Digital As-Built Harmony, Promoting Simplicity for both Utilities and Contractors

Jeff McCann
Leveraging GIS to Solve Water and Wastewater Problems
As-Built Submission Sources & Formats

- **Sources**
  - Internal Work Orders
  - Consultants
  - Contractors

- **Formats**
  - CAD
  - GIS
  - PDF
  - Paper
  - Napkins
Determine Software Platform Preference

- **GIS Based**
  - Easily Consumed into Existing Data
  - Build and Provide Features for submissions
  - Limited User Group with Designers and Contractors

- **AutoCAD/Bentley/Etc.**
  - Industry Standard for Design
  - Incorporate Excel for Tabular Data
  - Assists with Data Validation

- Build process and Standards to allow lowest possible source to provide critical information
Review internal applications

As submissions are initially for updating core GIS data; consider additional use of incoming data:

X = Daily Use
/ = Incremental Use
O = Non use, provided from GIS platform
EPA SWMM - historical models
ADS Slicer - Model Buildout and analyzing flow meter data
Develop Digital Submission Standards

- Define Purpose and Scope
- Itemize Definitions and Terms used through document
- Define what is to be included in submission
- Incorporate Record Drawings and final payment into contract documents
- Hold tap fee or bond as “leverage” to ensure complete as-built information

- List accepted formats:
  - Hard Copies
  - CD/DVD/Jump Drive/Cloud Uploads
- Design Excel tables
- Create sample drawing with approved layers & fonts
- Provide checklists
- Create review letter templates
- Web page for downloads and/or uploads
Submission Contents

- **To be Provided**
  - Sample CAD file prepped for GIS entry
  - CD label template
  - GIS data and database files
  - Digital GIS Data Requirements & Attribute Table Checklist

- **To be Submitted**
  - On disc (2 copies)
    - Record Drawing Digital Plan Data (PDFs)
    - Record Drawing GIS Data
    - Digital GIS Data Requirements & Attribute Table Checklist
  - Plotted (1 set)
    - Record Drawing Plans Plans (Paper)
Digital Submission Standards

- **Digital GIS file of all constructed/modified features.** (dwg/dgn/dxf formats)

Modified CAD file showing corrected locations of designed features, connections to existing features, required annotation, and other pertinent information regarding final constructed locations. Requirements for this file are as follows:

a) All information for new or altered elements in the project and all accompanying geodetic control shall be placed into one CAD file. The features in drawing files will be translated to real world locations. The geodetic control chosen must correspond to the existing features UTILITY GIS (State Plane East projection, NAD 1983 State Plane Indiana East, US Feet).

b) Acceptable control includes section corners and quarter section corners. State Plane coordinates exist for most quarter section corners in Marion and surrounding counties. Control assistance can be obtained by contacting the County Surveyor’s Office. It is a requirement that the control used be referenced and shown in the plan drawing. If point of control is located within the project limits, it should be symbolically indicated and annotated in the design file. If the nearest control is located well outside of the project area, then it should be tied to another geodetic control points used, and a reference tie annotated and indicated. Any land survey information, such as basis of bearings and or any assumptions must be submitted and annotated on the submitted file.

c) Features shall be submitted on the specified layer shown below. CAD systems which use a numbering system for layers instead of names shall also include a conversion chart explaining which layer number corresponds to the appropriate GIS layer name:

1. Sanitary Structures (SANSTR)
2. Sanitary Sewer Mains (SANSEWER)
3. Sanitary Laterals (SANLAT)
4. Sanitary Easements (SANEASE)
5. Geodetic Control (CNTRL)

d) Altered existing features shall use a different color than the new/improved infrastructure. It is at the discretion of the submitting firm as to colors.

e) Only layers that contain data shall be included in submission.
Submission Checklist/DVD Label

Digital Submission As-built Check List
Digital Data (CAD Format)
A CAD format file shall be submitted showing all new, altered, or removed asset elements:

As-Built No. ____________________________________________________________

Project Number: ______________________________________________________

Project Name: _______________________________________________________

Y  N  Is drawing format in AutoCAD (.dwg) or a universal DXF
Y  N  Is data in State Plane coordinates
Y  N  Are all elements placed on correct layer
Y  N  Are new, altered, or removed infrastructure with annotation shown
Y  N  Are sewer lines digitized as a single-line, individual entity, for each sewer segment between structures, on layer “SANSEWER” (sanitary) or “STORMLIN” (storm).
Y  N  Are sewer lines digitized in the same direction as their physical flow (from upstream to downstream) and labeled with upstream structure number
Y  N  Are sewer lateral digitized as a single-line, individual entity, for each segment, on layer “LATERAL”
Y  N  Are lateral lines digitized in the same direction as their physical flow (from upstream to downstream) snapping the end point to the mainline (lines shall be drawn from right-of-way perpendicular to the main)
Y  N  Are force mains digitized as a continuous polyline between structures/nodes, bends and curves included.
Y  N  Are sewer line ends snapped together.
Y  N  Are sewer structures/nodes digitized as point features, on layer “SANSTR”
Y  N  Are sewer structure points snapped to the sewer line endpoints.
Y  N  Are sewer lines and structures labeled with a DSGNID (Design ID) numbering scheme.
Y  N  Is sewer line DSGNID exactly the same as its upstream structure number.
Y  N  Is DSGNID text placed on the same layer as their respective features.

Tables are to be populated as required

Y  N  Were any of the files provided renamed
Y  N  Is data in State Plane coordinates
Y  N  Is correct table being used for each sewer line, structure type, or other features
Y  N  Do DSGNID numbers entered in the attribute data tables match the DSGNID numbers shown in the CAD file and PDF plans
Y  N  Are all required fields filled in with appropriate data. Additional information entered in the non-required fields is also helpful.
Y  N  Are correct units used for pipe diameter, pipe length, upstream elevation, etc.
Y  N  Are removed or abandoned features have the field “Servstat” populated with an “O” for out of service.
GIS Ready CAD File

LOW PRESSURE SERVICE LATERAL, DIGITIZED AS ONE LINE IN DIRECTION OF FLOW

FORCEMAIN, DIGITIZED AS ONE POLYLINE IN DIRECTION OF FLOW

DSGN_ID OF AS-BUILT UPSTREAM MANHOLE STRUCTURE

DSGN_ID OF AS-BUILT MANHOLE STRUCTURE
DVD Labels

Project No.
PROJECT NAME

As-Bid □
As-Built □
Submission Date: ________________

Index:
- Digital As-Built Files
  - All sheet names
  - Equal file names
  - for .tif/.pdf files
- GIS Drawing File
- GIS Attribute Tables
  - San Manhole
  - San Main
  - San Lateral
  - San Lift Station

File Formats:
- .dwg
- .tif
- .pdf
- .xls

Submitting Firm
Address
City, State Zip
Contact Name & Phone
Review Letter Templates

From: Reviewer
To: Submitter
Date: February 4, 2018
Re: Project Name

The disks submitted by XYZ Engineering for the above project contains the following:

- As-Built Digital Plan Data in PDF/TIF format
- As-Built Digital Plan Data in DWG/DXF format
- As-Built Digital GIS Data
  - Plan view of entire affected construction area in DWG/DXF format
  - Applicable attribute tables

I have reviewed the materials submitted on the original submission disk and found everything to be satisfactory. The project has been accepted on behalf of UTILITY in regards to sanitary assets only.

ACCEPTED

REJECTED

From: Reviewer
To: Submitter
Date: February 4, 2018
Re: Project Name

The disks submitted by XYZ Engineering for the above project contains the following:

- Record Drawing Digital Plan Data in PDF/TIF format
- Record Drawing Digital GIS Data
  - Plan view of entire affected construction area in DWG/DXF format
  - Applicable attribute tables

The material on this disk does not meet the Digital Data Submission Standards for the reasons listed below.

Record Drawing Digital Plan Data
- Approved

Record Drawing Digital GIS Data - Drawing
- Approved

Record Drawing Digital GIS Data - Attribute tables
- In reviewing the submitted attribute tables, it was evident they were modified from the original format provided. In submitting tables, do not revise column names, move columns, cell formats, or embed formulas. You may add columns to the tables but they MUST be placed at the end of the provided columns.
- SERVSTAT field must be populated with an “I” for “in service” or an “O” for “out of service”.
- ASBLT field should not be populated; this is reserved for internal coordination.
Excel Support Tables
(tables not provided)
Simplified GIS Workflow

Pre Construction
- Provide Documentation and Support Files

Construction
- Documentation
  - GPS

As-Builds
- Verify
- Consume
- Integrate
DSS Benefits

- Establishes Controls for As-Builts
- Defines who is responsible
- Leverage to ensure complete submissions
- Data Validation
- Data Integrity
- Streamlining
- Reduced effort for Utility
- Assists in keeping as-built costs low
Questions

Jeff McCann
Senior GIS Analyst/Senior Civil Designer
S&ME
6515 Nightingale Lane
Knoxville, TN 37909
865.970.0003
Jsmccann@smeinc.com