

**2012 Utility Infrastructure Upgrade  
Program Report**



**April, 2011  
(Amended March, 2012)**

## **Executive Summary**

This Program Report identifies the scope of work for the 2012 Utility Infrastructure Upgrade Project consisting of five campus utilities with related infrastructure needs listed. They are campus distribution systems for Electrical, Potable Water, Stormwater, Sanitary Sewer, and Telecommunication.

Results of the 2005 Master Plan are used as the starting point in evaluating what the current infrastructure is as of August, 2010. Projected growth of the campus is based on the 2010 Campus Master Plan being completed containing Phase I – Facilities Completed or Under Construction 2005 to Present, Phase II – Short Term Designate Projects, and Phase III – Long Term Recommended Projects. Per the 2012 report, the campus size increases from a Phase I of 1,741,216 SF, to a Phase II of 3,856,657 SF, and to a Phase III of 5,395,988 SF.

During recent months, work sessions were conducted with University facility and operations staff to identify changes to the 2005 Master Plan and to list specific utility upgrades needed to address future growth of the campus. The recommendations presented per utility are listed in the order of priority.

Campus housing is not included in the program report because it is not connect to the central utility infrastructure.

### General Notes

1. The related drawings in this utility report consist of
  - a. Phase I – Facilities Completed or Under Construction 2005 to Present.
  - b. Phase II/III – Upcoming Designate Projects (Short Term)/Recommended Projects (Long Term).
2. Each recommendation for a given utility is keyed to the drawings with a Phase and Number (i.e. II-x or III-x).
3. Appearing for each utility upgrade appears a statement regarding the information contained on the accompanying drawings.

## **Electrical Distribution System**

### Current Conditions

The existing Electrical Distribution System is shown on Electrical Drawing Phase I. It is the primary electrical distribution system of the campus fed from Georgia Power Company's two 10,000 KVA transformers delivering three-phase, 12,470 volts. They each feed one Georgia Power Company (GPC) metering cabinet and two KSU loop switches. The four loop switches are connected should one GPC transformer fail; the other transformer would carry the campus load over the three loop circuits. Distribution of power is supplied to the campus by two-200 Amp and one-400 Amp loop feed circuits.

The electrical peak load on campus has gone from 4,835 kW in 2005 to over 7,565 kW as reported for June 2010 (4.6 watts per square foot). Assuming a power factor of .95, the kVA is

7,965 kVA. This means the existing transformer capacity will not have 100% redundancy when 10,000 kVA is exceeded. Given the project growth of the campus noted above, it is estimated the load will be 10,860 kVA for Phase II and 16,935 kVA for Phase III.

The existing three primary 12,470 volt loop feeds have a total capacity of 800 amps. As noted in the 2006 Master Plan it consists of 2-200 amp and 1-400 amp loops. At 80% loading, the existing total current can handle 640 amps. Note that one 10,000 kVA at 100% load will deliver 465 amps to the three loops.

#### Recommendations – Phase II/III (Amended March, 2012)

*A detailed Electrical Distribution System Study prepared by Technicon dated December 16, 2011, replaces the original Electrical Distribution System recommendations outlined below. In both this report and that of the Technicon Study concluded the need for a new electrical substation to be located on the south end of the campus. The Technicon Study contains detailed field documentation of existing conditions, data analysis and recommendations and projected upgrade costs.*

Based on the July 30, 2010 Load Study by GPC and reviewed with KSU staff during work sessions, it was agreed to upgrade the campus electrical distribution system with the construction of a new substation on the south area of the campus. In order to retain the 100% redundancy required by KSU, provision will be made to allow the transfer of the entire campus load to one or the other substations through switching owned and operated by Georgia Power Company.

The scope of work of work related to the upgrade of primary electrical distribution for the campus is:

1. (II-1) Replace the existing west 200-amp loop with a new 400-amp loop. This includes the following:
  - a. Install two-sets of 400-amp, 15 kV cable, from empty slots on existing 600-amp loop switches at the north substation in the existing underground ductbank as shown on Electrical Drawing.
  - b. Replace bushings and elbows on all pad mounted transformers connected to the new loop distribution cables to accept the increased cable size.
  - c. At 4 locations, there are pad mounted transformers that do not have 3-way switching capability. These are at Kennesaw Hall, Convention Center, Library and Joe Mac Wilson building. They will be replaced with new transformers of the same size with switching ability to by-pass, fully connect, or fed from either side of the loop cabling.
  - d. With the installation of the new 400-amp, the remaining 200-amp and 400-amp loops will be rebalanced for future operation consistent with the campus expansion for Phase II and III.
2. (II-2) Install individual electrical meters at all campus buildings that have the capabilities of reporting usage via the fiber network.
3. (III-1) Replace the remaining 200-amp loop and loop switch from the North Substation with new 400-amp cabling 600 amp loop switch. It replaces the 200-amp switch and the existing 200-amp loop cabling as shown on the Phase II/III Electrical Drawing.

4. (III-2) Implement the installation of a second campus substation from GPC on the south side of the campus for two-10 mva transformers, metering cabinets, and sectionalizing switches. This includes the following:
  - a. Confirm the location of the new South Substation located at the southwest corner of Big Shanty and Chastain Road. It is estimated the substation will require 3,600 square feet.
  - b. In the same substation, install three 600- amp class sectionalizing switches for three new 400-amp loops.
  - c. New underground ductbanks and electrical manholes will be installed for the 15-kVA, 400-amp cabling..
  - d. GPC will install a single manual sectionalizing switch for the loops of the two campus substation to be connected in the event of failure of one of the substations. It will be owned and operated by GPC.
5. Phase II/III Drawing does not show the routing for the 400-amp loops origination from the new South Substation. Currently the University has engaged an engineering firm to conduct an electrical survey of the existing underground distribution system and submit a report of existing conditions. This engineering report will contain detailed recommendations for the upgrade for Phase II and III.

## **Domestic Water/Storm Water Distribution System**

### Current Conditions – Domestic Water and Fire Protection System

The existing Domestic Water System is shown on Drawing Domestic Water System Phase I. being over It includes the recommendations of the 2005 Master Plan for campus build out. It is based on two demand usages.

1. The water usage demand for the last 12 months ending October of 2010 was 73 mgy (million gallons per year). With the usage for September and October of 2010 averaging 8.3 mgm (million gallons per month) the annual water usage would be approaching 100 mgy.

On the same drawing, the following changes were made since the 2005 Master Plan and appear as current conditions:

1. The 12” line at the north end of the Old Frey Road was capped south of the new parking deck. A new 10” line was installed going west and terminated in a valve for future extension. Water service to the Health Science and Dining Hall are served from this new 10” line.

### Recommendations – Domestic Water and Fire Protection Systems

1. Due to the significant increase in water usage from that predicted in the 2005 Master Plan, 80 mgy with a peak of 800-1200 gpm, it is recommended a campus wide study be conducted of the domestic water system to reflect the short and long term growth of the campus. This study shall incorporate the results of the sanitary sewer flow monitoring being conducted now and assess the campus Fire Protection System.

2. (II-1) The existing 12" line coming into the campus from Frey Road, containing one of the KSU's water meters will have to be relocated north to allow for the addition of the Education Classroom Facility (Phase II) and its addition (Phase III).
3. (II-2) The above line will be extended along Bartow Ave west to the 8" water line in Frey Lake Road in a 10" line.
4. (III-1) The Student Center Expansion will conflict with the existing water line (unknown size) running west from the 8" line in KSU Road to the south of the Math/Science Building and connecting to the north-south line of unknown size.
5. (III-2) The Water Main Replacement Proposal dated January 15, 2010 was reviewed and a modified version is being made a part of the 2012 Utility Upgrade:
  - a. The existing west loop water line running south from Bartow Ave in Marietta Drive will be replaced with a 10" line as shown on Phase II/III Domestic Water drawing. It will terminate at the exiting 12 " line just south of Building 9.
  - b. A new 8" or 10" line will be extended west from the south end of the new line in item 'a' above to the 8" line in Campus Loop Road as shown on the Phase II/III Domestic Water drawing.
6. Phase II/III drawings contain the recommended changes noted above. Currently, an engineering firm is engaged in monitoring sanitary sewer flows and water usage. This will result in a report to identify the future upgrade.

#### Current Conditions – Storm Water System

The University's Storm Water Management system includes inlets, storm sewers, basins, and underground storm water structures to control runoff and limit flooding. The projected campus growth is estimated at over 200% although the increase in impervious area will be approximately 15%. This is due to the construction of new facilities in previously impervious areas. This will generate an additional run-off volume of 500,000 cf. Based on the 2005 Master Plan the following conditions must be considered in addressing the overall Campus Storm Water Management System:

1. Cobb County Department Standards require storm water management be implemented for all new construction. The purpose being to control both the rate and quality of the water being discharged off-site.
2. Refer to the recommendation below presented in the 2005 Master Plan regarding Cobb County Standards as it relates to runoff for new construction sites.
3. As water becomes a greater issue, the University will have to consider more efficient means of to reduce runoff and maintain water quality.
4. As the 2005 Master Plan noted, no analysis of the overall campus can be done until a mapping/inventory is done. Thus the current way this issue is addressed for new construction is on a by project basis.
5. Collection of storm water currently goes to predominately under-ground structures.

#### Recommendations – Storm Water System

1. Conduct a detailed mapping inventory of the storm water infrastructure in order to generate a capacity analysis of its components. This shall include a system wide study in

order to attain greater savings in the design, construction, and maintenance of each facility in the development of the campus.

2. The current Cobb County requirements will be documented with regards to capacity and quality requirements for new construction. This will be done to update the information submitted in the 2005 Master Plan.
3. Confirm Cobb County's Storm Water specific requirements regarding the way water quantity run-off is calculated on new building sites. In the 2005 Master Plan, it was noted that new building sites would have to calculate run-off as if the site was naturally wooded versus whatever the site currently happens to be.
4. Utilizing the inventory above, develop the recommendations from the 2005 Master Plan of creating four main corridors labeled A, B, C, and D.
5. New water quality standards will require incorporating such things as rain-water gardens, bio filtration in landscape areas, and porous pavements.
6. Further consideration, consideration should be given to the use of collected storm water for irrigation and fire protection.
7. Phase II/III Storm Water Distribution System drawings remain the same existing information as shown on Phase I. However, they appear on the proposed short and long term campus plans. Until the recommended inventory and mapping is completed and engineering a report is performed, no recommendations other than what had been made in the 2005 Master Plan report.

## **Sanitary Sewer Collection System**

### Current Conditions

The 2005 Master Plan incorporated the Sanitary Sewer Investigation and Capacity Flow Analysis completed by Prime Engineering in 2003. The 2003 report utilized data obtained from historical sewage flows and monitoring during a number of different periods.

The following changes were made after the 2005 Master Plan and incorporated as the current conditions and appear on the Sanitary Sewer Collection System Drawing Phase I.

1. The construction of the Health Science, Parking Deck and Dining Hall Addition revised the sanitary sewer from that recommended in the 2005 Master Plan. A new 10" line was installed from the new building area to the existing 8" line in Frey Lake Road.
2. An 8" line running 400 feet south from Bartow Ave just south of and tying into an existing 8" line has been abandoned.
3. Sanitary Sewer C: Based on revisions since the 2005 Master Plan, this line is no longer required.
4. Sanitary Sewer A-3: Part of this 8" line was shown coming from the Maintenance/Ground Building south to Bartow Avenue. No new work is required as there is an existing 8" line. It will be verified that the existing line does not need to be replaced. The remaining section of line A-3 from the manhole at the intersection of Bartow Ave and Owl Drive has been upgraded to a 10" line extending to the CCWS's 10" line in Campus Loop Road. Therefore, no new work related to the Utility Infrastructure Upgrade will be included for this section of line.

## Recommendations

From the 2005 Master Plan sanitary sewer recommendations, the following scope of work will be included in the 2012 Utility Infrastructure Upgrade Program.

1. (II-1) Sanitary Sewer A-1: A new 8" line will be installed along KSU Road from a point 1200 feet north of Chastain Road to the existing CCWS (Cobb County Water System) in Chastain Road. This line was noted as possibly being run west to Campus Loop Road or east to new line III-1.
2. (II-2) Sanitary Sewer A-2: A new 10" line will be installed starting at a location where a recent 10" line was installed between the Library and Student Center/Book Store and running south to the manhole at Paulding Ave. From this manhole the new line will run 1200 feet, replacing the existing 8", and terminating at the CCWS line in Campus Loop Road. The Heath Science Building site was relocated from being served from sanitary sewer corridor A-2 to its new location next to Central Parking Deck. Therefore the sanitary sewer line A-2 can be 10" versus the 12" recommended in the 2006 Master Plan.
3. (III-1) Sanitary Sewer B: A new 8" line will be installed in Frey Road starting at the baseball field and running south 900 feet to Chastain Road and tying into the existing CCWS line.
4. Phase II/III drawings contain the recommended changes noted above. Currently, an engineering firm is engaged in monitoring sanitary sewer flows and water usage. This will result in a report to identify future upgrades.

## **Telecom Network System**

### Current Conditions

The existing Telecom Network System is shown on Drawing Phase I has been updated with changes since the 2005 Master Plan. This report includes the recommendations of the 2005 Master Plan for campus build-out including the information brought forth during the Work Session. This was:

1. Telephone System
  - a. Preparation for Voice-Over Internet Protocol (VOIP) using the existing campus fiber network.
  - b. AT&T in the process of submitting conduit requirements to upgrade the campus underground pathways for its cabling.
2. Communication System
  - a. The PeachNet OC-3 is the campus internet.
  - b. Security level of server/data closets upgraded.
  - c. Existing buildings upgraded to Category 5E cabling with the exception of the Library. It appears below to be done in the 2012 Program Report.
  - d. Server room sizes and climate control are being upgraded on when renovations occur, or when new buildings are constructed.
  - e. Network links to the Towne Pointe, Chastain Pointe and KSU Center have been made.
3. The Telecom Network System Phase I drawing includes changes to network since the 2005 Master Plan.

## Recommendations

1. (II-1) Network cabling to link Building 79 (Owls Nest) to the Intramural Fields and KSU's new Soccer Stadium require a pathway and cabling. The KSU Foundation is providing partial pathway. The University will be responsible for the remainder, as well as the fiber link.
2. (II-2) A DAS (distributive antenna system) is needed throughout KSU to allow for local cell phone usage within buildings. KSU currently working with outside vendors to see if feasible.
3. (II-3) Install an additional fiber to buildings having only a single connection to the network backbone. The goal is to have redundancy capability for all buildings.
4. (II-4) AT&T is preparing a report outlining the need for additional conduit capacity for the existing telephone service. This report will define empty conduit to be provided by KSU.
5. (II-5) The campus telephone system is being prepared to install a VOIP. Continue preparation tasks for implementation.
6. (III-1) KSU is working with GDOT and Cobb County to install partial pathway from Big Shanty Rd. to George Busbee Pkwy. KSU will be responsible for remainder of pathway, as well as the fiber, to link main campus to off-site facilities.
7. (III-2) Conduct an assessment to quantify the capacity and pathway of the existing system. This is necessary to project the upgrade in the 5-10 year time frame.
8. Phase II/III drawings contain the existing network as shown on Phase I drawing on the short and long term campus expansion. Recommendations are keyed to the drawings either graphically if possible or referenced by written text.

## **Additional Recommendations**

The following are recommendations discussed during the work session held in preparing this program report. They are:

1. Conduct a feasibility study to investigate the economic and operational benefits of constructing district energy plants within new building construction for the following physical building needs:
  - a. Hot water heating
  - b. Chilled water cooling
  - c. Emergency electrical systems
2. Underground stormwater storage for campus irrigation .

End of Report