

**STATE OF SOUTH DAKOTA
William J. Janklow, Governor**

**DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Nettie H. Myers, Secretary**

**DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE
Kelly A. Wheeler, Director**

**GEOLOGICAL SURVEY
C.M. Christensen, State Geologist**

OPEN-FILE REPORT 80-UR - No. 17: PIERRE CITY - PROPOSED

**STATEWIDE LANDFILL STUDY:
PIERRE CITY - PROPOSED LANDFILL SITE CHARACTERISTICS**

by

**Sarah A. Chadima
Carolyn V. DeMartino
Keith A. Swenson**

**Science Center
University of South Dakota
Vermillion, South Dakota**

1996

CONTENTS

	Page
INTRODUCTION	1
Purpose and scope	1
Selection of sites	1
PIERRE CITY – PROPOSED LANDFILL	2
Location	2
Topography, drainage, and climate	2
Geology	2
Hydrology	3
Water quality	3
Adjacent land use and features	3
SUMMARY	4
REFERENCES CITED	4

FIGURES

1. Sites considered for further evaluation	5
2. Location of the Pierre City - Proposed landfill	6
3. Geology near the Pierre City - Proposed landfill	7
4. Locations of test holes drilled within 1 mile of the Pierre City - Proposed landfill	8

TABLE

1. List of sites considered for further evaluation	1
--	---

APPENDIX

A. Legal locations of Pierre City - Proposed landfill area logs of test holes	9
---	---

INTRODUCTION

Purpose and Scope

The purpose of this report is to summarize the geologic data, hydrologic data, and other site characteristics of the Pierre City - Proposed 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 Pierre City - Proposed landfill is the basis for this report.

After 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 Pierre City - Proposed landfill in 1986.

PIERRE CITY - PROPOSED LANDFILL

Location

The Pierre City - Proposed landfill is located in the northeast corner of Pierre in Hughes County. Its legal location includes S½ SW¼ sec. 35, T. 111 N., R. 79 W. and N½ NW¼ sec. 2, T. 110 N., R. 79 W. (fig. 2).

Topography, Drainage, and Climate

The information on topography and drainage was taken from the Pierre NE Quadrangle and the Pierre Quadrangle (United States Geological Survey, 1967 and 1973) The topography near the Pierre City - Proposed landfill is dominated by a deeply incised tributary valley to the Missouri River (fig. 2). The proposed site is located at the edge of the northern valley wall of the Missouri River floodplain. The proposed site slopes to the south, with steep slopes along the southern border. The elevation ranges from 1,597 to 1,763 feet for a maximum relief of 166 feet at the proposed site.

At the proposed site, drainage is controlled by intermittent tributary streams which empty onto the Missouri River floodplain. A deep valley, which originates at the northern boundary of the proposed site, crosses the site and ends on the Missouri River floodplain near the fairground. According to personnel from the Office of Air Quality and Solid Waste, the city of Pierre proposed that this valley, which contains a natural intermittent stream, be used to contain all waste rather than digging and filling a trench (Robyn Livermore, Office of Air Quality and Solid Waste, personal communication, March 1986). Other intermittent streams are present less than 1 mile to the south, west, and east of the site (fig. 2).

The average annual temperature in Hughes County is 46 degrees Fahrenheit. Precipitation averages 17 inches per year. The average annual class A pan evaporation is 52 inches. Climatological data are from Spuhler and others (1971).

Geology

Glacial deposits overlie the Pierre Shale in this area (fig. 3). Four test holes have been drilled within 1 mile of the proposed site (fig. 4; app. A). The lithologies vary widely because of the nature of the geologic environment. Test hole HG-57-80 was drilled into glacial outwash. Test holes HG-136-81, HG-135-81, and USCE were drilled into undifferentiated glacial drift.

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 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 material at the base of the proposed site presumably consists of topsoil and/or clay (till or shale). The permeability of this material is not known but can be represented in qualitative terms. In general, the permeability of clay is less than the permeability of sand and gravel. No site specific permeability data are available.

No monitoring wells are 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 ground water movement cannot be estimated for the landfill area. The nearest ground water supply (aquifer) is approximately half a mile south (surficial river alluvium).

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 utilized 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 proposed site or 1 mile of the proposed site boundaries. Only wells with recorded depths and with corresponding lithologic logs have been considered. This limit of 100 feet was arbitrarily chosen. 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 Pierre NE Quadrangle and the Pierre Quadrangle (United States Geological Survey, 1967 and 1973) and the General Highway Map - Hughes County (South Dakota Department of Transportation, 1977).

- * Within half a mile of the proposed landfill are eight gravel pits.
- * Within the proposed site is an intermittent stream. Several other intermittent streams are located within 1 mile of the proposed site. Four intermittent ponds are located within three-fourths of a mile of the proposed site. A reservoir is located three-fourths of a mile north of the proposed site.
- * A sewage disposal facility is located 1 mile southwest of the proposed site.
- * U.S. Highways 14 and 83 are located three-fourths of a mile south of the proposed site.
- * Railroad tracks are located three-fourths of a mile south of the proposed site.

- * The Pierre Municipal Airport is located three-fourths of a mile northeast of the proposed site.
- * The Pierre Indian School is located three-fourths of a mile south of the proposed site.
- * Radio towers are located 1 mile southeast of the proposed site.
- * A cemetery is located a quarter of a mile south of the proposed site.
- * A golf course is located 1 mile south of the proposed site.
- * A fairground is located half a mile south of the proposed site.

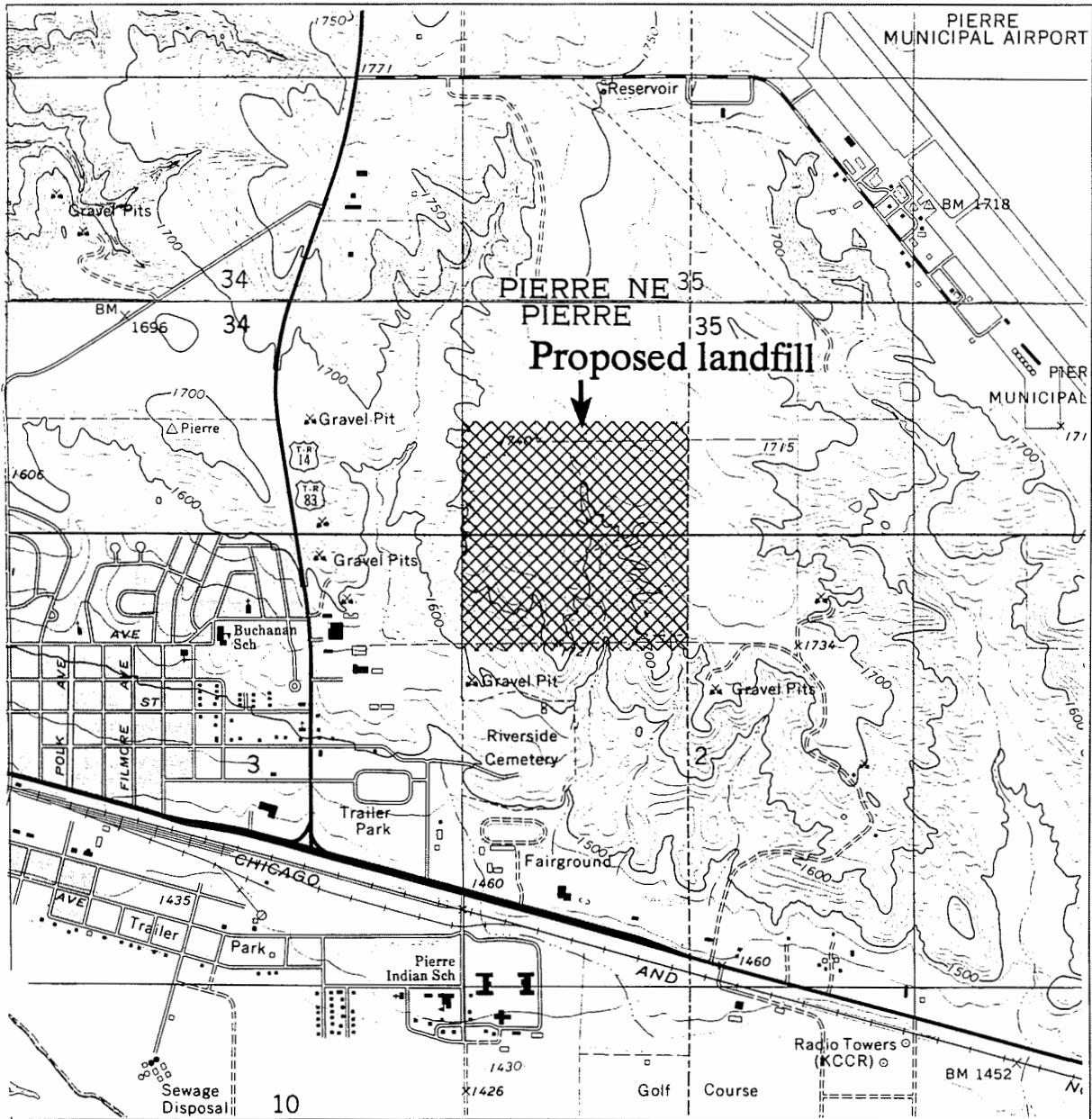
SUMMARY

- * The topography at this proposed site is dominated by a gully adjacent to the Missouri River floodplain.
- * The geology of this proposed site generally consists of glacial deposits overlying Pierre Shale.
- * No test hole logs were available within this proposed site. Four test hole logs were available within 1 mile of the proposed site.
- * No monitoring wells were present near this proposed site.
- * No water level data were available near this proposed site.
- * No water quality data were available near this proposed site.

REFERENCES CITED

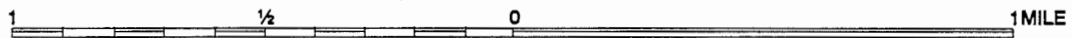
- Crandell, D.R., 1954, Geology of the Pierre quadrangle, South Dakota: United States Geological Survey Geologic Quadrangle Maps of the United States.
- South Dakota Department of Transportation, 1977, General Highway Map Hughes County, South Dakota: South Dakota Department of Transportation in cooperation with the United States Department of Transportation, (revisions as of June 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, 1967, Pierre NE quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000.
- _____, 1973, Pierre quadrangle, South Dakota: 7.5 minute series (topographic), scale 1:24,000.

R. 79 W.



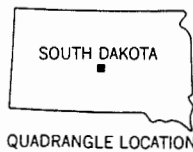
T. 110 N. | T. 111 N.

SCALE 1:24000



CONTOUR INTERVAL 10 FEET, PIERRE NE QUADRANGLE
CONTOUR INTERVAL 20 FEET, PIERRE QUADRANGLE

Landfill location: S½ SW¼ sec. 35, T. 111 N., R. 79 W., and
N½ NW¼ sec. 2, T. 110 N., R. 79 W.
Hughes County

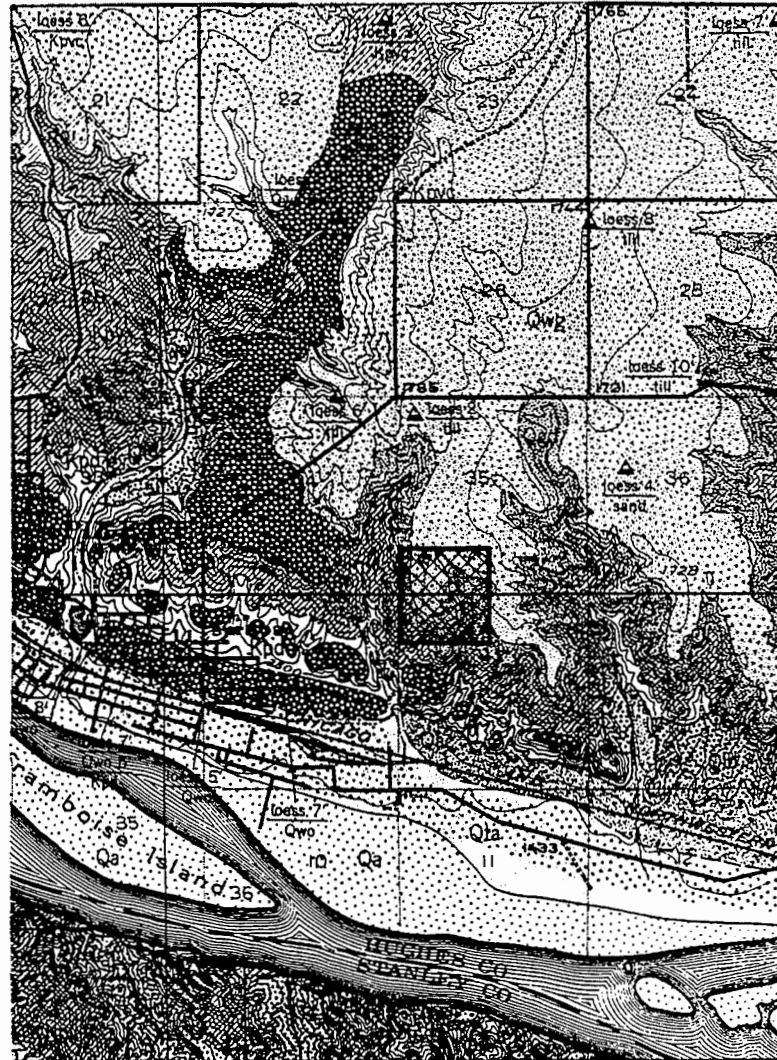


Adapted from United States
Geological Survey (1967, 1973)



Figure 2. Location of the Pierre City - Proposed landfill.

R. 79 W.



T. 110 N. | T. 111 N.

- Qa Floodplain alluvium
- Qta Terrace alluvium
- Qac Tributary alluvium and colluvium
- Qld Landslide deposits
- Qwo Glacial outwash terrace deposit
- Qwg Ground moraine
- Qdg Glacial drift undifferentiated
- Kpvc Virgin Creek member
- Kpv Verendrye member
- Kpd DeGrey member
- Proposed landfill

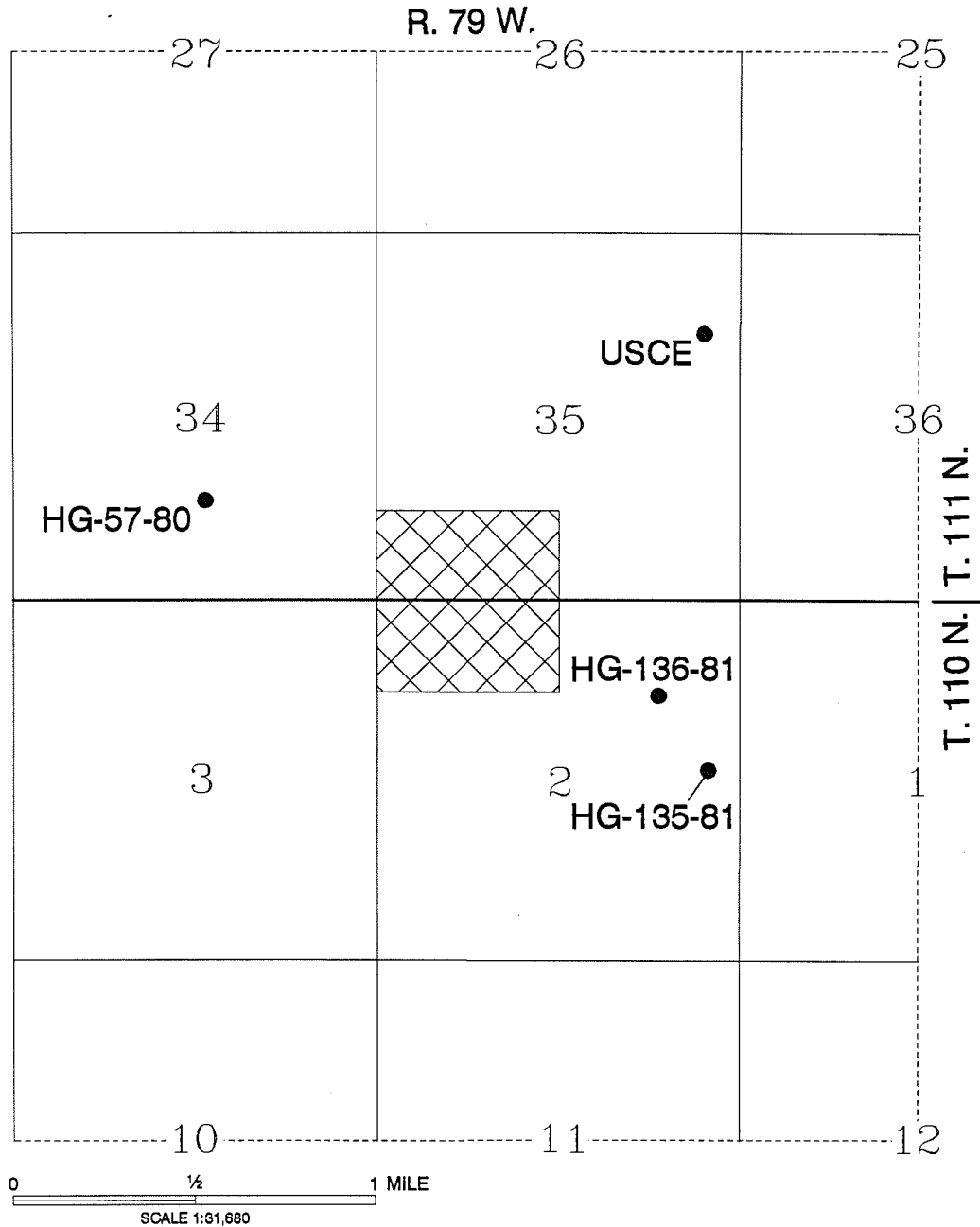
Pierre Shale

Adapted from Crandell (1954)

0 1/2 1 MILE
SCALE 1:82,500



Figure 3. Geology near the Pierre City - Proposed landfill.



Proposed landfill

Landfill location: S $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 35, T. 111 N., R. 79 W. and N $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 2, T. 110 N., R. 79 W. Hughes County



HG-57-80 • Test hole. Letters and numbers are the test hole identifier.

Figure 4. Locations of test holes drilled within 1 mile of the Pierre City - Proposed landfill.

APPENDIX A

Legal locations of Pierre City - Proposed 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.

SW SW NE NE sec. 02, T. 110 N., R. 79 W.

NE NW NE SE sec. 02, T. 110 N., R. 79 W.

SW SE NW SE sec. 34, T. 111 N., R. 79 W.

NW SE SE NE sec. 35, T. 111 N., R. 79 W.