

Final
Phase I Environmental Site Assessment
Theodore Roosevelt National Park
Tract 03-106
Billings County, North Dakota

Property Owner: Mr. Norbert V. Sickler



July 2003

EXECUTIVE SUMMARY

RMC Consultants, Inc. (RMC) performed this Phase I Environmental Site Assessment (ESA) for the Department of Interior, National Park Service (NPS) Midwest Regional Office in Omaha, Nebraska. The subject property, Tract 03-106, encompasses 149-acres in the South Unit of Theodore Roosevelt National Park (THRO) near Fairfield, North Dakota in Billings County. Dirt or paved roads do not provide access to the subject property; rather the site is accessed by foot from Interstate 94 and through the location of old Highway 10. Tract 03-106 is situated north of Interstate 94 and south of old Highway 10, and is bordered by federal land (THRO) to the north, east and west, and by Interstate 94 and private land (Theodore Roosevelt Medora Foundation) to the south (See Figures 1, 2, and 3).

The subject property is unimproved and has remained relatively undisturbed. The Phase I ESA revealed the following:

- Recognized environmental conditions were not observed during the visual site inspection.
- Small pieces of wood and asphalt debris were scattered around the location of old Highway 10. It is assumed that this debris is from the deconstruction of the road. In addition, large pieces of concrete and iron rod/rebar were located near the northwestern area of the property in a creek. It appeared to be remnants of a former bridge used to cross the creek.

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this assessment is to evaluate Theodore Roosevelt National Park (THRO) Tract 03-106 and identify recognized environmental conditions.

Recognized environmental conditions are defined by ASTM E1527-00, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, as: *the presence, or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or material threat of release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property.*

The information gathered as a result of this assessment attempts to disclose to any potential buyer that "all appropriate inquiry" into the previous ownership and uses of a property has been performed. This investigative work is performed to allow the United States Department of the Interior, National Park Service (NPS) to qualify for one of the conditions, i.e., "innocent landowner defense" to Comprehensive Environmental Response, Compensation and Liabilities Act/Superfund Amendments Reauthorization Act (CERCLA) and its amendments. Radon, lead in drinking water, asbestos, and lead-based paints are potential hazards that are not encompassed by CERCLA's appropriate inquiry responsibilities. The confirmation of the existence of these potential hazards was not within the scope of this environmental assessment.

RMC Consultants, Inc. (RMC) of Lakewood, Colorado was contracted by the NPS to conduct an environmental assessment of the site. This site, described as THRO Tract 03-106, is situated in Billings County, North Dakota and referred to herein as the "subject property" or the "site." The characteristics, history, and legal description are discussed in detail in Section 2.0. Supporting information is provided in Appendices A through E.

In accordance with ASTM E1527-00, the scope of services described in NPS Contract No. GS-10F-0482M between the NPS and RMC, and NPS' March 1999 Level I Pre-Acquisition

Environmental Site Assessment Guidance Manual, the environmental assessment conducted by RMC includes the following components:

1. Acquisition and review of any readily available documentation such as the property chain-of-title and federal, state, and local regulatory records.
2. Visual site inspection
3. Interviews
4. Review of readily available historical topographic maps and aerial photographs
5. NPS Level I Survey Checklist for Proposed Real Estate Acquisitions
6. Data evaluation and report preparation

1.2 SPECIAL TERMS AND CONDITIONS

The services performed by RMC and the use of the material presented in this report are strictly limited to the scope set forth in Sections 1.1 and 1.3 of this report.

1.3 LIMITATIONS OF ASSESSMENT

Use of this report is strictly limited to the NPS. The use of this report by third parties is the NPS' sole responsibility. Statements and conclusions in this report are estimates of the environmental conditions noted during the execution of this site inspection and are not a guarantee of the property's environmental conditions. Although no environmental assessment can wholly eliminate uncertainty regarding the environmental condition of a site, RMC's services are intended to reduce the amount of uncertainty in commercial real estate transactions. RMC established a balance between the competing goals of reasonable and practical environmental site assessments and the reduction in unknown conditions for a subject site. It should not be concluded or assumed this inquiry was not appropriate because it did not identify existing contamination. Conclusions reached are based on readily available information and the conditions of the site at the time of the assessment.

As with any environmental site assessment, RMC's inquiry should be evaluated based on the soundness of the judgments made at the time and under the conditions within which they were made. Subsequent environmental site assessments should not be considered valid standards to judge the appropriateness of any prior assessment based on hindsight, new information, or use of developing technology or analytical techniques.

2.0 PROPERTY DESCRIPTION

Pertinent information regarding the property is summarized in the following text. The regional location of the site is depicted in the topographic map and aerial photograph presented as Figures 1 and 2, respectively. An NPS parcel boundary map overlaid on a color aerial photograph of the area is included as Figure 3. Additionally, summarized site information is provided in the NPS Level I Survey included in Appendix C.

2.1 LOCATION AND LEGAL DESCRIPTION

Facility Names (of record):

Theodore Roosevelt National Park Tract 03-106

Location/Address (current):

The subject property is located in the South Unit of THRO, approximately seven miles east of Medora, North Dakota in Billings County and approximately 2.8 miles away from Scoria Point in THRO. Tract 03-106 is situated north of Interstate 94 and south of old US Highway 10. Dirt or paved roads do not provide access to the subject property; rather the site is accessed by foot from Interstate 94 and through the location of old Highway 10. There is no address for the subject property. The property is currently listed with Kukowski Land, Company and is a total of 191 acres, more or less. According to NPS records, the total acreage of Tract 03-106 and a nearby Tract 03-108 that is included in a separate Phase I ESA is approximately 176.30 acres. A portion of the property was taken when Interstate 94 was constructed through the area, so this may account for the difference in acreage. Another possibility for the difference is a portion of the land may be outside of the park boundary.

Legal Description:

The legal description below is from the Scope of Work provided by the NPS, dated May 7, 2003 (See Appendix B). Situated in the State of North Dakota, County of Billings in the southwest quarter of Section 28, southeast quarter of Section 33, Township 140 North, Range 101 West of the Fifth Principal Meridian, being more particularly described as follows:

A Tract of land situated in the southwest quarter of Section 28, southeast quarter of Section 33, lying south of the right-of-way of the old U.S. Highway Number 10 and north of the north right-of-way line of Interstate 94, containing 149 acres, more or less.

Owner of Record:

Mr. Norbert V. Sickler, Property Owner
11125 42nd Street SW
Dickinson, North Dakota 58601
(701) 225-5072

Facility Contact:

Ms. Valerie Naylor, Superintendent
Mr. Bruce Kaye, Chief Park Naturalist
Theodore Roosevelt National Park
P.O. Box 7, 315 2nd Avenue
Medora, North Dakota 58645-0007
(701) 623-3409

2.2 SITE CHARACTERISTICS

The characteristics of the subject property (149-acres) and surrounding area were primarily established by a site visit and inspection on June 17 and 18, 2003. Photographs of the site's features and surroundings taken during the site visit are included in Appendix A.

Supporting information showing site characteristics is provided in Appendix C.

Information describing the characteristics of the property is also included in Sections 3.0 and 4.0 of the report.

The subject property is located 2.8-miles west of the Painted Canyon Visitor Center in the South Unit of THRO. THRO lies in western North Dakota and encompasses 110-square miles of land. The badlands were formed millions of years ago from sediment carried off the eastern slopes of the Rocky Mountains and from volcano ash in South Dakota, Montana and Idaho carried by wind and rivers. The sediments were transformed into sandstone, siltstone and mudstone layers, and the ash layers into bentonite clay. The sedimentary rocks were then eroded by wind and rivers, creating the badland topography. Elevations range from 2,860-feet on Peck Hill in Painted Canyon to 2,250 in the creeks. The Environmental Data Resources (EDR) report identifies the soil component in the general area of the subject property as Badland; an unweathered bedrock with very slow infiltration

rate, with Class D soils that are clayey, have a high water table, or are shallow to an impervious layer (See EDR Report in Appendix D).

According to the EDR report, the subject property is not located on a flood plain. The property is located in the South Unit of THRO, north of Interstate 94 and south of old Highway 10. The topography of the subject property slopes gradually to the southeast towards the Interstate at approximately 2,572-feet above mean sea level (msl). The site is covered with grassy areas, low brush, and ponderosa pines. Elk, deer, bison, and wild horses frequent this area. Intermittent creeks and springs are located on the property.

2.3 SITE HISTORY

As per ASTM guidelines, the history of the subject property was established by: (1) inspection of county government reports and records (2) review of well permits and topographic maps; (3) review and interpretation of aerial photographs; (4) site visitation; (5) interviews of persons knowledgeable of the site; and (6) review of records on file at the state offices. A limited summary of the site's history is presented below. Current property owner documentation information is provided in Appendix B.

Earliest records reviewed showed that Adele F. McEntee owned the property (year purchased is unknown), and it was transferred to Mr. Maurice P. O'Connell and Kathleen A. O'Connell on February 11, 1961. According to a Tract Record and Valuation Data form, the site was appraised on January 18, 1964 and was listed as being used for agricultural dry land grazing. This property was also listed as Tract 01-102. According to Mr. Bruce Kaye (Chief Park Naturalist, National Park Service - THRO), St. Joseph's Catholic Church of Dickinson, North Dakota acquired the property sometime after 1972 (last record of O'Connell ownership in NPS file) and owned it until January 30, 1981 when Norbert and Loretta Sickler purchased the property from the Church. The Sickler's are the current property owners.

The subject property is undeveloped and unimproved and has existed primarily as undeveloped and unimproved land.

According to Mr. Bruce Kaye and Mr. Norbert Sickler, the subject property has remained relatively undisturbed and the site has not been used for the storage, transfer, or disposal of hazardous materials.

3.0 RECORDS REVIEW AND INTERVIEWS

A search of federal and state databases specific to environmental issues was performed to identify sites that have exhibited potentially negative impacts to the environment. The databases were searched within ASTM-recommended search distances (up to one mile) of the subject property. ASTM search distances are based on the likelihood of hazardous substances or petroleum products migrating onto the subject property in conjunction with, for example, the density and geology of the setting. A copy of the EDR Report is presented in Appendix D. Interviews were conducted with Mr. Norbert Sickler and Mr. Bruce Kaye.

3.1 FEDERAL AND STATE AGENCY DATABASE SEARCHES

As part of this environmental assessment, U.S. Environmental Protection Agency (EPA) and State of North Dakota records were researched. A discussion of the findings derived from these sources is provided below.

NPL/CORRACTS Sites:

A database search was conducted to identify all recorded National Priority List (NPL) facilities and state-equivalent priority sites within one mile of the site as of May 2003. The corrective action order database (CORRACTS) contains information regarding Resource Conservation and Recovery Act (RCRA) facilities that have been issued a Corrective Action Order. The information on each facility includes a history of all pre-remedial, remedial, removal and community relations activities or events at the facility, financial funding information for the events, and unrestricted enforcement activities. The search findings revealed the following:

- NPL or CORRACTS sites were not identified within the prescribed one-mile search radius of the site.

CERCLIS/NFRAP Sites:

A database search was conducted to identify all recorded No Further Remedial Action Planned (NFRAP) facilities within one-half mile of the site as of March 2003. The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list and state-equivalent SCL list identify facilities that are either proposed to be on or are on the NPL, and facilities that are in the screening and assessment phase for

possible inclusion on the NPL. NFRAP facilities may be sites where, following an initial investigation, no contamination was found, contamination was removed, or the contamination was not serious enough to require Federal CERCLA action or NPL consideration. The search findings revealed the following:

- CERCLIS facilities were not identified within the prescribed one-half mile search radius of the site.
- NFRAP facilities were not identified within the prescribed one-quarter mile search radius of the site.

RCRA Sites (i.e., Hazardous Waste Sites):

A database search was conducted to identify all recorded Resource Conservation And Recovery Information System (RCRIS) facilities within one-half mile of the site and all recorded RCRA-Large Quantity Generator (LQG)/Small Quantity Generators (SQG) facilities within one-quarter mile of the site as of April 2003. The EPA's RCRA program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities that report generation, storage, transportation, treatment or disposal of hazardous waste. Facilities that treat, store and/or dispose (TSD) of hazardous waste are RCRA TSDs. RCRA LQG are facilities, which generate at least 1000 kilograms (kg)/month of acutely hazardous waste, and SQG are facilities, which generate less than 1000 kg/month of non-acutely hazardous waste. The search findings revealed the following:

- TSD facilities were not identified within the prescribed one-half mile search radius of the site.
- LQG or SQG facilities were not identified within the prescribed one-quarter-mile search radius of the site.

Landfills:

A database search was conducted to identify all recorded Active/Inactive Solid Waste Landfill facilities within one-half mile of the site as of March 2003. This database is provided by the North Dakota Department of Health. The search findings revealed the following:

- Facilities were not identified within the prescribed one-half mile search radius of the site.

LUST Sites:

The North Dakota Department of Public Health maintains a list of facilities where Leaking Underground Storage Tanks (LUST) sites have been discovered as of May 2003. The search findings revealed the following:

- LUST facilities were not identified within the prescribed one-half-mile search radius of the site.

UST Sites:

The North Dakota Department of Environmental Health database was searched for facilities with underground storage tanks (USTs) registered in Billings County as of May 2003. The search findings revealed the following:

- Facilities were not identified within the prescribed one-quarter mile search radius of the site.

Spill Sites:

The EPA Emergency Response Notification System (ERNS) maintains a database identifying sites where hazardous substances have been released. The search findings revealed the following:

- Sites were not identified within the prescribed target property search radius of the site.

3.2 WATER WELL RECORDS

The site inspection confirmed that wells do not exist on the subject property. One United State Geologic Survey (USGS) well is located within a one-mile radius of the subject property (See Appendix D). The usage of the USGS well is a groundwater well. The static water level for this well is not reported, but the well depth is 1,490-feet. No FRDS Public Water Supply (PWS) wells are located within a one-mile radius of the subject property (see Well Data in Appendix D).

3.3 LOCAL AREA RECORDS

Local area records researched consisted of historical USGS topographic maps for 1962, 1981, and 1997, and USGS aerial photographs from 1983, 1991, and 2001 (See Appendices B and F). The topographic maps depict the subject property as unimproved land with a stream crossing the northeast side. The property is located north of the Little Missouri National Grassland. The 1962 topography map shows the location of old Highway 10, but it

is not shown on the 1981 or 1997 maps. The 1983, 1991, and 2001 aerial photographs also shows the property as unimproved land.

3.4 INTERVIEWS

Interviews were conducted with Mr. Bruce Kaye and Mr. Norbert Sickler. Details from the interviews are included throughout Section 4.0 and the interview logs are provided in Appendix G.

4.0 SITE RECONNAISSANCE FINDINGS

RMC personnel performed a property inspection on June 17 and 18, 2003. Site access was gained on foot from Interstate 94 and climbing over a wire fence. The perimeter of the site was inspected by walking on the old roadbed of Highway 10, which was removed in the mid 1960s. The THRO representative, Mr. Bruce Kaye, accompanied RMC personnel on the site inspection. This section presents the findings relative to the property's condition at the time of the inspection.

4.1 CONDITIONS AT THE TIME OF THE INSPECTION

The inspection conducted by RMC focused on identifying recognized environmental conditions at the site. This entailed observing the interior and exterior portions of accessible structures (if applicable), walking the perimeter and interior areas of the subject property, and observing adjoining properties from the property boundary. The various features of this site are addressed below and have been organized by undeveloped land (i.e. grounds), utilities, and structures.

4.1.1 Grounds

Tract 03-106 encompasses 149-acres within the eastern boundary of THRO. The topography of the subject property slopes gradually to the southeast towards the Interstate. An intermittent stream was observed on the northern portion of the property, as well as a few springs on the east and south areas of the property.

The site was primarily covered with low brush, grassy areas, pinion juniper pines and various sage bushes (See Photographs in Appendix A). The site appeared unimproved, with no structures or roads. Environmental concerns associated with the grounds were not present. Disturbed soil or stressed vegetation was not discovered. Waste, disturbed soil, or stressed vegetation was not discovered. Small pieces of wood and asphalt debris were scattered around the location of old Highway 10. It is assumed that this debris is from the deconstruction of the road. In addition, concrete and iron rod/rebar was located near the northwestern area of the property near a creek (See Photograph 6 in Appendix A). It appeared to be the remnants of a bridge used to cross the creek.

4.1.2 Utilities

Utilities were not observed on the subject property. The property is undeveloped and unimproved.

4.1.3 Structures

Structures were not located on the subject property.

4.2 SUPPLEMENTAL RECORDS

Supplemental records include historic topographic maps, and aerial photographs of the site (Appendices B and F).

4.3 CONCERNS FROM SURROUNDING PROPERTIES

According to the EDR overview map of Tract 03-106, the subject property is not situated in a 100-year flood zone. Environmental concerns to the subject property were not identified in conjunction with surrounding properties during the site inspection. The surrounding properties appeared undeveloped.

4.4 OTHER POTENTIAL ENVIRONMENTAL CONCERNS

Other potential environmental concerns were not identified throughout the course of this ESA.

5.0 FINDINGS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

RMC has performed this Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527 of the private inholding of Mr. Norbert Sickler, THRO Tract 03-106. This assessment has not revealed evidence of recognized environmental conditions in connection with the property. Based on the acquisition and review of readily available federal, state and local information, visual inspection and interviews, this assessment resulted in the following findings:

- Recognized environmental conditions were not observed during the visual site inspection.
- Small pieces of wood and asphalt debris were scattered around the location of old Highway 10. It is assumed that this debris is from the deconstruction of the road. In addition, large pieces of concrete and iron rod/rebar were located near the northwestern area of the property in a creek. It appeared to be remnants of a former bridge used to cross the creek.

5.2 RECOMMENDATIONS

The Phase I Environmental Site Assessment for THRO Tract 03-106 did not reveal direct visual evidence of contamination released at or on the property. Therefore, based on currently available information contained within this assessment, further inquiry into the environmental condition of the property is not necessary at this time.

6.0 LIST OF REFERENCES

Environmental Data Resources, Inc., EDR Radius Map with GeoCheck, June 5, 2003

Kaye, Bruce, Chief Park Naturalist, National Park Service, Theodore Roosevelt National Park, Estes Park, Colorado, Interview, June 17 and 18, 2003

NPS, Parcel Map

Sickler, Norbert, Property Owner, Telephone Interview, June 23, 2003

USGS, 1962, 1981, and 1997 Topographic Maps of Fryburg NW Quadrangle, North Dakota

USGS, 1983, 1991, and 2001 Aerial Photographs

APPENDIX A
PHOTOGRAPHS



1. Subject property from the northeast



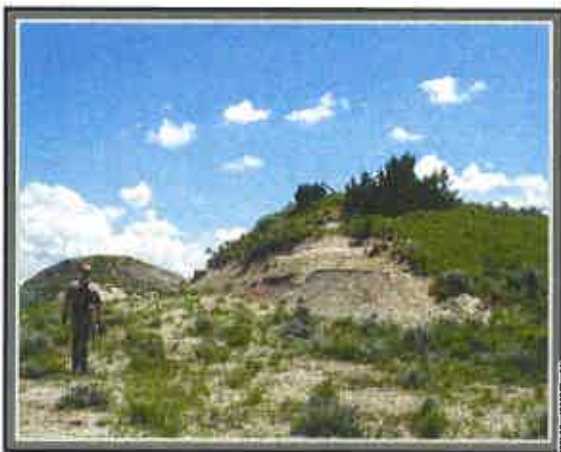
2. Subject property from the southeast looking northeast



3. View of the property from the north looking southwest



4. View of property from the north looking southeast



5. Northern border of property (fence posts)



6. Remnants of possible bridge over creek on northwest corner of property (concrete and iron rod/rebar)



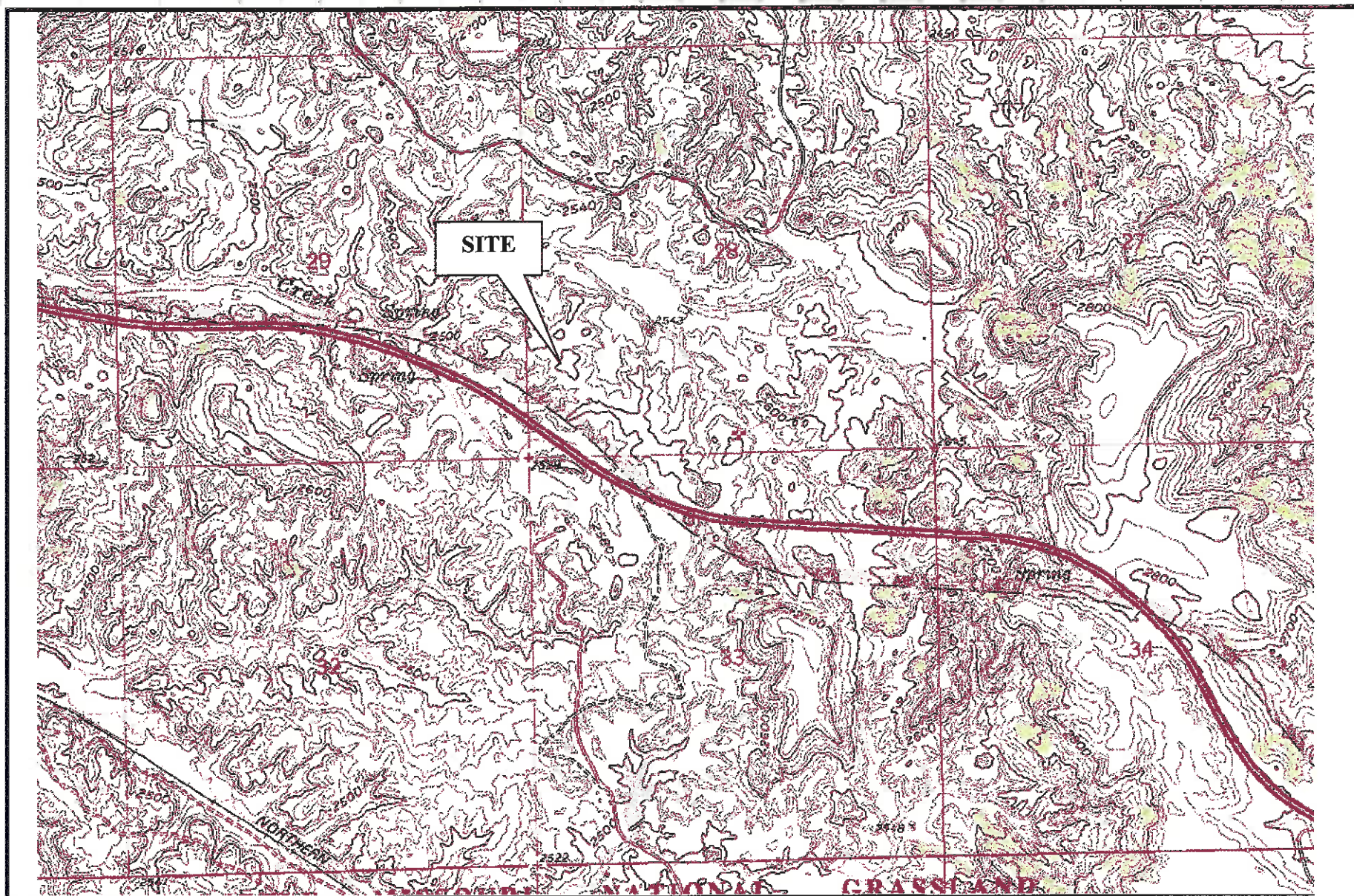
7. Property from the east



8. View of property from the south looking north

APPENDIX B

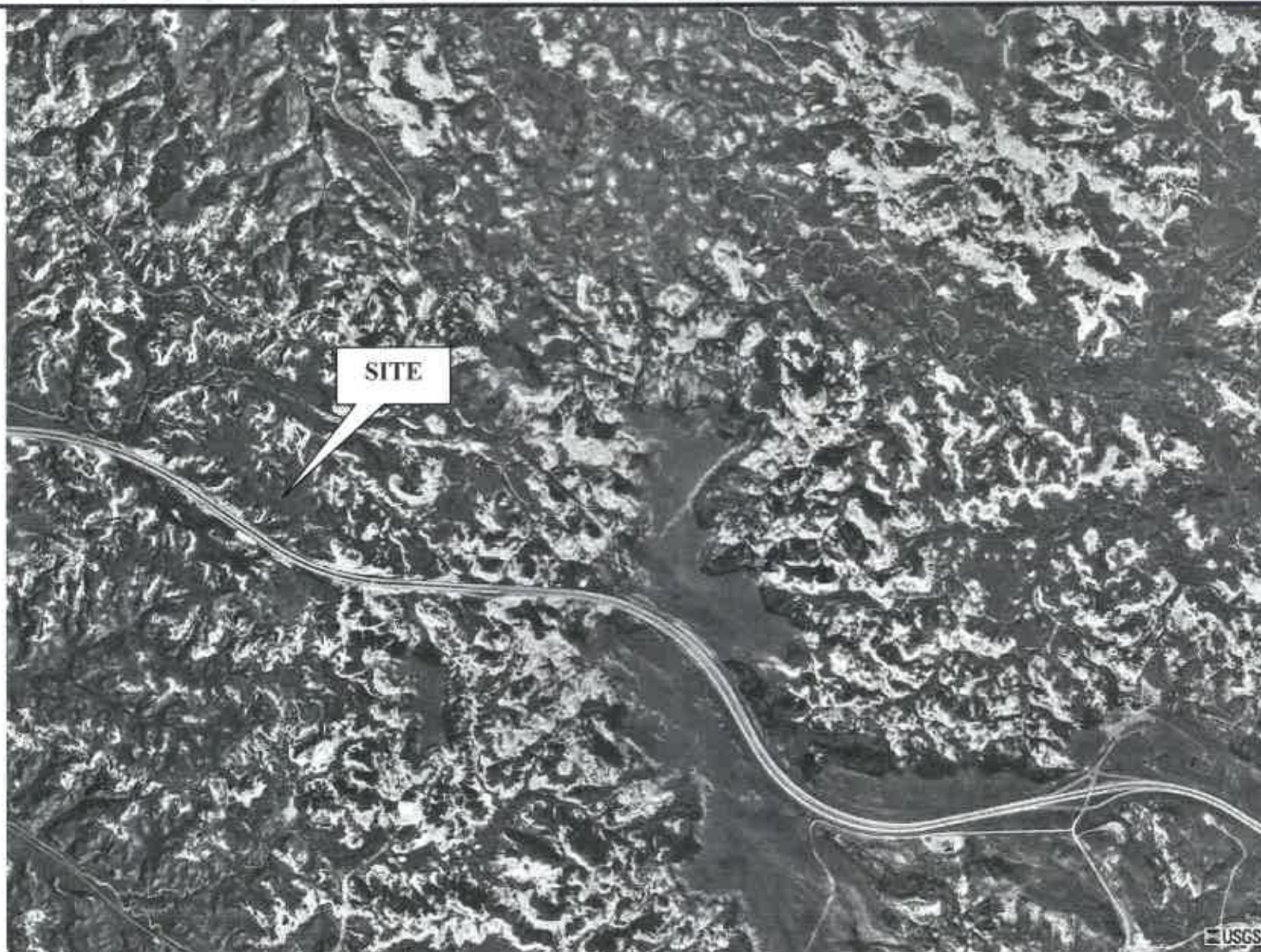
FIGURES



RMC
CONSULTANTS
INCORPORATED



FIGURE 1 – Site Location
2001 USGS Topographic Map
Theodore Roosevelt National Park
Tract 03-106
Fairfield, North Dakota



RMC
CONSULTANTS
INCORPORATED



FIGURE 2 – Aerial Photograph
1995 USGS Aerial Photograph
Theodore Roosevelt National Park
Tract 03-106
Fairfield, North Dakota

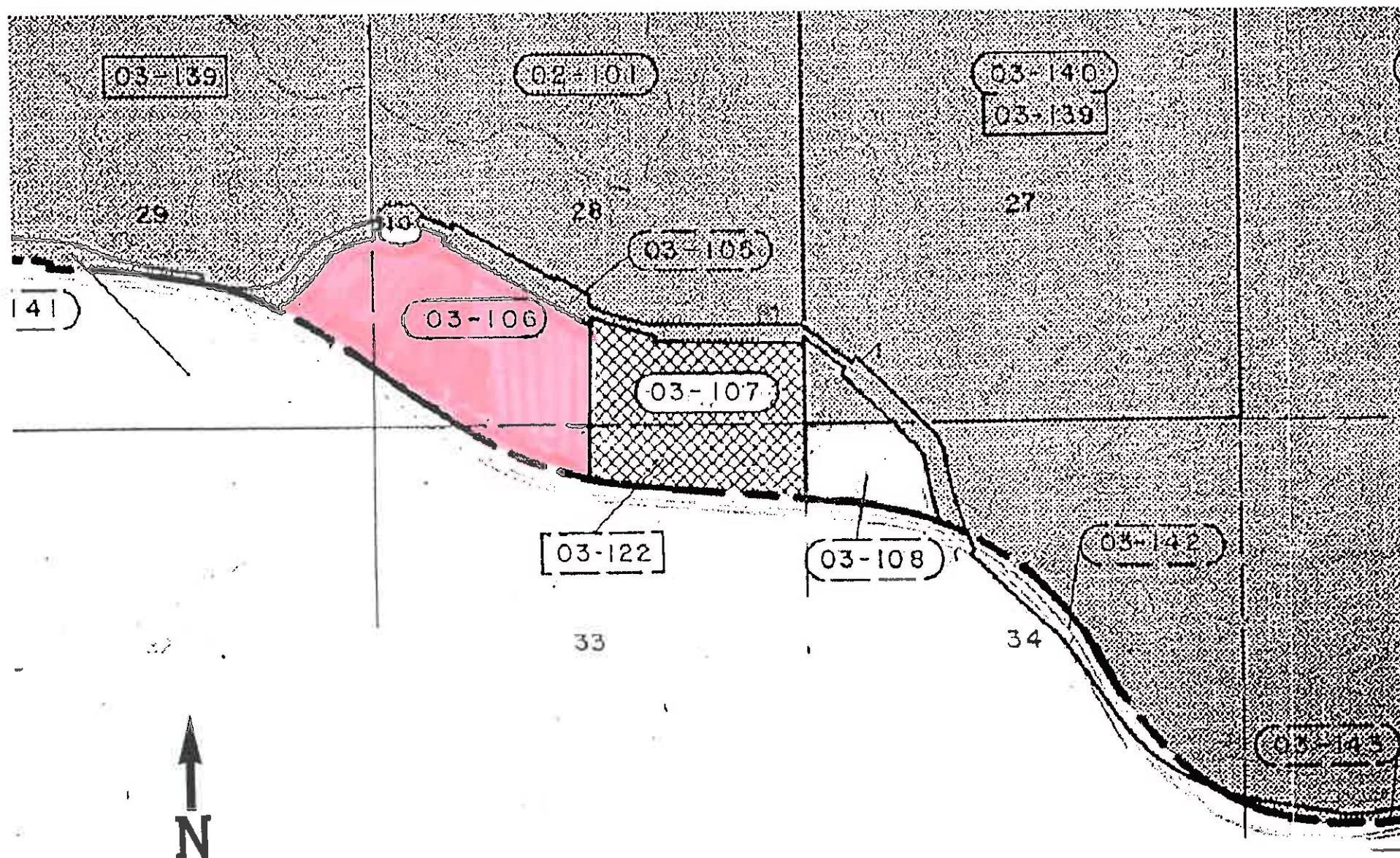


FIGURE 3

APPENDIX E

TOPOGRAPHIC MAPS & AERIALS



**The EDR-Historical
Topographic Map
Report**

**Theodore Roosevelt National Pa
Tracts 03-106 and 03-108
Fairfield, ND 58627**

June 10, 2003

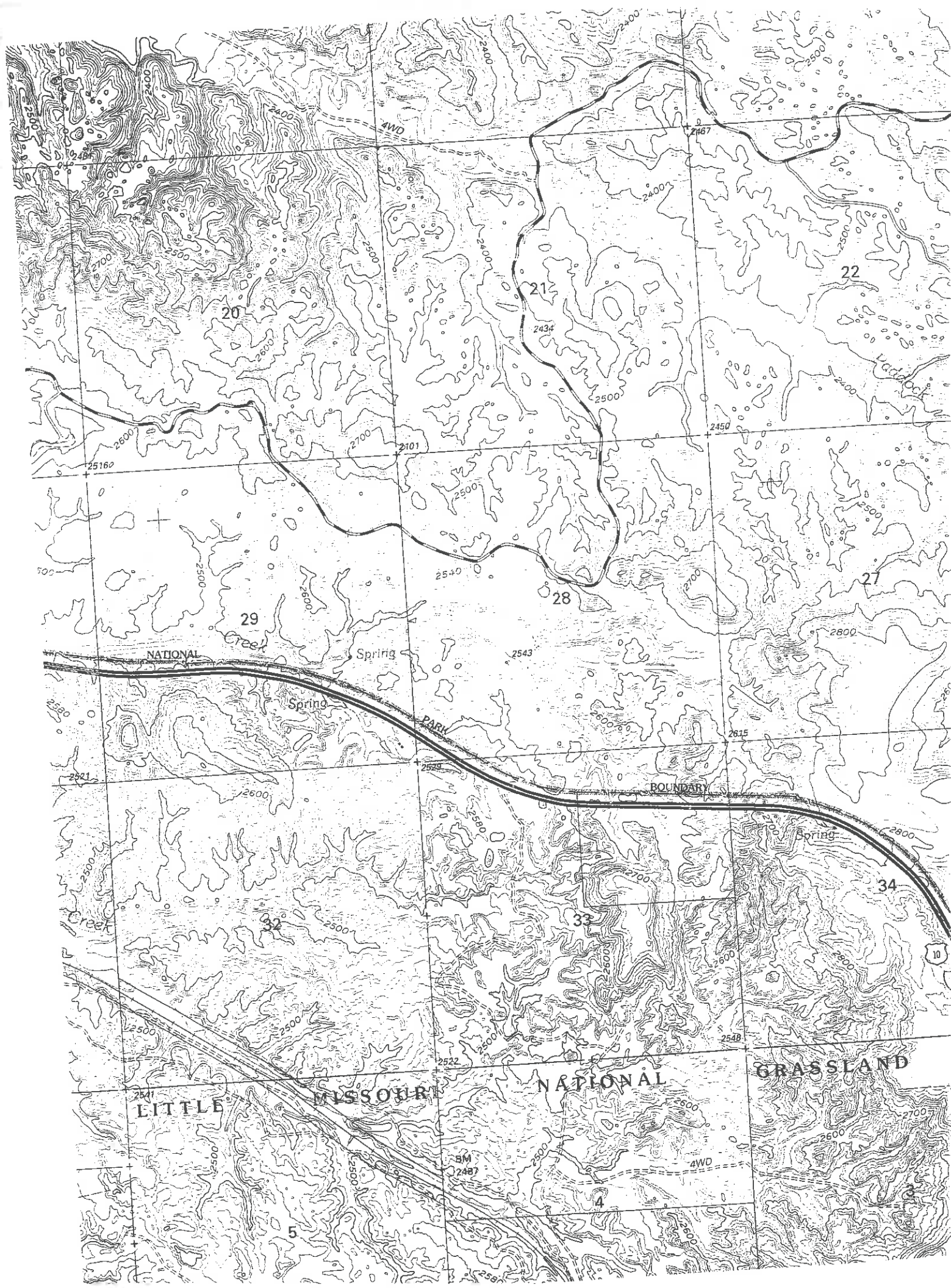
Inquiry Number: 990117-6

***The Source
For Environmental
Risk Management
Data***

3530 Post Road
Southport, Connecticut 06490

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802



Inquiry Number: 990117.6

TP Quad ☒ Adj Quad ☐

↑N

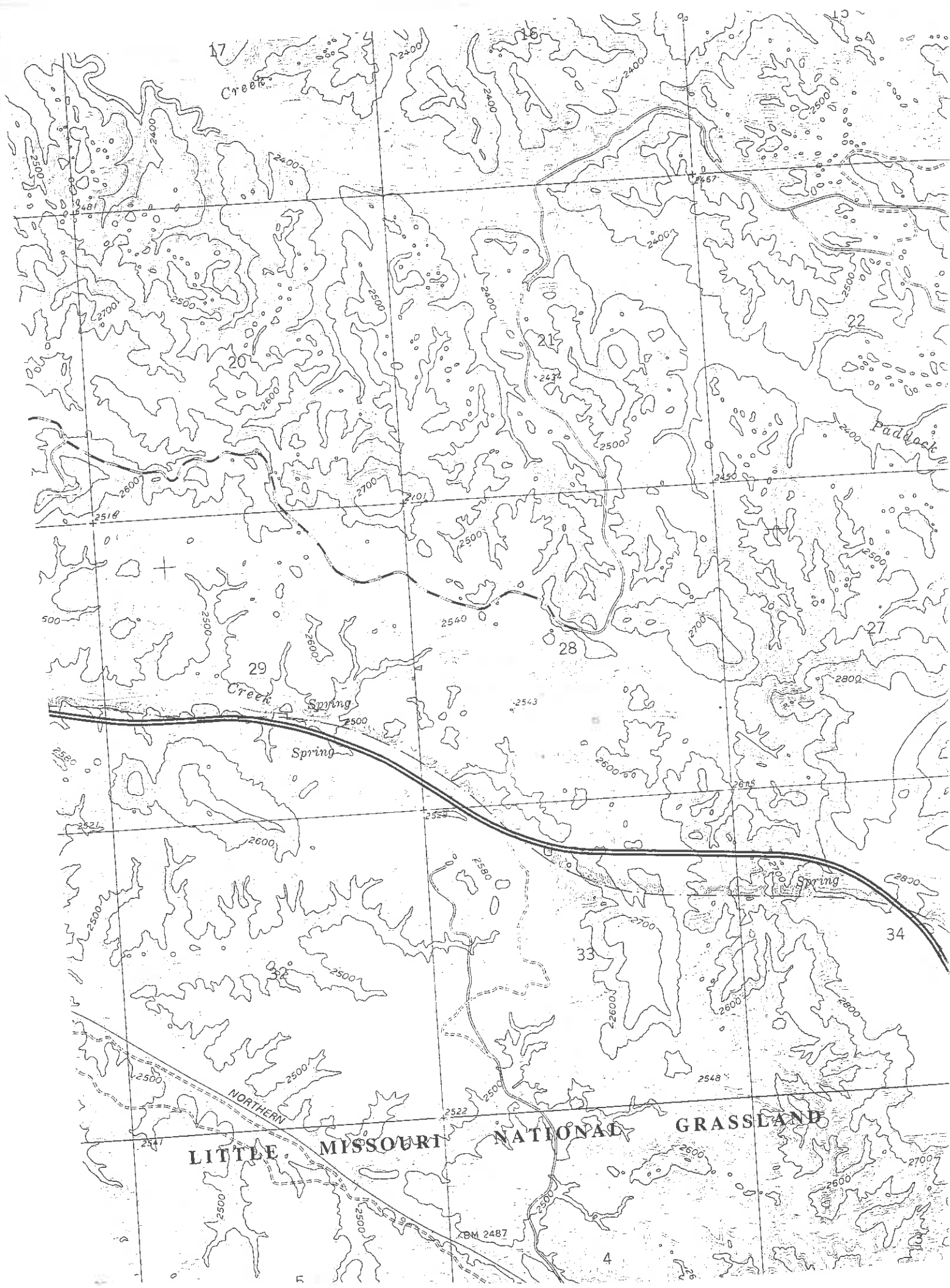
Quad FRYBURG NW, ND

Minute Series ☒ 7.5 ☐ 15 ☐ 30 ☐ 30x60

Year 1997 ☐ Provisional Edition ☐ Revised

☐ Photorevised ☐ Inspected from _____

☒ 1:24,000 ☐ 1:25,000 ☐ 1:31,680 ☐ 1:50,000
☐ 1:62,500 ☐ 1:100,000 ☐ 1:125,000



Inquiry Number: 990117.6

TP Quad ☒

Adj Quad ☐

↑N

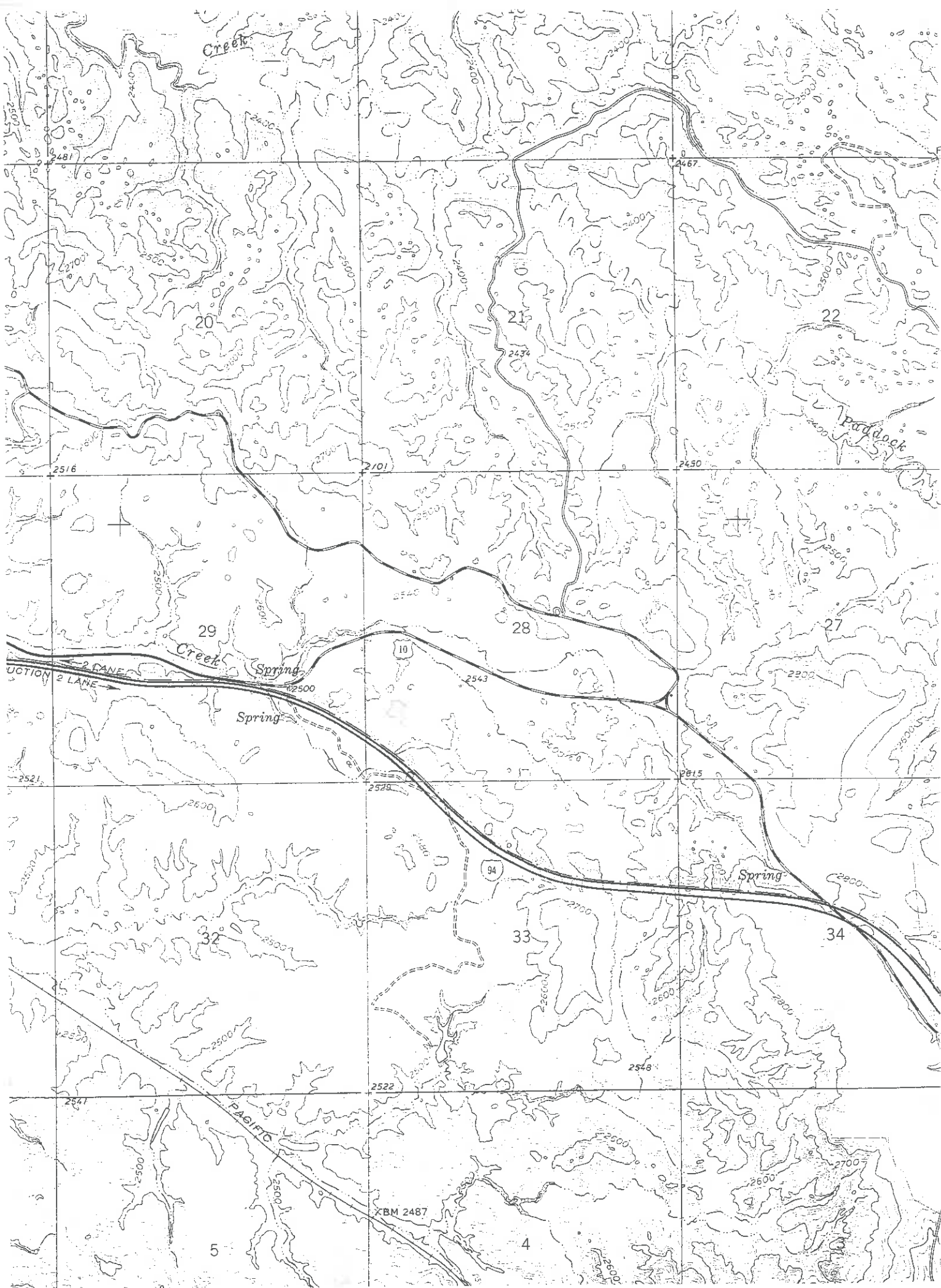
Quad FRYBURG NW, ND

Minute Series ☒ 7.5 ☐ 15 ☐ 30 ☐ 30x60

Year 1981 ☐ Provisional Edition ☐ Revised

☒ Photorevised ☐ Inspected from 1962

☒ 1:24,000 ☐ 1:25,000 ☐ 1:31,680 ☐ 1:50,000
☐ 1:62,500 ☐ 1:100,000 ☐ 1:125,000



Inquiry Number: 990117.6

TP Quad ☒ Adj Quad ☐

↑N

Quad FRYBURG NW, ND

Minute Series ☒ 7.5 ☐ 15 ☐ 30 ☐ 30x60

Year 1962 ☐ Provisional Edition ☐ Revised

☐ Photorevised ☐ Inspected from _____

☒ 1:24,000 ☐ 1:25,000 ☐ 1:31,680 ☐ 1:50,000

☐ 1:62,500 ☐ 1:100,000 ☐ 1:125,000

Environmental Data Resources, Inc.

Historical Topographic Map Report

Environmental Data Resources, Inc.'s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property, and its surrounding area, resulting from past activities. ASTM E 1527-00, Section 7.3 on Historical Use Information, identifies the prior use requirements for a Phase I environmental site assessment. The ASTM standard requires a review of *reasonably ascertainable standard historical sources*. *Reasonably ascertainable is defined as information that is publicly available, obtainable from a source with reasonable time and cost constraints, and practically reviewable.*

To meet the prior use requirements of ASTM E 1527-00, Section 7.3.2, the following *standard historical sources* may be used: aerial photographs, city directories, fire insurance maps, topographic maps, property tax files, land title records (although these cannot be the sole historical source consulted), building department records, or zoning and use records. ASTM E 1527-00 requires *"All obvious uses of the property shall be identified from the present, back to the property's obvious first developed use, or back to 1940, whichever is earlier. This task requires reviewing only as many of the standard historical sources as are necessary, and that are reasonably ascertainable and likely to be useful."* (ASTM E 1527-00, Section 7.3.2 page 11.)

EDR's Historical Topographic Map Report includes a search of available public and private color historical topographic map collections.

Topographic Maps

A topographic map (topo) is a color coded line-and-symbol representation of natural and selected artificial features plotted to a scale. Topos show the shape, elevation, and development of the terrain in precise detail by using contour lines and color coded symbols. Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination. The colors of the lines usually indicate similar classes of information. For example, topographic contours (brown); lakes, streams, irrigation ditches, etc. (blue); land grids and important roads (red); secondary roads and trails, railroads, boundaries, etc. (black); and features that have been updated using aerial photography, but not field verified, such as disturbed land areas (e.g., gravel pits) and newly developed water bodies (purple).

For more than a century, the USGS has been creating and revising topographic maps for the entire country at a variety of scales. There are about 60,000 U.S. Geological Survey (USGS) produced topo maps covering the United States. Each map covers a specific quadrangle (quad) defined as a four-sided area bounded by latitude and longitude. Historical topographic maps are a valuable historical resource for documenting the prior use of a property and its surrounding area, and due to their frequent availability can be particularly helpful when other standard historical sources (such as city directories, fire insurance maps, or aerial photographs) are not reasonably ascertainable.

Please call EDR Nationwide Customer Service at
1-800-352-0050 (8am-8pm ET)
with questions or comments about your report.
Thank you for your business!

Disclaimer

Copyright and Trademark Notice

This report contains information obtained from a variety of public and other sources. NO WARRANTY, EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES AS TO NON-INFRINGEMENT OF THIRD PARTY RIGHTS, ACCURACY, VALIDITY, COMPLETENESS, SUITABILITY, CONDITION, QUALITY, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR USE OR PURPOSE OF THIS REPORT OR THE INFORMATION CONTAINED OR REFERENCED THEREIN OR USED IN CONNECTION WITH THE PREPARATION THEREOF. ALL RISK IS ASSUMED BY THE USER. No liability to anyone is assumed, whether arising out of errors or omissions, negligence, accident or any other cause, for any loss or damage, including, without limitation, special, incidental, consequential, or exemplary damages.

Entire contents copyright 2000 by Environmental Data Resources, Inc. All rights reserved. Reproduction in any media or format, in whole or in part, of any report or map of Environmental Data Resources, Inc., or its affiliates, is prohibited without prior written permission.

EDR and the edr logos are trademarks of Environmental Data Resources, Inc. or its affiliates. All other trademarks used herein are the property of their respective owners. Use of such trademarks does not constitute an endorsement by Environmental Data Resources, Inc., or its affiliates, of the organizations claiming ownership thereof or the information obtained from such organizations and contained herein.



USGS Aerial Photography 3 Package

**Theodore Roosevelt National Pa
Tracts 03-106 and 03-108
Fairfield, ND 58627**

June 16, 2003

Inquiry Number: 990117-2

The Source For Environmental Risk Management Data

**3530 Post Road
Southport, Connecticut 06490**

Nationwide Customer Service

**Telephone: 1-800-352-0050
Fax: 1-800-231-6802**



The Interpretation of Color Infrared Aerial Photography

Color infrared photography, often called 'false color photography', is widely used for the interpretation of natural resources. Due to the subjected degrees of degradation in handling before exposure and the use of high speed film in color infrared photography, aerial photographs can and do vary in overall color tone. This variability may cause complications within the interpretation of colors between each unique photograph. The following guidelines are provided for our customers to aid them in their interpretations of this particular type of photography.

Knowledge of vegetation vigor and density is important in the interpretation of the various red shades within aerial photography. The color red is frequently associated with live vegetation. Very intense shades of red indicate dense vegetation that is growing quite vigorously. An irrigated alfalfa field would be an example of such vegetation. An evergreen forest, which also may be quite vegetatively dense, would not appear in a similar red tone since its level of growth activity is less compared to the irrigated alfalfa field.

As the amount of vegetation density and vigor decreases, the different red tones may change to more lighter red and pink colors. When the plant density activity becomes too low, the faint red coloring is overcome by the stronger colors representing the soil on which the plants have been growing. For instances such as these, the ground area would appear in shades of white, blue, or green, depending on the soil type and moisture content. When the plant vigor decreases, the vegetation would show as paler shades of red and pink, various shades of green, and possibly even tan in color. Dead vegetation, wheat stubble for example, would often be portrayed in tints of green or tan.

Bare soils appear as patches of white, blue, or green in most agricultural regions. Generally speaking, the moister the soil, the darker the soil color. Soil composition affects all color ranges shown on aerial photographs. Dry, sandy land will appear white in color. With the addition of moisture to this land, the white coloring turns into light gray or light tan. Soils composed of clay are darker in color than the sandy areas as well as tending toward more blue-green tones. Clay soils holding extreme moisture would resemble darker shades of the same colors. These identical soils, when high in organic matter, such as silt or loam, would be viewed darkest in the same corresponding color scheme.

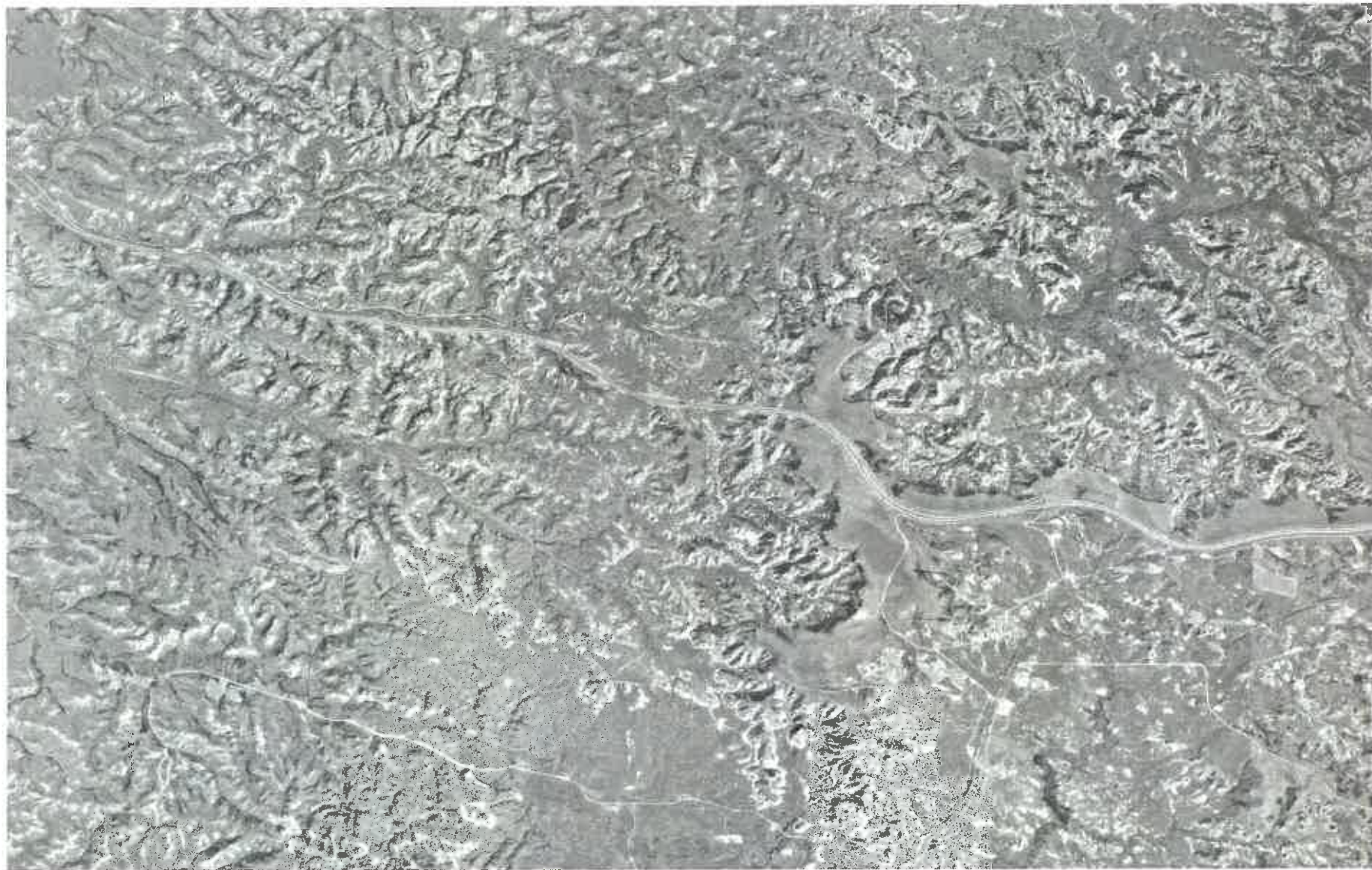
In aerial photography, man-made features correlate their colors to the materials with which they were constructed. For example, asphalt (whose coloring ranges from dark to light) and concrete roads (whose coloring ranges from light to dark) vary in intensity on opposite ends of the color spectrum depending on their age. Gravel or dirt roads are shown as less intense colors due to their variations in soil make-up and composition. A town's streets and buildings could be considered similar to the above examples with their color also relying on their material textures.

Water, as expected, appears through various shades of blue ranging from nearly black to very pale. Pristine water has a black appearance. With the increase of sediment deposits in beds of water, the aerial photography colors turn slowly to lighter blue tones. Shallow water would reflect the material present in its stream bottom. For example, a shallow creek, bottom included, would be viewed as a white color in order to mirror the high levels of built-up sand.

Aerial photographs on degraded film cast an overall blue or green shadow on their images. When this occurs, the interpreter must consider how the overall cast has effected the original rendition of the photograph and therefore alter his or her scenic view.

Please refer any comments or questions to:

EROS Data Center
Customer Service
Mundt Federal Bldg.
Sioux Falls, SD 571980
1-800-252-GLIS
Ph. 605-594-6151
Fax. 605-594-6589
E-mail. custserv@usgs.gov



RMC
CONSULTANTS
INCORPORATED

↑
N
1983 USGS

1983 USGS Aerial Photograph
Tracts 03-106 and 03-108
Theodore Roosevelt National Park, North Dakota

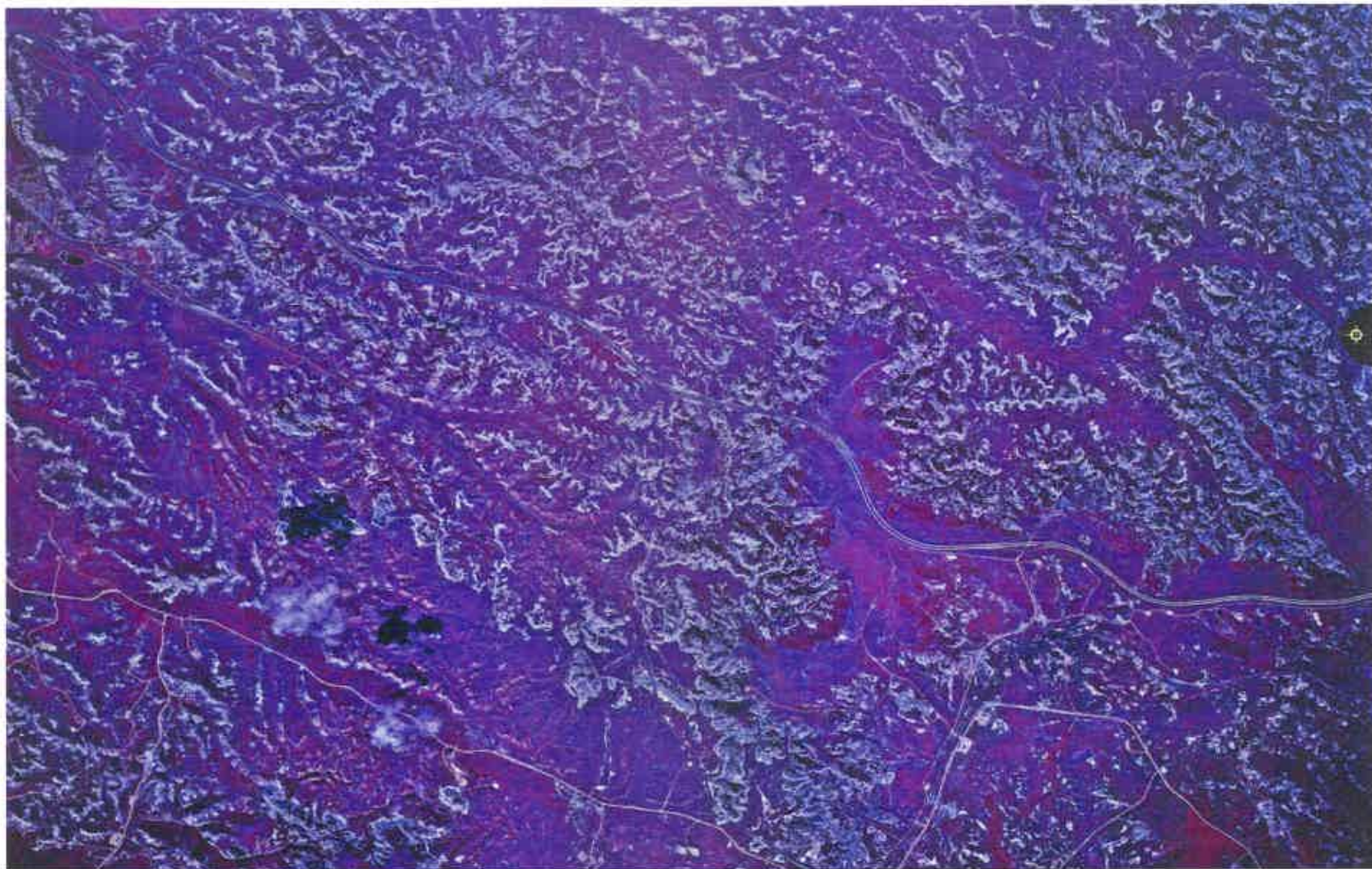


RMC
CONSULTANTS
INCORPORATED



USGS 1991

1991 USGS Aerial Photograph
Tracts 03-106 and 03-108
Theodore Roosevelt National Park, North Dakota



RMC
CONSULTANTS
INCORPORATED

↑
N
2001 USGS

2001 USGS Aerial Photograph
Tracts 03-106 and 03-108
Theodore Roosevelt National Park, North Dakota