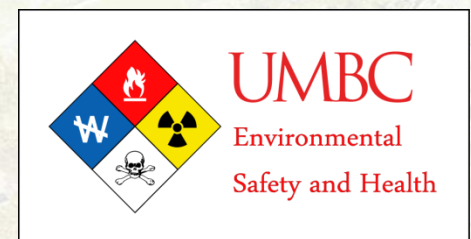




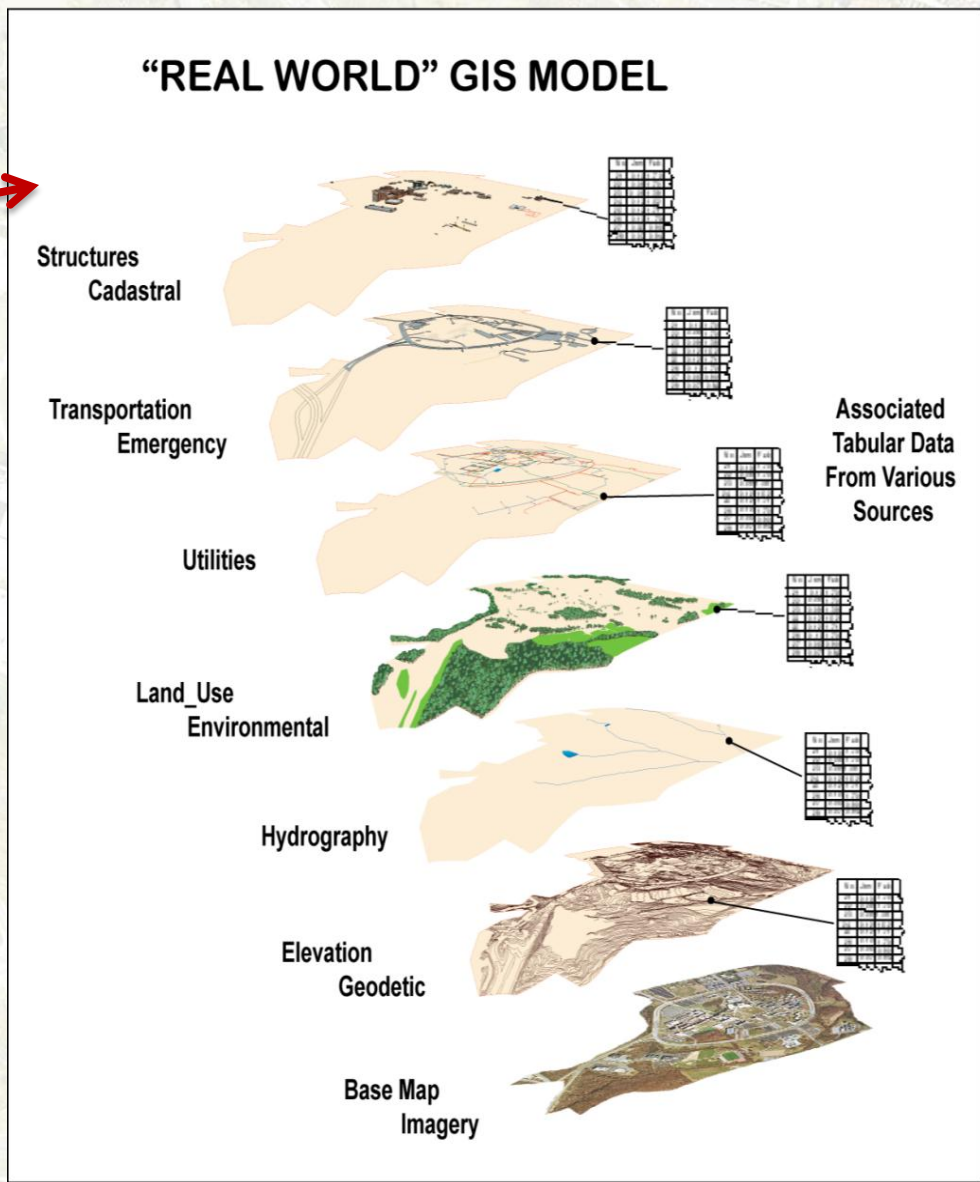
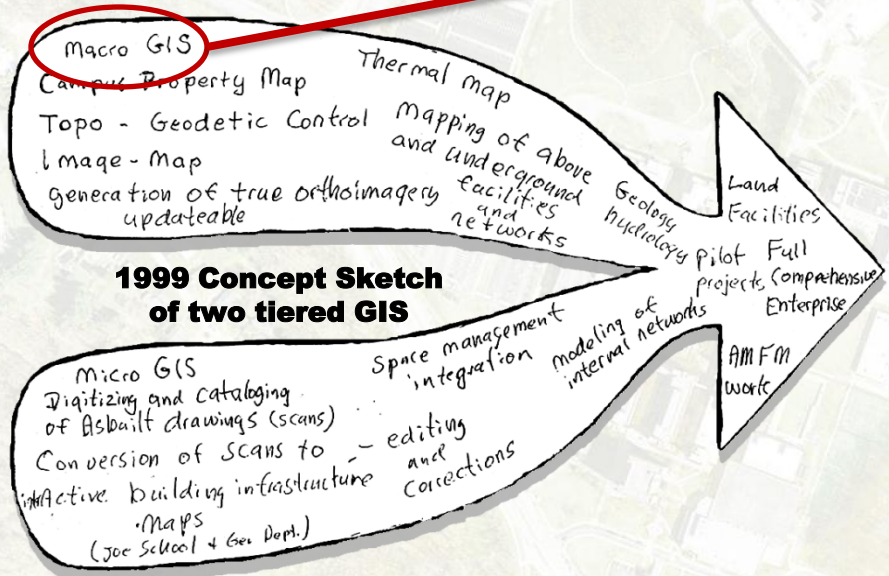
Geography & Environmental Systems

Campus Enterprise
Geographic Information System
Initiative

GPS / GNSS RTK MAPPING

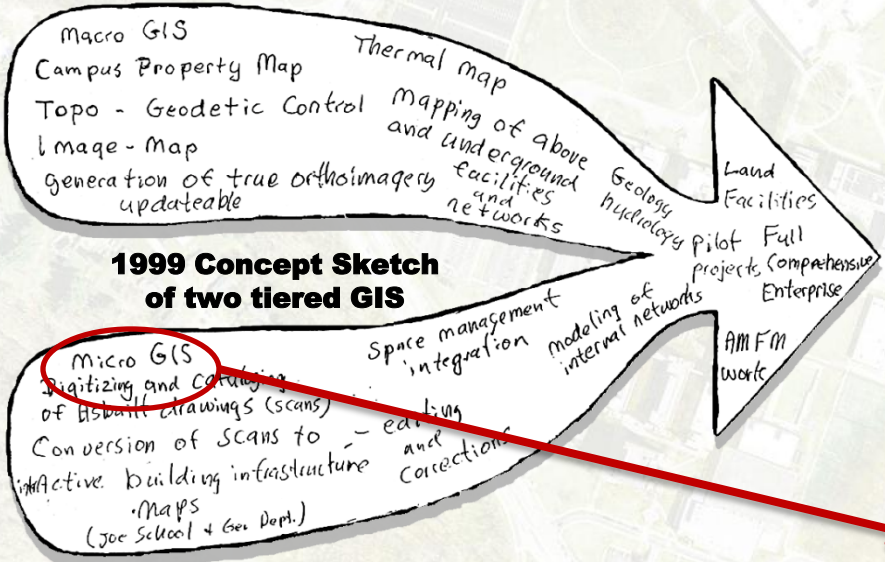
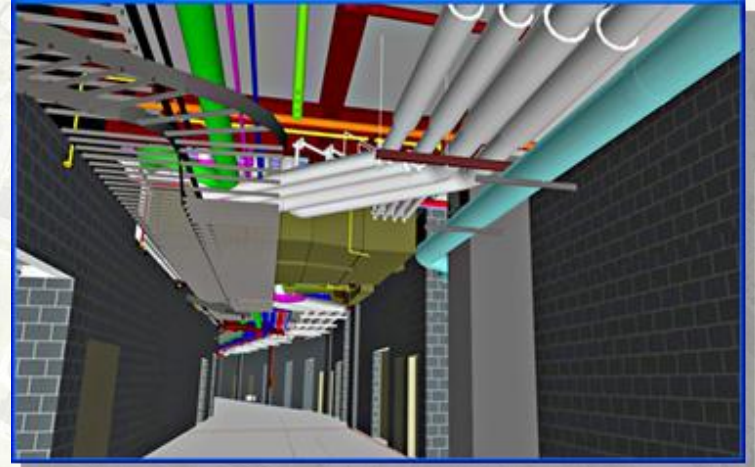


A Campus Enterprise Geographic Information System was Envisioned in the Fall of 1999 for the UMBC Campus

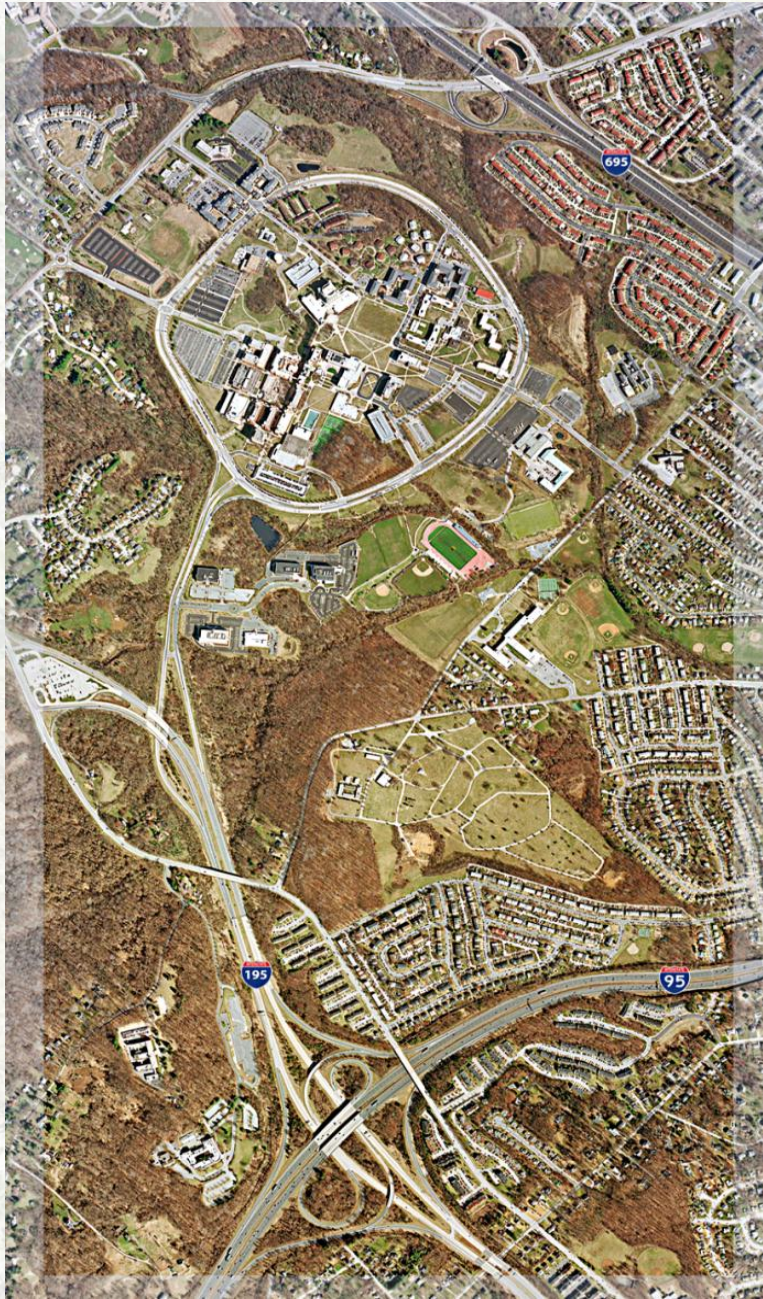


A Campus Enterprise Geographic Information System was Envisioned in the Fall of 1999 for the UMBC Campus

Building Information Model (BIM) of Performing Arts & Humanities Facility



UMBC Grid Index Created and Based on GIS Coordinates in 2000



NORTHWEST SECTOR						NORTHEAST SECTOR					
W01	W02	W03	W04	W05	W06	W07	W08	W09	W10	W11	W12
V01	V02	V03	V04	V05	V06	V07	V08	V09	V10	V11	V12
U01	U02	U03	U04	U05	U06	U07	U08	U09	U10	U11	U12
T01	T02	T03	T04	T05	T06	T07	T08	T09	T10	T11	T12
S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12
R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12
Q01	Q02	Q03	Q04	Q05	Q06	Q07	Q08	Q09	Q10	Q11	Q12
P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
O01	O02	O03	O04	O05	O06	O07	O08	O09	O10	O11	O12
N01	N02	N03	N04	N05	N06	N07	N08	N09	N10	N11	N12
M01	M02	M03	M04	M05	M06	M07	M08	M09	M10	M11	M12
L01	L02	L03	L04	L05	L06	L07	L08	L09	L10	L11	L12
K01	K02	K03	K04	K05	K06	K07	K08	K09	K10	K11	K12
J01	J02	J03	J04	J05	J06	J07	J08	J09	J10	J11	J12
I01	I02	I03	I04	I05	I06	I07	I08	I09	I10	I11	I12
H01	H02	H03	H04	H05	H06	H07	H08	H09	H10	H11	H12

SOUTHWEST SECTOR				SOUTHEAST SECTOR			
G03	G04	G05	G06	G03	G04	G05	G06
F03	F04	F05	F06	F03	F04	F05	F06
E03	E04	E05	E06	E03	E04	E05	E06
D03	D04	D05	D06	D03	D04	D05	D06
C03	C04	C05	C06	C03	C04	C05	C06
B03	B04	B05	B06	B03	B04	B05	B06
A03	A04	A05	A06	A03	A04	A05	A06

UMBC GRID REFERENCE SYSTEM

GRID CELL DEFINITION
 Perimeter: 500 x 500 Feet
 Area: 250,000 Sq. Feet
 Alpha Designation: A to W in Rows, South to North
 Numeric Designation: 01 to 12 in Columns, West to East
 Origin Point for Grid:
 1394500.000000 = X, Northing
 570100.000000 = Y, Easting

PROJECTED COORDINATE SYSTEM
 Projected coordinate system name: NAD_1983_StatePlane_Maryland_FIPS_1900_Feet
 Geographic coordinate system name: GCS_North_American_1983
 Grid Coordinate System Name: State Plane Coordinate System 1983
 FIPS Zone Identifier: 1900
 Lambert Conformal Conic Projection
 Standard Parallel: 38.1010000
 Standard Parallel: 39.4500000
 Longitude of Central Meridian: 76.0000000
 Latitude of Projection Origin: 37.6666667
 False Easting: 131233.333333
 False Northing: 0.0000000
 Planar Distance Units: survey feet
 Coordinate Encoding Method: coordinate pair
 Coordinate Representation: Abscissa Resolution: 0.000122
 Ordinate Resolution: 0.000122

GEODETTIC MODEL
 Horizontal Datum Name: North American Datum of 1983
 Ellipsoid Name: Geoidetic Reference System 80
 Spheroid Axis: 6378137.0000000
 Denominator of Flattening Ratio: 298.257222

ALTITUDE SYSTEM DEFINITION
 Resolution: 0.000010
 Encoding Method: Explicit elevation coordinate included with horizontal coordinates



RTK GPS System Established in 2001

Real Time Kinematic (RTK) Surveying Global Positioning System

Portable Field Unit

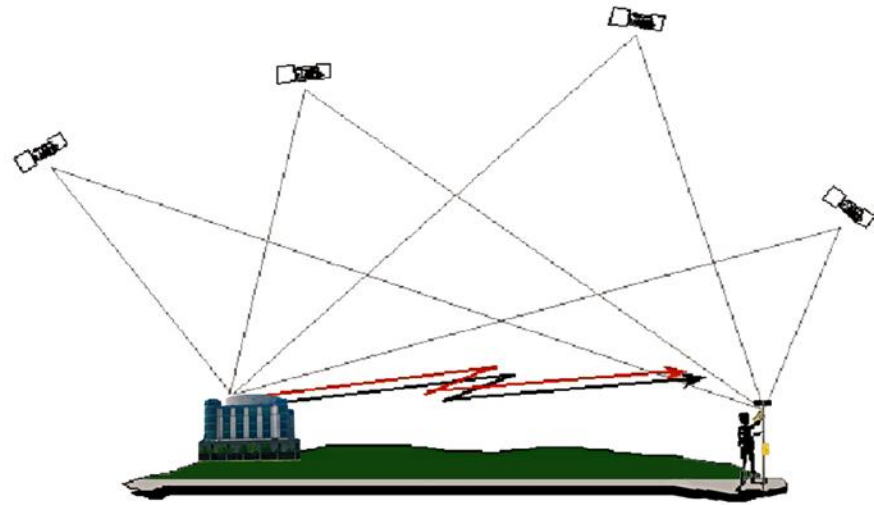
- Collects GIS coordinate points
- GPS receiver is a Trimble 5700

Fixed Antenna

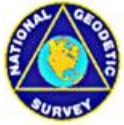
- Corrects position of portable field unit

Satellites

- Enables system to produce relative positioning of campus features recorded by field unit to within centimeters of their actual locations using the RTK correction



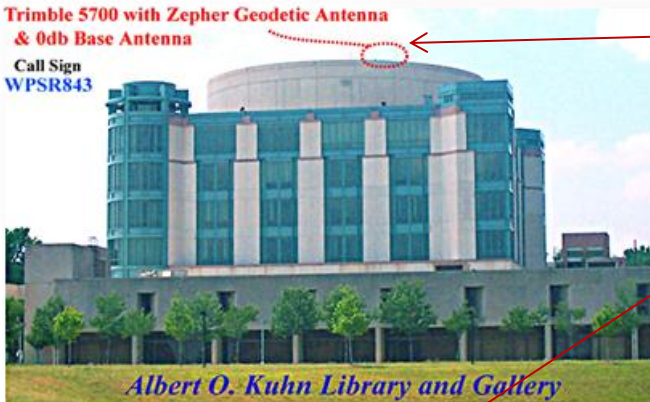
Member of NGS CORS since 2002



National Geodetic Survey - CORS

Trimble 5700 with Zephyr Geodetic Antenna
& Odb Base Antenna

Call Sign
WPSR843



Antenna

- On the top of the library's mechanical system penthouse

Computer Room

- Inside the penthouse
- Receivers and computer records the position of the Continuously Operating Reference Station (CORS)

NGS CORS

- Hosted through NOAA's National Geodetic Survey
- UMBC's position is constantly monitored so location shifts can be detected and mitigated



2003 LIDAR Scan (Light Detection & Ranging)



Aircraft

flown by vendor
used to scan UMBC campus with
LIDAR instrument



View from Cockpit

LIDAR operator (right) uses computer to
guide aircraft and record the LIDAR data

Campus Elevation Model from LIDAR Data

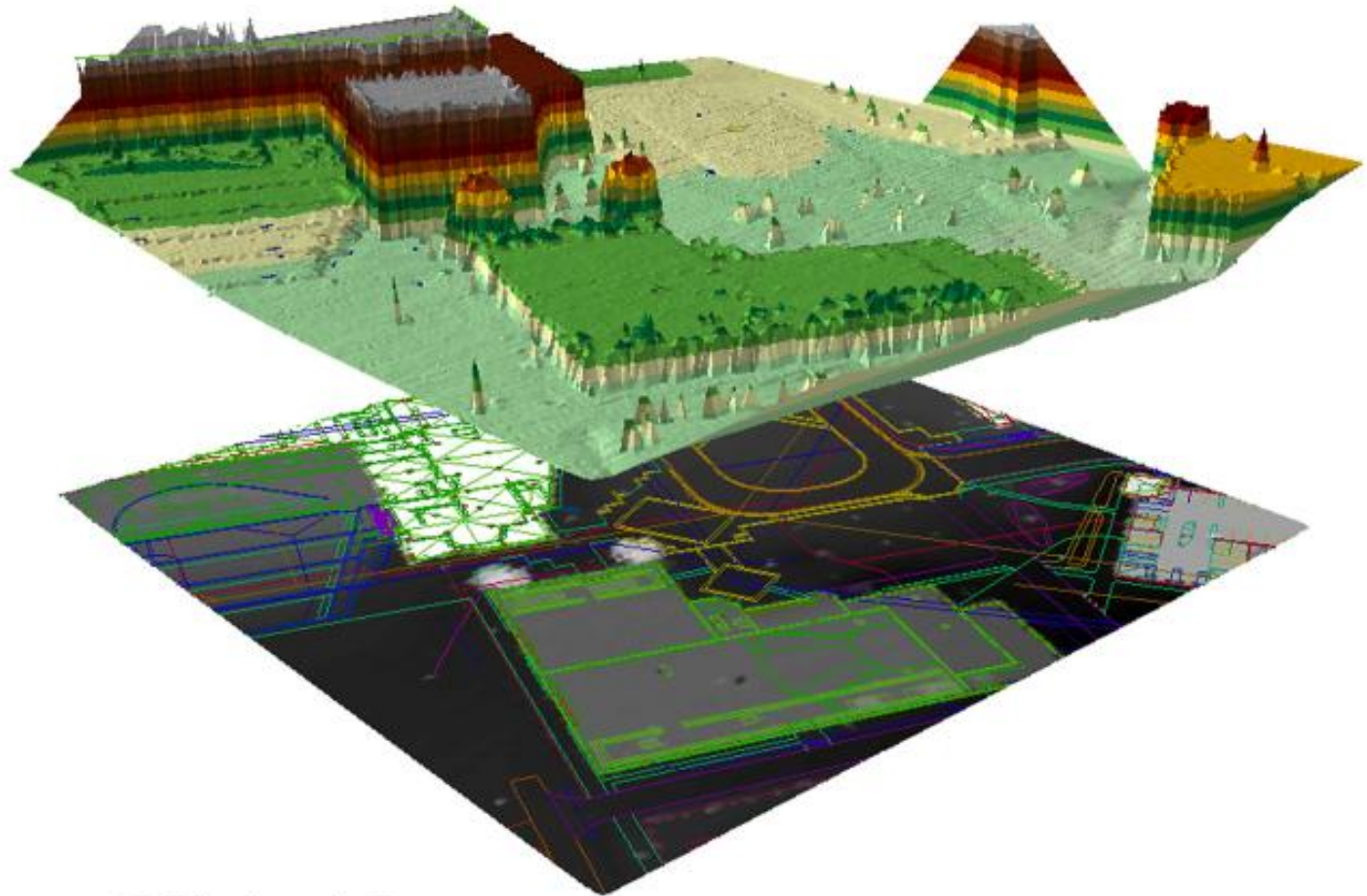


Hillshade of ArcGIS Grid data derived from raw LIDAR data.

Elevation Model Used to Build a Virtual 3D Campus

3D Lidar Data
with 3D planimetric data acquired from GPS

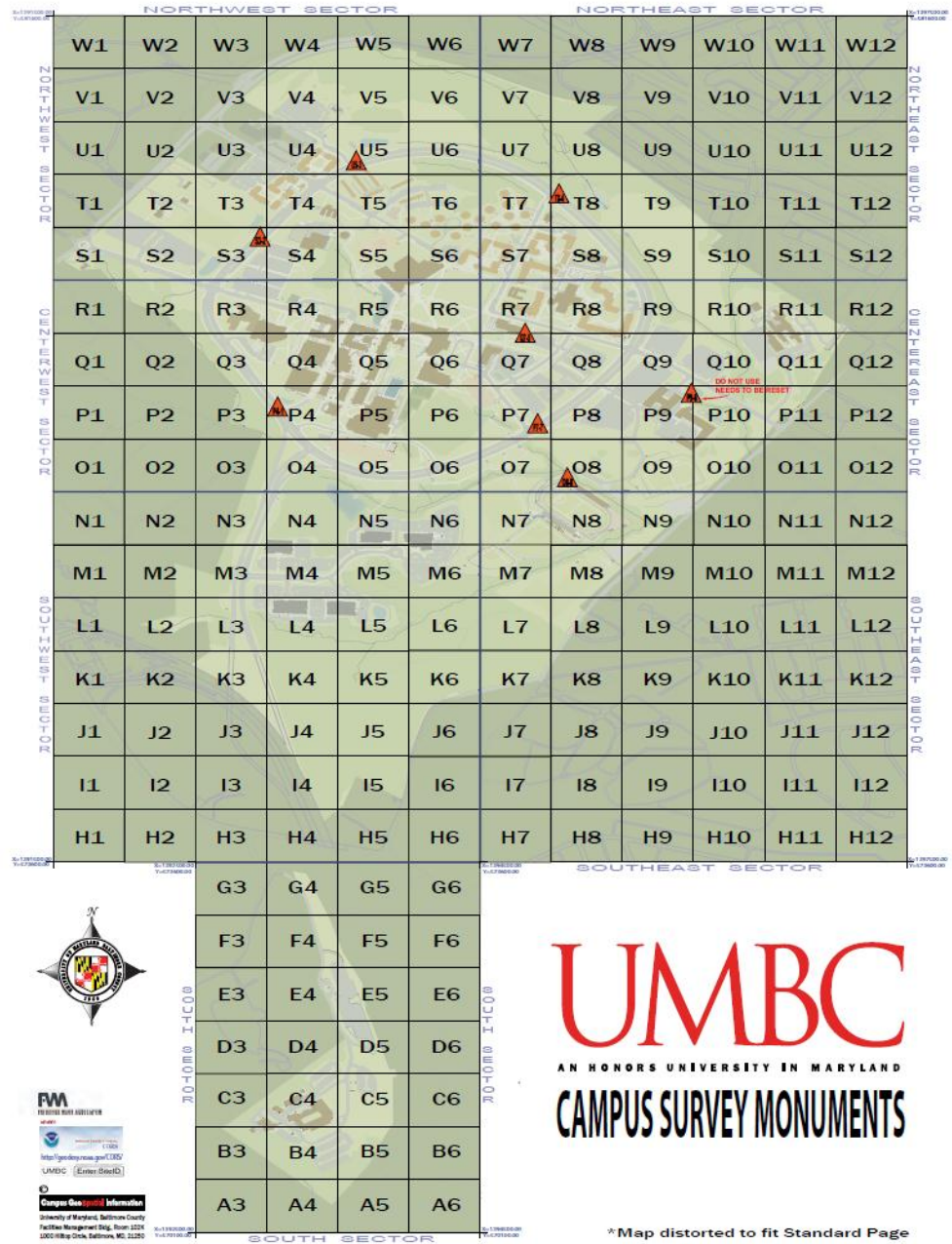
Scene layers	
<input checked="" type="checkbox"/>	9%cUTELCOM-point
<input checked="" type="checkbox"/>	9%cUTELCOM-CATV
<input checked="" type="checkbox"/>	9%cUtWATER-point
<input checked="" type="checkbox"/>	9%cUtWATER-line
<input checked="" type="checkbox"/>	9%cUNVENT
<input checked="" type="checkbox"/>	9%cUNSERV-tunnel
<input checked="" type="checkbox"/>	9%cUNSANITARY-point
<input checked="" type="checkbox"/>	9%cUNSANITARY-line
<input checked="" type="checkbox"/>	9%cUtMISC
<input checked="" type="checkbox"/>	9%cUtGAS-point
<input checked="" type="checkbox"/>	9%cUtGAS-line
<input checked="" type="checkbox"/>	9%cUNELEC-PoleLight
<input checked="" type="checkbox"/>	9%cUNELEC-point
<input checked="" type="checkbox"/>	9%cUNELEC-lvFeed
<input checked="" type="checkbox"/>	9%cUNELEC-lwFeed
<input checked="" type="checkbox"/>	8%cSTORM-point
<input checked="" type="checkbox"/>	8%cSTORM-line
<input checked="" type="checkbox"/>	8%cSTORM-channel
<input checked="" type="checkbox"/>	7%cATHL-facil
<input checked="" type="checkbox"/>	5%cPLANT-flower



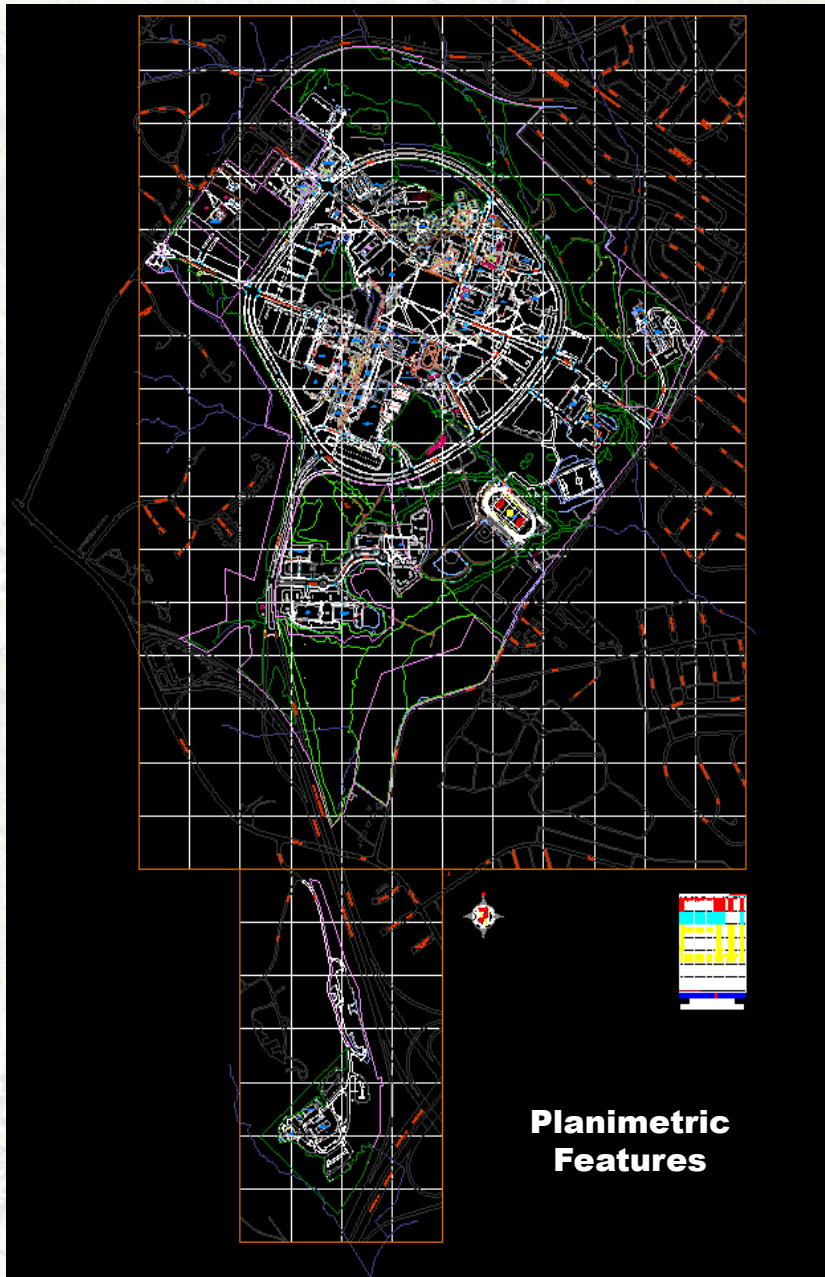
2D Planimetric Data
generated from field surveys and asbuilt inclusion



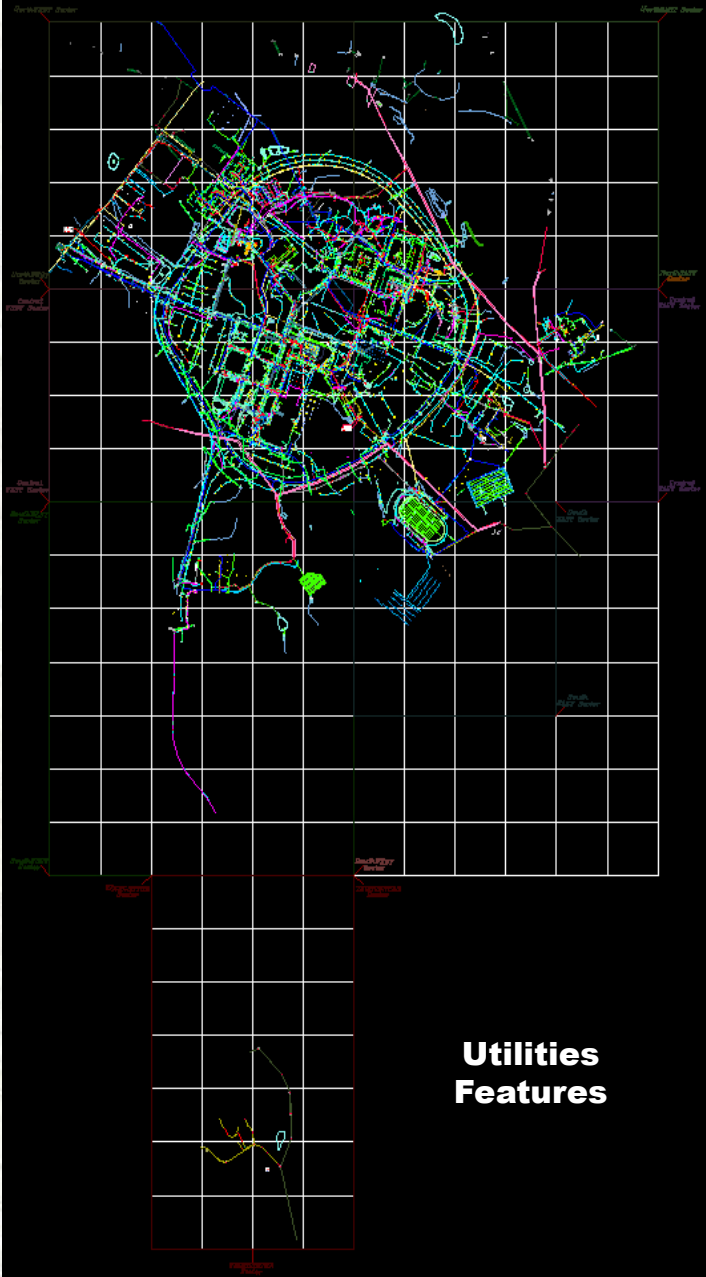
UMBC SURVEY CONTROL
1st order survey markers
Set in place by Frederick Ward
surveyors in 2007



Five AutoCAD Files Combined = UMBC Site Features Model



...completed since 2004



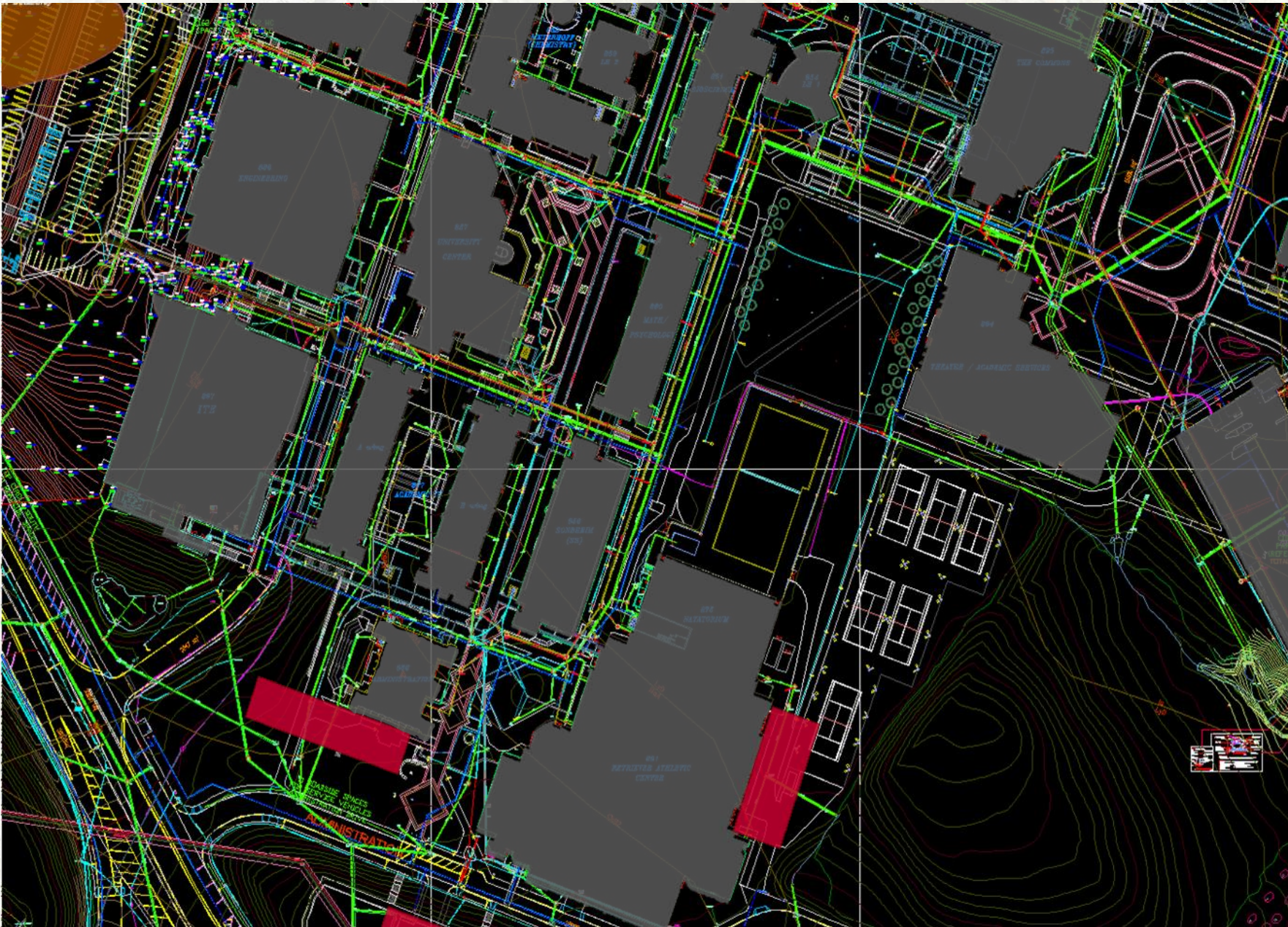
...through 2011



Detailed, Accurate, and Precise



Continuous Updates and Edits Keep Model Current



Current UMBC GIS Interactive Web Map

The screenshot shows a web browser window displaying a GIS interactive web map of the UMBC campus. The browser's address bar shows the URL `file:///cgsi/CGI_Workspace/ESH/Webmaps/Basemap.html` and the page title is "UMBC Campus Map". The browser interface includes a menu bar (File, Edit, View, History, Bookmarks, Tools, Help), a search bar with the Google logo, and a toolbar with various icons for map interaction. The map itself is a detailed aerial-style view of the campus, with numerous buildings and parking lots labeled. A "Building Selector" dropdown menu is located at the top left of the map area. A callout box labeled "EMERGENCY PHONES" is positioned at the top center of the map. The map includes a scale bar (0 to 200ft) and a north arrow in the bottom right corner. The browser window also shows a "Latest Headlines" section with a link to "6/1/2012 Elizabeth Riv..." and a "Getting Started" link.

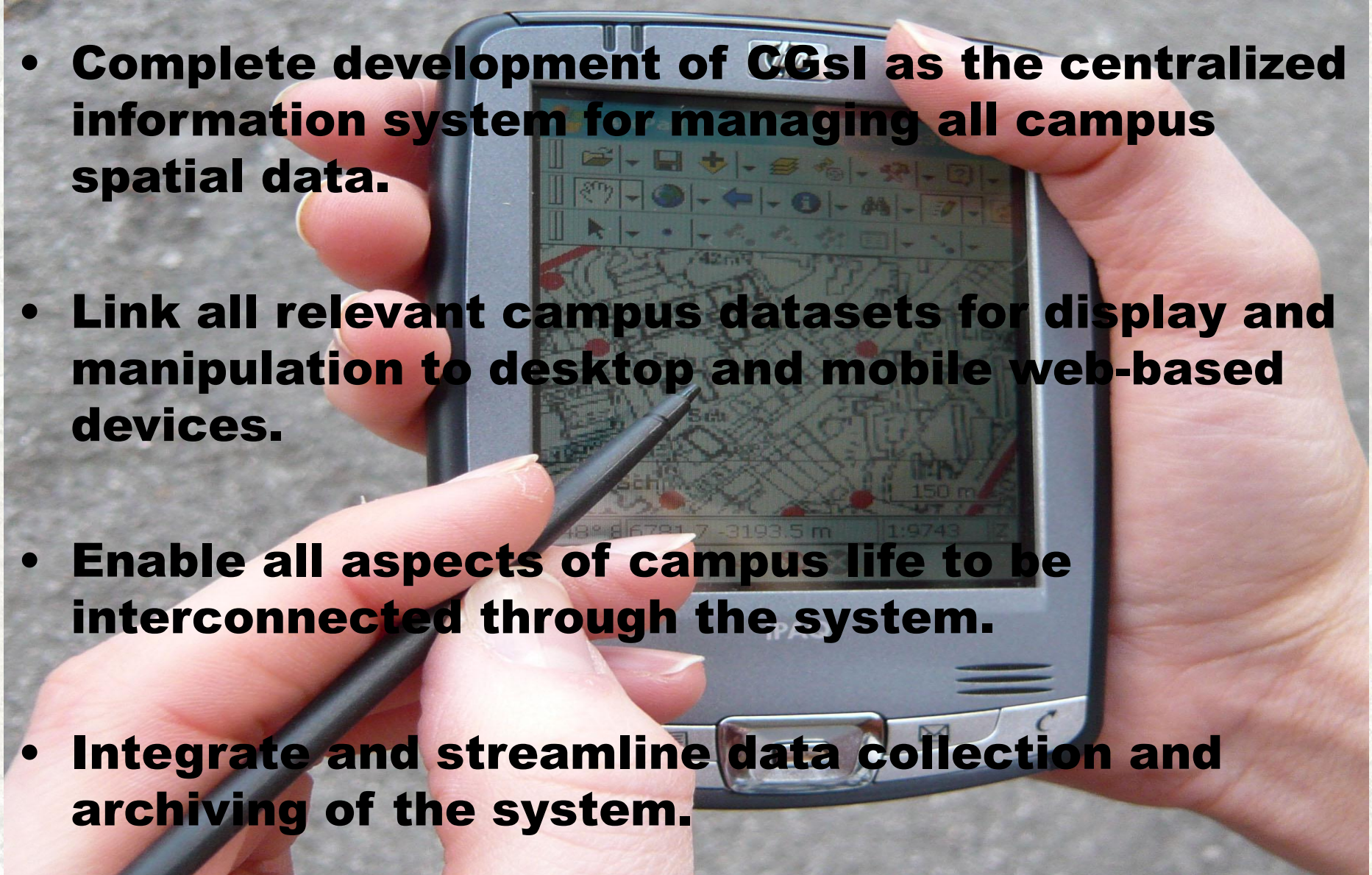
Browser window details:

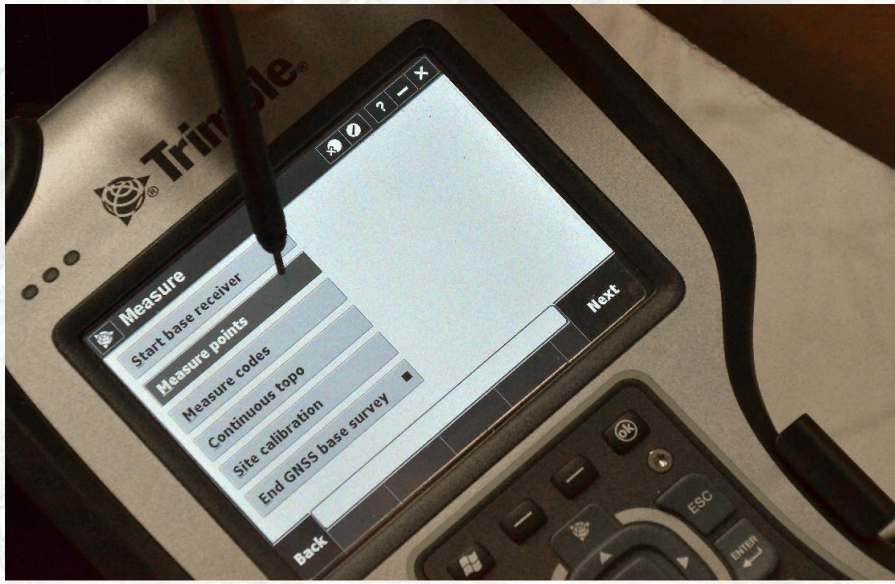
- Menu: File, Edit, View, History, Bookmarks, Tools, Help
- Page Title: UMBC Campus Map
- Address Bar: file:///cgsi/CGI_Workspace/ESH/Webmaps/Basemap.html
- Search: Google
- Toolbar: Building Selector, Accessibility icons, Map tools

Map Labels:

- PERFORMING ARTS AND HUMANITIES BUILDING (CONSTR)
- PERFORMING ARTS AND HUMANITIES BUILDING
- LOT 9
- FINE ARTS BUILDING
- ENGINEERING BUILDING
- INFORMATION TECHNOLOGY / ENGINEERING BUILDING
- SHERMAN HALL
- ADMINISTRATION BUILDING
- ADMINISTRATION DRIVE
- ADMINISTRATION DRIVE GARAGE
- ROBERT AND JANE MEYERHOFF CHEMISTRY BUILDING
- UNIVERSITY CENTER
- ADMINISTRATION BUILDING
- JANET AND WALTER SONDEHEIM HALL
- RETRIEVER ACTIVITIES CENTER
- MATH & PSYCHOLOGY BUILDING
- BIOLOGICAL SCIENCES BUILDING
- LECTURE HALL I
- THE COMMONS
- ACADEMIC SERVICES BUILDING
- COMMONS DRIVE GARAGE
- PHYSICS BUILDING
- COMMONS DRIVE
- PUBLIC POLICY BUILDING
- POPULAR AVENUE
- LOT 4
- PARK ROAD
- LOT 2
- LOT 3
- LOT 1
- STADIUM LOT
- TICKET BOOTH
- PHOTOCOPY ROOMS

Ultimate Goals

- **Complete development of CGSI as the centralized information system for managing all campus spatial data.**
 - **Link all relevant campus datasets for display and manipulation to desktop and mobile web-based devices.**
 - **Enable all aspects of campus life to be interconnected through the system.**
 - **Integrate and streamline data collection and archiving of the system.**
- 
- A hand is holding a PDA device (Personal Digital Assistant) which displays a map application. The screen shows a detailed map with various icons, including a folder, a globe, and a magnifying glass. There are also several red dots on the map, likely representing data points or locations. The background of the image is a blurred aerial view of a city or campus.



**Trimble Survey
equipment
acquired in July
2012 and September
of 2013**



UMBC Site Model Seed File with design geometry from consultants, GPS/GNSS points and new line work created from the field work

