



Key Elements for a Successful Main Replacement Program

Les Goodman - EN Engineering
Tracy Townsend – Washington Gas

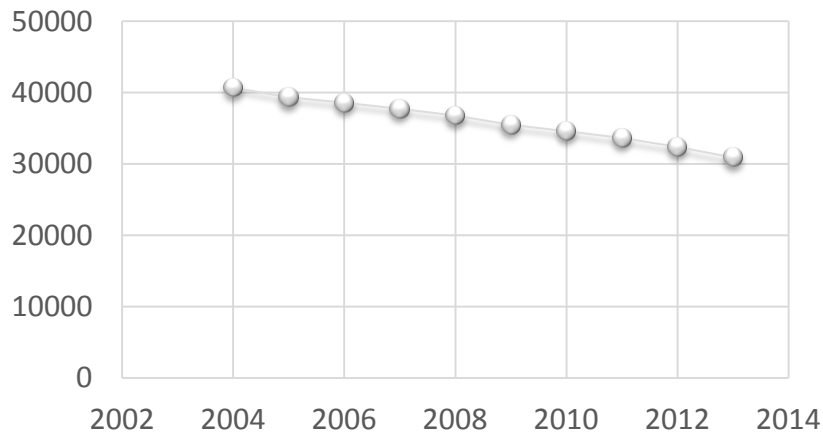


Cast Iron & Bare Steel Across United States

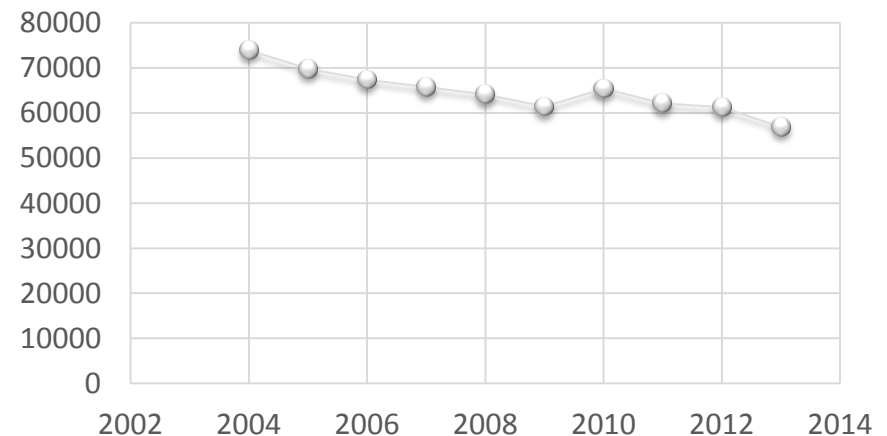
Miles of Main

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
CI Miles Main	40,696	39,342	38,598	37,721	36,774	35,486	34,604	33,629	32,394	30,904
BS Miles Main	73,953	69,798	67,398	65,744	64,158	61,448	65,424	62,158	61,310	56,883

CI Miles



BS Miles



Elements of a Successful MR Program

- **Identify Conditions & Threats**
- **Ranking & Prioritization**
- **Program Timeline**
- **Jurisdictional Collaboration**
- **Design & Construction Standards**
- **Work Management System**
- **Program Resources**
- **Program Communication**
- **Organization Structure & Governance**



Identify Conditions & Threats

- **Pipe Material**
 - **BS, CI Mains, PVC & PE (cracking)**
- **Network Analysis**
 - **Pressure Problem Areas**
- **Population Density**
 - **High risk areas**
- **Repair & Maintenance Records**
 - **Leaks by Cause & Material**



Identify Conditions & Threats

- **Soil Conditions**
 - Soil Corrosivity
 - Unstable Fill
- **Environmental Issues**
 - Flooding – Water Infiltration
 - Landslides
- **Construction Activities**
 - Parallel or Encroachment
 - Third Party Damage



Ranking & Prioritization

- **Commercially Available Applications**
- **Internally Developed Algorithm**
- **Risk Factors**
 - **Leak Incidence Rate**
 - **Segment Location**
 - **Surface Conditions**
 - **Population Density**
 - **Economics**
 - **Leak Consequence**
- **System-wide Risk Assessment**
 - **Segment Ranking**
 - **Prioritization Method**
- **Public Works Coordination**



Program Timeline

- Program Span
 - Identify Total Footage
 - Determine Annual Spend
 - Availability of Resources
 - Establish Program Timeframe
- Typical Program Timelines **10 to 20 Years**
- Typical Annual Replacement **50 to 100 Miles**
 - Annual Replacement May Increase By Expanding Outsourcing
 - Rate Recovery May Determine Replacement Activity



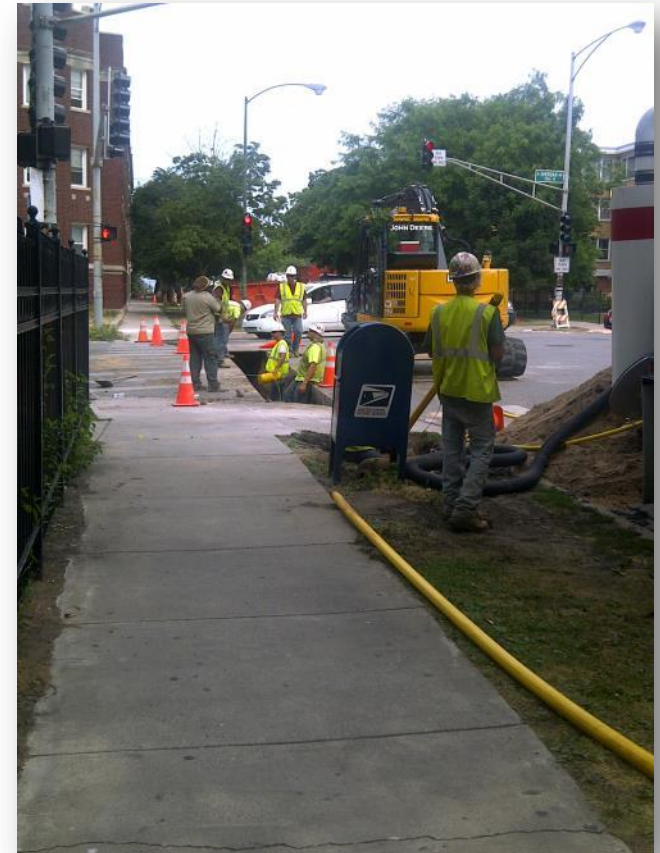
Jurisdictional Collaboration

- **Public Utility Commission**
 - Enhance Reliability & Safety
 - Reduce O&M Expenditures
 - Rate Case Strategy
- **Public Works**
 - Program Communication
 - Coordination with Public Improvement Projects
 - Consolidated / Blanket Permitting
 - Surface Restoration Agreements



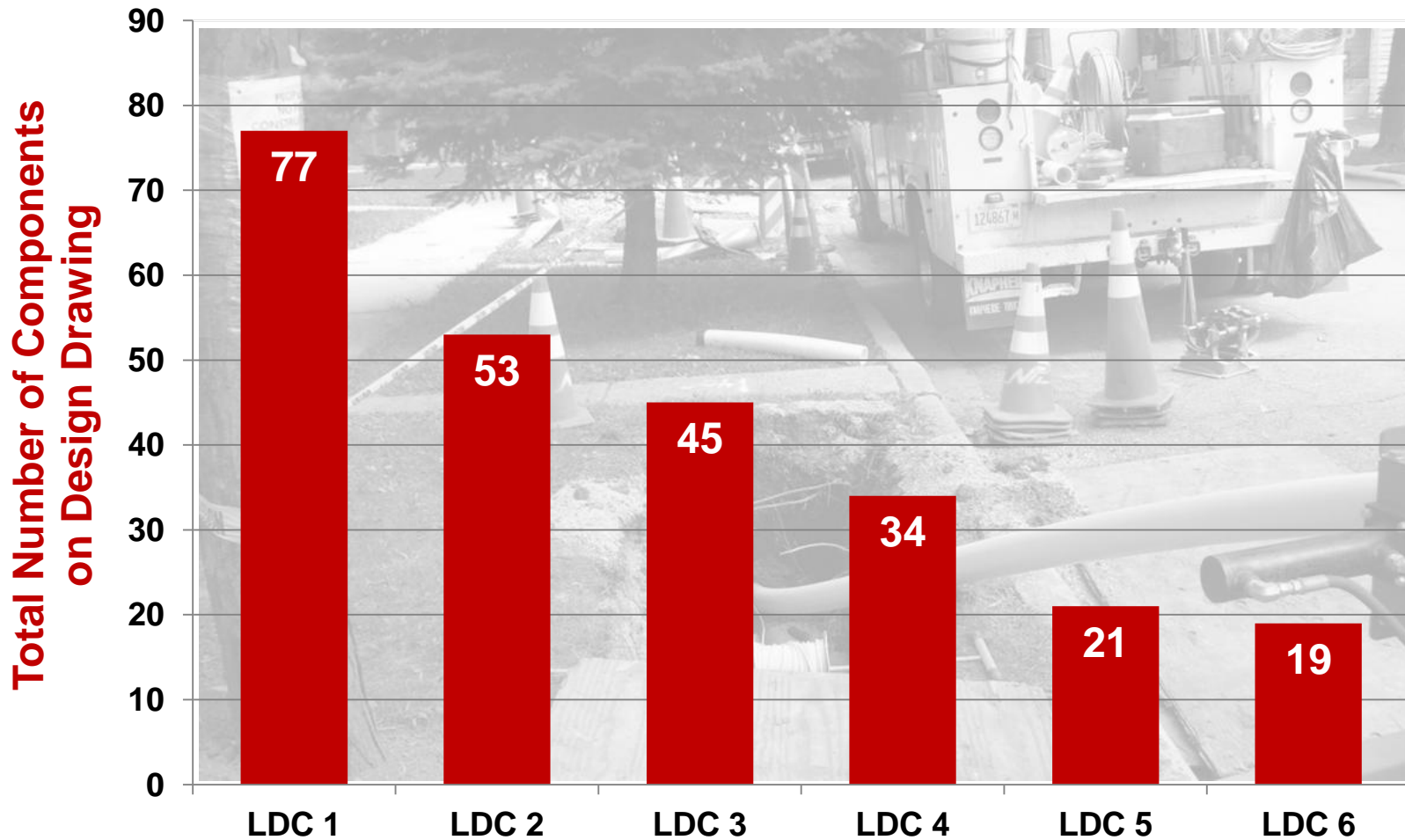
Design & Construction Standards

- **Simplified Design**
 - **Determine required level of detail**
 - **Permitting Agency Requirements**
 - **Construction Crew Needs**
- **Practical Construction Standards**
 - **Company Wide Installation Standards**
 - **Standard Materials**
 - **Preferred Method of Construction**

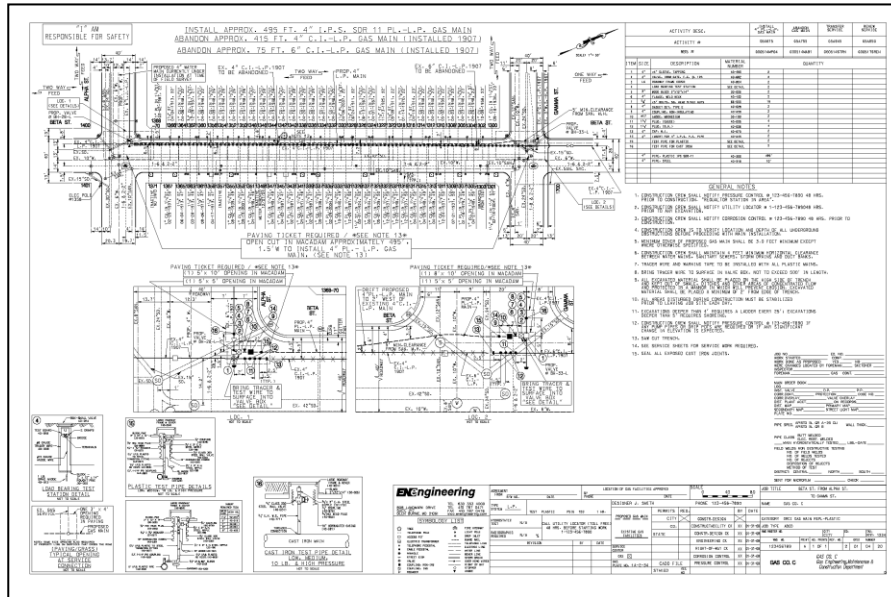


Design Detail Comparison – Number of Components

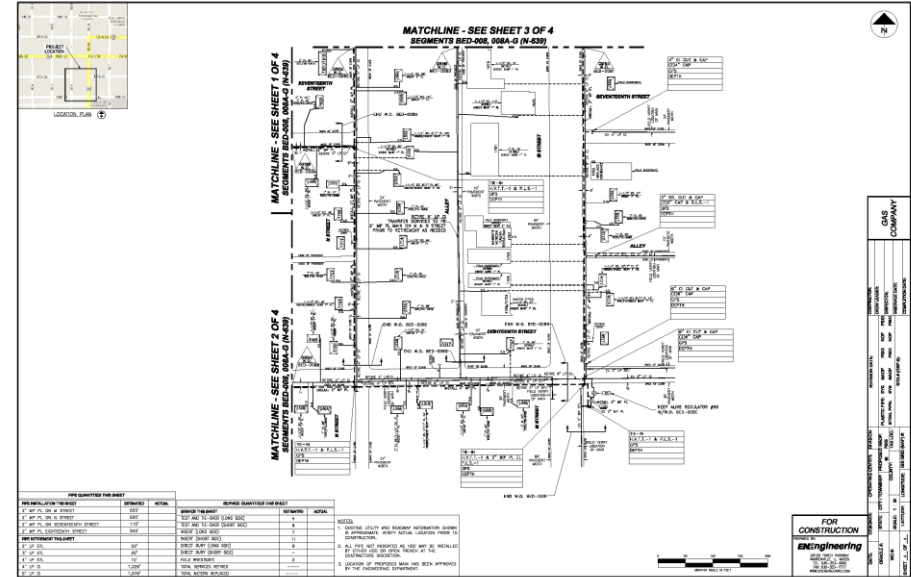
Replacement Design Detail Comparison



Design Detail Comparison – Drawing Comparison



**Sample Design
Drawing
MOST COMPLEX
CLIENT 1**



**Sample Design
Drawing
LEAST COMPLEX
CLIENT 6**

Contractor Access to Work Management System

- Assign design and construction tasks in WMS
- Monitor contractor work queue
- Monitor contractor resources
- Track design target dates
- Track design revisions
- Track permitting timeline
- Track construction scheduling & completion
- Track Status of as-built mapping
- Contractor invoicing

Program Resources

- **Internal**
 - **Program Development & Administration**
 - **Contractor Oversight**
- **Engineering & Design Contractor**
 - **Annual Design Quantity**
 - **“Design on the Shelf”**
- **Construction Contractor**
 - **Block Bid**
 - **Multi-Year Contracts**
- **Materials**
 - **Standardize & Simplify**
 - **Forecast Annual Usage**



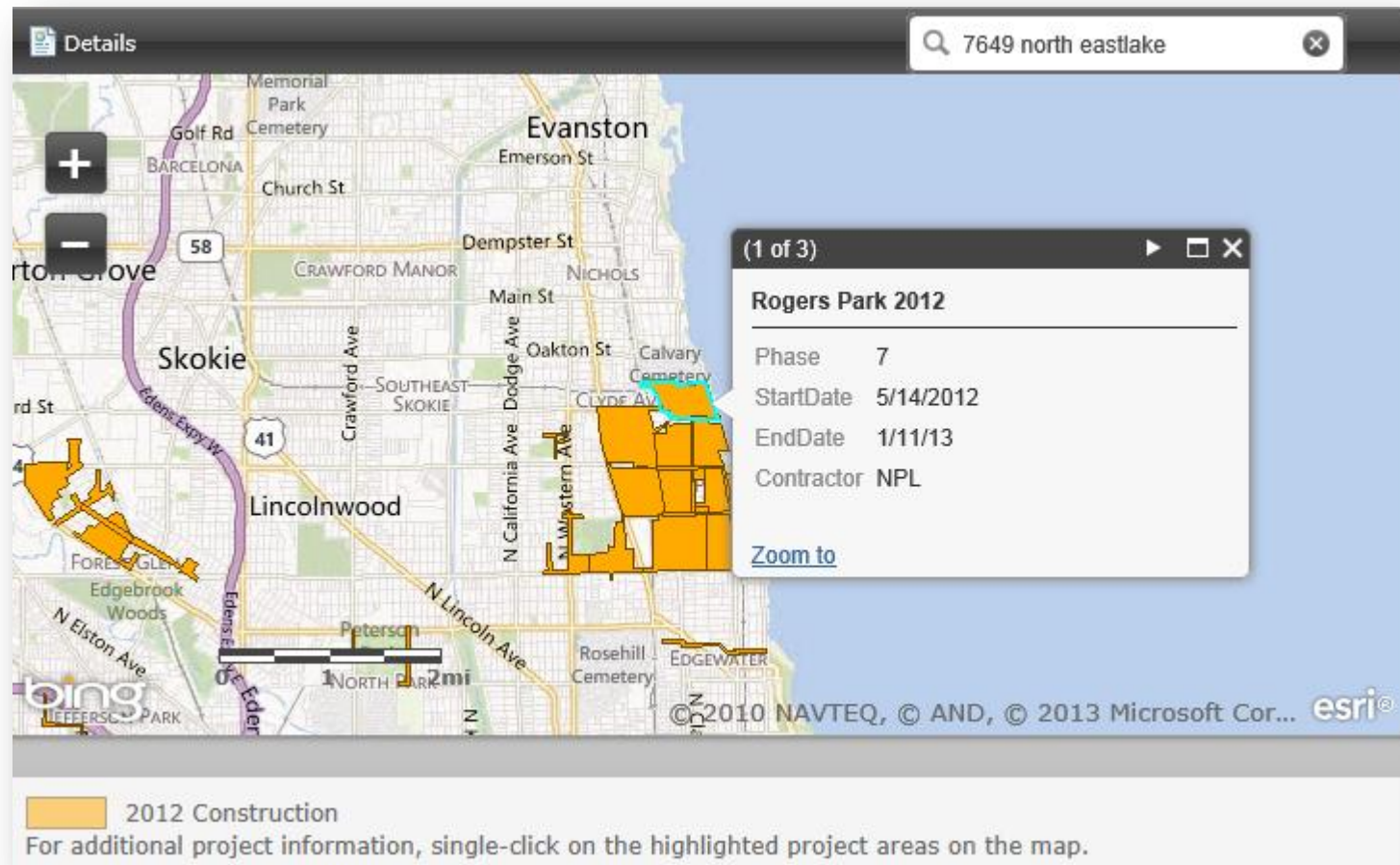
Program Communication

- **Program Communication Plan**
- **Internal**
 - **Operations**
 - **Engineering & Design**
 - **Procurement / Warehouse**
 - **Customer Inquiry Personnel**
- **External**
 - **PUC**
 - **Public Works**
 - **City / Town Officials**
 - **Affected Residents**
 - **Design & Construction Contractors**



Program Communication – Example Communication

“How & When Will Public Be Affected” Updated on Website



Program Communication – Example Communication

Project Phases

The following are the phases of the project that you can expect to experience.

Phase 1

A **LDC** representative will visit you prior to construction. They will discuss the project, review the meter location options and answer your questions. The **LDC** representative will require an agreement with the property owner before the work can proceed. We are aware of the impact this project will have on your property so we will work to restore it to your satisfaction.

Phase 2

Once the job is drawn out and the boundaries determined, construction begins. Construction for pipeline projects may take several weeks to complete. Traffic, street size, weather and soil type are significant factors in determining the time it takes to complete the job. Heavy equipment is necessary to facilitate this work. Noise is a common concern. We will use different equipment and construction techniques, depending on the location of the other underground facilities and soil conditions. It will be necessary to impose temporary parking restrictions in the construction areas. "No Parking" signs will be posted in the affected areas at least 72 hours in advance. This allows the project to flow at a productive rate and construction can be completed in a shorter time frame. This minimizes the inconveniences to your neighborhood.

Our construction crew leaders will work with residents and businesses to learn the impact of traffic concerns. Steel plates are used to temporarily cover excavation and trenches. Construction materials like soil, asphalt and pipe may be left on certain streets to eliminate delivery by extra equipment. We will secure our jobsites every night to restore as much "normalcy" as possible.

Once our main pipelines are installed and tested, we begin to prepare for the service lines. These are the underground pipes that run from the street to your gas meter location. When we schedule your service line replacement, we will make every effort to contact you three to five days prior to the work. An adult representative needs to be present at this time to give us access to the meter location and to relight the pilot lights on any gas appliances once the gas is restored. Usually the "relighting" is done between 2:30 p.m. and 5 p.m.

Phase 3

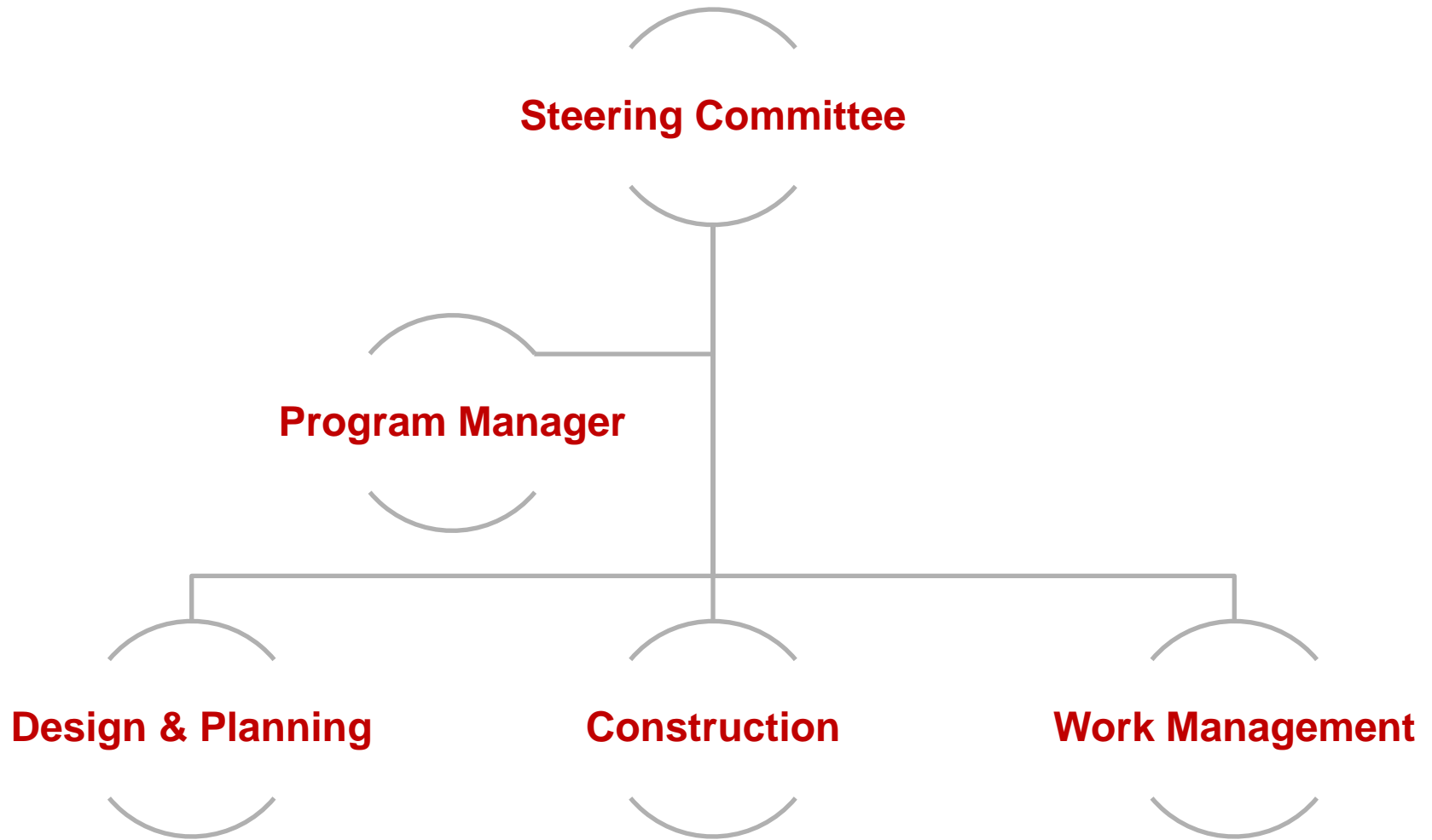
Once your gas is restored and our initial work is complete, construction moves ahead to the next street. We repeat the process until all the services are replaced.

The streets under repair are left covered with "temporary" asphalt during our initial phase of construction. Once we advance to the next area our paving contractor permanently paves and restores the street and sidewalks to their pre-existing conditions. If any paving is needed inside your property, the paving contractor will make arrangements with you for access.

We know the pipeline replacement program will be disruptive to your neighborhood. We appreciate your patience and cooperation and want you to be satisfied with our work. We will make every effort to minimize your inconvenience and to ensure that we continue to provide the safe, reliable service you've come to expect from **LDC**.

Organization Structure & Governance

Program Organizational Structure



Organization Structure & Governance

Replacement Program Steering Committee

The committee meets quarterly to review replacement program plan

- **Replacement candidate selection criteria**
- **Replacement budget forecast**
- **Replacement design schedule**
- **Replacement engineering and design contractor status**
- **Long term replacement strategy**
- **Replacement construction contractor resource requirements**
- **Replacement communication plan status**
- **State and local public works partnering efforts**
- **Replacement engineering and construction standards status**

KEY ELEMENTS FOR A SUCCESSFUL MAIN REPLACEMENT PROGRAM

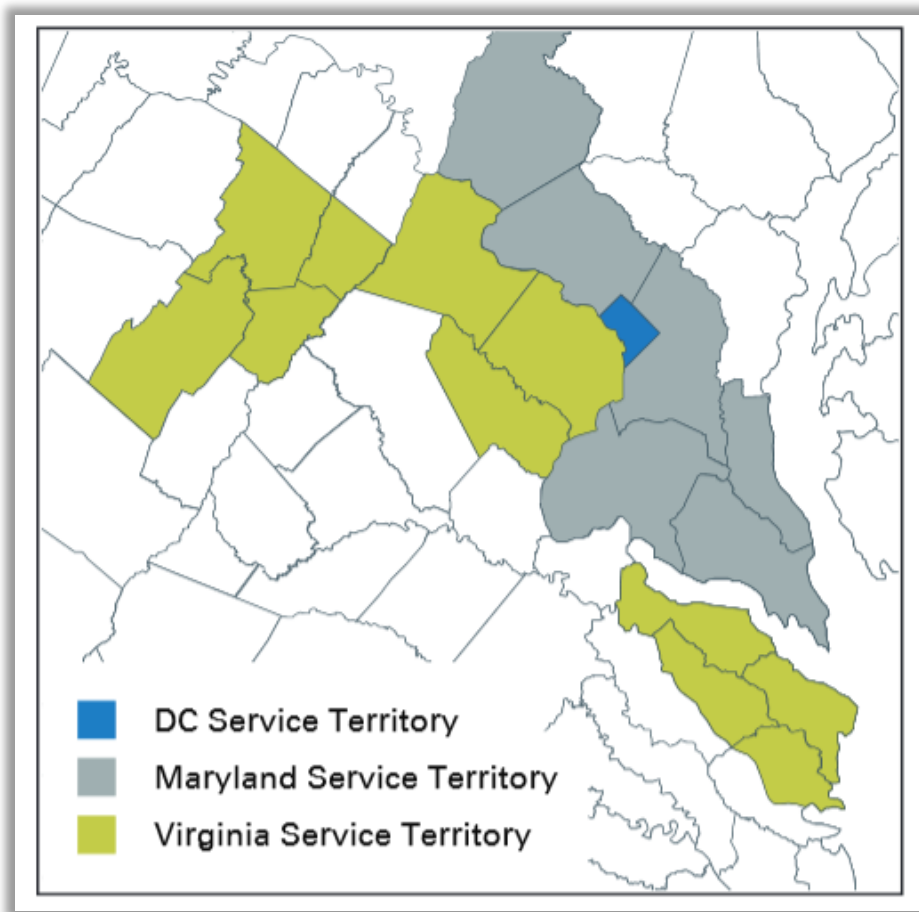
*ONE UTILITY'S EXPERIENCE WITH ACCELERATED PIPE
REPLACEMENT PROGRAMS*

TRACY L. TOWNSEND

VICE PRESIDENT – CONSTRUCTION & COMPLIANCE

APRIL 2015

SERVICE TERRITORY



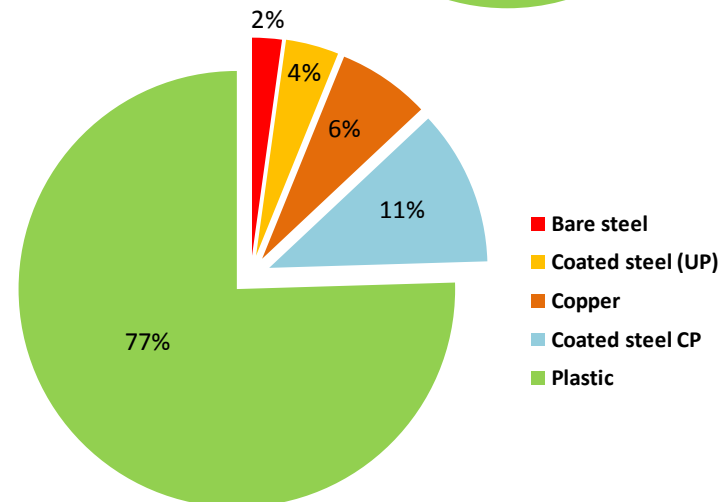
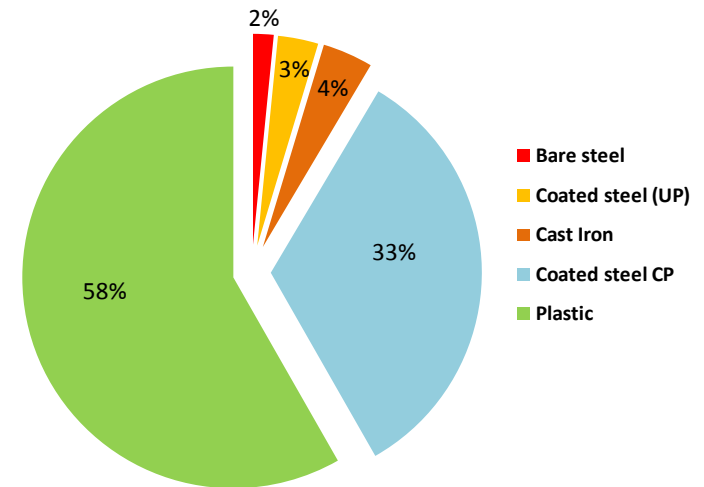
- Chartered in 1848
- Franchise area covers 6,213 square miles
- Distribution system in District of Columbia, Maryland and Virginia
- Over 1.1 million customers
- Approx. 13,456 miles of distribution main & 993,522 services
- Approx. 1,332 Employees
- Approx. 180 Contractor Construction Crews
- Other outsourced/external partnering work:
 - Line locating
 - Leak survey
 - Premise work
 - Engineering services
- Integrated Supply Model
- Mature Damage Prevention Program
 - 1.29 damages per 1,000 locates

ELEMENT 1: IDENTIFY CONDITIONS AND THREATS

DIMP: KNOW YOUR SYSTEM – MATERIALS

DISTRIBUTION SYSTEM – STARTING POINT

- 13,221 Miles of Main
 - Bare steel 2%
 - Coated steel (UP) 3%
 - Cast iron 4%
 - Coated steel (P) 33%
 - Plastic 58%
- 972,602 Service Lines
 - Bare steel 2%
 - Coated steel (UP) 4%
 - Copper 6%
 - Coated steel (P) 11%
 - Plastic 77%

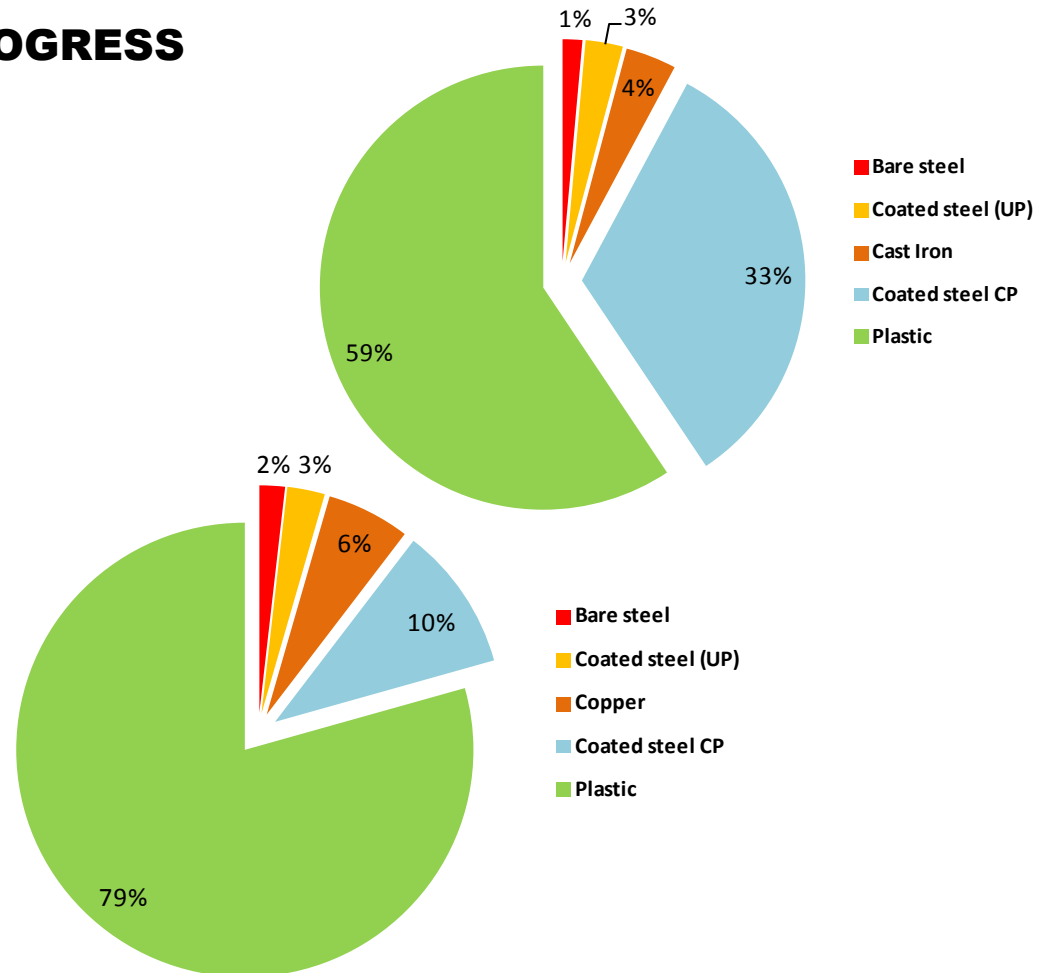


ELEMENT 1: IDENTIFY CONDITIONS AND THREATS

DIMP: PERIODIC EVALUATION AND IMPROVEMENT – MATERIALS

DISTRIBUTION SYSTEM – PROGRESS

- 13,456 Miles of Main
 - Bare steel 1%
 - Coated steel (UP) 3%
 - Cast iron 4%
 - Coated steel (P) 33%
 - Plastic 59%
- 993,522 Service Lines
 - Bare steel 2%
 - Coated steel (UP) 3%
 - Copper 6%
 - Coated steel (P) 10%
 - Plastic 79%



ELEMENT 1: IDENTIFY CONDITIONS AND THREATS

DIMP: KNOW YOUR SYSTEM – LEAKS

DISTRIBUTION SYSTEM – STARTING POINT

X ODOR CALLS PER YEAR

- X underground leaks
- X above-ground leaks

DIMP TOP 3 RISKS

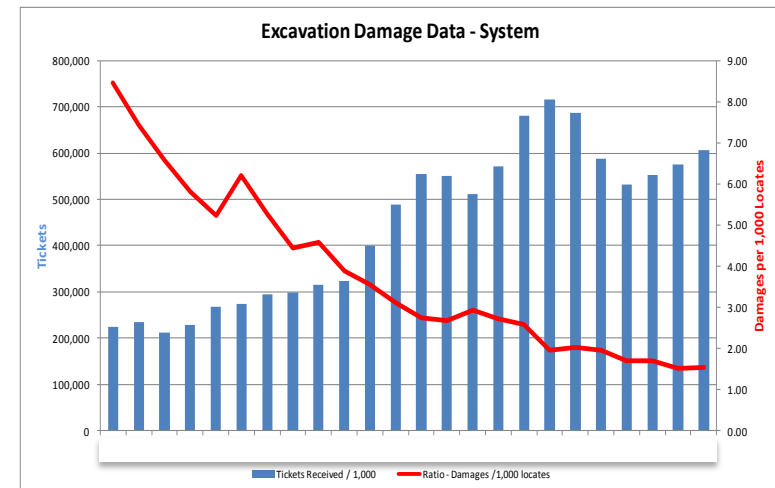
- Corrosion
- Coupling
- 3rd party damages

DAMAGE PREVENTION

- Tickets range from 200,000 to over 700,000 per year
- Reduced damages by 44% over the last 10 years

NON-LEAK THREATS

- Earth movement



ELEMENT 1: IDENTIFY CONDITIONS AND THREATS

DIMP: PERIODIC EVALUATION AND IMPROVEMENT - LEAKS

DISTRIBUTION SYSTEM – ANY CHANGES?

AVERAGE X ODOR CALLS

- X underground leaks
- X above-ground leaks

DIMP TOP 3 RISKS

- Equipment (coupling)
- Corrosion
- Excavation damage

DAMAGE PREVENTION

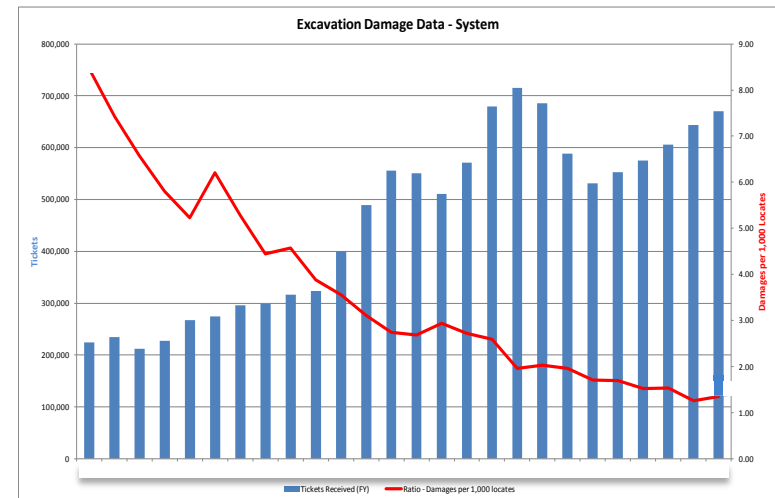
- Tickets range from 531,000 to over 714,000 per year
- Reduced damages by 48% over the last 10 years

NON-LEAK THREATS

- Earth movement

RELIABILITY

- LP to MP



ELEMENT 2: RANKING AND PRIORITIZATION

DIMP: KNOW YOUR SYSTEM – ANALYSIS

RANKING

- Leak history
- Potential to leak
- SME input

PRIORITIZATION

- Risk model – Optimain user
 - Probability
 - Consequence
- Risk reduction optimization

CONSTRUCTION EFFICIENCIES

- Annual plan review with other utilities and departments of transportation
- Envista user

RELIABILITY IMPROVEMENTS

ELEMENT 3: PROGRAM TIMELINE

SCOPE DEVELOPED

- Leak history
- Potential to leak
- SME input
- Industry action

TIMING CONSIDERED

- Capacity
 - Quality contractors
 - Support staff (internal and external)
 - Permitting
- Funding
 - Originally developed 15, 30, and 50 year plans
 - Resulted in 15, 22 and 40 year plans
 - Plans filed in total but approved with surcharge in 5-year increments

ELEMENT 4: JURISDICTIONAL COLLABORATION

DIMP ALIGNMENT - ENHANCE SAFETY AND RELIABILITY

VA SAVE

- Legislation passed July 2010
- Original Plan filed August 2010 and approved April 2011
- First Amendment filed August 2012 and approved December 2012
- Second Amendment filed February 2015 and awaiting Commission approval

MD BASE RATE CASE

- Plan filed April 2011 and authorized without funding November 2011

MD STRIDE

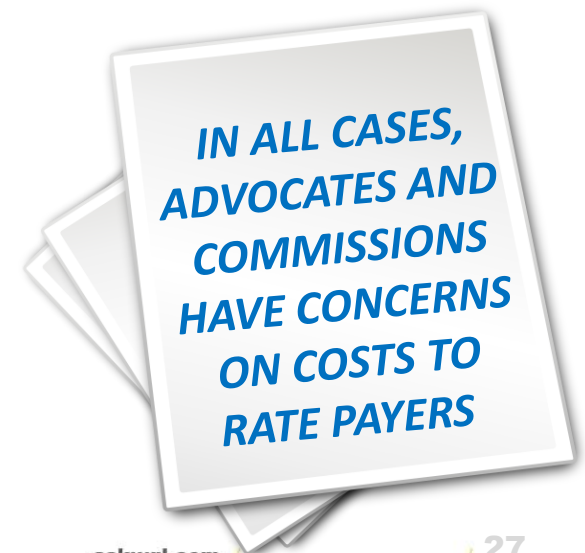
- Legislation passed May 2013
- Plan filed November 2013 and approved May 2014
- First Amendment filed March 2015 and awaiting Commission approval

DC FC 1027

- Plan ordered December 2009
- Plan re-affirmed May 2013

DC BASE RATE CASE

- ARP filed February 2012
- Rate Case Order May 2013
- Revised Plan filed August 2013
- Revised Plan settled January 2015



ELEMENT 4: JURISDICTIONAL COLLABORATION

(CONTINUED)

COORDINATION WITH OTHER UTILITIES AND DEPARTMENTS OF TRANSPORTATION

- Envista user
- Project meetings with departments of transportation
 - Scheduling
 - Cost sharing
- Other large scale improvement projects – PEPCO Undergrounding

COMMUNICATION TO PERMITTING JURISDICTIONS

- Blanket permits
- Permit expeditors
- Specifications revised

ELEMENT 5: DESIGN AND CONSTRUCTION STANDARDS

SIMPLIFIED DESIGN

- Input from long-standing contractor
- Permit jurisdiction requirements – template
- Use of SmallWorld, CAD, Application Extender and WMIS

PROCESS STANDARDIZATION

- Replacement standards
 - Revised service sizing charts
- Small hole technology
- Integrated supply model

ELEMENT 6: WORK MANAGEMENT SYSTEM

DESIGN

CONSTRUCTION PLANNING – PERMITTING

RELEASING OF WORK TO CONTRACTORS

SCHEDULING

MATERIALS REQUISITIONING

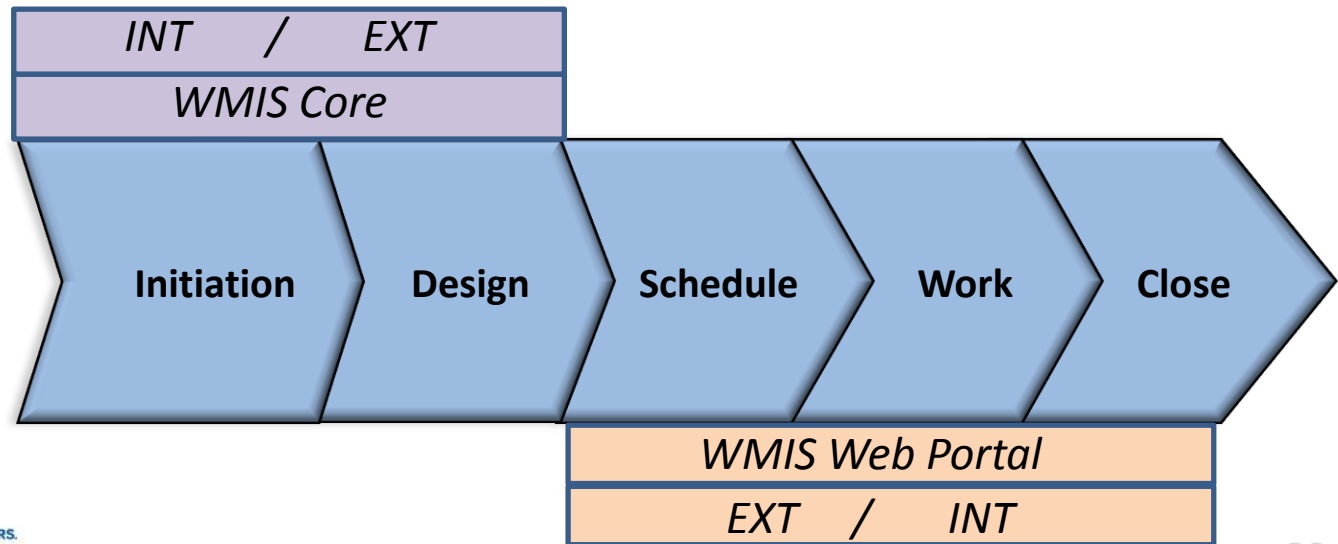
FIELD COMPLETE UPDATING

RELEASING OF WORK TO PAVING CONTRACTOR

AS-BUILDING

INVOICING

RECORDATION



ELEMENT 7: PROGRAM RESOURCES

PROGRAM DEVELOPMENT AND ADMINISTRATION

- Internal
 - Plan and testimony development - witness
 - Replacement engineering, paving and oversight
- External
 - Engineering/design contractor
 - Permitting expeditor

PROGRAM SUPPORT

- Materials – integrated supply model
- Communications – Corporate Communications and Government Affairs
- Reporting – Utility Metrics

PROGRAM EXECUTION

- Alliance
- Additional blanket contractors – Procurement
- Additional paving contractors - Procurement

ELEMENT 8: PROGRAM COMMUNICATIONS

INTERNAL COMMUNICATION

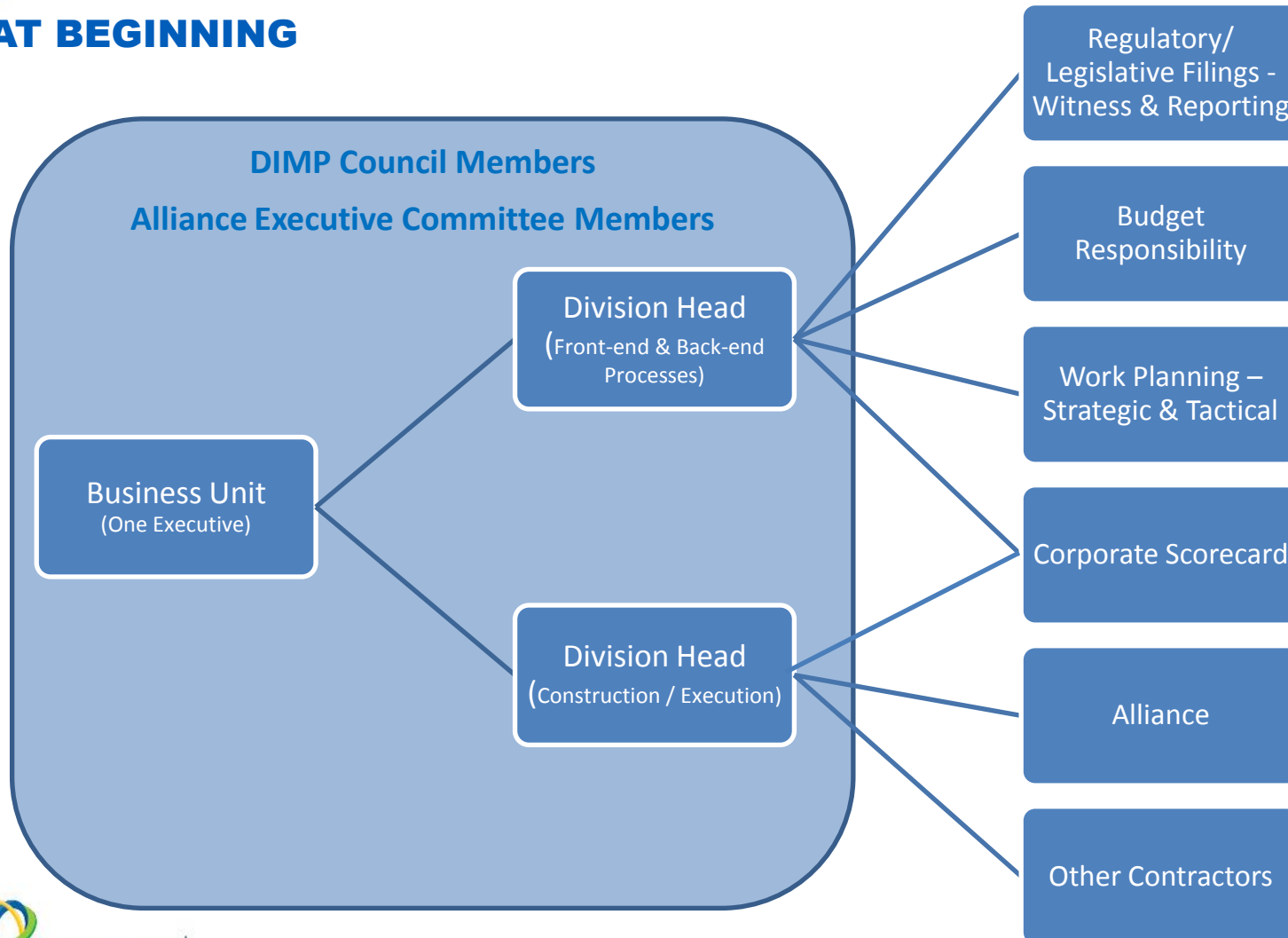
- All-hands meetings
- Energy Edge articles
- Presentations at other Business Units' staff meetings
- Partnered with Corporate Communications
- Workload meetings

EXTERNAL COMMUNICATION

- Commission notices and reporting
- Local government agencies and officials
- Other utilities, permitting jurisdictions and departments of transportation
- Homeowner Association meetings
- Letters to affected residents in advance
- Door hangers to customers and affected residents
- Self-service website on upcoming projects
- Customer Education Plan requirements

ELEMENT 9: ORGANIZATIONAL STRUCTURE AND GOVERNANCE

AT BEGINNING



ELEMENT 9: ORGANIZATIONAL STRUCTURE AND GOVERNANCE (CONTINUED)

NOW

