UTILITIES GIS SUPPORT FOR LINEAR SEGMENTATION
Utilities Linear Segmentation

ARA: Your USAF Utilities Linear Segmentation (ULS) Team - With Cardno – Essential Partner

Objectives:
• Review ULS progress since Sep 2015 (ARA-Cardno for AFCEC)
• Share observations from ~85 base visits/submittals
• Share best practices observed
• Share insight from experiences
OUTLINE – UTILITIES LINEAR SEGMENTATION (ULS)

- Project Objectives
- Process & Progress
- Feedback & Observations
- Utilities Sustainment Management System (U.SMS)
- GIS, SMS, & Asset Management Final Thoughts
Project Objectives
Thank you to each of you and many others who provided the logistics and supported our team with countless data requests.

Your assistance is greatly appreciated!
AFCEC Contract Project Objectives (PWS)

➢ Analyze Geospatial Information System (GIS) Data
  • Review Air Force base GIS data
  • Perform data gap analysis of Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) 3.1

➢ Collect-input missing utilities SDSFIE 3.1 GIS data
  • Collect from existing utility maps, reports, and studies
  • Interview base utility system experts

➢ Update GIS; Reconcile Real Property Inventory Qtys
  • Provide updated utility GIS (maps/database)
  • Provide updated Real Property inventory documents (DDF 1354s)
## GIO Project Expectations … Varied

<table>
<thead>
<tr>
<th>Project Included</th>
<th>Project Excluded</th>
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<tbody>
<tr>
<td>• 12 key attribution population</td>
<td>• Privatized systems</td>
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<tr>
<td>• Communication with Utility SMEs</td>
<td>• Partially privatized systems</td>
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<tr>
<td>(importance of continued communication)</td>
<td>• “Anticipated to privatize” systems</td>
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<tr>
<td>• Research for missing attribution</td>
<td>• Location accuracy/corrections</td>
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<tr>
<td>o Existing studies</td>
<td>• Creation of missing key features</td>
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<tr>
<td>o Tabs &amp; “As Built”</td>
<td>• Topology (slivers, dangles, etc…)</td>
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<tr>
<td>o “Shop Maps/Notes”</td>
<td>• “utilitiesMisc” feature dataset</td>
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<tr>
<td>• Geometry movement between feature classes (sequentially)</td>
<td>• Structures</td>
</tr>
<tr>
<td>• Draft 1354s (Adjusts Real Property)</td>
<td>• Electrical system components:</td>
</tr>
<tr>
<td>• Notes pertaining to data sources</td>
<td>- Current Regulators</td>
</tr>
<tr>
<td>• Segmentation, as last step</td>
<td>- Exterior Lighting</td>
</tr>
<tr>
<td>o IAW AFCEC SMS Policy</td>
<td>- Generators, Meters</td>
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<td>- Guy Wires, Structure Supports</td>
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<td></td>
<td>- Voltage Regulators</td>
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- Electric system components:
  - Current Regulators
  - Exterior Lighting
  - Generators, Meters
  - Guy Wires, Structure Supports
  - Voltage Regulators
Added Value for the USAF (within scope)

“GeoBase answers [base-wide] needs from …the USAF’s installation mapping and visualization workhorses—the Civil Engineers.”

MGen Dean Fox, AF/CE Quarterly, 2005

- GeoBase - much more today
  - Utilities data accuracy matters to …
  - Data stewardship still debated

- GIS-ULS data collection: ~85 bases visited
  - In all contacts, we conveyed big picture “why ULS?”
  - Expressed - Why data accuracy matters to the CE shops

Sought/seek to build utilities POC interest in their GIS data accuracy.
Process & Progress
AFCEC ULS Program Execution

AFCEC GIS Utilities Linear Segmentation
FY16 - FY19

Notes:
✓ 98 Active/Reserve Installations
✓ ARA-Cardno Team Consistency over 4-Yr period

A. Accepted Deliverables:
B. Submtl Prep:
C. ARA Planning:

FY16  FY17  FY18  FY19
• Features: Avg 23,500+/month
• Total Features: 1,135,000!
• Storm Features: Most meticulous, quirks, etc.
• Electrical: “I’ll pay you not to be assigned this one again!”
System Reviews after POC Interviews

- **Build System POC Relationship & ULS “Buy-In”**
  - Opportunity for ARA-Cardno **Team Inter-personal skills**
  - **Maximize** ULS data collection effectiveness, base POC engagement

1. Pre-visit **interview intro calls-establish connection**
2. Communication: show interest in POC & their knowledge-**verify together**
3. Continue POC **post-visit follow-up** of data entry completion & quality
4. Display color-coded map to **confirm collected utility attribute(s)**
5. **SEEING A GRAPHIC** is …
BASE GIS-ULS Process-Quality Control Checked

**STEP 1: GAP ANALYSIS**
- PM/GISP Start
- GIS Data gap analysis & QA/QC
- Initial Research (Phone Interviews)
- Data input into GIS format for LS attributes

**STEP 2: BASE VISIT**
- Mapping & Data Review
- Meeting and fill-in missing data in GIS
- Selective Verification/Condition Assessment
- Personal Research (Interviews)

**STEP 3: UPDATE GIS-RPI**
- Identify RP data in GIS Files
- Conduct 100% data review with Government
- Unassigned assets - DD Form 1354
- Final Research (Phone Follow-up)

**STEP 4: DELIVERABLES**
- GIS SDSFIE 3.1 Data-file
- STEP 5-6: RP RECONCILE DATA & DDF 1354(s)

**STEP 5-6: RP RECONCILE DATA & DDF 1354(s)**
- Mapping & Data Review
- Initial submittal (<30 days > visit)
- REVISE - Final Submittal (<30 total days)
- Govn Approval

**REVISE - Final Submittal (<30 total days)**
- Govn Review (30+ days > subm’tl)

**Process Review**
Feedback and Observations
Base Feedback

"We were nervous about having the ULS Team come here with FIAR and everything else going on. The ULS Team are real professionals, came prepared, and made us feel better and we are no longer nervous about the utilities aspect of our efforts"

- Ellsworth Real Property Officer

"I wanted to express my appreciation for the extraordinary effort your team put forth last week during our site visit. The GISP's and analysts explained …techniques that were incredibly useful. This site visit helped to secure a solid line of communication between myself (the GIO) and the shop foremen… Thanks again for sending a team of brilliant, talented gentlemen who I know will return an accurate, high-quality product

Maxwell Air Force Base - GIS Analyst
ULS Base Communication/Info Sharing

Base GIS/RP Personnel Contact

**Shared USAF Philosophies:**
- ULS expectations - RPUIIDs
- ULS Sustainment Business Rules Mechanics

**Shared USAF Guidance:**
- SMS Linear Segmentation Guidance/Info
- UTILITIES SMS Info

Other Base CES Players

- Base Asset Managers
- AMP Managers
- SubAMP Managers
  - Included in Kickoff & Wrap-Up Meetings
Data Collection Visits - ULS Observations

- **CE Shop SMEs were great!**
  - Interest & involvement were Very High
  - GIO-SME relationships were key--Access to SME “truck/shop maps”

- **GIO Best Practices**
  - Shops would call GIO when utility break occurred
  - Regular meetings with shop SME’s and/or RPO’s (Donuts maybe?)
  - Incremental progress; 10% field validation / system / quarter?

- **CE Engr Assistants – untapped resource?**
  - Many have interest, capability and time availability
  - Opportunity: GPS inventory/validation to capture missing utility assets
  - GIO Opportunity: Input for Utilities LS interest?

- **AMP Managers**
  - GIO’s new friends and advocates?
  - The **real data steward** may yet step forward
  - Will have greater interest in the near future
Vision: ULS Foundation for Asset Management

- Financial Improvement & Audit Readiness (FIAR)
  - ULS assistance, or, in AF lexicon: IFF—Identification of Friend or Foe
  - Hopefully: ULS was/is mediator between GIS & FIAR/RPO

- Utilities Segment Installation Dates –
  - One of biggest uncertainties (sources noted in GIS)

- System SME “Buy-In” and Regular Involvement
  - Established relationships worked; keeping system SMEs engaged and interested worked (the real “data stewards”)

- Sustaining & Improving Utilities GIS quality
  - Established CES Processes and System

- Outbrief “Main Take-Aways” for Next Steps
Utilities Sustainment Management System (SMS)
SMS Defined

A structured process for collecting, synthesizing, and organizing **information** about civil infrastructure and facility assets to support decisions pertaining to their **sustainment** over their lifecycle
UTILITIES™ Sustainment Mgt Sys

- UTILITIES SMS - Corps of Engineers, Engineer Research Dev. Center, Civil Engineer Research Laboratory (CERL) started in 2014
- AF funded “U.SMS v1.0” Water & Electric Modules; FY16-$1.9M for remaining (Sewer, Stormwater, Gas, and Thermal (chill water, steam/hot water) [Total: $3.65M]

- Beta tested U.SMS v 1.0+ at Hurlburt Field Jan/Aug 17 -- segmented utility GIS – pilot test of software and training; Hurlburt TRIRIGA-live: Dec 16-positive results

The initial version of U.SMS (version 1.0) will include Water and Electrical infrastructure, and will require input data from linear segmented installation GIS data files. It will contain the utilities inventory, provide age based or direct rating capabilities to score linear segmented data with red, amber, and green assessments, and provide life expectancy-based replacement investment forecasts. The system will be web enabled, and generate reports and work plans. Future development upgrades will include adding additional modules for Waste Water, Storm Water, Natural Gas, and Thermal Systems (steam & chilled water).

U.SMS data fields are aligned with the Spatial Data Standard for Facilities, Infrastructure & Environment (SDSFIE) version 3.1 format. The U.SMS meets the mandate for all real property facilities and components to be condition assessed and rated using an SMS or alternate data system which generates an FCI.

https://www.sms.erdc.dren.mil/Products/SMS-Utilities

Utilities Sustainment Mgt Sys (U.SMS)

- **ULS is preparation (Game Planning) for U.SMS**
  - GIS is foundation of U.SMS => Asset Management
  - AMP Manager focus: GIS-U.SMS—their playbook!

- **Utilities SMS Readiness Scorecard**
  - ARA-Cardno developed U.SMS Scorecard based on our ULS GIS experience/observations
  - **Priority:** Are all AF Utilities included & attributed in GIS?
  - Identified 5 categories of U.SMS-GIS deficiencies (Gaps)
  - Scored each category based on impact of Gap
  - **Scorecard Intent:** Depict GIS “system completeness” of each utilities’ & overall GIS readiness for U.SSMS
Utilities SMS Readiness Scorecard

- GIS "Gaps" impede ULS completion & U.SMS Readiness
- U.SMS Readiness Score (U.RedScore): ~Avg of systems’ Scores
- GIS Gap Definitions and Scores:

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<th>GAP</th>
<th>DEFINITION</th>
<th>SCORE</th>
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<tbody>
<tr>
<td>1:</td>
<td>GIS not reviewed: Not in Contract (N/A, if Privatized)</td>
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<tr>
<td>2:</td>
<td>GIS missing key Feature Class (system component category, e.g. laterals)</td>
<td>5</td>
</tr>
<tr>
<td>3:</td>
<td>GIS missing key Features in significant numbers (e.g. POL tanks, hydrants...)</td>
<td>6</td>
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<tr>
<td>4:</td>
<td>GIS missing significant geometry/locations accuracy</td>
<td>7</td>
</tr>
<tr>
<td>5:</td>
<td>GIS missing structures</td>
<td>9</td>
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<table>
<thead>
<tr>
<th>BASE</th>
<th>ULS System Status</th>
<th>Electric</th>
<th>Fuel</th>
<th>Gas</th>
<th>Sewer/Ind'l Waste</th>
<th>Storm-water</th>
<th>Thermal</th>
<th>Water</th>
<th>ULS GIS - U.RedScore</th>
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<tbody>
<tr>
<td>Base # 39</td>
<td>Contract</td>
<td>AF</td>
<td>AF</td>
<td>NIC</td>
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<tr>
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<td>Gap: 2</td>
<td>Gap: 1</td>
<td>Gap: 3, 4</td>
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<td>Gap: 2, 4</td>
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<td>Base # 75</td>
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Legend: NIC-Not in Contract, N/A-Not Applicable, P-Privatized, Prt'l-Partial
GIS, SMS, & Asset Mgt
Final Thoughts
GIS and AMP Management Support

- **GIS-Mapping/Attributing – Not Addressed**
  - Systems partially Privatized, or “Anticipated” but NOT
  - Airfield Lighting (Circuits and Fixtures)
  - NAVAIDS
  - Service Lines/Laterals
  - Secondary Electrical Distribution
  - Street Lights/Exterior Lighting
  - Generators
  - Hydrants
  - Geometric Networks/Improvements (including Topology issues-Dangles & Slivers)
UTILITIES™ SMS Update

- Pilot Test of Stormwater sub-domain conducted at Hurlburt Field, FL, 29-31 Aug 17
- Continued software testing at other AF bases with LS GIS data in FY 18
- Software Operational Testing and Evaluation (OT&E) to continue FY2019
- Roll-Out
  - Pilot Test Added - Nellis AFB
  - Developing Documentation and Training Aides
  - Initial Operating Capability FY20
Follow-up QC & Base Feedback

- **We added internal checks**
  - USAF/Industry Standards checked throughout

- **Potential Base POC Client Satisfaction Survey**
  - Planned email with (approved) link sent to POCs when appropriate
  - Four survey screens: eight 1-click questions + one comment question
  - Intent #1: Feedback for project methodology
  - Intent #2: Keep system POCs engaged (real “data stewards”)
  - Intent #3: Hone our ULS collection team skills and process
ULS—Asset Management Final Thoughts

- Utilities SMS will emphasize GIO utilities responsibilities at entirely **new level**
- EA & Shops Involvement – Force Multipliers
- ULS Sustainment
  - Utilities AMP Managers – your new best friend?
  - System POCs/SMEs involvement in ULS progress (sustainment and refinement - the real “data stewards”)
- GIS Utilities Database Quality refinements to increase your U.SMS Readiness “Score”