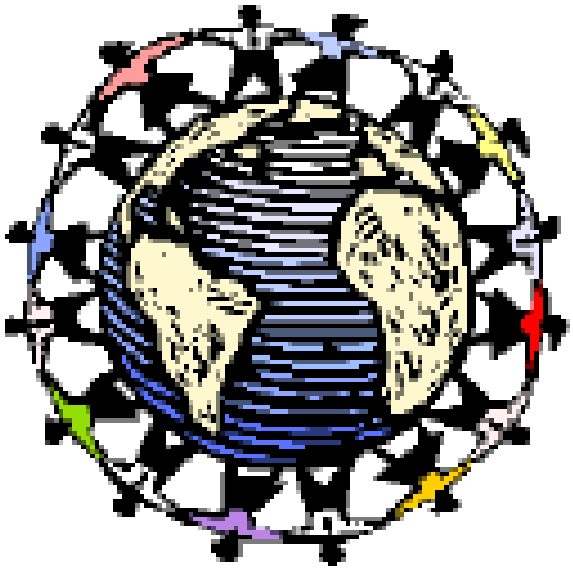
Kansas Department of Transportation

GeoSpatial Enablement Strategy Appendix 5- Stakeholder Review



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Appendix 5 – Stakeholder Review

Appendix 5 provides an overview of stakeholder data needs and data holdings that pertain to geospatially enabling the enterprise. Stakeholder information was gathered from KDOT employee interviews for the GIS/LRS Integration study (February 2003), from those who participated in the on-site stakeholder meeting (August 2004) and associated follow-up interviews, and from results tabulated from the "Stakeholder Survey for the GIS Strategic Plan Update." Most stakeholders are internal to KDOT.

1.1 Stakeholder Data Needs Survey

A questionnaire was given to KDOT stakeholders pertaining to their data usage and needs on November 2, 2004. There were over 100 respondents to the questionnaire. The questionnaire is shown in Appendix 4.

There were 103 surveys completed. This survey was administered to determine which data sets the majority of stakeholders at KDOT utilize. This in turn will allow these data sources to be designated as primary targets for geospatial enablement.

The first question asked in the survey was what level of user of KDOT data did each respondent consider themselves. This question was asked to determine the level of interaction each stakeholder has with the various databases available throughout the enterprise. Each respondent was asked to choose one category but some respondents fell into multiple categories and marked them accordingly on the survey. Table 1 conveys the results of this question.

Table 1 Level of User of Data

Category of User	Number of Responses	Percentage of Total Respondents
Viewer (Read only, Never updates data)	48	47 %
User (Limited query creation, Updates data regularly)	35	34%
Power User (Developer of applications)	18	17%
Data Administrator	5	5%

The majority of data consumers at KDOT need data in a read only capacity to complete their specific business processes. Thirty-four percent of the respondents stated they have write access to data used by various stakeholders throughout the enterprise. This is important because these people have the ability to populate the geospatial component of the various types of data utilized by various personnel at KDOT.

The next question the respondents were asked was if they require the usage of other stakeholders' data to complete their business function. Table 2 illustrates the results.

Table 2 Uses of Other Stakeholder Data

Use of Other Stakeholders' Data	Number of Responses	Percentage of Total Respondents
Yes	96	93 %
No	7	7%

The overwhelming majority of respondents require usage of the various data sources managed by others at KDOT. This is critical to understand because once the data is geospatially enabled analysis can be extended to include overlay analysis to derive more accurate conclusions. An example would be ROW owned by the DOT that housed equipment when a road was being built. It will be necessary to locate those parcels and then find out the proximity to various types of land uses to see what is permitted.

The next question asked to the respondents was what are the other types of data you require to complete your business process. This was asked for to determine which data sets would be of the highest priority to geospatially enable.

A brief profile of who the respondents are shows the depth of the survey. Table 3 shows the representative departments and number of respondents.

Table 3 Respondent Profiles

Department	Number of Responses
District 1	8
District 2	6
District 3	3
District 4	5
District 5	6
District 6	2
Aviation	1
BCS	3
Bridge	2
Construction & Maintenance	6
Design	8
Environmental	1

Department	Number of Responses
Human Resources	2
Legal	3
Local Projects	4
Materials & Research	6
Planning	20
Project Management	1
Public Information	1
ROW	6
Safety	2
Traffic Engineering	6
Videolog	2

There were 23 respondent work areas. The average number of responses per department was roughly 4. Planning had the most respondents with 20 and there were four departments that had 1 respondent. This provides a representative cross-section of the agency.

There were 38 types of data the respondents were asked if they used. Table 4 conveys the results.

Table 4 Stakeholders Data Requirements

Data Source	Number of Responses	Percentage of Total Respondents
State System Network	66	64%
State System Access Points	42	40%
Local (Non-State) Bridges	30	29%
City Streets	50	49%
Traffic Counts	57	55%
Functional Classification	45	44%
Signing	51	50%
Pavement	51	50%
Maintenance Projects	51	50%
Financial	16	16%
Railroad Network	30	29%
Pedestrian/Pedalcycle	18	17%
Trails	16	16%
Landmarks	22	21%

Data Source	Number of Responses	Percentage of Total Respondents
Utilities	42	41%
Imagery	40	39%
Air Quality	7	7%
Rest Areas	30	29%
Digital Elevation Models	19	18%
State System Bridges	55	53%
Local Road Network (Rural)	51	50%
Culverts	36	35%
Motor Vehicle Accidents (Crashes)	37	36%
Truck Counts	47	46%
Weigh-In-Motion	15	15%
Guard Fence	35	34%
Construction Projects	67	65%
Contracts	37	36%
At-Grade-Railroad Crossings	40	39%
Aviation	14	14%
Transit	11	11%
Scenic Byways	24	23%
Parcel/ROW	39	38%
Hydrography	21	20%
Environmental (T&E Species)	14	14%
KDOT Facilities	34	33%
Educational Facilities	11	11%
Digital Terrain Models	16	16%

The average number of data sources used by the respondents above was approximately 13 of the 38. One respondent said they used all 38 data sources and 2 respondents said they did not use any of them. The average number of data sources used for all respondents was approximately 13. The top 5 data sources are listed below:

1. Construction Projects (65%)
2. State System Network (64%)
3. Traffic Counts (55%)
4. State System Bridges (53%)
5. Signing, Pavement, Maintenance Projects and Local Road Network – Rural (50%)

The most significant fact in the list above is the State System Network is used 64% of the respondents. The network is already geospatially enabled and several of the data sources above reference the network. In addition, Construction Projects was the most used data source identified by the respondents. The Construction Project data has the ability to generate the LRS key used by KDOT and also contains the longitude and latitude durations of each project. This provides a basis to give a geospatial context for construction project data. In addition, 40% or more of the respondents on the survey used 13 of the data sources. This says that 1/3 of those data sources are used by a large percentage of the respondents.

The least used data sources are as follows:

1. Air Quality (7%)
2. Educational Facilities and Transit (11%)
3. Environmental - T&E Species (14%)

The last variable that was measured by the survey was the types of linear reference methods (LRM) used by the respondents. Table 5 shows the usage among the respondents.

Table 5 Stakeholder LRM Requirements

LRS Key or LRM	# Of Responses	% Total Respondents
KDOT LRS Key	57	55%
State Route Logmile	65	63%
Longitude/Latitude	47	46%
Easting/Northing	14	14%
County Route Logmile	56	54%
Reference Post	63	61%
Stationing	42	41%
X, Y Coordinates	18	17%
Other	8	8%

Fifty five percent of the respondents stated they were using KDOT's LRS key. This is imperative for linear referencing. Linear referencing is a methodology to provide spatial context to data that is locationally referenced. The LRM's that were used the most are as follows:

1. State Route Logmile (63%)
2. Reference Post (61%)
3. County Route Logmile (54%)
4. Longitude/Latitude (46%)

Eighty-one (79%) of the 103 respondents stated they use two or more LRM's to locate data. This is a pertinent fact with regard to completing the spatially enablement process. KDOT may want to consider adopting a universal LRM for analysis. There is a utility within GeoMedia Transportation that allows conversion between coordinate LRM's (longitude-latitude and easting-northing) and route-measure LRM's (State Logmile, County Logmile and Reference Post). The conversion would take place in the form of query thus the base data would not need to be appended or edited.

1.2 Inventory Assessment

The most current inventory assessment of data that could be geospatially enabled was performed for the GIS/LRS integration study that concluded in February 2003. This is not a substitute for a comprehensive inventory review. The caretaker of each respective data source should perform this and post to a central point of discovery.

1.2.1 KDOT Traditional Inventory Process

KDOT maintains an exhaustive repository of data. In many instances the same data exists across the enterprise in multiple databases. This creates inconsistency in identifying the most accurate and up to date data required for decision-making. This can potentially have disastrous ramifications when performing analysis.

A general process followed for data inventory at KDOT resembles the following steps:

1. Each data custodian will attempt to conduct the inventory or hire consultant with transportation expertise to assist.
2. Formulate questions that need to be answered about data holdings (not an actual inventory).
3. Attempt to identify throughout everyone within a given bureau that maybe a caretaker of information.
4. Publish findings to all agency departments.

A pre-defined and consistent methodology must be devised to conduct any inventory process. This is necessary for uniformity across all representative groups at KDOT.

1.2.2 GIS/LRS Stakeholder Participant Data Holdings Inventory from 2003

This section will list the elements and participants in the Stakeholder data-holding inventory performed for the GIS/LRS Integration study of 2003. The data elements examined in that study are as follows:

1. Data Collection and Structure

2. Metadata
3. Location Reference System
4. Enterprise Data Dissemination
5. Enterprise Data Access and Provision
6. Software Profile

KDOT personnel stated during the course of this study the components above have remained unchanged since the GIS/LRS Integration study of 2003. With that in mind these elements have used as a baseline to determine what the current level of geospatial enablement is for the major operational databases. This is not meant to serve as a substitute for a detailed inventory by each custodian of the operational databases.

The respondents to that study are listed below:

1. Office of Engineering Support - Program/Project Management Support
2. Bureau of Transportation Planning - Decision mapping and GIS applications
3. Bureau of Transportation Planning – Base Network Maintenance
4. Bureau of Transportation Planning – Kanroad (formerly CDRS and RCRS)
5. Bureau of Transportation Planning – GPS Centerline recalibration
6. Bureau of Transportation Planning - Reference Posts on state highway system
7. Bureau of Transportation Planning - Videolog
8. Bureau of Transportation Planning – Traffic Volume
9. Bureau of Transportation Planning - CANSYS2, state system bridges, and public at-grade railroad crossings data
10. Bureau of Transportation Planning - KARS
11. Bureau of Transportation Planning - ITS
12. Bureau of Construction and Maintenance - CDRS/RCRS, Rest Area Inventory, and Paint Striping Inventory
13. Bureau of Design Environmental Services Section - Environmental GIS-based project review and reporting
14. Bureau of Materials and Research Pavement Management Section - Substantial Maintenance Program and maintenance of the PIMS
15. Bureau of Transportation Information - Advanced Traveler Information System
16. Bureau of Local Projects - Data management of local bridge inventory
17. Bureau of Local Projects - KDOT's improvement program for roads and bridges
18. Bureau of Design Coordinating Section - Highway/Railroad crossing safety, utility adjustments, and preliminary design surveys
19. Bureau of Traffic Engineering Corridor Management Unit - Highway Access Permit System
20. Bureau of Public Involvement
21. Bureau of Computer Services - TRIS

In the GIS/LRS study the respondents were asked if they required access to other stakeholders data. Seventy-six percent stated they required access to other business unit's data. In the current survey 93% stated they needed access to other departments data within KDOT. This is significant because to use it in integrated spatial/linear analysis components such as the LRS key and a recognized LRM will be necessary.

These were the key corollary components of the two studies that were worth noting. Again, it should be reiterated the GIS/LRS data holding survey should not be substituted for a comprehensive analysis of the current business environment at KDOT.

1.3 Geospatial Enablement Components

There are several data and system components that allow data to be geospatially enabled. These will be analyzed using stakeholder interviews (CPMS, GIS/LRS 2003, and direct) in the following subsections to provide a preliminary indication of geospatial enablement among the major operational databases at KDOT. This will provide a reasonable assessment of the level of effort and strategic sources that will be impacted the GE effort. The components analyzed are:

1. Databases – This consists of the operational databases that are used by KDOT stakeholders. In addition, this also considers whether the database supports the storage of geospatial data.
2. Spatial and User-Defined Metadata – This consists of information describing who, when and how the data was collected, the geographic characteristics of the data and spatial extents.
3. Location Reference Component – This consists of the data containing the LRS key or a means by which to create the key or join to other data which has the LRS key.

1.3.1 Operational Database Enablement Profile

Of the above-mentioned stakeholders several maintain the official databases KDOT uses for policy and decision-making. These databases contain various levels of geospatial components. Most of them are partially geospatially enabled and some can be linked to other databases they have a relevant relationship to for decision making.

Table 6-1 in the main document illustrates the presence of geospatial components in the major KDOT operational databases.

There is incomplete data in this assessment. Most of this is due to nothing being provided by the respondents. Fourteen of the 22 respondents either store or can produce the KDOT LRSKey. This is a necessary in order to perform dynamic segmentation of tabular data containing an LRM that references the network. In addition, eight of the operational databases contain a spatial geometry type that allows spatial data to be graphically displayed in a GIS environment or database.

Five of the operational databases have both geometry storage and the LRSKey as a component of their database.

In addition, many of the operational databases have common relationships that have been defined in the Enterprise Architecture data model. These should be leveraged to utilize common fields that can be joined to form analytical relationships.

1.3.2 Spatial and User-Defined Metadata

Metadata refers to characteristics of the spatial component of the data, that is, datum, map projection, and reference coordinates that the data have been tied to in a cartographic sense. Metadata can also be created and published at the item, attribute, or event level. Metadata can tell the user about data collection techniques, data audience, data maintenance, data distribution, data age, and overall data fitness. Metadata can also help the user to identify usable or reliable data and can provide assumptions necessary when performing statistical or other analyses.

Table 6 shows the whether metadata is resident in the operational databases that were surveyed in the GIS/LRS Integration study of 2003.

Table 6 Metadata in operational databases

Database	Metadata
CPMS	N
GIS - Mapping	Y
GIS – Base Network	Y
KanRoad	Y
GPS Centerline	Y
Reference Posts	N
Videolog	N
Traffic Volume	N
Bridge	N
At-Grade Crossings	Y
Accident	N
ITS	
Rest Area	
Striping	
Environmental	N
Pavement	N
ATIS	N
Local Bridge	N
Local Roads	N
Access Permit	N
Public Affairs	N

Database	Metadata
TRIS	Y

Six (27%) of the 22 respondents stated they create metadata for their operational databases. Twelve (55%) of the 22 respondents stated they do not maintain any metadata for their operational databases. There was no information provided by three respondents.

Metadata will be a critical factor for uniform spatial enablement effort. Understanding the basic framework of the data is critical for consistency in the development of enterprise applications by KDOT. In addition, as KDOT continues to provide and exchange data with external agencies metadata will be critical for seamless usage of the data.

1.3.3 KDOT LRS Key and Location Reference Methods

The KDOT LRS key usage was also analyzed in the GIS/LRS study. Sixty-seven percent of the respondents in that study stated they have adopted the standard LRS key to manage the data holdings. Fifty-five percent of the respondents to the current study stated they have adopted the LRS key.

There were 11 different LRM's in use. Seventy-six percent of the respondents stated they used multiple LRM's. The most prevalent LRM's are county-route logmile and the Longitude/latitude LRM's. Of the 21 respondents, 57% used the county-route logmile LRM. This was the most used LRM is the GIS/LRS study. This is a contrast with the current survey that showed 63% of the current stakeholders use State Route Logmile and that is the most used LRM. In the GIS/LRS study 52% used the longitude/latitude LRM and that was the second most used LRM. In the current survey 46% used longitude/latitude. In both studies it was the second most frequently used LRM.