

**LEAD IN SOIL TESTING PROGRAM
WINNIPEG, MANITOBA**

Prepared for:

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EXECUTIVE SUMMARY

Under the direction of Manitoba Environment, Climate and Parks (MECP), Parsons Inc., in collaboration with Intrinsik Corp., conducted a soil lead sampling and assessment program in October/November 2021 and provided a review and interpretation of the lead analytical results and recommendations for further action. The work was conducted as follow up to the assessment conducted in 2019 by Intrinsik (Intrinsik, 2019). The investigation was conducted on public areas (parks or schools) in 40 neighbourhoods specified by MECP based on the priority areas specified from the 2019 assessment, and were generally located in the central parts of the City of Winnipeg, as well as within 500 m of the airport. Samples were collected from 53 school properties and 147 parks within these neighborhoods, for a total of 200 sites. From those 200 sites, a total of 2018 distinct locations were sampled for lead and compared to guidelines. Soil samples were collected at a depth of 0 - 2.5 cm below grade. The sampling sites focused primarily on public areas where children under seven years old frequent as they are at the greatest risk from exposure.

The results of the soil investigation indicated that of 2013 samples collected (excludes samples noted below), 118 (5.9%) contained concentrations of lead greater than the Canadian Council of Ministers of the Environment (CCME) Soil Quality Guideline (SQG) of 140 mg/kg, while 48 (2.4%) were greater than 210 mg/kg. One sample location (comprised of five individual samples) from Mission Park was excluded from these totals since concentrations were significantly higher (maximum of 88,000 mg/kg) than those from the other samples and artificially skewed the overall results.

It is recommended that further action is taken for a number of individual sites (parks or schools) sampled in 2021, which had concentrations greater than the referenced guidelines. Six sites have been identified as high priority for further action. An additional 20 sites were identified as medium priority, and 16 sites were identified as low priority. These actions will be based on an evaluation of risk, and may include inspection to ensure sufficient sod/vegetation cover to restrict direct access to exposed soils, further sampling to delineate exceedances, the application of capping measures (soil or hard surfaces), localized soil removal and replacement programs, or other appropriate options that limit direct exposure to impacted soils.

Based primarily on the results of the 2021 soil investigation, soil lead concentrations for a number of neighbourhoods have been identified for further action. Given that this work was a focused sampling initiative on schools and parks, several neighbourhoods with fewer applicable sampling sites (parks or schools) had a lower number of samples collected, and therefore the overall results may be skewed by the occurrence of one or two outliers. Consideration must be given to whether the sampling data is reflective of conditions across the neighbourhood as a whole, and of soil lead concentrations on residential properties where young children are likely to have the greatest opportunity for exposure. Several other neighbourhoods were not specifically identified for further consideration as a result of lower overall soil lead concentrations; however, it should be recognized that areas with higher soil lead concentrations than those identified in the selected

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sampling locations may exist. Consistent with recommendations provided by Intrinsik (2019), the assessment of potential risks associated with soil lead concentrations indicates that further study may be warranted. The neighbourhoods identified for further consideration, based on an analysis of the 2021 analytical data exclusively, are Centennial, Central St. Boniface, Daniel McIntyre, Dufresne, Holden, South Point Douglas, Weston, and William Whyte. Other neighbourhoods sampled in 2021 may be identified for further analysis at a later date, given limitations of the 2021 data set.

It is recommended that further evaluation of the current and available historical data is conducted along with a data gap analysis to identify those additional areas (neighbourhoods) that may require supplemental soil sampling. Consideration should also be given to collecting soil samples from residential properties for those neighbourhoods where soil lead concentrations on public spaces have been identified for further consideration, or where the low number of parks or schools in the neighbourhood resulted in a limited number of samples being collected during the 2021 investigation.

Given that there are sufficient data to demonstrate that soil lead concentrations in certain neighbourhoods warrant further consideration, blood lead monitoring may be an effective approach for assessing risks and the potential need for further soil sampling and/or the implementation of risk management measures. The objective of blood lead monitoring is to measure actual levels of lead exposure, which will help determine if exposures experienced by young children represent a potential health concern.

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a – one summary drawing for each sampling site, for a total of 201 pages (note: Kavanagh park straddles two neighbourhoods; two drawings are provided)

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1.0 INTRODUCTION

Under the direction of Manitoba Environment, Climate and Parks (MECP) (formerly Manitoba Conservation and Climate (MCC)), Parsons Inc. (Parsons) in collaboration with Intrinsic Corp (Intrinsic), conducted a soil sampling and assessment program consisting of lead sampling at selected properties (hereafter referred to as “sites”) in 40 neighbourhoods within the City of Winnipeg, Manitoba. As discussed below, the sampling program focused on public areas where toddlers and children under seven years frequent, such as schools, parks and fields or other green spaces. The soil sampling was undertaken for the purpose of the evaluation of shallow soil lead concentrations where toddlers and children under the age of seven frequent. This assessment program also included the analysis and interpretation of the analytical results and recommendations for go-forward action.

The field work was conducted in October and November 2021.

1.1 SCOPE OF WORK

The scope of work consisted of:

- Selecting 200 sampling sites on public lands (parks and schools) within the 40 specified neighbourhoods for soil sampling, with the approval of the sampling sites by MECP;
- Collecting shallow soil samples at a depth of approximately 0 - 2.5 cm below ground surface and the submission of the samples for laboratory analysis of lead; and,
- Preparation of a report that describes the sampling methodology, sample locations (including GPS coordinates), the results of the investigation, an analysis of the results, and high-level recommendations for further work.

2.0 BACKGROUND

Elevated concentrations of lead were detected in shallow soils during previous investigations in various central areas in the City of Winnipeg. The most recent applicable investigations consisted of shallow soil sampling conducted in 2007/2008 by Manitoba Conservation (MC, 2010), in 2017 by the University of Manitoba (U of M, 2017) and in 2018 by Manitoba Sustainable Development (MSD, 2019), however studies date back to between 1979 and 1985 when investigations detected elevated concentrations in soil at Weston School (MCC, 2021a).

In 2019, an assessment was completed by Intrinsic including a review of the available data, current and historical sources of lead in Winnipeg, and a jurisdictional overview of approaches for assessing and managing lead in soil in Canada (Intrinsic, 2019). The report indicated there was a variety of sources of lead within the City of Winnipeg, including automobile exhaust from leaded gasoline, and three secondary lead smelters that previously operated in the northwest

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area of the City. Other possible sources cited included scrap yards (from physical manipulation of lead-containing products), as well as rail yards/lines, waste-transfer stations, and other commercial/industrial operations in various areas of the City. Additionally, lead paint was cited as a possible source of lead in older neighbourhoods in the City. The primary sources of lead emissions are no longer present, following the phase-out of leaded gasoline from automobiles and the ceasing of smelter operations. Elevated concentrations of lead often persist in surface soils; leaching of lead is limited due to its tendency to adsorb to soil particles and it does not degrade over time. Leaded pipes in older neighbourhoods present a source of lead in drinking water.

As part of the 2019 assessment, a preliminary calculation of site-specific remediation criteria was undertaken to generate a guideline range for lead in soil based on non-threshold contaminant approach, with protection of neurodevelopment effects among infants and children as the primary health concern related to lead exposure (Intrinsik, 2019). The 2019 report indicated several neighbourhoods of potential concern, with a recommendation that testing and evaluation of lead concentrations in soil be conducted to support future decision making (Intrinsik, 2019).

3.0 SOIL SAMPLING LOCATIONS

3.1 NEIGHBOURHOODS

A total of 40 neighbourhoods within Winnipeg were selected by MECP for sampling (MCC, 2021a). The neighbourhoods specified are shown on Drawing No. 1 and included:

- Archwood
- Brooklands
- Burrows Central
- Burrows-Keewatin
- Centennial
- Central St. Boniface
- Chalmers
- Daniel McIntyre
- Dufferin
- Dufferin Industrial
- Dufresne
- East Elmwood
- Glenelm
- Holden
- Inkster-Faraday
- Lord Roberts
- Lord Selkirk Park
- Luxton
- Mynarski
- North Point Douglas
- Norwood East
- River-Osborne
- Riverview
- Robertson
- Sargent Park
- Shaughnessy Park
- South Point Douglas
- St. Boniface Industrial Park
- St. John's
- St. John's Park
- Stock Yards
- Tissot
- Tyndall Park
- Weston
- William Whyte
- Windsor Park

- Minto
- Mission Industrial
- Wolseley
- Winnipeg International Airport (buffer zone of 500 metres)

The neighbourhood boundaries were retrieved from the City of Winnipeg “Neighbourhood” map available from the Open Data Catalogue (City of Winnipeg, 2021a). For the airport area, a distance of 500 m was marked from the boundary of the “Airport” neighbourhood.

3.2 SELECTION OF SAMPLING SITES AND LOCATIONS

The sampling program focused mainly on public areas where toddlers and children less than seven years old frequent, as directed by MECP. Specifically, a total of 200 properties (sites) were selected for sampling within the specified neighbourhoods.

The following sites were prioritized for sampling as agreed by MECP:

- Elementary schools with grades that would include children under seven; and,
- Parks, open spaces, and greenfields, particularly those with play structures, wading pools, picnic areas, etc. that would attract young children.

The data sources reviewed and used to identify the sampling sites were as follows:

- Parks, open spaces, and greenfield/future park spaces owned by the City of Winnipeg were identified from the Map of Parks and Open Space (City of Winnipeg, 2021b).
- Public schools were identified using school division websites, maps, and/or lists (Louis Riel School Division 2021, Division Scolaire Franco-Manitobaine 2021, Winnipeg School Division 2021, St. James-Assiniboia School Division, 2021).
- Several independent elementary schools within the specified neighbourhoods were also included for sampling, as agreed by MECP.
- The property boundaries of the sites (schools and parks) were based on the City of Winnipeg map of Assessment Parcels (City of Winnipeg, 2021c).

The selected sampling sites within the 40 neighbourhoods are summarized on Drawings No. A.1 to A.40 in Appendix A.

The number of samples and specific sampling locations within each site (school or park) were selected based the size of the site, consideration for spatial distribution of sample locations, and location of any park/school facilities based on aerial photographs. Locations were chosen to avoid sampling imported fill materials (such as imported sand or gravel). Sampling locations were also chosen to avoid sampling directly underneath or adjacent to painted play structures, fences and buildings.

Note that for select sample locations (three locations, mainly prioritizing samples with high lead results), a laboratory re-analysis was requested of the originally submitted soil sample. Also, in a select number of locations (five), a return visit was conducted and additional soil samples were collected in proximity to samples which contained elevated concentrations.

3.2.1 SCHOOL PROPERTIES

A total of 53 school properties were sampled, as follows:

School Division	Number of Sampling Sites
Winnipeg School Division	40 ^a
St. James Assiniboia School Division	1
Louis Riel School Division	7
Division Scolaire Franco-Manitobaine	2
Independent Schools	3
Total:	53

a - includes Margaret Scott Park, which is owned by the Winnipeg School Division

Note: Weston School was reported to be previously assessed for lead, and was not sampled as part of the current assessment program.

3.2.2 CITY OF WINNIPEG PROPERTIES

A total of 147 City-owned sites were sampled, including parks, opens spaces, and greenfields/future parks owned by the City of Winnipeg (City of Winnipeg, 2021b). There are also two small parcels owned by the City that are used by the adjacent school (both within the Winnipeg School Division).

Description	Number of Sampling Sites
City properties	147
City properties used by Schools	2 ^a

a – these are small properties adjacent to a larger parcel and are not considered to be separate sampling sites when discussing total number of sites sampled.

4.0 SOIL SAMPLING PROTOCOLS

The field procedures were conducted in accordance with generally accepted industry practices.

Prior to sampling, the sampling equipment was laid on clean plastic sheeting to prevent contact with surrounding media. Soil sampling was conducted using a stainless-steel soil probe sampler device with a 1.5 cm inner diameter core. Any excess soil was brushed off prior to scrubbing the sampling devices with a solution of phosphate free detergent and water, then rinsed with distilled water and allowed to air dry.

As noted above, areas directly under or adjacent to potential sources of lead contamination (for example, painted play structures, fences and buildings) and areas with amended soils (such as imported gravel, sand, or silt/clay) were avoided for sampling. A pair of clean disposable nitrile

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gloves was worn and swapped out for each sampling location to mitigate potential cross contamination during sampling.

At each sampling location an “x” was created using two meter sticks to guide sample collection. During sampling, the stainless-steel probe was advanced into the ground using a twisting motion to a depth of approximately 2.5 cm. Along each meter stick five soil plugs were collected. For areas covered with sod, the probe was advanced until it was 2.5 cm into the soil-containing layer. The soil from each plug was retained and combined in a clean plastic sample bag provided by the laboratory to create a composite sample to be submitted for analysis. During the sampling process, organic material such as grass, roots and foreign objects were removed from the soil plugs before being placed in the bag to create the composite sample.

The bag containing the composite soil samples were placed within a second sample bag to prevent puncturing or sample leaks and each composite sample was stored in a cooler prior to shipment to the lab. Each soil sample was submitted to the laboratory for analysis of lead.

Sample locations were recorded using a Trimble Geo 7X handheld GPS.

Permission and/or notification to access the sites was arranged by MECP for the applicable school divisions, independent schools, and the City.

5.0 LABORATORY ANALYSIS

The soil samples collected were submitted for analysis of lead to Bureau Veritas (BV, formerly Maxxam Analytics), a laboratory accredited by the Canadian Association for Environmental Analytical Laboratories (CAEAL). Analytical methods used by the laboratory are referenced in the appended laboratory certificates of analysis.

The samples analyzed consisted of:

Description	Number of Samples
Total composite soil sampling locations	2018
Quality assurance/quality control samples (duplicates)	99
Samples re-analyzed by the laboratory using the originally submitted soil sample	3
Total Samples Analyzed:	2120

6.0 SOIL LEAD GUIDELINES

Soil analytical results for lead have been compared to the current Canadian Council of Ministers of the Environment (CCME) Soil Quality Guideline (SQG) of 140 mg/kg, for residential/parkland land use (CCME, 1999). As described by Intrinsik (2019), the current CCME guideline is not based on the most recent scientific evidence regarding lead toxicity.

The guideline range developed by Intrinsik (2019) of 100 mg/kg to 210 mg/kg for residential soils was also referenced, which is reflective of the current state of the science on lead toxicity. This guideline was developed using standard CCME approaches for non-threshold contaminants, and is intended to be protective of neurodevelopmental effects in children. The guideline was calculated based on a range of recently endorsed non-threshold-based toxicity reference values and literature-based bioaccessibility estimates. Further information is presented by Intrinsik (2019).

7.0 SUMMARY OF SOIL ANALYTICAL RESULTS

The soil analytical results for lead are presented and compared to the above-referenced guidelines as follows:

- Table 1 presents the 2021 soil analytical results, as well as relevant details including the sampling date, neighbourhood name, park/school name, property owner, and school division if applicable. The GPS coordinates of each sampling location are also provided;
- Drawing No. 2 is a graphical representation of the soil analytical results for each neighbourhood sampled;
- Drawing Nos. 4.1 to 4.5 presents an overview of soil analytical results for selected Community Health Areas which encompasses numerous neighbourhoods; and,
- Drawing Nos. 6.1(1) to 6.39(9)^a includes 201 drawings^b summarizing the soil analytical results for each sampling site (park or school property), ordered alphabetically by neighbourhood, then alphabetically by park name.

Note, for Table 1 and Drawing Nos. 6.1(1) to 6.39(9), which presents the full 2021 data set of analyzed samples, both the sample and duplicate and/or sample and re-test results are shown.

Additional information is provided in the following appendices:

^a There were 39 neighbourhoods sampled; one neighbourhood (Dufferin Industrial) had no parks/schools.

^b Kavanagh Park extends into two neighbourhoods; two drawings are provided.

- Appendix A: The selected sampling sites within the 40 neighbourhoods are summarized on Drawing Nos. A.1 to A.40;
- Appendix B: Photographs taken of sampling sites (note, photographs of sites where children were present where curtailed);
- Appendix C: A description and review of the quality assurance and quality control results; and,
- Appendix D: The laboratory certificates of analysis for the soil analytical results.

8.0 REVIEW AND INTERPRETATION OF SOIL LEAD RESULTS

A review and interpretation of the 2021 soil lead results is presented herein. This analysis concentrates mainly on 2021 analytical data, however Section 8.1.1 in particular includes a comparison of results collected from previous investigations. The overall approach is as follows:

- neighbourhood-wide analysis based on 2021 analytical data and identification of neighbourhoods for further consideration;
- a comparison of 2021 data to results from previous investigations for 10 neighbourhoods previously identified in 2019 for further consideration;
- a brief summary of potential sources of lead in Winnipeg, as identified in the Intrinsic (2019) study;
- community health area analysis including consideration of known sources of lead, as well as community composition, socioeconomic conditions, health indicators and access. These factors may indicate increased risk of adverse effects related to lead exposure; and,
- a discussion of lead concentrations for specific sites (schools or parks) identified for further study and the assignment of a recommended priority level for further analysis.

8.1 NEIGHBOURHOOD-WIDE DATA ANALYSIS

Soil lead concentrations were analyzed based on the neighbourhood in which the samples were collected. Table 2 presents the total number of samples and identifies the maximum and average (arithmetic mean) concentrations for each neighbourhood. A graphical representation of the data collected from each neighbourhood is presented on Drawing No. 2a and 2b. Where duplicates were collected or samples were re-tested, the higher of the concentrations reported for the original sample and duplicate or re-test were selected to represent the concentration for that sample. To provide an indication of the frequency and magnitude of the exceedances of health-based criteria, concentrations were compared to both the current CCME Soil Quality Guideline (SQG) of 140 mg/kg for lead in residential/parkland soils, and a concentration equal to the upper limit of the range of potential SQGs derived to be reflective of the current state of the science on lead toxicity (100-210 mg/kg) (Intrinsik, 2019). Neighbourhoods were retained for further consideration if either of the following conditions existed:

- 10% or more of samples with concentrations greater than the CCME SQG of 140 mg/kg;
- An average concentration greater than the low end of the range of 100-210 mg/kg.

It should be noted however, that due to the relatively small sample size for several of the neighbourhoods, the data in those neighbourhoods may not truly reflect the overall range or average soil lead conditions across the area as a whole.

<i>Neighbourhood</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Airport	24	190	35	1 (4.2%)	0
Airport Buffer (Jameswood)	25	77	24	0	0
Airport Buffer (King Edward)	21	43	20	0	0
Archwood	28	250	53	1 (3.6%)	1 (3.6%)
Brooklands	49	160	49	1 (2.0%)	0
Burrows Central	31	90	24	0	0
Burrows Keewatin	30	59	27	0	0
Centennial	87	390	75	15 (17%)	6 (6.9%)
Central St. Boniface	60	970	110	16 (27%)	6 (10%)
Chalmers	83	270	48	2 (2.4%)	1 (1.2%)
Daniel McIntyre	49	310	69	7 (14%)	4 (8.2%)
Dufferin	51	290	45	3 (5.9%)	2 (3.9%)
Dufresne	19	200	46	2 (11%)	0
East Elmwood	80	340	47	4 (5%)	1 (1.3%)
Glenelm	38	140	47	0	0
Holden	20	990	150	3 (15%)	3 (15%)
Inkster-Faraday	44	220	67	3 (6.8%)	1 (2.3%)
Lord Roberts	89	240	42	2 (2.2%)	1 (1.1%)
Lord Selkirk	48	330	63	3 (6.3%)	1 (2.1%)

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Table 2 Comparison of Maximum and Average Concentrations of Lead in Soil (2021 Investigation Results) by Neighbourhood to the CCME SQG and Upper Potential SQG (Intrinsic 2019)					
<i>Neighbourhood</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Luxton	21	2,000^b	120	2 (9.5%)	1 (4.5%)
Minto	48	210	64	4 (8.3%)	0
Mission Industrial	28	88,000	7,300	7 (25%)	7 (25%)
Mynarski	8	54	41	0	0
North Point Douglas	70	910	64	6 (8.6%)	3 (4.3%)
Norwood East	56	850	49	3 (5.4%)	1 (1.8%)
River-Osborne	55	260	48	4 (7.3%)	1 (1.8%)
Riverview	76	460	45	6 (7.9%)	2 (2.6%)
Robertson	55	130	41	0	0
Sargent Park	59	210	62	4 (6.8%)	0
Shaughnessy Park	35	80	37	0	0
South Point Douglas	18	380	140	6 (33%)	4 (22%)
St. Boniface Industrial Park	37	210	26	1 (2.7%)	0
St. John's	62	190	40	1 (1.6%)	0
St. John's Park	19	340	62	1 (5.3%)	1 (5.3%)
Stock Yards	13	54	22	0	0
Tissot	3	99	68	0	0
Tyndall Park	130	130	23	0	0
Weston	61	3,400	130	5 (8.2%)	1 (1.6%)
William Whyte	47	430	76	8 (17%)	4 (8.5%)
Windsor Park	166	53	22	0	0
Wolseley	75	220	48	2 (2.7%)	1 (1.3%)

Bold Concentration exceeds the CCME SQG of 140 mg/kg.

Grey Neighbourhoods highlighted in grey had 10% or more samples with concentrations above the CCME SQG of 140 mg/kg and/or an average concentration above the low end of the range of 100-210 mg/kg.

^a Concentration represents the upper limit of the potential range of 100-210 mg/kg for an SQG based on a non-threshold toxicity endpoint for lead (Intrinsic, 2019).

^b Concentration in original sample was 2,000 mg/kg. Concentration in re-test was 120 mg/kg.

Note: No samples were collected from Dufferin Industrial neighbourhood since there are no schools or City parks.

Although the neighbourhood of Luxton had an overall average concentration (120 mg/kg) that exceeded the lower end of the range of 100-210 mg/kg, this is primarily due to the occurrence of a concentration of 2,000 mg/kg measured in a sample (LX-LC-05, Drawing No. 6.18(2)) collected from Luxton Community Centre. Since this concentration was significantly higher than concentrations measured from other samples collected from this site, the sample was requested for laboratory re-analysis (using the originally submitted soil) which resulted in a concentration of 120 mg/kg. When a concentration of 120 mg/kg is used to represent this sample, the overall average for the neighbourhood is reduced to 35 mg/kg, with 4.8% of samples with concentrations exceeding 140 mg/kg. Therefore, overall, the neighbourhood of Luxton was not considered to be a priority for further investigation. Due to the uncertainty associated with the elevated concentration of lead measured in the sample (LX-LC-05), concerns related to this sample will be considered during site-specific analysis, presented below.

The neighbourhood of Mission Industrial represents a large area consisting almost entirely of commercial and industrial properties. Sampling in this neighbourhood was limited to the northern portion of Kavanagh Park (for which lead concentrations ranged from 21 to 48 mg/kg in eight samples) and Mission Park (for which significantly elevated concentrations were identified). Mission Park is located in the northwest corner of this neighbourhood and accounts for much of the limited non-commercial/industrial land. While concentrations in Mission Park represent a concern for this particular site, the absence or limited occurrence of residential properties, parks, or schools in this neighbourhood likely limits the opportunities for frequent and prolonged exposure for children. Therefore, due to the nature of the properties in this area, the neighbourhood of Mission Industrial was not considered to be a priority for further investigation.

Based on the comparisons provided in Table 2, and the discussion regarding the Luxton and Mission Industrial neighbourhoods above, the following eight (8) neighbourhoods were identified for further consideration related to lead in soils based on the 2021 sampling results:

- Centennial
- Central St. Boniface
- Daniel McIntyre
- Dufresne
- Holden
- South Point Douglas
- Weston
- William Whyte

The neighbourhoods identified for further consideration based on the 2021 investigation are summarized on Drawing No. 5.

It is noted that a limited number of samples were collected from several of these neighbourhoods which can result in one or two outliers skewing the results of statistical tests. Consideration must be given to whether the sampling data is reflective of conditions across the neighbourhood as a whole, and, of soil lead concentrations on residential properties where young children are likely to have the greatest opportunity for exposure.

Several other neighbourhoods have a proportion (but less than 10%) of samples greater than 140 mg/kg based on results of the 2021 investigation. These neighbourhoods were not identified for further consideration; however, it should be recognized that areas with higher soil lead concentrations than those identified in the selected sampling locations may exist.

Further consideration of these eight (8) neighbourhoods was conducted through additional statistical analysis, comparison to data collected from these neighbourhoods during previous soil studies, and consideration of factors such as the presence of vulnerable populations and proximity to environmental sources of lead. This analysis is intended to determine if soil results indicate the potential for neighbourhood-wide lead issues that may require further investigation.

8.1.1 COMPARISON OF 2021 DATA TO PREVIOUS INVESTIGATIONS FOR SELECTED NEIGHBOURHOODS

Ten neighbourhoods were identified in the 2019 analysis as having potential concern based on previous investigations (Intrinsik, 2019). For these neighbourhoods, the average and 95% upper confidence limit on the mean (UCLM) concentrations from previous soil investigations were compared to those from the 2021 investigation. Previous soil investigations included in the analysis are:

- 2007/2008 investigation by Manitoba Conservation (MC, 2010),
- 2018 investigation by Manitoba Sustainable Development (MSD, 2019), and,
- 2017 investigation by University of Manitoba (U of M, 2017), for the community of St. Boniface only.

As several samples from the 2018 investigation were intended to be co-located with the sampling sites from the 2007/2008 investigation, these two data sets were not combined. Separating these data also allowed for consideration of the influence of the different sampling depths utilized in each of these studies (*i.e.*, ≤ 5 cm for the 2007/2008 data set and 0-7.5 cm for the 2018 data set).

Several neighbourhoods identified for further consideration in Section 8.1 based on the 2021 data were not specifically characterized in the previous investigations and therefore were not included for comparison in Table 3 (specifically Dufresne, Holden, South Point Douglas, and William Whyte).

The average and 95% UCLM soil lead concentrations for the current 2021 investigation were generally lower than those for data collected during the previous investigations referenced above (MC 2010, MSD 2019, U of M 2017), as summarized in Table 3. The generally lower concentrations in these neighbourhoods measured during the 2021 investigation may be associated with a number of factors, including:

- Sample locations and property uses. The 2021 samples were collected from public parks, green spaces, community centres, and school yards. The University of Manitoba (2017) sampling included commercial and residential properties from the St. Boniface area. The Manitoba Conservation (2010) data included samples collected from residential boulevards, playgrounds, schools.
- Number of samples collected in each neighbourhood. Previous investigations for several neighbourhoods included the collection of a relatively small number of samples which can result in average and 95% UCLM concentrations being skewed by a small number of outliers. Larger sample sizes from the 2021 investigation may provide a more accurate representation of concentrations across the neighbourhood as a whole.

- Sample depth. The Manitoba Sustainable Development (2019) and University of Manitoba (2017) investigation collected samples from depths of 0 to 7.5 cm. The Manitoba Conservation (2010) investigation collected a mixture of sod (surface) soils, and soils from depths of 0 to 2.5 cm or 0 to 5 cm. The 2021 soil investigation, in contrast, focused only on samples collected from 0 to 2.5 cm depth, as these soils are what children would most likely be exposed to.

Table 3 Comparison of Soil Lead Concentration Data from Previous Investigations for 10 Neighbourhoods of Concern (Intrinsik, 2019) with the 2021 Soil Investigation Data

Neighbourhood	<i>Manitoba Conservation 2010; University of Manitoba 2017 (mg/kg)</i>			<i>Manitoba Sustainable Development (2019), University of Manitoba (2017) (mg/kg)</i>			<i>2021 Soil Investigation (mg/kg)</i>		
	# Samples	Average	95% UCLM	# Samples	Average	95% UCLM	# Samples	Average	95% UCLM
Centennial	14	110	155	4	43.0	61.3	87	75	100
Daniel McIntyre	50	134	172	5	65.0	109	49	69	89
Glenelm & Chalmers	45	71.6	101	19	61.0	77.3	121 ⁽¹⁾	47 ⁽¹⁾	54 ⁽¹⁾
North Point Douglas	33	473	647	27	195	279	70	64	125
River-Osborne	10	60.4	120	1	14.6	NC	55	48	60
Sargent Park	13	93.8	242	5	139	1,040	59	62	73
St. Boniface ⁽²⁾	197	87.8	94.0	177	88.6	92.9	NC ⁽²⁾	NC ⁽²⁾	NC ⁽²⁾
Weston	81	224	283	35	174	203	61	130	120
Wolseley & Minto	48	74.4	111	21	38.5	46.4	123 ⁽³⁾	54 ⁽³⁾	61 ⁽³⁾

NC Not calculated

(1) Data are combined for the neighbourhoods of Glenelm and Chalmers from 2021 investigation for comparison with previous data.

(2) Only a general sampling area is provided for U of M (2017) data; exactly locations or neighbourhood(s) that were sampled are not provided. For the 2021 soil investigation, samples were collected from Central St. Boniface and St. Boniface Industrial Park, as well as from other neighbourhoods in the St. Boniface Community Health Area.

(4) Data are combined for the neighbourhoods of Wolseley and Minto from 2021 investigation for comparison with previous data.

Note: Sample depths: 0 to 2.5 cm or 0 – 5 cm (MC, 2010), 0 to 7.5 cm (MSD 2019 and U of M 2017), 0 to 2.5 cm (Parsons, 2021 soil investigation).

8.1.2 POTENTIAL SOURCES OF LEAD CONTAMINATION IN WINNIPEG

The study by Intrinsik (2019) included an evaluation of potential emission sources that may have contributed to elevated soil lead concentrations in Winnipeg. Several potential point sources (many of which are no longer active) were identified. Figures from Intrinsik (2019) have been duplicated as Drawing No. 3.1 and 3.2 to provide additional context for the 2021 soil investigation results. A summary of potential sources identified is as follows:

- Three secondary smelters previously operated in the northwest quadrant of Winnipeg;
- Several facilities reported lead or tetraethyl lead emissions to the National Pollutant Release Inventory (NPRI) between 1994 to 2017;
- A number of known scrap metal yard/lead acid battery waste transfer or manufacturing facilities which may have the potential to affect soil quality in the surrounding areas.

- Historic vehicle-related emissions are also suspected of contributing to lead concentrations in soil in throughout Winnipeg, particularly for areas in proximity to major roadways.
- Aviation fuels for piston-engine aircraft contain lead, and the Winnipeg airport was included as a potential source of emissions.

It is likely that numerous additional sources of lead exist and were not identified, particularly those related to legacy contamination.

8.2 COMMUNITY FEATURES ANALYSIS

As summarized in Section 8.1, eight neighbourhoods were identified as potentially requiring further consideration based on the 2021 analytical results. It is noted that a limited number of samples were collected from several of these neighbourhoods which can result in one or two outliers skewing the results of statistical tests. Consideration must be given to whether the sampling data is reflective of conditions across the neighbourhood as a whole, and, of soil lead concentrations on residential properties where young children are likely to have the greatest opportunity for exposure. Additionally, several other neighbourhoods have a proportion of samples greater than 140 mg/kg that were not identified for further consideration, however areas with higher lead concentrations in soil than those sampled may exist.

Drawing No. 4.1 presents the Community Health Areas within the City of Winnipeg, as defined by the Winnipeg Regional Health Authority (WRHA, 2020). The areas of potential concern identified by Intrinsik (2019) are discussed below in the context of the 2021 soil investigation, with recent (2020) health statistics from the Winnipeg Regional Health Authority (WRHA) for each Community Area. The WRHA health statistics includes information such as socioeconomic status, social determinants of health, and general health status information for area residents relative to City of Winnipeg as a whole (e.g., maternal-child health, disease prevalence, mortality rates)

8.2.1 POINT DOUGLAS COMMUNITY HEALTH AREA

The Point Douglas Community Area was identified in Intrinsik (2019) as being of concern based on the sample data available at that time, consisting of a mixture of samples from parkland and residential boulevards. This Community Area encompasses 13 neighbourhoods as shown on Drawing No. 4.1 (WRHA, 2020); all 13 were specified by MECP for sampling during the 2021 investigation. The Dufferin Industrial neighbourhood was specified for sampling; however, no public parks or schools are located within this neighbourhood.

A total of 498 samples (including duplicates/re-runs) were analyzed in 2021 from neighbourhoods within the Point Douglas Community Area. Sixteen schools, five community centres, and several playgrounds and green spaces were included in this sampling. The 2021 soil investigation included sites in neighbourhoods not included in previous investigations (MC 2010,

MSD 2019, U of M 2017) including William Whyte, Burrows-Central, Inskter-Faraday, Luxton, Mynarski, Robertson, St. Johns, and St. Johns Park. Several neighbourhoods that were sampled previously were also sampled in 2021, with additional sampling sites included.

As summarized in Table 2 and in Section 8.1, the analytical data collected in 2021 indicates that several neighbourhoods within the Point Douglas Community Area contained sites with exceedances of the criteria, including:

- Dufferin (5.9% of samples above 140 mg/kg and 3.9% above 210 mg/kg),
- Inkster-Faraday (6.8% of samples above 140 mg/kg and 2.3% above 210 mg/kg),
- Lord Selkirk (6.3% of samples above 140 mg/kg and 2.1% above 210 mg/kg),
- Luxton (9.1% of samples above 140 mg/kg and 4.5% above 210 mg/kg),
- North Point Douglas (8.6% of samples above 140 mg/kg and 4.3% above 210 mg/kg),
- South Point Douglas (33% of samples above 140 mg/kg and 22% above 210 mg/kg),
- St. John's (1.6% of samples above 140 mg/kg and none above 210 mg/kg),
- St John's Park (5.3% of samples above 140 mg/kg and 5.3% above 210 mg/kg)

A summary of the soil analytical results for the Point Douglas Community Area, compared to the CCME and Intrinsic (2019) guidelines, is shown on Drawing No. 4.2. Overall, the information for this area suggests that a number of contamination hotspots are present within this community. Generally, the sites with exceedances are located in the southern and eastern portions of the Point Douglas Community Area.

Intrinsic (2019) noted that this area was likely influenced by historical industrial emissions, automobile-related lead emissions, and the use of lead-based paint on structures. The Point Douglas Community Area is recognized as being one of the oldest areas of Winnipeg and is transected by the rail line and two major roadways (Main Street and the Disraeli Freeway). The neighbourhoods in these areas are a mix of residential and various industrial/commercial activities along the major road arteries. Aerial imagery reveals a band of industrial/commercial operations between Sutherland Dr. and the railyard. The Point Douglas Community Area includes a number of major roadways, as shown on Drawing No. 3.2; the Manitoba Conservation (2010) report noted that soil lead concentrations in this area were likely influenced by vehicular emissions, as well as suspected emissions from nearby scrap yards. The potential point emission sources summarized on Drawing No. 3.1 includes a former smelter to the west/south of the Point Douglas Community Area (across the rail yard and tracks), as well as several scrap metal yards/lead acid battery waste transfer sites or other manufacturing facilities (Intrinsic 2019).

It is important to note that due to the focused nature of the sampling on only select public lands, the data at present do not provide a clear overall delineation of lead contamination within the Point Douglas Community Area or the neighbourhoods that make up this Community Area.

It was previously noted in the Intrinsic (2019) report that the Point Douglas Community area has a relatively high proportion of young children (0 to 9 years of age) compared to the City of

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Winnipeg as a whole, based on 2016 census data. A relatively large proportion of children are deemed as not being ready for school compared to other Winnipeg neighbourhoods (WRHA 2020a). The Point Douglas Community area is considered to be of lower socioeconomic status with a lower employment rate, food insecurity, housing challenges, poor access to health, mental health care and social services, poorer health status indicators (including disease prevalence, low birth weights, mortality rates, life expectancy) (WRHA 2020a). The area also has a higher proportion of visible minorities, recent immigrants, and Indigenous individuals relative to other areas of Winnipeg. These factors taken together may result in children residing within neighbourhoods in the Point Douglas Community Area as being of increased vulnerability to the effects of lead, as noted in Intrinsic (2019). Several of the sample sites had play structures, while others represent green spaces or playing fields in school yards or parks. It must be assumed that children of all ages could be present in the parks and schools, but those with attractions (such as playgrounds, etc.) are more likely to have children present on a regular basis. These neighbourhoods were also noted as having increased, non-soil related exposures to lead via older, lead-containing drinking water infrastructure, and older housing that may have lead-paint related impacts inside and outside (Intrinsic 2019).

8.2.2 DOWNTOWN COMMUNITY HEALTH AREA

The Intrinsic (2019) report identified the Downtown Community Area as being an area that includes neighbourhoods of potential concern regarding lead exposure. This Community Area encompasses 24 neighbourhoods as shown on Drawing No. 4.1 (WRHA, 2020), of which five were specified by MECP for sampling during the 2021 investigation.

A total of 334 samples (including duplicates) were collected in 2021 from the neighbourhoods of Centennial, Daniel McIntyre, Minto, Sargent Park, and Wolseley, within the Downtown Community Area. These samples were collected from public lands, including 12 schools, four community centres, and a number of playgrounds, athletic grounds and green spaces. Several neighbourhoods that were sampled previously were also included in the 2021 investigation, with additional sampling sites included.

As summarized in Table 2 and in Section 8.1, the 2021 analytical data indicates that the five neighbourhoods sampled in 2021 within the Downtown Community Health Area contained sites with exceedances of the criteria, including:

- Centennial (17% of samples above 140 mg/kg and 6.9% above 210 mg/kg),
- Daniel McIntyre (14% of samples above 140 mg/kg and 8.2% above 210 mg/kg),
- Minto (8.3% of samples above 140 mg/kg and none above 210 mg/kg),
- Sargent Park (6.8% of samples above 140 mg/kg and none above 210 mg/kg), and,
- Wolseley (2.7% of samples above 140 mg/kg and 1.3% above 210 mg/kg).

A summary of the soil analytical results for the Downtown Community Area, compared to the CCME and Intrinsic (2019) criteria, is shown on Drawing No. 4.3. As shown on Drawing No. 4.3,

multiple sites contained elevated concentrations of lead in the neighbourhoods of Centennial and Daniel McIntyre.

The Downtown Community Area includes a dense network of major roadways and two non-smelter emission sources within its boundaries, as identified on Drawing No. 3.1. Additionally, one former smelter and several non-smelter sources are also located west of the Downtown Community Area. Several of the downtown neighbourhoods are in close proximity to the railway corridor and rail yards.

The Intrinsic (2019) analysis indicated that based on Winnipeg Regional Health Authority data, residents within the Downtown Community Health Area are affected by a number of social and health issues. An updated profile for this area was released in 2020. Based on the more recent data from WRHA (2020b), the Downtown Community Area includes greater proportions of individuals who identify as Indigenous, new immigrants, or visible minorities. The WRHA (2020b) data are consistent with the information presented previously in Intrinsic (2019), where it is reported that the Downtown area is affected by low socioeconomic conditions, poverty, unemployment, food insecurity, poor access to education and quality childcare, affordable housing and supports for newcomers to the City. With respect to health status, the health statistics for the Downtown area were rated as being worse than for the City of Winnipeg as a whole (WRHA 2020b) for several health indicators (disease prevalence, mortality, life expectancy, maternal health, mortality etc.). As noted in Intrinsic (2019), children residing in Downtown neighbourhoods may be at increased risk of adverse effects in relation to lead exposures. Several of the sampled sites included play structures, while others represent green spaces or playing fields in school yards or parks. The sites with play structures are of particular interest, as young children are likely to frequent these locations. These neighbourhoods were also noted as having increased, non-soil related exposures to lead via older, lead-containing drinking water infrastructure, and older housing that may have lead-paint related impacts inside and outside (Intrinsic 2019).

8.2.3 ST. BONIFACE COMMUNITY HEALTH AREA

The St. Boniface Community Health Area includes a mixture of residential, commercial, and industrial properties. This Community Area is shown on Drawing No. 4.1 and encompasses 24 neighbourhoods (WRHA, 2020), of which 10 were specified by MECP for sampling during the 2021 investigation.

A total of 450 samples (including duplicates and re-tests) were collected in 2021 from neighbourhoods within the St. Boniface Community Health Area. The sample locations included nine schools, four community centres, and several public parks. The 2021 sample data in this area presented several exceedances of the criteria:

- Archwood (3.6% of samples above 140 mg/kg and 3.6% (1 sample) greater than 210 mg/kg),

- Central St. Boniface (27% of samples above 140 mg/kg and 10% (6 samples) greater than 210 mg/kg),
- Dufresne (11% of samples above 140 mg/kg and none greater than 210 mg/kg),
- Holden (15% of samples above 140 mg/kg and 15% (3 samples) greater than 210 mg/kg),
- Mission Industrial (25% above 140 mg/kg and 25% (7 samples) above 210 mg/kg),
- Norwood East (5.4% above 140 mg/kg and 1.8% (1 sample) above 210 mg/kg), and
- St. Boniface Industrial Park (2.7% above 140 mg/kg and none greater than 210 mg/kg).

No exceedances of 140 mg/kg or 210 mg/kg were reported for the Stock Yards, Tissot, or Windsor Park. A summary of the soil analytical results for the St. Boniface Community Area, compared to the CCME and Intrinsik (2019) criteria, is shown on Drawing No. 4.4.

The western, central and southern areas of the St. Boniface Community Area include residential areas and parks. There is a small residential area that is the neighbourhood of Holden, which is surrounded by industrial/commercial lands. The Mission Industrial area and the St. Boniface Industrial Area are primarily non-residential areas; although St. Boniface Industrial Area has a small residential area on the east end. Five of the potential lead emission sources presented on Drawing No. 3.1 are located within the St. Boniface Community Area. Several major roadways transect the Community Area, as well multiple rail corridors and rail spurs – all of which are potential lead emission sources (Intrinsik 2019).

A review of health statistics for the St. Boniface Community Area reveal that area residents are rating comparable or better than the City of Winnipeg with respect to the majority of health, social, and behavioural indicators, with the exception of the prevalence of asthma in children and osteoporosis (WRHA 2020c). With respect to health care access, in general, St. Boniface scored better or comparable to the City of Winnipeg. The WHRA (2020c) health profile for this Community Area does present a notable disparity in household incomes between the neighbourhoods, with the population with the lowest two income quintiles being located in Central St. Boniface, Norwood, Archwood, Niakwa Park, Maginot, and Windsor Park. No samples were collected for Niakwa Park or Maginot, but the other neighbourhoods were included in the 2021 investigation. The highest lead soil concentrations in the 2021 analytical data for these areas are from the Mission Industrial neighbourhood; which was noted in a review by Jacobs (2019) for the City of Winnipeg as being a heavy industry area historically. Multiple exceedances are noted in samples collected in the Central St. Boniface neighbourhood, with sporadic exceedances in Norwood East, Archwood, Dufresne, and Holden. As noted above, these particular neighbourhoods are reported to be of lower socioeconomic status relative to other areas within the St. Boniface Community Area, as well as the City of Winnipeg.

8.2.4 INKSTER COMMUNITY HEALTH AREA

The Intrinsik (2019) report identified the Inkster Community Area as an area of potential concern, particularly the neighbourhoods of Weston and Burrows-Keewatin. This Community Area encompasses 11 neighbourhoods (WRHA, 2020d) as shown on Drawing No. 4.1, of which five were specified by MECP for sampling during the 2021 investigation.

The 2021 soil investigation included the collection of 320 samples (including duplicates) from the Brooklands, Tyndall Park, Burrows-Keewatin, Shaughnessy Park, and Weston neighbourhoods. The sampling locations included eight schools, three community centres, and several parks/playgrounds. As summarized in Table 2 and Section 8.1, the 2021 sample data in this area noted the following exceedances of the criteria:

- Only 1 sample out of 49 from Brooklands presented an exceedance of the CCME guideline of 140 mg/kg.
- In Weston, 8.2% of the samples exceeded the guideline of 140 mg/kg with one sample exceeding 210 mg/kg.

No exceedances of the CCME guideline of 140 mg/kg or the upper bound of the range of 100-210 mg/kg were identified in the 2021 data set from the Burrows-Keewatin, Shaughnessy Park, or Tyndall Park neighbourhoods.

A summary of the soil analytical results for the Inkster Community Area, compared to the CCME and Intrinsik (2019) criteria, is shown on Drawing No. 4.5. All of the reported exceedances occur south of the rail corridor. The parks sampled are several blocks apart, and as a result, no clear spatial distribution patterns were identified in the data. However, it is important to note from the potential emission sources identified in Intrinsik (2019) and presented on Drawing No. 3.1, that two former secondary smelter operations are located in or near the southern portion of the Inkster Community Area (including one in Weston), in addition to other industrial sources such as scrap metal, and battery waste transfer stations. These neighbourhoods are also in close proximity to the rail corridor and railyard. A dense network of roadways is also located in this area, indicating that previous fuel-related emissions likely influenced soil lead concentrations in this area.

Health data from the WRHA (2020d) indicate that the Inkster Community Area has a higher proportion of individuals identifying as Indigenous, visible minorities, or recent immigrants relative to the Winnipeg health region as a whole. The eastern portion of the Inkster Community Area is noted by WRHA (2020d) to have a lower overall life expectancy and an increased mortality rate relative to the western portion of Inkster and Winnipeg as a whole. The lowest two income quartiles for Inkster Community Area are located within the eastern and south-central neighbourhoods of Inkster Industrial Park, Burrows-Keewatin, Shaughnessy Park, Brooklands, Weston, and Pacific Industrial (WRHA 2020d). Within the overall community area, there is a reported increased prevalence of cardiovascular and respiratory diseases and diabetes. An

increased number of young children are noted as being not ready for school learning relative to the City of Winnipeg (WRHA 2020d). Thus, the children living in this area are potentially more vulnerable to the adverse effects of lead exposure. Further, these neighbourhoods were also noted as having increased, non-soil related exposures to lead via older, lead-containing drinking water infrastructure, and older housing that may have lead-paint related impacts inside and outside (Intrinsic 2019).

8.2.5 AIRPORT

The Winnipeg Airport was not included in the previous soil investigations for lead, and sampling of a buffer around the airport was recommended in Intrinsic (2019). A total of 73 soil samples (including duplicates) were collected in the vicinity of the airport, and only one exceedance (a concentration of 190 mg/kg at St. James Memorial Sports Park) was identified. The potential for children to be exposed to lead in soil appears to be relatively low, given the overall low concentrations of lead in this area.

8.3 SITE SPECIFIC ANALYSIS

Soil sampling results from each individual site (park or school) were examined to determine if lead concentrations may further consideration, such as supplemental sampling, soil removal, or the implementation of risk management measures. Consistent with the assessment of soil lead results at a neighbourhood level, maximum lead concentrations for individual sites were compared to both the current CCME SQG of 140 mg/kg for lead in residential soils, and a concentration equal to upper limit of the range of potential SQGs of 100 - 210 mg/kg, as shown in Table 4. The number of samples with concentrations in excess of each of these criteria is also presented. Given the variation in the number of samples collected from some sites, particularly small sites with a low number of samples collected, examining the frequency of samples exceeding the criteria may not necessarily be an effective indicator for identifying those sites which may represent a concern. Where duplicates were collected or samples were re-tested, the higher of the concentrations reported for the original sample and duplicate or re-test were selected to represent the concentration for that sample.

Sites with a maximum concentration equal to or greater than 210 mg/kg (which represents the high end of the range of potential SQGs in Intrinsic (2019)), and/or those sites with an average concentration equal to or greater than the low end of this range (100 mg/kg) were retained for further consideration. The intention of this approach is to be protective of children and other site users that may spend prolonged periods of time in a given area of the site and may have frequent exposure to lead concentrations similar to the maximum, as well as those that move throughout the site randomly and be exposed to variable soil lead concentrations.

Table 4 Comparison of Maximum and Average Soil Lead Concentrations for Individual Sites to Health-Based Criteria (2021 Investigation Results)					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Airport					
St. James Memorial Sports Park	24	190	35	1 (4.2%)	0
Airport Buffer (Jameswood)					
Leicester Square Playground	12	77	25	0	0
Listowel Playground	13	28	22	0	0
Airport Buffer (King Edward)					
Collegiate Park	11	40	18	0	0
Legion Memorial Playground	10	43	22	0	0
Archwood					
Archwood C.C	6	44	28	0	0
Deniset Park	4	55	37	0	0
Happyland Park	18	250	64	1 (5.6%)	1 (5.6%)
Brooklands					
Bannatyne Playground	9	130	38	0	0
Blue Bird Park	9	100	38	0	0
Brooklands School (K-5)	12	52	31	0	0
Galmar Park	6	79	43	0	0
Lismore Park	6	160	89	1 (17%)	0
Pacific Dee Park	7	140	41	0	0
Burrows Central					
Boyd Park	10	59	18	0	0
King Edward School (N-6)	10	57	30	0	0
Margaret Scott Park	11	90	25	0	0
Burrows Keewatin					
Shaughnessy Park	20	51	25	0	0
Shaughnessy Park School (N-8)	10	59	30	0	0
Centennial					
Central C.C/Freighthouse	23	390	54	2 (8.7%)	2 (8.7%)
Dufferin Park	9	260	120	4 (44%)	1 (11%)
Dufferin School (N-6) – Adjacent City Property	3	48	43	0	0
Dufferin School (N-6)	10	300	130	3 (30%)	1 (10%)
Giizhigooweyaabikwe Park	10	240	120	4 (40%)	1 (10%)
Gord Dong Park	7	82	24	0	0
Pacific Avenue Tot Lot	8	120	45	0	0
Roosevelt Park	10	250	79	2 (20%)	1 (10%)
Ross Ellen Park	7	71	28	0	0
Central St. Boniface					
École Henri-Bergeron (4-8)	3	82	60	0	0
École Provencher (K-3)	5	95	45	0	0
La Verendrye Park	17	970	230	12 (71%)	6 (35%)
Marion School (K-8)	7	180	56	1 (14%)	0
Parc Club Optimist-Saint Boniface-Optimist Club Park	15	190	73	3 (20%)	0
Provencher Park / Notre Dame C.C	13	120	70	0	0
Chalmers					
Abdo and Samira El Tassi Park	9	110	49	0	0
Clara Hughes Recreation Park	10	270	70	1 (10%)	1 (10%)
East End Cultural & Leisure	10	77	30	0	0

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Table 4 Comparison of Maximum and Average Soil Lead Concentrations for Individual Sites to Health-Based Criteria (2021 Investigation Results)					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Centre					
Elmwood Winter Club	14	190	56	1 (7.1%)	0
Lord Selkirk School (N-6)	10	88	29	0	0
River Elm School (N-6)	11	85	42	0	0
Roy Davis Memorial Park	10	130	66	0	0
Union Tot Lot	9	51	36	0	0
Daniel McIntyre					
Home Playground	8	240	93	2 (25%)	1 (13%)
Jacob Penner Park	10	310	110	2 (20%)	1 (10%)
John M King School (N-6)	9	26	14	0	0
Lipton Park	4	230	100	1 (25%)	1 (25%)
Maryland Tot Lot	8	220	95	2 (25%)	1 (13%)
Wellington School (N-6)	10	59	20	0	0
Dufferin					
Immaculate Heart of Mary School (N-8)	5	290	110	2 (40%)	1 (20%)
Immaculate Heart Playground	10	86	37	0	0
Niji Mahkwa (N-8) and Children of Earth (9-12) Schools	11	97	29	0	0
Old Exhibition Athletic Grounds	20	220	40	1 (5%)	1 (5%)
Sargent Tommy Prince MM Veterans Park	5	77	50	0	0
Dufresne					
Kavanagh Park (south portion)	3	190	110	1 (33%)	0
Kavanagh Playground	13	34	19	0	0
Marion-Dufresne Riverbank	3	200	95	1 (33%)	0
East Elmwood					
Clyde Road Park	3	29	29	0	0
East Elmwood Park	11	48	20	0	0
Hap Hopkinson Memorial Park	13	69	26	0	0
Kent Road School (N-6)	19	210	36	1 (5.3%)	0
McCalman Parkette East	3	46	37	0	0
Prairie Central Adventist Academy (N-12) (formerly Red River Valley Academy)	10	340	120	2 (20%)	1 (10%)
Sir Sam Steele Park	10	54	32	0	0
St. Gerard School (N-8)	11	190	68	1 (9.1%)	0
Glenelm					
Elmwood Park	10	79	39	0	0
Glenelm School (N-6)	8	55	32	0	0
Hespeler Park	11	140	59	0	0
Talbot Tot Lot	9	93	55	0	0
Holden					
Lambert Park	20	990	150	3 (15%)	3 (15%)
Inkster-Faraday					
Arlington Tot Lot	8	180	110	2 (25%)	0
Faraday School (N-6)	10	79	34	0	0
Inkster School (N-6)	10	130	69	0	0
McKenzie Tot Lot	8	220	89	1 (13%)	1 (13%)
Parr Tot Lot	8	89	41	0	0
Lord Roberts					
Argue & Rosedale Athletic Field	5	240	78	1 (20%)	1 (20%)

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Table 4 Comparison of Maximum and Average Soil Lead Concentrations for Individual Sites to Health-Based Criteria (2021 Investigation Results)					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Brandon Avenue Tot Lot	9	130	53	0	0
Fort Rouge Leisure Centre	11	58	24	0	0
Lord Roberts C.C	12	57	24	0	0
Lord Roberts School (N-6)	11	42	20	0	0
McKittrick Park	15	62	29	0	0
Nassau Square Park	13	180	75	1 (7.7%)	0
Will and Jeanine Richard Memorial Park	13	120	50	0	0
Lord Selkirk					
David Livingstone School (N-8)	9	330	97	1 (11%)	1 (11%)
Dufferin Tot Lot-Kinsman	9	150	76	1 (11%)	0
North Winnipeg Action Centre	12	150	50	1 (8.3%)	0
Robinson Park	8	100	58	0	0
Turtle Island Community Centre	10	100	41	0	0
Luxton					
Dr. Louis Slotin Park	3	190	87	1 (33%)	0
Luxton C.C	9	2,000^b	260	1 (11%)	1 (11%)
Luxton School (N-6)	10	52	18	0	0
Minto					
Isaac Brock School (N-9)	10	150	82	2 (20%)	0
Minto Athletic Grounds	11	68	48	0	0
Minto Tot Lot	9	67	37	0	0
Sherburn Tot Lot	8	210	110	2 (25%)	0
Valour C.C-Isaac Brock Site	10	91	53	0	0
Mission Industrial					
Kavanagh Park	8	48	31	0	0
Mission Park	20	88,000	10,000	7 (35%)	7 (35%)
Mynarski					
Andrew Mynarski School (7-9)	8	54	41	0	0
North Point Douglas					
Aberdeen Adventure Playground	11	210	110	3 (27%)	0
Dr. Jim Shaver Memorial Playground	16	56	21	0	0
Joe Zuken Heritage Park	7	57	33	0	0
Michaëlle Jean Park / Norquay C.C	13	910	130	3 (23%)	3 (23%)
Norquay School (N-6)	10	100	56	0	0
Point Douglas Park	5	73	32	0	0
Syndicate Tot Lot	8	120	38	0	0
Norwood East					
Champlain C.C	16	48	19	0	0
Coronation Park	4	140	73	0	0
École Precieux-Sang (K-8)	10	55	19	0	0
Falcon Park	10	44	28	0	0
Heather Park	4	48	27	0	0
Traverse Park	12	850	130	3 (25%)	1 (8.3%)
River-Osborne					
Fort Rouge Park	15	160	53	1 (6.7%)	0
Fort Rouge School (N-6)	10	19	15	0	0
Gerald James Lynch Park	7	36	24	0	0
Mayfair Park East	16	260	78	3 (19%)	1 (6.3%)

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Table 4 Comparison of Maximum and Average Soil Lead Concentrations for Individual Sites to Health-Based Criteria (2021 Investigation Results)

<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Scott-Stradbrook Park	7	83	43	0	0
Riverview					
Arnold Avenue Park	10	230	57	1 (10%)	1 (10%)
Churchill Drive Community Gardens	11	460	61	1 (9.1%)	1 (9.1%)
Churchill Drive Park	15	190	59	3 (20%)	0
Don Togo Park	3	120	50	0	0
Fisher Park	8	48	41	0	0
Riverview C.C	19	46	16	0	0
Riverview School (N-6)	10	160	49	1 (10%)	0
Robertson					
John Shaley Tot Lot / Sinclair Park C.C	15	130	35	0	0
John Zuzyk Park-Sinclair Park C.C-Robertson Site	9	110	43	0	0
Lansdowne School (N-8)	16	82	49	0	0
Polson Bay Park-4	3	51	38	0	0
Robertson School (N-6)	12	81	37	0	0
Sargent Park					
Clifton Bay Park-3	3	75	60	0	0
Clifton School (N-6)	12	210	110	2 (17%)	0
Principal Sparling School (N-6)	10	97	55	0	0
Sargent Park	10	190	49	1 (10%)	0
Sargent Park School (N-9)	6	150	59	1 (17%)	0
Sargent Park School (N-9) – Adjacent City Property	4	70	43	0	0
Valour C.C-Clifton Site	14	110	43	0	0
Shaughnessy Park					
Lord Nelson School (N-6)	11	80	34	0	0
Northwood C.C	14	77	40	0	0
Rick Hudson Park	10	68	35	0	0
South Point Douglas					
Fort Douglas Park	4	380	130	1 (25%)	1 (25%)
Grace Street Tot Lot	10	170	110	2 (20%)	0
William Whyte Park	4	290	220	3 (75%)	3 (75%)
St. Boniface Industrial Park					
Camiel Sys Park	11	12	11	0	0
Mazenod Park	5	17	15	0	0
McLeans Pumping Station	12	210	58	1 (8.3%)	0
Shady Shores Park	9	13	10	0	0
St. John's					
Andrews Tot Lot	10	120	46	0	0
Champlain School (N-6)	10	190	42	1 (10%)	0
Machray Park	12	76	41	0	0
Machray School (N-6)	10	47	31	0	0
Ralph Brown School (N-8)	10	58	23	0	0
Salter Tot Lot	10	96	58	0	0
St. John's Park					
St. John's Park	19	340	62	1 (5.3%)	1 (5.3%)
Stock Yards					
Archwood School (K-8)	13	54	22	0	0
Tissot					
Provencher-Tissot Riverbank	3	99	68	0	0

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Table 4 Comparison of Maximum and Average Soil Lead Concentrations for Individual Sites to Health-Based Criteria (2021 Investigation Results)					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Tyndall Park					
Albina Fuga Park	9	25	14	0	0
Egesz Park	9	25	14	0	0
Fairgrove Window Park	9	22	13	0	0
Finestone Park	9	23	17	0	0
Gainsborough Cove Tot Lot	10	68	37	0	0
Garden Grove Park	10	26	17	0	0
Garden Grove School (N-6)	9	130	31	0	0
Kinver Park	11	35	16	0	0
Prairie Rose School (N-6)	12	69	21	0	0
Stanley Knowles School (N-8)	4	15	13	0	0
Tyndall Park C.C	19	24	14	0	0
Tyndall Park School (N-6)	8	24	18	0	0
Walsall Park	11	120	65	0	0
Weston					
Campion Tot Lot	10	130	60	0	0
Cecil Rhodes School (N-9) and Adolescent Parent Centre (9-12)	10	160	88	1 (10%)	0
Pascoe Playground	10	170	73	1 (10%)	0
Stanley Knowles Park	10	160	76	1 (10%)	0
Weston Memorial C.C	10	3,400	400	1 (10%)	1 (10%)
Weston Park	11	200	61	1 (9.1%)	0
William Whyte					
Alfred Tot Lot	9	320	92	1 (11%)	1 (11%)
Pritchard Playground	10	230	81	3 (30%)	1 (10%)
Rejoice Fun Park	10	430	140	4 (40%)	2 (20%)
Strathcona School (N-6)	10	65	30	0	0
William Whyte School (N-8)	8	39	28	0	0
Windsor Park					
Agate Park	10	48	28	0	0
Applewood Park	9	48	32	0	0
Baudoux Place Park	8	43	31	0	0
Crestwood Park	9	36	23	0	0
Durham Park	12	30	20	0	0
École Howden (K-6)	12	46	25	0	0
École Lacerte (K-8)	6	10	9.1	0	0
Frontenac Park	12	24	16	0	0
Frontenac School (K-8)	10	29	14	0	0
General Vanier School (K-8)	9	49	33	0	0
Howden Park	9	50	26	0	0
Jubenville Park	9	28	19	0	0
Lomond Park	11	53	27	0	0
Vincent Massey Park	12	40	20	0	0
Westmount Park	13	46	21	0	0
Winakwa C.C	15	47	14	0	0
Wolseley					
Aubrey Playground	10	200	62	1 (10%)	0
Greenwood Park	5	50	34	0	0
Laura Secord School (N-6)	6	5.7	4	0	0
Mulvey School (N-6)	11	80	39	0	0

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Table 4 Comparison of Maximum and Average Soil Lead Concentrations for Individual Sites to Health-Based Criteria (2021 Investigation Results)

<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Nick Ternette Memorial Park	5	85	62	0	0
Robert A. Steen Memorial C.C	4	24	17	0	0
Vimy Ridge Memorial Park	20	220	67	1 (5%)	1 (5%)
Westminster Tot Lot	6	130	54	0	0
Wolseley School (N-6)	8	76	36	0	0
Total^c	2013 ^c	3,400 ^c	53 ^c	118 (5.9%) ^c	48 (2.4%) ^c

Bold Concentrations exceed the CCME SQG of 140 mg/kg.

Grey Sites highlighted in grey had a maximum concentration equal to or above the high end of the range of 100-210 mg/kg and/or an average concentration equal to or above the low end of the range of 100-210 mg/kg.

^a Concentration represents the upper limit of the potential range of 100-210 mg/kg for an SQG based on a non-threshold toxicity endpoint for lead (Intrinsic, 2019).

^b Concentration in original sample was 2,000 mg/kg. Concentration in re-test was 120 mg/kg.

^c Excludes the original and four supplemental samples labelled as MI-MP-14 collected from Mission Park in which concentrations of lead (maximum of 88,000 mg/kg) significantly exceeded those found in other samples throughout the study area.

As shown in Table 4, of 2013 samples collected (which excludes one original sample and four supplemental samples collected from the same area in Mission Park, labelled as MI-MP-14), 118 (5.9%) contained concentrations of lead greater than the CCME SQG of 140 mg/kg, while 48 (2.4%) samples were greater than 210 mg/kg. The Mission Park samples were excluded from the analysis of total number of samples and the overall average shown in Table 4, since concentrations were significantly higher (maximum of 88,000 mg/kg) than those from the other samples and artificially skewed the overall results. The comparison presented in Table 4 resulted in 42 of 200 sites being retained for further consideration. The other analyzed sites were excluded from further analysis as not requiring further study based on the 2021 data.

Further examination of the soil lead results collected in 2021 for the 42 sites identified in Table 4 was completed, with consideration given to the nature of the property use, the presence of play structures or other features that may result in a higher frequency of use by young children, the size of the site and the sampling frequency, and the distribution of exceedances of health-based soil criteria. The soil concentrations across the neighbourhood as a whole was also considered in the assessment for individual sites. An overall recommendation was provided for each site, including a rating of low, medium, or high priority for further action. The sites were arranged by neighbourhood and overall community area as follows:

- Table 5: Point Douglas Community Area;
- Table 6: Downtown Community Area;
- Table 7: St. Boniface Community Area;
- Table 8: Inkster Community Area; and,
- Table 9: Other Areas.

Recommendations for further actions for individual sites may include supplemental sampling to further delineate the extent of exceedances, and/or localized soil removal. It may be acceptable to leave impacted soils in place provided that mitigative measures are applied, or confirmed to already exist, that serve to restrict exposure to impacted soils. The measures may include confirmation of the existence of consistent sod/vegetation cover to limit opportunity for direct exposure to underlying soils, the application of capping measures (clean soils or hard surfaces), or other appropriate options that limit direct exposure to impacted soils.

These recommendations are based exclusively on the results of the 2021 soil investigation and have not considered any historical data that may have been collected from these sites. It should be noted that observations of site characteristics and features were made using mainly aerial imagery obtained from the City of Winnipeg, dated from spring 2021 (City of Winnipeg, 2021d), and therefore may not be completely reflective of current conditions.

Table 5 Point Douglas Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Dufferin					
Immaculate Heart of Mary School (N-8)	5	290	110	2 (40%)	1 (20%)
<p>The maximum concentration of 290 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 2 of 5 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). The sampled area is a small area associated with the school which is anticipated to be used frequently by young children.</p> <p>Recommendation: High priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Supplemental sampling to further delineate exceedances, particularly in areas where exposed soil may exist.</p>					
Old Exhibition Athletic Grounds	20	220	40	1 (5%)	1 (5%)
<p>The maximum concentration of 220 mg/kg slightly exceeded the upper end of the SQG range of 100-210 mg/kg; however, only 1 of 20 samples exceeded the CCME SQG of 140 mg/kg and the average concentration was well below the low end of the range (100 mg/kg).</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
Inkster-Faraday					
Arlington Tot Lot	8	180	110	2 (25%)	0
<p>The maximum concentration of 180 mg/kg is below the upper end of the SQG range of 100-210 mg/kg, 2 of 8 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). The site is a large site that does not appear to currently include any play structures.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
McKenzie Tot Lot	8	220	89	1 (13%)	1 (13%)
<p>The maximum concentration of 220 mg/kg slightly exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 8 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was below the low end of the range (100 mg/kg). There are no visible play structures currently in the area with the elevated concentration that would draw a higher frequency of use, and there was good spatial distribution of samples.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					

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Table 5 Point Douglas Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Lord Selkirk					
David Livingstone School (N-8)	9	330	97	1 (11%)	1 (11%)
<p>The maximum concentration of 330 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 9 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was marginally below the low end of the range (100 mg/kg). Three (3) of the 9 samples contained concentrations above 100 mg/kg, each located along the eastern property line adjacent to the roadway, indicating relatively low but laterally extensive contamination in this area.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in areas with exceedances.</p>					
Luxton					
Luxton C.C	9	2,000	260	1 (11%)	1 (11%)
<p>The maximum concentration of 2,000 mg/kg significantly exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 9 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg) (as a result of the single elevated concentration). It should be noted that the sample with the concentration of 2,000 mg/kg was re-run (using the originally submitted soil) and the concentration was reported to be 120 mg/kg. Contamination appears to be localized to the central portion of the site. There are no visible play structures in the area with the elevated concentration that would draw a higher frequency of use.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling to delineate the area with exceedances. Consider localized soil removal.</p>					
North Point Douglas					
Aberdeen Adventure Playground	11	210	110	3 (27%)	0
<p>The maximum concentration of 210 mg/kg was equal to the upper end of the SQG range of 100-210 mg/kg, 3 of 11 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). Six (6) of the 11 samples contained concentrations above 100 mg/kg indicating relatively low but laterally extensive contamination across the southern portion of the site. The areas with exceedances are near apparent play structures.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling to delineate the area with exceedances.</p>					
Michaëlle Jean Park / Norquay C.C	13	910	130	3 (23%)	3 (23%)
<p>The maximum concentration of 910 mg/kg significantly exceeded the upper end of the SQG range of 100-210 mg/kg, 3 of 13 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was above the low end of the range (100 mg/kg). The site covers a large area with a long distance between sampling locations. There are no visible play structures in the area with the elevated concentrations that would draw a higher frequency of use.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling and potential soil removal in the area surrounding the sample with the 910 mg/kg result.</p>					
South Point Douglas					
Fort Douglas Park	4	380	130	1 (25%)	1 (25%)
<p>The maximum concentration of 380 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 4 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). The site is a very large and long strip of land along the river with a long distance between sampling locations, therefore, there is a higher degree of uncertainty regarding conditions across the site as a whole.</p>					

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Table 5 Point Douglas Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Supplemental sampling including the eastern area of the site where the maximum concentration was identified.					
Grace Street Tot Lot	10	170	110	2 (20%)	0
The maximum concentration of 170 mg/kg was below the upper end of the SQG range of 100-210 mg/kg, 2 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was marginally above the low end of the range (100 mg/kg). The site is a small park that contains numerous play structures that would attract young children. Five (5) of the 10 samples contained concentrations above 100 mg/kg and were located throughout the site, indicating relatively low but laterally extensive contamination.					
Recommendation: Medium priority for further action given the frequency of concentrations above 100 mg/kg, the presence of play structures, and concerns regarding the neighbourhood as a whole. Consider supplemental sampling and consideration for soil removal.					
William Whyte Park	4	290	220	3 (75%)	3 (75%)
The maximum concentration of 290 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 3 of 4 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration significantly exceeded the low end of the range (100 mg/kg). The site is a small park located adjacent to a major roadway. All four of the samples contained concentrations above 100 mg/kg and were located throughout the site.					
Recommendation: High priority for further action given the frequency of concentrations above 100 mg/kg and concerns regarding the neighbourhood as a whole. Supplemental sampling and consideration for soil removal.					
St. John's Park					
St. John's Park	19	340	62	1 (5.3%)	1 (5.3%)
The maximum concentration of 340 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 19 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was well below the low end of the range (100 mg/kg). The site is a large park consisting of a variety of features. Three (3) of the 19 samples contained concentrations above 100 mg/kg; however, none appear to be in areas with play structures.					
Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling where the maximum concentration was identified.					
William Whyte					
Alfred Tot Lot	9	320	92	1 (11%)	1 (11%)
The maximum concentration of 320 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 9 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was slightly below the low end of the range (100 mg/kg). The site is a small park that appears to contain play structures that would attract young children. Three (3) of the 9 samples contained concentrations at or above 100 mg/kg.					
Recommendation: Medium priority for further action given the frequency of concentrations above 100 mg/kg and concerns regarding the neighbourhood as a whole. Confirm consistent sod cover over areas with exceedances of 140 mg/kg, particularly in the north-western area of the site.					
Pritchard Playground	10	230	81	3 (30%)	1 (10%)
The maximum concentration of 230 mg/kg slightly exceeded the upper end of the SQG range of 100-210 mg/kg, 3 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was below the low end of the range (100 mg/kg). All 3 samples that exceeded 140 mg/kg were located in the north-western corner of the site. There are play structures that would attract young children.					
Recommendation: Medium priority for further action given the concerns regarding the neighbourhood as a whole. Confirm consistent sod cover over areas with exceedances of 140 mg/kg, particularly in the north-western area of the site. Consider supplemental sampling and consideration for soil removal.					

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Table 5 Point Douglas Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Rejoice Fun Park	10	430	140	4 (40%)	2 (20%)
<p>The maximum concentration of 430 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 4 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). The site is a small park that appears to contain play structures that would attract young children. Five (5) of the 10 samples contained concentrations above 100 mg/kg.</p> <p>Recommendation: High priority for further action given the frequency of concentrations above 100 mg/kg and concerns regarding the neighbourhood as a whole. Supplemental sampling and consideration for soil removal.</p>					

^a Concentration represents the upper limit of the potential range of 100-210 mg/kg for an SQG based on a non-threshold toxicity endpoint for lead (Intrinsik, 2019).

Table 6 Downtown Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Centennial					
Central C.C/Freighthouse	23	390	54	2 (8.7%)	2 (8.7%)
<p>The maximum concentration of 390 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg; however, only 2 of 23 samples exceeded the CCME SQG of 140 mg/kg and the average concentration was well below the low end of the range (100 mg/kg). There are no visible play structures in areas with elevated concentrations that would draw a higher frequency of use. Higher concentrations identified in western portion of the site.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
Dufferin Park	9	260	120	4 (44%)	1 (11%)
<p>The maximum concentration of 260 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 4 of 9 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). There are no visible play structures in areas with elevated concentrations that would draw a higher frequency of use. Higher concentrations identified in the northern portion of the site adjacent to a higher traffic roadway.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in the northern portion of the site.</p>					
Dufferin School (N-6)	10	300	130	3 (30%)	1 (10%)
<p>The maximum concentration of 300 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 3 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). The two samples in closest proximity to the play structure in the southern portion of the site contained lead concentrations above 100 mg/kg (110 and 130 mg/kg).</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in the southern portion of the site adjacent to any play structures and in the north around the highest observed concentration.</p>					
Giizhigooweyaabikwe Park	10	240	120	4 (40%)	1 (10%)
<p>The maximum concentration of 240 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 4 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). One of the two samples in closest proximity to visible play structures in the southern portion of the site contained a lead</p>					

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Table 6 Downtown Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
<p>concentration of 170 mg/kg. Higher concentrations were generally identified along the outer perimeter of the site adjacent to the larger roadways.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling particularly near park play structures/features.</p>					
Roosevelt Park	10	250	79	2 (20%)	1 (10%)
<p>The maximum concentration of 250 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg; however, the average concentration was below the low end of the range (100 mg/kg) and there was good spatial distribution of samples. The sample in closest proximity to the visible play structure in the south-central portion of the site contained the highest lead concentration (250 mg/kg).</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling particularly near park play structures/features.</p>					
Daniel McIntyre					
Home Playground	8	240	93	2 (25%)	1 (13%)
<p>The maximum concentration of 240 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 2 of 8 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was only marginally below the low end of the range (100 mg/kg). Higher concentrations were identified in the southwestern portion of the site.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in the southwestern portion of the site.</p>					
Jacob Penner Park	10	310	110	2 (20%)	1 (10%)
<p>The maximum concentration of 310 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 2 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). Samples with exceedances were located throughout the site.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling to further delineate exceedances, particularly in areas where exposed soil may exist.</p>					
Lipton Park	4	230	100	1 (25%)	1 (25%)
<p>The maximum concentration of 230 mg/kg slightly exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 4 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was equal to the low end of the range (100 mg/kg). Only 4 samples were collected, however, the site is relatively small. The single exceedance was more than 3x the next highest concentration (71 mg/kg) and was located in the eastern portion of the site. The site appears to be in use as a community garden.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in the eastern portion of the site.</p>					
Maryland Tot Lot	8	220	95	2 (25%)	1 (13%)
<p>The maximum concentration of 220 mg/kg slightly exceeded the upper end of the SQG range of 100-210 mg/kg, 2 of 8 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was only marginally below the low end of the range (100 mg/kg). The site is a small park that includes play structures which are anticipated to attract young children.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in areas with exceedances.</p>					

^a Concentration represents the upper limit of the potential range of 100-210 mg/kg for an SQG based on a non-threshold toxicity endpoint for lead (Intrinsik, 2019).

Table 7 St. Boniface Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Archwood					
Happyland Park	18	250	64	1 (5.6%)	1 (5.6%)
<p>The maximum concentration of 250 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg; however, only 1 of 18 samples exceeded the CCME SQG of 140 mg/kg and the average concentration was well below the low end of the range (100 mg/kg). There are no visible play structures in areas with elevated concentrations that would draw a higher frequency of use, and there was good spatial distribution of samples. Higher concentrations identified near the northeast corner may have been influenced by the adjacent major traffic intersection.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
Central St. Boniface					
La Verendrye Park	17	970	230	12 (71%)	6 (35%)
<p>The maximum concentration of 970 mg/kg significantly exceeded the upper end of the SQG range of 100-210 mg/kg, 12 of 17 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was well above the low end of the range (100 mg/kg). Exceedances were present across all areas of the site, with the highest concentrations located in the north-eastern portion.</p> <p>Recommendation: High priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Supplemental sampling and potential soil removal in the north-eastern portion of the site. Additional sample collection in the south end of the park near the play structure.</p>					
Dufresne					
Kavanagh Park (south portion)	3	190	110	1 (33%)	0
<p>The maximum concentration of 190 mg/kg is below the upper end of the SQG range of 100-210 mg/kg, 1 of 3 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). The site is a large, partially forested park with no play structures, and there is a large spacing between sampling locations minimal sampling coverage. The exceedance does not appear to be located in an area with any play structures.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod/vegetative cover over areas with exceedances of 140 mg/kg.</p>					
Holden					
Lambert Park	20	990	150	3 (15%)	3 (15%)
<p>The maximum concentration of 990 mg/kg significantly exceeded the upper end of the SQG range of 100-210 mg/kg, 3 of 20 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was above the low end of the range (100 mg/kg). Exceedances were localized within the north-central portion of the site.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling and potential soil removal in the north-central portion of the site.</p>					

Table 7 St. Boniface Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Mission Industrial					
Mission Park	20	88,000	10,000	7 (35%)	7 (35%)
<p>The maximum concentration of 88,000 mg/kg significantly exceeded the upper end of the SQG range of 100-210 mg/kg, 7 of 20 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was well above the low end of the range (100 mg/kg). Several of the exceedances were localized in an area in the eastern portion of the site adjacent to a major roadway, with others located more centrally.</p> <p>Recommendation: High priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Supplemental sampling and soil removal in the eastern portion of the site.</p>					
Norwood East					
Traverse Park	12	850	130	3 (25%)	1 (8.3%)
<p>The maximum concentration of 850 mg/kg significantly exceeded the upper end of the SQG range of 100-210 mg/kg, 3 of 12 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was above the low end of the range (100 mg/kg). The site contains visible play structures that would draw a higher frequency of use. Exceedances were located along the northern portion of the site.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling and potential soil removal in the area surrounding the sample with the 850 mg/kg result.</p>					
St. Boniface Industrial Park					
McLeans Pumping Station	12	210	58	1 (8.3%)	0
<p>The maximum concentration of 210 mg/kg was equal to the upper end of the SQG range of 100-210 mg/kg, 1 of 12 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was well below the low end of the range (100 mg/kg). The site is a large park and appears to consist of multiple baseball diamonds and grassed areas. Concentrations were below 100 mg/kg in all samples with the exception of one sample located in the north-western corner of the site.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over the area with the exceedance in the north-western area.</p>					

^a Concentration represents the upper limit of the potential range of 100-210 mg/kg for an SQG based on a non-threshold toxicity endpoint for lead (Intrinsik, 2019).

Table 8 Inkster Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Minto					
Sherburn Tot Lot	8	210	110	2 (25%)	0
<p>The maximum concentration of 210 mg/kg was equal to the upper end of the SQG range of 100-210 mg/kg, 2 of 8 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). Four (4) of the 8 samples contained concentrations above 100 mg/kg indicating relatively low but laterally extensive contamination across the site. There are no current play structures in the area with the elevated concentration that would draw a higher frequency of use.</p>					

Table 8 Inkster Community Area: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in areas with exceedances.					
Sargent Park					
Clifton School (N-6)	12	210	110	2 (17%)	0
The maximum concentration of 210 mg/kg was equal to the upper end of the SQG range of 100-210 mg/kg, 2 of 12 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). Three (3) of the 12 samples contained concentrations above 100 mg/kg indicating relatively low and infrequent contamination across the site. The site is a very large and long strip of land and there is a long distance between sampling locations.					
Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Confirm there are no play structures in the areas with the elevated concentration that would draw a higher frequency of use.					
Weston					
Weston Memorial C.C	10	3,400	400	1 (10%)	1 (10%)
The maximum concentration of 3,400 mg/kg significantly exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration significantly exceeded the low end of the range (100 mg/kg). The site is a large park that appears to contain multiple baseball diamonds and large grassed areas. Four (4) of the 10 samples contained concentrations above 100 mg/kg and were located throughout much of the site, indicating relatively low but laterally extensive contamination, with the exception of the maximum concentration of 3,400 mg/kg located in the south-eastern portion of the site which significantly exceeded the range of criteria.					
Recommendation: High priority for further action in the area surrounding the concentration of 3,400 mg/kg. Supplemental sampling and consideration for soil removal or soil capping.					
Wolseley					
Vimy Ridge Memorial Park	20	220	67	1 (5%)	1 (5%)
The maximum concentration of 220 mg/kg slightly exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 20 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was well below the low end of the range (100 mg/kg). The site is a large park consisting of a variety of features. Two (2) of the 20 samples contained concentrations above 100 mg/kg; with one sample located in close proximity to a swing set.					
Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Confirm there are no play structures in the area with the elevated concentration that would draw a higher frequency of use.					

^a Concentration represents the upper limit of the potential range of 100-210 mg/kg for an SQG based on a non-threshold toxicity endpoint for lead (Intrinsik, 2019).

Table 9 Other Community Areas: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Chalmers					
Clara Hughes Recreation Park	10	270	70	1 (10%)	1 (10%)
The maximum concentration of 270 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg; however, only 1 of 10 samples exceeded the CCME SQG of 140 mg/kg and the average concentration was well below the low end of the range (100 mg/kg). There are no visible play structures in areas with elevated concentrations that would draw a higher frequency of use.					
Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.					
East Elmwood					

Table 9 Other Community Areas: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
Kent Road School (N-6)	19	210	36	1 (5.3%)	0
<p>The maximum concentration of 210 mg/kg is equal to the upper end of the SQG range of 100-210 mg/kg; however, only 1 of 19 samples exceeded the CCME SQG of 140 mg/kg and the average concentration was well below the low end of the range (100 mg/kg). There are no visible play structures in the area with the elevated concentration that would draw a higher frequency of use, and there was good spatial distribution of samples.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
Prairie Central Adventist Academy (N-12) (formerly Red River Valley Academy)	10	340	120	2 (20%)	1 (10%)
<p>The maximum concentration of 340 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 2 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration exceeded the low end of the range (100 mg/kg). Six (6) of the 10 samples contained concentrations above 100 mg/kg indicating relatively low but laterally extensive contamination, particularly along the eastern and south-eastern property lines.</p> <p>Recommendation: Medium priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg. Consider supplemental sampling in areas with exceedances.</p>					
Lord Roberts					
Argue & Rosedale Athletic Field	5	240	78	1 (20%)	1 (20%)
<p>The maximum concentration of 240 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 5 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was below the low end of the range (100 mg/kg). There are no visible play structures in the area with the elevated concentration that would draw a higher frequency of use. The site is large and with a large spacing between sample locations.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
River-Osborne					
Mayfair Park East	16	260	78	3 (19%)	1 (6.3%)
<p>The maximum concentration of 260 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 3 of 16 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was below the low end of the range (100 mg/kg). The highest concentrations were primarily found in an area that does not contain play structures and is covered with grass and trees. There was a greater sampling frequency in the southern portion of the site where play structures are present, but concentrations were generally lower.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
Riverview					
Arnold Avenue Park	10	230	57	1 (10%)	1 (10%)
<p>The maximum concentration of 230 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 10 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was well below the low end of the range (100 mg/kg). There are no visible play structures in the area with the elevated concentration that would draw a higher frequency of use. The site is large with a large spacing between sample locations.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg.</p>					
Churchill Drive Community Gardens	11	460	61	1 (9.1%)	1 (9.1%)

Table 9 Other Community Areas: Further Analysis of Sample Sites of Potential Concern					
<i>Neighbourhood and Park/School</i>	<i>Total # of Samples</i>	<i>Maximum (mg/kg)</i>	<i>Average (mg/kg)</i>	<i># Samples Above CCME SQG (140 mg/kg)</i>	<i># Samples Above 210 mg/kg^a</i>
<p>The maximum concentration of 460 mg/kg exceeded the upper end of the SQG range of 100-210 mg/kg, 1 of 11 samples exceeded the CCME SQG of 140 mg/kg, and the average concentration was well below the low end of the range (100 mg/kg). The site is large with a large spacing between sample locations. There are no visible play structures in the area with the elevated concentration that would draw a higher frequency of use.</p> <p>Recommendation: Low priority for further action. Confirm consistent sod cover over areas with exceedances of 140 mg/kg and confirm that there are no features that may attract young children in the south-eastern portion of the site where the maximum concentration was found. Further delineation in this area if there is the potential for frequent use by children.</p>					

^a Concentration represents the upper limit of the potential range of 100-210 mg/kg for an SQG based on a non-threshold toxicity endpoint for lead (Intrinsik, 2019).

Based on the analysis provided in Tables 5 to 9, six sites were identified as high priority for further action, 20 as medium priority, and 16 as low priority, as summarized in Table 10 and on Drawing No. 5.

Table 10 Summary of Recommendations for Further Action for Individual Sites (2021 Investigation Results)		
<i>Low Priority</i>	<i>Medium Priority</i>	<i>High Priority</i>
<p>City of Winnipeg Parks:</p> <ul style="list-style-type: none"> • Happyland Park - Archwood • Central C.C./Freighthouse - Centennial • Clara Hughes Recreation Park - Chalmers • Old Exhibition Athletic Grounds - Dufferin • Kavanagh Park – Dufresne • Arlington Tot Lot – Inkster-Faraday • McKenzie Tot Lot – Inkster-Faraday • Argue & Rosedale Athletic Field – Lord Roberts • Mayfair Park East – River-Osborne • Arnold Avenue Park - Riverview • Churchill Drive Community Gardens - Riverview • Fort Douglas Park – South Point Douglas • McLeans Pumping Station – St. Boniface Industrial Park • Vimy Ridge Memorial Park - Wolseley <p>Schools:</p> <ul style="list-style-type: none"> • Kent Road School (N-6) – East Elmwood • Clifton School (N-6) – Sargent Park 	<p>City of Winnipeg Parks:</p> <ul style="list-style-type: none"> • Dufferin Park - Centennial • Roosevelt Park - Centennial • Giizhigooweyaabikwe Park - Centennial • Home Playground – Daniel McIntyre • Jacob Penner Park – Daniel McIntyre • Lipton Park – Daniel McIntyre • Maryland Tot Lot – Daniel McIntyre • Lambert Park - Holden • Luxton C.C - Luxton • Aberdeen Adventure Playground – North Point Douglas • Sherburn Tot Lot - Minto • Michaëlle Jean Park / Norquay C.C – North Point Douglas • Grace Street Tot Lot – South Point Douglas • Traverse Park – Norwood East • St. John’s Park – St. John’s Park • Alfred Tot Lot – William Whyte • Pritchard Playground – William Whyte <p>Schools:</p> <ul style="list-style-type: none"> • Dufferin School (N-6) - Centennial • Prairie Central Adventist Academy (N-12) (formerly Red River Valley Academy)– East Elmwood • David Livingstone School (N-8) – Lord Selkirk 	<p>City of Winnipeg Parks:</p> <ul style="list-style-type: none"> • La Verendrye Park – Central St. Boniface • Mission Park – Mission Industrial • Weston Memorial C.C – Weston • William Whyte Park – South Point Douglas • Rejoice Fun Park – William Whyte <p>Schools:</p> <ul style="list-style-type: none"> • Immaculate Heart of Mary School (N-8) – Dufferin
Total:		
Total number of Parks: 14 Total number of Schools: 2	Total number of Parks: 17 Total number of Schools: 3	Total number of Parks: 5 Total number of Schools: 1

9.0 SUMMARY AND CONCLUSIONS

Under the direction of Manitoba Environment, Climate and Parks (MECP), Parsons Inc., in collaboration with Intrinsik Corp., conducted a soil lead sampling and assessment program in October/November 2021 and provided a review and interpretation of the lead analytical results and recommendations for further action. The work was conducted as follow up to the assessment conducted in 2019 by Intrinsik (Intrinsik, 2019). The investigation was conducted on public areas

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(parks or schools) in 40 neighbourhoods specified by MECP based on the priority areas specified from the 2019 assessment, and were generally located in the central parts of the City of Winnipeg, as well as within 500 m of the airport. Samples were collected from 53 school properties and 147 parks within these neighborhoods, for a total of 200 sites. From those 200 sites, a total of 2018 distinct locations were sampled for lead and compared to guidelines. Soil samples were collected at a depth of 0 - 2.5 cm below grade. The sampling sites focused primarily on public areas where children under seven years old frequent as they are at the greatest risk from exposure.

The results of the soil investigation indicated that of 2013 samples collected (excludes samples noted below), 118 (5.9%) contained concentrations of lead greater than the Canadian Council of Ministers of the Environment (CCME) Soil Quality Guideline (SQG) of 140 mg/kg, while 48 (2.4%) were greater than 210 mg/kg. One sample location (comprised of five individual samples) from Mission Park was excluded from these totals since concentrations were significantly higher (maximum of 88,000 mg/kg) than those from the other samples and artificially skewed the overall results.

It is recommended that further action is taken for a number of individual sites (parks or schools) sampled in 2021, which had concentrations greater than the referenced guidelines. Six sites have been identified as high priority for further action. An additional 20 sites were identified as medium priority, and 16 sites were identified as low priority. These actions will be based on an evaluation of risk, and may include inspection to ensure sufficient sod/vegetation cover to restrict direct access to exposed soils, further sampling to delineate exceedances, the application of capping measures (soil or hard surfaces), localized soil removal and replacement programs, or other appropriate options that limit direct exposure to impacted soils.

Based primarily on the results of the 2021 soil investigation, soil lead concentrations for a number of neighbourhoods have been identified for further action. Given that this work was a focused sampling initiative on schools and parks, several neighbourhoods with fewer applicable sampling sites (parks or schools) had a lower number of samples collected, and therefore the overall results may be skewed by the occurrence of one or two outliers. Consideration must be given to whether the sampling data is reflective of conditions across the neighbourhood as a whole, and of soil lead concentrations on residential properties where young children are likely to have the greatest opportunity for exposure. Several other neighbourhoods were not specifically identified for further consideration as a result of lower overall soil lead concentrations; however, it should be recognized that areas with higher soil lead concentrations than those identified in the selected sampling locations may exist. Consistent with recommendations provided by Intrinsik (2019), the assessment of potential risks associated with soil lead concentrations indicates that further study may be warranted. The neighbourhoods identified for further consideration, based on an analysis of the 2021 analytical data exclusively, are Centennial, Central St. Boniface, Daniel McIntyre, Dufresne, Holden, South Point Douglas, Weston, and William Whyte. Other neighbourhoods sampled in 2021 may be identified for further analysis at a later date, given limitations of the 2021 data set.

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It is recommended that further evaluation of the current and available historical data is conducted along with a data gap analysis to identify those additional areas (neighbourhoods) that may require supplemental soil sampling. Consideration should also be given to collecting soil samples from residential properties for those neighbourhoods where soil lead concentrations on public spaces have been identified for further consideration, or where the low number of parks or schools in the neighbourhood resulted in a limited number of samples being collected during the 2021 investigation.

Given that there are sufficient data to demonstrate that soil lead concentrations in certain neighbourhoods warrant further consideration, blood lead monitoring may be an effective approach for assessing risks and the potential need for further soil sampling and/or the implementation of risk management measures. The objective of blood lead monitoring is to measure actual levels of lead exposure, which will help determine if exposures experienced by young children represent a potential health concern.

This assessment and recommendations were based largely on a comparison of soil lead concentrations to both the current CCME SQG of 140 mg/kg for lead in residential/parkland soils, and a range of potential SQGs (100-210 mg/kg) derived to be reflective of the current state of the science on lead toxicity and the potential restricted access to soil during the extended winter months in Winnipeg (Intrinsik, 2019). Overall, these guidelines are intended to ensure that exposure to lead in soil will have negligible impacts on young children and do not represent concentrations at which unacceptable adverse effects are anticipated to occur.

10.0 LIMITATION OF LIABILITY, SCOPE OF REPORT AND THIRD-PARTY RELIANCE

10.1 INTRINSIK CORP.

Intrinsik Corp. (Intrinsik) provided interpretation of the analytical results and recommendations for further investigation. This information was provided to Parsons Inc. and the Manitoba Ministry of Environment, Climate and Parks (hereafter referred to as Parsons and MECP) solely for the purpose stated in the report. The information contained in this report was prepared and interpreted exclusively for Parsons/MECP and may not be used in any manner by any other party. Intrinsik does not accept any responsibility for the use of this report for any purpose other than as specifically intended by Parsons/MECP. Intrinsik does not have, and does not accept, any responsibility or duty of care whether based in negligence or otherwise, in relation to the use of this report in whole or in part by any third party. Any alternate use, including that by a third party, or any reliance on or decision made based on this report, are the sole responsibility of the alternative user or third party. Intrinsik does not accept responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Intrinsik makes no representation, warranty, or condition with respect to this report, or the information contained herein other than that it has exercised reasonable skill, care and diligence in accordance with accepted practice and usual standards of thoroughness and competence for the profession of toxicology and environmental risk assessment to assess and evaluate information acquired during the preparation of this report. Any information or facts provided by others and referred to or utilized in the preparation of this report, is believed to be accurate without any independent verification or confirmation by Intrinsik. This report is based upon and limited by circumstances and conditions stated herein, and upon information available at the time of the preparation of the report.

Intrinsik has reserved all rights in this report, unless specifically agreed to otherwise in writing with Parsons/MECP.

10.2 PARSONS INC.

This report has been prepared and the work referred to in this report has been undertaken by Parsons Inc. (Parsons), for Manitoba Environment, Climate and Parks (MECP). It is intended for the sole and exclusive use of MECP, its affiliated companies and partners and their respective insurers, agents, employees and advisors (collectively, "MECP"). Any use, reliance on or decision made by any person other than MECP based on this report is the sole responsibility of such other person. MECP and Parsons, make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken based on this report or the work referred to in this report.

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The investigations undertaken by Parsons, with respect to this report and any conclusions or recommendations made in this report reflect Parsons' judgment based on the Site conditions observed at the time of the Site inspection on the date(s) set out in this report and on information examined at the time of preparation of this report. This report has been prepared for specific application to this Site and it is based, in part, upon visual observation of the Site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future Site conditions, portions of the Site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation may exist in areas of the Site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken.

If Site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations in this report may be necessary.

Other than by MECP, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of Parsons. Nothing in this report is intended to constitute or provide a legal opinion.

We trust that this information is satisfactory for your present requirements. If you have any questions or concerns, please do not hesitate to contact the undersigned.

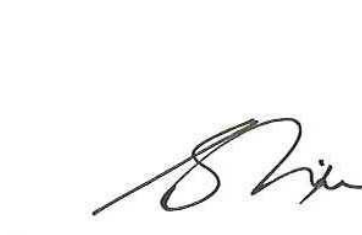
Respectfully submitted,

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REFERENCES

City of Winnipeg, 2021a. *Neighbourhood map, City of Winnipeg Open Data Portal*. Shapefile downloaded on August 10, 2021. Open Data Portal: <https://data.winnipeg.ca/Neighbourhoods>: <https://data.winnipeg.ca/City-Planning/Neighbourhood/fen6-iygi>

City of Winnipeg, 2021b. *Map of Parks and Open Space, City of Winnipeg Open Data Portal*. Shapefile downloaded on August 9, 2021. Open Data Portal: [https://data.winnipeg.ca/Parks and Open Spaces](https://data.winnipeg.ca/Parks%20and%20Open%20Spaces): <https://data.winnipeg.ca/Parks/Map-of-Parks-And-Open-Space/tug6-p73s>

City of Winnipeg, 2021c. *Assessment Parcels, City of Winnipeg Open Data Portal*. Shapefile downloaded on September 21, 2021. Open Data Portal: [https://data.winnipeg.ca/Assessment Parcels](https://data.winnipeg.ca/Assessment%20Parcels): <https://data.winnipeg.ca/Assessment-Taxation-Corporate/Assessment-Parcels/d4mq-wa44>

City of Winnipeg, 2021d. *Orthographic Photography Tiles, Spring 2021, City of Winnipeg Open Data Portal*. Image tiles downloaded from Open Data Portal: [https://data.winnipeg.ca/Aerial Imagery](https://data.winnipeg.ca/Aerial%20Imagery): <http://data.winnipeg.ca/City-Planning/Orthographic-Photography-Tiles/xwk4-6qbc>

City of Winnipeg, 2022. *Community Characterization Area map, City of Winnipeg Open Data Portal*. Shapefile downloaded January 2022. Open Data Portal: <https://data.winnipeg.ca/Map>: <https://data.winnipeg.ca/City-Planning/Community-Characterization-Area/d9gq-xua6>

CCME, 1999. *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Lead Factsheet, Canadian Environmental Quality Guidelines*. Canadian Council of Ministers of the Environment (CCME).

Division Scolaire Franco-Manitobaine, 2021. Map of schools from <https://www.dsfm.mb.ca/>

Intrinsik, 2019. *Assessment of Elevated Concentrations of Lead in Soil in Winnipeg Neighbourhoods*. Prepared by Intrinsik Corp., for Manitoba Health, Seniors and Active Living, Oversight Committee. November 29, 2019.

Jacobs (2019). *CSO Master Plan – Mission District Plan*. August 2019. Prepared for the City of Winnipeg. Available at: https://www.winnipeg.ca/waterandwaste/pdfs/sewage/projects/cso/Mission_Plan_Final_CO1_MP_08192019.pdf

Louis Riel School Division, 2021. List of schools from <https://www.lrsd.net/schools/Pages/Schools.aspx>

Manitoba Conservation and Climate (MCC), 2021a. *Stage 2 – Request for Proposals of Engineering and Architectural Services, RFP#: 6705-2021/22, Environmental Site Assessment, Lead in Soil Testing Program in Winnipeg, Manitoba*. Issued by Manitoba Conservation and Climate. July 29, 2021.

Manitoba Conservation and Climate (MCC), 2021b. *Questions and Answers #1, Request for Quotation (RFQ) #6705/2021/22, August 4, 2021, Soil Testing Program in Winnipeg*. Manitoba Conservation and Climate.

Manitoba Conservation and Climate (MCC), 2021c. *Questions and Answers #2, Request for Quotation (RFQ) #6705/2021/22, August 6, 2021, Soil Testing Program in Winnipeg*. Manitoba Conservation and Climate.

Manitoba Conservation (MC), 2010. Sampling Report: Surface Soil Lead Levels in Winnipeg, Manitoba: 2007 & 2008. Manitoba Conservation Report No. 2009-03. Winnipeg, MB. Available at <https://www.gov.mb.ca/sd/eal/registries/5998soilsurvey/index.html>

Manitoba Sustainable Development (MSD), 2019. Winnipeg Soil Survey, Fall 2018. Environmental Compliance and Enforcement Branch. January 2019. Available at <https://www.gov.mb.ca/sd/eal/registries/5998soilsurvey/index.html>

St. James-Assiniboia School Division, 2021. Map of schools from <https://www.sjasd.ca/Schools/Maps/>

University of Manitoba (U of M), 2017. Soil Sampling Results from the St. Boniface Area (unpublished).

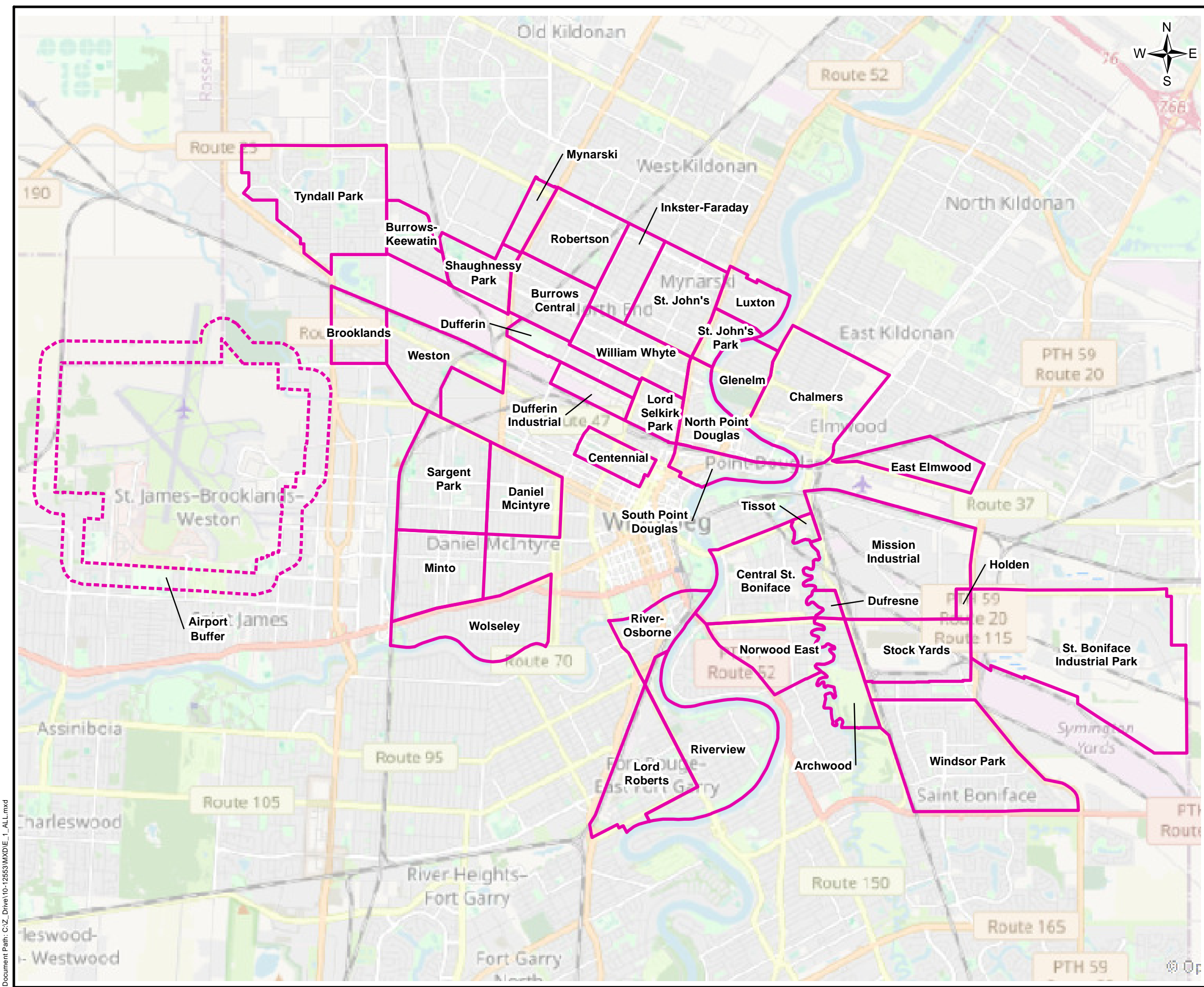
Winnipeg School Division, 2021. Catchment map from <https://www.winnipeg.sd.ca/page/9649/ward-boundaries-maps>, downloaded August 2021.

WRHA (Winnipeg Regional Health Authority). 2020a. Community Area Profile 2020. Point Douglas. Centre of Healthcare Innovation. Available at: <https://wrha.mb.ca/files/cha-2019-profile-point-douglas.pdf>

WRHA (Winnipeg Regional Health Authority). 2020b. Community Area Profile 2020. Downtown. Centre of Healthcare Innovation. Available at: <https://wrha.mb.ca/files/cha-2019-profile-downtown.pdf>

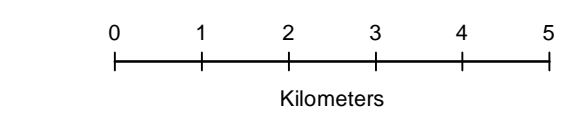
WRHA (Winnipeg Regional Health Authority). 2020c. Community Area Profile 2020. St. Boniface. Centre of Healthcare Innovation. Available at: <https://wrha.mb.ca/files/cha-2019-profile-st-boniface.pdf>

WRHA (Winnipeg Regional Health Authority). 2020d. Community Area Profile 2020. Inkster. Centre of Healthcare Innovation. Available at: <https://wrha.mb.ca/files/cha-2019-profile-inkster.pdf>



LEGEND

- Neighborhood Sampled
- Airport Buffer



Notes:

- Image: OpenStreetMap, downloaded from ESRI, Jan. 2022.
- Neighborhood Limits: June 2014, City of Winnipeg, Open Data Catalogue, downloaded August 2021 from www.datawinnipeg.ca (airport buffer is selected as within 500 m from the "Airport" neighborhood limits)

**Study Neighborhoods
Winnipeg, MB**

Drawn By: SLD	Ref: 10-12553
Reviewed By: GSK	Date: 13-Jan-2022



Drawing No.:
1

Document Path: C:\Z_Drive\10-12553\MXD\1_ALL.mxd

Lead Concentration (mg/kg)



Note: the maximum of the sample or duplicate/re-test is shown

LEGEND

- Lead Concentration (mg/kg)
- 140 mg/kg (CCME, 1999)
- - - 100 and 210 mg/kg (Intrinski, 2019)

Graphical Summary of Soil Analytical Results (mg/kg) by Neighborhood

Ref. No: 10-12553
Date: Feb 4, 2022

Drawn By: SLD
Reviewed by: GSK



Drawing No.:
2a

Lead Concentration (mg/kg)

1 10 100 1000 10000 100000



Note: the maximum of the sample or duplicate/re-test is shown

LEGEND

- Lead Concentration (mg/kg)
- 140 mg/kg (CCME, 1999)
- - - 100 and 210 mg/kg (Intrinski, 2019)

Graphical Summary of Soil Analytical Results (mg/kg) by Neighborhood

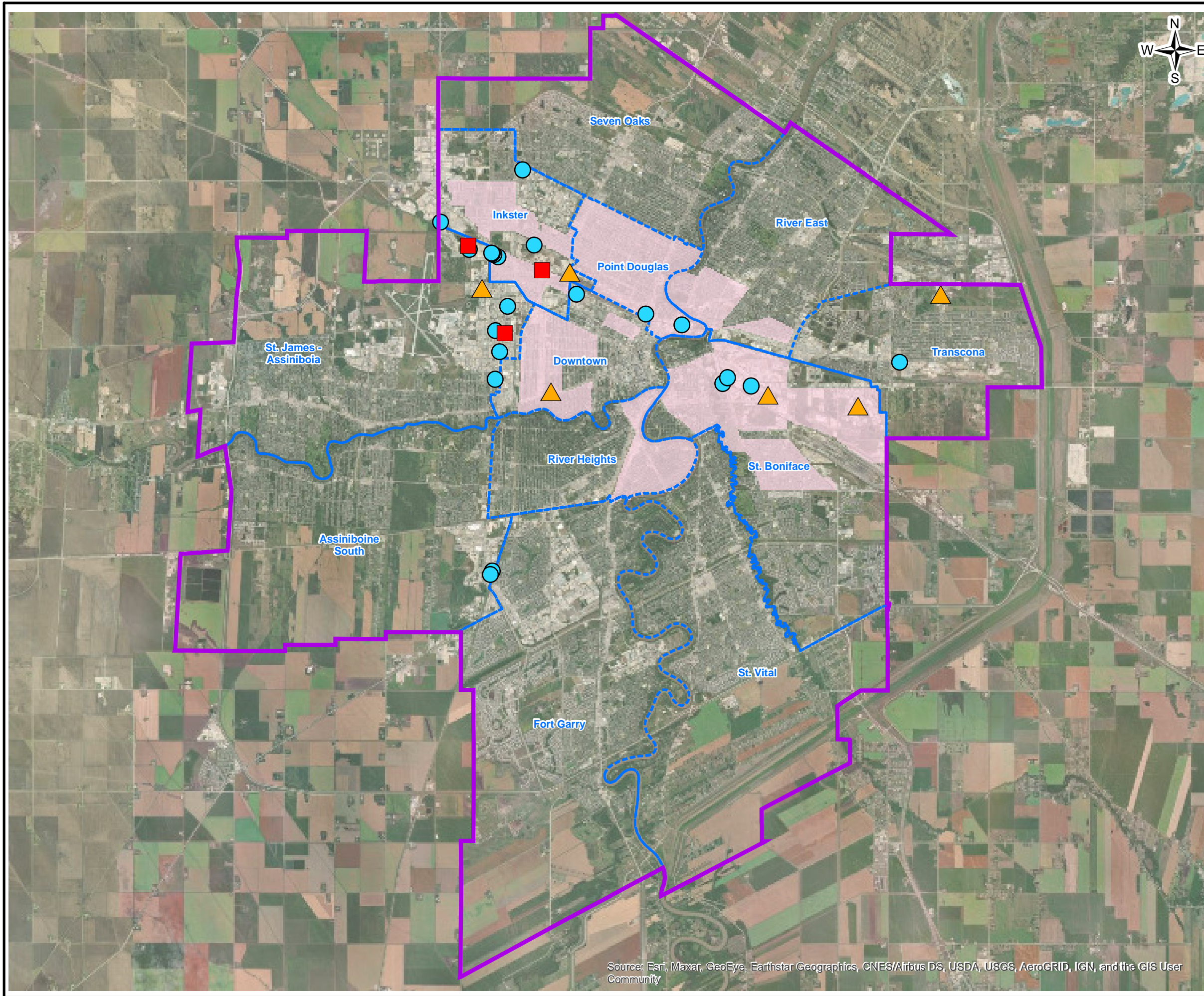
Ref. No: 10-12553
Date: Feb 4, 2022

Drawn By: SLD
Reviewed by: GSK

PARSONS

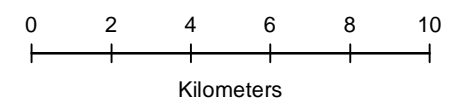
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2b

Document Path: C:\Z_Drive\10-12553\MXD\H_Intrinsic_PointSources.mxd



LEGEND

- ▲ NPRI Facilities
- Historical Secondary Smelter
- Scrap Metal Yard/Lead Acid Battery Waste Transfer or Manufacturing Facilities
- Neighborhood Sampled (2021)
- Community Health Area
- City of Winnipeg Boundary



Source: Intrinsic (2019) Figures 2.1 "Location of Three Secondary Lead Smelter Sites and 3.2 "Point Sources of Lead Contamination in Winnipeg"

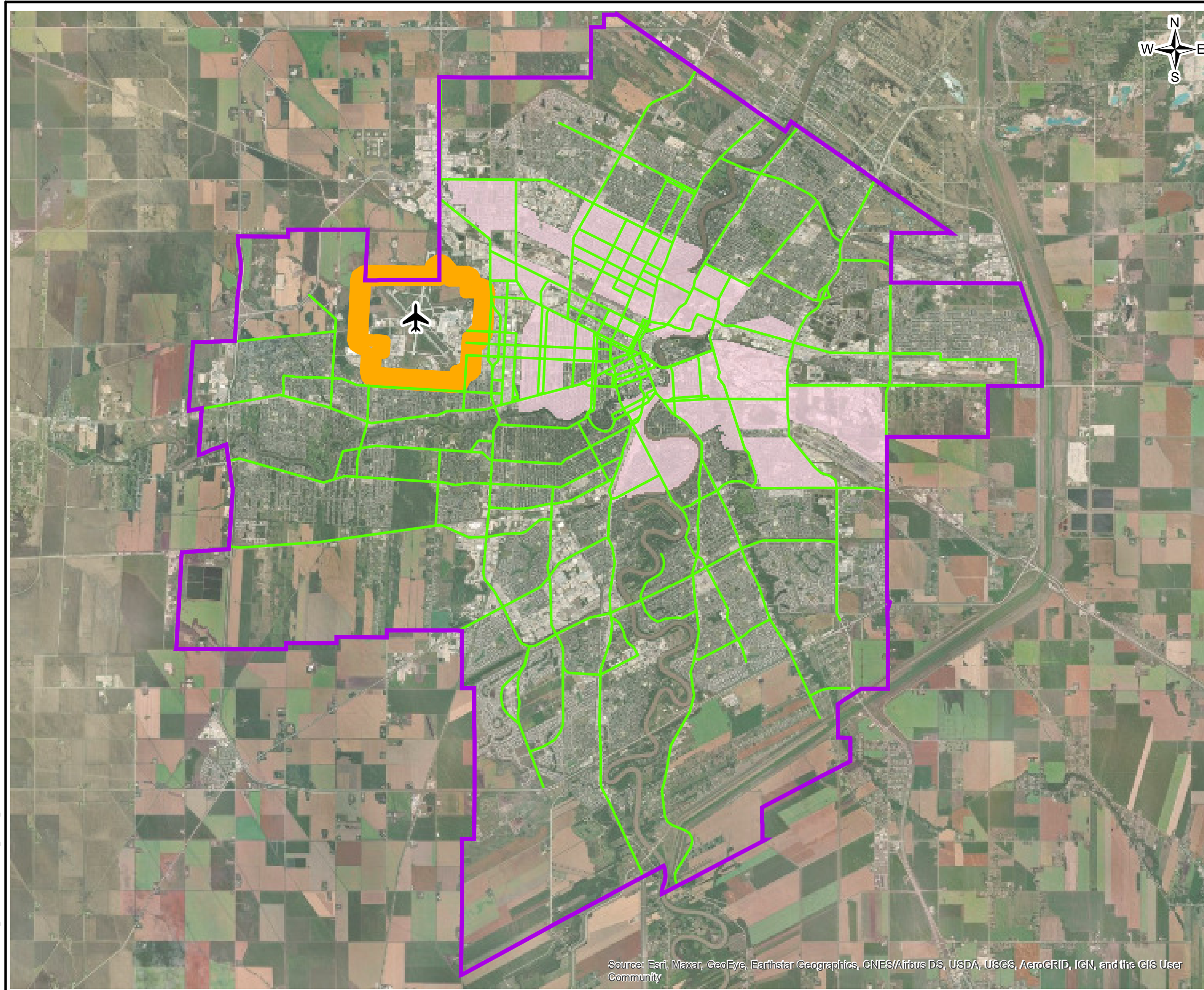
Potential Point Sources of Lead Contamination in Winnipeg






Winnipeg, MB

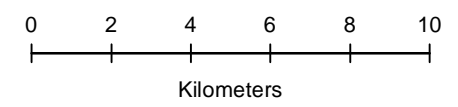
	Drawn By: SLD	Ref: 10-12553
	Reviewed By: GSK	Date: 06-Feb-2022
PARSONS	Drawing No.:	3.1

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Document Path: C:\Z_Drive\10-12553\MXD\H_Intrinsic_PointSources.mxd



- LEGEND**
-  Major Roadways
 -  Airport
 -  Airport Buffer Area (Parsons)
 -  Neighborhood Sampled (2021)
 -  City of Winnipeg Boundary



Source: Intrinsic (2019) Figure 3.3 "Sources of Leaded Gasoline Emissions Presented with the Neighbourhoods Included in Soil Investigation".

Sources of Emissions from Leaded Fuels

Winnipeg, MB

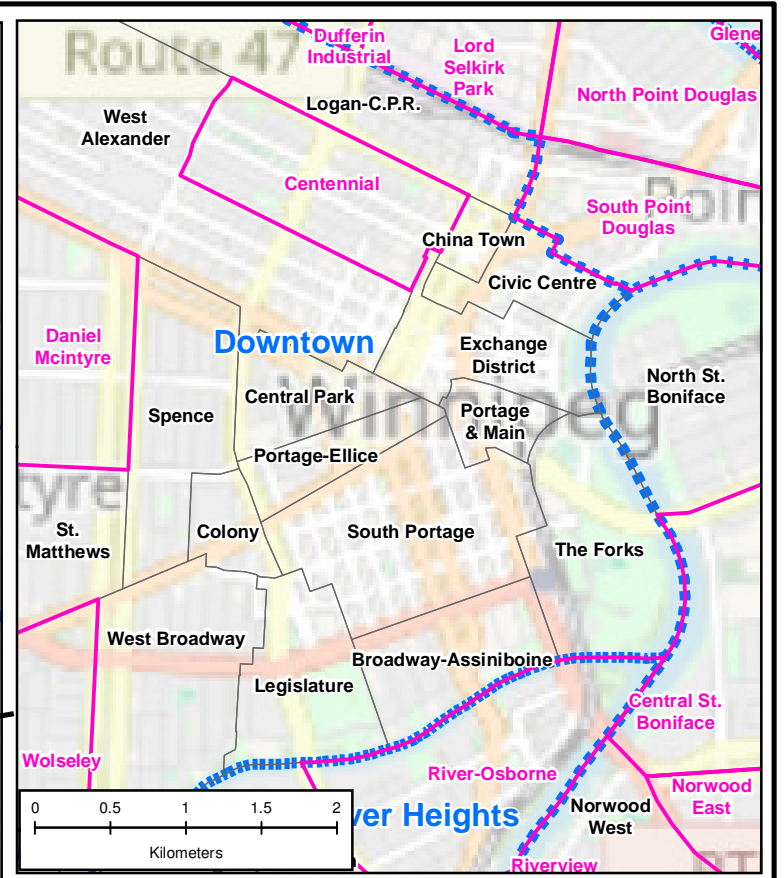
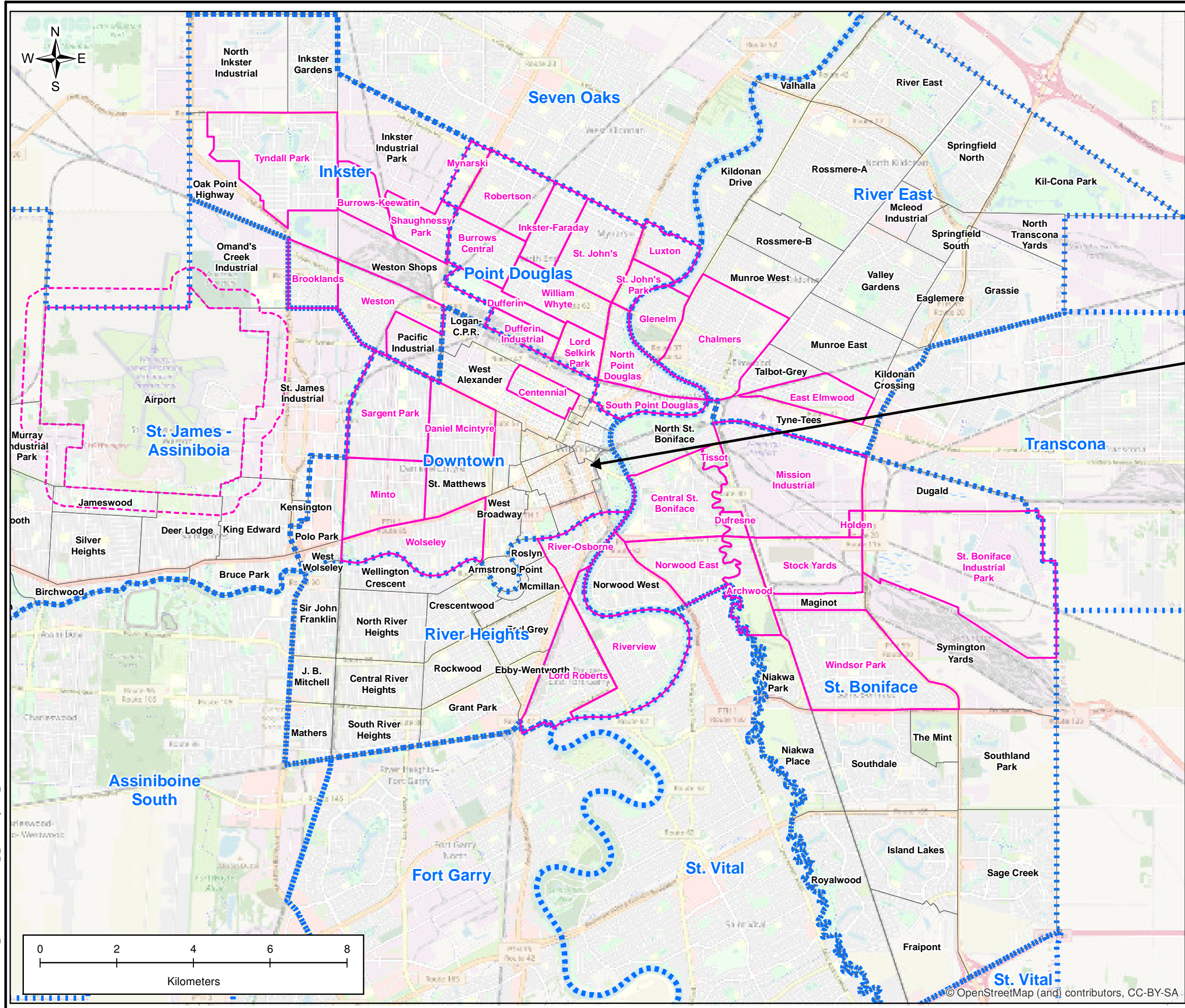


Drawn By: SLD	Ref: 10-12553
Reviewed By: GSK	Date: 06-Feb-2022



Drawing No.:
3.2

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



LEGEND

- Neighborhood Included in Study
- Airport Buffer
- Neighborhood
- Community Health Area Boundary

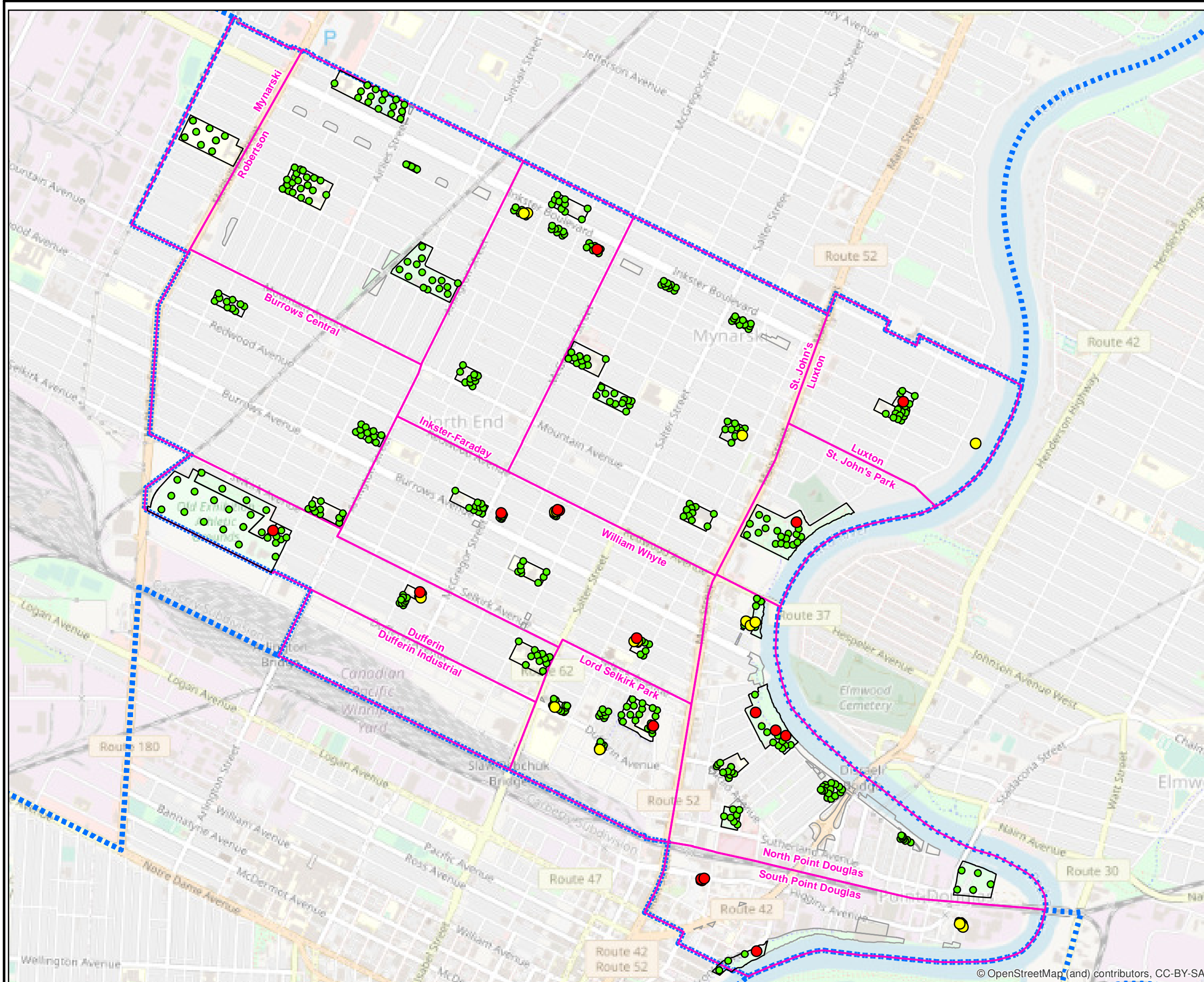
Community Health Area Overview

Winnipeg, MB

Drawn By: SLD	Ref: 10-12553
Reviewed By: GSK	Date: 10-Feb-2022

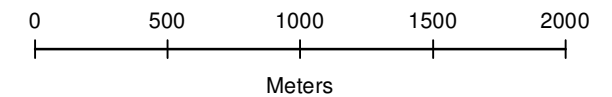
PARSONS

Drawing No.:
4.1



LEGEND

- Park or School Sampled
 - Park or School Not Sampled
 - Neighborhood Sampled
 - Community Area Boundary
- Lead Concentration (mg/kg)**
- <= 140 mg/kg (displays on bottom)
 - >140 to 210 mg/kg
 - >210 mg/kg (displays on top)



Notes:
 - Display priority is set so that exceedances of >210 mg/kg overly those of 140-210 mg/kg, which overly those of <= 140 mg/kg. If sample locations are close, overlying dots will obscure those underneath.

**Summary of Soil Lead Analytical Results
 Point Douglas Community Area**

Winnipeg, MB

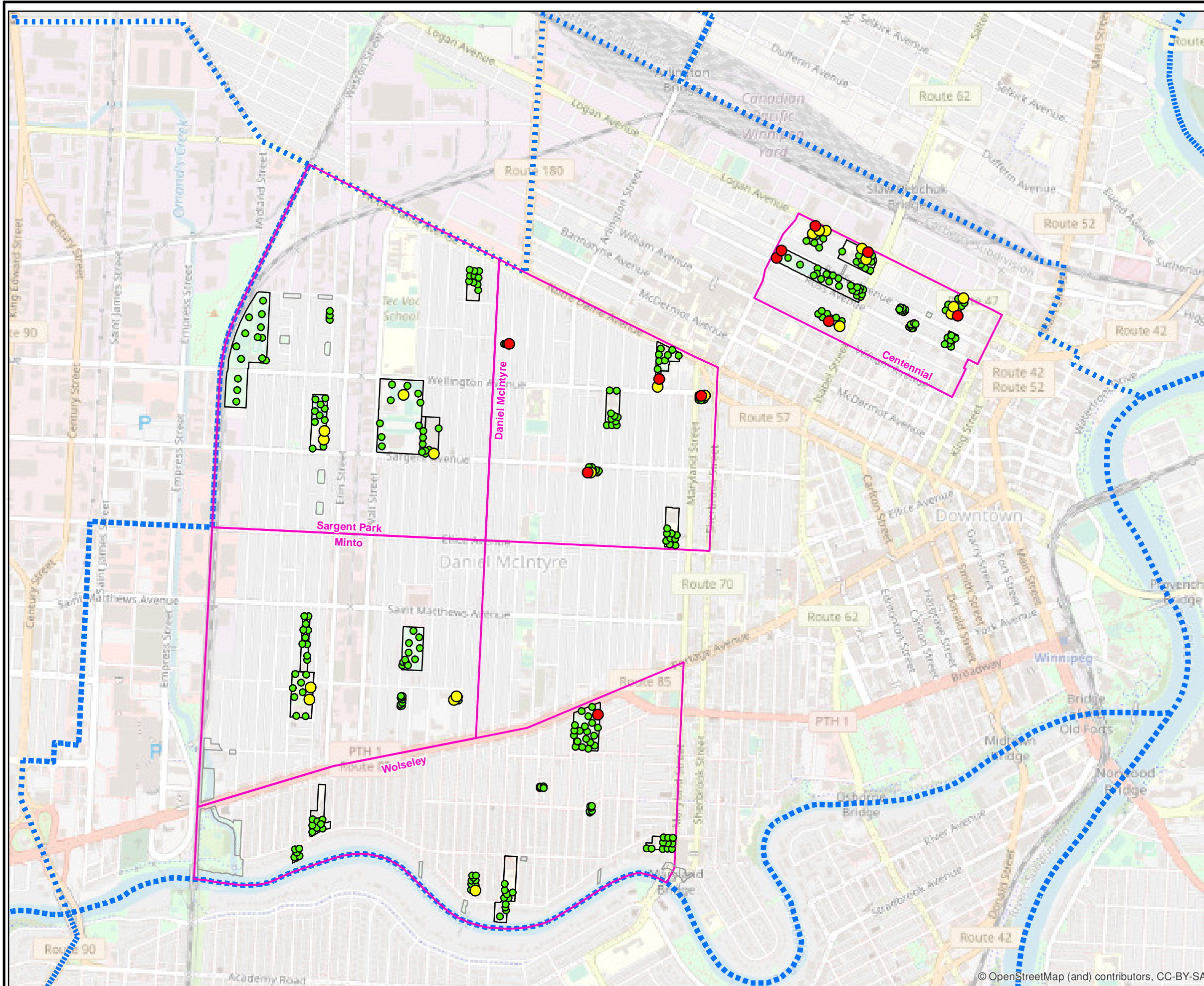
Drawn By: SLD Ref: 10-12553

Reviewed By: GSK Date: 06-Feb-2022

Drawing No.:

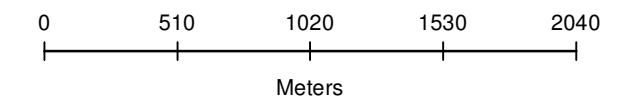
PARSONS

4.2



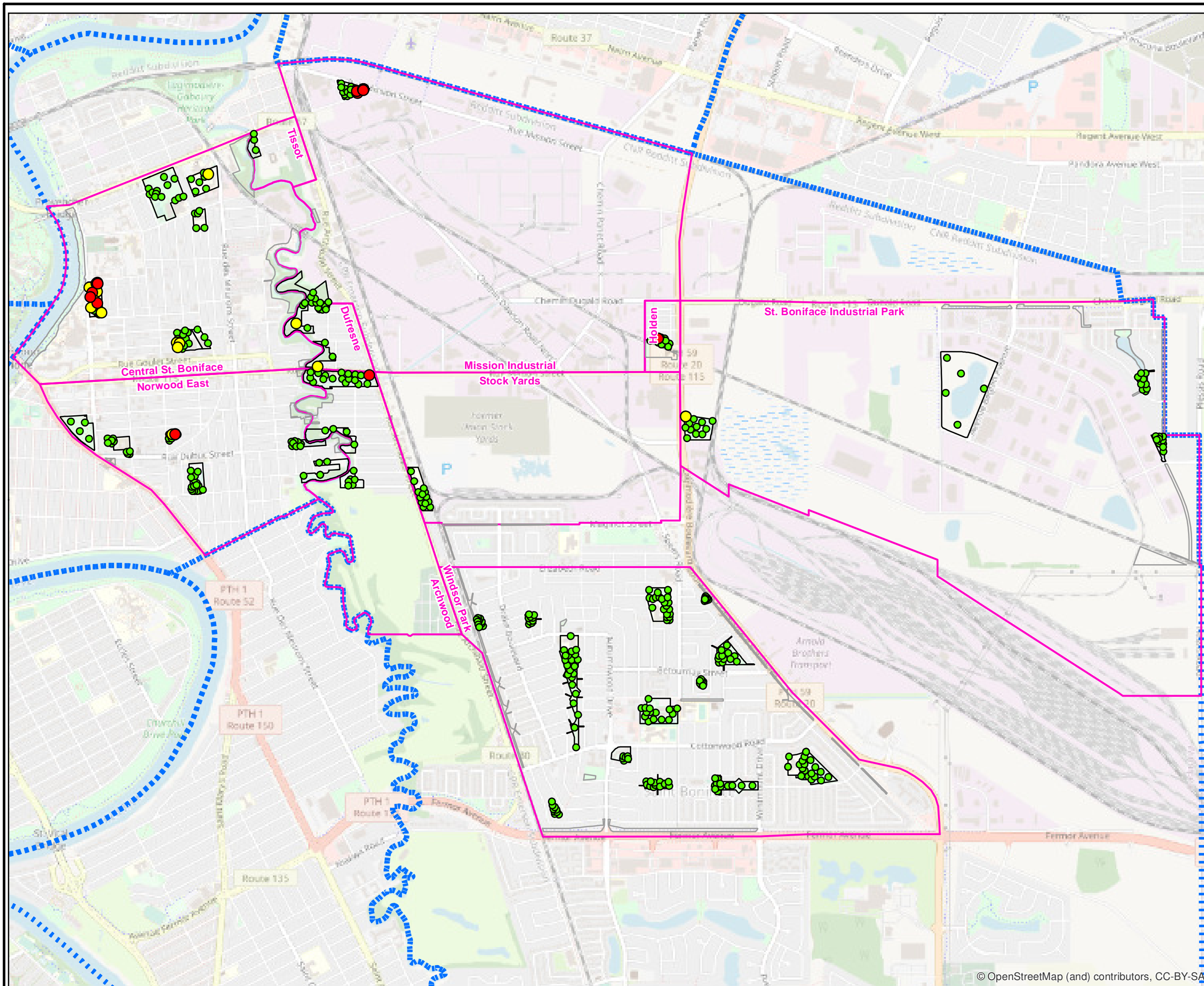
LEGEND

- Neighborhood Sampled
 - Park or School Sampled
 - Park or School Not Sampled
 - Community Area Boundary
- Lead Concentration (mg/kg)**
- <= 140 mg/kg (displays on bottom)
 - >140 to 210 mg/kg
 - >210 mg/kg (displays on top)



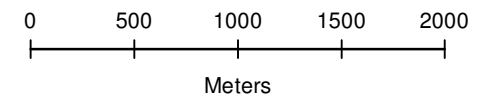
Notes:
 - Display priority is set so that exceedances of >210 mg/kg overlie those of 140-210 mg/kg, which overlie those of <= 140 mg/kg. If sample locations are close, overlying dots will obscure those underneath.

Summary of Soil Lead Analytical Results Downtown Community Area		
Winnipeg, MB		
	Drawn By: SLD	Ref: 10-12553
	Reviewed By: GSK	Date: 06-Feb-2022
PARSONS		Drawing No.:
		4.3



LEGEND

- Park or School Sampled
- Park or School Not Sampled
- Neighborhood Sampled
- Community Area Boundary
- Lead Concentration (mg/kg)**
- <= 140 mg/kg (displays on bottom)
- >140 to 210 mg/kg
- >210 mg/kg (displayed on top)



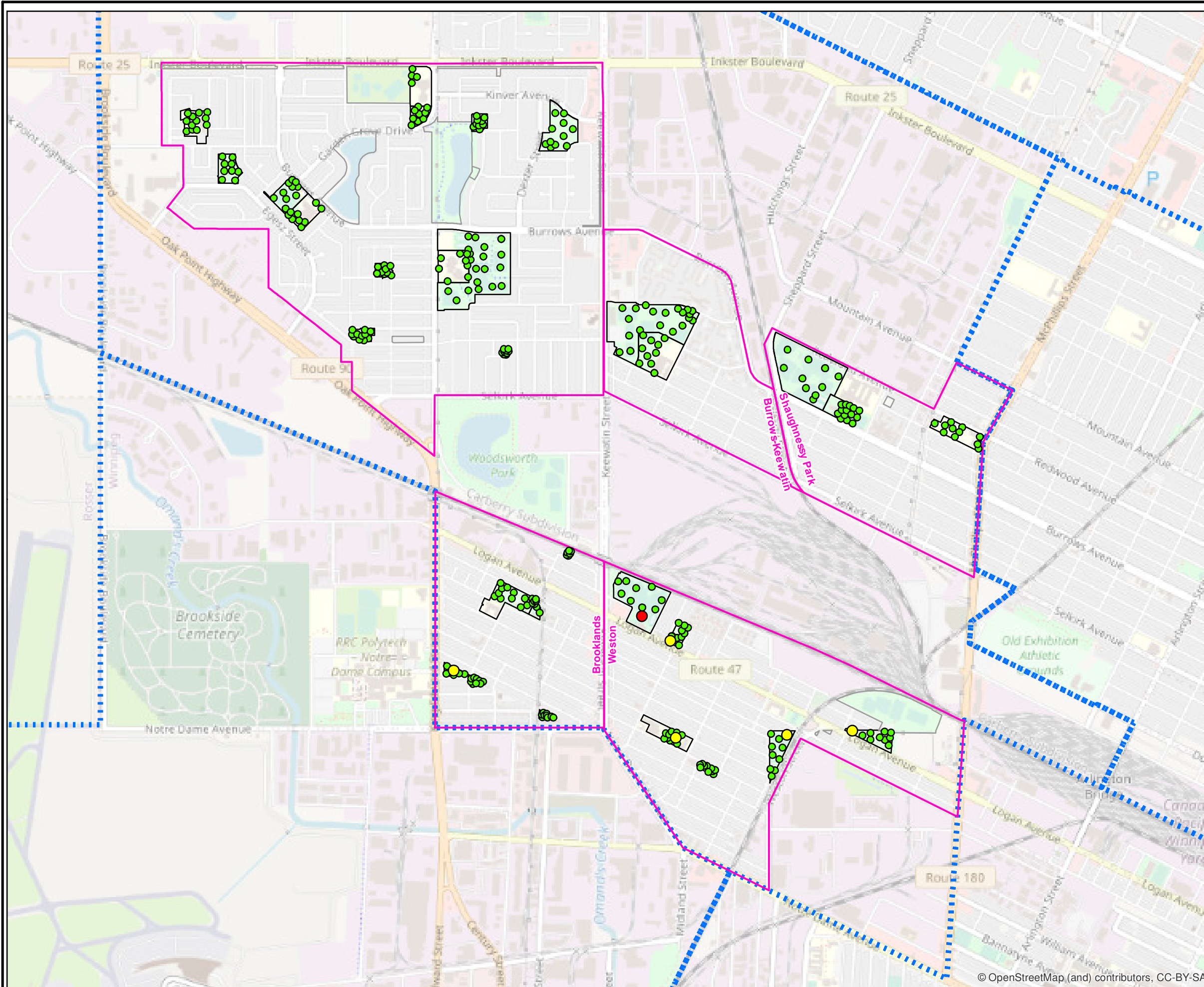
Notes:
 - Display priority is set so that exceedances of >210 mg/kg overly those of 140-210 mg/kg, which overly those of <= 140 mg/kg. If sample locations are close, overlying dots will obscure those underneath.

**Summary of Soil Lead Analytical Results
 St. Boniface Community Area**

Winnipeg, MB

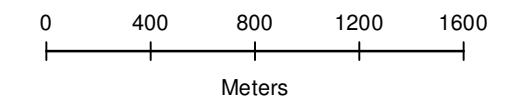
Drawn By: SLD	Ref: 10-12553
Reviewed By: GSK	Date: 06-Feb-2022
Drawing No.:	

PARSONS



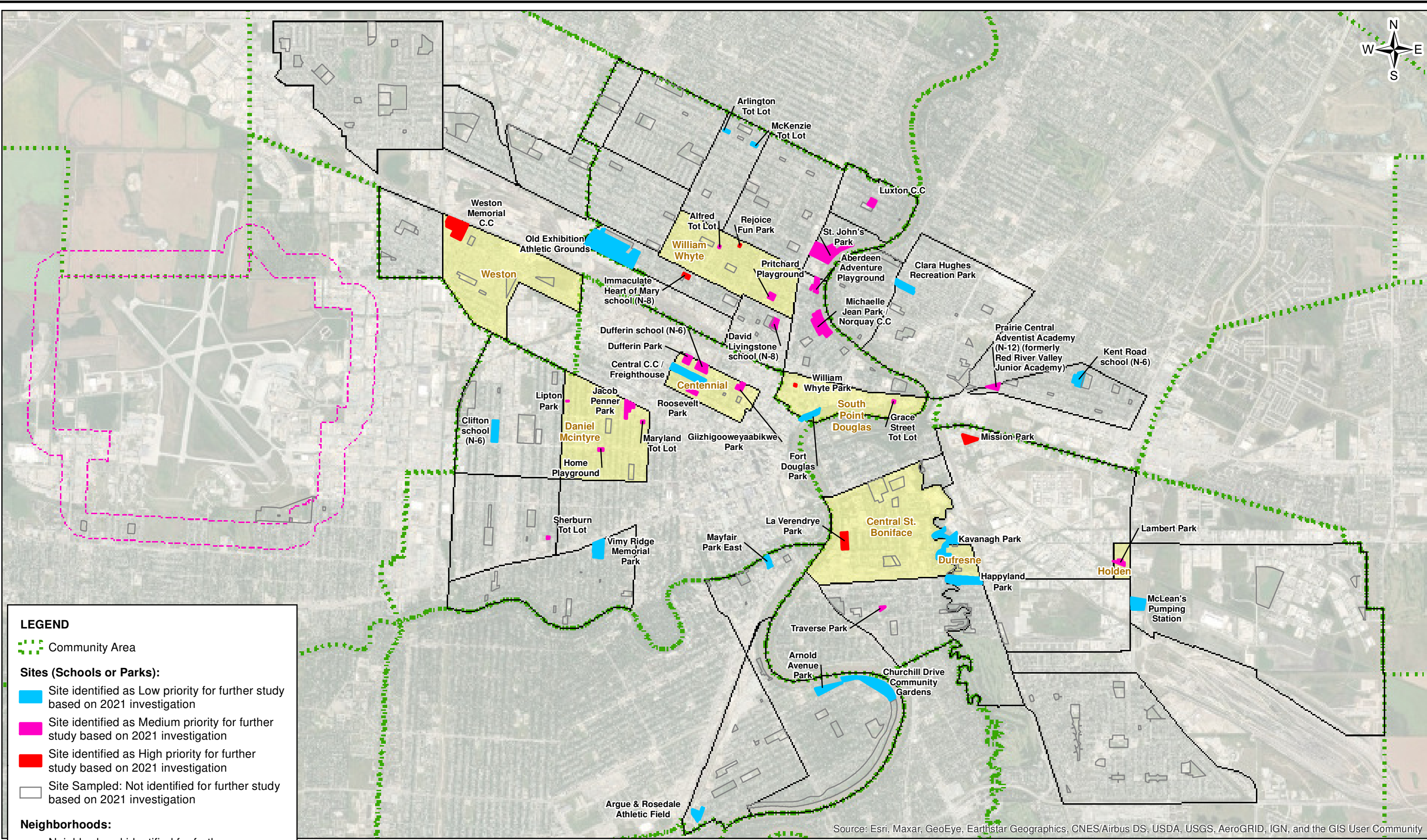
LEGEND

- Park or School Sampled
 - Park or School Not Sampled
 - Neighborhood Sampled
 - Community Area Boundary
- Lead Concentration (mg/kg)**
- <= 140 mg/kg (displays on bottom)
 - >140 to 210 mg/kg
 - >210 mg/kg (displays on top)



Notes:
 - Display priority is set so that exceedances of >210 mg/kg overly those of 140-210 mg/kg, which overly those of <= 140 mg/kg. If sample locations are close, overlying dots will obscure those underneath.

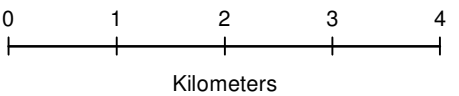
Summary of Soil Lead Analytical Results	
Inkster Community Area	
Winnipeg, MB	
Drawn By: SLD	Ref: 10-12553
Reviewed By: GSK	Date: 06-Feb-2022
PARSONS	
Drawing No.: 4.5	



LEGEND

- Community Area
- Sites (Schools or Parks):**
 - Site identified as Low priority for further study based on 2021 investigation
 - Site identified as Medium priority for further study based on 2021 investigation
 - Site identified as High priority for further study based on 2021 investigation
 - Site Sampled: Not identified for further study based on 2021 investigation
- Neighborhoods:**
 - Neighborhood identified for further consideration based on 2021 investigation
 - Neighborhood included in study (2021)
 - Airport Buffer

Notes:
 - These recommendations are based exclusively on the results of the 2021 soil investigation and have not considered any historical data that may be collected from these sites or neighborhoods.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Summary of Sites/Neighborhoods Identified for Further Consideration Based on 2021 Investigation

Winnipeg, MB

	Drawn By: SLD	Ref: 10-12553
	Reviewed By: GSK	Date: 11-Apr-2022
	Drawing No.:	
	5	

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