Health Consultation

BRECKENRIDGE MOBILE PARK DUMP

CITY OF BRECKENRIDGE, WILKIN COUNTY, MINNESOTA

MARCH 22, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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CITY OF BRECKENRIDGE, WILKIN COUNTY, MINNESOTA

Prepared by:

Minnesota Department of Health
Under Cooperative Agreement with the
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

FOREWORD

This document summarizes public health concerns at a dump site in Minnesota. It is based on a formal site evaluation prepared by the Minnesota Department of Health (MDH). A number of steps are necessary to do such an evaluation:

- Evaluating exposure: MDH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is found on the site, and how people might be exposed to it. Usually, MDH does not collect its own environmental sampling data. We rely on information provided by the Minnesota Pollution Control Agency (MPCA), U.S. Environmental Protection Agency (EPA), and other government agencies, businesses, and the general public.

- Evaluating health effects: If there is evidence that people are being exposed—or could be exposed—to hazardous substances, MDH scientists will take steps to determine whether that exposure could be harmful to human health. The report focuses on public health—the health impact on the community as a whole—and is based on existing scientific information.

- Developing recommendations: In the evaluation report, MDH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of MDH in dealing with individual sites is primarily advisory. For that reason, the evaluation report will typically recommend actions to be taken by other agencies—including EPA and MPCA. However, if there is an immediate health threat, MDH will issue a public health advisory warning people of the danger, and will work to resolve the problem.

- Soliciting community input: The evaluation process is interactive. MDH starts by soliciting and evaluating information from various government agencies, the organizations responsible for cleaning up the site, and the community surrounding the site. Any conclusions about the site are shared with the groups and organizations that provided the information. Once an evaluation report has been prepared, MDH seeks feedback from the public. *If you have questions or comments about this report, we encourage you to contact us.*

Please write to:	Community Relations Coordinator Site Assessment and Consultation Unit Minnesota Department of Health 625 Robert St. N. Box 64975 St. Paul, MN 55164-0975
OR call us at:	(651) 201-4897 or 1-800-657-3908 (toll free call—press "4" on your touch tone phone)
On the web:	http://www.health.state.mn.us/divs/eh/hazardous/index.htmls

I. Summary of Background and History

The Minnesota Department of Health (MDH) received a request from the Minnesota Pollution Control Agency (MPCA) to evaluate potential public health concerns regarding the Breckenridge Mobile Park Dump located at the southern edge of the city of Breckenridge, Wilkin County, Minnesota (the site). The site was identified by the MPCA through its Dump Assessment Program as an "action site", indicating that further evaluation was warranted due to its potential to adversely impact public health or the environment. This health consultation is based on a site visit conducted by MDH staff and a meeting with local officials on September 16, 2004, and a review of information provided to MDH by the MPCA and its consultant, STS Consultants, LTD (STS 2003a, STS 2003b, STS 2004).

The site is located between 2nd Street South and the Bois de Sioux River, within and adjacent to the Bois de Sioux Mobile Estates, a mobile home park. The site location is shown in Figure 1, and a site map is presented in Figure 2. The dump occupies approximately three acres. The eastern side of the dump is within the mobile home park, while the western side is partially wooded, and slopes down towards the river. A flood control dike bisects the former dump, and a flood control pumping station is located on the southern edge of the dump. A gun range was located to the south of the dump, and a concrete plant was located to the north of the dump. Both of these properties are now vacant land.

The dump was previously owned by the City of Breckenridge, and apparently began accepting wastes in the 1930s, and operated until the 1960s. The dump was created in a lowland area, and wastes were reportedly burned (STS 2003a). Cover materials at the time of closure may have included cinders from railroad track maintenance activities. The site is now owned by a private party. Access to the site is not restricted, and several mobile homes may be located on top of waste material.

As a public dump, the site likely accepted all types of wastes, including household garbage, wood wastes, auto parts, tires, and appliances; records are not available. The waste materials have mostly been covered and the surface re-worked, although some waste materials are currently exposed at the surface in several small areas of the dump (see below). Based on the STS Phase II site investigation, the volume of waste at the site is estimated to be approximately 50,000 cubic yards.

<u>Geology/Hydrogeology</u>

Based on geologic information provided by STS, soils at the site are composed primarily of Wahpeton clay underlain by glacial deposits (STS 2003a). The uppermost bedrock is expected to be metavolcanic bedrock, at a depth of approximately 350 feet below ground. Soil borings conducted by STS showed less than two feet of cover soils overlying waste materials that are up to 16.5 feet thick in some areas (STS 2004). Native silts, sand, and clay lie beneath the wastes. The location of the borings is illustrated in Figure 2 and cross-sections of the dump prepared by STS are presented in Figures 3 and 4.

The surficial groundwater flow is west towards the Bois de Sioux River. At the site, groundwater was encountered between eight and 15.5 feet below grade. Ultimately five permanent monitoring wells were installed to collect water samples, and the flow direction beneath the site was confirmed as to the west. No other water wells are located in the immediate vicinity of the site. The mobile home park itself is served by the Breckenridge city water supply.

<u>Site Visit</u>

On September 16, 2004, MDH staff visited the Breckenridge Mobile Park Dump site with representatives of the MPCA. The site is flanked by the mobile home park to the east, the river to the west, a former cement plant (now vacant land) to the north, and a former gun range to the south (also vacant land). A low dike runs across the top of the dump from north to south to protect the area from periodic river flooding. The river itself is about ten to 15 feet below the elevation of the dump surface. Access to the dump is unrestricted.

There is cover across the much of the dump, consisting of mowed grass on the mobile home area (approximately the east half) of the dump, with native vegetation over the rest of the dump. There are many trees on the dump. Wastes, consisting of small pieces of slag, glass, ceramics, and other materials, were visible in areas of bare soil: beneath trees, in a small (and dry) stormwater pond on the southern edge of the dump, and in other small areas. Some wastes (glass and metal) are also exposed along the riverbank.

There are three occupied mobile homes and four unoccupied spaces on the former dump. There is also one mobile home west of 2^{nd} Street South that is likely not over waste materials. According to the owner of the mobile home park, two of the occupied units are elderly adults, and one is occupied in the summer by a migrant family with children. There was no evidence of children playing in the area of the dump (such as toys, swingsets, etc) at the time of the site visit; however, an MPCA photo taken in August of 2003 showed a child's pair of shoes in one of the areas of exposed soil. Two "tree forts" have also been constructed next to the river on the north end of the dump. A pail of empty beer cans was found next to the structures, indicating that they may also be used by older people. Some of the adults living in the homes on the dump also have small ornamental garden plots next to their homes.

<u>Site Investigation</u>

An initial site investigation was conducted in late 2002 by STS on behalf of the U.S. Army Corp of Engineers (STS 2003a). The purpose of the investigation was to determine the nature of waste materials disposed at the site prior to the construction of the dike. The investigation consisted of five test trenches excavated to depths of up to eight feet below ground. The test trench locations are shown in Figure 2. Waste materials including glass, metal, demolition debris, and auto parts were common in the test trenches. A single piece of asbestos-containing transite siding was found in one test trench. Soil samples from the test pits were screened for soil vapors using a photo ionization detector (PID) equipped with a 10.6 eV lamp calibrated to a benzene standard. No organic vapors were detected.

Soil samples from the test pits were analyzed for volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), diesel range organics (DRO), herbicides, pesticides, and selected metals. No VOCs, PCBs, or herbicides were detected in any of the soil samples, and only a low level of one pesticide (DDE) was found in one soil sample (TP-5). Levels of DRO were generally low with the exception of one test trench (TP-5), which had a DRO concentration of 3,900 milligrams per kilogram (mg/kg), indicative of residual petroleum contamination. There is currently no soil screening criterion for DRO. Levels of PAHs, as expressed as benzo(a)pyrene equivalents, exceeded the MPCA Soil Reference Value (SRV) in one sample (TP-4). The SRVs represent the concentration of a contaminant in residential soil at or below which normal dermal contact, inhalation, and/or ingestion are unlikely to result in an adverse human health effect. Two metals (arsenic and lead) exceeded their SRVs and MPCA Soil Leaching Values (SLVs) in the all but one of the test trench soil samples. The SLVs represent the concentration of a contaminant in soil above which leaching could contaminate the groundwater to levels above established standards. Levels of lead were as high as 5,400 mg/kg in TP-3; the SRV is 400 mg/kg. The analytical results from the test trench soil samples and the MPCA soil screening criteria are presented in Table 1.

The second investigation, conducted by STS on behalf of the MPCA in April 2004, consisted of sampling eight soil borings and five monitoring wells (STS 2004). The boring locations are shown in Figure 2. The borings encountered up to 16.5 feet of waste materials in some areas. Solid wastes encountered in the borings included brick, roofing and siding materials, glass, scrap metal, concrete, plastics, organics, and ceramics. Field screening of soil and waste samples for organic vapors using a PID during drilling showed elevated levels of organic vapors in only one boring (B-3B, from five to 17 feet below grade). Methane gas was also detected in this boring at a concentration of 10.5% by volume, which is higher than the lower explosive limit (LEL) for methane gas (approximately 5.5% by volume) in air. Methane gas was not detected in any of the other soil borings nor in any of the monitoring wells, which were tested on several occasions.

Nine surface soil grab samples were collected from the locations where soil borings or monitoring wells were subsequently placed, or from separate locations and analyzed for cyanide, PCBs, PAHs, pesticides, DRO, and metals. No cyanide or PCBs were detected in any of the samples. Low levels of two pesticides (DDD and DDT) were found in one sample (B-2), and PAHs (less than the SRV) were detected in two samples. Elevated levels of DRO were found in many of the samples. Elevated levels of metals were also found in many of the samples. Levels of antimony, arsenic, copper, iron, and lead exceeded their respective SRVs in one or more samples. The lead concentration in one sample located within the mobile home park (B-1) was 13,000 mg/kg, far in excess of the SRV of 400 mg/kg. Arsenic, copper and iron are commonly found in soil. Nationally, concentrations range from one to 40 mg/kg with a mean of 5 mg/kg for arsenic (ATSDR 2000). In Minnesota, concentrations range from one to 802 mg/kg with a mean of 12 mg/kg for copper and 43 to 20,826 mg/kg with a mean of 1,123 mg/kg for iron (MPCA 1990). It is unclear if the high levels found are strictly related to the waste materials in the dump or reflect, at least in part, naturally occurring metals. The results of the surface soil samples can be found in Table 2; the sample locations are shown in Figure 2.

Because of the extremely high lead concentration in sample B-1 within the mobile home park, the MPCA staff requested that additional surface soil samples be collected and analyzed for total lead. Sixteen additional composite samples (plus one duplicate) were collected from the surface of the dump within the mobile home park. The composite samples were prepared by mixing five or six sub-samples from an approximately one-foot diameter area. The sub-samples were collected from below the sod in grassy areas. The sample locations are shown in Figure 2; the results are shown in Table 3. The lead concentration exceeded the SRV for lead in two of the 17 samples (LSS-10 and LSS-17), and lead concentrations were elevated in several other samples. Sample LSS-17 (2,300 mg/kg) was itself a duplicate of LSS-9 (368 mg/kg). This variability is typical of lead soil analyses, and may also reflect the inherent variability of composite sampling.

Samples of buried waste materials were collected at depths ranging from five to 12 feet below grade from three borings. The samples (plus one duplicate) were analyzed for metals, cyanide, VOCs, PCBs, PAHs, DRO, and pesticides. High levels of metals, including arsenic, lead, copper, and iron were found in three of the samples. Low levels of PAHs, DRO, and two pesticides were also found. No cyanide, VOCs or PCBs were found. The waste sample analytical results are presented in Table 4. The waste sample results appear similar to results from other old dumps in Minnesota where the waste materials were regularly burned.

Soil samples from beneath the waste were collected in three borings (B-1, B-2, and B-3) to determine if contaminants had leached from the waste materials into native soils. The soil samples (plus one duplicate) were also analyzed for metals, cyanide, VOCs, PCBs, PAHs, DRO, and pesticides. Only low levels of metals (primarily iron) were detected in the soil samples; therefore the data are not presented. No other contaminants were detected in any of the samples.

Groundwater samples were collected by STS on two occasions from the five permanent monitoring wells installed at the site. The monitoring well locations are shown in Figure 2; the data are presented in Table 5. These samples were analyzed for VOCs, metals, cyanide, PCBs, PAHs, DRO, and pesticides. The samples were filtered in the field so that the laboratory analysis was for the dissolved metals component. One VOC, acetone, was detected in a field blank. Multiple metals (with the exception of lead, which was not detected in any of the groundwater samples) were detected in all of the groundwater samples, many at levels above their respective MDH Health Risk Limits (HRLs) for groundwater or other criteria. The HRLs represent levels of contamination in drinking water supplies that MDH considers safe for daily human consumption over a lifetime, and have been promulgated into rule. No other VOCs, PAHs, PCBs, pesticides, or cyanide were detected.

Three sediment samples were collected from the exposed bank of the Bois de Sioux River, and three samples were collected from the river bottom itself. The sediment samples (plus one duplicate) were analyzed for metals, PCBs, PAHs, and pesticides. The sample locations are shown in Figure 2, and the data are presented in Table 6. Again, levels of metals were elevated in several of the samples, but no PCBs, PAHs, or pesticides were detected. Several of the metals (including lead) exceeded either their SRVs or MPCA ecological screening criteria known as sediment quality targets (SQTs).

II. Discussion

Dumps can pose a human health risk when people come into contact with chemicals in soil, water, or air at levels of health concern, or when people are exposed to physical hazards such as sharp objects or uneven ground. The Breckenridge Mobile Park Dump is a typical old city dump site because it is located on the edge of town, accepted all types of wastes, and had few if any controls.

Waste materials in old dumps are often buried beneath a thin layer of whatever type of soil was easily available at the time. This is the case at the site, where cover materials may have included cinders or other railroad fill. When cover materials are thin or absent, wastes and contaminants are exposed, and people or animals could come into contact with them. Over time, compaction and degradation of the waste result in settling and the emergence of large, sharp objects such as scrap metal that can pose a physical hazard. There are some exposed wastes at the site, along the banks of the Bois de Sioux River.

Organic waste materials in dumps (if not burned regularly) often degrade and generate methane and other gases. Low levels of chemical solvents can also be present in gas produced by old dumps. Together, these gases are referred to as “landfill gases.” These gases are potentially explosive and can migrate up to a few hundred feet from a waste deposit, depending on local conditions. This gas migration can result in explosive levels of methane and concentrations of solvents above health concerns in nearby homes or buildings. With the exception of boring B-3B, methane gas was below detection limits in soil borings at the site, and other organic vapors were detected only at very low levels. The concentration of methane gas in boring B-3B was 10.5% by volume, which exceeds LEL for methane of 5.5% by volume. Fortunately, methane gas was not detected in borings between B-3B and the mobile homes, indicating that the risk of methane gas migration into nearby structures is low. In addition, the mobile homes lack basements or even floor slabs, and have relatively well-ventilated skirting around their bases - further reducing the likelihood of methane gas intrusion.

The degradation of solid waste can produce leachate when infiltrating water contacts the waste and dissolves chemicals from it. Leachate can discharge to surface water or infiltrate into groundwater. Groundwater contaminated by leachate usually does not have any distinguishing appearance, color, or taste, and people are rarely aware of any problem unless the water is tested. Soil with contaminant concentrations below the SLVs is not expected to generate contaminant concentrations in leachate at levels above groundwater or surface water criteria. With the exception of several metals, soils beneath the waste materials do not appear to have been severely impacted by leachate. The groundwater beneath the dump also does not show signs of dump-related contaminants, with the possible exception of metals. Because lead was not detected in the groundwater (but is one of the major contaminants of concern in the waste itself), it is unclear if the metals found in the groundwater are strictly from the waste materials or are at least in part naturally occurring. The mobile home park is served by the Breckenridge city water supply, and no wells (including the city wells) are located in the immediate vicinity of the site. Direct exposure to the groundwater does not appear to be a pathway of concern at the site. Shallow groundwater may discharge to the Bois de Sioux River, however, and could impact surface water quality or the sediments. The shallow sediments do show some of the same metals contamination found in the dump itself.

Based on the results of surface soil samples, the main public health concerns at this site are: potential physical hazards from visible wastes, lead contaminated soil on the surface of the dump, and contaminated sediments along the river bottom. Surface soil samples have shown lead concentrations as high as 13,000 mg/kg, well above the SRV of 400 mg/kg. Other metals, including antimony and arsenic, also exceeded their SRVs in some samples. The inherent variability of lead soil sampling, and of the composite sampling method used for many of the surface samples may indicate that the lead contamination on the surface is more extensive than the data indicate. In addition, the majority of the surface soil samples were not collected in the obvious areas of bare soil/exposed wastes (such as beneath trees, around the small stormwater pond, or in garden areas), so it is unclear to what extent children or adults may be exposed to lead contamination by their activities. The surface soil samples collected in the grassy areas were taken from beneath the sod, so human contact with the contaminated soils would be limited in those areas if the sod is not disturbed. With access to the site essentially unrestricted, however, there is opportunity for people to come into contact with waste materials and contaminated soil during play or activities such as gardening or landscaping.

Samples from within the waste materials had elevated levels of lead, arsenic, other metals, and PAHs (in one sample), indicating contamination is present within the bulk of the dump site. Low levels of petroleum contamination (as measure by DRO) are also present in the waste, and asbestos-containing siding was also found in one test trench. Although direct human exposure to buried waste materials is unlikely at this time, disturbance of the waste materials by humans or animals could bring them to the surface where exposures could occur. Such disturbance may occur during the proposed reconstruction of the flood control dike across the site by the U.S. Army Corp of Engineers.

Evaluation of Toxicity and Exposure to Lead

Lead is one of the most common contaminants found at Superfund sites, and is also common in dump sites (ATSDR 1999). Elemental lead or lead compounds are or were used in a variety of products, including electrical batteries, ammunition, solder used in plumbing, gasoline additives, and paints. Its commercial use has been declining, and lead has been banned from use in gasoline since 1996. As a result of its past widespread use, however, lead is present throughout the environment and in the bodies of humans. The occurrence of an elevated blood lead level (a sign of lead exposure) in people, especially children, is still somewhat common as a result of the widespread presence of lead in the environment, and the health effects of exposure to lead are well documented.

Lead is toxic to many of the body’s organ systems, including primarily the nervous system (ATSDR 1999). Long-term exposure to lead has been associated with decreased neurological function in workers exposed to lead on the job. High blood pressure is another possible effect from exposure to lead. Of greatest concern, however, is toxicity to the developing nervous system. Children between one and five years of age are also the most likely group in the general population to have high lead exposures because their behaviors (e.g. playing on the floor or ground, frequent hand-to-mouth contact) result in greater exposures than the behaviors of older children and adults to contaminated paint, dust, and soil, both in general and based on a per pound of body weight basis. Children who ingest large amounts of lead may develop brain damage (ATSDR 1999). Ingestion of smaller amounts of lead, at once or over time, may result in lesser effects on brain function. Childhood ingestion of lead may also result in anemia, kidney damage, colic, and muscle weakness. Exposure to low levels over time may affect physical and mental growth. Prenatal exposure may result in premature birth, low birth weight, and impaired development.

The concentration of lead in blood serves as an indicator of exposure. The Centers for Disease Control and Prevention (CDC) considers children to have an elevated level of lead in their blood if the lead level is 10 micrograms per deciliter of blood (µg/dl) or higher (ATSDR 1999). This level of concern has also been recognized by MDH, EPA, and MPCA. Minnesota state statutes (Minn. Stat. § 144.9501) established 10 µg/dl as an “elevated blood lead level.” However, there is no firm threshold of toxic exposure to lead, so it is important for blood lead levels in any population to be as low as possible. Low blood lead levels are important both to protect the health of children (and others) from subtle adverse effects that might occur below 10 µg/dl and to limit the size of the population with blood lead levels above 10 μg/dl. A recent study published in the *New England Journal of Medicine* suggests that blood lead levels even below 10 μg/dl may be associated with intellectual impairment in children (Canfield et al 2003).

The MPCA has established a Soil Reference Value (SRV) of 400 mg/kg of lead in soil, assuming that human exposure to lead is chronic and occurs in a residential setting. This level is generally considered protective. However, MDH must conduct a lead risk assessment at a residence (including all common areas accessible to a child who lives in a building with 2 or more dwelling units) if the residence: 1) has a child with a blood lead level at or greater than 20 μg/dl; 2) has a child with a blood lead level of 15–19.9 μg/dl that persists for 3 months; or 3) has a pregnant woman with a blood lead level at or above 10 μg/dl (Minn. Stat. § 144.9504). MDH must then order soil replacement (of bare soil areas, especially play areas) if soil lead concentrations exceed 100 mg/kg, and replacement soils must not exceed 25 mg/kg (Minn. Stat. § 144.9508). Minnesota state statutes (Minn. Stat. § 144.9501) define a play area as "any established area where children play, or on residential property, any established area where children play *or bare soil is accessible to children*." (italics added). Minnesota state statutes (Minn. Stat. § 144.9508) established the maximum standard of 100 mg/kg of lead in bare soil in such cases. Therefore, if a person living within the mobile home park was found to have a blood lead level meeting one of the above criteria, the MDH soil lead standard would apply and remedial action would need to be taken.

<u>Agency for Toxic Substance and Disease Registry (ATSDR) Child Health Initiative</u>

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children make them of special concern to communities faced with contamination of their water, soil, air, or food. Children are at greater risk than adults from certain kinds of exposures to hazardous substances at waste disposal sites. They are more likely to be exposed because they play outdoors and they often bring food into contaminated areas. They are smaller than adults, which means they breathe dust, soil, and heavy vapors close to the ground. Children also weigh less, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Most importantly, children depend completely on adults for risk identification and management decisions, housing decisions, and access to medical care.

Children may be attracted to contaminants in bare soils at the site due to the presence of exposed debris such as shiny metal objects, glass, cinders, etc. The location of the dump within and adjacent to a residential area could also attract children. Access to the site is open, and there are some relatively isolated and wooded locations along the river that would preclude observation by adults. The presence of "tree forts" in one area also suggests that children or at least young adults may be using the site.

III. Conclusions

Based on a review of available information in MPCA files and a site visit conducted on September 16, 2004, it appears that this site poses an indeterminate public health hazard. The identified hazards include physical hazards from exposed wastes and possibly steep grades along the river, and chemical hazards from potential contact with contaminated surface soils or wastes. The indeterminate conclusion is based on the fact that while contaminants are present in surface soils at levels of health concern, the frequency and extent of human exposure is unknown. Reconstruction of the flood control dike could increase the risk of exposure by nearby residents to contaminants from the dump unless care is taken during reconstruction.

IV. Recommendations

1. The identified areas of lead (and other metal) contaminated soil should be further investigated to define the extent of the contaminated soil.
2. Alternatively, to prevent exposure to physical hazards and contaminated soils, soil throughout the entire dump site, especially all areas of contaminated soil and exposed wastes, should be removed, or adequate clean cover soil should be placed on the surface of the dump.
3. The proposed reconstruction of the flood control dike should be done in a manner that results in eliminating the possibility of human exposure to waste materials or lead contaminated soil.
4. The steep grades and exposed wastes along the river should also be covered and stabilized. This would help to reduce the amount of contamination potentially entering the Bois de Sioux River as a result of runoff. The cover material should be able to support vegetation and graded to promote runoff without excessive erosion.
5. Institutional controls, such as a notice filed with the property deed, should be enacted to record the location of the dump for future reference.
6. If residents of the Bois de Sioux Mobile Estates are concerned about possible exposure to lead contaminated soils, they should discuss it with their physician and/or request a blood lead test. Results of such testing should be provided to MDH for possible follow-up.

V. Public Health Action Plan

MDH's Public Health Action Plan for the site will consist of:

1. A letter to the MPCA, to city and county authorities, and to the site owner advising them of these conclusions and recommendations;

2. Communication with local residents; and

3. A review of any additional available data, and participation in any meetings or other public outreach activities.

VI. References

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CERTIFICATION

This Breckenridge Mobile Park Dump Health Consultation was prepared by the Minnesota Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Jeff Kellam
Technical Project Officer, SPS, SSAB, DHAC, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

for RE

Roberta Erlwein
Chief, State Program Section, DHAC, ATSDR

Table 1
Test Trench Soil Analytical Results
Concentrations in mg/kg

	TP-2 (2-4 ft.)	TP-3 (1-2 ft.)	TP-4 (1-8 ft.)	TP-4 (1-8 ft.)	TP-5 (1-9 ft.)	TP-6 (1.5-8 ft.)	SLV	SRV
Diesel Range Organics - DRO	**28**	**180**	**140**	**150**	**3900**	**16**	**NE**	**NE**
Metals EPA 6010								
Arsenic	**10**	**25**	**31**	**32**	**37**	**35**	**15.1**	**10**
Barium	**230**	**1300**	**970**	**770**	**690**	**940**	**842**	**1,200**
Cadmium	**1.4**	**20**	**5.4**	**3.4**	**3.8**	**5.9**	**4.4**	**35**
Chromium*	**25**	**43**	**46**	**33**	**62**	**38**	**18**	**71**
Lead	**240**	**5400**	**2200**	**990**	**860**	**2000**	**525**	**400**
Selenium	nd	**3.4**	**1.9**	**1.8**	**1.7**	**2.2**	**1.5**	**170**
Silver	nd	**0.75**	**0.92**	nd	**1.9**	**6.9**	**3.9**	**170**
Mercury	**0.37**	**0.63**	**0.62**	**0.39**	**0.31**	**0.16**	**1.6**	**0.7**
Polychlorinated Biphenyls - PCBs EPA 8082	No detects for all compounds analyzed						**varies**	**varies**
Polyaromatic Hydrocarbons - PAHs EPA 8270								
Benzo(a)pyrene equivalents	0	0	**1.285**	**5.128**	**0.05**	**1.452**	**10.2**	**2**
Pesticides EPA 8081								
p,p - DDE	nd	nd	nd	nd	**0.086**	nd	**NE**	**NE**

* = denotes value for total chromium (chromium (III) + chromium (VI)). SLV/SRV are for chromium VI only
nd = not detected
SLV = MPCA Soil Leaching Value
SRV = MPCA Soil Reference Value, Tier 1 (Residential)
NE = Not Established
Bold = Concentration above detection limits
[heavy-bordered box] = Concentration exceeds SLV
[shaded box] = Concentration exceeds SRV

Source: STS 2003a

Table 2
Surface Soil Analytical Results
Concentrations in mg/kg

	MW-4 Surface	MW-5 Surface	B-1 Surface	B-2 Surface	B-3 Surface	SS-A	SS-B	SS-C	SS-D	SLV	SRV
Diesel Range Organics - DRO	nd	nd	**43**	**89**	**13**	**170**	nd	**250**	**21**	**NE**	**NE**
Metals EPA 3050/6010											
Antimony	nd	nd	600	nd	nd	nd	nd	nd	nd	**2.7**	**14**
Arsenic	**4.5**	nd	22.2	21.2	**5.81**	**4.91**	**3.72**	**6.16**	**4.09**	**15.1**	**10**
Cadmium	nd	nd	**1.74**	**2.61**	nd	**0.317**	nd	**0.563**	nd	**4.4**	**35**
Chromium*	**29.3**	**25.5**	**33.6**	**41.3**	**27.3**	**16.2**	**6.26**	**23.1**	**24.9**	**18**	**71**
Copper	**27.8**	**21.2**	171	233	**26.8**	**36**	**9.49**	**43.1**	**21.3**	**400**	**100**
Iron	27700	21100	27500	74500	22400	16000	**7000**	18300	20500	**NE**	**7000**
Lead	**31.6**	**14.5**	13000	840	**23.2**	**128**	**9.83**	**21.7**	**27.9**	**525**	**400**
Manganese	**735**	**809**	**588**	**736**	**708**	**502**	**376**	**672**	**822**	**NE**	**1400**
Nickel	**21.4**	**31.1**	**25.9**	**45.2**	**32**	**17.6**	**8.6**	**28.2**	**25.6**	**88**	**520**
Zinc	**100**	**73.1**	**765**	**1170**	**81.3**	**205**	**248**	**145**	**80.2**	**1500**	**8700**
Mercury	**0.0585**	**0.034**	**0.219**	**0.354**	**0.038**	**0.141**	nd	**0.0231**	**0.0317**	**1.6**	**0.7**
Cyanide - EPA 9010A	No detects for all compounds analyzed									**varies**	**varies**
Polychlorinated Biphenyls - PCBs EPA 8082	No detects for all compounds analyzed									**varies**	**varies**
Polyaromatic Hydrocarbons - PAHs EPA 8270											
Benzo(a)pyrene equivalents	nd	nd	**0.038**	**1.915**	nd	nd	nd	nd	**1.452**	**10.2**	**2**
Pesticides EPA 8081											
4,4 - DDT	nd	nd	nd	**0.082**	nd	nd	nd	nd	nd	**NE**	**15**
4,4 - DDD	nd	nd	nd	**0.051**	nd	nd	nd	nd	nd	**NE**	**56**

* = denotes value for total chromium (chromium (III) + chromium (VI)). SLV/SRV are for chromium VI only
nd = not detected
SLV = MPCA Soil Leaching Value
SRV = MPCA Soil Reference Value, Tier 1 (Residential)
NE = Not Established
Bold = Concentration above detection limits
[heavy-outlined box] = Concentration exceeds SLV
[grey-shaded box] = Concentration exceeds SRV

Source: STS 2004

Table 3
Surface Soil Lead Analytical Results
Concentrations in mg/kg

	LSS-1	LSS-2	LSS-3	LSS-4	LSS-5	LSS-6	LSS-7	LSS-8	LSS-9	LSS-10	LSS-11	LSS-12	LSS-13	LSS-14	LSS-15	LSS-16	LSS-17 (dup of LSS-9)	SLV	SRV
Metals EPA 3050/6010																			
Lead	**356**	**168**	**147**	**6.06**	**10.1**	**103**	**91.5**	**269**	**368**	**528**	**85.4**	**32.4**	**49.3**	**25.2**	**27.1**	**31.7**	**2300**	**525**	**400**

SLV = MPCA Soil Leaching Value
SRV = MPCA Soil Reference Value, Tier 1 (Residential)
[bold-bordered box] = Concentration exceeds SLV
[shaded box] = Concentration exceeds SRV

Source: STS 2004

Table 4
Waste Analytical Results
Concentrations in mg/kg

	B-1 W (5-7')	B-2 W (5-7')	B-3B W (10-12')	B-8 W (5-7') (dup of B-2 W)	SLV	SRV
Diesel Range Organics - DRO	nd	**28**	**230**	**42**	**NE**	**NE**
Metals EPA 3050/6010						
Arsenic	**20.3**	**42.9**	**2.64**	**41.1**	**15.1**	**10**
Beryllium	nd	**1.46**	nd	nd	**1.4**	**55**
Cadmium	**1.54**	**11.2**	nd	**3**	**4.4**	**35**
Chromium*	**35**	**47.9**	**18.6**	**28.8**	**18**	**71**
Copper	**235**	**404**	**17.1**	**512**	**400**	**100**
Iron	**75000**	**95900**	**16000**	**90500**	**NE**	**7000**
Lead	**2470**	**1070**	**11.7**	**1680**	**525**	**400**
Manganese	**722**	**7360**	**210**	**476**	**NE**	**1400**
Nickel	**30.1**	**167**	**18.4**	**59.2**	**88**	**520**
Silver	nd	**11.1**	nd	**4.04**	**3.9**	**170**
Thallium	nd	**10.1**	nd	nd	**NE**	**3**
Zinc	**1360**	**2560**	**68.6**	**2860**	**1500**	**8700**
Mercury	**0.272**	**0.116**	**0.0354**	**0.0499**	**1.6**	**0.7**
Cyanide - EPA 9010A	No detects for all compounds analyzed				**varies**	**varies**
Polychlorinated Biphenyls - PCBs EPA 8082	No detects for all compounds analyzed				**varies**	**varies**
Volatile Organic Compounds - EPA 8260	No detects for all compounds analyzed				**varies**	**varies**
Polyaromatic Hydrocarbons - PAHs EPA 8270						
Benzo(a)pyrene equivalents	nd	**0.488**	nd	nd	**10.2**	**2**
Pesticides EPA 8081						
4,4 - DDT	nd	**0.013**	nd	nd	**NE**	**15**
4,4 - DDD	nd	**0.0097**	nd	nd	**NE**	**56**

* = denotes value for total chromium (chromium (III) + chromium (VI)). SLV/SRV are for chromium VI only
nd = not detected
SLV = MPCA Soil Leaching Value
SRV = MPCA Soil Reference Value, Tier 1 (Residential)
NE = Not Established
Bold = Concentration above detection limits
[heavy-bordered box] = Concentration exceeds SLV
[grey-shaded box] = Concentration exceeds SRV

Source: STS 2004

Table 5
Groundwater Sampling Analytical Results
Concentrations in ug/l

	MW-1		MW-2		MW-3		MW-4		MW-5		MW-6 (Dup. of MW-2 and MW-5 respectively)		Standard	Source
Sample Date	4/29/2004	5/12/2004	4/29/2004	5/12/2004	4/29/2004	5/12/2004	4/29/2004	5/12/2004	4/29/2004	5/12/2004	4/29/2004	5/12/2004		
Metals														
Antimony	**17.1**	**34.3**	**14.7**	**26.8**	**11.3**	**26.1**	**16.2**	**21.7**	**13.6**	**19**	**16.5**	**20.6**	**6**	**HRL**
Arsenic	**44.2**	**31.1**	**66.1**	**64.6**	**21.3**	**26.5**	**68.9**	**81.9**	**84.9**	**90.5**	**67.2**	**92.5**	**10**	**MCL**
Copper	**24**	**24.8**	**22.5**	**21.9**	**18.3**	**16.3**	**32.1**	**16.8**	**28.9**	**22.4**	**24.4**	**23.4**	**1,000**	**HBV**
Iron	**675**	<50	<50	<50	**2680**	**6,420.0**	<50	<50	**1,130**	**97.9**	<50	<50	**NE**	
Lead	<3	<3	<3	<3	<3	<3	<3	<3	**<3**	<3	<3	<3	**15**	**MCL***
Manganese	**1210**	**297**	**1870**	**2030**	**5470**	**5510**	**714**	**296**	**901**	**523**	**1740**	**535**	**1,000**	**HBV**
Nickel	<20	<20	**24.3**	**24.4**	**21**	**20**	**34.6**	<20	**176**	**75**	**25.9**	**78.6**	**100**	**HRL**
Selenium	**45.8**	**50.4**	**57.8**	**61.3**	**28.6**	**35.8**	**50.3**	**52.9**	**112**	**105**	**57.8**	**110**	**30**	**HRL**
Zinc	<20	<20	<20	<20	34.1	<20	27.7	<20	49	**42.6**	<20	**33.1**	**2,000**	**HRL**
Cyanide - EPA 9010	No detects for all compounds analyzed													
Votatile Organics Compounds - VOCs EPA 8260	No detects for all compounds analyzed												**varies**	**varies**
Polychlorinated Biphenyls - PCBs EPA 8082	No detects for all compounds analyzed												**varies**	**varies**
Polyaromatic Hydrocarbons - PAHs EPA 8270	No detects for all compounds analyzed												**varies**	**varies**
Diesel Range Organics - DRO	No detects for all compounds analyzed												**200**	**HBV**

< = Less than laboratory limit of detection
HRL = Health Risk Limit for Groundwater, Minnesota Department of Health
HBV = Health Based Value for Groundwater, Minnesota Department of Health
MCL = EPA Maximum Contaminant Limit
NE = Not Established
Bold = Concentration above detection limits
[shaded box] = Concentration exceeds HRL/HBV/MCL
* = action level for drinking water at the tap.

Source: STS 2004

Table 6
Sediment Sample Analytical Results
Concentrations in mg/kg

	SD-1	SD-2	SD-3	RB-1	RB-2	RB-3	RB-4 (dup of RB-2)	Standard	Source
Metals									
Arsenic	**8.09**	**6.89**	**5.32**	**15.3**	**10.1**	**9.09**	**7.12**	**9.8**	**SQT**
Cadmium	**0.577**	**2.21**	**0.331**	<0.370	**0.819**	<0.463	<0.361	**0.99**	**SQT**
Chromium *	**17**	**19**	**18**	**20**	**22.5**	**16.1**	**14.3**	**43**	**SQT**
Copper	**45**	**49.8**	**21.9**	**28.2**	**36.7**	**16.7**	**17.4**	**32**	**SQT**
Iron	**20400**	**20100**	**15800**	**45,500**	**21,800**	**14,900**	**15,200**	**20,000**	**LEL/ERL**
Lead	**265**	**481**	**17.5**	**37.2**	**75.8**	**18.7**	**36.1**	**36**	**SQT**
Manganese	**343**	**551**	**487**	**469**	**470**	**434**	**359**	**460**	**LEL/ERL**
Nickel	**17.25**	**22.8**	**19.7**	**21.8**	**24.2**	**20.8**	**16.5**	**23**	**SQT**
Zinc	**372**	**445**	**74.3**	**90.5**	**338**	**60.8**	**103**	**120**	**SQT**
Mercury	**0.102**	**0.158**	**0.0379**	<0.0295	**0.0901**	**0.041**	**0.0371**	**0.18**	**SQT**
Pesticides EPA 8081	No detects for all compounds analyzed							**varies**	**varies**
Polychlorinated Biphenyls - PCBs EPA 8082	No detects for all compounds analyzed							**varies**	**varies**
Polyaromatic Hydrocarbons - PAHs EPA 8270	No detects for all compounds analyzed							**varies**	**varies**

< = Less than laboratory limit of detection
SQT = Sediment Quality Target, MPCA
LEL = Lowest Effect Level, MPCA
ERL = Effects Range Low Value, MPCA

Bold = Concentration above detection limits
[shaded] = Concentration exceeds LEL/ERL or SQT
* = denotes value for total chromium (chromium (III) + chromium (VI)).

Source: STS 2004

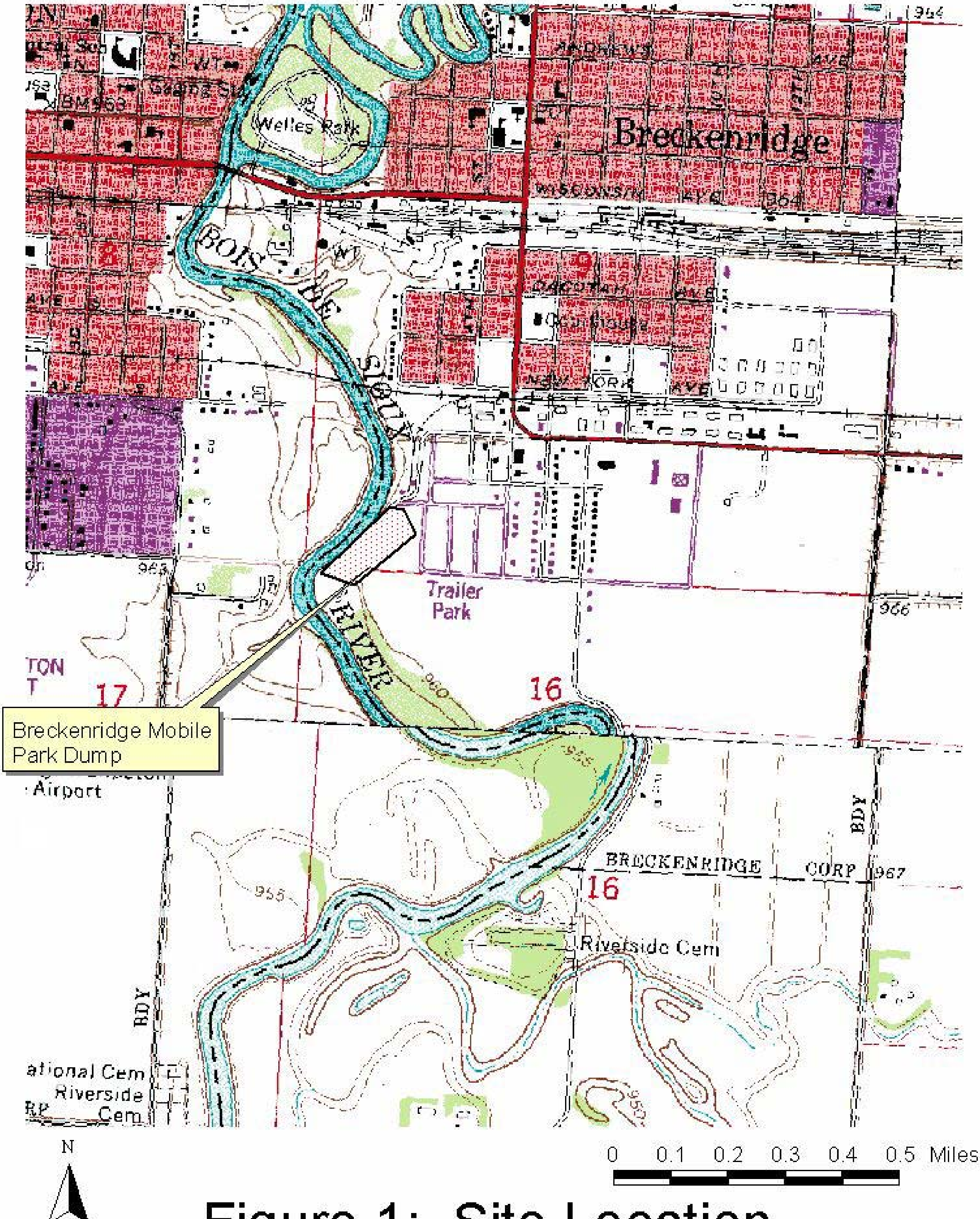

Figure 1: Site Location

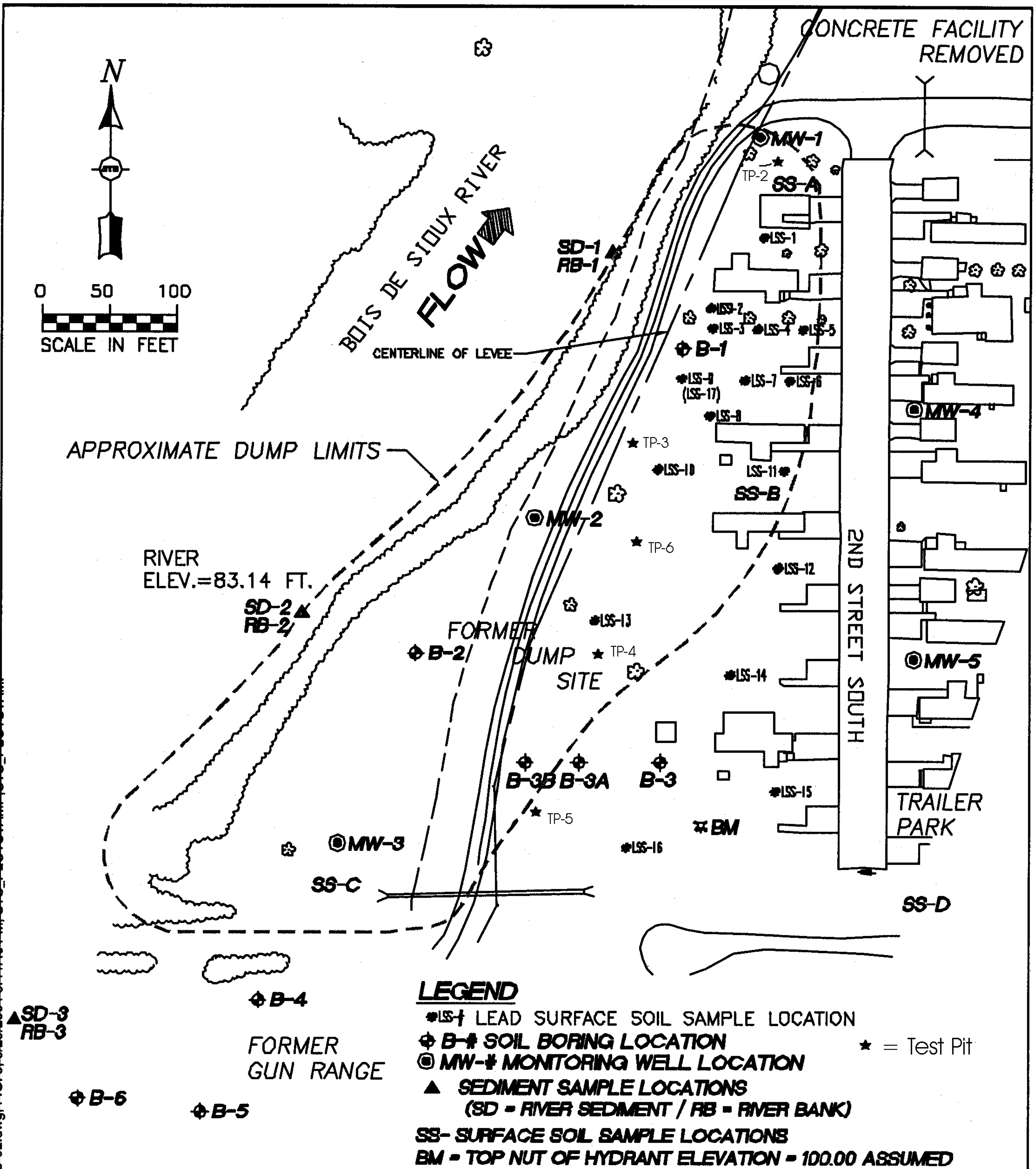

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Figure 2

SOIL BORING, MONITORING WELL
& SAMPLE LOCATION DIAGRAM
BRECKENRIDGE MOBILE PARK DUMP
BRECKENRIDGE, MINNESOTA

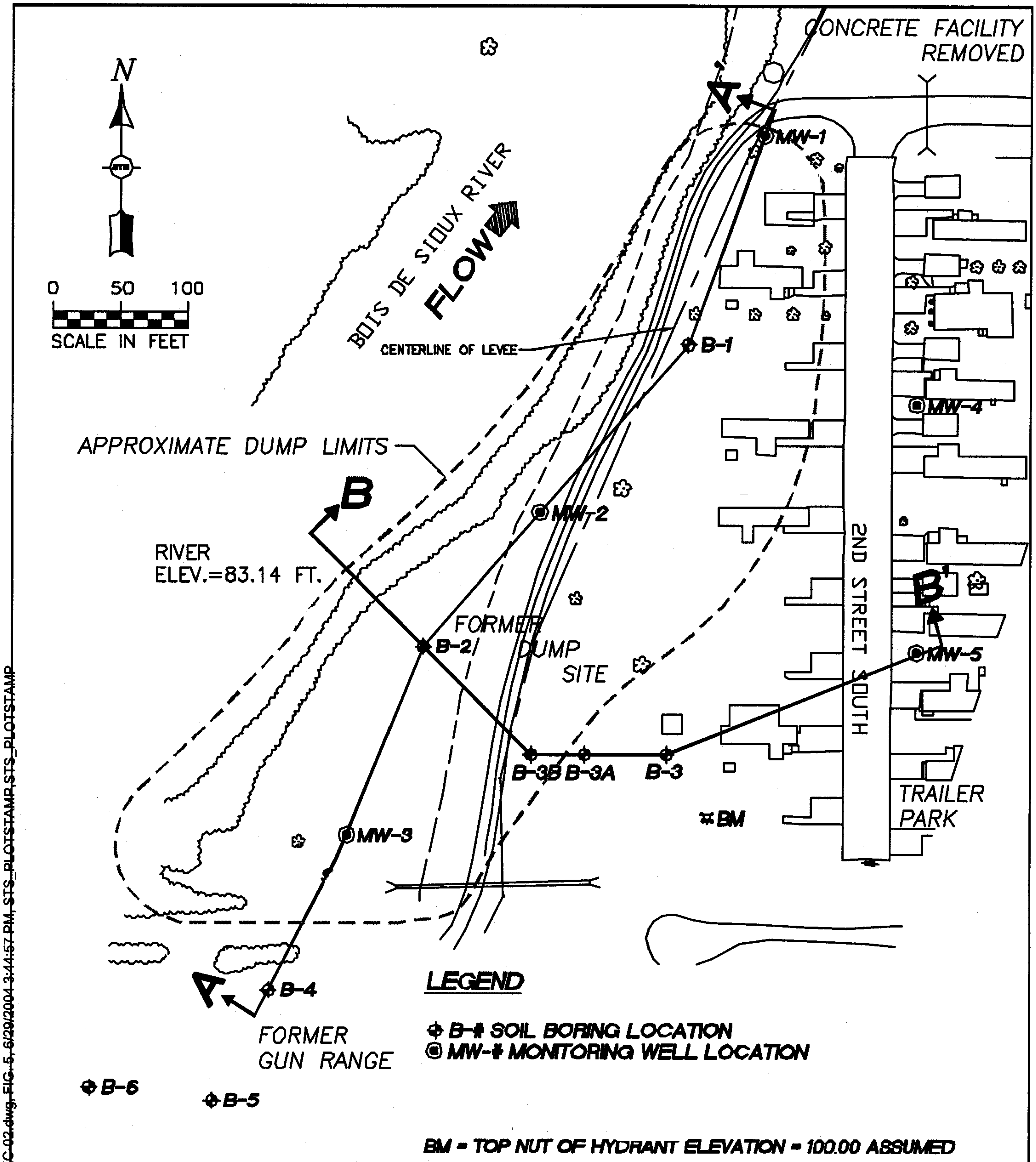

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Figure 3

CROSS SECTION ALIGNMENT DIAGRAM

BRECKENRIDGE MOBILE PARK DUMP
BRECKENRIDGE, MINNESOTA

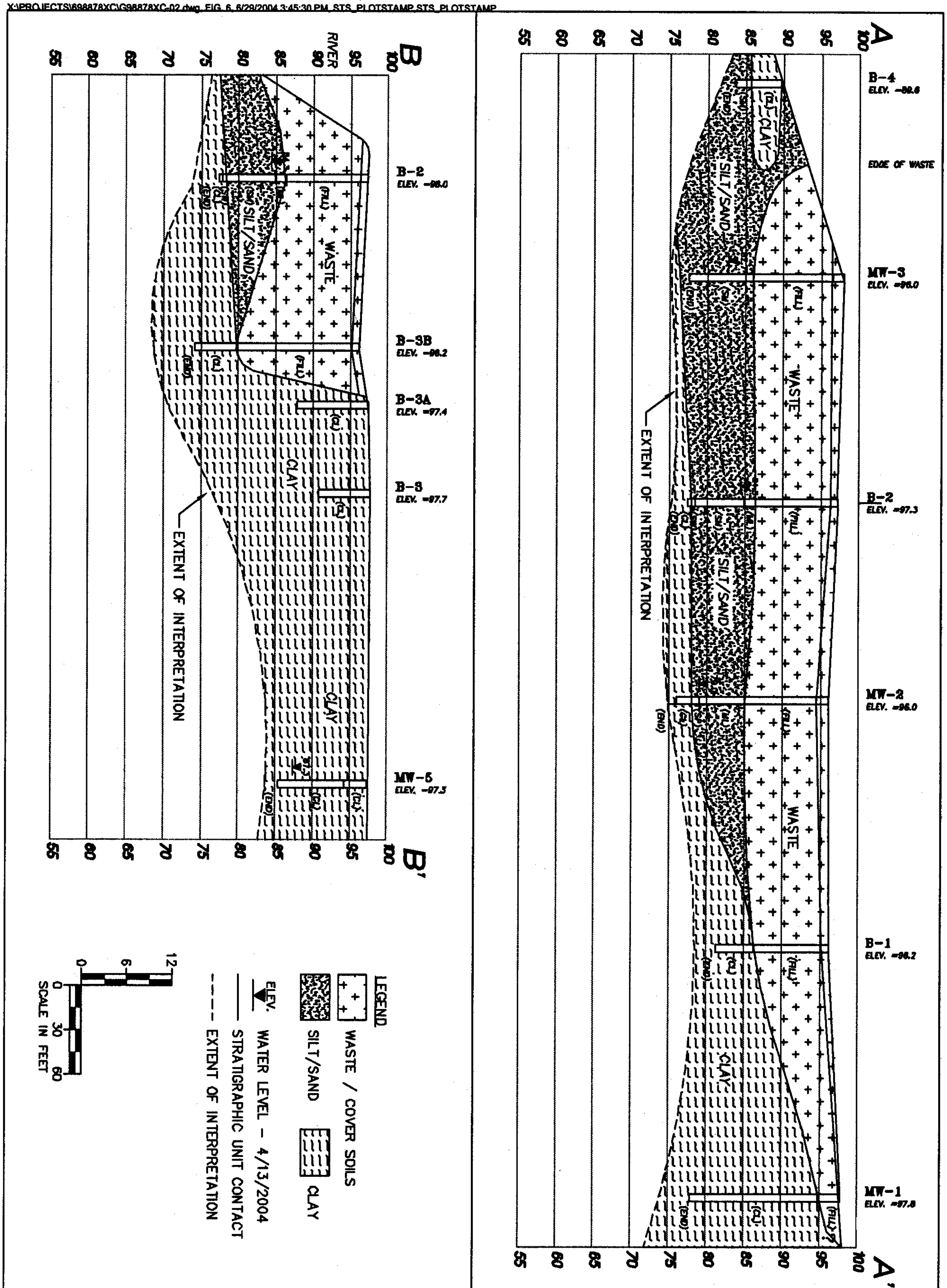

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Figure 4

Cross Sections

BRECKENRIDGE MOBILE PARK DUMP
BRECKENRIDGE, MINNESOTA