Powering the NASA-wide Institutional GIS with ArcGIS Server Technology

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Kelly Boyd – Author

Adam Murrah – Co-Author

Mark Mitchell – Co-Author

NASA Stennis Space Center, MS

- NASA-wide GIS Portal Overview
  - Common Uses of Portal
- Proof of Concept Applications
  - Real Estate Editor
  - Personal Property
  - Asset Mapping
- Plans

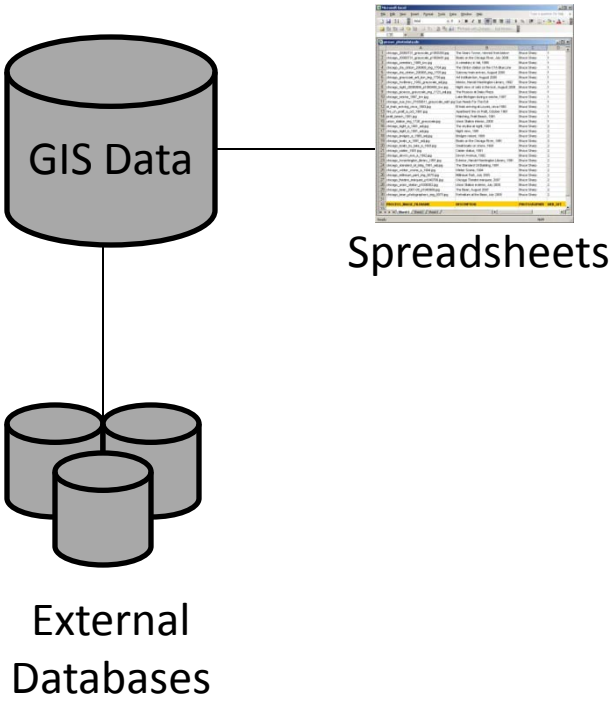
Presentation Summary

NASA-wide GIS Portal Overview

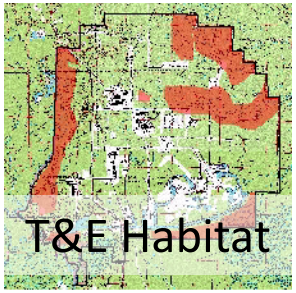
- Hosts spatial data sets for ten NASA centers and four component facilities.
- Data sets were collected from GIS organizations at the individual centers and consolidated into an enterprise system.
- The system is viewable at NASA HQ and the field centers to help improve situational awareness and to answer questions.

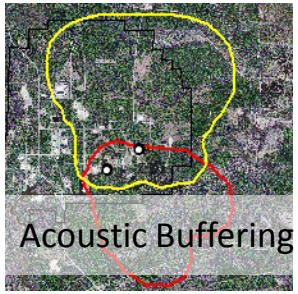
What is the NASA-Wide Institutional GIS?

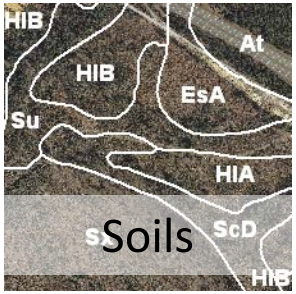
- Some officials lacked situational awareness of coastal centers during storm events.
- Integration of databases and tabular information allow personnel to save time by accessing it from their desktops.



Purpose

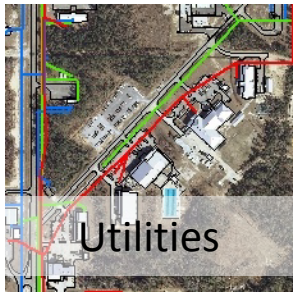






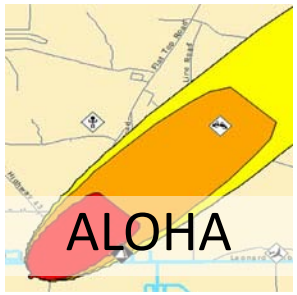
Environmental

+



Facilities

+



Emergency Response

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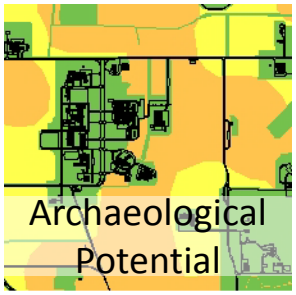


Cultural Resources

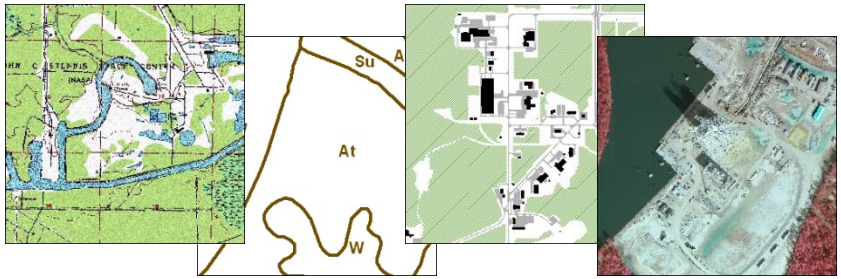
Project History

Data Sets Collected from Centers

- Cultural Resources
- NASA Real Property
- Center Infrastructure
  - Buildings
  - Parking
  - Roads
  - Boundaries
- Land Use
- Utilities
- Emergency Response
  - Tanks
- Natural Resources
- CERCLA/RCRA

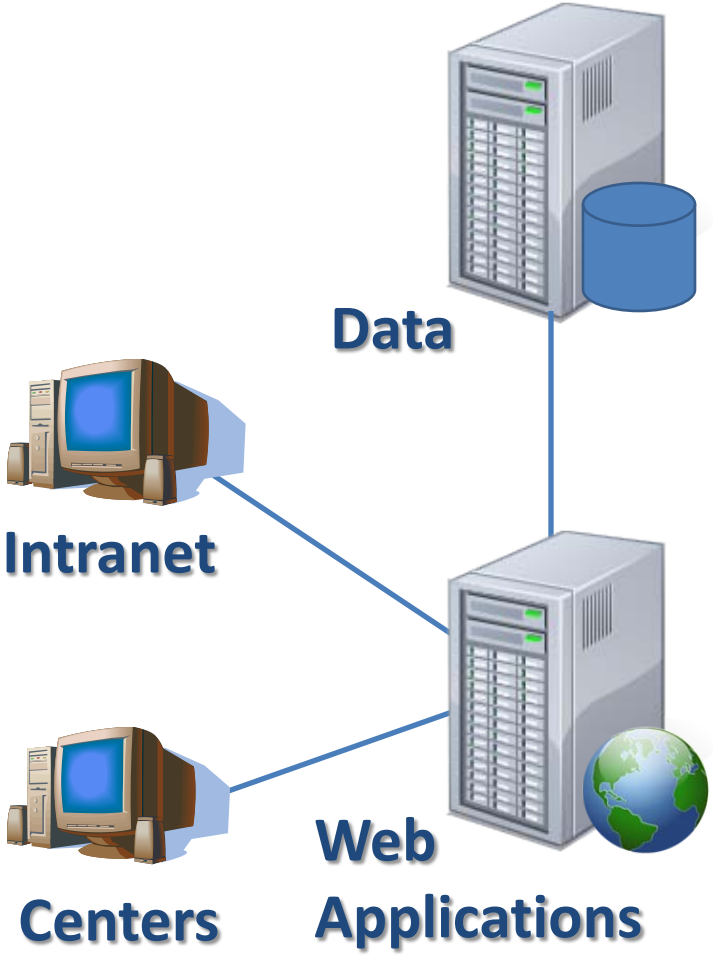
Data Sets Collected from Public Sources

- Water Bodies
- Flood Zones
- Storm Surge Data
- USGS Topographic Maps
- Elevation Contours
- NWI Wetlands
- Soil Types
- Aerial Photography



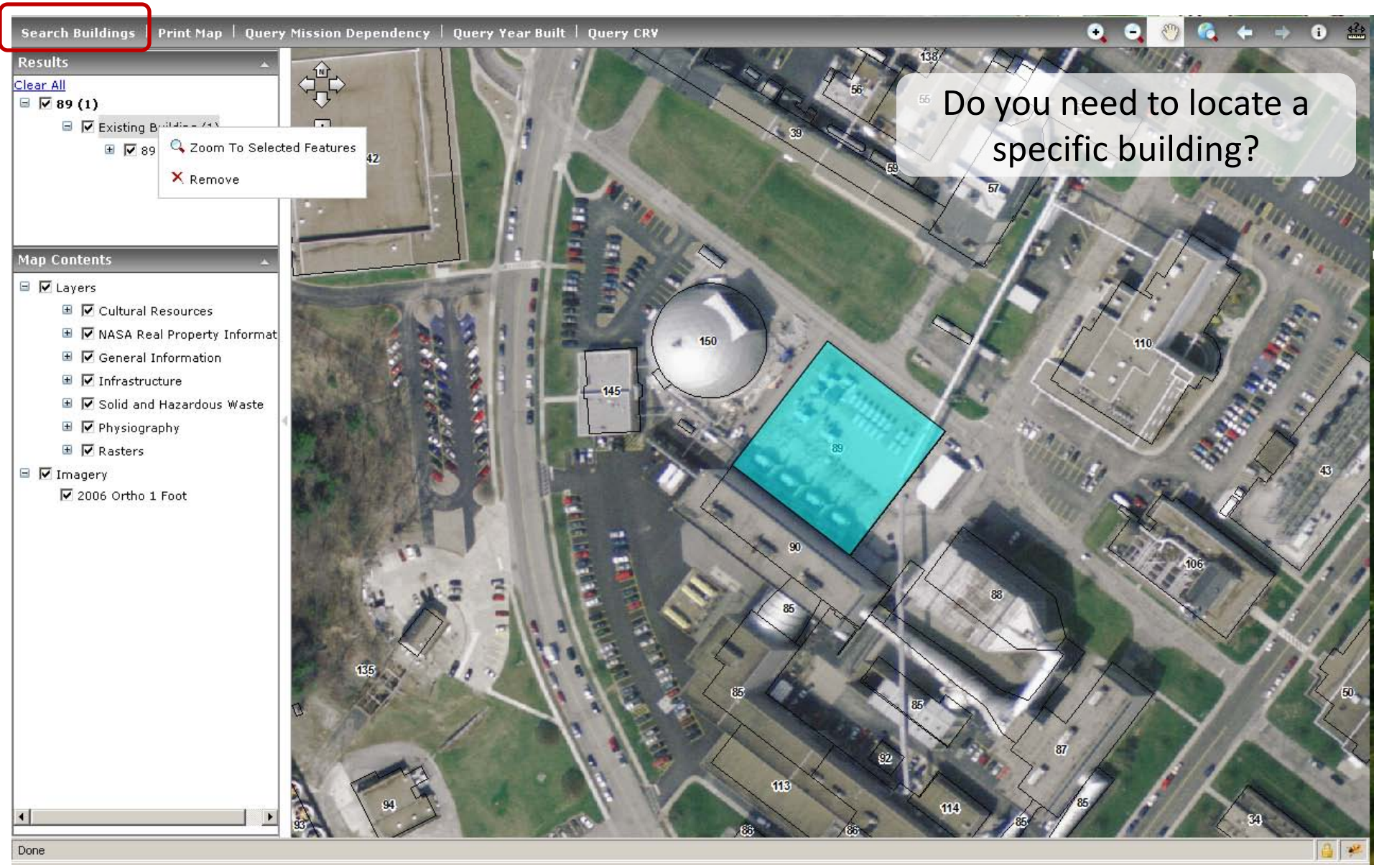
Common Data Themes included in NASA-Wide GIS

Implementation:	Web ADF
Data Storage:	ArcSDE
DBMS:	SQL Server 2008
Web Server:	IIS



System Configuration

Common Uses of the Portal



Search for Buildings

Search Buildings | Print Map | Query Mission Dependency | Query Year Built | Query CRV

Results

Map Contents

- Layers
  - Cultural Resources
  - NASA Real Property Informat
  - General Information
  - Infrastructure
  - Land Use
  - Emergency Response
    - Storage Tank
  - Natural Resources
  - Physiography
  - Rasters
- Imagery
  - Mask
  - 2007 3 Inch Ortho

Do you need to know the capacity of a tank?

T-42-01 (Storage Tank)

OBJECTID	4
TANK_NUM	T-42-01
TEMP_TANK_	Ambient
CHEMICAL_S	Liquid
CAPACITY	300 gal
MATERIAL	Diesel

Layers > Storage Tank

Add to Results

032a

032e

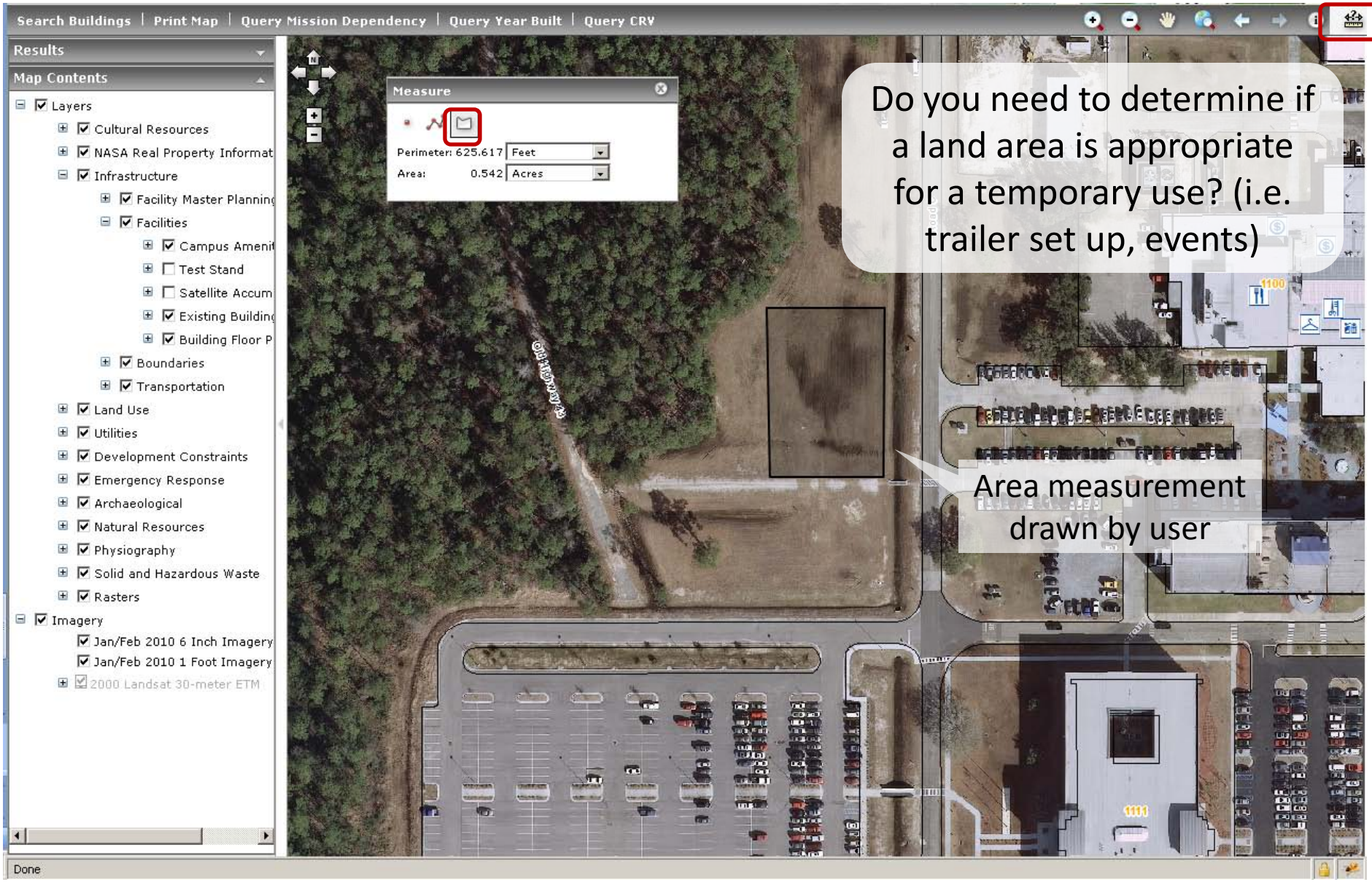
039a

T-39A

009

Done

Query Features



Take Measurements

National Aeronautics and Space Administration

NASA-Wide Institutional Geographic Information System

Search Buildings | Print Map | Query Mission Dependency | Query Year Built | Query CRV

Results

Clear All

- Query Mission Dependency (31)
  - Mission Dependency (31)

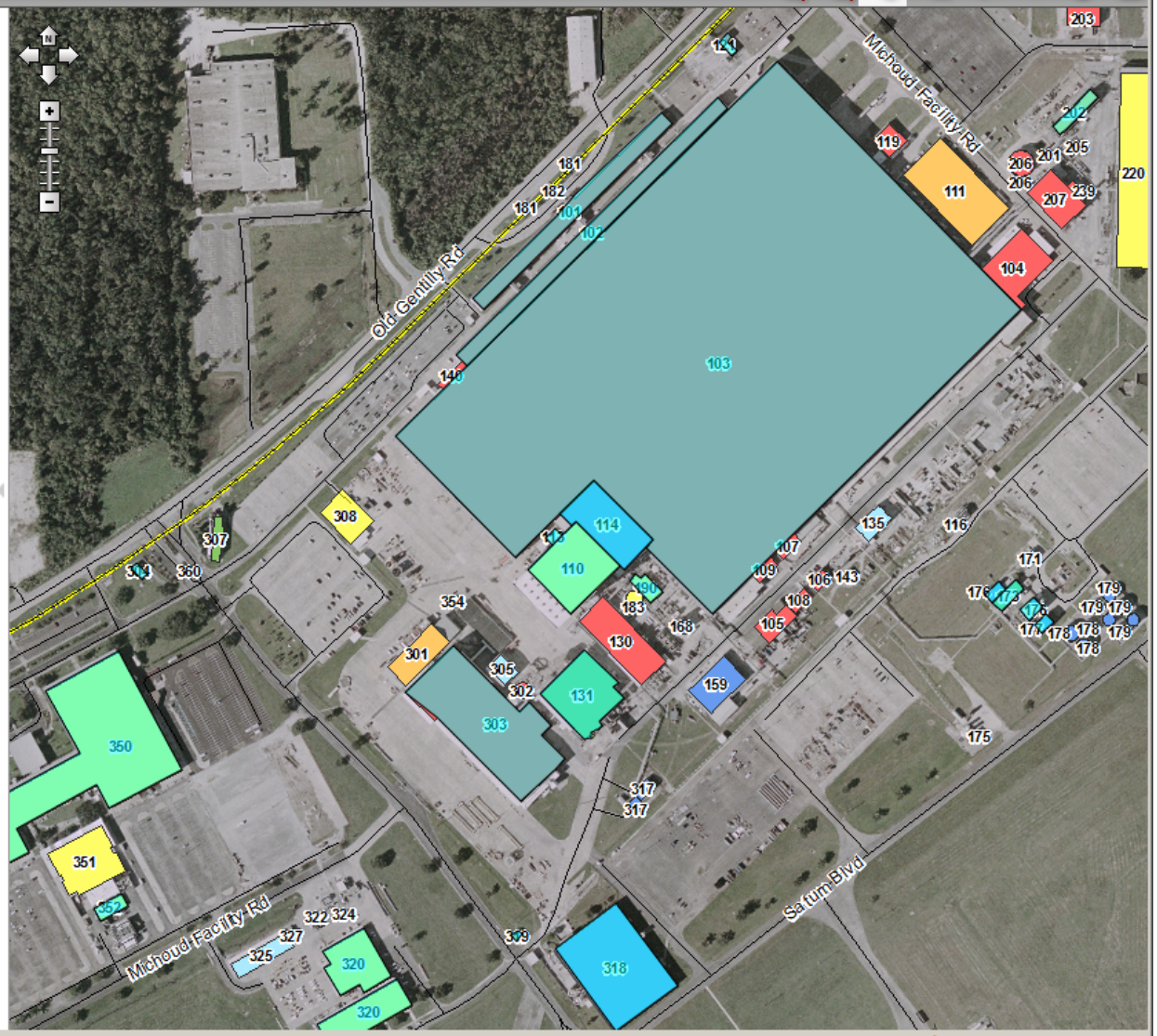
    Records 1 - 25 of 31 >
    - HAZARDOUS MATERIALS STORAGE

Building Number	221
Year Built	1966
Mission Dependency	MISSION CRITICAL
Site	MAF
Center	Michoud Assembly Fa
Property Name	HAZARDOUS MATERI
Status	ACTIVE
Classification	442-30
Category	Buildings
Book Value	498820
Current Replacement Value	3531252
NASA Measurement	18,761.00 FT2
GSA Measurement	18,761.00 FT2
Risk Description	SIGNIFICANT
Property Score	71

    - COMPONENT ABLATOR FACILITY
    - FACILITIES OPERATIONS BLDG

Map Contents

- Layers
  - Cultural Resources
  - NASA Real Property Information
    - Mission Dependency
    - Year Built
      - 1938 - 1950
      - 1951 - 1960
      - 1961 - 1970
      - 1971 - 1980
      - 1981 - 1990
      - 1991 - 2000
      - 2001 - 2010
    - Book Value
    - Current Replacement Values (CRV)

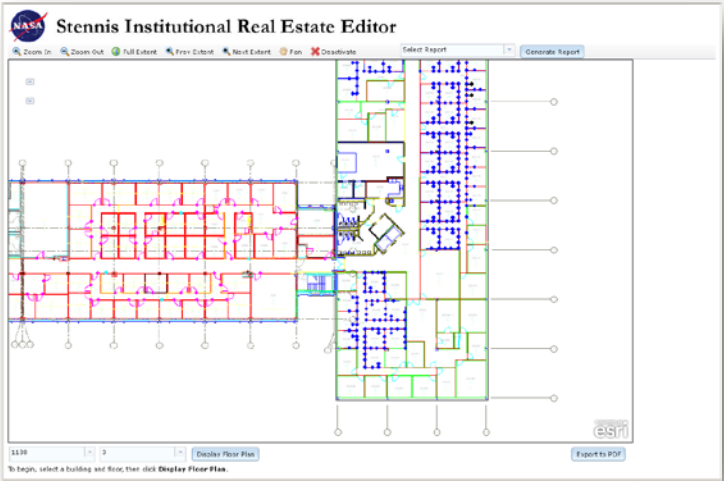


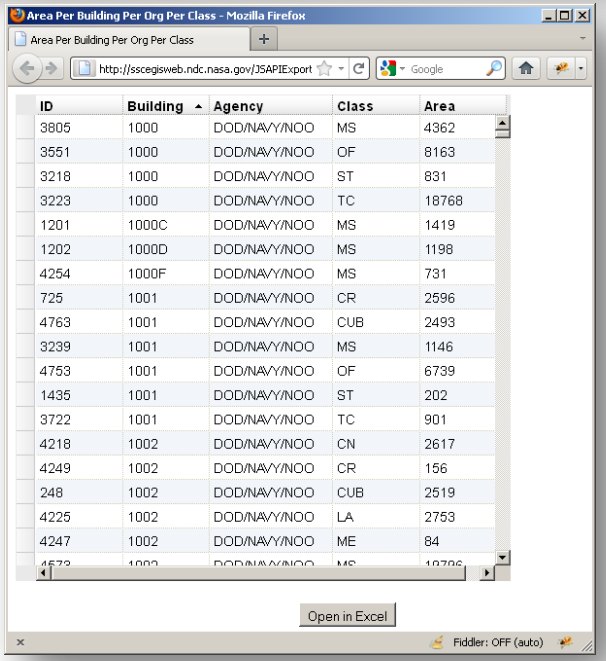
Fiddler: OFF (auto)

Query / Display Buildings by Year Built and other Real Property Fields

Proof of Concept Applications

- Stennis Space Center leases space to a variety of federal agencies and private companies.
- Managing personnel required ability to edit the information associated with rooms to ensure reporting was based on updated information so the appropriate billing could be assessed.
- Personnel required a map-based interface to edit the information

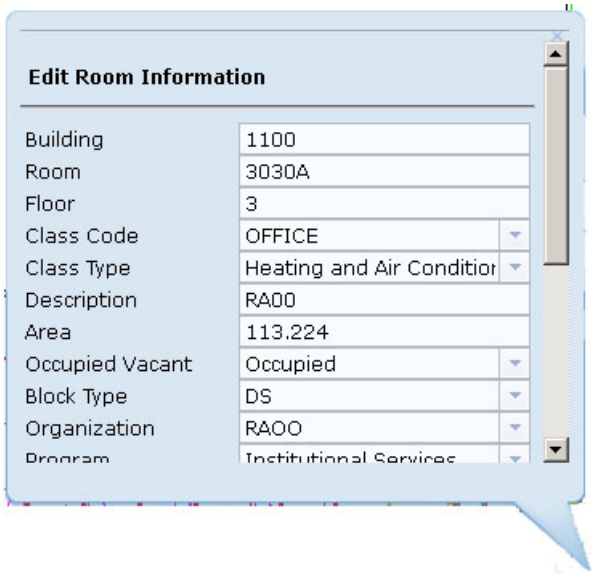


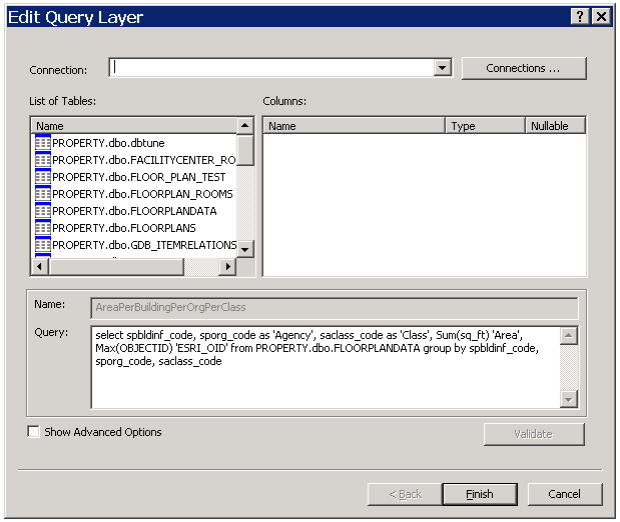


ID	Building	Agency	Class	Area
3805	1000	DOD/NAVY/NOO	MS	4362
3551	1000	DOD/NAVY/NOO	OF	8163
3218	1000	DOD/NAVY/NOO	ST	831
3223	1000	DOD/NAVY/NOO	TC	18768
1201	1000C	DOD/NAVY/NOO	MS	1419
1202	1000D	DOD/NAVY/NOO	MS	1198
4254	1000F	DOD/NAVY/NOO	MS	731
725	1001	DOD/NAVY/NOO	CR	2596
4763	1001	DOD/NAVY/NOO	CUB	2493
3239	1001	DOD/NAVY/NOO	MS	1146
4753	1001	DOD/NAVY/NOO	OF	6739
1435	1001	DOD/NAVY/NOO	ST	202
3722	1001	DOD/NAVY/NOO	TC	901
4218	1002	DOD/NAVY/NOO	CN	2617
4249	1002	DOD/NAVY/NOO	CR	156
248	1002	DOD/NAVY/NOO	CUB	2519
4225	1002	DOD/NAVY/NOO	LA	2753
4247	1002	DOD/NAVY/NOO	ME	84

Real Estate Editor - Requirements

- Application uses the ArcGIS API for JavaScript.
  - Easy to Use Applications
  - JavaScript Experience
- Attribute Inspector Widget
  - Minimal Click Editing Experience
  - Edit data using Combo Boxes, Text Fields, and Date Selectors
  - Fields can be set to read only.
  - Includes a delete feature button but this can be disabled.
- Query Layers
  - Edited data will update in reports





Real Estate Editor - Implementation Features

Stennis Institutional Real Estate Editor

Zoom In | Zoom Out | Full Extent | Prev Extent | Next Extent | Pan | Deactivate | Select Report | Generate Report

Building and Floor Combo Boxes are populated using a query task on the map service to return the building numbers and associated floors of the building selected.

1100 | 3 | Display Floor Plan | Export to PDF

To begin, select a building and floor, then click **Display Floor Plan**.

Real Estate Editor Application

Stennis Institutional Real Estate Editor

Zoom In | Zoom Out | Full Extent | Prev Extent | Next Extent | Pan | Deactivate | AreaPerBuildingPerOrgPerClass | Generate Report

Edit Room Information

Building	1100
Room	3030A
Floor	3
Class Code	OFFICE
Class Type	Heating and Air Conditior
Description	RA00
Area	113.224
Occupied Vacant	Occupied
Block Type	Occupied
Organization	Vacant
Program	Institutional Services

1100 | 3 | Display Floor Plan

To begin, select a building and floor, then click **Display Floor Plan**.

The user clicks inside a room to display the attribute inspector. The building, room, floor, and area fields are not editable. The user can enter/edit the vacancy status, room type, organization, heating/cooling status, etc.

CAD data are displayed in the map over features tied to the real estate database to provide the floor plan to the users in the way they are used to seeing it.

The requested floor plan is displayed through a layer visibility change and a definition query. The map also zooms to the requested floor.

Real Estate Editor Application

Stennis Institutional Real Estate Editor

Zoom In | Zoom Out | Full Extent | Prev Extent | Next Extent | Pan | Deactivate

AreaPerBuildingPerOrgPerClass | Generate Report

Area Per Building Per Org Per Class - Mozilla Firefox

Area Per Building Per Org Per Class

http://sscegisweb.ndc.nasa.gov/JS

ID	Building	Agency	Class	Area
3805	1000	DOD/NAVY/NOO	MS	4362
3551	1000	DOD/NAVY/NOO	OF	8163
3218	1000	DOD/NAVY/NOO	ST	831
3223	1000	DOD/NAVY/NOO	TC	18768
1201	1000C	DOD/NAVY/NOO	MS	1419
1202	1000D	DOD/NAVY/NOO	MS	1198
4254	1000F	DOD/NAVY/NOO	MS	731
725	1001	DOD/NAVY/NOO	CR	2596
4763	1001	DOD/NAVY/NOO	CUB	2493
3239	1001	DOD/NAVY/NOO	MS	1146
4753	1001	DOD/NAVY/NOO	OF	6739
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248	1002	DOD/NAVY/NOO	CUB	2519
4225	1002	DOD/NAVY/NOO	LA	2753
4247	1002	DOD/NAVY/NOO	ME	84

Open in Excel

Commonly used reports can be generated by selecting the desired report form the list. Edits made using the Attribute Inspector will dynamically update in the Query Layer Map Service

FileName.csv [Read-Only] - Micros...

	A	B	C	D	E
1	ID	Building	Agency	Class	Area
2	3805	1000	DOD/NAVY/NOO	MS	4362
3	3551	1000	DOD/NAVY/NOO	OF	8163
4	3218	1000	DOD/NAVY/NOO	ST	831
5	3223	1000	DOD/NAVY/NOO	TC	18768
6	1201	1000C	DOD/NAVY/NOO	MS	1419
7	1202	1000D	DOD/NAVY/NOO	MS	1198

1100 | 3 | Display Floor Plan

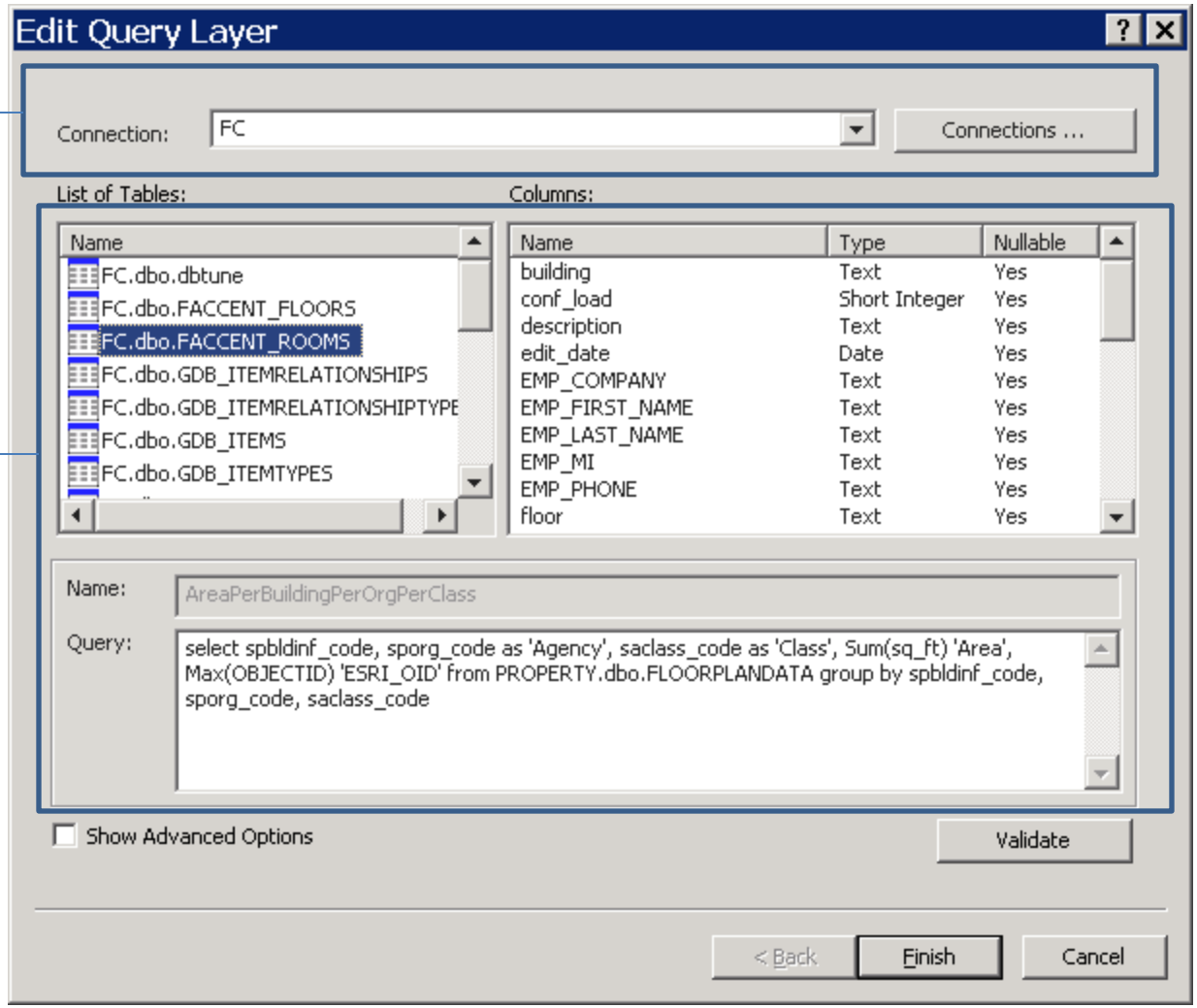
To begin, select a building and floor, then click **Display Floor Plan**.

Real Estate Editor Application - Reports

File -> Add Data -> Add Query Layer

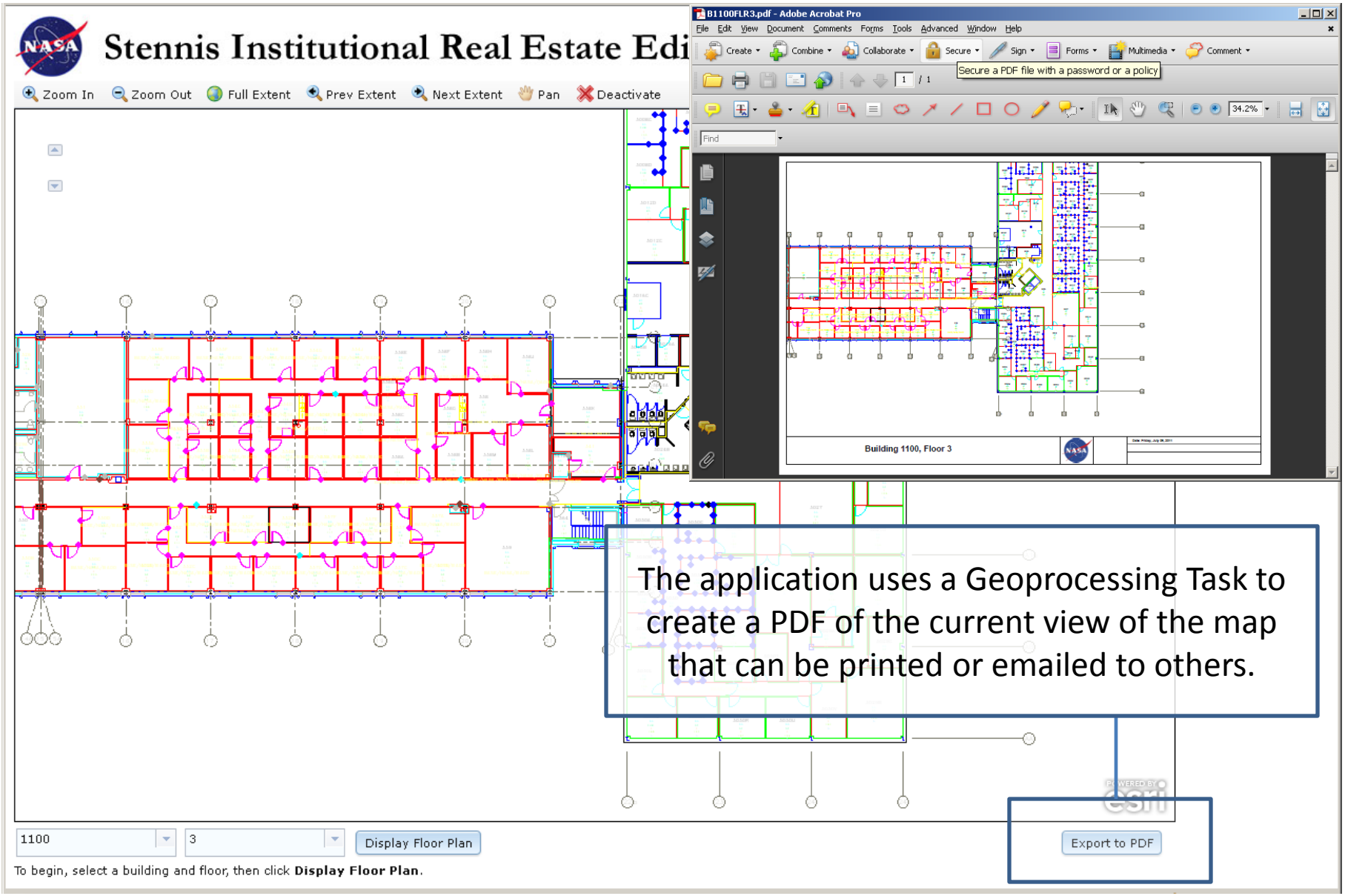
Connect to DBMS

Use Table and Field Names to Construct Custom Query



- Publish Query Layers in Map Service.
- Consumable in application via REST API

Query Layers used to power reports.



Real Estate Editor Application: Geoprocessing Task

- Utilizes the Mapping Module in ArcPy Site-package.
- File name and current map extent are passed from the JavaScript to the Geoprocessing Service.
- The PDF is created from a map template stored on the server.
- A batch file performs a clean up on the PDF file directory.

D:\FC\exportpdf1.py - Notepad++

File Edit Search View Encoding Language Settings Macro Run TextFX Plugins Window ?

exportpdf1.py

```
import sys, arcpy
arcpy.env.overwriteOutput = True
mxdPath = 'D:\\FC'
mxdTemplate = mxdPath + "\\" + str(sys.argv[1])
outWs = 'D:\\Inetpub\\wwwroot\\FC\\PDFs'
outFileName = sys.argv[2]
ext = sys.argv[3]
outFilePath = outWs + "\\" + outFileName + ".PDF"
mxdTemplateObject = arcpy.mapping.MapDocument(mxdTemplate)
df = arcpy.mapping.ListDataFrames(mxdTemplateObject)[0]
cad_layer = "D:\\FC\\" + outFileName + ".lyr"
addLayer = arcpy.mapping.Layer(cad_layer)
arcpy.mapping.AddLayer(df, addLayer, "AUTO_ARRANGE")
df.extent = ext
arcpy.mapping.ExportToPDF(mxdTemplateObject, outFilePath)
```

length : 60 Ln : 9 Col : 18 Sel : 0 Dos\Windows ANSI INS

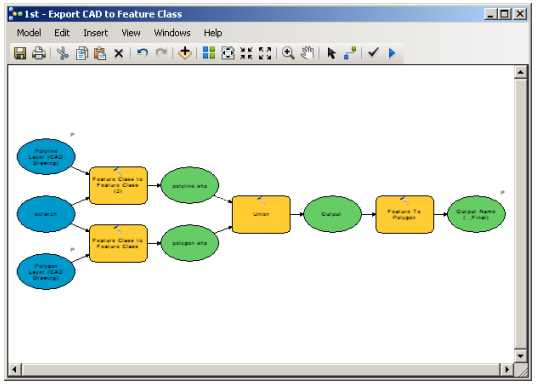
```
//Gets the current extent of map and passes it to the geoprocessing task
var mapextent = map.extent.xmin + " " + map.extent.ymin + " " + map.extent.xmax + " " + map.extent.ymax;
alert(file_name)
alert(mapextent);
var gp = new esri.tasks.Geoprocessor("http://sscegisweb.ndc.nasa.gov/ArcGIS/rest/services/FC/PrintService/GPServer/ExportToPDF");
dojo.connect(gp, "onExecuteComplete", openPDF);
dojo.connect(gp, "onError", DisplayError);
var params = { "mxdTemplate":mapdoc, "Output_File_Name":file_name, "Extent":mapextent };
gp.execute(params);
}
```

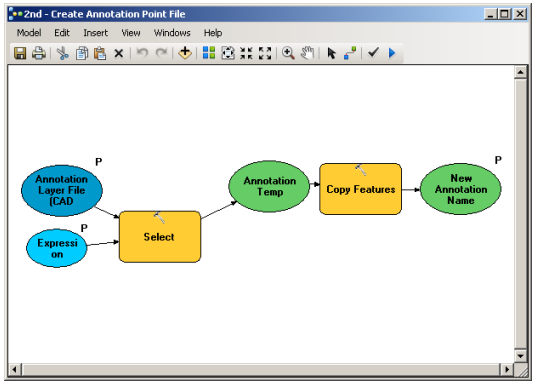
Real Estate Editor Application: Geoprocessing Task – Create PDF

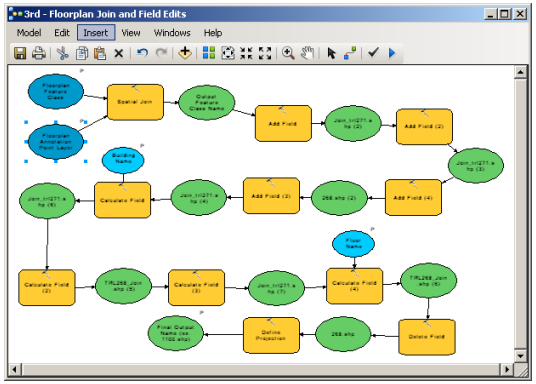
- Floor plans at SSC are managed by separate contract.

- Geoprocessing models and python scripts have been developed to convert CAD-based floor plans to feature class geometry.

- CAD Annotation building/room data is converted and joined with geometries to allow for tie to real estate database.







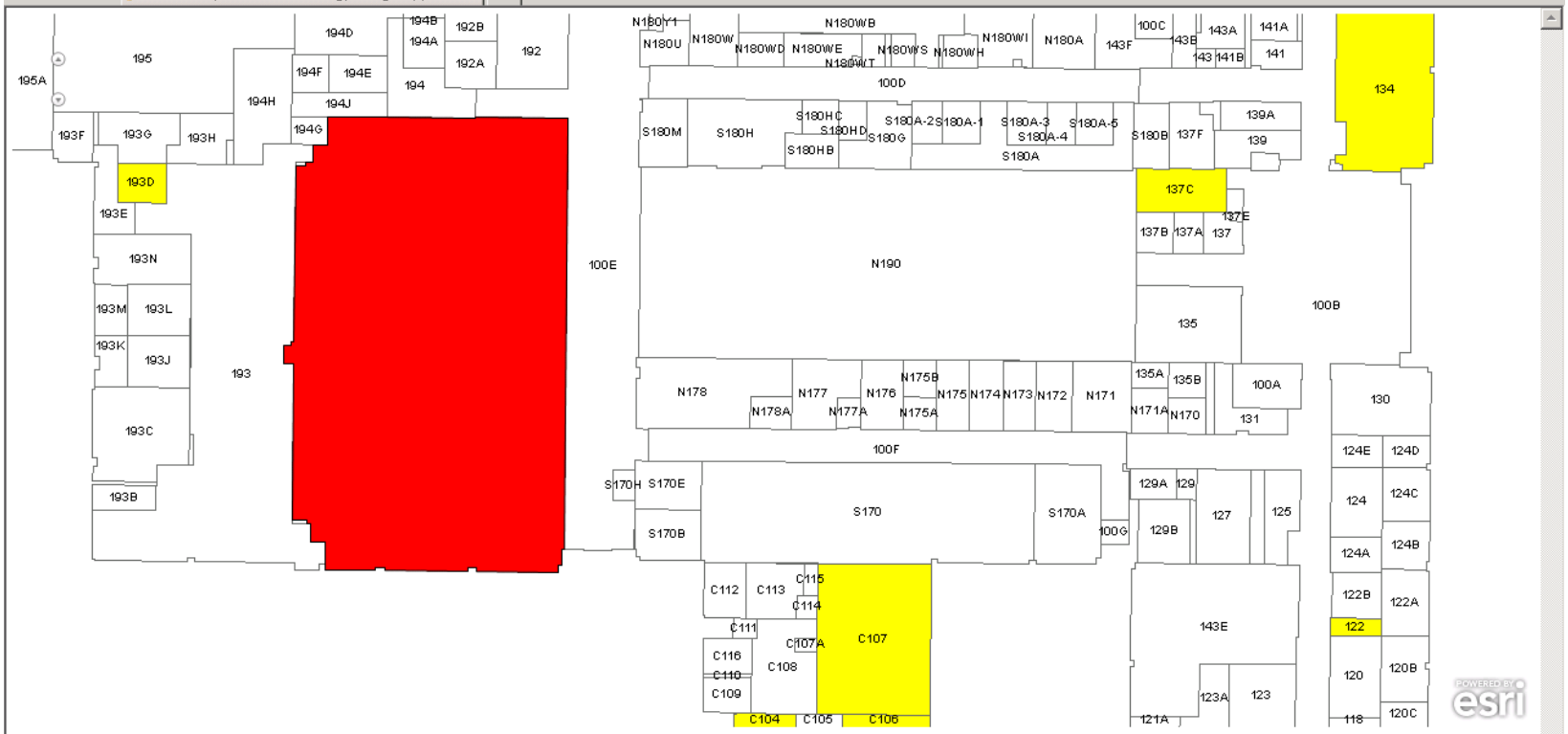
Floor Plan Updates using ModelBuilder/Python

Personal Property

- Personal property data is delivered from a remote database on a daily basis.
- Property records are associated with floor plan geometries in a one-to-many relationship.
- Records are associated with room based on room ID field comprised of ‘building-room number’ (i.e. 1100-3017C)

Personal Property

Favorites | Stennis Space Center Energy Usage Applicati... | Page | Safety | Tools



ID	ECN#	Item	Cost	MFR	Serial#	MFR Serial#	Year	Contract#	Desc
8606	2251089	TERMINAL, TOUCH SCREEN	4728	NCR CORP TERMINAL SYSTEMS	39558634	1151	2007	347104146	15 LCD
8607	2251090	TERMINAL, TOUCH SCREEN	4728	NCR CORP TERMINAL SYSTEMS	39558656	1151	2007	347104146	15 LCD
2089	2156911	DISPLAY UNIT	150	DELL COMPUTER CORP	CN095WUP4	E551	2003	347104146	15"
8387	1322602	CUTTER, FOOD	3619	HOBART CORP FOOD SERVICE DIV	561-005-727	84186	1992	347104146	18
6316	2250732	MIXER, FOOD	2835	GROVER MFG CORP	630521	SP300A	2007	347104146	30 QT.

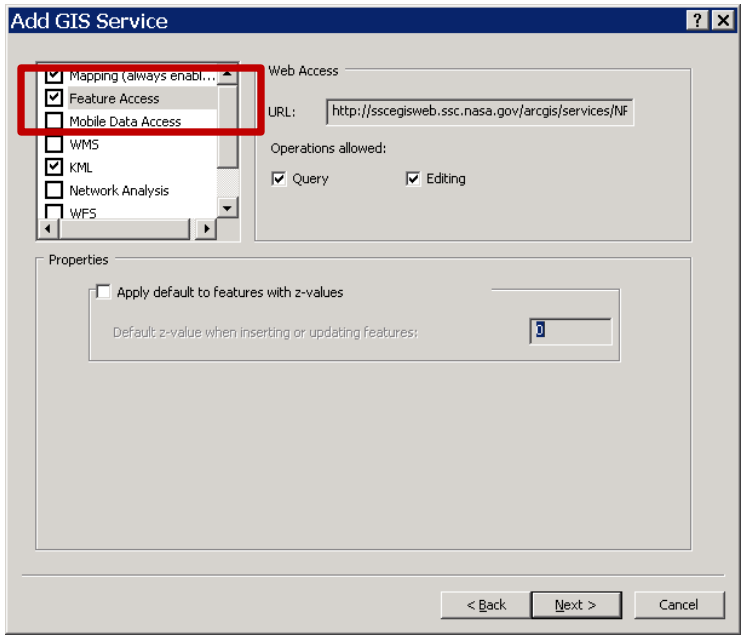
Done | Local intranet | 100%

Personal Property Application

- Feature Access must be checked when creating a map service to enable editing and related queries.

- The data served in feature services must be stored in ArcSDE.

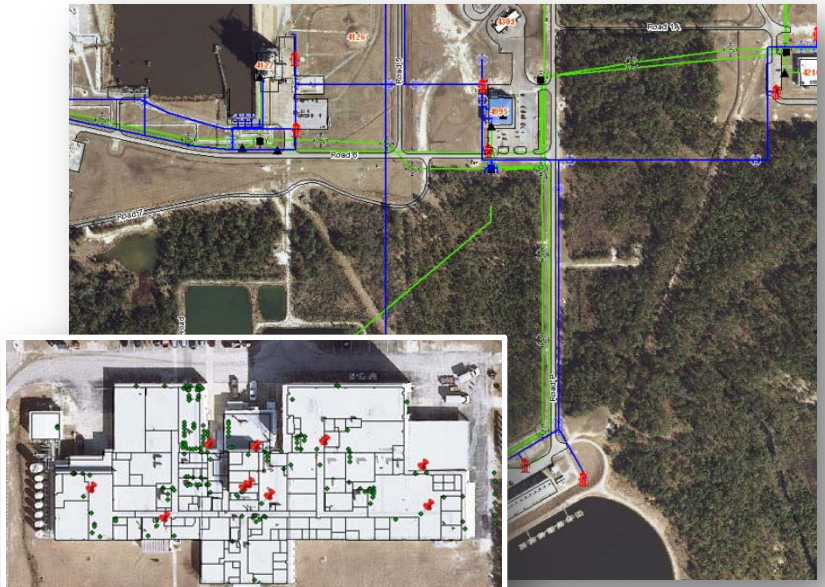
- Both the feature class and related table must be published in the map document in order for ArcGIS Server to recognize the relationship.



Editing/Related Queries: Implementation Notes

Asset Mapping

- Maintenance records for assets within and surrounding SSC facilities are stored in IBM maximo.
- A full integration of GIS into maximo would be most desirable but GIS and asset management are separate contracts.
- Established hyperlink from feature to maximo record, work order, tickets, etc. by passing the unique ID in the URL



Maximo Data Integration

Search Buildings | Print Map | Query Mission Dependency | Query Year Built | Query CRV | Search Maximo Features

Results

- eyewash (15)
  - Maximo (15)
    - EMERGENCY EYEWASH/SAFETY SHOWER UNIT

Building #	8100
Description	EMERGENCY EYEWASH/SAFETY SHOWER UNIT
Room #	115C
Equipment #	00977033
Floor #	1
Picture 1	Photo
Picture 2	Photo
Maximo Link	Link to Maximo
Maximo Work Order	Link to Maximo Work Orders
Work Order Ticket	Link to Maximo Work Order Tickets
Associated Costs	Link to Maximo Associated Costs
Asset ID	18636

- EMERGENCY EYEWASH
- EMERGENCY EYEWASH
- EMERGENCY EYEWASH
- EMERGENCY EYEWASH
- EMERGENCY EYEWASH/SAFETY SHOWER UNIT
- EMERGENCY EYEWASH
- EMERGENCY EYEWASH
- EMERGENCY EYEWASH
- EMERGENCY EYEWASH
- EMERGENCY EYEWASH/SAFETY SHOWER UNIT
- EMERGENCY EYEWASH/SAFETY SHOWER UNIT

Map Contents

- Stennis
  - Cultural Resources
  - NASA Real Property Information
  - Infrastructure
    - Facility Master Planning
    - Facilities
      - Campus Amenities
      - Test Stand
      - Satellite Accumulation Site
      - Existing Building
      - Buildings Floor Plans
        - 1st Floor

MAXIMO - Assets - Windows Internet Explorer

https://sscmaxprod.ssc.nasa.gov:9443/maximo/ui/login

Work Orders | Preventive Maintenance | Routes

Filter | 1 - 10 of 196

WO Group	Task	Is Task?	Description	Location	Asset	Class	Status	Priority	Target
0000276667		N	Eyewash & Safety Shower (B-8100)	00971960	00977033	WORKORDER	COMP	4	6/2/08
0000276667	270	Y	Connect flowmeter to shower or other mean...	00971960	00977033	ACTIVITY	COMP	4	
0000276667	210	Y	Verify provisions have be made to prevent u...	00971960	00977033	ACTIVITY	COMP	4	
0000276667	80	Y	Connect flowmeter to eyewash or other me...	00971960	00977033	ACTIVITY	COMP	4	
0000276667	120	Y	Place test gauge on top of the stream of the ...	00971960	00977033	ACTIVITY	COMP	4	
0000276667	150	Y	Verify water deliver by the eyewash is tepid.	00971960	00977033	ACTIVITY	COMP	4	
0000276667	70	Y	Verify controlled, low velocity water rinses ...	00971960	00977033	ACTIVITY	COMP	4	
0000276667	112	Y	equidistant from the center for testing. The in...	00971960	00977033	ACTIVITY	COMP	4	
0000276667	171	Y	around eyewash is well-lit.	00971960	00977033	ACTIVITY	COMP	4	
0000276667	100	Y	Verify water supply can deliver at least 3.0 ...	00971960	00977033	ACTIVITY	COMP	4	

Equipment Info:

Criticality 1

Availability Issue X

Facility 8100

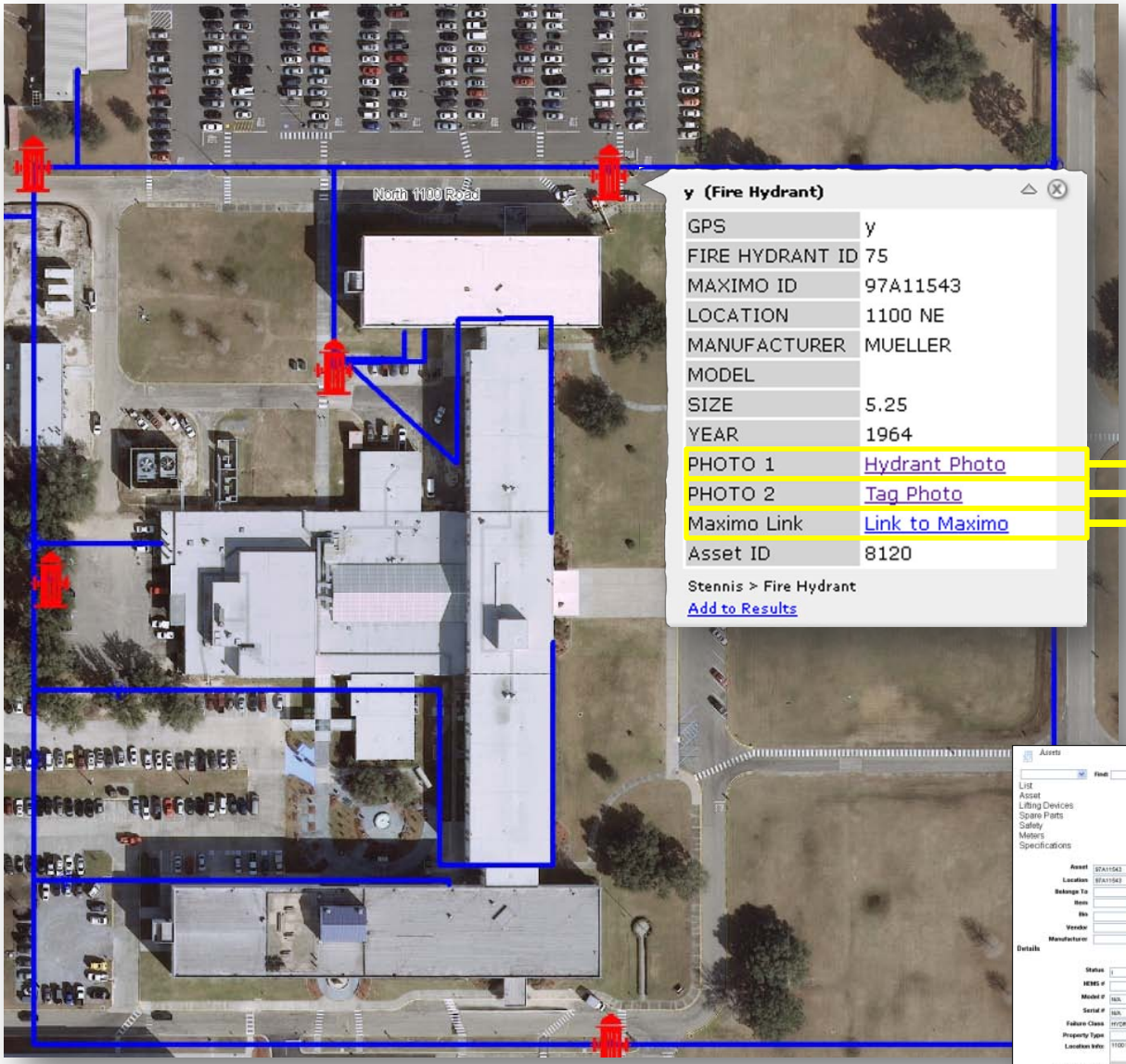
Room

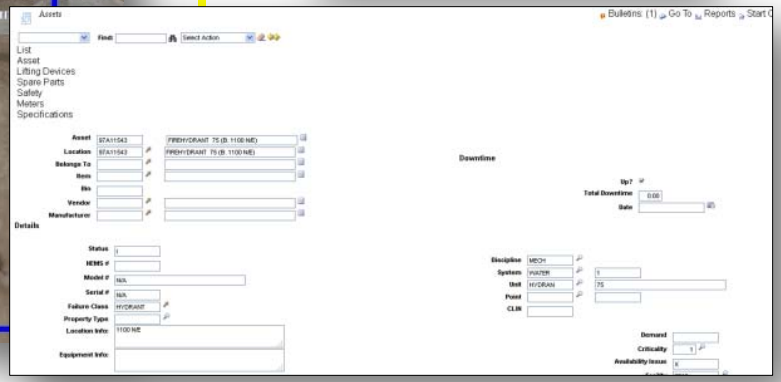
Date Inv 2/29/08

0 16 32 64 96 128 Feet

Internet 100%

Maximo Data Integration: Building Interior





Fire Department Support: Building Exterior Example

- Looking into portal migration plans considering future support of Web ADF

- Adding additional reports to the Real Estate Editor in light of new reporting requirements for federal agencies issued by GSA.

- Continue to look for additional data sets to integrate into system.

Plans

- Kelly Boyd
  228-688-2603
  Kelly.A.Boyd@nasa.gov

- Adam Murrah
  228-688-1619
  Adam.W.Murrah@nasa.gov

- Mark Mitchell
  228-688-1710
  Mark.A.Mitchell-1@nasa.gov

Questions?