

Project Understanding

The work to be performed by Floodace, LLC under this contract will consist of providing an Asset Management System Configuration Document, development of scripts for risk models for water and waste water assets, development of ArcGIS tools to speed up routine tasks, Development of GIS dashboards, System Testing and Implementation Services for Asset Management System Development for the City of San Marcos. The project consists of the following improvements:

General Description –

- 1) Review the city's current asset management system and provide recommendations as necessary for its enhancement.
- 2) Develop scripts based on the existing risk models so they can be implemented and executed via the City's server infrastructure (Microsoft SQL). Include a basic operation "how to" manual/supporting documentation.
- 3) Recommend and develop tools to support data integrity checks on asset management data.
- 4) Where necessary, provide integration between Maximo work order system and asset management risk data. Provide recommendations on how the City could better utilize and integrate Maximo to support asset management activities.
- 5) Develop ArcGIS tools to facilitate data population of repeatable tasks.
- 6) Recommendations for and possible development of web-based GIS dashboards to display real-time infrastructure condition and risk assessments of assets.
- 7) Provide recommendations and develop a process to use the risk models to identify future CIP projects and their prioritization.
- 8) Provide recommendations for developing the asset management system to further support the CIP development process and the day to day operation and maintenance of utility systems.

Basic Scope of Services

TASK 1 PROJECT MANAGEMENT

Floodace will include a virtual Project Kickoff Meeting where scope, schedule, communication, invoicing and other project coordination issues will be reviewed. Floodace will fill out City's pay request form and attach backup, status report to the invoice. This task includes Floodace's effort to manage the project, allocate staff, and invoice for work. Floodace will respond to City's needs in a timely manner and assign staff sufficient to meet deadlines for City submittal and review.

Deliverables

- Monthly invoicing with progress reports

- Meeting attendance (8) with the City to review intermediate work products.

TASK 2 ASSET MANAGEMENT DATA DISCOVERY

This scope of work details the tasks necessary to define configuration details for the Asset Management System Development. This task includes initial Discovery sessions with the City and the development of a comprehensive document detailing the required configuration.

This process will include four (4) 2-hour virtual meeting to review City's risk models, get the City's input on criteria priority and identify City's needs. The goal of this coordination is to aid Floodace in identifying the risk model functional criteria and help in scripting risk models moving forward.

Floodace will identify all engineering configuration needs for this task with the City's assistance. During the series of discovery meetings, all engineering implementation details will be developed for the selected risk models. This work will include research, preparation, follow-up and coordination for those meetings. These meetings will be conducted with City staff consisting of personnel familiar with risk model related business processes, as well as staff familiar with agency data.

Floodace will then identify best practice and optimal configuration requirements for specifically configuring the Asset Management System. The proposed configuration will be reviewed from a water/wastewater engineering best practices perspective. The breakdown of anticipated configuration review components is as follows:

- **Inventory Data Requirements** – Floodace will work with key City staff to confirm all inventory data needs and availability for use within the asset management system. This data forms an integral part of the risk model decision making and reporting processes that will be developed. Part of this inventory data discovery will include coordination with City staff to review water/wastewater GIS data and associated tables, Maximo data, availability and processes to use work order history data as input to risk models.
- **Consequence and Probability of Failure Categories** – Floodace expects to review and incorporate existing data developed for risk analysis into the engineering configuration of the Asset Management system. Floodace will review the use of available data within the Asset Management system with City staff for consequence and probability of failure categories and provide guidance with configuring the risk models based on the existing data. Floodace will also review relevant data from CCTV inspections such as Quick Structural Rating that relates to estimated time of failure for risk model development.
- **Review of Existing Excel Risk Models** – Floodace will review existing Risk models and ask City specific questions that will help in development of script-based Risk Models for water and waste water assets. The discussion will also aid in development of other Excel based risk models that the City desires to develop. Review the existing risk score ranges to recommend if any changes should be made to improve validation of the results.
- **Maximo Data Review** – The historical work order data will be reviewed to see how many breaks occurred on the same pipe segment within the past 5 years to update a Table in GIS to show break history. Floodace will analyze Maximo data to use in the risk models

of Water Assets. The same database configuration in Maximo will be used to transform break history for leaks into a score that could be used as a criterion for probability of failure.

- **Processes Improvement Review** – In order to assist with process improvements of routine tasks using ArcGIS tools, Floodace will observe City's step-by-step process for populating Consequence of Failure inputs into risk models based on criteria such as environmental buffers, transportation areas and segmenting pavement layers.
- **Construction and Maintenance History Requirements** – Floodace will review the City's currently available construction and maintenance data and develop processes and specific configuration within the script to capture this information.
- **Deterioration Model Expert Panel Determination** – Floodace will work with key City staff to review deterioration models for water and wastewater assets based on installation dates and CCTV inspection data to determine percent remaining service life.
- **Unit Cost Determination** – Floodace will identify the required repair/replacement unit cost data necessary from the City based on the proposed system setup and on the City's business processes. Floodace will field calculate repair/ replacement costs based on City's database of historical costs. .

Deliverables

- Engineering Configuration Document
- Provide detailed Scope & Fee for each of ArcGIS tools desired by the City so City could make a decision on which tools need to be developed that fit the budget.

TASK 3: SCRIPTING RISK MODELS

It is our understand that the City currently has Excel based risk models for water pipes, wastewater pipes and water storage tanks that are based on combination of weights associated with Probability of Failure (PoF) and Consequence of Failure (CoF). The City has setup a framework with several tables containing risk model structures for with weights for PoF and CoF for Manholes, Lift Stations, Valves, Pumps-Booster Stations and Wells. It is our understanding that data for risk models only exists for water pipes, waste water pipes and water storage tanks. Floodace assumes that the City will provide sample data for other assets they wish to include in the risk models. The additional Risk Data will be provided to Floodace.

Floodace will develop scripts based on the existing Excel risk models so they can be implemented and executed via the city's sever infrastructure (Microsoft SQL). The scripts will run automatically as new data becomes available to update risk scores and data display. Floodace will also develop scripts for other assets for which Excel risk models have not been developed. However, Floodace assumes that the City will populate sample data for its assets including Manholes, Lift Stations, Valves, Pumps-Booster Stations and Wells to enable Floodace to test scripts on these assets. Floodace will also provide a manual / documentation to include how to modify scripts to change weighting factors / categories for consequence of failure and probability of failure.

Floodace's understanding of current system architecture is shown below in Figure 1

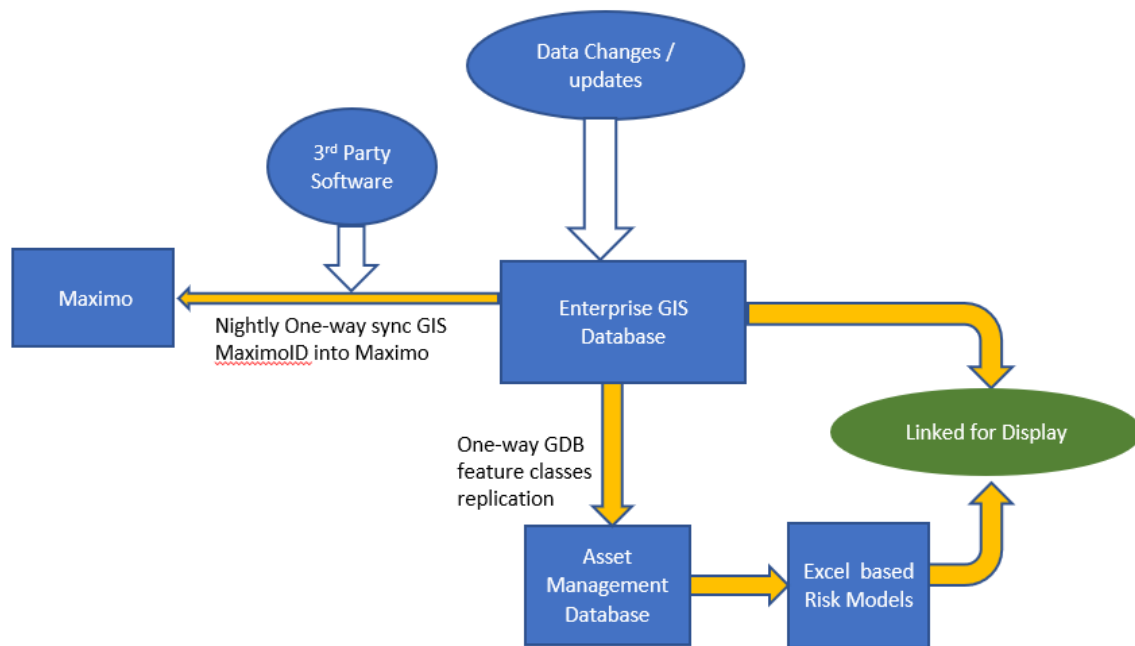


Figure 1 - Current System Architecture

Risk scores from scripting models will be used for data display. The City chose the following system architecture for System Implementation.

Future Scenario – ArcGIS Server based Solution

Under the proposed Future Scenario, scripting will be done to replace risk Excel modeling with risk tables / views, stored procedure in SQL server and python scripts to update asset management database. Under the Future Scenario , risk scores are replicated to enterprise GIS database. Data for ArcGIS Online Web Maps and dashboards could come from either Asset Management Database or Enterprise GIS database or both. GIS users across the City will be able to access risk scores and any relevant data that is replicated from the Asset Management database to the Enterprise Database. Under this scenario, python scripts will be scheduled to run on a nightly basis on windows server and risk mapping data is refreshed overnight. City's ArcGIS Server Map Service will be used to publish Web Maps & Dashboards.

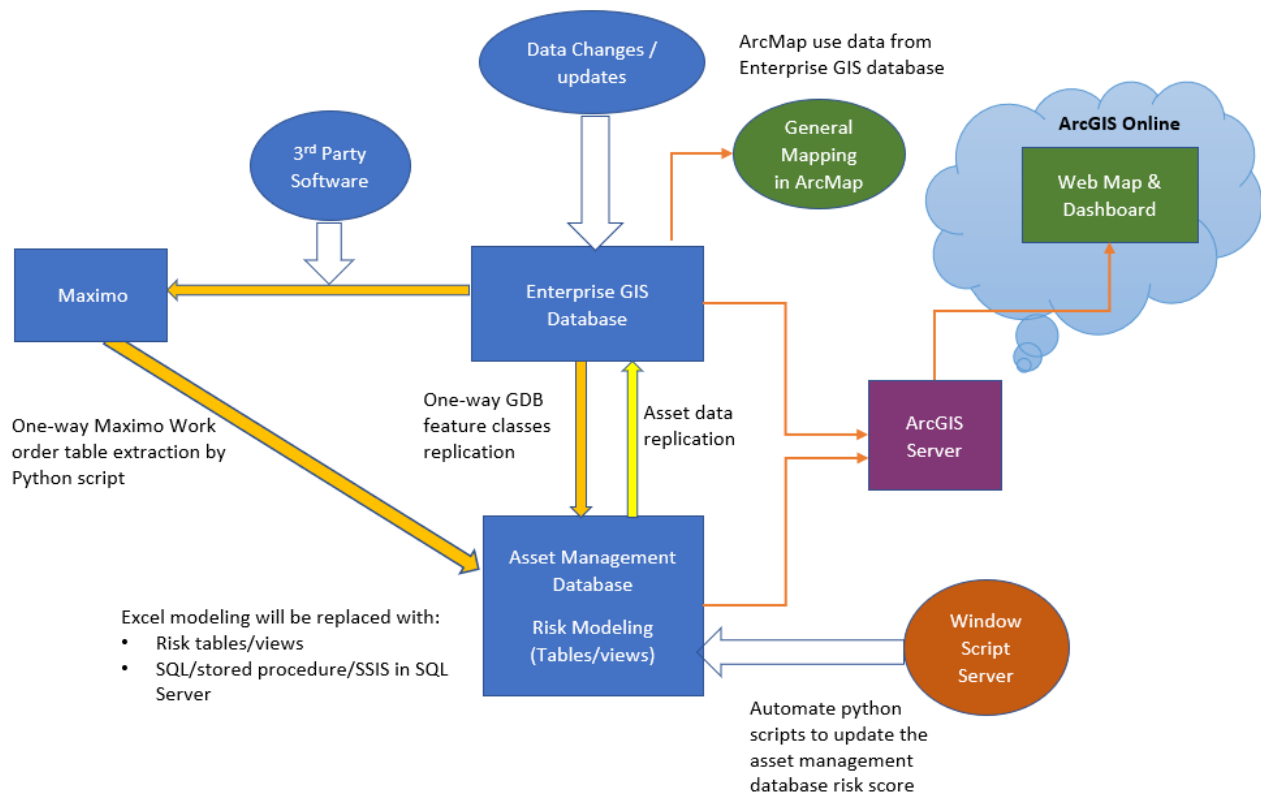


Figure 2 – Future Scenario Architecture

Deliverables

- Design/create tables in Asset management SQL database
- Design/create database views in Asset management SQL database
- Develop Python scripts to calculate and update risk scores in Asset management SQL database
- Develop SQL server Stored Procedure/SSIS package (optional or as needed) to support risk score calculation.
- Design/implement Spatial views to join GIS spatial data with asset management tables to support GIS mapping.
- Schedule window tasks to run python script in proper sequential time frame to make sure all data are updated correct.
- Documentation of Scripts

TASK 4: DASHBOARDS

The City produces various risk maps in ArcMap, which are exported and distributed in PDF format. There currently is no web map available. Risk maps use risk score from excel based risk models. The City desires to support its risk mapping efforts by displaying assets and risk scores automatically on a new web map. The City also desires to display Risk statistics on a dashboard.

Deliverables

1. Create web map for risk mapping, and include the following functions:
 - Display assets with different colors based on risk score/rank for Water Pipe, Wastewater Pipe and Water Storage Tank
 - Identify asset info / replacement value when user clicks on map
 - Turn on and off the CIP project layers.
 - Add Hyperlink to CCTV video for Wastewater Pipe layer. (Remark: external users need to access the CCTV Video from internet)
 - Web map will include other standard tools such as address search and measure tool.
 - Web map could include other advance tools such as Search by AssetID, Nearby Asset, around location.
2. Create AGO dashboard to display:
 - Length/percentage of pipe in each risk category.
 - Length/percentage of pipe in ranges of PoF score.
 - Length of pipe that has not been completely assessed.
 - Length/percent of pipe based on decade of installation.
 - Total length of pipe, etc.

TASK 5: ARCGIS TOOLS & CIP PROJECTS SELECTION

(ADDITIONAL SERVICE)

The purpose of this task is to improve current processes for asset data population and CIP project selection. Floodace will develop ArcGIS tools and also recommend improvements for current processes based on Floodace's understanding of the City's processes to populate data and CIP project selection during "Task 2 – Asset Management Data Discovery". This task is listed as an additional service.

At the completion of Task 2, Floodace will provide a detailed scope and fee for each of the ArcGIS tools desired by the City after watching City staff go through a step-by-step process of performing GIS analysis and populating risk data. It is also the desire of the City to automate the number of water main breaks within the last 5 years from Maximo work order table for risk

modeling. City also desires to develop data integrity checks. Floodace will analyze existing GIS datasets and current processes to determine if ArcGIS tools are feasible for what the City wants to achieve. Floodace will also make recommendations, if any, on how to improve current processes from which ArcGIS tools could be developed.

Based on Floodace's understanding of CIP project selection processes from "Task 2 – Asset Management Data Discovery" and how risk scores from water and waste water assets could be utilized to prioritize CIP projects or recommend new CIP projects, Floodace will make recommendations to the City on how risk data could be used for better project selection and planning. **City will issue a separate notice-to-proceed for this task via a change in service / additional service.** Floodace will not begin working on this task until it receives such notice-to-proceed.

Deliverables

- Develop ArcGIS tools to speed up routine tasks that fit City's budget.
- Provide recommendations on process improvements for CIP project selection using risk scores.

TASK 6: BENCHMARKING WITH OTHER CITIES

Floodace will gather data on how other municipalities are performing risk analysis for water and wastewater assets and how City of San Marcos could benefit themselves by identifying new ideas and innovations, cost reduction and improving service levels. This task involves Floodace speaking with other municipal government leaders in water / wastewater asset management industry. Floodace will choose 3 cities that are roughly about the same size as San Marcos and other 3 large cities within Texas. Floodace asks that City of San Marcos support Floodace's requests for discussions with other municipalities by joining with Floodace in the request. This should assure the other municipalities that the discussion is serving a public purpose.

Deliverables:

- Report of findings
- Recommendations for improvement

Project Assumptions

- It is assumed that City will provide sample risk data for Manholes, Lift Stations, Valves, Pumps-Booster Stations and Wells
- It is assumed that the City will grant Floodace necessary permissions / access to ArcGIS Online account, ArcGIS Server to create Webmaps and Dashboards.
- Floodace will develop scripts to work seamlessly with current versions of City's SQL server 2012 & ArcSDE 10.3.1.
- It is assumed that the City will independently test scripts and provide a formal acceptance of Floodace's deliverables.

Acceptance by the City of the test scripts is expected after the City of San Marcos tests the system and is able to provide Floodace comments about how the system functions. Floodace will modify the scripts as requested and will provide the modifications to the City of San Marcos. After retesting and further comments, Floodace will modify the scripts once more and provide them to the City of San Marcos for use. After the second modification, Floodace will perform additional modifications only if the particular script is failing to perform its function.

EXHIBIT 2 - FEE ESTIMATE								
City of San Marcos, Texas								
Asset Management System Development								
Staff								
	Professional Service Description	Total Task Hours	Total Task Cost	Project Manager	GIS Programmer	Senior Project Engineer	Project Engineer	Clerical Staff
				\$175.00	\$150.00	\$125.00	\$110.00	\$50.00
1.0	PROJECT MANAGEMENT	48	\$ 8,400					
	Project coordination / Invoicing with City	24	\$ 4,200	24				
	Sub-consultant coordination	24	\$ 4,200	24				
2.0	Asset Management Data Discovery	264	\$ 34,635					
	Meeting Preparation	3	\$ 500	2	1			
	Attend Meetings (4 - 2hr virtual Meetings)	44	\$ 6,180	8	16	12	8	
	Meeting Follow-up	8	\$ 1,120	2	2	2	2	
	Inventory Data Requirements	14	\$ 1,890	2	4	4	4	
	Consequence and Probability of Failure Categories	22	\$ 2,710	2	4		16	
	Review of Existing Excel Risk Models	18	\$ 2,430	2	8		8	
	Maximo Data Review	26	\$ 3,430	2	8	8	8	
	Processes Improvement Review	42	\$ 5,510	2	16	8	16	
	Construction and Maintenance History Requirements	6	\$ 790	2			4	
	Deterioration Model Expert Panel Determination	2	\$ 350	2				
	Unit Cost Determination	3	\$ 395	1			2	
	Develop Configuration Document	64	\$ 7,850	4	10	10	40	
	Address comments and update Configuration Document	12	\$ 1,480	1	2	1	8	
3.0	SCRIPTING RISK MODELS	346	\$ 53,475					
	Python virtual development environment / testing	14	\$ 2,150	2	12			
	SQL Server Installation & configuration, initial SQL database / GDB with schema to match COSM	13	\$ 1,975	1	12			
	GIS Server Installation	9	\$ 1,375	1	8			
	Existing Asset Management GIS feature classes review	12	\$ 1,900	4	8			
	Existing Asset Management Tables review	11	\$ 1,725	3	8			
	Excel Risk Model business logic design and review	60	\$ 9,500	20	40			
	GIS layers, tables, spatial view design	20	\$ 3,100	4	16			
	Risk Model tables design	20	\$ 3,100	4	16			
	Risk Model database dynamic view, Stored Procedure, SSIS package	75	\$ 11,500	10	65			
	Risk Model Python script development	100	\$ 15,250	10	90			
	User Testing and Acceptance	12	\$ 1,900	4	8			
4.0	DASHBOARDS	296	\$ 45,600					
	Python Script to update Asset Management data / View to Enterprise GIS system	18	\$ 2,750	2	16			

EXHIBIT 3 - FEE ESTIMATE									
City of San Marcos, Texas									
Asset Management System Development									
Staff									
		Professional Service Description	Total Task Hours	Total Task Cost	Project Manager	GIS Programmer	Senior Project Engineer	Project Engineer	Clerical Staff
					\$175.00	\$150.00	\$125.00	\$110.00	\$50.00
		GIS Server Map service design	18	\$ 2,750	2	16			
		AGO online GIS service & web map design	70	\$ 10,750	10	60			
		Web app design	70	\$ 10,750	10	60			
		Dashboard	20	\$ 3,100	4	16			
		User testing	10	\$ 1,550	2	8			
		Deployment of databases	10	\$ 1,550	2	8			
		Deployment of Pythin on Script Server	10	\$ 1,550	2	8			
		Deployment on GIS Server	10	\$ 1,550	2	8			
		AGO Online Reconfiguration	10	\$ 1,550	2	8			
		Support GoLive testing	10	\$ 1,550	2	8			
		Final project documentation	40	\$ 6,200	8	32			
6.0		BENCHMARKING WITH OTHER CITIES	55	\$ 7,775					
		Prepare Interview Questionnaire	6	\$ 850	2		4		
		Setup meetings with other Cities	3	\$ 375			3		
		Phone call meetings with other Cities	12	\$ 1,800	6		6		
		Report of findings	12	\$ 1,700	4		8		
		Recommendations for improvement	22	\$ 3,050	6		16		
		Total Basic Service Hours:	1,009	\$ 149,885.00	209	602	82	116	0

