Supplemental Appendices for
A Guide to Managing
Where’s My Stuff

An Implementation Guide for a Geospatially-Enabled
Enterprise-Wide Information Management System for
Transportation Agency Real Estate Offices

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Prepared For

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Transportation Research Board of the National Academies

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APPENDIX A EXECUTIVE SUMMARIES

The executive summaries presented in this appendix were developed for members of upper management within transportation agencies. The first summary focuses on the current state of the practice in ROW enterprise-level geospatially-enabled information management systems with a discussion of the benefits and costs associated with those systems in the context of designing and implementing such a system for right-of-way offices. The second summary focuses on what information is important for an executive to have for evaluation as part of a request to fund an enterprise-level geospatially-enabled information management system to improve its successful implementation.

Executive Summary 1: Improving Resource management and Operations in Right-of-Way Offices with Right-of-Way Information Management Systems

Improving Resource Management and Operations in Right of Way Offices

With Right-of-Way Information Management Systems

A well designed and implemented information management system can substantially improve management of resources – personnel, money, information, and time – which is critically important to successfully meeting state performance goals and budgets. Adding geospatial capabilities (GIS) to the system to replace hardcopy maps and tabular information and to give additional management and analysis functions can significantly increase its usefulness.

**BENEFITS**

- Improved on-time delivery of project real property
- Expedited project award
- Reduced staffing and/or improved staff efficiency
- Improved scheduling
- Improved access to information both internally and by the public
- Improved customer service and public relations
- Improved documentation and reporting uniformity
- Reduced time to perform tasks
- Reduced redundancy, primarily in data entry
- Increased management flexibility
- Improved oversight capabilities
- Improved integration, use, and sharing of information

**DOCUMENTED SAVINGS**

- A return on investment of more than 21%

Pennsylvania invested $829,000 on a ROW information system that reduced annual operating costs by nearly $680,000 while providing greater convenience to users. Because the system integrates with their financial system, the time to process payments reduced from several days to several minutes.

In the Right-of-Way office, this is particularly important because of the resources required to deliver real property for transportation improvements and manage state-owned land.
• **Staffing reductions and improved on-time performance**

In Virginia, the ROW information system provides over 500 staff and contractors all information on ROW projects, providing *exceptional customer service*. Information is entered only once, *eliminating duplication of effort*. Clear project tracking provides staff with a comprehensive understanding of the status of each project including resource allocation.

In Maryland, *research staff has been reduced by half* because parcel and other geospatial information is available through the intranet. *In-person courthouse research and travel time have been eliminated.*

New Mexico uses GIS to generate summaries on excess property for sale to the public, *reducing the time required* to provide this information from several hours to several minutes. The information includes a map with an aerial photograph image background resulting in dramatically *reduced questions from the public.*

Using GIS, the San Antonio district of Texas provides its staff with electronic access to project drawings, thus *eliminating the manual locating and reviewing of large drawing sets*. Drawings are accessed by simply clicking on a desired section of road.

• **One-person project oversight and management of real estate activities**

In Illinois, a multi-million dollar airport project is managed by a single person who has desktop *access to near real-time information* about the project.

**RISKS OF NOT IMPLEMENTING A SYSTEM**

A primary purpose of this type of information management system is to facilitate standard business operations and support information and decision making by providing easy access to both internal and external information relevant to meeting the goals and operational needs of the transportation agency and the real estate office.

Without such a system, decision makers are limited in their ability to monitor performance and identify opportunities quickly and make strategic adjustments to resource allocation as needed. The real estate office will be limited in its ability to respond to the rapidly increasing reliance on digital information exchange to perform its functions.

Expectations in the current technological environment are for faster, more accurate information with fingertip access to on-line maps. Without a geospatially enabled system, these expectations cannot be met for staff or the public.

**FOR MORE INFORMATION**

This document is part of the National Cooperative Highway Research Project 8-55A “Developing a Logical Model for a Geo-Spatial Right-of-Way Land Management System”. The project is managed by Ed Harrigan EHARRIGA@nas.edu and is being performed under Kathleen Hancock hancockk@vt.edu at Virginia Tech and was completed in 2/11.

Implementing an Information Management System in Right-of-Way Offices
An Overview for Executives

Increasing responsiveness and maximizing resources are important factors in how transportation agencies improve their business in today’s data-driven, performance-based environment. The ability to deliver projects on time and within budget is one measure of a transportation agency’s performance. The effective delivery of real property by the right-of-way office is fundamental to achieving this agency objective. A well designed and implemented information management system can substantially improve this capability. Adding geospatial capabilities (GIS) to the system to replace reliance on hardcopy maps and tabular information and to give additional management and analysis functions can significantly increase its usefulness.

Understanding the critical factors necessary to successfully implement an information management system can ensure the best value for the necessary outlay in resources and can substantially improve the realization of the system’s full potential. Obtaining strategic buy-in from agency executive-level decision makers to pursue implementation will provide the necessary foundation for system.

Implementing a System

The process to implement an information management system is well documented and follows standard procedures:

♦ Formalize support
♦ Assess requirements
♦ Assess capabilities
♦ Define the system
♦ Develop an implementation plan
♦ Implement the system
♦ Maintain the system

Implementation is typically considered complete at the point when the system being implemented has transitioned to “business as usual” for its users.

Implementation Responsibilities

♦ **Project champion:** This person is typically known and trusted by agency management and is responsible for marketing and promoting the system both inside and outside the agency.

Without an identified champion, history has shown that projects flounder at the first major challenge.

♦ **Steering group:** The steering group is responsible for ensuring that there is active and appropriate input and feedback to the system during the implementation process.

Transportation agencies consist of multiple departments and offices responsible for different aspects of doing business. Without representation from each group that will be impacted by the system, the system will face numerous challenges including: a) meeting agency information technology (IT) requirements, b) obtaining buy-in from stakeholders, and c) coordinating data sharing between data owners and users, as well as performing the tasks necessary to support right-of-way activities.

♦ **Project manager:** The project manager is responsible for the day-to-day management of the process.

This person must have the necessary skills, authority and resources to coordinate sometimes conflicting input from the groups and individuals involved in the process. The project manager must also have the organizational skills to ensure that the process stays on track and within design boundaries and sufficient technical understanding of the right-of-way process and individual functions to reasonably evaluate input during the development process.

♦ **Development team:** The development team consists of the people who will actually be developing the system.

They can be wholly from within the agency or wholly contracted from outside or a combination of both. The importance, at the proposal stage, is that the skills necessary to the project be clearly identified and articulated.
Implementation Factors

- **Assessing requirements**: Any proposal for a new information system should include a clearly stated understanding of the scope and goals of that system. As these requirements are refined, consideration should include the business areas to be included (often referred to as the enterprise), the functions that should be performed, the data needed to support these functions, other systems that should interact with the proposed system, security issues, and any legal and regulatory requirements.

- **Assessing capabilities**: An understanding of the capabilities in the right-of-way office and across the agency is critical to successfully implementing a system. Considerations include available or required hardware and software, existing applications including database management systems and GIS, datasets along with who is responsible for them, and agency policies and procedures related to IT including application development, data and data standards, and hardware and software acquisition. Knowing who will be responsible for maintaining the system and any corresponding data and output is also necessary. Availability of funding for development and continued maintenance is critical to the project’s success.

- **Defining the system**: This is the core of the system and will be the basis for the tool that manages the information associated with right-of-way offices. The technical considerations will be included in the detailed implementation plan. An important aspect of this definition is knowing the starting point for system development. Three common starting points include:
  - The system is being developed from scratch with no existing information management system or GIS.
  - The system is expanding on an existing information management system to include GIS.
  - The system is being developed to take advantage of existing GIS capabilities. Knowing this information will ensure that appropriate coordination is considered in the design.

Additional Considerations

The current evolution and expansion of technology is extremely rapid and most transportation agency policies and procedures are not designed to operate at the same rate of change. Innovative and flexible approaches to supporting improved information management tools could save money and time both in their implementation and use.

From concept to operation, a comprehensive information management system can take 12 to 24 months or longer, and, during that time, technology will become more powerful, faster, and more flexible at the same time that the general public will become more technologically sophisticated with fingertip access to information through smart phones and other similar devices. A flexible design can readily take advantage of this changing technology without requiring major modifications. However, waiting for the next advancement before initiating the process can, and often does, result in never starting.

Many transportation agencies are in the process of either designing or building an agency-wide infrastructure for sharing data and/or integrating computer systems. Although, the desire to fold individual systems into this larger initiative is compelling, the reality may be more problematic given the scale, complexity, and cost of the larger effort. With current technologies, consideration should be given to supporting individual systems if they provide the necessary connections to and support for integrating with the larger initiative.

For More Information

This document is part of the National Cooperative Highway Research Project 8-55A “Developing a Logical Model for a Geo-Spatial Right-of-Way Land Management System”. The project was managed by Ed Harrigan EHARRI@nas.edu and was performed under Kathleen Hancock hancockk@vt.edu at Virginia Tech and was completed in 2/11. A detailed implementation guide was developed as part of this project and will be available through TRB.

APPENDIX B   GUIDE ON HOW TO USE THE 8-55A LOGICAL MODEL

The 8-55A logical model was developed in Enterprise Architect (EA), a Computer Aided Software Engineering (CASE) tool by Sparx Systems, which provides a UML 2.3 modeling environment and supports full product development lifecycle. It includes visual tools for business modeling, systems engineering, enterprise architecture, requirements management, software design, code generation, and testing. At the time of this writing, a single professional license is $199 while the full corporate version is $335. Sparx Systems provides a free viewer, Enterprise Architect Viewer, EALite (http://www.sparxsystems.com/products/ea/downloads.html), which is included on the attached CD to allow you to view and navigate around the model. A full license is required to modify the model or print model details.

The first section of this guide provides a description of the Overall Logical Model Design Description, and of the Geospatial Model. The second section provides guidance on how to use the EA models as a starting point for your system. This discussion is designed for the implementation committee and not for those actually building the application.

Business processes, based on the FHWA Project Development Guide, are presented in Figure B-1 through Figure B-6. Figure B-1 provides the logic for an overall process for planning, designing, and constructing a transportation project with the core areas that make up the right of way enterprise addressed in this document highlighted in light brown near the center of the figure. Figure B-2 through Figure B-6 provide the processes for appraisal, acquisition, relocation, and property management, respectively. It is important to understand that the arrows in these diagrams do not represent the order that these activities occur but instead reflect a linkage between those activities. The actual order is established during system design.
Figure B-1. Overall Right-of-Way Business Process Flow
Figure B-2. Process Flow Diagram for Appraisal
Figure B-3. Process Flow Diagram for Acquisition
Figure B-4. Process Flow Diagram for Relocation, Part 1
Figure B-5. Process Flow Diagram for Relocation, Part 2
Figure B-6. Process Flow Diagram for Property Management
Overall Logical Model Design Description

In the terminology of software and information systems, the design and implementation of an information system primarily consists of Conceptual, Logical and Physical Data Modeling prior to actual system development [Nicewarner 2004, Bryce 2006]. The Conceptual and Logical Modeling captures the data, processes, activities and functions of a given business for which the information system is being developed, while the Physical Modeling describes how the system is implemented in terms of computer hardware/software, database files, information system screens etc. The conceptual and logical model designs are developed prior to the Physical Model design, which in combination are used for eventual software development.

Uniform Modeling Language (UML) is an accepted set of notation techniques for visually defining, documenting and representing software intensive systems. This uniform design supports the portability of framework development for any given model and provides an appropriate platform for modeling a rigorous and traceable information system for complex business activities. The model views that are used for the right-of-way information management system and available in UML design can be divided into two sets; Behavioral Model Views and Structural Model Views, as shown in Figure B-7.

![Figure B-7. UML diagrams included in the model and their classification](image)

The Behavioral Model Views capture the dynamic behavior of the system over time and are demonstrated by four UML models or series of diagrams:

- The Business Process Model (or Analysis model) captures the broad outline of procedures and the sequence of activities that drive the business.
• The *Use Case Model* defines the features or requirements that are expected to be provided by the system and captures the interactions within the system and with entities that are external to the system.

• *Sequence Diagrams* and *Communication Diagrams* are forms of Interaction Model Views, and are encompassed in the individual use cases and illustrate communication between objects and the messages that trigger those communications.

The Structural Modeling View defines the static architecture of a model and identifies the elements that constitute the system and the relationships and dependencies between the elements. The Structural Modeling View consists of three models:

• *Class Model Diagrams* reflect the logical structure of the system by capturing the attributes and behavior of the model in its static view and illustrating the relationships between the classes and interfaces.

• *Component Model Diagrams* depict how a system is decomposed into various components that can illustrate the structure of arbitrarily complex systems.

• *Package Model Diagrams* demonstrate the organization of packages and their elements, helping to organize use case diagrams, class diagrams, or other UML diagrams.

The 8-55A logical model captures right-of-way information and activities, which then facilitates the design of a comprehensive right-of-way information management system using these UML Model Views. Each individual model depicts explicit yet complimentary perspectives of the overall model. Further discussion and the application of these UML modeling views for designing the right-of-way system logical model are described in the following sections.

**Model Architecture**

In addition to project management, the four functional areas in the 8-55A logical model consist of appraisal or property valuation, acquisition, relocation, and property management. The enterprise also includes activities related to land being considered during early project development and post construction management.

The major governing actors include both individual human and agency actors that are expected to interact with the system. This helps in identifying roles and establishing responsibilities of the actors prior to model development. This, in turn, helps in establishing enterprise-wide right-of-way activities associated with these actors, ensuring interoperability across the enterprise system and helps in reducing conflicts that might arise in building the model, providing further clarity to right-of-way activities included in the logical model. Figure B-8 and Figure B-9 illustrate the actors and their relationships in UML notation.

Interoperability with the larger transportation enterprise is incorporated in the system design by identifying discrete external systems and including these interactions with right-of-way activities. Figure B-10 outlines the major systems in UML representation that interact with the overall right-of-way system.

From Figure B-7, the initial component of the architecture consists of capturing activities that make up the business of right-of-way offices as described in the Project Development Guide (FHWA 2004). This initial business modeling was fundamental to conceptualizing the right-of-way project processes and served as the base for modeling the system in UML.
Behavioral Model Views

Based on the process flow diagrams, the detailed model was built using the components defined in the previous section and shown in Figure B-7.

Business Process Model

The Business Process Model, also called the analysis model, is a simplified form of an activity model that captures the broad outline and procedures that govern the business processes, in this case, activities in a right-of-way office. The business process model helps in clearly mapping the scope of the entire system through different activities. For this purpose activity organizes and specifies the participation of subordinate behaviors, such as sub-activities or actions, to reflect the control and data flow of a process.
This model provides the primary form of the proposed system design and is instrumental in capturing significant activities, events, resources, inputs and outputs that are associated with the right-of-way business processes. As an example, the upper half of Figure B-11 shows the Business Process Model for “relocation planning”, which focuses on recognizing, at an early stage, any problems associated with the displacement of individuals, families, or businesses before the commencement of actions that cause these displacements. The primary actors in the relocation planning process, identified as a part of the model architecture, consist of the Relocation agent and the Displacing agency.

The relocation agent first identifies parcels with people or businesses that require relocation assistance from the available list of parcels to be acquired. This is modeled as the activity labeled “REL_parcel_for_relocation”. Relocation notices specified by the Guide are distributed to potentially displaced individuals/businesses, to help in resolving any identified problems, minimize the adverse impacts on the displaced persons, and expedite the overall progress. The activity “REL_Notices” is modeled as a composite activity in the UML design, as denoted by the \( \infty \) symbol in the activity box, and consists of several sub-activities related to each of the

Figure B-9. Human actors identified in the developed right-of-way system logical model
individual notices. The individual activities associated with “REL_Notices” are executed and the status of the affected parcels is updated to reflect the activity.

![Business Process Model diagram for Relocation Planning](image-url)

Figure B-11. Business Process Model diagram for Relocation Planning
Table B-1 through Table B-3 provide a summary of all activities included in the Business Process Model.

![Component model view of the overall right-of-way system in UML depicting the other integrated external systems](image)

**Use Case Model**

The second component of the Behavioral Modeling Diagrams is the Use Case Model. While the Business Process Model describes both the behavior and the information flows within the right-of-way system, the Use Case Model provides the system’s functionality in terms of actors, use cases, and the relationship between them. A use case denotes a collection of actions performed by a user (or sub-system) of an enterprise system. This helps in establishing the roles of the actors by exclusively identifying the functions within the system that are performed by that specific actor.
Figure B-11. Business Process Model diagram for Relocation Planning
Table B-1. List of activities captured in the Business Process Model of the right-of-way system

*Activities in bold indicate those that have further levels that are not shown in the table

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<tr>
<th>LEVEL I</th>
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| Project Establishment | Initial Planning | • Planning  
• Alignment Evaluation  
• Parcel Identification  
• Identification of Environmental impacts  
• Acquisition cost estimation  
• Relocation Survey and cost estimation  
• Environmental study  
• Hazardous Waste Site Evaluation  
• Final Alignment Selection | | |
| | Early Acquisition | | |
| | Project Authorization | | |
| | Project Agreement | | |
| | Encumber Funds | | |
| | ROW Mapping and Engineering | | |
| | Utility Relocation and Management | | |
| | Staff Identification | • Analyze Resources  
• Identify Staff Requirements | |
| | Staff Identification | • Initiate Contracts  
• Hire Staff  
• Assign Staff | |
| | Parcel Identification & Cost Estimation | • Type of acquisition  
• Parcel Alignment Inspection  
• Total Parcel  
• Partial Parcel  
• ROW Cost Estimate  
• Current & Completed Project Displacement Analysis  
• Relocation Problems Analysis  
• Relocation Survey  
• Survey of Replacement Properties | |
| | Title Documents | • Alternate Recommended Techniques  
• Title Search  
• Title Assurance  
• Title Insurance  
• Title Abstract and Title Opinion  
• Certificate of Title  
• Temporary and Permanent Easements  
• Minor Acquisitions  
• Low Value Parcel Acquisitions | |
| | Identification of Parcel Type | | |
Table B-2. List of activities captured in the Business Process Model of the right-of-way system (cont.)

*Activities in bold indicate those that have further levels that are not shown in the table*

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<td></td>
<td></td>
<td>• ACQ_Transfer Property Encumbrance releases</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ACQ_Prepare Documents and Update Parcel Records</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ACQ_Provide Written Offer and Acquisition Related Documents</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ACQ_Schedule Meeting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACQ_Closing</td>
<td>• ACQ_Pay Just Compensation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ACQ_Preparesettlement Statement and Deed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ACQ_Process Documents: Tax Forms, Titles, etc</td>
<td></td>
</tr>
</tbody>
</table>
Table B-3. List of activities captured in the Business Process Model of the right-of-way system (cont.)
*Activities in bold indicate those that have further levels that are not shown in the table*

<table>
<thead>
<tr>
<th>LEVEL I</th>
<th>LEVEL II</th>
<th>LEVEL III</th>
<th>LEVEL IV*</th>
</tr>
</thead>
</table>
| REL_Relocation Planning | REL_Relocation Planning | • REL_Check on the Displaced Persons eligibility for services  
• REL_No relocation Assistance  
• REL_Update Distribution Status(es) In the Inventory of Parcels with Displaced Persons  
• REL_Parcels for Relocation  
• REL_Notices  
• REL_Open Site Office |  |
| REL_Services | REL_Services | • REL_Available Properties for Sale and Lease, Community Amenities  
• REL_Last Resort Housing Planning  
• REL_Link to MLS (External Real Estate System)  
• REL_Conduct Personal Interview  
• REL_Determination of Occupant Needs  
• REL_Determine Eligibility for Each Type of Payments  
• REL_Explination of Services, Available Payments and Eligibility Requirements  
• REL_Provide advisory assistance (Assistance with Claim forms)  
• REL_Replacement Dwelling Assignment |  |
| REL_Assistance Payments | REL_Assistance Payments | • REL_Moving Expense Process  
• REL_Replacement Housing Payment Process  
• REL_Claim and Tax-Form Process |  |
| PM_Pre-Construction Property Management | PM_Pre-Construction Property Management | • PM_Improvement Disposition  
• PM_Personal Property  
• PM_Rental  
• PM_Requirement Type |  |
| PM_During Construction Property Management | PM_During Construction Property Management | Grading  
• PM_Excess  
• PM_ROW Disposal  
• PM_ROW Management  
• PM_Sale |  |
| PM_Post-Construction Property Management | PM_Post-Construction Property Management |  
• PM_Excess  
• PM_ROW Disposal  
• PM_ROW Management  
• PM_Sale |  |
| PM_Rodent Control | PM_Rodent Control |  |  |
| PM_Security Inspection | PM_Security Inspection |  |  |
| PM_Hazardous Materials | PM_Hazardous Materials |  |  |
| PM_Acquired Property | PM_Acquired Property |  |  |
| PM_Construction | PM_Construction |  |  |
| Update Excess to Inventory | Update Excess to Inventory |  |  |
| Review Project Plans | Review Project Plans |  |  |
| Accumulate and Store Records | Accumulate and Store Records |  |  |
| Status Report | Status Report |  |  |
| ROW Certification | ROW Certification |  |  |
| State defined Processes | State defined Processes |  |  |
| Final Claims | Final Claims |  |  |
| Close Accounting | Close Accounting |  |  |
| Re-open if necessary | Re-open if necessary |  |  |
| Encroachment Cleaning | Encroachment Cleaning |  |  |
| Excess Property Construction | Excess Property Construction |  |  |
This model is usually represented as one or more actors associated with one or more use cases, as shown in the second half of Figure B-11. Each of the actors in the use case model represents a role that is played either by a person or sub-system engaged in the reasonable functioning of the main system; and each use case represents a discrete unit of work to be implemented by the main system in collaboration with one or more actors. For example, the use case diagram for “relocation planning” outlines five goals or use cases to be realized by the system, as required by the identified actors: displacing agency and relocation agent. These use cases are summarized in Table B-4.

<table>
<thead>
<tr>
<th>Functional area (or sub-system)</th>
<th>Use Case(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relocation Planning</td>
<td>REL_Geospatial Enablement – Parcel for Relocation</td>
</tr>
<tr>
<td></td>
<td>REL_Open Site Office</td>
</tr>
<tr>
<td></td>
<td>REL_Notices</td>
</tr>
<tr>
<td></td>
<td>REL_Check on displaced persons eligibility for services</td>
</tr>
<tr>
<td></td>
<td>REL_Update Distribution Status(es) in the Inventory of Parcels with Displaced Persons</td>
</tr>
</tbody>
</table>

Use Case Models also help in providing traceability or the manner of implementation in the proposed system for the defined business processes. The use cases identified in the model are linked back to the business process model with <<implementation>> links to symbolize the dependant relationship between the models. This feature is used to link model elements or sets of elements that represent the same idea across model views. For example, Figure B-11 illustrates how the business processes of relocation planning are implemented by the corresponding use cases. To elaborate further, the activity “Parcels for relocation” that is defined as identifying the parcels required for relocation, is implemented by the use case “REL_Geospatial Enablement – Parcel for Relocation” identified in the use case model. Thus, as the model is developed and all the functional processes and activities are designed and linked to the use cases, accountability for each element in the model is established through traceability.

**Interaction Model Views**

The use case model is further enhanced through the interaction model which is composed of sequence and communication diagrams. These diagrams are “embedded” in the use case diagrams and describe the steps taken to carry out the use case.

**Sequence Diagrams**

Sequence diagrams graphically portray the workflow of the implementation of a use case. These diagrams are primarily composed of objects and the messages dispatched between the objects that helps in capturing a dynamic view of the system. They typically illustrate the interaction of the user with the objects and components in the order required to execute a use case. For example, a sequence diagram anchored under the use case “Open Site Office” is illustrated in Figure B-12.
The diagram depicts the sequence of steps implemented to realize the goal of “REL_Open Site Office”. The decision about “Site_Office_Requirement” is first made during project development prior to acquisition. This requirement is addressed by the Relocation Agent to open the site office or implement the current use case with the Displacing Agency acting as the controller. Thus, site office is opened by the displacing agency according to this requirement and the attributes of the “REL_Site_Office” class, which are described under the Class model, are updated. Simultaneously, as the decision for “Site_Office_Requirement” is made, the status of site office for the corresponding parcel file is updated. As the goal of the use case is achieved, and the attribute “Status_Site_Office_Establishement” of an instance of the class: “REL_Site_Office” is updated indicating its completion.

Similarly, the sequence diagrams for other use cases are modeled in relation to the methods and events supported by the corresponding classes.

**Communication Diagrams**

Communication diagrams represent a combination of information taken from Class, Sequence, and Use Case model diagrams describing both the static structure and dynamic behavior of a system. While sequence diagrams model the time ordering of messages, communication diagrams model the organization of messages, i.e., while sequence diagrams show the order in which the interactions take place, communication diagrams represent which elements interact with one another. The communication diagrams are also “embedded” in the corresponding use cases.

Figure B-13 shows the communication diagram for the use case “REL_Open Site Office”. Though semantically it provides the same information as that of the sequence diagram in Figure B-12, it depicts the inter-object relationships and the exchange of messages among Relocation Agent, Displacing Agency, Status_Site_office and the instance of the class “REL_Site_Office”. The exchanged communications are labeled in the diagram as 1.1, 1.2, 1.3, and 2.1 to illustrate the order of the messages exchanged.
Structural Model Views

Class Model
A class is defined as an element or an entity of a given system that captures certain unique features and functionalities of the entity in the form of attributes and methods. A class model provides an overview of these classes, attributes and their relationships. These diagrams reflect a static view of the system by depicting what classes interact but not what happens with their interaction. Class models are the basis for the system’s data model.

For the right-of-way 8-55A logical model, the class model has been developed in reference to the Business Process Model. The class model for the current system is developed in a way that is independent of any language/platform. The classes in this model are comprised of three elements, the class name, attributes of the class and their behavior. Figure B-14 illustrates the class diagram for “relocation planning”, which is a part of the class model for relocation. The class diagram in the figure depicts the following classes:

- REL_Notices
- REL_Site_Office
- REL_Relocation_Planning_Information
- REL_Additional_Relocation

Realization and association connectors are used to capture the relationships between these classes. REL_Relocation_Planning_Information and REL_Additional_Relocation classes are connected with a realization, which is used when the source object implements or realizes the destination. Since class diagrams provide a static view of the system, not all classes are modeled to have relationships with other elements in the model, like the REL_Site_Office shown in Figure B-14.
Separate compartments are used in the representation of classes to illustrate the class name, attributes, and operations. For the classes depicted in Figure B-14, the compartment below the class name lists their respective attributes. The notation that precedes the attribute indicates the visibility of the element according to the following:

- **+ Symbol** indicates public level of visibility
- **- Symbol** indicates the attribute is private
- **# Symbol** indicates the attribute is protected
Data elements identified in NCHRP Research Results Digest 310 for Integrating Geo-Spatial Technologies into Right-of-Way Data Management Process (Hancock 2006) helped in providing the necessary knowledge base for modeling the classes and their attributes for the enterprise-wide right-of-way logical model.

**Component Model**

The component model shows the structural components of a software system along with the organization and dependencies among these components. This model, like the class model, represents a static view of the system depicting the components that contain one or more classes or interfaces. The components act as the building blocks for the actual information system. Thus, the component model diagrams help provide a higher level view of the structure of the large and complex right-of-way 8-55A logical model.

Figure B-15 shows the component model diagram for relocation planning linked with different UML “connectors”. The five planning components shown in Figure B-15 include:

- Displacing Agency
- Notices
- Site_Office
- Parcel
- Planning Department

![Component Model diagram for Relocation Planning](image-url)
The names of those components that are derived from another package in the overall model are preceded with the deriving package name, as seen for the components Displacing_Agency and Parcel which are derived from the primary REL_Component Model Package and Component Model Package-Overall ROW, respectively. The inter-relationships between the components are illustrated with different connectors as shown in Figure B-15. The “assembly connector” links the providing interfaces supplied by the Planning_Department to the required interfaces specified by the Parcel. A lollipop symbol indicates an implemented interface and a socket symbol indicates a required interface as shown in the Model Documentation. Additional Relocation Information from the planning department acts as the providing interface to update the required interface of the Parcel: Attributes/Status. Similarly, notice distribution status acts as the provided interface for the Notices component. Information flow is used to model the flow of information between elements, and is used in Figure B-15 to map the flow between the Displacing Agency and Site_Office and Site_Office and the Parcel.

**Package Model**

The package model helps in establishing localized system boundaries within the enterprise by grouping coupled activities within the system. It helps in semantically providing a structure to all UML model views, includes the larger system engineering issues, and illustrates how the system is decomposed into categories that represent the logical relationships and dependencies among those categories.

Each of the use case, class, and component models is grouped by their related behavior or state into packages. For example, as shown in the Figure B-16, the use case model for relocation has been grouped into three packages:

- REL_Relocation Planning
- REL_Relocation Services
- REL_Relocation Assistance Payments

The dependencies between the three packages is captured through the connectors labeled as <<precedes>>, indicating the order of implementation of these packages. As shown in the diagram, use cases grouped under REL_Relocation Planning package model are implemented prior to both the REL_Services and REL_Relocation Assistance Payments.

Interactions between the major actors and packages are also illustrated in the package diagram. The dependency connector with the labels <<invokes>> and <<trace>> between the Relocation Agent, Displacing Agency and the packages in Figure B-16, illustrate the role of the actors in these packages either as directly invoking or tracing the implementation of the corresponding use cases in the package.
Figure B-16. Package model diagram illustrating Relocation Use Cases packages
**Geospatial Model**

This section describes the model designed for integrating a right-of-way business and information system with geospatial tools through a framework called ‘Geospatial Decision Making Activities’ (GDMA). This framework has been structured in two sub-components, Parcel Tracking (PT) and Geospatial Enablement (GE). Parcel Tracking tracks the detailed state of a parcel, as it is managed through the right-of-way project. Geospatial Enablement identifies the potential right-of-way activities that could benefit from geospatial enablement. The GDMA framework, through the combined Parcel Tracking and Geospatial Enablement, is expected to serve as a knowledge base for right-of-way offices in state transportation agencies for integrating geospatial capabilities to better manage the right-of-way business process.

The two sub-components of GDMA, are modeled in UML using State Machine and Data Flow Diagram Models, respectively, using Enterprise Architect.

**Parcel Tracking**

The primary objective of parcel tracking is to provide a visual method to track activities associated with parcels, manage resources, and provide right-of-way personnel with a tool for improving efficiency and timely project delivery. Information associated with Parcel Tracking indicates status of a key process, availability of important information for future right-of-way activities, or occurrences of certain right-of-way decisions. This information is divided into three categories; milestones, flags, and values. Milestones represent critical activities in right-of-way project management and act as project checkpoints. Milestones can either take a value or a flag, and serve as progress markers. For example, the identified milestones for parcel appraisal include, Appraisal Technique, Status: Appraisal Review, and Just Compensation. These three milestones indicate, respectively, the decision on the appraisal technique for parcel, status of completion of appraisal review, and the availability of just compensation value, which are critical to monitor the progress of appraisal. Flags capture the status of activities or processes within each functional area of right-of-way business, and help to monitor the project’s progression. For example, the parcel tracking attribute “Status: Appraiser Assignment” captures the state of progress or completion of the task of assigning an appraiser for the parcel. Values capture important information about parcel features that support project scheduling, and which help to visualize and evaluate parcels in a geospatial environment. For instance, “Appraisal type” is an important decision during parcel appraisal, and is captured as a value in Parcel Tracking.

Figure B-17 shows the representation of attributes or states of the parcel tracking framework in a logical process flow chart, and Table B-5 through Table B-8 summarize these modeled states including a brief description. The states or attributes of parcel tracking correspond to the activities modeled in the overall logical model as described in the previous section, in accordance with the Project Development Guide (FHWA 2006).
Figure B-17. Logical flow chart for Parcel Tracking
Table B-5. Attributes or States in Parcel Tracking: Project Development and Appraisal
*Attributes/States in bold represent milestones for parcel tracking

<table>
<thead>
<tr>
<th>Attribute/State*</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Number</td>
<td>Value</td>
<td>Project associated with parcel. Number generated by the Project Management System.</td>
</tr>
<tr>
<td>Project Parcel Number</td>
<td>Value</td>
<td>Unique parcel number that is project specific. Parcel status is tracked through the right-of-way project process using this number.</td>
</tr>
<tr>
<td>Parcel Type of Take</td>
<td>Value</td>
<td>Identifies whether whole take or a partial take. May take the values: Whole/Partial.</td>
</tr>
<tr>
<td>Parcel Land Use</td>
<td>Value</td>
<td>Identifies the highest and best use of parcel. Available land use or zoning classification for parcel obtained from primary parcel cadastre database. Parcel land use types could include: Residential, Industrial, Commercial, Recreational, Special purpose, Agricultural, Undeveloped.</td>
</tr>
<tr>
<td>Status: APP</td>
<td>Flag</td>
<td>Indicates progress of parcel appraisal. Activated at initiation of appraisal process.</td>
</tr>
<tr>
<td>Appraisal Type</td>
<td>Value</td>
<td>Indicates type of parcel valuation as: Donation; Waiver; or Appraisal. The type of appraisal can also be defined as the 'format required' for appraisal based on these three types.</td>
</tr>
<tr>
<td>Appraiser Type</td>
<td>Value</td>
<td>Identifies type of Appraiser employed. May take the value: staff / fee (contract) appraisers.</td>
</tr>
<tr>
<td>Status: Appraiser Assignment</td>
<td>Flag</td>
<td>Indicates appraiser assignment progress. Is activated at initiation of assignment.</td>
</tr>
<tr>
<td>Status: Parcel Evaluation &amp; Inspection</td>
<td>Flag</td>
<td>Initiated when parcel is evaluated after the parcel visit</td>
</tr>
<tr>
<td>Utilities</td>
<td>Value</td>
<td>Identifies if any utilities have been identified on the parcel. May take a value describing the specific utility, or N/A if none identified.</td>
</tr>
<tr>
<td>Appraisal Technique</td>
<td>Value</td>
<td>Identifies the method employed for appraisal or valuation. May take the value: Minimum Standards Appraisal-Short Appraisal, Minimum Standards Appraisal-Value Finding Appraisal, Detailed Appraisal-Cost Approach, Detailed Appraisal-Sales comparison, Detailed Appraisal-Income Approach or others as defined by agency.</td>
</tr>
<tr>
<td>Appraisal Complexity</td>
<td>Value</td>
<td>Identifies the complexity of appraisal process for parcel. May take a value that captures a categorical or relative value based on factors that affect the time and resources required to appraise parcel. This state can also help in tracking parcel assignment load of individual appraisers.</td>
</tr>
<tr>
<td>Status: Specialty Appraisal</td>
<td>Flag</td>
<td>Is activated if a specialty appraisal is warranted.</td>
</tr>
<tr>
<td>Status: Appraiser Certificate</td>
<td>Flag</td>
<td>Is activated when the preparation of the certificate is initiated by the appraiser.</td>
</tr>
<tr>
<td>Status: Appraisal Review</td>
<td>Flag</td>
<td>Is activated at the initiation of the Appraisal Review process.</td>
</tr>
<tr>
<td>Appraisal Reviewer Type</td>
<td>Value</td>
<td>Identifies type of appraisal reviewer employed for the parcel. May take the value: staff / fee (contract).</td>
</tr>
<tr>
<td>Status: Review Appraiser Certificate</td>
<td>Flag</td>
<td>Is activated when preparation of the certificate by the review appraiser is initiated.</td>
</tr>
<tr>
<td>Just Compensation</td>
<td>Value</td>
<td>Identifies the progress of establishing just compensation. May take the value: Established / Approved.</td>
</tr>
<tr>
<td>Status: Appraisal Report</td>
<td>Flag</td>
<td>Is activated when preparation of appraisal report is initiated.</td>
</tr>
</tbody>
</table>
Table B-6. Attributes or States in Parcel Tracking: Acquisition

<table>
<thead>
<tr>
<th>Attribute/State*</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status: ACQ</td>
<td>Flag</td>
<td>Indicates progress of parcel acquisition. Activated at initiation of acquisition process.</td>
</tr>
<tr>
<td>Acquisition Type</td>
<td>Value</td>
<td>Identifies type of acquisition. May take the value: Federal, Dedication, Donations or Purchase.</td>
</tr>
<tr>
<td>Status : Negotiator Assignment</td>
<td>Flag</td>
<td>Is activated when negotiator is assigned.</td>
</tr>
<tr>
<td>Negotiator Type</td>
<td>Value</td>
<td>Identifies the type of negotiator employed. May take value: staff / contract.</td>
</tr>
<tr>
<td>Acquisition Additional Factors</td>
<td>Value</td>
<td>Identifies additional factors that might affect the negotiation/acquisition process. May take values: assessments, functional replacement, inverse condemnation, uneconomic remnants, tenant-owned improvements, owner retention of improvements, Hardship and protective buying, railroad parcels, N/A.</td>
</tr>
<tr>
<td>Status : Negotiation</td>
<td>Flag</td>
<td>Is activated at commencement of negotiations.</td>
</tr>
<tr>
<td>Owner Correspondence</td>
<td>Value</td>
<td>Identifies correspondence to the owner. May take the value: personal contact, accelerated mail, other means.</td>
</tr>
<tr>
<td>Type of Purchase</td>
<td>Value</td>
<td>Identifies category of parcel for acquisition. May take values: ROW / Uneconomic Remnant.</td>
</tr>
<tr>
<td>Type of Negotiation</td>
<td>Value</td>
<td>Identifies the negotiation method employed. May take values: Administrative Settlement, Alternate Dispute Resolution (ADR), Legal/Condemnation, or methods defined by the state.</td>
</tr>
<tr>
<td>Settlement Amount Comparison</td>
<td>Value</td>
<td>Compares the final settlement amount with the established just compensation. May take values: Same as Just Compensation, More than just compensation.</td>
</tr>
<tr>
<td>Status : Property Encumbrance Release</td>
<td>Flag</td>
<td>Is activated when efforts are initiated to obtain property encumbrance releases on the parcel.</td>
</tr>
<tr>
<td>Status: Settlement Amount Payment</td>
<td>Flag</td>
<td>Is activated when closing documents and other tax related forms are processed. Status is completed when final payment is made available to the owner.</td>
</tr>
<tr>
<td>Status : Acquisition Claim Forms</td>
<td>Flag</td>
<td>Is activated when final acquisition claim forms are processed.</td>
</tr>
</tbody>
</table>

*Attributes/States in bold represent milestones for parcel tracking
<table>
<thead>
<tr>
<th>Attribute/State*</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status : Site Office</td>
<td>Flag</td>
<td>Indicates if parcel has associated site office, as identified during project dev</td>
</tr>
<tr>
<td>Status : REL</td>
<td>Flag</td>
<td>Activated when parcel is identified as requiring relocation services and relocation process is initiated</td>
</tr>
<tr>
<td>Primary Relocation Indicator</td>
<td>Value</td>
<td>Identifies type of relocation based on property or person to be displaced. May take values: Residential, Non-Residential, Personal Property, state defined, N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More specific identification of type of relocation. This indicator identifies categories under each general relocation indicator. May take values: Residential</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Persons eligible to receive advisory services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Persons occupying real property to be acquired Persons occupying real property adjacent to that being acquired who are caused substantial economic injury by the acquisition;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Persons who, as a result of the project, move or move personal property from real property not being acquired for the project;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Persons who move into property after acquisition, aware they have to move Non-residential relocation.</td>
</tr>
<tr>
<td>Secondary Relocation Indicator</td>
<td>Value</td>
<td>Identifies the status of identified comparable dwelling. May take values: Assigned, Accepted, Referred, Not available, Not accepted</td>
</tr>
<tr>
<td>Status : Relocation Services</td>
<td>Flag</td>
<td>Is activated at the initiation of relocation service offer at interview with owner</td>
</tr>
<tr>
<td>Status : Notice Distribution</td>
<td>Value</td>
<td>Indicates progress of distribution of notices to the displaced person</td>
</tr>
<tr>
<td>Status: Determination of Occupant Needs</td>
<td>Flag</td>
<td>Is flagged based on the progress of the identification and establishment of the needs the displaced person(s)</td>
</tr>
<tr>
<td>Replacement Dwelling</td>
<td>Value</td>
<td>Identifies the status of identified comparable dwelling. May take values: Assigned, Accepted, Referred, Not available, Not accepted</td>
</tr>
<tr>
<td>Last Resort Housing Assignment</td>
<td>Value</td>
<td>Identifies LRH. May take value: Assigned, Accepted, Referred, Not available, Not accepted</td>
</tr>
<tr>
<td>Status : DSS Inspection I</td>
<td>Flag</td>
<td>Is activated at completion of first DSS Inspection</td>
</tr>
<tr>
<td>Status : DSS Inspection II</td>
<td>Flag</td>
<td>Is activated at completion of second DSS Inspection</td>
</tr>
<tr>
<td>Status : Relocation Assistance Payments</td>
<td>Flag</td>
<td>Is activated at initiation of the process to provide assistance payments. Is concluded when all eligible payments are made &amp; all relevant forms processed</td>
</tr>
<tr>
<td>Status : Relocation Moving Expense Payment Method</td>
<td>Value</td>
<td>Identifies method employed for establishing amount for moving eligible items for residential relocation. May take values: Actual cost method; Schedule method; Self-Move; or state defined</td>
</tr>
<tr>
<td>Residential Moving Expense Payment Method</td>
<td>Value</td>
<td>Identifies method employed for establishing moving expense payments</td>
</tr>
<tr>
<td>Mobile Home Moving Expense Category</td>
<td>Value</td>
<td>Identifies category of moving expenses for mobile home. May take values: Owner and occupant; Owner not occupant, or Tenant</td>
</tr>
<tr>
<td>Non-Residential Moving Expense Payment Method</td>
<td>Value</td>
<td>Identifies method employed for establishing moving and business reestablishment costs, farm, or a non-profit organization (NPO). May take values: Actual Cost Method; Fixed in-lieu Payment; Self-Move; or state defined</td>
</tr>
<tr>
<td>Replacement Housing Payment Method</td>
<td>Value</td>
<td>Identifies method employed for establishing replacement housing payment. May take values: RHP with Home Owner for at least 180 Days; RHP Home Owner for 90-179 days, Tenants at Least 90 Days; RHP tenant less than 90 days.</td>
</tr>
<tr>
<td>Status : Replacement Housing Payment</td>
<td>Flag</td>
<td>Indicates progress of replacement housing payment to displaced person(s).</td>
</tr>
<tr>
<td>Displaced Person Move</td>
<td>Value</td>
<td>Status of displaced person's move. May take values: Scheduled, Moved, N/A.</td>
</tr>
<tr>
<td>Status : Replacement Housing Payment Appeal</td>
<td>Flag</td>
<td>Is activated if an appeal is initiated.</td>
</tr>
<tr>
<td>Status : Relocation Claim and Tax Forms</td>
<td>Flag</td>
<td>Is activated when processing is initiated for final relocation tax and claim forms. Is concluded when all forms are processed and relocation payments are made available to the displaced person or organization.</td>
</tr>
</tbody>
</table>
Table B-8. Attributes or States in Parcel Tracking: Property Management and Project Closing
*Attributes/States in bold represent milestones for parcel tracking

<table>
<thead>
<tr>
<th>Attribute/State*</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status : PM</td>
<td>Flag</td>
<td>Is activated with the initiation of Property Management activities when parcel is acquired.</td>
</tr>
<tr>
<td>Requirement Type</td>
<td>Value</td>
<td>Identifies parcel requirement type. May take values: Substantially excess / Substantially ROW.</td>
</tr>
<tr>
<td>Rental Type</td>
<td>Value</td>
<td>Identifies type of property rental. May take values: Rent to original occupant, Interim Tenant, N/A.</td>
</tr>
<tr>
<td>Property Disposition Type</td>
<td>Value</td>
<td>Identifies type of property disposition. May take values: Improvements, Personal Property, Rental.</td>
</tr>
<tr>
<td>Personal Property Disposition Type</td>
<td>Value</td>
<td>Identifies personal property disposition. May take values: Agency Retention, Sale, Demolition, N/A.</td>
</tr>
<tr>
<td>Improvement Disposition Type</td>
<td>Value</td>
<td>Identifies type of improvement disposition. May take values: Agency Retention, Sale, Demolition, N/A.</td>
</tr>
<tr>
<td>Status : Clearance</td>
<td>Flag</td>
<td>Is activated when parcel is identified for clearance. Is concluded when parcel is clear or certified for construction.</td>
</tr>
<tr>
<td>Personal Property Clearance</td>
<td>Value</td>
<td>Identifies required percentage of Personal Property Clearance.</td>
</tr>
<tr>
<td>Improvement Disposition Clearance</td>
<td>Value</td>
<td>Identifies percentage of Improvement Disposition Clearance.</td>
</tr>
<tr>
<td>Status : Grading</td>
<td>Flag</td>
<td>Indicates the status of grading according to the defined flag codes.</td>
</tr>
<tr>
<td>Disposing Parcel Type</td>
<td>Value</td>
<td>Identifies type of parcel for disposition. May take values: ROW, Excess, or more specific like access point.</td>
</tr>
<tr>
<td>Status : Parcel Disposition</td>
<td>Flag</td>
<td>Is activated when parcel (excess/row) is identified for disposition and is flagged for completion when the parcel is sold.</td>
</tr>
<tr>
<td>Excess/ROW Management Type</td>
<td>Value</td>
<td>Identifies how the excess land or ROW, which is no longer required, is managed when it is not disposed. May take the values: Rent, Lease, Internal Maintenance, or Other.</td>
</tr>
<tr>
<td>Status : Hazardous Material Mitigation</td>
<td>Flag</td>
<td>Is activated when parcel is identified as requiring mitigation of hazardous materials. Is concluded when hazardous materials have been mitigated.</td>
</tr>
<tr>
<td>Hazardous Material Mitigation</td>
<td>Value</td>
<td>Identifies type of required Hazardous Mitigation.</td>
</tr>
<tr>
<td>Rodent Control</td>
<td>Value</td>
<td>Identifies rodent control activities. May take values: Single occurrence, Under contract, NA</td>
</tr>
<tr>
<td>Security Inspection</td>
<td>Value</td>
<td>Identifies security inspection activities. May take values: Single occurrence, Under contract, NA</td>
</tr>
<tr>
<td>Notice to Proceed</td>
<td>Value</td>
<td>Identifies type of notice to proceed which is issued prior to the construction. May take values: Outstanding, Conditional, Final Notice.</td>
</tr>
<tr>
<td>Status : ROW Certification</td>
<td>Flag</td>
<td>Is activated when ROW certificate is issued.</td>
</tr>
<tr>
<td>Status : Federal Voucher Letter</td>
<td>Flag</td>
<td>Is activated when final federal voucher letter is submitted.</td>
</tr>
</tbody>
</table>

**Parcel Tracking State Machine Model**

State Machine diagrams, also referred to as State Diagrams, illustrate states of an object and the transitions between those states, along with the source or triggering events that cause state changes (Ambler 2004). State machine diagrams provide a dynamic modeling technique to capture the behavior of an instance of a single class within a system. In its broad sense, a state represents a particular stage in the behavioral pattern of an object. In a state diagram, these states are represented in rounded rectangles labeled with their name. Transitions between states are
triggered from events. These triggering events invoke the corresponding methods of a state that result in the change of state of an object. These methods are displayed in the compartment below the name of a state, and are preceded by the reserved words “do/entry/exit” indicating the action of the operation. Table B-9 provides an overview of the elements used in this State Machine Model.

Table B-9. State Machine Diagram Elements Representation Description

<table>
<thead>
<tr>
<th>Representation</th>
<th>Description</th>
</tr>
</thead>
</table>
| <<State>>     | - **State**: Represents a stage in the behavior pattern of an entity  
|                | - **Method**: Represents a UML operation (Captured in the compartment below the state name) |
| Initial element: Represents a pseudo-states indicating the start of flow |
| Exit Point: Represents a pseudo-states indicating where the flow is exited |
| Transition: Defines logical movement from one state to another |
| <<Package Name>>::<<Class Name>> | **Class**: Represents an object that reflects its structure and behavior within the system through its **attributes** and **methods**. Class name precedes the source package name in the class model |
| <<Package>> | **Package**: Contains a collection of classes grouped under a common name. |
| <<flow>> | **Information flow**: Represents flow of information between two elements in the diagram |

The Parcel Tracking (PT) State Machine Diagram captures the states of a parcel to assist in visually following its status through the ROW project process. A parcel undergoes several state changes during its lifecycle, from identification as a right-of-way parcel to project closing, and allocation as excess or right-of-way. These changes are based on corresponding ownership details, property valuations, legal procedures, and relocation activities, which are triggered by different personnel and, in some cases, by contractors. The State Diagram Model for Parcel Tracking, shown in Figure B-18, maps parcel data across the enterprise and captures the appropriate attributes from the right-of-way data or class model that triggers the state changes.

The initial transition for parcel tracking is denoted by the **Initial** element, representing the default state of parcel at the start of parcel tracking or a right-of-way project. In most right-of-way offices this initial state could be triggered by the right-of-way activity start date. An event that enables the parcel transition from one state to another state is reflected through the triggered operation, and captured under the **state method**. For example, the **state** “Project Number” is controlled by the **method** “entry/Project_ID”. Methods within the states are controlled by the attributes of **classes** modeled in the overall right-of-way system. The triggering methods for each
parcel state are captured in the model using an information flow directed from the source classes or packages. Tracing the information from the overall class model maintains the integrity of Parcel Tracking model with the overall right-of-way logical model.

A triggered method may not always readily obtain the necessary information from the overall logical class model in the right-of-way system. Sometimes the actions are abstracted to derive the relevant information from one or more related classes and/or class packages of the overall logical model. Such states are identified in blue text in Figure B-18. For example, for the state “Appraisal Type”, the attribute “Appraisal_type” is derived from the “APP_Appraisal Process Elements” package and “APP_Waiver_Establish_Value” class.

The states in the model represent the attributes of the parcel class which are categorized as milestones, flags, and values. Milestones are highlighted in yellow states, while flags are shown in red text, to provide visual clarity to the model. All parcel attributes that include flags, values and milestones, are linked to the overall class model with the information flow connector. Attributes categorized as flags, may have a value or be updated to denote progress or completion stage based on timestamps governed by the start and end dates of associated composite activities. With this understanding of flag, various states in the PT model, categorized reflect the progress of a corresponding activity for the parcel, allowing the parcel to be accordingly visualized in a geospatial environment. For example, the state “Status: Parcel Evaluation & Inspection”, reflects the progress of the activity for parcel evaluation. This flag state can take multiple values or status based on when contact is made with the owner or when the parcel is evaluated after the parcel visit. Along with other parcel states, these flags are described accordingly in Table B-9, but are not modeled at a greater level of detail due to diverse protocols that govern the implementation and execution of flags for each individual activity.

Four major states “Status_APP, Status_ACQ, Status_REL and Status_PM”, are designed as Composite states, with enclosed sub-states. These composite states model more complex behavior of the system when there is more than one hierarchical level. For example, these states are updated as the parcel traverses through related activities within the individual functional areas for Appraisal, Acquisition, Relocation and Property Management, respectively. The complete PT State Diagram Model is illustrated in Figure B-18 to Figure B-23.
Figure B-18. Parcel Tracking State Machine Model Diagram
Figure B-19. Parcel Tracking State Machine Model Diagram (Cont.)
Figure B-20. Parcel Tracking State Machine Model Diagram (Cont.)
Figure B-21. Parcel Tracking State Machine Model Diagram (Cont.)
Figure B-22. Parcel Tracking State Machine Model Diagram (Cont.)
Figure B-23. Parcel Tracking State Machine Model Diagram (Cont.)
Geospatial Enablement

Geospatial Enablement models activities that could benefit from geospatial visualization and analysis within the right-of-way office. In addition to specifying the activity, it also identifies the required geospatial data, other external resources, and components required to accomplish that activity in a geospatial environment.

Activities that could benefit from geospatial enablement along with possible geospatial layers are summarized in Table B-10 while Table B-11 describes the enablement of these activities in greater detail.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Geospatial Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Development</td>
<td></td>
</tr>
<tr>
<td>Alignment selection</td>
<td>- the parcel cadastre layer maintained by the state or exclusively by the right-of-way office on a project-by-project basis</td>
</tr>
<tr>
<td>Environmental studies</td>
<td>- existing road centerline layer</td>
</tr>
<tr>
<td>Evaluating hazardous waste sites</td>
<td>- new right-of-way layer or ROW plans</td>
</tr>
<tr>
<td>Parcel identification</td>
<td>- imagery</td>
</tr>
<tr>
<td>Parcel take classification</td>
<td>- utilities</td>
</tr>
<tr>
<td>Parcel take complexity</td>
<td>- demographic information</td>
</tr>
<tr>
<td>Apraisal</td>
<td>- wetlands and other layers from environmental management</td>
</tr>
<tr>
<td>Parcel review for complexity</td>
<td>- historic districts</td>
</tr>
<tr>
<td>Elevation changes for adjoining property</td>
<td>- 3-D buildings</td>
</tr>
<tr>
<td>Appraisal technique evaluation</td>
<td>- topography</td>
</tr>
<tr>
<td>Parcel valuation</td>
<td>- soil data</td>
</tr>
<tr>
<td>Parcel identification for specialty appraisal</td>
<td>- vegetation</td>
</tr>
<tr>
<td>Parcel identification for utility relocation</td>
<td>- historic parcel sales records</td>
</tr>
<tr>
<td>Relocation</td>
<td></td>
</tr>
<tr>
<td>Parcel identification for relocation</td>
<td>- identification of available property for relocation</td>
</tr>
<tr>
<td>Identification of property for relocation</td>
<td>- identification of property for utility relocation</td>
</tr>
<tr>
<td>Property Management</td>
<td></td>
</tr>
<tr>
<td>Parcel requirement type for disposal</td>
<td>- clearance/demolition analysis</td>
</tr>
<tr>
<td>Clearance/demolition analysis</td>
<td>- grading analysis</td>
</tr>
<tr>
<td>Grading analysis</td>
<td></td>
</tr>
<tr>
<td>Parcel disposal justification</td>
<td></td>
</tr>
<tr>
<td>Excess land identification and evaluation</td>
<td></td>
</tr>
</tbody>
</table>

Geospatial Enablement Data Flow Model

Data Flow Diagrams (DFD) help to model the system as a network of processes illustrating the way in which data flows between elements in a system and with other external entities. Components of a typical data flow include: entity, process, data store, flow connectors, and the diagram gate (Ambler 2004). Table B-12 gives an overview of these elements used in the modeling of data flow diagrams.
### Table B-11. Identified Right-of-Way Activities for Geospatial Enablement

<table>
<thead>
<tr>
<th>Geospatial Activity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Development</strong></td>
<td></td>
</tr>
<tr>
<td>Identify parcels during alignment selection</td>
<td>Overlay and analyze multiple layers affecting alignment selection. Estimate right-of-way cost for alignment selection.</td>
</tr>
<tr>
<td>Identify Environmental Impacts</td>
<td>Overlay and analyze multiple layers that could support identification of environmental impacts during the roadway alignment selection.</td>
</tr>
<tr>
<td>Perform environmental studies and hazardous waste sites evaluation</td>
<td></td>
</tr>
<tr>
<td>Identify parcels for right-of-way</td>
<td>Identify parcels by overlaying the Parcel Cadastre layer with the Road Design layer.</td>
</tr>
<tr>
<td>Define parcel type of take and divide parcel to ROW/Excess</td>
<td></td>
</tr>
<tr>
<td>Identify complexity</td>
<td></td>
</tr>
<tr>
<td><strong>Appraisal</strong></td>
<td></td>
</tr>
<tr>
<td>Initial Parcel Review for Value/Complexity</td>
<td>Determine appraisal complexity by overlaying and analyzing multiple layers including elevation, utilities, land use, imagery etc.</td>
</tr>
<tr>
<td>Elevation Changes affecting the parcel/property</td>
<td>Analyze the elevation that would affect the property with the new roadway.</td>
</tr>
<tr>
<td>Determine Appraisal Technique</td>
<td>Determine the method of appraisal employed for the parcel by interfacing with an external appraisal system.</td>
</tr>
<tr>
<td>Sales Comparison</td>
<td>Analyze and determine appraisal value for paired sales (sales comparison method), by interfacing with available historical parcel sales records.</td>
</tr>
<tr>
<td>Specialty Appraisal</td>
<td>Identify and extract parcels requiring specialty appraisal by analyzing the existence of special properties on each parcel.</td>
</tr>
<tr>
<td>Identification of Parcels with utilities</td>
<td>Identify and extract parcels with subsurface, surface and aerial utility facilities by overlaying and analyzing with utilities layer (electricity, natural gas, water, sewage etc.).</td>
</tr>
<tr>
<td><strong>Relocation</strong></td>
<td></td>
</tr>
<tr>
<td>Identify parcels for requiring relocation</td>
<td>Identify and extract parcels that require relocation assistance by analyzing each parcel's relocation indicators.</td>
</tr>
<tr>
<td>Identify available properties for sale, lease, community amenities</td>
<td>Identify possible locations for relocation, by analyzing and overlaying multiple layers including demographic data and interfacing with external real estate management system or lease/sale property management system.</td>
</tr>
<tr>
<td>Identify available areas for relocating utilities</td>
<td>Determine possible areas for adjusting the affected utilities by overlaying utilities layer with multiple layers including roadway ROW layer, parcel cadastre layer, and road network layer.</td>
</tr>
<tr>
<td><strong>Property management</strong></td>
<td></td>
</tr>
<tr>
<td>Parcel Requirement Type</td>
<td>Determine the requirement type of each parcel, either as substantially excess or substantially ROW, by overlaying ROW project parcels using the new ROW roadway layer.</td>
</tr>
<tr>
<td>Clearance/Demolition</td>
<td>Analyze and identify level and type of clearance required for personal property/improvement clearance, and display the clearance status thematically.</td>
</tr>
<tr>
<td>Grading</td>
<td>Determine cut and fill volumes, and total cost for the earthwork for the new roadway by overlaying and analyzing multiple layers including, topography/elevation of terrain and soil type layer.</td>
</tr>
<tr>
<td>Justification of ROW / Excess Disposal</td>
<td>Display the grading status for each parcel.</td>
</tr>
<tr>
<td>Manage Excess lands</td>
<td>Analyze and justify right-of-way (access/relinquishment/lease) and excess land disposal by overlaying multiple layers including roadway network (for highway safety, traffic demand), soil type layer vegetation layer etc.</td>
</tr>
</tbody>
</table>

The Geospatial Enablement (GE) framework is captured in UML using Data Flow Diagrams. Data flows are defined for the GE model to illustrate activities that can be geospatially enabled as tabulated in Table B-10 and Table B-11. This model helps in capturing the high-level system overview for use during the initial analysis and implementation stages of developing an integrated geospatial information management system in visualizing the flow of geospatial data through the system.
The package diagram that gives an overview of the GE data flow diagrams is shown in Figure B-24. It shows the data flow diagram packages for the four functional areas, Project Development, Appraisal, Relocation, and Property Management. No GE activities were identified for Acquisition or Project Closing. Figure B-24 also shows the major geospatial resources from a GIS warehouse that constitute common enabling infrastructure.

These layers along with other resources from the geospatial warehouse provide the required inputs for processes captured in the data flow diagrams for the individual right-of-way functional areas, shown in Figure B-25 through Figure B-28.

The data stores highlighted in red represent geospatial layers, while those in black denote standard databases. Red data flow connectors represent the geospatial data flow that results in the creation of new layers or databases and represent relations between critical layers in the warehouse. For example, the relation between the ROW Project Parcels and Parcel Cadastre Layer, and New Road Centerline ROW and the Road Centerline ROW layer, are illustrated through red data flow connectors. Table B-13 summarizes the resources in the GE model.
Figure B-24. Overview of Geospatial Enablement Data Flow Diagram Model
Figure B-25. Geospatial Enablement Data Flow Diagram for Project Development
Figure B-26. Geospatial Enablement Data Flow Diagram for Appraisal
Figure B-27. Geospatial Enablement Data Flow Diagram for Relocation
Figure B-28. Geospatial Enablement Data Flow Diagram for Property Management
### Table B-13. Summary of resources for Geospatial Enablement

<table>
<thead>
<tr>
<th>Type</th>
<th>Resource</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geospatial Layer</td>
<td>Parcel Cadastre Layer</td>
<td>Statewide Cadastre layer or project-by-project generated parcel layer for use by ROW.</td>
</tr>
<tr>
<td></td>
<td>Transportation Roadway Network</td>
<td>Statewide network of roadways layer.</td>
</tr>
<tr>
<td></td>
<td>Road Centerline ROW Layer</td>
<td>Statewide roadway right-of-way layer.</td>
</tr>
<tr>
<td></td>
<td>New Road Centerline ROW</td>
<td>Changes to roadway ROW layer based on new transportation project. Usually CAD drawings maintained by the state transportation agency.</td>
</tr>
<tr>
<td></td>
<td>VideoLog</td>
<td>Photographs of continuous views from a road and associated parcels.</td>
</tr>
<tr>
<td></td>
<td>Imagery</td>
<td>Aerial imagery of the parcel/roadway/ parcel property, and other related photographic data.</td>
</tr>
<tr>
<td></td>
<td>Topography</td>
<td>Statewide topography layer containing topographic contours.</td>
</tr>
<tr>
<td></td>
<td>Soil Data</td>
<td>Statewide soil layer containing 'soil types' and the related soil data.</td>
</tr>
<tr>
<td></td>
<td>Vegetation</td>
<td>Statewide vegetation layer containing 'vegetation classification' and other related data.</td>
</tr>
<tr>
<td></td>
<td>Utilities</td>
<td>Statewide utilities layer(s).</td>
</tr>
<tr>
<td></td>
<td>Demographic Data Layer</td>
<td>Statewide demographic layer containing demographic characteristics.</td>
</tr>
<tr>
<td>External System</td>
<td>ROW Mapping and Engineering Division</td>
<td>Department that prepares the right-of-way plans for the project.</td>
</tr>
<tr>
<td></td>
<td>External Environmental System</td>
<td>System facilitating the required NEPA environmental analysis and Hazardous waste sites evaluation.</td>
</tr>
<tr>
<td></td>
<td>External Appraisal System</td>
<td>System that helps in identifying the required technique for parcel appraisal.</td>
</tr>
<tr>
<td></td>
<td>External Historical Parcel Sales Records</td>
<td>System that provides the records for data analysis during sales comparison.</td>
</tr>
<tr>
<td></td>
<td>External Lease/Sale Property Management System</td>
<td>Systems like Zillow, MLS or other equivalent that provides information of available property for relocating the displaced.</td>
</tr>
<tr>
<td>Database</td>
<td>ROW Project Parcels</td>
<td>Parcels identified as part of new transportation project. Total parcels may be maintained or parcels may be split into ROW and excess. Linked table to cadastral layer or a separate geospatial layer maintained by the state transportation agency or ROW office.</td>
</tr>
<tr>
<td></td>
<td>ROW Parcel Utilities</td>
<td>Selection from statewide utilities layer(s)</td>
</tr>
<tr>
<td></td>
<td>Parcels with special properties</td>
<td>Selection from Cadastral layer or from ROW project parcel layer.</td>
</tr>
<tr>
<td></td>
<td>Candidate Parcel Inventory for Displaced Persons</td>
<td>Selection from the state cadastral layer or sale and/or lease property database.</td>
</tr>
<tr>
<td></td>
<td>Candidate Parcel Inventory for Relocating or Adjusting Utilities</td>
<td>Selection from the statewide utilities layer(s).</td>
</tr>
<tr>
<td></td>
<td>Excess Property</td>
<td>Linked table to the statewide Cadastral layer or a separate geospatial layer maintained by the state transportation agency or the ROW office.</td>
</tr>
</tbody>
</table>
Enterprise Architect and Using the 8-55A Logical Model

The 8-55A Logical Model consists of three separate models in two different .EAP files summarized in Table B-14.

<table>
<thead>
<tr>
<th>Model designation</th>
<th>Purpose</th>
<th>File name on CD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall ROW Business Model</td>
<td>For use by a state with no enterprise-level ROW land management system with no geo-spatial component</td>
<td>logical model.EAP</td>
</tr>
<tr>
<td>Geospatial Decision Making Activities Model</td>
<td>For use by a state wanting to geospatially enable an enterprise-level ROW management system or adding ROW management to an enterprise geospatial warehouse</td>
<td>logical model.EAP</td>
</tr>
<tr>
<td>data model</td>
<td>For use in establishing standardized data in an enterprise-wide system within the larger agency enterprise</td>
<td>datamodel.EAP</td>
</tr>
</tbody>
</table>

These are the underlying structures that can be used by states as blueprints for their own information management systems.

The Overall ROW Business Model

The overall model is designed as a hierarchical tree of activities which are grouped, as practical, into packets. States can evaluate each task or packet for its usefulness within their own requirements. If it does not meet their needs, it can be removed or modified. If a state has already built a system and wants to use one of the packets from this model, it can be exported into standard xmi or csv language which can then be imported into whatever development software is being used.

Geospatially Enabling an Existing System

The Geospatial Decision Making Activities Model to add GIS capabilities to an existing system has been divided into two different packages, one for tracking parcels, primarily allowing users to visualize status and information associated with parcels, and one for geospatially enabling decision making. The tracking package is structured around the data elements that would be linked to the geospatial parcel layer. Corresponding tables of attributes would be built into the underlying database and linked either dynamically or permanently to the geospatial parcel layer. The geospatial enablement package consists of Data Flow Diagrams which help to represent the system as a network of processes illustrating the way in which data flows between elements in a system and with other external entities. These can be used to modify an existing system and add the corresponding capability within the specific development environment.

Depending on the structure of the existing information management system, a separate mapping or GIS tool could be implemented that links to the database either as an independent application or as part of the reporting tool. For a more integrated approach, links to the GIS could be added to the user interface at the appropriate user interface location in the information management system.
Adding Information Management to an Enterprise GIS

Performing this activity does not provide a state with an actual information management system. Instead, personnel would use existing GIS software to incorporate, analyze, and display necessary information for the different business activities.

Attributes associated with the different functions in right-of-way offices have been identified in the data model and the parcel tracking component of the geospatial model which can be joined to a parcel layer within an Enterprise GIS. The right-of-way office can work with the GIS office or someone within the right-of-way office that has experience working with the available GIS software such as ESRI’s ArcGIS. Tables of these attributes can be accessed from the agency database or from data local to the real estate office and linked to the geospatial parcel layer. Macros can be developed for most GIS software that can generate standard theme maps based on a set of selections defined in custom dialog boxes generated by the macro. These macros allow personnel to use GIS software without necessarily knowing the details of that software.

The data elements for geospatial enablement have been identified with activities in a right-of-way office and data tables can be coordinated by areas – appraisal, acquisition, relocation, or property management – or by specific activities (Table B-11). Most database systems use standard queries to extract data elements which are then formatted for the GIS software. Using XML, this can be automated making the process more transparent to right-of-way personnel. Additional development work is necessary to build analyses tools directly into the GIS framework.

Enterprise Architect (Sparx Systems)

The logical model was developed in Enterprise Architect, a comprehensive visual modeling platform developed by Sparx Systems. It provides an enterprise framework that is scalable and traceable using UML2.3. UML is a 'language' for specifying, not a method or procedure, used to define a software system; to detail the artifacts in the system, and to document and construct. It is the language that the blueprint or framework is written in. UML was used to build the logical model but it does not specify the methodology or process for the software itself.

EALite

Enterprise Architect Lite, EA Lite, is a free, read-only edition of Enterprise Architect that enables people such as project sponsors to review a project without making any changes. Users of Enterprise Architect Lite also have access to:

- The Team Review, where readers can create and respond to posts, and link their comments to elements
- The Source Code Viewer, where readers can open and review external source code files
- The File menu, where readers can copy the project or create a shortcut to access it
- The Relationship Matrix, where readers can export the matrix contents to a CSV file to be opened in a spreadsheet application
- The Default Hours tab to review project metrics.

EA-Lite is provided on the associated CD or can be downloaded from the Sparx Systems website at http://www.sparxsystems.com/products/ea/downloads.html. The Users Guide is also included on the CD or can be downloaded from http://www.sparxsystems.com/bin/EAUserGuide.pdf.
Installing EA-Lite
To use EA-Lite, you will need to install it on your computer. Double click on the EALite.exe file in the Enterprise Architect folder on the CD and follow the directions provided by the Install Wizard. If you accept the default directory during the installation, a folder entitled Enterprise Architect 8 will be created in your list of programs. The name of the application under this folder will be Enterprise Architect. Click on this program to open the viewer. Once EA-Lite is installed, you can double click on either file name in Table B-14 to open the corresponding model. Figure B-29 shows the initial screen when Logical Model.eap is opened in EALite. The interface is the same as for the full Enterprise Architect but only viewing functions are enabled.

Figure B-29. Initial screen in EALite for the Logical Model

Maneuvering Through a Model in Enterprise Architect
When the overall/geospatial models are loaded into Enterprise Architect, a schematic appears in the main viewing page as shown in Figure B-30. If this page does not appear, select the tab at the bottom of the screen labeled Model Overview. This page provides links to the different model components for each of the primary right-of-way areas. Double clicking on any of the...
icons will open that model. Another method to maneuver through the model is to open the Project Browser shown on the right side of Figure B-30. It should default to being open. Clicking on the plus sign next to any icon will expand the components under that item. Double clicking on the name will open a dialog box with information associated with that item. If the icon does not have a plus next to it, double clicking will either open the corresponding diagram in the viewing window along with a tab along the bottom or it will open a dialog box with information associated with the object.

As seen in the Project Browser in Figure B-29, the highest level of the model includes the Model Overview (shown in the viewing screen in Figure B-29 and acting as a top level table of contents) and the Overall ROW Business Model and Geospatial Decision Making Activities Model. The first level of expansion of the Models is shown in the Project Browser on the right in Figure B-30.

![Figure B-30 Opening view of model](image-url)
Once a diagram is open in the viewing window, you can double click on any component in the window. If it is linked to another diagram in the model, that diagram will open and a corresponding tab will be added to the bottom of the screen as shown in Figure B-31. If it is not linked, a dialog box will open with information about the component as shown in Figure B-32.

Figure B-31. Example of a Diagram

By right-clicking on any component, you can use the “find” option to locate that diagram in the Project Browser. Similarly, by right clicking on any component in the Project Browser, you can select Find in Diagrams to open the appropriate diagram.
Figure B-32. Example of a Dialogue Box


Project statistics of the combined Overall and Geospatial models are provided in Table B-15. The complete set of diagrams is provided in Appendix C and the Data model diagrams are in Appendix D.
Table B-15. Model Statistics Report for *logical model.eap*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packages</td>
<td>93</td>
</tr>
<tr>
<td>Total Diagrams</td>
<td>410</td>
</tr>
<tr>
<td>Total Elements</td>
<td>2123</td>
</tr>
<tr>
<td>Total Connections</td>
<td>3452</td>
</tr>
<tr>
<td>Elements in Diagrams</td>
<td>2987</td>
</tr>
<tr>
<td>Element Attributes</td>
<td>1389</td>
</tr>
<tr>
<td>Element Operations</td>
<td>91</td>
</tr>
<tr>
<td>Element Operation Parameters</td>
<td>10</td>
</tr>
<tr>
<td>Element Testing</td>
<td>42</td>
</tr>
<tr>
<td>Element Scenario</td>
<td>159</td>
</tr>
<tr>
<td>Element Constraints</td>
<td>404</td>
</tr>
<tr>
<td>Element Requirement</td>
<td>16</td>
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<tr>
<td>Element Files</td>
<td>6</td>
</tr>
<tr>
<td>Activity</td>
<td>307</td>
</tr>
<tr>
<td>Actor</td>
<td>83</td>
</tr>
<tr>
<td>Artifact</td>
<td>21</td>
</tr>
<tr>
<td>Boundary</td>
<td>9</td>
</tr>
<tr>
<td>Class</td>
<td>178</td>
</tr>
<tr>
<td>Collaboration</td>
<td>3</td>
</tr>
<tr>
<td>Component</td>
<td>91</td>
</tr>
<tr>
<td>Decision</td>
<td>78</td>
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<tr>
<td>Event</td>
<td>12</td>
</tr>
<tr>
<td>Object</td>
<td>221</td>
</tr>
<tr>
<td>ObjectNode</td>
<td>2</td>
</tr>
<tr>
<td>Package</td>
<td>92</td>
</tr>
<tr>
<td>ProvidedInterface</td>
<td>13</td>
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<tr>
<td>RequiredInterface</td>
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<td>Sequence</td>
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</tr>
<tr>
<td>State</td>
<td>76</td>
</tr>
<tr>
<td>StateNode</td>
<td>2</td>
</tr>
<tr>
<td>Text</td>
<td>147</td>
</tr>
<tr>
<td>UseCase</td>
<td>246</td>
</tr>
</tbody>
</table>
APPENDIX C NCHRP 8-44A LOGICAL MODEL UML DIAGRAMS

Table C-1 through Table C-5 provide keys to the different types of models in the complete logical model. These are followed by UML diagrams for the Overall ROW Business Model and UML diagrams for the Geospatial Decision Making Activities Model. Both models exist in a single Enterprise Architect (logical model.EAP) file on the accompanying CD.
<table>
<thead>
<tr>
<th>Representation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class</strong></td>
<td>Is a particular instance of a <em>Class</em>. It defines the abstract characteristics of an entity, including the entities' characteristics (its attributes or properties) and its corresponding functionalities (its behaviors or methods or features). Objects are often used in analysis to represent the numerous artifacts and items that exist in any business, such as pieces of paper, faxes, information etc.</td>
</tr>
<tr>
<td><strong>Receive</strong></td>
<td>Is used to define the acceptance or receipt of a request, in an Activity diagram. Indicates that an event occurs in the system due to some external or internal stimulus. Typically this will invoke further activities and processing.</td>
</tr>
<tr>
<td><strong>Send</strong></td>
<td>Is used to model the generation of a stimulus in the system and the passing of that stimulus to other elements within the system or external to the system.</td>
</tr>
<tr>
<td><strong>Actor</strong></td>
<td>Is a user of a system; <em>user</em> can mean a human user, a machine, or even another system or subsystem in the model. Anything that interacts with the system from the outside or system boundary is termed an Actor.</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>Is an activity element comprising a set of well established tasks which expresses the concept of a business process. Typically a process involves inputs, outputs, work flows, goals and connections with other processes.</td>
</tr>
<tr>
<td><strong>Composite Process</strong></td>
<td>Is a Business processes that involve sub-processes are composite processes. Such processes are depicted by an additional infinity symbol on the right.</td>
</tr>
<tr>
<td><strong>Collaboration</strong></td>
<td>Defines a set of cooperating roles and their connectors. These are used to collectively illustrate a specific functionality.</td>
</tr>
<tr>
<td><strong>Decision</strong></td>
<td>Indicates a point of conditional progression. It is a point where subsequent activities vary based on the choice made.</td>
</tr>
</tbody>
</table>
### Table C-2. Key to Business Process Models: Connectors

<table>
<thead>
<tr>
<th>Representation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Information Flow" /></td>
<td>Indicates that the information or object linked to the process is viewed in the processing phase without alteration and/or exhaustion.</td>
</tr>
<tr>
<td><img src="image" alt="Dependency" /></td>
<td>Is used to model a wide range of dependent relationships between model elements. Signifies that a single or a set of model elements requires other model elements for their specification or implementation.</td>
</tr>
<tr>
<td><img src="image" alt="Object Flow" /></td>
<td>Links an output object, and two elements, with specific data passing through it.</td>
</tr>
<tr>
<td><img src="image" alt="Control flow Link" /></td>
<td>Links another process that represents the sequence of activities and the direction of work flow. It generally connects two business processes.</td>
</tr>
<tr>
<td><img src="image" alt="Association Link" /></td>
<td>Indicates that processes attached by this link work together on some activities to achieve the goals of the organization.</td>
</tr>
</tbody>
</table>
Table C-3. Key to Use Case Model

<table>
<thead>
<tr>
<th>Representation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Use Case1" /> Use Case</td>
<td>Represents a discrete unit of interaction between an actor (human or machine) and the system. It is a single unit of meaningful work.</td>
</tr>
<tr>
<td><img src="image" alt="Use Case1" /> Use Case1</td>
<td>Represents use case with embedded Sequence and/or Communication Diagram(s). Such use cases are depicted by an additional infinity symbol on the right.</td>
</tr>
<tr>
<td><img src="image" alt="Use Case" /> Use Case</td>
<td>Represents Use Case with composite diagram (containing coupled use cases).</td>
</tr>
<tr>
<td><img src="image" alt="Actor" /> Actor</td>
<td>Is a person, machine, another systems, current system, sub-system that triggers events or processes. An actor might be used to perform a business process (use case) or invoke a use case or just be associated with a use case.</td>
</tr>
<tr>
<td><img src="image" alt="Collaboration1" /> Collaboration</td>
<td>Defines a set of cooperating roles and their connectors. These are used to collectively illustrate a specific functionality.</td>
</tr>
<tr>
<td><img src="image" alt="Extend Link" /> Extend Link</td>
<td>Denotes alternative flow (scenario) in this system. Extend connection is also used to indicate that one use case (optionally) extends the behavior of another.</td>
</tr>
<tr>
<td><img src="image" alt="Association" /> Association</td>
<td>Is the general relationship type between elements.</td>
</tr>
<tr>
<td><img src="image" alt="Precede link" /> Precede link</td>
<td>Represents some mandatory sequence of use cases.</td>
</tr>
<tr>
<td><img src="image" alt="Invoke Link" /> Invoke Link</td>
<td>Depicts the cases where use case is triggered only by the presence of a specific element.</td>
</tr>
<tr>
<td><img src="image" alt="Dependency Link" /> Dependency Link</td>
<td>Shows dependency of one use case over another use case or actor for the completion of task.</td>
</tr>
</tbody>
</table>
Table C-4. Key to Sequence Diagrams

<table>
<thead>
<tr>
<th>Representation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actor</td>
<td>Is a Person, machine, another systems, current system, sub-system that triggers events or processes. An actor might be used to perform a business process (use case) or invoke a use case or just be associated with a use case.</td>
</tr>
<tr>
<td>LifeLine</td>
<td>Is an individual participant in an interaction. It represents a distinct connectable element</td>
</tr>
<tr>
<td>Class</td>
<td>Is a particular instance of a Class. It defines the abstract characteristics of an entity, including the entities’ characteristics (its attributes or properties) and its corresponding functionalities (its behaviors or methods or features). Objects are often used in analysis to represent the numerous artifacts and items that exist in any business, such as pieces of paper, faxes, information etc.</td>
</tr>
<tr>
<td>Boundary</td>
<td>Is a stereotyped Object that models some system boundary. It is used in the conceptual phase to capture users and external systems interacting with the current system through some boundary interface type.</td>
</tr>
<tr>
<td>Control</td>
<td>Is a stereotyped Object that models a controlling entity or manager. A Control organizes and schedules other activities and elements.</td>
</tr>
<tr>
<td>Entity</td>
<td>Is a stereotyped Object that models a store or persistence mechanism that captures the information or knowledge in a system.</td>
</tr>
<tr>
<td>Diagram Gate</td>
<td>Is a connection point for relating a Message outside an InteractionFragment with a Message inside the InteractionFragment. It is a simple graphical way to indicate the point at which messages can be transmitted into and out of the fragments.</td>
</tr>
<tr>
<td>Message</td>
<td>Indicate a flow of information or transition of control between elements.</td>
</tr>
<tr>
<td>Representation</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
</tr>
<tr>
<td><img src="image" alt="Actor" /></td>
<td>Is a person, machine, another systems, current system, sub-system that triggers events or processes. An actor might be used to perform a business process (use case) or invoke a use case or just be associated with a use case.</td>
</tr>
<tr>
<td><img src="image" alt="Class" /></td>
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</tr>
<tr>
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<tr>
<td><img src="image" alt="Entity" /></td>
<td>Is a stereotyped Object that models a store or persistence mechanism that captures the information or knowledge in a system.</td>
</tr>
<tr>
<td><img src="image" alt="Association" /></td>
<td>Is the general relationship type between elements.</td>
</tr>
<tr>
<td><img src="image" alt="Realize/Implements" /></td>
<td>Implements or Realizes its destination object. Realize Used in a Use Case, Component or Requirements diagram to express traceability and completeness in the model.</td>
</tr>
</tbody>
</table>
Overall ROW Business Model Diagrams

The following diagrams are in alphabetical order according to the method used by Enterprise Architect. It is STRONGLY recommended that you open the model in EALite and use the Project Browser to maneuver through the different diagrams since they are hyperlinked within the software.

Diagram: Business Process Diagram - Overall ROW

Diagram: Class Diagram - Overall ROW
Diagram: Component Diagram - Overall ROW

Component Model Package - Overall ROW

- Parcels
- Highway Right of Way
- Project Management Information System
- Document Management System
- Geospatial Warehouse
- Financial Information System
- Environmental System
- MLS (External Real Estate System)
- Tax Information System
- Turbo Relocation (or Similar)
- FHWA Annual Reporting System
- Local Government Systems
- Row Administrator
- Project Development
- Major ROW Functions
- Project Closing

Diagram: Use Case Diagram - Overall ROW

Use Case Model Package - Overall ROW

- Actors
- Project Development Package
- Major ROW Functions Package
- Project Closing Package
Diagram: Acquisition Activity Model

**ACQ_Pre-negotiation**
- **ACQ_Additional Factors for Consideration and Processing**
- **ACQ_Assign Negotiator**
- **ACQ_Contract Negotiator**
- **ACQ_Coordinate with Other Offices**
- **ACQ_Prepare Conveyance Documents**
- **ACQ_Prepare Notices**
- **ACQ_Process Dedication**
- **ACQ_Process Donation**
- **ACQ_Transfer Federal Lands (DOD, DVA, BIA)**
- **ACQ_Update Parcel Record**

**ACQ_Negotiation**
- **Negotiator**
  - **Owner**
  - **ACQ_Attach Negotiator's Log**
  - **ACQ_Detailed Negotiation Process**
  - **ACQ_Document and End Negotiation**
  - **ACQ_Follow up Phone Contact**
  - **ACQ_Mail Written Offer and Acquisition Related Documents**
  - **ACQ_Prepare Documents and Update Parcel Records**
  - **ACQ_Obtain Property Encumbrance releases**
  - **ACQ_Provide Written Offer and Acquisition Related Documents**
  - **ACQ_Schedule Meeting**
  - **ACQ_Update Parcel Record**

**ACQ_Closing**
- **ACQ_Pay Just Compensation**
- **ACQ_Prepare Settlement Statement and Deed**
- **ACQ_Process Documents: Tax Forms, Titles, etc**
- **ACQ_Update Acquisition Record for the Acquired Parcel**

Acquiring Agency
- **ACQ_Prepaketion Package**
  - **ACQ_Additional Factors for Consideration and Processing**
  - **ACQ_Assign Negotiator**
  - **ACQ_Contract Negotiator**
  - **ACQ_Coordinate with Other Offices**
  - **ACQ_Prepare Conveyance Documents**
  - **ACQ_Prepare Notices**
  - **ACQ_Process Dedication**
  - **ACQ_Process Donation**
  - **ACQ_Transfer Federal Lands (DOD, DVA, BIA)**
  - **ACQ_Update Parcel Record**

Acquiring Agency
- **ACQ_Negotiation Package**
  - **Negotiator**
    - **Owner**
    - **ACQ_Attach Negotiator's Log**
    - **ACQ_Detailed Negotiation Process**
    - **ACQ_Document and End Negotiation**
    - **ACQ_Follow up Phone Contact**
    - **ACQ_Mail Written Offer and Acquisition Related Documents**
    - **ACQ_Prepare Documents and Update Parcel Records**
    - **ACQ_Obtain Property Encumbrance releases**
    - **ACQ_Provide Written Offer and Acquisition Related Documents**
    - **ACQ_Schedule Meeting**
    - **ACQ_Update Parcel Record**

Acquiring Agency
- **ACQ_Closing Package**
  - **ACQ_Pay Just Compensation**
  - **ACQ_Prepare Settlement Statement and Deed**
  - **ACQ_Process Documents: Tax Forms, Titles, etc**
  - **ACQ_Update Acquisition Record for the Acquired Parcel**
Diagram: Appraisal Activity Model

```
Act Appraisal Activity Model

Acquisition Agency (GLOBAL) (from APP_Business Process Model Package)

APP_Appraisal (from APP_Business Process Model Package)

<<implement>>

APP_Use Case Model Package

+ ACQ_Acquisition
+ APP_Geospatial Enablement: Parcel, Right Of Way
+ APP_Initial Review
+ APP_Assign Appraiser
+ APP_Contract Appraiser
+ APP_Donation
+ APP_Waiver
+ APP_Appraisal Process
+ APP_Appraisal Review
+ APP_Appraiser Certificate
+ APP_Establish Just Compensation

(from Appraisal Model Package)
```
Diagram: Business Process Model - Overall ROW

class Business Process Model - Overall ROW

ROW Director

Project Development

Major ROW functions

Project Closing

Project Development Package

- Encumber Funds
- Geospatial Enablement
- Identification of Parcel Type
- Initial Planning
- Parcel Identification & Cost Estimation
- Project Agreement
- Project Authorization
- Project Establishment
- Protective Buying
- ROW Mapping and Engineering
- Staff Identification
- Title Documents
- Utility Relocation and Management

(from Use Case Model Package - Overall ROW)

Major ROW Functions Package

- Corridor Management
- Appraisal (APP)
- Acquisition (ACQ)
- Relocation (REL)
- Property Management (PM)
- Payment

(from Use Case Model Package - Overall ROW)

Project Closing Package

- Geospatial Enablement-Update Excess to Inventory
- Review Project Plans
- Accumulate and Store Records
- Status Report
- ROW Certification
- State defined Processes
- Final Claims
- Close Accounting
- Re-open if necessary
- Encroachment clearing
- Excess Property
- Construction

(from Use Case Model Package - Overall ROW)
Diagram: Initial Planning Activity Model

Planning → Alignment Evaluation → Parcel Identification → Identification of Environmental impacts → Hazardous waste site evaluation → Environmental study → Final Alignment Selection

Acquisition Agency (GLOBAL) (from APP_Business Process Model Package)

State DOT

Acquisition cost estimation → Relocation survey and cost estimation → Environmental study

Identification of Environmental impacts

Final Alignment Selection (from Project Development Package)

Planning (from Project Development Package)

Alignment Evaluation (from Project Development Package)

Parcel Identification (from Project Development Package)

Acquisition cost estimation (from Project Development Package)

Relocation cost estimation (from Project Development Package)
Diagram: Major ROW Functions Activity Model

Diagram showing the relationships between different roles and functions in a geospatial right-of-way land management system, including Corridor Management, Appraisal, Acquisition, Relocation, Property Management, and Payment.
Diagram: Parcel Identification Activity Model

- **Acquisition Agency**
  - (GLOBAL)
  - (from APP_Business Process Model Package)

- **Parcel Alignment Inspection**

- **Type of acquisition**
  - (from Project Development Package)
  - «precedes»

- **Total Parcel**
  - (from Project Development Package)
  - «extend»

- **Partial Parcel**
  - (from Project Development Package)
  - «extend»

- **Perform Cost Estimation**
  - (from Project Development Package)
  - «extend»

- **Estimate cost**
  - (from Project Development Package)
  - «extend»

- **Current and completed Project Displacement analysis**
  - (from Project Development Package)

- **Relocation Survey**
  - (from Project Development Package)
  - «extend»

- **Survey of Replacement Properties**
  - (from Project Development Package)
  - «extend»

- **Relocation Problems Analysis**
  - (from Project Development Package)
  - «extend»

- **ROW Cost Estimate**
  - (from Project Development Package)
Diagram: Staff Identification Activity Model

1. Identify Staff Requirements
2. Staff Available?
   - Yes: Assign Staff
   - No: Analyze resources
3. Hire Staff
4. Initiate Contracts
5. Identify Staff Requirements
6. Assign Staff

(Expressed in terms of 'precedes' and 'extends' relationships)
Diagram: ACQ_Business Process Diagram

Diagram: ACQ_Class Diagram

Diagram: ACQ_Component Diagram

Diagram: ACQ_Use Case Diagram
Diagram: ACQ_Business Process Model

class ACQ_Business Process Model

ACQ_Pre-negotiation

ACQ_Negotiation

ACQ_Closing

Acquiring Agency

ACQ_Pre-negotiation Package

ACQ_Negotiation Package

ACQ_Closing Package

(from ACQ_Use Case Model Package)

(from Acquisition Model Package)
Diagram: ACQ_Closing Activity

- **ACQ_Prepare Settlement Statement and Deed**
- **ACQ_Update Acquisition Record for the Acquired Parcel**
- **ACQ_Pay Just Compensation**
- **ACQ_Process Documents: Tax Forms, Titles, etc**

**Acquiring Agency**

**PM_Property Management**

- **«flow»**
- **«precedes»**

**From Acquisition Model Package**

**From ACQ_Closing Package**
Diagram: ACQ_Use Case Model

**ACQ_Pre-negotiation Package**
- ACQ_Additional Factors for Consideration and Processing
- ACQ_Assign Negotiator
- ACQ_Contract Negotiator
- ACQ_Coordinate with Other Offices
- ACQ_Prepares Conveyance Documents
- ACQ_Prepares Notices
- ACQ_Process Dedication
- ACQ_Process Donation
- ACQ_Transfer Federal Lands (DOD, DVA, BIA)
- ACQ_Update Parcel Record

**ACQ_Negotiation Package**
- Negotiator
- Owner
- ACQ_Attach Negotiator’s Log
- ACQ_Detailed Negotiation Process
- ACQ_Document and End Negotiation
- ACQ_Follow up Phone Contact
- ACQ_Mail Written Offer and Acquisition Related Documents
- ACQ_Prepare Documents and Update Parcel Records
- ACQ_Obtain Property Encumbrance Releasess
- ACQ_Provide Written Offer and Acquisition Related Documents
- ACQ_Schedule Meeting
- ACQ_Update Parcel Record

**ACQ_Closing Package**
- ACQ_Pay Just Compensation
- ACQ_Prepare Settlement Statement and Deed
- ACQ_Process Documents: Tax Forms, Titles, etc
- ACQ_Update Acquisition Record for the Acquired Parcel
Diagram: Pay Just Compensation

Diagram: Pay Just Compensation

(from Acquisition Model Package)
**Diagram: Process Documents: Tax Forms, Titles, etc**

- Acquiring Agency
- Closing Document Screen
- Documents (Checklist)
- Document Management System

(get())

(confirm())

(from Acquisition Model Package)
Diagram: Update Acquisition Record for the Acquired Parcel

(from Acquisition Model Package)
Diagram: ACQ_Pre-negotiation Use Case Model

Acquiring Agency
(from Acquisition Model Package)

ACQ_Process Dedication

ACQ_Process Donation

ACQ_Contract Negotiator

ACQ_Assign Negotiator

ACQ_Transfer Federal Lands (DOD, DVA, BIA)

ACQ_Prepare Conveyance Documents

ACQ_Prepare Notices

ACQ_Coordinate with Other Offices

ACQ_Additional Factors for Consideration and Processing

ACQ_Prepare

ACQ_Update Parcel Record
Diagram: Additional Factors for Consideration and Processing

(from Acquisition Model Package)
Diagram: Assign Negotiator

Communication Diagram: Assign Negotiator

(from Acquisition Model Package)
Diagram: Assign Negotiator

Sequence Diagram:
Assign Negotiator

1: Access()
1.1: Assign()
2: Store/Display Details()
Diagram: Contract Negotiator

Communication Diagram
: Contract Negotiator

(from Acquisition Model Package)
Diagram: Contract Negotiator

Sequence Diagram:
Contract Negotiator

1: Access()
1.1: Select()
2: Store/Display()
1.2: Get()

Diagram: Coordinate with Other Offices

Sequence Diagram:
Coordinate with Other Offices

1: get()
2: send()
3: send()
4: send()
Diagram: Coordinate with Other Offices

Acquiring Agency
Coordination Screen
Status Reports
Appraiser
Property Management Personnel
Displacing Agency

Communication Diagram:
Coordinate with Other Offices

(from Acquisition Model Package)
Diagram: Prepare Notices

Diagram: Process Dedication
Diagram: Process Dedication

Diagram: Process Donation
Diagram: Transfer Federal Lands (DOD, DVA, BIA)

Communication Diagram:
Transfer Federal Lands (DOD, DVA, BIA)

Sequence Diagram:
Transfer Federal Lands (DOD, DVA, BIA)
Diagram: Update Parcel Record

Communication Diagram:
Update Parcel Record

Sequence Diagram:
Update Parcel Record
Diagram: ACQ_Negotiation Use Case Model

Owner

ACQ_Prepare Documents and Update Parcel Records

ACQ_Mail Written Offer and Acquisition Related Documents

ACQ_Follow up Phone Contact

Negotiator

Acquiring Agency

(from Acquisition Model Package)

ACQ_Schedule Meeting

ACQ_Provide Written Offer and Acquisition Related Documents

ACQ_Update Parcel Record

ACQ_Document and End Negotiation

ACQ_Obtain Property Encumbrance releases

ACQ_Detailed Negotiation Process

ACQ_Attach Negotiator's Log

«precedes»
Diagram: Assign Agency Official

Sequence Diagram:
Assign Agency Official

Diagram: Assign Agency Official

1: get()
1.1: assign()
Diagram: Assign Agency Official

Communication Diagram:
Assign Agency Official
Diagram: Attach Negotiator's Log

Communication Diagram:
Attach Negotiator's Log
Diagram: Attach Negotiator's Log

Diagram: Contract with Third Party
Diagram: Contract with Third Party

(from Acquisition Model Package)

Communication Diagram:
Contract with Third Party
Diagram: Establish Third Party Settlement Amount

Communication Diagram:
Establish Third Party Settlement Amount
Diagram: Establish Third Party Settlement Amount

Diagram: Follow up Phone Contact
Diagram: Follow up Phone Contact

Communication Diagram:
Follow up Phone Contact
Diagram: Legal/Condemnation State Specific Activity

Communication Diagram:
Legal/Condemnation State Specific Activity

(from Acquisition Model Package)
Diagram: Legal/Condemnation State Specific Activity

Sequence Diagram: Legal/Condemnation State Specific Activity

Diagram: Mail Written Offer and Acquisition Related Documents

Sequence Diagram: Mail Written Offer and Acquisition Related Documents
Diagram: Mail Written Offer and Acquisition Related Documents

Communication Diagram:
Mail Written Offer and Acquisition Related
Diagram: Obtain Property Encumbrance releases

Communication Diagram:
Obtain Property
Encumbrance releases
Diagram: Obtain Property Encumbrance releases

Diagram: Payment Before Possession
Diagram: Payment Before Possession

Acquiring Agency -> Payment Before Possession Screen

Just Compensation

Payment Before Possession Screen -> Acquiring Agency

Communication Diagram:
Payment Before Possession

(from Acquisition Model Package)
Diagram: Prepare Updated Conveyance Documents

(from Acquisition Model Package)

Communication Diagram:
Prepare Updated Conveyance Documents
Diagram: Prepare Updated Conveyance Documents

Sequence Diagram:
Prepare Updated Conveyance Documents

Communication Diagram:
Prepare Updated Conveyance Documents

(from Acquisition Model Package)
Diagram: Provide Written Offer and Acquisition Related Documents

Communication Diagram:
Provide Written Offer and Acquisition Related

Diagram: Provide Written Offer and Acquisition Related Documents

Sequence Diagram:
Provide Written Offer and Acquisition Related
Diagram: Schedule Meeting and Present Updated Offer

Acquiring Agency → Detailed Negotiation Screen → Agency Official → Meeting → Owner → Written Offer and Other Documents → Document Management System

Schedule()
Diagram: State Specific Alternatives

(from Acquisition Model Package)
Diagram: Update Parcel Record

Sequence Diagram:
Update Parcel Record

Diagram: Update Parcel Record

Communication Diagram:
Update Parcel Record
Diagram: Upload Updated Conveyance Documents

Acquiring Agency

Conveyance Documents

Parcel Records

Conveyance Documents Screen

attach()

(save)
Diagram: Upload Updated Conveyance Documents

(from Acquisition Model Package)
Diagram: ACQ_Class Model

class ACQ_Class Model

ACQ_Pre-Negotiation Elements
- ACQ_Acquiring_Agency
- ACQ_Acquisition_Type
- ACQ_Activity_Report
- ACQ_Additional_Factors
- ACQ_Conveyance_Documents
- ACQ_Coordination
- ACQ_Dedication
- ACQ_Donation
- ACQ_Federal_Land
- ACQ_Hardship_Productive_Buying
- ACQ_Negotiator_Assignment
- ACQ_Negotiator_Contract
- ACQ_Notice
- ACQOwnerId_Retention_Of_Improvements
- ACQ_Status_Report
- ACQ_Tenant_Owned_Improvements

«precedes»

ACQ_Negotiation Elements
- ACQ_Accelerated_Negotiations
- ACQ_Contact_Owner
- ACQ_Negotiator
- ACQ_Offer_Acceptance
- ACQ_Owner
- ACQ_Owner_Meeting
- ACQ_Phone_Contact
- ACQ_Property_Encumbrance_releases
- ACQ_Uneconomic_Remnant
- ACQ_Written_Offer_Mail
- ACQ_Written_Offer_Meeting
- ACQ_Detailed_Negotiation_Elements

«precedes»

ACQ_Closing Elements
- ACQ_Just_Compensation
- ACQ_Negotiation_Closing_Documents
- ACQ_Parcel_Closing
Diagram: ACQ_Pre-Negotiation Class Model

```
class ACQ_Pre-Negotiation Class Model

ACQ_Donation
- Construction_Feature_Exchange: char
+ Parcel_ID: int
+ Waiver_Appraisal: boolean
- Update_Donation(char): Parcel_Status

ACQ_Dedication
- Land_Use_concession_to_Owner: char
+ Parcel_ID: int
+ Subdivision(Zoning)_Approval_Reference: char
- Update_Dedication(char): Parcel_Status

ACQ_Federal_Land
- Organization: char
+ Parcel_ID: int
+ Project_ID: int
+ Federal_Land_Transfer(): ACQ_Activity_Report

ACQ_Acquiring_Agency
- Agency_Address: char
+ Agency_ID: int
+ Agency_Name: char
+ Agency_Phone: int

ACQ_Acquisition_Type
- Acquisition_Type: char
- Date_Acquisition_Requested: Date
+ Parcel_ID: int
+ Project_ID: int

ACQ_Additional_Factors
- Add_Factor_Description: char
+ Parcel_ID: int
+ Project_ID: int
+ Status: char
- Process_Additional_Factors(): Parcel_Status

ACQ_Tenant_Owned_Improvements
- Acquisition_Cost_Tenant_Owned_Improvement: char
- Description_Of_Tenant_Owned_Improvements: char
- Final_Tenant_Compensation: int
+ Parcel_ID: int
+ Project_ID: int
+ Removal_Cost_Tenant_Owned_Improvement: char

ACQ_Hardship_Protective_Buying
- Agency_Decision: char
+ Agency_Provided_Official_Public_Notice: char
+ Parcel_ID: int
+ Project_ID: int
+ Project_Currently_Under_Approved_STIP: boolean
- Specific_Hardship_Property_Owner: char

ACQ_Owner_Retention_Of_Improvements
- Compensation_Through_Appraisal_Process: double
- Final_Compensation: int
+ Parcel_ID: int
+ Project_ID: int
- Retention_Value_Improvements: int

ACQ_Conveyance_Documents
- Date_Conveyance_Document: int
+ Parcel_ID: int
+ Project_ID: int

ACQ_Notice
- Date_Notice: int
+ Parcel_ID: int
+ Project_ID: int
+ Status_Notice: char
- Prepare_Notice(): ACQ_Notice

ACQ_Coordination
- Office_Name: char
+ Parcel_ID: int
+ Project_ID: int
- Status: boolean
- Establish_Coordination(): ACQ_Coordination

ACQ_Acquisition_Type
- Acquisition_Type: char
+ Parcel_ID: int
+ Project_ID: int
- Date_Acquisition_Requested: Date

ACQ_Negotiator_Contract
- Contract_Agency: int
+ Parcel_ID: int
+ Project_ID: int
+ Contract(): ACQ_Negotiator

ACQ_Negotiator_Assignment
- Assignment_Confirmation: boolean
+ Date_Assigned: int
+ Parcel_ID: int
+ Project_ID: int
+ Status_Negotiator_Assignment: Flag
+ Assignment(): ACQ_Negotiator

ACQ_Status_Report
- Document: Document

ACQ_Activity_Report
- Document: Document
```
Diagram: ACQ_Negotiation Class Model

- **ACQ_Negotiator**
  - Date_Assigned: int
  - Negotiator_ID: int
  - Negotiator_Name: char
  - Negotiator_Type: char
  + Project_ID: int

- **ACQ_Owner**
  - Address: char
  - Name: char
  - Phone_Number: int
  + Tax_ID: int

- **ACQ_Phone_Contact**
  - Negotiator: ACQ_Negotiator
  + Owner: ACQ_Owner
  + Parcel_ID: int
  - Phone_Contact_Status: char
  + Project_ID: int
  - Requirement: boolean
  + update(char): Parcel_Status

- **ACQ_CONTACT_OWNER**
  - Activity_Records: Document
  - Contact_Mode: char
  - Date_Init_Contacted: int
  - Negotiator: ACQ_Negotiator
  + Parcel_ID: int
  - Status_Correspondence_with_Owner: Flag
  + Establish_Contact(): void

- **ACQ_Accelerated_Negotiations**
  - Date_Mail: int
  - Mail_Information: char
  - Negotiator: ACQ_Negotiator
  + Parcel_ID: int
  + Project_ID: int
  + Negotiate(): ACQ_Detailed Negotiation Class Model

- **ACQ_Owner_Meeting**
  - Date_Meeting: int
  - Negotiator: ACQ_Negotiator
  + Parcel_ID: int
  + Project_ID: int
  - Time_Meeting: int
  - Schedule_Meeting(): ACQ_Owner_Meeting

- **ACQ_Owner_Meeting**
  - Date_Meeting: int
  - Negotiator: ACQ_Negotiator
  + Parcel_ID: int
  + Project_ID: int
  - Time_Meeting: int
  - Schedule_Meeting(): ACQ_Owner_Meeting

- **ACQ_Accelerated_Negotiations**
  - Date_Mail: int
  - Mail_Information: char
  - Negotiator: ACQ_Negotiator
  + Parcel_ID: int
  + Project_ID: int
  + Negotiate(): ACQ_Detailed Negotiation Class Model

- **ACQ_Written_Offer_Meeting**
  - 90_Day_notice_to_Vacate: boolean
  - Agent: ACQ_Negotiator
  - Damages_Compensation: double
  - Date_Written_Offer: int
  - Description_damage_compensation(remaining_property): char
  - Description_land/improvements/fixtures: char
  - Highway_To_Be_Constructed: char
  - Improvement_Retention_Cost: int
  - Just_Compensation_Value: double
  - List_of_structures/buildings/equipment/fixtures_Considered: char
  - Negotiator: ACQ_Negotiator
  + Parcel_ID: int
  + Project_ID: int
  + Relevant_Document: Document
  - Uneconomic_Remainder_Value: int
  - Written_Offer: int
  + Update(char): Parcel_Status

- **ACQ_Written_Offer_Mail**
  - 90_Day_notice_to_Vacate: boolean
  - Agent: ACQ_Negotiator
  - Damages_Compensation: double
  - Date_Written_Offer: int
  - Description_damage_compensation(remaining_property): char
  - Description_land/improvements/fixtures: char
  - Highway_To_Be_Constructed: char
  - Improvement_Retention_Cost: int
  - Just_Compensation_Value: double
  - List_of_structures/buildings/equipment/fixtures_Considered: char
  - Negotiator: ACQ_Negotiator
  + Parcel_ID: int
  + Project_ID: int
  + Relevant_Document: Document
  - Uneconomic_Remainder_Value: int
  - Written_Offer: int
  + Update(char): Parcel_Status

- **ACQ_Offer_Acceptance**
  - Acceptance: boolean
  + Parcel_ID: int
  + Project_ID: int
  + Update_Parcel(ACQ_Negotiation_Log)

- **ACQ_Property_Encumbrance_releases**
  - Parcel_ID: int
  + Project_ID: int
  - Status_Property_Encumbrance_release: Flag
  - Title_Information: char
  + update(char): Parcel_Status

- **ACQ_Uneconomic_Remnant**
  - %Fraction_Remnant: char
  - Compensation_After_Considering_Remnants: double
  - Compensation_Appraisal: int
  + Parcel_ID: int
  + Project_ID: int
  - Remnant_Fair_Market_Value: double
  - Usage_of_Remnant: char
  + End_Negotiation(): void
Diagram: ACQ_Closing Class Model

```
class ACQ_Closing Class Model

ACQ_Pre-Negotiation Elements::ACQ_Acquiring_Agency
- Agency_Address: char
- Agency_ID: int
- Agency_Name: char
- Agency_Phone: int

ACQ_Negotiation Elements::ACQ_Owner
- Address: char
- Name: char
- Phone_Number: int
+ Tax_ID: int

ACQ_J ust_Compensation
+ Parcel_ID: int
- Payment_Of_ACQ_Settlement_Amount: Flag
+ Project_ID: int
+ Payment(ACQ_J ust_Compensation) : boolean

ACQ_Negotiation_Closing_Documents
+ Parcel_ID: int
+ Project_ID: int
- Status_ACQ_Calim_Forms_Processing: Flag
- Tax_Forms: Document
- Title_Release: boolean
+ Attach(ACQ_Negotiation_Closing_Documents) : Cadastral_Parcel

ACQ_Parcel_Closing
- Encumbrance_Release: ACQ_Property-Encumbrance_releases
+ Parcel_ID: int
+ Project_ID: int
- Settlement_Date: Date
- Settlemet_Statement(Deed): Document
+ update(int) : Cadastral_Parcel
```
Diagram: ACQ_Componentet Model

ACQ_Pre-Negotiation Components
- + Conveyance Documents
- + Notice
- + Acquiring Agency
- + Additional Factors
- + Appraiser
- + Candidate Agency Officials
- + Candidate Contract Officials
- + Federal Highway Administration
- + Negotiator
- + Parcel Records
- + Property Management Personnel
- + Relocation Specialist

ACQ_Negotiation Components
- + Acquisition Related Documents (Written Offer)
- + Negotiation Log
- + Negotiator
- + Owner
- + Parcel Records
- + Property-Encumbrance releases
- + Uneconomic Remnant
- + ACQ_Detailed Negotiation Components

ACQ_Closing Components
- + Closing Forms
- + Settlement Deed / Statement
- + Tax Forms
- + Acquiring Agency
- + Document Management System
- + Internal Revenue Service
- + Just Compensation
- + Owner
- + Parcel Record
Diagram: ACQ_Pre-Negotiation Component Model

- **Federal Highway Administration**
- **Additional Factors**
  - Donation
  - Dedication
- **Parcel Records**
  - Update
- **Negotiator**
  - Contract Negotiator
  - Assign Negotiator
- **Candidate Contract Officials**
- **Candidate Agency Officials**
- **Notice**
- **Conveyance Documents**
- **Federal Land Transfer**
- **Acquiring Agency**
  - «delegate»
  - coordination
- **Property Management Personnel**
  - coordination
- **Relocation Specialist**
  - coordination
- **Appraiser**
  - coordination
Diagram: ACQ_Negotiation Component Model

- Owner
  - Written Offer (Mail)
  - Write Offer (Meeting)
- Negotiator
  - Negotiation Log
  - Uneconomic Remnant
  - Property-Encumbrance releases
- ACQ_Detailed Negotiation Components
  - Conveyance Documents
  - Acquiring Agency
  - Agency Official
  - Legal Office
  - Parcel Records
  - Settlement Amount
  - State
  - Third Party / Mediator

Additional Components:
- Accelerated Negotiations
- «delegate»
- Attach

Diagram elements are connected with arrows indicating the flow of information or action.
Diagram: ACQ_Detailed Negotiation Component Model

- **Agency Official**
  - Administrative Settlement «delegate»
  - Mediation «delegate»
  - Legal Settlement / Condemnation «delegate»
  - State Specific Alternative

- **Third Party / Mediator**
  - Mediation

- **Legal Office**

- **State**

- **Acquiring Agency**
  - Conveyance Documents

- **Settlement Amount**

- **ACQ_Negotiation Components:: Negotiation Log**
  - attach

- **Parcel Records**
Diagram: APP_Business Process Diagram

```
analysis APP_Business Process Diagram

APP_Business Process Model Package
  + APP_Appraisal
  + Acquisition Agency(GLOBAL)
```

Diagram: APP_Class Diagram

```
class APP_Class Diagram

APP_Class Model Package
  + APP_Appraiser_Assignment
  + APP_Appraiser_Candidate
  + APP_Appraiser_Certificate
  + APP_Appraiser_Contract
  + APP_Initial_Review
  + APP_Just_Compensation
  + Appraisal_Report
  + APP_Appraisal Process Elements
  + APP_Appraisal Review Class Elements
  + APP_Waiver Class Elements
```

Diagram: APP_Component Diagram

```
cmp APP_Component Diagram

APP_Component Model Package
  + Utilities
  + Appraisal_Waiver
  + Appraiser
  + Appraiser_Candidate
  + APP_Appraisal Process Components
  + APP_Appraisal Review Components
```
Diagram: APP_Use Case Diagram

pkg APP_Use Case Diagram

APP_Use Case Model Package

+ ACQ_Acquisition
+ APP_Geosaptial Enablement: Parcel, Right Of Way
+ APP_Initial Review
+ APP_Assign Appraiser
+ APP_Contract Appraiser
+ APP_Donation
+ APP_Waiver
+ APP_Appraisal Process
+ APP_Appraisal Review
+ APP_Appraiser Certificate
+ APP_Establish Just Compensation

Diagram: Waiver Class Model

class Waiver Class Mo...

APP_Waiver_Establish_Value

- Established Value: int
- Just Compensation: int
+ Parcel_Project_ID: int
- Type (Donation, Donation in Exchange, Dedication, Waiver): char
Diagram: APP_Appraisal Process Class Model

```
class APP_Appraiser
- Appraiser_Contact: char
+ Appraiser_ID: int
- Appraiser_name: char
- Appraiser_Type: char
+ Project_Parcel_ID: int

APP_Appraiser
- 5-Year Sales History: char
- Appraisal Type (Value Finding, Short Form, Detailed): char
+ Appraiser_ID: int
- Communication: char
- Complexity_Of_Appraisal: char
- Date_Inspection: Date
- Highest and Best Use: char
- Improvements Description: char
- Parcel Access: char
- Parcel Landscaping: char
- Parcel Plan: BLOB
- Parcel Shape: char
- Parcel Topography: char
- Photographs: BLOB
- Present Use: char
+ Project_Parcel_ID: int
- Status_Parcel_Evaluation_&_Inspection: Flag
- Utilities_Affected: char

APP_Minimum Standard Appraisal Class Elements
+ APP_Short_Form_Appraisal
+ APP_Value_Finding_Appraisal

APP_Detailed Appraisal Evaluation Class Elements
+ APP_Cost_Approach
+ APP_Detailed_Appraisal_Evaluation
+ APP_Income_Approach
+ APP_Sales_Comparision_Approach
+ APP_Speciality_Appraiser
+ APP_Speciliaty_Appraisal
```
### Diagram: APP_Minimum Standard Appraisal Class Model

#### class APP_Minimum Standard Appraisal Class Model

<table>
<thead>
<tr>
<th>APP_Value_Finding_Appraisal</th>
<th>APP_Short_Form_Appraisal</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Appraiser ID: int</td>
<td>- All other Adjustments (Dollars or %): int</td>
</tr>
<tr>
<td>- Basis for Value: char</td>
<td>- Appraisal Purpose: char</td>
</tr>
<tr>
<td>- Brief Analysis: char</td>
<td>+ Appraiser ID: int</td>
</tr>
<tr>
<td>- Date of Valuation: Date</td>
<td>- Date of Valuation: Date</td>
</tr>
<tr>
<td>- Interest Acquired: int</td>
<td>- Date of Valuation of Appraisal: Date</td>
</tr>
<tr>
<td>- Market Value: int</td>
<td>- Indicated Value: int</td>
</tr>
<tr>
<td>+ Project Parcel_ID: int</td>
<td>- Interest being Acquired: int</td>
</tr>
<tr>
<td>- Remarks: char</td>
<td>- Interest to be Acquired: int</td>
</tr>
<tr>
<td>- Value-Damages: int</td>
<td>- Lease Terms: char</td>
</tr>
<tr>
<td>- Value-Improvement: int</td>
<td>- Market Data Approach: char</td>
</tr>
<tr>
<td>- Value-Land: int</td>
<td>- Net Adjustment: int</td>
</tr>
<tr>
<td>- Value-Takings: int</td>
<td>- Partial acquisition Improvements Value: int</td>
</tr>
<tr>
<td>- Value Appraised: int</td>
<td>- Partial acquisition Land Value: int</td>
</tr>
<tr>
<td></td>
<td>- Partial acquisition Statement of Value - Damages: int</td>
</tr>
<tr>
<td></td>
<td>- Partial acquisition Statement of Value - Prope: int</td>
</tr>
<tr>
<td></td>
<td>- Price per Unit of Comp: int</td>
</tr>
<tr>
<td></td>
<td>- Problem to be Solved: char</td>
</tr>
<tr>
<td></td>
<td>+ ProjectParcel_ID: int</td>
</tr>
<tr>
<td></td>
<td>- Property Value Justification: char</td>
</tr>
<tr>
<td></td>
<td>+ Remarks: char</td>
</tr>
<tr>
<td></td>
<td>- Rights to be Appraised: char</td>
</tr>
<tr>
<td></td>
<td>- Sale Price: int</td>
</tr>
<tr>
<td></td>
<td>- Sale Price adjusted for Time: int</td>
</tr>
<tr>
<td></td>
<td>- Tenant Names: char</td>
</tr>
<tr>
<td></td>
<td>- Tenant Owned Buildings Value: int</td>
</tr>
<tr>
<td></td>
<td>- Tenant Owned Improvements Value: int</td>
</tr>
<tr>
<td></td>
<td>- Tenant Owned Structures Value: int</td>
</tr>
<tr>
<td></td>
<td>- Time Adjustment: int</td>
</tr>
<tr>
<td></td>
<td>- Title Information: char</td>
</tr>
<tr>
<td></td>
<td>- Total Adjustments Explanation: char</td>
</tr>
<tr>
<td></td>
<td>- Total Damage Explanation: char</td>
</tr>
<tr>
<td></td>
<td>- Value-Damages: int</td>
</tr>
<tr>
<td></td>
<td>- Value-Improvement: int</td>
</tr>
<tr>
<td></td>
<td>- Value-Land: int</td>
</tr>
<tr>
<td></td>
<td>- Value-Takings: int</td>
</tr>
<tr>
<td></td>
<td>- Value Appraised: int</td>
</tr>
</tbody>
</table>
Diagram: APP_Detailed Appraisal Class Model

class APP_Detailed Appraisal Class Model

- Zoning at the date of sale: char
- Access to the comparable: char
- Adjustment - Economic characteristics (Dollars or %): int
- Adjustment - Physical characteristics (Dollars or %): int
- Adjustment - Location (Dollars or %): int
- Adjustment - Time (Dollars or %): int
- Adjustment - Motivations for the transactions (Dollars or %): int
- Adjustment - Functional characteristics (Dollars or %): int
+ Appraiser ID: int
+ Cadastre/Parcel: Geospatial Reference
- Comparable data map: BLOB
- Conditions of sale (Motivation): char
- Consideration paid: int
- Date of Appraiser's Inspection: Date
- Date of data verification: Date
- Date of sale or offering: Date
- Description of Comparable Sales: char
- Description of improvements' Analysis: char
- Improvements Description: char
- Listings Available: char
- Location of comparable: char
- Method of financing: char
- Mineral, water, and other rights: char
- Offerings Available: char
- Parties to the transaction: char
- Persons with whom data was verified: char
- Photographs of principal improvements: BLOB
+ Project Parcel ID: int
- Rental Data Available: char
- Similarities or dissimilarities - Economic characteristics: char
- Similarities or dissimilarities - Location: char
- Similarities or dissimilarities - Motivation for the transactions: char
- Similarities or dissimilarities - Physical characteristics: char
- Similarities or dissimilarities - Time: char
- Size of the Improvements: char
- Source of financing: char
- Total area: int
- Total Appraisal Value: int
- Type of easements: char
- Type of improvements: char
- Verification by party involved in transaction: char

APP_Sales_Comparison_Appraisal

- Access to the comparable: char
- Adjustment - Economic characteristics (Dollars or %): int
- Adjustment - Functional characteristics (Dollars or %): int
- Adjustment - Time (Dollars or %): int
+ Appraiser ID: int
+ Comparable data map.: BLOB
- Conditions of sale (Motivation): char
- Consideration paid: int
- Date of Appraiser's Inspection: Date
- Date of data verification: Date
- Date of sale or offering: Date
- Description of functional and economical obsolescence: char
- Description of Physical Detrioriation: char
- Detailed analysis including calculation: char
- Explanation for lack of Sales comparison approach: char
- Highest and best use at date of sale: Analysis: char
- Land value (based on sales data): int
- Location of comparable: char
- Method of financing: char
- Mineral, water, and other rights: char
- Parties to the transaction: char
- Persons with whom data was verified: char
- Photographs of principal improvements: BLOB
- Price per Unit of area: int
- Project Parcel ID: int
- Reproduction or Replacement cost: int
- Similarities or dissimilarities - Economic characteristics: char
- Similarities or dissimilarities - Location: char
- Similarities or dissimilarities - Motivation for the transactions: char
- Similarities or dissimilarities - Physical characteristics: char
- Similarities or dissimilarities - Time: char
- Source of financing: char
- Total area: int
- Total Appraisal Value: int
- Type of easements: char
- Verification by party involved in transaction: char
- Zoning (at the date of sale): char

APP_Cost_Appraisal

- Access to the comparable: char
- Adjustment - Economic characteristics (Dollars or %): int
- Adjustment - Functional characteristics (Dollars or %): int
- Adjustment - Time (Dollars or %): int
+ Appraiser ID: int
- Comparable data map.: BLOB
- Conditions of sale (Motivation): char
- Consideration paid: int
- Date of Appraiser's Inspection: Date
- Date of data verification: Date
- Date of sale or offering: Date
- Description of functional and economical obsolescence: char
- Description of Physical Deterioriation: char
- Detailed analysis including calculation: char
- Explanation for lack of Sales comparison approach: char
- Highest and best use at date of sale: Analysis: char
- Land value (based on sales data): int
- Location of comparable: char
- Method of financing: char
- Mineral, water, and other rights: char
- Parties to the transaction: char
- Persons with whom data was verified: char
- Photographs of principal improvements: BLOB
- Price per Unit of area: int
- Project Parcel ID: int
- Reproduction or Replacement cost: int
- Similarities or dissimilarities - Economic characteristics: char
- Similarities or dissimilarities - Location: char
- Similarities or dissimilarities - Motivation for the transactions: char
- Similarities or dissimilarities - Physical characteristics: char
- Similarities or dissimilarities - Time: char
- Source of financing: char
- Total area: int
- Total Appraisal Value: int
- Type of easements: char
- Verification by party involved in transaction: char
- Zoning (at the date of sale): char

APP_Income_Appraisal

- Access to the comparable: char
- Adjustment - Economic characteristics (Dollars or %): int
- Adjustment - Functional characteristics (Dollars or %): int
- Adjustment - Time (Dollars or %): int
+ Appraiser ID: int
- Comparable data map.: BLOB
- Conditions of sale (Motivation): char
- Consideration paid: int
- Date of Appraiser's Inspection: Date
- Date of data verification: Date
- Date of sale or offering: Date
- Description of functional and economical obsolescence: char
- Description of Physical Deterioriation: char
- Detailed analysis including calculation: char
- Explanation for lack of Sales comparison approach: char
- Highest and best use at date of sale: Analysis: char
- Land value (based on sales data): int
- Location of comparable: char
- Method of financing: char
- Mineral, water, and other rights: char
- Parties to the transaction: char
- Persons with whom data was verified: char
- Photographs of principal improvements: BLOB
- Price per Unit of area: int
- Project Parcel ID: int
- Reproduction or Replacement cost: int
- Similarities or dissimilarities - Economic characteristics: char
- Similarities or dissimilarities - Location: char
- Similarities or dissimilarities - Motivation for the transactions: char
- Similarities or dissimilarities - Physical characteristics: char
- Similarities or dissimilarities - Time: char
- Source of financing: char
- Total area: int
- Total Appraisal Value: int
- Type of easements: char
- Verification by party involved in transaction: char
- Zoning (at the date of sale): char

APP_Speciality_Appraiser

- Project Parcel ID: int
- Speciality_Appraiser_Certification_Verification: boolean
- Speciality_Appraiser_Name: char
- Speciality_Appraiser_Type: char

APP_Speciality_Appraisal

- Project Parcel ID: int
- Speciality_Appraiser_ID: int
- Speciality_Appraiser_Name: char
- Speciality_Appraiser_Type: char

APP_Detailed_Appraisal_Evaluation

- Appraisal Purpose: char
+ Appraiser ID: int
- Basis for Highest use being different from Present use (Legally and Economically): char
- Consideration of Easements: char
- Consideration of Leases: char
- Detailed Appraisal Approach used (sales comparison, cash approach, income approach): char
- Estate Definition: char
- Partial acquisition Statement of Value - Benefits to the remaining property: int
- Partial acquisition Statement of Value - Damages to the remaining property: int
- Partial acquisition Statement of Value - Property: int
- Partial acquisition Statement of Value - Real Property: int
- Project Parcel ID: int
- Remarks: char
+ Speciality Appraisal Involved: boolean
- Statement of assumptions and limiting conditions: char
- Statement of known and observed encumbrances: char
- Statement of Value - Real Property: int
- Strengths and Weaknesses of each approach: char
- Title Information: char
- Total Appraisal Value: int

APP_Speciality_Appraisal

- Project Parcel ID: int
+ Speciality_Appraiser_ID: int
- Speciality_Appraiser_Name: char
- Speciality_Appraiser_Type: char

APP_Speciality_Appraiser

- Project Parcel ID: int
- Speciality_Appraiser_Certification_Verification: boolean
- Speciality_Appraiser_Name: char
- Speciality_Appraiser_Type: char
Diagram: APP_Appraisal Process Use Case Model

Appraiser

APP_Parcel Evaluate

APP_Determination of Appraisal Technique

APP_Minimum Standard Appraisal

APP_Detailed Appraisal
Diagram: APP_Appraisal Review Use Case Model

- APPArrangeAppraisalReviewer
- APP_Appraisal Review
  - Appraiser
  - Appraisal Reviewer
  - APP_Perform Deficient Appraisal
  - APP_Develop a new appraisal
  - APP_Prepare Review Appraisal Certificate
  - APP_Update Appraisal

Relationships: «precedes», «extend»
Diagram: APP_Arrange Appraisal Reviewer Use Case Model

Diagram: APP.Parcel Evaluate Use Case Model
Diagram: APP_Waiver Use Case Model

Diagram: Appraiser Certificate
Diagram: Assign Appraiser

1.1: Appraiser Requirements()
1.2: Staff Availability()
1.3: Assign Appraiser()
1.4: Update(Assignment Status, Appraiser ID)

Sequence Diagram:
Assign Appraiser

Parcel Log/Database
Diagram: Assign Appraiser

Communication Diagram:
Assign Appraiser
Diagram: Contact Owner

arc | Evaluate Screen

Owner

Appraiser

Contact Owner (Checkbox)

get details()
Diagram: Contract Appraiser

Communication Diagram: Contract Appraiser

Contract Appraiser

Parcel Log/Database

Assignment

Appraiser

Confirm Contract (Appraiser ID, Name, Date)

Parcel ID() save updated records()
Diagram: Contract Appraiser

1: Parcel ID()
1.1: Appraiser Requirements()
1.2: Contract()
1.3: Assign Appraiser()
1.4: update(Assignment Status, Appraiser ID)
Diagram: Detailed Appraisal

- Appraiser
- APP_Detailed Appraisal Evaluation
- APP_Income Approach
- APP_Sales Comparison
- APP_Cost Approach
- APP_Contract Appraiser
- APP_Staff Appraiser
- APP_Specialty Appraisal
- APP_Generate Appraisal Report

Relationships:
- «extend» from Appraiser to APP_Detailed Appraisal Evaluation
- «extend» from APP_Detailed Appraisal Evaluation to APP_Income Approach, APP_Sales Comparison, APP_Cost Approach
- «extend» from APP_Sales Comparison to APP_Generate Appraisal Report
Diagram: Establish Just Compensation

1: Parcel ID() → 1.1: Get() → 1.2: Update() → Parcel Database

2: Input() → Just Compensation

External Financial System

Sequence Diagram: Establish Just Compensation

Diagram: Evaluate Parcel

get() → Parcel Evaluation

Appraiser Screen

External (Real Estate) System
Diagram: Geospatial Enablement : Parcel, Right Of Way

Communication Diagram - Geospatial Enablement : Parcel, Right Of Way

GIS Screen  Parcel Inventory  Geospatial Layers

Perform appropriate operation (merge/clip layers etc)

Input Inventory of Parcels()
Diagram: Geospatial Enablement: Parcel, Right Of Way

Sequence Diagram:
Geospatial Enablement:
Parcel, Right Of Way

1: Access()
2: Perform()
3: Access()

1.1: Input()
2.1: Input()
3.1: Input()
3.2: Save()
Diagram: Initial Review

Review Screen  Geospatial Layers

Review parcels

Appraiser Requirements

Determine Appraiser skill set required()

Get()

Ascertain the updated parcel information()
Diagram: Initial Review

Sequence Diagram: Initial Review

1.1: Get() → 1.2: Ascertain parcel information() →

Review Screen → Geospatial Layers → Review

Appraiser Requirements → Complexity → Estimated Value
Diagram: Low Value Appraisal

Appraisal Process Screen

1.1: Calculate() → Just Compensation

Knowledgeable Staff

2: Input()

1.2: Update() → Parcel Records

Sequence Diagram:
Low Value Appraisal
Diagram: Minimum Payment Method

Sequence Diagram:
Minimum Payment Method

1.1: Confirm Minimum Payment Method
1.2: get
1.3: update

Appraisal Process Screen
Parcel Records
State
Minimum Payment Amount
Diagram: Minimum Payment Method

Communication Diagram:
Minimum Payment Method

Appraisal Method Screen
State
Parcel Record

confirm method()

Minimum Payment Calculation()
Confirm()

update()
Diagram: Parcel Visit with Owner

Appraiser

Parcel Visit
Details

Owner

Parcel Visit with Owner (Checkbox)

Diagram: Short Appraisal

Appraiser

Short Appraisal
Screen

Appraisal Report

Document Management System

Parcel Log

attach/update()
Diagram: Value Finding Appraisal

Diagram: Visit Parcel without Owner
Diagram: Waiver

Communication Diagram:
Waiver of Regulations ($10K or $25K)
Diagram: Waiver of Regulations ($10K or $25K)
Diagram: APP_Appraisal Process Activity

Act APP_Appraisal Process Activity

Acquisition Agency

Appraiser

APP_Parcel Evaluate

APP_Determination of Appraisal Technique

APP_Minimum Standards Appraisal

APP_Detailed Appraisal

APP_Appraisal Report

APP_Parcel Evaluate

APP_Determination of Appraisal Technique

APP_Minimum Standard Appraisal

APP_Detailed Appraisal

from APP_Use Case Model Package

from APP_Use Case Model Package

from APP_Use Case Model Package

from APP_Use Case Model Package

No

Yes

Detailed Appraisal Technique Required?

No

Yes
Diagram: APP_Appraisal Review Activity
Diagram: APP_Arrange Appraisal Reviewer Activity

Diagram shows the process of arranging an appraiser reviewer. The process starts with an acquisition agency (GLOBAL) and involves decision points and actions related to assigning and contracting appraiser reviewers. The diagram includes decision diamonds and participating actors.
Diagram: APP_Business Process Model Package

```
class APP_Business Process Model Pack...

Acquisition Agency (GLOBAL)

APP_Appraisal

<<implement>>

APP_Use Case Model Package

+ ACQ_Acquisition
+ APP_Geosaptial Enablement: Parcel, Right Of Way
+ APP_Initial Review
+ APP_Assign Appraiser
+ APP_Contract Appraiser
+ APP_Donation
+ APP_Waiver
+ APP_Appraisal Process
+ APP_Appraisal Review
+ APP_Appraiser Certificate
+ APP_Establish Just Compensation

(from Appraisal Model Package)
```
Diagram: APP_Detailed Appraisal Activity
Diagram: APP_Parcel Evaluate Activity

Acquiring Agency

APP_Contact Owner

APP_Parcel visit without owner

W/ Owner?

Yes

No

APP_Parcel Visit with Owner

Owner

APP_Visit Parcel without Owner

Appraiser

APP_Evaluate Parcel

Appraiser

APP_Parcel Visit with Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit without Owner

(W/ Owner?)

No

Yes

APP_Parcel visit without owner

(W/ Owner?)

No

Yes

APP_Parcel Visit without Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit with Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit with Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit with Owner

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(W/ Owner?)

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Yes

APP_Parcel Visit with Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit with Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit with Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit with Owner

(W/ Owner?)

No

Yes

APP_Parcel Visit with Owner

(W/ Owner?)

Yes

No
Diagram: APP_Waiver Activity

Acquisition Agency (GLOBAL)

APP_Waiver of Regulations ($10K or $25K)

No

APP_Low Value Appraisal

APP_Appraisal Report

APP_Minimum Payment Method

APP_Waiver of Regulations ($10K or $25K)

(from APP_Use Case Model Package)

<<implement>>

«precedes»

«precedes»

<<implement>>

<<implement>>

APP_Waiver Activity
Diagram: Component Model - Appraisal

Diagram shows the component model for appraisal processes, including components such as Appraisal Report, Appraiser Certificate, Speciality Report, Parcel Evaluation and Inspection, Appraisal/Valuation, Review Appraisal Certificate, and Appraisal_Reviewer. The model also includes other components like Appraiser, Parcel Status, Utilities, and Appraiser Contract. The flows and interactions between these components are represented in the diagram.
Diagram: APP_Appraisal Process Component Model

Component Model Package - Overall ROW::Parcels

Appraiser Certificate «flow»

Parcel Evaluation and Inspection «flow»

APP_Component Model Package::Appraiser

Appraisal Report

Speciality Report

Appraisal/Valuation
Diagram: APP_Appraisal Review Component Model

Component Model
Package - Overall
ROW::Parcels

«flow»

Review
Appraisal
Certificate

Appraisal_Reviewer
Diagram: PM_Business Process Diagram

Diagram: PM_Class Diagram

Diagram: PM_Component Diagram
Diagram: PM_Use Case Diagram

pkg PM_Use Case Model Package

+ Appraisal_System
+ PM_Pre-Construction Package
+ PM_During_Construction Package
+ PM_Post-Construction Package
+ PM_HazMat_Mitigation
+ PM_Rodent_Control
+ PM_Securit_Inspection

Diagram: APP_Appraisal

composite structure APP_Appraisal

Acquisition Agency(GLOBAL) (from APP_Business Process Model Package)

APP_Appraisal (from APP_Business Process Model Package)

<<implement>>

APP_Use Case Model Package

+ ACQ_Acquisition
+ APP_Geosaptial Enablement: Parcel, Right Of Way
+ APP_Initial Review
+ APP_Assign Appraiser
+ APP_Contract Appraiser
+ APP_Donation
+ APP_Waiver
+ APP_Appraisal Process
+ APP_Appraisal Review
+ APP_Appraiser Certificate
+ APP_Establish Just Compensation

(from Appraisal Model Package)
Diagram: PM_Business Process Model

**Class PM_Business Process Model**

- **PM_Acquired Property**
- **PM_Pre-Construction Property Management**
  - Parameter name: Integer
  - **PM_Hazardous Material Mitigation**
  - **PM_Rodent Control**
  - **PM_Security Inspection**
- **PM_During Construction Property Management**
  - **PM_Contract**
  - **PM_Grading - GEOSPATIAL ENABLEMENT**
- **PM_During Construction Property Management**
- **PM_Post-Construction Property Management**
  - **PM_Excess Disposal**
  - **PM_Excess Property Sale**
  - **PM_ROW Relinquishment**
  - **PM_State Property Sales**
  - **PM_Excess Management**
  - **PM_ROW Leasing**
  - **PM_ROW Management**
  - **PM_Access Disposal**
  - **PM_Access Management**
  - **PM_Airspace Management**

**PM_Pre-Construction Package**
- **Appraiser**
- **PM_HazMat Mitigation**
- **PM_Personal Property Clearance - GEOSPATIAL ENABLEMENT**
- **PM_Personal Property Retention**
- **PM_Acquired Property**
- **PM_Parcel Requirement Type - GEOSPATIAL ENABLEMENT**
- **PM_Contract**
- **PM_Rodent Control**
- **PM_Clearance Demolition**
- **PM_Maintenance**
- **PM_Rental**
- **PM_Improvements and Personal Property Sale**
- **PM_Justification**
- **PM_Improvement Owner Retention**
- **PM_Security Inspection**

**PM_Post-Construction Package**
- **PM_Excess Disposal**
- **PM_Excess Property Sale**
- **PM_ROW Relinquishment**
- **PM_State Property Sales**
- **PM_Excess Management**
- **PM_ROW Leasing**
- **PM_ROW Management**
- **PM_Access Disposal**
- **PM_Access Management**
- **PM_Airspace Management**

**PM_During Construction Package**
- **PM_Contract**
- **PM_Grading - GEOSPATIAL ENABLEMENT**

(from PM_Use Case Model Package)

(from PM_Use Case Model Package)
Diagram: PM_Contract Activity

Link to Contract Activity under Improvement Disposition

Diagram: PM_During Construction Activity

Geospatial Data.

PM_Contract \[\rightarrow\] PM_Grading \[\rightarrow\] PM_ROW Database

<<implement>>

PM_Contract

PM_Grading - GEOSPATIAL ENABLEMENT

(from PM_During_Construction Package)

(from PM_During_Construction Package)
Diagram: PM_Improvement Disposition Activity

PM_Contract

State Specific Use?

PM_Sale

PM_Justification

PM_Clearance/ Demolition:
PM_Clearance - GEOSPATIAL ENABLEMENT

PM_Owner Retention

PM_Improvement

PM_Improvements

and Personal Property Sale

PM_Clearance

Demolition

Apraisal_System

Parcel Database

Appraisal_System (from PM_Use Case Model Package)

PM_Contract (from PM_Pre-Construction Package)

PM_Improvement Disposition Activity (from PM_Pre-Construction Package)

PM_Clearance Demolition (from PM_Pre-Construction Package)

State (Global)

PM_Personnel (Global)

Appraisal System

(state Business Process Model Package - Overall ROW)

Parcel Database

Yes

No

<<implement>>

<<implement>>

<<implement>>

<<implement>>

«extend»

«extend»

«extend»

Yes

No
Diagram: PM_Post-Construction Activity
Diagram: PM_Pre-Construction Activity

PM_Requirement Type -> Parcel Database -> Geospatial Parcel Layer

(Property Disposition?)

PM_Personal Property

(Property Disposition?)

PM_Rental

PM_Improvement Disposition

APP_Appraisal

<<implement>>

PM_Parcel Requirement Type - GEOSPATIAL ENABLEMENT

(from PM_Pre-Construction Package)

(from Business Process Model Package - Overall ROW)

(from Business Process Model Package - Overall ROW)
Diagram: PM_ROW Disposal Activity

act PM_ROW Disposal Activity

PM_ROW Disposal Justification - GEOSPATIAL ENABLEMENT

PM_ROW Relinquishment (turnbacks)
PM_ROW Leasing
PM_Access Disposal
PM_Excess Disposal

PM_ROW Relinquishment (from PM_Post-Construction Package)
PM_ROW Leasing (from PM_Post-Construction Package)
PM_Access Disposal (from PM_Post-Construction Package)
PM_Excess Disposal (from PM_Post-Construction Package)

Approval

FHWA personnel
Disposition Committee

GeoSpatial Data.

FHWA

Appraisal System

<<implement>>

<<implement>>

<<implement>>

<<implement>>

(from Business Process Model Package - Overall ROW)
Diagram: PM_Pre-Construction Class Model

- **PM_Pre-Construction Class Model**
  - Area_Parcel_in_ROW: int
  - Parcel_ID: int
  - Parcel_Requirement_Type: char
  - Project_ID: int

- **PM_Requirement_Type**
  - Parcel_ID: int
  - Project_ID: int
  - Parcel_Requirement_Type: char

- **PM_Improvement_Disposition_Contract**
  - Contact: Document
  - Contract_Agency: char
  - Contract_Date: Date
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int

- **PM_Owner_Retention**
  - Basis_of_retention_value: Document
  - Code_review_(moving_structures): boolean
  - List_of_improvements: char
  - Parcel_ID: int
  - Project_ID: int
  - Retention_Value: double

- **PM_Property_Sale**
  - Cadaster: Geospatial_Reference
  - Intent_to_Dispose_of_Property: Document
  - Inventory_ID: int
  - Parcel_ID: int
  - Plan_of_RoW_to_be_disposed: char
  - Project_ID: int
  - Project_Parcel_ID: int
  - Remainder_or_uneconomic_remnant: boolean
  - Sales_Price: double
  - Status_of_parcel: desirability_for_parks_recreations_etc: char
  - Type_of_disposition: char

- **PM_Sale_Of_Improvements**
  - Date_of_sale_advertisement: Date
  - Date_Of_vacation_by_occupant: Date
  - Improvement_ID: int
  - Improvement_Sold: boolean
  - Parcel_ID: int
  - Performance_Bond_From_Purchaser: Document
  - Project_ID: int
  - Sale_Price: double

- **PM_Clearance/Demolition**
  - Clearance_Status: char
  - Clearance_Type: char
  - Clearance_Level: char
  - Cost_of_Clearance: char
  - Contract_for_RoW_Clearance: Document
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int

- **PM_Property_Rental**
  - Cadaster: Geospatial_Reference
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Remainder_or_uneconomic_remnant: boolean
  - Rental_Agreement: Document
  - Sales_Price: double
  - Type_of_rental: char

- **PM_Lease_Agreement**
  - Date_License: Date
  - Lease_Agreement: Document
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Personal_liability_Insurance: Document
  - Tenant_ID: int
  - Term_of_Lease: int

- **PM_Maintenance_Agreement**
  - Age_&_condition_of_structure: char
  - Cost_of_agreement: double
  - Description_of_level_of_maintenance: char
  - Level_of_maintenance: char
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Tenant_ID: int
  - Term_of_Lease: int

- **PM_Tenant_Selection**
  - Agreement_to_terms_and_conditions: boolean
  - Credit_Check: int
  - Financial_Statement: Document
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Tenant_ID: int
  - Tenant_Name: char

- **PM_Interim_Tenant**
  - Name_Interim_Tenant: char
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Social_Security_Number/Tax_ID: int

- **PM_Property_Rental**
  - Cadaster: Geospatial_Reference
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Remainder_or_uneconomic_remnant: boolean
  - Rental_Agreement: Document
  - Sales_Price: double
  - Type_of_rental: char
Diagram: PM_HazMat Mitigation

Diagram: PM_Rodent Control
Diagram: PM_Security Inspection

Diagram: PM_During_Construction Class Model
Diagram: PM_Use Case Model

**PM_Pre-Construction Package**
- Appraiser
- PM_HazMat Mitigation
- PM_Personal Property Clearance - GEOSPATIAL ENABLEMENT
- PM_Personal Property Retention
- PM_Acquired Property
- PM_Parcel Requirement Type - GEOSPATIAL ENABLEMENT
- PM_Contract
- PM_Rodent Control
- PM_Clearance Demolition
- PM_Maintenance
- PM_Rental
- PM_Improvements and Personal Property Sale
- PM_Justification
- PM_Improvement Owner Retention
- PM_Security Inspection

**PM_During_Construction Package**
- PM_Contract
- PM_Grading - GEOSPATIAL ENABLEMENT

**PM_Post-Construction Package**
- PM_Excess Disposal
- PM_Excess Property Sale
- PM_ROW Relinquishment
- PM_State Property Sales
- PM_Excess Management
- PM_ROW Leasing
- PM_ROW Management
- PM_Access Disposal
- PM_Access Management
- PM_Airspace Management
Diagram: Clearance/ Demolition - GEOSPATIAL ENABLEMENT

Diagram: Competitive Proposals
Diagram: Contractor Pre-qualification

Diagram: HazMat Mitigation
Diagram: Improvement Owner Retention

Diagram: Improvements and Personal Property Sale
Diagram: Noncompetitive Proposals

Non-Competitive Proposals (Checkbox) → Contracting Firm

input() → proposal

get() → establishment

establish() → Contract

Contract Screen
Diagram: Personal Property Retention

Pre-Construction Screen

Personal Property List

Retention (Checkbox/Justification)
Diagram: PM_Contract Use Case Model

PM_Competitive Proposals

PM_Noncompetitive Proposals

PM_Small Purchase Procedures

PM_Sealed Bids

PM_Contractor Pre-qualification

PM_Proposal Selection

PM_Contract Administration

«precedes»

«precedes»

«precedes»

«precedes»

«precedes»

«precedes»
Diagram: PM_Pre-Construction Use Case Model
Diagram: Rental

Diagram: Rodent Control
Diagram: Sealed Bids
Diagram: Security Inspection
Diagram: PM_During Construction Use Case Model

uc PM_During Construction Use Case Mo...

PM_Grading
- GEOSPATIAL ENABLEMENT

PM_Contract

PM_HazMat_Mitigation
(from PM_Use Case Model Package)

PM_Rodent_Control
(from PM_Use Case Model Package)

PM_Securit_Inspection
(from PM_Use Case Model Package)
Diagram: Justification - GEOSPATIAL ENABLEMENT

Diagram: PM_Post-Construction Use Case Model
Diagram: ROW Relinquishment

Row Relinquishment Screen

Assign Authority (Process Forms)

Agency Details

Document Management System

Agency involvement()

Term of lease()

Diagram: State Property Sales

Excess Property Sale

Excess Property Details

State

Sale
Diagram: PM_Pre-Construction Component Model

- PM_Clearance_Demolition
- PM_Sale
- PM_Interim_Tenant
- PM_Improvement_Disposition_Contract
- Component Model Package - Overall ROW::Parcels
- PM_Lease_Agreement

Diagram: PM_During_Construction Component Model

- PM_During_Construction Component Model
- PM_Grading
Diagram: PM_Post-Construction Component Model

- PM_Excess_Property_Disposition
- PM_Airspace_Related_Activities
- PM_New_Access_Points
- PM_Access_Changes
- Project Closing::Excess

PM_Component Model
Package::
PM_Inventory_Management
Diagram: REL_Business Process Diagram

Diagram: REL_Class Diagram

Diagram: REL_Component Diagram

Diagram: REL_Use Case Diagram
Diagram: REL_Business Process Model

class REL_Business Process Model

- REL_Relocation Planning
  - REL_Displaced Persons eligibility for services
  - REL_Geospatial Enablement - Parcel for Relocation
  - REL_Notices
  - REL_Open Site Office
  - REL_Update Distribution Statuses

- REL_Relocation Services
  - REL_Available Properties for Sale and Lease, Community Amenities
  - REL_Determination of Occupant Needs
  - REL_Explanation of Services and Available Payments and Eligibility Requirements
  - REL_Link to MLS (External Real Estate System)
  - REL_Personal Interview
  - REL_Provide advisory assistance (Assistance with claim forms)
  - REL_Replacement Dwelling Assignment

- REL_Relocation Assistance Payments
  - REL_Moving Expense Process
  - REL_Claim and Tax-Form Process
  - REL_Replacement Housing Payment

- Displacing Agency
- Relocation Agent

relations:
- «precedes»
- «invokes»
- «implies»
- «trace»
- «implement»
Diagram: REL_Check for the eligibility for Replacement Housing Payment (RHP) Activity

- Non-Residential Relocation?
  - Yes
  - No
- Mobile Home?
  - Yes
  - No
- Status of Mobile Home decided?
  - Yes
  - No
- REL_State-Specific
- REL_State-Specific
- REL_Coordinate with Acquisition
- REL_Coordinate with Acquisition
- Displacing Agency
  - (from REL_Use Case Model Package)
Diagram: REL_Check on the Displaced Persons eligibility for services Activity

Persons occupying real property to be acquired?

Persons occupying adjacent property?

Persons moving because of Non-Residential property acquisition?

Occupants renting DOT owned property prior to construction?

REL_Start Relocation Services

REL_Relocation Assistance Payment Process
Diagram: REL_Claim and Tax-Form Process Activity

Displacing Agency

REL_Claim and Tax-Related Form Processing

Check for the Eligibility for Assistance Payments?

Yes

REL_No Action

No

Displacing Agency

<<implement>>

REL_Claim and Tax-Related Form Processing

(from REL_Use Case Model Package)

(from REL_Relocation Assistance Payments)
Diagram: REL_Determination of Status of Mobile Home Activity

Displacing Agency

REL_Realty vs. Personality

REL_Mobile Home vs. Site

REL_Owner vs. Tenant

<<implement>>
Diagram: REL_Mobile Home Relocation Payment Activity

- REL_Determination of Status of Mobile Home
  - Owner in Mobile Home
  - Owner Not Occupant of Mobile Home
  - Tenant in Mobile Home

- REL_Determine Moving Expense Type
  - Displacing Agency

- REL_Moving Expense Payment
  - REL_Determination of Status of Mobile Home
    - Relocation Assistance Payments
      - «precedes»
  - REL_Determine Moving Expense Type
    - Relocation Assistance Payments
      - «precedes»
  - REL_Moving Expense Payment
    - Relocation Assistance Payments
Diagram: REL_Moving Expense Payments for Residential (not mobile home) Relocation Activity
Diagram: REL_Moving Expense Process Activity

1. Displacing Agency
2. Eligible for Moving Expense?
   - Yes: Fixed Residence Relocation?
     - Yes: REL_Moving Expense Payments for Residential (not mobile home) Relocation
     - No: REL_Moving Expense for Non-Residential Relocation
   - No: REL_Moving Expense Payment for Mobile Home Relocation
3. Non-Residential Relocation?
   - Yes: REL_Start Replacement Housing Payment Process
     - No: REL_Moving Expense for Non-Residential Relocation

Notes:
- <<implement>>
- (from REL_Use Case Model Package)
- (from REL_Relocation Assistance Payments)
Diagram: REL_Relocation Assistance Payments Activity

act REL_Relocation Assistance Payments Activ...

Displacing Agency

REL_Moving Expense Process

REL_Replacement Housing Payment Process

REL_Claim and Tax-Form Process

REL_Moving Expense Process

REL_Replacement Housing Payment

REL_Claim and Tax-Form Process

Displacing Agency

(from REL_Relocation Assistance Payments)

«precedes»

«precedes»

«precedes»
Diagram: REL Replacement Dwelling Assignment Activity

1. Displaced Person
2. Displacing Agency
3. 1st DSS Inspection Report
4. 2nd DSS Inspection Report
5. REL Decent, Safe, Sanitary (DSS) Inspection
6. REL Update Candidate Parcel Inventory for Displaced Persons
7. REL Replacement Dwelling Referring
8. REL DSS Inspection Result Notification
9. REL Update Parcel Inventories - Referred Replacement Dwelling Assigned, Referred Replacement Dwelling Accepted
10. REL Update Parcel Inventories - Referred Replacement Dwelling Not Assigned, Referred Replacement Dwelling Not Accepted
11. REL Decent, Safe, Sanitary (DSS) Inspection
12. REL Update Candidate Parcel Inventory for Displaced Persons
13. REL Start Relocation Assistance Payment Process
14. Inventory of Parcels with Displaced Persons
15. No
16. Yes
Diagram: REL_Use Case Model

uc REL_Use Case Model

Displacing Agency

Relocation Agent

REL_Relocation Planning

- REL_Displaced Persons eligibility for services
- REL_Geospatial Enablement - Parcel for Relocation
- REL_Notices
- REL_Open Site Office
- REL_Update Distribution Statuses

REL_Relocation Services

- REL_Available Properties for Sale and Lease, Community Amenities
- REL_Determination of Occupant Needs
- REL_Determine Eligibility for Each Type of Payments
- REL_Explanation of Services and Available Payments and Eligibility Requirements
- REL_Last Resort Housing Planning
- REL_Link to MLS (External Real Estate System)
- REL_Personal Interview
- REL_Provide advisory assistance (Assistance with claim forms)
- REL_Replacement Dwelling Assignment

REL_Relocation Assistance Payments

- REL_Moving Expense Process
- REL_Claim and Tax-Form Process
- REL_Replacement Housing Payment
Diagram: REL_Notices Model

Diagram: REL_Open Site Office
Diagram: REL_Open Site Office

Sequence Diagram: REL_Relocation Planning Elements: REL_Site_Office

1: Site_Office_Requirement()
   1.1: do/update()
   1.2: invoke()

2: update()

Class Model Model Package - Overall ROW: ROW_Parcel_Status

Diagram: REL_Relocation Planning Use Case Model

Relocation Agent
(from REL_Use Case Model Package)

Displacing Agency
(from REL_Use Case Model Package)

REL_Geospatial Enablement - Parcel for Relocation

REL_Notices

REL_Open Site Office

REL_Update Distribution Status(es)

REL_Displaced Persons eligibility for services

«precedes»

«precedes»

«precedes»
Diagram: Update Distribution Status(es) In the Inventory of Parcels with Displaced Persons

Diagram: Provide advisory assistance (Assistance with claim forms)
Diagram: 2nd DSS Inspection

Displacing Agency

Replacement Dwelling Screen

confirm()

(from REL_Use Case Model Package)

Diagram: Decent, Safe, Sanitary (DSS) Inspection

Displacing Agency

Replacement Dwelling Screen

confirm()

(from REL_Use Case Model Package)
Diagram: Displacing Dwelling Referring

Diagram: DSS Inspection Result Notification
Diagram: Explanation of Services and Available Payments and Eligibility Requirements

Diagram: Geospatial Enablement - Available Properties for Sale and Lease, Community Amenities
Diagram: REL_Relocation Services Use Case Model

- Displacing Agency
  (from REL_Use Case Model Package)
- Relocation Agent
  (from REL_Use Case Model Package)
- REL_Explanation of Services and Available Payments and Eligibility Requirements
- REL_Determination of Occupant Needs
- REL_Determine Eligibility for Each Type of Payments
- REL_Personal Interview
- REL_Link to MLS (External Real Estate System)
- REL_Provide advisory assistance (Assistance with claim forms)
- REL_Available Properties for Sale and Lease, Community Amenities
- REL_Replacement Dwelling Assignment
- REL_Last Resort Housing Planning
Diagram: Update Candidate Parcel Inventory for Displaced Persons

(from REL_Use Case Model Package)
Diagram: Update Parcel Inventories - Referred Replacement Dwelling Assigned, Referred Replacement Dwelling Accepted

Diagram: Update Parcel Inventories - Referred Replacement Dwelling Not Assigned, Referred Replacement Dwelling Not Accepted
Diagram: Actual Cost Move Payment with Commercial Mover

(from REL_Use Case Model Package)
Diagram: Alternate Actual Payment (If required) : Establish direct loss of tangible personal property

Diagram: Calculate Self-Documented Actual Cost Move Payment
Diagram: Calculation of RHP

Diagram: Check for the eligibility for Replacement Housing Payment (RHP)
Diagram: Claim and Tax-Related Form Process

Diagram: Computation of Replacement Housing Payments
Diagram: Decision on type of RHP

Diagram: Determination of Status of Mobile Home
Diagram: Determine Moving Expense Type

Diagram: Downpayment Assistance
Diagram: Fixed in-lieu Payment Calculation

- Displacing Agency
- Moving Expense for Non-Residential Relocation Screen
- Fixed in-lieu payment
- Turbo Relocation

calculate()

Diagram: Mobile Home vs. Site

- Displacing Agency
- Mobile Home Status Screen
- State
- Mobile Home Status (Mobile Home vs. Site)

get Status()

(from REL_Use Case Model Package)
Diagram: Moving Expense Payment

(from REL_Use Case Model Package)
Diagram: Moving Expense Payment for Mobile Home Relocation

uc Moving Expense Payment for Mobile Home Relocation

Displacing Agency
(from REL_Use Case Model Package)

- REL_Determination of Status of Mobile Home
  «precedes»

- REL_Determine Moving Expense Type
  «precedes»

- REL_Moving Expense Payment
Diagram: Moving Expense Payment using Schedule Method

Diagram: Moving Expense Payments for Residential (not mobile home) Relocation
Diagram: Moving Expense Process

Displacing Agency
(from REL Use Case Model Package)

REL_Moving Expense for Non-Residential Relocation

REL_Moving Expense Payment for Mobile Home Relocation

REL_Moving Expense Payments for Residential (not mobile home) Relocation
Diagram: Owner vs. Tenant

Displacing Agency

Mobile Home Status Screen

State

= Mobile Home Status (Owner vs. Tenant)

Get Status()

Confirm()

(from REL_Use Case Model Package)

Diagram: Purchase Supplement

Displacing Agency

RHP (at least 180 days owner) Calculation Screen

Calculate()

Purchase Supplement

 Turbo Relocation

(from REL_Use Case Model Package)
Diagram: Realty vs. Personalty

(from REL_Use Case Model Package)

Diagram: Reestablishment Expense Payment calculation

(from REL_Use Case Model Package)
Diagram: REL_Relocation Assistance Payments Use Case Model

Diagram: Rental Assistance Payment
Diagram: Rental Assistance Payment

Diagram: Replacement Housing of Last Resort (HLR)
Diagram: Replacement Housing Payment

(from REL_Use Case Model Package)

Diagram: Replacement Housing Payment Process

(from REL_Use Case Model Package)
Diagram: Respond to appeal

Diagram: Review of Special Circumstances
Diagram: RHP with Home Owner for 90-179-days or Tenants for at Least 90 Days

Diagram: RHP with Home Owner for at Least 180 Days
Diagram: RHP with Occupant less than 90 days

(from REL_Use Case Model Package)

Diagram: Self-Documented Actual Cost Move Payment

(from REL_Use Case Model Package)
Diagram: Tax-Form Process

Displacing Agency

(From REL_Use Case Model Package)

Diagram: REL_Class Model

REL_Relocation Planning Elements
- REL_Additional Relocation Information
- REL_Notices
- REL_Relocation_Planning_Information
- REL_Site_Office

REL_Relocation Services Elements
- REL_Advisory Services
- REL_Advisory_Services_Eligibility
- REL_Decent, Safe, Sanitary (DSS) Inspection
- REL_Housing of Last Resort
- REL_Replacement_Dwelling_Assignment
- REL_Residential Replacement Housing Determination
- REL_Services_Initiative

REL_Relocation Assistance Payments Elements
- REL_Claim and Tax Related Processing
- REL_Moving Expense Process Elements
- REL_Replacement Housing Payment Process Elements

REL_Parcel for Relocation
- Date_of_Move_of_Displaced_Person: Date
- Displacement_Dwelling_Parcel_ID: int
- Notices: REL_Relocation Services Class Model
- Parcel_ID: int
- Project_ID: int
- Project_Parcel_ID: int
- Relocation_Indicator_P: char
- Relocation_Indicator_S: char

REL_Displacing Agency
- Agency_ID: int
- Project_ID: int
Diagram: REL_Relocation Planning Class Model

class REL_Relocation Planning Class Model

- Hours of operation: char
- Location (point): Geospatial Reference
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
+ Relocation_Agent_ID: int
  # Site.Office Requirement: char
- Status_Site.Office_Establishment: Flag

REL_Site.Office

+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Relocation_Planning_Information_Availability: boolean

REL_Relocation_Planning_Information

+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Relocation_Planning_Information_Availability: boolean

REL_Notices

- 90 day Notice (with 30 day specific notice distributed)?: boolean
- Additional Information (if applicable): char
- Date_General Information Notice: Date
- Date_of_initiation_of_negotiations: Date
- Date_of locating at least one replacement dwelling: Date
- Date_of issuing notice: Date
- Date_Notice of Relocation Eligibility: Date
- General Information Notice Distributed?: boolean
- Information about advisory services: boolean
- Instructions about moving: boolean
- Language of notices: char
- Notice of Intent to Acquire distributed?: boolean
- Notice of Relocation Eligibility Distributed?: boolean
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Relocation payments description: boolean
  # Status_REL_Notice Distribution: Flag
- Vacate property before Negotiations?: boolean

REL_Additional Relocation information

- Basis for determination: char
- Denial_of_relocation_benefits_impacts_adversely_any_family_member: boolean
- Denial_of_relocation_benefits_impacts_adversely_the_continued_existence_of_family_unit: boolean
- Denial_of_relocation_benefits_impacts_adversely_the_health_or_safety_of_family_member: boolean
- Description of the comparable dwelling: char
- Each family member, either citizen or national of the US or legal alien in the US: boolean
- In case of incorporated business, farm, or nonprofit organization, corporation is authorized: boolean
- Individual, either citizen or national of the US or legal alien in the US: boolean
- Location: char
- Owner of unincorporated business, farm, or nonprofit organization, either citizen or national of the US or legal alien in the US: boolean
+ Parcel_ID: int
- Price used to set upper limit of replacement housing payment: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Rent used to set upper limit of replacement housing payment: int
- Required certification: Document
Diagram: REL_Relocation Assistance Payments Class Model

class REL_Relocation Assistance Payments Class Model

 REL_Relocation Assistance Payments Class Model

 REL_Claim and Tax Related Processing

- Claim and Tax Documents: Document
- Claim Forms Processed?: boolean
- Eligible for Assistance Payments?: boolean
+ Parcel_ID: int
+ Project_ID: int
+ ProjectParcel_ID: int
- Status of Replacement Housing Payment: Flag
- Status of Processing Relocation Claim & Tax Forms: Flag
- Tax Forms Processed?: boolean

 REL_Replacement Housing Payment Process Elements

- REL_Housing of Last Resort Payment
- REL_Mobile Home - Site Only
- REL_Mobile Home Replacement Housing Payments
- REL_Replacement Housing Determination for Mobile Homes
- REL_Residential Replacement Housing Payment Determination

 REL_Moving Expense Process Elements

- REL_Fixed_Residential_Moving Expense Payments
- REL_Mobile Home
- REL_Moving Expenses for Mobile Home
+ REL_Non-Residential Moving Expense Payment

 REL_Moving Expense Process Elements

- REL_Fixed_Residential_Moving Expense Payments
- REL_Mobile Home
- REL_Moving Expenses for Mobile Home
+ REL_Non-Residential Moving Expense Payment

 REL_Fixed_Residential_Moving Expense Payments

- Chosen bid amount: int
- Commercial mover bids: char
- Fixed_Residential_Payment type (Method): char
+ Parcel_ID: int
+ Project_ID: int
+ ProjectParcel_ID: int
- Self-documented move-activities: char
- Self-documented move-hourly rate paid: int
- Self-documented move-persons performing the move: char
- Self-documented move-purchases of supplies and services: char
- Self-documented move-time spent: char
- Total payment: int

 REL_Mobile Home

- Mobile home and/or site: char
- Mobile home considered Realty or Personalty: char
+ Parcel_ID: int
+ Project_ID: int
+ ProjectParcel_ID: int
- Type of individual being relocated: char

 REL_Moving Expenses for Mobile Home

- Category of Mobile Home for Moving Expense Calculation: char
- Cost for disconnecting and reconnecting appliances: int
- Cost for insurance on mobile home: int
- Cost for moving attached appurtenances: int
- Cost for moving mobile home: int
- Cost for moving personal property: int
- Cost for packing personal property: int
- Cost for repairs to move mobile home: int
- Cost for temporary lodging for mobile home occupants: int
- Cost for transportation of mobile home: int
+ Parcel_ID: int
+ Project_ID: int
+ ProjectParcel_ID: int
- Total Moving Costs: int
Diagram: REL_Non-Residential Moving Expense Payment

class REL_Non-Residential Moving Expense Payment

<table>
<thead>
<tr>
<th>REL_Non-Residential Alternate Actual Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Appraised value of the personal property: int</td>
</tr>
<tr>
<td>- Cost of moving: int</td>
</tr>
<tr>
<td>- Cost of sale: int</td>
</tr>
<tr>
<td>+ Parcel_ID: int</td>
</tr>
<tr>
<td>+ Project_ID: int</td>
</tr>
<tr>
<td>+ ProjectParcel_ID: int</td>
</tr>
<tr>
<td>- Sale proceeds: int</td>
</tr>
<tr>
<td>- Substitute equipment-Cost of new equipment: int</td>
</tr>
<tr>
<td>- Substitute equipment-No market-Moving cost: int</td>
</tr>
<tr>
<td>- Substitute equipment-No market-Property's value for continued use: int</td>
</tr>
<tr>
<td>- Substitute equipment-Sale of old equipment: int</td>
</tr>
<tr>
<td>- Total Payment: int</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REL_Non-Residential Actual Cost Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>- &quot;Actual&quot; cost of moving: int</td>
</tr>
<tr>
<td>- Bids or estimates: int</td>
</tr>
<tr>
<td>- Cost-Management time for overseeing the move: int</td>
</tr>
<tr>
<td>- Cost incurred by business for equipment: int</td>
</tr>
<tr>
<td>- Inventory list: char</td>
</tr>
<tr>
<td>- Mover type: char</td>
</tr>
<tr>
<td>+ Parcel_ID: int</td>
</tr>
<tr>
<td>+ Project_ID: int</td>
</tr>
<tr>
<td>+ ProjectParcel_ID: int</td>
</tr>
<tr>
<td>- Rate charged by local moving firms: int</td>
</tr>
<tr>
<td>- Regular rates of pay: int</td>
</tr>
<tr>
<td>- Specifications and instructions for the move: char</td>
</tr>
<tr>
<td>- Total Payment: int</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REL_Non-Residential Fixed in-lieu Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Annual income year 1: int</td>
</tr>
<tr>
<td>- Annual income year 2: int</td>
</tr>
<tr>
<td>+ Parcel_ID: int</td>
</tr>
<tr>
<td>+ Project_ID: int</td>
</tr>
<tr>
<td>+ ProjectParcel_ID: int</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REL_Non-Residential Reestablishment Expense Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Advertising of RS-Construction &amp; installation: int</td>
</tr>
<tr>
<td>- Business-Economic activity location: boolean</td>
</tr>
<tr>
<td>- Business-Employees &gt; 500: boolean</td>
</tr>
<tr>
<td>- Costs for searching for a new site: int</td>
</tr>
<tr>
<td>- Feasibility survey, soil testing and marketing studies: int</td>
</tr>
<tr>
<td>- Fixed payment for replacement site (RS): int</td>
</tr>
<tr>
<td>- Impact fees or one-time assessments: int</td>
</tr>
<tr>
<td>- Increased cost of operation for 2 yrs: int</td>
</tr>
<tr>
<td>- Licenses, fees and permits-Not paid in moving expenses: int</td>
</tr>
<tr>
<td>- Other costs: int</td>
</tr>
<tr>
<td>+ Parcel_ID: int</td>
</tr>
<tr>
<td>+ Project_ID: int</td>
</tr>
<tr>
<td>+ ProjectParcel_ID: int</td>
</tr>
<tr>
<td>- Professional services-Purchase and Lease of RS: int</td>
</tr>
<tr>
<td>+ Project_ID: int</td>
</tr>
<tr>
<td>+ ProjectParcel_ID: int</td>
</tr>
<tr>
<td>- Re-establishment payment (&lt;$10,000): int</td>
</tr>
<tr>
<td>- Redecoration of RS-paint, paneling, etc: int</td>
</tr>
<tr>
<td>- Repairs and improvements of RS: int</td>
</tr>
<tr>
<td>- Total Payments: int</td>
</tr>
<tr>
<td>- Utilities to RS: int</td>
</tr>
</tbody>
</table>
Diagram: REL_Replacement Housing Payment Process Class Model

class REL_Residential Replacement Housing Payment Determination
  - Actual rent - Displacement dwelling: int
  - Comparable Replacement Housing Available?: boolean
  - Date of purchase or rent and occupancy of replacement dwelling: Date
  - Difference: int
  - Down payment assistance: int
  - Incidental expenses description: char
  - Income of displaced person: int
  - Insurance received: int
  - Market rent - Displacement dwelling: int
  - Mortgage interest differential: int
  - Parcel_ID: int
  - Price differential: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Replacement dwelling cost(s): int
  - Replacement dwelling ID: int
  - Replacement housing category(s): char
  - Resident type (Time of stay, ownership): char
  - Special circumstances description: char
  - Status of any Replacement Housing Payment Appeal(s): Flag
  - Total RHP: int

REL_Housing of Last Resort_Payment
- HLR_Payment_Transaction: Transaction_Document
  + Parcel_ID: int
  + Project_ID: int
  + Total Cost of HRL: int
  + Written agreement: Document

REL_Replacement Housing Determination for Mobile Homes
- Assistance type: char
- Location of replacement site: Geospatial_Reference
- Ownership or Occupancy tenure: char
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Site available: boolean
- Type of Replacement housing: Site and mobile home/Mobile Home only/ Site only: char

REL_Mobile Home - Site Only
+ Parcel_ID: int
+ Parcel_Project_ID: int
+ Project_ID: int

REL_Mobile Home Replacement Housing Payments
- Acquisition price of displaced dwelling and site: int
- Acquisition price of displaced mobile home: int
- Acquisition price of displaced mobile home site: int
- Actual cost of replacement property: int
- Cost of comparable conventional dwelling: int
- Cost of comparable mobile home: int
- Cost of comparable mobile home site: int
- Cost of comparable replacement property: int
- Cost of repairs/modifications: int
- Difference - rent - mobile home: int
- Difference - rent - mobile home site: int
- Difference - rent - mobile home purchased: int
- DS & S mobile home purchased: int
- Market price displacement MH site: int
- Market rent - Displacement mobile home site: int
- Moving cost of mobile home: int
+ Parcel_ID: int
+ Price differential offer - mobile home: int
+ Price differential offer - mobile home site: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Related expenses: int
- Rent of comparable mobile home site: int
- Replacement site: int
- Salvage trade-in value - MH: int
- Set-up charges: int
- Site improvements: int
+ Total price differential payment: int
+ Total RHP payment - MH (<$22,500): int
+ Total to purchase MH and site: int
+ Value of displaced mobile home: int
Diagram: REL_Relocation Services Class Model

### REL_Advisory_Services_Eligibility
- Eligibility category: char
- Eligibility Description: char
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int

### REL_Advisory_Services
- Agencies providing services: char
  - Application or claim forms: Document
  - Current listings: char
  - Federal & state housing programs: char
  - Other social services: char
    - Parcel_ID: int
    - Project_ID: int
    - Project_Parcel_ID: int
  - Relocation agent ID: int
  - Status: Advisory service(s) provided: boolean
  - Transportation services: char

### REL_Replacement_Dwelling_Assignment
- DSS Inspection 2: REL_Decent, Safe, Sanitary (DSS) Inspection
  - DSS Inspection 1: REL_Decent, Safe, Sanitary (DSS) Inspection
  - DSS_Inspection_Result_Notification: boolean
  - DSS_Inspection_Report 2: Document
    - First_DSS_Report: Document
      - Parcel_ID: int
      - Project_ID: int
      - Project_Parcel_ID: int
      - Replacement_Dwelling_Selected?: boolean
      - Status_Of_DSS_Inspection I: Flag
      - Status_Of_DSS_Inspection II: Flag

### REL_Decent, Safe, Sanitary (DSS) Inspection
- ADA Accessible: boolean
  - Adequate in size: boolean
  - Bathroom: boolean
  - DSS Inspection: Document
  - DSS_Inspection_Complete: boolean
  - Electrical System: boolean
  - Heating System: boolean
  - Kitchen: boolean
  - Local housing/occupancy code compliance: boolean
    - Parcel_ID: int
    - Parcel_Project_ID: int
    - Potable Water: boolean
    - Project_ID: int
    - Replacement dwelling ID: int
    - Structurally sound: boolean

### REL_Services_Initiative
- Eligibility for Each Type of Payments Determined: boolean
- Information_made_Available (Services, Available Payments and Eligibility Requirements): char
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Status: Personal Interview: boolean
  - Status_Determination_of_Occupant_Needs: Flag

### REL_Residential Replacement Housing Determination
- Access to employment: char
- Access to public & commercial facilities: char
- Adverse environmental conditions: boolean
- Comparable Dwelling Notification: Document
  - Currently available: boolean
  - Location of replacement dwelling: Geospatial_Reference
    - Number of comparable dwellings offered: int
    - Other needs: char
      - Parcel_ID: int
      - Physical condition of replacement dwelling: char
        - Project_ID: int
        - Project_Parcel_ID: int
        - Replacement dwelling ID: int
        - Size of replacement dwelling: char
        - Typical residential site: boolean
        - Utility and cost of replacement dwelling: char

### REL_Housing of Last Resort
- Assignment of Last Resort Housing: char
- Housing of Last Resort Applicable?: boolean
- Method for providing housing of last resort: char
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
  - Reason for Housing of Last Resort: char
Diagram: REL_Relocation Assistance Payments Component Model

REL_Moving Expense Process Components
+ Fixed_Residential_Moving_Expense
+ Mobile Home
+ Non-Residential Actual Cost

REL_Replacement Housing Payment Process Components
+ Mobile Home - Site Only
+ Payments

Diagram: REL_Moving Expense Process Component Model

Fixed_Residential_Moving_Expense

REL_Fixed_Residential_Moving_Expense_Payments

REL_Component Model Package::Displacing_Agency

Mobile Home

REL_Moving Expense Payment for Mobile Home Relocation

REL_Replacement Housing Payment Process Components::Payments

REL_Non-Residential Actual Cost Payment, REL_Non-Residential Alternate Actual Payment
Diagram: Use Case Model Package - Overall ROW

Actors
+ Agency Actors
+ Human Actors

Project Development Package
+ Encumber Funds
+ Geospatial Enablement
+ Identification of Parcel Type
+ Initial Planning
+ Parcel Identification & Cost Estimation
+ Project Agreement
+ Project Authorization
+ Project Establishment
+ Protective Buying
+ ROW Mapping and Engineering
+ Staff Identification
+ Title Documents
+ Utility Relocation and Management

Project Closing Package
+ Geospatial Enablement-Update Excess to Inventory
+ Review Project Plans
+ Accumulate and Store Records
+ Status Report
+ ROW Certification
+ State defined Processes
+ Final Claims
+ Close Accounting
+ Re-open if necessary
+ Encroachment clearing
+ Excess Property
+ Construction

Major ROW Functions Package
+ Corridor Management
+ Appraisal (APP)
+ Acquisition (ACQ)
+ Relocation (REL)
+ Property Management (PM)
+ Payment
Diagram: Acquisition Use Case Model

Diagram: Appraisal Use Case Model
Diagram: Major ROW Functions Use Case Model

UC Major ROW Functions Use Case Model

Corridor Management

- Appraisal (APP)
- Acquisition (ACQ)
- Relocation (REL)

Property Management (PM)

- Payment

Diagram: Property Management Use Case Model

UC Property Management Use Case Model

PM_Pre-Construction Package

- Appraiser
- PM_HazMat Mitigation
- PM_Personal Property Clearance - GEOSPATIAL ENABLEMENT
- PM_Personal Property Retention
- PM_Acquired Property
- PM_Parcel Requirement Type - GEOSPATIAL ENABLEMENT
- PM_Contract
- PM_Rodent Control
- PM_Clearance Demolition
- PM_Maintenance
- PM_Rental
- PM_Improvements and Personal Property Sale
- PM_Justification
- PM_Improvement Owner Retention
- PM_Security Inspection

(from PM_Use Case Model Package)

PM_During_Construction Package

- PM_Contract
- PM_Grading - GEOSPATIAL ENABLEMENT

(from PM_Use Case Model Package)

PM_Post-Construction Package

- PM_Excess Disposal
- PM_Excess Property Sale
- PM_Row Relinquishment
- PM_State Property Sales
- PM_Improvement Management
- PM_ROW Leasing
- PM_ROW Management
- PM_Access Disposal
- PM_Access Management
- PM_Airspace Management

(from PM_Use Case Model Package)
Diagram: Relocation Use Case Model

- **Relocation Agent**
  - REL_Relocation Planning
    - REL_Displaced Persons eligibility for services
    - REL_Geospatial Enablement - Parcel for Relocation
    - REL_Notices
    - REL_Open Site Office
    - REL_Update Distribution Statuses
  - REL_Relocation Services
    - REL_Available Properties for Sale and Lease, Community Amenities
    - REL_Determination of Occupant Needs
    - REL_Determine Eligibility for Each Type of Payments
    - REL_Exploration of Services and Available Payments and Eligibility Requirements
    - REL_Last Resort Housing Planning
    - REL_Link to MLS (External Real Estate System)
    - REL_Personal Interview
    - REL_Provide advisory assistance (Assistance with claim forms)
    - REL_Replacement Dwelling Assignment
  - REL_Relocation Assistance Payments
    - REL_Moving Expense Process
    - REL_Claim and Tax-Form Process
    - REL_Replacement Housing Payment

- **Displacing Agency**
  - REL_Relocation Planning
    - REL_Displaced Persons eligibility for services
    - REL_Geospatial Enablement - Parcel for Relocation
    - REL_Notices
    - REL_Open Site Office
    - REL_Update Distribution Statuses
  - REL_Relocation Services
    - REL_Available Properties for Sale and Lease, Community Amenities
    - REL_Determination of Occupant Needs
    - REL_Determine Eligibility for Each Type of Payments
    - REL_Exploration of Services and Available Payments and Eligibility Requirements
    - REL_Last Resort Housing Planning
    - REL_Link to MLS (External Real Estate System)
    - REL_Personal Interview
    - REL_Provide advisory assistance (Assistance with claim forms)
    - REL_Replacement Dwelling Assignment
  - REL_Relocation Assistance Payments
    - REL_Moving Expense Process
    - REL_Claim and Tax-Form Process
    - REL_Replacement Housing Payment

Diagram: Acquisition cost estimation

- **Alignment Selection**
  - Parcel
    - External Systems (Real Estate)
      - Acquisition Cost Estimate

Communication Diagram: Acquisition cost estimation
Diagram: Acquisition cost estimation

Sequence Diagram:
Acquisition cost estimation

Diagram: Alignment Selection

Sequence Diagram:
Alignment Selection
Diagram: Alignment Selection

Project Details

GIS Warehouse

Geographical Information System (or Perform Geospatial Analysis)

Alignment Selection

Potential Corridor for new road

Project Development Package:
Alignment Selection
Diagram: Encumber Funds

Sequence Diagram:
Encumber Funds
Diagram: Encumber Funds

Communication Diagram:  
Encumber Funds
Diagram: Environmental study

External Environmental System

Identified Parcels for the Project

Geographical Information System (or
Geospatial Analysis)

Document Management System

Communication Diagram: Environmental study
Diagram: Environmental study

Sequence Diagram:
Environmental study

1.1: input()
1.2: output()
2: input()
Diagram: Final Alignment Selection

1.1: output()

Sequence Diagram: Final Alignment Selection
Diagram: Final Alignment Selection

Communication Diagram: Final Alignment Selection
Diagram: GEOSPATIAL ENABLEMENT

Geographical Information System (or Perform Geospatial Analysis)

update(Parcel Type)

save()

Communication Diagram:
GEOSPATIAL ENABLEMENT
Diagram: GEOSPATIAL ENABLEMENT

Sequence Diagram:
GEOSPATIAL ENABLEMENT
Diagram: Hazmat site evaluation

1: Send(Hazardous Waste Sites)

1.1: Calculate()

2: input()

Geographical Information System (or Perform Geospatial Analysis)

Financial Information System

Cleanup Cost

Sequence Diagram: Hazardous waste site evaluation
Diagram: Hazmat site evaluation

Communication Diagram:
Hazmat site evaluation
Diagram: Identification of Environmental impacts

1.1: Analyze()

Geographical Information System (or Perform Geospatial Analysis)

2: Input()

External Environmental System

3: input()

Identified Parcels for the Project

Document Management System

Sequence Diagram:
Identification of Environmental impacts
Diagram: Identification of Environmental impacts

Diagram: Initial Planning Use Case Model
Diagram: Initiate Contracts

State

1.1: approve()

Contract_Personnel

1.2: assign() -> Responsibility

2.1: establish()

Sequence diagram: Initiate Contracts
Diagram: Parcel Alignment Inspection

Communication Diagram:
Parcel Alignment Inspection
Diagram: Parcel Alignment Inspection

Sequence Diagram:
Parcel Alignment Inspection

1: inspect(analyze)
1.1: perform()
1.2: update(findings, if any)
Diagram: Parcel identification

1: extract() → Parcel

1.1: send() → Identified Parcels for the Project

1.2: output() → Geographical Information System (or Perform Geospatial Analysis)

2: send() → Alignment Selection

3: input() → External Systems (Real Estate)

Sequence Diagram:
Parcel identification
Diagram: Parcel identification

GIS Warehouse -> Parcel -> Alignment Selection -> External Systems (Real Estate) -> Geographical Information System (or Perform Geospatial Analysis) -> Identified Parcels for the Project

Communication Diagram:
Parcel identification
Diagram: Parcel Identification & Cost Estimation Use Case Model

- Parcel Alignment Inspection
- Type of acquisition
  - Total Parcel
  - Partial Parcel
- Relocation Survey
- Survey of Replacement Properties
- Relocation Problems Analysis
- Perform Cost Estimation
- Current and completed Project Displacement analysis
- ROW Cost Estimate

Relationships:
- «precedes»
- «extend»
Diagram: Planning

Communication Diagram: Planning
Diagram: Planning

Sequence Diagram:
Planning

Transportation Improvement Program (TIP/STIP)

Project Information System

2: load()
2.1: update data()

1: Establish()

Project

sd Planning
Diagram: Project Agreement

Project Agreement

Relocation Cost Estimate

Acquisition Cost Estimate

Project Information System

Document Management System

1: invoke()

1.1: generate()

1.2: update

Sequence Diagram: Project Agreement
Diagram: Project Agreement

Communication Diagram:
Project Agreement
Diagram: Project Authorization

Sequence Diagram:
Project Authorization

Assign(Project_ID)

Project Information System

FHWA

Authorize Project
Diagram: Project Authorization

Communication Diagram:
Project Authorization
Diagram: Project Establishment

Communication Diagram:
Project Establishment

Statewide Transportation Plan (STP) identify()

Project Details

input()
Diagram: Project Establishment

1: Establish()

1.1: Send(Project_ID)

2: Invoke()

Statewide Transportation Plan (STP)

Planning

Project

Sequence Diagram: Project Establishment
Diagram: Protective Buying

Communication Diagram: Protective Buying
Diagram: Protective Buying

Sequence Diagram:
Protective Buying

1: send()
1.1: attach()
2: update()
3: invoke()

Acquiring Agency

FHWA

Parcel

Protective Buying Justification
Diagram: ROW Cost Estimate

External Systems (Real Estate)

1.1: access()

1.2: calculate()

Parcel

Individual Cost Estimates (Partial/Whole)

ROW Cost Estimate

Project Development Package: ROW Cost Estimate
Diagram: ROW Cost Estimate

Sequence Diagram:
ROW Cost Estimate

Diagram: Staff Identification Use Case Model

Identify Staff Requirements

«precedes» «precedes» «precedes»

Initiate Contracts Assign Staff Hire Staff

«extend» «extend»
Diagram: Title Documents Use Case Model

Title Assurance

Title Abstract and Title Opinion

Title Insurance

Certificate of Title

Temporary and Permanent Easements

Minor Acquisitions

Low Value Partial Acquisitions

Diagram: Close Accounting

Transfer Funds

Financial Information System

Project Information System

(from Project Development Package)
Diagram: Construction

```
Project Information System
(From Project Development Package)

Construction Status/Progress

update()
```

Diagram: Excess Property

```
Excess Land Management System

Excess Land Inventory

Sequence Diagram:
Excess Property
```
Diagram: Excess Property

Communication Diagram: Excess Property
Diagram: Final Claims

Diagram: Geospatial Enablement-Update Excess to Inventory
Diagram: Geospatial Enablement-Update Excess to Inventory

Excess Land Inventory
(Parcel (from Project Development Package))

Geographical Information System (or Perform Geospatial Analysis)
(from Project Development Package)

Communication Diagram:
Geospatial Enablement-Update Excess to Inventory
Diagram: Project Closing Use Case Model

- Review Project Plans
- Excess Property
- Accumulate and Store Records
- Geospatial Enablement-Update Excess to Inventory
- Encroachment clearing
- Status Report
- Final Claims
- State defined Processes
- Close Accounting
- Re-open if necessary
- Construction
- ROW Certification

Arrows indicate the flow of the process.
Diagram: Review Project Plans

- Review Project Plans (Check box)
- Excess Land/Uneconomic Remnant, Encroachments or other Details
- Parcel

Actions:
- Review Plans()
- Identify()
- Input()
- serve()
Diagram: ROW Certification

1: output()

2.1: input(row status)

2: access()

Sequence Diagram: ROW Certification
Diagram: ROW Certification

Communication Diagram:
ROW Certification
Diagram: Actors

Agency Actors
- Acquisition Agency
- Disposition Committee (Global)
- FHWA
- Legal Office
- Mapping Office
- Planning Department
- ROW Office
- State
- State Transportation Agency
- Treasury

Human Actors
- Agency Official
- Appraisal Reviewer
- Appraiser
- Business Owner
- Contractors
- Displaced Person
- Interim Tenant
- Legal Council
- Negotiator
- Owner
- Project Manager
- Property Mgmt Personnel
- Public
- Relocation Agent
- ROW Director
- Tenant
- Third Parties
- Title Agent
Diagram: Agency Actors

UC Agency Actors

- Planning Department
- Mapping Office
- Acquisition Agency
- State Transportation Agency
- State
- Treasury
- Legal Office
- Disposition Committee (Global)
- FHWA

Arrows indicate relationships and interactions between the agencies.
Diagram: Human Actors

- Appraiser
- Appraisal Reviewer
- Public
- Negotiator
- Third Parties
- Tenants
- Business Owner
- Displaced Person
- Contractor
- Interim Tenant
- Title Agent
- ROW Director
- Project Manager
- Agency Official
- Legal Council
- Property Mgmt Personnel

- Owner
- Interim Tenant
Diagram: Project Development

Class Model Model Package - Overall ROW::ROW Parcel

Cadastral Elements:: Cadastral_Parcel

Project_Parcel
- Date Source Reference: Date
- Parcel ID: int
- Parcel_Boundary: Transportation_Centerlines_(FTRP)
- Parcel_RoW_Cost_Estimate: int
- Source Reference: char

Parcel_Title
- ProjectParcelID: int
- Title_Assurance: boolean
- Title_Certificate: Document
- Title_Search_Method: char

Non_Federal_Fund_Share
- Fund_Amount: int
- Project_ID: int
- Source_Funds(Local/State/Credit): char

Authorize_Project
+ Project ID: int
- Project_Transportation: Transportation_Project

Acquisition cost estimation
- Initial_Total_Acquisition_Estimate: int
- Project_ID: int
- RoW_Administrator_ID: int

Protective_Buying
- Parcel_ID: int
- Project_ID: int
- Protective_Buying_Acquisition_Cost: int

Relocation Survey and cost Estimation
- Initial_Relocation_Cost_Estimate: int
- Project_ID: int
- Relocation_Details: Document
- Relocation_Situation: char
- RoW_Administrator_ID: int
- Site_Office_Requirement: char

Staff_Identification
- Project_ID: int
- Staff_Address: char
- Staff_Contract: char
- Staff_ID: int
- Staff_Name: char
- Staff_Type(Assigned/Hired): char
- Task_Respnsible: char

Parcels_For_Alignment
- Date Source Reference: Date
- Parcel Photographs: BLOB
- Parcel_Boundary: Transportation_Centerlines_(FTRP)
- Parcel_ID: int
- Parcel_Inspection: boolean
- Source Reference: char
- Type_Of_Acquisition(Whole/Partial): char

Implementation Guide  Appendix C  UML Model Diagrams C-291
Diagram: Acquisition

**Composite Structure: Acquisition**

- **ACQ Class Model Package**
  - + ACQ_Pre-Negotiation Elements
  - + ACQ_Negotiation Elements
  - + ACQ_Closing Elements

(from Acquisition Model Package)

Diagram: Appraisal

**Composite Structure: Appraisal**

- **APP Class Model Package**
  - + APP_Appraiser_Assignment
  - + APP_Appraiser_Candidate
  - + APP_Appraiser_Certificate
  - + APP_Appraiser_Contract
  - + APP_Initial_Review
  - + APP_Just_Compensation
  - + Appraisal_Report
  - + APP_Appraisal Process Elements
  - + APP_Appraisal Review Class Elements
  - + APP_Waiver Class Elements

(from Appraisal Model Package)

Diagram: Major ROW functions

**Class: Major ROW functions**

- **Appraisal**
- **Acquisition**
- **Relocation**
- **Property_Management**
Diagram: Property Management

**composite structure Property_Management**

**PM_Class Model Package**

+ PM_HazMat_Mitigation
+ PM_Rodent_Control
+ PM_Security_Inspection
+ PM_ROW_Inventory
+ PM_Inventory_Management
+ PM_CONSTRUCTION
+ PM_Pre-Construction Elements
+ PM_During_Construction Elements
+ PM_Post-Construction Elements

(from Property Management Model Package)

Diagram: Relocation

**composite structure Relocation**

**REL_Class Model Package**

+ REL_Displacing_Agency
+ REL_Parcel_for_Relocation
+ REL_Relocation_Planning_Elements
+ REL_Relocation_Services_Elements
+ REL_Relocation_Assistance_Payments_Elements

(from Relocation Model Package)

Diagram: Project Closing

**class Project_Closing**

- Any_Outstanding_Condemnation_Identified: boolean
- Encroachments_Identified: boolean
- Excess_Property_Disposed: boolean
- Final_Claims_Processed: boolean
- Project_Accounting_Closed: boolean
+ Project_ID: int
- Project_Plans_Reviewed: boolean
- Records_Stored_and_Accumulated: boolean
- Status_OF_Federal_Voucher_Letter: Flag
- Status_of_Row_Certificate: Flag

**class Notice_to_Proceed**

- Additional_Comments: char
- Date_of_Issuance_of_Notice: Date
+ Project_ID: int
- Type_of_Notice_to_Proceed: char
Diagram: Cadastral Elements

```uml
class Cadastral Elements

  class Cadastral_Parcel
    - APP_Type: char
    - Basis_Of_Assessment: char
    - Date_Of_File: Date
    - Improved: char
    - Interpretation_Of_Assessment_Classification: char
    - Jurisdiction_Name: char
    - Jurisdiction_Parcel_Contact: char
    - Owner_Name: char
    - Owner_Type: char
    - Parcel_Area: double
    - Parcel_Centroid: Geospatial_Reference
    + Parcel_ID: int
    - Parcel_Envelope: Geospatial_Reference
    - Parcel_Street_Address: char
    - Parcel_Type: char
    - Parcel_Zoning: char
    - Primary_Value_Classification: char
    - Public_Parcel_Name: char
    - Secondary_Value_Classification: char
    - Source_Reference: char
    - Source_Reference_Date: int
    - Tax_Bill_Mailing_Address: char
    - Total_Value: int
    - Value_Of_Improvements: int
    - Value_Of_Land: int

  class Cadastral_Reference
    - Another_metadata_file(if_datum_not_unique_for_entire_jurisdiction): char
    + Control_ID: int
    - Coordinate_System: char
    - Coordinate_System_Description: char
    - Date_Coordinate: Date
    - Date_Monument: Date
    - Date_of_File: Date
    - East_X: Geospatial_Reference
    - Elevation-Z: Geospatial_Reference
    - Elevation_Accuracy: char
    - Elevation_Datum: char
    - Elevation_Units: Geospatial_Reference
    - Horizontal_Accuracy: char
    - Horizontal_and_Vertical_Datum: int
    - Horizontal_Datum: char
    - Jurisdiction_Contact: char
    - Jurisdiction_Name: char
    - Monument_Surveyor: char
    - Monument_Type: char
    - North_Y: Geospatial_Reference
    - Units_Of_Measure: char

class Geospatial_Reference

  - Date_Of_Orthophotos: int
  - Datums: int
  - Jurisdiction: char
  - Monumented_points: int
  - NGRS_Coordinate_System: char
  - Orthography: int
  - Terrain_Information: char
```

NCHRP 8-55A Developing a Logical Model for a Geospatial Right-of-Way Land Management System
Diagram: Component Model - Overall ROW

Enterprise Database

Financial Information System

Project Management Information System

Document Management System

Environmental System

Tax Information System

Turbo Relocation (or Similar)

Geospatial Warehouse

Highway Right of Way

Parcels

MLS (External Real Estate System)

FHWA Annual Reporting System

Local Government Systems

Project Development

- Environmental Assessment Document/Report
- Project Agreement / Contract Application
- Title Information
- Non_Federal_Fund_Share
- Parcels_For_Altignment
- ROW Administrator
- ROW Plans
- Staff

Major ROW Functions

- Acquisition
- Appraisal
- Relocation
- Property Management

Project Closing

- Closing Forms
- Federal Voucher Letter
- Notice to Proceed
- Parcel Review/Status Report
- ROW Certificate
- Excess
Diagram: Project Closing

cmp Project Closing

Component Model Package - Overall ROW::Parcels

ROW Certificate

Parcel Review/Status Report

Component Model Package - Overall ROW::Financial Information System

Closing Forms

Component Model Package - Overall ROW::Tax Information System

Excess

Component Model Package - Overall ROW::Project Management Information System

Notice to Proceed

Federal Voucher Letter

Component Model Package - Overall ROW::Financial Information System
Diagram: Acquisition

composite structure Acquisition

ACQ_Component Model Package

+ ACQ_Pre-Negotiation Components
+ ACQ_Negotiation Components
+ ACQ_Closing Components

(from Acquisition Model Package)

Diagram: Appraisal

composite structure Appraisal

APP_Component Model Package

+ Utilities
+ Appraisal_Waiver
+ Appraiser
+ Appraiser_Candidate
+ APP_Appraisal Process Components
+ APP_Appraisal Review Components

(from Appraisal Model Package)

Diagram: Property Management

composite structure Property Management

PM_Component Model Package

+ PM_Personnel
+ PM_Inventory_Management
+ PM ROW_Inventory
+ PM_HazMat_Mitigation
+ PM_Rodent_Control
+ PM_Security_Inspection
+ PM_Pre-Construction Components
+ PM_During Construction Components
+ PM_Post-Construction Components

(from Property Management Model Package)
Diagram: Major ROW functions Component Model

Diagram: Relocation

(composite structure Relocation)

REL_Component Model Package

+ Displacing_Agency
+ REL_Relocation Assistance Payments Components
+ REL_Relocation Planning Components
+ REL_Relocation Services Components

(from Relocation Model Package)
Geospatial Decision Making Activities Model Diagrams

The following diagrams are in alphabetical order according to the method used by Enterprise Architect. It is STRONGLY recommended that you open the model in EALite and use the Project Browser to maneuver through the different diagrams since they are hyperlinked within the software.

Diagram: Geospatial Decision Making Activities

```
pkg Geospatial Decision Making Activities

// Parcel Tracking (PT)
+ PT_State Machine Diagram Model

// Geospatial Enablement (GE)
+ GE_Data Flow Model
+ GE_Activity Model
```

Diagram: Geospatial Enablement (GE)

```
pkg Geospatial Enablement (GE)

// GE_Data Flow Model
+ GIS Warehouse
+ Imagery
+ New roadway ROW
+ Parcel_Cadastre Layer
+ Roadway ROW layer
+ ROW Project Parcels
+ Transportation Roadway Network
+ Utilities
+ VideoLog
+ Thematic / Visual Display
+ Project Development: Geospatial Enablement
+ APP: Geospatial Enablement
+ REL: Geospatial Enablement
+ PM: Geospatial Enablement

// GE_Activity Model
+ Project Development
+ Appraisal
+ Acquisition
+ Relocation
+ Property Management
+ Project Closing
```
Diagram: GE_Activity Model

- **Acquisition**
  - No geospatially enabled activities identified within Acquisition

- **Relocation**
  - Candidate Parcel Inventory for Displaced Persons - Layer, 1st DSS Inspection Report, 2nd DSS Inspection Report, Assignment Status

- **Appraisal**
  - APP_Parcel for Appraisal
    - (from APP_Business Process Model Package)
  - APP_Initial Review
    - (from APP_Business Process Model Package)
  - APP_Determination of Appraisal Technique
    - (from APP_Business Process Model Package)
  - APP_Specialty Appraisal
    - (from APP_Business Process Model Package)

- **Property Management**
  - REL_Available Properties for Sale and Lease, Community Amenities
    - (from REL_Business Process Model Package)
  - PM_Requirement Type
    - (from PM_Business Process Model Package)
  - PM_Clearance/Demolition: GEOSPATIAL ENABLEMENT
    - (from PM_Business Process Model Package)
  - PM_Grading
    - (from PM_Business Process Model Package)
  - PM_Excess
    - (from PM_Business Process Model Package)
  - PM_ROW Disposal Justification - GEOSPATIAL ENABLEMENT
    - (from PM_Business Process Model Package)
  - PM_Excess Disposal Justification - GEOSPATIAL ENABLEMENT
    - (from PM_Business Process Model Package)

- **Project Development**
  - Initial Planning
    - Alignment Evaluation
      - (from Business Process Model Package - Overall ROW)
    - Parcel identification
      - (from Business Process Model Package - Overall ROW)
  - Alignment Evaluation
    - Identification of Environmental Impacts
      - (from Business Process Model Package - Overall ROW)
    - Environmental study
      - (from Business Process Model Package - Overall ROW)
  - Final Alignment Selection
    - Hazardous waste site evaluation
      - (from Business Process Model Package - Overall ROW)
  - Geospatial data - Parcels, Right-of-Way
    - ROW Mapping and Engineering
      - (from Business Process Model Package - Overall ROW)
    - Parcel Alignment Inspection
      - (from Business Process Model Package - Overall ROW)
    - Identification of Parcel Type
      - (from Business Process Model Package - Overall ROW)
    - Parcel Type
      - (from Business Process Model Package - Overall ROW)
  - Update Excess to Inventory
    - (from Business Process Model Package - Overall ROW)
  - Geospatial Data - Parcels, Roads, Right-of-Way
    - (from Business Process Model Package - Overall ROW)
Diagram: PM: Geospatial Enablement
Diagram: REL: Geospatial Enablement

- GIS Warehouse
- Transportation Roadway Network
- Utilities
- Parcel Cadastre Layer
- ROW Project Parcels
- Demographic Data Layer
- Socio-Economic Factors
- Lease/Sale Property Management System
- Parcel Identification
- Data Query (Extraction)
- Spatial Analysis: Overlay / Spatial Query
- Candidate Parcel Inventory for Relocating or Adjusting Utilities
- Parcel Land Use or Primary Relocation Indicator
- Needs of the Displaced
- Suitable Parcel(s) / Location(s)
- Thematic / Visual Display
- Spatial Analysis / Modeling
- Suitable Parcels
- Parcel(s) for Requiring Relocation

- Suitable Parcel(s) / Location(s)
Diagram: APP: Geospatial Enablement

Analysis APP: Geospatial Enablement

GIS Warehouse

- Roadway ROW layer
- Parcel Cadastre Layer
- Imagery
- VideoLog
- Utilities
- ROW Parcel Utilities
- Identification of Parcels with utilities
- Historical parcel sales Records
- Data Query/Extraction/Overlay
- Spatial Analysis: 3D Analyst
- Data Query/Extraction
- Appraisal Technique (Data Analysis)
- Sales Comparison (Data Analysis)
- Appraisal System
- Special Property Identification
- Effect of Elevation Changes
- Thematic/Visual Display

ROW Project Parcels

New roadway ROW

Parcels with special properties

APP: Initial Review (Visual Display)

3D Analyst

Thematic/Visual Display

Effect of Elevation Changes

Special Property Identification

Appraisal Technique

Data Query/Extraction

Spatial Analysis: 3D Analyst

New roadway ROW

- Roadway ROW layer
- Parcel Cadastre Layer
- Imagery
- VideoLog
- Utilities
- ROW Parcel Utilities
- Identification of Parcels with utilities
- Historical parcel sales Records
- Data Query/Extraction/Overlay
- Spatial Analysis: 3D Analyst
- Data Query/Extraction
- Appraisal Technique (Data Analysis)
- Sales Comparison (Data Analysis)
- Appraisal System
- Special Property Identification
- Effect of Elevation Changes
- Thematic/Visual Display
Diagram: Project Development: Geospatial Enablement

- GIS Warehouse
- New roadway ROW
- Parcel Cadastre Layer
- VideoLog
- Roadway ROW layer
- Alignment Selection
- Imagery
- Spatial Analysis: Overlay & Extraction
- ROW Project Parcels Identification
- Define Parcel Type of Take: Spatial Analysis
- Divide Parcel(s): Spatial Analysis
- Environmental System/Other
- Environmental Hazardous Sites: Spatial Analysis
- Divide & Redefine ROW Project Parcels
- ROW Plans
- Environmental & Hazardous waste sites Evaluation/Study Reports
- ROW Mapping and Engineering
- Thematic/Visual Display
- Alignment Selection: Spatial Analysis
- ROW Project Parcels
- ROW Plans
- Environmental System/Other
- Environmental Hazardous Sites: Spatial Analysis
- Divide & Redefine ROW Project Parcels
- ROW Plans
- Environmental & Hazardous waste sites Evaluation/Study Reports
- ROW Mapping and Engineering
- Thematic/Visual Display
- Alignment Selection: Spatial Analysis
- ROW Project Parcels
- ROW Plans
- Environmental System/Other
- Environmental Hazardous Sites: Spatial Analysis
- Divide & Redefine ROW Project Parcels
- ROW Plans
- Environmental & Hazardous waste sites Evaluation/Study Reports
- ROW Mapping and Engineering
- Thematic/Visual Display
Diagram: Parcel Tracking (PT)

pkg Parcel Tracking (PT)

PT_State Machine Diagram Model

+ Notice to Proceed
+ Parcel Land Use
+ Parcel Take
+ Project Number
+ Project Parcel Number
+ State
+ State
+ State
+ Status: Federal Voucher Letter
+ Status: PM
+ Status: REL
+ Status: ROW Certification
+ Status: ACQ
+ Status: APP
+ Final
+ Initial

LEGEND

States in Blue represent: Attributes of the Parcel Log that are not related to any existing attribute; But, are derived from two or more classes or updated according to the corresponding activity in the ROW Parcel records.

States in Yellow represent: Milestones

States in Red represent: Flags. These flags may be invoked by the time stamps corresponding to the respective activities.
APPENDIX D   8-55A LOGICAL MODEL DATA ARCHITECTURE & CLASS MODEL

As indicated in the Guide, two primary approaches are taken to building an information management system. One is typically built in a database management system and acts as an electronic ledger. The other is an electronic work environment that is structured to assist users in performing their activities with business rules and decision support modules. These two approaches tend to result in different data models.

The first approach, by nature, is data-centric and the data model typically consists of structured tables of identified data elements that stakeholders identify. The data tables in NCHRP 8-55 (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w95.pdf), pages C-9 to C-26, provide the preliminary elements for this approach.

The second approach builds the business processes and use cases and corresponding class diagrams around activities performed in the business that will be included in the information management system. The class diagrams then provide the contents of the data model as provided in this section.

Both approaches are valid and result in effective and useful systems. The resulting data models are in different formats when visualized.

A note on the data elements listed in the class diagrams: This data model does not include time stamps (data elements that indicate when an activity was initiated or terminated or when a value was entered or updated) or flags that are used for scheduling and status or resource reporting purposes. This was done for two reasons. The first is that many of these are tied to other data elements or actions performed in the system and will be included when the system is programmed. The second is that inclusion of these would easily have tripled the number of elements without adding value to the generic model.
Data Model Diagrams

Diagram: Class Model Package - Overall ROW

Diagram: Class Model Package - Acquisition

Diagram: Class Model Package - Appraisal
Diagram: Class Model - Acquisition

class Class Model - Acquisition

**Pre-Negotiation**
- + Acquiring_Agency
- + Activity_Report
- + Additional_Factors
- + Conveyance_Documents
- + Coordination
- + Dedication
- + Document
- + Donation
- + Federal_Land
- + Hardship_Protective_Buying
- + Negotiator_Assignment
- + Negotiator_Contract
- + Notice
- + Owner_Retention_Of_Improvements
- + Status_Report
- + Tenant-Owned_Improvements

**Negotiation**
- + Accelerated_Negotiations
- + Contact_Owner
- + Negotiator
- + Offer_Acceptance
- + Owner
- + Owner_Meeting
- + Phone_Contact
- + Property-Encumbrance_releases
- + Uneconomic_Remnant
- + Written_Offer_Mail
- + Written_Offer_Meeting
- + Detailed_Negotiation

**Closing**
- + Just_Compensation
- + Negotiation_Closing_Documents
- + Parcel_Closing
### Diagram: Pre-Negotiation

#### Pre-Negotiation

<table>
<thead>
<tr>
<th>Class</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquiring_Agency</td>
<td>Agency_Address: char, Agency_ID: int, Agency_Name: char, Agency_Phone: int</td>
</tr>
<tr>
<td>Donation</td>
<td>Construction_Feature_Exchange: char, Parcel_ID: int, Project_ID: int, Waiver_Appraisal: boolean</td>
</tr>
<tr>
<td>Dedication</td>
<td>Land_Use_concession_to_Owner: char, Parcel_ID: int, Project_ID: int, Subdivision(Zoning)_Approval_Reference: char</td>
</tr>
<tr>
<td>Status_Report</td>
<td>Document: Document</td>
</tr>
<tr>
<td>Activity_Report</td>
<td>Document: Document</td>
</tr>
</tbody>
</table>

#### Negotiator_Assignment

<table>
<thead>
<tr>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment_Confirmation: boolean, Date_Assigned: int, Negotiator: Negotiator, Project_ID: int</td>
</tr>
<tr>
<td>Assignment() : Negotiator</td>
</tr>
</tbody>
</table>

#### Negotiator_Contract

<table>
<thead>
<tr>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract() : Negotiator</td>
</tr>
</tbody>
</table>

#### Additional_Factors

<table>
<thead>
<tr>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor: char, Parcel_ID: int, Project_ID: int, Status: char</td>
</tr>
<tr>
<td>Process_Additional_Factors() : Parcel_Status</td>
</tr>
</tbody>
</table>

#### Notice

<table>
<thead>
<tr>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date_Notice: int, Notice_Type: char, Parcel_ID: int, Project_ID: int, Status_Notice: char</td>
</tr>
<tr>
<td>Prepare_Notice() : Notice</td>
</tr>
</tbody>
</table>

#### Coordination

<table>
<thead>
<tr>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office_Name: char, Parcel_ID: int, Project_ID: int, Status: boolean</td>
</tr>
<tr>
<td>Establish_Coordination() : Coordination</td>
</tr>
</tbody>
</table>

#### Conveyance_Documents

<table>
<thead>
<tr>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date_Conveyance_Document: int, Name_Conveyance_Document: char, Parcel_ID: int, Project_ID: int, Purpose: char</td>
</tr>
<tr>
<td>Prepare_Conveyance_Document() : Document</td>
</tr>
</tbody>
</table>

#### Hardship_Protective_Buying

<table>
<thead>
<tr>
<th>Properties</th>
</tr>
</thead>
</table>

---

class Negotiation

Negotiator
- Date_Assigned: int
- Negotiator_ID: int
- Negotiator_Name: char
- Negotiator_Type: char
  + Project_ID: int

Contact_Owner
- Activity_Records: Document
- Date_Initial_Contacted: int
- Negotiator: Negotiator
  + Project_ID: int
  + Establish_Contact() : void

Owner_Meeting
- Date_Meeting: int
- Negotiator: Negotiator
  + Parcel_ID: int
  + Project_ID: int
  - Time_Meeting: int
  - Schedule_Meeting() : Owner_Meeting

Offer_Acceptance
- Acceptance: boolean
  + Parcel_ID: int
  + Project_ID: int
  + Update_Parcel(Negotiation_Log)

Written_Offer_Meeting
- 90_Day_notice_to_Vacate: boolean
- Agent: Negotiator
- Damages_Compensation: double
- Date_Written_Offer: int
- Description_damage_compensation(remaining_property): char
- Description_lands/Improvements/Structures: char
- Highway(To_Be_Constructed): char
- Improvement_Retention_Cost: int
- Just_Compensation_Value: int
- List_of_structures/buildings/equipment/fixtures_Considered: char
- Negotiator: Negotiator
  + Parcel_ID: int
  + Project_ID: int
  + Relevant_Document: Document
  - Uneconomic_Remnant_Revaluation: int
  - Written_Offer: int
  + Update(char) : Parcel_Status

Written_Offer_Mail
- 90_Day_notice_to_Vacate: boolean
- Agent: Negotiator
- Damages_Compensation: double
- Date_Written_Offer: int
- Description_damage_compensation(remaining_property): char
- Description_lands/Improvements/Structures: char
- Highway(To_Be_Constructed): char
- Improvement_Retention_Cost: int
- Just_Compensation_Value: int
- List_of_structures/buildings/equipment/fixtures_Considered: char
- Negotiator: Negotiator
  + Parcel_ID: int
  + Project_ID: int
  + Relevant_Document: Document
  - Uneconomic_Remnant_Revaluation: int
  - Written_Offer: int
  + Update(char) : Parcel_Status

Property_Encumbrance_releases
- Parcel_ID: int
- Project_ID: int
- Property_Encumbrance_releases_Status: char
- Title_Information: char
  + update(char) : Parcel_Status

Uneconomic_Remnant
- %Fraction_Remnant: char
- Compensation_After_Considering_Remnants: double
- Compensation_Preliminary: int
- Parcel_ID: int
- Project_ID: int
- Remnant_Fair_Market_Value: double
- Usage_of_Remnant: char
  + End_Negotiation() : void
Diagram: Closing

```plaintext
class Closing

  Pre-Negotiation:: Acquiring_Agency
  - Agency_Address: char
  - Agency_ID: int
  - Agency_Name: char
  - Agency_Phone: int

  Negotiation::Owner
  - Address: char
  - Name: char
  - Phone_Number: int
  + Tax_ID: int

  Just_Compensation
  - Amount: Settlement_Amount
  + Parcel_ID: int
  + Project_ID: int
  + Payment(Just_Compensation) : boolean

  Negotiation_Closing_Documents
  + Parcel_ID: int
  + Project_ID: int
  - Tax_Forms: Document
  - Title_Release: boolean
  + Attach(Negotiation_Closing_Documents) : Parcel

  Parcel_Closing
  - Encumbrance_Release: Property-Encumbrance_releases
  + Parcel_ID: int
  + Project_ID: int
  - Settlement_Statement(Deed): Document
  + update(int) : Parcel
```
Diagram: Appraisal_Process

**Class Appraisal_Process**

**Minimum_Standard_Appraisal**
- Short_Form_Appraisal
- Value_Finding_Appraisal

**Detailed_Appraisal_Evaluation**
- Cost_Approach
- Detailed_Appraisal_Evaluation
- Income_Approach
- Sales_Comparision_Approach

**Appraiser**
- Appraiser_ID: int
- Appraiser_name: char
- Appraiser_Type: char
+ Project_Parcel_ID: int

**Inspect_&_Evaluate_Parcel**
- 5-Year Sales History: char
- Appraisal Type (Value Finding, Short Form, Detailed): char
+ Appraiser_ID: int
- Communication: char
- Complexity: char
- Highest and Best Use: char
- Improvements Description: char
- Parcel Access: char
- Parcel Landscaping: char
- Parcel Plan: BLOB
- Parcel Shape: char
- Parcel Topography: char
- Photographs: BLOB
- Present Use: char
+ Project_Parcel_ID: int
- Utilities Affected: char
Diagram: Minimum_Standard_Appraisal

### Value_Finding_Appraisal

- **Appraiser ID**: int
- **Basis for Value**: char
- **Brief Analysis**: char
- **Date of Valuation**: Date
- **Interest Acquired**: int
- **Market Value**: int
- **Project_Parcel_ID**: int
- **Remarks**: char
- **Value-Damages**: int
- **Value-Improvement**: int
- **Value-Land**: int
- **Value-Takings**: int
- **Value Appraised**: int

### Short_Form_Appraisal

- **All other Adjustments (Dollars or %)**: int
- **Appraisal Purpose**: char
- **Appraiser ID**: int
- **Date of Valuation**: Date
- **Date of Valuation of Appraisal**: Date
- **Indicated Value**: int
- **Interest being Acquired**: int
- **Interest to be Acquired**: int
- **Lease Terms**: char
- **Market Data Approach**: char
- **Net Adjustment**: int
- **Partial acquisition Improvements Value**: int
- **Partial acquisition Land Value**: int
- **Partial acquisition Statement of Value - Damages**: int
- **Partial acquisition Statement of Value - Prope**: int
- **Price per Unit of Comp**: int
- **Problem to be Solved**: char
- **Project_Parcel_ID**: int
- **Property Value Justification**: char
- **Remarks**: char
- **Rights to be Appraised**: char
- **Sale Price**: int
- **Sale Price adjusted for Time**: int
- **Tenant Names**: char
- **Tenant Owned Buildings Value**: int
- **Tenant Owned Improvements Value**: int
- **Tenant Owned Structures Value**: int
- **Time Adjustment**: int
- **Title Information**: char
- **Total Adjustments Explanation**: char
- **Total Damage Explanation**: char
- **Value-Damages**: int
- **Value-Improvement**: int
- **Value-Land**: int
- **Value-Takings**: int
- **Value Appraised**: int
### Diagram: Detailed Appraisal

#### Sales Comparison Approach

- Zoning (at the date of sale): char
- Access to the comparable: char
- Adjustment - Economic characteristics (Dollars or %): int
- Adjustment - Time (Dollars or %): int
- Adjustment - Location (Dollars or %): int
- Adjustment - Motivation for the transactions (Dollars or %): int
- Adjustment - Physical characteristics (Dollars or %): int
- Appraiser ID: int
- Cadaster(Parcel): Geospatial Reference
- Comparable data map: BLOB
- Conditions of sale (Motivation): char
- Consideration paid: int
- Date of Appraiser’s Inspection: Date
- Date of data verification: Date
- Description of Comparables sales: char
- Highest and best use at date of sale: Analysis: char
- Improvements Description: char
- Listings Available: char
- Location of comparable: char
- Method of financing: char
- Mineral, water and other rights: char
- Offerings Available: char
- Parties to the transaction: char
- Person(s) with whom data was verified: char
- Photographs of principal improvements: BLOB
- Price per Unit of area: int
- Project Parcel ID: int
- Rental Data Available: char
- Similarities or dissimilarities - Economic characteristics: char
- Similarities or dissimilarities - Location: char
- Similarities or dissimilarities - Motivation for the transactions: char
- Similarities or dissimilarities - Physical characteristics: char
- Size of the improvements: char
- Source of financing: char
- Total area: int
- Type of easements: char
- Type of improvements: char
- Verification by parties involved in transaction: char

#### Cost Approach

- Access to the comparable: char
- Adjustment - Economic characteristics (Dollars or %): int
- Adjustment - Location (Dollars or %): int
- Adjustment - Motivation for the transactions (Dollars or %): int
- Adjustment - Physical characteristics (Dollars or %): int
- Appraiser ID: int
- Comparable data map: BLOB
- Conditions of sale (Motivation): char
- Consideration paid: int
- Date of Appraiser’s Inspection: Date
- Date of data verification: Date
- Description of functional and economical obsolescence: char
- Description of Physical Deterioration: char
- Detailed analysis including calculation: char
- Explanation for lack of Sales comparison approach: char
- Highest and best use at date of sale: Analysis: char
- Land value (based on sales data): int
- Location of comparable: char
- Method of financing: char
- Mineral, water, and other rights: char
- Parties to the transaction: char
- Person(s) with whom data was verified: char
- Photographs of principal improvements: BLOB
- Price per Unit of area: int
- Project Parcel ID: int
- Reproduction or Replacement cost: int
- Similarities or dissimilarities - Economic characteristics: char
- Similarities or dissimilarities - Location: char
- Similarities or dissimilarities - Motivation for the transactions: char
- Similarities or dissimilarities - Physical characteristics: char
- Size of the improvements: char
- Source of financing: char
- Total area: int
- Type of easements: char
- Verification by party involved in transaction: char
- Zoning (at the date of sale): char

#### Income Approach

- Adjustment - Economic characteristics (Dollars or %): int
- Adjustment - Location (Dollars or %): int
- Adjustment - Physical characteristics (Dollars or %): int
- Adjustment - Time (Dollars or %): int
- Appraiser ID: int
- Capitalization rate estimated: char
- Capitalization rate of the comparable: int
- Comparable data map: BLOB
- Date of Appraiser’s Inspection: Date
- Date of data verification: Date
- Estimated gross Market rent or income: int
- Explanation for lack of Sales comparison approach: char
- Improvements Description: char
- Location of comparable: char
- Method used for Capitalization rate: char
- Person(s) with whom data was verified: char
- Photographs of the comparable improvements: BLOB
- Project Parcel ID: int
- Remains: char
- Rental Data of the comparable: char
- Remaining economic life: char
- Rental Data of the comparable: char
- Similarities or dissimilarities - Economic characteristics: int
- Similarities or dissimilarities - Location: char
- Similarities or dissimilarities - Physical characteristics: char
- Similarities or dissimilarities - Time: char
- Size of the improvements: char
- Source of rates and factors by appraiser: char
- Type of improvements: char
- Verification by the owner: char
- Zoning: char

#### Detailed Appraisal Evaluation

- Appraisal Purpose: char
- Appraiser ID: int
- Approach used (sales comparison, cash approach, income approach): char
- Basis for Highest use being different from Present use (Legally and Economically): char
- Consideration of Easements: char
- Consideration of Leases: char
- Estate Definition: char
- Partial acquisition Statement of Value - Benefits to the remaining property: int
- Partial acquisition Statement of Value - Damages to the remaining property: int
- Partial acquisition Statement of Value - Property: int
- Project Parcel ID: int
- Remarks: char
- Statement of assumptions and limiting conditions: char
- Statement of known and observed encumbrances: char
- Statement of Value - Real Property: int
- Title Information: char
Diagram: Waiver

```
class Waiver

Waiver_Establish_Value
- Established Value: int
- Just Compensation: int
+ Parcel_Project_ID: int
- Type (Donation, Donation in Exchange, Dedication, Waiver): char
```

Diagram: Class Model Package - Property Management

```
class Class Model Package - Property Management

Class Model - Property Management
+ Construction
+ Hazardous_Materials
+ Inventory_Management
+ Rodent_Control
+ ROW_Inventory
+ Security_Impetition
+ Pre-Construction Property Management
+ During Construction Property Management
+ Post-Construction Property Management
```

Diagram: During Construction Property Management

```
class During Construction Property ...

Construction_Contract
- Contract: Document
- Contract_Agency: char
- Contract_Amount: int
- Contract_Period: int
- Date_Start_Of_Construction: Date
+ Project_ID: int

Grading
- Cut and Fill Analysis: boolean
- Grading Cost: int
+ Project_ID: int
```
Diagram: Appraisal_Review

```java
class Appraisal_Reviewer_Assignment {
    + Appraisal_Reviewer_ID: int
    - Appraisal_Reviewer_Name: char
    + Appraisal_Reviewer_ID: int
    + Date_Of_Reviewing: Date
    + Parcel_ID: int
    + Project_ID: int
    + Project_Parcel_ID: int
}

Appraisal_Reviewer

Perform_Appraisal_Review

+ Appraisal_Acceptance: char
+ Appraisal_Reviewer_ID: int
+ Appraiser_ID: int
+ Buildings_structures_improvements_and_fixtures_listed: boolean
+ Consideration_of_compensable_items_damages__benefits: boolean
+ Fair_market_value_estimated_for_partial_acquisition_Fair_market_value_for_real_property_and_damages_value_for_remaining_property_included: boolean
+ Follows_appraisal_principles_techniques_State__Federal: boolean
+ In Accordance_with_agency__s_appraisal_specifications: boolean
+ Inclusion_of_non_compensable_items_under_State_Law: boolean
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Reason(s)_for_Deficiency: char
- Sufficient_information_to_support_conclusions__market_value_estimate: boolean

Deficient_Appraiser_Assignement

Perform_Deficient_Appraisal

+ Appraisal_Reviewer_ID: int
+ Appraiser_ID: int
+ Deficient_Appraiser_ID: int
+ Description_of_corrections_made_to_Original_Appraisal: char
+ Field_inspection_of_comparable_sales: boolean
+ Field_inspection_of_parcel: boolean
+ Modified_Damages_Partial_acquisition: int
+ Modified_Damages_Partial_acquisition: int
+ Modified_Damages_Partial_acquisition: int
+ Modified_Real_Property_Compensation: int
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Reason_for_no_field_inspection_of_comparable_sales: char
- Reason_for_no_field_inspection_of_parcel: char
- Value_of_items_Compensable_under_State_Law_but_Not_Federal_Law: int

Appraisal_Reviewer_Certificate

- Appraisal_reports_reviewed: char
- Appraisal_reviewer_has_no_direct_indirect_present_future_personal_interest_monetary_benefit_from_acquisition: boolean
+ Appraisal_Reviewer_ID: int
+ Appraiser_ID: int
+ Damages_Partial_acquisition: int
+ Date_Of_Value: Date
+ Deficient_Appraiser_ID: int
+ Estimate_reached_without_collaboration_or_direction: boolean
+ Field_inspection_to_the_comparable_sales: boolean
+ Field_inspection_to_the_parcel: boolean
+ Just_Compensation_Estimate: double
+ List_of_Buildings_structures_improvements: char
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Reason_for_no_Field_inspection_to_the_comparable_sales: char
- Reason_for_no_field_inspection_to_the_parcel: char
- Signed_Review_Appraisal_Certificate: Document
```
Diagram: Class Model - Property Management

- **Pre-Construction Property Management**
  - Clearance/Demolition
  - Improvement_Disposition_Contract
  - Improvement_Disposition_Contract
  - Intermim_Tenant
  - Lease_Agreement
  - Lease_Agreement
  - Maintenance_Agreement
  - Maintenance_Agreement
  - Owner_Retention
  - Property_Sale
  - Sale_Of_Improvements
  - Tenant_Selection

- **During Construction Property Management**
  - Construction_Contract
  - Grading

- **Post-Construction Property Management**
  - Access_Changes
  - Airspace_Development
  - Airspace_Management
  - Airspace_Marketing
  - Excess_Property_Disposition
  - New_Access_Points
  - ROW_Property_Disposition

- **Rodent_Control**
  - Contract_ID: int
  - Contract_type: char
  - Cost_rodent_control: double
  - Date_occupant_vacates: Date
  - Date_Periodic_inspection: Date
  - Parcel_ID: int
  - Project_ID: int
  - Project.Parcel_ID: int
  - Status_Rodent_Control: char

- **Hazardous_Materials**
  - Hazardous_Materials_Existence: boolean
  - List_of_Hazardous_materials: char
  - Mitigation_Status: char
  - Parcel_ID: int
  - Project_ID: int
  - Project.Parcel_ID: int

- **Security_Inspection**
  - Cost_Of_Security: double
  - Parcel_ID: int
  - Project_ID: int
  - Project.Parcel_ID: int
  - Security_Inspection_Method: char
  - Status_Security_Inspection: char
Diagram: Pre-Construction Property Management

```
class Pre-Construction Property Management...

Tenant_Selection
- Agreement_to_terms_and_conditions: boolean
- Credit_Check: int
- Financial_Statement: Document
  - Parcel_ID: int
  - Project_ID: int
  - Tenant_ID: int
- Tenant_Name: char

Lease_Agreement
- Date_Lease: Date
- Lease_Agreement: Document
  + Parcel_ID: int
  + Project_ID: int
  + Project_Parcel_ID: int
- Social_Security_Number/Tax_ID: int

Interim_Tenant
- Name_Interim_Tenant: char
  + Parcel_ID: int
  + Project_ID: int
  + Project_Parcel_ID: int

Clearance/Demolition
- Contact_for_RoW_Clearance: Document
  + Parcel_ID: int
  + Project_ID: int
  + Project_Parcel_ID: int

Maintenance_Agreement
- Age_and_condition_of_structure: char
- Cost_of_agreement: double
- Description_of_level_of_maintenance: char
- Level_of_tenant_maintenance: char
  + Parcel_ID: int
  + Project_ID: int
- Property_maintenance_method: char
- Term_of_Lease: int
- Type_Of_Structure: char

Property_Sale
- Cadaster: Geospatial_Reference
- Intent_to_Dispose_of_Property: Document
  + Parcel_ID: int
  + Project_ID: int
  + Project_Parcel_ID: int
- Plan_of_RoW_to_be_disposed: char
- Property_maintenance_method: char
  + Parcel_ID: int
  + Project_ID: int
- Remainder_or_uneconomic_remnant: boolean
- Status_of_parcel:desirability_for_parks_recreations_etc: char
  + Parcel_ID: int
  + Project_ID: int
- Type_of_disposition: char

Owner_Retention
- Basis_of_retention_value: Document
- Code_review_moving_structures: boolean
- List_of_improvements: char
  + Parcel_ID: int
  + Project_ID: int
- Retention_Value: double

Sale_Of_Improvements
- Date_of_sale_advertisement: Date
- Date_Of_vacation_by_occupant: Date
- Improvement_ID: int
- Improvement_Sold: boolean
- Parcel_ID: int
  + Performance_Bond_From_Purchaser: Document
  + Project_ID: int
- Sale_Price: double
```

Improvement_Disposition_Contract
- Contract: Document
- Contract_Agency: char
- Contract_Date: Date
  + Parcel_ID: int
  + Project_ID: int
  + Project_Parcel_ID: int
Diagram: Class Model Package - Relocation

class Class Model Package - Relocation

Class Model Relocation

+ Displacing Agency
+ Planning Department
+ Parcels for Relocation
+ Relocation Planning
+ Relocation Services
+ Relocation Assistance Payments

Diagram: Class Model Relocation

class Class Model Relocation

Relocation Planning

+ Additional Relocation Information
+ Notice Distribution
+ Relocation_Planning Information
+ Site_Office

Relocation Services

+ Advisory Services
+ Advisory_Services_Eligibility
+ Decent, Safe, Sanitary (DSS) Inspection
+ Replacement_Dwelling_Assignment
+ Residential Replacement Housing Determination

Relocation Assistance Payments

+ Claim and Tax Related Processing
+ Moving Expense Process
+ Replacement Housing Payment Process

Planning Department

- Planning_Department: int
+ Project_ID: int

Displacing Agency

+ Agency_ID: int
+ Project_ID: int

Parcels for Relocation

- Displacement_Dwelling_Assignment_Status: char
+ Displacement_Dwelling_Parcel_ID: int
- Notices: Notice Distribution
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Relocation_Type(for Advisory Services): char
- Relocation_Type_for_Moving_Expense_Evaluation: char
- Relocation_Indicator(Displaced_Persons/Business): char
- Relocation_Status: char
- Residence_Type(if_applicable): char
Diagram: Relocation Planning

class Relocation Planning

- Hours of operation: char
- Location (point): Geospatial_Reference
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
+ Relocation_Agent_ID: int

Relocation_Planning_Information

+ Parcel_ID: int
- Possible_shortage_of_dwellings_for_the_above_people: boolean
- Presence_of_large_families?: boolean
- Presence_of_Low-income_elderly_people?: boolean
- Presence_of_People_with_disabilities?: boolean
+ Project_ID: int
+ Project_Parcel_ID: int

Notice Distribution

- 90 day Notice (with 30 day specific notice distributed)?: boolean
- Additional Information (if applicable): char
- Date_Of_General Information Notice: Date
- Date_of_initiation_of_negotiations: Date
- Date_of_locating_at_least_one_replacement_dwellings: Date
- Date_Of_Date_of_issuing_notice: Date
- Date_Of_Notice_of_Relocation_Eligibility: Date
- General Information Notice Distributed?: boolean
- Information about advisory services: boolean
- Instructions about moving: boolean
- Language of notices: char
- Notice of Intent to Acquire distributed?: boolean
- Notice of Relocation Eligibility Distributed?: boolean
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Relocation payments description: boolean
- Vacate property before Negotiations?: boolean

Additional Relocation information

- Basis for determination: char
- Denial_of_relocation_benefits_impacts_adversely_any_family_member: boolean
- Denial_of_relocation_benefits_impacts_adversely_the_continued_existence_of_family_unit: boolean
- Denial_of_relocation_benefits_impacts_adversely_the_health_or_safety_of_family_member: boolean
- Description of the comparable dwelling: char
- Each family member, either citizen or national of the US or legal alien in the US: boolean
- In case of incorporated business, farm, or nonprofit organization, corporation is authorized: boolean
- Individual, either citizen or national of the US or legal alien in the US: boolean
- Location: char
- Owner of unincorporated business, farm, or nonprofit organization, either citizen or national of the US or legal alien in the US: boolean
+ Parcel_ID: int
- Price used to set upper limit of replacement housing payment: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Rent used to set upper limit of replacement housing payment: int
- Required certification: Document
Diagram: Relocation Assistance Payments

**class Relocation Assistance Payments**

**Replacement Housing Payment Process**
- Housing of Last Resort
- Mobile Home - Site Only
- Mobile Home Replacement Housing Payments
- Replacement Housing Determination for Mobile Homes
- Residential Replacement Housing Payment Determination

**Moving Expense Process**
- Fixed Residential Moving Expense Payments
- Mobile Home
- Moving Expenses for Mobile Home
- Non-Residential Actual Cost Payment
- Non-Residential Alternate Actual Payment
- Non-Residential Fixed in-lieu Payment
- Non-Residential Reestablishment Expense Payment

**Claim and Tax Related Processing**
- Claim and Tax Documents: Document
- Claim Forms Processed?: boolean
- Eligible for Assistance Payments?: boolean
- Parcel_ID: int
- Project_ID: int
- Project_Parcel_ID: int
- Tax Forms Processed?: boolean
Diagram: Moving Expense Process

### Fixed Residential Moving Expense Payments
- Chosen bid amount: int
- Commercial mover bids: char
- Parcel_ID: int
- Payment type (Method): char
- Project_ID: int
- Project Parcel_ID: int
- Self-documented move activities: char
- Self-documented move hourly rate paid: int
- Self-documented move persons performing the move: char
- Self-documented move purchases of supplies and services: char
- Self-documented move-time spent: char
- Total moving expenses paid: int

### Moving Expenses for Mobile Home
- Cost for disconnecting and reconnecting appliances: int
- Cost for insurance on mobile home: int
- Cost for moving attached appurtenances: int
- Cost for moving mobile home: int
- Cost for moving personal property: int
- Cost for packing personal property: int
- Cost for repairs to move mobile home: int
- Cost for temporary lodging for mobile home occupants: int
- Cost for transportation of mobile home: int
- Cost for transportation of mobile home occupants: int
- Type of individual being relocated: char

### Mobile Home
- Mobile home and/or site: char
- Mobile home considered Realty or Personalty: char
- Parcel_ID: int
- Project_ID: int
- Project Parcel_ID: int
- Type of individual being relocated: char

### Non-Residential Actual Cost Payment
- "Actual" cost of moving: int
- Bids or estimates: int
- Cost-Management time for overseeing the move: int
- Cost incurred by business for equipment: int
- Inventory list: char
- Mover type: char
- Parcel_ID: int
- Project_ID: int
- Project Parcel_ID: int
- Rate charged by local moving firms: int
- Regular rates of pay: int
- Specifications and instructions for the move: char
- TOTAL PAYMENT: int

### Non-Residential Reestablishment Expense Payment
- Advertising of RS-Construction & installation: int
- Business-Economic activity location: boolean
- Business-Employees > 500: boolean
- Costs for searching for a new site: int
- Feasibility survey, soil testing and marketing studies: int
- Fixed payment for replacement site (RS): int
- Impact fees or one-time assessments: int
- Increased cost of operation for 2 yrs: int
- Licenses, fees and permits/Not paid in moving expenses: int
- Other costs: int
- Parcel_ID: int
- Professional services-Purchase and Lease of RS: int
- Project_ID: int
- Project Parcel_ID: int
- Re-establishment payment (<$10,000): int
- Repairs and improvements of RS: int
- Total Payments: int
- Utilities to RS: int

### Non-Residential Alternate Actual Payment
- Appraised value of the personal property: int
- Cost of moving: int
- Cost of sale: int
- Inventory list: char
- Mover type: char
- Parcel_ID: int
- Project_ID: int
- Project Parcel_ID: int
- Sale proceeds: int
- Substitute equipment-Cost of new equipment: int
- Substitute equipment-No market-Moving cost: int
- Substitute equipment-No market-Property's value for continued use: int
- Substitute equipment-Sale of old equipment: int
- Total Payment: int

### Non-Residential Fixed in-lieu Payment
- Annual income year 1: int
- Annual income year 2: int
- Average income-In Lieu Payment: int
- Parcel_ID: int
- Project_ID: int
- Project Parcel_ID: int
## Diagram: Replacement Housing Payment Process

**Residential Replacement Housing Payment Determination**

- Actual rent/Replacement dwelling: int
- Date of purchase or rent and occupancy of replacement dwelling: Date
- Difference: int
- Down payment assistance: int
- Incidental expenses: int
- Incidental expenses description: char
- Income of displaced person: int
- Insurance received: int
- Market rent/Replacement dwelling: int
- Mortgage interest differential: int
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Price differential: int
- Project_ID: int
- Project_Parcel_ID: int
- Project_Parcel_ID: int
- Replacement dwelling ID: int
- Replacement dwelling cost(s): int
+ Replacement dwelling ID: int
+ Replacement dwelling category(s): char
- Resident type (Time of stay, ownership): char
- Special circumstances description: char
- TOTAL PAYMENT: int

**Housing of Last Resort**

- Cost of Housing of Last Resort: int
- Method for providing housing of last resort: char
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Reason for Housing of Last Resort: char
- Written agreement: Document

**Mobile Home - Site Only**

+ Parcel_ID: int
+ Parcel_Project_ID: int
+ Project_ID: int

**Replacement Housing Determination for Mobile Homes**

- Assistance type: char
- Location of replacement site: Geospatial Reference
- Ownership or Occupancy tenure: char
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Type of Replacement housing: Site and mobile home/Mobile Home only/ Site only: char

**Mobile Home Replacement Housing Payments**

- Acquisition price of displaced dwelling and site: int
- Acquisition price of displaced mobile home: int
- Acquisition price of displaced mobile home site: int
- Actual cost of replacement property: int
- Cost of comparable conventional dwelling: int
- Cost of comparable mobile home: int
- Cost of comparable mobile home site: int
- Cost of comparable replacement property: int
- Cost of repairs/modifications: int
- Difference - rent - mobile home: int
- Difference - rent - mobile home site: int
- DS & S mobile home purchased: int
- Market price displacement MH site: int
- Market rent/Replacement mobile home site: int
- Moving cost of mobile home: int
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Related expenses: int
- Rent of comparable mobile home site: int
- Replacement site: int
- Salvage trade-in value - MH: int
- Set-up charges: int
- Site improvements: int
- Total price differential payment: int
- Total RHP payment - MH (<$22,500): int
- Total to purchase MH and site: int
- Value of displaced mobile home: int
Diagram: Relocation Services

**Advisory Services Eligibility**

- Eligibility category: char
- Eligibility Description: char
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int

**Advisory Services**

- Advisory service(s) provided: char
- Agencies providing services: char
- Application or claim forms: Document
- Current listings: char
- Federal & state housing programs: char
- Other social services: char
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
+ Relocation agent ID: int
- Transportation services: char

**Replacement Dwelling Assignment**

- DSS Inspection 2: Decent, Safe, Sanitary (DSS) Inspection
- DSS Inspection 1: Decent, Safe, Sanitary (DSS) Inspection
- DSS Inspection Result Notification: boolean
- DSS Inspection Report 2: Document
- First DSS Report: Document
+ Parcel_ID: int
+ Project_ID: int
+ Project_Parcel_ID: int
- Replacement Dwelling Selected?: boolean

**Residential Replacement Housing Determination**

- Access to employment: char
- Access to public & commercial facilities: char
- Adverse environmental conditions: boolean
- Comparable Dwelling Notification: Document
- Currently available: boolean
- Location of replacement dwelling: Geospatial Reference
- Number of comparable dwellings offered: int
- Other needs: char
+ Parcel_ID: int
- Physical condition of replacement dwelling: char
+ Project_ID: int
+ Project_Parcel_ID: int
+ Replacement dwelling ID: int
- Size of replacement dwelling: char
- Typical residential site: boolean
- Utility and cost of replacement dwelling: char

**Decent, Safe, Sanitary (DSS) Inspection**

- ADA Accessible: boolean
- Adequate in size: boolean
- Bathroom: boolean
- DSS Inspection: Document
- Electrical System: boolean
- Heating System: boolean
- Kitchen: boolean
- Local housing/occupancy code compliance: boolean
+ Parcel_ID: int
+ Parcel_Project_ID: int
- Potable Water: boolean
+ Project_ID: int
+ Replacement dwelling ID: int
- Structurally sound: boolean
Diagram: Project Development

**Staff_Identification**
- Project_ID: int
- Staff_Address: char
- Staff_Name: char
- Staff_Type(Assigned/Hired): char
- Task_Responsible: char

**Authorize_Project**
- Project_ID: int
- Project_Transportation: Transportation_Project

**Project_Title**
- Project_ID: int
- Title_Assurance: boolean
- Title_Search_Method: char

**Identify_Parcels_For_Alignment**
- Cadastre (Parcel): Parcel
- Date_Source_Reference: Date
- Parcel_Photographs: BLOB
- Parcel_Boundary: Transportation_Centerlines_(FTRP)
- Parcel_ID: int
- Parcel_Inspection: boolean
- Project_ID: int
- Source_Reference: char
- Type_Of_Acquisition(Whole/Partial): char

**Acquisition_cost_estimation**
- Initial_Total_Acquisition_Estimate: int
- Project_ID: int
- RoW_Administrator_ID: int

**Relocation_Survey_and_cost_Estimation**
- Initial_Relocation_Cost_Estimate: int
- Project_ID: int
- Relocation_Details: Document
- Relocation_Situation: char
- RoW_Administrator_ID: int

**Non_Federal_Fund_Share**
- Fund_Amount: int
- Project_ID: int
- Source_Funds(Local/State/Credit): char

**Protective_Buying**
- Acquisition_Cost: int
- Project_ID: int
- Parcel_ID: int

**Identified_Project_Parcels**
- Cadastre (Parcel): Parcel
- Date_Source_Reference: Date
- Project_ID: int
- Parcel_ID: int
- Parcel_Acquisition_Cost_Estimate: int
- Parcel_Boundary: Transportation_Centerlines_(FTRP)
- Parcel_RoW_Cost_Estimate: int
- Source_Reference: char
- Type_Of_Acquisition(Whole/Partial): char
- Type_Of_Parcel(RoW/Uneconomic_Remnant): char

**Staff_Identification**
- Project_ID: int
- Staff_Address: char
- Staff_Name: char
- Staff_Type(Assigned/Hired): char
- Task_Responsible: char

**Authorize_Project**
- Project_ID: int
- Project_Transportation: Transportation_Project

**Project_Title**
- Project_ID: int
- Title_Assurance: boolean
- Title_Search_Method: char

**Identify_Parcels_For_Alignment**
- Cadastre (Parcel): Parcel
- Date_Source_Reference: Date
- Parcel_Photographs: BLOB
- Parcel_Boundary: Transportation_Centerlines_(FTRP)
- Parcel_ID: int
- Parcel_Inspection: boolean
- Project_ID: int
- Source_Reference: char
- Type_Of_Acquisition(Whole/Partial): char

**Acquisition_cost_estimation**
- Initial_Total_Acquisition_Estimate: int
- Project_ID: int
- RoW_Administrator_ID: int

**Relocation_Survey_and_cost_Estimation**
- Initial_Relocation_Cost_Estimate: int
- Project_ID: int
- Relocation_Details: Document
- Relocation_Situation: char
- RoW_Administrator_ID: int

**Non_Federal_Fund_Share**
- Fund_Amount: int
- Project_ID: int
- Source_Funds(Local/State/Credit): char

**Protective_Buying**
- Acquisition_Cost: int
- Project_ID: int
- Parcel_ID: int
Diagram: Major ROW Functions

**Class Model - Appraisal**

- Appraiser_Assignment
- Appraiser_Candidate
- Appraiser_Certificate
- Appraiser_Contract
- Initial_Review
- Just_Compensation
- Appraisal_Process
- Appraisal_Review
- Waiver

(from Appraisal - Model)

**Class Model - Acquisition**

- Pre-Negotiation
- Negotiation
- Closing

(from Acquisition - Model)

**Class Model - Relocation**

- Displacing Agency
- Planning Department
- Parcels for Relocation
- Relocation Planning
- Relocation Services
- Relocation Assistance Payments

(from Relocation - Model)

**Class Model - Property Management**

- Construction
- Hazardous_Materials
- Inventory_Management
- Rodent_Control
- ROW_Inventory
- Security_Inspection
- Pre-Construction Property Management
- During Construction Property Management
- Post-Construction Property Management

(from Property Management - Model)

**Class Model - Overall RoW:**

- Parcel_Payment_Status
  - Just_Compensation_Payment_Status: char
  - Parcel_ID: int
  - Project_ID: int
  - Project_Parcel_ID: int
Diagram: Project Closing

```
class Project_Closing

- Any_Outstanding_Condemnations_Identified: boolean
- Encroachments_Identified: boolean
- Excess_Property_Disposed: boolean
- Final_Claims_Processed: boolean
- Project_Accounting_Closed: boolean
+ Project_ID: int
- Project_Plans_Reviewed: boolean
- Records_Stored_and_Accumulated: boolean
- RoW_Certification_Submitted: boolean
```
Diagram: Transportation Elements

class Transportation Elements

    class Transportation_Project
        - Alignment: Geospatial_Reference
        - Alignment_From_end_point: Geospatial_Reference
        - Alignment_To_end_point: Geospatial_Reference
        + Project_ID: int
        - Right_of_way_limits: Geospatial_Reference

    class Transportation_Centerlines
        + Authority_ID: int
        - Date_Transportaion_Centerline: Date
        - From-End-Point: Geospatial_Reference
        - FTSeg-Feature-Type (Optional): char
        - Intermediate-Point (when applicable): Geospatial_Reference
        - Length-Accuracy-Measurement-Method: char
        - Length (Optional and Recommended): int
        - Path-Description: char
        - State: char
        - Status_Transportation_Centerline: char
        - To-End-Point: Geospatial_Reference
        + Transportation-Segment-ID: int

    class Transportation_Centerlines_(FTRP)
        + Authority_ID: int
        - Date_Centerline: Date
        - Elevation: Geospatial_Reference
        - FTRP-Feature_type: char
        - Horizontal_accuracy: Geospatial_Reference
        - Horizontal_accuracy_measurement_method: Geospatial_Reference
        - Latitude: Geospatial_Reference
        - Location_description: char
        - Longitude: Geospatial_Reference
        - Status_Transportation_Centerline: char
        - Transportation_Segment_reference_point_ID: int
        - Vertical_accuracy: Geospatial_Reference
        - Vertical_accuracy_measurement_method: Geospatial_Reference

    class Transportation_Centerlines Authority description
        - Authority-Address: char
        - Authority-City: char
        - Authority-Country: char
        - Authority-Index-Access-Information: char
        - Authority-Information (optional): char
        - Authority-Postal-Code: int
        - Authority-State-or-Province: char
        + Authority ID: int
        - Authority Name: char
        - Contact-Electronic-Mail - Address: char
        - Contact-Facsimile-Telephone (optional): char
        - Contact-Instructions: char
        - Contact-Person-Primary: char
        - Contact-URL (optional): char
        - Contact-Voice-Telephone: char
        - Date_Of_Creation: Date
        - Status: char

    class Transportation Centerlines Equivalency table
        - Date_Of_Creation: Date
        - End_offset: Date
        + Equivalent_FTRP_ID or Equivalent_FTSeg_ID: int
        + Reference-FTRP_ID or Reference-FTSeg-ID: int
        - Start_offset: Geospatial_Reference
        - Status: char

    class Transportation Centerlines Connectivity table
        + Authority ID: int
        - Date_Of_Creation_Of_Connectivity: Date
        - FT_Seg_Offset-%: Geospatial_Reference
        - Offset-%-Accuracy-Description: char
        - Status_Centerline_Connectivity: char
        + Transportation-Segment-ID: int
        + Transportation Segment reference point ID: int
Diagram: overall data model  
Note: Use Zoom feature to see details of this diagram.
APPENDIX E  ANNOTATED BIBLIOGRAPHY

The following documents relate to information management systems
Building a Successful ArcIMS based Transportation Corridor Property Acquisition Tool


Web page: http://www.gis-t.org/files/aQFNU.pdf

Category of ROW functions: Property Acquisition
Information Management: GIS
Type of article/study: GIS-T Symposium presentation
Type of system: Not identified
Survey results: No
Benefit/cost information: No
Lessons learned: No
Data elements: No
Contact information: Yes

Applicability:
This presentation demonstrates the Property Acquisition Tracking (PAT) tool’s key features with the intent of sharing best practices for managing MOT/DOT property acquisition application.

Summary:
This presentation describes the features of the Property Acquisition Tracking (PAT) tool which allows stakeholders involved in the acquisition of property adjacent to transit thoroughfares, to track the complex event flow involved with this process. The application includes powerful symbology tools to render property in different states of acquisition, allows for attribute editing from within the web application, includes advanced search tools, custom query, export to excel, advanced markup tools and document management. The built in security mechanism allows administrators to restrict access to property jurisdictions based on an agent’s profile.
**Engineering Design Data Management – Practices and Framework Development**


**Category of ROW functions:** Other  
**Information Management:** Data management framework  
**GIS**  
**Type of article/study:** Technical Report  
**Type of system:** Various  
**Survey results:** No  
**Benefit/cost information:** No  
**Lessons learned:** No  
**Data elements:** Yes  
**Contact information:** Yes

**Applicability:**  
This report summarizes research conducted to evaluate and document current engineering design data management practices at TxDOT.

**Summary:**  
This report summarizes research conducted to evaluate and document current engineering design data management practices at TxDOT. The report also describes a prototype engineering data management framework to assist divisions and districts in their effort to manage engineering data effectively. The focus of the report is on data types; spatial and temporal data attributes, and associated documentation used during the design phase of typical highway improvement projects. The report summarizes procedures, practices, and systems TxDOT and other government agencies use for managing engineering design data; describes an integrated geographic information system (GIS)-based data model for engineering design data that complies with TxDOT data architecture requirements; and documents the results of tests completed on the engineering design data model by using offline and online testing environments.
Enhanced Coordination of Cadastral Information


Category of ROW functions: Other
Information Management: Map Inventory
GIS
Type of article/study: Report
Type of system: Digital Inventory
Survey results: No
Benefit/cost information: No
Lessons learned: Yes
Data elements: No
Contact information: Yes

Applicability:
This report presents the benefits of using the State Parcel Map Inventory (SPMI) and the benefits of coordination of cadastral and highway right-of-way information.

Summary:
Any project conducted by Mn/DOT that impacts property owners requires the coordination of cadastral (land ownership) and highway right-of-way information. The timely and accurate identification sharing and coordination of cadastral information is the basis for well-managed highway projects. Mn/DOT has already taken a step towards improving coordination between Mn/DOT offices and other government agencies with the State Parcel Map Inventory (SPMI), a resource with information about the status and accuracy of cadastral information in 87 Minnesota counties. Government agencies have seen the potential in the SPMI to better optimize data development and exchange through the use of GIS technologies. The finding of this project suggest that the SPMI is a starting point for helping coordination, but more targeted efforts are called for. Considering the heterogeneity of local government, individual relationships between organizational staff are crucial to overcoming institutional and technical obstacles.
**Enterprise Content Management Systems (Right of Way)**

*Oregon DOT (2008), Enterprise Content Management Systems (Right of Way), Survey Request to the American Association of State Highway and Transportation Officials.*

**Web page:**

Category of ROW functions: All  
Information Management: Business Process Management automation tools  
Electronic forms  
GIS Tools  
Type of article/study: Survey  
Type of system: Not applicable  
Survey results: Yes  
Benefit/cost information: No  
Lessons learned: No  
Data elements: No  
Contact information: No

**Applicability:**

This document consists of survey responses to ODOT’s request for information about information managements systems.

**Summary:**

The second phase of ODOT’s development of a Content Management System where they asked for state experience with Business Process Management automation tools, Electronic forms and GIS based tools to manage the acquisition of property and capture forms and data electronically where feasible.

They asked about systems that use some form of Content Management tools or other tools that electronically manage workflows and forms with a focus on web based tools (internet, intranet and extranet).
Florida Department of Transportation - Enterprise Geographic Information System (Establishing a Business Case)


Web page: [http://www.gis-t.org/files/CrTlr.pdf](http://www.gis-t.org/files/CrTlr.pdf)

Category of ROW functions: Other
Information Management: Enterprise GIS
Type of article/study: GIS-T Symposium Presentation
Type of system: GIS
Survey results: No
Benefit/cost information: Yes
Lessons learned: No
Data elements: No
Contact information: Yes

Applicability:
This presentation describes the different phases of the development of an Enterprise GIS by the Florida Department of Transportation.

Summary:
As part of developing an enterprise GIS, FDOT first conducted a literature review pertinent to the concept of enterprise GIS and later evaluated the past efforts in terms of certain parameters. Later the term enterprise GIS was clearly defined and a business needs assessment was conducted for developing an enterprise GIS. The study also evaluated four enterprise GIS implementation options which were:

- No-Build case: Status-quo
- Pseudo-Enterprise GIS: Ad-hoc data sharing
- Enterprise GIS: Distributed data storage with enterprise standards
- Enterprise GIS: Centralized data repository

After evaluating the options by doing a cost-benefit and risk analysis, it was found out that the distributed enterprise GIS implementation was the most beneficial option with moderate risk.
Geographic Information System Application for Transportation Right-Of-Way

Federal Highway Administration, Planning and Policy Analysis Division, U.S. Department of Transportation (2008), Geographic Information System Application for Transportation Right-Of-Way, Office of Interstate and Border Planning and Office of Real Estate Services, United States, Federal Highway Administration, U.S. Department of Transportation, Lee’s Summit, Missouri.


Category of ROW functions: All
Information Management: GIS
Type of article/study: FHWA Peer Exchange Report
Type of system: Various
Survey results: No
Benefit/cost information: No
Lessons learned: Yes
Data elements: No
Contact information: Yes

Applicability:

The report provides a summary of the presentations made and conversations held at the 2008 peer exchange on GIS in Right of Way (ROW).

Summary:

A peer exchange program, which was a follow up to a peer exchange held in August 2007 on the same topic, was held to provide the participants with an update on the progress of the National Cooperative Highway Research Program’s (NCHRP) Project 8-55A Developing a Logical Model for a Geospatial ROW Information Management System, to allow participants from the 2007 peer exchange to describe the progress each has made over the last year in developing their respective GIS for ROW applications and finally; to give state DOTs with noteworthy GIS applications for ROW the opportunity to share their knowledge and experiences with each other and with state DOTs in the beginning stages of implementing GIS in the ROW area. The current report provides a summary of the events at the peer exchange.
Geographic Information System Implementation of State Department of Transportation Right-Of-Way

A. Saka, (2004), Geographic Information System Implementation of State Department of Transportation Right-Of-Way, United States, Federal Highway Administration, DTFH61-03-H-00121, Washington, DC.


Category of ROW functions: Planning & Management
Property acquisition
Property appraisal
Relocation assistance
Property/Asset management
Utility relocation management
Outdoor advertising control

Information Management: GIS
Type of article/study: Other
Type of system: Various
Survey results: Yes
Benefit/cost information: No
Lessons learned: Yes
Data elements: No
Contact information: Yes

Applicability:
The article reports the pros and cons of GIS implementation by various DOTs particularly in right of way (ROW) activities and suggests possible improvements that can be made to promote its use.

Summary:
This report, based on the case study of eight state DOTs, documents the extent GIS technology is used in the various right of way (ROW) functional areas. Based on a combination of literature review, survey and interview, the pros and cons of GIS implementation by various DOTs are presented and it was revealed that although the GIS technology is still very much localized and in its infancy, the state DOTs are aware of the opportunities GIS presents in streamlining the implementation processes of right of way (ROW) programs. The survey also revealed that the major hindrance to large scale GIS application in the state DOTs is the lack of time and personnel resources; and adequate allocation of resources is necessary in order to mainstream the use of GIS in the implementation of right of way (ROW) programs at the state DOTs. The report also includes the best practice methods of GIS implementation for ROW functional areas most likely targeted for GIS application.
Geographic Information Technologies for Asset Management – A Peer Exchange

Transportation Research Board, Transportation Asset Management Committee and Spatial Data and Information Science Committee (2006), Geographic Information Technologies for Asset Management – A Peer Exchange, Transportation Research Board, Kansas City, Missouri.


Category of ROW functions: Asset management
Information Management: GIS
Type of article/study: Peer Exchange Report
Type of system: Various
Survey results: Yes
Benefit/cost information: No
Lessons learned: Yes
Data elements: No
Contact information: Yes

Applicability:
This report describes the proceedings of a peer exchange program held to investigate the state and local agency applications of spatial technologies for asset management activities and to identify ongoing issues and research directions.

Summary:
The following document reports the proceedings of the peer exchange conducted by the Transportation Research Board (TRB) Transportation Asset Management Committee and spatial Data and Information Science Committee to investigate state and local agency applications of spatial technologies for asset management activities and to identify ongoing issues and research directions. Results of the questionnaires given to the participating organizations are provided and the issues related to implementation of a true spatial data warehouse for developing comprehensive asset management products were identified. The discussions of the peer exchange focused on three major issues areas in moving spatial technology applications to the next level: managing change, data integration, and communication. Upon a thorough discussion of these issues, the peer participants identified research to address three areas of interest: temporal issues, symbology, and data and visualization models. Finally the roles of national organizations in sharing best practices and in promoting standards and open data architectures are also reported.
Geospatially Enabling Information Management for Right-of-Way Activities


Category of ROW functions: All
Information Management: GIS
Type of article/study: Conference Article
Type of system: GIS
Survey results: No
Benefit/cost information: No
Lessons learned: No
Data elements: No
Contact information: Yes

Applicability:
This paper presents examples of various information systems used by various State department of Transportation and shows the benefits of a geospatial technology.

Summary:
Challenges associated with Right of Way (ROW) activities can often delay transportation projects and result in increased costs. Automation of ROW functions and development of information management systems, particularly when integrated with geospatial technologies, can substantially improve performance and resource management within Right of Way agencies. This paper presents several examples of different types of systems currently in use by state agencies and how these systems have impacted their activities. It also begins to address the issues associated with moving into an enterprise information structure.
GPS to LRM: Integration of Spatial Point Features with Linear Referencing Methods

S Hallmark (2001), GPS to LRM: Integration of Spatial Point Features with Linear Referencing Methods, Office Research and Special Programs Administration, U.S. Department of Transportation, University Transportation Centers Project MTC-A-4 and the Iowa Department of Transportation, CTRE Management Project 00-68.

Web page: http://www.ctre.iastate.edu/reports/gpslrn.pdf

Category of ROW functions: Other
Information Management: Data management
Type of article/study: Technical Report
Type of system: Other
Survey results: No
Benefit/cost information: No
Lessons learned: No
Data elements: Yes
Contact information: Yes

Applicability:
The report evaluates the issues associated with integrating GPS data with a Linear Referencing Method (LRM)

Summary:
The following report summarizes the various issues in integrating point features with a LRM or between LRMs and recommendations are provided. The recommendations are based on a pilot study, where point features, linear datum, and a spatial representation of a LRM were created for six test roadway segments that were located within the boundaries of the pilot study conducted by the Iowa Department of Transportation linear referencing system project team. Topics relating to accuracy of GPS and loss of spatial information that occurs when a three-dimensional or two-dimensional spatial point feature is converted to one-dimensional representation on a LRM, are also discussed. Recommendations such as storing point features as spatial objects if necessary or preserving information such as coordinates and elevation are suggested. The lack of spatial accuracy characteristic of most cartography, on which LRM are often based, is another topic discussed. Finally some of the issues in transferring point feature data between LRMs are discussed.
Micro-Computer Based Real Estate Decision Making and Information Management – An Integrated Approach

P. Kershaw, R. Kooymans, & P. Rossini (1992), Micro-Computer Based Real Estate Decision Making and Information Management – An Integrated Approach, Department of Property Resource Management, University of South Australia, 2nd Australasian Real Estate Educators Conference.

Web page: 

Category of ROW functions: General Real Estate
Information Management: Information Management System
Type of article/study: Conference Paper
Type of system: Real Estate Information
Survey results: No
Benefit/cost information: No
Lessons learned: Yes
Data elements: Yes
Contact information: No

Applicability:
This paper presents the research and development into an integrated Real Estate Decision Making and Information Management System.

Summary:
The introduction and acceptance of computers for use in the Real Estate industry is widespread. The use has been mainly limited to word processing, accounting, financial analysis and more recently limited use as an information management tool. However, there is little evidence of the use of any integrated system that allows for the direct analysis of data from a comprehensive, market-wide database. The aim of this research project is to develop such a system.
Nevada DOT’s Integrated Right-of-Way Information Network Project


Web page: http://www.gis-t.org/files/GPSuY.pdf

Category of ROW functions: Property Acquisition
Property Management
Permits
Billboards

Information Management: GIS
Document management

Type of article/study: GIS-T Symposium Presentation
Type of system: GIS, Internet services
Survey results: No
Benefit/cost information: No
Lessons learned: Yes
Data elements: Yes
Contact information: Yes

Applicability:
This presentation summarizes the features of the Integrated Right of Way Information Network (IRWIN) application developed by the Nevada’s DOT.

Summary:
This presentation summarizes the features of the Integrated Right of Way Information Network (IRWIN) application, developed by the Nevada’s Department of Transportation. IRWIN consists of seven important modules for Geographic Information Systems (GIS), Videolog, Document management, Acquisition, Proper management, Permits, Billboards and Junkyards. All this modules put together form a complete GIS based Right-of-way information management system. The Graphical User Interface (GUI) for all the modules is shown and their features are explained. The things that are learned from the project and also its pros and cons are presented.
Peer Exchange on Applications of Geographic Information Systems in the Right-of-Way Area


Category of ROW functions: All
Information Management: GIS
Type of article/study: FHWA Report
Type of system: Various
Survey results: No
Benefit/cost information: No
Lessons learned: Yes
Data elements: No
Contact information: Yes

Applicability:

The following report provide a summary of the presentations made and the conversations held at the 2007 peer exchange program on GIS applications in Right-of-Way area.

Summary:

The Federal Highway Administration (FHWA) office of Interstate and Border Planning and Office of Real Estate Services sponsored a 1.5-day peer exchange program focusing on select State Departments of Transportation (DOTs) applications of the Geographic Information Systems (GIS) in the Right-of-Way (ROW) area. The purpose of the peer exchange was to allow State DOTs with noteworthy GIS applications for ROW to share their knowledge and experiences with each other and with State DOTs in the beginning stages of implementing GIS in the ROW area. This report provides a summary of the proceedings at the peer exchange program. An overview of the National Cooperative Highway Research Program’s (NCHRP) project 8-55 was also given as part of the peer exchange program. This report serves as a resource for other DOTs and transportation agencies looking to learn more about successful implementations or planned implementations of GIS in ROW. Lessons learned by the participating DOTs are also presented at the end of the report.
Right Of Way Real Property Asset Management – Prototype Data Architecture


Category of ROW functions: Other: Right-of-Way Assets
Information Management: GIS
Data management
Type of article/study: Technical Report
Type of system: Data Architecture
Survey results: No
Benefit/cost information: No
Lessons learned: No
Data elements: Yes
Contact information: Yes

Applicability:
This report presents the results of a project to develop a prototype of a data architecture for right of way assets.

Summary:
The Texas Department of Transportation (TxDOT) is responsible for managing 1.1 million acres of land that provide right of way for approximately 80,000 centerline miles of state-maintained roads. Management of the huge right of way asset involves considerable resources and the integration of numerous business processes. There is an urgent need to develop a right of way asset data architecture to facilitate the inventory and management of TxDOT right of way assets. This architecture would facilitate the identification of current right of way boundaries, tracking of right of way boundary changes, automatic mapping of right of way surveying data to other layers of information such as control section job and route number locations, and complete attribution of right of way assets. It would also simplify the production of reports, including those needed to address financial reporting requirements. As part of the research, the researchers evaluated current right of way data practices at TxDOT and other agencies, and developed and tested a prototype geographic information system (GIS)-based right of way asset data model. The data model included a logical model, a physical model, and data dictionary, following current TxDOT data architecture standards and findings from recent research and implementation projects.
Risk-Based Framework Using Geographic Information Systems to Identify Transportation Corridors Vulnerable to Development


Category of ROW functions: Other: Corridor Preservation
Information Management: GIS-based framework
Type of article/study: Technical Report
Type of system: GIS Application
Survey results: No
Benefit/cost information: No
Lessons learned: Yes
Data elements: Yes
Contact information: Yes

Applicability:
This report presents the results of a project to develop a GIS system to evaluate transportation corridors.

Summary:
The Virginia Department of Transportation (VDOT) is increasingly involved with the land development process in evolving transportation corridors. This process includes consideration of real estate interests, rezoning and permitting approvals, site plans, public utilities, right of way, access management, and the transportation facilities themselves. Localities may compete with one another for economic development and withhold plans for developing corridors or may simply be unaware of development intentions. It is therefore important that VDOT transportation planners anticipate and proactively address future development along corridors to avoid surprise, regret, and belated action. With many thousands of miles of undeveloped corridors across the Commonwealth, VDOT must prioritize the corridors and corridor sections most in need of immediate attention. This study developed a comprehensive approach using geographic information systems (GIS) to identify and prioritize the needs for protection strategies in countywide corridors. Over eighty GIS data layers sourced from VDOT, Fauquier County, and others were evaluated to determine appropriate factors for the analysis.
Streamlining and Integrating Right-of-Way and Utility Processes With Planning, Environmental, and Design Processes in Australia and Canada


Category of ROW functions: All
Information Management: GIS
Type of article/study: Scan Report
Type of system: GIS Application, Visualization
Survey results: No
Benefit/cost information: No
Lessons learned: Yes
Data elements: No
Contact information: Yes

Applicability:
This report reports the results of an international scan on practices related to land acquisition in Australia and Canada.

Summary:
Many transportation projects require acquisition of land and accommodation of utility facilities in the right-of-way. The Federal Highway Administration, American Association of State Highway and Transportation Officials, and National Cooperative Highway Research Program sponsored a scanning study of Australia and Canada to learn about innovative practices for right-of-way and utility processes. The study complemented a 2000 study of European countries. The scan team identified nine priorities for U.S. implementation: promote incentive-based reimbursement for utility relocations, pursue corridor preservation strategies, use an alliance contract approach to integrate right-of-way acquisition and utility coordination, enhance cooperative relationships with property owners to facilitate timely property acquisition, develop geographic information system (GIS)-based right-of-way project and asset management systems, promote visualization techniques to communicate project impacts, promote use of multiple-level memorandum of understanding (MOU) structures, promote use of utility coordination best practices during construction, and develop a framework to establish proficiency of right-of-way and utility professionals.
System Planning to Support Spatially Enabled Business Process: Research of an Enterprise Geographic Information System for Transportation


Category of ROW functions: Other
Information Management: GIS
Type of article/study: Final Technical Report
Type of system: Enterprise GIS
Survey results: No
Benefit/cost information: Yes
Lessons learned: Yes
Data elements: Yes
Contact information: Yes

Applicability:

This report presents the results of implementing an enterprise GIS within Florida DOT.

Summary:

This study formally analyzes the requirements and evaluates the business case for an enterprise system at FDOT. The project includes three tasks: 1 - Assemble and review literature germane to the concept of Enterprise GIS, including all previous work completed by the Department; 2 – Compare previous efforts against the adopted Information Systems Development Methodology (ISDM) manual, and identify missing products needed for evaluating a business case; 3 - Use pertinent information from past efforts to create or update missing products. As part of Task 3, business needs were analyzed through stakeholder interviews and data flow maps. Four implementation options were proposed: a no build case to maintain status quo (Option 1), a pseudo-Enterprise GIS for ad hoc data sharing (Option 2), a distributed Enterprise GIS with enterprise standards (Option 3), and a centralized Enterprise GIS (Option 4). These four options were evaluated using cost-benefit analysis and risk assessment. Based on the results of this analysis and considering current FDOT's environment, Option 3 was recommended as the preferred Enterprise GIS solution. Several critical success factors for successful implementation of this option were analyzed in detail, and recommendations were made.
Utility Installation Review System - 2008 Follow-Up Report


Web page: http://tti.tamu.edu/documents/5-2110-03-4.pdf

Category of ROW functions: Other
Information Management: GIS, Web application
Type of article/study: Final Technical Report
Type of system: GIS
Survey results: No
Benefit/cost information: Yes
Lessons learned: Yes
Data elements: No
Contact information: Yes

Applicability:
This report presents the results of the follow-up to the implementation of the web-based GIS system for managing utility installation requests at TexDOT.

Summary:
In December 2007, the Texas Department of Transportation (TxDOT) received delivery of a web-based system that automates the submission, review, approval, construction, and archival of utility installation requests at TxDOT. The system, called Utility Installation Review (UIR), enables users to submit and process installation requests online, including supporting documentation such as design and construction drawings. The system also includes an online geographic information system (GIS)-based interface that enables users to locate and query proposed installation requests using an interactive map. This report summarizes the work completed in 2008 which consisted of maintaining the UIR software, conducting knowledge transfer, and providing technical support to district and utility company users in the five districts where UIR was active.
Washington DOT – Digital Archiving and Spatial Enabling Real Estate Management


Category of ROW functions: Other
Information Management: GIS
Type of article/study: GIS- T Symposium Presentation
Type of system: Various
Survey results: No
Benefit/cost information: No
Lessons learned: No
Data elements: No
Contact information: Yes

Applicability:
This presentation describes a web-based system proposed by the Washington- DOT which integrates all tabular and spatial databases and allows of retrieval of scanned documents.

Summary:
Washington- Department of Transportation proposed a web-based system which integrates all the tabular and spatial databases, and also allows for the retrieval of scanned documents. Methodology is provided to convert paper maps into digital maps, which are then integrated into Geographic Information Systems (GIS) and Computer Aided Design (CAD) and demonstration for same is same is provided. The role of different people involved in the development of such a system is also discussed. And finally the benefits of Real Estate Services (RES) GIS system and RES process changes are also presented.
**Working GIS Miracles**


**Web page:**

Category of ROW functions: Other
Information Management: GIS
Type of article/study: Journal Article
Type of system: Enterprise GIS
Survey results: No
Benefit/cost information: No
Lessons learned: No
Data elements: No
Contact information: Yes

**Applicability:**

This article describes the development of a countywide enterprise GIS system for Washoe County in Nevada.

**Summary:**

This article describes how Washoe County in Nevada, upgraded its 20-year old geographic information system (GIS) system into a fully coordinated, countywide enterprise system. The original system was used only by the planning department and was incompatible with other departments. After a major flood in 1997 highlighted the shortcomings of the old GIS program, a new system was created. Currently, the county maintains 188 data layers in its central database, which is accessible by all GIS users and selected local agencies. The database provides seamless base mapping across jurisdiction boundaries within the county. The positional accuracy of spatial data and processing speed have both been greatly improved. Currently, 17 county departments use the GIS technology and mapping programs for a variety of uses including emergency vehicle deployments, property assessment, and defining mosquito spraying areas. Adapting the GIS to meet current needs required strong leadership, motivated technical staff, cooperation between departments and jurisdictions and an aggressive marketing plan.