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OPEN-FILE REPORT 80-UR - NO. 7: DE SMET CITY

STATEWIDE LANDFILL STUDY:

DE SMET 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 De Smet 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
2. Brookings City - Proposed
3. Brown County
4. Brule County
5. Byre (Private)
6. Davison County
7. De Smet City
8. Gregory County
9. Haarstad (Private)
10. Huron City
11. John Clements (Private)
12. Kadoka City
13. Marshall County
14. Miedema City
15. Milbank City
16. Miller City
17. Pierre City - Proposed
18. Pierre City - Old Site
19. Ralph Dawson (Private)
20. Rapid City
21. Sioux Falls (Runge) City
22. Vermillion City
23. Walworth County
24. Watertown City
25. Winner City
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 De Smet 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 De Smet City landfill in 1986.

DE SMET CITY LANDFILL

Location

The De Smet City landfill is located 3 miles south of De Smet in Kingsbury County. Its legal location is NW¼ NE¼ sec. 16, T. 110 N., R. 56 W. (fig. 2).

Topography, Drainage, and Climate

The information on topography and drainage was taken from the De Smet SE Quadrangle (United States Geological Survey, 1971). In actuality, the present landfill surface may be significantly different because of activities at the landfill.

The topography near the De Smet City landfill consists of gently rolling terrain. The landfill is located on the west side of a hill (fig. 2). The elevation ranges from 1,750 to 1,800 feet for a maximum relief of 50 feet at the site.

A draw cuts across the landfill from east to northwest. At the base of the draw (outside of the site) is a depression. To the north and southwest of this depression are several other depressions or sloughs, which together essentially serve as the origin of an intermittent stream that drains to the southwest. This intermittent stream drains into Rock Creek (United States Geological Survey, 1971), an intermittent stream in the James River basin. Several small stock ponds are located near the site. A series of lakes are located 1 to 2 miles east of the landfill site.

The average annual temperature in Kingsbury County is 45 degrees Fahrenheit. Precipitation averages 21 inches per year. The average annual class A pan evaporation is 48 inches. Climatological data are from Spuhler and others (1971).

Geology

Surficial deposits in the area of the De Smet landfill (fig. 3) consist of material mapped as glacial drift (Flint, 1955). Four test hole lithologic descriptions within the site are available. However, because the legal locations are unknown, the data have not been included in this report.

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, logs of test holes drilled by the South Dakota Geological Survey identify the drilling company as "SDGS."

Hydrology

According to the Office of Air Quality and Solid Waste records, the material at the base of the landfill consists primarily of sand and 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 a much lower permeability than sand. No site specific permeability data are available.

Although four monitoring wells have been installed at the landfill, their legal locations are unknown. Without locations and ground water elevations, the lateral hydraulic gradient and direction of potential ground water movement cannot be estimated for the landfill area. The nearest ground water supply (aquifer) is unknown.

Water Quality

Although water quality data were available, the legal locations and/or well depths were not known for the wells within the landfill. Only data meeting the South Dakota Geological Survey criteria were used in this study.

Water quality analyses were utilized only 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. 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 De Smet SE Quadrangle (United States Geological Survey, 1971) and the General Highway Map of Kingsbury County (South Dakota Department of Transportation, 1978).

* Located 1,000 feet north, east, and west of the site are stock ponds, one at each location. Five other stock ponds are located within 1 mile 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: De Smet City

2. Population served: 2,300

3. Method of disposal: Cut and fill (trench)

4. Estimated amount of waste received per unit time: 2,160 tons/year

5. Access to site:

   * Fenced: _X_ Yes ___ No Lockable gate: _X_ Yes ___ No
   * Litter fences present: ___ Yes _X_ No
   * All weather access road to site: _X_ Yes ___ No

6. List industry present: Lyle Signs, Raven Industries

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

* The geology at this site generally consists of glacial drift. No reliable test hole data are available near this site.

* The landfill is located near an intermittent stream and sloughs.

* No reliable monitoring wells were present near this site.

* No reliable water level data were available near this site.

* No reliable water quality data were available near this site.

REFERENCES CITED

Flint, R. F., 1955, Pleistocene geology of eastern South Dakota: United States Geological Survey Professional Paper 262, 173 p.

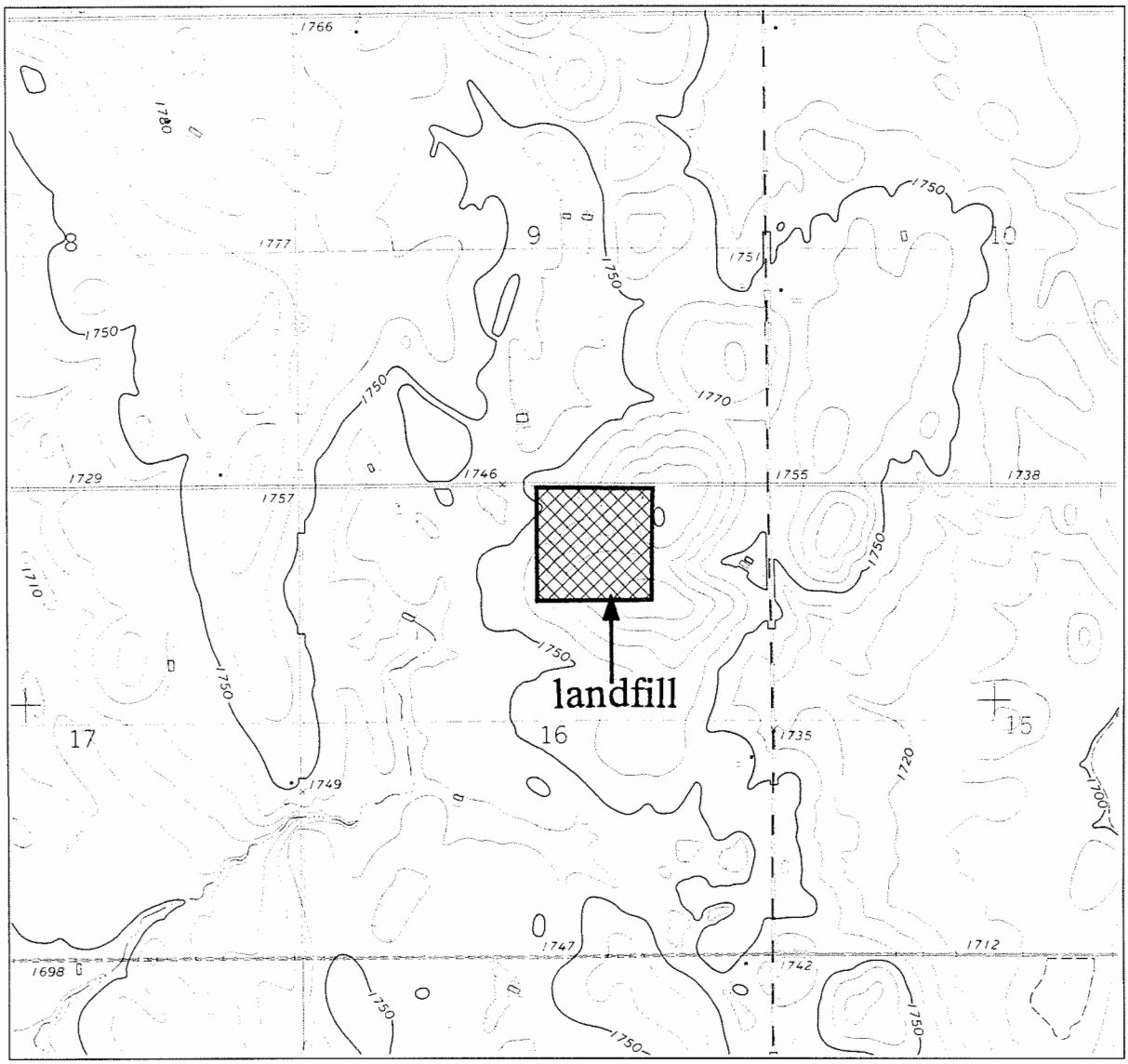
South Dakota Department of Transportation, 1978, General Highway Map Kingsbury County, South Dakota: South Dakota Department of Transportation in cooperation with the United States Department of Transportation, (revisions as of November 30, 1978).

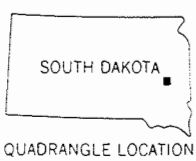
Spuhler, W., Lytle, W.F., and Moe, D., 1971, Climate of South Dakota: Brookings, South Dakota, South Dakota State University Agricultural Experiment Station Bulletin 582, 30 p.

United States Geological Survey, 1971, De Smet SE quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000.

Figure 1. Sites considered for further evaluation.

R. 56 W.

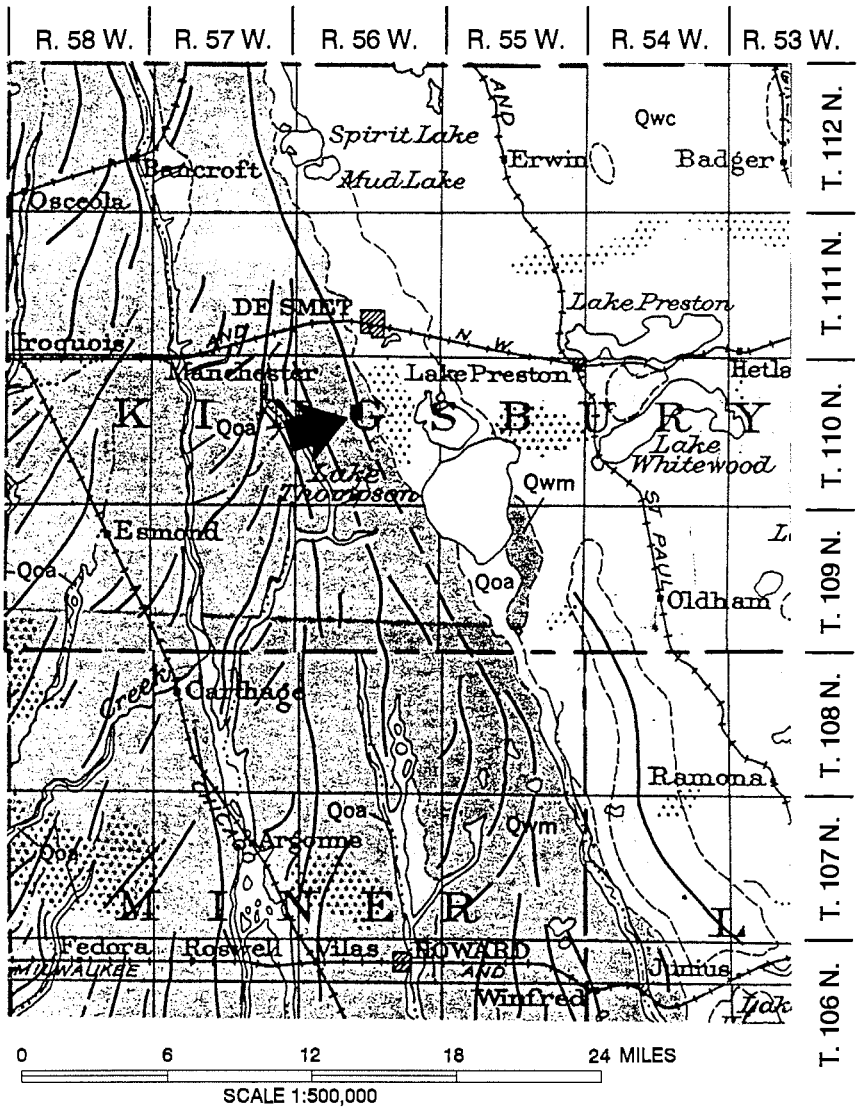




Landfill location: NW¼ NE¼ sec. 16,
T. 110 N., R. 56 W.
Kingsbury County

Adapted from United States
Geological Survey (1971)

Figure 2. Location of the De Smet City landfill.



Qoa ..... Outwash and alluvium

Collapsed drift

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 De Smet City landfill.