A Civilized Process for CIM:
USACE/Industry CIM Initiative

Joint Transportation Research Board
and buildingSMARTalliance Meeting
Digital Project Delivery
January 11, 2014
Introductions

• Connor Christian
  – BIM/CIM Involvement
    • USACE BIM and CIM Committees
    • National Building Information Modeling Standard (NBIMS)
      – Planning Committee Secretary, Standard Practice Subcommittee Chair
  • Association of General Contractors
  • United Brotherhood of Carpenters
    – Subject Matter Expert
Introductions

• Sean Douthett, PLS
  • Participation on USACE CIM committee
    – Survey context
  • Performing Laser Scanning Surveys since 2000
  • Creating existing conditions BIM’s since 2001
  • Creating existing conditions CIM’s since 2006
Introductions

• Steve Hutsell
  – Chief, Geospatial Section
    US Army Corps of Engineers, Seattle District
  – USACE BIM/CIM Contract Requirements Lead
  – USACE/Industry BIM and CIM Committees Lead
USACE/Industry BIM and CIM Committees

• CIM Committee has parallel efforts with the successful USACE/Industry BIM Committee
  – Developed the USACE BIM Contract Requirements
    • Ballot item on National BIM Standard, v3.0
    • Proven Success on Army MILCON CoS Projects
  – Projects have been executed by other programs or agencies, such as
    • Military Health Systems, U.S. Air Force, NAVFAC, FAA
USACE Proven Results with BIM

• 500-plus single- and multi-facility BIM CoS projects executed since January 2008
  – 46 million-plus square feet
  – More than $9 billion in construction programming.

• More than 600 facilities, 25 million-plus square feet, have been constructed to date.
History of USACE/Industry BIM Committee

• In Fall of 2006 USACE established a dialog with five BIM-aggressive AE firms in conducting discussions and workshops on mutually beneficial BIM issues

• Collaboration provided a tremendous opportunity to partner in strengthening federal and private sector BIM initiatives.
  – Best practices, Contract language, Standards

• GC’s and Academia joined soon after
USACE/Industry BIM Committee

• Membership requirements
  – Participation is strictly voluntary
  – All costs incurred to participate are the responsibility of the firms/agencies
  – Monthly on-site/webmeeting workshops and bi-weekly conference calls
  – Minimum level of participation required to maintain active status
Win-Win BIM: How USACE and Industry Established Mutually Beneficial BIM Requirements
What is CIM?

- Civil Information Modeling
  - Civil/Site/Infrastructure Design
  - Survey/LIDAR/DTM
  - Landscape Architecture
  - Surface and Subsurface Utilities
  - Also known as
    - ‘BIM’ for Civil Works
    - Civil Works Information Modeling
    - Infrastructure Information Modeling
    - Horizontal versus Vertical BIM
Why was the CIM Committee formed?

• Apply same benefits to the site design and construction requirements realized in BIM.
  – Create CIM standard processes and contract requirements
  – Survey deliverables need to support 3D site design and construction processes and tools
    • This has had limited consideration in the industry.

• Close the gap between BIM and GIS

• Industry Innovation: MAP 21, TransXML, InfraGML, IFC, CityXML
USACE/Industry CIM Committee

• Established in May 2012
• Mission: To create **fair, practical and reasonable** Contract Requirements in support of CIM Goals
USACE/Industry CIM Committee

• Current Members

USACE

• USACE HQ
  Jason Fairchild

• CAD/BIM
  Technology Center
  Edward Huell, Dave Johnson, Stephen Spangler

• Southwestern Division
  Bryon Haney

• Fort Worth District
  Greg Hall

• Louisville District
  Jeremy Nichols

• St. Louis District
  Brandon Meinert

• Seattle District
  Lisa Hansen, Steve Hutsell (Lead),
  Justin Jameson, Rob Nevitt,
  Kurt Noble (Co-Lead), Van Woods
USACE/Industry CIM Committee

Survey and Mapping

• 1 Alliance Geomatics  
  Brian Blevins, Jay Byrd, Jason Nakamura

• Aero-Metric  
  Steve Jones, George Maalouli

• APS Survey & Mapping  
  Tyler Sweet

• BergerABAM  
  Matthew Kumpala

• Continental Mapping  
  Paul Braun, Dave Hart, Jason Vande Hey

• David Evans & Assoc.  
  Sean Douthett, Marcus Reedy

• VTN Consulting  
  Keith Warren

• Independent  
  Craig Berry
USACE/Industry CIM Committee

AEC

• Burgess & Niple, Inc.  Chris Lykins, Terry Mullins
• Mason & Hanger  Ben Biddle, Eric Baker
• Kiewit Corp.  Connor Christian
• RBF Consulting  John Prince
• Sundt Construction  Eric Cylwik, Dan Russell

AGC and Associates:

• Hurtado, S.C., Counselors at Law  Brian Zimmerman

Academia:

• LACCD  Michael Rendler
USACE/Industry BIM and CIM Committee Relationship

CIM Committee

Survey CIM
3D Survey of Existing Conditions

AEC CIM
Civil/Site Design & Construction

AEC BIM for Facility Design & Construction

BIM Committee
What’s in it for You?

• Contract Language was developed for the USACE projects.

• Mutually beneficial for other industries and agencies
Hierarchical Information Relationships

Geospatial Information (GIS)
- Natural Asset
  - Air / Space
  - Underground
  - Water / Sea
- Land / Parcel
- Real Property Asset
  - Site
  - City
  - County
  - State / Province
  - Installation / Region
  - Country
- Theatre / World

Building Information (Building Information Models)

IAI-IFC Usage
- Building
  - System
  - Sub-Systems
  - Components
  - Level
  - Room
- Structure
  - System
  - Sub-Systems
  - Components
  - Level
  - Room
- Overlay
  - Node
  - Segment
Hierarchical Information Relationships

- Theatre / World
  - Country
    - Installation / Region
    - State / Province
      - County
        - City
          - Site
            - Natural Asset
              - Air / Space
              - Underground
              - Water / Sea
              - Land / Parcel
            - Real Property Asset
              - Facility / Built

Building Information (Building Information Models)

- Building
  - System
    - Sub-Systems
      - Components
        - Room
    - Level
      - Room
  - Structure
    - System
      - Sub-Systems
        - Components
        - Room
    - Level
    - Room
  - Linear Structure
    - Node
    - Segment

IAI-IFC Usage
THE GEOSPATIAL NEXUS

COMMON ATTRIBUTES
- LOCATION
- IDENTITY
- PROPERTIES
- RELATIONSHIPS

BIM
GIS
CIM
**Survey CIM**

**3D Survey of Existing Conditions**

**Life-cycle AEC CIM for Civil/Site project requirements**

**Life-cycle AEC BIM for Facility project requirements**

**CIM Goal #1**
Enhanced 3D Survey

Measure and model the existing environment and apply Site Data in support of AEC CIM project requirements.

**CIM Goal #2**
Common Operating Picture

CIM/BIM Models and Site/Facility Data integrated for optimal coordination of site and facility Life-cycle (Planning, Design, Construction and O&M) project requirements.
Typical CIM Projects

• BIM is typically vertical construction

• CIM is typically horizontal construction
Typical CIM Projects

• Government
  – USACE
    • MILCON and Civil Works
  – Federal Agencies
  – State Agencies
    • Oregon, Minnesota, etc.
  – Local Agencies
    • Los Angeles CCD
    • City of Las Vegas, NV

• Private-sector
CIM Goals

- Goal 1 - SURVEY CIM
  - Enhanced 3D Survey of Existing Conditions
  - Entails Modeling and Facility Data for infrastructure and the built-environment i.e. terrain modeling, site work/improvements, fencing, roads/parking, and structural/mechanical/electrical/telecomm systems as applicable, and surface/sub-surface utilities.
Unique Survey CIM Challenges

• Capturing, Creating and Utilizing 3D CIM Content
  – Modeling Challenges
    • Compared to BIM, CIM has a less comprehensive software toolset.
  – Measurement of Non-Verifiable Survey CIM Content
    • Adjust the M3 LOD for non-verifiable elements
  – Optimizing Survey Level of Effort
    • Initial Survey
    • Follow-Up Survey
  – Integrating Related Standards
    • CI/ASCE 38-02 “Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data”. Defines SUE Survey Quality Levels.

  – Coordinate Systems
Survey CIM APPLICATIONS
3D Infrastructure Model, Las Vegas

Courtesy of Keith Warren, VTN Consulting
CIM Goals

• Goal 2 - AEC CIM - Common Operating Picture
  • CIM/BIM Models and Site/Facility Data integrated for optimal coordination of site and facility Life-cycle (Planning, Design, Construction and O&M) project requirements.
    – Entails Modeling and Facility Data for infrastructure
    – Within the construction limit and utility corridors extending to the nearest connection and subsurface utilities located 5' outside the building footprint.
AEC CIM APPLICATIONS

- Design Coordination / Constructability Review
- Construction Scheduling
- Quantity Take Off
- GPS and Model Based Machine Control
  - Trench Excavation, Site Grading
CIM Initiatives

• 'Non-verified Utility Modeling' requirements and guidance

• Address data migration to/from BIM, CIM and GIS
  – Process and Interoperability
  – Contractual Requirements

• USACE CIM Object Library
What’s in it for You?

• Contract Language was developed for USACE projects.

• Mutually beneficial for other industries and agencies
How Do You Get CIM?

• You have to ask for it
  – The proper Contract Language is key

• You have to check it
  – Validate using QA/QC process
CIM Contract Requirements

• **Contract Language**
  – Survey & Mapping Pre-Solicitation, Performance Work Statement, Task Orders
  – Expanded BIM Contract Language to include AEC CIM requirements resulting in consolidated BIM/CIM Contract Language

• **Project Execution Plan (PXP)**
  – Expanded the BIM PXP to include AEC CIM requirements

• **Minimum Modeling Matrix (M3)**
  – Expanded the M3 to include Existing Site Conditions Minimum Modeling Requirements
USACE Mandate

• The essentials of ECB 2013-18 "BIM Requirements on USACE Projects“
  – Directs the use of BIM AND CIM processes and related technologies in all Military and Civil Works projects.
    • In-house and Contracted projects
  – BIM Implementation:
    • BIM projects shall comply with the requirements in ECB 2012-22, and incorporate the goals and objectives established in the BIM Roadmap.
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