MANAGEMENT AND GROWTH PLAN
for
UTILITIES AND INFRASTRUCTURE

THE UNIVERSITY OF ALABAMA
FINANCIAL AFFAIRS

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The Division of Financial Affairs maintains the following report on Campus Utilities and Infrastructure Strategic Management and Growth in order to provide and communicate a framework for the Division to meet and support the dynamics of a growing campus and to recognize the challenges and opportunities thereof. The Division is providing the 2013 update to reflect previous work accomplished in accordance with the plan, the impact of projects that are in planning and development (both long and short term), programmatic considerations, technology changes, emerging opportunities, strategic partner dynamics, funding, and, most importantly for this update, the impact of the acquisition of the Peter Bryce Campus.

Staff is also enhancing efforts to analyze and evaluate previous engineering assumptions and system performance to ensure optimization of systems, efficiency and financial return and the product of that is reflected herein. That information is also beneficial to project long term system needs as related to expected functional service life and the associated capital renewal cost and to provide more accurate budgeting information as additional demands are added to the system.

The Division of Financial Affairs is unique in that its support functions touch every aspect of campus activity for students, faculty, staff and visitors whether related to safety, security, facility comfort, campus appearance, employee, vendor, or student payments, collections, dining, housing, purchasing or employment. These aspects of campus activity are in turn all directly supported by the utility and infrastructure systems of the campus. In anticipation of the University’s growth, and as necessary for efficient management of University systems, the Division of Financial Affairs has prepared this summary to convey the future campus needs relative to the utilities and infrastructure systems of the campus including electrical distribution, sanitary sewer, storm sewer, thermal energy, energy management (including steam), natural gas and potable water, campus transportation network, and pedestrian enhancements.

The report provides information regarding the different campus systems including general background information, current efforts, system constraints and issues, and long term plans including budget information.

Additionally, information is also provided within the report on work which has been completed in the last fiscal period in support, maintenance and expansion of the systems. Risk management measures and protocols being taken to protect the systems are also addressed as well as management systems which are being, or suggested to be, implemented to facilitate management of the systems.

**Note:** Opportunities to partner with the City of Tuscaloosa, Utility providers and strategic partners must continue to be pursued to provide additional project funding and support. Almost every area listed below has either a direct benefit or the realization of a financial benefit to external partners.

**Electrical Distribution System**

The campus electrical distribution system is privately owned by the University and includes four (4) substations and primarily underground distribution lines. While system ownership entails extensive planning, capital expense, and a trained staff to operate and manage the system, the advantages are numerous. A summary of the advantages of a UA owned system, projected capacity needs, long
term overhead to underground conversion plans and required system upgrades and enhancements are as follow:

- Advantages of a privately owned electrical distribution system
  - Energy cost savings of approximately 60% - based on $.105/kwh normal commercial rate vs $.0675/kwh LPL rate
  - Precludes need for utility easements that would encumber valuable real estate
  - Alabama Power’s normal mode of distribution is overhead lines. To have underground Alabama Power distribution, the University would be responsible for the cost of underground duct banks.
    - Underground lines are much more reliable than overhead as they are protected from storm events and car accidents.
    - Underground lines allow for University to protect and enhance tree canopies which are subject to unattractive trimming and cutting when overhead lines are utilized.
    - The intangible of the aesthetic of not having overhead lines is difficult to quantify, but the impact of when lines have been removed is dramatic.
  - The University can make its own decisions regarding system design.
    - The ability to determine the level of system robustness and redundancy that coincides with risk management demands, budgetary constraints, and maintenance assets and capabilities
    - The ability to determine redundancy of substations and circuits in accordance with overall operating philosophy and desired level of flexibility
    - Control of system topology in conjunction with future plans, aesthetics, and other factors that may not be given consideration by the utility.
  - The University can operate the system as it desires.
    - Quick response to the needs of construction and system operation
    - Scheduled outages of any part of the system without the need to consider effect on other utility customers
    - Total control over response to unscheduled outages, without the need to consider restoring service to other utility customers

- The University, in conjunction with input from Alabama Power, is continually evaluating the electrical transmission and distribution systems (Annotation 1) that serve the campus relative to current capacity, load balancing between substations, future load projections (Annotation 2a), and individual circuit capacity from the substations to campus facilities. With currently planned projects, the need to have spare capacity in the system to support load shifting for emergencies, shutdowns and repairs, the assumption of the electrical service to the Magnolia area and the incorporation of the Bryce Campus current evaluations and projections indicate that an additional transformer will be required, in conjunction with additional circuitry and
switching, for the recently constructed North Substation at a projected cost of $3,114,790. The need for this additional capacity and switching is further evidenced by peak load demands on the certain transformers which have exceeded rated capacities at times (Annotation 2b)

- North Campus Substation Additional Capacity (Annotation 3)
  - Provides immediate additional capacity required to serve projects currently under construction and in planning (Annotation 2a)
  - Provides additional overall system capacity to accommodate the recently assumed electrical load in the Magnolia area along with additional loads for planned construction
  - Allows for the offloading of demand from the substations, particularly the west, and better load balancing
    - Both of the East and West substations are at over 90% capacity with current demand, and current construction projects will impose loads beyond transformer ratings.
    - Will allow the demand to be located closer to the substation, which enhances reliability and efficiency
  - Provides for future connectivity to the Bryce Campus and other developments in the area
    - As part of the North Substation and other recent construction projects, duct banks and circuits were installed towards the Bryce Campus in preparation for future extension.
    - This project will provide circuiting and switches to provide this connectivity.
    - The Bryce campus is currently served by an existing aged substation and the overall demand will not meet minimum metering requirements, particularly between the period that ADMH vacates the facility and the time when the UA population becomes significant. Connectivity to the UA system will allow the existing substation to be circumvented and for UA to provide the power under our enhanced rate structure.
  - Easily looped to the other substations to provide system redundancy/reliability
  - Provide for enhanced system reliability as it is fed from a separate APCO transmission line
  - APCO is proposing no direct cost due to incremental revenue increase from projected UA loads and the fact that the North Sub was designed and constructed to accommodate a second transformer. Only cost will be an
“Excess Facilities Charge” until trigger points are met (Annotation 3a). The amount of the fee is currently under negotiation with Alabama Power.

- This work is included in Tab 4 of the FY 13/14 Annual Capital Development Plan and is shown as part of the scheduled 2014 Bond Issue (Annotation 3b).

- Significant progress has been made on retiring overhead lines on Campus (Annotation 4) and efforts are continuing in coordination with Alabama Power for the removal of additional overhead transmission and distribution lines on campus through both strategic decommissioning and conversion of overhead to underground installations. These efforts are being considered in conjunction with construction projects in the area of the lines to take advantage of potential economies of scale when the opportunity presents. Future electrical loads are also being captured in anticipation of the revenue streams associated with these projects helping to defray the University’s cost from Alabama Power for their portion of this work.

  - Removal of overhead transmission and distribution lines from campus
    - Conversion of Distribution Line from overhead to underground along Wallace Wade from University to the Stadium (Annotation 5a)
      - Estimated cost is $325,000.
      - Costs have been included in preliminary budgets for the Bryant Denny Stadium Walk of Champions completion project.
    - Conversion of the balance of Distribution Line from overhead to underground along the east segment of University Boulevard in front of the Theta Chi and Pi Kappa Phi houses (across from Arby’s) (Annotation 5b)
      - Estimated cost is $531,320.
    - Conversion of the lines from 600 University to the McFarland Interchange in front of Nursing (Annotation 5b)
      - Estimated cost is $2,048,200.
      - The west ramp of the interchange must be bored and a portion is double circuited.
    - Conversion of the East University Boulevard Distribution line from Hackberry to 2nd Avenue
      - Estimated cost is $2,000,000.
    - Conversion of 4th Street East and Fraternity lane is highly contested as APCO does not want UA assuming this existing APCO load.
      - Opportunities relative to the pending KA construction need to be evaluated.
    - Transmission Line from McFarland Boulevard to East Substation
      - Estimated cost of duct bank installation is approximately $573,750.
• Estimated cost of Alabama Power’s work is approximately $1,076,250.
• Total Cost to go underground is $1,650,000.
• While this work is not presently funded, future routing of the underground duct bank is a part of current utility planning in the area.
  - North Central Bryce Campus Relocation to North side transmission line easement
    • Estimated cost is $250,000.
      o To date over 3.42 miles of overhead distribution and transmission have been removed from campus (Annotation 4).

The other facet to ensuring electrical system reliability and facilitating growth lies with maintenance and upgrading of the existing system. Numerous projects and programs are being evaluated to support this. Additionally, a cable evaluation program is in place to ensure the integrity of the system. Also proposed are additional loop feed connections to tie circuits from different substations together, some of which are included in the proposed North Campus MV distribution project(Annotation 3).

Advantages of a loop fed system:
  o Flexibility in distribution of loads between substations, and the ability to readily shift loads as they change due to utilization and new construction
  o The ability to minimize the impact of scheduled outages on circuits fed from both ends
  o The ability to minimize the impact of equipment or circuit failures

There are presently three connections between the East Substation and the South Substation, two connections between the West Substation and the South Substation, two connections between the North Substation and East Substation, one between the North Substation and West Substation and one connection between the East Substation and the West Substation. Additional connections are needed to take advantage of the intrinsic flexibility of the existing system.

Installation of additional loop feed connections, the addition of circuits and additional tie points follow.
  o Bryce Campus MV Distribution- Currently there are three (3) phases of work proposed for the Bryce Campus detailed as follows (Annotation 6).
    - Phase I includes distribution to the southeast corner of the Bryce campus and provides service to the Kidd Buildings, the Medical Building, Chapel, Women’s Admissions, Admissions and the Barnes Center.
- Estimated cost is $2,897,433 and this is included in the FY 13/14 ACDP DM Plan and the planned 2014 Bond Issue.
- Work will go in prior to the proposed ATRIP project so that service can be maintained once existing Bryce infrastructure is removed for that project

  Phase II includes distribution to the core of the Bryce campus from the existing duct bank circuit at Searcy and provides a tie point to Phase I and service to the Bryce Main and proposed Performing Arts center.
  - Estimated cost is $962,704.
  - Work is proposed to go in conjunction with either the ATRIP project or Performing Arts Center.

  Phase III includes distribution to proposed development at the north central area of the Bryce Campus and provides another loop/tie point from the North to the East Substations.
  - Estimated cost is $1,851,138.

- Completion of Magnolia Service Expansion necessary to support the Sorority Master Plan
  - Service to KD and removal of existing equipment on north side of lot including overhead feed to existing house
    - Estimated cost is $283,791.
  - Service to KKG & Phi Mu
    - Estimated cost is $634,000.
  - Service to lots 8, 9, 5, 18 and 19 is not considered here as there is no current demand from additional chapters (Annotation 7).

- Opportunities for installing loop feed and tie point connections are currently identified (Annotation 8). Each of these has most of the necessary underground duct bank already installed. Incurred costs will include circuiting, new pad mounted switches, and minor modifications and additions to existing duct banks. The locations are as follows:
  - Presidential to Ridgecrest—ties East Substation to West Substation
    - Estimated cost is $625,000.
    - This tie is critical to allowing load to be shed from the West substation.
  - Gorgas Library to Morgan Hall—ties East Substation to West Substation
    - Estimated cost is $125,000.
  - 4th Street Extension from 2nd Avenue to the School of Medicine will provide service to University associated Housing and a loop tie to the School of Medicine which will provide an important redundant feed to the facility.
    - Estimated cost is $250,000.
- Ties South Substation to East Substation
  - Install second service circuit to Bryant Denny Stadium from Barnwell to Bryant Denny Stadium
  - Accommodation of this work needs to be considered as part of the Phi Mu project. At a minimum the duct needs to be installed across the south end of the Phi Mu lot and the bore to the stadium completed so that UA will not have to disturb the Phi Mu site after it is completed.
  - Estimated Cost is $350,000.
  - Install internal tie point in stadium so that Stadium can be loop fed from second service circuit.
  - Estimated cost is $1,250,000.

- Extension to east campus areas currently served by APCO including Softball, Tennis, and Capstone Village (Annotation 9)
  - Estimated cost is $1.3 million with a projected payback of 5 years based on current Capstone Village occupancy rates.
    - Based on current loads, the Athletics’ pro-rata share would be approximately 25% or $325,000.
  - Will provide an additional loop feed to other UA facilities including Child Development and Nursing
    - Estimated cost is $865,538.
  - The timing of this project must carefully considered so that current substation loading constraints are not exacerbated.

To ensure optimal utilization of the campus electrical distribution system and continued reliability of the system and its operation, a power study is ongoing. The results of this study will be the foundation for operation of the system and future planning associated with the system.

- Pursuit of a Power Study as a system management tool. Data provided from the use of Smart Energy Meters mentioned in the energy management section below will be used to support and enhance the validity of the information.

  - Purposes of the study
    - Coordinate future energy requirements with serving utility to ensure continued adequate capacity.
    - Develop a computerized system model.
    - Determine long-range system requirements.
    - Provide recommendations for system modifications and operation.
    - Develop an Electrical System Crisis Management Plan.
  - Computerized system model capabilities
- Model actual system conditions based on current metered data.
- Model anticipated growth based on master planning.
- Model scheduled outages to plan minimal disruption.
- Model unscheduled outages.
- Model proposed system modifications.

- Development of a Crisis Management Plan based on system modeling
  - Model scenarios of unscheduled outages of circuits, switches, and substations at various times of the year.
  - Determine and record mitigation plans for outages.

The University is continually working with APC to identify collaborative research opportunities to further work in these areas.

**Campus Lighting**

Campus Lighting is continually being upgraded and improved through a comprehensive approach that integrates several different execution channels including distinct projects, incorporation into adjacent or related projects when possible, and continuous monitoring of the existing inventory in conjunction with external lighting providers such as Alabama Power and the City of Tuscaloosa. Existing lighting and lighting design standards are also being evaluated in compliance with Crime Prevention Through Environmental Design (CPTED) standards and principles. Monitoring of lights that have burned out has been improved through the development of a part time position to survey campus and report lights out and the engagement of University partners including Transportation Services and Security Resources to supplement reporting.

Following extensive research, a pilot project has been included with the construction of the new Riverside Parking Deck to utilize and test state of the art, radio controlled LED lighting fixtures. These fixtures allow for wireless control and monitoring remotely, including automatic notification of lights out and provide extensive capabilities for energy control, integration into the emergency mass notification system, and self-reporting of failing components. Based on the results of this pilot project, pole mounted fixtures utilizing this technology can be incrementally installed to replace older fixtures and the system and fixtures can be incorporated as part of Capital Projects. Additionally, the system “piggy backs” over the University’s new radio monitored utility monitoring system which greatly minimizes the implementation cost of both systems.

A survey of Campus night time illumination was compiled in 2008, and as a result of the survey, thirteen capital projects and over thirteen in-house projects were identified (Annotation 10). These projects include both conversion of the fixture to the University standard and improving the overall distribution and quantity of light. The initial estimate for these capital projects exceeded $6M and is being funded over several years through the Annual Deferred Maintenance plan and is being executed accordingly. This report was supplemented with a 2012 assessment of non-standard fixtures on Campus which provides additional information to help prioritize lighting projects (Annotation 11). Current needs include streetlights, pedestrian lights, and a traffic signal upgrade.
In the main campus area, the incremental installation of new lighting fixtures and the upgrade of existing lighting fixtures to the UA standard at a total estimated cost of $5.5 million.

Lighting needs on the Bryce campus are proposed for implementation as follows (Annotation 12):
- UA standard streetlights are proposed for the existing streets to remain on the south side of the campus at an estimated cost of $1.2 million.
- UA standard pedestrian pole lights are proposed for existing and new walkways on the south side of the campus at an estimated cost of $1.6 million.
- Lighting for in the upcoming ATRIPS roadway will be funded through that project.
- Lighting for the north side of the campus will be incrementally installed through construction projects that are part of the development of that area.

The traffic signal at the intersection of University Boulevard and Fifth Avenue is proposed for upgrade to a UA standard traffic signal at an estimated cost of $275,000.

UA is continually coordinating with APCO for the retirement of existing wood pole mounted fixtures as strategic overhead retirement is taking place. Recent examples include:
- Colonial Drive
- University Boulevard from Hackberry to Stadium Drive
- University east of 2nd Avenue
- Hackberry between the Rail Road tracks and 12th Street

Sanitary Sewer

The campus sanitary sewer system is primarily owned by the University. The City of Tuscaloosa has several large mains that the University connects to at different points. The sanitary sewer system in the core of the campus was installed after World War II; therefore, an extensive testing and evaluation program for the sewer system was completed in 2009 and updated in 2013 (Annotation 13). The deferred maintenance funds initially allocated for the cost of the study and the first phase of corrective work was $559,000. The University also submitted a competitive grant proposal to the State Department of Education to fund the study and was subsequently awarded funding. The study was completed during the summer of 2009, complete with the assessment of the University core sanitary sewer system composed of approximately 20 miles of sewer lines. The assessment included an evaluation of the sewer condition and adequacy to handle current sanitary sewer loads. From this assessment, a prioritized list of sewer segments that require attention and the measures needed to bring these segments up to the capacity and condition to provide reliable service was developed.

Also included in the report were budget costs for the repairs, refurbishment, or replacement for these segments. Phase I bid package was compiled using these estimates to select sanitary sewer segments for repair or replacement based on the remaining funds from the study, plus available deferred maintenance funds totaling $568,460. This work was bid and work was completed during
the summer of 2010. Phase II, in the area of tenHoor, was completed during the summer and fall of 2011 at a cost of $106,954. Phase III, summer 2012, replacing the sanitary sewer in Fraternity Lane and partial replacement in 6th Avenue during the 6th Avenue roadway replacement, had a total project cost of $327,840. Phase IV, during the summer of 2013, entailed replacement of sanitary sewer from west of Smith Hall to a point in Margaret Drive and removing the sewer main from passing under Smith Hall and slip lining the remainder of 6th Avenue and partial slip lining at the south end of Bryant Denny Stadium, for a total project cost of $294,563. In anticipation of the 9th Avenue replacement in the summer of 2016, deferred maintenance funds will be used to replace the sanitary sewer manhole between Carmichael and Graves Hall for an estimated $1.2 million.

The total estimated costs for all identified deficiencies and required upgrades to support the Master Plan is $6,802,000 (including the current project work), which will result in a sanitary sewer system capable of handling sanitary sewer loads without failures or problems previously associated with an aged and deteriorated system.

The acquisition of the Peter Bryce campus will require significant improvements to the sanitary sewer infrastructure. The existing Bryce sanitary sewer systems exhibit signs of deterioration due to age and lack of maintenance needs to be replaced. New underground sanitary sewer piping systems will be installed as part of the overall Bryce Infrastructure Plan (Annotation 14). Phase I funding, in the amount of $1,000,000 is included in Tab 4 of the June 2013 Annual Capital Development Plan and is projected to be included in the 2014 Bond Issue.

**Storm Sewer and General Drainage**

The campus storm sewer system is owned, almost in its entirety by the University and all cost of ownership, including managing, building, operating and maintaining the system are assumed by the University. Therefore, it is in the best interest of the University to plan and manage the system to maximize resources and to provide the best long term cost of ownership, which at times means providing capacity that is beyond immediate needs, but does recognize the long term Master Plan.

In an effort to plan and manage the Storm Sewer System, a Storm Water Inspection Program is currently being finalized. This program will establish inspection policy and procedures that will be instrumental in protecting the assets of the University. One component of this program is a Geographic Information System (GIS) that will help track the deficient areas of the system and levels of inspection needed for each part of the system. Over that last couple of years, Dr. Andrew Graettinger along with several graduate students and the University Surveyors have compiled preliminary GIS of the system along with inspections and identification of deficiencies. This system will be updated in the future as inspections are completed.

It is also appropriate to note that the University holds our own Municipal Separate Storm Sewer System (MS4) Permit (Annotation 15) for the discharge of stormwater into local waterbodies. Therefore, the University must operate the system in a manner that meets or exceeds Federal Regulatory requirements. One of the requirements is stormwater quality and the University is currently requiring Vortex at all new parking lots and major street inlets to remove the finer sediment, oil, and debris. Also, the storm system drains directly to the Black Warrior River at several
points which provides for enhanced observation from concerned parties which again reinforces the need for the University to aggressively manage the system including during construction operations.

The existing storm sewer system has constraints that need to be addressed so that campus growth and development are not impeded. The primary issues are the lack of storm sewer in certain areas, which leads to localized flooding, the capacity, condition, and configuration of the existing system, and the capacity of the discharge points from campus to accept additional flow. Areas of the system also run under several major buildings on campus and represent a concern due to the age of the system and the potential for consequential damage if they were to fail. Also, the existing capacity does not support further development as open, pervious spaces are transitioned to hardscape or buildings. This issue is being addressed through the development of a plan to replace existing components and to provide new capacity through the development of new outlets to the river.

The existing drainage basins and their points of discharge and associated issues are as follows:

- **East Campus and Southeast Quadrant of the Peter Bryce Campus**

  New storm lines to this area to support development along 5th Avenue were provided earlier in the decade, but the discharge point is located on the 19 acres acquired by the University for parking in 2007, which served as a detention area due to its low lying nature. This area drains to the east through a pipe under McFarland Boulevard, through two ponds on 26.02 acres of property that the University recently acquired and finally through an aged and deteriorating pipe under Jack Warner Parkway adjacent to the Bluffs apartments.

  The pipe under McFarland Boulevard is too small for additional flow and the potential impact to the deteriorated pipe under Jack Warner Parkway constrain additional development of the 19 acres of parking until they can be addressed.

  The 26.02 acres of land that the University recently purchased contains two ponds that must be reconstructed along with possible replacement of the pipe under McFarland Boulevard for detention in order to develop the additional parking on the 19 acre track. These ponds would also be used to control discharge under Jack Warner. The total estimated cost for this project, including the storm sewer work for the additional development of the 19 acres of parking, is $2,050,000 (Annotation 16).

  Additionally, there is a culvert located under the Bryce entrance off of 5th Avenue that is completely clogged. This culvert is approximately 150 feet north of the current end of 5th Avenue and drains the area adjacent to the Alice Kidd Buildings and Women’s Admission. To eliminate flooding issues at the northern end of 5th Avenue this pipe will need to be replaced. Also, this pipe needs to be extended southwestward along the northern edge of the northeast commuter parking lot and then northwestward to the Women’s Admission building. This project is estimated to cost $300,000. Development and enhancement of the system in this area will also facilitate the development of the southeast quadrant of the Bryce campus as this area drains to that basin (Annotation 17).
The open ditch between University Ave and Fourth Street and east of Kappa Alpha has been studied in order to determine the feasibility of eliminating the ditch. (Annotation 18) This study proposed construction of a 12’x5’ box culvert to route the water underground and the first section has been installed in front of the Phi Kappa Alpha Fraternity. The design and construction of this section of culvert will have to be completed in order to have a developable site. This balance of project is estimated to cost $1,000,000.

- Southwest quadrant of the Bryce Campus & East Central campus west of the Rec fields and north of University Boulevard and south along 2nd Avenue to the Railroad tracks

New storm lines installed around 2004 corrected localized flooding issues in the area, but an undersized culvert to a restricted City of Tuscaloosa drainage area (Cribbs Mill Creek Tributary) south of campus challenges future development. A study identified an optimal corrective action which includes the use of the southwest portion of the Bryce property as detention, which is the current condition, and route the discharge under Campus Drive into a detention pond just north of 4th Street. There is currently a detention pond located just north of 4th Street but the discharge from the Bryce property bypasses the existing pond. The size of the existing pond will have to be increased in size when the Bryce property discharge is routed through it (Annotation 19).

These improvements will not only facilitate development of campus, but also future development of the Peter Bryce campus as the southwest quadrant of that campus actually flows towards the areas described (Annotation 17). Managing this flow through active detention will make the issue of the current piping to the south manageable and provide for the conversion of additional areas and the elimination of a FEMA flood zone at 4th Street and 2nd Avenue.

- Northwest quadrant of the Peter Bryce Campus and the Riverside and Presidential Areas

A new storm line to the north is being constructed in Phases (Annotation 20). Phase I, which is complete, began at the Black Warrior River and ran North along the east side of Old Hackberry Lane to a point between Clara Verner Towers and The Highlands on Hackberry. The line then heads eastward to its current ending point, which is approximately 200 feet east of Old Hackberry Lane. The total cost of this phase was approximately $2,000,000.

Phase II of this project will begin where Phase I ended between Clara Verner Towers and The Highlands on Hackberry and continue running east and then south along the former UA/Bryce property line to a point west of the main Bryce building. This line will be installed as part of the 5th Avenue/Bryce Loop ATRIP project with most of the cost paid with ATRIP funds; however, this line will be upsized to carry additional flows other than the roadway which will require approximately $450,000 of additional cost.

This line will also be sized and located so as to facilitate future development to the Northern quadrant of the Peter Bryce campus.
**Note:** There is $5,000,000 for storm sewer included in Bryce Infrastructure, as included in Tab 4 of the June 2013 Annual Capital Development Plan and which is projected to be included in the 2014 Bond Issue, to address many of the items set out above (Annotation 16). This, in conjunction with components addressed in Capital Projects, will allow the University to continue to make significant progress towards this issue.

- **West Campus**

  Storm lines in this area are either aged, not routed in an optimal manner, run under existing facilities or are nonexistent. Currently several areas have severe localized flooding including, but not limited to, 6th Avenue between Burke and Parham, the Design House, Tutwiler, and Bryant Drive at 10th Avenue (Annotation 21).

  Some improvement has been made in this area through the use of in pipe (large diameter) detention, specifically in conjunction with the Magnolia and Barnwell lot sorority development. This work has provided storage capacity which then minimizes the discharge to critical areas such as Bryant and 10th/Colonial. While it does not solve the problem, it is an important incremental step to address the issue.

  An enhanced discharge point to the river and associated lateral piping must be developed to eliminate these issues and a preliminary plan has been developed (Annotation 22).

- **Note:** 40% of the drainage basin area is City of Tuscaloosa and therefore it has been proposed that the City participate with a pro-rata share. Grants have been submitted for this project, but none have been awarded to date (Annotation 23).

  The estimated cost of the West Campus storm drainage project is projected at $24,532,429 as reflected in Tab 2 of the June 2013 Annual Capital Development Plan.

  Additionally, there are some drainage issues on the quad which are due to the lack of fall across the quad. These conditions do not promote a healthy landscape environment and create large pools of standing water that diminish the pedestrian experience. Currently there is a storm sewer line that runs east to west across the quad just south of the library that will be used as the main line and smaller laterals connected to this line to other areas of the quad. There is also a master sidewalk improvement plan for the quad which will need to be coordinated with this drainage plan (Annotation 46). Based on the preliminary sidewalk layout the estimated cost for the quad drainage improvement is $400,000.

There are several areas, listed as follows, of general drainage that are of concern, particularly in major pedestrian pathways and preliminary plans have been made to address these concerns.

- Colonial and University, south side of intersection
- Campus Drive at pedestrian crossing to ten Hoor surface lot
- 6th Avenue between University and Bryant
- Bryant Drive and 10th Avenue, Southeast Corner (City of Tuscaloosa issue)
Implementation of the overall program will be critical to the continued development of several areas of campus including, but not limited to, Bryce, east campus between 5th Avenue and Fraternity Lane, and the central core bounded by University, 10th Street, Colonial, and Hackberry.

The University has also researched active water retention as a way of meeting green and sustainable building principles and addressing some of the issues at hand, but due to real estate constraints of the storage required and the economics and the robust nature of the City of Tuscaloosa’s water supply system, this approach is neither economically feasible nor readily achievable.

Finally, more than any other system, certain aspects of the Storm Water system are beyond the control of the University or within normal economic means to plan for. Generally accepted design standards for piping systems are 25 year events and 100 year events for detention basins. Weather Events beyond these design standards, which will occur at some point, will result in either localized or widespread flooding. Areas of particular concern are the intersection of Bryant and 10th Avenue/Colonial, Tutwiler, Coleman Coliseum parking lot and 2nd Avenue, Marrs Spring and Campus Drive and 6th and 9th Avenue on the Quad.

**Central Thermal Energy Systems**

Providing an efficient, reliable, and comfortable indoor air environment, which also supports and enhances teaching, learning and research, expansion of the existing Shelby Hall and East Quad Central Energy Plants with the associated distribution systems is important and included in the Campus Master Plan (Annotation 24). The University employs two (2) primary systems to provide thermal energy to buildings: central plants that serve multiple buildings or individual systems per building. Principally, central energy plants are more efficient and reliable to operate, and the University will continue to expand the existing systems.

The University has cataloged and documented its current equipment to facilitate the decision making related to thermal energy equipment (Annotation 25). This work includes gathering all relevant information on equipment including capacity, voltage, year of manufacture, etc. Having this information at hand ensures that any strategic redeployment or retirement is made from an informed perspective (Annotation 26).

Within the buildings, the University again operates two different types of systems known as a four pipe or two pipe systems. A four pipe system allows for the circulation of both hot and cold water while a two pipe only allows for circulation of either one or the other at a time. Older buildings typically have the two pipe system, which does not allow for adequate dehumidification or a wide range of temperature control. This type of system is especially uncomfortable during the late fall or early spring when there are wide temperature swings. The campus steam system does not easily allow for shutting down the heat, which leads to uncomfortable classrooms or offices on warm days. The University has been converting buildings as either total renovations or on the system level. Conversion to a Central Energy Plant system also facilitates the conversion to four pipe systems.

Central energy plant feasibility is enhanced and supported as the mechanical systems for numerous buildings reach the end of their normal service life requiring replacement of boilers and chillers, and mechanical systems for new buildings are launched. Instead of replacing the inefficient systems
independently, existing central energy plants are being expanded and new ones planned that can be easily expanded as demand increases.

Construction and expansion of Central Energy Plants provide these benefits:

- Reduced energy cost resulting from larger, more efficient chillers and reduced system electricity consumption at part load
- Provides more efficiency than air cooled chillers
- Provides the ability to reduce peak demand and associated charges
- Reduces electrical losses by eliminating a transformer per building
- Provides future construction cost savings by eliminating individual building heating and cooling equipment
- Builds electricity reduction
- Provides ability to diversify loads in central plant
- Reduces building maintenance cost
- Provides system wide redundancy instead of individual, non-connected systems
- Reduces noise and vibration from multiple cooling towers, chillers, pumps and fans currently for each building, which will make significant steps towards providing an exterior environment free of mechanical and electrical noise
- Enhances the visual appearance of campus/buildings by eliminating the equipment and fenced areas around each building
- Releases real estate required for building equipment for alternative uses
- Facilitates achievement of sustainability requirements and goals

The implementation of the Central Thermal Energy System also reflects a strategic approach in two important areas. One approach ensures the reliability to deliver thermal energy to campus by diversifying the supply. This process is accomplished by having multiple plants, but also having plants that are fed by different electrical substations. Should there be an issue with one of the primary feeds to campus, the University should still be able to provide thermal energy due to this diversity in both plants and the feeds to the plants. Depending on climatic conditions, a prioritization of the loads may have to take place, but the University will still be able to circulate thermal energy to the buildings.

The second strategic aspect is the redeployment of chillers and boilers from buildings that are connected to the system to replace aged units at buildings away from the system. This process is currently underway, and there are further plans for equipment as additional connections are made. Examples of this include redeployment of the Bevill, Russell, Bryant Academic, Moore and Little chillers to replace units that are problematic or aged.

In order to support the planning and management of the current system, including the incorporation of the Peter Bryce Campus, the University retained Burns and McDonnell to provide an analysis of the Campus system (Annotation 27). While this report provided a documented framework for the operation and planning of the system, recommendations were also provided for system improvements and ways to optimize central plant and thermal distribution efficiency.
The master plan for the core campus district heating and cooling plants has been incorporated into the University’s overall campus Master Plan (Annotation 28). Two significant milestones were completed in 2012: equipment build-out of the Shelby Hall plant and construction of the East Quad Energy Plant (EQEP) and associated distribution piping. With the EQEP on-line, thermal water is available from the Bevill Building, south along Hackberry, and across University Boulevard to 6th Street/Magnolia Drive. Bevill, the SEC complex, H.M. Comer, Bryant Academic, Gordon Palmer, Russell Hall, Moore Hall, Little Hall, President’s Masion, and the four new Sororities on Magnolia Drive are currently served from this distribution system.

The master plan includes the extension of the EQEP distribution system and current plans are in process to serve Ferguson Center, the new Fresh Foods on Hackberry, and NOAA, and the extension to Biology/Rogers Library is included in the Biology Renovation Capital Project that is anticipated to be funded in the 2014 Bond Issue. Facilities are planned to be connected and their valved connections were installed in previous phases, along with associated cost are as follow:

- Nott Hall/Gallalee Hall
- Lloyd Hall
- Mary Harmon Bryant
- Smith and WB Jones
- Associated Chiller Capacity

The projected cost for these additions is approximately $4,000,000. Costs for additions to the system are able to be minimized as the EQEP footprint included space for the necessary equipment.

Future plans to extend thermal piping and connect the remaining buildings adjacent to the distribution system (buildings along Hackberry, Woods Quad, and Mary Burke/Martha Parham, and east along Magnolia) and the associated additional plant capacity are continually being strategically developed and evaluated (Annotation 29). The interconnection of the Shelby and EQEP plants allows built-in redundancy and reliability, which will ensure the reliable indoor environment.

The third core campus energy plant will be located in the existing B.B. Comer steam plant, and its distribution of chilled water and hot water will be extended south and connect to the EQEP distribution, and north then east to the current Shelby distribution system, completing a loop around the core campus. The cost for the B.B. Comer plant and distribution piping has been set at approximately $32,000,000 (2013 Dollars) and completes the core campus energy heating and cooling distribution.

NOTE: An important component of this project would be the interconnection to the existing east system. This connection point is proposed to be located just south of the Ferguson addition currently under construction and cost and future disruption could be greatly minimized by installing the piping necessary to accomplish this concurrent with the Addition construction. Currently funding has not been provided for this tie point at an estimated cost of $780,000.
As part of the Burns & McDonnell analysis (Annotation 27), the impact of the acquisition of the Bryce campus was incorporated into the campus thermal energy master plan. The finalization of this master plan is underway, with the following anticipated features:

- The construction of an additional Bryce/East campus thermal energy plant. This plant will serve new and existing Bryce campus buildings either in a standalone or centrally connected manner depending on the density of load and the economic payback of connection to the main system.
- This plant will be sited to allow potential expansion of piping systems south along 5th Avenue to University Boulevard, with connections to existing and planned facilities.
- Initial plant and thermal distribution cost is estimated to be $26,500,000 (2013 Dollars).

The existing University steam system has begun to exhibit signs of deterioration consistent with its age. The average age of the steam system is approximately 35 years old, and the average expected service life for steam piping is 35 to 50 years and 20 to 25 for condensate piping. The estimated cost of replacement for the distribution system is in excess of $15 Million. Implementation of the thermal energy plants will eliminate the need for the campus steam distribution to campus buildings and allow it to be abandoned while providing building heat through the campus hot water and chilled water distribution. This will eliminate expensive maintenance and repair costs for the aging steam and condensate return system. The hot water distribution is not corrosive like steam and will not require maintenance as a steam system does. The steam plant boilers can continue to be used by use of steam to hot water converters and provide hot water to the campus distribution system.

**Energy Management**

New facilities, such as the South Engineering Research Center, North Engineering Research Center, Athletic Strength and Conditioning Facility, Digital Media Center, the Presidential Village Residential Community, the new Fresh Foods on Hackberry, new Greek Houses, and UA’s expansion into Bryce, coupled with the increase in enrollment and research will result in escalating utility costs. In 2005, the University’s electric, natural gas, and water bills totaled $10.5M and by fiscal year 2013, the total had increased to $21.6M. The primary factors for this escalation in energy costs were the construction of additional buildings, an increase in the number of students enrolled, an increase in the hours of operation of existing buildings on campus, and an increase in the utility rates of more than 41%. The campus wide energy use per square foot actually went down during this time period, and The University of Alabama campus currently uses 28% less energy per square foot of building space than the national average. The energy costs will continue to increase as we increase student enrollment, add new facilities, and increase the operating schedules for existing buildings. The estimated future utilities cost is $22.5M for fiscal year 2014 and $23.8M for fiscal year 2015.

In fiscal year 2006-2007, the University initiated hedging of natural gas. Hedging allows the University to lock into a fixed rate for a year and purchase 80% of its natural gas consumption at the fixed amount. The result is a more consistent budgeting process, avoiding an erratic market for a required commodity. We expect to continue to hedge natural gas prices in the future.

Concerted energy reduction audits and assessments are constantly conducted, and potential projects are reviewed throughout the year that will directly assist in reducing consumption of all energy and
natural resources. Current campus strategy and goals are to reduce energy consumption by 2% per square foot of building space per year. Future energy reduction projects include:

- The campus building automation system/energy management system (Niagara) and integrated lighting control systems are being implemented in new construction projects to improve the overall energy efficiency of the buildings and minimize the impact to existing budgets. Niagara is being retrofitted into additional existing buildings to reduce energy consumption and improve building comfort levels.
- Improved automated controls are being installed on boilers and chillers to increase operating efficiencies and reduce utility costs.
- LED and other styles of energy efficient lighting are being installed across campus.
- The expansion of the East Quad Energy Plant will allow for the continued removal of old inefficient chillers and boilers, significantly reducing utility and operational costs.
- The implementation of a building retro-commission program to ensure the older buildings on campus and their mechanical/electrical systems are optimized and interact efficiently to meet the building operational needs.
- New electrical and natural gas “smart meters” will be installed on campus that will allow continuous real time monitoring of energy usage. This will allow UA to accurately track actual energy usage by building, develop specific business case energy saving projects, and subsequently validate the amount of savings realized.

The university is in the process of implementing an enhanced water treatment program for the campus HVAC systems that combines computerized water treatment equipment and technologically advanced chemicals. This new water treatment program will result in increased efficiency, lower utility costs, and extended equipment life of UA’s HVAC equipment.

**Natural Gas**

Natural gas to campus is supplied from both Alagasco and the UA natural gas distribution system (Annotation 30). The total capacities of both systems are currently adequate for planned campus growth in the core campus areas, but will require adjustments and realignment on a per project basis.

Potential plans for the Tutwiler area, the construction of six new Sorority Houses, the renovation/expansion of several Sorority Houses, and the long term plan to provide all Sorority Houses with natural gas from the UA distribution system will necessitate modification of the UA natural gas distribution system. The existing 4” main supply line also serves Mary Burke, Martha Parham, Barnwell and Tutwiler. In order to ensure adequate supply, a new 6” natural gas supply line will be installed from the UA Natatorium Gas Substation to provide the increased natural gas requirements for this area of campus (Annotation 31). Several smaller branch supply lines are also identified to add redundancy and connect additional buildings to UA natural gas. The project is estimated to cost $455,000.

The acquisition of the Bryce campus will require significant improvements to the natural gas infrastructure on the Bryce property. The existing Bryce underground natural gas piping systems exhibit signs of deterioration due to age and will need to be replaced. A new underground natural gas piping system will be installed as part of the overall Bryce Infrastructure Plan. This new natural
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Gas system will be connected to and become part of the UA natural gas distribution system (Annotation 32).

**Potable Water**

Potable water to the University is supplied from the City of Tuscaloosa Water and Sewer Department. The total capacity of this system is adequate for planned campus growth in the core campus areas, but will require adjustments and realignment on a per project basis.

The acquisition of the Peter Bryce campus will require significant improvements to the potable water infrastructure. The existing Bryce potable water systems exhibit signs of deterioration and do not have adequate capacity for current fire water requirements due to age and needs to be replaced. New underground potable water piping systems will be installed as part of the overall Bryce Infrastructure Plan. Phase II for this work is included as part of the Bryce Infrastructure included in Tab 4 of the FY 13/14 Annual Capital Development Plan which in anticipated to be funded Summer of 2014. This new potable water system will be connected to and become part of the City of Tuscaloosa Water and Sewer Department system (Annotation 33).

**Road Network and Parking**

The Campus road network (Annotation 34) is being expanded consistent with the Master Plan, in consideration of the Bryce Campus acquisition and in coordination City of Tuscaloosa and ALDOT plans. The University also works to incrementally implement Master Plan goals in the design and planning of current projects. A relevant example of this would be the current north terminus of 5th Avenue at the Bryce property and the spacing of the lights along the east end of Campus Drive both of which will facilitate the future projects and to help minimize the overall cost to the University. Recent examples of expansion of the Campus Road Network include the Hackberry relocation, the new Marrs Spring extension, and the Magnolia Drive construction. These projects not only enhance traffic flow by routing traffic to the perimeter of campus, but also enhance and facilitate the pedestrian experience.

Traffic calming controls and devices are being incorporated to improve traffic flow and pedestrian safety, and several traffic count studies are underway to evaluate options to alleviate traffic issues on campus. The University has also partnered with the City on several traffic signal replacement projects to enhance the location, functionality and aesthetic of the signals on Campus.

Additionally, roads are being structurally designed and turning and curve layouts revamped to accept the increased weight, larger turning radii required and frequency of traffic, specifically with respect to buses.

A road evaluation program is also in progress to evaluate the existing condition of the roadways so that a long term plan for maintenance and replacement can be developed and the University is working with transit system drivers to identify physical infrastructure items that can be modified to improve route times. As the University is responsible for all cost of building, operating and
maintaining roadways on Campus continuous attentiveness to roadway performance and conditions is necessary to help minimize cost and provide for the best long term cost of ownership.

The disruption these projects cause is a challenge and the University has implemented a road closure web site to help better communicate these projects to the Campus community and visitors. In addition, notice of the projects is posted in the Crimson White and in Dialogue and extensive signage is posted to help minimize any inconvenience (Annotation 35).

Projects in Planning; Long & Short Term:

- **Realign the Marrs Spring/Campus Drive intersection**- This project cannot begin until a suitable location for the Grounds Department is identified.

- **Remove Capstone Drive Parking and provide dedicated Transit and service lanes**- This project will take place in coordination with the Gorgas Library Addition and the Academic Honors Plaza both of which are currently in design and anticipated to begin in December 2014.

- **Planning is taking place for the Peter Bryce Campus including the 5th Avenue Extension** that includes a fully signaled connection to Jack Warner Parkway and the main access corridor will provide a link with Campus Drive and interconnect the new area to the main campus (Annotation 36).
  - The 5th Street Avenue project is budgeted at $26 million and will be funded with ATRIP and UA Bonds.
  - Other projects for the Peter Bryce Campus include the repair of existing roads and the accommodation of University traffic including requirements for Transit (Annotation 37). Included in this work will be the removal of the Bryce entrance columns which will facilitate traffic flow due to the constriction that currently exist.

- **Realign Campus Drive at 7th Avenue** (Annotation 38)
  - Better pedestrian control in the area as the current oblique alignment does not correspond to pedestrian patterns
  - Provide for better spacing and access to the Ferguson Loading Dock as the current layout restricts traffic when vehicles are attempting to access the dock and this will provide more space for those turning and queuing.
  - Better alignment with the west access point to the Shelby Quad which will enhance pedestrian access in the area and provide for a dynamic view opportunity coming up Campus Drive into the Shelby Quad.

- **Expansion of the Northeast Commuter lot.** Recent property acquisitions will allow this lot to be expanded by almost 600 spaces. The area is currently a detention basin and that will be able to be relocated to the new property (Annotation 39).

- **Planning and design is currently in progress on the South Barnwell Parking Deck** and funding is anticipated in the 2014 Bond Issue (Annotation 40).
  - This project will provide additional parking for South Campus faculty, staff and students and is included as part of the Campus Master Plan.
  - This project has been coordinated with recent infrastructure work in the area which will help minimize any necessary rework or relocations and thus cost too.

- **Long term plans include a parking deck** in the Moody Music lot east of 2nd Avenue. This lot will fulfill the needs of several programs in the area and provide for a better experience for the many visitors to this part of Campus.
Realignment of 2nd Avenue from 4th Street to Campus Drive (Annotation 41)
- This project will minimize traffic through the Residential Area and provide a more direct route to the Peter Bryce Campus.
- This project will be coordinated with Storm Sewer projects in the area (Annotation 19).

Annual Maintenance and Repairs
- Funded by Transportation Services as their operating budget allows.
- This work is coordinated with capital and deferred maintenance projects to minimize potential rework.

Pedestrian Enhancements

The Campus is constantly being surveyed for potential enhancements for making the pedestrian experience easier, enjoyable, safer and inviting. The Master Plan is used as a guide to fully develop the look and feel of the pedestrian experience at The University of Alabama. This planning defines the hardscape elements such as sidewalks, open air structures, benches and other site appurtenances. Examples include the Hackberry Park, Enlarged Pedestrian Bridge at Riverside, sidewalk enhancements and the Peter Bryce Park enhancements.

A main concern is the access and safety of the pedestrians. Staff is constantly checking and eliminating tripping hazards around the entire campus. A recent survey was conducted around the Gorgas Library. Numerous trip hazards were identified and eliminated using a new cutting technique. This technique trims the trip hazard in a manner to create a new code complaint, sloping section in the sidewalk.

The pedestrian core and the main focal area of campus is The Quad. The Campus Master Plan includes a layout for new and renovated sidewalks that will enhance the flow and usage of the area. Many of the walks are designed to be 12 feet wide to accommodate two-way traffic as pedestrian and bicycle flow increases. Additionally, the Gorgas Library Expansion project will require adjustments to the walkways as access points into the building are modified. (Annotation 42)

As student, faculty, staff and the public actively travel around the campus, new areas are identified as common routes. Typically the landscape shows signs of wear, but we also survey direct lines of travel, which identifies new locations for sidewalks. University design guidelines support the construction and design of sidewalks ranging in size from common 4 foot wide to a multi-use 12 foot wide design. The annual budget is $50,000 for general repairs is funded through Annual Deferred Maintenance.

The on-campus student population is expanding and the pedestrian traffic from north campus has been increasing with Presidential Phase I opening in 2012 and Presidential Phase II opening in 2014. A primary access route to the main campus is the pedestrian bridge over Hackberry. A recently completed project was to replace this 6 foot wide bridge with a 12 foot wide bridge to accommodate the increased demand.

To help pedestrian flow from Presidential, the Riverside North Lobby enhancements project will open the lobby to pedestrian traffic while maintaining secure access points to that building. This
creates a path that improves pedestrian flow, shortens the route, and connects directly to the Riverside Pedestrian Bridge. Estimated cost for this project is $1,200,000 and the project is funded by HRC (Annotation 43).

A new Pedestrian Bridge over Jack Warner Parkway is being planned to provide safe connectivity to the core of campus which will allow for the expansion of Manderson Landing, Warrior River Walk and the new Rowing Facility, therefore a new Pedestrian Bridge over Jack Warner Parkway is being planned. Jack Warner Parkway is a four lane divided highway that borders the north edge of campus. The Jack Warner Parkway Pedestrian Bridge is an important project which addresses several key issues (Annotation 44):

- Improves pedestrian safety at Jack Warner Parkway and Hackberry and improves traffic flow by minimizing pedestrian and vehicular interaction
- Improves access to both the River Walk and Manderson landing for students and faculty
- Improves athlete access between the new Rowing Facility at Manderson Landing and their training facilities in the Student Center at Presidential Village
- Budgeted cost of the project is $2,220,000

The Kilgore Plaza featuring the Anna Hunter Pavilion is currently being designed and is located next to the Science and Engineering Library at the former Kilgore site (Annotation 45). Several of the plaza features are as follows:

- Open green space for outdoor activities
- Shaded and landscaped areas that have access to tables and seating
- A covered pavilion with seating
- Budget cost of the project is $400,000

The Peter Bryce Campus requires additional pedestrian needs to connect and incorporate this area into the fabric of camps. The master plans for the area include the following:

- Demolition of the existing sidewalks that do not meet UA Standards or are located in areas that are not conducive to constant traffic.
- Construction of new sidewalks of the size required to maintain increased traffic flow as building become active for UA operations.
- The development of Bryce Park located just north of Campus Drive on each side of the main entrance drive
- Budget cost for these sidewalk improvements are $1,600,000.
- The plan to fully develop Bryce Park to include landscaping, irrigation, lighting, security blue phones, and other features has a budgeted cost of $5,500,000 (includes sidewalk budget above) (Annotation 46).

The East McFarland Property is 26.02 acres located east of the Bryce Campus. The property has the potential to be developed into many uses that allow UA to develop existing property to its highest and best use and will allow students and faculty to explore a wooded, natural, environment within walking distance of the main campus. The proposed Master Plan Amendment leaves approximately 60% of the area in its natural state. Additional uses of the site are as follows (Annotation 47):
University Recreation has plans to include rope courses, natural trails and bike trails. Storm Drainage detention would re-create the ponds that were once located on the site. These features will also be used to enhance the pedestrian experience.

**Work Completed**

During the past Fiscal Year, the University has achieved major milestones towards incorporating strategic goals and addressing concerns and issues set forth in this report. Completion of this work both eliminates numerous liabilities and ensures the long term efficient operation of the campus. The status of work completed, projects in design and projects under construction are documented in the Facilities Investment Report (Annotation 48).

**Risk Management Measures and Protocols**

An important aspect of managing the systems covered in this report is to document, protect and inspect them at relevant intervals. As the system grows and changes, this becomes ever more important, and the University has put in place numerous practices to execute this on a consistent basis.

These include, but are not limited to, the following items:

- Line locate requirement and procedure for any excavation work on campus
  - The 811 system currently contacts the University to locate UA utilities when either UA contracted or external contractors work either adjacent to or on campus.
- Permissive Use Agreements for External Contractors
  - As several Right of Ways and Easements exist on campus that allow access to the campus by external contractors doing work on the behalf of external entities, the University has put in place the requirement for these contractors to execute a Permissive Use Agreement that sets forth measures that must be complied with on campus.
- Quarterly Reviews of electrical and thermal energy system actual performance and proposed changes are performed and include the following:
  - The actual demand is reviewed to ensure that base lines are still relevant and to gauge the validity of past assumptions to ensure that the system is operated at optimal levels.
    - Evaluate connected vs actual diversified loads
    - Review peak demand baselines
    - Evaluate unusual trends within the system
  - Proposed changes to campus and the impact of their loads on the systems are considered.
- Mapping of Utilities to central data base
  - This is a continuous process that incorporates data from numerous sources to ensure the most accurate campus map possible.
    - Location of utilities uncovered during the course of work
    - Location of utilities being installed
- Incorporation of utility provider information into the system as available
- Review of campus maps with long term knowledge holders
  - Long term goal is to integrate UA’s current data into a GIS platform where data and attributes can be related to physical assets.
  - A utility marking program has been put in place whereby brass markers are placed, located, and logged for utilities that run under sidewalks, curbs, etc. to facilitate future locating

- Storm Water System Inspection Program
  - Currently, the University is currently developing a program to periodically inspect all main storm lines on campus as many of them run under buildings and major structures.
  - Previous inspections have been held, but a formalized system was not put in place.
  - System will be based on visual inspection where possible and video elsewhere.
  - System will be in place by December 2013