

DIGITAL MAPPING TECHNIQUES 2018

The following was presented at DMT'18
(May 20-23, 2018 - University of Kentucky,
Lexington, KY)

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2018)

<http://ngmdb.usgs.gov/info/dmt/>

The Maine Geological Survey's Statewide Geodatabase Architecture and Initial Progress Towards GeMS Compliance.

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Description:

The Maine Geological Survey (MGS) has a statewide, seamless, multi-map, multi-scale, enterprise geodatabase that tightly integrates the mapping, data collection, project tracking, publishing and sales workflows for all Maine surficial and bedrock map products. We'll review the software and infrastructure that host the system. We'll also look in detail at the database schema and procedures that make this a powerful tool for centralizing all MGS data and serving it to ArcGIS, MS Access, MS Excel, ArcServer and our web site. Lastly, we'll review the initial steps taken to prepare the MGS database for providing GeMS-compliant deliverables. This includes a gap analysis between the two systems, a work plan for migration and factors that MGS will be considering before committing to this project.

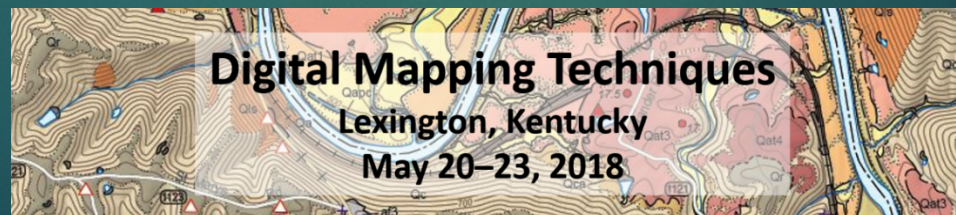
Abstract:

The Maine Geological Survey (MGS) has had a bedrock and surficial geologic mapping system for over 20 years. The system has migrated through many GIS and data technologies as vendors have upgraded software. Until recently, the GIS and business data have always existed in their own technology silos. Through a lot of experimentation and trial and error MGS has arrived at a single database architecture that meets all the data and GIS needs for users. A Microsoft SQL Server Express database running on-premise stores all the ESRI geodatabase objects that are used in ArcGIS for mapping and the business tables that support the project tracking, publishing and sales workflows. ArcGIS and Access provide the front-end data visualizations. SQL Server database views and stored procedures store the logic for data presentation. This system provides the best mapping draw and query performance and allows for the seamless integration of business and geospatial data. Additionally, mapped features are stored in single feature classes for all quadrangles at the mapped scale. When mapping by quadrangle, definition queries are set on the layers to only display data for the quadrangle. Access forms are used to filter and display tabular data by quadrangle to be entered or edited.

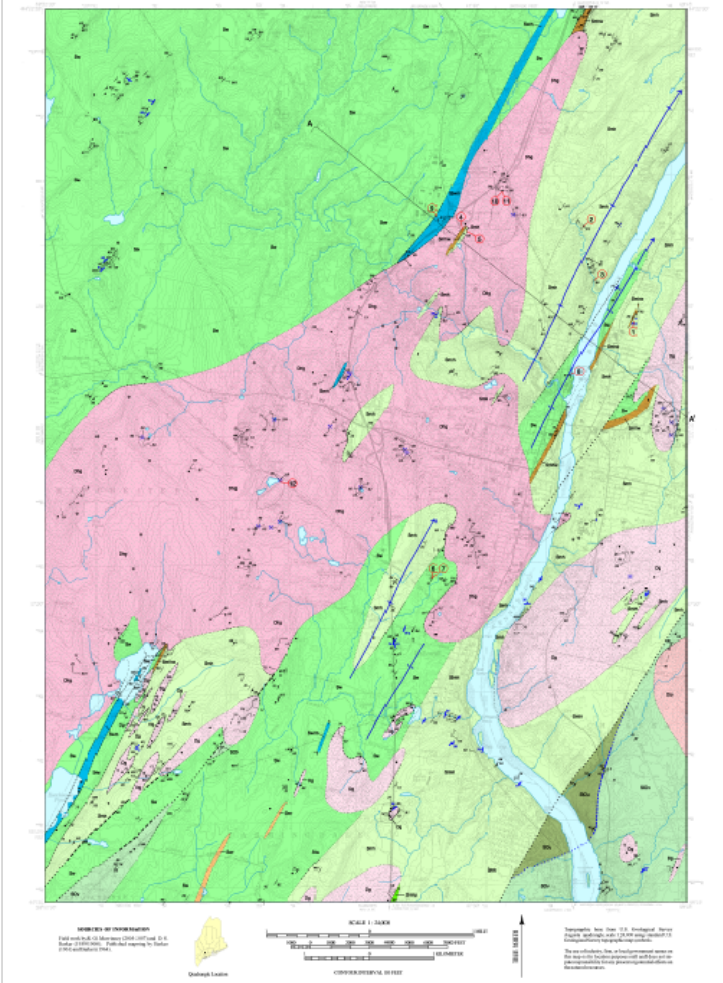
MGS started the GeMS evaluation process this winter. It was quickly apparent that MGS wouldn't use the GeMS file geodatabase, single quadrangle-based mapping tools because this would have been a technological step backwards. However, there were many excellent features of GeMS that MGS could implement like correlation of map units, the glossary and paragraph styles for the description of map units. The decision was made to treat GeMS as a data export product. A gap analysis was performed to assess what data was missing from the MGS system that would be needed to produce a GeMS compliant database for submission to USGS. The analysis also provided a work plan for migration. Results showed that there weren't significant amounts of data missing. However, there is still a significant amount of work that needs to be done. MGS is currently evaluating the costs and benefits of migration and assessing the correct timing for implementing the work plan.

Maine Geological Survey's Statewide Geodatabase Architecture and Initial Progress Towards GeMS Compliance

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Bedrock Geology



Augusta Quadrangle, Maine

Robert G. Harty
 Robert G. Harty
 Robert G. Harty
 Robert G. Harty

Maine Geological Survey
 Open-File No. 12-26
 2012



Photo 1. Photomicrograph showing the complex texture of the rock sample. The image displays a variety of mineral grains and structures, including what appears to be a large, elongated crystal.



Photo 2. Photomicrograph showing a different texture of the rock sample. The image displays a more uniform, fine-grained texture compared to the previous sample.



Photo 3. Photomicrograph showing a texture with distinct mineral grains and some darker inclusions. The image displays a more heterogeneous texture.

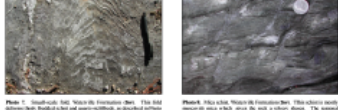


Photo 4. Photomicrograph showing a texture with elongated mineral grains and some darker inclusions. The image displays a more elongated texture.



Photo 5. Photomicrograph showing a texture with elongated mineral grains and some darker inclusions. The image displays a more elongated texture.



Photo 6. Photomicrograph showing a texture with elongated mineral grains and some darker inclusions. The image displays a more elongated texture.



Photo 7. Photomicrograph showing a texture with elongated mineral grains and some darker inclusions. The image displays a more elongated texture.

Agenda

- MGS data management history
- Review current MGS database design and key features
- GeMS Implementation Evaluation

EXPLANATION OF UNITS

EXPLANATION OF LINES

EXPLANATION OF SYMBOLS

INTERPRETIVE CROSS-SECTION

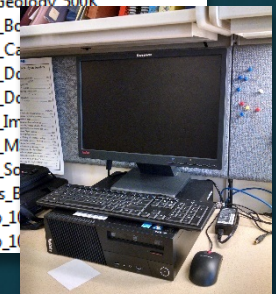
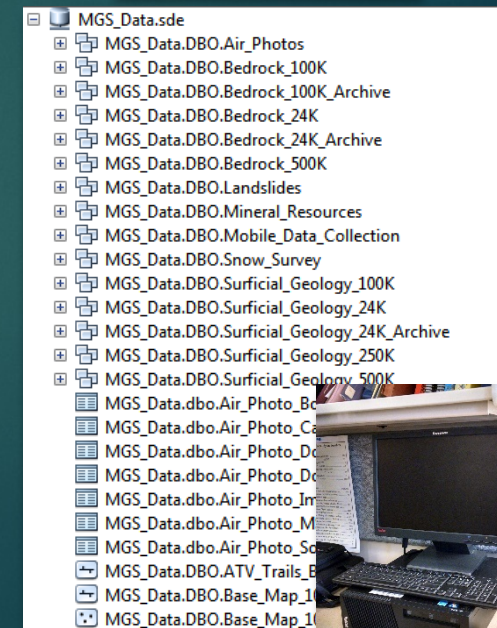
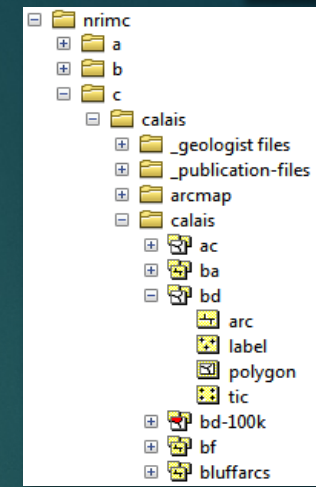
REFERENCES

GLOSSARY

CONTACT INFORMATION

MGS Data Management History

	Spatial Data	Business Data
1996	Paper	Reports
	Mylar	Tables
	----- Quadrangle based -----	
	ArcInfo	Text files
	Coverages	Lotus 123
~2002	AML	Excel
	Plot files	
2005	PDF files	Access
2014	----- Multi-map based -----	
	ArcGIS	Excel
	Enterprise SQL Server GDB	Access
2016	PDF	
	ArcGIS	Excel
2017	File Geodatabase	Enterprise database
	PDF	
	----- ArcGIS -----	
	Local SQL Server Express Geodatabase	
Future	PDF	
	Local SQL Server Express Geodatabase	



User Interfaces

Project/Map Status

Find Project: Name: Augusta, Series: Detailed bedrock geology, GIS Layer: Bedrock_Units

Project Name: Augusta, StatusID: 1447, Add New, Edit

Publication Series: Detailed bedrock geology, Quadrangle Tile Name: augusta, Scale: 24000, Pubcode: 12-36

Date	Task	Project Step
12/3/2012	To shapefiles	
7/24/2014	Made full pdf of published map 12-36 for printing and for web per Chris	5.00 - Final Review
8/21/2015	Updated map explanation in database.	5.05 - Final Review, Expl
9/2/2015	Have a cross section.	
9/3/2015	Added photo locations from misc anno. Still have ? that should be added around unit from misc anno.	
5/4/2016	TEW submitted completed status report to HNB. Available on S Drive	

Map Explanations

Symbology	Unit	LSymbol	Symbol	Description	Needs Review	MGS Comment
	Dg			Granite. Similar in lithology to Hallowell granite, but in small discontinuous bodies. Pegmatite veins are common in all bodies.	Y	
	Dhg			Hallowell granite. This unit includes several varieties of granite, but is dominated by light gray, medium-grained, equigranular two-mica granite consisting of feldspar, quartz, biotite, and muscovite. Minor pink garnet and Togos pluton. Biotite-muscovite ± garnet granite, granodiorite, and tonalite.	Y	
	Dto			Mayflower Hill Formation. Purplish brown, fine-grained to medium-grained quartz-feldspar-biotite granofels and minor schist. Bedding is pronounced	Y	
	Smh				Y	

Bedrock Data

Project: Augusta

StateID	QuadID	FieldID	Locality Description	UTM X Loaded	UTM Y	Owner	Is New	Is Deleted
482	480			439201.655975	49004.			
483	481			438776.716075	4900.			
484	482			438802.1163	4900168.331075	Robert G. Marvinney, Maine	N	
485	483			438801.61975	4900016.8616	Robert G. Marvinney, Maine	N	
486	484			438823.378525	4899882.9488	Robert G. Marvinney, Maine	N	
487	485							
488	486							
489	487							
490	488							
491	489							
492	490							

Record: 1 of 484 of 520

FeatureID	Feature Type	Modifier
63957	bcbk	Bedding, tops unknown.
63958	fofo	Foliation, metamorphic.

Menu

Open Applications:

- Project Status
- Map Explanations
- Bedrock
- Publications
- Publications Search
- Publications Sales
- Snow Survey
- Wells
- Wells Search
- Well Drillers
- Snow Survey
- NGWMN
- Marine Tides
- Landslide Analysis
- Field Photo Inventory
- Air Photo Inventory
- Collection Check Out
- GIS Lookups
- Mailing List
- Reports
- GIS Data Publishing

Help Documents:

- Help
- Publications
- Publications Search
- Publications Sales
- Snow Survey
- Wells
- Surficial 24K Mapping
- Bedrock 24K Mapping

Publications

Find Publication: PubCode: 12-36, Title: Bedrock geology of the Augusta quadrangle, Maine

Pubcode: 12-36, Date: 2012, Exact Date, PublicationID: 16641, Add New, Edit, Clone, Citation

Author: Marvinney, Robert G., and Barker, Daniel S.

Source: Maine Geological Survey, Open-File Map 12-36

Bibliography: MGS Pubs/Web, NGMGB, Sales, Supersede, MSL Fields

Keywords: areal geology, maps, geologic maps; bedrock; explanatory text; MGS, Kennebec County

AGI Categories: 14 Areal geology, maps and charts

Location: Front Desk Y, Library, Bibliography-Web Y

Find Well Number: 108113

Well Number: 108113, Old Number, Add New Card, Add Historical Well

Well Location: Town: AUGUSTA, Street Address: 54 BOLTON HILL ROAD, Tax Map Number: 7, Data Source: OWNER CARD, Tax Lot Number: 92-A

Owner: Driller, Builder/Developer, Previous Owner, Coordinates, Historical Parameters

First Name: JANE M. & BARBARA B., Last Name: WOLF, Company: , Address 1: 54 BOLTON HILL ROAD, City: AUGUSTA, State: ME, Zip: 04330

Enter Date, Edited By, Edit Date

Well Information

Date Drilled	10/29/2002	Well Depth (ft)	200	Depth (ft)	Yield (gpm)
Date Drilled Approx		Casing Length (ft)	80	Vein 1	0
Well Type	BEDROCK	Overburden Thickness (ft)	70	Vein 2	0
Well Use	DOMESTIC	Yield (gpm)	12	Vein 3	0
Well Construction		Yield Date	10/29/2002	Vein 4	0
Well Development		Static Level (ft)			
Replacement Well		Static Date		Geothermal Well	

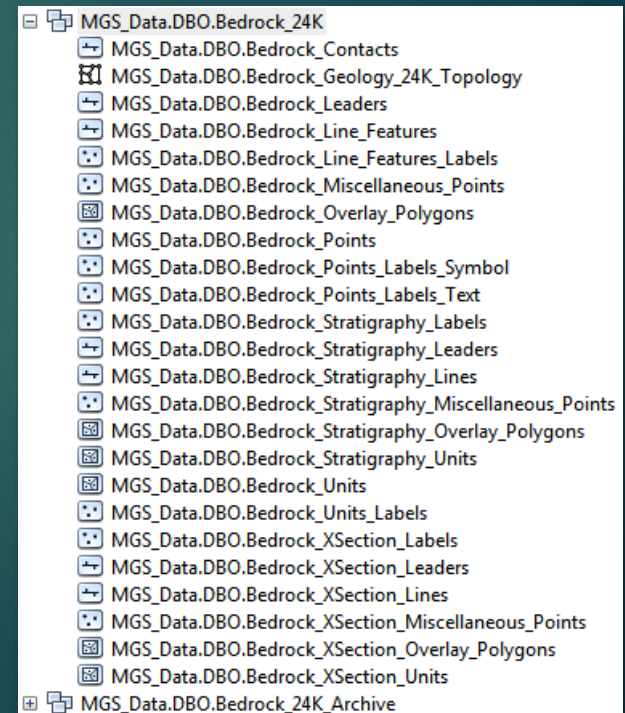
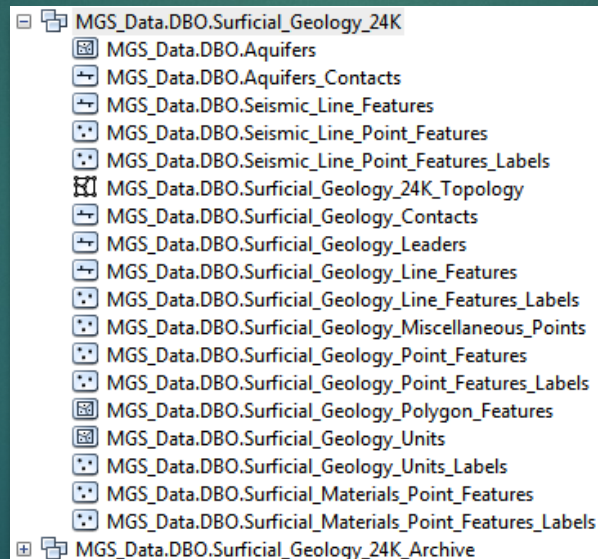
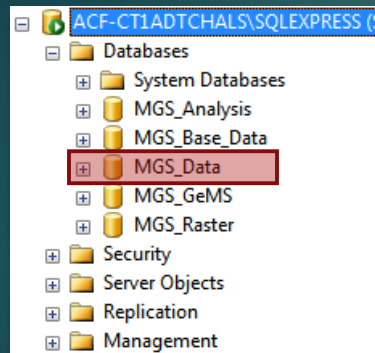
Comment:

Enter Date: 11/6/2002, Entered By, Field Date: 5/26/2004, Edit Date: 5/26/2004, Edited By, Field Code: P, Digitized Date: 2004, Revision Date, Revision Code



Statewide Data Storage: Why

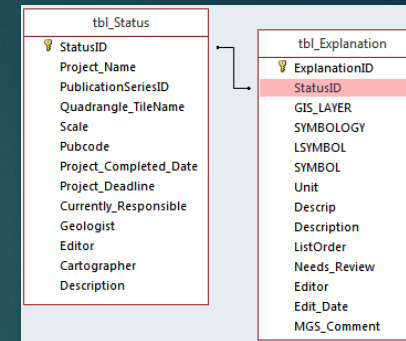
- Controlled data management
- Performance
- Discoverability
- Value added, any-scale analysis
- More stable code base and centralized logic



Statewide Data Storage: How

Form example:

- Each table has a foreign key that identifies the quadrangle the records belong to
- Forms are set up to filter by quadrangle



ExplanationID	StatusID	GIS_LAYER	LSYME	SYME	Unit	Descrip	Description	ListOrder	Needs_Rev	MGS_Comm
6920	1302	Bedrock_Units		382	pC#ct	Rocks of the Cf	Twin Bridges facies. Medium- to coarse-		Y	
6922	1327	Bedrock_Units		352	CDbig	Biddeford Plut	Biddeford Pluton. Light gray, medium-gr		Y	
6924	1327	Bedrock_Units		361	Dwb	Webhannet Pl	Webhannet Pluton. Light gray to pink, bi		Y	
6926	1327	Bedrock_Units		93	Sb	Berwick Forma	Berwick Formation. Medium-bedded, me		Y	
6927	1327	Bedrock_Units		615	SOe	Merrimack Gro	Eliot Formation. Generally thin-bedded.		Y	
6928	1327	Bedrock_Units		736	SOK	Merrimack Gro	Merrimack Group/Kittery Formation. Vari		Y	
6929	1326	Bedrock_Units		352	CDbig	Biddeford Plut	Biddeford Pluton. Light gray, medium-gr		Y	
6930	1326	Bedrock_Units		736	SOK	Merrimack Gro	Merrimack Group. Kittery Formation. Va		Y	
6932	1456	Bedrock_Units		32	DOpg	Passagassawak	Passagassawakeag Gneiss. This unit is a s		Y	
6933	1456	Bedrock_Units		364	DSlsf	Foliated and sh	Foliated and sheared Lincoln Syenite (Lir		Y	
6934	1456	Bedrock_Units		303	DSmp	Mixer Pond Gn	Mixer Pond Gneiss. A heterogeneous un		Y	
6935	1456	Bedrock_Units		15	Obr	Beaver Ridge F	Beaver Ridge Formation. Rusty weatheri		Y	
6937	1456	Bedrock_Units		756	Oebu	Cape Elizabeth	Cape Elizabeth Formation (A) to Scarboro		Y	

Menu | Map Explanations

Find Project: Name: Augusta | Series: Detailed bedrock geology | GIS Layer: Bedrock_Units | Clear Filter | Edit

Data Views: Missing Explanations | Missing Explanations - Quad | Missing Explanations - All | Explanations Used in GIS

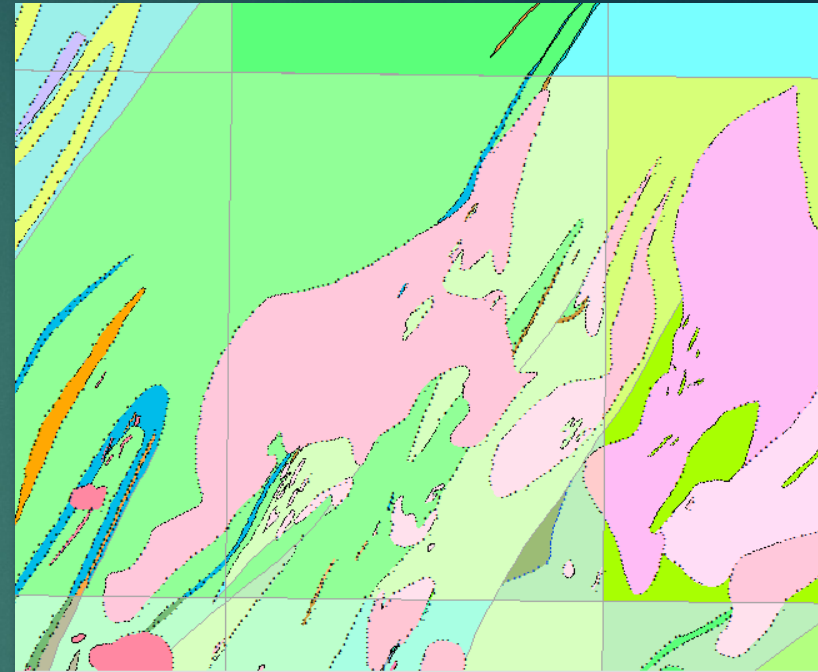
Symbology	Unit	LSymbol	Symbol	Description	Needs Review	MGS Comment
	Dg			Granite. Similar in lithology to Hallowell granite, but in small discontinuous bodies. Pegmatite veins are common in all bodies.	Y	
	Dhg			Hallowell granite. This unit includes several varieties of granite, but is dominated by light gray, medium-grained, equigranular two-mica granite consisting of feldspar, quartz, biotite, and muscovite. Minor pink garnet and Togus pluton. Biotite-muscovite ± garnet granite, granodiorite, and tonalite.	Y	
	Dto			Mayflower Hill Formation. Purplish brown, fine-grained to medium-grained quartz-feldspar-biotite granofels and minor schist. Bedding is pronounced	Y	
	Smh				Y	



Statewide Data Storage: How

Map example:

- All bedrock unit polygons for every mapped quadrangle are in the same feature class
- Each feature class has a QUADNAME field that identifies the quadrangle the feature belongs to



Bedrock_Units												
OBJECTID *	QUADNAME	COMPID	UNIT	COLOR	SYMBOLGY	SYMBOLGY_OVERLAY	DRAW	PUBLISH_DATA	SOURCE	COMMENTS	SHAPE *	
94	augusta	72	Dg	341	color-341	pattern-012	Yes	No	<Null>	<Null>	Polygon	
95	augusta	55	Dg	341	color-341	pattern-012	Yes	No	<Null>	<Null>	Polygon	
96	bangor	1	Sbr	143	color-143	<Null>	Yes	No	<Null>	<Null>	Polygon	
97	bangor	2	Sbp	152	color-152	<Null>	Yes	No	<Null>	<Null>	Polygon	
98	bangor	3	Sbp	152	color-152	<Null>	Yes	No	<Null>	<Null>	Polygon	
99	bangor	4	Sbl	58	color-058	<Null>	Yes	No	<Null>	<Null>	Polygon	
100	bangor	5	Sbk	83	color-083	<Null>	Yes	No	<Null>	<Null>	Polygon	
101	bangor	6	Sbp	152	color-152	<Null>	Yes	No	<Null>	<Null>	Polygon	
102	bangor	7	Sbl	58	color-058	<Null>	Yes	No	<Null>	<Null>	Polygon	
103	bangor	8	Sbr	143	color-143	<Null>	Yes	No	<Null>	<Null>	Polygon	
104	bar-harbor	1	-none-	0	color-000	<Null>	Yes	No	Bulletin 38	<Null>	Polygon	
105	bar-mills	4	CDgd	363	color-363	<Null>	Yes	No	<Null>	<Null>	Polygon	

Statewide Data Storage: How

Map example (continued):

- Python tool automatically sets the Definition Query for every layer in a map document
- `QUADNAME = 'augusta' AND DRAW = 'Yes'`

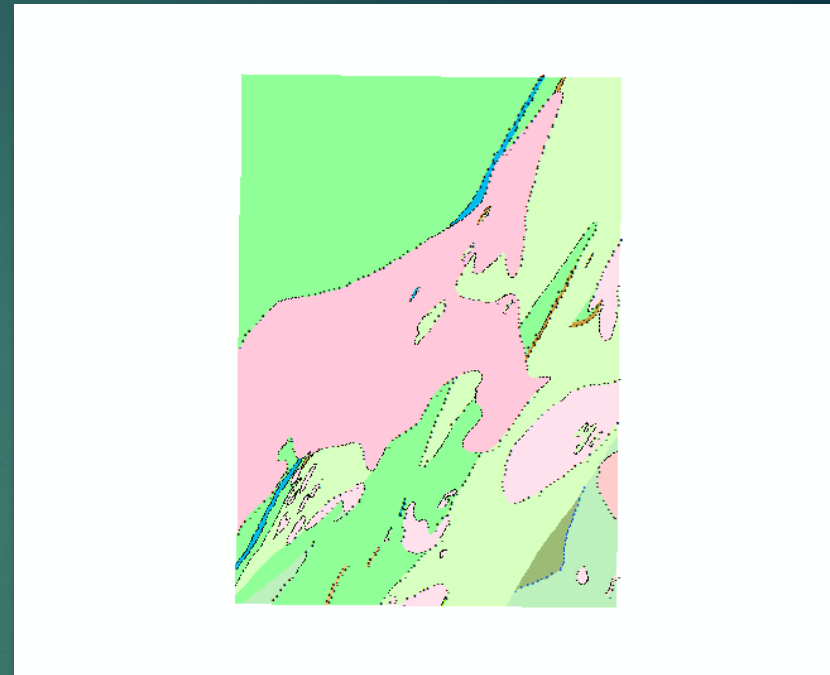
The screenshot displays the ArcGIS interface. On the left is the 'Table of Contents' showing a list of layers under categories like 'Layers', 'XSection', and 'Stratigraphy'. In the center is the 'ArcToolbox' with a tree view of tools under 'MGS_Custom_Toolbox'. On the right is a map showing a geologic map with various colored regions. Overlaid on the map is a dialog box titled 'Quadrangle Definition Query 24K'. The dialog has a 'Quad Name' dropdown set to 'augusta', a 'Clear Definition Query' checkbox (unchecked), and a 'Set DRAW to Yes' checkbox (checked). Below these are text boxes for 'Cross-section profile number (optional)' and 'Stratigraphy diagram number (optional)'. The dialog also contains a text area with instructions: 'Sets the definition query for MGS Surficial and Bedrock layers to a single quad. If a definition query for a quad is already applied it must be cleared by selecting the quad name and checking the Clear option.' At the bottom of the dialog are 'OK', 'Cancel', 'Environments...', '<< Hide Help', and 'Tool Help' buttons. At the bottom of the screen, a data table is partially visible.

94	augusta	72	Dg	341	color-341	pattern-012	Yes	No
95	augusta	55	Dg	341	color-341	pattern-012	Yes	No
96	bangor	1	Sbr	143	color-143	<Null>	Yes	No
97	bangor	2	Sbp	152	color-152	<Null>	Yes	No

Statewide Data Storage: How

Map example (continued):

- After the tool is run only the selected bedrock unit polygons show in the map



Bedrock_Units

	OBJECTID *	QUADNAME	COMPID	UNIT	COLOR	SYMBOLGY	SYMBOLGY_OVERLAY	DRAW	PUBLISH_DATA	SOURCE	COMMENTS	SHAPE *
▶	58	augusta	1	Sw	123	color-123	<Null>	Yes	No	<Null>	<Null>	Polygon
	41	augusta	2	Sw	123	color-123	<Null>	Yes	No	<Null>	<Null>	Polygon
	40	augusta	3	Swm	196	color-196	<Null>	Yes	No	<Null>	<Null>	Polygon
	42	augusta	4	Smhw	468	color-468	<Null>	Yes	No	<Null>	<Null>	Polygon
	60	augusta	5	Dhg	342	color-342	pattern-012	Yes	No	<Null>	<Null>	Polygon
	44	augusta	6	Smh	92	color-092	<Null>	Yes	No	<Null>	<Null>	Polygon
	45	augusta	7	Smh	92	color-092	<Null>	Yes	No	<Null>	<Null>	Polygon
	66	augusta	9	Smh	92	color-092	<Null>	Yes	No	<Null>	<Null>	Polygon
	65	augusta	10	Swm	196	color-196	<Null>	Yes	No	<Null>	<Null>	Polygon
	48	augusta	11	Smh	92	color-092	<Null>	Yes	No	<Null>	<Null>	Polygon
	62	augusta	13	Dg	341	color-341	pattern-012	Yes	No	<Null>	<Null>	Polygon
	61	augusta	15	Sw	123	color-123	<Null>	Yes	No	<Null>	<Null>	Polygon

Statewide Data Storage: Benefits

Create views that mix spatial and business data for use in GIS

Menu Bedrock Data

Project: Mooseleuk Lake

Source Localities Feature Type Codes Lithology Codes Modifier Codes Data Views:

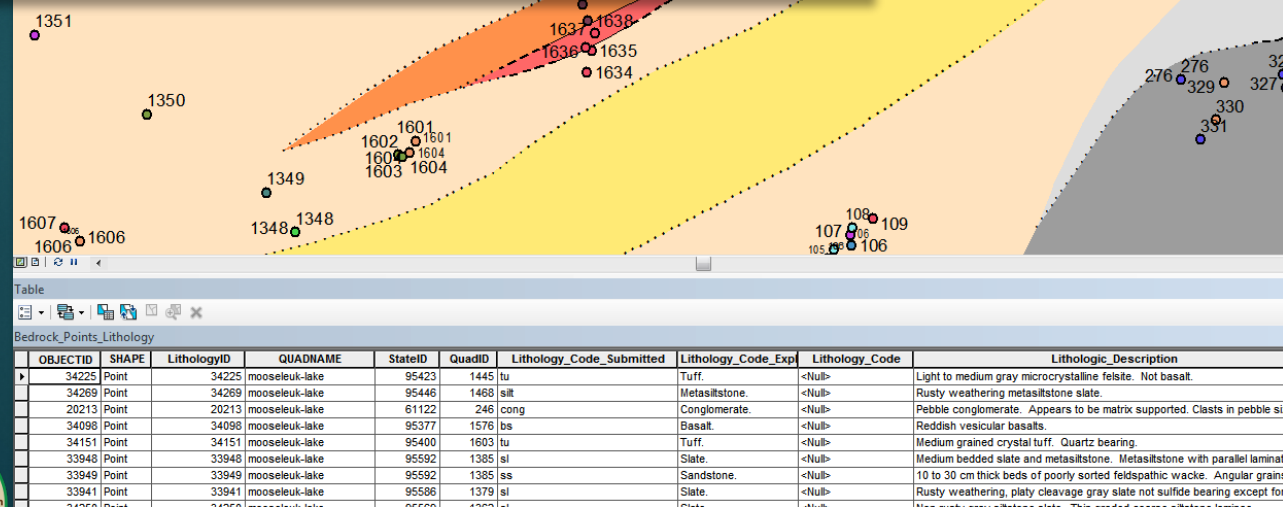
StateID	QuadID	FieldID	Locality Description	UTM X Loaded	UTM Y Loaded	Datum	Source
95389	1588	MOOLK 588 1	Woods crop.	501347	5159567	NAD27	Stephen G. F.
95390	1589	MOOLK 589 1	Woods crop.	500434	5159963	NAD27	Stephen G. F.
95391	1590	MOOLK 590 1	Woods crop.	500586	5159984	NAD27	Stephen G. F.
95392	1591	MOOLK 591 1	Woods crop.	500512	5159891	NAD27	Stephen G. F.
95393	1592	MOOLK 592 1	Edge of pond outcrop.	500167	5160133	NAD27	Stephen G. F.
95394	1593	MOOLK 593 1	Edge of pond outcrop.	500104	5160215	NAD27	Stephen G. F.
95395	1598	MOOLK 598 1	Large natural woods crop.	500885	5162336	NAD27	Stephen G. F.
95396	1599	MOOLK 599 1	Large natural woods crop.	500867	5162299	NAD27	Stephen G. F.
95397	1600	MOOLK 600 1	Woods crop.	500817	5162228	NAD27	Stephen G. F.
95398	1601	MOOLK 601 1	Hill side out crop. Frost heaved	501797	5152656	NAD27	Stephen G. F.
95399	1602	MOOLK 602 1	Hill side is remarkable for its steepness, lack o	501730	5152603	NAD27	Stephen G. F.
95400	1603	MOOLK 603 1	Small hillside crop.	501746	5152595	NAD27	Stephen G. F.
95401	1604	MOOLK 604 1	Fresh tree fall on steep hill side	501776	5152611	NAD27	Stephen G. F.
95402	1605	MOOLK 605 1	Pavement next to road and outcrop or near crop	500819	5152068	NAD27	Stephen G. F.

Record: 533 of 583

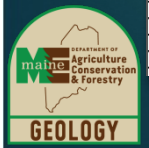
Features Lithology Fossils

Lithology Code	Lithology Code Explanation	Lithologic Description	Needs Review	MGS Comment
ss	Sandstone.	Lithologically complex. Float blocks of Munsun	Y	
bs	Basalt.	Dark gray basaltic like rock. Feldspathic.	Y	
silt	Metasiltstone.	Dark gray to black sulfidic siltstone similar to Bl	Y	
*			Y	

```
ALTER VIEW [dbo].[Bedrock_Points_Lithology] AS
SELECT tbl_Bedrock_Lithology.LithologyID AS OBJECTID
, Bedrock_Points_ewv.SHAPE
, tbl_Bedrock_Lithology.LithologyID
, Bedrock_Points_ewv.QUADNAME
, Bedrock_Points_ewv.StateID
, Bedrock_Points_ewv.QuadID
, tbl_Bedrock_Lithology_Code.Lithology_Code_Submitted
, tbl_Bedrock_Lithology_Code.Lithology_Code_Explanation
, tbl_Bedrock_Lithology_Code.Lithology_Code
, tbl_Bedrock_Lithology.Lithologic_Description
, tbl_Bedrock_Lithology_Code.MGS_Comment
, tbl_Bedrock_Lithology_Code.Needs_Review
, Bedrock_Points_ewv.DRAW
, Bedrock_Points_ewv.PUBLISH_DATA
, Bedrock_Points_ewv.created_user
, Bedrock_Points_ewv.created_date
, Bedrock_Points_ewv.last_edited_user
, Bedrock_Points_ewv.last_edited_date
FROM tbl_Bedrock_Lithology
JOIN Bedrock_Points_ewv
ON tbl_Bedrock_Lithology.StateID = Bedrock_Points_ewv.StateID
LEFT JOIN tbl_Bedrock_Lithology_Code
ON tbl_Bedrock_Lithology.LithologyCodeID = tbl_Bedrock_Lithology_Code.LithologyCodeID
```



- No joins in ArcMap
- Can do multi-field joins
- Faster draw performance
- No copying data
- Automatic data updates



Statewide Data Storage: Benefits

Perform geoprocessing tasks in the database

```
import sys, string, os, arcpy, datetime
arcpy.env.overwriteOutput = True #or 1
arcpy.env.outputZFlag = "Disabled"
arcpy.env.outputMFlag = "Disabled"

quad = arcpy.GetParameterAsText(0) #sys.argv[1]
scrfgdb = arcpy.env.scratchWorkspace + '/'

showPyMessage(" Selecting quadrangle")
arcpy.MakeFeatureLayer_management(r"Database Connections\MGS_Data.sde\MGS_Data.DBO.Index24', 'QuadPoly', "TILE_NAME = " + quad + "'")

showPyMessage(" Clipping lakes and ponds")
arcpy.MakeFeatureLayer_management(r"\\w-alt2-gisprd2\external\hydrography\nhd\NHD_H_Maine_GDB.gdb\Hydrography\NHDWaterbody', 'NHDWaterbody_Layer', "FType IN (390, 436,493)")
arcpy.Clip_analysis("NHDWaterbody_Layer", "QuadPoly", scrfgdb + "quad_nhdwaterbody", "#")

showPyMessage(" Clipping ocean and rivers")
arcpy.MakeFeatureLayer_management(r"\\w-alt2-gisprd2\external\hydrography\nhd\NHD_H_Maine_GDB.gdb\Hydrography\NHDArea', 'NHDArea_Layer', "FType IN (445, 460)")
arcpy.Clip_analysis("NHDArea_Layer", "QuadPoly", scrfgdb + "quad_nhdarea", "#")

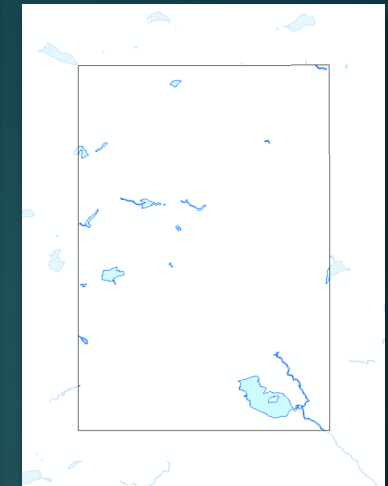
showPyMessage(" Union waters")
arcpy.Union_analysis(scrfgdb + "quad_nhdarea #;" + scrfgdb + "quad_nhdwaterbody #", scrfgdb + "quad_water", "ALL", "#", "GAPS")

showPyMessage(" Dissolving polygons")
arcpy.Dissolve_management(scrfgdb + "quad_water", scrfgdb + "quad_water_dissolve", "#", "#", "MULTI_PART", "DISSOLVE_LINES")

showPyMessage(" Loading units")
arcpy.AddField_management(scrfgdb + "quad_water_dissolve", 'QUADNAME', 'TEXT', '#', '#', '50', '#', 'NULLABLE', 'NON_REQUIRED', '#')
arcpy.AddField_management(scrfgdb + "quad_water_dissolve", 'DRAW', 'TEXT', '#', '#', '3', '#', 'NULLABLE', 'NON_REQUIRED', '#')
arcpy.AddField_management(scrfgdb + "quad_water_dissolve", 'PUBLISH_DATA', 'TEXT', '#', '#', '3', '#', 'NULLABLE', 'NON_REQUIRED', '#')
arcpy.AddField_management(scrfgdb + "quad_water_dissolve", 'UNIT', 'TEXT', '#', '#', '10', '#', 'NULLABLE', 'NON_REQUIRED', '#')
with arcpy.da.UpdateCursor(scrfgdb + "quad_water_dissolve", ('QUADNAME', 'DRAW', 'PUBLISH_DATA', 'UNIT')) as ucursor:
    for urow in ucursor:
        urow[0] = quad
        urow[1] = 'Yes'
        urow[2] = 'No'
        urow[3] = 'wa'
        ucursor.updateRow(urow)
del ucursor
fctarget = r"Database Connections\MGS_Data.sde\MGS_Data.DBO.Surficial_Geology_Units'
arcpy.Append_management(scrfgdb + "quad_water_dissolve", fctarget, "NO_TEST", "#")

showPyMessage(" Deleting temporary layers")
arcpy.Delete_management(scrfgdb + "quad_nhdwaterbody", "FeatureClass")
arcpy.Delete_management(scrfgdb + "quad_nhdarea", "FeatureClass")
arcpy.Delete_management(scrfgdb + "quad_water", "FeatureClass")
arcpy.Delete_management(scrfgdb + "quad_water_dissolve", "FeatureClass")

arcpy.RefreshActiveView()
```

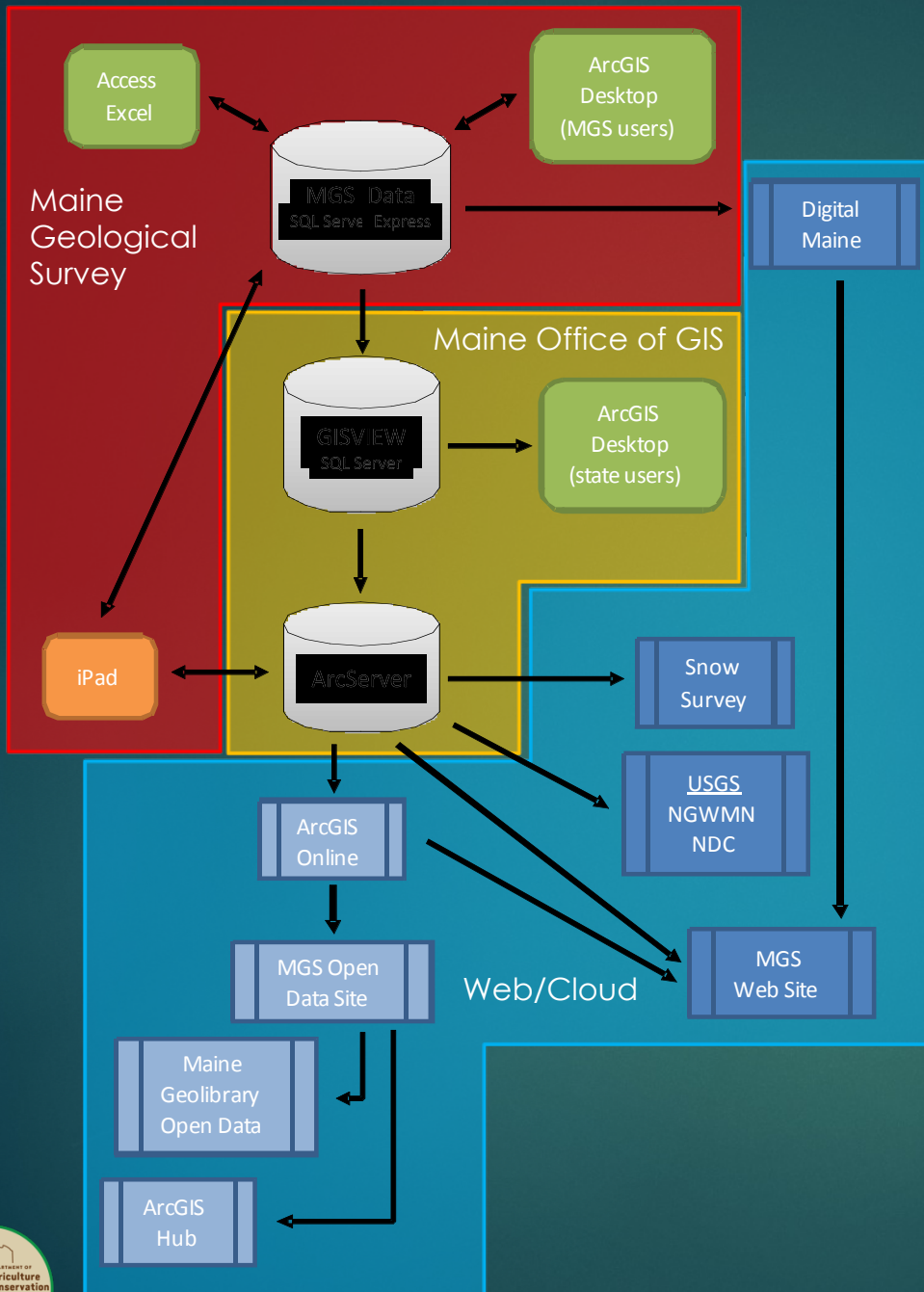


```
ALTER PROCEDURE [dbo].[uspSurficial_AddWaterUnits](@Quad nvarchar(50)) AS
BEGIN
INSERT INTO Surficial_Geology_Units_eww (QUADNAME, DRAW, PUBLISH_DATA, UNIT, created_user, created_date, SHAPE)
SELECT @Quad AS QUADNAME
, 'Yes' AS DRAW
, 'No' AS PUBLISH_DATA
, 'wa' AS UNIT
, UPPER(REPLACE(SUSER_NAME(), 'SOM', '')), GETDATE()
, tblUnion.Shape
FROM (
SELECT GEOMETRY::UnionAggregate(tblWater.SHAPE) AS Shape
FROM (
SELECT q.TILE_NAME, w.GNIS_Name, q.shape.STIntersection(w.shape) AS SHAPE
FROM Index24_eww AS q
JOIN MGS_Base_Data.dbo.NHDWATERBODY AS w ON q.shape.STIntersects(w.shape) = 1
WHERE q.TILE_NAME = @Quad
UNION ALL
SELECT q.TILE_NAME, w.GNIS_Name, q.shape.STIntersection(w.shape) AS SHAPE
FROM Index24_eww AS q
JOIN MGS_Base_Data.dbo.NHDAREA AS w ON q.shape.STIntersects(w.shape) = 1
WHERE q.TILE_NAME = @Quad
) AS tblWater
) AS tblUnion
END;
GO
```

- Extremely fast
- Doesn't require ArcGIS or Python



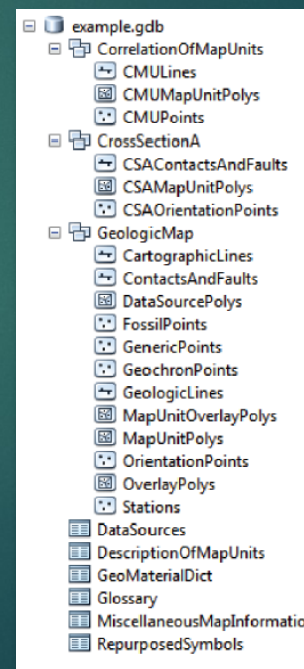
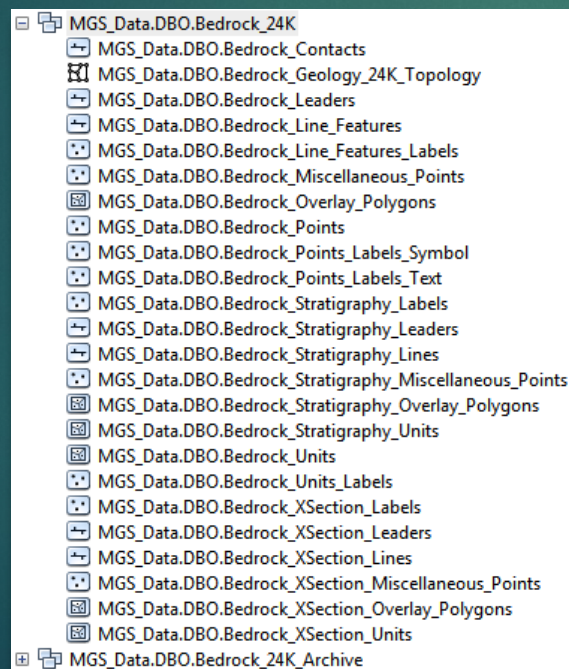
Data Sharing



- Processing data for delivery to other users and systems is extremely easy, fast and can be real-time using flags in the dataset
- ArcServer allows viewing data on any device
- Taking data to the field and editing with mobile devices is seamless, real-time and available connected or disconnected

MGS GeMS Evaluation

- MGS has a tightly integrated system that handles all data management and mapping aspects of the survey which makes moving to a new mapping system difficult and costly
- MGS will not adopt the GeMS single quadrangle mapping tools
- MGS is approaching GeMS as a standardized schema for data transfer and publishing



MGS GeMS Evaluation

Advantages of GeMS to MGS:

- More complete feature-level confidence and source metadata
- Automation of Description of Map Units – paragraph styles
- Glossary
- GeoLex integration
- Opportunity to review and upgrade database design
 - SYMBOLOGY vs Type, Value, Label
 - Capturing Map Text
- Paradigm shift that all objects on/in geologic maps are data

MGS GeMS Evaluation

Disadvantages of GeMS for MGS:

- More metadata entry
- Fine grained nature of source control
- GeoMaterial entry
- Picture and diagram management and storage
- Correlating the upkeep of Python code base with Esri versions
- No annotation or controlled labeling
- Multiple versions of same quadrangle map
- Time and cost to adopt

MGS GeMS Evaluation

Gap Analysis:

Compare MGS schema to GeMS to identify modifications needed to comply with GeMS

Maine Geological Survey - GeMS Migration Plan						
GeMS		MGS Bedrock				
Table/Feature Class	Field	Table/Feature Class	Field	Ex	Upgrade Notes	GeMS View Notes
DataSources	Source*	tbl_Bedrock_Source	Data_Source & Data_Method	Y		concatenate fields
DataSources	Notes	tbl_Bedrock_Source	MGS_Comment	Y		
DataSources	URL	tbl_Bedrock_Source	PublicationID	N	Foreign key to tbl_Publications for linking related publication.	get URL from tbl_Publications.Digital_Location
DataSources	DataSource_ID*	tbl_Bedrock_Source	SourceID	Y		GeMS view will concatenate "DAS" & SourceID

Maine Geological Survey - GeMS Migration P						
GeMS		MGS Surficial				
Table/Feature Class	Field	Table/Feature Class	Field	Ex	Upgrade Notes	GeMS View Notes
DataSources	Source*	tbl_Surficial_Source	Data_Source & Data_Method	N		concatenate fields
DataSources	Notes	tbl_Surficial_Source	MGS_Comment	N		
DataSources	URL	tbl_Surficial_Source	PublicationID	N	Foreign key to tbl_Publications for linking related publication.	get URL from tbl_Publications.Digital_Location
DataSources	DataSource_ID*	tbl_Surficial_Source	SourceID	N		GeMS view will concatenate "DAS" & SourceID

MGS GeMS Evaluation

Gap Analysis:

Maine Geological Survey - GeMS Migration Plan						
GeMS			MGS Bedrock			
Table/Feature Class	Field	Table/Feature Class	Field	Ex	Upgrade Notes	GeMS View Notes
MapUnitPolys	MapUnit*	Bedrock_Units	UNIT	Y	don't know how to not include special characters	
MapUnitPolys	IdentityConfidence*	Bedrock_Units	IdentityConfidence	N	use GeMS ExIDConfidenceValues domain	
MapUnitPolys	Label	Bedrock_Units_Labels	TEXTSTRING	Y		Concatenate '?' to Bedrock_Units.UNIT if IdentityConfidence is 'questionable' otherwise use Bedrock_Units.UNIT.
MapUnitPolys	Symbol	Bedrock_Units	SYMBOL	Y		
MapUnitPolys	DataSourceID*	Bedrock_Units	SourceID	N	Foreign key to tbl_Bedrock_Source for linking related source. Sometimes entered in *.SOURCE as alphanumeric.	
MapUnitPolys	Notes	Bedrock_Units	COMMENTS	Y		
MapUnitPolys	MapUnitsPolys_ID*	Bedrock_Units	COMPID	Y		concatenate "MUP" and COMPID

Maine Geological Survey - GeMS Migration Plan						
GeMS			MGS Surficial			
Table/Feature Class	Field	Table/Feature Class	Field	Ex	Upgrade Notes	GeMS View Notes
MapUnitPolys	MapUnit*	Surficial_Geology_Units	UNIT	Y		
MapUnitPolys	IdentityConfidence*	Surficial_Geology_Units	IdentityConfidence	N	use GeMS ExIDConfidenceValues domain	
MapUnitPolys	Label	Surficial_Geology_Units_Labels	TEXTSTRING	Y		concatenate '?' to Surficial_Geology_Units.UNIT if IdentityConfidence is 'questionable' otherwise use Surficial_Geology_Units.UNIT
MapUnitPolys	Symbol	Surficial_Geology_Units	SYMBOL	Y	may want to migrate away from using UNIT in style file and use 'color-###' like bedrock	
MapUnitPolys	DataSourceID*	Surficial_Geology_Units	SourceID	N	Foreign key to tbl_Surficial_Source for linking related source	
MapUnitPolys	Notes	Surficial_Geology_Units	COMMENTS	Y		
MapUnitPolys	MapUnitsPolys_ID*	Surficial_Geology_Units	COMPID	Y		concatenate "MUP" and COMPID



MGS GeMS Evaluation

Gap Analysis:

Maine Geological Survey - GeMS Migration Plan						
GeMS			MGS Bedrock			
Table/Feature Class	Field	Table/Feature Class	Field	Ex	Upgrade Notes	GeMS View Notes
ContactsAndFaults	Type*	Bedrock_Contacts Bedrock_Line_Features	SYMBOLGY	Y	Consider moving all tbl_Bedrock_Contacts data and tbl_Bedrock_Line_Features data where SYMBOLGY=%Fault% to new feature class ContactsAndFaults	pull data from both feature classes
ContactsAndFaults	IsConcealed*	Bedrock_Contacts Bedrock_Line_Features	DRAW	Y		
ContactsAndFaults	LocationConfidenceMeters	Bedrock_Contacts Bedrock_Line_Features	LocationConfidenceMeters	N		
ContactsAndFaults	ExistenceConfidence*	Bedrock_Contacts Bedrock_Line_Features	ExistenceConfidence	N		
ContactsAndFaults	IdentityConfidence*	Bedrock_Contacts Bedrock_Line_Features	IdentityConfidence	N	use GeMS ExIDConfidenceValues domain	
ContactsAndFaults	Label	Bedrock_Line_Features	TEXTSTRING	Y		
ContactsAndFaults	Symbol	Bedrock_Contacts Bedrock_Line_Features	SYMBOLGY	Y		
ContactsAndFaults	DataSourceID*	Bedrock_Contacts Bedrock_Line_Features	SourceID	N	Foreign key to tbl_Bedrock_Source for linking related source. Sometimes entered in *.SOURCE as alphanumeric.	
ContactsAndFaults	Notes	Bedrock_Contacts Bedrock_Line_Features	COMMENTS	Y		
ContactsAndFaults	ContactsAndFaults_ID*	Bedrock_Contacts Bedrock_Line_Features	COMPID	Y		concatenate "CAF" and COMPID

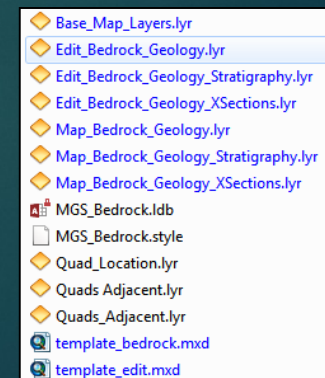
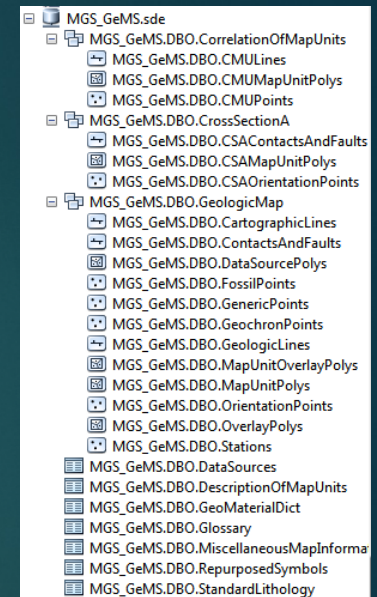
Maine Geological Survey - GeMS Migration P						
GeMS			MGS Surficial			
Table/Feature Class	Field	Table/Feature Class	Field	Ex	Upgrade Notes	GeMS View Notes
ContactsAndFaults	Type*	Surficial_Geology_Contacts	SYMBOLGY	Y		
ContactsAndFaults	IsConcealed*	Surficial_Geology_Contacts	DRAW	Y		
ContactsAndFaults	LocationConfidenceMeters	Surficial_Geology_Contacts	LocationConfidenceMeters	N		
ContactsAndFaults	ExistenceConfidence*	Surficial_Geology_Contacts	ExistenceConfidence	N		
ContactsAndFaults	IdentityConfidence*	Surficial_Geology_Contacts	IdentityConfidence	N	use GeMS ExIDConfidenceValues domain	
ContactsAndFaults	Label				not needed	
ContactsAndFaults	Symbol	Surficial_Geology_Contacts	SYMBOLGY	Y		
ContactsAndFaults	DataSourceID*	Surficial_Geology_Contacts	SourceID	N	Foreign key to tbl_Surficial_Source for linking related source. Sometimes entered in *.SOURCE as alphanumeric.	
ContactsAndFaults	Notes	Surficial_Geology_Contacts	COMMENTS	Y		
ContactsAndFaults	ContactsAndFaults_ID*	Surficial_Geology_Contacts	COMPID	Y		concatenate "CAF" and COMPID



MGS GeMS Evaluation

Proposed Work Plan:

- ✓ Create new GeMS database on MGS SQL Server
- Update MGS_Data schema with missing components identified in Gap Analysis
- MGS to FGDC Symbology crosswalk
- Update MGS map (.mxd) templates and layer files with new GeMS fields and domains
- Update MS Access forms with new GeMS fields
- Develop views and stored procedure to 'publish' a quadrangle from MGS_Data to MGS_GeMS
- Evaluate which GeMS Python tools are necessary and what tool logic can be moved into MGS_Data



MGS GeMS Evaluation

Before Proceeding with Work Plan:

- ✓ Further learning about GeMS – DMT 2018
- Assess costs to MGS to implement GeMS
 - Already spent the equivalent of 22% of normal 'other positions' StateMap grant state match amount on doing Gap Analysis
 - Explore funding options
- Assess and quantify benefits to MGS
- Evaluate costs and risks of waiting until GeMS is required
- Stay connected to the discussion of how “GeMS compliance” is defined

Summary

- Huge benefits of a tightly integrated, statewide, multi-map geodatabase
- A small(ish) state survey can build a multi-map database in an affordable IT architecture
- MGS is keeping an open mind about GeMS
- There are real benefits of portions of the GeMS schema to MGS
- Trying to manage costs and limit any negative impacts of GeMS implementation
- Biggest hurdle to adoption has been overcome – the acronym!

Thanks!