Digital Aerial Photography/Thermography – OIL Pipeline

The following aerial photographs and infrared thermograph of an actual **oil** pipeline leak illustrate the information used to identify and locate **oil** pipeline leaks. Also, the daylight aerial photographs (in electronic and/or hardcopy form) can be used by Security, Engineering, and Maintenance personnel.

Aerial Photograph (daylight) for Security, Engineering, and Maintenance personnel.

Infrared thermograph (night) is used to identify and locate the **oil** leak/plume using proprietary image processing software.

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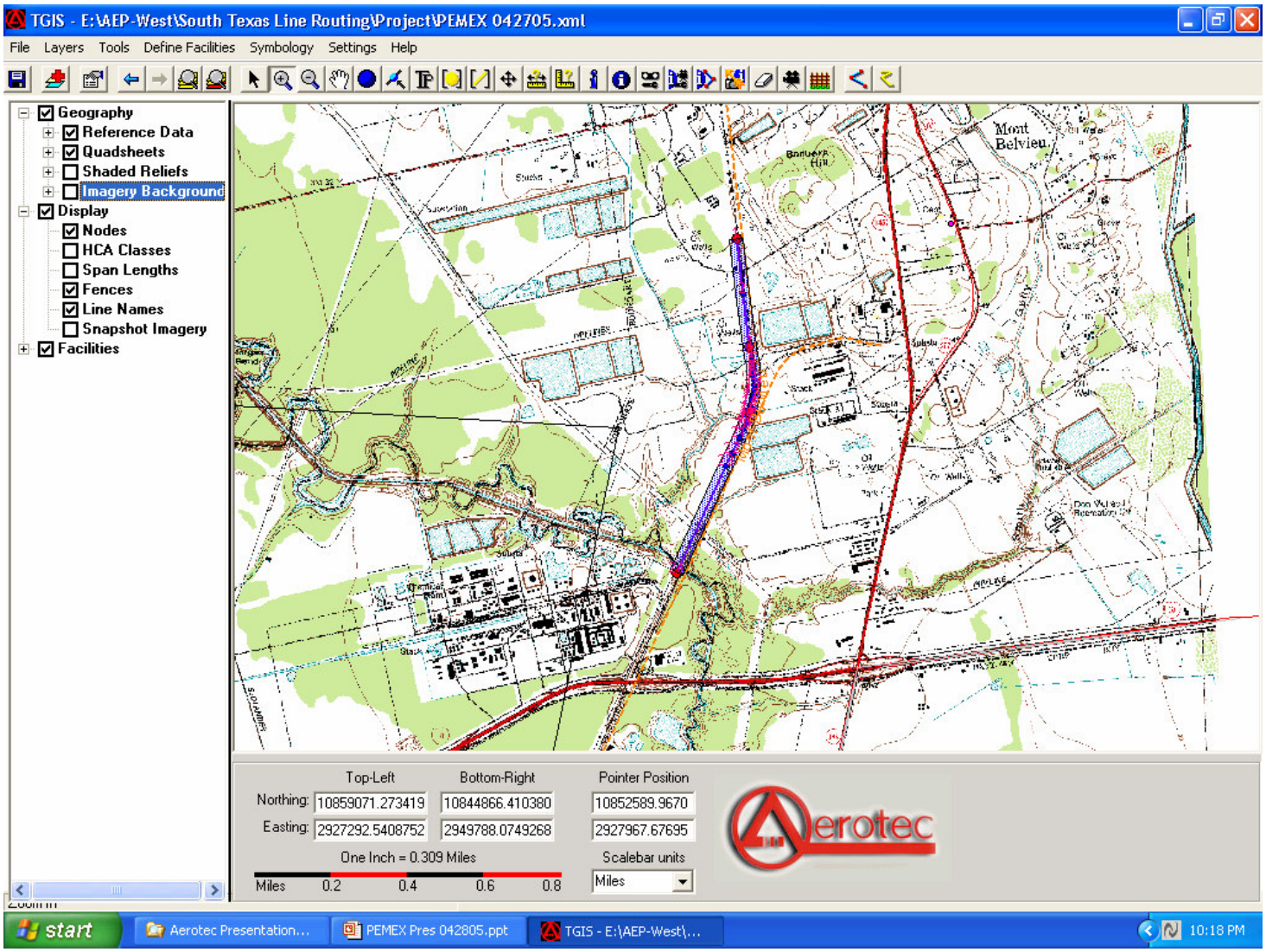
Oil Pipeline with Leaks Plotted onto a Map

The following map format is used to present the results of the process that identifies and locates the pipeline and its leaks. Locations where thefts are occurring would also be denoted on such a map. The maps (in hardcopy and/or electronic form) can be used by Security, Engineering, and Maintenance personnel.

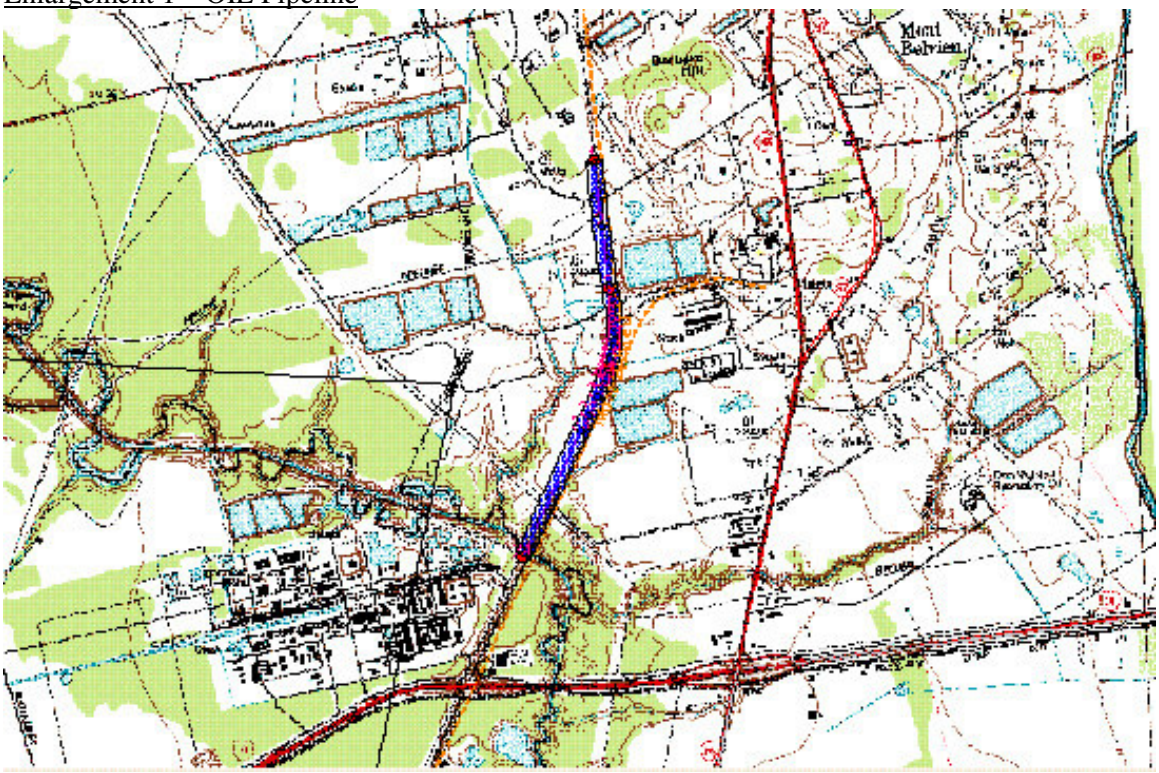


Shown in the map are:

1. Pipeline right-of-way segment (blue centerline and outlined right-of-way running parallel to the railroad) with leak locations denoted in red along the bend in the pipeline.
2. Buildings in close proximity to the pipeline (High Consequence Areas) shown in light blue tint and outlined. Note: High Consequence Areas are defined in terms of the number of buildings that exist within a) a specified distance perpendicular to the pipeline and b) a specified distance along the pipeline.
3. Ground contours
4. Roadways (red solid lines)
5. Railroad (orange dashed line)

The following two (2) illustrations are enlargements of the image shown on the previous page. These enlargements are used here only to illustrate the contents of the map image. Because these two (2) illustrations are enlargements of the previous image, some resolution has been lost. Using Aerotec's PGIS (Pipeline GIS) software, users of the map data would NOT experience any loss of resolution.

Enlargement 1 – OIL Pipeline



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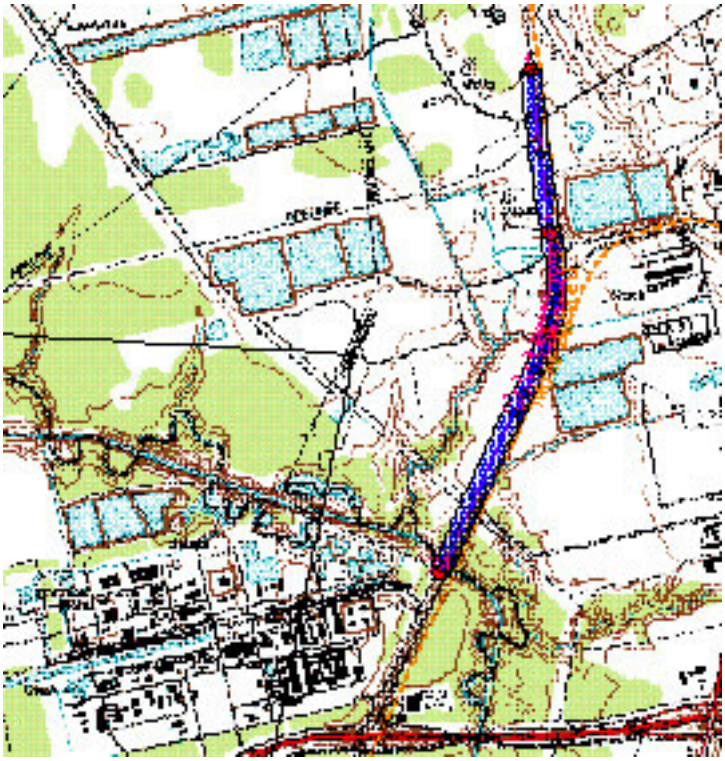
Enlargement 2 – OIL Pipeline



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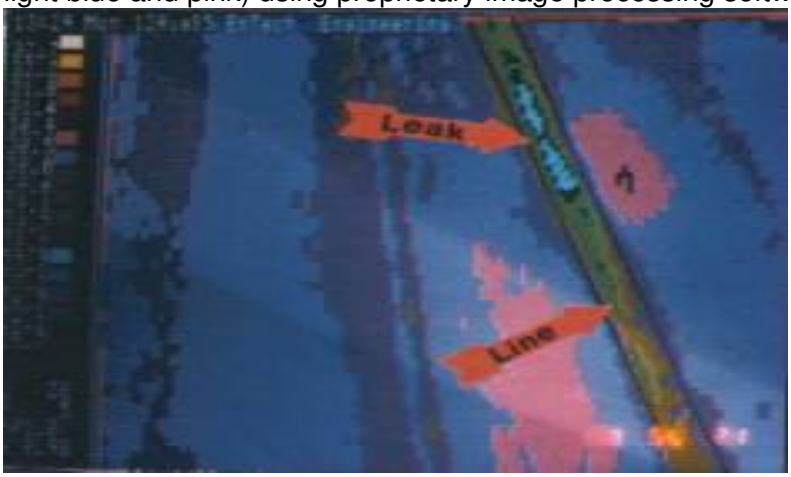
Digital Aerial Photography/Thermography – GAS Pipeline

The following aerial photographs and infrared thermograph of an actual **gas** pipeline leak illustrate the information used to identify and locate **gas** pipeline leaks. (In this case, the gas pipeline is crossing under a paved highway.) Also, the aerial photographs (in electronic and/or hardcopy form) can be used by Security, Engineering, and Maintenance personnel.

Aerial Photograph for Security, Engineering, and Maintenance personnel.

Infrared thermograph (night) is used to identify and locate the **gas** leak/plume (shown in light blue and pink) using proprietary image processing software.



Note: The same mapping techniques illustrated by Enclosure B would be used to map **gas** pipelines and their associated leaks.