

**MILWAUKEE COUNTY AUTOMATED MAPPING
AND LAND INFORMATION SYSTEM**

One-Hundredth Steering Committee Meeting

AGENDA

Date: December 8th 2015
Time: 9:00 a.m.
Place: Milwaukee Metropolitan Sewerage District
MMSD, Room 401
260 W Seeboth St.
Milwaukee, WI. 53204

I. Roll Call

II. Meeting Minutes

Consideration of the minutes of the 99th Steering Committee meeting held September 15rd, 2015

III. Reports

A. **2015-2016 Work Plan Status**

1. Interactive Map Viewer

VWR.01 – Improve the MCLIO Interactive Mapping Service

VWR.01.1 – System Architecture Design

B. **Maintain Core Foundational Elements**

1. Report by MCAMLIS Staff regarding progress on 2015 Regional Orthophotography Project.

2. Report by MCAMLIS Staff regarding progress on 2015 Regional Elevation Data Project.

C. **Promote the Integration of Parcel Based Land Information**

1. Report by Milwaukee County Register of Deeds staff on MCAMLIS street address and cadastral map maintenance operations.

2. Report by City of Milwaukee staff on MCAMLIS street address and cadastral map maintenance operations.

D. **Educational Outreach**

1. Report by MCAMLIS Staff on the status of work performance on behalf of MCAMLIS in support of local community GIS efforts.

E. Countywide Initiatives

1. Report by MCAMLIS Staff regarding Countywide Initiatives and program activity status.

F. Financial

Report by Milwaukee County DAS staff on MCAMLIS Fiscal status

IV. Old Business

- A. Report by MCAMLIS staff regarding the 2016 DRAFT Land Modernization Plan.
- B. Report by MCAMLIS staff regarding the 2016 Strategic Grant Initiative.

V. New Business

- A. Consideration of a 2016 agreement for Milwaukee County Surveyor Services between MCAMLIS and SEWRPC.
- B. Consideration of a 2016 agreement for Map Maintenance Services between MCAMLIS and the City of Milwaukee.
- C. MCAMLIS Datum Modernization Project, including Report by MCAMLIS staff on the SEWRPC Addendum to Report No. 206

VI. Correspondence

- A. Memorandum from SEWRPC - Revised Preliminary Draft Floodplain and Floodway Delineations along Portions of the Little Menomonee River in Milwaukee and Ozaukee Counties

VII. Date, time, and place of next meeting

VIII. Adjournment

MINUTES OF THE 99th MEETING
MILWAUKEE COUNTY AUTOMATED MAPPING AND LAND INFORMATION SYSTEM
STEERING COMMITTEE

Date: September 15th 2015
Time: 9:00 a.m.
Place: Milwaukee Metropolitan Sewerage District
MMSD
260 W Seeboth St.
Milwaukee, WI. 53204

Members Present

Kurt W. Bauer	Milwaukee County Surveyor
Emily Champagne	GIS Supervisor, Milwaukee Metropolitan Sewerage District
Doug Seymour	Director of Community Development, City of Oak Creek representing the Intergovernmental Coordinating Council of Milwaukee County
Jeremy Theis	Director, Facilities, representing Milwaukee County Department of Administrative Services Facilities Management
Julie Esch	Deputy Administration Director, Milwaukee County DAS, representing Director of Milwaukee County Department of Administrative Services
Nancy Olson, Vice Chair	Chief Information Officer, City of Milwaukee
John LaFave	Milwaukee County Register of Deeds

Members Absent

Greg High	Director, Architecture, Engineering and Environmental Services Division, representing Milwaukee County Department of Administrative Services Facilities Management
Dawn Neuy	Manager, EDAM Support, We Energies

Guest and Staff Present

Donald R. Nehmer	Controller, Milwaukee Metropolitan Sewerage District
William C. Shaw	MCAMLIS - Emeritus
Kevin Bruhn	MCAMLIS Project Manager, Milwaukee County DAS/ECD-MCAMLIS
Lee Frederick	Senior GIS Analyst, Milwaukee County DAS/ECD- MCAMLIS
Nicole Grams	GIS Analyst, Milwaukee County DAS/ECD-MCAMLIS
Kathleen Bach	GIS Analyst, Milwaukee County Register of Deeds Office
Tammy Bronson	GIS Analyst, City of Milwaukee, ITMD
Hardy Meihnsner	Consultant, Spatial Data Systems

Pamela Booth
Jim Tarantino

GIS Project leader, City of Milwaukee
Director, Economic and Community Development,
Milwaukee County

I. ROLL CALL

Vice Chairman Olson called the Ninety-Eighth meeting of the Milwaukee County Automated Mapping and Land Information System (MCAMLIS) Steering Committee to order at 9:00 a.m. Roll Call was taken by circulating an attendance signature sheet and a quorum was declared present.

Secretary's Note: Items II. Special Order of Business; 1.) Nomination and Election of MCAMLIS Steering Committee Chairman, and 2.) Recognition of MCAMLIS Committee Staff were taken out of order to accommodate attendee schedules. The remainder of the meeting agenda was followed in order.

II. SPECIAL ORDER OF BUSINESS

1. RECOGNITION OF MCAMLIS STEERING COMMITTEE AND STAFF

OLSON: Recognition to Bill Shaw for MCAMLIS Project Management, Recognition to Don Nehmer for Chairman of MCAMLIS Steering Committee

2. NOMINATION AND ELECTION OF MCAMLIS STEERING COMMITTEE CHAIRMAN

OLSON: Vice Chair will assume the Chairman role. Greg High was nominated to become Vice-Chair. Staff was directed to gather acceptance from Greg High.

LaFave: moved to nominate Greg High for Vice-Chair of MCAMLIS Steering Committee
Champagne: second, motion carried, unanimous

III. MEETING MINUTES

CONSIDERATION OF THE MINUTES OF THE 98TH STEERING COMMITTEE MEETING HELD MARCH 24TH, 2015

Bauer: moved approval of the minutes as written

Seymour: second, motion carried unanimous

IV. REPORTS

A. 2015 – 2016 WORK PLAN STATUS

1. INTERACTIVE MAP VIEWER

Bruhn: directed the Committee to the report included with the meeting materials. Migration of current plug-in website environment is underway. A contract with Latitude Geographics has been executed. The Project should be completed by end of year. He stated that the legacy website has been deprecated on July 1st and is no longer available. A data extraction service has been developed on a cloud based service. CAD and GIS data is available on a section-based extraction level.

Bruhn: directed the Committee to the report included with the meeting materials. A System Architecture Design project is being completed. A benchmarking document has been developed. Staff indicated the report will be presented at the next meeting. Olson: Questioned whether there will be a budgetary item resulting from this study. Bruhn stated that the initial thought would be a need to purchase a second ArcGIS server license.

2. MOBILE TECHNOLOGY

Bruhn: directed the Committee to the report included with the meeting materials. He noted that the mobile parcel viewer has been incorporated into the Interactive Map Viewer project. Initial development of a mobile viewer will be done and feedback will be solicited. LaFave: asked if there was any communication from municipalities, Bruhn: as soon as a prototype is available, the LIO will reach out.

3. COLLABORATION

Bruhn: directed the Committee to the report included with the meeting materials and stated that the webinars will continue when new staff is ready to present topics.

4. DATA

Bruhn: directed the Committee to the report included with the meeting materials. He stated that the esri Image Server extension was purchased. He also stated that the last two partial flights ('94 and '76) are complete and there are no more in the queue.

Bruhn: directed the Committee to the report included with the meeting materials. He stated that the topographic data update from 2010 is complete. A contract was executed with GRW to update .8 square miles of transportation area. The 2013 update is expected to be completed by the end of September.

B. MAINTAIN CORE FOUNDATIONAL ELEMENTS

1. 2015 REGIONAL ORTHOPHOTOGRAPHY PROJECT

Bruhn: directed the Committee to the report included with the meeting materials. The flight should be delivered by the week of September 14th. Processing will be commence once delivery has been made. Olson: asked if validation will be done once data has been acquired. Bruhn: stated that QC will be performed in-house.

2. 2015 REGIONAL ELEVATION DATA PROJECT

Bruhn: directed the Committee to the report included with the meeting materials, data is in process, 20% of 5 county area is completed. Delivery is expected no later than November 15th. Bruhn stated that deliverables include a DTM and contours, the derived products that were included in the 2010 flight will not be included and may need to be acquired if need arises. The LIO is exploring the possibility of creating the requested derived products in-house.

C. PROMOTE THE INTEGRATION OF PARCEL BASED LAND INFORMATION

1. REPORT BY MILWAUKEE COUNTY REGISTER OF DEEDS STAFF ON MCAMLIS STREET ADDRESS AND CADASTRAL MAP MAINTENANCE OPERATIONS

Bach: directed the Committee to the report included with the meeting materials, noting the continuing status of both the cadastral and address maintenance efforts conducted within the suburban communities.

2. REPORT BY CITY OF MILWAUKEE STAFF ON MCAMLIS STREET ADDRESS AND CADASTRAL MAP MAINTENANCE OPERATIONS

Bronson: directed the Committee to the report included with the meeting materials. Further reported that there has been 246 parcel updated through August 28, up from 198 last year. She continued, reporting that address updates within the City in 2014 there were over 11,000 as of August 28.

D. EDUCATIONAL OUTREACH

1. REPORT BY MCAMLIS STAFF ON THE STATUS OF WORK PERFORMANCE ON BEHALF OF MCAMLIS IN SUPPORT OF LOCAL COMMUNITY GIS EFFORTS

Bruhn: directed the Committee to the report included with the meeting materials, noting that staff had presented the yearly update to the Milwaukee County Economic Development Committee, the Office had facilitated the 13th and 14th meetings of the Metro Milwaukee GIS Users Group (MMGUG) held at Natural Resource Technologies on 4/21/2015 and AGSL on 8/4/2015. Bruhn stated the next meeting will be held at the Urban Ecology Center on 10/20/2015.

E. COUNTYWIDE INITIATIVES

1. REPORT BY MCAMLIS STAFF REGARDING COUNTYWIDE INITIATIVES AND PROGRAM ACTIVITY STATUS

Bruhn: directed the Committee to the report included with the meeting materials regarding the consolidated City of Milwaukee and County Cadastral Data and the importance of address information and related accomplishments. Bruhn: noted that there are discussions underway to streamline the update process from GCS, and the Office will be looking at doing a quarterly tax roll update instead of the current yearly

one. 500 more plat-of-survey documents have been processed. Olson: Questioned whether the parcels are lagging in updates or if it's only the attributes that are behind? Bruhn: Assured that yes, the just taxroll information. Seymour: Asked if the limitation is not the GCS [vendor], but the coordination of municipalities? Bruhn: Correct, it is the process of the submittal not the data itself. Bach: Clarified that current parcel info might be from 2016 but the taxroll lags a year behind, is currently from 2014 on the website. Champagne: Is there any concern from the State regarding discrepancies as related to statewide partial initiative? Bruhn: It looks like the State is looking for cleaner data but right now there is no requirement.

F. REPORT BY MILWAUKEE COUNTY DAS STAFF ON MCAMLIS FISCAL STATUS

Olson: noted that a fiscal report is being distributed at the meeting. Bruhn: stated that the fiscal report will be presented by Julie Esch from Milwaukee County Central Business Office.

Esch: noted fiscal reporting responsibilities have transferred from Administration Services to the Business Office.

Bruhn: the \$40k that is allotted to the Register of Deeds was not accounted for and was placed as a cross charge for this fiscal year.

LaFave: the ROD is on place for the estimated recorded document projection for the year.

V. OLD BUSINESS

A. REPORT BY MCAMLIS STAFF REGARDING STATUS OF THE STATE OF WISCONSIN ACT 20 INITIATIVES RELATED TO THE WISCONSIN LAND INFORMATION PROGRAM (WLIP).

Bruhn: directed the Committee to the report included with the meeting materials. Staff explained the responsibilities according to the ACT. Bruhn noted that there is a \$50k grant available to the LIO. The County is in compliance with the parcel information expect for a few tax roll attributes. Bruhn stated the LIO will submit the parcel information also, the LIO will try to submit zoning countywide being requested by the State. Olson: questioned if the \$50k is to improve the MCAMLIS participation in the ACT 20 initiative. Bruhn: the grant will be written to meet the benchmarks stated in the grant guidelines. Olson: Asked whether staff will bring the grant proposal to the December Steering Committee meeting? Bruhn: Yes, the grant application will be presented at the next meeting.

B. MILWAUKEE COUNTY CORPORATION COUNCIL RECOMMENDATION TO THE MCAMLIS STEERING COMMITTEE REGARDING DIGITAL COPYRIGHT PROTECTED MATERIALS.

Bruhn: directed the Committee to the report included with the meeting materials. Bruhn stated that a legal opinion was requested and received from Milwaukee County Corporation Counsel.

Bauer: motion to approve the Corporation Counsel recommendation to abandon the MCAMLIS digital copyright.

LaFave: second the motion, motion carries, unanimous

VI. NEW BUSINESS

A. REPORT BY MCAMLIS STAFF REGARDING STATUS OF THE STATE OF WISCONSIN BOUNDARY AND ANNEXATION SURVEY (CBAS) EFFORTS IN ACT 55 OF THE STATE BIENNIAL BUDGET.

Bruhn: directed the Committee to the report included with the meeting materials. Bruhn stated that the LIO must submit municipal boundary changes and wards twice a year. The LIO is in the process of validating the data. Bruhn stated that the LIO is complying with the ACT. Olson: stated that this process is part of the 2020 census project and that it is good to have MCAMLIS assist the municipalities with this initiative. Olson: staff should communicate that MCAMLIS is participating in this program to the municipalities. Bruhn: staff will bring any communication forward to the committee.

B. REPORT BY MCAMLIS STAFF REGARDING THE 2015 LAND MODERNIZATION PLAN UPDATE.

Bruhn: directed the Committee to the report included with the meeting materials. Olson: stated that this is an old but new business item. Bruhn: staff brought this forward for clarification for the Land Modernization Plan that need to be submitted to the State DOA by December 31st. Bruhn: this plan will need to be submitted every 3 years and as part of State Statute, the Land Modernization plan must also detail the makeup of the County Land Information Council. Olson: reviewed the 2010 discussion on this issue and stated that direction is needed again. LaFave: stated that in 2010 MCAMLIS would continue as is and serve as the Land Information Council. If the State did not respond in 2010, MCAMLIS should continue 'as is' again and serve as the council. Champagne: Asked if there is any information in plan that requires the names and roles for the Land Information Council. Bruhn: Yes, there is a diagram and penalties included in the 2015 plan directions. LaFave: stated that the State is aware of MCAMLIS and how successful it is. MCAMLIS can submit 'as is' again and update the membership if directed so by the State. Bauer: the Steering Committee was founded under a contract with the utilities. MCAMLIS is effective and has proven to be. Champagne: question, how has Dane county submitted their plan due to their similar makeup? Bruhn: no outreach was done before this meeting, also Waukesha stated in 2010 that they were making progress on the organizational makeup but was not complete. Olson: purpose was for governance, MCAMLIS has been that governance, recommendation to fill out plan as MCAMLIS as the Land Information Council. Bruhn: the 2010 plan did not include the makeup. Olson: the 2010 plan included the history and makeup of the MCAMLIS steering committee. Olson: a draft of the plan will be submitted by December 31st. Bauer: The plan will include MCAMLIS as the Lan Information Council. Champagne: can contact be brought up to the state for clarification? LaFave: recommends that we let the State request clarification from MCAMLIS. Esch: do we request a clarification from Corporation Counsel? Bruhn: State DOA indicated in 2010 to identify deficiencies in plan. Bauer: will the draft of the plan be presented to the committee before the final? Bruhn: staff will present it to the steering at the December Steering Committee.

VII. CORRESPONDENCE

NA

VIII. DATE, TIME, AND PLACE OF NEXT MEETING

Olson: set the next regular meeting for December 8th 2015 @ 9:00 am, MMSD

IX. ADJOURNMENT

By consensus of the Committee

Respectfully submitted,
Kevin Bruhn



**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: MCAMLIS Steering Committee
FROM: Kevin Bruhn, MCAMLIS Project Manager
DATE: November 30, 2015
SUBJECT: INTERACTIVE MAPPING

BACKGROUND

This work effort will deploy multiple improvements to the MCLIO Interactive Mapping and Data Extract services. The new viewer will offer improved responsiveness (timeliness of data rendering and tool functions), accessibility (map printing, Pictometry, CSM retrieval), usability (GUI), and availability of data.

The viewer will provide access to the Pictometry viewer via a web service (Pictometry Online). Users will also have access to Pictometry Online (POL) as a stand-alone viewer. In addition to supplying the web service, MCAMLIS will offer information on the availability of these tools and training on how to use them.

The viewer extract service will allow them to select one or more MCAMLIS reference data layers to be extracted for a user-specified geographic area, which will result in downloadable datasets in one of a predetermined set of data formats e.g., AutoCAD (.dxf or .dwg) and MicroStation (.dgn) formats.

STATUS:

The migration of the current viewer technology has been initiated. The MCLIO is currently assisting with the development of the new platform and viewer. A gap analysis has been performed to determine the extent of the tools and capabilities that will not be present (yet) in the current viewer technology.

ACTIVITIES THIS PERIOD: 9/15 – 12/15

- A development area has been set up to start the viewer migration.
- Timelines, project scope and goals have been determined.
- Tool and Search migration has been completed.
- A separate Parcel Viewer has been initiated.
- Developed SQL geometry spatial queries to supply the parcel viewer.

NEXT

- Complete migration of the Interactive Viewer

- Complete the Parcel Viewer
- Start rollout of the migrated interactive viewer.
- Start to gather feedback on the parcel viewer for refinements

* * * * *



**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: MCAMLIS Steering Committee
FROM: Kevin Bruhn, MCAMLIS Project Manager
DATE: November 30, 2015
SUBJECT: SYSTEM ARCHITECTURE DESIGN

BACKGROUND

The Milwaukee County Land Information Office entered into a contract with esri to prepare a System Capacity Plan. Under the work plan item VWR.01.1, the MCLIO requested an inventory, current capacity and roadmap document to gauge its ability to support the future GIS requests made to the Land Information Office.

The goal of this capacity plan is to generate a GIS infrastructure roadmap to follow as Milwaukee County increases the capacity of the enterprise GIS system. The Land Information Department and its governing body, Milwaukee County Automated Mapping and Land Information System, (MCAMLIS), need to protect its core mission and directives while at the same time supporting and contributing to the growing requests and needs from internal Milwaukee County departments and external MCAMLIS partners.

DELIVERABLES

- A system capacity plan that inventories the current Milwaukee County GIS infrastructure environment
- A document that provides Information Technology (IT) system recommendations to the MCLIO that will accommodate future requests and GIS growth

STATUS:

- The System Design Study has been completed and reviewed.

ACTIVITIES THIS PERIOD: 9/15 – 12/15

- Revisions of the draft system capacity plan have been generated.

Recommendation:

Milwaukee County's capacity of the current GIS environment is capable of supporting a growth of 50 to 75% more traffic in the current environment. This is primarily due to the purchase and deployment of new enterprise machines that are capable of handling more work per hour without increasing the number of servers or licenses of software.

This new hardware implementation will allow the MCLIO to support the increasing needs within Milwaukee County as well as the services and applications that are published to the public arena. The MCLIO will need to monitor the traffic and anticipate the need for a second environment due to GIS traffic.

One real reason to add additional server resources is to limit the exposure for a single point of failure. In the present GIS environment, there is a concern of the ability to maintain a higher level of availability. In a single GIS server environment, the MCLIO accepts a greater risk to downtime due to unexpected situations. A second server environment would limit that exposure of downtime. This liability needs to be addressed if any service level agreements are initiated for data and services that are requested.

NEXT

- Monitor GIS infrastructure during growth and capacity increases. Address the single point of failure when a service level agreement request of greater reliability is needed.

Attached:

System Design Study

* * * * *

System Capacity Plan

Prepared for

County of Milwaukee
Land Information Office
Suite 903, 633 W Wisconsin Ave
Milwaukee, WI 53203

June, 2015



esri®

380 New York Street
Redlands, California 92373-8100 USA
T 909 793 2853

Contents

1	Capacity Planning.....	4
1.1	Plan Goals	4
1.2	Current GIS Operations	4
1.3	Existing Infrastructure	5
1.4	Existing Servers.....	5
1.5	Server Storage.....	6
1.5.1	Existing SQL Server Database storage.....	6
1.5.2	File Storage.....	7
1.5.3	GIS Processing\GIS Web server, (caching storage)	7
1.5.4	External Retrievable storage (Dropbox)	8
1.6	Input: Application and User Load.....	8
1.7	Input: Service Level Goals	11
1.8	Input: Risks.....	11
1.9	Input: Best Practices.....	12
1.9.1	Separate Production Editing from Publication databases.....	12
1.9.2	Separate Business Function	12
1.9.3	Create a staging or test environment	13
1.9.4	Create a crowd sourced information database environment	13
1.10	Output: Infrastructure Capacities.....	14
1.11	Output: Proposed Architecture	17
1.12	Output: Conclusion	20
1.12.1	Proposed Specific Recommendations	21
2	Appendices.....	22
2.1	Appendix – Acronyms.....	22
2.2	Appendix – Additional Visio Diagrams	23
2.3	Appendix – Esri Licensing.....	23
2.4	Appendix – References	23

1 Capacity Planning

The capacity planning process assists with assessing an organizations readiness to supports its end users. To complete this process requires an understanding of all applications and users that will be accessing a system. In order to acquire this information, surveys and interviews are typically held at an organization with the provided information forming a foundational understanding of the goals and objectives for the systems within the organization itself. Unstated goals are therefore unable to be planned for and could alter recommendations within a plan. In addition because an organization changes over time, a plan needs to be updated or adapted as time progresses.

1.1 Plan Goals

The goal of this capacity plan is to generate a GIS infrastructure roadmap to follow as Milwaukee County increases the capacity of the enterprise GIS system to accommodate the growing needs. Milwaukee County is on the precipice of moving from a Land Information centric GIS system to a full enterprise multi-department organization. The Land Information Department and its governing body, Milwaukee County Automated Mapping and Land Information System, (MCAMLIS) needs to protect its independence and identity at the same time support and contribute to the growing requests and needs that are being proposed from internal Milwaukee County departments and external GIS partners.

This roadmap can be achieved from a thorough understanding of what is currently in place as a GIS infrastructure, single ArcGIS Server instance ported from the internal network externally through a Bluecoat reverse proxy, to an instance that can handle a multi-faceted enterprise GIS organization.

1.2 Current GIS Operations

The Land Information Department maintains the countywide GIS distribution systems and is the custodian of the core GIS datasets for Milwaukee County. The Land Information Department responds to GIS requests from municipalities of Milwaukee County as well as departments within Milwaukee County government, except for the Milwaukee County Airport. The Land Information Department has a single ArcGIS application server with web map services published both internally and externally. This ArcGIS server environment is hosted on an internal network and then made available to the internet through a Bluecoat ProxySG 300 proxy server. The Land Information Office hosts data, services, and applications for multiple MCAMLIS partners. This GIS data,

service, and application network traffic has been doubling year over year for the past four years.

Within the County, there is also a growing realization of the benefits a GIS system can provide to departments other than the Land Information Department. For example, there is an enterprise asset management project underway supported by a Cityworks ELA. This project will integrate with other GIS and non-GIS applications.

1.3 Existing Infrastructure

Servers reside on a VMWare host in a tier 1 data center. All servers and SAN devices are in the same data center connected via 2Gbps fiber. The WAN is a 500Mbps fiber connection to metro located offices where switches are available for 100Mbps to 1Gbps. More remote offices may be on connections with 100Mbps to 200Mbps depending on the location. Latency is worst to the airport facility location with 2-3ms, however it is not anticipated to participate in any of the currently scheduled GIS projects at this time.

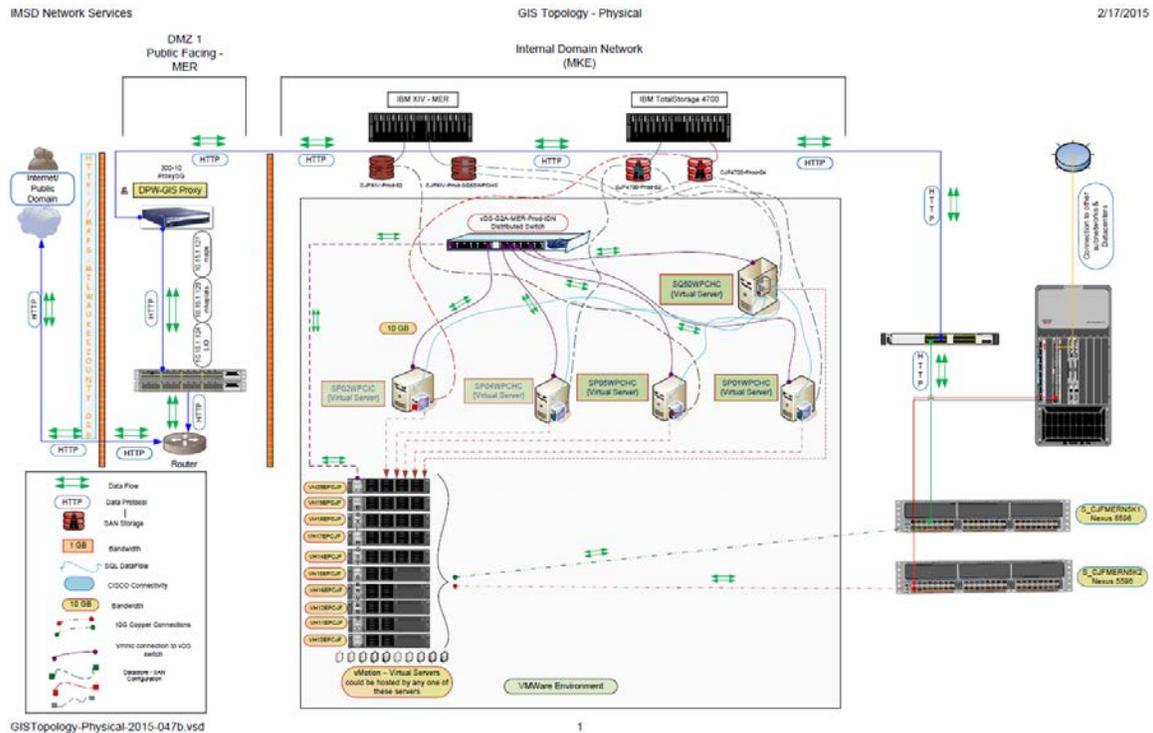


Figure 1 Existing environment

1.4 Existing Servers

The existing infrastructure is based on a set of virtual servers. It has been noted by County staff that the current virtual server needs additional resources to continue to support existing demands.

Table 1 Existing servers and function

Server Tier	Server Name	Server Function
Production	SP05WPCHC	Map Server (ArcGIS Server)
Internet Publication	WE50WPCHC	Web Server (ArcGIS Server)
Internet Publication	SQ50WPCHC	Database Server
Production	SP02WPCIC	File Server
Development	SQ41WPCHC	Web Server/Map Server (ArcGIS Server)
Production	SP04WPCHC	Web Server/Map Server (ArcGIS Server)
Production	SP01WPCHC	Database Server

The current architecture of the GIS solution is running on a virtualized instance of Server 2008 with a SQL Server 2008 backend. The virtualization hypervisor is VMware ESX 5.5 running on HP DL380 Generation 7 physical servers. These machines are attached to IBM XIVs for storage purposes. There is no failover or additional capacity configured for the server at this time.

The current ArcGIS application server has 24GB of RAM which is typically 73% consumed although a number of the services may be idle at any one time. The CPU has both busy and idle periods throughout most business days. Peak periods can sometimes tax memory and CPU resources.

1.5 Server Storage

1.5.1 Existing SQL Server Database storage

Highlighted databases have content that is published to the internet\intranet.

Table 2 Existing Database sizes and anticipated 1 year growth

Database	Current Usage	Yr1 Usage Expected
CITYWORKS (Editing)	1GB	2GB
CNTYPARK (Editing)	1GB	3GB
CNTYDATA (Editing)	13GB	15GB
CNTYPUBLISH (Publishing)	48GB	55GB

Database	Current Usage	Yr1 Usage Expected
CNTYRASTER (Publishing)	900GB	1.5TB
CNTYTEST (Staging)	10GB	10GB
MCAMLIS (Editing)	7GB	8GB
Totals	1TB	1.6TB

The County has about 1TB of raster data being delivered in Q4 of 2015. This is expected to be a re-occurring delivery, 500 GB every 2-3 years, then about 1TB every 5 years. The usage of the raster database is primarily from existing rasters stored in the geodatabase in addition to storing overviews for mosaic datasets used by the Image Extension for ArcGIS Server. This is one reason that the annual delivery of sizes does not necessarily match the sizes seen inside the relational database.

1.5.2 File Storage

First tier (i.e. SP02WPCIC), high performance environment for fast access to files. The highlighted folders have content that is published to the internet\intranet.

Table 3 Existing file storage sizes and anticipated 1 year growth

Database	Current Usage	Yr1 Usage Expected
Documents	103GB (86GB for Cityworks, 17GB for pdf docs)	125GB
Project folder	625GB	700GB
MCAMLIS	206GB	250GB
MISC	16GB	16GB
Totals	950GB	1.1TB

We will need 100-200GB in the next year.

Second Tier (ARCH01WPCHC), archive and mass storage is hosted on a server with slower drives with higher capacity. Of 5TB available to the LIO there is currently 3.5TB free. With the 2015 deliveries, there should still be adequate storage for a few years.

1.5.3 GIS Processing\GIS Web server, (caching storage)

Highlighted servers are publishing content to the internet\intranet

Table 4 Existing web server storage / map cache sizes and anticipated 1 year growth

Database	Current Usage	Yr1 Usage Expected
SP05WPCHC	300GB	500GB
WE50WPCHC	150GB	200GB

Totals	450GB	700GB
---------------	-------	-------

1.5.4 External Retrievable storage (Dropbox)

Current account 1.05TB
 Utilizing 300GB

With 2015 raster delivery, the County will utilize 800GB. They will need to plan for expansion in the next 2 years.

1.6 Input: Application and User Load

Users in this context are internet users making use of web services that have been published by LIO, some may be leveraging these services in another web application. It is anticipated that future web service users will also include those users interacting with the County-wide City Works system that is a current project, but has not yet been implemented.

Table 5 Application User Load

Workflow Name	Site Name	Application Name	Total Users	Active Users	Load Factor	Pacing	Throughput
Internal Service Users	633 Wisconsin	Web	200	100	100.00%	6.00	0
External Service Users	InternetUsers	Web	200	100	100.00%	6.00	0

As documented by County staff, existing, and currently proposed applications include the following. These are the client driven inputs to the server planning process:

Table 6 Existing applications and functions utilized, users are estimated

Application Name	Pattern	Application	Version	Services	Tasks	Caching	Yr1 Users	Yr2 Users
ArcGIS Desktop	Desktop	Desktop Advanced (ArcInfo)	10.3	Map	Editing	N/A	7	7
ArcGIS Desktop	Desktop	Desktop Extensions	10.3	GP	GP	N/A	3	3
ArcGIS Server Map Services	Web	ArcGIS Server	10.3	Map	Other	Dynamic / Cached	25	35
Interactive Viewer Geocortex SV Web App	Web	ArcGIS Server	10.3	Map	Find Address	Dynamic / Cached	100	100
Interactive Viewer Geocortex HTML5 Web App							100	100

Application Name	Pattern	Application	Version	Services	Tasks	Caching	Yr1 Users	Yr2 Users
Parcel Viewer Geocortex SV Web App							100	100
Interactive Viewer Geocortex ADF Web App	Web	ArcGIS Server	10.0	Map	Find Address	Dynamic / Cached	0	0
Tax Exempt Web App	Web	ArcGIS Online	N/A	Map	Navigation	Dynamic / Cached		
Economic Map Web App	Web	ArcGIS Online	N/A	Map	Predefined Query	Dynamic / Cached		
Pictometry Connect/Online Web App	Web	N/A	N/A	Image	Navigation	Cached		
Plat Scans	Web	N/A	N/A	Image	Search by Attributes	N/A		
Document Viewer	Web	N/A	N/A	Image	Search by Attributes	N/A		
Cartegraph	Web	ArcGIS Server	10.3	Feature	Editing	N/A	2	2
Cityworks	Desktop	Desktop Extensions		Map	Editing	N/A		
Cityworks	Mobile	ArcGIS Server	10.3	Map	Editing	N/A	30	60

ArcGIS for Server statistics revealed the following chart of requests over a seven day period. In general, services received 1500 or less requests in a 4 hour period during that snapshot in time. Several groups of services stand out in that time, MCLIO, Basemaps and Secure services. These three groups of services peaked at between 5,000 to 15,000 requests in a 4 hour period. Overall, 40,000 maps dynamic and cached web maps could be requested in a 4 hour window at the current volume.

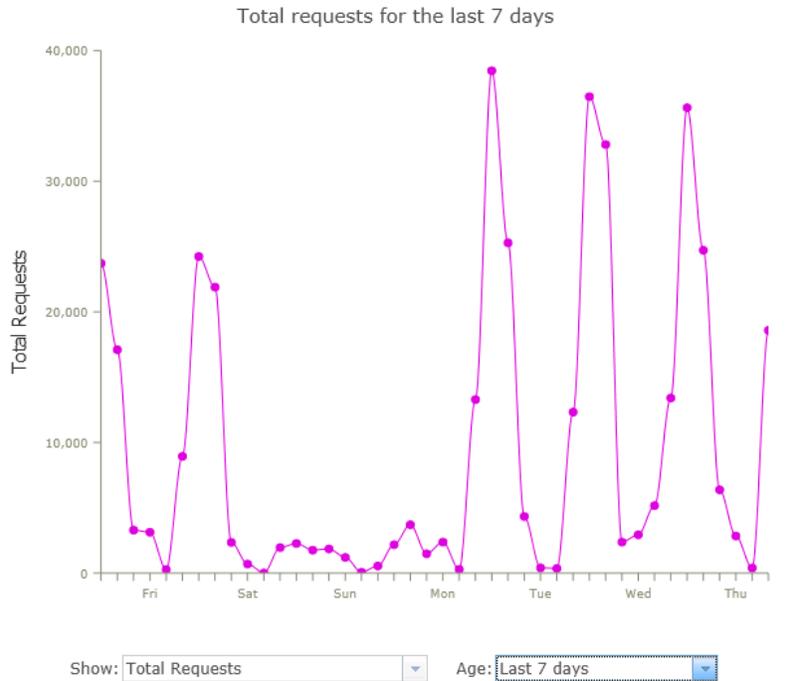


Figure 2 ArcGIS for Server Map Service Total Requests (4hr) over a 7 day period 8/13/2015-8/20/2015

The following diagram comes from the reverse proxy in place at the County. It shows network bandwidth consumed by the GIS applications over the past year. In general it shows that the GIS environment is currently averaging around .75Mbps traffic. This is just a portion of the 500Mbps fiber connection at the main County data center.

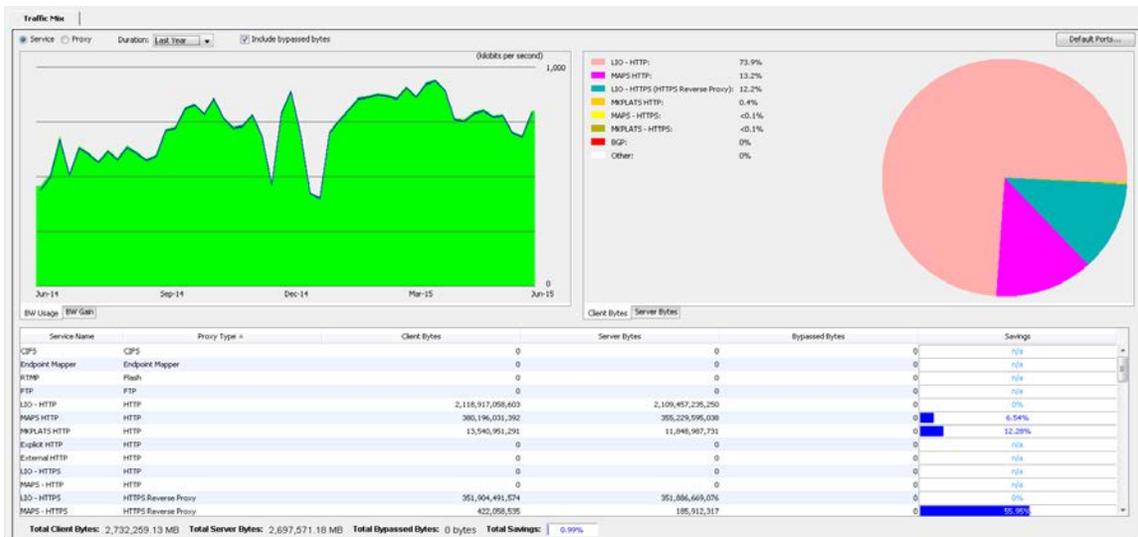


Figure 3 Network bandwidth consumed with application over the past year

Future applications that are under consideration by the County but were not included in the information provided, such as the facility management, self-mapping portal, or emergency management applications; are not included in the following projections.

1.7 Input: Service Level Goals

At the time of these meetings, the County does not have written requirements for service level availability within (or outside of) the County. At a meeting with IT staff, a defined best guess of goals included 4Hr Outage of availability (RTO), 15min data loss or less (RPO).

These requirements do not necessarily indicate a requirement for server clusters e.g. SQL Server clusters or Windows Clusters, but do indicate a preference for multiple/failover servers and environments. Databases should include full recovery models which include transaction log backups every 15min to help achieve the RPO goals.

A disaster recovery plan is not yet in place for the GIS environment, but should be developed with the increase of users at the County in mind that are and will be utilizing the GIS systems for ever more fundamental County functions.

1.8 Input: Risks

Developing a system architecture based on the point in time of a system has limitations as it is not always clearly known what direction an organization will go with the systems, data, applications, and user access in the future. In this case, the expectation is that the future use of mapping and generalized services will continue to expand from users and applications both inside and outside the County. However if expansion is different than that anticipated at the time of this review, it can impact the ability of the servers to meet the desired goals.

Additional risks can be found when additional third party components are included. At the time of this review, SOEs from both Cartegraph and CityWorks have been installed into the sole server hosting services for the Land Information Department. While these SOE's are not heavily used at this time, additional users being added for asset management within the County usage are anticipated to continue rising. When a third party component becomes heavily used and relied upon, it can impact the ability of other users of the system to react flexibly to events such as new version releases if all the other components on the system do not support the new version. This can be known as "rev locking" and can cause problems if version compatibility issues delay upgrading past a software versions retired date. Apart from the version issue, we did not have

models built for third party SOE's published by Esri support. In order to capture metrics for these extensions, additional performance testing of those extensions would need to occur. Without the metrics, the performance numbers are based on good faith estimates.

1.9 Input: Best Practices

Esri has a series of recommendations or best practices developed over a period of time that impact or advise our system architectures. These best practices include commonly accepted IT procedures. Specific best practices highlighted here for the County of Milwaukee include the following.

1.9.1 Separate Production Editing from Publication databases

By separating the databases where we are consistently editing our data we reduce impact to our editors by providing data access to our users from a more stable data store. We can use replication or ETL processes to move data from our editing data base to our publication database.

An additional reason for implementing this best practice comes from the methods used to ensure consistent data reads (table locks) which reduce the ability of data managers to react to data change requests with data sources also published as web services.



Figure 4 A Publication Geodatabase created from a Transactional Geodatabase

1.9.2 Separate Business Function

In many ways, systems are specified and sized with a specific set of tasks in mind, dividing servers by business function allows for the specialization of server

to function. This helps reduce the possibility of some services or requests on one server over-riding or overwhelming the resource pool available on another.

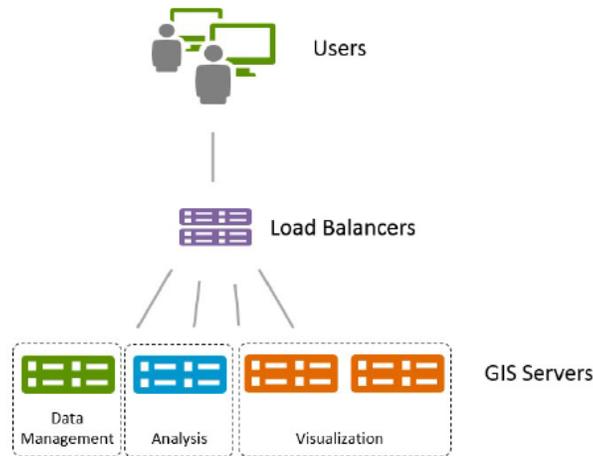


Figure 5 GIS Servers separated by business function

1.9.3 Create a staging or test environment

The creation of a separate environment to support the development of applications, testing of application functionality is ideal to help isolate the impact of environment changes on production systems. Most organizations setup a three tier environment, one level for developers to create new applications, one for testers to validate new or updated application functionality and then one for access by the end users, be they public or other County staff.

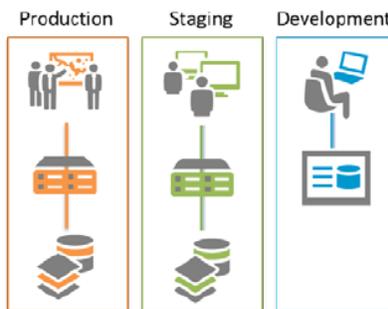


Figure 6 An example set of GIS system environments

1.9.4 Create a crowd sourced information database environment

Crowd-sourced information is collected by allowing the public to contribute to a map that uses a feature service. Because the data is not yet from the system of record and needs to be reviewed prior to mixing with system of record information, then it should be created and stored in a separate geodatabase for this type of information. A replica or scripted ETL type process could be used to synchronize the information to a publication database when required.

1.10 Output: Infrastructure Capacities

The following information describes the server hardware and network capacities that would be required to support the pattern based applications and activities summarized above. In the first instance, servers described match the requirements as defined through the system architecture inputs.

Assumptions Include:

- There is a need for web mapping and utility services to be available in a redundant manner across all users of the services provided.
- The LIO will continue to provide fundamental GIS mapping and utility services and applications to agencies across the County.
- The LIO will continue to provide fundamental GIS mapping applications and mapping services to external public/private bodies
- VMWare 5.5 will continue to be used to provision the server hosting environment.
- The LIO will move the support of asset mapping functionality (and the associated SOE components) to a separate set of application servers.
- The hardware chosen by the County is the HP DL 380 G9 with an Intel Xeon E5-2670 v3 processor.

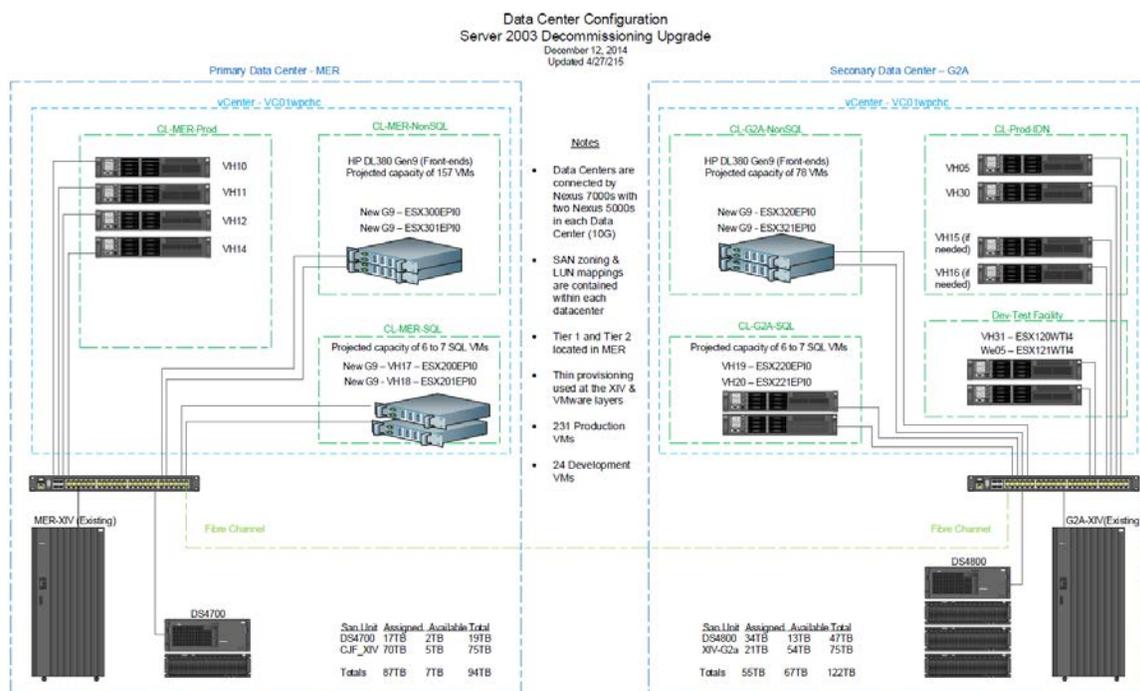


Figure 7 Diagram showing server plan for the County

The calculated capacity of this hardware is higher than the older machines it replaced. The capacity is partly based on the machines ability as defined by the SPEC organizations Integer Rate benchmark. The calculated capacity of the existing hardware is shown in the following diagram.

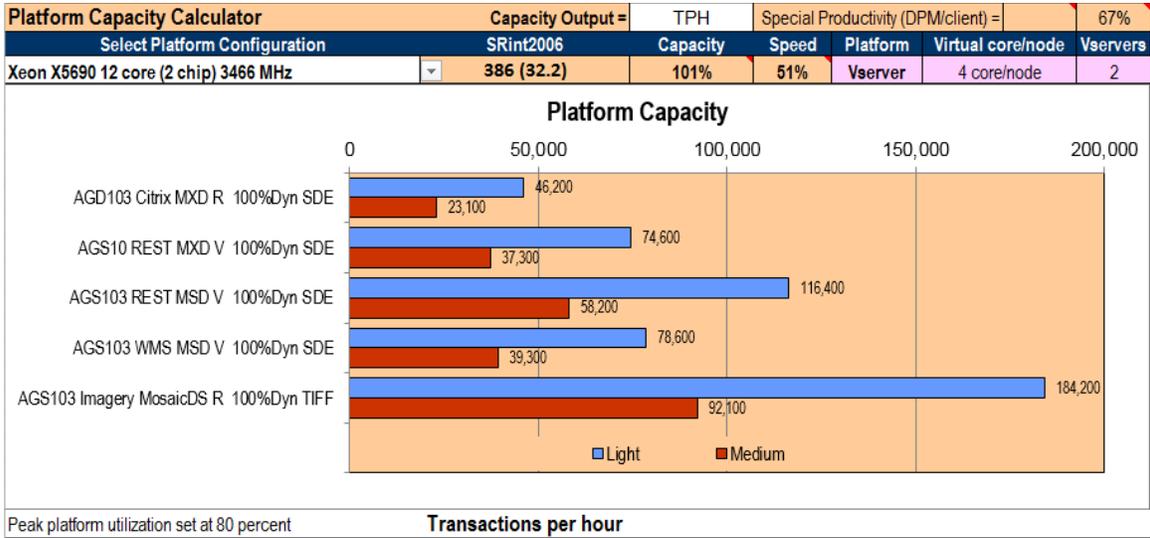


Figure 8 Estimated existing platform capacity based on processor

The following diagram shows potential levels of map throughput based on common map assumptions. For example, an ArcGIS for Server 10.3 instance publishing a 100% dynamic map with data stored in an enterprise geodatabase could possibly handle 83,000 transactions/maps per hour with a medium complexity map or over 166,000 maps/transactions per hour with a lightweight map. The map layers can have a large impact on the scalability of the map service itself.

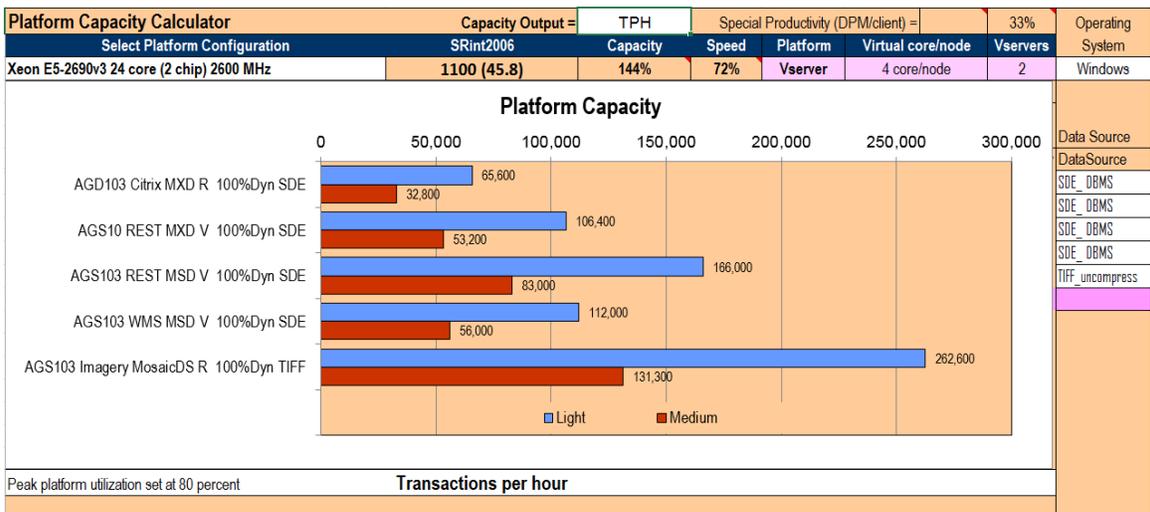


Figure 9 Estimated future platform capacity based on chosen processor

Based on the discussion regarding the environment at the County and server hardware that is available, the server requirements look like those listed in table 7. The type of server is listed in the Role column, the server name – as currently known is in the Name column and the number of machines required are in the quantity column. Expected utilization for each server at full utilization based on provided information is in the CPU Utilization column.

Table 7 Suggested Server Hardware Specifications by Role

Role	Name	Quantity (A/P) Calc	Vendor	Proc	Cores	Processor Clock Rate (MHz)	SPECRate Per Core	RAM (GB)	CPU Utilization
Prod File Server	SP02WPCIC	1	Hewlett-Packard Company	Intel Xeon E5-2670 v3	2 (V)	2300.00 MHz	42.08	24.00 GB	Variable
Prod LIO ArcGIS Server	SP05WPCHC	2	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	36.00 GB	52.5%
Devel LIO Server	SQ41WPCHC	1	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	24.00 GB	Variable
Prod SQL Server	SQ50WPCHC	1	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	36.00 GB	28.50%
Prod LIO Web Server	WE50WPCHC	2	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	24.00 GB	Variable
Test LIO ArcGIS Server	TBD	1	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	24.00 GB	Variable
Test LIO Web Server	TBD	1	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	24.00 GB	Variable
Parcel Hydration Server	TBD	1	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	24.00 GB	Variable
Prod CityWorks ArcGIS Server	TBD	2	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	36.00 GB	52.5%
Prod LIO Web Server	TBD	2	Hewlett-Packard Company	Intel Xeon E5-2670 v3	4 (V)	2300.00 MHz	42.08	24.00 GB	Variable
License Server	TBD	1	Hewlett-Packard Company	Intel Xeon E5-2670 v3	2 (V)	2300.00 MHz	42.08	16.00 GB	Lightweight

The network diagram for primary locations within the County shows an ability to support web based communications by internal GIS consumers.

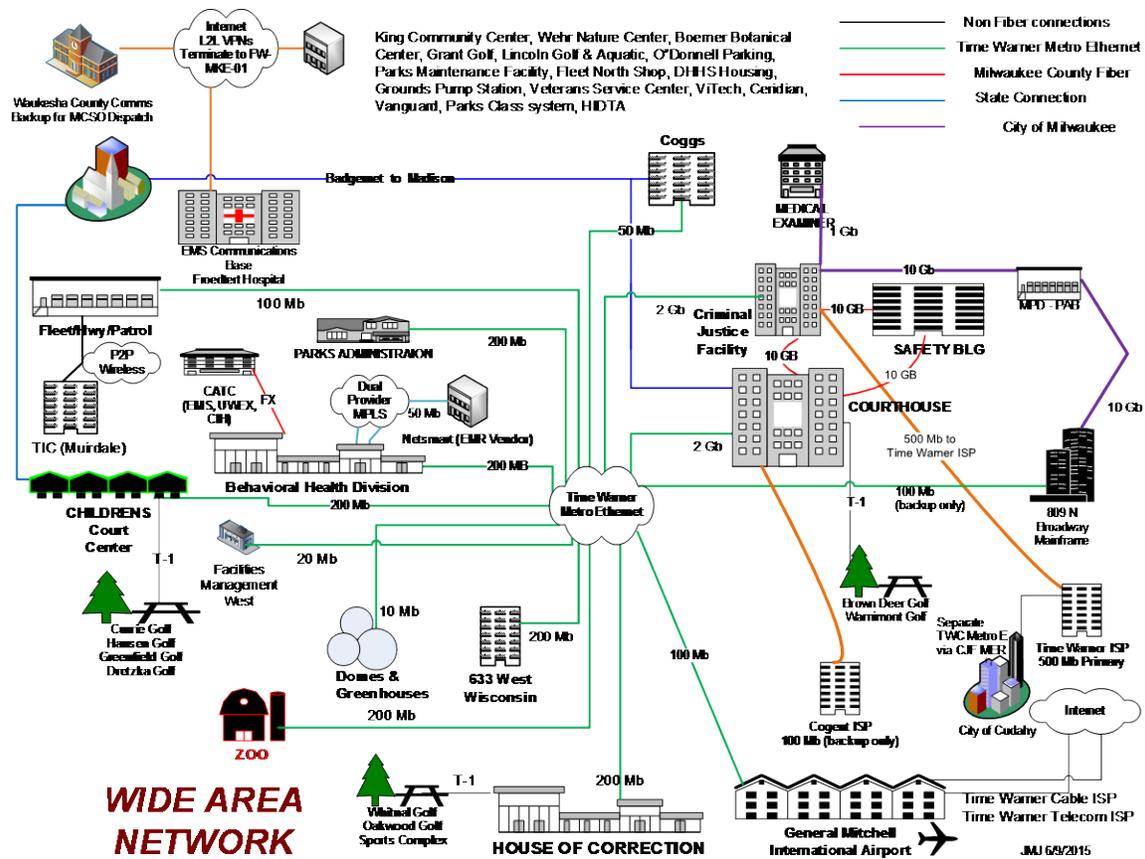


Figure 10 County WAN Network Diagram

File server and database capacity numbers were explored earlier in this document. A recommendation is to ensure there is an additional amount of storage available over and above that noted for organic growth of the data. In addition, ensure that the storage is not using complex technologies such as Windows clustering, Standard SAN and NAS technologies are highly recommended however.

1.11 Output: Proposed Architecture

The servers outlined in the previous table can get translated into a proposed design in Figure 8. This diagram shows a proposed production server environment based on current estimated of user numbers as well as manageability.

While the stated RTO goal does not require the use of SQL Server clusters, the diagram does show one in the expectation that as more users and applications get added to the system there will be more of a demand for services that may take the RTO to a point at which clusters make sense.

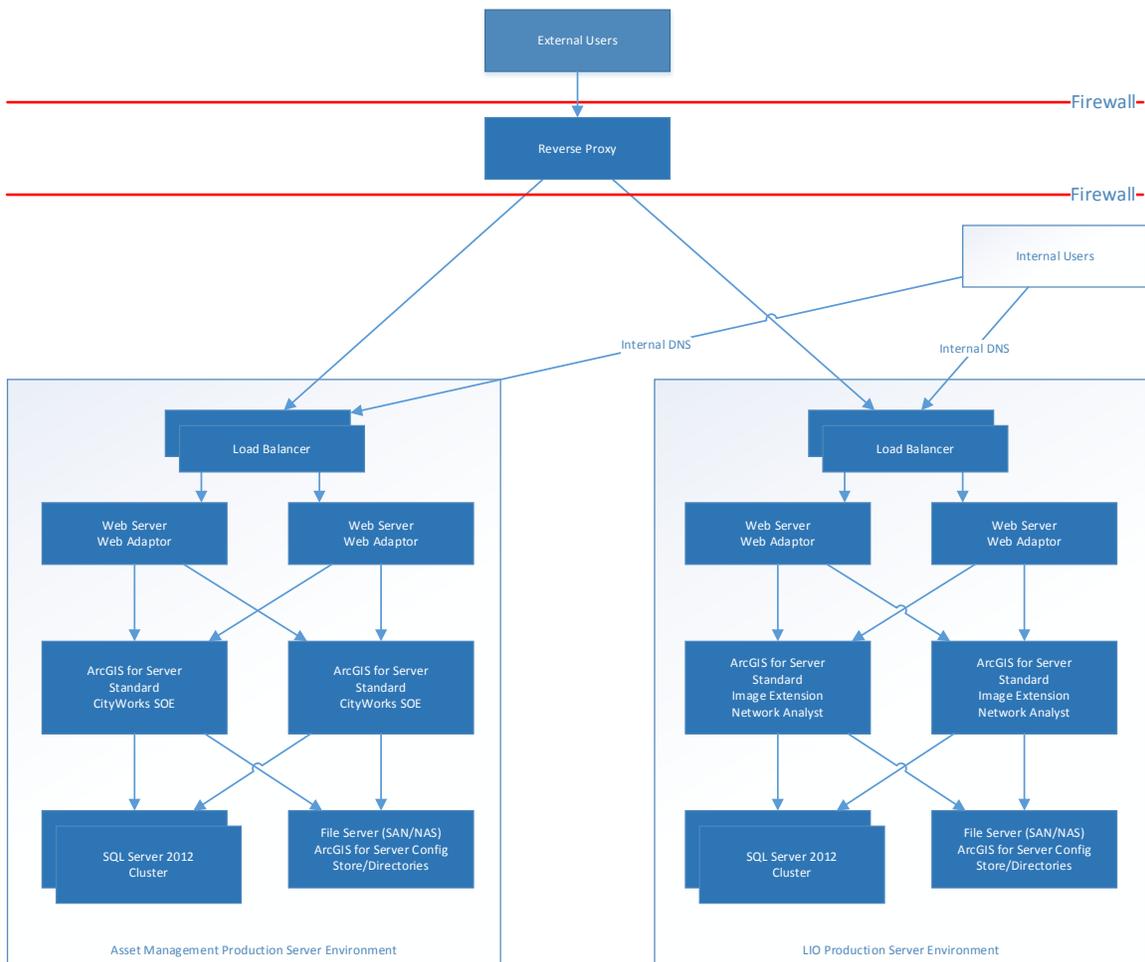


Figure 11 Proposed Long Term Production GIS Servers Configuration

In most organizations, demand for web mapping services grow over time as more applications and content is introduced and published. For the County of Milwaukee LIO, there is already a base demand for data and services which indicates the need for additional servers to improve server capacity is more urgent than it otherwise might be in a brand new environment.

For Asset Management at the County, it is unclear what the uptake will be on the new applications that are in an early phase of being developed. However a longer term view of the environment suggests splitting this functionality onto its own set of servers, in support of the identified best practice; would be a fundamental action towards the creation of an enterprise GIS environment at the County.

In addition to the servers setup to support the LIO web services consumed by internal and external users, there is also a need, not shown on this diagram, to have a server available to perform as a Property hydration gateway. This server

is listed in the server table. This server's function is to support the integration of parcel information from local governments to the county's environment.

The LIO group needs the addition of a test environment in addition to the servers noted above to enable the ability to test applications prior to deployment on a production server. In addition, the test servers provide a platform for the development of map caches instead of running these processes on the production hardware.

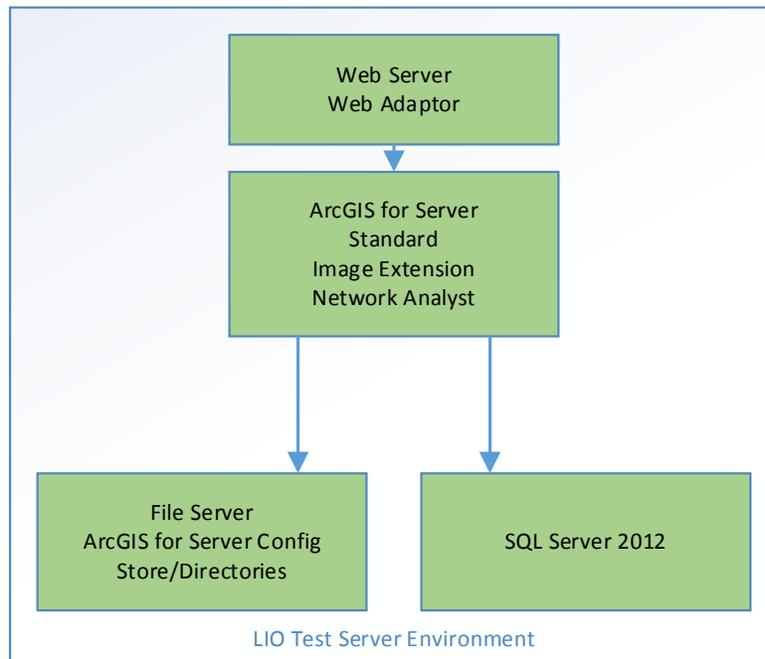


Figure 12 Test GIS Servers Configuration

Finally, Esri Developer Network licenses provide County developers with the tools that they need to develop new web applications. A diagram is not shown of any development servers as it is anticipated the model will look similar to those identified at the test or staging server level.

Based on these diagrams and discussion, the required ArcGIS for Server Licenses look like the following:

MCAMLIS

ArcGIS for Server Standard – Production x2

- Image Extension for Server x2

ArcGIS for Server Standard – Staging x1

- Image Extension for Server x1

CityWorks

ArcGIS for Server Standard – Production x2

- Network Analyst x2

ArcGIS for Server Standard – Staging x1

- Network Analyst x1

1.12 Output: Conclusion

IT staff have stated that the older virtual hardware will be replaced with newer servers. While the existing server infrastructure has been able to support the current level of map requests, the new servers proposed by Milwaukee IT have been sized to accommodate both internal and external map and service requests over the next couple of years as defined by the County LIO staff. It is important to note the risks noted in a previous section, for example that the addition of third party extensions on the application servers may impact the sizing of these machines.

Adding additional servers, as documented in the proposed server diagram; to provide redundancy in the event of a server failure is an important step in the provision of GIS services to both internal and external users. Without these redundant servers, a failure of a server would impact the user's ability to acquire required resources from LIO.

In addition to production servers, the proposed server configuration includes a Test Server for testing of web applications and new web services, another function of these servers is the creation of map caches in order to offload this work from the production ArcGIS for Server machine.

Depending on how quickly the asset management system is adopted by users within the County, the server development plan may vary. A proposed timeline is shown here for planning purposes, but should be evaluated based on the project plan in place and anticipated growth in user numbers.

Proposed Timeline				
Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016
Migration of LIO Production		Build Out of LIO Production		
	Creation of AssetMgt System		Build Out of AssetMgt System	
	Setup LIO Test Servers			

Figure 13 Proposed build out diagram showing a methodology for adding servers over time

Migration of LIO Production: This activity includes the upgrading of the existing single LIO server to the latest release of the ArcGIS Server software for the project as described in the server configuration section. In addition, this activity includes the migration of existing map services and functionality to the new application server machine.

Build out of LIO Production: This activity supports the addition of a second specified server to the LIO server system, as described in the server configuration section. The additional server is required to support a continuing increase in usage of county map services in addition to providing failover capability in the event of a system failure with redundancy support the primary focus.

Creation of Enterprise Asset Management System: This activity supports the standing up a single server with the asset management e.g. CityWorks extensions to support the asset management project as described in the server configuration section.

Build out of Enterprise Asset Management System: This activity supports the addition of the second specified server to the asset management server system e.g. CityWorks, as described in the server configuration section. The additional server is required to support an increase in the number of county users on the asset management system in addition to providing failover capability in the event of a system failure.

Setup LIO Test Servers: This activity supports the setup of a set of test servers within the County as described in the server configuration section.

A ROI analysis is beyond the scope of this document, however resources are included in the references section, or a project could be setup by the County to evaluate ROI once servers and processes have been in place for a period of time.

1.12.1 Proposed Specific Recommendations

- Monitor memory utilization at the guest Windows level, ensure there is enough available memory listed in Windows to handle all services being requested plus an additional 3GB of available RAM.
- Upgrade the existing server to the new virtual host environment.
- Acquire an additional ArcGIS Server license and possibly network analyst extension license to support the development of an asset management server environment.
- Install a server to support the county-wide Asset Management platform initiative (e.g. CityWorks)
- Acquire an additional ArcGIS Server license and image extension license to support system capacity and redundant servers for MCAMLIS.

- Install a server to support increased system capacity, and server redundancy on the existing MCAMLIS server environment.
- Acquire an additional ArcGIS Server license and possibly network analyst extension license to support the development of an asset management server environment.
- Acquire two ArcGIS for Server licenses along with appropriate extensions for use in a staging environment.

2 Appendices

2.1 Appendix – Acronyms

Acronym	Description
FIFO	First In, First Out (FIFO) backup scheme saves new or modified files onto the "oldest" backup media in the set.
GFS	Grandfather-Father-Son (GFS) backup rotation scheme to maintain backups on a daily, weekly, and monthly basis.
ELA	Enterprise License Agreement
ETL	Extract Transform Load, a process for moving data where is must be extracted from one location or database, transformed into an appropriate format and then loaded into the new location or database.
ITSC Plan	Information Technology Service Continuity Plan
Lidar	Acronym for light detection and ranging. A remote-sensing technique that uses lasers to measure distances to reflective surfaces.
LIO	The Milwaukee County Land Information Office (MCLIO) is organized within the County's Department of administrative Services – Division of Economic Development/MCAMLIS Section. MCLIO was created in 2005 as a result of Milwaukee County Resolution 90-707(a) mandating the MCAMLIS Program in Milwaukee County.
MCAMLIS	Milwaukee County Automated Mapping and Land Information System
MCLIO	Milwaukee County Land Information Office, see LIO
REST	Representational State Transfer (REST) Web service. REST-based services receive requests through simple data types passed back and forth as requests and responses, often through JavaScript Object Notation (JSON).
ROI	Return on Investment. A business metric for calculating the benefit to an organization of investing funds in a new workflow/application.
RPO	Recovery Point Objective (hrs) The RPO is only a measure of the maximum time period in which data might be lost if there is a Major Incident affecting an IT Service- not a direct measure of how much data might be lost.

Acronym	Description
RTO	Recovery Time Objective (hrs) how long can we be without the service specified without incurring significant risks or losses. The events that mark the start and end of the RTO duration must be pre-agreed between GIS and IT staff. It is best to agree to start the RTO clock at the moment when it is decided to proceed with the recovery.
SOE	Server Object Extension. A useful way to extend ArcGIS for Server in a way that's useable by Esri Web application programming interfaces (APIs)—for example, JavaScript, Flex, Silverlight, and so on—is to write a server object extension (SOE) as a Representational State Transfer (REST) Web service.

2.2 Appendix – Additional Visio Diagrams

These diagrams illustrate the sequence of software functions for all of the operations within each workflow.

2.3 Appendix – Esri Licensing

The following tables show the Esri licenses required for the server configuration described.

Table 8: Esri Licenses Required

<i>Title</i>	<i>Licensing Model</i>	<i>Licenses</i>
ArcGIS for Server Standard – Production	1 per 4 cores	4
Image Extension – Production	1 per 4 cores	2
ArcGIS Network Analyst – Production	1 per 4 cores	2
ArcGIS for Server Standard – Staging	1 per 4 cores	2
Image Extension – Staging	1 per 4 cores	1
ArcGIS Network Analyst – Staging	1 per 4 cores	1
Esri Developer Network (EDN)	1 per named user	1

2.4 Appendix – References

Processor references include the SPEC organization benchmark report for the underlying proposed hardware.

- <http://www.spec.org/cpu2006/results/res2014q4/cpu2006-20141006-32119.html>
- http://ark.intel.com/products/81709/Intel-Xeon-Processor-E5-2670-v3-30M-Cache-2_30-GHz

External Facing Applications

- MCLIO Data Download App
<http://mclio.maps.arcgis.com/apps/SimpleViewer/index.html?appid=9d71b12ae08440b7af1d092a64b22cb3>
- Milwaukee County Interactive Map
<http://lio.milwaukeecounty.org/mcamlis/> (Geocortex Silverlight Application)
One component is 4.1MB
- ArcGIS Server
<http://lio.milwaukeecounty.org/arcgis/rest/services>

Return on Investment

- Return on Investment, Ten GIS Case Studies
<http://www.esri.com/~media/files/pdfs/library/ebooks/return-on-investment.pdf>
- The Business Benefits of GIS: An ROI Approach
<http://esripress.esri.com/display/index.cfm?fuseaction=display&websiteid=142&moduleid=0>



**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: MCAMLIS Steering Committee

FROM: Kevin Bruhn, MCAMLIS Project Manager

DATE: November 30, 2015

SUBJECT: 2015 ORTHOPHOTOGRAPHY PROJECT STATUS

BACKGROUND

At its meeting held September 23, 2014, the MCAMLIS Steering Committee approved a staff recommendation to proceed with the acquisition of Pictometry International Inc AccuPLUS certified orthophotography.

Since the 2005 Regional Orthophotography Project, Milwaukee County has acquired digital orthophotography every two or three years. The most recent orthophotography covering Milwaukee County occurred in the spring of 2015. This digital orthophotography acquired for Milwaukee County was partially funded by SEWRPC in its support of regional planning efforts.

STATUS:

Pictometry Inc. delivered the mosaicked 2015 imagery to Milwaukee County. Upon review of the imagery it was noticed that there was the presence of limited amount of snow and ice. The MCLIO is currently reviewing this concern to rectify the situation.

ACTIVITIES THIS PERIOD: 9/15 – 12/15

- The MCLIO received delivery of the 2015 Milwaukee County 3 inch orthophoto flight
- Three tiles were identified as in error and Pictometry was notified. The tiles in question were fixed and integrated into the final mosaicked product.
- A boundary file was created to represent the areas present of snow or ice.
- SEWRPC created half township .sid compressed files for Milwaukee County that are available for download.

NEXT

- The MCLIO is currently in discussion with Pictometry to identify locations in the 2015 flight that have ice coverage that cover water shoreline or have snow that cover the ground.

- The MCLIO will negotiate, at no cost, a re-flight of those areas deemed 'out of specification' and prepare for a discrete 2016 flight.

Attached:

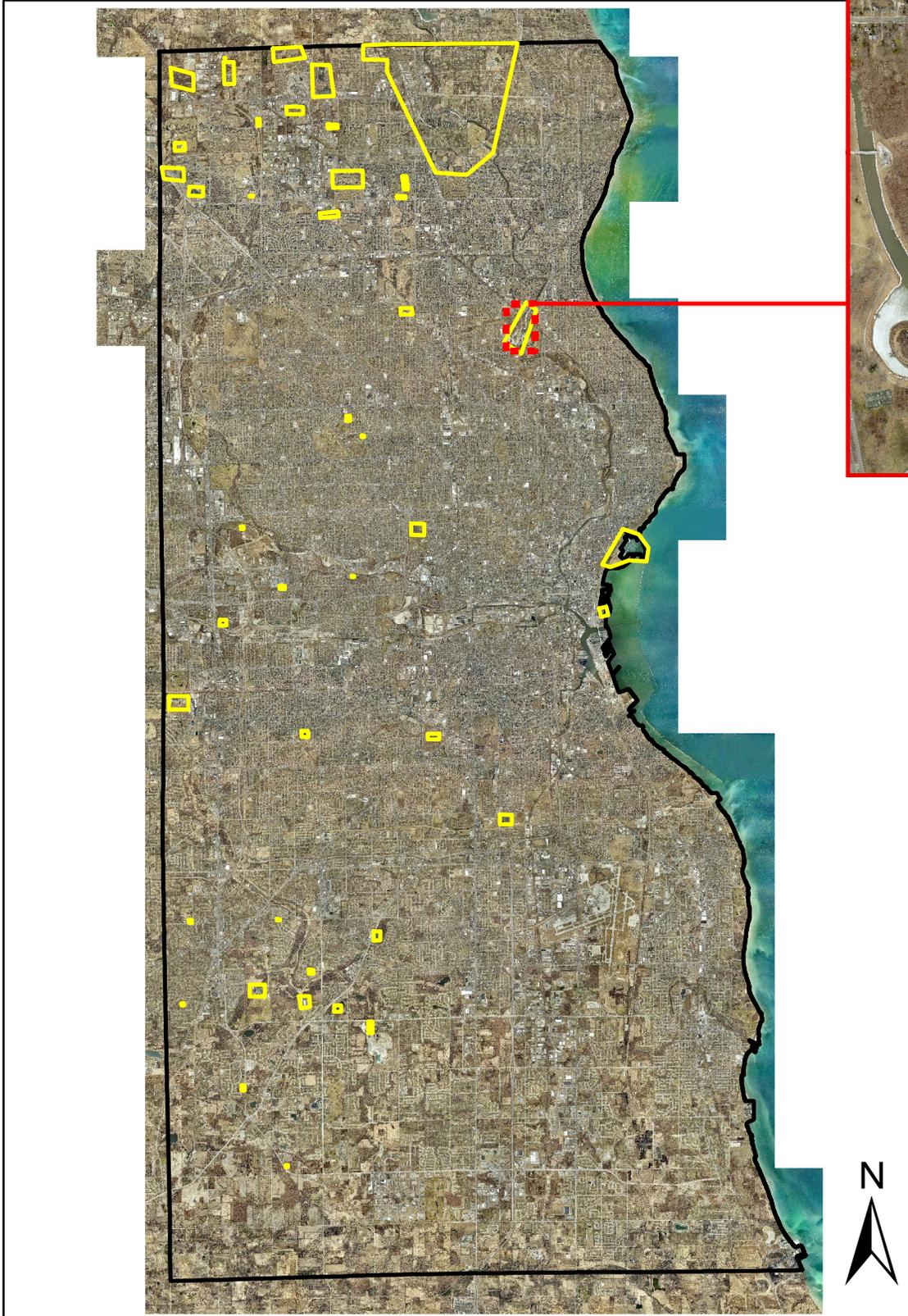
Exhibit of 2015 AccuPlus Photography with specification in question

* * * * *

Pictometry 2015 Orthophotography Ice Locations

Map produced by:
Milwaukee County Land Information Office
November 2015

Milwaukee County Ice Coverage



Close up: Milwaukee River
with ice obstructing
borders

Legend

-  Ice coverage areas
-  Milwaukee County



**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: MCAMLIS Steering Committee
FROM: Kevin Bruhn, MCAMLIS Project Manager
DATE: November 30, 2015
SUBJECT: 2015 ELEVATION DATA PROJECT STATUS

BACKGROUND

At its meeting held September 23, 2014, the MCAMLIS Steering Committee approved a staff recommendation to proceed with a joint project with SEWRPC and five counties located in southeastern Wisconsin to acquire updated Elevation Data for Milwaukee County. The approval of the Elevation Data Project authorized an expenditure of no more than \$62,343 to collect LiDAR derived elevation data.

STATUS:

The LiDAR vendor is currently processing the data that was collected as part of the project.

ACTIVITIES THIS PERIOD: 3/15 – 9/15

- Data production is 90% complete for 5 County project area (11/3).
- Delivery is expected no later than December 31st.
- MCLIO delivered the bridge deck and overpasses from the planimetric polygonalization project to vendor for contour and breakline QC (about 1,200).

NEXT

- The MCLIO will make the point cloud, digital terrain model (DTM), and contours available on the website, data service, and download (Dropbox).
- The MCLIO will evaluate options for change detection from the 2010 and 2015 LiDAR flights. This is needed to produce the candidate areas for the 2015 Planimetric data update, the last phase of the vector data improvement project.

Attached:

- Exhibits of 2015 LiDAR contour data

* * * * *

EXAMPLE 3

2010 Image: im_10K-6_2425_485.tif
2015 Topo: TOP10_10K_2425_485_dgn_Polyline
2015 DTM: (None)

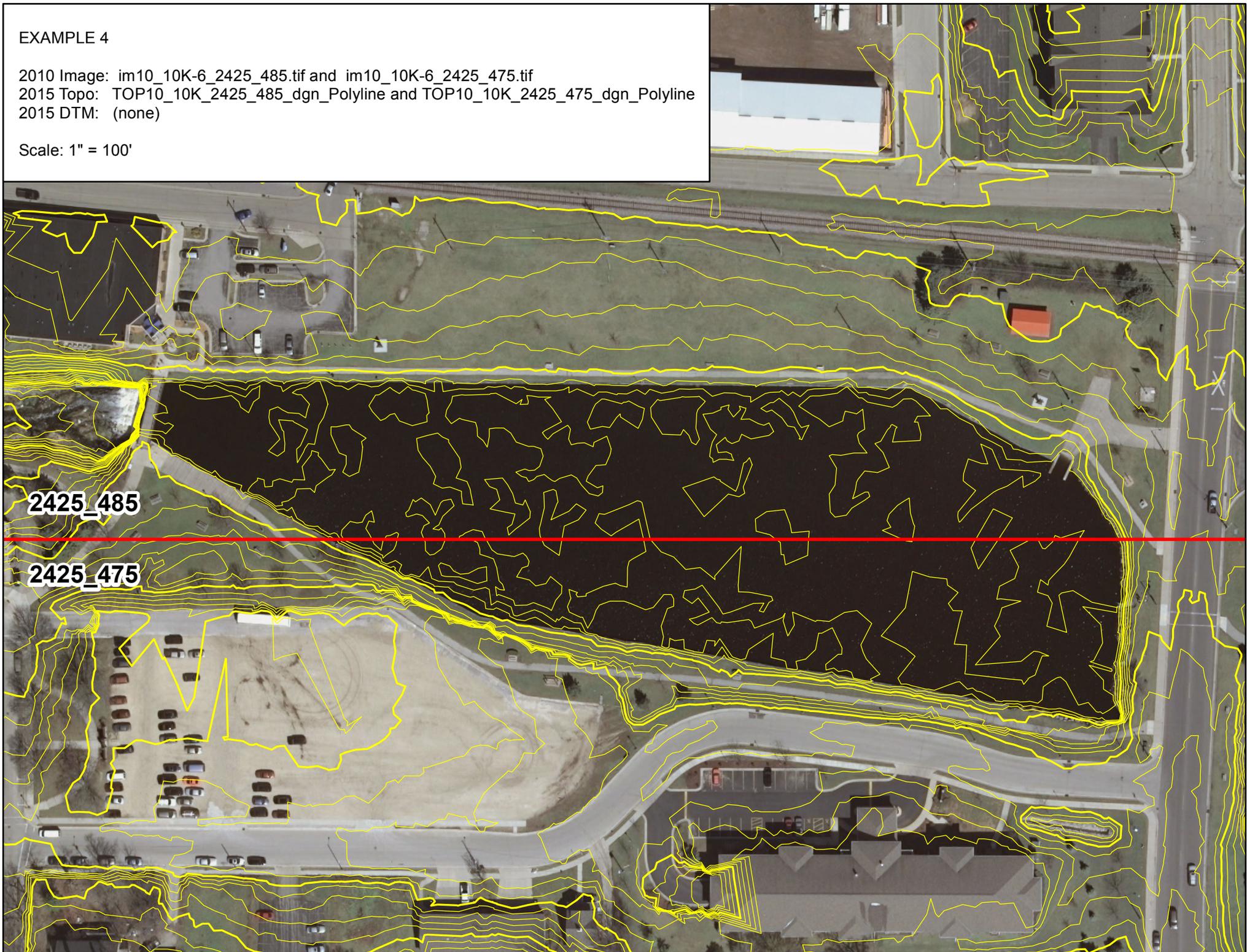
Scale: 1" = 100'



EXAMPLE 4

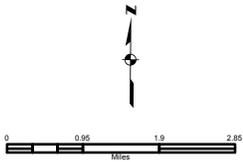
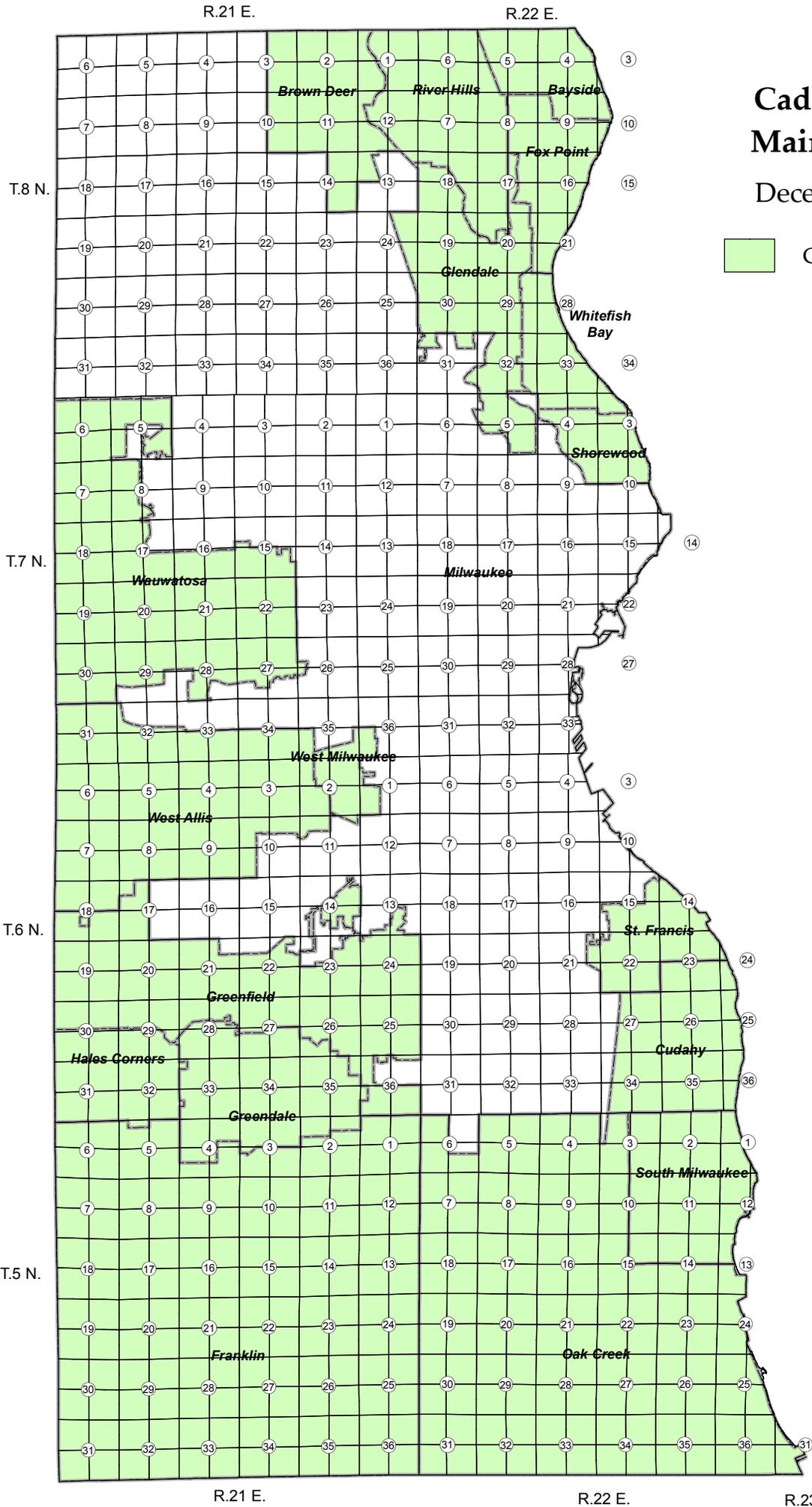
2010 Image: im10_10K-6_2425_485.tif and im10_10K-6_2425_475.tif
2015 Topo: TOP10_10K_2425_485_dgn_Polyline and TOP10_10K_2425_475_dgn_Polyline
2015 DTM: (none)

Scale: 1" = 100'



MCAMLIS Cadastral Database Maintenance Status December 2015 Status

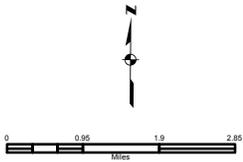
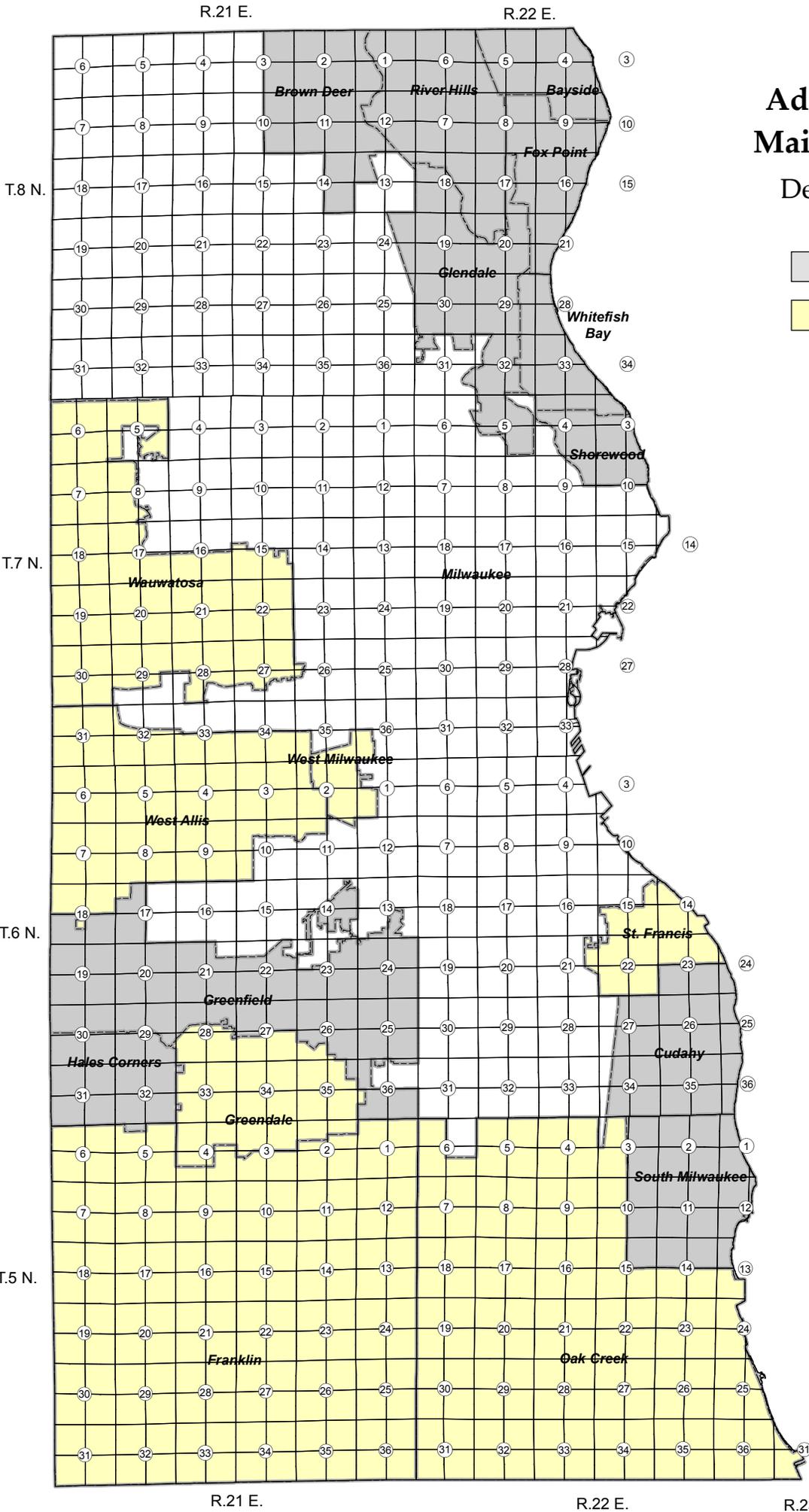
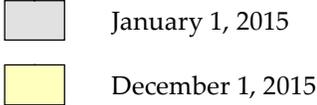
 Current as of November 1, 2015



Source: MCAMLIS Project Manager

MCAMLIS Address Database Maintenance Status

December 2015 Status



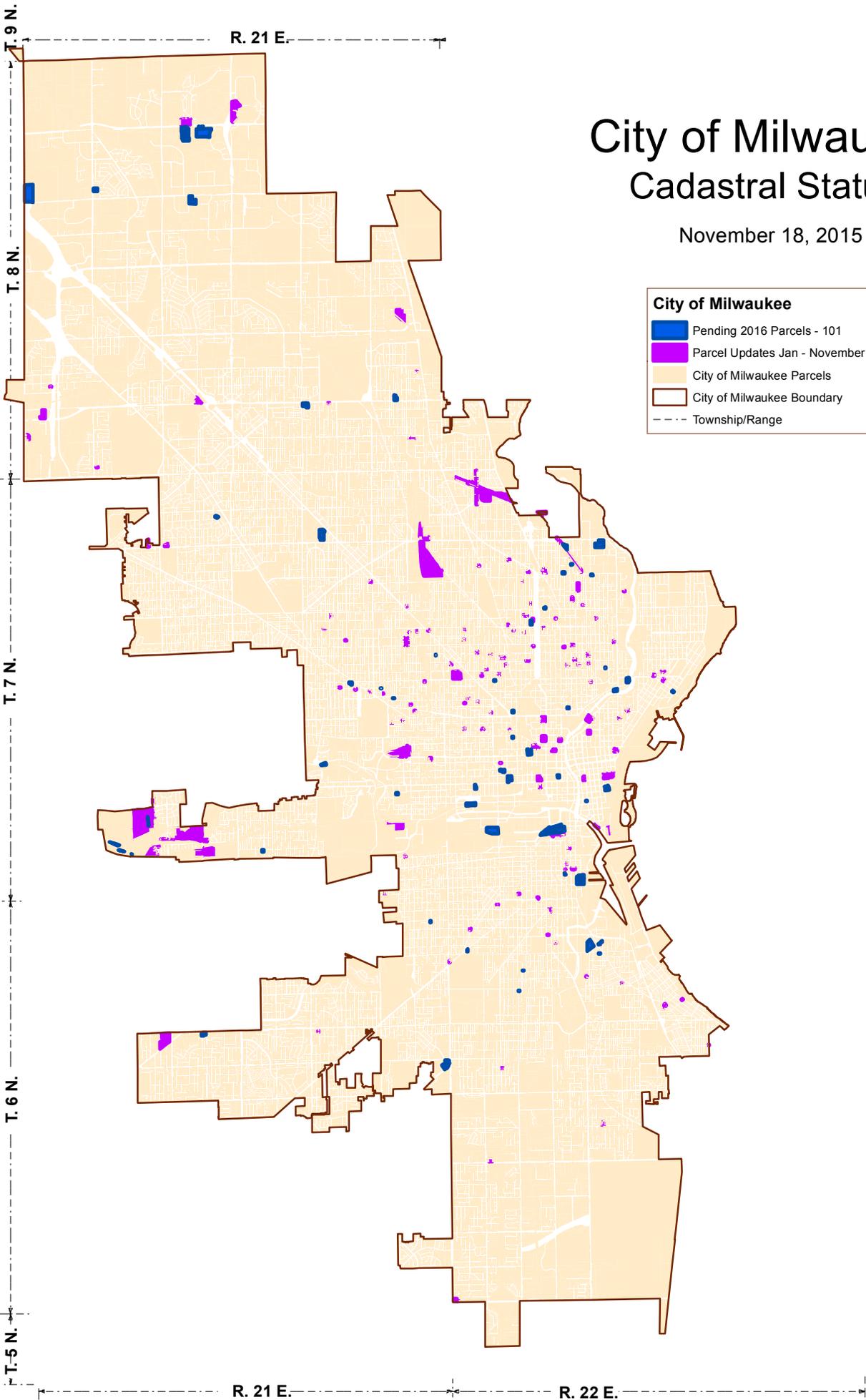
Source: MCAMLIS Project Manager

City of Milwaukee Cadastral Status

November 18, 2015

City of Milwaukee

-  Pending 2016 Parcels - 101
-  Parcel Updates Jan - November 18, 2015 - 267
-  City of Milwaukee Parcels
-  City of Milwaukee Boundary
-  Township/Range

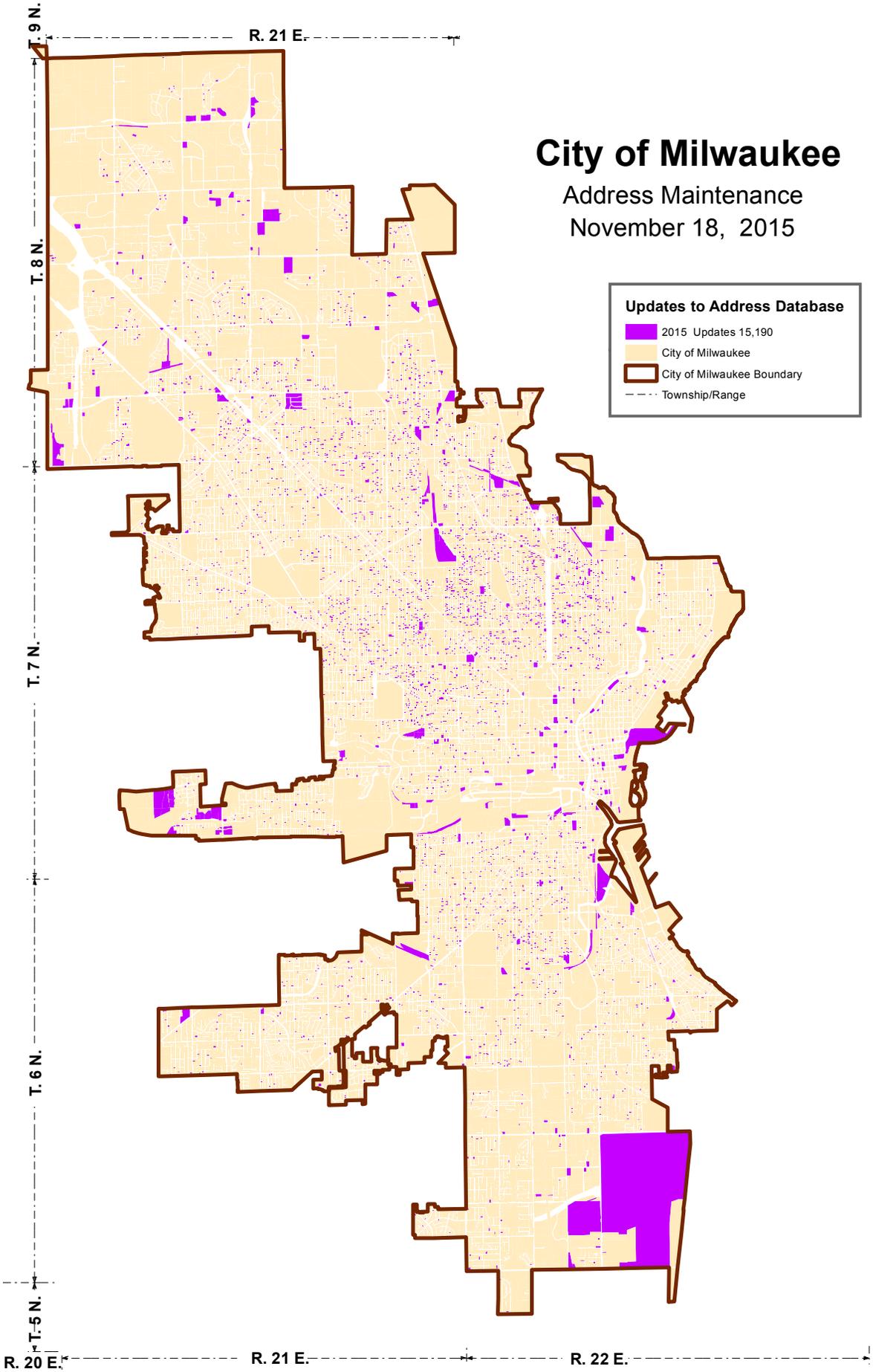


City of Milwaukee

Address Maintenance
November 18, 2015

Updates to Address Database

- 2015 Updates 15,190
- City of Milwaukee
- City of Milwaukee Boundary
- Township/Range





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: MCAMLIS Steering Committee
FROM: Kevin Bruhn, MCAMLIS Project Manager
DATE: November 30, 2015
SUBJECT: Educational Outreach Activity Status

BACKGROUND

The MCAMLIS Program Goals and Objectives included in the Land Information Strategic Assessment for 2013–2016 identified the need for MCAMLIS Staff to develop and promote MCAMLIS products and services to MCAMLIS partners and participants. The following describes MCAMLIS Staff activities under this objective for the preceding period:

ACTIVITIES THIS PERIOD – 9/15 – 12/15

1. Meetings and Presentations

- Presented the yearly MCAMLIS budget update to the Milwaukee County Board of Supervisors' Finance, Personnel, and Audit Committee 10/13/15
- Organized and facilitated the 15th meeting of the Milwaukee Metropolitan GIS Users Group (MMGUG). Meeting was held on 10/20/2015 @ The Urban Ecology Center
- Attended the Fall Wisconsin Land Information Association (WLIA) regional meeting
- Presented '*20 Questions with MCLIO*' at GIS Day located at the University of Wisconsin Milwaukee 11/18/15
- Presented '*Milwaukee County's Strategies for Integrating Act 20-Mandated Data into an Existing Land Information GIS*' at the ESRI Wisconsin Users Group 12/5/15

NEXT

- Continue MCLIO website training, data distribution and product enhancements
- Prepare for the 16th MMGUG Meeting, Spring 2016
- Continue to conduct monthly webinars on related GIS topics
- Attend the Annual WLIA meeting 2/10/16
- Continue to work with member participants to further their GIS goals



**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: MCAMLIS Steering Committee
FROM: Kevin Bruhn, MCAMLIS Project Manager
DATE: November 30, 2015
SUBJECT: COUNTYWIDE PROGRAM INITIATIVES

BACKGROUND

This Goal states that - Where appropriate, identify, initiate, and complete projects proposed by Milwaukee County or its constituent municipalities, agencies of the federal, state or regional government, public utilities and by private entities, including, importantly, interested citizens which would, by understanding of the MCAMLIS Steering Committee, prepare information and maps useful for meeting the needs of the County and *its* local units of government and contributing toward the implementation of the Wisconsin Land Information Program.

CURRENT ACTIVITIES THIS PERIOD – 9/15 – 12/15

1. Address Database Maintenance

- Deployed 3rd quarter consolidated Milwaukee County and City of Milwaukee Cadastral Data;
- Integrated the 2014 GCS taxroll data into the Cadastral dataset

Next

- Deploy 4th quarter consolidated Milwaukee County and City of Milwaukee Cadastral Data
- Continuation of ongoing efforts incorporating updated multiple address source information

2. Plat of Survey Maintenance

Plat of Survey Documents received from the Milwaukee County Surveyors Office are scanned and indexed to their respective parcel(s). The public is able to access these as they are posted to the MCLIO Interactive Mapping website. In total, there are 97,882 parcel documents currently available. Since January 2015, a total of 1,087 documents have been scanned and indexed into the Plat of Survey scanned document library.

2015 MCAMLIS YTD

		YTD	YE Projected
REVENUES - 2015 YTD			
2015 Actual Revenue		\$713,773	\$856,997.19
2014 Encumbrances Carried Over		\$339,945	\$339,945
	TOTAL	<u>\$1,053,718</u>	<u>\$1,196,942</u>
OPERATING EXPENSES - 2015 YTD			
2015 Actual Expenditures		\$581,025	\$697,612.25
2015 Encumbrances		\$213,048	\$213,048
Crosscharge from Register of Deeds		\$40,000	\$40,000
	TOTAL	<u>\$834,073</u>	<u>\$950,660</u>
2015 Est. Net Income (Loss)		<u>\$219,645</u>	<u>\$246,282</u>

Fund Balance:		YTD	YE Projected
2014 Year-End Fund Balance*		\$1,458,687	\$1,458,687
2015 Operating Revenues (Shown Above)	+	\$1,053,718	\$1,196,942
2015 Exp + Enc for \$8 Fee Projects + XC from Register of Deeds	-	\$834,073	\$910,660
2015 Est Fund Balance**		\$1,678,332	\$1,744,969
2014 Reserve Revenue @ 10%		\$0	\$0
2015 Est Fund Balance YTD - Unrestricted		\$1,607,236	\$1,673,873
2015 Est Fund Balance YTD - Restricted		\$71,096	\$71,096

*2014 YE Fund Balance represents the current amount in reserve as of 2014 YE close.

**2015 Est YTD Fund Balance represents the 2014 YE reserve netted against the actual 2015 expenditures and revenues. This figure will change throughout the year as additional 2015 expenditures and revenues are realized.

NOTE: 2015 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 MCAMLIS budget. The purpose of the report is to provide committee members a "financial snapshot" of MCAMLIS activities within a specific point in time.

2015 YTD Fiscal Report - MCAMLIS (\$8) - as of 10-31-2015

Vendor Name	Description	Amount Authorized	Amount Paid - Prior Years	2015 Amount Encumbered	Amount Paid 2015 YTD	Total Amount Paid 2015 (Encumbrances + Actual)	Remaining Unpaid Balance
SOUTHEASTERN WI REGIONAL	MCAMLIS Floodland Mapping Phase 2	\$ 436,000.00	\$ 161,300.00	\$ -	\$ 274,700.00	\$ 274,700.00	\$ -
SOUTHEASTERN WI REGIONAL	County Surveyor	\$ 82,916.00	\$ -	\$ 82,916.00	\$ 82,916.00	\$ 82,916.00	\$ -
CITY OF MILWAUKEE	Cadastral Address Maintenance	\$ 114,725.00	\$ -	\$ 91,780.00	\$ 68,835.00	\$ 114,725.00	\$ -
REGISTER OF DEEDS	Register of Deeds Scanning Projects	\$ 40,000.00	\$ -	\$ 40,000.00	\$ 40,000.00	\$ 40,000.00	\$ -
	2015 Authorized Projects						
GEOCORTEX	VWR: Improve MCLIO Mapping Service	\$ 50,000.00	\$ -	\$ 31,420.00	\$ 1,093.00	\$ 31,420.00	\$ 18,580.00
GEOCORTEX	MBL: Mobile Property Viewer	\$ 50,000.00	\$ -	\$ -	\$ -	\$ -	\$ 50,000.00
ESRI	COL: System Architecture Consulting Support	\$ 20,000.00	\$ -	\$ 22,942.00	\$ 13,941.25	\$ 22,942.00	\$ (2,942.00)
GRW	DAT: Planimetric Polygon Processing Part 1	\$ 98,650.00	\$ 67,476.60	\$ -	\$ 31,173.40	\$ 31,173.40	\$ -
GRW	DAT: Planimetric Polygon Processing Part 2	\$ 6,800.00	\$ -	\$ 6,800.00	\$ 6,800.00	\$ 6,800.00	\$ -
SEWRPC	DAT: Regional Orthophotography	\$ 126,158.00	\$ -	\$ 121,950.00	\$ 53,307.00	\$ 121,950.00	\$ 4,208.00
SEWRPC	DAT: Regional Elevation Data/Lidar	\$ 62,343.00	\$ -	\$ 62,343.00	\$ 23,021.00	\$ 62,343.00	\$ -
SIDWELL INC, RADGOV	DAT: Historical Aerials	\$ 10,000.00	\$ 3,500.00	\$ -	\$ -	\$ 5,250.00	\$ 1,250.00
	TOTAL	\$ 1,097,592.00	\$ 232,276.60	\$ 460,151.00	\$ 595,786.65	\$ 794,219.40	\$ 71,096.00

MILWAUKEE COUNTY LAND INFORMATION PLAN: 2015

Kevin Bruhn
Milwaukee County Land Information Officer

Milwaukee County Land Information Office
633 W Wisconsin Ave, Suite 903, Milwaukee, WI 53203
(414) 278-3927
<http://county.milwaukee.gov/mclio>

CONTENTS

- CONTENTS 1**
- EXECUTIVE SUMMARY 3**
- 1 INTRODUCTION 5**
- 2 FOUNDATIONAL ELEMENTS..... 6**
 - PLSS..... 6
 - Parcel Mapping..... 7
 - LiDAR and Other Elevation Data 9
 - Orthoimagery 10
 - Address Points and Street Centerlines 11
 - Land Use 12
 - Zoning..... 13
 - Administrative Boundaries 13
 - Other Layers 14
- 3 LAND INFORMATION SYSTEM..... 16**
- 4 CURRENT & FUTURE PROJECTS..... 20**
 - Project Plan to Achieve Searchable Format (Benchmarks 1 & 2)..... 27
 - Project Plan for Parcel Completion (Benchmark 3)..... 28
 - Project Plan for PLSS (Benchmark 4)..... 28

EXECUTIVE SUMMARY

The automated mapping and land information system for Milwaukee County has resulted in substantial improvements in both efficiency and effectiveness in the acquisition, conversion, storage, retrieval, and use of information about the land area which comprises Milwaukee County.

This update to the 2010 Land Information Plan is intended to provide County and local officials, State agencies, private entities, and other interested parties with basic knowledge of Milwaukee County's continued efforts to modernize its land records system. Since adoption of the original plan in 1990, Milwaukee County has diligently pursued the creation of a parcel-based, multi-purpose, multi-user automated mapping base as the foundation for land information systems. The initial focus was on the establishment of a geodetic framework, the preparation of large-scale planimetric and topographic base maps, and the preparation of companion large-scale maps. This mapping effort was completed in or converted to digital form and has been integrated into a computerized database now serving Milwaukee County. Now that the core land information have been completed and migrated into a standardized, maintained format, Milwaukee County is focused on how to effectively distribute and promote these datasets. This document describes how Milwaukee County will build on that database over the next three years while expanding our cooperation between County departments, local units of government, and with participating utility organizations operating in Milwaukee County in order to pursue important land records modernization initiatives.

MCLIO Background

The Milwaukee County Land Information Office (MCLIO) was created in 2005 as a result of Milwaukee County Resolution 90-707(a) mandating the Milwaukee County Automated Mapping and Land Information System (MCAMLIS) Program in Milwaukee County. The MCLIO has become the de-facto county entity to manage countywide geospatial data and services, and to coordinate these activities with other organizations to provide efficient and effective means to access and administer the county's geospatial data and services.

MCLIO is organized within the County's Department of Administrative Services – Division of Economic Development. The MCLIO provides several key services to state, federal, county and municipal government, citizens, and the geospatial professional community. These services include:

- Administration of the MCAMLIS Program and support of the MCAMLIS Steering Committees' oversight of the County's Land Records Modernization Plan
- Maintenance of the MCLIO geospatial data portal, to make data easily accessible to the public
- Coordination of county efforts with the state, federal and local geospatial professional community
- Development and maintenance of geospatial architecture (databases, servers) to provide robust mapping capabilities to county departments, municipalities and public-facing web services
- Maintenance of basemap reference data including cadastral, topographic, planimetric and high-resolution imagery
- Development of the application of Location Based Data and Technologies (LBDT) for use within county and local municipal government
- Maintenance of the county's street centerline and street address database(s)

Mission of the Land Information Office

The mission of the Milwaukee County Land Information Office is to provide baseline LBDT services, and to foster opportunities to advance the use of this technology in government and the public service sector within Milwaukee County.

Land Information Office Projects

To realize this mission, in the next three years, the county land information office will focus on the following projects:

1. Make Milwaukee County Land information available on mobile tablets and phones.
2. Improve the taxroll currency for Milwaukee County parcels
3. Continue maintenance on Countywide polygonalized planimetric dataset
4. Develop services to be utilized with mobile GPS/GIS technology
5. Continue Raster product developments
6. Product LiDAR derived products and analysis
7. Survey control modernization – transformation to North American Datum 1983\1988

The remainder of this document provides more details on Milwaukee County and the WLIP, summarizes current and future land information projects, and reviews the county's status in completion and maintenance of the WLIP map data layers known as Foundational Elements.

1 INTRODUCTION

On February 15, 1990, the Milwaukee County Board of Supervisors adopted the Southeastern Wisconsin Regional Planning Commission's (SEWRPC) Community Assistance Planning Report No. 177, Feasibility Study for a Milwaukee County Automated Mapping and Land Information System (hereinafter referred to as the "plan"). A 2010 plan update expanded and extended the original plan; this 2015 plan update builds upon the foundation which was put in place over 25 years ago.

The Milwaukee County plan, as originally adopted by the County Board, is believed to be unique within Wisconsin in that it created a public-private partnership that would jointly fund and develop the automated mapping system. Accordingly, a cooperative agreement was executed in November 1990, establishing the Milwaukee County Automated Mapping and Land Information System, known by the acronym MCAMLIS. Milwaukee County, the Milwaukee Metropolitan Sewerage District, Wisconsin Bell Telephone Company, the Wisconsin Electric Power Company, and the Wisconsin Gas Company all executed the agreement. The agreement provided for the creation of a Steering Committee with representatives from the County and City of Milwaukee, the suburban cities and villages within Milwaukee County, the Milwaukee Metropolitan Sewerage District, and the private utilities operating within the County.

This plan was prepared by the county LIO, the MCAMLIS Steering Committee, and others as listed below.

MCAMLIS Steering Committee

Nancy Olson, Chair	Chief Information Officer, City of Milwaukee
Greg High	Director, Architecture & Engineering, Milwaukee County Department of Administrative Services Facilities Management
Kurt W. Bauer	Milwaukee County Surveyor
Emily Champagne	GIS Supervisor, Milwaukee Metropolitan Sewerage District
Doug Seymour	Director of Community Development, City of Oak Creek representing the Intergovernmental Coordinating Council of Milwaukee County
Teig Whaley Smith	Director, Milwaukee County DAS, Milwaukee County Department of Administrative Services
John LaFave	Milwaukee County Register of Deeds
Dawn Neuy	Manager, EDAM Support, We Energies
Kevin Bruhn, Project Manager	GIS Manager – Land Information Officer, Milwaukee County Department of Administrative Services, Economic Development
Kevin S. Anderson	Design Area Manager, Milwaukee Metro North AT&T

2 FOUNDATIONAL ELEMENTS

PLSS

Public Land Survey System Monuments

Layer Status

For the PLSS Foundational Element, the table below documents Layer Status

PLSS Layer Status	
Name	Status/Comments
Total number of PLSS corners (section, ¼, meander) set in original government survey	1,065
Number and percent of PLSS corners that have been remonumented	1,065, 100%
Number and percent of remonumented PLSS corners with survey grade coordinates (see below for definition)	1,065, 100%
Number and percentage of survey grade PLSS corners integrated into county digital parcel layer	See above
Number and percentage of non-survey grade PLSS corners integrated into county digital parcel layer	None, 0%
Percentage of PLSS corners that have digital tie sheets (whether or not they have corresponding coordinate values)	100%
Digital tie sheets available online? Yes or No	Yes
Approximate number of PLSS corners believed to physically exist based on filed tie-sheets or surveys, but do not have coordinate values	None
Approximate number of PLSS corners believed to be lost or obliterated	None
Total number of PLSS corners along each bordering county	Racine – 26; Waukesha – 49; Ozaukee – 19
Number and percent of PLSS corners remonumented along each county boundary	Racine – 26, 100%; Waukesha – 49, 100%; Ozaukee – 19, 100%
Number and percent of remonumented PLSS corners along each county boundary with survey grade coordinates	Racine – 26, 100%; Waukesha – 49, 100%; Ozaukee – 19, 100%
Does your county collaborate with or plan to collaborate with neighboring counties for PLSS updates on shared county borders?	Yes

Custodian

Southeastern Wisconsin Regional Planning Commission (SEWRPC)

Maintenance

MCAMLIS will continue to work with the Commission and the County Surveyor, to perpetuate the U. S. Public Land Survey system within the County and maintain the attendant control survey network. The designation of areas to be remapped will be determined by the MCAMLIS Steering Committee.

Standards

The horizontal control surveys meet or exceed the specifications for Third-Order, Class I, accuracy standards as established by the National Geodetic Survey. Elevations were established for all of the monumented U. S. Public Land Survey system corners and for ancillary reference benchmarks. The vertical control survey network so created was based upon the National Geodetic Vertical Datum, 1929

adjustment. All level surveys conducted met or exceeded the specifications for Second-Order, Class II, accuracy standards as established by the National Geodetic Survey.

- Statutory Standards for PLSS Corner Remonumentation
 - s. 59.74, Wis. Stats. Perpetuation of section corners, landmarks.
 - s. 60.84, Wis. Stats. Monuments.
 - ch. A-E 7.08, Wis. Admin. Code, U.S. public land survey monument record.
 - ch. A-E 7.06, Wis. Admin. Code, Measurements.
 - s. 236.15, Wis. Stats. Surveying requirements.
- Wisconsin County Surveyor's Association **survey grade** standard:
Coordinates collected under the direction of a Professional Land Surveyor, in a coordinate system allowed by s. 236.18(2), and obtained by means, methods and equipment capable of repeatable 2 centimeter or better precision.

Other Geodetic Control and Control Networks

e.g., HARN, Height Mod., etc.

Layer Status

N/A

Parcel Mapping

Parcel Geometries

Layer Status

- Milwaukee County has completed parcel mapping of all the municipalities and villages in Milwaukee County and continues to take high priority in maintaining all of the Cadastral Layers.
- The county's parcels are available in a downloadable Esri geodatabase and are viewable on our Interactive Map Site that is published quarterly.
- All Milwaukee County data is referenced to the Wisconsin South State Plane coordinate system, datum of 1927.
- We reference all parcels to the public land survey system (PLSS) and maintain Tax Parcel Maps. The tax parcels are derived from information obtained in the Tax Listing Section of the Milwaukee County Register of Deeds Office and the City of Milwaukee Assessor's Office. All parcels are developed using legal information including recorded deeds, Certified Survey Maps, and Subdivision Plats and non-recorded data such as right-of way plats. In some cases, recorded information is not always available and erroneous data may be recorded. For this reason, tax parcels are intended to accurately represent the land but it is not a substitute for a legal land survey or guarantee of title. Updates and Corrections are part of daily protocol and historical parcel information is maintained and archived.
- Milwaukee County is moving toward the Esri Parcel Fabric data model and will embark upon a pilot project in 2016.

Custodian

Milwaukee County/MCAMLIS

Maintenance

The cadastral are updated daily and are published on quarterly basis to the MCLIO website. Parcel changes are based on recorded documents and tax listing changes in the ROD office & City of Milwaukee Assessor's Office.

Standards and Documentation

A data dictionary in human-readable form, with thorough definitions for each element/attribute name, and explanations of any county-specific notations, particularly for parcel attributes listed by s.

59.72(2)(a), is in progress.

The digital cadastral data sets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping. Therefore, cadastral features (subject to

possible errors and omissions) can be considered to be positionally accurate to within 3.3 feet of their true position on the ground for ninety percent or more of all features included as part of the cadastral basemap fabric.

Assessment/Tax Roll Data

Layer Status

Milwaukee County utilizes GCS Land Records software for the collection and organization of the taxroll and tax billing information. GCS Software is a company that provides land record management to our local municipalities they provide both real estate and personal property that serves as the basis to help calculate property information and provide property taxes and assessments data.

Custodian

Regarding assessment information in Milwaukee County, each community is responsible for storage and retrieval of their tax roll information through their own Assessors Office; the procedure may vary per office.

Maintenance

Each community in Milwaukee County is responsible for editing and maintaining their own tax assessment information through their own Assessors Office; the procedure may vary per office. In the suburbs, the Milwaukee County Register of Deeds Tax Listing section assists the Assessor’s Offices in preparing tax roll descriptions and maintaining ownership records.

Standards

Act 20 Attributes Required by s. 59.72(2)(a)	Field Name(s) in County Land Info System	Notes on Data or Exceptions to DOR Standard
Assessed value of land	LANDVALUE	
Assessed value of improvements	IMPVALUE	
Total assessed value	ASSESSEDVALUE	
Class of property, as specified in s. 70.32 (2)(a)	CLASS	
Estimated fair market value	FAIR_MKT_VAL	
Total property tax	GROSS_TAX	
Any zoning information maintained by the county		Milwaukee County does not maintain zoning info
Any property address information maintained by the county	OWNERADDR	
Any acreage information maintained by the county	ACRES	Incomplete – Milwaukee does not maintain acres

Non-Assessment/Tax Information Tied to Parcels

e.g., permits, easements, non-metallic mining, brownfields, restrictive covenants

Layer Status

N/A

ROD Real Estate Document Indexing and Imaging

Status

- **Grantor/Grantee Index.** Milwaukee County Register of Deeds Office started a Grantor/Grantee index in 1839. The names were first written in a ledger that tracked the names of the parties transferring the property and recording information such as Volume & Page and date of the document. The manual process was maintained until February 1, 1988 when it was replaced by a Land Records Management computer system.
- **Tract Index.** Milwaukee County Register of Deeds Office created a Tract Index system January 1, 1876. The tract index is based on the Public Land Survey system, which indexes documents by

Quarter Section, Section, Town and Range. In addition, they maintain a tract index for Subdivisions. The Subdivision index includes the Subdivision name, blocks, and lots. Examples of documents that are being tract include Warranty Deeds, Quit Claim Deeds, Mortgagees, Plats, Certified Survey Map, Government Liens, Easements, etc.

- **Imaging.** Milwaukee County Register of Deeds office started imaging recorded documents January 1, 2000 in their Land Records Management computer system. On March 1, 2010, Subdivision Plats, ¼ Section maps, Milwaukee Block maps, Indexes, were also scanned and entered into the computer system. The ROD continues to add historical document back to 1910.

Custodian

County Register of Deeds

Maintenance

The Milwaukee County Register of deeds continues to maintain the Grantor/Grantee Index and the Tract Index in a Land Records Management computer system and the currency of the indexes usually runs about 2 week behind the recording date. As well, the Register of Deeds Office continues to make great strides in improving the efficiency of the computer-based system by adding scanned historical documents which are back-indexed and verified.

Standards

- s. 59.43, Wis. Stats. Register of deeds; duties, fees, deputies.
- ch. 706, Wis. Stats. Conveyances of real property; Recording; Titles.

LiDAR and Other Elevation Data

LiDAR

Layer Status

The 2015 LiDAR capture is in progress and expected to be complete by early 2016. 2010 LiDAR products are currently available.

Custodian

Milwaukee County/MCAMLIS

Maintenance

In general, the MCLIO plans to acquire updated LiDAR data every 5 years.

Standards

The LiDAR flight captured by Quantum Spatial in 2010 had a specification of a QL2 level or 2 points per meter.

LiDAR Derivatives

e.g., terrain, contours, digital elevation models, etc.

Layer Status

The following 2010 LiDAR derivatives are available for download from the MCLIO website:

- Digital Elevation Model (DEM), Smoothed DEM, Hillshaded DEM
- Digital Surface Model, Hillshaded Digital Surface Model, Height Above Ground Digital Surface Model, Shaded LiDAR Digital Surface Model
- Slope Model in Percent Rise, Slope Model in Degrees
- LiDAR Return Intensity

Custodian

Milwaukee County/MCAMLIS

Maintenance

MCLIO is considering the production of LiDAR-derivatives in-house upon completion and delivery of the 2015 capture.

Standards

The LiDAR flight captured by Quantum Spatial in 2010 had a specification of a QL2 level or 2 points per meter.

Orthoimagery

Orthoimagery

Layer Status

Pictometry International Inc. complete 3-inch resolution image capture from March 16-24, 2015, updating the most-recent 2013 flights. Individual tiles are available on Pictometry Online, aerial triangulation and orthorectification are complete, and the reviewed imagery was delivered at the end of September 2015. Both dynamic and cached map services are available for viewing from the MCAMLIS interactive mapping website, and can be consumed via REST protocol.

Milwaukee County did not participate in WROC 2015.

Custodian

Milwaukee County/MCAMLIS

Maintenance

In general, the MCAMLIS program has acquired new orthophotography every 5 years beginning in 1995, but has begun increasing the update frequency to every 2 years.

Standards

Standards are coordinated by SEWRPC and the LIO of adjoining counties. The MCAMLIS committee approves the aerials.

Historic Orthoimagery

Layer Status

MCAMLIS staff had obtained variously dated un-rectified or poorly rectified digital datasets from UW Milwaukee AGS Library and UW Madison, Arthur Robinson Library. When necessary, these data were geo-rectified, mosaicked, and published as map and image services, with the final imagery completed in October 2015. Imagery from the following years is now available with full or partial-county coverage: 1928, 1937, 1951, 1956, 1958, 1961, 1963, 1966, 1967, 1970, 1975, 1976, 1980, 1985, 1995, 2000, 2004, 2005, 2007, 2008, 2009, 2010, 2013

Custodian

Milwaukee County/MCAMLIS

Maintenance

The MCLIO will rectify and mosaic historical imagery on an as-needed basis.

Standards

Standards vary with respect to the time the imagery was acquired and the technology available at that time.

Address Points and Street Centerlines

Address Point Data

Layer Status

The MCAMLIS Address Database program work effort is maintained as the MCAMLIS Enterprise Address System whereby street, parcel, building and unit addresses are fully integrated across the entire county. This project is currently in a maintenance cycle and published quarterly in concert with the cadaster update.

Custodian

Milwaukee County/MCAMLIS

Maintenance

All cadastral data is updated as changes occur, and released on a quarterly schedule. The address are updated based on information from the municipalities or recorded information in the Register of Deeds Office.

Standards

The MCAMLIS Cadastral datasets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

Building Footprints

Layer Status

Building footprint data is available as part of the MCAMLIS Planimetric datasets, as a stand-alone feature layer, or as part of the MCAMLIS Interactive Map.

Custodian

Milwaukee County/MCAMLIS

Maintenance

The exception to quarterly cadastral updates, building footprints are updated annually or when the planimetric datasets have been updated/replaced.

Standards

The MCAMLIS Planimetric datasets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

Street Centerlines

Layer Status

Street Centerlines are maintained as part of the MCAMLIS Topographic datasets. Special care is taken to update areas of recent construction and new development.

Custodian

Milwaukee County/MCAMLIS

Maintenance

The street centerlines are updated based on information from the municipalities or recorded information in the Register of Deeds Office.

Standards

The MCAMLIS Topographic datasets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

Rights of Way

Layer Status

Rights of Way are maintained as part of the MCAMLIS Cadastral dataset. Special care is taken to update areas of recent construction and new development.

Custodian

Milwaukee County/MCAMLIS

Maintenance

All Right of Way changes occur as a result of a deed being recorded in the Milwaukee County Register of Deeds Office.

Standards

The MCAMLIS Cadastral datasets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

Trails

e.g., recreational trails

Layer Status

N/A

Land Use

Current Land Use

Layer Status

MCAMLIS utilizes polygonal land use data as provided by the Southeastern Wisconsin Regional Planning Commission (SEWRPC). The polygons are digitized from aerial photography according to SEWRPC's land use classification system. The polygon features are current for the year 2010.

Custodian

Southeastern Wisconsin Regional Planning Commission, Land Use Division and GIS Division

Maintenance

The land use polygon features are digitized from aerial photography and are expected to be updated every 5 years.

Standards

SEWRPC, designated as the official area-wide regional planning agency, abides by s. 66.1001, Wis. Stats. Static Land Use Plan maps are available from SEWRPC's website.

Future Land Use

Layer Status

Milwaukee County does not maintain in-house data or reports for future land-use; rather, SEWRPC has the responsibility of developing and maintaining land use plans. Currently, SEWRPC is working on production of the 2050 Regional Land Use and Transportation Plan, which will update the current 2035 plan.

Custodian

SEWRPC

Maintenance

SEWRPC uses decadal census data to prepare population and economic forecasts, which are used to update, reevaluate, and extend the current land use and transportation plan. The 2000 census data was used to prepare and adopt the 2035 plan in 2006. The 2010 census data is now being used to prepare the updated 2050 plan. Thus, maintenance to the plan is likely to occur every 10 years.

Standards

SEWRPC, designated as the official area-wide regional planning agency, abides by s. 66.1001, Wis. Stats. Static Land Use Plan maps are available from SEWRPC's website.

Zoning

County General Zoning

Layer Status

N/A - Milwaukee County does not maintain zoning data for its municipalities.

County Special Purpose Zoning

e.g., shoreland, farmland preservation, floodplain, and airport protection

Layer Status

N/A

Municipal Zoning Information Maintained by the County

e.g., town, city and village, shoreland, floodplain, airport protection, extra-territorial, temporary zoning for annexed territory, and/or zoning pursuant to a cooperative plan

Layer Status

N/A

Administrative Boundaries

Civil Division Boundaries

e.g., towns, city, villages, etc.

Layer Status

The MCAMLIS cadastral data captures county and minor civil division boundaries.

Custodian

Milwaukee County/MCAMLIS

Maintenance

Very few changes occur to Administrative Boundaries in Milwaukee County but they are all based on recorded documents in the Register of Deeds Office and/or filed in the Office of the Secretary of State.

Standards

The MCAMLIS Cadastral datasets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping

School Districts

Layer Status

Milwaukee County school districts are available as polygon boundaries. Via the Milwaukee County tax roll system, individual parcels can be linked to school district tax codes.

Custodian

Milwaukee County/MCAMLIS

Maintenance

School district boundaries are updated on an as-needed basis.

Standards

Stand-alone layers that are not part of the MCAMLIS Topographic, Planimetric, or Cadastral datasets strive to meet National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

Election Boundaries

e.g., voting districts, precincts, wards, voting places, etc.

Layer Status

Milwaukee County voting districts (VTD) are available as polygon boundaries with the ward/district name and ID.

Custodian

Milwaukee County/MCAMLIS on behalf of Milwaukee County Clerk

Maintenance

Individual municipalities must inform the County Clerk of ward boundary changes twice a year, and Milwaukee County/MCAMLIS supports the integration of this data. Changes to the Ward maps are based on information provided from the municipality, and in the future, the Clerk's Office.

Standards

Stand-alone layers that are not part of the MCAMLIS Topographic, Planimetric, or Cadastral datasets strive to meet National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

Utility Districts

e.g., water, sanitary, electric, etc.

Layer Status

N/A

Public Safety

e.g., fire/police districts, emergency service districts, 911 call center service areas, healthcare facilities

Layer Status

N/A

Lake Districts

Layer Status

N/A

Native American Lands

Layer Status

N/A

Other Layers

Hydrography Maintained by County or Value-Added

e.g., hydrography maintained separately from DNR or value-added, such as adjusted to orthos

Layer Status

N/A

Cell Phone Towers

Layer Status

Communication towers are represented as points, lines, and polygons within the MCAMLIS Utilities Topographic dataset.

Custodian

Milwaukee County/MCAMLIS

Maintenance

Updates are done with the planimetric dataset changes and published at that time.

Standards

The MCAMLIS Cadastral datasets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

Bridges and Culverts

Layer Status

Bridges are represented as points, lines, and polygons (as well as text annotation) in the MCAMLIS Facilities Planimetric dataset. Culverts are available as lines representing the underground location or as points representing the ends within the MCAMLIS Hydrography Topographic dataset.

Custodian

Milwaukee County/MCAMLIS

Maintenance

Updates are done with the planimetric dataset changes and published at that time.

Standards

The MCAMLIS Planimetric datasets were compiled to a digital framework meeting National Map Accuracy Standards (NMAS) for one-inch-equals-100-feet-scale mapping.

3 LAND INFORMATION SYSTEM

This chapter describes the design of the Milwaukee County land information system, with focus on how data related to land features and data describing land rights are integrated and made publicly available.

Current Land Information System

County Parcel Data Workflow Diagram

The Milwaukee County Register of Deeds uses the software from Fidlar Technologies called I-Document (I-Doc.) to process all recorded Real Estate Documents. I-Doc is a Land Records Management Software used to record, enter data, verify, and search information for all recorded documents.

Milwaukee County also use Laredo and Tapestry from Fidlar Technologies for Land Records search engines for the public use to search real estate documents.

Fig 1. Milwaukee County Register of Deeds Real Estate Documents Process

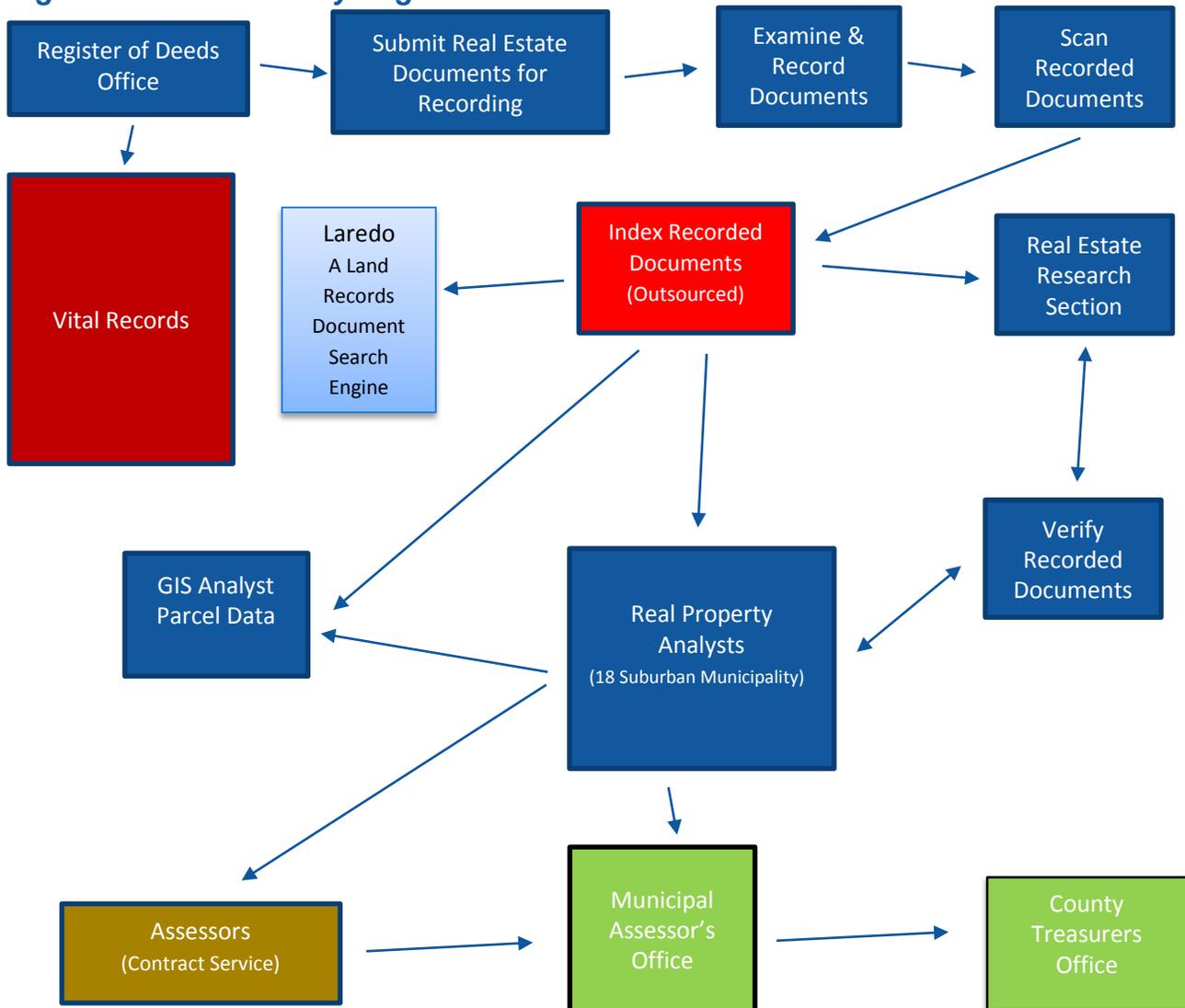
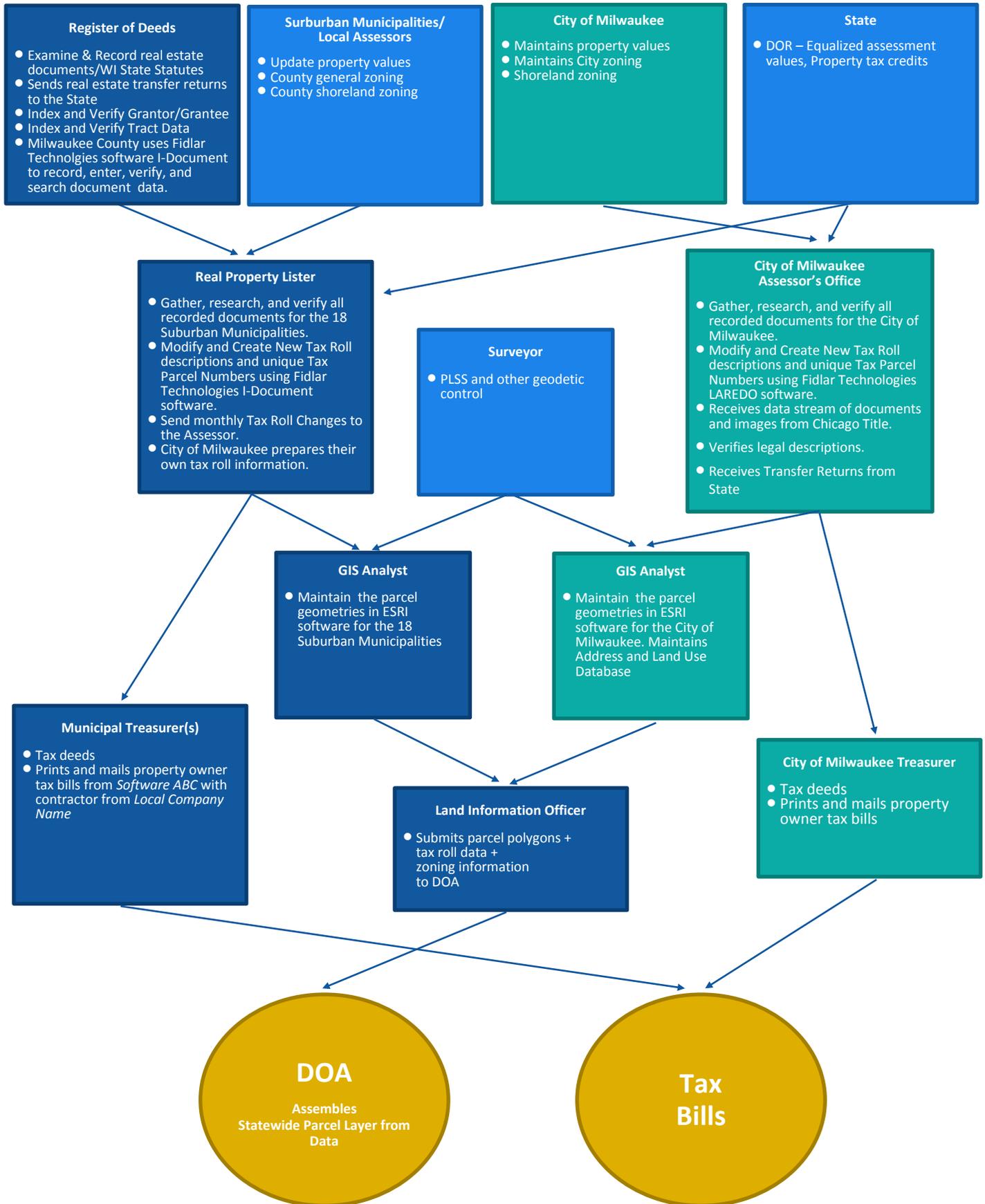


Fig 2. Milwaukee County Parcel + Tax Roll + Zoning Workflow



Technology Architecture and Database Design

The Milwaukee County Land Information Office has a single instance of ArcGIS Server that serves the land information data to internal and external clients. Due to the increased traffic and load to the current configuration, Milwaukee County is moving to a second ArcGIS Server instance that can handle the growing needs.

Metadata and Data Dictionary Practices

The Land Information Office generates metadata and data dictionaries to the core datasets that the office maintains. The Cadastral and Topographic datasets have current metadata and data dictionaries. The Land Information Office also acquires updated metadata when new raster products are published. This includes aerial photography as well as LiDAR datasets. A complete layer list is also available to catalog the long list of data that is published. This is available in a searchable format and static version.

Municipal Data Integration Process

The Land Information Office Aggregates the tax roll data through GCS and aggregates the City of Milwaukee cadastral dataset with the suburban communities of Milwaukee County. The Register of Deeds maintains the cadastral information outside of the City of Milwaukee.

The MCAMLIS program seeks to achieve cooperation between the various levels, units and agencies of government and private utilities operating within Milwaukee County. Indeed, the MCAMLIS program is founded in a formal cooperative arrangement between the County, the Milwaukee Metropolitan Sewerage District, and two private utilities operating within the County. That arrangement is expanded through membership of the MCAMLIS Steering Committee to include the City of Milwaukee and the 18 suburban units of government within Milwaukee County. Milwaukee County staffs the MCAMLIS Steering Committee. This arrangement ensures the use of sound and mutually acceptable technical standards and procedures in the MCAMLIS program, the dissemination of MCAMLIS data to municipal and utility users, and the scheduling of work elements in accordance with the perceived needs of the County agencies, Milwaukee Metropolitan Sewerage District, City of Milwaukee, and the suburban cities and villages within the County.

The past and present institutional structure has worked well in the creation of the foundational elements for the Milwaukee County automated mapping and land information system, and in the initial use of MCAMLIS data over a period of more than two decades.

Public Access and Website Information

List websites for public access to land information, perhaps in a table format as in the example below. If your county has one single URL for multiple functions (GIS web mapping, land records search, tax parcel search, zoning, and PLSS tie sheets), make sure it is clear to the reader that one website serves as a portal and/or achieves multiple functions. If county zoning information is available online—whether through an app, PDF map, or other format—note that as well.

If applicable, describe use of contractors, consultants, and/or third-party technology for access (e.g., specific web applications, consultants, software developers, offsite hosting).

Type of Website	Software or App	3 rd Party or Contractor	URL	Update Frequency/Cycle
GIS web mapping site	<i>esri/ArcGIS Latitude Geographics/Geocortex</i>	LIO	http://lio.milwaukeecounty.org/mcamlis/	Quarterly
ROD land records search tools	<i>Fidlar/Tapestry</i>	<i>Fidlar</i>	https://tapestry.fidlar.com/Tapestry2/Search.aspx	Daily
RPL or tax parcel site	<i>GCS/GCSWebPortal</i>	GCS	http://gcswebportal.milwaukeecounty.org/GCSWebPortal/Search.aspx	As records are updated
Zoning information (PDF or WebApp format)	<i>Software/app name</i>	NA	Zoning Information is not maintained by Milwaukee County	
PLSS tie sheets	<i>HTML/website</i>	County Surveyor	http://www.sewrpc.org/SEWRPC/DataResources/RegionalLandInfo/SurveyDocuments.htm	As records are updated

Data Sharing

Data Availability to Public

Milwaukee County currently shares all publishable data via multiple methods. Data can be consumed via REST service through an on premise ArcGIS Server. Cadastral and planimetric data covering individual areas of interest (or AOIs, such as PLSS sections) are available through an automated download process utilizing ArcGIS Online. Most historical imagery, raw LiDAR data, and larger compiled datasets are also available for download via a Dropbox account.

Data Sharing Restrictions

On March 22nd, 2011, the Milwaukee County Automated Mapping and Land Information System (MCAMLIS) Steering Committee approved staff recommendations to implement recommended changes to previously existing MCAMLIS Copyright and Data Distribution Policies including the adoption of:

- a revised Copyright License Agreement – executed on June 8, 2009 dissolving Utility copyright interests and granting Copyright Ownership of digital materials in digital form to the MCAMLIS Steering Committee,
- a revised MCAMLIS Requisition and Distribution Policy, and;
- a revised License Agreement Pertaining To The Non-Commercial Use Of Copyrighted Digital Base Mapping Materials.

In September 2015, MCAMLIS officially discontinued the enforcement of the copyright of the Cadastral and Topographic datasets of Milwaukee County.

Government-to-Government Data Sharing

MCAMLIS data is available via service and download.

Training and Education

The MCLIO performs monthly training sessions for the users via a web sharing service. A Metro Milwaukee GIS Users Group (MMGUG) was also formed to initiate collaboration between GIS users and like professionals, educators, private contractors, and the public. Participation for MMGUG is usually around 70+ attendees and is held on a quarterly basis.

4 CURRENT & FUTURE PROJECTS

In 2013, The Land Information Office authorized a needs assessment and produced a five-year plan. In March 2015, that plan was updated to include fiscal year 2019. The LIO is currently implementing fiscal year 2015 and 2016 projects.

Current Projects

#1: Improve the MCLIO Interactive Mapping Service

Project Description/Goal

This project will migrate and enhance the MCLIO Interactive Map Viewer. The current website viewing application(s) uses plug-in technology that is being deprecated and will soon be unsupported (e.g., Google has declared that all plug-ins will not load in the Chrome browser as of September 2015). ESRI has also declared that they have stopped development and will discontinue support as of June of 2016.

Objectives/Measure of Success

- Identifying new functionality and implementation
- Updating the GeoCortex user guide with MCLIO web viewer specifics. For example, how to access certain data (e.g., CSMs) and functions (e.g., Pictometry oblique imagery)
- Developing and executing training materials (online, self-paced, group, etc.)
- Marketing/support of the new viewer

Project Timeframes

Milestone	Duration	Date
Project #1 start	–	Nov 1, 2015
Deploy HTML5 Viewer	2 months	Jan 1, 2016
Refine viewer per comments	2 months	Mar 1, 2016
Deploy viewer	2 months	May 1, 2016
Project Complete	–	June 31, 2016

Responsible Parties

Sr. GIS Analyst (25%), GIS Analyst (25%)

#2: Deploy Mobile Property Locator Application

Project Description/Goal

The mobile property mapping application will provide organizations with the ability to view property ownership information in the field via a mobile application for phone or tablet. Core capabilities include the ability to retrieve the property and owner information at or near the user's current location, or to retrieve property information based on a user-supplied address. In addition, this task will develop and deploy feature data services for parcels.

Objectives/Measure of Success

- To have the MCAMLIS website available on mobile phones and tablets
- To have a Parcel viewer to easily retrieve property information

Project Timeframes

Milestone	Duration	Date
Project #2 start	–	Nov 1, 2015

Deploy beta parcel viewer	2 months	Jan 1, 2016
Refine viewer per comments	2 months	Mar 1, 2016
Deploy viewer	2 months	May 1, 2016
Project Complete	–	June 31, 2016

Responsible Parties

Sr. GIS Analyst (25%), GIS Analyst (25%)

Future Projects

#3: Prototype Mobile Applications Using Services

Project Description/Goal

This task will provide MCAMLIS staff experience with mobile applications and application of MCAMLIS map and feature services deployed in such applications. In particular, MCAMLIS will prototype asset viewer, field data collector, and property locator mobile applications. This task will most likely incorporate feature and map data services from the preceding mobile tasks.

Objectives/Measure of Success

- Prototypes of simple mobile applications, with MCAMLIS map and feature services: asset viewer, field data collector, and preliminary work on the property viewer
- Documented lessons learned for MCAMLIS parcel feature data services, MCAMLIS property locator, and online general lessons learned for MCAMLIS Partners
- Confirmation of Partners who will apply, at the least, the parcel feature data services and the MCAMLIS property locator application

Project Timeframes

Milestone	Duration	Date
Project #3 start	–	May 1, 2016
Prototype mobile services	2 months	May 1, 2016
Refine mobile services	3 months	July 1, 2016
Document processes	1 months	Oct 1, 2016
Project Complete		Nov 1, 2016

Responsible Parties

Sr. GIS Analyst (25%), GIS Analyst (25%), Contractor Services (2 months)

#4: Implement the MCAMLIS Portal

Project Description/Goal

This task would implement the MCAMLIS Partner Portal solution. This Portal would be a single location where Partners would interface with MCAMLIS. It would provide Partners with access to and use of MCAMLIS data and services, as well as a location to publish their business data. In addition, the portal would offer a location for Partner collaboration.

Objectives/Measure of Success

- Implementation and roll-out of portal solution
- Documentation
- Initial primary support of portal solution

Project Timeframes

Milestone	Duration	Date
Project #4 start	–	June 1, 2016
Deploy Portal	2 months	June 1, 2016
Refine Portal per comments	2 months	Aug 1, 2016
Document Portal project	2 months	Oct 1, 2016
Project Complete	–	Nov 30, 2016

Responsible Parties

GIS Analyst (25%)

#5: Make MCAMLIS Vector Data Improvements

Project Description/Goal

This task will update the current topographic dataset. The topographic dataset has been polygonalized as of 2010, with a major transportation update in 2013. This project will bring the currency of the dataset to 2015. The project will use the 2015 aerial photography as well as the 2015 LiDAR elevation dataset to process the change control from 2010. An update selection area will be produced based on differences observed from comparing the 2015 to the 2010 LiDAR elevation data. After the changes have been identified, the discrete area will be updated and incorporated into the current environment.

Objectives/Measure of Success

- Update the 2015 Topographic Polygonalized Dataset
- Incorporate the updated data to the current datasets, services, and caches

Project Timeframes

Milestone	Duration	Date
Project #5 start	–	Feb 1, 2016
Change Detection	2 months	Feb 1, 2016
RFP for defined area of update	2 months	Apr 1, 2016
Contract Selection period	1 month	May 1, 2016
Project updates	6 months	Nov 1, 2016
Project Complete	–	Dec 31, 2016

Responsible Parties

Sr. GIS Analyst (25%), GIS Analyst (25%), Contractor Services (6 months)

#6: Improve Property Record Currency

Project Description/Goal

This task will improve the processes that collect, process, and publish property record data. The result will be access to more current property ownership records and associated parcel data. This includes working with GCS, which provides a property record service to all but three municipalities and villages in the county, and individually with the municipalities and villages that do not use GCS. The initiative would include communicating the details of the information by posting the currency of the property record information to the MCAMLIS website.

Objectives/Measure of Success

Improved and enhanced automation of property and parcel data integration and publishing processes. Wisconsin State Statutes require that no later than June 30, 2017, the County board shall post on the Internet, in a searchable format determined by the department of administration, the following information related to individual land parcels:

1. Property tax assessment data as provided to the county by municipalities, including the assessed value of land, the assessed value of improvements, the total assessed value, the class of property, as specified in s. 70.32 (2) (a), the estimated fair market value, and the total property tax
2. Any zoning information maintained by the county
3. Any property address information maintained by the county
4. Any acreage information maintained by the county
 - An updated version of property and parcel data and/or data services
 - Improved and updated parcel and property metadata

Project Timeframes

Milestone	Duration	Date
Project #6 start	–	Feb 1, 2016
Create project scope and contract	1 month	Feb 1, 2016
Develop infrastructure and procedure	2 months	Apr 1, 2016
Update Automation processes and reporting methods	1 months	May 1, 2016
Conduct training and preform educational workshops on project	2 months	June 1, 2016
Project Complete	–	Aug 1, 2016

Responsible Parties

Sr. GIS Analyst (25%), Contractor Services (2 months)

#7: Support New Datum Requirements

Project Description/Goal

The current NAD 27 datum standard limits the interoperability of certain web services and use of MCAMLIS data in certain applications. This task will design and implement automated transformation tools so MCAMLIS Partners and other stakeholders can easily integrate MCAMLIS data with other data that is available in new datums. This task will leverage the work accomplished in the SEWPRC studies on the multiple datum issue.

Objectives/Measure of Success

- NAD 27 datum > New Datum transformation tools
- A deployed version of key MCAMLIS data and map/data services in the new datum
- Documented transformation procedures to create new map/data services

Project Timeframes

Milestone	Duration	Date
Project #7 start	–	Jan 1, 2017
Develop transformation methods and process	1 month	Jan 1, 2017
Perform data transformations	2 months	Feb 1, 2017
Document processes and procedure	1 month	Apr 1, 2017
Project Complete	–	May 1, 2017

Responsible Parties

GIS Analyst (25%)

#8: Make MCAMLIS Non-Vector Data Improvements

Project Description/Goal

This task will improve data management practices technologies that get MCAMLIS **non-vector** reference data into the MCAMLIS data repository and prepare it for efficient access. MCAMLIS non-vector reference data refers to the following: georeferenced imagery (Imagery: Ortho, Oblique, LiDAR, Caches), documents and

photos, and potentially, video and audio. This does not include Partner-shared or Partner-hosted data, and does not include MCAMLIS vector reference data.

Objectives/Measure of Success

- 2017-2018 Orthophotography Acquisition

Project Timeframes

Milestone	Duration	Date
Project #8 start	–	Oct 1, 2017
Develop contract to acquire Orthophotography	3 months	Oct 1, 2017
Initiate contract for acquisition	10 months	Jan 1, 2018
Quality Control and	1 month	Oct 1, 2018
Project Complete	–	Nov 1, 2018

Responsible Parties

GIS Analyst (25%), Contractor Services (10 months)

#9: Implement Cloud-Based GIS for MCAMLIS

Project Description/Goal

This task would provide a pathway toward MCAMLIS having a cloud-based GIS presence, potentially using ArcGIS Online (AGOL). However, the environment may change by the time this task is executed.

A cloud-based GIS presence will offer a collaborative content management system for maps, applications, and data. A cloud-based GIS capability will be an important technology that MCAMLIS can leverage to provide Partners and public users with access to data and services through mobile, web, and desktop applications in the future. This technology would be a means for accessing MCAMLIS-hosted data and services in addition to the MCLIO viewer.

This task includes an assessment of the proper implementation technology choices available, including AGOL, and includes a determination of initial and operating costs associated with a MCAMLIS cloud-based presence that Partners can access. A Go/No-Go determination will be made based on this assessment and then the solution will be acquired and implemented.

Objectives/Measure of Success

- Partners will see benefit in researching a cloud-based GIS solution
- Increase usage of MCAMLIS data
- Allow non-programmers to deploy and share web maps containing their own GIS data
- Allow mapping applications to be shared with a group or the public through a web browser, smart phone applications, social media, or emails
- Embed maps into websites

Project Timeframes

Milestone	Duration	Date
Project #9 start		Jan 1, 2018
Prototype cloud based GIS solutions	3 months	Jan 1, 2018
Refine cloud based GIS solutions	3 months	Apr 1, 2018
Document processes	1 months	July 1, 2018
Project Complete	–	Aug 1, 2018

Responsible Parties

Sr. GIS Analyst (25%), GIS Analyst (25%)

#10: Survey Control Modernization - Datum Update and Conversion

Project Description/Goal

The objective to this project is to update and reestablish the current accepted datum in Milwaukee County. The current datum for the Public Land Survey System (PLSS) is North American Datum 1927 horizontal and North American Datum 1929 vertical. This project will establish the datum North American Datum 1983-2011 horizontal and North American Datum 1988-2012 vertical. This would meet the requirements of Benchmark 4 within the Strategic Grant Initiative from the State of Wisconsin.

Objectives/Measure of Success

- NAD 27 datum > NAD 83 Vertical Datum
- NAD 29 datum > NAD 88 Horizontal Datum
- Updates Control Survey Summary Diagram (CSSD) sheets
- Revised Record of USPLSS Control Station Documents

Project Timeframes

Milestone	Duration	Date
Project #10 start	–	June 1, 2016
Develop project scope and contract	6 months	June 1, 2016
Develop transformation methods and process	6 months	June 1, 2016
Perform monument occupation	2 years	January 1, 2017
Perform survey control data transformation	6 month	January 1, 2019
Document processes and procedure	6 month	June 1, 2019
Project Complete	–	Dec 31, 2019

Note: This project will be completed for the entire Southeast Wisconsin Regional Planning Commission area. The estimated project timeline will be 3 years to complete. The estimated timeline above is an estimated time that it would take to complete Milwaukee County.

Responsible Parties

GIS Analyst (25%), GIS Manager (25%), Contractor Services (4 months)

#11: Plat of Survey Parcel Index Maintenance

Project Description/Goal

Every survey completed by a registered surveyor must be submitted to the local Planning Commission. The Local Planning Commission then collects these recorded plats. Milwaukee County acquires these hard copy submissions and has them scanned into digital format. After the scanning has been completed, the plats are geocoded and placed into an application that is published to the internet. Milwaukee County indexes the published plats to be retrieved from the Milwaukee County GIS interactive mapping site. A viewer is able to search for plats of survey that have been completed within Milwaukee County and retrieve a digital copy for display and printing.

Objectives/Measure of Success

- Scan Plats of Survey acquired from the Local Planning Commission, SEWRPC
- Index and geocode the Plats of Survey
- Update the Interactive Mapping Site for publication

Project Timeframes

Milestone	Duration	Date
-----------	----------	------

Project #11 start		Jan 1, 2016
Scan Plats of Survey	2-3 weeks per year	Jan 1, 2018
Index and Geocode Plats	1 month per year	Apr 1, 2018
Update Mapping site	Neg.	July 1, 2018
Project Complete	–	December 31, 2018

Responsible Parties

GIS Analyst (10%), Contractor Services

#12: Enterprise Address System Maintenance

Project Description/Goal

The enterprise address system program effort has continued to the present and is now maintained as the MCAMLIS Enterprise Address System whereby street, parcel, building and unit addresses are fully integrated across the entire county. Maintenance automation tools are utilized to manage the database as address component updates are required and maintenance is performed.

Objectives/Measure of Success

- Maintain integrity between address components
- Alter automation tools and procedures to adapt to additional information
- Continue Quality Control on individual address records

Project Timeframes

Milestone	Duration	Date
Project #12 start		Jan 1, 2016
Control integrity between components	2-3 weeks per year	Jan 1, 2018
Automation tool development	2-3 weeks per year	Apr 1, 2018
QC of Data	2 months per year	July 1, 2018
Project Complete	–	December 31, 2018

Responsible Parties

GIS Analyst (10%), SR GIS Analyst (10%)

#13: Street Centerline Maintenance

Project Description/Goal

A maintenance cycle is on place for the enterprise street centerline dataset. The centerlines are maintained for routing purposes as well as mapping purposes. The data is consumed by the Milwaukee County Sherriff's Office as well other municipalities located within Milwaukee County. A quarterly update of the discrete address range and spatial representation is completed.

Objectives/Measure of Success

- Update Street centerlines
- Update data views and data schema

Project Timeframes

Milestone	Duration	Date
Project #13 start		Jan 1, 2016

Update street centerline	2-3 weeks per year	Jan 1, 2018
Update Centerline Schema	Neg.	July 1, 2018
Project Complete	-	December 31, 2018

Responsible Parties

GIS Analyst (10%), SR GIS Analyst (10%)

Estimated Budget Information

Project	Item	Unit Cost	Cost	Total Project Cost
1. HTML5 GIS Website	a. GIS staff	25% of \$248,000	62,000	-
	b. Contractor Services	\$35,000	35,000	97,000
2. Mobile parcel viewer	a. GIS staff	25% of \$248,000	62,000	-
	b. Contractor Services	\$13,000	13,000	75,000
3. Prototype Mobile Services	a. GIS staff	25% of \$248,000	62,000	-
	b. Contractor Services	\$20,000	20,000	82,000
4. Implement the MCAMLIS Portal	a. GIS staff	25% of \$112,000	28,000	28,000
5. Make MCAMLIS Vector Data Improvements	a. GIS staff	50% of \$248,000	122,000	-
	b. Contractor Services	\$100,000	100,000	222,000
6. Improve Property Record Currency	a. GIS staff	25% of \$136,000	34,000	-
	b. Contractor Services	\$50,000	50,000	84,000
7. Support New Datum Requirements	a. GIS staff	25% of \$112,000	28,000	28,000
8. Make MCAMLIS Non-Vector Data Improvements	a. GIS staff	25% of \$112,000	28,000	-
	b. Contractor Services	\$145,000	145,000	173,000
9. Implement Cloud Based GIS for MCAMLIS	a. GIS staff	25% of \$248,000	62,000	62,000
10. Survey Control Modernization	a. GIS staff	25% of \$264,000	66,000	-
	b. Contractor Services	\$182,719	182,719	248,719
11. Plat of Survey Indexing	a. GIS staff	10% of \$112,000	11,200	-
	b. Contractor Services	\$2,000	\$2,000	13,200
12. Enterprise Addressing System Maintenance	a. GIS staff	10% of \$248,000	24,800	24,800
13. Street Centerline Maintenance	a. GIS staff	10% of \$248,000	24,800	24,800
			GRAND TOTAL	1,152,519

Note. These estimates are provided for planning purposes only. Budget is subject to change.

Project Plan to Achieve Searchable Format (Benchmarks 1 & 2)

Project Description/Goal

How searchable format will be met

Milwaukee County will develop standardized and repeatable processes to convert and deliver data in a searchable format required by the statewide parcel initiative data model requirements outlined in Appendix A of the V1 Interim Report.

One notable exception is that some of the attributes outlined in Appendix F (Parcel Scheme) will not be included because Milwaukee County is fully incorporated and thus does not maintain any assessed, class, or tax information. Milwaukee County does incorporate these data fields when they are maintained at the Municipal level.

A second exception to Appendix C (Zoning Format) occurs as Milwaukee County also does not maintain any zoning information. It is our intention to acquire and standardize this information across the County, but currently there is no project underway.

Objectives/Measure of Success

Milwaukee County is currently in compliance with Benchmark 1 and 2 of the Strategic Parcel Initiative.

Project Plan for Parcel Completion (Benchmark 3)

Objectives/Measure of Success

Milwaukee County is in compliance with Benchmark 3.

Project Plan for PLSS (Benchmark 4)

Project Description/Goal

Planned approach

This project will update and reestablish the basis of horizontal control for the Public Land Survey System (PLSS) to the North American Datum of 1983-2011 and the vertical control to the North American Vertical Datum of 1988-2012. Once the new control network is established, all existing data will be converted.

Milwaukee County will undertake a project to convert all PLSS Coordinates from NAD27/NGVD29 to NAD83/NAVD88. To do this, Milwaukee County is planning to reoccupy all monuments using modern GPS equipment. This will also upgrade corner accuracy from Third Order Class I to a value that meets the County Survey's definition of "survey grade". We expect an accuracy approaching 1 in 50,000. The relative change in distance between monuments is expected to be very small. Monuments will be entered into the parcel fabric using their new coordinate value. Parcels and related features will be adjusted to the new monuments using automated GIS tools.

Current status

100% of the 1,065 monuments in Milwaukee County have been remonumented.

- **0% - Survey-grade** – Coordinates collected under the direction of a professional land surveyor, in a coordinate system allowed by s. 236.18(2), and obtained by means, methods and equipment capable of repeatable 2 centimeter or better precision
- **100% - Sub-meter** – Accuracies of 1 meter or better
- **0% - Approximate** – Accuracies of within 5 meters or to coordinates derived from public records and other relevant information

Goals

Survey grade quality coordinates in NAD83/NAVD88 for 100% of the monuments in Milwaukee County.

Missing corner notes

- It is not known to Milwaukee County to have any missing corners.

County boundary collaboration

- The update and migration to the NAD 83\88 platform is being conducted at a Regional Level.

Business Drivers

This project is required to better accommodate integration of Milwaukee County data with other data generated by State and Federal agencies who have already adopted the new datums. In addition, this project is required to meet Benchmark 4 as defined in the [Version 1 Statewide Parcel Map Database Project](#).

Current workflows often require the conversion of datasets between the older and newer datums. For example, Milwaukee County topographic data that was captured in NGVD29 needed to be converted to coordinate with FEMA flood elevations published in NAVD88. This project will dramatically reduce the need for datum conversion, which has the potential to introduce error.

Objectives/Measure of Success

The objective is to meet Benchmark 4 (Completion and Integration of PLSS) by Dec 31, 2019

Project Timeframes

Due to staff and funding restrictions, it is anticipated that this project will take a total of 3 years to complete. Milestones that will relate to a Survey Township-based project plan will be developed and monitored.

Responsible Parties

Project oversight will be provided by the Land Information Officer. The staff at the Southeastern Wisconsin Regional Planning Commission, acting as County surveyor, will be responsible for completing the project.

- County Surveyor – Project Specifications, Quality Control, Project Coordination
- Land Information Officer – Project Coordination
- Southeastern Wisconsin Regional Planning Commission – Coordinate with other counties and publish new coordinate values.
- Private Surveying Firm – Field surveying, office work, dossier and control survey summary diagram preparation

Estimated Budget Information

It is estimated that the cost to convert to the NAD83-2011 horizontal datum will be \$155,470. Conversion to the Vertical NAVD88-2012 data will cost an additional \$27,249. There will be additional staff time that is not included in this cost that will need to be included once the project scope and approach has been completed.

Milwaukee County intends to use Strategic Initiative Grant awards (2016, 2017, 2018) with the balance from locally retained Wisconsin Land Information Program Funds. *This is a very rough estimate.*



SCOTT WALKER
GOVERNOR
SCOTT A. NEITZEL
SECRETARY
Wisconsin Land Information Program
Post Office Box 8944
Madison, WI 53708-8944
Voice (608) 266-3369
www.doa.state.wi.us/WLIP

Wisconsin Land Information Program 2016 Base Budget, Training & Education, and Strategic Initiative Grant Application

Complete this application form in order to receive 2016 Wisconsin Land Information Program (WLIP) grants, pursuant to Wisconsin Statute Section 16.967(7) and Wisconsin Administrative Code, Chapter Adm. 47.

Training & Education Grants

Training & Education grants may be used for the training and education of county employees for the design, development, and implementation of a land information system. Each county is eligible for a \$1,000 grant.

Strategic Initiative Grants

Strategic Initiative grants are for the purposes of addressing statutory directives to create a statewide digital parcel map and to post certain parcel information online in a standard searchable format. Strategic Initiative grant funding is to be prioritized to achieve "benchmarks" of parcel quality and completeness, as recommended in the *Version 1 Statewide Parcel Map Database Project Interim Report*. Each county is eligible for \$50,000 in 2016 Strategic Initiative grant funding.

There are four benchmarks for parcel data:

- Benchmark 1 – Parcel and Zoning Data Submission
- Benchmark 2 – Extended Parcel Attribute Set Submission
- Benchmark 3 – Completion of County Parcel Fabric
- Benchmark 4 – Completion and Integration of PLSS

Counties must prioritize their Strategic Initiative grant activities toward achieving the benchmarks in numerical order, beginning with Benchmark 1, proceeding to Benchmark 2, and so forth. The benchmarks are designed to complement and dovetail with the county land information plan. Thus, counties are encouraged to develop land information plans prior to or alongside completion of this grant application.

Base Budget Grants

Base Budget grants enable a county to develop, maintain, and operate a basic land information system and may be used for the implementation of the county's land information plan. Base Budget grants are only available to those counties with retained register of deeds document recording fees of less than \$100,000 in FY 2015 (July 1, 2014–June 30, 2015). See the grant eligibility table on page 9 to confirm your county's eligibility.

Application and Grant Timeline

All Applications should be submitted by December 31, 2015, but applicants are highly encouraged to submit earlier. Please submit the application by emailing a completed digital PDF form to WLIP@wisconsin.gov.

Grant application released	August 31, 2015
Grant application deadline	December 31, 2015
Draft county land information plan deadline	December 31, 2015
Training & Education grants distributed	By January 31, 2016
Grant agreements executed	By February 28, 2016
First 50% of Strategic Initiative grant distributed (upon successful data submittal for V2)	By March 31, 2016
Base Budget funds distributed	By May 31, 2016
Second 50% of Strategic Initiative grant distributed	Upon project completion

Contact

For questions regarding this application, please contact WLIP Grant Administrator Peter Herreid at peter.herreid@wisconsin.gov or (608) 267-3369.

How to Submit

1. Download application form
2. Use Adobe Reader or Adobe Acrobat to fill in form
3. Save a local copy by using "File » Save As." Add your county name to the end of the file, e.g., [2016 WLIP Grant Application - StCroix.pdf](#)
4. Complete the application using the "File » Save" menu item to save as you go.
5. When you are finished, save/print a copy for your records.
6. You may delete the first nine pages of instructions and any other unnecessary pages if you have access to PDF software that allows it.
7. Email the form as an attachment to WLIP@wisconsin.gov by December 31, 2015. Please include the name of your county in the Subject Line, e.g., [2016 WLIP Grant Application – Fond du Lac](#)

The instructions below are written in order, with each section number pertaining to a question on the application form. The application form begins on page 10. Section numbers on the form link back to the corresponding page of instructions.

General Application Instructions

Section 1 All counties are required to update their county land information plan in 2015–2016 to meet s. 59.72(3)(b). The *2015 Uniform Instructions for Preparing County Land Information Plans* were released in June 2015. Counties are requested to provide draft plan updates by December 31, 2015, which is a requirement for 2016 WLIP grant eligibility. Wisconsin Administrative Code, Chapter Adm. 47.06 (3) requires that projects must be consistent with an approved county land information plan (also referred to as a county-wide land records modernization plan).

Section 2 According to s. 59.72(3m)(b), the county land information council shall review the priorities, needs, policies, and expenditures of a land information office and advise the county on matters affecting the land information office. The land information council must have met within the last 12 months in order for the county to be eligible for a WLIP grant.

Section 3 Applicants must subscribe to the WLIP's e-mail listserv, doa-landinfo@lists.wi.gov.

Section 4 According to s. 59.72(2)(b), a county must submit an annual report to DOA on WLIP retained fee and grant spending. All counties submitted a *Retained Fee/Grant Report* for 2014.

Training & Education Grant Application Instructions

Section 5 The amount of \$1,000 is available to each county for 2016 Training & Education grants.

Section 6 Enter the amount requested (up to \$1,000).

Section 7 Brief description of intended expenditures for Training & Education grant: Provide information on plans to utilize the Training & Education grant funding.

Section 8 Land information officer name (typed) and date are required. Please do *not* sign and scan the form you send to WLIP. Handwritten signatures are not required. Applications should be submitted as a digital PDF, not a scanned copy.

[GO TO T&E APP](#)

Strategic Initiative Grant Application Instructions

Section 1 The amount of \$50,000 is available to each county for 2016 Strategic Initiative grants.

Section 2 Enter the amount requested (up to \$50,000).

Section 3 Summary of expenditures by benchmark. Indicate which benchmarks will be addressed with the grant. Check all benchmarks that apply.

Figure 1 on the following page summarizes the benchmarks. For more details on benchmark requirements, grant applicants should refer to the *Version 1 Statewide Parcel Map Database Project Interim Report*, and in particular the report appendices, available at www.sco.wisc.edu/publications.

[GO TO SI APP](#)



Figure 1. Summary of benchmarks from V1 Interim Report and V1 Interim Report Appendices

Strategic Initiative Grant Application Instructions (Continued)

Section 4 Indicate whether the county anticipates meeting Benchmark 1 for the Version 2 Statewide Parcel Map Database Project (V2) call for data. V2 data submittals will be due March 31, 2016. (Although the V2 data submission deadline has the potential to be extended to April 30, 2016, if a county needs an additional month to get their parcel dataset into either the export format or searchable format for V2.)

Counties are highly encouraged to meet either the export or searchable format standard for the V2 data submittal, using grant funds to do so if necessary.

- **Searchable format** – county data submittal is ready for immediate aggregation into the statewide parcel layer
- **Export format** – a more flexible format, which will be converted by the parcel aggregation team into the searchable format on behalf of counties. The export format is an alternative that will accommodate several data submission options, including GIS data, text files, and an option to provide tax roll data in the Department of Revenue’s XML format.

Export and searchable formats are defined in detail in the *Version 1 Statewide Parcel Map Database Project Interim Report* and report appendices.

All data for Benchmark 1 and 2 should be submitted in one of the formats, not a combination of the two. In other words, a county may not submit in a mixture of both the export and searchable formats. If V2 data submittal will be complete but it is not feasible the county will meet the export format by March 31, 2016, select “Other” in Section 4.

Section 5 Indicate whether the county will use the Strategic Initiative grant funding in the first quarter of 2016 to meet Benchmark 1 in the format you selected above in Section 4.

Figure 2 illustrates the timeline for Strategic Initiative projects. 2016 projects have a completion deadline of March 31, 2017, the projected V3 data submission deadline.

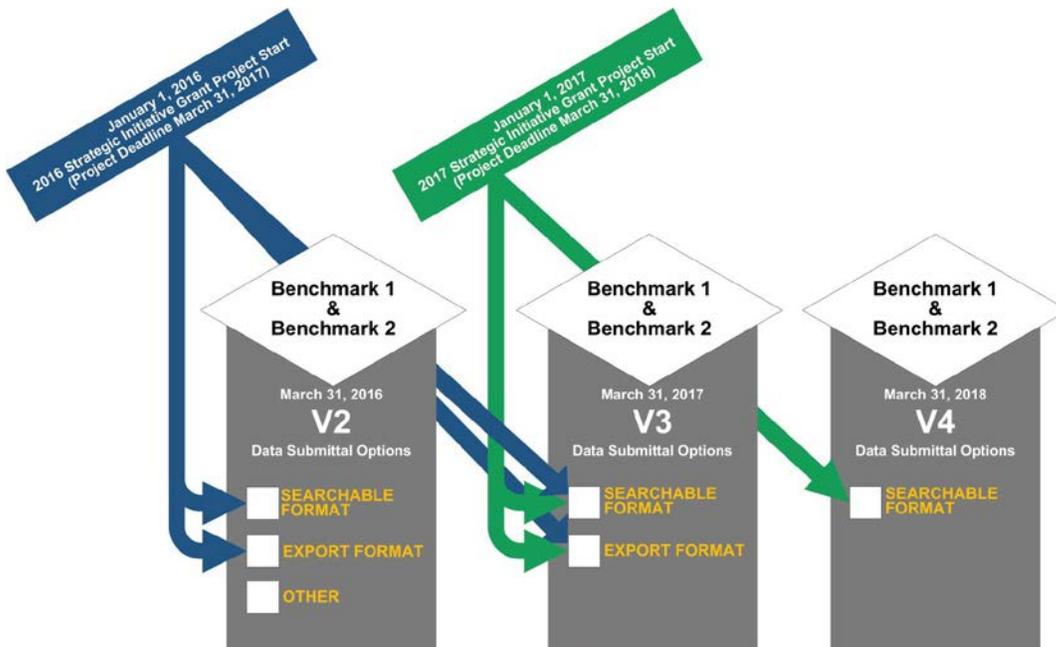


Figure 2. Strategic Initiative grant project timeline, where projects can span a calendar year plus one quarter

Section 6 Indicate whether the county will meet the export or searchable format option for the V3 call for data. For V3, the **searchable format** is the requested format for data submittal. However, counties may submit in export format for V3, if it is the only feasible option. Data must be in either the export or searchable format for V3.

Section 7 Indicate whether the county will use 2016 Strategic Initiative grant funding to achieve the format you selected above in Section 6 by March 31, 2017.

Section 8 The **searchable format** is the only option for the anticipated V4 call for data, anticipated to be due March 31, 2018. Counties must plan to meet the searchable format by March 31, 2018 at the latest.

Section 9 Benchmark 1 Land Information Plan Citations: List the corresponding citation (section and page numbers) from the county's land information plan for a *Project Plan to Achieve the Searchable Format for Benchmarks 1 & 2*.

Project Plan to Achieve Searchable Format for Benchmarks 1 & 2. The county must create a project within the county land information plan in the "Current & Future Projects" section to meet the searchable format for both Benchmark 1 and 2 by March 31, 2018 at the latest. Counties are encouraged to meet the searchable standard as soon as possible.

Exception: If a county believes its parcel data will already meet the searchable format standard for the V2 call for data in March of 2016, this should be clearly stated in the "Parcel Mapping" Foundational Element layer status section of the land information plan.

LIO certification upon data submission. Land information officers will be required to certify that data meets the standards for Benchmark 1 and 2 upon submission of data for V2. Counties will certify their own level of attribute completeness relative to an **element occurrence standard**. This means that if an element (such as a property address, a total assessed value, total property tax value, etc.) actually occurs for a given parcel, then this element should be included in the submitted dataset. This also means that there may be justifiable omissions from the submitted dataset. Examples might be missing tax data for tax exempt properties, no address when no structure is present on a property, etc. Data elements must be included only if they actually occur.

Section 10 Benchmark 1 Project Activities and Itemized Costs. For Benchmark 1, provide costs for the project to be paid with WLIP grant funds. Itemize costs where possible. Costs may be estimates determined through quotes received from vendors for specific activities. However, please do *not* include vendor estimates as attachments to this fillable PDF.

Note on staff funding. The county may either utilize the expertise of existing county staff or hire contractors from the private sector as part of Strategic Initiative grant expenses. As long as county staff activities funded by the Strategic Initiative grant are for the purposes specified in the grant application, it is acceptable to use grant funds to reimburse county or municipal staff.

Section 11 Benchmark 1 Total Costs. The "Total Costs" boxes are self-adding, which means they calculate the total automatically from the Itemized Costs boxes.

Section 12 Indicate whether the county anticipates meeting Benchmark 2 for the Version 2 Statewide Parcel Map Database Project (V2) call for data. V2 data submittals will be due March 31, 2016.

Counties are highly encouraged to meet either the **export** or **searchable format** standard for the V2 data submittal, using grant funds to do so if necessary. See Section 4 directions above.

Section 13 Indicate whether the county will use the Strategic Initiative grant funding in the first quarter of 2016 to meet Benchmark 2 in the format you selected above in Section 12. Figure 2 illustrates the timeline for Strategic Initiative projects.

Section 14 Indicate whether the county anticipates meeting Benchmark 2 for the Version 3 Statewide Parcel Map Database Project (V3) call for data. V3 data submittals will be due March 31, 2017. See also Section 4 directions above.

Section 15 Indicate whether the county will use 2016 Strategic Initiative grant funding to achieve the format you selected above in Section 14 by March 31, 2017.

Section 16 The **searchable format** is the only option for the anticipated V4 call for data, anticipated to be due March 31, 2018. Counties must plan to meet the searchable format by March 31, 2018.

Section 17 Benchmark 2 Land Information Plan Citations: List the corresponding citation (section and page numbers) from the county's land information plan for a *Project Plan to Achieve the Searchable Format for Benchmarks 1 & 2*. See Section 9 directions above.

Section 18 Benchmark 2 Project Activities and Itemized Costs. For Benchmark 2, provide costs for the project to be paid with WLIP grant funds. Itemize costs where possible. Costs may be estimates determined through

quotes received from vendors for specific activities. However, please do *not* include vendor estimates as attachments to this fillable PDF.

Section 19 Benchmark 2 Total Costs. The “Total Costs” boxes are self-adding, which means they calculate the total automatically from the Itemized Costs boxes.

Section 20 Indicate whether your county’s digital parcel fabric is complete. Give estimated year of completion if applicable.

There may exist within a county certain areas that do not require detailed parcel mapping, such as state forests. These areas can be treated as a single large parcel as long as they are designated as such in the submitted dataset.

Section 21 If the county’s parcel fabric is incomplete, indicate whether the county will use 2016 Strategic Initiative grant funds to work toward completion.

Section 22 Benchmark 3 Land Information Plan Citations: If a county has an incomplete digital parcel fabric, list the corresponding citation (section and page numbers) from the county’s land information plan for a *Project Plan for Parcel Completion*.

Project Plan for Parcel Completion. The county should create a project within the county land information plan in the “Current & Future Projects” section that outlines:

- (a) Current status of parcel data in the county, including a tally of the total number of parcels in digital format and an estimate of the number of parcel still to be digitized.
- (b) Goals (number of parcels to be added) for the funding period.
- (c) Planned approach for completing the parcel fabric.
- (d) Estimated budget and timeline to complete the county parcel fabric over time.

PLSS first approach. Some counties have a plan in place to complete PLSS remonumentation before completing the parcel fabric in a given area. Counties have the option of adopting a “PLSS first approach,” subject to a number of prioritization rules detailed in the *V1 Interim Report*. If selecting a PLSS first approach, note this in the *Project Plan for PLSS*, described in Section 28 below.

Exception: If a county’s digital parcel fabric is complete and/or at maintenance stage, this should be stated in the “Parcel Mapping” Foundational Element layer status section of the land information plan.

Section 23 Benchmark 3 Project Activities and Itemized Costs. For Benchmark 3, provide costs for the project to be paid with WLIP grant funds. Itemize costs where possible. Costs may be estimates determined through quotes received from vendors for specific activities. However, please do *not* include vendor estimates as attachments to this fillable PDF.

Section 24 Benchmark 3 Total Costs. The “Total Costs” boxes are self-adding, which means they calculate the total automatically from the Itemized Costs boxes.

Section 25 Indicate whether your county has reached a satisfactorily complete and integrated PLSS framework. This includes: rediscovery of PLSS corner monuments and physical remonumentation of corners without existing monuments; with exceptions, establishing accurate coordinates on these corners based on a modern datum; posting tie sheets online for these corners; and integrating all county PLSS corners into the county parcel fabric. Give estimated year of completion if applicable.

Section 26 If the county has determined that its PLSS has not reached a satisfactory level of completion and integration, indicate whether 2016 Strategic Initiative grant funds will be used to make progress toward Benchmark 4.

Those counties who utilize Strategic Initiative grant funds for PLSS work will be required to submit a digital copy of all county PLSS corner coordinates values for inclusion in the State Cartographer’s Office online *PLSSFinder* upon project completion (project deadline of March 31, 2017). New or updated corners must be tagged with their appropriate accuracy class (survey-grade, sub-meter, or approximate). This submission must include an attribute flag, timestamp, or other mechanism in the data to identify PLSS records that have been added or modified since the last submission.

Section 27 **Benchmark 4 waiver request to acquire LiDAR.** Strategic Initiative funds for 2016 are intended to be used for the purposes of parcel dataset development, as outlined in the *V1 Interim Report*. However, it may be possible to use Strategic Initiative funds for LiDAR, subject to the following conditions: First, a county would need to use the funds to meet parcel Benchmarks 1-3. Then, if a county has remaining Strategic Initiative grant funding, it may expend it on LiDAR *before* Benchmark 4 (Completion and Integration of PLSS).

Section 28 Benchmark 4 Land Information Plan Citations: If a county has not achieved satisfactory completion and integration of its PLSS framework, list the corresponding citation (section and page numbers) from the county's land information plan for a *Project Plan for PLSS*.

Project Plan for PLSS. The county should develop a project within the county land information plan in the "Current & Future Projects" section that outlines:

1. Planned approach for remonumenting, rediscovering, and establishing survey-grade coordinates for PLSS corners, and integrating corners into the parcel fabric. Due to cost, accessibility, or land ownership, lower-quality coordinates may be substituted. However, lower grade coordinates should be the exception, rather than the rule. In addition, counties may but are not required to use Strategic Initiative grant funds to upgrade their PLSS from a NAD 27 coordinate system to a more current datum.
2. Current status of PLSS data in the county including a tally of the total number of corners, their remonumentation status, and their coordinate status (accuracy class) if known. Accuracy classes include survey-grade, sub-meter, and approximate.
 - **Survey-grade** – Coordinates collected under the direction of a professional land surveyor, in a coordinate system allowed by s. 236.18(2), and obtained by means, methods and equipment capable of repeatable 2 centimeter or better precision.
 - **Sub-meter** – Accuracies of 1 meter or better
 - **Approximate** – Accuracies of within 5 meters or to coordinates derived from public records and other relevant information.
3. Goals for the funding period, including the number of corners to be remonumented and/or rediscovered, the number to have new coordinates established, the accuracy class for these new coordinates, and the way in which these points will be integrated into the parcel fabric.
4. Documentation for any missing corner data.
5. Efforts to collaborate with neighboring counties.

Exception: If a county believes it has achieved satisfactory completion and integration of its PLSS framework, this should be clearly stated in the "PLSS" Foundational Element layer status section of the land information plan.

Section 29 Benchmark 4 Project Activities and Itemized Costs. For Benchmark 4, provide costs for the project to be paid with WLIP grant funds. Itemize costs where possible. Costs may be estimates determined through quotes received from vendors for specific activities. However, please do *not* include vendor estimates as attachments to this fillable PDF.

Section 30 Benchmark 4 Total Costs. The "Total Costs" boxes are self-adding, which means they calculate the total automatically from the Itemized Costs boxes.

Section 31 Other County Strategic Initiative Projects: Applies only to situations in which a county has already met Benchmarks 1, 2, 3, and 4 (or 1-3 with LiDAR waiver). Specifically, this entails:

- Benchmarks 1 and 2 – Parcel and zoning data with extended parcel attributes will be submitted by March 31, 2016 for the V2 call for data, and will *at least* meet the export format standard
- Benchmark 3 – Parcel fabric is complete
- Benchmark 4 – PLSS framework has reached a level of satisfactory completion and integration, which is documented in the "PLSS" Foundational Element layer status section of the county land information plan (with the exception of LiDAR waiver counties described in Section 27.)

If a county has already met Benchmarks 1, 2, 3, and 4 (or 1-3 with LiDAR waiver), it will still remain eligible for \$50k in 2016 Strategic Initiative grant funding. Such a county may use the Strategic Initiative funding for a project as listed in the "Current & Future Projects" section within the county land information plan.

For example, another Strategic Initiative project might be to complete or comprehensively update another Foundational Element layer, such as LiDAR, orthoimagery, address points, street centerlines, land use, zoning, or administrative boundaries. For the expanded list of Foundational Elements, see the *2015 Uniform Instructions for Preparing County Land Information Plans*.

Strategic Initiative funding exclusions. Strategic Initiative grant funding may not be used for renewing annual software vendor contracts, ongoing operational costs, or maintenance of existing layers.

Estimated amount of \$50k to be left after applying any costs to achieve Benchmarks 1-4 (or 1-3 for LiDAR waiver counties). Enter zero or "More than zero" and dollar amount.

Addendum. If "More than zero" is selected, use the *2016 WLIP Grant Application Addendum* to document the projects the county will use the Strategic Initiative funding for. You may attach as many grant application addendum pages as necessary. Addendum pages are available for download at www.doa.state.wi.us/WLIP.

Section 32 Estimated amount of \$50k to be left after applying any costs to achieve Benchmarks 1-4 (or 1-3 for LiDAR waiver counties). Enter zero or "More than zero" and dollar amount.

Addendum. If "More than zero" is selected, use the *2016 WLIP Grant Application Addendum* to document the projects the county will use the Strategic Initiative funding for. You may attach as many grant application addendum pages as necessary. Addendum pages are available for download at www.doa.state.wi.us/WLIP.

LiDAR waiver counties should also use the addendum to document the LiDAR project you will use the Strategic Initiative funding for. Others may leave blank or **delete** the addendum page if necessary.

Section 33 TOTAL ALL STRATEGIC INITIATIVE GRANT PROJECT COSTS should not exceed Strategic Initiative Award Eligible amount of \$50k. Include costs for addendum projects in Strategic Initiative total if applicable.

Section 34 Land information officer name (typed) and date are required. Please do *not* sign and scan the form you send to WLIP. Handwritten signatures are not required. Applications should be submitted as a digital PDF, not a scanned copy.

GO TO SI APP

Base Budget Grant Application Instructions

Section 1 The amount your county is eligible for 2016 Base Budget grant. Refer to the grant eligibility table on page 9 for amount.

Section 2 Enter the amount requested. The amount of funds requested/disbursed may not exceed your county's eligible amount from the grant eligibility table on page 9.

Section 3 Project Title: Provide a title for the Base Budget project your county plans to undertake that accurately but concisely describes the project.

Section 4 Project Activity Areas: Select the project activity area covered by the Base Budget project title. Refer to Chapter Adm. 47.03 for eligible projects and activities. Projects must fall under one of the following categories:

- Digital parcel mapping
- PLSS remonumentation
- Other parcel work (e.g., ROD indexing)
- LiDAR
- Orthoimagery
- Address Points
- Street Centerlines
- Software
- Hardware
- Website Development/Hosting Services
- Administrative Activities and Management
- Training and Education
- Other (specify)

Please do not select "Other" as a Base Budget Project Activity Area unless the project genuinely does not fit into one of the categories above.

Section 5 Land Information Plan Citations: For each project, list the corresponding citation (section and page numbers) from the county's plan. All proposed grant activities must reflect goals and objectives contained in the county's land information plan.

Section 6 Project Activities and Itemized Costs: For each project, provide costs for the project to be paid with WLIP grant funds. Itemize costs where possible. Costs may be estimates determined through quotes received from vendors for specific activities. However, please do *not* include vendor estimates as attachments to this fillable PDF.

Section 7 Base Budget Project Total: The "Base Budget Project Total" boxes are self-adding, which means they calculate the total automatically from the Itemized Costs boxes.

Sections 8-22 Fill out sections 8-12, 13-17, and 18-22 only if your county has multiple Base Budget projects. Counties with more than four Base Budget projects should attach additional pages of the *WLIP 2016 Grant Application Addendum*. You may attach as many addendum pages as necessary. Addendum pages are available for download at www.doa.state.wi.us/WLIP.

Section 23 TOTAL ALL BASE BUDGET GRANT PROJECT COSTS should not exceed Base Budget Award Eligible amount. Include costs for addendum projects in Base Budget total if applicable.

Section 24 Land information officer name (typed) and date are required. Please do *not* sign and scan the form you send to WLIP. Handwritten signatures are not required. Applications should be submitted as a digital PDF, not a scanned copy.

GO TO BB APP

2016 Grant Eligibility Table

	FY 2015 Retained Fees (July 2014-June 2015)	BB Grant Eligibility (\$100k – FY 2015 Retained Fees)	Training & Education Grant Eligibility	Strategic Initiative Grant Eligibility	Total Grant Eligibility Amount
Adams	47,896	52,104	1,000	50,000	103,104
Ashland	22,880	77,120	1,000	50,000	128,120
Barron	71,400	28,600	1,000	50,000	79,600
Bayfield	34,816	65,184	1,000	50,000	116,184
Brown	302,160	NA	1,000	50,000	51,000
Buffalo	23,000	77,000	1,000	50,000	128,000
Burnett	37,816	62,184	1,000	50,000	113,184
Calumet	67,440	32,560	1,000	50,000	83,560
Chippewa	83,632	16,368	1,000	50,000	67,368
Clark	48,552	51,448	1,000	50,000	102,448
Columbia	79,064	20,936	1,000	50,000	71,936
Crawford	22,024	77,976	1,000	50,000	128,976
Dane	662,168	NA	1,000	50,000	51,000
Dodge	103,016	NA	1,000	50,000	51,000
Door	62,104	37,896	1,000	50,000	88,896
Douglas	55,752	44,248	1,000	50,000	95,248
Dunn	49,656	50,344	1,000	50,000	101,344
Eau Claire	119,536	NA	1,000	50,000	51,000
Florence	10,112	89,888	1,000	50,000	140,888
Fond du Lac	117,120	NA	1,000	50,000	51,000
Forest	21,208	78,792	1,000	50,000	129,792
Grant	58,184	41,816	1,000	50,000	92,816
Green	52,160	47,840	1,000	50,000	98,840
Green Lake	28,088	71,912	1,000	50,000	122,912
Iowa	35,088	64,912	1,000	50,000	115,912
Iron	14,584	85,416	1,000	50,000	136,416
Jackson	33,120	66,880	1,000	50,000	117,880
Jefferson	98,712	1,288	1,000	50,000	52,288
Juneau	40,472	59,528	1,000	50,000	110,528
Kenosha	178,432	NA	1,000	50,000	51,000
Kewaunee	28,584	71,416	1,000	50,000	122,416
La Crosse	136,440	NA	1,000	50,000	51,000
Lafayette	26,064	73,936	1,000	50,000	124,936
Langlade	35,472	64,528	1,000	50,000	115,528
Lincoln	43,784	56,216	1,000	50,000	107,216
Manitowoc	95,184	4,816	1,000	50,000	55,816
Marathon	165,792	NA	1,000	50,000	51,000

	FY 2015 Retained Fees (July 2014-June 2015)	BB Grant Eligibility (\$100k – FY 2015 Retained Fees)	Training & Education Grant Eligibility	Strategic Initiative Grant Eligibility	Total Grant Eligibility Amount
(Continued)					
Marinette	74,360	25,640	1,000	50,000	76,640
Marquette	25,832	74,168	1,000	50,000	125,168
Menominee	3,784	96,216	1,000	50,000	147,216
Milwaukee	810,768	NA	1,000	50,000	51,000
Monroe	58,440	41,560	1,000	50,000	92,560
Oconto	67,056	32,944	1,000	50,000	83,944
Oneida	80,752	19,248	1,000	50,000	70,248
Outagamie	226,032	NA	1,000	50,000	51,000
Ozaukee	123,632	NA	1,000	50,000	51,000
Pepin	12,224	87,776	1,000	50,000	138,776
Pierce	52,544	47,456	1,000	50,000	98,456
Polk	79,744	20,256	1,000	50,000	71,256
Portage	84,960	15,040	1,000	50,000	66,040
Price	25,224	74,776	1,000	50,000	125,776
Racine	215,600	NA	1,000	50,000	51,000
Richland	26,328	73,672	1,000	50,000	124,672
Rock	188,392	NA	1,000	50,000	51,000
Rusk	27,088	72,912	1,000	50,000	123,912
Sauk	139,656	NA	1,000	50,000	51,000
Sawyer	41,920	58,080	1,000	50,000	109,080
Shawano	61,768	38,232	1,000	50,000	89,232
Sheboygan	134,344	NA	1,000	50,000	51,000
St. Croix	132,136	NA	1,000	50,000	51,000
Taylor	28,024	71,976	1,000	50,000	122,976
Trempealeau	41,016	58,984	1,000	50,000	109,984
Vernon	41,520	58,480	1,000	50,000	109,480
Vilas	64,024	35,976	1,000	50,000	86,976
Walworth	158,208	NA	1,000	50,000	51,000
Washburn	36,600	63,400	1,000	50,000	114,400
Washington	179,384	NA	1,000	50,000	51,000
Waukesha	508,768	NA	1,000	50,000	51,000
Waupaca	74,536	25,464	1,000	50,000	76,464
Waushara	41,136	58,864	1,000	50,000	109,864
Winnebago	191,328	NA	1,000	50,000	51,000
Wood	86,120	13,880	1,000	50,000	64,880
Total	7,254,720	2,738,152	72,000	3,600,000	6,410,152

GO TO BB APP



2016 WLIP Grant Application

County: Milwaukee	LIO: Kevin Bruhn	
Mailing Address: 633 W. Wisconsin Ave, Suite 903		
City: Milwaukee	State: WI	Zip: 53203
Telephone: 414-278-3927	E-mail Address: Kevin.Bruhn@MilwaukeeCountyWI.gov	

1. County will submit draft 2016 land information plan to DOA by Dec. 31, 2015	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
2. Date of last county land information council meeting (mm/dd/yyyy)	12/08/2015
3. LIO subscribed to the Land Information Officer's listserv	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4. County's <i>Retained Fee/Grant Report</i> for 2014 submitted	<input type="checkbox"/> Yes <input type="checkbox"/> No

TRAINING & EDUCATION GRANT APPLICATION

5. Training & Education Award Eligible	\$1,000.00
6. Training & Education Award Amount Requested	\$ 1,000.00
7. Brief description of intended expenditures for Training & Education grant	
<p>Attending WLIA Annual & Regional conferences</p>	
<p>8. Statement and Authorization of Land Information Officer <i>As the Land Information Officer for the above county, I am authorized to submit this application, as an eligible applicant, on the authority of the county board. I understand that application authority shall be obtained by specific action of the county board, and that the WLIP may request evidence of such authority. Project work shall meet all standards and conditions as set forth by the relevant Wisconsin State Statutes, Wisconsin Administrative Code, and policy adopted by the Wisconsin Land Information Program or the Wisconsin Department of Administration. To the best of my knowledge, the information contained in this application is accurate and complete. I understand that Training & Education grant projects must be completed by December 31, 2017.</i></p>	
LIO Name (typed)	Date



2016 WLIP Grant Application

County	Name of Land Information Officer
--------	----------------------------------

STRATEGIC INITIATIVE GRANT APPLICATION

1. Strategic Initiative Award Eligible	\$50,000.00
2. Strategic Initiative Award Amount Requested	\$ 50,000.00
3. Summary of intended expenditures for 2016 Strategic Initiative grant (check all that apply)	
<input type="checkbox"/> Benchmark 1 <input type="checkbox"/> Benchmark 2 <input type="checkbox"/> Benchmark 3 <input checked="" type="checkbox"/> Benchmark 4 <input type="checkbox"/> Benchmark 4 waiver in favor of LiDAR project <input type="checkbox"/> Other county Strategic Initiative project(s)	

BENCHMARK 1

4. County anticipates meeting Benchmark 1 for the V2 call for data by March 31, 2016 in which format:
<input type="checkbox"/> Export format <input checked="" type="checkbox"/> Searchable format <input type="checkbox"/> In other format: County will not meet Benchmark 1 for V2
5. Will county use 2016 Strategic Initiative Funding to work toward selected V2 format for Benchmark 1 in the first quarter of 2016?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
6. County anticipates meeting Benchmark 1 for the V3 call for data by March 31, 2017 in which format:
<input type="checkbox"/> Export format <input checked="" type="checkbox"/> Searchable format
7. Will county use 2016 Strategic Initiative Funding to work toward selected V3 format for Benchmark 1?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
8. County anticipates meeting Benchmark 1 for the V4 call for data by March 31, 2018 in which format:
<input checked="" type="checkbox"/> Export format is <i>not</i> an option for V4 <input checked="" type="checkbox"/> Searchable format

9. Benchmark 1 Land Information Plan Citations for **Project Plan to Achieve Searchable Format for Benchmarks 1 & 2** – Section and page numbers

Milwaukee County currently supports downloadable and searchable parcel and tax info data. All attribute fields included in benchmark one that are maintain by the County will be included with the data submission

Commented [BK1]: Need to have Benchmark 1 and 2 defined in land plan

Commented [BK2]:

10. Benchmark 1 Project Activities and Itemized Costs ▼			
		11. Benchmark 1 Total Costs	0.00

BENCHMARK 2			
12. County anticipates meeting Benchmark 2 for the V2 call for data by March 31, 2016 in which format:			
<input type="checkbox"/> Export format <input checked="" type="checkbox"/> Searchable format <input type="checkbox"/> In other format: County will not meet Benchmark 2 for V2			
13. Will county use 2016 Strategic Initiative Funding to work toward selected V2 format for Benchmark 2 in the first quarter of 2016?			
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
14. County anticipates meeting Benchmark 2 for the V3 call for data by March 31, 2017 in which format:			
<input type="checkbox"/> Export format <input checked="" type="checkbox"/> Searchable format			
15. Will county use 2016 Strategic Initiative Funding to work toward selected V3 format for Benchmark 2?			
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			
16. County anticipates meeting Benchmark 2 for the V4 call for data by March 31, 2018 in which format:			
<input checked="" type="checkbox"/> Export format is <i>not</i> an option for V4 <input type="checkbox"/> Searchable format			
17. Benchmark 2 Land Information Plan Citations for <i>Project Plan to Achieve Searchable Format for Benchmarks 1 & 2</i> – Section and page numbers			
Milwaukee County currently supports downloadable and searchable parcel and tax info data. All attribute fields included in benchmark two that are maintain by the County will be included with the data submission			
18. Benchmark 2 Project Activities and Itemized Costs ▼			
		19. Benchmark 2 Total Costs	0.00

OTHER COUNTY STRATEGIC INITIATIVE PROJECTS

31. County anticipates meeting Benchmarks 1-4 (or 1-3 with LiDAR waiver) **and** foresees having some of the 50k Strategic Initiative funding "leftover"?

- Yes
- No

32. Estimated amount of 50k to be left after applying any costs to achieve Benchmarks 1-4 (or 1-3 for LiDAR waiver counties)

- Zero
- More than zero ▶ Specify amount ▶ \$

If "More than zero" is selected, use the 2016 WLIP Grant Application Addendum to describe the projects you will use the Strategic Initiative funding for.

33. TOTAL ALL STRATEGIC INITIATIVE PROJECTS **\$182,719**

34. Statement and Authorization of Land Information Officer

As the Land Information Officer for the above county, I am authorized to submit this application, as an eligible applicant, on the authority of the county board. I understand that application authority shall be obtained by specific action of the county board, and that the WLIP may request evidence of such authority. Project work shall meet all standards and conditions as set forth by the relevant Wisconsin State Statutes, Wisconsin Administrative Code, and policy adopted by the Wisconsin Land Information Program or the Wisconsin Department of Administration. To the best of my knowledge, the information contained in this application is accurate and complete. I understand that Strategic Initiative grant projects must be completed by March 31, 2017.

LIO Name (typed)	Date
------------------	------



2016 WLIP Grant Application

County	Name of Land Information Officer
--------	----------------------------------

BASE BUDGET GRANT APPLICATION	
1. Base Budget Award Eligible (from grant eligibiliy table on page 9)	\$
2. Base Budget Award Amount Requested	\$

3. Base Budget Grant Project Title 1			
4. Land Information Spending Category Click arrow at right to select from drop-down list			
5. Land Information Plan Citations – Section and page numbers			
6. Project Activities and Itemized Costs ▼			
7. Base Budget Project 1 Total			0.00

8. Base Budget Grant Project Title 2			
9. Land Information Spending Category Click arrow at right to select from drop-down list			
10. Land Information Plan Citations – Section and page numbers			
11. Project Activities and Itemized Costs ▼			
12. Base Budget Project 2 Total			0.00

BASE BUDGET GRANT APPLICATION CONTINUED

13. Base Budget Grant Project Title 3			
14. Land Information Spending Category Click arrow at right to select from drop-down list			
15. Land Information Plan Citations – Section and page numbers			
16. Project Activities and Itemized Costs ▼			
		17. Base Budget Project 3 Total	0.00

18. Base Budget Grant Project Title 4			
19. Land Information Spending Category Click arrow at right to select from drop-down list			
20. Land Information Plan Citations – Section and page numbers			
21. Project Activities and Itemized Costs ▼			
		22. Base Budget Project 4 Total	0.00

23. TOTAL ALL BASE BUDGET GRANT PROJECT COSTS

24. Statement and Authorization of Land Information Officer	
<i>As the Land Information Officer for the above county, I am authorized to submit this application, as an eligible applicant, on the authority of the county board. I understand that application authority shall be obtained by specific action of the county board, and that the WLIP may request evidence of such authority. Project work shall meet all standards and conditions as set forth by the relevant Wisconsin State Statutes, Wisconsin Administrative Code, and policy adopted by the Wisconsin Land Information Program or the Wisconsin Department of Administration. To the best of my knowledge, the information contained in this application is accurate and complete. I understand that Base Budget grant projects must be completed by December 31, 2017.</i>	
LIO Name (typed)	Date

2016 WLIP Grant Application Addendum

County

Addendum Type <input type="checkbox"/> Base Budget Project(s) <input type="checkbox"/> Other county Strategic Initiative Project(s)/LiDAR project

1. Project Title			
2. Land Information Spending Category Click arrow at right to select from drop-down list			
3. Land Information Plan Citations – Section and page numbers			
4. Project Activities and Itemized Costs ▼			
		5. Project Total	0.00

6. Project Title			
7. Land Information Spending Category Click arrow at right to select from drop-down list			
8. Land Information Plan Citations – Section and page numbers			
9. Project Activities and Itemized Costs ▼			
		10. Project Total	0.00

TOTAL ALL PROJECTS – Please include total, including addendum project costs, on application itself
--

AGREEMENT

COUNTY SURVEYOR SERVICES: MILWAUKEE COUNTY 2016

THIS AGREEMENT, entered into this ____ day of _____, 2015, by and between the Southeastern Wisconsin Regional Planning Commission (hereinafter referred to as the “Commission”); and the Milwaukee County Automated Mapping and Land Information System Steering Committee (hereinafter referred to as the “Steering Committee”).

WITNESSETH:

WHEREAS, under Section 59.74 of the *Wisconsin Statutes*, the Commission serves as the County Surveyor for Milwaukee County; and

WHEREAS, the County Surveyor is responsible for: (1) perpetuating the corners of the U.S. Public Land Survey which are subject to destruction, removal, and burial through construction and other activities; (2) maintaining the horizontal and vertical control survey networks in Milwaukee County which assign State Plane Coordinate values referred to the North American Datum of 1927, to each monumented U.S. Public Land Survey corner, and elevations referred to the National Geodetic Vertical Datum of 1929 to the monuments and accessory bench marks; (3) preparing records of the U.S. Public Land Survey corners and bench marks as monumented by the County Surveyor (dossier sheets) and attendant control survey diagrams; (4) maintaining a record of the surveys made for such perpetuation; and (5) receiving, indexing, and filing as a public record, a copy of each land survey plat prepared by a land surveyor practicing in Milwaukee County; and

WHEREAS, the activities of the Milwaukee County Surveyor are essential to the development and maintenance of the Milwaukee County Automated Mapping and Land Information System (MCAMLIS); and

WHEREAS, the Milwaukee County Board of Supervisors has determined that the expenses associated with the Milwaukee County Surveyor function should be paid from the annual operating budget of the MCAMLIS project; and

WHEREAS, Sections 66.0309(12)(b) and 66.0301 of the *Wisconsin Statutes* authorize the Commission to enter into contracts with local units of government and their agents to make and implement studies and plans and to otherwise provide advice and services.

NOW, THEREFORE, in consideration of these premises and of their mutual and dependent promises and agreements, the parties hereto contract and agree as follows:

1. Scope of Work

The Commission will provide the professional staff services as necessary to act in the capacity of County Surveyor for Milwaukee County pursuant to the provisions of Section 59.635 of the *Wisconsin Statutes*. More specifically, under this agreement, the Commission, acting in the capacity of the Milwaukee County Surveyor, will perform the following functions:

- a. In cooperation with the MCAMLIS project staff, record and maintain a file of all land survey plats prepared by land surveyors for parcels in Milwaukee County. An estimated 1,000 such land surveys are prepared and filed annually. Such plats of surveys are useful in the maintenance effort required to keep the MCAMLIS cadastral maps up-to-date.
- b. Perpetuate the corners of the U.S. Public Land Survey System throughout Milwaukee County. Such corners frequently are subject to destruction, removal, and burial through construction or other activities. The perpetuation work includes periodic inspection of the system of approximately 1,100 monuments and attendant reference benchmarks and witness marks, the removal and/or replacement of such monuments and reference benchmarks and witness marks either directly or through the supervision of others conducting such activities, and undertaking both horizontal and vertical control surveys to ensure the integrity of the geodetic reference framework that is critical to the maintenance of the automated mapping base established for Milwaukee County.
- c. Provide guidance and counsel to the Milwaukee County Automated Mapping and Land Information System Steering Committee through service on that committee.

d. Provide technical support and guidance to the staff assigned to develop and maintain the Milwaukee County automated mapping and land information system program.

2. Commission to Organize and Store Information Acquired by County Surveyor

In order to facilitate convenient use of the land survey records concerned by land surveyors, abstractors, assessors, appraisers, attorneys, engineers and other interested parties, the Commission agrees to maintain an orderly filing and retrieval capability for the land surveys by U.S. Public Land Survey township, range, section, and quarter section.

The Commission further agrees to maintain in an orderly manner, records of individual U.S. Public Land Survey Corners (dossier sheets), and records (control survey summary diagrams) of horizontal and vertical control surveys that have been run over the U.S. Public Land Survey corners.

3. Commission to Act as Custodian for all Milwaukee County Surveyor Records

The Commission agrees to maintain for inspection and copying as public documents, all records associated with its functions as the Milwaukee County Surveyor. The Commission further agrees to provide access to these data by U.S. Public Land Survey township, range, section, and quarter section.

4. Steering Committee to Receive Copies of Records

The Commission shall furnish to the Steering Committee, as necessary for the pursuit of its responsibilities, copies of the records created and maintained by the Milwaukee County Surveyor.

5. Timing

The work to be performed under this Agreement shall be carried out from January 1, 2016, through December 31, 2016.

6. Compensation

The Steering Committee, through Milwaukee County, shall pay to the Commission the following sum as payment for the professional services described herein during calendar year 2016: \$82,916.

7. Method of Compensation

The Commission shall submit a single invoice during the first quarter of each year in the amount specified in Article 6 to Milwaukee County. The County, on behalf of the Steering Committee, shall pay to the Commission the amount shown on the invoice upon receipt of said invoice.

8. Annual Report

The Commission shall submit to the County an annual report of services provided under this agreement by January 31, 2017.

9. Indemnity

Except for acts done or taken at the direction of or pursuant to the Steering Committee policy and procedures, the Commission agrees to the fullest extent permitted by law, to indemnify, defend and hold harmless, the Steering Committee, and its agents, officers, and employees from and against all loss or expense including costs and attorney's fees by reason of statutory benefits under Worker Compensation Laws, and/or liability for damages including suits at law or in equity, caused by any wrongful, intentional, or negligent act or omission of the Commission, or its agents which may arise out of or are connected with the activities covered by this agreement.

10. Insurance

The Commission, as an agency of the State, is self-funded for liability under Section 893.82 and Section 895.46(1) of the Statutes. As a result, such protection as is afforded under the respective Wisconsin Statutes is applicable to officers, employees, and agents while acting within the scope of their employment or agency. Since this is statutory indemnification, there is no liability policy as such that can extend protection to any other.

11. Records and Audits

The Commission shall allow Milwaukee County, the Milwaukee County Department of Audit, or any other party that Milwaukee County may name, when and as they demand, to audit, examine, and make copies of, excerpts or transcripts from, any records or other information directly relating to matters under this agreement. Any subcontracting by the Commission in performing the duties described under this contract shall subject the subcontractor and/or associates to the same audit terms and conditions as the Commission. The Commission (or any subcontractor) shall maintain and make available to Milwaukee County the aforementioned audit information for no less than three years after the conclusion of each year of the contract term.

12. Independent Contractor

Nothing contained in the Agreement shall constitute or be construed to create a partnership or joint venture between Milwaukee County or its successors or assigns; the Steering Committee or its successors or assigns; and the Commission or its successors or assigns. In entering into this Agreement, and in acting in compliance herewith, the Commission is at all times acting and performing as an independent contractor, duly authorized to perform the acts required of it hereunder.

13. Authorization

The Steering Committee approved the execution of this Agreement by action taken on _____, 2015.

IN WITNESS WHEREOF, the Commission and the Steering Committee have executed this Agreement, as of the date and year first above written.

ATTESTING WITNESS

By _____
Kenneth R. Yunker
Executive Director

**SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION**

By _____
David L. Stroik
Chairman

ATTESTING WITNESS

By _____
Kevin W. Bruhn
MCAMLIS Project Manager

**MAPPING AND LAND INFORMATION
SYSTEM STEERING COMMITTEE**

By _____
Nancy A. Olson (Date)
Chairman

ATTESTING WITNESS

By _____
Kevin W. Bruhn
MCAMLIS Project Manager

MILWAUKEE COUNTY

By _____
Teig Whaley-Smith, Director (Date)
Department of Administration Division
Of Economic Development

Approved with regards to County Ordinance Chapter 42:

By: _____ Date: _____
Community Business Development Partners

Reviewed by:

By: _____ Date: _____
Risk Management

Approved:

By: _____ Date: _____
Comptroller

Approved as to Wis. Stats. 59.42:

By: _____ Date: _____
Corporation Counsel

Approved for execution:

By: _____ Date: _____
Corporation Counsel

Approved:

By: _____ Date: _____
County Executive

AGREEMENT

Between

**THE CITY OF MILWAUKEE DEPARTMENT OF ADMINISTRATION, INFORMATION AND TECHNOLOGY
MANAGEMENT DIVISION AND THE MILWAUKEE COUNTY AUTOMATED MAPPING AND LAND
INFORMATION SYSTEM STEERING COMMITTEE**

THIS AGREEMENT, entered into this _____ day of _____, 20____, by and between the City of Milwaukee Department of Administration, Information and Technology Management Division (hereinafter referred to as the "City"); and the Milwaukee County Automated Mapping and Land Information System Steering Committee (hereinafter referred to as the "Steering Committee").

WITNESSETH:

WHEREAS, by Resolution No. 88-379, the Milwaukee County Board of Supervisors requested the Southeastern Wisconsin Regional Planning Commission to conduct a feasibility study pertaining to an automated mapping and land information system; and

WHEREAS, the requested feasibility study was completed and documented in SEWRPC Community Assistance Planning Report No. 177, "Feasibility Study for a Milwaukee County Automated Mapping and Land Information System," published in October 1989; and

WHEREAS, by resolution adopted on November 8, 1990, the Milwaukee County Board of Supervisors, working in cooperation with the utilities concerned, created a public-private partnership to implement the proposed Milwaukee County automated mapping and land information system, including creation of a Steering Committee to provide oversight in the implementation of the system recommended in SEWRPC Community Assistance Planning Report No. 177; and

WHEREAS, the aforereferenced Milwaukee County resolution adopted on November 8, 1990, further authorized the execution of a Cooperative Agreement between Milwaukee County and the public and private utilities serving Milwaukee County, whereby the County and such utilities agreed to jointly fund the development of the Milwaukee County automated mapping and land information system), such Agreement delegating to the aforereferenced Steering Committee full responsibility for all policy matters relating to the conduct of the work program, including proposed contracts and specifications and the selection of contractors; and

WHEREAS, the City Chief Information Officer serves as a member of the aforereferenced Steering Committee and the City actively participates in implementation of the MCAMLIS; and

WHEREAS, the City desires the financial support of the MCAMLIS program to maintain the cadastral maps within the City of Milwaukee to ensure conformance with selected MCAMLIS standards; and

WHEREAS, on August 26, 1999, the City, the Steering Committee, and the Commission, through an assignment, entered into an Intergovernmental Cooperation Agreement (ICA) whereby the City would provide technical services to the Steering Committee; and

WHEREAS, the Steering Committee on September 14, 2004, formally authorized the County to accept the responsibilities of Project Manager for the implementation of the recommended automated mapping and land information system; and

NOW, THEREFORE, in consideration of the mutual promises of each agency made to the other, the fulfillment of the terms and conditions, agreements, and understandings hereinafter set forth,

I. Scope of Work

In general, the City agrees to perform all of the tasks specified herein. Other tasks to be completed by the City not covered herein will be carried out under separate agreements.

The City will provide professional and technical information technology services. This will include maintenance on cadastral maps and the street address database in the adopted Milwaukee County geodatabase format. Copies of the data will be delivered to the MCAMLIS project manager at a minimum bi-annually. This arrangement will allow data collected and housed at the City of Milwaukee to be maintained in the same format that the County of Milwaukee uses to store and retrieve the MCAMLIS cadastral data.

Should software data transfer protocols and standards be developed, the City will work with Milwaukee County staff to deliver the cadastral and street address data on a more frequent basis.

II. Timing

All services to be performed under this Agreement shall be carried out over the period beginning January 1, 2016, and ending on December 31, 2016.

III. Compensation to City

The Steering Committee shall pay to the City the following amounts for those services described above:

SERVICES PROVIDED	AMOUNT
MCAMLIS Cadastral and Street Address Database Maintenance	\$90,280
Annual software maintenance	1,500
Total	\$91,780

IV. Method of Compensation

Compensation is to be provided to the Department of Administration Information and Technology Management Division (ITMD) for services performed through the County Department of Transportation and Public Works Org. 5084. ITMD will request on a quarterly (March 31, June 30, September 30, and December 31) basis reimbursement for said services provided.

If, during the course of carrying out the work elements identified herein, additional unanticipated work efforts not identified in the scope of work contained herein become necessary for successful project completion in the judgment of the City or in the judgment of the Steering Committee, then it is agreed that the City can request an amendment to the scope of work, with an attendant increase in the maximum amount payable to the City under this Agreement. Such an amendment would require the approval of both the City and the Steering Committee before becoming effective.

V. Support and Materials to be provided by others

It is assumed that the members of the Steering Committee, on behalf of their respective public agencies and private utilities, agree to make available without charge to the City all existing digital and hardcopy maps, documents, reports, legal records, and related materials deemed by the City to be needed to carry out its responsibilities under this Agreement. If this assumed level of cooperation does not materialize, then it is agreed that the City may, at its discretion, request payment from the Steering Committee for these costs above and beyond the total amount set forth in Section III of this Agreement.

VI. Ownership of Data

As the funds that are to be paid to the City for carrying out the herein described and required work are MCAMLIS project funds, the City agrees to share the data. The City, however, will retain sole ownership of all map files, as they exist in the City digital structure. As a condition of receiving payment from MCAMLIS, the City agrees that MCAMLIS will be free to use, reproduce, modify, display, and distribute the digital map files in the MCAMLIS digital structure.

The City will retain a nonexclusive, irrevocable and perpetual license to use and distribute the digital map files to any parties it desires.

VII. Subcontracts

Although the City does not anticipate use of subcontractors, the City agrees to bring any such subcontracts to the Steering Committee for its approval prior to execution.

VIII. Indemnity

Except for acts done or taken at the direction of or pursuant to the Steering Committee policy or procedures, the City agrees to the fullest extent permitted by law, to indemnify, defend and hold harmless, the Steering Committee, and its agents, officers and employees, from and against all loss or expense including costs and attorney's fees by reason of statutory benefits under Worker Compensation Laws, and/or liability for damages including suits at law or in equity, caused by any wrongful, intentional, or negligent act or omission of the City, or it's (their) agents which, may arise out of or are connected with the activities covered by this agreement.

IX. Authorization

The Steering Committee approved the execution of this Agreement by action taken on December 8, 2015.



**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: MCAMLIS Steering Committee

FROM: Kevin Bruhn, MCAMLIS Project Manager

DATE: November 30, 2015

SUBJECT: MCAMLIS DATUM MODERNIZATION PROJECT

BACKGROUND

In October of 2012, SEWRPC released the memorandum report "Estimate of the Costs of Converting the Foundational Elements of the Land Information and Public Works Management Systems in Southeastern Wisconsin from Legacy to New Datums." The summary and conclusion of this report stated that updating the current accepted datum, NAD27/29 to NAD 83/88, was cost-prohibiting. In August of 2015, SEWRPC released an addendum to this report which proposes an alternative option that will lower the cost of the project by occupying a smaller percentage of the survey monuments and calculating the adjustments to the remaining monuments. The methods and cost estimates are included in the attachments with this report.

There is a coordinated effort within the seven counties that are located in the SEWRPC district to modernize the datum collectively. It has been verbally agreed upon to investigate a project proposal to migrate the current horizontal and vertical datums. The vertical datum, NAD 29, needs to be updated at a regional level due to the datasets that are dependent on consistency across County boundaries, like floodplain mapping. A regional cost estimate has been provided by SEWRPC and divided up according to County area. Milwaukee County is fairly small in area in comparison to a few of the other counties in the SEWRPC area. The estimated cost to convert the vertical datum using the Wisconsin height modernization benchmarks within the Southeastern Wisconsin Region is \$27,249.

The horizontal datum conversion has a few options to consider. Milwaukee County can elect to occupy approximately 5% of the survey monuments and then calculate the adjustment for the rest of the survey control, or elect to have all Milwaukee County monuments be observed. There are two different methods for observing all 1,065 monuments. A document with a brief task list and cost estimate is included with this report. The full observation option would increase the accuracy standard from 1:10,000 error to 1:50,000 error. The 5% (or 206 monuments) method would not increase the accuracy. All methods and options would satisfy

benchmark 4 as part of the Strategic Initiative Grant Proposal. The estimated cost to modernize the horizontal datum ranges from \$35,396 to \$155,470, depending on the chosen method.

It is the intention to use the annual \$50,000 Strategic Initiative Grant award over three years to complete this project. It is estimated that this project would be completed by December 31, 2019 for compliance with the State Parcel Initiative.

DELIVERABLES:

ACTIVITIES THIS PERIOD: 9/15 – 12/15

- Milwaukee County participated in a meeting that was attended by the seven County LIO's that represent the South East Wisconsin Regional Planning Commission district as well as a representative of SEWRPC. This meeting was held to discuss the possibility of a consensus in modernizing the entire area of SEWRPC to a NAD 83 horizontal and NAD 88 vertical datum.
- A draft request was put into the Strategic Initiative Grant proposal to fund the transformation to the updated and more accurate datum.
- The datum modernization project was included in the 2016 Land Modernization Plan that will be submitted in final format at the March 2016 MCAMLIS Steering Committee meeting.
- Solicited surveyor opinions on concerns and interest for datum migration in Milwaukee County.

NEXT

- Continue discussion on the methods for coordination of the project
- Continue to solicit opinions on the best method of survey modernization for Milwaukee County
- Start to discuss the proposed items of the contract

Attached:

SEWRPC Addendum to Report No. 206

Meeting Notes from the Southeastern Wisconsin Land Information Officers Nov. 19th 2015 held at Waukesha County

SEWRPC cost estimate for Milwaukee County Horizontal modernization with options

* * * * *

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

W239 N1812 ROCKWOOD DRIVE • PO BOX 1607 • WAUKESHA, WI 53187-1607 • TELEPHONE (262) 547-6721
FAX (262) 547-1103

Serving the Counties of:

KENOSHA
MILWAUKEE
OZAUKEE
RACINE
WALWORTH
WASHINGTON
WAUKESHA



September 8, 2015

Mr. Kevin Bruhn
MCAMLIS Project Manager/LIO
633 W. Wisconsin Avenue, Suite 903
Milwaukee, WI 53203

Dear Mr. Bruhn:

Since early 1964 the Regional Planning Commission has recommended the use of a unique system of survey control as a basis for the completion of large scale topographic and cadastral maps, as a basis for the conduct of land and engineering surveys, and as a basis for the development of parcel based land information and public works management systems within the Region. The recommended survey control system provides two of the four essential foundations for such systems, namely: 1) a map projection and related horizontal and vertical geodetic datums; and, 2) a survey control network that manifests the projection and datums of surveys of the earth. The datums used in these foundational elements within the Region have, since 1964, been the North American Datum of 1927, and by National Geodetic Vertical datum of 1929.

The Federal government in 1986 adopted a new horizontal datum: the North American Datum of 1983, a datum that has since experienced a number of refinements within the Region, the latest being the North American Datum of 1983 (2011). In 1991 the Federal government also adopted a new vertical datum known as the North American Vertical Datum of 1988, a datum that has also undergone refinement within the Region. Acting in response to requests from some of the county Land Information Officers within the Region, the Commission in 2012 developed procedures for, and estimated the costs of, converting the legacy datums within the Region to the new Federal datums. Those procedures and costs were presented in SEWRPC Memorandum Report No. 206. The high cost of conversion documented in that report, among other reasons, made the conversion seem impractical.

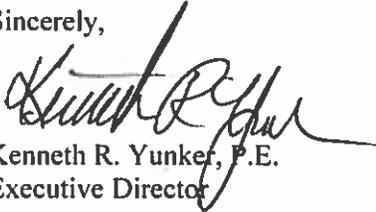
Continued interest was expressed by some Land Information Officers to pursue such conversion. Given the significant changes in surveying technology since the publication of Memorandum Report No. 206, the Commission in 2015, acting again in response to requests by some Land Information Officers, undertook a reevaluation of the procedures and costs set forth in Memorandum Report No. 206. As a part of that reevaluation, the Commission developed unique procedures for the conversion of both the horizontal and vertical datums within the Region. These procedures provided a significant reduction in the estimated cost of conversion set forth in Memorandum Report No. 206. The description of these procedures, and of the attendant costs, are presented in an Addendum to Memorandum Report No. 206. The attendant costs of conversion using the new procedures would appear to be readily attainable in the Region.

Mr. Kevin Bruhn
September 8, 2015
Page 2

As the designated Land Information Officer for one of the seven counties constituting the Southeastern Wisconsin Region, we are providing to you herewith a copy of that Addendum. We would urge you to review the Addendum and to bring it to the attention of key members of your staff.

Should you desire additional copies of the Addendum, or should you have any questions concerning the findings set forth therein, please do not hesitate to write or call.

Sincerely,

A handwritten signature in black ink, appearing to read "Kenneth R. Yunker". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Kenneth R. Yunker, P.E.
Executive Director

KRY/KWB/dd/kmd
#227802

Enclosure

cc: Kurt W. Bauer
Rob W. Merry

**ADDENDUM TO
MEMORANDUM REPORT
NUMBER 206**

**REEVALUATION OF PROCEDURES FOR
DATUM CONVERSIONS**

Prepared by the

Southeastern Wisconsin Regional Planning Commission
W239 N1812 Rockwood Drive
P.O. Box 1607
Waukesha, Wisconsin 53187-1607
www.sewrpc.org

The preparation of this publication was financed in part through planning grants from the U.S. Department of Transportation and the Wisconsin Department of Transportation. The contents of this report do not necessarily reflect the official views or policy of the above agencies.

August 2015

Inside Region: \$10.00
Outside Region: \$20.00
*These prices include a copy of
Memorandum Report 206*

TABLE OF CONTENTS

ADDENDUM TO SEWRPC MEMORANDUM REPORT NO. 206

Introduction	1
Development of New Procedures	1
Horizontal Control.....	1
Vertical Control.....	2
Summary and Conclusion.....	4

Appendices

Appendix		Page
C	Revised Procedures for Costs of Datum Conversions.....	C-1
	Introduction.....	C-3
	Methodology for Conversion of Horizontal Control.....	C-3
	Field Observations	C-4
	Computations	C-6
	Control Survey Station Numbering.....	C-8
	Demonstration Application of Methodology	C-10
	Methodology for Conversion of Vertical Control.....	C-11
	Revised “Record of USPLSS Control Station” Documents.....	C-15
	Costs.....	C-16
D	Minutes of August 21, 2015 SEWRPC Task Force on Datum Conversion.....	D-1

LIST OF TABLES

Table		Page
1	Format of Input Least Square Adjustment	C-8
2	NAD 83/2011 Computed Positions Versus GPS Observed Independent Positions.....	C-11
3	Cost Estimate – Horizontal Datum Conversion – Seven County Region	C-17
4	Cost Estimate – Horizontal Datum Conversion – Individual County	C-17
5	Cost Estimate – Horizontal Datum Conversion – Typical Township	C-18
6	Cost Estimate – Vertical Datum Conversion – Seven-County Region	C-18
7	Cost Estimate – Vertical Datum Conversion – Individual County	C-18

LIST OF FIGURES

Figure		Page
1	WISCORS Stations in and Adjacent to the Southeastern Wisconsin Region	C-5
2	Typical SEWRPC Control Survey Summary Diagram.....	C-7
3	Proposed Control Survey Station – USPLSS Corner – Numbering System	C-9

Figure		Page
4	SEWRPC Control Survey Summary Diagram – NAD27	C-12
5	SEWRPC Control Survey Summary Diagram – NAD83 (2011).....	C-13
6	Wisconsin Height Modernization Bench Marks within the Southeastern Wisconsin Region	C-14
7	Revised “Record of U.S. Public Land Survey Control Station”	C-15

ADDENDUM TO SEWRPC MEMORANDUM REPORT NO. 206

INTRODUCTION

In response to questions raised by some practicing surveyors and land information system managers concerning the continued use of the legacy datums within the Region, in 2012 the Commission prepared Memorandum Report No. 206 entitled “*Estimate of Costs of Converting the Foundational Elements of the Land Information and Public Works Management Systems in Southeastern Wisconsin from Legacy to New Datums.*” The report described the legacy and new datums in use within the seven-county planning Region. The report also described the regional control survey network and attendant topographic and cadastral mapping that together provide the foundational elements for the creation of parcel-based land information and public works management systems within the Region. In response to specific requests from some land information system managers, the report presented a procedure for converting the legacy datums within the Region to the newer datums and presented an estimate of the cost of such conversion meeting land and engineering survey accuracy standards. Given the high cost of the conversion, and the lack of evidence of any significant monetary benefit that might accrue from a conversion, the report recommended the continued use of the legacy datums within the Region. Despite these findings, some practicing land surveyors and land information system managers continue to express desires to pursue such a conversion.

Given this continued concern about datum conversion within the Region, and the significant changes in surveying technology that have taken place since the publication of Memorandum Report No. 206, in early 2015 the Commission undertook a reevaluation of the procedures for, and attendant costs of, conversion. This addendum presents the findings of that reevaluation, set forth more fully in an additional appendix – Appendix C – to Memorandum Report No. 206. As such this addendum and attendant appendix are intended to constitute an integral part of Memorandum Report No. 206. Proper consideration of this addendum and attendant appendix requires also consideration of Memorandum Report No. 206 published in 2012.

DEVELOPMENT OF NEW PROCEDURES

Horizontal Control

The procedure for the conversion of the horizontal control survey network within the Region from the legacy to the new datums as proposed in Memorandum Report No. 206, was based upon the technology available in 2012 to provide a high order of accuracy in the converted control survey network. The conversion procedure utilized a series of static Global Positioning System (GPS) observations¹ to provide new primary and secondary control survey networks within the Region. Based upon these networks, new state plane coordinate positions on the North

¹*Static global positioning system observations utilize two or more receivers simultaneously receiving data from the system satellites. These data include dual-frequency carrier phase measurements that in effect represent distances. Post processing of the simultaneous measurements provide precise vectors from which coordinate positions are computed. Static observations require positions to be occupied and attendant data observed for significant periods of time—ranging from approximately 15 minutes to one hour.*

American Datum of 1983 (NAD 83) could then be obtained by occupying all of the corners for further GPS observations. The procedure, while providing a high level of accuracy in the new position data, was costly – probably prohibitively so considering the lack of known offsetting benefits.

A significant change in survey technology has occurred since the completion of SEWRPC Memorandum Report No. 206. This change warranted the reconsideration of the survey procedure recommended in that memorandum for the conversion of the control survey network within the Region from the legacy to the newer datums. That change included the completion of the Continuously Operating Reference Stations (CORS) network within the State of Wisconsin, coupled with the development and acceptance of Virtual Reference Station (VRS) Technology.² This technology eliminates the need to rely upon static GPS observations for the datum conversion work. The use of Virtual Reference Station technology thus eliminates the need for measurements to be made simultaneously using a roving GPS receiver and an attendant base station or stations. It also eliminates the need for extended observation times at the occupied stations. These two changes—while continuing to require occupation of stations in the control survey network with a roving receiver—present significant increases in the efficiency of the field survey work, with attendant significant reductions in cost. Moreover, the Commission staff has developed a procedure which minimizes the number of control survey stations within subareas of the Region which must be occupied by a roving GPS receiver to carry out the necessary horizontal datum conversion survey work. This procedure combines field observations on a carefully selected minimum number of control survey stations in a survey area—such as a U.S. Public Land Survey System township—with measurement data collected in the original control surveys conducted within the Region, using these data to compute the coordinate positions on the remaining unoccupied stations in the survey area. This procedure is described in the attached Appendix C.

Vertical Control

The foregoing sections of this addendum apply to the datum conversion issues relating to the horizontal control survey network within the Region. A similar problem exists relating to the vertical control survey network within the Region. The elevation data provided by the Commission legacy vertical control survey network are based upon the National Geodetic Vertical Datum of 1929 (NGVD 29) formerly known as Mean Sea Level Datum. The National Geodetic Survey (NGS) in 1977, began a new adjustment project that became the new vertical datum, the North American Vertical Datum of 1988 (NAVD 88). As is the case for horizontal positions, no precise mathematical relationship exists between the legacy and new vertical datums. In 1995, the Commission retained Mr. Earl F. Burkholder, PLS, PE, Consulting Geodetic Engineer, to address the issue of conversions between the elevations on NGVD 29 and the orthometric heights on NAVD 88. The orthometric heights determined during the establishment of NAVD 88 are now referred to as NAVD 88 (1991) orthometric heights, to differential those heights from heights determined by subsequent vertical adjustments.³ The findings and recommendations of Mr. Burkholder were set forth in SEWRPC Technical Report No. 35, *Vertical Datum Differences in Southeastern Wisconsin*, published in December 1995.

²*Virtual Reference Station technology consisting of a system of hardware and software designed to facilitate real-time global positioning system measurements based on a network of reference stations known as Continuously Operating Reference Stations—performing the role as base stations in static global positioning surveys. The network of receivers is linked to a computation center, and each station contributes its raw data to help create network-wide models necessary to provide accurate positioning of the roving receiver. The primary benefit of the technology is that it permits real-time kinematic positioning using a single rover in the field while achieving centimeter-level accuracy.*

³*Orthometric heights “tagged” as NAVD88 were based on the original adjustment of NAVD 88 which was published by NGS in 1991. Since 1995 there have been subsequent adjustments of the vertical control network in southern Wisconsin. Therefore, orthometric heights determined by the 1991 adjustment are now labeled as NAVD 88 (1991). Subsequent adjustments in 2004, 2007, and 2012 are labeled as NAVD 88 (2004), NAVD 88 (2007), and NAVD 88 (2012), respectively. The current NGS datasheet does not allocate space for the inclusion of vertical adjustment tags. However, the adjustment date can be found in the data sheet under text describing the manner in which the various epochs of orthometric heights were determined by NGS.*

The technical report notes that three options then existed for determining the relationship between the two datums. The most costly options would be to resurvey all of the more than 11,000 bench marks within the Region on the new datum. Another option, also costly, was to abstract all control leveling data from existing records and readjust all of the control leveling networks within the Region to the new datum. The third option would be to employ a program, VERTCON, specifically developed by the NGS to permit conversion of orthometric height and elevation data between NGVD 29 and NAVD 88 (1991). The technical report documents the performance of VERTCON against surveyed orthometric heights and elevations on common bench marks within the Region.

The technical report concludes that VERTCON could be used to convert orthometric height and elevation data between the two datums on a point-by-point basis to achieve Second-Order, Class II accuracies—the class used by the Commission to establish bench mark elevations within the Region. The report further describes how VERTCON could be used to convert elevations between the two datums on an areawide basis. The report used the new datum data as published by the NGS for the 435 NGS (former U.S. Coast and Geodetic Survey) bench marks within the Region as a check on the performance of VERTCON within the Region. The new datum elevations for those bench marks were developed by NGS using original differential leveling data retained in NGS files. As a part of the work accomplished for the preparation of SEWRPC Technical Report No. 35, using VERTCON orthometric height and elevation data were computed for points located on a 10,000-foot State Plane Coordinate system grid overlaid on the Region. The grid point differences were used to develop an iso-hypsometric map of the Region, which map has served height and elevation conversions within the Region well for a period of 20 years.

A significant change in the status of vertical control within the Region has occurred since the completion and publication of Technical Report No. 35. More specifically, the Wisconsin Department of Transportation (WisDOT) in conjunction with NGS completed the Wisconsin Height Modernization Program (WI-HMP) within the Region. This program provided high-order orthometric height data on a carefully distributed network of substantially monumented bench marks. Within the Region the WI-HMP increased the number of bench marks having accurate orthometric height data on NAVD 88 from 435 to 460 bench marks. However, under WI-HMP only about one-half of the 435 bench marks used in the conversion methodology presented in SEWRPC Technical Report No. 35 could be found and used. The other one-half which could not be found were assumed to have been destroyed. The elevation data for approximately 60 percent of the remaining approximately 50 percent of the bench marks were readjusted under WI-HMP to NAVD 88 (2012), thus negating the use of VERTCON within the Region.

Given that VERTCON is not consistent with the readjustment of the entire vertical survey control network in the Region accomplished under WI-HMP, and given that VERTCON was used in the methodology set forth in SEWRPC Technical Report No. 35, and further given the uncertainties involved in the potential recovery of the 435 NGS bench marks used the development of the iso-hypsometric map presented in SEWRPC Technical Report No. 35, it is proposed that a new conversion between the legacy and new vertical datum be developed based upon use of the 460 available WI-HMP stations. Given the density of the Commission legacy vertical control network within the seven-county Region, it is now possible to transfer by field survey elevations referred to the legacy datum to the WI-HMP stations thus providing accurate, surveyed determined comparisons between the elevations on NGVD 29 and the orthometric heights on NAVD 88 (2012). Such transfer should require no more than the completion of approximately one-half mile of high-order differential level lines for each transfer. Using the bench marks having dual data a new iso-hypsometric map of the Region can be prepared. This map can then be used to transfer orthometric heights and elevations between the two datums to Second-Order, Class II accuracy standards. The description of the procedure to be used to create the new iso-hypsometric map is essentially duplicated in the appendix to this report, together with an estimate of the costs entailed.

SUMMARY AND CONCLUSION

This document is intended to comprise an addendum to SEWRPC Memorandum Report No. 206, *Estimate of the Costs of Converting the Foundational Elements of the Land Information and Public Works Management Systems in Southeastern Wisconsin from Legacy to New Datums*, October 2012. This document is intended to be considered within the context of that report. Since the completion of that report, the Commission has continued to receive specific requests from some land surveyors and some County Land Information Officers to reevaluate the procedures for, and the attendant costs of converting the legacy datum within the Region as presented in Memorandum Report No. 206. This addendum presents the findings of that reevaluation in the form of an additional appendix—Appendix C—to Memorandum Report No. 206.

As a part of the reevaluation, the Commission staff developed revised procedures for horizontal and vertical datum conversion within the Region. The procedure for horizontal datum conversion minimizes the number of control survey stations within the subareas of the Region which must be occupied by a GPS receiver to obtain coordinate positions in the new datum. This procedure combines field observations on a carefully selected minimum number of control survey stations in a survey area with measurement data collected in the original control surveys conducted within the Region, using these data to compute the coordinate positions on the new datum of the remaining unoccupied stations in the survey area. This procedure is described in the attached Appendix C.

The Commission staff also developed a revised procedure for conversion of the legacy vertical datum within the Region to the newer NAVD 88. This procedure utilizes the WI-HMP network completed within the Region. The procedure is also described in the attached appendix.

The procedure developed for the conversion of the horizontal datum within the Region reduces the cost of that conversion from the approximately \$2.3 million estimated in SEWRPC Memorandum Report No. 206 to approximately \$400,000 for the Region as a whole. The procedure could be carried out by subareas of the Region – one such subarea being the survey township. The cost of conversion per township is estimated at approximately \$7,600.00

These conversion costs, which logically would have to be borne by those county land information systems that desired a conversion, appear reasonable. These costs are shown by county in the following table.

Estimated Cost by County of Horizontal Datum Conversion

County	Cost Estimate ^a
Kenosha.....	\$40,896
Milwaukee.....	35,396
Ozaukee	36,040
Racine.....	51,120
Walworth.....	85,256
Washington.....	63,640
Waukesha.....	87,852
Total	\$400,200

^aThese costs assume that the entire county is included in a single project done by SEWRPC.

The benefits of the conversion of the horizontal datum remain largely intangible. However, the conversion using this procedure developed by the Commission staff would have one very important, although intangible benefit; namely, this conversion would retain the relative positions of all of the control survey stations within the Region as given by the legacy lengths and bearings of the quarter-section lines, thus preserving the integrity of the legacy horizontal control survey network within the Region. This benefit may be considered sufficient to warrant the relatively modest cost of the horizontal data conversion.

The procedure developed for the conversion of the vertical datum within the Region reduces the cost of that conversion from the approximately \$4.5 million estimated in SEWRPC Memorandum Report No. 206 to approximately \$300,000 for the Region as a whole. This conversion should be carried out for the Region as a whole in order to ensure consistent conversion factors throughout the Region across both natural boundaries such as watershed boundaries and across civic boundaries such as municipal and county boundaries. The cost of the conversion would have to be borne by the county land information systems within the Region on the basis of an agreed upon distribution of the cost among those systems. One such distribution of costs by county is set forth below.

Estimated Cost by County of Vertical Datum Conversion

County	Cost Estimate ^a
Kenosha.....	\$31,185
Milwaukee.....	27,249
Ozaukee.....	26,641
Racine.....	38,452
Walworth.....	64,792
Washington.....	49,048
Waukesha.....	65,398
Total	\$302,768

^aCost allocations to county based on area.

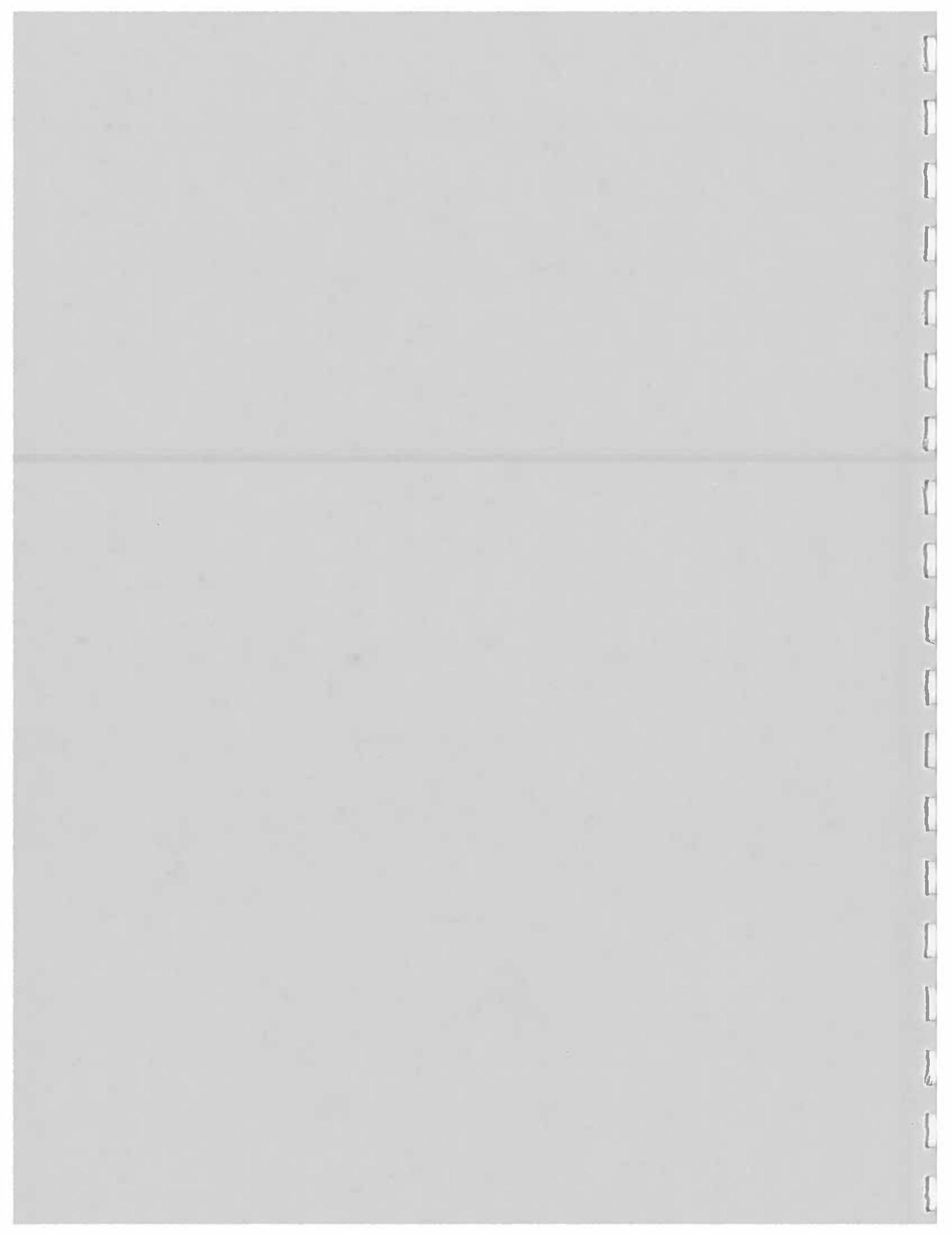
Based upon the findings presented in this addendum, it is recommended that each of the individual county land information systems within the Region determine if they want to proceed with the conversion of the horizontal datum now in use within the Region from NAD 27 to NGVD 83 (2011). If it is determined to proceed, the work could be accomplished by the Commission under contract to the land information systems concerned. In each case the work and cost could be spread over a 3-year period.

Similarly, with respect to the conversions of vertical heights from NGVD 29 to NAVD 88 (2012), the land information systems would have to decide whether or not to proceed. In this case, however, the conversion should be made for the Region as a whole. Therefore, all seven county land information systems would have to agree to proceed, and further would have to agree upon a distribution of the cost. If agreement were reached, the work could be done by the Commission under contract to all seven county land information systems.

The estimated costs of horizontal datum conversion presented in this addendum relate to only one of the four foundational elements of any good parcel-based land information or public works management system. Each of the other three foundational elements – the map projection, the topographic maps for ground truth, and the parcel based cadastral maps will require recompilation, or in the alternative some form of adjustment if those elements are to be useable with coordinate positions on the new datum. Such coordinate positions cannot be plotted on the map projection, or on the existing topographic and cadastral maps of the legacy systems. The conversion of the other three foundational elements of the existing systems will constitute by far, the major portion of the costs of the conversion as set forth in SEWRPC Memorandum Report No. 206.



APPENDICES



Appendix C

**REVISED PROCEDURES FOR COSTS OF
DATUM CONVERSIONS**



Appendix C

TO SEWRPC MEMORANDUM REPORT NO. 206

INTRODUCTION

The seven-county Southeastern Wisconsin Region has an extensive and accurate network of both horizontal and vertical control survey stations. The integrated horizontal and vertical control survey stations are comprised of the 11,985 U.S. Public Land Survey System (USPLSS) corners within the Region and accessories thereto. The horizontal network is referenced to the North American Datum of 1927 (NAD 27), while the vertical network is referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). The survey methods used to create the horizontal control network ranged from using theodolites and tellurometers to using Global Positioning System (GPS) instrumentation. The survey methods used to create the vertical control network ranged from using differential spirit leveling with invar rods read optically to using coded invar rods read automatically by the level instrument.

The introduction of newer technologies, especially the use of GPS instrumentation, has made the use of the legacy control survey network inconvenient when relating to newer datums created by the Federal government. The Commission continues to maintain the legacy control survey network in five of the seven counties comprising its Region and continues to monitor the use of the network within those counties. From time to time the Commission retains consultants to develop processes and/or mathematical formulas to assist surveyors, public works engineers, and other users in the use of the networks. However, some county land information system managers continue to request that the Commission investigate the means by which the legacy networks could be converted to newer datums and to estimate the attendant costs.

This appendix proposes new methods for converting the Commission legacy horizontal datum, from NAD 27 to the latest newer datum and adjustment—the North American Datum of 1983 with the National Adjustment of 2011, (NAD 83 (2011)), and for converting the legacy vertical datum from the NGVD 29 to the North American Vertical Datum of 1988 adjustment of 2012, (NAVD 88 (2012)), and to do so cost effectively.

METHODOLOGY FOR CONVERSION OF HORIZONTAL CONTROL

The Commission staff has developed a method for the conversion of its legacy horizontal control survey coordinate positions to the new horizontal datum while maintaining the relative positions of the legacy control survey stations, and maintaining the original accuracy standards of the network. The method utilizes the measurements made in the creation of the legacy horizontal control survey network within the Region and minimizes the number of field observations required to position the control survey stations on the new datum and

on the corresponding map projection. As already noted, the legacy network utilizes monumented corners of the USPLSS as control survey stations and, in effect, recreates the USPLSS within the Region tying that system to the National geodetic control system.

The datum conversion method developed by the Commission staff can be applied by subareas of the Region as small as six square miles in extent, although more practical subareas would consist of USPLSS townships, or of entire counties. When applied at the township level, the method requires field observations to obtain the coordinate positions of the township corners on the new datum together with such observations on a carefully selected number of control survey stations—approximately eight—consisting of section and quarter-section corners within the township. Four of the eight corners could be the four corners marking the exterior boundaries of a six-section SEWRPC Control Survey Summary Diagram (CSSD) used by the Commission to display the legacy control survey network. Having determined the coordinate positions on the new datum of approximately 12 USPLSS corners—the coordinates of the remaining 157 corners are computed using the lengths of the quarter-section lines and the interior angles of the quarter sections within the township as determined in the legacy survey. This computation consists of a least squares adjustment¹ of the network within the township.

Upon completion of the determination of the coordinate positions of all of the stations—USPLSS corners—within the area concerned, a small random sample of stations would be selected and the coordinate positions of these stations determined by additional field observations, thus providing a check on the accuracy of the completed conversion. If discrepancies exceeding the desired accuracy standards are found appropriate adjustments or further field measurements would have to be made.

The method developed by the Commission staff significantly reduces the cost entailed in datum conversion from such costs entailed in application of the conversion method proposed in SEWRPC Technical Report No. 206. Importantly, the method preserves the integrity of the legacy control survey network within the Region, maintaining the relative positions in the form of quarter-section-line lengths and bearings as determined in the creation of the legacy network, and does so within the accuracy standards of that network.

Field Observations

As noted, the conversion method requires the conduct of a limited number of field observations to determine the coordinate positions on the new datum of a carefully selected number of existing legacy stations. The necessary field observations would be made using state-of-the-art GPS instrumentation and procedures.

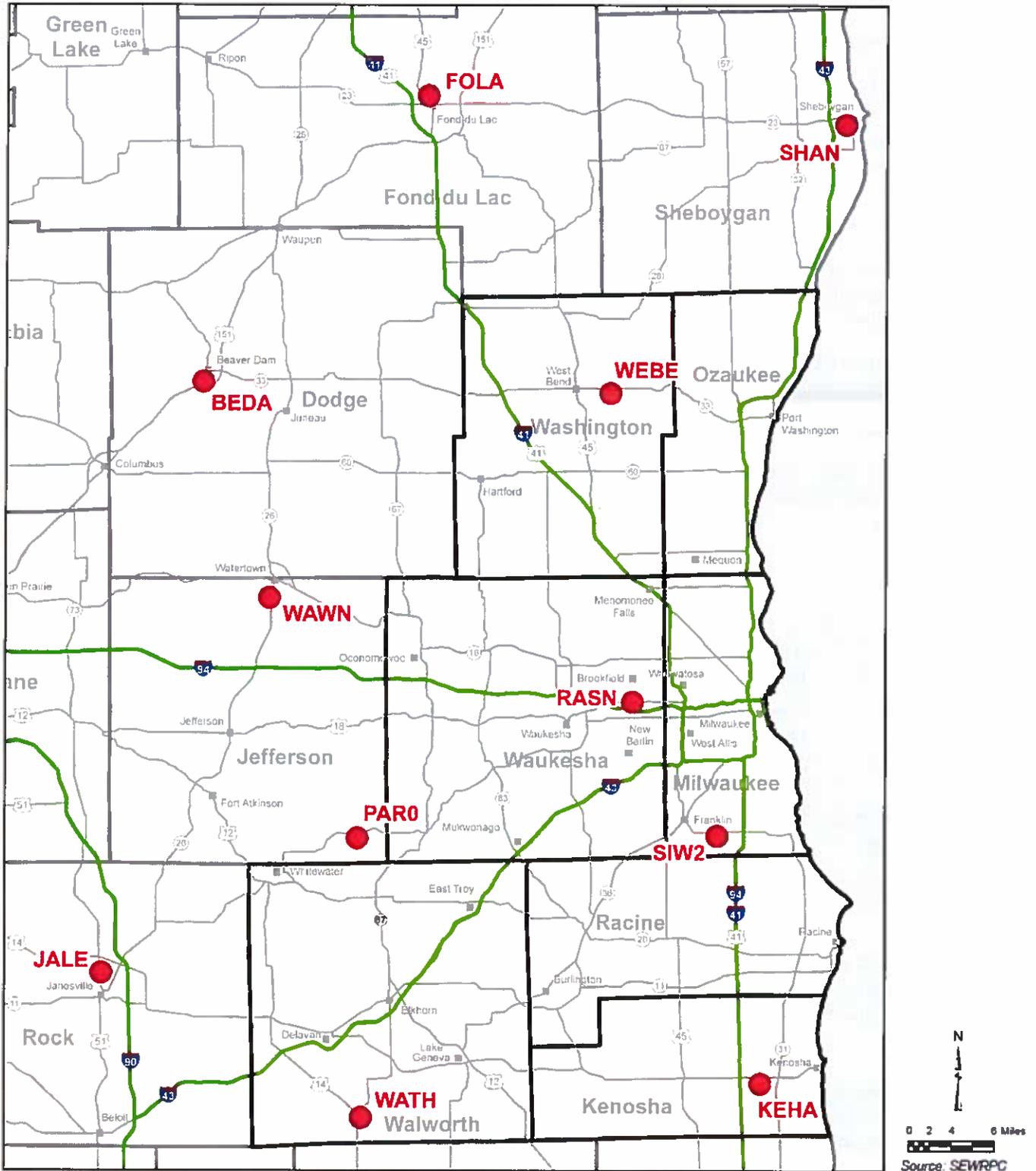
The Wisconsin Department of Transportation (WisDOT) completed a network of Continuous Operating Reference Stations (WISCORS) within the Region and the State in 2015. These stations within and adjacent to the Region are shown on Figure 1, and serve as the primary control network within the Region, replacing the old First- and Second-Order triangulation and base line stations. Satellite measurements permit the creation of a mathematical model that supports an online processing technology known as Virtual Reference Station (VRS) technology. This technology permits real-time positioning without the need for base stations and with minimal observation times while achieving centimeter-level accuracy. The VRS² technology is proposed to serve as the basis of the field measurements needed to determine horizontal positions in the new datum.

¹The term “least squares adjustment” refers to a mathematical procedure based on the theory of probability that derives the statistically most likely coordinate location of points defined by multiple measurements in a network. Moreover, a least squares adjustment defines a best-fit solution for weighed measurements finding a minimum for the sum of the squares of the measurement residuals. A measurement residual is the amount needed to correct a measurement for it to fit into the best-fit solution found by the least squares adjustment.

²For definition of VRS technology see Footnote 2, page 2, of Addendum.

Figure 1

WISCORS STATIONS IN AND ADJACENT TO THE SOUTHEASTERN WISCONSIN REGION



The following protocol would be followed in making the necessary field observations:

1. For each of the control survey stations—USPLSS corners—to be occupied, a copy of the SEWRPC “Record of U.S. Public Land Survey Control Station” (dossier sheet) shall be obtained.
2. The dossier sheet shall be used to recover the station, and a minimum of two of the tie distances from the station to witness marks shown on the dossier sheets shall be measured to ensure that the station has not been disturbed.
3. The following potential sources of error shall be considered and adjusted for in the measurement process: positional dilution of precision (PDOP), number of satellites visible, mask angle, potential multipath, and solar activity.
4. Each observation shall have a minimum duration of 5 seconds using a 1-second epoch rate.
5. At the end of the observation, the antenna of the instrument shall be set near the ground so a complete loss of satellite lock occurs. The antenna shall then be repositioned over the monument for an additional observation.
6. A minimum of three observations shall be made at each station occupied. The second and third direct observation shall also have at a minimum a duration of 5 seconds using a 1-second epoch rate.
7. Steps 5 and 6 shall be repeated as necessary to obtain the desired minimum of three observations.
8. The Root Mean Square Error (RMSE) of the three observations shall be calculated for each coordinate component (Northing, Easting, and Elevation) at each of the stations occupied using the following equation.

$$RMSE = \sqrt{\frac{\sum_{i=1}^N [Average_i - Check_i]^2}{N}}$$

Average_i = Average position of the Northing, Easting, or Elevation at the USPLSS Corner

Check_i = Northing, Easting, or Elevation value from the individual GPS observations at a USPLSS Corner

N = Number of observations at a USPLSS corner

9. The computed RMSE for the Northing, Easting, and Elevation components shall not exceed the following:
Northing 0.06 foot
Easting 0.06 foot
Elevation 0.09 foot
10. Additional observations shall be performed as required to meet the maximum allowable RMSE. Any combination of observations may be used to achieve the acceptable RMSE, provided all coordinate components (Northing, Easting, and Elevation) are used in the solution.

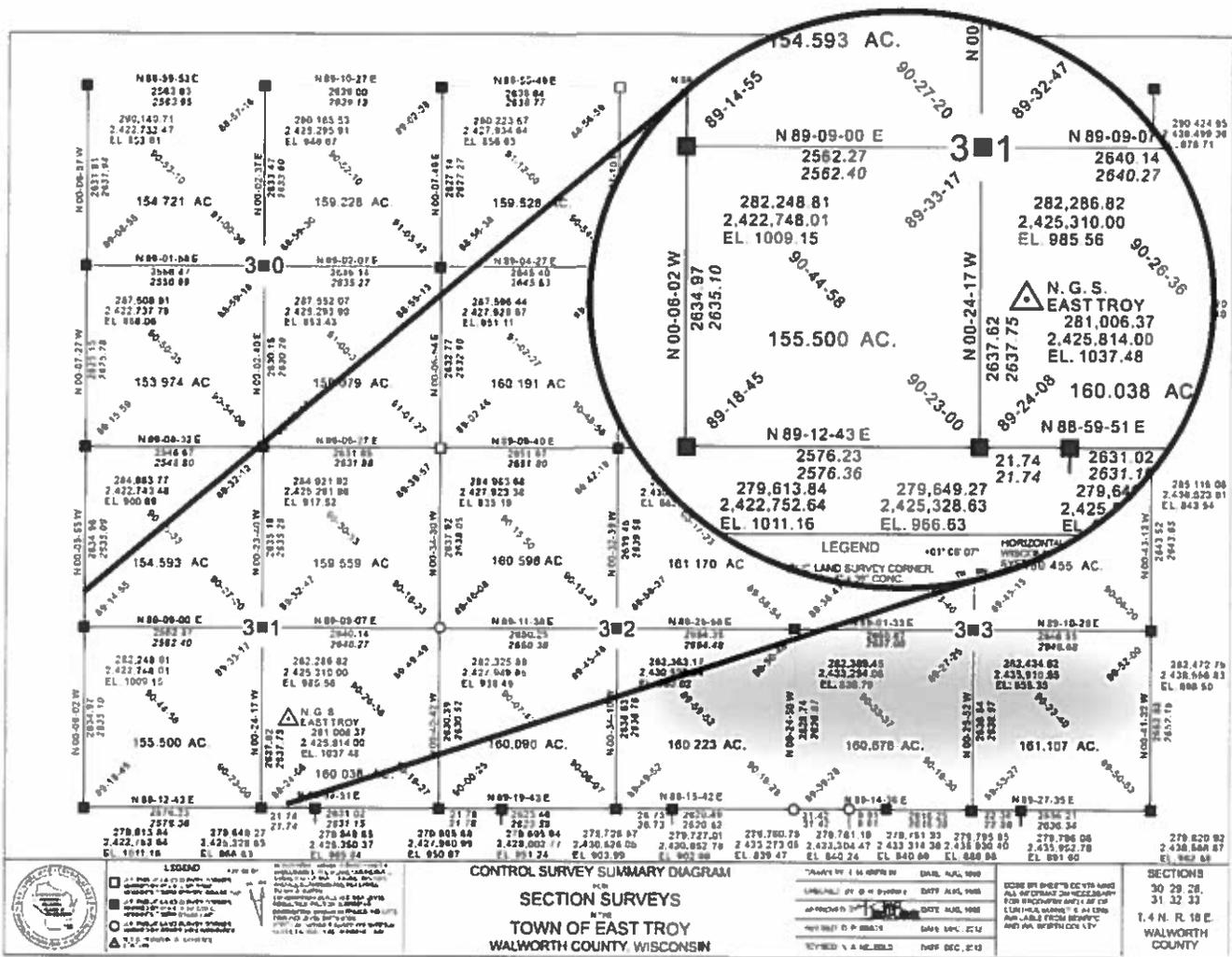
Computations

Two major computation phases are involved in the proposed horizontal datum conversion methodology. The first phase consists of the extraction of legacy system information. The second phase consists of a least squares adjustment converting the legacy positions to the new datum.

The use of legacy system information is considered the most significant feature of the proposed methodology. The use of this information will not only serve to reduce costs, but will assist in validating the control station positioning, and serve to identify any issues that might arise in the conversion process such as not achieving the desired accuracy standards in a part of the network.

Figure 2

TYPICAL SEWRPC CONTROL SURVEY SUMMARY DIAGRAM



Source: SEWRPC.

The information from the legacy system required is found on CSSD. The first and most important piece of such information consists of the published grid distance between stations – USPLSS Corners. Also required are the interior angles between quarter-section lines. The angles will be extracted so that at corners of the quarter sections the interior angles are read clockwise. Figure 2 provides an example of a CSSD, and of the information that will be extracted for use in a least squares adjustment of the network.

Using the station – corner – identification system that is described in the next section (See Figure 3), Table 1 illustrates the format of the values to be extracted from CSSD to be used in the least squares adjustments.

Once the legacy spatial measurements have been extracted from the CSSDs, the second phase of the computations—the least squares adjustment—can be carried out. The complexity entailed in the management of compilations relating a control survey network consisting of almost 12,000 stations makes a single adjustment impractical. It is therefore, proposed to break the conversion compilations into manageable segments consisting of subareas of the Region. As already noted, these areas could be as small as six square miles, or as large as a county. A survey township would constitute a particularly practical subarea. Individual adjustments would be performed working serially so adjacent subarea boundary corners can be constrained to fit from previous adjustments.

Table 1
FORMAT OF INPUT TO LEAST SQUARE ADJUSTMENT

Code (A: Angle)	Backsight – At – Foresight	Angle (Degrees – Minutes – Seconds)
A	0418144-0418169-0418168	89-18-45
A	0418145-0418144-0418169	90-44-58
A	0418168-0418145-0418144	89-33-17
A	0418169-0418168-0418145	90-23-00
A	0418145-0418168-0318012	89-24-08
Code (D: Distance)	From - To	Grid Distance (US Survey Feet)
D	0418144-0418169	2634.97
D	0418144-0418145	2562.27
D	0418169-0418168	2576.23
D	0418145-0418168	2637.62
D	0418168-0318012	21.74

Source: SEWRPC.

The first step in the least squares computation is to constrain the legacy control positions. This provides verification of the accuracy of the legacy control survey network as documented by each CSSD and the completeness of the input of the spatial measurements. After acceptance of the CSSD spatial measurements, additional CSSDs can be added to the network unit the defined adjustment area has been completed.

Once the individual areas have been completed in this manner, a final step prior to incorporating the new positional data is the application of an effective weighting strategy. This is critical given the use of legacy measurements integrating with the precise GPS field observed positioning. An effective strategy will allow displacement of the differences (measurement residuals) found between the measurement types, and account for the numerous possible measurement paths between unconstrained USPLSS corners. The algorithms in a least squares adjustment provide a rigorous means for this. Tolerance and weights could change once the network design is applied to the entire subarea concerned. However, a typical half mile length, the weight assigned for the grid distance would be 0.03 foot and interior angle at 30 arc seconds. USPLSS corner positions (new datum positions) that have been observed but not constrained in the network adjustment would be assigned weights of 0.1 foot (both Northing and Easting).

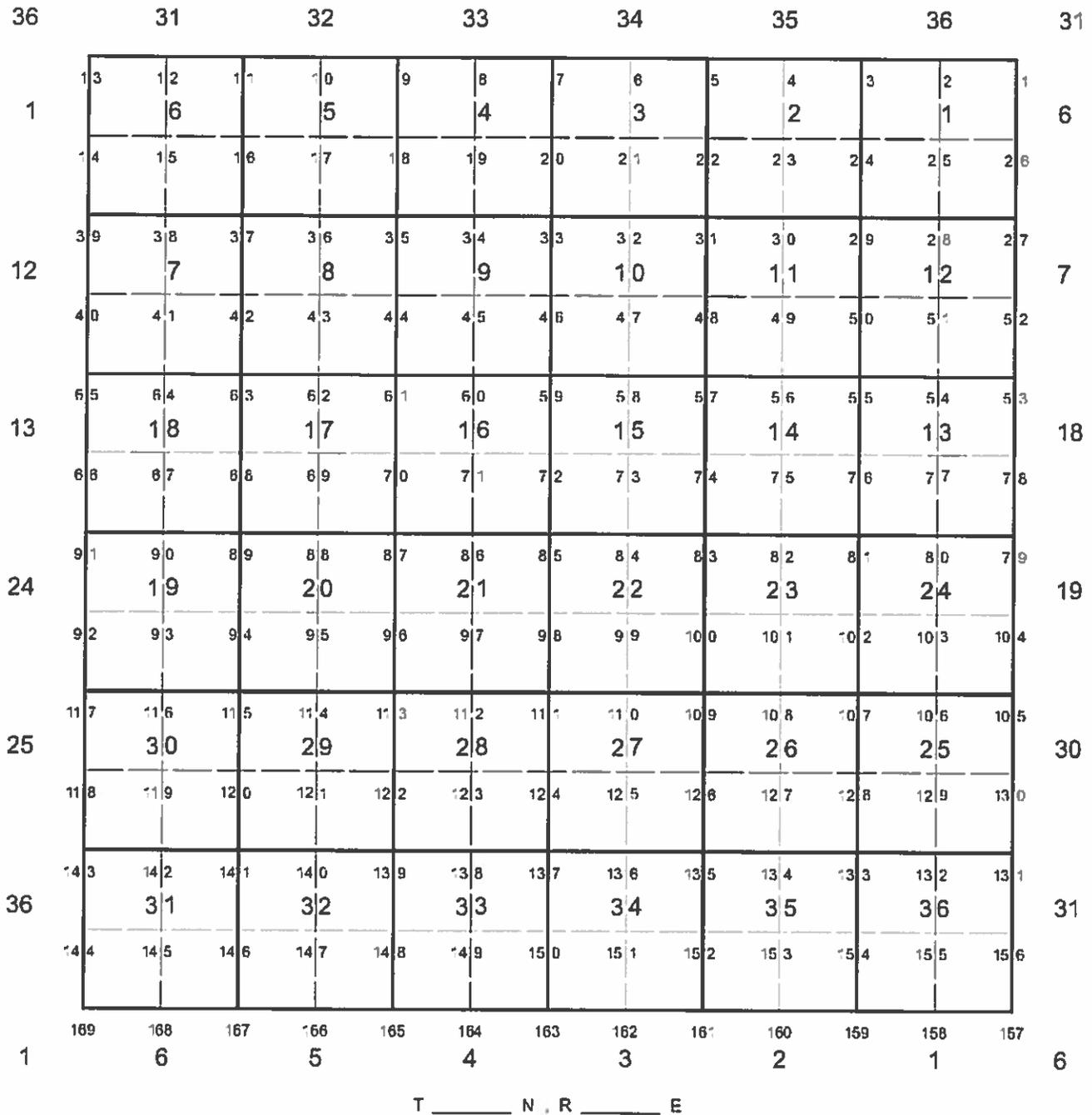
CONTROL SURVEY STATION NUMBERING

A control survey station numbering system will be required that provides a unique numeric identification for each control survey station in the network throughout the Region. This will allow stations to be used in multiple adjustments without conflict or duplication in the control networks. It is proposed to use the Commission's long-standing numbering system for this purpose. That system is illustrated in Figure 3.

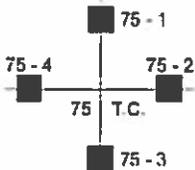
Under the Commission system, the number identifying each station, while unique within each township, it is not unique for corners located along common range lines between two townships, or for common corners along township lines. The Commission system would be modified by adding a prefix to each corner number specifying the township and range. Corners along the eastern and southern boundaries of every township would be numbered

Figure 3

PROPOSED CONTROL SURVEY STATION - USPLSS CORNER - NUMBERING SYSTEM



MEANDER CORNER NUMBERS



■ U.S.P.L.S. SECTION AND QUARTER SECTION CORNERS WHICH HAVE BEEN RELOCATED, MONUMENTED, AND COORDINATED

NOTE: IF NUMBER IS RULED OUT, SEE ABUTTING TOWN FOR DOSSIER.
PREPARED BY: SEWRPC.

Source: SEWRPC.

according to the normal township numbering system. However, corners along the northern and western boundaries would be numbered using the numbers of the corners in the adjacent township. This provides a unique number for every corner and eliminates the possibility of corners having two numbers as would be the case if numbered by individual township. The northern boundaries of townships containing closing corners would be numbered as followed by the Commission system aside from the added town and range prefix.

DEMONSTRATION APPLICATION OF METHODOLOGY

A demonstration application of the horizontal datum conversion methodology developed by the Commission staff was carried out in July 2015. A typical 6-square-mile area consisting of Sections 28 through 33 in Township 4 North, Range 18 East, Town of East Troy, Walworth County, was selected for the demonstration.

The legacy data for the demonstration area are shown on Figure 4. The monuments marking four corners of the area, together with the monument marking the Southwest corner of Section 29 which is near the center of the area, were occupied and the coordinate positions of these corners on NAD 83 (2011) were determined by a GPS survey. The survey was conducted in accordance with the protocol set forth in this appendix. The newly determined coordinate positions for these five corners are shown on Figure 5.

The ground level lengths of the quarter-section lines within the area, together with the interior angles of the quarter sections, were extracted from the legacy data shown on the diagram comprising Figure 4. The ground level lengths of the quarter-section lines were reduced to grid lengths using the combination elevation and scale reduction factor for the State Plane Coordinate System based upon the new datum. A least square adjustment of the network was then used to compute the State Plane Coordinates³ of the remaining 30 stations—corners—within the area. The resulting values are shown on the diagram comprising Figure 5. The grid distances and bearings of the one-quarter section lines on the new datum were then determined by inverse computation from the new coordinate values. The grid distances were then converted to ground level distances using the combination factor for the new coordinate system. The areas of the quarter-sections were computed using the new ground level distances and bearings of the quarter-section lines. These results are also shown on the diagram comprising Figure 5.

Examination of the two diagrams comprising Figures 4 and 5 will show that the maximum change in the ground level length of the quarter-section lines between the legacy and new datums was 0.13 foot. The maximum change in the bearings of the quarter-section lines was 7 seconds of arc. The maximum change in the computed areas of the one-quarter sections was 0.011 acre.

Seven of the computed USPLSS corners were selected for an independent performance evaluation. These corners are identified on the diagram comprising the Figure 5. The monuments marking these corners were occupied and the coordinate position of these corners on the new datum determined by GPS survey. A comparison of the computed and the surveyed values is provided in Table 2. The maximum difference in the coordinate values of 0.23 foot falls well within the desired accuracy standard specified for the legacy network within the Region.

³The NAD 83 state plane coordinate values are defined in meters. For this appendix the metric values were converted to feet using the ratio of 39.37 inches per meter exact to 12 inches per U.S. Survey Foot, which approximates 1 meter equaling 3.280833333 U.S. Survey Feet.

Table 2

NAD83/2011 COMPUTED POSITIONS VERSUS GPS OBSERVED INDEPENDENT POSITIONS

USPLSS Corner	Computed		GPS Observed (July 23, 2015)		Delta (USFT)	
	Northing (USFT)	Easting (USFT)	Northing (USFT)	Easting (USFT)	Northing	Easting
0418123	287,734.64	2,404,333.97	287,734.73	2,404,333.98	0.09	0.01
0418150	282,482.37	2,407,019.81	282,482.60	2,407,019.82	0.23	0.01
0418167	279,705.08	2,396,443.96	279,705.12	2,396,443.88	-0.04	0.08
			GPS Observed (March 5, 2015)			
0418115	290,233.03	2,396,397.43	290,233.00	2,396,397.53	-0.03	0.10
0418116	290,194.98	2,393,758.74	290,194.87	2,393,758.84	-0.11	0.10
			GPS Observed (February 9, 2015)			
0417130	287,518.28	2,391,200.65	287,518.24	2,391,200.67	-0.04	0.02
0418131	284,893.05	2,391,206.35	284,893.08	2,391,206.29	0.03	-0.06
				Average:	0.03	0.01
				Maximum Difference:	0.23	0.10
				Minimum Difference:	-0.11	-0.08
				Standard Deviation:	0.11	0.07

Source: SEWRPC.

METHODOLOGY FOR CONVERSION OF VERTICAL CONTROL

The foregoing text deals only with the datum conversion relating to horizontal positions. As noted in the addendum to which this appendix is attached, a similar problem exists relating to the vertical control survey network within the Region. The elevation data provided by the legacy vertical control survey network are based upon the NGVD 29. The National Geodetic Survey in 1977, began a new adjustment project that became the new vertical datum, the North American Vertical Datum of 1988 (NAVD 88). As is the case for horizontal positions, no precise mathematical relationship exists between the legacy and new datums. The Commission in 1995, published SEWRPC Technical Report No. 35, *Vertical Datum Differences in Southeastern Wisconsin*. That report provided a means for converting elevations from the legacy datum to the new datum and provided an iso-hypsometric map to facilitate the conversion of orthometric heights and elevations from one datum to the other. The iso-hypsometric map provided in SEWRPC Technical Report No. 35 was based on the interpolation of datum differences computed for points located on a 10,000-foot grid using VERTCON. The validity of VERTCON was checked by using the datum differences at the 435 NGS (former U.S. Coast and Geodetic Survey) bench marks within the Region as published by NGS.

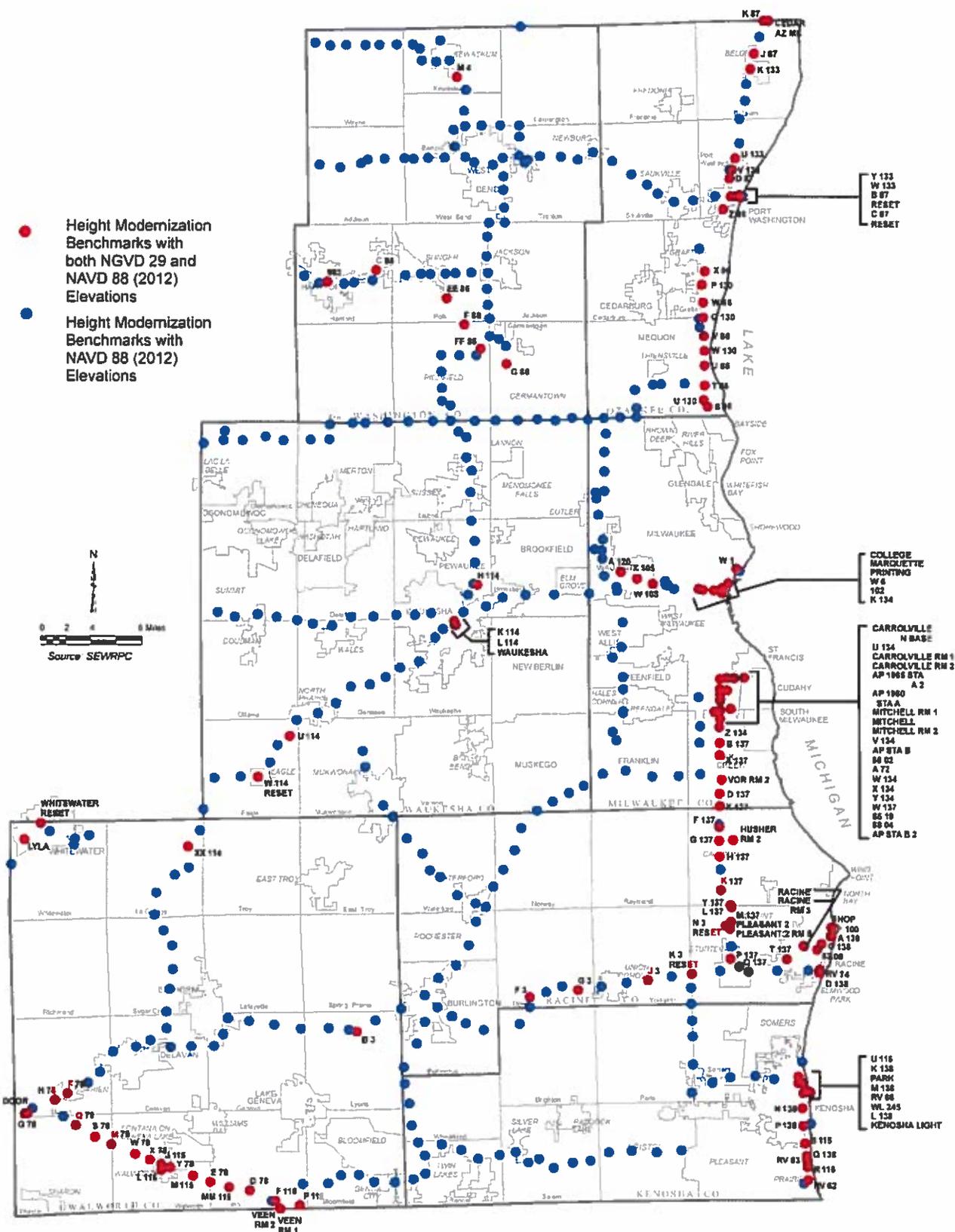
Since the completion of SEWRPC Technical Report No. 35, the Wisconsin Department of Transportation (WisDOT) in conjunction with NGS completed the Wisconsin Height Modernization Program (WI-HMP) within the Region. This program provided high-order orthometric height data on a carefully distributed network of substantial monumented bench marks. The locations of these bench marks are shown on Figure 6. The orthometric heights determined for these bench marks are referred to NAVD 88 (2012).

It is proposed to effect the conversion of elevations between the legacy and new datum by establishing accurate, measured legacy datum elevations on each of the 460 height modernization stations within the Region, thus, establishing an accurate, measured relationship between the two datums on each of the stations. The legacy datum elevations would be established by differential level surveys connecting the Commission legacy bench marks to the height modernization stations. Such transfer should involve no more than the survey of approximately one-half mile of high-order differential level lines for each transfer.

Using the accurate differences between the two datums as determined by actual differential level survey for each datum, a new iso-hypsometric map of the Region can be prepared. This map may be expected to be more accurate than the map provided in SEWRPC Technical Report No. 35. This map can then be used to transfer orthometric heights and elevations between the two datums to Second-Order, Class II accuracy standards.

Figure 6

WISCONSIN HEIGHT MODERNIZATION BENCHMARKS WITHIN THE SOUTHEASTERN WISCONSIN REGION



Source: SEWRPC.

REVISED "RECORD OF USPLSS CONTROL STATION" DOCUMENTS

The Commission has prepared and maintains a document known as "Record of U.S. Public Land Survey Control Station" for each of the more than 11,000 control survey stations – USPLSS corners within, and in a few cases, adjacent to the Region. These documents are commonly referred to as "dossier" sheets. As a control survey station is converted from the legacy to the new datums, a new dossier sheet will have to be provided. A revised format will be required for the dossier sheets and a proposed format is provided in Figure 7. The proposed format provides for the display of dual horizontal positions and vertical heights of the station.

Figure 7

REVISED "RECORD OF U.S. PUBLIC LAND SURVEY CONTROL STATION"

RECORD OF U. S. PUBLIC LAND SURVEY CONTROL STATION			
U. S. PUBLIC LAND SURVEY CORNER	30/29 37/32	T. 4 N. R. 18 E.	WALWORTH COUNTY, WISCONSIN
HORIZONTAL CONTROL SURVEY BY:	SEWRPC YEAR: 2001	HORIZONTAL CONTROL SURVEY BY:	SEWRPC YEAR: 2015
VERTICAL CONTROL SURVEY BY:	OWEN AYRES / SEWRPC YEAR: 2002/2012	VERTICAL CONTROL SURVEY BY:	SEWRPC YEAR: 2015
HORIZONTAL DATUM: WISCONSIN STATE PLANE COORDINATE SYSTEM NORTH AMERICAN DATUM OF 1927		HORIZONTAL DATUM: WISCONSIN STATE PLANE COORDINATE SYSTEM NORTH AMERICAN DATUM OF 1983 (2011)	
VERTICAL DATUM: NATIONAL GEODETIC VERTICAL DATUM OF 1929		VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (2012)	
STATE PLANE COORDINATES OF:		STATE PLANE COORDINATES OF:	
NORTHING:	284 963.68 USFT	NORTHING:	284 973.00 USFT
EASTING:	2 427 923.38 USFT	EASTING:	2 398 386.23 USFT
ELEVATION:	935 187 FT	ELEVATION:	
HORIZONTAL ACCURACY:	THIRD ORDER, CLASS I	HORIZONTAL ACCURACY:	THIRD ORDER, CLASS I (GPS OBSERVED)
VERTICAL ACCURACY:	SECOND ORDER, CLASS II	VERTICAL ACCURACY:	SECOND ORDER, CLASS II (INTERPOLATED)

LOCATION SKETCH:

The location sketch shows a plan view of the survey area. Honey Creek Road runs horizontally across the middle. STH 120 runs vertically through the center. A former city street, labeled '(FORMER CITY ST.)', runs vertically to the east of STH 120. A north arrow is located on the left side. Several survey points are marked with circles and labeled with bearings and distances. For example, one point is located '100.00' N. of the intersection. Another point is '100.00' S. of the intersection. The sketch also shows a 'SEWER BRASS CAP' and a 'CONCRETE MONUMENT' at the intersection. A 'WATER MAIN' is shown running parallel to Honey Creek Road. A 'BRASS CAP' is shown at the intersection of STH 120 and the former city street. A 'CONCRETE MONUMENT' is shown at the intersection of Honey Creek Road and the former city street. A 'WATER MAIN' is shown running parallel to Honey Creek Road. A 'BRASS CAP' is shown at the intersection of STH 120 and the former city street. A 'CONCRETE MONUMENT' is shown at the intersection of Honey Creek Road and the former city street.

SURVEYOR'S AFFIDAVIT:
STATE OF WISCONSIN) SS
WALWORTH COUNTY)

As Walworth County Surveyor, I hereby certify that following water main construction, I set a concrete monument with SEWRPC brass cap to mark the location of this corner, replacing a concrete monument with Walworth County brass cap set to mark the location of this corner in September 1985 by Lloyd L. Jensen, S-211, former Walworth County Surveyor; replacing a cast iron plug with cross set in the then existing bituminous driveway pavement in October 1961 by George A. Swier, State Highway Commission of Wisconsin Project Engineer, following highway reconstruction; that I have referenced the same as shown hereon; and that this record is correct and complete to the best of my knowledge and belief.

DATE OF SURVEY: 23 JULY 2007 REGISTERED LAND SURVEYOR S - 157

FORM PREPARED BY SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

COSTS

The costs of the various major work elements involved in datum conversion were estimated separately for the horizontal and vertical components of the work entailed. The costs were developed by analyzing the major work elements of each of the two conversions.

For the horizontal datum conversion, six major work elements were considered:

1. The extraction of the data required from the legacy control survey network. These data include the location and monumentation of existing control survey stations—USPLSS corners; the lengths of the quarter-section lines; the interior angles of the quarter-sections; and attendant combination scale and sea level reduction factors.
2. The necessary field observations including the recovery of a set of carefully located and distributed legacy control survey stations and the conduct of the GPS observations on these stations as required to determine the coordinates of the stations concerned referred to NAD 83 (2011).
3. The determination of the coordinate positions of all of the other stations in the network concerned utilizing the data extracted from the legacy network.
4. Selection of an approximately 10 percent sample of the stations having computed coordinates for occupation and GPS survey to check the coordinate values of the selected stations.
5. Preparation of new “Record of U.S. Public Land Survey Control Station” document—dossier sheet—for each of the control survey stations concerned.
6. Preparation and publication of a project completion report.

For each of these major work elements, estimates were made of the direct and indirect labor costs, of the associated overhead costs, and an allowance for contingencies. These costs are set forth in Table 3. The costs of such items as mileage, equipment, and report preparation would need to be estimated on a job-by-job basis, assuming that the Commission performs the work entailed. Estimates were made of the cost of implementation of the horizontal datum conversion for the seven-county Region as a whole; and for implementation by subarea—namely by survey township. These costs are presented in Tables 3 through 5. In any consideration of these cost estimates, it should be recognized that precise estimates, of the costs of completion of the work by a specific county, or by specific subarea, are possible only on the basis of a more detailed study design for the conduct of the work by the area concerned. Consequently, the costs of the work elements set forth in the Tables 3 through 5 must be considered tentative and changes in the allocation of costs to work elements must be expected as the work proceeds. It should be noted that if the datum conversion is implemented by subarea, the cost of completing a larger area, such as a county or the Region, as a whole, will be somewhat higher.

The costs of the work would have to be borne by those individual county land information systems that desire the horizontal datum conversion to be completed. Work could be accomplished for the county as a whole or by subareas, particularly survey townships. The estimated cost by county is provided in Table 4 and by typical township in Table 5.

For the vertical datum conversion, four major work elements were considered:

1. The high-order differential level circuits required to determine accurate elevations referred to NGVD 29 for each of the 460 Height Modernization stations within the Region. The total length of the level lines was estimated at approximately 250 miles.
2. The computation of the surveyed vertical datum differences at each of the 460 height modernization stations.
3. Preparation of a new iso-hypsometric map of the Region by interpolation of the datum differences found at the 460 height modernization stations.
4. Preparation and publication of a project completion report.

Table 3

COST ESTIMATE – HORIZONTAL DATUM CONVERSION - SEVEN COUNTY REGION

Description	Cost
Extraction of Legacy Measurements	\$49,600
Field Observations	
• Labor	179,520
Contingency for Additional Field Observations and Time for Inclusion into Least-Squares Adjustments	19,680
Determination of Coordinate Positioning using selected NAD83/2011 field observation and extracted legacy measurements	33,000
Preparation of new "Record of U.S. Public Land Survey Control Station" documents and Control Survey Summary Diagrams	118,400
Total	\$400,200^a

^aVehicle mileage and equipment costs must be estimated on a job-by-job basis; therefore, no line items are included for these costs in the table.

Source: SEWRPC.

Table 4

COST ESTIMATE – HORIZONTAL DATUM CONVERSION – INDIVIDUAL COUNTY

Description	Cost						
	Kenosha County	Milwaukee County	Ozaukee County	Racine County	Walworth County	Washington County	Waukesha County
Extraction of Legacy Measurements	\$5,080	\$4,400	\$4,400	\$6,360	\$10,520	\$7,960	\$10,880
Field Observations							
• Labor	18,240	16,200	15,960	23,040	38,400	28,800	38,880
Contingency for Additional Field Observations and Time for Inclusion into Least-Squares Adjustments	1,920	1,500	1,800	2,520	3,840	3,240	4,860
Determination of Coordinate Positioning using selected NAD83/2011 field observation and extracted legacy measurements	3,520	2,640	3,520	4,400	7,040	4,400	7,480
Preparation of new "Record of U.S. Public Land Survey Control Station" documents and Control Survey Summary Diagrams	12,136	10,656	10,360	14,800	25,456	19,240	25,752
Individual County Total	\$40,896^a	\$35,396^a	\$36,040^a	\$51,120^a	\$85,256^a	\$63,640^a	\$87,852^a

^aVehicle mileage and equipment costs must be estimated on a job-by-job basis; therefore, no line items are included for these costs in the table.

Source: SEWRPC.

For each of these major work elements, estimates of the costs were made in the same manner as for the horizontal datum conversion work.

As a practical matter, the work entailed in vertical datum conversion should be completed for the Region as a whole. These costs are presented in Table 6. The costs of the work would have to be borne by the individual county land information systems. The costs could be distributed among the counties on the basis of any system agreed to by the seven-county land information systems. One such possible system would utilize the proportional area that each county comprises of the Region. The application of this system is illustrated in Table 7.

Table 5

COST ESTIMATE - HORIZONTAL DATUM CONVERSION - TYPICAL TOWNSHIP

Description	Cost
Extraction of Legacy Measurements	\$ 960
Field Observations	
• Labor	3,600
Contingency for Additional Field Observations and Time for Inclusion into Least-Squares Adjustments	720
Determination of Coordinate Positioning using selected NAD83/2011 field observation and extracted legacy measurements	880
Preparation of new "Record of U.S. Public Land Survey Control Station" documents and Control Survey Summary Diagrams	1,480
Total	\$7,640^a

^aVehicle mileage and equipment costs must be estimated on a job-by-job basis; therefore, no line items are included for these costs in the table.

Source: SEWRPC.

Table 6

COST ESTIMATE - HORIZONTAL DATUM CONVERSION - SEVEN COUNTY REGION

Description	Cost Breakdown
High Order Differential Level Circuits to Determine Accurate NGVD 29 Elevations on 460 Height Modernization Bench Marks within Region	\$177,408
Compilation and Computations Supporting the Vertical Differences of the Height Modernization Bench Marks	26,400
Preparation of new Iso-Hypsometric Map	8,800
Preparation and Publication of Project Completion Report	13,200
Preparation of new "Record of U.S. Public Land Survey Control Station" documents and Control Survey Summary Diagrams	76,960
Total	\$302,768

Source: SEWRPC.

Table 7

COST ESTIMATE - VERTICAL DATUM CONVERSION - INDIVIDUAL COUNTY

Description	Percent of Regional Area	Cost
Kenosha County	10.3	\$31,185
Milwaukee County.....	9.0	27,249
Ozaukee County	8.8	26,644
Racine County	12.7	38,452
Walworth County.....	21.4	64,792
Washington County.....	16.2	49,048
Waukesha County.....	21.6	65,398
Total	100.0	\$302,768

Source: SEWRPC.

Appendix D

**MINUTES OF AUGUST 21, 2015
SEWRPC TASK FORCE ON DATUM CONVERSION**



Minutes
Meeting of the Technical Task Force Created by SEWRPC to
Review the Preliminary Draft of an Addendum to SEWRPC Memorandum Report No. 206

DATE: August 21, 2015
TIME: 8:30 a.m.
PLACE: Southeastern Wisconsin Regional Planning Commission
Racine Conference Room
W239 N1812 Rockwood Drive
Waukesha, WI 53187

Members Present:

Kurt W. Bauer, PE, PLS, AICP, Chairman..... Executive Director Emeritus, SEWRPC, County Surveyor,
Kenosha, Milwaukee, Walworth, and Waukesha Counties
Earl F. Burkholder, PS, PE Consulting Geodetic Engineer
Robert W. Merry, PLS Chief Surveyor, SEWRPC
Glen R. Schaefer, PE, PLS Captain, NOAA Corps (Retired),
also Former Geodetic Engineer, Wisconsin Department of Transportation
Phillip C. Evenson Special Projects Advisor, SEWRPC

Commission Staff:

Debra A. D'Amico Executive Secretary, SEWRPC
Recording Secretary to Task Force

Guests Present:

None

CALL TO ORDER AND ROLL CALL

Chairman Bauer called the meeting to order at 8:35 a.m. Roll call was taken and a quorum was declared present.

INTRODUCTION

Chairman Bauer welcomed the Task Force Members to the Commission offices, and on behalf of the Commission, thanked the members of the Task Force for their willingness to serve on the Task Force, and to make their experience and knowledge available to the Commission as a public service. Chairman Bauer noted that all of the Task Force members had also been members of the Task Force that had reviewed Memorandum Report No. 206.

Charge to Task Force

Chairman Bauer indicated that the Commission's charge to the Task Force was to conduct a critical review of the preliminary draft of an addendum to SEWRPC Memorandum Report No. 206, *Estimate of Costs of Converting the Foundational Elements of the Land Information and Public Works Management Systems in Southeastern Wisconsin from Legacy to New Datums*, October 2010, and to recommend any needed changes to the findings and recommendations set forth in the addendum.

Mr. Evenson asked what prompted the need for the preparation of the addendum. In reply, Chairman Bauer indicated that the Commission staff was aware of a continuing interest in datum conversion on the part of some County Land Information Officers. This interest existed regardless of the findings and recommendations set forth in Memorandum Report No. 206. As noted in the introduction of the draft addendum, given this continuing interest and the changes in technology that have taken place since the publication of Memorandum Report No. 206, the Commission staff, early in 2015, undertook a reevaluation of the procedures for, and attendant costs of, datum conversion.

PROPOSED REVIEW PROCEDURE

Chairman Bauer indicated that in accordance with long established Commission practice, the procedure proposed to be followed in the conduct of the Task Force Work was to collegially review on a page-by-page basis the preliminary draft of the addendum and attached appendix. He noted that all members of the Task Force had been provided with a copy of the draft of the addendum for review prior to the meeting along with a copy of Memorandum Report No. 206 which the document is intended to revise in part.

Chairman Bauer indicated it was hoped that the Task Force could complete its work in a single meeting. The proceedings of that meeting would be set forth in minutes of the meeting. A copy of those minutes would then be provided to all Task Force members for review, and the Task Force members would be asked to indicate their approval or conditional approval of the minutes or to request a second meeting to act on the minutes. The work of the Task Force would be completed when the minutes of the meeting had been approved.

REVIEW OF PRELIMINARY DRAFT OF ADDENDUM

The Task Force then undertook a page-by-page review of the preliminary draft of the addendum and attached appendix, the draft of the addendum proper being dated July 7, 2015, and the draft of the

attached appendix being dated July 30, 2015. The following comments were raised, discussed, and acted upon in the meeting.

Captain Schaefer distributed an annotated copy of the addendum and appendix on which he had noted suggested changes. He noted that the proposed changes were concerned primarily with the format, or presentation, and not with the technical substance of the document. He indicated that he would address the latter in the course of the meeting. Upon review of the suggested changes, it was the consensus of the Task Force that all of Captain Schaefer's suggested changes as set forth in the annotations made on the copy of the document distributed by Captain Schaefer be included in the final draft of the document.

Chairman Bauer indicated that the Commission staff, in consultation with Mr. Burkholder, had developed what is believed to be two new and unique procedures for the conversion of the legacy horizontal and vertical datums in use within the Region to the new Federal datums. He indicated further that the procedures were possible only because of the high quality of the existing control survey network within the Region. He noted further that the addendum proper, in effect, constituted an introduction to the attached appendix. The details of the proposed procedures and the attendant costs of implementation were set forth in the appendix. He then asked for comments on the first page of the addendum.

Mr. Evenson suggested that the date of the completion of the CORS network within and immediately adjacent to the Region be given in the text. Captain Schaefer indicated that it was not possible to cite a single date as marking the completion of the CORS network because that network was completed in phases. Mr. Merry noted that the entire network became operational in just the past year, although portions of the network became operational at various preceding dates. After some further discussion, it was the consensus of the Task Force that a specific date for the completion of the CORS network within the Region not be added to the text.

Chairman Bauer asked for comments on page 2; there being none, then on page 3 of the addendum proper. Captain Schaefer noted that on page 3 of his annotated copy, he had provided a paragraph providing some additional background information on the creation of the North American Vertical Datum of 1988 by the National Geodetic Survey. Mr. Evenson observed that it would be useful to include this information in the addendum. After some further discussion, it was the consensus of the Task Force that a footnote be prepared by the Commission staff incorporating the background information provided by Captain Schaefer in his annotation.

[Secretary's Note: The following footnote was prepared by the Commission staff for addition to the addendum:

³Orthometric heights "tagged" as NAVD 88 were based on the original adjustment of NAVD 88 which was published by NGS in 1991. Since 1995 there have been subsequent adjustments of the vertical control network in southern Wisconsin. Therefore, orthometric heights determined by the 1991 adjustment are now labeled as NAVD 88 (1991). Subsequent adjustments in 2004, 2007, and 2012 are labeled as NAVD 88 (2004), NAVD 88 (2007), and NAVD 88 (2012), respectively. The current NGS Data Sheet does not allocate space for the inclusion of vertical adjustment tags. However, the adjustment date can be found in the Data Sheet under text describing the manner in which the various epochs of orthometric heights were determined by NGS.

The reference for the footnote would be given in the 12th line of the first full paragraph on page 3 after the phrase, "by subsequent vertical adjustments.³"]

Chairman Bauer then asked for comments on page 4; there being none; then on page 5 of the addendum. Chairman Bauer noted that the inclusion of the paragraph quoted from Memorandum Report No. 206 was problematic as far as the Commission staff was concerned.¹

A lengthy discussion then ensued concerning the "pros" and "cons" of including this paragraph. Upon the conclusion of the discussion, it was the consensus of the Task Force to eliminate the paragraph concerned from the text, and furthermore, to strike the paragraph which begins on the bottom of page 5 and carries over to the top of page 6 together with the second full paragraph on page 6, and to substitute the following wording for the last two sentences of the first full paragraph on page 5: "This document is intended to be considered within the context of that report. Since the completion of that report, the Commission has continued to receive specific requests from some County Land Information Officers to reevaluate the procedures for, and the attendant costs of, converting the legacy datums within the Region as presented in

¹The subject paragraph is the first paragraph under the heading: "Summary and Conclusions" on page 13 of Memorandum Report No. 206.

Memorandum Report No. 206. This addendum presents the findings of that reevaluation in the form of an additional appendix—Appendix C—to Memorandum Report No. 206.”

Chairman Bauer then asked for any additional comments on pages 5 and 6; there being none; then on page 7. Mr. Evenson suggested that a reason should be provided as to why the conversion of the vertical datum within the Region should be accomplished for the Region as a whole rather than by subareas as is suggested for the horizontal datum. After some discussion, it was a consensus of the Task Force that the second sentence of the last paragraph on page 7 be revised to read as follows: “The conversion should be carried out for the Region as a whole in order to maintain uniformity across both natural boundaries, such as watershed boundaries, and across civil boundaries, such as municipal and county boundaries.”

Chairman Bauer asked for comments on page 8. Mr. Evenson noted that the table on page 8 should be revised to list the counties in alphabetical order.

Chairman Bauer indicated that this completed the review of the addendum proper and asked the Task Force to consider approval of that document as amended by the actions taken at the meeting for publication. The members of the Task Force were unanimous in their approval of the addendum proper as amended for publication.

[Secretary’s Note: The meeting was adjourned at 12 noon for lunch and reconvened at 12:30 p.m.]

REVIEW OF PRELIMINARY DRAFT OF APPENDIX C

Chairman Bauer directed the attention of the Task Force to Appendix C. He noted that the Task Force review was critical to ensuring that the detailed procedures proposed for the conversion of the horizontal and vertical datums within the Region were technically sound and that the attendant cost estimates were reasonable.

Chairman Bauer then asked for comments on page 1 of the appendix; and there being none, then on page 2.

In answer to a question by Mr. Evenson, Chairman Bauer indicated that the use by the Commission of a six-section control survey summary diagram dates back to the very beginning of the Commission’s

control survey program in the very early 1960s. The six-section size was simply dictated by the paper sheet size available and a scale which would make the diagrams easily readable.

Chairman Bauer asked for comments on page 3. Mr. Merry, referring to the eighth line of the second full paragraph, indicated that the word “precision” used should be changed to “accuracy” as indicated by Captain Schaefer’s annotations.

Captain Schaefer called attention to the footnote on page 3 and asked whether the addendum would be published with the appendix. Chairman Bauer indicated that the two documents would indeed be published together. A lengthy discussion then ensued about the protocol to be followed in making field observations as that protocol was listed on pages 3, 4, and 5. The discussion did not, however, lead to any proposed changes in the protocol.

Chairman Bauer then asked for comments on pages 4 and 5. Mr. Burkholder and Captain Schaefer indicated their endorsement of the protocol as listed.

Chairman Bauer then asked for comments on page 6 of the appendix. In answer to a question by Mr. Burkholder, Chairman Bauer indicated that conceptually the procedure developed for the conversion of the horizontal datum, in effect, regards the legacy lengths and interior angles of the quarter sections as measurements to be used in conjunction with field observations to determine in NAD 83 (2011) of a limited number of control stations to compute the coordinates of the remaining stations in the area being considered. He noted that in the procedure, the ground level distances given on the legacy control survey summary diagrams are reduced to grid level using NAD 88 State plane coordinate system combination factors. The computations are then accomplished on that grid level.

In answer to a question by Mr. Evenson, Mr. Merry indicated that the extraction of the data from the legacy diagrams would be done manually. In answer to a further question by Mr. Burkholder, Mr. Merry noted that the weighting strategy proposed to be used quickly identifies any network strain—that is discrepancies—and permits the troublesome measurements to be quickly identified and corrected.

Chairman Bauer then asked for comments on pages 7 and 8. Captain Schaefer suggested that the wording of the first two sentences on the page be changed to read as follows: “Extracting the relevant data from the control survey summary diagrams, as such diagrams are illustrated in Figure 2, permits tables such as Table 1 to be constructed for use in the least squares adjustment.”

Chairman Bauer asked for comments on page 9. Captain Schaefer indicated that the figure number cited in the last line of the second full paragraph should be “5” not “4.” He also suggested that the word “typical” be inserted before the phrase “6 square mile area” in the second line of the first full paragraph on the page. Mr. Merry noted that the footnote reference should be assigned to the word “coordinates” in the beginning of the sixth line of the last partial paragraph on the page.

Mr. Evenson suggested that the footnote on page 9 needed revision to read properly. Mr. Merry suggested the following wording: “The NAD 83 state plane coordinate values are defined in meters. For this appendix the metric values were converted to feet using the ratio of 39.37 inches per meter exact to 12 inches per U.S. Survey Foot, which approximates 1 meter equaling 3.280833333 U.S. Survey Feet.”

Chairman Bauer then asked for comments on page 10; there being none, then on pages 11 and 12. Captain Schaefer noted that the coordinates for the center of Section 28 were in error and should be corrected.

Chairman Bauer then asked for comments on page 13. There being none; then on page 14. Captain Schaefer noted that the term “NAVD 88” used in the legend to Figure 6 should be changed to NAVD 88 (2012).

Chairman Bauer then asked for comments on page 15. Captain Schaefer suggested that a section heading be made consistent with the document title given on Figure 7. Captain Schaefer suggested that the class of survey notation be dropped from the accuracy notations under both the horizontal and vertical designations and that, where the horizontal coordinates were not field measured, the accuracy order be indicated as computed as opposed to observed. Chairman Bauer noted that with respect to vertical accuracy, the terms used should be observed and interpolated as appropriate, interpolation referring to the use of the proposed iso-hypometric map.

Chairman Bauer asked for comments on page 16. Chairman Bauer noted that in the first line of the second full paragraph the number of work elements referred should be “6” not “5.”

Chairman Bauer then asked for comments for page 17. Captain Schaefer noted that in the last sentence of the first full paragraph the table numbers should be changed from “3” to “4,” and from “4” to “5.” He also noted that in the first line of the second paragraph, the number of major work elements should be changed from “3” to “4.”

Chairman Bauer then asked for comments on page 18; there being none, then on page 19. Mr. Evenson suggested that the table on page 19 was unnecessarily detailed and should be simplified by eliminating the columns given for material and hours leaving only the cost column under each County.

Chairman Bauer called for comments on page 20. Mr. Evenson suggested that Table 5 be changed by eliminating line items for vehicle mileage and equipment costs and adding a footnote stating, "Vehicle mileage and equipment costs must be estimated on a job-by-job basis; therefore, no line items are included for these costs in the table."

Conclusion and Adjournment

There being no further questions or comments, Chairman Bauer indicated that this completed the review of the appendix to the addendum proper and asked the Task Force to consider approval of that appendix as amended by the actions taken at the meeting for publication. The members of the Task Force were unanimous with their approval for the appendix as amended for publication.

Chairman Bauer indicated that the Task Force members would receive a preliminary draft of the minutes for review and comment and requested to indicate to the Commission staff their approval or conditional approval of the minutes or request a second meeting to act on the minutes. The work of the Task Force would be completed when the minutes of the meeting had been approved. A final copy of the minutes, as approved by the Task Force, will be published as Appendix D with the addendum.

Chairman Bauer once more thanked the Task Force members for their diligent review of the addendum and its appendix, and for their contribution of their time, knowledge, and experience as a public service to the work of the Commission.

The meeting was adjourned at 2 p.m.

Respectfully submitted,

Debra A. D'Amico
Task Force Recording Secretary

[Secretary's Note: The foregoing minutes were approved by the Task Force by electronic communication ballot, the last ballot being retained on September 3, 2015.]

Meeting Notes
Southeastern Wisconsin Land Information Officers
November 19, 2015 10:00 am
Room AC170 Waukesha County Administration Center

Attending: Al Brokmeier – Kenosha County, Cristina Pearson – Ozaukee County, Dale Drayna – Walworth County, Eric Damkot – Washington County, Kevin Bruhn – Milwaukee County, Kimberly Christman – Racine County, Don Dittmar – Waukesha County, Rob Merry – SEWRPC, Scott Schutze – Kenosha County, Mark Madsen (Nielsen Madsen & Barber) - Racine County Surveyor

1. Conversion to NAVD88 as the Vertical Datum standard
 - A consensus was reached among all 7 Counties that the conversion to NAVD 88 was desirable and agreed to participate
 - Most Counties agreed that conversion to NAVD88 was contingent on receiving WLIP Strategic Grant funding
2. Conversion to NAD83 as the Horizontal Datum standard
 - A consensus was reached among all 7 Counties that the conversion to NAD 83 was desirable and agreed to participate
 - Most Counties agreed that conversion to NAD83 was contingent on receiving WLIP Strategic Grant funding
 - Washington County indicated that they had received a cost estimate for the conversion process that includes occupying each PLSS point in the County to acquire a new coordinate values
 - Kenosha and Milwaukee indicated they would like to receive a cost estimate to complete the conversion to NAD83 based on occupying each PLSS point in their respective counties
 - Ozaukee, Racine, Walworth, and Waukesha Counties indicated that the process and cost estimates of completing the conversion to NAD83 based on occupying sample PLSS points as set forth in SEWRPC Addendum to Memorandum Report No. 206 was sufficient at this time
3. Land Information Plans
 - It was agreed that each of the 7 Counties would include a description for converting the NAVD88 and NAD83 base datums in the “Future Project” section of the County Land Information Plans due to be submitted to the State by December 31, 2015.
4. WLIP Strategic Initiative Grants
 - It was agreed that each of the 7 Counties would submit a Strategic Initiative grant request to the WLIP referring the datum conversion project described in the County Land Information Plan
5. Next Steps

- Mr. Merry of SEWRPC agreed to prepare cost estimates for conversion to the NAD83 horizontal datum for Kenosha and Milwaukee Counties
- Mr. Merry of SEWRPC agreed to work with Mr. Dittmar to develop a template contract to cover the proposed conversion work which will be brought back to this LIO group for review upon completion

**Horizontal Cost Estimates
Milwaukee County
1065 USPLSS Corners**

Horizontal Options	Contractor	SEWRC
Addendum 206 Method	\$63,966.25	\$35,396.00
Control 5% of Corners using VRS Methods Observe 5% of Corners using VRS Methods for QC Check Perform Least Squares Adjustment Create New Coordinate Dossier with new Coordinate		
Memorandum 206 - Rapid Static	\$235,624.00	\$155,470.00
Follow WIDOT Guidelines on Standards and Specifications for GPS Surveys, 23 October 1996 (revised 04 January 2005) Follow Accuracy Standards for 2nd Order, Class I (1:50,000) Observe all corners using Rapid Static Techniques Reobserve 30% as specified in guidelines Observation duration would take approximately 15min Approximately 20% of corners estimated as not GPS'able requiring offset and traversing to establish corner position Extra setup time allocated due to urban environment Create New Coordinate Dossier with new Coordinate		
New Technology - Memorandum 206 - VRS	\$218,936.00	\$141,630.00
Follow NGS-58 and NGS-59 No Accuracy Specification - Only Recommendations Observe all corners using VRS Methods Reobserve 100% as specified in guidelines by NGS Approximately 20% of corners estimated as not GPS'able requiring offset and traversing to establish corner position Create New Coordinate Dossier with new Coordinate		

COPY

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

W239 N1812 ROCKWOOD DRIVE • PO BOX 1607 • WAUKESHA, WI 53187-1607 • TELEPHONE (262) 547-6721
FAX (262) 547-1103

Serving the Counties of:

KENOSHA
MILWAUKEE
OZAUKEE
RACINE
WALWORTH
WASHINGTON
WAUKESHA



MEMORANDUM

TO: Mr. Jeffrey S. Polenske, P.E., City Engineer, City of Milwaukee
Ms. Mary Jo Lange, City Engineer, City of Cudahy
Mr. Michael G. Lewis, P.E., City Engineer, City of West Allis
Ms. Kim Egan, Village Administrator, Village of West Milwaukee
Mr. Jeff Katz, P.E., City Engineer, City of Greenfield
Mr. Gregory G. High, P.E., Director, Architectural Engineering and
Environmental Services Division, Milwaukee County
Mr. Thomas W. Chapman, P.E., Section Manager, Milwaukee
Metropolitan Sewerage District
Mr. James Zsebe, P.E., Project Manager, GMIA Engineering, Milwaukee County

FROM: SEWRPC Staff

DATE: October 27, 2015

**SUBJECT: REVISED FLOODPLAIN AND FLOODWAY DELINEATIONS ALONG THE
KINNICKINNIC RIVER, WILSON PARK CREEK, LYONS PARK CREEK, VILLA
MANN CREEK, AND TRIBUTARY TO VILLA MANN CREEK IN MILWAUKEE
COUNTY**

In 2008 and 2009, preliminary draft floodplain maps were prepared by the Southeastern Wisconsin Regional Planning Commission (SEWRPC) staff for the Kinnickinnic River, Wilson Park Creek/Edgerton Channel, Lyons Park Creek, Villa Mann Creek, and the Tributary to Villa Mann Creek. At that time, each of you, except for the Village of West Milwaukee and General Mitchell International Airport, were provided with the maps relevant to your municipality or area of jurisdiction. Those maps were developed under a joint program funded by the Milwaukee County Automated Mapping and Land Information System Steering Committee, the Milwaukee Metropolitan Sewerage District (MMSD), and SEWRPC. In 2012 the City of Milwaukee requested that the Commission staff prepare a Letter of Map Revision (LOMR) submittal to the Federal Emergency Management Agency (FEMA) and the Wisconsin Department of Natural Resources (WDNR) in order to revise the current regulatory floodplains along these streams to reflect the updated mapping. As the first step in that request, in 2013 the Commission staff submitted the hydrologic analysis developed under that mapping effort for review by the WDNR. In the course of their review, the Department staff ordered changes to that analysis that resulted in a general increase in flood discharge estimates. In September 2014 the revised hydrology was approved by the WDNR.

Due to the change in flood discharges, the Commission staff has revised the corresponding flood elevations and floodplain boundaries for the subject streams. The hydraulic models developed under the mapping effort were revised to not only reflect the new flood discharge estimates, but also to reflect recent physical changes that have occurred along these streams. These include new or revised bridges at S. 6th Street, Kinnickinnic River Parkway,

and W. Forest Home Avenue on the Kinnickinnic River; the MMSD channel rehabilitation project along the Kinnickinnic River between IH-94 and S. 6th Street; the IH-43 reconstruction and three commercial developments along Wilson Park Creek; and the IH-43/IH-894 reconstruction and channel rehabilitation work along Villa Mann Creek and its tributary. The Kinnickinnic River model was also revised to incorporate recent stream channel survey information between W. Becher Street and S. Chase Avenue.

Enclosed please find revised draft floodplain maps for the streams named above that reflect the results of the updated hydrologic and hydraulic modeling. The maps include floodplain boundaries for the 10-, 2-, 1-, and 0.2-percent annual probability (10-, 50-, 100-, and 500-year recurrence interval) flood events, as well as the floodway boundary for the 1-percent flood. Please note that the floodplain boundaries shown for the area north of Jackson Park in the City of Milwaukee and Village of West Milwaukee represent the backup of floodwater from the Kinnickinnic River and do not reflect flooding related to the S. 43rd Street Ditch tributary. That stream will be the subject of a separate floodplain study yet to be completed, which in turn will likely result in changes to the floodplain boundaries in that area.

A complete set of maps is being provided to both Milwaukee County and the MMSD. The enclosed Table 1 lists the maps that are being provided to the Cities of Cudahy, Greenfield, Milwaukee and West Allis, the Village of West Milwaukee, and Milwaukee County staff at General Mitchell International Airport (GMIA).

Please review the enclosed maps and contact Ms. Laura L. Kletti of the Commission staff with any questions or comments. It would be appreciated if comments were provided by November 30, 2015. Following review of the preliminary maps, we will incorporate any necessary changes prior to submitting the hydraulic models and maps to the WDNR for review and approval. After approval by the WDNR, a LOMR submittal will be prepared and sent to FEMA for their review and approval.

The efforts of the local staffs and engineering consultants that assisted in providing data used in preparation of the maps are appreciated. We trust that the information provided will be useful to you and we look forward to assisting you with this important project.

* * *

KRY/MGH/LLK/RJP/kmd

#228441 – MCAMLIS/MMSD/SEWRPC Kinnickinnic River Watershed Revised Prelim Flpl Map Memo

Enclosures

cc: Mr. Patrick Elliott, MMSD
Mr. Nathan D. Zoch, WDNR-Waukesha
Mr. Christopher J. Olds, WDNR-Madison
Mr. Lee Traeger, FEMA Region V
Mr. David Misky, City of Milwaukee Department of City Development
Mr. Steven J. Schaer, City of West Allis Planning and Zoning Division

bcc: Mr. John G. McDougall

Table 1

KINNICKINNIC RIVER WATERSHED FLOODPLAIN MAPS PROVIDED

Town/Range	U.S. Public Land Survey System One-Quarter Section	Communities Provided Maps
Township 6 North, Range 21 East	Section 1-SW 1/4	City of Milwaukee Village of West Milwaukee
	Section 2-SE 1/4	City of Milwaukee Village of West Milwaukee
	Section 10-NE 1/4	City of Milwaukee City of West Allis
	Section 10-SE 1/4	City of Milwaukee
	Section 11-NE 1/4	City of Milwaukee Village of West Milwaukee
	Section 11-NW 1/4	City of Milwaukee City of West Allis
	Section 11-SW 1/4	City of Milwaukee
	Section 12-NW 1/4	City of Milwaukee
	Section 12-SW 1/4	City of Milwaukee
	Section 12-SE 1/4	City of Milwaukee
	Section 13-NE 1/4	City of Milwaukee
	Section 13-SE 1/4	City of Greenfield City of Milwaukee
	Section 14-NE 1/4	City of Milwaukee
	Section 24-SE 1/4	City of Greenfield
Township 6 North, Range 22 East	Section 4-NE 1/4	City of Milwaukee
	Section 4-NW 1/4	City of Milwaukee
	Section 4-SW 1/4	City of Milwaukee
	Section 4-SE 1/4	City of Milwaukee
	Section 5-SE 1/4	City of Milwaukee
	Section 7-NE 1/4	City of Milwaukee
	Section 7-SW 1/4	City of Milwaukee
	Section 7-SE 1/4	City of Milwaukee
	Section 8-NE 1/4	City of Milwaukee
	Section 8-NW 1/4	City of Milwaukee
	Section 8-SW 1/4	City of Milwaukee
	Section 8-SE 1/4	City of Milwaukee
	Section 9-NW 1/4	City of Milwaukee
	Section 18-NW 1/4	City of Milwaukee
Section 18-SW 1/4	City of Milwaukee	
Section 18-SE 1/4	City of Milwaukee	
Section 19-NE 1/4	City of Milwaukee	
Township 6 North, Range 22 East	Section 19-NW 1/4	City of Milwaukee
	Section 19-SW 1/4	City of Milwaukee
	Section 20-NW 1/4	City of Milwaukee
	Section 20-SW 1/4	City of Milwaukee
	Section 20-SE 1/4	City of Milwaukee
	Section 21-SW 1/4	City of Milwaukee Milwaukee County - GMIA
	Section 21-SE 1/4	City of Milwaukee Milwaukee County - GMIA
	Section 26-NW 1/4	City of Cudahy

Table 1 (continued)

Town/Range	U.S. Public Land Survey System One-Quarter Section	Communities Provided Maps
Township 6 North, Range 22 East (continued)	Section 26-SW 1/4	City of Cudahy
	Section 27-NE 1/4	City of Cudahy
	Section 27-NW 1/4	City of Cudahy City of Milwaukee Milwaukee County - GMIA
	Section 27-SW 1/4	City of Cudahy City of Milwaukee Milwaukee County - GMIA
	Section 27-SE 1/4	City of Cudahy
	Section 28-NE 1/4	City of Milwaukee Milwaukee County - GMIA
	Section 28-NW 1/4	City of Milwaukee Milwaukee County - GMIA
	Section 28-SW 1/4	City of Milwaukee Milwaukee County - GMIA
	Section 28-SE 1/4	City of Milwaukee Milwaukee County - GMIA
	Section 29-NE 1/4	City of Milwaukee
	Section 33-NE 1/4	City of Milwaukee Milwaukee County - GMIA
	Section 34-NW 1/4	City of Cudahy City of Milwaukee Milwaukee County - GMIA

Source: SEWRPC.

#228441 – MCAMLIS/MMSD/SEWRPC Kinnickinnic River Watershed Revised Prelim Flpl Map Memo
 KRY/MGH/LLK/RJP/kmd
 10/22/15