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**OPEN-FILE REPORT 80-UR – No. 14: MIEDEMA CITY**

**STATEWIDE LANDFILL STUDY:**  
**MIEDEMA 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 Miedema 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).

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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 Miedema 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 Miedema City landfill in 1986.

## **MIEDEMA CITY LANDFILL**

### **Location**

The Miedema City landfill is located 1 mile east of Mitchell in Davison County. Its legal location is NW¼ sec. 25, T. 103 N., R. 60 W. (fig. 2).

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

The information on topography and drainage was taken from the Riverside Quadrangle (United States Geological Survey, 1957). In actuality, the present landfill surface may be significantly different because of activities at the landfill.

The topography at the Miedema City landfill consists primarily of flat land adjacent to a bluff, as well as portions of two floodplains (fig. 2). The northwestern part of the landfill site is located on the southeastern tip of a broad, flat area. The northeastern portion of the site consists of a sloping valley wall and the flat Firesteel Creek-James River floodplain. The southern half of the site consists of the Dry Run floodplain and valley walls. The elevation ranges from 1,215 to 1,300 feet for a maximum relief of 85 feet at the site.

Locally, drainage is controlled by the James River and its tributaries. Dry Run drains into Firesteel Creek which drains into the James River approximately half a mile southeast of the site. Firesteel Creek is a meandering stream which flows from the northwest to the southeast and its floodplain borders the site on the east. Dry Run is an intermittent stream in the southern half of the site.

The average annual temperature in Davison County is 46 degrees Fahrenheit. Precipitation averages 22 inches per year. The average annual class A pan evaporation is 51 inches. Climatological data are from Spuhler and others (1971).

## Geology

Surficial deposits near the Miedema City landfill are comprised of ground moraine (till) and alluvium (fig. 3). Within the landfill site, two test holes with reliable data have been drilled (fig. 4, app. A). In the northwest quarter of the site, test hole F-339-79 encountered topsoil overlying 4 feet of sand, 2 feet of marl, 9 feet of sand, and till. In the northeast corner of the site, test hole 57 encountered 64 feet of till overlying shale. Within 1 mile of the site, 12 additional test holes have been drilled (fig. 4, app. A). Sand or gravel overlying till is generally found in the alluvial environments. In the remaining areas, till is observed at the surface. Three of the deeper test holes encountered bedrock between 51 and 82 feet beneath the till. Test hole 54 encountered chalk, test hole 55 encountered 3 feet of gravel overlying chalk, and test hole DV-77-80 encountered sandstone. Test hole 54 encountered several additional bedrock lithologies to a depth of 435 feet.

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

The clay material at the base of the landfill consists primarily of till (landfill operator, Mitchell, South Dakota, personal communication, 1985). 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.

No monitoring wells with known legal locations were present within 1 mile of the site. Without the presence of adequately constructed monitoring wells (a minimum of three) in the proper locations and at the proper depths, the lateral hydraulic gradient and direction of potential ground water movement cannot be estimated for the landfill area.

It is thought that the Ethan aquifer is the closest aquifer to the landfill. It lies near the surface approximately 1 to 2 miles southwest of the landfill site (Hansen, 1983).

## Water Quality

Although water quality data were available, the legal locations and/or well depths were not known for wells within the landfill or within 1 mile of the landfill boundaries. Only data meeting the South Dakota Geological Survey criteria were used in this study. Water quality analyses were utilized 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 Use and Features

Information about adjacent land use and features was taken from the Riverside Quadrangle (United States Geological Survey, 1957) and the General Highway Map - Davison County (South Dakota Department of Transportation, 1976).

- \* Firesteel Creek and the James River are located half a mile north and east of the site. A pond is located on the northwest edge of the site. One pond is located half a mile southeast of the site. Two ponds are located three-quarters of a mile to 1 mile south of the site.
- \* Interstate 90 is located a quarter of a mile south of the site. State Highway 38 is located half a mile north of the site.
- \* The Miedema City landfill is adjacent to and north of the Davison County landfill 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: Miedema City
2. Population served: 3,240
3. Method of disposal: Cut and fill (trench)
4. Estimated amount of waste received per unit time: 10,140 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: Iowa Pork Industries, Syncom, Dakota Casting
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 site is partially located in floodplain areas.

- \* The geology at this site generally consists of alluvium on top of till or till overlying bedrock.
- \* Two reliable test hole logs were available for this site.
- \* Twelve additional test hole logs were available within 1 mile of the site.
- \* No reliable monitoring wells were available near this site.
- \* No water level data were available near this site.
- \* No reliable water quality data were available near this site.

### REFERENCES CITED

- Hansen, D.S., 1983, Water resources of Hanson and Davison Counties, South Dakota: United States Geological Survey Water Resources Investigations Report 83-4108, 55 p.
- South Dakota Department of Transportation, 1976, General Highway Map Davison County, South Dakota: South Dakota Department of Transportation in cooperation with the United States Department of Transportation, (revisions as of May 31, 1977).
- 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, 1957, Riverside quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000, (photorevised in 1974).
- Wong, H.D., 1960, Geology of the Alexandria quadrangle: South Dakota Geological Survey Geologic Quadrangle Map, scale 1:62,500, text.

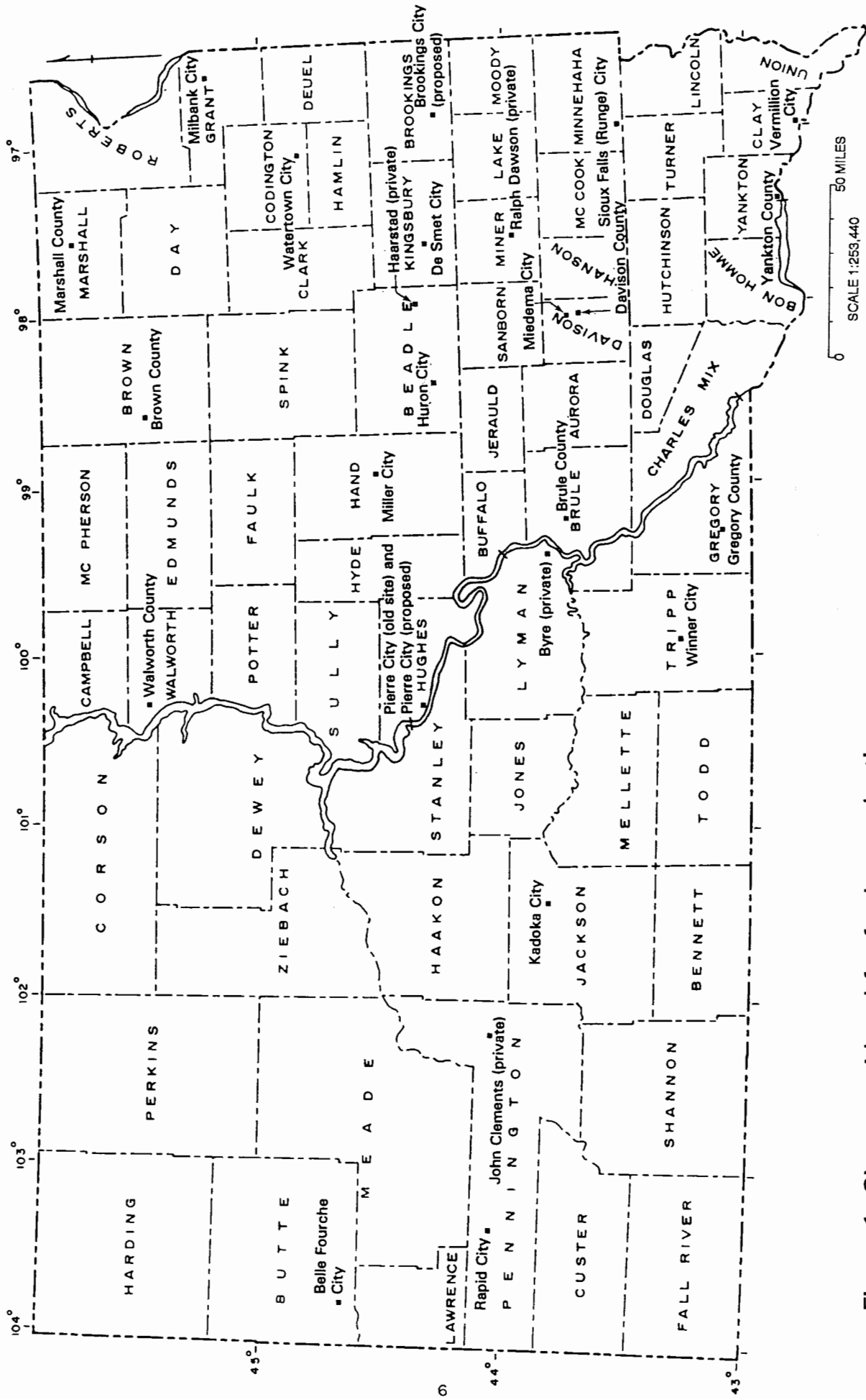
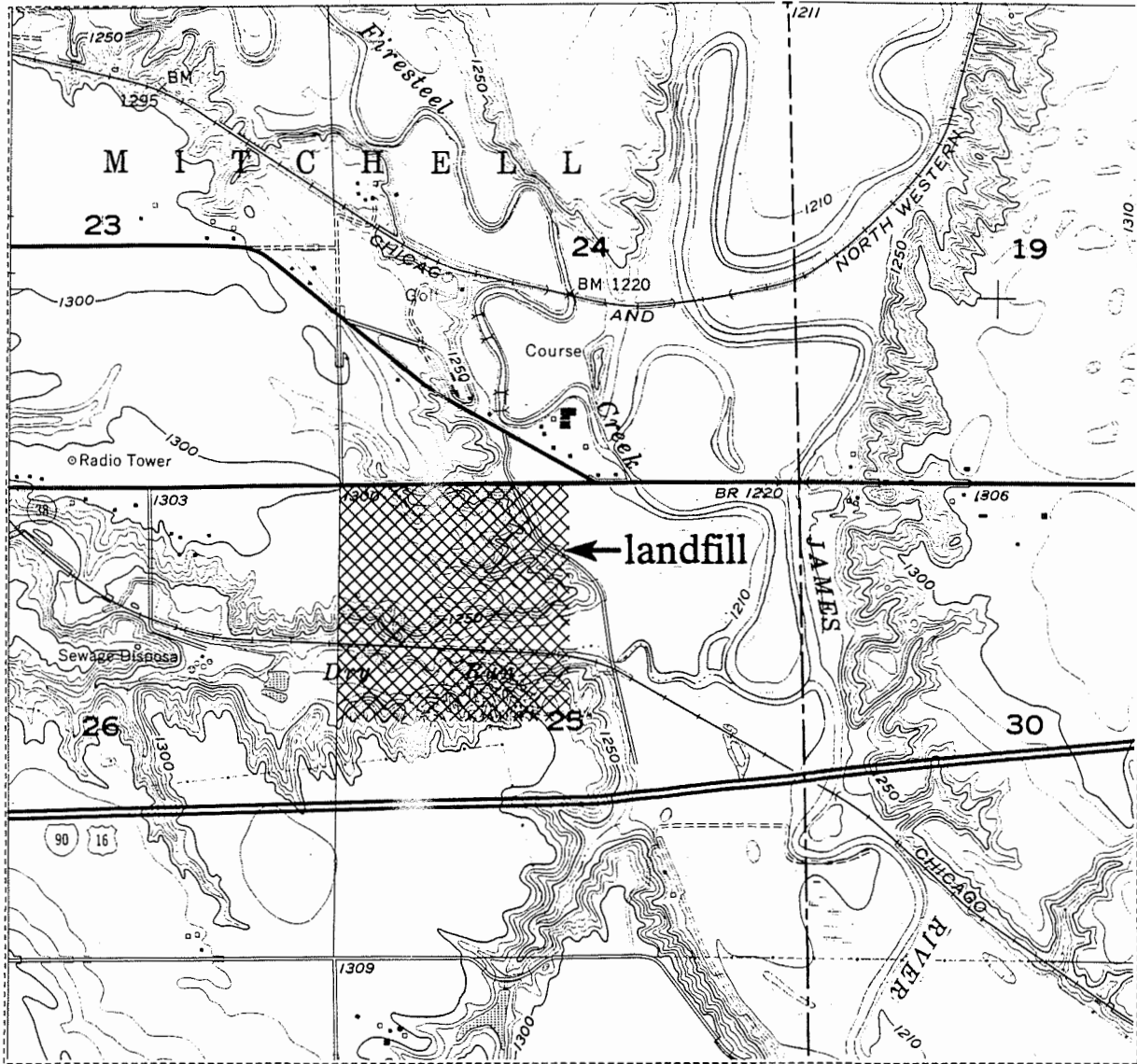


Figure 1. Sites considered for further evaluation.

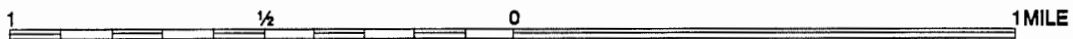


R. 60 W. | R. 59 W.

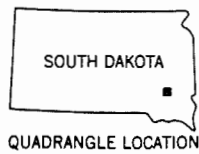


T. 103 N.

SCALE 1:24000



CONTOUR INTERVAL 10 FEET, RIVERSIDE QUADRANGLE



QUADRANGLE LOCATION

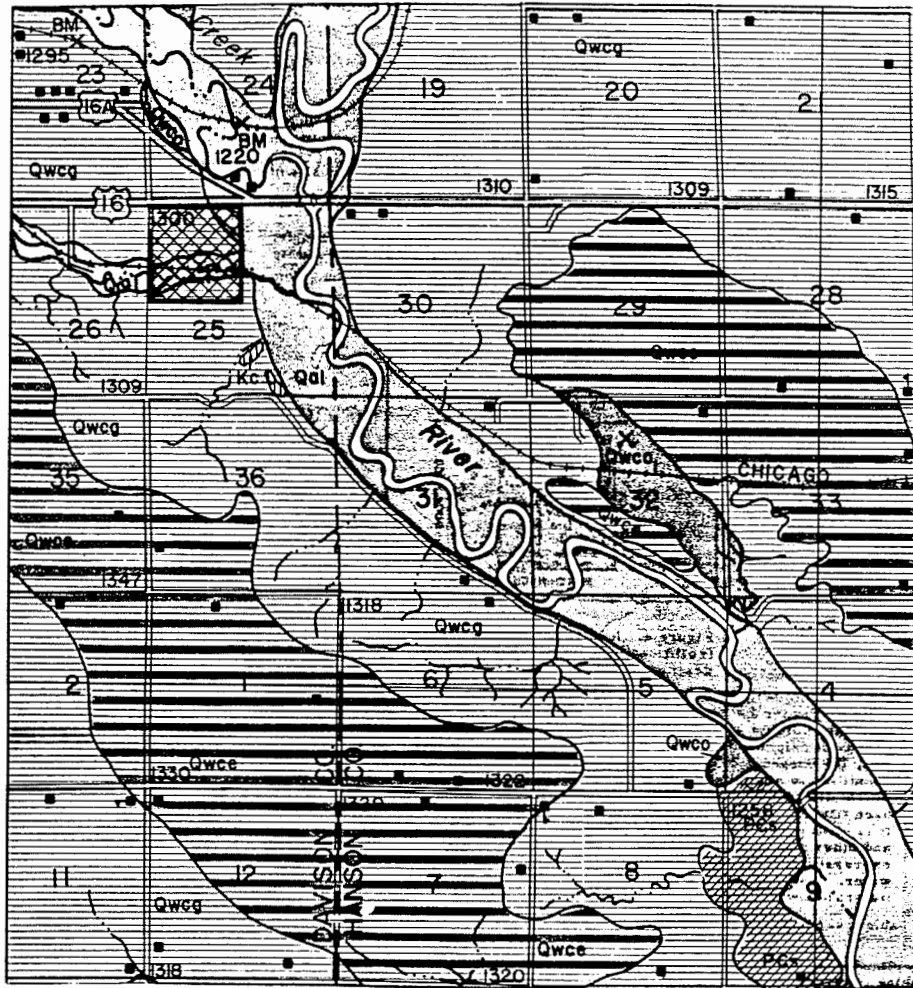
Landfill location: NW $\frac{1}{4}$  sec. 25,  
T. 103 N., R. 60 W.  
Davison County

Adapted from United States  
Geological Survey (1957)




Figure 2. Location of the Miedema City landfill.

R. 60 W. | R. 59 W.



T. 102 N. | T. 103 N.

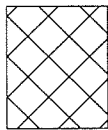
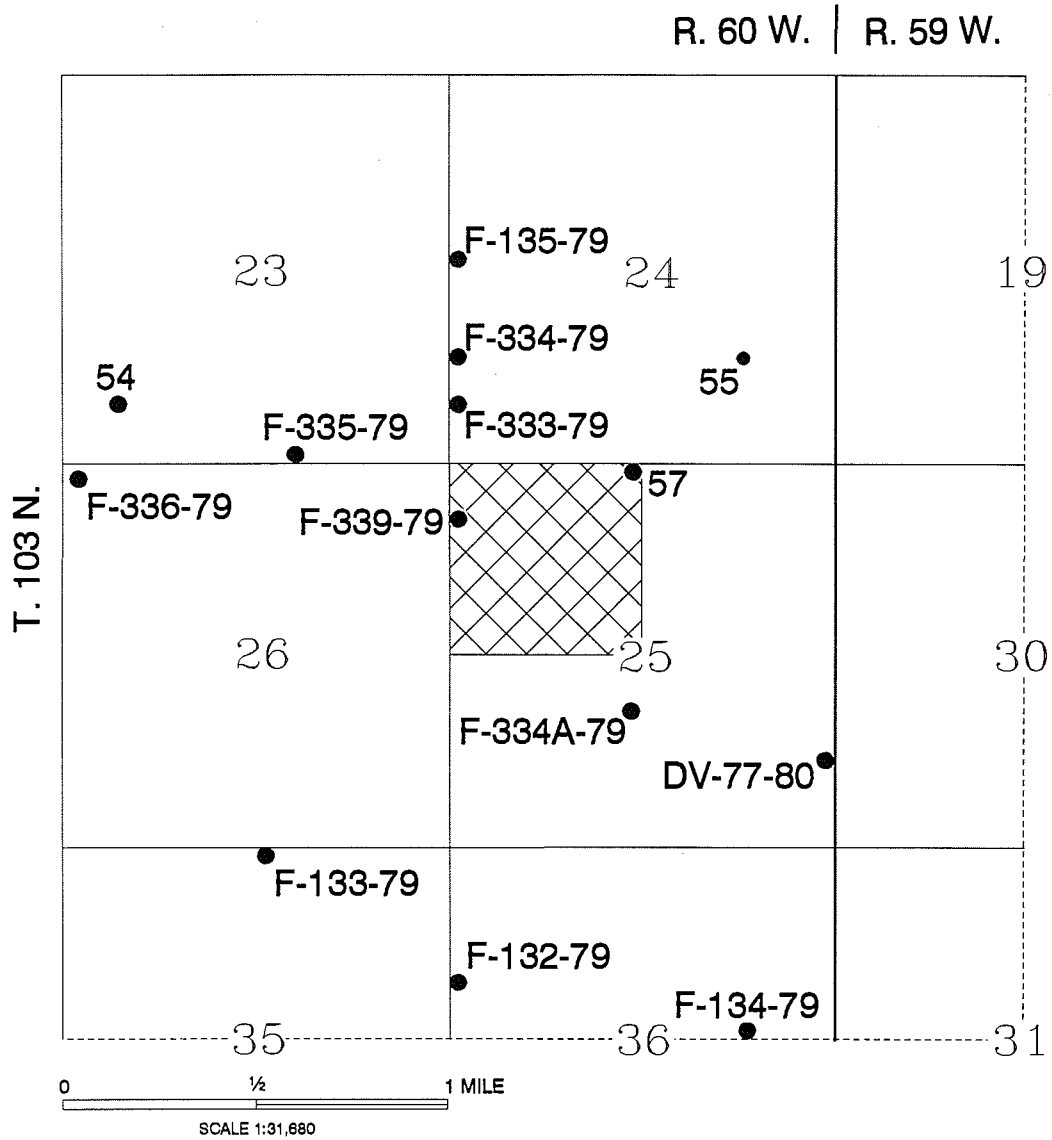
SCALE 1:62,500  
0 1/2 1 2 3 MILES

- Qal..... Alluvium
- Qwco..... Cary outwash
- Qwce..... Cary end moraine
- Qwcg..... Cary ground moraine
- P-Cs..... Sioux Formation
- Kc..... Carlile Shale
-  Landfill



Adapted from Wong (1960)

Figure 3. Geology near the Miedema City landfill.



Landfill

Landfill location: NW¼ sec. 25,  
T. 103 N., R. 60 W.  
Davison County



DV-77-80 ● Test hole. Letters and numbers are the test hole identifier.

Figure 4. Locations of test holes drilled within 1 mile of the Miedema City landfill.

## APPENDIX A

### Legal locations of Miedema City landfill area logs of test holes

Listed below are the legal locations of those test holes cited in this report. Please contact the South Dakota Geological Survey if a copy of a lithologic log is needed.

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SE SE NW SW sec. 23, T. 103 N., R. 60 W.  
SE SW SW SE sec. 23, T. 103 N., R. 60 W.  
SW SW SW NW sec. 24, T. 103 N., R. 60 W.  
NW NW SW SW sec. 24, T. 103 N., R. 60 W.  
NW SW SW SW sec. 24, T. 103 N., R. 60 W.

NW NW SE SE sec. 24, T. 103 N., R. 60 W.  
NE NE NE NW sec. 25, T. 103 N., R. 60 W.  
NW SW NW NW sec. 25, T. 103 N., R. 60 W.  
NE SE NE SW sec. 25, T. 103 N., R. 60 W.  
SE SE NE SE sec. 25, T. 103 N., R. 60 W.

NW NW NW NW sec. 26, T. 103 N., R. 60 W.  
NE NW NW NE sec. 35, T. 103 N., R. 60 W.  
SE SE SW NE sec. 36, T. 103 N., R. 60 W.  
SW NW SW NW sec. 36, T. 103 N., R. 60 W.