

MILWAUKEE COUNTY LAND INFORMATION COUNCIL

June 2019 Council Meeting

AGENDA

Date: June 4th 2019
Time: 9:00 a.m.
Place: Milwaukee Metropolitan Sewerage District
MMSD, OJ Noer Conference Room
260 W Seeboth St.
Milwaukee, WI. 53204

- I. Roll Call
- II. Minutes from the Council meeting held December 5th, 2018
- III. 2019 Land Information Office Budget Update
- IV. 2019 LIO Workplan Project Updates
- V. **Reports\Activities**
 - 1. 2018 County Surveyor Report
 - 2. 2018 Retained Fees & Grant Report
 - 3. 2020 LiDAR Capture
 - 4. 2020 Imagery Capture
- VI. **New Business**
- VII. **Date, time, and place of next meeting**
- VIII. **Adjournment**

MILWAUKEE COUNTY LAND INFORMATION COUNCIL
December 2018 Council Meeting

Minutes

Date: December 4th, 2018
Time: 9:00 a.m.
Place: Milwaukee Metropolitan Sewerage District
MMSD, OJ Noer Conference Room
260 W Seeboth St.
Milwaukee, WI. 53204

Members Present

Kathy Bach	GIS Analyst, Milwaukee County Register of Deeds, on behalf of John LaFave
Kevin Bruhn	Manager – LIO, Milwaukee County DAS/ECD-LIO
Emily Champagne	GIS Supervisor, Milwaukee Metropolitan Sewerage District
Jason Haas	Milwaukee County 14 th District Supervisor
Cathleen Hollers	Accountant Supervisor, Treasury Accounting Supervisor of Milwaukee County, DAS on behalf of David Cullen
Rob Merry	Milwaukee County Surveyor
Dawn Neuy	Manager, EDMA Support
Nancy Olson	Chief Information Officer, City of Milwaukee, Information and Technology Management Division
Karl Stave	P.E., Principal Civil & Site Engineer, Civil Engineering & Site Development Unit on behalf of Greg High
Zachary Swingen	GIS Specialist, Office of Emergency Management, on behalf of Christine Westrich

Guest and Staff Present

Chelsey Knuth	GIS Technician, Milwaukee County LIO
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- I. Roll Call
Chairman Bruhn called the meeting of the Land Information Council (LIC) to order. Roll call was taken by circulating the attendance sheet.

- II. Minutes from the Council meeting held June 5th, 2018
Champagne noted one amendment to be made to the minutes from the June meeting of the LIC on June 5th, 2018. In the fourth paragraph under

section IV – 2018 LIO Workplan Project Updates, under Emergency Management – NG911, Christine Westrich replaced Nicole Grams in the WLIA taskforce, not the Governor’s subcommittee. Bruhn asked if there were any other corrections on the LIC meeting minutes from June 5th, 2018. None were suggested.

III. Announcement of ICC Rep to Land Information Council

Bruhn noted that he and Christine Westrich from the Office of Emergency Management (OEM) worked together to solicit a representative from the Intergovernmental Cooperation Council (ICC) to be a member of the LIC. Shorewood Village President Rozek has decided to become a member, but was unable to attend the meeting. Her membership will help represent other municipalities in Milwaukee County. Bruhn asked whether there were any questions about the addition of the new ICC representative to the LIC. None were raised.

IV. 2018 Land Information Office Budget

Bruhn highlighted current and projected revenues for 2018. Predicted revenue was \$840,000 from the recording fees at the Register of Deeds. The actual number will likely come in around \$805,000, which is \$35,000 or 5% short. Miscellaneous revenue included work done for the North Shore Fire Department. Operating expenses remain consistent throughout the years, including a cross-charge of the Register of Deeds GIS Analyst position. There is a projected surplus for 2018 just under \$50,000. Changes are reflected in the reserve account and show a total of 1.65-1.7 million.

Bruhn added that the county surveyor and imagery projects have been encumbered and paid, while the vertical datum project has not been paid out but has been encumbered. Bruhn asked if there were any questions on the 2018 LIO budget. None were raised.

V. 2019 Land Information Office Budget

Bruhn reviewed major changes for the 2019 budget.

Bruhn stated that the cross-charge of the Register of Deeds GIS Analyst position has been changed into personal services. He notes that 15% of the budget towards the current healthcare and pension plans, while another 15% goes towards legacy costs. Bruhn has asked for some leeway from the LIO’s budget office, but has not yet received any. He has posed the question of what percentage in a budget is required before an abatement of cost is given. Unlike other departments, the Land Information Office (LIO) is 100% revenue-based.

Bruhn stated that in commodities, contract personal services were increased to reflect true cost of LTE employees and short-term projects.

Champagne inquired why there was a lack of funding for membership dues on the projected 2019 budget. Bruhn explained that it was not by his request, but was overlooked on the performance side by the budgeting office. Bruhn noted that these memberships were for the WLIA and GITA only, and that these memberships are important to maintain. Membership will populate in budget, even if it is a negative amount.

Bruhn asked if there were any additional questions on the 2019 budget. Supervisor Haas inquired about the absence of postage and internet from the projected 2019 budget. Bruhn explained that while packets used to be mailed out, it is now more efficient to send them electronically. Postage is usually used when mailing hard drives. The only internet charge would be for the cloud space needed to store our data and should be a minimal cost. Bruhn asked if there were any further questions on the 2019 budget. None were raised.

VI. Land Information Council Charter and Bylaws

Bruhn drafted a charter and bylaws for the LIC as a task determined at the last LIC meeting. Upon searching for relevant historical documents to inform his drafts, none were found other than a reference to a charter in 1989. The documents include a background of the LIC, including how and why it was created, the statute that implements it, the members, the duties of its members, etc.

Bruhn clarified that some of the duties of LIC members include voting on drafted articles, advising or recommending bylines, and guiding the LIO based on the needs of others in Milwaukee County. Along with the bylaws, the officers and duties were drafted, including terms and vacancies. The Milwaukee Corporation Council reviewed the draft and provided definitions for the LIC. It was written that agencies can appoint their own members. Formal member appointments through the County Board are not required.

Bruhn noted that agendas will be available five full days before meetings and other materials one week in advance, though he will strive to do so two weeks in advance. Minutes from LIC meetings will be distributed within ten business days of the meeting. Bruhn opened the proposal to questions, comments, or revisions. None were raised. Bruhn requested a motion to accept the updated charter and bylaws. The motion was made by Ms. Olson and seconded by Ms. Champagne, and approved unanimously.

VII. 2018 LIO Workplan Project Updates

Bruhn followed-up on the project updates discussed at the previous LIC meeting on June 5th, 2018.

1. Website

Bruhn noted that the new frontend website through Titan is complete and fully functional.

2. Migration to the Cloud

Bruhn explained that Milwaukee County now has a cloud-based infrastructure. To address potential hardware needs, the LIO had set \$40,000 aside, but no cost came to the LIO. Since the migration, the LIO's bandwidth and ability to process throughout and redundancies has grown exponentially. The department has since been able to take on greater throughput and data, as well as plan for disaster recovery.

3. Cityworks

Bruhn mentioned that an update on this will be given at a later time.

4. NextGen911

Bruhn stated that at the June 2018 meeting, this project was noted as 10% complete. This has been moved back to 0%. As communication improves and budget requests are made, there will be a better idea of the major requirements that may take place in this changing system. The State just moved forward with a two-year plan to pursue NextGen911. At this time, exact scope and requirements of the project are uncertain.

Olson inquired as to whether the project has an anticipated end date. Champagne responded that seminars have estimated the entire project, not just the GIS aspect, to take ten years to complete, though that is only speculation until more information about the project requirements are known.

Olson also inquired whether progress on that project will take place in 2019. Bruhn explained that once the project requirements are better understood, there will be progression on the project. There are currently zero data requirements from the State, all that is known is that \$6.4-6.9 million has been dedicated to creating the infrastructure for NextGen911. An educated stipulation about the state parcel initiative would place Milwaukee County in a better place to

implement the program than other counties with fewer resources and the grant could go to support their efforts, though the change is still in the very early stages. Bruhn noted that Minnesota is more than five years into the program and still working on it.

Olson asked whether NextGen911 is being combined with Esinet. Champagne stated yes, and Swingen elaborated that he believes Esinet is the hardware and infrastructure used to implement programs like NextGen911. Olson raised a point of clarification about whether NextGen911 can be implemented without Esinet. Swingen explained that the State will likely implement a grant to encourage municipalities to use a single statewide Esinet instead of individual programs for municipalities or counties. Olson asked whether similar programs besides NextGen911 are available, and Swingen confirmed that while other 911 text options might be available, NextGen911 offers the ability to receive and distribute photos and videos as well.

Bruhn followed-up that it is important to ensure that the dispatch is correct. Unknown portions of the GIS requirements will be discussed at future seminars. Many different levels of government will discuss this program, so it is important to maintain communication.

5. Cadastral Improvements

Bruhn mentioned that this will be discussed in a report.

6. LUCA

Bruhn said that this has been successfully submitted by Milwaukee County and most municipalities, but they have yet to hear back. The statistical analysis will be for the revision of census boundaries. The topic was mentioned at the user group meeting on November 8th, 2018 and then raised at a subsequent meeting with the other municipalities. The City of Milwaukee participates in this, but Milwaukee County does not. Olson noted that she had not heard anything about this prior except a request.

7. Unified Zoning Layer

Bruhn mentioned that a continued goal for 2019 is to have a unified zoning among the municipalities that can be aggregated together and presented.

8. Non-Map

Bruhn mentioned that this project would include having a text look-up apart from the spatial aspect.

9. Data Transformation

Bruhn mentioned that this will be discussed in a report with the vectors.

10. Vertical Datum Transformation

Bruhn said that this project is currently underway and is listed as 75% complete. Its estimated completion is in the beginning of 2019. Bruhn will report on the status of this at the next LIC meeting in June 2019.

Merry noted that the target date to complete the development for a regionwide transformation to NAD 83 is at the end of February.

Bruhn noted that the completion of this will also be the completion of the vertical and horizontal data transformation for the seven counties of SEWRPC from NAD 27 to NAD 83.

11. Orthophoto

Bruhn mentioned that this will be discussed in a report.

12. Sanborn (1894)

Bruhn noted that the Sanborn collection needs to be briefly taken down so that a few small errors can be fixed before it is republished.

13. Land Information Plan

Bruhn asked for questions on the 2018 plan. None were raised.

Bruhn noted that capital for enterprise asset management will conclude at the end of 2018. A GIS Analyst position has been created to support Facilities Management and is paid through Facilities Management. There are currently 107 layers in asset management or enterprise GIS. The collection is just shy of 250,000 assets at present throughout Milwaukee County. An estimated 60,000 service requests will be made each year, and about 10,000 requests have already come in. Senior management is now more aware of the program's GIS basis. Bruhn referenced the snapshots in the distributed documentation.

Bruhn noted that Service sites, collector applications, 3-D views, and inventory management of internal spaces at County facilities are among the current asset management efforts underway at the LIO. Bruhn asked for questions on the topic. None were raised.

Cadastral Report

Bruhn explained that Phase I of the project is 37% complete and is ahead of schedule. The completion rate at the previous meeting in June of 2018 was 5%. This rate is anticipated to slow down once the project moves into more dense areas in and around downtown, and the anticipated completion date for the project is December of 2019.

Merry inquired as to whether this data was referenced to NAD 83. Bruhn confirmed that it is.

Olson inquired as to why the project was being worked on in different areas. Bach explained that four editors are now working on the project, and that the areas currently being worked on around the City's periphery contain less complex data than the quarter sections closer to downtown.

Data Migration

Bruhn recounted that a user group meeting was held on November 8th, 2018 to announce and facilitate the transition of service from NAD 27 to NAD 83 for all Milwaukee County data users. December 31st, 2018 is the designated cutover date. After that date, Milwaukee County will no longer maintain data in NAD 27. It will still be available in archive folders for those who still have use for it.

Merry inquired whether the NAD 27 data will no longer be accessible to Milwaukee County data users. Bruhn clarified that NAD 27 data will be downloadable in Dropbox, but will not be available online. This is not a hard cutoff, but the goal is to encourage movement in the direction of NAD 83 before the next datum comes out in 2022. Bruhn asked for additional questions on the data migration. None were raised.

2018 Ortho and Oblique Capture

Bruhn said that the 2018 imagery has been published. Those services are available to view and download on the website. Going forward, reaching out to the largest consumers of this data for feedback should be a priority so their feedback and data needs can be addressed. The City of Milwaukee represents approximately two-thirds of the ortho and oblique imagery data usage. Their need for higher resolution imagery is already known. Meeting with the City of Milwaukee Assessor's Office will help

oblique accounts be monitored and meet requirements for consumers, even if the interval between oblique updates increases.

Champagne asked, on a related note, whether new Lidar is also included in this imagery. Bruhn explained that it is part of the three-year plan that includes a 2020 flight for new images.

Champagne followed-up with an inquiry as to whether the new imagery would change in resolution. Bruhn confirmed that there will be a change in technology and that it will need to comply with the planning commission. The 2020 flight will not go down in resolution, but at present, details are unknown about whether or how the new technology improves image resolution.

Merry stated that, unlike Geiger, flights could capture 20 points per meter instead of the previous 8 and fly higher than in the past. Data is still unavailable from flights conducted in 2017. At present, it is still difficult to determine how new technology will perform in urban areas, as it was not designed with them in mind. Additionally, emerging technologies like those with dual Lidar scanners might be better than Geiger.

Champagne stated that more requests have come in for 3-D topographic services for use as contour lines, etc. Processing these requests requires greater focus on precision and accuracy. Bruhn agreed that the County, including the engineering department, has had increased requests for 3-D topographic services as well.

Champagne noted that this is especially important given the new rules being implemented that will institute a seven-year interval. Merry confirmed this. Bruhn stated that five-year intervals should be fast enough for current needs. Champagne noted that this is also important given recent changes amongst floodplains in many communities.

VIII. 2019 LIO Workplan

Bruhn mentioned the importance of keeping the planimetric data updated along with the imagery. A major investment was made to do this about a decade ago and it needs to be updated in order to remain useful.

Olson inquired as to whether the updates would be done in-house. Bruhn assured that he would prefer to do so, especially the change detection, but if current workloads do not permit it, a previously used third-party could be contacted to take it on. Olson offered a point of clarification for the Council that the City of Milwaukee went to RFP for building footprints in the past, and were later told by Pictometry that the imagery could not be used. An attorney from the company reached out to state that another vendor's imagery could not be used either. This issue has yet to be fought. Merry inquired as to whether the limitations were put in

place for the Orthographic or Oblique imagery, as the Orthographic imagery is entirely public domain, while the Oblique imagery is proprietary. Olson noted that mention of the Oblique imagery may have been mistakenly included in the correspondence. Bruhn remarked that he has made Oblique imagery available for the public to download.

2020 Imagery and LIDAR

Bruhn mentioned that this is the same as mentioned previously, with 150 listed for imagery and 75 for the Lidar (corrected to 100). He noted that clarification must be made to identify where and who funding will come from.

Merry explained that it will come through planning programs and that money through the commission would be available, with \$200,000 divided amongst the seven counties. This currently takes place every five years, but the commission is considering an increased interval to address Milwaukee County's needs.

NG911

Olson asked whether the end date should be changed to say 2019. Bruhn said he will correct the date.

Cadastral Updates

Bruhn noted that Cadastral updates are expected to run through the end of 2019. The transition from Phase I to Phase II will address more complex issues and require the time and efforts of more senior staff. Each instance could take hours or days to research and correct.

Zoning

Bruhn explained that, as mentioned earlier, this has an expected end date of February 2019. An update will be given at the next LIC meeting in June of 2019. This information is also from the 2017 strategic initiative plan. Bruhn asked if there were any questions about zoning. None were raised.

Vertical Datum Change

Bruhn explained that this project has an anticipated end date of February 2019. A status update will be given at next meeting in June. This is also a carryover from the 2017 strategic initiative plan.

Bruhn asks if there are any questions with the 2019 LIO Workplan. None are raised.

IX. Reports\Activities

1. 2019 WLIP Grant Request

Bruhn noted that this will include the entire document from the State. \$1,000 for attending WLIA and other regional conferences. \$50,000 will be assigned to Lidar for 2020 and carryover. Lidar updates will be done first, in 2019, and imagery will be subsequently collected in 2020. Bruhn asked if there were any questions about the grant request. None were raised.

2. 2019-2021 Land Information Plan

Bruhn recounts that visions and feedback for the plan were requested at the June 2018 LIC meeting. All feedback has been included and is appreciated.

Haas noted that his last name is spelled incorrectly on page 49 of the distributed packet. Hollers noted that her first name is spelled incorrectly on page 49 of the distributed packet. Bruhn noted these mistakes for correction.

Bruhn mentioned that previously used workflows, structure, and technology will all be carried over from the last two-year plan, including the 2020 imagery capture and 2021 planimetric updates. A primary goal of this is to maintain core datasets and revisit the fabric at the project's tail end, once updated technology and maintenance techniques become available. Another goal is to help clarify what the government does and does not own and be able to trace the histories of properties. A pilot project has been completed containing a database to research and track deeds.

Supervisor Haas noted that City of Milwaukee and Milwaukee County maps sometimes have disparities in ownership. Bruhn responded that that is why the continued goals of Milwaukee County include the ability to provide access to as much historical data as is available.

Stave inquired whether this data shows up in the map or if the changes are displayed elsewhere. Bruhn explained that the maps are primarily used for internal processes to help identify gaps in documents. Bruhn asked if there were any further questions on the proposed two-year plan. None were raised.

Bruhn requested a motion to approve the Land Information Plan for 2019-2021. The motion was made by Mr. Merry, seconded by Ms. Bach, and was approved unanimously.

3. **USGS Grant Funds from 2015 Lidar**

Bruhn explained that the Lidar needs to be formatted in a specific manner, and the commission received the grant to take on that task. This is also noted in the 2018 budget under 'Grant List.' This will need to be recorded by Milwaukee County so that it is available to Audit. Bruhn asked Merry if he could elaborate on the process.

Merry explained that the USGS requires data to be in NAD 83 2011. The first step in the process is developing tools for transformations to relate to federal datums. The next step is to relate them to elevation models. This requires lots of processing to be developed and specifications must be met for admission into this program. Metadata will need to be developed relating to the new federal datums and related services. The cleaned-up data was originally delivered to Milwaukee County in 2013.

X. New Business

No new business was mentioned.

XI. Date, time, and place of next meeting

Bruhn announced that the next LIC meeting will take place on June 4th, 2019. Supervisor Haas checked to make sure this time will work and responded affirmatively.

Bruhn inquired as to where the next meeting should take place. Champagne stated that MMSD would be happy to host again.

XII. Adjournment

2018 LIO YTD

		YTD	YE Projected
REVENUES - 2018 YTD			
2018 Record & Filing Fees		\$775,913	\$775,913
2017 Encumbrances Carried Over		\$207,810	\$207,810
2018 Grants		\$63,875	\$63,875
2018 Misc Revenue		\$1,500	\$1,500
	TOTAL	<u>\$1,049,098</u>	<u>\$1,049,098</u>
OPERATING EXPENSES - 2018 YTD			
2018 Actual Expenditures		\$839,662	\$839,662
2018 Encumbrances		\$129,743	\$129,743
2018 ROD GIS Analyst		\$66,369	\$66,326
	TOTAL	<u>\$1,035,773</u>	<u>\$1,035,731</u>
2018 Est. Net Income (Loss)		<u>\$13,325</u>	<u>\$13,367</u>

Fund Balance:		YTD	YE Projected
2017 Year-End Fund Balance*		\$1,604,412	\$1,604,412
2018 Operating Revenues (Shown Above)	+	\$1,049,098	\$1,049,098
2018 Exp + Enc for \$8 Fee Projects	-	\$1,035,773	\$1,035,731
2018 Est Fund Balance**		\$1,617,737	\$1,617,779
2017 Reserve Revenue @ 10%		\$0	\$0
2018 Est Fund Balance YTD - Unrestricted		\$1,590,488	\$1,590,530
2018 Est Fund Balance YTD - Restricted		\$27,249	\$27,249

*2017 YE Fund Balance represents the current amount in reserve as of 2017 YE close.

**2018 Est YTD Fund Balance represents the 2017 YE reserve netted against the actual 2017 expenditures and revenues. This figure will change throughout the year as additional 2018 expenditures and revenues are realized.

NOTE: 2018 expenditures, revenues, and resulting fund balance are year-to-date ONLY. The figures represented in this report are not intended to project a year-end balance for the LIO budget. The purpose of the report is to provide committee members a "financial snapshot" of LIO activities within a specific point in time.

2019 LIO YTD

	YTD	YE Projected
REVENUES - 2019 YTD Through 03/31/19		
2019 Record & Filing Fees	\$160,264	\$840,000.00
2018 Encumbrances Carried Over	\$129,743	\$129,743
2019 Grants	\$1,000	\$51,000
2019 Misc Revenue	\$0	\$0
TOTAL	<u>\$291,007</u>	<u>\$1,020,743</u>
OPERATING EXPENSES - 2019 YTD Through 03/31/19		
2019 Actual Expenditures	\$108,892	\$891,000.00
2019 Encumbrances	\$113,452	\$113,452
2019 ROD GIS Analyst	\$0	\$0
TOTAL	<u>\$222,344</u>	<u>\$1,004,452</u>
2019 Est. Net Income (Loss)	<u>\$68,663</u>	<u>\$16,291</u>

3237
2299
4999

Fund Balance:	YTD	YE Projected
2018 Year-End Fund Balance*	\$1,605,418	\$1,605,418
2019 Operating Revenues (Shown Above)	+ \$291,007	\$1,020,743
2019 Exp + Enc for \$8 Fee Projects	- \$222,344	\$1,004,452
2019 Est Fund Balance**	= \$1,674,081	\$1,621,709
2018 Reserve Revenue @ 10%	\$0	\$0
2019 Est Fund Balance YTD - Unrestricted	\$1,563,916	\$1,511,544
2019 Est Fund Balance YTD - Restricted	\$ 110,165.00	\$110,165

*2018 YE Fund Balance represents the current amount in reserve as of 2018 YE close.

*2019 Est YTD Fund Balance represents the 2018 YE reserve netted against the actual 2018 expenditures and revenues. This figure will change throughout the year as additional 2019 expenditures and revenues are realized.

NOTE: 2019 expenditures, revenues, and resulting fund balance are year-to-date ONLY. The figures represented in this report are not intended to project a year-end balance for the LIO budget. The purpose of the report is to provide committee members a "financial snapshot" of LIO activities within a specific point in time.

**2018 YTD Fiscal Report -
LIO (\$8) - as of 03/31/19**

Vendor Name	Description	Amount Authorized	Amount Paid - Prior Years	Amount Encumbered	Amount Paid 2019 YTD	Canceled Encumbrance	Total Amount Paid (Encumbrances + Actual)	Remaining Unpaid Balance
SOUTHEASTERN WI REGIONAL	County Surveyor	82,916.00	-	82,916.00	-	-		82,916.00
SOUTHEASTERN WI REGIONAL	2018 Authorized Projects Vertical Datum Migration	27,249.00	-	27,249.00	-	-	27,249.00	27,249.00
	TOTAL	\$ 110,165.00	\$ -	\$ 110,165.00	\$ -	\$ -	\$ 27,249.00	\$ 110,165.00

LIO 2019 Workplan Update

TASK	STATUS	COMMENTS	PREVIOUS % COMPLETE	CURRENT % COMPLETE	LAST UPDATE	ASSIGNED TO	START DATE	END DATE	BUDGET	SPENT TO DATE	REMAINING FUNDS	SOURCE
1.) Planimetric Data Update	Not Started	Create change detection product - same process from 2013 and 2015	0	0		LIO	3/1/2019	3/31/2020	\$ 50,000		\$ 50,000	Recording Fees
2.) 2020 Imagery Contract	In Progress	Create contract for 2020 capture	0	50	12/5/18	LIO/SEWRPC	6/1/2019	12/31/2019	\$ 137,286	\$ -	\$ 137,286	Recording Fees - 2020 SI Grant - SEWRPC
3.) 2020 LiDAR Contract	In Progress	Create contract for 2020 capture	0	50	12/5/18	LIO/SEWRPC	6/1/2019	12/31/2019	\$ 99,788		\$ 99,788	Recording Fees -2019 SI Grant
4.) Emergency Management - NG911	In Progress	Requirements coming from State	0	0	12/5/18	LIO/EOM	1/1/2017	12/31/2019	\$ -		\$ -	
5.) Cadastral Improvements	In Progress	Working on multiple areas. Divided into 2 Phases. Cleanup and deep dive errors.	37	82	12/5/18	LIO	1/1/2018	12/31/2019	\$ 150,000	\$ 75,894	\$ 74,106	Recording fees - operating budget
6.) Cadastral Improvements - Phase 2	Not Started	Deep dive phase for complex errors - new map products	0	0		LIO	12/1/2019	12/31/2020	\$ -		\$ -	Current Staffing
7.) Milwaukee County Zoning Data Compilation	Complete	Creating generalized categories	0	100	12/5/18	LIO	3/1/2018	12/31/2019			\$ -	Current Staffing
8.) Non-Map GIS	Not Started	Behind on Project Workplan	0	0		LIO	6/1/2018	12/31/2019	\$ -	\$ -	\$ -	Current Staffing
9.) Datum Modernization - Vertical	In Progress	Technical Processing is underway	0	90	12/5/18	LIO/SEWRPC	6/1/2018	7/1/2019	\$ 50,000	\$ 4,508	\$ 45,492	2017 SI Grant



**DEPARTMENT OF ADMINISTRATIVE SERVICES
DIVISION OF FACILITIES MANAGEMENT
MILWAUKEE COUNTY LAND INFORMATION OFFICE**

633 West Wisconsin Avenue, Suite 903, Milwaukee, WI 53203 (414) 278-3927

MEMORANDUM

TO: Land Information Council
FROM: Kevin Bruhn, Land Information Officer
DATE: May 28, 2019

SUBJECT: Planimetric Data Update

BACKGROUND

The Planimetric data, (pavement edges, building footprints, pervious\impervious surfaces, waterline, utilities, etc.) has historically been updated after each capture of aerial imagery. This project is to refresh the Milwaukee County data that was completed in 2010 and 2013 and last updated in 2015. The update area has been identified at 4.48 square miles or about 2% of the county. It is the intention of the LIO to start this update in-house later in the year. Previous projects were completed with external resources and usually covered 17 square miles or 7% of the county each time.

ACTIVITIES THIS PERIOD: 12/18 - 6/19

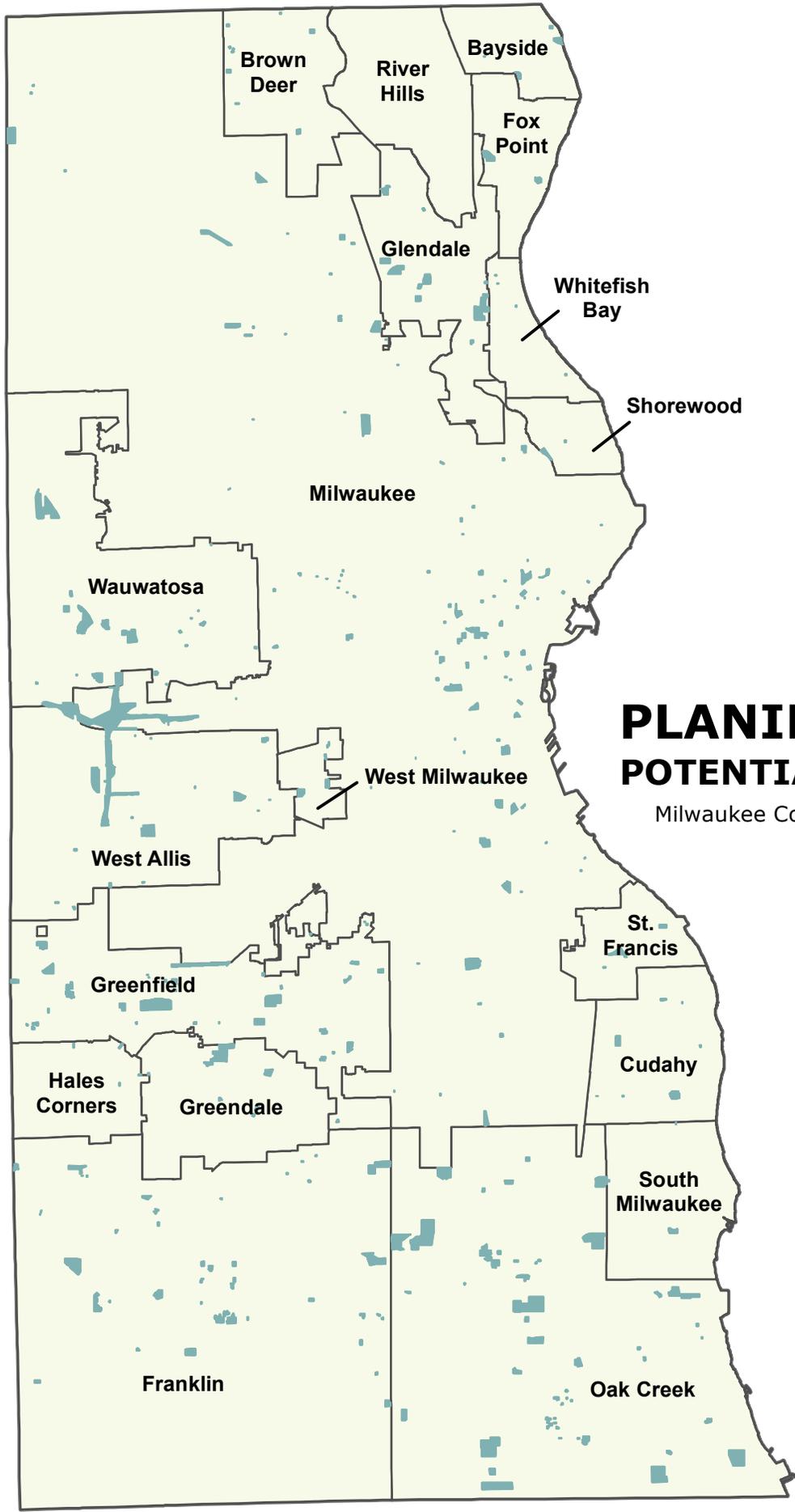
- Performed change detection from 2015 and 2018 imagery and property records
- Created map of change

NEXT

- Create project management documents
- Initiate updates
- Perform quality control

Attached:

Map of update areas
Exhibit of data layers



PLANIMETRIC DATA POTENTIAL UPDATE AREAS

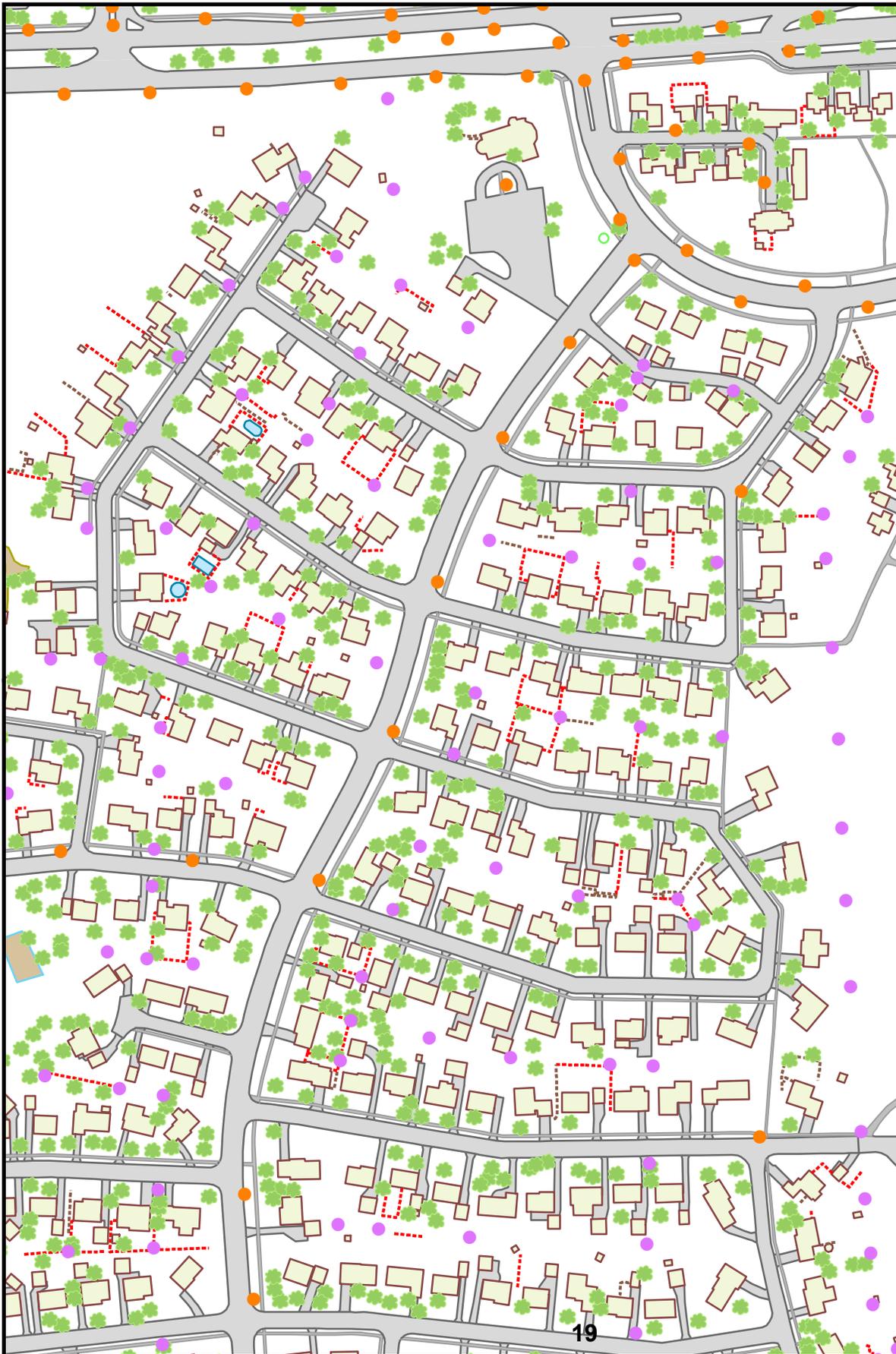
Milwaukee County Land Information Office

- Parcels with Updates
- Municipal Boundaries
- 4.84** square miles of parcels
- 2.0%** of total land area



PLANIMETRIC DATA FEATURES TO BE UPDATED

Milwaukee County Land Information Office



- Utilities Points**
 - Communications Tower
 - Light Pole
 - Power or Telephone Pole
 - Transmission Tower
- Utilities Lines**
 - Communications Tower
 - Pipeline
 - Substation Structure
 - Transmission Tower
- Environmental Points**
 - Marsh Symbol
 - Tree
- Structure Points**
 - Bridge
 - Fence
 - Propane Tank
 - Sign or Billboard Symbol
 - Structure
 - Wall
- Structure Lines**
 - Bridge
 - Concrete
 - Water Features
 - Fence, Guard Rail
 - Pool
 - Ruin Foundation Outline
 - Structure
 - Wall
 - Other
- Park and Recreation Lines**
 - Recreational: Athletic Fields, Courts, Baseball Diamonds
 - Recreational: Bleachers
 - Recreational: Golf Course Related
- Hydrographic Points**
 - Culvert Symbol
 - Water Flow Arrow
- Hydrographic Lines**
 - Culvert Line
 - Hydrography Hidden
 - Water Body
 - Water Line
- Transportation Points**
 - ⊗ Railroad Signal
- Transportation Lines**
 - Railway
 - Paved Road
 - Sidewalk
 - Trail
 - Unpaved Road
- Utilities Polygons**
 - Communication Tower
 - Substation Structure
 - Transmission Tower
- Hydrographic Polygons**
 - Water Body
- Park and Recreation Polygons**
 - Athletic Fields-Courts-Baseball Diamonds
 - Bleachers
 - Golf Course Related
- Transportation Polygons**
 - Paved Road
 - Sidewalk
 - Unpaved Road
- Environmental Polygons**
 - Marsh



**DEPARTMENT OF ADMINISTRATIVE SERVICES
DIVISION OF FACILITIES MANAGEMENT
MILWAUKEE COUNTY LAND INFORMATION OFFICE**

633 West Wisconsin Avenue, Suite 903, Milwaukee, WI 53203 (414) 278-3927

MEMORANDUM

TO: Land Information Council
FROM: Kevin Bruhn, Land Information Officer
DATE: May 28, 2019

SUBJECT: Cadastral Improvements

BACKGROUND

The process of updating the City of Milwaukee Cadastral data was developed 2017. Differences and inconsistencies were noted between the County and City data and a project to standardize this data was created. A pilot project was started in mid-October of 2017 that looked at 6 quarter sections throughout the City to set a foundation for the project. The findings in the pilot project were consistent throughout the 6 quarter sections and staff determined that it would be feasible to move forward on a County wide project. This project now focuses on the annotation, cartographic lines, geometry issues, and will note additional concerns.

- The annotation cleanup will address such items as varying placement of annotation, overstrikes, spacing, easement, and missing data.
- The cartographic lines will focus on removing the duplicate lines, correcting the subtypes in attributes tables, fixing and the location of lines, and addressing the easement details.
- The geometry issues will focus on the misaligned lines and polygons for Certified Survey Maps, Condominiums, and Subdivisions Plats for current data and historical data.

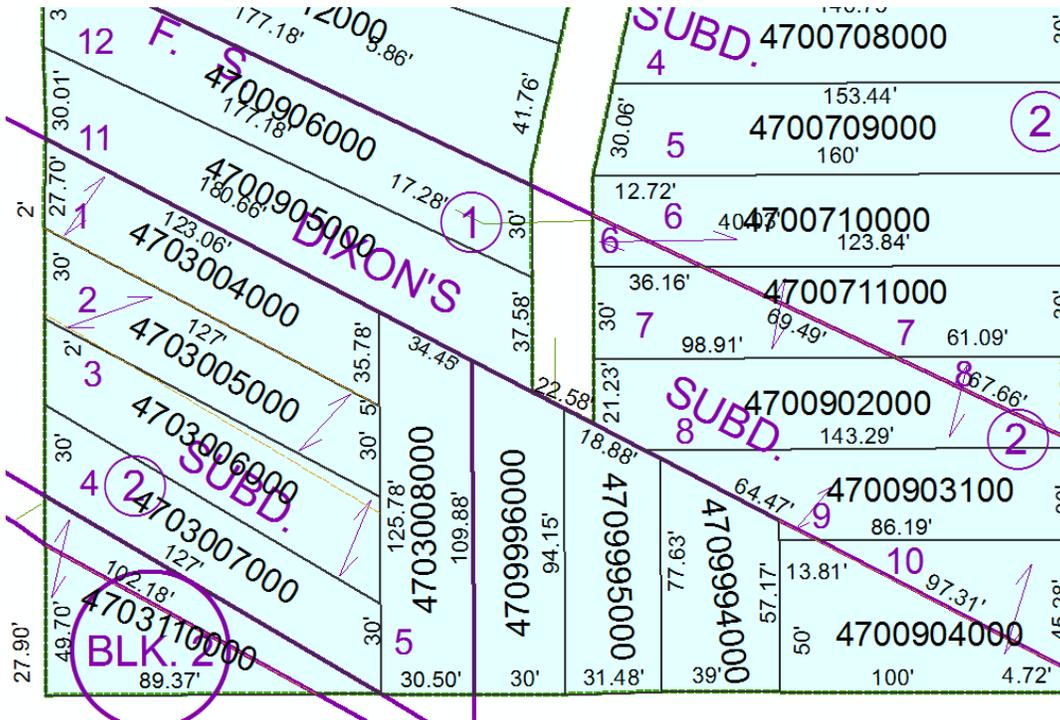
The final part of this project will quantify additional efforts needed by the staff to address specific problem areas like city and county owned land, editing the Condominium data for consistency, editing of Subdivision and Certified Survey polygons, issues with the parcel data, and right of way line work. All line work changes are validated from recorded deeds and documents. Documents that are used are being attached to the changes for historical reference. The time that is needed to fully research line work changes for phase 2 will be very meticulous and time consuming. A proposed project schedule will be developed near the end of phase 1.

ACTIVITIES THIS PERIOD: 12/8 – 6/19

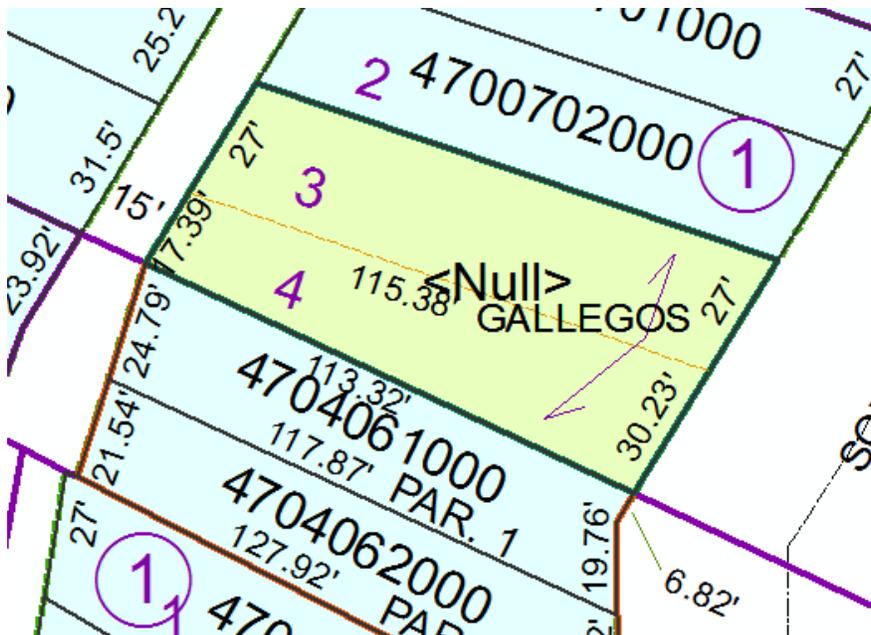
- 449 of 547 (82%) Sections have been completed
- 331 Phase 2 errors identified

Attached: Progress Report
Examples of items and tasks

Examples of areas to be cleaned up.



Subdivision Annotation and Cartographic tie lines



Condominiums

City of Milwaukee Cadastral Update Status

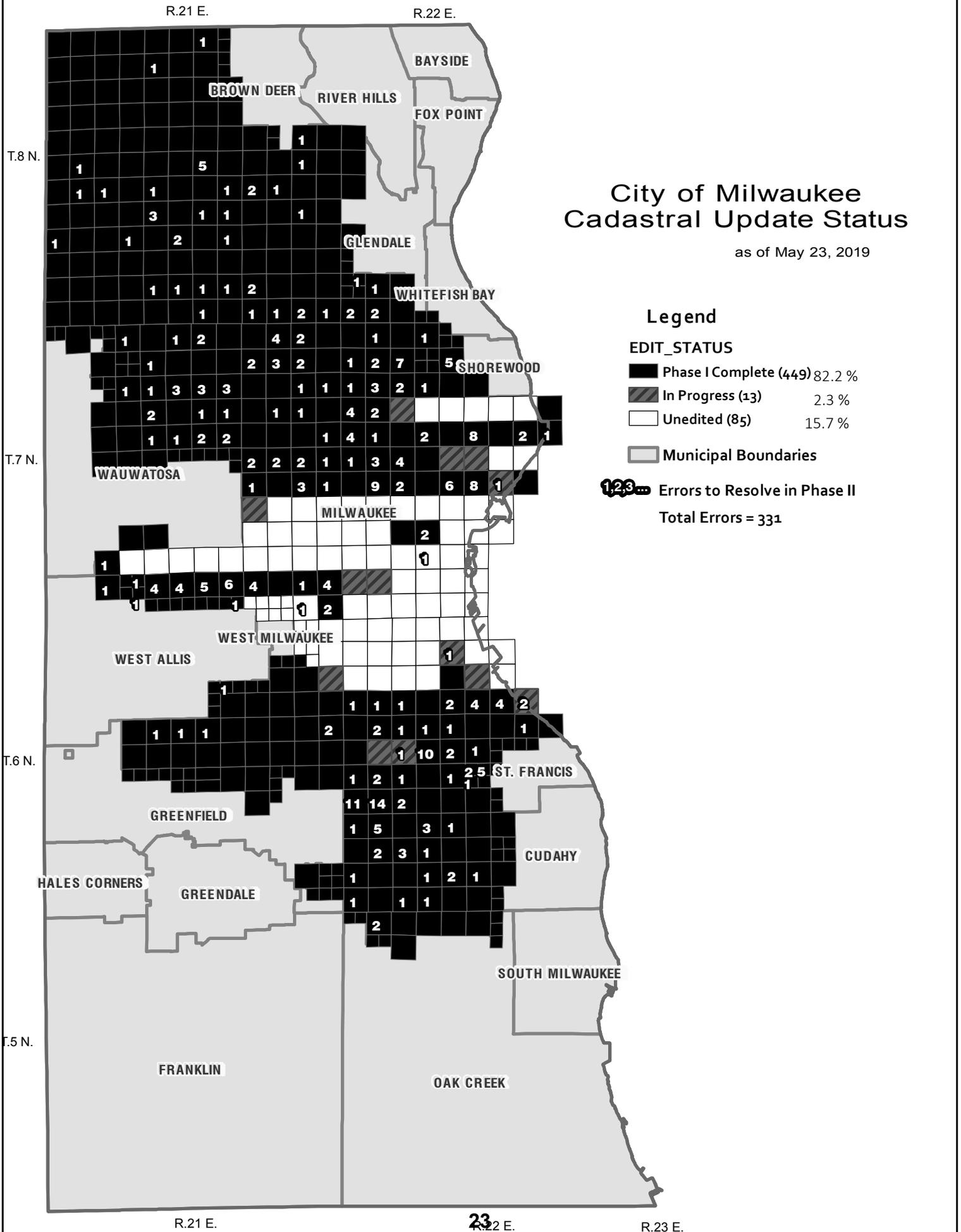
as of May 23, 2019

Legend

EDIT_STATUS

- Phase I Complete (449) 82.2 %
- In Progress (13) 2.3 %
- Unedited (85) 15.7 %
- Municipal Boundaries

123 Errors to Resolve in Phase II
Total Errors = 331





**DEPARTMENT OF ADMINISTRATIVE SERVICES
DIVISION OF FACILITIES MANAGEMENT
MILWAUKEE COUNTY LAND INFORMATION OFFICE**

633 West Wisconsin Avenue, Suite 903, Milwaukee, WI 53203 (414) 278-3927

MEMORANDUM

TO: Land Information Council
FROM: Kevin Bruhn, Land Information Officer
DATE: May 28, 2019

SUBJECT: Zoning Data Consolidation

BACKGROUND

The Land Information Office has consolidated the parcel zoning data from the municipalities within Milwaukee County. The zoning codes and descriptions vary from municipality within Milwaukee County and this effort was to bring in all of these datasets together to create a seamless coverage. Most zoning categories are able to be aggregated except for residential categories. There is not a consistent method for reporting residential properties. There is a mixture of 1-family, 2-family, general residential, and combined 1 and 2 family residential. At this point, there is not a way to combine this category in a more consistent report.

At this time, the data will not be distributed or submitted to the State of Wisconsin but will be made available as a service and viewing on the Milwaukee County GIS website.

ACTIVITIES THIS PERIOD: 12/18 - 6/19

- 16 of 18 municipalities have zoning zones. 2 municipalities are tied to the parcel
- 305 individual codes aggregated down to 19 categories
- GIS data layer representing generalized zoning

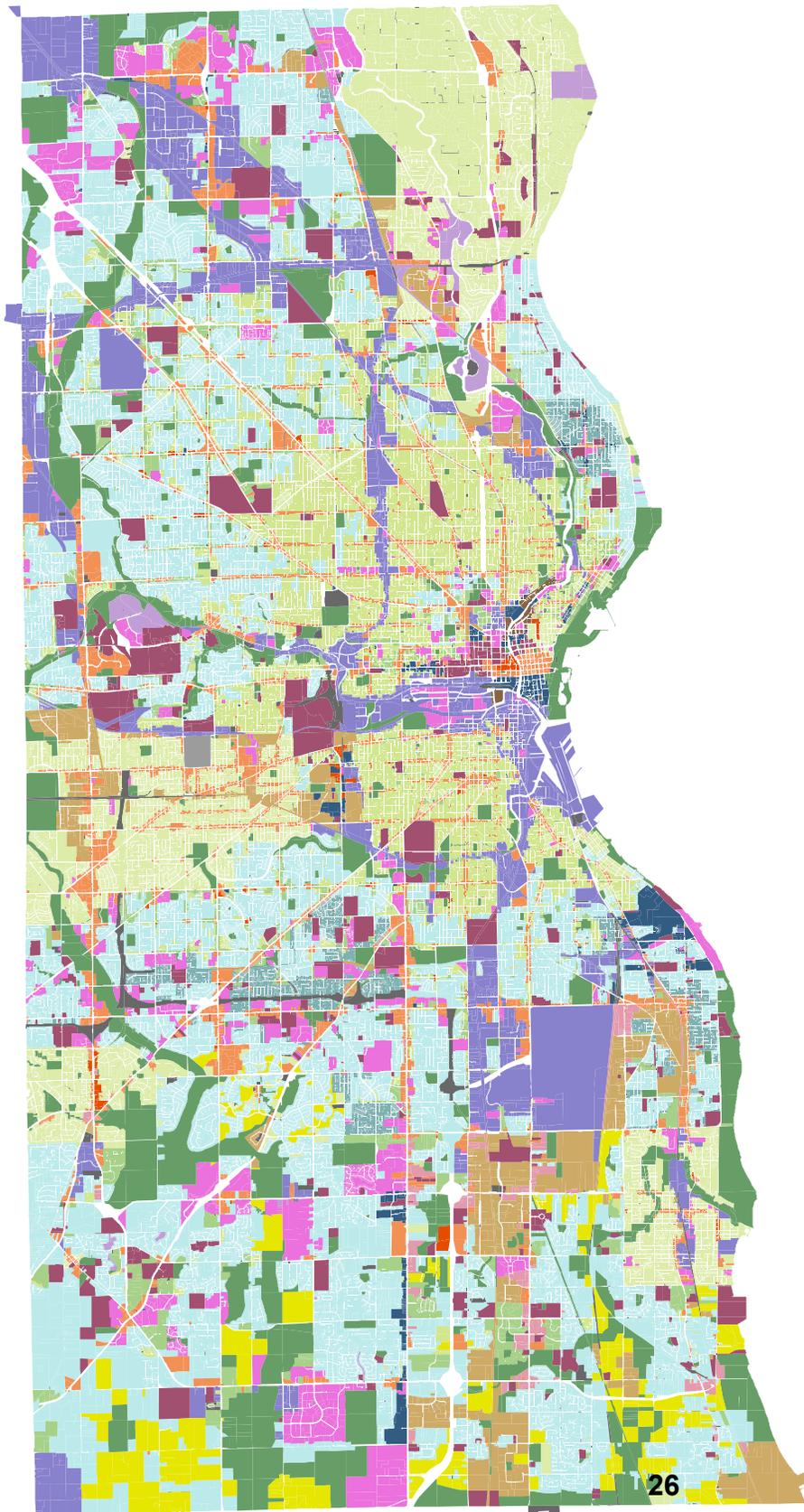
General Zoning Category	Zoning Code Count	Unique Zoning Codes
Commercial or Business Park	62	6, B1, B-1, B2, B-2, B3, B-3, B4, B-4, B-5, B-6, BP, C1, C-1, C2, C-2, C-3, C4, C-4, C9F, C9F(A), C9F(B), C9F(C), CO, CS, D, D-1, F, LB1, LB2, LB3, O, RB1, RB2, RO, SP-RP, VB
Residential: 1-Family	44	1, 1A, 2, R1, R-1, R1-15, R1-6, R1-9, R-1A, R-1E, R2, R-2, R2A, R3, R-3, R3A, R-3E, R4, R-4, R-5, R-6, RS1, RS-1, RS2, RS-2, RS3, RS-3, A, A-1, A-2, A-3, B, C, C9A, C9A(A), C9A(B), ER, R-1, R-2, R-3, R-4, R-5, R-7, R-7A, R-8, R-A, RA-1, RA-2, RA-3, RA-4, R-B, RB-1, RB-4, 4A, C9D, C9D(A), C9D(B), CC, E, F, I, I-1, IU, P-1, P-2, S-1, SP-INS, SP-MED, SP-PUB, TL
Residential	42	
Institutional	22	
Residential: Multi-Family	22	5, MFR1, MFR3, R4, R8, R-8, R-9, RM1, RM-1, RM2, RM-2, RM3, RM-3, RM4, RM5, RM6, RM7, Rs-5
Planned Development	18	9, B1, B-4, BPD, DTSMUPDD, OVPD, PD, PDD, PDD-1, PDD-2, PUD, RPD
Industrial	16	IC, IH, IL, IL1, IL2, IM, IO, IO1, IO2, M1, M-1, M2, M-2
Manufacturing	14	C9H, Lm-1, M, M1, M-1, M-2
Mixed Use	14	B-2, B-3, B-4, B-5, B-7, C9B, C9B(A), C9B(B), C9G, R3, R4, R5,
Parks	13	P, P-1, P-3, PK, PR, SP-POS
Retail	10	B-1, B-2, B-3, B-6, C-1, C9C, C9E, NS1, NS2
Residential: 1- and 2-	9	R2, R3, R3A, R4, R4A, R5, R-6, RD-1, RD-2
Residential: 2-Family	9	3, R2, R-7, Rd-1, RT1, RT2, RT3, RT4
Transportation	9	7, B-3, B-4, B-5, C3, P-1, SP-PKG, TUC-1
Environmental	6	C-1, FW, G, M-3, SP-CON
Agriculture	4	A, A-1, A-2
Other	3	8, SF, VARI
Unknown	2	PENDING, X
Redevelopment	1	RED
Total	320	

General Zoning Category	Taxkey Count
Residential: 1-Family	109,519
Residential: 2-Family	74,073
Residential	35,924
Commercial or Business Park	13,427
Residential: Multi-Family	12,786
Planned Development	12,658
Residential: 1- and 2-Family	10,210
Industrial	4,605
Mixed Use	1,980
Manufacturing	1,361
Parks	1,164
Institutional	835
Retail	666
Transportation	521
Redevelopment	499
Agriculture	358
Unknown	265
Environmental	59
Other	17
Total	280,927



Milwaukee County Zoning Categories by Parcel

Milwaukee County Land Information Office



Zoning Categories

-  Agriculture
-  Commercial or Business Park
-  Environmental
-  Industrial
-  Institutional
-  Manufacturing
-  Mixed Use
-  Other
-  Parks
-  Planned Development
-  Redevelopment
-  Residential
-  Residential: 1- and 2-Family
-  Residential: 1-Family
-  Residential: 2-Family
-  Residential: Multi-Family
-  Retail
-  Transportation
-  Unknown

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

W239 N1812 ROCKWOOD DRIVE • PO BOX 1607 • WAUKESHA, WI 53187-1607

TELEPHONE (262) 547-6721
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MEMORANDUM

TO: Mr. Kevin W. Bruhn, GIS Manager-Land Information Officer

FROM: Robert W. Merry, PLS, Milwaukee County Surveyor

DATE: February 13, 2019

SUBJECT: MILWAUKEE COUNTY SURVEYOR ACTIVITIES—2018

This memorandum is intended to provide the GIS Manager-Land Information Officer with a report on the work of the Milwaukee County Surveyor in the calendar year extending from January 1, 2018, through December 31, 2018. The office and the duties and functions of the County Surveyor are prescribed by Section 59.45 of the *Wisconsin Statutes*. In Milwaukee County the necessary work, pursuant to the direction of the County Board, was funded by document recording fees retained by the County pursuant to Section 59.43(2) of the *Wisconsin Statutes*. Since the Milwaukee County Land Information Office is charged by contract with administering these retained recording fees, a report to the Council on the activities of the County Surveyor is in order.

Within Milwaukee County, the U.S. Public Land Survey System has been combined with the State Plane Coordinate System and the National Geodetic Vertical Control System to provide the high order horizontal and vertical control survey network required for the preparation and maintenance of the large-scale topographic and cadastral maps. Therefore, the work of the Milwaukee County Surveyor entails not only the maintenance of the U.S. Public Land Survey System as such, but also the maintenance of the horizontal and vertical control survey network. Consequently, the work requires expertise in geodetic, as well as plane surveying, and in the legal aspects of property boundary determination.

Attachment 1 to this memorandum consists of a map of Milwaukee County on which are shown the location of all of the corners of the U.S. Public Land Survey System for which various types of perpetuation activities were undertaken in calendar year 2018. These activities involved the replacement of monuments marking the location of section, quarter section, center of section, witness and meander corners which were reported as damaged, disturbed, or destroyed, by construction, or other activities or actions. The work involved the setting of new monuments; and, as necessary, the replacement of attendant witness marks and benchmarks, the verification or establishment of new State Plane Coordinate values for corner monuments, and elevations for benchmarks. A total of eight corners required the reestablishment of vertical control survey reference benchmarks which in turn created the need for the Commission staff to complete about 9.5 miles of high order differential level lines. New records of U.S. Public Land Survey control station records – dossier sheets – were prepared for each remonumented corner shown on Attachment 1.

A copy of each completed new dossier sheet is provided in Attachment 2 to this memorandum. As indicated on Attachment 1, a total of 18 U.S. Public Land Survey corners were involved in the perpetuation activity from January 1, 2018, through December 31, 2018. In some cases, the perpetuation activity resulted in revised elevations for both the corner monuments concerned and the attendant benchmarks. In such cases, control survey summary diagrams were updated to reflect those changes. A copy of each of the revised diagrams concerned is herewith provided as Attachment 3.

Perpetuation of the corners included, where possible and necessary, the setting of preconstruction witness marks for the corners; remonumentation of the corners; the conduct of high order vertical control surveys to establish the elevations of the corner monuments and of accessories thereto, and the preparation of new dossier sheets for the corners. Where necessary, high order global positioning system (GPS) or conventional traverse surveys were conducted to reestablish, or verify, the state plane coordinate positions of corners.

Preconstruction field work was also completed for 40 U.S. Public Land Survey corners that were expected to require perpetuation due to street and highway or utility reconstruction proposed to be carried out in 2018. These corners are identified on Attachment 1 by open circles. This work included inspection of proposed construction limits at the corner locations; the setting and the measurement of distances to temporary witness marks located outside of the anticipated construction limits; and the transfer of reference benchmark elevations to stable benchmarks set outside of the anticipated construction limits.

It should be noted that, in accordance with Milwaukee County policies relative to the participation and use of disadvantaged business enterprises in the provision of County services, a contract was entered into with the firm of Dakota Intertek Corporation of Milwaukee, Wisconsin--a minority owned firm--to provide assistance to the County Surveyor pertaining to the maintenance of the U.S. Public Land Survey System. More specifically, the contract provided for assistance in the remonumentation of broken or substandard concrete monuments marking the location of corners pertaining to the system. The contract specified nine such monument locations where the contractor was instructed by the County Surveyor as to what type of work was to be performed and the specifications that were to be followed. After completion of such work, the County Surveyor performed an inspection of the monument installations, all of which were found to be in compliance with the specifications governing the work. Payment was made to the contractor in the amount of \$17,106.00 on October 6, 2018. This amount constituted 20.6 percent of the total cost of the County Surveyor services, thus exceeding the goal established by Milwaukee County for the participation of a disadvantaged business enterprise in this regard.

Pursuant to State Statutes, Professional Land Surveyors must provide copies of all plats of surveys other than land subdivision plats and certified survey maps conducted within the County to the Office of the County Surveyor for filing. Through December 31, 2018, the County Surveyor received, indexed, and filed 1,050 copies of new land surveys completed in 2018 within the County, bringing the total number of records of land surveys completed within the County, which have been filed with the County Surveyor since the inception of this work in 1984, to 101,341. The filed records are indexed to permit retrieval by name of the surveyor concerned, the property owner concerned, the address of the property concerned, if shown on the plat, the date of the survey plat, the civil division, and the U.S. Public Land Survey Township and Range, and Section and one-quarter section within which the plat is located.

In 2012, the County Surveyor assisted staff in the coordination of an annual program to update the Milwaukee County website in order to incorporate the copies of new land surveys received during the year and those to be received in subsequent years. In 2018, the Land Information Office staff produced digital scans of 1,050 hardcopies, and merged the new files with the existing files to create a total of 101,341 plats of survey that have been filed with the County Surveyor as of December 31, 2018. The purpose and intent of this project was to create a single digital database from the separate databases maintained by the Office

of the County Surveyor and the Milwaukee County Land Information Office to allow the digital images of the plats of survey to be accessed by the public through the Milwaukee County Interactive Map website.

In 2017, Milwaukee County under a separate agreement with the Commission converted the State Plane Coordinate positions of all 1,134 USPLSS or System corner monuments within the County from the legacy datum of the North American Datum of 1927 (NAD27) to the new datum of North American Datum of 1983 with the National readjustment of 2011 (NAD83(2011)). This conversion was completed using the procedures set forth in Appendix C of the SEWRPC Addendum Memorandum Report No. 206, *Revised Estimate of the Costs of Converting the Legacy Datums within the Region to the New National Datums*. The results of this conversion concluded that the horizontal datum conversion procedures developed by the Commission staff provided an accurate and cost-effective technique supporting the conversion of the legacy horizontal datum in use within the Region to the presently promulgated Federal datum – NAD83(2011). Independent field observation demonstrated that the converted State Plane Coordinate positions of the monumented County survey control network met Third Order, Class I Standards—providing linear distance closures of 1 part in 10,000 or better. These results from this conversion can be found in SEWRPC Technical Report No. 53, *Conversion of Horizontal Survey Control Network in Milwaukee County from Legacy Datum to New Federal Datum*. Each of the 1,134 USPLSS or System corner monuments were updated and a new “Record of U.S. Public Land Survey Control Stations” – so called dossier sheet – containing survey control station referenced to both the NAD27 and NAD83(2011) datums.

In the fall of 2018, the Commission commenced a Region-wide vertical conversion program going from the National Geodetic Vertical Datum of 1929 (NGVD 29) to the North American Vertical Datum of 1988 (NAVD 88) with completion expected in early 2019.

In conjunction with the horizontal and vertical conversion efforts, the Commission continues to assist Milwaukee County Land Information Office with the conversion efforts of all existing geospatial base mapping services to the new Federal datums. The assistance includes both training in software that permits the horizontal and vertical conversion of base mapping, raster, point (i.e., LiDAR), and vector data layers along with necessary documentation of the above procedures.

* * *

RWM/md
Milwaukee County Surveyor Activities 2018 (00240464-2).DOC

Enclosures

cc: Ms. Marcia G. Cornell, P.E., Manager of Central Drafting and Records, City of Milwaukee
Department of Public Works
Mr. Gregory G. High, P.E., Director, Architectural, Engineering and Environmental Services,
Milwaukee County DAS-FM
Mr. Daniel R. Talarczyk, Survey Services Supervisor, Milwaukee Metropolitan Sewerage District
Ms. Mary Dziejwiontkoski, Project Programming, City of Milwaukee



Wisconsin Land Information Program County Retained Fee/Grant Report

Instructions:

If your county has accepted a grant under s. 16.967(7) WIS STATS or retained any fees under s.59.72 (5) WIS STATS, submission of this report to the Wisconsin Department of Administration, Division of Intergovernmental Relations is required by June 30th of the following year in accordance with s. 59.72(2)(b) WIS STATS.

County Milwaukee	County FIPS 079	Recording Period:	
		From Jan. 1, 2018	To Dec. 31, 2018
Name of Land Information Officer Kevin Bruhn		Email Address kevin.bruhn@Milwaukeecountywi.gov	Phone Number 414-278-3927

1. Amount awarded in WLIP grants under s. 16.967(7) Wis. Stats. in the reporting period (Jan. 1 – Dec. 31, 2018)	\$ 51,000.00
2. Amount of document recording fees retained under s. 59.72(5) Wis. Stats. for land information in the reporting period at \$8 per document (Jan. 1 – Dec. 31, 2018)	\$ 778,680.00
3. Total amount of grants and retained fees provided through the WLIP in 2018	\$ 829,680.00

<p>Brief narrative or bulleted summary of 2018 land information activities, including relevant web-links:</p> <ul style="list-style-type: none"> • Orthophotography/Oblique imagery capture from Eagleview Technologies • Completed 50% of the cadastral improvements for the City of Milwaukee • Cadastral updates for all 19 municipalities of Milwaukee County • Quarterly aggregation and compilation of address and cadastral mapping updates, maintained by Milwaukee County and the City of Milwaukee, data is made available on public website. • Facilitated the 17th Milwaukee Municipal GIS Users Group (MMGUG) Meeting, November 8th • Conducted June, and December Land Information Council Meetings. • Georeferenced 1894 Sanborn mapping • Integration of eRTR DOR data with Fidlar parcel ownership information for published quarterly updates • Vertical Datum Migration from NAD27 to NAD83 • Data and service migration from NAD27 to NAD83 • Completed Charter and Bylaws for the Milwaukee County Land Information Council • Participated in the Census Bureau LUCA program
--

**Wisconsin Land Information Program
County Retained Fee/Grant Report – Continued**

Land Info Spending Category ▼	Project Title(s) Expand the height of rows if you have multiple projects in a spending category. Row height will automatically expand as you type. Do not delete rows. Add rows only for "Other."	Land Info Plan Citations Page number or section reference	Project Cost Note unit cost and project total for each project	Total Cost for Spending Category (ONE total per Spending Category)
Digital Parcel Mapping	Cadastral Maintenance: All 19 Municipalities Cadastral Improvements – City of Milwaukee	LRM: 2015, II.P7	\$129,235.85 2 FTE \$41,152.65 LTE	\$170,388.50
PLSS	Milwaukee County Surveyor Services Vertical Datum Modernization – NAD 83	LRM: 2015, II.P6	\$82,916 \$27,249 (SEWRPC)	\$110,165
Other Parcel Work (e.g., ROD indexing)	Plat of Survey parcel index maintenance	LRM: 2015, II. P8	1,125 Platt Scans @ \$.33 per	\$371.25
LIDAR	LP360 Software Renewal	LRM: 2015, II. P9	\$936.28	\$936.28
Orthoimagery	2018 3" Ortho/Oblique Imagery	LRM: 2015, II. P10	\$37,286	\$37,286
Address Points	Enterprise Address System	LRM: 2015, II. P10-11	.25 FTE	\$19,717.50
Street Centerlines	Street Centerline Maintenance	LRM: 2015, II. P10-11	.25 FTE	\$19,717.50
Software	Latitude Geographics GeoCortex ESRI Geocue - Blue Marble	LRM: 2015, III. P18	\$6,853.75 Latitude \$38,459 ESRI \$449.10 BlueMarble	\$45,761.85
Hardware	MCLIO Infrastructure Administration, Infrastructure and Hardware purchases Including Cross Charge	LRM: 2015, III. P17-19	\$92,083 1 FTE \$34,018.65 Charges \$1,154.22 Hardware	\$127,255.87
Website Development/ Hosting Services	LIO Website support, GIS Website support - HTML5	LRM: 2015, IV. P20	\$78,870 .5 FTE	\$39,435
Administrative Activities and Management	Milwaukee County Land Information Office (MCLIO) Operations and Project Management, Fiscal Management & Staffing, Data Requests, Dept Admin, legacy costs and overhead costs	LRM: 2015, III. P17-19	\$97,820 1 FTE \$1,154.22 Supplies \$34,018.65 Admin \$116,547.56 Legacy	\$233,671.59
Training and Education	esri Developers Summit, WLIA Annual and Regional, Metro Milwaukee User Group	LRM: 2015, III. P17-19	\$536.13 WLIA \$2,898.51 esri Dev \$200 User Group	\$3,998.95
Other (specify in second column)	1894 Sanborn fire insurance mapping - georectification, mosaic and service		\$23,726 .5 Intern	\$11,863
TOTAL				\$ 831,897.86
Amount of retained fees and grants spent on land records modernization in the reporting period Total may be more or less than the amount of grants awarded and fees retained in 2018 (if carried over from year to year)				
Amount of retained fees and grants carried forward to calendar year 2019 from previous years				\$ 1,605,418.29



**DEPARTMENT OF ADMINISTRATIVE SERVICES
 DIVISION OF ECONOMIC DEVELOPMENT
 MILWAUKEE COUNTY LAND INFORMATION OFFICE**

633 West Wisconsin Avenue, Suite 903, Milwaukee, WI 53203 (414) 278-3927

MEMORANDUM

TO: Land Information Council
FROM: Kevin Bruhn, Land Information Officer
DATE: May 28, 2019
SUBJECT: 2020 LiDAR Capture

BACKGROUND

Milwaukee County has been collecting Light Detection and Ranging, LiDAR, in intervals of 5 year acquisitions. This has been done in 2010 and 2015. A 2020 collection is a continuation of this program. One notable change in for this collection is the resolution of the data. Previous collections were done at 1.7 points per meter. This acquisition will be at 30 points per meter.

This will allow the county, its partners, and private business to perform transportation planning with design related applications, vegetation analysis, building modeling, micro drainage analysis, shoreline erosion analysis, utility asset extraction, and hydraulic modeling.

The State of Wisconsin Department of Transportation is willing to contribute to the collection of the high resolution LiDAR to support their design needs in Milwaukee County. The proposed contribution is estimated to be \$25,000.

	<u>GRANTS</u>	<u>COST</u>
2020 LIDAR		\$99,788
2019 STARTEGIC INITIATIVE GRANT	\$50,000	
WI DOT CONTRIBUTION	\$25,000	
<u>FINAL TOTAL:</u>		<u>\$24,788</u>

ACTIVITIES THIS PERIOD – 12/18 – 6/19

1. Meeting 4/9/19, of 7 County LIO's to gauge interest in LiDAR
2. General cost menu for high resolution elevation products

NEXT

- Complete contract for LiDAR from Ayres/Quantum Spatial.

Attached:

- Sample solution from Ayres\Quantum Spatial
- Scope of services from Ayres\Quantum Spatial
- Sensor capabilities collection benefits

Modelling in challenging environments

Utility Analytics

Precisely modeling utility assets – conductors, poles, transformers, guys – represents one of the most significant challenges for fixed-wing LiDAR. The challenge is magnified with distribution lines (as opposed to transmission) and in older neighborhoods, because:

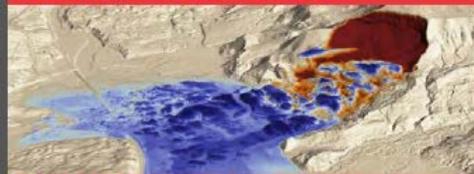
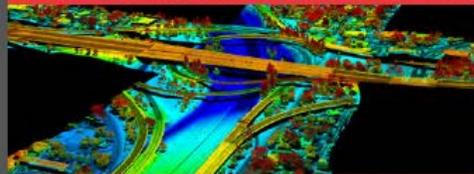
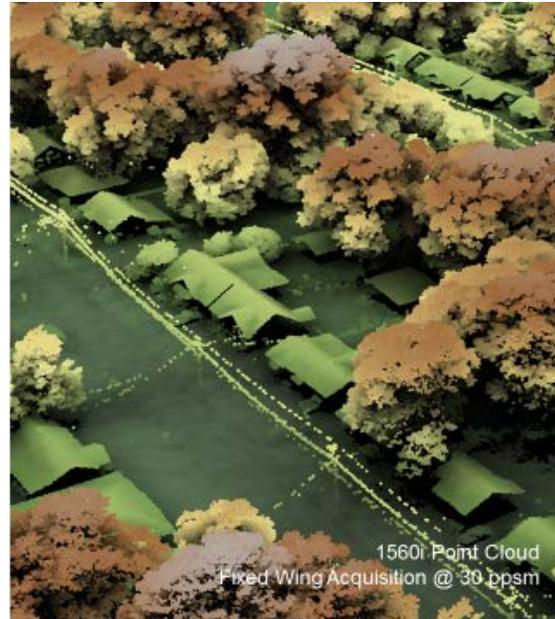
- Distribution lines are typically much smaller in diameter as compared to transmission conductors, providing a much smaller surface to reflect the LiDAR energy.
- Older neighborhoods typically have older conductors strung along the poles, where the reflectivity typically degrades over time.
- Older neighborhoods also have mature trees that tend to obscure assets falling within the tree canopy.

Riegl Advantage

All sensors perform differently with this detection, which is mainly a function of:

- Laser power
- Beam divergence
- Detection optics

The 1560i is best in class for the detection of fine features with LiDAR.



Topographic Modeling

From coastlines to mountaintops high density LiDAR data has shed new light on topography to support a diversity of land management, engineering, or planning initiatives. Enhanced surface modeling allows for more effective flood hazard mapping, inundation mapping, stream network updates, precision agriculture, watershed erosion studies, marine resource evaluations, snowpack measurements, and nationwide elevation coverage (USGS 3DEP).

Forest Inventory & Research

High density LiDAR enables the precise inventory of forest resources at large spatial scales. Biometrics can be calculated to estimate biomass, fuels, carbon, and forest health. From individual trees to entire watersheds or ownerships, high density LiDAR provides baseline data critical for effective forest management and monitoring efforts.

Built Environment Modeling & Urban Planning

With increasing urbanization and the need for complex city planning, high density LiDAR data captures man-made features in unparalleled detail and accuracy, allowing public works planners and civil engineers with the data they need for accurate impervious surface classifications and LiDAR derived planimetrics.

Infrastructure & Engineering Design

High density LiDAR supports transportation design, utilities mapping, navigation, and coastal/riverine public works infrastructure (levees, jetties, dams, reservoirs) through access to dense elevation point clouds, TINs, and detailed contour lines. Airborne, Mobile, or UAS LiDAR mapping can be used to capture existing infrastructure to make informed engineering decisions.

Natural Hazards Planning & Emergency Response

When disaster strikes, QSI's aircraft and crew can mobilize within 24 hours anywhere in the U.S. Timely geospatial data can enhance evacuation planning, site access planning, route detouring, and emergency response. High density LiDAR applications for hazard planning include detecting, evaluating or monitoring landslides, faults, volcanic activity, storm damage patterns, dam failure, aviation safety, and flood inundation risk.

Habitat Mapping

High density LiDAR data supports wildlife biologists and land managers with useful broadscale land cover or land use data for habitat protection, restoration design, population monitoring, and invasive species analysis.

April 1, 2019

Robert W. Merry, PLS
Chief Surveyor
Southeastern Wisconsin Regional Planning Commission
Waukesha, WI



Dear Rob:

Thank you for the opportunity to submit this proposal for lidar services for Milwaukee County in 2020. This letter describes the project approach, specifications, and fees for countywide high density lidar. The total project area is 247 square miles, which includes a 100 meter buffer around the County. Please refer to the Exhibit A for a map of the project area. The Ayres Associates/Quantum Spatial team will provide the following services.

Lidar Scope of Services

SEWRPC and Milwaukee County understand the importance updating elevation base data on a regular basis. In 2020, the County is considering a high density lidar project to take advantage of new technologies and to support its business needs and the needs of its constituents.

The County completed its previous lidar project in 2015. Lidar technology has advanced significantly since that time, and the County would like to take advantage of these advancements by collecting high density, high accuracy lidar data. The County can leverage the high density lidar data for transportation planning and design related applications, vegetation analysis, building modeling, micro drainage analysis, shoreline erosion analysis, utility asset extraction, and hydraulic modeling among uses.

Lidar Project Approach

Ayres Associates understands that the proposed Lidar project calls for the development of high accuracy topographic mapping and above ground modeling across 247 square miles (county-wide) in Milwaukee County. The lidar data collection will be done using a low altitude fixed wing aircraft equipped with an advanced lidar sensor and an airborne GNSS/IMU system for accurate georeferencing. The lidar point cloud will be captured during the spring leaf-off state, and when clouds or haze are not present between the aircraft and the ground.

The lidar will be collected at 30 points per square meter nominal pulse density. The lidar will achieve Quality Level 0 (QL0) vertical accuracy as defined by USGS Lidar Base Specifications, which equates to 5 cm RMSEz on level or uniformly sloped non-vegetated ground.

The raw lidar point cloud will be calibrated and then classified according base classification scheme listed below. All collected Lidar points will be retained in the point cloud according to these classifications. As an option, high vegetation and building classifications can be done using automated routines.

Lidar Base Classification Scheme:

- 1: Processed, but unclassified
- 2: Bare earth
- 7: Low noise
- 9: Water
- 17: Bridge deck
- 18: High noise
- 20: Ignored ground (breakline proximity)

Hydro breaklines will be collected for hydro flattening of ponded water bodies and ensuring proper downhill gradients for flowing water. A bare earth digital surface model for the project area will be generated from the processed lidar data and will support the generation of contours at 1-foot contour intervals.

Lidar Ground Control

Ayres Associates will use the airborne GNSS/IMU data collected at the time of flight to reduce the required amount of ground control. We will use WisCORS data collected during the flight from nearby permanent base stations to calibrate the raw lidar data. Ayres Associates will survey 20-25 ground control points across the county that will be used to validate the calibration of the raw lidar data.

Coordinate System and Datum

The lidar data will be delivered in Wisconsin State Plane Coordinates, South Zone. The horizontal datum will be NAD83 (2011), US Survey Feet, and the vertical datum will be NAVD88 (Geoid 12B), US Survey Feet.

Lidar Project Deliverables

Deliverable products included in the above proposal are as follows:

Base lidar datasets to meet USGS QL0 for point density and vertical accuracy

- Classified point cloud, LAS 1.4 format
- Hydro flattening breaklines (100-ft streams and 2 acre ponds), shapefile format
- Bare earth DEM, 1-ft pixel, 32-bit floating point grid
- Tile schematic, shapefile format
- Ground control report, PDF format
- Data acquisition and processing reports, PDF format

Lidar Enhancements and Derivatives

The following list of enhancements and deliverables is being provided for your consideration as you plan for this project. We can provide budgets for each of these derivatives individually, but these are not included in the proposed base project fees.

Recommended lidar enhancements to the base QL0 requirements (not included in Proposed Fees):

- Improved hydro breaklines (20-ft and wider streams and 2 acre ponds)
- 1-ft contour dataset (topologically cleaned, four contour types)
- Bare earth point cloud – class 2 points only
- Automated classification of high vegetation and buildings (classes 5 and 6)
- Vertical accuracy field survey and report generation (NVA and VVA)

Additional lidar derivative datasets for consideration (not included in Proposed Fees):

- Further improved hydro breaklines (8-ft and wider streams and 1-acre and larger ponds)
- Highway corridor point cloud ribbons and surface models
- Transportation and utility asset extraction, points and vectors
- 2D building outlines generated from building points
- 3D buildings generated from building points
- Tree canopy polygons from high vegetation points
- Intensity imagery
- Digital Surface Model (DSM) of first returns
- Culvert collection and hydro-enforced DEM
- Cloud hosting and delivery of point cloud and derivatives

Proposed Fees:

The following pricing is **not-to-exceed** lump sum amount for the countywide base lidar services listed in this proposal.

Lidar Base Project:

Lidar acquisition and processing of 30 ppsm data countywide: \$99,788.00

I hope that we have provided the information you require to proceed with planning for this important lidar project in 2020. If you need additional information or clarification on the proposal details, please feel free to contact me at 608.443.1207.

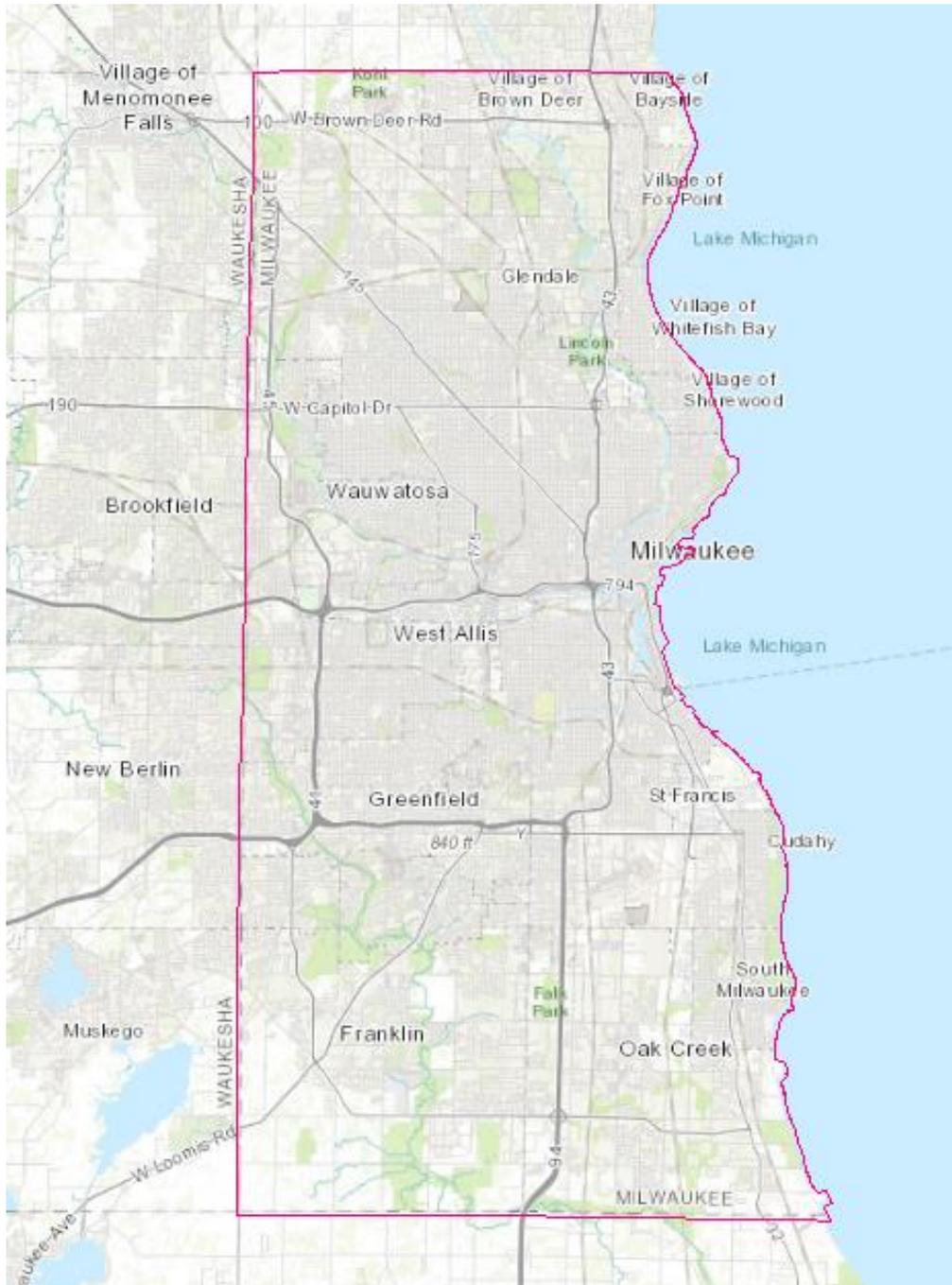
Sincerely,



Zachary J. Nienow, GISP
Ayres Associates Inc
Project Manager – Aerial Mapping Group
Direct: 608.443.1207
NienowZ@AyresAssociates.com

Exhibit A

Milwaukee County Project Area, 247 square miles including 100 meter buffer:



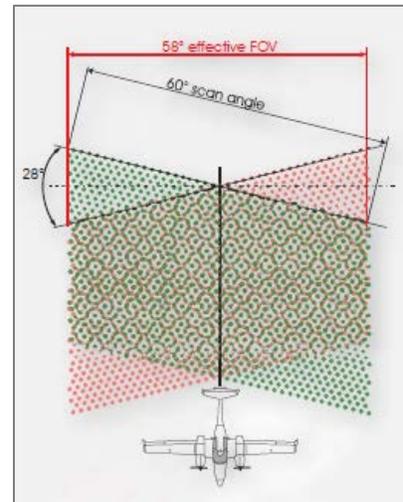
Riegl 1560i LiDAR Sensor

In 2017, in collaboration with key clients and Ayres Associates, Quantum Spatial performed a rigorous evaluation of the relative performance of the next generation of commercial linear-mode LiDAR sensors. Our analyses included comparison of various parameters, including number of valid returns, the distribution of returns by height above ground, and intensity values and distribution. From this, we have determined that for high density LiDAR applications, the **Riegl VQ-1560i** outperforms all other sensors currently on the market. Our 2017 purchase of the sensor has enabled us to more readily provide high density LiDAR of superior quality to Quantum Spatial and Ayres Associates clients, and many of our clients are now adopting 1560i specifications and requesting use of the sensor for their LiDAR programs. The following provides an overview and justification for our recommendation to employ the 1560i for the project areas in SE Wisconsin. The 1560i clearly represents the **best value for cost** for high density LiDAR applications. With the region's increasing use of high density LiDAR, the use of LiDAR data from this sensor will enhance the information that can be extracted from the LiDAR point cloud and hence the value of the datasets to the Region's foresters, land information officers, planners, engineers, and other decision-makers.

Sensor Capabilities

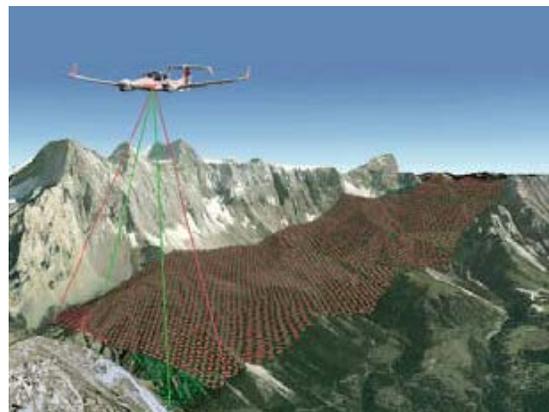
The Riegl VQ-1560i instrument features dual channel laser scanners, a laser pulse repetition rate of up to 2 MHz (> 1.3 million ground measurements per second), high performance IMU/GNSS system, a large field of view (58 degrees), forward/backward scan angle and a matrix scan pattern. The sensor operates at high altitudes (up to 15,500 ft) allowing for greater versatility, efficiency, and speed of acquisition for cost effective data collections at high pulse densities. The ability to fly at higher altitudes than traditional sensors renders it ideally suited for large area acquisitions.

One of the most unique and innovative features increasing performance and efficiency of the Riegl sensor is the advanced scan pattern - forward/backward (8 degree from nadir) look capability as well as offset laser channels (± 14 degrees) which provide for even and dense point spacing over variable terrain elevations. As illustrated (right), the sensor utilizes two laser sensors that scan in a synchronized cross-fire pattern that passes through the nadir position, increasing the probability of ground returns in heavily vegetated environments. This configuration allows for more effective and accurate data capture from multiple angles to more efficiently achieve higher point densities compared to traditional scanners where there is a greater chance that points from different flight lines "bunch up".



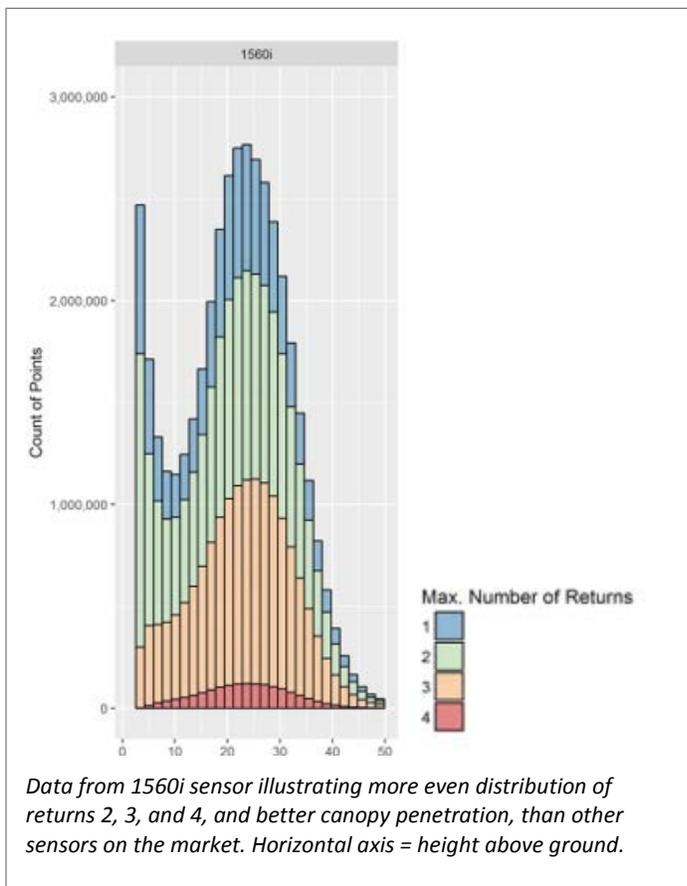
In addition, the **fully integrated and calibrated dual laser Multiple-Time-Around (MTA) airborne processing software**, echo digitization, and full-waveform **capability of the 1560i facilitate a range of options for multiple-target detection**. The MTA processing allows handling more than 10 pulses in the air simultaneously which is a significant consideration over the forested and urbanized areas found in SE Wisconsin.

With the Riegl 1560i matrix scan pattern, each laser channel is rotated ± 14 degrees from parallel to create the most optimal matrix scanning pattern of any LiDAR scanner available today. Graphics courtesy of Riegl.



Example Application: Greater Resolution of Forest Structure

Derivation of canopy structure metrics from the LiDAR such as height, crown size and canopy cover, and of derived variables such as basal area, DBH, volume, and potentially species, is greatly enhanced with improved differentiation of mid-canopy structure. As with photon counting sensors, number of points is not necessarily a good indication of information content. However, the strong signal to noise ratio of the Riegl 1560i means that most of the points recorded represent real features in the canopy. The Riegl 1560i's ability to produce up to 7 returns per laser pulse (other sensors provide up to 4) improves the probability of canopy penetration, resulting in a higher density of ground and near-ground returns. Moreover, with a significant increase in native pulse density to ≥ 30 pulses/m², we will see further improvement in the differentiation of sub-canopy features.

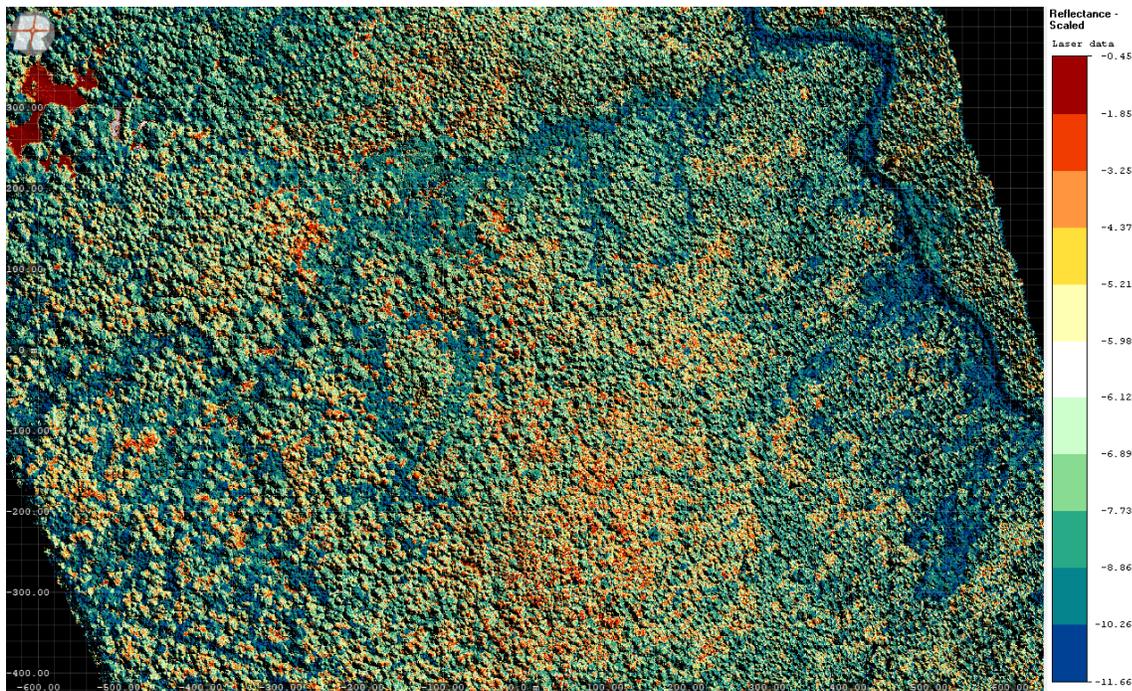


Riegl 1560i LiDAR point cloud displaying canopy penetration and vegetation detail. Points are colored by elevation.

Better Intensities

Accurate normalized intensity values across flight lines and project areas is critical to ensure the precision of above-ground vegetation classification. For all QSI sensors, we have developed effective methodologies to normalize intensities with respect to gain, laser power, atmospheric transmissivity, and laser scan angle resulting in a more useable intensity image. Variability in intensity values across the same target is minimized mathematically to arrive upon a normalized intensity value that approaches a true radiometric value for each discrete LiDAR return. In addition, the collection of consistent intensity data for large projects likewise requires close attention to consistent collection parameters - same sensor type and settings, and consistent time of year with respect to ground conditions.

The quality of intensity normalization depends on the sensor used. The Riegl 1560i has been engineered with specific attention to providing a high-value intensity image. Unlike most other sensors, it calibrates and normalizes the intensity, providing both return amplitude and reflectance values. This reflectance value corrects for the scan angle, return range and the power of the laser pulse from the measured amplitude of the return, normalizing the reflectance intensity in a uniform manner across the dataset. The information is captured in 16 bits, preserving fine scale differences in the surface reflectivity in the near infra-red band, which relates to the species and health of the vegetation. This information in conjunction with the LiDAR spatial resolution and accuracy **significantly advances the accuracy and resolution of vegetation classification** for forest inventory, restoration and planning. Compared to the information typically gained by pairing spectral data (imagery) with LiDAR, the coincident intensity and height information available from 1560i LiDAR alone is certainly more cost effective, and providing detailed spectral data for land cover mapping.



Calibrated reflectance values for a high density (≥ 30 pulses/ m^2) LiDAR acquisition using the Riegl 1560i. This dataset was captured during 2017-2018. The different colors consistently represent different vegetation and forest types across the study area.

Higher Value for the Same Cost

The team of Quantum Spatial and Ayres Associates proposes flying the SE Wisconsin region at a 30 pulses/ m^2 density with the advantage of next generation features. The next generation LiDAR sensors allow an increase in flight efficiency. This feature allows for an increase in the pulse density spec (to ≥ 30 pulses/ m^2) for forestry, urban mapping, engineering, and other applications with relatively minimal impact on project costs. The higher point density and greater canopy penetration of the 1560i is of particular interest in a mixed suburban/urban/forested area such as SE Wisconsin because it will allow improved characterization of the canopy and improved penetration to the ground so that the understory and the ground are delineated better. With the 1560i, LiDAR users can receive **higher density LiDAR with greater canopy penetration and superior intensity information at a minimal additional cost** vs the market rate for standard density LiDAR data.



DEPARTMENT OF ADMINISTRATIVE SERVICES
DIVISION OF ECONOMIC DEVELOPMENT
MILWAUKEE COUNTY LAND INFORMATION OFFICE

633 West Wisconsin Avenue, Suite 903, Milwaukee, WI 53203 (414) 278-3927

MEMORANDUM

TO: Land Information Council
FROM: Kevin Bruhn, Land Information Officer
DATE: May 28, 2019
SUBJECT: 2020 Ortho and Oblique Imagery Capture

BACKGROUND

The Southeast Wisconsin Regional Planning Commission organizes the regional orthophoto acquisition every 5 years. The Land Information Officers from the 7 Counties of the SEWRPC region are planning to capture imagery for the extents of the SEWRPC area. Federal Transportation and Planning grants have been identified at \$200,000 to assist with the acquisition of this regional flight. The estimated grant portion for Milwaukee County is \$18,032. There is also a rebate from the Vertical Datum Migration project of 2019 that will be about \$22,741. This is from over estimation of project complications and length.

The cost schedule has been generated from Eagle View formally known as Pictometry, the vendor for the oblique products that Milwaukee County historically utilizes. The resolution of this flight is consistent with the previous three flights before at a nominal 3 inch, oblique and ortho.

	<u>GRANTS</u>	<u>COST</u>
2020 IMAGERY		\$137,286
2020 STARTEGIC INITIATIVE GRANT	\$40,000	
2018 STARTEGIC INITIATIVE GRANT CARRYOVER	\$22,741	
SEWRPC CONTRIBUTION	\$18,032	
<u>FINAL TOTAL:</u>		<u>\$56,513</u>

ACTIVITIES THIS PERIOD – 12/18 – 6/19

1. Meeting 4/9/19, of 7 County LIO's to coordinate level of imagery resolution needed
2. General cost menu for imagery products

NEXT

- Complete contract for imagery from Eagle View\Pictometry.

Attached:

- Wisconsin Regional Orthophoto Consortium schedule
- 2020 Eagleview imagery capture agreement

WROC 2020 - 6"					WROC 2020 - 3"		
County	Area (sq mi)	\$80/sq mi	Commission	County	\$250/sq mi	Commission	County
Kenosha	272	\$21,760	\$17,408	\$4,352	\$68,000	\$20,352	\$47,648
Milwaukee	241	\$19,280	\$15,424	\$3,856	\$60,250	\$18,032	\$42,218
Ozaukee	233	\$18,640	\$14,912	\$3,728	\$58,250	\$17,434	\$40,816
Racine	333	\$26,640	\$21,312	\$5,328	\$83,250	\$24,916	\$58,334
Walworth	577	\$46,160	\$36,928	\$9,232	\$144,250	\$43,172	\$101,078
Washington	436	\$34,880	\$27,904	\$6,976	\$109,000	\$32,622	\$76,378
Waukesha	581	\$46,480	\$37,184	\$9,296	\$145,250	\$43,472	\$101,778
Totals	2673	\$213,840	\$171,072	\$42,768	\$668,250	\$200,000	\$468,250

Impervious/Nonimpervious					WROC 2020 - 3" (Revised)		
County	Urban	Suburban	Rural	Total	\$195/sq mi	Commission	County
Kenosha	\$85,680	\$87,040	\$106,080	\$278,800		\$20,351	
Milwaukee	\$404,880	\$77,120		\$482,000		\$18,032	
Ozaukee	\$73,395	\$93,200	\$83,880	\$250,475	\$45,435	\$17,434	\$28,001
Racine	\$104,895	\$133,200	\$119,880	\$357,975	\$64,935	\$24,916	\$40,019
Walworth	\$60,585	\$147,712	\$273,498	\$481,795	\$112,515	\$43,172	\$69,343
Washington	\$183,120	\$111,616	\$167,424	\$462,160	\$85,020	\$32,623	\$52,397
Waukesha	\$183,015	\$325,360	\$174,300	\$682,675	\$113,295	\$43,472	\$69,823
Totals	\$1,095,570	\$975,248	\$925,062	\$2,995,880	\$421,200	\$200,000	\$259,583

← All costs 3"

LiDAR - 30 PPM / 5cm Vert Accuracy		
County	Area (sq. mi.)	\$360/sq. mi.
Kenosha	272	\$97,920
Milwaukee	241	\$86,760
Ozaukee	233	\$83,880
Racine	333	\$119,880
Walworth	577	\$207,720
Washington	436	\$156,960
Waukesha	581	\$209,160
Totals	2673	\$962,280

Impervious/Nonimpervious		
Category	Range	Used
Urban	450-600	525
Suburban	320-480	400
Rural	120-180	150

Note: The above costs are based on 1/4 section and are only budgetary and will change based on areas to be mapped. Commission used Rural/Urban percentages from Comprehensive Plan and took some percentages from each to make Suburban Category as provided.

**AGREEMENT BETWEEN
 PICTOMETRY INTERNATIONAL CORP. (“PICTOMETRY”) AND
 MILWAUKEE COUNTY, WI (“CUSTOMER”)**

1. This order form (“Order Form”), in combination with the contract components listed below:

Section A: Product Descriptions, Prices and Payment Terms

Section B: License Terms:

- Delivered Content Terms and Conditions of Use
- Online Services General Terms and Conditions
- Web Visualization Offering Terms and Conditions
- Software License Agreement

Section C: Non-Standard Terms and Conditions

Appendix 1: Photogrammetric Product Specifications

Sector Map

(all of which, collectively, constitute this “Agreement”) set forth the entire understanding between Pictometry and Customer with respect to the subject matter hereof and supersedes all prior representations, agreements and arrangements, whether oral or written, relating to the subject matter hereof. Any modifications to this Agreement must be made in writing and be signed by duly authorized officers of each party. Any purchase order or similar document issued by Customer in connection with this Agreement is issued solely for Customer’s internal administrative purposes and the terms and conditions set forth on any such purchase order shall be of no force or effect as between the parties.

2. In the event of any conflict among any contract components comprising this Agreement, order of precedence for resolving such conflict shall be, from highest (i.e., supersedes all others) to lowest (i.e., subordinate to all others): Non-Standard Terms and Conditions; Photogrammetric Product Specifications; Product Descriptions, Prices and Payment Terms; License Terms in order as listed above under the heading ‘Section B: License Terms’; and Order Form.

3. All notices under this Agreement shall be in writing and shall be sent to the following respective addresses:

CUSTOMER NOTICE ADDRESS	PICTOMETRY NOTICE ADDRESS
633 W Wisconsin Ave Suite 903	25 Methodist Hill Drive
Milwaukee, WI 53203	Rochester, NY 14623
Attn: Kevin Bruhn, Land Information Officer	Attn: General Counsel
Phone: (414) 278-3927	Phone: (585) 486-0093 Fax: (585) 486-0098

Either party may change their respective notice address by giving written notice of such change to the other party at the other party’s then-current notice address. Notices shall be given by any of the following methods: personal delivery; reputable express courier providing written receipt; or postage-paid certified or registered United States mail, return receipt requested. Notice shall be deemed given when actually received or when delivery is refused.

4. This Agreement, including all licenses granted pursuant to it, shall be binding upon and inure to the benefit of the parties hereto, their successors and permitted assigns, but shall not be assignable by either party except that (i) Pictometry shall have the right to assign its right to receive Fees under this Agreement, provided no such assignment shall affect Pictometry’s obligations hereunder, and (ii) Pictometry shall have the right to assign all its rights under this Agreement to any person or entity, provided the assignee has assumed all of Pictometry’s obligations under this Agreement.

5. IN NO EVENT SHALL EITHER PARTY BE LIABLE, UNDER ANY CAUSE OF ACTION OF ANY KIND ARISING OUT OF OR RELATED TO THIS AGREEMENT (INCLUDING UNDER THEORIES INVOLVING TORT, CONTRACT, NEGLIGENCE, STRICT LIABILITY, OR BREACH OF WARRANTY), FOR ANY LOST PROFITS OR FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, PUNITIVE, OR OTHER SPECIAL DAMAGES SUFFERED BY THE OTHER PARTY OR OTHERS, EVEN IF A PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

6. With respect to any claims that Customer may have or assert against Pictometry on any matter relating to this Agreement, the total liability of Pictometry shall, in the aggregate, be limited to the aggregate amount received by Pictometry pursuant to this Agreement.

7. The waiver by either party of any default by the other shall not waive subsequent defaults of the same or different kind.

8. In the event that any of the provisions of this Agreement shall be held by a court or other tribunal of competent jurisdiction to be unenforceable, such provision will be enforced to the maximum extent permissible and the remaining portions of this Agreement shall remain in full force and effect.
9. Pictometry shall not be responsible for any failure on its part to perform due to unforeseen circumstances or to causes beyond Pictometry's reasonable control, including but not limited to acts of God, war, riot, embargoes, acts of civil or military authorities, fire, weather, floods, accidents, strikes, failure to obtain export licenses or shortages or delays of transportation, facilities, fuel, energy, supplies, labor or materials. In the event of any such delay, Pictometry may defer performance for a period of time reasonably related to the time and nature of the cause of the delay.
10. In consideration of, and subject to, payment by Customer of the Fees specified in Section A of this Agreement, Pictometry agrees to provide Customer with access to and use of the products specified in Section A of this Agreement, subject to the terms and conditions set forth in this Agreement. Customer hereby agrees to pay the Fees specified in Section A of this Agreement in accordance with the stated payment terms and accepts and agrees to abide by the terms of this Agreement.

This Agreement shall become effective upon execution by duly authorized officers of Customer and Pictometry and receipt by Pictometry of such fully executed document, such date of receipt by Pictometry being the "Effective Date."

PARTIES:

CUSTOMER	PICTOMETRY
MILWAUKEE COUNTY, WI	PICTOMETRY INTERNATIONAL CORP.
(entity type)	a Delaware corporation
SIGNATURE:	SIGNATURE:
NAME:	NAME:
TITLE:	TITLE:
DATE:	EXECUTION DATE:
	DATE OF RECEIPT (EFFECTIVE DATE):

SECTION A

PRODUCT DESCRIPTIONS, PRICES AND PAYMENT TERMS

Pictometry International Corp.
 25 Methodist Hill Drive
 Rochester, NY 14623

ORDER #
C11617576

BILL TO
Milwaukee County, WI
Kevin Bruhn, Land Information Officer
633 W Wisconsin Ave
Suite 903
Milwaukee, WI 53203
(414) 278-3927
kevin.bruhn@milwaukeecountywi.gov

SHIP TO
Milwaukee County, WI
Kevin Bruhn, Land Information Officer
633 W Wisconsin Ave
Suite 903
Milwaukee, WI 53203
(414) 278-3927
kevin.bruhn@milwaukeecountywi.gov

CUSTOMER ID	SALES REP
AI16717	DLars

QTY	PRODUCT NAME	PRODUCT DESCRIPTION	LIST PRICE	DISCOUNT PRICE (%)	AMOUNT
261	AccuPLUS 3in - PICT DTM - Per Sector	Product includes 3-inch GSD AccuPlus ortho mosaic tiles (GeoTIFF format), 3-inch GSD oblique frame images (4-way), 3-inch GSD orthogonal frame images, 3-inch GSD area-wide ortho mosaic (ECW format), 1-meter GSD ortho mosaic sector tiles and one area-wide 1-meter GSD mosaic (ECW format). Orthogonal GSD: 0.25 feet/pixel, Nominal Oblique GSD (all values +/-10%): Front Line 0.24 feet/pixel, Middle Line 0.28 feet/pixel, Back Line 0.34 feet/pixel. Ortho-mosaic accuracy: 1.00 ft RMSE (X or Y), 2.45 ft NSSDA 95%; meets or exceeds NMAS & ASPRS Class 1 at 1"=100'. Refer to attached terms and conditions. Applicable Terms and Conditions: Delivered Content Terms and Conditions of Use	\$695.00	\$526.00 (24.317%)	\$137,286.00
1	RapidAccess - Disaster Response Program	RapidAccess - Disaster Response Program is an emergency response program offering flights after an emergency or disaster. Refer to the attached detailed description of the Disaster Response Program. Applicable Terms and Conditions: Order Form	\$0.00		\$0.00
1	AccuPLUS Project Fee - PICT DTM	AccuPLUS project fee for projects without customer-supplied DTM. Applicable Terms and Conditions: Delivered Content Terms and Conditions of Use	\$7,500.00	\$0.00 (100%)	\$0.00
3	Pictometry Connect View - CA	Pictometry Connect View - CA (Custom Access) provides visualization-only access to the Pictometry-hosted custom imagery libraries specified elsewhere in this Agreement via a web application or server based integration. Requires a customer-provided web application or server based application. With respect to imagery available through this product to third parties or the Public, Pictometry reserves the right to reduce the resolution of the imagery available. Term commences on date of activation. The quantity represents the number of years in the Connect term. Applicable Terms and Conditions: Web Visualization Offering Terms and Conditions	\$2,250.00	\$0.00 (100%)	\$0.00
1	AccuPlus Imagery Bundle with Three (3) Years of EFS Maintenance & Support	Includes digital copy of the Licensed Documentation for the License Software, two (2) End User Training Sessions, one (1) Advanced User Technical Training, one (1) Administration / IT Training Session, fifteen (15) hours of telephone support, one copy of Pictometry Electronic Field Study (EFS) software, latest version, on the storage media specified herein, and access to download updated versions of the EFS Licensed Software for a period of three years from the initial date of shipment of the EFS software, along with a copy of the updated documentation. Applicable Terms and Conditions: Software License Agreement	\$0.00		\$0.00
1	Media Drive Capacity 931G - Drive Model IT - EXTPOWER	External USB 2.0 / eSATA Externally Powered. Delivery media prices include copying a complete image library	\$199.00	\$0.00 (100%)	\$0.00

QTY	PRODUCT NAME	PRODUCT DESCRIPTION	LIST PRICE	DISCOUNT PRICE (%)	AMOUNT
		onto media. Sub-warehousing sold separately Applicable Terms and Conditions. Order Form			
3	Pictometry Connect - CA - 100	Pictometry Connect - CA - 100 (Custom Access) provides up to 100 concurrent authorized users the ability to login and access the Pictometry-hosted custom imagery libraries specified elsewhere in this Agreement via a web-based, server-based or desktop integration. The default deployment is through web-based Pictometry Connect. Term commences on date of activation. The quantity represents the number of years in the Connect term. Applicable Terms and Conditions: Online Services General Terms and Conditions, Software License Agreement	\$9,900.00	\$0.00 (100%)	\$0.00

Thank you for choosing Pictometry as your service provider.	TOTAL	\$137,286.00
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*Amount per product = ((1-Discount %) * Qty * List Price)

FEES; PAYMENT TERMS

All amounts due to Pictometry pursuant to this Agreement ("Fees") are expressed in United States dollars and do not include any duties, taxes (including, without limitation, any sales, use, ad valorem or withholding, value added or other taxes) or handling fees, all of which are in addition to the amounts shown above and, to the extent applicable to purchases by Customer, shall be paid by Customer to Pictometry without reducing any amount owed to Pictometry unless documents satisfactory to Pictometry evidencing exemption from such taxes is provided to Pictometry prior to billing. To the extent any amounts properly invoiced pursuant to this Agreement are not paid within thirty (30) days following the invoice due date, such unpaid amounts shall accrue, and Customer shall pay, interest at the rate of 1.5% per month (or at the maximum rate allowed by law, if less). In addition, Customer shall pay Pictometry all costs Pictometry incurs in collecting past due amounts due under this Agreement including, but not limited to, attorneys' fees and court costs.

Due at Signing	\$11,440.50
Due at Initial Shipment of Imagery	\$34,321.50
Due at First Anniversary of Shipment of Imagery	\$45,762.00
Due at Second Anniversary of Shipment of Imagery	\$45,762.00
Total Payments	\$137,286.00

PRODUCT PARAMETERS

ACCUPLUS IMAGERY

Product:	AccuPLUS 3in - PICT DTM - Per Sector
Coverage Area Format:	Shapefile
Leaf:	Leaf Off: Less than 30% leaf cover

CONNECT

Product:	Pictometry Connect View - CA
Admin User Name:	Kevin Bruhn
Admin User Email:	kevin.bruhn@milwaukeecountywi.gov
Geofence:	WI Milwaukee WI Ozaukee WI Racine WI Washington WI Waukesha

Product:	Pictometry Connect - CA - 100
Admin User Name:	Kevin Bruhn
Admin User Email:	kevin.bruhn@milwaukeecountywi.gov
Geofence:	WI Milwaukee WI Ozaukee WI Racine WI Washington WI Waukesha

RapidAccess—Disaster Response Program ("DRP")

Customer is eligible for DRP described below from the Effective Date through the second anniversary of the initial Project delivery. Following payment to Pictometry of amounts due with respect to each subsequent Project, Customer will be eligible for the then-current DRP for a period of two years from delivery of such subsequent Project. Customer must be in good-standing with Pictometry to maintain eligibility for DRP.

- A. Disaster Coverage Imagery at No Additional Charge** – Pictometry will, upon request of Customer and at no additional charge, provide standard quality imagery of up to 200 square miles of affected areas (as determined by Pictometry) upon the occurrence of any of the following events during any period Customer is eligible for DRP:
- Hurricane:** areas affected by hurricanes of Category 2 and higher.
 - Tornado:** areas affected by tornados rated EF4 and higher.
 - Terrorist:** areas affected by damage from terrorist attack.
 - Earthquake:** areas affected by damage to critical infrastructure resulting from earthquakes measured at 6.0 or higher on the Richter scale.
 - Tsunami:** areas affected by damage to critical infrastructure resulting from tsunamis.
- B. Discounted Rate** – Coverage for areas affected by the events set forth above exceeding 200 square miles will be, subject to Pictometry resource availability, offered to Customer at the then current DRP rates. Also, coverage for areas affected by hurricanes below Category II, tornadoes below EF4 or earthquakes rated below 6.0 on the Richter scale will be, subject to Pictometry resource availability, offered to Customer at the then current DRP rates.
- C. Online Services – Use of Pictometry Connect Explorer™** – Pictometry’s DRP includes the use of Connect Explorer for a term of ninety days from the date of delivery of the DRP imagery. Customer shall have access to the DRP imagery for as long as they maintain an active Connect account.

**PICTOMETRY DELIVERED CONTENT
TERMS AND CONDITIONS OF USE**

These Pictometry Delivered Content Terms and Conditions of Use (the "Delivered Content Terms and Conditions"), in combination with the corresponding Agreement into which these terms are incorporated, collectively set forth the terms and conditions that govern use of Delivered Content (as hereinafter defined) for use within computing environments operated by parties other than Pictometry. As used in the Delivered Content Terms and Conditions the terms "you" and "your" in uppercase or lowercase shall mean the Customer that entered into the Agreement into which the Delivered Content Terms and Conditions are incorporated.

1. DEFINITIONS

- 1.1 "Authorized Subdivision" means, if you are a county or a non-state consortium of counties, any political unit or subdivision located totally or substantially within your boundaries that you authorize to have access to Delivered Content pursuant to the Delivered Content Terms and Conditions
- 1.2 "Authorized System" means a workstation or server that meets each of the following criteria (i) it is owned or leased by you or an Authorized Subdivision, (ii) it is located within and only accessible from facilities that are owned or leased by you or an Authorized Subdivision, and (iii) it is under the control of and may only be used by you or Authorized Subdivisions
- 1.3 "Authorized User" means any employee of you or Authorized Subdivisions that is authorized by you to have access to the Delivered Content through an Authorized System
- 1.4 "Delivered Content" means the images, metadata, data layers, models, reports and other geographic or structural visualizations or embodiments included in, provided with, or derived from the information delivered to you by or on behalf of Pictometry pursuant to the Agreement
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 - (iii) individual members of the public, but only through Authorized Users and solely for the purpose of making hard copies or jpg copies of images of individual properties or structures (but not bulk orders of multiple properties or structures) to the individual members of the public requesting them.
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- 2.6 You may not remove, alter or obscure copyright notices or other notices contained in the Delivered Content
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[END OF DELIVERED CONTENT TERMS AND CONDITIONS]

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- 6.10 This License Agreement constitutes the entire agreement of the parties with respect to its subject matter and replaces and supersedes any prior written or verbal communications, representations, proposals or quotations relating to that subject matter.

[END OF ONLINE SERVICES GENERAL TERMS AND CONDITIONS]

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- 5.2 "Covered Party" means (a) Pictometry, its affiliates and any officer, director, employee, subcontractor, agent, successor, or assign of Pictometry or its affiliates, and (b) each third party supplier of any WVO Licensed Content, third party alliance entity, their affiliates, and any officer, director, employee, subcontractor, agent, successor, or assign of any third party supplier of any WVO Licensed Content or third party alliance entity and their affiliates
- 5.3 TO THE FULLEST EXTENT PERMISSIBLE BY APPLICABLE LAW, UNDER NO CIRCUMSTANCES WILL THE AGGREGATE LIABILITY OF THE COVERED PARTIES IN CONNECTION WITH ANY CLAIM ARISING OUT OF OR RELATING TO THE WVO SERVICES OR THE WVO LICENSED CONTENT OR THIS WVO LICENSE AGREEMENT EXCEED THE LESSER OF YOUR ACTUAL DIRECT DAMAGES OR THE AMOUNT YOU PAID FOR THE WVO SERVICES IN THE TWENTY-FOUR MONTH PERIOD IMMEDIATELY PRECEDING THE DATE THE CLAIM AROSE YOUR RIGHT TO MONETARY DAMAGES IN THAT AMOUNT SHALL BE IN LIEU OF ALL OTHER REMEDIES WHICH YOU MAY HAVE AGAINST ANY COVERED PARTY
- 5.4 TO THE FULLEST EXTENT PERMISSIBLE BY APPLICABLE LAW, NEITHER YOU NOR THE COVERED PARTIES WILL BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER (INCLUDING, WITHOUT LIMITATION, ATTORNEYS' FEES) IN ANY WAY DUE TO, RESULTING FROM, OR ARISING IN CONNECTION WITH THE WVO SERVICES, THE WVO LICENSED CONTENT, OR THE FAILURE OF ANY COVERED PARTY TO PERFORM ITS OBLIGATIONS THE FOREGOING LIMITATION OF LIABILITY SHALL NOT APPLY TO A PARTY'S INDEMNITY OBLIGATIONS OR YOUR (OR ANY OTHER WVO SERVICES USERS') INFRINGEMENT OF INTELLECTUAL PROPERTY OR MISAPPROPRIATION OF PROPRIETARY DATA BELONGING TO PICTOMETRY OR ITS THIRD PARTY SUPPLIERS
- 5.5 Notwithstanding anything to the contrary in this Section 5
- (a) If there is a breach of the warranty in Section 4.1 above, then Pictometry, at its option and expense, shall either defend or settle any action and hold you harmless against proceedings or damages of any kind or description based on a third party's claim of patent, trademark, service mark, copyright or trade secret infringement related to use of the WVO Services or the WVO Licensed Content, asserted against you by such third party provided: (i) all use of the WVO Services and the WVO Licensed Content was in accordance with this WVO License Agreement, (ii) the claim, cause of action or infringement was not caused by you modifying or combining the WVO Services or the WVO Licensed Content with or into other products, applications, images or data not approved by Pictometry, (iii) you give Pictometry prompt notice of such claim, and (iv) you give Pictometry the right to control and direct the investigation, defense and settlement of such claim You, at Pictometry's expense, shall reasonably cooperate with Pictometry in connection with the foregoing
- (b) In addition to Section 5.5(a), if the WVO Services, the operation thereof or the WVO Licensed Content become, or in the opinion of Pictometry are likely to become, the subject of a claim of infringement, Pictometry may, at its option and expense, either (i) procure for you the right to continue using the WVO Services or the WVO Licensed Content, (ii) replace or modify the WVO Services or the WVO Licensed Content so that they become non-infringing, or (iii) terminate the WVO License Agreement on notice to you and grant you a pro-rata refund or credit (whichever is applicable) for any pre-paid fees or fixed charges
- (c) The provisions of Sections 5.5(a) and (b) shall constitute your sole and exclusive remedy for the respective matters specified therein

6. MISCELLANEOUS

- 6.1 The terms and conditions of this WVO License Agreement may be changed from time to time immediately upon notice to you If any changes are made to this WVO License Agreement, such changes will (a) only be applied prospectively, and (b) not be specifically directed against you but will apply to all similarly situated Pictometry customers using the WVO Services You may terminate this WVO License Agreement upon written notice to Pictometry if any change to the terms and conditions of this WVO License Agreement is unacceptable to you For termination to be effective under this Section 6.1, written notice of termination must be provided to Pictometry within 90 days of the effective date of the change Continued use of the WVO Services following the effective date of any change constitutes acceptance of the change, but does not affect the foregoing termination right Except as provided above, this WVO License Agreement may not be supplemented, modified or otherwise revised unless signed by duly authorized representatives of both parties Furthermore, this WVO License Agreement may not be supplemented, modified or otherwise revised by email exchange, even if the email contains a printed name or signature line bearing signature-like font The foregoing does not prohibit the execution of electronic contracts bearing electronic signatures of authorized representatives of both parties, provided such signatures include digital certifications or are otherwise authenticated
- 6.2 In the event of a breach of this WVO License Agreement by you or someone using the WVO Services, Pictometry may temporarily suspend or discontinue providing access to the WVO Services without notice and Pictometry may pursue any other legal remedies available to it
- 6.3 All notices and other communications hereunder shall be in writing Notices shall be deemed to have been properly given on the date deposited in the mail, if mailed or on the date received, if delivered in any other manner Legal notices to Pictometry should be sent to Pictometry, Attn: General Counsel, 25 Methodist Hill Drive, Rochester, New York 14623
- 6.4 The failure of you, Pictometry, or any third party supplier of the WVO Services or any WVO Licensed Content to enforce any provision hereof shall not constitute or be construed as a waiver of such provision or of the right to enforce it at a later time
- 6.5 You may not assign or otherwise transfer your rights or delegate your duties under this WVO License Agreement without the prior written consent of Pictometry Any attempt by you to assign, transfer or delegate your rights or obligations under this WVO License Agreement without Pictometry's consent shall be void, and shall also void the limited license granted to you by this WVO License Agreement This WVO License Agreement and any amendment thereto shall be binding on, and will inure to the benefit of the parties and their respective successors and permitted assigns
- 6.6 This WVO License Agreement shall be governed by and interpreted in accordance with the laws of the State of New York, excluding its conflicts of law principles Unless you are a government entity, in the event that any legal proceedings are commenced with respect to any matter arising under this WVO License Agreement, the parties specifically consent and agree that the courts of the State of New York or, in the alternative, the Federal Courts located in the State of New York shall have exclusive jurisdiction over each of the parties and over the subject matter of any such proceedings, and that the venue of any such action shall be in Monroe County, New York or the U.S. District Court for the Western District of New York, as applicable
- 6.7 This WVO License Agreement will be enforced to the fullest extent permitted by applicable law If any provision of this WVO License Agreement is held to be invalid or unenforceable to any extent, then (a) such provision will be interpreted, construed and reformed to the extent reasonably required to render it valid, enforceable and consistent with its original intent and (b) such invalidity or unenforceability will not affect any other provision of this WVO License Agreement
- 6.8 Where applicable, each affiliated company of Pictometry and each third party supplier of the WVO Services or any WVO Licensed Content has the right to assert and enforce the provisions of this WVO License Agreement directly on its own behalf as a third party beneficiary
- 6.9 In the event of a breach of your obligations under this WVO License Agreement or your payment obligations with respect to access to the WVO Services or the WVO Licensed Content, you agree to pay all of Pictometry's costs of enforcement and collection, including court costs and reasonable attorneys' fees
- 6.10 This WVO License Agreement constitutes the entire agreement of the parties with respect to its subject matter and replaces and supersedes any prior written or verbal communications, representations, proposals or quotations relating to that subject matter

[END OF WEB VISUALIZATION OFFERING TERMS AND CONDITIONS]

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[END OF SOFTWARE LICENSE AGREEMENT]

SECTION C

NON-STANDARD TERMS AND CONDITIONS

1. **Online Services Eligible Users:** Notwithstanding anything in the Online Services General Terms and Conditions incorporated in this Agreement to the contrary, the terms 'Eligible User' and 'Eligible Users' as defined in those Online Services General Terms and Conditions shall, for the purposes of this Agreement, also include each 'Authorized User' as that term is defined in the Delivered Content Terms and Conditions of Use incorporated in this Agreement.
2. **Applicable Law:** Notwithstanding anything to the contrary set forth elsewhere in this Agreement, this Agreement and any modifications, amendments or alterations shall be interpreted, construed and enforced in all respects in accordance with the laws of the State of Wisconsin, excluding its conflicts of law principles. Each party irrevocably consents to the exclusive jurisdiction of the courts of the State of Wisconsin in connection with any action to enforce the provisions of this Agreement, to recover damages or other relief for breach or default under this Agreement, or otherwise arising under or by reason of this Agreement.
3. **Non-appropriation of Funds.** Notwithstanding anything herein to the contrary, in the event that the funds due for subsequent projects and related deliverables under the terms and conditions of this Agreement are not lawfully appropriated, the following provisions shall apply:
 - a. Customer shall provide Pictometry with written documentation of non-appropriation of funds from its funding source prior to commencement of a subsequent project;
 - b. This Agreement shall remain in full force and effect, however commencement of the subsequent project shall be deemed postponed until such time as funds for the subsequent project have been appropriated and all other sums due under the terms and conditions of this Agreement have been paid by Customer. In the event that the postponement exceeds eighteen months, Pictometry reserves the right to terminate any and all obligations with respect to the postponed project and all subsequent projects included in this Agreement; and
 - c. If Customer, or any party authorized under the terms and conditions of this Agreement to use the licensed products set forth in Section A, is in possession of licensed products for which Pictometry has not been fully compensated in accordance with the payment terms of this Agreement, Customer or such authorized party shall immediately cease use of those licensed products, purge those licensed products from all Customer and authorized party computers, and return those licensed products to Pictometry.
4. Customer shall own the copy of the orthogonal imagery delivered to it by Pictometry pursuant to this Agreement. Customer is free to use, reproduce and redistribute copies of the orthogonal imagery so delivered in any manner without any accounting to Pictometry. Pictometry shall own those copies of the orthogonal imagery delivered pursuant to this Agreement that are in Pictometry's possession. Pictometry is free to use, reproduce and redistribute copies of the orthogonal imagery delivered pursuant this Agreement in any manner without any accounting to Customer. Except for the copy of the orthogonal imagery delivered to Customer by Pictometry pursuant to this Agreement, all imagery (including associated metadata) and software delivered or otherwise made available to Customer pursuant to this Agreement constitute Delivered Content or Pictometry Software, as appropriate, and are and shall remain the exclusive property of Pictometry, subject to the rights of Customer to use the Delivered Content and the Pictometry Software pursuant to the licenses granted by Pictometry elsewhere in this Agreement.

[END OF NON-STANDARD TERMS AND CONDITIONS]

AccuPlus® Premium Ortho-MosaicProduct Overview

Seamless ortho-mosaic produced from individual frames and tiled to customer's preferred tiling scheme

Acquisition

Flight plans will be prepared to capture image frames with nominal 60% forward overlap and nominal 30% sidelap in order to provide sufficient overlap for automatic aerial triangulation and mitigation of building lean in orthophotography produced. Source imagery will be acquired during times of optimal environmental conditions. Imagery will generally be captured when solar altitude is 30 degrees or greater and/or by using the most optimal four-hour window, except where capture season offers significantly longer window. Imagery will be acquired with ground free of snow cover and deciduous vegetation less than 30% of full bloom. Frames with clouds will be rejected and reflown. Any planned deviation from these conditions imposed by capture window constraints will be discussed with client prior to commencement of acquisition.

Camera

Pictometry utilizes its USGS certified, custom designed mapping camera incorporating a Kodak sensor and custom designed photogrammetric lenses. The sensor is fully calibrated according to Pictometry's USGS approved calibration process. Pictometry's sensor provides a dynamic range of 12 bits per band, RGB (resampled to 8 bits during processing).

Ortho-Rectification

Prior to the production of orthophotography, Pictometry will perform automatic aerial triangulation, utilizing the directly observed Exterior Orientations (EOs) and ground control points (GCPs), measured by a licensed surveyor, for the purpose of orienting the individual frames for creation of the final ortho imagery. In addition to the GCPs, sophisticated matching techniques will be employed to automatically create tie points for use in performing a bundle adjustment. Pictometry will utilize best available Digital Terrain Models, combined with the calibrated camera interior orientations, ground control points, and triangulated EOs to rectify the images. When the rectification requires a resampling of the source imagery, a cubic convolution method will be utilized.

Mosaic

Global color balancing will be applied to all orthophotos to create homogeneous orthophotos within the project area. Local adjustments of brightness values, color and contrast will be performed if needed. There will be no obvious seam edge between two adjacent orthophotos. Mosaic will be created using automated seamline steering, with manual edits to eliminate feature misalignment caused by seamlines which pass thru features above the elevation surface. Feature alignment across seamlines will be 3 pixels or better. When possible, seamlines will be steered away from elevated features to improve orthophoto quality. Once the mosaic has been produced, the imagery will be tiled and named according to the customer provided (or Pictometry generated) schema for delivery.

SECTOR MAP



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