



# ***BRAC Alexandria***



## **Alexandria BIMStorm™ Federal Friendly Zones™**

Society of American Military Engineers

Nov 5, 2008



Michael Chipley – Alexandria BRAC Coordinator



# BRAC Alexandria



## What is a Building Information Model?

### National BIM Standard Definition of BIM

- A Building Information Model (BIM) is a digital representation of **physical and functional characteristics** of a facility. As such it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its **life-cycle** from inception onward.
- *A basic premise of BIM is collaboration by different **stakeholders** at different phases of the life cycle of a facility to insert, extract, update or modify information in the BIM process to support and reflect the roles of that stakeholder. The BIM is a shared digital representation founded on open standards for **interoperability**.*



Courtesy of Deke Smith, Executive Director



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## Why Should I BIM?

BIM can deliver...

- A facility sooner
- A lower cost higher quality facility
- A facility with few or no change orders
- A significant reduction in RFI's
- A more energy efficient facility
- A more sustainable facility
- A more environmentally friendly facility

**As of FY 08 GSA and DoD BRAC projects are to delivered in BIM**

BIM is only the tool

- Build building electronically before you build it physically
- Collect information once by authoritative source
- Re-use information throughout the facility lifecycle
- Cut out non-value added effort (waste)



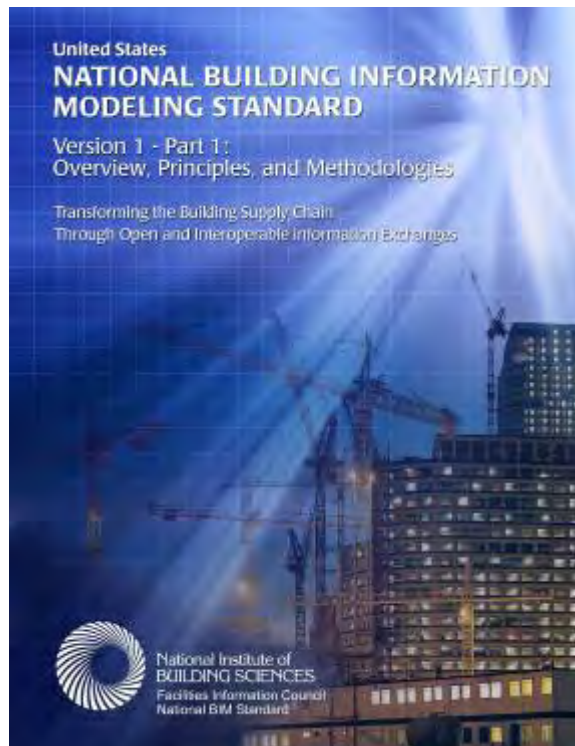
Courtesy of Deke Smith, Executive Director



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## Standard: NBIMS V1 P1



- Delivered Dec 27, 2007
- International Core
- National Specific
  - OmniClass
- Information Exchange Concepts
- Standard Development Process
- Information Assurance
- Capability Maturity Model
- References and Appendices
- Over 30 contributors

200,000+ Downloads



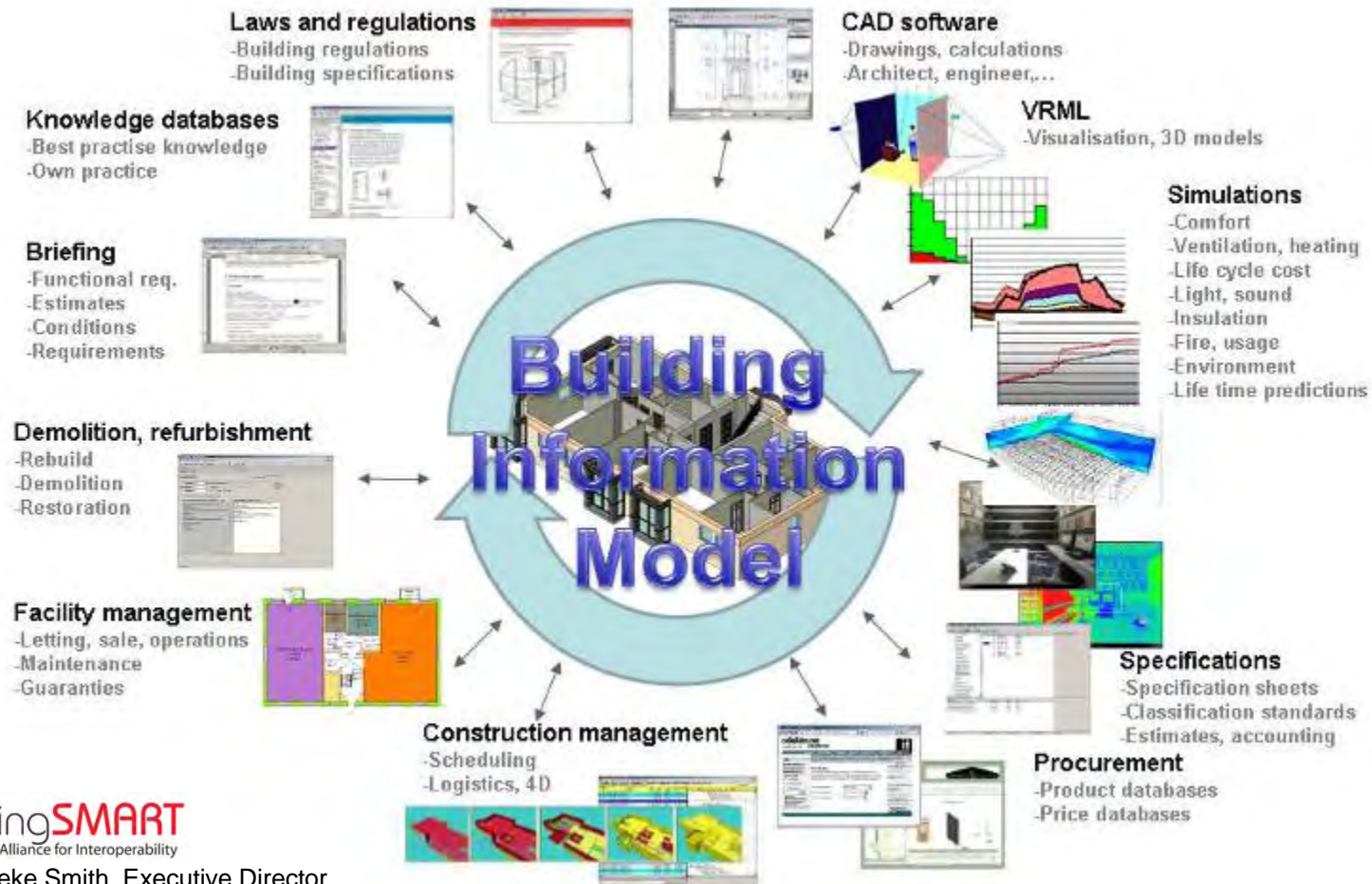
Courtesy of Deke Smith, Executive Director



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## BIM Lifecycle View



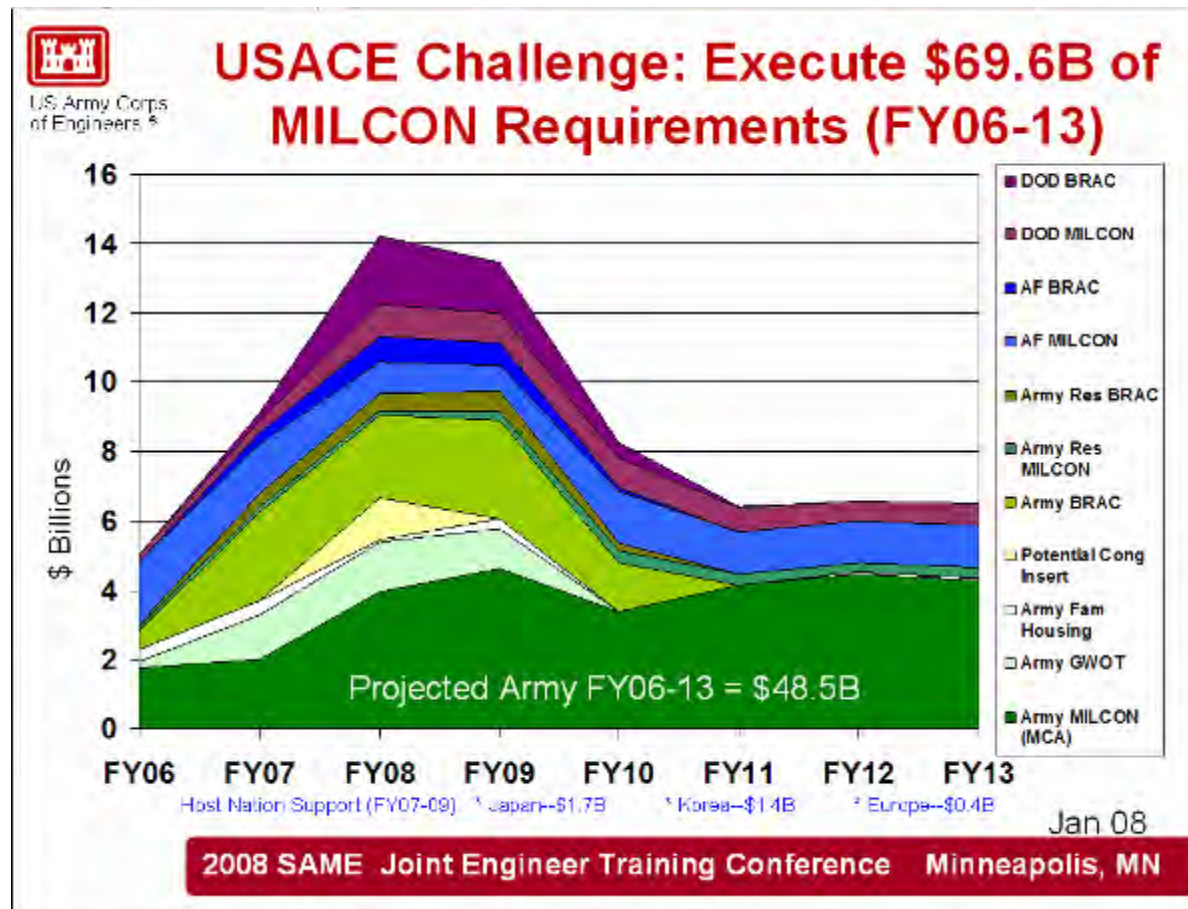
Courtesy of Deke Smith, Executive Director



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## Army MILCON Transformation





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## Army MILCON Transformation



US Army Corps  
of Engineers

### Interoperability Demonstrations

- 23-25 July 2008, Washington DC
- US Army Corps of Engineers co-sponsoring event with buildingSMART Alliance
- Three demonstrations:
  - Spatial Compliance Information Exchange (SCIE)
  - Coordination View Information Exchange (CVIE)
  - Construction Operations Information Exchange (COBIE)

*Information on this workshop can be obtained at <http://buildingsmartalliance.org/> under the "News / Events" tab.*

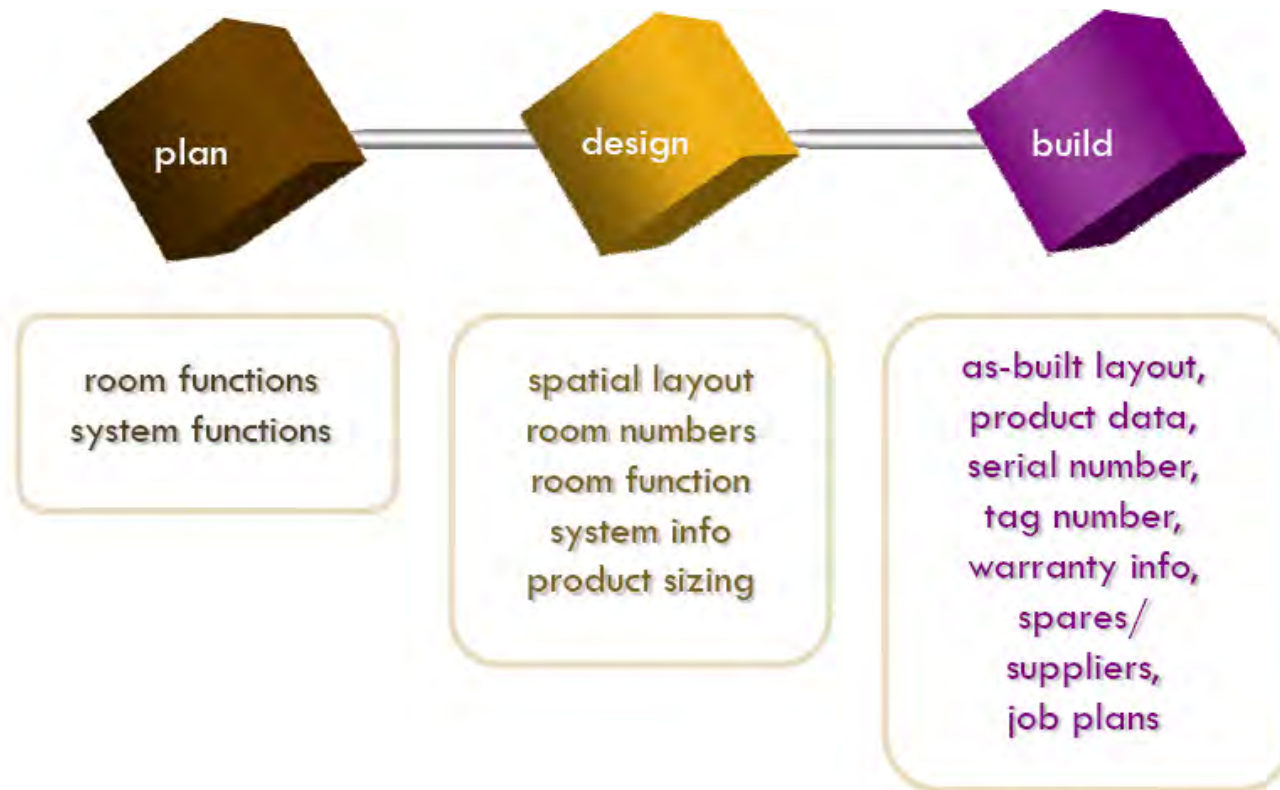
2008 SAME Joint Engineer Training Conference Minneapolis, MN



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## BIM-COBIE





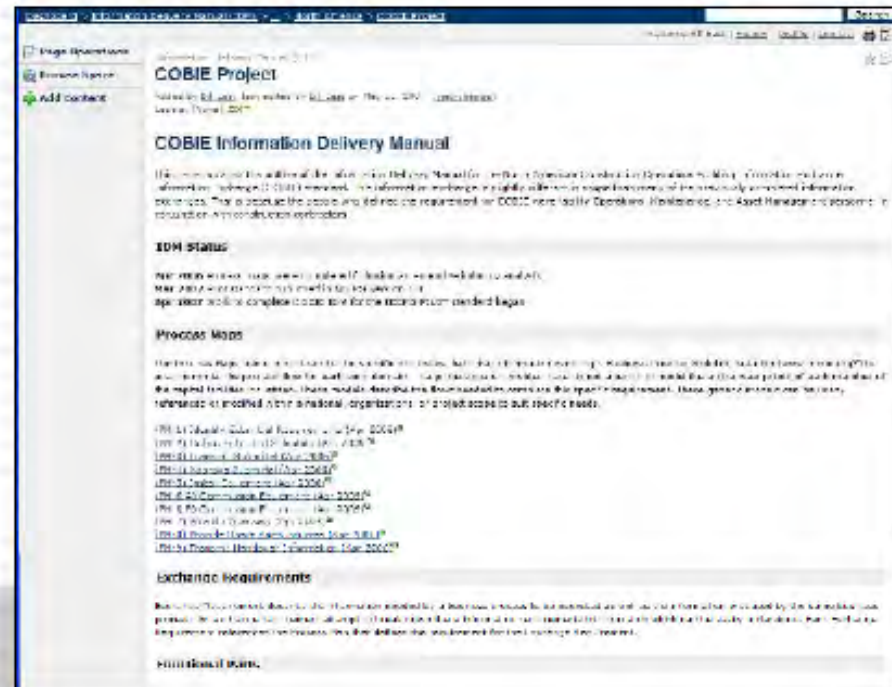
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## BIM-COBIE



wbdg.org



idm.buildingsmart.no



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## H.R.3221

### Renewable Energy and Energy Conservation Tax Act of 2007 (Engrossed as Agreed to or Passed by House)

*(7) HIGH-PERFORMANCE GREEN BUILDING- The term 'high-performance green building' means a building that, during its life-cycle, as compared with similar buildings (as measured by Commercial Buildings Energy Consumption Survey or Residential Energy Consumption Survey data from the Energy Information Agency)--*

*(A) reduces energy, water, and material resource use;*

*(B) improves indoor environmental quality, including reducing indoor pollution, improving thermal comfort, and improving lighting and acoustic environments that affect occupant health and productivity;*

*(C) reduces negative impacts on the environment throughout the life-cycle of the building, including air and water pollution and waste generation;*

*(D) increases the use of environmentally preferable products, including biobased, recycled content, and nontoxic products with lower life-cycle impacts;*

*(E) increases reuse and recycling opportunities;*

*(F) integrates systems in the building;*

*(G) reduces the environmental and energy impacts of transportation through building location and site design that support a full range of transportation choices for users of the building; and*

*(H) considers indoor and outdoor effects of the building on human health and the environment, including--*

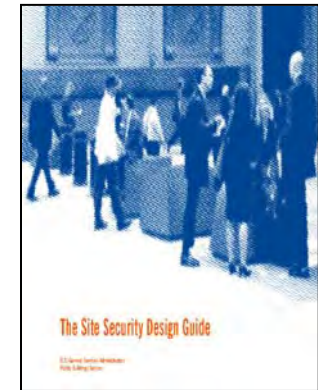
Objective is to reduce energy consumption and lead transformation of markets



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## Federal Security Standards



GSA and DoD developed separate security standards and apply them differently, both standards have tremendous impacts on public space, transit, communities, and best use of land.

They may have significant conflict with other design objectives.

**Blast is a significant design challenge**

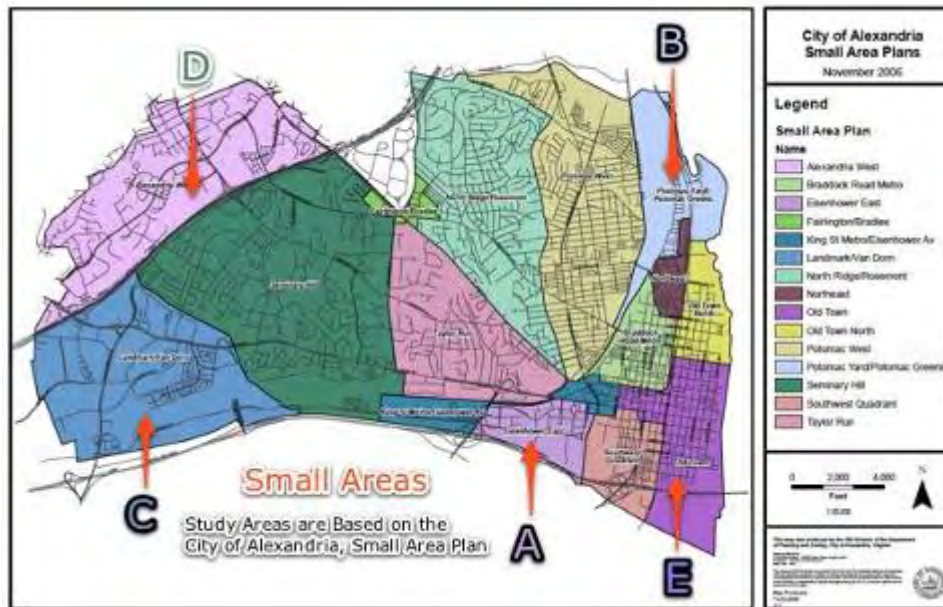




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## Alexandria - Why a BIMStorm?



- Long term economic growth based on eco-friendly and sustainable development
- Alexandria rebalancing commercial and residential tax base
- Direct Alexandria BRAC loss actions impacts approximately 7% of workforce and leases in Alexandria (7,200 jobs, 1.4 million square feet)
- Alexandria needs 5-10 million SF of office space designed to federal facility requirements to attract other federal agencies
- Building Information Modeling is rapidly changing the traditional process of design and analysis



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## BIM in Practice - WHS BRAC 133

RFP released 6 June 2008, **Build to Suit Campus**

1. Meet the BRAC statutory deadline of Sep 15, 2011
2. 6,409 person at single site, minimum of 6,200 person
3. Satisfy UFC 4-020-02FA for threats and Level of Protection and use **CPTED**
4. Easy and clear authorized person access
5. **Establish a strong “campus-like” atmosphere by protecting and enhancing natural environment and common open spaces**
6. Incorporate sustainable design, **LEED Silver**
7. Flexible design for future changes
8. Will be done using **Building Information Modeling (BIM)**
9. Submissions due 30 July 2008

**Mark Center selected as new WHS HQ site**

FOR OFFICIAL USE ONLY (FOUO)  
Procurement Sensitive Document

**Request For  
Proposal**  
DACA31-R-08-0034

Washington Headquarters Service (WHS)  
BRAC 133 Build to Suit (BTS)  
Requirements

FOR OFFICIAL USE ONLY (FOUO)  
Procurement Sensitive Document

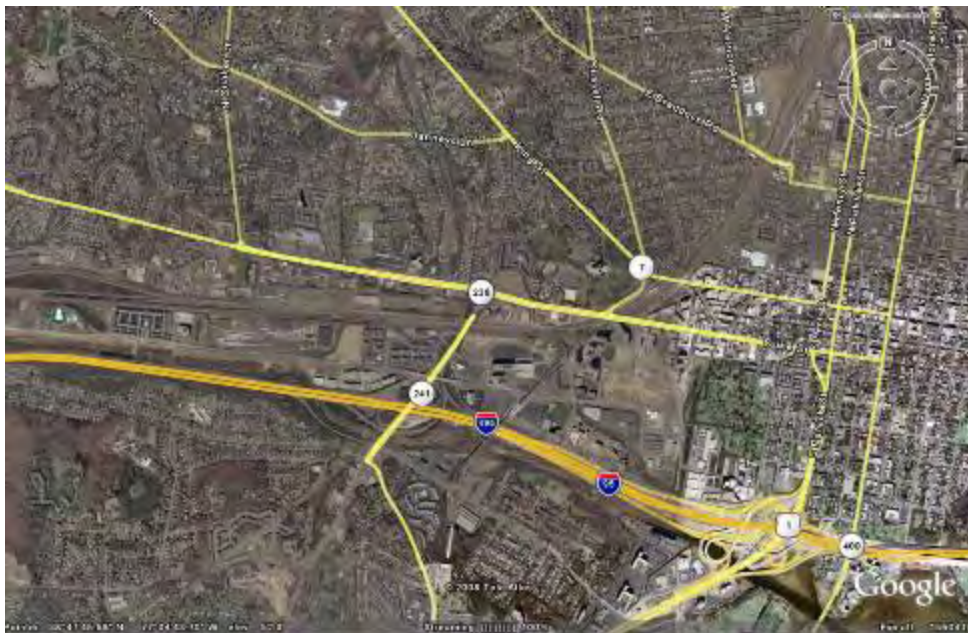
6 June 2008



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## Alexandria Pre-BIMStorm



**First BIMStorm to be in a hotel and team environment, city staff and SMEs in real time**

- Alexandria real estate opportunities not well known within federal government
- Alexandria was a “Flat World” – no 3D buildings and no presence on the web
- Community recovery strategy not defined
- City staff and community experience with PTO demonstrated new paradigm and possibilities to integrate federal agencies into an urban environment
- Federal government desire for transit oriented development, energy efficient buildings



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## Federal Friendly Zones™ (FFZ's)

Alexandria has many areas, neighborhoods and parcels that can meet these requirements, however, the process by which the federal government advertises, acquires and operates the commercial office lease space can conflict with many community objectives. The concept of the **Federal Friendly Zones** is to identify areas and sites that can support the federal requirements and become part of a larger integrated land use decision. Within each FFZ, there are three types of utilizations:

- Federal campus
- Single Federal Occupied Building
- Single building with federal agency as a tenant (dispersed)

Working with the local neighborhoods and federal agencies, a new approach can be developed to ensure the community grows and prospers to achieve mutually beneficial results (such as transit oriented development, Eco-City, enhanced water and air quality, etc.).

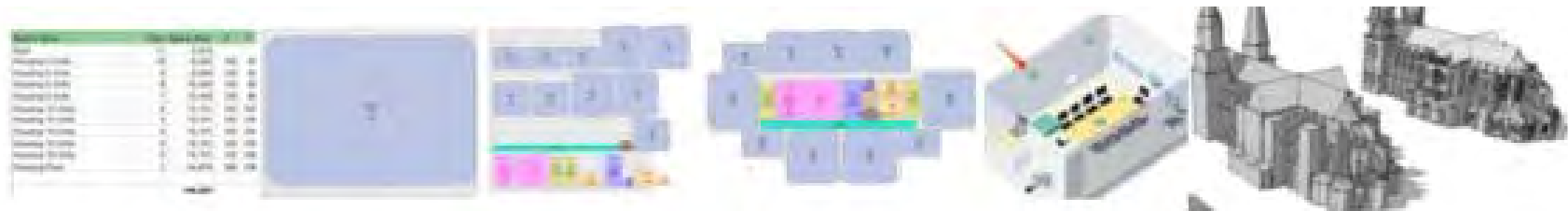
Another key objective of the **Federal Friendly Zones** is move from a **Protection** oriented process (using bollards, barriers, street closings, etc) that impact the streetscape and public space, **to a Resiliency, Redundancy, and Recovery model** that relies on enhanced police, fire, emergency management and community preparedness to respond to events (whether natural or man made).



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## Alexandria BIMStorm FFZ Objectives



LOD-0    LOD-1    LOD-2    LOD-3    LOD-4    LOD-5    LOD-6

- Educate stakeholders on new requirements and capabilities
- Demonstrate virtual planning, design collaboration, speed to market
- First BIMStorm to use real sites, real requirements, intensive GIS
- Create a Virtual Alexandria and web presence
- Highlight Alexandria as a place to Live, Work, Shop, Play
- Develop and capture Lessons Learned to refine FFZ concept



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## Alexandria BIMStorm FFZ Scenarios

Scenario	Study Area	Block	Project	Type	Notes
1	A	2	Campus DoD - Hoffman Block 2 - Class A 500,000 SF 10-15 story office building	New Construction	Office campus under development. This is for one of the blocks in the new campus.
1	A	2	Multi or Single Building GSA - Hoffman Block 2 - Class A 500,000 SF 10-15 story office building	New Construction	Office campus under development. This is for one of the blocks in the new campus.
1	B	1	Campus GSA - MRP Realty Landbay H Potomac Yard - Class A, 1 million SF campus with 2-4 buildings (Landbay H)	New Construction	Teams are to decide number and type of buildings.
1	C	1	Campus DoD - Jones Lang LaSalle Victory Center - Class A, 1 million SF campus with 2-4 buildings	New Construction	Teams are to decide number and type of buildings.
1	C	1	Campus GSA - Jones Lang LaSalle Victory Center - Class A, 1 million SF campus with 2-4 buildings (Victory Center)	New Construction	Teams are to decide number and type of buildings.
2	A	3	Multi or Single Building DoD - Hoffman Block 3 - Class A 500,000 SF 10-15 story office building	New Construction	Teams are to decide number and type of buildings.
2	D	1	Multi or Single Building Commercial - Duke Mark - Class A 1 million SF office building	New Construction	Teams are to decide number and type of buildings.
2	D	1	Multi or Single Building DoD - Duke Mark Center - Class A 1 million SF office building	New Construction	Teams are to decide number and type of buildings.

- DoD campus/buildings
- GSA campus/buildings
- Class A Speculative Office
- Historic Properties
- Cultural Resources
- Transit
- Environment

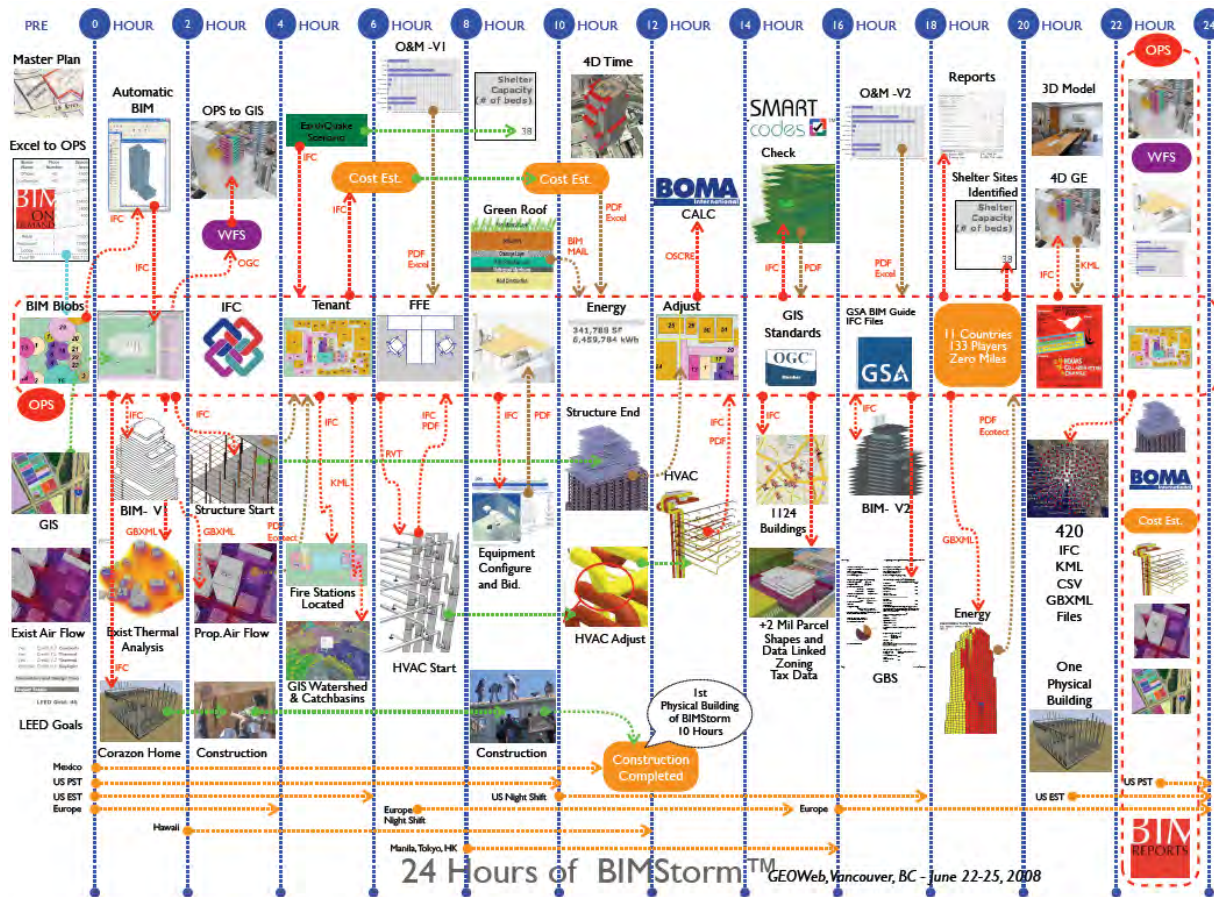
Scenarios were developed to highlight type, name, scale and challenge teams integration of multiple skills/disciplines



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## BIM 24 Hour Exercise Work Flow





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## Onuma Planning System

**BIM STORM** Onuma Planning System **OPS**

ID	Space Name	Source Number	Source Area	X	Y	Capacity
1	814 BUILDING POOLIC SUPPORT AREAS	30	0.48	0.49	0	
2	815 FIRE MCH ELEC ROOM ALARMS	515	22.7	22.7	0	
3	820 TELECOMMS ELECTRONIC EQP	180	12.28	12.28	0	
4	821 ELEVATOR MCH CHASISAL	90	18	19	0	
5	822 VERTICAL CIRCULATION	300	20.28	20.28	0	
6	824 DG LOOPER	240	10.5	10.5	0	
7	824 LAW ENFORCEMENT TEAM	240	10.5	10.5	0	
8	825 3PRINT READING ROOM	22	10.22	10.22	0	
9	826 COMPUTER BASED TRAINING CLASSRM					
10	827 WOMENS					
11	830 MEN					
12	835 PERSONAL STORAGE FOR CREW					
13	836 LUGGAGE					
14	837 CLOUT RM					
15	838 STORAGE					
16	839 ROOM					
17	840 ROOM GLOVE					
18	841 MEET					
19	842 OFF					
20	845 Gender					

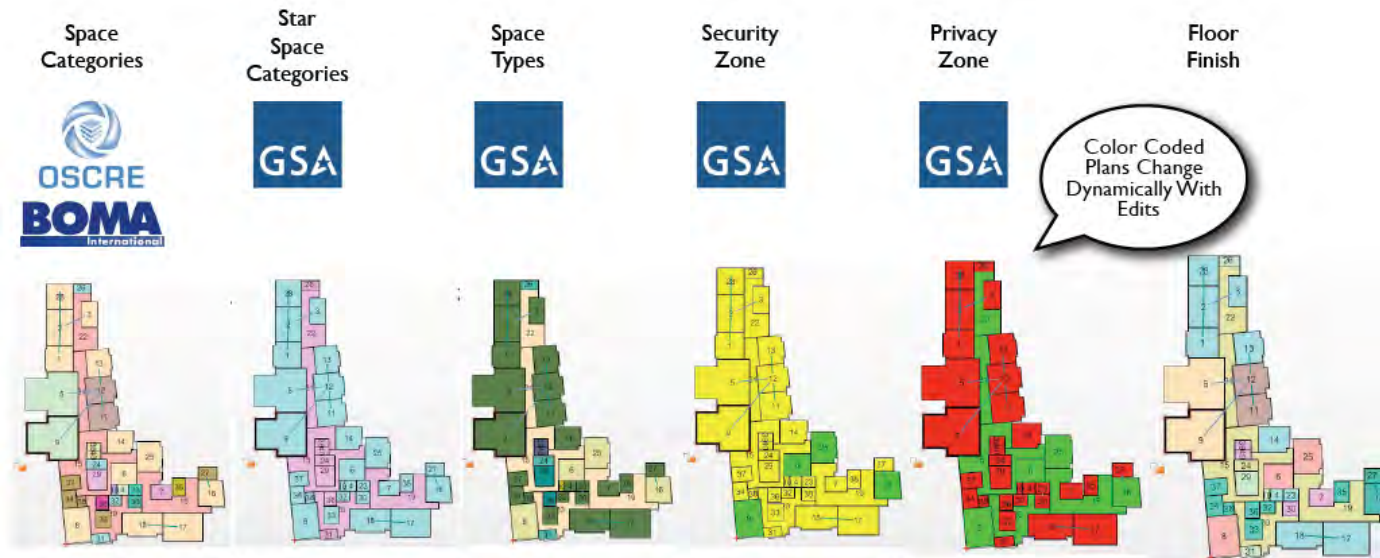
© copyright 2007, 2011 BIM, Inc. GEOWeb, Vancouver, BC - June 22-25, 2008



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## Define Space Attributes



Department Name	Color
Vertical Penetration 1400	[Color]
Mechanical 1410	[Color]
Restroom 2130	[Color]
Corridor 2210	[Color]
Storage 4170	[Color]
Training 4300	[Color]
Lecture and Classroom 4320	[Color]
Diagnostic 5320	[Color]
Nurse 5330	[Color]
Enclosed Workstation 5110	[Color]
Laboratory 5500	[Color]
Office 5100	[Color]
Secondary Circulation 3310	[Color]
Meeting 4130	[Color]
Data Center 5260	[Color]

Space Category	Color
01 - Assigned New	[Color]
02 - Building Common	[Color]
03 - Building Joint Use	[Color]
04 - Committed	[Color]
05 - Committed Under Alteration	[Color]
06 - Facility Common	[Color]
07 - Facility Joint Use	[Color]
08 - Lease Common	[Color]
09 - Structured Parking	[Color]
10 - Unmarketable	[Color]
11 - Vacant	[Color]
12 - Under Construction	[Color]
13 - Backfill	[Color]
14 - Zero Square Foot	[Color]
15 - Lease Joint Use	[Color]

Space Type	Color
ADP	[Color]
ANT	[Color]
AUD	[Color]
CFT	[Color]
CLD	[Color]
CON	[Color]
CRH	[Color]
CRJ	[Color]
CRV	[Color]
CST	[Color]
FDS	[Color]
FIT	[Color]
HUT	[Color]
LND	[Color]
INS	[Color]
JCC	[Color]

Security Zone	Color
Public	[Color]
Restricted	[Color]
Secure	[Color]

Privacy Zone	Color
Public	[Color]
Non-Public	[Color]

Floor Finish Schedule	Color
Vinyl Composite Tile	[Color]
Tile	[Color]
Granite	[Color]
Wood	[Color]
Cork	[Color]
Concrete	[Color]
Raised Floor	[Color]
Carpet 1	[Color]
Carpet 2	[Color]
Carpet 3	[Color]
Porcelain Floor Slip Resistant	[Color]



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## Add Furniture and Equipment

The screenshot shows the ONUMA software interface for adding furniture and equipment to a floor plan. The main window displays a floor plan with dimensions of 14' by 20'. A scale bar at the bottom indicates 0 to 10 feet, and the area is noted as 280 sq. ft. A callout box labeled "COBIE Component" points to a specific item in the furniture catalog. The catalog lists various mechanical and electrical components, including Supply Pumps, Oil Water Separator, Power Manifold, Oil Water Separator, Return, Service Entrance Panel, Supply Diffuser, Utility Transformer, and Water Heater Small. A list of furniture items is also visible on the right side of the interface, including Room Seating, Projector, Plasma/LCD Display, VTC, W/S Type 1, Standard File Cabinet, EQ Rack, Table Type 3, Speaker Phone, Telephone, Passage / Door, AHU Ceiling, and several Supply Diffusers. The interface includes a menu bar with options like Sites, Buildings/Floors, Spaces, Report/Print, Settings, Bug, and Help. The status bar at the bottom shows the copyright information for ONUMA and the date June 22-25, 2008.



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## Move into Room, Register and Name

The screenshot displays the OPS Studio buildingSMART software interface. The main window shows a 3D isometric view of a room with a yellow conference table and black chairs. A red arrow points to the table, with a callout bubble that says "2D & 3D Editable in Web Browser". The right-hand side of the interface features a "Furniture" panel with a list of items and their properties. A red arrow points to the "Register" field in the "HVAC System Corr" dropdown menu, with a callout bubble that says "COBIE System".

Project: USACE buildingSMART COBIE Demonstration  
Scheme: (S30\_13) Step 3-bimSMART Lab Resolved  
(B30\_4) Laboratory Building - Floor 1

Move Furniture

Spaces

Edit Space

Department

Import / Export

Furniture

Show Furniture Numbers:

1	Room Seating	+	☐
2	Projector	+	☐
3	Plasma/LCD Display	+	☐
4	Plasma/LCD Display	+	☐
5	VTC	+	☐
6	W/S Type 1	+	☐
7	Standard File Cabinet	+	☐
8	EQ Rack	+	☐
9	Table Type 3	+	☐
10	Speaker Phone	+	☐
	Telephone	+	☐
	Edge / Door	+	☐
	Chilling	+	☐
	14 - Return		☐

Register: HVAC System Corr  
Component Name: R-1  
Width: 2'  
Length: 0'-3"  
Height: 2'  
Angle: 0

© ONUMA.com

© copyright 2008 Onuma



# BRAC Alexandria



## Alexandria BIMStorm Scenario Start



Virtual Alexandria  
Flat World v0

The tools and technology were used educate participants on federal requirements, to expand the presence of Alexandria internationally, and on the web

Many federal agency players and observers

Courtesy Onuma Inc.



# BRAC Alexandria



## Alexandria BIMStorm Scenario Start



Virtual Alexandria  
3D World v1

Alexandria has  
robust GIS data  
sets

This BIMStorm  
was the first to use  
GIS in support of  
site selection,  
design, and  
analysis

Courtesy Onuma Inc.



# BRAC Alexandria



## Hoffman Block 2 & 3 DoD Campus



Courtesy TBD



Courtesy TBD



Courtesy Jacobs Engineering and Turner Construction

Three teams design solution for one site; trade off between stand off distance, height, density

Jacobs-Turner Team created BIM and Construction Model CPTED and LEED analysis performed in parallel, went to 4D time phased model (first time)



# BRAC Alexandria

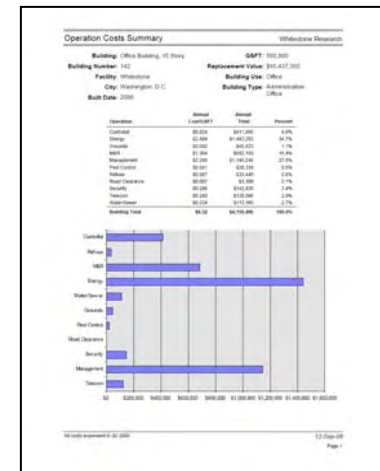
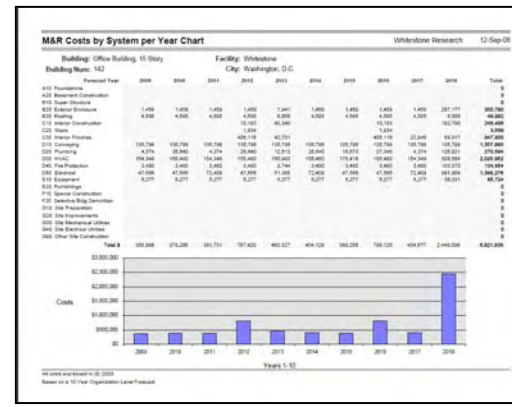


## Hoffman Block 2 & 3 DoD Campus Cost

**Average M&R Costs** Whitestone Research

Building: Office Building, 15 Story GSF: 500,000  
 Building Number: 142 PEV: \$91,437,300  
 Facility: Whitestone  
 City: Washington, D.C. Built Date: 2008

M&R Average Annual Cost Forecasts			
	Current Year	5 Year	15 Year
PM & Minor Repair:	\$244,214	\$252,439	\$260,553
Unscheduled Maintenance:	\$112,674	\$124,537	\$127,326
Renewal & Replacement:	\$0	\$86,153	\$263,711
<b>Total M&amp;R Costs:</b>	<b>\$356,888</b>	<b>\$463,129</b>	<b>\$551,590</b>
Per GSF:	\$0.71	\$0.93	\$1.10
As % of PEV:	0.37%	0.50%	0.70%



Building Cost Estimate

Average M&R Costs, Systems Costs by Year, Operations Cost Summary

Courtesy Faithful and Gould

Courtesy Whitestone Research

Initial design and costs quickly refined and preliminary life cycle costing completed; the real estate industry is now valuing buildings on LCA



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## Mark Center GSA Campus



The buildings are not joined with the GIS data – terrain is actually very hilly and steep and when the GIS and BIM are integrated, the perimeter protection plan and spaces can be tightly coupled

Courtesy TBD



# BRAC Alexandria



## Class A Speculative Office



Model height, FAR, shape and statistics change at the mouse click, real time “what if”; model can be placed on any parcel

Note water, energy, Carbon Footprint, demographics are defined at space level and refined as design evolves – all automatic and completes the preliminary CPTED and LEED checklists

Courtesy Lessard Group

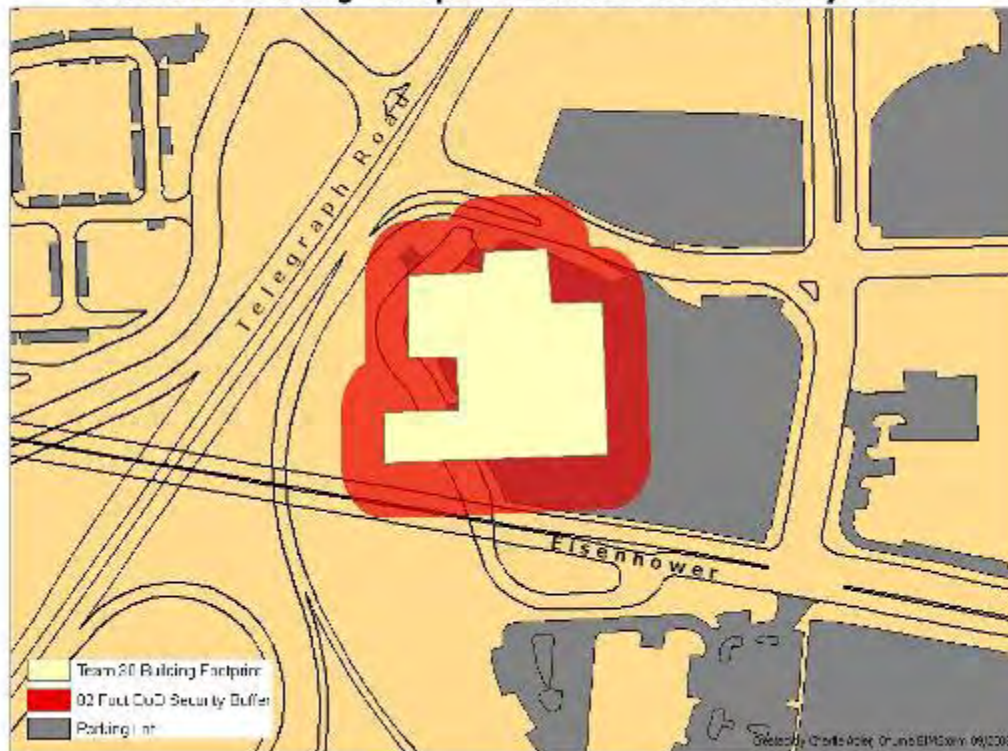


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## Blast Buffers Around Buildings

Alexandria, VA  
Hoffman Building Footprint and 82 Foot Security Buffer



Blast buffer zones and GSA Protection Zones can quickly form site constraints and enable the design team to explore mitigation options (floor plan, spaces, selective envelope hardening, road realignment, evacuation rally points)

Courtesy Onuma Inc.



# BRAC Alexandria



## Alexandria Historic Properties, Metro

### GMU

- Gadsby Tavern
- Torpedo Factory
- Washington Masonic Temple

Models to be posted

### UC

- City Hall
- Contraband and Freedmen Cemetery

Preliminary analysis but no models, yet..

Potential for CPTED analysis to tie disconnected trails, parking, roads and sidewalks together, eliminate vandalism/theft



Courtesy Wendell



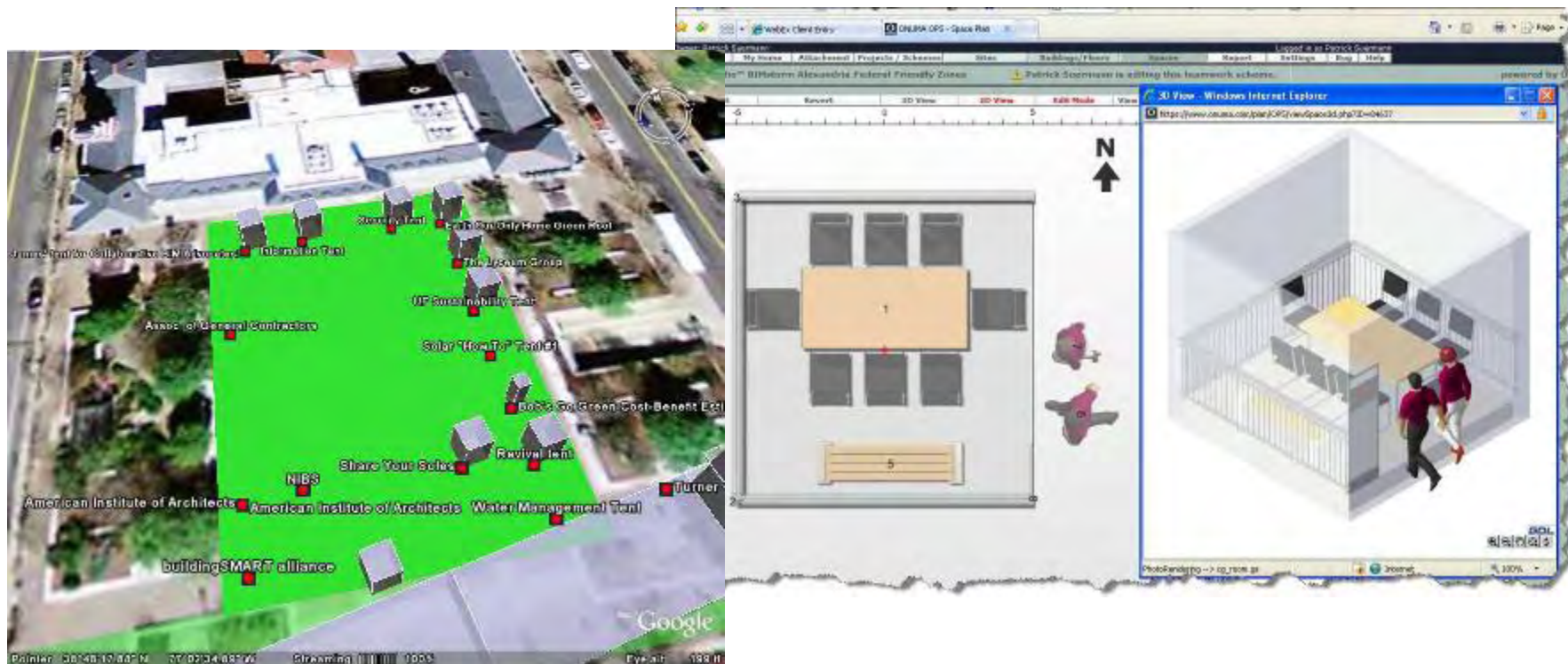
Courtesy Onuma Inc.



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## Alexandria City Hall Greenfest Tent Event



Public space, art, and events can be integrated into a FFZ, down to the furniture level

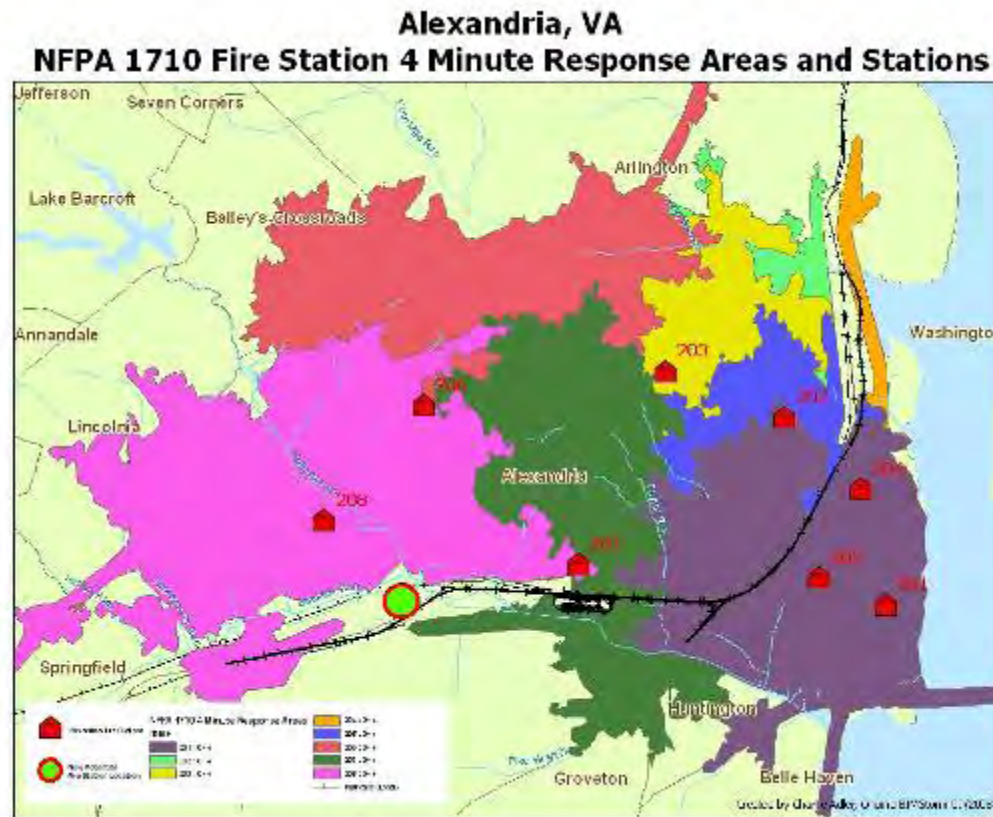
Courtesy BIM Education Co Op



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## Alexandria GIS Fire Station Analysis



Demonstrated response times and potential sites for new stations, road radius, ingress/egress points, type of size of equipment (ladder trucks, etc) generated as building is set on the parcel

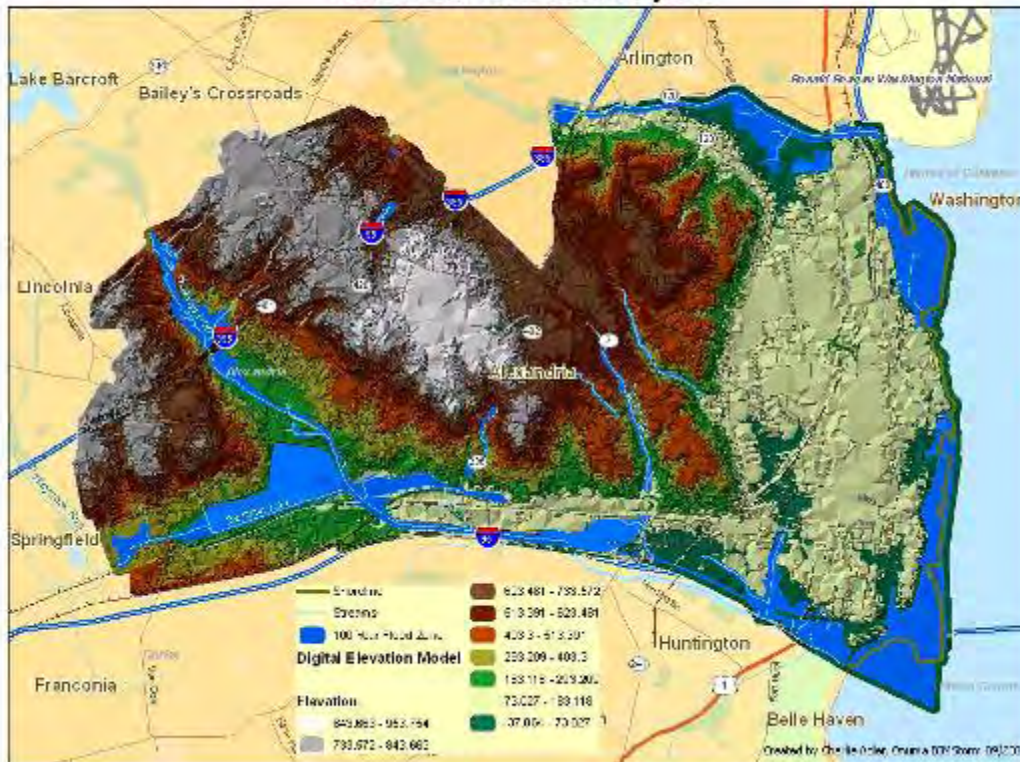


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## Alexandria GIS Flood Analysis

Alexandria, VA  
100 Year Flood Analysis



Used the FEMA HAZUS flood analysis overlaid with city GIS and digital elevation model data to create a topographical model, identify areas for redundant utilities, recovery staging areas

Building water and waste water, use of Green Roofs rain can be used as inputs to water shed model

Courtesy ESRI and Onuma Inc



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## Teams and SMEs, Lessons Learned

Over 200 players/observers

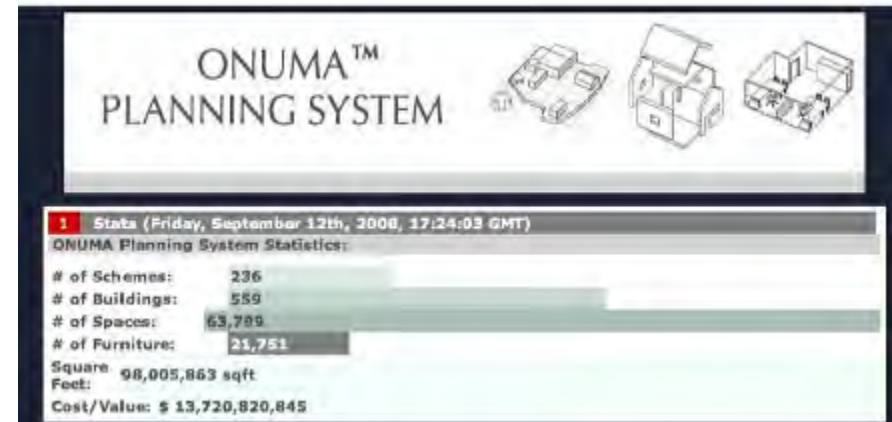
- Design Teams
- City Staff
- SME's

Lessons Learned

- Industry challenges
- Government challenges
- Organizations and Associations challenges
- IT challenges

BIM tools are revolutionizing virtual collaboration, parallel design, speed to market, waste reduction, total cost

Huge learning curve, challenging to implement, older versus younger adoption of technology, major changes in business processes required





# ***BRAC Alexandria***



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