

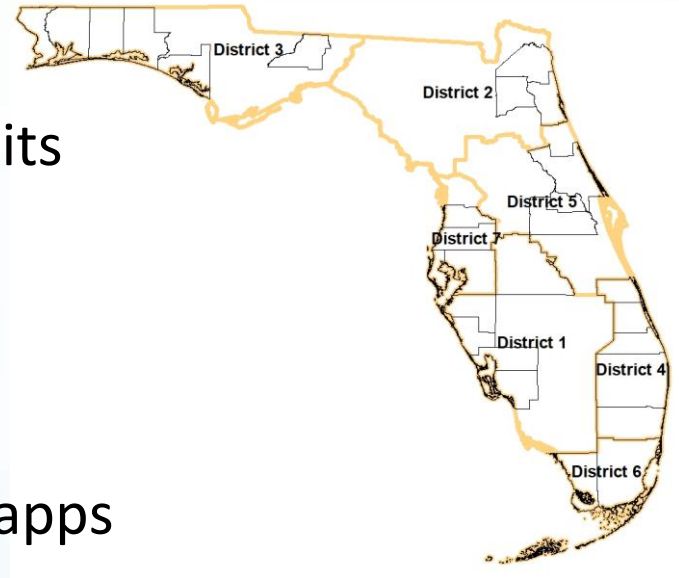
Leveraging Azure, Collector, and SSRS for a Statewide Stormwater Management and Reporting System

John May, GISP, CSM

**GIS Director
ESciences Inc**

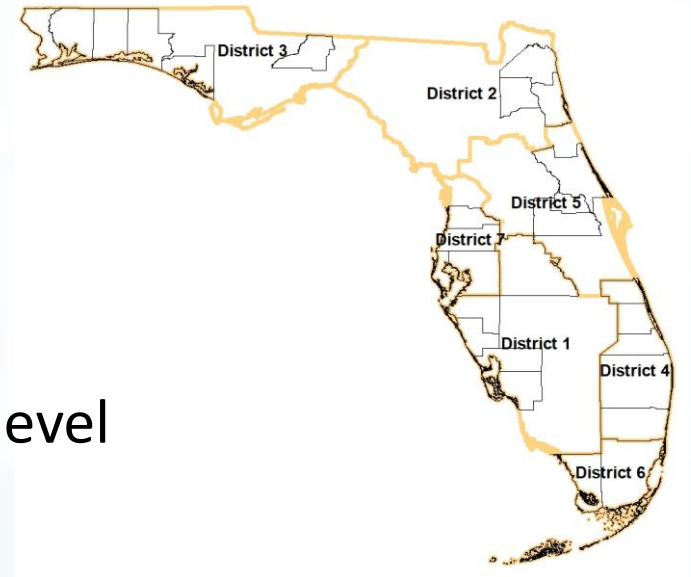
Background

- FDOT Central Office needed a tool to streamline state wide data tracking
- Current condition:
 - 24 Phase I and Phase II permits
 - 28 counties
 - 8 Districts
 - 8 different database systems
 - 4 different custom software apps



Needs

- Develop protocols for creating a consistent statewide stormwater asset database
- Decision points:
 - Web services
 - Field data collection
 - Reporting tools
 - Customizable at the District level



Web Services

■ Possible platforms / Considerations

- In-house system
 - *Hardware*
 - *Software*
 - *Support contracts*
- ArcGIS Online
 - *Service credits*
 - *Automation issues*
- Third party
 - *MS Azure*
 - *AWS*



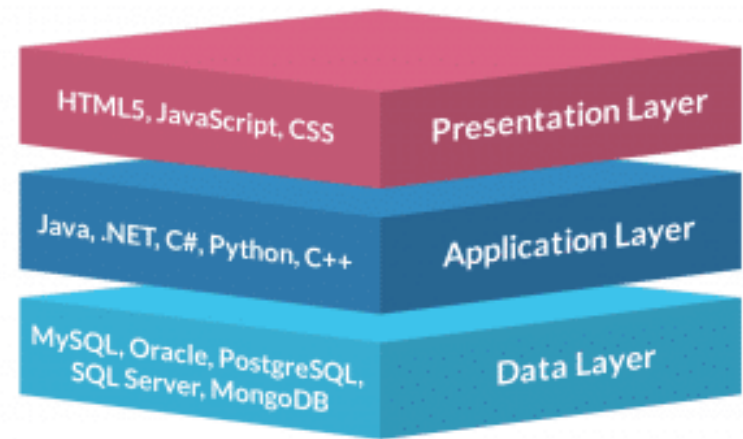
Field Data Collection

- Possible platforms
 - Custom applications
 - *4 of 8 Districts had custom software*
 - ESRI map integrated products
 - *Collector*
 - *Survey*



Reporting Tools

- Possible solutions
 - Manual
 - *5 of 8 Districts*
 - Custom applications
 - *3 of 8 Districts*
 - Integrate with Web
 - *SSRS*
 - *Tableau*
 - *Power BI*



Solution

- Microsoft Azure
 - SQL - SDE
 - Portal
 - SSRS
- ArcGIS Collector



Microsoft
Azure



Microsoft®
SQL Server®
Reporting Services

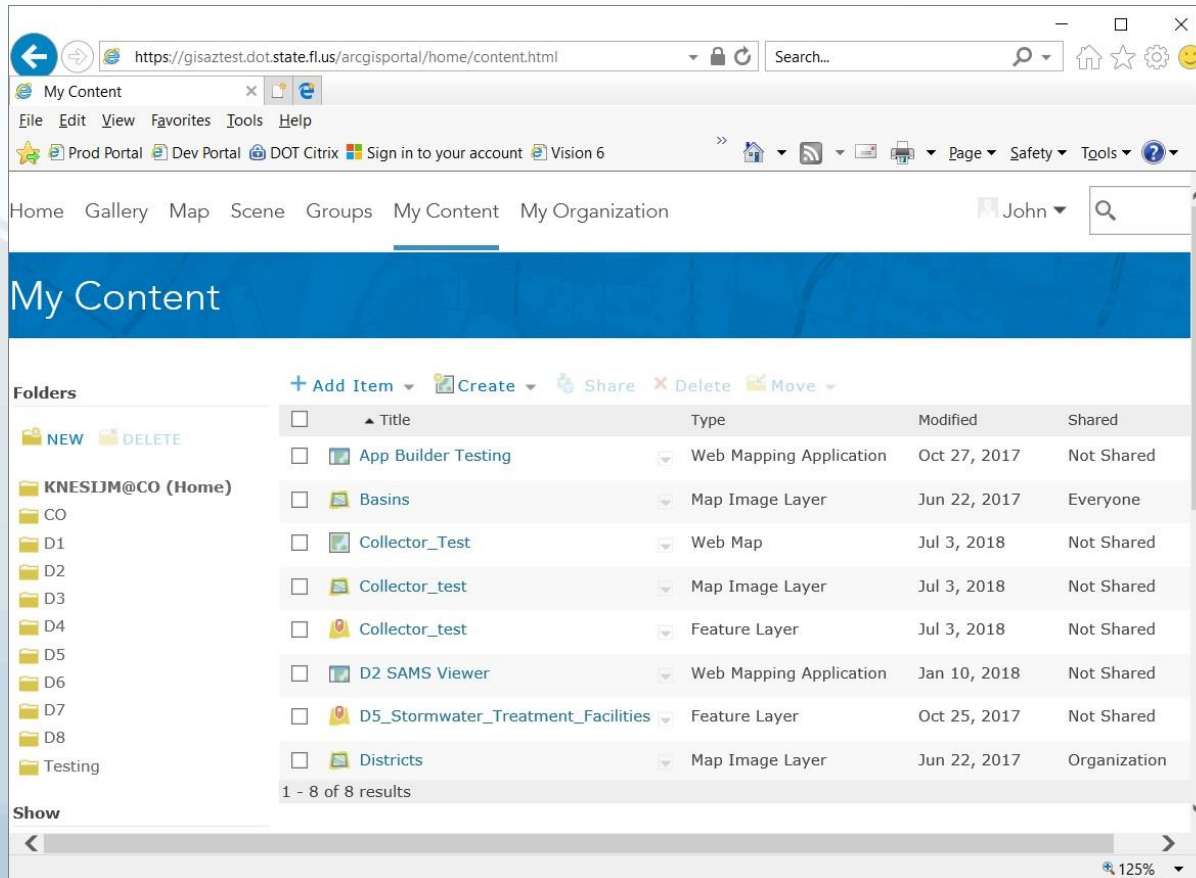
Collector
for ArcGIS

Collect and update data in the field



MS Azure

- Easy integration with
 - *SDE – There is a simple deployment wizard*
 - *Portal*



MS Azure

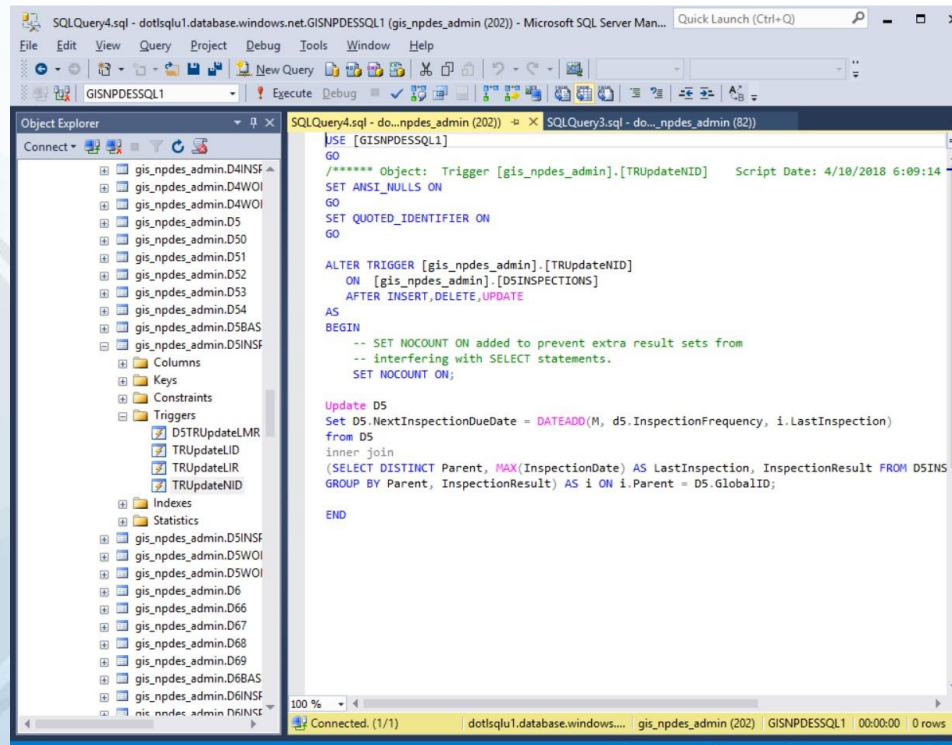
- SQL Server Management Studio
 - *Exposes database*
 - *SQL libraries*

The screenshot displays the Microsoft SQL Server Enterprise Manager interface. The left pane shows the 'Object Explorer' with a tree view of the 'gis_npdes_admin' database. The right pane shows the 'SQLQuery1.sql' window with a query: `select * from D5;`. Below the query window, the 'Results' pane displays a table with 22 rows and 9 columns. The status bar at the bottom indicates 'Query execut...' and '869 rows'.

	OBJECTID	Increment	StatewideFacilityID	FacilityID	District	FMNNumber	StateProjectNumber	Fz
1	1	01977	D5SWF75000-00001	75200-3519-01	5	239240	Not Reported	P
2	2	01902	D5SWF92000-00002	75010-3542-06	5	239416	Not Reported	P
3	3	02308	D5SWF92000-00003	92130-3503-11	5	242531	Not Reported	P
4	4	00915	D5SWF36000-00004	36070-3503-03	5	238678	Not Reported	P
5	5	01905	D5SWF75000-00005	75011-3508-02	5	239263	Not Reported	P
6	6	01900	D5SWF75000-00006	75010-3542-04	5	239416	Not Reported	P
7	7	00344	D5SWF18000-00007	18070-3524-03	5	240372	Not Reported	P
8	8	01816	D5SWF73000-00008	73001-3414-11	5	242340	Not Reported	P
9	9	02109	D5SWF79000-00009	79002-3425-09	5	242696	Not Reported	P
10	10	02042	D5SWF77000-00010	77060-3518-09	5	240174	Not Reported	R
11	11	01205	D5SWF70000-00011	70050-3535-04	5	237730	Not Reported	P
12	12	01916	D5SWF75000-00012	75050-3560-02	5	239535-2	Not Reported	P
13	13	00891	D5SWF36000-00013	36000-3604-01	5	241557	Not Reported	D
14	14	02155	D5SWF79000-00014	79100-3503-01	5	241009	Not Reported	V
15	15	01246	D5SWF70000-00015	70220-3500-04	5	413072	Not Reported	P
16	16	00935	D5SWF36000-00016	36100-3522-07	5	238635	Not Reported	P
17	17	01269	D5SWF70000-00017	70220-3501-09	5	405506-8	Not Reported	P
18	18	01985	D5SWF75000-00018	75250-3525-02	5	239289	Not Reported	P
19	19	02077	D5SWF77000-00019	77160-3601-08	5	242582	Not Reported	**
20	20	00930	D5SWF36000-00020	36100-3522-01	5	238635	Not Reported	P
21	21	01046	D5SWF75000-00021	407143-2-01	5	407143-2	Not Reported	P
22	22	02029	D5SWF77000-00022	77040-3521-01	5	240163	Not Reported	P

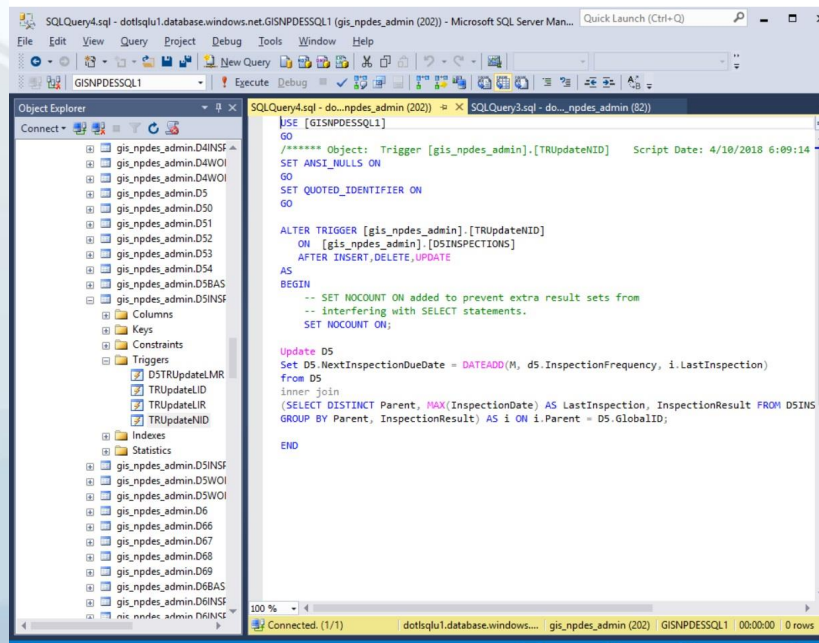
MS Azure

- Automate data tasks with triggers
 - *Autocalc attribute values from related tables*
 - *Autocalc meaningful ID's for new features*
 - *Send emails when certain data conditions arise*



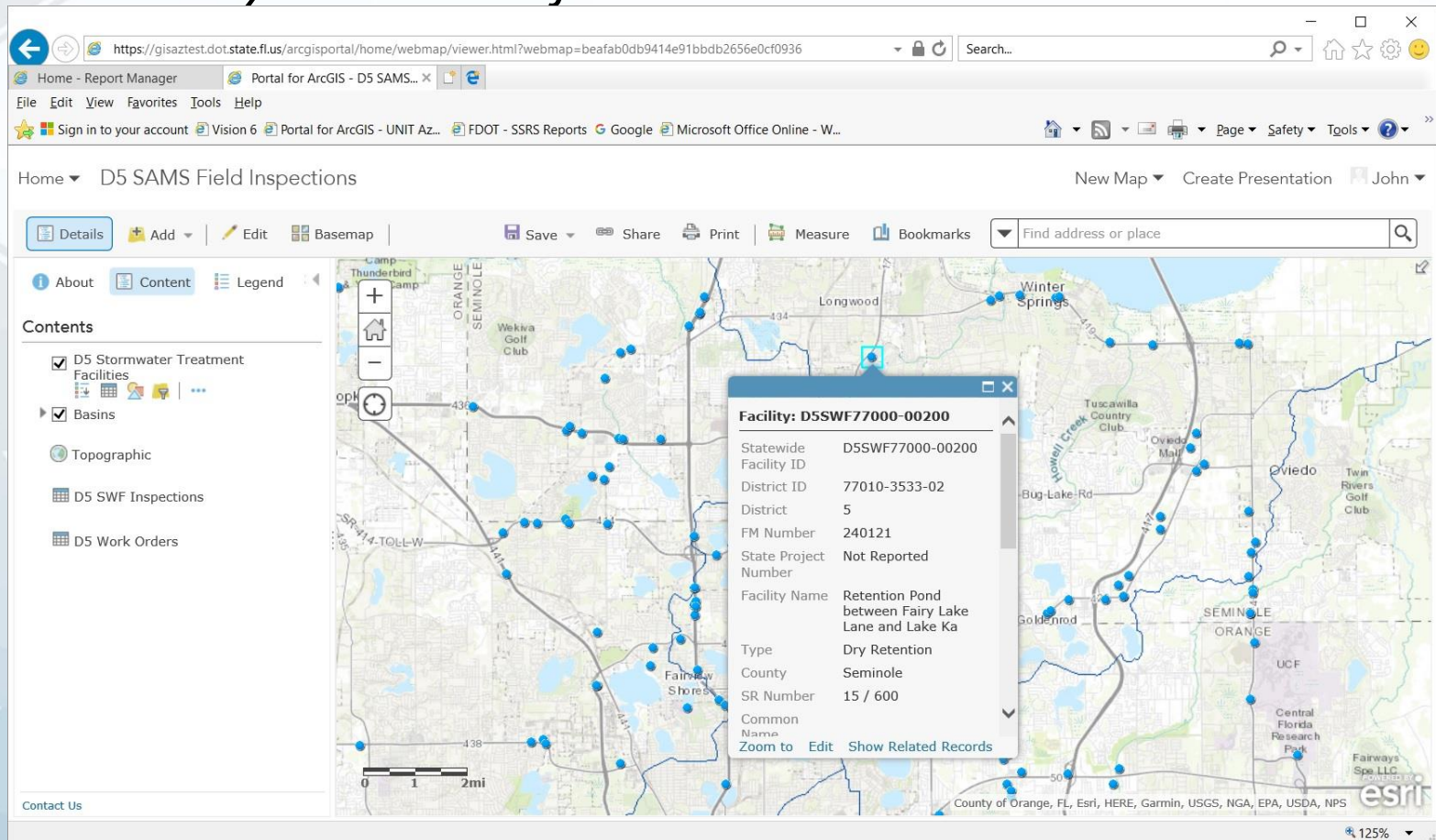
Field Data Collection

- ESRI Collector simplifies data environment
 - *Allows collection of data in related tables*
 - *Simplified data entry using domains*
 - *Easily customized for individual needs*
 - *Windows, iOS, and Android compatible*



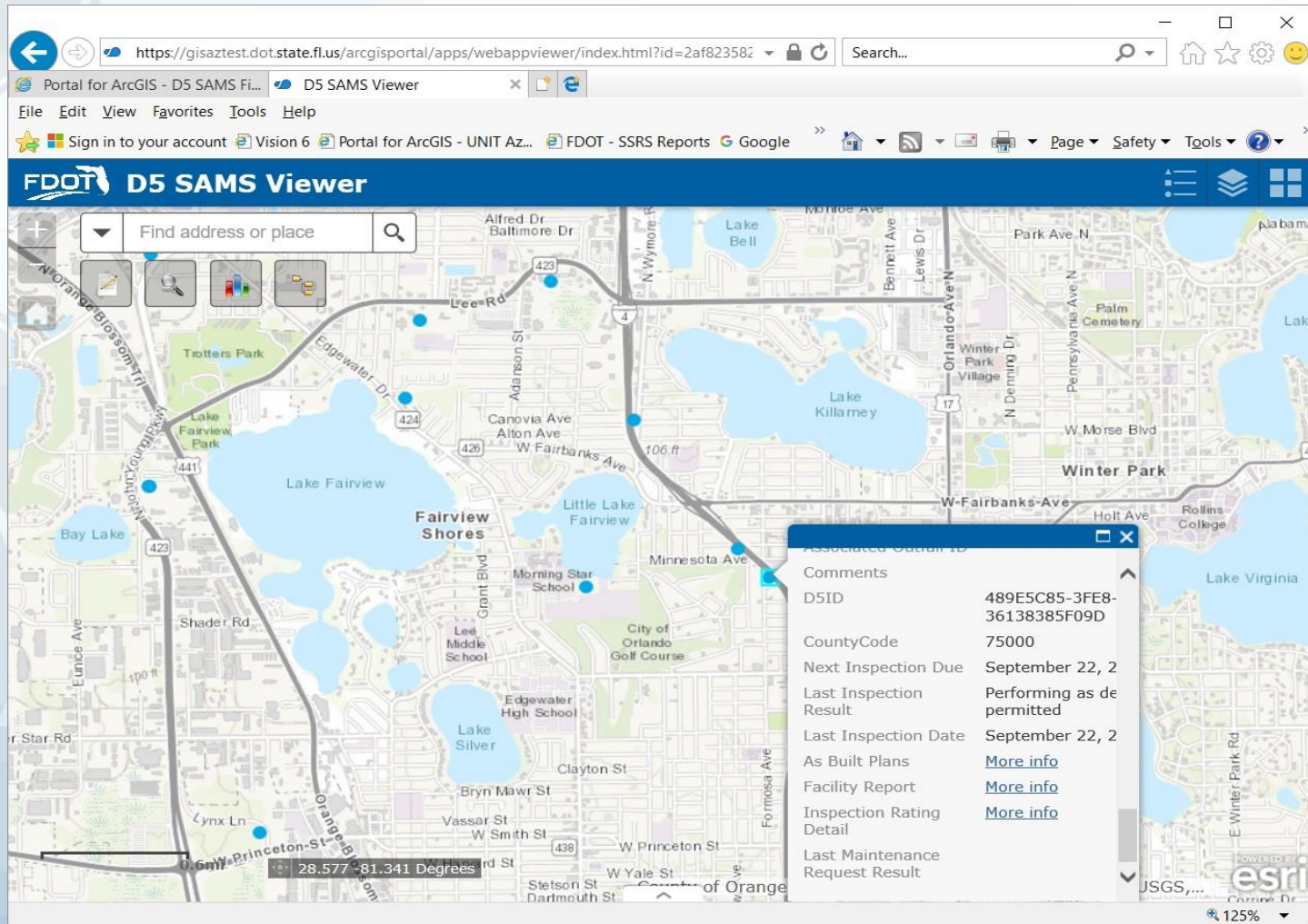
Web Mapping

- Standard ESRI Web Maps
 - *Easy but limited features*



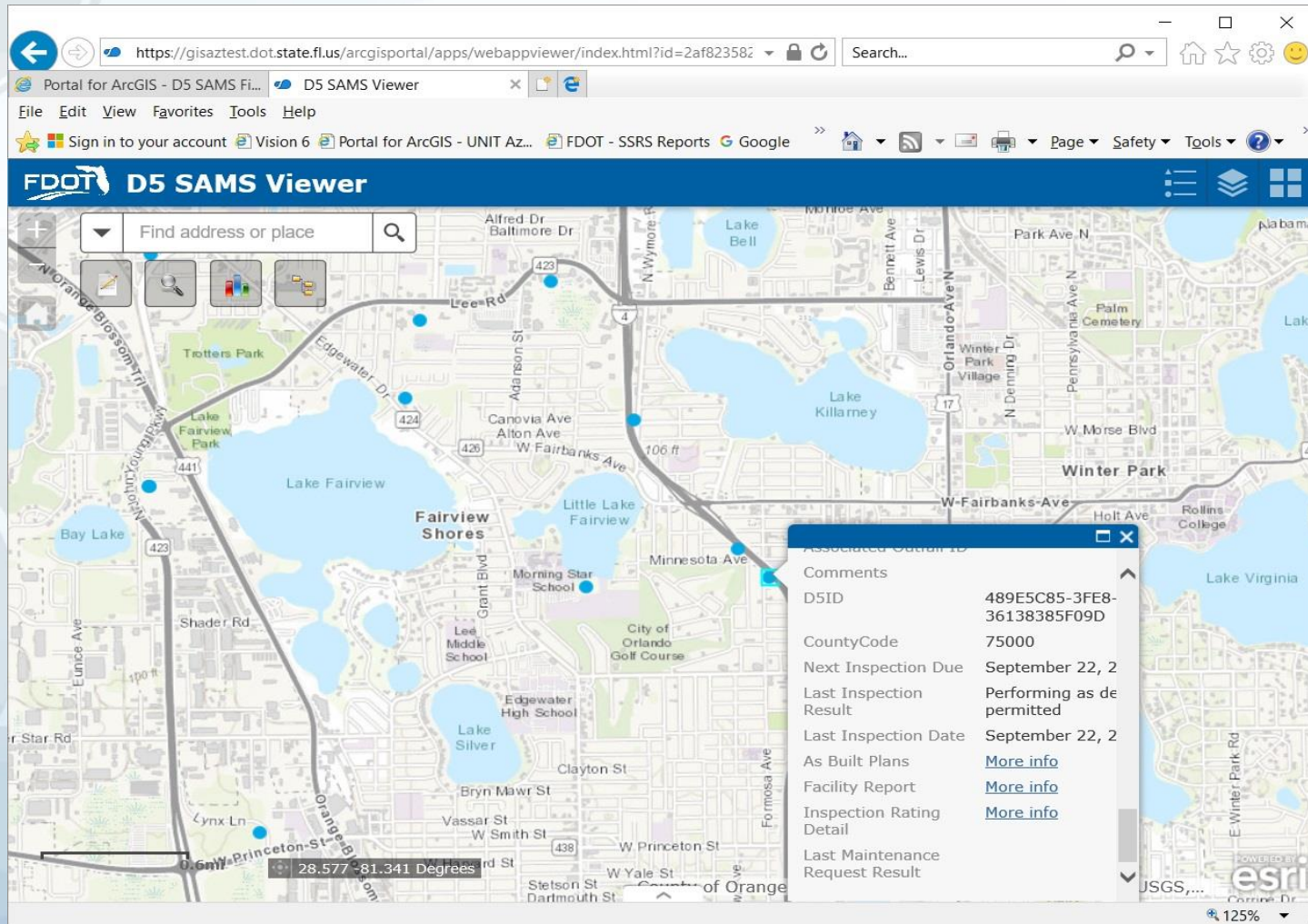
Web Mapping using AppBuilder

- *Cleaner presentation*



Web Mapping using AppBuilder

- *Mobile friendly with great configurability*



Reporting

- Custom Reporting with SSRS
 - *VS Power Shell (design and run time environments)*

Report Project1 - Microsoft Visual Studio

FILE EDIT VIEW PROJECT BUILD DEBUG SQL FORMAT REPORT TOOLS WINDOW HELP

Quick Launch (Ctrl+Q)

Report Data: Annual Report Temp...scape.rdl [Design]

Design Preview

FDOT

«Expr»

Physical Inventory Characteristics

«Expr»

Part III.A.1 - Structural Controls and Stormwater Collection Systems Operation

Report the number of inspection and maintenance activities conducted for each applicable type of structure included in Table II.A.1.a, and the percentage of the total inventory of each type of structure inspected and maintained.

Type of Structure	Number of Structures	Number of Inspections	Percent Inspected
[Type]	[Facilities]	[Inspections]	«Expr»

Inspection Results

«Expr»

Statewide Facility ID	District ID	FM Number	Type	County	Inspection Date
[statewidefacilityid]	[districtid]	[fmnumber]	[type]	[county]	«Expr»

County Facilities

County	Facilities
[County]	puntofcount

Toolbox

Search Toolbox

- Report Items
 - Pointer
 - Text Box
 - Line
 - Table
 - Matrix
 - Rectangle
 - List
 - Image
 - Subreport
 - Chart
 - Gauge
 - Map
 - Data Bar
 - Sparkline

Solution Explorer

Search Solution Explorer (Ctrl+Q)

Solution 'Report Project1' (1 project)

- Report Project1
 - Shared Data Sources
 - District5_Data.rds
 - Shared Datasets
 - Reports
 - Annual Report Template Landscape.rdl
 - Annual Report Template Portrait.rdl
 - charttest.rdl
 - COAnnualReportTemplateLandscape.rdl
 - COFacilityInventory.rdl
 - COInspectionDue365.rdl
 - COInspectionDueBetweenDates.rdl
 - Copy of D8Inspection.rdl
 - Copy of NewWorkOrder.rdl
 - Copy of WorkOrder.rdl
 - COSWFbySelectedSR.rdl
 - COSWFInspectionsBetweenDates.rdl
 - COSWFTypesbyCounty.rdl
 - D1 Facilities by County.rdl
 - D1_INSPIMAGE.rdl
 - D1AnnualReportTemplateLandscape.rdl
 - D1AnnualReportTemplatePortrait.rdl
 - D1Inspection.rdl
 - D1InspectionDue30.rdl
 - D1InspectionDue365.rdl
 - D1InspectionDue60.rdl
 - D1srpt_Inspections.rdl
 - D1srpt_WorkOrders.rdl
 - D1Test.rdl
 - D1WorkOrder.rdl
 - D2_INSPIMAGE.rdl

Reporting

- Custom Reporting with SSRS
 - *VS Power Shell (design and run time environments)*

The screenshot displays the Microsoft Visual Studio interface with a custom SSRS report titled "Annual Report Template Landscape.rdl" in Design view. The report is for "District 5 System Summary for the period 4/10/2016 to 4/10/2018".

Physical Inventory Characteristics

There are 868 stormwater facilities in the system.

Part III.A.1 - Structural Controls and Stormwater Collection Systems Operation

Report the number of inspection and maintenance activities conducted for each applicable type of structure included in Table II.A.1.a, and the percentage of the total inventory of each type of structure inspected and maintained.

Type of Structure	Number of Structures	Number of Inspections	Percent Inspected
Dry Detention	53	2	3.77%
Dry Detention and Filtration	4	1	25.00%
Dry Retention	230	38	16.52%
Wet Detention	581	140	24.10%

Inspection Results

179 inspections were performed between 4/10/2016 and 4/10/2018.

Statewide Facility	District ID	FM	Type	County	Inspection
Brevard					153
Flagler					59
Lake					47
Marion					76
Orange					195
Osceola					84
Seminole					81
Sumter					46
Volusia					127

The interface includes a Solution Explorer on the right showing the project structure, a Toolbox on the left for report items, and a status bar at the bottom indicating "Ready".

Reporting

- Custom Reporting with SSRS
 - *Unlimited data environments*

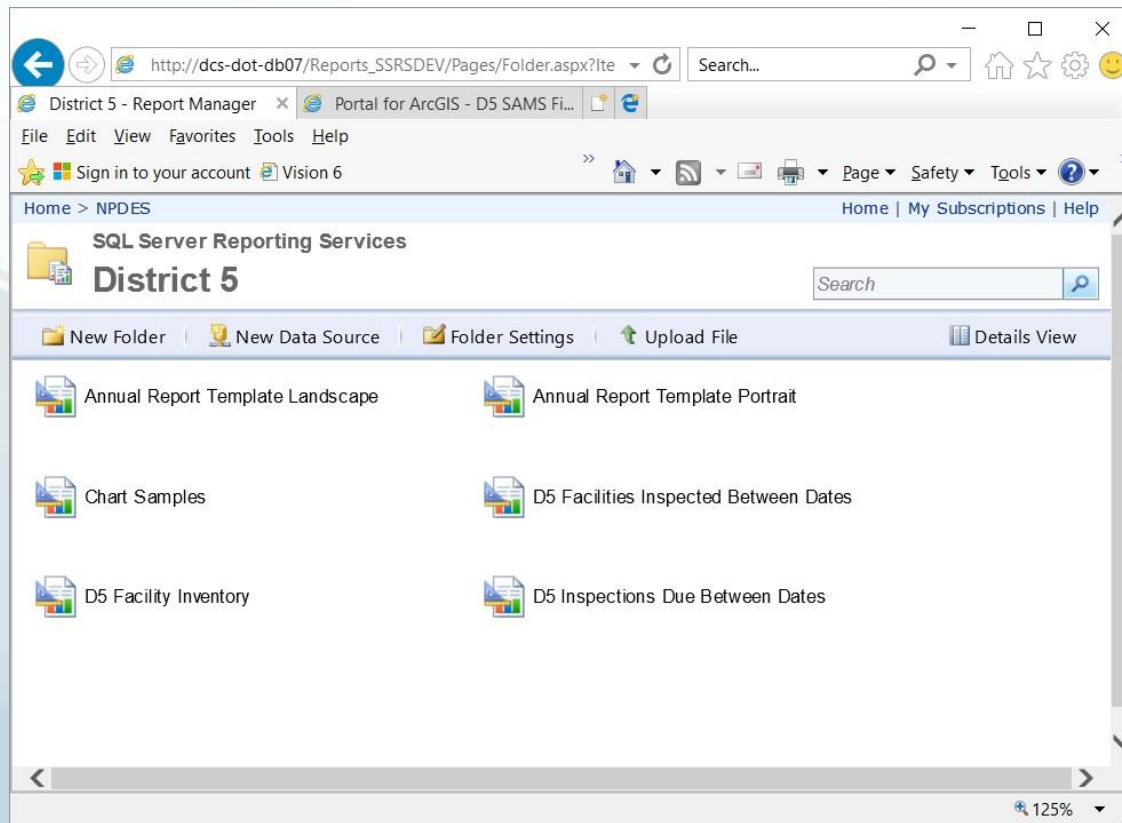
The screenshot shows the 'Dataset Properties' dialog box in SQL Server Reporting Services (SSRS), specifically the 'Query' tab. The dialog is titled 'Dataset Properties' and has a close button (X) in the top right corner. On the left, there is a vertical list of tabs: 'Query' (selected), 'Fields', 'Options', 'Filters', and 'Parameters'. The main area of the dialog contains the following elements:

- Choose a data source and create a query.**
- Name:** A text box containing 'DataSet1'.
- Use a shared dataset.** (radio button, unselected)
- Use a dataset embedded in my report.** (radio button, selected)
- Data source:** A dropdown menu showing 'District5_Data' and a 'New...' button.
- Query type:** Three radio buttons: 'Text' (selected), 'Table' (unselected), and 'Stored Procedure' (unselected).
- Query:** A large text area containing a SQL query. The query is as follows:

```
select a.statewidefacilityid, a.facilityid, a.fmnnumber, a.commonname, a.srnumber,
a.type, a.county, i.lastinspection, i.inspectionresult from
gis_npdes_admin.d5 as a
INNER JOIN
(SELECT DISTINCT Parent, MAX(InspectionDate) AS LastInspection, InspectionResult
FROM gis_npdes_admin.D5INSPECTIONS
GROUP BY Parent, InspectionResult) AS i ON i.Parent = a.GlobalID
order by 8, 1 desc;
```
- Buttons: 'Query Designer...', 'Import...', and 'Refresh Fields'.
- Time out (in seconds):** A spinner box set to '0'.
- Buttons: 'Help', 'OK', and 'Cancel'.

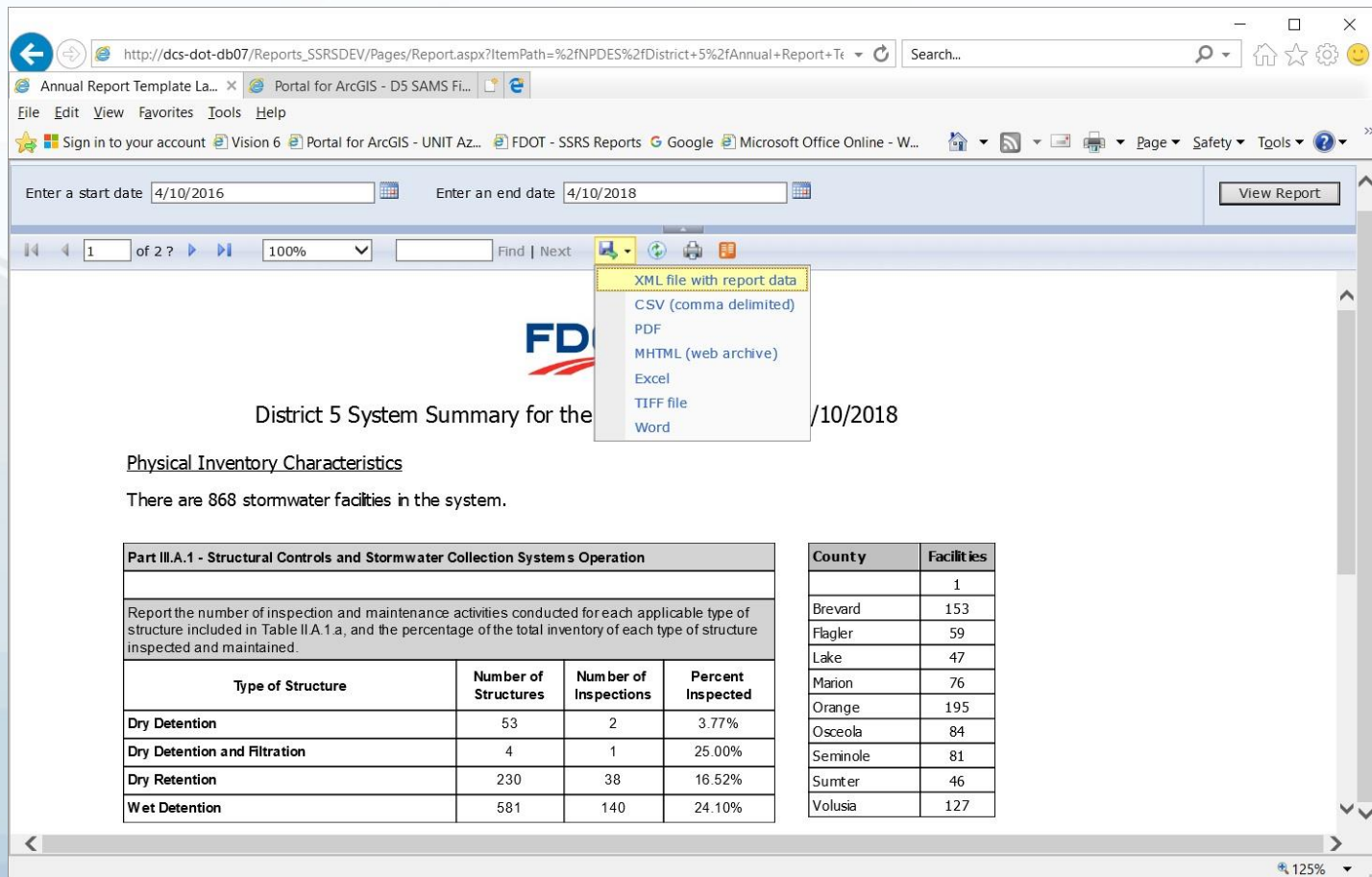
Reporting

- Custom Reporting with SSRS
 - *Deploy report libraries*



Reporting

- Custom Reporting with SSRS
 - *Download data in multiple formats*



Annual Report Template La... Portal for ArcGIS - D5 SAMS Fi...

File Edit View Favorites Tools Help

Sign in to your account Vision 6 Portal for ArcGIS - UNIT Az... FDOT - SSRS Reports Google Microsoft Office Online - W...

Enter a start date 4/10/2016 Enter an end date 4/10/2018 View Report

1 of 2 ? 100% Find | Next

XML file with report data
CSV (comma delimited)
PDF
MHTML (web archive)
Excel
TIFF file
Word

FD

District 5 System Summary for the /10/2018

Physical Inventory Characteristics

There are 868 stormwater facilities in the system.

Part III.A.1 - Structural Controls and Stormwater Collection Systems Operation			
Report the number of inspection and maintenance activities conducted for each applicable type of structure included in Table II.A.1 a, and the percentage of the total inventory of each type of structure inspected and maintained.			
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County	Facilities
	1
Brevard	153
Flagler	59
Lake	47
Marion	76
Orange	195
Osceola	84
Seminole	81
Sumter	46
Volusia	127

125%

Reporting

- Custom Reporting with SSRS
 - *Parameterization*

Home > NPDES > District 5 > D5 Facility Inventory

Select a county from the list: Orange

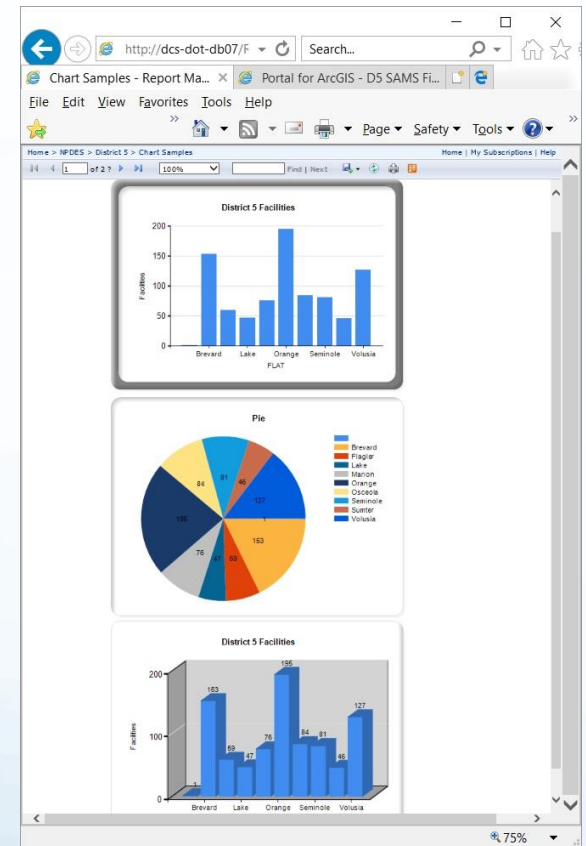
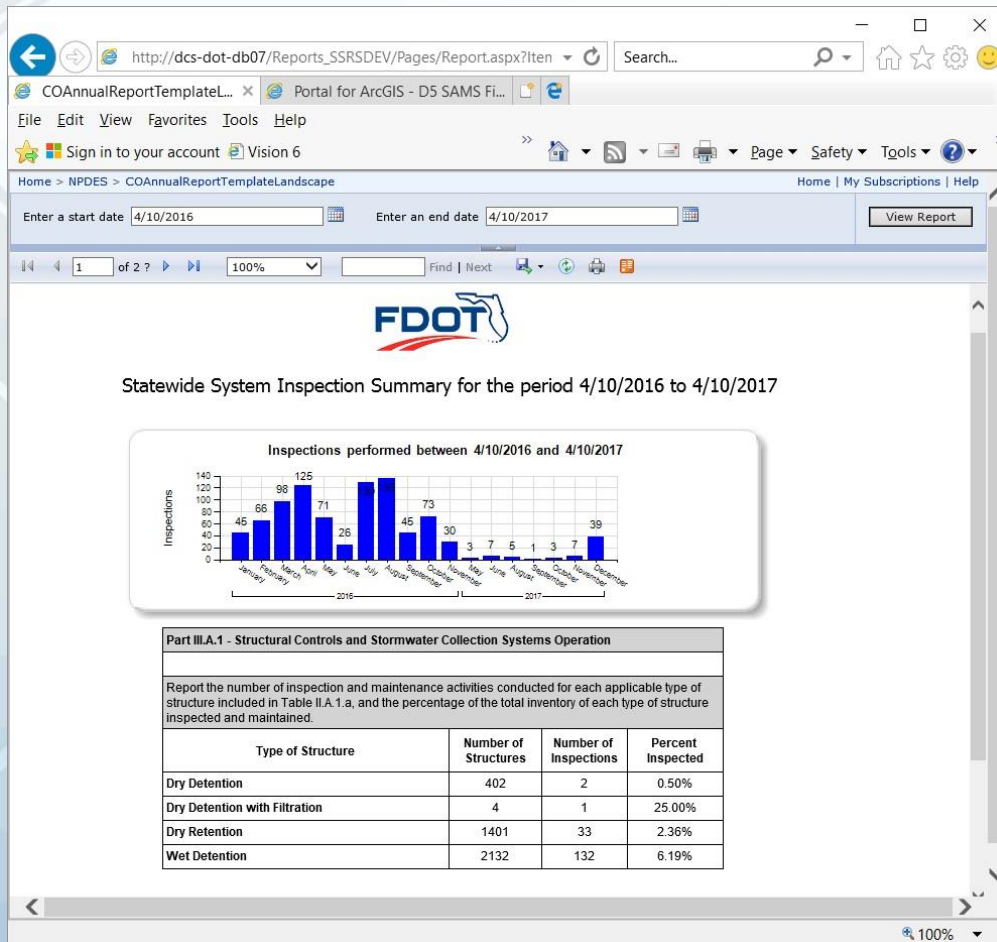
- ☐ Flagler
- ☐ Lake
- ☐ Marion
- ☒ Orange
- ☐ Osceola
- ☐ Seminole
- ☐ Sumter

District 5 Facility Inventory By County

County	Statewide Facility Number	Facility Name	FM Number	SR Number	Facility Type	
Orange	D5SWF75000-00001	75200-3519-01	Pond 1	239240	551	Wet Detention
Orange	D5SWF75000-00005	75011-3508-02	Pond C	239263	414	Dry Retention
Orange	D5SWF75000-00006	75010-3542-04	Pond 4	239416	500	Wet Detention
Orange	D5SWF75000-00012	75050-3560-02	Pond B is located at Sta. 541+50 east of the SR 91	239535-2	50	Wet Detention
Orange	D5SWF75000-00018	75250-3525-02	Pond 2B. Equalizes with 2A and 2C.	239289	438	Wet Detention
Orange	D5SWF75000-00021	407143-2-01	Pond W1	407143-2	482	Dry Detention
Orange	D5SWF75000-00025	242499-1100-1	**System is being replaced with I-4 Ultimate FM 43	242499	400	Wet Detention
Orange	D5SWF75000-00027	239535-4-03	Pond 3A	239535-4	50	Dry Retention
Orange	D5SWF75000-00030	242499-1600-1B	**System is being replaced with I-4 Ultimate FM 43	242499	400	Dry Retention
Orange	D5SWF75000-00034	75010-3513-03	Area 3 *Transferred*	238873	500	Wet Detention
Orange	D5SWF75000-00047	75280-3465-01	SR 400, SR 535 Interchange (Pond 1. MP 2.45)	242429	400	Dry Retention

Reporting

- Custom Reporting with SSRS
 - *Embedded charting*



The background features a series of soft, overlapping wavy lines in shades of light blue and pale yellow, creating a sense of depth and movement. On the left side, a dark grey road with white dashed lines curves upwards, adding a structural element to the abstract design.

Demo