Award Number G09AP00113

Detailed Surficial Geological Mapping for the O'Fallon 7.5' Quadrangle and Enhanced Detailed Surficial Geological Mapping of the Florissant, Clayton, Webster Groves, Oakville and Cahokia 7.5' quadrangles as a Portion of the St. Louis Area Earthquake Hazard Mapping Project (SLAEHMP)

Collaborative Research with:
United States Geological Survey; Earthquake Hazards Program Office
and
Missouri Department of Natural Resources;
Division of Geology and Land Survey

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Abstract

The Missouri Department of Natural Resources' Division of Geology and Land Survey (MoDNR' DGLS) proposed and has produced detailed geologic maps of surficial materials for the O'Fallon 7.5-minute USGS quadrangle and enhanced detailed geologic maps for the Florissant, Clayton, Webster Groves, Oakville and Cahokia 7.5-minute USGS quadrangles as part of the St. Louis Area Earthquake Hazard Mapping Project (SLAEHMP). Surficial materials mapping comprises the first phase of seismic hazard assessment by reducing the uncertainty in the three dimensional distribution of surficial material units and their related physical properties.

DGLS compiled and correlated existing data from multiple databases to characterize the study area. The maps are produced in the Geographic Information System (GIS) geodatabase format to reduce file size and improve the quality and functionality of the final product. Seismic cone penetration tests (SCPTs) performed by DGLS and the Missouri Department of Transportation (MoDOT) in the represented by the O'Fallon quadrangle yielded shear wave velocities ranging from 194 m/s to 674 m/s and depths from 3 to 15.6 meters. Most of the shear wave velocities are clustered between 240 m/s and 345 m/s. These data points were used to verify surficial material type. This analysis is necessary to assess seismic wave amplification and liquefaction potential of the unconsolidated material.

Introduction

The goal of the project for fiscal year 2009 (FY09) was to complete a new detailed surficial geologic map for the O'Fallon 7.5' quadrangle and to enhance the Florissant, Clayton, Webster Groves, Oakville and Cahokia 7.5' quadrangles (previously mapped by Lettis and Associates) by adding depth to bedrock in the SLAEHMP study area (Figure 1). Depth to ground water is being addressed by the SLAEHMP Technical Working Group (TWG) to rectify the true potentiometric surface.

Mapping for this project was completed using available subsurface data and stratigraphic profiles developed for the St. Louis Surficial Materials Database, St. Louis Database and correlated with published small-scale surficial material maps (Goodfield, 1965; Lutzen and Rockaway, 1971; Allen and Ward, 1977). Existing small-scale maps and reports indicate that these areas have surficial material units that vary from early Quaternary till, loess and alluvium, with wide ranges in grain sizes and numerous areas of artificial fill. Boring data was incorporated to develop three-dimensional spatial variation of surficial material unit properties. This analysis will be used to assess the response of the alluvial column and liquefaction potential in response to different magnitude earthquakes and the potential for site amplification to improve the accuracy of earthquake hazard maps being prepared by the SLAEHMP TWG.

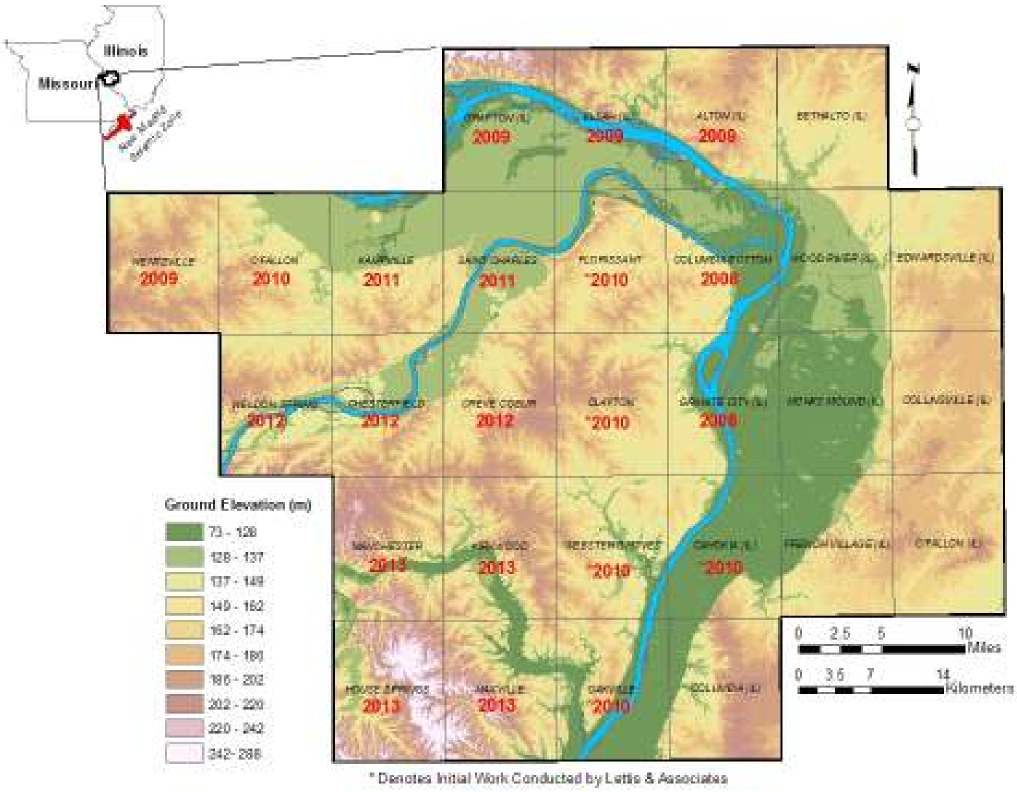

Figure 1. SLAEHMP AREA. The SLAEHMP study area and the proposed mapping priorities for the SLAEHMP TWG. Years listed in red denote the anticipated completion.

Methods

Borehole data derived from the division's St. Louis Surficial Materials Database developed by Jim Palmer as part of the National Earthquake Reduction Program (NEHERP) was supplemented by the St. Louis Database under development by Missouri University of Science and Technology (MS&T). All of the geotechnical information was compiled and correlated with the divisions' water well databases to identify any inconsistencies in depth to bedrock measurements. The corrected data was then imported into the divisions' geodatabase created for each individual quadrangle.

The GIS geodatabase format is preferred over the GIS shapefile format. This change in mapping methodology increases productivity and functionality while reducing file size. The structure of the individual geodatabase includes feature data sets of major layer groups which includes feature classes of specified data. An example of this structure is depicted in Figure 2. The O'Fallon geodatabase contains ten feature data sets. One of the feature data sets is transportation. Within the transportation feature data set are all the feature classes associated with transportation such as roads, railroads and various other transportation networks with their associated buffers. Within the data point feature data set are five feature classes associated with the type of data point such as geotechnical borings, seismic cone penetrometer test, shallow seismic by method and bedrock penetration.

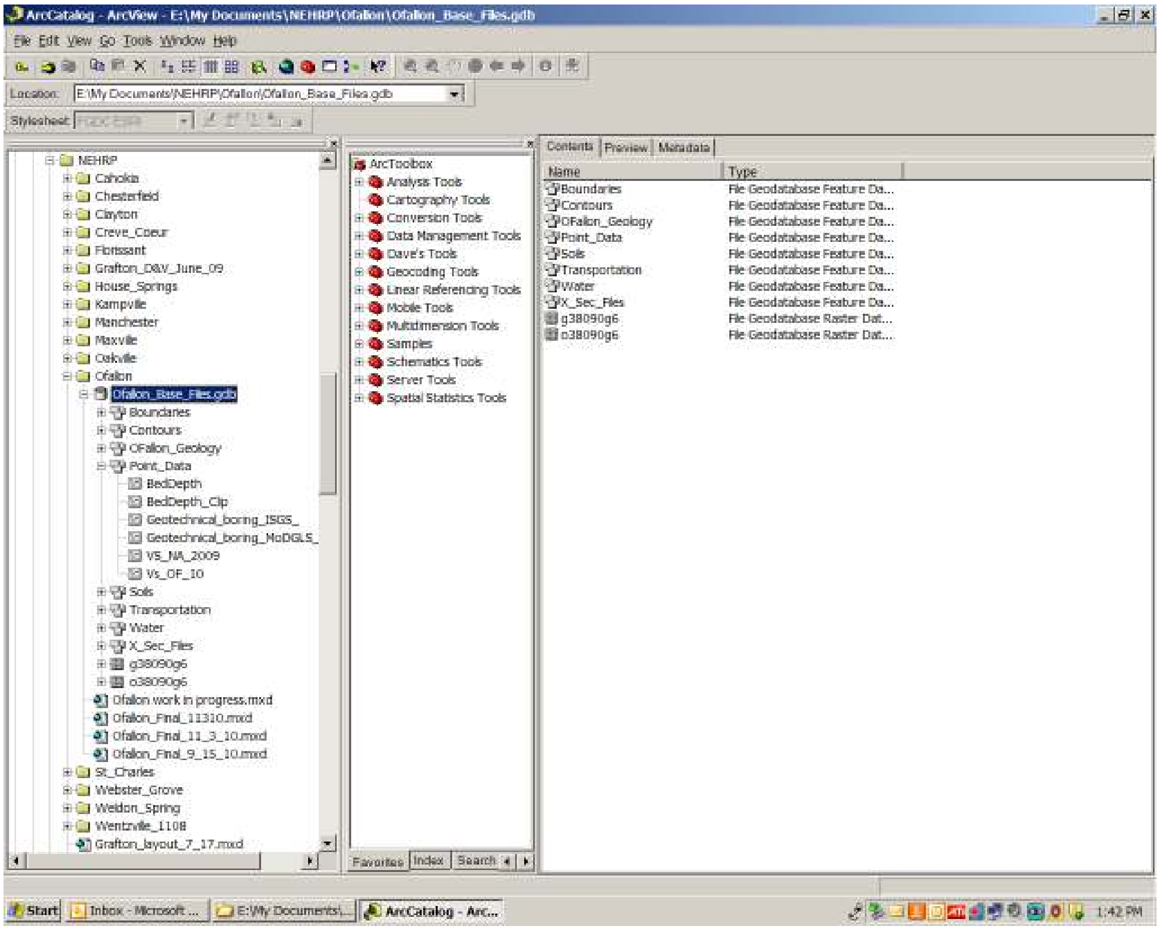

Figure 2. ARC CATOLOG. Screen shot of the structure of the O'Fallon geodatabase. The feature data sets are shown on the right while the feature classes contained in the feature data set, point data, are shown on the left.

The map consists of a 1:24,000 scale surficial material geologic map, a 1:24,000 scale cross section, a 1:60,000 scale Surficial Material Thickness map with material thickness contours overlaying a USGS Digital Elevation Model (DEM), a 1:60,000 scale bedrock elevation map with contours overlying a USGS DEM and a 1:60,000 scale data point Location map showing the spatial distribution of the types of data used in producing the map and pertinent information for various points. The surficial material geologic map is depicted in Figure 3.

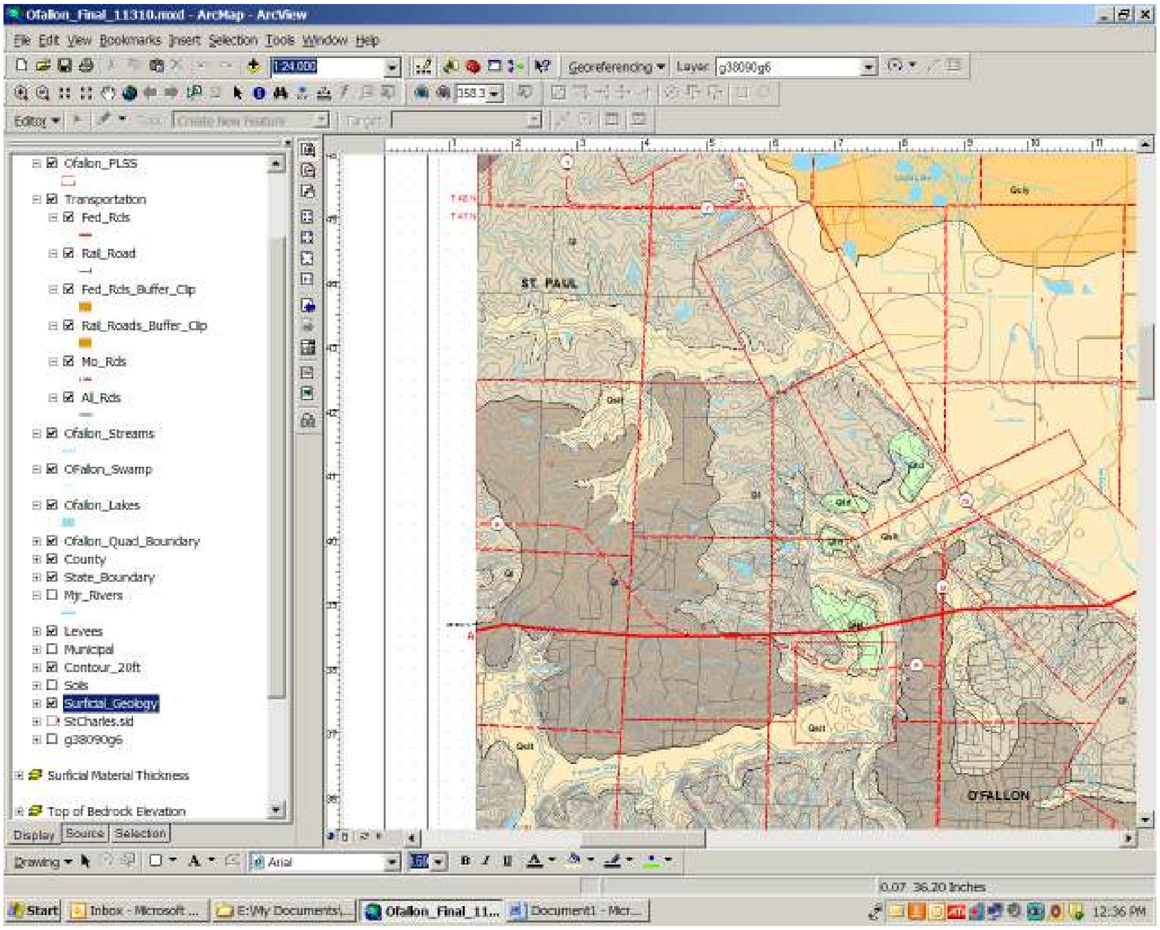

Figure 3. SURFICIAL GEOLOGY. The surficial material geologic above displays the layered structure of the map on the left. On the right is an example of the main map.

The surficial materials geologic map is in a layered format including all the pertinent information for a base map. The base mapping was created at DGLS by editing features from the USGS 7.5' topographic map, aerial photography from the National Agriculture Imagery Program (NAIP) 2007 and NAIP 2009 to represent annual surface water variations. NAIP 2008 was considered an editing source but inconsistencies in the imagery were identified so NAIP 2008 wasn't used as a source. Using multiple imagery sets for editing keeps the map current and surface changes become apparent. Various locations were picked for field verification during the mapping project. In the city of O'Fallon, southeast of the Interstate 70 and Highway K interchange, a construction site exposure was observed. The exposure revealed 47 feet of loess at the site. An additional 12 feet of trenching was conducted to the loess/till contact for a total thickness of 59 feet of loess overlying till at the toe of the slope. The associated information of surficial material type and characteristics are included in the attributes table as shown in Figure 4.

Attributes of Surficial_Geology

UNIT	AGE	INTERPRET_	DESCRIPT_	OCCURRENCE	STATE	GEOLOGY	S
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
Peyton Fm	postgla	colluvium	poorly sorted debris(silt loam to pebbly silt loam)	Lower slopes and slope b	Missouri	Qp(py)(Peyto	
	Pleisto	terrace(lake)	sand, clay, silt, and organic materials(5–30m:lacustrine, 10–40m:fluvial de	Adjacent to rivers and str	Missouri	Qtd(terrace o	
	Pleisto	terrace(lake)	sand, clay, silt, and organic materials(5–30m:lacustrine, 10–40m:fluvial de	Adjacent to rivers and str	Missouri	Qtd(terrace o	
	Pleisto	terrace(lake)	sand, clay, silt, and organic materials(5–30m:lacustrine, 10–40m:fluvial de	Adjacent to rivers and str	Missouri	Qtd(terrace o	
	Pleisto	terrace(lake)	sand, clay, silt, and organic materials(5–30m:lacustrine, 10–40m:fluvial de	Adjacent to rivers and str	Missouri	Qtd(terrace o	
	Pleisto	terrace(lake)	sand, clay, silt, and organic materials(5–30m:lacustrine, 10–40m:fluvial de	Adjacent to rivers and str	Missouri	Qtd(terrace o	
	Pleisto	terrace(lake)	sand, clay, silt, and organic materials(5–30m:lacustrine, 10–40m:fluvial de	Adjacent to rivers and str	Missouri	Qtd(terrace o	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
Peoria & Roxana Silts	Holoce	loess	silt and clay(3–25m)	Overlying bedrock and res	Missouri	Ql(pr)(Peoria	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
near-surface	Quater	residuum	Clay, silt sand with fragment of berock		Missouri	R(residuum)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	Quater	residuum	Clay, silt sand with fragment of berock		Missouri	R(residuum)	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
near-surface	Quater	residuum	Clay, silt sand with fragment of berock		Missouri	R(residuum)	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
Disturbed ground	postgla	artificial fill	fill or removed earth	Manmade construction	Missouri	af(dg)(artificia	
	Holoce	alluvium	clay, silt, sand, gravel and boulders(3–25m)	Floodplain of rivers and st	Missouri	Qa(alluvium)	
near-surface	preglac	bedrock	shale, sandstone, limestone, dolomite		Missouri	B(bedrock)	
near-surface	Quater	residuum	Clay, silt sand with fragment of berock		Missouri	R(residuum)	

Record: 1 Show: All Selected Records (0 out of 2031 Selected) Options

Figure 4. SURFICIAL GEOLOGY ATTRIBUTES. The surficial geology attributes table provides information about the materials being mapped. Displayed are common material types for the study area.

The attribute table lists the pertinent information for that feature class. The surficial material attribute table lists the type of feature, polygon, point or line, as well as symbol, description, interpretation, geologic setting, state, size and age of the surficial material if known. The project area contains approximately 2031 surficial material descriptions. The principle components to the thematic map contain attributes for the entire project area while periphery components are clipped to only contain the subject quadrangle. Characteristics of the surficial material are listed in the geotechnical data attributes table discussed later in this section.

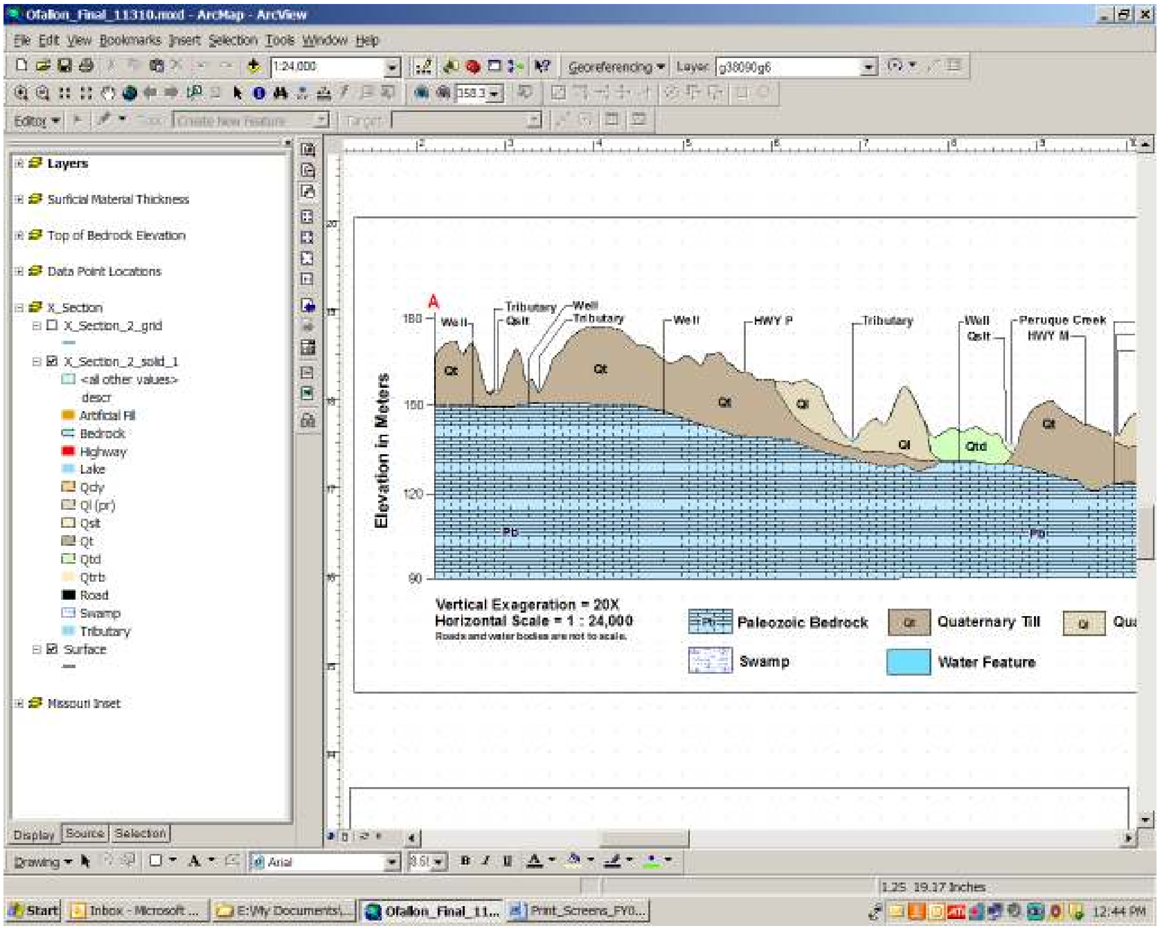

Figure 5. UPLAND CROSS SECTION. The 1:24,000 scale cross section provides a side view of the subject area. Above is the uplands portion of the depicted cross section. The cross section exhibits a 20X vertical exaggeration highlighting small variations in vertical change.

The 1:24,000 scale cross section in Figure 5 and Figure 6 is constructed using the same method as the surficial material geologic map. The cross section line is drawn from data point to data point across the subject quadrangle. The location of the cross section line is selected to show geomorphic characteristics of the mapped area and intersecting bedrock borings to allow better correlation of the bedrock surface. The topographic surface is line is generated from a DEM. The bedrock surface is interpreted from borings that intersect bedrock or that outcrop at the surface. Due to the changes in topography from the dissected uplands to the floodplain, a 20X vertical exaggeration was chosen so identification of low areas of relief could be recognized and mapped accordingly. Often, slight changes in topography within a floodplain can create higher or lower potentiometric surface values.

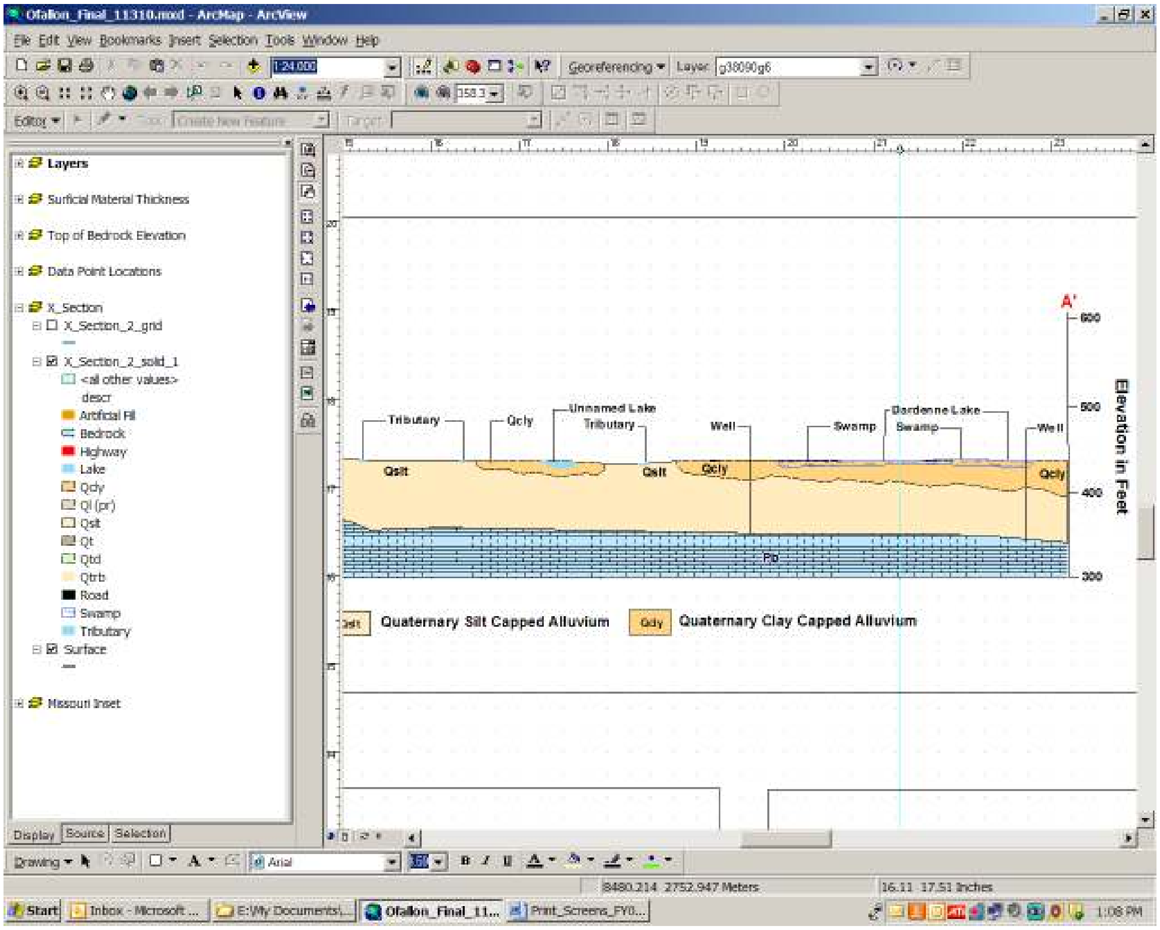

Figure 6. FLOODPLAIN CROSS SECTION. The 1:24,000 scale cross section provides a side view of the subject area. Above is the floodplain portion of the depicted cross section. The cross section exibits a 20X vertical exaggeration highlighting small variations in vertical change.

The floodplain portion of the cross section is depicted in Figure 6. The depth to alluvium (cap thickness) is quite variable and not well identified in boring logs. Therefore, the descriptions depicted on the cross section are the symbology of the sediment cap. The SCPT logs show various layered deposits of clay, silt, sand and gravels in variable amounts. This will be discussed later in the results section of the report.

The map layout contains 3 large scale inset maps showing the surficial material thickness, bedrock surface and data point locations. The inset maps are 1:60,000 scale maps, two of which use a DEM as a base layer while the third use a surficial materiel geologic layer as a base layer. The inset maps are shown in Figures 7, 8 and 9.

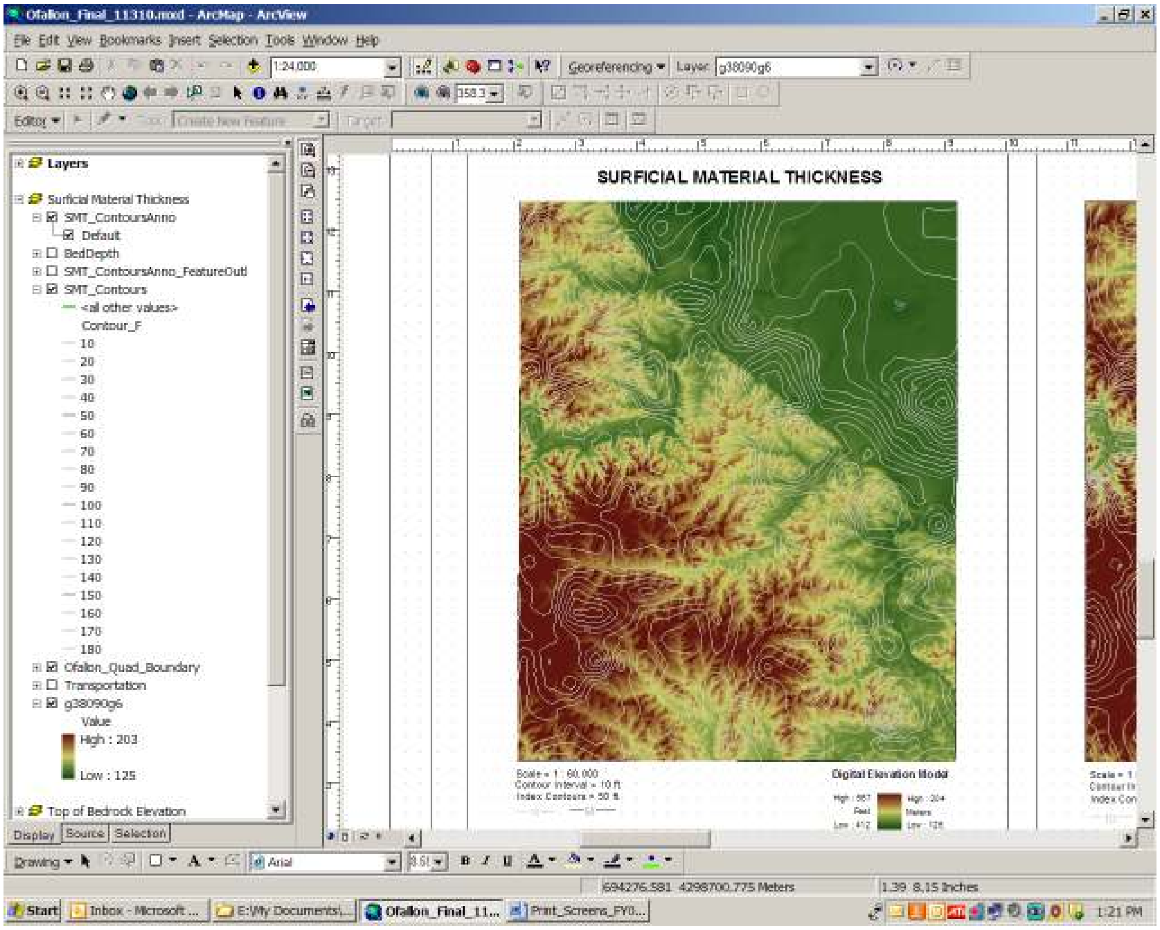

Figure 7. SURFICIAL MATERIAL THICKNESS. The 1:60,000 scale inset map displays the contoured thickness of the surficial material. The inset map has a 10 foot contour interval with index contours labeled every 50 feet.

The surficial material thickness inset map is constructed at a 1:60,000 scale and uses a USGS DEM as the base layer for this map. Thickness of the surficial materials was derived from the difference in elevation and depth to bedrock. The data was then processed using contouring software to interpret surficial material thickness. The contours are drawn using Inverse Distance Weighting (IDW) which provides generalities of the thickness. The contours are then hand edited to account for geomorphic and geologic influences. Older large and small scale maps were also referenced along with the divisions' water well databases. The type and characteristics of the surficial materials exist in the surficial geology attribute table and the geotechnical boring attribute table.

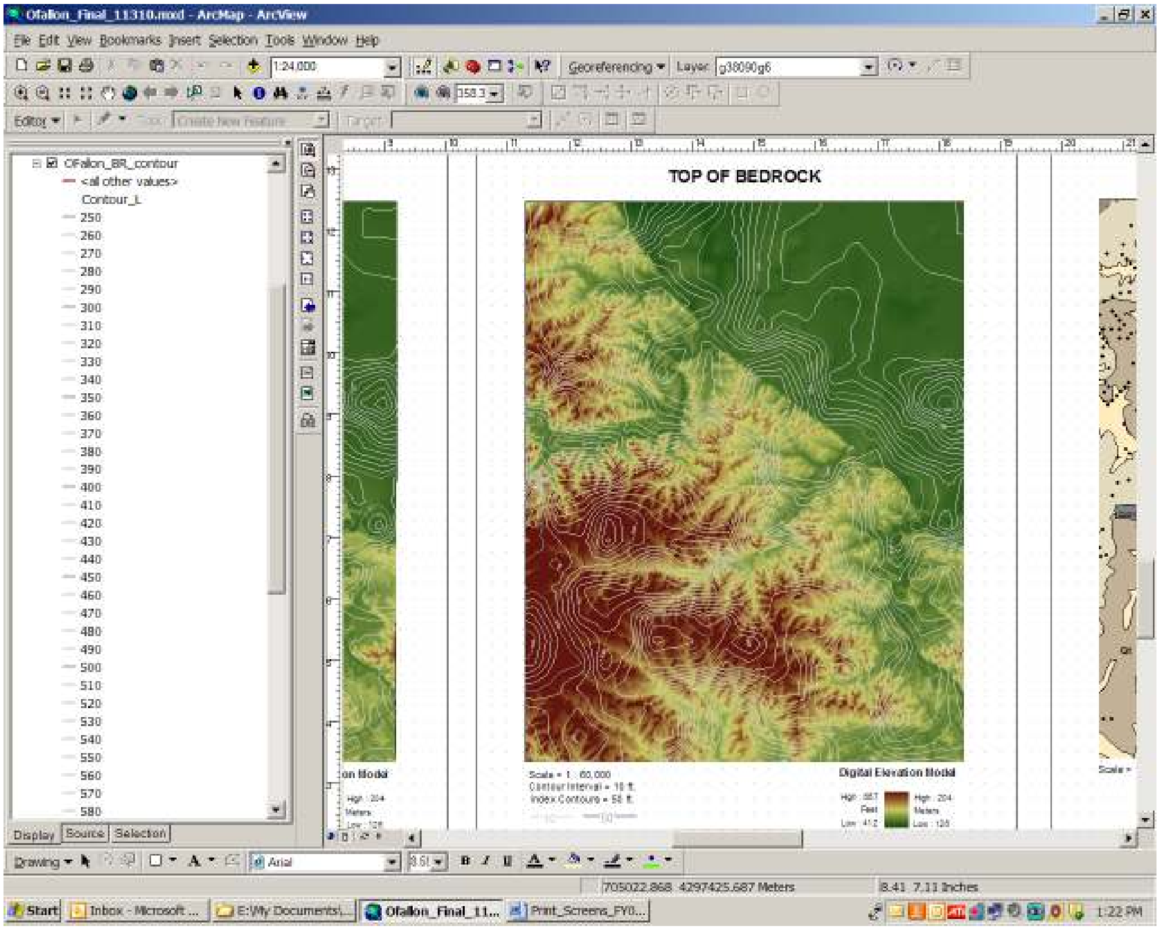

Figure 8. TOP OF BEDROCK. The 1:60,000 scale top of bedrock inset map displays the bedrock surface contours. The inset map has a 10 foot contour interval with labeled index contours every 50 feet.

The top of bedrock inset map is constructed at a 1:60,000 scale and uses a USGS DEM as the base layer for this map. The depth to bedrock determination was made by correlating drilling logs, shallow seismic surveys and water well databases from DGLS. The data was then processed using contouring software to interpret the bedrock surface. The contours are drawn using Inverse Distance Weighting (IDW) which provides generalities in the bedrock surface. The contours are then hand edited to account for geomorphic and geologic influences. Older large and small scale maps were also referenced. The type and characteristics of the bedrock borings and lithological characteristics are depicted in the bedrock attribute table.

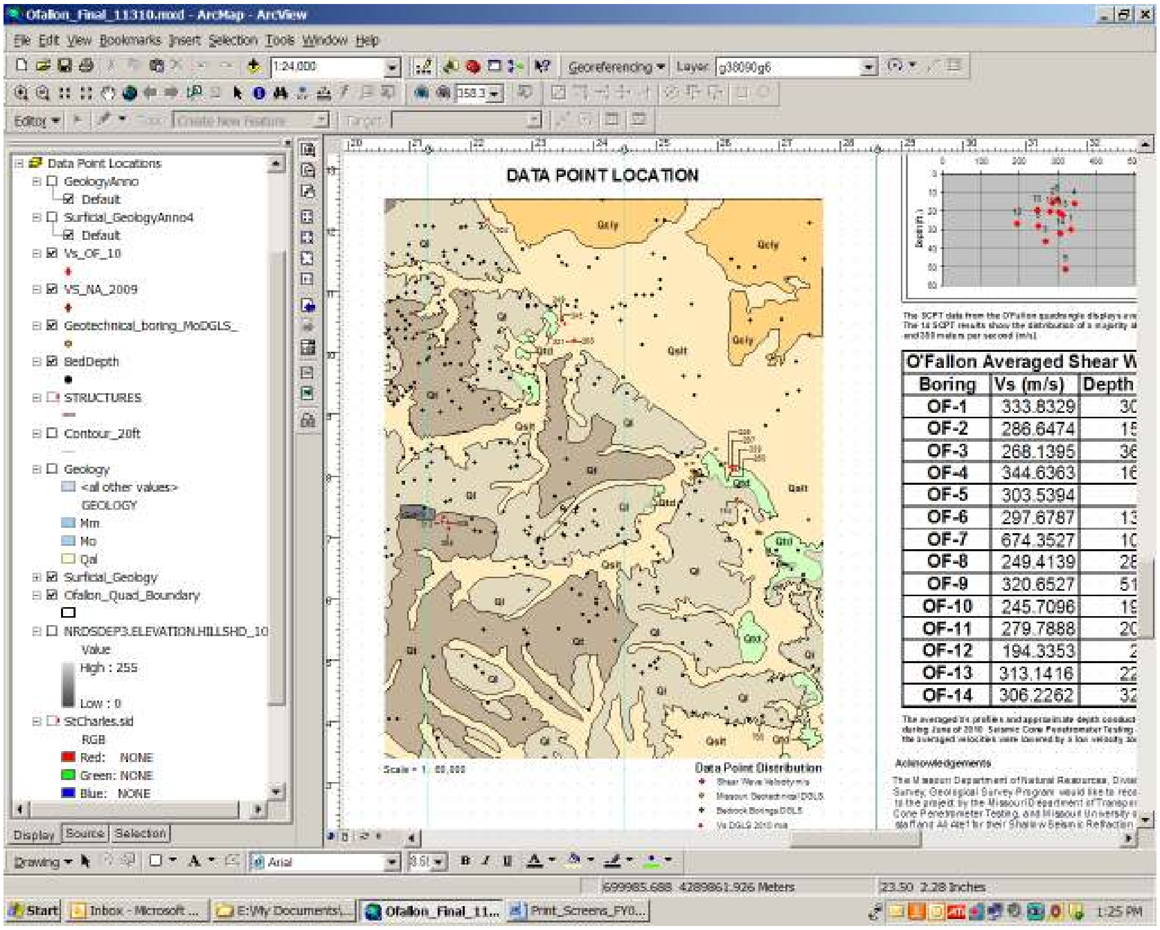

Figure 9. DATA POINT LOCATION. The 1:60,000 scale data point location inset map displays the spatial distribution and type of data points. The SCPT sample locations are labeled with shear wave velocity in meters per second.

The data point location inset map is constructed at a 1:60,000 scale and uses a surficial geology layer as the base layer for this map. This map displays the type of data point such as geotechnical boring, bedrock boring or seismic survey methods. The SCPT data points are labeled with relevant shearwave velocities in meters per second. Data points located near or on a terrace lake deposit recorded lower averaged values depicting a low velocity zone of organic soft material within the sediment column. The low velocity zones ranged from 117 meters per second (m/s) to 165 m/s lowering the averaged velocity by ten to twelve percent. This is not considered to be a serious reduction in averaged velocities but should be noted when encountered.

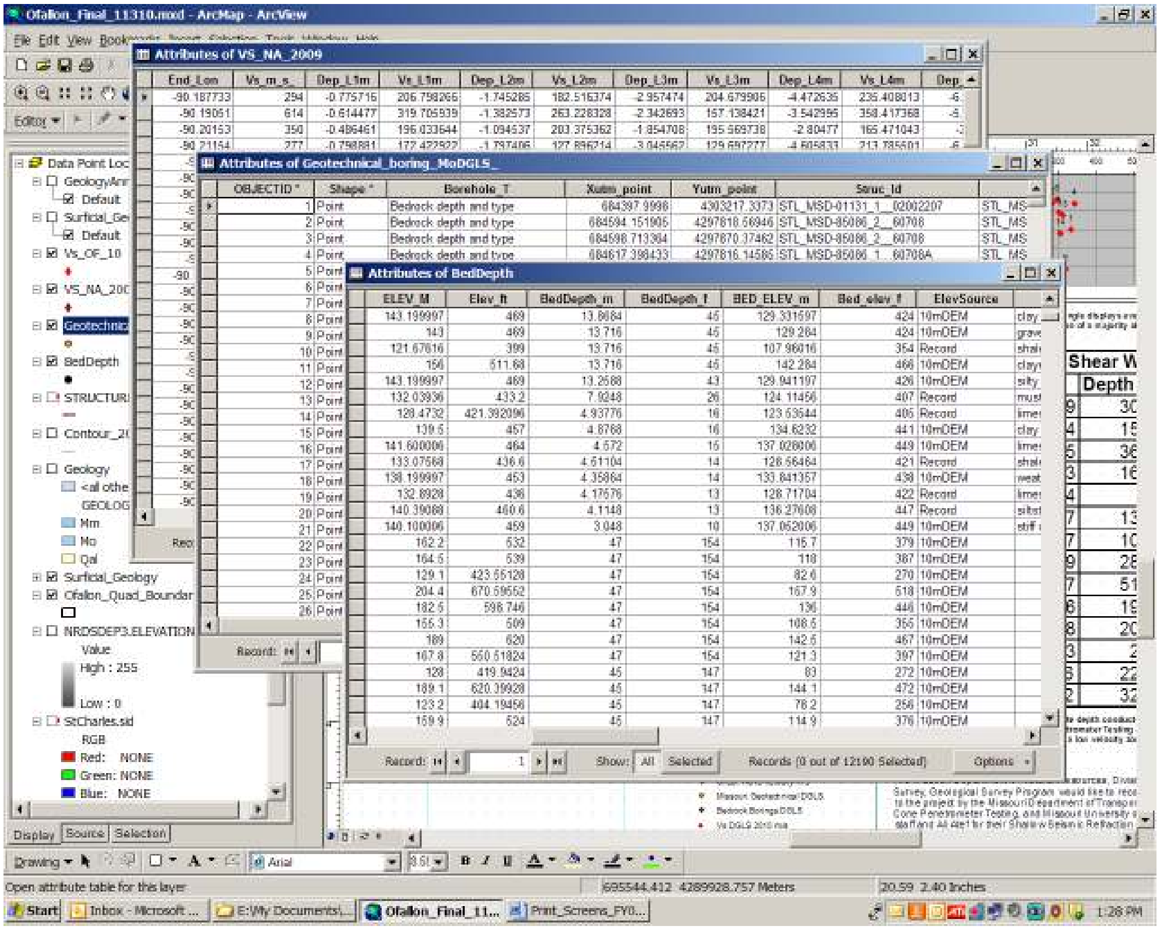

Figure 10. DATA POINT ATTRIBUTES. The screen shot displays the attribute tables of three of the five feature classes within the data point location feature data set. The attributes displayed are from the shear wave (v/s), geotechnical borings and the bedrock borings.

Each of the feature classes in each feature data set contains the information pertinent to that particular class. The bed depth feature class contains 12,190 lines of information. Each line is a data point within the project area. The attribute table lists the information in a table format and operates similar to other database tables. The desired fields are then added and populated. The attributes for the feature classes bed depth, geotechnical borings, Vs (shear wave velocity) and surficial geology contain the data for the entire project area while others only contain information for the particular quadrangle. When a feature class is being edited, the changes are also applied to all other feature classes within the feature data set. This allows greater continuity within the maps attribute tables and increased productivity.

A SCPT was performed at 14 locations in the O'Fallon quadrangle under a cooperative agreement with the Missouri Department of Transportation (MoDOT). The SCPT sampling locations were based on accessibility and spatial gaps in shear wave velocity information, as well as the need to evaluate materials beneath transportation infrastructure. Subsurface data and stratigraphic profiles were reviewed and compared with published small scale surficial material maps and other previously developed genetic and lithostratigraphic surficial material models to facilitate mapping. These data points were used to verify surficial material types and thicknesses, not to generate top of bedrock elevation contours. This analysis is necessary to assess seismic wave amplification and liquefaction potential of unconsolidated material. In addition, the accuracy and precision of earthquake hazard maps being produced by the SLAEHMP TWG will be improved through the application of this information.

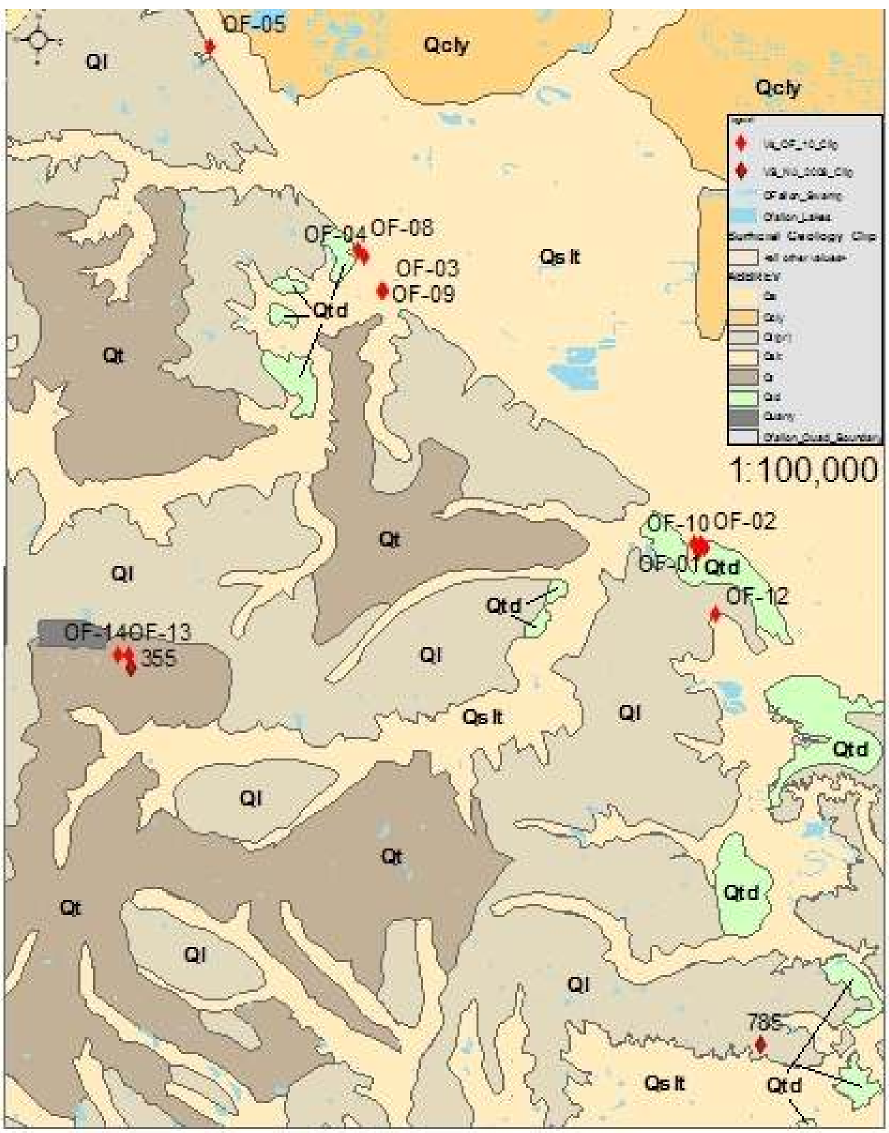

Figure 11. SCPT LOCATIONS. The SCPT test sites displayed above contain 14 new test sites conducted in 2010 by the DGLS and the Missouri Department of Transportation.

Results

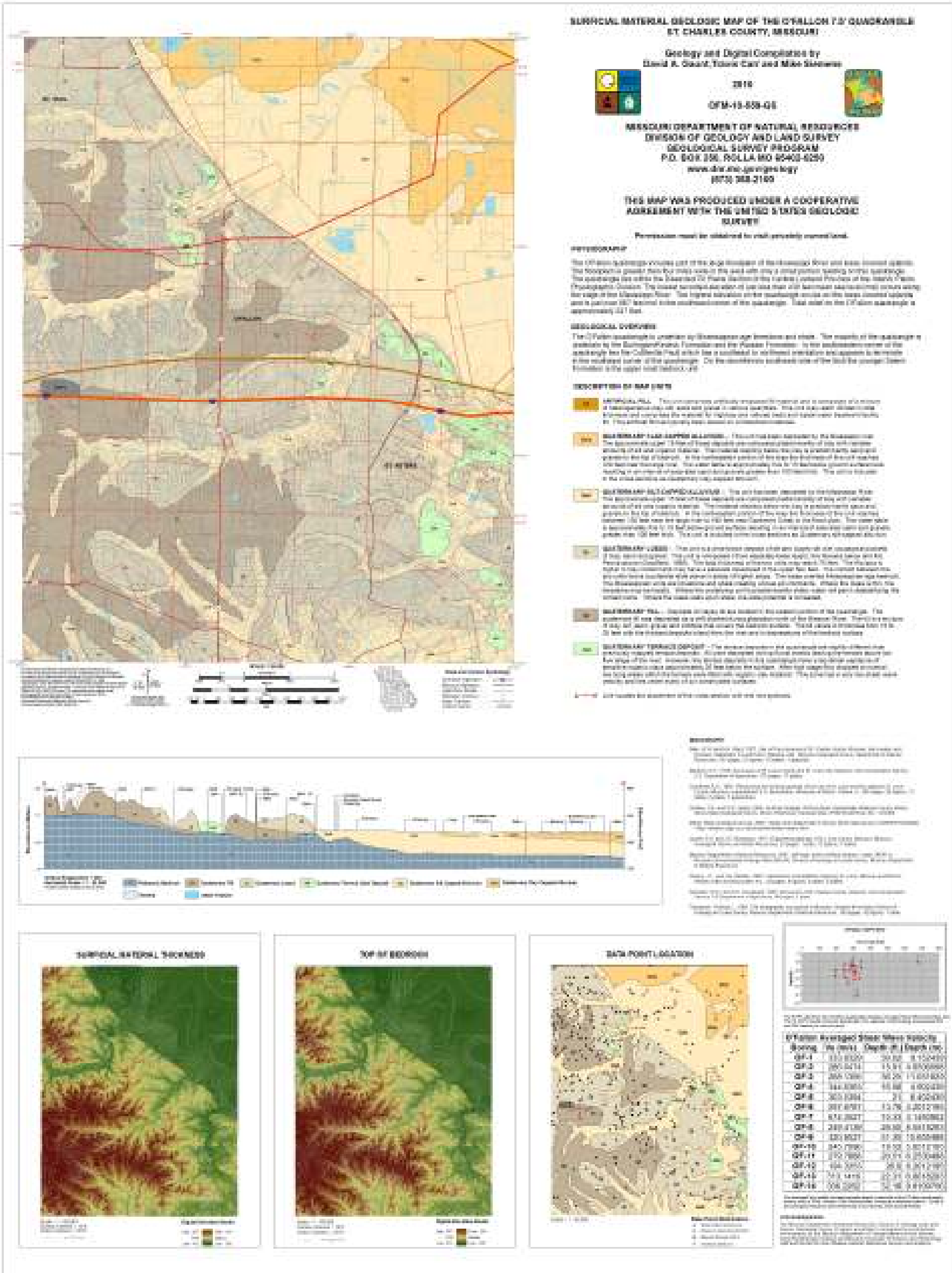

Figure 12. SURFICIAL MATERIAL GEOLOGICAL MAP OF THE O'FALLON QUADRANGLE. The O'Fallon quadrangle contains various surficial materials and displays the complex nature of the study area.

The area represented by the O'Fallon quadrangle is covered by between 10 feet and greater than 70 feet thick deposits of loess and glacial till on the upland areas and alluvium greater than 110 feet thick in the floodplain. The tributaries are lined with thick terrace lake deposits that are occasionally overlain from resulting weathering and transportation of the loess to the toe of slopes. The bedrock surface in the upland areas of the O'Fallon quadrangle can reach elevations of 650 feet mean sea level (msl) but is more commonly between 550 feet msl and 600 feet msl. At the mouth of the tributaries the bedrock surface is consistently around 400 feet msl while the bedrock surface at the head of the tributaries varies between 425 feet msl and 450 feet msl. The floodplain bedrock surface elevation ranges from 400 feet msl at the upland edge, to 300 feet msl toward the interior of the floodplain.

Table 1. AVERAGED SHEAR WAVE VELOCITIES. The averaged numeric values for the SCPT conducted for this study.

O'Fallon Averaged Shear Wave Velocity			
Boring	**Vs (m/s)**	**Depth (ft.)**	**Depth (m)**
OF-1	333.8329	30.02	9.152439
OF-2	286.6474	15.91	4.85061
OF-3	268.1395	36.25	11.05183
OF-4	344.6363	16.08	4.902439
OF-5	303.5394	21	6.402439
OF-6	297.6787	13.78	4.20122
OF-7	674.3527	10.33	3.14939
OF-8	249.4139	28.05	8.551829
OF-9	320.6527	51.35	15.65549
OF-10	245.7096	19.52	5.95122
OF-11	279.7888	20.51	6.253049
OF-12	194.3353	26.9	8.20122
OF-13	313.1416	22.31	6.801829
OF-14	306.2262	32.18	9.810976

The majority of the shear wave velocities ranged from 194 m/s to 674 m/s (Table 1) providing a detailed perspective on the response of the alluvial column to an earthquake. Sampling depths ranged from 3.1 m to 15.6 m before reaching refusal.

SCPT test site OF-12 encountered a low velocity zone (118 m/s) of soft organic material approximately 26 feet below the surface. After closely reviewing geotechnical logs from other study areas with the project area it was discovered to be common on terrace deposits that experienced back flooding from the rivers. The location of OF-12 combined with the SCPT and correlation logs suggest the loess is overlying the terrace lake deposit. The deposits are characterized by a low recovery of saturated highly organic clayey silts. These deposits support several types of infrastructure.

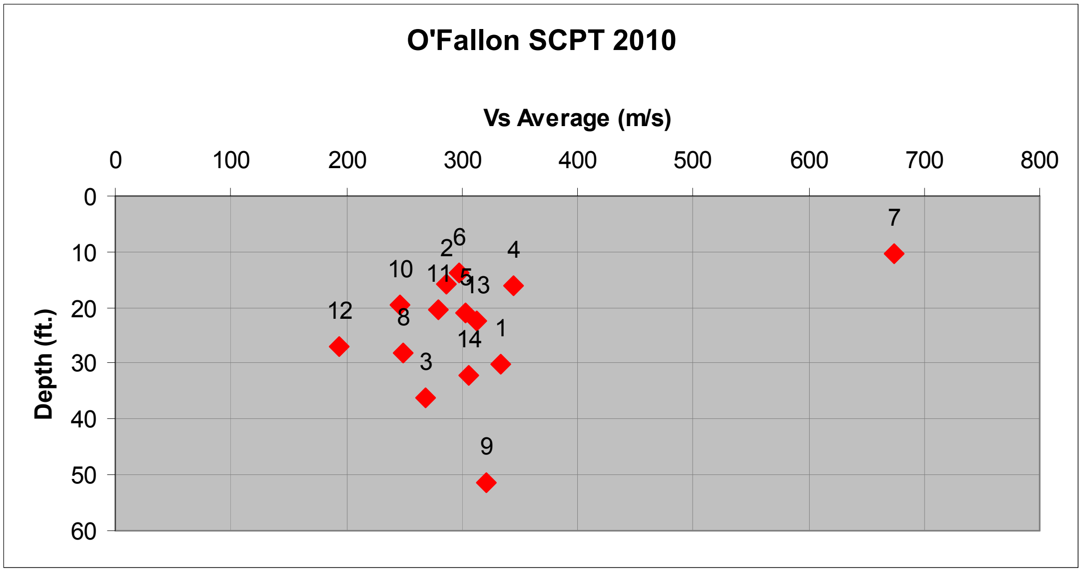

Figure 13. SCPT FY09 CHART. Results of the SCPT data show a clustering of shear wave velocities between 240 m/s and 345 m/s. Sampling began at three meters (10 feet) in depth.

The clustering of shear wave velocities between 240 m/s and 345 m/s shown in Figure 13 illustrates the recognized averages for these types of materials. Limitations of depth were a common occurrence due to encountering tight sands and limestone boulders at depth. The refusal material was determined by tip resistance and sleeve friction. Correlation logs provided the best insight to the depth to bedrock.

The bedrock surface in the Florissant quadrangle upland areas is highly variable. Bedrock surface ranges from approximately 550 feet msl to 365 feet msl excluding areas of aggregate mining which creates a bedrock surfaces as low as 292 feet msl. Floodplain areas of the quadrangle have bedrock elevations that range from 350 feet msl to 292 feet msl. However, consistent measurements of 300 feet msl to 320 feet msl are the most common.

The bedrock surface in the Clayton quadrangle displays the same variable bedrock surface as the upland areas of the Florissant quadrangle. Bedrock elevation ranges from 570 feet msl to 330 feet msl. The lowest recorded bedrock elevation was in the southeast corner of the quadrangle but the bedrock surface elevation generally decreases to the east in an irregular manner.

The bedrock surface of the Webster Groves quadrangle is highly karstic and depicts an irregular bedrock surface. Uplands bedrock surface ranges from 603 feet msl to 415 feet msl near the river. The comparable bedrock surface across the state line into Illinois ranges from 415 msl to 289 feet msl entering the floodplain.

The bedrock surface of the Oakville quadrangle ranges from 577 feet msl to 415 feet msl in the upland areas. The deepest measurement on the Missouri side is at the Meramec River mouth depicted by a recording of bedrock at 312 feet msl. The Mississippi River channel records indicate bedrock elevation is at 282 feet msl while Illinois floodplain records indicate bedrock elevations range from 290 feet msl to 380 feet msl near the Illinois upland areas.

The Missouri upland areas in the area of Cahokia quadrangle range in bedrock elevation from 544 feet msl to 365 feet msl near the floodplain. The bedrock elevations beneath the Mississippi floodplain range from 267 feet msl to 277 feet msl. The Illinois floodplain consistently shows recorded bedrock elevations of between 295 feet msl and 310 feet msl.

Conclusion

The surficial material geologic maps for the O'Fallon 7.5' quadrangle and the enhanced surficial material geologic maps for the Florissant, Clayton, Webster Groves, Oakville and Cahokia 7.5' quadrangles have been completed as deliverables in fulfillment of award number G09AP001113. These maps were compiled using new and existing data derived from the St. Louis Surficial Material Database (formerly compiled by DGLS), St. Louis Database, shallow seismic surveys, SCPT and from various sources listed in the bibliography.

The maps were constructed in a GIS geodatabase format for improved quality of the finished product. Each 7.5' quadrangle in the project area is its own geodatabase to easily be seamed with the other quadrangles in the project area. This provides the base for the latest mapping techniques to be applied. Attribute tables are associated with each feature class in the geodatabase for ease of viewing the data. While increasing the quality of the product, the division was able to reduce the file size also increasing storage capacity and facilitating the maps ease of transfer.

Specific age of mapped units was not determined or depicted, only their age in respect to other mapped units. Considerations were given to small scale maps in the region produced by former DGLS staff in addition to large scale map produced by the Illinois Geological Survey and Lettis and Associates, Inc. Inset contour maps were developed using a 10 m Digital Elevation Model (DEM) and data points across the 22 quadrangle SLAEHMP project site to generate contours based on the surficial material thickness and elevation of the top of bedrock. Contours were generated using a 10 foot contour interval and clipped to the specific quadrangle boundary. A surficial material vector map was utilized as the base map to display the spatial distribution of the point data. The inset maps were generated and added to the final map product.

The geologic surficial material mapping is the first product developed for seismic hazard analysis. The data gathered in the mapping process is critical base information in seismic hazard analysis. The depth to bedrock, depth to water table and type of surficial material is the fundamental bases for seismic assessment. Analysis of this data is used to assess how the alluvial column will respond to different magnitude earthquakes with respect to liquefaction potential and site amplification. This improves the accuracy and precision of earthquake hazard maps being prepared by the SLAEHMP TWG.

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