

# LOJIC Strategy Innovation

Recommendations to the LOJIC Policy Board



LOJIC Strategy Innovation Team  
July 14, 2015

## LOJIC STRATEGY AND INNOVATION

July 2015

This report, *LOJIC Strategy and Innovation*, is provided to the LOJIC Policy Board as the final deliverable of the LOJIC Strategy Innovation (SI) effort. Per the guidelines and goals set forth in the organizing charter, the SI team spent 15 months conducting an exhaustive analysis of the current status of, and future opportunities for, LOJIC with consideration given to governance, funding, technology and outreach. As the LOJIC SI Team progressed on its mission, it encountered many questions and gaps that should be addressed in order to assure the viability of the consortium. Some of the questions and gaps were those initially identified by the LOJIC Policy Board as a reason for chartering the team, while others were revealed as the team conducted the Discovery Phase of the SI process. Based on these inputs, the following questions served as the SI Team's focus for the Creating Phase, as well as an outline for the final recommendations to the LOJIC Policy Board included in this report:

- 1) **What is the ideal/recommended governance structure for LOJIC?**
- 2) **In what ways can LOJIC or its individual partners either generate revenue or offset the costs of operating LOJIC?**
- 3) **On what should the percentage cost responsibilities for the LOJIC partners be based, and how much should that be for each partner?**
- 4) **What applications can/should LOJIC develop that will have the greatest impact on and benefit for the user community?**
- 5) **What changes, if any, could/should be made to LOJIC's system architecture and data storage strategies that will optimally position the consortium in today's IT environment?**
- 6) **What steps can LOJIC take to strengthen, advertise and/or remake its brand and promote awareness of how to use it?**
- 7) **How will "Open Data" concepts and initiatives impact LOJIC mission and operations?**

This report contains references to four documents prepared and submitted by Crowell-Schulte IT Consultants (CS) as a part of the LOJIC Strategy Innovation effort. The reports are cited as follows:

CITATION	TITLE	DATE
CS-OUC	Status of LOJIC Operations and User Community	Feb 5, 2015
CS-NS	Report on National Survey of Multi-Organizational GIS Programs	Feb, 2015
CS-BIPPR	Best Innovative Practices Profile Report	Feb 5, 2015
CS-GFOI	Recommendations of LOJIC Governance, Funding and Operational Improvements	Mar 31, 2015

The recommendations contained herein represent the distillation of considerable research and analysis conducted by both the LOJIC SI Team and Crowell-Schulte IT Consultants.

# 1) What is the ideal/recommended governance structure for LOJIC?

## **BACKGROUND**

Original LOJIC partner lease/purchase agreements executed in 1988 between MSD (55% share), former City of Louisville (20% share), Jefferson County (20% share) and PVA (5% share) defined partner “buy-in”, governance, partner roles and responsibilities. Louisville Water Company joined LOJIC in 1996 under terms as an immediate equity owner (20% share) of the system, thereby reducing MSD’s ownership/funding level (to 35% share). These agreements expired in 2003, two years after City/County merger. Following Metro merger and reassembly of the LOJIC Policy Committee, members committed to maintaining existing governance structure and funding levels to keep LOJIC healthy and growing. At that time Metro simply assumed the combined 40% funding shares from the former City and County. Members also committed to completing a LOJIC strategic plan and to sustaining the partnership via MOU during the interim as well as working toward a renewed partnership agreement.

## **PLANNING AND VISIONING**

In 2006-2007 LOJIC and Esri conducted multi-day “GIS Visioning” workshops with partner managers. The Consortium conducted internal user surveys and developed statements of LOJIC mission, values, and vision. During that time the Policy Committee and staff also developed a LOJIC Strategic Plan to guide the partnership and further development of LOJIC for the following 3-5 years. An interim MOU crafted in 2006 was reviewed and approved by the Policy Committee and all partner legal counsel; however, this document was never officially fully executed by Louisville Metro. The Consortium has been operating without a formal agreement ever since. The aforementioned documents can be viewed through the following links:

Visioning Summary	<a href="http://www.lojic.org/main/about/visioning.htm">http://www.lojic.org/main/about/visioning.htm</a>
User Surveys	<a href="http://www.lojic.org/main/about/UserSurvey2006.htm">http://www.lojic.org/main/about/UserSurvey2006.htm</a>
LOJIC Mission, Values and Vision	<a href="http://www.lojic.org/main/about/mission.htm">http://www.lojic.org/main/about/mission.htm</a>
LOJIC Strategic Plan	<a href="http://www.lojic.org/main/about/pdfs/LOJIC_Strategic_Plan_2007.pdf">http://www.lojic.org/main/about/pdfs/LOJIC_Strategic_Plan_2007.pdf</a>

## **CURRENT ASSESSMENT**

A majority of Best Practices Survey respondents, notably those GIS partnerships of a size, scope, budget and duration comparable to LOJIC (e.g., MCAMLIS, PAGIS, SANGIS, METRO, CAGIS, KGIS, AIMS and others) maintain formal written agreements to define governance, partner roles, funding terms, relationships, responsibilities and ongoing mutual commitments. While most of these GIS partnerships provide limited levels of GIS products and support to ancillary entities such as small cities, neighborhood groups and academia, none are a significant source of revenue nor carry any governance or budgetary responsibility within the partnerships. The predominant form of GIS partnership consists of a limited number of major entities (city/county governments, local agencies and utilities) bound together via written agreement with shared responsibility for governing, funding and maintaining a GIS enterprise.

The need for a formal partnership agreement is echoed in the GIS Capability Maturity Model (CMM) Assessment performed for LOJIC by the Crowell-Schulte team and included in the Status of LOJIC Operations and User Community (CS-OUC) report. The CMM for LOJIC cites the need for, “active written agreements among partner organizations” as well as “improved and better defined role of Policy Board” as important enabling factors for LOJIC’s continued success.

User surveys and internal focus group discussions indicated a decline in direct interaction and collaboration with LOJIC staff, inactive technical committee and user groups attributable to the lack of formal commitment and shared funding among LOJIC partners. For 25 years LOJIC has endeavored to be viewed as extensions of partner staff. The post-2010 change in LOJIC funding in which MSD has carried nearly all operations expenses except for the ELA has caused reluctance among users to seek LOJIC staff assistance with new GIS projects and uses and reluctance among LOJIC staff to perform outreach to users.

**RECOMMENDATION #1:            RENEW FORMAL PARTNERSHIP AGREEMENT**

The SI team strongly recommends that LOJIC partner commitments be codified and formalized through a written inter-local agreement that defines governance, structure, roles, funding and mutual responsibilities. The agreement should name a managing partner agency with defined roles, responsibilities and appropriate cost sharing as necessary to provide office facilities, IT, human resources, procurement, financial and legal support for LOJIC. Over the years LOJIC participants have benefitted from having a single agency serve as managing partner and this business model should continue. A new agreement that covers the above provisions will stabilize the partnership, foster user confidence and ensure the future of LOJIC as a healthy, viable organization and shared resource. The unexecuted MOU from 2006 (Appendix 1) should serve as the ideal starting point.

**RECOMMENDATION #2:            CLARIFY ORGANIZATIONAL STRUCTURE AND ROLES**

LOJIC's longstanding governance and organizational structure consisting of a Policy Board, Managing Partner Agency, Steering (formerly Technical) Committee, LOJIC Manager and LOJIC staff has worked reasonably well over the years, but should be endorsed, revitalized and empowered via partner agreement with specific roles and responsibilities and to better respond to current needs. Key elements of LOJIC organizational structure are described below and further categorized in the matrix "LOJIC Operational Functions and Responsibilities" that follows.

LOJIC Policy Board

The LOJIC Policy Board should serve as the collaborative oversight body for LOJIC with authority on budgetary and policy matters for the consortium and should consist of the chief executive of each partner agency along with the LOJIC Manager. Policy Board members should be actively engaged as leaders and advocates for the effective use of LOJIC within their respective agencies and across the community. The Policy Board should meet at least quarterly with minimum expectation of a status report from the LOJIC Manager. The Policy Board should have review/approval authority for annual work plans and budgets, enterprise software licensing, partnership expansion and data/product policies, licenses and fees based on recommendations and input from the Steering Committee. Specific procedures for Policy Board approval of items of business must be defined.

LOJIC Steering Committee

A LOJIC Steering (formerly Technical) Committee, consisting of GIS leadership from partner agencies and key LOJIC staff, should be established and charged with the strategic direction of LOJIC. The Steering Committee should be empowered to plan and prioritize needs and solutions with appropriate decision making procedures. The Steering Committee should be expected to represent individual partner priorities and be directly involved in developing annual work plans for recommendation to the Policy Board and serve as the collaborative body for resolving technical and resource issues for LOJIC.

LOJIC Manager

The LOJIC Manager will provide oversight and direction to LOJIC operations, prepare and manage operational and capital budgets, strategic plans, operating procedures, negotiate contracts, administer GIS software licenses and Esri resources, and coordinate collaborations with user agencies. The LOJIC Manager will direct the day-to-day projects and activities of LOJIC technical staff in providing core GIS database management, applications development, user support, training and outreach. The LOJIC Manager should serve on the Steering Committee and serve as its liaison on the Policy Board to present recommendations, budget proposals, and report on resource needs, project status and user activities. LOJIC technical staff operates best when seen as extensions of partner agency staff to support data, applications, analysis, products and support needs of all users. Historically, this means of operation has resulted in a wide range of mission-critical uses of LOJIC from custom applications for daily maintenance of properties, street centerlines and addresses, Hansen/HARP viewers to ad hoc analysis and mapping for emergency response. Partners should take whatever steps are necessary via new partnership agreements, more equitably shared funding of operational expenses and other commitments to foster closer collaborations between LOJIC staff and users.

**LOJIC Operational Functions and Responsibilities**

Function	Sub-Task	Responsible Group				
		Policy Board	Steering Committee	LOJIC Manager	Managing Partner Agency	LOJIC Staff
<b>Budget</b>						
	Compile					
	Review					
	Approve					
	Administer/Report					
<b>SW / HW Licensing</b>						
	Negotiate					
	Review					
	Approve					
	Administer/Report					
	Manage ELA					
<b>SLA Licensing</b>						
	Negotiate/Draft Contract					
	Review					
	Approve					
	Administer/Report					
<b>Policy</b>						
	Develop					
	Review					
	Approve					
	Administer/Implement/Report					
<b>Procedures</b>						
	Develop					
	Review					
	Approve					
	Administer/Implement/Report					

**LOJIC Operational Functions and Responsibilities (Cont.)**

Function	Sub-Task	Responsible Group				
		Policy Board	Steering Committee	LOJIC Manager	Managing Partner Agency	LOJIC Staff
<b>Infrastructure</b>						
	Create					
	Maintain					
	Administer					
	House					
	Monitor					
<b>Planning</b>						
	Strategic Business Plan					
	Develop Workplan					
	Implement Workplan					
	Resource Allocations					
	Project Management					
	Succession					
<b>Staffing</b>						
	Identify / Justify Need					
	Review					
	Approve					
	Manage/Administer/Reporting					
	Evaluations					
	Succession Planning					
<b>Outreach / Marketing</b>						
	Identify Opportunities					
	Expand / Refine Brand					
	Approve					
	Set / Establish Goals					
	Identify Training Needs					
	Implement Training					
	Coordinate Communication					
	Manage Feedback from Stakeholders					

**2) In what ways can LOJIC or its individual partners either generate revenue or offset the costs of operating LOJIC?**

In its investigation of potential revenue sources and cost offsetting measures, the LOJIC SI Team utilized the Best Innovative Practices Profile Report (CS-BIPPR) assembled by Crowell-Schulte IT Consultants as well as input solicited through interviews with experts associated with various aspects of the GIS industry. The research survey conducted by Crowell-Schulte obtained feedback from 38 municipal and state GIS organizations across the United States and Canada. The team gave consideration to data sales as a revenue generator through the core consortium, as well as other potential options pertinent to LOJIC and/or individual partners.

## **DATA SALES**

- According to the CS-BIPPR, about half of survey Respondents indicated that funding comes from User Fees (charge-back services) or Sales of GIS Products/Services. The survey did not request information about the percentage of overall GIS program budgets contributed by the different sources but comments from respondents indicate that, in most cases, User Fees and Product/Service sales do not contribute or provide major revenue for most of the Respondents (CS-BIPPR p.24).
- While it is tempting to simply increase fees for standard data provision services, there appears to be little flexibility in Kentucky Revised Statutes (KRS) or other legal directives regarding the ability of public entities to recoup costs or generate revenue in such a manner. There appears to be an overall trend toward lowering or eliminating fees for standard data products (CS-BIPPR p. 24), and the increasing emphasis on “open data” will likely drive a continued decline in data requests from both the general public and commercial enterprises.
- The consensus of interviewed GIS industry experts and surveyed municipal GIS entities is that data sales may offer a method to recoup a portion of the cost of providing such services, but this practice has not proven to be a significant revenue stream. Industry experts also offered a common point of view that spending a disproportionate amount of time focused on a revenue stream with limited return is effort that is not being spent on identifying opportunities to better leverage the value of the system. This is where the highest payback potential lies.

## **RECOMMENDATION #1:           SELECT AND IMPLEMENT FEASIBLE COST OFFSET OPTIONS**

- Expand User Base to Surrounding Counties  
LOJIC currently serves Jefferson County, Kentucky and provides some form of licensing and/or data sharing services to the adjoining counties of Oldham and Bullitt. The Consortium has a system architecture and personnel knowledge base with the potential to provide core GIS services (especially web-based) to surrounding counties at a greatly reduced cost compared to funding their own GIS departments. Revenue is generated by leveraging the capacity of the LOJIC system and applications already in place to provide these services without a significant cost outlay. This model has been implemented successfully by private enterprises that have developed generic applications licensed to multiple municipalities. Pursuing this strategy would require an aggressive and focused effort to market these services by LOJIC staff.
- Market Services  
An additional approach that was discussed for generating funds by leveraging LOJIC expertise was the marketing/providing of GIS services (e.g. spatial analysis, custom maps and/or application production for commercial entities at a profit). Similar to offering services to adjoining counties, this would be a means of leveraging LOJIC’s expertise and skill sets. One potential barrier to this tactic is determining the legality of a publically funded organization such as LOJIC offering services in direct competition with private sector contractors/consultants. An additional risk is that these services could end up competing for priority with LOJIC partner needs (the primary mission) if LOJIC is inadequately staffed to accomplish the work. This option has potential but should be adequately vetted before moving forward.
- Grants  
According to the CS-BIPPR (p.25) Grants from outside organizations have been used in about a third (12) of the responding programs. These Grants typically do not provide major funding as

a percentage of the overall operational budget and are usually one-time sources intended to provide funds to support specific projects such as GIS database development. There is also a great deal of administrative overhead and expertise associated with pursuing such Grants. As a mature GIS, LOJIC's core data and operations would likely not benefit from Grants, but the potential is there for major projects driven by individual or joint LOJIC partner needs. This might have particular relevance in the areas of public health, public safety and social services. The application for such funding would be driven by the partner and may be facilitated by LOJIC if staff is involved with development. In such scenarios it is important to note that the actual cost of LOJIC participation be factored in and not viewed as "in kind" services.

- Transaction Fees % (Permits, Plats, etc.) Earmarked for LOJIC  
According to the CS-BIPPR (P.25), there were a number of survey respondents who reported funding through the allocation of a portion of permit or other government transaction fees. While a minority of the survey respondents use this funding mechanism, it delivers significant revenue for several organizations including MCAMLIS, Johnson County AIMS, and Nashville Metro GIS. This may be due to legislative/legal requirements, as well as the fact that increases in any fees are generally unpopular. Some entities reported the use of fees associated with land transfer recording and other transactions or services associated with property/parcels. Jefferson County PVA has already implemented a service provision model to fund its GIS in this manner.
- Capital Project % Cost Allocation  
MSD and LWC are the only two LOJIC Partners that perform capital construction work. Allocating a small percentage of the cost for each capital project to LOJIC would ease some of the burden on the respective Operations and Maintenance budgets. MSD already designates 20% of capital project cost to a force account designated for overhead, but with no specific earmark for LOJIC. This methodology is done in lieu of individuals charging time to specific projects. LWC does not currently have any cost allocation to overhead, and staff charge time to each capital project. Though not specifically a cost offset methodology, this approach might provide a mechanism to more closely tie the use of LOJIC as a resource to the construction/installation of capital assets facilitated by the use of LOJIC data.

## **RECOMMENDATION #2:           EXPAND LOJIC USE TO MAXIMIZE RETURN ON INVESTMENT**

Considering inputs from industry experts, examples from other consortia and even input from within LOJIC itself, the LOJIC Strategy Innovation Team has determined that the most significant cost offsetting strategy for LOJIC partners is not through fees associated with core services or data. Rather it is to aggressively pursue the efficiencies and effectiveness achieved by leveraging the GIS as an "enabling" technology throughout and across organizational operations. The Croswell-Schulte reports support this as well by recommending that the best way to maximize benefits from the GIS investment is to further expand the user community and its uses within the partner agencies. This is typically accomplished through the development of prioritized strategic objectives that are supported by spatial data/technology. The ROI for using LOJIC's core data for rudimentary browse/query alone is limited. However, when recognized as an essential building block for generating solutions that support or enhance business or organizational processes, the returns on investment are virtually unlimited. This focus on "multi-generational GIS" is where the largest rewards lie.



### **3) On what should the percentage cost responsibilities for the LOJIC partners be based, and how much should that be for each partner?**

The survey of municipal GIS organizations performed by Crowell-Schulte (CS-NS) revealed no single model for determination of cost sharing exhibited among municipal GIS consortia. The Consultant's report indicated there is a wide array of funding splits among other GIS partnerships that are dependent on the make-up of the specific group. Some municipalities split costs equally among partners, while others divide cost responsibilities based on how the Consortium's resources are used. One size does not fit all.

The partners should consider that the cost of operating LOJIC goes hand-in-hand with the expectations placed on the Consortium by its members. An excerpt from the Crowell-Schulte report Recommendations on LOJIC Governance, Funding and Operational Improvements (p.77) states:

*"The LOJIC stated mission and past strategic planning targets a broad user environment that includes the main partner organizations, licensee organizations, and the broader regional community of users that includes businesses, community groups, and the general public. LOJIC operations and the products and services it provides has done a reasonably good job in supporting this broad user community, but availability of resources and formal work programs of the LOJIC staff and GIS management and staff in partner organizations have not always addressed that broad community."*

With this statement, Crowell-Schulte clearly endorses expanded investment in LOJIC to bolster its capabilities; however, the most immediate hindrance to the long term viability of LOJIC appears to be the existence of disparate points of view among the Partners regarding what the Consortium staff are expected to provide in the way of services (Appendix 2), as well as the costs associated with providing those services. For partnership cost responsibilities to be fairly split, it must first be agreed upon exactly what the partners want LOJIC to be.

- Should LOJIC be solely a provider of base mapping?
- Should LOJIC provide application development and project management services and, if so, for whom?
- What level of user technical support is expected from consortium staff?
- If LOJIC is expected to "modernize" the delivery and use of geospatial technology and data, can it innovate and support those actions given current staffing and funding?

When considering the cost of LOJIC, each partner must also consider the responsibility for elements of the GIS (IT architecture/servers, software licensing/administration, staff/technical support, etc.) that would fall to individual partner agencies or departments in lieu of participating in the consortium.

#### **RECOMMENDATION #1: RESUME PRE-2010 COST SHARING**

As a result of the 2009 economic downturn, MSD agreed to temporarily subsidize all LOJIC operational expenses with the exception of annual expenses for Esri ELA, and licenses for Citrix, Oracle and SUN required to maintain the LOJIC network. Partner funding shares of LOJIC capital budget remained constant, but from FY10 through FY15, MSD has carried from 75% to 80% of LOJIC annual operational expenses, a net MSD subsidy of over \$2.7 million (Appendix 3).

Based on the current partnership environment, the Croswell-Schulte analysis of LOJIC and other municipal GIS entities with similar characteristics concluded there is nothing to indicate that the original partnership funding percentages are grossly inequitable when considering the following:

- Number of users
- Level of support required
- Use of, and dependency on, LOJIC developer resources
- Use of, and dependency on, LOJIC IT Architecture

The Croswell-Schulte Report (CS-GFOI, p.78) endorses the *“restoration of the prior contribution levels as it realistically represents the user communities in main partner organizations”*. This supports a return to the following funding shares for LOJIC annual operations and capital expenditures:

Louisville Metro	40%
MSD	35%
LWC	20%
PVA	5%

As stated above, this recommendation is based on an assessment of the current utilization of LOJIC resources (Appendix 4 & Appendix 5) supported by the findings of Croswell-Schulte IT Consultants. **Further adjustments to the cost responsibilities will require focused deliberation and negotiation among the LOJIC partners at the Policy Board level, and should be addressed with urgency to ensure the health viability of the consortium.**

#### **4) What applications can/should LOJIC develop that will have the greatest impact on and benefit for the user community?**

During the Discovery Phase the LOJIC SI Team determined that there are considerable opportunities for expanded user community benefits through applications development. To determine application possibilities, The LOJIC SI team reviewed responses from 1) internal and external user surveys developed by the team, 2) reports from Croswell-Schulte IT Consultants, and 3) the Team’s own perceptions based on need from each agency regarding additional applications that should be considered for development. The entire SI team then ranked the applications by perceived level of priority independently and then averaged the rankings to determine the highest priority applications according to the group as a whole. The team then reviewed the top 10 applications for internal and external applications to determine feasibility and include them in this report. Open Data was a high ranking application; however, that topic is addressed as another area of consideration in this report.

Effort Level:

Staff Time categories: Low (0 to 50 hours), Moderate (50 to 400 hours), High (400 to 1000 hours), Very High (more than 1000 hours).

Cost:

Direct Cost includes expenditures for vendors, contractors, and other monetary costs with categories: Low (0 to \$20,000), Moderate (\$20,000 to \$50,000), High (\$50,000 to \$200,000), Very High (more than \$200,000).

**External Applications or services:**

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
<b>Road Closure Application</b>	<p><b>Description:</b> The purpose of this app would be to provide a graphic way to show road closures around Louisville Metro. These closures may be due special events (parades, runs, etc.), construction (Ohio River Bridge Project), maintenance (repaving), or emergencies (flooding). <b>Feasibility:</b> From a technology aspect, LOJIC currently has the software and skills to develop this application. Metro Public Works currently has a Road Closures map built on ArcGIS Online but the data is not updated in timely matter. Esri has developed a Road Closure Emergency Management solution (<a href="http://solutions.arcgis.com/emergency-management/help/road-closures/">http://solutions.arcgis.com/emergency-management/help/road-closures/</a>) that includes a data template, ArcGIS Desktop to create the service, ArcGIS Online for Organization to create the application and ArcGIS Server to provide the service. Another good example of a road closure application is New York City at <a href="http://gis.nyc.gov/streetclosure/">http://gis.nyc.gov/streetclosure/</a>. The biggest challenge is creating and maintaining an accurate and timely GIS road closure data layer. Several Government entities or stakeholders are involved in road closures. They include the Kentucky Transportation Cabinet, Metro Public Works, Metro Code Enforcement, Metro Emergency Services and MSD. Several types of road closures require permits (special event and construction) so some of the information may exist in the Hansen database. In the past, efforts to coordinate all stakeholders involved in road closures have failed to produce viable data. Success probably depends on finding a major stakeholder to lead the coordination of the creation and maintenance of the data. <b>Resources:</b> LOJIC technical staff and Metro IT staff has the software and skills to create an application. However, the road closure data will need to be created and a process of maintaining the data would need to be established.</p>	Web Application	Moderate	Low  There would be minimum cost to create the application as all software needed is currently available within the LOJIC system as well as the skills to create the data, services and application. The majority of time and cost would be spent on creating and developing a process to maintain the data.	It is recommended that the creation of the application be pursued. However, a major stakeholder needs to be secured to coordinate all the stakeholders and get them to commit to providing accurate and timely information. The major stakeholder probably should come from Metro Government as it contains most of the stakeholders involved. Metro IT and LOJIC technical staff can serve as support to the stakeholders. A good phase 1 goal could be to create an application with only the permitted closures (special event and construction) with a phase 2 goal expanding to closures that are more temporary (emergencies like flooding, traffic accidents, fires, etc.).

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
<b>Route App/Service (From here to there)</b>	<p><b>Description:</b> The purpose of this service or app is to allow a user to enter multiple addresses and see a map of the route and/or written directions. It could be a standalone app or a service within an app. The Jefferson County Clerk is waiting for LOJIC to create this service for inclusion in their "Where Do I Vote?" to show citizens a map from the entered address (typically their residence) to their polling location. Could be used via the service option within public facing applications to route citizens from points of interest to another.</p> <p><b>Feasibility:</b> LOJIC staff has the data and technology to support a routing application service. LOJIC staff has been testing a street centerline network that has been used on a limited basis internally. One identified issue has been the network update process as the street centerline data used to create the network is update daily. Further exploration needs to be done to better defining the network update process and the update network interval.</p> <p><b>Resources:</b> LOJIC Technical staff currently has the data, software and skills to create and develop a tool or widget that can be incorporated into an application or to create a standalone application.</p>	Web Service or Application	Low to Moderate	<p>Low</p> <p>There would be a minimum cost to create a routing tool as all software needed is currently available within the LOJIC system as well as the skills to create the data, services and tools and/or applications.</p>	It is recommended that the creation of a routing service with routing tools and/or applications be created. Additionally, it was recommended by the SI consultant as an application to be developed.
<b>Route Planner (Traveling Salesman)</b>	<p><b>Description:</b> The purpose of this service or app is allows users to enter or import a list of addresses to find the optimal route between them. The primary use for this would be to efficiently route employees to a wide range of sites.</p> <p><b>Feasibility:</b> LOJIC staff has the data and technology to support a routing application service. LOJIC staff has been testing a street centerline network that has been used on a limited basis internally. One identified issue has been the network update process as the street centerline data used to create the network is updated daily. Further exploration needs to be done to better define the network update process and the update network interval.</p> <p><b>Resources:</b> LOJIC Technical staff currently has the data, software and skills to create and develop a service and a tool or widget that can be incorporated into an application or to create a standalone application.</p>	Web Service or Application	Low to Moderate	<p>Low</p> <p>There would be a minimum cost to create a routing tool as all software needed is currently available within the LOJIC system as well as the skills to create the data, services and application. Because it is more complex, it would probably take more time to develop than the Here to There routing tool.</p>	It is recommended that the creation of a routing service with route planner application be created. This may be a good candidate requiring a subscription for external users. Additionally, it was recommended by the SI consultant as an application to be developed.
<b>Place names Service</b>	<p><b>Description:</b> The purpose of this service is to provide a list of landmark or place names that is linked to a geographic</p>	Web service	Moderate	Low	It is recommended that the creation of this service be pursued. However, an ad hoc

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
	<p>identifier (address or x, y coordinate) that allows users to query and go to it in an interactive map. This would be a service embedded in an application and would probably not be a standalone app. Used in combination with an address lookup. (Humana Building, Slugger Field)</p> <p><b>Feasibility:</b> Like the road closure application, the major issue with creating a place name service is creating accurate and timely data and developing a plan to maintain it. LOJIC currently has the software and skills to develop this service. LOJIC staff has created a common name place table by merging several published LOJIC layers. However, this table has not been maintained.</p> <p><b>Resources:</b> LOJIC technical staff has the software and skills to create a service. However, the common name place data will need to be reviewed and a process of maintaining the data would need to be established.</p>			<p>There would be minimum cost to create this service as all the software needed is currently available within the LOJIC system as well as the skills to create the data, services and application. The majority of time and cost would be spent on review and developing a process to maintain the data.</p>	<p>committee consisting of the LOJIC Partner agencies needs to be formed to review the current common name place table, develop an update process and define a procedure and standards for adding places to the list that may not be in a published layer. (I.e. Hogan's Fountain Pavilion)</p> <p><u><a href="#">This was also recommended by Crowell-Schulte (CS-GFOI) page 32 – DA6</a></u></p>
<p><b>Enhanced Snow Route Information</b></p>	<p><b>Description:</b> The primary enhancement to the Metro Snow Route application would be to add plow locations for more real time information. Consider making cloud based to handle spikes in service.</p> <p><b>Feasibility:</b> Adding real time data requires 2 major additions to the LOJIC system. Metro Public Works needs to procure the equipment needed to capture the real time data and LOJIC needs deploy the ArcGIS GeoEvent Processor for Server to process and display the data. Although they have tried several times by putting out requests for proposals, Metro Public Works has not been able to secure funding for the equipment. However, LOJIC's Esri Enterprise License Agreement (ELA) that renews in February 2016 will include GeoEvent Processor for Server. However, if the data can be acquired is it very feasible that a usefully application can be created like the Warrior Watch by the City of Columbus, Ohio. <a href="http://warriorwatch.columbus.gov/">http://warriorwatch.columbus.gov/</a></p> <p><b>Resources:</b> LOJIC and Metro Public Works staff has the necessary skills to create and maintain basic data, services and applications, real time plow location data is not available and GeoEvent Processor for Server will not be available until 2016.</p>	<p>Web Application</p>	<p>Moderate</p>	<p>Very High</p> <p>The bulk of the cost will be in the acquisition and maintenance of the real time plow location data which could be from \$200,000 to \$300,000. There would also be a cost for cloud data storage. There should be no additional cost for software.</p>	<p>Until Metro Public Works can acquire the equipment and real time data, real time data enhancements cannot be added. In the mean time, Metro Public Works is making minor enhancements like adding Trimarc camera feeds to the existing application. Exploring the use of cloud storage is recommended to handle spikes for usage during a snow event.</p>
<p><b>PVA Subscription service linked to LOJIC Online Map</b></p>	<p><b>Description:</b> Although there is currently a link from the PVA Subscription to the LOJIC Online map, this enhancement would allow a user to open to the PVA Subscription service</p>	<p>Web Application</p>	<p>Low</p>	<p>Low</p> <p>There may be a cost to</p>	<p>It is recommended that the creation of link be pursued. This would benefit current PVA subscribers and would drive new customers to</p>

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
	<p>from the LOJIC Online Map.</p> <p><b>Feasibility:</b> LOJIC staff has the skills to add this link to the LOJIC Online map with minimal effort. It would require setting up a process to pass a property identification parameter like the LRSN to the PVA Subscription site. It would require work from the PVA Subscription site consultant for the PVA to setup an authentication process to allow subscribers to log into the PVA site.</p> <p><b>Resources:</b> LOJIC staff currently has the resources to complete this enhancement to the LOJIC Online Map.</p>			<p>the PVA for the staff time used by their consultant to complete this project.</p>	<p>the PVA Subscription Map.</p>
<p><b>Products Estimator App</b></p>	<p><b>Description:</b> The purpose of this app is to allow customers to determine cost estimates for custom digital or map products online, eliminating the need for involvement in cost estimates of LOJIC staff. This app would allow customers to select their project area, select needed data layers and specify a data format or map size, scale and format. This cost estimate should be able to be saved so that an estimate can be converted to a product if needed. Since the beginning of 2015, LOJIC staff has processed 28 product requests per month that require cost estimates. It took LOJIC staff 14 to 21 hours to process these estimates. 25% of these products were not converted to products. At a staff cost of \$50.00 per hour, the estimates not converted cost about \$260 per month or \$3,120 per year.</p> <p><b>Feasibility:</b> LOJIC staff most likely have the skills to develop this application but they would need to spend time researching and developing a work plan as this would be a new type of application for them. ArcGIS Online may be able to be used and perhaps a feature service.</p> <p><b>Resources:</b> LOJIC staff currently has the resources to complete this app.</p>	<p>Web application</p>	<p>Moderate to High</p>	<p>Low</p> <p>There would be minimum cost to create the application as all software needed is currently available within the LOJIC system.</p>	<p>It is recommended that the creation of link be pursued. This would free up staff time, prevent the lost of over \$3,000 per year, and make it easier and quicker for customers to order the products they need which may cause an increase of products ordered.</p>
<p><b>Mass Mail Generator</b></p>	<p><b>Description:</b> The purpose of this app is to generate a mailing list for a user specified area either through a geographic selection (Metro Council District) or from a user selection area (unique graphic or buffer) with only deliverable addresses. Should also search by type (Residential, Businesses, Both).</p> <p><b>Feasibility:</b> Due to third party agreements with mailing vendors, it is not probable that USPS would allow this app to be made available to the general public.</p> <p><b>Resources:</b> NCOALink Systems</p>	<p>Web application or service</p>	<p>NA</p>	<p>NA</p>	<p>Due to licensing limitations, it is recommended to not pursue this application for external users. However, this may be a viable internal user app.</p>

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
<b>Data Product generator and pay online</b>	<p><b>Description:</b> The purpose of this app is to allow LOJIC products customers to use the project specifications set in the Products Estimator app, generate the product, complete an Open Records Request and pay the fees associated with the request (data cost recovery and processing fees) from an internet site.</p> <p><b>Feasibility:</b> LOJIC staff most likely have the skills to develop this application but they would need to spend a substantial amount of time researching and developing a work plan as this would be a new type of application for them. It is highly likely that they would need assistance from a third party to develop payment procedures. There would also be a substantial amount of research need to develop policies to process Open Records Requests online.</p> <p><b>Resources:</b> It is not know if LOJIC currently has all the resources needed to develop this app.</p>	Web application	Very High	High	This should not be pursued until after the Products Estimator app is created.
<b>Translate LOJIC Online for Mobile Devices</b>	<p><b>Description:</b> Revise the existing LOJIC Online Interactive Map to function properly on mobile devices, specifically tablets and not phones. This would not be a complete redesign.</p> <p><b>Feasibility:</b> LOJIC staff currently has the software, skills and equipment to accomplish this update. Currently, 80% to 90% of the map functions in the mobile environment. Some of the tools do not function properly in the mobile environment but all the services and navigation tools function properly.</p> <p><b>Resources:</b> LOJIC staff now has tablets available for testing.</p>	Web Application	Low to Moderate	Low  There would be a minimum cost to update the LOJIC Online Map for mobile use as all software and equipment needed is currently available within the LOJIC system as well as the skills to update the application.	It is recommended that LOJIC staff update the LOJIC Online Interactive Map to function on mobile tablet devices. Making LOJIC maps more accessible in the mobile environment has been requested by LOJIC’s internal and external customers. It is important to keep this contained to an update to the current application and resist the urge to make it a complete redesign, delaying its completion.  <u><a href="#">This was also recommended by Croswell-Schulte (CS-GFOI), page 28 – DA2</a></u>

**Internal Applications or services:**

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
<p><b>Route Planner (Traveling Salesman)</b></p>	<p><b>Description:</b> The purpose of this service or app is to allow a user to enter multiple addresses and see a map of the route and/or written directions. It could be a standalone app or a service with an app. This could be used by inspectors for both MSD and Metro to route addresses to inspect according to the most efficient routes. This would gain efficiencies for those users. Could be used via the service option within applications to route staff from points of interest to another</p> <p><b>Feasibility:</b> LOJIC staff has the data and technology to support a routing application service. LOJIC staff has been testing a street centerline network that has been used on a limited basis internally. One identified issue has been the network update process as the street centerline data used to create the network is updated daily. Further exploration needs to be done to better define the network update process and the update network interval.</p> <p><b>Resources:</b> LOJIC technical staff has the software and skills to create a service.</p>	<p>Web Application</p>	<p>Moderate</p>	<p>Low</p>	<p>It is recommended that the creation of a routing service with routing tools and/or applications be created. <u>This was also recommended Croswell-Schulte (CS-GFOI), page 69– Table 9</u></p>
<p><b>Route App/Service (From here to there)</b></p>	<p><b>Description:</b> The purpose of this service or app is to allow a user to enter multiple addresses and see a map of the route and/or written directions. It could be a standalone app or a service with an app. This would be a great addition to our web applications and mobile applications.</p> <p><b>Feasibility:</b> LOJIC staff has the data and technology to support a routing application service. LOJIC staff has been testing a street centerline network that has been used on a limited basis internally. One identified issue has been the network update process as the street centerline data used to create the network is update daily. Further exploration needs to be done to better defining the network update process and the update network interval.</p>	<p>Web Service</p>	<p>Moderate</p>	<p>Internal: Low Contracted: High</p>	<p>It is recommended that the creation of a routing service with routing tools and/or applications be created.</p> <p><u>This was also recommended by Croswell-Schulte (CS-GFOI), page 69– Table 9</u></p>



Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
<b>Place Name Service</b>	<p><b>Description:</b> The purpose of this service to provide a list of landmark or place names that is linked to a geographic identifier (address or x, y coordinate) that allows users to query and go to it in an interactive map. This would be a service embedded in an application and would probably not be a standalone app. This would be used in several other applications for ease in identifying those locations</p> <p><b>Feasibility:</b> Like the road closure application, the major issue with creating a place name service is creating accurate and timely data and developing a plan to maintain it. LOJIC currently has the software and skills to develop this service. LOJIC staff has created a common name place table by merging several published LOJIC layers. However, this table has not been maintained.</p> <p>Resources: LOJIC staff and Metro resources</p>	Web Service	Low	Low	<p>Like the road closure application, the major issue with creating a place name service is creating accurate and timely data and developing a plan to maintain it. LOJIC currently has the software and skills to develop this service. LOJIC staff has created a common name place table by merging several published LOJIC layers. However, this table has not been maintained.</p> <p><u><a href="#">This was also recommended Croswell-Schulte (CS-GFOI), page 32 – DA6</a></u></p>
<b>Address Verification Service</b>	<p><b>Description:</b> This service would accept an address or x, y coordinate as input and return true/false that the address is valid, in addition to the properly formatted address that should be stored for consistent and accurate lookup results.</p> <p><b>Feasibility:</b> This project is desirable in that it would allow us to verify addresses prior to saving them in many different areas throughout Metro and the Partnership as we all need address data. There are issues with implications: The data needs clean-up work, mainly due to assets being added that are sections of I65, intersection. Through discussions with LOJIC staff we identified LOJIC has a DOJO Widget that can be deployed to other partners for their projects. Foundation is here for other projects going forward.</p>	Web Service	Low	Low	It is recommended to continue building the application for additional needs.
<b>Mass Mail Generator</b>	<p><b>Description:</b> Tool used to enter zip codes, a buffer around an address, and search type (Residential, Businesses, Both) and return the address information for the area in question. This has been requested previously by Council Members and could be used by all partners to generate mailings.</p> <p><b>Feasibility:</b> This application needs more research to decide how to proceed. The application could be used to clean our data or used only for processing the current list. LOJIC staff previously attempted</p>	Service	Moderate	Moderate	It is recommended to proceed with finding a provider for this application.

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
	working this with the USPS but they were not cooperative. Probably the best way to achieve results for this is to use a service provider. Issue is the data – would need to add an attribute to the data for things that are not addresses and then continually clean the data <b>Resources:</b> NCOALink Systems				
<b>Viewer or tool for saving viewer parameters (Save layers checked on) and markup graphics or text</b>	<b>Description:</b> This would be a tool created for partner users who are not GIS experts but need to provide maps, aerial views of properties, write text regarding these maps/properties, circle, underline etc. Then be able to save that completed map product to a user area for updates later. Similar to products estimator save shape or graphic. <b>Feasibility:</b> Implementing this is more cost effective than for users in ArcGIS desktop and the learning curve is lower. <b>Resources:</b> training, and conducting needs assessments for build. Monitoring of ArcGIS Online subscriptions would be needed.	Web Application	Low	Moderate –if we need to purchase additional ARCGIS ONLINE licenses	Recommendation is to implement using ArcGIS Online.  This is the most cost effective way would be to use ARCGIS Online for Organizations to be managed by LOJIC. LOJIC will have a subscription for 50 users, beginning in 2016
<b>Capital Projects</b>	<b>Description:</b> Goal for this project is to create a tool that all Partners can use when a capital project is occurring in order to coordinate only destroying, repaving once instead of multiple times on the same area. This would be one view for all and they would need to be notified when updates occur. This would save costs for paving, construction, etc. <b>Feasibility:</b> This has been attempted several times in the past and in order to succeed would need a strong project champion. Consider making this a public application so all non-contributors can see the data to assist in planning. This includes, TARC, Police, and Fire. <b>Resources:</b> Staff members from each partner to update the data and therefore the sustainment of the project.	Web Application	Moderate	Low	It is recommended to proceed with this project, provided there is a strong stakeholder assigned to this project.  <u>This was also recommended by Croswell-Schulte (CS-GFOI), page 69– Table 9</u>
<b>Hansen Data Viewer (i.e. permits, citations, etc)</b>	<b>Description:</b> Initial goal would be to feed all spatial information from Hansen into a layer or layers in LOJIC so that the consortium could use it to visualize permits, demolitions, service requests and property maintenance cases easily on a Map. MetroCall would	Web Application Desktop	Moderate	Low	<u>It is recommended to complete this project.</u> <u>This was also recommended by Croswell-Schulte (CS-GFOI), page 35 – DA15</u>

Application or Service	Description	Platform	Level of Effort	Cost	Recommendation
	<p>like to be able to incorporate mapviews into Hansen or HARP for easy viewing between Service Requests.</p> <p><b>Feasibility:</b> Further research is required but the main resource required would be staff time to familiarize themselves to the data</p> <p><b>Resources:</b> Metro staff would be required to identify what data is needed from Hansen to provide for display.</p>				
<p><b>Migrate appropriate desktop apps to ArcGIS Online</b></p>	<p><b>Description:</b> There are several apps that are currently being used throughout the partnership that are for basic query/edit functions that are in stand-alone desktop apps. This would require and assessment of existing needs and services. Plan would be to update groups of viewers and not editors. Examples are the Census Tools, Farm Assessment App</p> <p><b>Feasibility:</b> These could be moved to the ARCGIS ONLINE to eliminate dependencies on particular versions of the ESRI software and would make upgrading these tools and the LOJIC environment easier in the future.</p>	<p>ArcGIS Online</p>	<p>Moderate</p>	<p>Low</p>	<p>Implement using ArcGIS Online.</p> <p>This is the most cost effective way would be to use ARCGIS Online for Organizations to be managed by LOJIC. LOJIC will have a subscription for 50 users, beginning in 2016.</p>
<p><b>Develop app with basic query capability</b></p>	<p><b>Description:</b> Application to give users access to query the information in LOJIC and get back data without having to go through desk top ESRI tools. This application would allow users to choose queries based on selections, not open query building.</p> <p><b>Feasibility:</b> This could make the GIS more accessible to a broader base of users and eliminate the number of users covered by the ELA agreement</p>	<p>Web Application/ArcGIS Online</p>	<p>High</p>	<p>Low if developed in-house</p> <p>Moderate – High if we need to purchase additional ARCGIS ONLINE licenses</p>	<p>Recommend implementing this application. Need further exploration to determine best implementation method.</p> <p>Two options are</p> <ol style="list-style-type: none"> <li>1. ArcGIS Online (explore using Portal)</li> <li>2. Custom Web Application.</li> </ol> <p>Could possibly use ARCGIS ONLINE with the LOJIC ARCGIS ONLINE Portal to avoid using credits</p> <p>ARCGIS Online for Organizations to be managed by LOJIC. LOJIC will have a subscription for 50 users, beginning in 2016.</p> <p><u><a href="#">This was also recommended Crowell-Schulte (CS-GFOI), page 69– Table 9</a></u></p>

## **5) What changes, if any, could/should be made to LOJIC’s system architecture and data storage strategies that will optimally position the consortium in today’s IT environment?**

LOJIC currently relies on MSD IT for network architecture and software license support required to house and serve all GIS software, data, applications and web services to partners. Over the past year MSD has upgraded or replaced major components of its IT software that directly benefit LOJIC, including upgrades to Citrix, Oracle, Windows Server, Hansen/Infor, replaced Virtual Infrastructure servers, added new SAN storage and implemented new system monitoring tools. MSD has worked to improve its IT architecture including data switch and line replacements and server upgrades. MSD has provided network and Oracle resources to support LOJIC’s upgrade to ArcGIS/Server 10.2.1 and acquired NAS to better store and serve LOJIC’s “big data”. MSD and LWC are currently collaborating on a shared disaster recovery and backup system/architecture and MSD will complete an overall IT strategic plan over the next several months. LOJIC will derive long-term benefit from improvements to MSD IT architecture, the process itself combined with significant recent turnover among MSD IT staff has, in the near term, impeded LOJIC’s software upgrade and some levels of direct user support.

### **RECOMMENDATION #1:            PERFORM COMPREHENSIVE SYSTEM REVIEW**

The SI Team recommends, upon complete deployment of LOJIC’s upgrade to ArcGIS 10.2.1, that LOJIC secure services from Esri or other IT consultants to perform an in-depth review of all system configurations, architecture and processes toward recommendations and technical specifications to improve accessibility, performance and reliability of the LOJIC GIS enterprise. It will be necessary for LOJIC to have a cohesive set of goals and objectives in order to accurately project the Consortium’s architecture for the future.

### **RECOMMENDATION #2:            RESEARCH BUSINESS CASE FOR CLOUD COMPUTING**

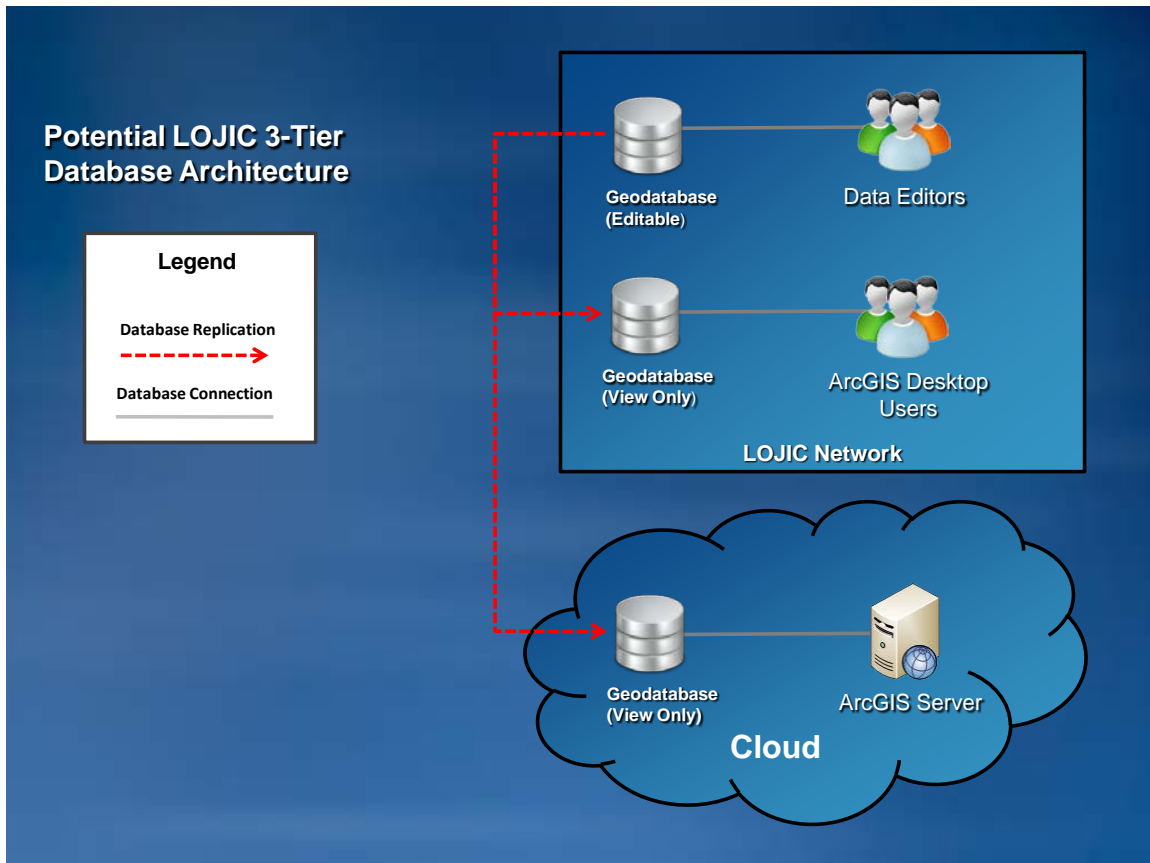
LOJIC should implement appropriate levels of on-premise and explore Cloud-based database replication and supporting architecture (see graphic below) to eliminate reliance on core production databases for all but mission-critical editing operations, including:

- On-premise production database (Oracle) consisting of a subset of only versioned data accessible via Citrix only to data editors within the LOJIC enterprise;
- Non-versioned, read-only, on-premise database (Oracle) accessible within the LOJIC enterprise via Citrix to support spatial analysis, mapping and general use by ArcGIS Desktop users;
- Non-versioned database, either on-premise or Cloud, and replicated from non-versioned database above to support ArcGIS Server and ArcGIS Online applications. Workflows and processes must be implemented for database replication from production servers to on-premise servers and/or Cloud to ensure data currency.

LOJIC should explore the feasibility of deploying a full Cloud-based (AGOL, EC2, or other) ArcGIS Server configuration to include all software, replicated data, web services and applications fully independent of other on-premise LOJIC/MSD resources. This configuration has several potentially significant benefits, with no negative impacts to the LOJIC enterprise, including:

- Increased up-time for web services, applications and data;
- Easy and open access to web services (e.g., via ArcGIS Online);
- Eliminates web traffic from on-premise LOJIC production servers;

- Reduced system outages and staff time for performing data and system maintenance;
- Ability to automatically scale up resources during peak usage.



**RECOMMENDATION #3: ADOPT A MOBILE STRATEGY AND STANDARDS**

LOJIC must develop and implement standards for software, design, device and operating system and make wider use of ArcGIS Online to support field/mobile GIS across partner agencies. LOJIC currently has no defined standards supporting field-based GIS applications for tablet computers and smart phones (software platform, design guidelines, device OS and type). With the exception of LWC, there is relatively little use of field/mobile GIS applications, but considerable opportunities for future applications exist. LOJIC partners, with support of IT personnel (and leveraging work already done at LWC), should prepare a basic set of standards that guide design and deployment of field/mobile GIS applications. Creating such standards would provide for a more unified development of field-based applications. Such a standard would address the following factors: a) mobile device types, features and operating system (for tablet computers and smart phones), b) wireless communication services, c) GPS-GNSS location specifications and capabilities, and d) server-based or mobile device software.

**RECOMMENDATION #4: EVALUATE DELIVERY ARCHITECTURE (e.g., ArcGIS Online)**

The national survey conducted by Croswell-Schulte indicated there is currently relatively little use of ArcGIS Online (AGOL). This may be a reflection that the technology is still evolving and the cost/benefit ratio is still a bit uncertain. As the platform matures, LOJIC should still explore the feasibility of

optimizing the performance of Esri software and other resources through adoption of Esri Local Government Data Models, workflows and out-of-the-box application solutions wherever feasible to enable LOJIC to be more responsive and nimble in providing solutions. Leveraging standard data models and Web App Builder templates would facilitate expanded use of ArcGIS Online, which in turn could reduce the demand for ArcGIS Desktop, simplify customized internal applications and lessen the reliance on third-party software products.

**All system architecture strategies are heavily reliant upon LOJIC partners having a well-developed strategy for their own business needs, as well as the unified visions of both the Steering Committee and Policy Board for how such an approach would serve the Consortium as a whole. All architecture decisions should have a defined plan and purpose to support operations rather than following the current IT “flavor of the month” or blanket recommendations from Esri.**

## 6) What steps can LOJIC take to strengthen, advertise and/or remake its brand, and promote awareness of how to use it?

The LOJIC SI team conducted a brainstorming session to come up with a list of actions for rebranding and promoting awareness of LOJIC as a valuable shared resource. Ideas were considered with the focus of driving expanded use and benefits from LOJIC. The team then grouped and ranked the actions based on perceived level of importance. The rankings were averaged to determine an overall level of importance. Based on the responses, actions were grouped into four categories: Branding, Feedback, Training, and Promoting Awareness. The top 3 Action Items from these categories are listed in the tables below.

### Recurring question:

Who are LOJIC's customers? - External/General Public/Open Data Developers, Consortium Partners/Licensees, can LOJIC collaborate with private firms?

### Effort Level:

Staff Time categories: Low (0 to 50 hours), Moderate (50 to 400 hours), High (400 to 1000 hours), Very High (more than 1000 hours).

### Cost:

Direct Cost includes expenditures for vendors, contractors, and other monetary costs with categories: Low (0 to \$20,000), Moderate (\$20,000 to \$50,000), High (\$50,000 to \$200,000), Very High (more than \$200,000).

### **Branding**

(Cross referenced recommendations from CS-GFOI - GM17, AP2)

Top 3 Ideas	Action Item	Effort Level	Cost
New logo/redesign logo to look like something related to mapping. Consider changing name – “LOJIC with no G, is confusing”.	Establish team to evaluate options, have competition with users to come up with new design	Med-high	Moderate - Could be expensive if need to outsource and replace logo on items
Distribute promotional Swag	Develop list of items, provide at user group meetings, training sessions, school events, ask consortium	Low	Low

	members to distribute items at various meetings.		
Promote events such as mayor day of service - map sites	Become more active in creating map displays for events. This could spark interest to the next gen employees of the consortium members.	Med- High, need the people to be in the know and available to produce the maps	Low

### Seek and Respond to Feedback

(Cross referenced recommendations from CS-GFOI - GM2, GM12, GM13)

Top 3 Ideas	Action Item	Effort Level	Cost
User group meetings with all users and individual agencies	Hold user group meetings and implement suggested changes	Mid-High	Low
Regular meetings with partner agencies, not just technical committee or steering committee	Hold group meetings and implement suggested changes	Mid-High	Low
Forum focus groups of internal users and external market groups - IE realtors, land attorneys, neighborhood groups.	Establish relationships with the various groups and engage them in group meetings	High, need to the resources and time to meet with the users and to implement the take a ways from these meetings	Low

### Training

(Cross referenced recommendations from CS-GFOI - GM10, GM11 )

Top 3 Ideas	Action Item	Effort Level	Cost
Host mini training/brown bag lunch demos	Host training routinely	Mid-High, need the people to organize and facilitate	Low
Host topical training webinars, in-person seminars	Host training routinely	Mid-High, need the people to organize and facilitate	Low
Provide instructional videos, YouTube, Metro TV	Host training routinely	Mid-High, need the people to organize and facilitate	Low

### Promoting Awareness

(Cross referenced recommendations from CS-GFOI - GM2, GM12, GM13, GM15, GM18 )

Top 3 Ideas	Action Item	Effort Level	Cost
Highlight Consortium, activities, services in publications	Determine which publications would best communicate the services/resources provided. Topics or areas to highlight would need to be determined.	Med, Time and resources to contact publications	Moderate
Promotion by policy board	They need to be more hands on. Do on-site tours of Consortium members use of GIS.	Low	Low

Participate in agency/community events	Become more active in creating map displays for events. This could spark interest to the next gen employees of the consortium members.	Med- High, need the people to be in the know and available to produce the maps	Low
--	--	--	-----

**RECOMMENDATION: DETERMINE CUSTOMER FOCUS AND ASSIGN TEAM**

The return on investment for marketing and potential rebranding of LOJIC is promoting the value of the services provided to both the partnering agencies and the community. The extent of this effort will depend heavily on having a common understanding of exactly who LOJIC’s customers are. In defining customer focus, consideration must be given to the fact that LOJIC means different things to different agencies and users. To some, LOJIC and its various application interfaces are the main resources for geospatial data and capabilities. For others, LOJIC is a behind the scenes facilitator that spatially enables workflows, operations and analyses through partner agency solutions. Both of these roles require very different marketing, education and support strategies. LOJIC’s primary customer focus will require discussion and agreement at the Policy Board level. Once that vision is clarified the SI Team recommends that a committee be formed to pursue the action items listed above with a well-defined customer focus.

**7) How will “Open Data” concepts and initiatives impact LOJIC mission and operations?**

What is Open Data? From the “Open Data Handbook”

- **Availability and Access:** the data must be available as a whole and at no more than a reasonable reproduction cost, preferably by downloading over the internet. The data must also be available in a convenient and modifiable form.
- **Reuse and Redistribution:** the data must be provided under terms that permit reuse and redistribution including the intermixing with other datasets.
- **Universal Participation:** everyone must be able to use, reuse and redistribute - there should be no discrimination against fields of endeavor or against persons or groups. For example, ‘non-commercial’ restrictions that would prevent ‘commercial’ use, or restrictions of use for certain purposes (e.g. only in education), are not allowed.

Why Open Data at LOJIC?

In October 2013, Louisville Mayor Greg Fischer signed Executive Order No. 1, Series 2013, “An Executive Order Creating an Open Data Plan”, that ordered Louisville Metro Government to review its data and make it more accessible to the public through an open data portal. GIS data was identified as one set of data that should be included in the open data portal. However, LOJIC’s current GIS data policies as endorsed by the LOJIC Policy Board, which are in accordance with KRS 61, establish data cost recovery fees on some of LOJIC GIS data layers utilized in a commercial manner. All LOJIC GIS data even the majority of the data layers that do not have a commercial fee associated with them, are only available from LOJIC upon request, but are not currently available through an online data portal. In spring of 2014, at the request of Louisville Metro Government, the LOJIC Policy Board approved the availability of a limited set of LOJIC GIS data on Louisville Metro’s Open Data site and agreed to consider recommendations for an Open Data Policy pertaining to LOJIC GIS data.



Limited Data sets approved by LOJIC Policy Board for inclusion on the Metro Government’s Open Data Portal:

Address Points	Emergency Warning Sirens	Olmsted Parkways	Streams
Alleys	FEMA Flood Plain	Railroads	Street Centerlines
Bikeways	Historic Areas	Recreation Areas	Traffic Signs
Buildings	Historic Markers	School Board Districts	U. S. Congressional Districts
Cemeteries	Metro and Olmsted Parks	Soils	Urban Neighborhoods
Community Ministries Areas	Metro Council Districts	Spot Heights	Vegetation Lines
Community Ministries Sites	Municipalities	State Legislative Districts	Water Bodies
Downtown Public Parking	Natural Areas	State Senate Districts	ZIP Codes

The catalyst for this Open Data initiative is a growing trend across the government community as more and more governments at all levels see the value of sharing their data in ways that benefit their communities and help them provide more efficient governments services. Indeed, all of the committee interviewees acknowledged the public expectation for open data that can lead to innovative uses of the data. As they pointed out, data cost recovery fees will not cover the cost to support a GIS. This has been true at LOJIC since its inception and fees have declined in the past few years.

Additionally, Croswell-Schulte cited the observation of this growing trend toward Open Data in their final recommendations and endorsed the gradual elimination of data cost recovery fees for data sales (excluding license agreements) and more focus on fees for services. (custom products, analysis, applications) The expansion of Open Data would occur at the same time to handle the demand for more data requests and was recommended that this be a High Priority. (F15, page 37)

Currently the majority of the LOJIC data layers have no data cost recovery fee so they are clearly Phase 1 candidates for an Open Data initiative.

It is already possible to point to a large number of areas where open government data is creating value. Some of these areas include:

- Transparency and democratic control
- Participation
- Self-empowerment
- Improved or new private products and services
- Innovation
- Improved efficiency of government services
- Improved effectiveness of government services
- Impact measurement of policies
- New knowledge from combined data sources and patterns in large data volumes

According to Esri’s 2014 Open Data year in review at <http://dc.esri.com/2014/>, more than 750 organizations around the world have joined ArcGIS Open Data, publishing 391 public sites, resulting in 15,848 open data sets shared. These organizations include more than 100 cities, 43 countries, and 35 US states. At the beginning of 2015, the organizations represented included 390 from North America, 157 from Europe, 121 from Africa, 39 from Asia, and 22 from Oceania. More than 42,000 shapefiles, KML files, and CSV files were downloaded from these sites since July 2014. Clearly, more and more government entities are realizing the advantages of providing data to their citizens.

Socrata, an Open Data Industry leader, has also seen demand increase in the first quarter of 2015 and generated 104% year-over-year growth in its customer base. It launched 46 new data-driven projects in the first quarter of 2015. Find more information at <http://www.socrata.com/>.

Some examples with some terms of use:

- Washington DC Open Data - <http://opendata.dc.gov/>  
Terms of use: <http://dc.gov/page/terms-and-conditions-use-district-data>
- Detroit Open Data - <http://d3.d3.opendata.arcgis.com/>, <https://data.detroitmi.gov/about>
- State of Maryland: MD iMAP - <http://data.imap.maryland.gov/>
- Lexington, KY - <http://data.lexingtonky.gov/>, <http://data.lexingtonky.gov/terms>
- City of Chicago - <https://data.cityofchicago.org/>
- Denver, CO - <http://data.denvergov.org/>, <http://data.denvergov.org/termsfuse>
- Louisville, KY - <http://portal.louisvilleky.gov/service/data>,  
<http://portal.louisvilleky.gov/content/terms-use-accessibility-data-policy>

Although all of these are beneficial for a community, the improved efficiency of government services directly benefits LOJIC through cost avoidance of staff time to process data requests.

Since Metro activated their open data portal in 2014, there have been nearly 22,000 views of the GIS data accessible via the portal. It is estimated that 25% of the views resulted in downloads. If these were processed by LOJIC staff, that would equate to 30 minutes to an hour of staff time per request or 2,750 to 5,500 hours. With increasing interest in open data, these requests will clearly increase.

Although there is definite cost avoidance, there is also a cost associated with providing on demand downloadable data via an open data portal. It is likely that the most efficient way to provide downloadable data is through web services following one or more of the following scenarios:

- Create dedicated web services for each partner based on the data layers they chose to provide in an open data portal. The time to build and maintain these services may be 40 hours per year. By creating dedicated partner web services, metrics can be generated based on usage.
- Open Data Portals can be built using ArcGIS Online or Portal for GIS both of which will be included in the renewed ELA starting in February of 2016.
- Create a dedicated, replicated database for exclusive use by the dedicated partner web services. This database may reside on LOJIC servers or in the cloud and cost associated with this may be \$10,000 to \$20,000 per year.
- Use of dedicated partner web services will help determine the cost to each partner for providing downloadable data in an Open Data Portal.

By providing GIS data to the general public, there are many innovative (entrepreneurial/academic) uses of the data that may not be imagined by the LOJIC Partners. Some uses already known are:

- Opportunity Space – using government property data to help the property be sold or used. <http://www.opportunityspace.org/>
- Zonability – a mobile app featuring zoning data. [www.zonability.com](http://www.zonability.com)
- Junk Picker app – app showing junk pickup areas/schedules to help junk pickers.
- Here – provides current streets and addresses to Esri base maps and other street base maps.
- Google – needs current streets and addresses to improve all apps using Google.

- Open Street Map – used by many including American Printing House for the Blind geotrigger apps and Ride the City Louisville. <http://www.ridethecity.com/louisville>
- Develop Louisville projects such as Urban Heat Island Study, Urban Tree Canopy Study, Preservation Green Lab Partnership

An Ad Hoc LOJIC Open Data committee has been formed to start this process but was suspended pending the outcome of the Strategic Innovation report.

Some keys objectives that this committee could address are:

- Determine which current published layers can be included in an open data portal by performing a data audit.
- Define reasons for layers not included. (Revenue generation, Security, Licensing Restrictions).
- Define costs associated to each partner to support their Open Data services on the LOJIC network.
- Define data standards for open data layers.
  - Metadata standards
  - Update schedules
- Define process for determining open data status for new layers.
- Determine open data formats.
- Present an open data policy to the LOJIC Policy Board for their approval.

**RECOMMENDATION:    DEFINE AND MANAGE OPEN DATA THROUGH ESTABLISHED COMMITTEE**

The LOJIC SI Team acknowledges that Open Data has become an essential component for any credible GIS as it expands the use of GIS data to a wider audience while reducing staff costs or by avoidance of cost. This is a growing trend among government entities as they promote innovation while increasing their value to the community. LOJIC should continue the work of the Ad Hoc Open Data committee to develop open data policies and procedures for the LOJIC Consortium for approval by the LOJIC Policy Board.

**CONCLUSION AND NEXT STEPS**

The LOJIC SI Team has a high level of confidence in the thoroughness and quality of the assessment of the Consortium as it exists today and what it should/could be in the future. Surveys conducted by both the SI Team and Crowell-Schulte indicate that people want more from LOJIC, but the keys are prioritization, resource allocation and funding. The multiple recommendations made by the Team cover a wide scope, ranging from operational to organizational, and should be viewed, not as a definitive road map, but as an indication of direction for LOJIC to head. All recommendations, regardless of the focus area, will require active engagement at the user, management and policy levels.

**PRIORITIES AND EXPECTATIONS**

The LOJIC SI Team emphasizes that the recommendations related to operational aspects of LOJIC (applications, architecture, services) can only be successfully implemented within a unified and strong organizational structure as made possible by the partners. With this in mind, the SI Team believes the greatest priority is for the partners, through the Policy Board, to solidify the foundation of LOJIC through a renewed formal written agreement including shared funding responsibilities, ultimately at the pre-2010 levels. Short of resuming pre-2010 partnership, governance and funding, the partners must

negotiate an alternate arrangement in LOJIC ownership, agency licensing, system and software access, shared databases and services necessary to sustain LOJIC operations.

Additionally, it will be necessary for the partners to reach mutual agreement on the role LOJIC is to play in the development of spatial data and technology for the partners and the community at large. What are the primary duties and responsibilities of LOJIC staff and what groups of users and needs are LOJIC expected to support going forward? Is LOJIC to support only current partners and licensees, the entire Louisville Metro Community, the multi-county region...all the above? In short, who are LOJIC's "customers"? Only after these foundational components have been defined and established by LOJIC partner agreement can relevant operational goals be targeted.

**Appendix 1**

**MEMORANDUM OF UNDERSTANDING**

**CONTINUATION OF THE LOJIC PARTNERSHIP**

This Agreement is made this            day of            , 2006, between the Louisville and Jefferson County Metropolitan Sewer District, (hereinafter referred to as MSD), Louisville Metro Government (hereinafter referred to as Metro), Jefferson County Property Valuation Administrator (hereinafter referred to as PVA); and the Louisville Water Company (hereinafter referred to as LWC); and collectively referred to as Louisville/Jefferson County Information Consortium (hereinafter referred to as LOJIC) Partners.

WITNESSETH, that whereas the parties desire to continue the partnership that previously existed between the LOJIC Partners for the purpose of operating and maintaining LOJIC; and

WHEREAS, in 1988, MSD and the former separate governments of Jefferson County and the City of Louisville executed individual partnership agreements for joint funding of data conversion, computer hardware and software required for the creation, ongoing management, maintenance and technical support of a computerized geographic information system (hereafter GIS) initially known as the Community Mapping and Data Management System and later known as LOJIC; and

WHEREAS, in 1989, the PVA and MSD executed a similar partnership agreement toward the same goals and objectives; and

WHEREAS, in 1996, the LWC and MSD executed a partnership agreement toward the same goals and objectives; and

WHEREAS, the LOJIC GIS has grown to include a rich array of spatial data and applications which are used by numerous local government agencies, utilities, various businesses and the public; and

WHEREAS, the LOJIC partnership has become a nationally recognized model of successful interagency collaboration and cooperation in the implementation and use of GIS technology; and

WHEREAS, in 2003, following the consolidation of Jefferson County and City of Louisville governments into Louisville Metro government, and upon the expiration of the original partnership agreements, the standing LOJIC Policy Committee entered into negotiations on future funding and management activities required for the continued operation, maintenance, expansion and mutual enjoyment of the LOJIC GIS as a beneficial and valuable shared community resource; and

WHEREAS, the LOJIC Policy Committee, which consists of a member appointed by the Chief Executive Officer of each of the LOJIC Partners, has defined and agreed upon appropriate shares of ownership and the need for funding for the perpetuation of the LOJIC partnership and continued operation of the community's shared GIS;

NOW THEREFORE, as attested by the signatures below, there is an agreement among the LOJIC Partners to continue the further development, management and maintenance of the LOJIC GIS as a shared resource for the benefit of the community, citizens, industry and government of Louisville Metro pursuant to the following terms and conditions specified in this Memorandum of Understanding (hereafter MOU) or any subsequent amendments hereto.

1. The allocation of shared annual operating and capital costs as may be deemed necessary for the continued operation and maintenance of the LOJIC GIS shall be:

Louisville Metro Government	40%
Louisville and Jefferson County Metropolitan Sewer District	35%
Louisville Water Company	20%
Jefferson County Property Valuation Administrator	5%

Subsequent new partners shall be assessed a pro rata share of the operating and capital costs of LOJIC, and any other costs deemed appropriate as determined by consensus by the LOJIC Policy Committee. If the Policy Committee cannot reach consensus on the pro rata share and other costs to assess a subsequent new partner, then the amount of the shared costs will be determined by a Policy Committee vote on any proposed costs to assess and each Partner's vote will be weighted according to the percentage share of operating and capital costs then being borne by that LOJIC Partner. Thereafter, the percentage of costs borne by the LOJIC Partners will be adjusted by reducing each Partner's total cost by their percentage of share multiplied by the amount being assessed to the new subsequent partner. The LOJIC Partners will also recover costs by providing LOJIC products and services to non-participating organizations and to the public and reduce, proportionate to the established pro rata share, annual cost to all partners.

2. The Chief Executive or the designated representative of each LOJIC Partner shall serve as a member of the LOJIC Policy Committee to provide general oversight of the continued implementation of the LOJIC GIS. They shall meet from time to time to review the policies and practices of the Partnership but no less than quarterly, and that any further policies, procedures, and/or amendments regarding this Agreement shall be jointly acted upon by the LOJIC Partners.
3. MSD shall continue to serve as the Project Management Agency on behalf of the LOJIC Partners. As Project Management Agency, MSD will provide office facilities, technical and administrative support staff, materials, procurement and legal support, records administration and other resources and guidance as may be deemed necessary by the Policy Committee for the ongoing operation and maintenance of the LOJIC GIS.

LOJIC operating and capital budgets will be prepared as part of MSD's annual budget process, and shall be reviewed and approved in advance by the Policy Committee. The LOJIC budget will include all necessary costs for the successful operation, maintenance and growth of the LOJIC GIS for the betterment of the Partners' internal operations and the citizens served by the Partners. As the Project Management Agency for the LOJIC

GIS, MSD will invoice the LOJIC Partners quarterly for the operating and capital costs and overhead of the LOJIC GIS based on the approved budget for the then current year.

As the Project Management Agency for the LOJIC GIS, MSD will also establish a LOJIC Reserve Fund to hold any budget surplus from year to year. The LOJIC Policy Committee will be responsible for allocation of funds from the LOJIC Reserve Fund for operating and capital expenditures. Any budget surplus will be used to fund operating and capital expenditures that are approved in future budget years. Any budget deficit will result in the reduction of the accumulated surplus, should any exist. If the accumulated surplus balance is not sufficient to cover the deficit, the Partners agree to immediately fund the remaining balance of the deficit in accordance with the contribution rates identified in Section 1 of this MOU. MSD agrees to maintain records in such a manner that financial statements, balance sheets and income statements can be produced relating to LOJIC operations. These financial statements will be made available to the LOJIC Partners on at least a quarterly basis.

4. Each LOJIC Partner agrees to take the appropriate steps within the framework of their organization to allocate the funds needed to support their share of the LOJIC GIS operational, maintenance and capital costs as budgeted on an annual basis.
5. LOJIC technical staff shall be organized as a separate department within MSD's overall organizational structure, and will be responsible for day-to-day operations and maintenance of the LOJIC GIS, including, but not limited to system/network administration; spatial database design, implementation and management; application development; user training and support; and development of products and services for sale and distribution. Quarterly reports shall be provided to the LOJIC Policy Committee on the status of functions, work accomplishments and budget performance of the LOJIC GIS.
6. The LOJIC Policy Committee shall name a standing LOJIC Technical Committee, whose membership shall be different individuals than those that serve on the LOJIC Policy Committee and be generally representative of LOJIC users, to analyze, develop, promote and review the technical and non-policy issues pertaining to the LOJIC GIS. Each LOJIC partner shall have representation appointed to serve on the LOJIC Technical Committee. The LOJIC Technical Committee and LOJIC technical staff shall work with the Policy Committee to establish and support other miscellaneous functions relating to, but not limited to, fee structures for non-partners' use of LOJIC data, custom maps and other GIS products; system architecture, security, maintenance and expansion; staffing, training, and technical support of the LOJIC GIS.
7. The LOJIC Partners agree that the LOJIC Policy Committee shall develop a long range strategic plan to determine the future structure and partnership agreement for LOJIC. This strategic plan will be conducted in 2006, and presented to the LOJIC Partners by April 1, 2007. The strategic plan will develop LOJIC's mission, vision, and strategies to assure LOJIC's long term viability as an information utility serving the Louisville Metro region. The strategic plan will also include a marketing analysis to develop commercially available products and services that will generate revenue to offset annual operating costs of LOJIC.

8. This MOU shall remain in force for a term of three years from the execution date, and thereafter be automatically renewable from year to year, unless not later than ninety (90) days prior to any anniversary of the effective date of this Agreement or any renewal date, any party hereto notifies the others, in writing, of its intention to terminate this MOU, in which event this MOU as it effects the withdrawing partner shall terminate on the anniversary date following the notice. The withdrawing LOJIC Partner shall receive a digital copy of all current LOJIC data.

This MOU provides the basic understanding among the partners, and may be amended from time to time to accommodate the addition of new partners, changes in the LOJIC GIS, and to support more detailed formal agreements between the partners to further ensure the ongoing funding, support, operations and maintenance of the LOJIC GIS.

In recognition of the foregoing terms, the following representatives from the LOJIC Partners have executed this MOU on the date specified and shall become effective upon the latest date signed by one of the Partners.

\_\_\_\_\_  
Jerry E. Abramson, Mayor  
Louisville/Jefferson County Metro

Date: \_\_\_\_\_

\_\_\_\_\_  
Approved as to Form and Legality  
Metro Government

\_\_\_\_\_  
John T. May  
Jefferson County Property Valuation Administrator

Date: \_\_\_\_\_

\_\_\_\_\_  
Approved as to Form and Legality  
Jefferson County Attorney

\_\_\_\_\_  
John Huber, President  
Louisville Water Company

Date: \_\_\_\_\_

\_\_\_\_\_  
Approved as to Form and Legality  
Louisville Water Company

\_\_\_\_\_  
H. J. Schardein, Executive Director  
Louisville and Jefferson County  
Metropolitan Sewer District

Date: \_\_\_\_\_

\_\_\_\_\_  
Approved as to Form and Legality  
Metropolitan Sewer District



## Appendix 2

### LOJIC Catalog of Services

#### CUSTOM ANALYSIS

- Custom spatial analysis

#### DATABASE MANAGEMENT

- Database warehouse maintenance
- Base map creation, maintenance, and updates
- Custom data creation

#### APPLICATION DEVELOPMENT

- API development (Hansen, Castanet, Address Verification)
- Application development (on demand)
- Custom applications
- Application design, coding, testing and documentation

#### DATABASE EXTRACTION

- Extract data from database in AutoCad/Shapefile format
- Importing data to layers
- FTP site

#### PROVIDING CONSUMABLE DATA AND MAP SERVICES

- Make routing/geocoding web services publicly available
- Create services
- Make address lookup service publicly available
- Provide PDFs of commonly requested thematic maps

#### LICENSE MANAGEMENT (including some needs assessment)

- User account / Esri software license management
- Negotiate Service Level Agreements with licensees
- Esri ELA Administration
- Software and system upgrades

## **TRAINING AND USER SUPPORT**

- Esri product training
- Software/application training
- Write specialized training for ArcGIS Desktop users
- Provide training for LOJIC Interactive Maps
- Training for partners
- Provide and coordinate training for ArcGIS Desktop
- LOJIC Helpdesk

## **CUSTOM MAPPING**

- Custom cartographic products
- Printable maps
- Custom mapping

## **TECHNICAL SUPPORT FOR LOJIC APPS**

- ArcGIS Desktop support
- General user/technical support
- LOJIC Interactive Map internet/telephone support
- Application support – troubleshooting, maintenance

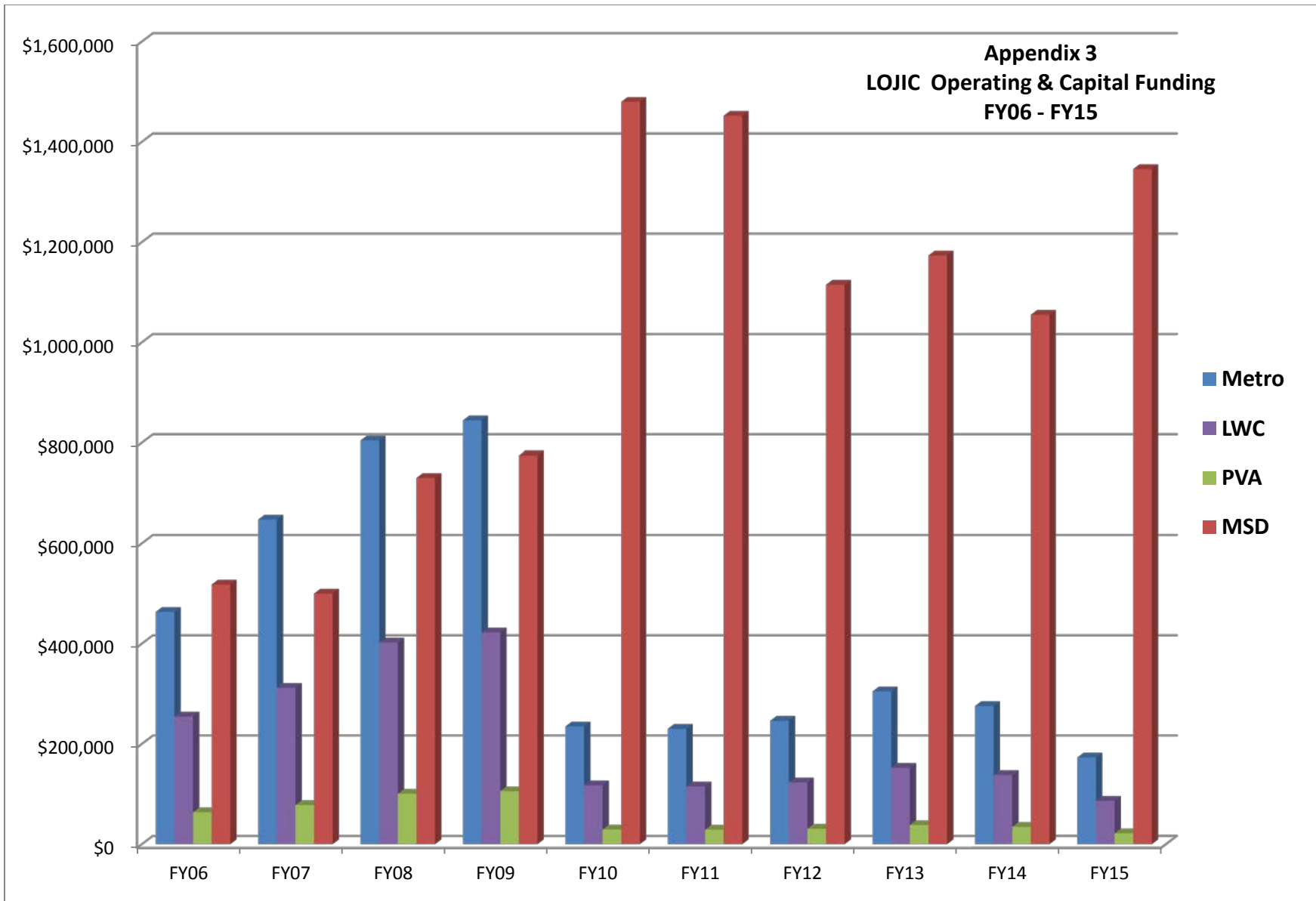
## **HOSTING DATA & APPLICATIONS**

- Hosting data & applications

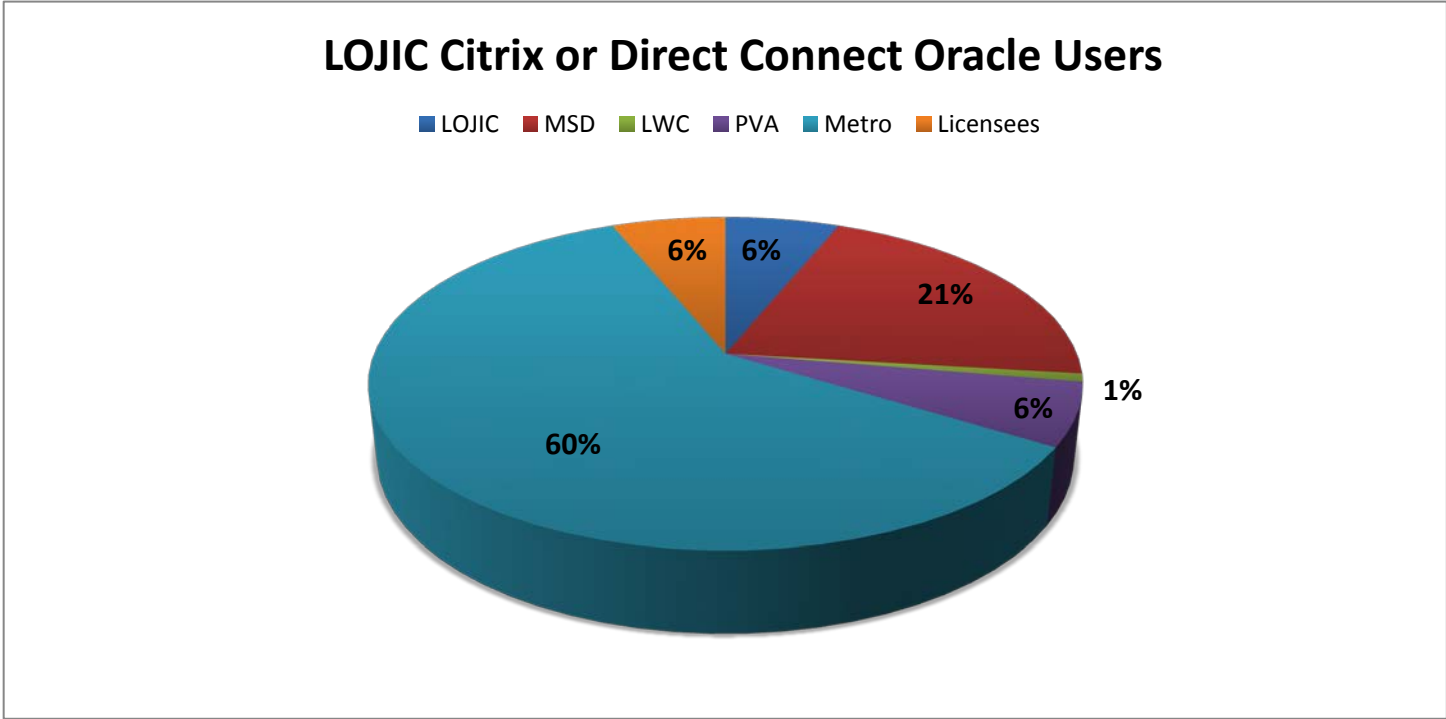
## **CONSULTING**

- Needs assessments for LOJIC Partner agencies
- Resource consulting – new hire screening (position description, interviews)
- Project consulting
- RFP preparation, review and contractor selection
- Serve as “spatial data and GIS experts” on projects for partners with limited resources
- Review RFPs involving the use of GIS for LOJIC Partners
- Project scoping and management
- Consultation on projects/applications undertaken by partners
- Database design and conversion

**Appendix 3  
LOJIC Operating & Capital Funding  
FY06 - FY15**



**Appendix 4**  
**Number of LOJIC Citrix or Direct Connect Oracle Users**  
**July 2, 2015**



Participant	No. LOJIC Citrix or Direct Connect Oracle Users
LOJIC	8
MSD	27
LWC	1
PVA	8
Metro	78
<u>Licensees</u>	<u>8</u>
<b>Total</b>	<b>130</b>

## Work Order Activity (Last Quarter)

