APPA Effective and Innovative Practice Award Submission– January 2009

Western Michigan University
Physical Plant GIS Initiative

Statement of Program

When Western Michigan University's (WMU's) Physical Plant staff moved to update the documentation of capital assets several years ago, we were able to utilize current technology while saving the University a major financial investment.

The departments of Maintenance Services and Landscape Services have stewardship over millions of dollars of capital assets, both above and below ground; however, details about campus utility systems and landscape infrastructure existed primarily on old faded drawings and in the minds of a few seasoned employees.

Facility professionals in public and private sectors suggested that future utility and grounds asset management would involve Geographic Information Systems (GIS). By engaging WMU students who possessed the latest GIS training (from the Department of Geography and College of Engineering and Applied Sciences), WMU was able to implement and test a valuable technical resource. The University established a vital and flexible database, while also providing students with a valid field work experience. It is significant to note that this was done in a time of limited funding and without sacrificing other facility management initiatives.

Institutional Benefit

The GIS Initiative enabled WMU to move mission critical data from unstable sources (*i.e.*, paper originals and institutional knowledge) to a stable digital storage format, enhance the content and accuracy of that data, and apply the data to improve both student navigation and institutional asset management on campus.

The first step was to create a complete and accurate base map. A base map includes features such as roads, sidewalks, parking lots, building footprints, and bodies of water. Using aerial imagery initially acquired free from the City of Kalamazoo and then from satellite data, we were able to expand our GIS data at a lower cost.

With the accurate base map of campus in hand, we began to identify other GIS mapping initiatives that could enhance Physical Plant operations: 1) GIS was used to modify and update the Landscape Services snow removal plan. Prior to GIS, the snow removal plan existed primarily as colored pencil drawings. In a region accustomed to over 60 inches of snow per season, the detailed identification of features, priorities, and routes has been a tremendous asset. 2) GIS student employees worked with a physically disabled student to map ADA accessibility routes to and from points on campus. This included the mapping of handicap accessible parking spaces and curb cuts, as well as the ADA accessible entrances to buildings. 3) We also completed a Tree Inventory Project, which established GPS location of over 4,000 trees along with their species and diameter at a standard 4 foot height. At a time when the Emerald Ash Borer, an invasive species deadly to ash trees, cut a swath through southwest Michigan, WMU's Landscape Services was able to quickly identify not just all ash trees, but specifically those considered especially valuable, and take steps to protect those trees from the insect. 4) GIS technology was used to record the position of all storm and sanitary line access points (manholes), electrical and steam vaults, and the corresponding lines to each utility. Data from the City of Kalamazoo and Consumers Energy was integrated to serve the mapping needs for water and gas distribution. WMU added GPS locations of shutoff valves and meters to improve location accuracy. In addition to assisting with requests for utility locations, the enhanced GIS data has enabled WMU to significantly reduce the staff time involved in filling such requests.

With this uniform and easily up-dated GIS database, Physical Plant staff in both Maintenance Services and Landscape Services have their enhanced operational efficiency and service.

Innovativeness and Creativity

Use of Students

Students from the Department of Geography and College of Engineering and were hired for their technical GIS expertise and were managed by the campus utilities manager and the Landscape Services director. Once the project objective was established, the students were responsible to design, complete, and integrate the projects. By utilizing the skills and knowledge of our students on campus, the Physical Plant benefited from their training, while the students gained professional work experience. Electing not to hire outside contractors or full-time GIS employees saved the University thousands of dollars. The project management opportunities offered to students in the GIS Initiative directly resulted in quality professional experience, and led to several of the students acquiring similar professional jobs in the public and private sectors.

3-D Renderings

In 2007 the GIS team participated in Google's "Model Your Campus" competition. The scope of this project was to model all 151 of WMU's buildings in 3 dimensions (3-D) and submit them to Google for inclusion in the Google Earth database. The incorporation of rendering technology led to a new initiative that is now in its infancy. WMU is working to transform existing CAD drawings into 3-D renderings of underground utility vaults. This is an application which will allow anyone within the Physical Plant to view the actual layout of the vaults in 3-D, thus eliminating the necessity of one having to go through confined space training.

Mash-ups

The GIS data was leveraged again in 2008 to develop a Google "Mashup" of driving directions to specific buildings on campus. Prior to this development, visitors using location technology, such as Google maps or GPS navigation, would have been routed to the University's general mailing address at 1903 W. Michigan Ave. This was not the intended destination of potential students who were trying to visit specific buildings or activities on campus. The result is that we now can provide accurate driving directions to all campus locations. The project, which was a partnership with in-house IT staff, took minimal research and development by groups. Without existing GIS data, this project would have required a huge investment of time and resources. The site, which also contains overlays for parking and ADA accessibility, can be viewed at http://maps.pp.wmich.edu/interactive. A map is included in this packet.

Repeatable, Sustainable, and Portable

New Position

The GIS Initiative created an amazing amount of data. However, the constant cycling of students combined with the lack of technical GIS knowledge on the part of the Physical Plant staff who had been supervising the students left the program without clear direction. To provide consistency in supervision, continuity in program goals, and increased technical expertise to expand the program, Physical Plant management wanted to hire a professional GIS manager. A new position was created by merging vacancies gained through retirements and attrition at a time when the entire State of Michigan and the University were battling funding shortfalls. As always, the Physical Plant was constantly working to provide more and better services with less money; employing the GIS technology and its increased efficiencies fit this mission. The GIS manager would be responsible for the oversight of GIS data collection, data management and security, and data accessibility for other University users.

Web Services

One of goals of the GIS Initiative was to make the collection of GIS data available to Physical Plant and other University users through a user-friendly, interactive web application. The ideal application also would provide secure hosting of security sensitive data, such as the locations of the utility infrastructure. The department purchased and developed a modified version of ESRI's ArcIMS software. Initially, the upkeep of the site was handled internally by the Physical Plant Network Services staff. However, given the Physical Plant's reliance on emerging technologies for all seven the division departments, the Network Services staff was stretched to the max. The new GIS manager would maintain the GIS website and continuously look for ways to improve it. The website has both a public and a secure access application that can be accessed from http://gis.pp.wmich.edu. *(WMU's Physical Plant GIS manager is available to discuss the secure access application with other APPA colleagues.)*

With minimal training, staff members are able to use the site to view the location of features and associated information about size, type, and condition. Reports and analyses that are completed on parts of a system can be attached to a database, which then can be viewed either within the mapping application or via an external hyperlink. Examples of information linked to this site include videos of the sanitary sewer condition, thermal imaging reports of the steam system, and the previously mentioned 3-D drawings of steam vaults. It is important to note that the website is completely customizable and expandable, and data can be readily extracted to accommodate the needs of the University.

Thanks to a University-wide site license for ESRI GIS software, the Physical Plant did not have to incur any large annual software maintenance fees. Also, the Plant is part of the University-wide wireless network, which provides staff access to this information from any computer or handheld device within the campus.

Management Commitment and Employee Involvement

The commitment from both Physical Plant management and University administration to GIS development is obvious from their 2008 decision to add a full-time professional staff person to manage this initiative. Over several years, the GIS Initiative has grown from a trial program with unknown benefits to one of multiple functionality with the creation of tangible and accurate campus maps. The Physical Plant GIS Initiative is considered vital to the organization and is used as a model for other GIS systems in the area.

Most of the day-to-day employee involvement in GIS data collection is on a feedback basis. Staff use the mapping website and inform the GIS department about how it might be changed to better serve their needs. Also, as a result of the existence of the website, other areas of data management have been improved. Currently if an employee finds an error, they are encouraged to print a map from the website, mark the corrections, and pass it to GIS staff. The data is then modified and updated on the website.

GIS is used frequently in the "Miss Dig" utility locator program, in which WMU is a participant. When dig requests are made in areas on or adjacent to the campus, a map of the potentially affected utilities is generated. The appropriate utility manager is then responsible for locating the utility and marking the map. If the manager finds discrepancies between the map and the actual utility, the manager communicates the correction to the GIS staff. The GIS data also has enabled the campus utility managers to identify the condition of their systems in order to prioritize line repairs and replacements, with the goal of fixing it before it fails.

It should be noted that the purpose of having a GIS manager is to move the GIS Initiative in the direction that benefits both the administrative team and trade workers in the field. As a result of heavy reliance on student labor, the Physical Plant has been very successful in establishing relationships with academic departments to ensure a constant cycle of quality student employees.

The process of mapping is never complete. There is always the next level of accuracy and the next level of attributes to give to a system. Over the last several years, the focus of the GIS Initiative has shifted from collecting data, to data management and analysis.

Program Analysis and Documentation

The Physical Plant at Western Michigan University is responsible for operating and maintaining the physical environment of the University community. This includes 151 buildings with 8,814,880 square feet of building space, over 1,200 acres of grounds, 23 miles of roadways, 39 miles of walkways,13.4 miles of underground electrical cable, 2.2 miles of overhead electrical cable, 12.75 miles of steam and condensate lines, 6.59 miles of water lines, 6.94 miles of sewer lines, and 7.4 miles of storm piping. The Physical Plant staff are charged to maintain all campus assets in a manner that minimizes disruption of the research, educational and public service missions of the University. Knowing the precise location of all the aspects of the physical environment has proved invaluable in planning, executing, and analyzing projects on campus. Whereas, not knowing vital information such as the location of underground utilities, and sticking a backhoe into the ground in the wrong spot, could cost anywhere from tens of thousands of dollars to the loss of life.

Given the informal way WMU went about the development of the GIS Initiative, it is difficult to ascertain the program's specific cost to implement. Our best estimates put the cost between $50,000 to $60,000 per year. Most of this was spent on part-time student wages, staff support, and contracted services. At no time in the recent years of public education finance in Michigan would the University have been able to make an upfront fiscal commitment of that size without sacrificing other critical infrastructure needs. In fact, the initial start up costs consisted of 2 Trimble GPS data collectors, a single workstation computer, and three student staff, representing an upfront cost of approximately $20,000. The students were simply redirected to use and expand their technical experience to collect and organize GIS data, so the student wages truly were not a new or additional expense. The GIS Initiative used technology and students to transform existing information from a fragile hard-copy state, where it was difficult to find key information, into a specifically organized, secure, and easy-to-use system.

The detailed information gathered by the GIS Initiative will make it possible in the future to go about asset management in an organized and quantifiable fashion. Currently, we are using GIS to assist in calculating the replacement cost of several of the utility systems. Also, the expandability of GIS enables us to gather increasing amounts of data in a resource that facilitates future analysis and more informed decisions. The GIS Initiative was based on flexibility from the start and today that continues to be so. The data has survived several changes in software, hardware, and direction. We now are able to identify not only "where is it?" and "how much to of it do we have?" but also "what condition is it in?"

The GIS Initiative combines the mission of the University to educate students with the demand on the University to deliver services. In this initiative, the students themselves have been essential to creating a system that effectively expanded their educational achievements and improved the operational success of the University.


Western Ave
Oliver St
Fieldhouse Dr
Image WMU
© 2009 Tele Atlas
Image © 2009 DigitalGlobe
Google
42°17'04.50" N 85°36'28.90" W
elev 253 m
Apr 3, 2007
Eye alt 441 m


Western Michigan University
Map Layers
Legend
Map Tools
Find a Location
Query/Select
Maps/Reports
Settings
Current Selection
Storm Points
One Feature Found
Type Curb Inlet
Vault ID CI9-18-3-1
Distance to bottom 5.00000
Pipe 1 - 12 A
Pipe 2
Pipe 3
Pipe 4
Pipe 5
Pipe 6
X Coord 12787248.619
Y Coord 288610.030001
Reference Map:
Zoom
Parking Structure #1
Ellsworth Hall
Lutheran House
Student Recreation Center
University Arena / Read Field House
29
13
94
16
18
0
249ft

WMU Maps

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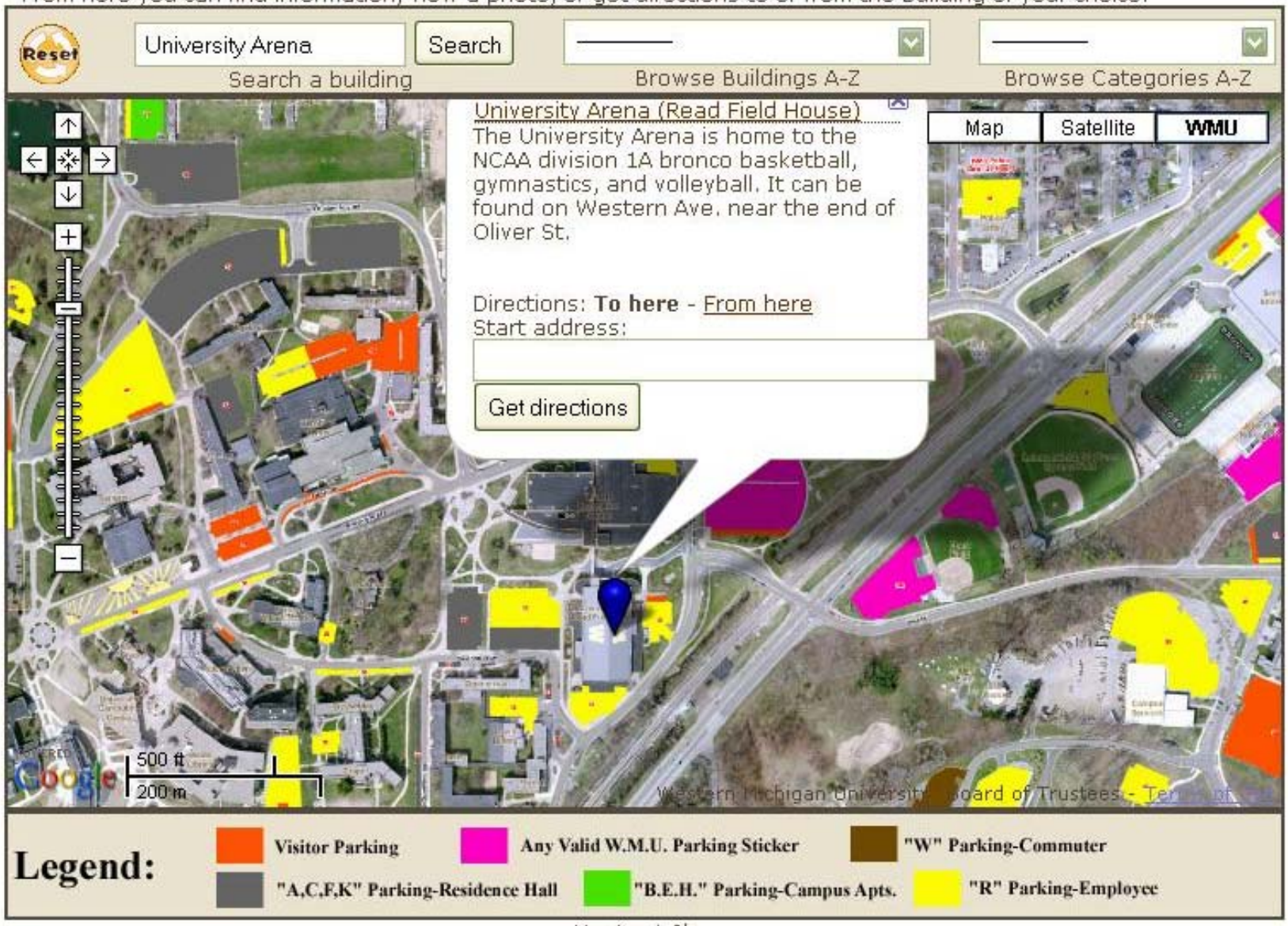
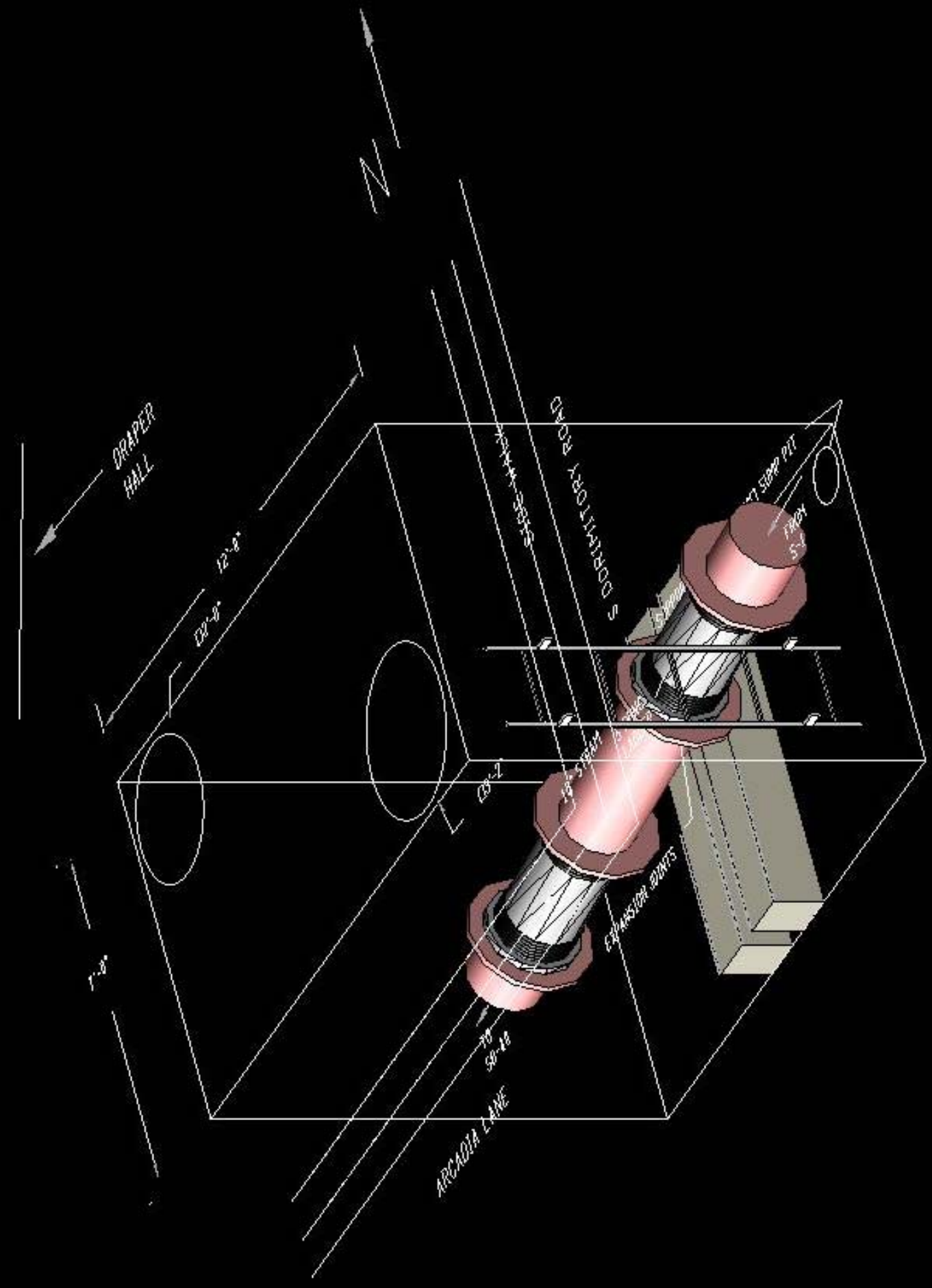
Interactive Campus Map

Welcome to WMU's interactive map!
Find a building by searching or browsing the dropdowns.
From here you can find information, view a photo, or get directions to or from the building of your choice.



Version 1.0b

Click the refresh button in the far left of the menu above to clear all of the markers, as well as any directions.


N
DRAPER HALL
12'-6"
EXPANSION JOINTS
ARCADIA LANE