: Oumalik Core Test #11 is on the same pad as Oumalik #1 and is ranked based on association.

Figure 1: Aerial photo showing the locations of the test holes at Oumalik.

Figure 2: The orange marker shows the position of Oumalik Core Test #11 and its proximity to Oumalik Test Well #1.

Figure 3: Oumalik Core Test #11 (June 2011).

Figure 4: Oumalik Core Test #11 (June 2011).

Figure 5: Oumalik Core Test #11 (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Oumalik Core Test #11 is located approximately 24 feet south of Oumalik Test Well #1. Total depth of the core test is 303 feet. The U.S. Navy drilled this core test in March 1949 with a Failing 1500 rig. There were no oil or gas shows.

- **Well Condition**: The open casing measures 8 ⅝ inches with a 2 ⅜-inch tubing inside. The outer casing is clamped at the ground surface. A 2x2-inch piece of wood is lodged inside the outer casing. It is unknown how deep the 2 ⅜-inch tubing goes down the wellbore.

- **Wellhead Components**: There is no wellhead at this site.

- **Geologic Setting**: The core test was only deep enough to encounter the Grandstand Formation (Robinson and Bergquist 1956).

Development Potential: Near-term development is unlikely, as the Oumalik area is not of interest to industry given its limited exploration and remoteness. If left unplugged, the core test has no potential to adversely affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

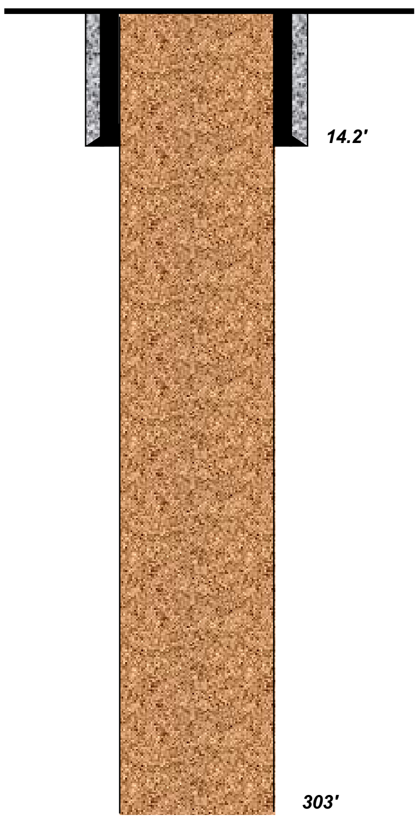
Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: Low

Justification: Oumalik Core Test #11 is a shallow hole drilled to a total depth of 303 feet. There were no oil of gas shows and no plugs added. Drilling muds were added in the wellbore and allowed to freeze.

Oumalik Core Test #11	Rig:	Failing M 314-C Rotary Core Drill (M-1500)	
	Drilled:	Mar 9 - Mar 22, 1949	
Oumalik Area Core Tests and Test Wells	API #:	**50-119-10003-00**	Created
	GL: 171.5'	KB: N/A	5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	69° 50' 18"N - 155° 59' 24"W	Last mod
	Reviewing Engineer:	Justin T. Miller	

Original RKB = N/A



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
8-5/8"	UNK	UNK	UNK		0	14.2

Drilled with rock bit of unknown diameter on a 2-3/8" drillstring. It can be assumed bit size was 5-7/8" as with Oumalik Core Tests 1 & 2. 8-5/8" casing was set at 14.2' and had to be recemented when it was washed out while drilling at a depth of 127'.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	303	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	3/22/49	303	Hole abandoned after bailing drilling mud to TD. Thermocouples were likely installed, but this is not verified.
B			
C			

Figure 6: Oumalik Core Test #11 wellbore diagram.

Oumalik Core Test #12

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.8292° N, -155.6958° W. The Oumalik Core Test #12 is approximately 55 miles southeast of Atqasuk, 100 miles west/northwest of Umiat, and 100 miles south of Barrow. Oumalik Core Test #12 is located within the same operations area as Oumalik Test Well #1 **[Figure 1]**.

Site Description: The Oumalik Core Test #12 site consists of open casing [**Figures 2-3**]. The core test is adjacent to the Oumalik Test Well #1 Site and could be considered an extension of that site. The U.S. Navy drilled the core test in 1949. There is no reserve pit or pad associated with the core test, except for the common operations area shared with Oumalik Test Well #1.

Surface Risk Assessment: Moderate

Justification: Oumalik Core Test #12 is on the same pad as Oumalik #1 and is ranked accordingly based on association.

Figure 1: Aerial photo showing the locations of all cased holes at Oumalik Core Test Well #1. For scale, the willows in the foreground are approximately 4 feet tall.

Figure 2: Orange marker defining the location of Oumalik Core Test #12. The pipe sticking up in the upper middle portion of the photo shows the approximate location of Oumalik Core Test #1.

Figure 3: After uncovering the casing, Oumalik Core Test #12 (June 2011).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Oumalik Core Test #12 is approximately 56 feet south of Oumalik Test Well #1. Total depth of the core test is 300 feet. There were no oil or gas shows. The U.S. Navy drilled the core test in April 1949.

- **Current Condition**: The open casing measures 8 ⅝-inches, with 1 ⅞-inch OD tubing inside. There is a small 2x2 foot wooden box built around the core test. It is unknown how deep the 1 ⅞-inch OD tubing goes down the wellbore, as there is no description of its depth in the available source information.

Geologic Setting: The core test only encountered the Grandstand Formation (Robinson and Bergquist 1956).

Development Potential: Near-term development is unlikely, as the Oumalik area is not of interest to industry given its limited exploration and remoteness. If left unplugged, the core test has no potential to adversely affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

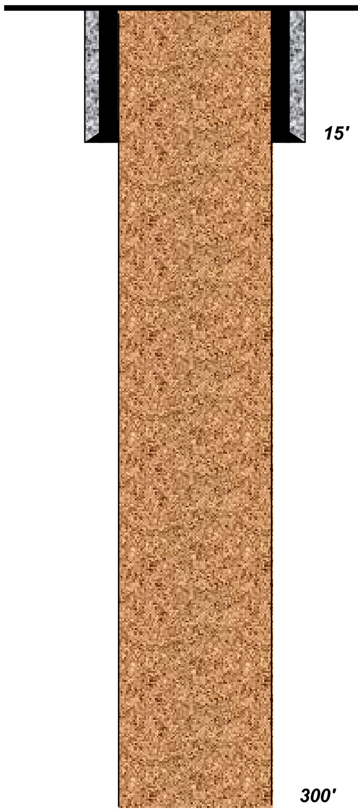
Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: Low

Justification: Oumalik Core Test #12 is a shallow hole drilled to a total depth of 300 feet. There were no oil of gas shows and no plugs added. Drilling muds were added in the wellbore and allowed to freeze.

BLM ALASKA	**Oumalik Core Test #12**	Rig:	Failing M 314-C Rotary Core Drill (M-1500)	
		Drilled:	April 1949 (Estimated)	
	Oumalik Area Core Tests and Test Wells	API #:	**50-119-10003-00**	Created
		GL: 171.5'	KB: N/A	5/7/13
	Naval Petroleum Reserve - 4	Lat/Long:	69° 50' 18"N - 155° 59' 24"W	Last mod
		Reviewing Engineer:	Justin T. Miller	

Original RKB = N/A



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
8-5/8"	UNK	UNK	UNK		0	15 (Est.)

Drilled with rock bit of unknown diameter on a 2-3/8" drillstring. It can be assumed bit size was 5-7/8" as with Oumalik Core Tests 1 & 2. Engineering data are not available for this core test, but it can be assumed to be similar in design to Oumalik Core Test #11.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	300	Open Hole (Est.)

Fish/Fill Information

Item	Date	Depth	Comment
A	April-49	300	Hole abandoned likely after bailing drilling mud to TD. Thermocouples were likely installed, but this is not verified.
B			
C			

Figure 4: Oumalik Core Test #12 wellbore diagram.

Oumalik Foundation Tests #1 through #10

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 69.8292° N, -155.6958° W. The Oumalik Foundation Tests #1 through #10 are approximately 60 miles southeast of Atqasuk, 93 miles west/northwest of Umiat, and 102 miles south of Barrow. The site is located at the Oumalik Test Well #1. The last site visitation was in July 2012.

Site Description: The Oumalik Foundation Tests #1 through #10 are all uncased holes, all less than 50 feet in depth. Their purpose was to test the permafrost at the Oumalik Test Well #1 location. They all occur within the same disturbed area as Oumalik #1.

Surface Risk Assessment: None.

Justification: There is no indication of a well site.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled the 10 Foundation Tests to test the permafrost at the Oumalik #1 location. It was assumed that the thickness of the permafrost was about 900 feet, so in 1948, when it was decided to drill a deep test in the area, extensive foundation tests were made on the problems pertaining to the thawing of the frozen ground, which might result from the circulation of hot drilling mud. Ice lenses, as much as 40 feet thick were discovered (Robinson and Bergquist 1956).

- **Well Condition:** The foundation test holes are uncased.

- **Wellhead Components:** There is no wellhead or casing associated with the foundation tests.

Geologic Setting: The holes encountered less than 50 feet of the Chandler Formation of the Nanushuk Group.

Development Potential: These uncased foundation tests will have no effect on future drilling or production in the area.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at this location. The Alaska Oil and Gas Conservation Commission reviewed these foundation tests and do not consider them to require any remediation.

Subsurface Risk Assessment: None

Justification: This is a shallow uncased drill hole and did not penetrate oil or gas stratigraphy or water resources. The old drill location has blended harmlessly with the environment.

There are no wellbore diagrams for the uncased foundation tests.

Peard #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.7156° N, -159.0007° W. The Peard Bay #1 site is 26 miles east of Wainwright, 41 miles west/northwest of Atqasuk, and 64 miles southwest of Barrow. Peard #1 is 12 miles northwest of Kugrua #1. The last site inspection was in July 2012.

Site Description: The Peard Bay #1 site consists of a well inside a constructed wooden cellar, a pad, and a reserve pit **[Figure 1].** Husky Oil drilled the site under contract to USGS in 1979. The wooden cellar is constructed of 2x12 and is intact **[Figure 2]**. It is in surprisingly good condition considering its age and no maintenance. There is standing water in the base, deep enough to cover the bottom valves and casing spool **[Figure 3]**. An old drum and scrap wood are lying in the cellar. Wooden pilings extend eastward from the wellhead and have been exposed due to the ground settling **[Figure 4-6]**. Like all other well sites in the National Petroleum Reserve in Alaska, the pilings were cut off to match the surrounding ground level upon the conclusion of drilling operations. Their current exposure is an indicator of freeze-thaw ground shifting. The rat hole is outside of the cellar.

The drill pad is of the thin pad design. The pad was created from excavated reserve pit material and spread across an operations area. As Peard #1 did not use insulation for the pad, the pad area is being reclaimed by the surrounding tundra. The pad has revegetated about 60 percent, with mosses and a little grass. The reserve pit and adjacent flare pit have joined a nearby pond.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the Peard #1 site. There does not appear to be any effects to surface waters from Peard #1. The Alaska Department of Environmental Conservation sampled the reserve pit and closed it in 1995 in its current condition. There was nothing in the pit considered harmful in its current condition.

Figure 1: Aerial view of Peard #1 (July 2012).

Figure 2: Peard #1 wellhead with the rat hole outside the cellar and a multitude of wooden pilings. Some of the pilings are just inside the shoreline of the reserve pit (July 2012).

Figure 3: View of the Peard #1 wellhead inside the cellar (July 2012).

Figure 4: Looking across the shoreline of the reserve pit back toward the Peard #1 wellhead (July 2012).

Figure 5: Pilings sticking out into the Peard #1 reserve pit (July 2012).

Figure 6: Pilings were not quite in the Peard #1 reserve pit in June 2003. Water levels in the reserve pit may have been lower, as most water within the reserve pit was locked up as ice.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Drilling operations commenced with rig-up on Jan. 2, 1979. The Peard #1 well was spudded on Jan. 26, 1979, and the rig was released on April 13, 1979. The well was drilled to a total depth of 10,225 feet, cased to 8,600 feet, and plugged back to 2,026 feet. To allow for USGS temperature monitoring, there was no surface plug set. Diesel fuel was chosen as the medium as it will not corrode the casing, nor freeze at the temperatures encountered downhole.

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the Navy plugged the well back to 2,026 feet. Four cement and mechanical plugs were set at various intervals in the wellbore, with the top of the shallowest cement plug at 2,026 feet. From 1,900 feet to the surface, the hole is filled with diesel fuel overlying 126 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 13 ⅜-inch surface casing has cement from 2,632 feet to surface with cement in the 13 ⅜-inch by 20-inch casing annulus from 88 feet to surface. The 9 ⅝ in casing was cut off at 2,170 feet and removed, with a retainer set above, and with cement set on top of the retainer [**Figure 7**].

- **Wellhead Components**: There is one gate valve, and it is functional. The needle valve was replaced with a removable 2-inch cap to facilitate well-bore temperature monitoring. [**Figure 8**]

Geologic Setting: The primary objective of the Peard #1 well was to test the anomalous conditions noted on the seismic sections of the energy reflected from within the Cretaceous, Jurassic, and Carboniferous age zones.

There were some gas shows in the Cretaceous aged rocks. Minor methane gas was present throughout the Nanushuk Formation. The best shows in the Peard well were from the Torok Formation and were fairly common throughout the sequence. A small gas show was encountered in the Kingak Formation of Jurassic age. No oil shows were encountered in the well (Husky Oil 1982).

Development Potential: If development were to occur, this well is adequately cased and cemented, securing the well from all lower formations, and will not affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

An all-season airstrip was constructed about 2 miles to the northeast in support of the DEWLine system. This airstrip was relied upon heavily for support of drilling operations at Peard, Kugrua, and South Meade. The airstrip and its connecting road are unusable due to frost heaves.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

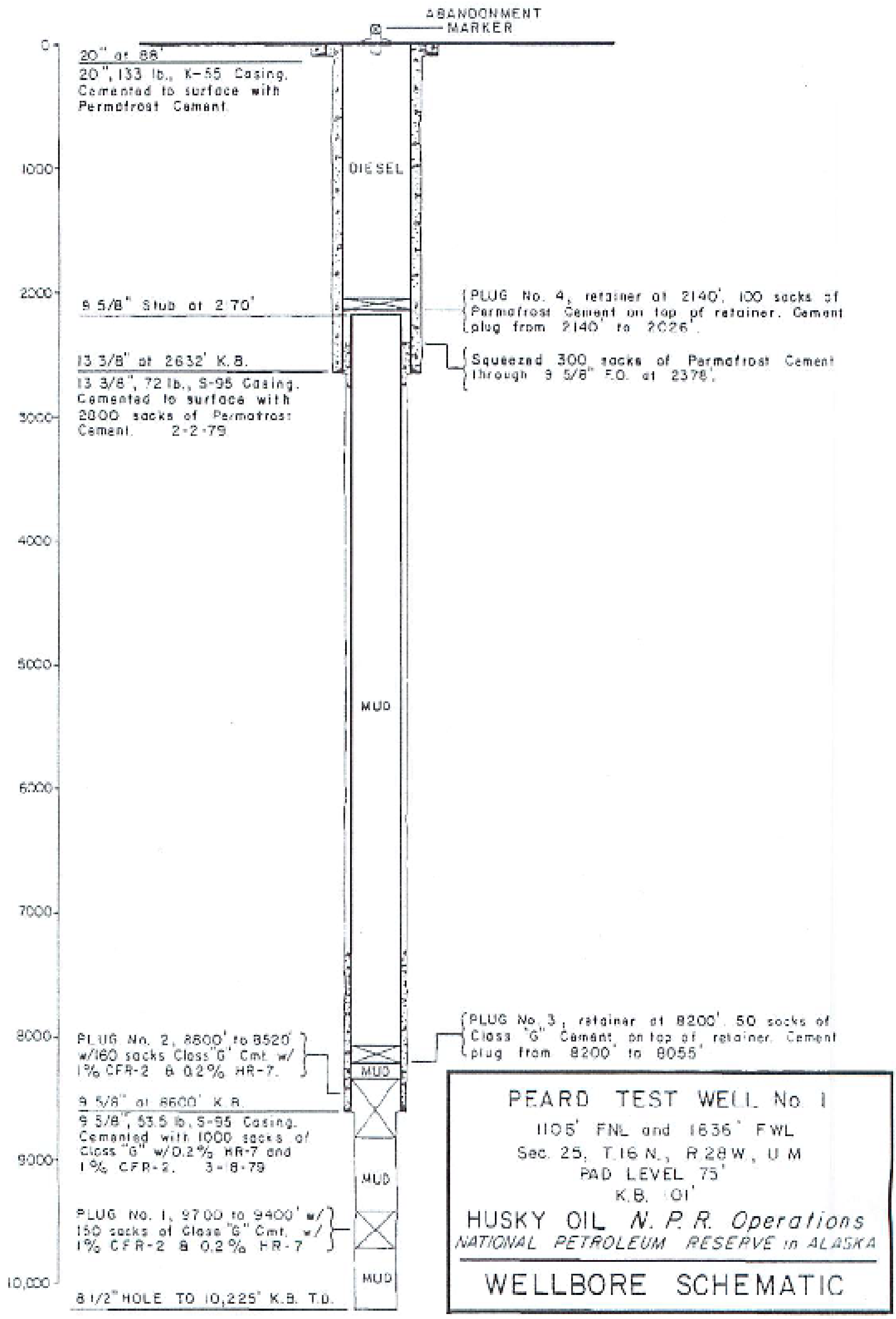


Figure 7: Peard #1 wellbore diagram.

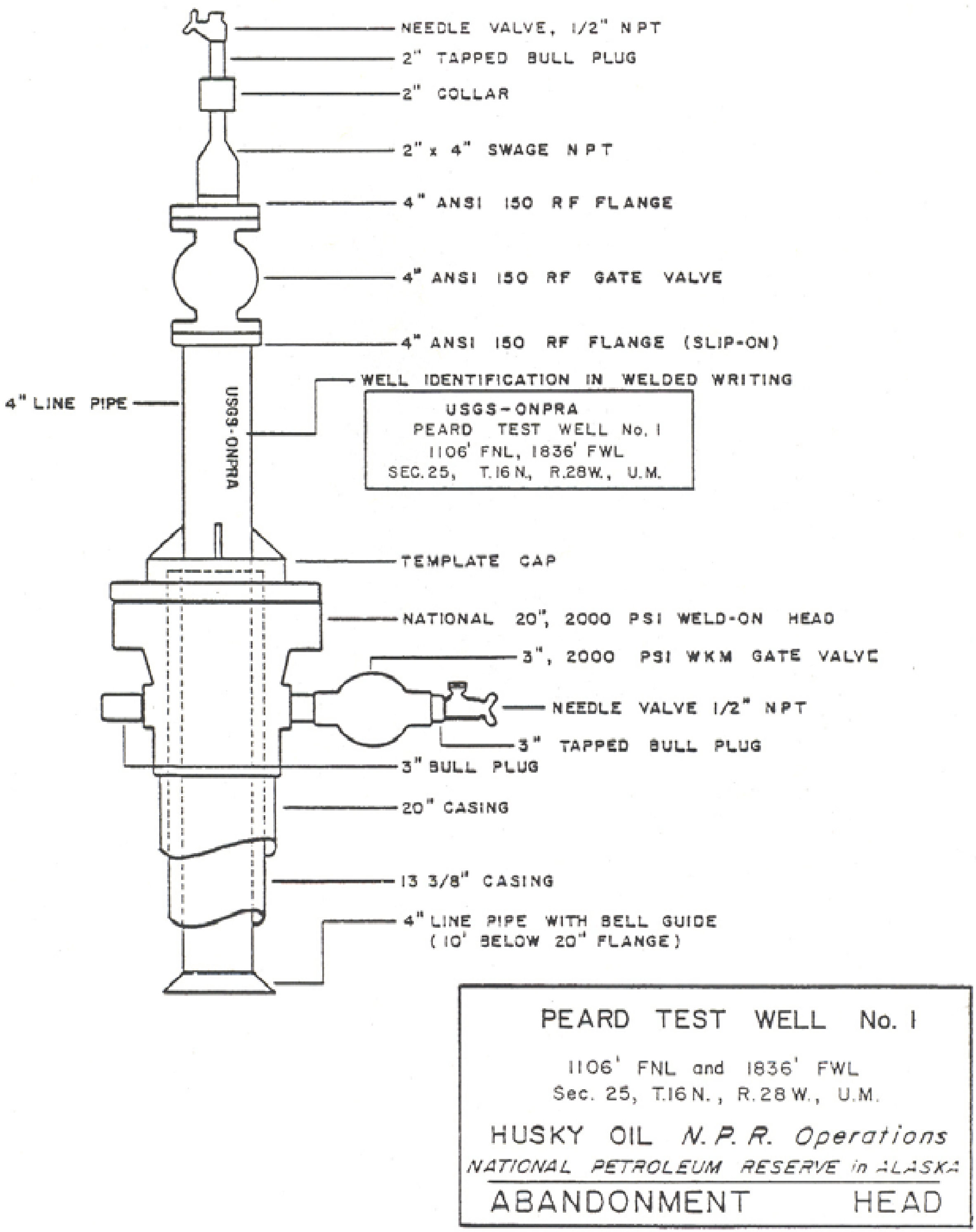


Figure 8: Peard #1 wellhead assembly.

Seabee #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 69.3796° N, -152.1731° W. The Seabee #1 site is 1 mile northwest of Umiat and 64 miles south of Nuiqsut. Umiat is not a village, but serves as a camp for industry and as the primary hub for recreational activities in the eastern National Petroleum Reserve in Alaska and western Central Arctic Management Area. Umiat has one of the few remote, year-round airstrips on the North Slope and is one of the few locations aircraft fuel is available for purchase. The last site inspection was in July 2012.

Site Description: The Seabee #1 site consists of a well in a metal cellar, a pad, and a flare pit merged into the reserve pit [**Figures 1-3]**. Husky Oil drilled the Seabee #1 well under contract to USGS in 1979-1980. The wellhead is capped with a closed and operational gate valve and cap **[Figure 4]**. The wellhead is patched with a piece of rubber due to what appears as bullet holes puncturing the pipe. [**Figures 5-6**] The cellar is a metal culvert with a steel frame and is filled with water.

The gravel pad is of thick pad design and is in good condition. The materials for the pad came from nearby Seabee Creek. The well is on an active lease and the lease holder uses the pad to stage materials [**Figure 7].** The pad is connected by gravel road to the 5,000 foot airstrip at Umiat.

Seabee #1's flare pit walls have eroded to the point that they are no longer separated from the reserve pit. The reserve pit walls are eroding slightly, allowing water to escape to the surrounding tundra during high water events. The Alaska Department of Environmental Conservation sampled the reserve pit and closed the pit in 1995 in its current condition.

There is some minor trash on the drilling pad, primarily consisting of wires. Rotting timbers and a small amount of drilling muds are also present next to the wellhead. Industry has staged equipment on the Seabee pad at various times over the past 10 years.

A natural oil seep occurs in Umiat Lake near Seabee #1 **[Figure 8]**.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. Seabee #1 is within ¼ mile of Seabee Creek, a small tributary of the Colville River. There is no threat of Seabee Creek or the Colville River eroding this pad or pit. Additionally, the well site does not appear to have any effect on the creek or river.

Figure 1: Aerial view of the Seabee #1 pad (July 2012).

Figure 2: Current condition of the Seabee #1 reserve and flare pits (July 2012).

Figure 3: August 2008 photo shows the access road from Umiat, the Seabee #1 drill pad, and associated reserve and flare pits.

Figure 4: Gate valve on top of the line pipe at Seabee #1. This is the access point for temperature sampling by the USGS (August 2008).

Figure 5: Puncture bullet holes in the Seabee #1 line pipe (August 2006).

Figure 6: Shows the rubber pad placed around the bullet holes to avoid accidental spillage of diesel while logging the Seabee #1 wellbore (August 2006).

Figure 7: Equipment staged on the Seabee #1 pad (August 2008).

Figure 8: Natural oil seeps in Umiat Lake near Seabee #1 (August 2003).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Seabee #1 was drilled at Umiat. A Hercules C-130 aircraft from Inigok moved the drilling rig to Umiat. Rig move-in operations began on June 14, 1979, and the Seabee #1 well was spudded on July 1, 1979. A labor dispute halted drilling operations. Nabors Alaska Drilling, Inc., drilled the well in 1979-1980, using Nabors Rig 25, a National 100 drill rig. With the total depth at 6,551 feet, the wellbore was isolated with a retrievable bridge plug and cement plug set at 3,635 feet. The well remained suspended from Aug. 21, 1979, to Oct. 16, 1979. Drilling resumed on Oct. 21, 1979, and continued until March 15, 1980, when it reached the total depth of 15,611 feet. The well is cased to 12,814 feet, and plugged back to 1,478 feet (Husky Oil 1983).

  The well is properly plugged back and filled with diesel fuel from the top of the uppermost plug to the surface to facilitate USGS temperature monitoring. Diesel was chosen as the medium for temperature monitoring as it will not corrode the casing, nor freeze at the temperatures encountered downhole.

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the well was plugged back with 8 cement and mechanical plugs set at selected depths, with the top of the shallowest cement plug (10 barrels of cement) on top of a cement retainer at 1,478 feet (cement PBTD estimated to be at 1,337 feet). From 1,320 feet to the surface, the hole is filled with diesel fuel overlying 17 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 13 ⅜ in surface casing has cement from 3,983 feet to surface, with cement in the 13 ⅜-inch by 20-inch casing annulus from 1,617 feet to surface. The 9 ⅝-inch by 13 ⅜-inch casing annulus was cemented to surface from 9 ⅝ inches fluid oriface (FO) at 1,990 feet. There are no downhole concerns with the well at this time **[Figure 9]**.

- **Wellhead Components**: There are two gate valves on the wellhead. The gate valve closest to the 2-inch cap on top of the assembly is functional. It is maintained by the USGS for accessing the wellbore for temperature monitoring studies. **[Figure 10]**

Geologic Setting: The Seabee #1 well is near Umiat. The primary objective of the well was to penetrate into the top of the Kingak Shale, testing the Nanushuk Group, the Fortress Mountain, and the “Pebble Shale” unit. Drilling was terminated in the “Pebble Shale” unit equivalent.

Hydrocarbon shows were common in the Nanushuk Group, but only one zone was considered worthy of testing. A sandstone at 2,654-2,673 feet was tested, but recovered only some slightly oil and gas-cut mud while reversing out. At 5,328 feet, a sand was encountered in the upper Torok with enough pressured gas to flow the well. Two drill-stem tests were attempted, but the packers failed on each. This sand was later tested through casing and recovered a maximum of 6. 7 million cubic feet per day, declining to 6.2 MMCFPD after 8 hours. Surface pressures decreased from 2,250 psi to 2,100 psi.

No other tests were performed at Seabee #1, although other hydrocarbon shows, predominantly gas, were observed below this sand. Reservoir qualities were considered poor in the remainder of the well, and those shows that were encountered were presumed to be partially associated with fractures and faulting (Husky Oil 1983).

Development Potential: There has always been interest in the Umiat area given the known oil reserves. Industry has made efforts to delineate the oil field and attempt to bring it into production. Seabee #1 is adequately cased and cemented, securing the well from all lower formations, and will not affect future development.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead. Umiat is on the north bank of the Colville River, 60 miles upstream from the village of Nuiqsut. Early explorers discovered the natural oil seeps at Umiat. This discovery, along with the detection of seeps at Cape Simpson, motivated the U.S. Navy to conduct its drilling program. Umiat and the Simpson Peninsula were the primary exploration targets in the mid- to-late 1940s. Both locations have active seeps today. The Umiat seep locations tend to shift over time. Currently they are active in Umiat Lake, just off the northeast portion of the airstrip, and in a channel of the Colville River.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

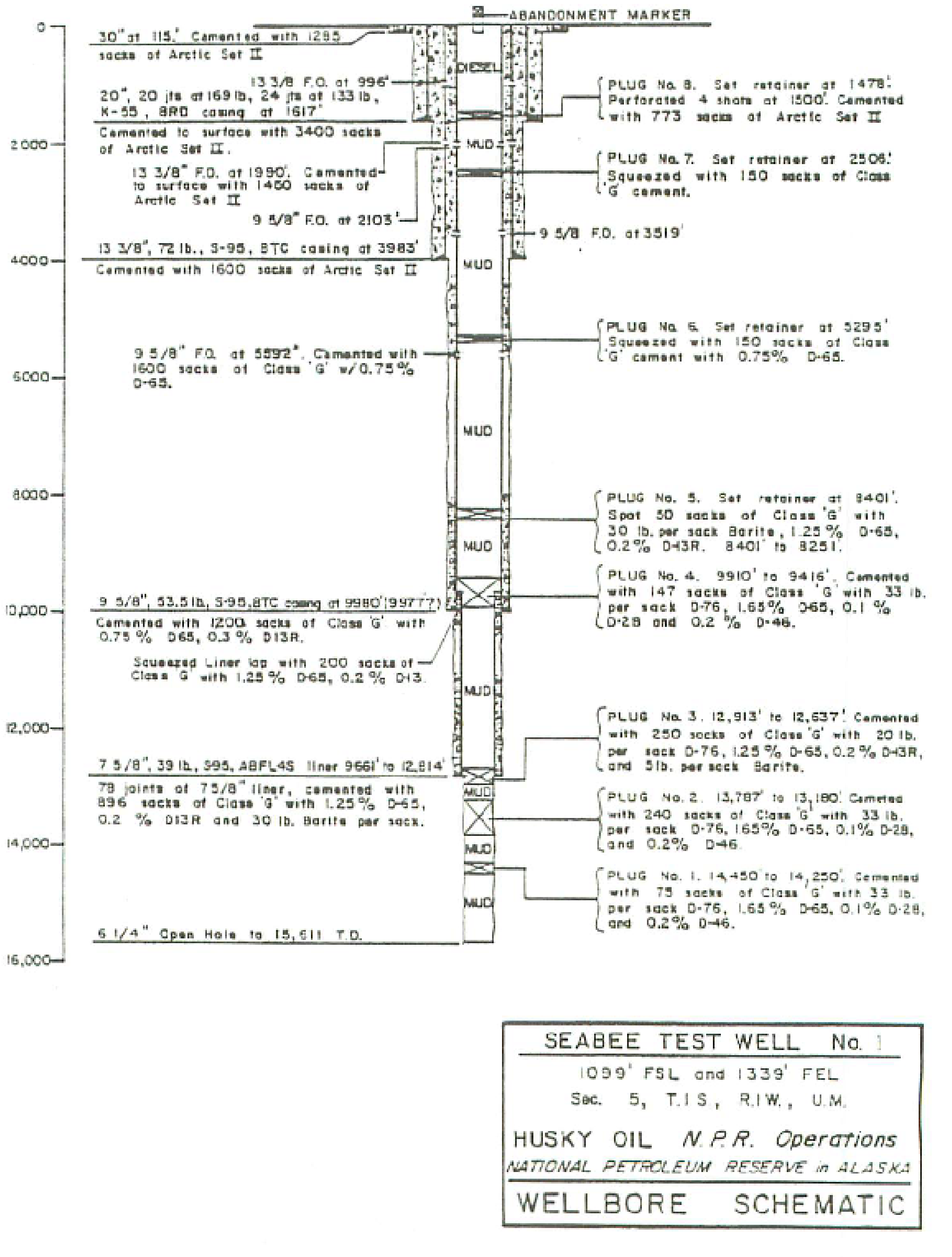


Figure 9: Seabee #1 wellbore diagram.

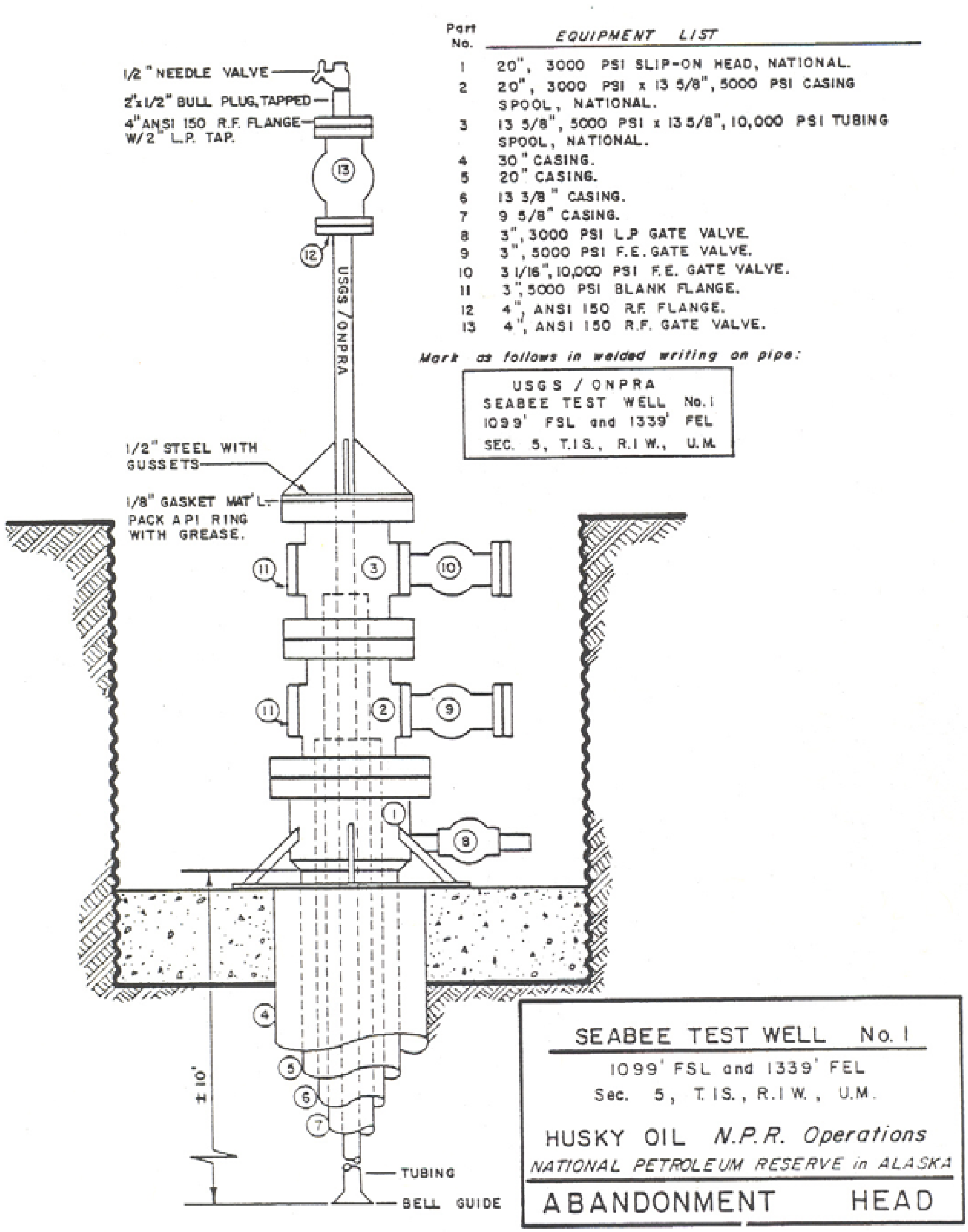


Figure 10: Seabee #1 wellhead assembly.

Sentinel Hill Core Test #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 69.6016° N, -151.4503° W. The Sentinel Hill Core Test #1 site is 23 miles north/northeast of Umiat and 43 miles south of Nuiqsut alongside the Colville River. The last site visitation was in July 2012.

Site Description: The Sentinel Hill Core Test #1 consisted of a wellhead inside a gravel-filled cellar. The U.S. Navy drilled the core test in 1947. No pad or reserve pit was associated with the site. The core test was located at the base of 350-foot bluffs of the coal-bearing Upper Cretaceous Prince Creek Formation near the axis of a small surface syncline along the Colville River (Flores et al 2007). Due to its proximity at the base of this steep bluff of unstable material on Alaska's largest arctic river; the Sentinel Hill Core Test #1 site was consequently buried by a landslide in 1947, several months after its completion (Robinson and Collins 1959) [**Figure 1**]. As a result, there is currently no surface expression of the core test remaining. [**Figures 2-4**]

Five 55-gallon metal drums are present on the bluff overlooking the general area of the core test alongside the Colville River. [**Figures 5-6**]

Surface Risk Assessment: None

Justification: A landslide covered the core test in 1947 and no surface expression currently exists of the site. The 5 metal drums on top of the bluff should be removed as funding allows or in conjunction with other scheduled operations, if possible.

Figure 1: A landslide of these bluffs along the Colville River buried Sentinel Hill Core Test #1 in 1947.

U.S. Navy coordinates put the core test in this location (July 2012).

Figure 2: Estimated coordinates from the U.S. Navy put the Sentinel Hill Core Test #1 at this point on the Colville River.

Figure 3: Same area along the Colville River as the previous aerial photo, showing ravages from landslides in the area pinpointed by U.S. Navy estimated coordinates for the Sentinel Hill Core Test #1 (July 2012).

Figure 4: Slumping and rock slides from the 350-foot bluff along this portion of the Colville River, a major 350-mile river of the Arctic Ocean coast of Alaska, is a common occurrence (July 2012).

Figure 5: Five scattered drums are the only visible debris on the tundra above the Colville River in the area pinpointed as the Sentinel Hill Core Test #1 site area by U.S. Navy estimated coordinates (July 2012).

Figure 6: The same drums on the bluff near the Sentinel Hill Core Test #1 estimated location as shown in the previous photo (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled Sentinel Hill Core Test #1 in 1947 along the base of cliffs on the Colville River to a total depth of 1,180 feet **[Figure 7]**. Drilling commenced in January and concluded in March of that year. The Navy filled the cellar with gravel before moving the equipment out. Upon completion, 1,172 feet of 2 ½ in diameter tubing was run into the hole and filled with about 8 ¼ barrels of diesel fuel for future temperature monitoring. The tubing was plugged at the top and bottom; it is also welded to the top of the 7-inch casing (Robinson and Collins 1959).

- **Well Condition**: Unfortunately, this core test was completed before the day of readily obtaining accurate GPS coordinates. The listed coordinates from the Navy for Sentinel Hill Core Test #1 are estimated coordinates only. This makes the task of finding the buried core test even more problematic. The BLM searches a 1-mile stretch of the Colville River annually for Sentinel Hill Core Test #1 in the event the wellhead becomes exposed.

- **Wellhead Components**: A description of the wellhead components are not described in the limited literature associated with this core test.

Geologic Setting: The purpose of the Sentinel Hill Core Test #1 was to ascertain the nature of shallow subsurface formations on the Sentinel Hill anticline and test shallow oil possibilities. The core test encountered no oil or gas shows. The test hole penetrated early and late Cretaceous aged rocks. The Kogosukruk Tongue of the Prince Creek Formation (non-marine) makes up half of the strata encountered downhole. The Sentinel Hill Member of the Schrader Bluff Formation (marine) accounts for the remainder of the geology downhole (Robinson and Collins 1959).

Development Potential: There is little interest in the area near Sentinel Hill Core Test #1.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: Drilling location is on a gravel bar of the Colville River just below the 350 feet bluffs, approximately 12 miles due north of Gubik #1. The site is near the mouth of the Kogosukruk River. The coordinates given for the core test is based on preliminary topographic surveys and is subject to correction (Robinson and Collins 1959).

Subsurface Assessment: Low

Justification: Sentinel Hill was a relatively shallow core test reaching a total depth of 1,180 feet. The core test had no oil or gas shows. Approximately 8 ½ barrels of diesel was added to 2 ½ inch tubing extending down to 1,172 feet. However, the tubing was plugged at the top and bottom, effectively trapping the diesel fuel. Drilling muds added into the wellbore after well completion have frozen in place.

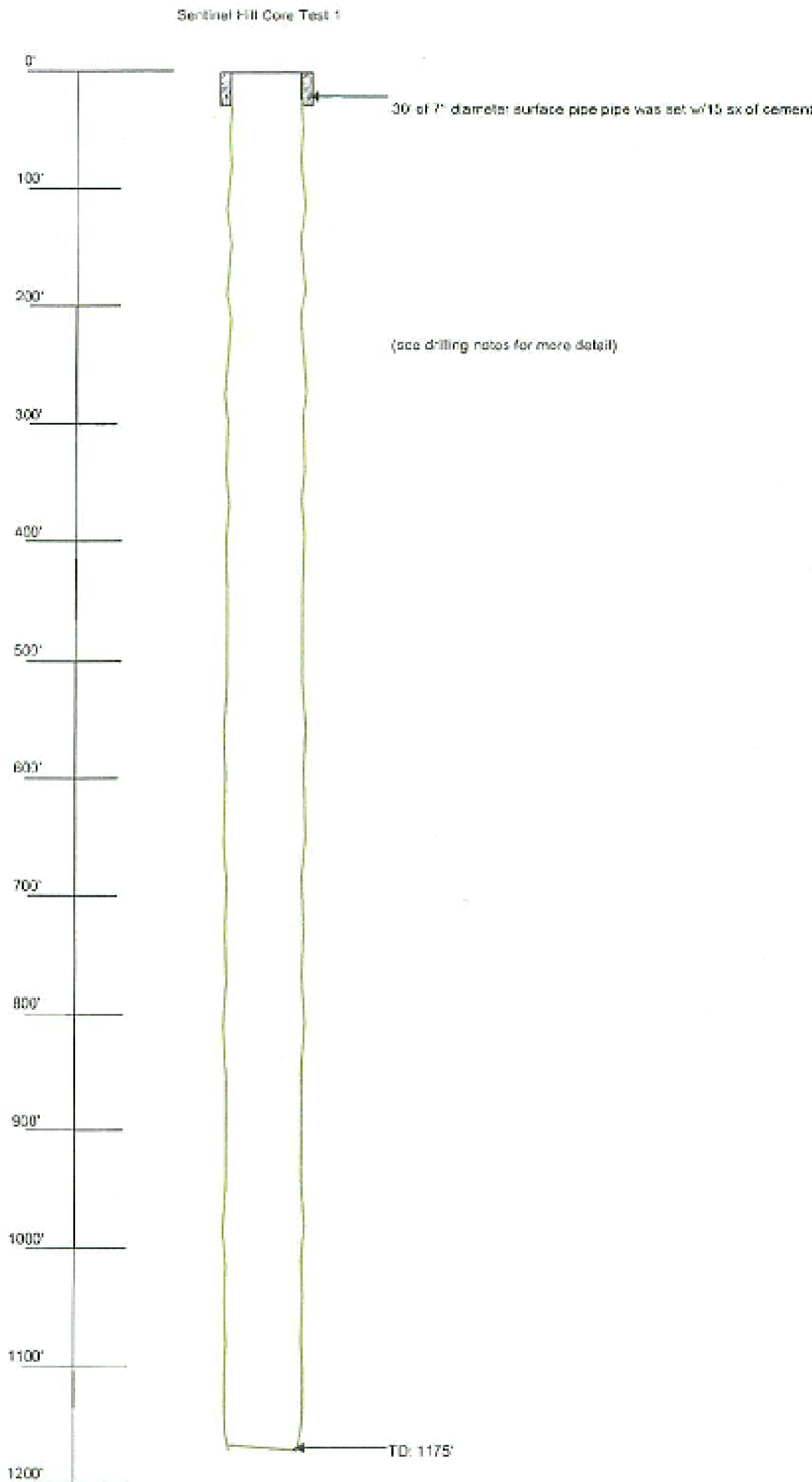


Figure 7: Sentinel Hill Core Test #1 wellbore diagram.

Simpson #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9533° N, .155.3644° W. The Simpson #1 well site is 40 miles southeast of Barrow and 65 miles northeast of Atqasuk on the western side of the Simpson Peninsula. The last site inspection was in July 2010.

Site Description: The Simpson #1 well site consists of a well inside a constructed wooden cellar and surrounded by a concrete pad. [**Figure 1**] The U.S. Navy drilled the well in 1947. There is no reserve pit associated with the site. The pad is highly visible and constructed in the same fashion as Fish Creek #1, which used concrete as a working pad. The concrete was poured over a landing mat placed on wooden pilings. The freeze-thaw process has resulted in buckling of the concrete in numerous places, creating a partially-collapsed surface. Beyond the concrete, a pad does not exist. The tundra, however, was heavily disturbed at the time of drilling, probably by bulldozing a working area.

The cellar consists of an 8-foot by 8-foot wooden box with pilings. [**Figure 2**] Vegetation has grown within the cellar, indicating it is mostly free of water. The open casing is approximately 5 feet high and consists of a single valve, which is rusting. The hole on top is open. A plumb-bob was dropped down the wellbore and hit solid (likely an ice plug) at 6 feet. [**Figure 3**] The rat hole is open to the environment approximately 5 feet from the well and is roughly 2 feet in height with a diameter of 10 ¾ inches.

Site debris includes the cement pad and wood pilings around the well. [**Figures 4-6**] There is a single pipe with a water-type valve coming from the cellar; the pipe doesn't appear to be hooked up to anything. There are some scattered wood in the tundra toward the north and northwest. Crushed cement piles are adjacent to the cement, as well as two additional piles in the disturbed tundra to the north. Smaller pieces of debris is scattered within the disturbed area. There is a small pile of drilling muds near the well.

Surface Risk Assessment: **Moderate**

Justification: There is no evidence of any contaminants present on the site. The linear water features shown in the photographs below are a result of deep cuts make with a bulldozer blade, exposing the ice-rich permafrost ground, and water filling it over time. There is no evidence of hydrocarbons in any of the surrounding surface water. The site itself is not under any threat due to erosion or any other natural processes. Surface debris present on the site is both an impact to visual resources and could pose a travel risk to local residents.

Figure 1: Aerial photo showing the Simpson #1 cement pad and large disturbed area, which has naturally revegetated.

Figure 2: Simpson #1 well head.

Figure 3: Dropping a plumb bob downhole at Simpson #1 to determine depth of solids.

Figure 4: Simpson #1 well with concrete pad and pilings.

Figure 5: Simpson #1 pad extending from well.

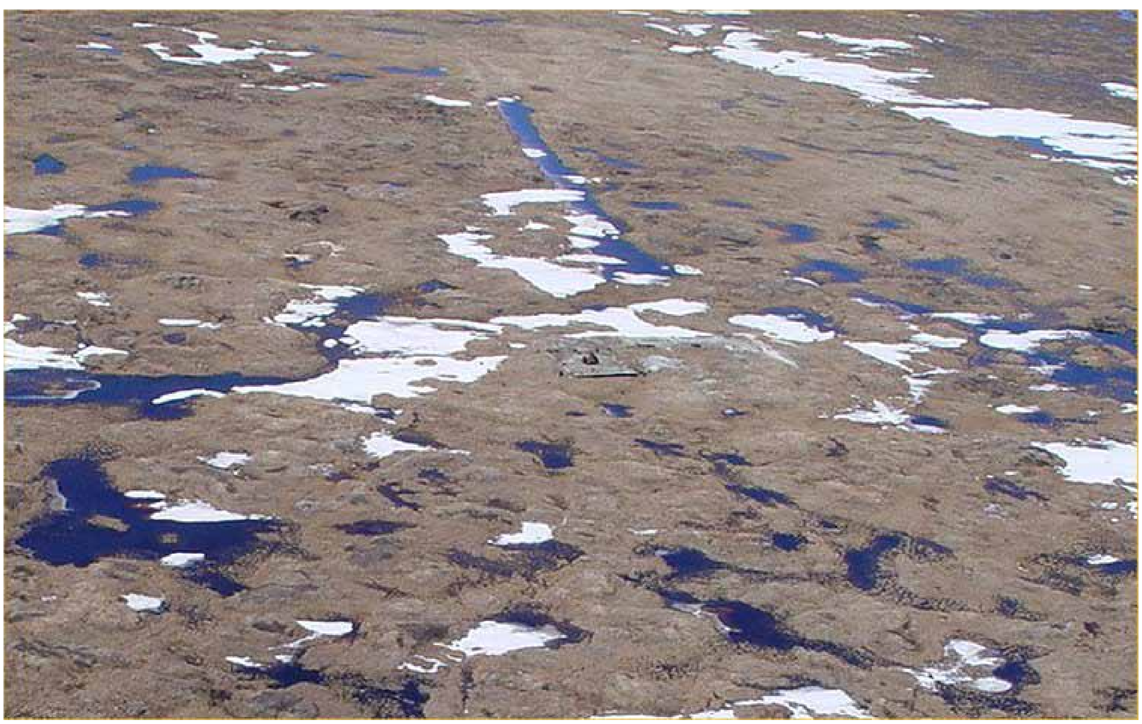


Figure 6: Simpson #1 area during spring thaw.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: The Simpson #1 test well was drilled with a rotary rig in 1948 by the U.S. Navy. The well reached a total depth of 7,002 feet and is cased to 5,954 feet. [**Figure 7**]

- **Well Condition**: The open casing is approximately 5 feet high and consists of a single valve, which is not functional and is rusting. The hole on top is open. A plumb-bob was dropped down the wellbore and hit solid (likely an ice plug) at 8 feet.

- **Wellhead Components:** There is no wellhead. No gauges or valves are present. The wellhead components are as follows:

    » Base Plate on 11¾-inch casing to casing spool Shaffer (20x1¼-inch studs)
    » Casing spool = 2-inch nipple to Nordstrom Wing Valve (LOT 3230, D40)
    » Tubing spool = Shaffer (20x1¼-inch studs), wings bull plugged
    » Top flange (12x1-inch studs), welded collar–open

Geologic Setting: The purpose of the Simpson #1 well was to test the various formations of the Lower Cretaceous and Upper Jurassic rocks. The well encountered several very poor oil and gas shows and one productive gas sand in the Lower Jurassic at a depth of 6,183 to 6,193 feet. The well produced gas at rates up to 3 million cubic feet per day during open hole flow tests of this Lower Jurassic sand. The gas zones are currently isolated from other formations and the surface by two cement plugs set above the productive sand. The top of the shallowest plug is at 5,520 feet (Robinson and Yuster 1959).

Development Potential: Exploration and development in this well's vicinity is not likely within the next 20 years, despite potential for industry to target the Lower Jurassic.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There were no natural gas odors around the well or visible oil sheen on site.

Subsurface Risk Assessment: Low

Justification: Simpson #1 is plugged above the productive gas sand that was encountered between 6,183 and 6,193 feet. The well is cased to 5,924 feet and filled with drilling muds, which have frozen given the thickness of the permafrost, creating an ice plug.

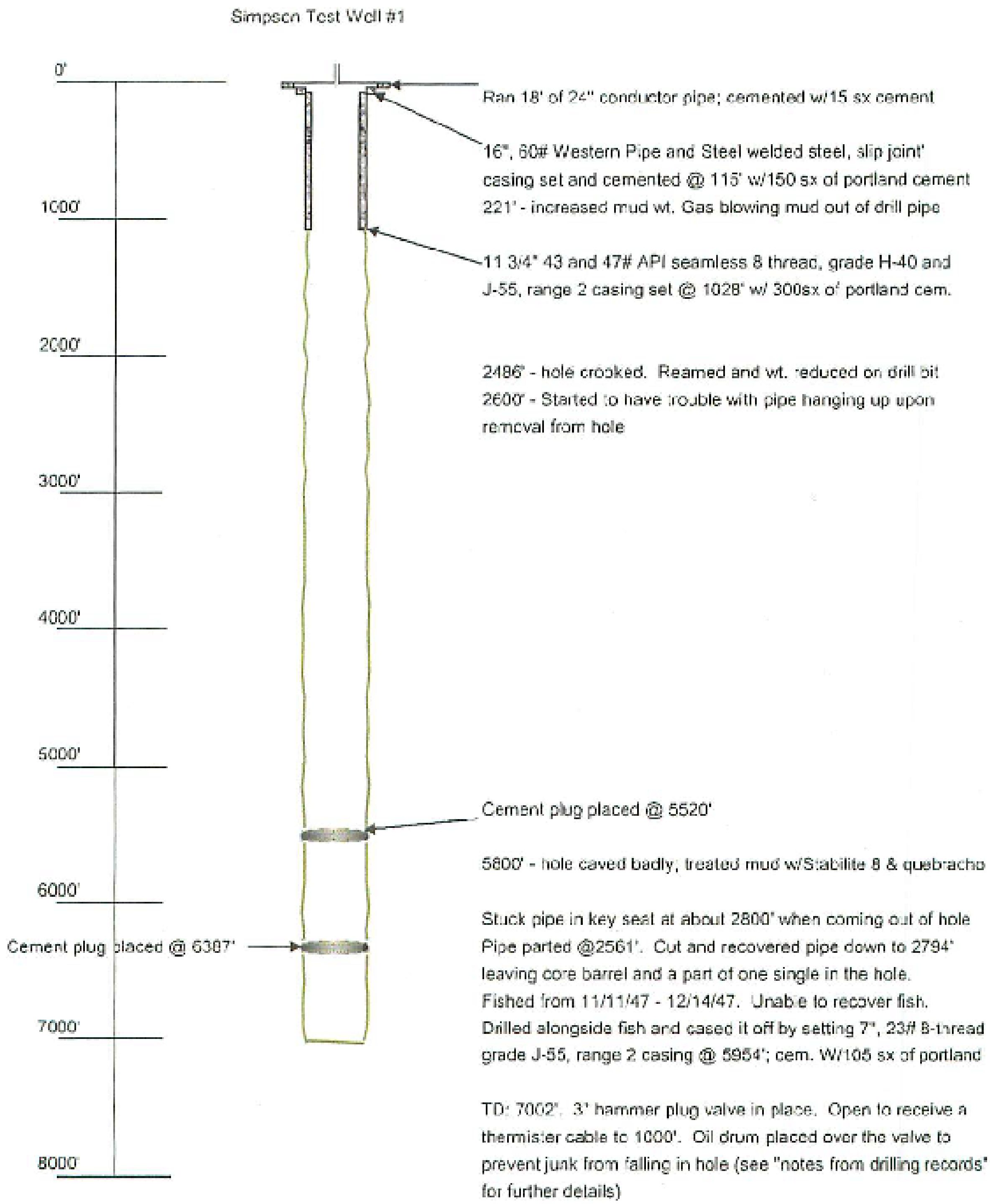


Figure 7: Simpson #1 wellbore diagram.

Simpson Core Tests #1 through #12

SURFACE INFORMATION

Site Location: Coordinates of general area for the Simpson Core Tests (DD NAD 83).

Simpson Core Test #	Coordinates	
1	70.9283° N	-155.2894° W
2	70.9275° N	-155.2917° W
3	70.9274° N	-155.2917° W
4	70.9294° N	-155.2644° W
5	70.9381° N	-155.2792° W
6	70.9328° N	-155.2092° W
7	70.9303° N	-155.2025° W
8	70.9453° N	-155.2939° W
9	70.9453° N	-155.2919° W
10	70.9619° N	-155.2922° W
11	70.9803° N	-155.2922° W
12	70.9719° N	-155.2917° W

Simpson Core Tests #1 through #12 are 43 miles southeast of Barrow and 60 miles northeast of Atqasuk on the Simpson Peninsula. The last site visit was in July 2012.

Site Description: None of the core tests were cased. The drill holes have completely disappeared by collapsing internally and the surface has revegetated **[Figures 1-4]** The small hole left behind from the hole collapsing likely healed itself naturally in one or two seasons after drilling the core test. It is now impossible to find the core tests as they have long since blended harmlessly to the environment.

The BLM has made numerous attempts to find these uncased core tests utilizing both air and ground searches in multiple years. The ground searches involved using a metal detector while taking numerous bodies to walk a grid in the locations specified from the U.S. Navy reports **[Figures 5-8]**. In 2010, staff from the Alaska Oil and Gas Conservation Commission accompanied the BLM in an extensive ground search for Simpson Core Tests #1-#4. No cased core tests were ever found.

There is a small amount of surface debris present in the general area associated with Simpson Core Tests #1-#4, nothing in the vicinity of the other core tests. Specifically, there is a single partially buried 4 ½-inch casing joint, one rubber weasel track, an old wooden box, one half drum, an old pulley, and a rusty pipe **[Figures 9-12]**.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on these sites. The very small amount of surface debris poses no risk to the environment. The actual location of the core tests has no indication of a well site.

Figure 1: General topography of the western portion of the Simpson Peninsula where Simpson Core Tests #1 through #12 occurred (July 2012).

Figure 2: Simpson Core Tests #1 through #8 were concentrated around the three lakes in the center of the photograph. Simpson Core Tests #9 through #12 were located north of the two adjacent smaller lakes (July 2012). Camp Simpson (not pictured) is just south of the larger lake (July 2012).

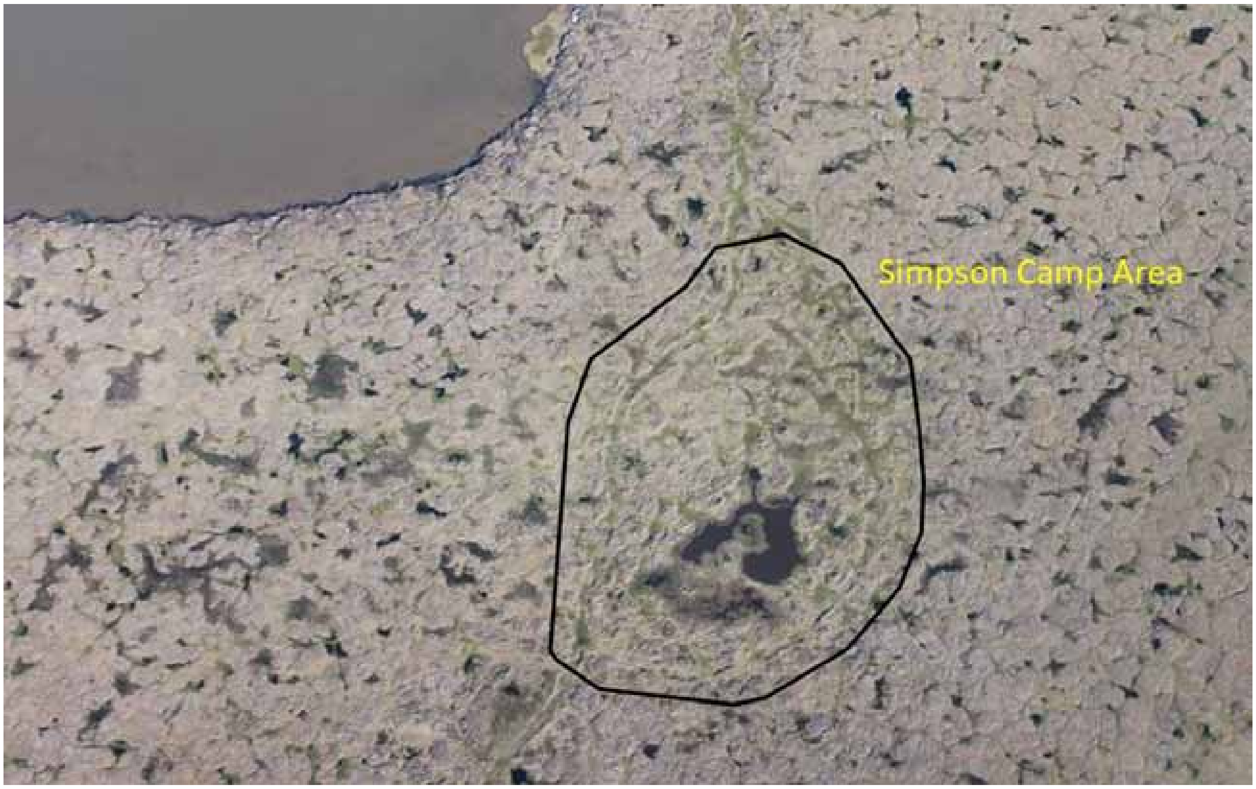


Figure 3: The old location of Camp Simpson is still visible today in addition to two associated trails (August 2010).

Figure 4: Closer view of the Camp Simpson area (August 2010).

Figure 5: A BLM employee uses a magnetic wand in an attempt to locate a cased core test near the historic Camp Simpson area (August 2010).

Figure 6: A BLM employee uses a magnetic wand in an attempt to locate a cased core test near the historic Camp Simpson area (August 2010).

Figure 7: An employee from the BLM (left) and another from the Alaska Oil and Gas Conservation Commission (right) search for uncased core tests near the historic location of Camp Simpson (August 2010).

Figure 8: Approximate location of the uncased Simpson Core Test #1 (August 2010).

Figure 9: A 4 ½-inch casing joint partially buried near the historic location of Camp Simpson. The 4 ½-inch casing was the common casing size used and pulled from many of the Simpson Core Tests (August 2012).

Figure 10: A rubber weasel track is partially buried in the wet tundra, left behind from the early U.S. Navy exploration period (July 2010).

Figure 11: An old pulley used in the Simpson core test drilling operations and abandoned near the location of Simpson Core Test #4 (August 2010).

Figure 12: Closer view of the old pulley near Simpson Core Test #4 (August 2010).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** During the summer of 1945, Navy Construction Battalion Detachment #1058 drilled Simpson Core Holes #1 through #12 10 miles west of Cape Simpson to obtain subsurface information on structure, lithology, and age. The core tests were also to check results gained from other exploration methods. Core Tests #1 through #12 are clustered together within a 3-mile diameter.

  The first 6 core holes were drilled within a radius of less than 1 mile from Camp Simpson. The Simpson camp consisted of a large area of tundra mat cleared away by a bulldozer to accommodate a headquarters for the drilling operations.

  Unfamiliarity with the frozen ground of the region resulted in mechanical difficulties and the loss of drill pipe in the first two attempts to obtain a deep hole. Thus Core Tests #1, #2, and #3 resulted from skidding the drilling rig 3 times. Simpson Core Test #4 was located east-northeastward of #2 and #3, as one of 2 additional holes at the apices of a triangle to determine the local dip of the beds. Simpson Core Test #5 was drilled to complete the triangle. No reliable correlation was obtained, but there was a suggestion of southeasterly dip. Simpson Core Test #6 was located west of the camp to see if such a dip in stratigraphy could be picked up in the near-surface beds between Core Tests #4 and #6.

  Core tests #7 through #10, drilled for further information, penetrated much of the same section of alternate soft sandstone and clay shale of Cretaceous age. Simpson Core Test #11, the northernmost of the holes, revealed a predominantly clay shale column. The presence of slickensides and steep dips suggested faulting, so at the end of the season, Simpson Core Test #12 was hurriedly drilled at an intermediate position between #10 and #11. Clay shale was penetrated. Much later, the anomaly was explained as an unconformity. Difficulty with icing was found in almost all of these tests.

  Core tests #6, #8, #9, and #10 had shows of oil and indications of an oil trap. On the basis of the information from the core tests and to a larger extent on seismic evidence, Simpson Test Well #1 was drilled in 1947 and completed 1948 (Robinson and Brewer 1964).

  All of these core tests were shallow holes, none exceeded 580 feet [**Figures 13-22**] (see table below):

Simpson Core Test #	Total Depth (feet)
1	116
2	226
3	368
4	151
5	130
6	149
7	532
8	580
9	320
10	500
11	580
12	460

- **Well Condition:** These are uncased core tests. Simpson Core Tests 1-4 appear cased based on the wellbore diagrams, but were not cemented.

- **Wellhead Components:** There are no wellheads or casing associated with these core tests.

Geologic Setting: There were three main geologic formations penetrated by the Simpson Core Tests #1-#12. With the exception of Simpson Core Test #3, all core tests encountered the shallow Gubik Formation (less than 100 feet). The Seabee Formation was only encountered in the core tests #11 and #12 (over 500 feet thick in core test #11). Conversely, the Grandstand Formation was encountered in all these core tests, with the exception of #11 and #12 (just over 500 feet thick in core test #8). The limited oil shows within these core tests were all associated with the Grandstand Formation (Robinson and Brewer 1964).

Development Potential: These uncased core tests will have no effect on future drilling in the area.

Groundwater Resource: None, continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There are no indications of hydrocarbon escapement at these locations.

Subsurface Risk Assessments: None

Justification: These are shallow uncased drill holes and did not penetrate oil or gas stratigraphy or water resources. The old drill locations have blended harmlessly with the environment. Simpson Core Tests 1-4 did not have their casing cemented and were likely pulled or dropped into the Formation.

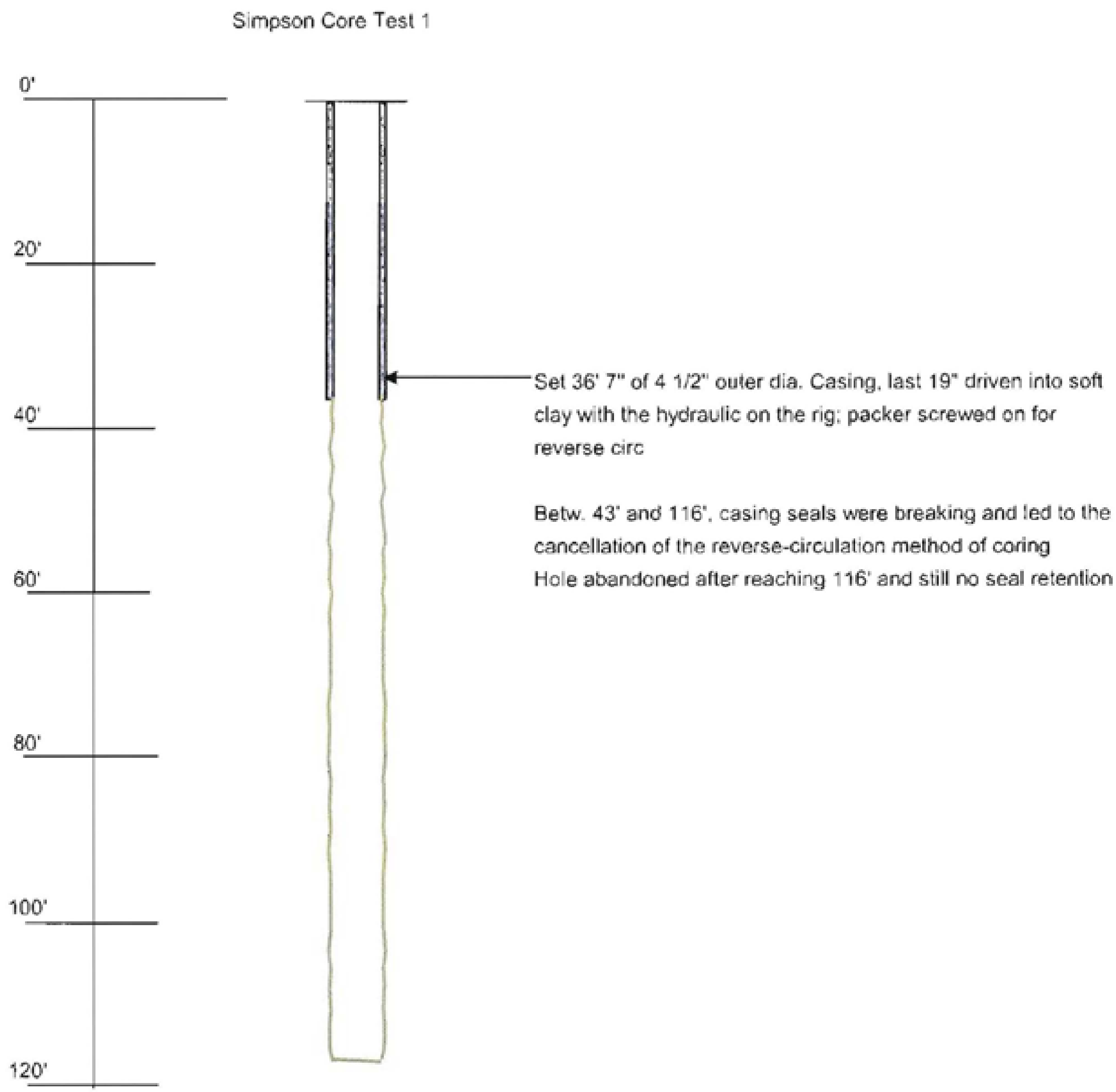


Figure 13: Simpson Core Test #1 wellbore diagram.

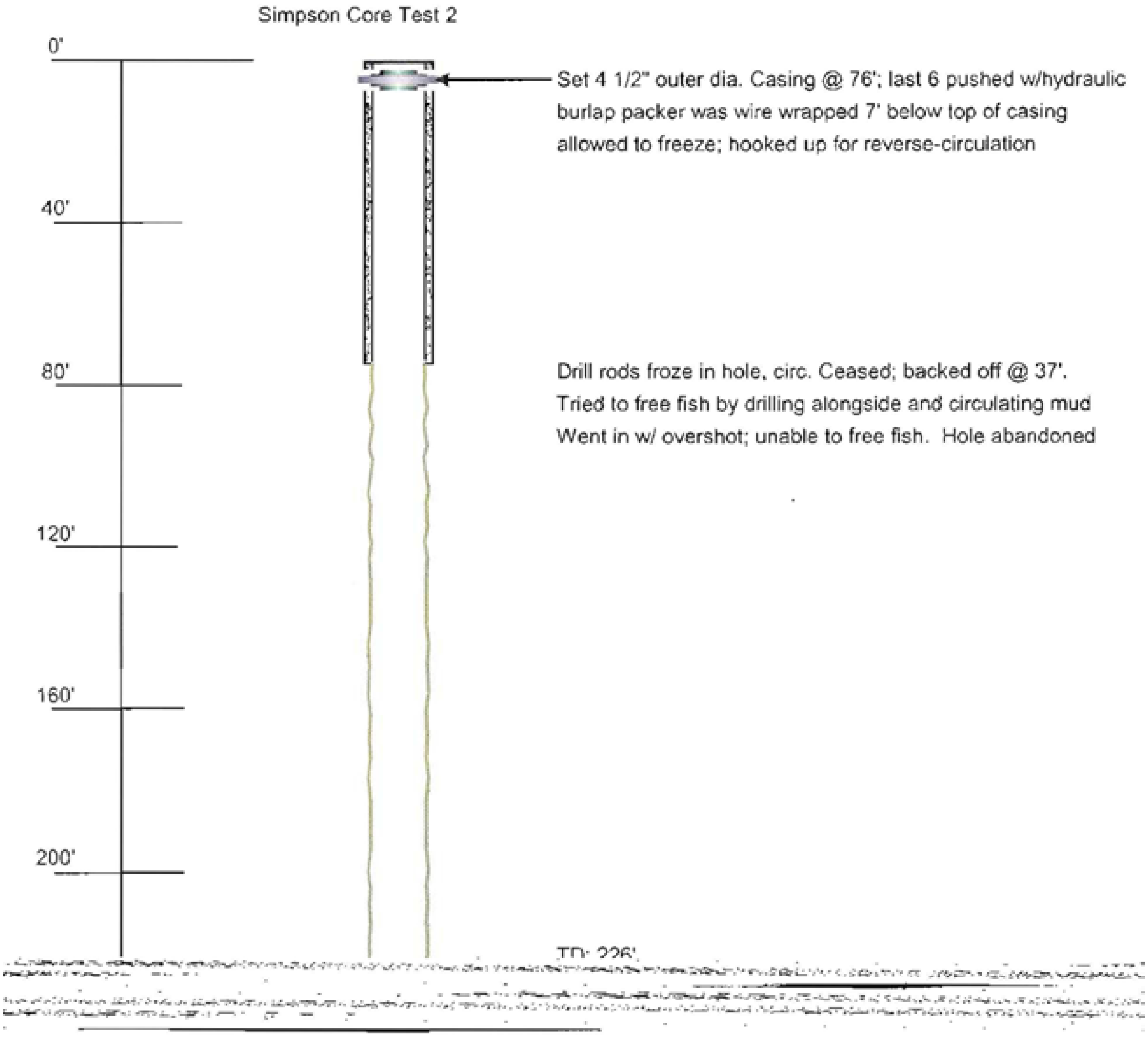


Figure 14: Simpson Core Test #2 wellbore diagram.

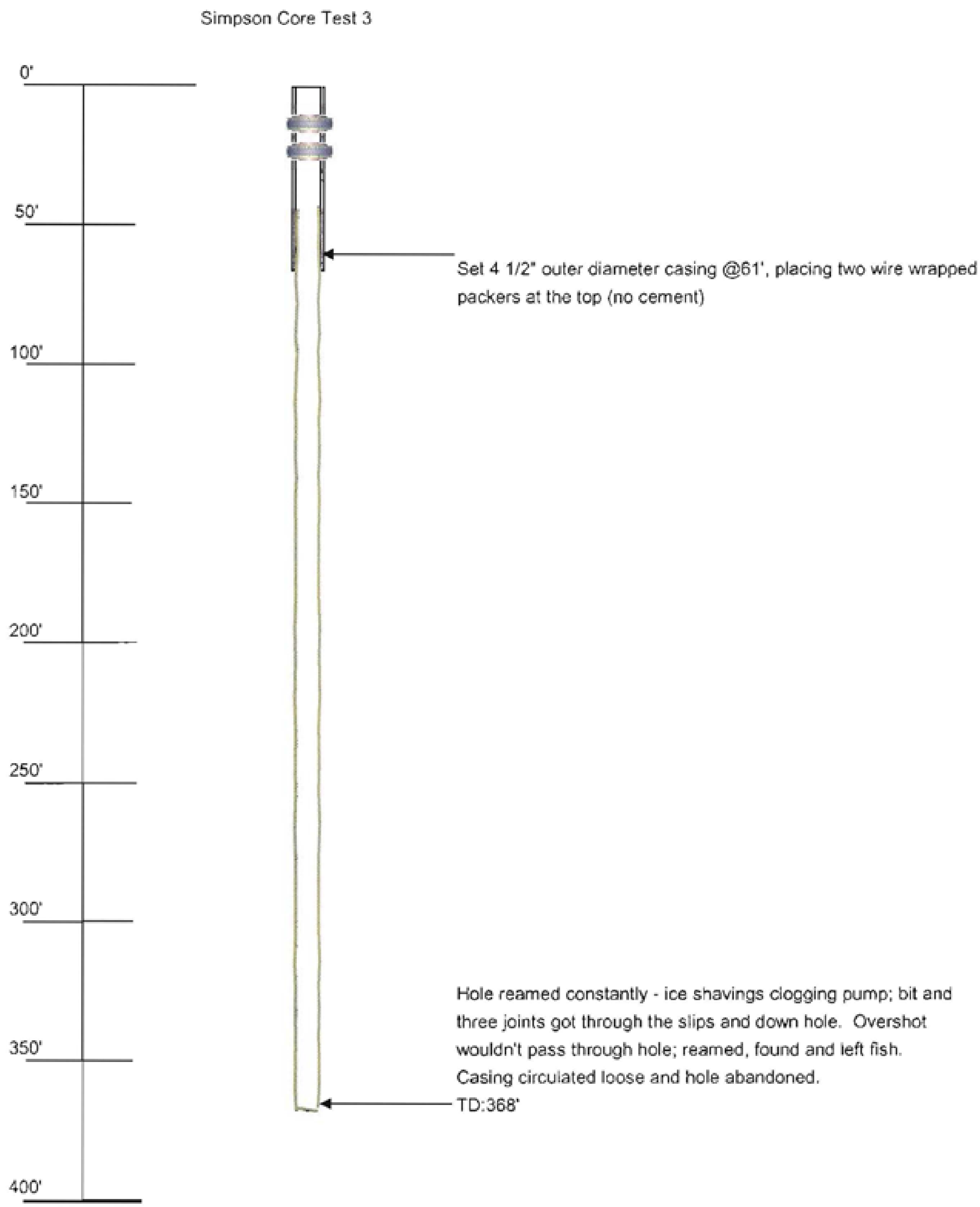


Figure 15: Simpson Core Test #3 wellbore diagram.

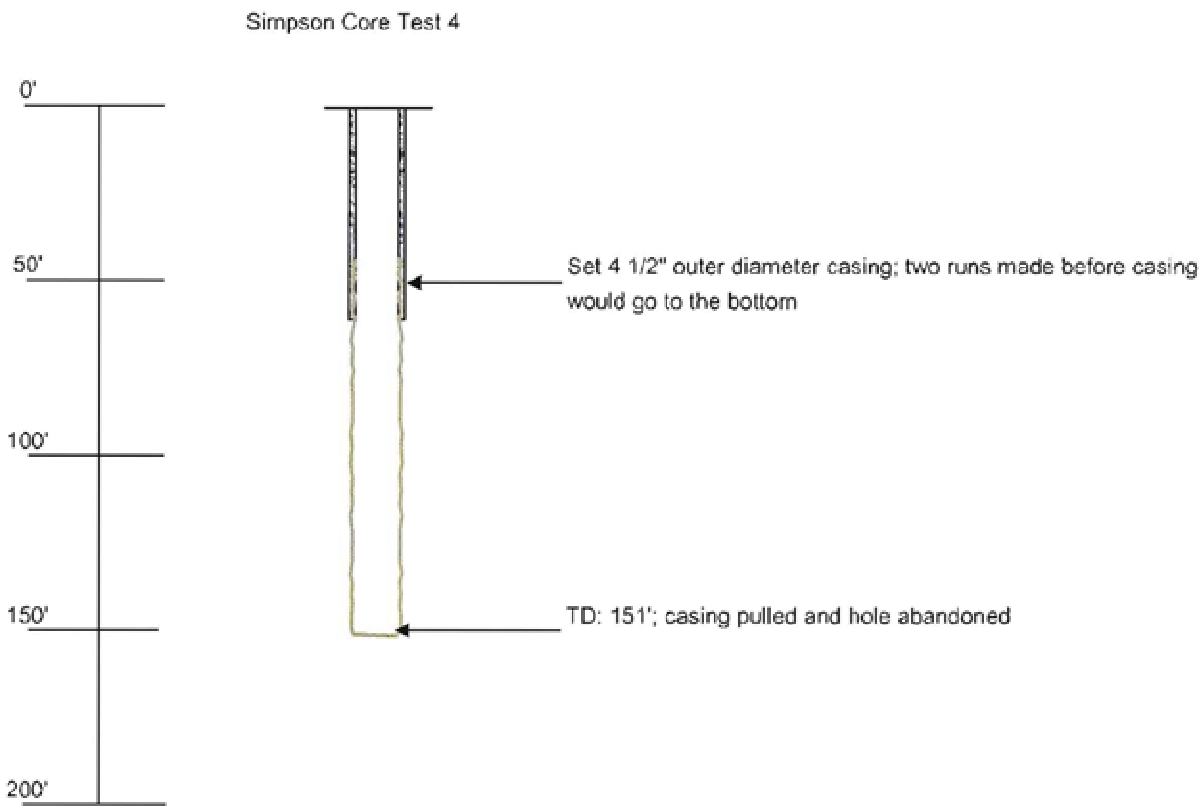


Figure 16: Simpson Core Test #4 wellbore diagram.

Simpson Core Test #5	Rig:	Navy Construction Battalion Det. No. 1058		
	Drilled:	Jul 11 - Jul 12, 1945		
Simpson Area Core Tests	API #:	**50-279-10005-00**		Created
	GL: 11'	KB: 17'		5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	70° 56' 17"N - 155° 16' 45"W		Last mod
	Reviewing Engineer:	Justin T. Miller		

Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm

Uncased; Drilled with a fishtail bit of diameter either 3-7/8", 4-1/2", or 5-7/8". Coring was done with 3" bits and conventional core barrels.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

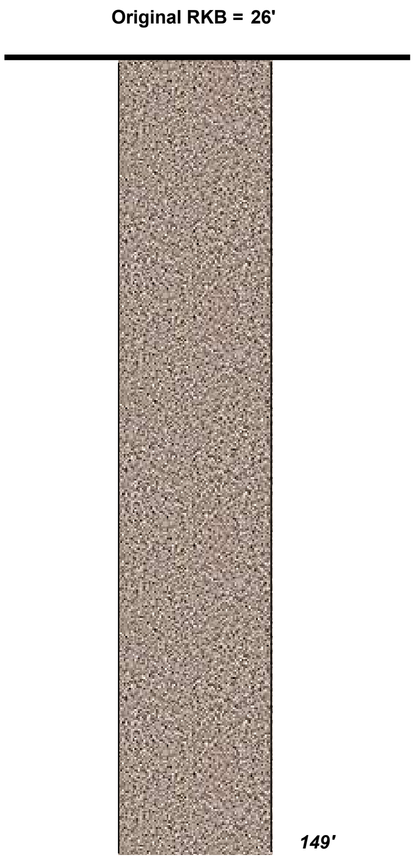
Date	Zone	Top	Btm	Comments
		0	130	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	7/12/45	130	Hole abandoned full of frozen drilling mud. No thermistor cables were installed.
B			
C			

Figure 17: Simpson Core Test #5 wellbore diagram.

BLM ALASKA				
Simpson Core Test #6	Rig:	Navy Construction Battalion Det. No. 1058		
	Drilled:	Jul 12 - Jul 13, 1945		
Simpson Area Core Tests	API #:	**50-279-10006-00**		Created
	GL: 20'		KB: 26'	5/7/13
Naval Petroleum Reserve - 4	Lat/Long:	70° 55' 58"N - 155° 18' 33"W		Last mod
	Reviewing Engineer:		Justin T. Miller	



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm

Uncased; Drilled with a fishtail bit of diameter either 3-7/8", 4-1/2", or 5-7/8". Coring was done with 3" bits and conventional core barrels.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	149	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	7/13/45	149	Hole abandoned full of frozen drilling mud. No thermistor cables were installed.
B			
C			

Figure 18: Simpson Core Test #6 wellbore diagram.

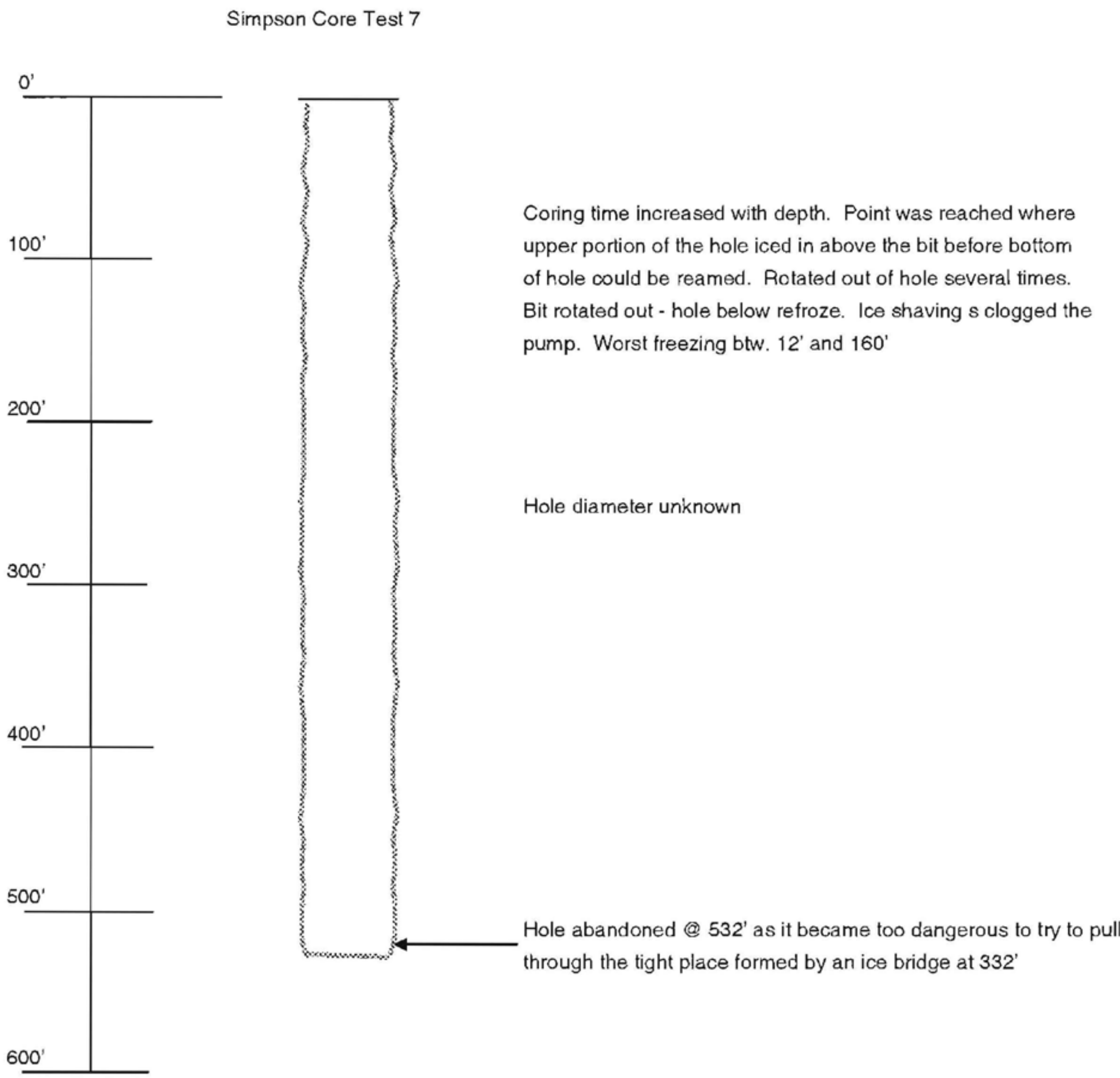


Figure 19: Simpson Core Test #7 wellbore diagram.

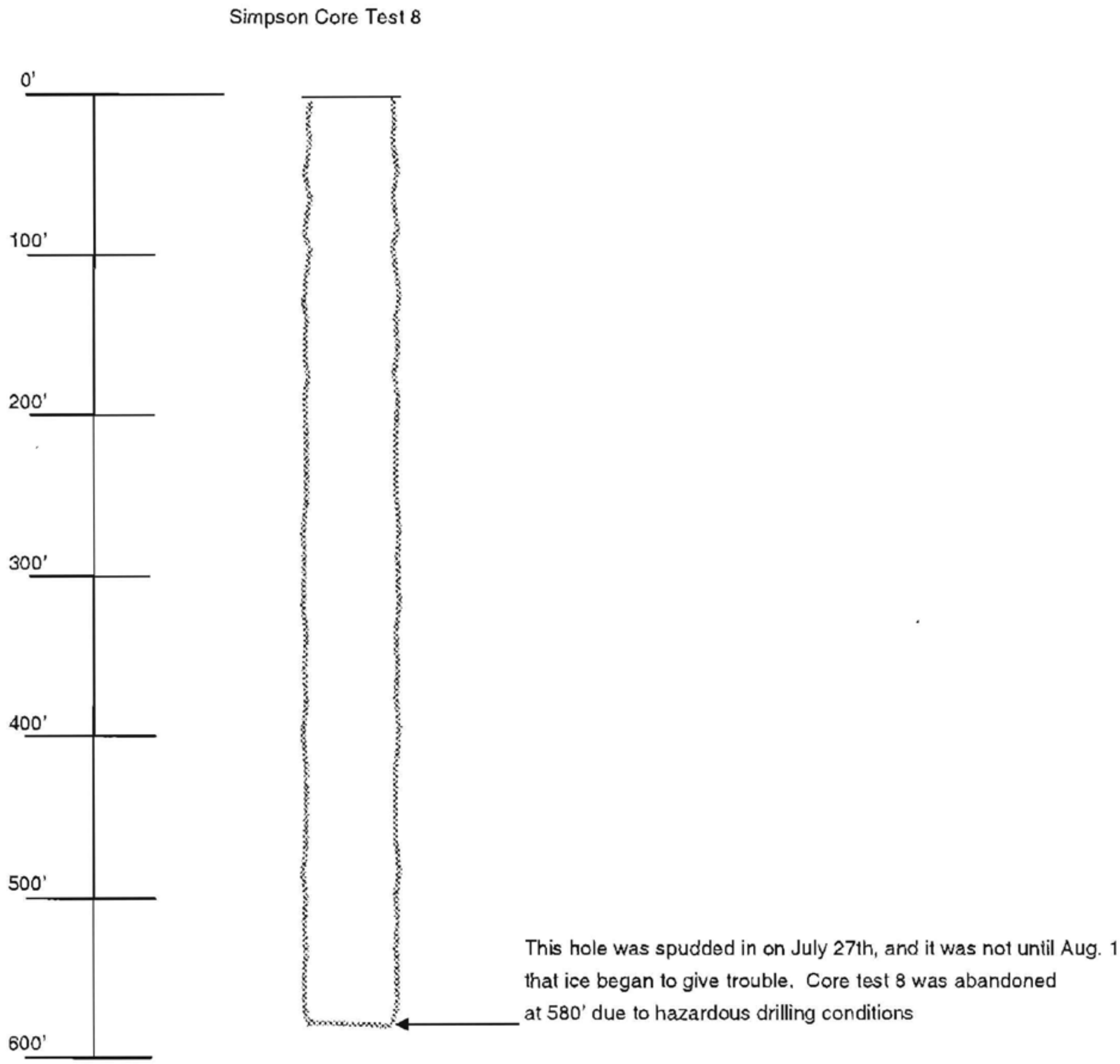


Figure 20: Simpson Core Test #8 wellbore diagram.

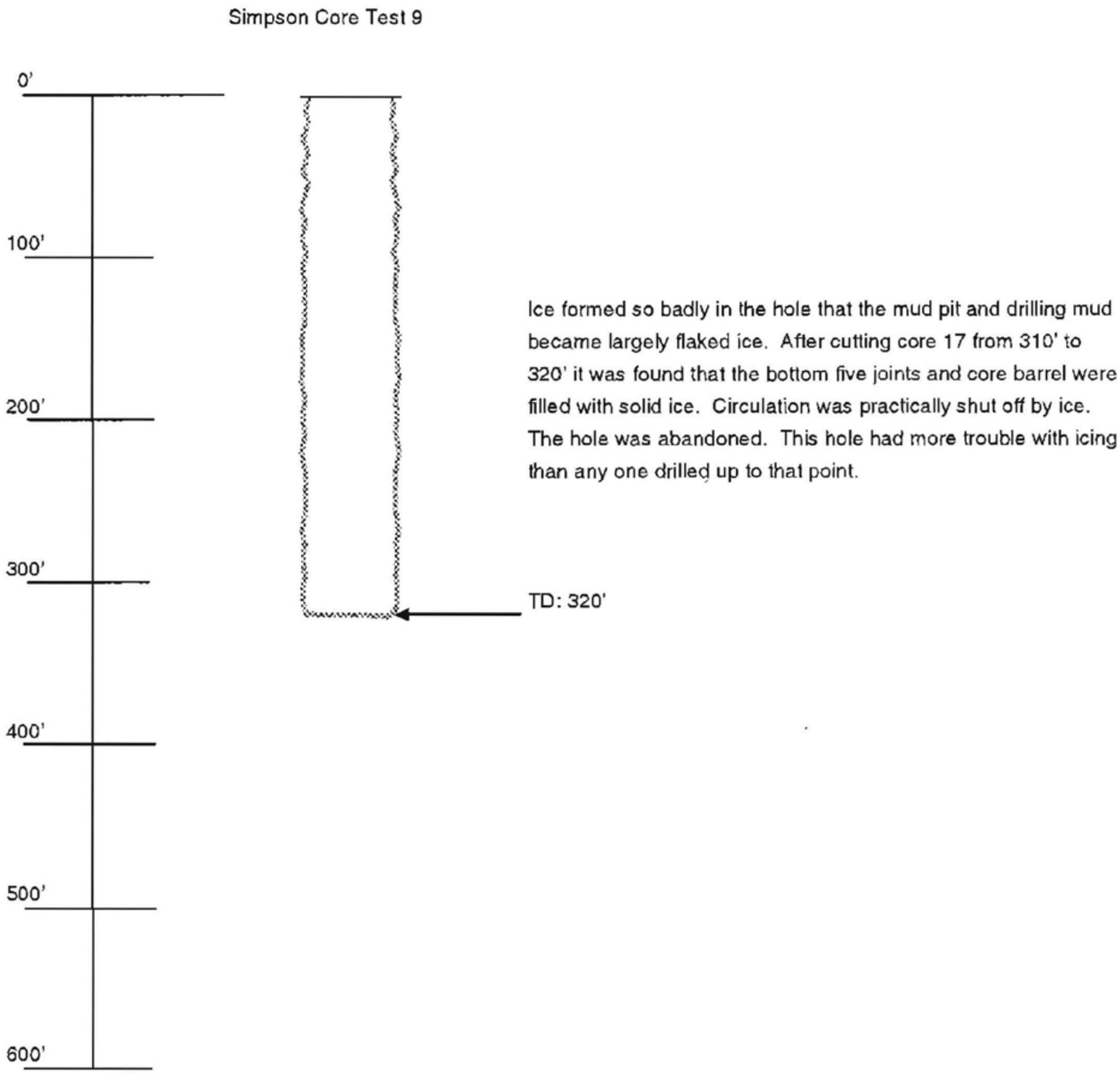


Figure 21: Simpson Core Test #9 wellbore diagram.

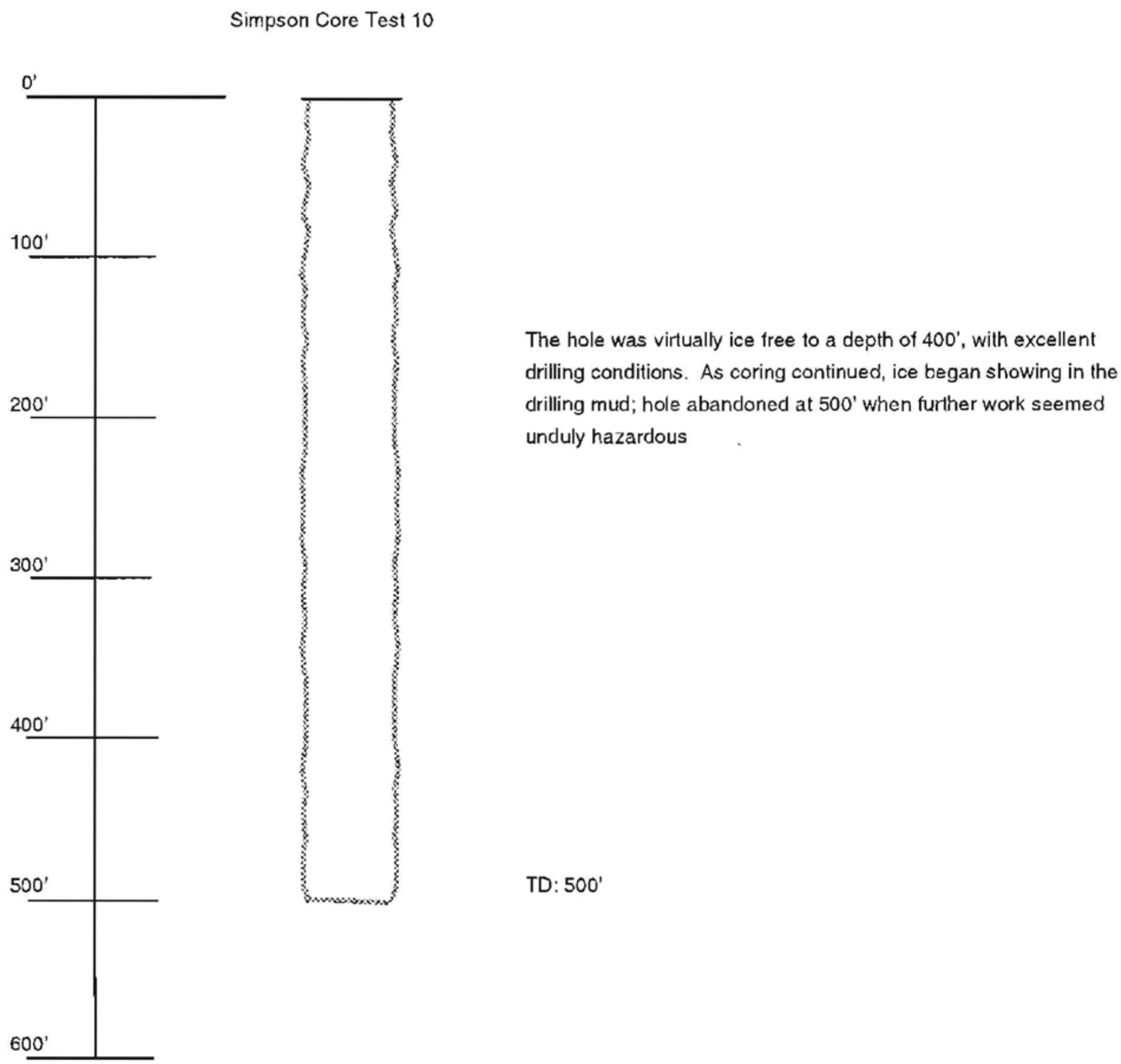


Figure 22: Simpson Core Test #10 wellbore diagram.

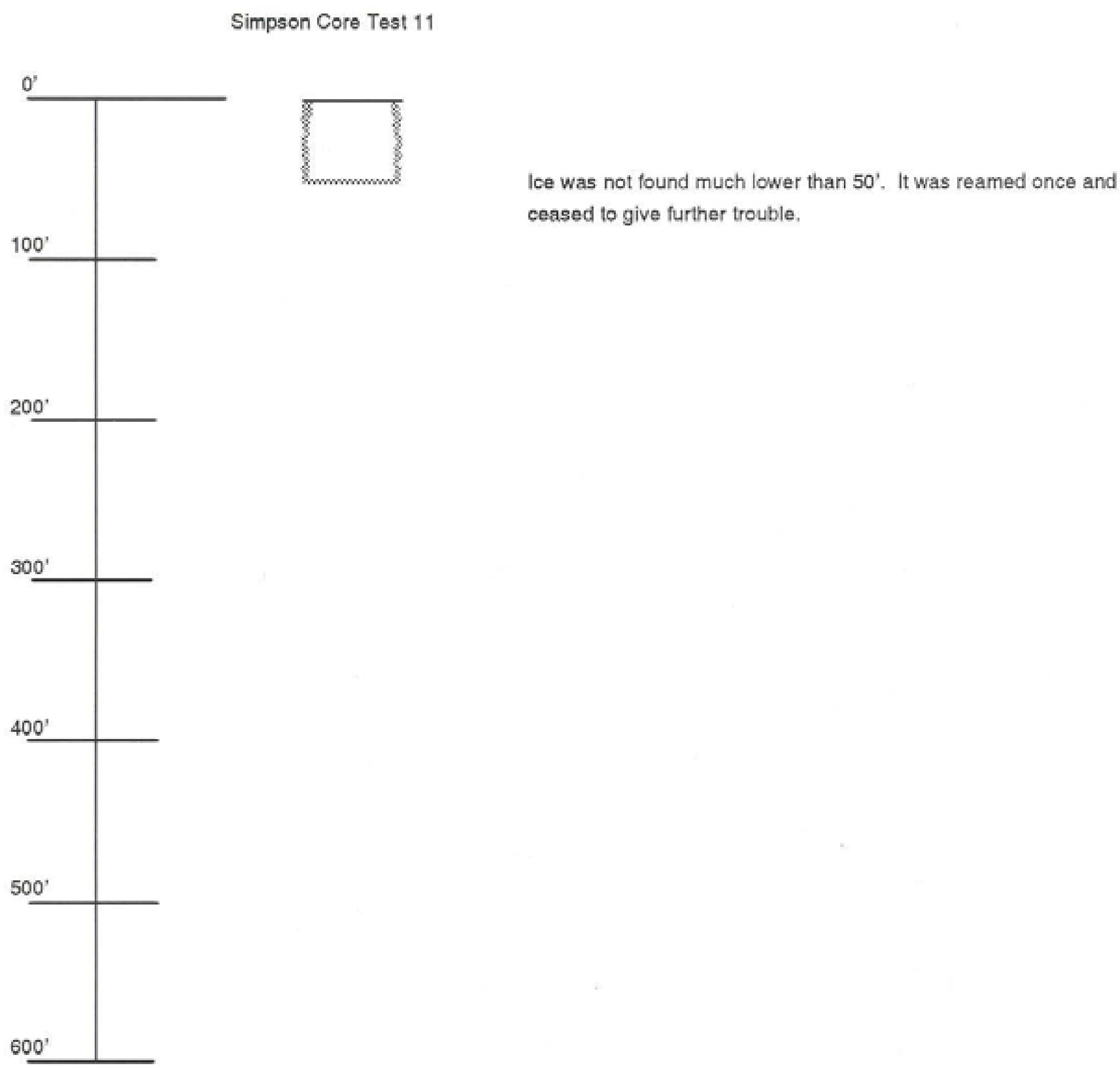


Figure 23: Simpson Core Test #11 wellbore diagram.

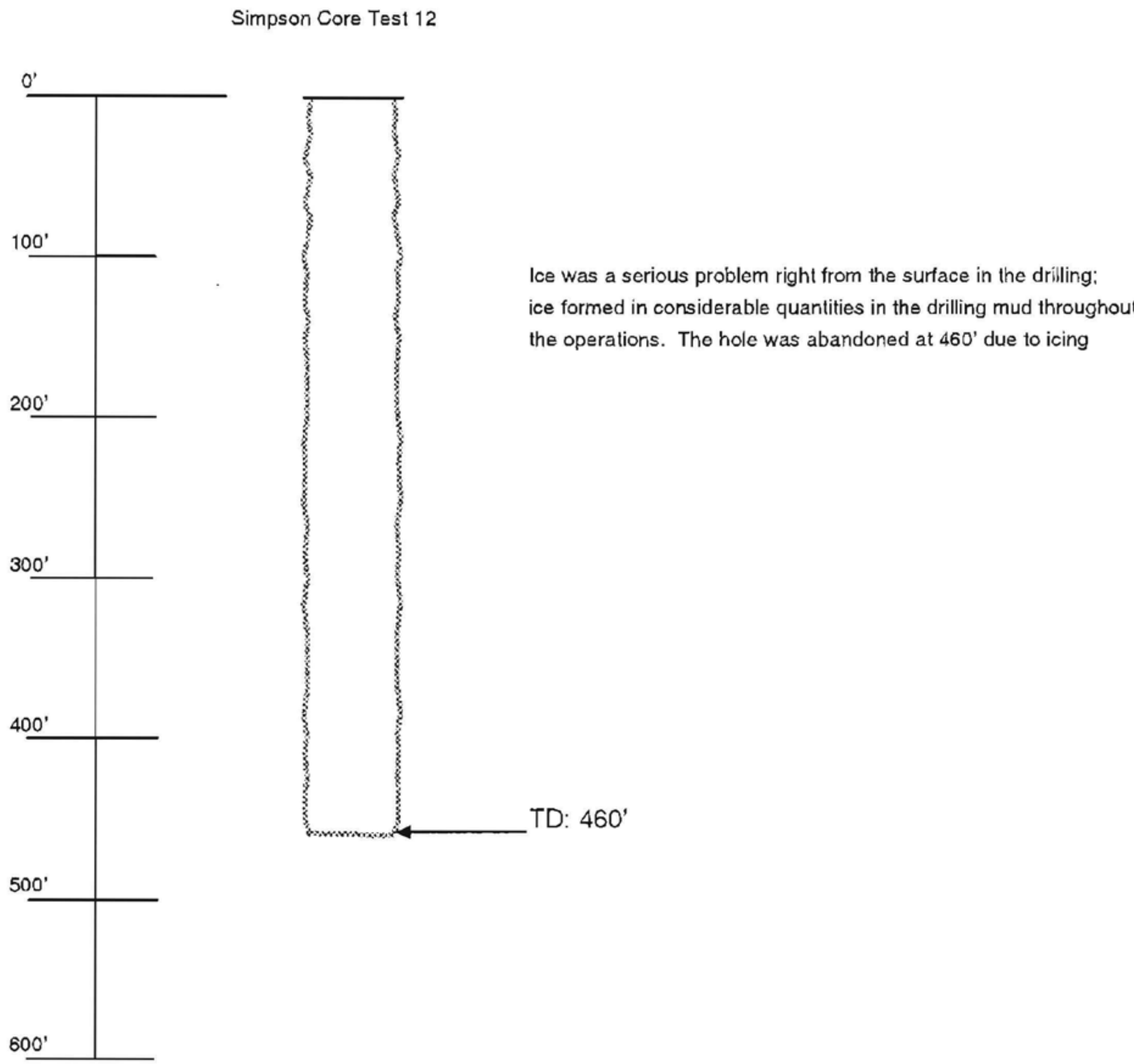


Figure 24: Simpson Core Test #12 wellbore diagram

Simpson Core Test #13

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9828° N, -154.6453° W. The Simpson Core Test #13 site is approximately 54 miles southeast of Barrow and 74 miles northeast of Atqasuk on the Simpson Peninsula in the National Petroleum Reserve in Alaska. The last site inspection was in August 2011.

Site Description: The Simpson Core Test #13 consists of an open casing and a small amount of associated surface debris. [**Figure 1**] The U.S. Navy drilled the core test in 1949. There is no pad, reserve pit, or cellar associated with the core test. The core test consists of a 8 ⅝-inch diameter drill pipe casing that has been cut off approximately 2 inches above the ground surface. [**Figure 2**] Approximately 15 feet southeast of the core test is a small pile of weathered lumber that is partially embedded in the tundra. [**Figure 3**]

Surface Risk Assessment: Low

Justification: There are no known contaminants present at the Simpson Core Test #13 site. While the vegetation mat was removed during the drilling activities in 1949, the entire area around the core test appears to have naturally re-vegetated, with little to no indication of the prior surface disturbance discernible. There are no flowing waters in the immediate vicinity of the Simpson Core Test #13. Small ponds are nearby, but do not appear to be effected by the core test. The Beaufort Sea is located about 1 mile to the east, and the site is not under threat due to erosion. There is little to no solid waste on site and it does not pose a travel risk to local residents.

Figure 1: Distance relationship between Simpson Core Test #13 and Seep #2 (the helicopter is parked at the upper western limit of the seep).

Figure 2: Simpson Core Test #13; note small chunks of concrete.

Figure 3: Small pile of lumber located near Simpson Core Test #13 (marked by orange stake).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: The U.S. Navy drilled the Simpson Core Test #13 during the summer of 1949. It was a relatively shallow test and did not generate any significant oil or gas shows. Total depth of the core test reached 1,438 feet. The top 26 feet are cased and the hole was filled with water-based drilling mud. [**Figure 4**]

- **Well Condition**: The 8 ⅝-inch casing was cut off at ground level. The core test is open to the atmosphere. There is a small amount of cement at the open casing.

- **Wellhead Assembly:** There is no wellhead at this site.

Geologic Setting: The core test encountered residual hydrocarbons in the Seabee and Grandstand Formations at depths of 1,079-1,084 feet and 1,138-1,148 feet (Robinson and Brewer 1964). No oil or gas was recovered during production tests. The core test is over 3 miles north of the core tests that penetrated productive Grandstand sands.

Development Potential: Exploration and development in the vicinity of the Simpson Core Test #13 is a not likely within the next 20 years. In its current condition, it is unlikely this core test will have an adverse impact on development, as it did not penetrate productive zones and future development will likely target deeper, more productive formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: An orange marker was placed at the open casing for aiding in identification. No hydrocarbon escapement has been observed at Simpson Core Test #13.

Subsurface Risk Assessment: **Moderate**

Justification: Simpson Core Test #13 encountered very poor oil and gas shows, but recovered no hydrocarbons during attempted production tests. No cement plugs were set. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

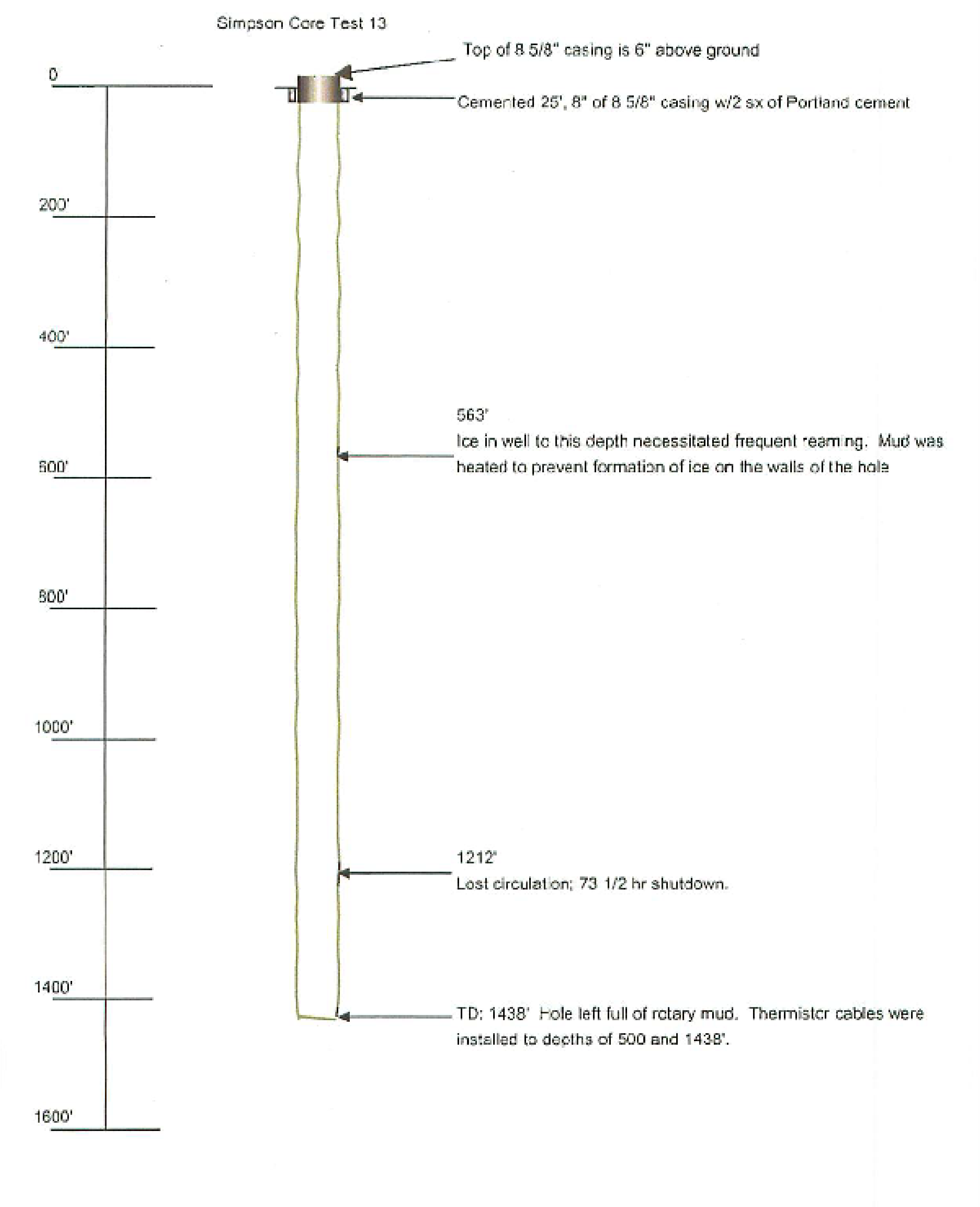


Figure 4: Simpson Core Test #13 wellbore diagram.

Simpson Core Test #14 and #14A

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9867° N, -154.6267° W and 70.9867° N, -154.6272° W respectively. The site is approximately 54 miles southeast of Barrow and 74 miles northeast of Atqasuk on the Simpson Peninsula within the National Petroleum Reserve in Alaska. A large active natural oil seep is present approximately 500 feet to the east of the core test, and a smaller oil seep is present approximately 1,000 feet to the north. [**Figure 1**] The last site inspection was in August 2011.

Site Description: The Simpson Core Test #14 and #14A site consists of two core tests in an area measuring 5 feet in diameter. [**Figure 2**] The U.S. Navy drilled the core tests in 1949. There is no pad, reserve pit, or cellars associated with the core tests. The core tests consist of two 8 ⅝-inch diameter metal pipes that are open at the top and extend above the ground surface approximately 36 inches. The only surface debris on site is one piece of concrete immediately adjacent to the southern core test. Ice is currently visible inside both open casings. [**Figure 3**]

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the site. There is no indication that either core test has the potential to affect surface water. The overall site is relatively undisturbed and the vegetation is consistent with the surrounding landscape. The Beaufort Sea is located 1 mile to the east of the seep area, and there is no threat to the site due to coastal erosion. There is little to no solid waste on site and it does not pose a travel risk to local residents.

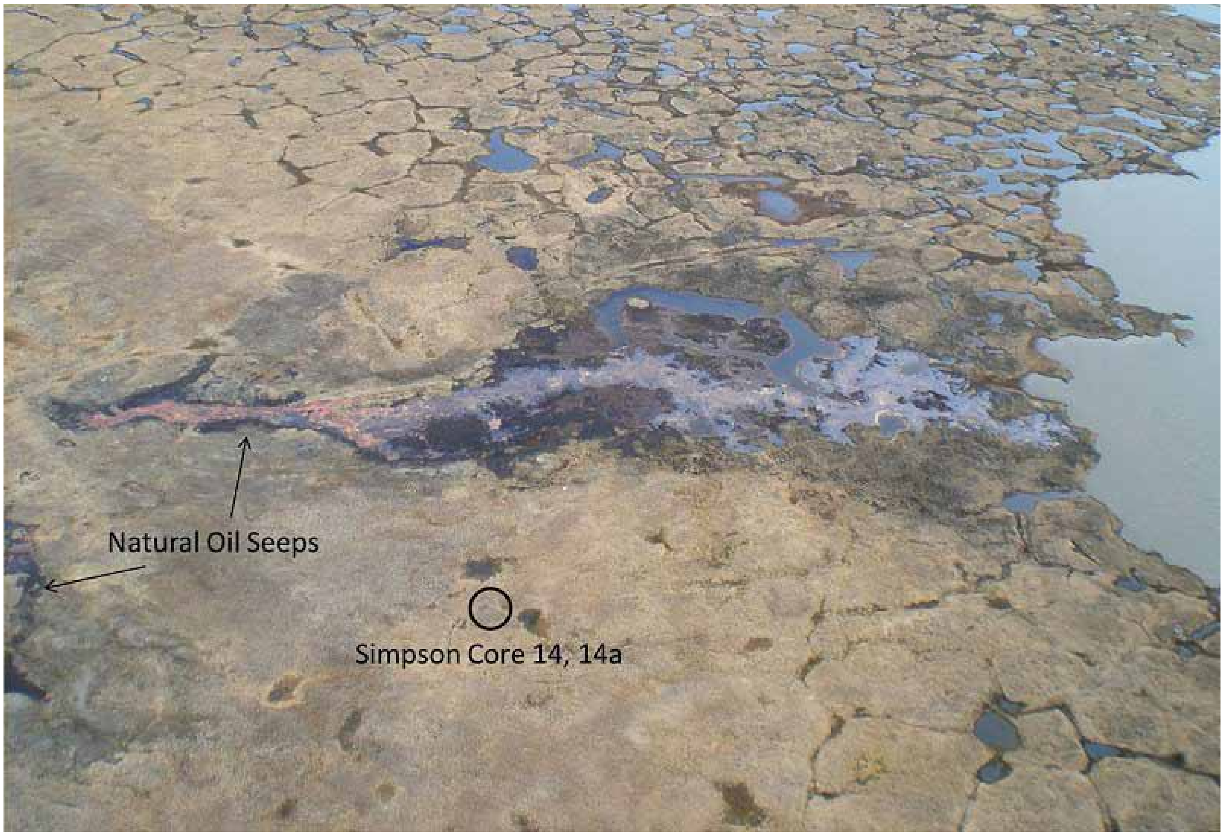


Figure 1: Aerial view of Simpson Core Test #14 and #14a showing proximity to natural oil seeps.

Figure 2: View of general Simpson site area and Core Test #14 and #14A

Figure 3: Photo showing the inside of the open casing at Simpson Core Test #14; note ice at the ground surface.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Simpson Core #14 was drilled in 1949 to a depth of 1,270 feet and casing was set to a depth of 32 feet. [**Figure 4**] Core test #14A was drilled to a total depth of 290 feet, which was uncased according to the records kept by the U.S. Navy. [**Figure 5**] Both core tests were drilled using a Failing 1500-S rig. Likely, the rig was skidded on top of two 12x12-inch timbers, which were removed after the drilling was completed.

- **Well Condition:** It is located 500 feet to the west of an active oil seep. There is some discrepancy between the USGS 305-L report and the BLM field findings in terms of the core tests. According to the report, Core #14A was uncased and the casing for Core #14 was cut off at ground level. In 2002, the BLM discovered both holes side-by-side with open casing extending upwards 36 inches from the ground surface. The BLM is only assuming the two cased holes represent #14 and #14A. In reality, one cased hole may be the rat hole to #14.

- **Wellhead components:** There is no wellhead at this site.

Geologic Setting: The core tests only encountered past evidence of hydrocarbons in the Ninuluk/Seabee and Grandstand Formations. No oil or gas was recovered during tests (Robinson and Brewer 1964) and fresh water aquifers are not present. Present day location of the core tests is approximately 1,000 feet to the west of an active oil seep.

Development Potential: Exploration and development in the vicinity of these core tests is a not likely within the next 20 years. In its current condition, it is unlikely this core test will have an adverse impact on development as it did not penetrate productive zones and any future development will likely target deeper, more productive formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: No hydrocarbons were observed around these core tests.

Simpson Core Test #14 Subsurface Risk Assessment: Low

Justification: No oil or gas shows were discovered when drilling Simpson Core Test #14. No cement plugs were set.

Simpson Core Test #14A Subsurface Risk Assessment: Low

Justification: Simpson Core Test #14A is a shallow drill hole that reached a total depth of 290 feet. No oil or gas shows were discovered. No cement plugs were set.

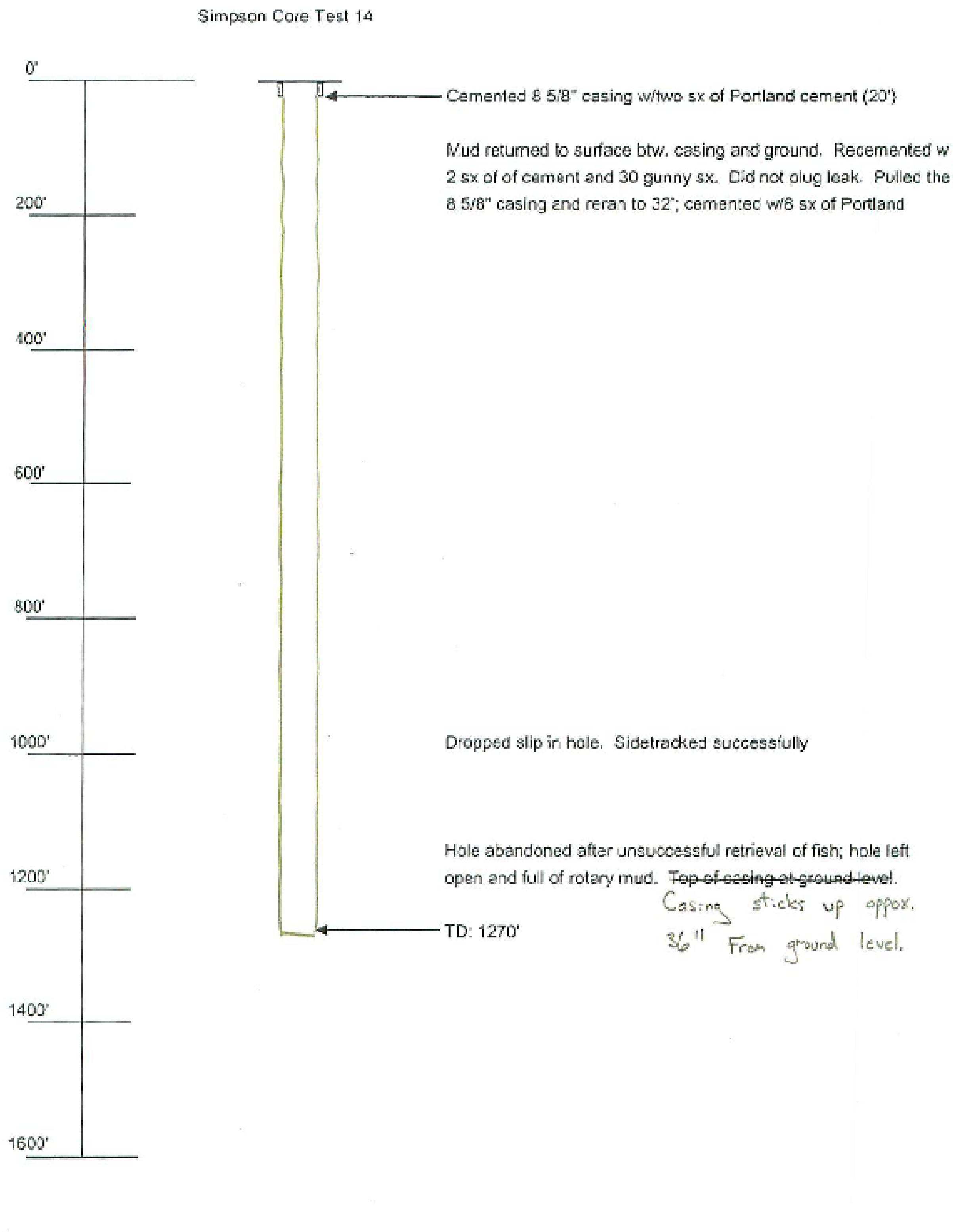


Figure 4: Simpson Core Test #14 wellbore diagram.

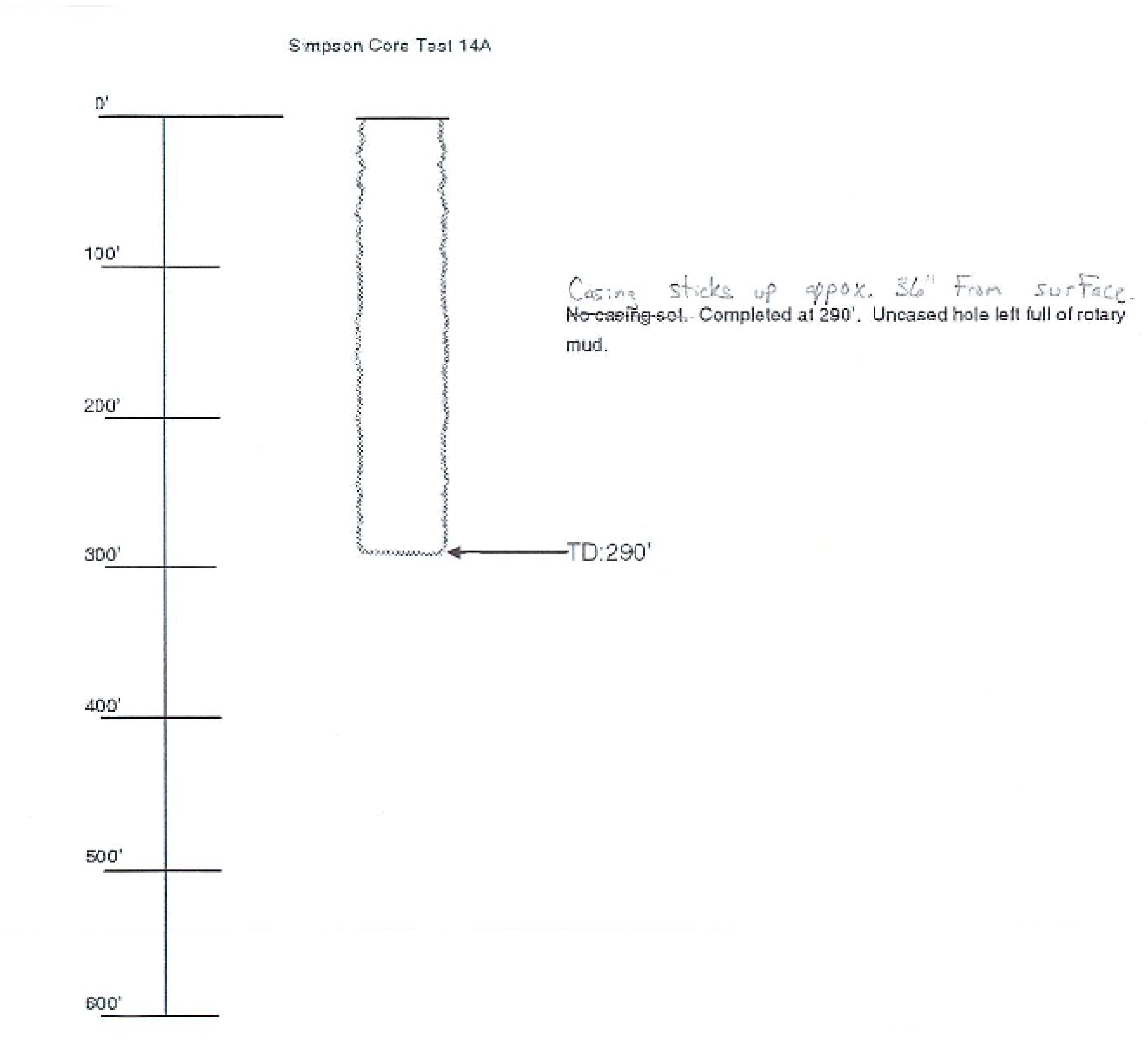


Figure 5: Simpson Core Test #14A wellbore diagram.

Simpson Core Test #15

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9850° N, -154.6358° W. The site is approximately 54 miles southeast of Barrow and 74 miles northeast of Atqasuk on the Simpson Peninsula in the National Petroleum Reserve in Alaska. Two active natural oil seeps are present a quarter of a mile to the south of the core test. [**Figure 1**] The last site inspection was in August 2011.

Site Description: The U.S. Navy drilled Simpson Core Test #15 in 1949. There is no pad, reserve pit, or cellar associated with the core test [**Figure 2**]. There is no surface debris associated with the site. The core test consists of an 8 ⅝-inch diameter pipe open at the top and extending 18 inches above the ground surface. Water is currently visible inside the casing at the ground surface. [**Figure 3**]

Surface Risk Assessment: Low

Justification: There are no known contaminants present on this site. There is no indication that the core test has the potential to affect surface water. The overall site is relatively undisturbed and the vegetation is consistent with the surrounding landscape. The Beaufort Sea is located approximately 1 mile to the east of the area, and there is no threat to the site due to coastal erosion. There is little to no solid waste on site and it does not pose a travel risk to local residents.

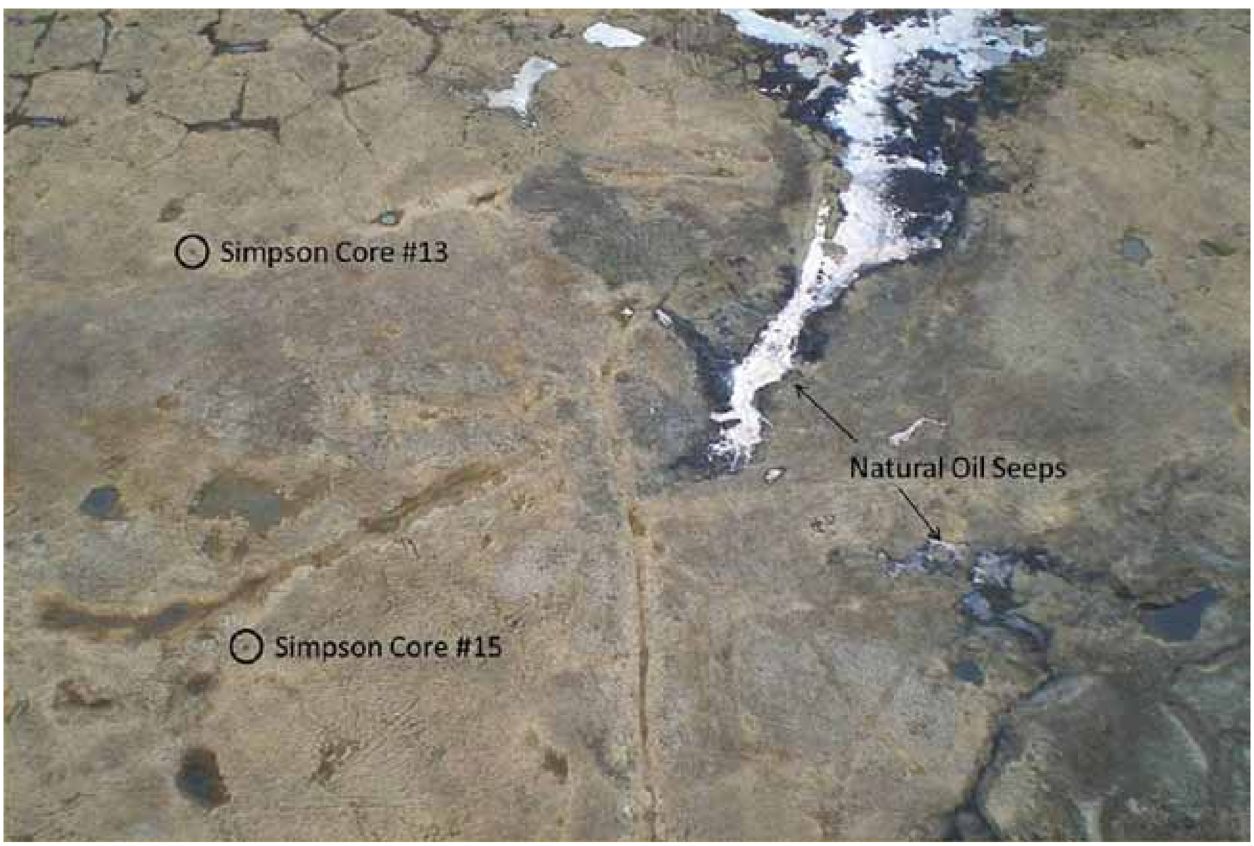


Figure 1: Aerial view of Simpson Core Test #15 showing the relationship to natural oil seeps.

Figure 2: Simpson Core Test #15.

Figure 3: Inside open casing of Simpson Core Test #15.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Simpson Core Test #15 was drilled in August 1949 about a quarter of a mile north of an active oil seep. The core test was drilled to a total depth of 900 feet and cased to 18 feet. [**Figure 4**] No oil or gas was recovered during tests.

- **Well Condition:** The core test consists of open-ended casing with a height of 18 inches.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The core test encountered only residual hydrocarbons in the Ninuluk/Seabee and Grandstand Formations (Robinson and Brewer 1964).

Development Potential: In its current condition, it is unlikely this core test will have an adverse impact on development as it did not penetrate productive zones and future development will likely target deeper, more productive formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers were not encountered while drilling Simpson Core Test #15.

Other Information: No hydrocarbons were observed near the core test.

Subsurface Risk Assessment: Low

Justification: Simpson Core Test #15 is a shallow drill hole that reached a total depth of 900 feet. No oil or gas shows were discovered. No cement plugs were set.

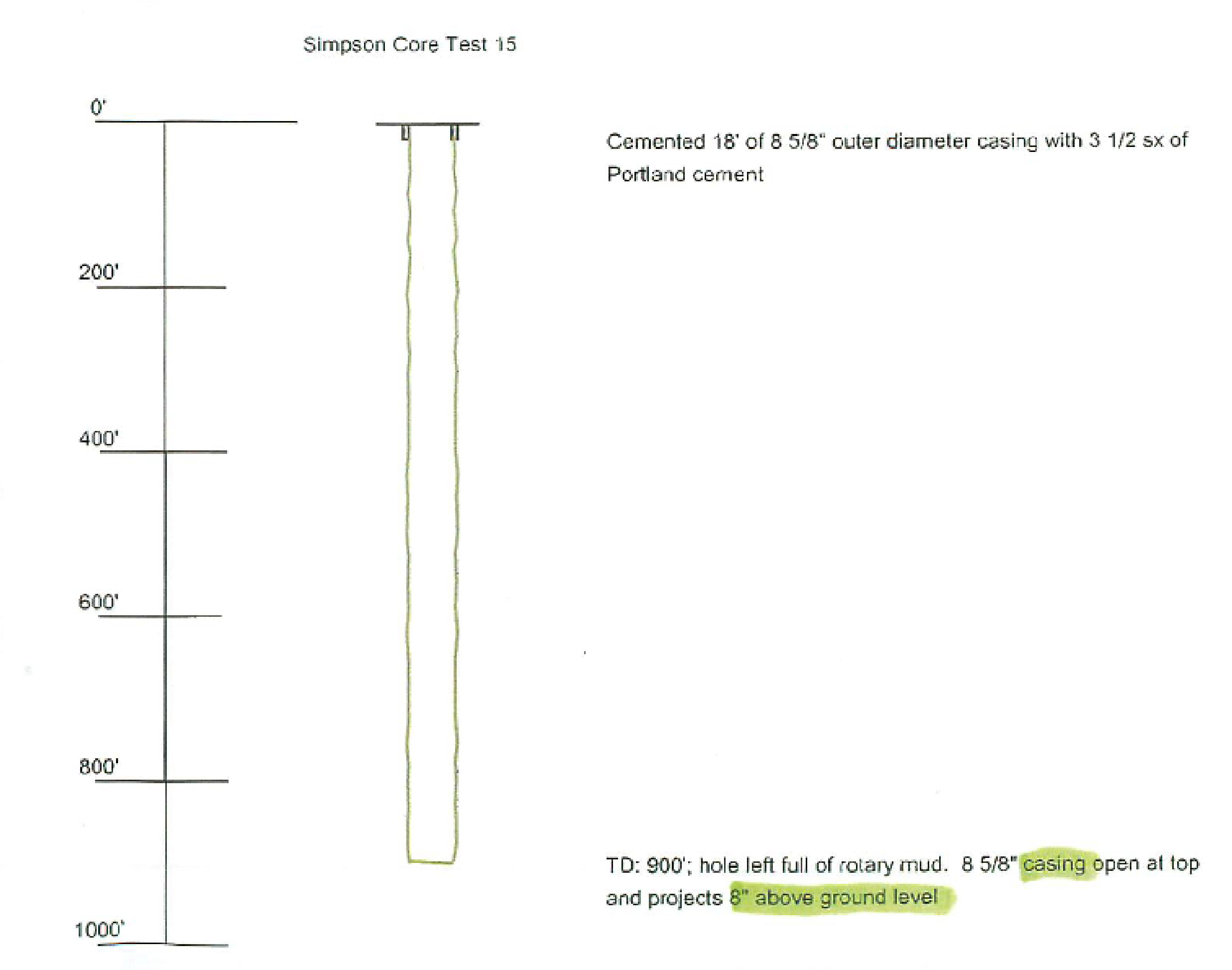


Figure 4: Simpson Core Test #15 wellbore diagram.

Simpson Core Tests #16-25

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83)

Simpson Core Test #	Latitude (deg)	Longitude (deg)	Total Depth (feet)
16	70.9833°N	-154.6311°W	800
17	70.9867°N	-154.6425°W	1,100
18	70.9939°N	-154.6703°W	1,460
19	70.9878°N	-154.7158°W	1,061
20	70.9969°N	-154.5886°W	1,002
21	70.9969°N	-154.5886°W	1,002
22	70.9922°N	-154.6042°W	903
23	71.0345°N	-154.6340°W	1,035
24	71.0294°N	-154.6170°W	900
25	70.9361°N	-154.7033°W	1,510

These uncased core tests are on the eastern half of the Simpson Peninsula. They are approximately 50 miles southeast of Barrow and 65 miles northeast of Atqasuk. The last overflight inspection for this group of core tests was in July 2012.

Site Description: These uncased drill holes have completely disappeared by collapsing internally and the surface becoming revegetated. The small surface holes left behind after the hole collapsed probably healed naturally in one or two seasons after the core tests were drilled. In the subsurface, the collapsed holes have refrozen into the Simpson Peninsula permafrost layer, which is 800-900 feet thick. Any evidence left from these core tests have blended harmlessly into the existing environment. These conditions make it extremely difficult, if not impossible, to find the actual core tests, although their GPS coordinates are known.

The BLM has made numerous attempts by both air and ground searches over several years to find these uncased core tests at their given coordinates. The ground searches involved several people using metal detectors and walking a grid in the locations specified from the U.S. Navy reports. Despite these efforts, no cased core tests have been found for Simpson Core Tests #16-#25.

There are minor amounts of solid wastes associated with these core tests. There are old wooden 2x4s sitting on the tundra near the vicinity of Simpson Core Test #16. There is also some minor camp trash, including a cut 55-gallon drum near Core Test #17 **[Figures 1-3]**.

Surface Risk Assessment: None

Justification: All of these core tests are uncased and have harmlessly disappeared. Even the potential threat from the uncased gas blowout at Simpson Core Test #16 in 1949, over 60 years ago, has proved enough time for the uncased hole to close up and recover on its own. There is no indication of a well site at the given coordinates for these uncased core tests.

Figure 1: Rotting two by fours sitting on the tundra near Simpson Core Test #16 (August 2002).

Figure 2: Scrap drum pieces and other minor trash near Simpson Core Test #17 (June 2007).

Figure 3: Minor camp trash sitting on the tundra near Simpson Core Test #17 (June 2007).

Figure 4: Depression left behind from failed drilling operations at Simpson Core Test #16 (August 2002).

Figure 5: Slumping walls around the depression from the failed drilling operation at Simpson Core Test #16 (August 2002).

SUBSURFACE INFORMATION

Well Information

- **Well History**: Core tests #16 through #24 used mud pits blasted in the ground to avoid having to set surface casing. Total depth for these tests ranged from 800 feet to 1,500 feet. All of these core tests encountered the Seabee Formation, and all but #18 to #20 and #22 penetrated the Grandstand Formation (Robinson and Brewer 1964).

  Simpson Core Test #16 was the only core test in this group to have been a real problem. Gas ignited accidentally on Aug. 31, 1949, when the hole reached the total depth of 800 feet. The drilling equipment was quickly moved away from the flaming hole. Approximately 600 gallons of water was pumped downhole, but most of it blew back out from the gas pressure. The heat from this incident melted the surrounding permafrost which caused sloughing around hole. The result was a funnel-shaped cavity approximately 25 feet in diameter **[Figures 4-5]**. The flame went out three days later although gas continued to flow at a reduced rate for a little over a year (Robinson and Brewer 1964). The remaining uncased core tests, #17 through #25, were all left full of drilling mud upon abandonment. There were minor problems with muds freezing downhole during drilling, but each test was able to reach its targeted total depth [**Figures 6-14**] (Robinson and Brewer 1964).

- **Well Condition**: The drill holes are uncased and have harmlessly blended into the earth.

- **Wellhead Components:** There are no wellheads or cased drill holes associated with these core tests.

Geologic Setting: The results of drilling all core tests and test wells, plus an evaluation of the uppermost part of the seismic profiles, indicated that the Simpson Oil Field is a stratigraphic trap or a series of traps formed by an erosional unconformity within the Seabee Formation of the Colville Group (Upper Cretaceous). The oil occurs in the first sandstone, either in the basal part of the undifferentiated Seabee and Ninuluk Formations (Upper Cretaceous) or in the Grandstand Formation of the Nanushuk Group (Lower Cretaceous), appearing beneath the unconformity. The highly porous sandstone regionally dips very gently east and is truncated by a deep canyon on a north-south line just west of the seeps. The oil is trapped on topographic highs on a ridge above the east wall of the canyon under the shaly Seabee Formation. The oil, found only about 300 feet below the surface, is seeping up, probably through cracks or fissures in the frozen ground (Robinson and Brewer 1964).

Development Potential: These uncased core tests will have no effect on future drilling in the area.

Groundwater Resource: None, continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement today at these locations, including Simpson Core #16.

Subsurface Risk Assessment: None

Justification: These are shallow uncased drill holes that did not penetrate oil or gas stratigraphy or water resources. The old drill locations have blended harmlessly with the environment.

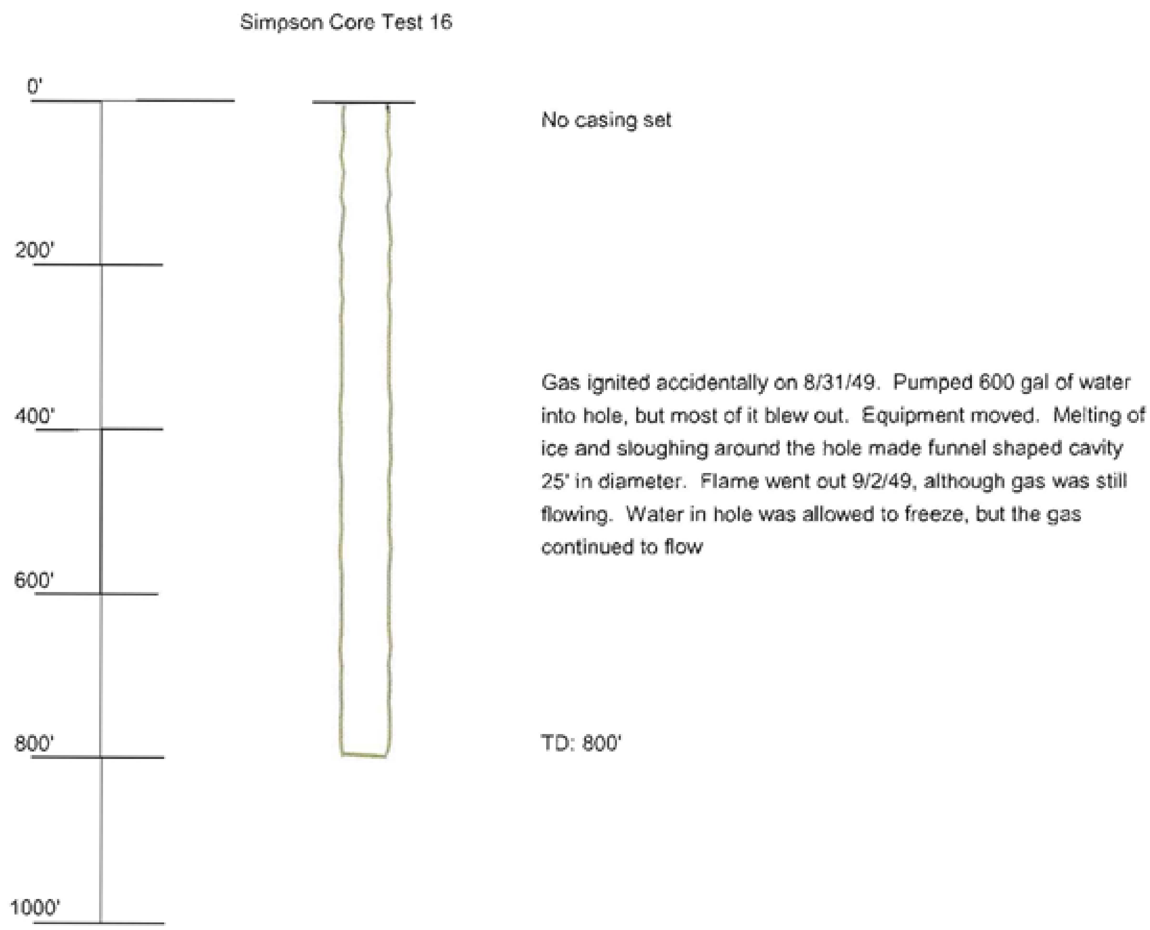


Figure 6: Simpson Core Test #16 wellbore diagram.

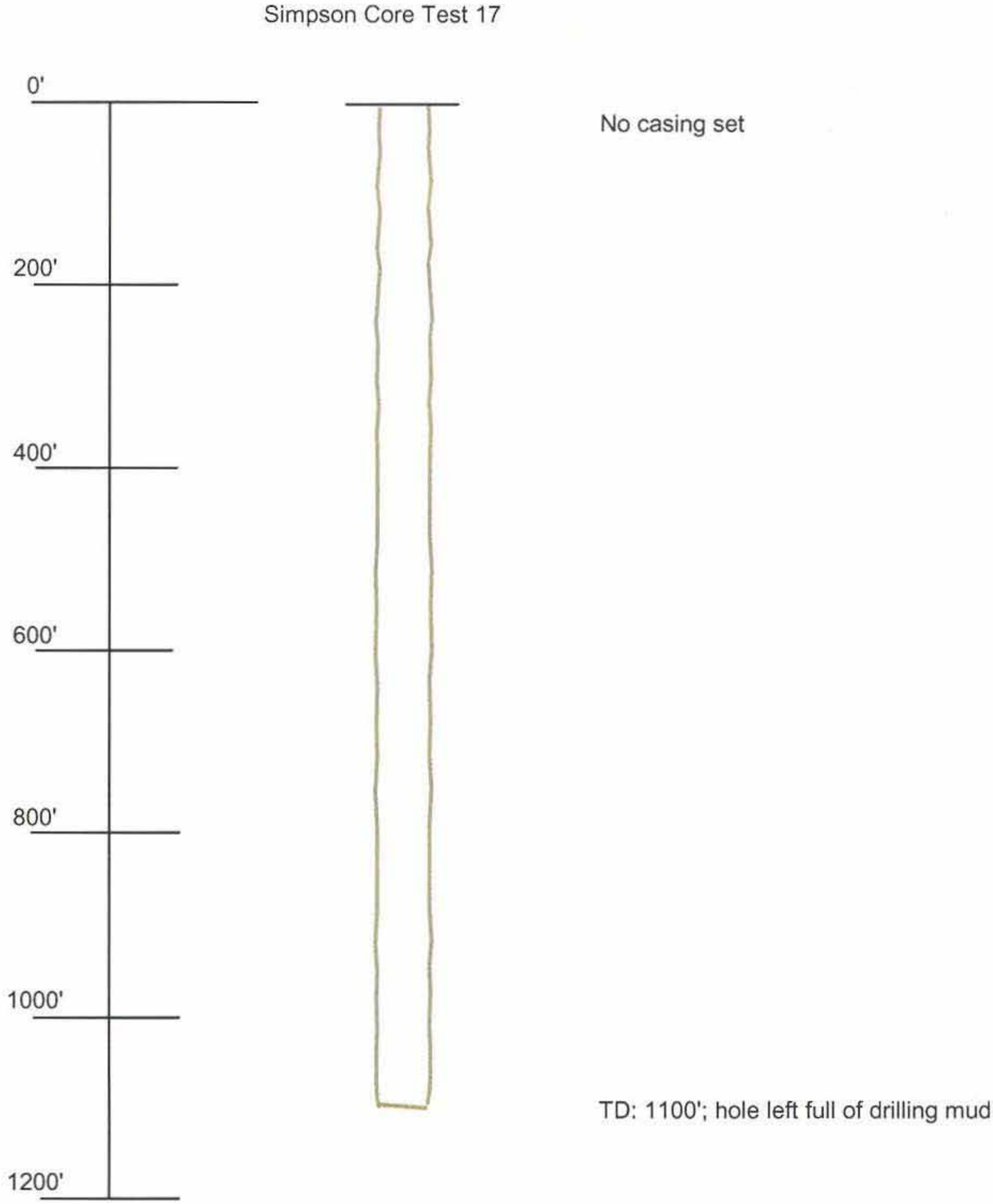


Figure 7: Simpson Core Test #17 wellbore diagram.

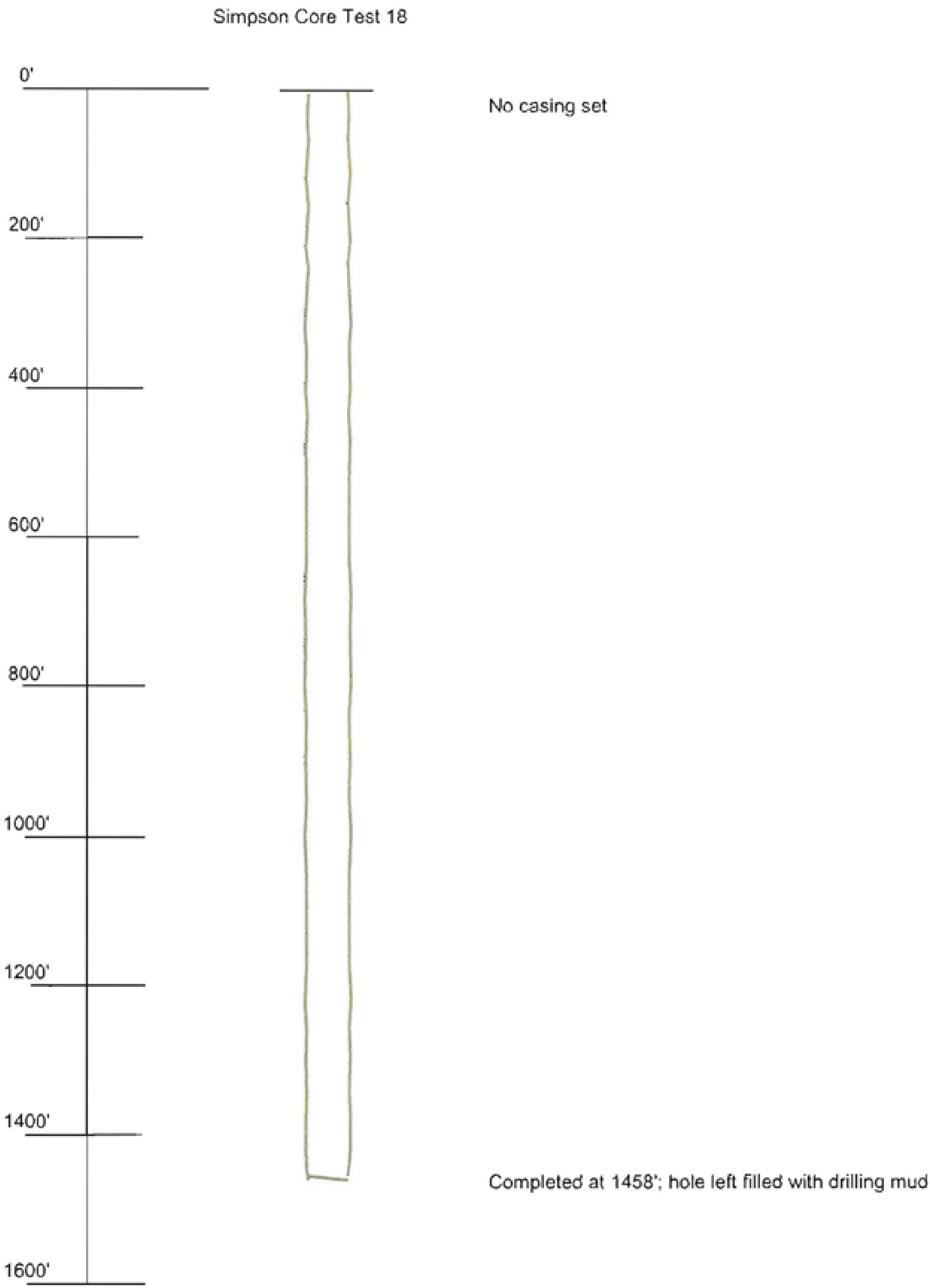


Figure 8: Simpson Core Test #18 wellbore diagram.

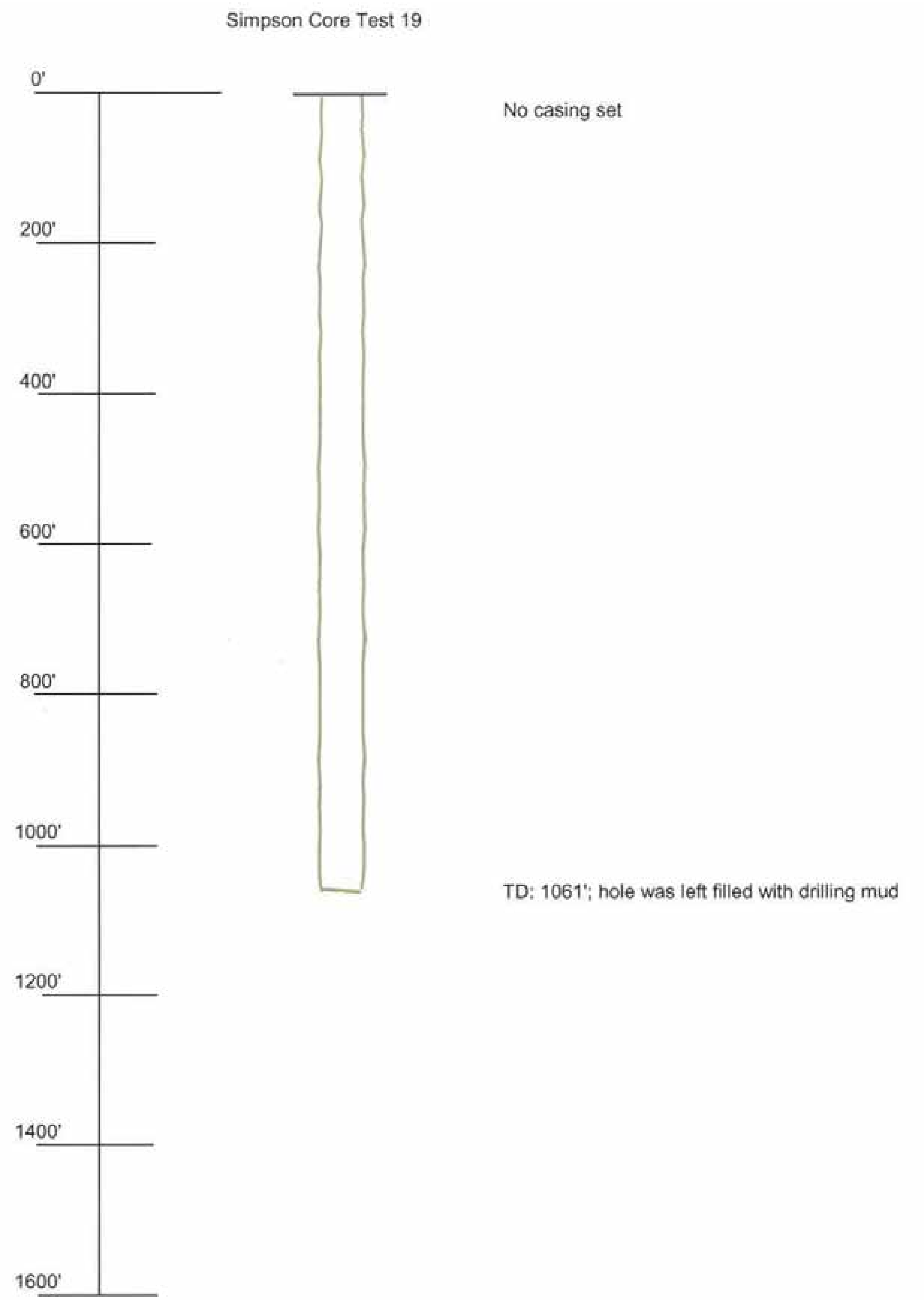


Figure 9: Simpson Core Test #19 wellbore diagram.

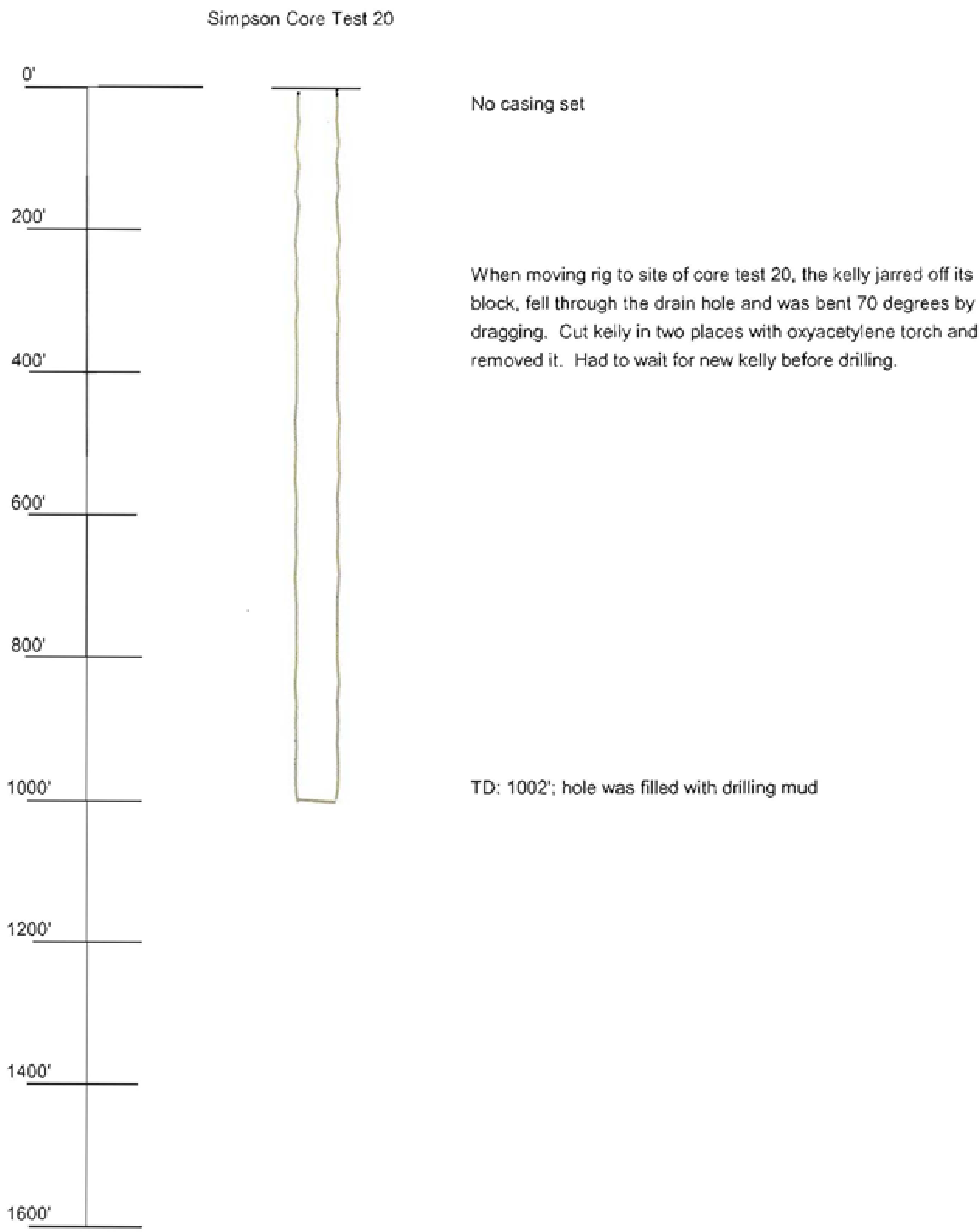
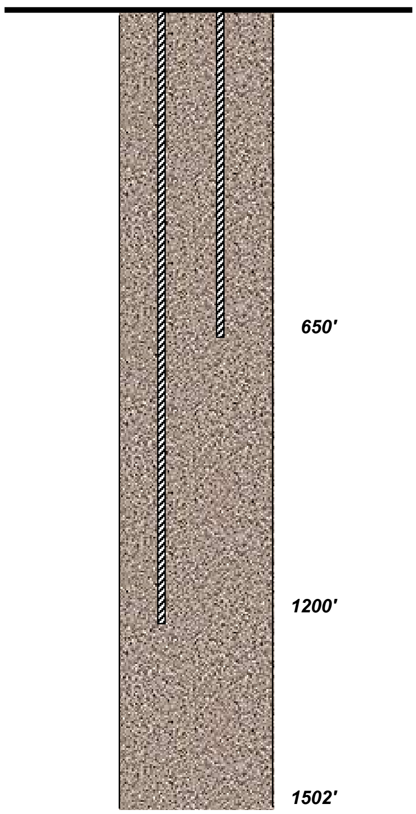


Figure 10: Simpson Core Test #20 wellbore diagram.

BLM ALASKA	**Simpson Core Test #21**	Rig:	Failing M 314-C Rotary Core Drill (M-1500)	
		Drilled:	Oct 13 - Oct 27, 1949	
	Simpson Area Core Tests	API #:	**50-023-10001-00**	Created
		GL: 22'	KB: 26'	5/7/13
	Naval Petroleum Reserve - 4	Lat/Long:	71° 00' 29"N - 154° 36' 54"W	Last mod
		Reviewing Engineer:	Justin T. Miller	

Original RKB = 26'



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm

Uncased, except for a short section of surface pipe of undocumented length or type. Likely drilled with 5-7/8" Reed-T bits, it is also possible bits ranging in size from 5-7/8" to 10-3/4" were used. Coring was done with 5-7/8" hard and soft formation bits.

Jewelry Detail

No	Depth	ID	Item
			None

Perforations

Date	Zone	Top	Btm	Comments
		0	1502	Open Hole

Fish/Fill Information

Item	Date	Depth	Comment
A	10/27/49	1502	Hole abandoned full of frozen drilling mud with thermistors run to depths of 650' and 1,200'.
B			
C			

Figure 11: Simpson Core Test #21 wellbore diagram.

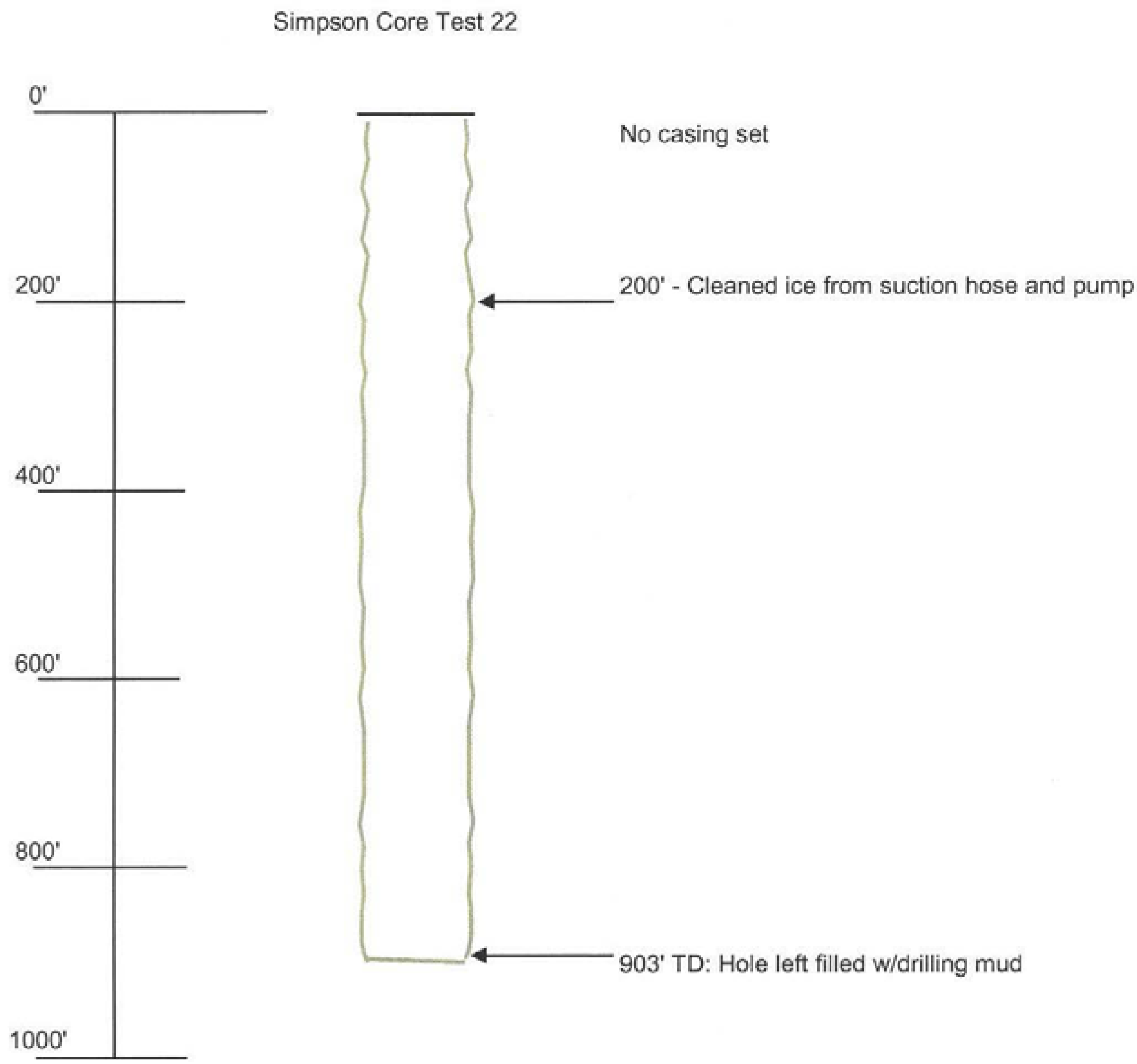


Figure 12: Simpson Core Test #22 wellbore diagram.

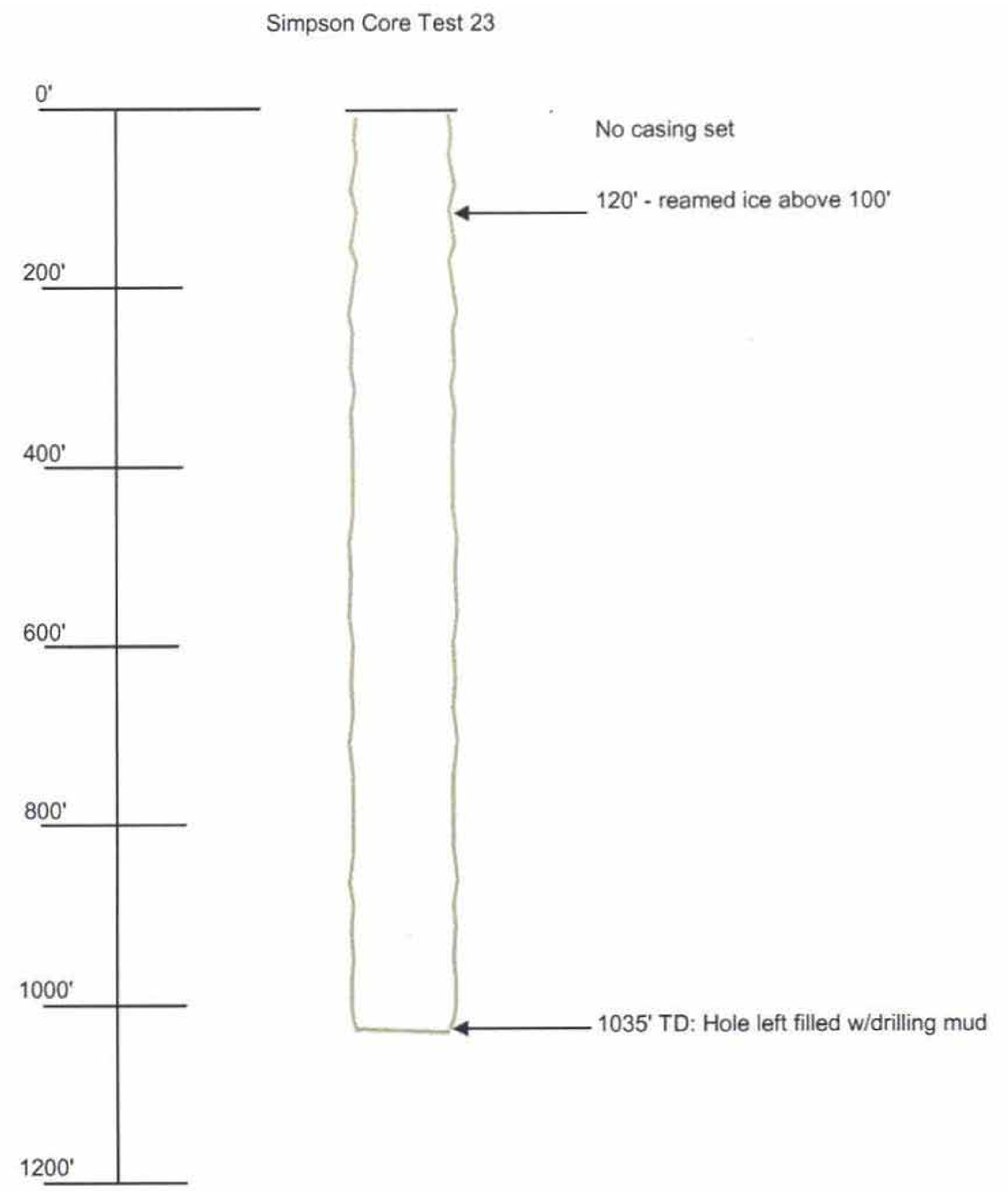


Figure 13: Simpson Core Test #23 wellbore diagram.

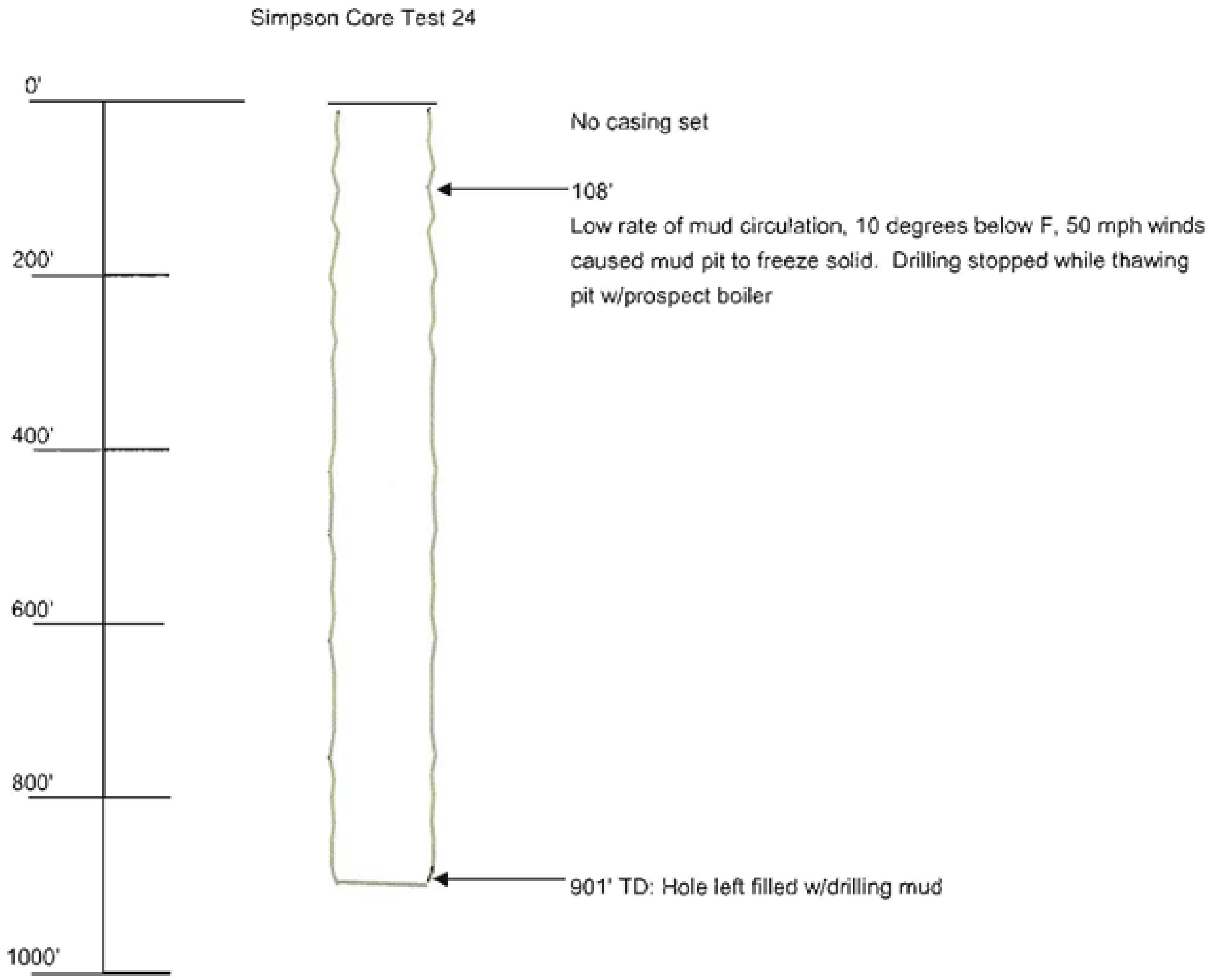


Figure 14: Simpson Core Test #24 wellbore diagram.

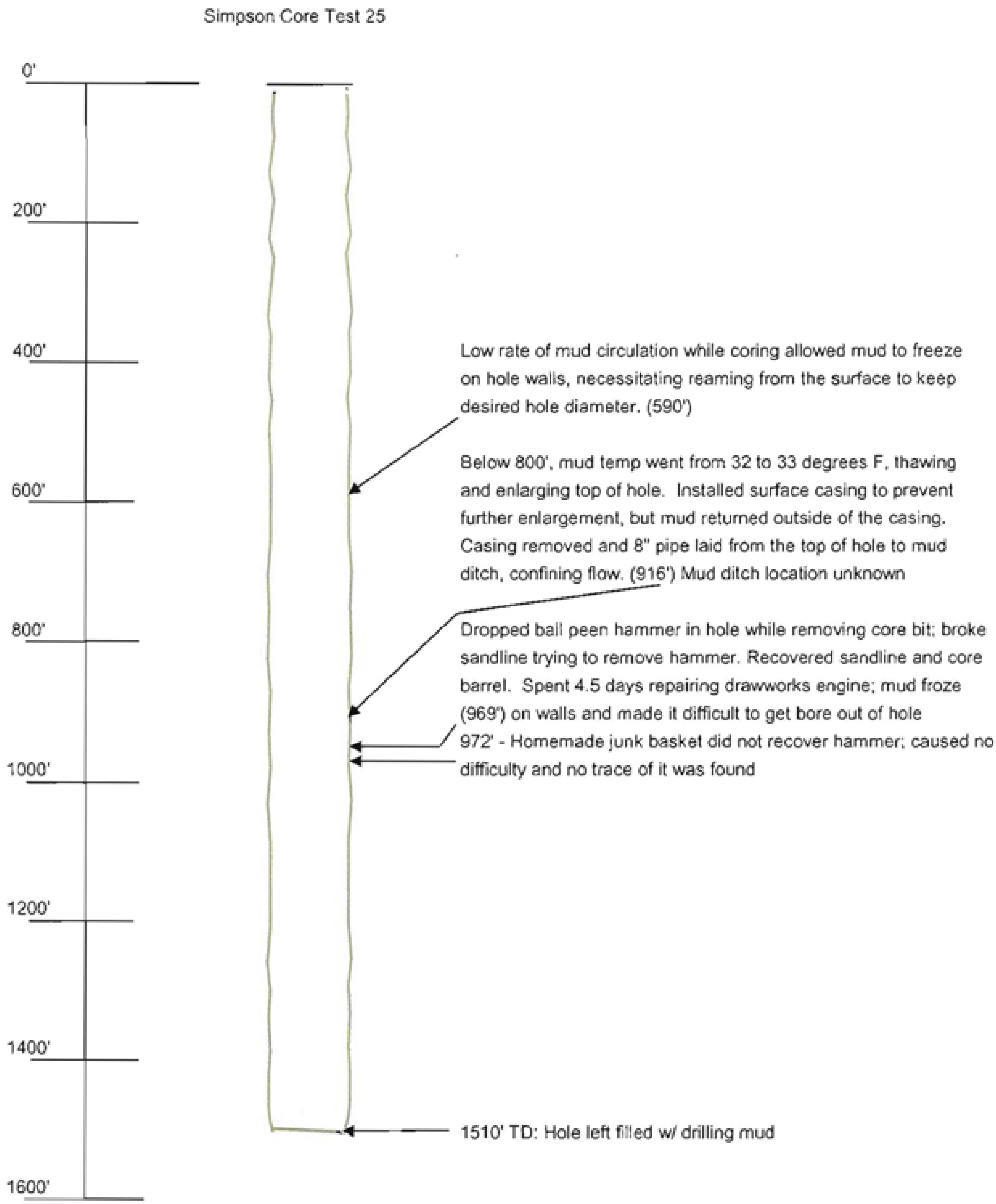


Figure 15: Simpson Core Test #25 wellbore diagram.

Simpson Core Test #26

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9356° N, -154.6844° W. The Simpson Core Test #26 site is 54 miles southeast of Barrow and 72 miles northeast of Atqasuk. [**Figure 1**] The last site inspection was in July 2012.

Site Description: The U.S. Navy drilled the Simpson Core Test #26 in 1950 within one of the larger active oil seeps in the National Petroleum Reserve in Alaska. [**Figures 2-3**] The Navy described this location as Seep #3. No drill pad or reserve pit was established at the site. The area around the core test appears to have been bulldozed during the early 1950s in an attempt to collect the seeping oil. The scraped-up earth was then used to build berms around the depression of the seep. Light amounts of trash appear to have been buried inside these berms. The Navy cleaned up the site in the late 1970s, removing most of the drums and other debris. Today, solid wastes, including half barrels and other drums, can be found in the wet tar that fills the depression at Simpson Core Test #26.

There are approximately 8-10 stuck drums in the middle of the oily water/tar pit area left behind by the U.S. Navy. [**Figure 4**] These drums will be difficult to remove, and this is probably why they were left behind after the cleanup during the 1970s. Approximately 100 feet south of the tar pit is a drum full of casing collars and an old pile of hardened concrete. [**Figures 5-6**]

The large active seep adjacent to the wellhead does not freeze below the snow layer and is not navigable. Any attempt to drive across it or to retrieve the solid wastes would result in equipment becoming stuck. This is why the BLM did not retrieve the remaining solid wastes when the BLM plugged the Simpson Core Test #26 well in 2006.

Surface Risk Assessment: High

Justification: Simpson Core Test #26 was drilled into an active, natural oil seep; one of many seeps that are present in this area and that are part of the environment. The BLM plugged and abandoned Simpson Core Test #26 in 2006. However, during the drilling of this core test, a bulldozed trail was created that has since thawed substantially and now forms a seasonal water-soaked trail between the natural seep and Lake Sinclair. It is possible for the natural oil from the seep to slowly migrate toward Lake Sinclair (Minga) during high water events. There is little-to-no surface relief along this water-soaked trail.

In August 2005, the North Slope Borough expressed concerns that oil from the pooled area next to Simpson Core Test #26 was entering into Lake Sinclair, threatening the local fish population. In August 2005, the BLM created an oil spill boom on a narrow portion of the wet trail to prevent the oil from entering into the freshwater lake.

Figure 1: General map of the cased Simpson Core Tests.

Figure 2: Aerial view of Simpson Core Test #26. The wellhead is within the man-made tar pit in the mid-right portion of this photo (July 2012). Lake Sinclair (Mingo) is on the upper right.

Figure 3: Closer view of the Simpson Core Test #26 area (July 2012).

Figure 4: View across the seep consisting of tar and oily water in the area of Simpson Core Test #26. This photo was taken in August 2010, and the core test was plugged in 2006.

Figure 5: Drum containing casing collars lying on the tundra in the area of Simpson Core Test #26 (August 2010).

Figure 6: Old cement remnant from the Navy's drilling operations in 1950. The Simpson Core Test #26 wellhead is in the distance, upper center of photo (June 2003).

Figure 7: Gas seeping around the casing on Simpson Core Test #26 prior to plugging (June 2003).

Figure 8: Simpson Core Test #26 prior to plugging operations (April 2006).

Figure 9: Plugging operations Simpson Core Test #26 (April 2006).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Simpson Core Test #26 was drilled in 1950 within one of the larger active oil seeps in the National Petroleum Reserve in Alaska. The core test reached a total depth of 1,171 feet and was cased to 350 feet. [**Figure 7**] No drill pad was ever established. Simpson Core Test #26 was the discovery well of the Simpson Oil Field. It flowed 110 barrels per day through a 2 ½-inch line from perforations between 289 and 325 feet (Robinson and Brewer 1964).

  In 1999, the USGS sampled and analyzed gas from Simpson Core #27 that is part of the same oil field, located less than half mile to the east. Analysis showed the gas to be biogenic methane, indicating that microbial alteration (breakdowns) of the hydrocarbons were responsible for the generation of gas. Additionally, oil sampled from the wellbore was extremely biodegraded. Simpson Core #26 has a wellhead flanged to the casing, a 2-inch line pipe, and four wing valves and will likely flow oil if the valves are opened. Access to the wellhead is limited by the depth of oily-water surrounding its base.

  The need to plug the core test was first realized during the summer of 2001, when gas bubbles were first observed around the base of the casing. [**Figure 7**] Simpson Core Test #26 was plugged April 20, 2006, by BLM contractor Cruz Construction and members of the USGS. An ice pad was constructed a few days prior to provide for a stable work surface. [**Figures 8-9**] The wellbore was accessed using existing valves, so the wellhead could be left intact through an agreement the BLM made with the Alaska State Historic Preservation Office (SHPO). An inflatable N_2 activated packer was ran downhole to 160 feet, then topped with approximately 36 sacks of Arctic Set Lite cement. Before the plugging occurred, the core test was capable of flowing at a rate of 40 psi.

- **Well Condition:** The core test remains plugged with a thick column of cement to the surface [**Figure 10**].

- **Wellhead Components:** The wellhead remains in place as per the agreement with SHPO. If opened, the four valves will do nothing as it is not capable of flowing oil or gas.

Geologic Setting: The core test encountered one very poor gas show and one productive oil sand in the undifferentiated Ninuluk/Seabee formations. In production tests, the test hole flowed at rates averaging 110 barrels of oil per day. Simpson Core Test 26 was completed in the coal-bentonite beds just short of the sandstone, but the oil is probably coming up from the sandstone. Other formations encountered include the Gubik, Seabee, and Grandstand formations (Robinson and Brewer 1964).

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no hydrocarbons seeping from the plugged wellbore.

Subsurface Risk Assessment: Low

Justification: The well was plugged in 2006 to prevent hydrocarbons from reaching the surface, but still requires a surface plug.

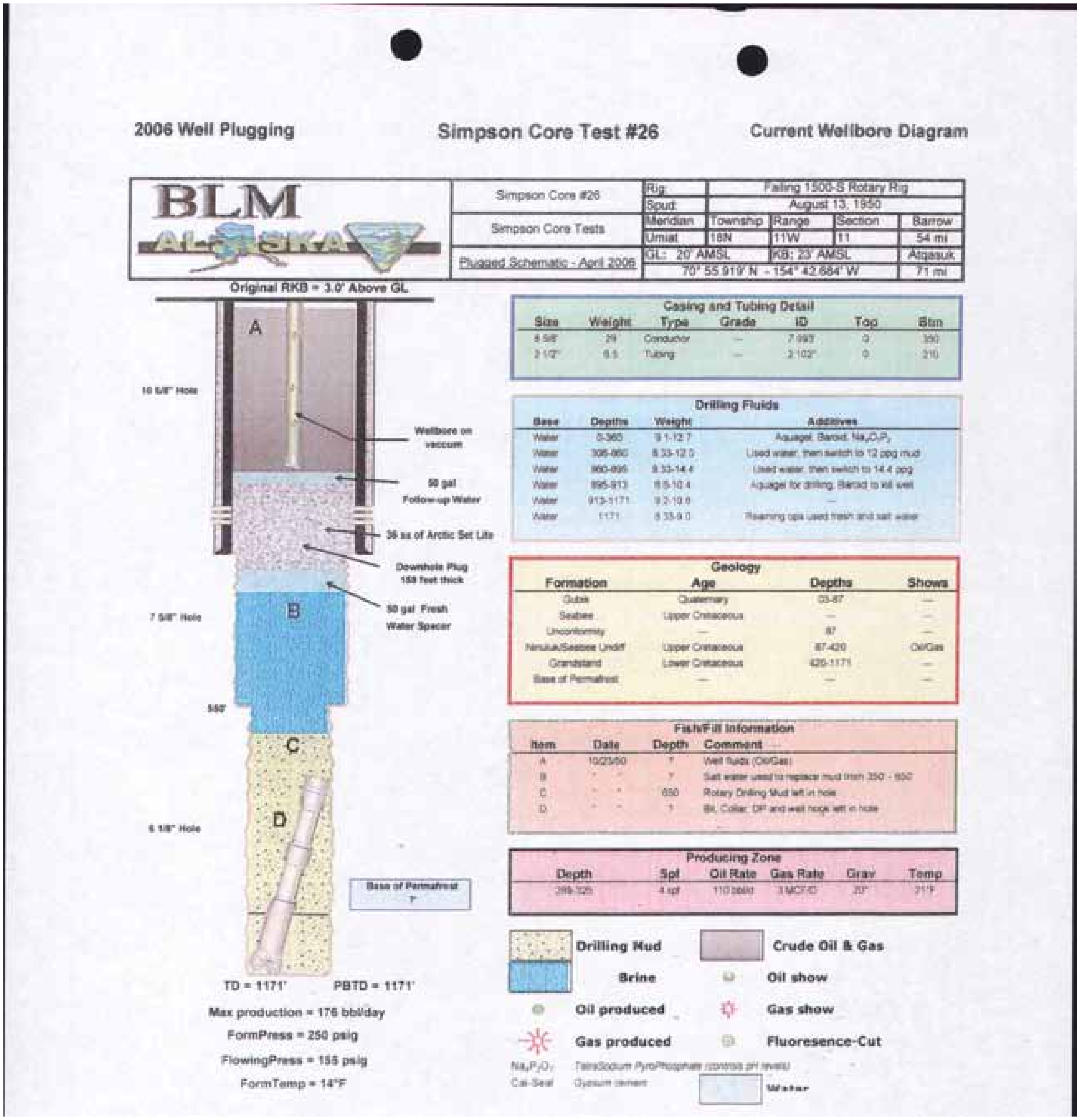


Figure 10: Simpson Core Test #26 wellbore diagram.

Simpson Core Test #27

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9353° N, -154.6678° W. The Simpson Core Test #27 is approximately 54 miles southeast of Barrow and 72 miles northwest of Atqasuk. The last site inspection was in July 2012.

Site Description: The U.S. Navy drilled the Simpson Core Test #27 site in an area of natural asphalt in 1951. [**Figures 1-2**] There is no cellar, pad, reserve pit or any surface debris associated with the site. The BLM plugged and abandoned the core test in 2006. [**Figures 3-4**] After abandonment, the BLM placed the wellhead back on the wellbore per an agreement established with the Alaska State Historic Preservation Office (SHPO) prior to plugging operations. This agreement was created due to the fact that, given the age of the site and the importance of the U.S. Navy drilling operation on the North Slope, the Simpson Core Test #27 site is most likely eligible for inclusion on the national Register of Historic Places.

Surface Risk Assessment: None

Justification: Simpson Core Test #27 site has been fully remediated.

Figure 1: Simpson Core Test #27 (August 2010).

Figure 2: Simpson Core Test #27 (August 2010).

Figure 3: Simpson Core Test #27 prior to plugging (April 2006).

Figure 4: Plugging operations on Simpson Core Test #27 (April 2006).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Simpson Core Test #27 was spudded February 1951 and completed one month later. Total depth is 1,500 feet with casing down to 102 feet. Oil was encountered at a depth of 380 feet and was bailed at a rate of 3 barrels per day. [**Figure 5**]

  The core test encountered the same formations as Simpson Core Test #26, with a few very poor gas shows and one productive oil bearing sand in the undifferentiated Ninuluk/Seabee formations. Oil-based muds were used from the drilling depth of 325 to 661 feet. At that point the oil was displaced and the drilling crew resumed using water-based muds. Additional crude was added downhole at a depth of 1,320 feet. The drill pipe was stuck and the two front derrick legs collapsed below the 4-foot extension in an effort to free the pipe. The drilling muds in place were re-circulated during the repair process. In an attempt to free the pipe, 73 barrels of crude and 23 barrels of diesel were used to replace the muds and the pipe was worked free. The oil was gradually replaced by mud as the drilling continued; however, some oil remained in the hole after completion. The crude used downhole came from Simpson Core Test #26 (Robinson and Brewer 1964).

  The USGS sampled Simpson Core Test #27 for both oil and gas in 1999. Analysis showed the gas to be biogenic methane, indicating that microbial alteration (breakdowns) of the hydrocarbons were responsible for the generation of gas. Additionally, oil sampled in the wellbore was extremely biodegraded.

During a site visit to the well in 2005 prior to plugging in 2006, oil and gas could still flow from the wellbore when the surface valve was opened. Plans to plug the well took this into account, and steps were taken to either drill and circulate out the fluids in the wellbore or circulate through the surface valve. Construction of an ice pad around the core test for setting up equipment started on April 11, 2006, and the plugging equipment was set up around the core test on April 14, 2006. The core test was opened with no response and shut-in while continuing to set up equipment. The morning of April 15, 2006, started with getting the drilling rig prepared over the casing, setting up the spill containment and repairing a broken heater. The next day, April 16, 2006, the wellbore was opened for a few minutes prior to the anticipated start of drilling operations, when the wellbore began to flow. The surface valve was closed, the produced oil cleaned up, and operations were briefly suspended to evaluate plans. It was decided that trying to drill while the core test flowed would be very risky and may be unnecessary. The core test flowed at a rate of 1 gal/min at 15 psi. To determine if any obstructions would prevent fluids from being pumped down the wellbore, water was pumped ahead of cement. A 50-gallon water spacer followed by 24 sacks of cement and 50 gallons of follow-up water was pumped into the wellbore and allowed to set overnight. The next day, April 17th, with the drilling rig still over the casing, open-ended core rods were run into the hole and tagged solid at 15 feet. The site and equipment were cleaned up and the wellhead was returned to its original configuration. The following day the wellhead was opened with no response and operations concluded on the core test. The wellhead was left in its original configuration per an agreement established with the Alaska State Historic Preservation Office (SHPO) prior to plugging operations.

- **Well Condition:** The core test is plugged with a cement plug to the surface.
- **Wellhead Components:** There is one valve on the wellhead.

Geologic Setting: A few very poor gas shows and one productive oil bearing sand in the undifferentiated Ninuluk/Seabee formations were discovered. Simpson Core Test #27 produced 3 barrels per day. Other formations encountered downhole include the Gubik (Quaternary), Seabee, and Grandstand (Cretaceous) formations (Robinson and Brewer 1964).

Development Potential: The core test is plugged and will not affect future development as they would likely seek deeper formations. The Simpson Oil Field is contained within the permafrost and due to its small size, would not likely be a primary target.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There are no hydrocarbons seeping from the plugged wellbore.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

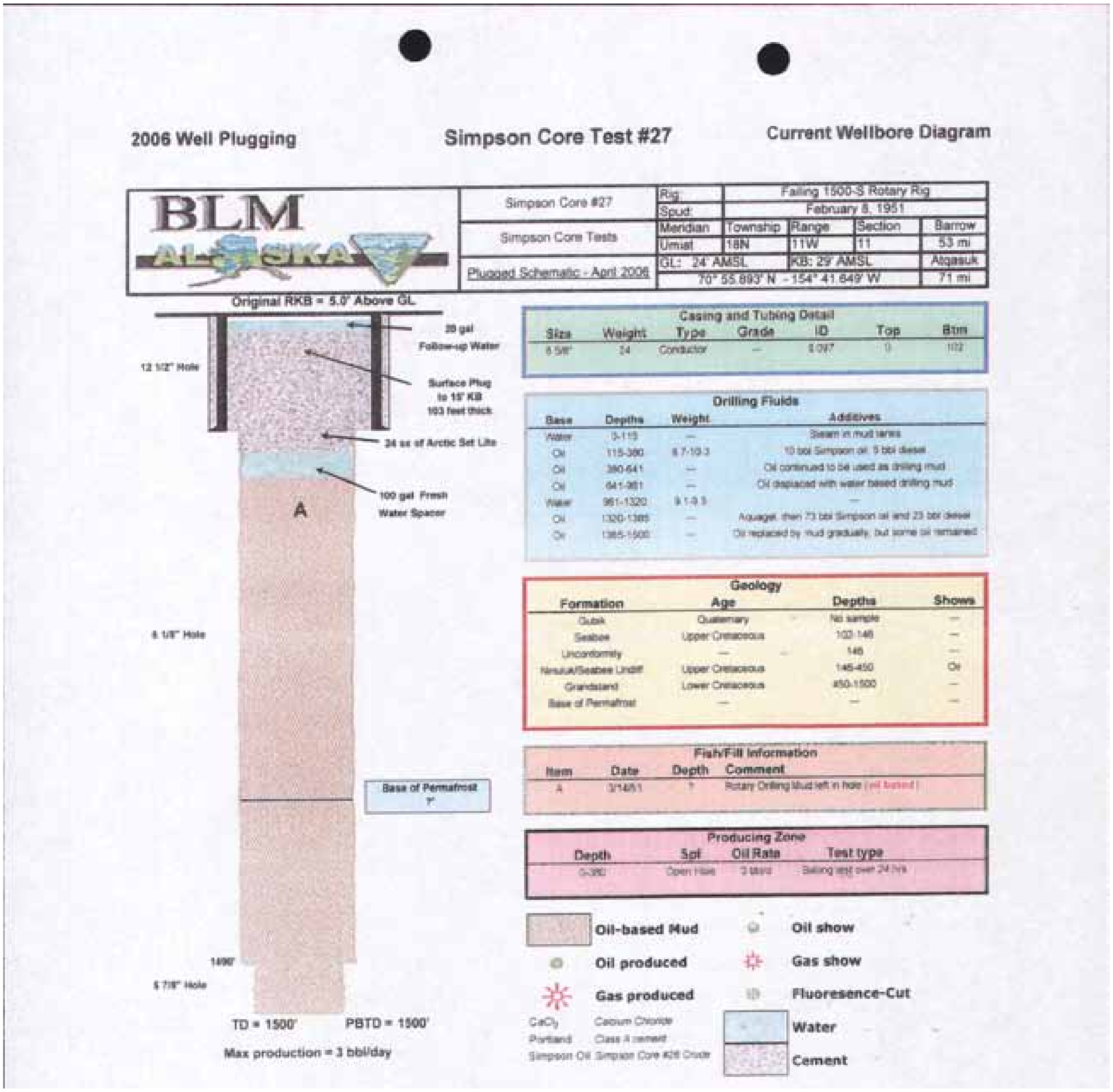


Figure 5: Simpson Core Test #27 wellbore diagram.

Simpson Core Test #28

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9925° N, -154.6711° W. The Simpson Core Test #28 is approximately 52 miles southeast of Barrow and 73 miles northeast of Atqasuk. **[Figure 1]** The last site inspection was in August 2011.

Site Description: The Simpson Core Test #28 site consists of a core test located in a constructed wooden cellar and a large amount of scattered surface debris in an area approximately 300 feet in diameter. **[Figure 2]** The U.S. Navy drilled the core test in 1950. It consists of open casing inside an 8x8-foot wooden cellar. The cellar is dry in late summer and promotes vegetation growth. **[Figures 3-4]** The casing is open to the environment.

There is considerable solid waste in the area; including numerous metal pilings, drill pipe, small piles of rotten cement, large wood fragments (spool, plywood, timbers), and some partially crushed drums. There was a small pile of old grease (about 1 foot by 1 foot) near the open casing.

Surface Risk Assessment: **Moderate**

Justification: A small pile of old grease is present near the open casing, but the grease is contained within the cellar. Surface waters are not likely to be affected from Simpson Core Test #28. There are no large lakes or flowing waters in the immediate area. The site is currently not under threat from erosion due to nearby water. Surface debris present on the site is both an impact to visual resources and could pose a travel risk to local residents.

Figure 1: Overview of Simpson Core Test #28.

Figure 2: View of the Simpson Core Test #28 site showing the cellar and scattered surface debris.

Figure 3: Five thermistor cables hanging over the wooden frame of the Simpson Core Test #28 cellar.

Figure 4: Simpson Core Test #28 casing inside the dry 8x8-foot cellar.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Simpson Core Test #28 was drilled in September 1950 to a total depth of 2,505 feet and cased to 110 feet. **[Figure 5]** This was the only core test on the Simpson Peninsula drilled with the larger Cardwell rotary drill rig rather than the Failing rotary rig. Despite the depth, the hole did not have any hydrocarbon shows (Robinson and Brewer 1964).

- **Well Condition**: The core test consists of 11 ¾-inch open casing inside an 8-foot by 8-foot wooden cellar. The casing is 3 feet in height. The cellar is dry in late summer and promotes vegetation growth. The core test is open to the environment. Upon completion, the hole was left full of lightweight natural mud, which were allowed to freeze and create an ice plug. The BLM recently dropped a plumb-bob downhole and struck solid at 8 feet, likely hitting an ice plug.

  Upon completion, the U.S. Navy installed 5 thermistor cables to the following depths (in feet); 196, 616, 956, 1191 and 2416.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: There were no hydrocarbon shows associated with the core test. It did penetrate several geologic formations including the Gubik, Seebee, and Grandstand. The Gubik Formation was encountered from the surface to approximately 120 feet, followed by the Seabee Formation. An unconformity was discovered at approximately 1,020 feet between the Seabee Formation and the Grandstand Formation. This same unconformity was encountered in several other core tests and was determined to be from the Upper Cretaceous, approximately 400 feet of the Grandstand Formation was missing. The Grandstand Formation rounded out the geology to total depth (Robinson and Brewer 1964).

Development Potential: Exploration and development in the vicinity of this core test is not likely within the next 20 years. Additionally, this core test would unlikely have an adverse impact on any future development since it did not penetrate productive zones and future development will likely target deeper, more productive formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. At this location, permafrost is present from just below the ground surface to 910 feet.

Subsurface Risk Assessment: Low

Justification: There were no oil or gas shows associated with this Simpson Core Test #28. There are no cement plugs.

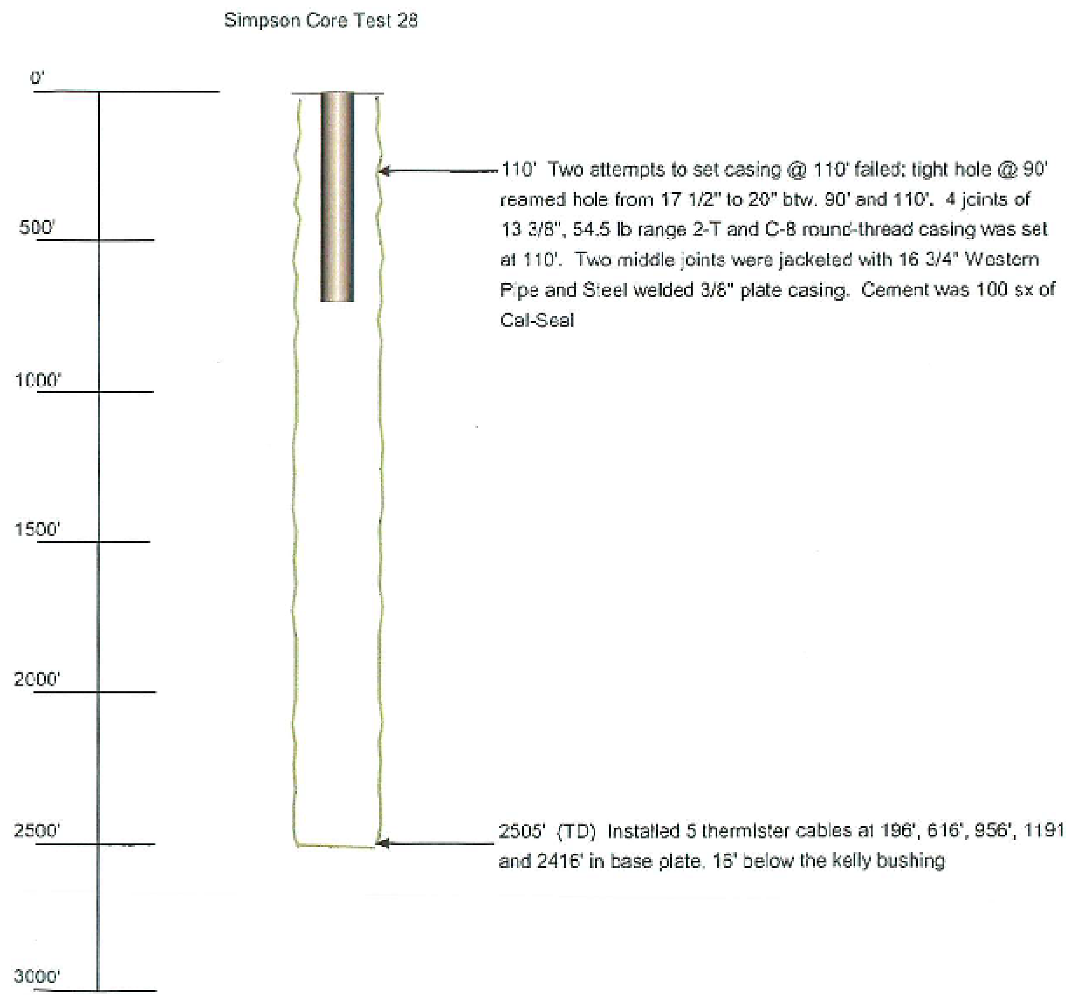


Figure 5: Simpson Core Test #28 wellbore diagram.

Simpson Core Test #29

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9297° N, -154.6919° W. The Simpson Core Test #29 is located approximately 54 miles southeast of Barrow and 71 miles northeast of Atqasuk. **[Figure 1]** The last site inspection was in August 2011.

Site Description: The Simpson Core Test #29 site consists of open casing in a constructed wooden cellar, and a minor amount of associated surface debris. The U.S. Navy drilled the core test in 1950. There is no pad or reserve pit associated with the site. The tundra shows little sign of disturbance, with some minor debris near the open casing. The wooden cellar measures 4x4 square feet. The cellar is filled with standing water and debris, including a section of drill pipe, various pieces of scrap wood, and a small barrel pump. **[Figures 2 and 3]** A small pile of lumber is on the ground near the cellar.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the site. The open casing of the core test or its cellar does not appear to have any impact on the surrounding surface water. The site does not appear threatened by erosion from nearby waters. There is little to no solid waste on site and it does not pose a travel risk to local residents.

Figure 1: Aerial view of Simpson Core Test #29. The scrap wood is to the right of the core test.

Figure 2: Simpson Core Test #29.

Figure 3: Simpson Core Test #29 with standing water in the cellar and a barrel pump jammed into the open casing of the core test.

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Simpson Core Test #29 is a dry hole drilled in 1950 to a depth of 700 feet and cased to 152 feet. **[Figure 4]** The purpose of the core test was to determine the limits of production for the Simpson Oil Field.

- **Well Condition:** There is not much ground disturbance at Simpson Core Test #29. A drilling pad was never established. The core test is identifiable by its 8 ⅝-inch casing, and is open to the atmosphere at a height of 6 inches with protruding thermistor cables. The core test was left with a mixture of mud and brine downhole.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: A very poor oil show was identified in the Seabee Formation. The productive sand present in the other Simpson Cores does not exist here. The test hole also penetrated the Gubik and Grandstand formations. No oil was recovered from this core test (Robinson and Brewer 1964).

Development Potential: This core test would unlikely have an adverse impact on development, since it did not penetrate productive zones and future development will likely target deeper, more productive formations.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: **Moderate**

Justification: Simpson Core Test #29 encountered a very poor oil show, but has no cement plugs. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

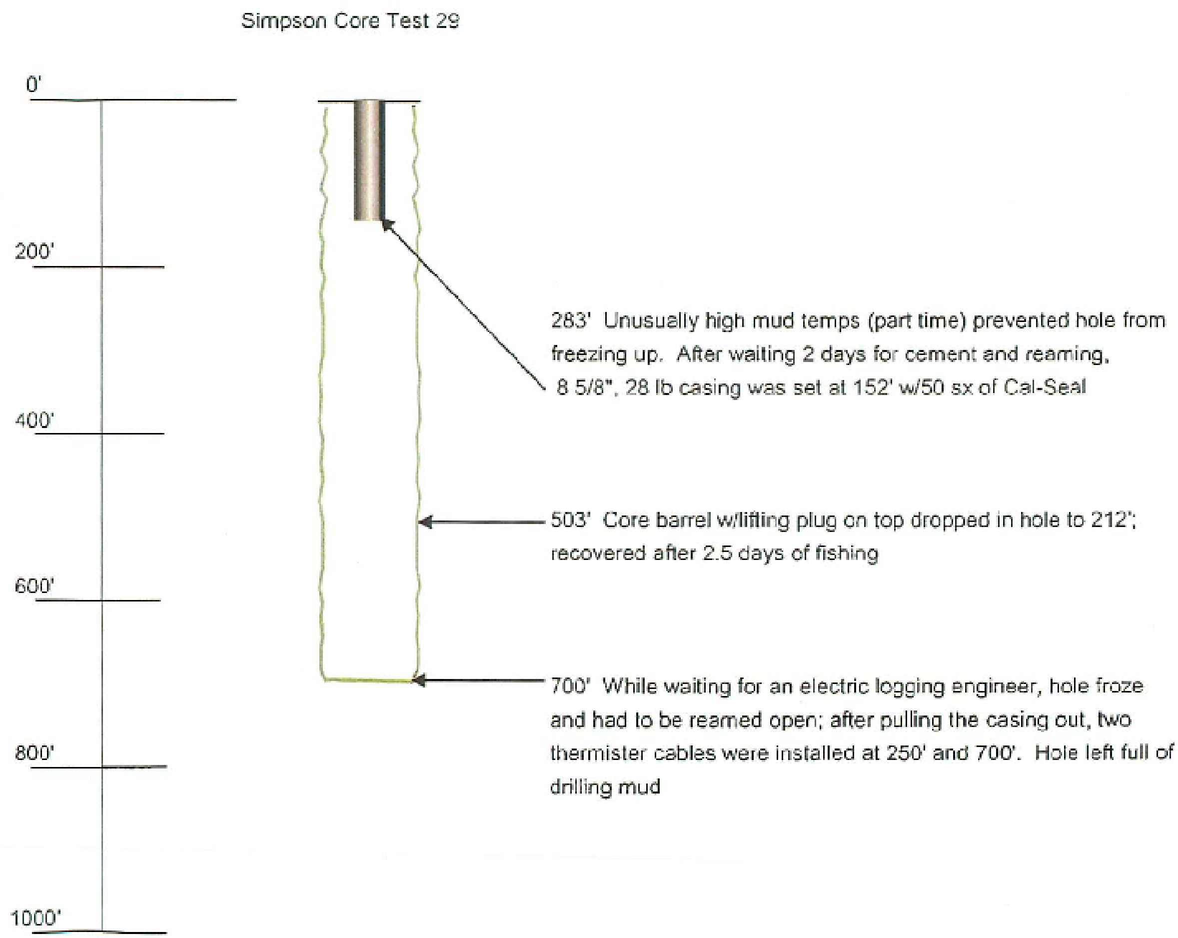


Figure 4: Simpson Core Test #29 wellbore diagram.

Simpson Core Test #30 and #30A

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9308° N, -154.6764° W and 70.9308° N, -154.6808° W. The Simpson Core Tests #30 and #30A are located approximately 54 miles southeast of Barrow and 72 miles northwest of Atqasuk. These tests were drilled about 50 feet apart in the same natural oil seep. [**Figures 1-2**] The last site inspection was in July 2012.

Site Description: The Simpson Core Test #30 site consists of a cased hole, the remains of a wooden cellar, and a small amount of debris that is currently embedded in the oily tar of the natural seep that surrounds the core test. The U.S. Navy drilled the core tests in 1951. There is no drill pad associated with the site, as the Navy drilled within the seep and camped on the tundra. This seep appears to be relatively shallow, less than 2 feet or 3 feet over the majority of the seep area. General topography of the area is primarily flat, with tens of feet of relief. Debris includes old concrete fragments, lumber, metal fragments, metal cables and possible the remains a few 55-gallon drums. **[Figures 3-6**]

The Simpson Core Test #30A has a wellhead. There is little to no debris in the oil seep around Test #30A; the majority of the debris is closer to #30.

Surface Risk Assessment: High

Justification: Both core tests have been plugged and abandoned. However, surface debris remains within the natural oil seep. [**Figures 7-14**] This portion of Seep 3 is not noticeably disturbed and does not connect to nearby surface waters.

Figure 1: Aerial view of the natural oil seep that contains Simpson Core Tests #30 and #30A (July 2012).

Figure 2: Locations of Simpson Core Tests #30 and #30A within an active oil seep (July 2012).

Figure 3: Various debris present in the oil seep near the open casing of Simpson Core Test #30 (August 2011).

Figure 4: Simpson Core Test #30 with what appears to be a collapsed wooden cellar (August 2011).

Figure 5: Photo showing the broken drill string within the wellbore of Simpson Core Test #30 (August 2011).

Figure 6: Simpson Core Test #30 (August 2010).

Figure 7: The Simpson Core Test #30 casing was altered during plugging operations (April 2006). Photo was taken before attaching flowlines to the brass gate valve in preparation for water injection.

Figure 8: Simpson Core Test #30 before plugging operations (June 2003).

Figure 9: Sheared casing for Simpson Core Test #30 before plugging operations (June 2003).

Figure 10: Simpson Core Test #30A (August 2010).

Figure 11: Simpson Core Test #30A after the construction of a thin ice pad used for plugging operations (April 2006).

Figure 12: Plugging operations for Simpson Core Test #30A (April 2006).

Figure 13: Prior to the plugging of Simpson Core Test #30A, when the valve was open, hydrocarbons would come to the surface around the casing (June 2003).

Figure 14: Bubbling around the surface casing of Simpson Core Test #30A (August 2001).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy drilled Simpson Core Tests #30 and #30A about 50 feet apart in the same oil seep. The seep is part of the same regime that contains Cores #26 and #27. The Navy drilled these core tests to gain an understanding of the producing field limits and to help determine underlying structure. Simpson Core #30 was drilled in 1951 to a depth of 1,500 feet. No plugs were set, and the core test was cased to 102 feet. [**Figure 15**] After the U.S. Navy abandoned the core test, the casing was sheared, leaving behind open surface casing.

  Plugging operations Simpson Core Test #30A began on April 17, 2006. For the water injection process, a brass gate valve and flowlines were attached to the wellhead. The flow back from circulating water downhole was contained in a large tank that was subsequently pumped into a truck used for liquid wastes. Once the water was pumped, then cement was added and the flowlines removed. The well was plugged with 24 sacks of arctic-grade cement, creating a 105-foot cement plug to the surface. [**Figure 16**] Gas bubbling up around the base of the casing began to subside while the cement was pumped into the wellbore before eventually stopping. Through an agreement established with the Alaska State Historic Preservation Office (SHPO) prior to plugging operations, the Simpson Core Test #30A wellhead was returned to its original configuration. The site was cleaned of all operations debris on April 18, 2006. When the site was visited over the next several days, there was no further gas bubbling around the casing.

  Plugging operations for Simpson Core Test #30 began on April 18, 2006, but the operations were suspended until April 20, 2006 following the discovery of an ice plug. The core test was incapable of flowing crude oil because of the ice plug. An attempt to melt the ice plug failed, as its thickness was underestimated. The original sheared casing was cut several inches below the top to enable the operator to weld on an additional casing, which provided for a manageable working surface. A small drilling rig was used to drill through the existing ice plug. The drill string became stuck at a depth of 69.5 feet. An attempt to free the drill string failed and ultimately it was cut off and left in the hole. The core test was plugged with 12 sacks of Arctic grade cement, creating a 52-foot cement plug in the wellbore. Through an agreement established with the Alaska State Historic Preservation Office (SHPO) prior to plugging operations, the wellhead was returned to its original configuration. Surface debris that was visible through the snow and ice around the open casing was collected and properly disposed of.

- **Well Condition:** The core tests are plugged with a cement surface plug with verified frozen drilling muds underneath.

- **Wellhead Components:** There is a wellhead including a single valve on Simpson Core Test #30A. Simpson Core Test #30 does not have a wellhead.

Geologic Setting: As expected, both holes encountered the same formations as Cores #26 and #27; Gubik, Seabee, undifferentiated Ninuluk/Seabee, and Grandstand formations wells with a few poor gas shows and one productive sand in the undifferentiated Ninuluk/Seabee formations. Poor oil shows were also noted in the deeper Grandstand Formation. During production tests of the shallow oil sand, the test hole was bailed at rates averaging 5 barrels of oil per day (Robinson and Brewer 1964).

Development Potential: Both core tests have a surface plug and will likely not affect future development, as industry would probably seek deeper formations. There is some concern of the cement surface plug for Simpson Core Test #30, as it was not set below the casing shoe due to the drill string becoming stuck. The fact that there was very little pressure on the core test during drilling, however, and that hydrocarbons from the underlying formations are already coming to the surface in the natural oil seep, this core test is unlikely to have an effect on future development.

Groundwater Resource: None. There are no fresh water aquifers in the area given the thick, continuous permafrost on the Simpson Peninsula.

Other Information: No hydrocarbons are leaking into the seep from the core tests. They are located three tenths of a mile from both Simpson Core Tests #26 and #27.

Subsurface Risk Assessment: None

Justification: The wells have been adequately plugged per Federal regulations.

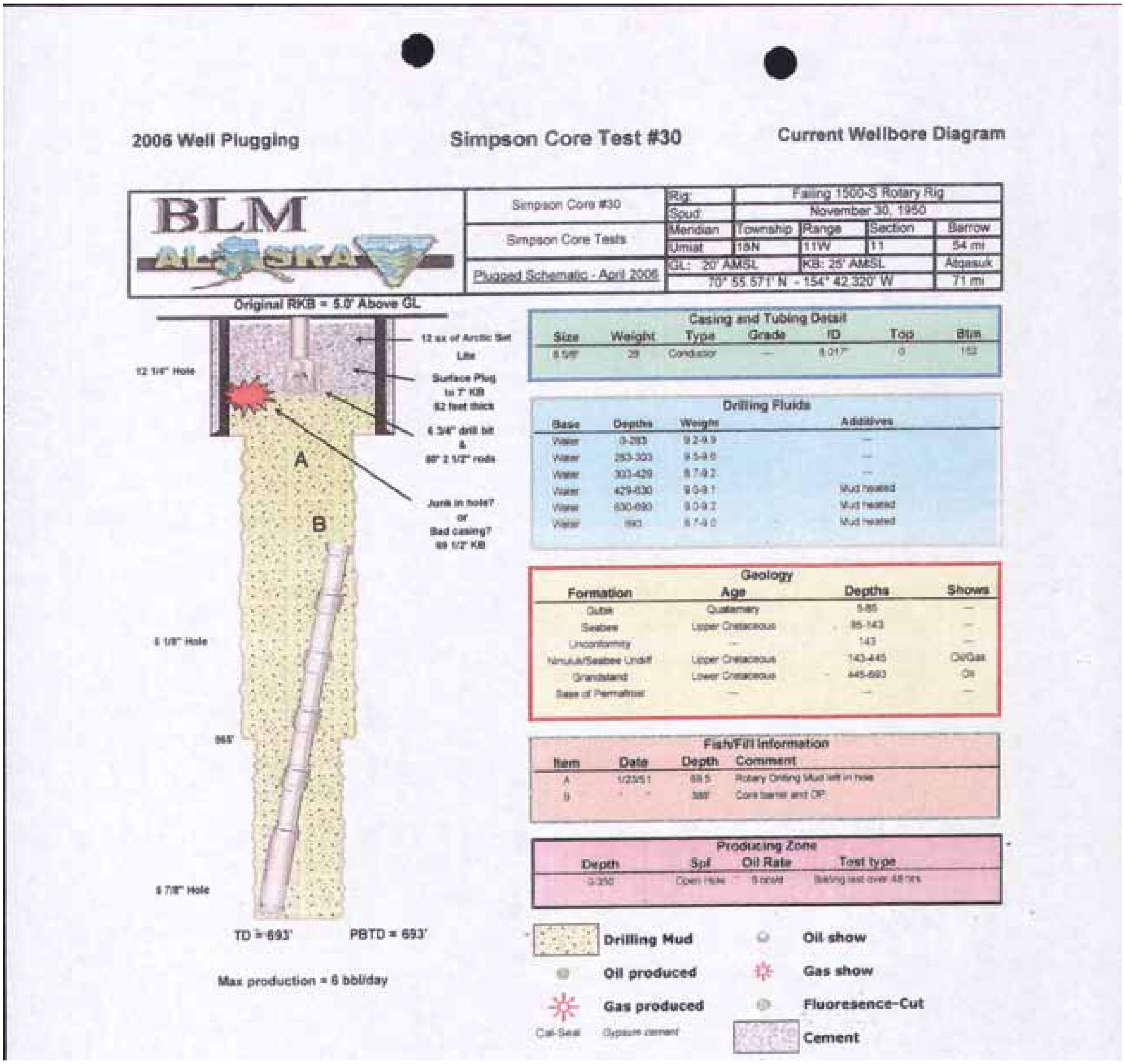


Figure 15. Simpson Core Test #30 wellbore diagram.

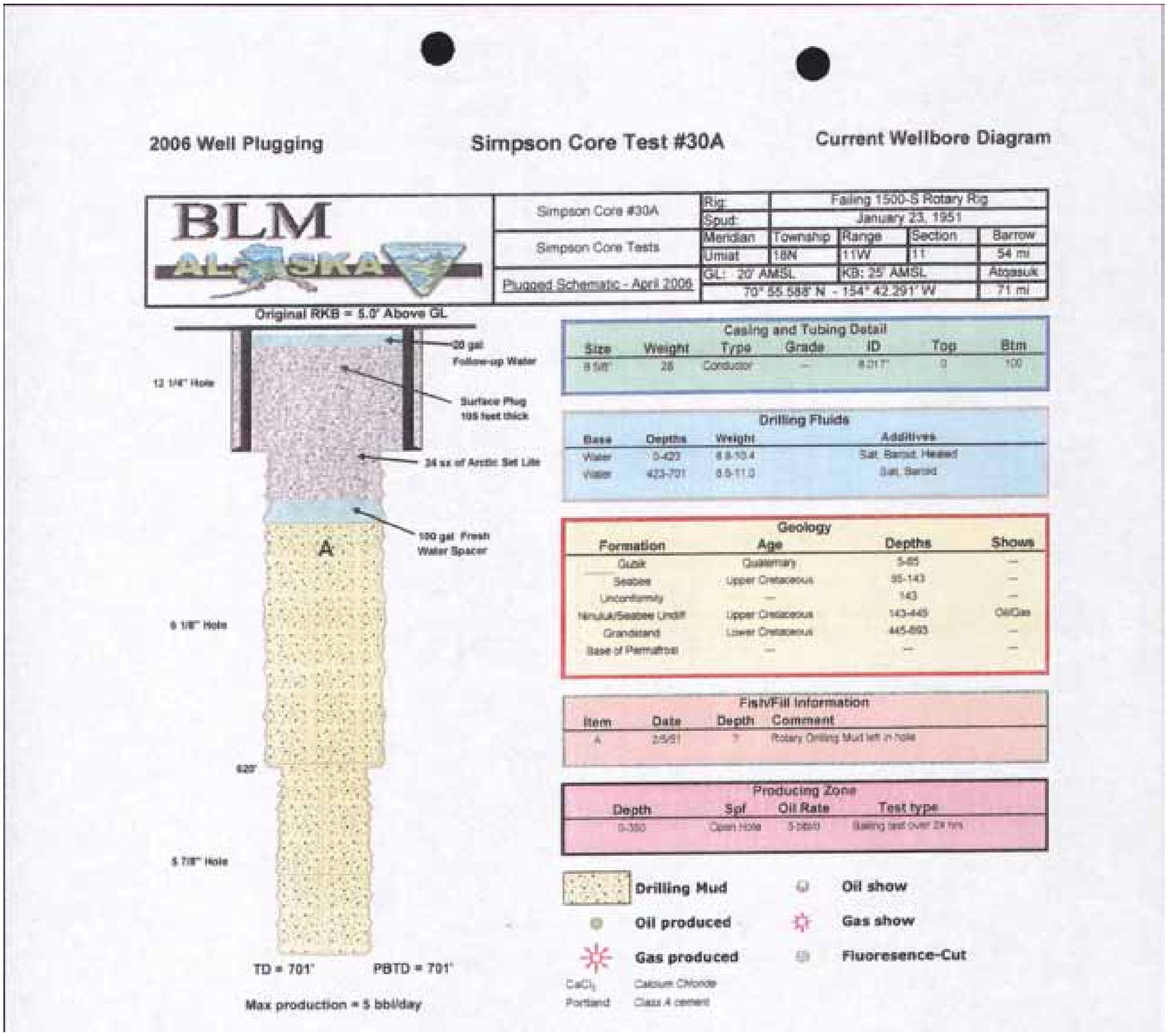


Figure 16: Simpson Core Test #30A wellbore diagram.

Simpson Core Test #31

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.9556° N, -154.6289° W. The Simpson Core Test #31 is approximately 55 miles southeast of Barrow and 73 miles northeast of Atqasuk. The last site inspection was in July 2012.

Site Description: The Simpson Core Test #31 site consists of a wellhead; there is no cellar, pad or reserve pit associated with the site. [**Figures 1-4**] The U.S. Navy drilled the core test in 1951. There is no surface debris associated with the site.

Surface Risk Assessment: None

Justification: The core test was plugged and abandoned in 2006, and the site has no remaining surface debris. [**Figures 5-12**] The BLM plugged and abandoned the Simpson Core Test #31 in 2006. After abandonment, the BLM placed the wellhead back on the wellbore per an agreement established with the Alaska State Historic Preservation Office (SHPO) prior to plugging operations. This is due to the fact that, given the age of the site and the importance of the U.S. Navy drilling operation on the North Slope, the site is most likely eligible for inclusion on the National Register of Historic Places.

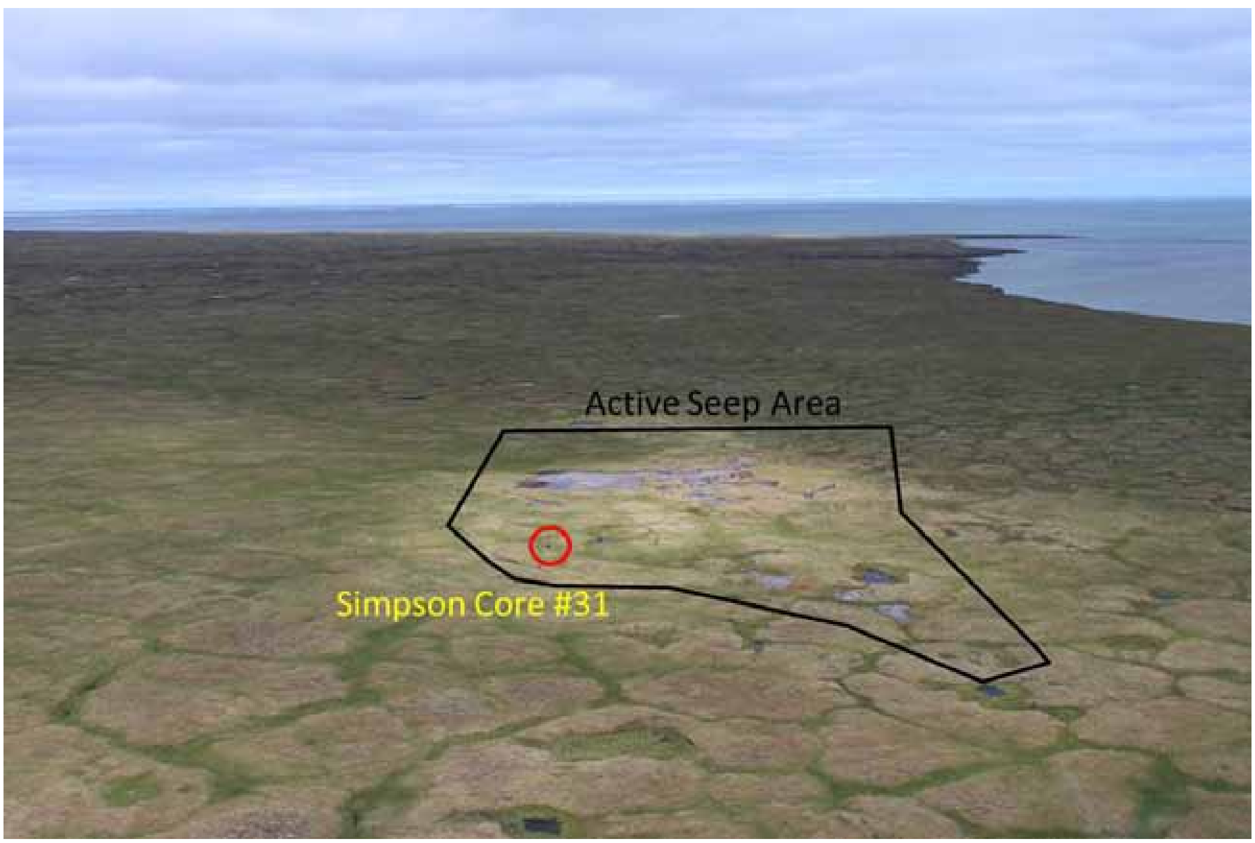


Figure 1: Location of Simpson Core Test #31 in relation to the active seep. The Beaufort Sea is in the background and to the right (July 2012).

Figure 2: Same location as previous photo showing the Simpson Core Test #31 aerial, relation to the oil seep, and the Beaufort Sea.

Figure 3: Simpson Core Test #31 4 years after adding a surface plug in 2006 (August 2010).

Figure 4: Fresh oil coming to the surface near the Simpson Core Test #31 wellhead (August 2010).

Figure 5: Simpson Core Test #31 prior to plugging operations in March 2006.

Figure 6: Plugging operations at Simpson Core Test #31 in March 2006.

Figure 7: Simpson Core Test #31 in June 2003, approximately 2 years after installing the new gate valve.

Figure 8: Simpson Core Test #31 after installing a new master valve in 2001.

Figure 9: Simpson Core Test #31 replacing old valve (June 2001).

Figure 10: Simpson Core Test #31 before replacement of the old swedge and wing valve. The pipe extension was used to collect oil (June 2001).

Figure 11: Old valve and arm from Simpson Core Test #31.

Figure 12: Simpson Core Test #31 leaking oil from the swedge (June 2000).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Simpson Core Test #31 is a shallow core test drilled in 1951 to a depth of 355 feet and cased to 101 feet [**Figure 13**]. The objective of drilling was to collect a core to view the material at the bottom of the seep.

  At some point prior to 2000, a 10-foot extension pipe was hooked up to the wing valve. The extension allowed for the oil to flow down the arm and collect in a bucket. It is unknown how long it served as a collection point for the locals. In 2000, it was reported to the BLM that oil was seeping out of a corroded swedge on the wellhead and the wing valve was occasionally left in the open position. This impending scenario was mitigated by the fact oil was spilling into a natural oil seep. In June 2001, the BLM spent $35,000 in replacing the wing and master valve with a new master valve and needle valve. The extension pipe was also removed at this time. The USGS took oil and gas samples prior to the replacement. It was capable of flowing at a rate of 70 psi.

  Simpson #31 was plugged on April 20, 2006, as equipment was mobilized from Simpson #26. The fluids were recirculated and an inflatable packer was set at about 100 feet. Twenty-four sacks of Arctic Set Lite cement was added downhole, creating a 105-foot plug.

- **Well Condition:** The core test remains plugged with a cement plug to the surface.

- **Wellhead Components:** The wellhead remains in place, and has one valve. It can no longer flow to the surface when opened.

Geologic Setting: The core test encountered a few sands with shows and one productive sand in the undifferentiated Ninuluk/Seabee Formation. In 65 hours of testing, this zone flowed oil to the surface at rates averaging 125 barrels and 2,000-4,000 cubic feet of gas per day. Flowing pressure was measured at 60 psi. The core test also penetrated the Gubik and Seabee Formations, which were unproductive (Robinson and Brewer 1964).

Development Potential: Simpson Core Test #31 is plugged and will not affect future development as industry would likely seek deeper formations. The Simpson Oil Field is contained within the permafrost and due to its small size, would not likely be a primary target.

Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There are no hydrocarbons seeping from the plugged wellbore.

Subsurface Risk Assessment: None

Justification: The Simpson Core Test Well #31 has been adequately plugged per Federal regulations.

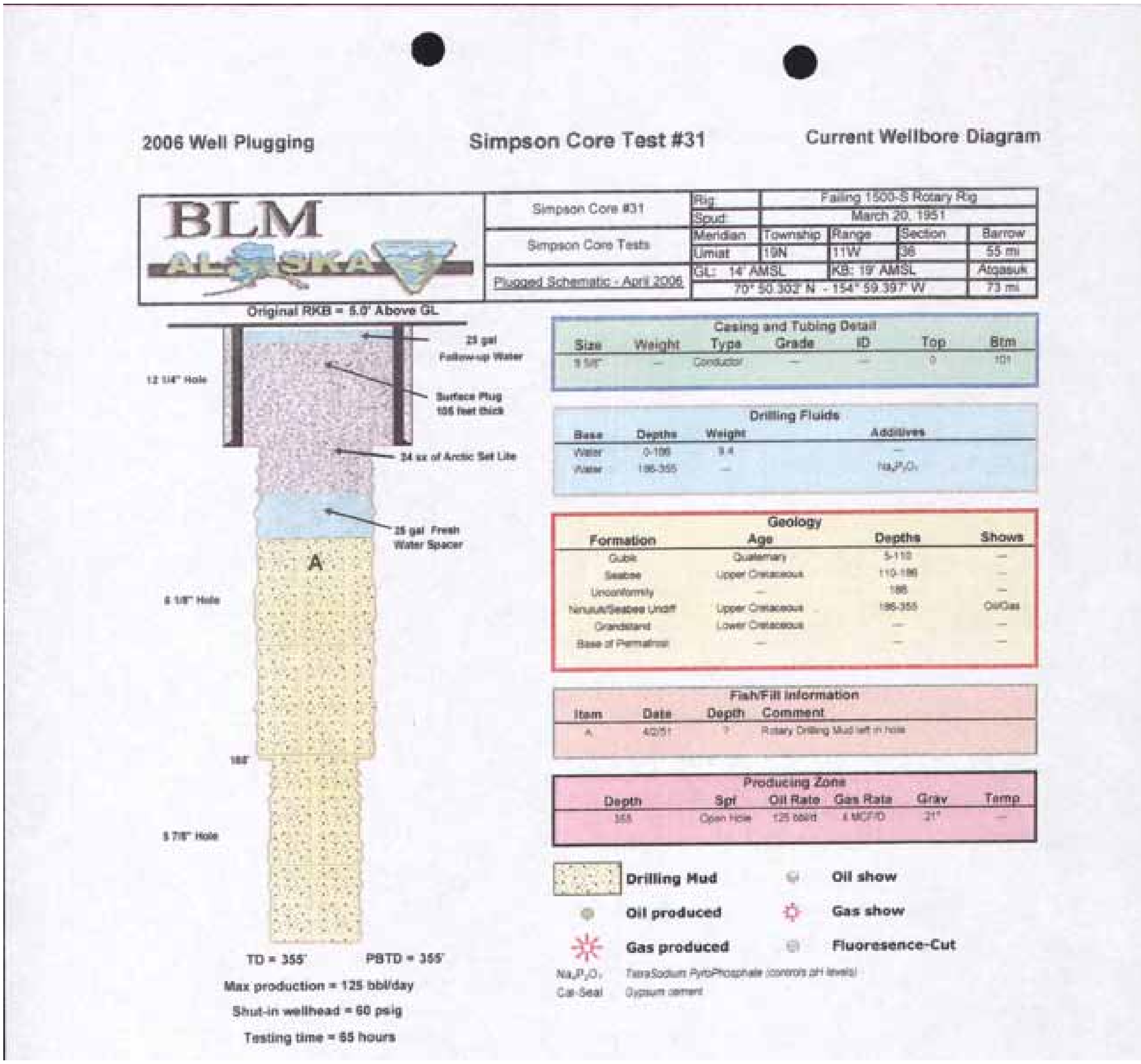


Figure 13: Simpson Core Test #31 wellbore diagram.

Skull Cliff Core Test #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.8998° N, -157.6000° W. The site is located 30 miles southwest of Barrow and 60 miles east of Wainwright. The last site visit was in July 2010.

Site Description: Skull Cliff Core Test #1 is approximately 1 mile from the Chukchi Sea. It is about 50 feet above sea level. The U.S. Navy drilled the core test in 1947. The core test was drilled on polygonal ground. A large area of activity roughly 150 feet by 200 feet is evidenced by about 200 drums, metal tracks, wood debris and various other metal hardware that litter the site [**Figures 1-8**]. The U.S. Army Corps of Engineers (USACE) and the Native Village of Barrow are in the characterization process of cleaning up the solid wastes at the surface though the Native American Lands Environmental Mitigation Program (NALEMP).

A drill pad was never established; instead, an area was cleared for drilling operations. The core test, which lies within the drum scatter, consists of open 7-inch diameter casing that sticks up about 4- to 5-feet above the ground inside the cellar. [**Figures 2-3**]. A shallow wood cellar was cut about 2-feet into the earth and has partially filled with water. The wooden cellar is low and appears to be made of only a single round of 2x6 lumber. There is no vegetation growth in the cellar. Solid wastes are also present in the cellar, including some lumber scraps, and some other metal hardware pieces. A wooden block was cut to fit inside the open casing to prevent water and birds from entering. The large timbers used to support the drill rig are still present around the casing. Overall, the polygonal ground around the open casing is mostly intact and representative of the surrounding undisturbed land.

Surface Risk Assessment: **High**

Justification: There are no known contaminants on the site. The site is currently not under any threat due to erosion or other natural processes. However, the large amount of solid waste is considered significant, and could pose a public safety risk to local residents from Barrow, Atqasuk and Wainwright.

Figure 1: Aerial view of Skull Cliff Core Test #1.

Figure 2: Aerial view of Skull Cliff Core Test #1 and main drum concentration.

Figure 3: Skull Cliff Core Test #1 and cellar.

Figure 4: Skull Cliff Core Test #1 main drum concentration.

Figure 5: Skull Cliff Core Test #1 main drum concentration.

Figure 6: Skull Cliff Core Test #1 main drum concentration.

Figure 7: Skull Cliff Core Test #1 with U.S. Navy identification.

Figure 8: Skull Cliff Core Test #1 with U.S. Air Force and U.S. Army identification.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Skull Cliff Core Test #1 was drilled in March 1947 to a depth of 779 feet and is classified as a dry hole. While drilling to the target depth of 1,500 feet, the drill string was lost in the hole and attempts to recover it were unsuccessful [**Figure 9**]. The drilling mud was bailed down to the top of the fish and the remainder of the core test was filled with diesel to a depth of 54 feet to prevent the wellbore from freezing and facilitate downhole temperature measurements (Collins and Brewer 1961).

- **Well Condition**: The casing is in fair condition and is set 30 feet below the surface.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: Despite the nearby oil seeps, no shows of oil or gas were reported while drilling through the Gubik, Grandstand, and Topagoruk formations.

Development Potential: Exploration and development in the vicinity of Skull Cliff Core Test #1 is not likely within the next 20 years. If development were to occur, this core test would not likely have an adverse impact on development since industry will likely target deeper, more productive formations.

Groundwater Resource: There are no groundwater resources present in this area. Thick, continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist in this area. The shallow-set casing is a low risk for corrosion since that portion of the hole was topped off with diesel oil.

Other Information: An oil seep located at the base of Skull Cliff (land-ocean contact) was observed and documented in the 1940s, which influenced the Navy's decision to drill. BLM and USGS crews searched for the seep when they were in the area, but nothing was found at the cliff-beach contact. However, another seep was reported in 1996 by a group from the Academy of Natural Sciences in a small gully about a mile to the east near the old radio tower site. This seep was never confirmed by the BLM.

Subsurface Risk Assessment: Moderate

Justification: Skull Cliff Core Test #1 is a shallow drill hole reaching a total depth of 779 feet. No cement plugs were set. The moderate ranking is due to approximately 54 feet of diesel (approximately 16 barrels) sitting on top of drilling muds within the wellbore. There is no indication that is ever overtopped the open casing as evidenced by the lack of stressed vegetation around the water-filled cellar. As long as the cut plug remains in place, water cannot enter the wellbore.

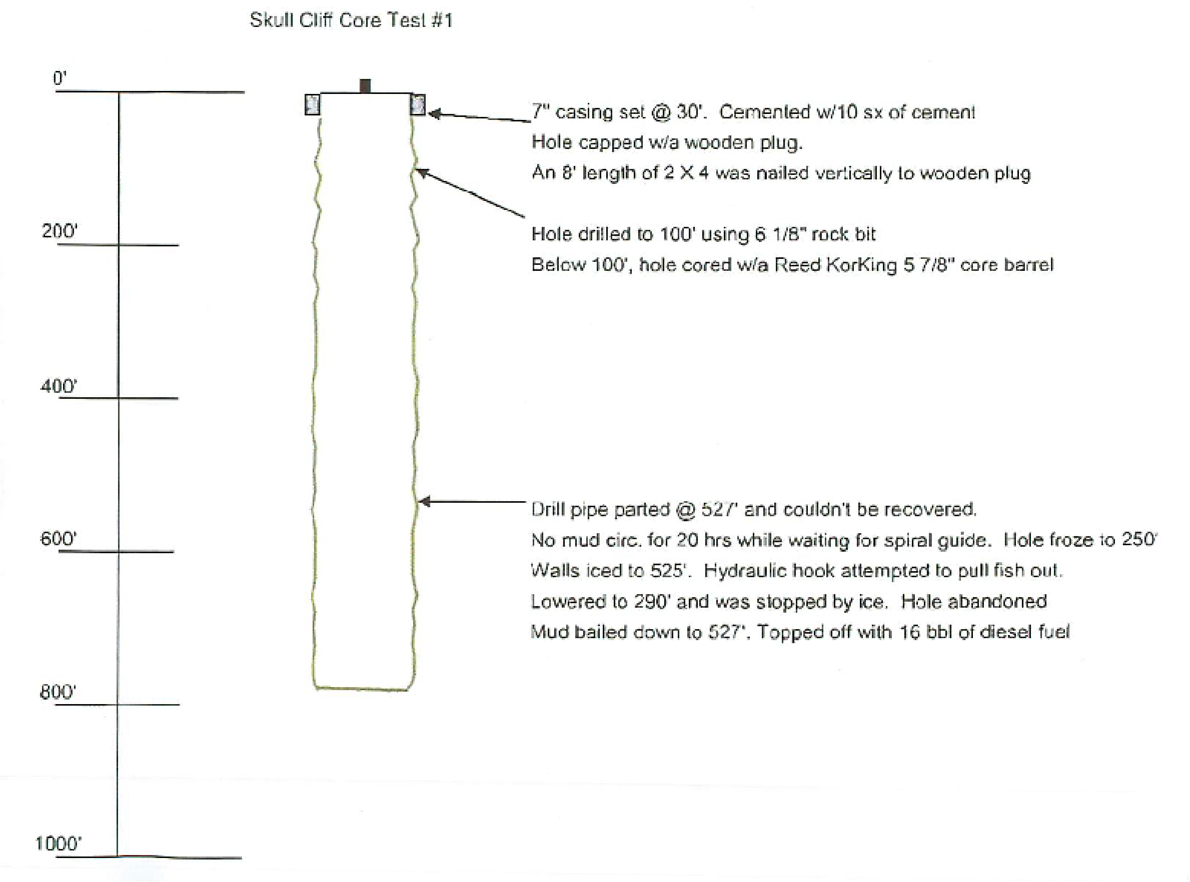


Figure 9: Skull Cliff Core Test #1 wellbore diagram.

South Barrow #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.3200° N, -156.7044° W. The site is located in Barrow at the intersection of Cakeeater Road and Stevenson Street, near the area of town referred to as NARL (the former Naval Arctic Research Station). The well was drilled on the shore of the Middle Salt Lagoon, and the Arctic Ocean is located about 300 feet to the north of the site, on the other side of Stevenson Street. The last site inspection was in July 2012.

Site Description: The South Barrow #1 site consists of a well and rat hole, along with scattered surface debris in an area measuring 12 feet in diameter [**Figures 1-2**]. The U.S. Navy drilled the well in 1948. There is no pad, reserve pit, or cellar associated with the well. The wellhead assembly consists of 7-inch casing clamped inside 11 ¾-inch casing with 4-inch casing extending to the top of the open hole. Total height is approximately 12 feet. The clamp that was used to secure the casing within the larger diameter pipe is broken. Thermistor cables attached to a 2x4 are mounted at the top of the open 4-inch casing. A ¾-inch cable is also attached to the 2x4, and a large pile of additional ¾-inch cable is located on the ground at the base of the well [**Figure 3**]. A second 10-inch diameter pipe is located 10 feet to the east of the well. This pipe extends 10 feet above the ground surface and is presumed to be the rat hole. Chunks of cement are also present on the ground near the well.

Surface Risk Assessment: **Moderate**

Justification: There are no known contaminants present on the site. Additionally, although the site is located on the shore of the Middle Salt Lagoon and near the shore of the Arctic Ocean, the site is not currently under threat by coastal erosion. However, the site is located within the community of Barrow and serves as a potential hazard to residents traveling through the area by ATV and snow machine.

Figure 1: South Barrow #1 well (left) and rat hole (right), Middle Salt Lagoon in background.

Figure 2: South Barrow #1 during spring thaw.

Figure 3: South Barrow #1 well close-up of pipe, note broken clamp.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: South Barrow #1 well was spudded August 1948 and completed in November 1948. The purpose of the well was to determine the age and character of the rocks in the area. This well was the first of the deep wells drilled near Point Barrow. The well reached a total depth of 3,553 feet **[Figure 4]**.

- **Well Condition**: There are no reserve pits, drilling pad, or cellar. The well assembly consists of 7-inch casing clamped inside 11 ¾-inch casing with 4-inch casing extending to the top of the open hole. Total height is approximately 12 feet. The clamp has been damaged. The large pipe to the right of the well is presumed to be the rat hole. A drilling pad was not constructed, as the existing terrain around South Barrow #1 consists of sand deposits form the Arctic Ocean.

- **Wellhead Component:** There is no wellhead at this site.

Geologic Setting: There were only faint oil shows between 3,045 feet and 3,226 feet in thin sandstone beds of the Pebble Shale Unit. Formation tests recovered no shows of oil or gas. The hole penetrated the Nanushuk, Torok, and Pebble Shale Unit before reaching argillite basement rocks of the pre-Mesozoic (Collins and Brewer 1961).

Development Potential: Gas development has occurred near South Barrow #1 for several decades. No detrimental effects from South Barrow #1 have been observed. Future production of the Barrow gas fields will continue in the foreseeable future. The BLM plans to plug this well within the next 3 years.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost is about 440 m thick throughout the entire Barrow region (Alaska Department of Environmental Conservation 2012). Freshwater aquifers are not present. The town of Barrow gets its drinking water from treated surface water, not from aquifers.

Other Information: No hydrocarbons are present at South Barrow #1.

Subsurface Assessment: **Moderate**

Justification: There were faint oil shows between 3,045 and 3,226 feet with no cement plugs in the wellbore. Drilling muds were placed downhole. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

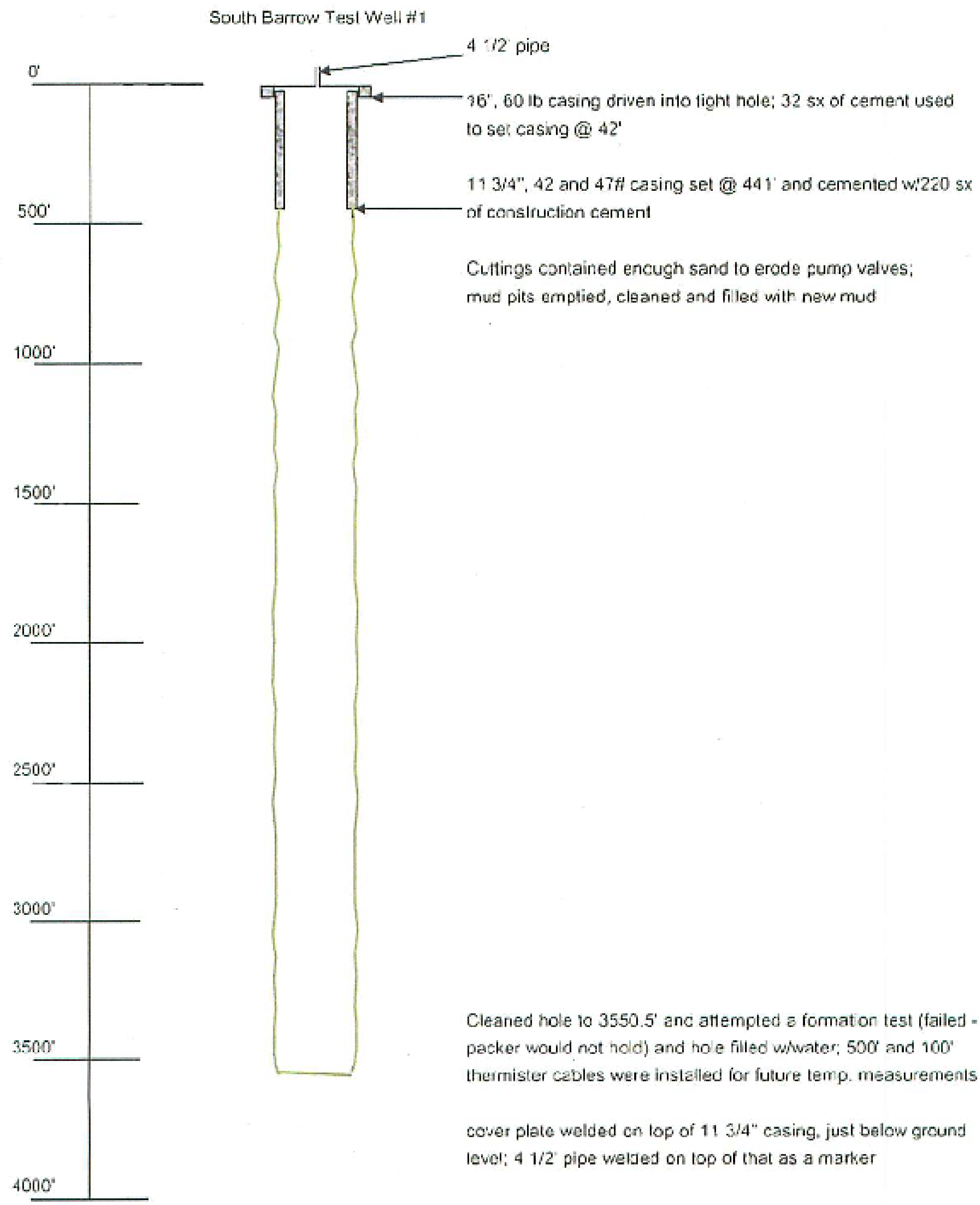


Figure 4: South Barrow #1 wellbore diagram.

South Barrow #2

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.2622° N, -156.6342° W. The site is located approximately 4 miles south of Barrow, within the currently active Barrow Gas Field, adjacent to the East Barrow Gas Field Road, and within view of the East Barrow Central Processing Facility **[Figure 1]**. This well is located on privately owned land with oil and gas reserved to the North Slope Borough. The last site inspection was in July 2012.

Site Description: The South Barrow #2 site consists of a well housed inside a constructed wooden box that sits inside a concrete well cellar, along with associated surface debris in an area approximately 50 feet north to south and 30 feet east to west. The U.S. Navy drilled the well in 1949. There is no pad or reserve pit associated with this well. The constructed wooden box consists of plywood walls attached to a 2x4 frame that measures 3 feet by 3 feet and is 8 feet tall **[Figure 2]**. A door is present in the southern wall, and the remaining walls are intact. No roof is present on the wooden box. The box completely encompasses the well and is located within the concrete cellar, which measures about 8 feet square. The concrete cellar was constructed on top of a plywood frame that sits on about six wooden pilings **[Figure 3]**. The exact number of pilings supporting the cellar is unknown, and the plywood base appears to be slowly collapsing at the southwest corner.

Associated surface debris includes at least 12 wood pilings about 10 inches in diameter and about 16-24 inches above the ground surface in the immediate vicinity of the well. There is also a small pile of drilling muds about 8 feet in diameter and 12 inches thick that lies 50 feet southwest of the wellhead **[Figure 4]**. A 10-inch diameter metal pipe is present south of the well, extending vertically about 24 inches above the ground surface. This pipe is assumed to be the rat hole used to hold the next drill pipe section during drilling. Other miscellaneous debris on the site includes several small pieces of weathered lumber, sections of narrow diameter (approximately 1- to 4-inch) metal pipe, and chunks of broken concrete. It should be noted that scattered debris is present beyond the boundary of the South Barrow #2 well site, due primarily to the active and ongoing use of the Barrow Gas Field.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the site. The well site and surface debris are located in an area of seasonally flooded tundra. A small stream is located to the south that appears to be in an established channel between two drained lakes (Dry and Footprint Lakes), but is not an erosional threat to the wellsite. There is little to no solid waste on site. The site does not pose a travel risk to local residents because of its proximity to other infrastructure in the area. Residents who travel through the Barrow gas field utilize the road located adjacent to the site.

Figure 1: Aerial view of South Barrow #2 and vicinity (June 2007).

Figure 2: Plywood box that houses the South Barrow #2 well.

Figure 3: Close-up showing the plywood base that hosts the concrete cellar and the plywood box.

Figure 4: A small pile of what appears to be drilling muds; telephone lines and an old production line from the South Barrow Gas Field are also present.

Figure 5: Wellhead for South Barrow #2; several bolts are missing on the top two flanges and the control for the gate valve still attached, but is broken. A thermistor cable protrudes from the top of the wellhead.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: The well was completed in April 1949, reaching a total depth of 2,505 feet **[Figure 6]**. It was the first well in the Petroleum Reserve to produce a useful quantity of gas. By July 1949, the gas was used to heat the Barrow camp. The purpose of the hole was to test a structural trap formed by faults that was identified during seismic surveys. Once the well was in production, it flowed at 1,020 psi, supplying as much as 500,000 cubic feet per day in February 1950. Several months later, a broken gas line caught the well on fire, destroying installations. The well was killed with mud. An impression block showed the 7-inch casing had collapsed. At this point, the well was full of mud and was already freezing, so it was abandoned (Collins and Brewer 1961).

- **Well Condition:** The wellhead is missing numerous bolts on the top two flanges and the control for the gate valve is broken but still attached **[Figure 5]**. The valve is probably in the open position, as a thermistor cable protrudes from the top of the well to some depth below the surface.

- **Wellhead Components**: The wellhead consists of a broken gate valve and no gauges.

Geologic Setting: Findings included staining to slight oil and fair to good gas shows in the Pebble Shale Unit between 1,930 and 2,328 feet. Between 2,328 and 2,443 feet, the hole penetrated the Barrow sands, which had good oil staining and slight shows. Beyond 2,443 feet to total depth consisted of argillite basement rocks. Four formation tests were run (1 test in the Pebble Shale and 3 tests in the Barrow sands), with each recovering at least a slight amount of gas. There were no oil or gas shows above 1,850 feet of the Torok Formation (Collins and Brewer 1961).

Development Potential: There are no hazardous materials associated with the well that would pose a risk to the general health and safety of the land. Subsurface resources do not appear to be affected by the current downhole status of South Barrow #2. This is evident by the gas production that is occurring less than 1 mile away.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost is about 1,400 feet thick throughout the entire Barrow region. Freshwater aquifers are not present. The town of Barrow gets its drinking water from treated surface water not from aquifers (Alaska Department of Environmental Conservation 2012).

Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Assessment: Moderate

Justification: Gas shows are documented downhole and there are no cement plugs. Drilling muds were placed into the wellbore and allowed to freeze. South Barrow #2 also has a wellhead to contain any gas that could potentially made its way to the surface.

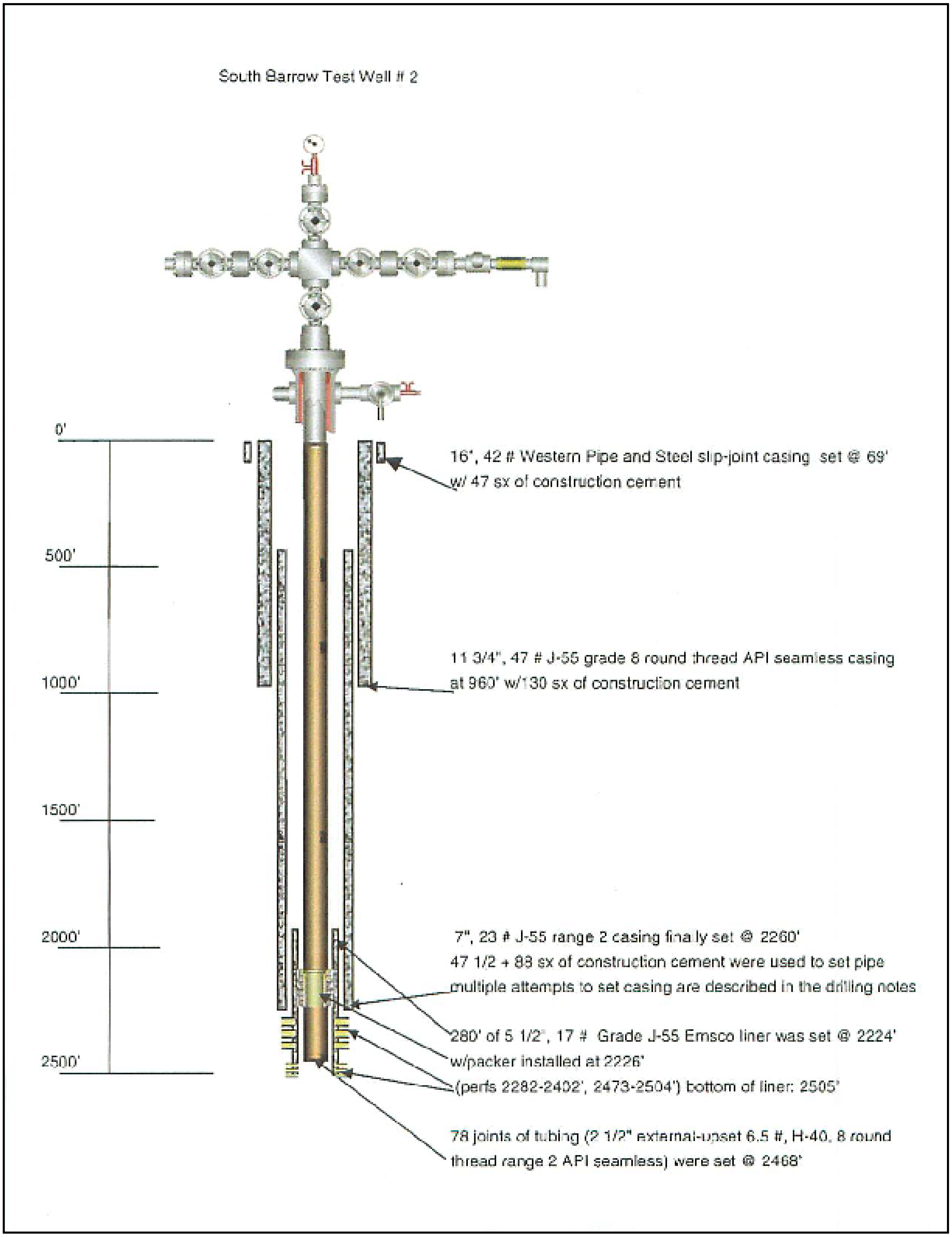


Figure 6: South Barrow #2 wellbore diagram.

South Barrow #3

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 71.1582° N, -156.5671° W. The South Barrow #3 site is approximately 10 miles south of Barrow. This well is on privately owned land, with oil and gas reserved to the North Slope Borough. The last site inspection was in July 2012.

Site Description: The South Barrow #3 site consists of a well, along with associated scattered surface debris in an area measuring approximately 120 feet north to south by 50 feet east to west **[Figure 1]**. The U.S. Navy drilled the well in 1949. There is no pad or reserve pit associated with the well. The well is located within an 8-foot by 8-foot concrete cellar that is 16 inches above the ground surface. The concrete cellar was constructed in an area that was excavated 10 inches below the ground surface. Two wooden pilings were embedded in each of the east and west concrete walls. These pilings have a diameter of about 10 inches and the two southernmost extend 3 feet above the ground surface, while the northernmost pilings are 2 feet above the ground surface **[Figure 2]**. Two metal I-beams rest on top of the pilings and are assumed to be the only remains of the massive substructure that held the well platform and drilling rig. More than 50 additional pilings are present on the site, extending 50 feet both north and south away from the well cellar in an evenly-spaced pattern. The pilings all have a diameter of about 10 inches and vary from 3- to 24-inches above the ground surface **[Figure 3]**. A few of the pilings have been soaked in creosote and are identified by their black color **[Figure 4]**.

The concrete cellar has standing water in the bottom and has been filled with a variety of debris **[Figure 5]**. The well itself consists of an open-ended 10-inch casing that is cut off at the ground surface **[Figure 6]**. Above the well opening is a constructed 4-inch diameter pipe tripod measuring 4 feet tall by 3 feet wide at the base. The pipe tripod was intentionally constructed to be placed over the well opening but has shifted, leaving the well open to the elements. Additional debris present within the cellar includes a 55-gallon metal drum filled with soil and vegetation growing out of the top; several small pieces of metal plate cut into a variety of shapes, several small sections of 4-inch diameter pipe, several small pieces of metal military Marsden Matting, several small pieces of 12-inch diameter metal tubing, numerous concrete chunks, and a few rusted tin cans.

Surface Risk Assessment: **Moderate**

Justification: There are no known contaminants present at the site. Based on the visual inspection, there is no indication that that well or any of the associated surface debris has the potential to affect surface water. While there are ponds and a seasonal stream channel adjacent to the site, the site is not under threat from erosion. Surface debris present on the site is both an impact to visual resources and could pose a travel risk to local residents.

Figure 1: Aerial view of the South Barrow #3 area; the well is in the center of the photo.

Figure 2: South Barrow #3 has a concrete cellar and steel beams stacked on pilings that were cemented into the cellar. The well is cut off at ground level inside the cellar.

Figure 3: South Barrow #3 (center) with weather station (left) and wooden pilings.

Figure 4: Wood pilings that once held up platforms in support of South Barrow #3 drilling operations. The black pilings are soaked in creosote.

Figure 5: Close-up of debris located in the South Barrow #3 cellar.

Figure 6: The 4-inch pipe is welded to a plate that covers the 11 ¾-inch casing of South Barrow #3.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: The South Barrow #3 was drilled 10 miles south of Barrow over the summer of 1949 to a total depth of 2,900 feet **[Figure 7]**. The purpose of the well was to test a structural high area with a closure.

- **Well Condition**: The well consists of an open-ended 4-inch pipe welded to a plate that covers 11 ¾-inch casing. The plate cover removes easily.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: A slight oil show was discovered in the Mesozoic beds of the Torok Formation, but was not sufficient to produce oil in drill-stem tests. Another drill-stem test conducted in the argillite basement rocks between 2,800 and 2,900 feet resulted in a fair blow for 35 minutes before becoming plugged. Other slight gas shows occurred in the Barrow sand and within the Shublik Formation, which also contained visible oil cuts (Collins and Brewer 1961).

Development Potential: Exploration and development in the vicinity of this well is a remote possibility within the next 20 years. It is unlikely this well will have an adverse impact on future development in its current state.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost is about 1,400 feet thick throughout the entire Barrow region. Freshwater aquifers are not present. The town of Barrow gets its drinking water from treated surface water, not from aquifers (Alaska Department of Environmental Conservation 2012).

Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Assessment: Moderate

Justification: Very poor oil and gas shows were observed by the U.S. Navy while drilling. No cement plugs were set. Drilling muds were placed into the wellbore and allowed to freeze. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

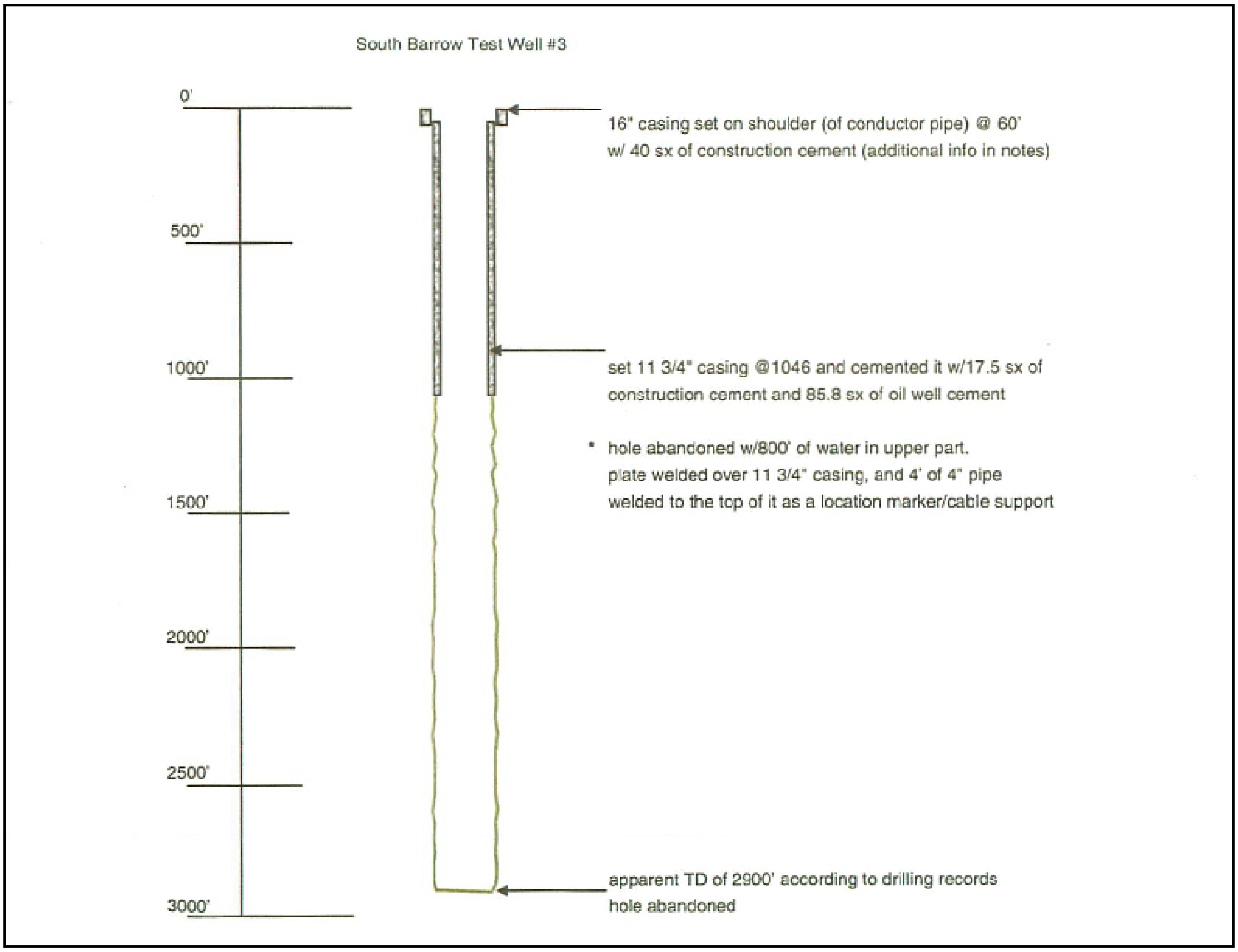


Figure 7: South Barrow #3 wellbore diagram.

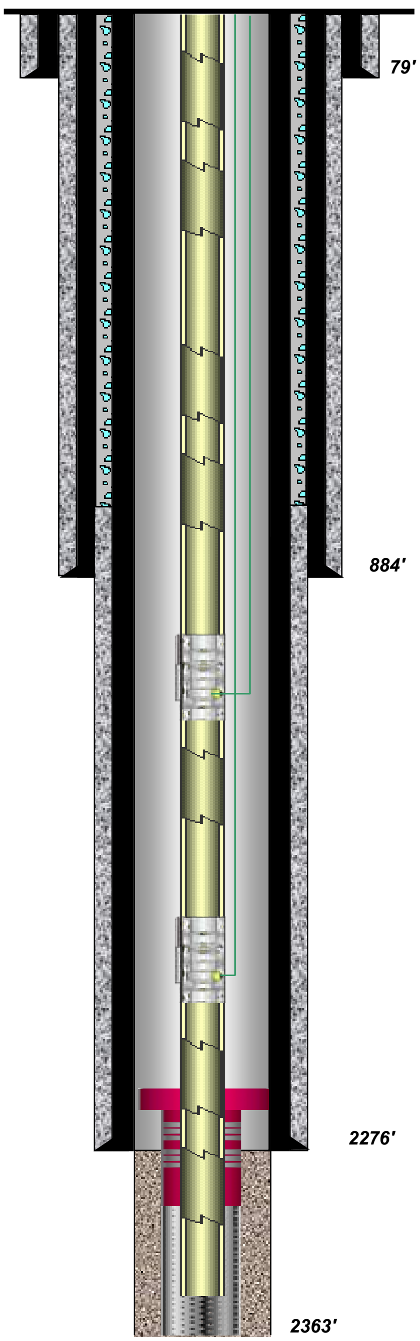
South Barrow #4 through #20 and Walakpa #1 and #2

The South Barrow wells #4 through #20 and Walakpa #1 and #2, drilled by either the U.S. Navy or the USGS, are mentioned in this report. These were conveyed to the North Slope Borough (NSB) in the Barrow Gas Field Transfer Act of 1984 (P.L. 98-366, 98 Stat. 468, July 17, 1984). The Barrow Gas Field Transfer Act conveyed specific oil and gas estates along with the wells, facilities, pipelines, and equipment to the North Slope Borough.

South Barrow #4 through #10 was drilled between 1950 and 1973 to determine the natural gas potential around Barrow. The results were very good, prompting the need for production wells. The remaining wells, South Barrow #11 through #20, Walakpa #1 and #2, were drilled between 1974 and 1982 to supplement the local gas supply. The South Barrow Gas Field continues to supply gas to the town of Barrow. These wells are not monitored by the BLM.

South Barrow #6	Rig:	Navy Cardwell Rig Model H	
	Drilled:	Mar 1 - Mar 26, 1964	
South Barrow Gas Field	API #:	**50-023-10015-00**	Created
	GL: 22.2'	KB: 39.7'	5/7/13
Naval Petroleum Reserve - 4	Loc:	1337' FNL 2483 FWL, S-14, T-22N, R-18W	
	Reviewing Engineer:	Justin T. Miller	

Original RKB = 39.7'



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
16"	65.0	UNK	SLJ		0	79
11-3/4"	47.0	J-55	STC		0	884
7"	29.0	N-80	LTC		0	2276
5-1/2"	19.85	J-55	SFJ		2209	2363
2-7/8"	6.5	N-80	EUE		0	2354

Jewelry Detail

No	Depth	ID	Item
	2209		7" x 5-1/2" Burns Lead Seal Liner Hanger
	1484		Chemical Injection Line
	2014		Chemical Injection Line

Perforations

Date	Zone	Top	Btm	Comments
		2276	2363	Open Hole (perforated liner)

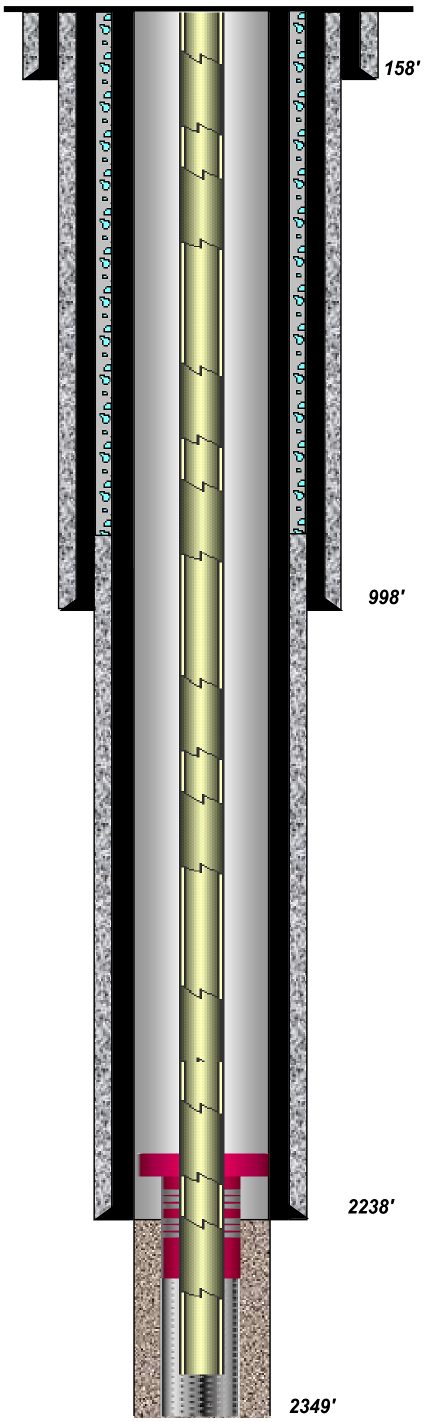
Fish/Fill Information

Item	Date	Depth	Comment
A			
B			
C			

Figure 1: South Barrow #6 wellbore diagram.

South Barrow #7	Rig:	Navy Cardwell Rig Model H
	Drilled:	Mar 4 - Apr 1, 1968
South Barrow Gas Field	API #:	**50-023-20001-00** Created
	GL: 24.0' KB: 36.0'	5/7/13
Naval Petroleum Reserve - 4	Loc:	NE/4 S-14, T-22N, R-18W, UMM
	Reviewing Engineer:	Justin T. Miller

Original RKB = 36.0'



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
16"	65.0	UNK	UNK		0	158
10-3/4"	51.0	N-80	UNK		0	998
7"	29.0	N-80	UNK		0	2238
5-1/2"	19.85	J-55	SFJ		2200	2349
2-7/8"	UNK	UNK	UNK		0	2339

Jewelry Detail

No	Depth	ID	Item
	2200		7" x 5-1/2" Liner Hanger

Perforations

Date	Zone	Top	Btm	Comments
		2238	2349	Open Hole (perforated liner)

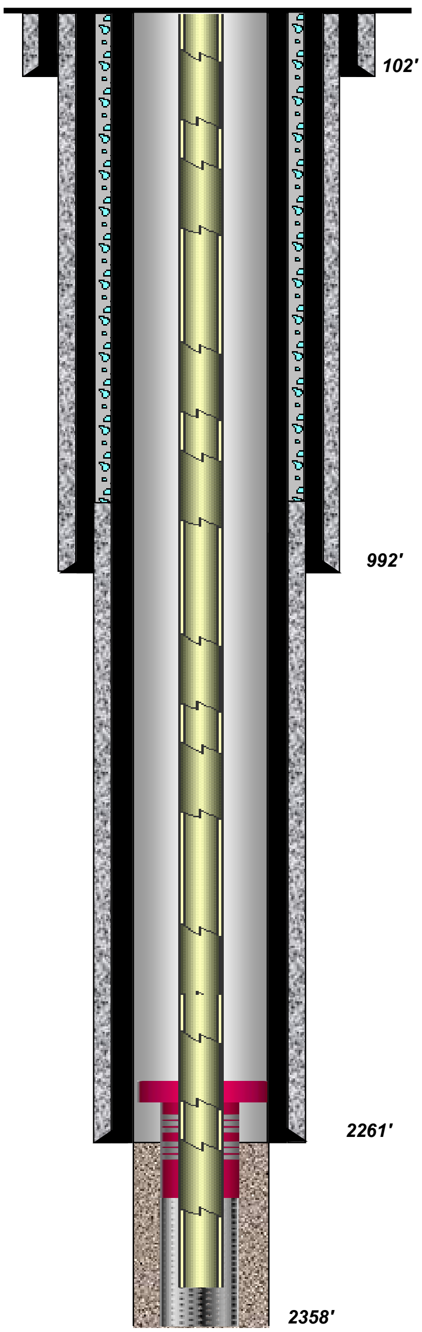
Fish/Fill Information

Item	Date	Depth	Comment
A			
B			
C			

Figure 2: South Barrow #7 wellbore diagram.

South Barrow #8	Rig:	Navy Cardwell Rig Model H	
	Drilled:	Apr 4 - May 2, 1969	
South Barrow Gas Field	API #:	**50-023-20002-00**	Created
	GL: 18.0' (Est.)	KB: 31.2'	5/7/13
Naval Petroleum Reserve - 4	Loc:	128' FSL 26' FEL S-14, T-22N, R-18W	
	Reviewing Engineer:	Justin T. Miller	

Original RKB = 18.0' (Est.)



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
18-5/8"	UNK	UNK	SW		0	102
9-5/8"	40.0	N-80	UNK		0	992
7"	38.0	N-80	UNK		0	2261
5"	18.00	J-55	XL		2166	2358
2-7/8"	6.5	N-80	CS		0	2348

Jewelry Detail

No	Depth	ID	Item
	2166		7" x 5" Burns Lead Seal Liner Hanger

Perforations

Date	Zone	Top	Btm	Comments
		2261	2359	Open Hole (perforated liner)

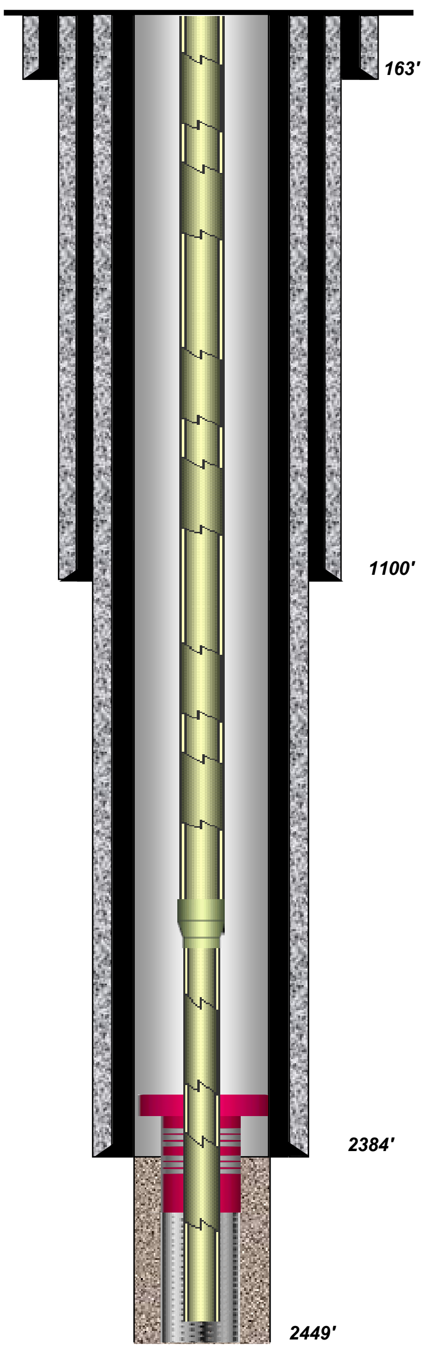
Fish/Fill Information

Item	Date	Depth	Comment
A			
B			
C			

Figure 3: South Barrow #8 wellbore diagram.

South Barrow #9	Rig:	Navy Cardwell Rig Model H	
	Drilled:	Mar 17 - Apr 15, 1970	
South Barrow Gas Field	API #:	**50-023-20003-00**	Created
	GL: 17.0'	KB: 29.0'	5/7/13
Naval Petroleum Reserve - 4	Loc:	2258' FEL 588' FSL S-11, T-22N, R-18W	
	Reviewing Engineer:	Justin T. Miller	

Original RKB = 17.0'



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
13-3/8"	54.5	N-80	STC		0	163
9-5/8"	40.0	N-80	S/LTC		0	1100
7"	38.0	N-80	S/LTC		0	2384
5"	18.00	J-55	XL		2371	2449
2-7/8"	6.5	N-80	CS		0	2232
2-3/8"	5.3	N-80	CS		2232	2442

Jewelry Detail

No	Depth	ID	Item
	2371		7" x 5" Burns Lead Seal Liner Hanger
	2232		2-7/8" x 2-3/8" Tubing Adaptor

Perforations

Date	Zone	Top	Btm	Comments
		2384	2449	Open Hole (perforated liner)

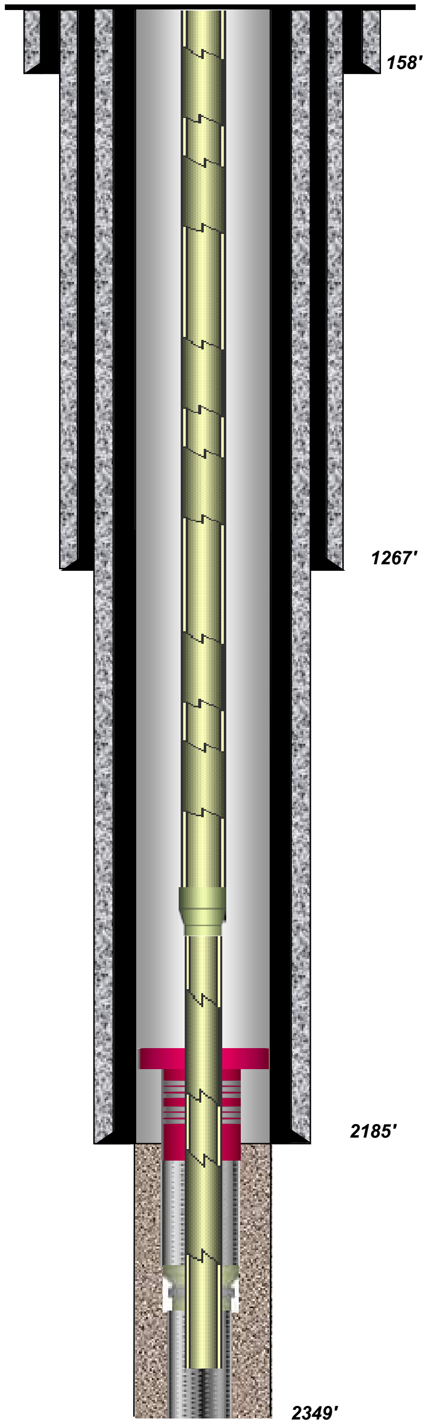
Fish/Fill Information

Item	Date	Depth	Comment
A			
B			
C			

Figure 4: South Barrow #9 wellbore diagram.

BLM ALASKA	**South Barrow #11**	Rig:	Navy Cardwell Rig Model H
		Drilled:	Feb 10 - Mar 6, 1974
	South Barrow Gas Field	API #:	**50-023-20005-00** Created
		GL: 22.0' (Est.)	KB: 34.0' 5/7/13
	Naval Petroleum Reserve - 4	Loc:	1709' FSL 1871' FEL S-14, T-22N, R-18W
		Reviewing Engineer:	Justin T. Miller

Original RKB = 22.0' (Est.)



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
16"	75.0	N-80	STC		0	158
10-3/4"	51.0	P-51	BTC		0	1267
7"	23.0	UNK	FJ		0	2185
5-1/2"	20.00	J-55	SFJ		2138	2306
5"	18.0	J-55	SFJ		2306	2349
2-7/8"	6.5	N-80	CS		0	2232
2-3/8"	5.3	N-80	CS		2232	2442

Jewelry Detail

No	Depth	ID	Item
	2137.5		7" x 5-1/2" Brown Oil Tool Liner Hanger
	2163		2-7/8" x 2-3/8" Tubing Adaptor
	2306		5-1/2" x 5" Liner X-over

Perforations

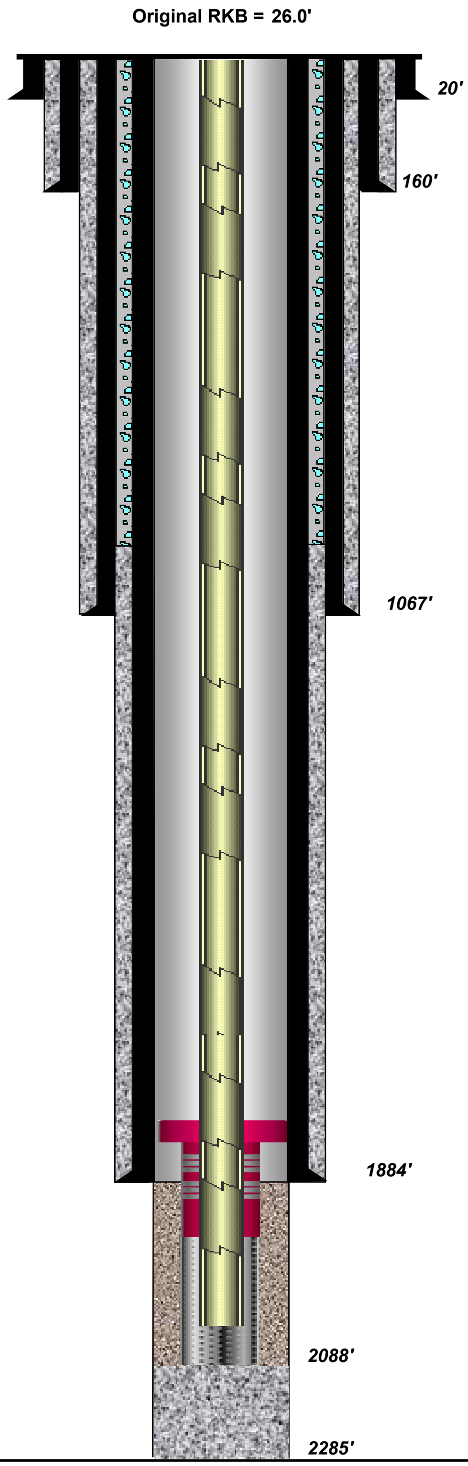
Date	Zone	Top	Btm	Comments
		2185	2349	Open Hole (perforated liner)

Fish/Fill Information

Item	Date	Depth	Comment
A			
B			
C			

Figure 5: South Barrow #11 wellbore diagram.

South Barrow #12	Rig:	Navy Cardwell Rig Model H	
	Drilled:	Apr 13 - May 4, 1979	
South Barrow Gas Field	API #:	**50-023-20006-00**	Created
	GL: 14.0'	KB: 26.0'	5/7/13
Naval Petroleum Reserve - 4	Loc:	23' FSL 1755' FEL S-23, T-22N, R-17W	
	Reviewing Engineer:	Justin T. Miller	



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
24"	UNK	UNK	UNK		0	20
16"	75.0	N-80	8rd		0	160
10-3/4"	51.0	P-51	BTC		0	1067
7"	23.0	UNK	FJ		0	1884
5-1/2"	20.00	J-55	FJ		1861	2062
2-7/8"	6.5	J-55	8rd		0	2053

Jewelry Detail

No	Depth	ID	Item
	1861		7" x 5-1/2" Brown Oil Tool Liner Hanger

Perforations

Date	Zone	Top	Btm	Comments
		1884	2088	Open Hole (perforated liner)

Fish/Fill Information

Item	Date	Depth	Comment
A	5/4/79	2088-2285	PBTD (cement plug)
B			
C			

Figure 6: South Barrow #12 wellbore diagram.

South Harrison Bay #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.4248° N, -151.7312° W. South Harrison Bay #1 is 22 miles northwest of Nuiqsut, 72 miles north of Umiat, and 130 miles southeast of Barrow. The last site visit was July 2012.

Site Description: The area around South Harrison Bay #1 has very little topographic relief and a ground elevation of 25 feet (Husky Oil 1983) **[Figures 1-3]**. The landscape is a combination of wet, patterned ground and thaw lakes of varying sizes. The soil is thin, with permafrost close to the surface. South Harrison Bay #1 has a relatively large pad (roughly 300 feet by 300 feet) of thick pad design, and a small reserve pit (roughly 75 to 100 square feet). Revegeation has occurred on more than 75 percent of the pad.

South Harrison Bay #1 site was transferred to the Arctic Slope Regional Corporation (ASRC)

the South Harrison Bay Land Exchange on Sept. 27, 2002. The conveyance included both the surface and subsurface.

The well casing that extends about 6 feet above the ground surface has a diameter of about 4 inches **[Figure 4]**. The cellar around the wellhead is constructed of a single round of wooden 2x12s on 12x12-inch wood beams. The cellar walls are disintegrating, and the cellar is filled with soil and/or drilling mud.

Pilings on the pad extending from the wellhead toward the west were cut off at ground level when the site was abandoned in 1977. Some settling has occurred since then; piling exposure above the ground is presently 6 to 8 inches.

There is low-density concentration of refuse on the southwestern end of the pad, roughly 30 to 40 feet diameter **[Figure 5]**.

The reserve pit is shallow and fairly entrenched, with little influence from erosion or thawing. The southern shore of the pit experienced some slumping as the ground settled. However, vegetation has sense stabilized the situation **[Figure 6-8]**.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. There is minor amounts of solid waste present. There does not appear to be any effect to surrounding surface waters from South Harrison Bay #1. The Alaska Department of Environmental Conservation in 1995 sampled and closed the reserve pit in its current condition (BLM 1995).

Figure 1: Aerial view of South Harrison Bay #1 showing the natural pond on the left and reserve pit on the right (August 1999).

Figure 2: Aerial view of South Harrison Bay #1 (August 2001).

Figure 3: Aerial view of South Harrison Bay #1 (July 2012).

Figure 4: South Harrison Bay #1 wellhead and sandy cellar (July 2012).

Figure 5: Light camp debris on the southwest portion of the South Harrison #1 drilling pad (July 2012).

Figure 6: South Harrison #1 reserve pit and slumping soil that has been stabilized by vegetation (July 2012).

Figure 7: Photo of the shallow South Harrison Bay #1 reserve pit and stabilized slumping that occurred prior to vegetation growth (July 2012).

Figure 8: Stabilized slumping on the south end of the South Harrison Bay #1 reserve pit (August 1999).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: The drilling pad was created in March 1976 to allow stabilization to occur over the summer. Parco Rig 128, a TBA Helihoist 2000 drilling rig, was brought over from East Teshekpuk #1 in 129 Rolligon loads. An ice airstrip was constructed nearby to accommodate drilling operations. Drilling operations commenced with rig-up on Nov. 10, 1976, the well was spudded on Nov., 1976, and activity terminated on Feb. 16, 1977. The well was drilled to a total depth of 11,290 feet, cased to 8,370 feet, and plugged back to 2,289 feet (Husky Oil 1983).

  Diesel fuel is present in the wellbore from the upper-most plug to the surface to facilitate temperature monitoring conducted by the U.S. Geological Survey (USGS). Diesel was chosen as the medium for temperature monitoring because it will not corrode the casing, nor will it freeze at the temperatures encountered downhole.

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the well was plugged back with eight cement and mechanical plugs set at selected depths. The top of the shallowest cement plug is at 2,289 feet. From 2,173 feet to the surface, the hole is filled with diesel fuel overlying 116 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 13 ⅜-inch surface casing has cement from 2,600 feet to the surface, with cement in the 13 ⅜-inch by 20-inch casing annulus from 83 feet to surface. The 9 ⅝-inch casing was cut off at 2,412 feet and removed with cement plugs set above top of casing stub from 2,392 feet to 2,289 feet **[Figure 9]**. There are no downhole concerns with the well at this time. The wellhead is capped with a closed and operational gate valve and cap.

- **Wellhead Components**: There is one gate valve, and it is functional. The needle valve was replaced with a removable 2-inch cap to facilitate well-bore temperature monitoring **[Figure 10].**

Geologic Setting: The primary objectives of the well were the Sadlerochit and Lisburne Groups, with secondary interests in the Kuparuk Sandstone, Sag River Sandstone, and the basal sandstone in the Torok Formation. Hydrocarbon shows were limited to minor methane gas and scattered fluorescence until sandstones of the Torok were encountered. Two sandstone units (5,677 to 5,795 feet and 7,123 to 7,220 feet) exhibiting fair to good fluorescence and cuts were drill-stem tested, with negative results. However, Electric Log characteristics show these sandy zones to have low porosities.

Hydrocarbon shows below the Cretaceous consisted of only scattered fluorescence and minor gas peaks in the limestones of the Shublik Formation. Some porosity, up to 15 percent, was noted in the Sag River Sandstone and Ivishak Formation. All are computed to have high water saturations (Husky Oil 1983).

Development Potential: South Harrison Bay #1 is under the jurisdiction of ASRC. If future development were to occur, this well is aadequately cased and cemented, securing the well from all lower formations, and will not affect future development.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire NPR-A. Freshwater aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

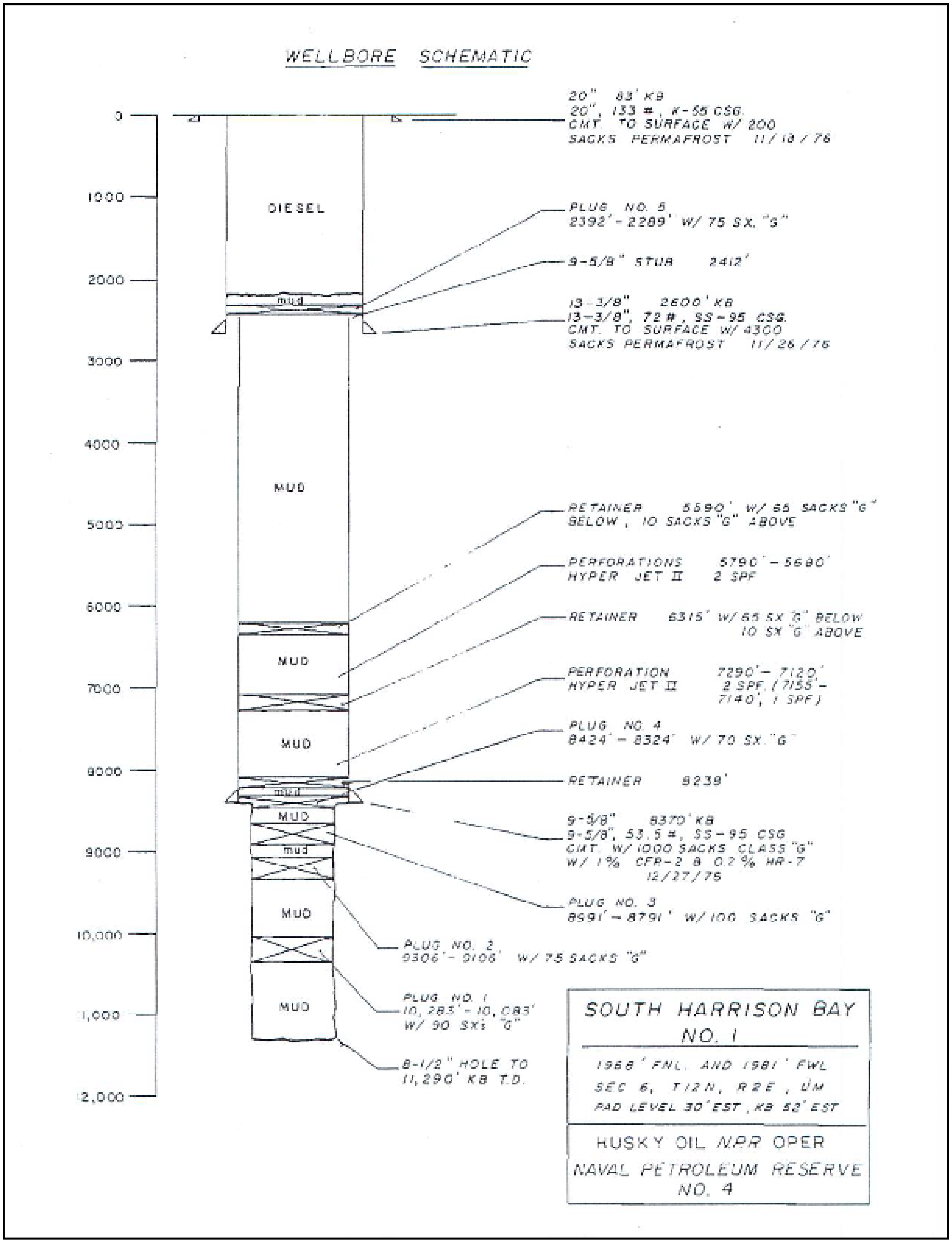


Figure 9: South Harrison Bay #1 wellbore diagram.

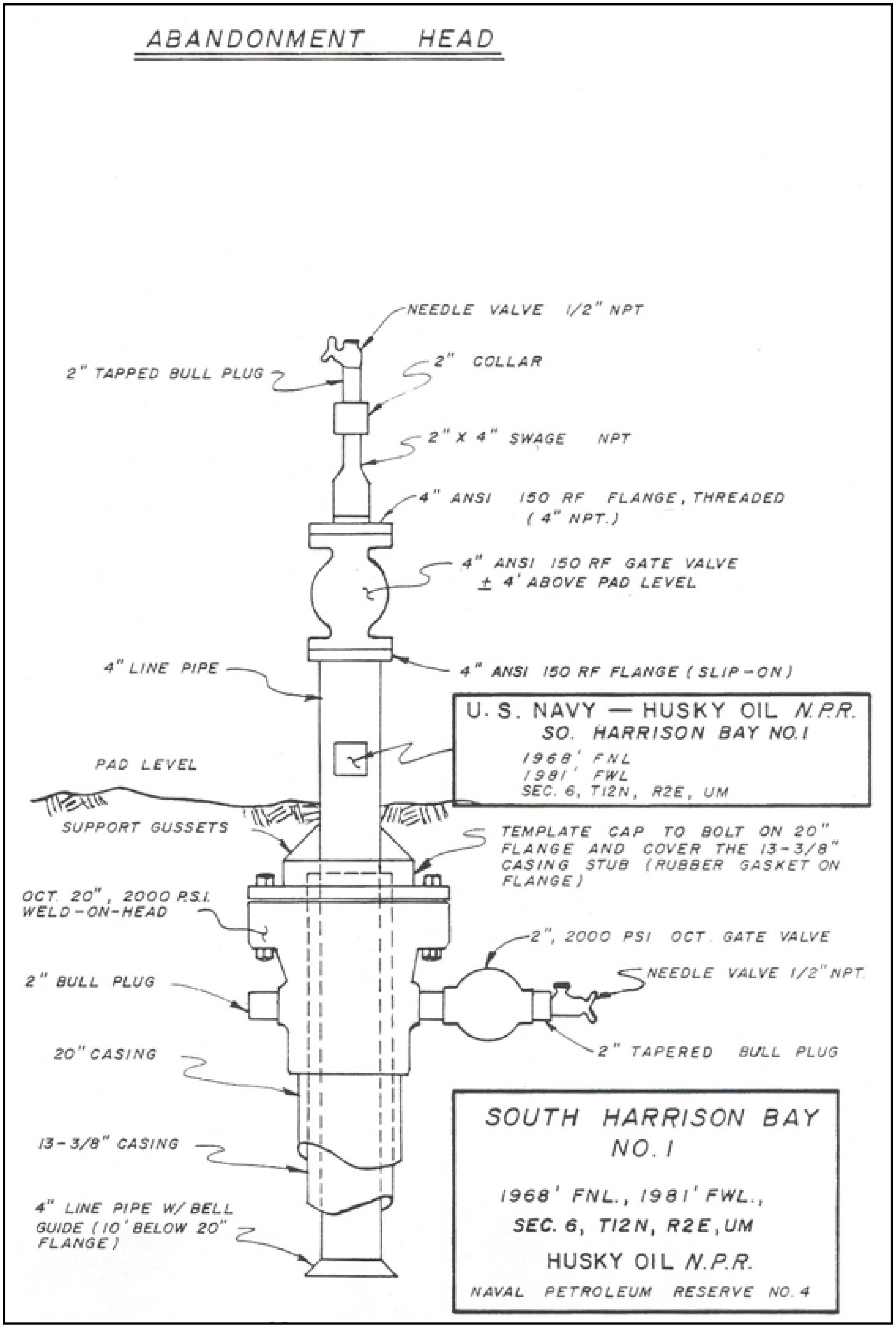


Figure 10: South Harrison Bay #1 wellhead assembly.

South Meade #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.6062° N, -156.8759° W. South Meade #1 is 15 miles northeast of Atqasuk, 46 miles south of Barrow, and 77 miles east of Wainwright. South Meade #1 was last visited by the BLM in August 2011.

Site Description: The drill site is in an area of small shallow lakes and marshes approximately 4 miles south of the Meade River. Dry, sandy soils dominate the site. Small sand dunes are fairly common in this portion of the National Petroleum Reserve in Alaska. Husky Oil drilled the well under contract with the U.S. Geological Survey (USGS) in 1978.

The site consists of a large pad and surrounding area of disturbance that is more than 500 sq feet **[Figures 1-4]**. In the pad is a reserve pit filled with water, a smaller flare pit **[Figure 5]**, the wellhead and cellar **[Figures 6-7]**, a series of pilings **[Figure 8]**, a large pile of drill mud between the well and reserve pit, and two small concentrations of camp debris mounded on the pad north of the wellhead.

The thick pad has experienced some subsidence due to the annual freeze-thaw process. Dunes have been building adjacent to the reserve pit. It is apparent where vegetation has helped stabilize portions of the pad. Areas with no vegetation have been scoured by the wind.

The wellhead is capped with a closed and operational gate valve and cap. The cellar (8x8 feet) around the wellhead is constructed of wooden 2x12s on 12x12-inch wood beams. It was not dug into the ground. Originally about 2 feet in height, most of the cellar walls have fallen apart. The cellar is filled with soil and vegetation such that the lower valves are covered with sediment. A 13 ⅜-inch diameter rat hole **[Figure 9]** projecting about 3 feet above the ground surface is about 5 feet outside the cellar, and is open to the environment. Rows of about 90 to 100 wooden pilings extend away from the wellhead and cellar in one direction, covering an area roughly 30 feet by 50 feet. The diameter of the wooden pilings are about 12 inches, and are variously 1 inch to 12 inches above the ground surface.

The reserve pit walls have subsided such that during break-up, water flows from the reserve pit onto the surrounding tundra. The flare pit is now mostly filled with sand and has very little water and vegetation growing inside. This deposition has kept the flare pit from eroding and connecting with the reserve pit.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. There are many lakes of various sizes in the general vicinity of the well site. A lake that looks like a large oxbow is situated just off the reserve pit. However, none of the water bodies exhibit any indication the well or well site has any negative effect. Overall, the site is slowly becoming reclaimed by the surrounding tundra.

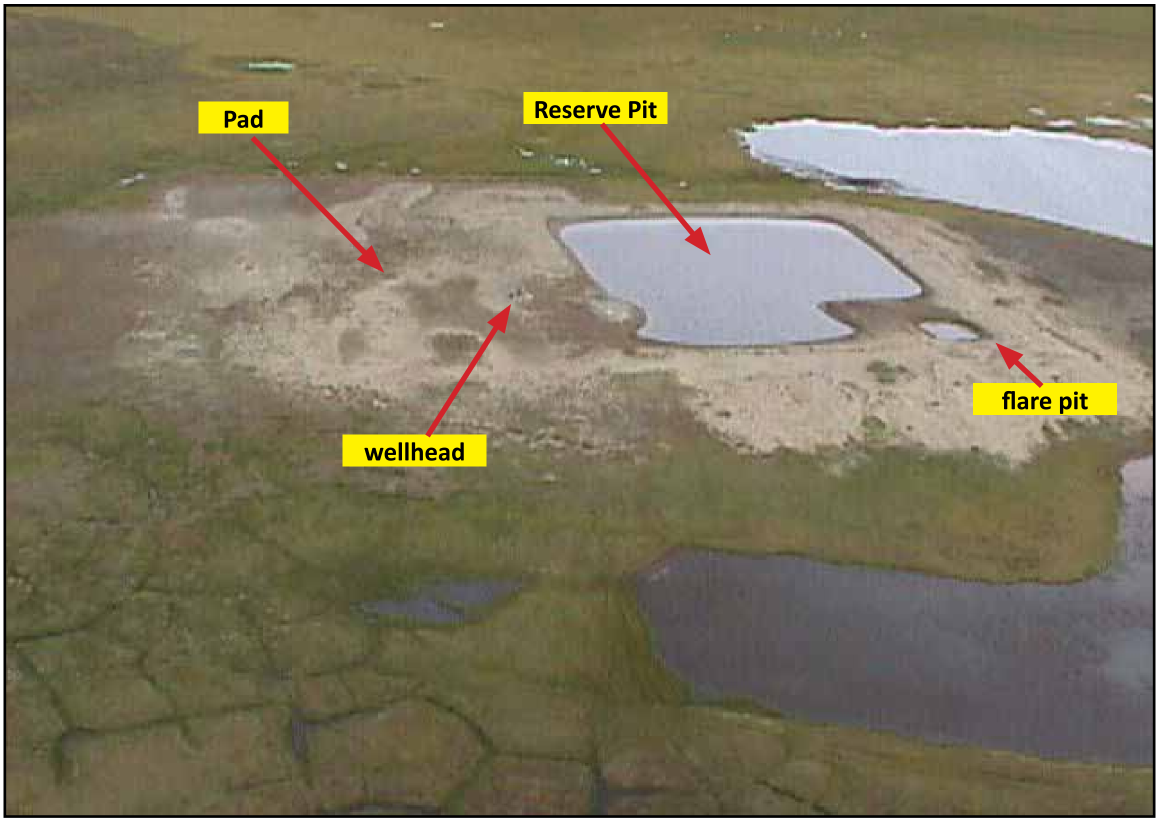


Figure 1: Aerial view of South Meade #1 in August 1999.

Figure 2: Aerial view of South Meade #1 in August 2011.

Figure 3: South Meade #1, showing the small dunes next to the reserve pit and the nearly filled in flare pit (August 2011).

Figure 4: South Meade #1 during the spring snow melt; the area behind next to the wellhead becomes a small pond, which dries into a grassy field during the summer (June 2003).

Figure 5: South Meade #1, a close up of the flare pit (August 2011).

Figure 6: South Meade #1 wellhead during spring break-up (June 2003).

Figure 7: South Meade #1 wellhead and cellar (August 2011).

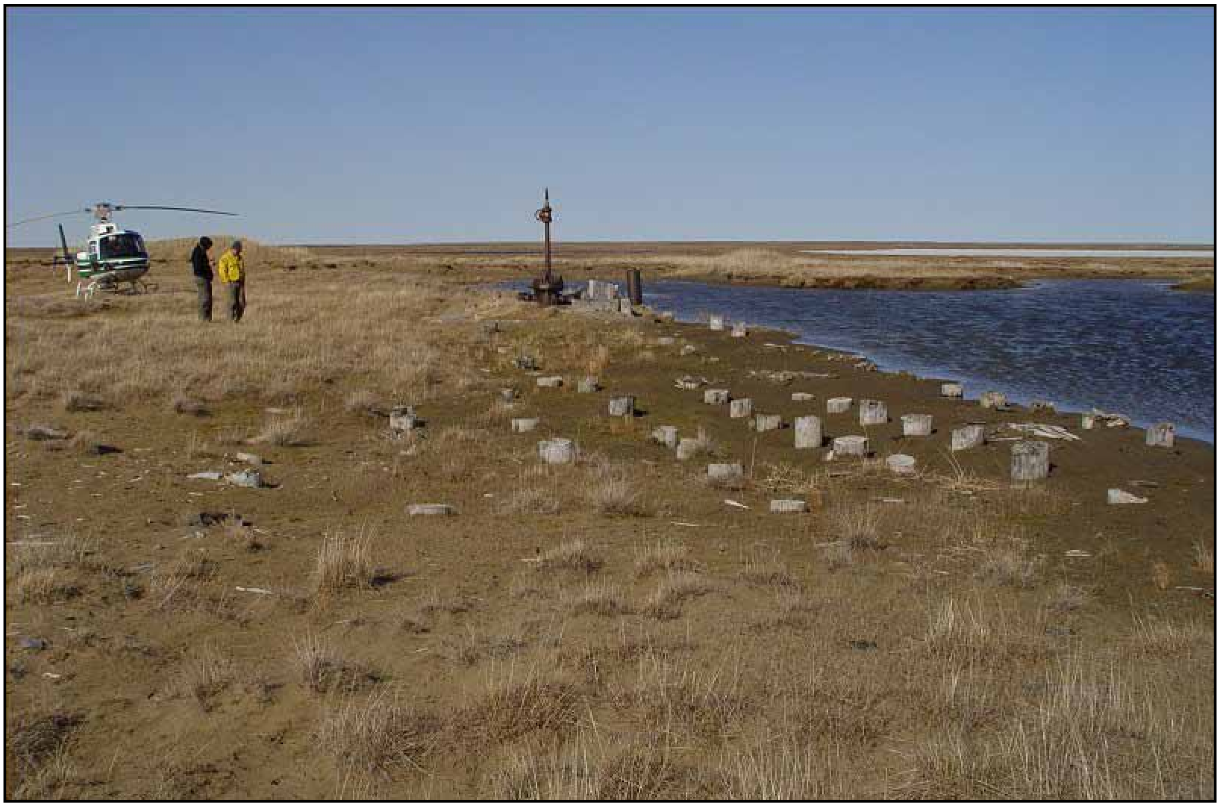


Figure 8: South Meade #1 wellhead and pilings (June 2003).

Figure 9: South Meade #1 rat hole next to the cellar (June 2003).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Rig-up operations on the South Meade well began on Jan. 17, 1978. The well was drilled using Nabors Rig 1, an Emsco A 800 drilling rig. The rig was moved to this location from South Simpson using Rolligons. The well was spudded on Feb. 7, 1978, and drilling was suspended for the summer on May 17, 1978. Drilling related operations began again on Nov. 28, 1978, and activity terminated on Jan. 22, 1979. The well was drilled to a total depth of 9,945 feet, cased to 8,023 feet, and plugged back to 1,875 feet (Husky Oil 1982) **[Figures 10 and 11]**. Diesel is present from the upper-most plug to the surface to facilitate temperature monitoring conducted by the USGS. Diesel was chosen as the medium for temperature monitoring because it will not corrode the casing, nor will it freeze at the temperatures encountered downhole.

  Support for the drilling operations was by air, with an ice airstrip constructed on a nearby lake. The strip was large enough to accommodate a Hercules C-130 aircraft (Husky Oil 1982).

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the well was plugged back with five cement and mechanical plugs. The top of the shallowest cement plug is at 1,875 feet From 1,808 feet to the surface, the hole is filled with diesel fuel overlying 67 feet of mud. Arctic Pack was left in the 9 ⅝-inch by 13 ⅜-inch annulus from the 9 ⅝ in fluid orifice (FO) at 2,349 feet to the surface wellhead. There are no identified issues with the surface or subsurface at South Meade at this time. There is no indication of hydrocarbon escapement at or near the wellhead. The rat hole is outside the cellar and is open to the environment.

- **Well Components**: The wellhead consists of two valves. The upper gate valve is operational. The USGS replaced the needle valve with a 2-inch cap to facilitate wellbore temperature monitoring.

Geologic Setting: The well was a stratigraphic test on the crest of the Meade Arch. The primary objective of the well was to test a Jurassic sand and the Sadlerochit Group, as well as a possible stratigraphic closure within the Kayak/Kekiktuk Formations.

Minor gas shows were observed in sandstones of both the Nanushuk Group and Torok Formation of the Cretaceous, but none of the sandstones warranted testing or further evaluation.

Other geologic units encountered were the Pebble Shale of the Cretaceous, Kingak Formation of the Jurassic, Sag River Sandstone and Shublik Formation of the Triassic, and the Sadlerochit Group (including the Ivishak Formation) of the Permian-Triassic.

Development Potential: There has been very little interest in this area to date. If development were to occur, this well is adequately cased and cemented, securing the well from all lower formations, and will not affect future development.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: The well has been an active USGS monitor site and poses no identified risks. There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

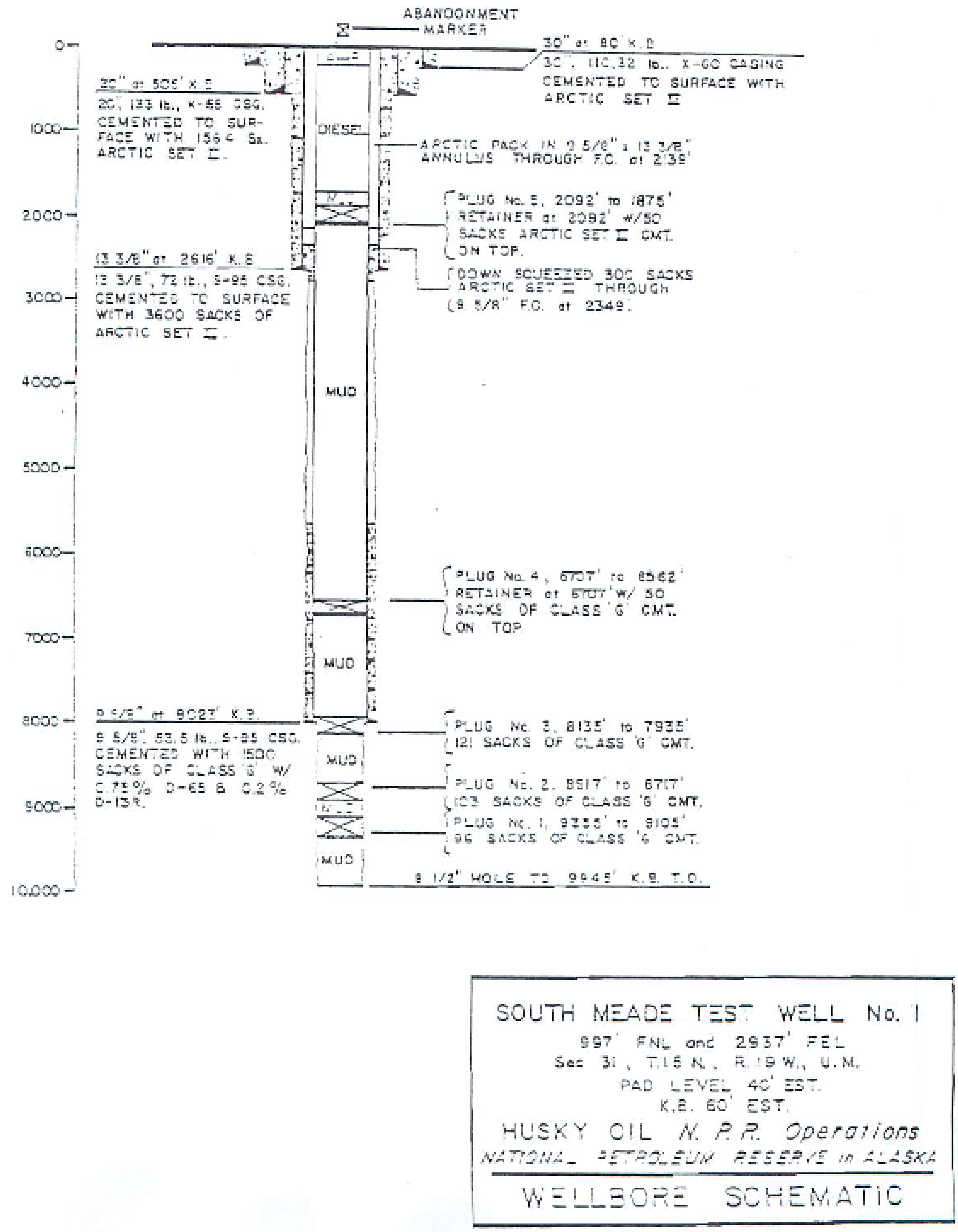


Figure 10: South Meade #1 wellbore diagram.

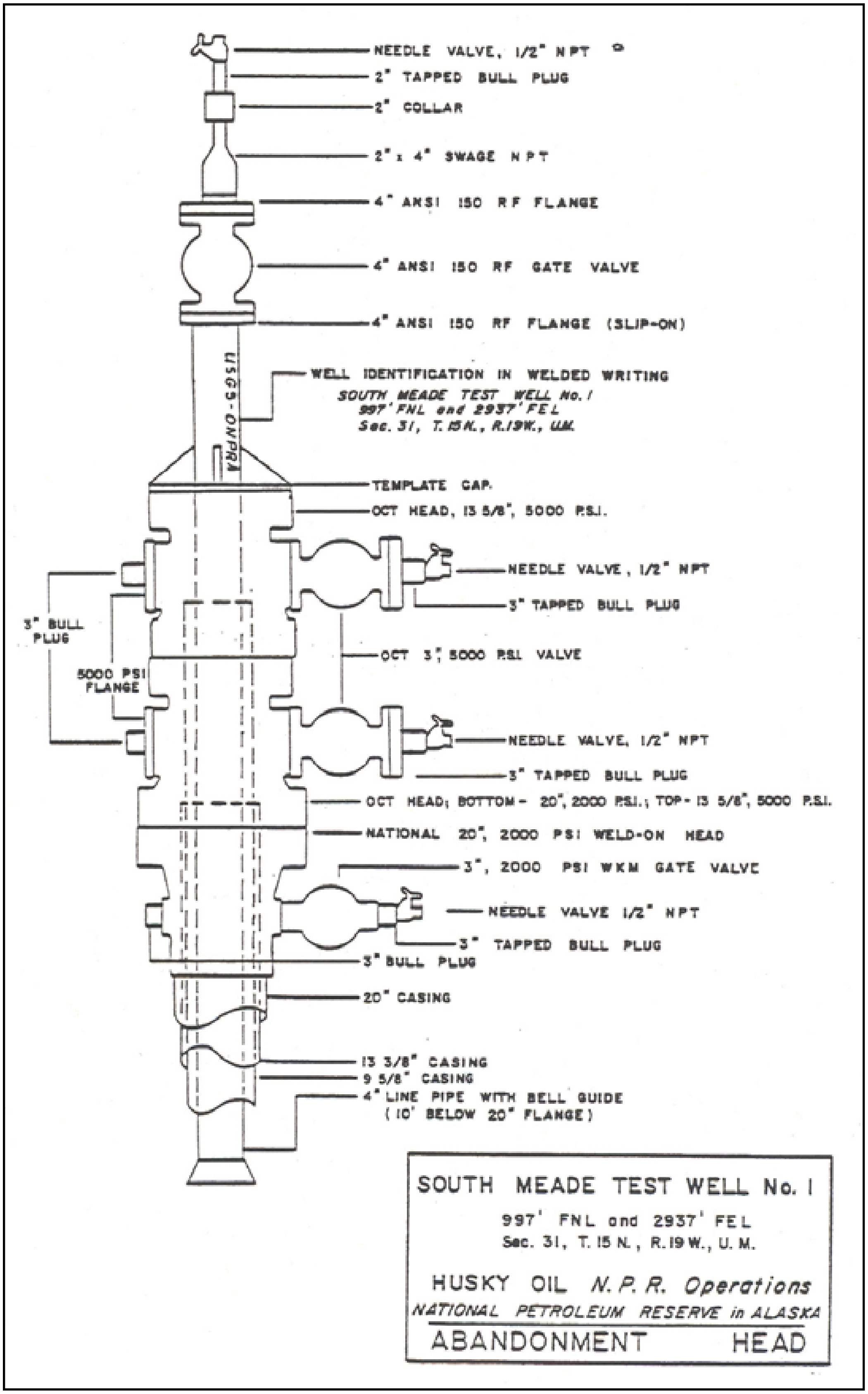


Figure 11: South Meade #1 wellhead assembly.

South Simpson #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.8069° N, -154.9819° W. South Simpson #1 is 53 miles southeast of Barrow and 61 miles northeast of Atqasuk. South Simpson #1 was last visited by the BLM in August 2010.

Site Description: South Simpson #1 was drilled in an area of low-centered polygons **[Figures 1-2]**. The surrounding tundra is marked by standing water and various grasses. Larger lakes are present in this area, as well as the expansive Chipp River delta. There is little to no topographic relief.

The site has a large pad (about 300-400 sq. feet). The gravel pad was constructed as a thin pad without the addition of insulation. As a consequence, the pad is slowly being reclaimed by the surrounding tundra. The pad has experienced much vegetation growth and has been overtaken by natural polygonal patterning. Vegetation cover is approximately 65 percent. The pad boundary is rounded and blends in with the natural surroundings on the east side, with no obvious boundary to the surrounding tundra.

The reserve pit is filled with water (about 150 feet by 200 feet), which now encompasses the flare pit. The well casing head is partially buried with silt. The approximately 8-foot by 8-foot cellar around the wellhead is constructed of wooden 2-by-12s. It was not dug into the ground. Originally about 2 feet in height, most of the cellar walls have fallen apart. The cellar is filled with soil and vegetation. A rat hole is present about 5 feet from the wellhead and is full of water; the diameter is about 12 inches and projects about 1 foot above the ground surface. A mouse hole is filled with muds (no standing water), about 2 feet from the well. The diameter is about 12 inches and stands 1 foot above the ground surface.

Solid waste at the site consists of an old Ski-Doo Skandic 377 snowmachine in poor condition adjacent to the well, and wooden pilings sticking out of the ground next to the well. A bent pipe was found sticking up on the shoreline of the reserve pit. A shredded blue tarp is found in the reserve pit **[Figure 7]**. Concrete appears to form an island in the middle of the flare pit **[Figure 8]**.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. The reserve and flare pit walls have subsided such that during break-up and major precipitation events, the reserve pit waters mix with nearby surface waters. However, the pits were sampled and closed by ADEC in 1995. The site is not under threat due to erosion or other natural processes. There is little to no solid waste on site and it does not pose a travel risk to local residents.

Figure 1: South Simpson #1; the well site is located in the center of the photo.

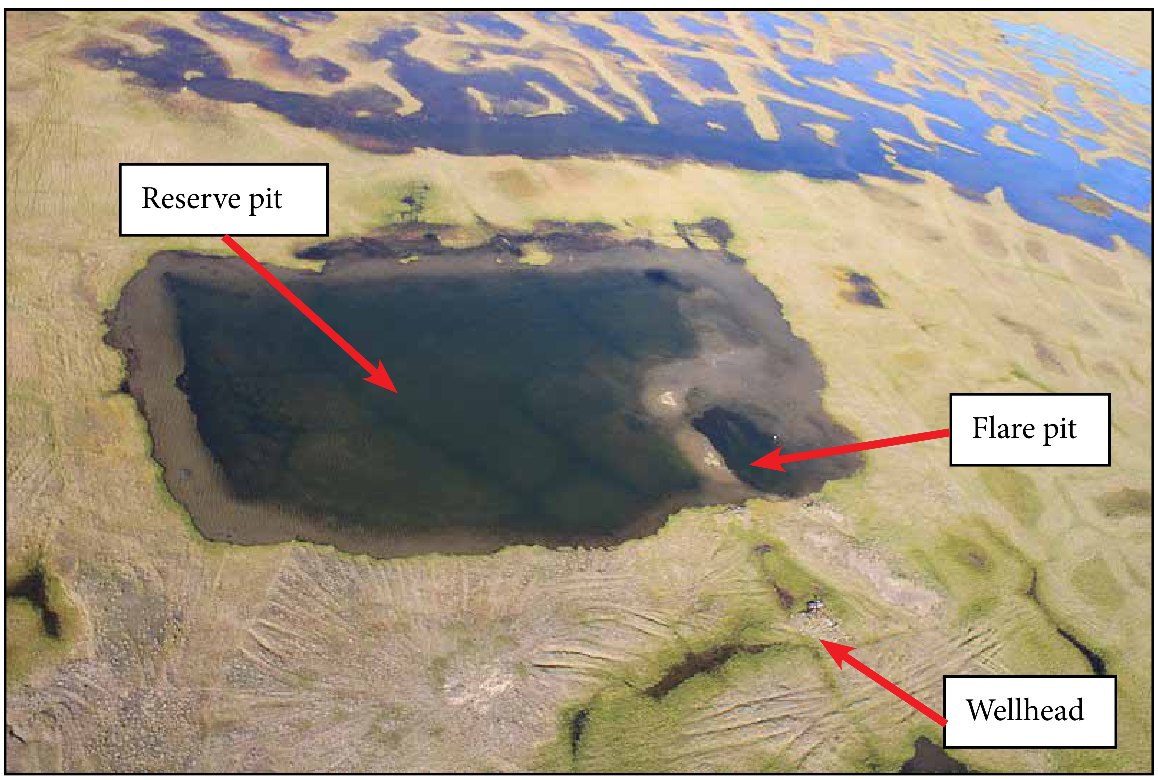


Figure 2: South Simpson #1, reserve pit with flare pit (lower right corner of reserve pit); the two are now connected. The polygonal ground is also apparent within the reserve pit itself.

Figure 3: South Simpson #1, photo showing the locations of the snowmachine, mouse hole and rat hole in relation to the well.

Figure 4: South Simpson #1, wellhead, cellar, wood pilings and an old snowmachine.

Figure 5: The master valve on South Simpson #1 is frozen in the open position.

Figure 6: South Simpson #1, looking into the wellbore; the master valve is frozen in the open position.

Figure 7: South Simpson #1, bent pipe and torn blue tarp (in pit)

Figure 8: South Simpson #1; the two islands on the left are part of the now submerged boundary of the flare pit. In the middle of the flare pit, a concrete block protrudes above the water surface.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: South Simpson #1 was drilled in 1977. The purpose of the well was to test the Sadlerochit Formation where it laps onto the south flank of the Barrow Arch. The well was drilled to 8,795 feet and cased to 7,206 feet. The well was plugged to the surface upon completion **[Figure 9]**. Drill stem tests did not recover any oil.

- **Well Condition**: The cellar has been backfilled with silt which resulted in the burial of the casing head. Beneath the casing head the well is plugged to surface. A rat hole is present about 5 feet from the wellhead and is full of water. A mouse hole is filled with muds (no standing water), about 2 feet from the well.

- **Wellhead Assembly**: The wellhead consists of a 4-inch line pipe and master valve, which stands about 8 feet above the ground surface **[Figures 3-6]**. There is one valve present above ground. There is no needle valve or cap at the top. The valve is frozen in the open position. A plumb-bob was dropped and hit solid at 12 feet, likely hitting the top of the surface plug. Additional valves are present in association with the casing head, which was buried under the dirt when the cellar was backfilled **[Figure 10].**

Geologic Setting: Reports show that poor gas shows were identified in the Nanushuk Group, Kingak Shale and Shublik Formation. Gas flowed at a rate of 75 MCFPD between 6,522 - and 6,568 feet within the Kingak Shale (Gyrc 1988). The gas contained more than 70 percent nitrogen. The origin of the high nitrogen content is unknown but appears to be a localized phenomenon (Burruss 2003). Sandstone tongues (Simpson sand) within the Kingak Shale in the Simpson and Barrow localities are known to display good gas reservoir quality (Houseknecht 2001). Poor oil shows were discovered in the Nanushuk Group, Shublik and Torok formations.

Development Potential: This area is not of much interest to industry at the present. South Simpson #1 is plugged to the surface and has no potential to adversely impact future development.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire NPR-A. Freshwater aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at this location.

Subsurface Assessment: None

Justification: The test well encountered a poor gas show. The well was plugged to surface with five plugs set prior to abandonment.

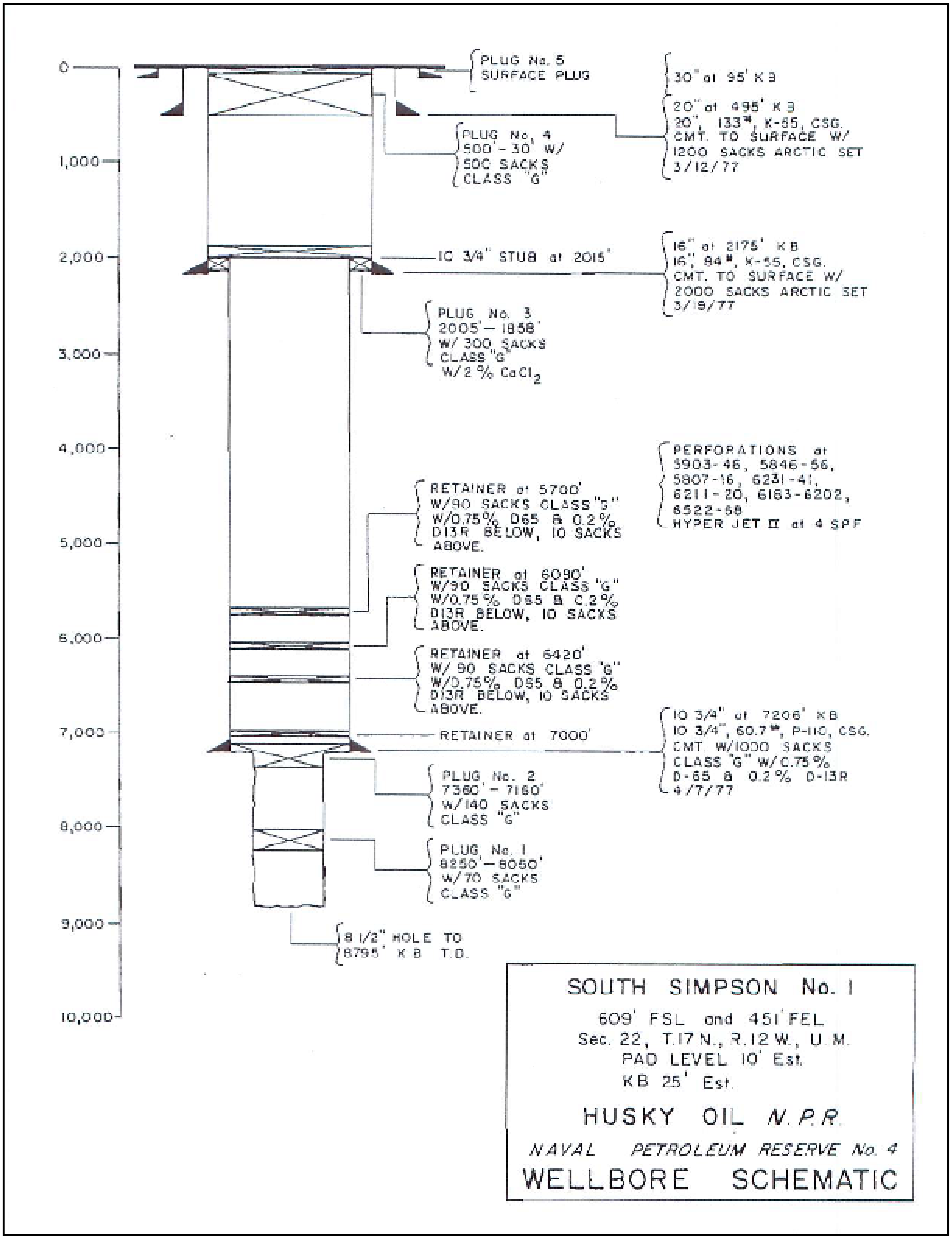


Figure 9: South Simpson #1 wellbore diagram.

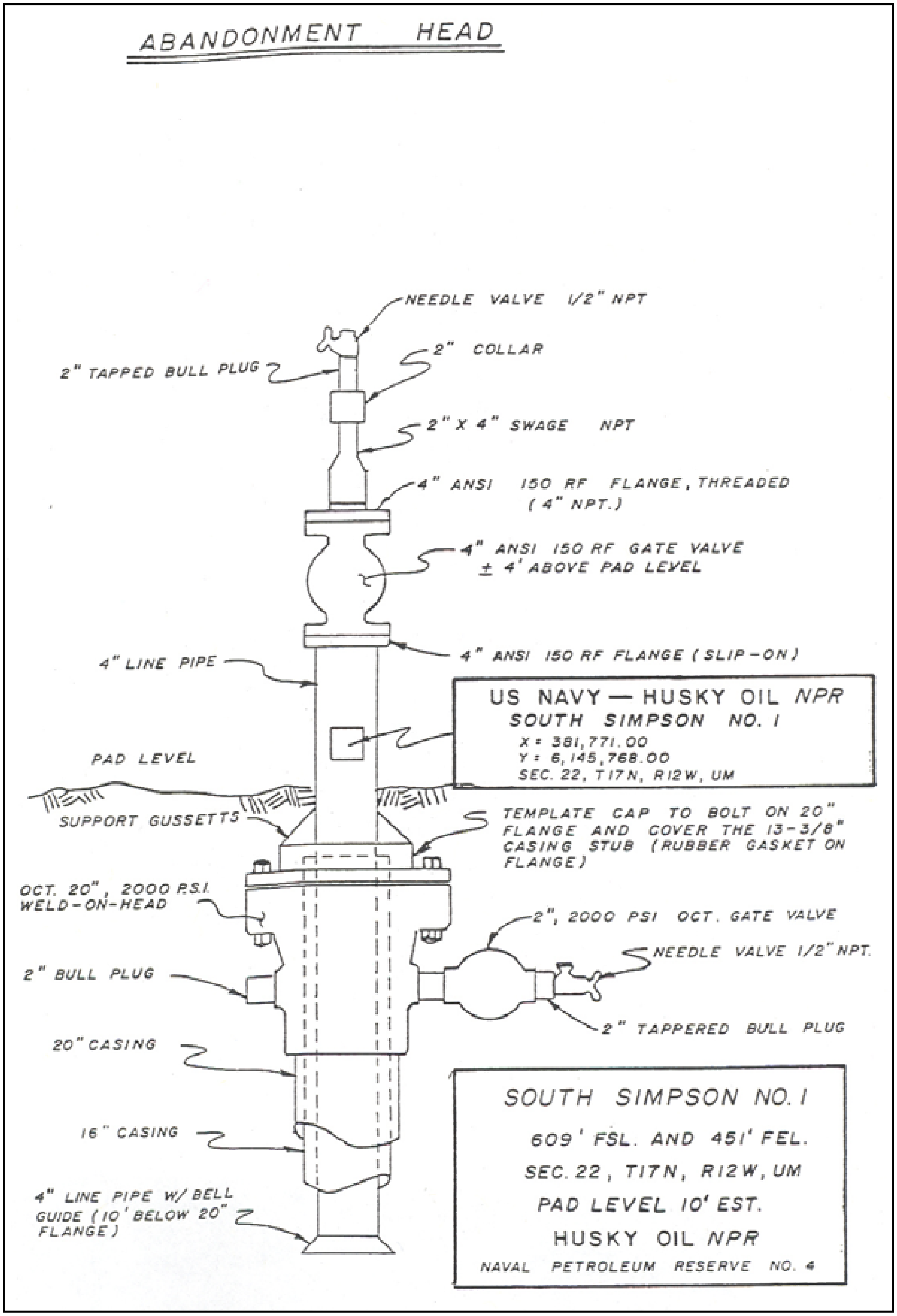


Figure 10: South Simpson #1 wellhead assembly

Square Lake #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.5667° N, -153.3000° W. Square Lake #1 is 31 mi west/ northwest of Umiat and 71 mi southwest of Nuiqsut. Square Lake #1 was last visited by the BLM in July 2012.

Site Description: The U.S. Navy drilled Square Lake #1 along the eastern banks of Key Creek in 1952. Surrounding topography is gently sloping hills with tussock tundra [**Figure 1**]. No drilling pad was established, but a work area was created by bulldozing the vegetation. An airstrip on top of a nearby hill and a connecting trail down to the well site was bulldozed to support the drilling operation. The airstrip at the top of the ridge has also revegetated but is still visible [**Figure 2**].

There is no wellhead; the well today is an open 10 ¾-inch casing about 8 to 10 inches in diameter that has been cut off at ground level [**Figures 3-5**]. The casing has a surrounding cement collar about 2 to 2½ feet in diameter that projects an additional 1 foot above the lip of the casing. The wood cellar around the casing (about 8x8 feet) is still in place and filled with water, and appears to have been dug into the ground 1 to 2 feet. It is constructed of wooden 2x12s, with original wall heights of about 2 feet. The site still contains a minor amount of solid wastes in the form of metal deadmen pilings (anchors). The trail scar leading to the well site location and the area cleared away for an airstrip are still visible. The airstrip was approximately a quarter mile away on top of a low hill.

Surface Risk Assessment: Low

Justification: There are no known contaminants at the site. The site still contains a minor amount of solid wastes in the form of metal deadmen pilings (anchors), which could pose a hazard to travelers in the area. There does not appear to be any effect to Key Creek or other surface waters from the Square Lake #1 site. Additionally, no seepage or stressed vegetation from hydrocarbons has been observed around the wellsite.

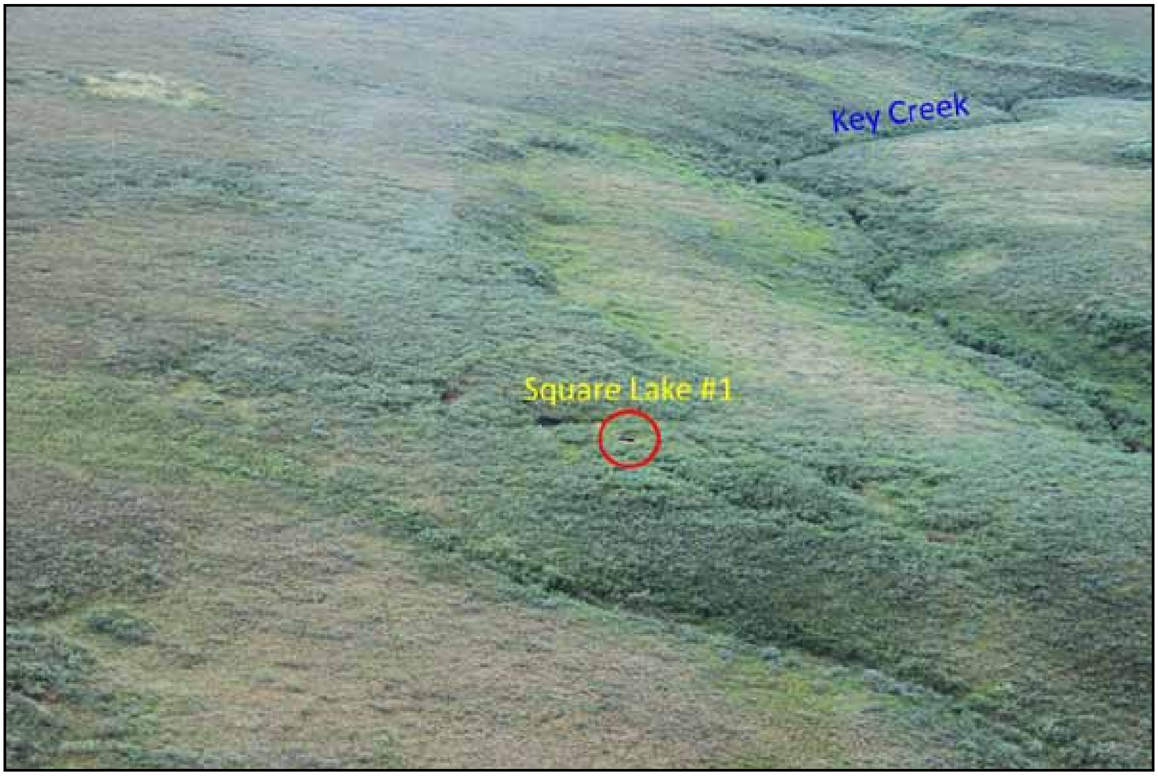


Figure 1: Aerial locator of Square Lake #1, it is approximately 200 feet from Key Creek (July 2012)

Figure 2: Square Lake #1, tundra scar of an old airstrip used in support of drilling operations (July 2012).

Figure 3: Square Lake #1 contains a wooden cellar full of water and cement around open casing (July 2012).

Figure 4: Square Lake #1 contains a wooden cellar full of water and cement around open casing (July 2012).

Figure 5: Square Lake #1, the open casing is visible below the water surface inside the cement column (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Square Lake #1 is a U.S. Navy well that was spudded Jan. 26, 1952 and drilled to a depth of 3,987 feet. The well was completed Apr. 18, 1952, and was plugged and abandoned. The ground surface was heavily disturbed during drilling operations, which has since revegetated.

- **Well Condition:** Upon completion in 1952, four plugs were set in the hole through open-end drill pipe to seal off the gas-bearing sandstones and to protect them from contamination by water-bearing sands. The first plug was set by displacing cement at 2,935 feet with the top of the plug at 2,745 feet. The next two cement plugs were set in the gas zone, spanning depths from 1,865 to 1,934 feet and from 1,640 to 1,840 feet. The top plug was set from 770 to 741 feet, well above the gas shows and spanning the 10 ¾-inch casing shoe set at 728 feet. In addition to the four cement plugs, water and mud filled the remaining distance to the surface (Collins and Bergquist 1959). Upon successive visits to the site, BLM field crews dropped a plumb-bob down the hole and hit a solid obstruction 10 feet below the surface. The site was visited by BLM personnel in August 2003 with an underwater camera and determined the solid surface to be cement. The wellbore diagram confirms a cement surface plug.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The primary intent of this well was to test the Cretaceous rocks in east-west trending anticline structure (Collins and Bergquist 1959). No significant shows of oil were found. Gas shows were encountered in various sandstone beds between 1,600 and 1,900 feet, but otherwise the hole was dry.

Development Potential: Industry has expressed some interest in the Square Lake area but no new wells have been drilled to date. Square Lake #1 in its current condition with its four plugs will not affect future drilling.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire NPR-A. Freshwater aquifers do not exist.

Other Information: There is no evidence of hydrocarbon escapement at this location.

Subsurface Risk Assessment: None

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations.

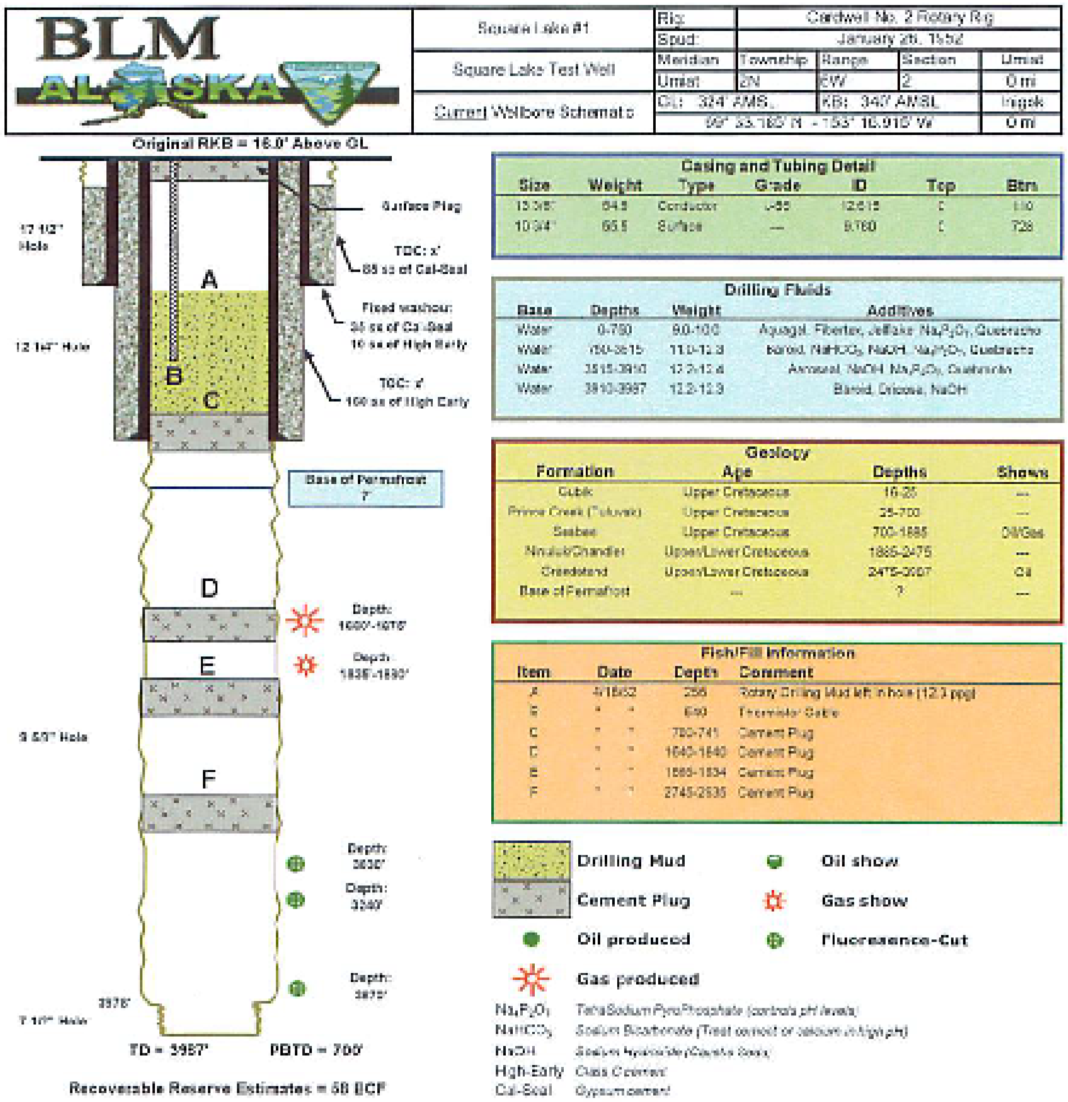


Figure 6: Square Lake #1 wellbore diagram

Titaluk #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.4225° N, -154.5678° W. Titaluk #1 is 60 miles west of Umiat, 102 miles southwest of Nuiqsut, and 100 miles southeast of Atqasuk. The BLM last visited Titaluk #1 in July 2012.

Site Description: The U.S. Navy drilled Titaluk #1 in 1951. The well is located in an area of rolling hills and moderate topographic relief **[Figures 1-2]**. There is no drill pad; however, a large area surrounding the well was disturbed in support of the drilling operation, and vegetation has thrived since the initial disturbance. The well is easily located by following the scar left behind from an access trail created in the 1950s that damaged the permafrost and changed the vegetation structure.

The well consists of 10 ¾-inch diameter casing sticking up above the ground to a height of 3 feet. **[Figure 3]**. There is no wellhead; the casing is open to the air. The 8-foot by 8-foot cellar around the well is constructed of wooden 2x12s, originally about 2 feet in height. The cellar was not dug into the ground.

The site is clean, with very little other cultural debris. One crushed drum is partially buried in the tundra near the well.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. The site is not under threat due to erosion or other natural processes. There is minor solid waste on site and it does not pose a travel risk to local residents.

Figure 1: Titaluk #1 aerial view.

Figure 2: Titaluk #1 aerial view.

Figure 3: Titaluk #1 well casing and surrounding cellar.

Figure 4: Titaluk #1 well casing and surrounding cellar. The BLM dropped a plumb bob downhole to determine the depth of the ice plug.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Titaluk #1 was drilled in 1951 to a depth of 4,020 feet and is classified as a dry hole. The purpose of the well was to drill on the end of an anticline to test the oil and gas potential of formations within the Nanushuk Group.

- **Well Condition**: The well consists of 10 ¾-inch casing rising above the ground to a height of 3 feet. A plumb-bob was dropped downhole in 2002 and hit solid, likely an ice plug, at 8 feet **[Figure 4]**.

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: A few very poor oil and gas shows were encountered in the Grandstand and Topagoruk formations, but no oil or gas was recovered during multiple production tests. The Ninuluk and Chandler formations were also encountered, but with no shows. One cement plug was set at 3,471 feet. **[Figure 5]** It is unclear why the plug was placed at this depth, because the shows (albeit poor) were reportedly discovered above this level (Robinson and Bergquist 1959).

Development Potential: Near-term development is unlikely as the area does not hold much interest to industry at this time.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the well.

Subsurface Assessment: **Moderate**

Justification: Titaluk #1 encountered very poor oil and gas shows. One plug was set, but according to available records, was placed below the show. Upon well completion, drilling muds were placed into the wellbore and allowed to freeze. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

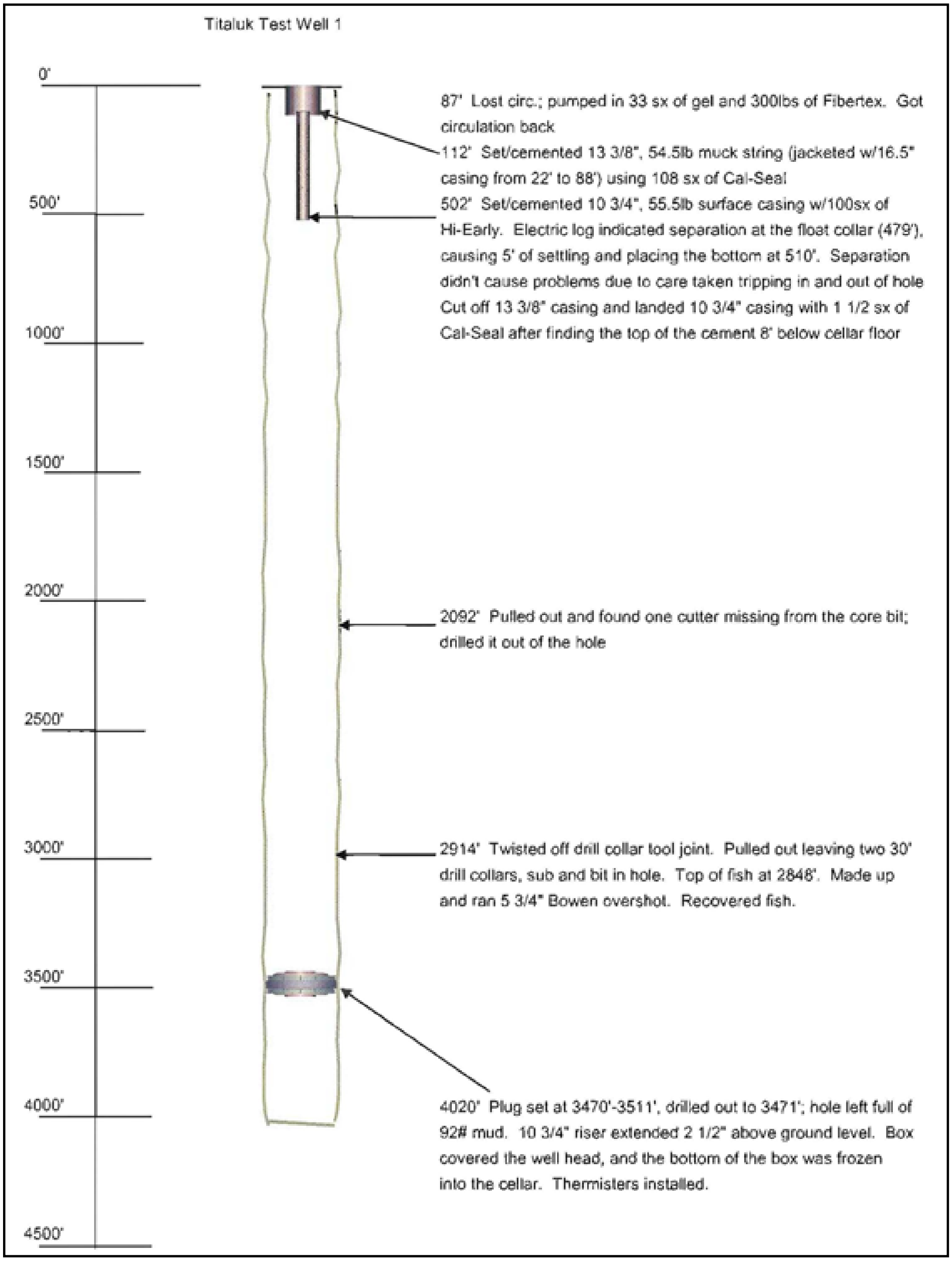


Figure 5: Titaluk #1 wellbore diagram.

Topagoruk #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.6247° N, -155.8934° W. Topagoruk #1 is 50 miles southeast of Barrow, and 37 miles northeast of Atqasuk. The last site visit was in July 2012.

Site Description: The site is approximately 2 miles from the Topagoruk River, on flat, low-relief topography marked by low-centered polygons and dwarf willows **[Figure 1]**. The U.S. Navy drilled the well in 1952. There is no visible pad, but an area of disturbance stretches at least ½-mile in an east-west direction and ⅛-mile in a north-south direction. The total disturbed area is difficult to see due to vegetation regrowth. On the ground, solid waste debris helps define the disturbed area.

The well is cut off at the ground surface, with several protruding thermistor cables in the center of the wooden cellar **[Figure 2]**. A thin-walled metal cylinder fits around the cut-off casing to resemble a marker. This weathered cylinder, originally about 5 feet in height, has been smashed at the base and now lies bent on its side. The cellar has some vegetation growth, with a small pile of drilling muds about 3 feet in diameter occupying one corner. The 8-foot by 8-foot cellar around the well is constructed of wooden 2x12s, originally about 3 feet in height. There is a 1 in-diameter pipe encircling the outside of the cellar. The cellar was not dug into the ground.

Surface and near-surface solid wastes include remaining piping from a refrigeration system that circulated diesel fuel to keep the permafrost frozen **[Figures 3** and **4]**. There is still diesel fuel in the ground circulation lines. These lines stretch approximately 500 feet to the east, 200 feet to the north, and 100 feet to the south from the well.

Battery cores were found approximately ¼-mile north of the Topagoruk #1 well. About seven batteries, bogey wheels, banding, wood fragments, and other smaller solid wastes are present at this location, forming a concentration about 6 feet in diameter. **[Figure 5]** The garbage site is old and has revegetated.

Other debris on the site include a burned-out drill rig that consists primarily of large ferrous metal hardware and partially burned wooden timbers **[Figure 6]**, a water-filled wooden box that resembles a cellar (¼-mile east of the Topagoruk #1 well), and drilling muds **[Figures 7** and **8]**.

Surface Risk Assessment: **High**

Justification: The battery cores at this site are degrading and pose a risk to the surrounding environment. This, in conjunction with the diesel refrigeration system on the site, is why Topagoruk #1 has a high surface risk assessment.

Figure 1: Aerial photo showing the components of the wide-spread Topagoruk #1 site.

Figure 2: Thin, weathered metal lying on its side; this appears to have been a marker for the Topagoruk #1 well, but the base was smashed at some point. Thermistor cables stick up from the wellbore.

Figure 3: The Topagoruk #1 well showing the cellar and straight lines representing the old diesel refrigeration system.

Figure 4: The Topagoruk #1 well and various piping remaining from the diesel refrigeration system.

Figure 5: Old battery cores lying on the tundra at the Topagoruk #1 site.

Figure 6: Remnants of a burned rig; other pieces of wood and scrap metal are scattered over the disturbed area at Topagoruk #1.

Figure 7: Undocumented cellar with an adjacent pile of drilling muds and a large pipe at Topagoruk #1.

Figure 8: Undocumented cellar and no well pipe apparent at Topagoruk #1.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Topagoruk #1 was drilled in 1951 to a depth of 7,154 feet and is a dry hole. The intent was to test a small, buried anticline and the various formations associated with it.

- **Well Condition**: The well was cased to 6,073 feet, plugged back to 6,175 feet, and then drilled to a new total depth of 10,503 feet. Prior to re-drilling to total depth, approximately 250 barrels of crude oil from Cape Simpson were added downhole to help offset lost circulation and caving. Additionally, 20 barrels of diesel were added downhole during the drilling phase. There are no plugs on the hole deviation **[Figure 9]**.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: Drilling the well encountered the following stratigraphic units: Gubik, Grandstand, Topagoruk, and Oumalik formations, Middle and Upper Jurassic rocks, Shublik Formation (Triassic age), Permian rocks, and Lower-Middle Devonian rocks. Hydrocarbon shows were limited to a few very poor gas shows in the Oumalik Formation. No oil or gas was recovered during multiple production tests (Collins and Bergquist 1958).

Development Potential: Industry does not have much interest in the Topagoruk area.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: The undocumented cellar east of the well is unmentioned in all reports viewed by the BLM staff. The drilling muds adjacent to it suggest it was a hole; however, all reports and field visits have negated that. In 2012, the BLM lowered a long segment of ½-inch pipe into the unknown cellar and struck solid ice surface at 6 feet, then systematically dragged the pipe along the bottom of the cellar. The bottom was smooth like an ice surface with settled muds on top. Nothing was indicative of pipe or anything else that suggested the cellar could house a drill hole. There is no indication of hydrocarbon escapement at this location.

Subsurface Risk Assessment: Moderate

Justification: Topagoruk #1 encountered very poor oil and gas shows. One plug was set, but was placed below the shows. The sidetrack is below the shows and encountered no other oil and gas shows to total depth. Approximately 20 barrels of diesel was pumped downhole and topped out 796 feet. Drilling muds were used to fill the wellbore and have frozen, creating an ice plug.

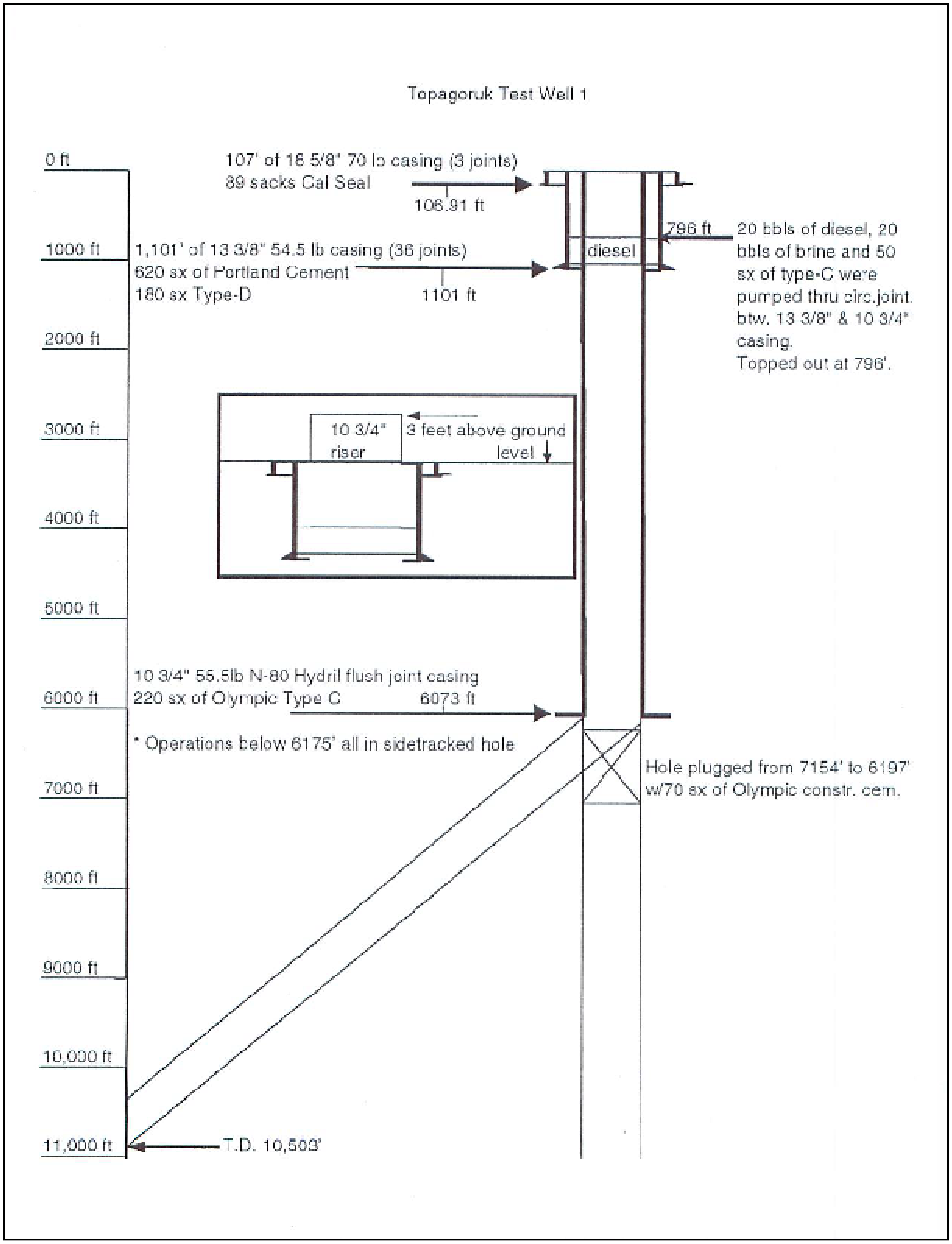


Figure 9: Topagoruk #1 wellbore diagram.

Tulageak #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 71.1890° N, -155.7095° W. The Tulageak #1 well is in the northern portion of the National Petroleum Reserve in Alaska and west of Dease Inlet. The site is approximately 25 miles southeast of Barrow on the same peninsula and 62 miles northeast of Atqasuk, the next closest population center. The last site inspection was in July 2012.

Site Description: The Tulageak #1 site consists of a well inside of a constructed wooden cellar, a pad, and a reserve pit [**Figures 1, 2,** and **3**]. Husky Oil drilled the well under contract with the USGS in 1981. The cellar is constructed of wooden 2x12s on 12x12-inch wood beams **[Figure 4]**. The cellar is filled with water and its walls are in good condition **[Figure 5]**. A rat hole is ocntained within the cellar and a mouse hole lies outside of the cellar.

The surrounding tundra is slowly reclaiming the thin pad due to the annual freeze-thaw process. The pad was constructed by heaping silty clay from the excavated reserve pit on top of the tundra. The original pad thickness was nearly 24 inches (Husky Oil 1982), but in 2005 the BLM measured it at 12 inches (BLM 2005). The pad is now completely revegetated with tundra vegetation.

The reserve and flare pits were holes dug into the tundra and do not have walls. The reserve and flare pits have subsided to the point where water flows freely into each other as well as surrounding ponds **[Figure 6]**.

Wooden pilings used for drilling operations extend from the wellhead to the east. The southernmost pilings are now within the shoreline of the reserve pit **[Figure 7]**.

Surface Risk Assessment: Moderate

Justification: There are no known contaminants or solid wastes at the Tulageak #1 site. The Beaufort Sea lies approximately 350 feet to the east from the edge of the reserve pit. The distance is closing annually because ice lenses beneath the shallow soil erode quickly once in contact with the wave action from the sea. The 5-foot ice-rich bluff erodes much more quickly than an area where no ice is exposed. Large chunks of tundra collapse into the sea during the 4 months of ice-free open water **[Figures 8** and **9]**. The erosion rate for this location has not been officially measured, but casual observations would suggest approximately 15 to 20+ feet per year. The primary threat from the site due to this erosion is the diesel fuel that is presently contained within the secure wellbore.

Figure 1: The advancing shoreline of the Beaufort Sea is visible to the east of the Tulageak #1 wellhead (July 2012).

Figure 2: The Beaufort Sea shoreline showing Tulageak #1 in June 2007.

Figure 3: Tulageak #1 reserve pit, wellhead and pad area in August 2001; wooden pilings have begun to enter the reserve pit through the thermokarsting process.

Figure 4: Tulageak #1 wellhead and cellar (July 2012).

Figure 5: The Tulageak #1 rat hole is contained within the water-filled cellar (July 2012).

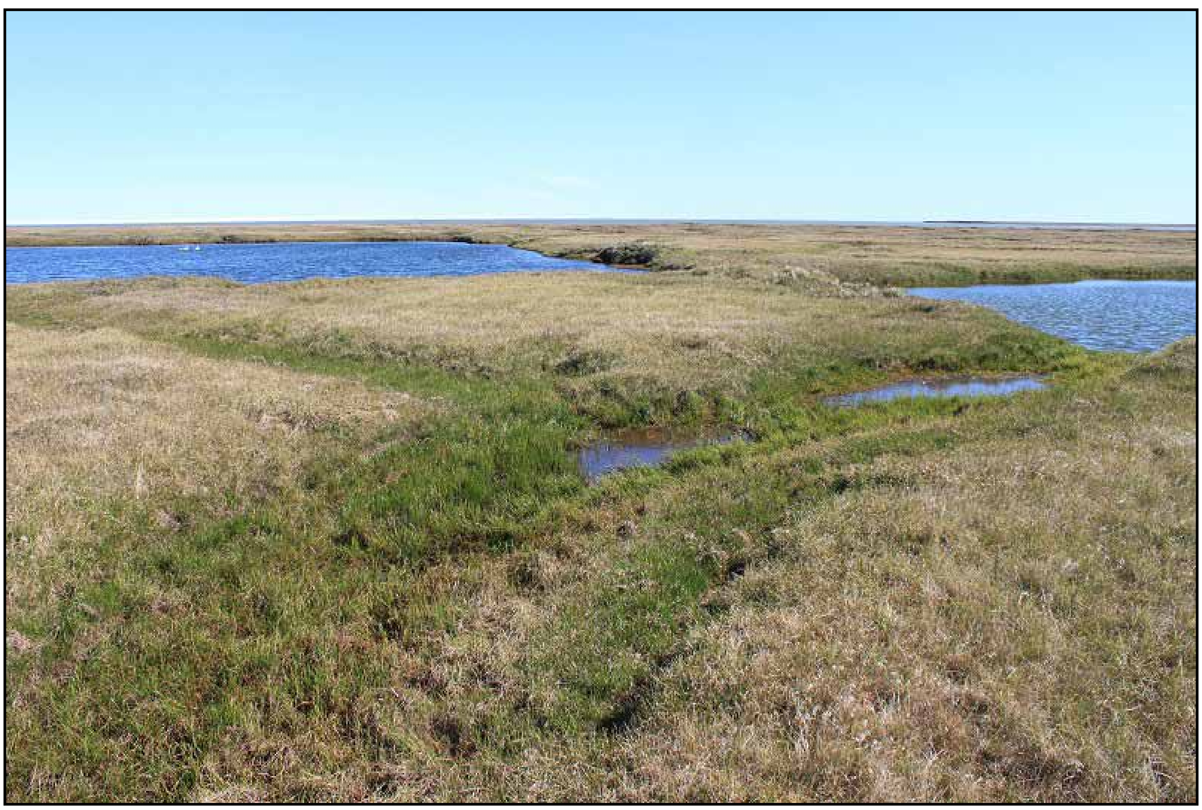


Figure 6: Potential connectivity between the Tulageak #1 reserve pit (left) and flare pit (right); the wet, grassy channel is a result of thawing (July 2012).

Figure 7: Tulageak #1 piling exposure along the reserve pit (July 2012).

Figure 8: Beaufort Sea coastal erosion on the 5-foot ice-rich bluff near Tulageak #1 (July 2012).

Figure 9: Beaufort Sea coastal erosion on the 5-foot ice-rich thick bluff near Tulageak #1 (July 2012).

Figure 10: Gate valve on Tulageak #1 (June 2003).

Figure 11: Mouse hole outside the cellar (June 2003).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The Tulageak #1 well is in the northern portion of National Petroleum Reserve-Alaska, west of Dease Inlet. Drilling-related operations commenced with rig-up on Feb. 20, 1981. Brinkerhoff Rig 31, a National T-20 rig, was used to drill the well. The rig was brought to Tulageak #1 on 34 Rolligon loads from the Walakpa Test Well #2. The well was spudded on Feb. 26, 1981, and activity terminated with rig released on Mar. 23, 1981. An ice airstrip that could support a Hercules C-130 was set up near on the frozen lake surface directly to the south. The well was drilled to a total depth of 4,015 feet, cased to 2,720 feet, and plugged back to 2,600 feet (Husky Oil 1982). Diesel fuel was added from the top of the upper plug to the surface to facilitate temperature monitoring by the USGS. Diesel was chosen as the medium for temperature monitoring as it will not corrode the casing, nor freeze at the temperatures encountered downhole.

- **Well Condition:** The wellhead is capped with a closed and operational gate valve and cap [**Figure 10**]. The rat hole is within the cellar and is open to the environment. There was a light sheen on the water in the rat hole, but it appears to be organic since it broke apart when touched. A mouse hole approximately 6 inches high is outside of the cellar and is open to the environment [**Figure 11**].

  At the conclusion of the drilling and evaluation operations, two cement and mechanical plugs were set in the wellbore with the top of the second plug at 2,600 feet. From 2,000 feet to the surface, the hole is filled with diesel fuel overlying 600 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 9 ⅝-inch surface casing has cement from 2,720 feet to surface with cement in the 9 ⅝-inch by 20-inch casing annulus from 105 feet to surface (Husky Oil 1982) [**Figure 12**].

- **Wellhead Components:** The USGS maintains the wellhead as they use the well for temperature monitoring surveys. The components [**Figure 13**] are in good working condition.

Geologic Setting: The primary objective of the well was to test the sandstones in the basal portion of the Pebble Shale unit. Secondary objectives were the equivalents of the Jurassic Barrow sandstones and the Sag River Sandstone. The argillite basement was reached at 3,964 feet. The primary objective, Pebble Shale Unit, encountered only periodic slight oil shows with dull- to-bright fluorescence. The Barrow sand showed minor evidence of dead oil (bitumen). Slight to good oil shows were discovered in the Sag River Sandstone and upper portion of the Shublik Formation (Triassic). The well also encountered the Torok Formation of the Cretaceous with no shows. No gas was encountered in any formation during drilling (Husky Oil 1982).

Development Potential: This well is adequately cased and cemented, securing the well from all lower formations.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead. The West Dease #1 well site is approximately 3 miles to the southeast.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

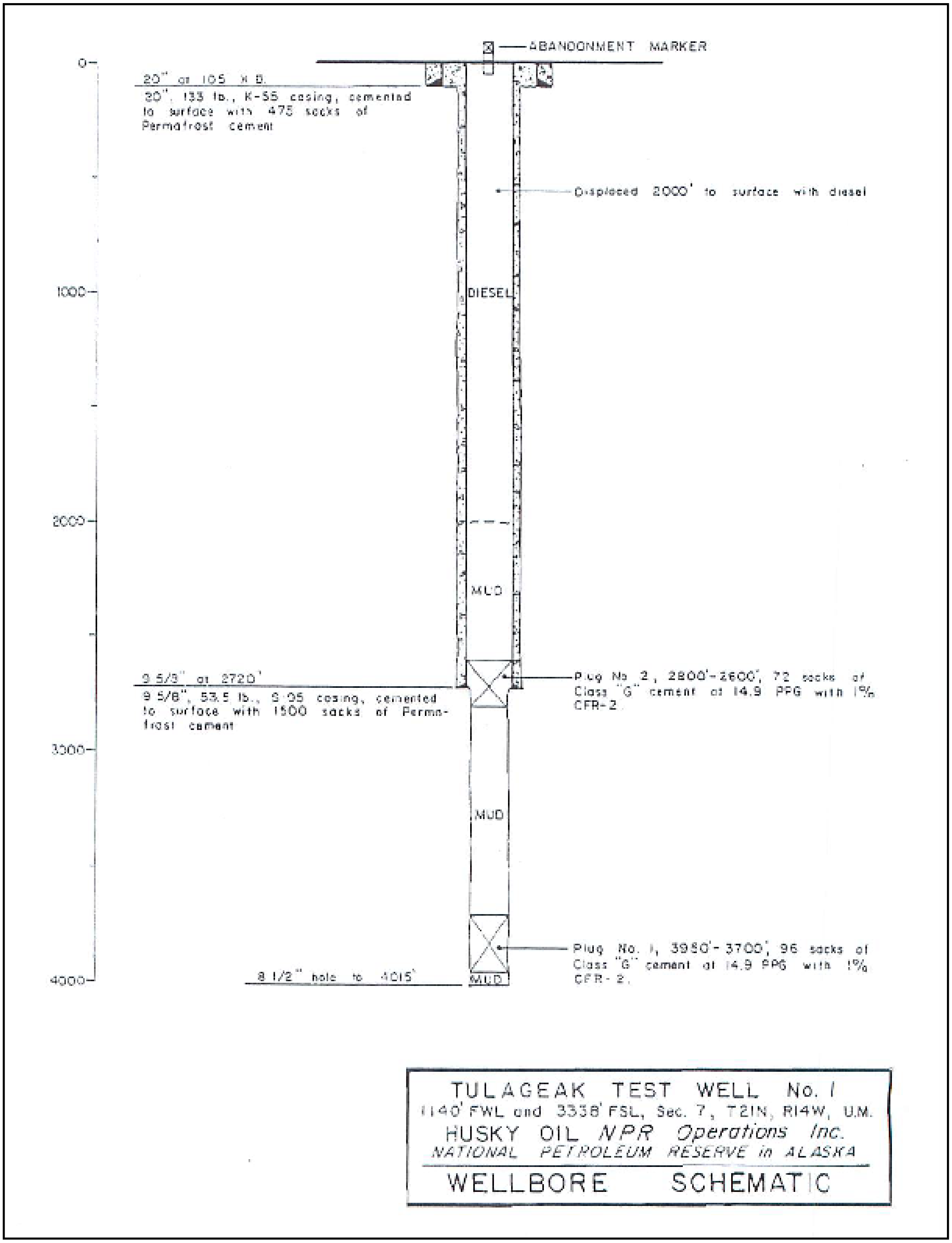


Figure 12: Tulageak #1 wellbore diagram.

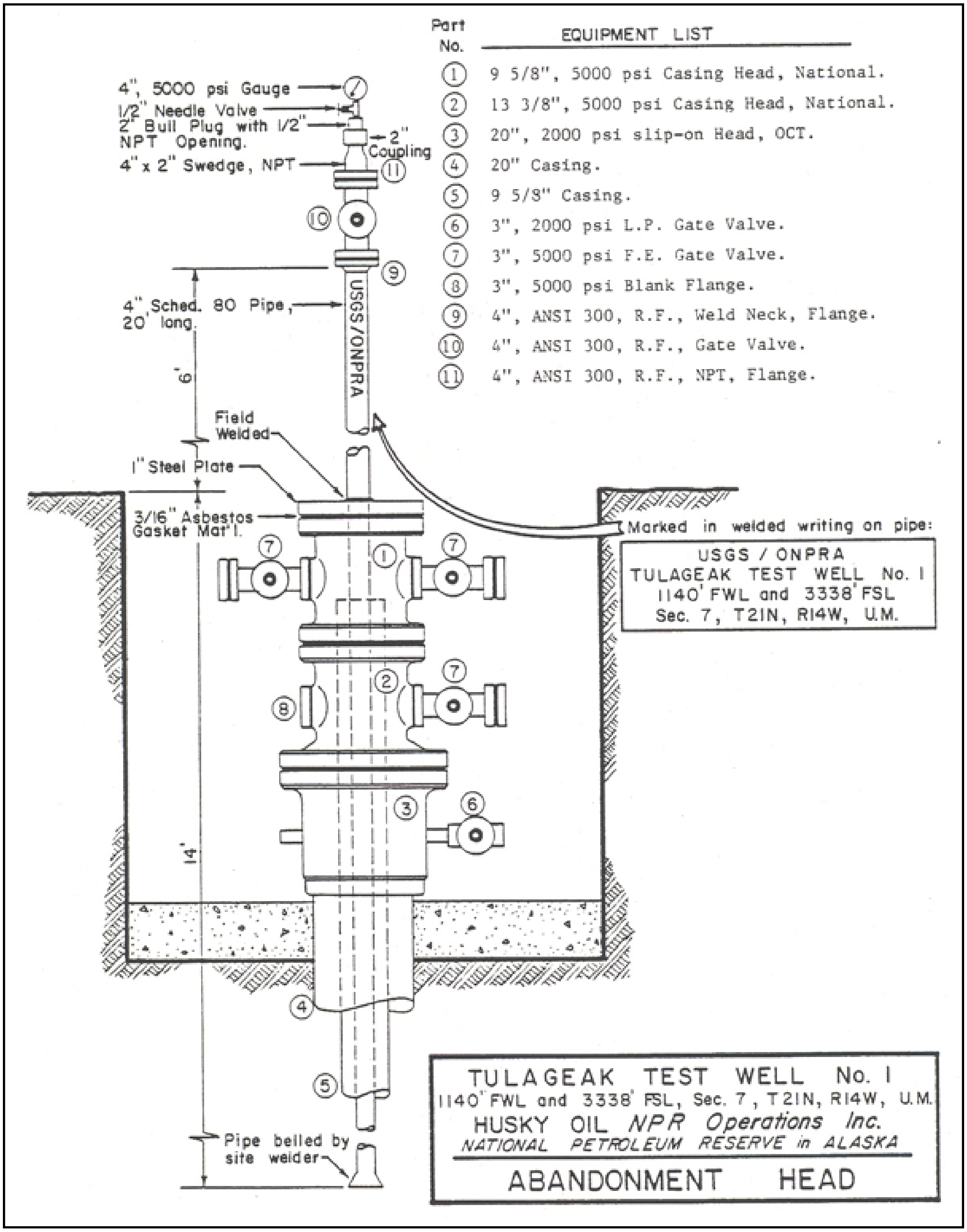


Figure 13: Tulageak #1 wellhead assembly.

Tunalik #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.1969° N, -161.0720° W. The Tunalik #1 site is located 37 miles southwest of Wainwright, 90 miles west of Atqasuk, and 125 miles southwest of Barrow. Tunalik #1 is the westernmost legacy well. The last site inspection was in July 2010.

Site Description: The Tunalik #1 site consists of a well inside a metal culvert cellar, a pad, a reserve pit, flare pit, fuel pit and an adjacent airstrip. A road connects the airstrip to the drill pad. Husky Oil drilled the well under contract with the U.S. Geological Survey (USGS) in 1978. The wellhead contains a closed and operational gate valve and cap. The rat hole is outside of the cellar and is open to the environment. The cellar is a metal culvert encompassed by a steel frame and is filled with water. **[Figures 1** and **2]** The wall of the cellar is approximately 2 feet above ground surface.

The surrounding tundra has slowly reclaimed the gravel pad due to the annual freeze-thaw cycle. The pad type is an insulated thick pad, similar to pads at Inigok and Awuna. Styrofoam that has eroded from the pad is present around the wellhead **[Figures 3** and **4]**. A large-diameter pipe that appears to have been buried on the pad is now partially exposed **[Figure 5]**. The pad is connected to a 5,000-foot airstrip with a gravel road **[Figures 6, 7,** and **8]**. The gravel road and one end of the airstrip have subsided due to thawing and are no longer usable. A pile of drilling mud is between the wellhead and the reserve pit **[Figure 9]**.

The flare pit and fuel pit walls have eroded to the point that they are now joined to the reserve pit. The reserve pit walls have subsided and water can move out onto the surrounding tundra. Wave action from the reserve pit is beginning to erode pieces of insulation and lining from the drilling pad. Tunalik #1 differs from Awuna #1 in that prevailing wind direction does not force erosion in the direction of the wellhead.

The region surrounding the well site is characterized by very gently rolling terrain, except adjacent to the predominantly northwesterly flowing streams, where topographic relief is more pronounced. Surface soils consist of organic silty sand or silt over most of the area. The primary vegetation type in the low areas is moist tundra comprised of a mosaic of plant communities typical of most of the coastal plain. In the higher and better-drained areas are heath grasses, sedges and occasionally birch and willow. The entire area is underlain by continuous permafrost with an average annual thaw depth (active layer) of about 18 inches. The presence of permafrost is reflected by polygonal patterned ground, thaw-oriented lakes and occasionally by beaded streams (Husky Oil 1983).

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the Tunalik #1 site. There does not appear to be any impact to surrounding surface waters from the well site and associated support facilities (road and airstrip). The well does not appear to be under threat from the minor erosion occurring or other natural processes.

Figure 1: Wellhead with steel beams next to the metal cellar at Tunalik #1 (July 2008).

Figure 2: Standing water inside the Tunalik #1 cellar (July 2008).

Figure 3: Aerial view of Tunalik #1 showing the erosion to the drilling pad and exposed Styrofoam (August 2006).

Figure 4: Erosion along the edge of the Tunalik #1 reserve pit with the wellhead in the distance (July 2008).

Figure 5: Exposed pipe from subsidence at Tunalik #1 (July 2003).

Figure 6: Aerial view showing the relationship of the Tunalik #1 drilling pad to the airstrip (July 2003).

Figure 7: Road leading away from the drilling pad toward the airstrip (July 2008).

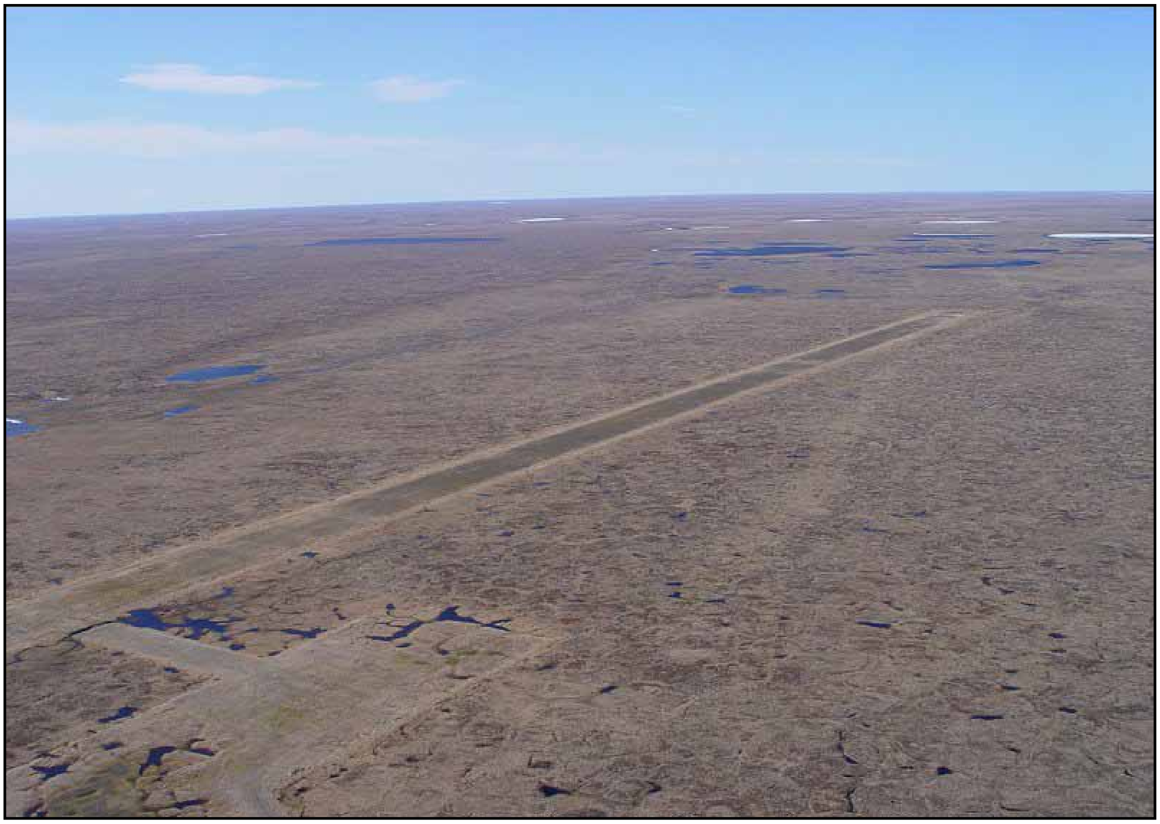


Figure 8: The airstrip at Tunalik #1 (July 2003).

Figure 9: Drilling muds adjacent to the Tunalik #1 reserve pit (August 2006).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Operations commenced with rig-up on Oct. 18, 1978. Parco, Inc. was the drilling contractor, and Parker Rig 95, a National 130, was used to drill the well. The well was spudded on Nov. 11, 1978, and activity ceased on Jan. 7, 1980. The well was drilled to a total depth of 20,335 feet, cased to 14,719 feet, and plugged back to 1,825 feet (Husky Oil 1983).

  An all-season airstrip and a connecting road were built to support operations during the time it took to drill the deepest well in the National Petroleum Reserve in Alaska. The drilling rig was mobilized from Peard Bay, where it was stacked after drilling Kugrua #1. The rig was brought to location with 97 Rolligon loads over the course of 10 days (Husky Oil 1983).

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the well was plugged back with six cement and mechanical plugs. The top of the shallowest cement plug is at 1,825 feet. From 1,800 feet to the surface, the hole is filled with diesel fuel overlying 25 feet of mud. **[Figure 10]** An Arctic pack was left in the 9 ⅝-inch by 13 ⅜-inch annulus from 9 ⅝-inch fluid orifice (FO) at 2,149 feet to the surface wellhead (Husky Oil 1983).

- **Wellhead Components**: The USGS maintains the wellhead as they use the well for temperature monitoring surveys. The components **[Figure 11]** are in good working condition.

Geologic Setting: The primary objective of the well was to test a structurally closed anticline trap in the Sadlerochit and Lisburne Groups. Secondary interest was in the Pebble Shale Formation and Kingak Sands. The primary objectives were found to be generally composed of low-porosity and low-permeability rocks. Thick sandstone (approximately 550 feet) of Neocomian age with very poor porosity (average of approximately 6 percent) was encountered from 10,905 feet to 11,672 feet within the Pebble Shale unit (Husky Oil 1983c).

Minor shows of gas were noted within the lower part of the marine Nanushuk Group at approximately 5,000 feet to 6,000 feet and within thin (less than 5 feet) sandstones of the Torok Formation. These shows are considered to represent slightly over-pressured, low-volume reservoirs.

Several gas shows were also noted in sandstones within lower portions of the Neocomian age rocks. The most significant gas show in this interval occurred from an interbedded sandstone and shale sequence between 12,550 feet and 12,600 feet. A maximum of 1,250 units of ditch gas (100 perent methane) was recorded before the well was shut-in. No definitive pressures was obtained from the attempted tests, nor were any fluid samples collected due to the inability to obtain a packer seal within the formation (Husky Oil 1983c).

Development Potential: There is no interest in oil and gas exploration in this area. Tunalik #1 is adequately cased and cemented, effectively sealing off all lower formations.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

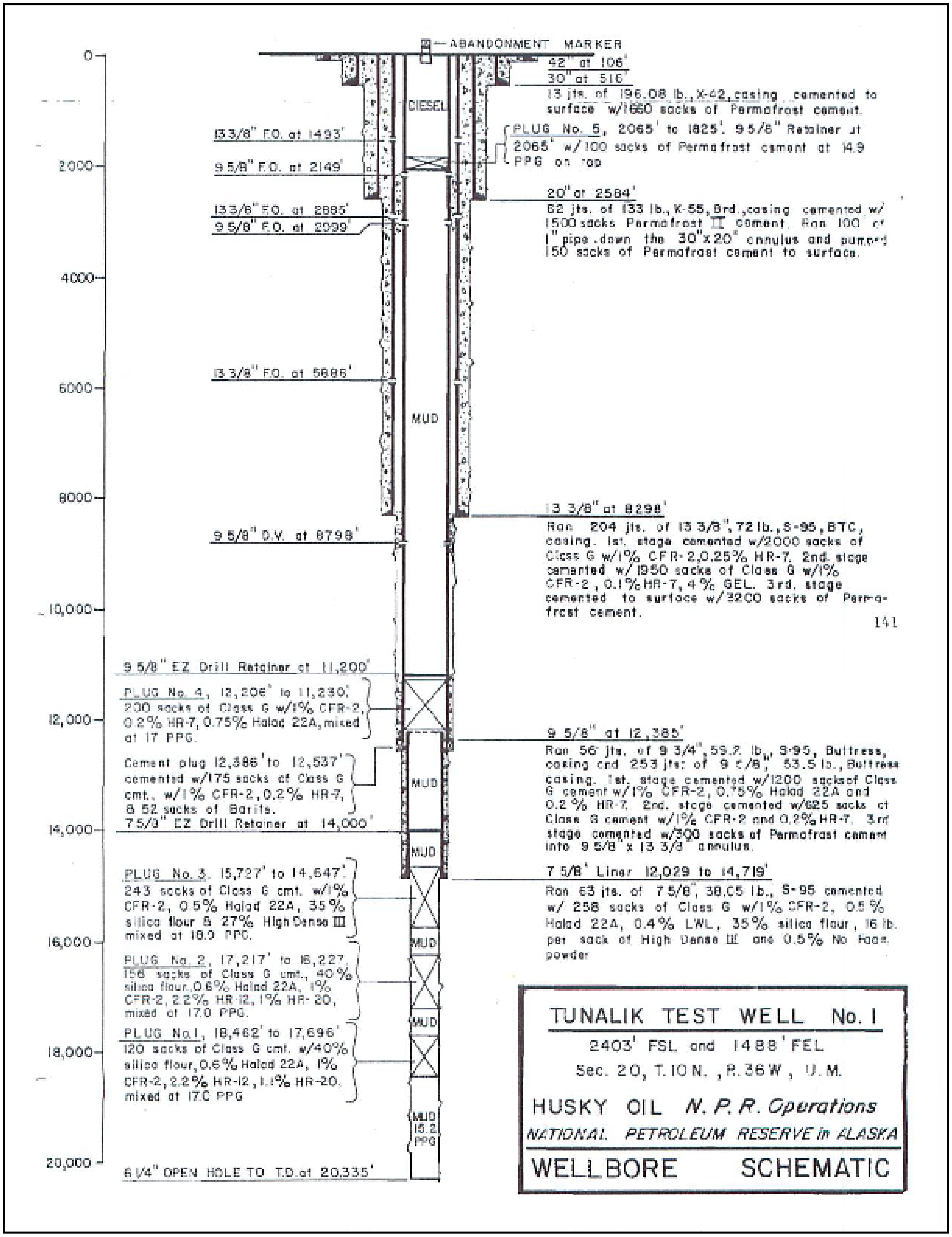


Figure 10: Tunalik #1 wellbore diagram.

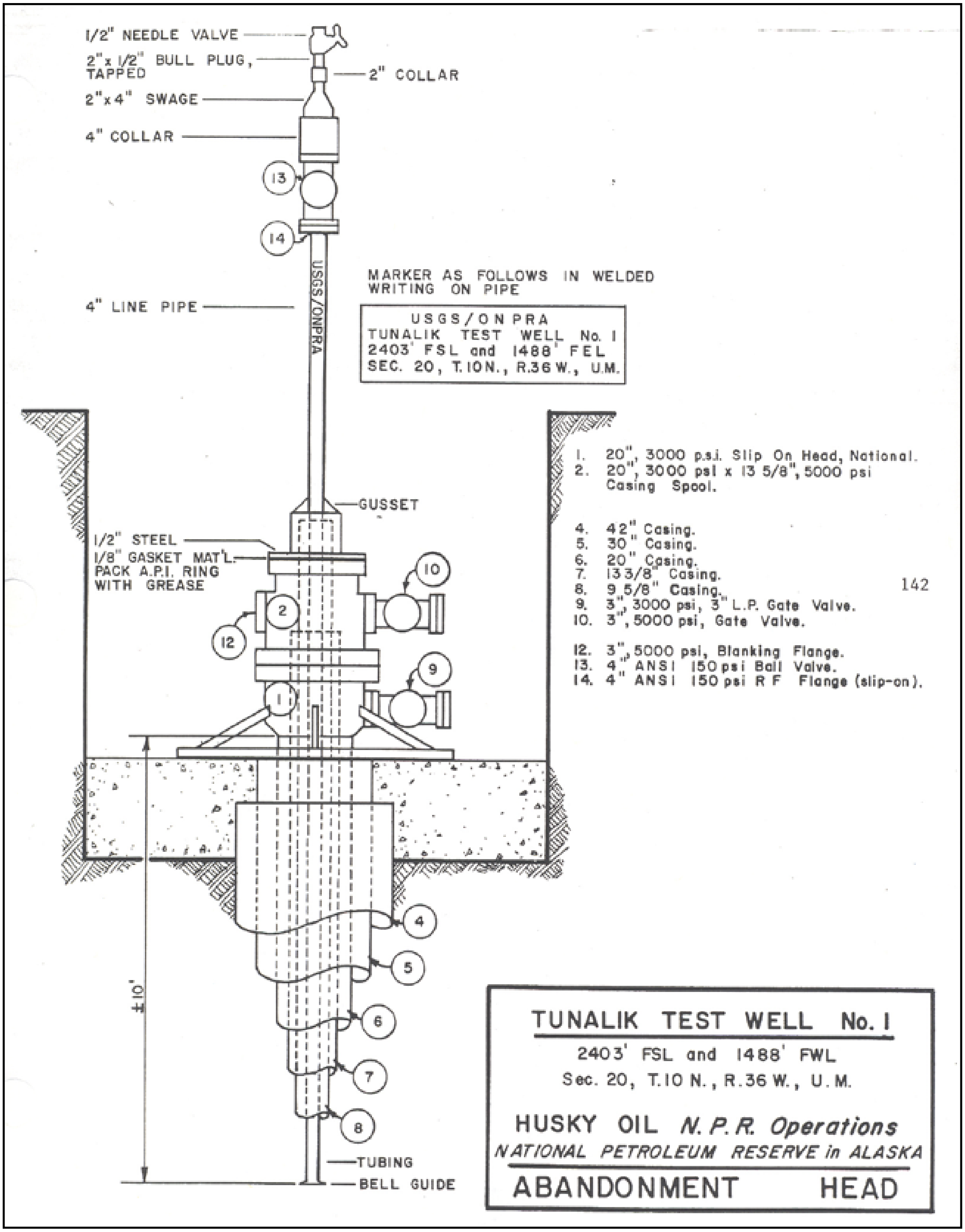


Figure 11: Tunalik #1 wellhead assembly.

Umiat #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3965° N, -152.3284° W. The site is 5 miles northwest of Umiat. The last site visit was in July 2012.

Site Description: The U.S. Navy drilled the Umiat #1 site in 1947. The site consists of a well inside a constructed wooden cellar. There was no drill pad established, but a large area (at least 200 feet by 300 feet) was disturbed for drilling operations. Willows now cover that area, in contrast to the tussock tundra vegetation dominating the natural area [**Figures 1** and **2**]. The well is on an unleased tract at the crest of a hill that divides the north and south forks of Seabee Creek.

The Umiat #1 wellhead is within an approximately 8-foot by 8-foot wooden cellar that is filled in with some solid wastes, soil, and vegetation. The cellar was excavated to a shallow depth (about 1 foot). The cellar walls are only one plank high (2x10s). [**Figures 3, 4,** and **5]**

Solid waste in the form of steel framing, tools, small parts, and scrap metal are present along the ridge [**Figure 6**]. A steel frame (about 5 feet by 6 feet) sits in a rectangle hole adjacent to the wellhead [**Figure 7**]. The residual substance at the bottom of the hole suggests that it was used to hold drilling muds.

Three piles of drilling muds are located immediately east and north of the wellhead [**Figures 6** and **7]**. Vegetation is absent on the slick, clay-type material.

Surface Risk Assessment: Moderate

Justification: The U.S. Army Corps of Engineers (USACE) tested the three drilling mud piles around the Umiat #1 well and found the mud contains barium, a common drilling fluid component. Through sampling, the USACE determined the barium has not migrated down the hill and poses no danger to the Seabee Creek drainage (Ecology and Environment 1999). There is no indication of stressed vegetation down-gradient from the drill muds. The site is not under threat due to erosion or other natural processes. Surface debris present on the site is an impact to visual resources. The site does not pose a travel risk due to the dense willows within the disturbed area.

Figure 1: Aerial overview of Umiat #1, located on a ridge that overlooks Seabee Creek (July 2012).

Figure 2: Aerial overview of Umiat #1 on a ridge that overlooks Seabee Creek (July 2012).

Figure 3: Umiat #1 wellhead and cellar (July 2012).

Figure 4: Umiat #1 wellhead (July 2012).

Figure 5: Umiat #1 wellhead (July 2012).

Figure 6: Umiat #1 well vicinity; note the metal debris and drill mud (July 2012).

Figure 7: Umiat #1 well vicinity; note the metal debris, stray planks, and drilling mud (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Umiat #1 was spudded in 1945 and completed in 1946. Total depth reached was 6,005 feet, and the well was cased to 685 feet. The purpose of the well was to test the Umiat anticline. It was the first deep test in Naval Petroleum Reserve No. 4 and was originally scheduled to be drilled at Cape Simpson. The plan was changed after the Umiat anticline was found to have several hundred feet of closure, in contrast to the area of unknown structure at Cape Simpson. The Umiat #1 site is located on a ridge between two branches of Seabee Creek was picked on the basis of geologic and topographic reconnaissance mapping (Collins and Bergquist 1958).

- **Well Condition:** The well does not contain cement plugs. Drilling muds were placed downhole at a depth 950 feet, just below the reported permafrost depth of 920 feet **[Figure 8]**.

- **Wellhead Components:** There is no pressure on the wellhead and it is fitted with a blind plate, a 2-inch nipple, and a functional brass service-type valve.

Geologic Setting: The well encountered residual hydrocarbons and a few poor gas shows in the Seabee, Ninuluk, Chandler, Grandstand, and Topagoruk Formations. The sands of the Grandstand were outside the productive area encountered by other Umiat wells, located 5 miles to the east. Such small amounts of oil were recovered in bailing tests that the oil was measured in pints, rather than barrels, and was officially recorded as a trace. Lab tests determined the oil to be of a different type of crude oil than the type found in the productive Umiat wells. The Umiat #1 well was too low structurally to produce oil (Collins and Bergquist 1958). The small amount of crude recovered in each test is indicative of residual oil staining.

Development Potential: Future development is unlikely because of Umiat #1's location outside of the Umiat structure.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. No fresh water aquifers exist in the Umiat area, so this well poses no threat to sub-surface water resources.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Moderate

Justification: A trace amount of oil was discovered during exploratory drilling. The amount was so minor, it was measured in pints. However, no cement plugs were placed downhole. Drilling muds were added in the wellbore and have subsequently frozen, creating an ice plug.

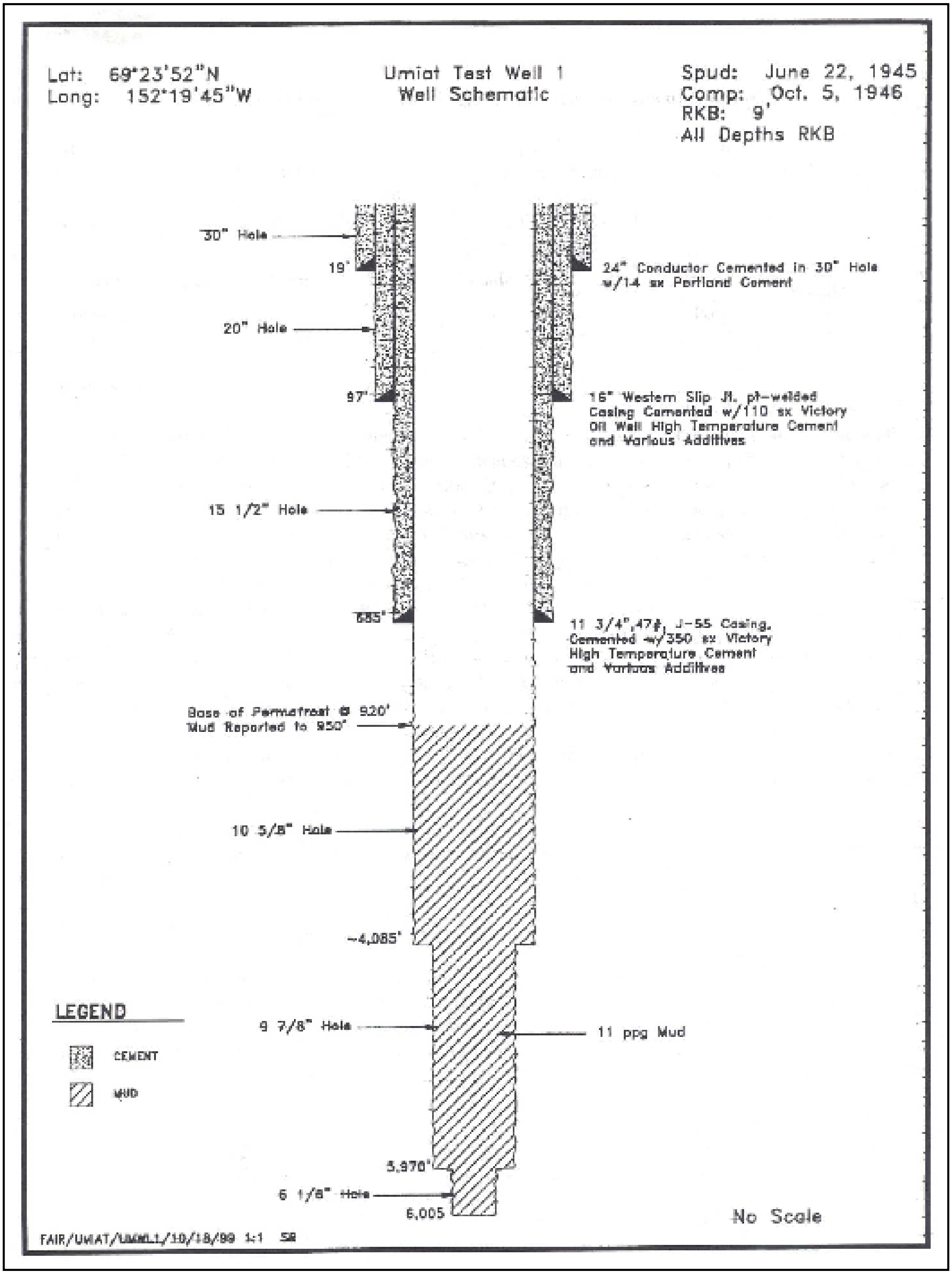


Figure 8: Umiat #1 wellbore diagram.

Umiat #2 and #5

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3821° N, -152.0826° W and 69.3836° N, -152.0797° W respectively. The site is less than 1 mile east of Umiat and 62 miles south/southwest of Nuiqsut. The last site visit was in July 2012.

Site Description: The Umiat #2 and Umiat #5 wells were drilled along the northern bank of the braided Colville River. Shallow, sloping, rolling hills are common in this portion of the National Petroleum Reserve in Alaska. The Colville River has eroded part of the site area, and only a 150-foot by 100-foot remnant of the drilling pad remains, as indicated by deciduous vegetation that is common in disturbed areas [**Figures 1- 3**]. The only features that existed at the Umiat #2 and #5 site are the wells and their surrounding cellars. Umiat #2 had a cement cellar measuring 8 feet by 8 feet that was dug about 4 feet into the ground. The well casing projected about 6 feet above the ground surface and its diameter measured at about 10 inches. The casing was closed by a wellhead with one valve [**Figure 4**]. Next to the cellar was a 55-gallon barrel with a 10-inch diameter pipe projecting out of it. The Umiat #5 well had a wooden platform around it, measuring roughly 10 feet by 15 feet. There is a large section of casing in the river near where the two wells were located [**Figures 5-6**]. The wells were plugged and abandoned in 2002 [**Figures 7-8**], and all materials related to the wells (including the concrete cellar) removed from the site.

Surface Risk Assessment: None

Justification: There are no known contaminants on the site. The wells have been fully remediated. The well site for both Umiat #2 and #5 have been cleaned of surface debris, as well as the remediation of petroleum-contamined soils.

Figure 1: Aerial view of Umiat #2 and Umiat #5 along the Colville River (July 2012).

Figure 2: Shows the approximately locations of Umiat #2 and #5 with the Colville River in the foreground (July 2012).

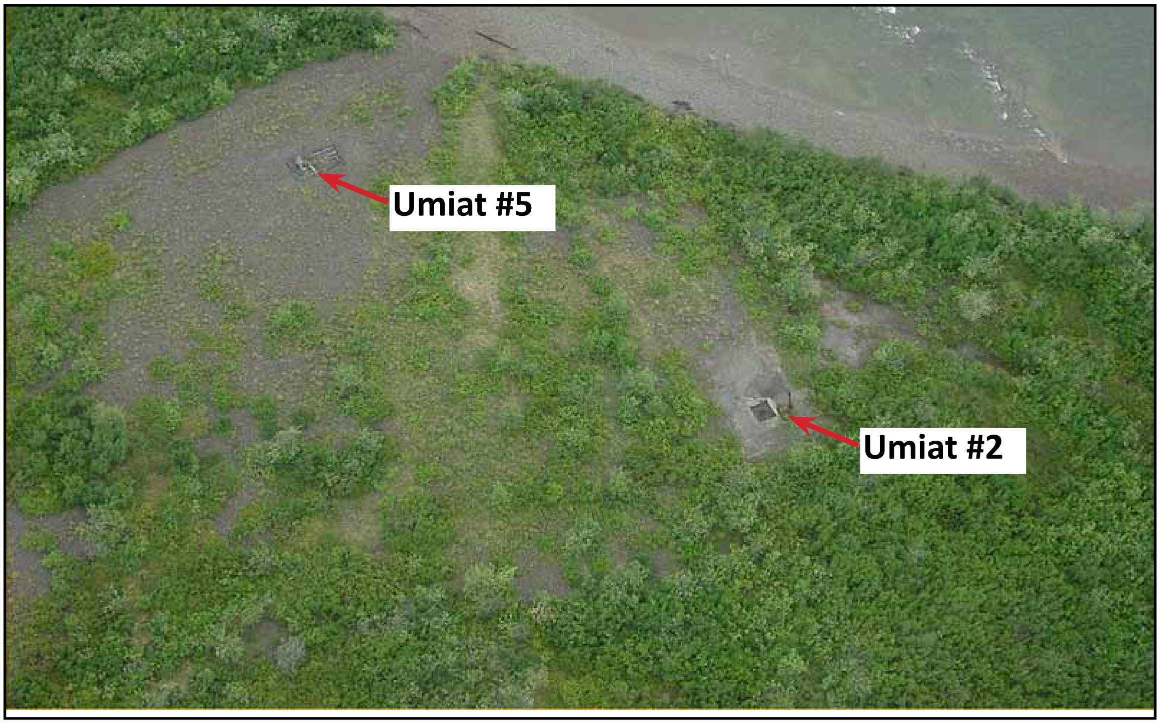


Figure 3: Aerial view of Umiat #2 (right) and Umiat #5 (left) in August 2000.

Figure 4: Umiat #2 with concrete cellar before plugging occurred (August 2000).

Figure 5: Casing joint lying in the Colville River near the old location of Umiat #5 (July 2010).

Figure 6: The same casing joint from Figure 5 (July 2010).

Figure 7: Plugging operations at Umiat #5 (April 2002).

Figure 8: Plugging operations at Umiat #2 (April 2002).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The wells were drilled on a common 4-acre pad in 1947 and 1951. Problems were encountered with the drilling muds while drilling Umiat #2. Analysts determined that the freshwater drilling fluid caused formation damage downhole. In 1951, the Umiat #5 well was drilled adjacent to the #2 with a cable-tool rig. The well produced 400 barrels per day with the most productive sandstones in the lower Chandler and upper Grandstand. Below a depth of 1,075 feet, crude oil from both Umiat and Simpson as well as diesel fuel were used in the drilling fluids (Collins and Bergquist 1958).

  The U.S. Army Corps of Engineers (USACE) plugged and abandoned both Umiat #2 and #5. Both wells were plugged using a truck-mounted drilling rig. At Umiat #2 collapsed casing was encountered at 20 feet and prevented running the planned 3 ½-inch drill string. Instead, USACE ran 2-inch and 1-inch high-density polyethylene (HDPE) pipe to an obstruction at 272 feet. A 22-foot viscous pill was placed on top to act as a base for a 200 feet surface cement plug. The Umiat #2 cement cellar and Umiat #5 wooden platform were excavated and removed; then a plate was welded onto the existing casing after it was cut off at 28 feet below ground level.

  All of these plugging activities cost approximately $25 million, with the majority of the costs attributed to soil remediation. Approximately 30,000 tons of petroleum-contaminated soil was excavated. The soil was transported on an ice road to the Umiat camp, where it was thermally treated in a rotary kiln to remove petroleum residues. After the excavation was completed, small quantities of PCB contaminants were unexpectedly encountered. The source of the PCBs has been linked back to the Umiat #5 well and the fluids the USACE used downhole when they drilled the well.

- **Well Condition:** The Colville River has nearly eroded back to the Umiat #2 and Umiat #5 location. The large hole dug to remove the contaminated soil and some minor solid wastes are still visible at the site.

- **Wellhead Components:** The wellheads for Umiat #2 and #5 were removed in 2002.

Geologic Setting: The purpose of the two wells was to test for producing formations and determine petroleum quantities. Both wells penetrated the Gubik Formation, Nanushuk Group (Chandler and Grandstand formations), Topagoruk Formation and Oumalik Formation. All oil and gas shows were associated with the shallow Chandler and Grandstand formations (Collins and Bergquist 1958).

Development Potential: Despite the cross-contamination of formations that appeared to be occurring during the original drilling in 1947 (Umiat #2), both Umiat #2 and Umiat #5 wells are now adequately plugged and will not affect future development.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface, as the well is properly plugged. There is a natural, intermittent oil seep in the Colville River near this location.

Subsurface Risk Assessment: None.

Justification: The well has been adequately plugged per Federal regulations.

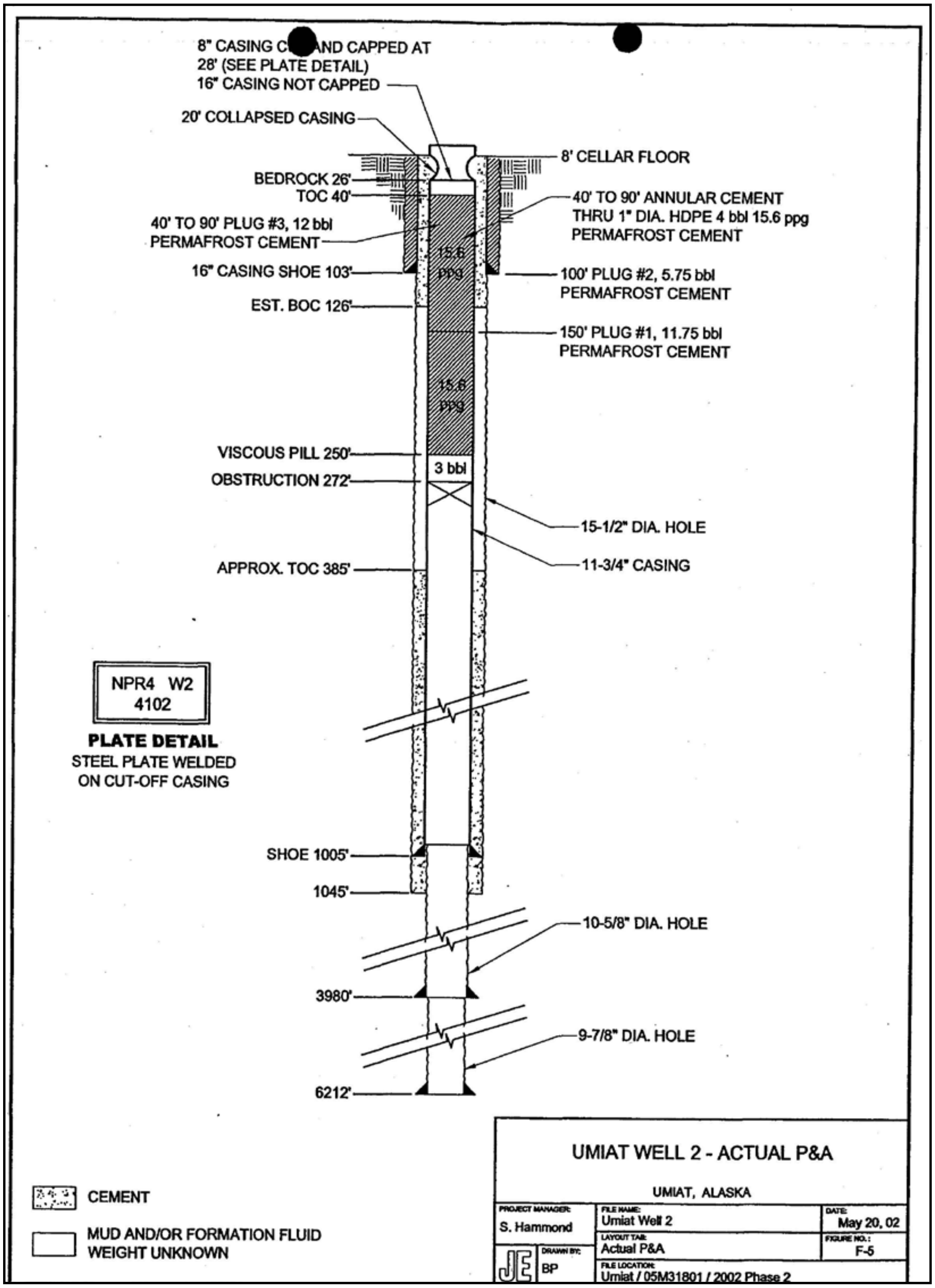


Figure 9: Umiat #2 wellbore diagram.

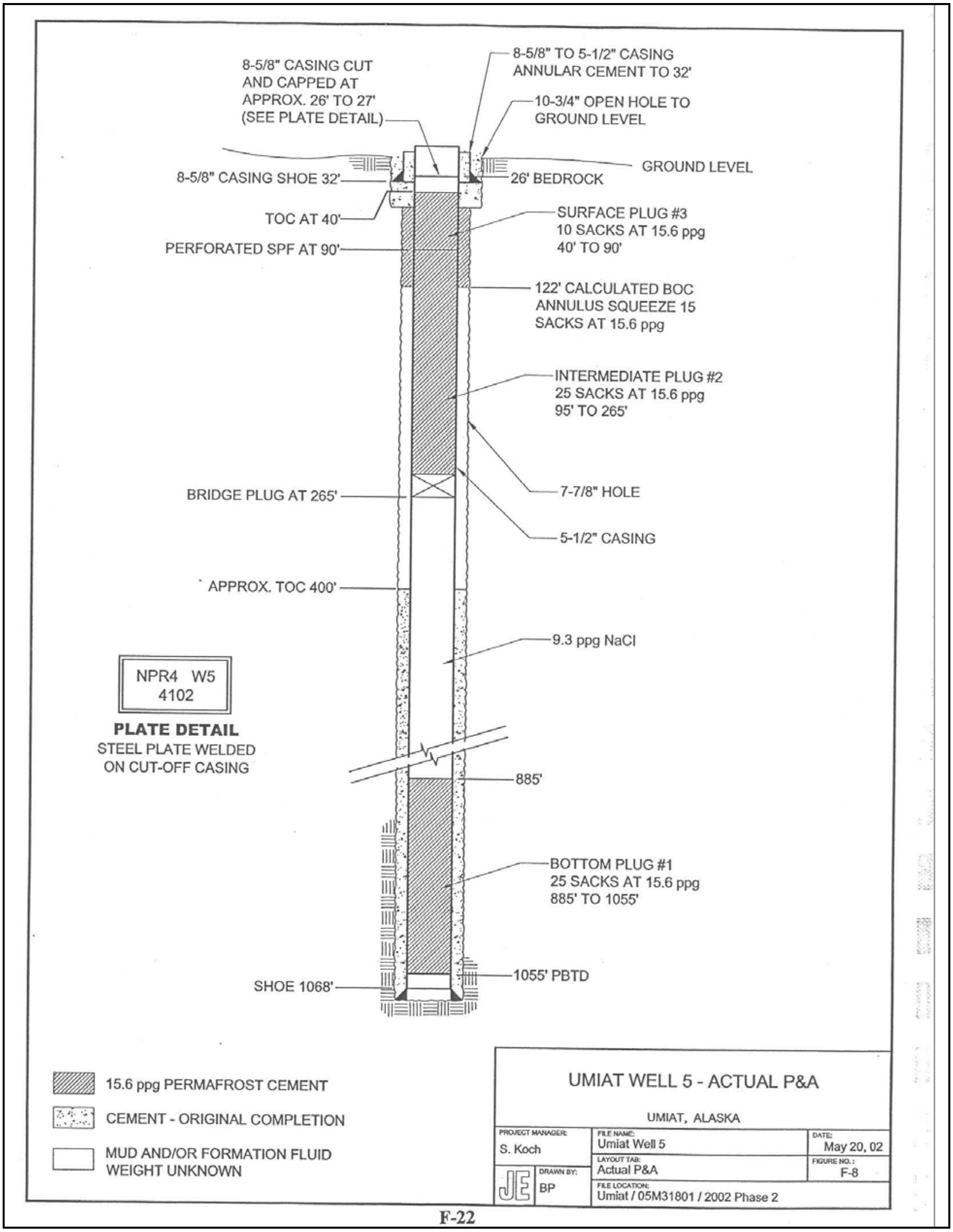


Figure 10: Umiat #5 wellbore diagram.

Umiat #3

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3867° N, -152.0847° W. The Umiat #3 site is less than 1 mile east of Umiat and 62 miles south/southwest of Nuiqsut. The last site visit was in July 2012.

Site Description: Umiat #3 is located along the Colville River floodplain, approximately ¼-mile from the river. It is close to Umiat Lake, roughly 200 feet to the west. The U.S. Navy drilled the well in 1946. There is no established drilling pad, but deciduous vegetation common to disturbed areas that resulted from past drilling operations in the late 1940s and early 1950s surrounds the site. The tundra in this area has revegetated as willow. [**Figures 1-2**].

The only feature at the site is the wellhead, which presently stands about 6 feet above the surface.

Surface Risk Assessment: Low

Justification: No known contaminants are present on the site. There is no threat to surface waters, as Umiat #3 is no longer capable of flowing to the surface.

Figure 1: Aerial view of Umiat #3 (August 2002).

Figure 2: The base of the Umiat #3 well shows the presumed production piping (June 2003).

Figure 3: Natural oil seeping in Umiat Lake (August 2003).

Figure 4: Umiat #3 before plugging operations (April 2004).

Figure 5: Extracting the wellhead to access the wellbore for plugging operations (April 2004).

Figure 6: Umiat #3 the following spring after plugging operations; Umiat Lake is in the upper left (June 2004).

Figure 7: Umiat #3 the following spring after plugging operations (June 2004).

Figure 8: Umiat #3 during spring break-up, showing the production piping still in place after plugging operations (June 2006).

Figure 9: The plumb-bob was dropped downhole in Umiat #3 to check the depth of fluids and the presence of ice lenses downhole. The cement surface and fluid level was tagged on this same visit using an interface meter (June 2006).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Umiat #3 (originally known as Umiat Core Test #1) was spudded in December 1946 and drilled to test some of the oil bearing zones encountered while drilling Umiat #1. The U.S. Navy drilled the well on the northeast corner of Umiat Lake, just below the hill from Umiat #4. The hole produced 50 barrels per day prior to shut-down. The well was re-tested 9 months later, after production had dropped to 24 barrels per day (Collins and Bergquist 1958). There is no seeping present at this site; however, seeps are common in this area, including an active oil seep in Umiat Lake, approximately 200 feet to the west [**Figure 3**].

  Plugging operations commenced May 9, 2004, [**Figures 4-8**]. When the wellhead was removed, tubing was hanging from the bottom. The tubing was cut and junked in the hole, as done in Umiat #4. An interface meter indicated that the fluid level in the well was at 118 feet. A viscous gel pill was placed at 118 feet and cement was placed from 118 feet to the surface. The cement was tagged at 66 feet, indicating that the cement had fallen from its original height at the surface. However, warmer weather led to the cessation of plugging operations on the tundra and further well operations were suspended.

- **Well Condition:** In 2006, the BLM revisited this well to gather data on the cement plug last checked in 2004, in order to determine the amount of additional cement needed to complete the plugging of Umiat #3. [**Figure 9**] The site visit showed the cement plug had slid downhole. The top of the cement was tagged at 134 feet. [**Figure 10**].

- **Well Components:** The wellhead consists of homemade components with a single water service-type valve. It is capped with a needle valve.

Geologic Setting: Umiat #3 penetrated the Gubik Formation and the Nanushuk Group. The Grandstand Formation within the Nanushuk Group is considered the primary source of oil between the depths of 258 and 514 feet (Collins and Bergquist 1958).

Development Potential: The cement level needs to be retagged to determine if additional slippage has occurred. It is important for the top of the plug remain above the casing shoe, or it could have an effect on future operations in the area. The Umiat Field is of interest to industry.

Groundwater Resource: There are no groundwater sources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface at Umiat #3, as the well is plugged at the surface.

Subsurface Risk Assessment: None.

Justification: Once the plug is retagged and if it is determined more cement is necessary, the BLM would change the subsurface ranking based on the depth of the plug. Good oil shows were present within the Grandstand Formation between 258 and 514 feet. If the tagged plug has slipped below the casing shoe but above 258 feet, it would be given a new ranking of low. If the tagged plug has slipped below 258 feet, the well would be ranked moderate. If no new slippage has occurred, the well would maintain its current ranking of none.

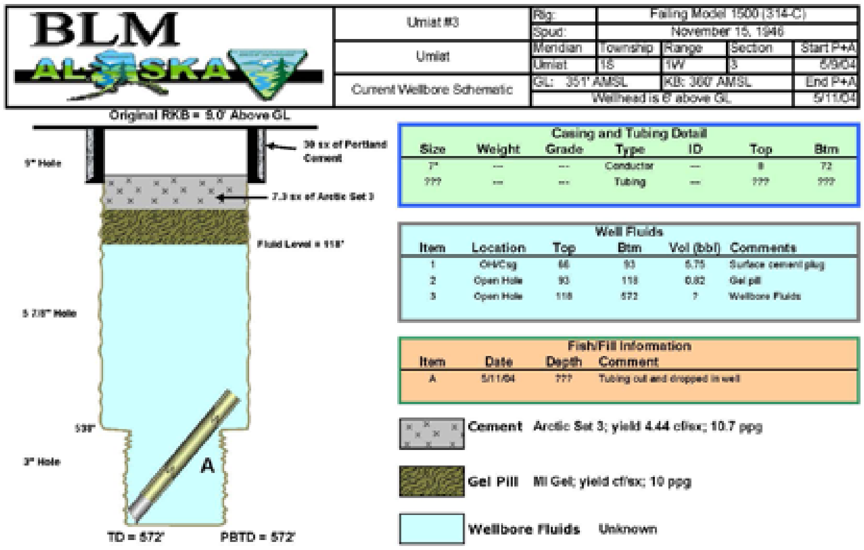


Figure 10: Umiat #3 wellbore diagram.

Umiat #4

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3878° N, -152.0789° W. The Umiat #4 site is less than one mile east of Umiat and 62 miles south/southwest of Nuiqsut. The last site visit was in July, 2012.

Site Description: The plugged Umiat #4 well is on top a hill above Umiat #3. The well is within 20 feet of a steep slope that leads down to Umiat #3 [**Figure 1**]. The area was disturbed during drilling, but is now revegetated by willows. There is no cellar. The use of cable-tool rigs did not require the excavation of a cellar. There was no drilling pad established for this well. Some bare ground remains around the well due to the exposure of rocky soil.

The only feature at the site is the well, which consists of an 11 ¾-inch diameter casing protruding 36-inch above the ground surface [**Figures 2-3**]. The casing is capped with a steel plate. Upon removal of the plate, the hole is open to the environment. No valves or gauges are present.

There is what appears to be production piping that connects from Umiat #4 pad down the hill to Umiat #3 [**Figures 4-5**]. A water type valve is attached to the piping near Umiat #4.

Surface Risk Assessment: Low

Justification: No known contaminants are present on the site. The Umiat #4 site is cleaned up of all solid wastes, except for the production pipe. There does not appear to be any effect to surface waters from Umiat #4. Umiat Lake, down the hill from Umiat #4 and adjacent to Umiat #3, is subject to a periodic, but natural oil seep.

Figure 1: View of Umiat #4 showing its proximity to the edge of the hill. Umiat Lake is the water body located in the upper right and the Colville River is in the upper left (June 2003).

Figure 2: Umiat #4 in its current condition (August 2010). The well was plugged to the surface in 2006 and the casing was left in place per an agreement between the BLM and the Alaska State Historic Preservation Office.

Figure 3: Gathering data prior to plugging the well in 2004 (June 2003).

Figure 4: 2-inch production pipe near Umiat #4 that leads back down the slope to Umiat #3 (June 2003).

Figure 5: The 2-inch pipe leading down the hill toward Umiat #3 (June 2003).

Figure 6: Umiat #4 is in the lower middle portion of the photo prior to plugging (April 2004).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Umiat #4 is on top of a small hill near the edge to the northeast of Umiat #3 and east of Umiat #8. The U.S. Navy drilled the well in May 1950 to a total depth of 840 feet using a cable-tool rig. Drilling encountered good oil shows around 300 feet with a total of 500 barrels produced (Collins and Bergquist 1958).

  Plugging operations began on May 7, 2004 [**Figure 6**]. The flange on the top of the well was opened, revealing a string of tubing and rods hanging from the bottom of the flange. The tubing and rods were cut at the surface and dropped into the hole. An interface meter showed the fluid level in the well was at 201 feet. To set the plug in the open hole, a water spacer with a viscous gel pill was pumped ahead of the cement. The cement plug was placed from 117 feet to surface. The top of cement was later tagged at 11 feet, and the flange was placed back on the well. Operations concluded on May 9, 2004. The well was marked with the well name and plugged date on the cap, but otherwise left in its original condition in accordance with an agreement established with the Alaska State Historic Preservation Office (SHPO).

- **Well Condition:** The well has a 117 feet column of cement to the surface [**Figure 7**].

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The hole bored through the Ninuluk, Chandler and Grandstand formations. Oil was found in the upper and lower sandstone of the Grandstand Formation.

Development Potential: Umiat #4 is plugged at the surface, but may need additional plugs before full-field development of the Umiat Oil Field.

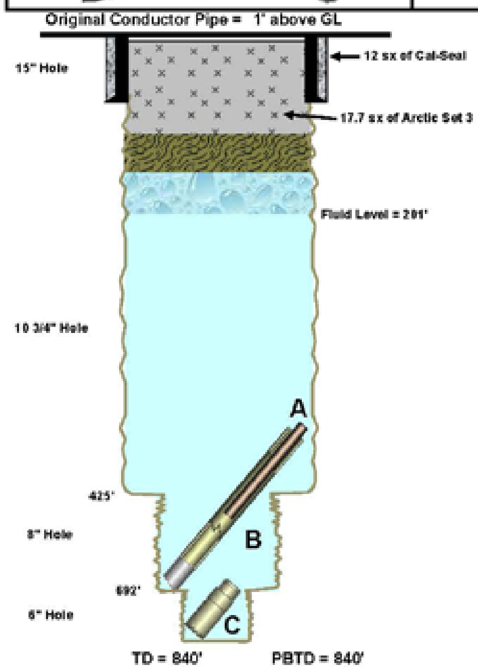
Groundwater Resource: None. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface as the well plugged at the surface. The surface casing is still in good condition.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

Umiat #4	Rig:	Bucyrus-Armstrong Cable Tool (29-W)				
	Spud:	May 26, 1950				
Umiat	Meridian	Township	Range	Section		Start P+A
	Umiat	1S	1W	3		5/7/04
Current Wellbore Schematic	GL: 482' AMSL		CP: 483' AMSL			End P+A
	Conductor Pipe 1' above GL					5/9/04



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
11 3/4"	---	---	Conductor	---	0	33
???	---	---	Tubing	---	???	???

Well Fluids

Item	Location	Top	Btm	Vol (bbl)	Comments
1	OH/Csg	11	70	13.96	Surface cement plug
2	Open Hole	70	102	3.33	Gel pill
3	Open Hole	102	201	11.90	Fresh Water
4	Open Hole	201	840	?	Wellbore Fluids

Fish/Fill Information

Item	Date	Depth	Comment
A	5/6/04	???	Rods cut and dropped in well inside tubing
B	5/8/04	???	Tubing cut and dropped in well
C	7/29/50	792	Cable Tool Fish

Cement Arctic Set 3; yield 4.44 cf/sx; 10.7 ppg

Gel Pill MI Gel; yield cf/sx; 10 ppg

Wellbore Fluids Unknown

Fresh Water

Figure 7: Umiat #4 wellbore diagram.

Umiat #6

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3778° N, -152.0917° W. The Umiat #6 site is less than 1 mile east of Umiat and 62 miles south/southwest of Nuiqsut. The last site visit was in July 2012.

Site Description: The well is located in wet tundra along the vast Colville River floodplain, about 300 feet from the river [**Figures 1-2**]. The well lies about 100 feet from a gravel spur road that connects the Colville River to the eastern edge of the Umiat airstrip. No drilling pad was ever established, but the tundra was heavily disturbed during drilling operations. The use of cable-tool rigs did not require the excavation of a cellar. The Navy removed the wellhead upon well completion, leaving behind 8 ⅝-inch casing at a height of 2.5 feet above ground level [**Figures 3-6**].

Two thermistor cables were added to the wellbore upon well completion in 1950 [**Figures 3-4**]. One 55-gallon drum was the only solid waste found on the site, and it was removed during the 2012 plugging operations [**Figure 6**].

Surface Risk Assessment: None

Justification: The Umiat #6 well site has been cleaned up of all solid wastes. There is no surface indication of a well site.

Figure 1: Aerial view of Umiat #6; the well was plugged in March 2012. The casing was cut off 3 feet below the Colville River center mudline depth and mounded with dirt (July 2012).

Figure 2: Aerial view of Umiat #6; the well was plugged in March 2012. The casing was cut off 3 feet below the Colville River center mudline depth and mounded with dirt (July 2012).

Figure 3: Umiat #6 prior to welding the hinged cover in 2004; two thermistors protrude from the open casing (June 2003).

Figure 4: Umiat #6 prior to welding the hinged cover in 2004; two thermistors protrude from the open casing (August 2002).

Figure 5: Umiat #6 after installation of the hinged cover plate and prior to plugging in 2012 ((June 2011).

Figure 6: Umiat #6 with a marker that was set in place to identify the well during the winter months; the drum to the right of the well was removed in 2012 (June 2006).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** The U.S. Navy spudded Umiat #6 in August 1950. The hole was drilled to a depth of 825 feet using a cable tool rig. Umiat #6 was cased to 35 feet and a 42-foot cement plug was placed on the bottom of the well to stop water influx from sands at the base of the permafrost (Collins and Bergquist 1958).

  A hinged cover plate was fabricated and installed in April 2004. Umiat #6 was plugged in March 2012. The ice plug was melted from downhole and a column of cement was placed from the total depth of 825 feet to the surface. No problems were encountered.

- **Well Condition:** The open casing with a hinged cover plate was removed when the well was plugged. The wellbore was filled with cement from a depth of 415 feet to the surface. The casing was cut off 3 feet below the Colville River center mudline depth and mounded with dirt prior to leaving the site [**Figure 7**].

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The Umiat #6 well was drilled to test the southern limits of the Umiat anticline. Very poor oil shows were encountered in the Killik Tongue (Chandler Formation) and productive sand was found in the upper Grandstand Formation. Oil recovered in open-hole pumping tests was produced at rates averaging 53 barrels of oil per day. Insufficient energy exists in the reservoir for the well to flow to surface. Major caving of the hole occurred and the well was backfilled with mud (Collins and Bergquist 1958).

Development Potential: Umiat #6 is properly plugged and will not affect any future development in the Umiat area.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface around the well, as it is plugged.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

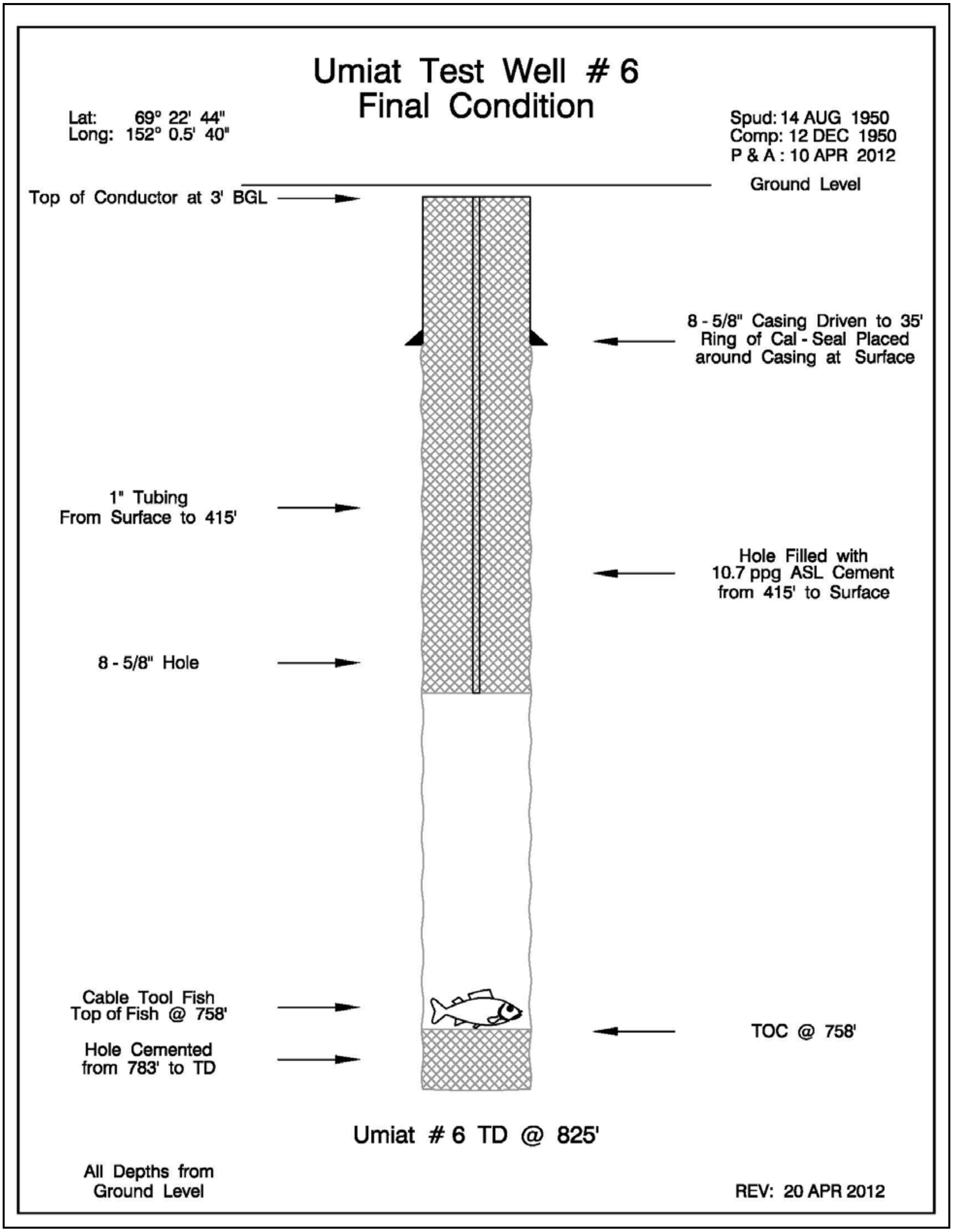


Figure 7: Umiat #6 wellbore diagram.

Umiat #7

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3747° N, -152.1014° W. The Umiat #7 site is less than 1 mile east of Umiat and 62 miles south/southwest of Nuiqsut. The last site visit was in July 2012.

Site Description: Umiat #7 was drilled in an open, wet, grassy area [**Figure 1**]. It is unclear whether the wet grasses were the original vegetation type before the area around this well was disturbed during drilling operations. No drilling pad was ever established, and no cellar was ever built. Prior to plugging, the only feature at the site was the well, which consisted of open 6 ⅝-inch casing (with collar), clamped inside a 11 ¾-inch casing [**Figures 2-3**]. The open casing was cut off 30 inches above ground level. A drum was split open and placed over the open 11 ¾-inch casing.

Surface Risk Assessment: None

Justification: The Umiat #7 well site has been cleaned up of all solid wastes. There is no surface indication of a well site.

Figure 1: Umiat #7 (September 2002).

Figure 2: Umiat #7 prior to welding a cover for the open casing (June 2003).

Figure 3: Umiat #7 prior to plugging; the hinged plate cover was installed in April 2004 (July 2010).

Figure 4: Aerial locator of Umiat #7. This photo shows the mound of soil left in place after the well was plugged the previous winter (July 2012).

Figure 5: Umiat #7 was plugged and abandoned in March 2012; upon completion, the casing was cut, an identification plate was welded in place, and dirt was mounded over the top (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** the U.S. Navy drilled the Umiat #7 well in 1951 to a depth of 1,384 feet using a cable-tool drilling rig. It was cased to 1,196 feet and completed as a dry hole. It was the southernmost well drilled on the Umiat anticline. The objective was to further delineate the southern extent of the producing field (Collins and Bergquist 1958)

  In 2004, a hinged cover plate was fabricated and placed over the open hole of the well casing.

  Umiat #7 was plugged and abandoned in March 2012. The ice plug was melted from downhole and a column of cement was placed from total depth to the surface. No problems were encountered.

- **Well Condition:** The well was plugged in March 2012. Cement was placed downhole from a depth of 340 feet to the surface [**Figure 6**]. The open casing, cut drum, and hinged cover plate were removed. The casing was cut off 3 feet below the Colville River center mudline depth and mounded with dirt prior to leaving the site [**Figures 4-5**].

- **Wellhead Components:** There is no wellhead at this site.

Geologic Setting: The well encountered residual hydrocarbons in the Chandler and Grandstand formations. Such small quantities of oil were recovered in bailing tests that the oil was measured in gallons instead of barrels. The small amount of crude recovered in each test is indicative of residual oil staining. The sands encountered in Grandstand are downdip of the productive reservoir and is water-bearing. Minor gas shows were encountered at 260 feet (Collins and Bergquist 1958).

Development Potential: Umiat #7 is properly plugged and will not affect any future development in the Umiat area.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface around the well, as it is plugged.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

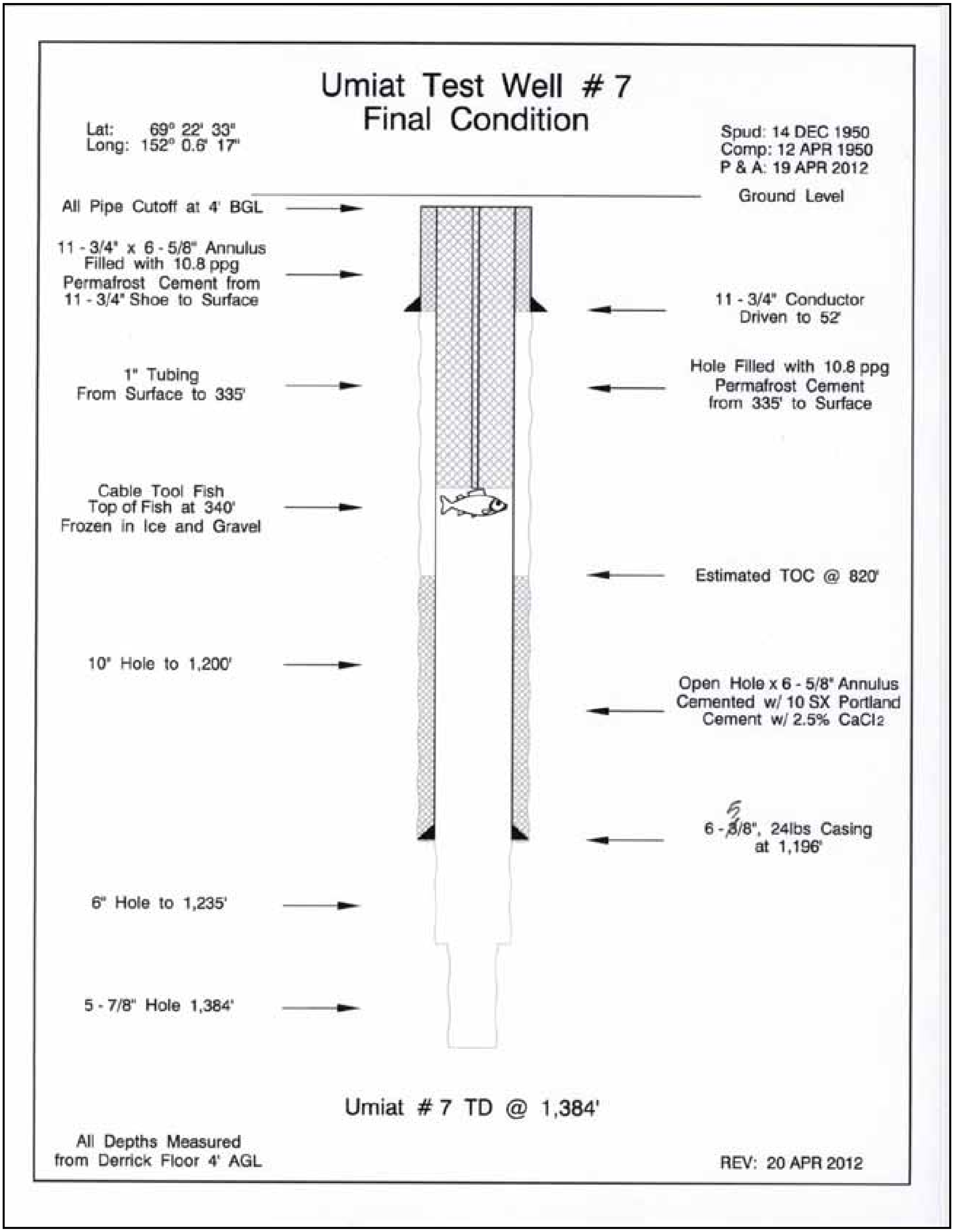


Figure 6: Umiat #7 wellbore diagram.

Umiat #8

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3986° N, -152.1147° W. The site is located less than 2 miles north of Umiat and 61 miles south/southwest of Nuiqsut. The last site visit was in July 2012.

Site Description: The site is located on top of a ridge that separates Umiat from the Bear Paw Creek valley [**Figure 1**]. No drilling pad was ever established, and Umiat #8 was drilled using a cable tool rig, resulting in no need for a cellar. Regrowth around the site has been slow, consisting primarily of patchy willows and a few non-native species. The wellhead is the primary feature at the site and stands about 10 feet above the ground surface [**Figures 2** and **3**].

There is an old stock tank approximately 75 to 100 feet from the plugged well that was likely used to capture produced oil from the well [**Figure 4**]. Weathered 2-inch piping leads from near the wellhead to the tank. No other features are present at the site.

Surface Risk Assessment: None

Justification: The Umiat #8 well site has been cleaned up of all surface debris.

Figure 1: Aerial view of Umiat #8 in June 2004, a little more than a month after plugging operations ceased (June 2004).

Figure 2: Gravelly soils dominate the immediate area around the Umiat #8 well (July 2012).

Figure 3: Umiat #8, known as the whistling well due to the constant gas seeping from various locations on the wellhead (July 1996).

Figure 4: Overview of Umiat #8 and the empty stock tank; the buildings of Umiat are visible between the edge of the hill and Colville River in the upper right of the photo (July 2012).

Figure 5: Gas bubbles are visible inside the collar on the Umiat #8 wellhead (August 2002).

Figure 6: Building the snow pad to support plugging operations at Umiat #8 (May 2004).

Figure 7: The snow pad at Umiat #8 after it is completed and ready for plugging operations (May 2004).

Figure 8: Conex containers and an enclosed plywood shack were constructed around the Umiat #8 wellhead (May 2004).

Figure 9: Inside the plywood shack that supported plugging operations for Umiat #8 (May 2004).

Figure 10: Umiat #8 wellhead 8 years after plugging occurred in 2004 (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Umiat #8 was spudded in May 1951 and completed in August 1951. The hole encountered good gas shows, and the well was shut in with a gas pressure of 275 pounds per square inch (psi). The gas was analyzed by the Bureau of Mines and determined to be 97.3 percent methane. Brine was mixed (35 lbs of salt per barrel of water) and used in the drilling fluid to prevent freeze up. Brine solution of approximately the same ratio of salt per barrel of water was used to kill the well and set the plug while cementing casing. A total of 21,695 lbs of salt were used in the well (Collins and Bergquist 1958).

  Known locally as the whistling well, Umiat #8 was plugged in April 2004. Initially, the well had 250 psi of pressure and was leaking from multiple fittings and valves, with the largest leak occurring just above the top flange where a 4-inch nipple and collar were welded together [**Figure 5**]. A considerable amount of preparation went into setting up the well site, including the building of a 6 feet tall snow pad to access the well [**Figures 6-9**]. Utilizing a cement mixer, pump, and soft lines connected to the wellhead, plugging operations commenced with the melting of a small surface ice plug. Following the removal of the ice plug, a 378 feet cement plug was set by bullheading cement to the bottom of the well. A 93 feet plug was set in the tubing annulus at the surface, and a 287 feet plug was set in the tubing at the surface. Prep work started on Apr. 22, 2004, and ended with the completion of plugging operations on May 2, 2004.

  Upon completion, the wellhead was left intact [**Figure 10**], in accordance to an agreement with the BLM and the Alaska State Historic Preservation Office (SHPO).

- **Well Condition:** The well is properly plugged [**Figure 11**].

- **Wellhead Components:** The original wellhead and components were left in place due to their potential historic significance. A technical description of the wellhead is as follows (from ground level up):

  - 53 inches of 11 ¾-inch casing to clamp
  - 8 ½-inch casing with flange welded on (8 x ¾-inch studs), 2-inch wing valve below flange, with bull plug and T to nipple to Nordstrom Valve (C5319) to nipple and elbow (open)
  - Between flanges 2 wing valves Walworth (DD 500, WOG 4892), one side has bull plug and other side has 90 to nipple to swedge to gauge
  - Top flange (8 x 1-inch studs)
  - 4-inch welded, nipple and collar
  - nipple and T, Lunkenheimer 1000 PSI (2-350) to needle valve and gauge
  - From top of T, 2 x 3-inch swedge to 3-inch Walworth Gate Valve (DD 500, 4390) to 3-inch nipple, ball valve, and plug with needle valve

Geologic Setting: The well was drilled to determine the quality and quantity of hydrocarbons in the Grandstand Formation near the crest of the anticline structure. The Grandstand Formation produced approximately 60 to 100 barrels per day of oil and more than 6 million cubic feet per day of gas. Other formations encountered included the Seabee, Ninuluk, and Chandler.

Development Potential: Umiat #8 is plugged, so it will not affect any future development in the Umiat area.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface around the well, as it is plugged.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

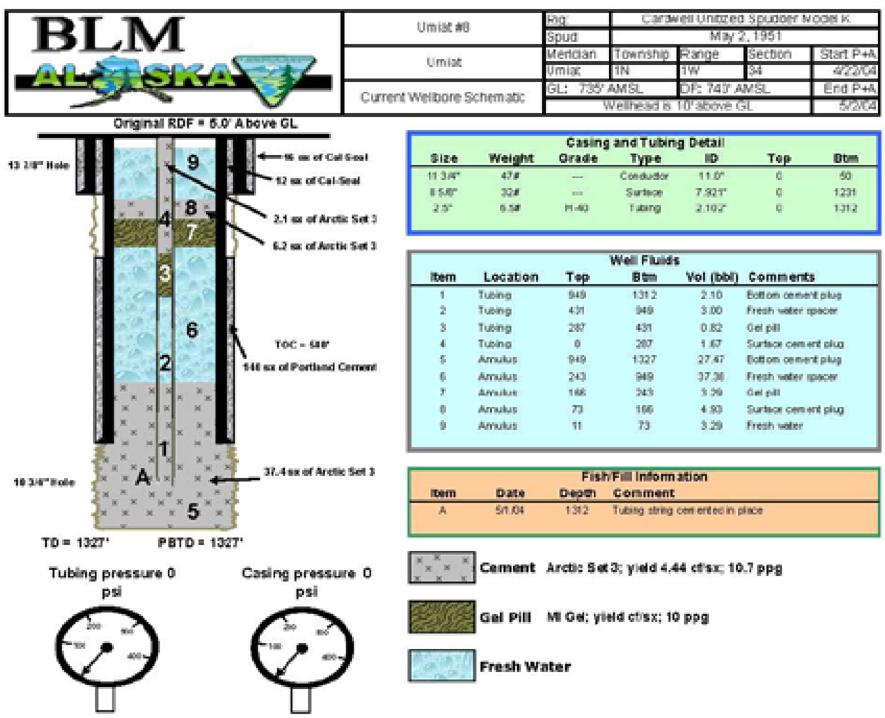


Figure 11: Umiat #8 wellbore diagram.

Umiat #9

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3864° N, -152.1667° W. The site is less than 2 miles north of Umiat, and 61 miles south/southwest of Nuiqsut. The last site visit was in July 2012.

Site Description: Umiat #9 is located about halfway up the hill from Seabee #1 and Umiat #10. It is adjacent to a small intermittent drainage that is currently undergoing cleanup for PCB contamination. A gravel pad was not created as was common with early U.S. Navy drilling; nor is there a cellar around the well. The only feature at the site is the well and wellhead, standing about 6 feet above the ground surface [**Figure 1**]. Some wooden planks were found around the well (which have since been removed during the plugging operation, as well as a pile of drilling muds directly to the north of the well that are devoid of vegetation.

Surface Risk Assessment: High

Justification: The extent of the PCB contaminants has been identified and cleared by the U.S. Army Corps of Engineers (USACE), beginning in 2009 [**Figures 9-12**]. This well is ranked high because of the contaminants. There are no solid wastes present.

Figure 1: Umiat #9 prior to any remediation work or plugging operations (June 2003).

Figure 2: USACE conducting winter cleanup operations at Umiat #9 (March 2011).

Figure 3: BOP test arrangement prior to plugging at Umiat #9 (April 2011).

Figure 4: Umiat #9 wellbore cemented prior to welding identification plate (April 2011).

Figure 5: Identification plate after welding it on top of the casing (April 2011).

Figure 6: Cutting off the base of the wellhead casing in preparation of re-welding the wellhead to the identification plate (April 2011).

Figure 7: The final task prior to abandonment was filling in the hole to cut off the casing and mounding the dirt in anticipation of settling (April 2011).

Figure 8: Umiat #9 is plugged and abandoned, with the wellhead left in place (July 2012).

Figure 9: Umiat #9, 2 years prior to plugging; USACE began their PCB cleanup operation in 2009 (April 2009).

Figure 10: Stripped vegetation and soil removal around the wellhead after the second winter of PCB removal at Umiat #9; the well was plugged 3 months prior to this photo. The mounded material around the wellhead has not yet settled (June 2011).

Figure 11: The USACE is cleaning up PCB-contaminated soils around Umiat #9.

Figure 12: Ground view of the wellhead and PCB recovery area (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Umiat #9 was spudded in June 1951 and completed in January 1952 by the U.S. Navy. The well was drilled with a Failing rotary rig and mounted on a welded steel sled placed on 12x12 inch timbers. The well is cased to a depth of 1,257 feet. The purpose of the well was to determine the western extent of the producing field. It was also the first hole in which oil-based muds were used in the Umiat area (Collins and Bergquist 1958). Umiat #9 is about a half-mile to the northeast of the Seabee pad.

  In 2003, the U.S. Army Corps of Engineers took samples at Umiat #9 that indicated elevated levels of diesel range organics (DRO), residual range organics (RRO) and PCBs around the work area for Umiat #9 (U.S. Army COE 2003).

  The BLM coordinated with the USACE to help alleviate the mobilization and demobilization costs. The responsibility of the BLM was to plug and abandon the well, while USACE removed PCB-contaminated soils within the Umiat area, including soils around Umiat #9. Plugging operations commenced Mar. 25, 2011, and were completed Apr. 4, 2011 [**Figures 2-7**]. The wellhead was cut 5 feet below ground level so an abandonment marker plate could be installed, then the original wellhead was welded back in place [**Figure 8**] as per an agreement between the BLM and the Alaska State Historic Preservation Office.

- **Well Condition:** Umiat #9 is adequately plugged with an abandonment marker welded on 5 feet below the surface [**Figure 13**]. The historic wellhead assembly was then welded back into place. The USACE continues to conduct removal and remediation of PCB-contaminated soils downhill from the well.

- **Well Components:** The wellhead is equipped with two bull plugs, a flange and a 2 ¾-inch nipple, standing at approximately 5½ feet above ground level (AGL).

Geologic Setting: The drill hole penetrated several known oil and gas formations: Ninuluk, Chandler, Grandstand and Topagoruk. Hydrocarbon shows were prevalent within both the Grandstand and the Topagoruk formations. Multiple sands were perforated and tested. Production exceeded 217 barrels per day, thus seemingly showing the benefit of using an oil-based mud. The muds, however, did not allow the different formations to be distinguished. Cement was used in an attempt to plug back and isolate individual formations. Samples were taken and sent to a Bureau of Mines lab where the amount of chemical tracer used during drilling and found in the samples was measured and the various sandstone samples examined.

This allowed a study of the different lithologies to be conducted. The tracer Aroclor was used in the well, introducing PCB contamination. The well was allowed to flow for 7 weeks at 200 barrels per day prior to shutting it in (Collins 1958).

Development Potential: Umiat #9 is properly plugged and will not affect any future development in the Umiat area.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Freshwater aquifers do not exist.

Other Information: There has been no indication of hydrocarbons leaking to the surface around the well as it is plugged.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

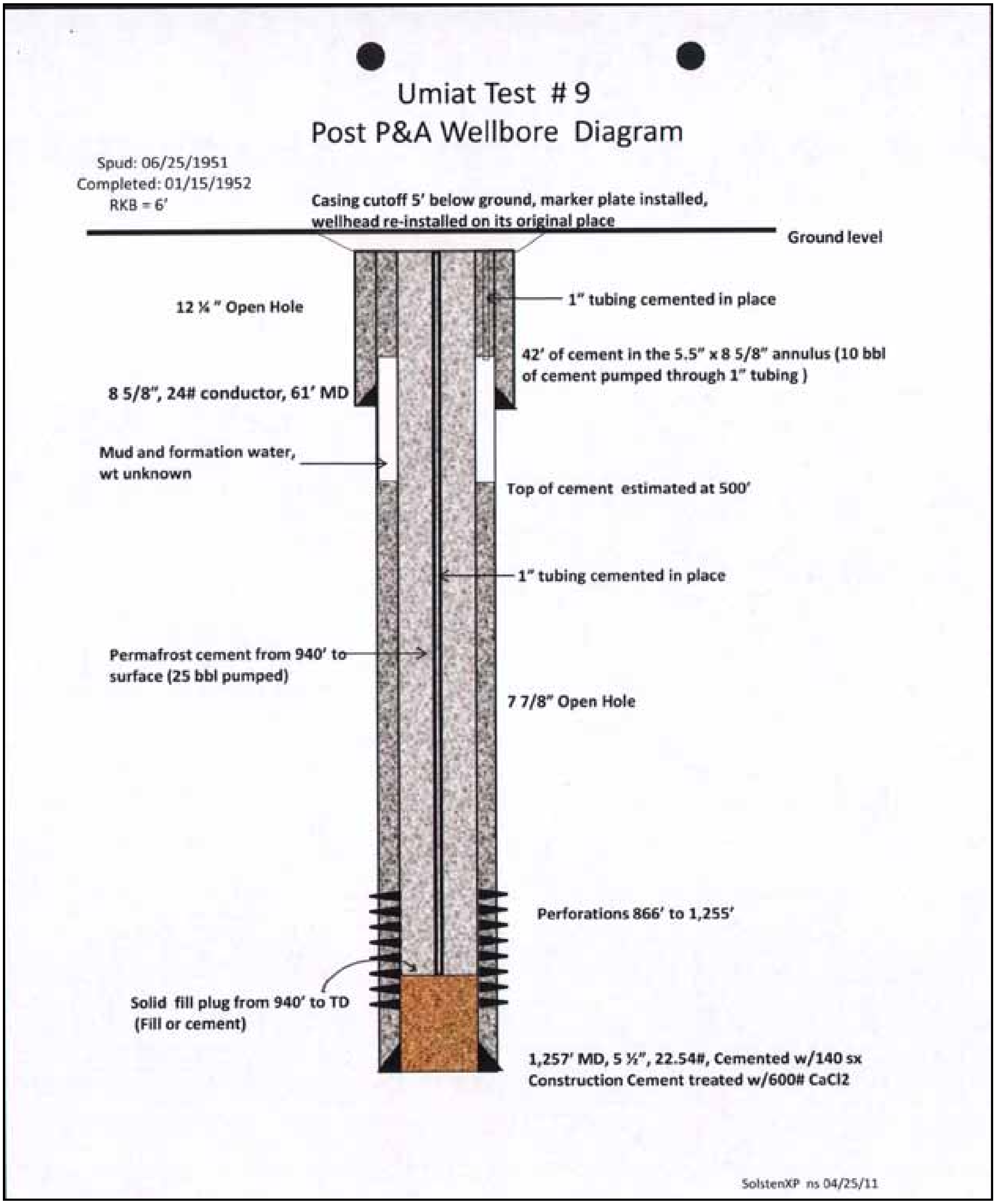


Figure 13: Umiat #9 wellbore diagram.

Umiat #10

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.4003° N, -152.1169° W. The Umiat #10 site is 2 miles north of Umiat and 61 miles south/southwest of Nuiqsut. The last site visit was in July 2012.

Site Description: Umiat #10 is located on top of a ridge that separates Umiat from the Bear Paw Creek valley [**Figures 1-2**]. A small pond exists next to the wellhead, most likely the result of thawing tundra. There was no drilling pad established for this well, nor a remaining cellar. The only feature at the site is the well and wellhead, with a casing measuring 8 ⅝-inches that is open at the top and stands about 10 feet above the ground surface [**Figures 3-5**]. There are no other features or surface debris around the well.

Surface Risk Assessment: None

Justification: The Umiat #10 site has been cleaned of surface debris.

Figure 1: Aerial view of Umiat #10 as it appears 8 years after plugging operations (July 2012).

Figure 2: Umiat #10 two months after plugging operations (July 2004).

Figure 3: Umiat #10 prior to revegetation and the occurrence of ground settling around the wellhead (July 1976).

Figure 4: Umiat #10 prior to plugging operations (June 2003).

Figure 5: Umiat #10 prior to plugging operations (September 2002).

Figure 6: Umiat #10 prior to plugging operations (April 2004).

Figure 7: Creating the snow pad at Umiat #10; the bulldozer is pulling a drag bar to flatten the surface (May 2004).

Figure 8: Plugging operations at Umiat #10 (May 2004).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Umiat #10 was spudded in September 1951 and completed in January 1952. This well was drilled to test the Umiat anticline and is located about a half-mile northwest of Umiat #8. Total depth of the well is about 1,573 feet. When the well was bailed, it produced 222 barrels of oil in a 24-hour time span. The hole was somewhat problematic, as it caved considerably during drilling. Operations consisted of a drill rig set on a foundation of 12x12 timbers with a thin layer of gravel in-between (Collins and Bergquist 1958).

  Following the successful plugging of Umiat #8, operations were moved to Umiat #10. Twenty-five pounds of salt mixed with Aquagel and water (per barrel) were used downhole to help lubricate the drill bit above the 650 feet marker (from the surface). More Aquagel-brine mud was added down to about 1,000 feet to keep the hole from caving.

  This well was plugged May 6, 2004 [**Figures 6-8**]. Plugging operations started with the melting of a surface ice plug. The wellbore was much different than that of Umiat #8 because it was an exploratory oil well that had low reservoir pressure, which prevents the well fluids from flowing to surface. The fluid level was several hundred feet below ground surface. An inflatable bridge plug was run into the well to 100 feet and inflated with nitrogen. A cement plug was set on top of the plug to just a few feet below ground surface.

  The wellhead was left in place as per a prior agreement with the Alaska State Historical Preservation Office (SHPO).

- **Well Condition:** The well is properly plugged [**Figure 9**].

- **Wellhead Components:** The wellhead contains two valves, a master and a gate.

Geologic Setting: The most productive layers occurred at 980 feet and 1,095 feet, penetrating both the Ninuluk and Grandstand Formation. The Seabee and Chandler formations were also encountered downhole (Collins and Bergquist 1958).

Development Potential: Umiat #10 is properly plugged, so it will not affect any future development in the Umiat area.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

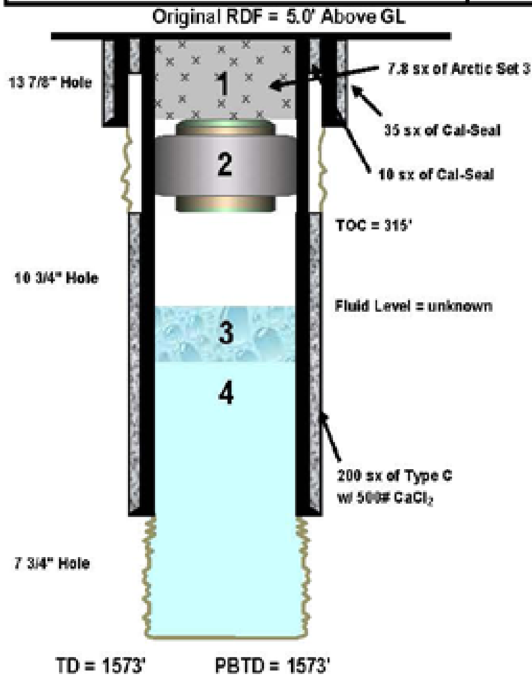
Other Information: There has been no indication of hydrocarbons leaking to the surface around the well, as it is plugged.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

BLM ALASKA

Umiat #10	Rig:	Cardwell Unitized Spudder Model K				
	Spud:	September 9, 1951				
Umiat	Meridian	Township	Range	Section	Start P+A	
	Umiat	1N	1W	33	5/1/04	
Current Wellbore Schematic	GL: 741' AMSL		DF: 746' AMSL		End P+A	
	Wellhead is 10' above GL				5/6/04	



Casing and Tubing Detail

Size	Weight	Grade	Type	ID	Top	Btm
?"	---	---	Structural	---	0	?
11 3/4"	---	---	Conductor	---	0	70
8 5/8"	---	---	Surface	---	0	1339

Wellbore Items

Item	Location	Top	Btm	Vol (bbl)	Comments
1	Casing	0	100	6.16	Surface cement plug
2	Casing	100	105	---	Inflatable Bride plug
3	Casing	? Unknown ?		---	Circulating Brine
4	OH/Csg	? Unknown ?		---	Wellbore Fluids

Fish/Fill Information

Item	Date	Depth	Comment
			Not Applicable

Legend		
Cement	Arctic Set 3; yield 4.44 cf/sx; 10.7 ppg	
Wellbore Fluids	Unknown	
Fresh Water		

Figure 9: Umiat #10 wellbore diagram.

Umiat #11

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.1239° N, 152.0972° W. The Umiat #11 site is 4 miles northeast of Umiat. The last site visit was in July 2012.

Site Description: The drilling area is approximately 50 feet to the east of Bear Paw Creek in the alluvial plain **[Figure 1]**. The creek lies in a small valley consisting primarily of willows and tussock tundra. The main feature at the site is a 10 ¾-inch open-ended well casing with a collar sticking up inside a 30-inch conductor that is filled with water **[Figures 2-4**]. A drilling pad was never created, as operations consisted of mounting the drill rig on a sled and then placing it on top of large timbers that were secured to pilings. According to records, an 8-foot by 8-foot concrete cellar was constructed 4 feet in depth (Collins and Bergquist 1958). The cellar has either been overgrown with vegetation to the point it is no longer visible, or it was removed, as there is no indication of it at the site.

Debris, including wooden planks, wood pilings, rig anchor, and pipe, can be found around the well in a roughly 50-foot diameter radius **[Figures 2-6]**. Thermistor cables are lying on the ground next to the well **[Figure 4]**. A pile of unvegetated drilling muds is present 30 feet west of the open casing, between the well and Bear Paw Creek **[Figure 5]**. It appears that something was burned on top of the mud pile, given the large number of rusted nails scattered over its surface.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the site. There does not appear to be any effect to Bear Paw Creek from Umiat #11. The site is not under threat due to erosion or other natural processes. There is a minor amount of solid waste on site and it does not pose a travel risk to local residents.

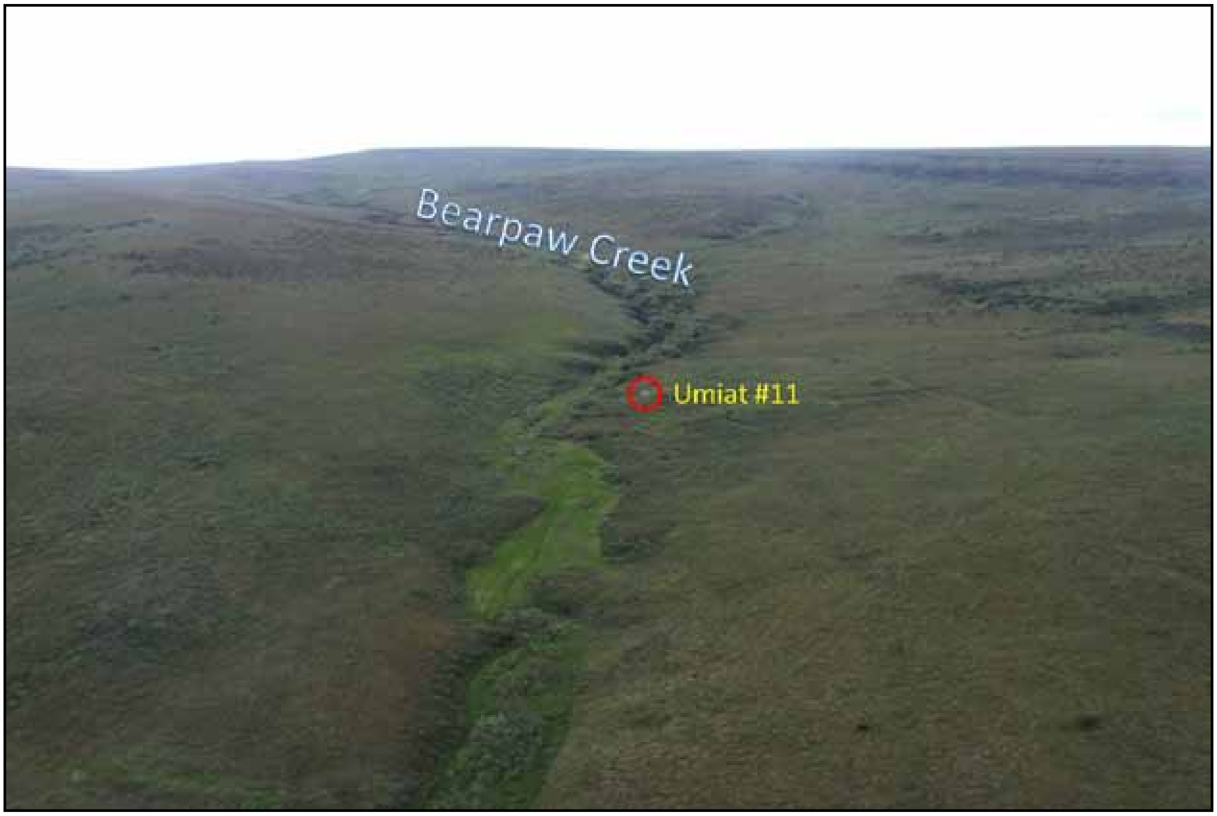


Figure 1: Aerial view showing the location of Umiat #11.

Figure 2: Umiat #11 with drilling muds and Bearpaw Creek (behind the muds) (2002).

Figure 3: Open casing at Umiat #11; there is no indication of a concrete cellar.

Figure 4: Thermistor cable laying on the ground next to the Umiat #11 well.


Figure 5: Drilling muds with a black residue and rusty nails on top of the clay at Umiat #11.


Figure 6: Rig anchor with Umiat #11 (upper center of photo) and wood pilings.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Umiat #11 was spudded in June 1952 and completed 2 months later. It reached a total depth of 3,303 feet, with 486 feet cased. One cement plug was placed at 440 feet. The objective was to test production possibilities of the Grandstand Formation on a fault that parallels the Umiat anticline. It is the most northerly test hole on the Umiat anticline (Collins and Bergquist 1958).

- **Well Condition**: Umiat #11 consists of 10 ¾-inch open-ended well casing with a collar sticking up inside a 30-inch conductor that is filled with water **[Figure** 7]. There does not appear to be any corrosion to the casing.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: The well encountered residual hydrocarbons in the Seabee, Ninuluk, and Grandstand formations, but no oil or gas was recovered during production tests. The sands of the Grandstand were outside the productive area encountered by other Umiat wells, which are more than 1 mile to the south. Umiat #11 is the only Umiat well to penetrate the Prince Creek Formation (Collins and Bergquist 1958).

Development Potential: The tract is located on an active oil and gas lease, but there is little possibility of the well interfering with future development due to its location outside the Umiat structure.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost is approximately 770 feet deep at this location. Freshwater aquifers will not be found in the permafrost zone.

Other Information: There is no indication of hydrocarbon escapement at or near the well. Umiat #8 is 0.6 miles to the west.

Subsurface Risk Assessment: Low

Justification: Umiat #11 encountered residual hydrocarbons, but are located below the cement plug. The wellbore was filled with muds and has subsequently frozen.

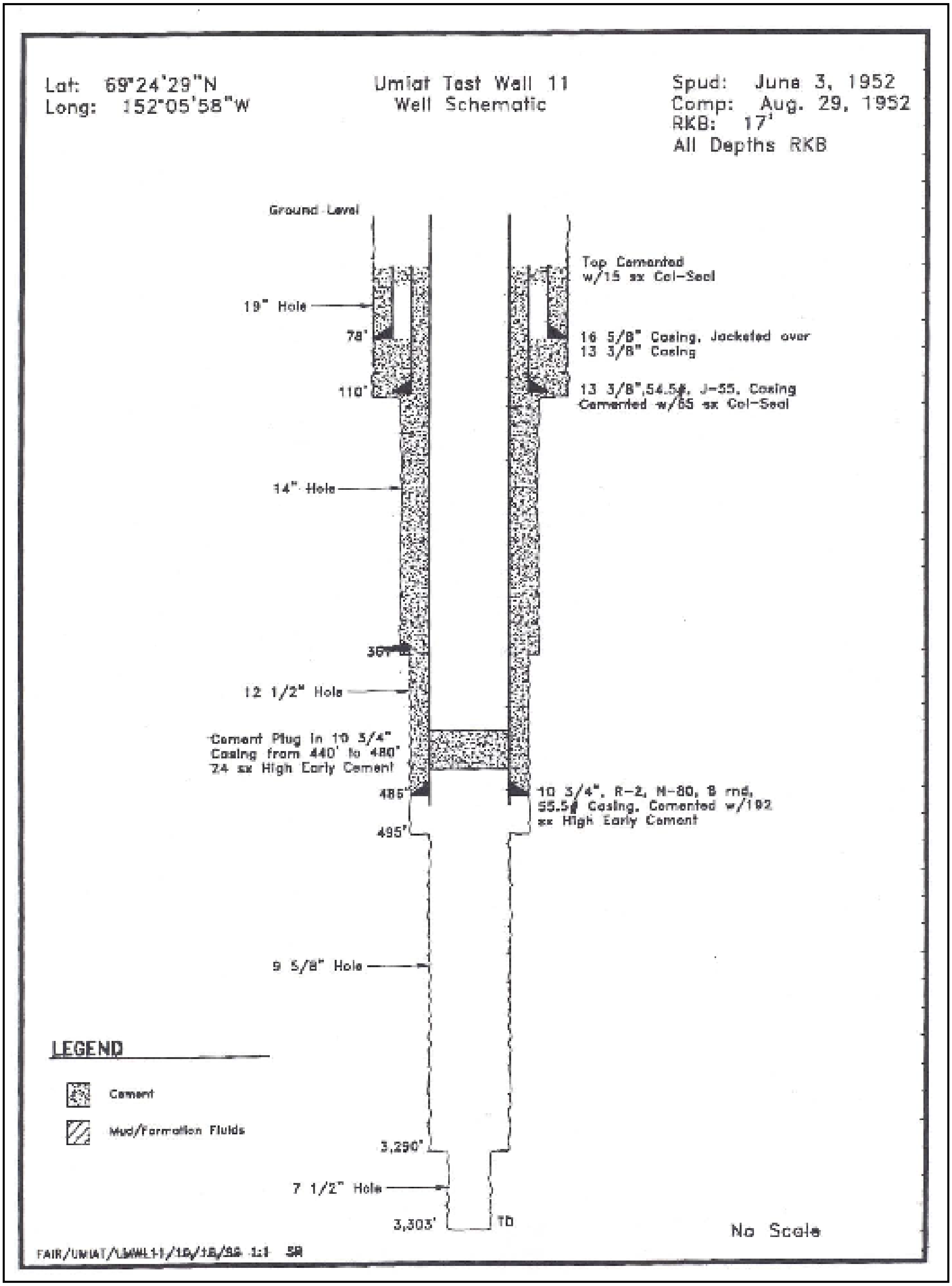


Figure 7: Umiat #11 wellbore diagram.

W.T. Foran #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 70.8322° N, -152.3031° W. W.T. Foran #1 is 52 miles northwest of Nuiqsut and 108 miles east/southeast of Barrow. The last visit was in July 2010.

Site Description: W.T. Foran #1 [**Figure 1**] is located along the coast near the geographical feature known as Cape Halkett. The well site is less than 500 feet from the Beaufort Sea; however, the coastline near the well appears to be an area of deposition [**Figure 2**]. Bluff height varies from zero to 3 feet at this location.

Husky drilled the W.T. Foran #1 under contract to the USGS in 1977. The BLM transferred these lands to the Arctic Slope Regional Corporation (ASRC) as part of the Cape Halkett land exchange in December 1981. After the land exchange, ASRC authorized Chevron in 1982 to drill the Livehorse #1 well on the same pad as W.T. Foran #1. When Livehorse #1 completed, Chevron removed the wellhead for W.T. Foran #1 and placed a well abandonment marker.

The edges of the drilling pad are settling into the surrounding tundra surface. Years of the freeze-thaw cycle has opened up cracks in the pad, creating polygonal ground, which is natural in this area. Some of the pad has revegetated with mostly grasses, sedges, and lichens since the completion of the Livehorse #1 well. There were not any common non-native vegetation species (i.e., invasive weeds) growing on the pad. Husky Oil constructed the cellar, and Chevron removed the W.T. Foran #1 wellheads.

The original reserve pit berms have thawed along the margins, creating cracks consistent with the surrounding polygonal-patterned ground. Surface waters are allowed to mix with reserve pit waters. A smaller reserve pit was constructed for Livehorse within the original W.T. Foran pit [**Figure 1**]. The majority of the new pit has been filled with dirt, and the berms are still intact.

The flare pit has been breached at several locations so that surface waters move freely between the flare, W.T. Foran reserve pit, and the surrounding polygon wedges.

The abandonment marker for the Livehorse #1 well location is knocked over [**Figure 3**]. A seismic vehicle likely caused this to happen when conducting winter seismic work. In 2002 Livehorse #1 is seen upright and undisturbed [**Figure 4**].

Surface Risk Assessment: None

Justification: There are no known contaminants on the site. Despite its proximity to the Beaufort Sea, the low bluff and areas of sediment deposition indicate the coastline may be advancing slowly or not at all toward the WT Foran #1 well site. There is little to no solid waste on site and it does not pose a travel risk to local residents or impact visual resources. W.T. Foran #1 is outside of the BLM's jurisdiction.

Figure 1: Aerial view showing the WT Foran #1 and Livehorse #1 wellheads location, reserve pit, and drilling pad (July 2010).

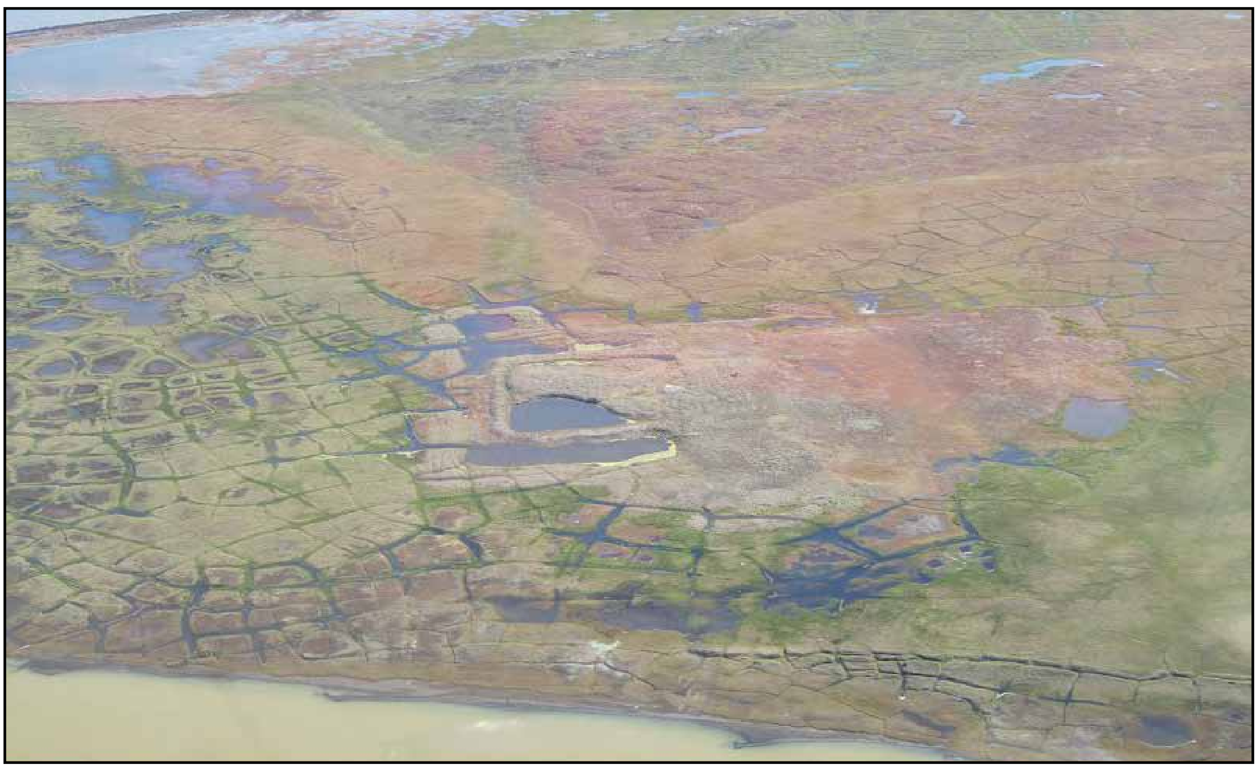


Figure 2: Another aerial view of WT Foran #1 and Livehorse #1, showing the deposition of sediments along both shorelines (upper and lower portions of the photo); Cape Halkett is just off the left portion of the image (July 2010).

Figure 3: Image showing the fallen Livehorse #1 abandonment marker and the WT Foran #1 marker (July 2010).

Figure 4: The Livehorse #1 and W.T. Foran #1 abandonment markers were both upright in this August 2002 photo.

SUBSURFACE INFORMATION:

Well Information:

- **Well History**: W.T. Foran #1 was drilled in 1977 to a total depth of 8,820 feet. It was cased down to 7,587 feet. and plugged back to the surface (Husky Oil 1983). W.T. Foran #1 is on Arctic Slope Regional Corporation (ASRC) land. Husky drilled the W.T. Foran #1 well in 1977, under contract through the USGS, to a total depth of 8,864 feet. Five plugs were set, including a surface plug, in 1977 **[Figure 5]**.

- **Well Condition**: W.T. Foran #1 and Livehorse #1 are both plugged and abandoned.

- **Wellhead Components**: There is no longer a wellhead at this site.

Geologic Setting: The primary objective of the WT Foran #1 well was to determine if hydrocarbons were present within the Sadlerochit and Lisburne Groups. Gas shows encountered showed only trace amounts in the Ivishak Formation and the Lisburne and Endicott Groups. Poor to good oil shows were discovered in the Ivishak Formation and the Lisburne Group. A drillstem test of the Lisburne Group recovered 22 barrels of oily water. Oil and trace gas were also recovered within the Ivishak Formation (Gyrc 1988).

Development Potential: The BLM does not manage the surface and subsurface, as they now belong to the ASRC. Development potential is likely low, given the remoteness of the area. As Livehorse #1 is on private land, its drilling results were not released to the public.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at this location. **Livehorse #1** is a private well and a copy of the wellbore diagram is not included in this report.

Subsurface Risk Assessment: None

Justification: The well has been adequately plugged per Federal regulations.

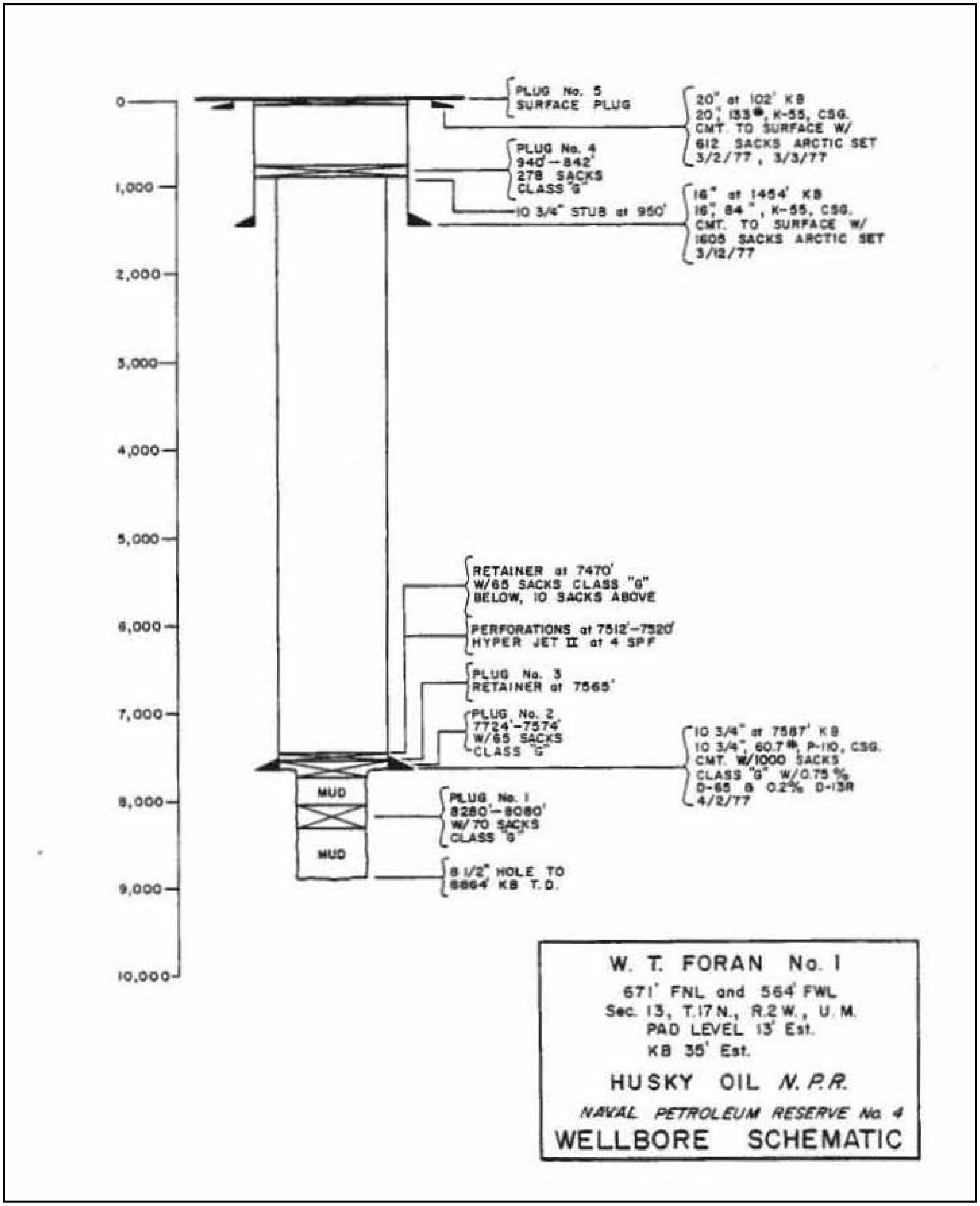


Figure 5: W.T. Foran #1 wellbore diagram.

West Dease #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 71.1592° N, -155.6307° W. The West Dease #1 site is 27 miles southeast of Barrow and 63 miles northeast of Atqasuk. The Tulageak #1 well site is approximately 3 miles to the northwest. The last West Dease #1 site inspection was in July 2012.

Site Description: The West Dease #1 site consists of a well located in a constructed wooden cellar, a pad, and a reserve pit. **[Figure 1-3]** Husky Oil drilled the well under contract with the USGS in 1980. The cellar is constructed of wooden 2x12s on 12x12-inch wood beams, and is in good condition. The cellar is filled with water. The 13 ⅜-inch rat hole is located inside the cellar and is open to the environment. There is a light sheen on the water in the rat hole, but the sheen appears to be organic in origin as it splits apart when touched. A 13 ⅜-inch mouse hole is present outside the casing and is also open to the environment. **[Figures 4-5]**

Primarily silty clay materials gathered from excavating the reserve pit were heaped on top of the tundra to create the thin drilling pad. Revegetation occurred naturally and now encompasses roughly 70 percent of the pad. Drilling muds are stacked up in small piles in two separate locations on the pad. Arctic fox appear to have taken up residence in the unvegetated material [**Figure 6**]. There does not appear to have been much settling to the pad, as the pilings that were cut off at ground level upon cessation of drilling operations are barely visible in 2012.

The reserve pit and flare pit are now connected by a small body of water that resulted from the ground thawing [**Figures 7-8**]. Both pits have been subject to thawing as well, and they mix with the shallow waters of the adjoining polygonal ground. The area around West Dease #1 is basically flat, as there is very little topographic relief. The landscape is a combination of wet, patterned ground and thaw lakes of varying sizes. The soil is thin with permafrost close to the surface. The pad is approximately ¾-mile from the coastline.

Surface Risk Assessment: Moderate

Justification: The wellsite is being closely monitored for coastal erosion. There are no known contaminants present on the West Dease #1 site. There are numerous large thaw lakes in the vicinity of the well. Additionally, a small developed stream meanders within several hundred feet of the wellhead. There does not appear to be any threat of capturing the reserve pit from erosion. The stream does not appear to move around much, as oxbow lakes or meander scars are not present. Additionally, there does not appear to be any effect to surface waters from West Dease #1. The Alaska Department of Environmental Conservation sampled the reserve pit and closed it in its current condition in 1995.

Figure 1: West Dease #1 is approximately ¾-mile from the Beaufort Sea (July 2012). The reserve and flare pits are highly visible in the center of the photo.

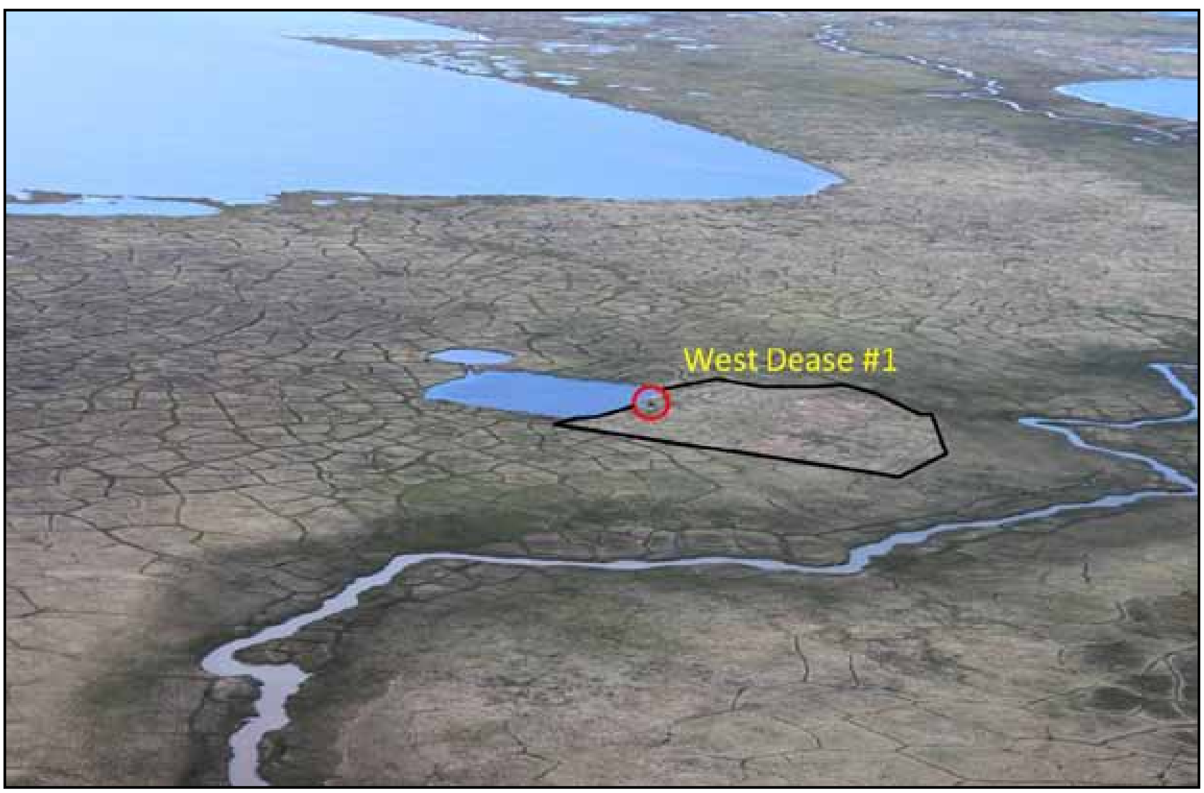


Figure 2: The West Dease #1 wellhead is indicated by the red circle and the drilling pad is outlined in black (July 2012).

Figure 3: Aerial photo of the West Dease #1 pad and pits in August 2001.

Figure 4: West Dease #1 wellhead, rat hole (inside cellar), mouse hole, and pilings (July 2012).

Figure 5: West Dease #1 cellar (filled with water), wellhead, rat hole (July 2012).

Figure 6: An arctic fox has a den among an old tailings pile on the West Dease #1 drilling pad (July 2012).

Figure 7: Long-tail ducks swimming in the West Dease #1 reserve pit. The flare pit and connecting channel are in the upper left (July 2012).

Figure 8: Channel created from thermokarsting connecting the West Dease #1 reserve and flare pits (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Drilling-related operations commenced with rig-up on Feb. 8, 1980, the well was spudded on Feb. 19, 1980, and activity terminated with rig release on Mar. 26, 1980. The well was drilled to a total depth of 4,170 feet, cased to 2,970 feet, and plugged back to 2,700 feet. The wellhead is entered by the USGS on regular intervals to conduct downhole temperature monitoring. Diesel was chosen as the medium for temperature monitoring as it will not corrode the casing, nor will it freeze at the temperatures encountered downhole.

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the well was plugged with 4 cement and mechanical plugs. The top of the shallowest cement plug is at 2,700 feet. From 2,700 feet to the surface, the hole is filled with diesel fuel. There is no Arctic Pack in any of the remaining casing annuluses. The 9 ⅝-inch surface casing has cement from 2,970 feet to the surface, with cement in the 9 ⅝-inch by 13 ⅜-inch casing annulus from 288 feet to the surface.

- **Wellhead Components**: There are a total of two operational gate valves and a needle valve **[Figure 10]**. All valves are kept in the closed position.

Geologic Setting: The primary objective of the well was an updip stratigraphic pinchout of the Sag River Sandstone (Triassic age) onto the Barrow Arch. The well penetrated into Argillite of Pre-Carboniferous age. The Sag River Sandstone was only 110 feet in thickness, down from 190 feet in thickness at the South Simpson #1 well to the east. Hydrocarbon staining was encountered, but there were no oil or gas shows. Minor oil staining with a few encounters of oil bleeding from the core was also discovered in the Barrow Sand and Shublik Formation. The Barrow Sand is the lithology directly above (younger) the Sag River Sandstone and the Shublik Formation is directly below. The well also encountered the Nanushuk Group, Torok Formation, Pebble Shale (all Cretaceous in age), and the Kingak Formation (Jurassic) (Husky Oil 1983).

Development Potential: This well is adequately cased and cemented, effectively sealing off all lower formations.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

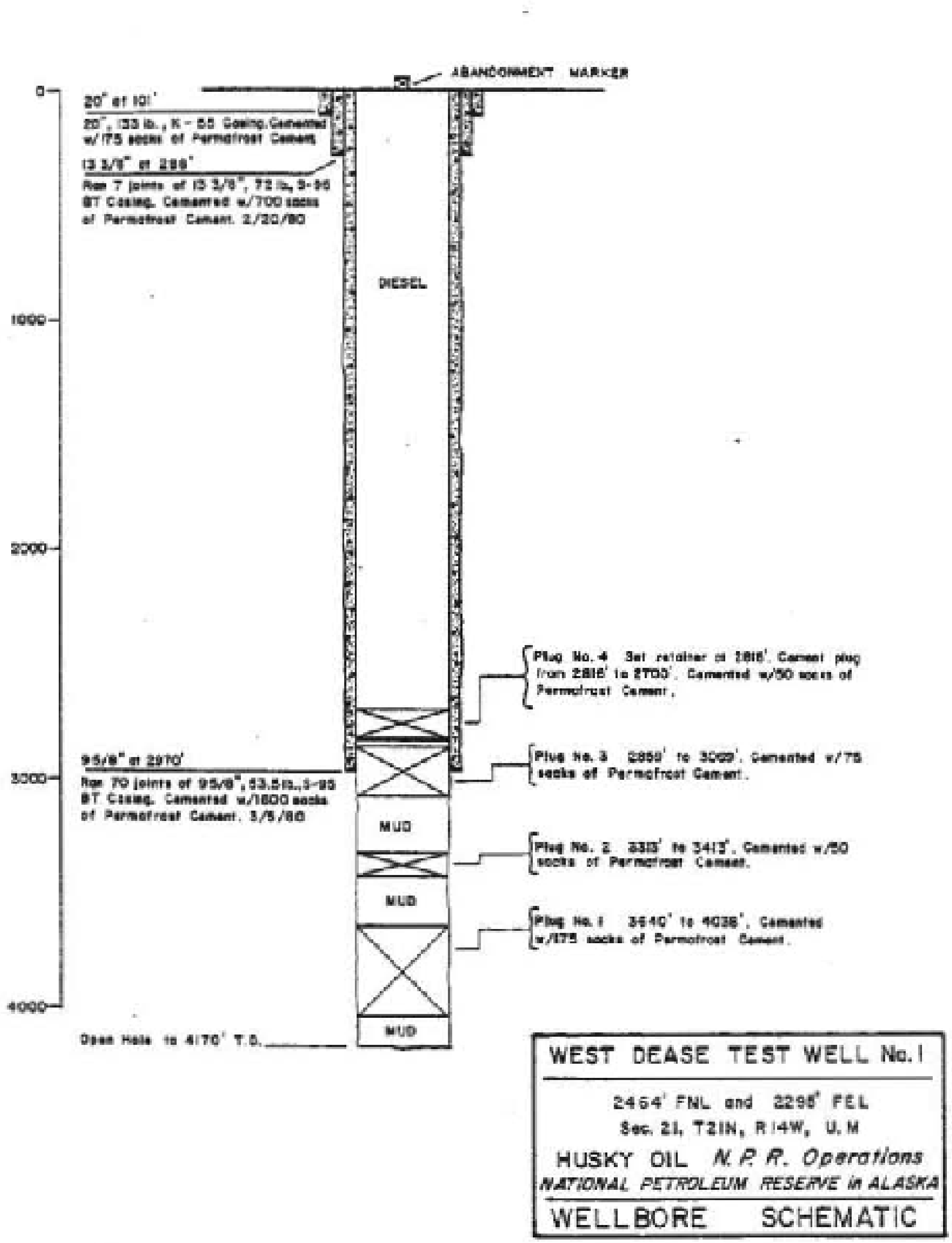


Figure 9: West Dease #1 wellbore diagram.

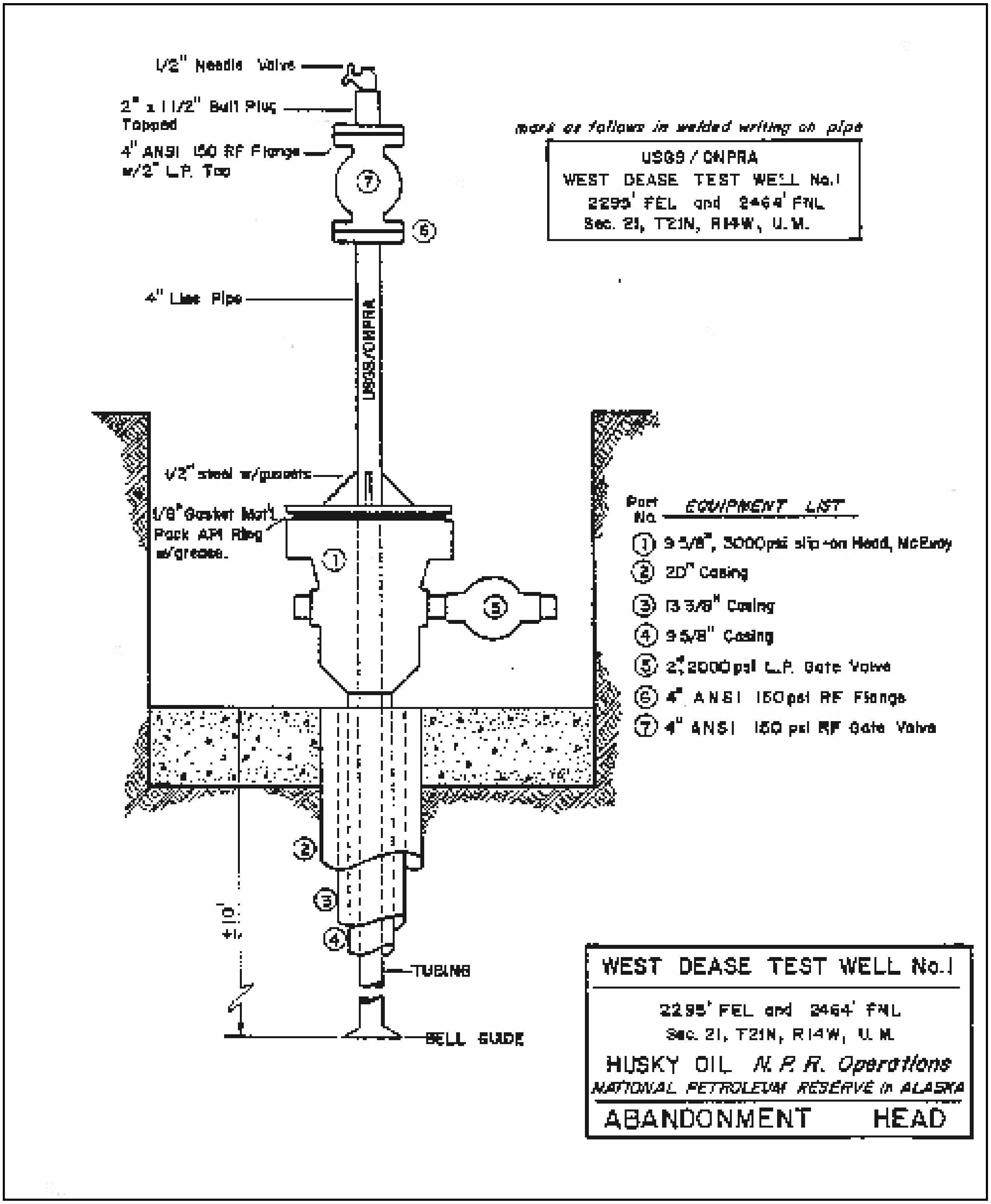


Figure 10: West Dease #1 wellhead assembly.

West Fish Creek #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD 83) 70.3267° N, -152.0606° W. The West Fish Creek #1 site is located 25 miles west of Nuiqsut, 127 miles east of Atqasuk and 128 miles southeast of Barrow. The last site inspection was in July 2012.

Site Description: The West Fish Creek #1 site consists of a well, a pad, and a reserve pit **[Figures 1-2]**. Husky Oil drilled the well under contract with the USGS in 1977. There is no cellar in conjunction with the well, but drilling muds are present on the ground around the wellhead **[Figure 3]**. The wellhead is capped with a closed and operational gate valve and cap **[Figure 4-5]**. The gate valve was replaced in 2006 when the wellbore was made usable for temperature logging. Baffling and PVC was extracted from within the wellbore in August 2006 **[Figures 6-7]**. The USGS conducted logging of the West Fish #1 well in August 2009 **[Figure 8]**.

Surface debris includes one small piece of scrap metal sticking up in the reserve pit, as well as some broken concrete blocks near the wellhead **[Figure 9]**.

The reserve and flare pits are separate from each other. The pit walls have subsided more noticeably in the reserve pit than the flare pit **[Figures 10-12]**. Water can escape to the surrounding tundra during spring break-up or other high water events.

The thick pad is difficult to identify due to the extent the pad has been reclaimed by the surrounding tundra since 1977 **[Figures 13]**. The borrow site for the pad was a location 2.2 miles west/northwest of the pad. The material brought in was primarily sand. Current condition of the pad is almost completely revegetated by tundra. There are a number of ruts that appear to have been made by tracked equipment on the pad before operations concluded. Tussocks have filled in the area between the track marks. The depressions created are now damp ground overgrown with grasses. There are no pilings at West Fish Creek #1.

The West Fish Creek #1 area is dominated by wet tundra. Lakes of various sizes dot the neighboring landscape. There is very little topographic relief in this area. The average depth to permafrost off the pad is 12 inches. (BLM 2005).

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. There are some small linear ponds near the well, as well as a large lake to the west, but neither shows any visible effect from the surrounding well site, and they are no threat to the site, in terms of erosion potential. There is very minor solid waste.

Figure 1: Aerial view of West Fish Creek #1 (July 2012) - The wellhead location is represented by the red circle, and the drilling pad is outlined in a black dashed line.

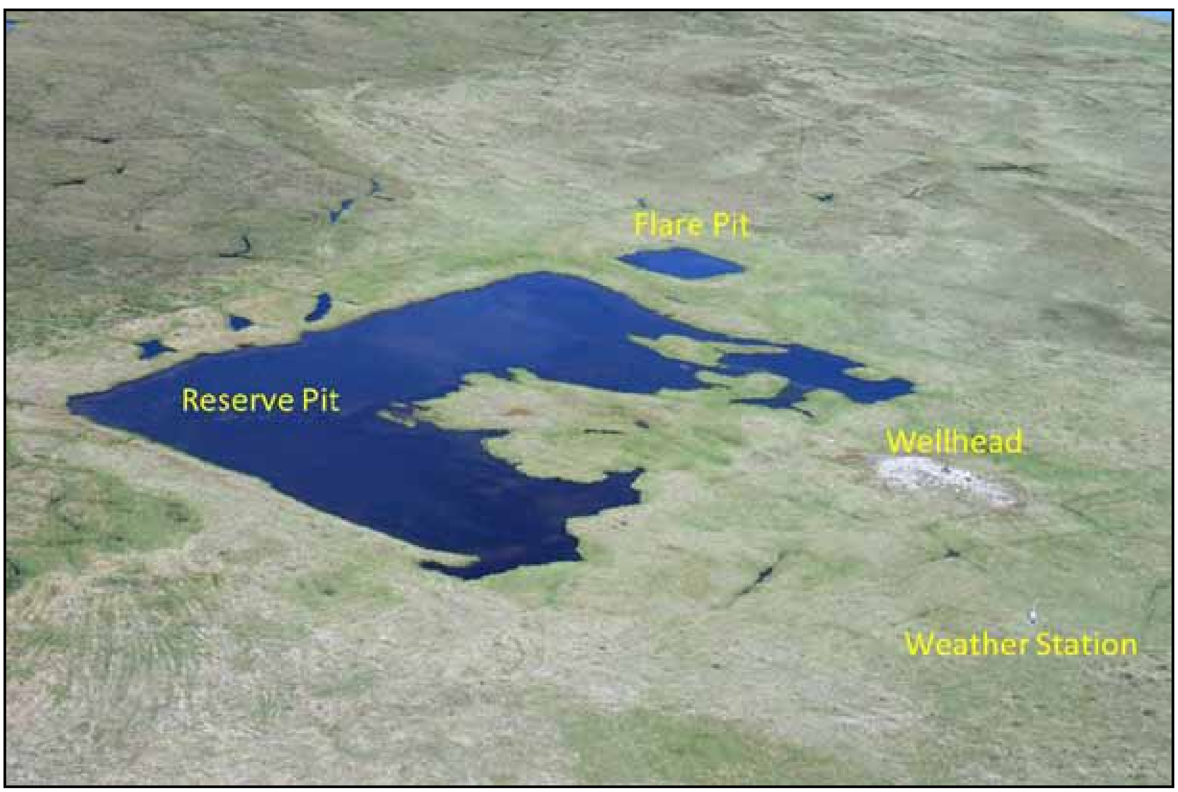


Figure 2: Closer view of the West Fish Creek #1 site (July 2012).

Figure 3: The West Fish Creek #1 wellhead has no visible cellar and is surrounded by drilling muds with little vegetation (July 2012).

Figure 4: Installation of a new gate valve was completed at West Fish Creek #1 following the removal of the baffling and PVC downhole (August 2006).

Figure 5: Wellhead on West Fish Creek #1 (August 2002).

Figure 6: Extracting the baffling and PVC from within the West Fish Creek #1 wellbore in August 2006.

Figure 7: Extracted baffling and PVC from West Fish Creek #1 are lined up on a tarp for removal (August 2006).

Figure 8: The USGS logging the West Fish Creek #1 well in August 2009.

Figure 9: Small pile of scrap wood and concrete near the West Fish Creek #1 wellhead (July 2012).

Figure 10: The West Fish Creek #1 reserve pit has been highly influenced by subsidence, with thriving vegetation. Smaller birds, including plovers and phalaropes, have been frequently observed (July 2012).

Figure 11: West Fish Creek #1 flare pit in the foreground; the reserve pit (right) and wellhead (left) are in the background (July 2012).

Figure 12: The reserve pit at West Fish Creek #1 is highly revegetated with a mixture of grasses, moss, and algae (July 2012).

Figure 13: Ruts appear to have been made by tracked equipment on the West Fish Creek #1 pad before operations concluded. Tussocks have filled in the area between the track marks, while the depressions created are now damp ground overgrown with grasses (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: West Fish Creek #1 operations commenced with rig-up on Feb. 1, 1977. The well was spudded on Feb. 14, 1977, and activity terminated on May 4, 1977. Drilling operations were supported by an ice strip on a neighboring lake that was long enough to land a Hercules C-130. The drilling rig was Parco Rig 96, a National 130, and was moved from Deadhorse to the drilling location by Hercules C-130. It took 15 days and a total of 105 loads. Prior to being moved to Deadhorse by Rolligon, Mobil Oil used the rig to drill at West Staines (Husky Oil 1982).

  The well was drilled to a total depth of 11,427 feet, cased to 9,216 feet, and plugged back to 2,443 feet. Diesel fuel was added from the top of the plug to the surface to facilitate temperature monitoring by the USGS. Diesel fuel was chosen as the medium because it will not corrode the casing, nor will it freeze at the temperatures encountered downhole.

  One variation that occurred at West Fish Creek #1 was to add buffling and PVC pipe downhole to assist in temperature logging. The PVC pipe would keep the sensor in a straight line while the baffling held the PVC in place. Unfortunately, upon installation the PVC became misaligned downhole, making the wellbore unusable.

  In 2006, the USGS extracted the baffling and PVC from the wellbore so that temperature logging could occur. This was necessary because other monitoring wells were either already plugged or scheduled to be plugged in the near future. Their efforts were successful and the well is currently used for monitoring.

- **Well Condition**: At the conclusion of the drilling and evaluation operations, the well was plugged with five cement and mechanical plugs. The top of the shallowest cement plug is at 2,429 feet. From 2,343 feet to the surface, the hole is filled with diesel fuel overlying 86 feet of mud. There is no Arctic Pack in any of the remaining casing annuluses. The 13 ⅜-inch surface casing has cement from 2,614 feet to surface with cement in the 13 ⅜-inch by 20-inch casing annulus from 104 feet to the surface. The 9 ⅝-inch casing was cut off at 2,465 feet and removed, with a retainer set above at 2,443 feet and 10 sacks of cement set on top of the retainer (est. 2,429 feet TOC) **[Figure 14]**.

- **Wellhead Components**: There is a functional master valve and a 2-inch plug (which replaced the needle valve). The wellhead is maintained by the USGS for wellbore temperature monitoring **[Figure 14].**

Geologic Setting: The primary objectives of the well were the Kuparuk River Sandstone, the Sadlerochit Group, and the Lisburne Group, with secondary interests in the Sag River Sandstone and the basal Torok sand. The objectives were met but with limited results. The primary objectives had no shows, with porosity too poor to serve as a potential host for hydrocarbon accumulation. The secondary objectives turned out slightly better, as the Cretaceous Era rocks (Nanushuk Group and Torok Formation) had periodic poor visual oil shows with scattered faint staining and fluorescence. Limited weak gas shows were also recorded in the mud loggers. The sandstones where the shows were observed were thin and shaley, with poor porosity. The Sag River Sandstone (Triassic) showed a range of poor to good oil cuts but also had poor porosity (Husky Oil 1983).

The well encountered the Colville Group and Pebble Shale of the Cretaceous, Kingak Formation of the Jurassic, Shublik Formation of the Jurassic, Sadlerochit Group of the Triassic-Permian, Lisburne Group of the Pennsylvanian-Mississippian (Carboniferous), and Endicott Group of the Mississippian (Husky Oil 1983).

Development Potential: Interest has been shown in the area in the recent past, but no development has occurred. This well is adequately cased and cemented, securing the well from all lower formations, and will not affect future development.

Groundwater Resource: There are no groundwater resources present in the area. Continuous permafrost exists throughout the entire NPR-A. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the wellhead.

Subsurface Risk Assessment: Low

Justification: The well is adequately cemented and cased with numerous plugs, sealing off lower formations. The USGS is still using the upper portion of the wellbore to the surface to collect subsurface temperature data. There is a wellhead to contain the diesel within the wellbore.

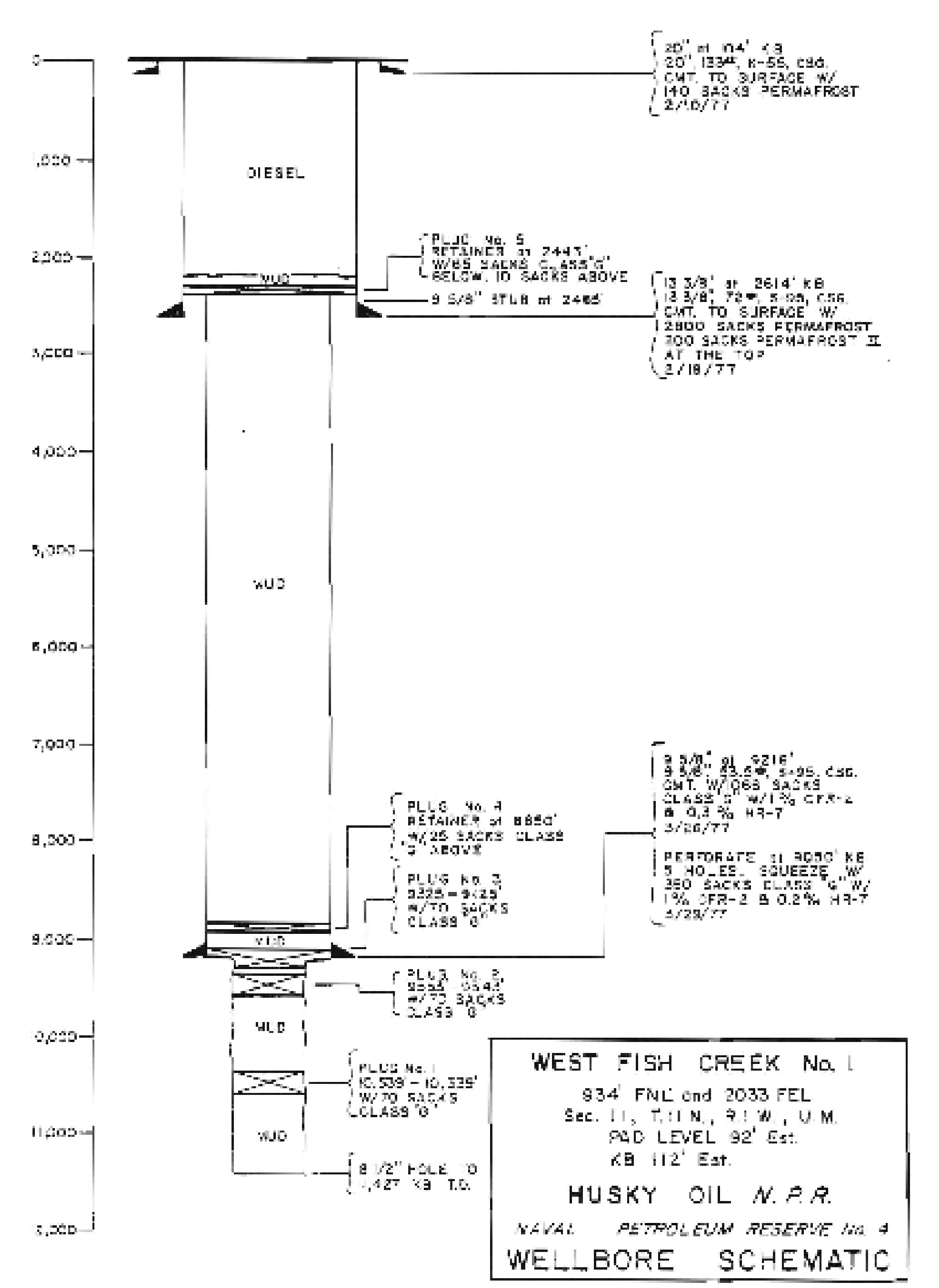


Figure 14: West Fish Creek #1 wellbore diagram.

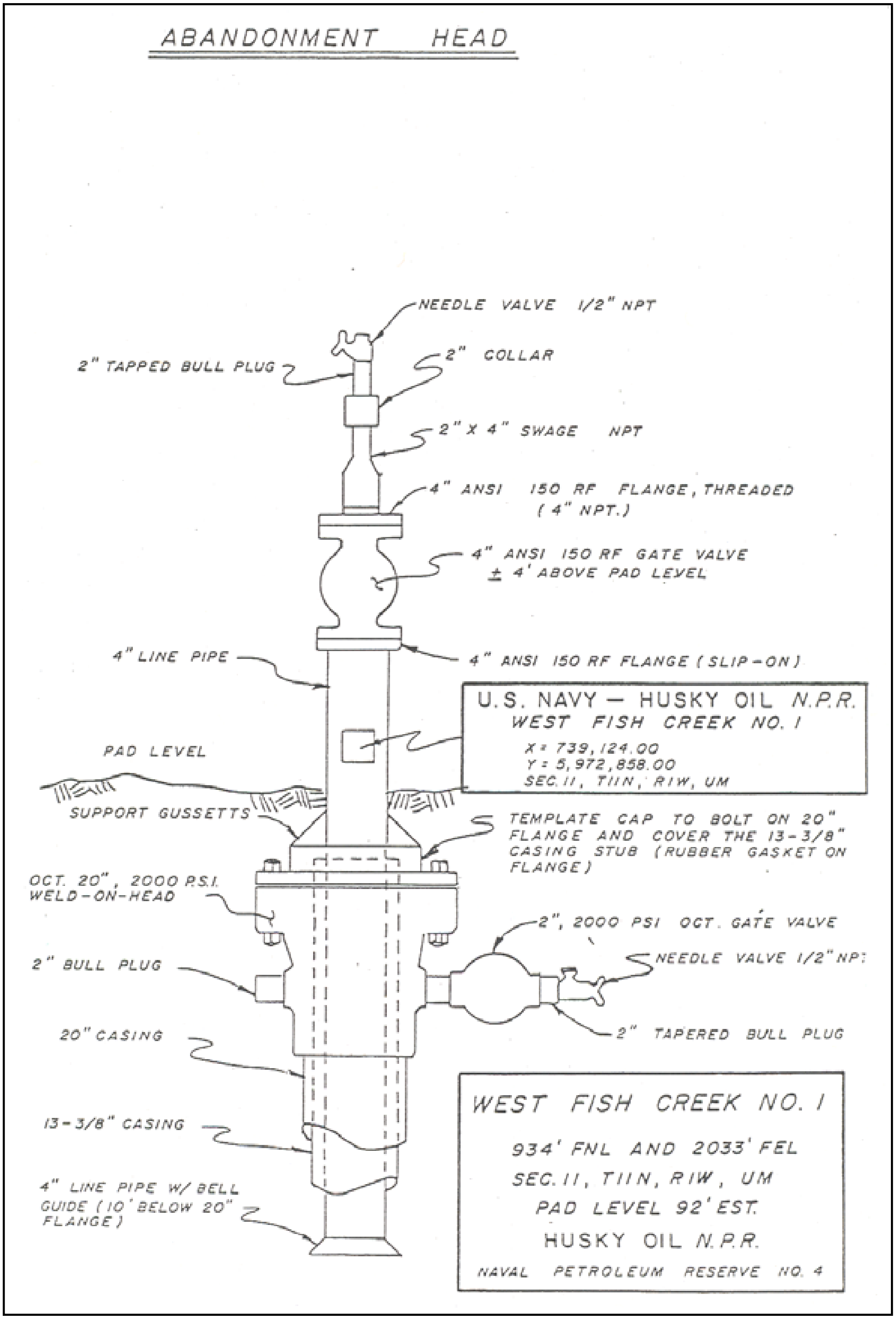


Figure 15: West Fish Creek #1 wellhead assembly.

Wolf Creek #1

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3864° N, -153.5208° W. The Wolf Creek #1 site is approximately 35 miles west of Umiat. The last site inspection was in July 2012. The Wolf Creek #3 test well shares the same work area **[Figure 1]**.

Site Description: The Wolf Creek #1 site consists of a well pipe about 5 feet above the ground surface **[Figures 2-4]**. There is a small ground hole where the casing meets the ground surface. This hole was first noted in 2003 and has not increased in size since then **[Figure 5]**. Gas is not coming from the hole.

There is no cellar, drilling pad, or reserve pit associated with the site. The well was drilled in 1951 by the U.S. Navy. The Navy cleared an area at the crest of the hill to create a work area for drilling. Natural revegetation has occurred and has stabilized the cleared area, which blends it in with the surrounding landscape. No surface debris is present in conjunction with this site.

Wolf Creek #1 is just below the crest of the hill, about 250 feet lower in elevation than Wolf Creek #3. The general vegetation in the area is tussock tundra, with small rills lined by willows.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the site. The site is not under threat due to erosion or other natural processes. There are no surface waters near the open casing. A tributary to Wolf Creek flows in the valley bottom below Wolf Creek #1 and #3; however, there do not appear to be any impacts to the creek from the wells. There is little to no solid waste on site and it does not pose a travel risk to local residents.

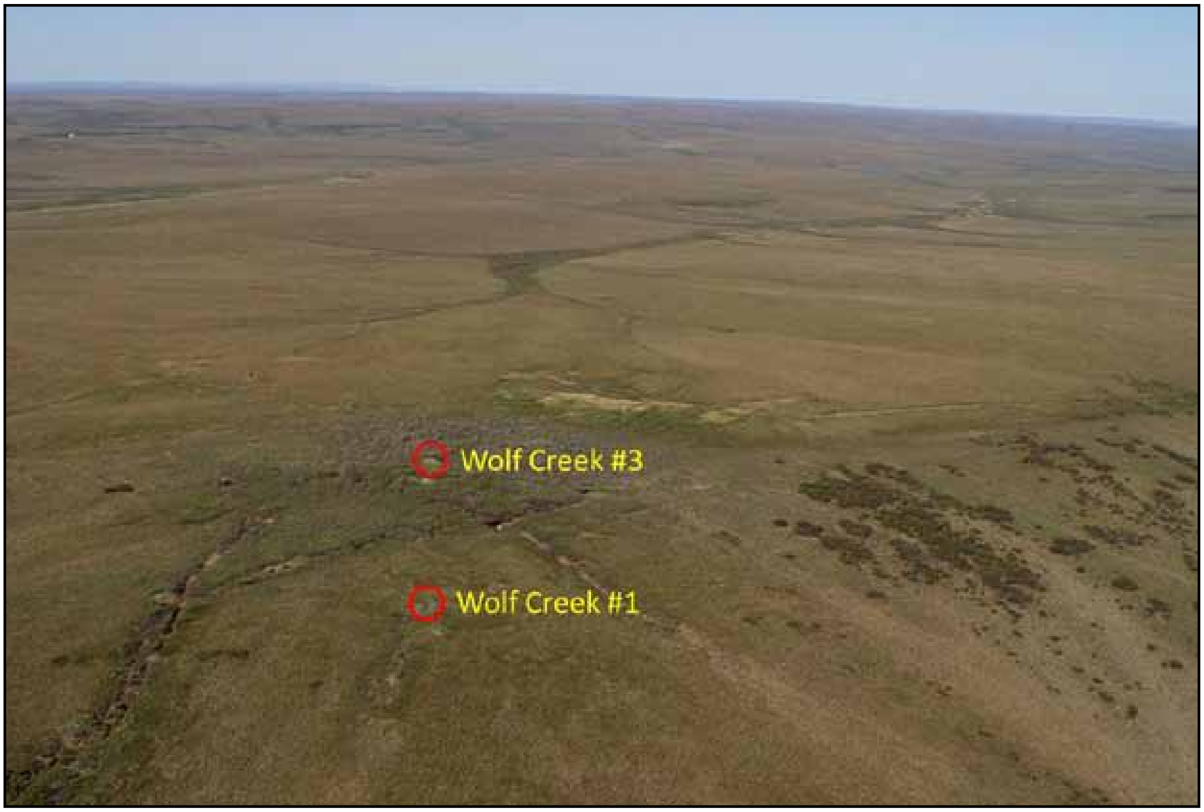


Figure 1: Wolf Creek #1 and #3 well locations

Figure 2: Wolf Creek #1 (July 2012) - The valve is closed and the J-B Weld is holding and in good condition.

Figure 3: Wolf Creek #1 in 2008 - The circle on the weld identifies where the leak that was repaired in 2004.

Figure 4: Wolf Creek #1 close-up of the J-B Weld patch (July 2012).

Figure 5: Ground hole around the casing at Wolf Creek #1 (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History:** Wolf Creek #1 is a gas well drilled in 1951 to a depth of 1,500 feet and cased to 48 feet. There were no plugs set as evidenced in the wellbore diagram. The canvas rig housing caught fire while the tools were extracted from the well after encountering a gas show at 863 feet.

- **Well Condition:** A small gas leak was detected in the threaded wellhead flange in 2003. For unknown reasons, the Navy appears to have cut the top of the casing and re-welded it together prior to abandoning the site. That weld weakened over the years and developed a small leak in 2003 **[Figure 3]**. J-B Weld was applied to all possible leaking surfaces in 2004 **[Figure 4]**. The well no longer leaks. However, it still has very weak gas pressure. If the valve is opened, it will flow about 10 MCFPD. The pressure is so low that it does not register on a gauge.

- **Wellhead Components:** The well is equipped with a blind plate, a 2-inch nipple and a brass gate valve.

Geologic Setting: The purpose of the well was to test the Grandstand Formation, the same formation that produced oil at Umiat. Specifically, the Navy wanted to assess the petroleum content and reservoir possibilities at this location. The well encountered very poor gas shows in the Killik Tongue of the Chandalar Formation and productive sands in the Grandstand Formation. The well produced gas at rates up to 881 MCFPD in open-hole tests of the Grandstand. The extent of the reservoir that the gas originates from is uncertain. The well also encountered the Ninuluk Formation as deep as 455 feet from the surface (Collins and Bergquist 1959).

Development Potential: Industry drilled a well in this vicinity during the winter of 2009. That well, however, was plugged and abandoned. No further interest in the area has been shown. Near-term development is this area is unlikely until it is economical to produce the gas resources.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh-water aquifers do not exist.

Other Information: There is no evidence of hydrocarbon escapement at Wolf Creek #1.

Subsurface Assessment: Moderate

Justification: Gas shows were encountered while drilling Wolf Creek #1. No cement plugs were set, but it does have a wellhead. Gas pressure on the wellhead is very weak (10 MCFPD). The leaking surface was patched in 2004 and has not leaked since.

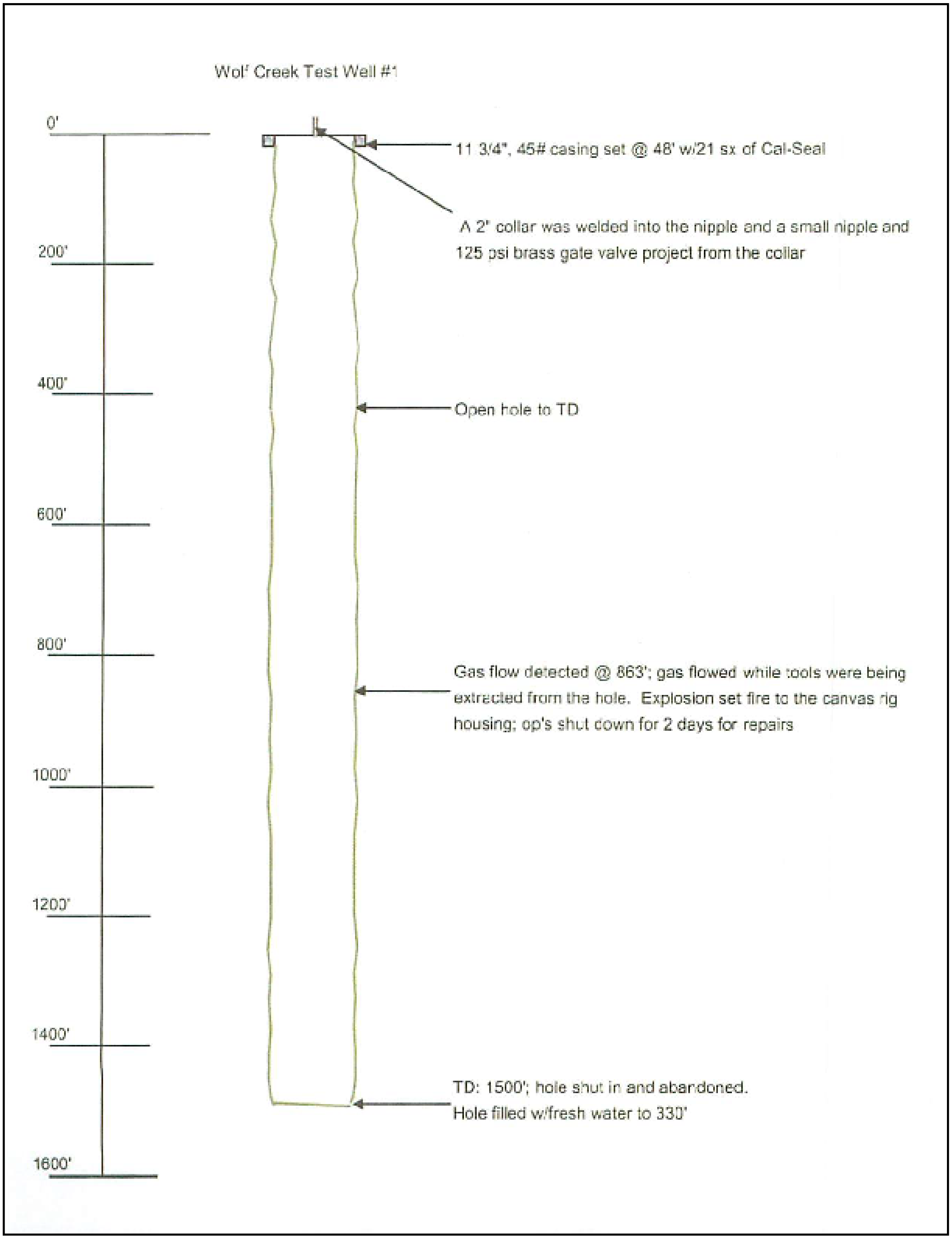


Figure 6: Wolf Creek #1 Wellbore Diagram

Wolf Creek #2

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.4047° N, -153.5208° W. The Wolf Creek #2 site is approximately 35 miles west of Umiat. The last site visit was in July 2012.

Site Description: The Wolf Creek #2 site consists of a capped wellbore about 4 inches above the ground surface. The U.S. Navy drilled the well in 1951. There is no cellar, pad or reserve pit associated with the site.

Wolf Creek #2 was drilled in the Wolf Creek valley, approximately 50 feet from the creek **[Figure 1]**. The well is located on a disconnected floodplain consisting primarily of grasses and low shrubs which easily obscure Wolf Creek#2 **[Figures 2-4]**. Associated debris consists of a few empty 55-gallon drums upstream along the upper floodplain of the creek.

Surface Risk Assessment: Low

Justification: There are no known contaminants on the site. There is little risk of erosion to the well, as the small stream is well entrenched in its existing channel, which is further anchored by thick vegetation. There were no tailings piles or hazardous substances noted on-site that could pose a threat to Wolf Creek. There is little to no solid waste on site and it does not pose a travel risk to local residents.

Figure 1: Wolf Creek #2 showing its location to the nearby creek (July 2012).

Figure 2: Wolf Creek #2 is cut off at ground level and easily obscured by willows (July 2012).

Figure 3: Wolf Creek #2 after cutting back the willows (July 2012).

Figure 4: Wolf Creek #2 in 2010.

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Wolf Creek #2 is a dry hole. The well was drilled in 1951 to 1,618 feet and was cased to 53 feet. It is located roughly 1.25 miles north of Wolf Creek test wells 1 and 3 [**Figure 5**]. The purpose for drilling at this location was to determine if the gas-bearing sandstone beds previously encountered in Wolf Creek #1 would contain any oil.

- **Well Condition**: There is no existing drill pad. The well consists of a plate welded onto the 11 ¾-inch casing that was cut off at ground level. Drilling muds were left in the wellbore. The welded plate is very difficult to spot from the air, as it is easily overtaken by willows. The well was located in 2012 by reviewing previous years' photographs and conducting a ground search. The willows were cleared away in 2012, but because they thrive at this location, they will grow back soon, so it is only a temporary fix. The well needs a tall, brightly colored marker to help locate this well in the future.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: Records indicate a very poor gas show was encountered in the Killik Tongue, but no oil or gas was recovered in production tests (Collins and Bergquist 1959). Other formations encountered downhole include the Seabee, Ninuluk, Chandler, and the Grandstand.

Development Potential: Industry drilled a well in this vicinity during the winter of 2009. However, that well was plugged and abandoned, and there has been no further interest in the area. Near-term development is this area is unlikely until it is economical to further explore and produce gas resources.

Groundwater Resource: There are no groundwater resources present here. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no indication of hydrocarbon escapement at or near the well.

Subsurface Risk Assessment: Moderate

Justification: A very poor gas show was recorded in the Killik Tongue. No cement plugs were set, and there is no wellhead. Drilling muds were placed into the wellbore and allowed to freeze. There has been no indication of hydrocarbon migration through the frozen column of drilling mud.

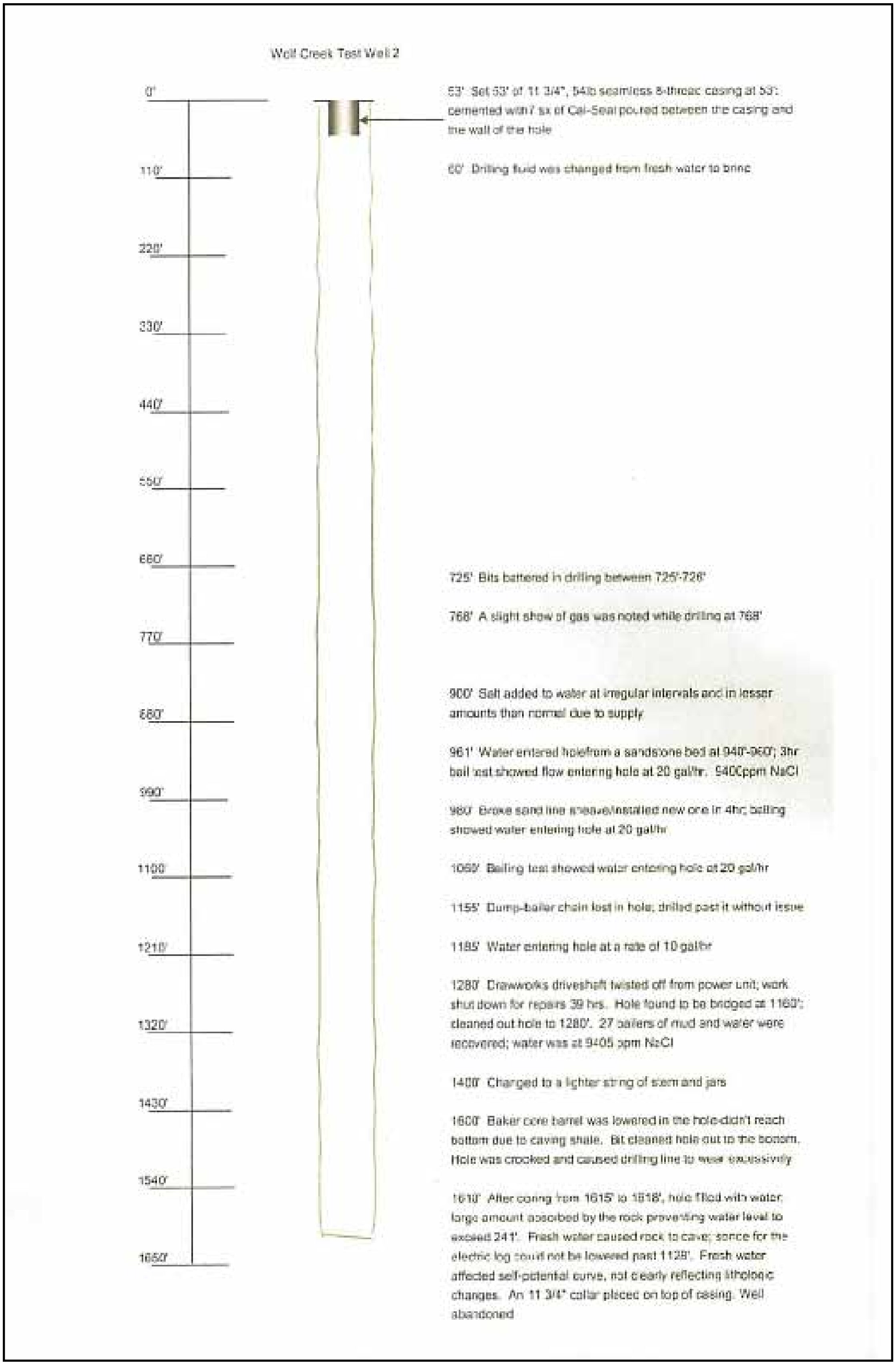


Figure 5: Wolf Creek #2 Wellbore Diagram.

Wolf Creek #3

SURFACE INFORMATION

Site Location: Coordinates (DD NAD83) 69.3864° N, -153.5236° W. The Wolf Creek #3 site is approximately 35 miles west of Umiat. The last site inspection was in July 2012 [**Figure 1]**.

Site Description: The Wolf Creek #3 well consists of an open wellbore cut off approximately 6 inches above the ground surface **[Figure 2]**. The U.S. Navy drilled the well in 1952. There is no cellar, pad, or reserve pit associated with the site. There is some debris consisting of wood pilings and steel pipe standing 1 foot to 3 feet above the ground surface **[Figure 3]**. A small pile of drilling mud is present about 810 feet south of the well.

The well was drilled on the top of a hill, about 250 feet in elevation above Wolf Creek #1, dominated by tussock tundra, with willows lining small rills that provide drainage to the Wolf Creek tributary in the valley below. Wolf Creek #2 is located to the north, adjacent to the creek.

Surface Risk Assessment: Low

Justification: There are no known contaminants present on the site. There are no surface waters near the open casing. A Wolf Creek tributary flows in the valley bottom below Wolf Creek #1 and #3; however, there do not appear to be any impacts to the creek from the wells.

Seasonal precipitation accumulates in the hole and spills over the sides, which has inhibited vegetation growth around the open casing, and there is visible oil-eating bacteria (orange) inside the casing [**Figure 4**]. Fluids within the wellbore were collected and sampled by the BLM in 2004, but the results came back negative for petroleum. There is no bubbling in the liquids within the casing. The drill pad is shared with Wolf Creek #1, which is approximately 485 feet to the east. The site was moderately disturbed from drilling operations. Willows have thrived on the disturbed ground [**Figure 5**]. There is a small amount of solid waste on site, but given the extremely remote location of the site, Wolf Creek #3 does not pose a travel risk to local residents.

Figure 1: Aerial view of the open casing at Wolf Creek #3 (July 2010).

Figure 2: Stressed vegetation around the Wolf Creek #3 open casing (July 2010).

Figure 3: Wood pilings and pipe near Wolf Creek #3 (June 2003).

Figure 4: Open casing of Wolf Creek #3 showing the orange colored oil-eating bacteria (July 2012).

Figure 5: Location of drilling muds near Wolf Creek #3 (July 2012).

Figure 6: Cut off metal pipes near the Wolf Creek #3 well (July 2012).

SUBSURFACE INFORMATION

Well Information:

- **Well History**: Wolf Creek #3 was drilled in 1952 to a depth of 3,760 feet and cased to 625 feet. The well is deeper than the other two Wolf Creek wells because its primary purpose was to test the Grandstand Formation (the producing formation around Umiat, 35 miles to the east). Two bridge plugs were set [**Figure 7**]. When abandoned, the wellbore was filled with oil-based drilling muds and left open to the environment. A total of 103 barrels of crude were used (Collins and Bergquist 1959). The visible oil at the surface of the wellbore is apparently from the oil-based drilling muds.

- **Well Condition**: The casing was cut off 6 inches above the ground surface. There is no visible sign of gas bubbling in the liquids within the open casing.

- **Wellhead Components**: There is no wellhead at this site.

Geologic Setting: The Grandstand Formation produced from 4 different sands. In open-hole flow tests of the well, it produced at rates up to 445 thousand cubic feet per day (MCFPD). The gas appeared to be sufficient to supply a small camp, but not of commercial proportions. Two plugs were set in the well above the Grandstand Formation. The top of the shallowest plug is inside the casing at 554 feet. In addition to the Grandstand, the hole penetrated the Ninuluk, Chandler, and Topagoruk formations.

Development Potential: Industry drilled a well in this vicinity during the winter of 2009. That well, however, was plugged and abandoned. No further interest in the area has been shown. Near-term development is this area is unlikely until it is economical to produce the gas resources.

Groundwater Resource: There are no groundwater resources present in this area. Continuous permafrost exists throughout the entire National Petroleum Reserve in Alaska. Fresh water aquifers do not exist.

Other Information: There is no evidence of hydrocarbon escapement at Wolf Creek #3.

Subsurface Risk Assessment: Low

Justification: Wolf Creek #3 encountered gas shows in the Grandstand Formation. Two plugs were placed above the shows. The upper most plug spans the casing shoe. After the plugs were set, oil-based drilling muds were added downhole. There is no movement of hydrocarbons from the well column.

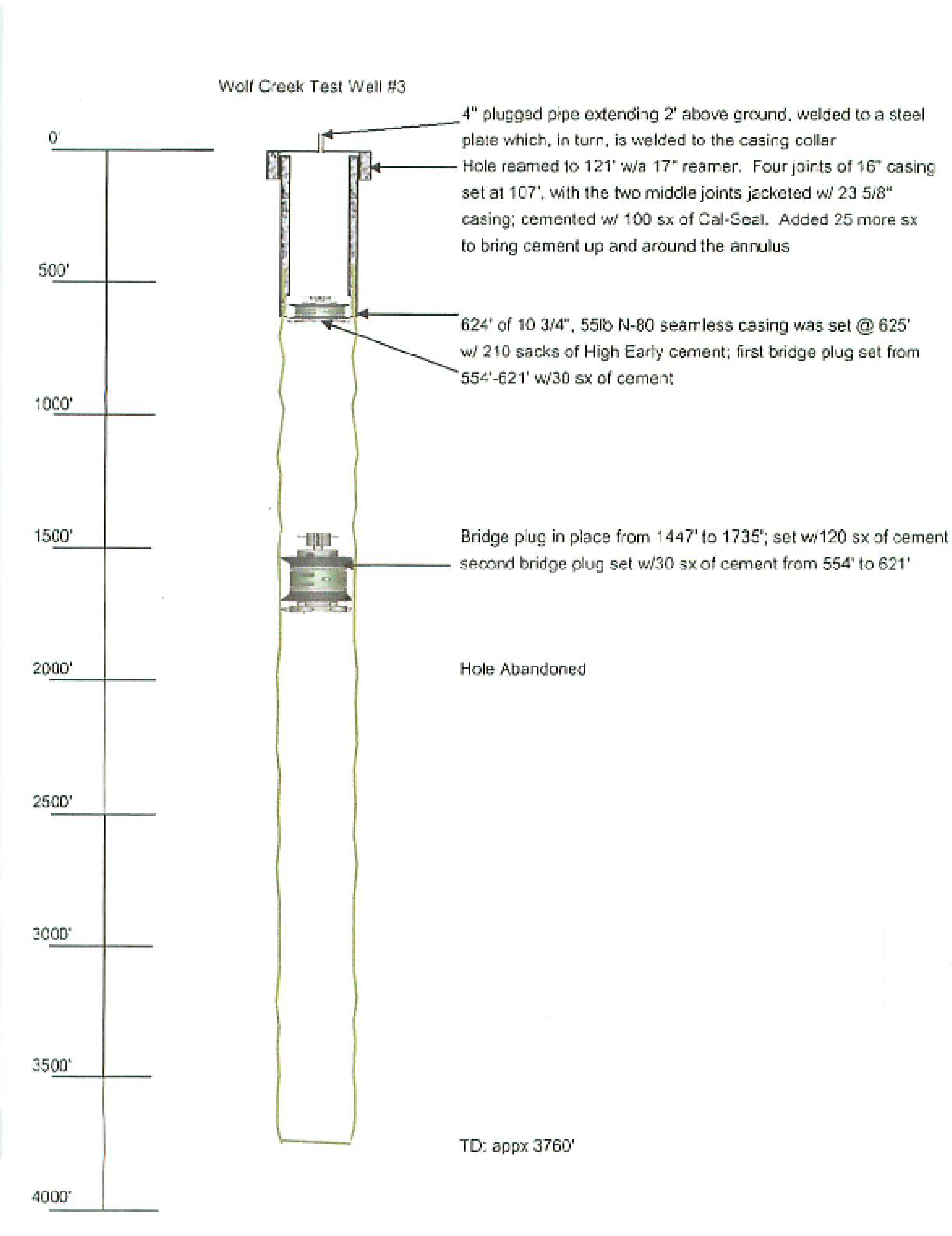


Figure 7: Wolf Creek #3 Wellbore Diagram

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Glossary of terms

A

abandon v: to temporarily or permanently cease production from a well or to cease further drilling operations.

abandoned well n: a well no longer in use; whether dry, inoperable, or no longer productive.

air quality n: The properties and degree of purity of air to which people and natural and heritage resources are exposed.

annulus n: the space around a pipe in a well bore, sometimes termed the annular space.

B

barite n: barium sulfate, $BaSO_4$; a mineral frequently used to increase the weight or density of drilling mud. Its relative density is 4.2 (it is 4.2 times denser than water). See mud.

barrel (bbl) n: 1. a measure of volume for petroleum products. One barrel is the equivalent of 42 U.S. gallons or 0.15899 cubic meters (9,702 cubic inches), measured at 60 degrees F.

basket n: a device placed in the drill or work string to catch debris when a drillable object is being milled or drilled downhole.

berm n: A raised area with vertical or sloping sides.

bit n: the cutting or boring element used in drilling oil and gas wells.

blowout n: an uncontrolled flow of gas, oil, or other well fluids from the well.

blowout preventer (BOP) n: one or more valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and the drill pipe or in an open hole (for example, hole with no drill pipe) during drilling or completion operations.

bore n: the inside diameter of a pipe or a drilled hole. v: to penetrate or pierce with a rotary tool.

bottomhole n: the lowest or deepest part of a well (total depth).

bottom plug n: a cement wiper plug that precedes cement slurry down the casing. The plug wipes drilling mud off the walls of the casing and prevents it from contaminating the cement. See cementing, cement plug.

C

casing n: steel pipe cemented in an oil or gas well to prevent the wall of the hole from caving in or the hole from collapsing; prevents movement of fluids from one formation to another or seals off formation fluids; aids in well control.

cased hole n: a wellbore in which casing has been run.

casing coupling (collar) n: a tubular section of pipe that is threaded inside and used to connect two joints of casing.

casing-tubing annulus n: in a wellbore, the space between the inside of the casing and the outside of the tubing.

cellar n: a pit in the ground to provide additional height between the rig floor and the well head to accommodate the installation of blowout preventers, ratholes, mouseholes, and so forth. The cellar may also collect drainage water and other fluids for subsequent disposal.

cement n: a powder consisting of alumina, silica, lime, and other substances that hardens when mixed with water. Extensively used in the oil industry to bond casing to the walls of the wellbore. Cement is used to “set” casing in the well bore and to seal off unproductive formations and apertures.

cementing or "Setting Pipe" n: the application of a liquid slurry of cement and water to various points inside or outside of the casing.

cementing materials n pl: a slurry of cement and water and sometimes one or more additives that affect either the density of the mixture or its setting time. The cement used may be high early strength, common (standard), or slow setting. Additives include accelerators (such as calcium chloride), retarders (such as gypsum), weighting materials (such as barium sulfate), lightweight additives (such as bentonite), or a variety of lost circulation materials.

cement plug n: 1. a portion of cement placed at some point in the wellbore to seal it. 2. a wiper plug. See cementing.

circulation n: Flow; the movement of drilling fluid out of the mud pits, down the drill stem, up the annulus, and back to the mud pits. circulate v: The continuous pumping of drilling fluid ("mud") through the space between the drill pipe and the borehole. The flow of mud moves the rock cuttings and carries them up to the mud system.

Circulating fluid see Drilling Fluid, Mud.

ing fluid n: see drilling fluid, mud.

clean out v: to remove sand, scale, and other deposits from the producing section of the well to restore or increase production.

collar n: 1. a coupling device used to join two lengths of pipe, such as casing or tubing. A combination collar has left-hand threads in one end and right-hand threads in the other. 2. a drill collar.

conductor casing n: generally, the first string of casing in a well. It may be lowered into a hole drilled into the formations near the surface and cemented in place; it may be driven into the ground by a special pile driver (in such cases, it is sometimes called drive pipe). Its purpose is to prevent the soft formations near the surface from caving in and to conduct drilling mud from the bottom of the hole to the surface when drilling starts. Also called conductor pipe.

conductor pipe n: the largest diameter casing and the topmost length of casing. It is relatively short and encases the topmost string of casing.

core n: a cylindrical sample taken from a formation for geological analysis.

core analysis n: laboratory analysis of a core sample that may determine porosity, permeability, lithology, fluid content, angle of dip, geological age, and probable productivity of the formation.

core barrel n: a tubular device, usually from 10 to 60 feet (3 to 18 meters) long, run in place of a bit and used to cut a core sample.

core sample n: 1. a small portion of a formation obtained by using a core barrel and core bit in an existing wellbore. See core bit. 2. a spot sample of the contents of an oil or oil product storage tank usually obtained with a thief, or core sampler, at a given height in the tank.

core test n: a type of well that was drilled prior to deeper test wells in the same area, for the purposes of acquiring stratigraphic or foundation information.

corrosion n: any of a variety of complex chemical or electrochemical processes, such as rust, by which metal is destroyed through reaction with its environment.

cultural resources n: the physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and the conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

cuttings n pl: material removed from the bore hole by the drill bit and lifted to the surface; the fragments of rock dislodged by the bit and brought to the surface in the drilling mud. Geologists analyze washed and dried cuttings samples for information about the formations drilled.

D

diesel fuel n: a light hydrocarbon mixture for diesel engines; it has a boiling range just above that of kerosene. In Alaska, diesel fuel is often used in wells since it is non-corrosive, non-freezing and is a reliable fluid for measuring temperature at various depths.

displacement fluid n: in well cementing, the fluid, usually drilling mud or salt water, that is pumped into the well after the cement is pumped into it to force the cement out of the casing and into the annulus.

downhole adj, adv: pertaining to the wellbore.

drill v: to bore a hole in the earth, usually to find and remove subsurface formation fluids such as oil and gas.

drilling fluid n: circulating fluid, one function of which is to lift cuttings out of the wellbore and to the surface. Drilling fluid also serves to cool the drill bit and to counteract downhole formation pressure.

drilling mud n: a specially compounded liquid circulated through the wellbore during rotary drilling operations. See drilling fluid, mud.

drilling pad n: A temporary drilling site; usually constructed of local materials such as gravel, ice, or even wood or cement. The drilling pad houses the wellhead(s). Drill pads range from 5-foot thick gravel pads to “thin” pad designs of variable thicknesses. These drilling pads have ice or ice-rich silt cores, partial insulation, or are ice pads covered with insulated panels.

drill pipe n: the heavy seamless tubing used to rotate the bit and circulate the drilling fluid. Joints of pipe are generally approximately 30 feet long are coupled together by means of tool joints.

dry hole n: any well that does not produce oil or gas in commercial quantities. A dry hole may flow water, gas, or even oil, but not in amounts large enough to justify production.

E

erosion n: the removal, detachment, and entrainment of earth materials by weathering, dissolution, abrasion, and corrosion, later to be transported by moving water, wind, gravity, or glaciers.

F

fish n: an object left in the wellbore during drilling or workover operations that must be recovered before work can proceed. It can be anything from a piece of scrap metal to a part of the drill stem.

fishing n: the procedure of recovering lost or stuck equipment in the wellbore.

flare n: process that burns and evacuates unused gases.

flare pit n: a pit constructed below the flare stacks to contain any fluids present in the gas stream. These pits were approximately 20 feet by 20 feet in size.

flow n: a current or stream of fluid or gas.

flowing well n: a well that produces oil or gas by its own reservoir pressure rather than by use of artificial means (such as pumps).

formation: A rock/mineral deposit or structure covering an area with the same physical properties.

formation testing n: the gathering of pressure data and fluid samples from a formation to determine its production potential before choosing a completion method.

formation water n: 1. the water originally in place in a formation. 2. any water that resides in the pore spaces of a formation.

fuel pit n: A shallow, lined pit where fuel was stored, typically in drums. Fuel pits were approximately 10 feet by 10 feet in size.

G

gravel n: sand or glass beads of uniform size and roundness used in gravel packing.

H

horizontal drilling n: deviation of the borehole from vertical so that the borehole penetrates a productive formation in a manner parallel to the formation.

hydrocarbons n pl: organic compounds of hydrogen and carbon whose densities, boiling points, and freezing points increase as their molecular weights increase. Although composed of only two elements, hydrocarbons exist in a variety of compounds, because of the strong affinity of the carbon atom for other atoms and for itself. The smallest molecules of hydrocarbons are gaseous; the largest are solids. **Petroleum** is a mixture of many different hydrocarbons. A compound formed from carbon and hydrogen, for example oil and gas.

I

impermeable adj: preventing the passage of fluid. A formation may be porous yet impermeable if there is an absence of connecting passages between the voids within it. See permeability.

ice plug n. frozen drilling muds contained within hundreds of feet of permafrost; Functions similar to a cement plug by entrapping hydrocarbons within the frozen permafrost zone.

J

junk n: metal debris lost in a hole. Junk may be a lost bit, pieces of a bit, pieces of pipe, wrenches, or any relatively small object that impedes drilling or completion and must be fished out of the hole. v: to abandon (as a nonproductive well).

junk basket n: a device made up on the bottom of the drill stem or on wireline to catch pieces of junk from the bottom of the hole. Circulating the mud or reeling in the wireline forces the junk into a barrel in the tool, where it is caught and held. When the basket is brought back to the surface, the junk is removed. Also called a junk sub or junk catcher.

K

kill v: 1. in drilling, to control a kick by taking suitable preventive measures (for example, to shut in the well with the blowout preventers, circulate the kick out, and increase the weight of the drilling mud). 2. in production, to stop a well from producing oil and gas so that reconditioning of the well can proceed.

L

liner n: 1. a string of pipe used to case the open hole below an existing casing. A liner extends from the setting depth up into another string of casing, usually overlapping about 100 feet (30.5 meters) above the lower end of the intermediate or the oil string. Liners are nearly always suspended from the upper string by a hanger device. 2. a relatively short length of pipe with holes or slots that is placed opposite a producing formation. Usually, such liners are wrapped with specially shaped wire that is designed to prevent the entry of loose sand into the well as it is produced. They are also often used with a gravel pack. 3. in jet perforation guns, a conically shaped metallic piece that is part of a shaped charge. It increases the efficiency of the charge by increasing the penetrating ability of the jet. 4. a replaceable tube that fits inside the cylinder of an engine or a pump.

log n: a systematic recording of data, such as a driller's log, mud log, electrical well log, or radioactivity log. Many different logs are run in wells to discern various characteristics of downhole formation. v: to record data.

lost circulation n: the quantities of whole mud lost to a formation, usually in cavernous, pressured, or coarsely permeable beds. Evidenced by the complete or partial failure of the mud to return to the surface as it is being circulated in the hole.

lost pipe n: drill pipe, drill collars, tubing, or casing that has become separated in the hole from the part of the pipe reaching the surface, necessitating its removal before normal operations can proceed; for example, a fish.

M

mechanical rig n: a drilling rig in which the source of power is one or more internal-combustion engines and the power is distributed to rig components through mechanical devices (such as chains, sprockets, clutches, and shafts). Also called a power rig.

mousehole n: shallow bores under the rig floor, usually lined with pipe, in which joints of drill pipe are temporarily suspended for later connection to the drill string.

mud n: the liquid circulated through the wellbore during rotary drilling and workover operations.

N

natural gas n: a mixture of hydrocarbon gases that occurs naturally beneath the Earth's surface, often with or near petroleum deposits. Natural gas contains mostly methane, but also has varying amounts of ethane, propane, butane, and nitrogen. Natural gas is used as a fuel and in making organic compounds.

nipple n: a tubular pipe fitting threaded on both ends used for making connections between pipe joints and other tools.

O

Occupational Safety and Health Administration (OSHA) n: a U.S. government enforcement agency that conducts worksite inspections and incident investigations, and researches causes of occupational diseases and accidents. Address: U.S. Department of Labor; 200 Constitution Avenue, NW, Washington, DC 20210; (800) 321-OSHA.

oil n: a simple or complex liquid mixture of hydrocarbons that can be refined to yield gasoline, kerosene, diesel fuel, and various other products.

oil-base mud n: a drilling or workover fluid in which oil is the continuous phase and which contains less than 2 percent and up to 5 percent water. This water is spread out, or dispersed, in the oil as small droplets. See oil mud.

oil mud n: a drilling mud, such as oil-base mud or invert-emulsion mud, in which oil is the continuous phase. Oil mud is useful in drilling certain formations that may be difficult or costly to drill with waterbase mud.

oil zone n: a formation or horizon of a well from which oil may be produced. The oil zone is usually immediately under the gas zone and on top of the water zone if all three fluids are present and segregated.

open hole n: If the casing does not extend all the way to total depth, the uncased portion is referred to as an open hole. 1. any wellbore in which casing has not been set. 2. open or cased hole in which no drill pipe or tubing is suspended. 3. the portion of the wellbore that has no casing.

P, Q

packer n: a piece of downhole equipment consisting of a sealing device, a holding or setting device, and an inside passage for fluids.

permeability n: The rate of flow of a liquid or gas through a porous material.

petroleum n: a substance occurring naturally in the earth in solid, liquid, or gaseous state and composed mainly of mixtures of chemical compounds of carbon and hydrogen, with or without other nonmetallic elements such as sulfur, oxygen, and nitrogen. In some cases, especially in the measurement of oil and gas, petroleum refers only to oil—a liquid hydrocarbon—and does not include natural gas or gas liquids such as propane and butane.

pipe n: a long, hollow cylinder, usually steel, through which fluids are conducted. Oilfield tubular goods are casing (including liners), drill pipe, tubing, or line pipe.

plug n: any object or device that blocks a hole or passageway (such as a cement plug in a borehole).

plug and abandon (P&A) v: to place cement plugs into a dry hole and abandon it. A well is abandoned when it reaches the end of its useful life or is a dry hole. The casing and other equipment is removed and salvaged. Cement plugs are placed in the borehole to prevent migration of fluids between the different formations. The surface is reclaimed.

plug back v: to place cement in or near the bottom of a well to exclude bottom water, to sidetrack, or to produce from a formation higher in the well. Plugging back can also be accomplished with a mechanical plug set by wireline, tubing, or drill pipe.

production n: 1. the phase of the petroleum industry that deals with bringing the well fluids to the surface and separating them and storing, gauging, and otherwise preparing the product for delivery. 2. the amount of oil or gas produced in a given period.

production casing n: the last string of casing set in a well, inside of which is usually suspended a tubing string.

production test n: a test of the well's producing potential usually done during the initial completion phase.

R

rathole n: 1. a hole in the rig floor, some 30 to 40 feet (9 to 12 meters) deep, which is lined with casing that projects above the floor, into which the kelly and the swivel are placed when hoisting operations are in progress. 2. a hole of a diameter smaller than the main hole and drilled in the bottom of the main hole. v: to reduce the size of the wellbore and drill ahead.

ream v: to enlarge the wellbore by drilling it again with a special bit.

remediation n: abatement, clean-up, or other method to contain or remove a hazardous substance from an environment.

reserve pit n: Large pit used to capture drilling muds and fluids while drilling. It was considered a much safer environmental practice in Alaska than leaving drilling muds stacked on the tundra.

reservoir n: a subsurface, porous, permeable or naturally fractured rock body (usually limestones, dolomites, sandstones, or a combination) that holds stores of oil or gas. The four basic types of hydrocarbon reservoirs are oil, volatile oil, dry gas, and gas condensate. An oil reservoir generally contains three fluids—gas, oil, and water—with oil the dominant product. In the typical oil reservoir, these fluids become vertically segregated because of their different densities. Gas, the lightest, occupies the upper part of the reservoir rocks; water, the lower part; and oil, the intermediate section. In addition to its occurrence as a cap or in solution, gas may accumulate independently of the oil; if so, the reservoir is called a gas reservoir. Associated with the gas, in most instances, are salt water and some oil. Volatile oil reservoirs are exceptional in that during early production they are mostly productive of light oil plus gas, but, as depletion occurs, production can become almost totally completely gas. Volatile oils are usually good candidates for pressure maintenance, which can result in increased reserves. In the typical dry gas reservoir natural gas exists only as a gas and production is only gas plus fresh water that condenses from the flow stream reservoir. In a gas condensate reservoir, the hydrocarbons may exist as a gas, but, when brought to the surface, some of the heavier hydrocarbons condense and become a liquid.

revegetation n**:** The reestablishment and development of self-sustaining plant cover. On disturbed sites, human assistance will speed natural processes by seedbed preparation, reseeding, and mulching.

rig n: describes the equipment needed when drilling a well; the derrick or mast, drawworks, and attendant surface equipment of a drilling or workover unit.

rotary drilling n: a drilling method that uses a sharp, rotating bit to drill a hole downward through the Earth's crust while applying a downward force. The spinning of the drill bit can penetrate even the hardest rock. Additional joints of drill pipe are added as drilling progresses. Drilling fluids are circulated down through the wellhole during the drilling process to keep the drill cool, lubricated, control well pressure, remove debris and cuttings, and coat the well walls.

S

samples n pl: 1. the well cuttings obtained at designated footage intervals during drilling. From an examination of these cuttings, the geologist determines the type of rock and formations being drilled and estimates oil and gas content. 2. small quantities of well fluids obtained for analysis.

set casing v: to run and cement casing at a certain depth in the wellbore.

spud v: 1. to begin drilling a well; such as, to spud in. 2. to force a wireline tool or tubing down the hole by using a reciprocating motion.

string n: the entire length of casing, tubing, sucker rods, or drill pipe run into a hole.

surface disturbing activities: Any authorized action that disturbs vegetation and surface soil, increasing erosion potential above normal site conditions. This definition typically applies to mechanized or mechanical disturbance. However, intense or extensive use of hand or motorized hand tools may fall under this definition. Examples of surface disturbing activities include construction of well pads and roads, pits and reservoirs, pipelines and powerlines, mining, and vegetation treatments.

surface casing n: the first string of casing (after the conductor pipe) that is set in a well.

T, U

tag v: to touch an object downhole with the drill stem and record its depth; reference point or obstruction in the wellbore with the tubing string.

temperature-monitoring wells n: U.S. Geological Survey (USGS) exploratory wells drilled in the 1970's to monitor the thermal state of permafrost. Today, the USGS uses these wells for research data to determine the magnitude of contemporary climate change in arctic Alaska and to better understand the effects of climate change on permafrost. These wells are plugged above their hydrocarbon bearing zones and into the well's surface casing. The wells are filled with diesel fuel from their shallowest plugs to the surface.

thermokarst n: A periglacial landscape that is characterized by enclosed depressions (some with standing water) and so resembles a karst landscape. It is caused by the selective thaw of ground ice associated with thermal erosion by water and may reflect the influences of climatic changes or human activity upon permafrost.

total depth (TD) n: the maximum depth reached in a well.

uncased hole n: see open hole.

V

valve n: a device used to control the rate of flow in a line to open or shut off a line completely, or to serve as an automatic or semiautomatic safety device. Valves used extensively include the check valve, gate valve, globe valve, needle valve, plug valve, and pressure relief valve.

vegetation type: A plant community with visually distinguishable characteristics, named for the apparent dominant species.

viewshed: The areas seen from any given point.

visibility: The visual quality of the view or scene in daylight, with respect to color, rendition, and contrast definition. The ability to perceive form, color, and texture.

visual range: The distance at which a black object just disappears from view.

visual resource: The composite of basic terrain, geologic features, water features, vegetation patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for viewers

W, X, Y, Z

well n: the hole made by the drilling bit, which can be open, cased, or both. Also called borehole, hole, or wellbore.

wellbore n: a borehole; the hole drilled by the bit. A wellbore may have casing in it or it may be open (uncased); or part of it may be cased, and part of it may be open. Also called a borehole or hole.

well completion n: 1. the activities and methods of preparing a well for the production of oil and gas or for other purposes, such as injection; the method by which one or more flow paths for hydrocarbons are established between the reservoir and the surface. 2. the system of tubulars, packers, and other tools installed beneath the wellhead in the production casing; that is, the tool assembly that provides the hydrocarbon flow path or paths.

wellhead n: the equipment installed at the surface of the wellbore. A wellhead includes such equipment as the casing head and tubing head. adj: pertaining to the wellhead.

well site n: the physical location on which an oil or gas well is drilled. The size of the well site generally ranges from about ½ to 2 acres, depending on the footprint of the production facilities needed.

zone n: 1. [Geology] A unit or interval of rock differentiated from surrounding rocks based on fossil content or other features, such as faults or fractures. Stratigraphy. 2. [Well Testing] A slab of reservoir rock bounded above and below by impermeable rock.