

**Limited Environmental and  
Geotechnical Data Review**

City of Minneapolis Impound Lot/  
Former Irving Avenue Dump Site/Linden Yard Area  
Northwest of the Interstate 94 and 394 Interchange  
Minneapolis, Minnesota

*Prepared For*

**Minneapolis Community Development Agency**

Project Number CMXX-00-0013  
March 13, 2000

Braun Intertec Corporation

**BRAUN**<sup>SM</sup>  
**INTERTEC**

**Braun Intertec Corporation**  
6875 Washington Avenue South  
Minneapolis, Minnesota 55439  
612-941-5600 Fax: 833-4701

*Engineers and Scientists Serving  
the Built and Natural Environments®*

March 13, 2000

Project No. CMXX-00-0013

Mr. Steve Maki  
Minneapolis Community Development Agency  
Crown Roller Mill, Suite 200  
105 Fifth Avenue South  
Minneapolis, MN 55401-2534

Dear Mr. Maki:

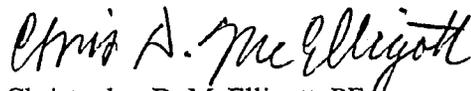
Re: Limited Environmental and Geotechnical Data Review, City of Minneapolis Impound  
Lot/Former Irving Avenue Dump Site/Linden Yard Area, Northwest of the Interstate 94 and  
394 Interchange, Minneapolis, Minnesota.

In accordance with your authorization, Braun Intertec Corporation (Braun Intertec) conducted a limited environmental and geotechnical data review of the referenced properties (*Site*). The objective of the data review was to summarize available environmental and geotechnical records pertaining to the *Site* and assess the potential impact of the recognized environmental and geotechnical conditions on potential redevelopment scenarios for the *Site*.

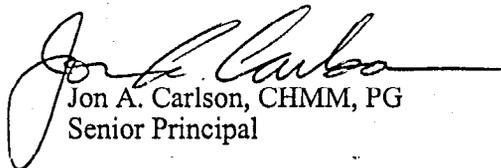
The attached report summarizes data obtained and reviewed for this project. Please contact us if you would like to meet to discuss this information or would like copies of any of the referenced documents, boring logs, laboratory reports, aerial photographs, etc.

We appreciate the opportunity to provide our professional services to you for this project. If you have any questions regarding this letter or the attached report, please contact Chris McElligott at (612) 833-4769 or Jon A. Carlson at (612) 833-4750.

Sincerely,



Christopher D. McElligott, PE  
Senior Remediation Engineer



Jon A. Carlson, CHMM, PG  
Senior Principal

Attachment: Limited Environmental and Geotechnical Data Review Report

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Appendix B: *Site* Photographs

## **A. Purpose**

Braun Intertec Corporation (Braun Intertec) received authorization from Mr. Steve Maki of the Minneapolis Community Development Agency (MCDA) to conduct a limited environmental and geotechnical data review of the City of Minneapolis Impound Lot/Former Irving Avenue Dump Site/Linden Yard Area located northwest of the Interstate 94 and 394 interchange in Minneapolis, Minnesota (*Site*). A *Site* location map and *Site* map (Sheet 1) are included in Appendix A.

The services provided for this project included obtaining and reviewing historical and technical documents of environmental and geotechnical work completed at the *Site*, and assessing the potential impact of the recognized environmental and geotechnical conditions on potential redevelopment scenarios for the *Site*.

## **B. Site Reconnaissance**

A *Site* reconnaissance of the Impound Lot and former Irving Avenue Dump Site was conducted by Braun Intertec personnel on March 2, 2000. Braun Intertec was unaccompanied at the time of the reconnaissance.

Photographs taken at the Impound Lot/Former Irving Avenue Dump portion of the *Site* on March 2, 2000 are included in Appendix B.

### **B.1. City of Minneapolis Impound Lot**

At the time of this assessment, a portion of the *Site* consisted of the City of Minneapolis Impound Lot. The main office building was located on the northeast corner of that property and the car storage area occupied the remainder of the Impound Lot. Besides being stored within the original fenced Impound Lot and fenced expansion area (Impound Lot 2), vehicles were also being stored on most of the former Irving Avenue Dump Site. Only the far western end of the Former Irving Avenue Dump Site was not being utilized for vehicle storage.

The original Impound Lot and Impound Lot 2 portion of the *Site*, which were completely enclosed by fencing, were bordered on the north by Bassett Creek with commercial/industrial properties located beyond, on the east by commercial/industrial properties, on the south by Burlington Northern/Santa Fe railroad tracks with the City of Minneapolis Linden Yard material storage yard located beyond, and on the west by undeveloped land known as the Former Irving Avenue Dump Site. According to Mr. Frederick Campbell of the Minnesota Pollution Control Agency (MPCA), approximately 50 percent of the Impound Lot is considered to be within the boundaries of the Former Irving Avenue Dump Site (personal communication, January 11, 2000).

## **B.2. Former Irving Avenue Dump Site**

At the time of this assessment, a portion the *Site* consisted of the Former Irving Avenue Dump Site, also currently owned by the City of Minneapolis.

The former Irving Avenue Dump portion of the *Site* was approximately bounded on the north by Bassett Creek and commercial/industrial properties located beyond, and on the south by Burlington Northern/Santa Fe railroad tracks and Bryn Mawr Meadows Park beyond. The known limits of the former dump area extend westward to approximately the hillslope near Cedar Lake Road and eastward to approximately Colfax Avenue. The limits of the former dump may extend north of the creek and west of Cedar Lake Road (MPCA, 1995). The eastern portion of the Former Irving Avenue Dump Site is part of the City of Minneapolis Impound Lot, which is accessible via Colfax Avenue. The central and western portion of the Former Irving Avenue Dump Site are accessible via the Irving Avenue bridge over Bassett Creek, which is gated. The Former Irving Avenue Dump Site appeared to be only partially enclosed by fencing. Within the western portion of the Former Irving Avenue Dump Site, several temporary living shelters, most likely occupied by homeless individuals, were noted to be present within the wooded southern portion of the *Site* adjacent to and north of the railroad tracks.

## **B.3. Linden Yard**

At the time of this assessment, a portion of the *Site* consisted of the City of Minneapolis Linden Yard. As noted in a Phase I environmental site assessment prepared by Braun Intertec in 1998, this portion of the *Site* is utilized by the Department of Public Works and contains or has contained stockpiles of gravel, concrete rubble, topsoil and compost material. Construction materials and equipment are also stored on this portion of the *Site*. No buildings are present at the Linden Yard, with the exception of an office trailer at the yard entrance gate and a small wood-frame shed replica of a train station (labeled Linden Yard) owned by the Minneapolis Parks and Recreation Board. The train station replica is located on the Linden Avenue bikeway within the southwestern portion of the property (Braun Intertec, 1998c).

The Linden Yard portion of the *Site* was bordered on the north by Burlington Northern/Santa Fe railroad tracks with the NSP Aldrich electrical substation, City of Minneapolis Impound Lot, Former Irving Avenue Dump Site and commercial/industrial properties beyond; on the east by Lyndale Avenue with Interstate 94 located beyond; on the south by a City of Minneapolis pedestrian and bicycle pathway with Linden Avenue and Interstate 394 located beyond; and on the west by Bryn Mawr Meadows Park with residential properties located beyond.

## **C. Historical Document Review**

### **C.1. History of Bassett Creek/Bryn Mawr Meadows Area**

In 1880, the course of Bassett's Creek had not yet been altered by man. The swampy valley was undesirable for residential purposes and was becoming a dump site.

Between 1889 and 1920, seasonal flooding of lower Bassett's Creek Valley was creating increasing problems. In the spring or during periods of high water, the creek would flood and large areas were inundated with sewage and filth. This situation resulted in the construction of the North Minneapolis sewer tunnel, which began in 1885. This tunnel was designed to drain adjacent lands, raise property values and render the area usable for building purposes. Between 1914 and 1923, a concrete conduit 20 feet in width and 10 feet in height was constructed to completely enclose the downstream portion of the creek from near Second and Dupont Avenues North (Gustafson, 1965).

In 1920, upper Bassett's Creek Valley was beginning to experience the same problems the lower valley had. Between Glenwood Park and the entrance to the tunnel near Second and Dupont Avenues North, both banks of the creek were lined with a series of dumps filled with broken glass, tin cans, ashes, barrel hoops, bed springs, automobile tires, old buggy tops, wrecked automobile bodies, dead animals and all manner of refuse. The only place free from such dumping was land adjacent to the Glenwood-Inglewood Company and Fruen's Mill. Beginning in 1934, work began to fill and grade the dumps, drain and fill low marshy spots, and clean the creek channel from Cedar Lake Road through Theodore Wirth Park (formerly named Glenwood Park). Filling and grading was also being carried on in Bryn Mawr Meadows (Gustafson, 1965).

## **C.2 History of the Impound Lot/Former Irving Avenue Dump Site**

An executive summary for a preliminary assessment under Federal Superfund prepared by the MPCA dated June 29, 1984 (MPCA, 1984) indicates that the area known as the Irving Avenue Dump, located between Colfax Avenue and Logan Avenue along Bassett Creek and north of the Burlington Northern Railroad tracks, has operated as a dump since the 1930s. The current Impound Lot is included within said boundaries. The MPCA executive summary states the following:

- It is believed that the site began operating as a dump around 1930 and has continued up to the present.
- The site was used in the 1950s and 1960s as a storage area by Napco Industries Inc. for batteries, oil, gasoline and surplus equipment.
- Municipal staff recall seeing tons of pried open batteries next to the creek.
- The site near the Colfax Street end of the property is the old site of Richards Oil.
- The Army Corps of Engineers observed 1 to 2 feet of tar-saturated soils while test trenching and taking borings on the site.
- The *Site* has been used as a demolition and debris site for concrete, bricks, cinders and other materials since 1964.
- It is alleged that Leef Industrial Laundry and Hollywood Candy disposed of barrels of waste at the *Site*.

- It is alleged that oil and battery acid spills from Warden Oil and a local scrapyard, respectively, were deposited on the *Site* during high water periods on Bassett Creek.
- The *Site* was first formally inspected as a potential hazardous waste site on July 20, 1982 by the Army Corps of Engineers. Significant concentrations of lead and zinc were found in the soil and groundwater. Low levels of polychlorinated biphenyl (PCB) and poly aromatic hydrocarbons were also found. The dump has been found to be 15 to 17 feet deep with fill material.

The Irving Avenue Dump Site had a tentative score of 10 for listing on the State Superfund list, and was subsequently added to the Minnesota Superfund Permanent List of Priorities.

Since the 1930s, a portion of the Irving Avenue Dump Site along the east side of Irving Avenue had been occupied by Gopher Stone Company. Since the late 1980s, the City of Minneapolis Impound Lot has occupied the eastern portion of the Irving Avenue Dump Site. The remainder of the Irving Avenue Dump Site has been used as an unlicensed dump, demolition landfill, material storage yard, vehicle parking area and railroad switch yard. As a result of past disposal activities, the Former Irving Avenue Dump Site contains a variety of fill materials such as bricks, wood, asphalt, concrete rubble and decorator stone fragments (Barr, 1990).

The Former Irving Avenue Dump Site property was purchased by the City of Minneapolis in March 1987. The City of Minneapolis has used this portion of the *Site* as a storage area for seal coat chips and excess construction borrow material (Public Works, 1998).

In 1992, the U. S. Army Corps of Engineers (U.S. COE) completed a flood control project for the Bassett Creek watershed. This project involved constructing a replacement tunnel for the creek, and widening and realignment of the creek channel. The goal of the project was to provide the area with 100-year flood protection and prevent the storage of water on the Former Irving Avenue Dump Site. The Former Irving Avenue Dump Site was used for disposal of the fill material generated from the tunnel and creek channel excavation; the fill was placed in three spoil piles on the site. Two of the piles were found to contain lead contamination, which did not pass the EP toxicity leach test. The piles were subsequently combined, regraded and capped with clay by the city of Minneapolis in September and October 1998. Plans prepared by the City of Minneapolis Department of Public Works, Sewer Planning and Design Division, are included in Appendix A. As-built drawings were not provided to Braun Intertec. The Impound Lot expansion (Impound Lot 2) resides over a portion of the spoils and the remainder of the spoils are located immediately south and southwest of Impound Lot 2.

### **C.3. History of the Linden Yard**

Our research indicated that the Linden Yard portion of the *Site* was developed as a rail yard at the time of the earliest readily available historical-use source, an 1885 Sanborn Map Atlas (Sanborn).

According to the 1885-1969 Sanborns and the 1938-1983 aerial photographs, numerous railroad tracks were located in this portion of the *Site*. At the time of the 1993 aerial photograph, all of the railroad lines apparently had been removed from this portion of the *Site* (Braun Intertec, 1998c).

According to Sanborn maps from 1885-1969 and aerial photographs from 1938-1974, a grain elevator with an apparent attached office area was located on the eastern side of the Linden Yard portion of the *Site* near Lyndale Avenue. Please note, on the 1885 and 1890 Sanborns, two elevator buildings were noted on this portion of the *Site* and only one elevator building was noted on the aerial photographs reviewed. There were no records available to indicate the circumstances or time that this second building was removed. At the time of the 1978 aerial photograph, the grain elevator had been completely demolished and wood and soil debris were apparent in the place of the former building. At the time of the 1993 aerial photograph, the former elevator facility location was occupied by stockpiles of soil and sand and hauling equipment (Braun Intertec, 1998c).

According to the 1912 Sanborn map and the aerial photographs from 1938-1950, a facility identified as the Elliott Fuel Company yard was located to the north of the Linden Yard portion of the *Site*. After 1950, the former fuel yard was apparently replaced by a vehicle and material storage yard (Braun Intertec, 1998c).

According to the 1938-1960 aerial photographs, Laurel Avenue bisected the center of the Linden Yards portion of the *Site* from east to west. In the 1970 aerial photograph, Laurel Avenue was abandoned and by the 1974 aerial photograph the street was completely removed (Braun Intertec, 1998c).

#### **C.4. Sanborn Fire Insurance Maps**

Fire insurance maps are produced by private fire insurance map companies that indicate uses of property at specified dates and that encompass the *Site*. The information noted on the maps include uses of individual structures, locations of fuel and/or chemical storage tanks, and storage of other potentially hazardous substances. Braun Intertec requested Sanborn maps from the Minnesota Historical Society and VISTA Information Solutions, Inc.

##### **C.4.1. Impound Lot/Former Irving Avenue Dump Site**

No Sanborn map coverage was available for the vicinity of the Impound Lot and Former Irving Avenue Dump Site.

##### **C.4.2. Linden Yard**

Braun Intertec reviewed copies of the 1885, 1890, 1912, 1923, 1950, 1952, 1963, 1966 and 1969 Sanborn maps for information pertaining to the Linden Yard portion of the *Site*. Sanborn coverage for this portion of the *Site* was limited to the eastern half of the property from Lyndale Avenue to Dupont Avenue (Braun Intertec, 1998c).

On the 1885 and 1890 Sanborn maps, the Linden Yard portion of the *Site* was occupied by numerous railroad tracks, two elevator buildings, and an apparent office building. The St. Paul and Manitoba Railroad was located to the north of the buildings and the Minnesota and St. Louis Railroad was located to the south of the buildings. The rectangular-shaped buildings were labeled Elevator A#1 and Elevator A#2. The North Star Lumber Company was located to the north and residential dwellings and the Northwestern Pipe and Paving Company was located to the south. Surrounding land use appeared to be a mixture of commercial and residential properties (Braun Intertec, 1998c).

On the 1912 through 1969 Sanborn maps, the Linden Yard portion of the *Site* remained unchanged from the previous Sanborns. Additional railroad tracks were apparent to the north of the buildings and were labeled the Great Northern Railroad. The Elliott Fuel Company yard was located to the north of this portion of the *Site* on the 1912 Sanborn. On the 1950 Sanborn, Linden Avenue was rerouted to be parallel to the southern set of railroad tracks. Commercial properties were located to the south of this portion of the *Site* (Braun Intertec, 1998c).

#### **C.5. Aerial Photographs**

Braun Intertec obtained aerial photographs of the *Site* from the University of Minnesota Wilson Library dated 1937, 1940, 1945, 1953, 1957 and 1964 and from Hennepin County dated 1938, 1947, 1956, 1960, 1967, 1970, 1974, 1978, 1983 and 1993.

##### **C.5.1. Vicinity of the Impound Lot/Former Irving Avenue Dump Site**

Aerial photographs taken in 1937 and 1940 indicate that the Impound Lot portion of the *Site* was used as a landfill and railroad tracks were present south of the *Site* (Barr, 1986).

On the 1938 aerial photograph, the northeast quarter was occupied by a building and piles of coal or soil, the northwest quarter was occupied by soil piles, and the southern half of the Impound Lot portion of the *Site* was occupied by a railyard.

On the 1950 aerial photograph, the only apparent change from the 1938 photograph was the addition of three more buildings on the northeast corner of the Impound Lot portion of the *Site*.

Aerial photographs taken in 1953 indicate that the Impound Lot portion of the *Site* was used as a railroad yarding area; fill appears to have been dumped immediately west of the yarding area (Barr, 1986).

On the 1956 and 1960 aerial photographs, the following changes were apparent: approximately 12 railroad spurs and a materials storage yard were located on the northwest corner, and a material storage yard extended from an adjacent property onto the north-central portion of the Impound Lot portion of the *Site*.

On the 1970 and 1974 aerial photographs, the previously mentioned buildings on the northeast corner of the Impound Lot portion of the *Site* are no longer apparent.

On the 1978 and 1983 aerial photographs, half of the previously mentioned railroad spurs on the northwest corner of the Impound Lot portion of the *Site* are no longer apparent.

On the 1993 aerial photograph, the existing original (pre-expansion) City of Minneapolis Impound Lot was located at this portion of the *Site*.

#### **C.5.2. Vicinity of the Linden Yard**

Due to the large size of the Linden Yard portion of the *Site*, the following descriptions will discuss the property from east to west. On the 1938-1960 aerial photographs, a large rectangular-shaped building (identified as an elevator and an apparent office building on the Sanborn maps) was located on the eastern quarter of the Linden Yard portion of the *Site*. In addition, two smokestacks were apparent on the small attached office building. Approximately four sets of railroad tracks were apparent to the south of the buildings and approximately 27 sets of railroad tracks were apparent to the north of the buildings. The railroad tracks ran the length of the Linden Yard portion of the *Site* from the northeast to the southwest. An apparent above-ground storage tank (AST) was located adjacent to and north of the buildings and the railroad tracks. Laurel Avenue bisected the center of the Linden Yard portion of the *Site* from the east to the west. Located to the north of the Linden Yard portion of the *Site* was the Elliott Fuel Company yard (as identified on the 1912 Sanborn); the current Lyndale Avenue was located to the east; the Minneapolis Gas Light Company and gas holder tank, presumably for coal gas storage, was located adjacent to the southeast corner; the current Linden Avenue was located adjacent to the southeastern boundary; Wayzata Boulevard was located to the south; and undeveloped land with indications of dumping was located to the west of the Linden Yard portion of the *Site* (Braun Intertec, 1998c).

On the 1970 aerial photograph, the Linden Yard portion of the *Site* was unchanged from the previous aerial photographs, except that the former Laurel Avenue was abandoned and partially removed. In addition, the previously mentioned apparent AST, located adjacent to and north of the elevator building and the railroad tracks, had been removed. The previously mentioned Minneapolis Gas Light Company, located adjacent to the southeast corner, had been remodeled into an apparent office building and the former gas holder tank had been filled and paved as a parking area. The current Interstate 394 was under construction south of the Linden Yard portion of the *Site*. Surrounding land use appeared to be commercial properties and storage yards on all sides of the Linden Yard portion of the *Site* (Braun Intertec, 1998c).

On the 1974 aerial photograph, the former Laurel Avenue was completely removed from the Linden Yard portion of the *Site* and Interstate 394 was complete. A pedestrian bridge was apparent in the location of the former Laurel Avenue (Braun Intertec, 1998c).

On the 1978 and 1983 aerial photographs, the formerly mentioned rectangular-shaped building (identified as an elevator and an apparent office building on the Sanborn maps) was removed. Wood debris and soil dumping were apparent in place of the former elevator building. On the 1983 aerial photograph, the railroad tracks on the north half were apparently removed (Braun Intertec, 1998c).

On the 1993 aerial photograph, all of the previous railroad lines had been removed, except for one line on the northern boundary. The part of the Linden Yard portion of the *Site* closest to Lyndale Avenue was used for truck and trailer parking. In the vicinity of the former elevator building, stockpiles of soil and sand were apparent along with hauling equipment and associated small office buildings. Northeast of the previously mentioned pedestrian bridge was an area apparently used for barrel and equipment storage. Southwest of the pedestrian bridge down to Interstate 394, apparent excavation and dumping activities were noted (Braun Intertec, 1998c).

#### **C.6. Water Wells**

The Minnesota Geological Survey (MGS) maintains a limited database of water well records called the Minnesota County Well Index (MCWI). Not all private water wells are listed in that database. Well records for locations in the vicinity of the *Site*, indicate only two wells operating in the *Site* area. One well is used by Leef Brothers, Inc. for process water and the other is located at the Sculpture Garden for irrigation and makeup water for the pond at the Sculpture Garden. The Sculpture Garden well, unique well #431591, was completed at 273 feet below land surface (bls) in the Shakopee Formation. Details concerning the Leef Brothers, Inc. well were unavailable from the MCWI.

Past groundwater uses for industrial and commercial purposes occurred at the former Munsingwear facility (now International Market Square) 275 Glenwood Avenue and the former Twin City Milk Producers facility (now A&L Laboratories) 1001 Glenwood Avenue. The following two wells (abandoned) were located at the former Munsingwear facility: unique well #200346 was completed at 388 feet bls in the Prairie du Chien-Jordan aquifer and unique well #200614 terminated in Pleistocene unconsolidated deposits at 180 feet bls and did not penetrate bedrock. The former Twin City Milk Producers well # 200347, presumably abandoned, terminated at 809 feet bls in the Eau Claire formation (Braun Intertec, 1998c).

### **D. Technical Document Review**

Copies of documents pertaining to the *Site* which Braun Intertec obtained and reviewed are listed in Section G, References. The information is summarized in the following sections.

#### **D.1. Impound Lot/Former Irving Avenue Dump Site**

##### **D.1.1. Summary of Geotechnical Information**

Most of the historical subsurface investigation work performed at the Impound Lot/Former Irving Avenue Dump portion of the *Site* has been primarily for environmental investigation purposes. However, the data obtained during those investigations does include information that can be used to develop a generalized geotechnical characterization of the *Site*.

Information concerning the geology of the Impound Lot/Former Irving Avenue Dump portion of the *Site* was obtained from available borings performed by the U.S. COE in 1980, 1982, and between

1987 and 1989; test pits conducted by the U.S. COE in July 1982; soil borings and monitoring wells installed by Barr Engineering Company (Barr) in February 1988, August 1989, October 1989 and June 1994; soil borings conducted for the City of Minneapolis Department of Public Works in March 1986; soil borings and monitoring wells installed by Twin City Testing Corporation (TCT) in May 1986; and soil borings performed by Braun Intertec in January 1999. The approximate locations of soil borings, monitoring wells and test pits are shown on Sheet 2 included in Appendix A.

Boring 80-31M, performed by the U.S. COE on August 19, 1980, encountered swamp deposits throughout the entire 34-foot deep boring. Boring 82-68M was performed by the U.S. COE on June 11, 1982 to a depth of 20 feet. Fill was encountered from 0 to 18 feet and organic swamp deposits were found from 18 to 20 feet below grade (Barr, 1989b).

Eleven randomly located test pits were dug with a backhoe by the U.S. COE in July 1982. The purpose of the test pits was to characterize soil and groundwater contamination conditions for planning purposes associated with the planned construction of the Bassett Creek tunnel inlet area and ponding area. The test pits were dug to an average depth of 7 feet. All of the test pits were described as containing dump fill. Materials observed within the fill included clay bricks, glass containers, clay, cinders, ash, wood, reddish sand, tar, domestic rubbish, electrical wiring insulation, electrical conduits, gravel and reddish orange soil (Barr, 1989b).

The City of Minneapolis Department of Public Works had five soil borings, labeled 1 through 5, drilled in the northeast portion of the Impound Lot portion of the *Site* in March 1986. In general, the borings encountered up to 2 feet of topsoil consisting of black sandy loam underlain by a thickness of up to 13 feet of swamp deposits consisting of one or a combination of peat, muck, marl, soft organic silts and clays. Underneath the swamp deposits, medium fine sand was encountered to the termination depth of the borings at 20 feet below grade (Barr, 1986).

TCT performed five 20-foot borings (B6 through B10) and one monitoring well (MW5) near the western boundary of the Impound Lot portion of the *Site* in May 1986. The borings indicated that the site contained a layer of fill consisting of a mixture of ashes, cinders, silt, sand, wood, glass, metal, concrete, brick and other demolition debris underlain by swamp deposits. The thickness (depth) of fill ranged from 6 to 20 feet. The borings suggested that most dumping occurred west of boring

B-10 and south of MW5 (Barr, 1986).

As part of a preliminary geotechnical and limited environmental assessment for a proposed roadway and bridge across the *Site*, which would connect the southern end of Girard Avenue North to the northern end of Dunwoody Boulevard, Braun Intertec performed seven standard penetration test borings in January 1999. Three of the seven borings, ST-3, ST-4 and ST-5, were performed on the Impound Lot/Former Irving Avenue Dump portion of the *Site* (Braun Intertec, 1999).

Borings ST-3, ST-4 and ST-5 were advanced to depths of 24.5, 12.3 and 15.4 meters (m), respectively. All three of the borings encountered fill underlain by organic soils. Some of the borings then encountered strata of silty sands and/or fat clay. The fill layer was generally a silty sand, clayey sand or sandy lean clay. Some organic soils were encountered within the fill. There were varying amounts of rubble consisting of wood, concrete, brick and glass. Fill depths varied from 6.7 to 9.1 m. A thin stratum (1.2 m) of fibrous peat swamp deposits was encountered below the fill in boring ST-3. The fill had N values (blows required to drive the sampler 0.3 m) ranging from 2 to 21, but generally less than 10. The higher penetration resistances were a result of encountering wood or concrete during the sampling process. The moisture content of a sample of the peat in Boring ST-3 was 167 percent with an organic content of 21 percent (Braun Intertec, 1999).

All of the borings encountered a stratum of organic silt swamp deposits with some shells below the fill and peat. This stratum was thickest (9.5 m) at ST-3. In the organic silts the N values ranged from penetration under the weight of the hammer (WH) without driving to 2, indicating the very soft nature of this stratum. Laboratory tests indicated the moisture contents of the organic silt samples from ST-3 ranged from 122 percent to 96 percent. Organic contents of the organic silt samples from ST-3 ranged from 10 percent to 12 percent (Braun Intertec, 1999).

A strata of fat clay was encountered in ST-3 between the organic silt and the silty sand. The N values of the fat clay varied from 2 to 5 indicating a soft to rather soft consistency. These soils generally were stiffer with depth. The silty sand had N values ranging from 13 to 20, increasing with depth, indicating medium dense conditions (Braun Intertec, 1999).

The fill was waterbearing at 3.7 to 3.9 m. This is the approximate elevation of the water level in Bassett Creek along the proposed road alignment (Braun Intertec, 1999).

#### **D.1.2. Generalized Subsurface Soil and Hydrogeologic Conditions**

The generalized subsurface conditions depicted by soil boring logs from the Impound Lot/Former Irving Avenue Dump portion of the *Site* indicate mixed fill overlying peat and/or swamp deposits overlying coarse alluvium.

The mixed fill is generally 10 to 20 feet thick and covers most of the Impound Lot/Former Irving Avenue Dump portion of the *Site*. The mixed fill, which was placed as part of the uncontrolled dumping at the Impound Lot/Former Irving Avenue Dump portion of the *Site*, is reported to be composed of sand, gravel, ashes and cinders, concrete, brick, asphalt, metal, glass, wood, tar, decorator stone fragments, domestic rubbish and other demolition debris (Barr, 1990).

Underlying the fill is a layer of swamp deposits including peat, marl, silt and organic clay. Most of the swamp deposits contain shell fragments, fibrous organic material, rootlets and/or silt laminae. In general, the swamp deposits range in thickness from 10 to 40 feet. The swamp deposits are thickest

(35 to 55 feet) in the central portion of the Impound Lot/Former Irving Avenue Dump portion of the *Site* near borings SB1, SB2, and 88-175M. The swamp deposits thin to the northeast and to the west where they grade into lacustrine clay deposits (Barr, 1990).

A lacustrine deposit of fat clay underlies the swamp deposits in the Impound Lot/Former Irving Avenue Dump portion of the *Site* vicinity. The thickness of the fat clay varies across this portion of the *Site*. The unit ranges from 10 to 20 feet thick near the eastern boundary of the Former Irving Avenue Dump Site, up to 40 feet thick in the central and western portion of the Impound Lot/Former Irving Avenue Dump portion of the *Site*, and appears to be discontinuous north of the Impound Lot (Barr, 1990).

Deposits of alluvial sand lenses are present beneath the fat clay unit over much of the Impound Lot/Former Irving Avenue Dump portion of the *Site*. The poorly graded, fine- to medium-grained, waterbearing sand lenses are approximately 11 to 18 feet thick in the western, southern and northeastern portion of the Former Irving Avenue Dump Site (Barr, 1990).

Across much of the Impound Lot/Former Irving Avenue Dump portion of the *Site*, sandy lean clay tills underlie the swamp deposits, lacustrine clays and alluvial sands. Where encountered, the till unit ranged from 28 to at least 70 feet thick. The till is at least 10 to 21 feet thick in the southern, northeastern and western portions of the Former Irving Avenue Dump Site (Barr, 1990).

The hydrogeologic system at the Impound Lot/Former Irving Avenue Dump portion of the *Site* has been characterized as containing four hydrogeologic units: (1) the uppermost waterbearing zone in the fill and underlying swamp and lacustrine deposits (termed the upper confining unit); (2) the alluvial sand lenses; (3) the till (termed the lower confining unit); and (4) the paleozoic bedrock aquifers (Barr, 1990).

Within the uppermost waterbearing zone, the fill and underlying swamp and lacustrine deposits, the water table generally occurs near the contact between the fill and the upper confining unit at an elevation of about 805 feet above mean sea level (MSL). The average elevation of the Former Irving Avenue Dump Site is approximately 810 feet MSL. Horizontal groundwater flow within the uppermost waterbearing zone is generally towards the east with a gradient of approximately 0.002 feet per foot. There is also a northerly component to the flow along the northern portion of the Impound Lot/Former Irving Avenue Dump portion of the *Site* near Bassett Creek, and a southerly flow component near the southern boundary of the Impound Lot/Former Irving Avenue Dump portion of the *Site*. The nested monitoring wells (MW5/MW105) near the northwestern portion of the Impound Lot have indicated that the vertical component of groundwater flow in the uppermost waterbearing zone is downward with a vertical gradient of 0.18 to 0.25 feet per foot (Barr, 1990).

Groundwater elevation data collected in 1994 and 1995 indicated that the elevation of the water table at the Impound Lot/Former Irving Avenue Dump portion of the *Site* was 4 to 6 feet lower than that

observed in 1990. The decrease in groundwater elevations was principally attributed to the lowering of the Bassett Creek base flow elevation by the U.S. COE as part of the 1992 of the Bassett Creek Flood Control project in this area (Barr, 1996).

Groundwater conditions within the other three hydrogeologic units, the alluvial sand lenses, the till and the bedrock aquifers, have not been studied in detail at the Impound Lot/Former Irving Avenue Dump portion of the *Site*.

#### **D.1.3. Geotechnical Limitations on Site Development**

City of Minneapolis Department of Public Works sewer plans show an existing 72-inch circular brick and a 48-inch circular reinforced concrete sewer across the Impound Lot portion of the *Site*, directly south of Dupont Avenue. The locations of these sewer lines are depicted on the Department of Public Works plans included in Appendix A. Cross-section plans of the sewer at Currie Avenue North, approximate 400 feet north of the Impound Lot, show that due to poor soil conditions the sewer pipe is supported on piling driven to a depth of 75 feet for support (Barr, 1986).

Physical characteristics of the Impound Lot/Former Irving Avenue Dump portion of the *Site* impose several restrictions on the development of this portion of the *Site*. Unfavorable soil conditions make it difficult to provide adequate foundation for the construction of structures. The fact that the western part of this portion of the *Site* lies within the Bassett Creek regional 100-year floodplain also may pose limitations on development. City of Minneapolis floodplain regulations may require that development not decrease the 100-year flood storage on this portion of the *Site* (Barr, 1986).

Due to the historical uncontrolled fill placement activities at the Impound Lot/Former Irving Avenue Dump portion of the *Site*, and the presence of the compressible swamp deposits, construction of footings without remedial measures would likely result in very large total and differential settlements and possibly bearing failure of building footings (Barr, 1986).

#### **D.1.4. Summary of Environmental Information**

Numerous environmental investigations and phases of investigation have been performed at the Impound Lot/Former Irving Avenue Dump portion of the *Site* since 1987. Most of the investigation activities have focused on the Former Irving Avenue Dump Site, which includes the western portion of the Impound Lot.

Investigations have included performing soil borings and test pits, installing groundwater monitoring wells, chemically analyzing soil and groundwater samples, sampling the water quality in Bassett Creek and sampling seeps along Bassett Creek. Soil and groundwater contamination has been identified at the Former Irving Avenue Dump Site and Impound Lot.

Information concerning the environmental conditions of the Impound Lot/Former Irving Avenue Dump portion of the *Site* was obtained from borings performed by the U.S. COE in 1980, 1982, and between 1987 and 1989; test pits conducted by the U.S. COE in July 1982; soil and stream sediment samples collected by the U.S. COE in August 1983; soil borings and monitoring wells installed by

Barr in February 1988, August 1989, October 1989 and June 1994; soil borings and monitoring wells installed by TCT in May 1986; and soil borings performed by Braun Intertec in January 1999. The approximate locations of soil borings, test pits, monitoring wells, surface water samples and stream sediment samples are shown on Sheet 2 in Appendix A.

**D.1.4.1. Soil Analytical**

Contaminants identified within soil on the Impound Lot/Former Irving Avenue Dump portion of the *Site* include metals, volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

High levels of PAHs have been found in soil samples collected from the Impound Lot/Former Irving Avenue Dump portion of the *Site*. A soil sample collected from a depth of 12 feet in boring B-7, located near the western edge of the Impound Lot, had total PAHs greater than 150,000  $\mu\text{g}/\text{kg}$ . Samples from test pits 82-73TP, 82-74TP and 82-78TP all had total PAH concentrations greater than 100,000  $\mu\text{g}/\text{kg}$ . A surface sample collected near the railroad tracks, 82-80TP, exhibited significantly lower levels of PAHs, (12,300  $\mu\text{g}/\text{kg}$ ), suggesting that the PAH contamination may be associated with waste disposal activities rather than general railroad operations (Barr, 1986).

Soils in the Impound Lot/Former Irving Avenue Dump portion of the *Site* area have been analyzed for heavy metal contamination. Elevated concentrations of cadmium, copper, lead, mercury and zinc were found in soil samples collected from the test pits conducted by U.S. COE. No arsenic, antimony or selenium was detected. The primary metal contaminant in soils is lead. Samples collected north of the Impound Lot/Former Irving Avenue Dump portion of the *Site* had lead levels which failed the extraction procedure (EP) toxicity leach test and can be considered hazardous waste. Samples collected from the Impound Lot/Former Irving Avenue Dump portion of the *Site* also exhibited high levels of total lead, and although these samples were not subjected to the EP leach test, the total lead levels are high enough to estimate that many of the samples would not have passed the EP leach test (Barr, 1986).

Eleven randomly located test pits were dug with a backhoe by the U.S. COE in July 1982. The purpose of the test pits was to characterize soil and groundwater contamination conditions for planning purposes associated with the planned construction of the Bassett Creek tunnel inlet area and ponding area. The test pits were dug to an average depth of 7 feet. Soil and groundwater samples were obtained from the resulting excavations. Two of three soil samples collected from the U.S. COE test pits and submitted to the laboratory for the EP leach test failed the test for lead. The EP test leachates also exceeded the 1986 National Water Quality Criteria for protection of aquatic organisms from acute toxicity due to copper, lead and zinc (Barr, 1989b).

Three of twelve soil samples collected from the eleven U.S. COE test pits had detectable levels of PCBs. PCBs were detected in both the soil and surface soil samples at Test Pit 82-71 and in the soil sample at Test Pit 82-72 (Barr, 1989b).

VOCs have been detected at low levels in soil and do not appear to have impacted groundwater quality.

Additional testing of 62 soil and stream sediment samples was conducted by U.S. COE in August 1983 at 47 sites along the creek channel. The samples were analyzed for leachable metals, pesticides and herbicides. Pesticides and herbicides were not detected. Lead concentrations in the leachate from 5 of the 62 samples exceeded the RCRA criteria for hazardous waste designation. In the most highly contaminated area, the deepest samples were more highly contaminated than the shallower samples (Barr, 1989b).

During collection of soil samples 13 to 15 and stream sediment samples 42 to 46 by the U.S. COE, an oil-based substance was observed. One groundwater (83-3-49), one stream sediment sample (83-3-51) and two soil samples (83-3-48 and 83-3-50) were subsequently collected in September 1983 in the area where the oil-based substance had been observed. These samples were analyzed for VOCs and PAHs. Toulene and 1,1,1-trichloroethane were detected at low parts per billion (ppb) concentrations in the soil and stream sediment samples. Benzene and 1,1-dichloroethane were detected at low ppb concentrations in one of the soil samples. PAHs were detected in the soil, stream sediment and groundwater samples. Pentachlorophenol was detected in both soil samples. In addition, the groundwater sample was analyzed for metals, total phenols and cyanides. Mercury was detected in the groundwater sample at a concentration of 3 µg/l and the lead concentration was 1,100 µg/l; 55 times greater than the MDH RAL (Barr, 1989b).

As the City of Minneapolis considered acquiring property (for the Impound Lot) owned by Burlington Northern on the eastern portion of the Former Irving Avenue Dump Site, the City of Minneapolis Department of Public Works had analysis performed on four soil and two groundwater samples collected from the western edge of the Burlington Northern property in March 1986. The soil sampling sites were labeled 1 through 4, and the groundwater sampling sites were labeled 3A and 4A. All samples were analyzed for herbicides, pesticides, PCBs and creosote; additionally, the soil sample from Location 1 and the groundwater sample from Location 4A were analyzed for PAHs. No herbicides, pesticides, PCBs or creosote were detected in any of the samples. PAHs were detected in both the soil sample (2,600 µg/kg of carcinogenic PAHs) and groundwater sample (210 µg/l of carcinogenic PAHs) (Barr, 1989b).

In May 1986, TCT collected and analyzed soil samples from five 20-foot deep borings, labeled B6 through B10, and one monitoring well, labeled MW5. PAHs were detected in the soil samples collected from 12 to 13.5 feet in B9 and B10. The soil sample from a depth of 12 to 13.5 feet in B7 contained 90,000 µg/kg of carcinogenic PAHs (Barr, 1989b).

In February 1988, Barr collected soil samples from five 3-foot-deep borings labeled SB88-1 through SB88-5. The samples were analyzed for total metals, leachable metals (EP-toxicity leach test), PAHs, phenols, VOCs and PCBs. None of the samples failed the leach test. PAHs were detected in the soil samples with the highest concentration being 20,500 µg/kg carcinogenic PAHs in the sample from SB88-4. 1,1,1-trichloroethane was detected in the soil samples from SB88-4 and SB88-5 at concentrations of 83 and 71 µg/kg, respectively. Trichloroethylene was found in the soil sample collected from SB88-4 at 99 µg/kg. No other VOCs or phenolic compounds were detected. PCB-1254 was detected in the soil sample from SB88-3 at a concentration of 0.13 mg/kg (Barr, 1989b).

As part of a preliminary geotechnical and limited environmental assessment for a proposed roadway and bridge across the *Site*, which would connect the southern end of Girard Avenue North to the northern end of Dunwoody Boulevard, Braun Intertec performed seven standard penetration test borings in January 1999. Three of the seven borings, ST-3, ST-4 and ST-5, were performed on the Impound Lot/Former Irving Avenue Dump portion of the *Site*. Soil samples were observed for the presence of visual and olfactory evidence of contamination and screened for the presence of organic vapors with a photoionization detector (PID) equipped with a 10.6 eV lamp. No visible discoloration, odors, or elevated PID readings were detected in the borings. Soil samples were collected from Borings ST-3, ST-4 and ST-5 for analysis of the eight RCRA metals. None of the metals detected exceeded the applicable MPCA Residential or Industrial Soil Reference Values (SRV) (Braun Intertec, 1999).

#### ***D.1.4.2. Groundwater Investigations***

At least ten groundwater monitoring wells have been installed at the Impound Lot/Former Irving Avenue Dump portion of the *Site* and eight wells currently are present.

Groundwater samples were collected from the test pits dug by the U.S. COE. The analytical results showed limited contamination by heavy metals or VOCs. Two of the test pit groundwater samples were analyzed for and exhibited elevated levels of PAHs. One of the test pit groundwater samples exhibited low levels of PCBs which were in excess of the Minnesota Department of Health (MDH) Recommended Allowable Limits (RALs) (Barr, 1990).

In May 1986, TCT installed an 11-foot-deep monitoring well labeled, MW5. Analysis of a groundwater sample collected from MW5 in May 1986 indicated the sample contained 32.7 µg/l of carcinogenic PAHs, well in excess of the RAL of 0.028 µg/l (Barr, 1989b).

In October 1989, Barr installed six shallow monitoring wells labeled MW1, MW2, MW3, MW4, MW6 and MW7, ranging in depth from 13 to 20.5 feet at the Impound Lot/Former Irving Avenue Dump portion of the *Site*. A deep (29.8 feet) monitoring well, MW105, was installed adjacent to MW5 in October 1989 in order to evaluate both the groundwater quality

below the swamp deposits and vertical groundwater gradients. Groundwater samples collected from the monitoring wells in November 1989 and January 1990 were analyzed for PAHs, metals, VOCs, PCBs and general parameters. All metal concentrations were below the U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs) and MDH RALs for drinking water. No PCBs were detected. A few VOCs, including benzene; 1,1- and 1,2-dichloroethane; ethyl ether; methylene chloride; 1,1,1-trichloroethane and trichlorofluoromethane were detected in the ppb range well below the MCLs and RALs. PAHs were detected at concentrations exceeding the RALs. The incidence of VOCs and PAHs was scattered across the Impound Lot/Former Irving Avenue Dump portion of the *Site* with no pattern that would indicate a contaminant plume (Barr, 1990).

In June 1994, Barr installed monitoring wells MW8 and MW9. Groundwater monitoring wells MW3 and MW4 were damaged in 1991 during creek channel work and were subsequently sealed (Barr, 1996).

#### ***D.1.4.3. Surface Water Investigations***

In November 1989 and April 1990, upstream and downstream samples of water were collected from Bassett Creek. The first round of samples was analyzed for PAHs, filtered metals, VOCs, PCBs and general parameters and the second round of samples were analyzed for filtered metals. The only metal detected was iron at 0.05 mg/l in the downstream station in the second sampling round. No PCBs or VOCs were detected. Both upstream and downstream samples had detectable levels of PAH compounds. The surface water samples indicated some slight contamination of the creek, which originates upstream of the Impound Lot/Former Irving Avenue Dump portion of the *Site*. Comparison of upstream and downstream sampling results did not indicate any negative effect of the Impound Lot/Former Irving Avenue Dump portion of the *Site* on the surface water quality in Bassett Creek (Barr, 1990).

In November 1998, two temporary monitoring wells, TW1 and TW2, were installed near seeps along the southern bank of Bassett Creek. The seeps are approximately located between the U.S. COE soil and stream sediment samples locations labeled as 22 and 24 on Sheet 2 in Appendix A. A photograph of the one of the seeps observed during our *Site* reconnaissance on March 2, 2000 is included in Appendix B. Groundwater samples collected from the wells were analyzed for dissolved RCRA metals, chloride and PAHs. The inorganic compounds iron, zinc and chloride were detected. Iron was detected at concentrations of 6.2 to 9.6 mg/l, which exceed the HRL for iron of 0.3 mg/l and the Class 2A chronic surface water standard of 0.221 mg/l. None of the zinc concentrations exceeded HRLs, drinking water criteria or surface water standards. Concentrations of carcinogenic PAHs in samples from both wells exceeded drinking water criteria and, in some cases, surface water standards. Some noncarcinogenic PAHs also exceeded surface water standards (Barr, 1998b).

#### **D.1.5. Environmental Limitations on Site Development**

Environmental conditions that may affect development of the Impound Lot/Former Irving Avenue Dump portion of the *Site* include the presence of soil and groundwater contamination, and the inclusion of the Irving Avenue Dump portion of the *Site* within the Minnesota Superfund Permanent List of Priorities program.

Soil sampling and analysis has indicated that concentrations of PAHs and heavy metals exist, which may be considered hazardous. Soils excavated at the Impound Lot/Former Irving Avenue Dump portion of the *Site* would have to be managed in accordance with state and federal regulations. Excavated soils that contain regulated concentrations of contaminants would have to properly managed on site, treated and disposed off site, or disposed in a hazardous waste landfill.

If dewatering during development activities is necessary, the resulting water generated would likely be contaminated and would likely require special treatment and permitting to allow extraction and disposal.

Because the Irving Avenue Dump portion of the *Site* is listed as a Minnesota Superfund site, future uses of this portion of the *Site* may be limited due to constraints imposed by the final MPCA-approved remedy chosen and implemented. Based upon our review of documents concerning the Impound Lot/Former Irving Avenue Dump portion of the *Site* and a conversation on March 2, 2000 with Mr. Frederick Campbell at the MPCA, future activities concerning the Former Irving Avenue Dump Site will likely include:

- The site is currently within the process of being delisted (removed from the Superfund Permanent List of Priorities); however, it will not be ready for the delisting event, which will take place in the spring of 2000. A Minnesota Decision Document (MDD) has not yet been issued.
- Contaminant concentrations present in the groundwater seeps located along the southern bank of Bassett Creek exceed the Class 2A surface water quality standards, but the creek has enough flow to allow for adequate dilution. Active remediation of the seeps will likely not be required; however, Hennepin County will implement a phytoremediation pilot project at the seeps.
- The final remedy for the Former Irving Avenue Dump Site will likely include a restrictive covenant placed on the deed, which will concern future actions to be taken if site soils are disturbed during construction or other intrusive activities.
- Currently, there is a temporary crushed asphalt surface at Impound Lot 2. Impound Lot 2 was constructed over the consolidated lead-impacted soils generated during the U.S. COE Bassett Creek channel work. Capping of this area with a bituminous surface is planned by the City of Minneapolis Department of Public Works; however, this work will not be completed until the future use of the site is determined.

- Depending on the future use of the Former Irving Avenue Dump Site, fencing of the entire site may be required.
- The future actions with respect to groundwater contamination at this portion of the *Site* will likely consist of a long-term groundwater monitoring program.
- With respect to possible future development scenarios at this portion of the *Site*, potential exposure to contaminated soils will be the main environmental issue.

## D.2. Linden Yard

### D.2.1. Summary of Geotechnical Information

Braun Intertec performed a preliminary geotechnical evaluation and a preliminary Phase II environmental site assessment (ESA) of the Linden Yard portion of the *Site* in 1998. Nine standard penetration test borings were performed throughout the property. Five of the borings were taken to a depth of 120 feet below existing grade. Four of the borings, in the northeast corner of the property, were taken to depths of 23 to 38 feet below existing grade. The soil borings encountered four distinct strata: fill, swamp deposits, alluvial deposits and glacial deposits. The approximate boring locations are shown on Sheet 1 in Appendix A (Braun Intertec, 1998b).

The borings encountered 11 to 37 feet of fill and possible fill consisting of sands with various amounts of silts and clays. Debris such as plastic, cinders, bituminous, wood, brick, limestone and concrete were encountered in the fill. Some of the fill was also organic. The penetration resistances of the fill encountered varied from 2 to 29 blows per foot (BPF), indicating that the fill was most likely placed in an uncontrolled manner (Braun Intertec, 1998b).

Swamp deposits consisting of organic clays and peat were encountered at Borings ST-5 and ST-6 below the fill to depths of 22 to 24 feet below the surface. The penetration resistances of the organic clays and peat varied from 3 to 4 BPF. These soils are soft, but are relatively consolidated in comparison to most organic soils due to the fill that was located on top of them. It is also likely that much of the site contained swamp deposits at one time, which may have been removed or have been significantly consolidated by the fill. It is possible that small or compressed organic deposits were not encountered at the other boring locations due to the normal vertical spacing of sampling (Braun Intertec, 1998b).

Alluvial deposits consisting of sands with various amounts of silts and clays were encountered from 11 to 64 feet below the surface at the boring locations. The penetration resistances of the sands encountered varied from 4 to 22 BPF, indicating those soils were very loose to medium dense. The penetration resistances of the alluvial clays encountered varied from 4 to 7 BPF, indicating those soils were rather soft to medium (Braun Intertec, 1998b).

Below the strata mentioned above, the borings encountered glacial deposits to their termination depths. These soils typically consisted of sands with various amounts of silt, and clays with various

amounts of sand. The penetration resistances of the glacial sands encountered varied from 7 to 30 BPF, indicating those soils were loose to medium dense. The penetration resistances of the clay glacial soils encountered varied from 3 to 28 BPF, indicating those soils were soft to very stiff (Braun Intertec, 1998b).

Groundwater was typically encountered at 11 to 14 feet below the surface at the boring locations. Groundwater was usually encountered wherever organic soils were encountered. It is possible that the water table has been drawn down due to construction of drainage systems such as the Bassett Creek drainage system consisting of a covered box culvert or due to other grading that has occurred around this particular property (Braun Intertec, 1998b).

It is not anticipated that groundwater will affect construction due to the anticipated deep foundation systems of new structures. However, due to the large area of the Linden Yard portion of the *Site*, it may be prudent to place several piezometers throughout the site to monitor groundwater fluctuations. Fluctuations in the groundwater level after construction could have significant effects on fill and structures because groundwater can affect foundation systems and cause consolidation of soils. It may be prudent to perform a large-scale hydraulic survey based on the scope of any proposed construction. Seasonal and annual fluctuations in the groundwater levels should be anticipated (Braun Intertec, 1998b).

As part of a preliminary geotechnical and limited environmental assessment for a proposed roadway and bridge across the *Site*, which would connect the southern end of Girard Avenue North to the northern end of Dunwoody Boulevard, Braun Intertec performed seven standard penetration test borings in January 1999. Two of the seven borings, ST-1 and ST-2, were performed on the Linden Yard portion of the *Site*. The approximate boring locations are shown on Sheet 1 in Appendix A (Braun Intertec, 1999).

Borings ST-1 and ST-2 were advanced to 12.3 and 24.5 m, respectively. Both of the borings encountered fill underlain by organic soils (swamp deposits). Both of the borings then encountered strata of silty sands and fat clay. The fill layer was generally a silty sand or clayey sand. Some organic soils and rubble consisting of wood, cinders and brick were encountered within the fill at ST-2. Fill depths were 3.7 and 3.8 m at Borings ST-1 and ST-2, respectively. The fill had N values (blows required to drive the sampler 0.3 m) ranging from 4 to 9 (Braun Intertec, 1999).

A thin stratum of fibrous peat swamp deposits was encountered below the fill in boring ST-2. Both of the borings encountered a stratum of organic silt swamp deposits with some shells below the fill and peat. This stratum was thinnest (1.2 m) at the southerly boring, ST-1, and was 5.2 m thick at ST-2. In the organic silts the N values ranged from 1 to 2 indicating the very soft to soft nature of this stratum. Laboratory tests indicated the moisture contents of the organic silt samples from ST-2 ranged from 148 to 80 percent. Organic contents of the organic silt samples from ST-2 ranged from 4 to 7 percent (Braun Intertec, 1999).

Both borings encountered a stratum of silty sand alluvium below the organic silt. The stratum was about 5.2 and 3.0 m thick in borings ST-1 and ST-2, respectively. The silty sands had N values ranging from 8 to 15 indicating loose to medium dense conditions. Both borings terminated in strata of fat clay lacustrine deposits. The N values of the fat clays varied from 6 to 14 indicating a medium to stiff consistency. Water was not observed in the auger while drilling the borings. The need to grout the bore holes prevented further water level readings (Braun Intertec, 1999).

#### **D.2.2. Geotechnical Limitations on Site Development**

In general, the soil conditions were worse in the western two-thirds of the Linden Yard portion of the *Site* where borings ST-1 through ST-3, and ST-5 through ST-6 were performed. At these locations, the fill, swamp deposits and alluvial soils were quite deep. The best soil conditions were encountered at borings ST-7 through ST-10, located in the northeast corner of the Linden Yard portion of the *Site*. The results of these borings are consistent with previous soil borings and geotechnical data collected in this area (Braun Intertec, 1998b).

The existing fill, swamp deposit and most of the alluvial soils at the Linden Yard portion of the *Site* are typically not suitable to support single- or multi-level structures designed based on a typical shallow foundation system. Because these deposits are so deep, deep foundation systems will most likely be required for new buildings in these areas. Utilities will also most likely need to be placed on piles to prevent excessive movement of the utilities that would cause them to fail (Braun Intertec, 1998b).

The potential exception to this the very northeast corner of the Linden Yard portion of the *Site* where borings ST-7 through ST-10 were performed. The soils in this area could potentially be corrected so that a shallow foundation system could be used. A fairly significant soil correction would need to be made. However, additional deep borings would be needed in this area to further define this potential. It appears the box culvert containing Bassett Creek is buried within the northeast corner of the Linden Yard portion of the *Site*. If development of this area is proposed, the U.S. COE should be contacted to review the location of the culvert and to review the implications of constructing near the culvert (Braun Intertec, 1998b).

New fill placed on the site will most likely consolidate the soft underlying clays and the existing fill soils may also realize some additional settlement. For that reason, it is anticipated that differential settlement will occur between the buildings and the utilities, exterior slabs and pavements that are not supported on a deep foundation system. If not more than 1 foot of new fill is placed on the site, the differential settlement should be minimal and on the order of a few inches (Braun Intertec, 1998b).

Additional debris could be encountered during construction such as foundations, basement slabs and floor slabs from previous structures that were located on the Linden Yard portion of the *Site*. It is known that a structure was located near the locations of borings ST-7 through ST-10. Other structures could also have been located on this site (Braun Intertec, 1998b).

### **D.2.3. Summary of Environmental Information**

Braun Intertec performed a preliminary geotechnical evaluation and a preliminary Phase II ESA of the Linden Yard portion of the *Site* in 1998. The objective of the Phase II ESA was to evaluate whether the soils and/or groundwater in this portion of the *Site* were adversely impacted by the recognized environmental conditions outlined in the Phase I ESA performed by Braun Intertec in 1998. Nine standard penetration test borings were performed throughout the property. The results of this Phase II ESA indicate that all parameters detected in the soil samples were below the applicable MPCA residential SRVs and no RCRA metals were detected at concentrations above naturally-occurring background levels. Also, none of the groundwater samples that were analyzed had concentrations greater than or equal to the laboratory method detection limits for DROs, GROs, VOCs included in the MDH 465E list of parameters, PAHs, MDA List 1 and 2 pesticides and organophosphorous pesticides. The groundwater samples did contain concentrations of RCRA metals that exceeded applicable HRLs or MCLs. However, this is likely due to the presence of fine sediments within the groundwater sample. The concentrations of RCRA metals in groundwater could be more accurately evaluated by installing permanent groundwater monitoring wells, data from which can be used to obtain MPCA liability assurances related to chemical releases (Braun Intertec, 1998b).

Suspected asbestos-containing materials (ACM) were observed in site debris. Positive identification of this material as ACM has yet to be determined. Sampling and microscopic analysis of these materials would be necessary in order to determine the actual asbestos content (Braun Intertec, 1998b).

As part of a preliminary geotechnical and limited environmental assessment for a proposed roadway and bridge across the *Site*, which would connect the southern end of Girard Avenue North to the northern end of Dunwoody Boulevard, Braun Intertec performed seven standard penetration test borings in January 1999. Two of the seven borings, ST-1 and ST-2, were performed on the Linden Yard portion of the *Site*. Soil samples obtained during drilling were observed for the presence of visual and olfactory evidence of contamination and screened for the presence of organic vapors with a photoionization detector (PID) equipped with a 10.6 eV lamp. No visible discoloration, odors, or elevated PID readings were detected in the borings (Braun Intertec, 1999).

### **D.2.4. Environmental Limitations on Site Development**

Based upon limited information obtained and reviewed by Braun Intertec, there does not appear to be significant recognized environmental contaminant conditions that would impose limitations on development of the Linden Yard portion of the *Site*. However, additional Phase II ESA work may be warranted at the Linden Yard portion of the *Site*. The coverage provided by the limited Phase II ESA performed in 1998 has too many gaps between the borings for such a large site. Further evaluation of the suspected ACM is also warranted.

## **E. Future Development Scenarios for the *Site***

At the request of the MCDA, Braun Intertec cursorily evaluated the recognized environmental and geotechnical implications of potential future development scenarios for the Impound Lot/Former Irving Avenue Dump and Linden Yard portions of the *Site*. The following four potential scenarios were briefly evaluated: continue to utilize the *Site* for its present uses, develop the *Site* for light industrial uses, utilize the *Site* as green space, and develop the *Site* for residential uses.

### **E.1. Present Use Scenario**

Under this scenario, the Impound Lot/Former Irving Avenue Dump portion of the *Site* would continue to be utilized as an Impound Lot and soils stockpile/staging area. MPCA Industrial SRVs would apply to soil in this portion of the *Site*. The MPCA has indicated that Impound Lot 2, which overlies a portion of the consolidated, lead-impacted spoils generated by the U.S. COE during the Bassett Creek flood control project, will need to be capped with an impervious paved surface. If other portions of the Former Irving Avenue Dump Site are to be used for vehicle storage they also should be paved to prevent potential human exposure to soil contaminants and limit leaching of the soil contaminants.

Portions of the Former Irving Avenue Dump Site that may be used for material stockpiling and staging should be paved to prevent underlying, potentially contaminated soils from being inadvertently excavated during stockpile removal, etc.

To restrict public access to this portion of the *Site* and reduce the potential for public exposure to soil contaminants, the remainder of the Former Irving Avenue Dump portion of the *Site* should be fenced to restrict access. If the remainder of this portion of the *Site* will not be enclosed by fencing, consideration should be given to placing a clean fill/soil cover over the unpaved portions of the *Site*. The required thickness of a clean fill/soil cover would most likely be a minimum of 2 feet.

The MPCA has indicated that a long-term groundwater monitoring program likely will be required at the Former Irving Avenue Dump portion of the *Site*. As part of the final remedy for this portion of the *Site*, the MPCA likely will require a restrictive covenant placed on the deed, which will concern future actions to be taken if soils are disturbed during construction or other intrusive activities.

Under this scenario, the Linden Yard portion of the *Site* would continue to be utilized as a construction materials storage, equipment storage and soil/gravel/concrete rubble stockpile site. Evaluation of the suspected ACM would be warranted. In our opinion, there does not appear to be any other future environmental or geotechnical implications associated with the present use of this portion of the *Site*.

### **E.2. Light Industrial Use Scenario**

Under this scenario, the Impound Lot/Former Irving Avenue Dump portion of the *Site* would be developed for light industrial usage. MPCA Industrial SRVs would apply to soil in this portion of

the *Site*. Contaminated soils excavated during construction, including the lead-contaminated tunnel spoil pile, would either have to be reused on the *Site* (with MPCA approval), treated and disposed of off site, or directly disposed of off site at an appropriately permitted facility. The concentration of leachable lead in the soil in portions of the Impound Lot/Former Irving Avenue Dump Site have been characterized as being a hazardous waste and would likely have to be handled and disposed of as such. Earthwork at the *Site* would require the use of 40-hour HAZWOPER-trained workers.

The MPCA has indicated that a long-term groundwater monitoring program likely will be required at the Former Irving Avenue Dump portion of the *Site*. As part of the final remedy for this portion of the *Site*, the MPCA likely will require a restrictive covenant placed on the deed, which will concern future actions to be taken if soils are disturbed during construction or other intrusive activities.

A large portion of the Former Irving Avenue Dump Site resides within the 100-year floodplain of Bassett Creek, which may pose limitations on development. City of Minneapolis floodplain regulations may require that development not decrease the 100-year flood storage on this portion of the *Site*.

Due to geotechnically poor soil conditions at the Impound Lot/Former Irving Avenue Dump portion of the *Site*, deep pilings would most likely be required for support of buildings and utilities.

Under this scenario, the Linden Yard portion of the *Site* would be developed for light industrial usage. Additional Phase II ESA work would be warranted to further define the identified environmental conditions of this portion of the *Site*. Evaluation of the suspected ACM also would be warranted. Due to geotechnically poor soil conditions at this portion of the *Site*, deep pilings also would be required for support of buildings and utilities, except for the northeastern-most portion of the Linden Yards parcel, where shallow foundations may be possible after rather extensive geotechnical soil correction.

### **E.3. Green Space Use Scenario**

Under this scenario, the Impound Lot/Former Irving Avenue Dump portion of the *Site* would be utilized as green space. If accessible to the public, MPCA Residential SRVs likely would apply to soil in this portion of the *Site*. For example, the MPCA likely would require that the lead-impacted spoils generated by the U.S. COE during the Bassett Creek flood control project at least be capped with an engineered soil cover or pavement.

To restrict public access and reduce the potential for public exposure to soil contaminants, the Former Irving Avenue Dump Site should be fenced to restrict access. If accessible to the public, a clean fill/soil cover should be placed over the unpaved portions of the Former Irving Avenue Dump Site. The required thickness of a clean fill/soil cover would most likely be a minimum of 2 feet. In addition, the seeps from the Former Irving Avenue Dump Site into Bassett Creek should be intercepted and managed with engineering controls or at least restricted from public access.

The MPCA has indicated that a long-term groundwater monitoring program will likely be required at the Former Irving Avenue Dump portion of the *Site*. As part of the final remedy for this portion of the *Site*, the MPCA likely will require a restrictive covenant placed on the deed, which will concern future actions to be taken if soils are disturbed during construction or other intrusive activities.

Under this scenario, the Linden Yard portion of the *Site* would be utilized as green space. Additional Phase II ESA work would be warranted to further define the identified environmental conditions. Evaluation of the suspected ACM also would be warranted.

#### **E.4. Residential Use Scenario**

Under this scenario, the Impound Lot/Formal Irving Avenue Dump portion of the *Site* would be developed for residential usage. MPCA Residential SRVs would apply to soil in this portion of the *Site*. The MPCA likely would not allow residential development with hazardous concentrations of any contaminants in soil. Removal of all soil exhibiting hazardous concentrations of contaminants from the Former Irving Avenue Dump portion of the *Site* would not be technically or economically feasible.

The MPCA has indicated that a long-term groundwater monitoring program likely will be required at the Former Irving Avenue Dump portion of the *Site*. As part of the final remedy for this portion of the *Site*, the MPCA likely will require a restrictive covenant placed on the deed, which will concern future actions to be taken if soils are disturbed during construction or other intrusive activities.

A large portion of the Former Irving Avenue Dump Site resides within the 100-year floodplain of Bassett Creek, which may pose limitations on development. City of Minneapolis floodplain regulations may require that development not decrease the 100-year flood storage on this portion of the *Site*.

Due to geotechnically poor soil conditions at the Impound Lot/Formal Irving Avenue Dump portion of the *Site*, deep pilings would most likely be required for support of buildings and utilities. The expense of deep foundation systems may be cost-prohibitive for single-family and low-rise residential buildings.

Under this scenario, the Linden Yard portion of the *Site* would be developed for residential usage. Additional Phase II ESA work would be warranted to further define the identified environmental conditions of this portion of the *Site*. Evaluation of the suspected ACM also would be warranted. Due to geotechnically poor soil conditions at this portion of the *Site*, deep pilings also would be required for support of buildings and utilities, except for the northeastern-most portion of this parcel, where shallow foundations may be possible after rather extensive geotechnical soil correction.

## F. General

In performing its services, Braun Intertec uses that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession practicing in the same locality. No other warranty is made or intended.

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