



MEMO

PROFESSIONAL SERVICES

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To: Water Resources Management Commission
From: Ann Hirekatur, PH and Eric Thompson, P.E., CFM
Subject: Stormwater Utility Feasibility Study Progress Report and Preliminary ERU Size Determination
Date: March 12, 2010

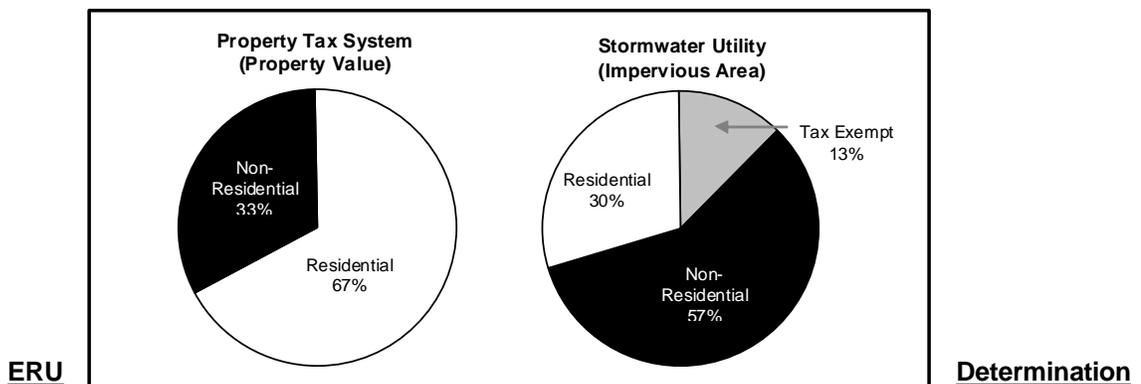
Introduction

In 2006 the City of Middleton conducted a very small scale evaluation of the feasibility of a stormwater utility. Because of the limited scope of the 2006 study it was necessary to operate within the limits of certain assumptions; one of those assumptions was that land use in the City of Middleton, specifically, the density of impervious area within typical land uses, was the same as published 'text-book' values. This memorandum represents a revision to the previous study following some additional parcel evaluations to obtain a more Middleton-specific estimate of impervious area density for the different land uses in the City.

Stormwater Program Funding

Under the current system of funding the City's stormwater program through property taxes, residential homeowners pay for approximately 67 percent of the stormwater management costs while owners of nonresidential property pay for 33 percent of the program¹. Under a stormwater utility, charges would shift to property owners that generate more stormwater runoff. Specifically, residential property owners would pay for only 30 percent of the stormwater management program, while non-residential and tax-exempt users will fund 57 and 13 percent, respectively², as illustrated in figure 1.

FIGURE 1: CITY OF MIDDLETON STORMWATER PROGRAM FUNDING



¹ Property value figures are from the 2006 stormwater feasibility study conducted by MSA.

² In the 2006 stormwater utility feasibility study, the estimated distribution of charge under a stormwater utility was non-residential = 55%, tax exempt = 14%, and residential = 31%.

Offices in Illinois, Iowa, Minnesota, and Wisconsin

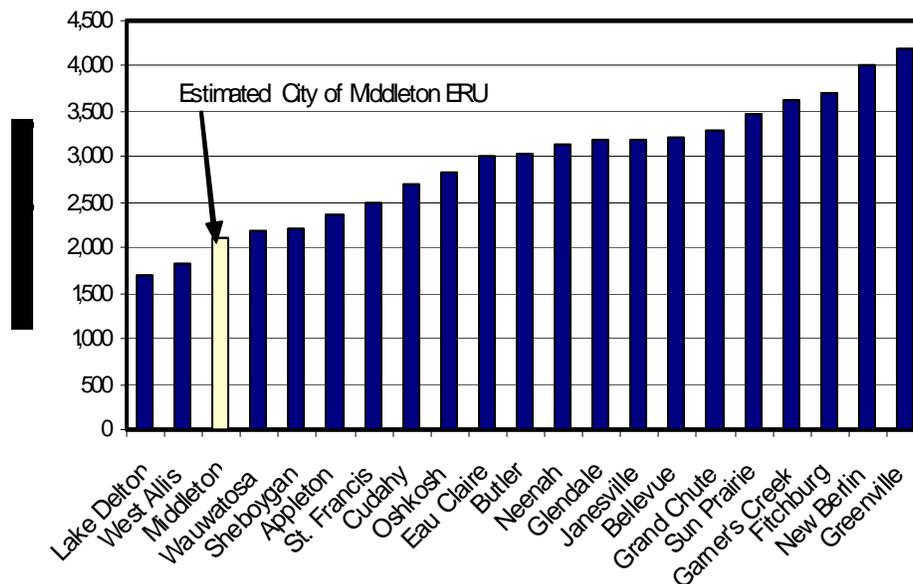
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In Wisconsin, the most commonly used approach for determining stormwater utility charges is the equivalent residential unit (ERU) method. An ERU is the average amount of impervious area associated with single-family, duplex, and multifamily living units. Preliminary data used to determine the Middleton ERU size is summarized in Table 1. According to this preliminary data, the estimated Middleton ERU size is 2,106 square feet³. This is less than the average ERU size for Wisconsin municipalities, which is roughly 3,000 square feet, as illustrated in Figure 2.

TABLE 1. RESIDENTIAL UNIT IMPERVIOUS AREA SUMMARY

Type of Residential Unit	Average Impervious Area Per Unit (sq. ft.)	Approximate Number of Units Citywide
Single-Family	3,144	3,589
Duplexes	1,985	518
Multi-Family	1,259	4,329
	Weighted Average = 2,106	Total Living Units = 8,436

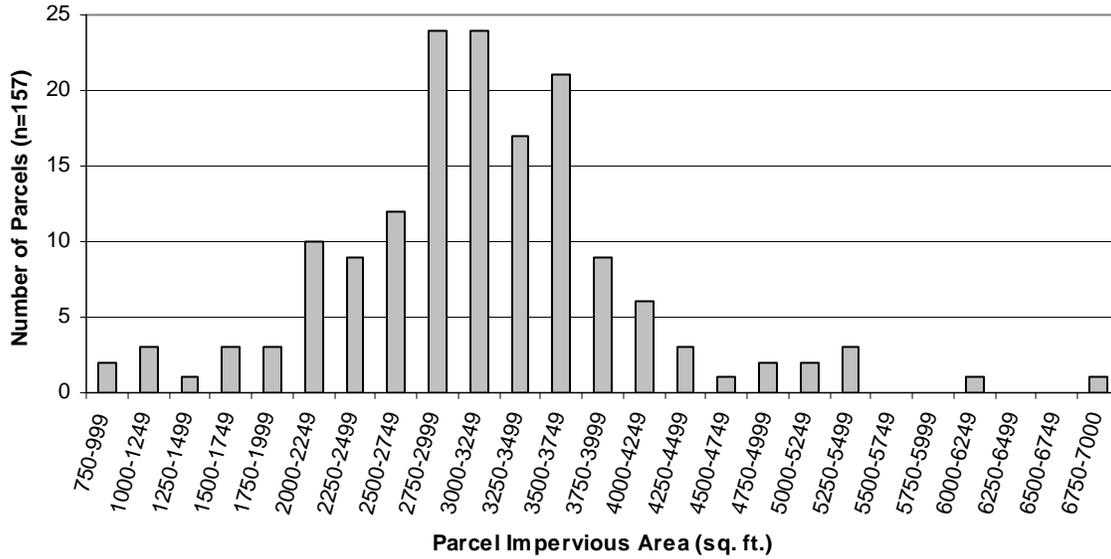
FIGURE 2. WISCONSIN STORMWATER UTILITY ERU SIZE COMPARISON



A randomly selected sample of 157 of the city's 3,589 single-family parcels were analyzed to determine the average amount of impervious surface for single-family homes in the City of Middleton. This average was found to be 3,144 square feet; the distribution of sample data is shown on Figure 3.

³ The estimated ERU size was 2,121 in the 2006 stormwater utility study.

FIGURE 3. SINGLE FAMILY RESIDENTIAL PARCEL IMPERVIOUS AREA DISTRIBUTION



Each of the 436 parcels identified as duplex or multifamily (multi-family parcel dwelling units ranged from 3 to 260 units per parcel) were evaluated also. The entire set of data related to residential land use was evaluated to determine the ERU size as shown in Table 2.

Since the residential parcel analysis shows that the average impervious area of multi-family living units to be substantially less than the average impervious area associated with single-family living units, it is recommended that the City consider charging each multi-family unit a fraction of an ERU. Based on the relative average impervious areas of the three residential property types summarized in Table 1, it was assumed for the purpose of this study that the City will charge 1 ERU for each duplex and single-family living unit, and 0.6 ERUs for each multi-family residential (MFR) living unit. Under this scenario, the total number of residential ERUs Citywide is 6,704, as summarized in Table 2.

TABLE 2. RESIDENTIAL ERU SUMMARY

Type of Residential Unit	Approximate Number of Units Citywide	ERUs Per Living Unit	Approximate Number of ERUs Citywide
Single-Family	3,589	1	3,589
Duplexes	518	1	518
Multi-Family	4,329	0.6	2,597
	8,436		6,704

Non-Residential ERU Count

The total number of non-residential ERUs in the City was determined by estimating the total non-residential impervious area, and dividing this amount by the estimated ERU size. For the 2006 study, this step was completed using textbook values of average impervious area for typical land uses. For this study these numbers were determined by the following:

- 1) Assigning a land use classification to all non-residential parcels based on land use (or zoning) information provided by the City. These land uses were then divided into subsets containing land uses with similar impervious area density.
- 2) Recent aerial photos were evaluated using GIS software, and impervious surfaces were measured on approximately 25% of the non-residential parcels.
- 3) The average density of impervious areas was determined for each land use and subset.
- 4) The previous assumptions (2006 study) of 15% impervious for the airport and 0% impervious for vacant parcels was maintained.

Using the process described above, it was estimated that there are a total 619.6 acres of taxable, non-residential impervious area and 139.2 acres of tax-exempt non-residential area in the City. Applying an ERU size of 2,106 square feet results in 12,815 and 2,879 non-residential taxable and tax-exempt ERUs, respectively. The total number of ERUs Citywide was estimated to be 22,398 by adding the total number of residential and non-residential ERUs, as summarized in Table 4⁴.

TABLE 4: IMPERVIOUS AREA BY PARCEL TYPE SUMMARY

Parcel Type	Impervious Surface (Acres)	# ERUs
Single Family Residential	259.0	3,589
Duplex Residential	23.6	518
Multi-Family Residential	125.1	2597
Non-Residential, Taxable	619.6	12,815
Non-Residential, Tax Exempt	139.2	2,879
Total	1134.1	22,398

Estimation of Charges

The charge per billing unit in a stormwater utility is determined by dividing the total stormwater program budget by the total number of ERUs in the community. Among Wisconsin municipalities with stormwater utilities, the charge per ERU ranges from \$12 to over \$100, with the average being approximately \$54 annually (see Figure 4). Table 5 presents a range of possible charges and the projected annual revenue for the City of Middleton.

⁴ The estimated number of ERUs Citywide in the 2006 stormwater utility feasibility study was 23,913. This estimate was developed assuming a flat percent imperviousness by zoning classification for all non-residential parcels. Specifically, the following impervious percentages were assumed for the 2006 study: commercial, 85%; manufacturing, 72%; developed tax-exempt parcels, 60%; airport parcels and Orchid Heights Park, 15%.

FIGURE 4: WISCONSIN STORMWATER UTILITY RATES

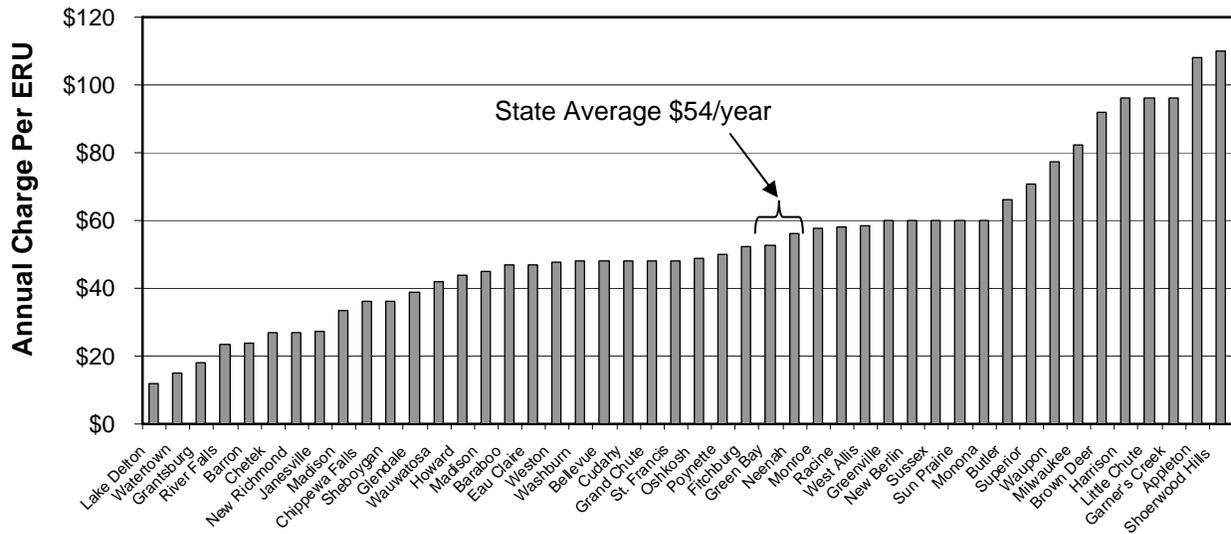


TABLE 5: ESTIMATED REVENUE FOR RANGE OF ERU CHARGE RATES

Annual Charge per ERU	Projected Annual Revenue ⁵
\$20	\$ 448,000
\$35	\$ 784,000
\$50	\$1,120,000
\$65	\$ 1,456,000
\$80	\$ 1,792,000

“Typical 10” and “Top 13” Customer Bill Estimates.

It is often useful, when considering a stormwater utility, to prepare some sample ‘utility bills’ to determine the impact that creation of a stormwater utility may have on future utility customers. The follow section summarized presents sample bills⁶ for a selection of non-residential property owners estimated by the City to represent the ‘average’ and largest customers that would exist in a stormwater utility. The results of this evaluation are summarized in **Table 6???**, and are illustrated in the figures attached to the end of this report⁶.

⁵ Projected annual revenue rounded to the nearest thousand dollars.

⁶ The imperious areas and parcel boundaries shown in these figures and summarized in Table 3, were based on the best data available to MSA at this time. We are also aware of some data inconsistencies that we were unable to address due to project scope and budget limitations. For example, the Elm Lawn Elementary School site includes some parcels classified as single-family residential that according to staff, are part of the school site. For the purposes of this study, these parcels were treated as non-residential in the Citywide ERU count, but as non-residential in the “top 7” sites evaluation. Additionally, the school district transportation site appears to be under construction in the most recent available aerial photos (2008 NAIP).



Middleton, WI Stormwater Utility Feasibility Study

Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Middleton Community Bank
 Site Area: 1.0 Acres
 Impervious Area: 0.89 Acres
 Estimated ERUs: 18.4

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study
Typical 10 Customer Bill Estimates

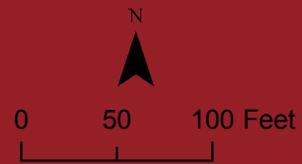
Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Middleton Glen
 Site Area: 4.9 Acres
 Impervious Area: 2.21 Acres
 Estimated ERUs: 45.8

Legend

 Parcel Boundary

 Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

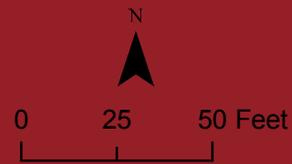
Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Kelley Williamson
 Site Area: 1.9 Acres
 Impervious Area: 1.3 Acres
 Estimated ERUs: 26.9

Legend

-  Parcel Boundary
-  Impervious Area





The Dane County building footprint shapefile was utilized in place of operator digitizing from the 2005 Orthophoto for all impervious building areas. The building footprint shapefile was created from photo diapositives digitally scanned at 15 microns and photogrammetrically processed to produce the final imagery and products.

Middleton, WI Stormwater Utility Feasibility Study

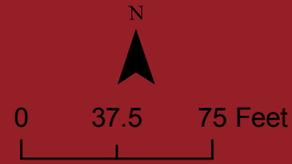
Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: X-S Night Club
 Site Area: 1.9 Acres
 Impervious Area: 1.48 Acres
 Estimated ERUs: 30.7

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Keva Sports Center

Site Area: 4.9 Acres

Impervious Area: 2.63 Acres

Estimated ERUs: 54.4

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Fairfield Inn
 Site Area: 2.6 Acres
 Impervious Area: 1.47 Acres
 Estimated ERUs: 30.4

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study
Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Denny's
 Site Area: 1.2 Acres
 Impervious Area: 0.92 Acres
 Estimated ERUs: 19.0

Legend

 Parcel Boundary

 Impervious Area

N



0 25 50 Feet






Middleton, WI Stormwater Utility Feasibility Study

Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: St. Bernard's Church
 Site Area: 4.9 Acres
 Impervious Area: 3.52 Acres
 Estimated ERUs: 72.8

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

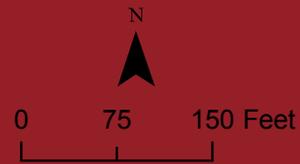
Typical 10 Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Middleton Ford
 Site Area: 8.6 Acres
 Impervious Area: 6.94 Acres
 Estimated ERUs: 143.6

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

Typical 10 Customer Bill Estimates

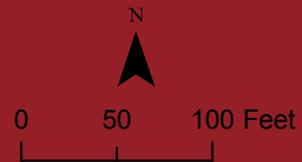
Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Soft Switch Technology
 Site Area: 5.3 Acres
 Impervious Area: 3.82 Acres
 Estimated ERUs: 78.9

Legend

 Parcel Boundary

 Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

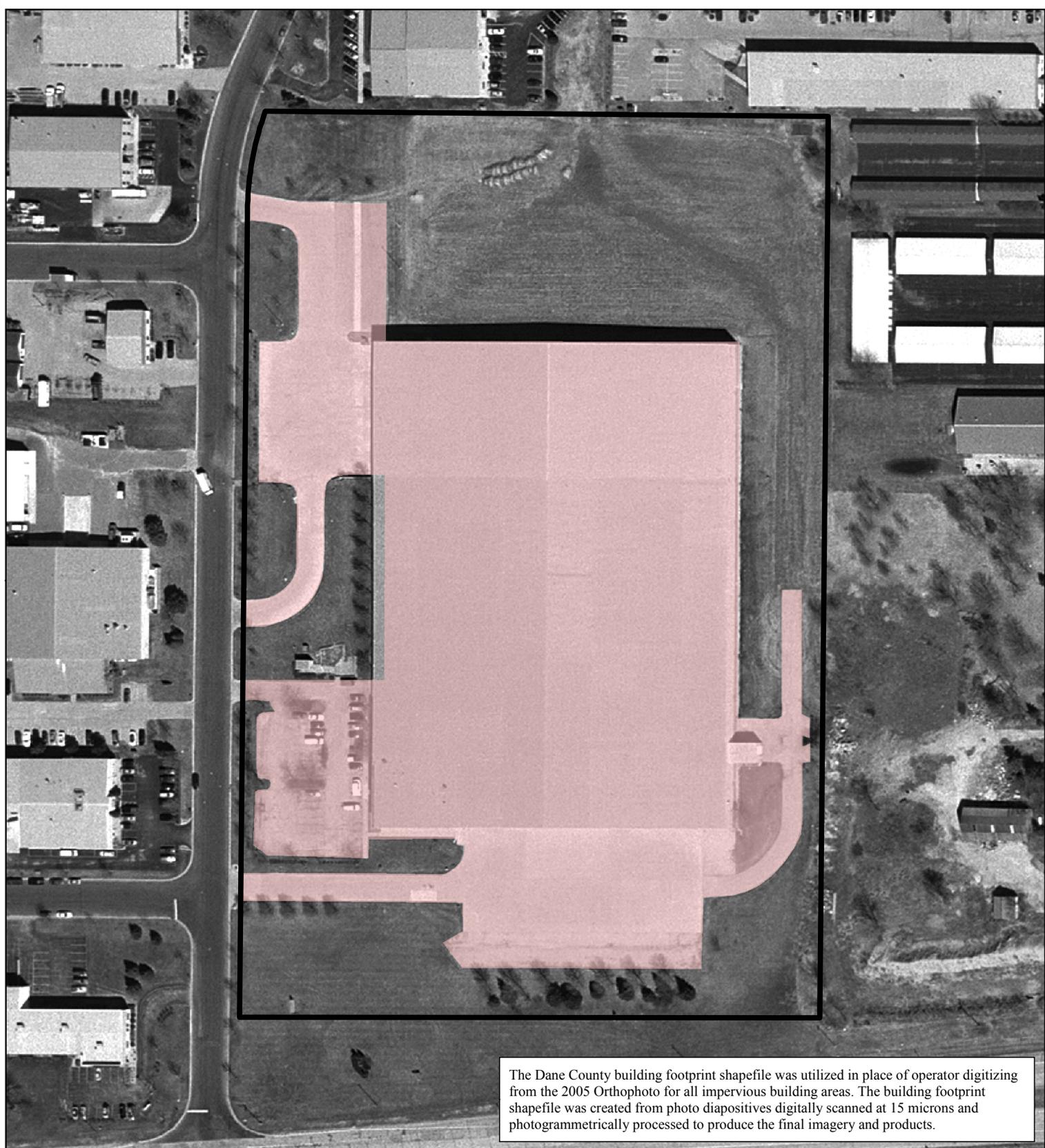
Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: ETC
 Site Area: 42.9 Acres
 Impervious Area: 15.65 Acres
 Estimated ERUs: 323.8

Legend

-  Parcel Boundary
-  Impervious Area





The Dane County building footprint shapefile was utilized in place of operator digitizing from the 2005 Orthophoto for all impervious building areas. The building footprint shapefile was created from photo diapositives digitally scanned at 15 microns and photogrammetrically processed to produce the final imagery and products.

Middleton, WI Stormwater Utility Feasibility Study

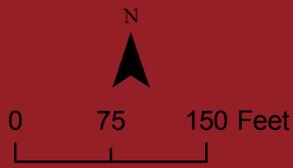
Top Customer Bill Estimates

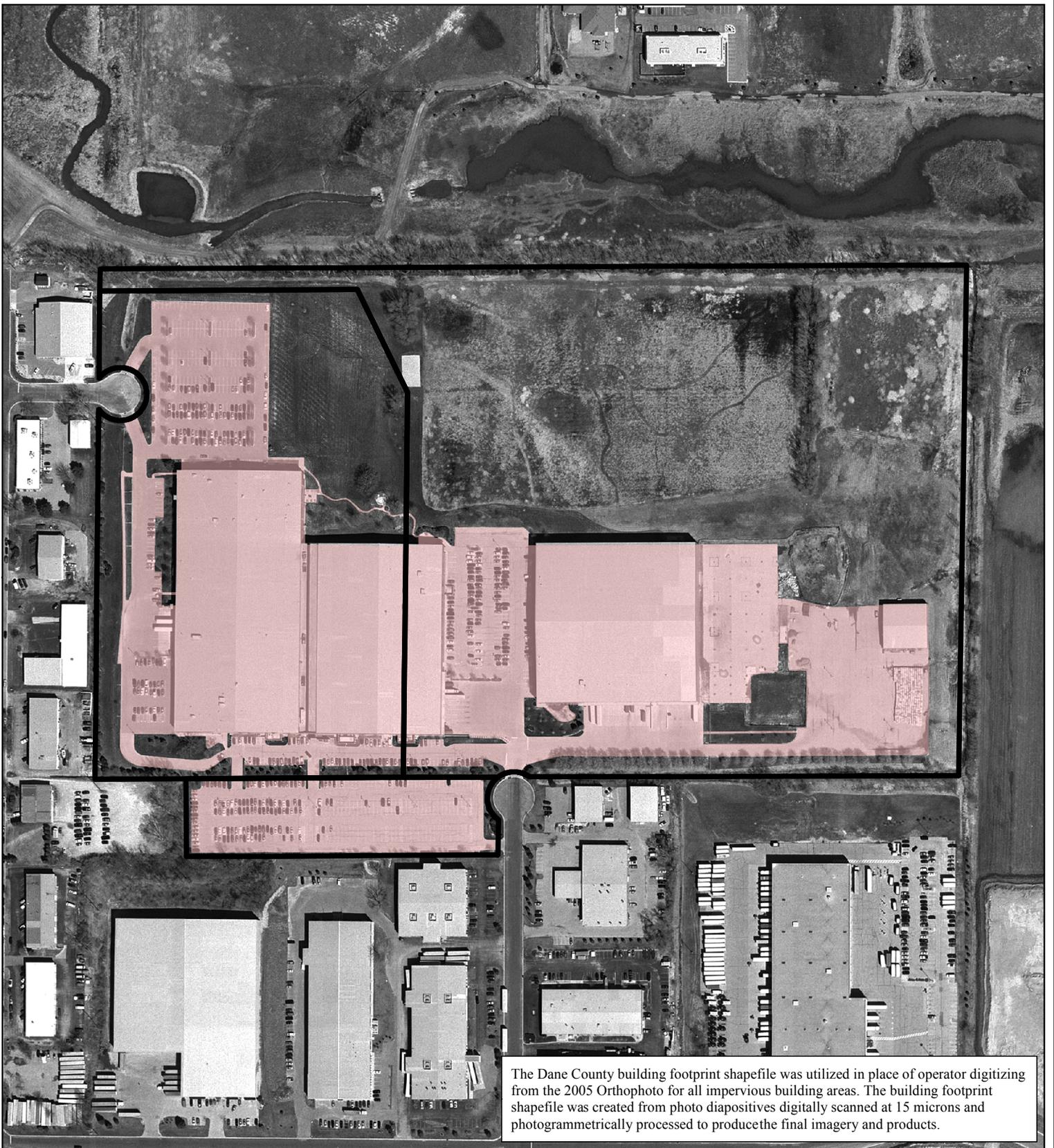
- Sources
- 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Ray-O-Vac
 Site Area: 15.6 Acres
 Impervious Area: 8.53 Acres
 Estimated ERUs: 176.5

Legend

- Parcel Boundary
- Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

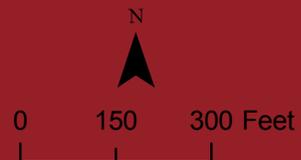
Top Customer Bill Estimates

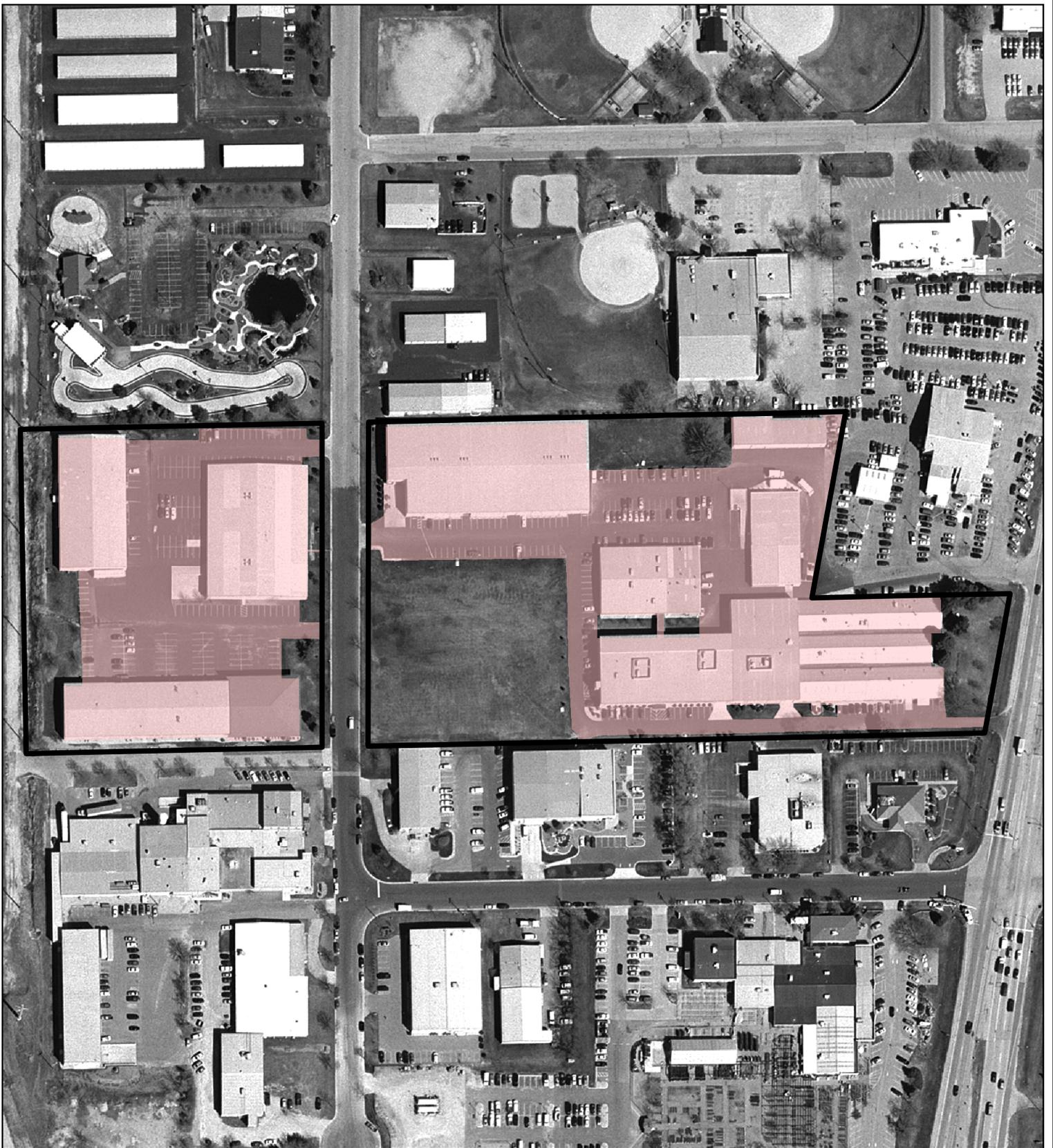
Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Pleasant Company
 Site Area: 54.8 Acres
 Impervious Area: 24.94 Acres
 Estimated ERUs: 515.9

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

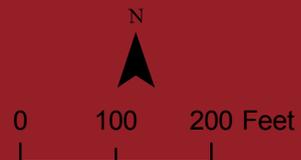
Top Customer Bill Estimates

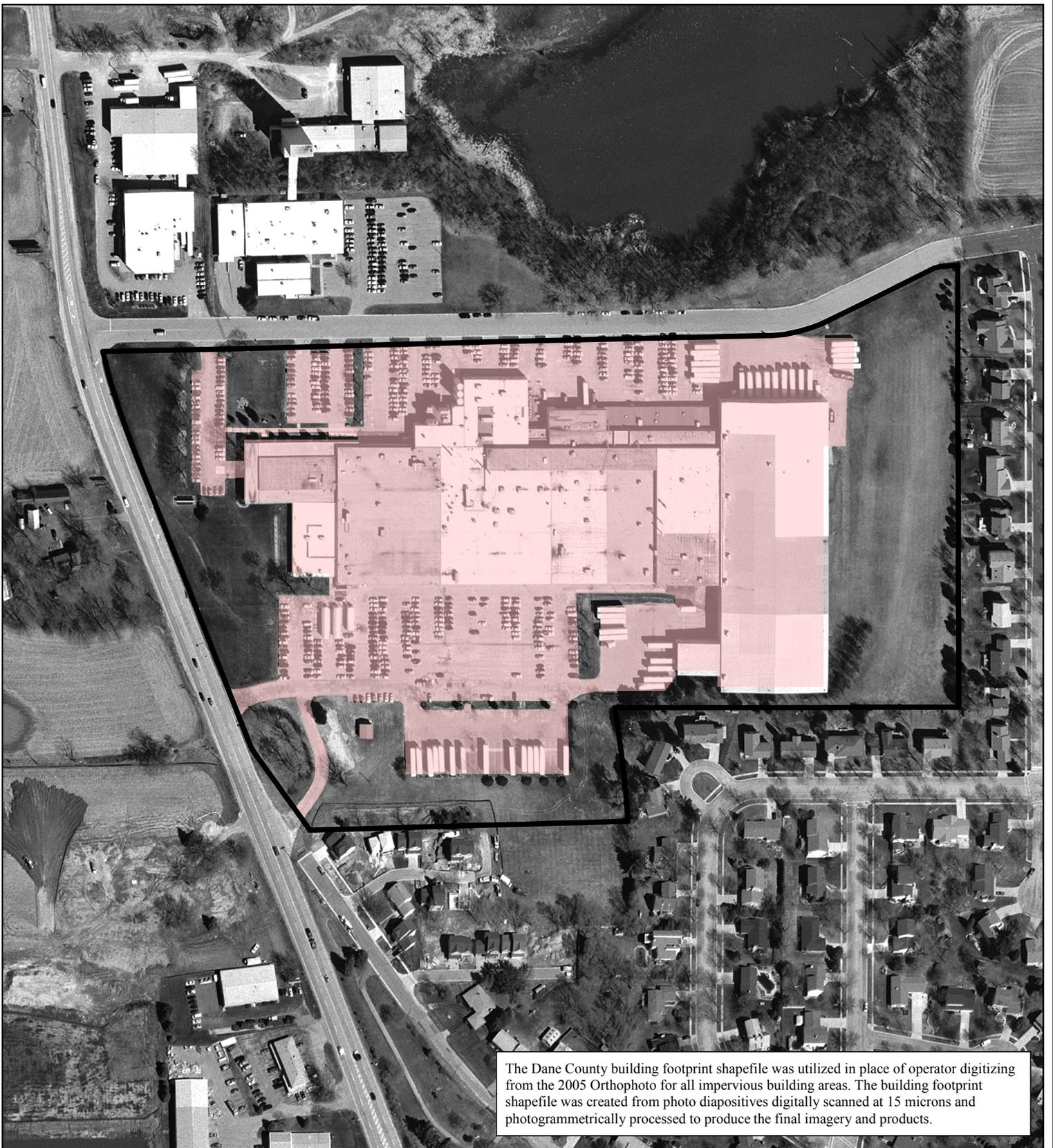
Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Gilson Medical
 Site Area: 14.2 Acres
 Impervious Area: 9.67 Acres
 Estimated ERUs: 200.1

Legend

-  Parcel Boundary
-  Impervious Area





The Dane County building footprint shapefile was utilized in place of operator digitizing from the 2005 Orthophoto for all impervious building areas. The building footprint shapefile was created from photo diapositives digitally scanned at 15 microns and photogrammetrically processed to produce the final imagery and products.

Middleton, WI Stormwater Utility Feasibility Study

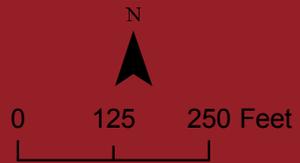
Top Customer Bill Estimates

- Sources
- 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Springs Industries
 Site Area: 27.9 Acres
 Impervious Area: 17.15 Acres
 Estimated ERUs: 354.7

Legend

- Parcel Boundary
- Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

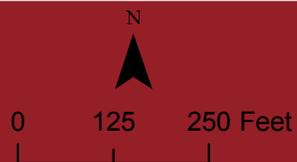
Top Customer Bill Estimates

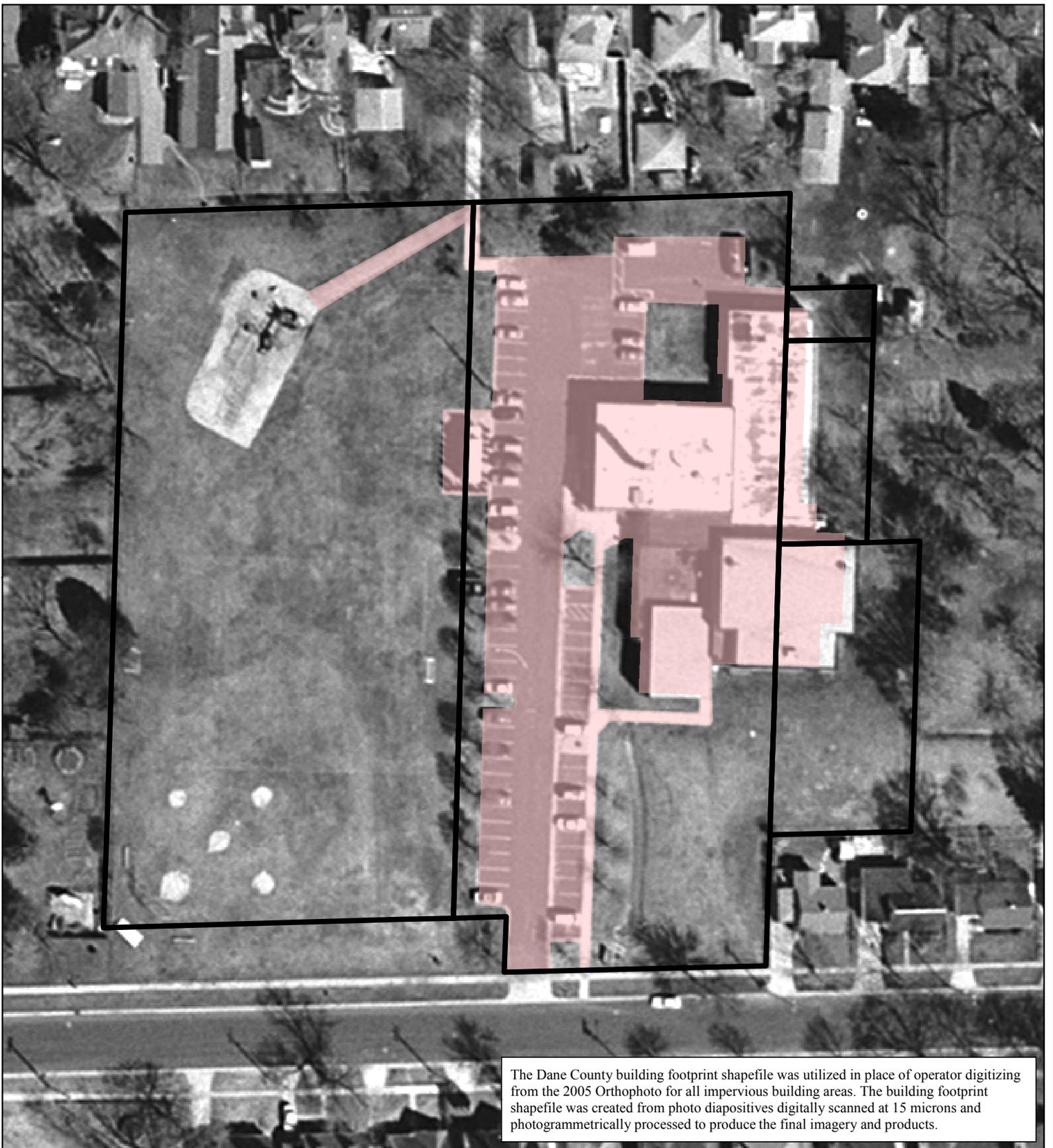
Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: Greenway Station
 Site Area: 40.8 Acres
 Impervious Area: 29.70 Acres
 Estimated ERUs: 614.4

Legend

-  Parcel Boundary
-  Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

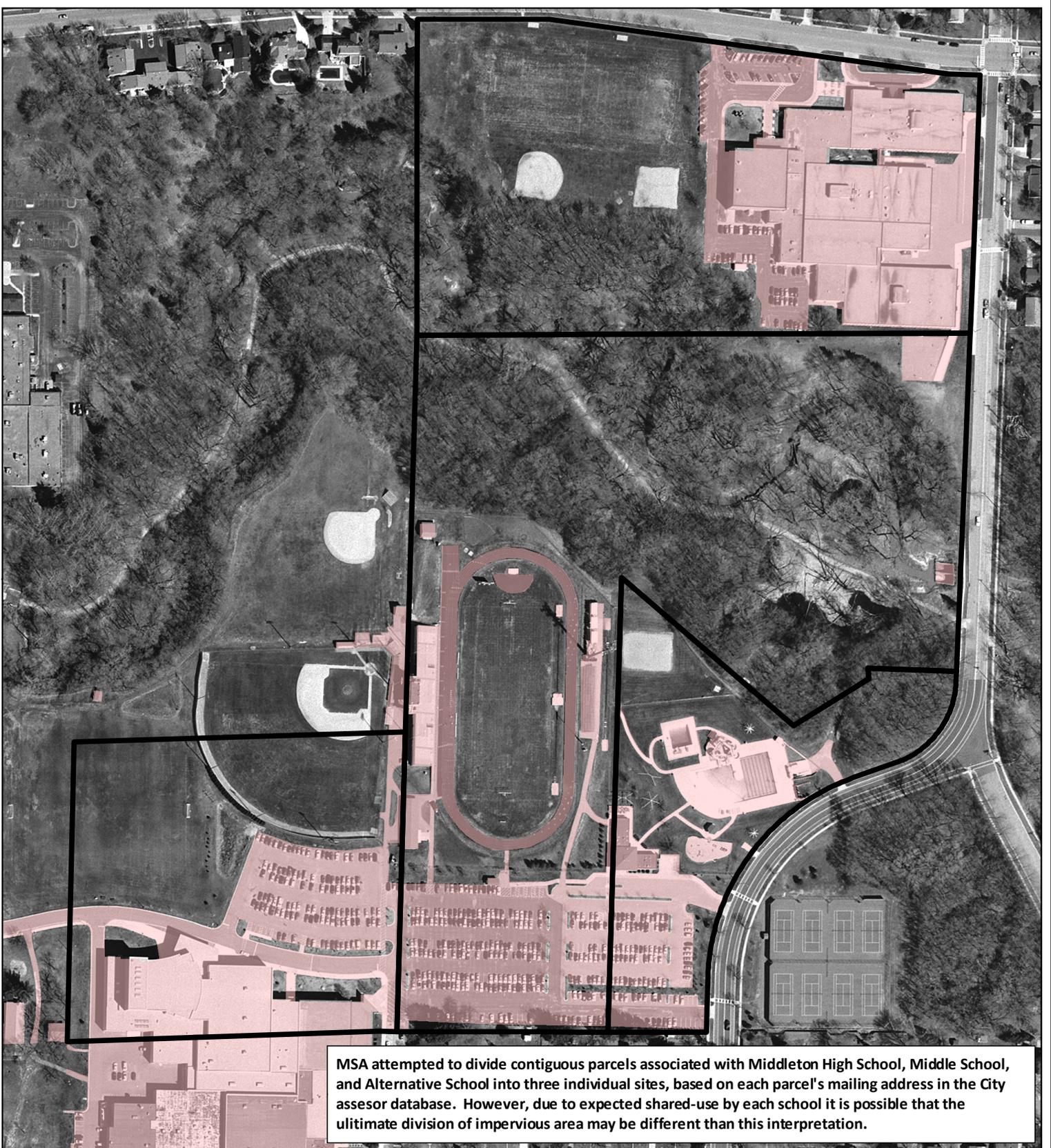
Site Name: School District - Administrative Center
 Site Area: 4.1 Acres
 Impervious Area: 1.22 Acres
 Estimated ERUs: 25.2



Legend

-  Parcel Boundary
-  Impervious Area





MSA attempted to divide contiguous parcels associated with Middleton High School, Middle School, and Alternative School into three individual sites, based on each parcel's mailing address in the City assessor database. However, due to expected shared-use by each school it is possible that the ultimate division of impervious area may be different than this interpretation.

Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: School District - E.G. Kromrey Middle School
 Site Area: 48.8 Acres
 Impervious Area: 15.33 Acres
 Estimated ERUs: 317.2



Legend

- Parcel Boundary
- Impervious Area





The Elm Lawn School site includes some parcels classified as single-family residential. According to City staff, these residential parcels are part of this site. For the purpose of this study, these parcels were treated as non-residential for in the "top 7" sites evaluation, and included as part of the total amount impervious area of this site.

Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

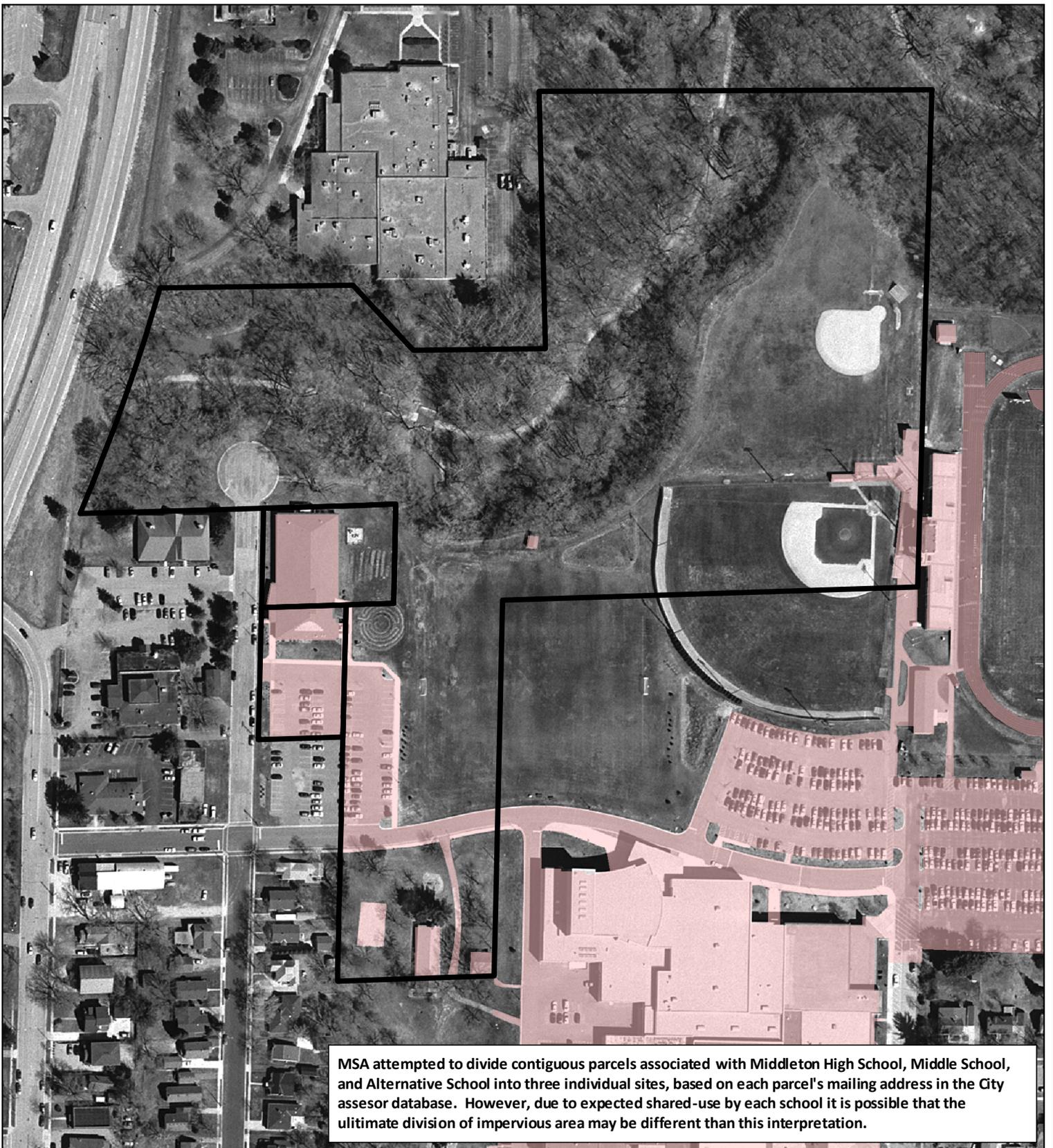
Site Name: School District - Elm Lawn Elementary School Site
 Site Area: 11.8 Acres
 Impervious Area: 4.48 Acres
 Estimated ERUs: 92.7



Legend

- Parcel Boundary
- Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

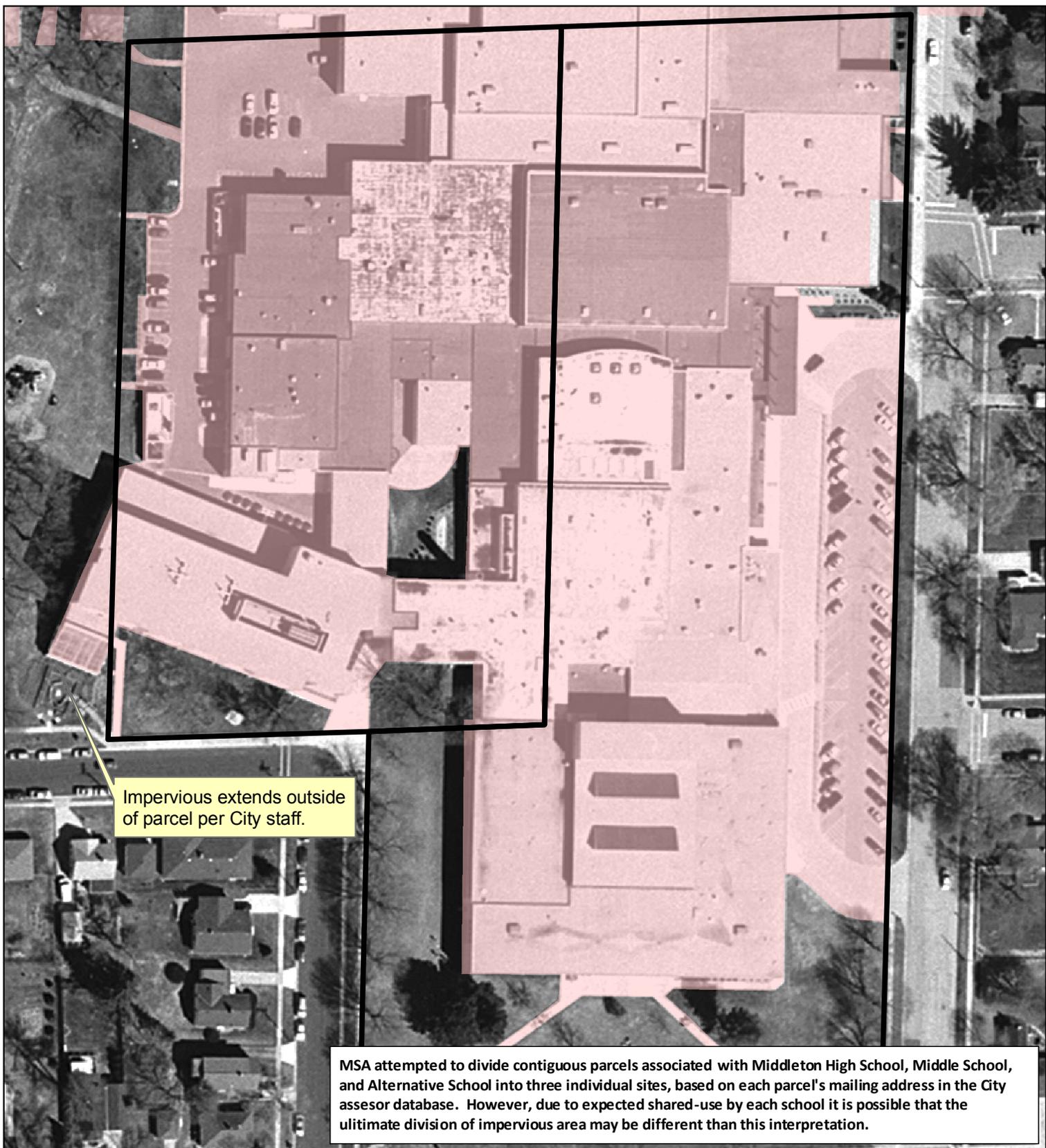
Site Name: School District - Middleton Alternative High School
 Site Area: 19.6 Acres
 Impervious Area: 1.89 Acres
 Estimated ERUs: 39.0



Legend

- Parcel Boundary
- Impervious Area





Impervious extends outside of parcel per City staff.

MSA attempted to divide contiguous parcels associated with Middleton High School, Middle School, and Alternative School into three individual sites, based on each parcel's mailing address in the City assessor database. However, due to expected shared-use by each school it is possible that the ultimate division of impervious area may be different than this interpretation.

Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

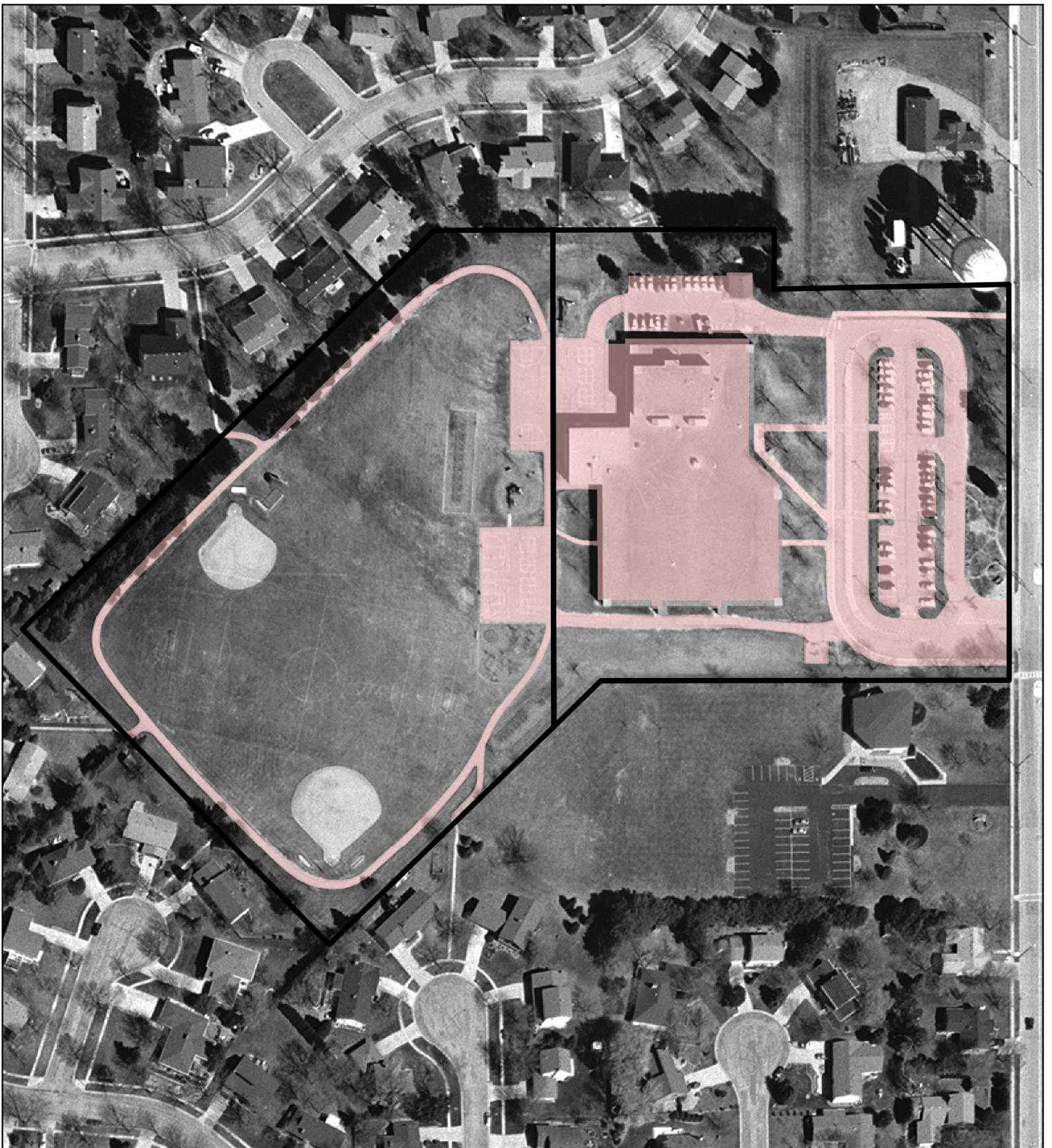
Site Name: School District - Middleton High School
 Site Area: 10.0 Acres
 Impervious Area: 8.01 Acres
 Estimated ERUs: 165.7



Legend

- Parcel Boundary
- Impervious Area





Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: School District - Northside Elementary School
 Site Area: 12.4 Acres
 Impervious Area: 4.02 Acres
 Estimated ERUs: 83.2



Legend

- Parcel Boundary
- Impervious Area





Impervious areas located outside of the site boundaries provided by City staff were not included.

Middleton, WI Stormwater Utility Feasibility Study

Top Customer Bill Estimates

Sources
 - 2009 Dane County Parcels
 - 2005 Dane County Orthophoto
 - 2008 NAIP Orthophoto
 - Dane County Building Footprints

Site Name: School District - Sauk Trail Elementary School
 Site Area: 10.8 Acres
 Impervious Area: 2.62 Acres
 Estimated ERUs: 54.2



Legend

-  Parcel Boundary
-  Impervious Area

