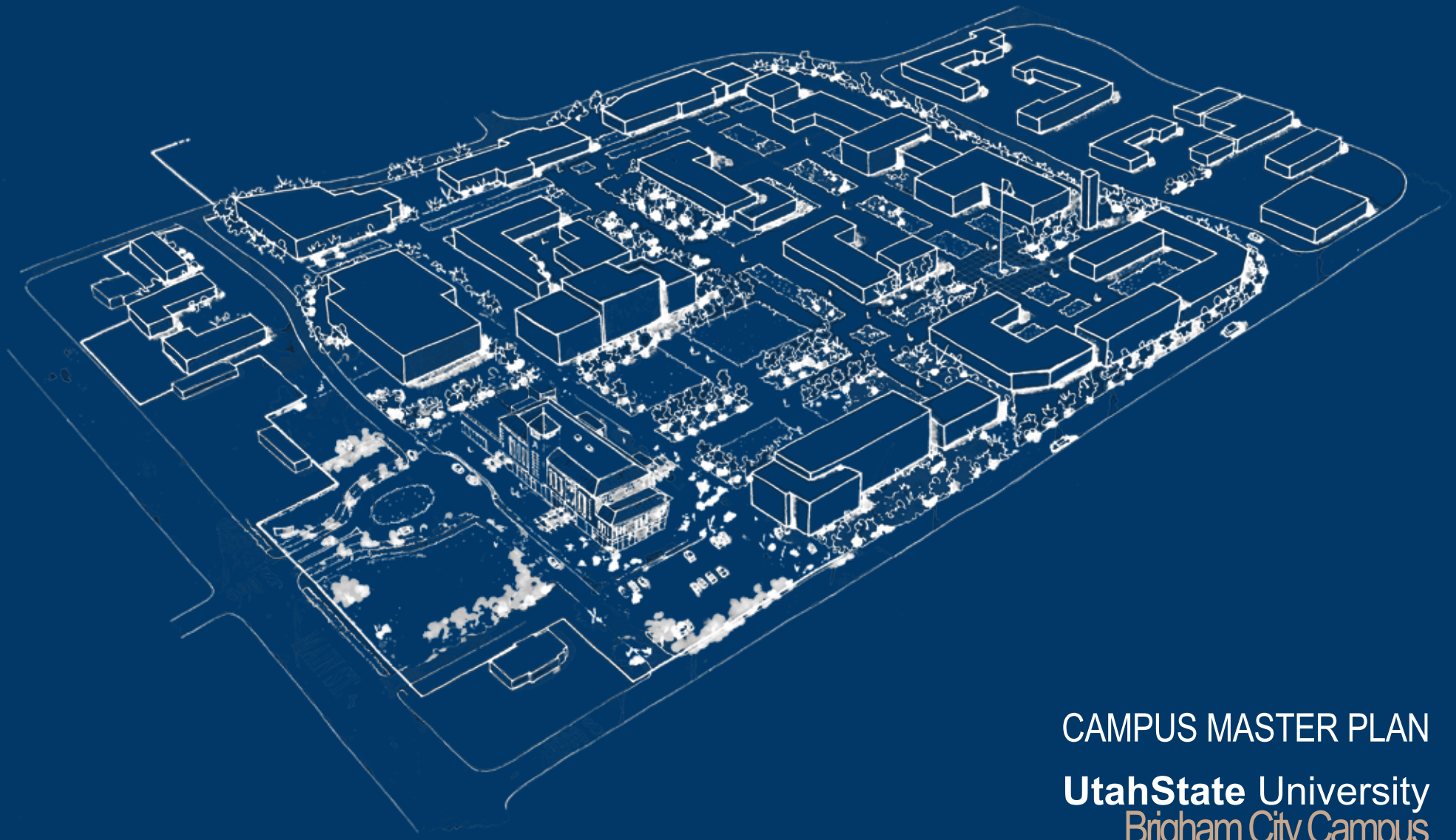
CRSA

UtahStateUniversity
BRIGHAM CITY REGIONAL CAMPUS



CAMPUS MASTER PLAN

UtahState University
Brigham City Campus

ACKNOWLEDGMENTS

Consultants

CRSA

Kathy Wheadon, LEED AP	*Senior Principal*
Kelly Gillman, ASLA, AICP	*Principal, Project Manager*
Mehrdad Samie, AIA	*Architect*
Donald Buaku, AICP	*Urban Designer/Illustrator*
Bryce Ward	*Landscape Designer*
Rachel David, LEED AP BD+C	*Sustainability Director*

Fehr & Peers

Preston Stinger	*Transportation Engineer*
Julie Bjornstad, AICP	*Transportation Planner*

Civil Solutions Group

Danny Macfarlane, PE	*Civil Engineer*

Sine Source Solutions

Shane Swenson, PE	*Electrical Engineer*
Donald J. Patton	*Electrical Engineer*

Van Boerum & Frank Associates

Ray Vernon, PE, LEED AP	*Mechanical Engineer*
Jed Jenkins	*Mechanical Engineer*

Brigham City

Dennis Fife	*Mayor*
Paul Larsen	*Econ Dev't. Director*
Mark Bradley	*City Planner*
Dave Burnett	*Public Power*
Blake Fonnesbeck	*Public Works*
Brett Jones	*City Engineer*

Utah State University

Dr. Tom Lee	*Dean, BC Campus*
Jordy Guth	*Architect, Facilities Planner*
Andy Shinkle	*Assistant Director, BC Campus*
Colby Goodliffe	*RCDE Manager*
Ben Berrett	*Director, Planning, Design & Construction*
Dale Huffaker	*Director, Real Property*

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USU Brigham City Student Government Representatives 2011/2012. Courtesy brighamcity.usu.edu

Existing USU Brigham City Regional Campus Building

BRIGHAM CITY CAMPUS VISION

The Brigham City Campus of Utah State University has, since the early 1990's, primarily served students during evening hours. Drawing students from Box Elder County, Northern Weber County, and also Cache County, the campus has acted primarily like a community college offering a local option for completing course work. While USU Brigham City will continue to provide classes under this model for many years to come, it is envisioned that additional options will be made available to students. More students are seeking courses at USU Brigham City as part of their course work at the main Logan campus. As this demand grows, and population growth pushes north from the Wasatch front, and as degree offerings grow, it is anticipated that more daytime classes will be added to the existing complement of evening courses.

As the campus is able to provide classes at multiple times of day, the overall square foot to full time student ratio, which is commonly used to measure space allocation on campuses, will remain low. As the campus grows and matures however, additional services will be made available to students, such as a student center that will also be a venue for community events. This will cause the ratio to change over time.

DISTANCE EDUCATION

Distance education is another factor that affects space allocation and overall vision at the USU Brigham City Campus. Classes taught via broadcast are available at all USU Campuses across the state. Thus, a classroom of 4 to 6 students is common at the Brigham City campus, and there are approximately 15 of these classrooms, with another 10 larger classrooms. Five to ten more classrooms are anticipated in the near future. If this trend continues, non traditional classroom spaces may be needed as well as larger class rooms for traditional classes. As the campus continues to deliver classes in broadcast, online, and traditional formats, class sizes will need to be re-evaluated.

DEMOGRAPHICS

The age of the average student at the USU Brigham City Campus has been dropping over the past few years. The current average age is 31, down from 35 a few years ago. This student is primarily taking classes between 5pm and 11pm. One third of the students at the campus are in the Brigham City area. One third travel from the north, the other third travel from south of campus to take courses. It is envisioned that this demographic will change in the coming years. The Governor's Office of Planning & Budget projects heavy increases in population

in northern Utah. The USU Brigham City Campus will likely absorb much of the educational needs for this growth.

New students at the campus will be a mix of non- traditional students as well as traditional students who are unable to obtain degrees off the main USU campus. This mix will push average age of campus students down over the years and is reflected in the overall campus vision to provide more services for on campus students. This transition will take place as more degree offerings are added, and as more daytime classes are offered. It is the intent of the University that evening classes will still be offered for non-traditional students as this allows facilities to be used twice during the day making for effective utilization of resources and lowering the square feet needed on campus.

FACILITY HISTORY

Utah State University began offering classes in Brigham City in 1983. At this time rooms were rented in a small home. This condition continued until 1986 when the campus began utilizing space at a local school. In 1991 the campus was moved to its current location in the strip mall. The campus has expanded at this location over the years as follows:

History of Facilty			
1991	Initial Space	4,000 sf	In Strip Mall
1996	Expansion	18,000 sf	
2000	Expansion to	22,000 sf	Into Fred Meyer Bldg.
2004	Expansion	38,000 sf	
2007	Expansion	44,000 sf	
2008	Expansion	50,000 sf	Added Faculty Bldg.

Although about 60% of the Fred Meyer building has been developed, it is anticipated that this space will be completely used within approximately five years. The facility is currently near capacity and is at parking capacity. With the BATC next door also growing, space will soon be limited at the current site. Adjacent land for expansion is limited by the expense of the property. There is currently a book store at the site, and common study space. However there are no student services such as a student center.

EXISTING INVENTORY

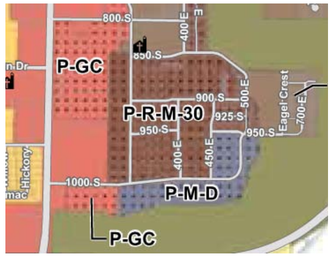
The existing facility at the strip mall provides a mix of classroom and instructional spaces. Approximately 25 of the classrooms on campus are distance learning rooms. Many of these are small rooms which provide small groups of students access to a course being taught at a different location. Larger classrooms often have a teacher on site. The main building, in addition to classroom, has a book store and general study space. There is also a faculty building in the adjacent strip mall.

NEW SITE DESCRIPTION

In 2003 the Kmart site on Main Street was received as a gift by Utah State University which includes almost 90,000 square feet on 8 acres of land. There are 50 to 60 acres of available land adjacent to this facility to the north and east. This property is generally known as the "Indian School." Originally it was used by the military in World War II as a hospital. Following this use it was used as the Intermountain Indian School. The federal government turned over use of the site for public use and is now privately owned. Most of the original structures are still on the site with little recent development. Although the structures will need to be torn down, the site will essentially be a blank slate for campus growth. This site has some natural slope, up, from south to north. However, as the site was previously developed the land is flat enough as to make slope a non-issue for conceptual planning purposes. There are City maintained streets at and through the site and access from UDOT controlled Main Street. USU purchased the majority of the Indian School property in 2011.

NEW SITE ZONING

Brigham City zoning for the proposed site is mixed. The frontage is zoned commercial conditional while the bulk of the site is residential with a specialty planning overlay. Although the University could move forward with its plans without City zoning in place to match, it is suggested that the City modify existing zoning to reflect plans, which the City is supportive of, if USU purchases the land. An alternative planning district overlay is a potential solution, as is a rezone. Current zoning allows for seven story construction throughout the site.

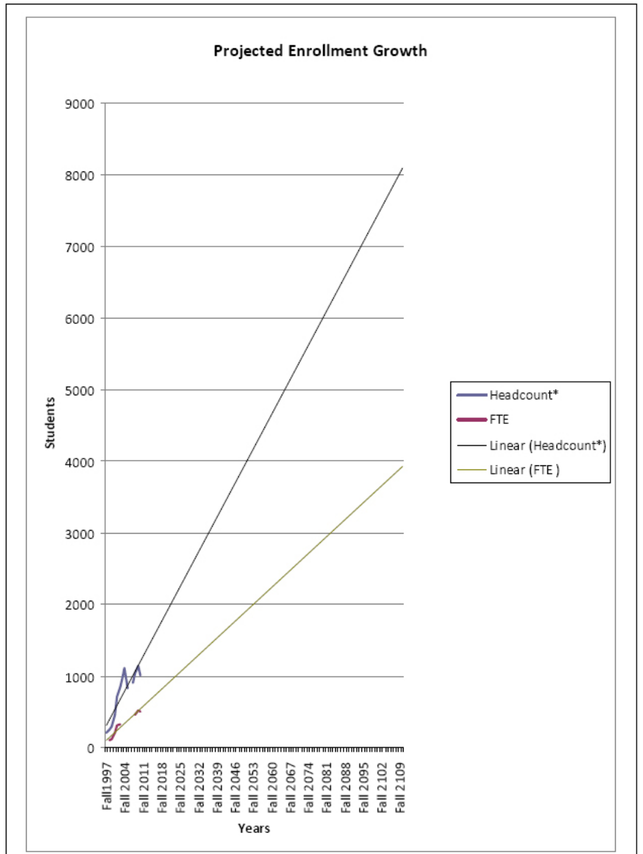


Source: Brigham City Zoning map

FTE AND SQUARE FOOT RATIOS

Student enrollment history is shown below:

Brigham City Enrollments		
Year	Head count*	FTE
Fall 1997	206	
Fall 1998	253	99
Fall 1999	299	114
Fall 2000	456	203
Fall 2001	705	305
Fall 2002	848	321
Fall 2003	958	
Fall 2004	1112	
Fall 2005	837	
Fall 2006		
Fall 2007	902	
Fall 2008	1043	457
Fall 2009	1139	520
Fall 2010	1012	511
Does not include concurrent enrollment		



Although some gaps exist, a trend line can be plotted (see previous page) for both student head count and full time equivalent counts (FTE). Understanding how many students will be on campus is the first step in the campus planning exercise. Potential enrollment data will help us determine spatial needs for facilities, parking, and open space. At the USU Brigham City campus, as there are many non-traditional students taking a partial load of credits, the headcount is much higher than the corresponding full time equivalent. The ratio has been dropping over the years but headcount remains approximately double FTE.

The trend line chart that precedes, extends the enrollment data to the 50 and 100 year time frame. In 2060 it is projected that there will be approximately 2100 FTE students on campus. This number grows to 3900 FTE students in 2100. This analysis does not distinguish between traditional vs non-traditional services. However, it is assumed that the number of traditional students taking a full load of credits will grow. The following chart indicates that headcount will grow to over 8000 in 2100.

In reality it is expected that the headcount trend line will grow at a slower rate to more closely match the main USU campus ratios. However, no revisions to the headcount data have been undertaken at this time. Rather, the study counts on FTE for space planning purposes. Currently there are 511 FTE students on campus utilizing 50,000 SF of space. This results in a space utilization of 97 SF per student. This is a very efficient use of space. The appendices include a chart indicating the state wide allocations for various campuses. 97 SF per student is among the lowest and is consistent with a non-traditional student commuter campus. Additionally, this low number can be attributed to the sharing of space between daytime and evening courses.

As the vision of the campus is to grow into a full regional campus with many student resources such as a student center, the square foot ratio will change. More square feet per student will be the result of constructing more services on campus. The target number of square feet per student has been set at 220 for this study.

GREEN SPACE PLANNING

Open space has been calculated using a square foot per student methodology, similar to the facility analysis. 100 square feet per student is provided in the more services scenario in the 50 year horizon, and 200 SF per student in the 100 year horizon. Fewer square feet are provided in the fewer services option, 50 and 100 respectively for the 50 and 100 year horizon. As more parking is calculated in the fewer services options, less green/open space is available.

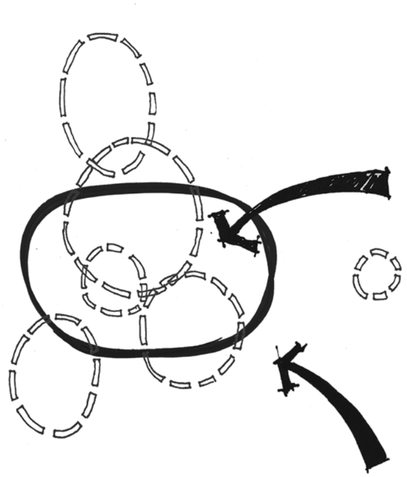
PARKING

There are approximately 515 parking stalls at the current strip mall facility which are shared by the adjacent BATC and the other tenants in the strip mall such as the driver license division. However, the adjacent uses, including BATC, usually use the stalls during the day. USU utilized only a portion of stalls during the day; however these stalls are nearly 90% occupied in evening hours. Approximately 140 stalls will be lost when the lease along the north side of the parking lot is not renewed. As daytime classes are added, the ability to serve the campus with parking will diminish. The parking availability will worsen as more students demand classes in daytime hours.

A shuttle (operating limited evening service) is provided by Utah State Brigham City for students travelling from Logan to Brigham City, but does not significantly reduce parking needs.

For the purposes of planning, the following parking ratios have been explored: In the 50 year planning horizon, one stall per student has been chosen in the fewer services option, matching current ratios. If more services are provided and/or mass transit has increased, a ratio of 0.5 stalls per student has been chosen. This lower ratio has been chosen as typically campuses with fewer services are more likely to be commuter campuses. Included in this equation is a consideration for on campus housing, although no structures have been designated as housing on the campus plans and would likely be provided by local developers on private land. It is also assumed that more transit will be available in the 50 to 100 year time horizons.

Green and open spaces encourage pedestrian activity and provide opportunities for psychological and physiological relief for campus users



2. CAMPUS PROGRAMMING PLAN

SPACE ALLOCATION STUDY

The planning team utilized the 2110 Campus Phasing Scenario of 1,100,000 gross square feet (GSF) of built-out space to accommodate the growth and development of Utah State University's regional campus. Planning exercises were utilized as a means to consider options for distributing square footage by building type, including student services space (library, administration, facilities/grounds, central plant, etc.) within the campus bounds over the first 100-years of campus use.

The development of campus organizational diagrams, illustrated in Chapter 3, considered the location and purpose of the first campus buildings and the subsequent phases of construction to craft a cohesive campus plan. The planning team used four primary planning drivers to help organize and craft schemes, including the desire to:

- Strengthen the University's role in the community,
- Establish a connected campus,
- Create a pedestrian friendly campus, and
- Preserve the natural environment and USU's heritage.

In order to accurately predict how and when new buildings will be needed on campus due to enrollment growth, the planning team reviewed existing and projected future conditions. As the USU Brigham City Campus grows, space has been allocation at 220 GSF per student, currently in alignment with USHE 2011 space standards. In addition, by utilizing enrollment trends, crafting projections of faculty and staff, and parking requirements the planning team was able to illustrate, during the three major phases of campus development, when and how new facilities and site development may take place.

Enrollment and Space Needs Projections

	PHASE 1	PHASE 2				PHASE 3		BUILD-OUT
Square footage of building(s) on campus	70,000	150,000	250,000	375,000	525,000	675,000	825,000	1,100,000
Additional square footage to be built		80,000	100,000	125,000	150,000	150,000	150,000	275,000
Projected FTE (220 GSF/FTE)	**318**	**682**	**1,136**	**1,705**	**2,386**	**3,068**	**3,750**	**5,000**
Headcount (.74)	430	921	1,536	2,303	3,225	4,146	5,068	6,757
Projected GSF/FTE	220	220	220	220	220	220	220	220
Projected # of faculty & staff (using 10% F&S to FTE ratio)	32	68	114	170	239	307	375	500
Total Campus Population (FTE + Faculty|Staff)	**350**	**750**	**1,250**	**1,875**	**2,625**	**3,375**	**4,125**	**5,500**
Parking Ratio (1 stall / 2.5 FTE)	140	300	500	750	1050	1350	1650	2200
Reqr. Acres	1.1	2.4	4.0	6.0	8.4	10.8	13.2	17.6
Parking Ratio (1 stall / 4 FTE)	88	188	313	469	656	844	1031	1375
Reqr. Acres	0.7	1.5	2.5	3.8	5.3	6.8	8.3	11.0

During the first phase of development the campus will develop a multi-use facility that has the opportunity to utilize public partnership opportunities to fund the construction of a first building. The 70,000 GSF of facilities will accommodate between 300 and 500 students with general use classrooms, faculty offices, student support space, a small bookstore, and larger instruction/meeting spaces which will also be used as a conference facility in partnership with Brigham City. During this period the campus will also utilize the existing facilities off-campus in Brigham City.

During this phase there will be development of vacant land as green fields in partnership with the City. Short term uses for the land may include agriculture and recreational space. There will be the need for the acquisition of secondary water shares with infrastructure developed for it.

Phase Two campus development will accommodate student enrollment growth from 500 to 2,400 students and allow for the steady transition away from heavy use of existing/off-campus facilities. The campus plan will accommodate an additional 450,000 GSF of new facilities which will define the campuses eastward and northward growth. During this phase student support facilities will come into higher demand. Campus growth will include the development of freestanding facilities to accommodate library, student union and student recreation.

Phase Three campus development will accommodate the continued campus student growth from 2,400 students to approximately 4,000 to 5,500 students at build out. Depending on the allocation of space for new and or growing program areas it is expected that the GSF/FTE ratio may grow to accommodate larger space allocations for laboratories which have a significantly higher square foot to student ratio. During this the campus plan will accommodate an additional 575,000 GSF of new facilities which will complete the campuses full build-out.

As the campus grows precincts may develop to include the collaboration between distinct departmental areas. The planning team reviewed USU regional campuses in Vernal, Tooele, and Blanding to understand distribution of academic programs by department/course offering. Additional review of USU department structure was completed in light of current course offerings at the Brigham City campus to consider current and future space allocation. In light of growth academic areas precincts may include STEM (science, technology, engineering and math), arts/humanities, and education.

GENERAL PROGRAMMING OF REQUIRED USES

The planning team utilized Utah System of Higher Education (USHE) space standards to craft the future build-out of academic and non-academic space on the USU BC campus in detail. A review of space utilization on other similar regional academic campuses was helpful to verify general programming requirements. The following chart illustrates areas of growth, the ratios of space by type, and the accommodation of on-demand academic space needed to support the academic mission of the USU BC campus at 1,100,000 GSF.

100	Classroom	15%	12 ASF/FTE	165,000
200	Teaching Laboratory	7%	15 ASF/FTE	77,000
	General Academic Instruction			
200	Teaching Laboratory	7%	5 ASF/FTE	77,000
	Technical Instruction			
200	Open Laboratory	8%	6 ASF/FTE	88,000
300	Office	20%	150 ASF/FTE	220,000
400	Study	7%	6 ASF/FTE	77,000
500	Special Use	4%	3 ASF/FTE	44,000
	Clinic, Demonstration			
600	General Use	14%	11 ASF/FTE	154,000
	Assembly, Education, Food Facility, Lounge, Manufacturing, Meeting Room			
700	Support	5%	4 ASF/FTE	55,000
	Central Storage, Vehicle Storage			
	USU Brigham City Regional Campus at Build-out			1,100,000

While this chart illustrates a standard space allocation, campus development must consider the need to be responsive at certain phases of its development to specific programmatic areas to serve student use, academic need and the development of utility systems. The following areas require specific attention be paid to campus growth and development milestones which will serve as leading indicators to planning for their short-term development.

Academic Instruction and Administrative Space

As USU regional campuses are tasked with primarily supporting general education, the variety of course offerings from education to science, must be accommodated within a set of flexible facilities. In the early years of campus growth and development buildings will be multifunctional, servicing administrative, academic and outreach needs. As the campus grows buildings dedicated to individual academic department or collaborative multi-departmental use will be developed based on demand. Building size and configuration must accommodate both general and specific programmatic uses. Building massing to address flexibility is addressed specifically in Chapter 4.

Student Services

Student services, including admissions, registrar, financial aid, cashiering, and advising will initially be accommodated in the first campus building. These important service points must be located in easily accessible areas, adjacent to convenient parking to serve the needs of this campus' students. In addition, a small campus bookstore will be developed. As the campus grows, these student oriented resources may be partnered with career services, disabilities resources, student involvement and leadership and campus administration. Student recreation has not been accommodated within the development of long-term space planning, althoughoutdoor open space has been programmed.

Innovation Campus

USU defines its Innovation Campus(es) as a place that provides an environment with facilities, services and technology, as well as programs and expertise that stimulate and support the growth of research and technology-based enterprises. (*www.innovationcampus.usu.edu)*. An Innovation Campus is planned for the BC Campus.

The Innovation Campus at USU BC may be considered a campus within a campus. While strong linkages to the campus' central mission exist, the Innovation Campus will have a strong individual identity necessary to meet the goals of the Institution's Innovative Campus goals. It will be located close to the southeast corner of campus along 400 East, and will provide convenient vehicular circulation and a strong street frontage within the campus.

Campus Utility Systems

The construction of the first building on campus will initiate a discussion regarding the contribution each of the first few buildings will make in supporting a centralized or decentralized utility system. This document reviews a myriad of issues that need to be discussed to craft a long-term utility plan. The illustrative campus master planning diagrams were developed with the potential of a central system in mind, thus pedestrian circulation systems should be planned and designed to serve as tunnel locations.

Surface and Structured Parking

The development of parking on the USU BC campus will initially take advantage of existing parking facilities associated with the existing Kmart facility. As the campus grows, parking lots initially developed to provide easily accessible parking adjacent to buildings may become future building sites. As the campus transitions between Phase Two and Three there will come a time when structured parking on campus will be warranted, both due to the heightened value on both open space and buildable real estate. This campus master plan places structured parking centralized on the west side of campus, immediately north of the first academic building.

Structured parking on a campus should conform to the overall architectural language and be easily accessible by campus users.

ENGINEERING ANALYSIS

The consulting team for the master planning process included civil, mechanical, electrical, and transportation engineers. Their input was critical in informing the decisions the planning and design team made. Detailed memoranda and maps can be found in Appendix D.

Mechanical Analysis

The total campus elevation delta is approximately 55-feet and the gradient is gradual. The central plant may therefore be located anywhere on campus without imposing an excessive load on any building. The campus high point is on the north-east corner, with the low point being on the south-west corner. Locating the central plant at the high or low point offers a slight advantage with steam distribution. The proposed concept does not facilitate an optimum central plant location from an elevation perspective. The plant will be located on the southeast corner of the site to facilitate overall campus vision and circulation. The tunnel distribution loop will encircle the campus as depicted in on the next page.

CIVIL ANALYSIS

Overview

The following sections outline the completed utility analysis for the Utah State University Brigham City Campus at the 100 year planning horizon. The build-out size, number of students, open space areas, etc is based upon the *CRSA* Campus Plan Feasibility Study for the Brigham City Campus. The scope of this study is to analyze water, sewer, storm drain, secondary irrigation and gas and identify any red flag issues associated with each utility. This analysis did not determine the need for capital improvement projects between the current phase and the 100 year planning horizon phase.

Utility Inventory

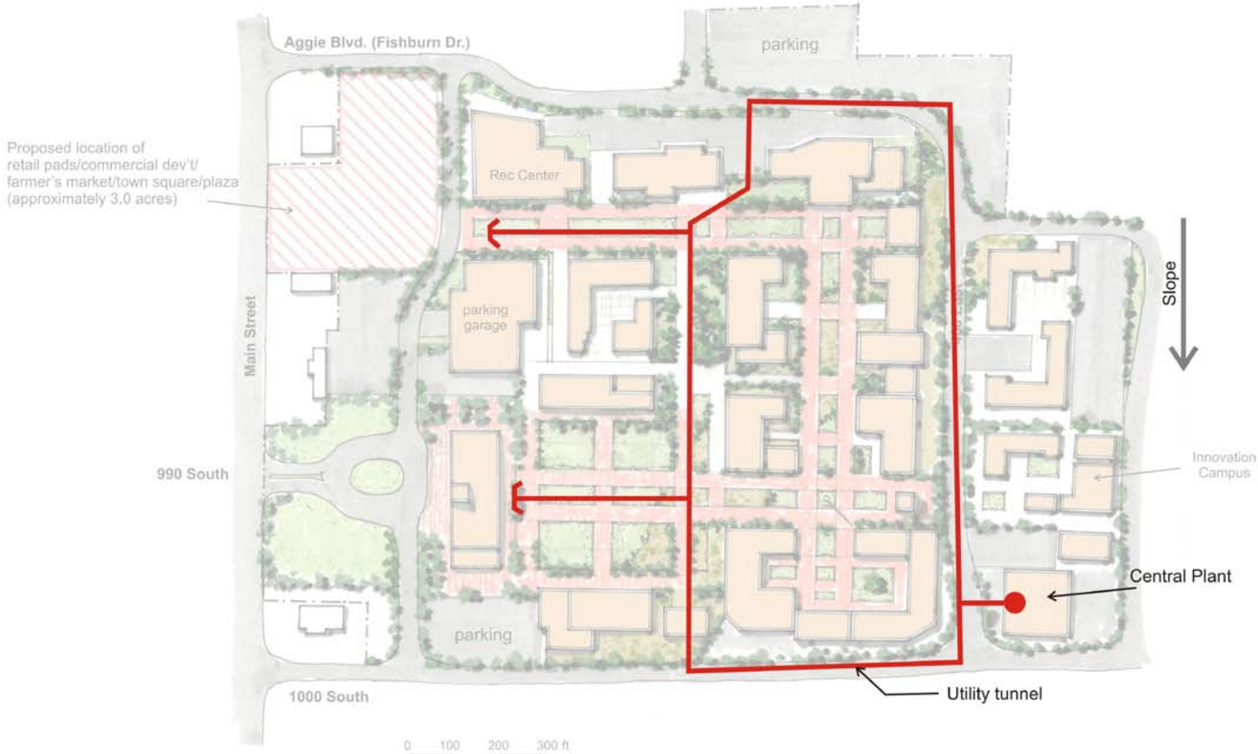
GIS data was collected from the Brigham City GIS department for water, sewer, storm drain, gas, and communication lines. The information was compiled onto individual utility maps for each water, sewer, storm drain, and natural infrastructure.

Existing Sewer Elevation Data

The rim elevation of the sewer manholes within the project boundary were obtained from the GIS data files provided by the Brigham City GIS department. The vertical depth from the rim to the flow line of trough in the base of the sewer manhole was obtained by physically removing the sewer manhole lid and measuring the depth to the flow line.

Existing Utility Analysis

Water: The existing culinary water lines within the study area range from 6-inches to 12-inches in diameter. The material of each water line is unknown. There are a number of water valves and fire hydrants within the study area as shown on the map. The capacity of the existing water system was analyzed by calculating the indoor and outdoor water demands at the 100 year build out scenario. The total full time equivalent number of students for the 100 year planning horizon was calculated, during the Feasibility Study that preceded this Master Plan. The total full time equivalent (FTE) students from that report



Map showing proposed location of central plant

was determined to be about 3,900. For planning purposes it is estimated that 30% of those students would live on campus at the 100 year planning horizon. The total peak demand and peak instantaneous water demand for indoor and outdoor use were then calculated utilizing the recommended values from section R309-510-7 of the State of Utah Administrative
Rules and the total estimated FTE for the campus. State of Utah Administrative rules require that a water system be modeled for the peak demand plus fire flow scenario and the peak instantaneous demand scenario.

Understanding that the expected building types would be type III B construction, two stories tall, and approximately 40,000 sf per building, thus according to the International Fire Code (IFC), a 4,250 gallons per minute (gpm) fire demand is required. The peak demand plus fire flow and the peak instantaneous demand were given to the Brigham City
Engineering department for analysis in their water model. The demands were modeled for both scenarios and the following recommendations were made by Brett Jones, P.E. the Brigham City Engineer:

1. In general the distribution system in the area is very healthy and the proposed peak instantaneous flows you sent should not be a problem.
2. The fire flow demand of 4,250 gpm was able to be serviced by the system but in most cases with undesirable velocities. Velocities of 13-24 feet per second were observed. For this reason, we recommend that campus buildings be fitted with fire sprinkler systems as dictated by the building code and the local Brigham City fire authority.
3. We recommend that the 8" main in Fishburn Drive be extended and connected to the water main in 200 East as the roadway is constructed in this area. We also recommend that the 6" and 8" mains that currently service the old Kmart property be looped into the water system to the east or the north to provide adequate looping in the future.
4. The water mains will likely require replacement in the 100 year build-out timeframe. When replaced, we recommend replacement at the existing diameter unless the existing diameter is less than 8". These mains should be replaced at 8" diameter to comply with existing City Standards.

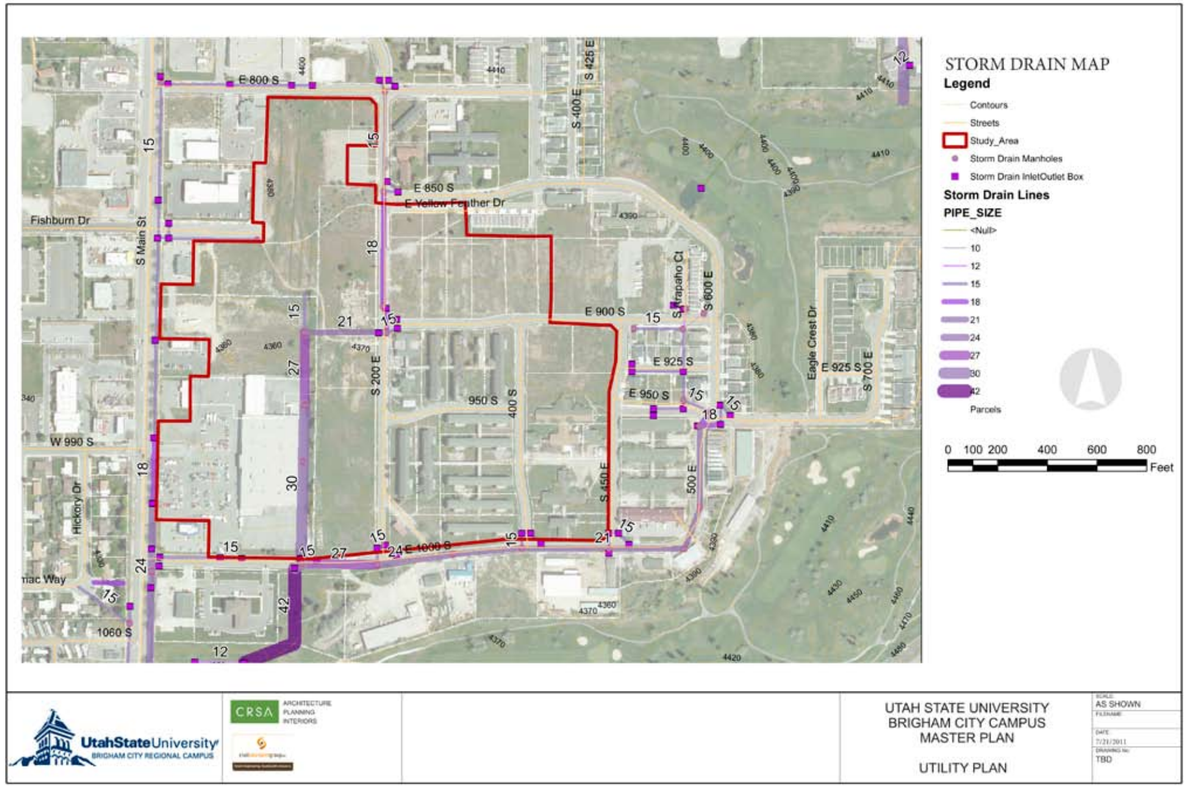
Sewer

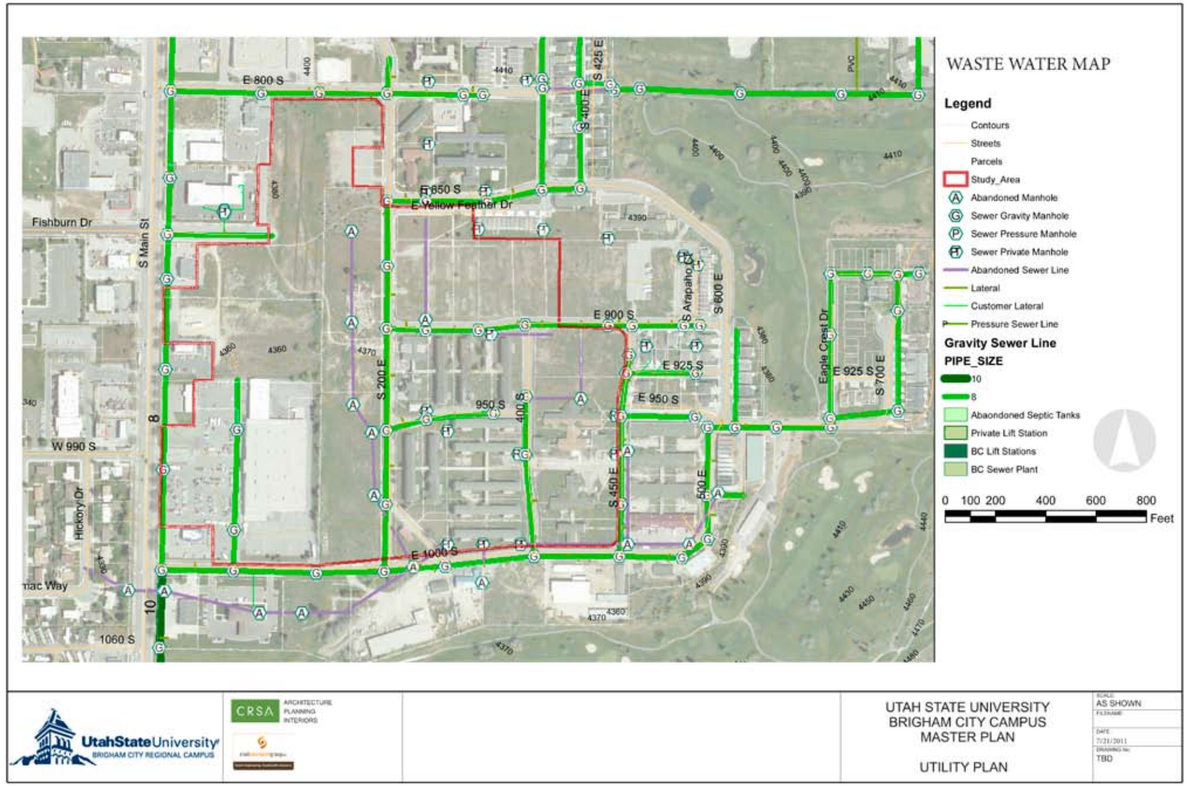
The existing sewer system within the study area consists of 8-inch sewer mains (see Sewer Map, Appendix A). All major roadways within the study area contain an 8-inch sewer main, with depths from the manhole lids of ranging from 8.40 ft to 10.75 ft deep. All the sewer mains within the study area flow to the southwest corner of the project at the corner of 1000 South Main Street. The existing sewer system was analyzed considering the 100 year planning horizon for the 3,900 FTE students. The average water demand of 400 gallons per day (gpd) minus a 15% depletion rate with a
multiplier of three applied yields the design sewer flow per equivalent residential connection (ERC).

The wastewater calculations illustrate the method used to determine the design sewer flow for the study area. The calculations also considered sewer inflow from connections upstream of the study area. It is estimated that 100 ERC's are connected upstream of the manhole at 200 East 850 South and 80 ERC's are contributing flow upstream of 450 East 1000 South. The estimated ERC's are based upon a visual aerial survey analysis. The wastewater flow from areas upstream of the study area were applied at the applicable manholes, with one third of the study area projected wastewater flow being applied at 450 East 950 South and the other third being applied at 450 East 1000 South. The remaining third of the study area projected wastewater flow is assumed to flow to the sewer main along Main Street. The wastewater flow values, invert elevations, and lengths of pipe were inserted into AutoCAD Storm and Sanitary Analysis software.

The results of the analysis are found in Appendix C of this report. The following are the summary and recommendation from the analysis of the sewer system:

1. All existing pipes have acceptable velocities (less than 6 feet per second) and the pipes had adequate capacity (Peak Flow Depth/Total Flow Depth ratio less than 0.49)
2. The majority of the sewer mains have a minimum depth at the roadway of 8.4 feet to the invert providing adequate depth for sewer service connection to the proposed buildings.





3. It is recommended that the sewer main extension in Fishburn Drive be an 8-inch main and that the main connect to the sewer main in 200 East. It may be advantageous to divert wastewater flow from areas north of the study area west into the Fishburn Drive sewer main. This will increase the available flow capacity of the sewer mains in 200 East Street and 1000 South Street.
4. It is recommended that water efficient fixtures be utilized within the proposed buildings to reduce the water demand thus reducing the wastewater demand on the existing sewer system.

Storm Drain

An inventory of the depths, location and flow direction of the existing storm drain system was completed (see Storm Drain Map, Appendix A). All major intersections within the study area have a storm drain box connected to the city storm drain system. The storm drain system generally flows to the southwest corner of the study area. A 42" pipe flows directly south to a regional storm water basin at approximately 100 East 1000 South. According to a Brett Jones, P.E., City Engineer the storm water system within the city right-of-way is designed to handle 0.1 cubic feet per second (cfs) per acre of discharge from any project site. The owner then must detain the 10 year storm event.

It has been discussed that Utah State University typically employs injector wells (sumps) to detain storm water on site. Brigham City Engineer discourages the use of injector wells, but he did acknowledge that recent percolation tests for the Thomas Development project (northeast of the study area) had percolation rates that would support sumps for storm water discharge. The following are recommendations pertaining to the existing storm water system:

1. Complete percolation tests on a project by project basis to determine the feasibility of using sumps
for storm water detention and percolation.
2. Utilize the ability to discharge 0.1/cfs per acre to the Brigham City storm water system, thus reducing the total amount of storm water detention/retention required.
3. There may be a conflict with the existing 30 and 27 inch storm drain pipes and the proposed first building. It is recommended that the building layout avoid interrupting this main storm sewer line.
4. Additional storm drain stubs may be required for development near 900 South, 400 East and 450 East if the Campus elects to release the allowable discharge from each site to the City storm drain system.

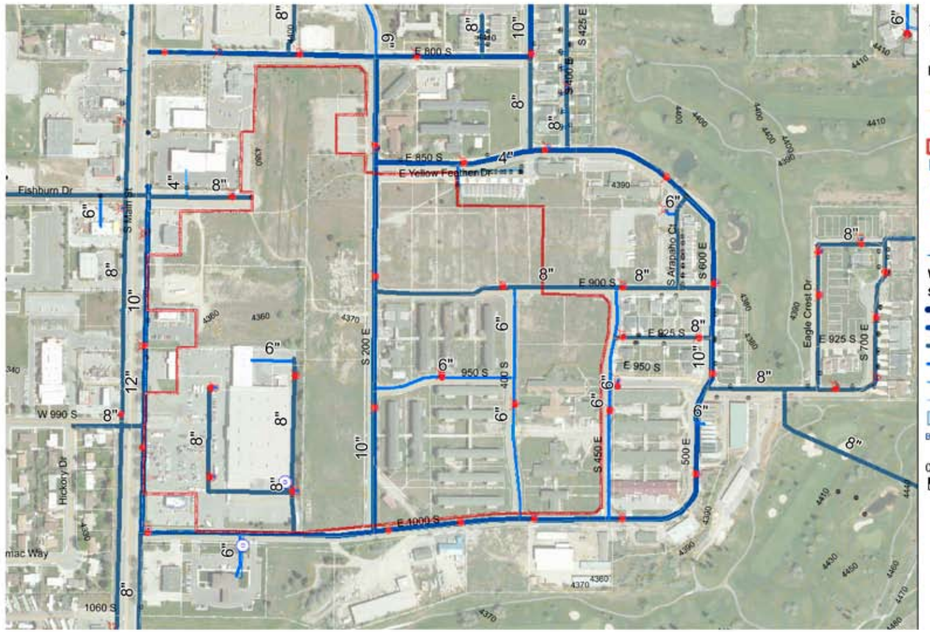
Secondary Irrigation

This section explores the feasibility of providing the secondary water demands within the study area from the Pine View Canal. Specifically the total number of required shares, length of main line required from canal to study area and the average cost of water shares are analyzed in this section. Directly southeast of the study area is the Pine View Canal. The canal originates from the Pine View Reservoir. Currently the canal does not have excess shares to allocate to a secondary irrigation project according to Terrell Grimsley with the Pine View Canal Company.

Mr. Grimsley is the manager of the Weber/Box Elder Conservancy District, which manages the Pine View Canal in Brigham City. Each share in the canal company represents one acre-feet of water and on average sales for approximately $1,250 per share. He recommended two options to obtain water shares for a secondary irrigation system:
1. Purchase the necessary shares from willing sellers for market value and petition that the shares be included in the Weber/Box Elder Conservancy District. The shares would then be physically connected to the parcel where the irrigation will occur. The yearly assessment fees would be due for the water shares.

2. Enter into an agreement with existing share holders that are not putting their shares to use. A petition would need to be made to include the shares into the Weber/Box Elder Conservancy District and the shares would then be connected to the parcel being irrigated. The yearly assessments would be due for the water shares. The detailed calculations in Appendix B illustrate the total amount of water shares required for the 100 year planning horizon. Based upon the "more services" option of the previous Campus Plan Feasibility Study 17.91 acres of green space will be provided at build out. According to the State of Utah Division of Water Rights the irrigation duty rate for Brigham City is 4 acre-feet per acre.

At the 100 year planning horizon the campus would require 71.64 acre-feet of irrigation water or 72 shares in the Pine View Canal Company. This represents an approximate investment of $89,550 in water share purchases and the assessment fees for all the shares on an annual basis if option one is selected. If option two is selected the assessment fees for 72 shares would need to be paid on an annual basis.
This report doesn't include a construction cost estimate or feasibility study, but preliminary layout of the distribution pipe from the canal to the Campus requires 1,000 feet of pipe. The size of the pipe is unknown at this time.



WATER MAP

Legend

- Contours
- Streets
- Parcels
- Study_Area
- PRV Station
- Water Manhole
- Fire Hydrant
- Fire Hydrant Valve
- Water Meter
- Water Service

Water Transmission Lines

Size_

- 12"
- 10"
- 8"
- 6"
- 4"
- 2"

- Water Tank
- Water Tank Drain

0 100 200 400 600 800 Feet

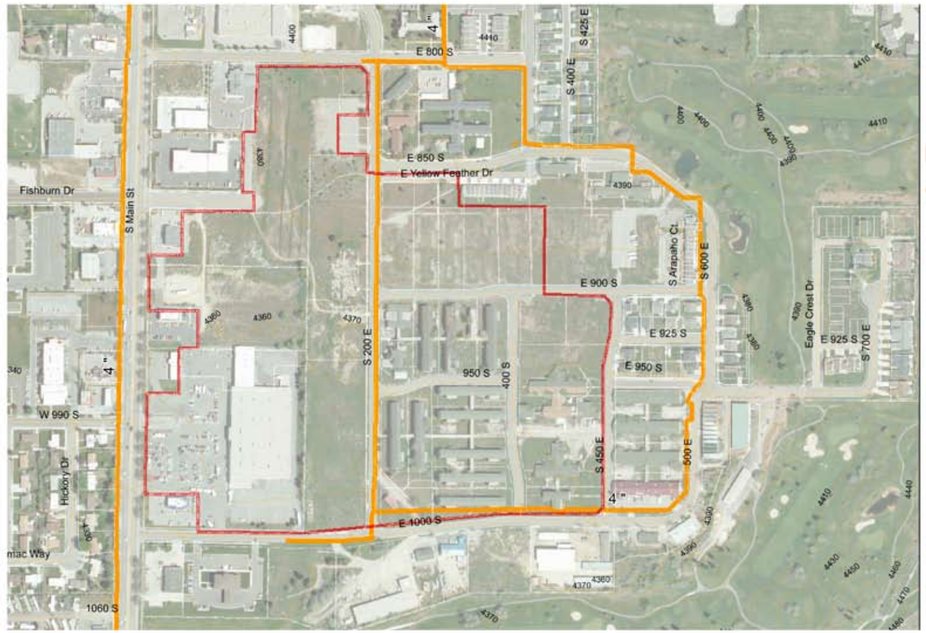
UtahStateUniversity BRIGHAM CITY REGIONAL CAMPUS

CRSA ARCHITECTURE PLANNING INTERIORS

UTAH STATE UNIVERSITY
BRIGHAM CITY CAMPUS
MASTER PLAN

UTILITY PLAN

SCALE: AS SHOWN
FILENAME:
DATE: 7/21/2011
DRAWING No: TBD



GAS MAP

Legend

- Contours
- Streets
- Parcels
- Study_Area

LINE_SIZE

- QUESTAR GAS

0 100 200 400 600 800 Feet

UtahStateUniversity BRIGHAM CITY REGIONAL CAMPUS

CRSA ARCHITECTURE PLANNING INTERIORS

UTAH STATE UNIVERSITY
BRIGHAM CITY CAMPUS
MASTER PLAN

UTILITY PLAN

SCALE: AS SHOWN
FILENAME:
DATE: 7/21/2011
DRAWING No: TBD

Natural Gas

Questar Gas Company provides natural gas to the study area as shown on the Gas Map (Appendix A). A four inch gas line exists around the exterior of the USU Brigham City Campus area. There are gaps in existing gas line coverage along 450 East Street, 400 East Street, 900 South Street, 950 South Street, and the area between 200 East and Main Street. Many of those roadways will be reconfigured according to the Site Plan/Phasing Plan resulting in rerouting of the existing gas lines. The following recommendations are made:

1. Overall the existing gas lines have adequate coverage for the proposed campus at the 100 year build out.
2. Coordinate with Questar Gas during proposed construction of the Utah State University Brigham City Campus to extend, reroute, and construct gas lines as needed to service the proposed campus.

ELECTRICAL ANALYSIS

Central Plant Distribution

Power: Using the central plant concept for owner distribution of power and communications is feasible for the USU Brigham City campus. The planned central plant location at the south-east corner of campus is not ideal, but can be utilized. The proposed concept would be to take delivery from Brigham City Power at 12470V using a single, primary meter at or near the central plant. The owner would then install primary distribution equipment at that location. The lines would then be loop fed throughout the campus as development of the campus progresses. The initial phasing would be intrusive to existing road/infrastructure as new lines ideally would need to be buried for the incoming utility delivery, and for outgoing distribution from the central plant location to the first academic building.

Phase 2 work will require extensive coordination with Brigham City Power and Qwest. An existing main overhead line is routed N/S along 200 east to 1000 S and then feeds back up around 600E. These lines are tapped to distribute power to customers to the south, and east of campus. There is also a connection from the main line to an underground line that feeds customers to the east. Alternate distribution is feasible, but utility coordination will be required so that main lines are not re-routed through future building footprints.

The anticipated campus demand for each phase is as follows:

- Phase 1: 1.75 Megawatts
- Phase 2: 2.9 Megawatts (total)
- Phase 3: 3.75 Megawatts (total)

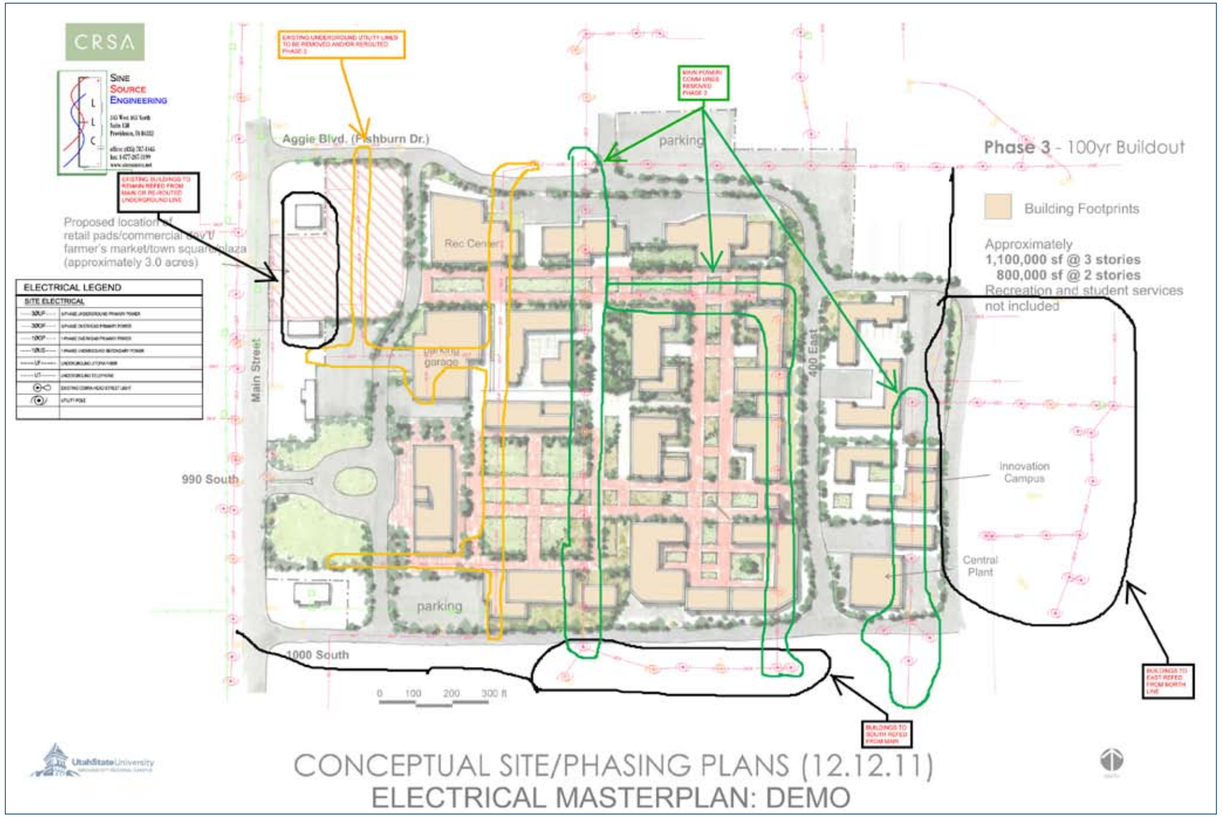
Demands given are total, cumulative, anticipated demand at the end of each phase's construction. Demands have been calculated using USU's main Logan campus as a model taking the campus's existing demand to determine a watt/square foot average demand, giving it an adjustment factor to allow for a more dense campus and measurement discrepancies, and then extrapolating that to the proposed campus masterplan for each phase. "Demand" represents actual, anticipated draw on the utility system, but does not correspond to calculated loads based on the National Electrical Code which would indicate higher requirements.

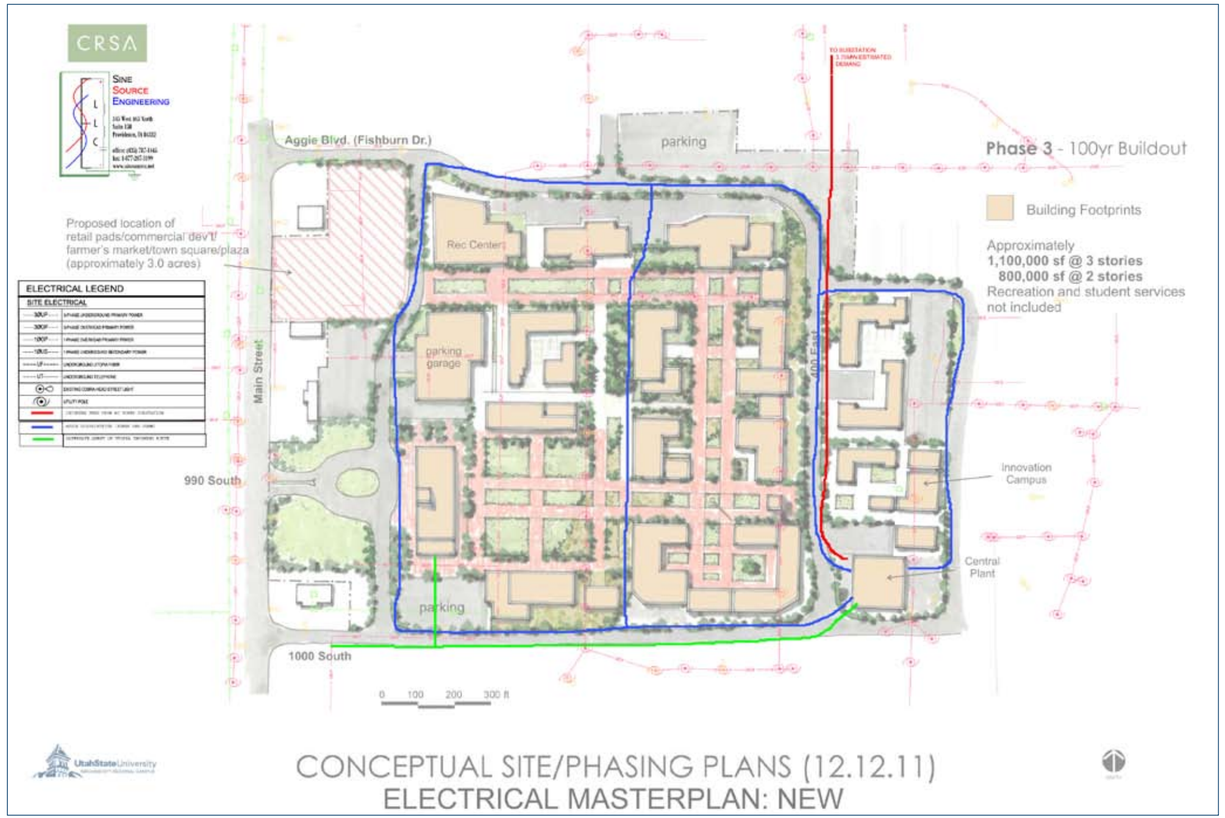
Communications: It is anticipated that the campus will have a central data center at some point which may be near, or part of, the central plant. The concept for owner distribution of communications is similar to that of power—and new communications lines would be routed along the same path as the power infrastructure. Qwest and Utopia lines are both near the campus. Both utilities are available from the north and could be routed generally along the same path as the incoming power lines.

However, an alternate route coming in from Main Street along 1000 W is also worth consideration as it is possible that distribution throughout the campus for phase 1 and phase 2 may be from the Academic Building while infrastructure is being built.

Existing utility lines and customers:

a. Many of the existing lines are routed overhead. If the utility system were to be maintained, some of the lines could be relocated underground fairly easily when tunnels were constructed.
b. As was previously mentioned, some customers are served north, south, and east of campus via lines that will be affected by the campus construction. For either scenario—central plant/owner distribution or utility distribution, the utility infrastructure around the campus will need to be adapted to re-serve these customers.





TRANSPORTATION ANALYSIS

The purpose of the transportation analysis is to provide background and future transportation information in regards to the Utah State University (USU) Brigham City Regional Campus. Under existing conditions, the proposed Utah State University (USU) Brigham City Campus site is composed of a quasi-grid roadway system. As the campus expands, many of the existing roadway will removed and internal circulation will emphasize pedestrians and bicycles.

Traffic Volumes

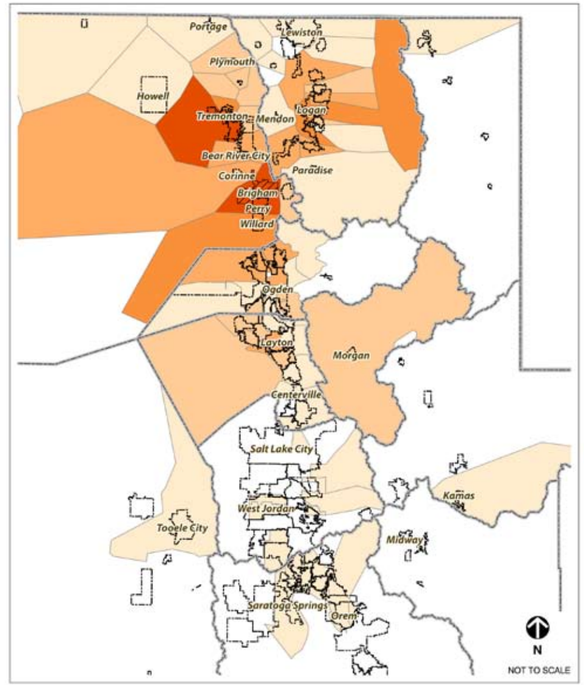
Daily traffic volumes were collected from June 21, 2011 to June 23, 2011 on 800 South, 1000 South, and 200 East. The following shows the average daily traffic (ADT) on those respective roadways:

- 800 South: 690 ADT
- 1000 South: 1,110 ADT
- 200 East: 730 ADT

Main Street has an ADT of approximately 17,600. The historic traffic growth on Main Street near the campus site, based on five years of Utah Department of Transportation (UDOT) data (2005-2009), is approximately 2%. In other words, the traffic on Main Street has increased by about 1,330 ADT since 2005.

Main Street Intersection Spacing

UDOT has classified Main Street (SR-13) as a Regional Urban roadway, also known as a Category 6 roadway. The State Highway Access Management Standards state that Category 6 roadways should meet the following spacing requirements:



FEHR PEERS

USU BRIGHAM CITY
Student Population by Zip Code
FIGURE 1

- Minimum Signal Spacing: 1,320 feet
- Minimum Street Spacing: 350 feet
- Minimum Access Spacing: 200 feet

This information is and will be important when making decisions on the future of the Kmart / Main St. signalized intersection, signalization of the Fishburn / Main St. intersection, and any other street connections (present and future) on Main Street.

Parking

The following are preliminary numbers regarding parking. We have gathered information (parking spaces, students, square footage, utilization, etc.) supplied by USU from the existing USU Brigham City Regional Campus and the USU Tooele Regional Campus. The parking rate for the Brigham City Regional Campus is 0.25 stalls/student (using the 80% utilization during the peak period – 5:00pm to 8:00pm). Assuming the first main building at the new campus site in Brigham City is expected to hold the same number of students as the existing campus site (1,971 students), then approximately 500 parking stalls would need to be supplied at the new campus site for the first building (using the Brigham City rate of 0.25 stalls/student).

In the future, the Campus is expected to grow in the next hundred years to 3,900 full-time equivalent students (FTE), or roughly 7,800 students (the USU Brigham City Campus Feasibility Study cites a ratio of FTE to headcount as 2:1). Thus, preliminary numbers indicate around 2,000 parking spaces are needed for the 100-year full build of the site.

AVERAGE DAILY TRAFFIC (ADT)

Existing traffic volumes internal to the site are minimal. Existing ADT on 200 East is 730; on 800 South is 690; and 1000 South is 1,110. Over the next five years as the main campus building is built, ADT is expected to rise but generally stay at or below 4,000 vehicles on Fishburn and 990 South. In both the short- and long-term future, internal ADT is expected to remain low while the main entrances to campus, such as Fishburn and 1000 South, are expected to increase substantially.

Roadway Design

Campus roadway sizes were determined by phase based on capacity and projected ADT. Given the environment of the USU Brigham City campus, the following roadway capacities are expected:

- Two-lane 10,500 ADT
- Three-lane 11,500 ADT
- Four-lane 22,500 ADT

Using the above standards, all campus roadways will function at a projected Level of Service (LOS) C or better with a two-lane configuration. As the campus moves toward its 100-year build-out, the three main entrances to campus, Fishburn, 990 South, and 1000 South, will experience an increase in traffic, but should remain under the threshold for LOS C on a two-lane roadway. It is recommended that all roadways include bicycle lanes, sufficiently wide sidewalks, and, if applicable, transit pullouts.

Intersection Control

Most intersections on campus are projected to be unsignalized and will require a two-way stop, four-way stop, or roundabout as a control measure. Campus intersections with Main Street may warrant signals in future years as the campus and enrollment expands.

Traffic Calming

Internal roadway speeds should be minimized to preserve the nature of a college campus. Recommended traffic calming measures include bulb-outs, speed tables, and chicanes where necessary. Crossings for pedestrians should be accommodated through raised crosswalks. For roadways not expected to carry the bulk of traffic, such as 500 East, lane widths should be reduced and should be kept in the 10-foot range.

COMPLETE STREETS

Complete streets are those that adequately provide for all roadway users, including bicyclists, pedestrians, transit riders, and motorists, to the extent appropriate to the function and context of the street.

American streets were once quite successful in this regard. However, for several decades there was a drift towards a focus on the automobile. More recently there has been a growing recognition that minimizing driving delay should not be the only goal of a roadway and may even be undesirable depending on the context. Street design is now recognized as an important determinant of the character and quality of a place.

One of the transportation goals of this master plan is to make campus streets serve as destinations in themselves and as part of the open space system rather than thoroughfares for automobiles.

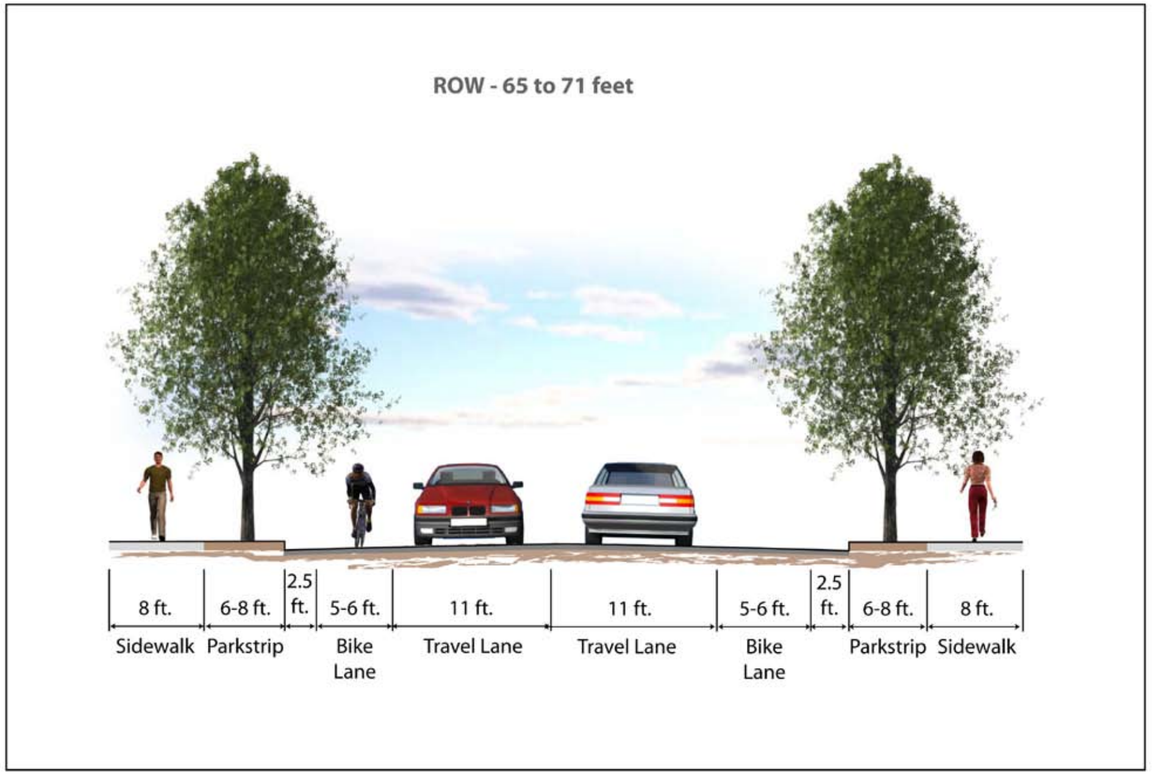
Designing streets with this concept in mind does the following:

1. Improve the functionality and appearance of streets
2. Facilitate pedestrian and bicycle travel
3. Reduce the potential for speeding and other safety problems
4. Introduce desirable elements, such as landscaped strips, street furniture, public art, street trees, etc.

WHY COMPLETE STREETS FOR USU BC?

Complete streets are those that adequately provide for all roadway users, including bicyclists, pedestrians, transit riders, and motorists, to the extent appropriate to the function and context of the street.

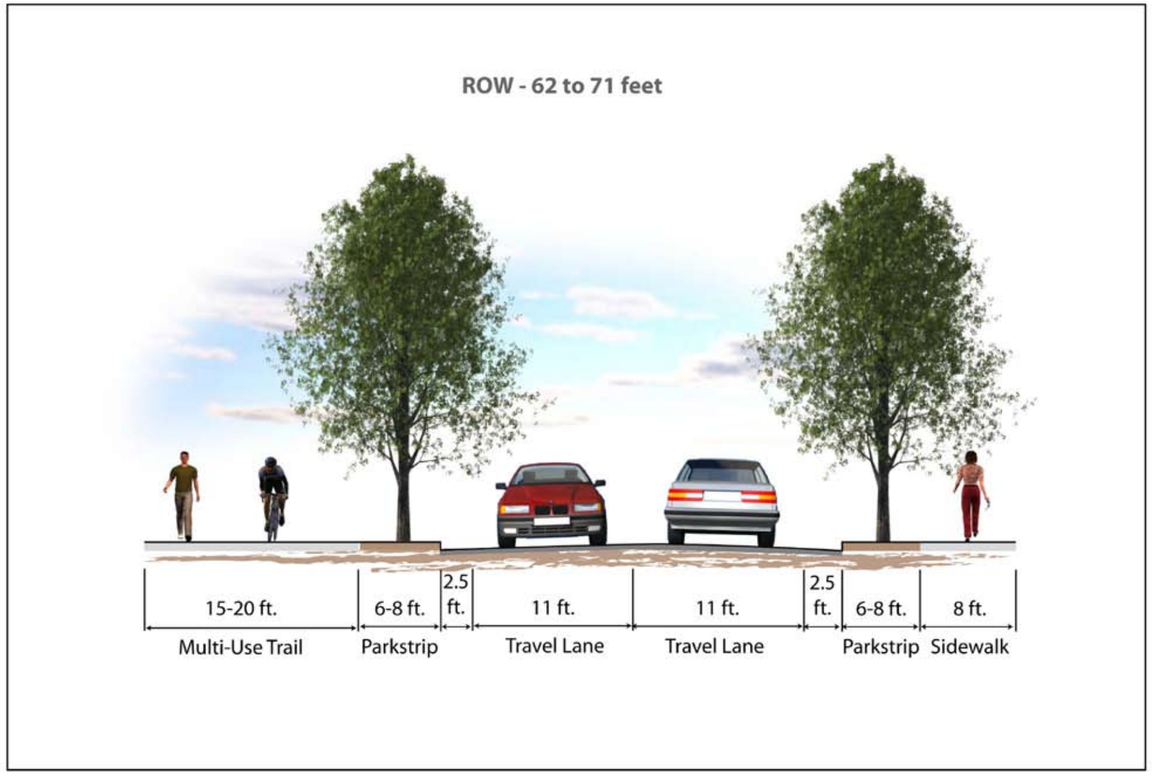
1. Campus transportation routes will be pleasant, safe, and beautiful corridors
2. Transportation routes will be part of the open space system and will not serve merely as conduits for vehicular travel



FEHR PEERS

USU BRIGHAM CITY
Example Cross-Section

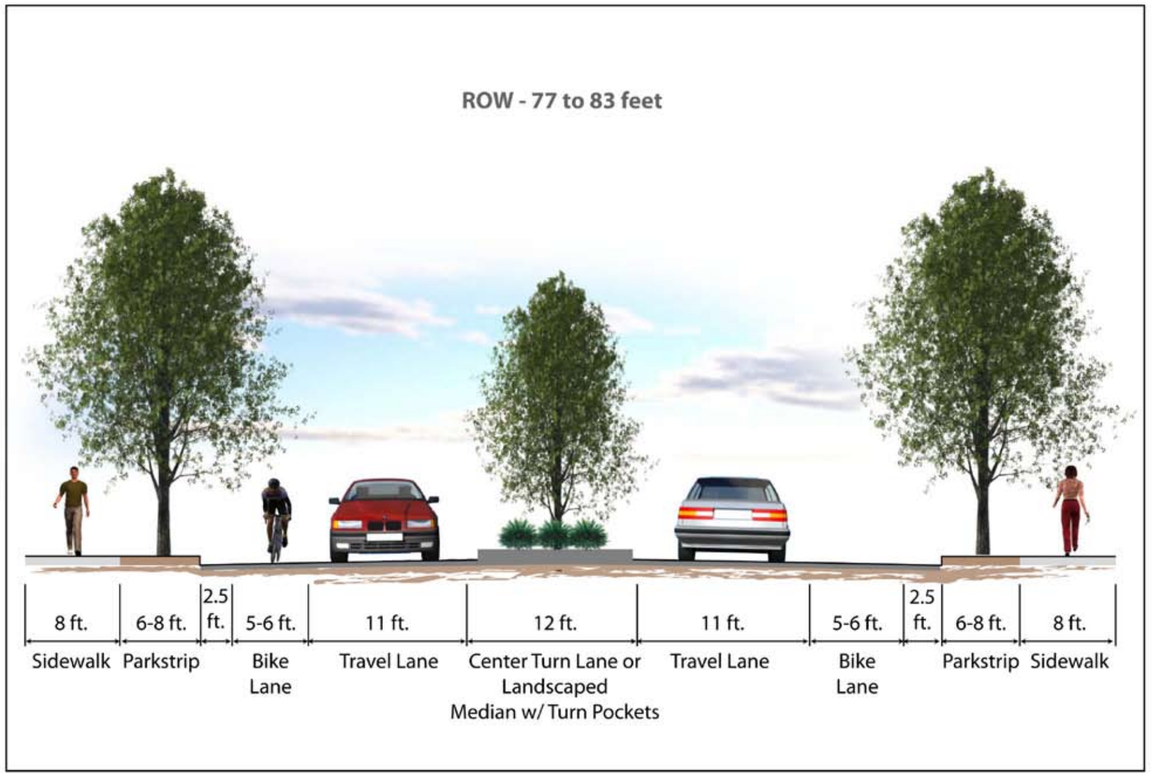
FIGURE 4a



FEHR PEERS

USU BRIGHAM CITY
Example Cross-Section

FIGURE 4b



FEHR PEERS

USU BRIGHAM CITY
Example Cross-Section

FIGURE 4c

PUBLIC DIALOGUE

Open Houses

Two public Open Houses were held during the master planning process. These provided opportunities for Stakeholders (businesses and residents in close proximity to the site), and citizens to contribute to the planning process.

Open House #1 August 2011: The meeting was attended by about 60 residents of Brigham City. This included attendees to the Stakeholder Meeting which preceded the Open House. The Open House was the first formal opportunity to introduce initial concepts to residents. Concerns from residents were addressed, where feasible, helping immensely to determine the overall functional relationships and layout of the campus. Public comment cards were also available and the comments provided were documented and can be found in Appendix B of the report.

For instance, residents to the immediate east of the campus property had concerns with the then planned location of a parking garage (100 year build out) in the northeast corner of the property. (see Appendix B for early concepts). The Planning team responded to these concerns and relocated the parking garage to another site on the property.

Open House #2 January 2012: The second Open House, which was attended by about 40 residents, was held five (5) months later to update residents on the plans and concepts and to give them another opportunity to contribute to the process. Dr. Tom Lee, Dean of the Brigham City Regional Campus briefed attendees on the entire process. He also took questions from the residents regarding justification for the project, student enrollment projections and the project time line.

Dr. Tom Lee addresses participants at workshop

Participant interaction at workshop

Brigham City

Brigham City's Mayor, elected officials, and City staff were actively involved in the planning process and played a vital role by providing the consulting team with the relevant background information and technical resources.

Departmental Staff Meetings: Two meetings were held during the process with Brigham City departmental staff. The first meeting focused on existing conditions and background information. This was necessary to inform the consulting team on the City's standards and requirements for development. Civil and infrastructure maps for the site were also discussed in the first meeting.

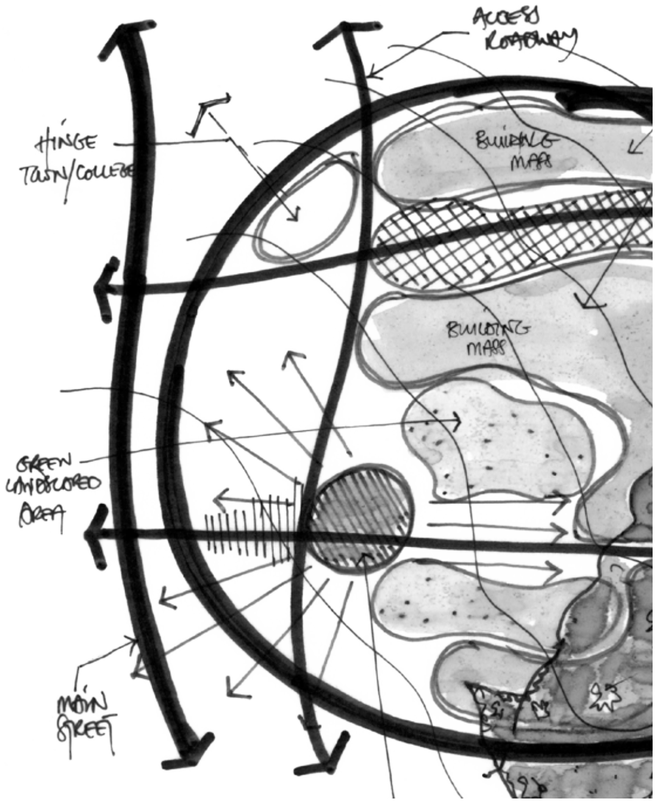
The second meeting came later in the process and focused on presenting the concepts and layout to the City staff for their review. Staff members examined the proposed layout and ensured that there were no red flags in the proposed concepts.

City Council: Brigham City Mayor Dennis Fife was very involved in the planning process and attended both Open Houses, departmental staff meetings and a project progress meeting, (project progress meetings were held frequently and involved the planning consultants and representatives from USU, and Brigham City).

A formal presentation was made to City Council to brief Council Members on the planning process. Council Members responded positively to the Plan's intents.

Public Open House - August 2011

Paul Larsen, Brigham City's Economic Development Director (left) in a conversation with attendees about the new campus plan.



3. CAMPUS ILLUSTRATIVE PLAN

SPATIAL DISTRIBUTION

Site Context

The site for the new campus draws energy from its proximity to major transportation corridors (Highway 89, Main Street), a mix of land uses on its periphery, a backdrop of Eagle Mountain Golf Course, and the benches of the Wasatch Mountain Range. The 40 acre site slopes gently, but considerably, from the northeast to the southwest corner - a change in elevation of about 55 feet. The site's location also lends itself to the role of a gateway to Brigham City.

Site Design Considerations

Connections: Connections, as expressed in site design, play functional, spatial, and visual roles. The campus was designed with an understanding of these connections and their impact on the built form.

Functional connectivity ensures that campus buildings meet the needs of users and contribute to efficiency in daily tasks. An example may include the relationship between the location of the main administrative building and a parking garage.

Spatial connections are concerned with the relationships between solids and voids on horizontal and vertical planes across the campus. Solids and voids refer to built structures and adjacent open spaces. How these interact with each other create overall volumes and spaces which are comfortable to the pedestrian and which aid in the overall performance of the campus design.

Visual connectivity is concerned with sight lines and the impact of vistas, edges, nodal points, etc on the users of the campus as well as the connection to the site's periphery. In particular the visual connections to the first building on campus (the new academic building), from main Street was a major consideration.

Vistas: A vista is a landmark, visual terminus, or focal point. Vistas help with way finding and legibility, while helping to create an identity. The campus was designed with a consideration for the location of vistas and focal points. The primary focal point will be the tower envisioned for the top of the main academic building. Another major vista is a bell tower that terminates the east end of the primary east-west pedestrian mall. Elements on some campus buildings will serve as vistas and contribute to the legibility of campus.

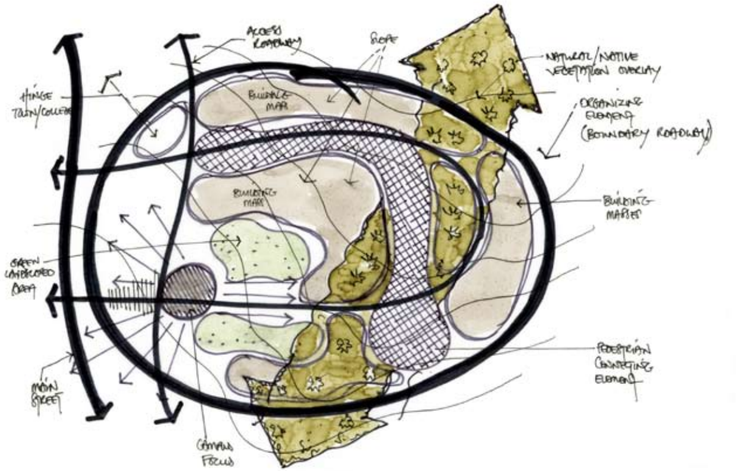
Placemaking: Campuses are typically self sufficient spaces within a larger urban or rural setting. They serve as destination and sojourning points for their users for

several hours in a day, and for several days in a year. Campus spaces should therefore be dynamic, interesting, and beautiful all year while supporting the primary role as an academic institution.

Placemaking is a term that describes the provision/creation of open spaces like parks, plazas, squares, landscaping etc., for the enjoyment and pleasure of people. Campuses that are designed with an underlying placemaking objective are successful at retaining users in different zones for different activities. The campus has been laid out to serve as a backdrop for placemaking through all its phases of development - from the first phase to the third phase or 100 year build out. Quads, open spaces, and linear pedestrian malls offer opportunities for the inclusion of placemaking elements and pedestrian amenities. Placemaking elements include plazas, amphitheaters, band stands, waterbodies, gardens, signage etc.

CAMPUS PLANNING CONCEPTS AND LAYERING

The campus will bring together multiple systems and functions to create a space that promotes academic work, reinforces the identity of Brigham City and USU, and respects and protects the natural environment. Due to its proximity to Main Street, the campus will offer a presence



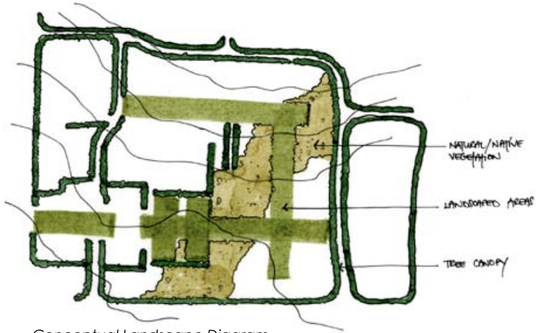
Conceptual Site Organization Diagram

that will serve as a gateway and focal point for Brigham City. Its location will enable the campus to meet certain community needs such as recreation and learning resources.

The master plan intends to marry the built and natural environments on the campus with minimal impact on existing natural systems throughout its growth. In so doing large portions of natural vegetation and native plants will be incorporated in the landscape design of the campus. Pedestrian activity will be primary on the campus and buildings and spaces will be organized around pedestrian movement patterns. A loop road around campus will serve as the organizing element and contain activity within the core of campus. The following concept overlays describe campus systems at the full build-out.

Landscape Concept

The landscaping will include considerable amounts of natural vegetation and native planting. Native planting eliminates the need to irrigate; demands very little maintenance; reduces erosion to a minimum; increases habitat for native flora and fauna. Hard and soft programmed landscaped areas



Conceptual Landscape Diagram

will complement the natural areas. Tree canopies will line the loop road around campus and occur along major accesses and as clusters with the landscape program.

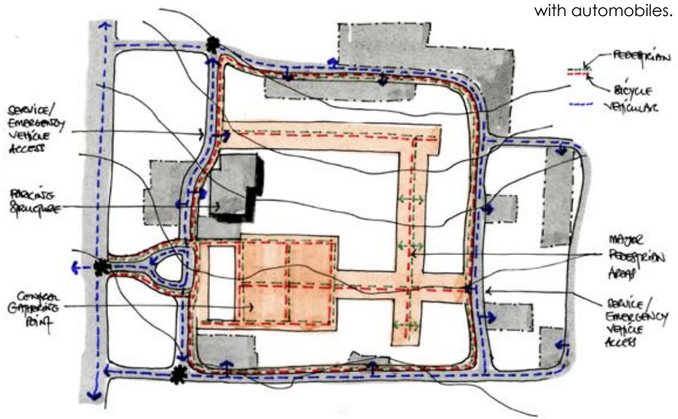
Mobility Concept

Efficient mobility systems are important for the day to day functioning of an academic campus. Mobility systems include modes such as pedestrian, bicycle and vehicular movement. Well-functioning systems eliminate conflict and maximize the utilization of each mode.

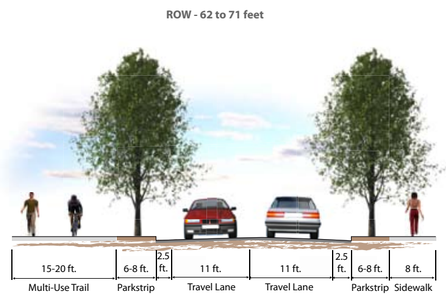
USU's Brigham City Campus is envisioned as a pedestrian friendly campus which will allow students, faculty, and visitors to move between buildings and outdoor spaces with minimum conflict with automobiles. Well programmed pedestrian malls with pedestrian amenities will serve as major corridors of activity and mobility within the campus. Although dedicated to pedestrian (and bicycle) activity, these malls will allow access to service and emergency vehicles as needed. A multi-use use trail will be located along the loop road to provide pedestrian and vehicular connections to other roads in the City.

Vehicular traffic will be limited to the periphery - along the loop road and the private access road to be placed a block east of Main Street.

<u>Parking:</u> A number of surface parking lots will be placed at the periphery of campus providing access to most campus buildings. A parking garage will be located at an appropriate location on campus to serve as a central parking point.



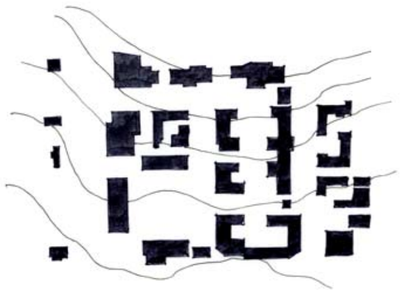
Conceptual Circulation Diagram



Loop Road Section

Massing

Building massing is important as it determines the overall feel of the place. The conceptual building footprints as shown in the graphic above will allow for the creation of outdoor rooms and landscaped open spaces while maintaining strong corridors and vistas.



Conceptual Massing Diagram

Building forms will be eventually determined by building use and other design considerations, however it will be necessary to ensure that building heights, depths and sizes create an appropriate scale for the campus and for the City. Current planning numbers project the campus to meet its 100 year square foot needs (about 1 million square feet) at 2.5 to 3 stories.

The proposed USU Brigham City Regional Campus Plan has been developed based on the following criteria and stategies:

PLANNING & DESIGN PRINCIPLES

Criteria

1. Accommodate projected increase in enrollment in a 100 year time horizon, using FTE enrollment data.
2. Maintain a compact walkable academic core.
3. Strengthen & clarify USU's image
4. Enhance compatibility with the community.

Brigham City's historic Main Street

5. Efficient and safe pedestrian and vehicular travel.

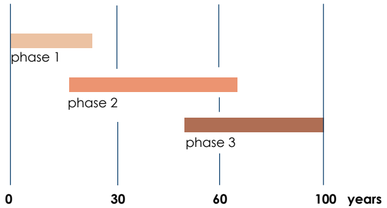
Strategies

The following strategies were utilized in developing this plan:

1. Preserve the community grid system, for civic clarity and infrastructure efficiency.
2. Incorporate quadrangles and courtyards as part of a traditional campus layout plan.
3. Identify key nodes and gateways, making use of the existing traffic signal at 990 South and Main to maintain a safe access and egress to and from the campus.
4. Maintain a network of interconnected large and diverse open spaces, which may include quads, courtyards, plazas, squares, and recreational fields.
5. Two to three story buildings, to increase density for more efficient land use of the finite land resource. Buildings should be used to strengthen the street frontage and to frame open space features.
6. Parking should be adequate to support the space, but should not be a dominant feature. Surface lots should be located towards the back of buildings, where possible. The design should be softened by integrating landscaping and pedestrian walkways. Parking terraces should be considered.
7. Maintain a compact core, and plan for infrastructure efficiency. A future central plant location should be considered.
8. Patterns and density of new developments should be compatible with the scale and character of the surrounding community, and should support the campus image.
9. Set forth architectural style and building material standards to support the regional context.
10. Incorporate principles of green building and sustainability, including passive energy strategies as well as current technology.
11. Spatially organize site to allow an orderly phasing of new facilities.

An estimated 1,000,000 sf is needed to meet the needs of the campus at the 100 year build out. (This does not include recreation and student services). The proposed footprints of buildings in the 100 year illustrative plan can meet this requirement at heights of about 2.5 stories across the campus. This implies that a combination of 2 and 3 story buildings should be able to meet this estimate.

Due to the long vision time frame, it is the intent of the Plan that each phase functions efficiently to provide the academic needs of the campus while strengthening the fabric of the community. The diagram below provides an approximate time line for the phase development of the campus.



Detailed diagrams of the phasing plans can be found on the next few pages.

Major Themes

1. Strengthen the University's role in the Community: The University intends to operate within the broader context of Brigham City providing a focal point for economic development, employment, and an array of community services in the areas

of community recreation, sports, continuing education and culture. The provision of soccer fields, and the proposed location of a recreation center on the campus property for use by residents of the City will help to integrate the campus into the community fabric.

Also proposed on the campus property will be an area for commercial/retail development to foster the connection between Main Street and the campus. This development will serve as a community space for social discourse and exchange and could include a plaza space, farmer's market, shopping, and eating opportunities.

2. Preserve the natural environment and USU's heritage: USU was originally founded as Utah's agricultural college in 1888. The University's image is typically associated with agriculture, natural environments, mechanization and research.

The USU Brigham City Regional Campus will be a model for environmental responsibility through the physical development of the campus, and activities such as teaching, research and demonstration. The first two phases of the master plan, in particular, will incorporate community recreation fields and agricultural demonstration orchard plots.

Natural areas and vegetation will be kept to aid in storm water management while preserving natural habitats. Sustainable design and planning practices (discussed in detail in Chapter 4 of this document) will also be paramount to the design of this campus.

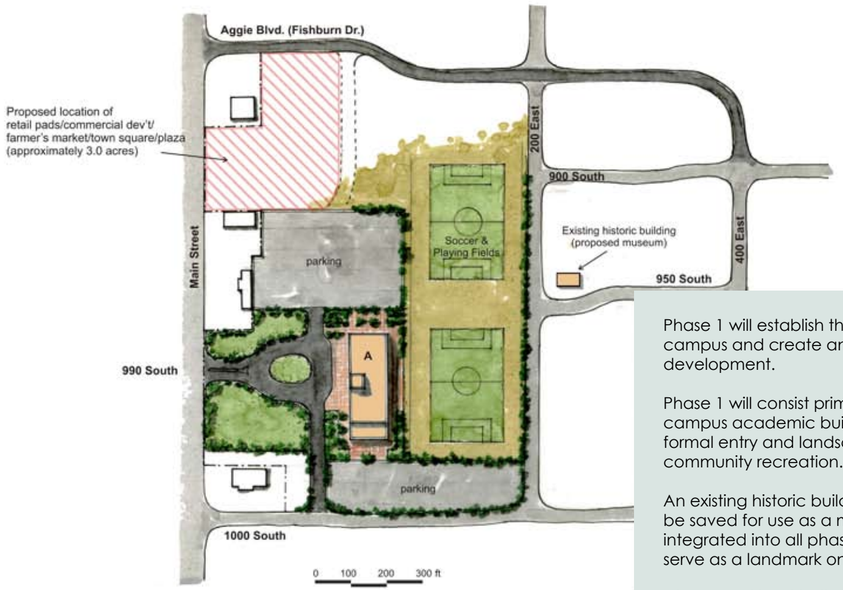
A belt of natural vegetation (grasses and plants) will weave through the formal campus landscaping at the 100 year build out.

3. Create a pedestrian friendly campus: The intent is to keep all activity within the core of campus and to encourage walking and biking for most trips. Pedestrian malls and walkways will be included in the pedestrian zones. The campus will be connected to the rest of the City and the greater region with a transit system.

Pedestrian amenities like furniture, lighting, trash receptacles etc. will be necessary to encourage walking and biking.

4. Establish a connected campus: Physical and virtual connectivity is important for the Brigham City Regional Campus. Efficient transportation systems are necessary for the campus to function well. Automobiles, transit, shuttle and bicycle systems should augment pedestrian activity and bring pedestrians close to their destinations on campus safely and without conflict.

A long-term 100 year planning window and the advent of virtual/online teaching and distance education in colleges demands a plan for the new campus that creates opportunities to maximize internet connectivity and use. In that regard interior and exterior spaces on the campus should be designed to maximize internet access and use.



Phase 1

A New Academic Building

70,000 GSF
Including 10,000 square foot Business Resource Center

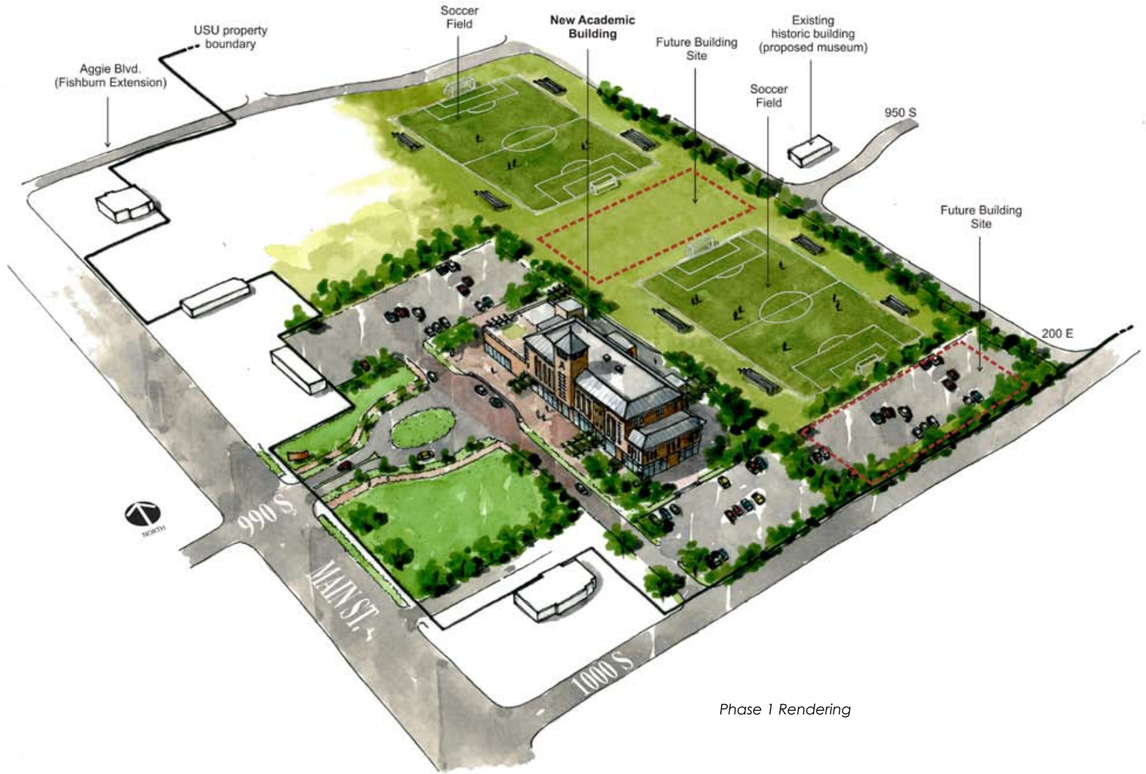
Approximately
600 Parking Stalls

Phase 1 will establish the identity of the regional campus and create an anchor for its future development.

Phase 1 will consist primarily of the new regional campus academic building, Main Street frontage formal entry and landscaping, and soccer fields for community recreation.

An existing historic building on the campus site will be saved for use as a museum. This structure will be integrated into all phases of the Master Plan and will serve as a landmark on the campus.

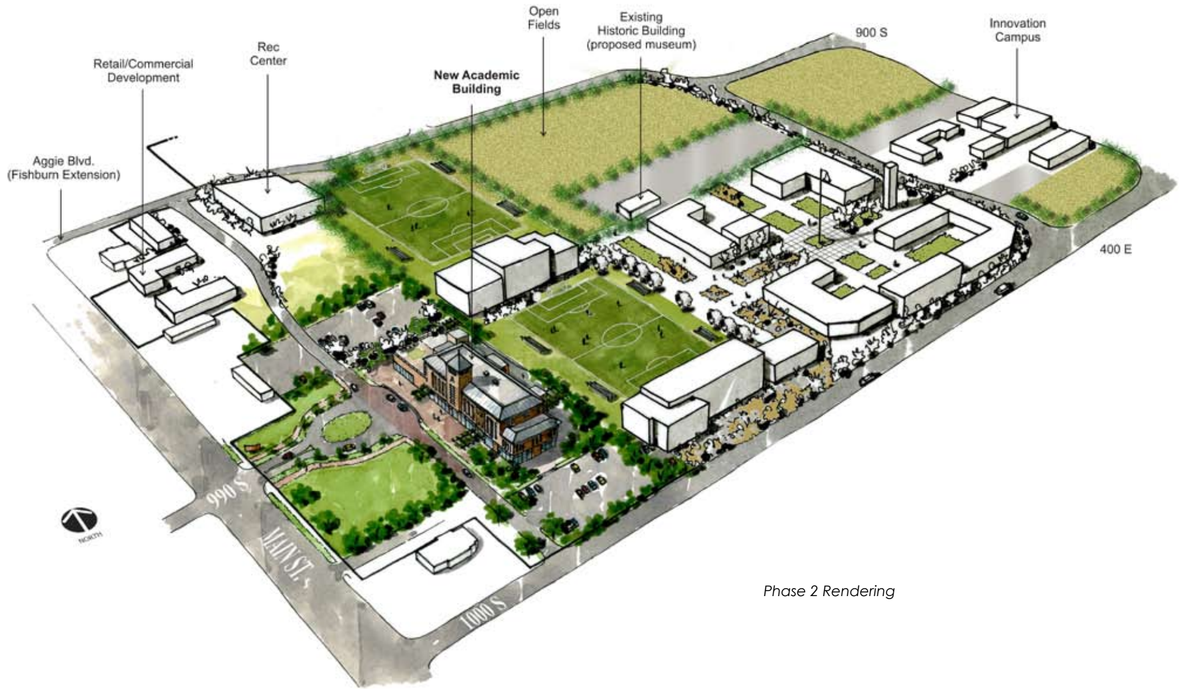
USU-owned land to the northwest of campus can be developed into retail pads or commercial development as appropriate to generate revenue and to serve as a community gathering area.



Phase 1 Rendering

Phase 2 introduces more campus buildings and an innovation campus. An east-west oriented pedestrian mall is laid out from the first building and terminates at a bell tower. The soccer fields are still present and development surrounds it.

A proposed community recreation center will come in at this time to take advantage of the energy from the playing fields and commercial development.

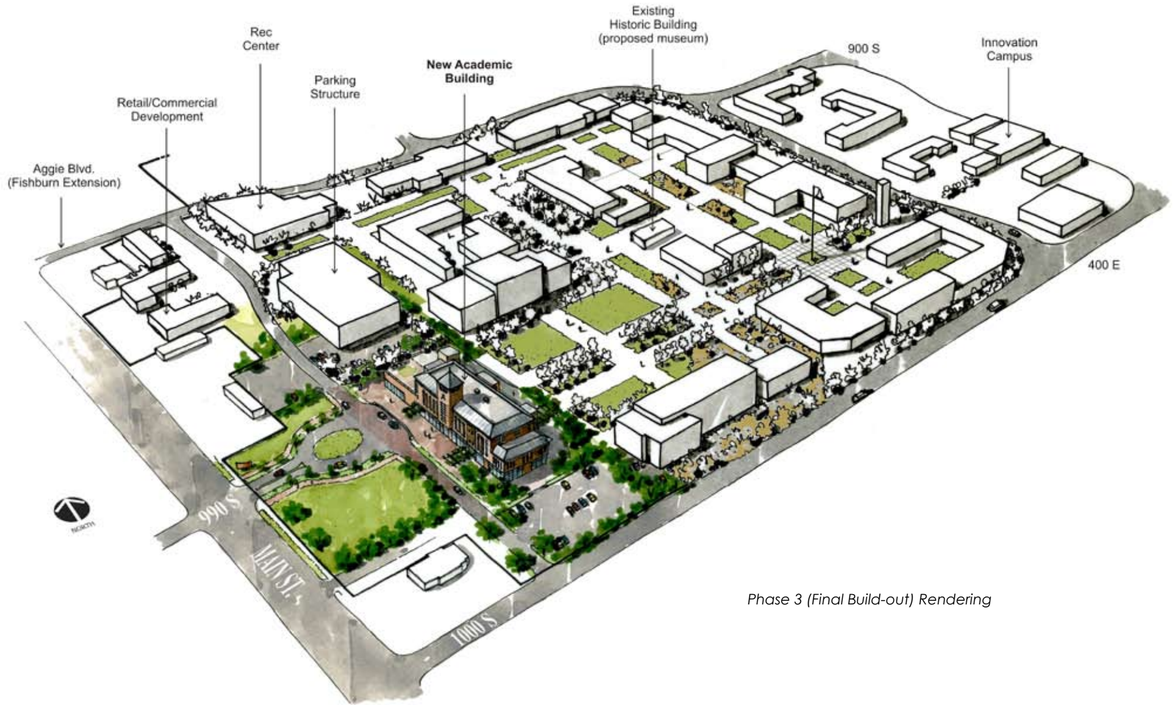


Phase 2 Rendering

ILLUSTRATIVE CAMPUS PLAN

The Illustrative campus plan shows the third phase and 100 year buildout of the campus. It also shows the relationship between the built and natural environments. It represents an ideal future configuration, translating the principles and key planning themes into a graphical representation. The plan illustrates opportunities for development and provides a guide for growth - representing future building envelopes, their relative scale, and how they shape the campus space.

The plan above and the 3 dimensional impression on the next page show opportunities for future buildings, roadways, open space, parking, and pedestrian zones and accesses. The illustrative plan results from a cumulation of projected analyses of campus needs, a campus programming plan, and layers of design concepts. It introduces a spatial order and acts as a canvas to support other principles and best practices including architectural, landscape, and sustainability guidelines.



Phase 3 (Final Build-out) Rendering

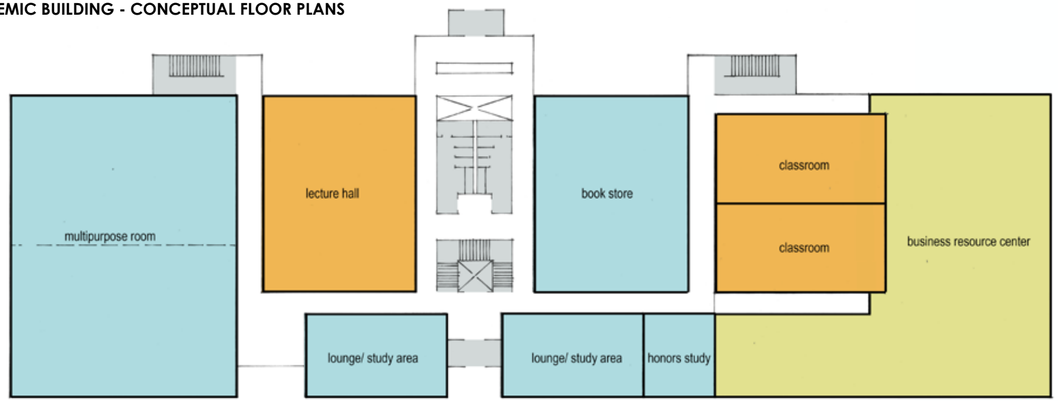
NEW ACADEMIC BUILDING (FIRST CAMPUS BUILDING)

The new academic building will be approximately 60,000 square feet, to house classrooms, faculty and staff offices and student support spaces such as study space and a bookstore. It will also include a large multi-use room and large lecture hall for university and community uses. Funding is being sought for an additional 10,000 square foot Business Resource Center.

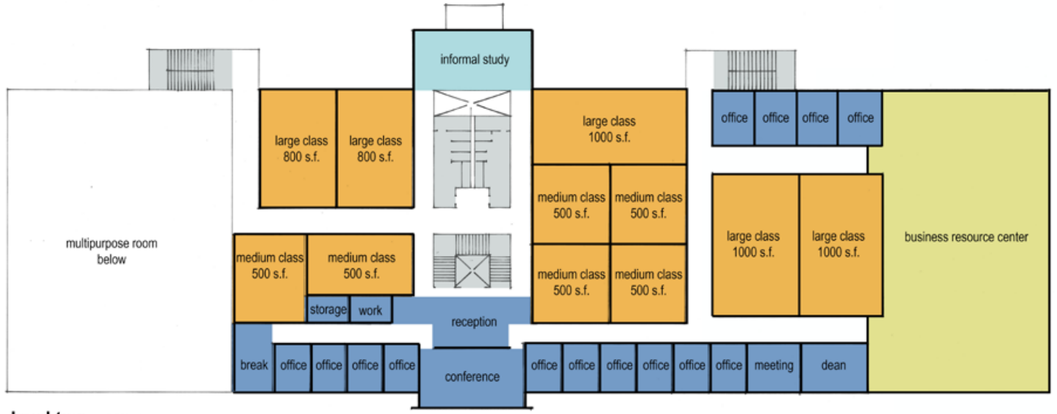
This new building will accommodate the first phase of the move to the new site, consisting of most of the academic program and student support space with the exception of certain science programs that already have high quality lab space in the current facility.

The building will also serve community needs and be a shared resource for the City, County, and school district.

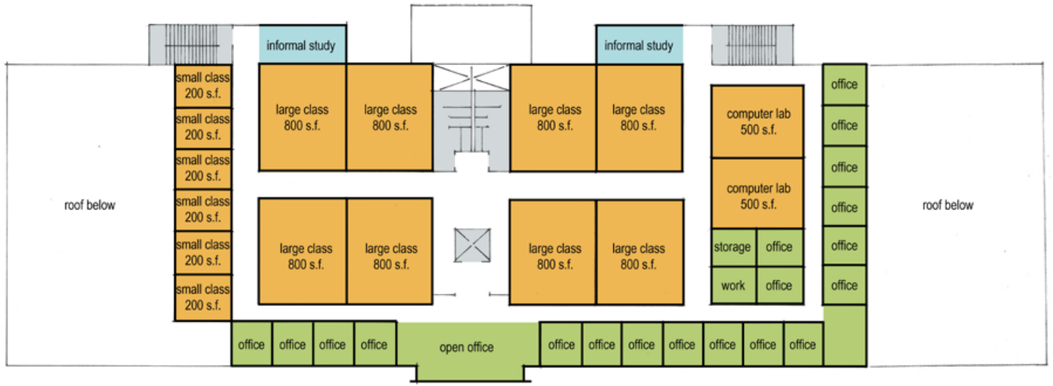
New Academic Building - looking southeast



main level 27,350 s.f.

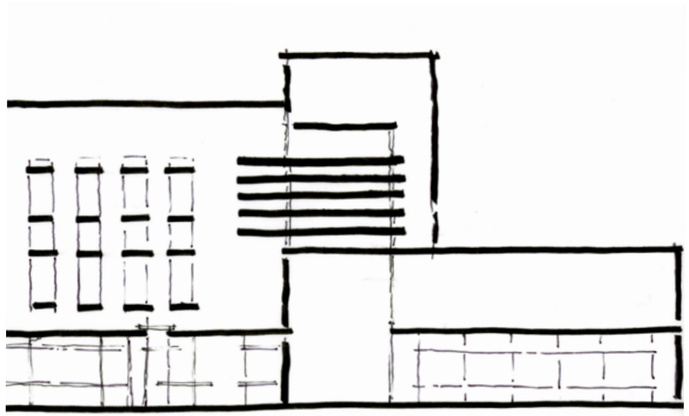


level two 17,750 s.f.



level three 23,550 s.f.

4. CAMPUS ARCHITECTURE AND DESIGN GUIDELINES



ARCHITECTURAL GUIDELINES

OVERVIEW

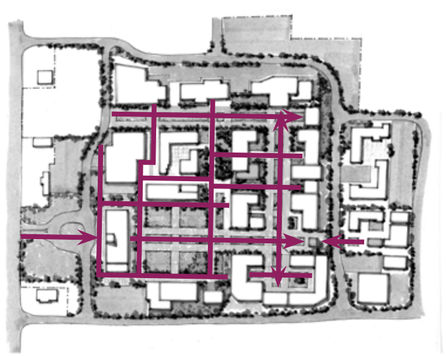
Across institutions, architectural design guidelines represent a spectrum of approaches to development, from highly proscriptive (stylistic requirements and proprietary building materials) to visionary (expressions of purpose or intent). Utah State University, Brigham City Campus encourages unity of development as a campus without resorting to uniformity of architectural style of buildings. The campus should be perceived as a unified whole, with over arching organization relating to primary and secondary elevations, building entries, service nodes and materiality.

The design guidelines are intended to facilitate both an approach to development and an architectural dialogue. The guidelines are also a tool for a design for USU BC and enforce primary organizational concepts to advance realization of the campus master plan. Topics in this section include:

- Massing
- Horizontal Hierarchy & Façade Articulation
- Building Heights and Vertical Hierarchy
- Architectural Style & Materials
- Facilities Planning
- Sustainability

GUIDING PRINCIPLES

- Incorporate quadrangles and courtyards as part of a traditional campus layout plan.
- Identify key nodes and gateways, making use of the existing traffic signal at 990 South and Main and preparing for a main campus entrance at Fishburn Drive to maintain a safe access and egress from the campus.



- Maintain a network of interconnected large and diverse open spaces, which may include quads, courtyards, plazas, squares, and recreational fields.
- Three to four story buildings (two story buildings used for space planning), to increase density for more efficient land use of the finite land resource. Buildings should be used to strengthen the street frontage and to frame open space features.
- Innovation Campus uses may require one story buildings and should be planned on the services side and be screened by main streets
- Parking should be adequate to support the space, but should not be a dominant feature. Surface lots should be located towards the back of buildings, where possible. The design should be softened by integrating landscaping and pedestrian walkways. Parking terraces should be considered.
- Maintain a compact core, and plan for infrastructure efficiency. A future central plant location should be considered.
- Pattern and density of new developments to be compatible with the scale and character of the surrounding community, and should support the campus image.
- Architectural style and building materials standards should be set forth and should support the regional context.
- Incorporate principles of green building and sustainability, including passive energy strategies as well as current technology.
- Site spatially organized to allow an orderly phasing of new facilities.
- Site spatially organized to utilize existing K-mart facility allowing it to be phased out in time.
- USGCB Silver certification or higher and State of Utah High Performance Building Rating System compliant,

BRIGHAM CITY CONTEXT

The context of Brigham City and the surrounding landscape has served as inspiration in the planning this regional campus for Utah State University. The desire to craft a distinct campus grounded within Brigham City have inspired the campus master planning process to review the contextual references of urban planning, architecture and landscape architecture.

City Hall - Brigham City

Brigham City is dominated by a strong urban street grid orienting the campus along the cardinal axis's. The city, with narrow streetscapes, is walkable, tree lined and pedestrian friendly. The USU Brigham City campus will interface with the street grid to support campus and urban integration.

Blessed with a historic building stock, Brigham City's late 19th and 20th centuries structures have been respected and drawn upon the crafting new civic buildings. With low window to wall ratios, structured facades separated into building base, middle, and cap, and with towers and other architectural accent. The rhythm of punched openings, roof forms, focused sense of entry, and sheltered porches support the city's welcoming, friendly nature. Historically, building materials have a textural and modular repetitiveness, and primarily consist of masonry and stone. Grounded, stable and often with a hand hewn quality material use has inspire a new generation of compatible civic architecture.

Commercial Building - Brigham City

Historic structure on site

Main Street - Brigham City

Campus buildings typically have a strong presence while responding to local architecture and circulation patterns

CIVIC STRUCTURE | ACADEMIC ARCHITECTURE | COLLEGIATE CAMPUS LANDSCAPE

Brigham City's contextual overlay influenced three core organizing elements of the USU Brigham City Regional Campus proposed campus master plan – its civic structure, academic architecture, and collegiate campus landscape. The three elements are interwoven to form a campus of distinct but integrated design elements supporting a larger, consistent campus fabric.

The civic structure of a campus is composed of its interconnected public spaces: its streets, quadrangles, courtyards, and the major public spaces within its buildings. These constitute the campus's public realm, organizing and linking together its buildings to form a coherent environment.

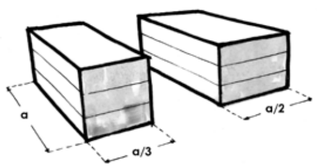
The academic architecture is a strong supporting partner giving form to outdoor spaces and crafting campus quality through the use of building materials, spatial organization and pedestrian focused design. Architectural drivers inspired by Brigham City and refined for the USU campus support aesthetic continuity.

The collegiate campus landscape builds upon the streetscape civic qualities of Brigham City and develops into refined exterior plazas and quads, naturalized riparian corridors from the foothills landscapes, and structured view corridors. These elements support the larger urban context and the more intimate personal spaces.

- Materials should be contextual to the region, contain recycled content and environmentally responsive,
- Buildings orientation should facilitate capturing daylight and views, active solar, and renewable energy opportunities,
- Buildings and their intrinsic outdoor spaces must support the interdisciplinary, collaborative, community building of the USU BC campus,
- Construction shall be commensurate with a university-level research campus,
- Plan of building lifespan of 50-years.

MASSING

A range of proportional relationships reflects the master plan footprints. Academic classrooms and administration buildings are in the range of a : a/3. Laboratory buildings of labs flanked by lab support and offices is in the a : a/2 range, with the narrow dimension between 90 to 100 feet.



This approach to massing generates sustainable opportunities, including: reducing land use, reduce imperious building areas, increase access to daylight and increase the opportunities for natural ventilation in non-lab spaces.

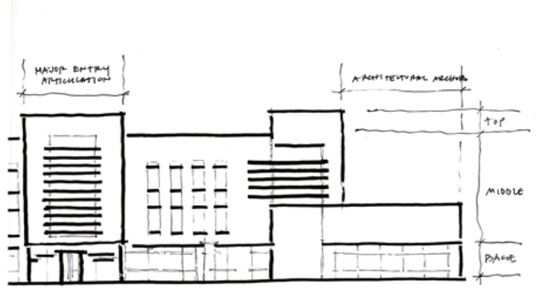
As the campus will be primarily populated with academic classroom, offices and administrative buildings there will naturally be a consistency in building massing. Unique elements, large lecture halls and unique structures, such as a campus library, administrative building or student union, should be considered iconic structures and be articulated differently. Where deep floor plates are a programmatic requirement, such as recreation facilities, then building articulation that acknowledges campus scale should be considered.

The master plan recommends a variety of uses and floor plan areas but suggests relatively narrow floor plates for most building types.

Horizontal Hierarchy and Facade Articulation

Buildings following the massing and height recommendations will be predominantly horizontal. Without vertical articulation, long, repetitive facades may lack visual interest. Building facades that occur at the terminus of a street or campus quad, site gateway or anchor a distinct site present major opportunities for articulation and change of expression. Major entries are also natural locations to interrupt horizontal compositions. To maintain verticality, these nodes should range in width from one to two structural bays, or 20 to 40 feet.

The master plan suggests locations for primary building entries. Change in program, for example from lab or office to conference room or collaboration space, also provides



opportunity for change in articulation. Primary building entrances should be located at or near the center of a building's primary façade and articulated. For secondary building entries typically located near building corners should consider vertical interruptions or articulation of horizontal compositions particularly on long facades.

Buildings should have a base, middle, and top. An articulated ground floor is important, as it reinforces a building's connection to the public spaces upon which it fronts. The development of the lowest level of a building is an opportunity to mediate between the scale of buildings and he pedestrian scale of adjacent pedestrian pathways and outdoor spaces through the use of architectural of landscape features or plantings.

Building Heights and Vertical Hierarchy

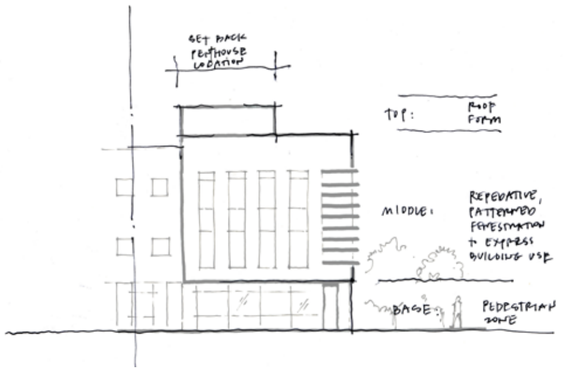
Utah State University, Brigham City campus buildings will have a range of heights from two to four stories, maintaining a human scale streetscape and pedestrian experience. Typical floor-to-floor heights for academic classroom and lab buildings are in the range of 14 to 16 feet. High bay maintenance and innovation campus technology development areas may require clearance above 20 feet. The activities that require high bay space may best fit in a taller first level or a one-story wing.

Two- and three-story building design organizations should consider roof forms that integrate the penthouse into the body of the building. Three- and four-story projects should acknowledge the scale of the lowest neighbors by utilizing setbacks above the fourth story and penthouse.

Setbacks to building massing above street level should be considered to permit daylight to reach streets, sidewalks, and landscaping. Scale in the built environment is a function of both size and articulation. USU BC buildings should have a general vertical organization:

- Base is where the building meets the grade and shapes the pedestrian experience. Consider a high degree of transparency associate with public or campus community spaces. A higher level of detail and finish are appropriate.
- Middle is the body of the building, often comprised of repetitive, patterned fenestration, with expression of office, classroom, laboratory, or other planning module. Large areas of typical cladding define the materiality of the building
- Top is where the building meets the sky. This building area presents an opportunity for a change in material and to reinforce building character.

Base, middle and top is not a strict pattern of composition, rather it acknowledges the organization of traditional campus buildings



Vegetated green roof

with the expectation that materials and components are vertically interwoven to create visual interest and to express sophisticated architectural concepts.

ROOFSCAPE

Perhaps as much as any aspect of the building, the roof has the ability to convey character. Additionally, the roof is an area that can contribute to a building's sustainability footprint. As a stormwater collection point, roof type can influence storm water management. Expressive roof forms in association with penthouse placement and design can be an important consideration for the architectural character of USU BC.

For sloped roof surfaces, blue roof strategies should be considered as a means to collect and store rainfall for on site use, such as irrigation, toilet flushing, etc. For low-slope roofs, vegetated "green roof" approaches may be more appropriate, as this minimizes roof runoff through evaporate-transpiration and improves water quality.

ARCHITECTURAL STYLE AND MATERIALS
Masonry

Brick and unit masonry should comprise the body of the building and are appropriate for the development of secondary facades. Masonry uniquely expressed pattern and texture at the human scale and simultaneously conveys massing concepts such as plane and volume.

While differentiated from primary facades by material and complexity, secondary facades are expected to be thoroughly designed and respond to program and context.

- USU BC will develop an approved range of brick colors and types to provide coherence to the campus; USU BC may also elect to develop a proprietary brick blend as a component of campus identity. Designers are expected to comply with these requirements.
- Concrete masonry units (CMU) may be used at the building base or as accents but should not comprise more than one quarter of the envelope.
- Consider locally manufactured materials to reduce the embodied energy associated with shipping

Accents

Architectural pre-cast, stone and terra cotta are natural complements to masonry. These materials are appropriate for use at public entries and special architectural elements. When choosing accent materials, it is important to consider limiting the range in variation of color in any single natural or manmade material.

Storefront and Curtain Wall

Primary facades, as discussed in the Site Design Guidelines, present opportunities to enhance the arrival experience, terminating visits, primary street or internal campus greens, and building entries. These facades are suggested locations for transparency and feature materials. Key opportunities for this type of expression include major gateway entries off of Aggie Boulevard and 1000 South in addition to facades and vistas on 200 West and 400 West.

With unparalleled transparency, storefront and curtain wall systems are an example of a primary facade that is ideal for admitting daylight into buildings. Deep views in buildings also put activities on display and make the campus feel occupied. With this in mind, a significant portion of building facades may be curtain wall with relatively transparent glazing. Use of integral solar shading will prevent unwanted glare and/or heat gain. High-performance glazing will improve the thermal characteristics of the window wall assembly. It is also important to consider the use of building integrated photovoltaic (BIPV) in glazing or shading devices.

Metal Panels

A component to curtain wall and storefront systems is metal panels. Metal panels should have limited application as an accent or background material. Metal panels achieve a contemporary expression through a variety of systems, from traditional standing-seam pans applied to curve surfaces and volumes to the finished appearance of composite panel and insulated stressed skin systems. Face-fastening metal siding is not an appropriate exterior finish, except at maintenance facilities,

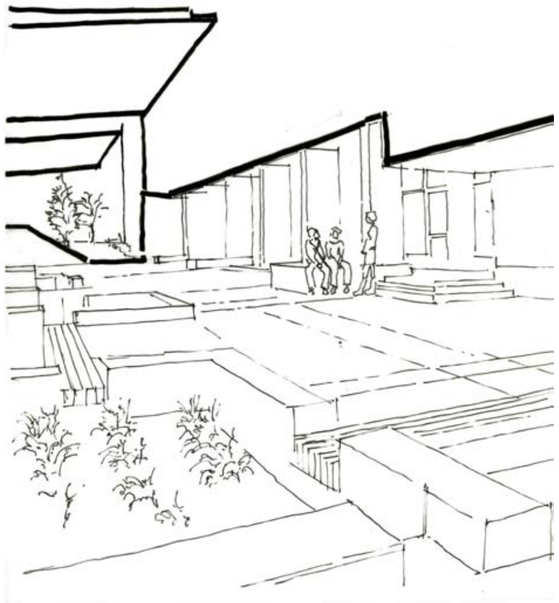
- Where metal panels receive painted finish, the finish should be maintenance-free, durable, and reasonably non-fading over the life of the facility,
- Consider natural finish for metal panels, such as zinc or cooper, which have recycled content and develop a "self-healing" patina.

A play of transparencies and solids optimizes the use of daylight, while creating interesting patterns, rhythms and texture. Interesting and well-articulated roof lines cap this vertical play of elements.

The landscape should reflect the architectural character of the adjacent buildings. Elements on the facade can be repeated in the landscape to create a continuum of expression and a unified identity.

The building envelope should be highly efficient and functional - engaging users inside while aiding in the performance of daily tasks, while creating a comfortable feel and scale on the outside.

Focal points and entry features such as bell towers and are important for cognition of space and for maneuvering through campus , while helping to reinforce a civic/ academic feel.



Clearly articulated lines and edges define the character of indoor and outdoor spaces and inform the organization of building forms, landscaping, overall character and movement patterns.

LANDSCAPE DESIGN GUIDELINES

GOALS AND GUIDING PRINCIPLES

Because Utah State University is the State's Agriculture school, Education and Sustainability are the two over-arching goals that reflect the campus standards.

USU having roots in agriculture practices and landscape architecture, the campus landscape design ought to reflect best practices, discovered in these vocations. This means the integration of functional, aesthetic, and sustainable designs.

To help create an academic feel at this campus, the implementation of universal/ accessible design ought to be regarded and maintained. The creation of a safe and accessible environment will achieve this academic feel.

SITE DESIGN

Site design is the physical application of the campus goals and provides guidelines for future development. The following components provided below frame the campus site planning criteria:

- Campus Circulation Systems
- Grading and Stormwater Systems
- Utilities & Services
- Campus Views
- Campus Spaces

Campus Circulation Systems

Because this will be a phased campus, it is important to have a circulation master plan for multi-modal usage. This means creating clear and connected hierarchy for pedestrians, cyclist, automobiles, and mass transit.

Pedestrian Circulation

For this campus, pedestrian circulation should include:

- sidewalks
- plazas
- malls
- trails
- crosswalks

To work effectively, pedestrian corridors will need to be distinct and predictable.

Bicycle Circulation

Like the pedestrian circulation, bicycle corridors will need to be distinct and predictable, but should also be physically or visually separated from the pedestrian walkways. On the perimeter of campus dedicated lanes will help to maintain a safe campus circulation system. Provisions should also be made for bike storage/racks on the campus.

Vehicular Circulation

Automobiles and other motorized transportation systems should contribute positively to the overall landscape. This will include parking areas, routes, and supporting infrastructure.

CAMPUS SPACES

Public Spaces

Academia preaches the importance of democracy and public voice. Creating spaces for students to express themselves

is an important factor to a well functioning campus. These spaces (shown in blue on the next page) range from spaces for large gatherings to small courtyards, and are used for recreation and passive uses. This will include the development of malls, quads, and recreational fields.

Building Sites

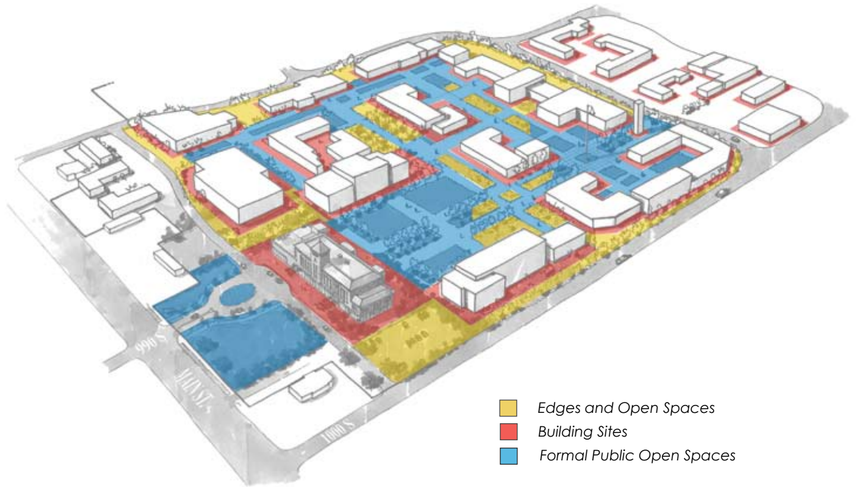
Shown in the image as red, these spaces are landscapes immediately adjacent to buildings. These sites could be developed with energy conservation and renewable energy in mind. Sites like these could also play a significant part with rain water retention and harvesting. Building sites should compliment both the structure and the overall master plan.

Edges and Open Spaces

Shown in the images as yellow, these spaces are both intensive and extensive landscapes. Their uses would range from formal campus edges to open fallow fields. Because raw land has a "weedy" look to them, it would be recommended that these landscapes be reseeded with native plants.

Educational Spaces

Depending on the class subject matter, many outdoor spaces can be use to give real world examples. If Utah State chooses to provide agriculture classes, garden and crop plots ought to be planned and designed to maximize the learning experience. These landscape will work with the phasing of campus plan because they provide a use for vacant lands.
Beside agricultural uses, other educational landscape may include sustainable civil engineering, architectural and landscape



architectural design practices. Additionally vacant landscape become wildlife habitat and provide environmental/ ecological educational spaces.

Besides actual outdoor type "labs", these spaces ought to enhance a studying environment for the campus patron. These study-friendly spaces encourage the importance of education. Plazas, quads, malls and sitting areas encourage these types of outdoor room study environments.

SITE TREATMENTS/DETAILS

There are many details to consider as the campus is developed. When discussing the detail treatments it helps to think from the ground up.

Soil: A well conditioned growing medium that will allow the establishment of all vegetation. It's important to remove all contaminants and have the appropriate depth for the specified plants.

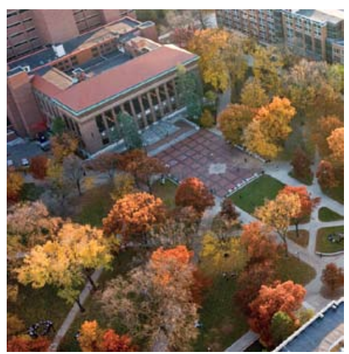
Groundcovers: A medium ranging from turf grasses and shrubs to organic and inorganic mulches.

Ornamental shrubs: These plants help to define and enhance outdoor spaces through strategic placement. Color, size, shape, texture, and smell are important characteristics to consider when using these plants.

Pavement: A hard walking surface that is easily accessible and that addresses the adjacent environment appropriately.

Drainage: A crucial component of landscape design is how precipitation is managed on a site. When considering sustainability practices in the design of this campus, storm water ought to be managed on-site. On-site retention, (which will most likely be on the southeast and lower end of the campus) should be incorporated in the landscape plan.

Trees: Important environmental elements that have a multitude of functions, i.e. air quality, climate control, aesthetics, and habitat. The appropriate placement of native and adaptive trees will help to establish the campus feel and function.



Walkways and areas of intense pedestrian activity should be paved with a variety of materials that are safe and comfortable. Earth tones would be preferred for brick pavers and stamped concrete.

Provide for proper collection and drainage of water, snow, and ice from roofs, balconies, etc., to avoid standing water on walkways that may freeze and create a slipping hazard. Landscape design should provide for storm water treatment and management on the campus.

Pedestrian ameinities should enhance the walking experience on the campus and provide comfort to its users. Furnishings include seating/ rest areas, information kiosks, water fountains, lights, bike racks, bollards, bus shelters etc. These elements also help to tie the landscaping to the adjacent buildings.

Drainage grates must allow safe passage by bicycles and pedestrians, and must be designed with some redundancy to reduce the possibility of clogging by leaves and other debris. They must be compliant with ADA standards.

SUSTAINABILITY STRATEGIES

USU Commitment to Sustainability

In early 2007, USU President Stan Albrecht signed the American College and University Presidents Climate Commitment, as part of a nationwide movement to reduce global warming by achieving climate neutrality. USU was the first institution of higher education in the state of Utah to sign on to the commitment. The USU Sustainability Council was convened immediately following the signing of the commitment, and was charged with developing strategies to achieve the goals and benchmarks set forth by the Climate Commitment, administered by the Association for the Advancement of Sustainability in Higher Education (AASHE). Since the signing, the university has developed a Sustainability Policy (Policy #106 of the USU Policies Manual). It reads:

Utah State University (USU) is one of the nation's premier, student-centered, land-grant, and space-grant universities. The University is committed to enhancing the quality of life for individuals and communities by promoting sustainability in its operations and academic and service missions.

USU will develop appropriate systems for managing environmental, social, and economic sustainability programs with specific goals and objectives. This policy supports the goal of the USU statewide system to prepare students, faculty, and staff to proactively contribute to a high quality of life for present and future generations.

Additionally, USU established a benchmark document to establish its carbon footprint, and is tracking changes annually. The USU Climate Action Plan document outlines key areas of focus and strategies to achieve carbon neutrality by 2050.

Because the USU Climate Action Plan ambitiously aims for climate neutrality by 2050, USU will need to take big steps towards this goal. Commuting and energy usage by buildings are by far the biggest contributors to the university's carbon footprint. Energy efficiency, alternative energy, and alternative transportation strategies will be the major areas of focus in achieving climate neutrality. Culture and educational programs will also play a major role in behavioral shifts.

State of Utah Commitment to Green Buildings

The State of Utah design requirements states that all new buildings must achieve LEED Silver certification at a minimum. It further stipulates that projects must achieve the following credits mostly emphasizing water and energy efficiency:

1. WE Credit 1.1: Water Efficient Landscaping: Reduce by 50%
2. EA Credit 3: Enhanced Commissioning
3. EQ Credit 3.1: Construction IAQ Management Plan: During Construction
4. EQ Credit 4.1: Low-Emitting Materials: Adhesives and Sealants
5. EQ Credit 4.2: Low-Emitting Materials: Paints and Coatings

USU has met or exceeded this standard since it was implemented. In the past several years, USU has constructed one (1) LEED Platinum certified building, two (2) LEED Gold certified buildings (+1 pending), and one (1) LEED Silver building (+ 1 pending).

Sustainability for the new Brigham City Campus

The new USU campus in Brigham City has a unique opportunity to become an example for USU in sustainable campus design. As the new campus is shaped, planning for sustainability should be emphasized from the start. Sustainable design may be accomplished on many levels, from neighborhood development, site design, transportation planning, and building design.

Objectives for sustainability should be set early in the design process, and a system for developing measurable, high performance projects should be implemented and followed.

Leadership in Energy and Environmental Design (LEED)

One of the better known green building rating systems, Leadership in Energy and Environmental Design or LEED is an independent, third-party verification that a building or community was designed and built using strategies aimed at achieving high performance in the following categories:

- Sustainable Sites
- Water Efficiency
- Energy Efficiency
- Materials Selection
- Indoor Environmental Quality
- Innovation & Design
- Regional Priority

Each project must achieve a set of prerequisites and will be awarded up to 100 possible points which will result in varying levels certification beginning with "Certified", graduating to "Silver", "Gold" and "Platinum" certification. As mentioned above, the State of Utah requires Silver certification for all new state buildings and Utah State University has commonly surpassed this goal.

With various potential rating system tracks within the LEED family, LEED for New Construction (LEED-NC) will likely be most commonly used for new buildings on the Brigham City Campus. However LEED for Neighborhood Development (LEED-ND), addressing larger scale community planning and growth, would be a beneficial guide for the campus development. Incorporating a specialized set of prerequisites and up to 110 potential points, LEED-ND rates high performance in the following categories:

- Smart Location & Linkage
- Neighborhood Pattern & Design
- Green Infrastructure & Buildings
- Innovation & Design
- Regional Priority

Location and Resources

The location of the campus within Brigham City sets it up for economic stability and increased walkability/bikability by its placement near retail and within walking distance of downtown. Brigham City has shown its support, both financial and by way of endorsement of the project, giving it a commitment for success. Development of this brownfield site provides new life to the area and economic stimulus in the future while clearing out existing environmental hazards in the buildings being removed.

While the Brigham City campus has its own challenges and advantages for sustainability, it is part of a large network of Utah State University campuses. Decisions and goals for this location should be made to maximize the location while taking into consideration the larger overarching goals of USU. Among others, USU's initiatives in transportation, carbon offsets, site and process water reduction, and recycling. Specific strategies to review for the Brigham City Campus location include wind, ground source heat and solar opportunities.

Wind: USU has begun wind power investigations with wind power metering installed near the mouth of Logan Canyon to determine if there is justification for a wind generator project. Wind should be reviewed for a possible resource at Brigham City campus. Using wind resource estimate maps from the National Renewable Energy Laboratory, the wind expectation for the campus is between 4-6 meters/second annual average wind speed at 80 meters.

Areas with annual average wind speeds around 6.5 meters/second and greater at 80 meters are generally considered to have a wind resource suitable for wind development. Given this data, it would be useful to use an anemometer to review the specific site for wind viability. Wind resource at a micro level can vary specifically dependent upon location and height of wind capture.

Solar: Using photovoltaic solar resource maps from the National Renewable Laboratory, the state of Utah is estimated to produce between 5.3-6.3 kWh/m2/day or 5.3-6.3 kilowatt hours per square meter per day. This refers to the effective amount of power able to be harnessed though photovoltaic panels per day, providing

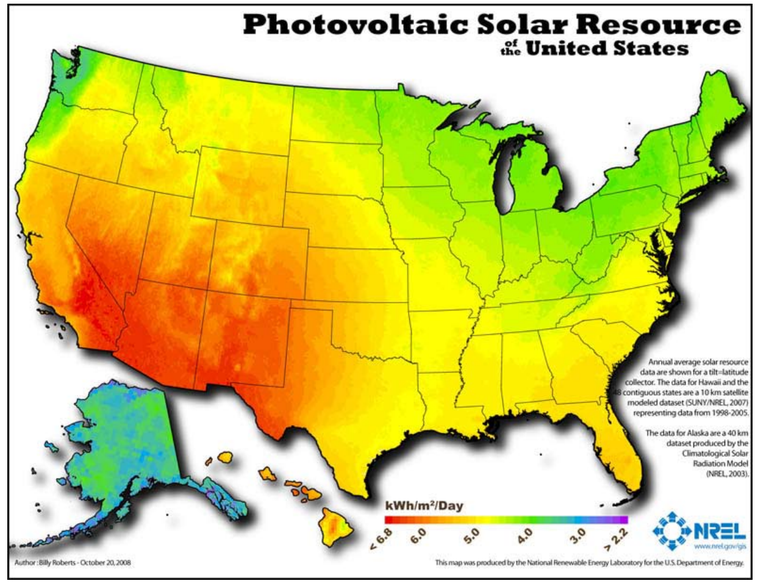
power sufficient for panel installation to contribute to the campus building or site electrical use. In this same theme, solar hot water panels can use this same viable solar resource to provide low cost hot water for campus buildings. This is especially cost-effective on dorms or recreational buildings which have higher hot water needs.

Ground Source Heat: Many regions in Utah have been located as viable locations for ground source heat pump use including the Utah House located in Kaysville. With this system the relatively constant ground temperature can be used to pre-heat/cool water or be used to reject waste heat/cooling. To review the Brigham City campus site for potential to use ground source heat pump, USU will need to commission a thermal conductivity (TC) test to explore the grounds ability to move and transmit heat.

Sustainable Site Initiative (SITES)

THE SUSTAINABLE SITES INITIATIVE™

A relatively new rating system has been developed by the American Society of Landscape Architects with the Lady Bird Johnson Wildflower Center and the United States Botanic Garden called the Sustainable Sites Initiative (SITES). This program promotes sustainable land development and management practices that can apply to sites with and without buildings. Using this guideline would offer a holistic approach of viewing the new campus and its design to fit within your sustainable culture. This rating system includes a system of prerequisites and



points awarded for high performance in the following categories:

- Site Selection
- Pre-Design Assessment & Planning
- Water
- Soil & Vegetation
- Materials Selection
- Human Health & Well-Being
- Construction
- Operations & Maintenance
- Monitoring & Innovation

Achievement in these categories results in points rendering final ratings between one (1) and four (4) stars. Whether USU decides to pursue this certification or not, the guidelines within this rating system provide an organized approach and standards for sustainable site development.

Key elements to success of sustainability goals include following planning guidelines and designing to prioritized goals. Early planning will allow many elements to be skillfully coordinated before constructed features become obstructions

5. APPENDIX A: CONCEPT PLAN PROCESS

INITIAL CONCEPT PLANS

The planning process explored several options for the layout of campus and for the placement of the first building. Major considerations included accessibility and visibility from Main Street, especially to the first building, and the future growth patterns of the campus.

Five (5) options were initially explored for the master planning of the campus. These are discussed below:

Option 1

Option 1 placed the first building north of 900 S and halfway between 200 E and 400 E.

Pros:

1. Good views from Hwy 89 to first building which is placed on highest point of campus.
2. No need to realign existing campus streets
3. First two (2) phases can work with Kmart building in place.

Cons:

1. First campus building is far from Main Street
2. Streets run through the heart of campus.

Option 2

Option 2 is similar to option 1 but places the first building at the intersection of 900 S and 400 E.

Pros:

1. Good views from Hwy 89 to first building which is placed on highest point of campus.
2. First building serves as vista at the end of 400 E.

3. Campus development can continue for a while without affecting Kmart building.

Cons:

1. First campus building is far from Main Street.
2. Streets run through the heart of campus.

Option 3

Option 3 locates the first campus building at the corner of 900 S and 200 E

Pros:

1. Good views from Hwy 89 to first building which is placed on highest point of campus. Appreciable view from Main Street as well.
2. No need to realign existing campus streets.
3. First two (2) phases can work with Kmart building in place.

Cons:

1. First campus building is far from Main Street
2. Streets run through the heart of campus.
3. First building does not focus on primary north-south pedestrian mall.

Option 4

This option locates the first campus building north of the Kmart building and between Main Street and 200 E.

Pros:

1. Good views to first building from Main Street.
2. No need to realign existing campus streets.

Cons:

1. May be difficult to create a cohesive campus feel.
2. Existing Kmart building may hinder campus development in first two phases.

Option 5

Option 5 locates the first campus building to the east of 400 E and about halfway between 950 S and 1000 S.

Pros:

1. Good views to first building from Hwy 89
2. No need to realign existing campus streets in the first two phases.
3. Opportunity for consolidated campus development.

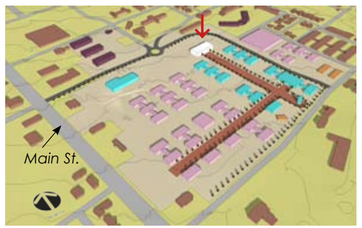
Cons:

1. Kmart building will block views from Main Street to first campus building.

These five (5) options were narrowed down to three (3), and then to one concept during the process. The consolidated concept (named Option 6) is shown and discussed below:

Option 6

Option 6 was carried through for most of the process until the final plan was developed.



The major consideration for Option 6 was the creation of a loop road (referred to as Aggie Blvd.) around the campus to keep a consolidated pedestrian-friendly feel. This loop road was to be created by re-aligning Fishburn Dr. and connecting it to 400 E. The first building was to be located at the position proposed in Option 1.

Final Concept

The final concept for the master plan is discussed in detail in the third chapter of this document (Illustrative Plan). The final concept places the first building on the Kmart site to take advantage of the Main Street presence, while maintaining most of Option 6.

Fishburn Dr. Concepts

The alignment of Fishburn Dr. was an important conversation during the planning process. It was going to serve as the main gateway into campus for most of the concepts discussed. The street had to be realigned to ensure that it provided room for the Brigham Place Apartment complex just north of it. As a major draw to campus, there was also the need to consider traffic flow and its cross sections.

A roundabout was originally proposed for the intersection of the loop road and 200 E with an idea of eliminating the lower portion of 200 E in future phases. The roundabout was to serve as a gateway feature as one approached the first building on campus.

However the roundabout concept was discarded for a 4-way (eventual 3-way) option.

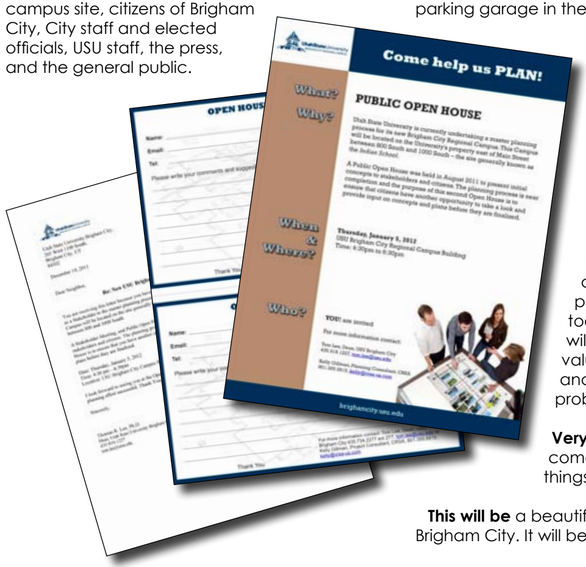
Option 6 full build out

PUBLIC OPEN HOUSE MATERIALS AND COMMENTS

Two public Open Houses were held during the planning process to explain the process to residents and to solicit input. The first open house was held on August 18, 2011 and the second on January 5, 2012.

The Open Houses were advertised in the local newspapers and in the USU newsletter. Individual letters were also sent to stakeholders (residents and businesses in close proximity to the campus).

Both Open Houses were well attended with attendees including stakeholders to the campus site, citizens of Brigham City, City staff and elected officials, USU staff, the press, and the general public.



Comments from residents in both open houses were generally positive and applauded the efforts at creating the new campus in Brigham City. A sample of public comments from the first Open House in August 2011 are documented below:

I am very concerned about the location of the parking garage in the master plan. It is right across from residential homes where young people/children play. I believe that is a real danger to our children. A better option may be to locate the parking closer to Main Street where it is easier and accessible to all attending the University.

Please seriously consider moving the parking garage in the back of the property away from the residential areas so the amount of traffic generated by a parking garage will not affect the safety of the children that play and ride their bikes on those streets. Please keep our children safe!!!

Very concerned about location of parking garage being too close to homes. This will reduce our home value, be an eye sore and cause terrible traffic problems for children.

Very excited to see this come about – I hope things can come forward.

This will be a beautiful addition to Brigham City. It will be fun to watch it grow

Glad to see steps being taken in this direction. Great boon to BC.

Beautiful! Looking forward to seeing it build out!!

I am excited to see what happens with this land development. I currently reside in the Eagle Ridge Condominiums and feel that the property could definitely benefit from this development. Keep up the good work on keeping us informed.

This is a great plan but obviously would like the plan to be quicker than the "100-year plan"

I feel it would be fantastic to incorporate Indian art and design in the planning of this facility

Design looks fine but need to keep parking controlled so neighbors won't have concern on crowding.

I was so excited when they said that you purchased this land, was going to use it to enhance this area and continue to provide higher ed. for this area. Good luck and God speed.

We think it is great to have this beautiful campus in Brigham. Congratulations

Would love to have a copy of your long-term anticipated development plans. We are so excited about your plans and look forward to seeing you grow over the years.

Looks great! I also got valuable info on taking classes. Suggestion: we could use some restaurants and fast food in Brigham. I hope they'll put in a stoplight or two on Main Street

Here are some comments I feel are pertinent to the planning you are involved in:

1. Parking area will never be enough. So plan on double what you think its going to take.

2. Streets should be extra wide so people can park on either side and also drive both ways.

3. There is no nice meeting place for groups to get together for lunch and other functions in Brigham City today. For many years people used the large room in the Brigham City Community Hospital at a nominal charge for their get together. But that room is now used for physical therapy and no longer available. The new academic building should have such a room on the main floor available for rent to local groups for such functions. An attached kitchen for serving (and not cooking-groups cater the food) would be an asset.

4. A walking/jogging track around the recreation area would be a plus

5. The land facing Main street should be saved for future businesses. The campus will attract new businesses- eating places, clothing stores, fitness equipment stores, bicycle shops etc.- a good source of income for the University.

6. Continue to have open houses every 6 months or so to keep the public updated. Have a formal presentation when you do. At the open house last week we were not sure what we were there for and unless one asked for an introduction to what was being done it was not offered.


Box Elder News Journal

WHAT'S Inside

BOX ELDER COUNTY

WWW.BENEWSJOURNAL.COM

BC Chamber banquet set Saturday

USU-BC unveils plans for facility

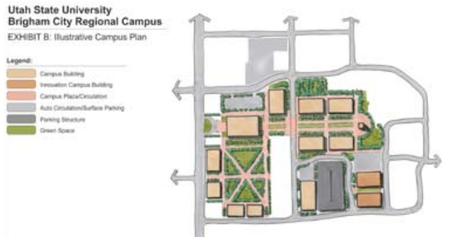
No Cache for BE landfill

"Why waste the effort if we aren't going to pursue it?"

County Commissioner Ryan Vingler

Open house photos. Top right: News feature on the front page of the Box Elder News Journal, January 11, 2012

6. APPENDIX B: FEASIBILITY STUDY DOCUMENTS



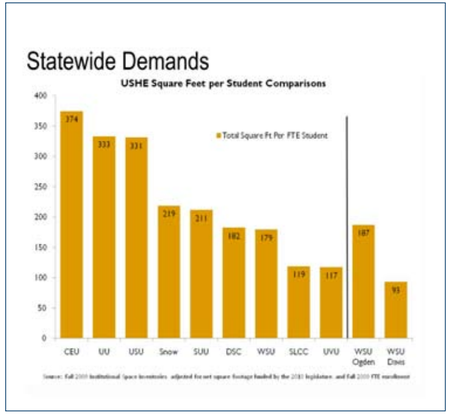
Layout and rendering of the campus envisioned during the master plan feasibility study in the fall of 2010.

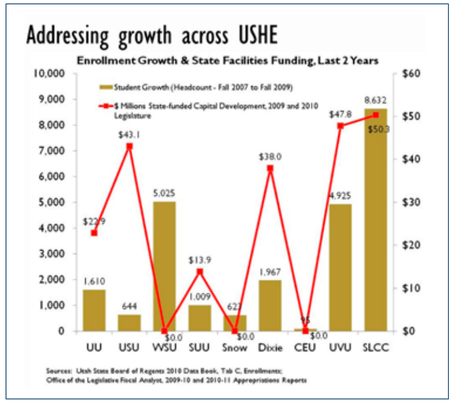
A feasibility study was conducted in the fall of 2010 as a precursor to this master planning effort. The scope of the study was as follows:

1. Develop an understanding of the vision and mission of the Brigham City Campus.
2. Develop an understanding of the unique functional considerations of the regional campus, including demographic information, distance education, and the needs of a non-traditional student body that primarily commutes.
3. Determine current and future space needs, based on enrollment data and projections.
4. Develop an inventory of existing space (USU database can provide) and parking.
5. Develop an analysis of the proposed new site and potential expansion configurations. This analysis is to include consideration of proximity of utilities, access, transit, parking, safety, zoning, multi-use potential, and regional context.
6. Outline master planning principles. Incorporate those set forth by USU, Brigham City, while responding to unique contextual and functional considerations.
7. Provide an illustrative site layout for each phase of the campus development.
8. Provide a cost estimate, including land costs, infrastructure costs, renovation costs, and new construction costs.

The following data helped inform the feasibility study and the master planning process:

USHE SF/FTE DOCUMENTATION





FUTURE PROGRAMS TO BE OFFERED AT USU BC

The following programs are currently being considered as future offering at the Brigham City Regional Campus.

- Agribusiness
- Computer/Office Systems
- Health Sciences
  - o Nursing
  - o Medical Technology
  - o Health Science Administration
  - o (currently serve many pre-nursing, pre-med students with biology and chemistry courses that use the cadaver lab and science lab)
- Aerospace Technology
- Recreation Resource Management
- Forensic Science
- Criminal Justice

EXISTING AND PROPOSED DEGREE PROGRAMS

UtahStateUniversity
BRIGHAM CITY REGIONAL CAMPUS

Degrees & Programs Available in Brigham City

Learning Options
Courses are offered in one or more of the following formats:
- *Interactive Broadcast*
- *Face to Face*
- *Online*
- *Hybrid*

Master's Degrees
- Agriculture Systems Technology (3 specializations)
- Computer Science
- Elementary Education
- English – Technical Writing
- Family & Human Development
- Health, Physical Education, & Recreation
- Human Resources (Executive Program)
- Instructional Technology
- Psychology – School Counseling
- Rehabilitation Counseling
- Secondary Education
- Social Work
- Special Education

Certificates
- Deafblindness Preservice Training
- Personal Financial Planning

Bachelor's Degrees
- Accounting
- Agribusiness
- Business
- Communicative Disorders & Deaf Education *(1st Bachelors)*
- Communicative Disorders & Deaf Education *(2nd Bachelors)*
- Early Childhood Education *(pre-3)*
- Economics
- Elementary Education *(K-6)*
- English Education
- Entrepreneurship
- Family Life Studies
- Family, Consumer, & Human Development
- History
- Interdisciplinary Studies
- Management Information Systems (MIS)
- Math Education
- Psychology
- Recreation Resource Management
- Special Education *(mild, moderate)*

Associate's Degrees
- General Studies *(AS)*
- Criminal Justice
- Office Systems Support *(AAS)*
- Pre-Engineering

Licensures

Undergraduate Programs
- Early Childhood-Alternative Teacher Preparation
- Secondary Education
  - – English Teaching
  - – History Teaching
  - – Psychology Teaching
  - – ESL Teaching *(minor)*
  - – School Library Media *(minor)*

Graduate Programs
- Administrative/Supervisory
- Secondary Education (ARL*)
  - – Math
  - – English
  - – History
  - – Psychology
  - – Science
  - – Social Studies
  - – ESL

Endorsements
- Distance Learning
- English as a Second Language
- Gifted and Talented
- Math *(UMEP)*
- Reading
- School Library Media
- Special Education – Early Childhood (ATP)

** Alternative Route to Licensure*

Additional Information:
- Minors are available in Anthropology and Sociology as well as many of the bachelor's degree programs.
- Lower division courses are available for engineering and health sciences.
- Other resources located on campus include the Little Brigham Aggies Early Care and Education Center and the USU bookstore.

(435) 734-2277
brighamcity.usu.edu

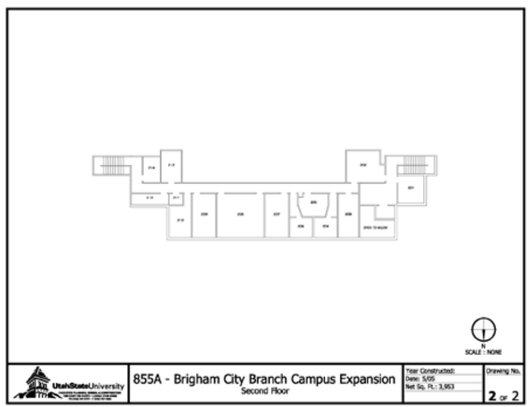
04-19-2010 Above information is subject to change.

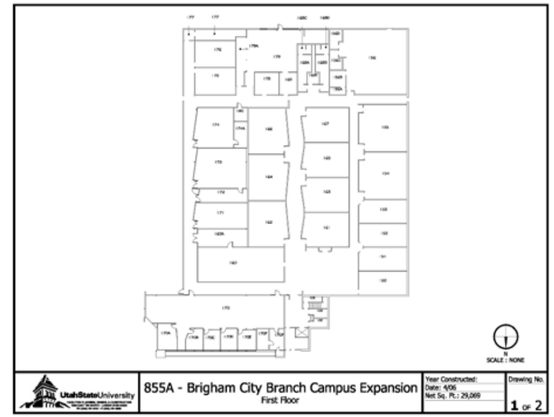
EXISTING FACILITY

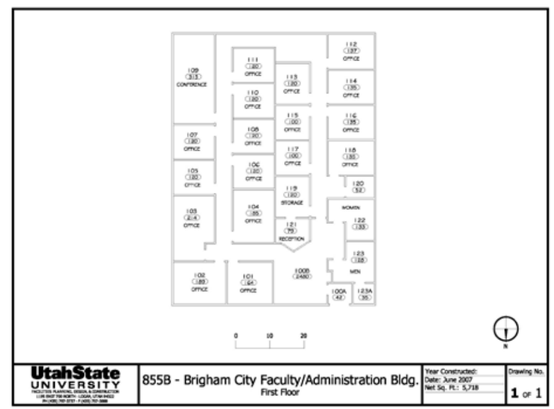
The existing Utah State University Brigham City Regional Campus includes the following square foot breakdown:

Description	Interior Sq ft	Sq ft
BC Regional Campus	10,761	14,280
Milton R. Miller	22, 304	24,520
Brigham City Faculty/ Administration	5,718	16,701

Laboratory Spaces







7. APPENDIX C: ENGINEERING MEMORANDA

civilsolutionsgroup PLLC

Leaders in sustainable engineering and planning

January 23, 2012

This report is per your request for an in depth analysis of the existing utility systems within the study area (as shown on the Utility Maps in Appendix A of this report) of the proposed Utah State University Brigham City Campus. The analysis of the existing utilities is based upon the 100 year planning horizon and associated data as calculated by CRSA in the Campus Plan Feasibility Study for the Brigham City Campus. The analysis is also based upon the most recent Conceptual Site Plan/Phasing Plan (12.12.11) illustrating the 100 year build-out of the campus.

Civil Solutions Group determined that **there are no critical utility conflicts with the proposed conceptual plan dated 12.12.11.** Current utilities within Brigham City rights-of-way will require preservation during construction of the campus for efficient utility service. The existing 30 and 27 inch storm drain line east of the existing Kmart building may conflict with the layout of the first building on the campus. It is recommended that the building be shifted west to avoid this conflict. As the three phases of the current conceptual plan are developed and existing roadways are closed it is recommended that the existing utilities are preserved and continue to operate for efficiency.

All existing road rights-of-way have adequate sewer, water, and storm drain systems to service the campus from a spatial basis. There is a gap in utility coverage between Main Street and 200 East Street due to the lack of development in that area. The overall slope of the project and the depth of the existing sewer and storm drain utilities provide excellent opportunities for connection points of future lines within this gap in utility coverage. It is recommended that water, sewer, and gas lines be connected between 200 East and Main Street.

A four inch gas line exists around the exterior of the USU Brigham City Campus area. **There are gaps in existing gas line coverage along 450 East Street, 400 East Street, 900 South Street, 950 South Street, and the area between 200 East and Main Street**. It is anticipated that as the campus is built that gas line stubs will be extended as needed.

Further analysis of the secondary irrigations system will be required to determine financial feasibility, which is beyond the scope of this report. This report did confirm the possibility and feasibility of purchasing or renting shares from the canal company to create a secondary irrigation system for the campus area. Please contact me with any questions or comments.

Sincerely,

Danny Macfarlane, P.E.

2 N. Main St., Suite #7 Providence, UT 84332 | www.CivilSolutionsGroup.net | 435.213.3762

civilsolutionsgroup PLLC

Leaders in sustainable engineering and planning

Introduction

The following sections outline the completed utility analysis for the Utah State University Brigham City Campus at the 100 year planning horizon. The build out size, number of students, open space areas, etc is based upon the CRSA Campus Plan Feasibility Study for the Brigham City Campus. The scope of this study is to analyze water, sewer, storm drain, secondary irrigation and gas and identify any red flag issues associated with each utility. This analysis did not determine the need for capital improvement projects between the current phase and the 100 year planning horizon phase.

Utility Inventory

GIS data was collected from the Brigham City GIS department for water, sewer, storm drain, gas, and communication lines. The information was compiled onto individual utility maps for each water, sewer, storm drain, and natural infrastructure. The red outline shown on each map illustrates the study boundary of this analysis. The right side of each of the four maps contains a legend detailing the different key components of the maps such as line sizes, manholes, fire hydrants, storm drain boxes, gas meters, etc. The maps can be found in Appendix A of this report.

Existing Sewer Elevation Data

The rim elevation of the sewer manholes within the project boundary were obtained from the GIS data files provided by the Brigham City GIS department. The vertical depth from the rim to the flow line of trough in the base of the sewer manhole was obtained by physically removing the sewer manhole lid and measuring the depth to the flow line.

Existing Utility Analysis

Water

The existing culinary water lines within the study area range from 6-inches to 12-inches in diameter. The material of each water line is unknown. There are a number of water valves and fire hydrants within the study area as shown on the map. The capacity of the existing water system was analyzed by calculating the indoor and outdoor water demands at the 100 year build out scenario. CRSA calculated the total full time equivalent number of students in the Campus Plan Feasibility Study completed for the 100 year planning horizon. The total full time equivalent (FTE) students from that report are 3,900. CRSA estimated that 30% of those students would live on campus at the 100 year planning horizon.

The total peak demand and peak instantaneous water demand for indoor and outdoor use were then calculated utilizing the recommended values from section R309-510-7 of the State of Utah Administrative Rules and the total estimated FTE for the campus. State of Utah Administrative rules require that a water system be modeled for the peak demand plus fire flow scenario and the peak instantaneous demand scenario. CRSA said that the expected building types would be type III B construction, two stories tall, and approximately 40,000 sf per building. According to the International Fire Code (IFC) a 4,250 gallons per minute (gpm) fire demand is required.

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The peak demand plus fire flow and the peak instantaneous demand were given to the Brigham City Engineering department for analysis in their water model. The demands were modeled for both scenarios and the following recommendations were made by Brett Jones, P.E. the Brigham City Engineer:

1. In general the distribution system in the area is very healthy and the proposed peak instantaneous flows you sent should not be a problem.
2. The fire flow demand of 4,250 gpm was able to be serviced by the system but in most cases with undesirable velocities. Velocities of 13-24 feet per second were observed. For this reason, we recommend that campus buildings be fitted with fire sprinkler systems as dictated by the building code and the local Brigham City fire authority.
3. We recommend that the 8" main in Fishburn Drive be extended and connected to the water main in 200 East as the roadway is constructed in this area. We also recommend that the 6" and 8" mains that currently service the old Kmart property be looped into the water system to the east or the north to provide adequate looping in the future.
4. The water mains will likely require replacement in the 100 year build-out timeframe. When replaced, we recommend replacement at the existing diameter unless the existing diameter is less than 8". These mains should be replaced at 8" diameter to comply with existing City Standards.

Sewer

The existing sewer system within the study area consists of 8-inch sewer mains (see Sewer Map, Appendix A). All major roadways within the study area contain an 8-inch sewer main, with depths from the manhole lids of ranging from 8.40 ft to 10.75 ft deep. All the sewer mains within the study area flow to the southwest corner of the project at the corner of 1000 South Main Street.

The existing sewer system was analyzed considering the 100 year planning horizon for the 3,900 FTE students. The average water demand of 400 gallons per day (gpd) minus a 15% depletion rate with a multiplier of three applied yields the design sewer flow per equivalent residential connection (ERC). The wastewater calculations contained in Appendix B illustrate the method used to determine the design sewer flow for the study area. The calculations also considered sewer inflow from connections upstream of the study area. It is estimated that 100 ERC's are connected upstream of the manhole at 200 East 850 South and 80 ERC's are contributing flow upstream of 450 East 1000 South. The estimated ERC's are based upon a visual aerial survey analysis.

The wastewater flow from areas upstream of the study area were applied at the applicable manholes, with one third of the study area projected wastewater flow being applied at 450 East 950 South and the other third being applied at 450 East 1000 South. The remaining third of the study area projected wastewater flow is assumed to flow to the sewer main along Main Street. The wastewater flow values, invert elevations, and lengths of pipe were inserted into AutoCAD Storm and Sanitary Analysis software. The results of the analysis are found in Appendix C of this report. The following are the summary and recommendation from the analysis of the sewer system:

1. All existing pipes have acceptable velocities (less than 6 feet per second) and the pipes had adequate capacity (Peak Flow Depth/Total Flow Depth ratio less than 0.49)
2. The majority of the sewer mains have a minimum depth at the roadway of 8.4 feet to the invert providing adequate depth for sewer service connection to the proposed buildings.
3. It is recommended that the sewer main extension in Fishburn Drive be an 8-inch main and that the main connect to the sewer main in 200 East. It may be advantageous to divert wastewater flow from

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areas north of the study area west into the Fishburn Drive sewer main. This will increase the available flow capacity of the sewer mains in 200 East Street and 1000 South Street.

4. It is recommended that water efficient fixtures be utilized within the proposed buildings to reduce the water demand thus reducing the wastewater demand on the existing sewer system.

Storm Drain

An inventory of the depths, location and flow direction of the existing storm drain system was completed (see Storm Drain Map, Appendix A). All major intersections with the study area have a storm drain box connected to the city storm drain system. The storm drain system generally flows to the southwest corner of the study area. A 42" pipe flows directly south to a regional storm water basin at approximately 100 East 1000 South. According to a Brett Jones, P.E., City Engineer the storm water system within the city right-of-way is designed to handle 0.1 cubic feet per second (cfs) per acre of discharge from any project site. The owner then must detain the 10 year storm event.

It has been discussed that Utah State University typically employs injector wells (sumps) to detain storm water on site. Brigham City Engineer discourages the use of injector wells, but he did acknowledge that recent percolation tests for the Thomas Development project (northeast of the study area) had percolation rates that would support sumps for storm water discharge. The following are recommendations pertaining to the existing storm water system:

1. Complete percolation tests on a project by project basis to determine the feasibility of using sumps for storm water detention and percolation.
2. Utilize the ability to discharge 0.1 cfs per acre to the Brigham City storm water system, thus reducing the total amount of storm water detention/retention required.
3. There may be a conflict with the existing 30 and 27 inch storm drain pipes and the proposed first building. It is recommended that the building layout avoid interrupting this main storm sewer line.
4. Additional storm drain stubs may be required for development near 900 South, 400 East and 450 East if the Campus elects to release the allowable discharge from each site to the City storm drain system.

Secondary Irrigation

This section explores the feasibility of providing the secondary water demands within the study area from the Pine View Canal. Specifically the total number of required shares, length of main line required from canal to study area and the average cost of water shares are analyzed in this section. Directly southeast of the study area is the Pine View Canal. The canal originates from the Pine View Reservoir. Currently the canal does not have excess shares to allocate to a secondary irrigation project according to Terrell Grimsley with the Pine View Canal Company.

Mr. Grimsley is the manager of the Weber/Box Elder Conservancy District, which manages the Pine View Canal in Brigham City. Each share in the canal company represents one acre-feet of water and on average sales for approximately $1,250 per share. He recommended two options to obtain water shares for a secondary irrigation system:

1. Purchase the necessary shares from willing sellers for market value and petition that the shares be included in the Weber/Box Elder Conservancy District. The shares would then be physically connected to the parcel where the irrigation will occur. The yearly assessment fees would be due for the water shares.

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2. Enter into an agreement with existing share holders that are not placing their shares to use. A petition would need to be made to include the shares into the Weber/Box Elder Conservancy District and the shares would then be connected to the parcel being irrigated. The yearly assessments would be due for the water shares.

The detailed calculations in Appendix B illustrate the total amount of water shares required for the 100 year planning horizon. Based upon the "more services" option of the CRSA Campus Plan Feasibility Study 17.91 acres of green space will be provided at build out. According to the State of Utah Division of Water Rights the irrigation duty rate for Brigham City is 4 acre-feet per acre. At the 100 year planning horizon the campus would require 71.64 acre-feet of irrigation water or 72 shares in the Pine View Canal Company. This represents an approximate investment of $89,550 in water share purchases and the assessment fees for all the shares on an annual basis if option one is selected. If option two is selected the assessment fees for 72 shares would need to be paid on an annual basis.

This report doesn't include a construction cost estimate or feasibility study, but preliminary layout of the distribution pipe from the canal to the Campus requires 1,000 feet of pipe. The size of the pipe is unknown at this time.

Natural Gas

Questar Gas Company services natural gas to the study area as shown on the Gas Map (Appendix A). A four inch gas line exists around the exterior of the USU Brigham City Campus area. **There are gaps in existing gas line coverage along 450 East Street, 400 East Street, 900 South Street, 950 South Street, and the area between 200 East and Main Street.** Many of those roadways will be reconfigured according to the Conceptual Site Plan/Phasing Plan (12.12.11) resulting in rerouting of the existing gas lines. The following recommendations are made:

1. Overall the existing gas lines have adequate coverage for the proposed campus at the 100 year build out.
2. Coordinate with Questar Gas during proposed construction of the Utah State University Brigham City Campus to extend, reroute, and construct gas lines as needed to service the proposed campus.

Appendix A – Utility Maps

Appendix B – Water, Wastewater, and Secondary Irrigation Design Calculations

Utah State University - Brigham City Regional Campus

100 Year Utility Analysis

Full time equivalent (FTE) Students 2110[1]	3900	students
Percentage of Students Living on Campus[2]	30%	

Indoor Water Demand

Peak Water Demand (Data from Utah Administrative Rules R309-510-7)

Type of Use, per person	FTE	Peak Demand per Person (gpd)[3]	Total Peak Day Demand (gpd)	Total Peak Day Demand (gpm)
School Boarding per day	1170	75	87,750	61
School, per day, with cafeteria, gym and showers	2730	25	68,250	47
		Total	156,000	108

Peak Instantaneous Demand

The State of Utah Administrative Rules for distribution pipe sizing is based upon the equivalent residential connection (ERC). For peak day demand the ERC for a residential connection is 800 gpd, while the demand for boarding per day is 75 gpd. To determine the peak instantaneous values for sizing purposes it is assumed that boarding per person per day is equivalent to 9.3% of an ERC and school facility, per day, with cafeteria, gym and showers is equivalent to 3.1% of an ERC.

Type of Use, per person	FTE	Total # of FTE per ERC	Total # of ERC's	Peak Instantaneous Demand (gpm)	Peak Instantaneous Demand (gpd)
School Boarding per day	1170	10.80	108	217	311,913
School, per day, with cafeteria, gym and showers	2730	32.25	85	185	266,361
		Total	193	402	578,275

Outdoor Water Demand

Peak Water Demand (Data from Utah Administrative Rules R309-510-7)

Total Green Space (acres)[4]	Peak Day Demand (gpm/irrigated acre)[5]	Peak Day Demand (gpm)[3]	Peak Day Demand (gpd)
17.91	3.96	71	102,130

Peak Instantaneous Demand (Data from Utah Administrative Rules R309-510-7)

Total Green Space (acres)[4]	Peak Instantaneous Demand (gpm/irrigated acre)[5]	Peak Instantaneous Demand (gpm)[3]	Peak Instantaneous Demand (gpd)
17.91	7.92	142	204,260

Total Peak Day Water Demand	**258,130**	gpd
Total Peak Day Water Demand	**179**	gpm
Total Peak Instantaneous Water Demand	**782,535**	gpd
Total Peak Instantaneous Water Demand	**543**	gpm

Secondary Irrigation System Analysis

Pineview Canal Information

Volume per Share	1	acre-foot
Average Cost per Share	$ 1,250.00	$/share[7]
Irrigation Duty Rate	4	acre-feet/acre/yr
Total Irrigation Requirement for USU BC Campus	71.64	acre-feet/yr
Total Pineview Canal Company Shares Required	72	shares
Approximate Total Cost of Water Shares	$ 89,550.00	Current $

[1]The full time equivalent number of students is based upon the Campus Plan Feasibility Study completed by CRSA for a 100 year planning horizon

[2]gpd is defined as gallons per day

[3]gpm is defined as gallons per minute

[4]The total green space acreage represents the "More Services" 100 year planning horizon

[5]Based upon irrigation duty value of 4 (Utah Division of Water Rights, 2011)

[6]Current concept plan does not detail student housing, this is an assumption for planning purposes only.

[7]Based upon information provided by Terrell Grimsley with the Pineview Canal Company

Wastewater Flows

*Assume 15% Depletion

*Assume flows occur during a 14-hour period

*A peaking factor of 3.0 is generally applied to the average water demand to determine wastewater flows for design. This analysis will apply a peaking factor of 1.5 to the peak day demand which is double the average day demand.

Total Indoor Peak Water Demand (gpd)	Peaking Factor	Adjusted Total Indoor Peak Water Demand (gpd)	Depletion (gpd)	Wastewater Flow (gpd)	Wastewater Flow (14 hour period, gph)
156,000	1.5	234,000.0	35,100	198,900	14,207

Additional Inflow (Wastewater from areas outside the study area)

Intersection	Total Residential Units	Peak Water Demand (gpd)	Total Indoor Peak Water Demand (gpd)	Depletion (gpd)	Wastewater Flow (gpd)	Wastewater (14 hour period, gph)
450 East 1000 South	80	800	64,000	9,600	54,400	3,886
200 East 850 South	100	800	80,000	12,000	68,000	4,857

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Appendix C – Wastewater Model Results

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Project Description

File Name ..... Sewer Model.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Analysis Options

Start Analysis On	Jul 28, 2011	00:00:00
End Analysis On	Jul 29, 2011	00:00:00
Start Reporting On	Jul 28, 2011	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	0
Nodes	24
Junctions	23
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	22
Channels	0
Pipes	22
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Node Summary

SN	Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Ponded Area	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
			(ft)	(ft)	(ft)	(ft)	(ft²)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1	Jun-51	Junction	4326.83	4336.43	0.00	0.00	0.00	0.37	4326.99	0.00	9.44	0 00:00	0.00	0.00
2	Jun-52	Junction	4315.43	4325.88	0.00	0.00	0.00	0.38	4315.59	0.00	10.29	0 00:00	0.00	0.00
3	Jun-53	Junction	4316.00	4326.54	0.00	0.00	0.00	0.02	4316.06	0.00	10.48	0 00:00	0.00	0.00
4	Jun-54	Junction	4316.88	4327.42	0.00	0.00	0.00	0.02	4316.94	0.00	10.48	0 00:00	0.00	0.00
5	Jun-55	Junction	4318.99	4328.95	0.00	0.00	0.00	0.02	4319.05	0.00	9.90	0 00:00	0.00	0.00
6	Jun-56	Junction	4313.17	4325.12	0.00	0.00	0.00	0.00	4313.17	0.00	11.95	0 00:00	0.00	0.00
7	Jun-57	Junction	4308.65	4318.83	0.00	0.00	0.00	0.00	4308.65	0.00	10.18	0 00:00	0.00	0.00
8	Jun-58	Junction	4301.66	4311.86	0.00	0.00	0.00	0.00	4301.66	0.00	10.20	0 00:00	0.00	0.00
9	Jun-59	Junction	4298.82	4308.42	0.00	0.00	0.00	0.38	4299.01	0.00	9.41	0 00:00	0.00	0.00
10	Jun-60	Junction	4320.10	4328.89	0.00	0.00	0.00	0.02	4320.16	0.00	8.73	0 00:00	0.00	0.00
11	Jun-61	Junction	4321.52	4328.95	0.00	0.00	0.00	0.02	4321.56	0.00	7.39	0 00:00	0.00	0.00
12	Jun-62	Junction	4313.97	4323.92	0.00	0.00	0.00	0.14	4314.06	0.00	9.86	0 00:00	0.00	0.00
13	Jun-64	Junction	4306.31	4317.03	0.00	0.00	0.00	0.16	4306.41	0.00	10.62	0 00:00	0.00	0.00
14	Jun-65	Junction	4297.25	4308.00	0.00	0.00	0.00	0.15	4297.35	0.00	10.65	0 00:00	0.00	0.00
15	Jun-66	Junction	4292.00	4300.85	0.00	0.00	0.00	0.15	4292.19	0.00	8.66	0 00:00	0.00	0.00
16	Jun-67	Junction	4291.23	4300.55	0.00	0.00	0.00	0.14	4291.43	0.00	9.12	0 00:00	0.00	0.00
17	Jun-68	Junction	4287.64	4296.16	0.00	0.00	0.00	0.53	4287.96	0.00	8.20	0 00:00	0.00	0.00
18	Jun-69	Junction	4290.71	4299.14	0.00	0.00	0.00	0.14	4290.91	0.00	8.23	0 00:00	0.00	0.00
19	Jun-70	Junction	4286.72	4295.51	0.00	0.00	0.00	0.53	4287.04	0.00	8.47	0 00:00	0.00	0.00
20	Jun-71	Junction	4283.35	4293.00	0.00	0.00	0.00	0.53	4283.59	0.00	9.41	0 00:00	0.00	0.00
21	Jun-72	Junction	4284.72	4294.12	0.00	0.00	0.00	0.00	4284.72	0.00	9.40	0 00:00	0.00	0.00
22	Jun-73	Junction	4311.35	4320.74	0.00	0.00	0.00	0.00	4311.35	0.00	9.39	0 00:00	0.00	0.00
23	Jun-74	Junction	4294.63	4303.28	0.00	0.00	0.00	0.38	4294.82	0.00	8.46	0 00:00	0.00	0.00
24	Out-01	Outfall	0.00					0.53	4283.37					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	Link-01	Pipe	Jun-56	Jun-73	70.59	4313.17	4311.35	2.5800	8.000	0.0150	0.00	1.68	0.00	0.00	0.00	0.00	0.00	Calculated
2	Link-02	Pipe	Jun-73	Jun-67	123.24	4311.35	4291.23	16.3300	8.000	0.0150	0.00	4.23	0.00	0.00	0.00	0.00	0.00	Calculated
3	Link-03	Pipe	Jun-67	Jun-69	105.14	4291.23	4290.71	0.4900	8.000	0.0150	0.14	0.74	0.20	1.64	0.20	0.30	0.00	Calculated
4	Link-04	Pipe	Jun-69	Jun-67	104.64	4290.02	4291.23	-1.1500	8.000	0.0150	0.14	0.90	0.16	1.89	0.18	0.27	0.00	Calculated
5	Link-05	Pipe	Jun-65	Jun-66	51.89	4297.25	4292.00	10.1000	8.000	0.0150	0.15	3.05	0.05	4.68	0.10	0.15	0.00	Calculated
6	Link-06	Pipe	Jun-64	Jun-65	109.20	4306.31	4297.25	8.3000	8.000	0.0150	0.15	3.02	0.05	4.69	0.10	0.15	0.00	Calculated
7	Link-09	Pipe	Jun-61	Jun-60	29.48	4321.52	4320.10	4.8200	8.000	0.0150	0.02	2.30	0.01	2.09	0.04	0.06	0.00	Calculated
8	Link-10	Pipe	Jun-55	Jun-54	55.86	4318.99	4316.88	3.7800	8.000	0.0150	0.02	2.04	0.01	1.78	0.04	0.07	0.00	Calculated
9	Link-11	Pipe	Jun-60	Jun-55	101.32	4320.10	4318.99	1.1000	8.000	0.0150	0.02	1.10	0.02	1.16	0.06	0.09	0.00	Calculated
10	Link-12	Pipe	Jun-54	Jun-53	63.53	4316.88	4316.00	1.3900	8.000	0.0150	0.02	1.23	0.01	1.26	0.06	0.08	0.00	Calculated
11	Link-13	Pipe	Jun-53	Jun-52	45.70	4316.00	4315.43	1.2500	8.000	0.0150	0.02	1.17	0.01	1.21	0.06	0.09	0.00	Calculated
12	Link-14	Pipe	Jun-52	Jun-59	1039.62	4315.43	4298.82	15.1500	8.000	0.0150	0.38	4.08	0.09	7.34	0.14	0.21	0.00	Calculated
13	Link-15	Pipe	Jun-58	Jun-59	46.57	4301.66	4298.82	6.1000	8.000	0.0150	0.00	2.59	0.00	0.00	0.00	0.00	0.00	Calculated
14	Link-16	Pipe	Jun-57	Jun-58	81.80	4308.65	4301.66	8.5500	8.000	0.0150	0.00	3.06	0.00	0.00	0.00	0.00	0.00	Calculated
15	Link-17	Pipe	Jun-68	Jun-68	76.76	4290.71	4287.64	4.0000	8.000	0.0150	0.14	2.09	0.07	3.41	0.12	0.18	0.00	Calculated
16	Link-18	Pipe	Jun-74	Jun-68	86.83	4293.00	4287.64	6.1700	8.000	0.0150	0.38	2.97	0.13	5.92	0.16	0.24	0.00	Calculated
17	Link-19	Pipe	Jun-68	Jun-70	82.64	4287.64	4286.72	1.1100	8.000	0.0150	0.53	1.11	0.48	3.13	0.32	0.49	0.00	Calculated
18	Link-20	Pipe	Jun-70	Jun-71	100.12	4286.72	4283.35	3.3700	8.000	0.0150	0.53	1.82	0.27	4.69	0.24	0.36	0.00	Calculated
19	Link-22	Pipe	Jun-59	Jun-74	94.28	4298.82	4293.00	6.1700	8.000	0.0150	0.38	2.21	0.17	4.81	0.19	0.28	0.00	Calculated
20	Link-23	Pipe	Jun-62	Jun-64	74.28	4313.97	4306.31	10.3100	8.000	0.0150	0.16	3.35	0.05	5.16	0.09	0.14	0.00	Calculated
21	Link-24	Pipe	Jun-51	Jun-52	167.74	4326.83	4315.43	6.8000	8.000	0.0150	0.37	2.73	0.13	5.44	0.16	0.25	0.00	Calculated
22	Link-25	Pipe	Jun-71	Out-01	0.01	4283.35	4283.30	500.0000	8.000	0.0150	0.53	23.42	0.02	26.79	0.07	0.11	0.00	Calculated

Pipe Input

SN	Element ID	Length	Inlet Invert Elevation	Inlet Offset	Outlet Invert Elevation	Outlet Offset	Total Drop	Average Pipe Slope	Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flap Gate	No. of Barrels
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(in)	(in)					(cfs)	
1	Link-01	70.59	4313.17	0.00	4311.35	0.00	1.82	2.5800	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
2	Link-02	123.24	4311.35	0.00	4291.23	0.00	20.12	16.3300	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
3	Link-03	105.14	4291.23	0.00	4290.71	0.00	0.52	0.4900	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
4	Link-04	104.64	4290.02	-1.98	4291.23	0.00	-1.21	-1.1500	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
5	Link-05	51.89	4297.25	0.00	4290.02	-1.98	7.23	11.6800	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
6	Link-06	109.20	4306.31	0.00	4297.25	0.00	9.06	8.3000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
7	Link-09	29.48	4321.52	0.00	4320.10	0.00	1.42	4.8200	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
8	Link-10	55.86	4318.99	0.00	4316.88	0.00	2.11	3.7800	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
9	Link-11	101.32	4320.10	0.00	4318.99	0.00	1.11	1.1000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
10	Link-12	63.53	4316.88	0.00	4316.00	0.00	0.88	1.3900	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
11	Link-13	45.70	4316.00	0.00	4315.43	0.00	0.57	1.2500	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
12	Link-14	1039.62	4315.43	0.00	4298.82	0.00	16.61	15.1500	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
13	Link-15	46.57	4301.66	0.00	4298.82	0.00	2.84	6.1000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
14	Link-16	81.80	4308.65	0.00	4301.66	0.00	6.99	8.5500	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
15	Link-17	76.76	4290.71	0.00	4287.64	0.00	3.07	4.0000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
16	Link-18	86.83	4293.00	-1.63	4287.64	0.00	5.36	6.1700	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
17	Link-19	82.64	4287.64	0.00	4286.72	0.00	0.92	1.1100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
18	Link-20	100.12	4286.72	0.00	4283.35	0.00	3.37	3.3700	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
19	Link-22	94.28	4298.82	0.00	4293.00	-1.63	5.82	6.1700	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
20	Link-23	74.28	4313.97	0.00	4306.31	0.00	7.66	10.3100	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
21	Link-24	167.74	4326.83	0.00	4315.43	0.00	11.40	6.8000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1
22	Link-25	0.01	4283.35	0.00	4283.30	4283.30	0.05	500.0000	CIRCULAR	8.040	8.040	0.0150	0.5000	0.5000	0.0000	0.00 No	1

Junction Input

SN	Element ID	Invert Elevation	Ground/Rim (Max) Elevation	Ground/Rim (Max) Offset	Initial Water Elevation	Initial Water Depth	Surcharge Elevation	Surcharge Depth	Ponded Area	Minimum Pipe Cover
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft²)	(in)
1	Jun-51	4326.83	4336.43	9.60	0.00	-4326.83	0.00	-4336.43	0.00	0.00
2	Jun-52	4315.43	4325.88	10.45	0.00	-4315.43	0.00	-4325.88	0.00	0.00
3	Jun-53	4316.00	4326.54	10.54	0.00	-4316.00	0.00	-4326.54	0.00	0.00
4	Jun-54	4316.88	4327.42	10.54	0.00	-4316.88	0.00	-4327.42	0.00	0.00
5	Jun-55	4318.99	4328.95	9.96	0.00	-4318.99	0.00	-4328.95	0.00	0.00
6	Jun-56	4313.17	4325.12	11.95	0.00	-4313.17	0.00	-4325.12	0.00	0.00
7	Jun-57	4308.65	4318.83	10.18	0.00	-4308.65	0.00	-4318.83	0.00	0.00
8	Jun-58	4301.66	4311.86	10.20	0.00	-4301.66	0.00	-4311.86	0.00	0.00
9	Jun-59	4298.82	4308.42	9.60	0.00	-4298.82	0.00	-4308.42	0.00	0.00
10	Jun-60	4320.10	4328.89	8.79	0.00	-4320.10	0.00	-4328.89	0.00	0.00
11	Jun-61	4321.52	4328.95	7.43	0.00	-4321.52	0.00	-4328.95	0.00	0.00
12	Jun-62	4313.97	4323.92	9.95	0.00	-4313.97	0.00	-4323.92	0.00	0.00
13	Jun-64	4306.31	4317.03	10.72	0.00	-4306.31	0.00	-4317.03	0.00	0.00
14	Jun-65	4297.25	4308.00	10.75	0.00	-4297.25	0.00	-4308.00	0.00	0.00
15	Jun-66	4292.00	4300.85	8.85	0.00	-4292.00	0.00	-4300.85	0.00	0.00
16	Jun-67	4291.23	4300.55	9.32	0.00	-4291.23	0.00	-4300.55	0.00	0.00
17	Jun-68	4287.64	4296.16	8.52	0.00	-4287.64	0.00	-4296.16	0.00	0.00
18	Jun-69	4290.71	4299.14	8.43	0.00	-4290.71	0.00	-4299.14	0.00	0.00
19	Jun-70	4286.72	4295.51	8.79	0.00	-4286.72	0.00	-4295.51	0.00	0.00
20	Jun-71	4283.35	4293.00	9.65	0.00	-4283.35	0.00	-4293.00	0.00	0.00
21	Jun-72	4284.72	4294.12	9.40	0.00	-4284.72	0.00	-4294.12	0.00	0.00
22	Jun-73	4311.35	4320.74	9.39	0.00	-4311.35	0.00	-4320.74	0.00	0.00
23	Jun-74	4294.63	4303.28	8.65	0.00	-4294.63	0.00	-4303.28	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1	Jun-51	0.37	0.37	4326.99	0.16	0.00	9.44	4326.99	0.16	0 00:00	0 00:00	0.00	0.00
2	Jun-52	0.38	0.00	4315.59	0.16	0.00	10.29	4315.59	0.16	0 00:07	0 00:00	0.00	0.00
3	Jun-53	0.02	0.00	4316.06	0.06	0.00	10.48	4316.06	0.06	0 00:24	0 00:00	0.00	0.00
4	Jun-54	0.02	0.00	4316.94	0.06	0.00	10.48	4316.94	0.06	0 00:22	0 00:00	0.00	0.00
5	Jun-55	0.02	0.00	4319.05	0.06	0.00	9.90	4319.05	0.06	0 00:22	0 00:00	0.00	0.00
6	Jun-56	0.00	0.00	4313.17	0.00	0.00	11.95	4313.17	0.00	0 00:00	0 00:00	0.00	0.00
7	Jun-57	0.00	0.00	4308.65	0.00	0.00	10.18	4308.65	0.00	0 00:00	0 00:00	0.00	0.00
8	Jun-58	0.00	0.00	4301.66	0.00	0.00	10.20	4301.66	0.00	0 00:00	0 00:00	0.00	0.00
9	Jun-59	0.38	0.00	4299.01	0.19	0.00	9.41	4299.01	0.19	0 00:27	0 00:00	0.00	0.00
10	Jun-60	0.02	0.00	4320.16	0.06	0.00	8.73	4320.16	0.06	0 00:01	0 00:00	0.00	0.00
11	Jun-61	0.02	0.00	4321.56	0.04	0.00	7.39	4321.56	0.04	0 00:00	0 00:00	0.00	0.00
12	Jun-62	0.14	0.14	4314.06	0.09	0.00	9.86	4314.06	0.09	0 00:00	0 00:00	0.00	0.00
13	Jun-64	0.16	0.00	4306.41	0.10	0.00	10.62	4306.41	0.10	0 00:01	0 00:00	0.00	0.00
14	Jun-65	0.15	0.00	4297.35	0.10	0.00	10.65	4297.35	0.10	0 00:01	0 00:00	0.00	0.00
15	Jun-66	0.15	0.00	4292.19	0.19	0.00	8.66	4292.18	0.18	0 00:02	0 00:00	0.00	0.00
16	Jun-67	0.14	0.00	4291.43	0.20	0.00	9.12	4291.43	0.20	0 00:17	0 00:00	0.00	0.00
17	Jun-68	0.53	0.00	4287.96	0.32	0.00	8.20	4287.96	0.32	0 00:23	0 00:00	0.00	0.00
18	Jun-69	0.14	0.00	4290.91	0.20	0.00	8.23	4290.91	0.20	0 00:21	0 00:00	0.00	0.00
19	Jun-70	0.53	0.00	4287.04	0.32	0.00	8.47	4287.04	0.32	0 00:28	0 00:00	0.00	0.00
20	Jun-71	0.53	0.00	4283.59	0.24	0.00	9.41	4283.59	0.24	0 00:29	0 00:00	0.00	0.00
21	Jun-72	0.00	0.00	4284.72	0.00	0.00	9.40	4284.72	0.00	0 00:00	0 00:00	0.00	0.00
22	Jun-73	0.00	0.00	4311.35	0.00	0.00	9.39	4311.35	0.00	0 00:00	0 00:00	0.00	0.00
23	Jun-74	0.38	0.00	4294.82	0.19	0.00	8.46	4294.82	0.19	0 00:28	0 00:00	0.00	0.00

Pipe Results

SN	Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
		(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1	Link-01	0.00	0 00:00	1.68	0.00	0.00		0.00	0.00	0.00		Calculated
2	Link-02	0.00	0 00:00	4.23	0.00	0.00		0.00	0.00	0.00		Calculated
3	Link-03	0.14	0 00:21	0.74	0.20	1.64	1.07	0.20	0.30	0.00		Calculated
4	Link-04	0.14	0 00:17	0.90	0.16	1.89	0.92	0.18	0.27	0.00		Calculated
5	Link-05	0.15	0 00:02	3.05	0.05	4.68	0.22	0.10	0.15	0.00		Calculated
6	Link-06	0.15	0 00:01	3.02	0.05	4.69	0.39	0.10	0.15	0.00		Calculated
7	Link-09	0.02	0 00:01	2.30	0.01	2.09	0.24	0.04	0.06	0.00		Calculated
8	Link-10	0.02	0 00:23	2.04	0.01	1.78	0.52	0.04	0.07	0.00		Calculated
9	Link-11	0.02	0 00:22	1.10	0.02	1.16	1.46	0.06	0.09	0.00		Calculated
10	Link-12	0.02	0 00:24	1.23	0.01	1.26	0.84	0.06	0.08	0.00		Calculated
11	Link-13	0.02	0 00:24	1.17	0.01	1.21	0.63	0.06	0.09	0.00		Calculated
12	Link-14	0.38	0 00:27	4.08	0.09	7.34	0.25	0.14	0.21	0.00		Calculated
13	Link-15	0.00	0 00:00	2.59	0.00	0.00		0.00	0.00	0.00		Calculated
14	Link-16	0.00	0 00:00	3.06	0.00	0.00		0.00	0.00	0.00		Calculated
15	Link-17	0.14	0 00:21	2.09	0.07	3.41	0.38	0.12	0.18	0.00		Calculated
16	Link-18	0.38	0 00:28	2.97	0.13	5.92	0.24	0.16	0.24	0.00		Calculated
17	Link-19	0.53	0 00:28	1.11	0.48	3.13	0.44	0.32	0.49	0.00		Calculated
18	Link-20	0.53	0 00:29	1.92	0.27	4.69	0.36	0.24	0.36	0.00		Calculated
19	Link-22	0.38	0 00:28	2.21	0.17	4.81	0.33	0.19	0.28	0.00		Calculated
20	Link-23	0.16	0 00:01	3.36	0.05	5.16	0.24	0.09	0.14	0.00		Calculated
21	Link-24	0.37	0 00:07	2.73	0.13	5.44	0.51	0.16	0.25	0.00		Calculated
22	Link-25	0.53	0 00:14	23.42	0.02	26.79	0.00	0.07	0.11	0.00		Calculated

SINE SOURCE ENGINEERING
545 W 465 N., Suite 150, Providence, Ut 84332
office: (435) 787-1445 , fax: 1-877-207-3199
www.sinesource.net

MEMO

UTAH STATE UNIVERSITY
BRIGHAM CITY CAMPUS MASTER PLAN
1/24/2012

I have looked at the final concept drawings for the Brigham City Masterplan and compared them with the existing power and communications infrastructure. I have also reviewed VBFA's central tunnel concept. I am going to reference their drawings and Civil Solutions Group fiber and power drawings as they show much of the information applicable to my scope of work.

Existing Conditions

Power: There is currently a 3-phase power infrastructure throughout the campus. There is a dividing line at 200E with lines to the west of 200E mostly underground and those to the east overhead. Additionally there is a utility substation to the north of the campus about 700 S 400 E.

Communications: Utopia fiber infrastructure appears to be developed around the North and West perimeters of the campus, but appear to be largely undeveloped throughout the campus. Qwest lines are developed throughout the campus and generally seem to follow the power distribution whether it be overhead or underground.

Central Plant Concept

The concept of central plant distribution for power and communications utilities has more to deal with metering and control of lines than it does with usage or demand. When a utility owns the lines they require that the installations comply with their standards. They also require access easements anywhere the lines are routed. Additionally, they charge a base rate for each service location in addition to the usage charges. Many large customers opt for a single point of delivery, which could be taken to a central plant location. There are advantages and disadvantages to both.

1. Advantages:
    a. Single point of delivery which simplifies billing
    b. Better (lower) rate schedule from utility
    c. Flexibility to determine own distribution standards. In this case, USU already has standards in place for medium voltage and communications distribution and could continue with those standards on BC campus.
    d. Allows flexibility for internal metering/billing procedures
    e. Don't need to grant utility easements

2. Disadvantages:
    a. Owner maintenance of lines and equipment is required.
    b. Skilled workers and/or external contractors needed for maintenance
    c. May require removing or abandoning existing utility distribution throughout the campus.
        i. Some of the lines routed through campus serve customers to the south and east of campus.

Brigham City Campus Feasibility

1. Central Plant Distribution:
    a. Power: Using the central plant concept for owner distribution of power and communications is feasible for the USU Brigham City campus. The planned central plant location at the south-east corner of campus is not ideal, but can be utilized. The proposed concept would be to take delivery from Brigham City Power at 12470V using a single, primary meter at or near the central plant. The owner would then install primary distribution equipment at that location. The lines would then be loop fed throughout the campus as development of the campus progressed. The initial phasing would be intrusive to existing road/infrastructure as new lines ideally would need to be buried for the incoming utility delivery, and for outgoing distribution from the central plant location to the first academic building (see attached file with estimated delivery routes).

    Phase 2 work will require extensive coordination with Brigham City Power and Qwest. An existing main overhead line is routed N/S along 200 east to 1000 S and then feeds back up around 600E. These lines are tapped to distribute power to customers to the south, and east of campus. There is also a connection from the main line to un underground line that feeds customers to the east. Alternate distribution is feasible, but utility coordination will be required so that main lines are not re-routed through future building footprints.

    The anticipated campus demand for each phase is as follows:
    - Phase 1: 1.75 Megawatts
    - Phase 2: 2.9 Megawatts (total)
    - Phase 3: 3.75 Megawatts (total)

    Demands given are total, cumulative, anticipated demand at the end of each phase's construction. Demands have been calculated using USU's main Logan campus as a model taking the campus's existing demand to determine a watt/square foot average demand, giving it an adjustment factor to allow for a more dense campus and measurement discrepancies, and then extrapolating that to the proposed campus masterplan for each phase. "Demand" represents actual, anticipated draw on the utility system, but does not correspond to calculated loads based on the National Electrical Code which would indicate higher requirements.

    b. Communications: It is anticipated that the campus will have a central data center at some point which may be near, or part of, the central plant. The concept for owner distribution of communications is similar to that of power—and new communications lines would be routed along the same path as the power infrastructure. Qwest and Utopia lines are both near the campus. Both utilities are available from the north and could be routed generally along the same path as the incoming power lines.

However, an alternate route coming in from Main Street along 1000 W is also worth consideration as it is possible that distribution throughout the campus for phase 1 and phase 2 may be from the Academic Building while infrastructure is being built.

2. Existing utility lines and customers:
    a. Many of the existing lines are routed overhead. If the utility system were to be maintained, some of the lines could be relocated underground fairly easily when tunnels were constructed.
    b. As was previously mentioned, some customers are served north, south, and east of campus via lines that will be affected by the campus construction. For either scenario—central plant/owner distribution or utility distribution, the utility infrastructure around the campus will need to be adapted to re-serve these customers (see attached).

Please let me know if there are any additional questions or concerns.
Thank You,
Shane Swenson, PE

VAN BOERUM
& FRANK ASSOCIATES, INC.
CONSULTING ENGINEERS

Corporate Office
Salt Lake City
330 South 300 East
Salt Lake City, UT 84111
T 801 530 3148
F 801 530 3150

St. George
1070 W. 1600 South
Suite #104
St. George, UT 84770
T 435 674 4800
F 435 674 2708

Logan
40 W. Cache Valley Blvd.
Building 1, Suite B
Logan, UT 84321
T 435 752 5081
F 435 752 0355

Arizona
1414 W. Broadway Rd.
Suite #159
Tempe, AZ 85282
T 480 889 5075
F 480 889 5076

January 9, 2012

Based on the preliminary concept drawings, we have performed a feasibility review of a central plant system for the USU Brigham City Campus. District heating and cooling are best used in applications where 1. the thermal load density is high (i.e. high building density) and 2. when the annual load factor is high.

Load Density: The high load density is required to cover the capital investment associated for the transmission and distribution system, which usually constitutes most of the capital cost for the overall system (ASHRAE suggests the distribution system typically comprise 50-75% of the total cost associated with district heating and cooling.) A central plant and distribution system that utilizes multiple utilities (Phone, IT, etc. in addition to district heating & cooling) maximizes return on investment.

Load Factor (avg. power divided by peak power): It is important that the annual load factor be high because the total system is capital intensive. These factors make district heating and cooling systems most attractive in serving high-density building clusters with high thermal loads.

For the above reasons district heating is best suited to areas with high building and population density in relatively cold climates. District cooling applies in most areas that have appreciable concentrations of cooling loads such as schools, laboratories, rec-centers, etc.

Advantages: Central plant systems offer the following advantages.

1. 25% Diversity Factor: Typically the total required capacity of the plant is approximately 75% of the sum of each building's maximum instantaneous demand.
2. Less Capital: Due to economy of scale & diversity, the central plant requires less capital than providing heating and cooling individually at each building. It has been our experience, however, that distribution systems with walkways capable of supporting golf cart support vehicles often offsets the savings associated with the central plant.
3. O&M Staffing & Costs are Reduced: A central plant requires less, and higher trained, personnel. Optimization and continuous and accurate monitoring is practical.
4. Increased Efficiency: Central plants are typically equipped with multiple high efficient water cooled centrifugal chillers. Modern DDC control systems are able to stage chillers for optimum efficiency. For this reason, part load performance and efficiencies are substantially improved. District heating typically does not have an associated efficiency increase but opportunities for heat reclamation and recovery are greatly improved with a central plant system (see item 5 below.)
5. Green Building Optimization is More Practical: Opportunities for thermal storage, Co-Gen, Heat Recovery, Wind, Solar, Ground Water Heat Rejection, Load Shedding (selective load reduction to

PRINCIPALS
Mechanical: Kim P. Harris, P.E. | Richard G. Reeder, P.E. LEEP AP BD+C | Byron Torgersen, P.E. | Jeffrey S Watkins, P.E. | Donald K Bradshaw, P.E. CPD | Benjamin Davis, P.E. | Ladd M. Birch, P.E. | Michael S. Mooney | Neil H. Spencer, P.E. LEED AP BD+C | Wade W. Bennion, P.E. LEED AP BD+C | Steven T. Shepherd, P.E., LEED AP BD+C | Brad W. Rosenhan, P.E. | Ray D. Vernon, P.E. LEED AP BD+C | J. Howard Van Boerum, P.E., FACEC (emeritus) | John D. Frank, P.E. (emeritus)
Electrical: Barry L. Hulet, P.E. | Stan W. Johns, P.E. | Lawrence A. Rember
Civil and Fire Protection: David P. Baranowski, P.E.

maximize utility rates) etc. become more practical when the generation of heating, cooling, and electricity are centralized.
6. Building utility metering: Central plants offer the ability to meter the utilities at each building.
7. Redundancy: Central plants are typically equipped with N+1 redundancy. The loss of a single boiler or chiller typically results in no interruption. Central plants equipped with Co-Gen electricity generation also offer redundancy, typically limited to emergency power.

Disadvantages: Central plant systems typically have the following disadvantages.

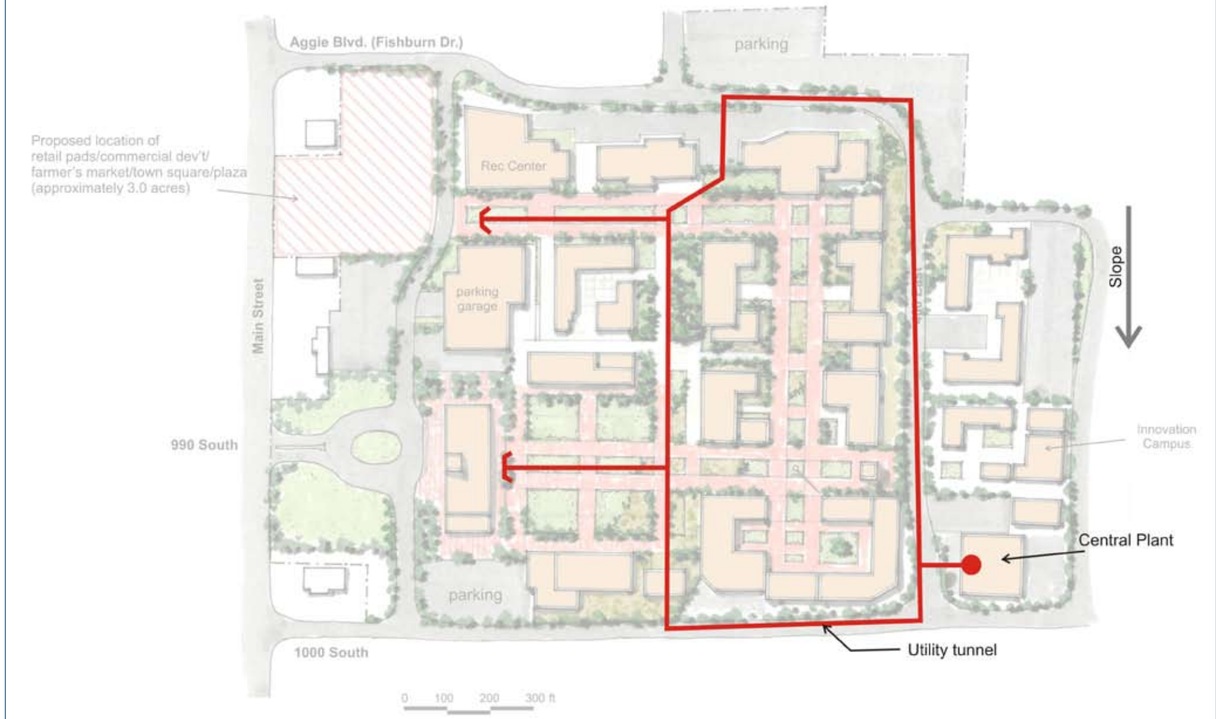
1. Thermal & Hydraulic losses occur in large distribution networks.
2. Initial construction costs require large capital investment.

Brigham City Campus Feasibility: The total campus elevation delta is approximately 55-feet and the gradient is gradual. The central plant may therefore be located anywhere on campus without imposing an excessive load on any building. The campus high point is on the north-east corner, with the low point being on the south-west corner. Locating the central plant at the high or low point offers a slight advantage with steam distribution. The proposed concepts do not facilitate an optimum central plant location. The plant will be located on the southeast corner. The tunnel distribution loop will encircle the campus as depicted on the attached drawing.

Sincerely,

VAN BOERUM & FRANK ASSOCIATES, INC.

Ray Vernon, P.E.
Mechanical Engineer



FEHR PEERS

USU BRIGHAM CITY

TECHNICAL MEMORANDUM

To: CRSA

Date: January 27, 2012

From: Fehr & Peers

Subject: Transportation Information - DRAFT UT11-901

The purpose of this memorandum is to provide background and future transportation information in regards to the Utah State University (USU) Brigham City Regional Campus. The information contained herein will eventually be put into a more formal memorandum. All referenced figures located at the end of the memorandum.

Under existing conditions, the proposed Utah State University (USU) Brigham City Campus site is composed of a quasi-grid roadway system. As the campus expands, many of the existing roadway will removed and internal circulation will emphasize pedestrians and bicycles.

ZIP CODE DATA

USU provided zip code data for the students that attend the Brigham City Regional Campus. Figure 1 shows the distribution of the student population at the current Brigham City Campus location. This information will be used to determine the distribution of traffic to/from the new campus site.

TRAFFIC VOLUMES

Daily traffic volumes were collected from June 21, 2011 to June 23, 2011 on 800 South, 1000 South, and 200 East. The following shows the average daily traffic (ADT) on those respective roadways:

- 800 South: 690 ADT
- 1000 South: 1,110 ADT
- 200 East: 730 ADT

Main Street has an ADT of approximately 17,600. The historic traffic growth on Main Street near the campus site, based on five years of Utah Department of Transportation (UDOT) data (2005-2009), is approximately 2%. In other words, the traffic on Main Street has increased by about 1,330 ADT since 2005.

MAIN STREET INTERSECTION SPACING

UDOT has classified Main Street (SR-13) as a Regional Urban roadway, also known as a Category 6 roadway. The State Highway Access Management Standards state that Category 6 roadways should meet the following spacing requirements:

- Minimum Signal Spacing: 1,320 feet

2180 South, 1300 East, Suite 220 Salt Lake City, Utah 84106 (801) 463-7600 Fax (801) 486-4638
www.fehrandpeers.com

DRAFT

- Minimum Street Spacing: 350 feet
- Minimum Access Spacing: 200 feet

This information is and will be important when making decisions on the future of the Kmart / Main St. signalized intersection, signalization of the Fishburn / Main St. intersection, and any other street connections (present and future) on Main Street.

PARKING

The following are preliminary numbers regarding parking. We have gathered information (parking spaces, students, square footage, utilization, etc.) supplied by USU from the existing USU Brigham City Regional Campus and the USU Tooele Regional Campus. The parking rate for the Brigham City Regional Campus is 0.25 stalls/student (using the 80% utilization during the peak period – 5:00pm to 8:00pm). Assuming the first main building at the new campus site in Brigham City is expected to hold the same number of students as the existing campus site (1,971 students), then approximately 500 parking stalls would need to be supplied at the new campus site for the first building (using the Brigham City rate of 0.25 stalls/student).

In the future, the Campus is expected to grow in the next hundred years to 3,900 full-time equivalent students (FTE), or roughly 7,800 students (the USU Brigham City Campus Feasibility Study cites a ratio of FTE to headcount as 2:1). Thus, preliminary numbers indicate around 2,000 parking spaces are needed for the 100-year full build of the site.

ADT

Existing traffic volumes internal to the site are minimal. Existing ADT on 200 East is 730; on 800 South is 690; and 1000 South is 1,110. Over the next five years as the main campus building is built, ADT is expected to rise but generally stay at or below 4,000 vehicles on Fishburn and 990 South. In both the short- and long-term future, internal ADT is expected to remain low while the main entrances to campus, such as Fishburn and 1000 South, are expected to increase substantially. Figures 2 through 4 show campus-wide ADT for the three future phases of the campus.

Roadway Design

Campus roadway sizes were determined by phase based on capacity and projected ADT. Given the environment of the USU Brigham City campus, the following roadway capacities are expected:

- Two-lane 10,500 ADT
- Three-lane 11,500 ADT
- Four-lane 22,500 ADT

Using the above standards, all campus roadways will function at a projected Level of Service (LOS) C or better with a two-lane configuration. As the campus moves toward its 100-year build-out, the three main entrances to campus, Fishburn, 990 South, and 1000 South, will experience an increase in traffic, but should remain under the threshold for LOS C on a two-lane roadway.

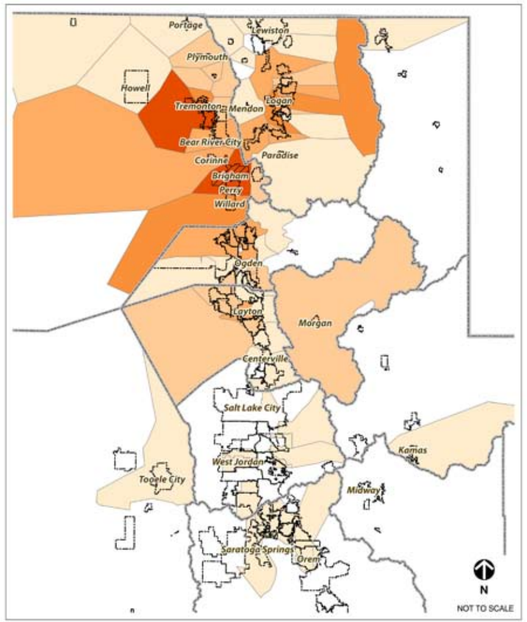
It is recommended that all roadways include bicycle lanes, sufficiently wide sidewalks, and, if applicable, transit pullouts. Figures 4a, 4b, and 4c show proposed campus cross sections.

Intersection Control

Most intersections on campus are projected to be unsignalized and will require a two-way stop, four-way stop, or roundabout as a control measure. Campus intersections with Main Street may warrant signals in future years as the campus and enrollment expands.

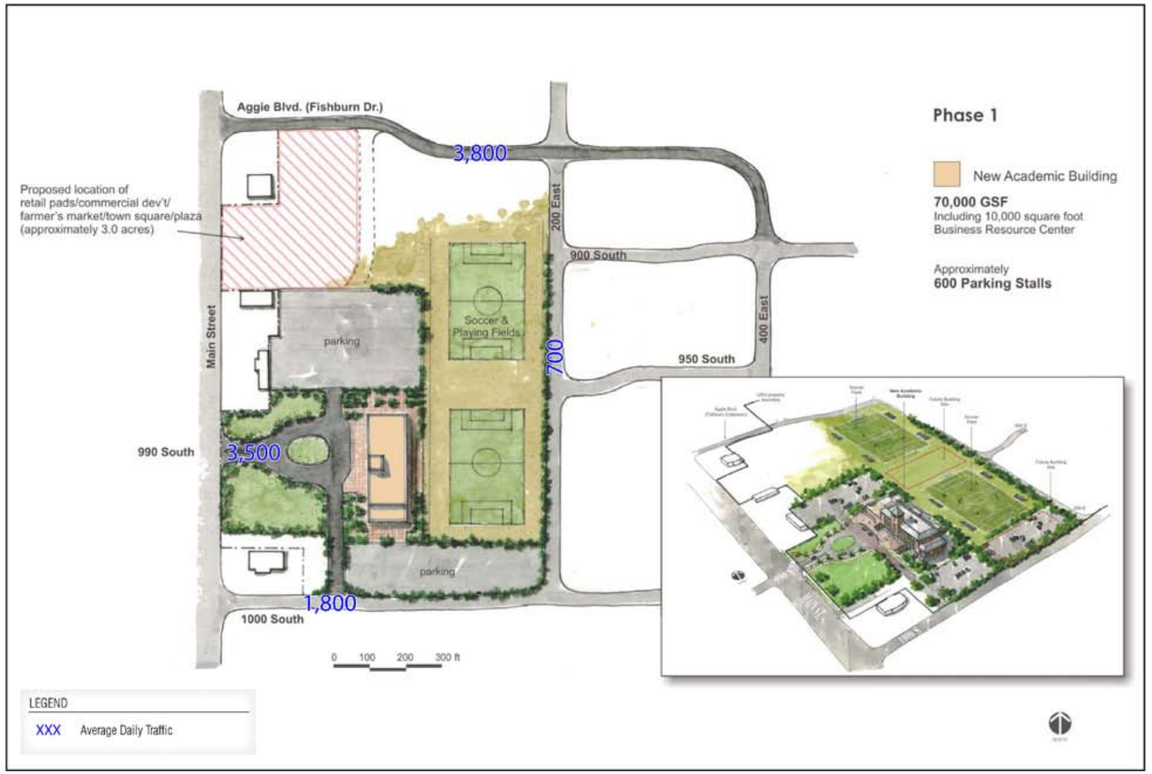
Traffic Calming

Internal roadway speeds should be minimized to preserve the nature of a college campus. Recommended traffic calming measures include bulb-outs, speed tables, and chicanes where necessary. Crossings for pedestrians should be accommodated through raised crosswalks. For roadways not expected to carry the bulk of traffic, such as 500 East, lane widths should be reduced and should be kept in the 10-foot range.



FEHR PEERS

USU BRIGHAM CITY
Student Population by Zip Code
FIGURE 1



FEHR PEERS

USU BRIGHAM CITY
Projected Phase 1 Average Daily Traffic

FIGURE 2

FEHR PEERS

USU BRIGHAM CITY
Projected Phase 2 Average Daily Traffic

FIGURE 3

FEHR PEERS

USU BRIGHAM CITY
Projected Phase 3 Average Daily Traffic

FIGURE 4