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**OPEN-FILE REPORT 80-UR - No. 16: MILLER CITY**

**STATEWIDE LANDFILL STUDY:**  
**MILLER CITY LANDFILL SITE CHARACTERISTICS**

**by**

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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 Miller 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, which 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).

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**TABLE 1. List of sites considered for further evaluation**

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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

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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 Miller 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 Miller City landfill in 1986.

## **MILLER CITY LANDFILL**

### **Location**

The Miller City landfill is located half a mile north of Miller in Hand County. Its legal location is SW $\frac{1}{4}$  NW $\frac{1}{4}$  sec. 2, T. 112 N., R. 68 W. (fig. 2).

### **Topography, Drainage, and Climate**

The information on topography and drainage was taken from the Miller Quadrangle (United States Geological Survey, 1967). In actuality, the present landfill surface may be significantly different because of activities at the landfill.

The topography at the Miller City landfill slopes to the northeast (fig. 2). In the extreme northeast corner is a trench-like depression which may actually be a landfill trench which was used before the landfill was first permitted on December 17, 1974. The elevation ranges from 1,540 to 1,555 feet for a maximum relief of 15 feet at the site.

There is no readily apparent drainage for this site other than the sloping land surface. However, there are two intermittent streams located within a quarter of a mile of the landfill: one east of the site and the other directly west of the site (Ree Creek). Surface water drainage of creeks in the area is directed northeast into the James River.

The average annual temperature in Hand County is 45 degrees Fahrenheit. Precipitation averages 19 inches per year. The average annual class A pan evaporation is 49 inches. Climatological data are from Spuhler and others (1971).

### **Geology**

Surficial deposits in the area of the Miller City landfill are glacial drift which is composed of till (fig. 3). Buried outwash 5 to 20 feet thick underlies the site at a depth estimated between 100 and

155 feet below the land surface (Christensen, 1962). A small amount of alluvium is present along Ree Creek adjacent to the landfill site (Christensen, 1962).

Two test holes (A1-85-39 and A1-85-40) are located on the eastern boundary of the landfill site. These test holes contained 1 foot of topsoil and oxidized clay till to depths of 25 and 15 feet respectively (fig. 4; app. A). Eight additional test holes are located near the landfill site (fig. 4; app. A). Seven of the eight holes were completed between the depths of 15 and 41 feet. Only clay-rich till was encountered. The only deep test hole (9) contained 8 feet of sand overlying 294 feet of till. Two sand and gravel deposits, 5 and 10 feet thick, occur in the till in test hole 9 at a depth of 155 feet and 168 feet, respectively. Pierre Shale occurs from 302 feet to the bottom of the hole at 320 feet.

Some available data were not included because they did not meet the South Dakota Geological Survey criteria used in this study. Lithologic logs were utilized if the log 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 (presumably 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.

Eight monitoring wells were installed at the landfill in 1985, four nested sets of two each (fig. 4). One well in each nested set was at a depth of approximately 15 feet, the other at approximately 27 feet. Four days after the wells were installed, the depth to water was measured in each well and it varied from 1.4 to 24.27 feet below the ground surface. One well was dry. Although the water levels may not have reached equilibrium, it appears as though the ground water flow direction may be to the northeast and east. The nearest ground water supply (aquifer) is estimated to be at an approximate depth of 100 to 150 feet beneath the site (Christensen, 1962).

### Water Quality

No water quality analyses were available, however, field conductivity values were measured on water samples from seven of the eight wells nested wells (fig. 4) 4 days after they were installed. Values ranged from 5,800 to 8,400 micromhos per centimeter. These field conductivity values are reported on the test hole log forms.

### Adjacent Land Use and Features

Information about adjacent land use and features was taken from the Miller Quadrangle (United States Geological Survey, 1967) and the General Highway Map - Hand County (South Dakota Department of Transportation, 1977).

- \* Ree Creek is located about 2,000 feet from the west edge of the site. Two ponds are located 1,000 feet from the site, one to the northeast and one to the southwest. There are several ponds located three-quarters of a mile to a mile south-southeast of the site.
- \* Sewage disposal ponds are located adjacent to the north site boundary.
- \* State Highway 45 is located a quarter of a mile west of the site.
- \* Land use for residential and business purposes is located about 1 mile south of the site.
- \* A golf course is located a quarter of a mile northwest of the site.

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

The most common responses found on the Office of Air Quality and Solid Waste site inspection reports prior to 1986 are given in this section. Copies of the microfiche data are available from the Department of Environment and Natural Resources in Pierre.

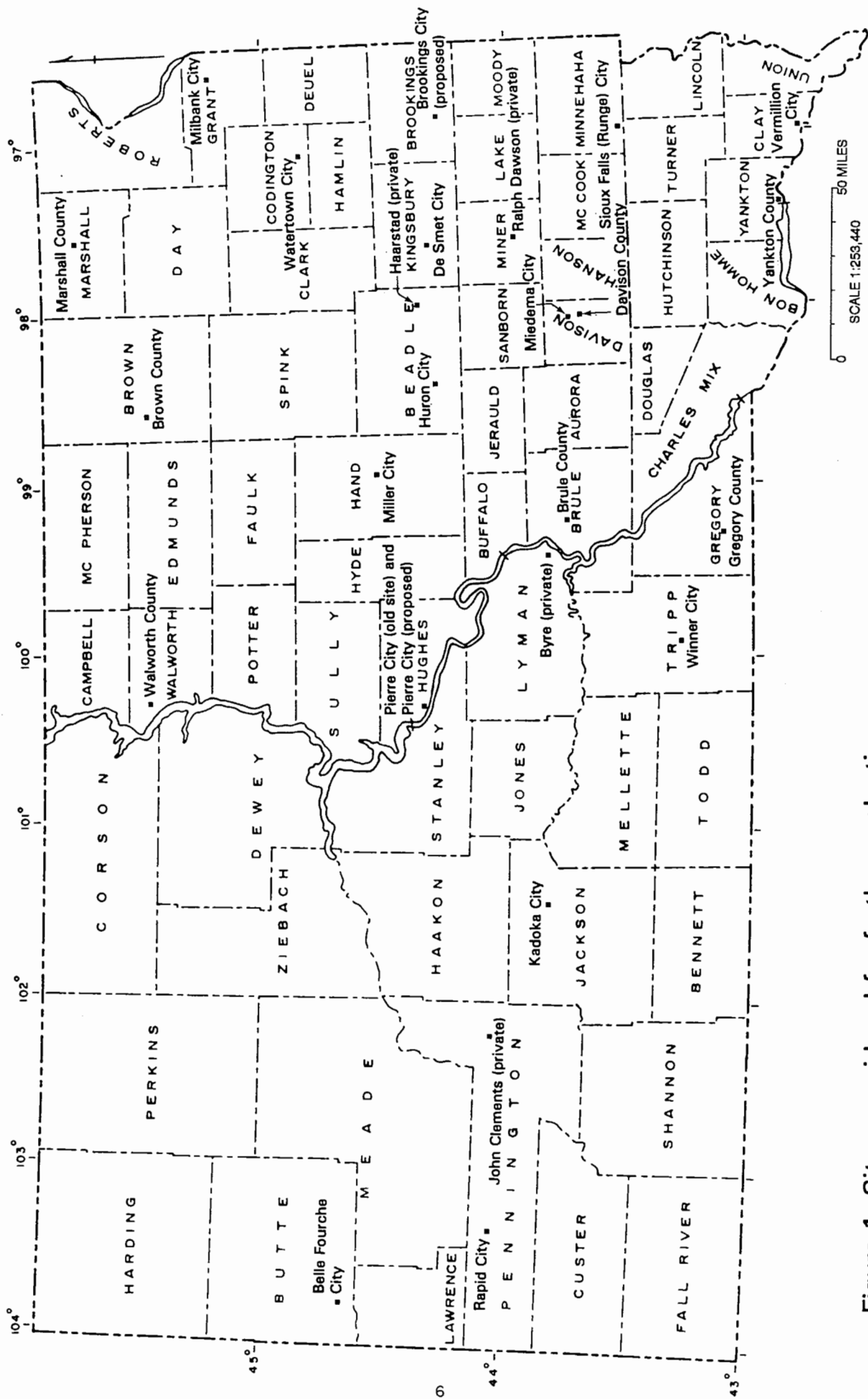
1. Site: Miller City
2. Population served: 2,300
3. Method of disposal: Cut and fill (trench)
4. Estimated amount of waste received per unit time: 2,886 tons/year
5. Access to site:
  - \* Fenced:  Yes  No      Lockable gate:  Yes  No
  - \* Litter fences present:  Yes  No
  - \* All weather access road to site:  Yes  No
6. List industry present: Kennedy Houseboat, Inc., Tri-State Insulation
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 slopes gently to the northeast.
- \* The geology at this site generally consists of till overlying Pierre Shale. Buried outwash 5 to 20 feet thick underlies the site at a depth estimated between 100 and 155 feet below land surface.
- \* Ten reliable test hole logs were available near this site.
- \* Eight monitoring wells were present near this site.
- \* Water level measurements (collected 4 days after the well installations) were available near this site.
- \* Field conductivity values were available for seven monitoring well samples.

## REFERENCES CITED

- Christensen, C.M., 1962, Water supply for the city of Miller: South Dakota Geological Survey Special Report 17.
- Flint, R.F., 1955, Pleistocene geology of eastern South Dakota: United States Geological Survey Professional Paper 262, 173 p.
- South Dakota Department of Transportation, 1977, General Highway Map Hand County, South Dakota: South Dakota Department of Transportation in cooperation with the United States Department of Transportation (revisions as of January 31, 1978).
- 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.
- United States Geological Survey, 1967, Miller quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000.



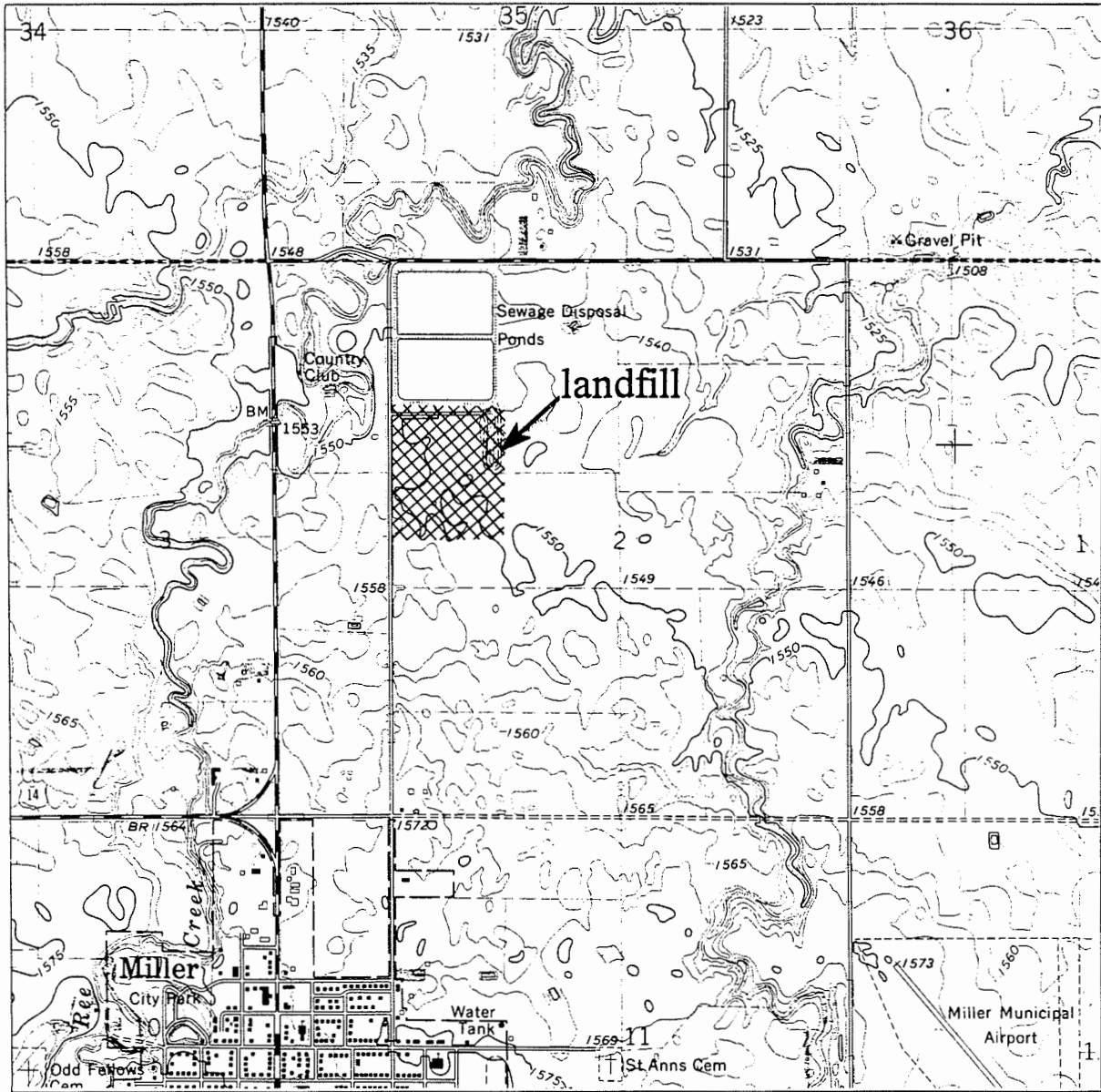
SCALE 1:253,440  
0 50 MILES

Figure 1. Sites considered for further evaluation.

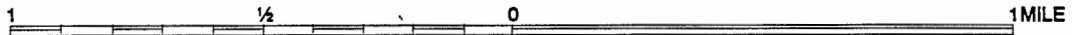


R. 68 W.

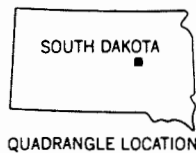
T. 112 N. | T. 113 N.



SCALE 1:24000



CONTOUR INTERVAL 5 FEET, MILLER QUADRANGLE

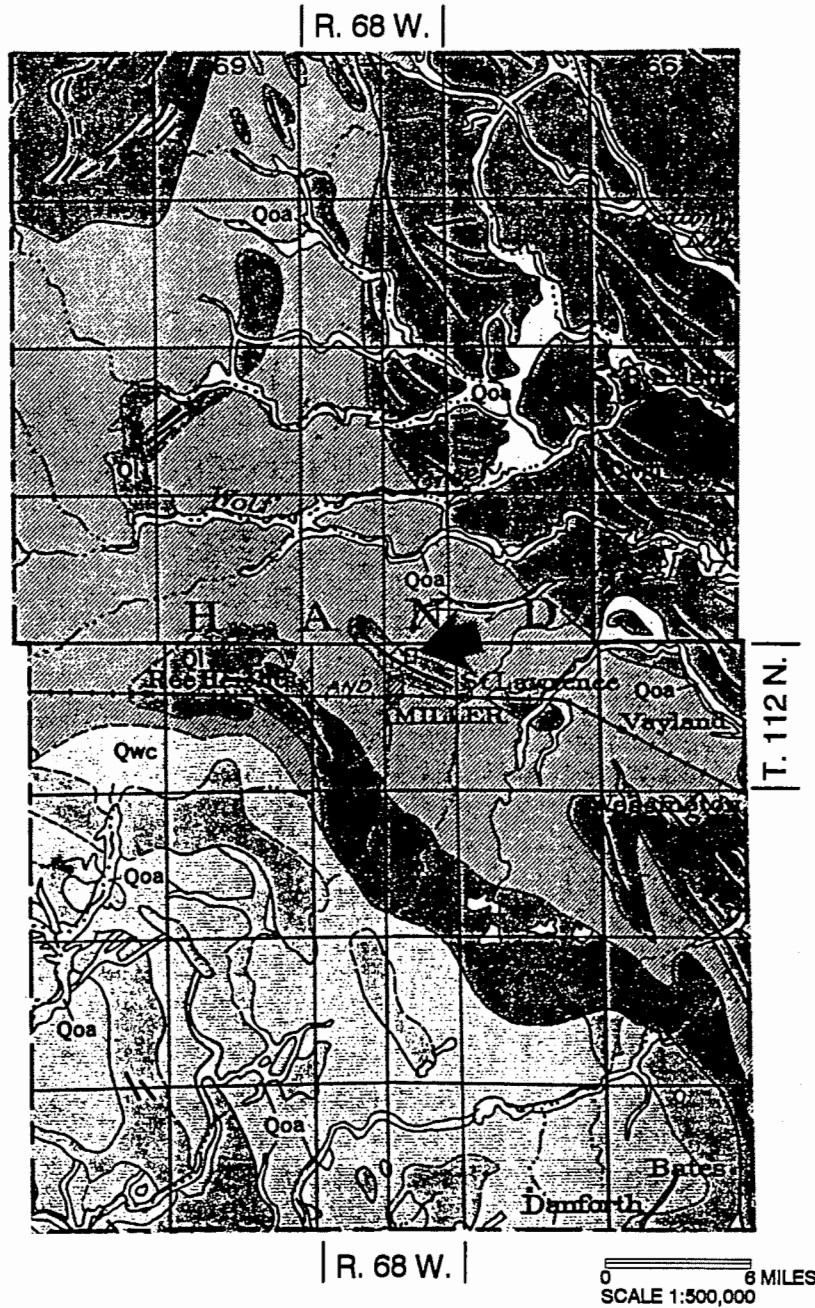


Landfill location: SW $\frac{1}{4}$  NW $\frac{1}{4}$  sec. 2,  
T. 112 N., R. 68 W.  
Hand County

Adapted from United States  
Geological Survey (1967)



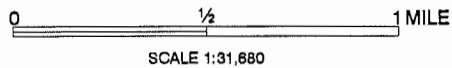
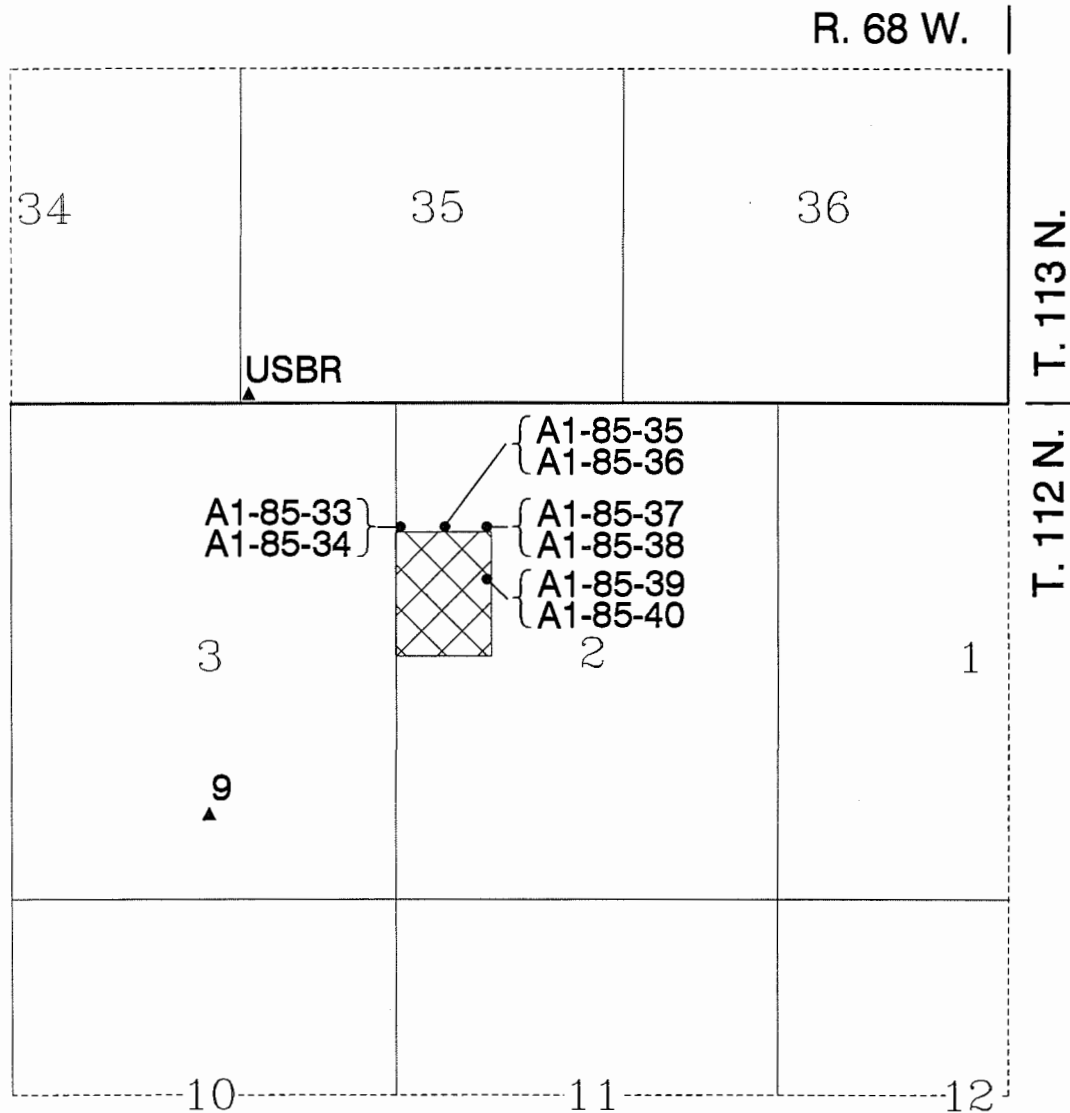
Figure 2. Location of the Miller City landfill.



- Qoa ..... Outwash and alluvium
- Ql ..... Glacial lake sediments
- Qwm ..... Glacial drift - Mankato substage
- Qwc ..... Glacial drift - Cary substage
- Principal crests of end moraines
- - - Contact, dashed where approximately located
- - - Indefinite contact
- Landfill

Adapted from Flint (1955, pl. 1)

Figure 3. Geology near the Miller City landfill.



Landfill

Landfill location: SW $\frac{1}{4}$  NW $\frac{1}{4}$  sec. 2,  
T. 112 N., R. 68 W.  
Hand County



**USB** Test hole. Letters or number are the test hole identifier.

**A1-85-33** } • Nested well set. Letters and numbers are the monitoring well identifiers  
**A1-85-34** } in that set.

Figure 4. Locations of test holes and monitoring wells drilled within 1 mile of the Miller City landfill.

## APPENDIX A

### Legal locations of Miller City landfill area logs of test holes and monitoring wells

Listed below are the legal locations of those test holes cited and wells 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, then more than one test hole or well is present at that location.

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SW SW NW NW	sec. 02,	T. 112 N.,	R. 68 W.
SW SW NW NW	sec. 02,	T. 112 N.,	R. 68 W.
SW SE NW NW	sec. 02,	T. 112 N.,	R. 68 W.
SW SE NW NW	sec. 02,	T. 112 N.,	R. 68 W.
SE SE NW NW	sec. 02,	T. 112 N.,	R. 68 W.
SE SE NW NW	sec. 02,	T. 112 N.,	R. 68 W.
SE NE SW NW	sec. 02,	T. 112 N.,	R. 68 W.
SE NE SW NW	sec. 02,	T. 112 N.,	R. 68 W.
NW SW SW SE	sec. 03,	T. 112 N.,	R. 68 W.
SW SW SW SW	sec. 35,	T. 113 N.,	R. 68 W.