



BYERS ENGINEERING COMPANY

Proposal

To

Indian River County, Florida

Implementation of NexusWorx

Byers Engineering Company

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Indian River County Implementation

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1. OVERVIEW

This proposal is in response to Indian River County (IRC), Florida acquiring subscriptions of Byers NexusWorx fiber asset management solution. As part of fully implementing this solution, network data needs to be populated into the NexusWorx database. IRC has existing fiber network data in their GIS system. However, this data does not contain fiber connectivity data needed to have a fully functional system. To get this data populated, Byers is proposing this entire effort to be completed in four phases. Only one of these phases is for the entire network, and the other are for a pilot area that will evaluate the value of a field inventory and verifying fiber splicing.

The first phase will consist of migrating the GIS data into NexusWorx intelligent features and building associations as the data permits. The second phase covering a segment of the network known as the "Pilot" will consist of a field inventory of both OSP/ISP physical plant. The third phase will consist of verifying OSP splicing (connectivity) within the pilot area along with the collecting details for Aerial slack loops. The fourth phase will consist of building the connectivity in NexusWorx from the data collected during the inventory.

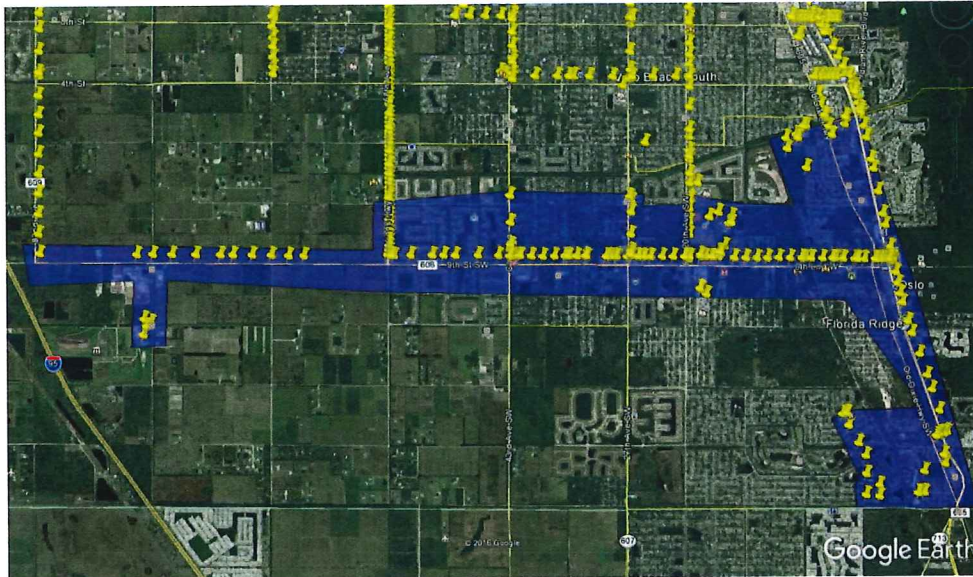
The total lump sum price for this entire work is \$49,000 and it's fully expected that all work will be completed within 120 business days from receiving a PO. This price is based on the quantities and scope listed in this document, any deviation from these could require adders to this pricing.

2. PROJECT SCOPE

The following outlines the scope of this project.

Phase 1 – All of the consortium fibers that belong to IRC, City of Vero Beach and Indian River County School Board.

- Migration of:
 - Fiber Optic Cables
 - Copper Cables
 - Conduit Access Points
 - Conduit Duct Bank and Conduit Duct Groups
 - Splice Locations
 - Equipment Cabinets (Traffic Cabinets)
 - Fiber Termination Locations (Buildings)
 - Poles
- Phases 2, 3 & 4 (Pilot) – This is the most southern portion of the network as indicated in the image below.



- Field Inventory
 - Fiber Handholds
 - Traffic Cabinets
 - Building Termination Locations
- Fiber Splicing (OSP Splices)
 - Underground Splices and Aerial Cabinet Cross-Connects

3. PROCESS AND TASK

Phase 1

Data Migration – Byers will utilize and extract the following features from the provided ESRI Geodatabase of the consortium’s fiber optic facilities. The table on the following page outlines the source feature and NexusWorx target features, as well as the general rules for setting attributes.

General rules are as following:

1. Conduit Access Points, Equipment Locations (Traffic Cabinets) and Splice Locations (Closures) will be extracted from the County Handhole features.
2. Poles will be loaded from County Poles.
3. Fiber Optic Cable will be extracted from County Fiber Optic Cable – This includes abandoned cables.
4. Conduit Duct Point and Conduit Duct Group – will be extracted from County Fiber Optic Cable-
5. Copper Cables – This will be extracted from Fiber Optic Cable where Size values dictate a copper cable.

In addition to migrating the Geodatabase features these initial processes.

1. Breaking Fibers at splice locations (cases)
2. Adding Splice Locations and associating to fiber optic cables and building termination locations.



Indian River County Implementation

| NexusWorx Feature | GDB Column | NexusWorx Column | Rule | Note |
|--|-----------------------------|--------------------------|--|---|
| Fiber Optic Cable | Owner | Owner | Map NxWx Owner Code | |
| Fiber Optic Cable | Size | Fiber_MTL_CD | Extrapolate and set Fiber_MTL_CD. Where Copper will be removed and migrated to Copper Cable. | Where this contains multiple cable sizes, thus sheaths, must be broken out into individual records in source table. Copper Cables will need to be manually stripped from source feature |
| Fiber Optic Cable | Manufacture | Fiber_MTL_CD | Use value with Size to extrapolated Fiber MTL. NULL=Unknown | |
| Fiber Optic Cable | Placement | Installation Type | Map to Construction Type Code. Filter out records with Conduit and no Count populated. | Note Abandon feature |
| Fiber Optic Cable | Count | | Seems to be used to express fiber Size-Mode when Size has conduit size | |
| Fiber Optic Cable | Installed Ft | Length | If source is NULL enter Geo_Length as Length value. | |
| Fiber Optic Cable | PO_COVB | % Ownership Vero Beach | New Field | |
| Fiber Optic Cable | PO_IRC | % Ownership IRC | New Field | |
| Fiber Optic Cable | PO_SCH | % Ownership School Board | New Field | |
| Fiber Optic Cable | PO_Traffic | % Ownership Traffic | New Field | |
| Fiber Optic Cable | PO_SEB | % Ownership SEB | New Field | |
| Fiber Optic Cable | | Feature State | Need to set features with Abandon in Placement to Abandon Feature State | Add Feature State to Muni Config. |
| NexusWorx Feature | GDB Column | NexusWorx Column | Rule | Note |
| Conduit Duct Bank | Owner | Owner | Map NxWx Owner Code | |
| | | Usage | Set to COMM | |
| | | | Migrate feature ID to maintain correlation between NxWx ID and original ID | |
| | ID | IPID | | |
| NexusWorx Feature | GDB Column | NexusWorx Column | Rule | Note |
| Conduit Duct Group | Size | Type | Extrapolate Type CD from Size values | Source is County Fiber Optic Cable feature |
| | Size | Size | Extrapolate Size CD from Size values | Source is County Fiber Optic Cable feature |
| | Size | Quantity | Extrapolate Quantity CD from Size values | Source is County Fiber Optic Cable feature |
| | | Conduit_Duct_Bank_ID | | |
| NexusWorx Feature | GDB Column | NexusWorx Column | Rule | Note |
| Copper Cable | Size | Size | Extrapolate Size CD from Size values | |
| | Size | Gauge | Extrapolate Size CD from Size values | |
| NexusWorx Feature | GDB Column | NexusWorx Column | Rule | Note |
| Conduit Access Point | Owner | Owner | Map NxWx Owner Code | |
| Conduit Access Point | Location Intersection | Name | | |
| Conduit Access Point | CH_ID | IPID | | Only Load features where CH_TYPE=H (These are Handholes) |
| | | Type | Set by default to Handhole | Will be updated based on field instruction |
| NexusWorx Feature | GDB Column | NexusWorx Column | Rule | Note |
| Equipment Location (Traffic Cabinets) | Owner | Owner | Map NxWx Owner Code | |
| | Location Intersection | Name | | |
| | | Site ID Name | Same as Name to Start | Need to update per convention |
| Conduit Access Point | CH_ID | IPID | | Only Load features where CH_TYPE=C (These are Traffic Cabinets) |
| | | Admin | Set to Signal Traffic by default | |
| NexusWorx Feature | GDB Column (Fiber Building) | NexusWorx Column | Rule | Note |
| Equipment Location (Fiber Termination) | Type | Type | Map NxWx Type Code | |
| Equipment Location (Fiber Termination) | Name | Location Name | | |
| Equipment Location (Fiber Termination) | Address | Address | | |
| Equipment Location (Fiber Termination) | CH_ID | IPID | | |
| NexusWorx Feature | GDB Column (Handhole) | NexusWorx Column | Rule | Note |
| Splice Closure | Owner | Owner | Map NxWx Owner Code | |
| Splice Closure | Location Intersection | Name | | |
| Splice Closure | | Sit ID Name | Same as Name to Start, or ABC if null | Need to update per convention |
| Splice Closure | CH_ID | IPID | | Only Load features where CH_TYPE=S (These are Splice Locations) |
| NexusWorx Feature | GDB Column (Pole) | NexusWorx Column | Rule | Note |
| Pole | Owner | Owner | Map NxWx Owner Code | |
| Pole | Type | Material | | |
| Pole | Size | Height | Need to parse out in some cases | Source field contains both Height and Class |
| Pole | Size | Class | Need to parse out in some cases | Source field contains both Height and Class |

Phase 2 – OSP/ISP Field Inventory & NexusWorx Update

The following covers the task and data that will be collected from a field inventory of the ISP and OSP plant. This phase will also include adding & updating features in NexusWorx.

- At Underground Handholes
 - Type and Size
 - Number, Type and Size of Ducts and/or Innerducts
 - Fiber Optic Cable; Manufacture, Size, Sequentials (at Duct, at Splice Case or Center)
 - Verify Splice Closures.
 - Site Pictures.
- Aerial Locations
 - Denote and verify Splice Locations and/or Slack Loops.
 - Site Pictures.
- Traffic Cabinets
 - Fiber Terminating Devices, Type, Manufacture, Model, Serial #, Number of Ports
 - Fiber Optic Cable; Manufacture, Size, Sequentials (at Duct, at Splice Case or Center)
 - Cross-connect (jumpers) Details – Where possible, we do not disconnect or demount equipment.
 - Site and cabinet content pictures.
- Equipment Locations (Buildings)
 - Fiber Terminating Devices, Type, Manufacture, Model, Serial #, Number of Ports, Port Connector Types.
 - Terminating Conduit – Number, Type and Size of Ducts and/or Innerduct.
 - Fiber Optic Cable; Manufacture, Size, Sequentials (at Duct, at Splice Case or Center)
 - Cross-connect (jumpers) Details - Where possible, we do not disconnect or demount equipment.
 - Rack Details – Type, Size and rack positions for equipment.
 - Site & equipment pictures
- Poles
 - Only visual verification will be performed on Poles, meaning a check to see if pole exist.
 - * May verify cross-connect details at OPGW cross connects, this depends on access and if access not required by bucket truck.

The updating of data in NexusWorx will include the following items:

- Breaking Fibers Optic Cables at inventoried splice locations not found in the GIS data.
- Import Fiber Devices into Traffic Cabinets and Equipment Locations (Buildings)
- Attachment of digital pictures
- Creating Racks and mounting fiber devices and attaching pictures.

Phase 3 – OSP Splice & Aerial Slack Loop Verification

This phase will not start until the completion of Phase 2. Byers will provide our splicing sub-contractor direction to specific locations where OSP splice and/or aerial slack loop verification needs to be performed. For Splice Verification the sub-contractor will open splice closures and inspect splicing to determine and document strand to strand connectivity or where strands dead end or are “pass-through” which means the strands are within undisturbed buffer tubes. In addition to the splice details they will capture in the aerial environment the fiber optic cable size, manufacture, and cable sequentials, if obtainable, at splice closure and IN/OUT points for slack loops.

This information will be provided back to Byers back-office team where QA (Quality Assurance) will be

performed and prepared for data encoding of splice connectivity in NexusWorx.

While it's not expected to occur or a very rare circumstance the sub-contractor will be responsible for restoring splices or end-terminations to expected or working condition if anything is disturbed during the visual inspection of the splicing. This restoration is not covered under the Field Verification lump sum pricing and will be performed under Splicing Unit pricing when this occurs based on the quantity of splices. The Sub-Contractor will perform OTDR test at 1330 and 1550 nm wavelength to assure any reworked splicing loss meets IRC loss threshold requirements.

IRC contact will be notified when any existing splices are disbursed and need to be re-spliced in particular where coordination is required to disconnect light emanating equipment.

Phase 4 – Build Splice Connectivity in NexusWorx.

Upon completion of Phase 3 Byers NexusWorx data technician will utilize the OSP and ISP connectivity data to build fiber strand and/or port connectivity in NexusWorx. Since this connectivity is for the limited Pilot area connectivity will not be complete A to Z for known paths, but only the path within the “Pilot” area.

4. ASSUMPTIONS

The following are the assumptions regarding each phase.

Phase 1 - Data Migration –

- Fibers will be loaded only from County Fiber Optic Cable feature class since this contains all of the consortium fibers.
- Fiber Optic Cable feature class contains Copper cables and Conduits which will be extracted and loaded into Copper Cable and Conduit Duct Bank features.
- The County Handhole feature class contains, in addition to Handholes, Patch Panel, Traffic Cabinets and Splice Closure locations. Only Handholes, Traffic Cabinets, and Splice Locations will be loaded with these features.
- Fiber Termination or Building locations will be generated from Fiber Building feature class.
- Byers will add new attributes to capture percentage ownership.
- All data appears to geographically accurate so that no updates will be performed on these features. Fiber cables may be offset from structure or conduit running line.

Phase 2 – OSP/ISP Field Inventory & NexusWorx Update

- No Manholes exist or any underground structure requiring ventilation.
- All Handholes should be visible, or can be discovered by; electronic locating method or GPS location. Byers will not be rodding or pressurizing conduit to discover Handhole locations.
- No GPS updating or collecting is part of this effort.
- IRC will need to coordinate and/or provide access to building/ISP locations that will work within the timeframe Byers personnel on-site.
- IRC will provide any requirements or key's regarding the access of OPGW cross connect cabinets.
- Number of Inventory Locations
 - 144 Handholes
 - 12 Traffic Cabinets
 - 13 Building Locations
 - 4 OPGW Cross Connect Cabinets

Phase 3 – OSP Underground Splice



- All locations are accessible by truck or splicing trailer.
- IRC will coordinate any required access to easements or right-of-way that might be required.
- Byers splicing vendor will notify IRC in the case any existing splices are disturbed.
- Number of Locations
 - 11 Underground Handholes Splices
 - 0 Aerial Splices – (*We do not see Aerial splice closures requiring validation*)
 - 1 Traffic Cabinet Splice (It is not known if this is splice case or patch scenario in the cabinet)

Phase 4 - Build Splice Connectivity in NexusWorx.

- No assumptions.

5. COST

The following are Byers lump sum or unit prices. All prices are based the number of expected units.

Phase – Unit Type – Cost – Scope

Phase 1 Data Migration – Lump Sum - \$ 5,000 – Entire GIS dataset

Phase 2 OSP/ISP Field Inventory and NexusWorx Update – Lump Sum - \$ 17,000 - Pilot Area

Phase 3 OSP Splice Verification UG Location - Per Location – Lump Sum \$ 25,000- Pilot Area

Phase 4 Build Connectivity in NexusWorx – Lump Sum - \$ 2,000 - Pilot Area

Adder –

Splicing Unit Prices –

Single Fusion Splice – Unit – \$67.50 ^(a) x 100 = ~~16,750.00~~

12 Strand Buffer Single Fusion – Unit - \$800 ^(a) x 5 = ~~4,000.00~~

(a) – This pricing is direct invoicing from the fiber splicing vendor to IRC and not through Byers.

6. TIMELINE

Byers' expects that we can produce our deliverables within 90 calendar days of a notice to proceed or PO from the utility board for the services as outlined in this proposal.