Health Consultation

EXCELSIOR PARKLAND DUMP

CITY OF EXCELSIOR, HENNEPIN COUNTY, MINNESOTA

Prepared by the
Minnesota Department of Health

JULY 29, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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FOREWORD

This document summarizes public health concerns at a contamination 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 Street 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.html

Executive Summary

INTRODUCTION	The Minnesota Department of Health's (MDH) mission is to protect, maintain, and improve the health of all Minnesotans. For communities living near state or federal Superfund sites or other contaminated sites, MDH's goal is to protect people's health by providing health information the community needs to take actions to protect their health. MDH also evaluates environmental data, and advises MPCA and local governments on actions that can be taken to protect public health. The Excelsior Parkland Dump is a typical small dump. This document is based on limited historical information and environmental investigations conducted at the site. The site is covered (in some places poorly) and graded, but minor physical hazards remain along the exposed southern edge of the site and in Studer Pond. PAHs have been detected at levels of health concern in the soil in and around the community garden. Exposure to PAHs and contact with physical hazards represent the only identified exposure pathways of health concern. Residual petroleum products and PAHs have impacted the groundwater on site at low levels. Methane gas and VOCs in soil vapor appear to have been successfully mitigated by the installation of a passive vapor trench. Investigation of the potential impact of the site on Studer Pond is needed.
OVERVIEW	MDH reached four important conclusions in this Health Consultation.
CONCLUSION 1	MDH concludes that exposure to PAHs in soil and contact with physical hazards on the site will not harm people's health.
BASIS FOR DECISION	Physical hazards at the site are relatively minor, and the areas where PAHs exceed levels of health concern are small. The community garden has been suspended for 2010, and areas where PAH contamination and physical hazards are present will be removed and/or covered with clean fill, preventing people from coming into contact with contaminated soil.
NEXT STEPS	Local government should ensure the soil cleanup takes place and should take steps to ensure that any future use continues to prevent access to buried contaminated soils.
CONCLUSION 2	MDH concludes that low levels of contaminants in groundwater at the site will not harm people's health.
BASIS FOR DECISION	The groundwater contamination is unlikely to be extensive and has not impacted nearby drinking water wells.
CONCLUSION 3	MDH concludes that exposure to methane and VOCs in soil vapor is not expected to harm people's health.
BASIS FOR DECISION	The installation of a passive vapor trench provides a "path of least resistance" for soil vapor to vent safely to the air.
NEXT STEPS	Continued monitoring of the performance of the trench is needed.
CONCLUSION 4	MDH cannot currently conclude whether exposure to surface water or sediments in Studer Pond could harm people's health.
BASIS FOR DECISION	No surface water or sediment samples have been collected in Studer Pond.
NEXT STEPS	Surface water and sediment samples should be collected in the pond.

FOR MORE INFORMATION	If you have concerns about your health, you should contact your health care provider. You may also call MDH at 651-201-4897 or 1-800-657-3908 (press #4). You may also visit our MDH Web site at http://www.health.state.mn.us/divs/eh/hazardous/topics/ .

I. 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 Excelsior Parkland Dump, located in the City of Excelsior, Hennepin County, Minnesota (the site). The site is enrolled in the MPCA's Voluntary Investigation and Cleanup (VIC) Program (VP24230). This health consultation is based on a site visit conducted by MDH staff on April 22, 2009, and on information provided to MDH by the MPCA, Hennepin County Environmental Services, and the City of Excelsior and its environmental consultant, Barr Engineering (Barr; Barr 2007, Barr 2008a, Barr 2008b, Barr 2009a, Barr 2009b).

The site is located at the southwest corner of the intersection of Oak Street and Beehrle Avenue in Excelsior, along its western boundary with the City of Shorewood, about 15 miles west of the City of Minneapolis. The dump itself is in a former marsh or wetland area that has been converted into parkland owned by the City of Excelsior. The site location is shown in Figure 1, and a site map is presented in Figure 2 (all figures for this report are adapted from Barr reports, and are found in Appendix 1). The dump area occupies approximately 5 acres; it is mostly covered with open grass, a walking path, a former seasonal hockey rink, and a community garden.

Wastes were dumped at the site primarily in the 1950s and 1960s; dump operations ended about 1970 when ownership was transferred to the City of Excelsior (Barr 2007). The dump primarily accepted mixed municipal wastes and general rubbish, and wastes were reportedly burned. Other wastes such as demolition wastes, appliances and auto parts have also been observed at the site. The area immediately surrounding the site is largely commercial, residential, and parkland. The nearest homes are located approximately ¼ mile to the south and north.

Only small amounts of waste are currently exposed at the surface of the dump as a result of erosion of the cover materials along the southern side of the park, on the bank of the pond (Studer Pond). The volumes of waste and fill at the site are difficult to estimate, as no records are available.

Geology/Hydrogeology

Available geologic information provided by Barr indicates that surface soils at the site consist of one to four feet of silty sand, gravel, and sandy clay lying over waste materials (Barr 2008a, Barr 2009). Soil borings and test trenches dug at the site confirmed the presence of waste materials (primarily ash, glass, metal, and asphalt) at depths of up to 16-18 feet. In one boring drilled through the waste, clay soils were found below the fill to a depth of 47 feet below ground. The locations of the test trenches and borings are illustrated in Figure 2.

Surficial groundwater was encountered at a depth of 8 feet below ground in the borings drilled by Barr for installation of monitoring wells at the site. Waste materials are present in some areas below the surficial water table. The surficial groundwater appears to flow north towards Lake Minnetonka (visible in Figure 1), based on data from on-site monitoring wells. The uppermost bedrock aquifer is the Prairie du Chien limestone, which occurs at depths of approximately 250 to 300 feet below grade according to nearby well logs. The thick clay layer below the waste should inhibit the migration of contaminants in the dump and surficial groundwater to lower groundwater aquifers.

Site Visit

On April 22, 2009, MDH staff conducted a site visit at the Excelsior Parkland Dump, located southwest of the intersection of Oak Street and Beehrle Avenue in Excelsior. The weather was sunny and mild. During the site visit, MDH staff met City of Excelsior Public Works staff to discuss the site features. The site is located across the street from the City of Excelsior Public Works facility, which includes a standpipe and two city wells. A sign marks the entrance to the park. A number of photographs were taken.

The site is a city park, a mostly flat, open grassy area with few shrubs or trees. The center of the park has been graded and was used for a hockey rink in the winter months. In some areas (especially the east end of the park) the grass cover is poor, with many bare spots. On the south side, the flat area slopes down to a worn asphalt path that runs along the south side of the park, near the pond that borders the park to the south and east. A gazebo is located in the eastern end of the park, and is the only structure present. The site is bordered to the north by Oak Street, and two businesses: an animal hospital and an auto body shop. The two businesses do not have basements, and would therefore be at limited risk for methane or vapor intrusion. To the west is a treeline, and beyond that is a retail plant nursery (that also lacks a basement) that is mostly open space with low wooden racks for holding plant containers.

The west end of the park is occupied by a community garden. This area appears elevated from the rest of the park – at least six inches from the main portion of the park, and 1-2 feet from the property to the west. It is apparent that clean fill and compost were brought in for the garden; this was corroborated by the city staff. The soil appeared clean and black, with no evidence of wastes or debris. A local citizen was planting vegetables during the site visit, and indicated he had never seen any evidence of wastes or other materials in the garden, even when tilling, and that plants grew well. Thirty garden plots are rented out yearly by the city. Three city water taps are located in the garden area for watering crops. A manhole cover is located next to the garden; upon removal it appeared to access a stormwater conveyance pipe. A ladder led down a shaft approximately six feet to a water-filled area. Local stormwater appears to drain to the pond on the south side of the site.

Refuse is visibly protruding from the pond bank that forms the southern edge of the dump. The refuse includes concrete and asphalt, and metal debris such as containers, appliances, and possibly auto parts. Refuse was also visible in the pond itself. The bank appears to be unstable, and crumbling in spots. Four permanent monitoring wells are visible on the site, as well as the locations where test trenches were excavated. Next to monitoring well MW-103, ash and metal debris were visible on the ground surface from the construction of the well.

In the area of the former hockey rink, a large pile of soil with small amounts of debris (bricks) was observed. The soil pile was on plastic, and a silt fence was present to prevent soil from eroding into the pond. According to city staff, the soil was from the demolition of an old house, is not known to be contaminated, and could be used as additional cover material for the site.

Since the date of the site visit, a soil vapor mitigation trench has been installed along the north edge of the park, the community gardens have been closed, and additional work has been done to investigate and clean up the site. These activities are described further below.

Site Investigations

Six test trenches dug at the site in 1996 for geotechnical (construction) purposes identified fill and waste materials (Barr 2007). In 2002, eight soil borings for geotechnical purposes were advanced by STS at the site by use of a hollow-stem auger. The borings encountered a layer of sand to silty clay cover soils overlying up to 17.5 feet of fill and waste materials. This layer in turn overlies native organic silts and outwash sands. Solid wastes encountered included wood, metal, concrete, coal cinders, plastic, and glass. Organic vapor measurements were collected by use of a photo ionization detector (PID) during drilling. Organic vapors were found above a concentration of 5 PID units, which is considered a background level, in only one boring. The organic vapor concentration in this boring was 8 PID units, and was found at a depth of 2.5 to 7.5 feet below grade. Methane gas was also measured using a different meter, but it was not detected in any of the borings. Methane gas cannot be detected using a PID.

Environmental site investigations were initiated by Hennepin County and the City of Excelsior in 2008. The initial on-site investigation consisted of two soil borings, seven test trenches, four near-surface composite soil samples, and ten Geoprobe soil gas sampling probe locations (Barr 2008a). The sample locations are shown in Figure 2. The results of this and later supplemental investigations are discussed individually by media.

Soil

For the first investigation the site was divided into four quadrants. Composite near-surface soil samples (0 to 4 feet in depth) were collected from the test trenches and sampling points identified in each quadrant as shown in Figure 2, with one duplicate. The samples were analyzed for metals, polyaromatic hydrocarbons (PAHs, a class of semi-volatile organic compounds or SVOCs), and dioxins/furans. Three shallow (0 to 1 foot in depth) grab soil samples from the test trenches were also analyzed for volatile organic compounds (VOCs); no VOCs were detected. Several metals, PAHs, and dioxins/furans were detected in the composite soil samples, however. Levels of contaminants exceeded the applicable MPCA soil screening criteria for the protection of human health in three of the composite samples, with different contaminants exceeding the criteria in different quadrants. These criteria are known as Soil Reference Values (SRVs; MPCA 2009). An SRV represents the concentration of a contaminant in soil below which normal dermal contact, inhalation of dust, and/or incidental ingestion does not represent a human health risk. Because the site is located in a park, the SRVs for recreational land use were used for comparison. The surface soil analytical results (only selected SVOCs/PAHs are shown) are presented in Table 1 (tables can be found in Appendix 2). Also shown in Table 1 are MPCA Soil Leaching Values (SLVs). SLVs represent the concentration of a contaminant in soil above which the contaminant could leach into the groundwater at levels in excess of drinking water standards.

Eight samples (plus one duplicate) of soil/waste materials from individual test trenches were collected from depths of 4 to 14 feet below grade. The samples were analyzed for metals, PAHs, VOCs, and dioxins/furans. Only one VOC, naphthalene, was detected in subsurface soil, at levels less than one milligram per kilogram (mg/kg, or part per million (ppm)). Metals, PAHs, and dioxins/furans were commonly detected, and levels of each exceeded SRVs and/or SLVs in multiple samples. The exceedances (of SRVs) are shown in Figure 3; SLVs are listed in Table 1.

Because of the detections of elevated levels of PAHs in the composite soil samples from the community garden area (quadrant 1) of the site, in late 2008 the MPCA requested that additional surface soil samples from the garden be collected for chemical analysis (Barr 2009a). Samples were collected from the surface to a depth of 1.5 feet using a hand auger. The sample locations were determined by separating the garden area into four sub-quadrants (NW, NE, SW, and SE). Four discrete samples were collected and combined to form a composite sample from each quadrant for analysis for metals, PAHs, and dioxins/furans. A separate grab sample was also collected for VOC analysis from each quadrant. The sample locations are shown in Figure 4; the results are shown in Table 2.

Only one sample result from the community garden area (from the SE quadrant composite sample) met or slightly exceeded the appropriate MPCA recreational SRV. The sample result for total PAHs expressed as benzo(a)pyrene (BaP) equivalents was 2.2 mg/kg; the SRV is 2 mg/kg. No VOCs were detected in the grab samples, and levels of metals, dioxins/furans, and other PAHs were relatively low. Note that the SRVs do not take into account uptake of contaminants by plants.

To better characterize the distribution of metals and other contaminants in the surface and near-surface soil at the site in 2009 the MPCA requested that additional soil samples be collected for analysis (Barr 2009b). The samples results were also intended to help guide the development of a site remediation plan. The work included the collection of the following soil samples:

- Quadrant 1: Three composite soil samples from three depths (0-1, 1-2, and 2-3 feet) were collected from outside the community garden area and analyzed for PAHs.
- Quadrant 2: No samples were collected; previous work had not identified SRV exceedances.
- Quadrant 3: Three composite soil samples from three depths (0-1, 1-2, and 2-3 feet) were taken and analyzed for dioxins/furans.
- Quadrant 4: This quadrant was divided into eight subareas. Two grab samples were collected from each subarea (0-1 and 1-2 foot depth). Each of the eight subarea grab samples was analyzed for metals. Remaining soil from the 1-2 foot depth interval was analyzed for PAHs and dioxin/furans. For these analyses, two subarea samples were composited based on their location, resulting in four composite samples. The subarea samples that were composited were: 1 & 4, 2 & 5, 3 & 6, and 7 & 8.

The sample locations are shown in Figure 5; the data are presented in Tables 3a-3e. The results of the quadrant 1 soil sample analyses for PAHs showed that BaP equivalents ranged from 11-15 mg/kg, which exceeds the recreational SRV for BaP of 2 mg/kg (note: non-detect values were estimated at ½ the method detection limit, a conservative, health-protective approach). In quadrant 3, concentrations of dioxins/furans from the soil samples collected from the 0-1 foot and 1-2 foot depth intervals were below the recreational SRV for dioxins/furans (based on a calculation of 2,3,7,8-TCDD toxicity equivalency factors, or TCDD-TEQs) of 25 nanograms per kilogram (ng/kg, or part per trillion (ppt)). The TCDD-TEQ concentration of the soil sample collected from the 2-3 foot depth (30 ng/kg) slightly exceeded the recreational SRV.

In quadrant 4, concentrations of metals in each of the grab soil samples collected from the 0-1 foot depth interval were below recreational SRVs for metals (Table 3c). In the soil samples collected from the 1-2 foot interval in subareas 2, 3, 4, and 5, lead concentrations exceeded the recreational SRV (Table 3d). In subarea 2, the lead concentration at 1-2 feet was 7,300 mg/kg. Another sample (grab 5) also had levels of antimony and copper that also exceeded the SRV.

Concentrations of PAHs in the four composite soil samples from the 1-2 foot interval exceeded the recreational SRV for BaP when non-detect values were calculated using ½ the method detection limit (Table 3e). Dioxin/furans in these composite soil samples were below the recreational SRV for dioxin/furans.

<u>Groundwater</u>

During the initial 2008 environmental investigation, two groundwater samples were collected from the bottom of test trenches TT-1/2 and TT-7 using a pump. The samples were analyzed for metals and VOCs. Low levels of metals, including arsenic, chromium, lead, nickel, selenium, silver, thallium, and zinc were detected in the samples, which were not filtered. The concentration of thallium in TT-1/2 (8.7 micrograms per liter, ug/L) exceeded the MDH Health Risk Limits (HRL) for groundwater of 0.6 ug/L. The HRL represents the level of a contaminant in groundwater that MDH considers safe for daily human consumption over a lifetime. Two VOCs were detected in the groundwater sample from TT-7. Acetone was detected at a concentration of 23 ug/L, and naphthalene was detected at a concentration of 15 ug/L. Both concentrations were well below the MDH HRLs of 700 ug/L and 300 ug/L, respectively.

The second phase of site investigation included the installation of four permanent monitoring wells at the site and one up-gradient monitoring well with a hollow stem auger drill rig (Barr 2009a). Four of the wells (MW-101, MW-102, MW-103, and MW-104) were installed as shallow water table wells; one deeper well (MW-201) was installed to a depth of 50 feet to monitor deeper groundwater conditions below the waste at the site. The off-site well (MW-104) was installed northwest of Oak Street along a trail owned by the Hennepin County Regional Rail Authority. The well locations are shown in Figure 6.

Groundwater samples were collected from the monitoring wells in March 2009. However, no sample was collected from the upgradient well, MW-104, because it did not contain enough water for sampling. The water samples (which were not filtered) were analyzed for metals, PAHs, VOCs, and dioxins/furans. The sample results (detects only for PAHs and VOCs) are shown in Table 4.

Low levels of several metals, PAHs, dioxins/furans, and primarily petroleum-related VOCs were detected in the groundwater samples. All of the groundwater sample results were below their respective HRLs, HBVs, or federal criteria for public water supplies known as Maximum Contaminant Levels (MCLs), with the exception of the sample from MW-101 which contained BaP at a concentration higher than the MCL and total BaP equivalents above the HBV. The other monitoring well samples (from MW-102, MW-103 and MW-201) did not contain detectable levels of BaP or the PAHs that are used to calculate BaP equivalents. However, the elevated detection limits for the samples and the calculation method used (reporting non-detects as ½ the detection limit) to report BaP equivalents resulted in apparent exceedances of the BaP HBV of 0.05 ug/L in all of the wells. Barr postulated that the amount of particulate matter in the samples may have contributed to the elevated detection limits and BaP results, as most PAHs are not very water soluble and tend to stick to particulate matter. Thus, the results may not accurately reflect groundwater conditions or groundwater quality as it leaves the site. Barr indicated that prior to collecting future groundwater samples, the monitoring wells would be purged more effectively to flush out particulate matter and allow for a more representative sample (Barr 2009a).

Groundwater samples were collected on a quarterly basis from the monitoring wells in June, October, and December 2009 (Barr 2010). The water samples were analyzed for metals, PAHs, and VOCs (dioxins/furans were included in the June samples). A more refined analytical technique was used to analyze for PAHs in order to improve the detection limits for the September and November samples. Samples were also collected in June from the two deep city wells located just to the north of the site and were analyzed for the same parameters. The two city wells are approximately 450 feet deep and are considered of low susceptibility to surficial contaminants by MDH due to their depth, construction, and the local geology (see http://mdh-agua.health.state.mn.us/swa/pdwgetpws.cfm)

In general, the monitoring well results for the second, third and fourth quarter monitoring events were consistent with or, more typically, lower than the March samples. The detection limits for metals were higher in some samples so direct comparisons for metals were difficult. The analytical detection limits for PAHs were lowered by at least a factor of ten, improving the accuracy of the calculation of BaP equivalents. The BaP result for MW-101 in the June sample (0.4 ug/L) exceeded the MCL; the BaP results for the September and November samples did not. In the other quarterly samples, only MW-201 had total BaP equivalents that exceeded the HBV (in the September and November samples). However, it was noted that these two samples were cloudy, indicating increased particulate matter that could be associated with elevated PAHs.

Very low levels of metals and dioxins/furans were detected in the two city wells, well below the applicable MCLs. No PAHs or VOCs were detected in the two Excelsior community wells.

Soil Vapor/Methane

In the initial environmental investigation at the site, two soil borings were advanced to eight feet in depth using direct-push methods to characterize soil and waste materials (Barr 2008a). During the advancement of the borings, soil gases including carbon monoxide, hydrogen sulfide, oxygen, and methane were field monitored using direct-reading instruments. In both borings, methane was found at levels above the site field action level of 10% of the lower explosive limit (LEL) of methane in air (5% by volume). As a result of the methane detections, soil borings for the characterization of soil and wastes were discontinued in favor of test trenches, which allow soil vapor to safely vent into the air.

Later during the initial environmental investigation at the site, ten dedicated soil vapor probes were advanced to 6-7 feet below grade to characterize soil vapor. The probe and sample locations are shown in Figure 2. Again, soil gases including carbon monoxide, hydrogen sulfide, oxygen, and methane were field monitored using direct-reading instruments. Four soil vapor samples (at SV-1, 2, 6, and 7) were also collected using stainless steel Summa canisters for analysis for VOCs using EPA Method TO-15 (Barr 2008a). Methane was detected in each of the borings, at levels up to 42.9 % by volume, well above the LEL of 5% by volume. The analysis of the soil vapor samples detected multiple VOCs. Data for methane and selected VOCs are presented in Table 5. Only one VOC, naphthalene, exceeded the appropriate MPCA screening value of 100x the industrial Intrusion Screening Value (ISV; MPCA 2009). The ISVs represent the concentration of a chemical in air that is safe based on lifetime chronic exposure. This screening value is the most applicable screening value for soil vapor samples collected at depth (and not beneath a building) at a non-residential site.

To further characterize soil vapors and methane gas at the site, in 2008 an additional 63 soil vapor probes were advanced (Barr 2008b). Soil vapors were again screened for carbon monoxide, hydrogen sulfide, oxygen, and methane using direct-reading instruments, and eleven soil vapor samples were collected using Summa canisters for VOC analysis. The soil vapor monitoring locations are shown in Figure 7, and the methane and VOC results are also shown in Table 5. Methane gas was detected at multiple locations at levels above 5% (the LEL, also shown in Figure 7), and as high as 70.1% in SV-56 at the northwest corner of the site. Multiple VOCs were also detected, all at levels below 100x the industrial ISVs.

Also in 2008, indoor air in a building located adjacent to site was screened for the presence of methane and organic vapors using field instruments (Barr 2008b). No methane or elevated organic vapors were detected.

<u>Response Actions</u>
To mitigate the potential risk to nearby buildings and users of the park posed by elevated levels of methane gas and potentially VOCs in soil vapor at the site, Hennepin County and the City of Excelsior, in consultation with the MPCA, proposed that a passive vapor trench be constructed (Barr 2008b). A passive vapor trench is intended to provide a “path of least resistance” to allow soil vapors to safely vent to the atmosphere and prevent them from building up below ground or in nearby structures. The MPCA approved the proposed mitigation by letter dated November 14, 2008.

The passive vapor trench was constructed in July 2009 (Barr 2009c). The location of the vapor venting trench at the site is shown in Figure 8. The trench is over 800 feet long, and was constructed by excavating a ditch about eight feet deep and backfilling it with six feet of coarse fill material (small rock or gravel) into which a horizontal, perforated pipe was placed. The trench was then covered with clean soil and seeded. Approximately every 25 feet a vertical two-inch slotted vent pipe was installed to the bottom of the coarse fill to allow soil vapor to vent to the air. The vent pipes extend approximately 27 inches above the ground, and are screened and capped to prevent water from entering and to protect the pipe from becoming obstructed by insects or tampering.

To monitor the performance of the passive vapor trench, seven permanent vapor monitoring points were installed near or just to the north of the trench. Their locations are shown in Figure 8. The locations were chosen in consultation with the MPCA and were intended to monitor conditions in areas that had previously shown elevated levels of methane. Samples were collected from the monitoring points immediately after construction of the trench, and after one, two, and four weeks. Additional samples were collected at two and four months post-construction. The vapor monitoring points were field-screened for methane and other indicator parameters, and samples were collected using Summa canisters for laboratory analysis for methane and VOCs. The 2009 results for methane and VOCs (selected detects only) are shown in Table 6.

Methane detections were sporadic and generally low, and there was good agreement between methane levels as measured using field screening and laboratory instruments. This indicates that the trench is effective. An exception is VM-7, which is located furthest away from the trench. Barr has speculated that the methane detections in VM-7 are related to residual organic materials from wetlands that were previously located in this area, and not related to the site or wastes. This contention is somewhat reinforced by the relatively lower levels of VOCs detected in VM-7. Low levels of VOCs were detected in each of the vapor monitoring points, and the levels have in general declined with each sample. None of the VOCs exceeded the applicable soil vapor screening level of 100x the industrial ISV, indicating minimal risk that VOCs are capable of migrating towards nearby structures.

Hennepin County and the City of Excelsior are proposing to mitigate soil contamination at the site in 2010 by excavating contaminated soils that exceed relevant screening criteria in parts of the site, and installing an improved soil cover (Barr 2009b). The work would involve excavation and off-site disposal of contaminated soil, and varying depths of clean fill to bring the site up to a consistent grade with a four foot thick clean soil cap. The final cleanup plans have been approved by the MPCA and bid specifications are in development.

II. Discussion

Unpermitted or abandoned solid waste dump sites may pose a potential human health risk when waste products or chemicals that were disposed at the site are present in exposed soil, groundwater, surface water, or air at levels of potential health concern. Waste materials in old dumps are often buried beneath a shallow layer of whatever type of soil was easily available at the time. Often, the cover materials are thin or absent in spots, exposing wastes and contaminants. There are also potential health risks when people are exposed to physical hazards such as sharp objects, debris, depressions, or holes that result from uneven settling, or steep grades that may result from improper closure or maintenance of the site. The dump located in the Excelsior Parkland Dump is typical of small dumps that operated in the 1950s and 1960s, and presents many of these hazards.

For actual health risks or adverse health effects to occur, the chemicals (or hazards) must be present and people must come into contact with them. In addition, the levels of contaminants or the degree of contact must be high enough that sufficient amounts of chemicals enter the body to produce an adverse effect. This concept is known as a completed exposure pathway. The remainder of this section will focus on evaluating media at the site (soil, groundwater, surface water/sediments, and soil vapor) to determine whether a completed exposure pathway exists.

<u>Potential for Human Exposure: Soil/Wastes/Physical Hazards</u>

Most of the Excelsior Parkland Dump site is covered with soil. Some areas are poorly vegetated, and erosion has exposed wastes along the southern edges of the dump next to the pond. Waste materials and ash can be observed in scattered areas throughout the park, with the exception of the community garden area. Debris such as scrap metal, concrete and asphalt, and appliances are visible along the bank and in Studer Pond; these minor physical hazards are a completed human exposure pathway.

The results of the initial laboratory analysis of surface soil samples showed elevated levels of metals (antimony, arsenic, copper, and lead) in quadrant 4, dioxins/furans (quadrant 3) and PAHs (quadrant 1) in open areas at the site. The concentration of contaminants exceeded the MPCA recreational SRVs for these contaminants. Follow-up investigations confirmed the presence of elevated levels of PAHs outside of the community garden in quadrant 1, and in one location in the community garden. However, levels of metals in excess of the SRV were not confirmed at the soil surface in quadrant 4, but were found at depth. Dioxins/furans in quadrant 3 were below the SRV at the surface, but were slightly higher at depth. Since these areas of the site are covered and at least partly vegetated, frequent or extensive exposure to contaminants below the surface is not expected.

It appears that contact with PAHs in surface soil on the western side of the park is the only completed exposure pathway at the site for surface soil. Exposure to levels of PAHs above the recreational SRVs could occur outside of the community garden area, and to a much lesser extent in the community garden area based on the result of one of four composite samples collected there (Table 2 and Figure 4). PAHs are ubiquitous in the environment, especially in urban areas, and concentrations of PAHs in soil similar to those detected at the site may not be uncommon (ATSDR 1995). Levels of BaP as high as 14 mg/kg have been reported in urban soils, and levels of other PAHs can range from 0.1 to 166 mg /kg (ATSDR 1995).

It can often be difficult to determine how often a park is used by individual people or groups; an exception to this is the community garden area, where the city rents out thirty garden plots to local residents. It is expected that these residents come to the site on a regular basis during the spring, summer and fall to prepare, plant, maintain, and harvest their garden plots.

PAHs tend to bind to soil particles, especially organic matter, and therefore tend to remain in soils and sediments. Early published studies suggested that PAHs are poorly taken up by terrestrial plants (ATSDR 1995). Because of their affinity for organic matter, however, PAHs can accumulate in aquatic and terrestrial organisms, and become concentrated as they move up the food chain (ATSDR 1995). This effect is somewhat balanced by the ability of many organisms, including plants, to metabolize or break down PAHs. In soil, microorganisms can also metabolize PAHs.

Environmental factors like soil nutrients, types of microbes present, and the properties and concentrations of PAHs present influence the extent and rate of decomposition and potential uptake (ATSDR 1995). More recent, detailed laboratory studies have shown that some PAHs may be taken up by plants, but that cellular metabolism and in some cases photolysis (break down induced by sunlight) reduce the concentrations relatively quickly (Wild et al 2007). When PAHs are detected in plant tissues, the source is usually from atmospheric deposition from air pollution. Other organic contaminants, such as dioxins/furans, are also poorly taken up by most plant species and atmospheric deposition is also expected to be the main source of contamination in plants (Zhang et al 2009).

Given the relatively low levels of contaminants found in the community garden area itself, and the amount of organic material that appears to have been added (which can inhibit the uptake of contaminants by plants), MDH concluded that for the 2009 season the benefits of gardening outweighed any potential health risk from using the garden to grow crops. To communicate this finding to local users and patrons of the garden, MDH developed a joint information sheet with the City of Excelsior (see Appendix 3). Data for the soils around the community garden were not available until later in 2009. However, guidance provided in the information sheet regarding steps that could be taken to limit incidental ingestion of and contact with soil would also be effective for reducing exposure to soil in areas of the park outside the community garden.

The information sheet also provided information on response actions at the site, and provided contact information if gardeners or resident had questions. The pending soil response actions at the site should further reduce the potential for incidental contact with surface contamination around the community garden. The continued addition of organic matter (in the form of compost or other natural fertilizers) to the garden by users should also help to inhibit the uptake of contaminants by garden plants.

MDH has been informed that the community garden is not open for the 2010 growing season, pending completion of the soil remediation project. In addition, consideration is being given to moving the community garden to another portion of the site, in a more open area that would receive more sun (Al Timm, MPCA, and Kevin Eisen, Barr, personal communications 2010).

Samples of the buried waste materials showed elevated concentrations of PAHs, dioxins/furans, and metals, with a concentration of lead at one location (Q4 1-2 Grab 2) of 7,300 mg/kg. People are unlikely to come into contact with the buried waste materials, however, unless the materials are excavated or disturbed. This type of activity should not be occurring on a regular basis, given the fact that the site is used as a public park. Workers who need to excavate at the site for utilities, landscaping, or other purposes should be notified of the presence of waste materials. A formal notice filed with the property deed would also alert any future landowners to the presence of a dump. To minimize the risk to future workers, and to reduce the leaching of contaminants to groundwater, “hot spot” removal of areas of high contamination such as the Q4 1-2 Grab 2 location should be done.

Potential for Human Exposure: Groundwater

The degradation of solid waste produces leachate when infiltrating water contacts the waste and dissolves chemicals from it. The SLVs measure the tendency of the waste materials or contaminated soil to produce contaminated leachate. Leachate may 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.

As described above, multiple contaminants were found in the waste materials at levels in excess of the SLVs. Arsenic, cadmium, chromium, nickel, and silver were found in groundwater at the site at low levels, indicating that they may be leaching from soils or waste into the groundwater. However, these metals are also common in natural, non-impacted soil and groundwater, and the low levels found do not eliminate the possibility that they are naturally occurring. Similar levels of metals were found in the two Excelsior community wells located to the north of the site, suggesting either a ubiquitous low level of groundwater contamination in the area, or that the metals are in fact naturally occurring.

PAHs are ubiquitous in urban environments from the use of fossil fuels, but tend to bind to particulate matter and are not very mobile in soil or groundwater (ATSDR 1995). Levels of BaP equivalents in excess of the MDH HBV were found in all five samples collected from beneath and around the site in the initial round of testing. Improved sampling and analytical techniques were used in subsequent sampling rounds, and in the most recent testing BaP equivalents exceeded the HBV in only one monitoring well, MW-101 at the northern edge of the site. Much lower levels were found in the other monitoring wells. While the levels are low, the consistent detections of PAHs in MW-101 suggest they are related to the presence of burned and buried wastes at the site. Very low levels of dioxins/furans (in the low ppt range) have been detected in the monitoring wells. The very low detection limits (parts per trillion) for dioxins/furans make it more difficult to conclude that they are related to the waste materials, as dioxins/furans are also relatively ubiquitous in the environment at very low levels (ATSDR 1998).

The data indicate that an area of groundwater contamination exists beneath and perhaps around the site. The full extent of the contamination in groundwater is not clear, because the scope of the investigation was limited to the area immediately on and around the dump. The main types of contaminants detected at levels of concern (i.e. metals, PAHs, and dioxins/furans) typically do not migrate great distances in groundwater, however. A well survey was conducted around the site, and no private wells were found within a 500 foot radius. In addition, the shallow groundwater likely discharges primarily into nearby wetlands/ponds and Lake Minnetonka.

It seems unlikely that the site contaminants have impacted the two Excelsior community wells or private wells in the area. The community wells are deemed by MDH to be of limited susceptibility to surficial contamination due to the local geology and their depth and construction. Therefore, exposure to site contaminants through consumption of contaminated groundwater does not appear to be occurring.

<u>Potential for Human Exposure: Surface Water and Sediment</u>

No samples of surface water or sediment in the pond adjacent to the site (Studer Pond) have been collected to date. Contaminants from the site may have entered the pond through the discharge of contaminated groundwater, or through runoff of rain and snow melt over exposed wastes or contaminated soil near the pond. Barr has recommended that surface water samples be collected from Studer Pond (Barr 2010). MDH cannot currently evaluate whether exposure to site contaminants could occur through contact with surface water or sediments.

<u>Potential for Human Exposure: Soil Vapor/Methane</u>

Organic waste materials in a dump (if it was not burned regularly) often degrade and generate methane and other gases. Low levels of chemical solvents may also be present in gas produced by old dumps from wastes disposed of at the site. Together, these gases are referred to as “landfill gases.” These frequently gases can migrate up to a few hundred feet from the dump site, 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.

This site is somewhat atypical in that it appears that even though wastes were burned at the site, enough unburned wastes remain to generate methane gas and VOCs in sufficient quantities to be detectable in soil borings and vapor monitoring points. Some of the methane could be the result of natural processes, as it appears that some portions of the site and nearby areas were once wetlands.

The installation of the passive vapor trench appears to be effectively mitigating the methane and VOCs from the wastes at the site, with the possible exception of the VM-7 area. It does not appear that methane and VOCs represent a completed human exposure pathway at this time.

Evaluation of Toxicity

This section will focus on polyaromatic hydrocarbons (PAHs), the primary contaminant of concern through the sole completed exposure pathway at the site (through surface soil). PAHs are produced by the incomplete combustion of organic materials such as coal, oil and fuels, wood, tobacco, and cooked food and as a result are very common in the environment (ATSDR 1995). They are also found in petroleum products such as asphalt, coal tar, creosote, and roofing tar. Hundreds PAHs are known to exist, and they are usually found in the environment as mixtures. PAHs generally fall into two groups based on their potential health effects: those that are carcinogenic (cancer causing, known as cPAHs), and those that are not (non-carcinogenic PAHs, or nPAHs). The PAHs found on site (a mixture of cPAHs and nPAHs) are likely present as a result of the burning of wastes while the dump was in operation, or from the disposal of waste materials that may be high in PAHs, such as asphalt.

Exposure to high levels of PAHs in general has also been associated in animals with reproductive difficulties and adverse effects on the skin and immune system. Adverse effects on the liver and gastro-intestinal tract have also been noted (ATSDR 1995).

Limited toxicological data are available for PAH mixtures; therefore, individual PAHs are typically evaluated as separate chemicals for risk characterization. Numerous PAHs have been classified as probable or possible human carcinogens by the International Agency for Research on Cancer (IARC) (ATSDR 1995). The MDH has guidance (www.health.state.mn.us/divs/eh/risk/guidance/pahmemo.html) that recommends a consistent approach to assess health risks from exposures to carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in soil and other media. MDH recommends the 25 PAHs identified by the California Environmental Protection Agency (CA EPA) be evaluated as probable or possible carcinogens at this time.

MDH recommends a potency equivalency factor (PEF) methodology for assessing cancer risks associated with cPAHs. To estimate the toxicity of cPAH mixtures, a series of PEFs have been developed that compare the toxicity of cPAHs to BaP. Individual PAH contaminant concentrations are multiplied by a PEF and the total is added for the mixture. The overall toxicity of the mixture is then calculated in terms of total BaP equivalents. PEFs are intended to be used pending additional research on specific PAH compounds. This is the methodology that has been used to estimate total PAHs in various media at the site for comparison to the MPCA recreational SRV for BaP (2 mg/kg). The PEFs are shown in the table below:

cPAH Potency Equivalency Factors*

PAH (or PAH Derivative)	Potency Equivalency Factors	PAH (or PAH Derivative)	Potency Equivalency Factors
Benzo[a]pyrene**	1.0	Dibenzo[a,l]pyrene	10
Benz[a]anthracene	0.1	Indeno[1,2,3-c,d]pyrene	0.1
Benzo[b]fluoranthene	0.1	5-Methylchrysene	1.0
Benzo[j]fluoranthene	0.1	1-Nitropyrene	0.1
Benzo[k]fluoranthene	0.1	4-Nitropyrene	0.1
Dibenz[a,j]acridine	0.1	1,6-Dinitropyrene	10
Dibenz[a,h]acridine	0.1	1,8-Dinitropyrene	1.0
7H-Dibenzo[c,g]carbazole	1.0	6-Nitrochrysene	10
Dibenzo[a,e]pyrene	1.0	2-Nitrofluorene	0.01
Dibenzo[a,h]pyrene	10	Chrysene	0.01
Dibenzo[a,i]pyrene	10		

*Source: CA EPA, 1999
**Index Compound

A number of surface soil samples had levels of cPAHs in excess of the MPCA SRV. MDH emphasizes that values such as the MPCA SRVs are screening tools for health assessment, and are not to be confused with health effect or toxicity levels. They are developed to be a health-protective first step in evaluation environmental contamination levels. Exposure to levels of contaminants above the SRVs do not mean that adverse health effects will occur, but are an indication that further investigation to quantify actual exposures or remedial actions are necessary. In the case of the Excelsior Parkland Dump site, remedial actions have been the preferred alternative to ensure that public health is protected. No adverse health effects (cancer or non-cancer) are expected from past exposures.

Child Health Considerations

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.

While the dump is located in a park that is used by children, significant contact with exposed contaminated soils and waste materials may not be frequent. Information on reducing exposure to contaminated soil was provided to users of the community garden. Children are not directly exposed to the contaminated groundwater, and are unlikely to have spent significant time in nearby buildings where soil vapors could have intruded. Consumption of produce from the community garden also does not appear to be a significant source of exposure to contaminants at the site.

III. Conclusions

The Excelsior Parkland Dump is a typical small dump based on the limited historical information available and investigations conducted at the site. Large items, including scrap metal, appliances, and construction/demolition wastes were disposed there, and at least some wastes were burned. The site is covered (in some places poorly) and graded, but some minor physical hazards remain along the exposed southern edge of the site and in Studer Pond. PAHs in the soil/ash/waste material are the only identified chemicals of concern for a completed exposure pathway, primarily in and around the community garden.

MDH has concluded that past exposure to physical hazards and PAHs in soil will not harm people's health because the physical hazards are minor and PAHs levels are relatively low; future exposure to the physical hazards and contaminated soil will be mitigated by the suspension of the community garden and the pending soil remediation project. MDH concludes that low levels of contaminants in groundwater at the site will not harm people's health. The groundwater contamination is unlikely to be extensive and has not impacted nearby drinking water wells. MDH also concludes that exposure to methane and VOCs in soil vapor is not expected to harm people's health. The installation of a passive vapor trench has provided a "path of least resistance" for soil vapor to vent safely to the air. Lastly, MDH cannot currently conclude whether exposure to surface water or sediments in Studer Pond could harm people's health. No surface water or sediment samples have been collected in Studer Pond.

IV. Recommendations

1. The planned soil remediation should be implemented to ensure that any areas of bare soil, exposed contaminants, and physical hazards on the site are covered with clean fill and seeded, especially in the western area of the site. "Hot spots" should also be removed.
2. Areas where erosion is occurring on the southern edge of the dump along the shore of Studer Pond should be covered to prevent further exposure of waste and runoff of contaminants.
3. Monitoring of the passive soil vapor trench, monitoring points, and groundwater monitoring wells should continue as planned.
4. Surface water and sediment sampling for site contaminants should be conducted in Studer Pond.
5. City or other workers who plan to excavate at the site for utilities, landscaping, or other purposes should be notified of the presence of waste materials and proper precautions should be taken.
6. Institutional controls such as a notice filed with the property deed should be implemented to record the location of the dump for future reference.

V. Public Health Action Plan

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

1. A letter to the MPCA, the City of Excelsior and Hennepin County advising them of MDH's conclusions and recommendations;
2. A review of any additional available data and participation in any meetings or other public outreach activities; and
3. Distribution of an information sheet describing this report and recommended steps the public can take to minimize exposure to contaminants at the site.

VI. References

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CERTIFICATION

This Excelsior Parkland 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. Editorial review was completed by the Cooperative Agreement partner.

Trent LeCoultre
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 Alan Yarbrough

Alan Yarbrough
Chief, State Program Section, SSAB, DHAC, ATSDR

Appendix 1: Figures

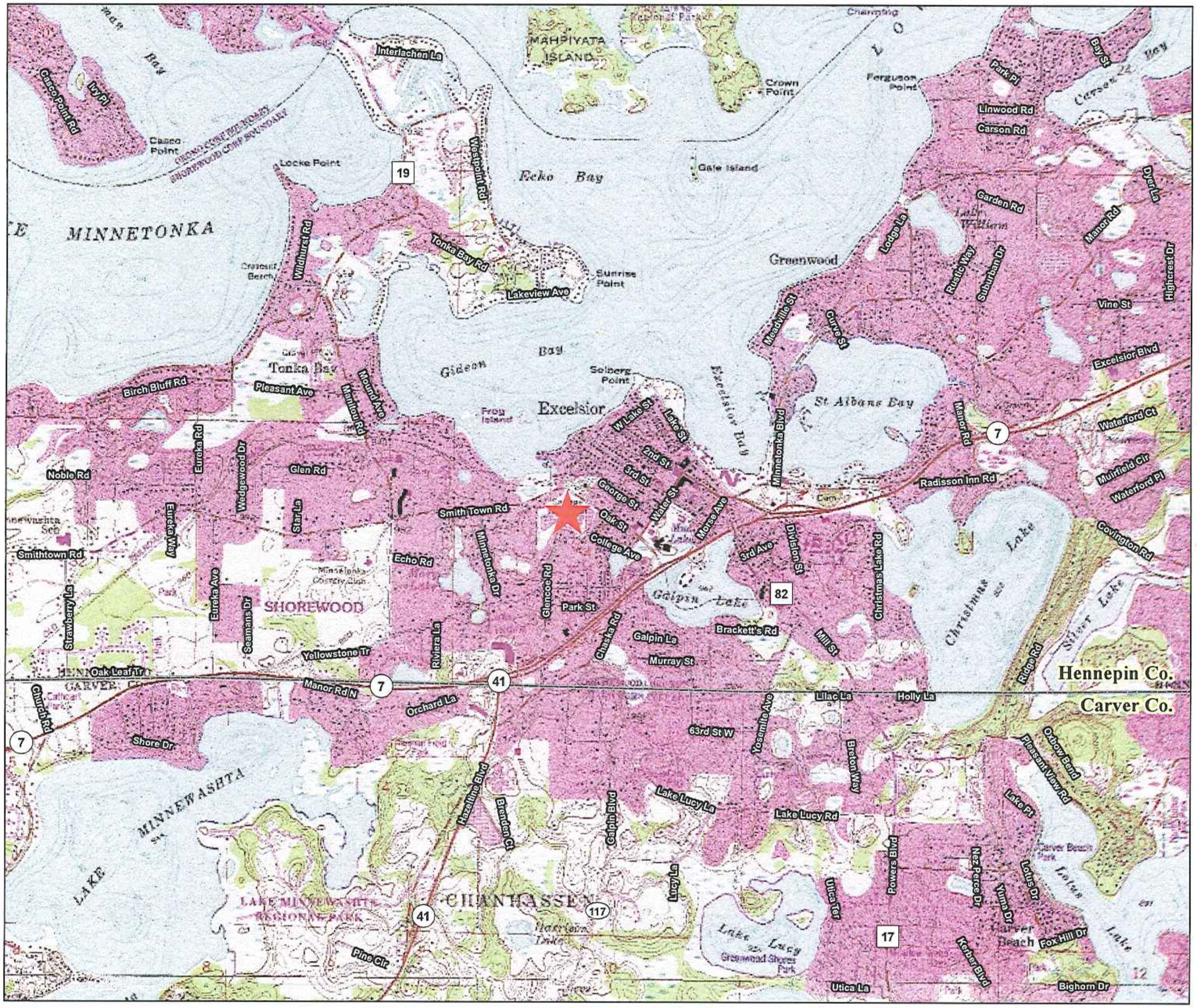


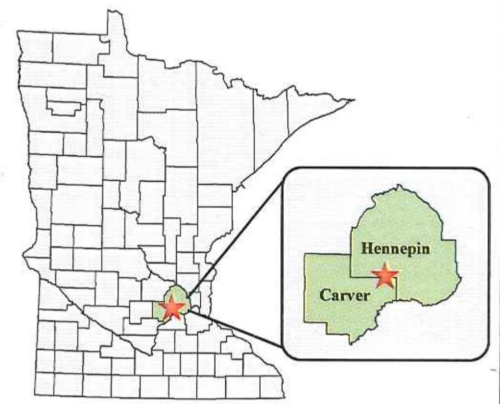
Figure 1

SITE LOCATION MAP

Excelsior City Park/Former Dump

Excelsior, Minnesota

★ Site Location



0 1,000 2,000 4,000
Feet
1 inch equals 2,000 feet

BARR

Figure 2

INVESTIGATION SAMPLE LOCATIONS

Excelsior, Minnesota

- Approximate Property Boundary
- Approximate Parcel Boundary
- Approximate Dump Extent Boundary
- Assigned Dump Quadrants
- Approximate Athletic Field/Hockey Rink Boundary
- Test Trench Location
- Soil Vapor Sample Location
- Surface Soil Cover Composite Subsample Location
- Soil Boring

Property Features

- Hydrant

0 37.5 75 150

Feet

1 inch equals 75 feet

BARR

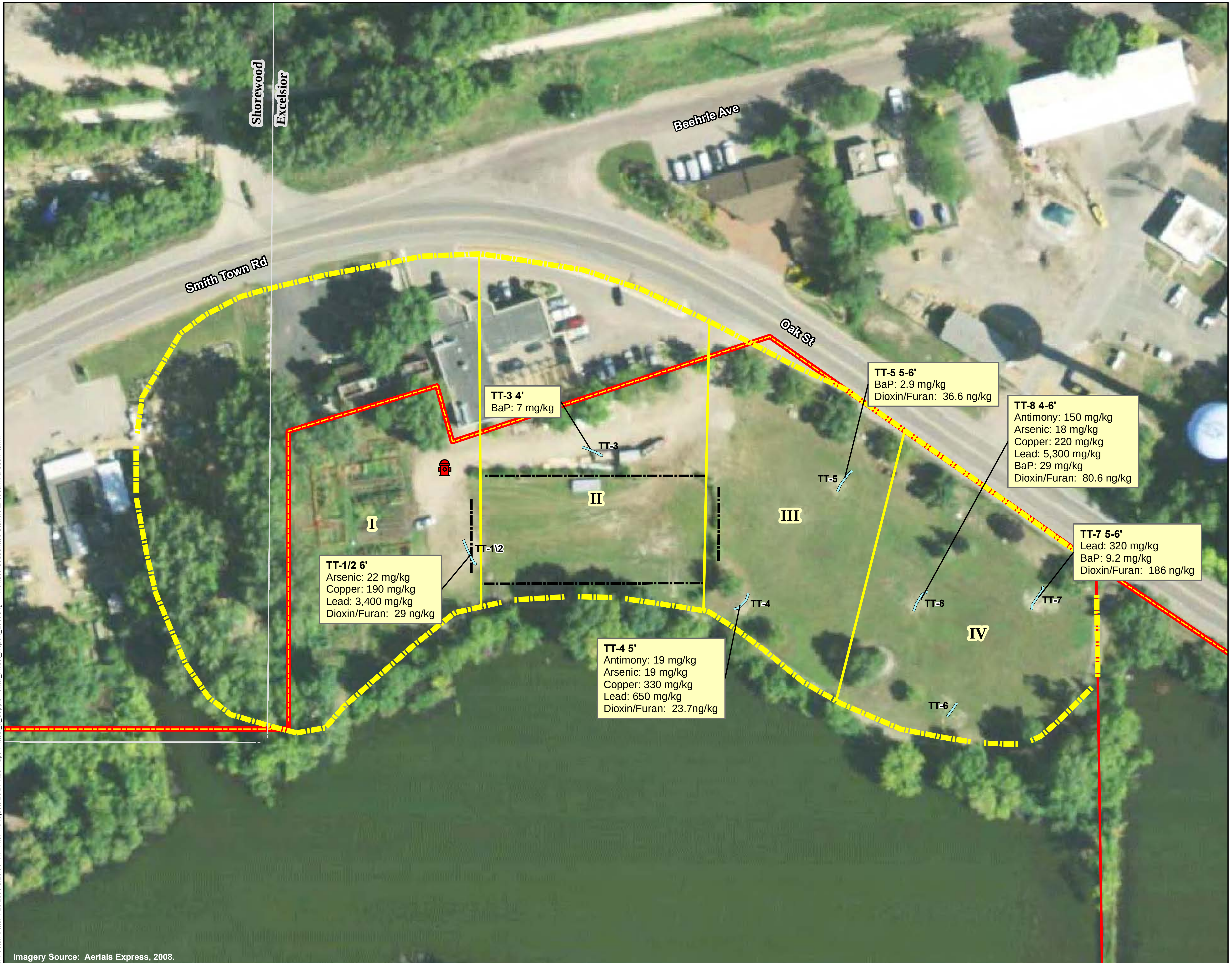


Figure 3

REVISED SUBSURFACE SOIL SAMPLE EXCEEDANCES (> 4' below ground surface)

Excelsior, Minnesota

- Test Trench Location
- Approximate Property Boundary
- Approximate Parcel Boundary
- Approximate Dump Extent Boundary
- Assigned Dump Quadrants
- Approximate Athletic Field/Hockey Rink Boundary
- Approximate City Boundary

Property Features

- Hydrant

MPCA Soil Reference Value (SRV) – with 12/08 Revisions[1]

Parameter	Tier II Recreational (mg/kg)	Tier II Industrial (mg/kg)
Antimony	16	100
Arsenic	11	20
Copper	100	9,000
Lead	300	700
BaP	2	3
Dioxin/Furan	25 (ng/kg)	35 (ng/kg)

Notes:
1. Arsenic and copper SRV Tier II Recreational concentrations were increased from 5 mg/kg to 11 mg/kg and 11 mg/kg to 100 mg/kg respectively.

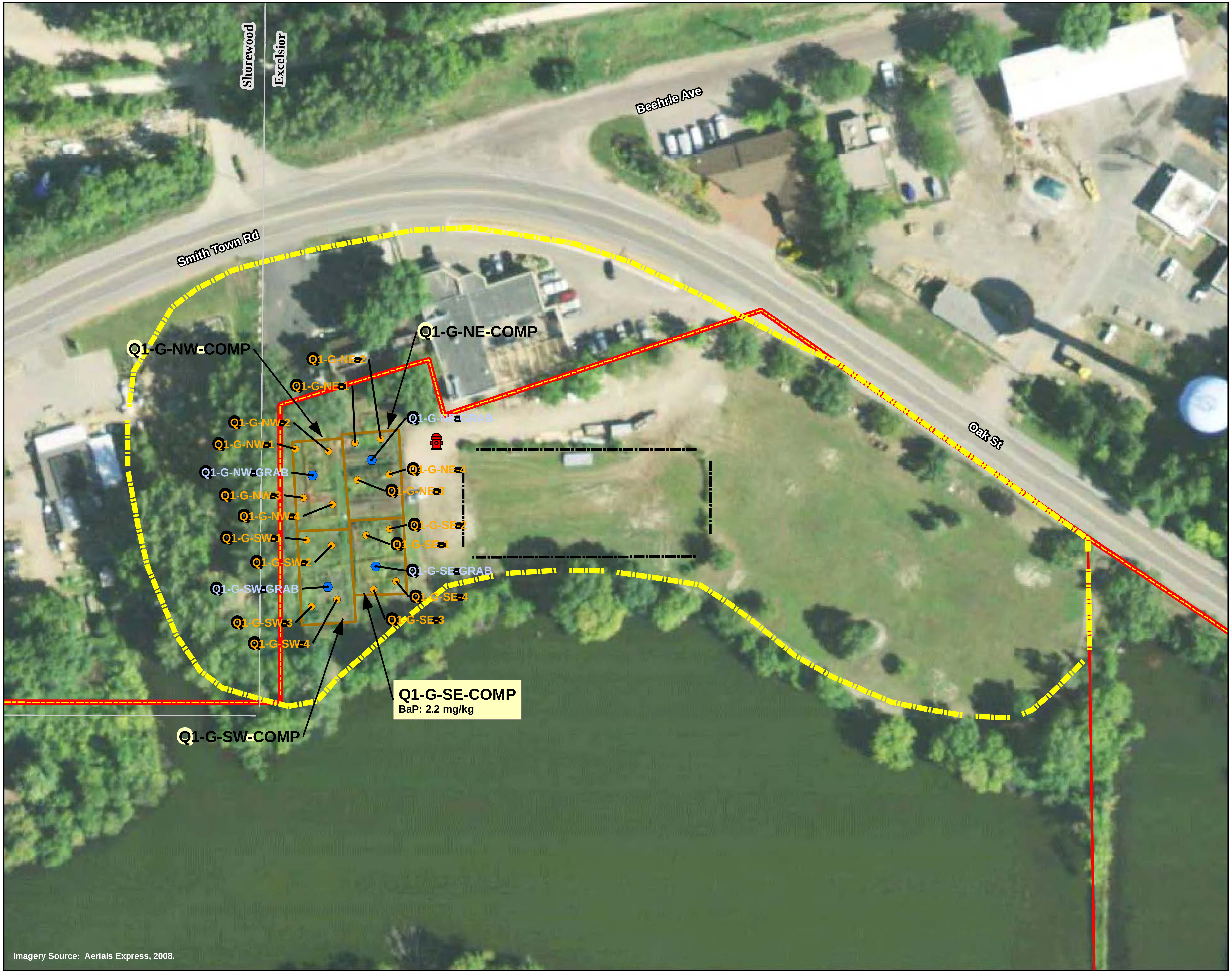
0 37.5 75 150
Feet

1 inch = 75 feet

BARR

Figure 4

GARDEN AREA SURFACE SOIL SAMPLING LOCATIONS AND EXCEEDANCES
Excelsior, Minnesota



- Composite Surface Soil Sampling Location
- Grab Surface Soil Sampling Location
- Approximate Property Boundary
- Approximate Parcel Boundary
- Approximate Dump Extent Boundary
- Approximate Athletic Field/Hockey Rink Boundary
- Approximate City Boundary
- Garden Area Quadrants

Property Features

- Hydrant

Sampling Interval: 0-1.5 feet below ground surface.

MPCA Soil Reference Value (SRV)

Parameter	Tier II Recreational (mg/kg)
BaP	2

0 37.5 75 150
Feet

1 inch = 75 feet

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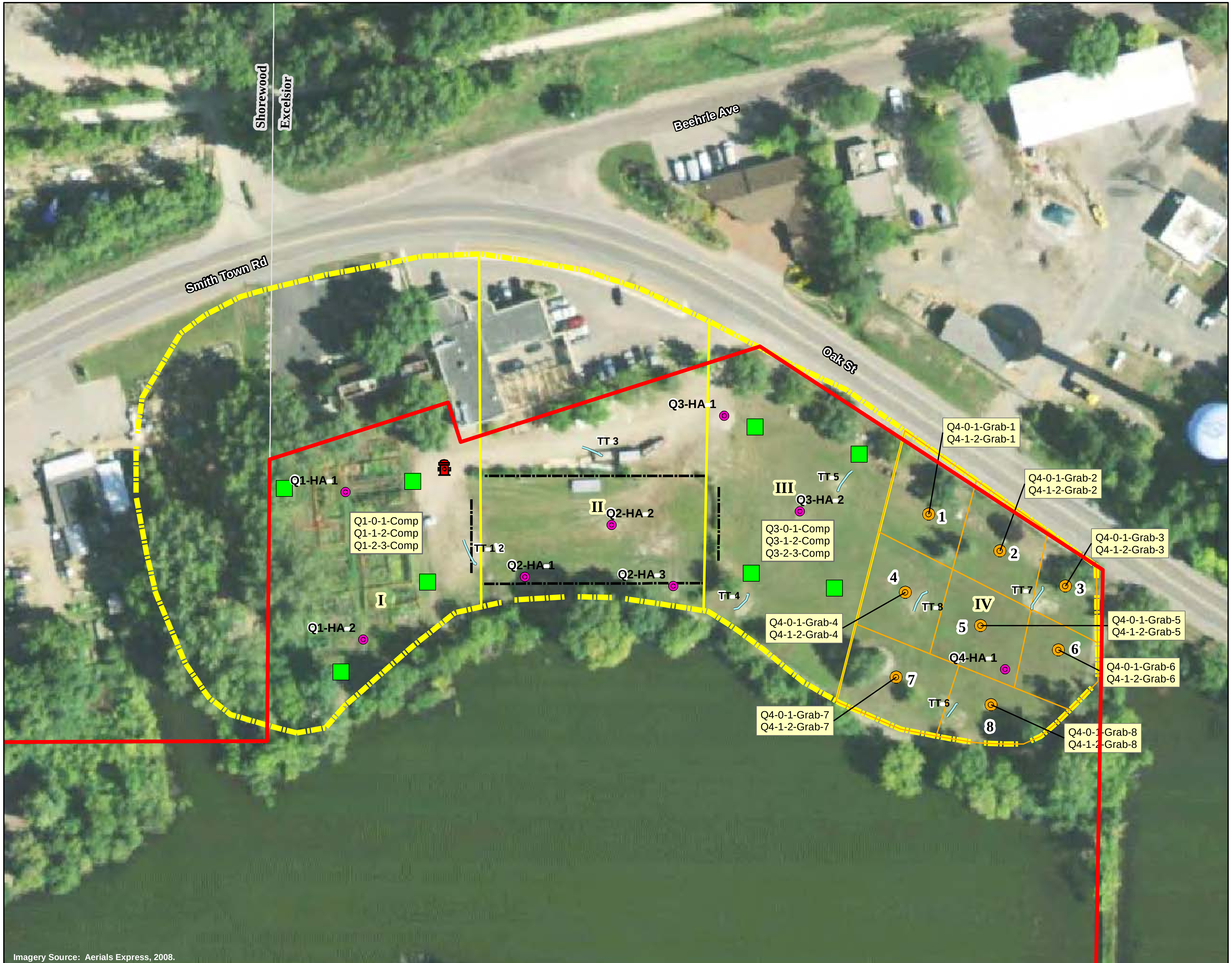
Figure 5

NEAR SURFACE SOIL SAMPLE LOCATIONS

Excelsior, Minnesota



- Grab Sample Location
- Sub-Sample Aliquot Location
- Approximate Dump Extent Boundary
- Assigned Dump Quadrants
- Approximate Athletic Field/Hockey Rink Boundary
- Approximate City Boundary

Property Features

- Hydrant

Note:
Quadrant I and Quadrant III composite samples will consist of 4 sub-samples per quadrant for each one-foot depth interval.

0 37.5 75 150
Feet

1 inch = 75 feet

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Figure 6

MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATIONS Excelsior, Minnesota

- Drinking Water Supply Well (CWI)
- Monitoring Well Location
- Approximate Property Boundary
- Approximate Parcel Boundary
- Approximate Dump Extent Boundary
- Area Unaccessible During Site Visit
- Approximate Athletic Field/Hockey Rink Boundary
- Approximate City Boundary

Property Features

- Hydrant

Note:
Groundwater elevations were measured on April 8, 2009.

0 50 100 200
Feet

1 inch = 100 feet

BARR

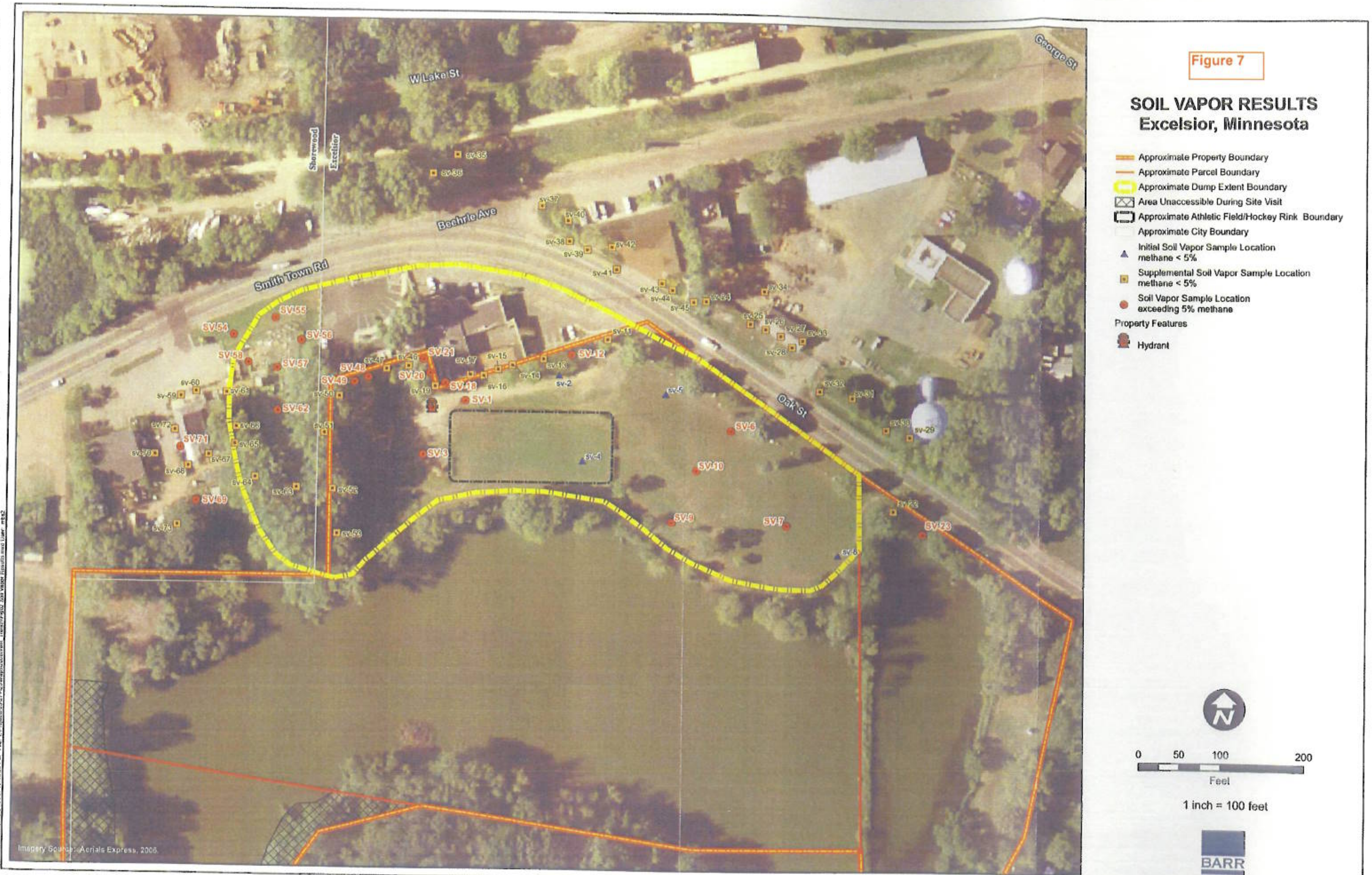

Figure 7
SOIL VAPOR RESULTS
Excelsior, Minnesota
Approximate Property Boundary
Approximate Parcel Boundary
Approximate Dump Extent Boundary
Area Unaccessible During Site Visit
Approximate Athletic Field/Hockey Rink Boundary
Approximate City Boundary
Initial Soil Vapor Sample Location methane < 5%
Supplemental Soil Vapor Sample Location methane < 5%
Soil Vapor Sample Location exceeding 5% methane
Property Features
Hydrant
0 50 100 200
Feet
1 inch = 100 feet
BARR
George St
W Lake St
Beehrle Ave
Smith Town Rd
Oak St
Shorewood
Excelsior
SV-1
SV-3
SV-6
SV-7
SV-9
SV-10
SV-12
SV-23
sv-2
sv-4
sv-5
sv-29
Imagery Source: Aerials Express, 2006.

W Lake St
Shorewood
Excelsior
Beehrle Ave
Smith Town Rd
Oak St
VM-7
VM-3
VM-6
VM-2
VM-4
VM-1
VM-5
Figure 8
VAPOR MONITORING LOCATIONS
Excelsior, Minnesota
Approximate Property Boundary
Approximate Parcel Boundary
Approximate Dump Extent Boundary
Approximate Former Hockey Rink Boundary
Approximate City Boundary
Vapor Monitoring Location
Vent Location
Trench Clean-Out Location
Passive Vent Trench
N
0
50
100
200
Feet
1 inch = 100 feet
BARR

Appendix 2: Tables

Table 1
Soil Analytical Results
Near-Surface (0-4') Samples
Excelsior City Park - Former Dump
Excelsior, Minnesota
(concentrations in mg/kg, unless noted otherwise)

Location Date Dup	MPCA Recreational SRV 12/10/2008	MPCA Tier I SLV	Q1-HA-comp 6/24/2008	Q2-HA-comp 6/24/2008	Q3-HA-comp 6/24/2008	Q3-HA-comp 6/24/2008 DUP	Q4-HA-comp 6/23/2008
Exceedance Key	Bold						
Metals							
Antimony	16	2.7	<0.56	<0.56	<0.54	<0.54	20
Arsenic	11	15.1	4.5	6.6	5.9	4.2	**15**
Beryllium	75	1.4	<0.28	<0.28	<0.27	<0.27	<0.27
Cadmium	35	4.4	<0.28	<0.28	<0.27	<0.27	8.5
Chromium	120 CR	18	14	12	12	16	36
Copper	100	400	13	11	15 *	34 *	500
Lead	300	525	11	14	74 *	49 *	780
Mercury	1.2 MC	1.6	<0.11	<0.11	<0.11	<0.11	0.21
Nickel	800	88	13	13	11	13	30
Selenium	200	1.5	<1.1	<1.1	<1.1	<1.1	<1.1
Silver	200	3.9	<0.28	<0.28	<0.27	<0.27	1.9
Thallium	3		<2.2	<2.2	<2.2	<2.2	<2.1
Zinc	12000	1500	39	32	56	64	3300
SVOCs/PAHs							
2-Methylnaphthalene	120		<0.37	<0.37	<0.36	<0.36	<0.35
Acenaphthene	1860	50	0.39	<0.37	<0.36	<0.36	<0.35
Acenaphthylene	--		0.53	<0.37	<0.36	<0.36	<0.35
Anthracene	10000	942	1.5	<0.37	<0.36	<0.36	<0.35
Benzo(g,h,i)perylene	--		1.0	<0.37	0.45	<0.36	<0.35
Carbazole	720		<0.37	<0.37	<0.36	<0.36	<0.35
Dibenzofuran	130		0.50	<0.37	<0.36	<0.36	<0.35
Fluoranthene	1290	295	4.4	0.50	1.2	0.94	1.1
Fluorene	1200	47	0.86	<0.37	<0.36	<0.36	<0.35
Naphthalene	24	7.5	<0.37	<0.37	<0.36	<0.36	<0.35
Nitrobenzene	--		<0.37	<0.37	<0.36	<0.36	<0.35
o-Cresol	95		<0.75	<0.75	<0.73	<0.73	<0.71
p-Cresol	11		<0.75	<0.75	<0.73	<0.73	<0.71
Pentachlorophenol	80		<0.75	<0.75	<0.73	<0.73	<0.71
Phenanthrene	--		4.3	<0.37	0.47	<0.36	0.48
Phenol	1500		<0.75	<0.75	<0.73	<0.73	<0.71
Pyrene	1060	272	4.2	0.47	1.0	0.78	1.0
Benzo(a)anthracene	T		2.3	<0.37	0.55	0.46	0.50
Benzo(b)fluoranthene	T		2.3	<0.37	0.83	0.70	0.74
Benzo(k)fluoranthene	T		0.98	<0.37	<0.36	<0.36	<0.35
Benzo(a)pyrene	T		1.9	<0.37	0.62	0.52	0.58
Chrysene	T		2.2	<0.37	0.64	0.52	0.55
Dibenz(a,h)anthracene	T		<0.37	<0.37	<0.36	<0.36	<0.35
Indeno(1,2,3-cd)pyrene	T		1.1	<0.37	0.45	<0.36	<0.35
BaP equivalent, non-detects at half of the detection limit.[1]	2 T	10.2	**2.7**	0.36	0.93	0.78	0.84
Dioxins/Furans, ng/kg							
2,3,7,8-TCDD	25 DI		0.142 EMPC	0.125 EMPC	0.676 EMPC	0.626 j	0.350 EMPC
1,2,3,7,8-Dioxin penta	--		0.279 EMPC	0.229 j	1.97 j	2.19 j	0.558 j
1,2,3,4,7,8-Dioxin, hexa	--		0.163 j	0.104 EMPC	0.814 j	0.948 j	0.335 j
1,2,3,6,7,8-Dioxin, hexa	--		0.745 j	0.921 j	60.1	44.3	1.70 j
1,2,3,7,8,9-Dioxin, hexa	--		1.26 j	0.965 j	13.2	9.52	1.24 EMPC
1,2,3,4,6,7,8-Dioxin, hepta	--		13.2	20.0	666 e	483 e	30.0
Dioxin octa	--		102	176	1620 e*	849 *	245
2,3,7,8-TCDF	--		<0.285	0.373 j	0.936 j	1.33	1.32 EMPC
1,2,3,7,8-Dibenzofuran, penta	--		0.117 j	0.224 j	1.63 j	1.25 j	0.875 j
2,3,4,7,8-Dibenzofuran, penta	--		0.121 EMPC	0.314 j	1.98 j	1.79 j	1.73 j
1,2,3,4,7,8-Dibenzofuran, hexa	--		0.259 EMPC	0.566 j	11.1	9.85	3.41

Table 1
Soil Analytical Results
Near-Surface (0-4') Samples
Excelsior City Park - Former Dump
Excelsior, Minnesota
(concentrations in mg/kg, unless noted otherwise)

Location Date Dup	MPCA Recreational SRV 12/10/2008	MPCA Tier I SLV	Q1-HA-comp 6/24/2008	Q2-HA-comp 6/24/2008	Q3-HA-comp 6/24/2008	Q3-HA-comp 6/24/2008 DUP	Q4-HA-comp 6/23/2008
Exceedance Key	Bold						
1,2,3,6,7,8-Dibenzofuran, hexa	--		0.203 j	0.258 j	6.41	5.70	1.46 j
1,2,3,7,8,9-Dibenzofuran, hexa	--		<0.0196	<0.0429	0.670 j	<0.718	0.0667 EMPC
2,3,4,6,7,8-Dibenzofuran, hexa	--		0.301 j	0.422 j	14.1	11.9	1.65 j
1,2,3,4,6,7,8-Dibenzofuran, hepta	--		2.65 j	4.98	647 e	571 e	8.52
1,2,3,4,7,8,9-Dibenzofuran, hepta	--		0.187 j	0.332 j	15.1	13.8	0.786 j
Dibenzofuran octa	--		7.34	19.1	707	684	16.7
TEQ $_{DF}$ WHO05[2], non-detects at half of the detection limit	25	0.001	0.721 a	1.06 a	27.7 a	22.9 a	2.74 a
Dioxin penta, Total	--		11.8	8.41	25.3	22.4	24.0
Dioxin tetra, Total	--		7.20	2.79	9.92	10.5	15.5
Dioxin, hepta, Total	--		26.4	45.6	1460	910	63.1
Dioxin, hexa, Total	--		14.7	13.8	394	235	27.4
Dibenzofuran penta, Total	--		2.62 j	5.23	56.0	53.3	33.4
Dibenzofuran tetra, Total	--		1.32	10.8	28.3	28.3	43.5
Dibenzofuran, hepta, Total	--		8.27	18.3	2200	1870	23.3
Dibenzofuran, hexa, Total	--		4.77	7.99	822	645	29.0

Notes:

DUP	Duplicate sample.
--	No criteria/not analyzed.
*	Estimated value, QA/QC criteria not met.
ND	Not detected.
CR	Value represents the criterion for Chromium, hexavalent.
DI	Value represents a criterion for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.
EMPC	Estimated Maximum Possible Concentration.
MC	Mercury as Mercuric Chloride.
a	Estimated value, calculated using some or all values that are estimates.
e	Estimated value, exceeded the instrument calibration stage.
j	Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.
T	Value represents criteria for the total carcinogenic PAHs as BaP. Total carcinogenic PAHs are: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, Chrysene and Indeno(1,2,3-cd)pyrene.

Table 2
Soil Analytical Results
Garden Soil Area
Excelsior City Park Dump
Excelsior, Minnesota
(concentrations in mg/kg, unless noted otherwise)

Location Date Dup	MPCA Recreational SRV 12/10/2008	Q1-G-NE-Comp 12/8/2008	Q1-G-NE-Comp 12/8/2008 DUP	Q1-G-NW-Comp 12/8/2008	Q1-G-SE-Comp 12/8/2008	Q1-G-SW-Comp 12/8/2008
Exceedance Key	**Bold**					
Metals						
Arsenic	11	4.9	5.1	4.6	5.1	4.9
Barium	1100	110	120	100	160	100
Cadmium	35	<0.30	<0.29	<0.29	0.62	<0.28
Chromium	120 CR	14	14	15	16	14
Lead	300	14	15	13	18	15
Mercury	1.2 MC	<0.12	<0.12	<0.12	<0.12	<0.11
Selenium	200	<1.2	<1.2	<1.2	<1.2	<1.1
Silver	200	<0.30	<0.29	<0.29	<0.29	<0.28
SVOCs/PAHs						
2-Methylnaphthalene	120	<0.39	<0.39	<0.38	<0.39	<0.38
Acenaphthene	1860	<0.39	<0.39	<0.38	<0.39	<0.38
Acenaphthylene	--	<0.39	<0.39	<0.38	<0.39	<0.38
Anthracene	10000	<0.39	<0.39	<0.38	1.5	<0.38
Benzo(g,h,i)perylene	--	0.43	0.39	0.79	0.7	<0.38
Carbazole	720	<0.39	<0.39	<0.38	<0.39	<0.38
Dibenzofuran	130	<0.39	<0.39	<0.38	<0.39	<0.38
Fluoranthene	1290	1.5	1	1.9	4.3	0.42
Fluorene	1200	<0.39	<0.39	<0.38	0.64	<0.38
Naphthalene	24	<0.39	<0.39	<0.38	<0.39	<0.38
Nitrobenzene	--	<0.39	<0.39	<0.38	<0.39	<0.38
o-Cresol	95	<0.80	<0.79	<0.78	<0.79	<0.76
p-Cresol	11	<0.80	<0.79	<0.78	<0.79	<0.76
Pentachlorophenol	80	<0.80	<0.79	<0.78	<0.79	<0.76
Phenanthrene	--	0.8	0.57	0.93	5.2	<0.38
Phenol	1500	<0.80	<0.79	<0.78	<0.79	<0.76
Pyrene	1060	1.5	1.1	1.8	4.1	0.42
Benzo(a)anthracene	T	0.8	0.57	1	2.1	<0.38
Benzo(b)fluoranthene	T	0.97	0.75	1.5	1.7	<0.38
Benzo(k)fluoranthene	T	<0.39	<0.39	0.56	0.77	<0.38
Benzo(a)pyrene	T	0.77	0.6	1.2	1.5	<0.38
Chrysene	T	0.83	0.62	1	2	<0.38
Dibenz(a,h)anthracene	T	<0.39	>0.39	<0.38	<0.39	<0.38
Indeno(1,2,3-cd)pyrene	T	0.48	0.4	0.82	0.81	<0.38
BaP equivalent, non-detects at half of the detection limit.[1]	2 T	1.1	0.91	1.7	**2.2**	0.37
Dioxins/Furans, ng/kg						
2,3,7,8-TCDD	25 DI	0.0881 EMPC	0.103 EMPC	0.135 j EMPC	0.155 j EMPC	<0.0212
1,2,3,7,8-Dioxin penta	--	0.240 j	0.329 j	0.245 j	0.371 j EMPC	0.331 j
1,2,3,4,7,8-Dioxin, hexa	--	0.258 j EMPC	0.304 j	0.195 j	0.264 j EMPC	0.231 j EMPC
1,2,3,6,7,8-Dioxin, hexa	--	0.985 j	1.28 j	1.0 j	1.05 j	1.62 j
1,2,3,7,8,9-Dioxin, hexa	--	1.03 j	2.02 j	1.33 j	1.61 j	2.14 j
1,2,3,4,6,7,8-Dioxin, hepta	--	21.7	33.1	25	24.9	43.8
Dioxin octa	--	208	275	214	222	437
2,3,7,8-TCDF	--	<0.585	<0.384	<0.618	<0.371	<0.386
1,2,3,7,8-Dibenzofuran, penta	--	0.124 j	<0.0350	<0.0559	0.134 j	0.115 j EMPC
2,3,4,7,8-Dibenzofuran, penta	--	0.172 j	0.150 j	<0.0559	0.172 j	0.161 j EMPC
1,2,3,4,7,8-Dibenzofuran, hexa	--	0.328 j	0.496 j	0.375 j	0.380 j	0.504 j EMPC
1,2,3,6,7,8-Dibenzofuran, hexa	--	0.228 j	0.337 j	0.216 j	0.164 j EMPC	0.304 j EMPC
1,2,3,7,8,9-Dibenzofuran, hexa	--	<0.108	<0.355	<0.12	<0.104	<0.0976
2,3,4,6,7,8-Dibenzofuran, hexa	--	0.228 j	0.435 j EMPC	0.368 j	0.364 j	0.508 j

Table 2
Soil Analytical Results
Garden Soil Area
Excelsior City Park Dump
Excelsior, Minnesota
(concentrations in mg/kg, unless noted otherwise)

Location Date Dup	MPCA Recreational SRV 12/10/2008	Q1-G-NE-Comp 12/8/2008	Q1-G-NE-Comp 12/8/2008 DUP	Q1-G-NW-Comp 12/8/2008	Q1-G-SE-Comp 12/8/2008	Q1-G-SW-Comp 12/8/2008
Exceedance Key	Bold					
1,2,3,4,6,7,8-Dibenzofuran, hepta	--	3.1	4.55	4.45 j EMPC	3.59	6.69
1,2,3,4,7,8,9-Dibenzofuran, hepta	--	0.254 j	0.339 j EMPC	<0.176	0.313 j EMPC	<0.205
Dibenzofuran octa	--	8.33	12.4	9.28	10.4	21.2
TEQ $_{DF}$ WHO05^2, non-detects at half of the detection limit	25	0.982 a	1.39 a	1.05 a	1.06 a	1.51 a
Dioxin penta, Total	--	6.53	23.4	8.92	6.38	8.51
Dioxin tetra, Total	--	3.51	12.7	2.4	2.32	3.73
Dioxin, hepta, Total	--	43.2	69.7	53.8	50.9	95.4
Dioxin, hexa, Total	--	12.3	27.4	14.5	14.5	19.9
Dibenzofuran penta, Total	--	6.46	5.59	2.66 j	4.51	4.68
Dibenzofuran tetra, Total	--	2.04	3.38	1.72	2.99	1.6
Dibenzofuran, hepta, Total	--	9.53	14.5	8.67	11.3	24.2
Dibenzofuran, hexa, Total	--	3.56	4.65	6.95	3.84	9.08

Notes:

DUP	Duplicate sample.
--	No criteria/not analyzed.
*	Estimated value, QA/QC criteria not met.
ND	Not detected.
CR	Value represents the criterion for Chromium, hexavalent.
DI	Value represents a criterion for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.
EMPC	Estimated Maximum Possible Concentration.
MC	Mercury as Mercuric Chloride.
a	Estimated value, calculated using some or all values that are estimates.
e	Estimated value, exceeded the instrument calibration stage.
j	Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.
T	Value represents a criterion for the total carcinogenic PAHs as BaP. Total carcinogenic PAHs are: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, Chrysene and Indeno(1,2,3-cd)pyrene.

Table 3a
Soil Results - Quadrant 1
Excelsior City Park
(concentrations in mg/kg)

Sample Location & Date	MPCA Recreational SRV	Q1 0-1 Comp 4/30/2009	Q1 1-2 Comp 4/30/2009	Q1 1-2 Comp 4/30/2009	Q1 2-3 Comp 4/30/2009
				DUP	
Exceedance Key	Bold				
SVOCs					
2-Methylnaphthalene	120	<0.13	<0.13	<0.13	<0.12
Acenaphthene	1860	<0.13	<0.13	<0.13	<0.12
Acenaphthylene	--	0.45	0.14	0.20	0.19
Anthracene	10000	0.42	<0.13	0.23	0.21
Benzo(e)pyrene	--	0.80	0.31	0.63	0.56
Benzo(g,h,i)perylene	--	0.73	0.35 *	0.64 *	0.57
Carbazole	720	<0.13	<0.13	<0.13	<0.12
Fluoranthene	1290	2.2	0.66 *	1.7 *	1.2
Fluorene	1200	<0.13	<0.13	<0.13	<0.12
Naphthalene	24	<0.13	<0.13	<0.13	<0.12
Perylene	--	0.32	0.13	0.25	0.21
Phenanthrene	--	1.0	0.23	0.82	0.51
Pyrene	1060	2.2	0.69 *	1.5 *	1.2
Benzo(a)anthracene	T	1.3	0.37	0.84	0.69
Benzo(b&j)fluoranthene	T	1.5	0.55	1.1	0.97
Benzo(k)fluoranthene	T	0.63	0.21	0.47	0.39
Benzo(a)pyrene	T	1.2	0.44 *	0.92 *	0.80
Chrysene	T	1.3	0.40 *	0.91 *	0.77
Dibenz(a,j)acridine	T	<0.13	<0.13	<0.13	<0.12
Dibenz(a,h)acridine	T	<0.13	<0.13	<0.13	<0.12
Dibenz(a,h)anthracene	T	0.20	<0.13	0.15	0.13
7h-Dibenzo(c,g)carbazole	T	<0.063	<0.064	<0.063	<0.062
Dibenzo(a,e)pyrene	T	<0.13	<0.13	<0.13	<0.12
Dibenzo(a,h)pyrene	T	0.18	<0.13	0.17	0.12
Dibenzo(a,i)pyrene	T	<0.13	<0.13	<0.13	<0.12
Dibenzo(a,l)pyrene	T	0.36	0.16	0.33	0.27
7,12-Dimethylbenz(a)anthracene	T	<0.13	<0.13	<0.13	<0.12
1,6-Dinitropyrene	T	<0.63	<0.64	<0.63	<0.62
1,8-Dinitropyrene	T	<0.32	<0.33	<0.32	<0.32
Indeno(1,2,3-cd)pyrene	T	0.76	0.34 *	0.65 *	0.56
3-Methylcholanthrene	T	<0.14	<0.14	<0.14	<0.14
5-Methylchrysene	T	0.18	<0.13	0.14	0.13
5-Nitroacenapthene	T	<0.13	<0.13	<0.13	<0.12
1-Nitropyrene	T	<0.13	<0.13	<0.13	<0.12
6-Nitrochrysene	T	<0.25	<0.26	<0.25	<0.25
2-Nitrofluorene	T	<0.13	<0.13	<0.13	<0.12
BaP equivalent, non-detects at half of the detection limit.1	2 T	**15**	**11 a**	**14 a**	**13**

Table 3a
Soil Results - Quadrant 1
Excelsior City Park
(concentrations in mg/kg)

DUP Duplicate sample.

* Estimated value, QA/QC criteria not met.

a Estimated value, calculated using some or all values that are estimates.

T Value represents a criterion for the total carcinogenic PAHs as BaP.

1 Total BaP equivalence (2002) calculated using half of the detection limit on the non detected compounds.

Table 3b
Soil Analytical Results
Quadrant 3
Excelsior City Park Dump
(concentrations in ng/kg)

Location Date	MPCA Recreational SRV 12/10/2008	Q3 0-1 Comp 4/30/2009	Q3 1-2 Comp 4/30/2009	Q3 2-3 Comp 4/30/2009
Exceedance Key	**Bold**			
Dioxins/Furans, ng/kg				
2,3,7,8-TCDD	25 DI	<0.0321	0.259 j EMPC	3.04
1,2,3,7,8-Dioxin penta	--	0.432 j	1.18 j	8.756
1,2,3,4,7,8-Dioxin, hexa	--	0.496 j	0.866 j	5.31
1,2,3,6,7,8-Dioxin, hexa	--	1.85 j	3.69	18
1,2,3,7,8,9-Dioxin, hexa	--	2.11 j	3.89	27.1
1,2,3,4,6,7,8-Dioxin, hepta	--	44.2	68.2	254
Dioxin octa	--	288	547	1060
2,3,7,8-TCDF	--	<0.167	0.592 j EMPC	8.41
1,2,3,7,8-Dibenzofuran, penta	--	<0.112	0.672 j EMPC	6.51
2,3,4,7,8-Dibenzofuran, penta	--	<0.107	1.40 j	11.5
1,2,3,4,7,8-Dibenzofuran, hexa	--	0.812 j	3.49	27.3
1,2,3,6,7,8-Dibenzofuran, hexa	--	0.447 j EMPC	1.73 h	12.4
1,2,3,7,8,9-Dibenzofuran, hexa	--	<0.154	<0.175	<0.199
2,3,4,6,7,8-Dibenzofuran, hexa	--	0.590 j	2.71 j	14.8
1,2,3,4,6,7,8-Dibenzofuran, hepta	--	9.44	18	57.8
1,2,3,4,7,8,9-Dibenzofuran, hepta	--	0.602 j EMPC	1.33 j	3.47
Dibenzofuran octa	--	17.9	38.9	47
TEQ_{DF} WHO05[2], non-detects at half of the detection limit	25	1.7 a	4.5 a	**30**
Dioxin penta, Total	--	16.1	38.6	187
Dioxin tetra, Total	--	1.68	8.99	191
Dioxin, hepta, Total	--	26.8	52.5	101
Dioxin, hexa, Total	--	15.4	34.5	115
Dibenzofuran penta, Total	--	3.57	23.7	134
Dibenzofuran tetra, Total	--	0.238 j	6.48	69.5
Dibenzofuran, hepta, Total	--	79.5	133	453
Dibenzofuran, hexa, Total	--	14.3	35.3	199

Notes:

--	No criteria.
DI	Value represents a criterion for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.
EMPC	Estimated Maximum Possible Concentration.
a	Estimated value, calculated using some or all values that are estimates.
j	Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.

Table 3c
Soil Analytical Results (0-1 Feet) - Quadrant 4
Excelsior City Park Dump
(mg/kg)

Location Date	MPCA Recreational SRV 12/10/2008	Q4 0-1 Grab1 4/30/2009	Q4 0-1 Grab2 4/30/2009	Q4 0-1 Grab3 4/30/2009	Q4 0-1 Grab4 4/30/2009	Q4 0-1 Grab5 4/30/2009	Q4 0-1 Grab6 4/30/2009	Q4 0-1 Grab7 4/30/2009	Q4 0-1 Grab8 4/30/2009
Exceedance Key	**Bold**								
Metals									
Antimony	16	<0.57	<0.57	<0.57	0.62	<0.57	<0.57	<0.56	<0.55
Arsenic	11	5.5	5	3.9	4.2	5.4	4.5	4.1	4.8
Beryllium	75	<0.29	<0.28	<0.28	<0.29	<0.29	<0.29	<0.28	<0.27
Cadmium	35	<0.29	<0.28	<0.28	0.38	0.52	<0.29	<0.28	<0.27
Chromium	120 CR	13	14	14	13	11	13	12	16
Copper	100	12	12	12	16	11	11	14	16
Lead	300	12	22	8.4	36	25	23	65	35
Mercury	1.2 MC	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.12
Nickel	800	16	15	16	13	12	16	11	8.8
Selenium	200	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
Silver	200	<0.29	<0.28	<0.28	<0.29	<0.29	<0.29	<0.28	<0.27
Thallium	3	<2.3	<2.3	<2.3	<2.3	<2.3	<2.3	<2.2	<2.2
Zinc	12000	41	44	40	57	110	41	45	28

Notes:

CR — Value represents the criteria for Chromium, hexavalent.

MC — Mercury as Mercuric Chloride.

Table 3d
Soil Analytical Results (1-2 Feet) - Quadrant 4
Excelsior City Park Dump
(mg/kg)

Location Date	MPCA Recreational SRV 12/10/2008	Q4 1-2 Grab1 4/30/2009	Q4 1-2 Grab2 4/30/2009	Q4 1-2 Grab3 4/30/2009	Q4 1-2 Grab4 4/30/2009	Q4 1-2 Grab5 4/30/2009	Q4 1-2 Grab6 4/30/2009	Q4 1-2 Grab7 4/30/2009	Q4 1-2 Grab8 4/30/2009
Exceedance Key	**Bold**								
Metals									
Antimony	16	<0.58	1.3	3.6	4.1	**20**	<0.60	1	<0.57
Arsenic	11	4.7	6.6	8.7	6.5	9.8	4	4.4	4.9
Beryllium	75	<0.29	<0.38	0.86	<0.30	<0.30	<0.30	<0.27	<0.28
Cadmium	35	<0.29	1.5	2.4	1.4	4.6	<0.30	0.78	<0.28
Chromium	120 CR	13	15	19	19	28	15	18	12
Copper	100	10	47	99	36	**220**	13	30	11
Lead	300	6.4	**7300**	**340**	**300**	**380**	7.6	68	21
Mercury	1.2 MC	<0.12	<0.15	0.16	<0.12	<0.12	<0.12	<0.11	<0.11
Nickel	800	17	17	19	16	19	16	13	13
Selenium	200	<1.2	<1.5	<1.5	<1.2	<1.2	<1.2	<1.1	<1.1
Silver	200	<0.29	1.4	1.5	<0.30	1.8	<0.30	1.2	<0.28
Thallium	3	<2.3	<3.0	<3.0	<2.4	<2.4	<2.4	<2.2	<2.3
Zinc	12000	35	270	510	250	1000	39	140	33

Notes:

CR Value represents the criteria for Chromium, hexavalent.

MC Mercury as Mercuric Chloride.

Table 3e
Soil Analytical Results (1-2 Feet) - Quadrant 4
Excelsior City Park Dump
(mg/kg)

Location Date Dup	MPCA Recreational SRV 12/10/2008	Q41-2-Grb1&4 4/30/2009	Q41-2-Grb1&4 4/30/2009 DUP	Q41-2-Grb2&5 4/30/2009	Q41-2-Grb3&6 4/30/2009	Q41-2-Grb7&8 4/30/2009
SVOCs/PAHs						
2-Methylnaphthalene	120	<0.13	<0.13	<0.16	<0.14	<0.12
Acenaphthene	1860	<0.13	<0.13	<0.16	<0.14	<0.12
Acenaphthylene	--	<0.13	<0.13	<0.16	<0.14	0.30
Anthracene	10000	<0.13	<0.13	<0.16	0.16	0.39 *
Benzo(e)pyrene	--	<0.13	<0.13	0.23	0.35	1.2
Benzo(g,h,i)perylene	--	<0.13	<0.13	0.2	0.29	1.0 *
Carbazole	720	<0.13	<0.13	<0.16	<0.14	<0.12
Fluoranthene	1290	0.2	<0.13	0.66	0.63	3.2 *
Fluorene	1200	<0.13	<0.13	<0.16	<0.14	<0.12
Naphthalene	24	<0.13	<0.13	<0.16	<0.14	<0.12
Perylene	--	<0.13	<0.13	<0.16	0.16	0.49
Phenanthrene	--	0.18	<0.13	0.69	0.52	0.95
Pyrene	1060	0.29	0.13	0.67	0.68	3.1 *
Benzo(a)anthracene	T	0.13	<0.13	0.27	0.34	1.4
Benzo(b&j)fluoranthene	T	<0.26	<0.26	0.38	0.54	2.2
Benzo(k)fluoranthene	T	<0.13	<0.13	0.16	0.20	0.82
Benzo(a)pyrene	T	0.14	<0.13	0.27	0.39	1.5 *
Chrysene	T	0.13	<0.13	0.34	0.44	1.6
Dibenz(a,j)acridine	T	<0.13	<0.13	<0.16	<0.14	<0.12
Dibenz(a,h)acridine	T	<0.13	<0.13	<0.16	<0.14	<0.12
Dibenz(a,h)anthracene	T	<0.13	<0.13	<0.16	<0.14	0.23
7h-Dibenzo(c,g)carbazole	T	<0.065	<0.065	<0.08	<0.068	<0.061
Dibenzo(a,e)pyrene	T	<0.13	<0.13	<0.16	<0.14	<0.12
Dibenzo(a,h)pyrene	T	<0.13	<0.13	<0.16	<0.14	0.17
Dibenzo(a,i)pyrene	T	<0.13	<0.13	<0.16	<0.14	<0.12
Dibenzo(a,l)pyrene	T	<0.13	<0.13	<0.16	<0.14	0.38
7,12-Dimethylbenz(a)anthracene	T	<0.13	<0.13	<0.16	<0.14	<0.12
1,6-Dinitropyrene	T	<0.65	<0.65	<0.8	<0.68	<0.61
1,8-Dinitropyrene	T	<0.33	<0.33	<0.41	<0.35	<0.31
Indeno(1,2,3-cd)pyrene	T	<0.13	<0.13	0.19	0.28	1.0 *
3-Methylcholanthrene	T	<0.14	<0.14	<0.18	<0.15	<0.13
5-Methylchrysene	T	<0.13	<0.13	<0.16	<0.14	0.20
5-Nitroacenapthene	T	<0.13	<0.13	<0.16	<0.14	<0.12
1-Nitropyrene	T	<0.13	<0.13	<0.16	<0.14	<0.12
6-Nitrochrysene	T	<0.26	<0.26	<0.32	<0.27	<0.24
2-Nitrofluorene	T	<0.13	<0.13	<0.16	<0.14	<0.12
BaP equivalent, non-detects at half of the detection limit.[2]	2 T	9.5	9.4	12	10	15 a

Table 4
Monitoring Well Groundwater Analytical Results
Excelsior City Park Dump
(concentrations in ug/L, unless noted otherwise)

Location Dup	MN Health Risk Limits	EPA Maximum Contaminant Levels	MN Health Based Values	MW-101 3/12/2009	MW-101 3/12/2009 DUP	MW-201 3/12/2009	MW-102 3/12/2009	MW-103 3/12/2009
Exceedance Key	Bold	Underline	Box					
Metals								
Antimony	6	6	--	<1.1	<1.1	<1.1	<1.1	<1.1
Arsenic	--	10	--	9.1 j	9.9 j	7.9 j	4.3 j	6.6 j
Beryllium	0.08	4	--	<0.21	<0.21	<0.21	<0.21	<0.21
Cadmium	4	5	--	<0.099	<0.099	<0.099	<0.099	<0.099
Chromium	100	100	--	0.55 jb	0.52 jb	3.1 jb	0.86 jb	0.68 jb
Copper	--	1300 TT (7)	--	<1.4	<1.4	<1.4	<1.4	<1.4
Lead	--	15 TT (7)	--	<0.68	<0.68	<0.68	1.3 j	<0.68
Mercury	--	2	--	0.060 j	0.040 j	<0.031	0.050 j	0.060 j
Nickel	100	--	--	0.31 j	0.42 j	2.7 j	1.9 j	2.3 j
Selenium	30	50	--	<2.2	<2.2	9.0 jb	<2.2	<2.2
Silver	30	--	--	0.49 j	0.24 j	1.7 j	0.24 j	0.20 j
Thallium	0.6	2	--	<2.6	<2.6	<2.6	<2.6	<2.6
Zinc	2000	--	--	<4.4	<4.4	6.1 j	8.0 j	<4.4
SVOCs								
2-Methylnaphthalene	--	--	--	<0.30	<0.30	<0.30	1.1 j	<0.30
Acenaphthene	400	--	--	1.2 j	1.1 j	2.7 j	<0.14	<0.14
Acenaphthylene	--	--	--	<0.16	<0.16	<0.16	<0.16	<0.16
Anthracene	2000	--	--	1.6 j	1.0 j	0.56 j	<0.17	<0.17
Benzo(g,h,i)perylene	--	--	--	1.1 j	<0.22	<0.22	<0.23	<0.22
Benzoic Acid	30000	--	--	5.8 j	5.4 j	3.6 j	<0.71	8.6 j
Carbazole	--	--	20	1.4 j	1.1 j	5.1 j	<0.23	<0.22
Dibenzofuran	--	--	20	<0.25	<0.25	2.3 j	<0.25	<0.25
Fluoranthene	300	--	--	5.9 j	3.6 j	<0.21	<0.22	<0.21
Fluorene	300	--	--	1.6 j	<0.15	3.6 j	<0.15	<0.15
Phenanthrene	--	--	--	6.2 j	4.5 j	5.7 j	<0.12	<0.12
Pyrene	200	--	200	4.8 j	3.1 j	<0.22	<0.23	<0.22
Benzo(a)anthracene	--	--	T	1.7 j	1.1 j	<0.17	<0.17	<0.17
Benzo(b)fluoranthene	--	--	T	2.2 j	<0.17	<0.17	<0.17	<0.17
Benzo(k)fluoranthene	--	--	T	0.81 j	<0.20	<0.19	<0.20	<0.19
Benzo(a)pyrene	--	0.2	T	1.4 j	<0.21	<0.20	<0.21	<0.20
Chrysene	--	--	T	2.3 j	1.5 j	<0.14	<0.14	<0.14
Dibenz(a,h)anthracene	--	--	T	<0.23	<0.23	<0.23	<0.24	<0.23
Indeno(1,2,3-cd)pyrene	--	--	T	1.1 j	<0.18	<0.18	<0.18	<0.18
BaP equivalent, non-detects at half of the detection limit.[3]	--	--	0.05	2.1	0.32	0.20	0.21	0.20
VOCs								
1,2,4-Trimethylbenzene	--	--	100	0.53 j	0.54 j	<0.040	9.4	22
1,3,5-Trimethylbenzene	--	--	100	0.23 j	0.19 j	<0.051	1.5	3.8
Benzene	2	5	--	<0.10	0.57 j	<0.10	1.5	0.58 j
Butyl benzene	--	--	--	<0.057	<0.057	<0.057	0.69 j	0.53 j
Butylbenzene sec	--	--	--	<0.045	<0.045	<0.045	0.63 j	1.4
Butylbenzene tert-	--	--	--	<0.028	<0.028	<0.028	0.23 j	<0.028
Cumene (isopropyl benzene)	300	--	--	<0.064	0.14 j	<0.064	0.72 j	0.67 j
Cymene p- (Toluene isopropyl p-)	--	--	--	0.57 j	0.53 j	<0.040	1.9 j	2.1 j
Ethyl benzene		700	50	0.36 j	0.31 j	<0.064	1.8	1.8
Naphthalene	300	--	--	1.5 j	1.5 j	2.6 j	1.7 j	1.1 j
Propylbenzene	--	--	--	<0.044	<0.044	<0.044	0.61 j	1.1
Toluene		1000	200	<0.062	0.29 j	<0.062	0.78 j	0.63 j
Xylene m & p	10000	--	--	0.68 j	0.62 j	<0.16	1.8 j	4.1
Xylene o-	10000	--	--	0.56 j	0.46 j	<0.078	0.86 j	2.2
Xylenes total	10000	--	--	1.24 a	1.08 a	ND	2.66 a	6.3

Location Date Dup	MPCA Recreational SRV 12/10/2008	Q41-2-Grb1&4 4/30/2009	Q41-2-Grb1&4 4/30/2009 DUP	Q41-2-Grb2&5 4/30/2009	Q41-2-Grb3&6 4/30/2009	Q41-2-Grb7&8 4/30/2009
Dioxins/Furans, ng/kg						
2,3,7,8-TCDD	25 DI	0.326 j EMPC	0.512 j	<0.06	0.190 j EMPC	0.132 j EMPC
1,2,3,7,8-Dioxin penta	--	0.971 j EMPC	1.79 j	0.380 j	0.768 j	0.329 j
1,2,3,4,7,8-Dioxin, hexa	--	0.651 j	1.41 j	0.326 j EMPC	0.592 j	0.175 j
1,2,3,6,7,8-Dioxin, hexa	--	2.22 j	5.63	1.17 j	2.23 j	0.715 j
1,2,3,7,8,9-Dioxin, hexa	--	3.39	5.74	1.51 j	2.75 j	1.46 j
1,2,3,4,6,7,8-Dioxin, hepta	--	62.8	232	23.9 *	49.4 *	12.2
Dioxin octa	--	363	1620	182 *	387 *	91.4
2,3,7,8-TCDF	--	2.57	3.42	0.781 j	0.869 j EMPC	0.456 j EMPC
1,2,3,7,8-Dibenzofuran, penta	--	2.13 j	2.2 j	0.450 j	0.567 j EMPC	0.321 j
2,3,4,7,8-Dibenzofuran, penta	--	5.32	3.9 j	0.791 j	1.06 j	0.617 j
1,2,3,4,7,8-Dibenzofuran, hexa	--	11.7	10.1	1.73 j	2.78 j	1.33 j
1,2,3,6,7,8-Dibenzofuran, hexa	--	4.67	4.01	0.696 j	1.25 j	0.522 j
1,2,3,7,8,9-Dibenzofuran, hexa	--	0.0854 j EMPC	<0.158	<0.187	<0.165	<0.0655
2,3,4,6,7,8-Dibenzofuran, hexa	--	6.54	5.83	0.945 j	1.37 j	0.682 j EMPC
1,2,3,4,6,7,8-Dibenzofuran, hepta	--	13.5	24.4	3.79*	8.20 *	3.77
1,2,3,4,7,8,9-Dibenzofuran, hepta	--	0.922 j	1.69 j	0.293 j	0.450 j EMPC	0.267 j EMPC
Dibenzofuran octa	--	6.07	39.6	5.09 j*	11.4 *	5.99
TEQ $_{DF}$ WHO05[2], non-detects at half of the detection limit	25	6.4 a	10.2 a	1.7 a	3.0 a	1.3 a
Dioxin penta, Total	--	69.2	74.5	12.3	17.6	12.1
Dioxin tetra, Total	--	77.9	83	14.2	22.1	6.73
Dioxin, hepta, Total	--	22.7	61.8	8.71	18.3	9.01
Dioxin, hexa, Total	--	42.2	56.3	8.63	16.6	8.94
Dibenzofuran penta, Total	--	42.1	44.3	8.23	17.7	15.3
Dibenzofuran tetra, Total	--	16.5	14.6	3.05	5.74	8.89
Dibenzofuran, hepta, Total	--	118	457	48.9	101	27.0
Dibenzofuran, hexa, Total	--	50.7	82.4	16	33.8	16.4

Notes:

DUP	Duplicate sample.
--	No criteria/not analyzed.
*	Estimated value, QA/QC criteria not met.
ND	Not detected.
DI	Value represents a criterion for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.
EMPC	Estimated Maximum Possible Concentration.
a	Estimated value, calculated using some or all values that are estimates.
e	Estimated value, exceeded the instrument calibration stage.
j	Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.
T	Value represents a criterion for the total carcinogenic PAHs as BaP. Total carcinogenic PAHs are: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, Chrysene and Indeno(1,2,3-cd)pyrene.

Table 4
Monitoring Well Groundwater Analytical Results
Excelsior City Park Dump
(concentrations in ug/L, unless noted otherwise)

Location Dup	MN Health Risk Limits	EPA Maximum Contaminant Levels	MN Health Based Values	MW-101 3/12/2009	MW-101 3/12/2009 DUP	MW-201 3/12/2009	MW-102 3/12/2009	MW-103 3/12/2009
Exceedance Key	**Bold**	Underline	Box					
Dioxins/Furans, pg/L								
2,3,7,8-TCDD	--	--	--	1.78 j EMPC	2.21 j EMPC	<0.418	1.08 j EMPC	1.20 j EMPC
1,2,3,7,8-Dioxin penta	--	--	--	0.537 j EMPC	0.827 j EMPC	<0.336	6.76 j	2.13 j EMPC
1,2,3,4,7,8-Dioxin, hexa	--	--	--	0.619 j EMPC	0.803 j EMPC	<0.378	7.21 j	1.96 j
1,2,3,6,7,8-Dioxin, hexa	--	--	--	2.32 j EMPC	3.92 j	<0.309	27.5	9.73 j
1,2,3,7,8,9-Dioxin, hexa	--	--	--	1.96 j EMPC	3.50 j	<0.338	24.7 j	10.6 j
1,2,3,4,6,7,8-Dioxin, hepta	--	--	--	41.6	57.9	0.930	450	312
Dioxin octa	--	--	--	354	517	6.71	3690	5350
2,3,7,8-TCDF	--	--	--	<0.396	<0.509	<0.435	6.65 j	1.69 j EMPC
1,2,3,7,8-Dibenzofuran, penta	--	--	--	<0.232	<0.268	<0.200	3.99 j EMPC	1.75 j
2,3,4,7,8-Dibenzofuran, penta	--	--	--	0.551 j	0.704 j	<0.196	7.68 j	3.05 j
1,2,3,4,7,8-Dibenzofuran, hexa	--	--	--	1.46 j EMPC	2.05 j	<0.158	27.4	8.43 j
1,2,3,6,7,8-Dibenzofuran, hexa	--	--	--	0.837 j	0.892 j	<0.148	9.11 j	2.78 j
1,2,3,7,8,9-Dibenzofuran, hexa	--	--	--	<0.176	<0.322	<0.182	<1.85	<0.249
2,3,4,6,7,8-Dibenzofuran, hexa	--	--	--	0.867 j	1.09 j	<0.167	11.7 j	4.12 j
1,2,3,4,6,7,8-Dibenzofuran, hepta	--	--	--	14.4 j	16.7 j	<0.232	64.0	24.3 j
1,2,3,4,7,8,9-Dibenzofuran, hepta	--	--	--	1.23 j	<0.500	<0.306	5.13 j	1.47 j EMPC
Dibenzofuran octa	--	--	--	252	40.2 j	1.50	121	110
TEQ DF WHO05[4], non-detects at half of the detection limit	--	30	--	2.6 a	3.9 a	0.53	28 a	11 a
Dioxin penta, Total	--	--	--	17.7 j	21.8 j	<0.336	128	25.3
Dioxin tetra, Total	--	--	--	11.6	16.1	<0.418	43.8	7.72 j
Dioxin, hepta, Total	--	--	--	81.1	116	0.930 j	852	660
Dioxin, hexa, Total	--	--	--	27.4	42.2	<0.309	349	116
Dibenzofuran penta, Total	--	--	--	14.3 j	20.4 j	<0.196	115	40.5
Dibenzofuran tetra, Total	--	--	--	1.12 j	6.02 j	<0.435	98.9	36.9
Dibenzofuran, hepta, Total	--	--	--	40.7	48.7	<0.232	198	83.5
Dibenzofuran, hexa, Total	--	--	--	18.8 j	25.7	<0.148	103	43.8

DUP	Duplicate sample.
--	No criteria.
ND	Not detected.
EMPC	Estimated Possible Maximum Concentration.
TT	Treatment technique.
a	Estimated value, calculated using some or all values that are estimates.
b	Potential false positive due to blank data validation procedure.
j	EPA recommended sample preservation, extraction or analysis holding time was exceeded.
(1)	Lowest HBV value for toxicological endpoint of cancer is displayed. Higher HBV values exist for other toxicological endpoints. See documentation for other HBVs for this compound.
(2)	1998 Final Rule for Disinfectants and Disinfection By-products: The total for trihalomethanes is 0.08 mg/L.
(7)	Copper action level at 1.3 mg/L, Lead action level at 0.015 mg/L
T	Value represents a criterion for the total carcinogenic PAHs as BaP. Total carcinogenic PAHs are: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, Chrysene and Indeno(1,2,3-cd)pyrene.
3	Total BaP equivalence (2002) calculated using half of the detection limit on the non detected compounds.

Table 5

Soil Vapor Methane (%) and Selected VOC Analytical Results (ug/m^3)

Soil Vapor Probes, Excelsior City Park Dump

Soil Vapor Location	Methane (% by vol.)(1)	VOC→	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Benzene	1,3-Butadiene	Ethyl Benzene	Napthalene	Toluene	PCE(3)	Vinyl Chloride	Xylenes
		ISV(2)→	2,000	2000	1300	100	300,000	3,000	1,000,000	6,000	300	30,000
SV-1	28.5		200	73	66	18	49	730	82	<11	<11	196
SV-2	2.6		71	24	45	19	22	**3500**	32	<6.4	<6.4	77
SV-3	21.6											
SV-4	0.3											
SV-5	0.4											
SV-6	42.9		200	82	110	<27	27	57	27	<27	150	1193
SV-7	20.1		180	98	74	<13	160	20	140	45	250	610
SV-8	0.5											
SV-9	6.3											
SV-10	22											
SV-11	0.1											
SV-12	46.9		100	32	39	<11	38	890	41	<11	<11	79
SV-13	0											
SV-14	0											
SV-15	0											
SV-16	0											
SV-17	0											
SV-18	15.5		18	<6.9	13	9	13	24	18	<6.9	<6.9	28
SV-19	1.3											
SV-20	58.4		120	<63	<63	<63	<63	<63	<63	<63	<63	<130
SV-21	18.4											
SV-22	3.2											
SV-23	14.3		18	8.3	5.4	<2.1	25	250	20	<2.1	<2.1	34
SV-24	2.8											
SV-25	0											

Table 5

Soil Vapor Methane (%) and Selected VOC Analytical Results (ug/m^3)

Soil Vapor Probes, Excelsior City Park Dump

Soil Vapor Location	Methane (% by vol.)(1)	VOC→	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Benzene	1,3-Butadiene	Ethyl Benzene	Napthalene	Toluene	PCE(3)	Vinyl Chloride	Xylenes
		ISV(2)→	2,000	2000	1300	100	300,000	3,000	1,000,000	6,000	300	30,000
SV-26	0											
SV-27	0											
SV-28	0											
SV-29	0											
SV-30	0											
SV-31	0											
SV-32	0											
SV-33	0											
SV-34	0		18	6.1	43	<6	14	<6	19	<6	<6	40
SV-35	0											
SV-36	0.1		6	1.5	1.3	2.3	3.1	3.7	7.9	<0.6	<0.6	11
SV-37	0											
SV-38	0											
SV-39	0											
SV-40	0											
SV-41	0											
SV-42	0											
SV-43	0											
SV-44	0											
SV-45	0											
SV-46	0.3											
SV-47	0											
SV-48	18.2		12	3.5	26	6.4	5.1	0.66	13	2.8	0.8	23
SV-49	23.9											
SV-50	0.1											

Table 5

Soil Vapor Methane (%) and Selected VOC Analytical Results (ug/m^3)

Soil Vapor Probes, Excelsior City Park Dump

Soil Vapor Location	Methane (% by vol.)(1)	VOC→	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Benzene	1,3-Butadiene	Ethyl Benzene	Napthalene	Toluene	PCE(3)	Vinyl Chloride	Xylenes
		ISV(2)→	2,000	2000	1300	100	300,000	3,000	1,000,000	6,000	300	30,000
SV-51	0.1											
SV-52	0											
SV-53	1.9		20	14	6.6	4.6	5.7	1.9	11	3.8	<0.6	34
SV-54	14.1											
SV-55	9											
SV-56	70.1		<38	<38	<38	<38	<38	<38	<38	<38	<38	<76
SV-57	61.8											
SV-58	23.7											
SV-59	1.8											
SV-60	0.1											
SV-61	4		8.3	1.9	0.73	<0.6	2.5	2.6	4.9	<0.6	<0.6	13
SV-62	33.7											
SV-63	0.1											
SV-64	0											
SV-65	0											
SV-66	0											
SV-67	0											
SV-68	4											
SV-69	14.2		5	1.2	2.6	1.3	1.9	2	4.1	<0.6	<0.6	10
SV-70	0											
SV-71	14.9											
SV-72	0.3											
SV-73	0.3											

(1) Note the lower explosive limit (LEL) of methane is 5% by volume and the upper explosive limit (UEL) is 15% by volume.

(2) ISV represents 100x the MPCA Industrial ISV

(3) Tetrachloroethene

Table 6

Soil Vapor Methane (%) and Selected VOC Analytical Results (ug/m³)

Permanent Vapor Monitoring Points, Excelsior City Park Dump

Location/ Date	Methane (% by vol.)(1)	VOC→	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Benzene	1,3-Butadiene	Ethyl Benzene	Napthalene	Toluene	PCE(3)	Vinyl Chloride	Xylenes
		ISV(2)→	2,000	2000	1300	100	300,000	3,000	1,000,000	6,000	300	30,000
VM-1												
8/5/2009	0.4		30	24	3.2	<0.66	4.3	4.4	6.9	2	<0.66	52
8/12/2009	6.8		8.1	10	0.97	<0.63	1.4	2.1	3.1	2.8	<0.63	10.6
8/20/2009	18.9		3.1	2.1	1.7	<0.61	1.1	<0.61	2.2	2.3	<0.61	5.2
9/2/2009	0.1		3.7	1	0.63	<0.6	0.82	1.7	2.6	2.4	<0.6	4.6
10/20/2009	0		1.1	<0.59	<0.59	<0.59	<0.59	<0.59	1.1	0.98	<0.59	<1.2
12/23/2009	x		<0.63	<0.63	<0.63	<0.63	<0.63	<0.63	0.77	<0.63	<0.63	>1/3
VM-2												
8/5/2009	0.3		29	8.6	9.8	1.4	11	19	24	16	<0.65	46
8/12/2009	0.3		6.9	2.3	1.6	<0.63	2	6	6.7	7.1	<0.63	9.4
8/20/2009	0		2.6	0.63	<0.62	<0.62	<0.62	1.8	2.1	5.6	<0.62	3.3
9/2/2009	0.3		2.8	0.7	<0.61	<0.61	<0.61	0.75	1.5	3.5	<0.61	3
10/20/2009	0		1.1	<0.6	<0.6	<0.6	<0.6	<0.6	1.1	2	<0.60	<1.2
12/23/2009	x		2.6	0.77	3.3	<0.63	2.8	<0.63	52	1.8	<0.63	11.3
VM-3												
8/5/2009	25.2		44	15	<6.7	<6.7	11	220	18	60	<6.7	80
8/12/2009	0.2		3.7	1.1	<0.62	<0.62	1.5	4.5	3	110	<0.62	7.2
8/20/2009	0.1		2.6	<0.63	<0.63	<0.63	<0.63	2.5	1.7	120	<0.63	3
9/2/2009	0.1		2.5	<0.61	<0.61	<0.61	<0.61	2.2	1.8	120	<0.61	3.2
10/20/2009	0.2		<0.61	<0.61	<0.61	<0.61	<0.61	<0.61	0.82	48	<0.61	<1.2
12/23/2009	x		1.7	<0.68	1.3	<0.68	1.5	<0.68	27	27	<0.68	6.5
VM-4												
8/5/2009	0.6		18	5.1	13	1.1	9.1	13	27	99	<0.65	29.6
8/12/2009	0.2		2.9	0.75	0.8	<0.6	1	1.4	3.6	52	<0.60	11.8
8/20/2009	0		2.1	<0.62	<0.62	<0.62	<0.62	1.4	1.8	100	<0.62	2.6
9/2/2009	0.3		1.6	<0.61	<0.61	<0.61	<0.61	0.92	0.81	98	<0.61	<1.2
10/20/2009	0		0.75	<0.59	<0.59	<0.59	<0.59	<0.59	<0.59	45	<0.59	<1.2
12/23/2009	x		<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	<0.57	19	<0.57	<1.1
VM-5												

Table 6

Soil Vapor Methane (%) and Selected VOC Analytical Results (ug/m^3)

Permanent Vapor Monitoring Points, Excelsior City Park Dump

Location/ Date	Methane (% by vol.)(1)	VOC→	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Benzene	1,3-Butadiene	Ethyl Benzene	Napthalene	Toluene	PCE(3)	Vinyl Chloride	Xylenes
		ISV(2)→	2,000	2000	1300	100	300,000	3,000	1,000,000	6,000	300	30,000
8/5/2009	0.4		43	21	21	<0.67	21	200	51	3.3	<0.67	107
8/12/2009	0.5		18	7.2	2.5	<0.61	2.3	58	9	1.8	<0.61	29
8/20/2009	0		10	2.5	1.7	<0.6	1.2	20	4.9	1.9	<0.60	14.2
9/2/2009	0.2		6.9	1.7	1.4	<0.61	0.88	14	3.2	1.7	<0.61	9.2
10/20/2009	0		1.4	<0.6	<0.6	<0.6	<0.6	5.6	0.9	0.92	<0.60	<1.2
12/23/2009	x		<0.68	<0.68	<0.68	<0.68	<0.68	<0.68	0.9	<0.68	<0.68	<1.4
VM-6												
8/5/2009	0.4		13	3.6	4.4	<0.65	6.1	11	17	13	<0.65	22.4
8/12/2009	0.2		3	0.71	<0.61	<0.61	0.7	3.5	3.2	6.3	<0.61	3.8
8/20/2009	0		2.8	0.62	<0.6	<0.6	1.6	2	43	2.7	<0.60	7.3
9/2/2009	0.3		2.2	<0.61	<0.61	<0.61	<0.61	1.8	0.93	3.7	<0.61	2.2
10/20/2009	0		<0.62	<0.62	<0.62	<0.62	<0.62	<0.62	<0.62	<0.62	<0.62	<1.2
12/23/2009	x		0.95	<0.69	<0.69	<0.69	<0.69	<0.69	3.5	0.73	<0.69	<1.4
VM-7												
8/5/2009	33.2		12	<6.4	<6.4	<6.4	<6.4	8	14	<6.4	<6.4	<6.4
8/12/2009	36.2		<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
8/20/2009	39.2		<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1
9/2/2009	42.2		<6.3	<6.3	<6.3	<6.3	<6.3	<6.3	<6.3	<6.3	<6.3	<6.3
10/20/2009	51.3		<6	<6	<6	<6	<6	<6	<6	<6	<6	<6
12/23/2009	4.4		<0.64	<0.64	0.65	<0.64	<0.64	<0.64	1.7	<0.64	<0.64	<0.64

(1) Note the lower explosive limit (LEL) of methane is 5% by volume and the upper explosive limit (UEL) is 15% by volume.

(2) ISV represents 100x the MPCA Industrial ISV

(3) Tetrachloroethene x = instrument malfunction, no reading

Table 1
Soil Analytical Results
Near-Surface Samples
Excelsior City Park - Former Dump
Excelsior, Minnesota
Footnotes

DUP	Duplicate sample.
--	No criteria/not analyzed.
*	Estimated value, QA/QC criteria not met.
ND	Not detected.
CR	Value represents the criteria for Chromium, hexavalent.
DI	Value represents a criteria for 2,3,7,8-TCDD or 2,3,7,8-TCDD equivalents.
EMPC	Estimated Maximum Possible Concentration.
M	Value represents the criteria for mixed Xylenes.
MC	Mercury as Mercuric Chloride.
a	Estimated value, calculated using some or all values that are estimates.
e	Estimated value, exceeded the instrument calibration stage.
j	Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.
T	Value represents a criteria for the total carcinogenic PAHs as BaP. Total carcinogenic PAHs are: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, Chrysene and Indeno(1,2,3-cd)pyrene.

1 Total BaP equivalence (2002) calculated using half of the detection limit on the non detected compounds.

	CAS No.	Site Conc. (mg/kg) dry weight	Relative Potency Factor	BaP Equivalent (mg/kg)
Benzo(a)anthracene	56553	0.000	0.1	0.000
Benzo(b)fluoranthene	205992	0.000	0.1	0.000
Benzo(k)fluoranthene	207089	0.000	0.1	0.000
Benzo(a)pyrene	50328	0.000	1	0.000
Chrysene	218019	0.000	0.01	0.000
Dibenz(a,h)anthracene	53703	0.000	0.56	0.000
Indeno(1,2,3-cd)pyrene	193395	0.000	0.1	0.000
		Total BaP equivalence = compare this value to the BaP criteria		0.000

2 Total TEQ $_{DF}$ equivalents calculated using half of the detection limit on the non detected compounds.

	Site Conc.	Toxicity Equivalency Factor (WHO05)[q]	TEQ $_{DF}$
2,3,7,8-TCDD	0.000	1	0.000
1,2,3,7,8-Dioxin penta	0.000	1	0.000
1,2,3,4,7,8-Dioxin, hexa	0.000	0.1	0.000
1,2,3,6,7,8-Dioxin, hexa	0.000	0.1	0.000
1,2,3,7,8,9-Dioxin, hexa	0.000	0.1	0.000
1,2,3,4,6,7,8-Dioxin, hepta	0.000	0.01	0.000
Dioxin octa	0.000	0.0003	0.000
2,3,7,8-TCDF	0.000	0.1	0.000
1,2,3,7,8-Dibenzofuran, penta	0.000	0.03	0.000
2,3,4,7,8-Dibenzofuran, penta	0.000	0.3	0.000
1,2,3,4,7,8-Dibenzofuran, hexa	0.000	0.1	0.000
1,2,3,6,7,8-Dibenzofuran, hexa	0.000	0.1	0.000
2,3,4,6,7,8-Dibenzofuran, hexa	0.000	0.1	0.000
1,2,3,7,8,9-Dibenzofuran, hexa	0.000	0.1	0.000
1,2,3,4,6,7,8-Dibenzofuran, hepta	0.000	0.01	0.000
1,2,3,4,7,8,9-Dibenzofuran, hepta	0.000	0.01	0.000
Dibenzofuran octa	0.000	0.0003	0.000
	Total TEQ $_{DF}$ =		0.000

q Van den Berg, et al., The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. ToxSci Advance Access published July 7, 2006.

Appendix 3: 2009 Information Sheet

Environmental Health Information

Excelsior Parkland

May 2009

Background

Excelsior Parkland is located at the southwest corner of the intersection of Oak Street and Beehrle Avenue in Excelsior, Minnesota. The park is about three acres in size, and has a walking path, gazebo, pond, and community gardens. The site was a unpermitted dump in the 1950s and 1960s before the City of Excelsior obtained it.

While the dump has been covered with clean soil, the cover is not adequate and wastes are exposed along the shore of a pond on the south side of the park. The City of Excelsior is working with Hennepin County, the Minnesota Pollution Control Agency (MPCA), and the Minnesota Department of Health (MDH) to ensure the site is properly covered and potential health risks are addressed.

What contamination has been found at the site?

Much of the waste dumped at the site appears to have been burned, which was a common practice at the time. Contaminants commonly linked with burned wastes, such as polynuclear aromatic hydrocarbons (PAHs), heavy metals such as arsenic and lead, and dioxins/furans have been detected in the waste materials and to a much lesser extent in the surface soils. Methane gas has also been detected in the soil.

Additional soil samples were collected in the western end of the park, which is rented out as community gardens, because people are likely to have more contact with the soil while gardening. The results showed that levels of heavy metals and PAHs were slightly elevated in some surface soil samples. Higher levels were found in the waste materials, four feet or more below the ground.

What cleanup is planned for the site?

The City of Excelsior, using grant funding from Hennepin County, will be taking several steps in 2009 to address the contamination at the site. First, a trench will be dug and a venting system installed to safely vent methane gas. In the fall, the City plans to bring in additional clean soil to provide a thicker cover over the waste materials. Access to the park and community garden may be restricted for a short time during cleanup activities.

Is the community garden area safe to use now?

Levels of contaminants in the community garden were low. MDH believes that the health benefits of a community garden (outdoor physical activity and consuming fresh, locally grown produce) outweigh any possible health risks associated with using the garden for the 2009 growing season.

What can you do to prevent or reduce contact with contaminants in the soil?

There are steps that park users and gardeners can take this summer (2009) to reduce accidental swallowing of even slightly contaminated soil. Accidental swallowing is more likely to happen when soil is left on fingers and hands or on produce. Children are more likely to have contact with the soil. Preschool-age children are even more likely to be exposed because they often put their hands in their mouths. Contaminated soil can also be tracked into the house on shoes and can end up on indoor surfaces and toys. Once additional clean soil is put on the dump, these precautions will no longer be needed.

- Adults should wash their hands before feeding their children, smoking, eating or drinking. Water is available at the garden that can be used for this purpose.
- Wash children's hands and faces, especially before eating and bedtime. Keep fingernails short and clean. Clean any toys brought to the park/garden that children may put in their mouths.
- Take off your garden shoes when you enter your home to prevent tracking contaminated soil inside. Store outdoor/garden shoes at entryways. Remember that pets can carry in soil dust on their paws.
- Use gardening gloves (leather is better than cloth) when gardening to keep contaminated dust out from under fingernails and reduce the chance that soil on fingers and hands could be swallowed.
- Keep garden tools and gloves in one area of the garage or shed.
- Periodically rinse tools off.
- Don't smoke or eat while gardening.
- Thoroughly wash and peel all vegetables and produce before eating or cooking them.

For more information, or if you have questions, please contact:

City of Excelsior:

Kristi Luger, City Manager, 952-474-5233, kluger@ci.excelsior.mn.us

MDH:

James Kelly, Health Assessor, 651-201-4910, james.kelly@state.mn.us

Hennepin County:

John Evans, Senior Environmentalist, 612-348-4046, john.evans@co.hennepin.mn.us

MPCA:

Shanna Schmitt, Hydrogeologist, 651-757-2697, shanna.schmitt@state.mn.us

For more information contact:

MDH/Site Assessment and Consultation: (651) 201-4897 or 1 (800) 657-3908, press "4" and leave a message.

To request this document in another format, call (651) 201-5000 or TDD: (651) 201-5797.

This information sheet was prepared with partial support from the federal Agency for Toxic Substances and Disease Registry (ATSDR). This statement does not imply that ATSDR has endorsed this information sheet.