

CHALLENGES IN MAJOR PIPELINES CONSTRUCTION.

Wayne Ahrens
Director, Dannenbaum Engineering
Houston, TX

Introduction: This presentation will address the unique challenges of constructing large diameter water lines (LDWL) in the Houston area. Routing, designing and constructing LDWL in an urban environment is significantly different than areas where wide easements and significant working area is available. This discussion will cover routing, easement acquisition, design issues, construction issues and public perception associated with LDWL in the Houston area. The City of Houston's Northeast Transmission Line (NETL) and the West Harris County Regional Water Authority's (WHCRWA) Surface Water Supply Project (SWSP) are prime examples of LDWL projects installed in congested urban environments.

Routing in Urban Areas: Routing a LDWL in a developed area creates numerous issues during both design and construction. Routing issues include not going in a straight line unless you are purchasing numerous businesses and houses, and most streets and other possibly simpler routes terminating before the entirety of the route is accommodated. The routes of the NETL and the SWSP provide examples of alignments with numerous bends and curves to work with available corridors and avoid as much disruption to the public as possible. Both the NETL and SWSP utilize a combination of paved roads, existing pipeline easements, neighborhood utility easements, and public right-of-way for routing. There are numerous entities that must be coordinated with such as the City of Houston, Harris and Fort Bend Counties, TxDOT, HCTRA, HCFCD, CenterPoint, pipeline companies, etc. to be sure the routes are compatible with their criteria, existing utilities and future plans.

Right of Way and Easement Acquisition: In an urban area the routing requires acquiring agreements, permits, easements, and letters of no objection from many of the entities previously mentioned as well as easements from numerous private parties. For instance, the WHCRWA is acquiring approximately 750 private and public easements for the SWSP, as well as numerous agreements and permits. Significant effort and time are required to obtain these easements, often involving multiple parties and frequently requiring eminent domain procedures.

Design Challenges: In an urban area there are special considerations for existing infrastructure and structures that may be impacted by the construction. There are many street/road crossings and the difficult decisions lie in determining which ones can be open cut versus tunneled and how to maintain traffic if they are open cut. There are multiple crossings of major highways and drainage features for the SWSP Project. The WHCRWA's SWSP has five crossings of major freeways and crosses numerous drainage features, including many of the major bayous that meander through Houston. Another issue in the Houston area is the varying soil conditions, including crossing multiple faults. There are many faults in the area that require special design to

address the movement over time and in some cases the designer may alter the alignment completely to better deal with the long term impacts of movement in fault zones. Design of tunnels required along the alignment for the varying soil conditions requires special attention. Some shorter tunnels are hand mined and longer tunnels are performed with tunnel machines, with the varying soil conditions and existing infrastructure dictating what type of machine is required.

Construction Issues: Constructing LDWL in urban areas creates a whole series of special issues. First construction is normally in narrow corridors, often 40 to 60 feet wide easements, which limits the ability to stockpile excavated soils, string out pipe, and move large equipment along the easement to handle the large pipe required for the NETL and SWSP. The nature of large diameter work requires more truck traffic to handle the pipe and backfill material, which increases the traffic control requirement and evaluation of haul routes. In many cases, there are homes or businesses immediately adjacent to the corridor, which impacts the construction by restricting working hours, requiring special noise and dust abatement requirements, making construction work more visible to the public, etc. In a non-urban area the contractor for a recent project was able to install up to 300 feet of 96 inch pipe per day using 50 foot sections, but in a congested urban area, 25 to 50 feet per day will be typical using much shorter pipe sections, often 25' sections.

Public Perception: Constructing LDWL in urban areas can create significant disruption to people and businesses which can cause anger and protests. Construction may be next to homes, in people's back yards, streets in front of their homes or businesses, all of which cause traffic issues. It is important to communicate with the public in advance and let them know what is going to happen and why. It is also important to let them know what is being done to minimize the impacts of construction as much as possible. Conveying to the public that these projects are necessary to meet future population projections can help ease some of the tension involved while constructing the projects.