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OPEN-FILE REPORT 80-UR - No. 21: SIOUX FALLS (RUNGE) CITY

STATEWIDE LANDFILL STUDY:
SIOUX FALLS (RUNGE) CITY LANDFILL SITE CHARACTERISTICS

by

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1996

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INTRODUCTION

Purpose and Scope

The purpose of this report is to summarize the geologic data, hydrologic data, and other site characteristics of the Sioux Falls (Runge) City landfill. This information was compiled as a part of the Statewide Landfill Study.

In 1984, the state of South Dakota had 38 permitted solid waste landfills, both private and public, that accepted waste other than ordinary household waste. A study was undertaken in an effort to evaluate selected landfills in South Dakota and identify those that may be best suited for the disposal of these special wastes.

This study was conducted by the South Dakota Geological Survey and the Office of Air Quality and Solid Waste of the Department of Water and Natural Resources, now known as the Department of Environment and Natural Resources. The Office of Air Quality and Solid Waste contracted with the South Dakota Geological Survey for certain geological services. The South Dakota Geological Survey contribution to this study was three-fold. First, available geologic and hydrologic data from landfills in South Dakota were reviewed and evaluated. Second, monitoring well systems were designed and installed at four landfills which were selected by the Office of Air Quality and Solid Waste. Finally, the geology was evaluated in more detail at these four landfills.

Selection of Sites

Existing information concerning 38 permitted and 2 proposed landfill sites was reviewed by the Office of Air Quality and Solid Waste in order to prioritize the sites. The Office of Air Quality and Solid Waste used this preliminary screening to reduce the number of potential sites from 40 to 26 (table 1 and fig. 1).

TABLE 1. List of sites considered for further evaluation

1. Belle Fourche City	14. Miedema City
2. Brookings City - Proposed	15. Milbank City
3. Brown County	16. Miller City
4. Brule County	17. Pierre City - Proposed
5. Byre (Private)	18. Pierre City - Old Site
6. Davison County	19. Ralph Dawson (Private)
7. De Smet City	20. Rapid City
8. Gregory County	21. Sioux Falls (Runge) City
9. Haarstad (Private)	22. Vermillion City
10. Huron City	23. Walworth County
11. John Clements (Private)	24. Watertown City
12. Kadoka City	25. Winner City
13. Marshall County	26. Yankton County

Subsequently, the South Dakota Geological Survey evaluated these 26 sites and prepared a draft report describing each site. No field checking was done. Topics such as topography, drainage, climate, soils, geology, hydrology, water quality, adjacent land use, hazardous waste records, and operational practices were addressed. These reports included copies of available maps, lithologic logs, and water quality analyses. Draft copies of these unpublished reports are on file at the Department of Environment and Natural Resources in Pierre and the South Dakota Geological Survey in Vermillion. The individual report on the Sioux Falls (Runge) City landfill is the basis for this report.

After the initial assessment of the 26 sites, the Office of Air Quality and Solid Waste established criteria for further prioritizing the sites. Four sites were selected for the installation of monitoring wells. The South Dakota Geological Survey conducted detailed investigations at the Brown County, Watertown City, Yankton County, and Rapid City landfills (fig. 1). A draft copy of the unpublished summary report is on file at the Department of Environment and Natural Resources in Pierre and the South Dakota Geological Survey in Vermillion. The following information was available regarding the Sioux Falls (Runge) City landfill in 1986.

SIoux FALLS (RUNGE) CITY LANDFILL

Location

The Sioux Falls (Runge) City landfill is located 6 miles west of Sioux Falls in Minnehaha County. Its legal location is SW $\frac{1}{4}$ sec. 35, T. 101 N., R. 51 W. (fig. 2).

Topography, Drainage, and Climate

The information on topography and drainage was taken from the Hartford South Quadrangle and the Lennox NW Quadrangle (United States Geological Survey, 1971 and 1978). In actuality, the present landfill surface is significantly different because of activities at the landfill.

The topography near the Sioux Falls (Runge) City landfill consists of irregularly shaped, moderately sloping hills. The landfill is located on a hillside which slopes to the south. The elevation of the land surface ranges from 1,525 to 1,570 feet for a maximum relief of 45 feet at the site prior to the existence of the landfill (fig. 2). However, usage of the site as a landfill has resulted in surface elevations above 1,570 feet in areas where filling is complete (Derric Iles, South Dakota Geological Survey, personal communication, 1986).

Locally, surface drainage is controlled by the Big Sioux River and its tributaries. According to figure 2, an intermittent stream originates in the southwest corner of the landfill. It joins a larger intermittent drainage south of the site. This larger drainage flows generally east near the southern border of the site. However, field inspection of the site reveals that the smaller intermittent stream now originates in an intermittently wet area adjoining the northern boundary of the site and flows southward through the site (Derric Iles, South Dakota Geological Survey, personal communication, 1986). The intermittent stream to the south of the site drains into Skunk Creek which flows into the Big Sioux River approximately 8 miles east of the landfill (United States Geological Survey, 1971, 1976, and 1978).

The average annual temperature in Minnehaha County is 46 degrees Fahrenheit. Precipitation averages 25 inches per year. The average annual class A pan evaporation is 50 inches. Climatological data are from Spuhler and others (1971).

Geology

Surficial deposits in the area of the Sioux Falls (Runge) City landfill consist of till end moraine deposits (fig. 3). Steece (1959) describes the till as being a boulder clay consisting of 60 to 70 percent calcareous clay and silt with some rock fragments. Test holes drilled in 1978, 1983, and 1984 verify that the geology of the Sioux Falls (Runge) City landfill is characterized primarily by silty or sandy clay (till). A few sand lenses are present, but are believed to be discontinuous or have a limited lateral extent (Iles, 1989). The greatest amount of sand was found to be located along the east edge of the landfill site. Please refer to Iles (1989) for additional information. The locations of test holes drilled prior to July 1984 are shown in figure 4 (app. A). Great Plains Engineering drilled five test holes in 1978. In November and December 1983, Envirollogic Systems, Inc. supervised a total of 22 test hole borings. The locations of the 80 test holes drilled and monitoring wells installed by the South Dakota Geological Survey in July 1984 are shown in figure 5 (app. B).

Only data meeting the South Dakota Geological Survey criteria were used in this study. Lithologic logs were utilized if the legal locations were known to four quarter sections (2.5 acres) and if they were located within the landfill site or within 1 mile of the site boundaries. Also, the source of a log must have been known or the log was not utilized; for example, all logs of test holes drilled by the South Dakota Geological Survey identify the drilling company as "SDGS."

Hydrology

According to records from the Office of Air Quality and Solid Waste, the material at the base of the landfill consists primarily of clay (till). The permeability of till is difficult to characterize due to the highly variable nature of its physical composition and texture (i.e., grain size) in both the vertical and horizontal directions. Fractures, if any, in the upper weathered portion of the till can also contribute to significant spatial changes in permeability. Let it suffice to say that till, as a unit, generally has much lower permeability than sand. No site specific permeability data are available.

In July 1984, the South Dakota Geological Survey installed 36 monitoring wells at the Sioux Falls (Runge) City landfill. No other wells had been installed. Figure 6 shows that the potential for lateral shallow ground water flow is to the south (Iles, 1989). The nearest supply of ground water in the area of the landfill is probably the Wall Lake aquifer, as defined by Hedges and others (1982), which lies directly beneath the landfill at an estimated depth of 100 feet (Derric Iles, South Dakota Geological Survey, personal communication, 1986). Please refer to Iles (1989) for additional information.

Water Quality

Many water quality data are available from the Sioux Falls (Runge) City landfill. All reliable analyses are listed by legal location in appendix C according to the South Dakota Geological Survey criteria explained in the last paragraph of this section. The water quality data were collected by the Office of Air Quality and Solid Waste during a joint South Dakota Geological Survey-Office of Air Quality and Solid Waste 1984 study (Derric Iles, South Dakota Geological Survey, personal communication, 1986).

At the Sioux Falls (Runge) City landfill, the concentration of total dissolved solids was determined for 37 samples from 30 wells and one uncased test hole. The legal location of the uncased test hole is SE NE NE SW sec. 35, T. 101 N., R. 51 W. The maximum, minimum, and average values observed for total dissolved solids were 5,828, 88, and 2,139 milligrams per liter, respectively. These

values were obtained by averaging all analyses from each well where more than one analysis was available, then averaging the well-averaged values.

Only data meeting the South Dakota Geological Survey criteria were used in this study. Water quality analyses from wells were included in appendix C if the legal locations were known to four quarter sections (2.5 acres) and if they were located within the landfill or within 1 mile of the site boundaries. Only wells with recorded depths less than 100 feet and with corresponding lithologic logs have been considered. This limit of 100 feet was arbitrarily chosen. It was assumed that any major changes in water quality would probably be detected within this 100-foot depth limit because of the relatively low permeability of the underlying till. Also, the analytical laboratory that produced a water quality analysis must have been known or the analysis was not utilized.

Adjacent Land Features

Information in this section was taken from the Hartford South Quadrangle and the Lennox NW Quadrangle (United States Geological Survey, 1971 and 1978) and the General Highway Map - Minnehaha County (South Dakota Department of Transportation, 1982).

- * The surface water nearest the site is an intermittent stream located in the western portion of the site. Intermittent streams in the area flow into an intermittent stream located less than a quarter of a mile south of the southern border of the site.

Operational and Siting Criteria – Summary from the Office of Air Quality and Solid Waste Records

All information given in this section are the most common responses found on the Office of Air Quality and Solid Waste site inspection reports prior to 1986.

1. Site: Sioux Falls (Runge) City
2. Population served: 150,000
3. Method of disposal: (Cut and fill) trench
4. Estimated amount of waste received per unit time: 101,400 tons/year
5. Access to site:
 - * Fenced: Yes ___ No Lockable gate: Yes ___ No
 - * Litter fences present: Yes ___ No
 - * All weather access road to site: Yes ___ No
6. List industry present: Du-al Manufacturing Company, Tri-State Refining, Walling Chemical, John Morrell, Litton, Citibank, Industrial Park, Raven Industries, Jordan Mill Works, American Freight, Heartland Paper Company, Farm Machine Equipment Manufacturing, Lakeside Dairy, Terrace Park Dairy, McKennen Hospital, Sioux Valley Hospital
7. Land Use:

- * Preoperational land use: Agriculture
- * Proposed post-operational land use: Agriculture
- * Current land use within a quarter of a mile radial area: Agriculture

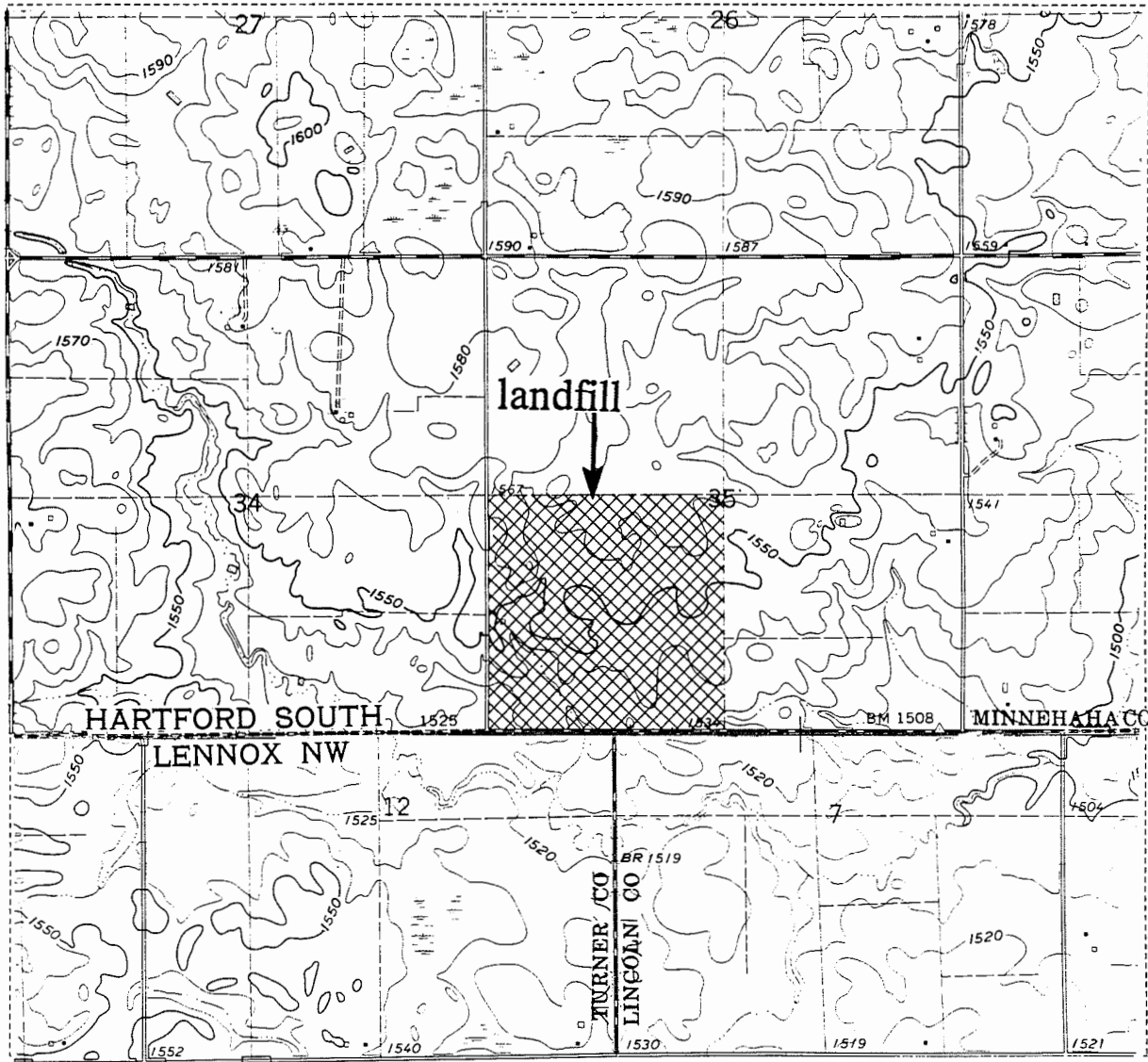
SUMMARY

- * This landfill is located on a hillside.
- * The geology at this site generally consists of topsoil overlying clay-rich till. A few sand lenses are present, but are believed to be discontinuous or have a limited lateral extent. A total of 107 test holes have been drilled near this site.
- * Thirty-six monitoring wells were present near this site.
- * The potential for lateral shallow ground water flow was to the south.
- * Water quality data were available for 30 monitoring wells and one uncased test hole near this site.

REFERENCES CITED

- Hedges, L.S., Burch, S.L., Iles, D.L., Barari, R.A., and Schoon, R.A., 1982, Evaluation of ground-water resources, eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa: Final Report, Report prepared by the United States Army Corps of Engineers, Contract DACW 45-80-C-0185, Vermillion, South Dakota, South Dakota Geological Survey.
- Iles, D.L., 1989, Investigation of the Sioux Falls sanitary landfill: South Dakota Geological Survey Open-File Report 58-UR, 69 p.
- South Dakota Department of Transportation, 1982, General Highway Map Minnehaha County, South Dakota: South Dakota Department of Transportation in cooperation with the U.S. Department of Transportation, (revisions as of March 15, 1983).
- Spuhler, W., Lytle, W.F., and Moe, D., 1971, Climate of South Dakota: Brookings, South Dakota, South Dakota State University Agricultural Experiment Station Bulletin 582, 30 p.
- Steece, F.V., 1959, Geology of the Hartford quadrangle: South Dakota Geological Survey Geologic Quadrangle Map, scale 1:62,500, text.
- United States Geological Survey, 1971, Hartford South quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000.
- _____, 1976, Sioux Falls West quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000.
- _____, 1978, Lennox NW quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000.

R. 51 W.

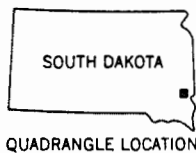


R. 52 W. | R. 51 W.

SCALE 1:24000



CONTOUR INTERVAL 10 FEET, HARTFORD SOUTH QUADRANGLE
CONTOUR INTERVAL 10 FEET, LENNOX NW QUADRANGLE

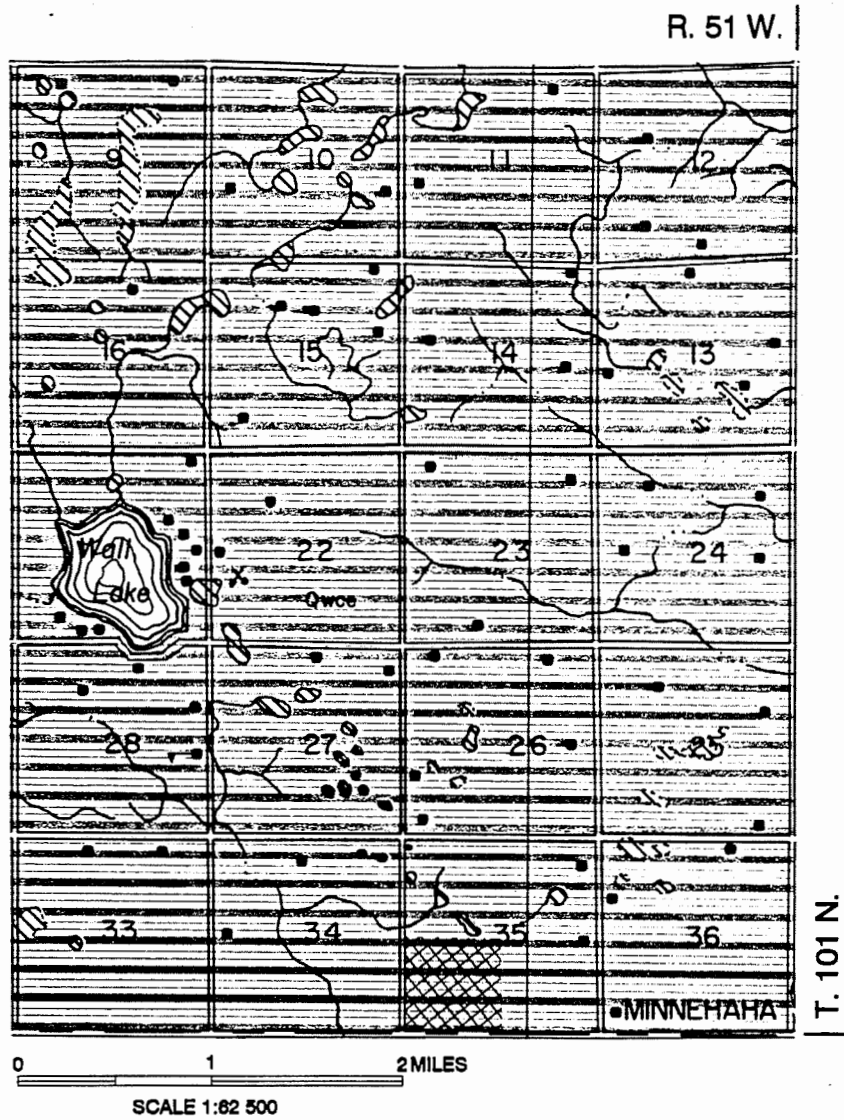


Landfill location: SW $\frac{1}{4}$ sec. 35,
T. 101 N., R. 51 W.
Minnehaha County

Adapted from United States
Geological Survey (1971 and 1978)



Figure 2. Location of the Sioux Falls (Runge) City landfill.



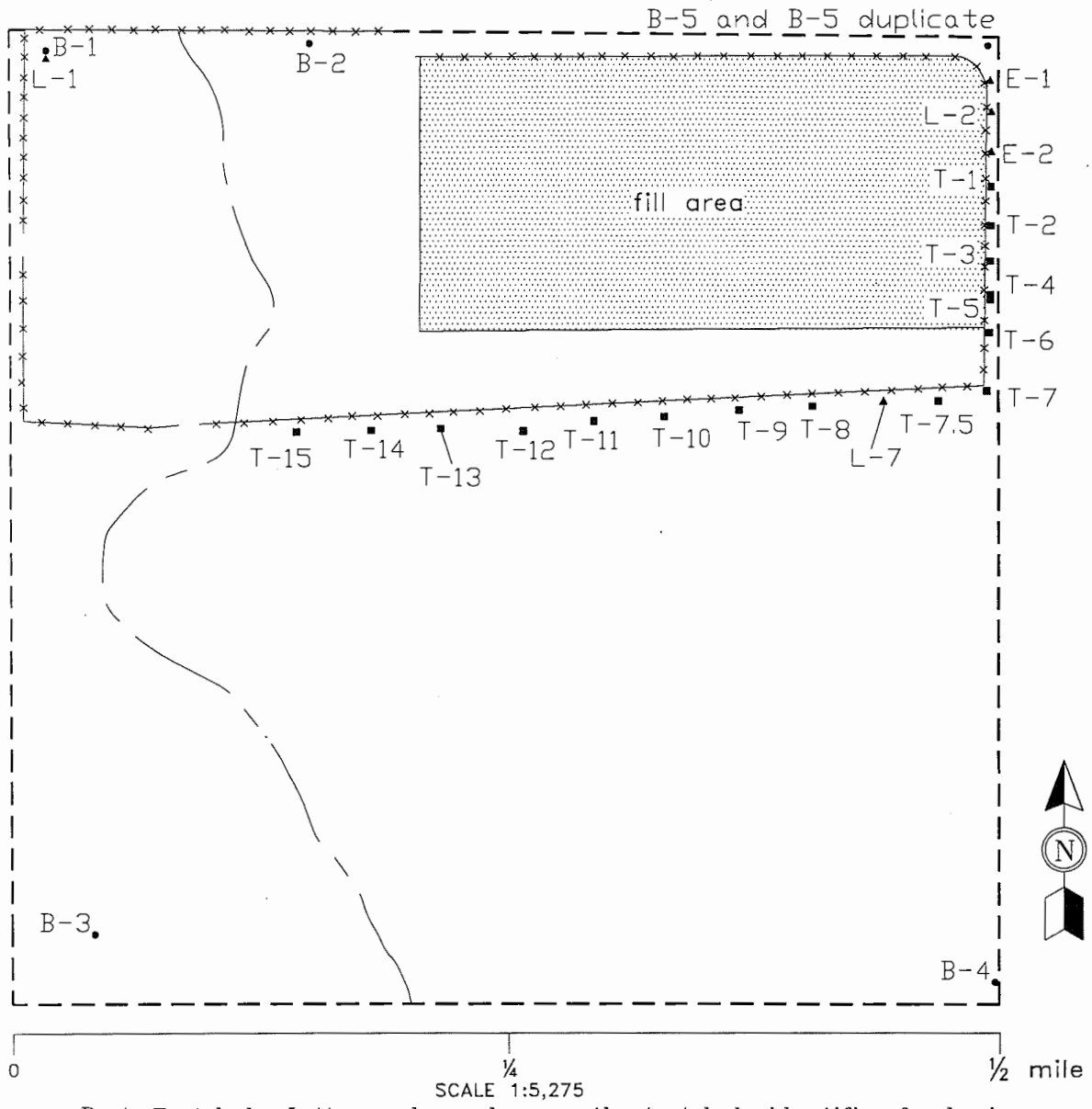
Qwce..... Cary end moraine

Landfill

Adapted from Steece (1959)



Figure 3. Geology near the Sioux Falls (Runge) City landfill.



B-4. Test hole. Letter and number are the test hole identifier for borings drilled in 1978 by Great Plains Engineering.

L-7 Test hole. Letter and number are the test hole identifier for borings drilled in November 1983, supervised by Envirollogic Systems, Inc.
 E-1. Includes the B-5 duplicate test hole.

T-2. Test hole. Letter and numbers are the test hole identifier for borings drilled in December 1983, supervised by the Division of Environmental Quality, South Dakota Department of Water and Natural Resources.

See appendix A for test hole locations.

- Intermittent stream
- Landfill
- Litter fence

Adapted from Iles (1989)

Figure 4. Locations of test holes drilled prior to July 1, 1984.

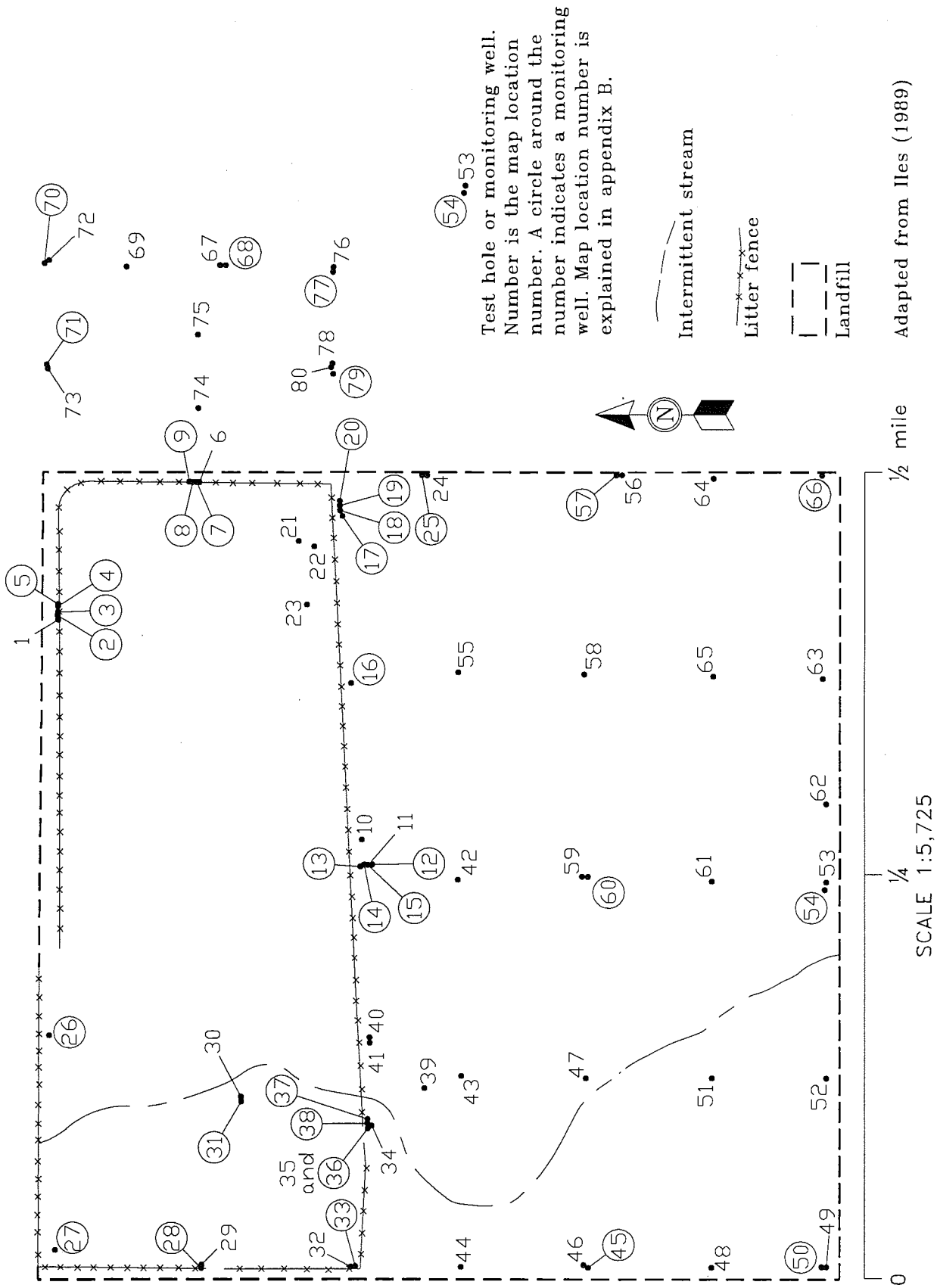
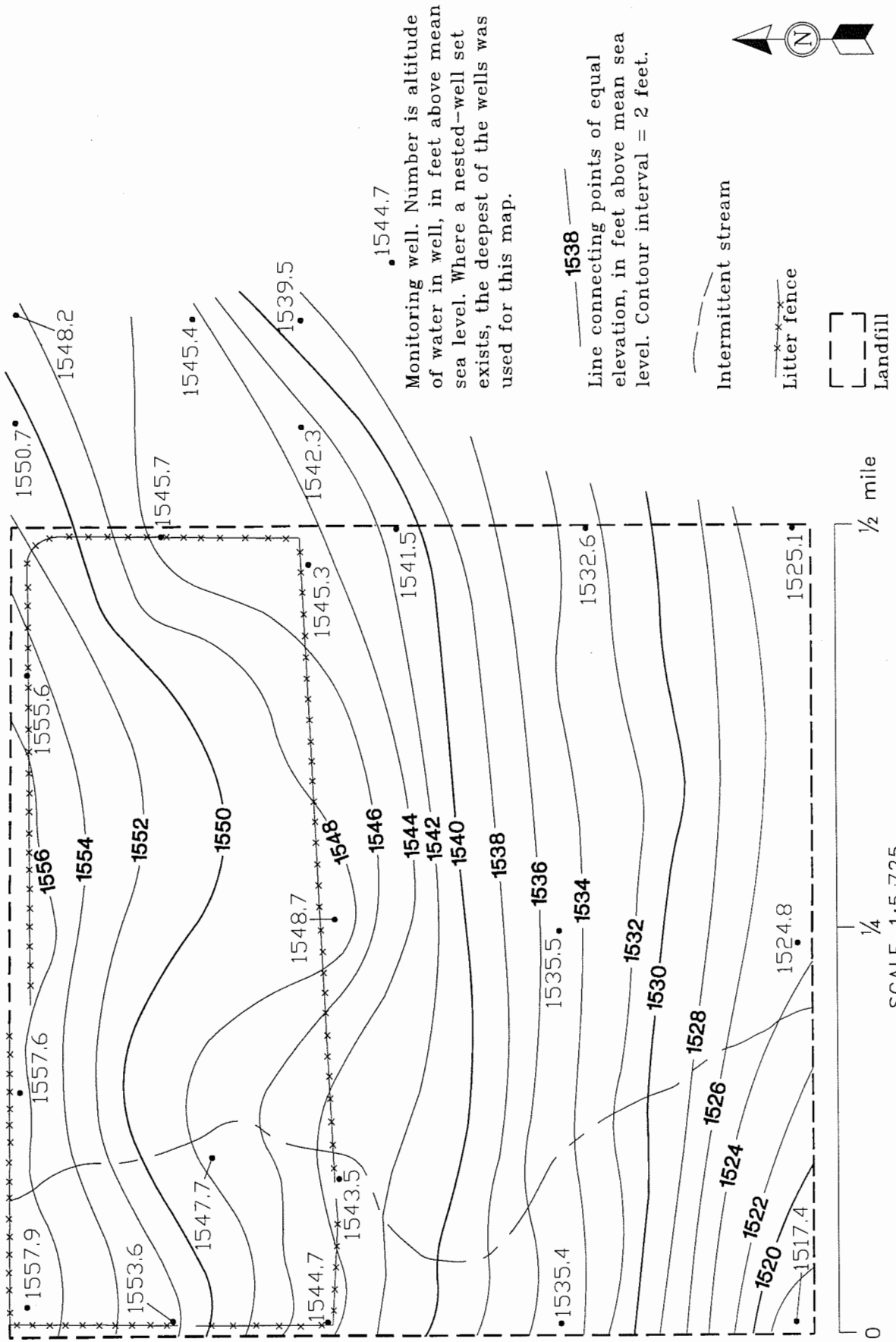


Figure 5. Locations of test holes drilled and monitoring wells installed in July 1984.



• 1544.7

Monitoring well. Number is altitude of water in well, in feet above mean sea level. Where a nested-well set exists, the deepest of the wells was used for this map.

— 1538

Line connecting points of equal elevation, in feet above mean sea level. Contour interval = 2 feet.

— Intermittent stream

-x-x-x- Litter fence

[] Landfill

0 1/4 1/2 mile

SCALE 1:5,725

Figure 6. Water table elevations - September 5, 1984.

Adapted from Iles (1989)

APPENDIX A

Legal locations of Sioux Falls (Runge) City landfill area logs of test holes drilled prior to July 1, 1984

Listed below are the legal locations of the test holes cited in this report. Please contact the South Dakota Geological Survey if a copy of a lithologic log is needed. If a legal location is duplicated, that means more than one test hole has been drilled location.

NE NE NE SW sec. 35, T. 101 N., R. 51 W.
NE NE NE SW sec. 35, T. 101 N., R. 51 W.
NE NE NE SW sec. 35, T. 101 N., R. 51 W.
NE NE NE SW sec. 35, T. 101 N., R. 51 W.
NE NE NE SW sec. 35, T. 101 N., R. 51 W.

SE NE NE SW sec. 35, T. 101 N., R. 51 W.
SE NE NE SW sec. 35, T. 101 N., R. 51 W.
SE NE NE SW sec. 35, T. 101 N., R. 51 W.
SW SW NE SW sec. 35, T. 101 N., R. 51 W.
SW SW NE SW sec. 35, T. 101 N., R. 51 W.

SE SW NE SW sec. 35, T. 101 N., R. 51 W.
SE SW NE SW sec. 35, T. 101 N., R. 51 W.
NE SE NE SW sec. 35, T. 101 N., R. 51 W.
NE SE NE SW sec. 35, T. 101 N., R. 51 W.

NE SE NE SW sec. 35, T. 101 N., R. 51 W.
SW SE NE SW sec. 35, T. 101 N., R. 51 W.
SE SE NE SW sec. 35, T. 101 N., R. 51 W.
SE SE NE SW sec. 35, T. 101 N., R. 51 W.
NW NE NW SW sec. 35, T. 101 N., R. 51 W.

NW NW NW SW sec. 35, T. 101 N., R. 51 W.
NW NW NW SW sec. 35, T. 101 N., R. 51 W.
SW SE NW SW sec. 35, T. 101 N., R. 51 W.
SW SE NW SW sec. 35, T. 101 N., R. 51 W.
SE SE NW SW sec. 35, T. 101 N., R. 51 W.

SW SW SW SW sec. 35, T. 101 N., R. 51 W.
SE SE SE SW sec. 35, T. 101 N., R. 51 W.

APPENDIX B

Legal locations of Sioux Falls (Runge) City landfill area logs of test holes and wells drilled and installed in July 1984

Listed below are the legal locations of the test holes and wells cited in this report. Please contact the South Dakota Geological Survey if a copy of a lithologic log is needed. If a legal location is duplicated, that means more than one test hole or well has been drilled or installed at that location. The map location numbers shown on figure 5 are numbers that were assigned to the logs according to the order in which they are listed.

Map Location No.	Location
1	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
2	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
3	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
4	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
5	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
6	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
7	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
8	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
9	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
10	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
11	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
12	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
13	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
14	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
15	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
16	SE SW NE SW sec. 35, T. 101 N., R. 51 W.
17	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
18	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
19	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
20	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
21	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
22	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
23	NW SE NE SW sec. 35, T. 101 N., R. 51 W.
24	SE SE NE SW sec. 35, T. 101 N., R. 51 W.
25	SE SE NE SW sec. 35, T. 101 N., R. 51 W.
26	NW NE NW SW sec. 35, T. 101 N., R. 51 W.
27	NW NW NW SW sec. 35, T. 101 N., R. 51 W.
28	SW NW NW SW sec. 35, T. 101 N., R. 51 W.
29	SW NW NW SW sec. 35, T. 101 N., R. 51 W.
30	SE NW NW SW sec. 35, T. 101 N., R. 51 W.
31	SE NW NW SW sec. 35, T. 101 N., R. 51 W.
32	SW SW NW SW sec. 35, T. 101 N., R. 51 W.
33	SW SW NW SW sec. 35, T. 101 N., R. 51 W.
34	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
35	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
36	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
37	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
38	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
39	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
40	SW SE NW SW sec. 35, T. 101 N., R. 51 W.

APPENDIX B - continued.

Map Location No.	Location
41	SW SE NW SW sec. 35, T. 101 N., R. 51 W.
42	NE NE SW SW sec. 35, T. 101 N., R. 51 W.
43	NW NE SW SW sec. 35, T. 101 N., R. 51 W.
44	NW NW SW SW sec. 35, T. 101 N., R. 51 W.
45	SW NW SW SW sec. 35, T. 101 N., R. 51 W.
46	SW NW SW SW sec. 35, T. 101 N., R. 51 W.
47	SE NW SW SW sec. 35, T. 101 N., R. 51 W.
48	NW SW SW SW sec. 35, T. 101 N., R. 51 W.
49	SW SW SW SW sec. 35, T. 101 N., R. 51 W.
50	SW SW SW SW sec. 35, T. 101 N., R. 51 W.
51	NW SE SW SW sec. 35, T. 101 N., R. 51 W.
52	SW SE SW SW sec. 35, T. 101 N., R. 51 W.
53	SE SE SW SW sec. 35, T. 101 N., R. 51 W.
54	SE SE SW SW sec. 35, T. 101 N., R. 51 W.
55	NW NE SE SW sec. 35, T. 101 N., R. 51 W.
56	SE NE SE SW sec. 35, T. 101 N., R. 51 W.
57	SE NE SE SW sec. 35, T. 101 N., R. 51 W.
58	SE NE SE SW sec. 35, T. 101 N., R. 51 W.
59	SW NW SE SW sec. 35, T. 101 N., R. 51 W.
60	SW NW SE SW sec. 35, T. 101 N., R. 51 W.
61	NW SW SE SW sec. 35, T. 101 N., R. 51 W.
62	SW SW SE SW sec. 35, T. 101 N., R. 51 W.
63	SE SW SE SW sec. 35, T. 101 N., R. 51 W.
64	NE SE SE SW sec. 35, T. 101 N., R. 51 W.
65	NW SE SE SW sec. 35, T. 101 N., R. 51 W.
66	SE SE SE SW sec. 35, T. 101 N., R. 51 W.
67	SW NE NW SE sec. 35, T. 101 N., R. 51 W.
68	SW NE NW SE sec. 35, T. 101 N., R. 51 W.
69	NE NW NW SE sec. 35, T. 101 N., R. 51 W.
70	NE NW NW SE sec. 35, T. 101 N., R. 51 W.
71	NE NW NW SE sec. 35, T. 101 N., R. 51 W.
72	NE NW NW SE sec. 35, T. 101 N., R. 51 W.
73	NE NW NW SE sec. 35, T. 101 N., R. 51 W.
74	SW NW NW SE sec. 35, T. 101 N., R. 51 W.
75	SE NW NW SE sec. 35, T. 101 N., R. 51 W.
76	NE SW NW SE sec. 35, T. 101 N., R. 51 W.
77	NE SW NW SE sec. 35, T. 101 N., R. 51 W.
78	NE SW NW SE sec. 35, T. 101 N., R. 51 W.
79	NE SW NW SE sec. 35, T. 101 N., R. 51 W.
80	NE SW NW SE sec. 35, T. 101 N., R. 51 W.

APPENDIX C

Legal locations of Sioux Falls (Runge) City landfill area water quality analyses

Listed below are the legal locations of the wells which have one or more water quality analyses available. Please contact the South Dakota Geological Survey if a copy of an analysis is needed. If a legal location is duplicated, it means that more than one well with water quality data are available at that location or that multiple analyses are available for one well.

SAMPLE NO.	LOCATION
1	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
2	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
3	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
4	NW NE NE SW sec. 35, T. 101 N., R. 51 W.
5	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
6	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
7	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
8	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
9	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
10	SE NE NE SW sec. 35, T. 101 N., R. 51 W.
12	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
13	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
14	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
15	SW SW NE SW sec. 35, T. 101 N., R. 51 W.
16	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
17	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
18	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
19	NE SE NE SW sec. 35, T. 101 N., R. 51 W.
20	SE SE NE SW sec. 35, T. 101 N., R. 51 W.
21	SE SE NE SW sec. 35, T. 101 N., R. 51 W.
22	NW NE NW SW sec. 35, T. 101 N., R. 51 W.
23	NW NW NW SW sec. 35, T. 101 N., R. 51 W.
24	SE NW NW SW sec. 35, T. 101 N., R. 51 W.
25	SW SW NW SW sec. 35, T. 101 N., R. 51 W.
26	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
27	SE SW NW SW sec. 35, T. 101 N., R. 51 W.
28	SW NW SW SW sec. 35, T. 101 N., R. 51 W.
29	SW NW SW SW sec. 35, T. 101 N., R. 51 W.
30	SE SE SW SW sec. 35, T. 101 N., R. 51 W.
31	SE NE SE SW sec. 35, T. 101 N., R. 51 W.
32	SW NW SE SW sec. 35, T. 101 N., R. 51 W.
33	SW NW SE SW sec. 35, T. 101 N., R. 51 W.
34	SE SE SE SW sec. 35, T. 101 N., R. 51 W.
35	SW NE NW SE sec. 35, T. 101 N., R. 51 W.
36	NE NW NW SE sec. 35, T. 101 N., R. 51 W.
37	NE SW NW SE sec. 35, T. 101 N., R. 51 W.
38	NE SW NW SE sec. 35, T. 101 N., R. 51 W.