“Spatial Data Infrastructure – First line of Defence for clean water network”

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Abstract:
The water science team has ever increasing requirements in reducing the impact of water contamination prior to raw water entering the system. The focus being reducing cost and risk in terms of water quality, where operationally able to better predict when contamination is likely to occur and not draw water from that source but to find alternatives that are more cost effective to produce clean water from

This paper highlight to develop a core catchment GIS platform for Water Utilities for capturing, storing, processing and discovering both geographical and non-geographical data, which will be the foundation for the catchment team to conduct spatial risk assessments, geo informatics, and conceptual modelling to lower the cost of water treatment through identification of risks at catchment.

About the Author:

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Introduction

The objective of the program is to develop a core catchment GIS platform for Water Utilities that would aid the business to identify the potential risk areas of water contamination and take preventive measures to reduce the risk of water contamination. The primary KPI of this engagement is to deliver a spatial data infrastructure (SDI) for capturing inputs from various sources (both from within and outside the organization) for parameters that control the quality and contamination of water data. This will include storing, processing and discovering both geographical and non-geographical data which will be the foundation for the catchment team to conduct spatial risk assessments, geo informatics, and conceptual modelling.

Design Consideration
Define and design the system based on corporate standard, guideline and reuse of existing Infrastructure

- Infrastructure that can host both spatial and non-spatial data comes from internal and external system
- System to integrate with future content management tools
- Platform diagnostic mobile platform to capture data from field and store in the catchment GIS database
- Agile platform to cope with the change in a timely manner
- Scalable platform to expand based on business demand like updated infrastructure, software and more system storage

Solution Evaluation
**Architecture View**

Fig: 1 - High Level view of the solution

**Business Case & Data Flow**

Outcome: To have a reoccurring diffuse pollution risk map

Fig: 2 - Business case and dataflow
User Test Case

<table>
<thead>
<tr>
<th>Test case</th>
<th>Hypothesis</th>
<th>Data</th>
<th>Other considerations</th>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td>Water quality testing</td>
<td>o Water quality levels often higher than regulated, due to limited options to monitor all parameters in near real time; o Reduce the quantity of chemical o Improve sustainability as well as reduce cost</td>
<td>Data is regulated determinants levels v actual levels achieved, measured against source water quality Data Sources o Flow meters o Water quality sensors o Water quality figure o Chemical usage</td>
<td>o Required (regulation) v actual, o kW/gall, o chemicals/gall o Average Value of THMs (mg/L) o Average Value for Turbidity (NTU) o Average Annual Treated Water Turbidity (NTU) o If issues are detected, send immediate alert to field staff so action can be taken.</td>
<td>o Load water network, reservoir location on survey 123 o Design forms in Survey123 o Collect data in filed using Survey123 o Stores collected data in Esri GDB o Perform analysis o Notify for any water contamination</td>
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**Steps:**

- Create Spatial Data Infrastructure

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<thead>
<tr>
<th>Name</th>
<th>Type</th>
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<tbody>
<tr>
<td>GIS_Catchment.DBO.Catchments</td>
<td>SDE Feature Dataset</td>
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<tr>
<td>GIS_Catchment.DBO.DCWW_Waste_Assets</td>
<td>SDE Feature Dataset</td>
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<td>GIS_Catchment.DBO.DWSPs</td>
<td>SDE Feature Dataset</td>
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<tr>
<td>GIS_Catchment.DBO.Image_Mensuration</td>
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<td>GIS_Catchment.DBO.LPIS</td>
<td>SDE Feature Dataset</td>
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**Fig: 3- Spatial Data Infrastructure – Data Model**
Configure ArcGIS Server and Publish Mapservices

Configure Portal and create web application

Design Form in Survey123
Business Benefits
Spatial Data Infrastructure (SDI) helps Business & IT team
Catchment Team:
  - Manage and communicate work effectively and electronically
  - Minimize visits to the back office
Enterprise System:
  - Centralized geodatabase
  - Integrated System
  - Track work for traceability and easy hand-off

Conclusion

Water catchment team design forms to capture data using survey123 and the collected data stores in Geodatabase for further statistical and the spatial analysis using Esri extension. The solution connects to a diverse range of External & Internal Data, FME ETL tool helps to convert these data to Geodatabase and to provide a predictive spatial model that will allow users to quickly and easily visualize the output spatially in the map view to take better decisions. The solution can be expanded further to get data from Machine Learning to execute complex event to avoid incident.

References
1. https://survey123.arcgis.com/