Thickness of Surficial Sediment at and near the Idaho National Engineering Laboratory, Idaho

by S.R. Anderson, Michael J. Liszewski, and Daniel J. Ackerman

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For additional information write to:

U.S. Geological Survey
INEL, MS 4148
P.O. Box 2230
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CONVERSION FACTORS

Multiply	By	To Obtain
foot (ft)	0.3048	meter
square mile (mi^2)	2.590	square kilometer

Thickness of Surficial Sediment at and near the Idaho National Engineering Laboratory, Idaho

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Abstract

Thickness of surficial sediment was determined from natural-gamma logs in 333 wells at and near the Idaho National Engineering Laboratory in eastern Idaho to provide reconnaissance data for future site-characterization studies. Surficial sediment, which is defined as the unconsolidated clay, silt, sand, and gravel that overlie the uppermost basalt flow at each well, ranges in thickness from 0 feet in seven wells drilled through basalt outcrops east of the Idaho Chemical Processing Plant to 313 feet in well Site 14 southeast of the Big Lost River sinks. Surficial sediment includes alluvial, lacustrine, eolian, and colluvial deposits that generally accumulated during the past 200 thousand years. Additional thickness data, not included in this report, are available from numerous auger holes and foundation borings at and near most facilities.

INTRODUCTION

The Idaho National Engineering Laboratory (INEL) is operated by the U.S. Department of Energy (DOE) and covers about 890 mi^2 of the eastern Snake River Plain in eastern Idaho (fig. 1). Facilities at the INEL are used in the development of peacetime atomic-energy applications, nuclear safety research, defense programs, and advanced energy concepts. Liquid radionuclide and chemical wastes generated at these facilities have been discharged to onsite infiltration ponds and disposal wells since 1952. Liquid-waste disposal has resulted in detectable concentrations of several waste constituents in water in the Snake River Plain aquifer underlying the INEL (Orr and Cecil, 1991).

Concern about the potential for migration of radioactive and chemical wastes in the unsaturated zone and aquifer has resulted in numerous studies of the subsurface at the INEL. In 1988, the U.S. Geological Survey (USGS) in cooperation with the DOE, began a study of the stratigraphy of basalt and sediment underlying the INEL to determine stratigraphic relations that might affect the movement of wastes. Three earlier reports, Anderson and Lewis (1989), Anderson (1991), and Anderson and Bowers (1995), describe stratigraphic relations and their implications regarding the movement of wastes at the Radioactive Waste Management Complex (RWMC), the Idaho Chemical Processing Plant (ICPP), the Test Reactor Area (TRA), and Test Area North (TAN) (fig. 1). A fourth report, Anderson and others (1996), describes stratigraphic relations in 333 wells at and near the INEL and includes revised relations for the RWMC, ICPP, TRA, and TAN. Each of these reports describes the thickness of surficial sediment; data are contoured at the RWMC, ICPP, TRA, and TAN, and Anderson and others (1996) subdivide the sediment into stratigraphic units.

Purpose and Scope

This report describes the thickness of surficial sediment determined from natural-gamma logs in 333 wells at and near the INEL (figs. 2-5 and table 1, located at back of this report). Surficial sediment, disregarding stratigraphic criteria, is defined as the unconsolidated clay, silt, sand, and gravel that overlie the uppermost basalt flow at each well. Surficial sediment includes alluvial, lacustrine, eolian, and colluvial deposits that generally accumulated during the last 200 thousand years.

This report was designed to provide reconnaissance data for future site-characterization studies, such as those that would be required for building sites, storage tanks, pipelines, landfills, and waste ponds. Additional thickness data, not included in

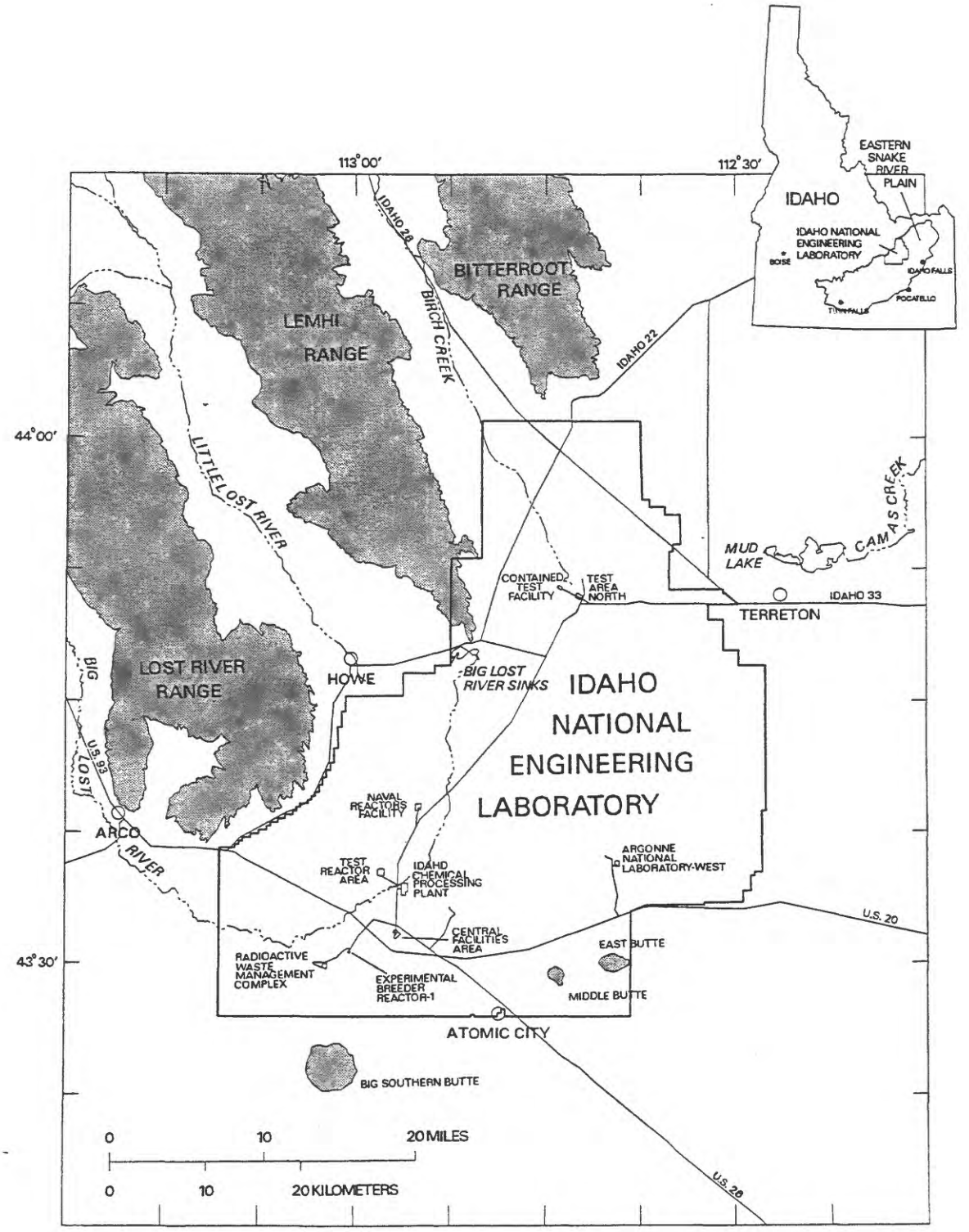

Figure 1. Location of the Idaho National Engineering Laboratory and selected facilities.

this report, are available from numerous auger holes and foundation borings at and near most facilities. Distribution of surficial sediment is described by Kuntz and others (1994). Mineralogy and grain size of surficial sediment and selected sedimentary interbeds are described by Bartholomay and others (1989), Bartholomay (1990), and Reed and Bartholomay (1994).

THICKNESS OF SURFICIAL SEDIMENT

Surficial sediment covers much of the INEL and adjacent areas, but is thickest in a zone that extends northeastward from the Central Facilities Area (CFA) to Mud Lake (fig. 6, located at the back of this report) (Kuntz and others, 1994). Areas inside this zone are covered by alluvial, lacustrine, and eolian deposits derived from the Big Lost River, Little Lost River, Birch Creek, Camas Creek, Mud Lake, and ancient Lake Terreton. Areas outside of this zone are covered mainly by basalt and a veneer of wind-blown sediment and colluvium. Facilities inside the zone of thickest sediment accumulation include the CFA, ICPP, TRA, and TAN; the Contained Test Facility (CTF) and Naval Reactors Facility (NRF) also lie within this zone (fig. 1). Facilities that overlie shallow basalt include the RWMC, the Experimental Breeder Reactor-1 (EBR-1), and Argonne National Laboratory-West (ANL-W).

Thickness of surficial sediment ranges from 0 feet in wells NPR Test, NPR WO-2, PBF #2, PBF(CW), PBF(WW), Sdd-1, and Sdd-2 that were drilled through basalt outcrops east of the ICPP to 313 ft in well Site 14, southeast of the Big Lost River sinks (fig. 1; and figs. 6-9 and table 1, located at the back of this report). Thickness of sediment in wells ranges from about 10 to 30 ft at the CFA and NRF, about 20 to 60 ft at the CTF and TAN, and about 20 to 70 ft at the ICPP and TRA. Facilities where sediment thickness is least include the RWMC, EBR-1, and ANL-W; thickness of sediment in wells ranges from about 5 to 20 ft at the RWMC and EBR-1 and is less than 10 ft at ANL-W. Areas of thickest sediment accumulation occur near and southeast of the Big Lost River sinks and near Terreton, southwest of Mud Lake; thickness of sediment ranges from 177 to 313 ft in wells DH1B, DH2A, DH3, and Site 14 and from 68 to 132 ft in wells USGS 27, Ashcraft, Barney North, Barney South, Callaway, and Cope. Most surficial sediment at and near the INEL accumulated during the last 200 thousand years, although deposits are younger than about 100 thousand years in the northern part of the RWMC and are about 470 thousand years old in the area of thickest accumulation near and southeast of the Big Lost River sinks (Anderson and others, 1996).

SUMMARY

Thickness of surficial sediment was determined from natural-gamma logs in 333 wells at and near the INEL to provide reconnaissance data for future site-characterization studies. Thickness of surficial sediment ranges from 0 feet in seven wells drilled through basalt outcrops east of the ICPP to 313 ft in well Site 14, southeast of the Big Lost River sinks. In general, sediment thickness in wells ranges from about 5 to 20 ft at the RWMC and EBR-1, about 10 to 30 ft at the CFA and NRF, about 20 to 60 ft at the CTF and TAN, and about 20 to 70 ft at the ICPP and TRA; sediment thickness is less than 10 ft at ANL-W. Sediment thickness ranges from 177 to 313 ft in four wells near and southeast of the Big Lost River sinks and from 68 to 132 ft in six wells southwest of Mud Lake near Terreton. Most surficial sediment was deposited during the last 200 thousand years, although sediment is younger than about 100 thousand years in the northern part of the RWMC and as old as about 470 thousand years in the area of thickest accumulation. Additional thickness data, not included in this report, are available from numerous auger holes and foundation borings at and near most facilities.

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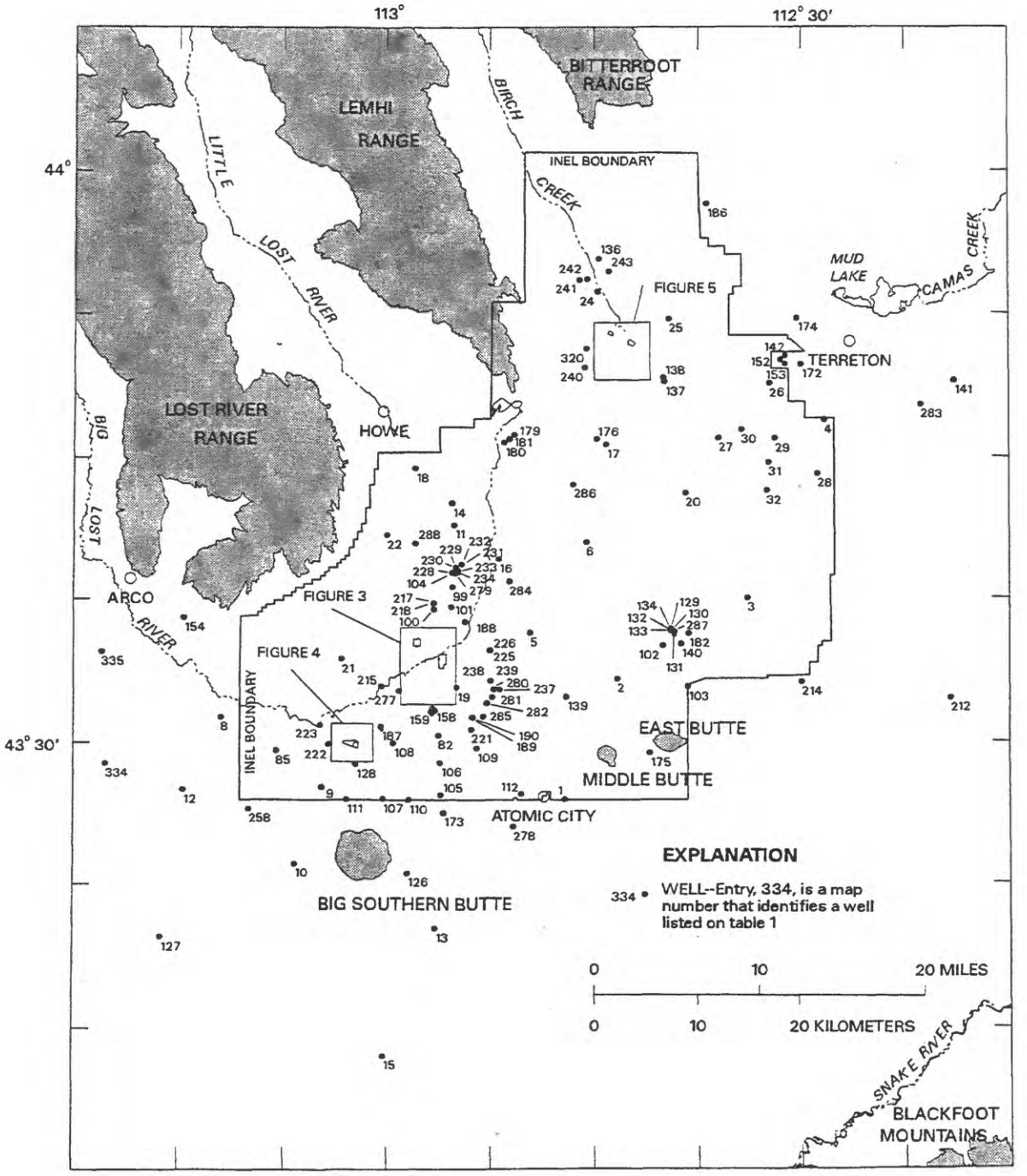

Figure 2. Locations of wells used to determine thickness of surficial sediment at and near the Idaho National Engineering Laboratory.

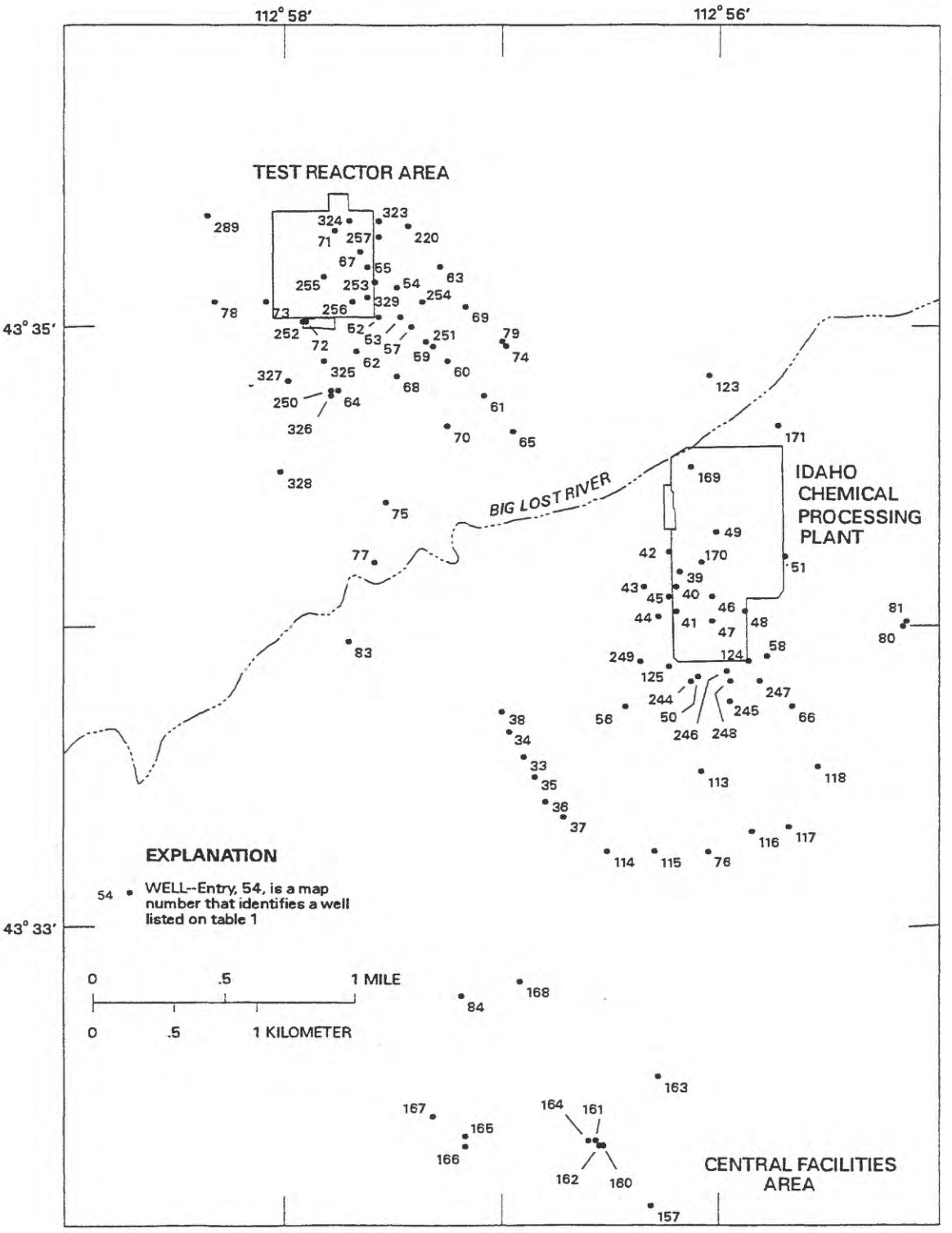

Figure 3. Locations of wells used to determine thickness of surficial sediment at and near the Idaho Chemical Processing Plant, Test Reactor Area, and Central Facilities Area (area keyed to figure 2).

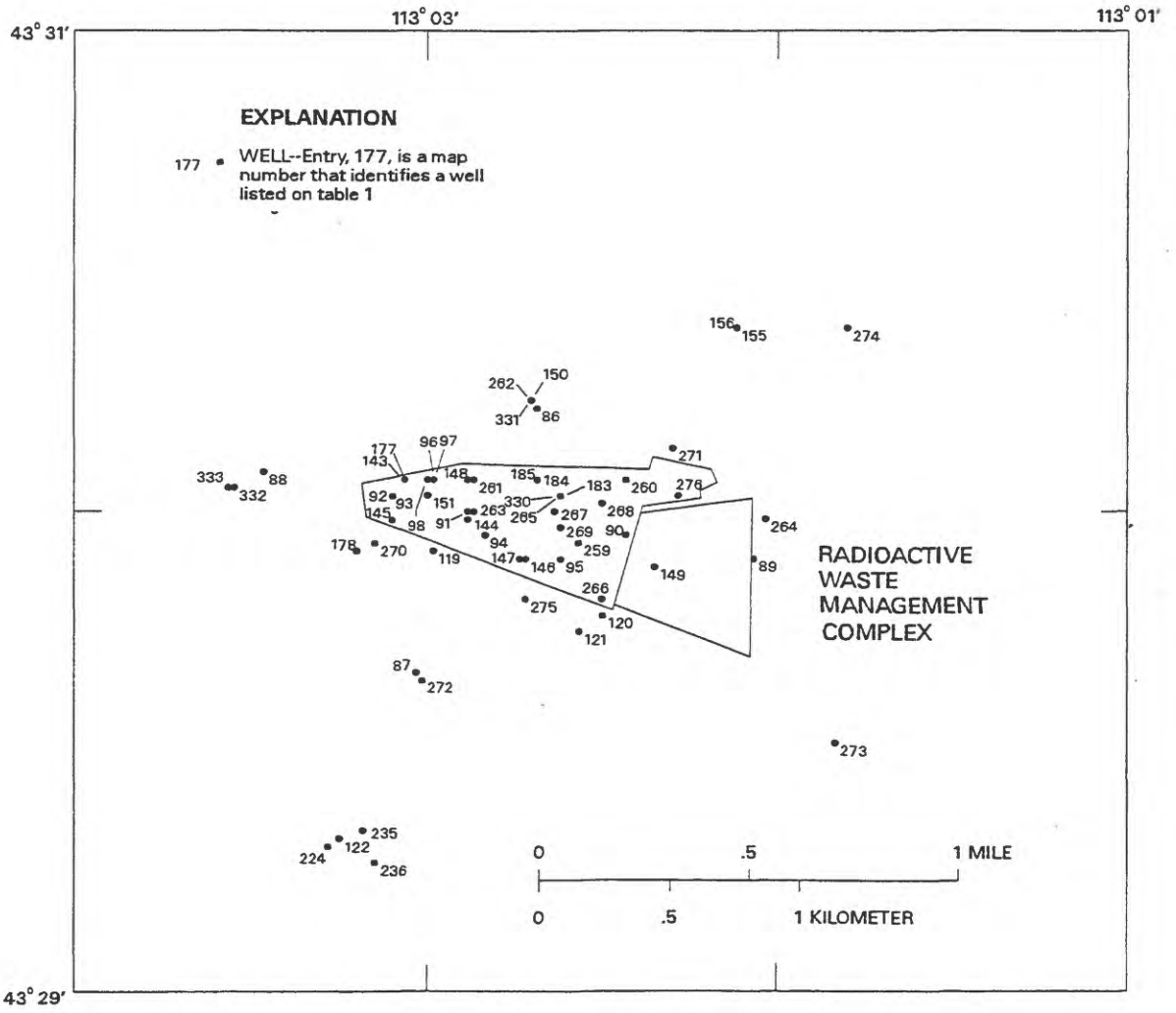

Figure 4. Locations of wells used to determine thickness of surficial sediment at and near the Radioactive Waste Management Complex (area keyed to figure 2).

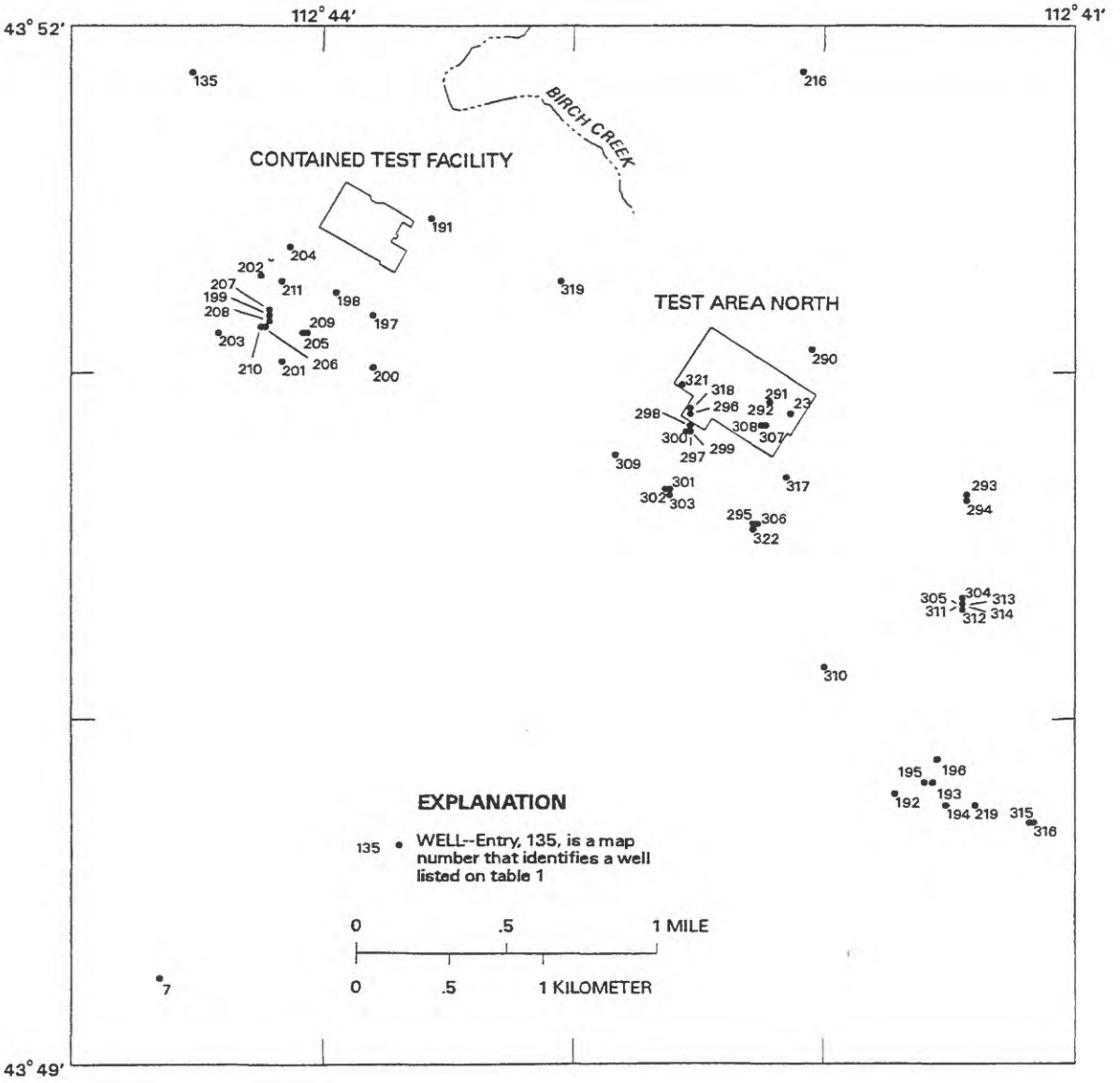

Figure 5. Locations of wells used to determine thickness of surficial sediment at and near the Contained Test Facility and Test Area North (area keyed to figure 2).

Table 1. Thickness of surficial sediment in wells at and near the Idaho National Engineering Laboratory

[Map number: Entries, 1 through 335, identify the locations of wells on maps; numbers in parentheses, 2, 3, 4, and 5, correspond to figure numbers of maps. Thickness: Entries, 0 through 313, indicate the thickness of surficial sediment, in feet; numbers in parentheses indicate that data are posted on figures 6, 7, 8, or 9. Map numbers from Anderson and others (1996); map numbers 213 and 227 not used]

Well identifier	Map number (Figure number)	Thickness (Figure number)	Well identifier	Map number (Figure number)	Thickness (Figure number)
USGS 1	1 (2)	6 (6)	USGS 44	43 (3)	35 (7)
USGS 2	2 (2)	6 (6)	USGS 45	44 (3)	53 (7)
USGS 3A	3 (2)	13 (6)	USGS 46	45 (3)	41 (7)
USGS 4	4 (2)	22 (6)	USGS 47	46 (3)	40 (7)
USGS 5	5 (2)	7 (6)	USGS 48	47 (3)	32 (7)
USGS 6	6 (2)	8 (6)	USGS 49	48 (3)	27 (7)
USGS 7	7 (5)	123 (9)	USGS 50	49 (3)	46 (7)
USGS 8	8 (2)	6 (6)	USGS 51	50 (3)	31 (7)
USGS 9	9 (2)	9 (6)	USGS 52	51 (3)	43 (7)
USGS 11	10 (2)	3 (6)	USGS 53	52 (3)	45 (7)
USGS 12	11 (2)	49 (6)	USGS 54	53 (3)	60 (7)
USGS 13	12 (2)	13 (6)	USGS 55	54 (3)	42 (7)
USGS 14	13 (2)	7 (6)	USGS 56	55 (3)	55 (7)
USGS 15	14 (2)	41 (6)	USGS 57	56 (3)	49 (7)
USGS 16	15 (2)	0 (6)	USGS 58	57 (3)	46 (7)
USGS 17	16 (2)	18 (6)	USGS 59	58 (3)	22 (7)
USGS 18	17 (2)	6 (6)	USGS 60	59 (3)	50 (7)
USGS 19	18 (2)	8 (6)	USGS 61	60 (3)	60 (7)
USGS 20	19 (2)	21 (6)	USGS 62	61 (3)	53 (7)
USGS 21	20 (2)	7 (6)	USGS 63	62 (3)	56 (7)
USGS 22	21 (2)	10 (6)	USGS 64	63 (3)	42 (7)
USGS 23	22 (2)	5 (6)	USGS 65	64 (3)	51 (7)
USGS 24	23 (5)	57 (9)	USGS 66	65 (3)	49 (7)
USGS 25	24 (2)	35 (6)	USGS 67	66 (3)	23 (7)
USGS 26	25 (2)	24 (6)	USGS 68	67 (3)	45 (7)
USGS 27	26 (2)	132 (6)	USGS 69	68 (3)	50 (7)
USGS 28	27 (2)	8 (6)	USGS 70	69 (3)	44 (7)
USGS 29	28 (2)	8 (6)	USGS 71	70 (3)	55 (7)
USGS 30A	29 (2)	15 (6)	USGS 72	71 (3)	36 (7)
USGS 31	30 (2)	18 (6)	USGS 73	72 (3)	56 (7)
USGS 32	31 (2)	17 (6)	USGS 74	73 (3)	32 (7)
USGS 33	32 (2)	11 (6)	USGS 75	74 (3)	43 (7)
USGS 34	33 (3)	32 (7)	USGS 76	75 (3)	73 (7)
USGS 35	34 (3)	33 (7)	USGS 77	76 (3)	13 (7)
USGS 36	35 (3)	30 (7)	USGS 78	77 (3)	67 (7)
USGS 37	36 (3)	37 (7)	USGS 79	78 (3)	14 (7)
USGS 38	37 (3)	22 (7)	USGS 80	79 (3)	41 (7)
USGS 39	38 (3)	33 (7)	USGS 81	80 (3)	2 (7)
USGS 40	39 (3)	55 (7)	USGS 82	81 (3)	3 (7)
USGS 41	40 (3)	44 (7)	USGS 83	82 (2)	10 (6)
USGS 42	41 (3)	32 (7)	USGS 84	83 (3)	58 (7)
USGS 43	42 (3)	52 (7)	USGS 85	84 (3)	26 (7)

Table 1. Thickness of surficial sediment in wells at and near the Idaho National Engineering Laboratory—Continued

Well identifier	Map number (Figure number)	Thickness (Figure number)
USGS 86	85 (2)	34 (6)
USGS 87	86 (4)	3 (8)
USGS 88	87 (4)	5 (8)
USGS 89	88 (4)	10 (8)
USGS 90	89 (4)	5 (8)
USGS 91	90 (4)	9 (8)
USGS 92	91 (4)	19 (8)
USGS 93	92 (4)	13 (8)
USGS 93A	93 (4)	11 (8)
USGS 94	94 (4)	12 (8)
USGS 95	95 (4)	23 (8)
USGS 96	96 (4)	13 (8)
USGS 96A	97 (4)	13 (8)
USGS 96B	98 (4)	14 (8)
USGS 97	99 (2)	38 (6)
USGS 98	100 (2)	6 (6)
USGS 99	101 (2)	32 (6)
USGS 100	102 (2)	4 (6)
USGS 101	103 (2)	3 (6)
USGS 102	104 (2)	19 (6)
USGS 103	105 (2)	22 (6)
USGS 104	106 (2)	3 (6)
USGS 105	107 (2)	15 (6)
USGS 106	108 (2)	3 (6)
USGS 107	109 (2)	10 (6)
USGS 108	110 (2)	7 (6)
USGS 109	111 (2)	1 (6)
USGS 110	112 (2)	2 (6)
USGS 111	113 (3)	8 (7)
USGS 112	114 (3)	24 (7)
USGS 113	115 (3)	20 (7)
USGS 114	116 (3)	16 (7)
USGS 115	117 (3)	20 (7)
USGS 116	118 (3)	24 (7)
USGS 117	119 (4)	14 (8)
USGS 118	120 (4)	14 (8)
USGS 119	121 (4)	3 (8)
USGS 120	122 (4)	12 (8)
USGS 121	123 (3)	29 (7)
USGS 122	124 (3)	24 (7)
USGS 123	125 (3)	31 (7)
USGS 124	126 (2)	4 (6)
1-27-14	127 (2)	5 (6)
A11A31	128 (2)	3 (6)
ANL-IWP-M1	129 (2)	8 (6)
ANL-IWP-M2	130 (2)	9 (6)
ANL-IWP-M3	131 (2)	7 (6)
ANL-IWP-M4	132 (2)	5 (6)
ANL-IWP-M5	133 (2)	8 (6)
ANL-IWP-M6	134 (2)	5 (6)
ANP #6	135 (5)	35 (9)
ANP #7	136 (2)	4 (6)
ANP #9	137 (2)	76 (6)
ANP #10	138 (2)	61 (6)
AREA II	139 (2)	6 (6)
Arbor Test 1	140 (2)	2 (6)
R. Archer	141 (2)	6 (6)
Ashcraft	142 (2)	110 (6)
BG-76-1	143 (4)	7 (8)
BG-76-2	144 (4)	12 (8)
BG-76-3	145 (4)	18 (8)
BG-76-4	146 (4)	7 (8)
BG-76-4A	147 (4)	2 (8)
BG-76-5	148 (4)	11 (8)
BG-76-6	149 (4)	4 (8)
BG-77-1	150 (4)	4 (8)
BG-77-2	151 (4)	18 (8)
Barney North	152 (2)	88 (6)
Barney South	153 (2)	74 (6)
Butte City #2	154 (2)	86 (6)
C-1	155 (4)	2 (8)
C-1A	156 (4)	4 (8)
CFA 1	157 (3)	26 (7)
CFA 2	158 (2)	10 (6)
CFA 4	159 (2)	7 (6)
CFA LF 2-8	160 (3)	26 (7)
CFA LF 2-9	161 (3)	27 (7)
CFA LF 2-10	162 (3)	26 (7)
CFA LF 2-11	163 (3)	25 (7)
CFA LF 2-12	164 (3)	22 (7)
CFA LF 3-8	165 (3)	13 (7)
CFA LF 3-9	166 (3)	8 (7)
CFA LF 3-10	167 (3)	26 (7)
CFA LF 3-11	168 (3)	16 (7)
CPP 2	169 (3)	35 (7)
CPP Disp.	170 (3)	47 (7)
CPP 4	171 (3)	34 (7)
Callaway	172 (2)	68 (6)
Cerro Grande	173 (2)	3 (6)
Cope	174 (2)	100 (6)

Table 1. Thickness of surficial sediment in wells at and near the Idaho National Engineering Laboratory—Continued

Well identifier	Map number (Figure number)	Thickness (Figure number)
Corehole 1	175 (2)	8 (6)
Corehole 2A	176 (2)	4 (6)
D-10	177 (4)	9 (8)
D-15	178 (4)	2 (8)
DH1B	179 (2)	210 (6)
DH2A	180 (2)	177 (6)
DH3	181 (2)	>203 (6)
DH-50	182 (2)	6 (6)
DO-2	183 (4)	15 (8)
DO-6	184 (4)	3 (8)
DO-6A	185 (4)	2 (8)
Dahle	186 (2)	6 (6)
EBR I	187 (2)	11 (6)
EFS Well	188 (2)	18 (6)
EOCR	189 (2)	3 (6)
EOCR (Disp)	190 (2)	17 (6)
FET-Disp-1	191 (5)	40 (9)
GIN #1	192 (5)	45 (9)
GIN #2	193 (5)	36 (9)
GIN #3	194 (5)	32 (9)
GIN #4	195 (5)	36 (9)
GIN #5	196 (5)	26 (9)
GIN #6	197 (5)	57 (9)
GIN #7	198 (5)	33 (9)
GIN #8	199 (5)	50 (9)
GIN #9	200 (5)	49 (9)
GIN #10	201 (5)	45 (9)
GIN #11	202 (5)	47 (9)
GIN #12	203 (5)	47 (9)
GIN #13	204 (5)	6 (9)
GIN #14	205 (5)	49 (9)
GIN #15	206 (5)	50 (9)
GIN #16	207 (5)	38 (9)
GIN #17	208 (5)	43 (9)
GIN #18	209 (5)	48 (9)
GIN #19	210 (5)	48 (9)
GIN #20	211 (5)	8 (9)
Highway #1 (piezo. A)	212 (2)	6 (6)
Highway #2	214 (2)	14 (6)
Highway #3	215 (2)	35 (6)
IET Disp.	216 (5)	8 (9)
INEL #1	217 (2)	12 (6)
Water Supply for INEL #1	218 (2)	12 (6)
LPTF Disposal	219 (5)	34 (9)
MTR Test	220 (3)	49 (7)
Main Gate Well	221 (2)	11 (6)
NA 89-1	222 (2)	2 (6)
NA 89-2	223 (2)	12 (6)
NA 89-3	224 (4)	1 (8)
NPR Test	225 (2)	0 (6)
NPR WO-2	226 (2)	0 (6)
NRF #4	228 (2)	33 (6)
NRF #6	229 (2)	8 (6)
NRF #6P	230 (2)	12 (6)
NRF #7	231 (2)	23 (6)
NRF #7P	232 (2)	25 (6)
NRF 89-04	233 (2)	21 (6)
NRF 89-05	234 (2)	21 (6)
OW-1	235 (4)	5 (8)
OW-2	236 (4)	7 (8)
PBF#2	237 (2)	0 (6)
PBF (CW)	238 (2)	0 (6)
PBF (WW)	239 (2)	0 (6)
PSTF Test	240 (2)	55 (6)
P & W #1	241 (2)	33 (6)
P & W #2	242 (2)	57 (6)
P & W #3	243 (2)	115 (6)
PW-1	244 (3)	31 (7)
PW-2	245 (3)	17 (7)
PW-3	246 (3)	27 (7)
PW-4	247 (3)	31 (7)
PW-5	248 (3)	30 (7)
PW-6	249 (3)	37 (7)
PW-7	250 (3)	50 (7)
PW-8	251 (3)	56 (7)
PW-9	252 (3)	49 (7)
PW-10	253 (3)	48 (7)
PW-11	254 (3)	42 (7)
PW-12	255 (3)	35 (7)
PW-13	256 (3)	39 (7)
PW-14	257 (3)	34 (7)
Quaking Aspen Butte Well	258 (2)	11 (6)
RWMC-78-1	259 (4)	15 (8)
RWMC-78-2	260 (4)	2 (8)
RWMC-78-3	261 (4)	4 (8)
RWMC-78-4	262 (4)	2 (8)
RWMC-78-5	263 (4)	12 (8)
RWMC-79-1	264 (4)	5 (8)
RWMC-79-2	265 (4)	13 (8)

Table 1. Thickness of surficial sediment in wells at and near the Idaho National Engineering Laboratory—Continued

Well identifier	Map number (Figure number)	Thickness (Figure number)
RWMC-79-3	266 (4)	13 (8)
RWMC-88-1D	267 (4)	18 (8)
RWMC-88-02D	268 (4)	6 (8)
RWMC-89-01D	269 (4)	22 (8)
RWMC M1SA	270 (4)	7 (8)
RWMC M3S	271 (4)	5 (8)
RWMC M4D	272 (4)	8 (8)
RWMC M6S	273 (4)	7 (8)
RWMC M7S	274 (4)	9 (8)
RWMC M10S	275 (4)	6 (8)
RWMC Prod.	276 (4)	7 (8)
Rifle Range Well	277 (2)	29 (6)
Leo Roger's #1	278 (2)	3 (6)
S5G Test (NRF #5)	279 (2)	37 (6)
Sdd-1	280 (2)	0 (6)
Sdd-2	281 (2)	0 (6)
Sdd-3	282 (2)	8 (6)
Siddoway	283 (2)	72 (6)
Site 6	284 (2)	22 (6)
Site 9	285 (2)	59 (6)
Site 14	286 (2)	313 (6)
Site 16	287 (2)	9 (6)
Site 17	288 (2)	8 (6)
Site 19	289 (3)	49 (7)
TAN #3	290 (5)	54 (9)
TAN #4	291 (5)	63 (9)
TAN #5	292 (5)	59 (9)
TAN #6	293 (5)	50 (9)
TAN #7	294 (5)	38 (9)
TAN #8	295 (5)	43 (9)
TAN #9	296 (5)	26 (9)
TAN #10	297 (5)	36 (9)
TAN #10A	298 (5)	36 (9)
TAN #11	299 (5)	36 (9)
TAN #12	300 (5)	40 (9)
TAN #13	301 (5)	40 (9)
TAN #13A	302 (5)	39 (9)
TAN #14	303 (5)	39 (9)
TAN #15	304 (5)	16 (9)
TAN #16	305 (5)	17 (9)
TAN #17	306 (5)	41 (9)
TAN #18	307 (5)	48 (9)
TAN #19	308 (5)	47 (9)
TAN #20	309 (5)	46 (9)
TAN #21	310 (5)	39 (9)
TAN #22	311 (5)	18 (9)
TAN #22A	312 (5)	18 (9)
TAN #23	313 (5)	20 (9)
TAN #23A	314 (5)	18 (9)
TAN #24	315 (5)	24 (9)
TAN #24A	316 (5)	22 (9)
TAN Drainage Disp.#1	317 (5)	27 (9)
TAN Drainage Disp.#2	318 (5)	24 (9)
TAN Drainage Disp.#3	319 (5)	49 (9)
TAN Exploratory Well	320 (2)	13 (6)
TCH #1	321 (5)	44 (9)
TCH #2 Piezo A	322 (5)	40 (9)
TRA #3	323 (3)	53 (7)
TRA #4	324 (3)	40 (7)
TRA 05/PZ1	325 (3)	70 (7)
TRA 06A	326 (3)	43 (7)
TRA 07	327 (3)	43 (7)
TRA 08	328 (3)	57 (7)
TRA Disp.	329 (3)	42 (7)
TW-1	330 (4)	14 (8)
VZT-1	331 (4)	4 (8)
WWW#1	332 (4)	5 (8)
WWW#2	333 (4)	3 (8)
Water table	334 (2)	3 (6)
Weaver and Lowe	335 (2)	30 (6)

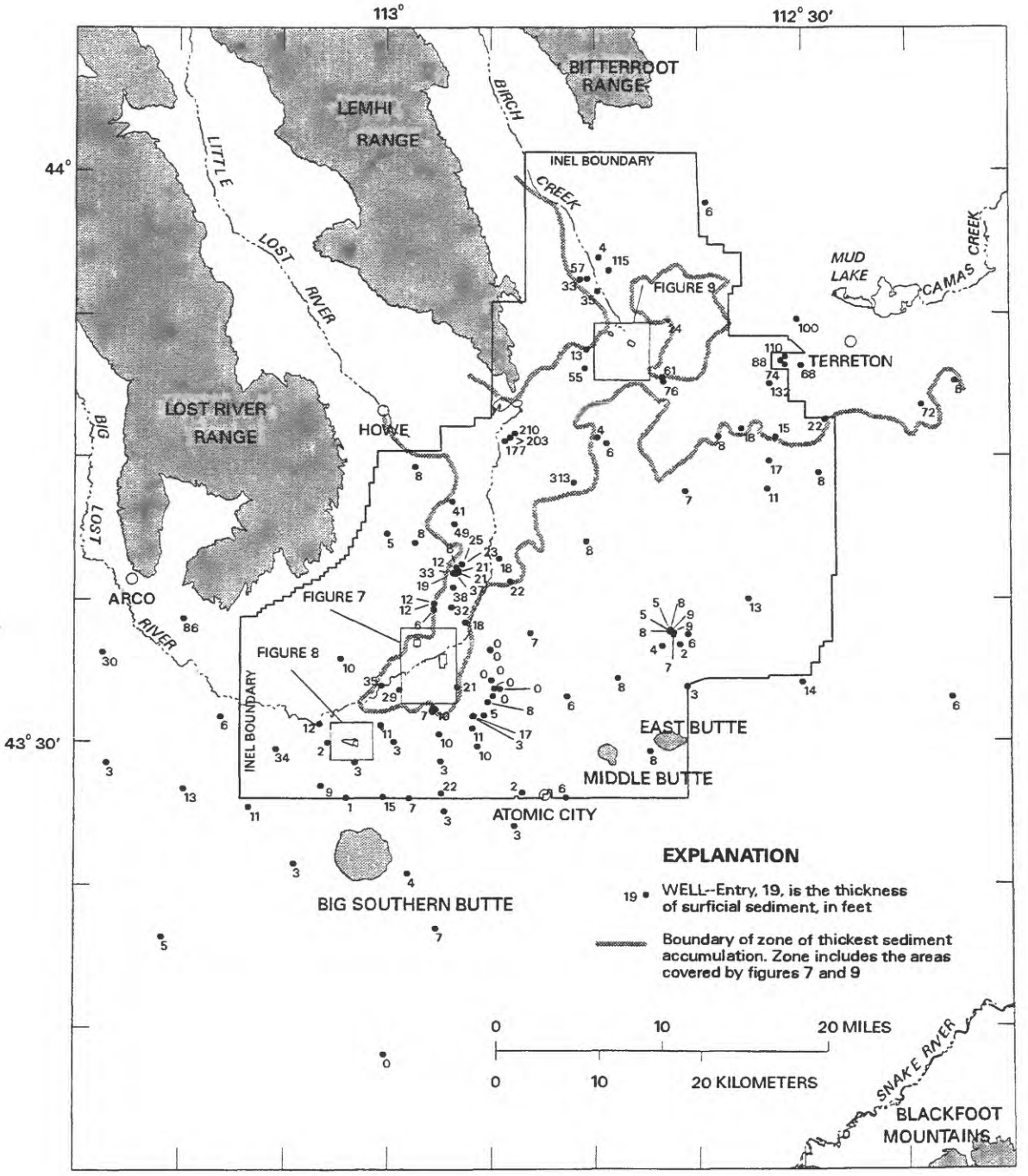

Figure 6. Thickness of surficial sediment in wells at and near the Idaho National Engineering Laboratory

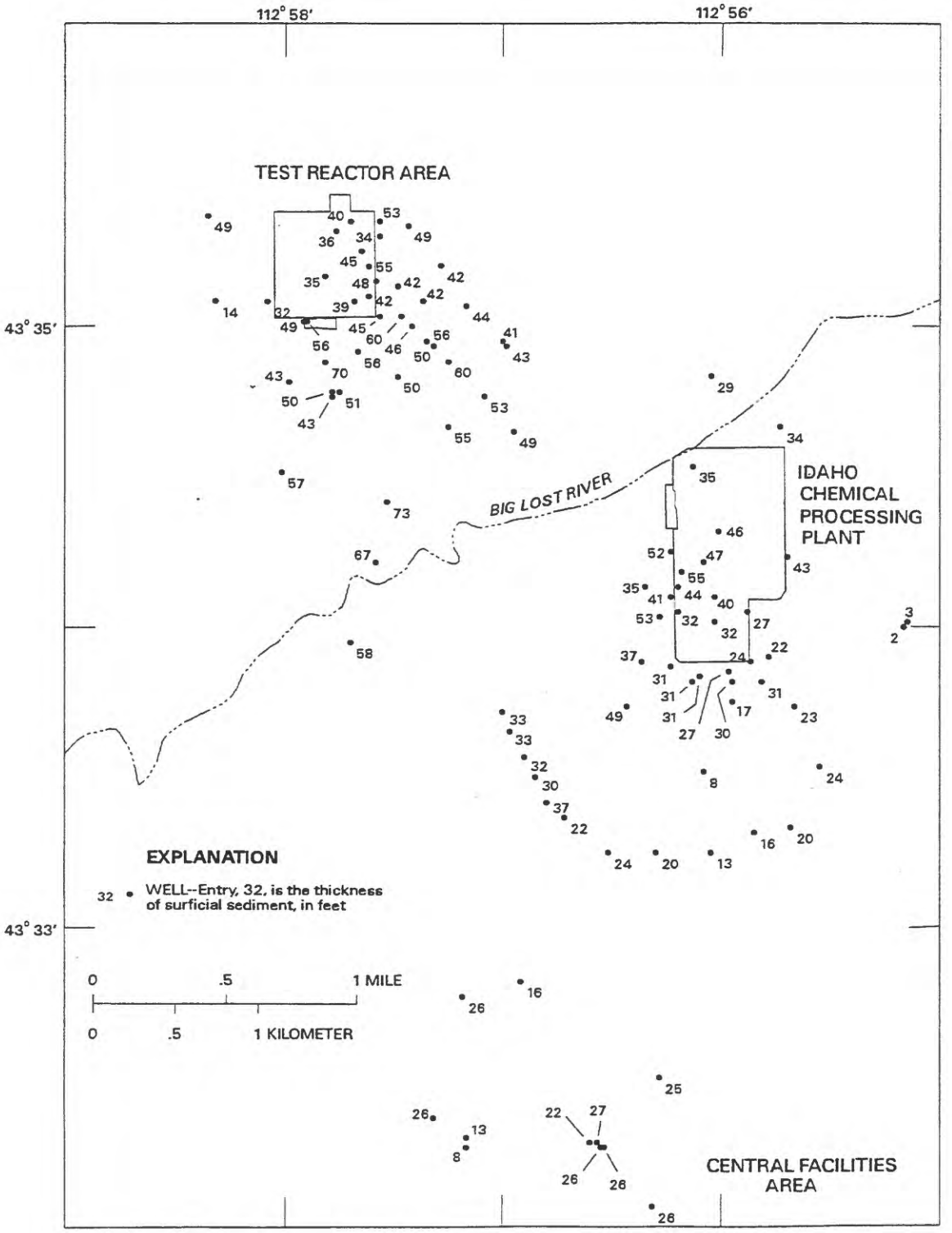

Figure 7. Thickness of surficial sediment in wells at and near the Idaho Chemical Processing Plant, Test Reactor Area, and Central Facilities Area (area keyed to figure 6).

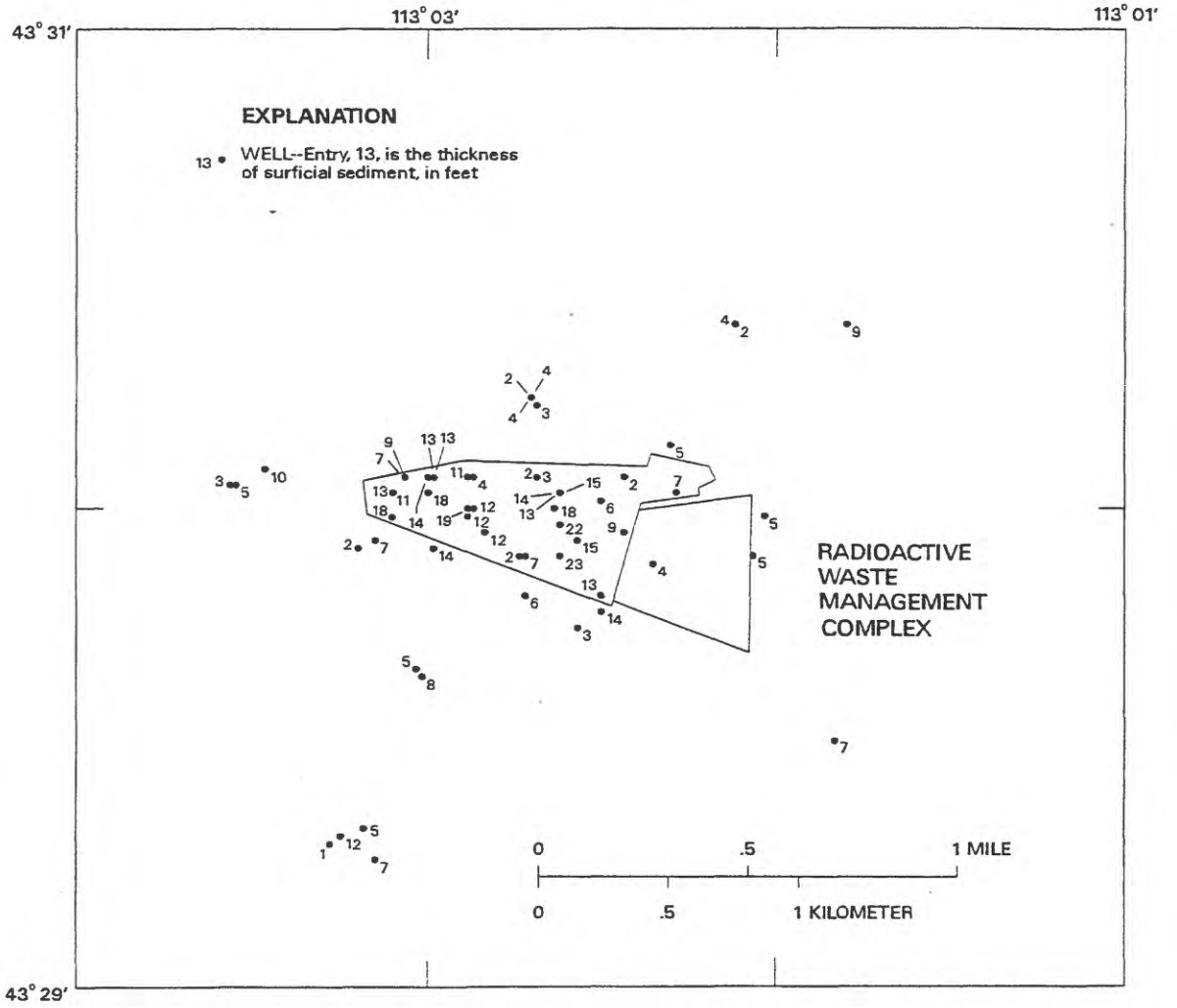

Figure 8. Thickness of surficial sediment in wells at and near the Radioactive Waste Management Complex (area keyed to figure 6).

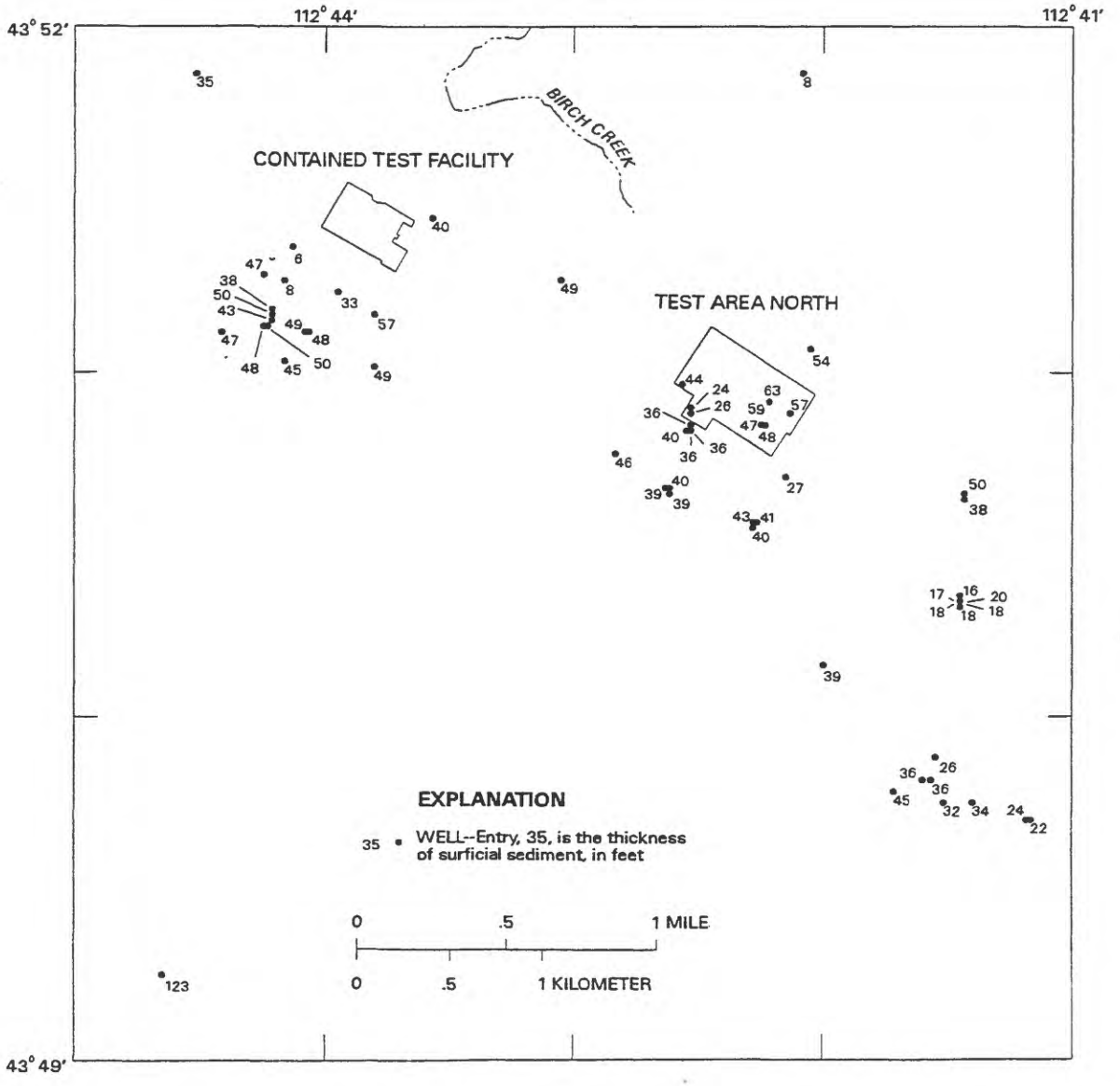

Figure 9. Thickness of surficial sediment in wells at and near the Contained Test Facility and Test Area North (area keyed to figure 6).