WE MAKE ENERGY HAPPEN

# It's Not Fun to be Lost: Implementing the Navigator App at Williams

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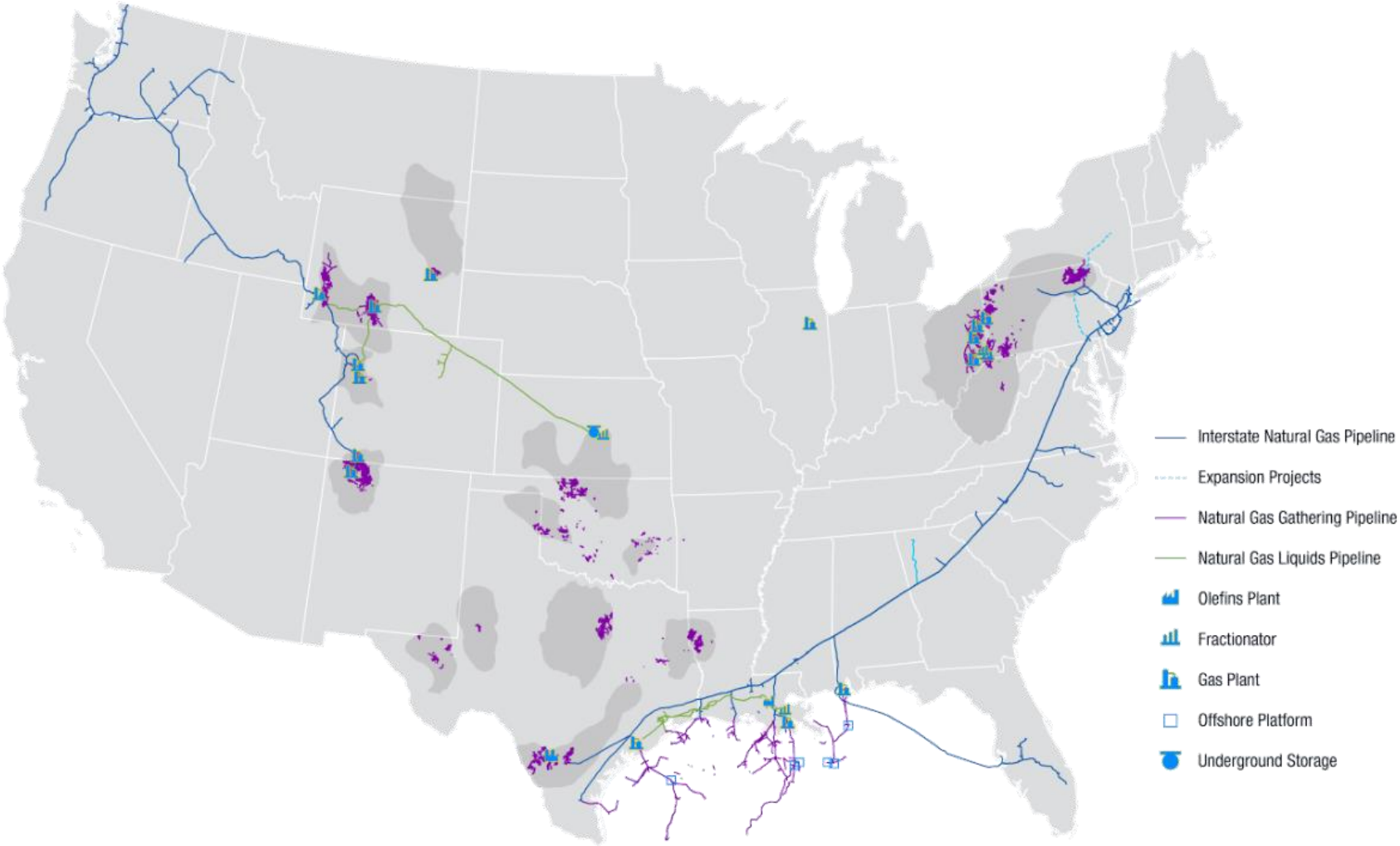
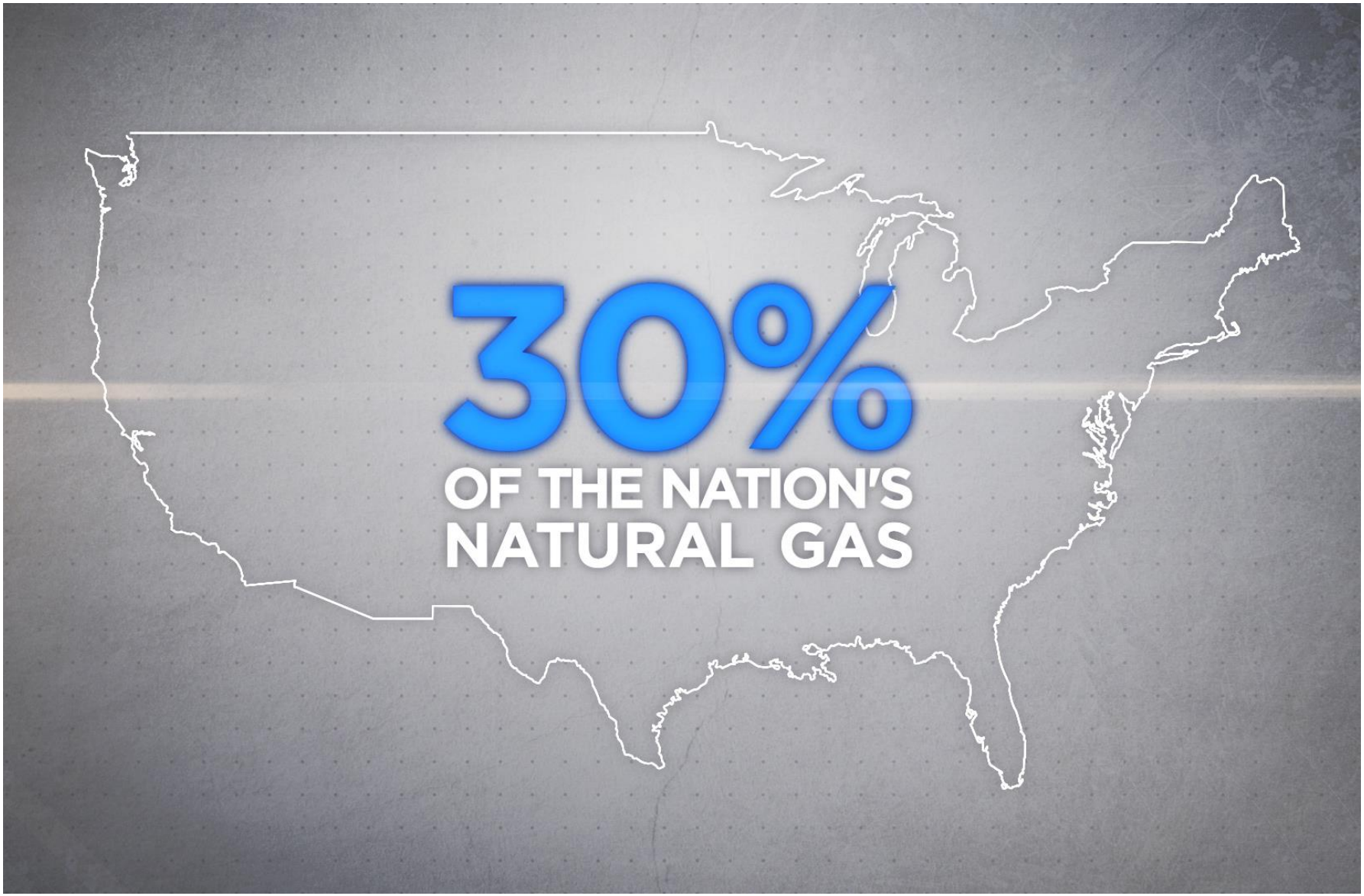
NYSE: WMB
williams.com

# Outline

- About Williams
- Business Drivers for Mobile Navigation
- Project Approach – Navigator for ArcGIS Implementation
  - Requirements Gathering
  - Design
  - Configuration
  - Testing and Deployment
- Rollout Plan, Maintenance and Support
- Lessons Learned to Date

# Williams is one of the premier natural gas infrastructure providers in North America





# Connecting the best supplies to the best markets

## Williams' Operating Areas

### ATLANTIC GULF

- Includes Transco, the nation's largest volume interstate natural gas pipeline system
- Gathering & processing facilities include processing plants, pipelines and floating crude oil and natural gas production platforms along the U.S. Gulf Coast

### NORTHEAST

- Extensive footprint to serve Northeast producers
- Positioned to capture the value of significant investment
- Focused on creating market hubs in Susquehanna, Bradford, Ohio River and Utica

### WEST

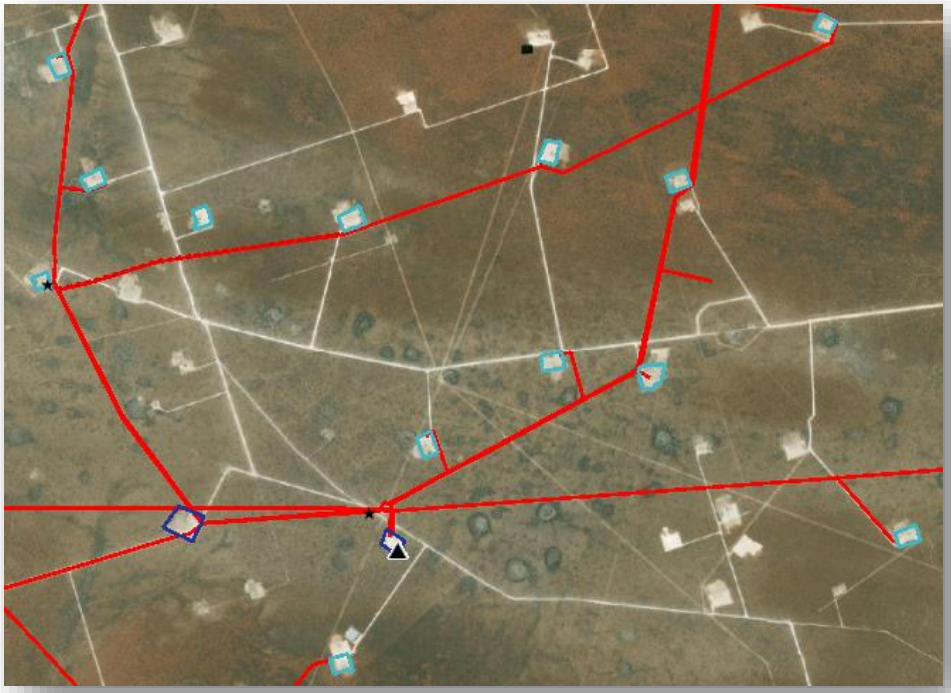
- Natural gas gathering and processing operations in Colorado, Wyoming, New Mexico, Oklahoma, Texas and Louisiana.
- Northwest Pipeline interstate natural gas transmission system
- Natural gas liquids pipelines and a fractionation and storage facility in Conway, Kansas.

# The Project

# Navigation Business Drivers

## Optimal Routing for Field Operations

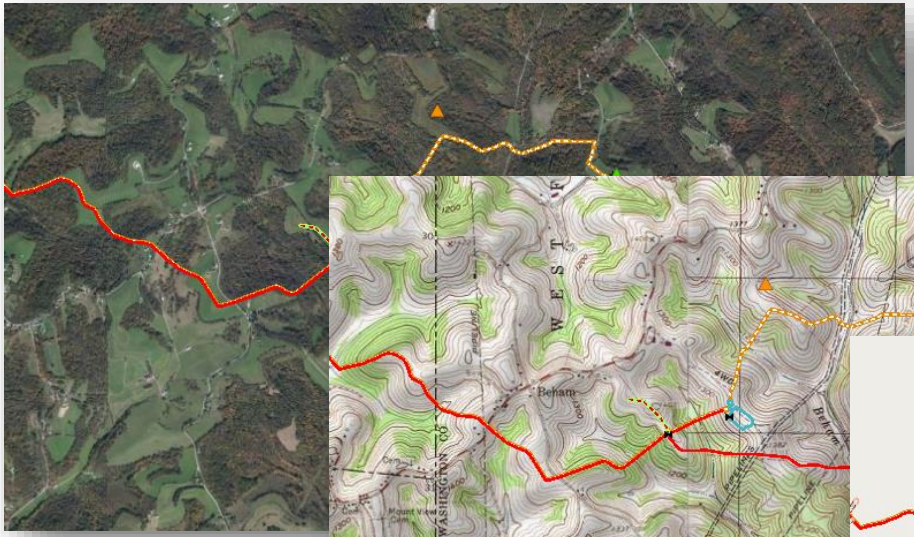
- Oil and gas operations commonly use access roads or lease roads to get to facilities in the field
- In busy gas fields, there can be many well pads and many lease roads crowded together making it difficult for an operator to know which road to use

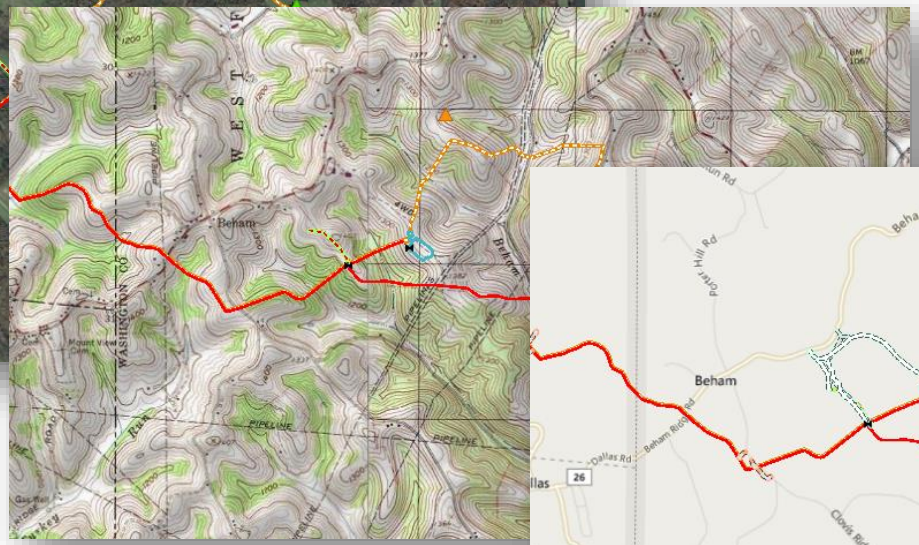


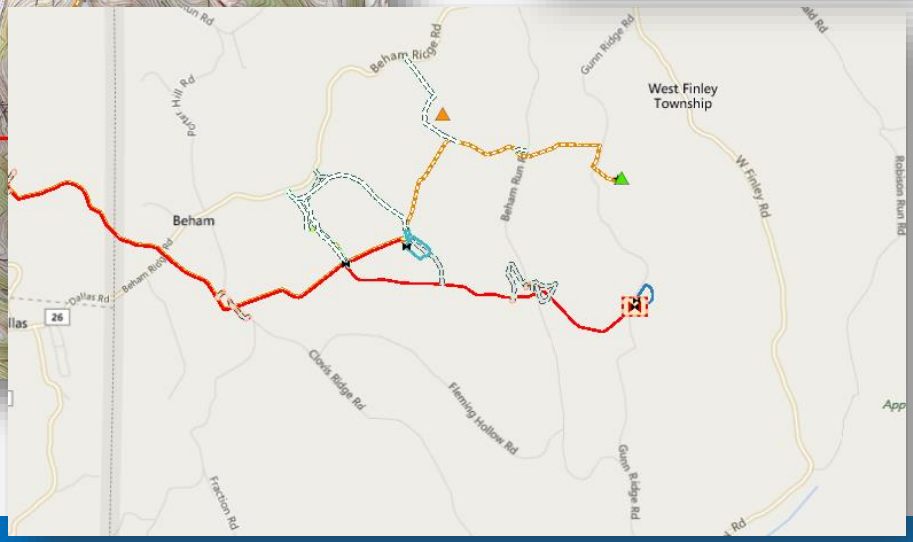
# Navigation Business Drivers

## Save Time and Eliminate Frustrations

> **In very rural areas with remote or rugged terrain, it's not uncommon for an employee to get lost trying to locate the access road, going miles outside of his or her way**






# Navigation Business Drivers

## Consolidate Applications and Reduce Costs

- **Replace legacy and consumer applications:**
  - Consolidate to one enterprise-wide navigation tool
  - Find a tool that can work offline
  - Incorporate Williams' assets, standard symbology and access (custom) roads
  - Allow for use on a phone or tablet
  - Support multi-stop routing
- **Save money by decommissioning other legacy applications**
- **Enable app-linking with other mobile applications**

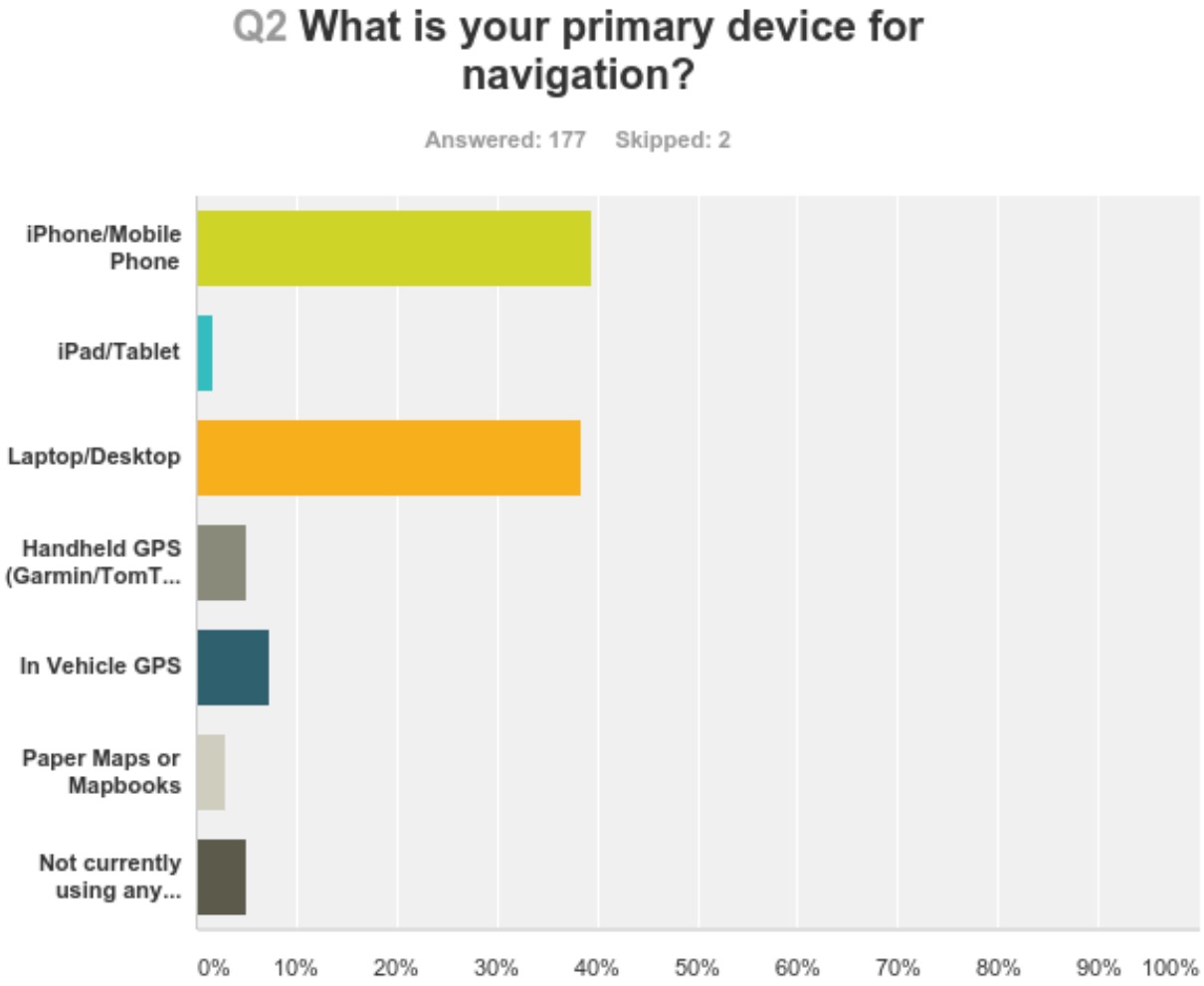
# Requirements Gathering

## Survey of Field Technicians

- **In late 2016, we distributed an online survey for field users asking about their current routing and navigation tools and general needs**

- **Questions included:**
  - Do you frequently travel to different Williams assets?
    - If so, are these assets reached via access roads?
  - Do you currently use a Navigation tool?
    - If so, what is it? And, does it meet all of your needs?
  - Do you have a need to route to multiple stops in a day?
  - Are you frequently in areas with no cell or wifi service?

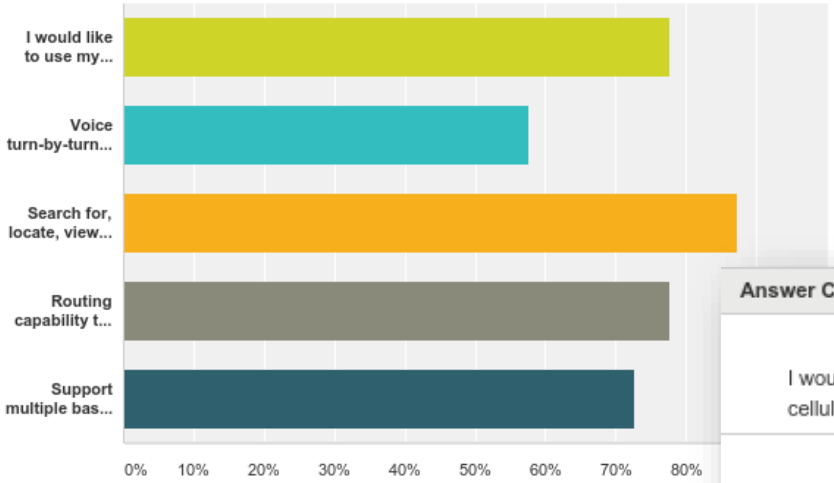
# Requirements Gathering



# Requirements Gathering

**Q9 From the list below select all of the functionality that you would like for your routing/navigation tool to be able to perform. (select all that apply)**

Answered: 165 Skipped: 14




| Answer Choices | Responses |
|---|---|
| I would like to use my routing and navigation tool in an offline mode. For example, no wifi or cellular service available. | 77.58% 128 |
| Voice turn-by-turn navigation. | 57.58% 95 |
| Search for, locate, view and navigate to Williams assets. For example: facility, offices, valve sites, meter runs, etc. | 87.27% 144 |
| Routing capability to Williams assets. | 77.58% 128 |
| Support multiple base map options. For example: topo, aerial, streets, etc. | 72.73% 120 |
| **Total Respondents: 165** | |

# Requirements Gathering

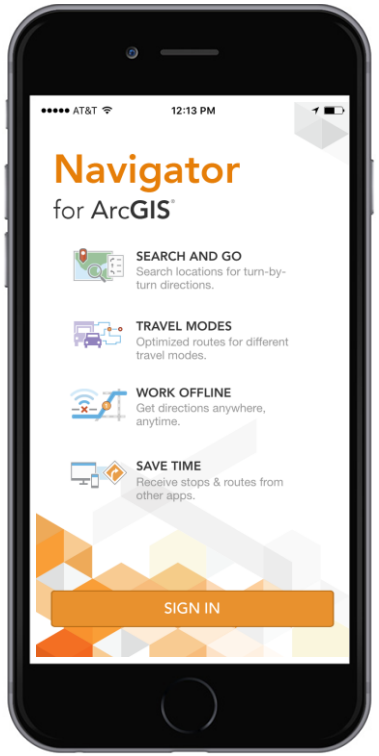
## Target User Comments

- **"I need a search function for Williams assets. Being able to search and find specific assets"**
- **"It would be nice to have the navigation in a smaller form. My computer takes up a lot of space and the battery life is typically less than 3-4 hrs"**
- **"I am over ROW Maintenance, and I get calls for problems while on the go. I need it to be mobile."**
- **"I'm assuming new operations employees will use this daily until they become familiar with their area."**
- **"It would be great to have routing capability available, however in certain areas this would mean that lease roads would have to be GPS'd and a layer would have to be created for this function to be useful."**

# Solution: Esri's Navigator for ArcGIS

## "Get Where You Need to Be"

- **"Navigator for ArcGIS is a mobile app that gets your field workforce where it needs to be, unlocking efficiency and improving reliability. Use the data provided or your own data to search and navigate directly to your organization's assets"***
  - Company proprietary asset data
  - Custom road data
- **Works when the user does not have cellular service**
- **Similar look and feel to commercial navigation apps**
- **Documentation: http://doc.arcgis.com/en/navigator/**

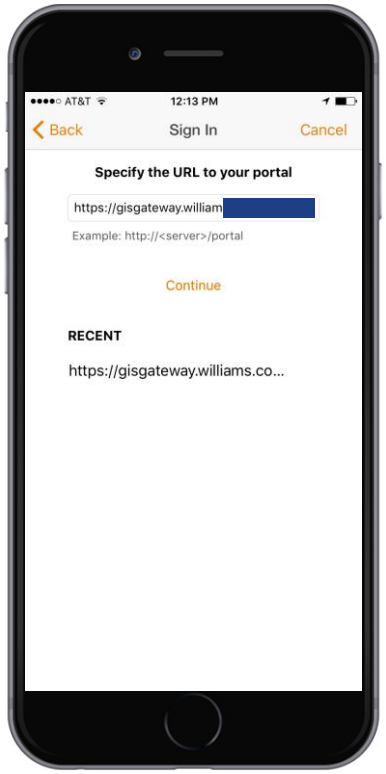


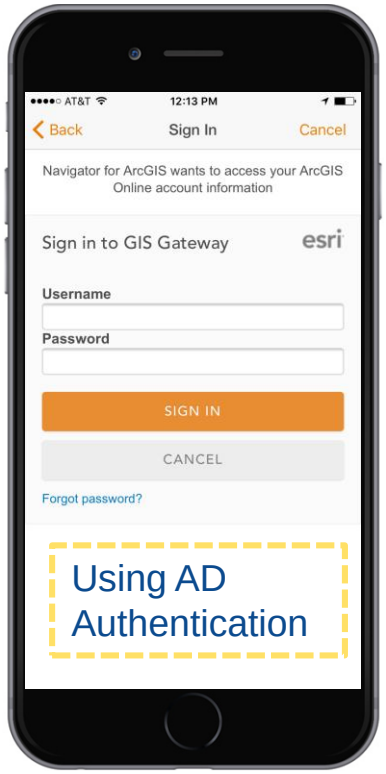

* http://www.esri.com/products/navigator

# Technical Requirements

## Technical Foundation for Navigator at Williams

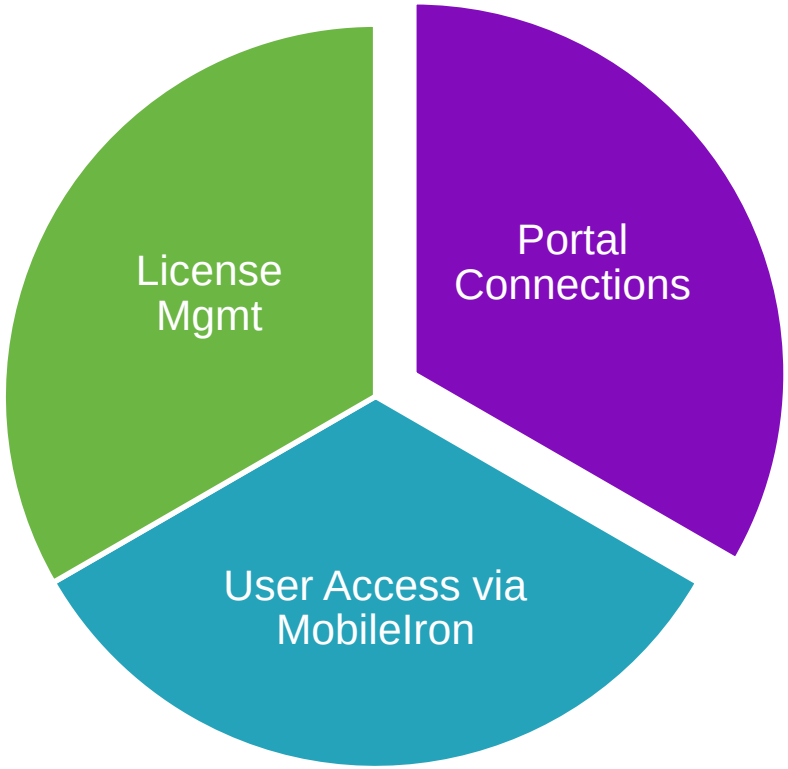
- **Portal for ArcGIS**
  - License provisioning at the user level
  - Started with 1,000 users
- **ArcGIS Pro**
  - Create aggregated street network
  - Create mobile map package
- **StreetMap Premium**
  - Limited copies
- **Data Reviewer**
- **Network Analyst**
- **MobileIron (optional)**



# Design

## Factors to Consider



# Design

## Mobile Map Packages

- **Determine extents for the Mobile Map Packages**
  - A mobile map package (MMPK) stores the navigation map used by the application. It includes the base map, roads and assets, if applicable.
  - Williams' needs dictated that we add custom roads and assets to an Esri-provided navigation map.
- **Storage limitations on the devices**
- **Symbology**
- **Labeling**
- **Searchable fields in asset layers**
- **Projection**

| Name | Date modified | Type | Size |
|---|---|---|---|
| Williams_West_Navigation.mmpk | 6/14/2017 9:30 PM | MMPK File | 1,869,479 KB |
| FacilityLocatorWest.lox | 6/7/2017 8:04 AM | LOX File | 12,549 KB |
| FacilityLocatorWest.loc | 6/7/2017 8:04 AM | XML Document | 392 KB |

# Configuration

## Data Gathering

- **Identify custom roads to incorporate with Esri's Street Map Premium (SMP) data**

- **Road data sourced from multiple locations**
  - CAD, databases, shapefiles, openspace files, text files

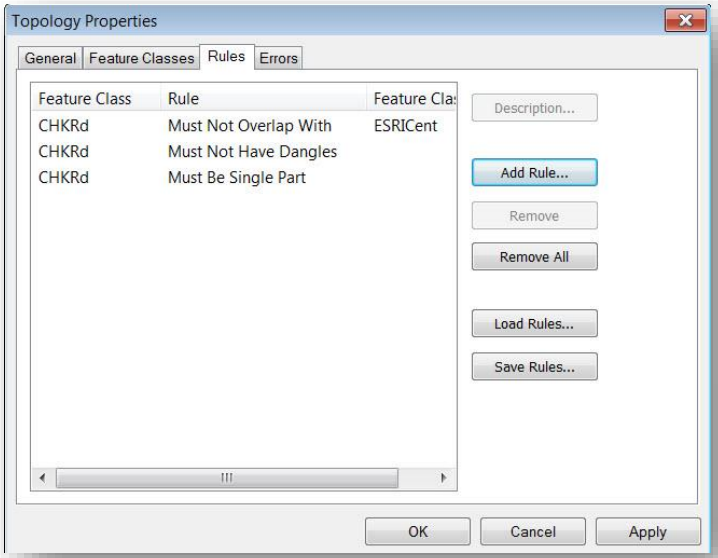
- **Integrate into a centralized dataset in a FGDB**
  - New roads will be added into SDE then migrated to a FGDB

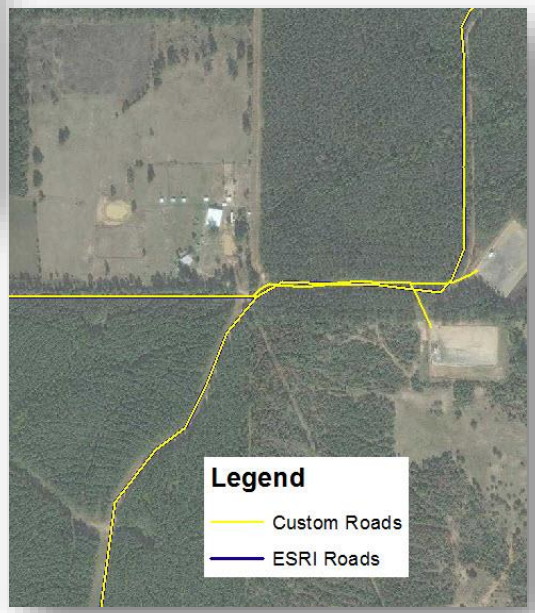
# Configuration

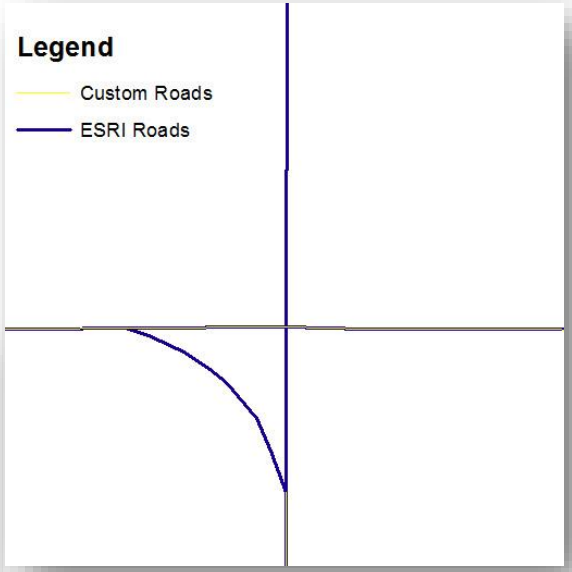
## Data Preparation

- **Data Clean Up to Achieve Network Connectivity**
  - Using topology rules in ArcMap
  - Geometry clean up
    - Overlaps
    - Dangles
    - Multi-part lines
  - ArcToolbox
    - Blanket Extend
    - Blanket Trim
  - Removing duplicates between custom roads and SMP roads

# Topology



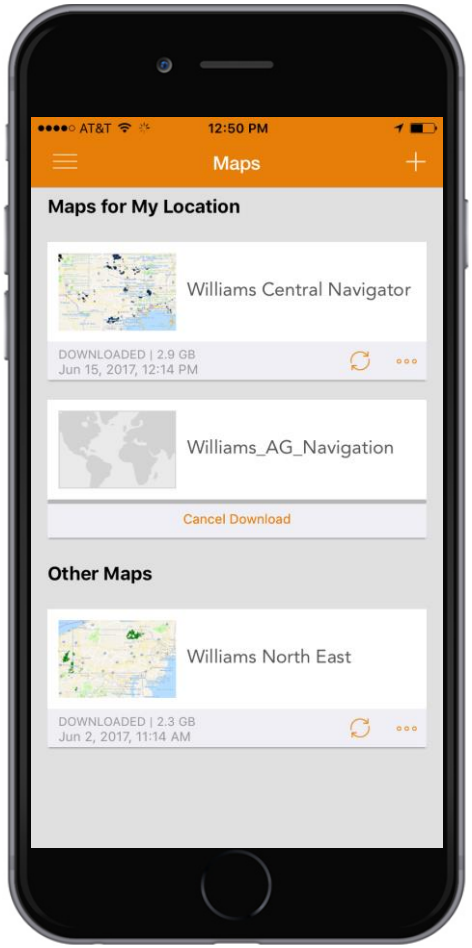
# Configuration

## App Configuration

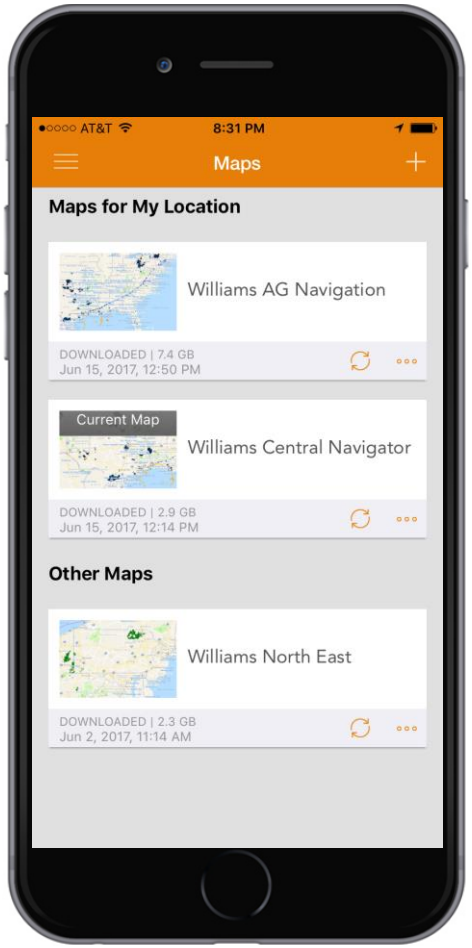
> **Create Connectivity and Override Points**

- Using Data Reviewer in ArcMap
  - Create connectivity between Williams custom roads and SMP roads
- Load Williams custom roads and override points into the SMP database
- Using Network Analyst
  - Add override points to create network connectivity
  - Points need to be added at locations where custom roads intersect SMP roads or custom roads intersect one another.
- Build the network – Runs much quicker in ArcGIS Pro
- Create Mobile Map Package (MMPK) – Has to be done using ArcGIS Pro

# Configuration



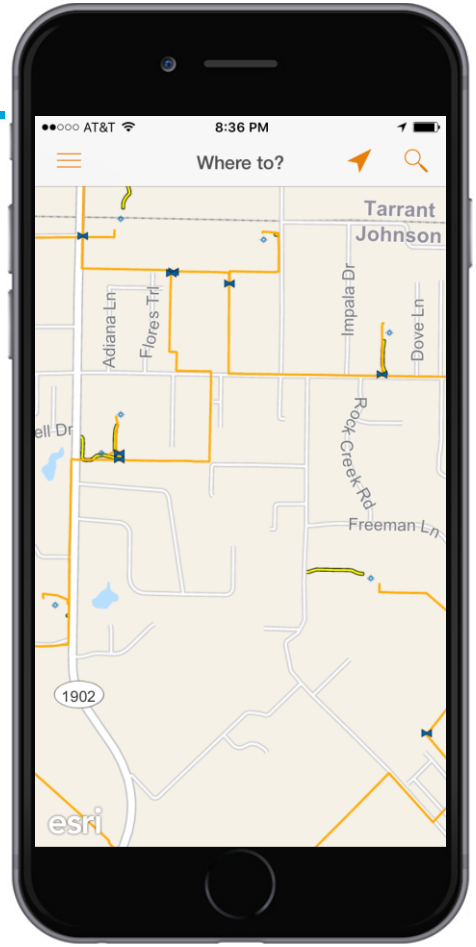

- Users download the map packages they need
- Users can check for updates to the MMPKs
- Note: navigation cannot cross map packages

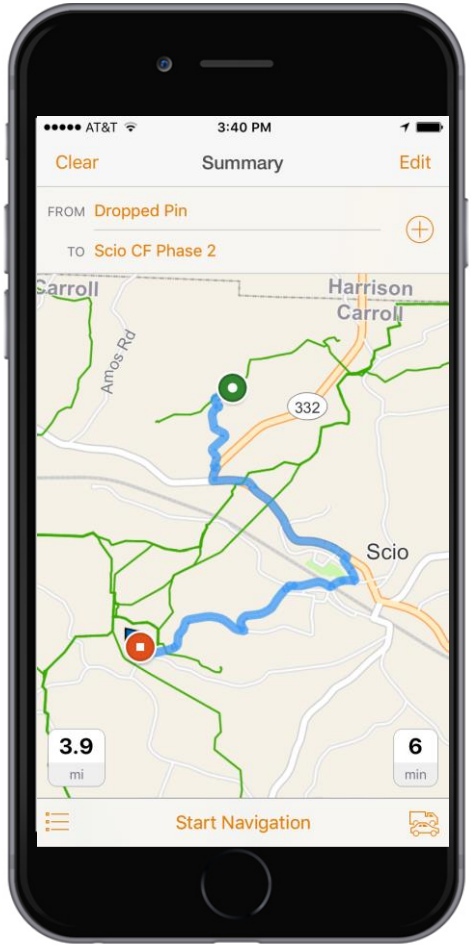


# Configuration

## Routing on the Phone

- Users can search for pipelines and facilities by name
- Access roads and facilities are distinguished with symbology
- Routing works much like consumer navigation apps

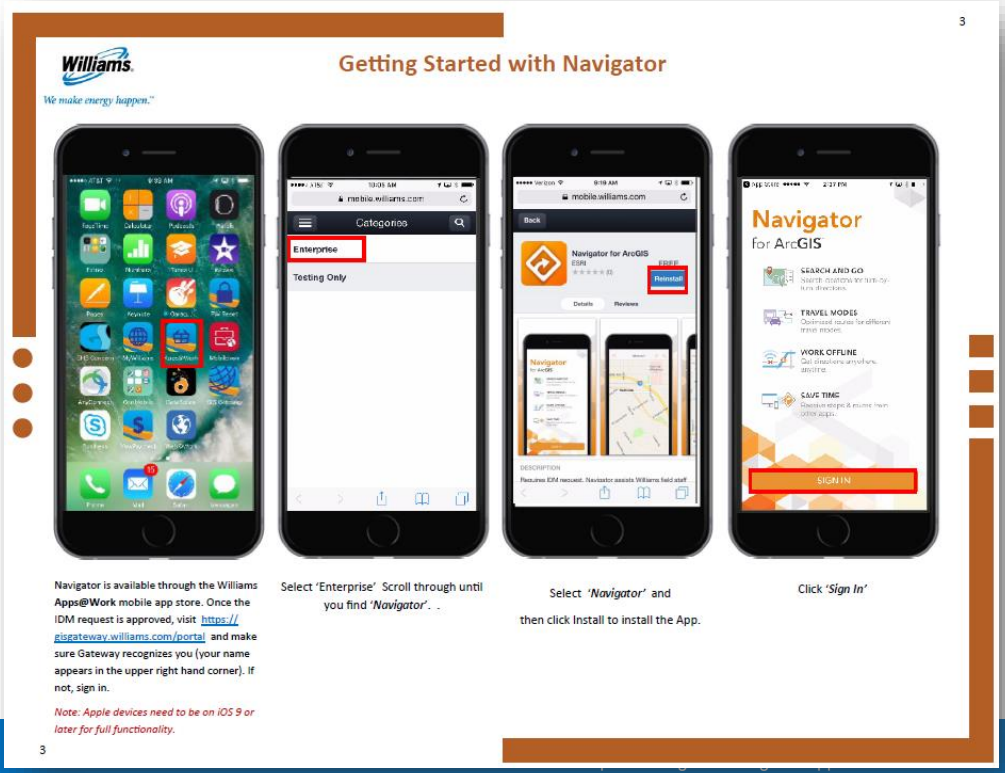


# User Testing

## Testing

- **Find the issues before our users do!**
- **Internal IT Testing and Business Analyst Validation**
  - Downloading and configuring the app
  - Downloading the MMPKs
  - Testing the routing functionality
- **GIS Users Pilot**
  - Conducted in June 2017
- **End Users Pilot**
  - Planned for July 2017



# Deployment

## Careful and Thoughtful Deployment

- Planned deployment for remainder of 2017 and into 2018
- Developed an FAQ document
- Developed detailed user guides
- Launched the application within our Production MobileIron environment

# Rollout, Maintenance and Support

## Rollout Plan

- **Identified GIS analysts who could devote time to improving the access road data**
  - Hundreds of missing roads!
  - Many data stores to investigate to find data
- **Developed a map package maintenance plan and schedule**
  - Incorporate
  - Monthly refreshes
- **Partnered with Operations to create a rollout plan**

# Lessons Learned

- **Implement a standard for access roads**
  - Survey standard
  - Post-processing standard that address connectivity
- **Over-estimate the amount of time data prep will take**
- **Make symbology and labeling decisions early on**
- **Store the data locally to reduce processing time**
  - Some of our areas for MMPK's are extremely large and processing time can still be 12+hrs for MMPK builds.
- **Store all data in a common location**
- **Develop internal documentation to complement what Esri provides**
- **Allow plenty of time to fix map package issues between configuration, testing and rollout phases**

# Thanks to the Project Team

## Key Contributors

- **IT Team:**
  - Paul Huskins – IT Manager – License acquisition and vision
  - Samantha Dent – IT Project Manager
  - Paula Hays – Business Analyst – Requirements gathering and resource herding
  - Lou Early – IT Analyst – Design and Configuration
  - Troy Bumgardner – IT Business Systems Analyst – Design and Configuration
- **Engineering Services GIS Team**
  - Emily McNamar – Sr GIS Analyst – Data QC
  - Dustin Miller – Manager – Oversaw testing and rollout
  - Todd Grim – GIS Analyst – User documentation, pilot facilitation and rollout planning

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