Construction Project Data Management

Establishing Foundations for an Asset Database

Scot Twining
Project Activities Supported by GIS

- Cadastral Mapping
- Proposed Pipeline Route Selection
- Right Of Way Acquisition
- Survey Planning and Tracking
- Survey Data Collection and Management
- Environmental Permit Application Maps
- Construction Drawing Generation
- Community Relations and Public Meetings
Benefits of Using GIS in Construction Projects

- Concurrent Pre-Construction Activities
- Data-Centric Approach to Project Activities
- Avoid Spending Time on Unnecessary Activities
- Manage Centralized Project Data
- Get Answers Quickly to Managers and Engineers
- More Planning, Less Field Work, Less Sitting Around
- Use of Existing GIS Datasets
- Progress is Easily Tracked
- Public Perception of Competence
- Reduce Rework
- Reduce Cost
Construction Project Data Requirements

- Ortho-Corrected Aerial Photography
- Land Parcel Boundaries
- Land Parcel Ownership Information
- Survey Permission and Completion Status
- Existing Pipelines and Pipeline Features (If Applicable)
- Proposed Pipeline Routes
- Construction Access Roads
- Environmental Features
- Archaeological Sites
- ROW and Temporary Workspace Layout
- Civil Survey Information for Ties and Crossings
- Proposed Pipeline Design
Data Collection & Survey Chronology

- Preliminary Data Collection
- Preliminary Survey (If Applicable)
- Proposed Route Location (Iterative)
  - Detailed Civil Survey
  - Design Phase
    - Construction Phase
- Fly Ortho-Photography
- Gather Existing GIS Data
- Gather Parcel / Ownership Data
- Existing Pipeline and Facility Survey
- Proposed Pipeline and ROW / TWS Survey
- Environmental Survey
- Archaeological Survey
- ROW Acquisition
- Civil Survey
- Pipeline Design
- Pipeline Construction
- As-Built Survey
Aerial Photography

- Ortho-Correction is Necessary
- Plan for Flights During Winter
- Cover All Proposed Routes
- High Resolution for Large Scale Map Products Such as Plat Maps
Land Parcel Data

- ROW Acquisition Support
- Appears on All Mapping Products
- ROW / Workspace Dependencies
- Parcel Polygons – Ownership Data Linkage
- Importance of Scale and Accuracy
- Municipal & Tax Map Sources
- Parcel Title Searches (Best Method)
- Refine with Property Corner Surveys (< cm)
- Ownership Attributes for ROW acquisition
- Survey Permission Attributes to Avoid Trespassing
- Survey Progress Attributes for Progress Reporting
- Construction Sheet Ownership Band Display
Existing Pipeline C/L and Features

- For Construction in an Existing ROW
- Sub-Centimeter Survey for Construction Purposes (Avoid Existing Facilities)
- Existing ROW Configuration Offset from C/L
- Proposed Pipeline C/L Offset from Existing C/L
- Temporary Workspace Offset from Existing C/L
- Crossover Planning
- Refine Existing Facility Data
- Features that Affect Construction
ROW & Temporary Workspace Configuration

- Increase of Existing ROW or Development of New ROW
- Temporary Workspace for Entire Length of Construction
- Additional Workspace at Road, Railroad, and Water Crossings
- Where Do You Park Vehicles?
- Where Do You Store Materials?
- Where Do You Store Spoil?
- Sloping Areas Require More Temporary Workspace
- Environmental Features to Avoid
- Directional Drilling Pads
ROW & Temporary Workspace Configuration
Access Roads

- Select and Locate Access Roads Early
- Private Roads Require Owner Permission
- Use Access Roads for Surveys Also
- Environmental Permitting Must Cover Access Roads as well as Proposed ROW
- Survey From Proposed ROW to Paved Road
Environmental Survey

- For Permit Applications
- Helps with Construction Method Planning at Water Crossings
- Include Wetlands, Ponds, Lakes, Waterways, T & E Plants, T & E Animals, and Archaeological Sites
- Features as Insignificant as Wet Weather Conveyances Are Considered in Most States
- Intersection with Proposed ROW and Access Roads
- Re-Routing Proposed C/L to Avoid Sensitive Areas will Save Money and Ensure Permitting
- Involve Regulators from the Beginning
- Environmental Band on Construction Alignment Sheets
- Other Mapping Products
Utility, Road, & Railroad Crossings

- Collect During Civil Survey of Proposed Corridor
- Sub-Centimeter Survey will Ensure that Crossings Fall in the Correct Parcel Polygon
- Drilling Planning Support
- Casing Location Planning Support
- Avoidance of Overhead Crossings During Construction
- Some Crossings Have a ROW and Some can be Represented with a Single Line
- Will be Mapped in the Film Window and Stationing Band of Construction Alignment Sheets
Point Features

- Collect During Civil Survey of Proposed Pipeline Corridor
- i.e. Poles, Building Corners, Existing Aerial Markers, Drinking Water Wells
- Avoid or Move During Construction
- Use Perpendicular Distances for Ties on Construction Alignment Sheets
Proposed Pipeline Design Data

- Use Preliminary Construction Alignment Sheets as Basis for Design
- Proposed Centerline Route and Stationing Should be Finalized
- Design Data can be Provided Using Coordinate Geometry or Stationing
- Design Data Includes: Pipe Material Specifications, Pipeline Coatings, Concrete, Casings, Appurtenances, Valves, and CAD Drawing References
- Design Data will be Displayed in Design Bands and Materials Lists on the Final Construction Alignment Sheets
Survey Permission & Survey Progress

- Necessary if Client Wishes to Track Survey Permission and Progress Using GIS
- Attributes Should be Linked to Parcel Polygons
- Survey Permission Attributes Should be Updated Daily and Maintained by ROW Agents
- Survey Progress Attributes Should be Updated Daily and Maintained by Survey Contractors
- Web-Based GIS Survey Tracking Software is Ideal For Displaying and Maintaining These Data
- Beneficial for Planning Daily Survey Activities
- Multiple Survey Efforts Can be Tracked at the Same Time
- Maps Can be Created to Aid Survey Contractors in Finding Locations and Staying in Permitted Areas
Data Management

- Survey, Pipeline Design, Land Parcel, Ownership, and Survey Progress Data
- Must be able to generate sheets for constantly changing pipeline route
- Many sources of input
- Sheets must reference data vintage
- Web-based project collaboration software is very helpful in managing data submittals, data deliveries, and map product deliveries
- Must ensure that client and other contractors always have access to the most recent data
- Survey data dictionaries, procedure documents, and training are essential
- Linear referencing is required
Survey Data Dictionaries

- Keep Final Output in Mind
- Consider Existing Facility Data Model
- Will Ensure Data is Formatted Properly for Input into Data Processing Programs
- Must be Coupled with Procedures and Training
- Should be Instrument Independent
- Use Consistent Feature Attributes, Required Fields, and Drop-Down Menus
- Keep it Simple
- Whenever Possible, Collect Lines as Lines to Avoid Post-Processing of Survey Data
Data Flow & Processing
Map Output & GIS Applications

- Land Parcel Plat Maps
- Web-Based GIS Survey / Activity Progress Tracking Application
- Environmental Permit Application Maps
- Construction Alignment Sheets
- Mobile GIS for Data Collection & Verification
- As-Built Alignment Sheets
Land Parcel Plat Maps
Web-Based GIS Survey Tracking Application
# Web-Based GIS Survey Tracking Report

## Detailed Report

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Environmental Permit Application Maps
Conclusion

- Keep Final Products of Project in Mind
- Make Sure Data is of Sufficient Accuracy
- Use Ortho-Corrected Aerial Photography
- Use Survey Data Dictionaries, Defined Survey Procedures, and Provide Training to Surveyors
- Web-Based Project Collaboration Software is Ideal for Managing Data Submittals from the Field and Deliveries of Map Products
- Survey Permission and Progress Tracking is Very Useful to Construction Managers and Subcontractors
- The Proposed Pipeline Route is Dynamic, so Data Vintage Should be Tracked and Reported on Map Products