

Final Report

Transportation Portal Enhancements for the Oregon Spatial Data Library Phase 2



30 August 2012

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Phase 2

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Prepared by

The Institute for Natural Resources

Created by the Oregon Legislature through the 2001 Oregon Sustainability Act, the Institute for Natural Resources' mission is to provide Oregonians with ready access to current, relevant, science-based information, methods, and tools for better understanding natural resource management challenges and developing solutions.

The Institute for Natural Resources is an Oregon University System institute.

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for

Oregon Department of Administrative Services , Geospatial Enterprise Office (DAS-GEO)

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About the Oregon Explorer

The [Oregon Explorer](http://www.oregonexplorer.info) (www.oregonexplorer.info) is a collaborative program between the Institute for Natural Resources and the OSU Libraries. This natural resources digital library provides access to integrated natural resources information organized by topic, location and data portals. Through the Oregon Explorer, users can interact with place-based, up-to-date scientific information through maps, data, images, publications, and user-driven tools. Information is archived, value-free, and maintained over the long-term. The [Oregon Spatial Data Library](http://osdl.oregonexplorer.info) (OSDL) is an Oregon Explorer data portal and is a collaborative effort with DAS-GEO. OSDL enables access to spatial data for the state of Oregon (spatialdata.oregonexplorer.info).

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Disclaimer

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Executive Summary

DAS-GEO, in cooperation with Oregon State University, Oregon Department of Transportation (ODOT), and Oregon Emergency Management, applied for and was awarded a 2010 National Spatial Data Infrastructure CAP Category 7, Demonstration of Geospatial Data Partnerships across Local, State, Tribal, and Federal Government, grant. The award focused on Implementing Best Practices for Road Centerline Data Sharing in Oregon. The Institute for Natural Resources and OSU Libraries was hired to perform the work which involved completion of eight tasks. These eight tasks represent *Phase 2* of the Transportation portal enhancements for the Oregon Spatial Data Library (OSDL) and were identified through conversations with DAS-GEO and the outcome of a scoping process with the Transportation Framework Implementation Team (TFIT) on October 27, 2011. With this scope of work, the existing OSDL Transportation portal was enhanced and best practices for sharing transportation data were reported on to address and inform the business needs of DAS-GEO, ODOT and other partners involving in gathering, maintaining and distributing road centerline data.

Scope of Work

1. Expose metadata to geo.data.gov for periodic harvesting
2. Implement browse view, ontology search and fix preview link with ESRI Geoportal Server 1.1
3. Make a publicly accessible version of the road centerline dataset available
4. Give users the ability to access road centerline data via other service types (ArcGIS Map Service, WMS, WFS)
5. Implement standard symbolization for road centerline data for display in the OSDL Add new transportation related data layers to the OSDL (e.g., traffic counts, crashes)*
6. Upgrade the Map Viewer with Geocortex software to incorporate a more robust set of search, display and download options
7. Develop web extension folders for metadata extraction
8. Research and document best practices related to transportation data sharing

Accomplishments

- OSDL metadata is harvested monthly by geodata@usgs.gov:



Figure 1. Metadata harvest notice

- Upgrade of the Geoportal Server from 1.1 to 1.2.2 enabling new functionality of browse view, ontology search, and fixed preview links.

New tab

Folder browse of Framework categories or content type

BROWSE

Browse

Browse the library by selecting a catalog folder below.

Catalog

- Oregon Framework Categories
 - Admin Boundaries
 - Bioscience
 - Cadastral
 - Climate
 - Elevation
 - Geodetic Control
 - Geoscience
 - Hazards
 - Hydrography
 - Imagery
 - Land Use/Land Cover
 - Transportation
 - Utilities
 - Reference
 - Content Type

18 filtered results fish

Showing 1-10 1 2

Lahontan Cutthroat Trout Distribution

Oregon Fish Passage Barriers - Current

Oregon Fish Habitat Distribution

Figure 2. Browse view addition

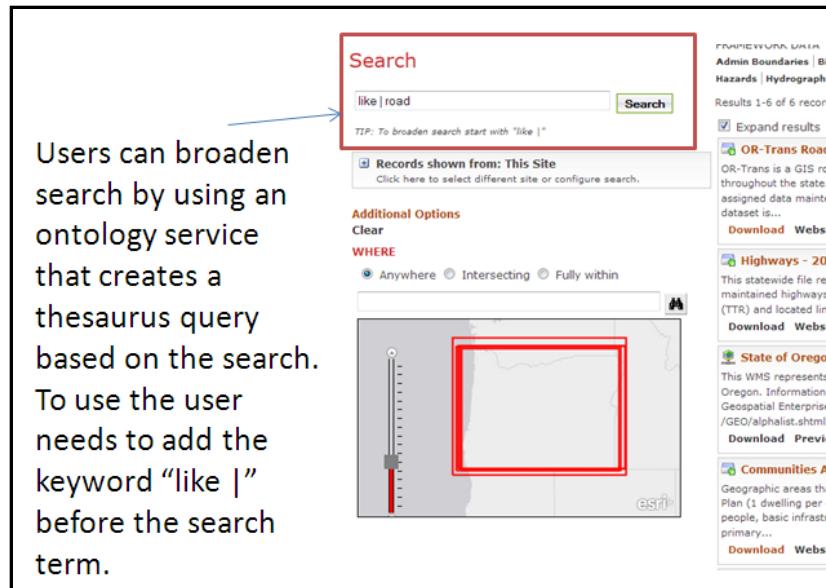


Figure 3. Ontology Search addition

- A publicly accessible version of the road centerline dataset was acquired from ODOT and is available from the OSDL

The screenshot shows two entries for the "OR-Trans Road Centerline 2012" dataset. The top entry is titled "OR-Trans Road Centerline 2012" and describes it as a GIS road centerline dataset compiled from numerous sources of data throughout the state. It includes download and website links. To the right is a small thumbnail image of a road network. The bottom entry is titled "OR-Trans Road Centerline 2012 (State Agencies Only)" and has the same description. It also includes download and website links. To its right is another small thumbnail image of a road network.

Figure 4. Logged in view of both public and state agency versions of the road centerline layer

- OSDL users have the ability to access road centerline data via other service types (ArcGIS Map Service, WMS, and WFS). For example, Oregon Explorer Map Viewer is streaming road centerline data from DAS-GEO. URL for access to road centerline map service layer:
 - ArcGIS MapServer REST Service Endpoint:
http://navigator.state.or.us/ArcGIS/rest/services/Framework/Trans_GeneralMap/MapServer/3
 - WMS Service endpoint for Transportation Map Service.
http://navigator.state.or.us/arcgis/services/Framework/Trans_GeneralMap/MapServer/WMServer?request=GetCapabilities&service=WMS

- Oregon Explorer Map Viewer has been upgraded with Geocortex software to incorporate a more robust set of search, display and download options. This allows Oregon Explorer Map Viewer users to search from the OSDL.

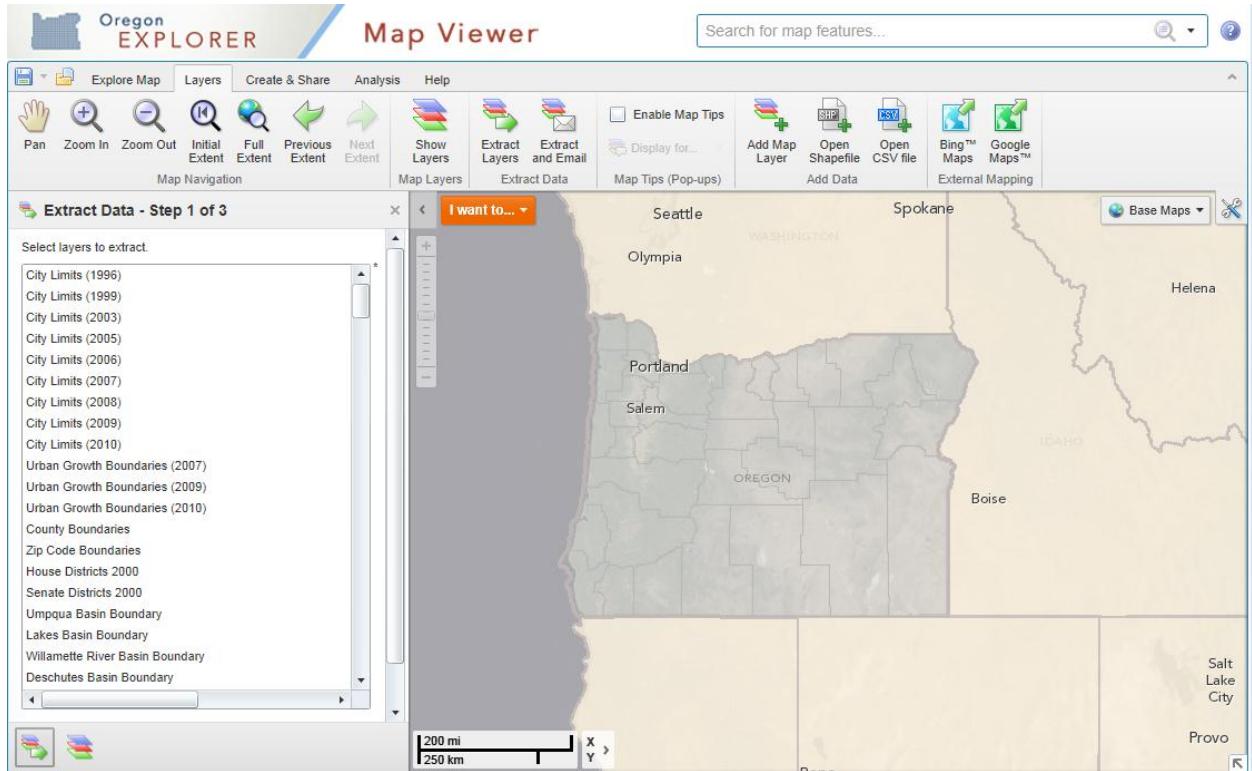


Figure 5. Oregon Explorer map viewer

- A web accessible folder (WAF) for metadata extraction has been set up for use by DAS-GEO.

Manage Resources

Document title:

Document UUID:

Site UUID:

Document owner: Any

Approval status: Any Publication method: Any Protocol Type: WAF

Update date between: ... and ... (yyyy-mm-dd)

For selected records:

Apply action to the entire result set:

Results 1-1 of 1 record(s)

Action	Title	Owner	Status	Method	Date	Access
	GEO - SDL Metadata folder	GEO_user	Approved	Registration	2011-08-23	Unrestricted

Figure 6. A web accessible folder

- The data extraction interface and functionality has been developed for the road centerline for the rest of the OSDL. The interface and functionality now support raster extraction and can extract data from any of the layers in Oregon Explorer Map Viewer. The user can search for a layer with an auto-completer and the layer will be drawn on the map so that a user knows what they are downloading.

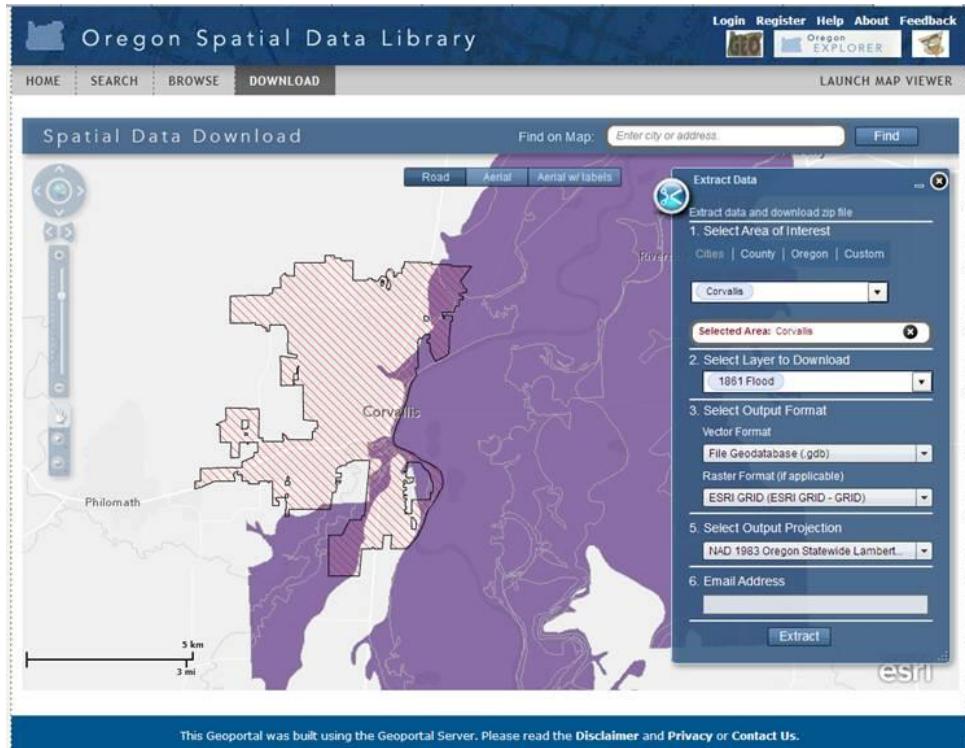


Figure 7. Data extraction interface for the rest of OSDL

- An upgraded map viewer that is linked off of the OSDL in the upper right menu location to take use of the Geoportal widget that was developed for inclusion with Flex viewers. A simple version is currently running.

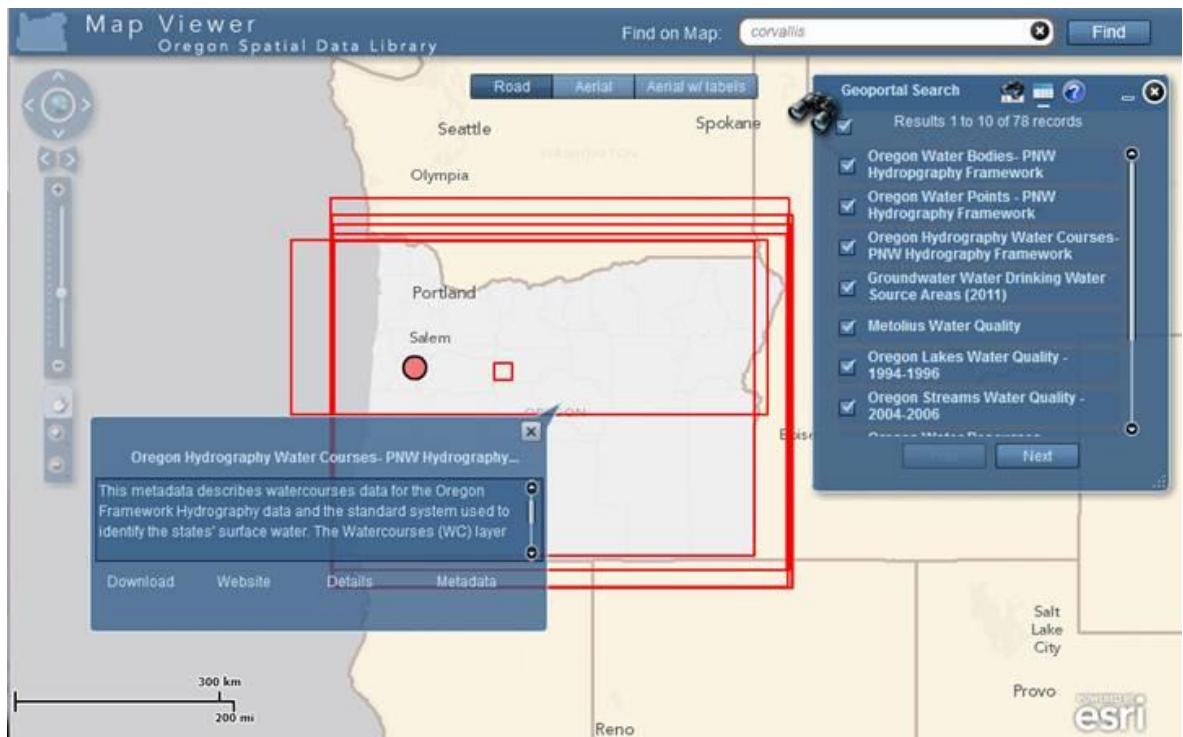


Figure 8. Simple version of upgraded map viewer that is linked off of the OSDL

- Ten interviews were conducted with road centerline data providers from county, state, federal and private organizations. The report of best management practices for sharing road centerline data is provided in Appendix A.

Appendix A. Best Management Practices for Sharing Road Centerline Data Report

Prepared by Darrell Oldfield, Institute for Natural Resources

The purpose of this report is to document best practices for sharing transportation data in Oregon, specifically road centerline data. Surveys were conducted during the summer of 2012 by Darrell Oldfield, Faculty Research Associate with the Oregon Explorer program.

Background

There are approximately 330 road authorities responsible for maintaining the road system in Oregon, but only a small percentage maintain Geographic Information System (GIS) road centerline data. In consultation with the Oregon Department of Administrative Services Geospatial Enterprise Office (DAS-GEO), a sample of these road authorities was selected and interviews were conducted during the summer of 2012 with representatives from 10 organizations that maintain and use transportation data in Oregon:

Oregon Department of Transportation	Linn County GIS
U.S. Geological Survey	Lincoln County GIS
Bureau of Land Management	Deschutes County GIS
US Forest Service	Crook County GIS
GeoSolve Inc.	Harney County GIS

These ten organizations represent three federal agencies, one state agency, one private company, and five Oregon counties. Representatives were questioned on their current policy for sharing data, the pros and cons of this policy, and the factors that influence sharing road centerline data. This report summarizes the responses and best practices from the study respondents.

Current State of Data Sharing

State agencies

Oregon Department of Transportation (ODOT) is the lead state agency for transportation data. For their statewide road centerline dataset, ODOT collects and compiles about 50 separate datasets that are obtained from federal, state, and local agencies. ODOT has both formal and informal agreements in place to share road centerline GIS data. ODOT currently has formal, written data sharing agreements with 20 of the 36 counties. There are 5 counties that provide their data in the public domain and the

other 11 counties provide their data to ODOT through informal agreements. With these formal and informal agreements, ODOT has been able to create a statewide roads layer that is fairly comprehensive and relatively accurate and up-to-date. This has, however, taken much effort on their part to collect the data, convert it into their format, match edges, and conduct other data manipulation. Gaps in the data provided by the counties consist of roads they do not maintain such as tribal, private, or federal. ODOT is able to fill in these gaps from other sources such as the Bureau of Land Management (BLM), the U.S. Forest Service (USFS), and the Oregon Office of Emergency Management (OEM).

Federal agencies

The USFS and BLM have made efforts to share data more formally with each other, but this has been slow to develop because of a lack of resources and willingness to make it a high priority. Both parties agree that this would benefit them, but as of yet the difficulties persist. The USFS and the BLM have mostly informal data sharing agreements with various state and local agencies to provide and receive road centerline data. The BLM works especially closely with counties where they are a large landowner. These agreements are also informal but the relationships are much closer and more mature than some of the other informal relationships.

The U.S. Geological Survey (USGS) has shown interest in a statewide transportation data layer and provided funding for a project to compile one, but a satisfactory result was never achieved. There were issues over obtaining the data, the quality of the data, and making the data available publically. The USGS has backed away from using state data for their topographic maps and have gone to a private company to provide this data. They recognize that this is not an ideal situation for them and are investigating the possibility of using the Census Bureau's TIGER data. In this case, the states would provide their data to the Census Bureau and USGS would retrieve it from the Census Bureau.

Federal agencies are in a unique position in that they are mandated to make the data publically available; however, this is an obstacle when they seek to get data from counties that do not want their data to be made public.

County and other local jurisdictions

Data sharing agreements among counties, cities and local governments are mostly of the informal variety and used on an as needed basis. These "gentlemen's agreements" tend to work better than might be expected in that most local organizations are willing to provide their data to other public agencies free of cost. Despite the "gentlemen's agreement" there are some local organizations that still require the data receiver to sign usage agreements.

Usage agreements often state that use of the data is limited to the organization receiving the data and that they are prohibited from distributing it to other parties. For some local organizations, it was considered inappropriate to give away a product that was produced using public resources to private companies that may profit from it. However, there were other local organizations who thought that if the private companies were going to get that data from somewhere it should be the best data that is

available. If the data that the county maintains is the best data, then there is an indirect benefit to the taxpayers and residents of that county that may end up purchasing the product from the reseller.

Some counties stated that they do not have a need for their data to be updated frequently or be as comprehensive as other counties do. For example, there is one rural county that only keeps data on roads with addresses. In these cases, they expressed a preference for data requesters to get their data from other sources that have more complete and up-to-date data.

Liability is an underlying issue with data in the public domain or data that is sold. As of yet, the liability of road centerline data has not been resolved. Two of the counties interviewed were wary of potential lawsuits.

Data Sharing Issues

Public access vs. cost recovery policies

Of the ten organizations participating in this study, only two have a cost recovery policy. Organizations are finding that the cost in time spent packaging and selling data products often is not recovered by the income received from these products. There is one county that has seen a recent, cost-offsetting boost in revenue when it began selling road data during a recent increase in building development and growth. It remains to be seen if they can continue to profit now that the growth rate has declined, but at this point they remain committed to charging for GIS road data.

Some counties note an ethical argument that people should not be able to profit off of publicly produced data products. This might be the biggest hurdle to overcome when thinking about data being placed in the public domain. There are also other non-monetary issues with the selling of data. One of these is the customer service that is expected to accompany a purchased product. This requires the seller to spend time providing customer service related tasks that again cost time and money. GeoSolve Inc. is a private company that currently provides data services to 16 Oregon counties. They said they came across this issue often when initially establishing business with the counties and were able to convince the counties fairly easily that the selling of road centerline data was not profitable when considering all the factors. They also pointed out that ODOT provides a value back to the county in the form of new and improved data, such as crash and bridge data.

Formal vs. informal agreements

In almost all of the cases studied, the informal “gentlemen’s agreement” was acceptable to all parties involved. Those who needed data were able to get it, and those who had it were willing to share it. This is not to say it was always an easy process. Sometimes there was some negotiation needed regarding formats, distribution, and use, but in each case an agreement was eventually reached. An issue with informal agreements is that they are struck between individuals rather than organizations. If there is a change in the individual responsible for the data, past agreements may become forgotten or, due to differing opinions, agreements can be quickly and unilaterally nullified. Although there were not any examples of this noted by the study respondents, this is a possibility.

In certain cases a written formal agreement may be the only way to facilitate obtaining the data. This does not mean that all data sharing need be covered by a formal agreement. For organizations like ODOT, who are responsible for creating a statewide dataset that relies on data from multiple sources, it would take multiple agreements with many different organizations that have their own policies on the use and distribution of the data, or collaboration with an outside entity, like GeoSolve Inc., to facilitate data sharing between local entities. Large complex data sharing agreements may not be feasible.

“Data sharing agreements work best when they are small and nimble. Large all-inclusive agreements fail under their own weight. The more people who have to interpret and administer the agreement, the less clear and more contentious it becomes” -- ODOT respondent

Data Formats

A variety of formats can be used for road centerline GIS data and the format used depends on the need of the data creator and the situation. For instance, the USFS and BLM must use national standards for their data. GeoSolve Inc. created a data format with input from their county clients that provides a standard format and retains the ability to customize it for each county's individual needs. Other counties use an event table type of format. In this format, the geometry is kept separately from the attributes that are stored in tables. The tables can then be attached to the geometry as needed and the tables can then be shared or not depending on the need to provide the information or the need to protect it. The entity requesting the data then converts it into the format they need. There are cases, however, where the data provider is asked to convert the data before delivery.

The variety of data formats presents many technical issues for sharing data with across different users, including but not limited to:

- **Edge matching** – When wanting to join datasets from different sources edge matching can be problematic. Some jurisdictions that use their data for optimized routing have agreement points established with bordering jurisdictions and thus the edge matching is relatively accurate. However in jurisdictions that do not have a need for accurate edge matching it would be up to the person collecting the datasets to do the edge matching. This can be done as accurately as they need it to be, but each level of accuracy costs additional time and money.
- **Checker boarding** – If a complete collection of data cannot be obtained when combining data, there will be data gaps that lead to a checkerboard effect – areas with and without data. BLM data, for instance, tends to have this effect as their roads are often interrupted by lands owned by non-BLM owners, both private and public. The USFS, however has little checker boarding because each forest is self-contained and contiguous. County and local data will have some checker boarding also due to changes in ownership and authority. It would fall upon the collector to fill in these gaps as best they can.
- **Attributes** – Datasets may contain sensitive attributes in their native or original format that the owner of the data may not want to share. This can lead to reluctance in sharing the data or the need to put restrictions on its use. Many organizations are compensating for this by

using an event table format, through which sensitive information can easily be removed from the dataset. Attributes can also cause issues when there are many attributes attached to the geometry. The more attributes that are added, the smaller the geometries become because of the need to break up longer continuous lines into smaller ones, simply to allow for a change in an attribute.

- **Location of the road centerline** – There were two distinct ways to show the locations of a roadway” (1) the traveled route, which shows the road in its location on the ground as built; and (2) the right-of-way, which shows the legal description of the road. Most organizations use the *traveled route* as the location of the road. One reason for this is that this data is often used for emergency response purposes and knowing exactly where the road is located in real space is critical for routing and navigation. The *right-of-way* is mostly used by development departments that need to know the legal location of the road. It becomes important to understand this difference when it is discovered that a road is not built exactly where the right-of-way indicates. It is often the case that within a county there can be two road centerline datasets being used that are significantly different from each other.

Conclusions

The widespread use of GIS for transportation data has only occurred in the past three decades and continues to be developed and improved at a rapid pace; therefore, best management practices to share this type of data are relatively new and continue to be created and redefined at a similar pace. Many of these practices exist as “gentlemen’s agreements” that are subject to unilateral change at any time. That being said, these relationships seem to work well for most parties that need data and those that are in a position to provide it. It could be that having more formal agreements in place would provide a level of certainty that currently does not exist, but this is not necessarily true and could in fact complicate the process to a point where it may not work as well as it does now. All parties interviewed for this study, with the possible exception of ODOT, are able to get the data that they need and are willing to provide it to public agencies that request it; the exception is providing free data to private entities that plan on using the data in commercial for profit ventures.

The goal of a complete, accurate, and current statewide road centerline dataset is an enviable goal and would be well received by all organizations that were interviewed. The process for creating this dataset, however, would be cumbersome, expensive, and time-consuming. It would take an organization with the resources, the commitment to see the project to completion, and the authority and ability to broker agreements with the many parties that would need to be involved in the process.

In creating the initial dataset, informal agreements would most likely be sufficient but updating and maintenance of the data should perhaps be dealt with through more formal agreements. Without a formal process in place for updating, quality, and agreement points the data layer would quickly become out of date and inaccurate. It would also take considerable time and effort to convert the data received into one standard format that would be useful to all the potential users of the data.

CAP Feedback for G10AC00207

What are the CAP Program strengths and weaknesses?

Strengths:

- Promotes targeted initiatives
- Results are shared
- Funding provided

Weaknesses:

- Funding, although generous, is generally only sufficient to start an effort

Where did this cooperative agreement “make a difference” to your State?

The agreement encouraged the development, compilation, and release of a new version of the ORTRANS road centerline dataset. This dataset was made available thru the transportation portal which was also developed via encouragement and support from the agreement. Finally, the best practices report facilitated an objective evaluation of the road centerline data sharing situation in Oregon.

Was the assistance you received sufficient or effective?

Assistance (in the form of dollars) was effective and sufficient to meet the stated goals of the project. The challenges of data sharing go well beyond the scope of the project and the assistance provided. Oregon is very appreciative of the opportunity provided by the project.

What would you recommend that the FGDC do differently?

Nothing that I can think of at the present time.

Are there factors that are missing or additional needs that should be considered?

It might be interesting to consider “multiple award” or serial projects. This could take the form of a proposal that, if successful in its first stage, might receive priority consideration for subsequent awards. Such a structure might encourage a longitudinal survey or other such project that is current not a good fit for the program.

Are there program management concerns that need to be addressed, such as the time frame?

No, FGDC is flexible with deadline extensions which is much appreciated by this recipient.

If you were to do this again, what would you do differently?

I did not anticipate the magnitude of potential changes (staff, organizational, and focus) both in our agency as well as partner agencies and the affect that would have on our ability to follow thru on our commitments. Were I to have the opportunity again I'd anticipate or allow for these factors to a greater degree.