



November 9, 2012

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Parks & Open Space Department
Surveyor's Office
Transit Office
Transportation Department
Water Resources Department

Maria Munoz
U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration
Office of Contracts and Procurement, PHA-30
1200 New Jersey Avenue, SE, E22-305
Washington, D.C. 20590

Re: Grant Agreement No.: DTPH56-11-G-PHPT13

I am pleased to present the attached PHMSA Grant Final Report and Federal Financial Report. Dakota County has completed the objectives stated in the grant application. The total cost of the project exceeded \$50,000; however, the additional costs were funded internally. The project was completed by September 30, 2012.

The results of the project will continue to be useful to Dakota County, its cities, and its residents for many years.

If you have any questions, please contact me at 952-891-7080 or randy.knippel@co.dakota.mn.us.

Sincerely,

A handwritten signature in black ink that reads "Randy Knippel". The signature is fluid and cursive, with a large, sweeping flourish at the end.

Randy Knippel, GIS Manager

PHMSA Grant Final Report Dakota County, Minnesota DTPH56-11-G-PHPT13

Project objective: “Improve GIS pipeline locations using GPS field surveys, improve existing maps for emergency responders by showing accurate pipeline locations, and perform risk analysis using a variety of other existing GIS layers representing key resources, vulnerable population and public gathering places.”

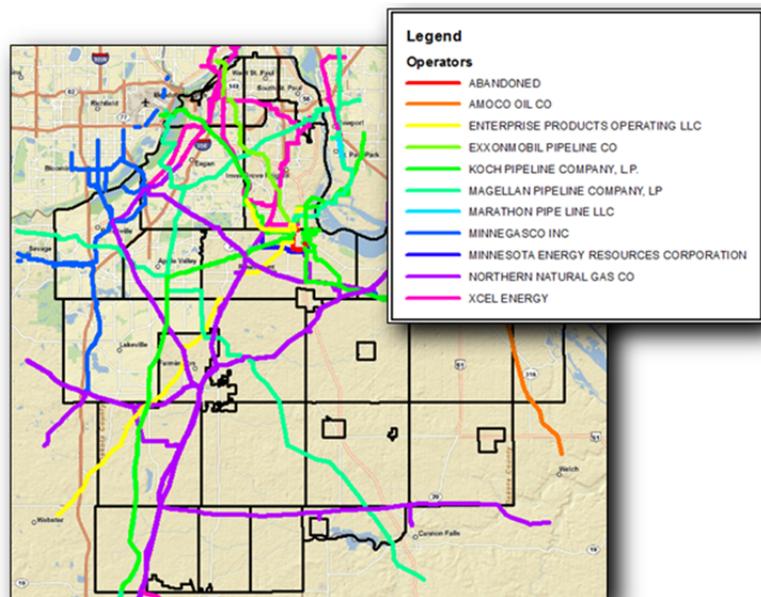
The basic approach to improve pipeline locations was to perform field surveys using survey-quality GPS data collectors, under the direction of a licensed surveyor, to collect locations of visible pipeline markers through field observations. These locations were then used to adjust existing pipeline data using GIS software.

The project leveraged existing GIS software, computing hardware, and survey equipment, as well as existing GIS and survey professional staff.

The project was completed in four phases; initial assessment, pilot project, data collection & refinement, and mapping & analysis.

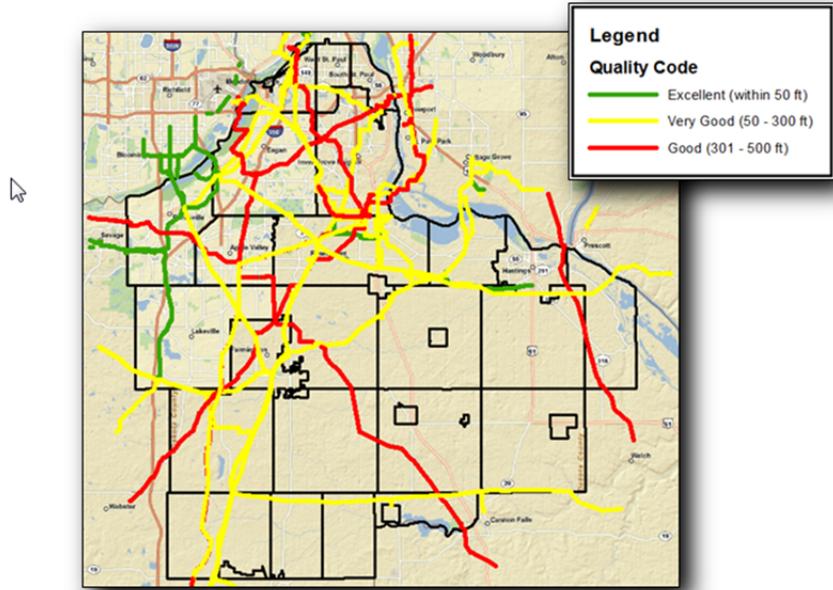
Initial Assessment

Current pipeline data was downloaded from the PIMA website. Initial review showed that there were 10 different pipeline operators in Dakota County, with a majority held by 3 operators.

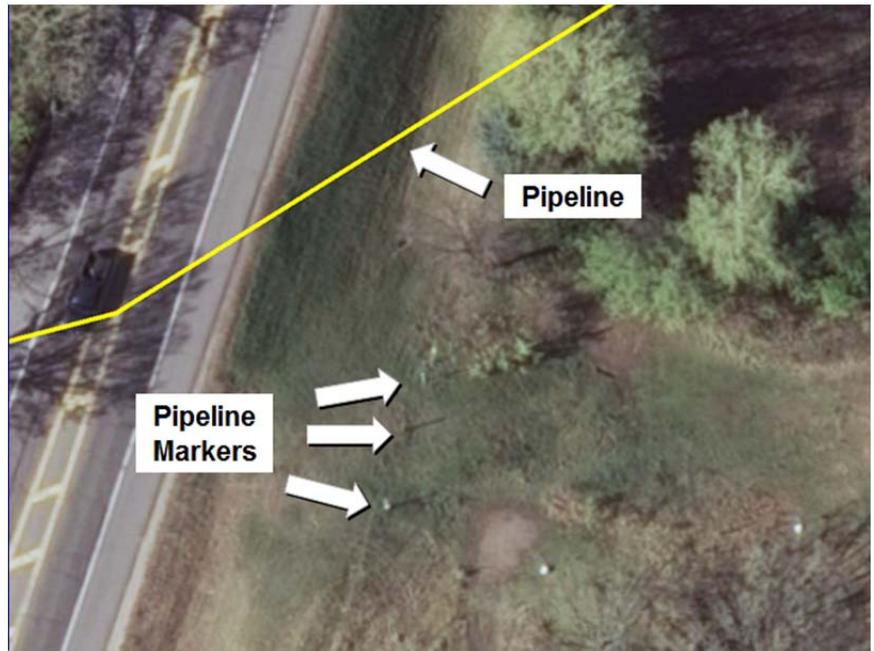


Initial contact with pipeline operators was attempted via email, using the contact information associated with the pipeline data. The email described the project and requested further communication to determine a contact with GIS expertise and if additional GIS data existed. Responses to this email varied by operator and led to detailed phone conversations with several operators. One operator (Magellan) responded with much interest in the project, stating they were currently refining their data and wanted the results of our project to assist them. We shared what we had collected up to that point of their facilities. They also shared some update pipeline data, beyond what was in PIMA.

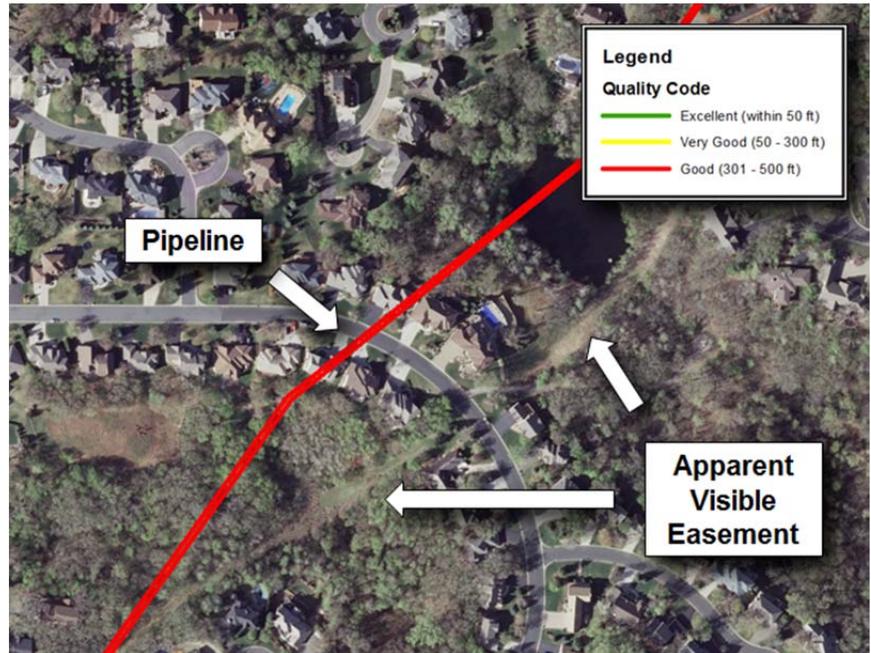
Further review of the “Quality_CD” field showed that Dakota County had 3 levels of quality: “E”, “V”, and “G”, with the majority in the “V” category. This was further reviewed to understand the number of miles of each operator by quality code. This information was used to select a pilot project area and prioritize the field data collection, with highest priority given to the least accurate data.



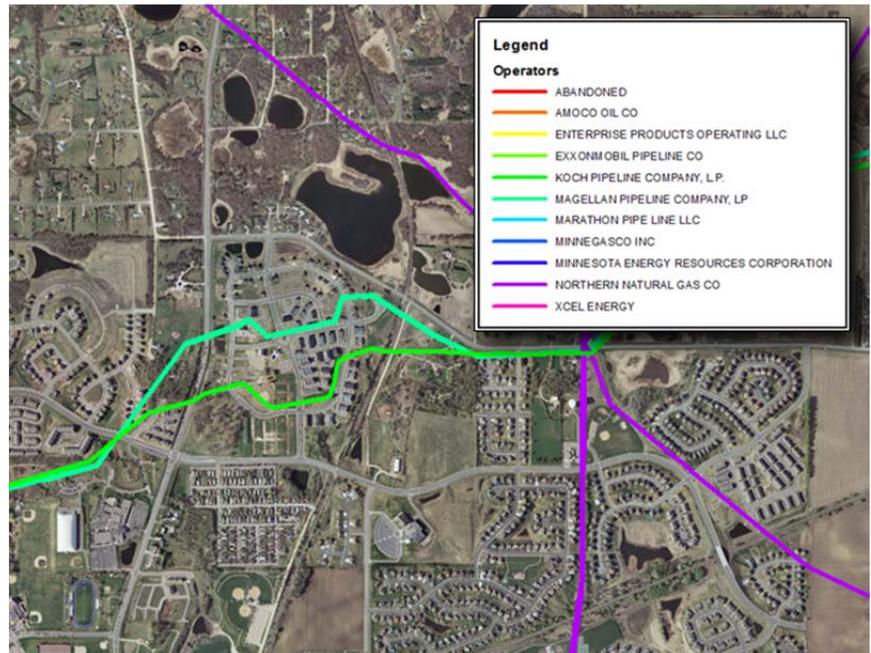
The data was overlaid on 2010 aerial photography acquired by Dakota County. This aerial photography has a resolution of 6 inches and a tested positional accuracy of +/- 1.7 feet. At this resolution, many pipeline markers are visible. In general, pipelines were found to not match visible markers very well.



In developed areas, the pipeline easement is visible due to the removal of trees and other large vegetative cover. In these areas, many of the lines did not fall within the apparent easement.



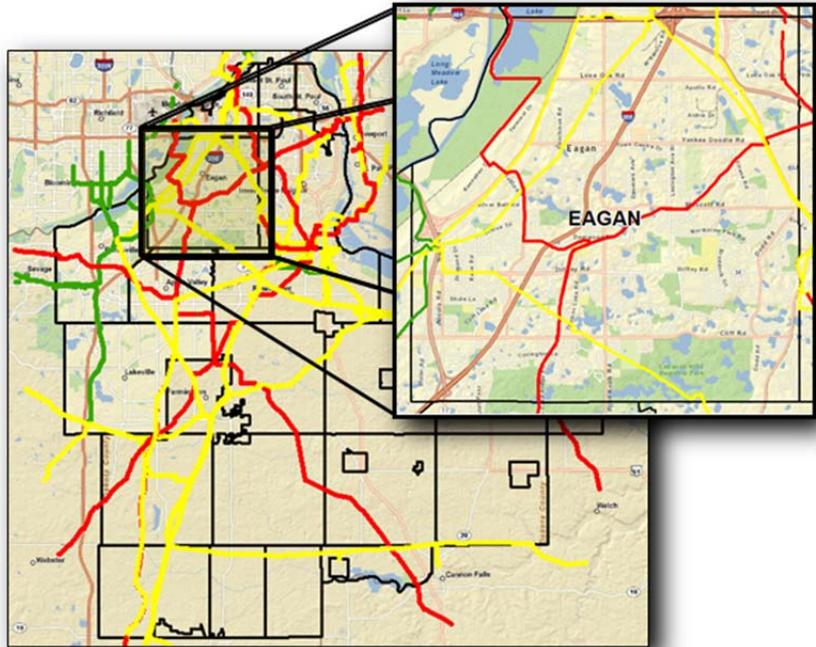
In other cases, pipelines from two operators appeared to have the same shape, implying they share the same easement and alignment. However, the lines were not in the same location.



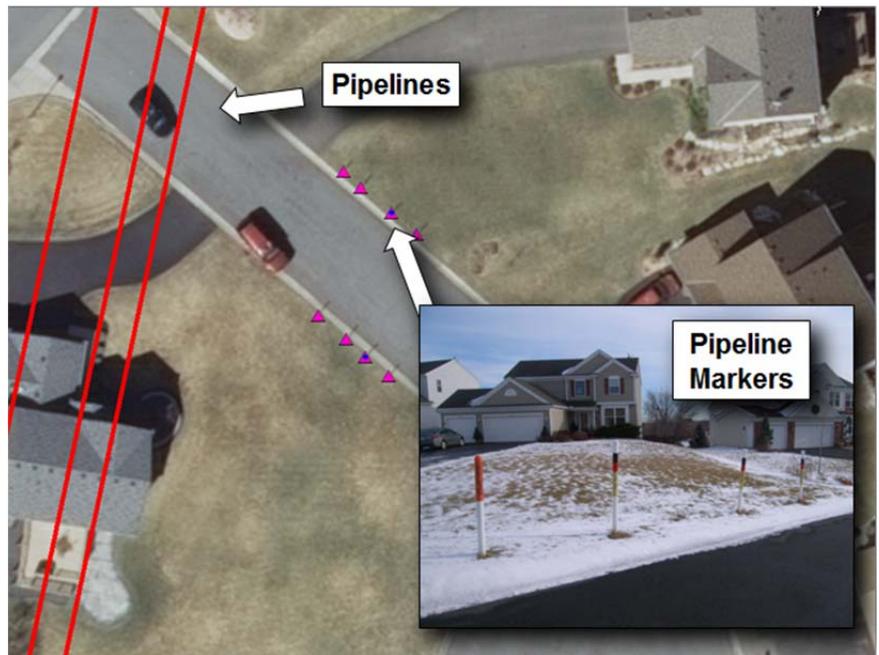
Pilot Project

Following the initial assessment, the City of Eagan was selected as the pilot project area. The City was a good candidate since it involved the four pipeline operators with the most pipeline miles in the county. The majority of the pipelines in the City were also of the lowest quality classification.

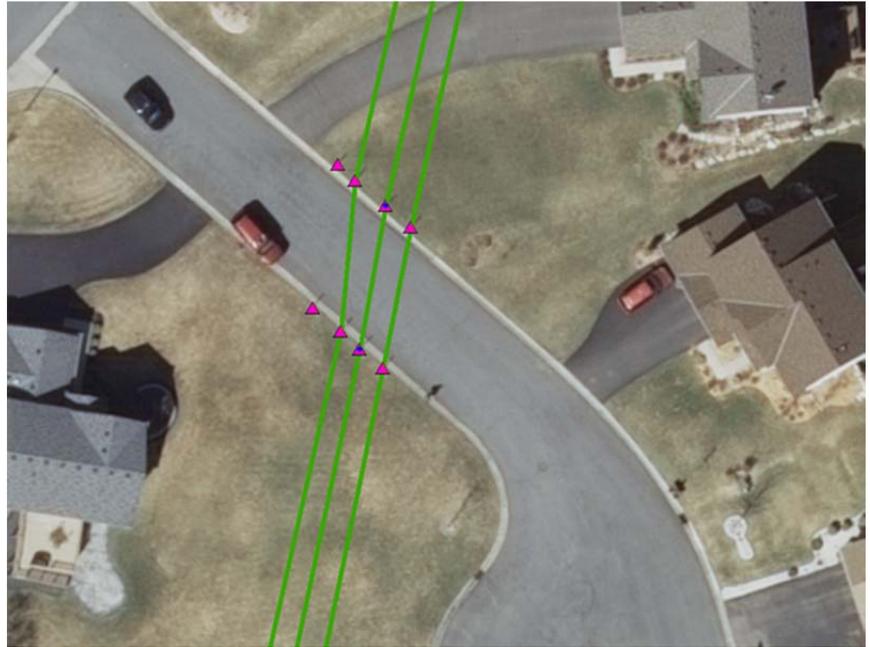
Additionally, the Eagan Fire Department had previously raised questions about the accuracy of pipeline data in the City, especially as it related to risk analysis. As a result, City GIS personnel were very interested in the project and were able to capitalize on the results early in the project.



Maps were created to assist the survey crew in following pipelines. Using the maps, they were able to find the associated pipeline markers and follow them, collecting GPS locations as they went. Additionally, they collected photographs at each set of markers for further investigation during data refinement.



The existing pipeline data was modified to fit the surveyed markers. To preserve the existing attribution on the pipeline data, lines were edited to snap existing vertices to the marker points. Vertices were added or removed to provide the best visible fit to the marker points. The photographs were used to help discern which markers were associated with which pipelines.



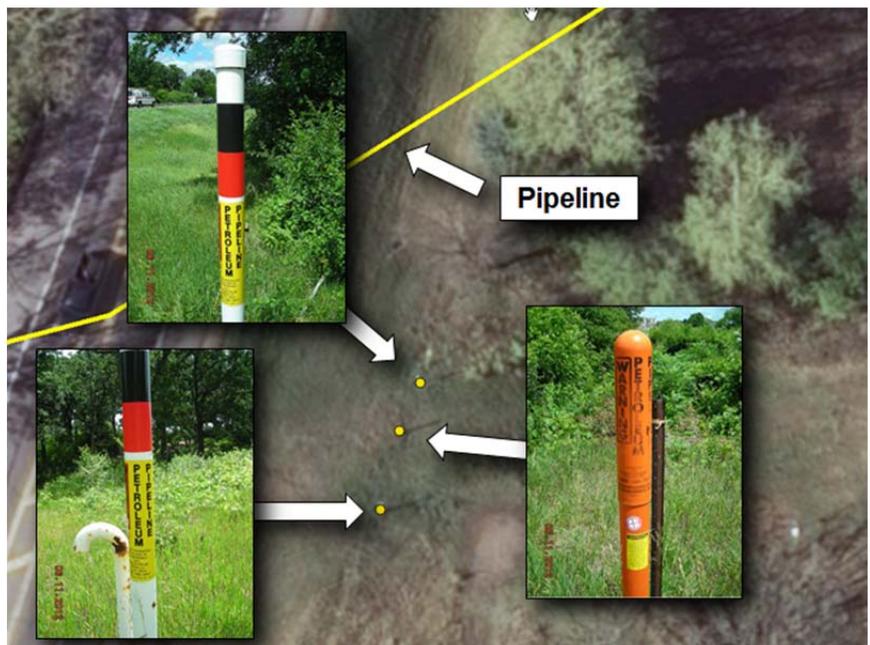
Following completion of the pilot area, an estimate of the amount of time and effort required to do the rest of the county was made. The initial strategy was to contract for private survey and engineering services. However, after consulting with the County Surveyor, it became evident that grant funds could be used much more effectively by contracting with County Survey staff to do the remainder of the work. The County Surveyor determined there were sufficient survey resources to complete the work.

This approach greatly reduced administrative overhead costs associated with finding a contractor and administering a contract. Plus, the cost of using internal staff was much lower than standard rates for surveying services with private surveying and engineering firms. Also, given that they had already performed the services associated with the pilot project, they could start work without further delay and leverage the experience gained during the pilot phase.

Data Collection & Refinement

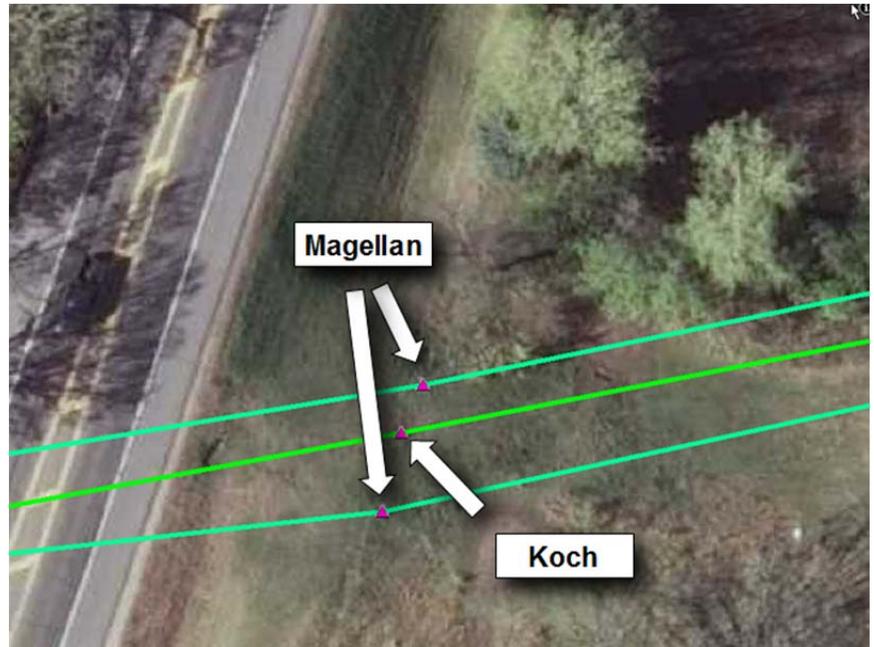
Data collection was modified slightly during the pilot phase to include collection of one photograph for each pipeline marker. The resolution of the photographs was also increased and the survey technicians were instructed to take the photograph so the operator name on the marker was visible.

The GPS points and photos were collected using an integrated system that automatically associated each photo with the corresponding point. When point data was loaded in to the GIS database, hyperlinks to the photos

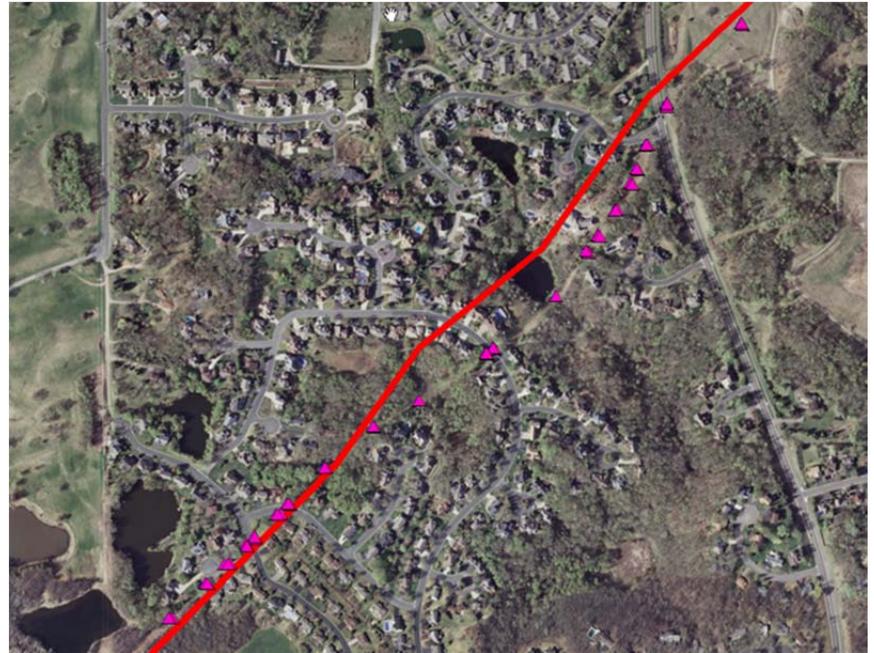


were automatically generated, allowing them to be accessed using built-in features of ArcMap. This streamlined the data refinement process by making each photo readily available, using a simple button click.

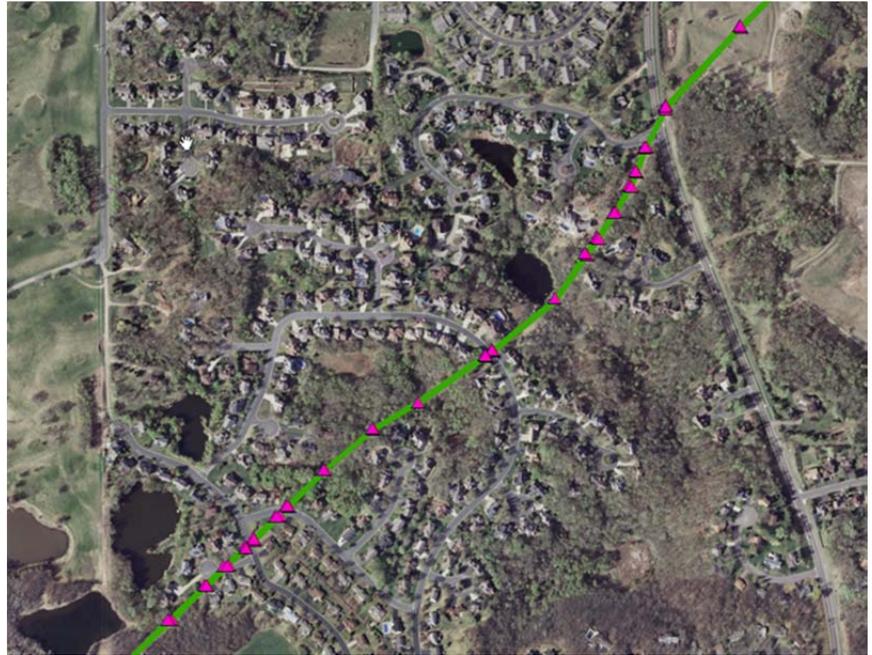
In cases where multiple operators share the same easement and alignment, the individual photographs and visible operator names on them assisted the data refinement process, making it easier to determine which pipeline went with which surveyed marker.



Field data collection was performed by following a given easement, collecting all pipeline markers. Priority was assigned to those pipelines with the lowest quality code ("G"), and continued to include higher quality codes.

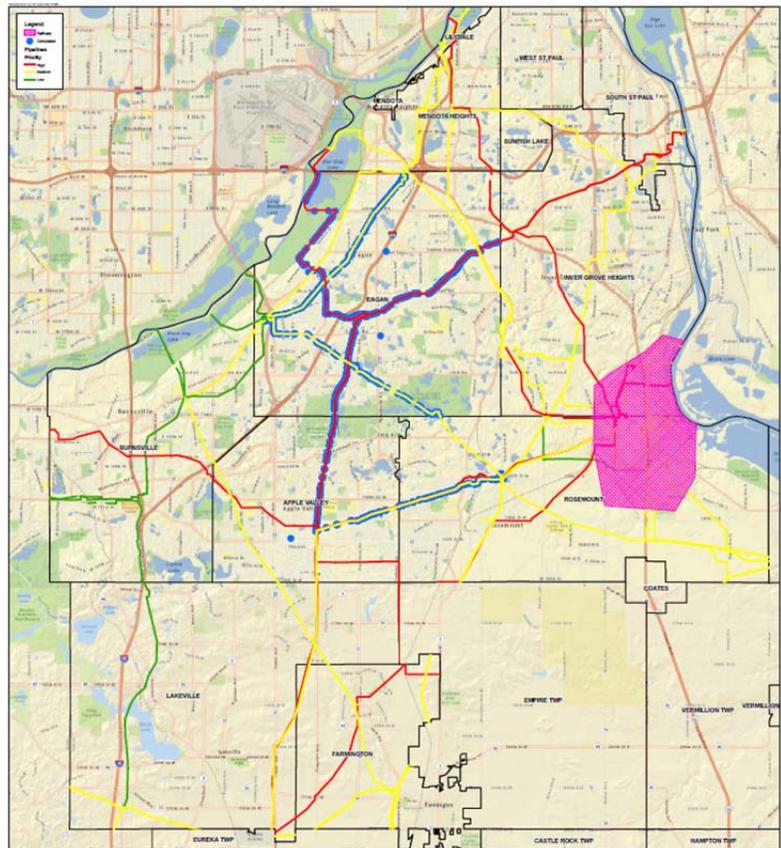


The field-collected data was provided to GIS Specialists incrementally, so they could perform corresponding refinement as it became available. This also allowed an assessment of work progress, which was extrapolated to determine how much work could be completed using the grant resources.



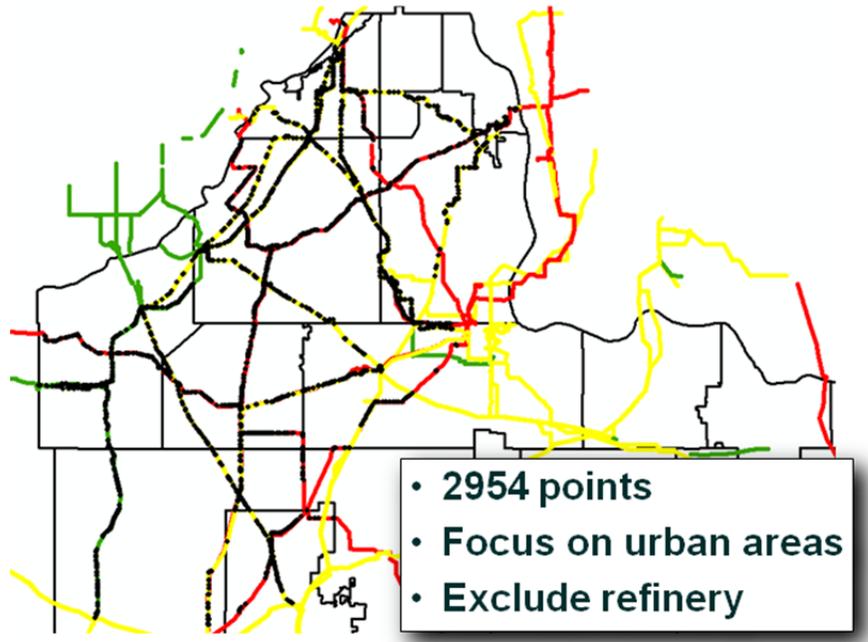
As data collection and refinement progressed, it became apparent that the entire county could not be completed using the grant resources. Therefore, to maximize the effectiveness of the grant, a target area was selected which encompassed the majority of residential, commercial, and industrial land use in the county. The primary justification was that the main objective of improving pipeline locations was to improve the ability to analyze the associated risks to property and populace.

Dakota County is home to a major refinery. This part of the reason we have the amount of pipelines we have. However, the area within the refinery was also excluded, since access to the site is limited and the land is used exclusively by the refinery.



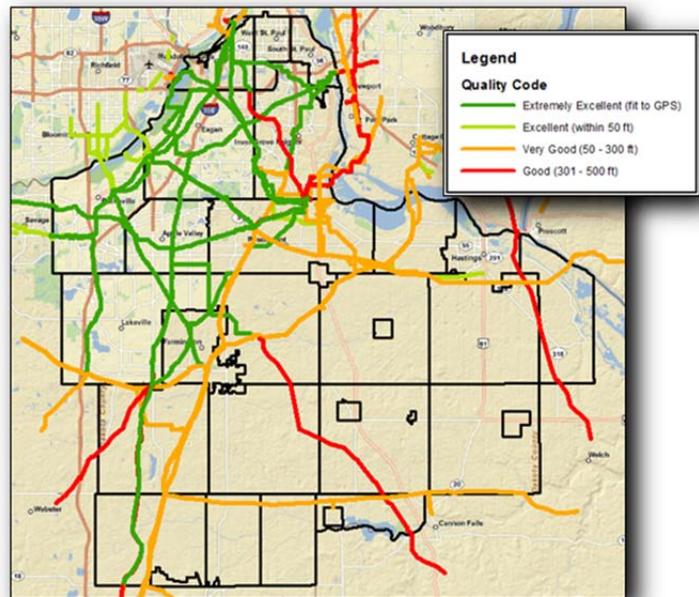
Based on the number of pipeline miles in the remaining target area and the time estimated to complete it, we determined that the work could realistically be completed.

The final result was 2,954 pipeline locations collected, the majority of those with accompanying photographs. All the associated pipeline data was adjusted to fit those points. All adjusted lines include comments with a general indication of what kind of refinement was performed.



The map on the right depicts all adjusted lines in dark green.

Three fields were added to the pipeline data to document the results of the refinement effort. No original field values were modified.



The added fields include:

- QUALITY_CD2
- EDIT
- EDIT_DESC

Original values from PIMA field QUALITY_CD, plus “X” representing the lines adjusted to fit GPS pipeline markers.

1 = edited, Null or 0 = not edited

Free form text with general description of adjustment performed.

A total of 248 miles of pipeline were adjusted through this project. Although the pipeline markers are known to not represent the exact location of the actual pipe in the ground, the expectation is that all the adjustments resulted in a better position than existed previously.

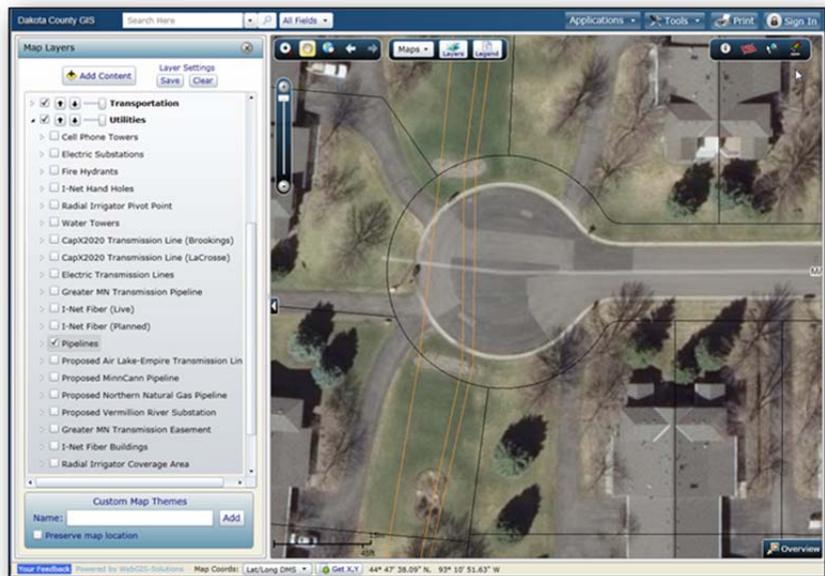
Results (Miles)	
• Before	• After
52 Excellent	248 Extremely
585 Very good	34 Excellent
331 Good	476 Very good
	210 Good

Mapping & Analysis

The refined pipeline data has been incorporated into the Dakota County GIS database, replacing the original data downloaded from PIMA. Through the GIS database, it can be viewed by county and city staff through ArcMap or through the Dakota County Interactive Map – DCGIS.

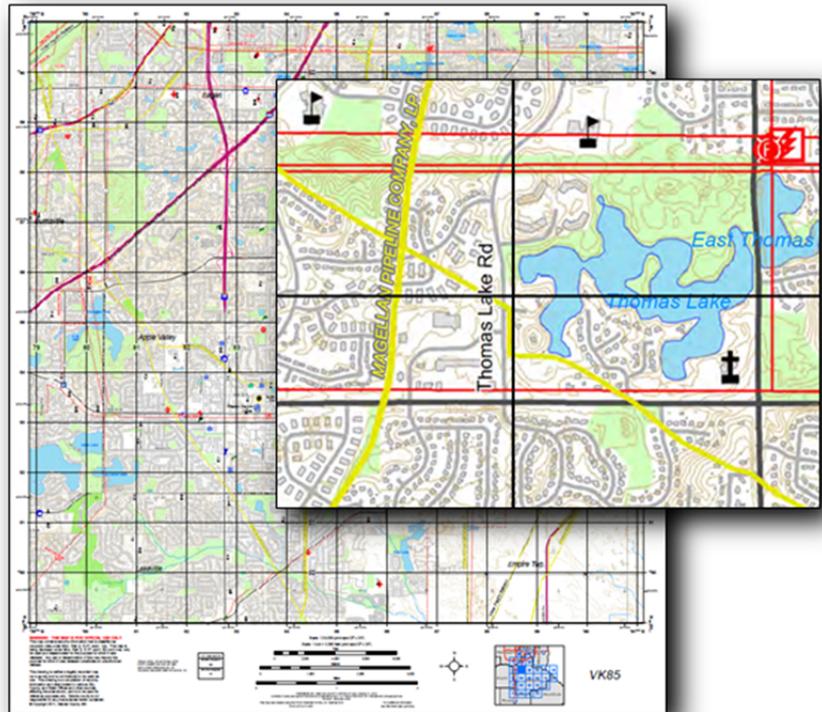
<http://gis.co.dakota.mn.us/DCGIS/>

Note that this data layer is not available to the public.



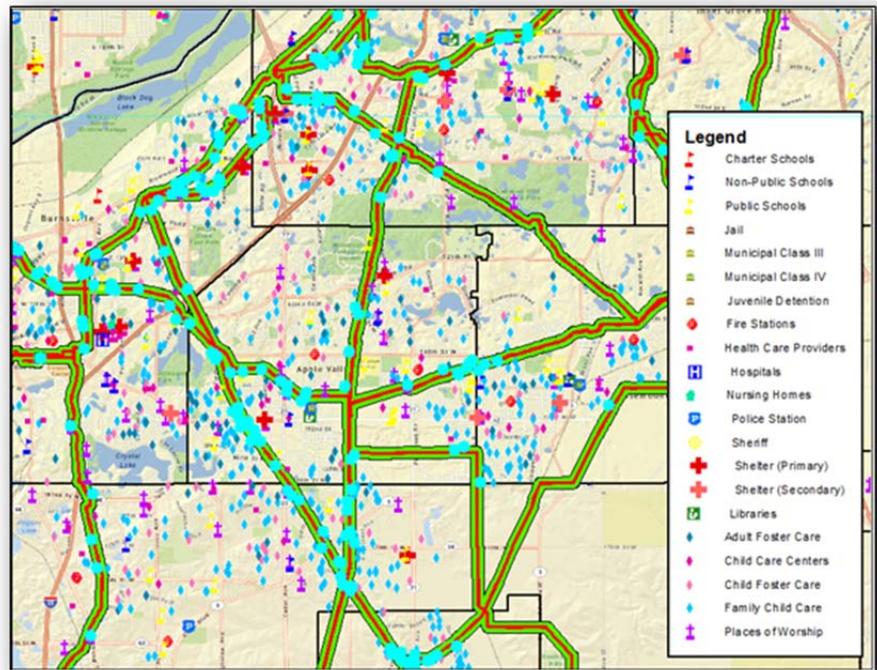
Standard maps created by Dakota County for emergency managers and first responders have been updated to show the improved pipeline location. These are available as PDF files and in printed form as 22" x 24" maps. Copies of these maps have been printed and distributed to municipal fire departments.

The improved location is much more reliable in areas where the pipeline location is most likely to be an important factor in determining potential risk to the surrounding community.



A variety of GIS layers are maintained in the Dakota County GIS database representing critical infrastructure, key resources, and vulnerable population. With improved pipeline locations, queries and analysis are much more reliable.

Shown on the right is a map with a 500' buffer derived from the improved pipeline locations, with daycares, schools, nursing homes, and other similar vulnerable population features highlighted within them. Over 100 miles of the pipelines in Dakota County, downloaded from the NPMS, were classified with an accuracy of 301' to 500', causing this kind of detailed risk analysis to be previously ineffective.



Continuing Efforts

Related efforts will continue, beyond the grant term. The pipeline data refinements provide an excellent foundation for continued discussions with pipeline operators, as well as potential beneficiaries, such as public safety, public works, and planning. As awareness grows, it will lead to further mapping and analysis.

Dakota County is committed to continuing to work with pipeline operators to provide them with the results of the project, including surveyed pipeline markers, photographs, and adjusted pipeline data. On-going discussions will continue to help them understand the methodology of the project, refining the results further, if necessary. The ultimate objective will be to encourage them to submit the refined pipeline locations resulting from this project.

Project Costs

Project costs were based on Dakota County staff resources. Dakota County possessed adequate surveying and GIS software and hardware for the project. No additional hardware or software was required. Significant cost savings were realized by using county staff to perform data collection and data refinement, allowing much more to be accomplished than was previously anticipated. Using internal staff eliminated costs associated with administering a contract with an external service provider.

Survey fieldwork was performed using senior technicians teamed with an intern, providing even further cost savings. All survey work was performed under the supervision of the County Surveyor.

GIS work was performed by a GIS Specialist and the GIS Manager. The GIS Manager did all the preliminary investigation and assessment, designed the pilot project and worked with the survey team to develop the field procedures. As field data was collected, the GIS Manager developed a procedure to refine the pipeline data and a GIS Specialist completed the refinement.

All staff costs include salary and benefits only, incurred during the term of the grant period. No overhead costs are included. Any costs incurred by Dakota County, beyond the \$50,000 grant, including all continuing efforts, have been absorbed by Dakota County in the interest of realizing further benefits from the project.

Cost Summary:

	Project Hours	Hourly Rate	Total
Survey Intern	352	\$11.50	\$4,048
Survey Technician 1	113	\$46.97	\$5,308
Survey Technician 2	536	\$51.67	\$27,695
Survey Technician 3	82	\$59.44	\$4,874
Survey Technician 4	9	\$62.91	\$566
GIS Specialist	57	\$44.84	\$2,556
GIS Manager	97.5	\$63.64	\$6,205
	<u>1246.5</u>		<u>\$51,252</u> Total