

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. 18: PIERRE CITY - OLD SITE

STATEWIDE LANDFILL STUDY:
PIERRE CITY - OLD SITE 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 - OLD SITE LANDFILL	2
Location	2
Topography, drainage, and climate	2
Geology	3
Hydrology	3
Water quality	3
Adjacent land use and features	4
Operational and siting criteria – summary from the Office of Air Quality and Solid Waste records	4
SUMMARY	4
REFERENCES CITED	5

FIGURES

1. Sites considered for further evaluation	6
2. Location of the Pierre City - Old Site landfill	7
3. Geology near the Pierre City - Old Site landfill	8
4. Locations of test holes drilled within 1 mile of the Pierre City - Old Site landfill	9

TABLE

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

APPENDIX

A. Legal locations of Pierre City - Old Site landfill area logs of test holes	10
--	----

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 - Old Site 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 - Old Site 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 Pierre City - Old Site landfill in 1986.

PIERRE CITY - OLD SITE LANDFILL

Location

The Pierre City - Old Site landfill is located east of Pierre near the municipal airport in Hughes County. Its legal location is NW¼ SE¼ sec. 35, T. 111 N., R. 79 W. (fig. 2).

Topography, Drainage, 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). In actuality, the present landfill surface is significantly different because of activities at the landfill.

The topography near the Pierre City - Old Site landfill is dominated by the deeply incised Missouri River valley which occurs about 1 mile south of the landfill (fig. 2). The landfill is located at the top edge of the northern valley wall. The site slopes to the southeast along the eastern border. The elevation ranges from 1,658 to 1,745 feet for a maximum relief of 87 feet at the site.

At the landfill, drainage is controlled by an intermittent tributary stream, approximately 2 miles long, which terminates on the Missouri River floodplain. A large draw covers all but the southwest quarter of the site. According to the Office of Air Quality and Solid Waste (Robyn Livermore, personal communication, March 1985), this natural draw is used to contain all waste. A pipe has been installed along the deepest portion of the gully in an attempt to address surface drainage concerns (Barker, Pierre City Engineer, personal communication, 1986). According to a letter to the Office of Air Quality and Solid Waste dated September 30, 1975, the joints on the metal pipe buried beneath the landfill may not be sealed (this may allow percolating water to seep through the landfill and enter the buried pipe and be discharged to the valley which ultimately discharges into the alluvium or the Missouri River). The intermittent stream closest to the landfill is less than a quarter of a mile to the east. Several other intermittent streams originate less than 1 mile to the south and west 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

The area near the Pierre City - Old Site landfill is represented by glacial deposits overlying the Pierre Shale (fig. 3). According to a letter in the Office of Air Quality and Solid Waste records dated September 30, 1975, from the South Dakota Geological Survey, the glacial drift in section 35 is composed mostly of clay with sand and pebbles and with small, isolated sand lenses.

Four test holes have been drilled within 1 mile of the landfill (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 landfill presumably consists primarily of clay (Office of Air Quality and Solid Waste records). 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 potential ground water movement cannot be estimated for the landfill area. The location and depth to the nearest ground water supply (aquifer) are approximately 1 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 1 mile of the site. 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 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 shale. 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).

- * The nearest surface water is a pond located a quarter of a mile east of the site. Two other ponds are located within half a mile of the site.
- * Gravel pits are located half a mile to three-quarters of a mile south and west of the site.
- * U.S. Highways 14 and 83 are located about 1 mile west of the site.
- * The Pierre Municipal Airport and runways are approximately half a mile northeast 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: Pierre City - Old Site
2. Population served: 16,009
3. Method of disposal: Ravine fill - area landfill
4. Estimated amount of waste received per unit time: 6,000 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: No information available.
7. Land Use:
 - * Preoperational land use: Grazing
 - * Proposed post-operational land use: Grazing
 - * Current land use within a quarter of a mile radial area: Airport, grazing, agricultural

SUMMARY

- * The topography at this site is dominated by a gully adjacent to the Missouri River valley.

- * The geology at this site generally consists of glacial deposits overlying Pierre Shale.
- * No test hole logs were available within this site. Four test hole logs were available within 1 mile of the site.
- * No monitoring wells were present near this site.
- * No water level data were available near this site.
- * No reliable water quality data were available near this 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.

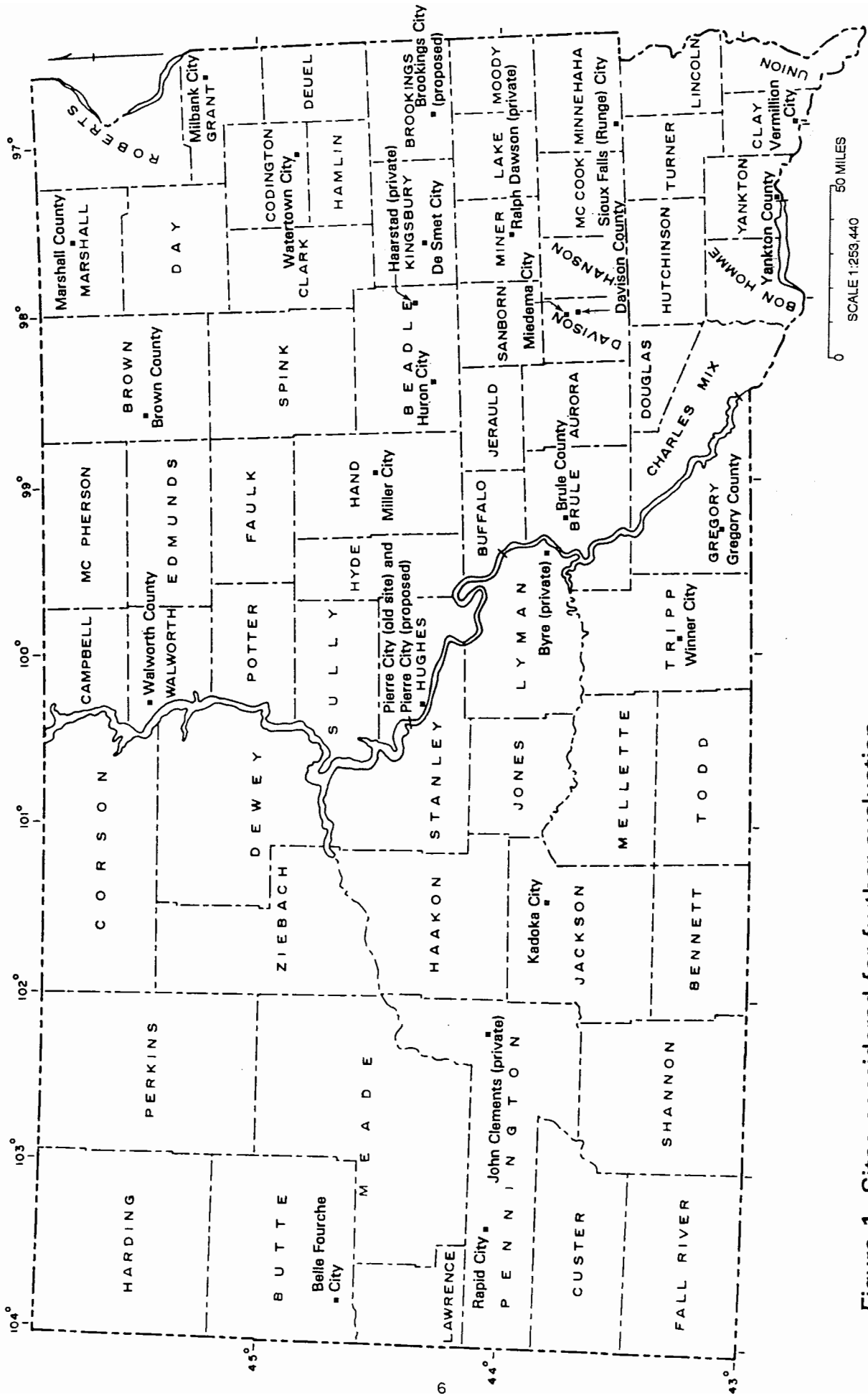
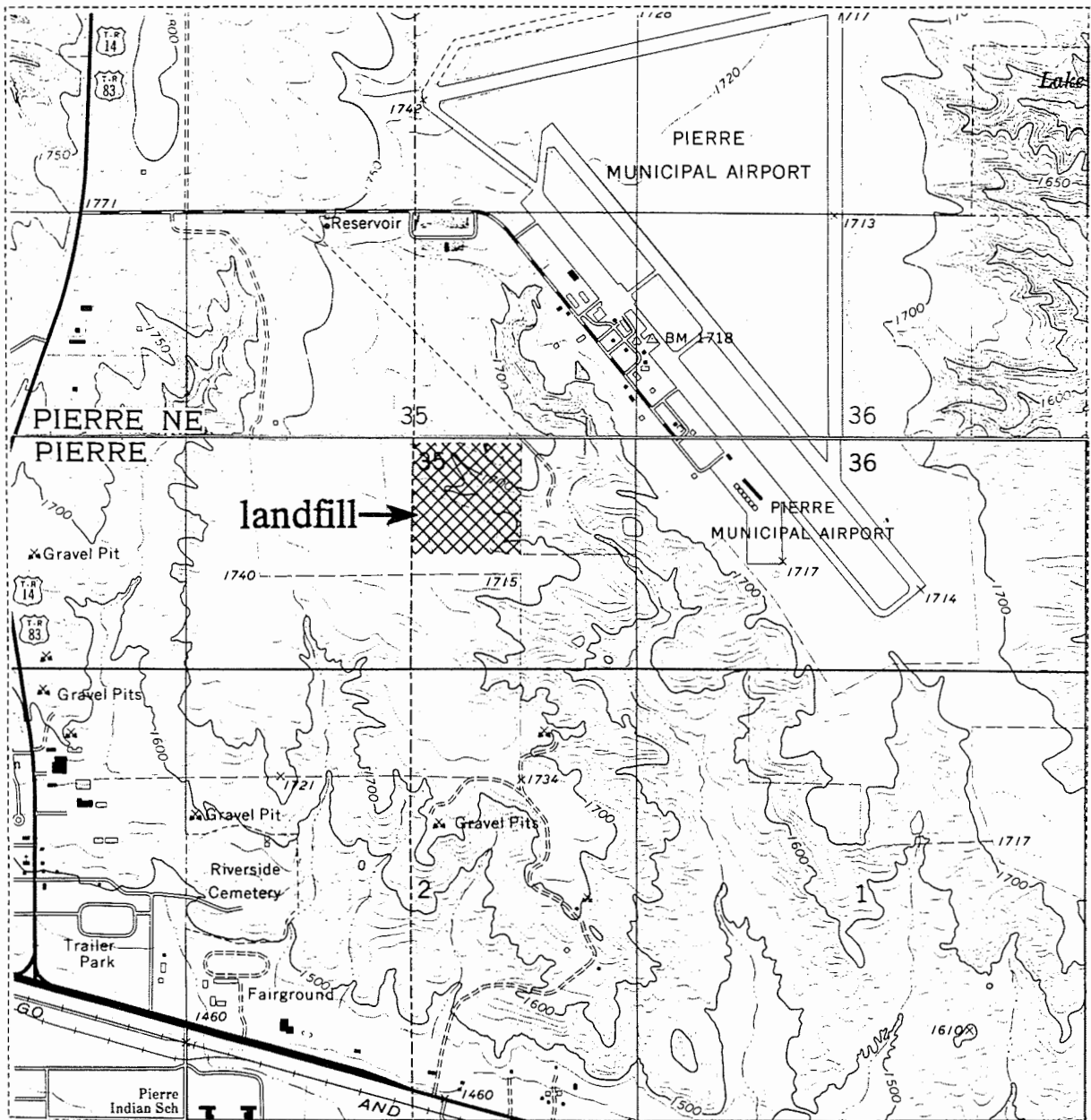


Figure 1. Sites considered for further evaluation.

R. 79 W.

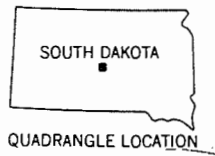


T. 110 N. | T. 111 N.

SCALE 1:24000



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

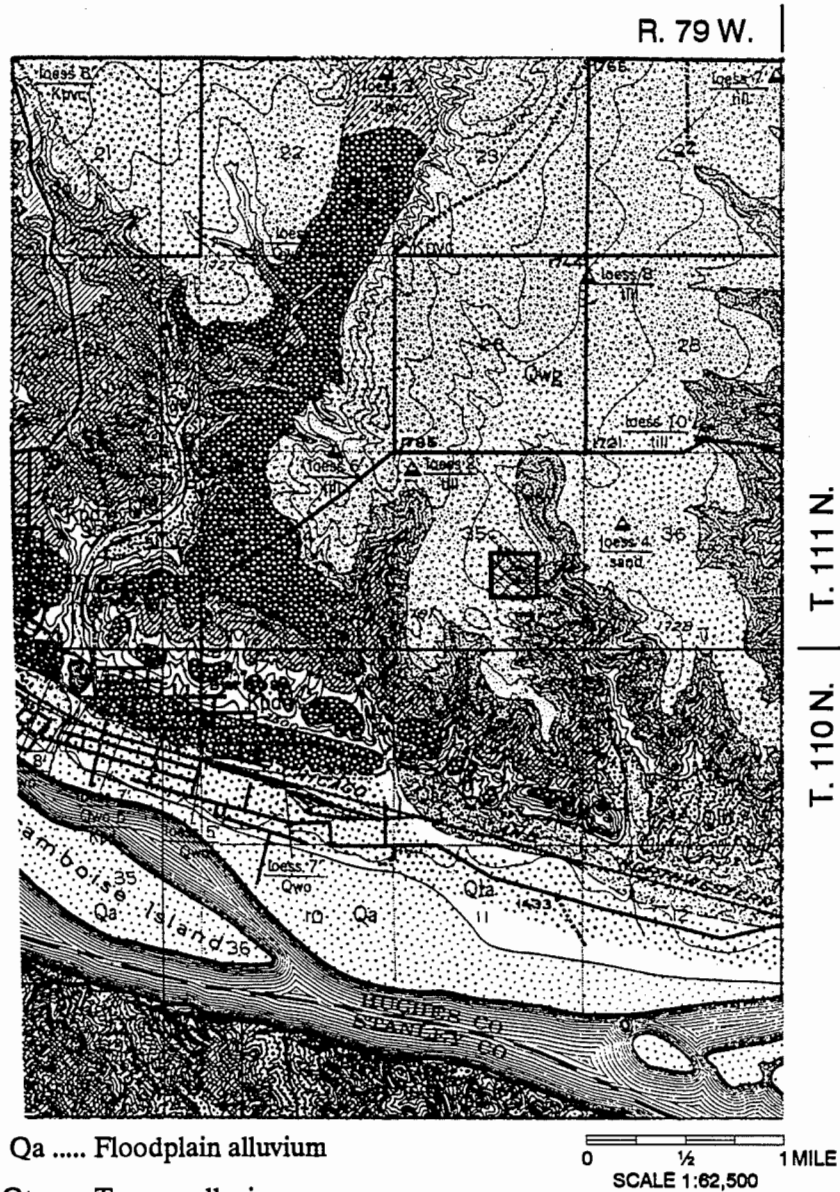


Landfill location: NW¼ SE¼ sec. 35,
T. 111 N., R. 79 W.
Hughes County

Adapted from United States
Geological Survey (1967 and 1973)



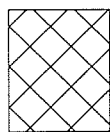
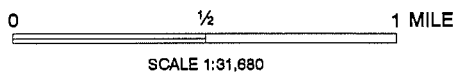
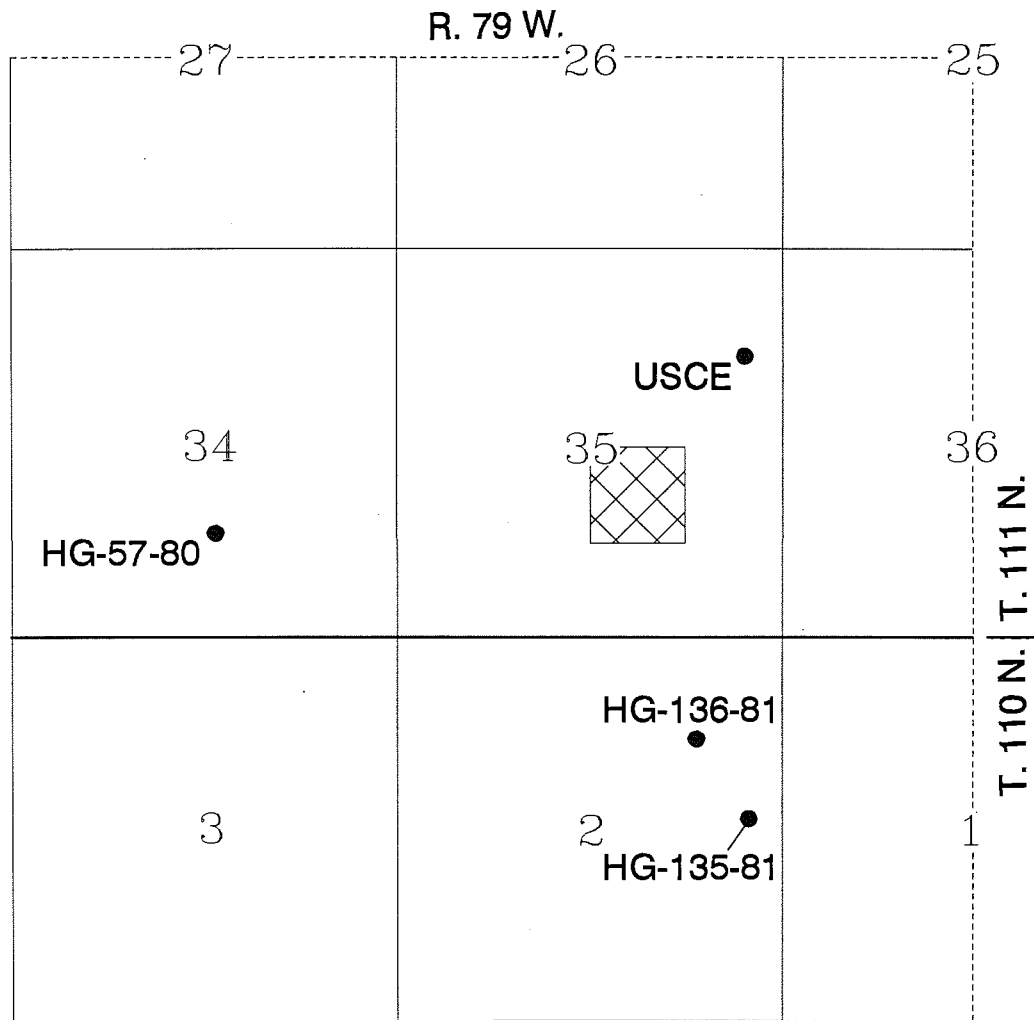
Figure 2. Location of the Pierre City - Old Site landfill.



- 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
- } Pierre Shale
- Landfill

Adapted from Crandell (1954)

Figure 3. Geology near the Pierre City - Old Site landfill.



Landfill

Landfill location: NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35,
T. 111 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 - Old Site landfill.

APPENDIX A

Legal locations of Pierre City - Old Site 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.