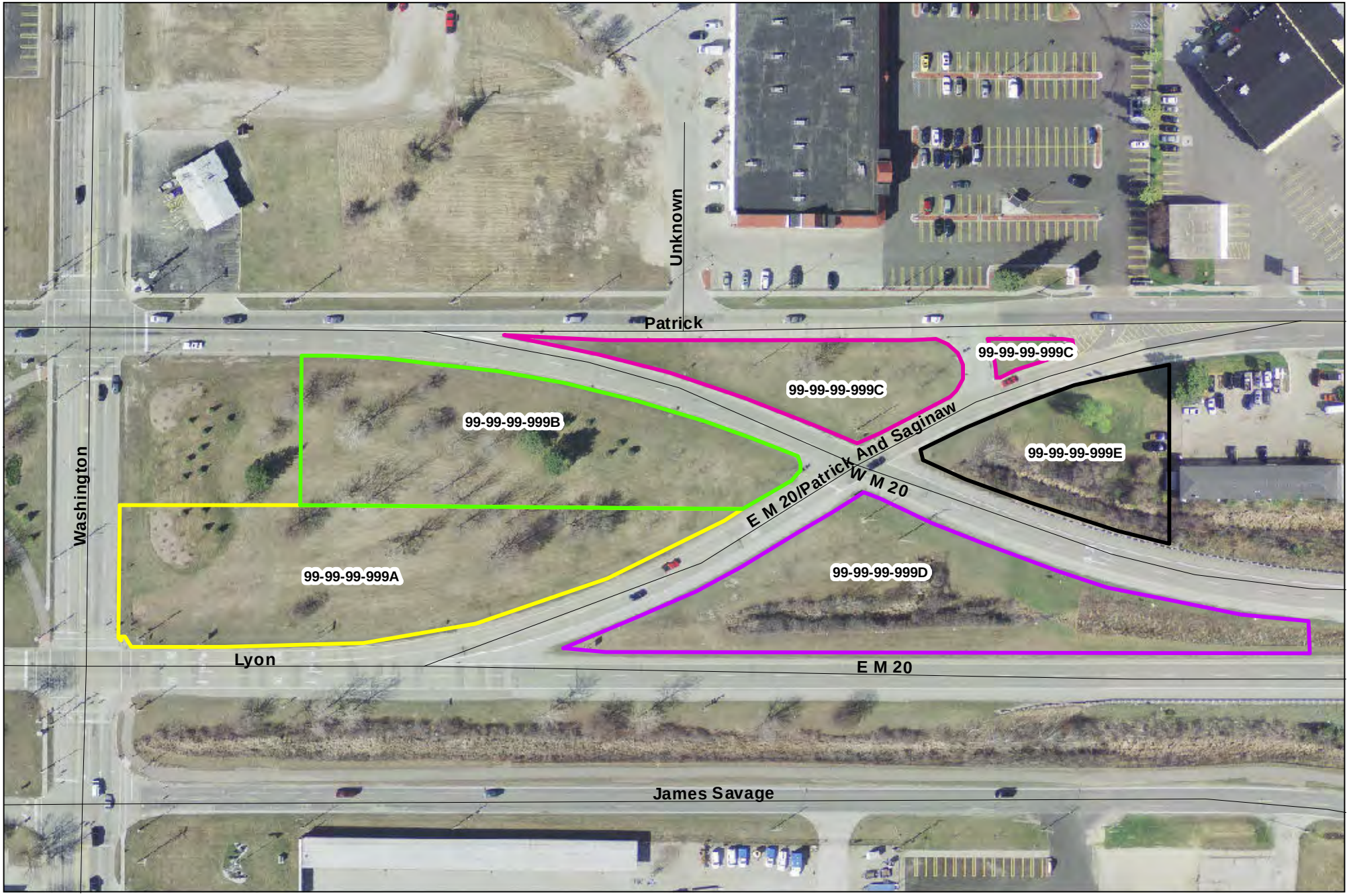
Attachment A



MIDLAND RESOLUTION

LEGEND
PIN
A
B
C
D
E
Roadways

Notes:

0 65 130 260 Feet

Parcel MDOT Right-of-Way

1012 E PATRICK RD
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increments
- Property
- Roadways

Notes:
1.30 Acres
30 Increments

0 30 60 120 Feet

Parcel A
DOT - Right of Way
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increments
- Property
- Roadways

Notes:
1.20 Acres
30 Increments

0 30 60 120 Feet

Parcel B
DOT - Right of Way
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increments
- Property
- Roadways

Notes:
0.49 Acres
20 Increments

0 30 60 120 Feet

Parcel C
DOT - Right of Way
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increments
- Property
- Roadways

Notes:
1.20 Acres
30 Increments

0 37.5 75 150 Feet

Parcel D
DOT - Right of Way
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increments
- Property
- Roadways

Notes:
0.52 Acres
20 Increments

0 20 40 80 Feet

Parcel E
DOT - Right of Way
Midland Resolution Sampling Plan

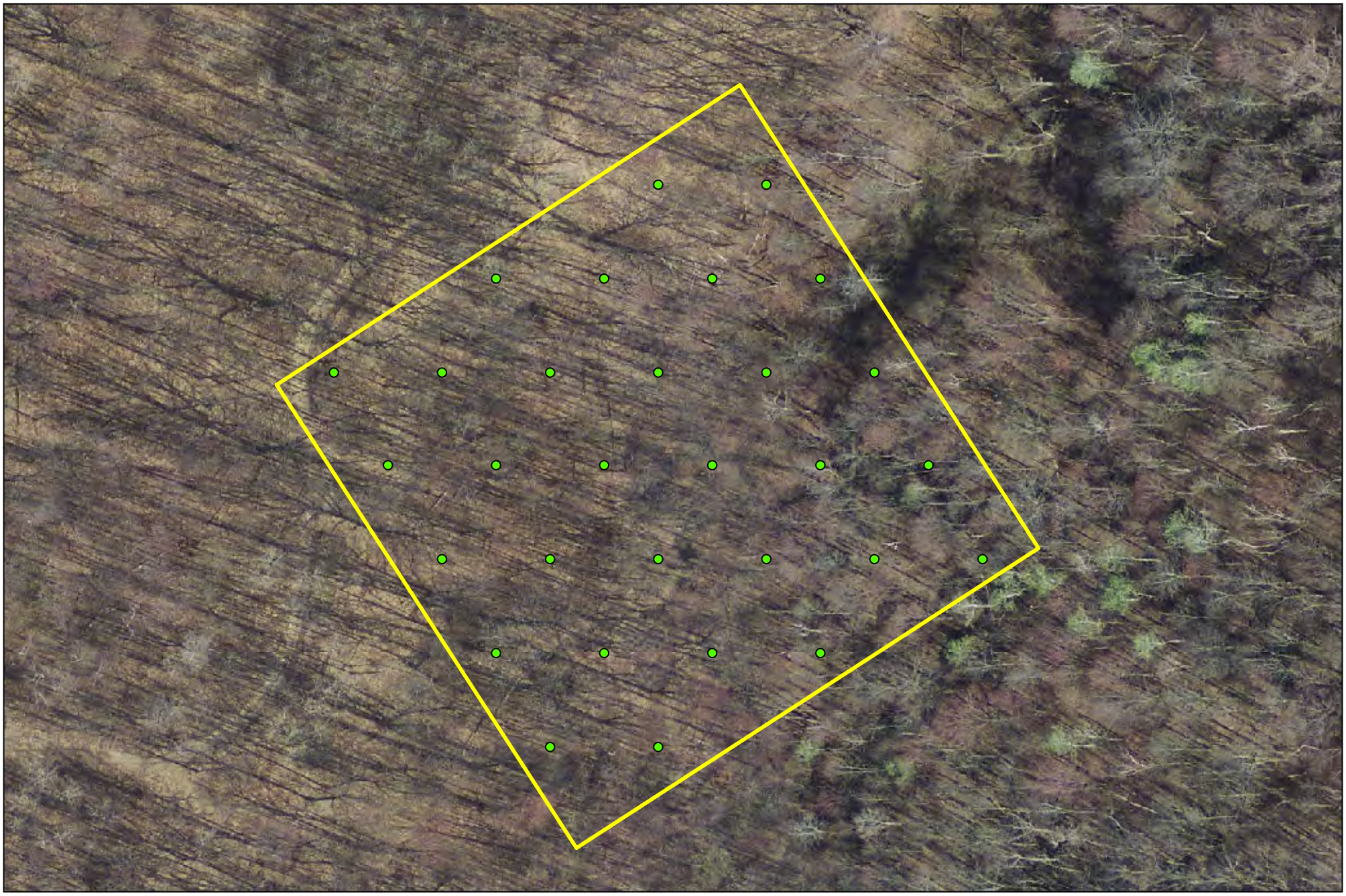
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
2.28 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-14-30-010 (I-008)
2301 WALDO AVE
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND

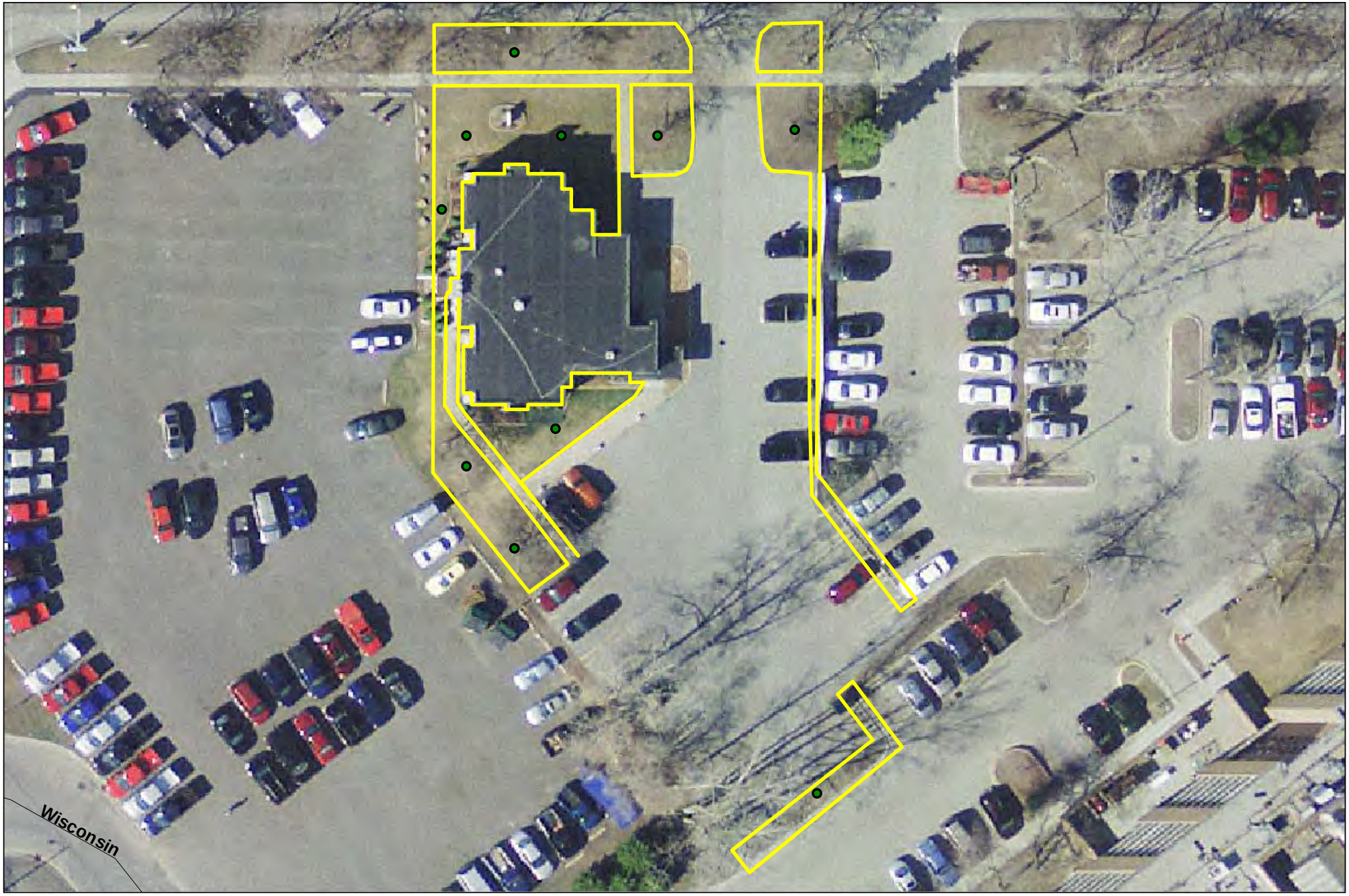
- Increment Locations
- Property
- Roadways

Notes:
2.06 Acres
30 Increments

0 35 70 140 Feet

Parcel 14-13-10-800 (I-010)
3500 E ASHMAN ST
Midland Resolution Sampling Plan

Attachment B



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.17 Acres
10 Increments

0 20 40 80 Feet

Parcel 14-15-30-498
910 EASTLAWN DR
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.10 Acres
10 Increments

0 25 50 100 Feet

Parcel 14-15-30-504
2214 WISCONSIN ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Commercial Property
- Roadways

Notes:
0.10 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-15-40-334
1607 E PATRICK RD
Midland Resolution Sampling Plan

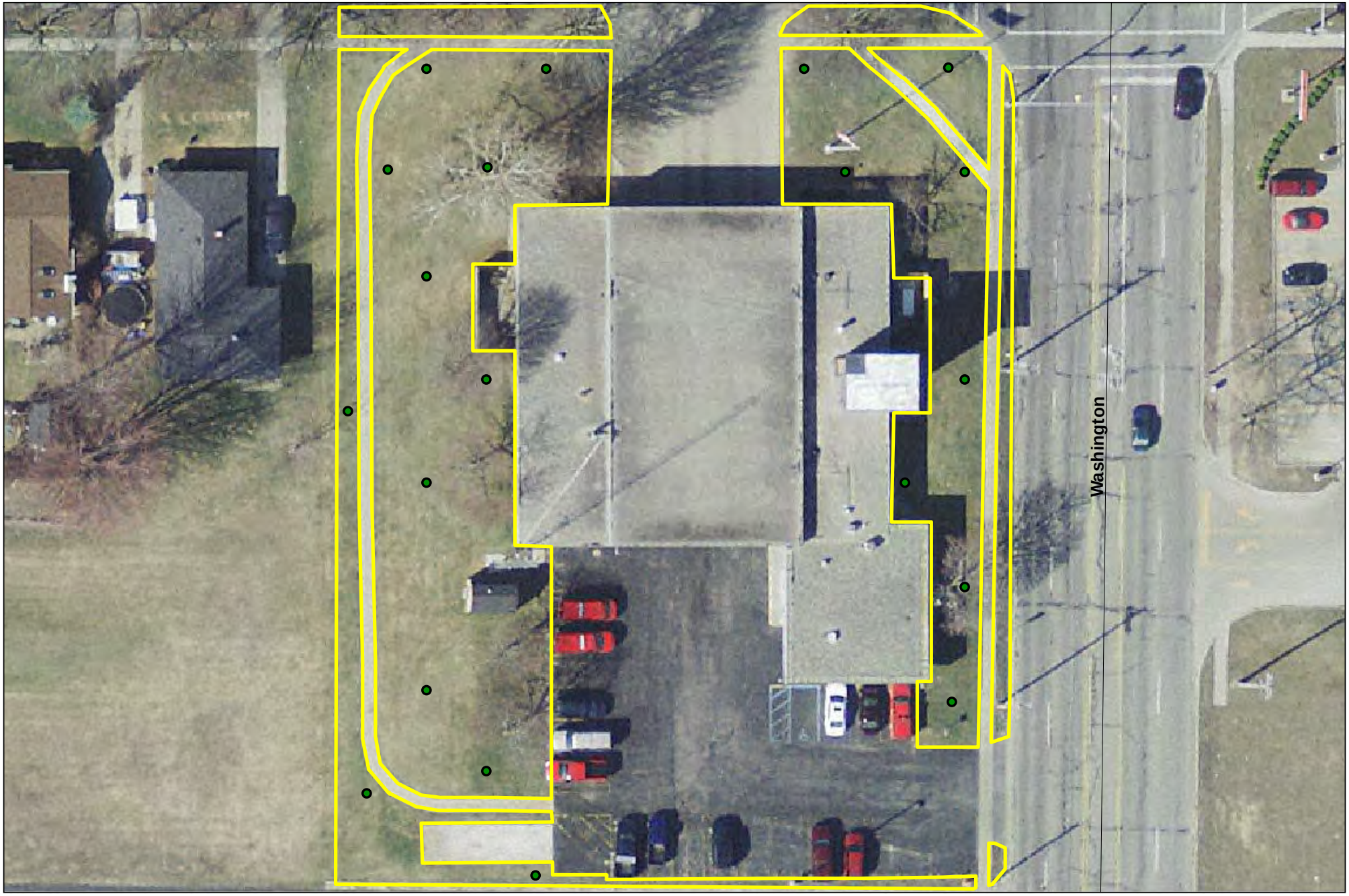
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.22 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-15-40-340
1613 E PATRICK RD
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

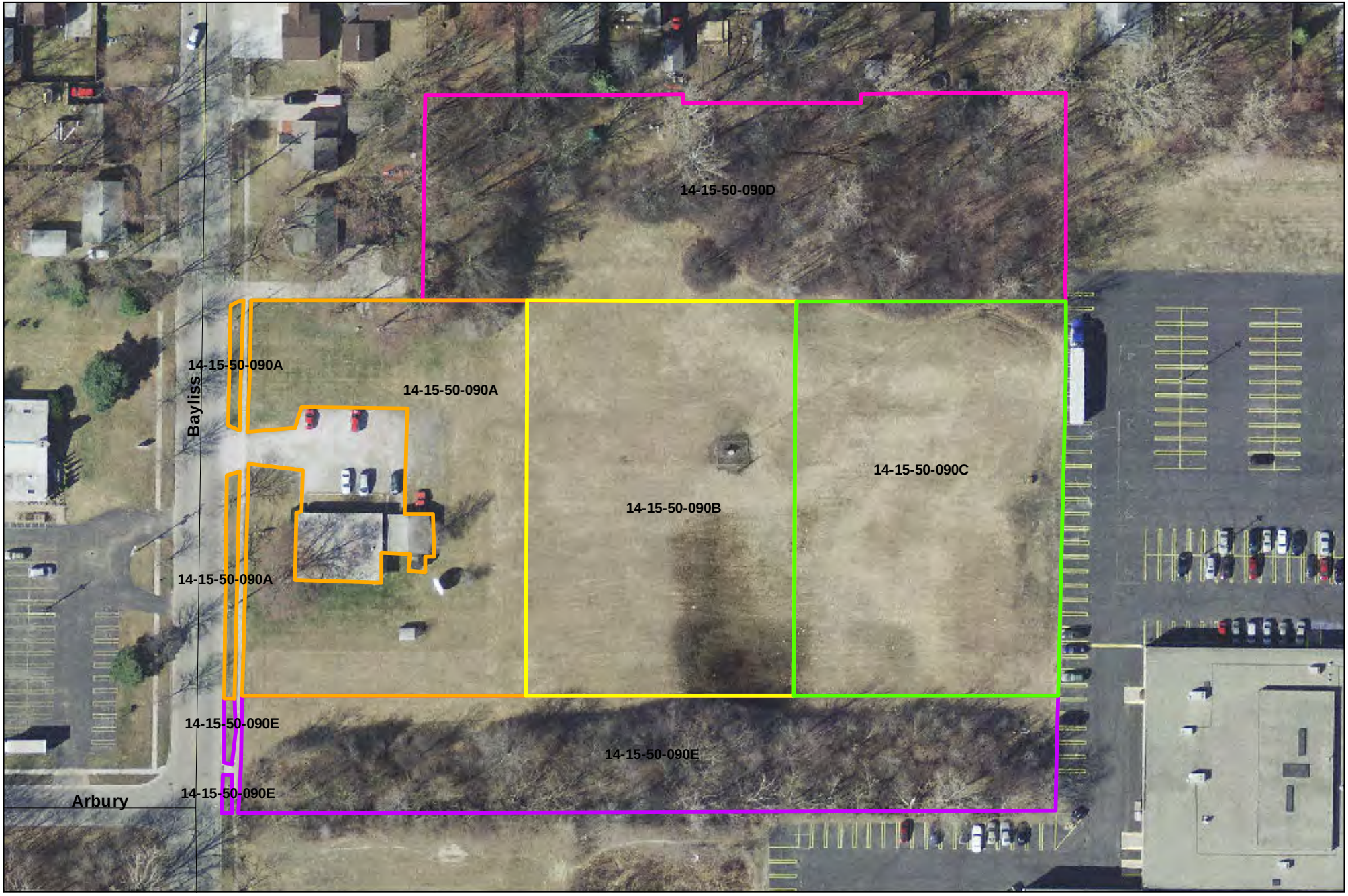
LEGEND

- Increment Locations
- Property
- Roadways

Notes:
0.55 Acres
20 Increments

0 20 40 80 Feet

Parcel 14-15-50-004
816 E HALEY ST
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
14-15-50-090A
14-15-50-090B
14-15-50-090C
14-15-50-090D
14-15-50-090E
Roadways

Notes:

0 45 90 180 Feet

Parcel 14-15-50-090
1510 BAYLISS ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
1.05 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-15-50-090A
1510 BAYLISS ST A
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
1.19 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-15-50-090B
1510 BAYLISS ST B
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
1.18 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-15-50-090C
1510 BAYLISS ST C
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.01 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-15-50-130
1302 BAYLISS ST
Midland Resolution Sampling Plan

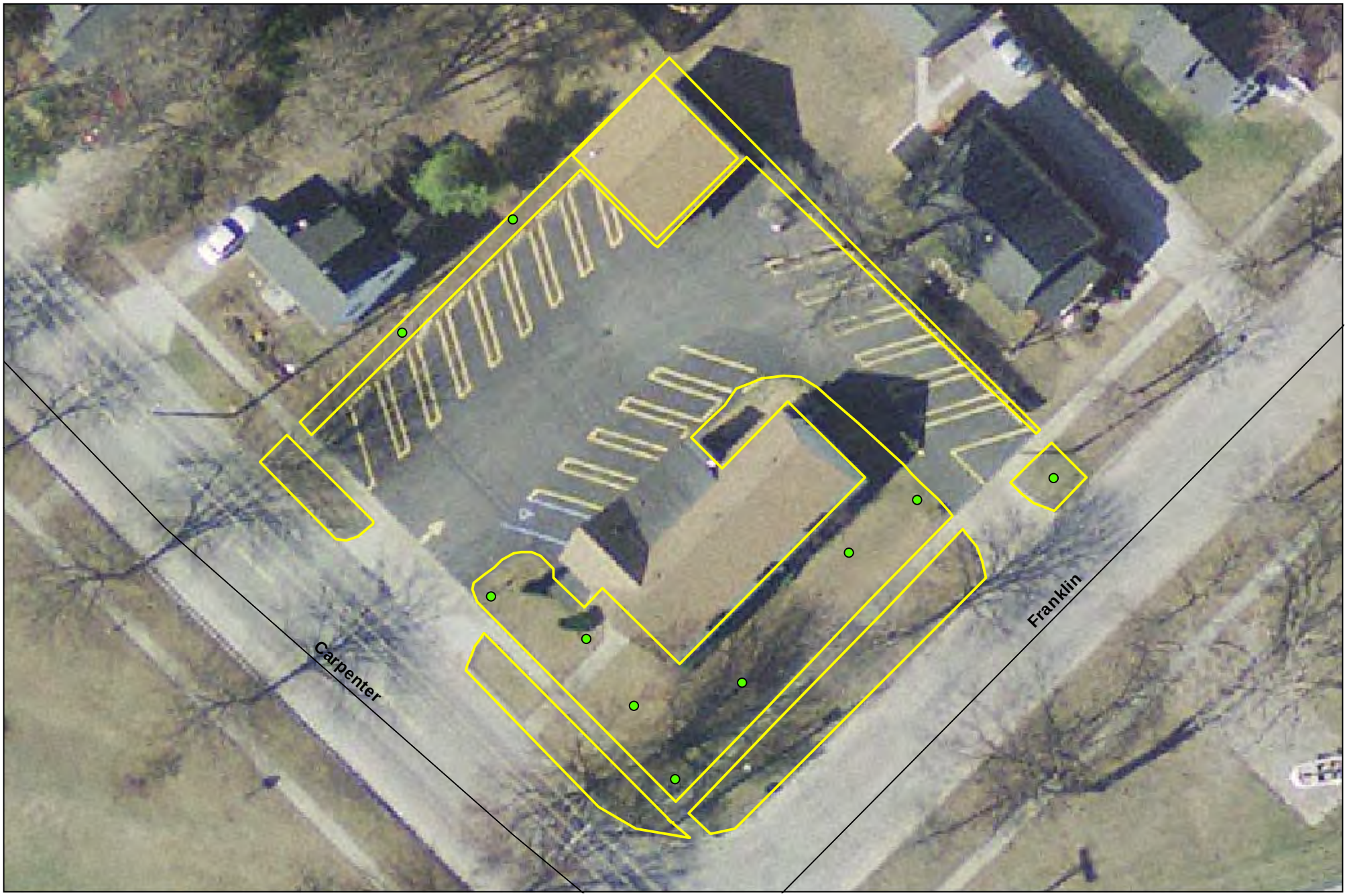
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.64 Acres
20 Increments

0 25 50 100 Feet

Parcel 14-15-60-270
502 CHERRY ST
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.14 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-104
1113 E CARPENTER ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.08 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-136
1001 E CARPENTER ST
Midland Resolution Sampling Plan

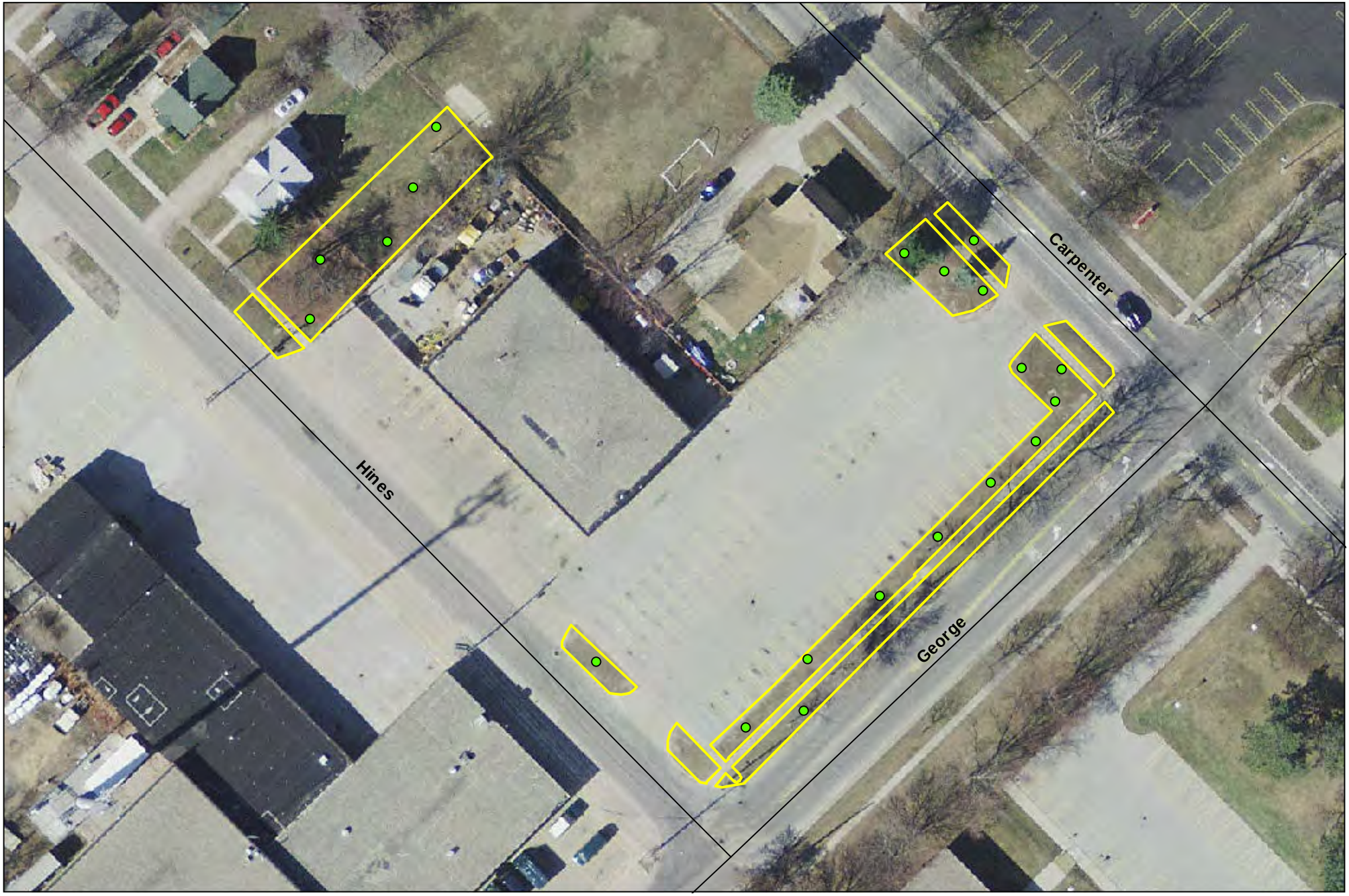
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.03 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-180
915 E CARPENTER ST
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.17 Acres
10 Increments

0 30 60 120 Feet

Parcel 14-16-40-334
411 E HINES ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.08 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-350
406 E HINES ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.11 Acres
10 Increments

0 30 60 120 Feet

Parcel 14-16-40-368 & 14-16-40-372
802 & 800 TOWNSEND ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Commercial Property
Roadways

Notes:
0.004 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-380
805 GEORGE ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.02 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-402
715 GEORGE ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.005 Acres
10 Increments

0 20 40 80 Feet

Parcel 14-16-40-478
712 GEORGE ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.02 Acres
10 Increments

0 20 40 80 Feet

Parcel 14-16-40-508
706 MILL ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Commercial Property
- Roadways

Notes:
0.22 Acres
10 Increments

0 40 80 160 Feet

Parcel 14-16-40-512 & 14-16-40-540

803 & 815 STATE ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- 14-16-40-574A
- 14-16-40-574B
- 14-16-40-574C
- Roadways

Notes:

0 50 100 200 Feet

Parcel 14-16-40-574
600 E CARPENTER
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Commercial Property
- Roadways

Notes:
0.81 Acres
20 Increments

0 25 50 100 Feet

Parcel 14-16-40-574A

600 E CARPENTER ST A
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
1.12 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-16-40-574B
600 E CARPENTER ST B
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.18 Acres
10 Increments

0 20 40 80 Feet

Parcel 14-16-40-574C
600 E CARPENTER ST C
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.09 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-670
1006 E CARPENTER ST
Midland Resolution Sampling Plan

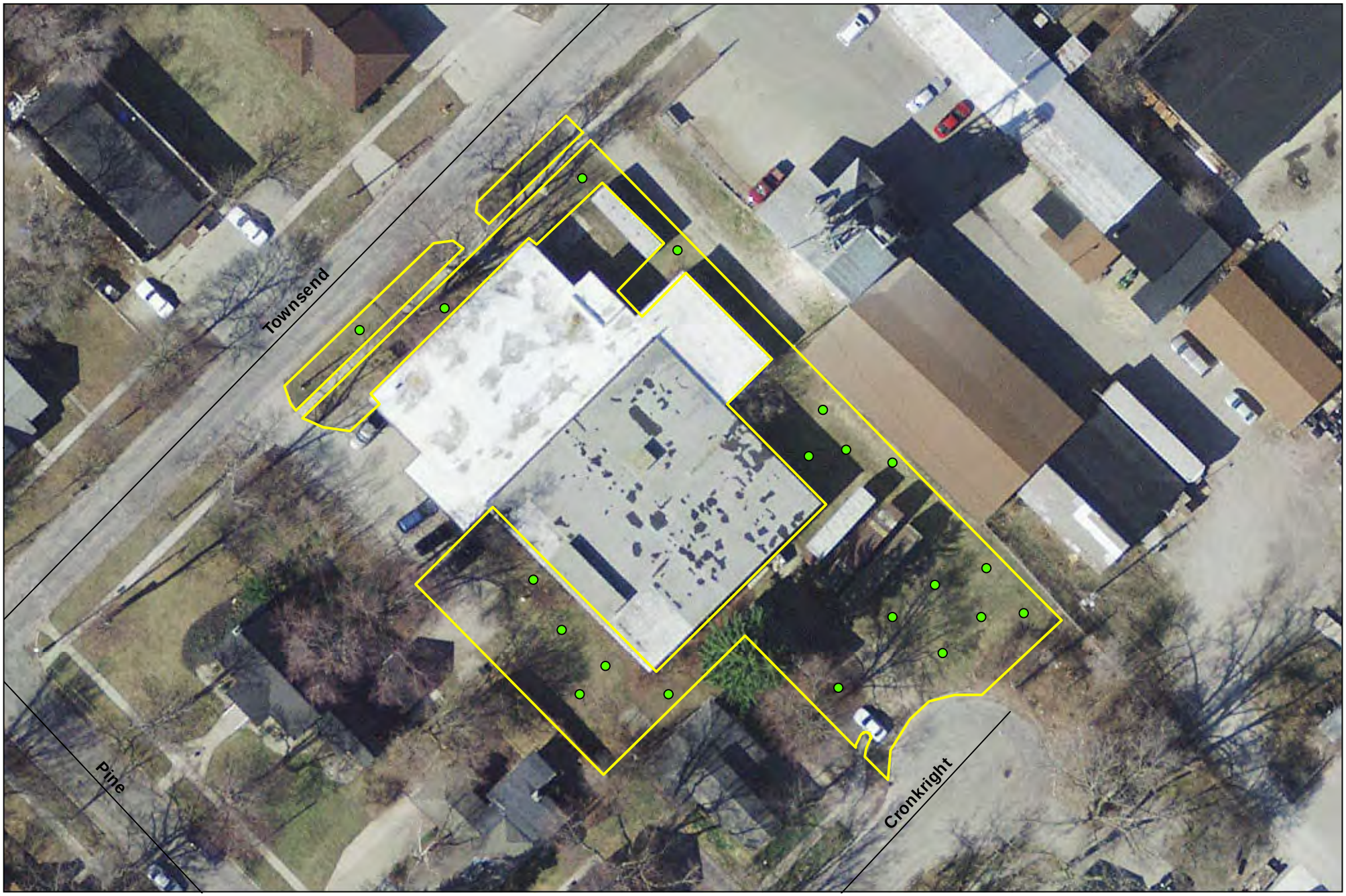
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.05 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-40-672
1016 HALEY ST
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.45 Acres
20 Increments

0 25 50 100 Feet

Parcel 14-16-50-008
712 TOWNSEND ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.10 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-068
501 GEORGE ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Commercial Property
Roadways

Notes:
0.18 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-122
502 TOWNSEND ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Commercial Property
- Roadways

Notes:
0.33 Acres
20 Increments

0 25 50 100 Feet

Parcel 14-16-50-124
414 TOWNSEND ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Commercial Property
Roadways

Notes:
0.08 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-130
409 E BUTTLES ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND

- Increment Locations
- Commercial Property
- Roadways

Notes:
0.24 Acres
10 Increments

0 20 40 80 Feet

Parcel 14-16-50-164
309 E INDIAN ST
Midland Resolution Sampling Plan

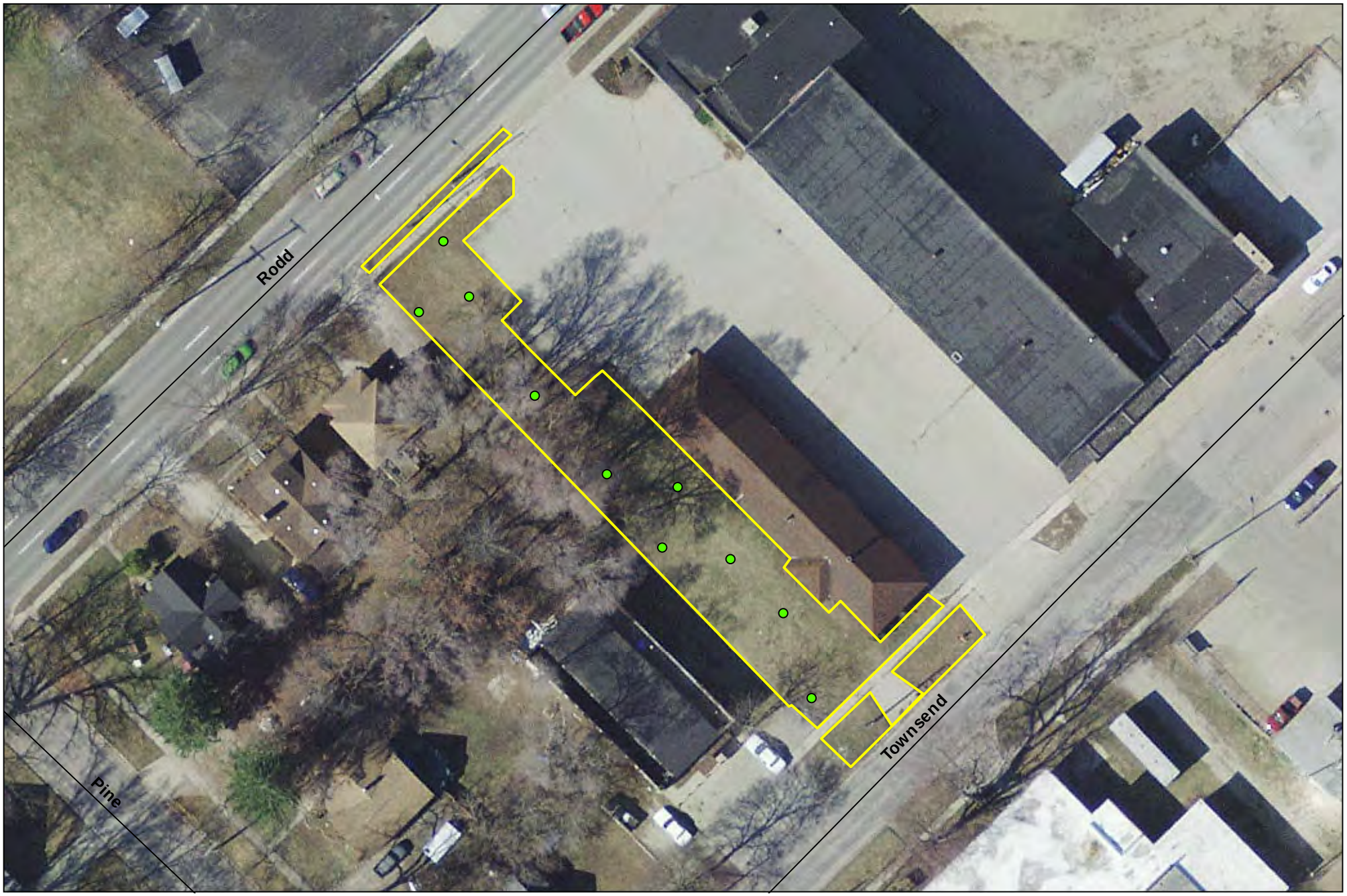
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.08 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-186
709 TOWNSEND ST
Midland Resolution Sampling Plan



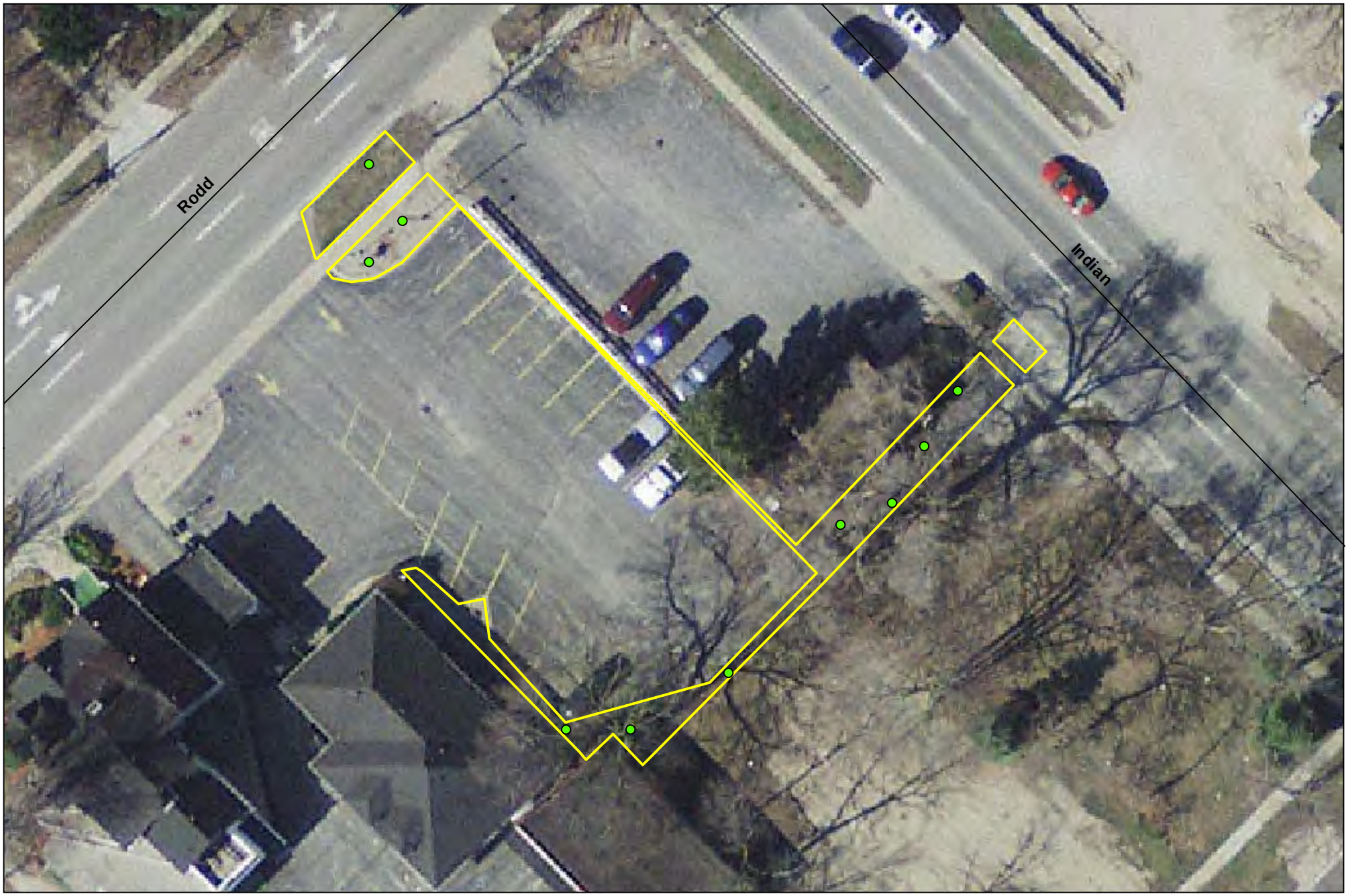
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.24 Acres
10 Increments

0 25 50 100 Feet

Parcel 14-16-50-188
715 TOWNSEND ST
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
Increment Locations
Commercial Property
Roadways

Notes:
0.05 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-232
408 RODD ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.09 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-16-50-234
302 E INDIAN ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
1.00 Acres
30 Increments

0 30 60 120 Feet

Parcel 14-16-60-030
803 TOWNSEND ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
Increment Locations
Commercial Property
Roadways

Notes:
0.11 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-398
614 HALEY ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.10 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-530
901 E INDIAN ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.10 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-558
701 HALEY ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.09 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-562
711 HALEY ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.13 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-564
715 HALEY ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.007 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-568
907 E PINE ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.08 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-608
601 MILL ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.12 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-10-612
609 MILL ST
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.04 Acres
10 Increments

0 15 30 60 Feet

Parcel 14-21-80-499
402 GEORGE ST
Midland Resolution Sampling Plan

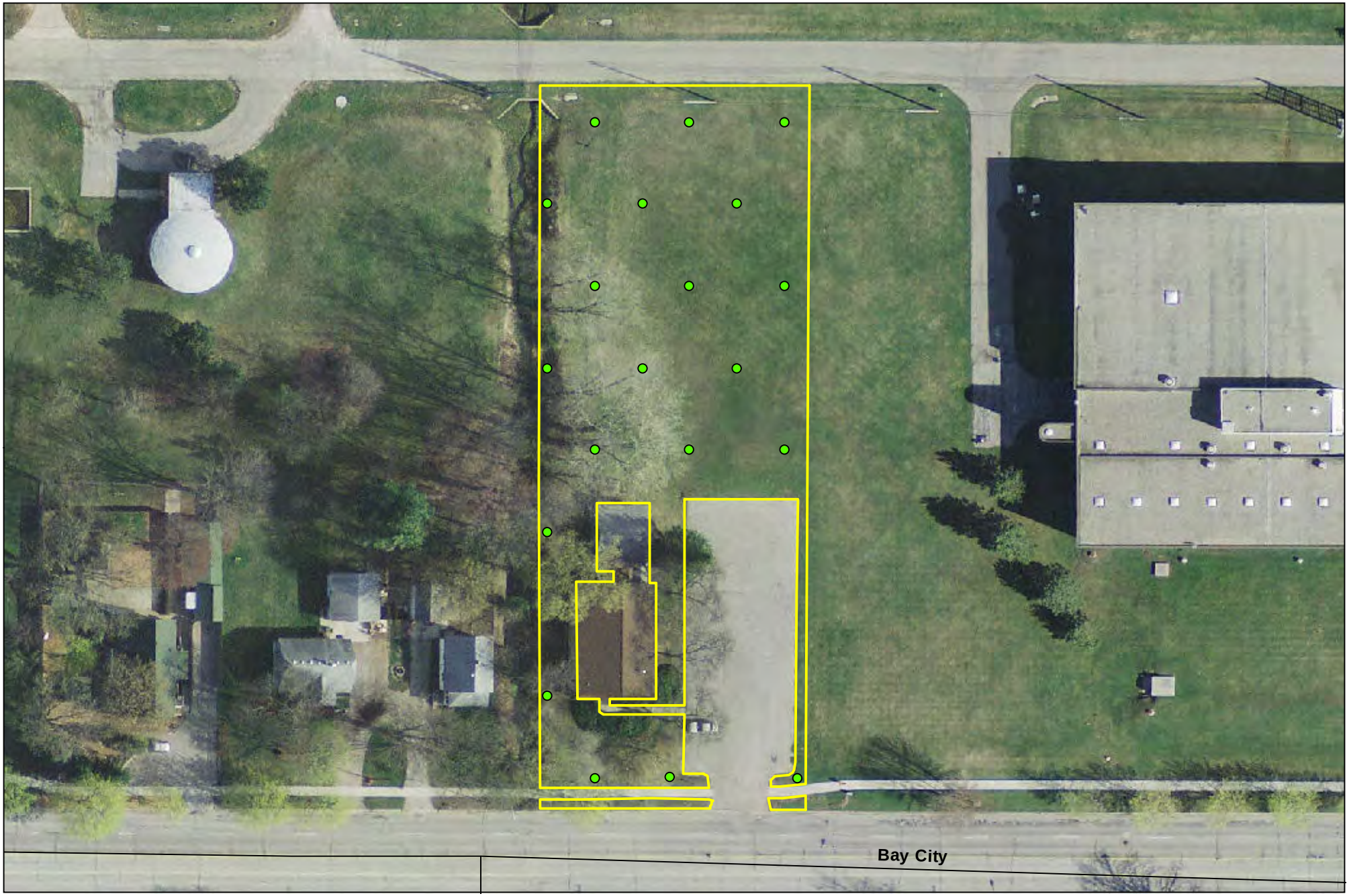
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
1.50 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-22-10-004
1612 E PATRICK RD
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.98 Acres
20 Increments

0 37.5 75 150 Feet

Parcel 14-23-20-004
2505 BAY CITY RD
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Commercial Property
- Roadways

Notes:
0.18 Acres
10 Increments

0 25 50 100 Feet

Parcel 14-23-30-018A
3216 BAY CITY RD A
Midland Resolution Sampling Plan

MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.41 Acres
20 Increments

0 15 30 60 Feet

Parcel 14-23-60-160
309 KENT CT
Midland Resolution Sampling Plan

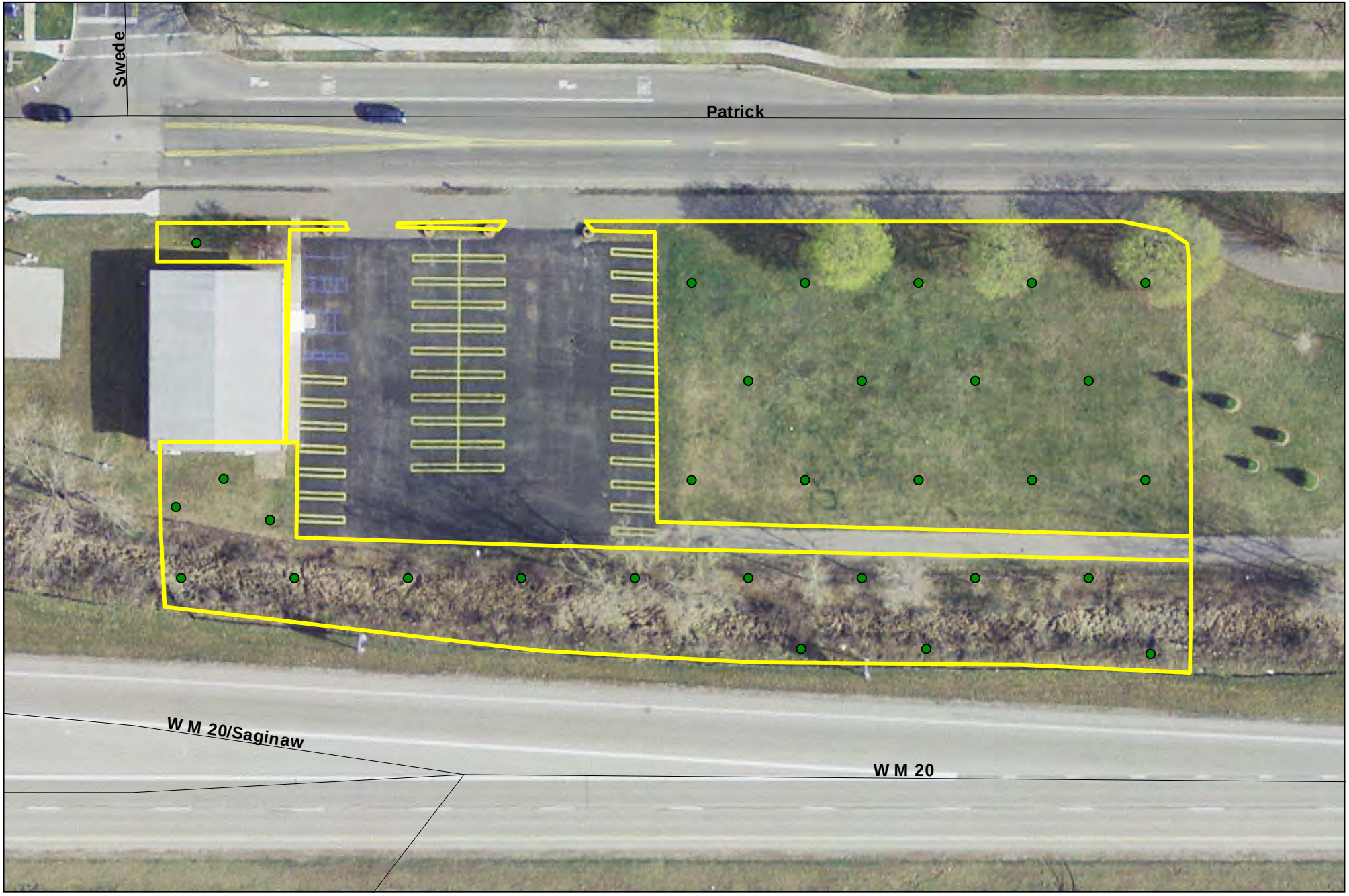
MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
0.40 Acres
20 Increments

0 15 30 60 Feet

Parcel 14-23-60-180
401 KENT CT
Midland Resolution Sampling Plan



MIDLAND RESOLUTION

LEGEND
- Increment Locations
- Property
- Roadways

Notes:
1.10 Acres
30 Increments

0 25 50 100 Feet

Parcel 14-23-80-090
1700 E PATRICK RD
Midland Resolution Sampling Plan

Attachment C

1.0 Overview of Adaptive Management

The May 25, 2012 Interim Response Activity Plan Designed to Meet Criteria Work Plan (Work Plan) allows for project specific implementation details to be modified, based on field experience and data evaluation through an adaptive management process. In support of this process, an adaptive management evaluation of 2012 data was previously provided in the approved 2013 Work Plan and Adaptive Management Report. This has been continued by conducting a thorough evaluation of the cumulative data generated through 2013, as described in the following sections.

The following aspects of the response activity work were evaluated:

- Analytical Methods (Section 7.4.3.3 of the Work Plan);
- Decision Rules for Residential Land Use (Section 7.4.4 of the Work Plan);
- Determine relationship between building age and toxic equivalent (TEQ); and
- Analysis of Relative Standard Deviation (RSD) by Phase.

2.0 Analytical Methods

During 2012 and 2013 sampling, three independent replicates were collected from each DU; a primary, duplicate, and triplicate. The primary sample was tested by the Midland 8280 MAS (Fast Analysis) method (which is considered to be an estimate of the EPA Method 1613b concentration). The statistical correlation between the dioxin TEQ concentrations using the Midland 8280 MAS (Fast Analysis) method versus the laboratory EPA Method 1613b was reevaluated using the Years 1 and 2 data. There were 154 properties in this data set for which sample concentrations were available from both the Fast and laboratory analyses. Both results were obtained using extracts of the same multi-incremental sample (MIS) designated as the "primary" sample. Consequently, these paired results were directly comparable to each other and could be used to evaluate the statistical correlation between them.

Of the 154 properties, results for one property (515 E. Buttles) were excluded. At this property, soil fill was imported from a source suspected to be contaminated. Results from both the Fast and laboratory analyses showed very high concentrations (>2,200 ng/kg). After excluding this

one property, the data set provided 153 pairs of Fast Analysis and laboratory concentrations, which are shown in Table C-1.

The difference, Δ (Fast Analysis concentration – laboratory concentration) was calculated for each pair of data. Figure C-1 shows a plot of Δ versus the laboratory concentrations. The plot shows a decreasing trend indicating that the Fast Analysis bias relative to the laboratory value is smaller for higher laboratory values. All except three Δ values in Figure C-1 are positive and the average of all Δ values is about 33 ng/kg. This average upward bias of the Fast Analysis is comparable to the value of 40 ng/kg found in the previous evaluation using only the Year 1 data.

Figure C-2 shows a plot of the laboratory concentrations (on the x-axis) versus the Fast Analysis concentrations (on the y-axis) and the regression line that was fitted to the data. For purposes of comparison, the 45-degree line between the two sets of values that would pass through the origin (i.e., with a zero intercept) is also shown. If the Fast Analysis were to provide unbiased estimates of the laboratory concentrations, the data points would plot randomly on either side of the 45-degree line. All except three data points plot above the 45-degree line, which confirms the previous finding that the Fast Analysis over-estimates the laboratory concentrations. The regression line is observed to be sloping towards the 45-degree line, which confirms that the bias (i.e., the difference between the regression line and the 45-degree line) is smaller at higher laboratory concentrations.

3.0 Decision Rules for Residential Land Use

The established 2013 confidence interval approved in the approved 2013 WP-AMR (URS, 2013) was defined as < 280 ppt TEQ and > 220 ppt TEQ based on extensive pilot study data set. The approved confidence interval and the corresponding decision rules were utilized during the completion of 2013 implementation activities. Based on the cumulative results of 2012 through 2013 samples collected from yards within the Midland Resolution Area, this confidence interval was evaluated to determine whether or not an adjustment to the zone was warranted.

The uncertainty zone for the dioxin TEQ concentration was defined such that if the sample Fast Analysis concentration for a given property were to exceed the upper bound of this zone, the property would be considered to be contaminated and subsequently remediated. If the concentration were to be below the lower bound of the uncertainty zone, the property would be considered to be clean and no further action would be undertaken. If the concentration were to fall within the bounds of the uncertainty zone, the triplicate MIS samples collected for the property would be analyzed in the laboratory. The resulting concentrations would then be used to calculate the 95% upper confidence limit (UCL) of the mean concentration, which would be compared to the action level of 250 ng/kg.

The bounds of the uncertainty zone were previously calculated using only Year 1 data. These bounds were reassessed using the combined Years 1 and 2 data. The derivation of the bounds required the following steps:

1. Develop a statistical relationship to estimate Fast Analysis TEQ concentration as a function of laboratory TEQ concentration.

2. Estimate the relative standard deviation (RSD) of triplicate laboratory TEQ concentrations.

3. Calculate the standard deviation of the Fast Analysis TEQ concentrations if the mean laboratory TEQ concentration were at the action level of 250 ng/kg.

4. Calculate the lower and upper bounds around the estimated Fast Analysis concentration if the mean laboratory TEQ concentration were at the action level of 250 ng/kg.

   The implementation of these steps is described below.

1. Develop a statistical relationship to estimate Fast Analysis TEQ concentration as a function of laboratory TEQ concentration.

   The correlation between Fast Analysis and laboratory TEQ concentrations was shown previously in Figure C-2. The following regression equation was derived to estimate Fast Analysis concentration as a function of laboratory concentration:

   Fast Analysis concentration (ng/kg) = $b_0 + b_1 \times$ Laboratory concentration (ng/kg)
   $= 78.1 + 0.788 \times$ Laboratory concentration (ng/kg) (1)

   Number of data points for regression = $n = 153$

   Root mean square error (RMSE) of the regression equation = 15.2 ng/kg (2)

2. Estimate the relative standard deviation (RSD) of triplicate laboratory TEQ concentrations.

   Triplicate laboratory TEQ concentrations were available for the 153 properties shown previously in Table C-1. For one of these properties (604 E. Haley St.), one of the replicate values was anomalously high (110%). The Fast Analysis value was 224 ng/kg, the primary sample laboratory value was 200 ng/kg, the Replicate #1 laboratory value was 1,180 ng/kg, and the Replicate #2 laboratory value was 177 ng/kg. The Replicate #1 value of 1,180 ng/kg could not be reproduced with additional extracts from the same soil sample, and hence, it appeared to be due to a laboratory analytical error. The data for this property was excluded from the estimation of RSD of triplicate laboratory values. Table C-2 shows the laboratory concentrations of the triplicate samples in each of the remaining 152 properties, the property acreage available for sampling, the number of increments, and the basic statistics of the triplicate concentrations (mean, standard deviation, and RSD). This data set was used to estimate the sampling variability of laboratory concentrations.

   The number of increments used to form the MIS may influence the RSD. This number was different, depending on the area (acreage) of each property available for sampling. The

properties were divided into three groups based on the area. These groups and the number of increments used to form the MIS in each group were as follows:

Group 1: Area less than or equal to 0.25 acres; 10 increments
Group 2: Area between 0.25 and 1 acre; 20 increments
Group 3: Area greater than 1 acre; 30 increments

Of the 152 properties listed in Table C-2, 140 were in Group 1, 10 were in Group 2, and 2 were in Group 3. The sampling variability of the triplicate sample values was analyzed separately for each group. Plots of RSD against the mean laboratory concentration did not show any significant trend; therefore, the average value in each group was used as the best estimate of RSD in each group. Table C-3 summarizes the results in terms of the range and the average of the RSD values in each group.

3. Calculate the standard deviation of the Fast Analysis TEQ concentrations if the mean laboratory TEQ concentration were at the action level of 250 ng/kg.

The variance of the Fast Analysis TEQ concentrations can be calculated from the following equation:

Variance of Fast Analysis concentrations
$= s^2$
$= b_1^2 \times$ variance of laboratory concentrations + MSE of regression equation $\times (1 + 1/n)$
$= b_1^2 \times (\text{RSD of laboratory concentrations} \times \text{mean of laboratory concentrations})^2 + \text{MSE} \times (1 + 1/n)$ (3)

Table C-4 shows the calculated variance of the Fast Analysis concentrations from Equation (3), and the corresponding standard deviation, for each of the three groups of properties defined previously.

4. Calculate the lower and upper bounds around the estimated Fast Analysis concentration if the mean laboratory TEQ concentration were at the action level of 250 ng/kg.

   The bounds on the uncertainty zone were derived based on the hypothesis testing procedure. In deriving the upper bound, one should have high confidence that, when the true mean concentration is below the action level of 250 ng/kg, the sample concentration would not exceed the upper bound. Therefore, the null and alternative hypotheses for deriving the upper bound were defined as follows:

   H_0: True mean concentration ≤ 250 ng/kg (i.e., property is "clean")

   H_A: True mean concentration > 250 ng/kg (i.e., property is "contaminated")

   If the true mean concentration were 250 ng/kg, the laboratory mean concentration could also be assumed to be 250 ng/kg. An estimate of the Fast Analysis mean concentration, calculated from Equation (1), is 275 ng/kg. The individual Fast Analysis concentrations would be spread around this mean with an estimated standard deviation shown previously in Table C-4.

   The null hypothesis would be rejected if the Fast Analysis concentration were to exceed the upper bound of the distribution of Fast Analysis concentrations corresponding to (1-α) confidence. Assuming normal distribution for concentrations, this upper bound is given by

   $$\text{Mean} + t_{(n\text{-}1,\ 1\text{-}\alpha)} \times s \qquad (4)$$

   in which,

   s = standard deviation of the Fast Analysis concentrations shown in Table C-4

   $t_{(n\text{-}1,\ 1\text{-}\alpha)}$ = Student's t value for (n-1) degrees of freedom and (1-α) confidenceIn deriving the lower bound of the uncertainty zone, one should have high confidence that, when the true concentration exceeds the action level of 250 ng/kg, the sample concentration would not be below the lower bound. Therefore, the null and alternative hypotheses are now reversed and the lower bound is calculated from:

   $$\text{Mean} - t_{(n\text{-}1,\ 1\text{-}\alpha)} \times s \qquad (5)$$

The upper and lower limits were calculated from Equations (4) and (5), respectively, for α = 5%. These limits define the bounds on the uncertainty zone for Fast Analysis concentration of the primary sample for each property in a given group. Table C-5 shows these bounds for each of the three property groups. The bounds for the three property groups are similar and may be rounded to a single set of numbers that apply to all three property groups. These rounded lower and upper bounds are 240 ng/kg and 300 ng/kg, respectively.

The lower uncertainty zone bounds shown in Table C-5 for all three groups are higher than 220 ng/kg, which was the lower bound calculated in the previous Year 1 analysis. The present analysis confirms that this lower bound of 220 ng/kg is conservative (i.e., more properties might be remediated). That is, if the Fast Analysis concentration for a property is lower than 220 ng/kg, one can be at least 95% confident that the true mean concentration would not exceed the specified action level of 250 ng/kg.

Similarly, the upper uncertainty zone bounds for all three groups are higher than 280 ng/kg, which was the upper bound calculated in the previous Year 1 analysis. This confirms that the previous upper bound of 280 ng/kg is also conservative in that the threshold for concluding that a property is contaminated is lower than the 95% confidence upper bounds shown in Table C-5 and hence more properties may be remediated.

The RSD values for Group 1 properties (area less than or equal to 0.25 acres, 10 increments) show large variability with a range of 0.3% to 35%. Higher RSD values decrease the lower bound of the uncertainty zone. Values at the upper end of this range could result in a lower bound that is below 220 ng/kg. For any future sampling, it may be desirable to increase the number of increments from10 to, say, 20 for this group of properties in order to reduce the upper range of RSD values.

4.0 Property Development Age vs Dioxin TEQ Concentration

The statistical correlation between dioxin TEQ concentration from aerial deposition and building age in the year 2013 was analyzed to evaluate whether older buildings might show a different pattern of concentrations. For the analysis of this correlation, we used the 6" Fast Analysis concentrations for individual properties. The data set consisted of 1,121 properties that contained a residential building and for which an estimate of the building age was available.

A scatterplot of Fast Analysis concentration versus building age showed that the variance of data points around the linear regression line increased with building age. This indicated that a logarithmic transformation of the Fast Analysis concentration values would help in stabilizing the variance around the regression line. Figure C-3 shows a scatterplot of ln(concentration) versus building age. The ln(concentration) values show an increasing trend with building age. A closer examination of this plot reveals that, an increasing trend is present up to an age of about 66 years; however, beyond that age, the cloud of the data points appears to flatten out and does not show an increasing trend.

To examine these patterns further, we divided the range of building ages into two discrete groups, as follows: (1) age less than or equal to 66 years (i.e., buildings built in or after 1947) and (2) age greater than 66 years (i.e., buildings built prior to 1947). An analysis of variance (ANOVA) was performed to evaluate the variations in concentration across the two age groups. The ANOVA results are presented in Figure C-4 for both parametric (Welch test) and nonparametric (Wilcoxon Rank Sum test) analyses. Results of both tests show that the mean ln(concentration) for the age group of less than or equal to 66 years is significantly lower than that for the age group of greater than 66 years.

To further examine the influence of age on concentration within each of the two statistically significant age groups, a separate regression analysis was performed for each group.

Figure C-5 shows a scatterplot of ln(concentration) versus building age for the first group (age less than or equal to 66) and the fitted linear regression line. The slope of the regression line is

significantly different than 0 ($p < 0.0001$), indicating a statistically significant relationship between ln(concentration) and age for this age group. The following regression equation may be used to estimate the mean ln(6" Fast Analysis concentration) as a function of age when age is less than or equal to 66 years:

Mean ln(concentration) = 3.87 + 0.0176 × Age (years)
Root Mean Square Error (RMSE) = 0.478

Figure C-6 shows a scatterplot of data points for the second age group (age greater than 66 years). The data points appear to scatter randomly around a line that is almost horizontal, indicating that age has little influence on c oncentration for this age group. The correlation between concentration and age is practically zero and the slope of the regression line is statistically not significantly different from 0 ($p = 0.22$). Therefore, for this age group, ln(concentration) may be considered to be randomly distributed irrespective of building age. The mean and standard deviation of ln(concentration) for this group are 5.2 and 0.4, respectively. This translates into a median concentration of 181 ng/kg with a one standard deviation band of 122 ng/kg to 270 ng/kg. In contrast, the estimated median concentration for a 20-year old building would be 68 ng/kg with a one-standard deviation band of 42 ng/kg to 110 ng/kg.

5.0 Analysis of Relative Standard Deviation (RSD) by Phase

To further examine the variability and potential trends in RSD values, a statistical analysis of RSD values by phase was performed. Five phases were defined for this analysis:

- 2012 – Original plus Supplemental Properties
- 2013 – Phase 1 (Early kickoff)
- 2013 – Phase 2 (Spring)
- 2013 – Phase 3 (Fall)
- 2014 – Phase 1 (Final)

Figure C-7 shows plots of mean and mean plus one standard deviation of RSD values by phase. The plots show an increasing trend with each successive phase with a steep increase in 2014.

To evaluate the statistical significance of the RSD variability by phase, ANOVA was performed. Because some of the RSD data sets were not normally distributed, a nonparametric ANOVA test (Kruskal-Wallis test) was applied. The ANOVA results, presented in Figure C-8, show that the RSD differences among the phases are statistically significant ($p = 0.0015$). The median RSD of 9.2% for 2014-Phase 1 is significantly higher than 3.2% for 2012 ($p = 0.0122$) and 3.6% for 2013-Phase 1 ($p = 0.0046$), and to a lesser extent, higher than 4.6% for 2013-Phase 2 ($p = 0.0826$). No other RSD differences are statistically significant. The median RSD of 6.3% for 2013-Phase 3 falls in between those for the 2013-Phase 2 and 2014-Phase 1.

These ANOVA results confirm the findings of the trend plots in Figure C-7; namely, RSD values have generally increased over the five successive phases, and the 2014 values are significantly higher than those for the 2012 phase and first two 2013 phases. Most of the higher RSD values in 2014 phase are from Group 1 properties (area less than or equal to 0.25 acres, 10 increments).

6.0 References

URS (2012). *Interim Response Activity Plan Designed to Meet Criteria Work Plan.* The Dow Chemical Company, Midland, Michigan.

URS, 2013. 2013 Work Plan and Adaptive Management Report. February 2013. Revised May 2, 2013.

Table C-1
Laboratory versus Fast Analysis Dioxin TEQ Concentrations

Parcel Address	Fast Analysis Dioxin TEQ Concentration (ng/kg)	Laboratory (Primary Sample) Dioxin TEQ Concentration (ng/kg)
1010 E Grove St	260	221
301 Kent Ct	224	174
311 Walter Ct	277	239
319 Walter Ct	270	214
325 Walter Ct	268	234
329 Walter Ct	223	184
510 Mill St	232	209
516 George St	228	179
516 Mill St	279	232
602 Haley St	230	190
609 Fournie St	252	212
613 Haley St	242	195
808 E Grove St	223	184
914 E Grove St	275	232
915 E Indian St	250	208
1002 Haley St	267	215
1006 Mill St	234	192
1007 Haley St	237	195
711 Fournie St	259	216
806 Haley St	252	213
810 Mill St	271	213
811 Fournie St	277	242
811 Haley St	272	216
812 Mill St	279	234
813 Fournie St	267	229
819 Haley St	244	199
906 E Carpenter St	221	168
916 E Carpenter St	265	240
212 Arbury Pl	236	192
224 Arbury Pl	236	201
2021 Bay City Rd	277	239
2316 Bay City Rd	247	197
1316 Bayliss St	230	198
812 E Carpenter St	229	177
905 E Carpenter St	222	166
911 E Carpenter St	249	213
611 E Grove St	228	206
615 E Grove St	222	182
610 E Pine St	259	206
611 E Pine St	254	203
616 E Pine St	238	195
702 E Pine St	222	187
706 E Pine St	277	228
716 E Pine St	237	193
1115 Fournie St	227	183
1116 Fournie St	265	227

Table C-1
Laboratory versus Fast Analysis Dioxin TEQ Concentrations

Parcel Address	Fast Analysis Dioxin TEQ Concentration (ng/kg)	Laboratory (Primary Sample) Dioxin TEQ Concentration (ng/kg)
1307 Fournie St	223	190
1311 Fournie St	277	234
1315 Fournie St	228	221
1316 Fournie St	267	225
1309 Franklin St	222	185
1112 Haley St	239	175
1302 Haley St	269	205
1314 Jefferson Ave	260	215
1315 Jefferson Ave	243	193
1317 Jefferson Ave	250	193
1402 Jefferson Ave	269	207
1410 Jefferson Ave	242	212
1401 Lincoln St	230	191
1406 Lincoln St	222	169
1408 Lincoln St	245	201
1411 Lincoln St	252	200
1414 Lincoln St	254	192
1001 Mill St	279	238
1005 Mill St	269	210
1112 Mill St	256	197
1116 Mill St	217	189
1120 Mill St	234	206
1302 Mill St	268	215
1303 Mill St	227	177
1316 Mill St	271	225
811 Mill St	234	187
813 Mill St	196	199
1301 Patrick Rd	259	214
1008 State St	270	208
1110 State St	264	214
1302 State St	247	201
1306 State St	266	213
1310 State St	236	197
602 State St	224	184
802 State St	273	222
820 State St	237	193
426 Walter Ct	231	187
1408 Iowa St	227	196
1513 Swede Ave	259	237
1605 Swede Ave	225	217
1609 Swede Ave	232	211
1506 E Haley St	267	243
1418 E Haley St	261	240
1412 E Haley St	276	249
1402 E Haley St	255	216
1605 Iowa St	231	210

Table C-1
Laboratory versus Fast Analysis Dioxin TEQ Concentrations

Parcel Address	Fast Analysis Dioxin TEQ Concentration (ng/kg)	Laboratory (Primary Sample) Dioxin TEQ Concentration (ng/kg)
1415 Colorado St	226	214
1503 E Patrick Rd	264	243
1511 E Patrick Rd	242	207
604 E Haley St	224	200
1406 E Haley St	261	232
206 Bradley Ct	224	211
1514 Jefferson Ave	266	226
1506 Jefferson Ave	224	217
1502 Jefferson Ave	238	239
113 Arbury Pl	224	207
1502 State St	223	219
1414 State St	222	212
1413 State St	252	244
1318 E Haley St	243	216
1401 Fournie St	229	206
1423 Fournie St	240	204
1407 Haley St	258	234
1415 Haley St	226	218
915 North St	256	232
618 Reardon Ct	230	210
613 E Carpenter St	239	237
715 E. Carpenter St	227	214
1419 Iowa St - DU 2	234	206
1105 Michigan St	228	195
1001 Michigan St	233	208
801 E Haley St	256	226
702 Walnut St	274	238
2102 Bayliss St	243	222
2306 Jefferson Ave	243	220
301 E Haley St	231	212
302 Maple St	227	209
327 Kent Ct (Wooded DU)	250	212
1115 North St - DU A	254	240
404 Sauve St - DUA	245	225
404 Sauve St - DUB	225	196
1209 E Haley St	223	198
1125 E Haley St	231	217
2113 Tennessee St	228	219
2109 Swede Ave - DU A	272	244
1407 E Haley St	230	213
1205 E Haley St	250	223
2106 Tennessee St	327	314
2101 Tennessee St	232	223
2303 Carolina St	217	206
2202 Kentucky St	231	209
1129 E Haley St	224	188

Table C-1
Laboratory versus Fast Analysis Dioxin TEQ Concentrations

Parcel Address	Fast Analysis Dioxin TEQ Concentration (ng/kg)	Laboratory (Primary Sample) Dioxin TEQ Concentration (ng/kg)
1509 E Haley St	209	207
1106 Rodd St	226	207
1410 Ohio St	244	223
2213 Carolina St	404	360
1510 Maryland St	235	232
1414 Ohio St	306	288
3128 Bay City Rd - DU B	232	214
1306 Ohio St	230	207
2205 Carolina St	210	198
2215 Virginia St	323	309
2004 Virginia St	216	219
410 E Nelson St - DU O	271	253
2205 Tennessee St	235	218
328 Longview St	232	205
1617 Maryland St	225	211

Table C-2
Laboratory Dioxin TEQ Concentrations for Triplicate Samples

Parcel Address	Primary Dioxin TEQ Conc (ng/kg)	Duplicate Dioxin TEQ Conc (ng/kg)	Triplicate Dioxin TEQ Conc (ng/kg)	Average (ppt)	Standard Deviation (ppt)	Relative Standard Deviation (RSD)	Available Acreage for Sampling	Number of Increments
1010 E Grove St	221	214	206	213.7	7.51	3.5%	1.31	30
301 Kent Ct	174	177	159	170.0	9.64	5.7%	0.33	20
311 Walter Ct	239	234	234	235.7	2.89	1.2%	0.18	10
319 Walter Ct	214	194	187	198.3	14.01	7.1%	0.15	10
325 Walter Ct	234	240	238	237.3	3.06	1.3%	0.17	10
329 Walter Ct	184	191	197	190.7	6.51	3.4%	0.20	10
510 Mill St	209	205	210	208.0	2.65	1.3%	0.09	10
516 George St	179	186	181	182.0	3.61	2.0%	0.11	10
516 Mill St	232	225	250	235.7	12.90	5.5%	0.18	10
602 Haley St	190	193	189	190.7	2.08	1.1%	0.13	10
609 Fournie St	212	208	213	211.0	2.65	1.3%	0.14	10
613 Haley St	195	210	227	210.7	16.01	7.6%	0.12	10
808 E Grove St	184	190	184	186.0	3.46	1.9%	0.13	10
914 E Grove St	232	203	209	214.7	15.31	7.1%	0.13	10
915 E Indian St	208	213	220	213.7	6.03	2.8%	0.13	10
1002 Haley St	215	209	215	213.0	3.46	1.6%	0.12	10
1006 Mill St	192	198	194	194.7	3.06	1.6%	0.16	10
1007 Haley St	195	182	172	183.0	11.53	6.3%	0.14	10
711 Fournie St	216	249	267	244.0	25.87	10.6%	0.14	10
806 Haley St	213	210	175	199.3	21.13	10.6%	0.14	10
810 Mill St	213	215	225	217.7	6.43	3.0%	0.12	10
811 Fournie St	242	237	278	252.3	22.37	8.9%	0.13	10
811 Haley St	216	218	198	210.7	11.02	5.2%	0.14	10
812 Mill St	234	242	248	241.3	7.02	2.9%	0.14	10
813 Fournie St	229	224	216	223.0	6.56	2.9%	0.16	10
819 Haley St	199	189	188	192.0	6.08	3.2%	0.14	10
906 E Carpenter St	168	187	135	163.3	26.31	16.1%	0.15	10
916 E Carpenter St	240	253	252	248.3	7.23	2.9%	0.17	10
212 Arbury Pl	192	195	178	188.3	9.07	4.8%	0.15	10
224 Arbury Pl	201	206	199	202.0	3.61	1.8%	0.13	10
2021 Bay City Rd	239	282	252	257.7	22.05	8.6%	0.23	10
2316 Bay City Rd	197	187	188	190.7	5.51	2.9%	0.84	20
1316 Bayliss St	198	199	199	198.7	0.58	0.3%	0.10	10
812 E Carpenter St	177	173	173	174.3	2.31	1.3%	0.10	10
905 E Carpenter St	166	173	173	170.7	4.04	2.4%	0.14	10
911 E Carpenter St	213	214	207	211.3	3.79	1.8%	0.13	10
611 E Grove St	206	199	199	201.3	4.04	2.0%	0.12	10
615 E Grove St	182	200	187	189.7	9.29	4.9%	0.13	10
610 E Pine St	206	212	221	213.0	7.55	3.5%	0.25	10
611 E Pine St	203	205	199	202.3	3.06	1.5%	0.12	10
616 E Pine St	195	180	191	188.7	7.77	4.1%	0.12	10
702 E Pine St	187	185	182	184.7	2.52	1.4%	0.14	10
706 E Pine St	228	137	152	172.3	48.79	28.3%	0.10	10
716 E Pine St	193	188	262	214.3	41.36	19.3%	0.14	10
1115 Fournie St	183	184	172	179.7	6.66	3.7%	0.13	10
1116 Fournie St	227	206	199	210.7	14.57	6.9%	0.13	10
1307 Fournie St	190	201	197	196.0	5.57	2.8%	0.12	10
1311 Fournie St	234	225	230	229.7	4.51	2.0%	0.14	10
1315 Fournie St	221	193	230	214.7	19.30	9.0%	0.21	10

Table C-2
Laboratory Dioxin TEQ Concentrations for Triplicate Samples

Parcel Address	Primary Dioxin TEQ Conc (ng/kg)	Duplicate Dioxin TEQ Conc (ng/kg)	Triplicate Dioxin TEQ Conc (ng/kg)	Average (ppt)	Standard Deviation (ppt)	Relative Standard Deviation (RSD)	Available Acreage for Sampling	Number of Increments
1316 Fournie St	225	245	252	240.7	14.01	5.8%	0.22	10
1309 Franklin St	185	188	180	184.3	4.04	2.2%	0.12	10
1112 Haley St	175	183	196	184.7	10.60	5.7%	0.07	10
1302 Haley St	205	205	196	202.0	5.20	2.6%	0.10	10
1314 Jefferson Ave	215	207	217	213.0	5.29	2.5%	0.12	10
1315 Jefferson Ave	193	213	267	224.3	38.28	17.1%	0.14	10
1317 Jefferson Ave	193	134	171	166.0	29.82	18.0%	0.21	10
1402 Jefferson Ave	207	185	190	194.0	11.53	5.9%	0.18	10
1410 Jefferson Ave	212	225	252	229.7	20.40	8.9%	0.08	10
1401 Lincoln St	191	198	190	193.0	4.36	2.3%	0.13	10
1406 Lincoln St	169	167	172	169.3	2.52	1.5%	0.11	10
1408 Lincoln St	201	220	209	210.0	9.54	4.5%	0.11	10
1411 Lincoln St	200	198	211	203.0	7.00	3.4%	0.13	10
1414 Lincoln St	192	168	193	184.3	14.15	7.7%	0.13	10
1001 Mill St	238	230	246	238.0	8.00	3.4%	0.12	10
1005 Mill St	210	213	203	208.7	5.13	2.5%	0.14	10
1112 Mill St	197	178	179	184.7	10.69	5.8%	0.10	10
1116 Mill St	189	184	206	193.0	11.53	6.0%	0.13	10
1120 Mill St	206	204	218	209.3	7.57	3.6%	0.11	10
1302 Mill St	215	224	224	221.0	5.20	2.4%	0.11	10
1303 Mill St	177	187	193	185.7	8.08	4.4%	0.12	10
1316 Mill St	225	207	200	210.7	12.90	6.1%	0.18	10
811 Mill St	187	201	193	193.7	7.02	3.6%	0.15	10
813 Mill St	199	184	192	191.7	7.51	3.9%	0.12	10
1301 Patrick Rd	214	197	190	200.3	12.34	6.2%	0.30	20
1008 State St	208	223	220	217.0	7.94	3.7%	0.12	10
1110 State St	214	200	205	206.3	7.09	3.4%	0.14	10
1302 State St	201	204	203	202.7	1.53	0.8%	0.12	10
1306 State St	213	214	226	217.7	7.23	3.3%	0.13	10
1310 State St	197	188	189	191.3	4.93	2.6%	0.12	10
602 State St	184	148	202	178.0	27.50	15.4%	0.20	10
802 State St	222	253	245	240.0	16.09	6.7%	0.16	10
820 State St	193	193	196	194.0	1.73	0.9%	0.13	10
426 Walter Ct	187	176	174	179.0	7.00	3.9%	0.17	10
1408 Iowa St	196	171	170	179.0	14.73	8.2%	0.10	10
1513 Swede Ave	237	244	227	236.0	8.54	3.6%	0.25	20
1605 Swede Ave	217	206	214	212.3	5.69	2.7%	0.28	20
1609 Swede Ave	211	169	155	178.3	29.14	16.3%	0.12	10
1506 E Haley St	243	225	218	228.7	12.90	5.6%	0.17	10
1418 E Haley St	240	219	213	224.0	14.18	6.3%	0.29	20
1412 E Haley St	249	231	241	240.3	9.02	3.8%	0.24	10
1402 E Haley St	216	242	210	222.7	17.01	7.6%	0.26	20
1605 Iowa St	210	181	166	185.7	22.37	12.0%	0.23	10
1415 Colorado St	214	217	199	210.0	9.64	4.6%	0.16	10
1503 E Patrick Rd	243	221	217	227.0	14.00	6.2%	0.22	10
1511 E Patrick Rd	207	212	191	203.3	10.97	5.4%	0.21	10
1406 E Haley St	232	234	245	237.0	7.00	3.0%	0.12	10
206 Bradley Ct	211	239	219	223.0	14.42	6.5%	0.16	10
1514 Jefferson Ave	226	224	206	218.7	11.02	5.0%	0.09	10

Table C-2
Laboratory Dioxin TEQ Concentrations for Triplicate Samples

Parcel Address	Primary Dioxin TEQ Conc (ng/kg)	Duplicate Dioxin TEQ Conc (ng/kg)	Triplicate Dioxin TEQ Conc (ng/kg)	Average (ppt)	Standard Deviation (ppt)	Relative Standard Deviation (RSD)	Available Acreage for Sampling	Number of Increments
1506 Jefferson Ave	217	224	210	217.0	7.00	3.2%	0.10	10
1502 Jefferson Ave	239	229	227	231.7	6.43	2.8%	0.13	10
113 Arbury Pl	207	209	208	208.0	1.00	0.5%	0.13	10
1502 State St	219	196	225	213.3	15.31	7.2%	0.14	10
1414 State St	212	165	150	175.7	32.35	18.4%	0.11	10
1413 State St	244	260	259	254.3	8.96	3.5%	0.17	10
1318 E Haley St	216	231	244	230.3	14.01	6.1%	0.16	10
1401 Fournie St	206	192	189	195.7	9.07	4.6%	0.18	10
1423 Fournie St	204	197	190	197.0	7.00	3.6%	0.13	10
1407 Haley St	234	233	243	236.7	5.51	2.3%	0.13	10
1415 Haley St	218	213	218	216.3	2.89	1.3%	0.16	10
915 North St	232	245	218	231.7	13.50	5.8%	0.16	10
618 Reardon Ct	210	136	232	192.7	50.29	26.1%	0.12	10
613 E Carpenter St	237	234	234	235.0	1.73	0.7%	0.12	10
715 E. Carpenter St	214	216	221	217.0	3.61	1.7%	0.14	10
1419 Iowa St - DU 2	206	222	226	218.0	10.58	4.9%	1.26	30
1105 Michigan St	195	224	228	215.7	18.01	8.4%	0.14	10
1001 Michigan St	208	206	208	207.3	1.15	0.6%	0.23	10
801 E Haley St	226	186	226	212.7	23.09	10.9%	0.18	10
702 Walnut St	238	200	202	213.3	21.39	10.0%	0.10	10
2102 Bayliss St	222	194	184	200.0	19.70	9.8%	0.20	10
2306 Jefferson Ave	220	212	219	217.0	4.36	2.0%	0.10	10
301 E Haley St	212	203	203	206.0	5.20	2.5%	0.15	10
302 Maple St	209	151	182	180.7	29.02	16.1%	0.13	10
327 Kent Ct (Wooded DU)	212	199	221	210.7	11.06	5.3%	0.30	20
1115 North St - DU A	240	230	234	234.7	5.03	2.1%	0.16	10
404 Sauve St - DUA	225	211	217	217.7	7.02	3.2%	0.07	10
404 Sauve St - DUB	196	195	210	200.3	8.39	4.2%	0.57	20
1209 E Haley St	198	209	203	203.3	5.51	2.7%	0.13	10
1125 E Haley St	217	279	241	245.7	31.26	12.7%	0.23	10
2113 Tennessee St	219	245	188	217.3	28.54	13.1%	0.12	10
2109 Swede Ave - DU A	244	208	248	233.3	22.03	9.4%	0.07	10
1407 E Haley St	213	211	214	212.7	1.53	0.7%	0.13	10
1205 E Haley St	223	250	233	235.3	13.65	5.8%	0.13	10
2106 Tennessee St	314	265	273	284.0	26.29	9.3%	0.13	10
2101 Tennessee St	223	234	244	233.7	10.50	4.5%	0.18	10
2303 Carolina St	206	186	341	244.3	84.31	34.5%	0.14	10
2202 Kentucky St	209	205	203	205.7	3.06	1.5%	0.08	10
1129 E Haley St	188	161	177	175.3	13.58	7.7%	0.23	10
1509 E Haley St	207	257	240	234.7	25.42	10.8%	0.14	10
1106 Rodd St	207	182	236	208.3	27.02	13.0%	0.15	10
1410 Ohio St	223	213	229	221.7	8.08	3.6%	0.16	10
2213 Carolina St	360	243	215	272.7	76.92	28.2%	0.15	10
1510 Maryland St	232	210	223	221.7	11.06	5.0%	0.16	10
1414 Ohio St	288	221	270	259.7	34.67	13.4%	0.16	10
3128 Bay City Rd - DU B	214	120	122	152.0	53.70	35.3%	0.21	10
1306 Ohio St	207	214	216	212.3	4.73	2.2%	0.18	10
2205 Carolina St	198	191	200	196.3	4.73	2.4%	0.17	10
2215 Virginia St	309	265	277	283.7	22.74	8.0%	0.17	10

Table C-2
Laboratory Dioxin TEQ Concentrations for Triplicate Samples

Parcel Address	Primary Dioxin TEQ Conc (ng/kg)	Duplicate Dioxin TEQ Conc (ng/kg)	Triplicate Dioxin TEQ Conc (ng/kg)	Average (ppt)	Standard Deviation (ppt)	Relative Standard Deviation (RSD)	Available Acreage for Sampling	Number of Increments
2004 Virginia St	219	187	207	204.3	16.17	7.9%	0.20	10
410 E Nelson St - DU O	253	292	393	312.7	72.25	23.1%	0.88	20
2205 Tennessee St	218	185	218	207.0	19.05	9.2%	0.15	10
328 Longview St	205	196	233	211.3	19.30	9.1%	0.20	10
1617 Maryland St	211	220	264	231.7	28.36	12.2%	0.19	10

Table C-3
Relative Standard Deviation of Laboratory Triplicates by Property Group

Property Group	Property Area Range	Number of Properties	Number of Increments	Relative Standard Deviation (RSD) of Laboratory Triplicates		
				Min	Average	Max
1	≤ 0.25 acre	140	10	0.3%	6.4%	35.3%
2	> 0.25 and ≤ 1 acre	10	20	2.7%	6.8%	23.1%
3	> 1 acre	2	30	3.5%	4.2%	4.9%

Table C-4

Variance and Standard Deviation of Individual Fast Analysis Dioxin TEQ Concentrations

Property Group	Property Area Range	Number of Increments	Average Relative Standard Deviation (RSD) of Laboratory Triplicates	Slope (b_1) of Regression Equation to Estimate Fast Analysis Value from Laboratory Value	Action Level (ng/kg)	Root Mean Square Error (RMSE) of Regression Equation	Mean Square Error (MSE) of Regression Equation	Number of Data Points Used in the Regression Analysis (n)	Variance of Individual Fast Analysis Values	Standard Deviation of Individual Fast Analysis Values
1	≤ 0.25 acre	10	6.4%	0.788	250	15.2	231	153	391	19.8
2	> 0.25 and ≤ 1 acre	20	6.8%	0.788	250	15.2	231	153	412	20.3
3	> 1 acre	30	4.2%	0.788	250	15.2	231	153	301	17.3

Table C-5
Lower and Upper Bounds on Individual Fast Analysis Dioxin TEQ Concentrations

Property Group	Property Area Range	Number of Increments	Action Level (ng/kg)	Mean of Fast Analysis Values (ng/kg)	95% Confidence Lower Bound on Individual Fast Analysis Concentration (ng/kg)	95% Confidence Upper Bound on Individual Fast Analysis Concentration (ng/kg)
1	≤ 0.25 acre	10	250	275	242	308
2	> 0.25 and ≤ 1 acre	20	250	275	241	309
3	> 1 acre	30	250	275	246	304

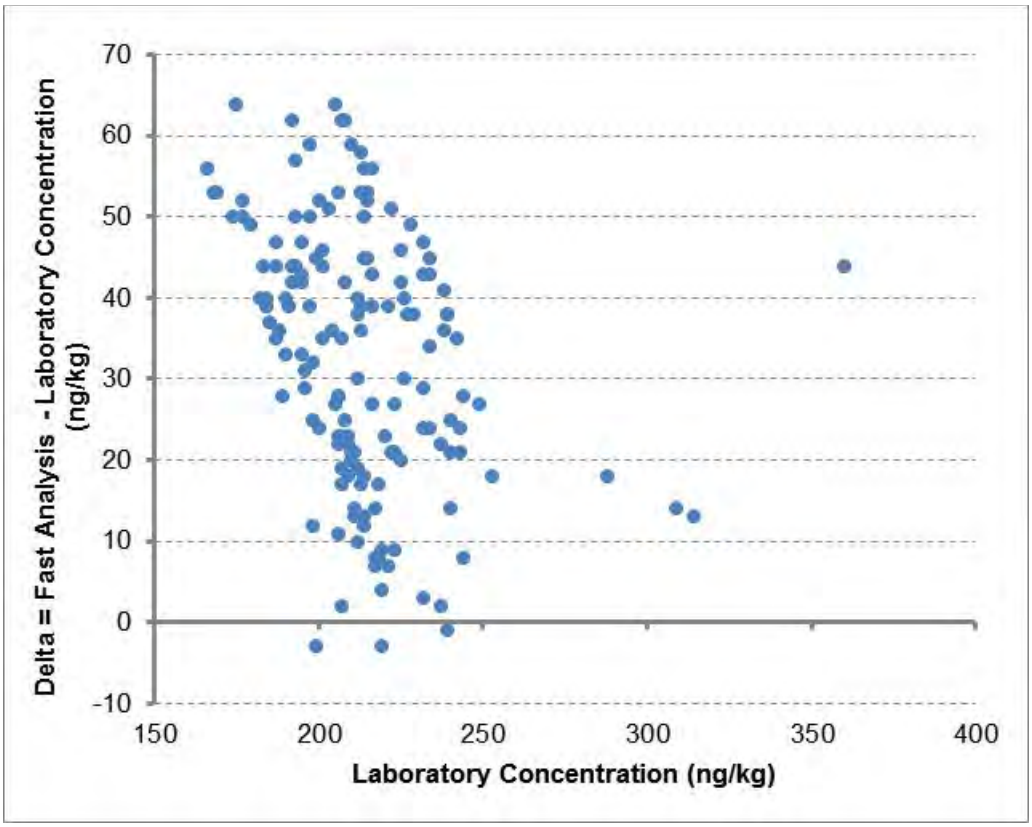


Figure C-1. Delta versus Laboratory Concentrations

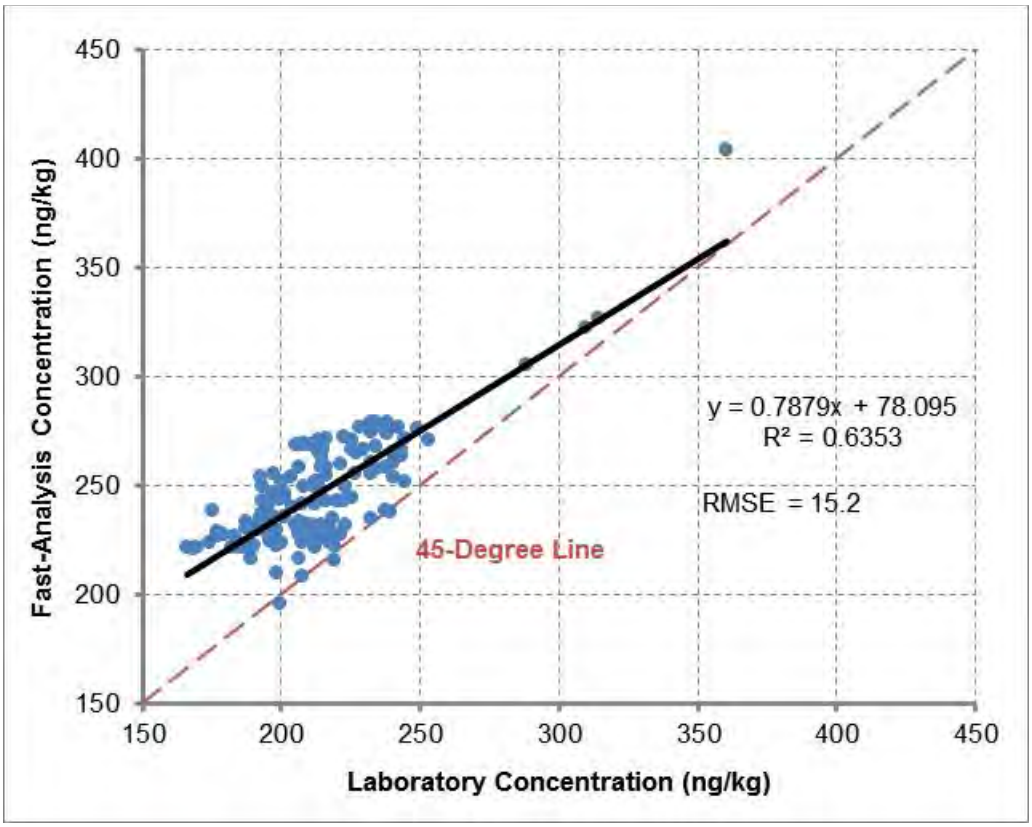


Figure C-2. Fast Analysis versus Laboratory Dioxin Concentrations

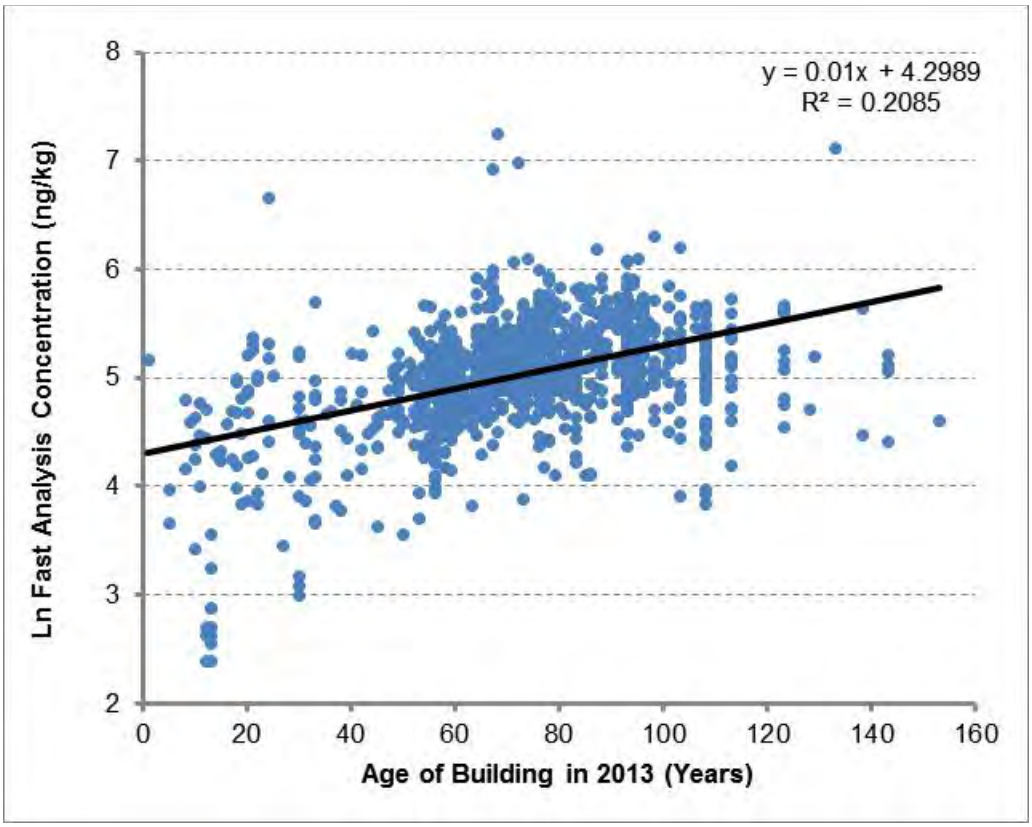
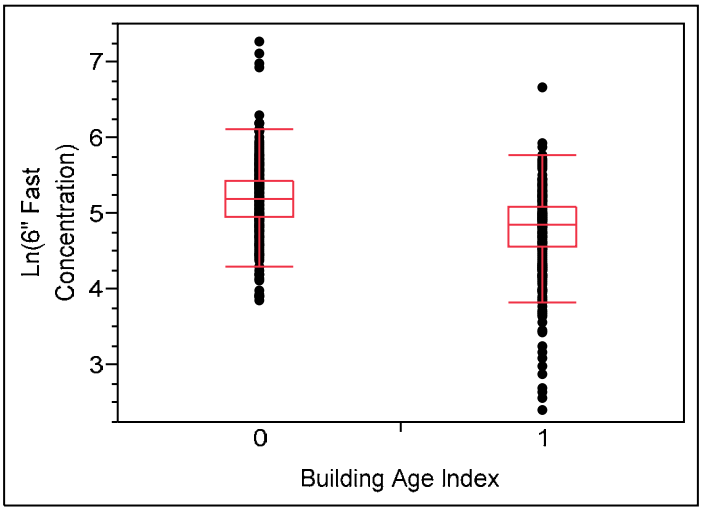


Figure C-3. Scatterplot of Logarithmic 6" Fast Analysis Concentration vs Building Age

Figure C-4. ANOVA Results for Building Age Effect

Oneway Analysis of Ln(6" Fast Concentration) By Building Age Index

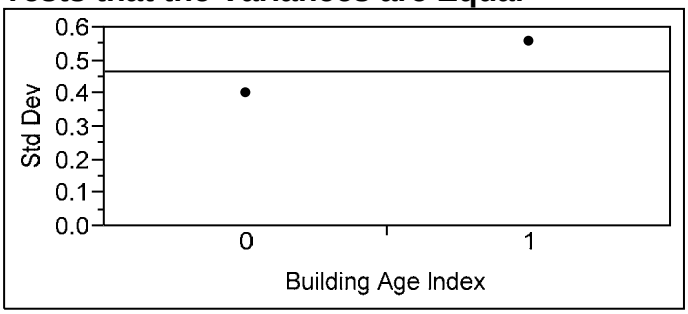
Building Age Index = 0 for Age > 66 Years; Building Age Index = 1 for Age <=66 Years



Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	691	5.19591	0.400325	0.01523	5.1660	5.2258
1	430	4.75220	0.560445	0.02703	4.6991	4.8053

Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
0	691	0.4003249	0.2976270	0.2976056
1	430	0.5604447	0.3917223	0.3826902

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	21.1463	1	1119	<.0001*
Brown-Forsythe	17.2056	1	1119	<.0001*
Levene	22.2293	1	1119	<.0001*
Bartlett	61.9140	1	.	<.0001*
F Test 2-sided	1.9599	429	690	<.0001*

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
204.5791	1	700.75	<.0001*

t Test
14.3031

Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
0	691	464573	387651	672.319	14.594
1	430	164309	241230	382.113	-14.594

2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
164308.5	-14.5940	<.0001*

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
212.9869	1	<.0001*

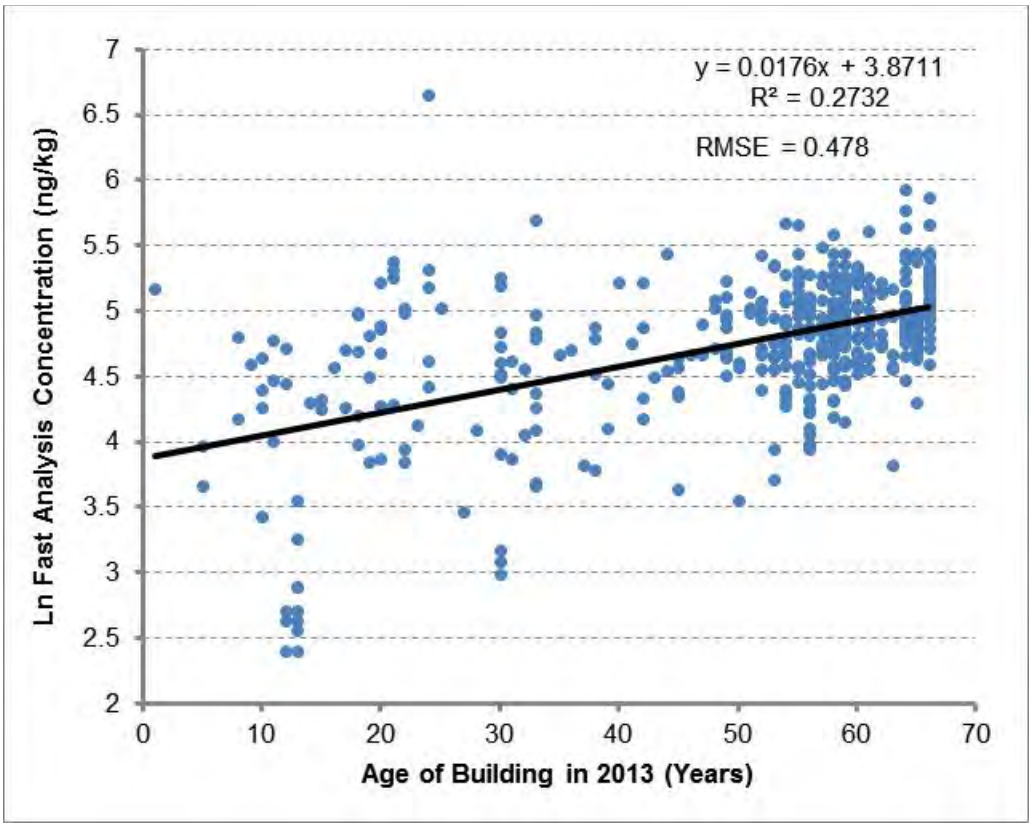


Figure C-5. Scatterplot of Logarithmic 6" Fast Analysis Concentration versus Building Age in 2013 (Age ≤ 66 years)

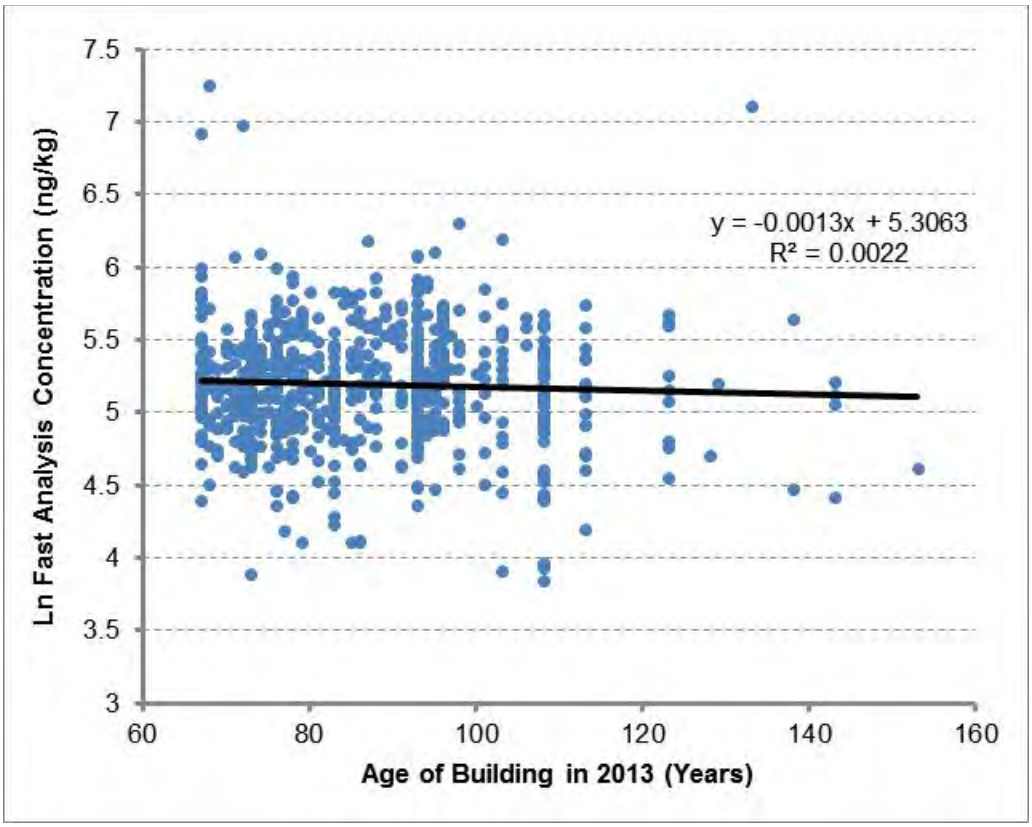


Figure C-6. Scatterplot of Logarithmic 6" Fast Analysis Concentration versus Building Age in 2013 (Age > 66 years)

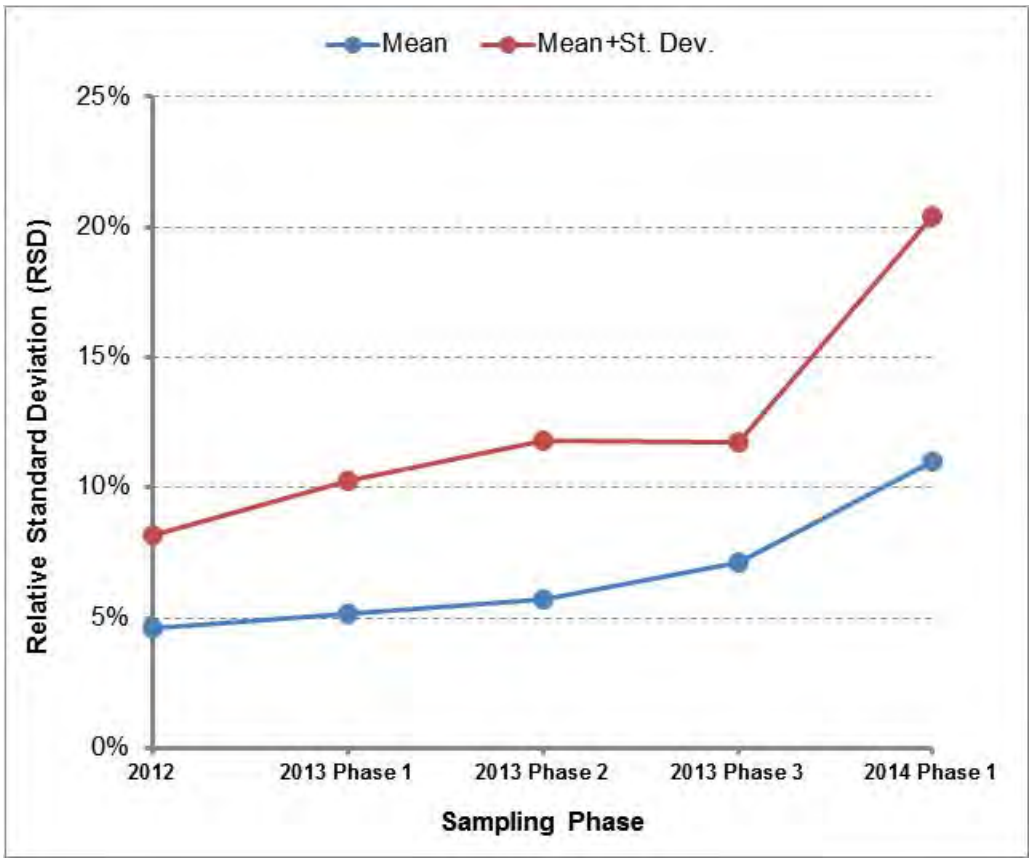
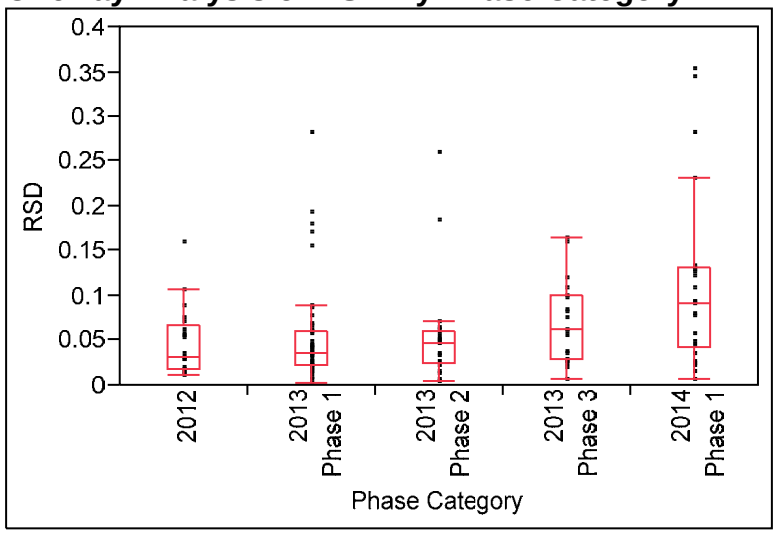


Figure C-7. Relative Standard Deviation (RSD) by Sampling Phase

Figure C-8. ANOVA Results for RSD by Phase

Oneway Analysis of RSD By Phase Category



Quantiles

Level	Minimum	10%	25%	Median	75%	90%	Maximum
2012	0.010918	0.012539	0.017444	0.031681	0.066834	0.105986	0.161095
2013 Phase 1	0.002906	0.014738	0.02328	0.036219	0.059523	0.096346	0.283106
2013 Phase 2	0.004808	0.007968	0.024391	0.046148	0.060827	0.172901	0.261034
2013 Phase 3	0.005569	0.020087	0.029536	0.063292	0.100244	0.160644	0.163421
2014 Phase 1	0.007183	0.020036	0.042831	0.091674	0.130115	0.300986	0.353308

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
2012	29	0.046102	0.035759	0.00664	0.03250	0.05970
2013 Phase 1	58	0.051615	0.050926	0.00669	0.03822	0.06500
2013 Phase 2	20	0.057146	0.061008	0.01364	0.02859	0.08570
2013 Phase 3	19	0.071342	0.045772	0.01050	0.04928	0.09340
2014 Phase 1	26	0.109844	0.094285	0.01849	0.07176	0.14793

Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
2012	29	1859.00	2218.50	64.103	-1.683
2013 Phase 1	58	3902.00	4437.00	67.276	-2.027
2013 Phase 2	20	1419.00	1530.00	70.950	-0.602
2013 Phase 3	19	1742.00	1453.50	91.684	1.604
2014 Phase 1	26	2706.00	1989.00	104.077	3.506

1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
17.6268	4	0.0015*

Nonparametric Comparisons For All Pairs Using Steel-Dwass Method

q*	Alpha
2.72777	0.05

Level	- Level	Score Mean Difference	Std Err Dif	Z	p-Value	Hodges-Lehmann	Lower CL	Upper CL
2014 Phase 1	2013 Phase 1	20.02520	5.757016	3.478399	0.0046*	0.0458388	0.008828	0.0769423
2014 Phase 1	2012	13.82294	4.326935	3.194627	0.0122*	0.0457546	0.006125	0.0816416
2013 Phase 3	2013 Phase 1	12.75181	5.913663	2.156331	0.1965	0.0218115	-0.005909	0.0563179
2014 Phase 1	2013 Phase 2	10.12885	3.992220	2.537146	0.0826	0.0436227	-0.003669	0.0849895
2013 Phase 3	2012	8.79855	4.132119	2.129306	0.2075	0.0233310	-0.007345	0.0635189
2013 Phase 3	2013 Phase 2	5.69605	3.652685	1.559415	0.5236	0.0207448	-0.019142	0.0602336
2014 Phase 1	2013 Phase 3	4.69130	3.964034	1.183465	0.7609	0.0200448	-0.028411	0.0721336
2013 Phase 2	2013 Phase 1	2.52155	5.876091	0.429121	0.9929	0.0031397	-0.017117	0.0233372
2013 Phase 1	2012	2.35345	5.744563	0.409683	0.9941	0.0025863	-0.016116	0.0176431
2013 Phase 2	2012	1.81638	4.153139	0.437351	0.9924	0.0033074	-0.022102	0.0296588

Attachment D

Midland Soils Sampling Agreement Form
1008 Jefferson Avenue
Midland, MI 48640

Property Information
Property Address: «ADDRESS BLOCK 1»

Point of Contact:

Address:

Phone Number:

E-mail Address:

Description of Service Agreements:
(Activities that will be performed on property by Dow and it's contractors)

- Collect approximately 10 soil cores for laboratory analyses.
- The soil cores will be 1-inch wide and 6-inches in depth, unless otherwise noted below.
- Laboratory results will be submitted in writing to the point of contact.
- The sampling activities will require 1.5 hours and be a single occurrence.

_____
_____
_____
_____

Special Conditions:

_____
_____
_____

Please Check One

[ ] I agree [ ] I decline to allow The Dow Chemical Company and it's contractor(s) to implement the activities described above and perform follow up as necessary. I understand the MDEQ may be present during these activities.

_____ _____
Authorized Signature *date*

I warrant that I have the authority to make decisions regarding activities on the above mentioned property, and have read and understand the agreement.

Dow Representative:_____ ***Date:***_____

Midland Soils Cleanup Activities Agreement Form

1008 Jefferson Avenue
Midland, MI 48640

Contact Information

Property Address: _____

Point of Contact: _____

Address: _____

Phone Number: _____ E-mail: _____

Description of Service Agreements:

(Activities that will be performed on property by Dow and it's contractors)

- Remove 12-inches of soil from property (soil removal will be cut 1 foot (12-inches) from permanent structures including side-walks, driveways, parking lots, and decks.
- Backfill with six-inches of clean screen borrow and six-inches of topsoil
- Removal and replacement of vegetation and landscaping like for like, see property drawing (exceptions noted)

Other Service Agreements:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

I [ ] agree to [ ] decline to (please check one)

allow the Dow Chemical Company and it's contractors to implement the activities described above and perform follow up as necessary. I (we) understand the MDEQ may be present during these activities.

_____ _____

Authorized Signature *date*

I warrant that I have the authority to make decisions regarding activities on the above mentioned property, and have read and understand the agreement.

Dow Representative:_____ ***Date:***_____